U.S. Department of Housing and Urban Development
Office of Policy Development and Research

Assessing Housing Durability: A Pilot Study

PATH (Partnership for Advancing Technology in Housing) is a new private/public effort to develop, demonstrate, and gain widespread market acceptance for the “Next Generation” of American housing. Through the use of new or innovative technologies, the goal of PATH is to improve the quality, durability, environmental efficiency, and affordability of tomorrow’s homes.

PATH is managed and supported by the U.S. Department of Housing and Urban Development (HUD). In addition, all federal agencies that engage in housing research and technology development are PATH Partners, including the Departments of Energy, Commerce, and Agriculture, as well as the Environmental Protection Agency (EPA) and the Federal Emergency Management Agency (FEMA). State and local governments and other participants from the public sector are also partners in PATH. Product manufacturers, home builders, insurance companies, and lenders represent private industry in the PATH Partnership.

To learn more about PATH, please contact:

451 7th Street, SW
Washington, DC 20410
202-708-4277/202-708-5873 (fax)
e-mail: pathnet@pathnet.org
website: www.pathnet.org

Visit PD&R's Web Site
www.huduser.org
to find this report and others sponsored by
HUD's Office of Policy Development and Research (PD&R).

Other services of HUD USER, PD&R's Research Information Service, include listservs;
special interest, bimonthly publications (best practices, significant studies from other sources);
access to public use databases; hotline 1-800-245-2691 for help accessing the information you need.

Assessing Housing Durability: A Pilot Study

Prepared for

U.S. Department of Housing and Urban Development
Office of Policy Development and Research
Washington, DC

Contract C-OPC-21289

by

NAHB Research Center, Inc.
Upper Marlboro, Maryland

November 2001

Acknowledgments

This report was prepared by the NAHB Research Center under contract to the U.S. Department of Housing and Urban Development (HUD). The principal author is Phillip Davis. Internal technical review was provided by Jay Crandell. Contributing analysts include Daniel Priest. We would like to acknowledge the helpful review and guidance given by Dana Bres and William Freeborne.

NOTICE

ABOUT THE NAHB RESEARCH CENTER, INC.

The NAHB Research Center is a not-for-profit subsidiary of the National Association of Home Builders (NAHB). The NAHB has 200,000 members, including 50,000 builders who build more than 80 percent of new American homes. The NAHB Research Center conducts research, analysis, and demonstration programs in all areas relating to home building and carries out extensive programs of information dissemination and interchange among members of the industry and between the industry and the public.

Foreword

Durability is one of the least understood attributes of the nation's housing stock. Although many attempts have been made to provide solutions to real and perceived durability problems, little has been done to benchmark and monitor the durability of U.S. housing. Such information can provide the proper focus and perspective for improving housing durability while avoiding costly mistakes that may adversely affect the affordability or longevity of homes.

In response to the lack of information, the U.S. Department of Housing and Urban Development commissioned a pilot study of the durability performance of a representative sample of homes in Anne Arundel County, Maryland. This report presents the findings of facts from this pilot study and provides useful criticisms of the study methodology. The study reports several interesting statistics, cause-and-effect relationships, and observations on housing durability. The report also discusses lessons learned from the study with a view toward improved techniques should this effort be expanded to a regional or national level.

The findings of this study not only demonstrate the feasibility of benchmarking and monitoring the durability of the nation's housing stock but also reveal the importance of certain design, construction, maintenance, and environmental factors related to durability. These findings, however, must be tempered with the understanding that they are associated with a relatively small sample in one locality in the United States. The results of this pilot study should not be interpreted beyond the limits of the sampled houses and occupants.

Lawrence L. Thompson
General Deputy Assistant Secretary for
Policy Development and Research

Contents

Tables

Page

Figures

I. INTRODUCTION

Housing constitutes an essential part of the U.S. infrastructure and economy. For many people, a home is their primary investment and provides the shelter and function needed for a decent "standard of living." Therefore, the durability of residential buildings, including their component parts and materials, is an area that deserves special attention and improved understanding. Unfortunately, little objective or comprehensive feedback information regarding the longevity or service life of existing houses is available to guide decisions that affect the balance between the affordability and durability of future homes. As a result, design and construction decisions regarding durability rely on various forms of experience embodied in standards, building codes, individual builders and designers, manufacturer recommendations, building inspectors, court decisions, and other factors. Without the benefit of a systematic process to obtain objective feedback about actual end-use conditions and the performance of the existing house inventory, trends in design and construction practices affecting durability may tend to drift or not "keep pace" with changes in housing styles, material choices, and owner expectations.

This report presents the findings of a pilot study aimed at developing a reliable and objective means to obtain periodic feedback on the durability performance of the housing stock. The objectives of the pilot study are to

- benchmark the durability performance of a trial sample of the existing housing stock;
- develop and refine a functional method for housing durability assessment;
- determine if the resulting durability assessment data are able to reveal any causal relationships between the condition of a house and various factors; and
- consider practical applications of the study findings.

The pilot study focused on the condition of the exterior envelope for 10- and 30-year-old homes and considers only single-family detached and attached (townhouse) dwellings. The pilot project involved two types of data-collection activities as follows:

- a site condition assessment; and
- a homeowner survey.

The site condition assessment was limited to the characteristics and condition of the exterior envelope of the housing unit, its appurtenances, and the lot. The condition of the interior of the homes and their features were beyond the scope of the study. The homeowner survey, however, addresses both interior and exterior conditions.

Section II of this report describes the data-collection methodology. Section III presents the results from the site assessment and homeowner survey. In particular, Section III provides a combination of anecdotal and statistical findings. Section IV evaluates the durability assessment methodology and recommends improvements. Sections V and VI provide a summary of key conclusions and recommendations resulting from the overall effort.

II. METHODOLOGY

GENERAL

The pilot study focused on the condition of two random samples of single-family homes located in Anne Arundel County, Maryland. One sample consisted of homes in the five- to ten-year-old category and the other on homes in the 25- to 30-year-old category.

The samples were randomly selected by using a GIS-based software package (ArcView) and property tax data obtained from Maryland Property Data, Inc.[1] A total of 211 homes were randomly selected from a population of 185,291 properties in the county. Three units were subsequently disqualified from the study, yielding a total sample of 208 units–103 in the five- to ten-year-old category and 105 homes in the 25- to 30-year-old category. The entire sample of 208 dwellings was retained for statistical analysis. Figure 1 shows the sample region and its geographic distribution.[2]

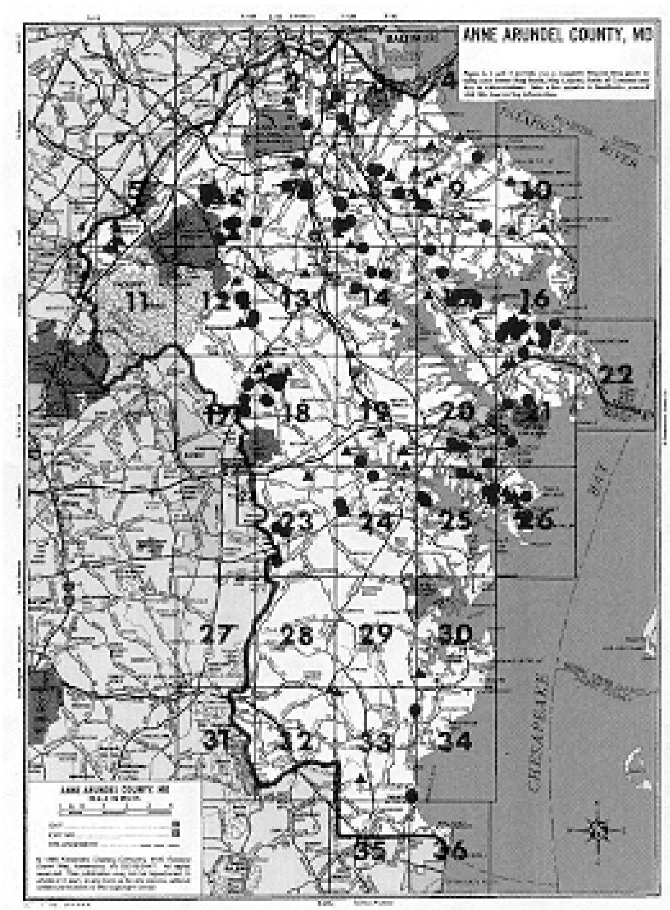

Figure 1
Study sample region.
(Anne Arundel County, MD)

---

[1]MD Property Data Set, Anne Arundel County, GIS Integrated Solutions, Laurel, MD, March 31, 2000.
[2]Developed using the "ADC Maps on CD" map of Anne Arundel County, Maryland, produced by GIS Integrated Solutions.

The survey method, developed and approved through the Paperwork Reduction Act (OMB #2528-0207), required that a letter be sent to each owner or occupant of the houses in the sample (see Appendix A). The letter explained the purpose of the contact and informed the homeowner or occupant that the home had been randomly selected as a candidate for a site condition assessment. The letter also informed the homeowners that they would be contacted to schedule a site assessment visit and to conduct a telephone survey. A homeowner survey form (see Appendix B) was included with the letter.

SITE ASSESSMENT

The Inspection Form. A site condition assessment form was created for gathering information on a broad range of house and site characteristics and their associated physical conditions. A copy of the site condition assessment form is included in Appendix C. The form used several different methods for entering the required data. For some categories, the inspector entered a "yes" or "no" to signify whether a condition or component was present. For other categories, the inspector checked a single block from among multiple choices. Finally, a 1 to 5 numerical rating was used to rate the condition of the house or component. The numeric score equated to the general condition of the subject component as follows:

1 - Excellent
2 - Good
3 - Adequate
4 - Poor
5 - Needs Repair

In addition, an instructional form given to each inspector provided component-specific guidelines for assigning the numerical scores (see Appendix D).

The use of different methods to record data provided an opportunity to assess the advantages and disadvantages of each method.

The Inspection Team. Five three-inspector teams conducted visual surveys of the exterior of the houses and surrounding site conditions. They recorded selected characteristics of each house and site, assessed the overall condition of the house and various components, and compiled a photographic record. At least one photograph of each house was required. Each inspection team was charged with inspecting roughly 40 houses. At least two members were required to inspect each home and complete separate inspection forms. The use of multiple inspections of selected homes permitted an analysis of consistency in execution of the methodology.

The five teams participated in two calibration exercises. The first exercise was conducted at the beginning of data collection, in part to resolve differences in the application of the form and rating system. Another was conducted at the end of the data collection. The primary goal of collecting the calibration data was to assess the variability in the survey data across individual inspectors before and after the site assessments.

At the completion of the site assessment, the forms for 208 houses were deemed suitable for analysis. The useful response rate varied from question to question due mainly to the presence of conflicting data provided by the inspectors. The conflicting responses were removed from the data reported in Section III. While this procedure resulted in a smaller effective sample size available for statistical analysis, the presence or frequency of conflicting data provided a useful measure of the suitability of various aspects of the data-collection methodology. Appendix E summarizes the raw data as collected.

HOMEOWNER SURVEY

The project team also conducted a telephone survey of homeowners to gather historical information about respondents' homes. The survey addressed sampled a broad spectrum of durability and fitness-of-use issues from the perspective of the homeowners or occupants (see Appendix B for a copy of the telephone survey form).

The homeowner survey form was attached to the homeowner letter mentioned previously; however, only a few homeowners responded. Follow-up telephone contacts improved the response rate, with just short of a 10 percent completion rate achieved. The subsequent site assessment visits provided additional opportunities to increase the survey response rate by permitting inspectors to speak directly with occupants. In the end, the homeowner survey achieved a response rate of 20.7 percent (based on survey forms containing at least partial information).

III. RESULTS

SITE ASSESSMENT

Sample Housing Characteristics

This section presents a discussion of the typical characteristics of the houses in both age-group samples. Each discussion topic is followed by one or more figures (graphs) that complement the text. The study collected a variety of housing characteristic data with the view toward possible explanatory relationships concerning the durability or condition of the sampled homes. It must be noted that the percentages reflected in both the discussion and the graphs are based on sample sizes that vary as explained in Section II, Methodology.

- General

Most of the houses in both age groups were detached (74 percent and 56 percent of the 1970s and 1990s samples, respectively). Two-story structures accounted for most of the homes in both the 1970s (71 percent) sample and the 1990s (81 percent) sample. The orientation (the direction that the front of the house faces) varied greatly in both samples so that no one direction dominated either sample. The most prevalent orientation in the 1970s sample was south (25 percent); in the 1990s sample, it was north (22 percent). The wind exposure of 97 percent of the 1970s houses and 94 percent of the 1990s houses was judged to be a "B" (suburban or wooded exposure) according to ASCE 7 definitions (ASCE, 1999).

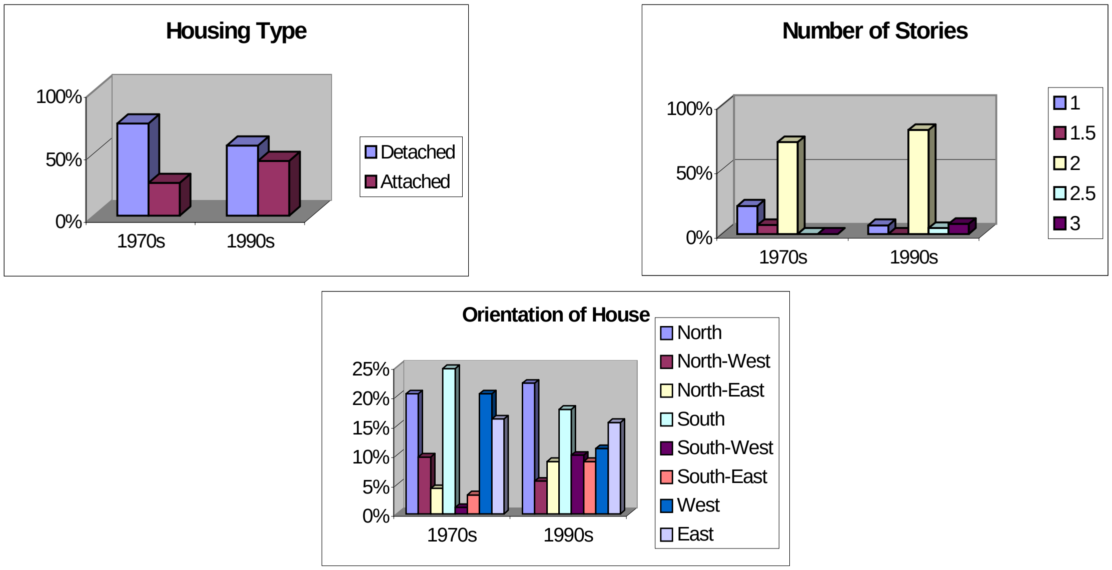

Figure 2
General sample housing characteristics.

- Foundations

Most of the houses in both samples were constructed on basement foundations (57 percent and 78 percent, respectively). Block was the predominant foundation material in the 1970s homes (51 percent), but concrete accounted for the majority of 1990s foundations (73 percent). Seven percent of both samples had window wells, and 1 to 2 percent of the samples had covered wells. Twenty-two percent of the 1970s sample and 21 percent of the 1990s samples had walkout basements. Sixteen percent of the 1970s sample and 19 percent of the 1990s sample had a stairwell.

Figure 3
Foundation characteristics of sampled homes.

- Exterior Finishes

Vinyl siding was the most common siding material in both samples (33 percent and 63 percent for the 1970s and the 1990s, respectively). While aluminum (23 percent) and brick (22 percent) closely rivaled vinyl in the 1970s sample, the 1990s sample contained no close competitors. It appears that the high frequency vinyl siding in the 1970s sample was the result of retrofits; vinyl did not find widespread use in new-home construction until much later. The siding on 59 percent of the 1970s houses and 84 percent of the 1990s houses terminated at least six inches above ground.

Metal was the most common soffit material in both the 1970s and 1990s samples (45 percent and 53 percent, respectively). Wood was the second most common material (40 percent and 24 percent) and vinyl the third most common (13 percent and 22 percent, respectively). Most 1970s houses had an exposed wood fascia (54 percent) while the most common material in the 1990s houses was metal over wood (46 percent). Metal accounted for another 39 percent in the 1970s sample and wood for 41 percent in the 1990s sample. Vinyl followed in both the 1970s and 1990s sample with 6 percent and 11 percent, respectively. Ninety-seven percent of the 1970s homes and 99 percent of the 1990s homes had gutters and downspouts. Aluminum accounted for the majority of gutters and downspouts in both samples (87 percent and 82 percent, respectively). Eighty-two percent of the 1970s homes and 98 percent of 1990s homes had splash blocks.

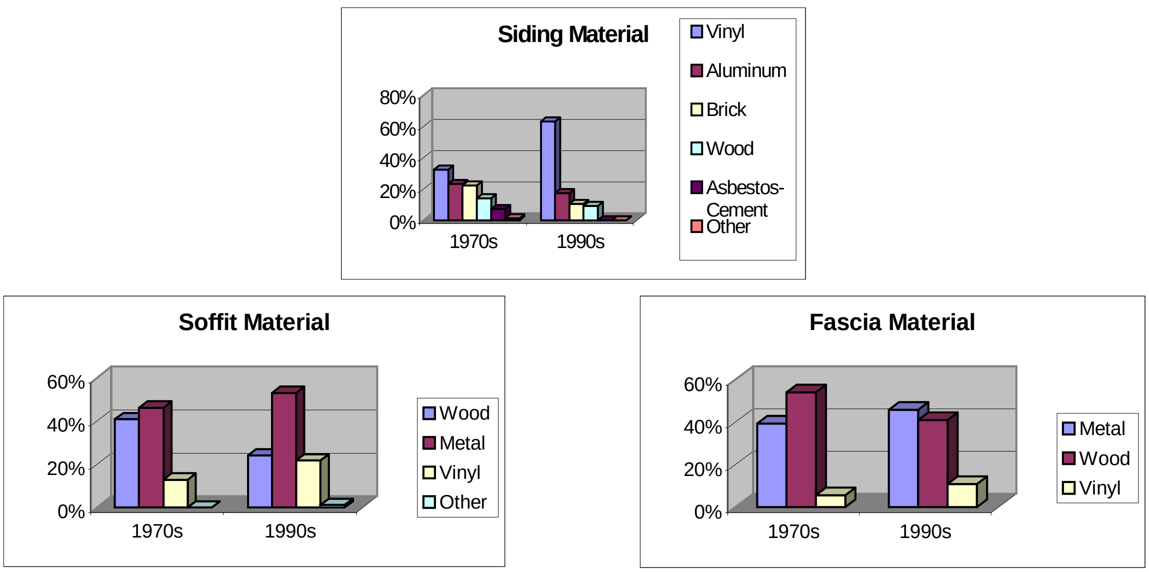

Figure 4
Exterior finish materials on walls and overhangs.

Asphalt shingles (99 percent and 100 percent for the 1970s and 1990s sample, respectively), gable roofs (84 percent and 99 percent), and a slope range of 3 to 6 inches in 12 inches dominated both samples (94 percent and 88 percent, respectively). While overhangs of 6 to 12 inches were the most common in the 1970s sample (26 percent), a variety of larger overhangs were also common (totaling 60 percent). The 6- to 12-inch overhangs (65 percent) were also the most common in the 1990s sample. The size of market share claimed by overhangs in the range of 6 to 12 inches in the 1990s sample suggests a trend away from the larger overhangs of the 1970s.

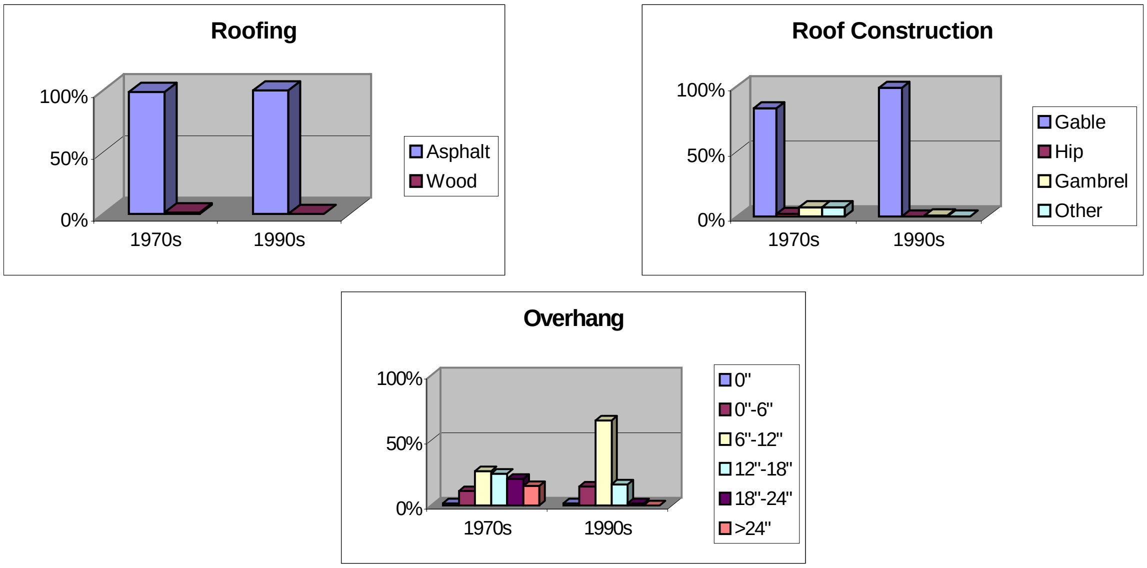

Figure 5
Roof characteristics.

