Substantial Damage Estimator (SDE) User's Manual and Workbook

Using the SDE Software Program to Perform Substantial Damage Determinations

FEMA P-784 / Software Version 1.0 / May 2010

Substantial Damage Estimator

The SDE software is a tool to help local officials administer the Substantial Damage requirements of their floodplain management ordinances in keeping with the minimum requirements of the NFIP.

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For technical assistance, consult the local Regional Office of the Federal Emergency Management Agency (FEMA). The addresses and telephone numbers for the FEMA Regional Offices are included in Appendix A of this document.

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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS iv

DEFINITIONS v

SECTION ONE BACKGROUND 1-1

SECTION TWO INTRODUCTION 2-1

SECTION THREE HOW TO USE THE SUBSTANTIAL DAMAGE ESTIMATOR 3-1

3.1 Prerequisites 3-1
3.2 Getting Started 3-2
3.3 Using the Program 3-7
3.3.1 Introduction 3-7
3.3.2 Help Buttons 3-10
3.3.3 Using SDE through Navigation Buttons 3-10
3.4 Populating the Database 3-12
3.4.1 Properties 3-12
3.4.2 Custom Fields 3-12
3.4.3 Warning Signals 3-13
3.4.4 Residential Assessments 3-15
3.4.5 Non-Residential Structures 3-36
3.5 Import/Export of Data 3-55
3.6 Database Functions and Assignments 3-58
3.7 Reports 3-59
3.8 Generate a Georeferenced File 3-61

SECTION FOUR TECHNICAL ASSISTANCE 4-1

Figures

Figure 3-1. Setup.exe Location 3-2
Figure 3-2. Setup Wizard 3-3
Figure 3-3. Selecting the Installation Folder 3-4
Figure 3-4. Confirming Installation 3-5
Figure 3-5. Completed Installation Screen 3-6
Figure 3-6. The SDE Icon 3-6
Figure 3-7. Program Introduction Screen 3-7
Figure 3-8. Database Information Screen 3-7
Figure 3-9. Program Main Menu 3-8
Figure 3-10. Navigation Toolbar 3-11
Figure 3-11. Search Function 3-11
Figure 3-12. Search Results Screen 3-12
Figure 3-13. Custom Fields Window 3-13
Figure 3-14. Warning Pop-up 3-14
Figure 3-15. Warning Signals 3-14
Figure 3-16. Using an Existing Property for a New Assessment 3-15
Figure 3-17. Adding a Record for Residential Structures 3-15
Figure 3-18. Address Information for Residential Structures 3-16
Figure 3-19. Address Tab Required Data for Residential Structures 3-18
Figure 3-20. Structure/Damage/NFIP Info for Residential Structures 3-20

Figure 3-21. Structure/Damage/NFIP Info Tab – Required Data for Residential Structures 3-23
Figure 3-22. Cost for Residential Structures 3-24
Figure 3-23. Square Foot Calculator Tool for Residential Structures 3-25
Figure 3-24. Square Foot Calculator Data Entry Screen....3-25
Figure 3-25. Residential Adjustments....3-27
Figure 3-26. Additional and Lump-Sum Adjustments....3-28
Figure 3-27. Computed Actual Cash Value 3-28
Figure 3-28. Examples of Excellent Condition 3-30
Figure 3-29. Examples of Good Condition 3-30
Figure 3-30. Examples of Average Condition....3-31
Figure 3-31. Percent Breakdown Screen for a Residential Structure 3-32
Figure 3-32. Output Summary....3-33
Figure 3-33. Damage Summary....3-34
Figure 3-34. Optional User-Entered Data 3-35
Figure 3-35. Photo and Document Upload....3-36
Figure 3-36. Adding a Record for Non-Residential Structures....3-36
Figure 3-37. Address Information for Non-Residential Structures 3-37
Figure 3-38. Address Tab Required Data for Non-Residential Structures....3-39
Figure 3-39. Structure/Damage/NFIP Info Tab for Non-Residential Structures....3-40
Figure 3-40. Structure/Damage/NFIP Info Tab Required Data for Non-Residential Structures....3-42
Figure 3-41. Cost for Non-Residential Structures 3-43
Figure 3-42. Square Foot Calculator Tool for Non-Residential Structures 3-44
Figure 3-43. Square Foot Calculator Data Entry Screen for Non-Residential Structures....3-44
Figure 3-44. Non-Residential Adjustments....3-46
Figure 3-45. Additional and Lump-Sum Adjustments....3-47
Figure 3-46. Computed Actual Cash Value 3-47
Figure 3-47. Element Percentages for a Non-Residential Structure....3-50
Figure 3-48. Output Summary....3-52
Figure 3-49. Damage Summary....3-53
Figure 3-50. Optional User-Entered Data 3-53
Figure 3-51. Photo and Document Upload....3-54
Figure 3-52. Import/Export Function....3-55

Tables

Table 3-1. Legend of SDE Icons 3-10
Table 3-2. Quality of Construction 3-21

Appendices

Appendix A FEMA Regional Office Locations

Appendix B Sample User-Generated Reports

Appendix B.1 Example of One-Page Individual Building Summary

Appendix B.2 Example of an Individual Building Detailed Report

Appendix B.3 Example of Community Report

Appendix B.4 Example of Structure and Percent Damage Report

Appendix C References

Acronyms and Abbreviations

ACV	Actual Cash Value
BCA	Benefit-Cost-Analysis
BEA	Bureau of Economic Analysis
BFE	Base Flood Elevation
CAV	Community Assistance Visit
CD	Compact Disk
CID	Community Identification Number
CMU	Concrete Masonry Unit
DDF	Depth-Damage Function
DFE	Design Flood Elevation
DFIRM	Digital Flood Insurance Rate Map
EIFS	Exterior Insulation Finishing System
FBFM	Flood Boundary and Floodway Map
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FMV	Fair Market Value
GIS	Geographic Information System
GPS	Global Positioning System
HVAC	Heating, Ventilation, and Air-Conditioning
ICC	Increased Cost of Compliance
ICF	Insulating Concrete Form
KML	Keyhole Markup Language
KMZ	Compressed Keyhole Markup Language
MB	Megabytes
NFIP	National Flood Insurance Program
NRHP	National Register of Historic Places
SD	Substantial Damage
SDE	Substantial Damage Estimator
SFHA	Special Flood Hazard Area
SI	Substantial Improvement

Definitions

Terms below may appear in the User's Manual, Field Workbook, or software.

Actual Cash Value (ACV): A value equal to the replacement cost for a building minus any depreciation. For the purposes of this tool, actual cash value is considered synonymous with fair market value (FMV).

Adjustments: This refers to adjustments to the Cost that include additional building features (fireplaces, upgraded flooring, etc.) that are not part of the basic building as defined by the unit costs. This includes physical improvements to the main building that either protect the building or significantly enhance its habitable functions. Relative to adjustments, "Roofing" implies the final surface application (i.e., shingles, tiles, metal decking, etc.).

Assessment: Different from property records within the software, an assessment refers to records that include field-collected data required for a substantial damage determination.

Base Flood Elevation (BFE): The elevation (above sea level or other datum) of the flood that has a 1-percent chance of being equaled or exceeded in any given year (also called the 1-percent-annual-chance or 100-year flood).

Best Available Data: The most recent hydrologic, hydraulic, or mapping data with written approval from the Federal Emergency Management Agency (FEMA) that shows the 100-year flood elevation (BFE) and floodplain boundary (Special Flood Hazard Area [SFHA]).

Building Elements: Individual elements of the building that, together, form the structure. The user enters the percent damage to each building element within the software to develop a damage percentage value. Building elements provided in the Substantial Damage Estimator (SDE) vary for residential and non-residential structures, and are dependent on the structure attributes (or building type for non-residential structures) to form the element percentages.

Building Value: The market value of a building. The value of the lot on which the building is constructed and any surrounding land is not part of this value.

Community Assistance Visit (CAV): Visits conducted periodically by State floodplain management or FEMA officials to ensure that National Flood Insurance Program (NFIP)-participating communities are adequately administering and enforcing their adopted floodplain development regulations and to provide related technical assistance.

Community: A city, village, township, county, parish, or other entity with the statutory authority to enact floodplain regulations and participate in the NFIP.

Cost per Square Foot: This is determined using an industry-accepted cost-estimating guide. The cost will depend on the type, style, and quality of the building.

Depreciation: The decrease in value of a fixed asset over time due to physical wear and tear and lack of maintenance. However, depreciation does not take into account functional obsolescence (e.g., outmoded design or construction that pre-dates current codes) or factors that are external to the structure (e.g., reputation of schools or distance to shopping and parks). Commercially available references provide tables and formulas to calculate physical depreciation.

Design Flood Elevation (DFE): Flood protection elevation required by a community that is often expressed as the Base Flood Elevation plus additional freeboard (i.e., BFE + 2 feet).

Digital Flood Insurance Rate Map (DFIRM): A Flood Insurance Rate Map (FIRM) that has been prepared as a digital product, which may involve converting an existing manually produced FIRM to digital format, or creating a product from new digital data sources using a geographic information system (GIS) environment.

Element Percentages: An element percentage is applied to each building element, and is derived from the attributes chosen for the structure (or building type for non-residential structures). These percentages reflect the fraction of value each element has with respect to the total building.

Exterior Finish: Any finish to the exterior of the superstructure, including stucco, aluminum, vinyl or wood siding, brick veneer, shingles, plywood, hardboard, and Exterior Insulation and Finish System (EIFS).

Fair Market Value (FMV): This is typically referred to as the market or selling price of a structure. It is always based on the condition of the structure just before the damage occurred, and is developed by a professional appraiser. The value of the land and improvements to the land (such as landscaping) are not included in the FMV.

Flood Boundary and Floodway Map (FBFM): Official map prepared by FEMA that displays the boundaries of the regulatory floodway.

Flood Insurance Rate Map (FIRM): The insurance and floodplain management map produced by FEMA that identifies, based on detailed or approximate analyses, the areas subject to flooding during a 1-percent-annual-chance (100-year) flood event in a community. Flood insurance risk zones, which are used to compute actuarial flood insurance rates, also are shown. In areas studied by detailed analyses, the FIRM shows BFEs to reflect the elevations of the 1-percent-annual-chance flood. For many communities, when detailed analyses are performed, the FIRM may also show areas inundated by 0.2-percent-annual-chance (500-year) flood and regulatory floodway areas.

Flood Insurance Study (FIS): Report prepared by FEMA that contains information and limited technical data, including flood profiles and floodway widths, for the community FBFM and FIRM.

Freeboard: Under the NFIP, a factor of safety, usually expressed in feet above a flood level, for the purposes of floodplain management.

Geographic Adjustment: Adjustments to the cost from an industry-accepted residential or non-residential cost-estimating guide that recognizes regional differences in construction costs.

Historic Building: A building that has been designated in the National Register of Historic Places (NRHP) and/or on a State register as a Historic Building, or has been determined to be eligible to be listed on the NRHP or a State register. Local entities should contact their State Historic Preservation Office when properties that might be eligible for historic building designation are not already listed on either the NRHP or their State's register.

Increased Cost of Compliance (ICC): An additional claim payment made to a flood insurance policy holder to help cover the cost of bringing a substantially damaged or repetitively damaged building into compliance with the NFIP construction standards for new buildings. The claim must be a direct result of a flood loss.

KMZ File: KMZ files are zipped files containing KML (Keyhole Markup Language) files. These files are used in two-dimensional and three-dimensional mapping programs.

Manufactured Housing: A structure that is transportable in one or more sections, built on a permanent chassis, and designed for use with or without a permanent foundation when attached to utilities. The term includes mobile homes and doublewide manufactured homes.

Quality: A measure of the design, materials, finish, workmanship, and detailing used to construct the building. Quality levels (excellent, good, average, budget, low) are used to help establish the cost of a particular building.

