NBSIR 75-641

Performance of Mobile Homes Data Acquisition and Analysis Methodology

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Interim Report

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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary

NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

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4.0 Summary Comments

Performance of Mobile Homes
Data Acquisition and Analysis Methodology

by

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Abstract

In a study at the National Bureau of Standards (NBS), funded by the Department of Housing and Urban Development (HUD), methods for inspecting mobile homes to identify performance problems, recording the problems and analyzing the problem data were developed. Maintenance work orders for 2881 mobile homes, a part of 12,500 provided by HUD for emergency housing in the aftermath of Hurricane Agnes, at Wilkes-Barre, Pennsylvania, were reviewed and computer coded by an inter-disciplinary team of engineers. Also, performance data were obtained from State and other Federal agencies for over 967 privately owned mobile homes. A second task was the field inspection of 257 mobile homes to assist in the determination of the causes and consequences of the problems identified in the data acquisition task. Computer techniques were developed to process the data and print out problem summation tables, graphs to establish trends, compile data on obvious problems and ferret out those problems which may not be obvious. This first report documenting the data acquisition and analysis methodology will be followed by a series of reports which will present results and relate them to current standards, the regulatory and insurance processes.

Key Words: Construction; Hurricane Agnes; Housing; Mobile Homes; Mobile Home Parks; Performance data; Regulatory Process; Standards

1.0 INTRODUCTION

1.1 Objectives of Project. Recently, many people and groups have questioned the effectiveness of mobile homes in providing safe, adequate and low-cost shelter. Although life-safety aspects such as fire safety and wind damage receive the most publicity, functional characteristics appear to be of broader concern to mobile home owners. It is recognized that mobile homes are subjected to conditions prior to occupancy, e.g., manufacturing, transportation and siting[1] which differ greatly from conventional housing. Because of these unique conditions, mobile homes exhibit performance problems which may not be encountered in other forms of housing. Unfortunately, there is a limited amount of organized documentation of these performance problems, making it difficult to pinpoint what aspect of the mobile home production process (standards, regulatory, manufacturing, transportation or siting) could be at fault. There is also limited data to assist in evaluation of the durability and maintainability aspects of mobile home construction.

To investigate these recognized problems, a project funded by the Office of Policy Development and Research of the Department of Housing and Urban Development (HUD) was structured around the following objectives:

A. Identification and documentation of significant mobile home performance problems.

B. Determination of the relationship between the identified performance problems and provisions of:

   1. ANSI A119.1 Standard for Mobile Homes.

   2. Inspection, Quality Assurance, and Regulatory Processes.

   3. Mortgage Insurance Requirements.

C. Determination of problem areas requiring additional mobile home research.

1.2 Mobile Home Industry. Mobile homes have risen to a position of dominance in housing in the United States representing approximately one-fifth of new housing starts in each of the past five years. The production of mobile homes increased dramatically from 100,000 units in 1960 to around 600,000 units in 1973 (Figure 1). In the under $20,000 new housing market, mobile homes represented 96% of the houses produced in 1973 which is somewhat higher than the rate for years 1968 to 1972 (Figure 2).

The growth of the mobile home industry has resulted from its ability to produce a product which meets the price requirements for lower income groups during a period of rising costs for all types of housing. Young families and an increasing number of retired persons are creating a demand for lower-cost housing containing the modern amenities. The growth of the industry has also been helped by the willingness of the commercial banking system to extend loans to customers and dealers for the purchase of mobile homes.

The basic dimensions of mobile homes can vary in width from 8 feet to 16 feet and in length up to 70 feet. Flexibility in home configuration can be obtained with units designed with expandable portions, and single wide units designed to form double wides when placed adjacent to one another, or in some cases, triple wides. The width of the units is an important dimension because of its impact on transportation over the highways. The distribution of mobile home shipments for the years 1971, 1972 and 1973 as a function of width is shown in Figure 3. The percentage of shipments of 12-foot wide units has been decreasing somewhat during the period while shipments of 14-foot wides and double wides have increased. The number of 8, 10 and 6-foot wides and expandables[2] is a small portion of total shipments. It is anticipated

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1/ Siting encompasses placement and leveling the mobile home on its foundation, installing steps, skirting and connecting utilities.

2/ Units designed with sections which either push-out or swing out from the mobile home at the site.

that 14 and 16 foot wide mobile homes will increase their share of the total market in future years as more states relax highway transport width limits.

1.3 Mobile Home Standards. The mobile home industry is unique within the building industry in that there is a single standard, ANSI A119.1 Standard for Mobile Homes [1] 3/, which covers the major aspects of the mobile home building process, i.e., construction, electrical, plumbing and mechanical. Park considerations are included in ANSI A119.3 Standard for Mobile Home Parks [2]. These standards are developed using the concensus process by ANSI Committee A119 on Mobile Homes and Recreational Vehicles. The committee is sponsored by three industry groups (Mobile Home Manufacturers Association, Trailer Coach Association, and the Recreational Vehicle Institute) and the National Fire Protection Association. Committee membership is drawn from the mobile home, recreational vehicle, and related industries as well as from state and federal governmental organizations, consumer groups, trade associations, insurance industry and other interested groups.

States that have legislated mobile home construction requirements have most frequently adopted ANSI A119.1 as a whole or have used it as a model upon which to base their standards. As of June 1, 1974, 45 states have adopted or are in the process of adopting ANSI A119.1 or portions thereof.

1.4 Mobile Home Regulatory Process. Because of the nature of the product and its manufacturing process, the regulatory process for mobile homes is unique to the housing industry. Enforcement of a mobile home standard is the responsibility of the state in which it is manufactured and generally includes certification that the construction meets the codes requirements and inspection of the product in the factory to insure that the approved design is met.

There are two basic regulatory programs which are used separately or in combination by the states. Some states set up mobile home agencies to enforce regulations while others utilize independent third party organizations to perform such services. A typical combination would be for the states to set up an in-house agency for plan certification while employing a third-party to perform in-plant inspection. A recent National Bureau of Standards publication by Cooke, Tejuja, Dikkers and Zelenka [3] outlines the various programs in use by the 50 states as of early 1974. This report establishes the fact that there is considerable legislative activity at the state level in the mobile home and manufactured building regulatory field.

1.5 Project Approach. In order to address the stated objectives, the project was organized around three basic tasks.

Task 1 - Collection and Analysis of Existing Mobile Homes Performance Data

Collection of data from Federal agencies, State regulatory agencies, and consumer groups to reflect trends and identify functional failures and major problem areas.

Task 2 - Field Inspection of Mobile Homes

Inspection of mobile homes in the field in an attempt to determine the causes and consequences of the performance problems documented in Task 1.

Task 3 - Summarize Data and Develop Conclusions

Synthesize data obtained in Tasks 1 and 2 to fulfill the other objectives of the project. Develop additional source documents in the standards and regulatory areas.

3/ References are listed at end of report.

A. Regulatory Study - Visit State agencies regulating mobile homes and manufacturers within that state to determine specific effects of the regulatory programs. In addition, visit selected states representing a cross section of typical programs such as state operated programs, third party programs, and combinations of the two used throughout the United States.

B. ANSI A119.1 Standard for Mobile Evaluation Study - Prepare a document outlining changes in the specific requirements of the ANSI A119.1 Standard from the 1969 edition through the 1972, 1974, and 1975 editions.

2.0 DATA ACQUISITION PROCEDURES

2.1 Introduction. The mobile home data obtained consisted of maintenance records, consumer complaints, on-site inspection reports, etc. and data resulting from NBS field team inspections of mobile homes. Because of the varying nature, location and availability of these data sources, procedures had to be established which would provide a cost-effective and timely means of data retrieval.

In the planning phases of the project, it was anticipated that the major portion of performance data would come from mobile homes used by HUD as emergency housing following the 1972 Hurricane Agnes disaster. Later, when it became evident that these units were all manufactured at approximately the same time and were put into use under emergency conditions, it was decided to seek additional data sources in order to obtain a more representative data base. These added sources included other Federal agencies, state regulatory agencies, consumer groups, and private owners of mobile homes.

2.2 Available Mobile Home Performance Data

2.2.1 HUD Data (Hurricane Agnes Mobile Homes). As a response to Hurricane Agnes, HUD set-up and maintained a records system which allowed an evaluation of the performance of the mobile homes used as temporary housing.

2.2.1.1 HUD Response to Hurricane Agnes Disaster. The Department of Hosuing and Urban Development purchased approximately 18,000 mobile homes that were used as temporary housing for victims of the Hurricane Agnes disaster which occurred in June, 1972. The largest concentration of these mobile homes was in the Wilkes-Barre, Pennsylvania area where they totaled approximately 12,500 units. The urgent need for mobile homes was such that large quantity purchase contracts were negotiated and awarded in a minimal time period to manufacturers and dealers with the primary requirement being the earliest possible delivery date. Since this immediate need exhausted the local market of mobile homes, manufacturers and dealers from as far south as Florida and as far west as Texas, supplied mobile homes to the disaster relief effort.

The exigencies of time, in many instances, precluded specifying that these mobile homes meet the requirements of standards such as ANSI A119.1 or of the code of the state in which the home was purchased.

The processing procedure for incoming mobile homes in the Wilkes-Barre area was as follows. Three large staging areas were established at convenient locations in the city, namely the Red, White, and Blue staging areas (See Figure 4). Each mobile home that entered the area was delivered to a particular, previously assigned staging area. Upon arrival at the staging area each mobile home was visually inspected to determine if it could be assigned for use immediately or if some repairs were needed as a result of manufacturing omissions or possible transport damage. Repair crews were available to make the mobile homes "field ready" after which the homes were delivered to either private sites or to the various mobile home parks that were being constructed in the area. Field crews were then given the task of blocking and leveling the units, hook-up of all utilities, and installing preconstructed

wooden stairs at the entrance doors and installing skirting on the mobile homes.

As soon as the mobile homes were available for occupancy, families were assigned and moved into them. The occupants then had the use of these units until their pre-disaster dwellings were rehabilitated or until permanent housing became available. Any maintenance or repairs to the mobile homes needed during occupancy was accomplished by HUD repair crews or designated contractors. The occupant simply had to call the HUD Maintenance Office giving his or her name and address along with the HUD number assigned to their mobile home and request the needed repairs. A record of the call was made by filling out a repair work order. These repair orders were then assigned to maintenance crews for disposition. Upon receipt of the order, the maintenance crew would proceed to the mobile home and make the necessary repairs noting the extent of the repair, the time required, and materials used for each ordered repair. This copy of the repair order was then returned to the maintenance office and placed in a file folder that had been established for each mobile home under the HUD identification number. A typical "maintenance work order" is presented in Appendix A, (Exhibit 1). Using this procedure a complete history of all repairs made to each mobile home while occupied or available for occupancy (through park manager initiated maintenance orders) was established.

As permanent housing became available to the initial occupants, the units were either reassigned to new tenants or kept available on a standby basis. As the need for temporary housing declined each empty unit was evaluated by HUD inspectors to a set of criteria established by HUD so that a disposition decision could be made. Typical forms used in this "criteria inspection" are also presented in Appendix A, (Exhibit 2). The disposition options were as follows: refurbish the unit and store it for future disaster use; declare it surplus and place it on the market for transfer to other federal government agencies that expressed a need; or declare the unit unusable and allow it to be salvaged for repair of other units. The option selected generally depended on the dollar outlay required to refurbish the mobile home. A small number of units were sold to the occupants that had resided in them and indicated a desire to purchase. The Kaminski storage area (See Figure 4) was established to accommodate the vacated mobile homes as each of the parks were deactivated and until final disposition of the units could be completed. This storage area was the location of the NBS field team inspection operations described herein.

2.2.1.2 Data Acquisition Procedures. The two major sources of data used in this phase of the project, maintenance and refurbishment data (Appendix A - Exhibits 1 and 2), were brought to NBS on loan from HUD. Only data for approximately 10,000 units of the 12,500 total were included since HUD required that files for all active mobile homes (those still occupied) must remain in Wilkes-Barre.

The other source of data was HUD Finance Department records which could not be taken from Wilkes-Barre. It was necessary to have access to these files since they contained valuable mobile home identification information such as manufacturer, serial number, state and year of manufacture, purchase cost, number of occupants and length of occupancy. A former HUD staff member with experience on the Hurricane Agnes Disaster Team was placed under contract to extract information from these files and also to provide liaison for all NBS Wilkes-Barre activities.

2.2.1.3 Sample Selection Criteria. As previously noted, the files obtained from Wilkes-Barre had a numbering system which uniquely identified each mobile home. The system was based on an eight digit number with the first four digits being the contract number and the last four digits being the number of the mobile home purchased under that contract. For example, the mobile home with the HUD number 3092-0100 represents unit 100 purchased under contract number 3092. The files were ordered consecutively by HUD contract number and by unit number within each contract. The number of mobile homes within a contract varied from one to several hundred.

Since it would not be possible to evaluate data for the entire 10,000 units, a method of selecting a representative sample without bias was devised by the Statistical Engineering Section of the NBS Institute of Basic Standards. This method consisted of randomly selecting 500 units at a time without replacement. A random number table was generated and used

to select a 3000 unit sample (in 500 unit blocks) from the numerically ordered files for detailed evaluation. The sample was deemed to be both manageable and representative of the 10,000 unit population. The vast majority of the problems were gleaned from the maintenance work orders; only about 10% of the problems were provided by the refurbishment data. The maintenance work orders for these 3000 units were separated to facilitate computer coding of the performance problems. Refurbishment data were found for only 1560 of these 3000 units because a large amount of this data had been shipped from Wilkes-Barre with the mobile homes to other storage locations throughout the country.

2.2.2 Privately Owned Mobile Home Data

2.2.2.1 General. Acquisition of performance data on mobile homes from sources other than HUD was a basic requirement of the project. It was felt that these data from privately owned mobile homes were needed to augment the performance data obtained from Wilkes-Barre. Consideration of the two data sources should enhance the general applicability of the overall study results and tend to minimize any variations caused by the differences between Federal government and private procurement and certification procedures.

2.2.2.2 Data Source Selection Criteria. Since the study resources were finite and limited, it was decided early in the planning phase to concentrate on those states with large mobile home populations such as California, Texas, Florida, etc. Using this approach it was possible to gain access to the maximum quantity of mobile home performance data for a minimum expenditure of time and money. It is recognized that this data acquisition method does not render results that are statistically reliable for the total mobile home population of the U.S. On the other hand, the results are generally representative of the performance problems encountered by mobile home users. The performance problems identified in privately owned mobile homes can be useful in ferreting out the major problems and their relation to the mobile home standard (ANSI A119.1) as well as to regulatory procedures.

Initial emphasis concentrated on the state agencies responsible for mobile home regulation and/or administration. Table 1.2.2 from reference [3] was found to be extremely useful as a guide to the location and personnel of the state agencies regulating mobile homes. These agencies varied widely from state-to-state and were attached to building code, consumer affairs, community development, labor or motor vehicle organizations. In addition to the state organizations, other agencies with potential data banks on mobile home performance were contacted. These included Federal agencies such as the Veterans Administration, mobile home owners organizations, privately owned mobile home parks with rental units, and various consumer groups. There was no attempt to interview private mobile home owners on an individual bases.

2.2.2.3 Data Acquisition Procedures. The initial contact with the various potential sources of mobile home performance data was made by a telephone call to the organization. The scope of the project was discussed and a request was made for the organization's cooperation in making data available to NBS. The request included forwarding NBS a sample copy of two or three documented cases of mobile home performance problems from their files along with an estimate of the total number of such cases available. As a follow-up action to the phone call, a letter was transmitted to the individual contacted recapping the phone conversation with a request for sample cases and other information. As a result of the above procedure, responses including sample cases were received from 14 sources as listed in Table 1.

After initial discussions with agencies having data, it became clear that most of these agencies did not have sufficient staff to extract the data needed by NBS from their mobile home files. As a result it was decided to send project field teams to those sources which appeared to have maximum quantities of mobile home performance problems on file. Visit arrangements were coordinated with the selected source and usually a two man team made the visit and retrieved the data. Normal procedure on arrival at the source's office was to review the total mobile home file available, and select a representative sample of cases where the file was too voluminous to copy each docket. For each case selected a copy was made of the owner's initial complaint letter and, when available, the agency follow-up

inspection report. In addition, mobile home identification data were recorded for each case using the form shown in Exhibit 3, Appendix A. Using the above procedure a total of 967 mobile home performance problem cases were obtained as summarized in Table 1.

2.3 Field Inspection Data

2.3.1 Selection Criteria. It became necessary to establish a selection criteria for mobile homes because of the large number available both in the HUD stockpile and in the private sector.

2.3.1.1 HUD Units. Initially it was planned to select units for field inspection at Wilkes-Barre that were included in the 3000 mobile home sample undergoing performance data analysis (Section 2.2.1.3). It became evident very early in the field inspection operations that this type of procedure would not be practical because of the difficulty encountered in locating specific units in the large rapidly changing inventory of mobile homes at Wilkes-Barre. Units were being moved on a 24 hours per day basis in and out of the storage area making it virtually impossible to obtain an accurate current inventory or locate specific units. Additionally, the inventory was down to 2000 units from the initial 12,500 mobile homes used in the disaster effort.

As a result, the procedure adopted was simply to select units at random for field inspection with no attempt at pre-selection (random sampling). There was an attempt to inspect units of as many different manufacturers as possible and to skip duplicate units. A total of 237 units were field inspected at Wilkes-Barre.