- Windows and Doors

Wood was the most common window frame material in the 1970s sample (40 percent) while most 1990s houses had vinyl windows (65 percent). Double-pane windows were the most common glazing type in both samples (65 percent and 98 percent for the 1970s and 1990s, respectively). Single-pane windows were not uncommon in the 1970s houses (35 percent) but were almost absent in the 1990s sample (2 percent). Most houses did not have storm windows (67 percent and 96 percent for the 1970s and 1990s houses, respectively).

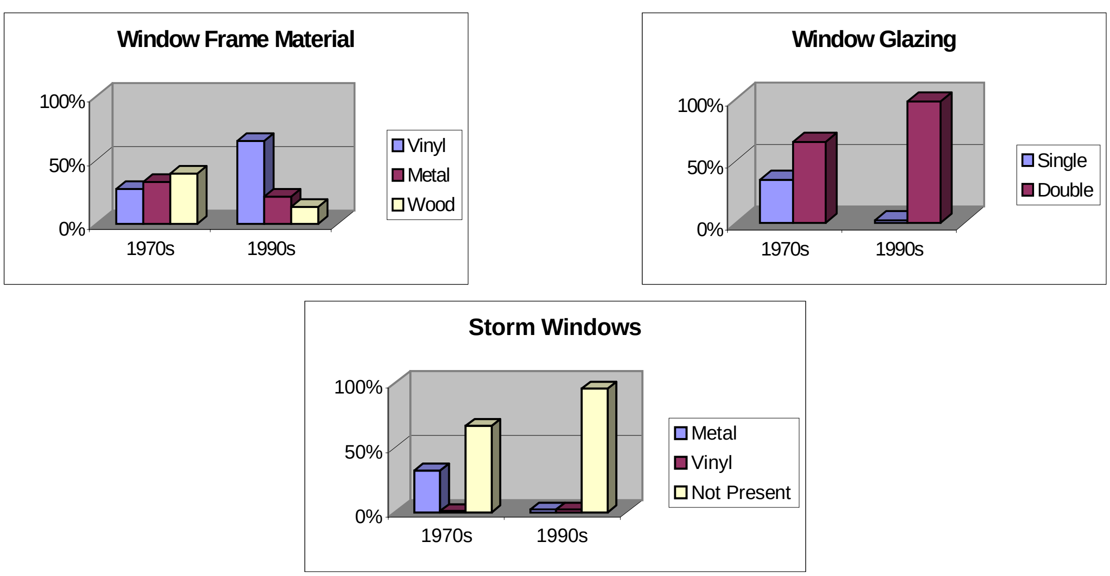

Figure 6
Window characteristics.

Seventy-five percent of the 1970s doors were constructed of wood while metal accounted for 66 percent of the exterior doors in the 1990s. Metal captured the other 25 percent of the 1970s sample. Wood (26 percent) and vinyl (5 percent) accounted for most of the remaining 1990s doors. Twenty-seven percent of the 1970s houses had no storm door, and 59 percent of the 1990s sample had none.

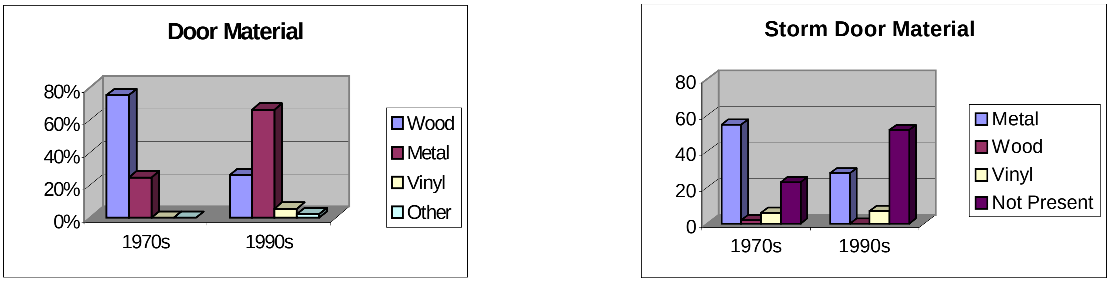

Figure 7
Door characteristics.

- Roof Venting and Penetrations

Sixty-one percent of the 1970s homes made use of gable vents, 61 percent soffit vents and 34 percent ridge vents. Fifty-nine percent were fitted with plumbing vents and 7 percent with fan vents. Thirty-one percent of the 1990s homes used gable vents, 83 percent soffit vents, and 74 percent ridge vents. Forty-nine percent were reported to have plumbing vents penetrating the roof, as observed in the survey.

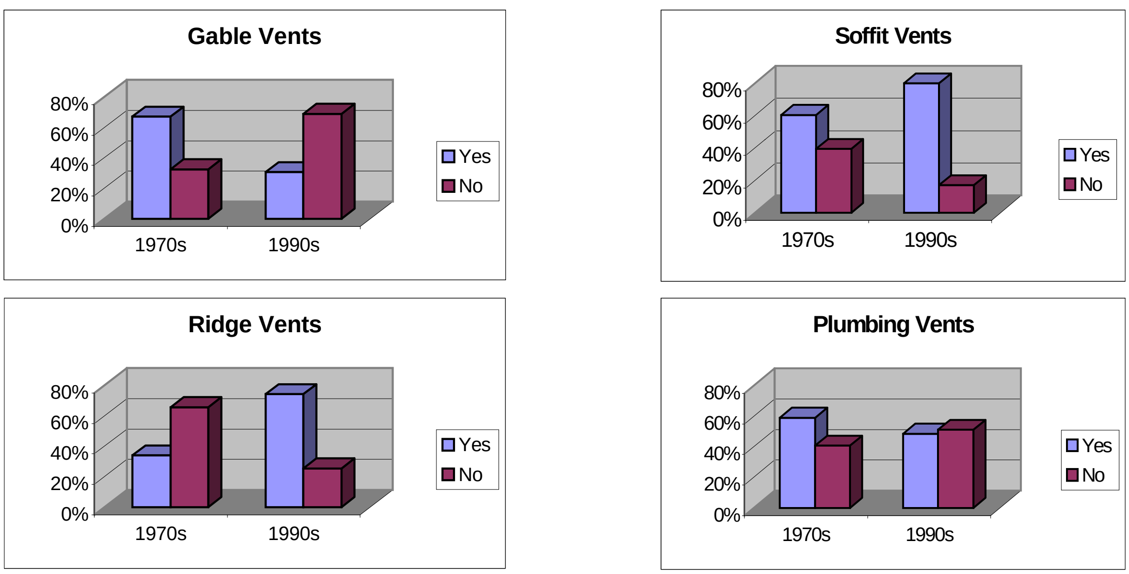

Figure 8
Roof venting and penetrations.

- Appurtenant Structures

Forty-one percent of the 1970s houses had garages as did 45 percent in the 1990s sample. Eighty-six percent of the 1970s garages and 96 percent of the 1990s garages were attached to the housing unit.

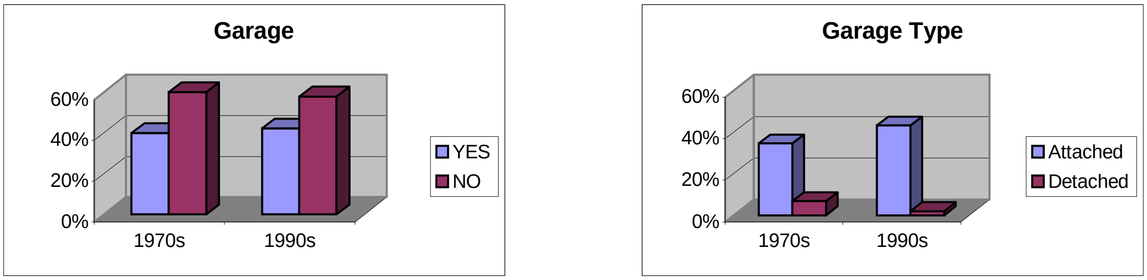

Figure 9
Garage characteristics.

Almost all houses in both samples (96 percent and 95 percent of the 1970s and 1990s samples, respectively) had sidewalks. Ninety-six percent and 97 percent of the 1970s and 1990s sidewalks, respectively, were impervious (e.g., concrete or asphalt). Approximately 98 percent of both samples had driveways. Ninety-five percent of the drives in both samples were impervious.

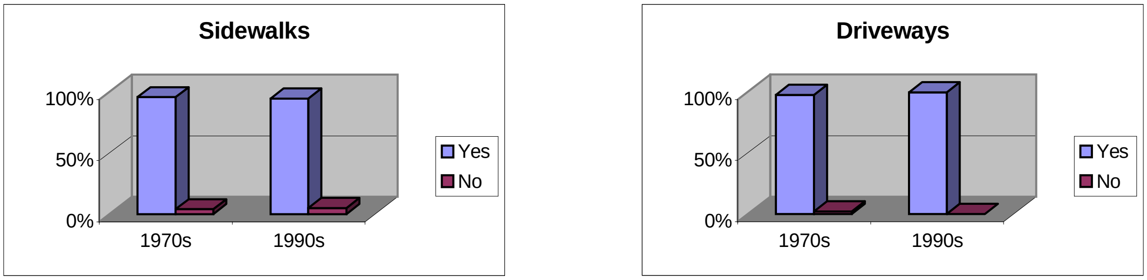

Figure 10
Sidewalk and driveway data.

Forty-three percent of the 1970s homes had decks as compared with 68 percent of the 1990s sample. Ninety-three percent of the 1970s decks and 96 percent of the 1990s decks were constructed of treated wood. Ninety-eight percent of the 1970s decks and 92 percent of the 1990s decks were surface nailed. Two-thirds of the 1970s houses were on fenced lots while only 44 percent of the 1990s houses were likewise on fenced lots.

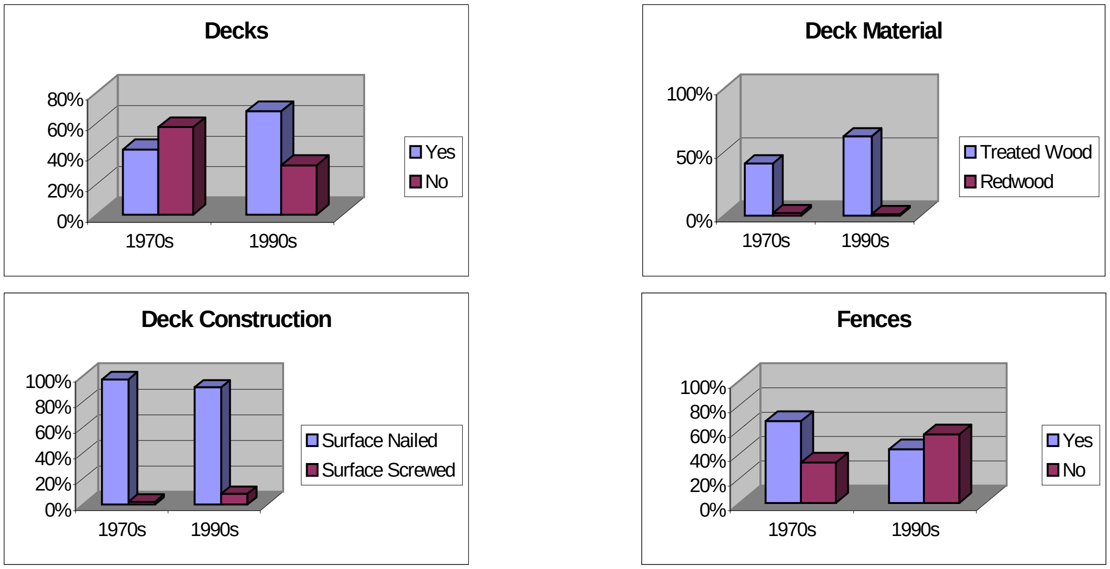

Figure 11
Deck characteristics.

- Landscaping

Ninety-three percent of 1970s houses and 95 percent of 1990s houses had landscape plants within 10 feet of the structure. The most common landscaping features adjacent to the 1970s homes were large shrubs (83 percent), flowerbeds (81 percent), and wood mulch (62 percent). The most common landscaping features of the 1990s homes were flowerbeds (90 percent), wood mulch (84 percent), and large shrubs (52 percent). In all, 9 percent of the 1970s houses and 8 percent of the 1990s houses were sited on lots with retaining walls.

Condition Assessment

This section presents a summary of the results of the visual assessment of both housing sample age groups. The assessment is based on both quantitative and qualitative measures of the state of the houses and their components. As with the data in the Housing Characteristics section, the sample size discussed in this section varies by component due to the elimination of conflicting inspection results. Please refer to Appendix E for comprehensive tabulations of data from the visual survey. In addition, the photographic record of this section provides illustrations of various observed conditions.

- Site Grade and Drainage

The occurrence of surface depressions accounted for almost twice the share of houses in the 1970s sample compared with the 1990s sample (20 percent vs. 11 percent). Surface depressions are indicative of poor site drainage that may be associated with durability concerns such as cracked foundations (e.g., settlement) or water intrusion in basement foundations. The Causal Relationship discussion explores the impact of site and exterior envelope characteristics such as surface depressions on the condition of the exterior of the home. This study did not consider the connection between exterior and interior conditions.

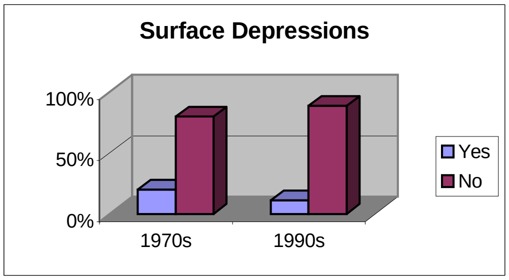

Figure 12
Frequency of surface depressions observed on sampled sites.

- Foundation Cracks

While most visually detected cracks were small, the study made no measurements. Visible cracks occurred in 34 percent of the 1970s sample and 19 percent of the 1990s sample. The occurrence of foundation cracks, while not always a significant structural problem, may indicate differences in foundation performance associated with material selection and site conditions, among other factors considered later in this section.

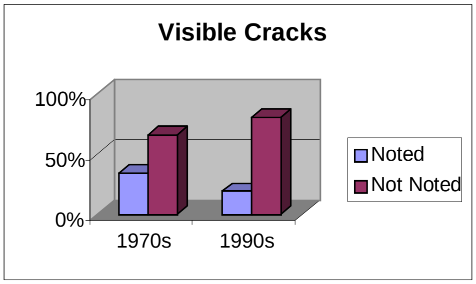

Figure 13
Frequency of observed foundation cracks on sampled homes.

- Rot

Any detected rot resulted in a positive response on the survey form. Rot commonly occurred in exterior wood trim components and usually appeared to be localized in nature. Thirty-one percent of the 1970s homes and 22 percent of the 1990s homes were noted as exhibiting some rot.

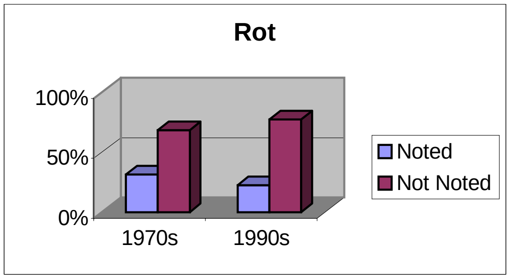

Figure 14
Frequency of observed rot in sampled homes.

- Insect Damage

Three percent of the 1970s houses were reported to have visual signs of insect damage compared with only 1 percent of the 1990s houses. Inspectors noted termite drill holes at two 1970s houses and carpenter bee boring holes at another. No specific insects were mentioned for the 1990s houses.

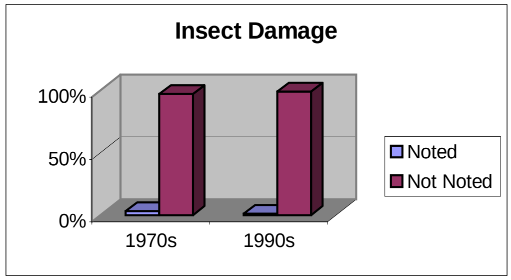

Figure 15
Frequency of observed termite damage.

- Windows

This and later sections use qualitative ratings to describe the condition of components as judged by the inspectors. A "good" condition generally signified little sign of wear and tear and complete function. "Adequate" may be interpreted to mean that the component was judged to be functional with reasonable signs of wear and tear. A rating of "poor" is associated with some loss of function. Windows tended to be rated in good condition in both samples (49 percent of the 1970s houses vs. 89 percent of the 1990s houses). For the 1970s houses, a substantial share (44 percent) had windows judged to be adequate. Eight percent of the 1970s windows were rated as poor, but none of the 1990s windows rated that low. Most storm windows in the 1970s sample (53 percent) were judged to be in adequate condition, although the vast majority of the 1990s storm windows (79 percent) were in good condition.

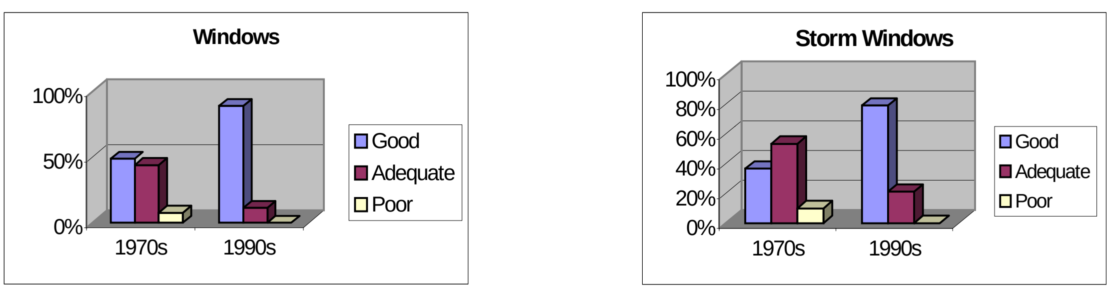

Figure 16
Window condition ratings of sampled homes.

- Doors

The inspectors rated the doors in 54 percent of the 1970s houses and 89 percent of the 1990s houses as good. Another 40 percent in the 1970s houses and 11 percent in the 1990s houses earned a rating of adequate. Six percent of the 1970s houses had doors that were rated poor. Most storm doors in both the 1970s and 1990s sample (56 percent and 87 percent) were rated good by the inspectors.

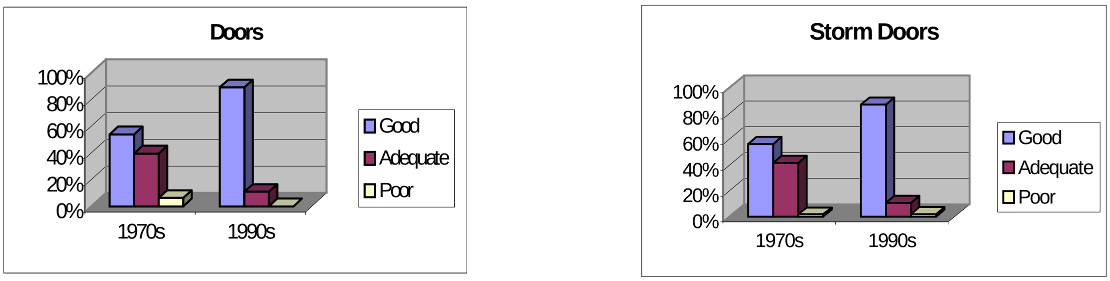

Figure 17
Door condition ratings of sampled homes.

- Fascia

The fascia on the 1990s houses were mostly in good condition (58 percent) while the fascia on the 1970s sample houses were typically in adequate condition (51 percent). Another 39 percent of the fascia on 1970s houses were judged by the inspectors to be in good condition, and an additional 15 percent of the 1990s houses were rated adequate.

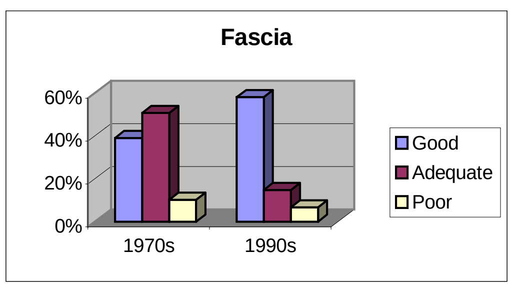

Figure 18
Fascia condition ratings.

- Roof

Both roof valleys and roof openings[3] in the 1990s (88 percent and 71 percent, respectively) sample tended to be in good condition by a wide margin. Most of the 1970 houses were graded adequate for roof valleys and roof openings (52 percent and 60 percent, respectively). With exterior inspections from the ground only, it is difficult to assign a quantitative measure to these ratings. However, the homeowner survey offered some insight into water leakage problems that may be associated with these and other construction features (see Homeowner Survey).

[3]The term "opening" is meant to signify any penetration of the roof to accommodate mechanical and plumbing vent requirements.

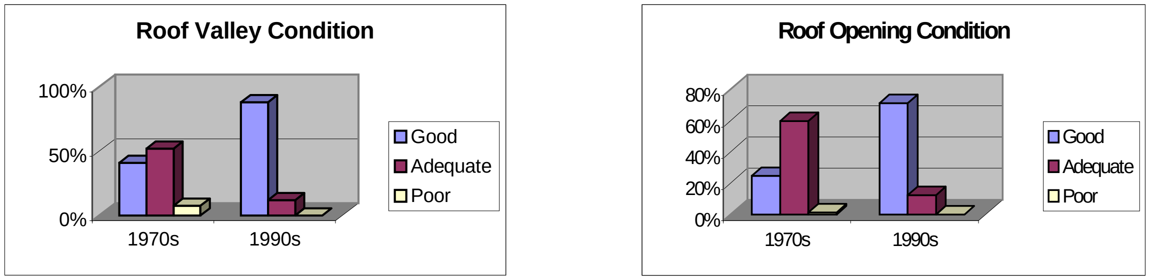

Figure 19
Condition ratings of roof features.