Quantity: Amounts of the specified adjustments (roofing, heating/cooling, etc.) are the summations of each unit cost of measurement. These quantities can be field measured or estimated.

Reconstruction: Building or repairing a new structure on the old foundation or slab of a structure that was destroyed, damaged, purposefully demolished, or razed. The term also applies when an existing structure is moved to a new site.

Replacement Value: The cost to construct a building similar to the existing building that is located at the same site, constructed of like materials, built with comparable quality of construction, and has the same building use.

Special Flood Hazard Area (SFHA): The 1-percent-annual-chance or 100-year floodplain as defined on a community's FIRM.

Square Footage: The area of a building's footprint multiplied by the number of stories above ground. Area can be defined as the total living space, excluding basement or garage areas.

Structure Attributes: Defined for the purpose of data entry in the SDE software, the structure attributes are key elements of the structure entered by users and processed in the tool. For residential properties, these include the foundation; superstructure; roof covering; exterior finish; heating, ventilation, and air-conditioning (HVAC) system; and number of stories. For non-residential properties, structure attributes are chosen internally by the software, based on the building type selected by the user.

Substantial Damage (SD): Damage of any origin sustained by a structure whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.

Substantial Improvement (SI): Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. For the purposes of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor, or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. This term includes structures that have incurred "substantial damage," regardless of the value of or actual cost of repair work performed.

The above term does not, however, include: (1) any project for improvement of a structure to correct existing violations of State or local health, sanitary, or safety code specifications that have been identified by the local code enforcement official and which are the minimum necessary to ensure safe living conditions; or (2) any alteration of a structure (including historic

buildings) listed in the NRHP or a State Inventory of Historic Places, provided that the alteration will not preclude the structure's continued designation as a "historic building."

Superstructure: The portion of the building above the foundation that provides the habitable area and structural capacity, including masonry-block or wood-frame walls, floor joists, and main roofing structure. Note that while this is the definition for superstructure, when estimating percent damage for a non-residential structure, the term superstructure refers strictly to the floor joists and main roof structure not including the roof covering. See Section 2.2.2 of the Field Workbook for detailed descriptions of construction elements.

Tax Assessed Value: The value of a property assigned by the municipality, which can be higher or lower than the market value, and is used to determine the taxes paid on that property.

SECTION ONE BACKGROUND

Communities participating in the National Flood Insurance Program (NFIP) often have difficulty determining whether buildings are substantially damaged. This difficulty is magnified after a major flood or other disaster where a large number of buildings have been damaged and there is a need to provide timely substantial damage determinations so that reconstruction can begin. Buildings located in a Special Flood Hazard Area (SFHA) that are determined to be substantially damaged or improved, must be brought into compliance with the minimum requirements of the community's NFIP-compliant floodplain management laws or ordinances. This requirement applies to all structures in the SFHA, but is independent of the source of damage to the structure; damage as a result of flooding, high winds, fire, or any other source can trigger the requirement.

The Substantial Damage Estimator (SDE) was developed to assist State and local officials in estimating building value and costs to repair for residential and non-residential buildings. The SDE software is based on the concept of using damage estimates for individual building elements to determine whether the structure as a whole is substantially damaged. Common non-residential structures (e.g., office buildings, strip malls, restaurants, etc.) are represented in the software. This computer application was created to support enforcement of the NFIP's regulatory requirements and is intended to be used in conjunction with an industry-accepted construction cost-estimating guide. Local officials who may have limited experience in construction estimating, appraisal, or real estate backgrounds can make reasonable estimates of pre-damage market values and costs to repair to pre-damage conditions.

SDE software Version 1.0 has the ability to attach documentation, including photographs, to the structure records. This allows for a single storage location for data collected as part of substantial damage determinations. SDE also allows the user to import multiple files at once using the program's Enterprise Import function, includes a data export feature, provides the ability to make property assignments for inspectors in the field that can be uploaded through a network database, and allows users to create georeferenced files that can be used to map properties in the SDE database. This User's Manual describes the functionality of the SDE Version 1.0 software.

SECTION TWO INTRODUCTION

When existing buildings undergo repair or improvement, it presents an opportunity for floodplain management programs to reduce flood damage. More than 20,800 communities participate in the NFIP by adopting and enforcing regulations and codes that apply to development in SFHAs. Local floodplain regulations and codes contain minimum NFIP requirements not only for new buildings and structures, but also for existing buildings and structures with proposed "substantial improvements" or "substantial damage." Substantial Damage/Improvement is the ratio of the cost to repair/improve a building to the market value of the building:[1]

$$\frac{\text{Cost of Improvement or Cost to Repair to Pre-Damage Condition}}{\text{Market Value of Building}} \geq 50\%$$

Note that the formula uses the value of the repairs or improvements, which is not a market value. The replacement value is the cost to restore an item or structure to its pre-loss condition, which is different from the appraisal or adjusted tax value. Additional information regarding substantial damage may be found in Federal Emergency Management Agency (FEMA) Publication No. P-758, *The Substantial Improvement/Substantial Damage (SI/SD) Desk Reference* (FEMA, 2010), which provides practical guidance and suggested procedures to implement the NFIP requirements for substantial damage and substantial improvements.[2] Additionally, FEMA Publication No. 213, *Answers to Questions about Substantially Damaged Buildings* (FEMA, 1991), includes information about NFIP regulations and policy governing substantially damaged buildings.

> Both the Building Value and the Cost of Repairs/Improvement must be determined using reasonable judgment and industry-accepted methodologies that can withstand regulatory, administrative, and judicial review. It is highly recommended that the methodology used to determine Building Value be consistent for all structures within a given community.

The SDE software is a consolidated application to help State and local officials estimate substantial damage to either residential or non-residential buildings. This tool assists State and local officials in using FEMA-accepted approaches to estimate the value of a building and determine costs to repair/reconstruct a building. From this information, a "Percent Damaged" or "Improved" value can be calculated to establish a substantial damage/improvement determination for each residence. The program is a valuable tool since the "…enforcement of the substantial improvement requirement as defined in the NFIP regulations (44 CFR 59.1) frequently becomes a major concern for local officials after a community has experienced serious damages as a result of a flood or other disaster" (FEMA, 1991).

The SDE application is designed to accommodate residential and non-residential buildings such as single-family residences, manufactured housing, schools, office buildings, police stations, hospitals, courthouses, department stores, grocery stores, convenience stores, and strip malls. The SDE does not address buildings designated by State or Federal entities as historic buildings.

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[1] If the building has been damaged, the pre-damage market value is considered for this computation.

[2] For copies of FEMA Publications, call 1-800-480-2520 or download the publications directly from the FEMA Library online at http://www.fema.gov/library/index.jsp.

Although communities that participate in the NFIP are not required to use the SDE software to meet their responsibility to determine substantial damage, SDE is highly encouraged. Local officials who want to use an alternative methodology are encouraged to check with the Mitigation Director of their FEMA Regional Office (see Appendix A) to confirm the alternative methodology before initiating substantial damage inspections or determinations. Alternative methodologies must meet NFIP minimum requirements, provide reasonable estimates of pre-damage building values and repair costs, and provide fair and equitable determinations on a community-wide basis while also evaluating building-specific damages.

Use of other FEMA software or software components to determine substantial damage may not be appropriate. Specifically, use of the depth-damage functions (DDFs) from the FEMA Benefit-Cost Analysis (BCA) tools is not appropriate because the DDFs were designed to be specific to a particular hazard, do not consider other sources of damages (fire, wind, earthquake, etc.), and may underestimate the total building damages. The BCA DDFs are designed to predict future damages based on regional or national average figures, do not consider site-specific factors such as flood durations, and do not calculate damages that are unique to the building under consideration. As stated elsewhere in this User's Manual, depth of flooding is not a sole, determining factor for substantial damage determinations. SDE is a tool to assist State and local officials with substantial damage determinations, but ultimately, the official makes the determination.

SECTION THREE HOW TO USE THE SUBSTANTIAL DAMAGE ESTIMATOR

This section explains the prerequisites and system requirements to successfully install and run the SDE software, and provides detailed instructions for installing the SDE software for Windows XP, Vista, and 7.

3.1 PREREQUISITES

You need to have *full local administrative rights* on the computer on which you will install the software, or have someone assisting you who has adequate rights to perform the installation.

The following are the minimum system requirements to run the SDE software successfully:

32-Bit Processor

1-gigahertz (GHz) or faster processor recommended

Framework

.NET (“dot NET”) Framework 2.0

If .NET Framework 2.0 is not already installed, the SDE installation program will attempt to install it.

Operating System

Windows XP with Service Pack 2 or later

Windows Vista (32-bit or 64-bit)

Windows 7

Memory

1 gigabyte (GB) minimum; 2 GB or more recommended

Hard Disk

Approximately 60 megabytes (MB) of available hard-disk space is recommended for installation. If SDE is installed on a network drive, it should be set up in Standalone mode.

Display

Super VGA (1,024x768 pixels) or higher-resolution video adapter and monitor

Recommended Software

Adobe Reader version 9.3 or higher. Note: other versions or programs may work to display the PDF files, but for the help links within the software to work as intended, use the recommended version of Adobe Reader.

3.2 GETTING STARTED

The installation compact disk (CD) provided with this manual includes all the files required to run SDE Version 1.0. SDE Version 1.0 was developed using Microsoft .NET 2.0 Framework and it should not interfere with other existing applications already loaded on the computer.

Note: When installing the software, any existing SDE versions should be removed from the computer using the Windows Add/Remove function.

1. Insert the CD. The contents of the CD should display automatically; if not, browse to display them. Double-click on **setup.exe** (Figure 3-1) to install the SDE software. *Note:* You must have local administrative privileges on your computer to install the software successfully, or have an authorized person install it for you.