While the large concentration of mobile homes in the Wilkes-Barre area as a result of Hurricane Agnes created an excellent opportunity for field inspection of mobile homes, some drawbacks were apparent. All of the units had been manufactured at approximately the same time (1971-1972) and many were transported over unusually long distances and had been sited under emergency conditions. The temporary nature of the mobile home parks and private site placements created problems that would not have been encountered under normal circumstances. The conditions were further complicated by the fact that the occupants were living in mobile homes by necessity and not by choice. Also, the performance data gathered at Wilkes-Barre by the field inspection team represents an atypical condition in that the team was looking for and recorded the most extreme problems encounted.

2.3.1.2 Privately-Owned Units. The peculiar conditions related to acquisition, siting and occupancy of the HUD Agnes mobile homes made it necessary to inspect mobile home usages under more normal conditions. The field study was enlarged to include units from the private sector.

Because of the difficulties of locating and arranging inspection of individually owned mobile homes, sources were sought out which would allow access to a large number of units at a single location. Also, it was desirable to have access to purchase specifications and maintenance records of the homes inspected. Four such sources were located at various locations in the United States.

A privately owned mobile home park in Lexington Park, Maryland, consisting of 25 new single wide (12 foot wide) units which had just been installed and occupied, was inspected. These were duplex rental units and had been purchased to a specification established by the owner and had unique construction characteristics. Each unit was divided into two living areas with separate bath, kitchen and sleeping facilities.

Mobile homes constructed in 1962 and 1965 were inspected at Warren Air Force Base in Cheyenne, Wyoming to obtain data which could be related to durability. These units which are being used as housing for families of construction personnel have been moved eleven times over an average distance of 650 miles each move. The mobile homes were purchased under a specification prepared by the Air Force and have been maintained for the Government by a

private company since purchase.

A private mobile home park containing 200 mobile homes manufactured in 1971 and 1972 was inspected in Montgomery, Alabama. These units were owned by the Alabama Farm Bureau (not state affiliated) and rented to Air Force personnel attending 12 week courses at Maxwell Air Force Base. In addition to inspection of these units, maintenance records for one twelve week occupancy period were obtained along with refurbishment data for the life of each unit.

Five mobile homes being modified under a HUD Grant for use by handicapped students were inspected at St. Andrews College in Laurinburg, North Carolina. These units were obtained by the College from the HUD Agnes stockpile and purchase, maintenance, and refurbishment data for the units were available.

2.3.2 Interdisciplanary Team Approach. The mobile home field inspection team consisted of NBS staff members with expertise in various phases of the building process. The team members had many years of experience in their particular area of the building process and also had some experience in the mobile home field. The team consisted of a structural engineer-project manager and five other members with engineering expertise in the fields of materials, plumbing, heating, electrical, and fire technology.

Prior to initiation of the field inspection task, the team members became familiar with the construction of mobile homes by visiting several mobile home manufacturing plants including one that produced average quality units as well as a plant that produced a superior product. A visit to a manufacturer of mobile home frames and metallic roll roofing was also included in the familiarization program. These plant tours were very instructive and the plant managers extremely helpful and cordial in their efforts to explain the manufacturing processes used for producing mobile homes.

In addition to the plant tours, the Mobile Home Maintenance School established by HUD in Wilkes-Barre for training of repair crews, was visited by the field inspection team. These training courses for maintenance of heating, electrical and plumbing systems were established by HUD to increase efficiency of the repair crews responsible for maintenance of the disaster units.

2.3.3 Development of Field Inspection Techniques. In conjunction with the plant inspections and maintenance shcool visits additional training was afforded the field inspection team by visits to the Red and White Staging areas at Wilkes-Barre (See Figure 4).

The White Staging Area was the "grave yard" for units that had been damaged beyond repair. These units had been either damaged in transport, during placement at the mobile home parks and private sites, or during occupancy. Several units that had been destroyed by fire were also stored here. These units were being salvaged of all usable parts for repair of other mobile homes. Inspection of these units made it possible to observe structural framing techniques (including roof trusses), plumbing trees, wiring techniques, heat duct assemblies and insulation, and vapor barrier installations. Many units had been damaged so severely that it was not necessary to remove paneling for inspection purposes as large portions of the paneling had already been removed or destroyed.

At the Red Staging Area eighteen mobile homes were set aside for use by the field inspection team. While some of these units had been declared unsuitable for further use by HUD because of damaged or inadequate construction such as short outriggers, aluminum wiring, bent frames, excessive refurbishment costs, etc., most were in good condition. Permission was granted to NBS to perform any type of destructive evaluation on these units that the field inspection team deemed appropriate including complete dismantling of the unit if necessary.

The type of "destructive disassembly" inspection procedures employed included the selective removal of ceiling and wall panels (interior and exterior), flooring and undercarriage weather protection barrier, to observe workmanship, structural framing, insulation, vapor barriers, wiring methods and plumbing trees. Samples of the materials such as cabinet doors,

wall paneling, ceiling materials, electrical and plumbing parts and fixtures were removed and returned to NBS for study.

Since it would not be possible to "destructively" inspect any more of the 2000 units at Wilkes-Barre and at private sites, it was necessary to develop "non-destructive" inspection procedures. Evaluation of the eighteen units indicated that it was difficult to remove and replace interior and exterior paneling easily without damage to the paneling. Also, the plumbing trees and heating distribution systems could not be thoroughly inspected without laboriously removing paneling, flooring, or undercarriage weather protection which would be difficult to replace in a like-new condition. The roofing system including metallic membrane, truss construction, insulation, vapor barrier and finished ceiling is unitized. The minimum possible non-destructive method of evaluation would require the removal of the furnace vent stack in order to inspect the immediate area of its penetration through the roof. This vent stack would then have to be replaced and resealed from outside the roof to eliminate water leakage potential.

Consequently, the "non-destructive" inspection procedure used for the vast majority of mobile homes became a visual inspection without the removal of permanent construction. Partition construction could be observed in unfinished closets, water heater compartments and furnace enclosures. Plumbing inspections had to be confined to the hot water heater compartment, under kitchen and bathroom sinks or at washer hookups. Heating system evaluation was confined to the furnace compartment and by removal of floor registers. The electrical distribution system could be evaluated at the load center and by removal of switch plates and duplex outlet covers.

2.3.4 Data Recording Techniques. The data recording techniques used in the field inspection effort were both written and visual. Inspection forms were filled out on each mobile home inspected. These forms included identification, structural, plumbing, heating and electrical information. A photographic record was also made of each unit that included any unusual conditions encountered or failures that were evident. These inspection forms and photographs along with the maintainence and refurbishment data then formed the data base for evaluation of the individual mobile homes examined during the field inspection effort.

2.3.4.1 Inspection Form Development. Since "destructive" inspection was precluded, except for the few units described earlier, a "non-destructive" or visual inspection procedure was developed to record all available information.

A four step approach to the development of the inspection forms for mobile homes was followed. First, each member of the inspection team prepared a list of all information within his particular field of expertise that would be advantageous to know in evaluating the performance of the mobile home. The second step was to list all information that could possibly be observed in an actual non-destructive visual inspection based on the experiences gained in the destructive evaluation experiment. The third step was to collate these two lists with the ANSI A119.1 standard and thereby establish what could be observed as standard variances. The fourth step was to develop an inspection form sheet for each discipline that would evaluate these standard requirements with the available information in a simple check list type format. A typical set of inspection form sheets used is included in Appendix A, (Exhibit 4).

Since an objective of the project is the evaluation of ANSI A119.1 Standard for Mobile Homes, the data retrieved on the data forms is related directly to specific sections of the standard (1974 edition), where possible.

2.3.4.2 Photographic Documentation. To augment the inspection form data and to provide a cross check for future evaluation, a photographic record of each mobile home inspection was made. The first photograph taken was of the front of the mobile home that clearly identified the unit by its unique identification number. Each succeeding photograph taken was of that particular unit and included code violations, component or system failures and any other unusual conditions related to performance that existed on the interior and exterior of the unit. Typical photographic documentation for a mobile home

is shown in Appendix B.

3.0 DATA ANALYSIS METHODOLOGY

3.1 General. An initial project task was to develop a methodology for data analysis which could be used to evaluate the vast amount of mobile home performance data acquired from the various sources. Because of this large quantity of data, it was apparent that computer techniques should be used. It was necessary to develop a coding system whereby a reviewer could record the problems to form a data base for analysis. The data analysis system developed consists of a Problem Catalog which lists a broad range of performance problems, coding techniques to record the problems and computer programs to organize and process the data. In developing this system the following guidelines were followed:

1. The data analysis system should be easily understood and capable of being used with a minimum possibility of error.

2. Data analysis system should be readily expandable and not sensitive to change.

3. Data analysis system should be easy to check.

3.2 Problem Catalog Development. The Problem Catalog contained in Appendix C is composed of two major sections: (1) Mobile Home Identification Data, and (2) Performance Problem List.

The Identification Data Section provides a method of recording information describing characteristics of each mobile home such as manufacturer, state and year of manufacture, serial number, seal or seals of approving agencies, dimensions, construction characteristics, etc.

The Performance Problem List is organized into three subsections which permits categorizing of the mobile home performance problems encountered. (Figure 5):

A. Problems Related to ANSI A119.1 Standard for Mobile Homes

B. Routine Maintenance Problems

C. Appliance and Equipment Problems

The Performance Problem List was developed through a process of evolution; as new problems appeared in the performance data new items were added to the list. The ANSI Standard A119.1 subsection represents virtually the entire 1974 edition of the Standard (NFPA No. 501B-1973), with coding symbols being assigned for appropriate paragraphs. In the case of the Electrical (Part E), Plumbing (Part C), and Heating (Part D) sections of the standard the paragraph numbers and key words in the catalog appear in sequential order, just as they do in the standard. Construction (Part B) differs in that the catalog is organized around major construction components, such as roof, floor, walls and doors etc. Therefore, some paragraph numbers which pertain to several components are repeated and are not necessarily in sequence.

It became apparent in the early stages of data analysis that many of the problems encountered in the Wilkes-Barre files could only be related to ANSI A119.1 in a very general way. While most of the maintenance work orders identified the type and location of problem and stated the manner in which it was corrected, some were lacking in necessary detail. For example, a water leak may have been recorded without any indication as to where in the mobile home it occurred or what was done as a repair. It should be pointed out that much of these data were recorded under emergency conditions with no thought that they would be later used in this project.

In view of these shortcomings, and because of the need to preserve the detail of the problems recorded, it was decided to create a Routine Maintenance Subsection and an Appliance and Equipment Subsection which would be separate from the ANSI A119.1 section. If there

was not sufficient information to record a problem under an ANSI A119.1 heading it was placed in one of these other subsections. These two subsections of the catalog were also developed in an evolutionary manner. The initial organization was established by a concensus judgement of the project staff, a pilot survey of the maintenance records for about fifty Wilkes-Barre mobile homes and a review of Wilkes-Barre mobile home performance problems produced in a separate study conducted by the HUD Office of Policy Research and Development. When a previously unreported problem occurred, a new coding symbol was added to the appropriate section, continually increasing its coverage.

The Routine Maintenance Subsection was organized under the same general headings as the ANSI A119.1 Subsection; i.e. construction, plumbing, heating, and electrical. The Appliance and Equipment Subsection was grouped by appliance; i.e. furnace, range, hot water heater, refrigerator, exhaust fan and smoke detector. Since components of each appliance are listed, it is possible to record as high a degree of detail as the data permitted. Furniture problems and the occurrence of a fire in a mobile home were recorded under a category separate from the three subsections.

A problem level concept is employed to organize and assist in the evaluation of the data. These levels are used for organizational purposes only; they do not indicate or imply the degree of importance of the problems. Figure 5 illustrates problem levels 1, 2 and 3 and Figure 6 isolates ANSI A119.1 (Construction) to illustrate levels 2 through 7. The number in the extreme right hand column of the Problem Catalog in Appendix C indicates the problem level for each item.

3.3 Problem Coding Techniques. The development of the Problem Catalog and coding techniques were interdependent in that they were evolved concurrently. The design of the coding techniques were influenced by the project schedule, flexibility of adding new items to the Problem Catalog, available facilities for preparation of input data and the minimization of computer coding errors. The latter could be most readily accomplished by a coding form which could be read electronically, producing a magnetic tape for computer input. This would eliminate, of course, the human error inherent in the conventional method of preparing computer input data by keypunching computer cards. Two systems are currently available wherein it is possible to transcribe data from coding forms directly to magnetic tape. One, the Film Optical Sensing Device for Input to Computers (FOSDIC) system, is well developed and has been used by the Bureau of the Census for many years; the second, the Optical Character Recognition (OCR) system, is limited for handprinted alpha-numeric characters. Although the FOSDIC and OCR systems are attractive from the point of view of minimizing keypunching errors, they do not satsify any of the other criteria. Both systems would take at least three months to develop and have the forms printed; once the forms were printed, it would be very difficult to make additions or effect changes. Additionally, both systems can only be serviced at a limited number of facilities. In view of the above, it was decided to use the conventional approach of filling out coding sheets and keypunching cards for computer input.

The coding technique selected for use in conjunction with the Problem Catalog is designed to minimize errors in filling out computer coding sheets. The standard computer card is separated into eight fields of ten spaces each as shown on Figure 7. The first field is used to identify the mobile home; H 3092-0100 in the case shown refers to HUD unit 3092-0100. Each source of data has a unique identification letter in the first space of this field. Identification data, other than mobile home number, and problem data are recorded in fields 2 through 8.

There is an alpha-numeric coding symbol in the Problem Catalog for each problem or piece of identification information which is entered by a reviewer on a computer coding sheet Figure 7), using contiguous fields (i.e. there should be no blank fields between the first and last entry). While the coding symbols in the ANSI A119.1 subsection are tabulated exactly as shown, the numeric part of each coding symbol in the Routine Maintenance and Appliance and Equipment subsections can be either: 1. (adjust), 2. (repair), or 3. (replace) depending on the type of problem (Appendix C). For example, the repair of a kitchen faucet assembly would be recorded as NPKA2., while the replacement of the same component would be NPKA3. Entries in field 2 through 8 can be made in any order and if more than one card is

required, the identification number would be repeated in field 1 of succeeding cards. The order of the cards in the assembled deck is unimportant since they can always be sorted by identification number in field 1.

As an example of the coding technique consider the following problems and the resulting code entries on Figure 7.

Problem	Section of Problem Catalog	Code	Page
1. Rain leak through vent pipe in bathroom	ANSI A119.1	RLMP2.	47
2. Replace Glass in Window	Routine Maintenance	NCWR3.	57
3. Replace Furnace Blower Limit Switch	Appliance and Equipment	AFLS3.	59

The personnel who reviewed the files and filled out the data sheets were all engineers or highly skilled technicians. The field inspection team formed the nucleus of the file review team. All the technical disciplines required to effectively review the files were represented on this team. The team worked as a group, so that everyone would benefit from discussions concerning the proper coding symbols for the problems found in the files. Also, as new coding symbols were needed, they could be readily formulated and distributed to the team.

3.4 Computer Techniques. Because of the vast amount of collected mobile home performance data (approximately 32,000 reported problems), computer techniques were used for sorting, combining blocks of data and other data processing needs. The system selected for coding performance problems readily lends itself to this because each element of data has a unique permutation of alphanumeric characters. Prior to manipulating the data, once it was in the computer, an accuracy check of the data was made to eliminate coding form entry and keypunch errors. Several programs were written to process the data and printout out tables and plots once the data had been verified.

3.4.1 Data Verification Programs. Since keypunching of cards was the most error prone step in the recording of problems, a computer program was written to printout all coding symbols which were not in the Problem Catalog. The incorrect coding symbols on the printout were checked against the coding form and corrected if possible. This checking procedure reduced the coding symbol discard rate to less than 1 percent of the over 30,000 problems recorded.

A particular checking problem occurred in recording performance data for the 3000 unit HUD sample described in Section 2.2.1.3. This sample was selected from 10,000 files shipped from Wilkes-Barre to NBS. The 3000 unit numbers selected for analysis were transcribed onto computer coding sheets and keypunched to provide a check list for data input to the computer. The corresponding files were located and reviewed by the data analysis team. Because of human errors inherent in the manual processing of Wilkes-Barre files, it was not possible to locate files for approximately 4% of the 3000 units in the sample which resulted in a final total of 2881 units for the sample.

3.4.2 Problem Summation Programs and Graphical Presentations. Data processing programs were developed to establish trends, compile data on obvious problems, and ferret out those

problem areas which may not be obvious.

The most important of these is a program which prints out summations of problems relative to the levels within the Problem Catalog. This program processes a given data base and instructs the computer to print out summations and percentages for levels of problem refinement (Appendix D).

Once the data bases were established, computer programs were developed to print tables, graphs and histograms to assist in the evaluation of the data. These included tables relating data such as; (1) year of manufacture versus number of units in the data file, (2) width versus number of units in the data file, (3) state of manufacture versus the number of units in the data file, (4) seal of approving agency versus problems versus number of units in the data file. These tables are illustrated in Appendix E along with a typical computer plot developed for seal of approving agency versus average number of problems per mobile home. These preliminary data are for illustrative purposes only and not for analysis. This indicates the potential of the computer techniques which will be fully utilized in specific aspects of data analysis as required in later reports.

3.5 Application of Methodology to Various Data Bases. The application of the Problem Catalog and data processing techniques has been discussed for the HUD Hurricane Agnes mobile home data (Section 2.2.1). The privately owned mobile home data (Section 2.2.2) were handled in exactly the same manner except it was not necessary to select a small sample of units from a large data base. Reported problems for all 967 mobile homes were included in the data base.