- Exterior Appurtenances

Exterior stairs were most commonly rated good in the 1990s sample but only adequate in the 1970s sample. Cracking and signs of settlement were common factors that resulted in poor ratings for exterior stairs in relatively few homes. The majority of patios (57 percent) and decks (56 percent) in the 1970s sample were graded adequate while the 1990s patios (71 percent) and decks (67 percent) were judged to be typically in good condition. Porches, on the other hand, were typically rated adequate in both the 1970s and 1990s samples (70 percent and 75 percent, respectively).

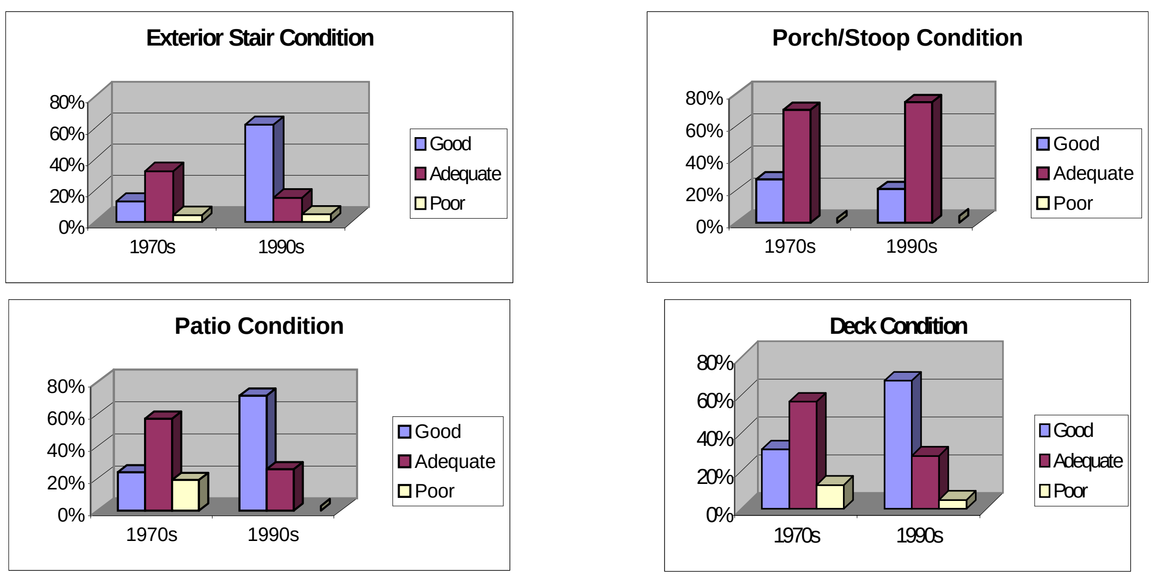

Figure 20
Ratings of exterior stair, porch, patio, and deck condition.

Inspectors rated the fences of 56 percent of the 1970s houses as adequate and 56 percent of the 1990s fences as good. Thirty percent of the 1970s fences were rated to be in good condition while 38 percent of the 1990s fences were judged to be in adequate condition.

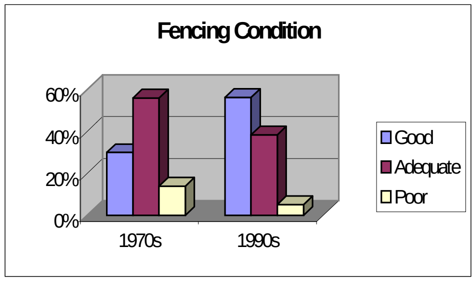

Figure 21
Rating of fencing condition.

Scoring

Each inspector was required to record four scores for each component of every house, one score for each orientation or side of the house–front, left, right, and rear (see survey form in Appendix C). A mean score for each component-orientation combination was developed for each house by averaging the scores of the inspectors. The resulting mean score of all of the houses was then averaged for each component-orientation category. Appendix E presents the results. The four orientation-category scores served as the basis for developing an overall average score for each component in the 1970s sample, the 1990s sample, and the total sample. Table 1 presents the results.

TABLE 1
AVERAGES OF BUILDING COMPONENT CONDITION RATINGS

BUILDING COMPONENT CONDITION VISUAL SURVEY RESULTS			
	1970s	**1990s**	**Total Sample**
Grading	2.29	2.22	2.25
Landscaping	2.79	2.52	2.66
Sidewalk	2.80	2.27	2.58
Foundation	2.61	2.14	2.37
Porch	2.86	2.52	2.71
Deck	2.99	2.83	2.90
Siding	2.70	2.33	2.51
Door	2.74	2.21	2.47
Windows	2.77	2.20	2.48
Trim	2.93	2.63	2.78
Openings	2.91	2.62	2.76
Soffits	2.71	2.28	2.48
Fascia	2.92	2.50	2.70
Gutters	2.84	2.40	2.60
Flashing	3.07	3.18	3.13
Roof	2.72	2.19	2.43
Caulk	3.34	3.02	3.20
Paint	3.00	2.46	2.77

Scores between 1 for excellent and 5 for needs repair are possible, but the average scores in the table fall in a more narrow range between 2.14 and 3.34 (i.e., between good and adequate). While the difference between the 1970s scores and the 1990s scores may be small, no statistical analysis was performed to determine whether any of the 1970s data sets differ statistically from their 1990s counterparts. The reservations concerning the scoring data expressed in Section IV of this report bring into question the value of such an analysis. Nonetheless, the data in Table 1 offer some useful insights.

- With the lone exception of flashing, the 1970s sample scores are higher (worse) than the 1990s scores.
- The caulk-related scores were worse than the average of overall scores in both age groups.
- Windows, doors, roofs, and the paint on window frames, soffits, and siding were among the components in the 1970s sample that fared the worst proportionately when compared with the 1990s sample.
- Siding, trim, and fascia were among the components in the 1970s sample that did not fare as poorly when compared proportionately with the 1990s sample.

Table 2 presents the coefficients of variations for each of the scored components. In half of the categories, the variation in the ratings for the 1990s sample is greater than that for the 1970s sample, suggesting that the assessed conditions tended to vary similarly in both age groups. Some additional observations include the following:

- All of the paint and caulk category ratings varied more proportionately in the 1990s sample than in the 1970s sample.
- The condition rating of windows, doors and roofs showed more relative variation in the 1970s sample than in the 1990s sample.
- Siding, trim, and fascia in the 1990s category showed more rating variation than the 1970s sample.
- The component with greatest variation in overall rated condition was grading.

Causal Relationships

Based on the housing characteristic and condition data presented in the previous sections, the study explored several possible cause-and-effect relationships to explain the data more fully.

Typically, the methodology involved the use of contingency tables to classify the houses in the survey in accordance with some construction characteristic and some housing condition. To illustrate the approach, Table 3 presents the contingency table that was used to examine the role of foundation material in the occurrence of visible foundation cracks.

TABLE 2
COEFFICIENTS OF VARIATION FOR BUILDING COMPONENT CONDITION RATINGS

Building Component Condition Visual Survey Results			
Coefficients of Variation			
	1970s	**1990s**	**Total Sample**
Grading	0.53	0.48	0.51
Landscaping	0.25	0.24	0.25
Sidewalk	0.37	0.32	0.38
Foundation	0.26	0.30	0.30
Porch	0.19	0.33	0.26
Deck	0.26	0.31	0.29
Siding	0.27	0.29	0.29
Door	0.31	0.27	0.31
Windows	0.27	0.22	0.28
Trim	0.23	0.29	0.27
Openings	0.25	0.29	0.27
Soffits	0.27	0.24	0.27
Fascia	0.25	0.37	0.32
Gutters	0.30	0.25	0.29
Flashing	0.38	0.33	0.36
Roof	0.28	0.25	0.29
Caulk	0.28	0.39	0.35
Paint	0.24	0.33	0.30

TABLE 3
2X2 CONTINGENCY TABLE:
VISIBLE CRACKS IN FOUNDATIONS VERSUS FOUNDATION MATERIAL

	Block	Concrete	Total Houses
Has visible cracks	35	9	44
Has no visible cracks	19	83	102
Total Houses	54	92	146

The data in the contingency table were then subjected to a statistical analysis tool called a Chi-square test. This procedure determines whether it is likely that the two groups of houses differ (in a statistical sense) in terms of the proportion that evidence a given condition, for example, the presence of foundation cracks. A confidence level of 95 percent was used for all such comparisons.

A discussion of the findings of the analysis follows (see Appendix F for a more in-depth discussion of the statistical analysis).

- Foundation Material versus Foundation Cracks

A statistical analysis of the survey data indicated that foundation type is a factor in the occurrence of visible foundation cracks. Foundation material and the methods used with each material seem to play a role. Examination of the survey data reveals that 65 percent of block foundations have visible cracks while only 10 percent of concrete foundations have visible cracks.

An examination of the data revealed that about two-thirds of houses with block foundations were built in the 1970s. Further analysis of the data indicated that the 1970s houses have a higher proportion of visible cracks. These findings brought into question whether time or foundation material was the real factor. Since most house foundations built in the 1970s are block foundations, does it merely appear that block foundations tend to have more cracks? A separate analysis of the foundation material and visible foundation crack data was performed for each age group. The results for both groups indicated that the occurrence of cracks is not independent of the type of foundation material. So, while time may be a factor in the occurrence of visible foundation cracks, block foundations appear to be associated with a higher proportion of cracks.

- Site Condition versus Foundation Cracks

A similar analysis sought to test for a relationship between the presence of surface depressions on a site and the occurrence of visible foundation cracks. The results did not support the proposition that they are unrelated; therefore, it appears that surface depressions also play a role in the occurrence of visible foundation cracks. In the study sample, the 28 percent of the sites with surface depressions accounted for 44 percent of the sites with cracked foundations

- Wood Rot

A similar analysis focused on wood rot and the presence of housing characteristics that may be associated with rot, such as the age of the house and the size of the roof overhang. Statistical tests did not indicate that any of these factors play a role in the occurrence of rot. However, these results are believed to point to factors other than a lack of physical cause.

Several factors, including remodeling, may have played a role. Casual observations by the inspectors indicated that many of the houses built during the 1970s were resided. Exterior trim, including soffit and fascia, had been replaced or covered with aluminum or vinyl sheathing. A similar situation was noted with the windows. These observations are confirmed by the graphs of siding and window frame materials on houses built in the 1970s (see Sample Housing Characteristics). Older houses with vinyl siding and vinyl window frames were probably retrofitted since these materials were not commonly used in the early to mid-1970s. Assessment of the condition of covered original materials was usually not possible.

- Housing Orientation Analysis

Additional analyses attempted to associate differences in the orientation of the house with siding, paint, and front-door caulk problems, using numerical scoring data from the visual survey of building components. This effort failed to yield meaningful results. Since the results of the condition-rating component of the survey form was used for this analysis, the lack of a statistically valid relationship may likely be associated with a lack of precision in the execution of the rating methodology by the inspectors.

Photographic Record

This section provides photographs of various observed conditions of the sample homes and sites. The photographs are intended to convey the rating system as applied by the inspectors in completing the survey form. Items that did not require a rating (e.g., the presence of foundation cracks or surface depressions on the site) are also illustrated.

- Site Grade and Drainage

Figure 22 provides an example of good site grade and drainage as rated by the field inspectors. In this case, the grade is sloped away from the house on all sides. Figure 23, by contrast, shows small surface depressions next to the foundation at the air-conditioner compressor units and where the trash cans are stored. In this case, the site drainage was rated as poor by the field inspectors. In addition, the existence of surface depressions was recorded on the survey form.

Figure 22
Example of good rating for site grade and drainage.

Figure 23
Example of poor rating for site grade and drainage.

- Foundation Cracks

When observed, the existence of foundation cracks was also recorded on the survey forms for each sample house. Figures 24 and 25 illustrate typical cracks found in concrete and masonry foundations.

Figure 24
A typical small crack found in a concrete foundation wall.

Figure 25
A typical small crack found in a masonry foundation wall.

- Rot

As shown in Figures 26 and 27, the nature of observed rot was similar in the 1970s and 1990s sample houses. Rot of the exterior woodwork was commonly found on wood or wood composite doors, trim, and siding. Aside from the general vulnerability of untreated wood to decay, rot was often localized at end joints in trim and siding as shown in Figures 28 and 29. Rot was also associated with trim details that trap moisture (see Figure 30). Wood decay was also found on doors, particularly garage doors with wood composite sheathing as shown in Figure 31.

Figure 26
Rot at the bottom of a door frame in a 1990s sample house.

Figure 27
Rot at the bottom of a door frame and trim in a 1970s sample house.

Figure 28
Rot in exterior wood trim of a 1990s sample house.

Figure 29
Rot at the bottom of wood panel siding (insufficient ground clearance) in a 1970s sample home.

Figure 30
Rot in wood trim associated with poor detailing (i.e., lack of cap flashing) and maintenance in a 1990s sample home.

Figure 31
Rot of wood composite panel on a garage door (1970s house sample).

- Windows and Doors

While most windows and doors were rated as good or adequate in the sampled homes, Figures 32 through 35 depict examples of poor ratings. Causes of a poor rating included abnormal wear and tear, broken glazing, and condensation inside double-pane windows.

Figure 32
Abnormal wear and tear on a wood window as an apparent result of pet scratching.

Figure 33
Broken window pane on second-story window.

Figure 34
Condensation inside double-pane windows.

Figure 35
Abnormal wear and tear on a wood door as an apparent result of pet scratching.

- Fascia, Eaves, Soffits, and Guttering

Roof fascia, eaves, soffits, and guttering exhibited several problems. In some cases, possible rot or other signs of durability problems were concealed from the view of inspectors as shown in Figure 36. Figure 37 shows the fascia of a 1970s sample home that was rated adequate but was in need of minor repair and maintenance. In this case, the condition of the wood fascia material was sound.

Figure 36
Example of aluminum fascia covering older fascia material on a 1970s sample house (rated good by inspector).

Figure 37
1970s sample house with wood fascia needing minor repair (rated adequate by inspector).

Figure 38 shows that the wood fascia of a 1970s townhouse was also subject to rot at end joints at the brick party wall. Figures 39 and 40 illustrate a failed gutter and damaged soffit for two 1970s sample homes. Other problems with gutters are shown in Figures 41 through 45.

Figure 38
Fascia with a poor rating due to signs of rot and paint failure at butt joint to a party wall on a 1970s townhouse sample.

Figure 39
Failed gutter and signs of water damage to soffit on a 1970s duplex house sample.

Figure 40
Failed guttering and signs of water damage on wood fascia underneath aluminum fascia cover (1970s house sample). Note paint failure on window frames.

Figure 41
Vegetation growing in poorly maintained gutter.

Figure 42
Failure to maintain outfall of gutter downspout. Note that wood panel siding does not have sufficient ground clearance.

Figure 43
Damaged downspout (same house in Figure 42).

Figure 44
Sagging gutter.

Figure 45
Rusting party wall cap flashing and damaged gutters.

- Roof and Roofing

Figures 46 and 47, respectively, show typical examples of adequate roofs for 1970s and 1990s house samples. Examples of poor roofing ratings are illustrated in Figures 48 and 49. The tell-tale sign of poor roof shingle condition was the "curling" of shingle tabs. Figure 48 also illustrates improper valley flashing (receiving a poor rating) and buckled roof sheathing.

Figure 46
Example of a 1970s house sample with roofing rated as adequate.

Figure 47
Example of a 1990s house sample with roofing rated as adequate.

Figure 48
A 1970s house with a poor roof based on improper valley flashing and curled shingle tabs on the left roof surface.

Figure 49
Poor roofing rating due to curled shingle tabs (1970s house sample).

- Exterior Appurtenances

This section addresses porches, decks, and sidewalks. Figures 50 and 51 show the porches of two 1990s and 1970s sampled homes that were rated as good. In each case, the porch floor was concrete and wood, where used, was adequately protected from weather and moisture. However, wood deterioration was evident on the porches of the 1970s and 1990s house samples as shown in Figures 52 and 53, respectively.

Figure 50
Porch with good rating (1990s house sample).

Figure 51
Porch with good rating (1970s house sample).

Figure 52
Rot in a wood picket on the porch of a 1970s sample home (one picket has been replaced with treated wood).

Figure 53
Wood floor boards under the porch roof of a 1990s house sample show signs of deterioration.

Figures 54 and 55 show typical decks with a good rating. Unfortunately, the photographic record does not include usable pictures of decks in poor condition for purposes of contrast.

Figure 54
Example of a wood deck in good condition (1990s house sample).

Figure 55
Example of a wood deck in good condition (1970s house sample; age of deck unknown).

Figure 56 shows an example of a sidewalk in poor condition for a 1970s sample home. Uplift of the sidewalk was caused by growth of a tree planted too close to the sidewalk. In Figure 57, ponding of water on a sidewalk adjacent to a 1990s house sample is apparent immediately following rain. The downspout and splash block discharge to the sidewalk surface.

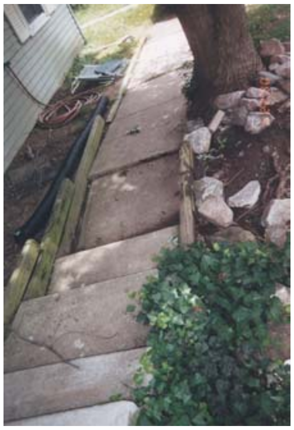

Figure 56
Sidewalk of a 1970s sample house in poor condition due to root movement and growth of a closely located tree.

Figure 57
Ponded water on a sidewalk (1990s house sample).

HOMEOWNER SURVEY

Forty-three homeowner survey forms (see Appendix B) contained answers at the completion of the telephone contacts and site surveys. Twenty-eight respondents provided answers to Question 2, which asked about the maintenance of eight major housing components. Fifteen responses were recorded for Question 3, which asked homeowners/occupants to identify any problems with the home. Seventeen respondents answered Question 4, which asked about natural causes resulting in damage to the home. Only one positive response was recorded for Question 5, which asked respondents about any injuries attributable to the house. Questions 6 and 7 were administrative in nature and related to information needed for the site assessments. Questions 6 and 7 had four and seven responses, respectively.

The following summarizes the meaningful data and findings from the homeowner survey. Statistics are based on a relatively small sample size of only the homeowners who responded. Therefore, the findings should not be considered representative of all homeowners within the study region. The findings, however, do provide some useful insights.

Question 1: Time of Residence

On average, the homeowners in the survey had owned their houses for 13 years (see Question 1 on survey form in Appendix B). The time of residence ranged from one to 29 years.

Question 2: Maintenance

With respondents providing answers for more than one category, a total of 87 answers to Question 2 were recorded.. Table 4 presents a tabulation of the number of responses by the number of components that required maintenance. Table 5 presents the number of responses for each component indicated in Question 2, along with the average number of years since replacement and the average number of years occupants lived in their house. Given that some of the respondents furnished only partial answers (i.e., provided a comment but did not report replacement date), the computation of averages was sometimes based on fewer responses than reflected in the column headed "Number of Respondents."

TABLE 4
RESPONSES TO QUESTION 2

Number of Components Indicated as Requiring Maintenance	Number of Respondents
8	1
7	2
5	3
4	2
3	6
2	10
1	4

TABLE 5
ANALYSIS OF QUESTION 2 RESPONSES

Component	Number of Responses	Average Years since Replacement	Average Years in House
Roofing	16	6.1	17.6
Paints	16	2.3	11.0
Windows	14	4.4	15.9
Caulking and Sealants	13	1.9	11.1
Siding	11	3.6	15.0
Doors	8	4.0	18.2
Flashing	6	3.8	8.0
Gutters	3	9.3	14.7

The answers to Question 2 indicate that a large proportion of respondents perform maintenance tasks that help prolong the life of a house. For example, 16 of the 28 respondents reported that they had painted, on average within the last 2.3 years (see third column in Table 5). Thirteen reported replacement of caulking and sealants, on average, in the last 1.9 years. Respondents also frequently mentioned major components such as siding, roofing, and windows.

The size of the homeowner survey sample precluded any attempt to draw statistical inferences regarding the two populations of houses. For example, an average frequency of replacement or "return time" can be computed by dividing the number of positive responses for a component by the total house-years in the sample. House-years equals the sum of all responses to the length-of-occupancy question. The house-years for the 43-response sample totaled 504. Dividing 504 into the 16 positive responses for roofing yields a result of 3.2 percent. If this estimate were statistically valid, it would mean that we expect 3.2 percent of the roofs in the sample to be reroofed every year.

Question 3: Durability Problems

Over half of the 15 responses to Question 3 centered on two issues. Five indicated a problem or potential problem related to the foundation or standing water in the basement or crawl space. Another three cited problems related to leaks or water stains around windows. Another two indicated an attic water problem, one related to the fire sprinkler system. The remaining answers varied, citing problems such as nail pops, settling, soffit deterioration, and damage from a fallen tree.

Question 4: Damage from Natural Causes

Seventeen respondents of the 43 answered Question 4, which asked if natural causes had resulted in damage to the home. The question allowed respondents to select from five specific natural cause categories and an "Other" category. Table 6 presents a tabulation of the number of responses to Question 4 by the number of natural causes of damage cited by the respondent.