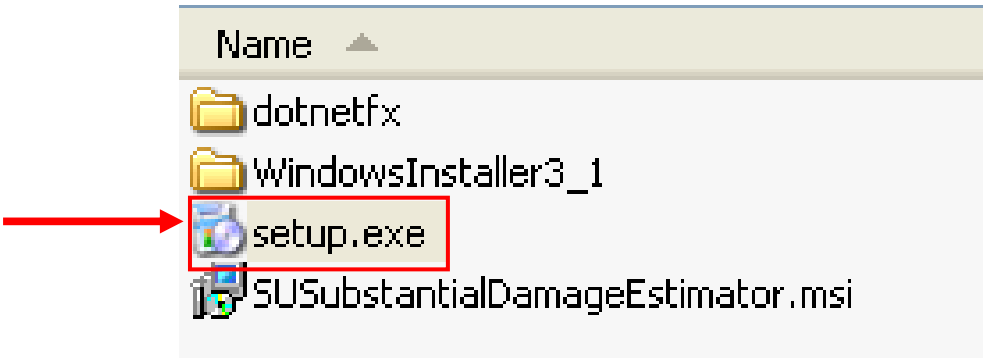


Figure 3-1. Setup.exe Location

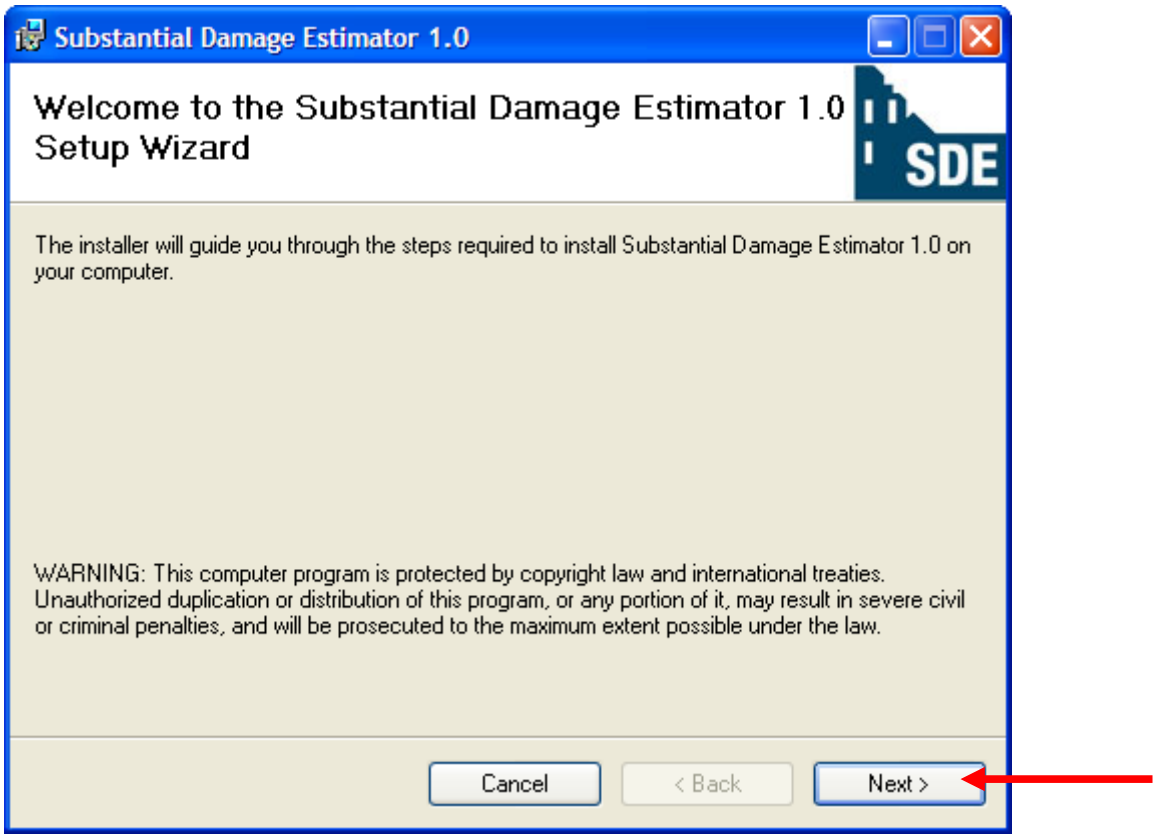


Figure 3-2. Setup Wizard

2. Click **Next** to continue.

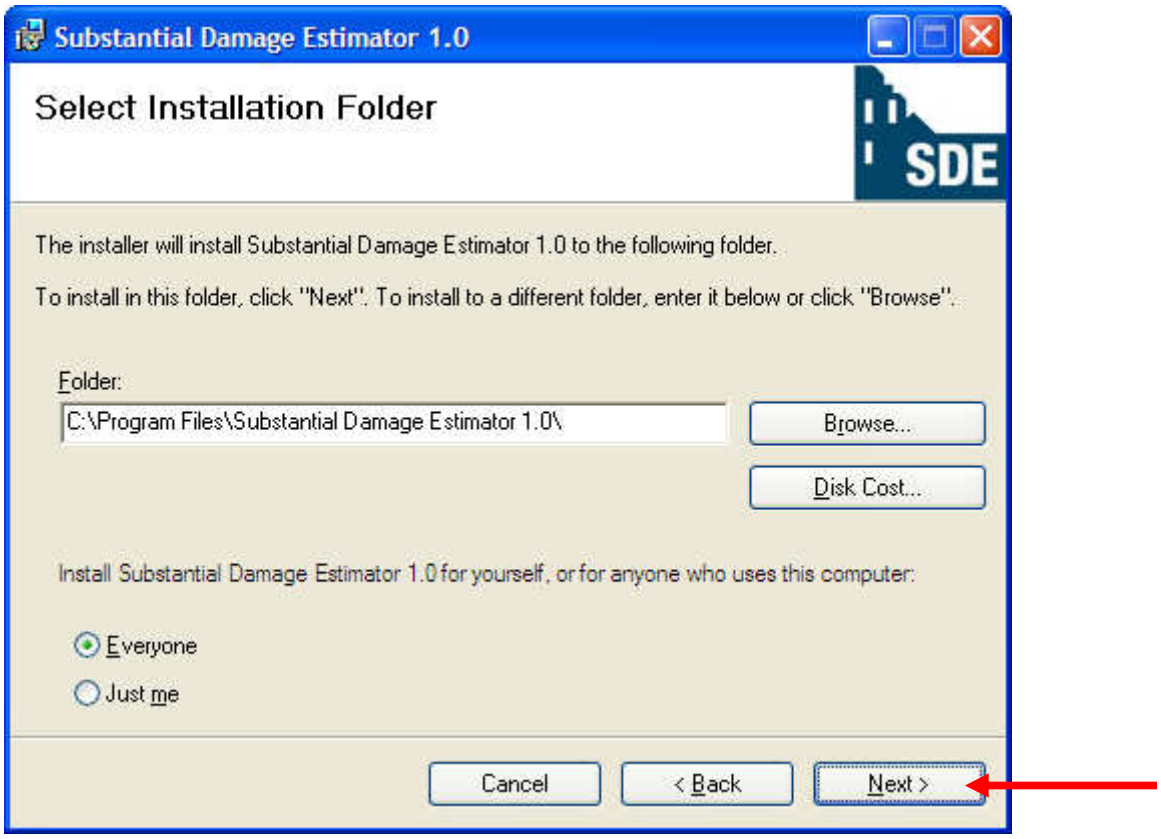


Figure 3-3. Selecting the Installation Folder

3. The *Folder* field will be populated with the default location for software installations based on your operating system. Selecting "Everyone" allows anyone who uses the computer to run the SDE software; selecting "Just me" allows only the user currently logged on to run the SDE software. Click **Next** to continue (Figure 3-3).

   Note to Vista users: If you have difficulty proceeding with the installation, you may not have installation privileges on the default program storage folder, "C:\Program Files." Return to this step and enter your own path for the installation, such as "C:\FEMA\SDE V1.0."

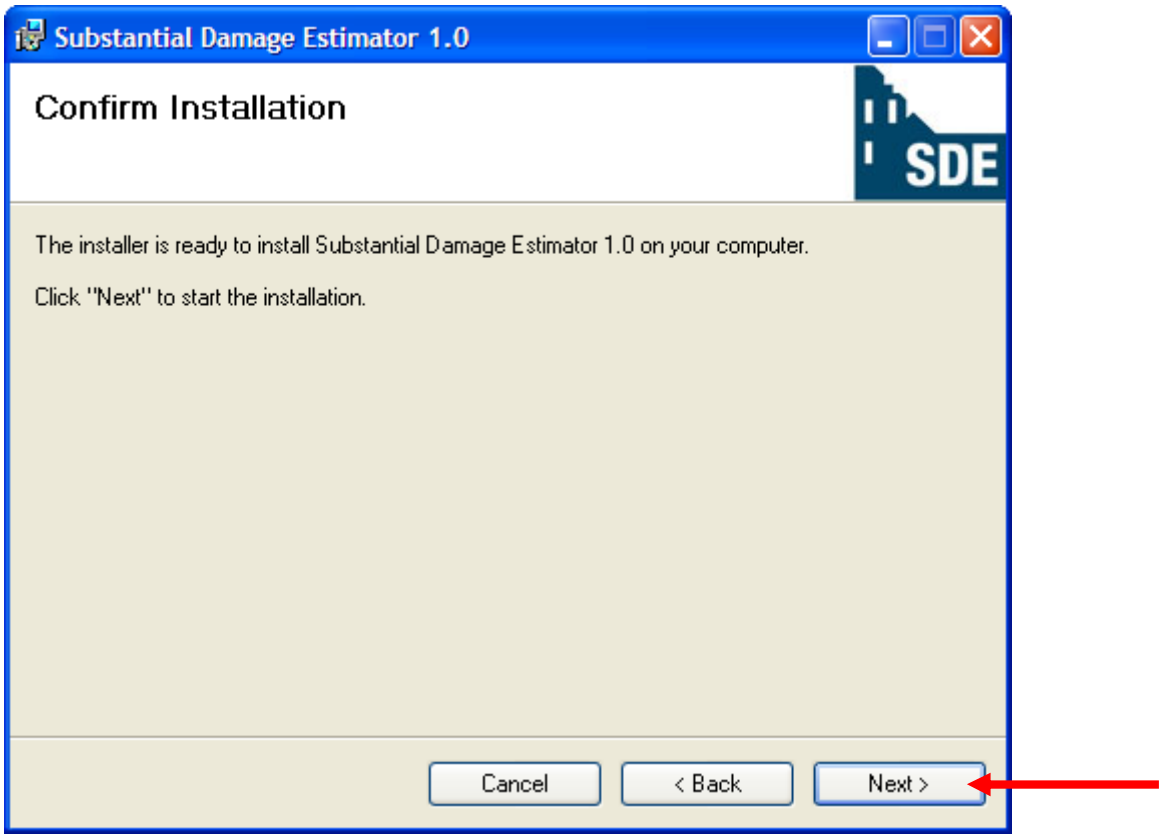


Figure 3-4. Confirming Installation

4. Click **Next** to continue.

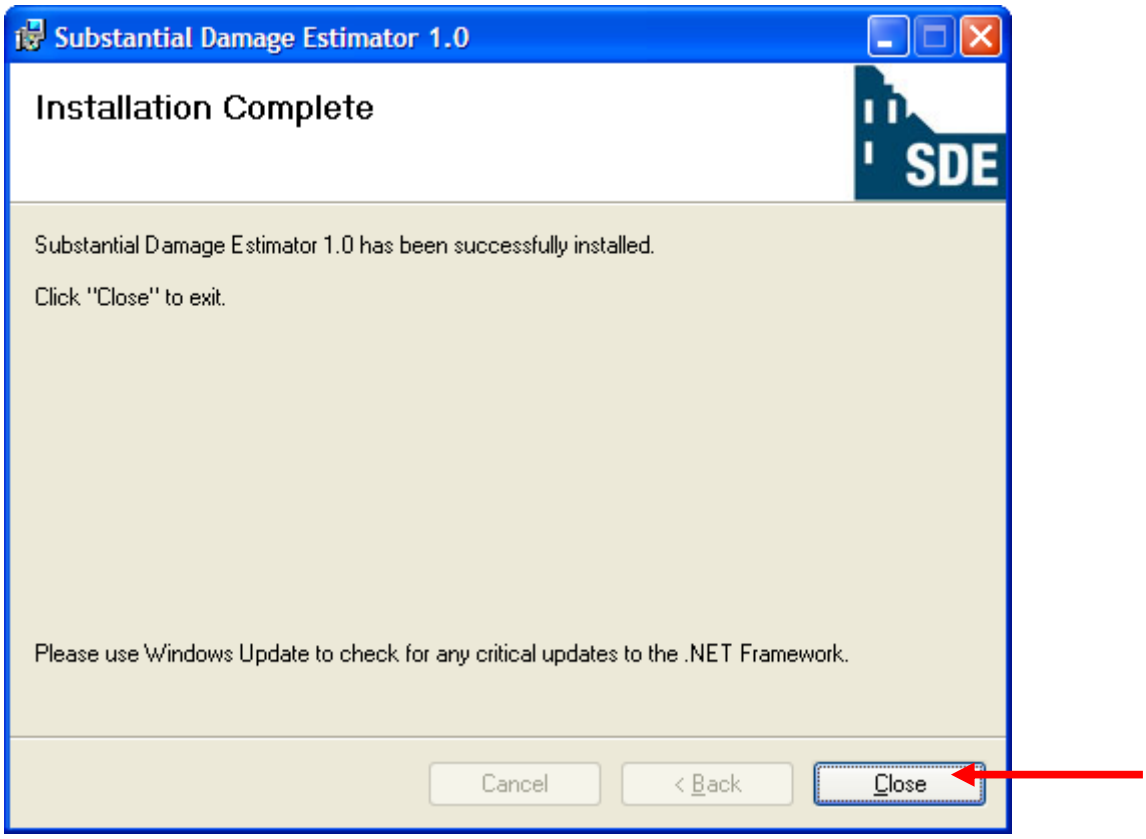


Figure 3-5. Completed Installation Screen

5. Once the installation is complete, click **Close.** (Figure 3-5)

6. The installation process will place an SDE icon similar to the one below on your desktop. Double-click the icon (Figure 3-6) to run the SDE software.