The forms completed during the field inspection of mobile homes, photographic documentation, and available maintenance and refurbishment data which were available constituted the data base for the field inspection task (Section 2.3). These data were coded by the Field Inspection Team using the format of the Problem Catalog.

The three data bases, HUD Agnes data, private data, and field inspection data were maintained separately in computer storage files permitting any type of analysis deemed desirable by the project staff. Analysis could proceed separately within each data file or selective combinations of data could be made.

4.0 SUMMARY COMMENTS

This report is part of a HUD funded project to identify and document significant mobile home performance problems and to relate them to possible inadequacies in the mobile home standard, regulatory processes or to insurability aspects of concern to HUD. The data acquisition and analysis methodology documented herein shows a unique approach used to solve a complex problem of data retrieval and analysis.

The results and conclusions of the project tasks outlined in Section 1.5 of this report will be developed in future reports planned for this project.

Acknowledgement

The authors are indebted to many persons for contributions and guidance that made this report possible. Special thanks are given to NBS staff members who participated in the regulatory and field inspection activity and provided invaluable assistance in the data reduction effort discussed in this report. Staff members from the Center for Building Technology included R. Beausoliel, T. Ray, and W. Niessing. E. Budnick and J. Scott of the Center for Fire Research provided expertise in Fire Protection Engineering and J. Peebles of Plant Division was responsible for the electrical discipline. M. Vogt of Technical Analysis Division prepared the computer programs used for data analysis. J. Finnan and T. Porter, working under outside contracts, provided valuable support to important project tasks.

The outstanding cooperation of John Gibson, Director of the Office of Emergency Preparedness (OEP) of the Department of Housing and Urban Development and his staff, both in Washington, D. C. and at Wilkes-Barre, Pennsylvania, contributed significantly to the success of this project. Mr. James McCollom of HUD, Office of Policy Development and Research provided valuable liaison between NBS staff and OEP operations personnel.

References

1. ANSI A119.1 "Standard for Mobile Homes", National Fire Protection Association, Boston, Massachusetts.

2. ANSI A119.3 "Standard for Mobile Home Parks", National Fire Protection Association, Boston, Massachusetts.

3. NBS Technical Note 853 "State Building Regulatory Programs for Mobile Homes and Manufactured Buildings - a Summary" by Cooke, Tejiya, Dikkers.

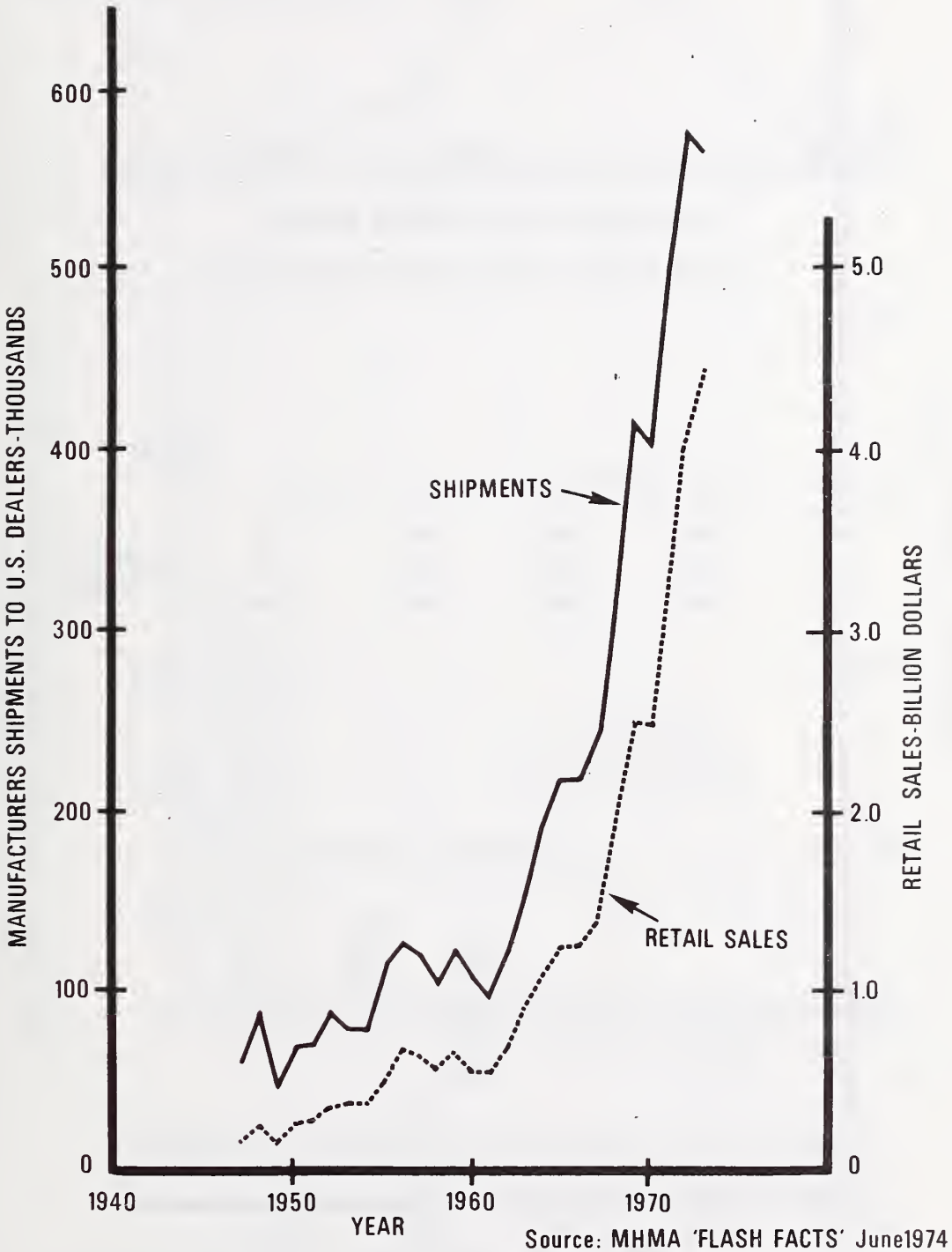

FIGURE I - MOBILE HOME SHIPMENTS & RETAIL SALES

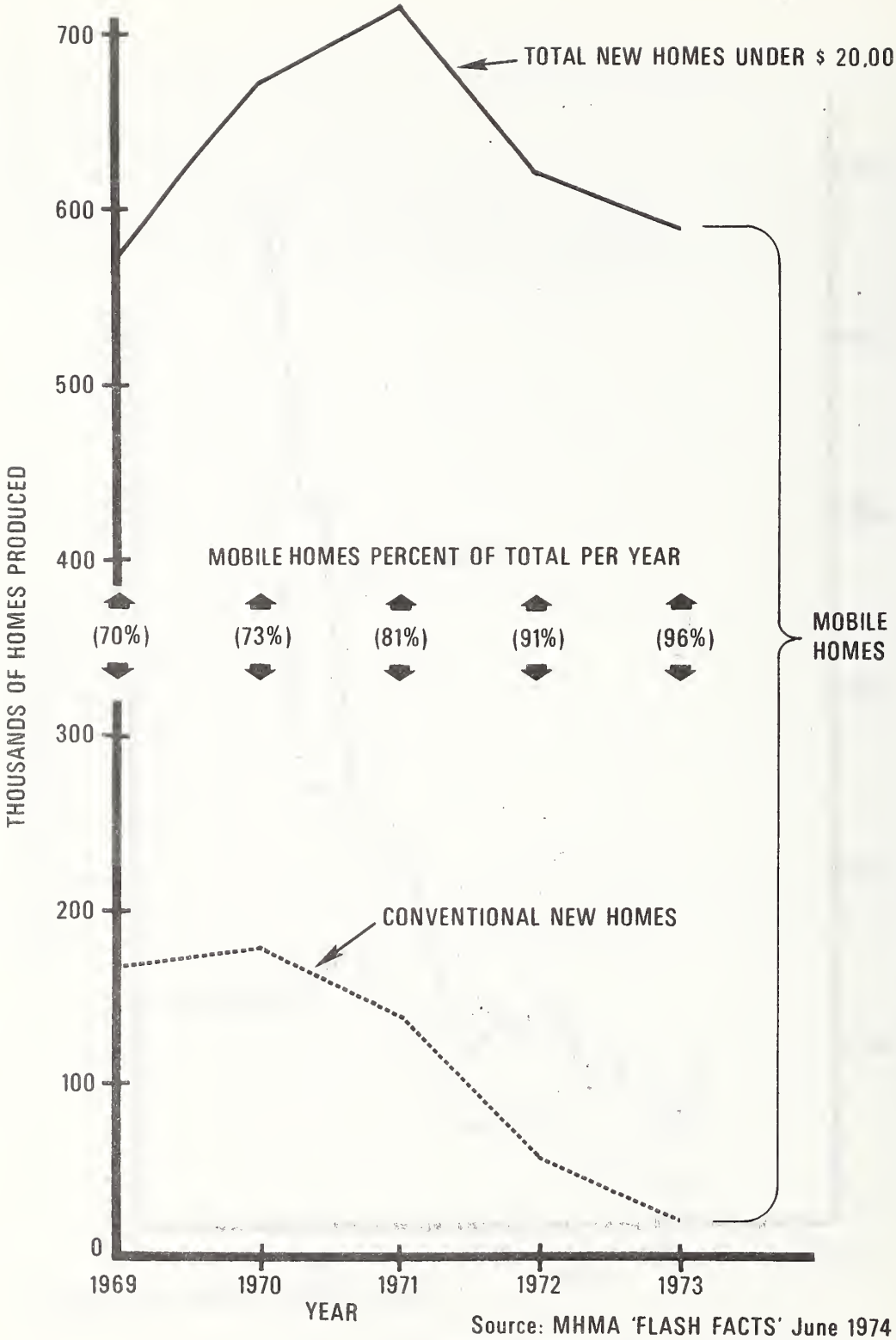

FIGURE 2 - THE UNDER $ 20,000 NEW HOME MARKET

DISTRIBUTION OF SHIPMENTS TO U.S. DEALERS BY HOME WIDTH OR TYPE FOR CALENDAR YEAR 1971, 1972, 1973

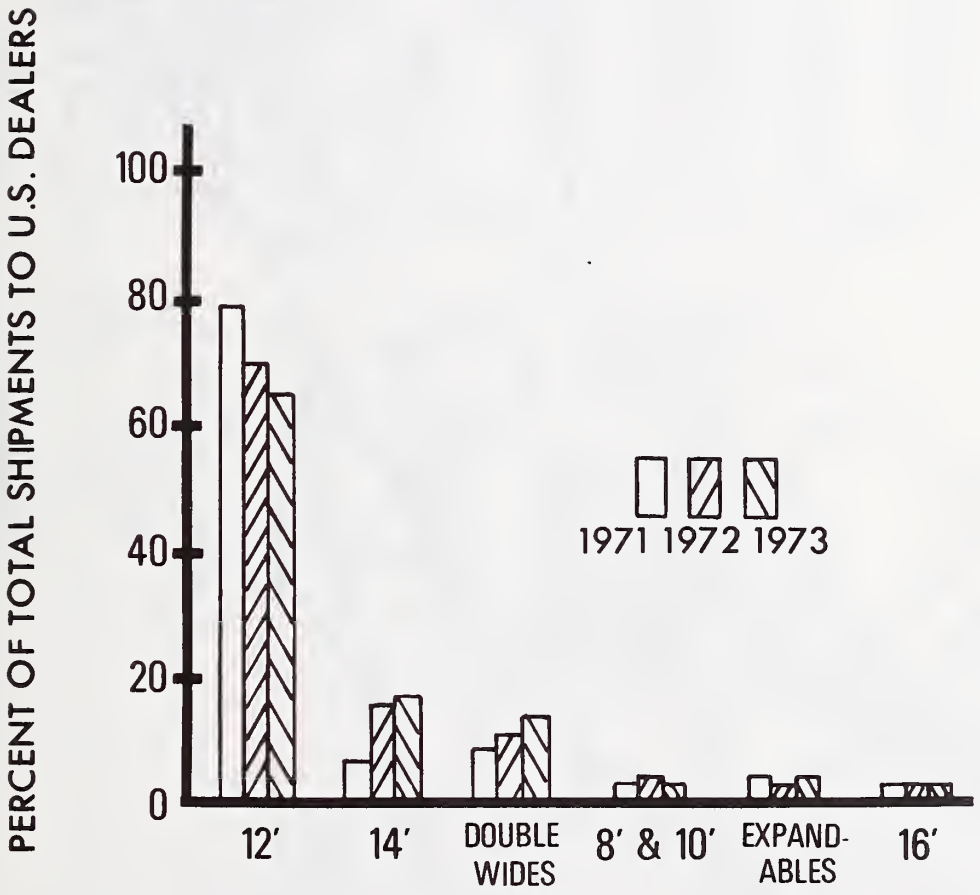

FIGURE 3 - WIDTH OR TYPE OF MOBILE HOME

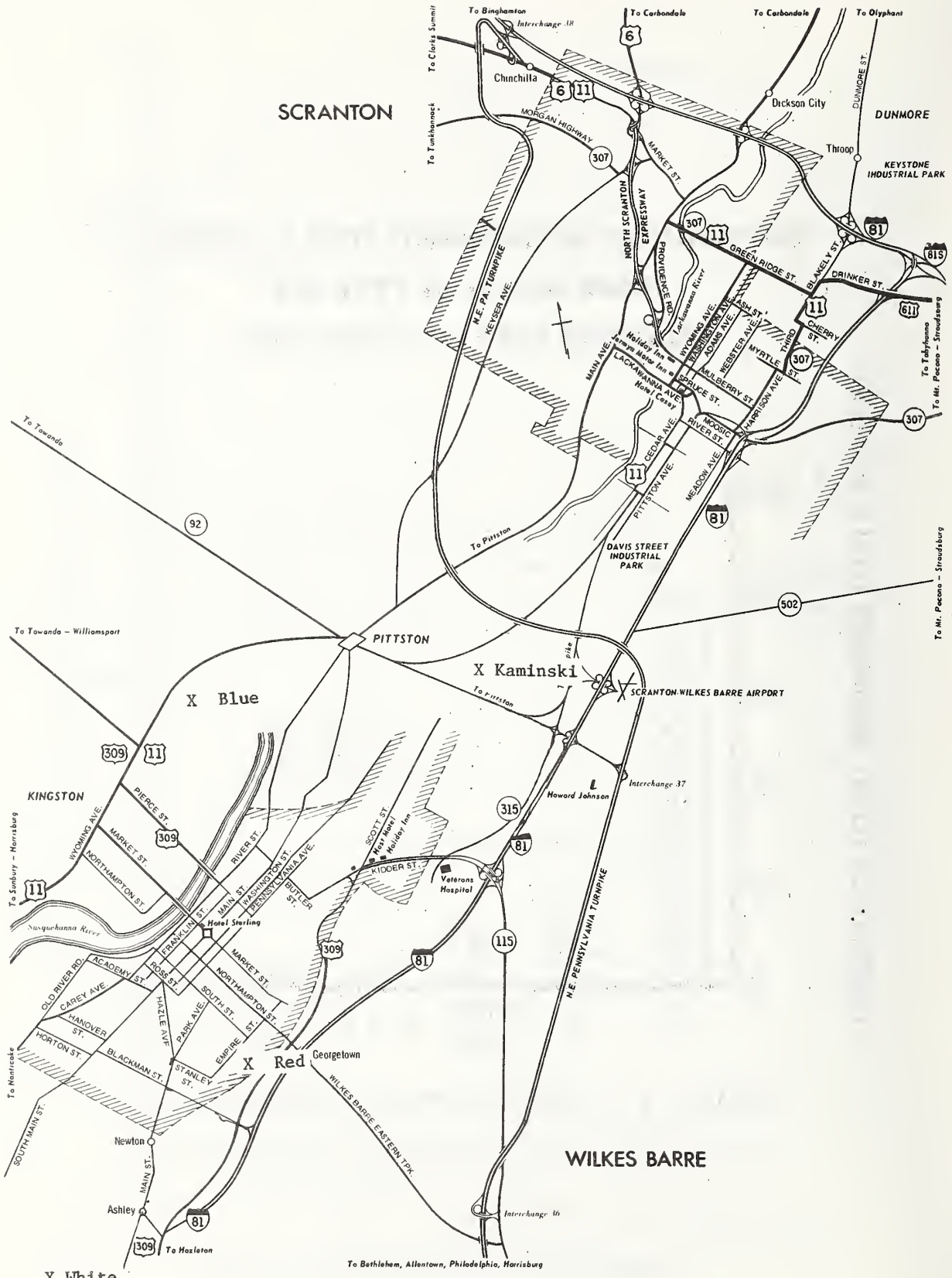

Figure 4 - Map Showing Staging Areas.