TABLE 6
RESPONSES TO QUESTION 4

Number of Natural Causes indicated	Number of respondents
1	15
2	2

Table 7 presents the number of responses for each cause indicated in Question 4, along with the average year of the incident and the occupant's average number of years in the house. Given that some of the respondents furnished only partial answers for Question 4, the computation of averages was sometimes based on fewer responses than reflected in the column headed "Number of Responses."

TABLE 7
ANALYSIS OF QUESTION 4 RESPONSES

Cause	Number of responses	Average year of damage	Average years in house
Wind	3	1998	5.5
Hail	3	1997	6.0
Flooding	3	N/A	14.5
Fire	2	1993	18.0
Termites/Bugs	4	1986	23.3
Other	4	1994	8.8

As with Question 2, the small sample size prevents the drawing of statistical inferences regarding issues such as the frequency of the various damage/cause categories. If a larger data set were available, such inferences would be computed in manner analogous to the frequencies for Question 2.

It should be noted that owners/occupants provided little information regarding the extent of damage. None reported catastrophic losses. One respondent indicated $3,000 in wind damage. Another reported minor damage from a fire. Still another reported termite/carpenter ant damage to a deck.

Question 5: Injuries (Fitness of Use)

Only one person responded positively to Question 5, which asked if any injuries were attributable to the house. While 16 respondents indicated damage to the house associated with natural causes, only one injury was reported and it was associated with a flood. The response did not indicate the nature of the injury. No injuries associated with features of the house, such as stairs, were reported.

Discussion

While all of the homeowner survey information must be regarded as anecdotal owing to the relatively small sample size and response rate, larger studies along the same lines are likely to yield more detailed and statistically valid insights into important issues related to housing durability and fitness of use. In particular, the homeowner survey adds time-experience information that complements the "point-in-time" condition assessment results reported earlier.

IV. EVALUATION OF THE METHODOLOGY

During the analysis phase of the project, several improvements to the survey methodology were identified. The first improvement relates to enhancing inspector consistency.

Part of the inspection form required inspectors to check the appropriate block to indicate selected house and site characteristics and conditions. While this approach seems simple and straightforward, the results indicate that some of the inspectors experienced problems. For example, inspectors sometimes disagreed about the number of stories in a house. Difficult-to-classify designs, such as split foyers and walk-out basements, might have contributed to the confusion. Such a problem could be minimized by creating a comprehensive set of detailed, illustrated definitions and a survey guide to better educate inspectors before they attempt any field work. It is also unclear whether certain data, such as house style, are relevant to significant durability concerns. Thus, some assessment data may be eliminated to streamline the assessment process.

The site condition assessment form offered inspectors six choices for the length of overhang: 0", 0-6", 6-12", 12-18", 18-24", >24". Inspectors differed on the size of the overhang for 100 of 208 houses. Approximately one quarter of those responses referenced categories that were not contiguous. While some of the contradictions probably resulted from differences in opinion about the <u>exact</u> size of the overhang, some of the discrepancies may have occurred because inspectors examined different sides of houses with different overhang lengths. Perhaps some inspectors were looking at end gables and others at the sidewalls. This source of error could be removed by modifying the survey form to require data for each side of the house. But this approach raises possible confusion as to what constitutes a "side" of a house for homes with complex plans.

Replacing the multiple-choice approach with one that allows the inspector to write in an estimate might also improve the data. While such an approach would not eliminate disagreements, it would likely offer the analyst better insights into the magnitude of such differences. It may be that the disparity between the resulting point estimates will not be as great as that suggested when the multiple-choice categories are used.

The next section of the site condition assessment survey is the Building Component Condition Visual Survey. In this section, inspectors enter a numerical score to rate the condition of each component. Instructional material furnished to the inspectors provided an explanation of scoring criteria for each component to be inspected. The criteria for some components address not only the condition of a component but also related construction details. For example, the siding assessment criteria corresponding to the "2-Good" category required the siding to be more than six inches above grade and no rot to be present. The "4-Poor" category required siding be less than six inches above the finish grade but permitted rot on up to 15 percent of end joints. The value of a statistical analysis that attempts to relate such scores as these with other data in the survey is questionable. Even if the analyst were able to isolate a statistical relationship, its meaning would not be clear because the score summarizes changes in two different phenomena. If numerical grading is to be used, each category/score should be associated with only one variable.

The numerical scoring section presented another problem. The criteria for scoring used words such as "adequate" and "sound", which call for personal judgment. Accordingly, the scores carry some degree of subjectivity. Since one inspector's "adequate" may not correspond to another's, equal scores may not reflect the same set of conditions; thus, any comparison or averaging of the two scores may be misleading. Because of the complexity of the grading approach, it is entirely possible that inspectors tended to assign ratings based more on personal judgment than on a strict application of multiple criteria.

In view of the above difficulties, a simpler data collection approach focusing on key durability indicators is essential. Such an approach could mean the elimination of numerical scoring in favor of a survey where inspectors place a check in a block or provide an estimate. Such an example was tested on a few homes in this pilot study (see Appendix G). While the results of the test were also plagued by contradictory assessments, the vehicle's straightforward layout seems easier to follow and is less prone to omissions. Features of the streamlined approach could be incorporated into a new form.

Both the site assessment forms and the telephone survey should also include a "none" and "unknown" response for many of the questions so that such situations could be differentiated from each other and from an entry left blank.

V. SUMMARY AND CONCLUSIONS

This pilot study was intended to provide guidance for larger-scale studies of building durability in the at-large housing stock. As such, the study succeeded. In addition, it yielded certain telling findings related to durability in the housing sample:

- Housing Characteristics

  - The size of roof overhangs decreased between the 1970s and 1990s. Eighty-two percent of the 1990s samples had overhangs of 12 inches or less. In the 1970s sample, only 40 percent fell into that range.
  - The use of vinyl window frames increased to 65 percent. Wood and metal frames were the dominant materials in the 1970s.
  - Metal doors became the dominant door type in the 1990s, capturing about two-thirds of the 1990s sample. Seventy-five percent of the doors in the 1970s sample were wood.
  - Vinyl became the dominant siding material. It claimed almost two-thirds of the 1990s sample.

- Housing Condition

  - Site grading appears associated with foundation cracks. Seventy-three percent of houses on lots with surface depressions had visible foundation cracks compared with only 19 percent for those with no identified surface depressions.
  - The occurrence of rot in newer and older homes was 22 percent and 31 percent, respectively. Most rot was associated with wood trim materials.
  - Masonry foundations tended to evidence cracks more frequently than concrete foundations.
  - Most windows and doors were rated in good or adequate condition.

- Homeowner Survey

  - The response rate of the homeowner survey was 21 percent of the 208 houses sampled.
  - The average time of occupancy of respondents was 13 years.
  - Sixteen respondents indicated that they had performed various maintenance activities in recent years.
  - The most common durability problems mentioned by respondents (over half of 15 responses) were related to water, including wet basements and leaky windows.
  - Reports of damage by natural causes covered all causes listed in the survey form; however, the number of responses per cause ranged from two to four. The extent or nature of damage was not generally reported.
  - Only one injury related to a flood was reported; the nature of the injury was not disclosed.

While this study produced important insights into the state of the housing surveyed, it also represented an opportunity to assess different survey methods. The project was intentionally designed to cast a wide net. The assessment form was designed to capture data on a large number of residential features. In addition to the exterior components of the house, it solicited information on features such as driveways, sidewalks, fences, and landscaping. At the same time, it sought some fairly detailed information, such as how the deck material was fastened and whether the patio material was pervious. In addition, the form provided for alternative methods of gathering the needed information.

Based on the results of the data analysis, it appears that the survey would benefit from narrowing the focus of the form to concentrate on the major issues that influence durability, particularly those that were clearly identified in the pilot study. The survey form should also be modified to reflect a single, objective approach that minimizes the exercise of inspector judgment.

VI. RECOMMENDATIONS

Important recommendations from this study include the following:

- The lessons learned from this pilot study need to be incorporated into an improved assessment methodology.

- A comprehensive set of inspector training documents and training materials should be developed for the improved methodology.
- A simplified, user-friendly survey form should be designed and focus on key issues as identified in this pilot study.
- Techniques and procedures aimed at minimizing inspector error should be developed and implemented. They could include creation of a photographic record of each major problem encountered and quality checks of completed survey forms and prompt on-site follow-up to address any discrepancy identified.
- An additional small-scale trial inspection to test the improved methodology should be conducted.
- Once an efficient methodology is finalized, full-scale studies of the U.S. housing stock should be conducted on a regional basis.

APPENDIX A
HOMEOWNER/OCCUPANT LETTER

September 15, 1999

«First_Name» «Middle_initial» «Last_Name»
«First_Name1» «Middle_initial1» «Last_Name1»
«Address»
«City», «State» «Zip»

D*ear Sir or Madam:*

In order to improve the design, construction, and durability of tomorrow's housing, we need to know the successes and failures of yesterday's homes. As part of discovering these successes and failures, the U.S. Department of Housing and Urban Development (HUD) has asked the NAHB Research Center, Inc. (NAHB-RC) in Upper Marlboro, Maryland to conduct an evaluation of existing housing in the United States. As part of a pilot study in the Mid-Atlantic Region, we have randomly selected your house at «Address» to be included. However, your participation in this study is strictly voluntary.

Within the next two weeks, an NAHB-RC engineer will attempt to contact you via telephone to request your participation, and to obtain some general information about your home. They then will be conducting a visual inspection of the exterior of your house. This exterior survey will be enhanced if the inspector can walk around the property and examine all sides of the house. If you would prefer to call us, you may contact ________________ of the NAHB Research Center at 800-638-8556 or 301-249-4400.

The NAHB Research Center, Inc. is an independent, not-for-profit, research organization, and they are not associated with any regulatory, code, or tax assessment agency.

The survey results will be solely used as data for a general overall condition assessment of single-family housing, and will be blind to individual property addresses. Any information you provide will be kept strictly confidential.

If you are interested in the results from this study, let us know, and we will include you in the final report distribution. If there are any concerns or question regarding this research please feel free to call me at 202-708-4370 x 5725, or NAHB-RC at 800-638-8556.

In advance, I thank you for your participation in this research.

Sincerely,

William E. Freeborne
Program Analyst

APPENDIX B
HOMEOWNER/OCCUPANT SURVEY FORM

CONDITION ASSESSMENT SURVEY FORM
Phase I, Owner Survey

Report Date _________________ Inspection ID # _________________

INSPECTION ADDRESS: ____

____

OWNER INFORMATION:
Name: ____
Phone Number:____(____) - ____-______ Home:____(____) - ____-______
Owner Occupied: ____ (Y/N)

1.) How long have you owned the house ____

2.) Last maintenance on the following areas, if known (please list approximate year or date if within the last 12 months).

Component	Replacement year - Date	Comments
Siding replacement		
Roofing		
Painting		
Caulking/Sealants		
Windows		
Doors		
Flashings		
Gutters/Downspouts		

3.) Any problems with the house?
(Please list items with brief notes, such as “Patched roof after noting damp ceiling”)

- Foundation cracking or settlement?
- Any water leakage or standing in basement or crawlspace?
- Noticed water stains around window casings?

____
____
____

4.) Any damage by natural causes?

Yes/No	Natural Cause	Insurance Claim (Yes/No)	Approx Cost $	Approximate Year
	Wind			
	Hail			
	Flooding			
	Fire			
	Termites/Bugs/Ect			
	Other			

5.) Any injuries directly attributable to the house?
(Please list items with brief notes, such as “Broke arm when fell down the stairs”.)

____
____

6.) May we arrange a time to enter the property to conduct a detailed visual exterior inspection?
When ___________________________________ Do you want to be present? _____________

7.) Do you have an unfinished basement or crawlspace?

APPENDIX C
SITE CONDITION ASSESSMENT FORM
Report Date ________________

INSPECTION ADDRESS: ____
____

REPORTED AGE: ______________ DATE PURCHASED___________ PHOTO Roll ___ # ___
NOTED REPLACEMENT OF ROOFING, SIDING OR WINDOWS_______WHEN_______________________
FRONT OF HOUSE FACES: __________ GENERAL DESCRIPTION: _____________________________

DRAW PLAN VIEW OF THE PROPERTY:

PLEASE INCLUDE:
APPROXIMATE SHAPE OF STRUCTURE
APPROXIMATE LOCATIONS OF VISIBLE DAMAGE
SHIELDING FROM BUILDINGS / TREES
SIDEWALKS / DRIVEWAYS
GARAGES/ CARPORTS
NORTH DIRECTION VECTOR
DOORS; FRONT, REAR
DORMERS
APPURTENANCES, PORCHES, CHIMNEYS

Type of House

SINGLE FAMILY ____ MULTIFAMILY ___ ATTACHED ___ DETACHED ___

RANCH ___ COLONIAL ___ TUDOR ___ TOWNHOUSE ___ OTHER ___

NUMBER OF STORIES: 1 ___ 1 ½ ___ 2 ___ 2 ½ ___ 3___

GARAGE ___ (Y/N) ATTACHED ___ DETACHED ___

BASEMENT ___ CRAWLSPACE ___ SLAB-ON-GRADE ___ UNDETERMINED ___

SITE CONDITIONS

GENERAL GRADING:

SIGNS OF PONDING ___ SURFACE DEPRESSIONS ___

LANDSCAPING:

WITHIN 10’ ____ (Y/N)

LARGE TREES ___ LARGE SHRUBS ___ COMMENTS _________________________________

FLOWER BEDS ___ WOOD MULCH ___

PATIO SLABS:

PRESENT ___ (Y/N) ATTACHED ___ UN-ATTACHED ___ 2% = ¼” IN 1 FT

IMPERVIOUS ___ PERVIOUS ___ ≥ 2% SLOPE ___ < 2% ___ NEG ___ COMMENTS________________

TYPE: BRICK ____ BLOCK____ CONCRETE _____ OTHER ______________

CONDITION: GOOD ___ ADEQUATE ____ POOR ___ DESCRIPTION ________________________

RETAINING WALLS: PRESENT ___ (Y/N) APPROXIMATE HEIGHT ____ MATERIAL _____________

CONDITION: GOOD ___ ADEQUATE ____ POOR ___ DESCRIPTION ________________________

DRIVEWAYS/PARKING: PRESENT ___ (Y/N)

OFF STREET ___ (Y/N) PERVIOUS ___ (Y/N) DISTANCE FROM HOUSE <10’ __ ≥ 10’___

CONDITION GOOD ___ ADEQUATE ____ POOR ___ DESCRIPTION ________________________

SIDEWALKS: PRESENT ___ (Y/N) PERVIOUS ___ (Y/N) SLOPE ≥ 2% ____ < 2% _____

WIND EXPOSURE RATING ____ (A, B, C, OR D) (ASCE 7)

DEGREE OF WIND SHIELDING: EXCELLENT ___ NORMAL ____ POOR____

FOUNDATION

MATERIAL: BRICK ____ BLOCK ____ CONCRETE ____ PIER ____ OTHER _____

VISIBLE EXTERIOR CRACKS ___ (Y/N) WINDOW WELLS ___ (Y/N) COVERED ___ (Y/N)

WALK OUT BASEMENT ___ (Y/N) STAIRWELLS ___ (Y/N)

STAIRWELL CONDITION: GOOD ___ ADEQUATE ____ POOR ___ DESCRIPTION ________________________

TYPE AND CONDITION OF EXTERIOR ENVELOPE

SIDING:

TYPE: BRICK___ VINYL ___ ASBESTOS-CEMENT ___ WOOD ___ ALUMINUM ___ STUCCO ___

DESCRIPTION ______________________________________

INSTALLATION: HEIGHT ABOVE FINISH GRADE < 6” ___ ≥ 6” ___ COMMENTS ___________________

ROOF:

TYPE: GABLE ___ HIP ___ GAMBREL ___ SHED ___ OTHER ____________

PITCH OF ROOF <3/12 ___ 3 TO 6 IN 12 ___ > 6/12 ___

ROOF COVERING: COMPOSITION ___ WOOD ___ SLATE ___ TILE ___ BUILT-UP ___

ASPHALT SHINGLES ___ METAL ___ OTHER ___

COMMENTS ____

NUMBER OF VALLEYS ____

GENERAL VALLEY CONDITION(S): GOOD ___ ADEQUATE ___ POOR ____ DESCRIPTION _____________

Number of Roof Openings ____

General Opening Condition(s): Good ___ Adequate ___ Poor ____ Description ______________

Number of Skylights ____

General Skylight Condition(s): Good ___ Adequate ___ Poor ____ Description _____________

Vents: Gable ___ Ridge ___ Soffit ___ Plumbing ___ Through Roof (Fan ___ Turbine ___ Passive __)

Roof Flashing: Roofing Drip Edges ___ (Y/N), Spaced < ¼" ___ ≥ ¼" ____

Soffits: Type , Wood ___ Metal ____ Vinyl ___ Other ____

Slope: Horizontal ___ Angled _____ If angled approximate slope ________________________

Overhang: Length of Overhang 0" ___ 0-6" ___ 6-12" ___ 12-18" ___ 18-24" ____ > 24" ____

Same for all locations ___ (Y/N)

Gutter/downspout: Present on all roofs ___ (Y/N) Signs of Recent Maintenance ___ (Y/N)

Material: aluminum ___ steel ___ copper ___ Plastic ___ Other ______________

Splash Blocks / Run-off Provisions ___ (Y/N) Water Flow Directed 2' minimum ___ (Y/N)

Comments ____

Windows: Material: Wood ___ Metal ___ Vinyl ___ Other _____________________________________

Glazing: single ___ double ___ triple ___ Other ____

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Storm windows: Not Present ___ Wood ___ Metal ___ Vinyl ___ Other __________________

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Doors: (F = Front, R = Rear)

Material: Wood ___ Metal ___ Vinyl ___ Other ____

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Storm doors: Not Present ___ Wood ___ Metal ___ Vinyl ___ Other _____________________

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Decks , Deck Present ___ (Y/N)

Material: Treated Wood ___ Redwood ___ Cedar ___ Can't Tell ___ Other ______________

Surface Nailed ___ Surface Screwed ___ Other _________________

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Fencing Present ___ (Y/N)

Type, Wood ___ Metal ___ Plastic ___ , Describe ____

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Porch/Stoop

Material: Wood Frame ___ Concrete ____ Covered ____ Other _____________

Condition: Good ___ Adequate ___ Poor ____ Description _________________________________

Exterior stairs

Material: Wood Frame ___ Concrete ____ Metal ___ Other _____________________________

Condition: Good ___ adequate ___ Poor ____ Description _________________________________

Chimney Storm Cap: _____ (Y/N)

Condition: Good ___ adequate ___ Poor ____ Description _________________________________

FASCIAS

MATERIAL: WOOD ___ METAL ___ VINYL ___ OTHER ___________________________

CONDITION: GOOD ___ ADEQUATE ___ POOR ____ DESCRIPTION _________________________

WOOD ROT (INSECT DAMAGE, TERMITE, ETC.)

Any Wood Rot Noted ___ (Y/N)

If Yes, Describe Location(s) and Probable Cause(s): ____

Any Insect Damage Noted ___ (Y/N)

If Yes, Describe Location(s) and Probable Cause(s): ____

BUILDING COMPONENT CONDITION VISUAL SURVEY*

CONDITION RATINGS, 1 = EXCELLENT, 2 = GOOD, 3 = ADEQUATE, 4 = POOR, 5 = NEEDS REPLACED, 6 = NA

BUILDING SIDE	FRONT	RIGHT	REAR	LEFT	Comments
COMPONENT CONDITIONS					**House Road Side Faces N S E W**
GRADING					
LANDSCAPING					
SIDEWALKS					
FOUNDATION					
PORCHES					
DECKS					
SIDING					
DOORS					
WINDOWS					
TRIM					
OPENINGS					
SOFFITS					
FASCIA					
GUTTERS					
FLASHING					
ROOF					
CAULKING					
FASCIA/SOFFIT					
SIDING/SOFFIT					
SIDING/TRIM					
SIDING/WINDOWS					
SIDING/DOORS					
SIDING/OPENINGS					
PAINT					
FASCIA					
SOFFIT					
SIDING					
TRIM					
WINDOWS					
DOORS					

*NOTE: Refer to Appendix D for a detailed description of the numeric rating system.

APPENDIX D
RATING SYSTEM

Rating System Description for: Building Component Condition Visual Survey

Condition Ratings, 1 = excellent, 2 = good, 3 = Adequate, 4 = Poor, 5 = Needs repaired 6 = NA

Building Side	Front	Right	Rear	Left	Comments
Component Conditions					**House Road Side Faces N S E W**
Grading					
Scope: The grading is associated with the drainage characteristics of the first 10 ft of the ground in an area encompassing the 10 feet perpendicular and adjacent to the foundation.					
Importance: The slope of the finish grade in the 10 feet adjacent and perpendicular to the foundation establishes and promotes proper surface drainage for the bulk water away from the structure. This region is particularly important to proper drainage because it is both the area that was excavated and back filled during construction (thereby being more porous) and any additional water surcharge load is proportionally added to lateral structural loads resisted by the foundation. Saturation of the soil in this region can also hasten any decay being present, raise the micro-environment relative humidity, encourage insect growth, and many more problems. As a first defense for these and other potential problems the bulk water needs to be removed from this region within 10-foot promptly.					
Condition Rating Descriptions:					
1.	Excellent				
Slope 5% (5/8” per foot) or greater away from the structure a minimum of 10’ adjacent and perpendicular No VISIBLE depressions for standing water for the entire perimeter area					
2	Good				
Slope 5% or greater than 4’ adjacent and perpendicular from the foundation then, positive a minimum of 10 ‘ total adjacent and perpendicular from the foundation Either properly drained or no visible depression for standing water within 10’ for the entire perimeter.					
Slope 2% to 5% 10’ adjacent and perpendicular from the foundation. Either properly drained or no visible depression for standing water within 10’ for the entire perimeter					
3	Adequate				
Positive slope 0 to 2% 10’ adjacent and perpendicular from the foundation. Less than 1 ft^2 of water retaining depressions per 10 linear foot of wall					
4	Poor				
Level slope with in the 4’ adjacent and perpendicular from the foundation Between 1ft^2 and 5 ft^2 of water retaining depressions per 10 linear foot of foundation Less than 1 ft^2 per 20 LINEAR foot of foundation sloped back toward the foundation					
5	Needs repair				
Slope negative to level for more than 1ft^2 per 20 linear feet of foundation Greater than 5ft^2 of water retaining depressions per 10 linear foot of wall					

Landscaping

Scope: Landscaping is focused on the plantings that are within a 10’ zone around and above the structure.