Figure 3-6. The SDE Icon

3.3 USING THE PROGRAM

3.3.1 Introduction

The SDE Version 1.0 Substantial Damage Estimator screen (Figure 3-7), which includes a brief description of the software's purpose, will appear momentarily when the program is opened.

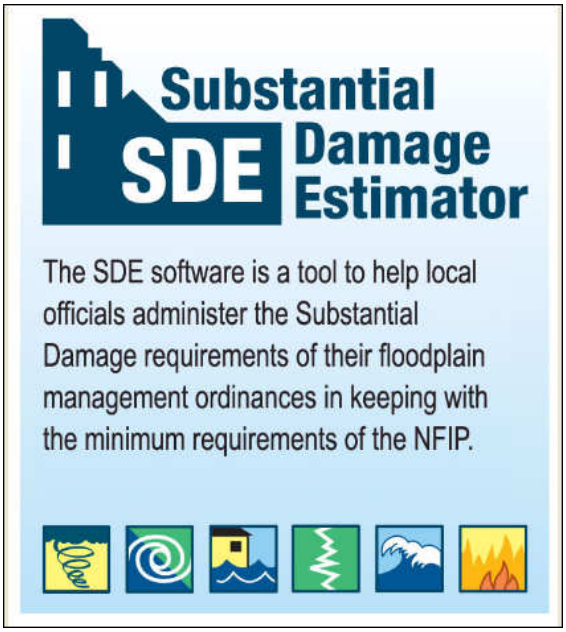


Figure 3-7. Program Introduction Screen

The first time the program is run on a computer, the Database Information window (Figure 3-8) will appear, prompting the user to select the database type. See Section 3.6 for more information on Client and Server machines. The SDE Version 1.0 main menu screen (Figure 3-9) will open next. The main menu allows the user to access the program's features.

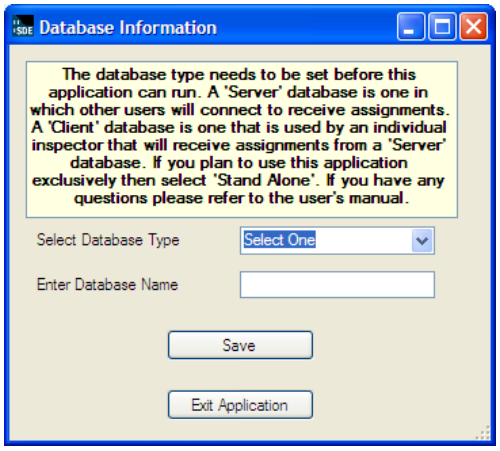


Figure 3-8. Database Information Screen

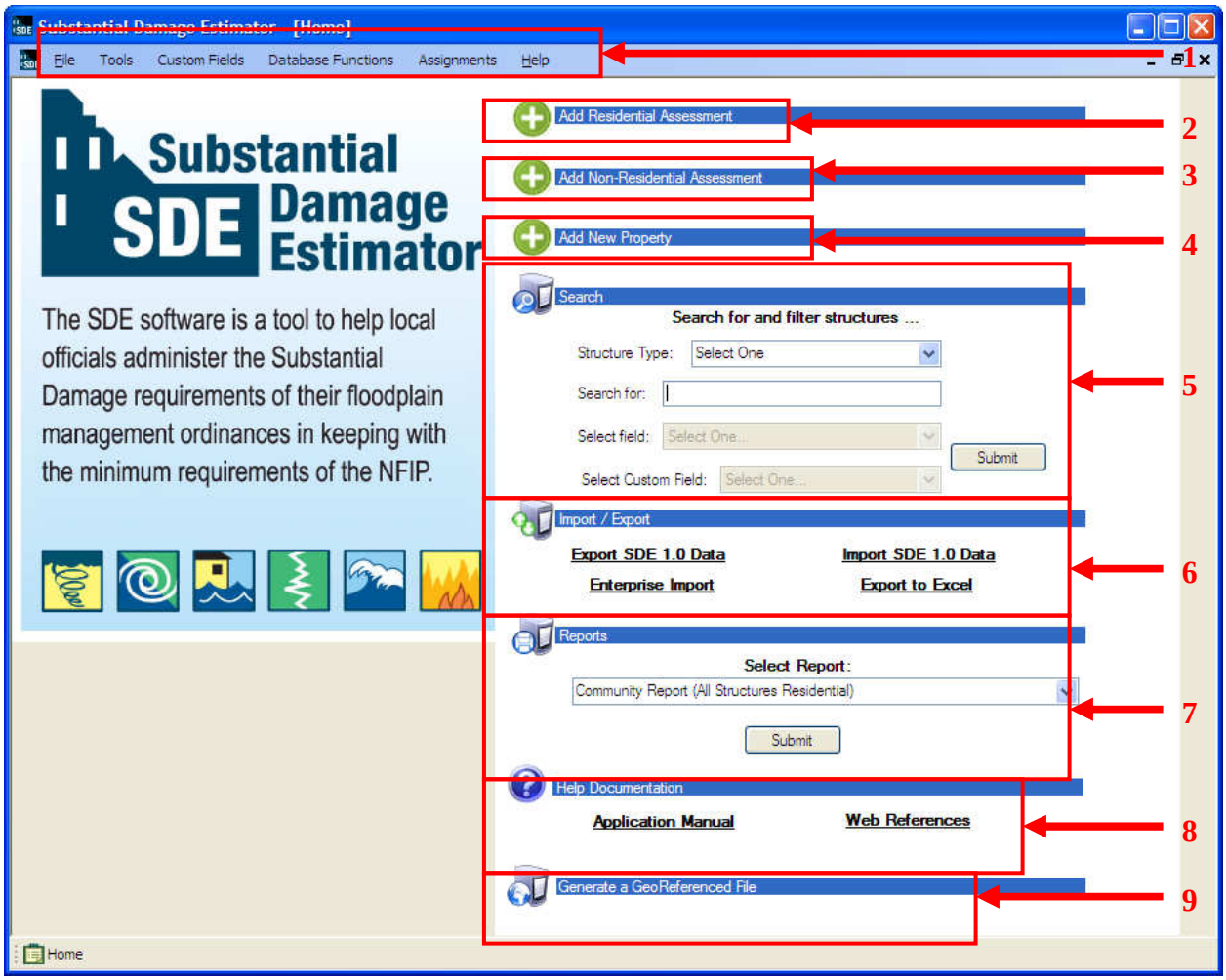


Figure 3-9. Program Main Menu

1. *Main Toolbar* – This standard toolbar can be accessed at any point within the SDE software, providing the user with constant access to both basic and more specific functions (the descriptions of which will follow in this chapter):

   - File
     - New Residential Assessment
     - New Non-Residential Assessment
     - Recent Assessments
     - Save
     - Main Menu
     - Exit
   - Tools
     - Latitude/Longitude Validation

    - Import
    - Export
    - Summary Report for Current Assessment
    - Detailed Report for Current Assessment
    - Latitude/Longitude Import
  - Custom Fields
    - Add/Edit/Delete Custom Fields
  - Database Functions
    - Update Database Name
    - Enterprise Import
    - Add Property
  - Assignments (contents subject to user type, i.e., Client, Server, or Standalone)
  - Help
    - Contents
    - Search
    - About…

2. *Add Residential Assessment* – This function allows the user to begin a residential assessment on either a new or existing property. For more information, see Section 3.4.4.
3. *Add Non-Residential Assessment* – This function allows the user to begin a non-residential assessment on either a new or existing property. For more information, see Section 3.4.5.
4. *Add New Property* – This function can be used to create a new property in the database. Properties in SDE can be used at any point for new assessments, and each property can have multiple assessments. For more information, see Section 3.4.1.
5. *Search* – The search function on the main menu screen provides the user with a tool to access existing properties and assessments in the SDE database. The user can select the structure type, input a string to search for, or select a specific field to narrow the search results. For more information, see Section 3.3.3.
6. *Import/Export* – These functions allow the user to import SDE records as individual properties and/or assessments (using the Import function) or in groups (using the Enterprise Import function). The Export function will export assessments to a chosen location, and the Export to Excel function will create an excel file containing all data within the database. For more information, see Section 3.5.
7. *Reports* – A number of different reports can be generated using this function. From the drop down menu, the user can select the type of report to be generated. For more information, see Section 3.7.

8. *Help Documentation* – Help documentation references this User's Manual, the Field Workbook, and applicable references to aid the user in the assessment process and use of the SDE software. For more information, see Section 3.3.2.
9. *Generate a Georeferenced File* – This function will create a compressed Keyhole Markup Language (KMZ) file that can be used with geographic and spatial mapping programs. For more information, see Section 3.8.

Table 3-1. Legend of SDE Icons

Icon	Significance
	The green icon is placed next to invalid or empty fields that are suggested but not required in order to save a valid assessment
	The yellow icon is placed next to invalid or empty fields that are required to complete a valid assessment (but are not required before saving)
	The red icon is placed next to invalid or empty fields that are required before saving an open assessment
	Help icons can be found next to certain fields, and upon selection will direct the user to the appropriate section of the User's Manual

3.3.2 Help Buttons

Users can access the SDE User's Manual through the software, or view or print it from the User's Manual PDF file contained on the SDE installation CD. Accessing the User's Manual through the software can be done in several ways. The user may go directly to the "Help" menu on the main toolbar at the top of the screen. From here, the user may select "Contents" or "Search," which both apply to the User's Manual. The user may also select one of the blue question marks near fields and entry points throughout the tool. These are typically shown in the residential and non-residential assessment tabs, and will direct users to the section of the manual regarding the subject. When the User's Manual or Field Workbook is accessed through SDE, the software will only allow the user to have one help window open at a time.

Note: The Search function only locates a page in the User's Manual where the word appears. The other sections listed under the Search function tab will include additional information on the subject word.

3.3.3 Using SDE through Navigation Buttons

The software is set up to open individual windows for functions, and the user can open multiple windows from the main menu screen and manipulate them separately by using the minimize,

maximize, and close buttons at the top right corner of each window. Using the navigational bar at the bottom of the tool, the user may navigate to opened windows or ongoing assessments directly (Figure 3-10).

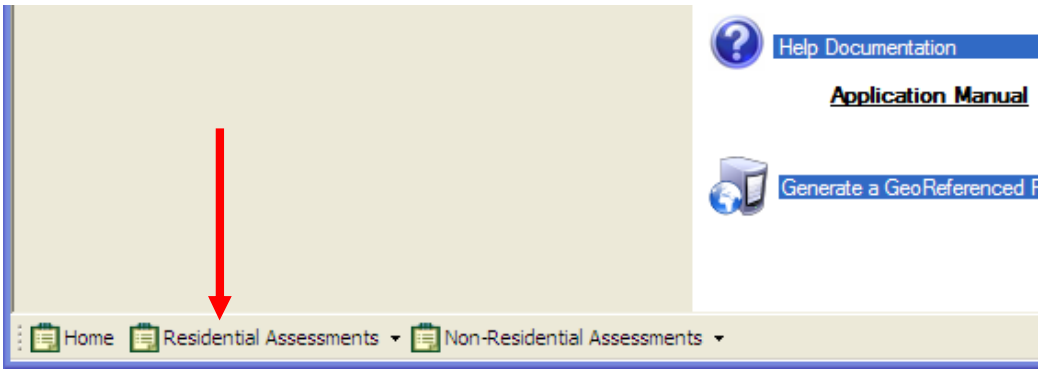


Figure 3-10. Navigation Toolbar

The **Search** function on the main menu allows the user to search for and filter records using multiple options (Figure 3-11). A search can be performed by structure type, (i.e., residential, non-residential, or both). The search can be further narrowed by entering a specific term in the *Search for* field and then selecting a specific field from the drop-down menu in the *Select field* section, if desired.