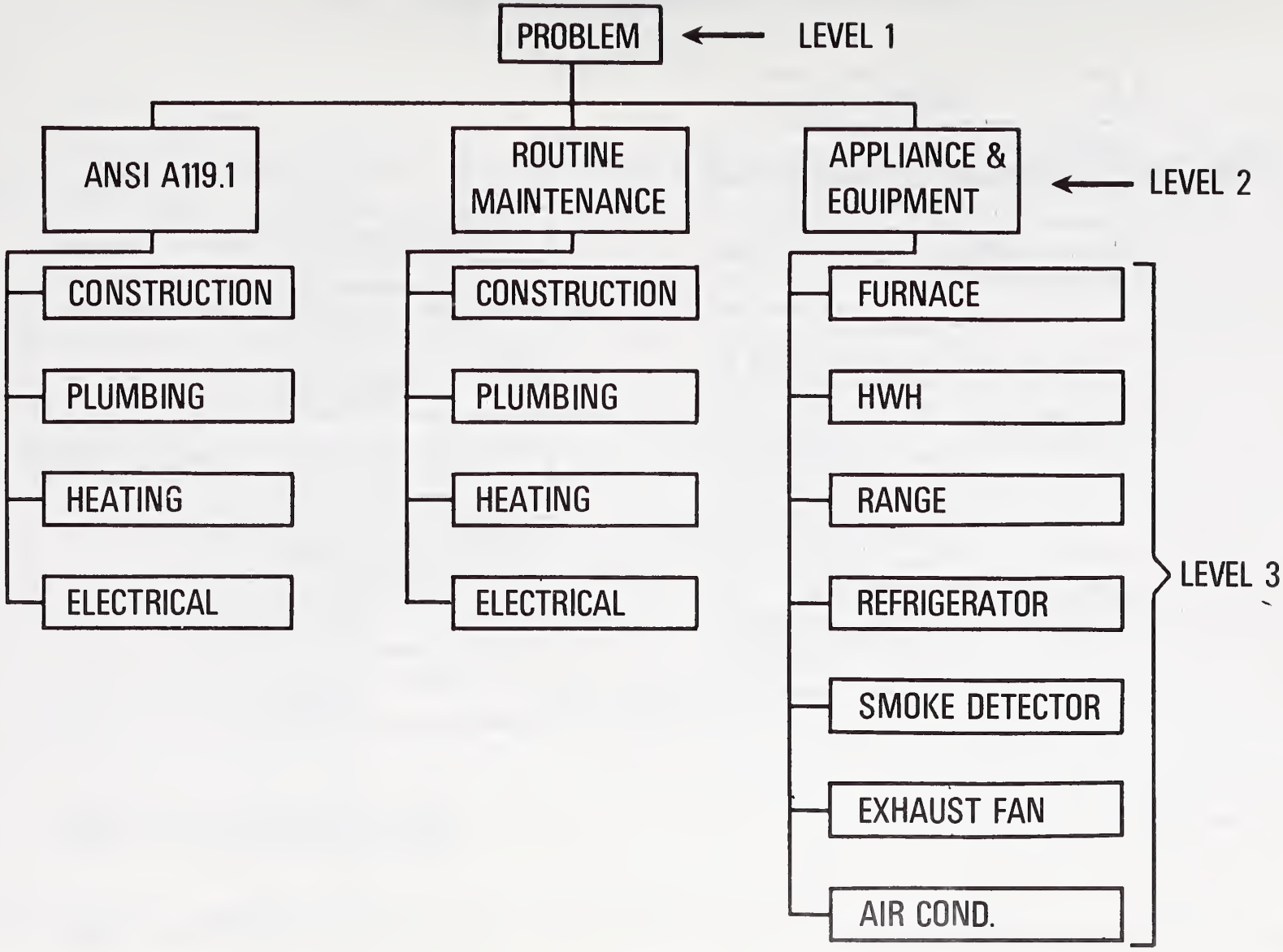

Figure 5 - Organization of Problem Catalog (Levels 1, 2 and 3)

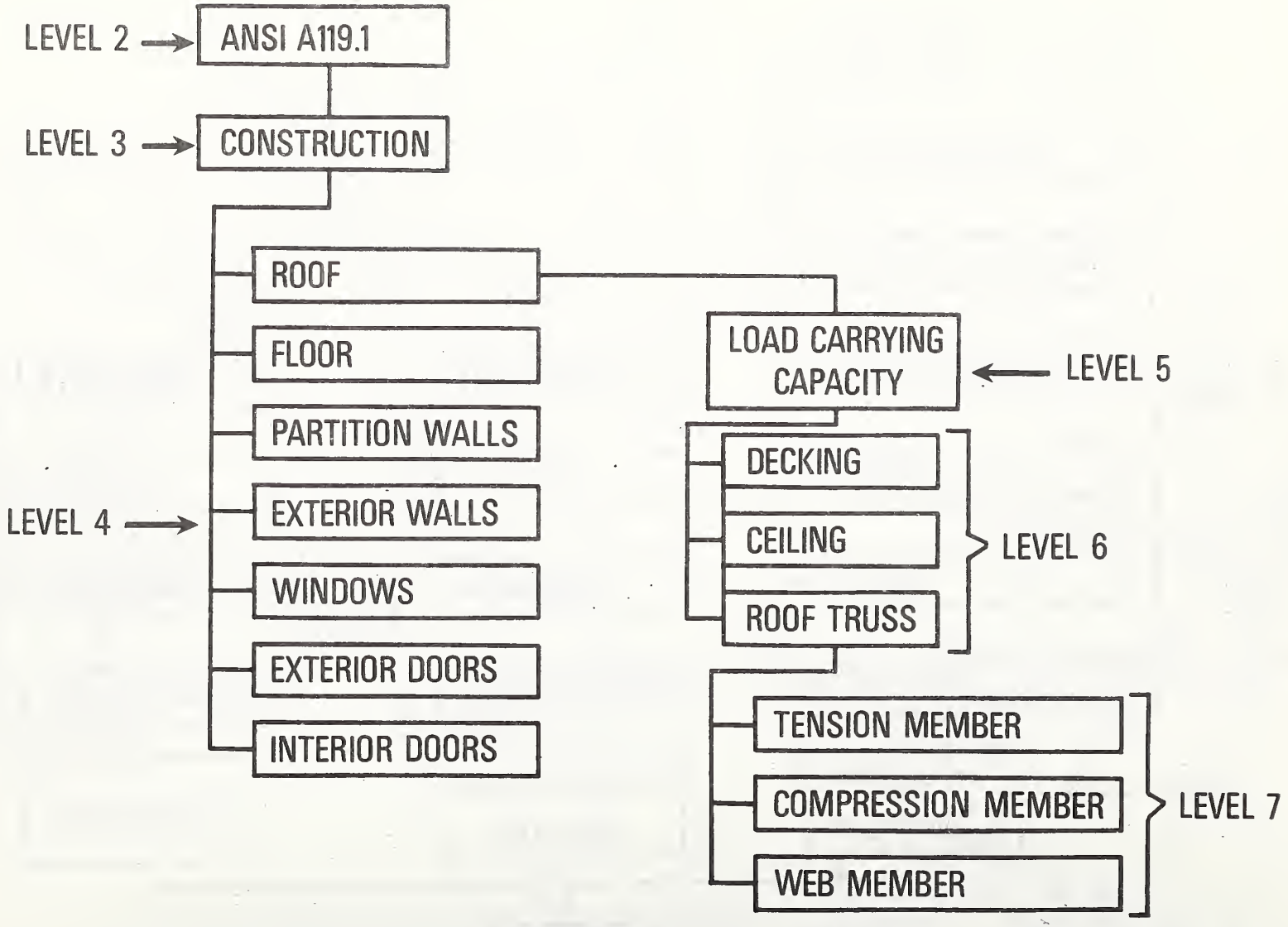

Figure 6 - Organization of Problem Catalog (Levels 3 through 7)

Name _____
Telephone NO. _____
Date _____

MOBILE HOMES DATA
CODING FORM

HUD NO.	ALPHANUMERIC CODING						
	FIELD 1	FIELD 2	FIELD 3	FIELD 4	FIELD 5	FIELD 6	FIELD 7	FIELD 8
H	3092-0100	RLMP2-	NCWR3-	AFLS3-				
H								
H								
H								
H								
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Figure 7 - Mobile Home Data Coding Form

Table 1

Mobile Home Performance Problem Data Sources

Source and Location	Visit to Source Agency	Approximate Number of Mobile Home Cases Potentially Available (early 1974)	Number of Mobile Home Cases Obtained
Texas - Dept. of Labor and Standards - Mobile Home Div. - (Austin)	Yes	257	171
California - Dept. of Housing and Community Development - Div. of Codes and Standards - (Sacramento)	Yes	3,000	162
Arizona - Division of Building Codes - (Phoenix)	No	273	1
Florida - Dept. of Highway Safety and Motor Vehicles - (Tallahassee)	Yes	1,400	142
Virginia - Dept. of Agriculture and Commerce - Office of Consumer Affairs - (Richmond)	Yes	300	32
Georgia - Office of Comptroller General - State Fire Marshall - (Atlanta)	No	300	-
Louisiana - Office of the Governor - Office of Consumer Protection - (Baton Rouge)	No	700	3

Table 1 (con't)

Source and Location	Visit to Source Agency	Approximate Number of Mobile Home Cases Potentially Available (early 1974)	Number of Mobile Home Cases Obtained
Washington - Dept. of Labor and Industries - Mobile Home, Commercial Coach and Recreational Vehicle Section - (Seattle)	Yes	300	152
Veterans Administration Office - (Jacksonville, Florida)	Yes	250	47
Veterans Administration Regional Office - (Montgomery, Alabama)	Yes	125	40
Veterans Administration Center - (Jackson, Mississippi)	No	123	1
Alabama Farm Bureau - (Montgomery, Alabama)	Yes	200	199
American Mobilehome Association - (Lakewood, Colorado)	No	10	8
Minnesota - Dept. of Administration - Building Code Division - (St. Paul)	No	25	9

Appendix A - Data Forms

Exhibit 1 - HUD Maintenance Work Order Form
Exhibit 2 - Criteria Inspection Form
Exhibit 3 - Private Data Retrival Form
Exhibit 4 - Field Inspection Forms

Exhibit 1

HUD WORK ORDER

(1) WORK OROER NO. ☐ № 200087

(2) OATE ____ (Mo. Day Yr.) (3) TIME ____ (Mil.)

(4) H.U.O. No. ____ - ____ ____

(or) G S A - ____

(5)
1. ☐ ROUTINE
2. ☐ EMERGENCY
3. ☐ PREVENTIVE

(6)
4. ☐ REPLACEMENT
5. ☐ FIELD

(7) TENANT ____ (Last) (First) (Telephone No.)

(8) LOCATION ____ (Street or Pad No.)

(City / Township or Park Site)

(9) OK TO ENTER ☐ ____ (Signature / Approval) (10) ____ (Prepared By) (11) ____ (Tenant Will Be Home / Time / Date)

(12) WORK TO BE OONE ____

(13) ORIGINATOR CODE ____ (14) E ☐ OUPLICATE W.O.

(15) ASSIGNEO TO ____ (16) OATE ____ (Mo. Day Yr.) (17) TIME ____ (Mil.)

(18) MAINTENANCE EMPLOYEE NUMBER ____ ____ ____ (Last 4 Digits of Social Security Number)

(19) WORK OONE (BE BRIEF) ____

(THIS LINE FOR OFFICE USE ONLY)

(20) HOURS WORKEO ____ . ____ (21) DATE COMPLETEO ____ (Mo. Day Yr.) (22) TIME COMPLETEO ____ (Mil.)

(23) MATERIALS USEO ____

(24) SIGNATURE ____ (Tenant) (25) DATE ____

CHARGES:

FOR OFFICE USE ONLY

(28) MANHOUR $ ____ . ____

(29) MATERIAL $ ____ . ____

CHARGE TO CONTRACTOR

(30) ____

(26) WORK DONE CODE ____

(27) CHARGE TO: (Recommendation)

MAINTENANCE	☐ 1
MANUFACTURER	☐ 2
SET UP CONTRACTOR	☐ 3
SITE DEVELOPER	☐ 4
SUPPLIER	☐ 5
NO CHARGE	☐ 6
	☐ 7
	☐ 8
	☐ 9

COPY OISTRIBUTION:

4. GOLOENROO – AFTER WORK COMPLETEO – TO MANAGER
3. PINK – AFTER EOIT – TO KEY PUNCH THEN M / H FILES
2. YELLOW – AFTER COSTING – TO FINANCE
1. WHITE – AFTER COSTING – TO KEY PUNCH THEN M / H FILES

(31) PROCESSEO BY ____

(Revision Date: Oct. 1, 1972)

WB-13-CM

Exhibit 2

Serial Number

SERIAL NUMBER INSPECTION

Name _____ Degree _____

Zone _____

Address or
Pad Number _____

Box Size _____

_____ O. A. L. _____

HUD
Number _____

Serial
Number _____ Accepted _____

Bedrooms _____ Rejected _____

Mfr. _____ Hold _____

Mod. _____ Sales _____

Notes: _____

_____

_____

_____

_____

_____

Signature: _____

Date: _____

Tail Lights Installed by Inspector: Yes No

WB-118-QC

Serial Number

Exhibit 2
2/21/73
4/32/73 Rev. A
10/30/73 Rev. B

MOBILE HOME DISPOSITION CHECK LIST

LEVEL I

	CRITERIA REF.	ACCEPTABLE	UNACCEPTABLE
MFD NO. _____ SERIAL NO. _____ MFGR. _____			
A. Axles			
Minimum (2) per mobile home (Third axle - management decision)	3.2.1		
B. Frame:			
1. Deflection normal (in unblocked condition)	3.2.2		
2. Straight (horizontally)	3.2.2		
3. Longitudinal "I" beams shall be continuous from front to rear or are pieced beams of uniform size or minimum beam size of 8" (vertical measurement)	3.2.2		
C. Outside Walls:			
1. Studs $1\frac{1}{2}$ x $2\frac{1}{2}$ (finished size) on 16" centers (exceptipn: $1\frac{1}{2}$ x 2 (finished size) for all studs if studs at windows and doors are $1\frac{1}{2}$ x $3\frac{1}{2}$ (finished size)	3.2.3		
2. Inside paneling secured to exterior walls	3.2.3		
D. Roof arched or peaked, 5" minimum, glued truss construction on 16" centers	3.2.4		
E. Floor deck (glued) to floor joists	3.2.5		
F. Insulation thickness: Wall / Ceiling / Floor			
Gas or Oil: 1" / $1\frac{1}{2}$" / 1"	3.2.6		
Electric: 2" / $2\frac{1}{2}$" / $2\frac{1}{2}$"	3.2.6		
G. Plumbing			
Metal pipe or tubing with screwed, sweated joint or flare fittings are preferable; however, approved (ANSI A119.1 Table C-1) plastic piping for the water distribution system is acceptable	3.2.7		
H. Electric			
Interior wiring shall be all copper preferably; however, listed (UL) copper-clad aluminum wire is acceptable	3.2.8		
I. Deluxe features limiting transportability not present	3.2.9		

INSPECTOR'S NAME, PRODUCTION _____ DATE _____

DETAILED DESCRIPTION OF UNACCEPTABLE ITEMS

Exhibit 2

2/21/73
4/23/73 Rev. A
10/30/73 Rev. B

MOBILE HOME DISPOSITION CHECK LIST

LEVEL II

HUD NO. _____
MFGR. _____
SERIAL NO. _____

		CRITERIA REF.	ACCEPTABLE	UNACCEPTABLE	REPAIR	REPLACE	T and M COST *
A.	Tongue (weld and straightness)	3.3.1					
B.	Outriggers:						
1.	Welded	3.3.2					
2.	Spacing (maximum 8 feet)	3.3.2					
3.	Extend to edge of mobile home and are secured to perimeter plate with carriage or lag bolts	3.3.2					
C.	Floor						
1.	The wooden floor joist system shall be securely attached to the front metal crossmember	3.3.3					
2.	Frame within 36" (2" x 6" long.), 18" (2" x 4" long.) 6" (trans.)	3.3.3					
D.	Skin Fastened						
1.	Skin fastened at proper intervals	3.3.4					
2.	Panels across front and from tongue to a distance 8 ft. back on either side secured	3.3.4					
E.	Exterior Storm Door (main entrance only) (if applicable)	3.3.5					
F.	Water Heater Access Door:						
1.	Large enough to remove water heater and/or repair unit	3.3.6					
2.	Exterior Door						
a.	Insulated	3.3.6					
b.	Gas water heater has adequate outside air opening (minimum 8 sq. in.)(ANSI A119.1 Para. D.6.3.2)	3.3.6					
G. 1.	Exterior electrical receptacle within 24" of the water pipe	3.3.7					
2.	Weatherproof cover for receptacles mounted in a vertical plane position	3.3.7					
H.	Ground wire - Copper #8 (alum. #6 acceptable) if present	3.3.8					
I.	Windows:						
1.	Screens on all	3.3.9					
2.	Storm windows on all except bathroom (Northern only units)	3.3.9					
3.	Storm windows on other than Northern Zone mobile homes installed (if available)	3.3.9					
J.	Floor covering in good condition (vinyl)(carpets)	3.3.10					
K.	Clothes Washer Connections (including all plumbing and valves)(if applicable)	3.3.11					
L.	Ceiling not sagging or leak stained (stain overcoated)	3.3.12					
M.	Interior panels secure and undamaged	3.3.13					
N.	Doors are serviceable	3.3.14					
O.	All windows are serviceable	3.3.15					
P.	Furnace complete and secure (include stack)	3.3.16					
Q.	Hot air system registers and ducts in good condition	3.3.17					
R.	Brakes are operable and effective	3.3.18					

☐ ADDITIONAL COMMENTS ON REVERSE

* Time and material cost

Exhibit 2

2/21/73
4/23/73 Rev. A
10/30/73 Rev. B

MOBILE HOME DISPOSITION CHECK LIST

LEVEL II (CON'T)

HUD NO. _____
MFGR. _____
SERIAL NO. _____

		CRITERIA REF.	ACCEPTABLE	UNACCEPTABLE	REPAIR	REPLACE	T&M* COST
S.	Wheels:						
	1. Tires in good condition	3.3.19					
	2. Rims in good condition	3.3.19					
	3. All wheel lugs secure	3.3.19					
T.	Springs in good condition, including attaching bolts and shackles	3.3.20					
U.	Axles						
	1. Axles have 2" minimum upward camber	3.3.21					
	2. Minimum two axles per mobile home	3.3.21					
	3. All axles have dust caps	3.3.21					