Importance: plantings can pose potential problems to the structure ranging from roots pushing on and below the foundation to the watering for the plants creating wet basements and high relative humidity micro-climates to falling trees and limbs introducing large impact loads. The main issues with respect to durability are:

- Air movement around the structure to promote evaporation.
- Air movement to crawl-space vents for proper ventilation
- Large trees a minimum of 10 feet away to minimize impact due to root growth.
- A means to help stabilize the moisture content of the soil within the first 10”, either shrubs, grass, impermeable barrier, or bushes.
- Minimizing the introduction of excessive additional water into the region.

1	Excellent

All Bushes and plantings are a minimum of 1 foot from foundation vents

A minimum of 6” separation of all foliage from the siding.

Large trees (greater than 12’ tall) are a minimum of 10’ away from the structure

Any wood mulch is a minimum of 6 inches away from the siding

Well drained plantings without signs of excessively moist surroundings within 10’ of structure.

2	Good

All Bushes and plantings are a minimum of 6 inches from foundation vents

A minimum of 6” separation of all foliage from the siding.

Large trees (greater than 12’ tall) are a minimum of 10’ away from the structure

Less than 1 small tree (less than 12’ tall) per 20 linear foot of foundation within 10’ of structure

Wood mulch is a minimum of 6 inches away from the siding

No plantings with signs of excessively moist surroundings within 6’ of structure

3	Adequate

All bushes and plantings are a minimum of 6 inches from foundation vents.

A minimum of 6” separation of all foliage from the siding at least 90% of the structure.

Large trees (greater than 12’ tall) are a minimum of 10’ away from the structure.

Less than 1 small tree (less than 12’ tall) per 10 linear foot of foundation within 10’ of structure.

Any wood mulch is a minimum of 6 inches away from the siding.

No plantings with signs of excessively moist surroundings within 4’ of structure.

4	Poor

All Bushes and plantings are a minimum of 1 foot from foundation vents

A minimum of 6” separation of all foliage from the structure at least 75% of the structure.

Large trees (greater than 12’ tall) are a minimum of 10’ away from the structure

Less than 2 small trees (less than 12’ tall) per 10 linear foot of foundation within 10’ of structure

No plantings with signs of excessively moist surroundings within 2’ of structure

5	NEEDS REPAIR

FOUNDATION VENTS ARE COVERED WITH VEGETATION.

LESS THAN 6” SEPARATION OF ALL FOLIAGE FROM THE SIDING FOR MORE THAN 25% OF THE STRUCTURE.

LARGE TREES WITHIN 10’ AWAY FROM THE STRUCTURE.

MORE THAN 2 SMALL TREES (LESS THAN 12’ TALL) PER 10 LINEAR FOOT OF FOUNDATION WITHIN 10’ OF STRUCTURE.

WOOD MULCH IS A LESS THAN 6 INCHES AWAY FROM THE SIDING.

PLANTINGS WITH SIGNS OF EXCESSIVELY MOIST SURROUNDINGS WITHIN 2’ OF STRUCTURE.

FOUNDATION					

SCOPE: THE CONDITION SURVEY OF THE FOUNDATION IS INTERESTED IN THE EXTERIOR CONDITION OF THE FOUNDATION AND ITS STRUCTURAL INTEGRITY.

IMPORTANCE: THE FOUNDATION IS THE SUPPORT FOR THE STRUCTURE. IT NEEDS TO BE ABLE TO SUPPORT THE STRUCTURE WITH A MINIMUM OF DEFLECTION AND CRACKING. DISTRESS IN THE FOUNDATION IS GENERALLY SEEN IN AREAS OF RE-ENTRANT CORNERS, FOUNDATION CORNERS, LOCATION OF SETTLEMENTS, AND OPENINGS FOR UTILITIES.

1	EXCELLENT

NO VISIBLE EXTERIOR CRACKS.

ALL MORTAR PROPERLY TOOLED AND IN GOOD CONDITION.

FOUNDATION SQUARE AND PLUMB.

NO NOTICEABLE BULGES.

NO ROT OR DECAY OF WOOD COMPONENTS.

NO EFFLORESCENCE.

ALL TIE HOLES PATCHED.

CRAWLSPACE VENTILATION PROPERLY SCREENED AND UNOBSTRUCTED.

2	GOOD

CRACKS FROM RE-ENTRANT CORNERS SHORTER THAN 2 TIMES THE WALL THICKNESS

ALL CRACKS LESS THAN 1/32” (.03125”)

NO CRACKS IN CONTACT WITH THE FINISH GRADE

EFFLORESCENT ON CONCRETE / MASONRY EXTENDS ≤ 1” ABOVE FINISH GRADE

NO ROT OR DECAY OF WOOD COMPONENTS.

≥ 50% OF ALL TIE HOLES PATCHED

MORTAR IS SOUND

NO MASONRY SPALLING

3	Adequate				
Foundation cracks are less than 1/32” (0.03125”) wide at ground level No noticeable separation of the foundation at or around openings No VISIBLE rot or decay, especially around the crawlspace access, exterior basement entrance, or basement windows. Crawlspace VENTILATION of approximately 1/150th of the footprint. Efflorescent’s do not extend more than 2” above the foundation No loose Masonry Units					
4	Poor				
Cracks’ radiating out of re-entrant corners ≥ 4 times the thickness. crack widths ≥1/32 “ Mortar cracks and masonry spalling on < 10% of visible masonry Efflorescent noted > 3” above finish grade. Stable settlement cracks ≤ ¼” at widest visible point. Foundation ≤ ½” in 4’ out of plumb. Buldge ≤ ¼” per wall					
5	Needs repair				
Cracks radiating out of re-entrant corners ≥ 5 times the thickness Crack widths ≥ ½” Masonry loose on > 5% of the visible area Foundation > ½” in 4’ out of plumb bulge > ¼” per wall Efflorescent > 5” above finish grade Active settlement cracks > ¼” In-Active Settlement cracks > ½” Masonry spalling > 10% of visible area > 20% of mortar bed joints gone.					
Siding					
Scope: The siding assessment is focused on the condition of the siding. Regardless of the type of siding system (face sealed or wind screen) the regions of earliest degradation are generally the end but regions, the area closest to the finish grade, and any interfaces with interfaces and features.					
Purpose: The siding serves to shed the bulk water. Bulk water generally is delivered as rain by wind or splashing but can also be from sprinklers fountains etc. This is one of the largest and most important components in the building envelope. Degradation may be seen as decay/rot, localized or gross deformation, spalling, and cracking, ect. The functional requirement is to direct the bulk water away from the structure.					
1	Excellent				

All siding is in place Siding is > 6 inches above the finish grade No visible rot/decay good overlap, interlock, surface finish, mortar tooling ect No surface fungus growth. Surfaces are square and plumb	
2	Good
All siding is in place Siding is > 6 inches above the finish grade No visible rot/decay good overlap, interlock, mortar tooling ETC. Siding is less than 1/8" in 4' out of plumb Wall Bulges of less than 1/2".	
3	Adequate
All siding is in place Siding is ≥ 6 inches above the finish grade Visible rot/decay at butt joints ≤ 5% of joints, substrate still sound. Visible rot/decay at interfaces ≤ 5% of linear seals of interfaces. Siding is less than ¼" in 4' out of plumb Wall Bulges of less than 1". Siding may be face nailed and painted/sealed.	
4	Poor
< 1% of the siding missing from protected areas. Siding is less than 6" above the finish grade. Siding is rust stained Rot noted on ≤ 15% of the end joints and interfaces but siding is still sound. Either no or obstructed weep holes (masonry, Pure wind screens) Siding is less than ½" in 4' out of plumb Wall Bulges of less than 1 ½".	

<table>
<tr><td>5</td><td colspan="5">Needs repair</td></tr>
<tr><td colspan="6">Less than 1% of siding missing
Siding is in contact with the finish grade.
Decay progression around nail holes such that water intrusion is allowed.
Rot noted on > 15% of the end joints and interfaces or siding substrate is no loner sound.
Siding is bowed and/or warped allowing water intrusion.</td></tr>
<tr><td>Porches</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Scope: Porches are interested in the condition of either concrete stoops or covered porches. The main point of interest is to assess the overall condition in terms of structural ability to support the occupants and the ability to direct the bulk water away from the structure.</td></tr>
<tr><td colspan="6">Importance: Porches are the entrance staging areas directly attached and/or adjacent to structures. They are often improperly constructed such that they allow bulk water to remain in contact with the structure and promote decay. Ideally they should be attached and properly covered with a functioning roof or detached and freestanding. Since this is not normally done where the porch or stoop comes in contact with the structure is a prime location for decay. The decay can be seen as wood rot, efflorescence, mold, ect.</td></tr>
<tr><td>1</td><td colspan="5">Excellent</td></tr>
<tr><td colspan="6">Covered and flashed
Siding is a minimum 6” above finish grade.
Minimum of 2% slope away from the structure.
Minimum 18” separation of joist to the ground.
No surface cracks.
Porch and railing freestanding a minimum of 2” away from the structure.
No observable rot od decay
All wood in contact with the ground is treated or naturally resistant
All locations of contact are inspectable for termite tunnels.</td></tr>
</table>

2	GOOD
COVERED AND FLASHED SIDING IS A MINIMUM 6” ABOVE FINISH GRADE. MINIMUM OF 2% SLOPE AWAY FROM THE STRUCTURE. MINIMUM 18” SEPARATION OF JOIST TO THE GROUND. NO SETTLEMENT CRACKS IN SLAB ON GRADE. PORCH AND RAILING ATTACHED TO THE STRUCTURE , FREE DRAINING AND PROPERLY FLASHED. NO OBSERVABLE ROT OD DECAY ALL WOOD IN CONTACT WITH THE GROUND IS TREATED OR NATURALLY RESISTANT ALL LOCATIONS OF CONTACT ARE INSPECTABLE FOR TERMITE TUNNELS. ALL CONTACT WITH THE STRUCTURE IS PROPERLY FLASHED.	
3	ADEQUATE
RAIN EXPOSED ELEMENTS ARE SLOPED AWAY FROM THE STRUCTURE. CRACKS UP TO 1/8” IN SLAB ON GRADE. COVERED AND FLASHED OR OPEN AIRED. SIDING IS A MINIMUM 6” ABOVE FINISH GRADE. MINIMUM 18” SEPARATION OF JOIST TO THE GROUND. NO SETTLEMENT CRACKS IN SLAB ON GRADE. PORCH AND RAILING ATTACHED TO THE STRUCTURE IS FREE DRAINING AND PROPERLY FLASHED. ROT OR DECAY IS NOTED ON FLOORING AND NON-STRUCTURAL ELEMENTS IN LESS THAN 1% OF THE SURFACE, SUBSTRATE SOUND. ALL WOOD IN CONTACT WITH THE GROUND IS TREATED OR NATURALLY RESISTANT ALL LOCATIONS OF CONTACT ARE INSPECTABLE FOR TERMITE TUNNELS. ALL CONTACT WITH THE STRUCTURE IS PROPERLY FLASHED.	
4	POOR
LEVEL TO NEGATIVELY SLOPED. NO RAILING IF MORE THAN 7” ABOVE FINISH GRADE. RAIN EXPOSED ELEMENTS ARE LEVEL TO 2% SLOPE TOWARD THE STRUCTURE. CRACKS < 1/2” (INCLUDING SETTLEMENT CRACKS) IN SLAB ON GRADE. COVERED AND FLASHED OR OPEN AIRED. SIDING IS LESS THAN 6” ABOVE FINISH GRADE. MINIMUM 12” SEPARATION OF JOIST TO THE GROUND. PORCH AND RAILING ATTACHED TO THE STRUCTURE. ROT OR DECAY IS NOTED ON FLOORING ON LESS THAN 10% OF THE SURFACE, SUBSTRATE SOUND. ROT OR DECAY IS NOTED ON STRUCTURAL MEMBERS < 5% OF THE SURFACE, SUBSTRATE SOUND.	

5	Needs repair

Concrete directly in contact with structure wood components

Level to negatively sloped.

No railing if more than 7” above finish grade.

Rain exposed elements are level to back to the structure.

Cracks ≥ 1/2” (including settlement cracks) in slab on grade.

Covered or open aired.

Siding in contact with finish grade.

Porch and railing attached to the structure.

Rot or decay is noted on flooring on more than 10% of non-structural elements and 5% of the structural elements or substrate no longer sound.

Decks					

Scope: Decks are exterior extensions of the living area. generally constructed of either wood (pressure treated, cedar, redwood), or masonry patios (concrete, flagstone, ETC). The survey focus is to assess the structural integrity to safely support the occupants and direct the bulk water away from the structure.

Importance: In mild climates decks are often used as extensions of the living space and placed next to the structure. They are generally open aired structures that are directly adjacent to and or attached to the structure. Decks are problematic since they are often constructed of wood and built in a horizontal fashion allowing rain to be easily deposited. Railings also have locations where water can stand and promote rapid decay. The normal construction methods also create localized areas on face attached decking where water can stand and create accelerated decay.

1	Excellent

Level to 2% sloped to the exterior of the structure.

Free standing.

Minimum of 2” SEPARATION from the structure.

Not face fastened

Hand railing in place.

Treated wood or naturally resistant material in contact with the finish grade.

Signs of water repellent finish.

No VISIBLE rot or decay.

Adequate supporting columns

Adequate joist, both spacing and size/span.

<table>
<tr><td>2</td><td>Good</td></tr>
<tr><td colspan="2">Level to 2% sloped to the exterior of the structure.
Attached to the structure with good flashing.
Face fastened
Hand railing in place.
Treated wood or naturally resistant material in contact with the finish grade.
Signs of water repellent finish.
No visible rot or decay.
Adequate supporting columns
Adequate joist, both spacing and size/span.</td></tr>
<tr><td>3</td><td>Adequate</td></tr>
<tr><td colspan="2">Level to 2% sloped to the exterior of the structure.
Attached to the structure whit some flashing.
Face fastened
Hand railing in place.
Treated wood or naturally resistant material in contact with the finish grade.
Visible rot or decay on less than 1% of surface, substrate sound.
Adequate supporting columns
Adequate joist, both spacing and size/span</td></tr>
<tr><td>4</td><td>Poor</td></tr>
<tr><td colspan="2">Level to 2% sloped toward the structure.
Attached to the structure without flashing.
Face fastened
Hand railing not in place, insufficient hand railing.
Non-Treated wood or naturally resistant within 6” of the finish grade.
Visible rot or decay on less than 10% of surface, substrate sound.
Adequate supporting columns.
Adequate joist, both spacing and size/span.</td></tr>
</table>

5	Needs repair
Level to 2% sloped toward the structure. Attached to the structure without flashing. Face fastened Hand railing not in place, insufficient hand railing. Non-Treated wood or naturally resistant within 6” of the finish grade. Visible rot or decay on more than 10% of surface or substrate not sound. Inadequate supporting columns. Inadequate joist, both spacing and size/span.	
Doors	
Scope: Doors are interested in the condition of the ingress and egress door, the sealing of these openings, and the structural integrity of the door and frame.	
Importance: the doors serve as the barriers and the ingress and egress points through the exterior envelope. It is therefore their job to be structurally sound to withstand the wind loading, protect against unwelcome ingress, and seal against the elements. The sealing for the elements is protection against both air infiltration and bulk water migration. While doing these jobs it must still remain operable as points of ingress and egress.	
1	Excellent
Doors and Frames show no sign of rot and or decay Gaskets are in place and sealed, including both threshold and edge seals. No visible air gaps are noticeable. Threshold is sloped to the exterior a minimum of 2% (1/4” per foot) Doors are level, plumb, and centered in the frame. Frames are intact and sound.	
2	Good
Doors and Frames show no sign of rot and or decay Gaskets are in place and but not fully compressed, both threshold and edge seals. No visible air gaps are noticeable. Threshold is sloped to the exterior a minimum of 2% (1/4” per foot) Doors are centered in the frame. Frames are intact and sound.	
3	Adequate
Frames shows minimal rot and/or decay at outside bottom only. Gaskets are in place and making contact over 90% of their length. Threshold is level or sloped to the exterior less than 2% (1/4” per foot) Doors are centered in the frame. Frames are intact and sound.	

4	POOR

FRAMES SHOWS MINIMAL ROT AND/OR DECAY AT BOTTOM.

DOORS SHOW SIGNS OF ROT DECAY EXTENDING LESS THAN 1 INCH ABOVE THRESHOLD, SUBSTRATE STILL SOUND.

THRESHOLD SEAL IS IN PLACE, NO SIDE SEALS ARE IN PLACE.

THRESHOLD IS LEVEL.

DOORS ARE NOT CENTERED LEVEL AND/OR PLUMB IN THE FRAME.

FRAMES ARE INTACT AND SOUND.

5	NEEDS REPAIR

FRAMES SHOWS ROT AND/OR DECAY AT BOTTOM, SPLICES, AND/OR BUTT JOINTS, .

DOORS SHOW SIGNS OF ROT DECAY EXTENDING MORE THAN 1 INCH ABOVE THRESHOLD, SUBSTRATE STILL SOUND.

DOOR SUBSTRATE NO LONGER SOUND.

NO THRESHOLD SEAL IS IN PLACE, NO SIDE SEALS ARE IN PLACE.

THRESHOLD IS SLOPED INTO THE STRUCTURE.

DOORS ARE NOT CENTERED LEVEL AND/OR PLUMB IN THE FRAME.

FRAMES ARE NOT INTACT AND SOUND.

WINDOWS					

SCOPE: THE WINDOWS ASSESSMENT IS FOCUSED ON THE WINDOW FRAME, SILL, GLAZING, AND/OR STORM WINDOWS WHEN PRESENT. IN PARTICULAR IS THE SYSTEMS ABILITY TO KEEP WATER FROM INFULTRATING AND DIRECTING THE WATER TO THE EXTERIOR.

IMPORTANCE: WINDOWS ARE OPENINGS IN THE EXTERIOR ENVELOPE THAT ALLOW LIGHT AND VENTILATION (INTENTIONAL AND UN-INTENTIONAL) INTO THE STRUCTURE. STRUCTURALLY THEY RESIST THE LOADS DUE TO WIND AND RAIN BY TRANSFERRING THE LOADS INTO THE WALL STRUCTURE THROUGH THE FRAMES. THEY HISTORICALLY ARE SOURCES OF BULK AND ENTRAINED WATER INTO THE BUILDING ENVELOPE.

1	EXCELLENT

WINDOW FRAME

NO VISIBLE SEPARATION OF THE JOINTS AND THE FINISH IS IN TACT. IE. BUTT JOINTS, FINGER JOINTS, AND MULLIONS.

SILL

SLOPED TO THE EXTERIOR ≥ 5%

GLAZING

COMPLETE WITH NO CRACKED PANES

NO TRAPPED CONDENSATE IN MULTI-PANED WINDOWS

STORM WINDOWS

PROPERLY ATTACHED, IN PLACE, AND SEALED.