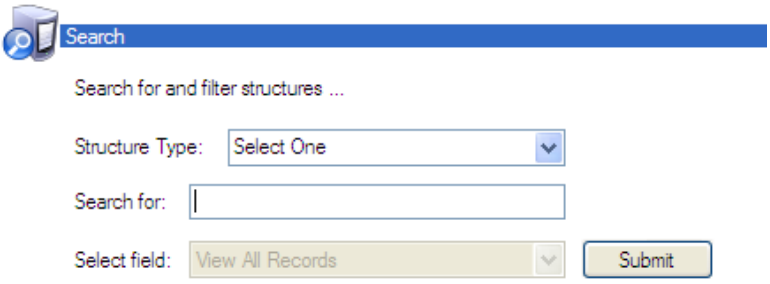


Figure 3-11. Search Function

In the Search Results screen, the user may double-click on an existing record to access it. Properties will be displayed as white rows, while assessments will be displayed as grey lines in collapsible groups under their respective property.

From this screen (see Figure 3-12), the user may choose to select either an assessment on a property or just the property itself. If a property that has already had an assessment performed is selected, the user may not edit the property information, but may select "New Assessment" at the bottom of the screen. If an assessment is selected, the user may edit any part of the assessment. The user may also choose to navigate through results by selecting either the filter or pin icons next to each column header. The filter button will allow users to see only entries with specific entries or of specific types, and the pin button will allow the user to lock a particular field while scrolling in order to navigate through entries while viewing that particular locked field.

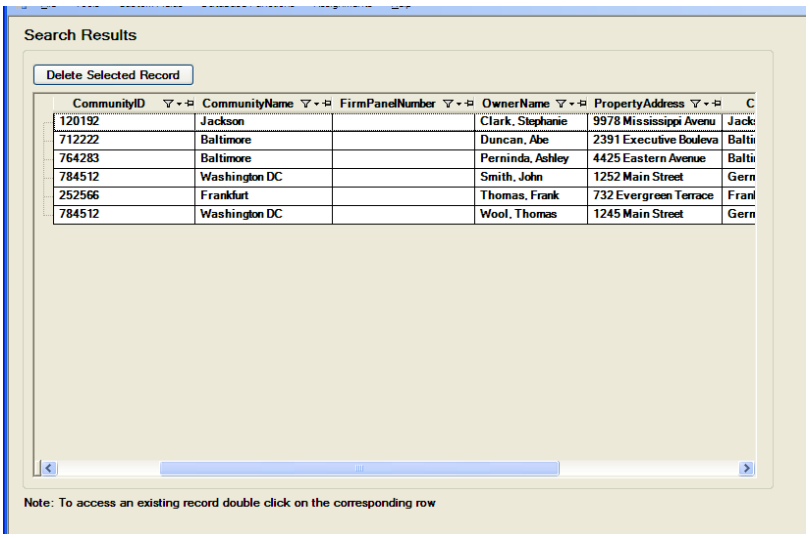


Figure 3-12. Search Results Screen

3.4 POPULATING THE DATABASE

The SDE software holds a database of properties on the hard drive of the computer. This database stores properties (both residential and non-residential) and assessments on those properties. The user can choose to create or import property records, for which assessments can be created at any time, or to simply create or import full assessments. If assessments are created without using existing properties in the database, the user will need to enter some basic property data on the ***Address Information*** tab.

3.4.1 Properties

SDE allows users to create property records that can be selected for assessments later. To do this, select "Add New Property" from the main menu. A screen will appear with fields for the property data, and when they have been sufficiently completed, the user may save the property. Properties can also be imported in large quantities using the Enterprise Import function.

3.4.2 Custom Fields

In addition to the fields provided in the residential and non-residential ***Address Information*** tabs, the user has the ability to create a maximum of three custom fields. This can be done through the "Custom Fields" menu. By selecting "Add/Edit/Delete Custom Field," the tool will display a window in which the user may modify custom fields. From this window, the user may delete an

existing custom field, create custom fields, or modify custom fields. The user may select to automatically display custom fields and/or make them unique to each property.

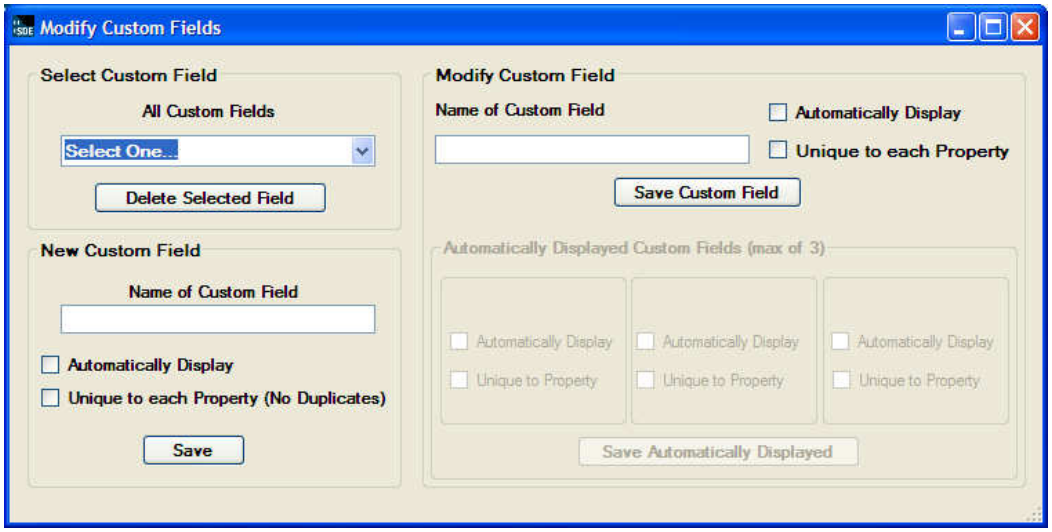


Figure 3-13. Custom Fields Window

3.4.3 Warning Signals

When adding a new record, the software requires specific data fields to be completed before the user can save the record. If the user attempts to save the record before the required data are entered, an error message, as shown in Figure 3-14, will appear indicating that required fields (which are marked with a red pushpin) have been left blank. Red, yellow, and green pushpins appear next to the fields that have not been completed satisfactorily, as shown in Figure 3-15. While fields with red pushpins must be completed to save the record, fields with yellow pushpins indicate data fields that must be filled out to prepare a complete and valid record, and green pushpins indicate data fields that have not been completed satisfactorily, but do not indicate that the record is incomplete or invalid. The error identification screen will clearly identify the fields that *must* be corrected before the assessment can be saved, those that *must* be corrected before the assessment can be valid, and those that are suggested information to provide a comprehensive report.

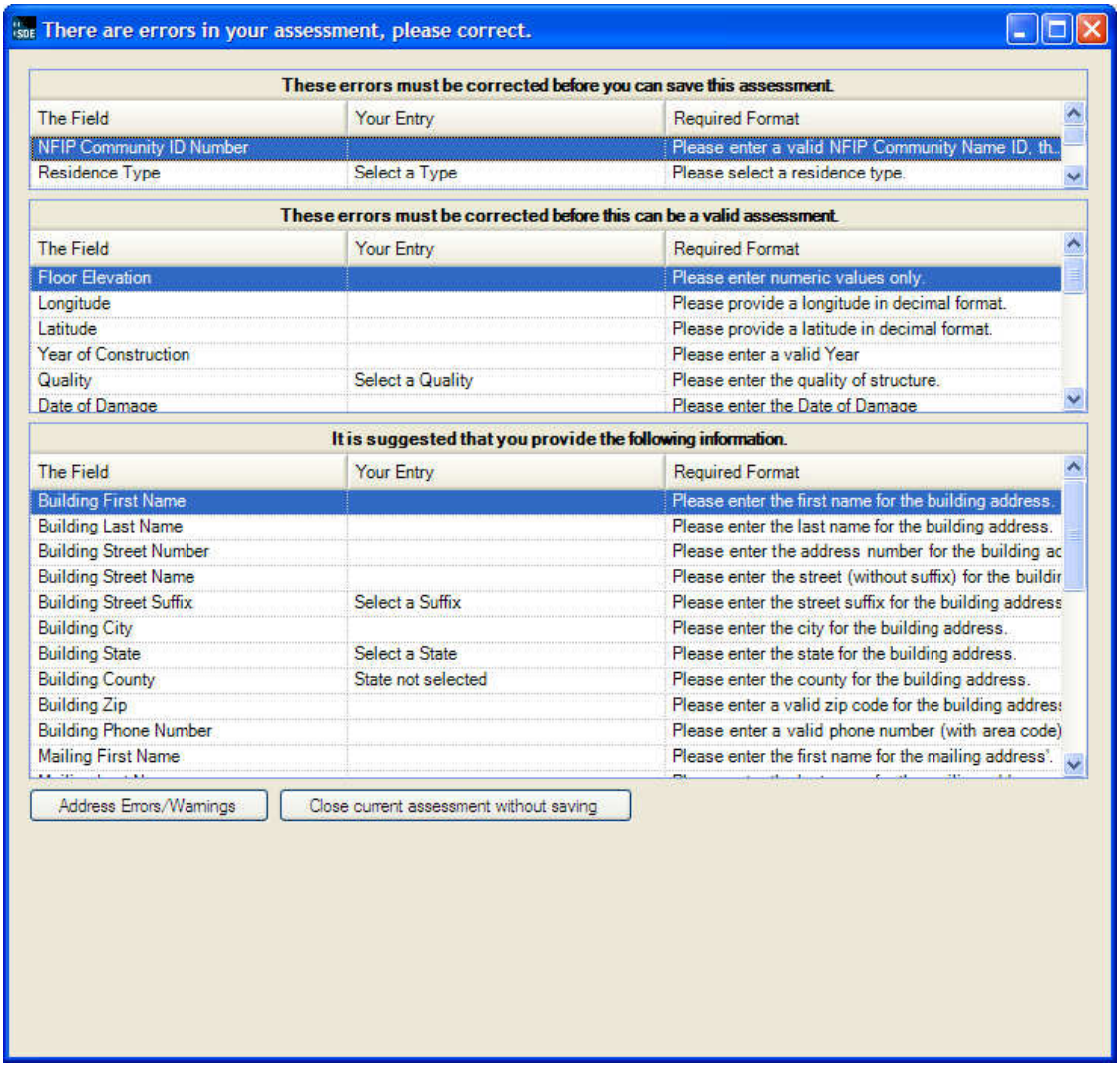


Figure 3-14. Warning Pop-up

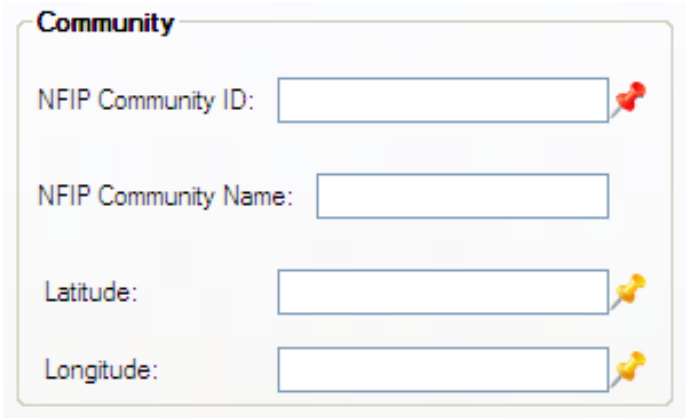


Figure 3-15. Warning Signals

3.4.4 Residential Assessments

Upon choosing "Add Residential Assessment" from the main menu, the application will open a screen with six tabs. If the user has already entered properties into the tool (see Section 3.5 on enterprise imports, and the SDE Field Workbook on pre-disaster inventories), a window asking whether the assessment is based on a pre-existing property will appear, with the option of creating a new property for the new assessment (Figure 3-16). The first four tabs have input fields for which the user must provide data in order to determine the percent damage. The tabs are arranged in the order that the user should input the data. If the option to perform an assessment based on an existing property is selected, and if an assessment has already been performed on the existing property, then an additional tab will appear under the new assessment screen that will display the results of the previous assessment on this property. This User's Manual uses the following formatting style to display the information related to each tab:

- Tabs are denoted in bold italicized lettering
- Sections within tabs are denoted in underlined italicized lettering
- Fields are denoted in italicized lettering

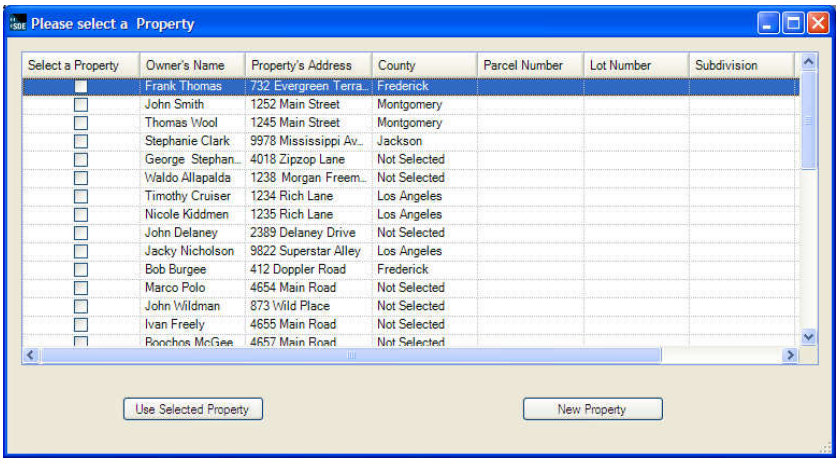


Figure 3-16. Using an Existing Property for a New Assessment

The fifth tab (***Output Summary***) provides the results of the substantial damage determination, and the sixth tab (***Files & Photos***) is an interface to allow the user to attach documents and photographs to the record. The following flow chart (Figure 3-17) shows the types of data and information, by tab, which are entered into or displayed by the tool to create a record for a property.

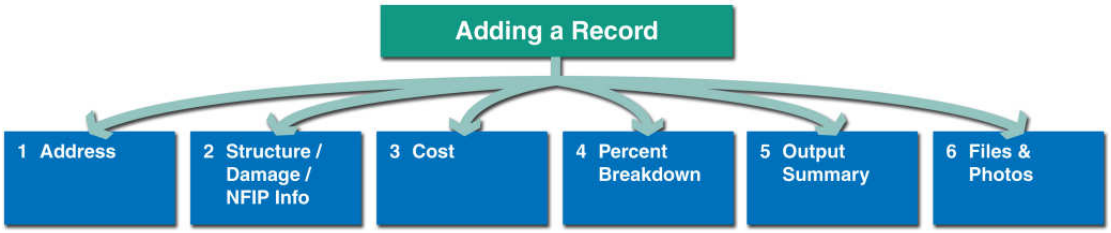


Figure 3-17. Adding a Record for Residential Structures

3.4.4.1 Address Information Screen

The first tab is the ***Address*** tab, where the user enters owner, resident, and address information. It is important to get accurate location data and contact information for the owner (and resident if it is a rental property) for this tab in case any follow-up is necessary. Figure 3-18 shows the ***Address*** tab and presents sample data. Each of the sections of the tab is numbered and is explained in further detail following the figure.

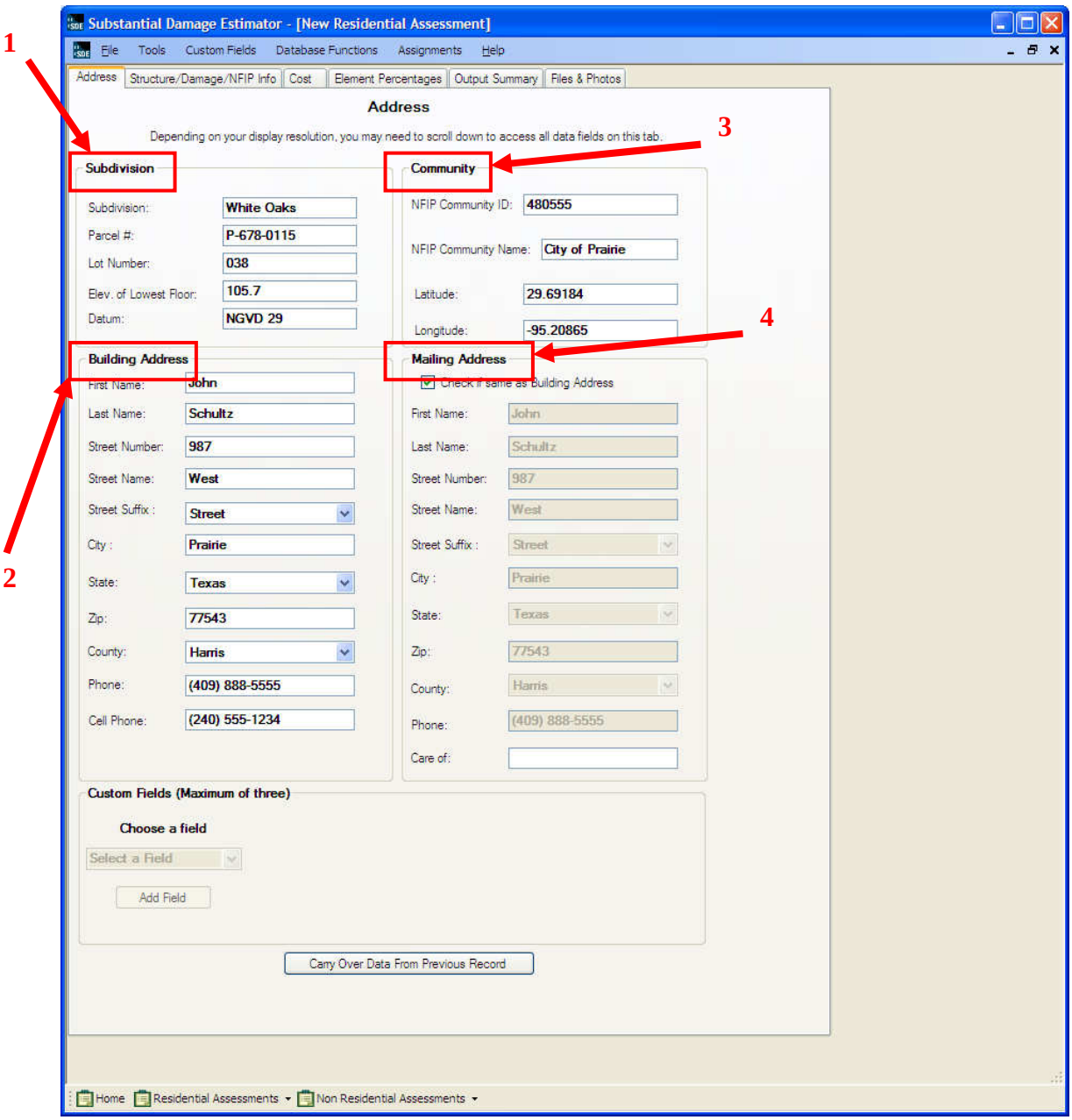


Figure 3-18. Address Information for Residential Structures

1. The *Subdivision* section contains data fields for the subdivision name, community parcel and lot numbers, and the elevation of the first floor along with its reference datum. Parcel and lot number information is generally available from community tax assessment records. The elevation data may be available from community floodplain management or building code enforcement offices.
2. Under the *Building Address* section, the user can enter the property address of the site as well as contact information for the resident. A pull-down menu for the street suffix is provided to ensure a uniform format can be used for all street types (e.g., Avenue, Boulevard, etc.). If the residence is a rental property, then the resident's information and the structure address should be entered into the *Building Address* section.
3. In the *Community* section, the NFIP community identification number (CID) and community name are entered. Tool users should have copies of Flood Insurance Rate Maps (FIRMs) or digital Flood Insurance Rate Maps (DFIRMs) for the affected area before going into the field. This NFIP information is available from the FIRMs. There is also a field for latitude and longitude coordinates, which can be acquired onsite using a handheld global positioning system (GPS) device. Accurate latitude/longitude coordinates are essential for geographic information systems (GIS) mapping, and are required on FEMA mitigation grant applications.
4. If the residence is a rental property, then the owner's name and mailing address should be provided in the *Mailing Address* section. If the owner is the occupant and his/her mailing address is the building address, there is a check box at the top of the *Mailing Address* section that, when checked, will automatically populate the *Mailing Address* section with data from the *Building Address* section.

The *NFIP Community ID* is the only field on the ***Address*** tab that must be completed before saving. This field will be marked with a red pushpin if not completed and the user attempts to save the file (Figure 3-19). Fields necessary to prepare a complete record (marked with a yellow pushpin if they are empty following a save attempt) include: the elevation of the lowest floor and the latitude and longitude coordinates. Although a required data point for a complete record, accurate latitude/longitude coordinates are not required to save the record. If the latitude/longitude validation function (accessed through the "Tools" menu) is turned on, latitude and longitude will be checked internally by the tool upon input to determine if the data entered are within the State where the structure is located.

"Carry over data from the previous record" button: The "carry over" feature was included in the application to facilitate and reduce the amount of data entry by using data from the previous record when applicable. This is done by pulling select information from the previous assessment performed. This can be useful if, for example, a series of structures on a street are being assessed, the user can use this function to carry over information that would be the same for each structure. The user may do this by selecting the button at the bottom of the ***Address Information*** tab. The data carried over are from the last record entered without regard to where the current record counter is located in the inventory. Obviously it is very important that any property-specific information be edited for the current property to avoid duplication of records or future uncertainty about a record's contents. The following data are carried over from the previous record.