_____ _____
INSPECTOR'S NAME, PRODUCTION DATE

COMMENTS:

( ) ADDITIONAL COMMENTS ON REVERSE

* Time and material cost

Exhibit 2

2/21/73
4/23/73 Rev. A
10/30/73 Rev. B

MOBILE HOME DISPOSITION CHECK LIST

LEVEL III

HUD NO. _____
MFGR. _____
SERIAL NO. _____

			ACCEPTABLE	UNACCEPTABLE	REPAIR	REPLACE	TEAM COST
A.	Kitchen/Dining area:						
	1. Sink	3.4.1					
	2. Dinette table						
	3. Chairs (6)						
	4. Refrigerator, minimum (12) cubic feet						
	5. Cooking range, 4 burner, with oven						
	6. Lighted range hood						
	7. Exhaust fan						
	8. Light fixture and shade globe						
	9. Drapes and rods for each window						
B.	Living Room:						
	1. Couch or sofa bed capable of sleeping (1) person	3.4.2					
	2. Armchair						
	3. One (1) end table						
	4. One (1) coffee table						
	5. Table or hanging lamp with shade globe						
	6. Drapes and rods for each window						
C.	Bathroom:						
	1. Commode	3.4.3					
	2. Commode top and seat						
	3. Tub/shower and shower curtain						
	4. Lavatory						
	5. Medicine cabinet						
	6. Mirror						
	7. Light fixture and shade globe						
D.	Bedroom #1:						
	1. Bed, w/metal frame or legs (screwed to metal corner plate), box spring and mattress	3.4.4					
	2. Storage chest, built-in or free standing						
	3. Light fixture and shade globes						
	4. Drapes and rods for each window						
E.	Bedroom #2:						
	1. Bed, w/metal frame or legs (screwed to metal corner plate), box spring and mattress	3 4.4					
	2. Storage chest, built-in or free standing						
	3. Light fixture and shade globes						
	4. Drapes and rods for each window						

COMMENTS:

☐ ADDITIONAL COMMENTS ON REVERSE

2/21/73 Exhibit 2
4/23/73 Rev. A
10/30/73 Rev. B

MOBILE HOME DISPOSITION CHECK LIST

LEVEL III (CON'T)

HUD NO. _____
MFGR. _____
SERIAL NO. _____

	CRITERIA REF.	ACCEPTABLE	UNACCEPTABLE	REPAIR	REPLACE	T&M* COST
F. Bedroom #3:						
1. Bed, w/metal frame or legs (screwed to metal corner plate), box spring and mattress	3.4.4					
2. Storage chest, built-in or free standing						
3. light fixture, and shade globes						
4. Drapes and rods for each window						
G. Miscellaneous:						
1. Water heater, thirty (30) gallon preferred, but existing unit acceptable	3.4.5					
2. Water valves						
a. Exterior water shut-off valve						
b. Plastic check valve on inlet water line or an existing anti-syphon valve on water heater						
3. Fire extinguishers - five (5) pound, filled and mounting bracket (remove and ship separately)						
4. Smoke detector (remove and ship separately)						
5. Two (2) sets of keys for each exterior door						
6. Provisions for outside light fixture and shade globe (if applicable)						
7. Power supply cord - twenty-five (25) feet long for "50 Amp, Mobile Home Use", unspliced						
8. Hall light and switch (if applicable)						

COMMENTS:

I. PECTOR'S NAME _____ DATE _____

☐ ADDITIONAL COMMENTS ON REVERSE

* Time and material cost

Exhibit 3

MOBILE HOME PROBLEM DATA SHEET

Data Source: _____

_____

Source Docket No.: _____

MH Manufacturer: _____

_____

Model: _____ Year: _____ Serial No. _____

Seals Attached (MHMA, TCA, SEMHI, State, or Other):_____

Length: _____ Width: _____ No. Bedrooms:_____

Location: _____

_____

Problems Reported in Source Document Dated: _____

Figure 1 - Sample of Data Sheet Used for Recording Mobile Home Coach Identification Information

HUD No. _____
Date of Inspection _____

Construction Data

Length _____ Feet
Width _____ Feet

Manufacturer _____
Model _____
Serial Number _____
Year _____

Seals	Number

1. Under Frame
   - Number of Axles _____
   - Type of Outrigger
     - _____ Z Member
     - _____ C Member
     - _____ Open Web Joist
     - _____ Other
   - Outrigger Spacing _____ Feet
   - Long Beam Spacing _____ Feet
   - Long Beam Depth _____ Inches

	Yes	No	Picture
Metal Under Frame Damage			
Moisture Barrier Damage			
Hurricane Straps			

   Number _____

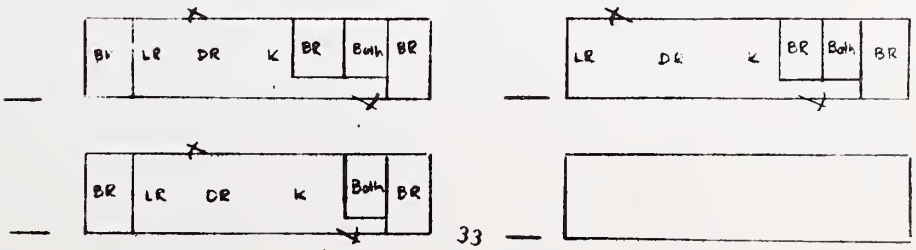
2. Wall Framing

	Not Seen	Framing Type
Exterior Wall		
Interior Wall		

3. Floor Framing
   - Not Seen _____
   - Framing Type _____

4. Roof System
   - Type of Truss
     - _____ Bowstring
     - _____ Peaked
     - _____ Other (Identify)
   - Not Seen _____
   - Roof Construction (Check)
     - _____ Ceiling Material
     - _____ Vapor Barrier
     - _____ Insulation
     - _____ Roof Truss
     - _____ Insulation
     - _____ Vapor Barrier
     - _____ Metal Covering

5. Flame Spread
   - Ceiling
     - _____ Gypsum Bb.
     - _____ Veg. Fiberbd.
   - Kitchen Cabinet
     - _____ Wood
     - _____ Pressed Wood
     - _____ Plastic
   - Paneling
     - _____ Fire Rated
     - _____ Not F.R.
     - _____ Flame Spread



6. General

	Yes	No	Picture
Rusted Exterior Fasteners	_____	_____	_____
Interior Rain Leaks	_____	_____	_____
Emergency Egress Window	_____	_____	_____
Good _____ (No obstructions)			
Bad _____ (Obstructions)			

Comments:

Exhibit 4

HUD No. _____
Date of Inspection _____

Electrical Data

1. Distribution Panel Box (Part E-9 - 10)

Ampere Rating: 50 - 60 - 100 - 125 - 150

10.9	Located in rear third of home:	Yes _____	No _____
9.2	Minimum 24 in. from floor:	Yes _____	No _____
9.3	Minimum 6 in. clear space in front:	Yes _____	No _____

9 Fastened to: _____ Paneling _____ Stud Framing

_____ Other (indicate)

2. Type of Wire: _____ Copper _____ Aluminum _____ Cu Clad Aluminum

3. Branch Circuits (Part E-7)

4-15 Amp. Circuits: Yes _____ No _____
2-20 Amp. Circuits: Yes _____ No _____

4. Receptacle Outlets Required (Part E-6)

		Yes	No
	Receptacles Approved for wire used:		
6.1	Maximum 12 foot spacing:		
6.1a.	Counter tops in kitchen:		
6.1b	Adjacent to refrigerator and range:		
6.1c	Built-in vanities:		
6.1d	Counter tops under all cabinets:		
6.2	Within/adjacent shower/tub space:		

Outside Fixture: Yes ____ No ____ Weathertight: Yes _____ No _____

5. Wiring Methods (part E-11)

		Yes	No	Not Seen
11.3	Nomet. cable with nomet. boxes:			
11.4	Outlet boxes flush with surface:			
11.5	Boxes securely fastened:			
11.6	Continued sheath between boxes:			
11.7	Cable thru studs protected:			
11.9	Cable supported within 12" boxes, etc.:			
11.10	Support nonmet. cable 8":			

Lighting Fixture (Part E-20)
Ceiling fixture securely fastened: Yes _____ No _____

6. Hot Water Heater Enclosure

A. Accessibility: Good _____ Bad _____

_____ Interior _____ Exterior

B. Enclosure Construction

_____ Unfinished (backside of paneling, exposed studs)
_____ Paneled - Thickness _____
_____ Gypsum Wallboard - Thickness _____
_____ Insulation - Foil backed _____

Cable across HWH door: Yes _____ No _____

Exhibit 4

7. Range

Name Brand _____
Model No. _____
Fuel _____ L.P.G. _____ Natural _____ Elec.
Clearances: _____ Overhead Distance to Cabinets
_____ Exhaust Hood (Yes or No)
Charring of adjacent cabinets: Yes _____
No _____

8. Refrigerator

Name Brand _____
Model No. _____

Comments:

Exhibit 4

HUD No. _____
Date of Inspection _____

Heating Data

1. Heating System

Name Brand _____
Model No. _____
Fuel Type _____ Gas _____ Oil _____ Electric
_____ LP
_____ Natural

Input Capacity _____ BTU
Output Capacity _____ BTU

Heating Unit Enclosure Construction

_____ Unfinished (backside of paneling, exposed studs)
_____ Paneled - Thickness _____
_____ Gypsum Wallboard - Thickness _____
_____ Insulation - Foil backed _____

Certificate: Yes _____ No _____
Where: _____ Furnace Company
_____ Electric Panel
_____ Others

	Yes	No
Wall thermostat		
3 ft. or more from furnace		
Floor register w/dampers		
Smooth riser connection		
(5.1.1.1) Combust. intake rodent proof		
(6.4.2b) Drafthood aligned & secured		

Pipe material and size _____
Fitting material _____

2. Fuel Burning Appliances

	Furnace		HWH		Dryer		AC	
	Yes	No	Yes	No	Yes	No	Yes	No
A. Information on clearances, input, etc., attached to appliance (6.6.1)	___	___	___	___	___	___	___	___
B. Type of fuel marked on each fuel burning appliance (6.6.2)	___	___	___	___	___	___	___	___
C. Appliance accessible for inspection, repair, replacement w/o removing construction (6.7)	___	___	___	___	___	___	___	___

Exhibit 4

3. LP - Natural Gas Piping

		Yes	No
(5.1.10.1)	Supply location on "A" frame 18" from roadside		
(5.1.11)	Metal tag at gas supply con.		
(5.1.2.2)	Alum. connectors used outdoors		
(5.1.16)	Gas piping used for electric ground		
(5.1.18)	Adequate pipe hangers & supports		

4. Outside Venting _____ No Roof Inspection

	Yes	No	Not Seen
Furnace vent roof jack			
Secured			
HWH drafthood aligned/secured			
Roof jack secured			
Vent terminating under mobile home			
3 ft. or more from air intake			
Cooking Appl. vent within 10 ft.			
Wall _____			
Ceiling _____			
Attic vents			
Eaves _____			
Roof _____			
Roof jack secured			

Comments:

HUD No _____
Date of Inspection _____

Plumbing Data

1. Approved Materials (Table C-1 Appendix C)

	Yes	No	Not Labeled	Not Seen
DWV Piping				
Water Piping				
Valves				
Water Closet				
Lavatory				
Bath Tub				
Kitchen Sink				

2. Plumbing Facilities

	Yes	No	Missing
At Least One Water Closet			
At Least One Lavatory			
At Least One Kitchen Sink			
Adequate Washer Drain			
Adequate Washer Water Supply			
Accessible Facilities			

3. Water Distribution (Part C-11)

	Yes	No	Not Seen
Minimum Size Piping (11.1.1)			
Proper Water Connection Location (11.2.1)			
Cap and Chain			
Tagged			
Minimum Size			
Backflow Protection (11.2.2.1)			
Adequate air gaps (11.2.3)			
Anti-siphon Ball Cock (11.2.6)			
Dishwasher (11.2.4)			
Clothes Washer (11.2.4)			

Types of Piping Materials

Copper _____ Location _____
Galv. Street _____ Location _____
Plastic _____ Location _____

Indication of External Corrosion Yes _____ No _____
Indication of Frozen Water Piping Yes _____ No _____

4. Hot Water Heater (11.3)

_____ Gas
_____ Electric

_____ Interior Access
_____ Exterior Access
_____ Not Accessible
_____ Missing

	Yes	No	Not Seen
Labeled Heater			
Valve(s) T&P Relief (11.3.1.1)			
Approved & Listed T&P Valves (11.3.1.1)			
Proper Location T&P Valves (11.3.1.2)			
Proper Location Relief Valve Drain (11.3.1.3)			
Threated End (11.3.1.3)			
Terminated in floor			

5. Drainage System (Part C-12)

Drain Outlets	Yes	No	Not Seen
Drain Outlets			
Proper Location (12.2.1)			
Proper Clearance (12.2.2)			
Hose Coupler (12.2.3)			
Cap and Chain (12.3.3)			
Min. Outlet Size (12.3.3.3)			
Proper Trap Arm Length (12.5.3)			
Adequate Traps (8.1)			
Clean Outs (8.2)			
Trap Arm Grade (8.1.9.1)			

	Yes	No	Not Seen
Removability of Traps (8.1.9.4)			
Access to Bathtub Slip Joint Connection and Trap (9.1.4)			
Dishwasher Drain Air Gap (9.2.3)			
Clothes Washer (9.2.4)			
Proper Drain (9.2.4.1)			
Standpipe Dimensions (9.2.4.2)			
Trap for Standpipe (9.2.4.2)			
Vented Standpipe Trap (9.2.4.2)			
Accessible Standpipe (9.2.4.7)			

Type of DWV Piping Materials

_____ABS _____PVC

6. Vents and Venting (Part C-13)

	Yes	No	Not Seen
Main Vent Through Roof (13.3.1)			
Individual Vents (13.3.2)			
Individual Vent Valves			
Vent Grade (13.4)			
Adequate Horizontal Vents			
Adequate Vent Term (13.5)			
Water Tight Flashing (13.5.2)			
Removable Vent Caps (13.5.2)			

7. Protective Requirements (Part C-5.2)

	Yes	No	Not Seen
Protection of Piping/Weather			
Protection of Piping/Road Damage			
Rodent Resistance			

Comments:

Appendix B

Typical Field Inspection Photographic Documentation

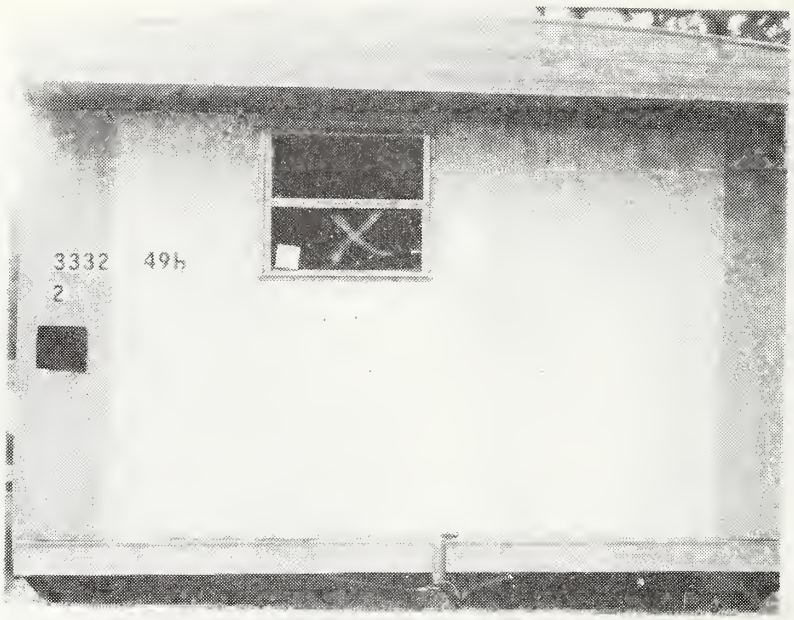


Figure 1 - Front of Mobile Home

Figure 2 - Light Fixture in Area of Water Damage Pulled Loose from Ceiling

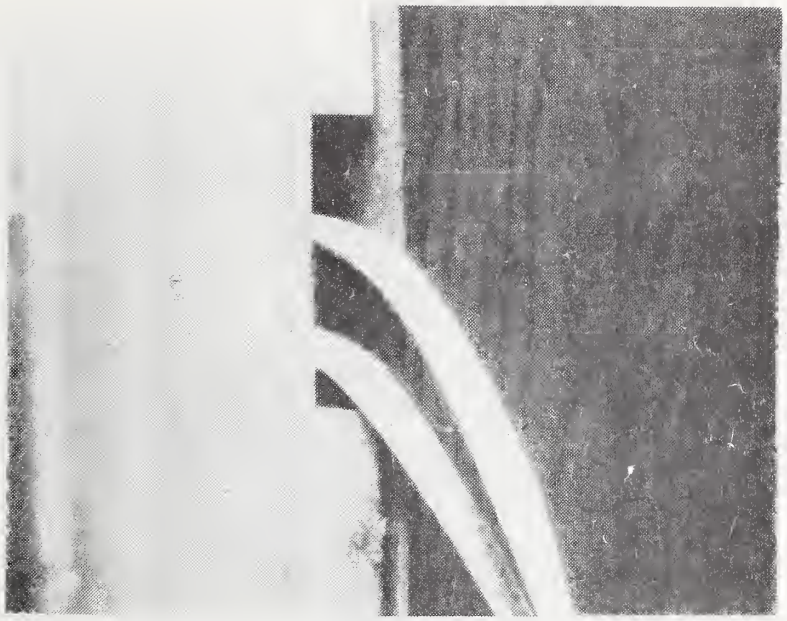


Figure 3 - Electrical Wiring Passing Through Stud Unprotected

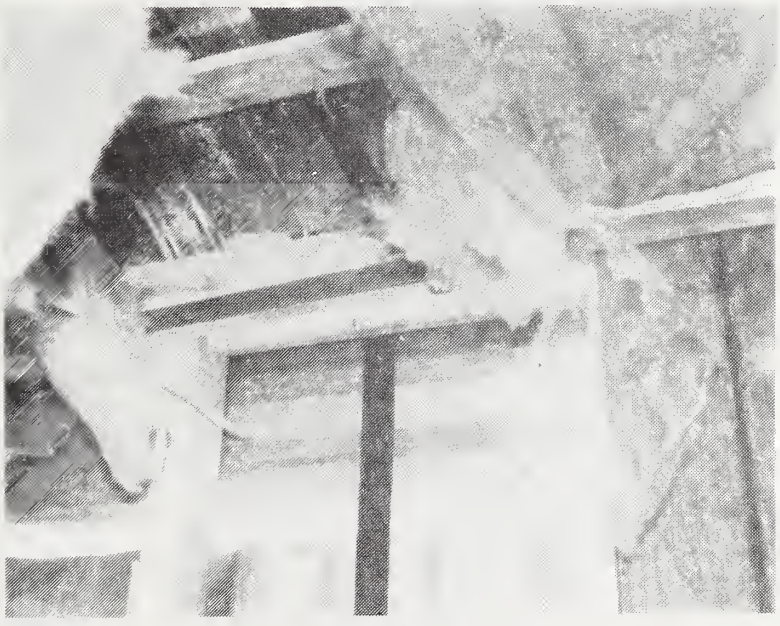


Figure 4 - Hurricane Strap in Exposed Roof and Wall Construction

Appendix C

Problem Catalogue

Mobile Home Identification Data

IDEN	IDENTIFICATION OF MOBILE HOME
HXXXX-XXXX.	HOUSING AND URBAN DEVELOPMENT [HUD] NUMBER
PXXXX.	PRIVATE SECTOR IDENTIFICATION NUMBER
SOURXXX.	SOURCE OF INFORMATION
MANUXXX.	NAME OF MANUFACTURER
STATXX.	STATE WHERE MOBILE HOME WAS MANUFACTURED
CITYXXX.	CITY/TOWN WHERE MOBILE HOME WAS MANUFACTURED
MODLXXX.	ENTER THE CODE FOR THE MODEL NAME
SEALXXX.	NAME OF THE AGENCY ISSURING THE ATTACHED SEAL
YEARXX.	YEAR OF MANUFACTURE
MLNUXXX.	ENTER THE LAST 5 CHARACTERS OF THE MODEL NUMBER
SERLXXXXX.	ENTER THE LAST 5 CHARACTERS OF THE SERIAL NUMBER
SNUMXXXXX.	ENTER THE LAST 5 CHARACTERS OF THE SEAL NUMBER -
MIWBXXXXX.	MILAGE TO WILKES-BARRE
CHARXXXX.	FREIGHT CHARGES TO WILKES-BARRE
COSTXXXXX.	COST OF MOBILE HOME, ENTER WHOLE DOLLASR
WGHTXXXXX.	WEIGHT OF MOBILE HOME, ENTER POUNDS.
	DIMENSIONS OF MOBILE HOME
LENGXX.	LENGTH OF MOBILE HOME IN FEET
WIDHXX.	WIDTH OF MOBILE HOME IN FEET
WDBL	DOUBLE WIDE UNIT
HIGHXX.	HEIGHT OF MOBILE HOME IN FEET
	BEDROOMS
BDRMX.	TOTAL NUMBER OF BEDROOMS
BDRRX.	NUMBER AT REAR OF UNIT
BDRFX.	NUMBER AT FRONT OF UNIT.
	BATHROOMS
BATHX.	TOTAL NUMBER IN UNIT [INCLUDE 1/2 BATHS]
BARRX.	NUMBER AT REAR OF UNIT
BAFTX.	NUMBER AT FRONT OF UNIT
EXFN1.	BATHROOM HAS AN EXHAUST FAN
EXFN2.	BATHROOM DOES NOT HAVE AN EXHAUST FAN
DFETX.	EXTERIOR ENTRANCE DOORS
DETLX.	TOTAL NUMBER OF DOORS
DERSX.	NUMBER ON RIGHT SIDE
DELSX.	NUMBER ON LEFT SIDE
DERRX.	NUMBER AT THE REAR
DFFTX.	NUMBER AT THE FRONT
DSTMX.	NUMBER OF STORM DOORS
	ROOF
RFAP1.	ARCHED, METAL
RFAP2.	ARCHED, SHINGLE
RFAP3.	PEAKED, METAL
RFAP4.	PEAKED, SHINGLE
	UNDERFRAME
AXLE1.	1 AXLE
AXLE2.	2 AXLES
AXLE3.	3 AXLES
AXLE4.	4 AXLES
	DEPTH OF LONG BEAM [IN INCHES]
DBLM1.	) 6 IN.
DBLM2.	6) 8 IN.
DBLM3.	8) 10 IN.
DBLM4.	10) 12 IN.
DBLM5.	\ 12 IN.

Mobile Home Identification Data

	SPACING OF LONG BEAM (IN FEET)
SLBM1.	) 4 FT.
SLBM2.	4) 6 FT.
SLBM3.	6) 8 FT.
SLBM4.	8) 10 FT.
SLBM5.	10) 12 FT.
SLBM6.	12) 14 FT.
SLBM7.	\ 14 FT.
	TYPE OF FRAME
FRAM1.	BEAM AND OUTRIGGER FRAME
FRAM2.	PERIMETER FRAME
	HURRICANE STRAPS
HRST1.	NO. OF HURRICANE STRAPS
HRST2.	TWO HURRICANE STRAPS
HRST3.	THREE HURRICANE STRAPS
HRST4.	FOUR HURRICANE STRAPS
HRST5.	FIVE HURRICANE STRAPS
HRST6.	SIX HURRICANE STRAPS
	TYPE OF ELECTRICAL WIRING
ELWI1.	COPPER
ELWI2.	ALUMINUM
ELWI3.	COPPER CLAD ALUMINUM
	ELECTRICAL SERVICE
ELSR1.	50 AMPS OR) 50 AMPS
ELSR2.	100 AMPS \ 50) 100 AMPS
ELSR3.	150 AMPS \ 100) 150 AMPS
ELSR4.	200 AMPS \ 150) 200 AMPS
	PLUMBING - WATER SYSTEM PIPING
PWSP1.	METAL SUPPLY
PWSP2.	PLASTIC SUPPLY
PWSP3.	METAL DWV
PWSP4.	PLASTIC DWV
	HEATING SYSTEM
HSFU1.	GAS FUELED (NATURAL GAS + LPG)
HSFU2.	OIL FUELED
HSFU3.	ELECTRIC
	HOT WATER HEATER
HWAH1.	GAS FUELED
HWAH2.	ELECTRIC
	AIR CONDITIONING
ACON1.	GAS FUELED
ACON2.	ELECTRIC

Performance Problem List

CODE		DESCRIPTION	LEVEL
ANSI	ANSI STANDARD A119.1		2
CONS	PART B	CONSTRUCTION	3
ROOF	B6/B7	ROOF SYSTEM	4
PLCC	B6.4	LOAD CARRY CAPACITY	5
RDEL	B6.4	DECKING	6
RTRS	B6.4	ROOF TRUSS	6
RTRS1.	B6.4	TENSION MEMBER FAILURE	7
RTRS2.	B6.4	COMPRESSION MEMBER FAILURE	7
RTRS3.	B6.4	WEB MEMBER FAILURE	7
RTRS4.		ROOF TRUSS CUT FOR ROOF JACK	7
CEIL		CEILING	6
RDEF	B6.10	DEFLECTION	5
RDEF1.	B6.10	DECKING	6
RDEF2.	B6.10	ROOF TRUSS	6
RDEF3.	B6.10	CEILING	6
RFSS	B6.5	FASTENING OF STRUCTURAL SYSTEMS	5
RFSS1.	B6.5	TRUSS CONSTRUCTION	6
RFSS2.	B6.5	TRUSS-TO-WALL CONSTRUCTION	6
RFSS3.	B6.5	ROOFING TO TRUSS ATTACHMENT	6
RFSS4.	B6.5	CEILING TO TRUSS ATTACHMENT	6
RFSS5.	B6.5	DOUBLE WIDE MISALIGNMENT	6
RFSS6.	B6.5	TIP OUT MISALIGNMENT	6
RLWR	B7.1	RAIN LEAK - WATER RESISTANCE MEM. PENET.	5
RLMP	B7.1	MEMBRANE PENETRATION	6
RLMP1.	B7.1	AT MEMBRANE JOINT [WITHIN FIELD OF R	7
RLMP2.	B7.1	AT VENT PIPE [PLUMBING]	7
RLMP3.	B7.1	AT VENT PIPE [HEATING]	7
RLMP4.	B7.1	AT DOUBLE WIDE JOINT	7
RLMP5.	B7.1	AT TIP OUT JOINT	7
RIEW	B7.1	INTERSECTION OF ROOF AND EXTERIOR WALL,	6
RDUR		DURABILITY	5
RDUR1.		MEMBRANE	6
RDUR2.		CAULKING	6
CIFS	B7.3	INTERIOR FLAME SPREAD - CEILING	5
RRES	B7.4	RODENT RESISTANCE	5
RHLS	B7.5	HEAT LOSS	5
RHLS1.	B7.5	INSULATION	6
RHLS2.	B7.5	AIR INFILTRATION	6
RREC	B7.6	METALLIC ROOF BONDING/EXTERIOR COVERINGS	5
RCNR	B7.2	CONDENSATION RESISTANCE	5
RCNR1.	B7.2	VAPOR BARRIER IN CEILING	6
RCNR2.	B7.2	CEILING VENTILATED	6
FLOR	B6/B7	FLOOR SYSTEMS	4
FLCC	B6.9	LOAD CARRYING CAPACITY	5
FLCC1.	B6.9	DECKING	6
FLCC2.	B6.9	FLOOR JOISTS	6
FDEF	B6.10	DEFLECTION	5
FDEF1.	B6.10	DECKING	6
FDEF2.	B6.10	FLOOR JOISTS	6
FDUR		DURABILITY	5
FDUR1.		FLOOR COVERING	6
FDUR2.		FLOOR COVERING TO DECKING	6
FDUR3.		DECKING	6
FASS	B6.5	FASTENING OF STRUCTURAL SYSTEMS	5
FASS1.	B6.5	DECKING TO FLOOR JOISTS	6
FASS2.	B6.5	FLOOR SYSTEM TO METAL FRAME	6

FASS3.	B6.5	FLOOR SYSTEM TO EXTERIOR WALLS	6
FASS4.		WEATHER BARRIER	6
FLWR	B7.1	WEATHER RESISTANCE	5
FLWR1.	B7.1	UNDERNEATH OF FLOOR SYSTEM	6
FLIF	B7.3	INTERIOR FLAME SPREAD-FLOOR COVERING	5
FLIF1.		HOT WATER HEATER COMPARTMENT DOOR	6
FLRR		RODENT RESISTANCE	5
FLHL	B7.5	HEAT LOSS	5
FLHL1.	B7.5	INSULATION	6
FLHL2.	B7.5	AIR INFILTRATION	6
FLDN	B6.9.1	DRILLING/NOTCHING OF STRUCTURAL MEMBERS	5
INTW	B6/B7	PARTITION WALLS	4
INCC	B6.7	LOAD CARRYING CAPACITY	5
INCC1.	B6.7	PANELING	6
INCC2.	B6.7	WALL FRAMING	6
INSS	B6.5	FASTENING OF STRUCTURAL SYSTEMS	5
INSS1.	B6.5	PANELING TO WALL FRAMING	6
INSS2.	B6.5	WALL TO ROOF SYSTEM	6
INSS3.	B6.5	WALL TO FLOOR SYSTEM	6
INSS4.	B6.5	DOOR FRAMING	6
INSS5.	B6.5	PARTITION TO EXTERIOR WALL	6
INDR		DURABILITY OF PANELING	5
INFS	B7.3	INTERIOR FLAME SPREAD - PANELING	5
INDN	B6.6.1	DRILLING/NOTCHING OF STRUCTURAL MEMBERS	5
EXTW	B6/B7	EXTERIOR WALLS	4
EXCC	B6.6	LOAD CARRYING CAPACITY	5
EXCC1.	B6.6	EXTERIOR COVERING	6
EXCC2.	B6.6	WALL FRAMING	6
EXCC3.	B6.6	INTERIOR COVERING	6
EXSS	B6.5/6.6	FASTENING OF STRUCTURAL SYSTEMS	5
EXSS1.	B6.5/6.6	EXTERIOR COVERING TO WALL FRAMING	6
EXSS2.	B6.5/6.6	INTERIOR COVERING TO WALL FRAMING	6
EXSS3.	B6.5/6.6	WALL TO ROOF	6
EXSS4.	B6.5/6.6	WALL TO FLOOR	6
EXSS5.	B6.5/6.6	WALL TO WALL	6
EXWR	B7.1	WEATHER RESISTANCE - RAIN LEAKS	5
EXWR1.	B7.1	PENETRATION OF EXTERIOR COVERING	6
EXWR2.	B7.1	WINDOWS	6
EXWR3.	B7.1	DOORS	6
EXWR4.	B7.1	INTERSECTION OF WALL AND ROOF	6
EXWR5.	B7.1	INTERSECTION OF WALL AND FLOOR	6
EXDR	B7.1	DURABILITY	5
EXDR1.	B7.1	EXTERIOR COVERING	6
EXDR2.	B7.1	INTERIOR COVERING	6
EXDR3.	B7.1	CAULKING	6
EXDR4.	B7.1	EXTERIOR FASTENERS	6
EXDR5.	B7.1	INTERIOR FASTENERS	6
EXFS	B7.3	INTERIOR FLAME SPREAD - INTERIOR COVERIN	5
EXHL	B7.5	HEAT LOSS	5
EXHL1.	B7.5	INSULATION	6
EXHL2.	B7.5	AIR INSULATION	6
EXBM	B7.6	METALLIC ROOF BONDING/EXTERIOR COVERINGS	5
EXCR	B7.2	CONDENSATION RESISTANCE	5
EXCR1.	B7.2	VAPOR BARRIER IN CEILING	6
EXCR2.	B7.2	NO VAPOR BARRIER IN CEILING	6
WNDW	B6/B7/B8	WINDOWS	4
WNWR	B7.1/B8.5	WEATHER RESISTANCE - WATER LEAK	5
ANCR	B7.2/B8.5	CONDENSATION RESISTANCE	5

WNHL	B7.5/B8.5	HEAT LOSS - AIR INFILTRATION	5
WNCC	B6.3	LOAD CARRYING CAPACITY - RACKING	5
WNS7	B8.3.1	SIZE	5
WNGL	B8.3.1	GLAZING	5
WNDR		DURABILITY	5
WNBR	B8.1.2	BATHROOM	5
DEXT	B6/P7/B8	DOORS EXTERIOR	4
DEWR	B7.1	WEATHER RESISTANCE - WATER LEAK	5
DEHL	B7.5	HEAT LOSS - AIR INFILTRATION	5
DELC	B6.3	LOAD CARRYING CAPACITY - RACKING	5
DES7	B8.3.1	SIZE	5
DENL	B8.3.1	NUMBER AND LOCATION	5
DEDU		DURABILITY	5
DINT	B8.3.2/3	DOOR INTERIOR	4
DILH	B8.3.2/3	LOCKS, HARDWARE	5
DIDU		DURABILITY	5
FWEQ	B9.1	FIRE WARNING EQUIPMENT	4
FWEQ1.	B9.1	LISTED DETECTOR	5
FWEQ2.	B9.1	TROUBLE SIGNAL	5
FWEQ3.	B9.1	LOCATION	5
TIDN	B6.5.1	TIEDOWNS	4
TIDN1.	B6.5.1.4	WEATHER RESISTANCE	5
TIDN2.	B.6.5.1	LOAD CAPACITY	5
TIDN3.	B.6.5.2	SPACING	5
SREQ	B8.4	SPECIAL REQUIREMENTS	4
SREQ1.	B8.4.1	MINIMUM AREAS	5
SREQ2.	B8.4.2	MINIMUM WIDTH	5
SREQ3.	B8.4.3	TOILET COMPARTMENT	5
SREQ4	B8.4.4	HALLWAYS	5
TRAN	B-APP.	TRANSIT CONSIDERATIONS	4
TRAN1.	B.1	A FRAME ASSEMBLY	5
TRAN12.		LONGITUDINAL MEMBERS	6
TRAN13.		TRANSVERSE MEMBERS	6
TRAN2.	B.2	COUPLING MECHANISM	5
TRAN3.	B.3	RUNNING GEAR ASSEMBLY	5
TRAN4.	B.4	SPRING/SPRING HANGERS	5
TRAN5.	B.5	AXLES	5
TRAN6.	B.6	HUBS AND BEARINGS	5
TRAN7.	B.7	WHEELS/RIMS	5
TRAN8.	B.8	TIRES	5
TRAN9.	B.9	BRAKES	5
TRAN10.	B.9.1	MAXIMUM STOPPING DISTANCE	6
TRAN11.	B.10	LOW VOLTAGE WIRING	5
PLUM	PART C	PLUMBING	3
PFAP	C5.1.4	PROHIBITED FITTINGS AND PRACTICES	4
PFAP1.	C5.1.4.1	DRAINAGE/VENT PIPING - DRILLED OR TAPED	5
PFAP2.	C5.1.4.2	VENT PIPES NOT AS DRAIN PIPES	5
PFAP3.	C5.1.4.3	OBSTRUCTIVE FITTINGS, CONNECTIONS,ETC	5
PFAP4.	C5.1.4.4	MATERIAL IMPERFECTIONS [CONCEALED]	5
PFAP5.	C5.1.4.5	IMPROPER LOCATION OF PIPE, FIXT/EQUIP	5
PFAP6.	C5.1.4.6	GALVANIZED PIPE BENT OR WELDED	5
ATDF	C5.1.5	ALIGN OF FITTINGS/DIRECTION OF FLOW	4
PREQ	C5.2	PROTECTIVE REQUIREMENT	4
PREQ1.	C5.2.1	CUTTING STRUCTURAL MEMBERS	5
PREQ2.	C5.2.2	EXPOSED PIPING	5
PREQ3.	C5.2.3	ROAD DAMAGE	5
PREQ4.	C5.2.4	FREEZING	5
PREQ5.	C5.2.5	RODENT RESISTANCE	5