GENERAL

NO SIGNS OF DECAY OR ROT

ALL WEEP HOLES ARE UNOBSTRUCTED

2	GOOD
WINDOW FRAME NO VISIBLE SEPARATION OF THE JOINTS. IE. BUTT JOINTS, FINGER JOINTS, AND MULLIONS. THE FINISH MAY BE HAIRLINE CRACKED SILL SLOPED TO THE EXTERIOR ≥ 2% GLAZING NO MISSING GLAZING COMPOUND. COMPLETE WITH NO CRACKED PANES. NO TRAPPED CONDENSATE IN MULTI-PANED WINDOWS. STORM WINDOWS PROPERLY ATTACHED, IN PLACE, AND SEALED. GENERAL NO SIGNS OF DECAY OR ROT ALL WEEP HOLES ARE UNOBSTRUCTED	
3	ADEQUATE
WINDOW FRAME JOINTS ARE SEPARATED ≤ 1/16”. IE. BUTT JOINTS, FINGER JOINTS, AND MULLIONS. THE FINISH MAY BE HAIRLINE CRACKED SILL LEVEL TO SLOPED TO THE EXTERIOR ≥ 2% GLAZING CRACKED AND LESS THAN 10% OF GLAZING COMPOUND MISSING. LESS THAN 1% CRACKED PANES, ALL PANES IN PLACE. MAY HAVE TRAPPED CONDENSATE IN MULTI-PANE WINDOWS. STORM WINDOWS PROPERLY ATTACHED AND IN PLACE. GENERAL MINIMAL ROT OR DECAY (LESS THAN 5% OF JOINTS) CONCENTRATED AT JOINTS WITH THE SUBSTRATE BEING SOUND 50% OR MORE OF WEEP HOLES ARE UNOBSTRUCTED	

4	POOR
WINDOW FRAME JOINTS ARE SEPARATED ≤ 1/8”. IE. BUTT JOINTS, FINGER JOINTS, AND MULLIONS. THE FINISH MAY BE CRACKED AND PEELING AT JOINTS SILL LEVEL TO SLOPED TO THE INTERIOR < 2% GLAZING CRACKED AND LESS THAN 20% OF GLAZING COMPOUND MISSING. LESS THAN 5% CRACKED PANES, LESS THAN 5% OF PANES MISSING PLACE. MAY HAVE TRAPPED CONDENSATE IN MULTI-PANE WINDOWS. STORM WINDOWS POORLY ATTACHED AND/OR COMPONENTS NOT IN PLACE. GENERAL ROT OR DECAY ON MORE THAN 5% OF THE JOINTS WITH THE SUBSTRATE BEING SOUND LESS THAN 50% OF WEEP HOLES ARE UNOBSTRUCTED	
5	NEEDS REPAIR
JOINTS ARE SEPARATED > 1/8”. IE. BUTT JOINTS, FINGER JOINTS, AND MULLIONS. THE FINISH MAY BE CRACKED AND PEELING AT JOINTS OBVIOUS SIGNS OF WATER INGRESS. SILL LEVEL TO SLOPED TO THE INTERIOR ≥ 2%. GLAZING: CRACKED AND LESS THAN 20% OF GLAZING COMPOUND MISSING, MORE THAN 5% CRACKED PANES, MORE THAN 5% OF PANES MISSING PLACE, MAY HAVE TRAPPED CONDENSATE IN MULTI-PANE WINDOWS. STORM WINDOWS POORLY ATTACHED AND/OR COMPONENTS NOT IN PLACE. GENERAL ROT OR DECAY ON MORE THAN 10% OF THE JOINTS. THE SUBSTRATE IS NOT SOUND LESS THAN 75% OF WEEP HOLES ARE UNOBSTRUCTED	

<table>
<tr><td colspan="2">Trim</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Scope: The Trim assessment is focused on the condition of the brick moulding around doors and windows plus the corner trim on building edges and transitions. In essence the ability of the element to resist the elements and retain there intended function.</td></tr>
<tr><td colspan="7">Importance: Trim is an essential part of the exterior envelope. It allows smooth transition from the siding system to openings and features. These smooth transitions allow the application of sealant to help guard against water and air infiltration into the building envelope. Degradation is often seen as erosion of the drip edge, rot/decay of joints (butts, Miters, Finger, Splices), and rot/decay of the members themselves.</td></tr>
<tr><td>1</td><td colspan="6">Excellent</td></tr>
<tr><td colspan="7">All trim is in place.
All horizontal trim is sloped away from the building envelope.
All horizontal trim has a distinct drip edge.
all joints (Butt, Miter, Finger, Ect) are closed
No visible cracks in the coating over joints.
No visible rot or decay.</td></tr>
<tr><td>2</td><td colspan="6">Good</td></tr>
<tr><td colspan="7">All trim is in place.
All horizontal trim is sloped away from the building envelope.
All horizontal trim has a distinct drip edge.
all joints (Butt, Miter, Finger, Ect) are open less than 1/16”.
Visible hairline cracks in the coating over joints.
No visible rot or decay.</td></tr>
<tr><td>3</td><td colspan="6">Adequate</td></tr>
<tr><td colspan="7">All trim is in place.
All horizontal trim is level.
All joints (Butt, Miter, Finger, Ect) are open less than 1/8”.
Visible cracks in the coating over joints.
Rot or decay visible on less than 5% of joints, substrate sound.</td></tr>
</table>

<table>
<tr><td>4</td><td colspan="6">Poor</td></tr>
<tr><td colspan="7">less than 1% of trim is missing.
All horizontal trim is level to sloping toward the structure.
All joints (Butt, Miter, Finger, Ect) are open less than 1/4”.
Visible cracks and/or peeling of the coating over joints.
No obvious bulk water ingression.
Rot or decay visible on less than 25% of joints.
Substrates are sound.</td></tr>
<tr><td>5</td><td colspan="6">Needs Repair</td></tr>
<tr><td colspan="7">More than 1% of trim is missing.
All horizontal trim is level to sloping toward the structure.
All joints (Butt, Miter, Finger, Ect) are open more than 1/4”.
Visible cracks and/or peeling of the coating over joints.
Obvious bulk water ingression.
Rot or decay visible on more than 25% of joints.
Substrates not sound.</td></tr>
<tr><td colspan="2">Opening</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="7">Scope: The opening assessment is focused on the condition and design of the utility entrances through the building envelope. The main criterion for assessment is the protection from water and air infiltration, separation for termite inspection, and integrity of the attachment(s) of the services.</td></tr>
<tr><td colspan="7">Importance: Utilities bring desired services into the structure such as power, phone, plumbing, tv, ect. Through openings in the exterior envelope. We want these services to enter through the openings, not air and water intrusion and possible avenues for insect infestation. Problems associated with openings are generally details such as poor caulking or no drip loop.</td></tr>
<tr><td>1</td><td colspan="6">Excellent</td></tr>
<tr><td colspan="7">Lines coming up from finish grade are spaced to allow inspection for termite tunnels.
Entrances are flashed.
Lines entering from above have drip loops.
Entrance holes are sealed with no visible gaps.
Lines are securely fastened to the structure without going through the sealing system.</td></tr>
<tr><td>2</td><td colspan="6">good</td></tr>
<tr><td colspan="7">Lines coming up from finish grade are spaced to allow inspection for termite tunnels.
Lines entering from above have drip loops.
Entrance holes are sealed with no visible gaps.
Lines are securely fastened to the structure without going through the sealing system</td></tr>
</table>

3	ADEQUATE
LINES COMING UP FROM FINISH GRADE ARE SPACED TO ALLOW INSPECTION FOR TERMITE TUNNELS. LINES ENTERING FROM ABOVE HAVE DRIP LOOPS. ENTRANCE HOLES ARE SEALED WITH NO VISIBLE GAPS. LINES ARE SECURELY FASTENED TO THE STRUCTURE.	
4	POOR
LINES COMING UP FROM FINISH GRADE ARE NOT SPACED TO ALLOW INSPECTION FOR TERMITE TUNNELS. LINES ENTERING FROM ABOVE DO NOT HAVE DRIP LOOPS. ENTRANCE HOLES ARE SEALED WITH NO VISIBLE GAPS. LINES ARE NOT FASTENED TO THE STRUCTURE.	
5	NEEDS REPAIR
LINES COMING UP FROM FINISH GRADE ARE NOT SPACED TO ALLOW INSPECTION FOR TERMITE TUNNELS. LINES ENTERING FROM ABOVE DO NOT HAVE DRIP LOOPS. ENTRANCE HOLES ARE NOT SEALED AND HAVE VISIBLE GAPS. LINES ARE NOT FASTENED TO THE STRUCTURE.	
SOFFITS	
SCOPE: THE SOFFIT ASSESSMENT IS FOCUSED ON THE CONDITION OF THE SOFFIT. IN PARTICULAR THE ORIENTATION OF THE SOFFIT, WHETHER THEY ARE VENTED, THEIR MATERIAL, AND OVERALL CONDITION.	
IMPORTANCE: SOFFITS ARE THE FINISH ELEMENTS FOR THE UNDERSIDE OF THE OVERHANGS. THEY HELP KEEP WIND DRIVEN BULK WATER FROM ENTERING THE BUILDING ENVELOPE ALONG THE RAFTER TAILS. THEY MAY BE INSTALLED LEVEL OR SLIGHTLY SLOPED AND ARE OFTEN MADE OF MATERIAL RANGING FROM PLYWOOD TO VINYL SHEETING. DEGRADATION IS MOST GENERALLY SEEN AROUND THE SOFFIT IN THE FORM OF WOOD DE-LAMINATION AND ROT. THE GENERAL REASONS FOR THIS OBSERVED DEGRADATION IS GENERALLY MOISTURE NOT DRAINING OUT OF THE SOFFIT, LEAKING ROOFS, AND CONDENSATION.	
1	EXCELLENT
WELL VENTED WITH LOUVERED OR SCREENED VENTS SLOPED LEVEL TO 2% AWAY FROM THE BUILDING ENVELOPE ALL AREAS ARE ENCLOSED VISIBLE DRAIN HOLES NO VISIBLE ROT/DECAY OR DELIMITATION.	
2	GOOD
WELL VENTED WITH LOUVERED OR SCREENED VENTS. SLOPED LEVEL TO 2% AWAY FROM THE BUILDING ENVELOPE. ALL AREAS ARE ENCLOSED NO VISIBLE ROT/DECAY OR DELIMITATION.	

3	ADEQUATE

VENTED WITH LOUVERED OR SCREENED VENTS.

NOT VENTED.

SLOPED LEVEL TOO SLIGHTLY AWAY FROM THE BUILDING ENVELOPE.

ALL AREAS ARE ENCLOSED.

VISIBLE ROT/DECAY OR DELIMITATION AT LESS THAN 10% OF THE JOINTS AND INTERFACES

4	POOR

VENTED WITH LOUVERED OR SCREENED VENTS, UP TO 10% OF SCREENS MISSING

NOT VENTED.

SLOPED LEVEL TO SLIGHTLY TOWARD THE BUILDING ENVELOPE

ALL AREAS ARE ENCLOSED.

VISIBLE ROT/DECAY OR DELIMITATION AT LESS THAN 25% OF THE JOINTS AND INTERFACES SUBSTRATE STILL SOUND

5	NEEDS REPAIR

NOT VENTED

VENTED WITH LOUVERED OR SCREENED VENTS, GREATER THAN 10% OF THE SCREENS OR THE LOUVERS ARE MISSING.

SLOPED TOWARD THE BUILDING ENVELOPE.

ALL AREAS ARE NOT ENCLOSED

VISIBLE ROT/DECAY OR DELIMITATION AT GREATER THAN 25% OF THE JOINTS AND INTERFACES.

SUBSTRATES NO LONGER SOUND.

VISIBLE ROT/DECAY/DELIMITATION AWAY FROM THE JOINTS/INTERFACES.

FASCIA					

SCOPE: THE FASCIA ASSESSMENT IS FOCUSED ON THE CONDITION OF THE FASCIA. IN PARTICULAR THE ORIENTATIONS OF THE FASCIA, PRESENCE OF A DISTINCT DRIP EDGE, THEIR MATERIAL, AND OVERALL CONDITION.

IMPORTANCE: THE FASCIA IS THE TRIM PARALLEL TO THE SIDING ALONG THE ROOF EDGE. THIS ELEMENT HELPS PREVENT THE DRIVEN RAIN AND WIND BORNE RUN OFF FROM ENTERING THE BUILDING ENVELOPE PAST THE END OF THE RAFTERS. IT ALSO HELPS PROMOTE PROPER ROOF DRAINAGE BY CREATING A DISTINCT DRIP EDGE FOR BULK WATER. DEGRADATION IS GENERALLY SEEN AS DELIMITATION, DRIP EDGE EROSION, ROT/DECAY AT BUT JOINTS, AND GENERAL OVERALL DECAY/ROT.

1	EXCELLENT

DISTINCT DRIP EDGE.

ORIENTED PLUMB TO ± 5% FROM PLUMB.

FASCIAS ARE COMPLETE.

NO VISIBLE ROT/DECAY OR DELIMITATION.

2	GOOD
DISTINCT DRIP EDGE. ORIENTED PLUMB TO ± 20% FROM PLUMB. FASCIAS ARE COMPLETE. NO VISIBLE ROT/DECAY OR DELIMITATION.	
3	ADEQUATE
DISTINCT DRIP EDGE. FASCIAS ARE COMPLETE. VISIBLE ROT/DECAY OR DELIMITATION AT LESS THAN 10% OF THE JOINTS AND INTERFACES	
4	POOR
NO DISTINCT DRIP EDGE. FASCIAS ARE COMPLETE. VISIBLE ROT/DECAY OR DELIMITATION AT LESS THAN 25% OF THE JOINTS AND INTERFACES SUBSTRATE STILL SOUND.	
5	NEEDS REPAIR
NO DISTINCT DRIP EDGE. FASCIAS ARE INCOMPLETE. VISIBLE ROT/DECAY OR DELIMITATION AT GREATER THAN 25% OF THE JOINTS AND INTERFACES. SUBSTRATES NO LONGER SOUND. VISIBLE ROT/DECAY/DELIMITATION AWAY FROM THE JOINTS/INTERFACES.	

GUTTERS/DOWNSPOUTS				
SCOPE: THE GUTTER/DOWNSPOUT ASSESSMENT IS FOCUSED ON THE PRESENCE AND CONDITION OF THE GUTTER/DOWNSPOUT SYSTEM. IN PARTICULAR THE SLOPE OF THE GUTTER, WHETHER THEY ARE INSTALLED, THEIR MATERIAL, THE PRESENCE OF GROUND DISPERSION, AND OVERALL CONDITION.				
IMPORTANCE: GUTTERS ARE ELEMENTS ATTACHED TO THE EDGE OF ROOFS TO CATCH AND DIRECT THE BULK WATER FROM THE ROOF AWAY FROM THE STRUCTURE. BY PROPERLY CONTROLLING THIS RUN-OFF DAMAGE DUE TO WIND BORNE BULK WATER AND BACK-SPLASHED WATER IS REDUCED. IN CONCERT WITH GUTTERS AND DOWNSPOUTS SPLASH BLOCKS, TILES, ECT FOR GROUND DISPERCEMENT ARE IMPORTANT. DEGRADATION IS GENERALLY THROUGH CLOGGING, SAGGING, PARTS SEPARATING, IMPROPER INSTALLATION, AND CORROSION.				

1	EXCELLENT
INSTALLED WITH POSITIVE DRAIN (1/4" PER 10') TO DOWNSPOUTS. ALL COMPONENTS INSTALLED. NO VISIBLE SAGS. DOWNSPOUTS ARE IN-PLACE DOWNSPOUTS DIRECT THE WATER INTO TILES OR OTHER SUBSURFACE DRAINAGE STRUCTURE. DOWNSPOUTS EXTEND A MINIMUM OF 10' AWAY FROM THE STRUCTURE. GUTTERS APPEAR CLEAN AND FREE FROM DEBRIS. GUTTERS AND DOWNSPOUTS ARE ATTACHED SOUNDLY.	

2	Good				
Installed with positive drain (1/4” per 10’) to downspouts. All components installed. No visible sags. downspouts are in-place Downspouts extend a minimum of 5’ away from the structure. Splash blocks are used to direct water away from the structure a minimum of 5’ Gutters appear clean and free from debris. Gutters and downspouts are attached soundly.					
3	Adequate				
Installed level to positive drain (0 to 1/4” per 10’) to downspouts. All components installed. No locations for standing water. downspouts are in-place Downspouts extend a minimum of 3’ away from the structure. Splash blocks are used to direct water away from the structure a minimum of 3’ Gutters and downspouts are attached soundly.					
4	Poor				
Installed level to positive drain (0 to 1/4” per 10’) to downspouts. More than 90 % of components installed. Sags where standing water may collect, but no signs of overflow are present. downspouts are in place Downspouts extend a minimum of 3’ away from the structure. Splash blocks are used to direct water away from the structure a minimum of 3’ Gutters are attached soundly downspouts may be loose.					
5	Needs repair				
Less than 90 % of components installed. Sags where standing water may collect, signs of overflow are present. downspouts are not in place Downspouts extend less than 3’ away from the structure. No Splash blocks. Gutters and/or downspouts may be loose.					
Flashing					
Scope: The flashing assessment is focused on the presence and condition of flashings. In particular the presence of flashing above doors and windows, in roof valleys, and transitions where required. The free draining of the flashing is paramount.					

Importance: Flashing is a required and integral component to all siding and roofing systems. When properly installed flashing allows any bulk water that gets behind the primary sealing systems be directed out away from the building envelope and drained. Flashing should be in place above any horizontal change in the wall surface, such as windows and doors, where roofs blend into walls, such as porches, roof valleys, and protrusions trough the roof. Most leakage is due to omissions of flashing, flashing sloped back to instead of away from the structure, and poorly treated flashing edges.					
1	Excellent				
sloped ≥ 5% away from the structure. In place over all doors and windows Distinct drip edges spaced a minimum of ¼ “ from horizontal elements					
2	Good				
sloped ≥ 2% away from the structure. In place over all doors and windows Distinct drip edges spaced a minimum of 1/8 “ from horizontal elements					
3	Adequate				
Level to positively sloped (0 to 2% away from the structure) In place over all doors and windows Capillary break between all horizontal elements					
4	Poor				
Level to positively sloped (0 to 2% away from the structure) No signs of standing water. In place over at least 90% of all doors and windows Capillary break between all horizontal elements					
5	Needs repair				
Level to negatively sloped (≥ 0% slope toward the structure.). missing on more than 10 % of doors and windows No capillary breaks between horizontal elements					
Roof					
Scope: The roof assessment is focused on the condition of the roof material, the valleys/ridges, and the roof edges. In particular, the focus is on condition of shingles, valleys, ridge caps, and roof edges from a ground visual survey.					
Importance: The roof is the primary system for controlling and removing bulk water from entering the structure. Its style helps to direct and shed the water. Failure generally initiates in valleys, protrusions through the roof (ie, vents, pipes, flues ect), and the edges of the roof (approximately last 2’ to 3’).					

1	EXCELLENT

SHINGLES

COMPLETE COVERAGE, NO MISSING SHINGLES

NO NOTICEABLE SHINGLE DEGRADATION

VALLEYS

ALL VALLEYS ARE FLASHED OR HAVE PROPER SHINGLE TREATMENT (CALIFORNIA WEAVE, UNDERLAY AND TRIM, ETC.)

MINIMUM 2" SEPARATION BETWEEN THE ROOFING AND THE SIDING – PROPERLY FLASHED.

ALL MASONRY IS PROPERLY STEP FLASHED.

RIDGE CAPS

RIDGE CAPS ARE IN PLACE

RIDGES ARE STRAIGHT, NO VISIBLE SAGS.

ROOF EDGES

ALL ROOF EDGES ARE STRAIGHT AND TRUE.

DRIP EDGE IS INSTALLED.

DRIP EDGE IS SPACED A MINIMUM OF ¼ " FROM THE ROOF DECKING

2	GOOD

SHINGLES

COMPLETE COVERAGE, NO MISSING SHINGLES

SHINGLE DEGRADATION IS LIMITED TO FADING AND MINOR AGGREGATE LOSS (NO BARE ASPHALT VISIBLE)

VALLEYS

ALL VALLEYS ARE FLASHED OR HAVE PROPER SHINGLE TREATMENT (CALIFORNIA WEAVE, UNDERLAY AND TRIM, ETC.)

MINIMUM 2" SEPARATION BETWEEN THE ROOFING AND THE SIDING – PROPERLY FLASHED.

ALL MASONRY IS PROPERLY STEP FLASHED.

RIDGE CAPS

RIDGE CAPS ARE COMPLETE AND IN PLACE.

RIDGES ARE STRAIGHT, NO VISIBLE SAGS.

ROOF EDGES

ALL ROOF EDGES ARE STRAIGHT AND TRUE.

DRIP EDGE IS INSTALLED.