Address Information Screen

- Subdivision Name
- NFIP Community ID Number
- Street Name
- City Name
- State Name
- Zip Code
- County Name

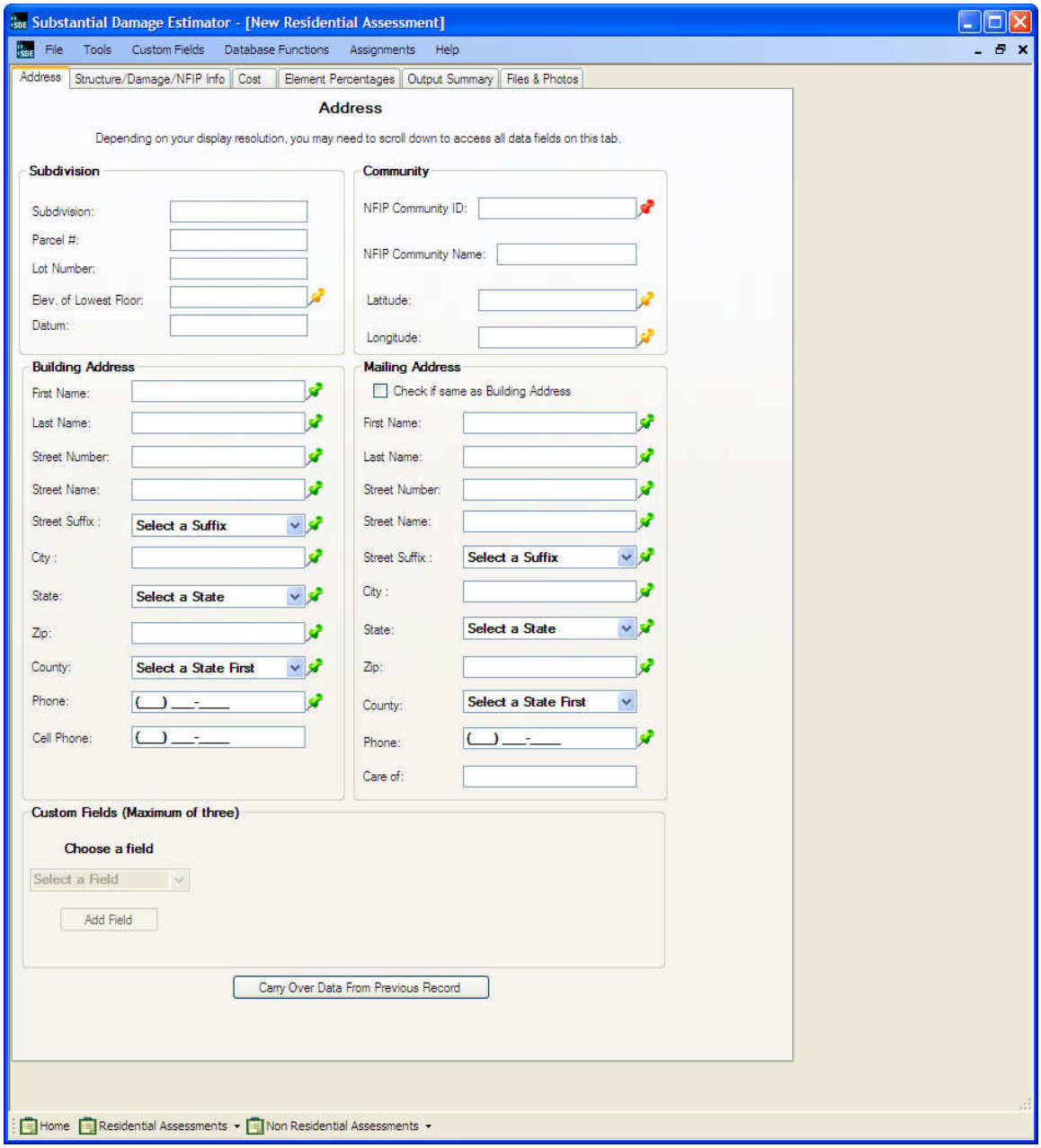


Figure 3-19. Address Tab Required Data for Residential Structures

Data that are not necessary (but that can be valuable in helping to identify property location) includes basic address information, subdivision name, property parcel, and lot number.

3.4.4.2 Structure/Damage/NFIP Info

The second tab is titled ***Structure/Damage/NFIP Info***. On this tab, the user provides some basic information about the structure type and the structure's attributes, when and how it was damaged, inspector information, and NFIP FIRM data for the site. Figure 3-20 shows the ***Structure/Damage/NFIP Info*** tab; the numbered sections depicted on Figure 3-20 are explained in further detail following the figure.

Structure/Damage/NFIP Info Screen

- Date Damage Occurred
- Cause of Damage
- Inspector's Name
- Inspector's Phone Number
- NFIP Community ID Number

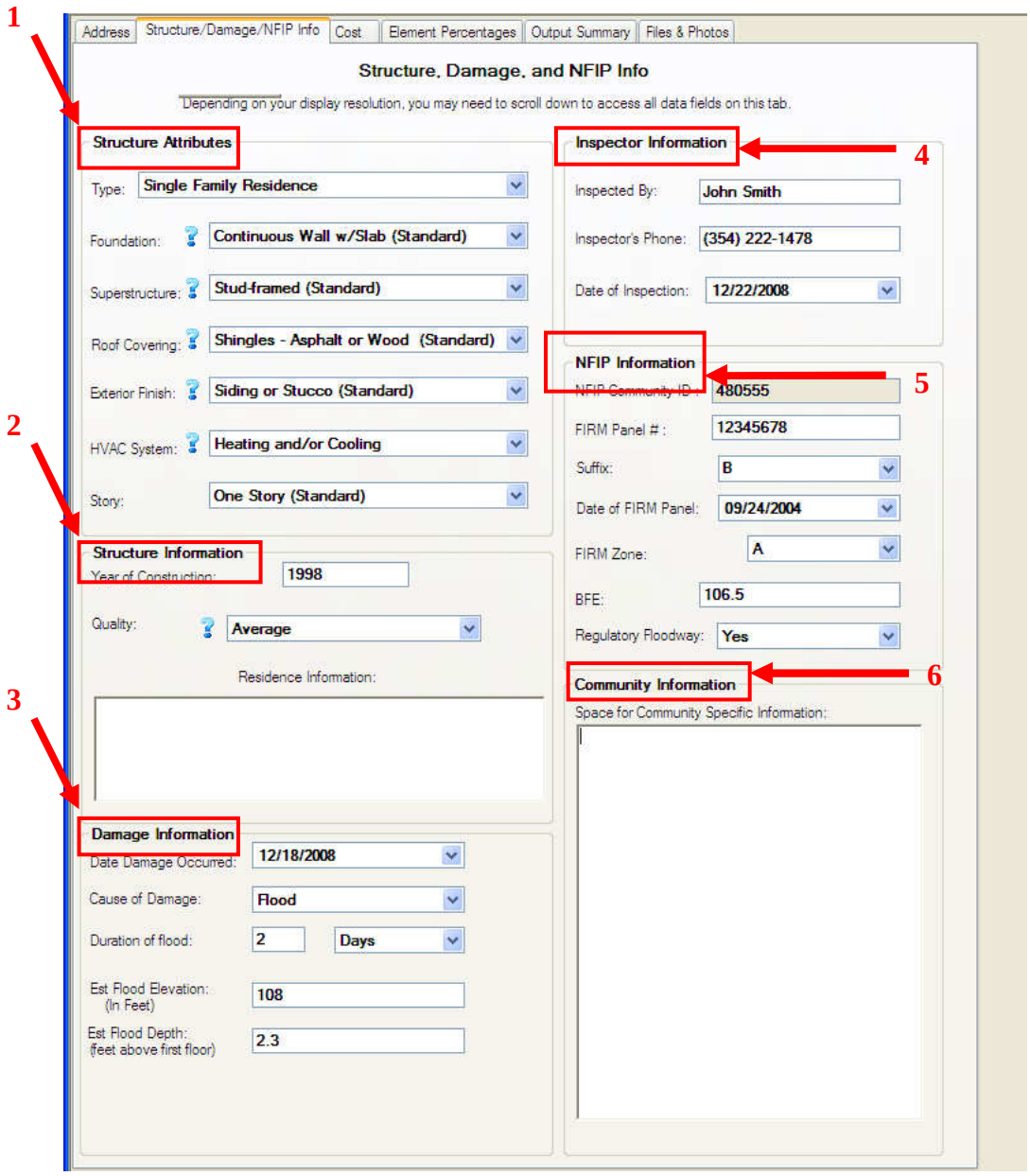


Figure 3-20. Structure/Damage/NFIP Info for Residential Structures

1. Data in the *Structure Attributes* section characterize the type, style, and attributes of construction. The attributes and building characteristics discussed in the Field Workbook are included here. The *Foundation* attribute allows the user to choose from one of five foundation types including continuous wall with slab, piles, crawlspace, piers and posts, slab-on-grade, and basement, unless the structure is a manufactured house. The *Superstructure* attribute provides four choices: stud-framed, masonry, insulating concrete form (ICF), and common brick. The *Roof Covering* attribute allows the user to choose either shingles (asphalt, wood, or fiberglass), clay tile, slate, or standing seam (metal). The *Exterior Finish* attribute allows the user to select siding or stucco, brick veneer, exterior insulation finishing system (EIFS), or none as the exterior finish of the structure.

The user also has the ability to input whether the structure has any type of central heating or cooling and the number of stories. Once the user has chosen the structure's attributes, the information is used to determine the relative value for each of the structure's elements as shown on the ***Element Percentages*** tab. The structure attributes are required in order to save the assessment.

2. Data in the *Structure Information* section characterize the age and quality of construction. This information is used to determine the cost of the building, especially when using replacement values. To determine the quality of construction refer to Table 3-2, which provides details about each of the quality of construction categories. To enter the *Quality of Construction* in the tool, the user must choose from a drop-down menu that contains the categories identified in Table 3-2. The *Year of Construction* is provided in this section and it must be in the full, four-digit format. This section also includes the field *Residence Information*, which can be used by the inspector to enter any additional information or commentary specific to the property being assessed. This information is displayed in the Detailed Report generated by the tool, but not the Summary Report.

Table 3-2. Quality of Construction

QUALITY OF CONSTRUCTION						
Quality of Construction	**Method of Production**		**Interior Finishes**	**Exterior Finishes**	**Architectural Interior Elements**	
	Mass	**Custom**			**Mass**	**Custom**
Low	X		plain, inexpensive, no attention to detail	plain, inexpensive, no attention to detail	X	
Budget[1]	X		plain	limited ornamentation on front elevation	X	
Average[1]	X		average finish	some ornamentation on front elevation	X	
Good[1]	X	X	well finished, paneling, wallpaper	ornamentation and adjustments throughout	X	X
Excellent		X	unique, high quality	well detailed and refined with custom ornamentation		X

[1] These quality of construction types are used for most homes found in subdivisions.

3. *Damage Information* to be entered into the tool includes the date and mode of damage. If flood was the mode of damage, characteristics of the flood at the site should also be noted here, including the duration of flooding and estimated flood elevation and depth.

4. In the *Inspector Information* section, users should identify themselves and provide some other basic information. Users must enter the date of inspection in this section to save the assessment.

5. Within the *NFIP Information* section, the user should record FIRM panel data, the SFHA designation, the BFE, and whether or not the property is within the regulatory floodway.

   The *NFIP Community ID* is copied from the ***Address*** tab. The inventory reports available to the user through the Reports portion of the SDE main menu rely on the identification number as a criteria for sorting the data, so it is imperative that this number be entered correctly on the ***Address*** tab.

   The *Regulatory Floodway* field contains a pull-down menu with the options of Yes, No, or Possible. This refers to the FEMA-designated floodway from either a FIRM or a Flood Boundary and Floodway Map (FBFM). Clicking "Yes" indicates that the property lies within a FEMA-designated floodway, while "No" indicates that the community does not have a FEMA-designated floodway, or the property is not within a floodway. The selection for "Possible" location within the floodway is available because it may be difficult to determine if a building is within the floodway while data are still being collected in the field. Floodway designations should always be verified against the appropriate FEMA map.

6. The *Community Information* section contains a memo (or notes) field where the user can enter community-specific information to explain an unusual situation about the current building or the flood event. This may include information such as "Flood was estimated to be between a 50-year and 100-year event according to the community's Flood Insurance Study." It could also include information on the type of mitigation that has occurred within the community in the past or with the building in question.

As with the ***Address*** tab, some data on the ***Structure/Damage/NFIP Info*** tab must be provided to save the record. Other data are necessary to prepare a valid record, but are not required in order to save it. Figure 3-21 shows the data fields marked with red and yellow pushpins. As the red icon indicates, the data field labeled *Inspected By* must be populated to save the record. To prepare a valid, complete record, the fields marked with yellow pushpins (most of the other fields on this tab) must be populated.