JCTI	C7.1	JOINTS + CONNECTIONS/TIGHT [GAS, WATER]	4
JCTI1.	C7.1.1	ASSEMBLING PIPE	5
JCTI2.	C7.1.2	THREADED JOINTS.	5
JCTI3.	C7.1.3	SOLDERED JOINTS	5
JCTI4.	C7.1.4	PLASTIC PIPE, FITTING AND JOINTS	5
JCTI5.	C7.1.5	UNION JOINTS	5
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NCBE	LEVELING	5
NCBR	RACKING OF DOORS	5
NCHH	HOT WATER HEATER COMPARTMENT	4
NCHI	INSULATION	5
NCHD	COMPARTMENT DOOR	4
NCSM	SKIRTING	4
NCES	EXTERIOR STAIRS	4
NCTD	TIE DOWN STRAPS LOOSE, ETC	4
NCMG	SITE GRADING	4
NCWD	WINDOWS	4
NCWP	REGLAZED	5
NCWH	HARDWARE	5
NCWF	IMPROPER FIT	5
NCWT	STORM	5
NCWS	SCREENS	5
NCXD	EXTERIOR DOORS	4
NCXP	REGLAZED	5
NCCD	CANOPY	5
NCXH	HARDWARE	5
NCXF	IMPROPER FIT	5
NCXS	SCREENS	5
NCSR	FROZEN	5
NCST	STORM	5
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NCPH	HARDWARE	5
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NPLM	PLUMBING	3
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NPXY3.	DRAIN FROZEN	6
NPTW	WAX SEAL	6
NPXX	CLOGGED DRAIN	6
NPTT	FLUSH TANK	6
NPTA	TOILET SEAT	6
NPTP	TANK TOP	6
NPTK	TOILET FLANGE FITTING	6
NPTS	WATER SUPPLY CONNECTION	6
NPKS	KITCHEN SINK	5
NPKF	FLANGE SEAL	6
NPKD1.	DRAIN	6
NPKD2.	DRAIN LEAK	6
NPKD3.	DRAIN FROZEN	6
NPKC	CLOGGED DRAIN	6
NPKA	FAUCET ASSEMBLY	6
NPBS	LAVORATORIES	5
NPBF	FLANGE SEAL	6
NPBD1.	DRAIN	6
NPBD2.	DRAIN LEAK	6
NPBD3.	DRAIN FROZEN	6
NPBC	CLOGGED DRAIN	6
NPBA	FAUCET ASSEMBLY	6

NPCB	BATHTUB WITH SHOWERHEAD	5
NPCC	CAULKING	6
NPCD1.	DRAIN	6
NPCD2.	DRAIN LEAK	6
NPCD3.	DRAIN FROZEN	6
NPCP	CLOGGED DRAIN	6
NPCA	FAUCET ASSEMBLY	6
NPWS	WATER SUPPLY PIPING	4
NPWI	INTERIOR	5
NPWA	FROZEN	6
NPWE	EXTERIOR	5
NPWR	FROZEN	6
NPBT	SEWER	4
NPMW	WASHING MACHING	4
NPMS	WATER SUPPLY	5
NPMD	DRAIN	5
NPDW	DISH WASHER	4
NPDS	WATERSUPPLY	5
NPEX	EXTERIOR DARIN-FURNACE,WATER HEATER	4
NPPR	PRESSURE REGULATOR	4
NHTG	HEATING	3
NHGP	GAS SUPPLY PIPING	4
NHOP	OIL SUPPLY PIPING	4
NHOF	FROZEN	5
NHGR	GAS PRESSURE REGULATOR	4
NHSP	INSTALLED SPACE HEATERS	4
NHRJ	ROOF JACK	4
NELC	ELECTRICAL	3
NEDP	DISTRIBUTION PANEL BOARD	4
NEDF	FUSES	5
NEDT	FUSTAT	5
NECB	CIRCUIT BREAKERS	5
NERC	RECEPTICAL OUTLETS	4
NERI	INTERIOR	5
NERF	FACEPLATE	6
NERO	OUT DOOR	5
NEHT	HEAT TAPE	6
NELF	LIGHT FIXRURE	6
NESW	SWITCHES	4
NESF	FACEPLATE	5
NEIF	INTERIOR LIGHTING FIXTUERS	4
NEIN	NOT SECURELY ATTACHED	5
NEPP	POWER POLE/LIFELINE	4
NESR	SERVICE	4
NEGR	EXTERNAL GROUNDING	4
NEBC	BRANCH CIRCUIT MALFUNCTION	4
NEEF	EXTERIOR LIGHT FIXTURE	4
APEQ	MECHANICAL/ELECTRICAL APPLIANCES -EQUIPMENT	2
AFHA	FURNACE,HOT AIR,GAS OR OIL	3
AFPL	PILOT/ELECTRONIC IGNITION	4
AFPR1.	RELIGHT PILOT	5
AFWT	WALL THERMOSTAT	4
AFTA	TRANSFORMER	5
AFCL	CONTROLS	4
AFBU	BURNER	5
AFTC	THERMOCOUPLE	6
AFCV	CONTROLS VALVE	6
AFCR	RESET BUTTON	6

AFCA	CAD CELLS	6
AFEE	ELECTRODE	6
AFBW	BLOWER	5
AFLS	LIMIT SWITCH	6
AFBR	RESET BUTTON	6
AFIW	INTERNAL WIRING	5
AFES	ON/OFF EMERGENCY SWITCH	6
AFAB	BURNER ASSEMBLY	4
AFBL	BLOWER ASSEMBLY	4
AFBD	BELT DRIVE	5
AFBR	BEARINGS	5
AFBM	BLOWER MOTOR	4
AFBG	BEARINGS	5
AFMM	MOTOR MOUNT	5
AFFG	FUEL GUN	4
AFFP	PUMP	5
AFFM	PUMP MOTOR	5
AFFN	NOZZLE / ORIFICE	5
AFFW	WRONG INITIALLY INSTALLED	6
AFFO	OIL LEAK	5
AFFL	GAS LEAK	5
AFDR	FURNACE DOORS	4
AFGR	GAS REGULATOR	4
AFSC	FUEL SUPPLY CONNECTION	4
AFTR	FILTER	4
AFEB	ELECTRIC BASEBOARD HEATING UNITS	3
AFMT	HEATING ELEMENT	4
AFST	THERMOSTAT	4
AFTF	TRANSFORMER	5
AFNC	CONTROLS	4
AFPT	THERMOCOUPLES	5
ARGE	RANGE - GAS/ELECTRIC	3
ARPL	PILOT	4
ARPRI	RELIGHT PILOT	5
ARCL	CONTROLS	4
ARTH	THERMOSTAT	5
ARSB	SURFACE BURNER	5
AROB	OVEN BURNER	5
ARTI	TIMER	5
ARBU	BURNER	4
ARBV	OVEN	5
ARBS	SURFACE	5
ARHW	HARDWARE	4
ARHO	OVEN DOORS	5
ARHH	HINGES	5
ARHD	DRAWS	5
ARHK	KNOBS	5
ARGL	GAS LEAK	4
ARIW	INTERNAL WIRING	4
AHWH	HOT WATER HEATERS	3
AHGS	GAS HOT WATER HEATER	4
AHPL	PILOT	5
AHPR	RELIGHT PILOT	6
AHBR	BURNER	5
AHNZ	NOZZLE/ORIFICE	6
AHRG	REGULATOR	6
AHRL	LEAK	6
AHTG	TANK	5

AHTL	LEAK	6
AHPG	PRESSURE REGULATOR	5
AHRV	PRESSURE RELIEF VALVE	5
AHAV	ANTI-SIPHON VALVE	5
AHCL	CONTROLS	5
AHCB	BURNER	6
AHCR	RESET BUTTON	6
AHCT	THERMOSTAT	6
AHEL	ELECTRIC HOT WATER HEATER	4
AHEH	HEAT ELEMENT	5
AHTK	TANK	5
AHTE	LEAK	6
AHEP	PRESSURE REGULATOR	5
AHEP	PRESSURE RELIEF VALVE	5
AHES	ANTI-SIPHON VALVE	5
AHEC	CONTROLS	5
AHEE	HEATING ELEMENT	6
AHEB	RESET BUTTON	6
AHEM	THERMOSTAT	6
ACRF	REFRIGERATOR	3
ACRC	COMPRESSOR	4
ACRM	COMPRESSOR MOTOR	4
ACRR	REFRIGERANT SYSTEM	4
ACRZ	FREEZER COILS	5
ACRI	REFRIGERATOR COILS	5
ACRT	TUBING	5
ACRH	RECHARGE	5
ACRG	GASKETING (DOORS	4
ACRL	CONTROLS	4
ACRD	DEFROST TIMER	5
ACRS	SWITCHES	5
ACRA	FAN	5
ACRN	FAN	4
ASDE	SMOKE DECTOR	3
AEEX	EXHAUST FAN	3
FURN	FURNITURE	2
OCCU	OCCUPIED	2
UNOC	UNOCCUPIED	2
UAOF	USED AS OFFICE	2
FIRE	FIRE IN MOBILE HOME	2

Appendix D

Typical Summation of Performance Data

Percentages of Second Level Problems

Total Number of Problems

FIRST LEVEL SUMMATION:
TOTAL NUMBER OF PROBLEMS — NO. 3528

Number of Problems at the Second Level

Percentage of First Level Problems

Number of Homes with problems

Number of Problems at the Third Level

PRELIMINARY

SECOND AND THIRD LEVEL SUMMATIONS:

			NO.	%2NO	%1ST	HOMES	%HOMES	LEVEL
ANSI	ANSI STANDARD A119.1	(0)	2120		60.1	246	95.7	2
CONS	PART B CONSTRUCTION	(0)	730	34.4	20.7	235	91.4	3
PLUM	PART C PLUMBING	(0)	701	33.1	19.9	208	80.9	3
HEAT	PART D HEATING SYSTEM	(0)	409	19.3	11.6	168	65.4	3
ELEC	PART E ELECTRICAL	(0)	280	13.2	7.9	142	55.3	3
NANS	ROUTINE MAINTENANCE	(0)	934		[illegible]	169	65.8	2
NCON	CONSTRUCTION	(0)	550	[illegible]	[illegible]	143	55.6	3
NPLM	PLUMBING	(17)	[illegible]	[illegible]	[illegible]	94	36.6	3
NHTG	HEATING	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13.2	3
NELC	ELECTRICAL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	28.8	3
APFQ	MECHANICAL/ELECTRICAL APPLIANCE EQUIPMENT	(0)	[illegible]		10.6	106	41.2	2
AFHA	FURNACE.HOT AIR.GAS OR OIL	(39)	181	48.4	5.1	77	30.0	3
AFEB	ELECTRIC BASEBOARD HEATING UNITS	(1)	1	.3	.0	1	.4	3
ARGE	RANGE - GAS/ELECTRIC	(11)	72	19.3	2.0	36	14.0	3
AHWW	HOT WATER HEATERS	(28)	82	21.9	2.3	52	20.2	3
ACRF	REFRIGERATOR	(9)	10	2.7	.3	9	3.5	3
ASOE	SMOKE DECTOR		3	.8	.1	3	1.2	3
AEEX	EXHAUST FAN		25	6.7	.7	14	5.4	3
FURN	FURNITURE		100		2.8	53	20.6	2

		NO.	%	LEVEL
FIRE	FIRE IN MOBILE HOME	10	3.9	2

TOTAL NUMBER OF MOBILE HOMES REVIEWED = 257

FOURTH LEVEL SUMMATION:				NO.	%3RD	%2ND	%1ST	HOMES	%HOMES	LEVEL
* ANSI	ANSI STANDARD A119.1		0)	2120			60.1	246	95.7	2 *
CONS	PART 8	CONSTRUCTION	0)	730		34.4	20.7	235	91.4	3
ROOF	B6/B7	ROOF SYSTEM	0)	184	25.2	8.7	5.2	112	43.6	4
FLOR	B6/B7	FLOOR SYSTEMS	0)	75	10.3	3.5	2.1	60	23.3	4
INTW	B6/B7	PARTITION WALLS	0)	120	16.4	5.7	3.4	100	38.9	4
EXTW	B6/B7	EXTERIOR WALLS	0)	237	32.5	11.2	6.7	173	67.3	4
WNOW	B6/B7/B8	WINDOWS	0)	12	1.6	.6	.3	10	3.9	4
DEXT	B6/B7/B8	DOORS EXTERIOR	0)	16	2.2	.8	.5	15	5.8	4
DINT	B8.3.2/3	DOOR INTERIOR	0)	0	.0	.0	.0	0	.0	4
FWEQ	B9.1	FIRE WARNING EQUIPMENT	0)	0	.0	.0	.0	0	.0	4
TION	B6.5.1	TIEDOWNS	0)	3	.4	.1	.1	3	1.2	4
SREQ	B8.4	SPECIAL REQUIREMENTS	0)	0	.0	.0	.0	0	.0	4
TRAN	B-APP.	TRANSIT CONSIDERATIONS	0)	83	11.4	3.9	2.4	53	20.6	4
PLUM	PART C	PLUMBING	0)	701		33.1	19.9	208	80.9	3
PFAP	C5.1.4	PROHIBITED FITTINGS AND PRACTICES	0)	3	.4	.1	.1	3	1.2	4
ATDF	C5.1.5	ALIGN OF FITTINGS/DIRECTION OF FLOW	0)	0	.0	.0	.0	0	.0	4
PREQ	C5.2	PROTECTIVE REQUIREMENT	0)	50	7.1	2.4	1.4	45	17.5	4
JCTI	C7.1	JOINTS + CONNECTIONS/TIGHT [illegible]	1)	105	15.0	5.0	3.0	58	22.6	4
TANC	C8	TRAPS AND CLEANOUTS	0)	1	.1	.0	.0	1	.4	4
PFIA	C9	PLUMBING FIXTURES	0)	143	20.4	6.7	4.1	76	29.6	4
PHAS	C10	HANGERS AND SUPPORTS	0)	2	.3	.1	.1	2	.8	4
WDTN	C11	WATER DISTRIBUTION SYSTEM	0)	218	31.1	10.3	6.2	156	60.7	4
DSYS	C12	DRAINAGE SYSTEMS	0)	152	21.7	7.2	4.3	84	32.7	4
VANV	C13	VENTS AND VENTING	0)	27	3.9	1.3	.8	23	8.9	4
HEAT	PART D	HEATING SYSTEM	0)	409		19.3	11.6	168	65.4	3
HLPG	D4.2.5	LP GAS SAFETY DEVICES		1	.2	.0	.0	1	.4	4
HPSY	05	PIPING SYSTEM	0)	210	51.3	9.9	6.0	117	45.5	4
HAPL	D6	APPLIANCES	0)	198	48.4	9.3	5.6	133	51.8	4
ELEC	PART E	ELECTRICAL	0)	280		13.2	7.9	142	55.3	3
ERXY	E5.0	MATERIALS AND EQUIPMENT	0)	19	6.8	.9	.5	19	7.4	4
EREC	E6	RECEPTACLE OUTLETS REQUIRED	0)	36	12.9	1.7	1.0	28	10.9	4
EBCR	E7	BRANCH CIRCUITS REQUIRED	0)	0	.0	.0	.0	0	.0	4
EDIS	E9	DISCONNECTING MEANS AND BRANCH CIRCUIT	0)	4	1.4	.2	.1	4	1.6	4
EPOW	E10	POWER SUPPLY	0)	4	1.4	.2	.1	4	1.6	4
EWOR	E11	WIRING METHODS	21)	179	63.9	8.4	5.1	108	42.0	4
EUND	E12	UNDER CHASSIS WIRING	0)	0	.0	.0	.0	0	.0	4
EFPL	E13	SWITCHES AND RECEPTACLE PLATES	0)	0	.0	.0	.0	0	.0	4
ECON	E14	CONDUCTORS IN OUTLET BOXES	0)	0	.0	.0	.0	0	.0	4
EPOL	E16	POLARIZATION	0)	0	.0	.0	.0	0	.0	4
ETER	E17	CONNECTION TO TERMINALS AND SPLICES	0)	0	.0	.0	.0	0	.0	4
ESWL	E18	WALL SWITCHES	3)	3	1.1	.1	.1	2	.8	4
EFRO	E19	RECEPTACLE OUTLETS	0)	3	1.1	.1	.1	3	1.2	4
EXUR	E20	LIGHTING FIXTURES	14)	15	5.4	.7	.4	12	4.7	4
EBFA	E22	OUTDOOR OUTLETS, FIXTURES, AIR-COOLING	5)	12	4.3	.6	.3	12	4.7	4
EGDB	E23	GROUNDING AND BONDING	0)	5	1.8	.2	.1	5	1.9	4