DRIP EDGE IS SPACED A MINIMUM OF 1/8 " FROM THE ROOF DECKING

<table>
<tr><td>3</td><td>Adequate</td></tr>
<tr><td colspan="2">shingles
Complete coverage, no missing shingles.
Shingle degradation is limited to fading and minor aggregate loss (No bare asphalt visible).
Minor curl at edge of tabs noted.
valleys
All valleys are flashed or have proper shingle treatment (california weave, underlay and trim, etc.)
Minimum 2” separation between the roofing and the siding – properly flashed.
All masonry is properly step flashed.
ridge caps
Ridge caps are complete and in place.
Ridges are straight.
Visible sags are limited to area between roof joists..
roof edges
All roof edges are straight.
Drip edge present.</td></tr>
<tr><td>4</td><td>Poor</td></tr>
<tr><td colspan="2">shingles
Less than one % of shingles are missing.
Significant aggregate loss (bare asphalt substrate visible).
Shingle curling at edge of tabs noted.
valleys
Valley flashing is to narrow
Improper valley shingle treatment (california weave, underlay and trim, etc.).
Less than 2” separation between the roofing and the siding or no flashing at wall interface.
Masonry is surface flashed.
ridge caps
Ridge caps minimal missing shingles (< 1%) concentrated over gables/overhangs.
Ridges may be bowed (or sagging) less than 1” per 10’.
roof edges
All roof edges may be out of linearity no more than 1” per 10’.
No drip edge is installed.</td></tr>
</table>

5	NEEDS REPAIR				
CAULKING					
FASCIA/SOFFIT					
SIDING/SOFFIT					
SIDING/TRIM					
SIDING/WINDOWS					
SIDING/DOORS					
SIDING/OPENINGS					
PAINT					
FASCIA					
SOFFIT					
SIDING					
TRIM					
WINDOWS					
DOORS					

APPENDIX E
SUMMARY OF SITE SURVEY DATA

Orientation 1970s	North	North-West	North-East	South	South-West	South-East	West	East	Uncertain	Total
	19	9	4	23	1	3	19	15	12	105
Type 1970s	Detached	Attached	Blank	Uncertain	Total					
	65	23	1	16	105					
Style 1970s	Colonial	Ranch	Townhouse	Other	Uncertain	Total				
	16	38	23	12	16	105				
Stories 1970s	1	1.5	2	2.5	3	Uncertain	Total			
	19	6	62	0	0	18	105			
Garage 1970s	TRUE	FALSE	Uncertain	Total						
	40	60	5	105						
Garage Type 1970s	Attached	Detached	Blank	Uncertain	Total					
	36	7	61	1	105					
Foundation Type 1970s	Basement	Crawlspace	Slab-on-grade	Uncertain	Total					
	51	7	31	16	105					
Ponding 1970s	True	False	Uncertain	Total						
	15	68	22	105						
Surface Depressions 1970s	True	False	Uncertain	Total						
	17	68	20	105						
Ten Feet 1970s	True	False	Uncertain	Total						
	78	6	21	105						
Large Trees 1970s	True	False	Uncertain	Total						
	26	55	24	105						
Shrubs 1970s	True	False	Uncertain	Total						
	62	13	30	105						
Flower Beds 1970s	True	False	Uncertain	Total						
	52	12	41	105						
Wood Mulch 1970s	True	False	Uncertain	Total						
	50	31	24	105						
Patio Slab 1970s	True	False	Uncertain	Total						
	34	48	23	105						
Slab Type 1970s	Attached	Detached	No answer	Uncertain	Total					
	47	5	50	3	105					
Patio Permeability 1970s	Impervious	Pervious	No answer	Uncertain	Total					
	49	3	49	4	105					
Patio Slope 1970s	<2%	>+2%+	Blank	Uncertain	Total					
	12	29	52	12	105					
Patio Material 1970s	Brick	Block	Concrete	Other	No answer	Uncertain	Total			
	5	1	41	0	49	9	105			
Patio Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total				
	10	24	8	49	14	105				
Patio Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total				
	10	24	8	49	14	105				
Retaining Wall 1970s	True	False	Uncertain	Total						
	6	96	3	105						
Retaining Wall Height 1970s	16"	20"	2'	3'	6'	8'	10'	Blank	Uncertain	Total
	0	1	3	0	1	0	1	96	3	105

Retaining Wall Material 1970s	Brick	Block	Concrete	Other	Blank	Uncertain	Total						
	3	1	1	4	96	0	105						
Drive parking 1970s	True	False	Uncertain	Total									
	95	2	8	105									
Off-Street Parking 1970s	True	False	Uncertain	Total									
	76	5	24	105									
Drive Permeability 1970s	Impervious	Pervious	Blank	Uncertain	Total								
	91	5	2	7	105								
Drive Length 1970s	<10'	>=10'	Blank	Uncertain	Total								
	65	15	2	23	105								
Sidewalks 1970s	True	False	Uncertain	Total									
	94	4	7	105									
Sidewalk Permeability 1970s	Impervious	Pervious	Blank	Uncertain	Total								
	89	4	4	8	105								
Sidewalk Slope 1970s	<2%	>+2%	Blank	Uncertain	Total								
	16	58	5	26	105								
Wind Rating 1970S	A	B	C	Uncertain	Total								
	0	99	3	3	105								
Wind Shield 1970s	Excellent	Normal	Poor	Uncertain	Total								
	7	86	0	12	105								
Wind Shield 1970s	Excellent	Normal	Poor	Uncertain	Total								
	7	86	0	12	105								
Foundation Material 1970s	Block	Concrete	Brick	Uncertain	Total								
	43	39	2	21	105								
Visible Cracks 1970s	Cracks	No Cracks	Uncertain	Total									
	29	56	20	105									
Window Wells 1970s	True	False	Uncertain	Total									
	7	88	10	105									
Covered Wells 1970s	True	False	Uncertain	Total									
	1	103	2	106									
Walk Outs 1970s	True	False	Uncertain	Total									
	20	69	16	105									
Stairwell 1970s	True	False	Uncertain	Total									
	16	82	7	105									
Siding 1970s	Vinyl	Aluminum	Brick	Wood	Asbestos-Cement	Other	Uncertain	Total					
	28	20	19	12	6	1	19	105					
Above Grade Finish 1970s	<6"	>=6"	Uncertain	Total									
	24	35	46	105									
Roof Types 1970s	Gable	Hip	Gambrel	Other	Uncertain	Total							
	81	2	7	7	8	105							
Roof Slope 1970s	<3" in 12"	3" to 6" in 12"	>6" in 12"	Uncertain	Total								
	4	78	1	22	105								
Roofing Material 1970s	Asphalt	Wood	Uncertain	Total									
	99	1	5	105									
Number of Valleys 1970s	0	1	2	3	4	5	6	7	8	14	Blank	Uncertain	Total
	67	5	10	2	3	0	0	0	1	0	2	15	105
Valley Condition 1970s	Good	Adequate	Poor	Uncertain	Blank	Total							
	11	14	2	10	68	105							

Number of Roof Openings 1970s	0	1	2	3	4	5	6	7	8	9	Blank	Uncertain	Total
	3	13	25	10	13	6	3	1	1	1	7	22	105
Roof Opening Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	19	46	1	11	28	105							
Number of Skylights 1970s	0	1	2	3	4	Blank	Uncertain	Total					
	85	3	3	3	0	10	1	105					
Gable Vents 1970s	True	False	Uncertain	Total									
	64	31	10	105									
Ridge Vents 1970s	True	False	Uncertain	Total									
	31	60	14	105									
Soffit Vents 1970s	True	False	Uncertain	Total									
	46	30	29	105									
Plumbing Vents 1970s	True	False	Uncertain	Total									
	42	29	34	105									
Vent Fans 1970s	True	False	Uncertain	Total									
	7	87	11	105									
Turbine Vents 1970s	True	False	Uncertain	Total									
	2	100	3	105									
Passive Vents 1970s	True	False	Uncertain	Total									
	2	84	19	105									
Roof Drip Edges 1970s	True	False	Uncertain	Totals									
	14	76	15	105									
Drip Edge Spacing 1970s	<2"	>=2"	Blank	uncert	Total								
	8	17	77	3	105								
Soffits 1970s	Wood	Metal	Vinyl	Other	Blank	Uncertain	Total						
	38	43	12	0	2	10	105						
Soffit Orientation 1970s	Horizontal	Angled	Uncertain	Total									
	94	4	7	105									
Soffit Slope 1970s	Slight	20 degrees	25 degrees (Rev)	6" in 12"	3"-6" in 12"	Uncertain	Blank	Total					
	1	1	0	2	2	3	96	105					
Overhang 1970s	0"	0"-6"	6"-12"	12"-18"	18"-24"	>24"	Uncertain	Total					
	1	6	14	13	11	8	52	105					
Overhang Same 1970s	True	False	un	Total									
	38	26	41	105									
Gutters & Downspouts 1970s	True	False	Uncertain	Total									
	91	3	11	105									
Gutter & Downspout Maint. 1970s	True	False	Uncertain	Total									
	7	69	29	105									
Gutter & Downspout Mat. 1970s	Aluminum	Steel	Blank	Uncertain	Total								
	71	11	1	22	105								
Splash Run-Off 1970s	True	False	Uncertain	Total									
	61	13	31	105									
Water Flow 1970s	True	False	Uncertain	Total									
	36	22	47	105									
Window Frame 1970s	Vinyl	Metal	Wood	Uncertain	Total								
	25	30	36	14	105								
Window Glazing 1970s	Single	Double	Uncertain	Total									
	32	60	13	105									

Window Condition 1970s	Good	Adequate	Poor	Uncertain	Total								
	39	35	6	25	105								
Storm Windows 1970s	Metal	Vinyl	Not Present	Uncertain	Total								
	30	1	62	12	105								
SW Cond 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	11	16	3	61	14	105							
Door Material 1970s	Wood	Metal	Vinyl	Other	Uncertain	Total							
	67	22	0	0	16	105							
Door Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	34	25	4	1	41	105							
Storm Door 1970s	Metal	Wood	Vinyl	Blank	Not Present	Uncertain	Total						
	55	2	6	0	23	20	106						
Storm Door Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	31	23	1	22	28	105							
Deck 1970s	True	False	Uncertain	Total									
	41	55	9	105									
Deck Material 1970s	Treated Wood	Redwood	Cedar	Other	Can't Tell	Blank	Uncertain	Total					
	42	2	0	1	2	55	3	105					
Deck Construction 1970s	Surface Nailed	Surface Screwed	Blank	Uncertain	Total								
	44	1	59	1	105								
Deck Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	10	18	4	64	9	105							
Fencing 1970s	True	False	Uncertain	Total									
	63	31	11	105									
Fencing Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	15	28	7	31	24	105							
Porch/Stoop 1970s	Concrete	Covered	Wood Frame	Other	Blank	Uncertain	Total						
	85	3	3	3	5	6	105						
Porch/Stoop Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	18	47	2	11	27	105							
Ext. Stair Construction 1970s	Wood Frame	Concrete	Other	Blank	Uncertain	Total							
	15	35	3	45	7	105							
Ext. Stair Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	12	30	4	47	12	105							
Chimney Storm Cap 1970s	True	False	Uncertain	Total									
	43	49	13	105									
Chimney Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	26	25	2	38	14	105							
Fascia Construction 1970s	Metal	Wood	Vinyl	Blank	Uncertain	Total							
	35	48	5	1	16	105							
Fascia Condition 1970s	Good	Adequate	Poor	Blank	Uncertain	Total							
	27	35	7	9	27	105							
Rot 1970s	Noted	Not Noted	Uncertain	Total									
	28	61	16	105									
Insect Damage 1970s	True	False	Uncertain	Total									
	3	101	2	106									

Orientation 1990s	North	North-West	North-East	South	South-West	South-East	West	East	Uncertain	Total			
	20	5	8	16	9	8	10	14	13	103			
Type 1990s	Detached	Attached	Blank	Uncertain	Total								
	50	39	3	11	103								
Style 1990s	Colonial	Ranch	Townhouse	Other	Uncertain	Total							
	38	11	37	5	12	103							
Stories 1990s	1	1.5	2	2.5	3	Uncertain	Total						
	6	0	72	4	7	14	103						
Garage 1990s	TRUE	FALSE	Uncertain	Total									
	40	55	8	103									
Garage Type 1990s	Attached	Detached	Blank	Uncertain	Total								
	44	2	56	1	103								
Foundation Type 1990s	Basement	Crawlspace	Slab-on-grade	Uncertain	Total								
	69	9	11	14	103								
Ponding 1990s	True	False	Uncertain	Total									
	11	74	18	103									
Surface Depressions 1990s	True	False	Uncertain	Total									
	10	79	14	103									
Ten Feet 1990s	True	False	Uncertain	Total									
	77	4	22	103									
Large Trees 1990s	True	False	Uncertain	Total									
	7	83	13	103									
Shrubs 1990s	True	False	Uncertain	Total									
	35	32	36	103									
Flower Beds 1990s	True	False	Uncertain	Total									
	63	7	33	103									
Wood Mulch 1990s	True	False	Uncertain	Total									
	64	12	27	103									
Patio Slab 1990s	True	False	Uncertain	Total									
	20	62	21	103									
Slab Type 1990s	Attached	Detached	No answer	Uncertain	Total								
	28	6	62	7	103								
Patio Permeability 1990s	Impervious	Pervious	No answer	Uncertain	Total								
	34	3	63	3	103								
Patio Slope 1990s	<2%	>+2%+	Blank	Uncertain	Total								
	4	25	63	11	103								
Patio Material 1990s	Brick	Block	Concrete	Other	No answer	Uncertain	Total						
	5	1	26	3	64	4	103						
Patio Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	25	9	1	64	4	103							
Patio Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	25	9	1	64	4	103							
Retaining Wall 1990s	True	False	Uncertain	TOTAL									
	6	91	6	103									
Retaining Wall Height 1990s	16"	20"	2'	3'	6'	8'	10'	Blank	Uncertain	Total			
	1	0	2	3	0	1	0	93	3	103			
Retaining Wall Material 1990s	Brcik	Block	Concrete	Other	Blank	Uncertain	Total						
	0	4	0	4	93	2	103						
Drive parking 1990s	True	False	Uncertain	Total									
	98	0	5	103									

Off-Street Parking 1990s	True	False	Uncertain	Total									
	86	1	16	103									
Drive Permeability 1990s	Impervious	Pervious	Blank	Uncertain	Total								
	90	5	2	6	103								
Drive Length 1990s	<10'	>=10'	Blank	Uncertain	Total								
	57	32	1	13	103								
Sidewalks 1990s	True	False	Uncertain	Total									
	94	5	4	103									
Sidewalk Permeability 1990s	Impervious	Pervious	Blank	Uncertain	Total								
	91	3	5	4	103								
Sidewalk Slope 1990s	<2%	>+2%	Blank	Uncertain	Total								
	11	65	6	21	103								
Wind Rating 1990S	A	B	C	Uncertain	Total								
	1	87	5	10	103								
Wind Shield 1990s	Excellent	Normal	Poor	Uncertain	Total								
	2	83	2	16	103								
Wind Shield 1990s	Excellent	Normal	Poor	Uncertain	Total								
	2	83	2	16	103								
Foundation Material 1990s	Block	Concrete	Brick	Uncertain	Total								
	22	63	1	17	103								
Visible Cracks 1990s	Cracks	No Cracks	Uncertain	Total									
	18	75	10	103									
Window Wells 1990s	True	False	Uncertain	Total									
	7	90	6	103									
Covered Wells 1990s	True	False	Uncertain	Total									
	2	99	2	103									
Walk Outs 1990s	True	False	Uncertain	Total									
	15	57	31	103									
Stairwell 1990s	True	False	Uncertain	Total									
	18	77	8	103									
Siding 1990s	Vinyl	Aluminum	Brick	Wood	Asbestos-Cement	Other	Uncertain	TOTAL					
	55	15	9	8	0	0	16	103					
Above Grade Finish 1990s	<6"	>=6"	Uncertain	Total									
	12	62	29	103									
Roof Types 1990s	Gable	Hip	Gambrel	Other	Uncertain	Total							
	100	0	1	0	2	103							
Roof Slope 1990s	<3" in 12"	3" to 6" in 12"	>6" in 12"	Uncertain	Total								
	1	72	9	21	103								
Roofing Material 1990s	Asphalt	Wood	Uncertain	Total									
	98	0	5	103									
Number of Valleys 1990s	0	1	2	3	4	5	6	7	8	14			
	37	3	20	1	8	3	4	2	0	1			
Valley Condition 1990s	Good	Adequate	Poor	Uncertain	Blank	Total							
	45	6	0	11	41	103							
Number of Roof Openings 1990s	0	1	2	3	4	5	6	7	8	9	Blank	Uncertain	Total
	3	25	16	8	11	6	5	1	0	0	8	20	103
Roof Opening Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	57	10	0	13	23	103							
Number of Skylights 1990s	0	1	2	3	4	Blank	Uncertain	Total					
	71	11	6	2	3	8	2	103					

Gable Vents 1990s	True	False	Uncertain	Total				
	28	63	12	103				
Ridge Vents 1990s	True	False	Uncertain	Total				
	64	22	17	103				
Soffit Vents 1990s	True	False	Uncertain	Total				
	58	12	33	103				
Plumbing Vents 1990s	True	False	Uncertain	Total				
	37	39	22	98				
Vent Fans 1990s	True	False	Uncertain	Total				
	1	100	2	103				
Turbine Vents 1990s	True	False	Uncertain	Total				
	0	100	3	103				
Passive Vents 1990s	True	False	Uncertain	Total				
	11	83	9	103				
Roof Drip Edges 1990s	True	False	Uncertain	Totals				
	13	77	13	103				
Drip Edge Spacing 1990s	<2"	>=2"	Blank	Uncertain	Total			
	16	5	79	3	103			
Soffits 1990s	Wood	Metal	Vinyl	Other	Blank	Uncertain	Total	
	20	44	18	1	0	20	103	
Soffit Orientation 1990s	Horizontal	Angled	Uncertain	Total				
	101	0	2	103				
Soffit Slope 1990s	Slight	20 degrees	25 degrees (Rev)	6" in 12"	3"-6" in 12"	Uncertain	Blank	Total
	0	0	1	2	0	0	100	103
Overhang 1990s	0"	0"-6"	6"-12"	12"-18"	18"-24"	>24"	Uncertain	Total
	1	8	36	9	1	0	48	103
Overhang Same 1990s	True	False	un	Total				
	39	15	49	103				
Gutters & Downspouts 1990s	True	False	Uncertain	Total				
	93	1	9	103				
Gutter & Downspout Maint. 1990s	True	False	Uncertain	Total				
	3	75	25	103				
Gutter & Downspout Mat. 1990s	Aluminum	Steel	Blank	Uncertain	Total			
	76	17	0	10	103			
Splash Run-Off 1990s	True	False	Uncertain	Total				
	79	2	22	103				
Water Flow 1990s	True	False	Uncertain	Total				
	48	12	43	103				
Window Frame 1990s	Vinyl	Metal	Wood	Uncertain	Total			
	58	19	12	14	103			
Window Glazing 1990s	Single	Double	Uncertain	Total				
	2	99	2	103				
Window Condition 1990s	Good	Adequate	Poor	Uncertain	Total			
	71	9	0	23	103			
Storm Windows 1990s	Metal	Vinyl	Not Present	Uncertain	Total			
	2	2	85	14	103			
SW Cond 1990s	Good	Adequate	Poor	Blank	Uncertain	Total		
	15	4	0	81	3	103		
Door Material 1990s	Wood	Metal	Vinyl	Other	Uncertain	Total		
	24	61	5	2	11	103		
Door Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total		
	73	9	0	0	21	103		

Storm Door 1990s	Metal	Wood	Vinyl	Blank	Not Present	Uncertain	Total						
	28	0	7	1	52	15	103						
Storm Door Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	40	5	1	48	9	103							
Deck 1990s	True	False	Uncertain	Total									
	65	31	7	103									
Deck Material 1990s	Treated Wood	Redwood	Cedar	Other	Can't Tell	Blank	Uncertain	Total					
	55	1	1	0	0	31	15	103					
Deck Construction 1990s	Surface Nailed	Surface Screwed	Blank	Uncertain	Total								
	54	5	40	4	103								
Deck Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	29	12	2	48	12	103							
Fencing 1990s	True	False	Uncertain	Total	0	0							
	40	51	12	103	0								
Fencing Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	22	15	2	52	12	103							
Porch/Stoop 1990s	Concrete	Covered	Wood Frame	Other	Blank	Uncertain	Total						
	78	0	12	2	2	9	103						
Porch/Stoop Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	15	54	3	8	23	103							
Ext. Stair Construction 1990s	Wood Frame	Concrete	Other	Blank	Uncertain	Total							
	15	61	4	15	8	103							
Ext. Stair Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	52	13	4	15	19	103							
Chimney Storm Cap 1990s	True	False	Uncertain	Total									
	49	37	17	103									
Chimney Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	52	5	0	36	10	103							
Fascia Construction 1990s	Metal	Wood	Vinyl	Blank	Uncertain	Total							
	38	34	9	2	20	103							
Fascia Condition 1990s	Good	Adequate	Poor	Blank	Uncertain	Total							
	43	11	5	15	29	103							
Rot 1990s	Noted	Not Noted	Uncertain	Total									
	20	69	14	103									
Insect Damage 1990s	True	False	Uncertain	Total									
	1	101	1	103									