FOURTH LEVEL SUMMATION:			NO.	%3RD	%2ND	%1ST	HOMES	%HOMES	LEVEL
EMKE	E25 ELECTRICAL MARKING	(0)	0	.0	.0	.0	0	.0	4
* NANS	ROUTINE MAINTENANCE	(0)	934			26.5	169	65.8	2 *
NCON	CONSTRUCTION	(0)	550		58.9	15.6	143	55.6	3
NCBL	BLOCKING	(9)	20	3.6	2.1	.6	15	5.8	4
NCHH	HOT WATER HEATER COMPARTMENT	(0)	27	4.9	2.9	.8	26	10.1	4
NCSM	SKIRTING		32	5.8	3.4	.9	21	8.2	4
NCES	EXTERIOR STAIRS		41	7.5	4.4	1.2	25	9.7	4
NCTD	TIE DOWN STRAPS LOOSE, ETC		4	.7	.4	.1	4	1.6	4
NCMG	SITE GRADING		7	1.3	.7	.2	7	2.7	4
NCWD	WINDOWS	(23)	122	22.2	13.1	3.5	66	25.7	4
NCXO	EXTERIOR DOORS	(43)	244	44.4	26.1	6.9	97	37.7	4
NCPD	PARTITIONS DOORS	(15)	40	7.3	4.3	1.1	27	10.5	4
NCFL	FLOOR	(1)	13	2.4	1.4	.4	9	3.5	4
NPLM	PLUMBING	(17)	216		23.1	6.1	94	36.6	3
NPFX	FIXTUERS	(0)	69	31.9	7.4	2.0	42	16.3	4
NPWS	WATER SUPPLY PIPING	(15)	79	36.6	8.5	2.2	53	20.6	4
NPBT	SEWER		29	18.1	4.2	1.1	26	10.1	4
NPMW	WASHING MACHING		0	.0	.0	.0	0	.0	4
NPDW	DISH WASHER		0	.0	.0	.0	0	.0	4
NPEX	EXTERIOR DARIN-FURNACE,WATER HEATER		0	.0	.0	.0	0	.0	4
NPPR	PRESSURE REGULATOR		12	5.[illegible]	[illegible]3	.3	9	3.5	4
NHTG	HEATING	(4)	[illegible]	[illegible]	[illegible].7	[illegible]2	34	13.2	3
NHGP	GAS SUPPLY PIPING		23	[illegible]	2.5	.7	20	7.8	4
NHOP	OIL SUPPLT PIPING	(7)	7	15.[illegible]	[illegible]	.2	[illegible]	2.3	4
NHGR	GAS PRESSURE REGULATOR		0	.0	.0	.0	[illegible]	.0	4
NHSP	INSTALLED SPACE HEATERS		10	22.7	1.1	[illegible]	[illegible]	3.1	4
NHRJ	ROOF JACK		0	.0	.0	[illegible]	[illegible]	.0	4
NELC	ELECTRICAL	(6)	124		13.3	3.5	74	28.8	3
NEDP	DISTRIBUTION PANEL BOARD	(10)	55	44.4	5.9	1.6	40	15.6	4
NERC	RECEPTICAL OUTLETS	(1)	33	26.6	3.5	.9	26	10.1	4
NESW	SWITCHES	(6)	7	5.6	.7	.2	6	2.3	4
NEIF	INTERIOR LIGHTING FIXTURES	(1)	1	.8	.1	.0	1	.4	4
NEPP	POWER POLE/LIFELINE		18	14.5	1.9	.5	17	6.6	4
NESR	SERVICE		1	.8	.1	.0	1	.4	4
NEGP	EXTERNAL GROUNDING		0	.0	.0	.0	0	.0	4
NEBC	BRANCH CIRCUIT MALFUNCTION		0	.0	.0	.0	0	.0	4
NEEF	EXTERIOR LIGHT FIXTURE		3	2.4	.3	.1	3	1.2	4
* APEQ	MECHANICAL/ELECTRICAL APPLIANCES -EQUIPMENT	(0)	374			10.6	106	41.2	2 *
AFHA	FURNACE,HOT AIR,GAS OR OIL	(39)	181		48.4	5.1	77	30.0	3
AFPL	PILOT/ELECTRONIC IGNITION	(3)	40	22.1	10.7	1.1	32	12.5	4

FOURTH LEVEL SUMMATION:			NO.	%3RD	%2ND	%1ST	HOMES	%HOMES	LEVEL
AFWT	WALL THERMOSTAT	(17)	21	11.6	5.6	.6	18	7.0	4
AFCL	CONTROLS	(2)	35	19.3	9.4	1.0	21	8.2	4
AFAB	BURNER ASSEMBLY		2	1.1	.5	.1	2	.8	4
AFBL	BLOWER ASSEMBLY	(2)	2	1.1	.5	.1	2	.8	4
AFBM	BLOWER MOTOR	(2)	4	2.2	1.1	.1	2	.8	4
AFFG	FUEL GUN	(0)	32	17.7	8.6	.9	20	7.8	4
AFDR	FURNACE DOORS		1	.6	.3	.0	1	.4	4
AFGR	GAS REGULATOR		1	.6	.3	.0	1	.4	4
AFSC	FUEL SUPPLY CONNECTION		1	.6	.3	.0	1	.4	4
AFTR	FILTER		3	1.7	.8	.1	3	1.2	4
AFEB	ELECTRIC BASEBOARD HEATING UNITS	(1)	1		.3	.0	1	.4	3
AFMT	HEATING ELEMENT		0	.0	.0	.0	0	.0	4
AFST	THERMOSTAT	(0)	0	.0	.0	.0	0	.0	4
AFNC	CONTROLS	(0)	0	.0	.0	.0	0	.0	4
ARGE	RANGE - GAS/ELECTRIC	(11)	72		19.3	2.0	36	14.0	3
ARPL	PILOT	(3)	18	25.0	4.8	.5	16	6.2	4
ARCL	CONTROLS	(2)	11	15.3	2.9	.3	10	3.9	4
ARBU	BURNER	(0)	6	8.3	1.6	.2	5	1.9	4
ARHW	HARDWARE	(0)	3	4.2	.8	.1	3	1.2	4
ARGL	GAS LEAK		14	23.1	3.5	.5	14	5.4	4
ARIW	INTERNAL WIRING		2	8.3	1.6	.2	2	.8	4
AHWW	HOT WATER HEATERS	(28)	53		2[illegible]	2.[illegible]	5[illegible]	20.2	3
AHGS	GAS HOT WATER HEATER	(2)	1[illegible]	1[illegible]4	2.[illegible]	[illegible]	[illegible]	3.5	4
AHEL	ELECTRIC HOT WATER HEATER	(17)	43	52.4	11.[illegible]	1.2	[illegible]	11.3	4
ACRF	REFRIGERATOR	(9)	10		2.7	.3	[illegible]	3.5	3
ACRC	COMPRESSOR		0	.0	.0	.0	0	.0	4
ACRM	COMPRESSOR MOTOR		0	.0	.0	.0	0	.0	4
ACRR	REFRIGERANT SYSTEM	(0)	0	.0	.0	.0	0	.0	4
ACRG	GASKETING (DOORS		0	.0	.0	.0	0	.0	4
ACRL	CONTROLS	(0)	1	10.0	.3	.0	1	.4	4
ACRN	FAN		0	.0	.0	.0	0	.0	4
ASDE	SMOKE DECTOR		3		.8	.1	3	1.2	3
AEEX	EXHAUST FAN		25		6.7	.7	14	5.4	3

Appendix E

Typical Graphical Presentation of Data by Computer

Table E-1. Year of manufacture versus number of units in the date file.

Year of Mfgr.	No of Units
1974.	32
1973.	350
1972.	333
1971.	179
1970.	14
1969.	4
1968.	1
19U.K.	54

Table E-2. Width versus number of units in data file.

Width of Unit	No. of Units
12. FEET	365
14. FEET	84
16. FEET	1
20. FEET	6
24. FEET	284
UNKNOWN	227

Table E-2 State of manufacture versus number of units in the data file

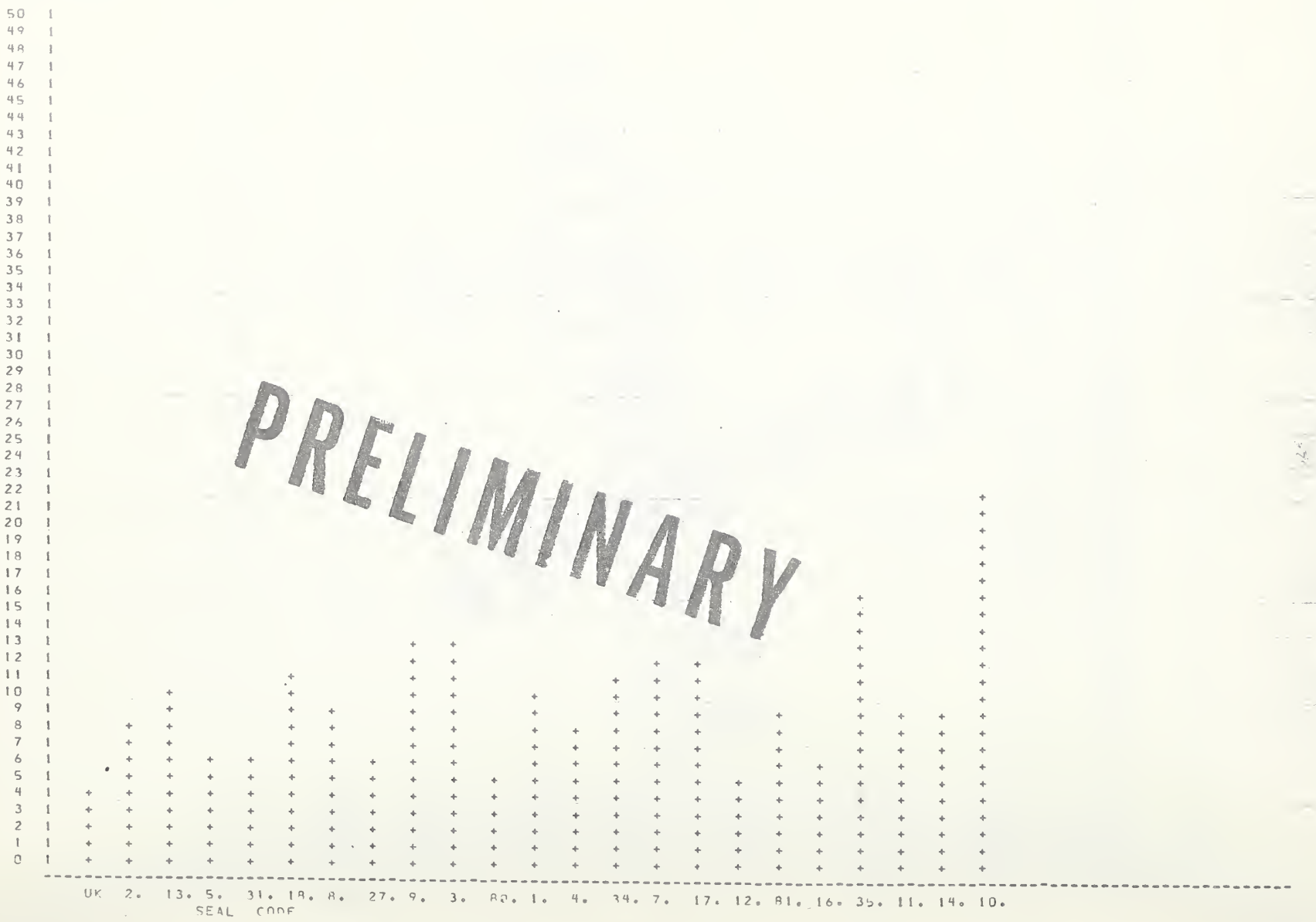
State of Mfgr.	No. of Units
ALABAMA	34
ALASKA	1
ARIZONA	1
ARKANSAS	2
CALIFORNIA	160
COLORADO	4
FLORIDA	92
GEORGIA	76
IDAHO	30
INDIANA	1
KANSAS	1
KENTUCKY	1
LOUISIANA	9
MARYLAND	1
MICHIGAN	1
MINNESOTA	4
MISSISSIPPI	1
MISSOURI	1
NORTH CAROLINA	7
OKLAHOMA	6
OREGON	61
PENNSYLVANIA	2
SOUTH DAKOTA	2
TENNESSEE	1
TEXAS	148
VIRGINIA	5
WASHINGTON	58
WISCONSIN	3
WYOMING	1
UNKNOWN	238

Table E-3. Seal of approval versus problems versus number of units in the data

SEAL OF APPROVAL 3/	PROBLEMS TOTAL	1/ C	P	H	E	HOMES TOTAL	2/ C	P	H	E
1.	2300	1118	758	166	258	588	396	340	126	167
2.	3415	1715	1141	194	365	469	418	377	137	233
3.	467	262	132	20	53	70	65	55	13	31
4.	0	0	0	0	0	0	0	0	0	0
5.	299	174	88	11	26	32	31	22	10	13
6.	16	7	7	2	0	3	3	2	2	0
7.	0	0	0	0	0	0	0	0	0	0
8.	0	0	0	0	0	0	0	0	0	0
9.	4	0	3	0	1	1	0	1	0	1
10.	0	0	0	0	0	0	0	0	0	0
11.	0	0	0	0	0	0	0	0	0	0
12.	0	0	0	0	0	0	0	0	0	0
13.	0	0	0	0	0	0	0	0	0	0
14.	0	0	0	0	0	0	0	0	0	0
15.	17	10	6	0	1	2	2	1	0	1
16.	0	0	0	0	0	0	0	0	0	0
17.	0	0	0	0	0	0	0	0	0	0
18.	32	14	11	2	6	5	5	5	2	3
19.	11	5	4	1	2	2	2	2	1	1
20.	68	34	25	5	4	6	6	5	4	3
21.	282	140	97	15	30	27	26	24	10	19
22.	0	0	0	0	0	0	0	0	0	0
23.	0	0	0	0	0	0	0	0	0	0
24.	0	0	0	0	0	0	0	0	0	0
25.	0	0	0	0	0	0	0	0	0	0
26.	0	0	0	0	0	0	0	0	0	0
27.	0	0	0	0	0	0	0	0	0	0
28.	0	0	0	0	0	0	0	0	0	0
29.	0	0	0	0	0	0	0	0	0	0
30.	0	0	0	0	0	0	0	0	0	0
31.	0	0	0	0	0	0	0	0	0	0
32.	0	0	0	0	0	0	0	0	0	0
33.	0	0	0	0	0	0	0	0	0	0
34.	0	0	0	0	0	0	0	0	0	0
35.	1923	991	644	98	190	369	286	251	77	127
36.	7641	3883	2480	373	905	928	843	733	273	475
37.	0	0	0	0	0	0	0	0	0	0
38.	0	0	0	0	0	0	0	0	0	0
39.	56	30	17	3	6	9	9	7	3	4
40.	0	0	0	0	0	0	0	0	0	0
41.	0	0	0	0	0	0	0	0	0	0
42.	8	4	3	0	1	1	1	1	0	1
43.	0	0	0	0	0	0	0	0	0	0
44.	46	18	17	2	9	5	5	4	1	4
45.	120	56	36	10	18	13	13	10	7	10
46.	9	4	2	0	1	2	2	1	0	1
47.	12	2	5	2	3	1	1	1	1	1
48.	0	0	0	0	0	0	0	0	0	0
49.	0	0	0	0	0	0	0	0	0	0
50.	0	0	0	0	0	0	0	0	0	0
51.	0	0	0	0	0	0	0	0	0	0
52.	0	0	0	0	0	0	0	0	0	0
53.	0	0	0	0	0	0	0	0	0	0

1/ CPH & E denote the number of construction, plumbing, heating and electrical problems respectively.
2/ CPH & E denote the number of mobile homes having construction, plumbing heating and electrical problems respectively.
3/ Numbers indicate a specific seal of approving agency.

Plot No. E-1. Seal of approving agency versus average number of problems per Mobile Home



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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.)*

In a study at the National Bureau of Standards (NBS), funded by the Department of Housing and Urban Development (HUD), methods for inspecting mobile homes to identify performance problems, recording the problems and analyzing the problem data were developed. Maintenance work orders for 2881 mobile homes, a part of 12,500 provided by HUD for emergency housing in the aftermath of hurricane Agnes, at Wilkes-Barre, Pennsylvania, were reviewed and computer coded by an inter-disciplinary team of engineers. Also, performance data were obtained from State and other Federal agencies for over 967 privately owned mobile homes. A second task was the field inspection of 257 mobile homes to assist in the determination of the causes and consequences of the problems identified in the data acquisition task. Computer techniques were developed to process the data and print out problem summation tables, graphs to establish trends, compile data on obvious problems and ferret out those problems which may not be obvious. This first report documenting the data acquisition and analysis methodology will be followed by a series of reports which will present results and relate them to current standards, the regulatory and insurance processes.

17. KEY WORDS *(six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons)*

Construction; Hurricane Agnes; Housing; Mobile Homes; Mobile Home Parks; Performance data; Regulatory Process; Standards

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