BUILDING COMPONENT CONDITION VISUAL SURVEY RESULTS											
AVERAGE SCORES											
	1970s	1990s	Total		1970s	1990s	Total		1970s	1990s	Total
GRADING _ FRONT	2.71	2.39	2.55	TRIM _ FRONT	2.99	2.83	2.91	SIDING/WIND _ FRONT	3.36	3.08	3.22
RIGHT	2.11	2.10	2.11	RIGHT	2.91	2.49	2.71	RIGHT	3.36	2.96	3.19
REAR	2.28	2.27	2.27	REAR	2.99	2.63	2.79	REAR	3.33	3.02	3.18
LEFT	2.05	2.11	2.08	LEFT	2.83	2.57	2.70	LEFT	3.18	3.50	3.33
AVERAGE	2.29	2.22	2.25	AVERAGE	2.93	2.63	2.78	AVERAGE	3.31	3.14	3.23
LANDSCAPING _ FRONT	2.92	2.71	2.81	OPENINGS _ FRONT	2.86	2.55	2.69	SIDING/DOOR _ FRONT	3.28	3.13	3.21
RIGHT	2.73	2.52	2.63	RIGHT	2.85	2.67	2.76	RIGHT	3.25	3.04	3.17
REAR	2.79	2.34	2.54	REAR	3.07	2.71	2.87	REAR	3.24	2.93	3.08
LEFT	2.73	2.53	2.63	LEFT	2.87	2.57	2.70	LEFT	3.16	3.11	3.13
AVERAGE	2.79	2.52	2.66	AVERAGE	2.91	2.62	2.76	AVERAGE	3.23	3.05	3.15
SIDEWALK _ FRONT	3.03	2.07	2.56	SOFFITS _ FRONT	2.66	2.28	2.47	SIDING/OPEN _ FRONT	3.30	2.99	3.13
RIGHT	2.62	2.39	2.55	RIGHT	2.67	2.28	2.48	LEFT	3.27	2.86	3.07
REAR	2.65	2.29	2.52	REAR	2.75	2.31	2.51	REAR	3.48	3.22	3.34
LEFT	2.91	2.35	2.70	LEFT	2.75	2.24	2.48	RIGHT	3.81	3.46	3.65
AVERAGE	2.80	2.27	2.58	AVERAGE	2.71	2.28	2.48	AVERAGE	3.47	3.13	3.30
FOUNDATION _ FRONT	2.52	2.08	2.29	FASCIA _ FRONT	2.93	2.63	2.78	FASCIA _ PAINT_FRONT	3.08	2.71	2.91
RIGHT	2.67	2.22	2.46	RIGHT	2.92	2.48	2.70	LEFT	3.07	2.55	2.83
REAR	2.59	2.14	2.35	REAR	2.94	2.49	2.70	REAR	3.09	2.53	2.82
LEFT	2.67	2.13	2.39	LEFT	2.89	2.40	2.64	RIGHT	3.10	2.52	2.86
AVERAGE	2.61	2.14	2.37	AVERAGE	2.92	2.50	2.70	AVERAGE	3.09	2.57	2.85
PORCH _ FRONT	2.80	2.25	2.52	GUTTERS _ FRONT	2.98	2.50	2.74	SOFFIT _ PAINT_FRONT	2.91	2.34	2.67
RIGHT	2.86	3.00	2.91	RIGHT	2.73	2.32	2.49	LEFT	2.95	2.30	2.69
REAR	2.93	2.60	2.79	REAR	3.02	2.41	2.69	REAR	2.97	2.25	2.64
LEFT	2.86	2.25	2.64	LEFT	2.65	2.37	2.48	RIGHT	2.91	2.29	2.68
AVERAGE	2.86	2.52	2.71	AVERAGE	2.84	2.40	2.60	AVERAGE	2.94	2.30	2.67
DECK _ FRONT	2.71	3.19	2.95	FLASHING _ FRONT	3.24	3.26	3.25	SIDING _ PAINT_FRONT	2.92	2.39	2.72
RIGHT	3.33	3.00	3.22	RIGHT	2.94	3.18	3.06	LEFT	2.91	2.32	2.67
REAR	3.03	2.62	2.78	REAR	3.14	3.19	3.17	REAR	3.06	2.38	2.78
LEFT	2.89	2.50	2.67	LEFT	2.94	3.10	3.02	RIGHT	2.91	2.33	2.71
AVERAGE	2.99	2.83	2.90	AVERAGE	3.07	3.18	3.13	AVERAGE	2.95	2.35	2.72
SIDING _ FRONT	2.63	2.18	2.40	ROOF _ FRONT	2.66	2.22	2.44	TRIM _ PAINT_FRONT	3.20	2.95	3.08
RIGHT	2.69	2.42	2.56	RIGHT	2.67	2.18	2.40	LEFT	3.09	2.58	2.85
REAR	2.71	2.30	2.49	REAR	2.78	2.21	2.48	REAR	3.14	2.84	2.98
LEFT	2.78	2.42	2.59	LEFT	2.75	2.16	2.41	RIGHT	3.12	2.68	2.93
AVERAGE	2.70	2.33	2.51	AVERAGE	2.72	2.19	2.43	AVERAGE	3.14	2.76	2.96
DOOR _ FRONT	2.57	2.13	2.36	FASCIA/SOFFIT _ FRONT	3.32	2.96	3.16	WIND _ PAINT_FRONT	2.99	2.40	2.77
RIGHT	2.93	2.14	2.57	RIGHT	3.35	2.91	3.19	LEFT	2.98	2.32	2.70
REAR	2.83	2.28	2.52	REAR	3.32	2.92	3.14	REAR	3.06	2.42	2.80
LEFT	2.64	2.30	2.45	LEFT	3.28	2.80	3.10	RIGHT	2.98	2.43	2.77
AVERAGE	2.74	2.21	2.47	AVERAGE	3.32	2.90	3.15	AVERAGE	3.00	2.39	2.76
WINDOWS _ FRONT	2.74	2.21	2.48	SIDING/SOFFIT _ FRONT	3.16	2.83	3.02	DOOR _ PAINT_FRONT	2.76	2.35	2.56
RIGHT	2.80	2.24	2.53	RIGHT	3.18	2.96	3.10	LEFT	2.89	2.46	2.71
REAR	2.81	2.15	2.46	REAR	3.31	2.90	3.13	REAR	2.92	2.43	2.69
LEFT	2.75	2.19	2.47	LEFT	3.24	2.80	3.08	RIGHT	3.00	2.18	2.69
AVERAGE	2.77	2.20	2.48	AVERAGE	3.22	2.87	3.08	AVERAGE	2.89	2.36	2.66
				SIDING/TRIM _ FRONT	3.49	3.23	3.38				
				RIGHT	3.47	3.03	3.29				
				REAR	3.51	3.03	3.29				
				LEFT	3.49	2.88	3.25				
				AVERAGE	3.49	3.05	3.30				

BUILDING COMPONENT CONDITION VISUAL SURVEY RESULTS

COEFFICIENTS OF VARIATION

	1970s	1990s	Total		1970s	1990s	Total		1970s	1990s	Total
GRADING _ FRONT	0.27	0.35	0.31	TRIM _ FRONT	0.24	0.32	0.28	SIDING/WIND _ FRONT	0.29	0.29	0.29
RIGHT	0.60	0.53	0.57	RIGHT	0.24	0.30	0.28	RIGHT	0.24	0.32	0.28
REAR	0.63	0.51	0.57	REAR	0.23	0.28	0.27	REAR	0.24	0.27	0.26
LEFT	0.63	0.54	0.59	LEFT	0.20	0.27	0.24	LEFT	0.22	1.28	0.91
AVERAGE	0.53	0.48	0.51	AVERAGE	0.23	0.29	0.27	AVERAGE	0.25	0.54	0.44
LANDSCAPING _ FRONT	0.23	0.23	0.23	OPENINGS _ FRONT	0.27	0.26	0.27	SIDING/DOOR _ FRONT	0.30	0.31	0.30
RIGHT	0.23	0.25	0.24	RIGHT	0.25	0.34	0.29	RIGHT	0.22	0.43	0.31
REAR	0.27	0.25	0.28	REAR	0.25	0.27	0.26	REAR	0.22	0.31	0.27
LEFT	0.26	0.24	0.25	LEFT	0.22	0.28	0.26	LEFT	0.22	0.41	0.32
AVERAGE	0.25	0.24	0.25	AVERAGE	0.25	0.29	0.27	AVERAGE	0.24	0.36	0.30
SIDEWALK _ FRONT	0.72	0.30	0.66	SOFFITS _ FRONT	0.26	0.25	0.27	SIDING/OPEN _ FRONT	0.24	0.31	0.28
RIGHT	0.26	0.29	0.27	RIGHT	0.29	0.25	0.29	LEFT	1.18	1.48	1.31
REAR	0.26	0.25	0.26	REAR	0.27	0.25	0.28	REAR	0.22	0.59	0.45
LEFT	0.23	0.45	0.32	LEFT	0.25	0.19	0.25	RIGHT	0.21	0.27	0.24
AVERAGE	0.37	0.32	0.38	AVERAGE	0.27	0.24	0.27	AVERAGE	0.46	0.66	0.57
FOUNDATION _ FRONT	0.29	0.26	0.29	FASCIA _ FRONT	0.25	0.61	0.45	FASCIA _ PAINT_FRONT	0.30	0.36	0.33
RIGHT	0.25	0.29	0.28	RIGHT	0.27	0.31	0.30	LEFT	0.30	0.33	0.33
REAR	0.29	0.34	0.33	REAR	0.23	0.27	0.27	REAR	0.26	0.33	0.30
LEFT	0.21	0.33	0.29	LEFT	0.23	0.28	0.27	RIGHT	0.23	0.38	0.30
AVERAGE	0.26	0.30	0.30	AVERAGE	0.25	0.37	0.32	AVERAGE	0.27	0.35	0.32
PORCH _ FRONT	0.26	0.27	0.29	GUTTERS _ FRONT	0.29	0.27	0.30	SOFFIT _ PAINT_FRONT	0.30	0.31	0.32
RIGHT	0.13	0.27	0.19	RIGHT	0.28	0.22	0.26	LEFT	0.25	0.33	0.30
REAR	0.23	0.36	0.29	REAR	0.31	0.28	0.32	REAR	0.27	0.35	0.33
LEFT	0.13	0.43	0.26	LEFT	0.31	0.24	0.28	RIGHT	0.19	0.33	0.27
AVERAGE	0.19	0.33	0.26	AVERAGE	0.30	0.25	0.29	AVERAGE	0.25	0.33	0.31
DECK _ FRONT	0.35	0.32	0.33	FLASHING _ FRONT	0.61	0.34	0.49	SIDING _ PAINT_FRONT	0.25	0.33	0.29
RIGHT	0.33	0.35	0.33	RIGHT	0.32	0.34	0.33	LEFT	0.19	0.33	0.26
REAR	0.20	0.27	0.25	REAR	0.29	0.31	0.30	REAR	0.21	0.37	0.29
LEFT	0.16	0.30	0.25	LEFT	0.28	0.32	0.30	RIGHT	0.19	0.33	0.27
AVERAGE	0.26	0.31	0.29	AVERAGE	0.38	0.33	0.36	AVERAGE	0.21	0.34	0.28
SIDING _ FRONT	0.30	0.31	0.32	ROOF _ FRONT	0.29	0.26	0.29	TRIM _ PAINT_FRONT	0.25	0.35	0.30
RIGHT	0.26	0.29	0.28	RIGHT	0.29	0.24	0.29	LEFT	0.23	0.34	0.29
REAR	0.24	0.28	0.27	REAR	0.27	0.24	0.28	REAR	0.19	0.31	0.26
LEFT	0.28	0.26	0.28	LEFT	0.27	0.25	0.29	RIGHT	0.20	0.33	0.27
AVERAGE	0.27	0.29	0.29	AVERAGE	0.28	0.25	0.29	AVERAGE	0.22	0.33	0.28
DOOR _ FRONT	0.29	0.31	0.31	FASCIA/SOFFIT _ FRONT	0.27	0.26	0.27	WIND _ PAINT_FRONT	0.28	0.27	0.30
RIGHT	0.36	0.21	0.35	RIGHT	0.24	0.25	0.25	LEFT	0.24	0.36	0.30
REAR	0.26	0.25	0.28	REAR	0.21	0.26	0.24	REAR	0.24	0.31	0.29
LEFT	0.32	0.29	0.31	LEFT	0.24	0.22	0.25	RIGHT	0.21	0.28	0.26
AVERAGE	0.31	0.27	0.31	AVERAGE	0.24	0.25	0.25	AVERAGE	0.24	0.31	0.29
WINDOWS _ FRONT	0.29	0.24	0.29	SIDING/SOFFIT _ FRONT	0.25	0.31	0.27	DOOR _ PAINT_FRONT	0.28	0.40	0.35
RIGHT	0.28	0.26	0.30	RIGHT	0.22	0.29	0.25	LEFT	0.25	0.27	0.30
REAR	0.25	0.20	0.27	REAR	0.19	0.24	0.22	REAR	0.21	0.29	0.26
LEFT	0.26	0.19	0.26	LEFT	0.23	0.24	0.24	RIGHT	0.16	0.39	0.26
AVERAGE	0.27	0.22	0.28	AVERAGE	0.22	0.27	0.25	AVERAGE	0.23	0.34	0.29
				SIDING/TRIM _ FRONT	0.28	0.29	0.29				
				RIGHT	0.25	0.29	0.27				
				REAR	0.20	0.26	0.24				
				LEFT	0.25	0.23	0.26				
				AVERAGE	0.25	0.27	0.26				

APPENDIX F
STATISTICAL INFORMATION

The statistical analysis entailed the use of Contingency Tables to organize the data and Chi-square tests to assess relationships between housing characteristics and component conditions. Typically the Null Hypothesis (H_o) is that there is no difference between two set of houses, classified according to the presence or absence of some characteristic, in terms of the proportion of the houses with some selected condition. In other words, membership in either housing-characteristic group is independent of the subject condition.

To illustrate, the frequency of visible foundation cracks was examined in relation to the type of foundation material. The Null Hypothesis was that houses with block foundation do not differ from those with concrete foundation in terms of the proportion of foundations with visible cracks. The alternative hypothesis (H_1) is that the occurrence of foundation cracks is not independent of foundation material.

An example of a contingency table is presented below. The resulting chi-square, corrected for continuity, is 46.4. Based on a significance level of .05 and 1 degree of freedom, we find that we must reject the H_0 in favor of H_1. The material seems to play a role in the occurrence of visible foundations cracks. In fact if we look at the tabulation, we see that 65 percent of block foundations and only 10 percent of concrete foundation were found to have visible cracks.

TABLE F1
2X2 CONTINGENCY TABLE
VISIBLE CRACKS IN FOUNDATIONS VS. FOUNDATION MATERIAL

	BLOCK	CONCRETE	TOTAL HOUSES
Has visible cracks	35	9	44
Has no visible cracks	19	83	102
Total Houses	54	92	146

However an examination of the data indicated that 2/3 of the houses with block foundations were built in the 1970s. A further examination of the data and Chi-square testing indicates that that the 1970's houses have a higher proportion of cracks. These findings raised a question - Is time or the type of foundation material the real factor? Since most foundations of houses built in the 1970s have block foundations, does it only appear that block foundations tend to have more cracks? A separate analysis of the foundation material and visible foundation cracks was performed for each age group. The results are tabulated in the following two tables.

TABLE F2
2X2 CONTINGENCY TABLE
VISIBLE CRACKS IN FOUNDATIONS VS. FOUNDATION MATERIAL
1970s

	BLOCK	CONCRETE	TOTAL HOUSES
Has visible cracks	21	6	27
Has no visible cracks	14	27	41
Total Houses	35	33	68

TABLE F3
2X2 CONTINGENCY TABLE
VISIBLE CRACKS IN FOUNDATIONS VS. FOUNDATION MATERIAL
1990s

	BLOCK	CONCRETE	TOTAL HOUSES
Has visible cracks	14	3	17
Has no visible cracks	5	56	61
Total Houses	19	59	78

Chi-squares of 10.7 and 35.8 for the 1970s and 1990s data, respectively, meant that the null hypothesis was rejected in each case. Thus the presence of cracks is not independent of the foundation material in either period. These finding would seem to indicate that, while time is a factor in the occurrence of foundation cracks, block foundations have a higher proportion of cracks.

A similar analysis relating the presence of surface depressions to the occurrence of foundation cracks produced similar results. A chi-square of 29.0 meant that the null hypothesis must be rejected in favor of the H_1 that surface depressions play a role in the occurrence of foundation cracks.

TABLE F4
2X2 CONTINGENCY TABLE
VISIBLE CRACKS IN FOUNDATIONS VS. SURFACE DEPRESSIONS

	HAS DEPS.	NO DEPS.	TOTAL HOUSES
Has visible cracks	19	24	43
Has no visible cracks	7	104	111
Total Houses	26	128	154

Statistical analysis attempted to examine the relationship of such factors as the age of the house or the size of the overhang to the occurrence of rot. Analysis of the data did not yield any meaningful insights into conditions associated with the occurrence of rot.

Remodeling of the houses may have played a role by either eliminating or concealing rot. Casual observations by the inspectors indicated that many of the houses built during the 1970s might have been re-sided. At times trim, including soffit and fascia, had been covered with aluminum or vinyl sheathing or replaced. A similar situation was noted with the windows.

Analysis of the numerical scoring data from the building component condition visual survey failed to yield meaningful results. Inspectors were required to provide a numerical rating for 28 separate component categories for each of the four sides of every house. Each house was inspected and graded by up to three inspectors. The average of the scores across inspectors was computed for each component category in every house.

In order to use the contingency table/chi-square analysis, each component score was classified as either "good" or "bad" based on the magnitude of the score. This binary classification allowed the use of 2x2 contingency tables. Unfortunately, the subsequent analysis failed to isolate any differences between orientation of the house and trouble with siding, paint, or front-door caulk.

The convention is this section is that a score of "2" means "good" and, a "3" means "adequate". The averaged scores tended not to exhibit much variation - they tend to be in the good end of the range. The average score for each of the component for the 1970s sample, the 1990s sample and the total sample fell in either the 2 or 3 range. The apparent reluctance to give "excellent" or "poor" grades made it difficult to separate out conditions that can be associated with housing deterioration.

Due to these problems with the scoring data, no further analysis of the data was undertaken.

APPENDIX G
ALTERNATIVE CONDITION ASSESSMENT FORM

ADDRESS:

GRADING

Slope	Depressions
5%+, 10'	None
5%+,4'	No/10'
0 to 2%	1 ft2 per 10'
level	1 to 5 ft2 per 10'
negative	5 ft2 per 10'
NA	NA

LANDSCAPE

Vents	Large Trees	Moist Plants	6" foliage from siding
1' away	10' away	10'	6" min., all
6" away		6'	6" min.,90%
covered	Mulch	4'	6" min. 75%
NA	6"away	2'	6" min.,25%
		very, w/2'	NA
		NA	

FOUNDATION

Cracks	Re-entrant cracks	Tie holes	Rot	Mortar
none	2x wall thickness	all patched	at entry	good
less than 1/32	4x	50%	wood	cracks
less than1/4	5x	0%		20% gone
less than 1/2	Bulges	Plumb	Effloures	CMU
no contact w/grade	None	perfect	no	spalling
ground level	< 1/4"	<1/2 in 4"	<1"above grade	<10%
NA	> 1/4"	>1/2 in4"	>5" above grade	>10%
	NA	NA	<2"above found.	loose
			NA	>5%
				NA

SIDING

Plumb	Rot	Bulges	General	Missing siding
prefect	none	none	> 6" above grade	< 1%
out1/8"in 4'	<5% butts	less 1/2"	< 6" above grade	> 1%
out1/4"in 4'	<5% interfaces	less1"	less than 6"	NA
out1/2"in 4'	<15% end+interfac	less 11/2"	weeps clogged	
NA	>15% end+interfac	water entry	rust stained	
	substrate not sound	NA	nail hole decay	
	NA		2" sep.from roof	

DOORS			
Rot	Threshold		Seals
none	slope, ext., 2%	centered	sealed
frame bottom only	>2%	good substr.	90%
bottom, outside	level	NA	no sides
bottom, splices, joints	negative		no seals
door, 1" above thres.	NA		NA
door >1" above thres.			
NA			

WINDOWS				
Frame	Sill	Storms	Glazing	Rot
intact	5% SLOPED	attach, seals	complete	none
finish cracks	2%	poor attach	cracked <1%	>5%
<1/16" joint separat.	<2%	NA	5%crack glass	<5%
<1/8	>2%		10% putty gone	<10%
>1/8	NA		20% putty gone	bad substrate
peeling paint			5% glass gone	NA
weeps free			NA	
rot				
NA				

SOFFITT			
Rot	Slope	**FASCIA**	Rot
joints - >10%	level to 2%	Drip edge	no
<25%	level to 2%	complete	<10%
>25%	negative	plumb 5%	<25%
substrate bad	NA	plumb 20%	25%
non joint rot		NA	NA
NA			

GUTTERS			
Pitch	Extentions	Components	General
1/4" in 10'	10' away	all	sags
0 to 1/4"	5'	<90%	d-spouts installed
level	3'	>90%	overflows
NA	<3'	loose	NA
	NA	NA	

ROOF			
Shingles	Valleys	Ridge	Edges
complete	flashing too narrow	sags, joists	out of line,1"per 10'
fading,minor agg. loss	improper shingles	miss shingles	NA
curling at tabs	masonry stepflash	bow 1" per 10'	
bare asphalt	NA	NA	
1% shingles missing			
NA			

PORCHES

Rot	Railing	Cracks(SOG)	Slope	Siding
none	freestand,2"away from H	none	2% away from H.	6"above grade
non-structual, <1%	attached to H.,flash,drain	up to 1/8"	level to 2%	<6"above grade
non-structual, <10%	attached to house	< 1/2"	level to negative	in contact w/grade
non-structual, >10%	no railing	>1/2"	NA	NA
Structural rot, <5%	NA	NA	General	
Structural rot, >5%	Cover		18",,joist to ground	
elements not sound	cover and flashed		12", joist to ground	
NA	cover,flashed,or open air		treat.wood,soil contact	
	covered or open aired		termite inspectable	
	NA		concrete contact wood	

DECKS

Rot	Attachment	Railing	General	Slope
none	Freestanding	in place	face fastened	level to 2% away
<1%	attached w/good flashing	not in place	not face fastened	level to 2% toward
<10%	attached w/some flashing	insufficient	treat.wood in contact	NA
>10%	attached w/o flashing	none	non treated,6"above gr.	
	NA		inadequate columns	
			inadequate joists	
			NA	

TRIM

Joint Coating	Rot	Joints	General	Slope
no cracks	none	open<1/16"	all trim in place	sloped away
hairline cracks	<5% of joints	open<1/8"	<1% missing	level
visible cracks	<25% of joints	open<1/4"	>1% missing	sloped toward
peeling coating	>25% of joints	open>1/4"	horiz.trim has drip edge	NA
NA	substrate not sound	NA	no bulk water entry	
	NA		obvious bulk water entry	
			NA	

FLASHING

Slope	Drip Edge	In Place
>5% away from house	spaced 1/4" from hor.elem	over all Drs.+ windows
>2% away from house	spaced 1/8" from hor.elem	over 90% Drs.+ windows
0 to 2% away	capil.break from hor.elem.	missing more than 10%
0 to 2%, no water stand	no capil.break from H.E.	NA
> 0% away	NA	
NA		

OPENINGS

General	Termites	Drip Loops	Entrance Holes
lines fastened w/o going thru sealing system	lines spaced for inspect.	yes	sealed
lines fastened to house	not spaced	no	not sealed
lines not fastened to H.	NA	NA	NA
NA			

U.S. Department of Housing and Urban Development
HUD USER
P.O. Box 6091
Rockville, MD 20849

Official Business
Penalty for Private Use $300

FIRST-CLASS MAIL
POSTAGE & FEES PAID
HUD
Permit No. G-795

June 2002