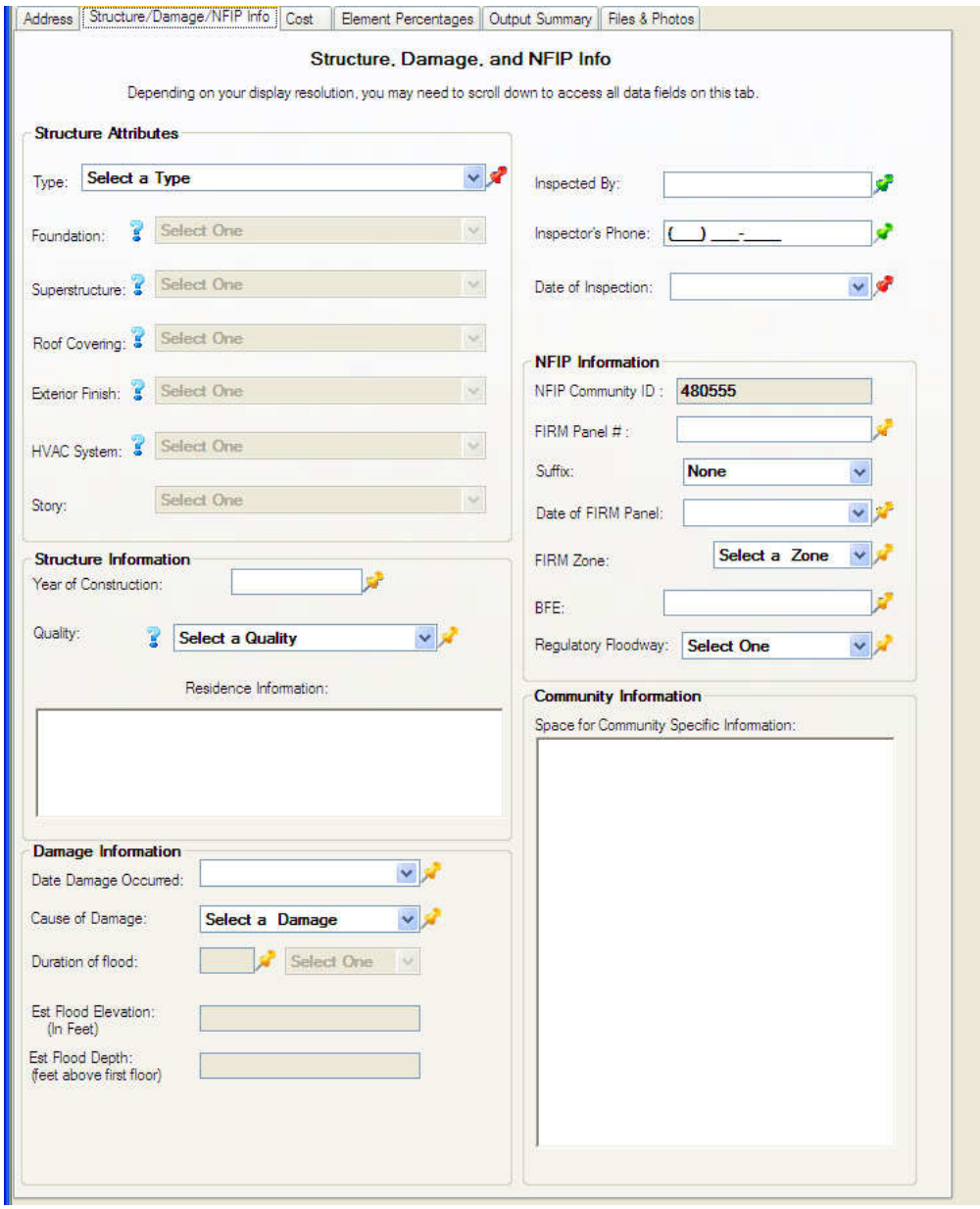


Figure 3-21. Structure/Damage/NFIP Info Tab – Required Data for Residential Structures

3.4.4.3 Cost

The third tab is titled ***Cost*** and is shown in Figure 3-22. On this tab, the user enters a cost per square foot (unit cost) for the building and an estimated depreciation percentage to determine the

replacement value and actual cash value (ACV) of the structure. For the purposes of this tool, ACV is considered to be the market value of the structure. Information regarding building unit costs and adjustments, as well as appropriate descriptions, can be found in industry-accepted residential cost-estimating guides among other sources, such as locally or regionally developed cost data.

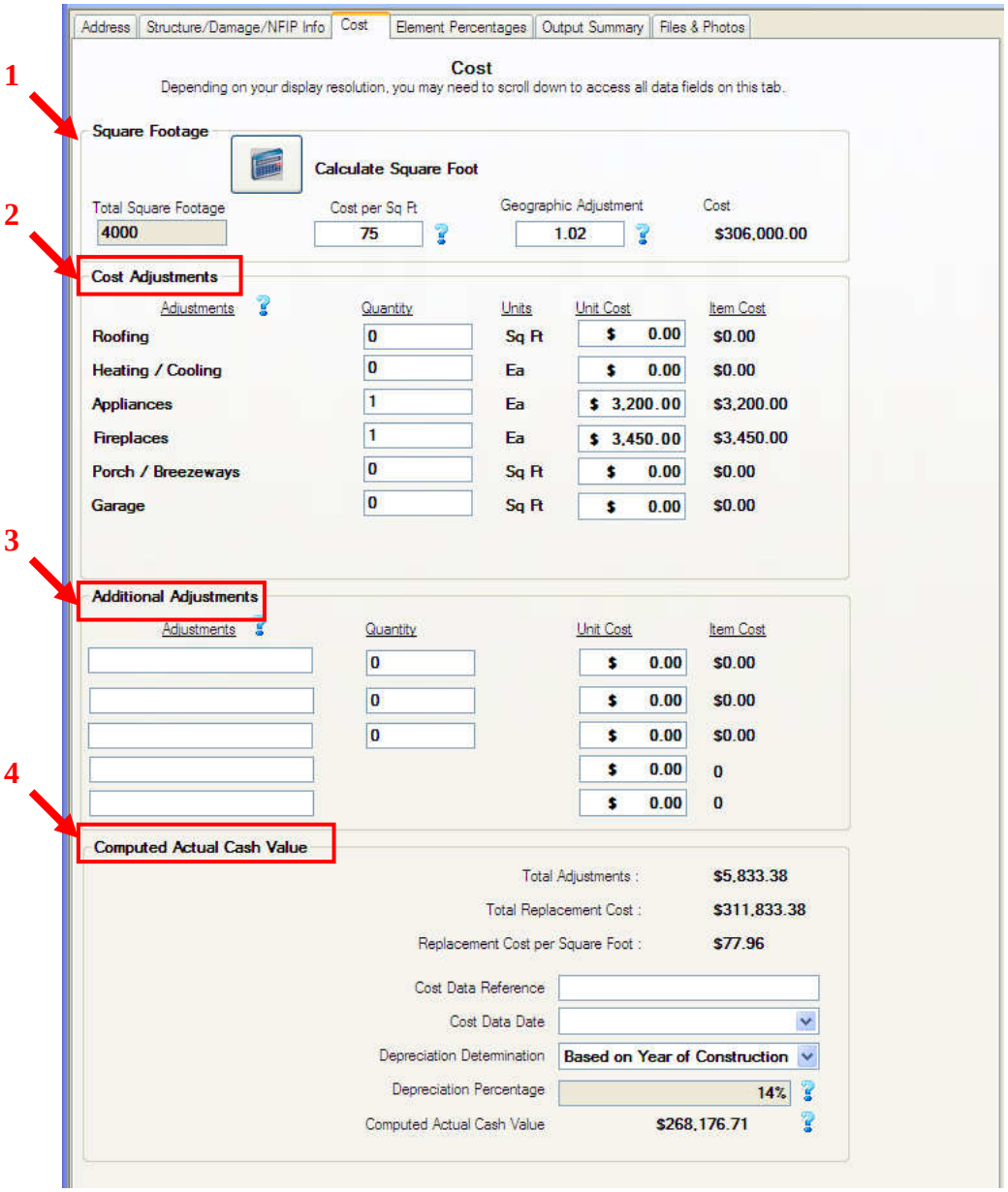


Figure 3-22. Cost for Residential Structures

1. In the *Square Footage* section, the user clicks on the "Calculate Square Foot" button to determine the area of the structure and to populate the *Total Square Footage* data field. (Note: the only ways to enter the square footage of a building are through the square footage tool or enterprise import). After clicking on the "Calculate Square Foot" button, a window is brought up where the user must choose from four types of building shapes

(Figure 3-23). When a building shape is selected, another window is opened where the user enters the estimated dimensions and number of stories of the building (Figure 3-24). Once the dimensions are entered, the user should click the "Calculate" button, which calculates the total square footage. The user must then click the "OK" button which enters the information into the square footage calculator tool screen. The user should then click the "Submit" button, which returns the user to the ***Cost*** tab with the *Total Square Footage* field now populated.

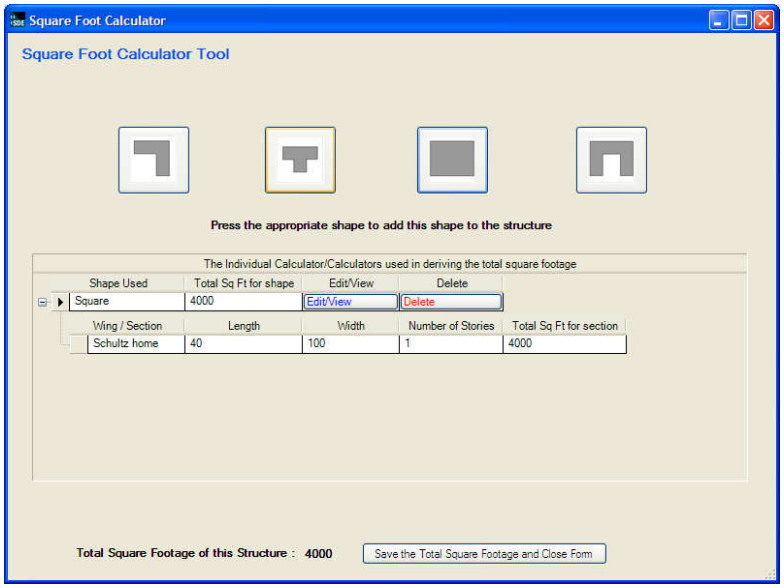


Figure 3-23. Square Foot Calculator Tool for Residential Structures

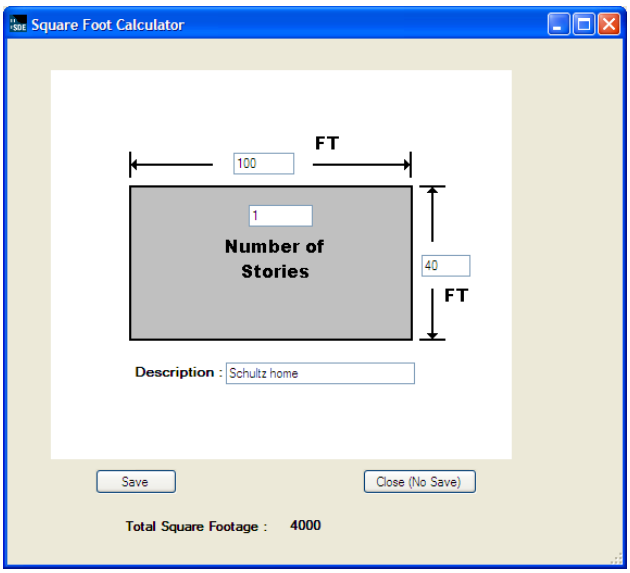


Figure 3-24. Square Foot Calculator Data Entry Screen

The *Total Square Footage* value is based on living space for the floors above ground and is calculated by multiplying the length times the width times the number of stories above ground (length and width are in units of feet). For split-level homes, the number of stories

can be entered as 1.5 and the square footage is adjusted accordingly. Users cannot enter *Total Square Footage* value on the ***Cost*** tab without using the calculator, which requires length and width dimensions. Another method for entering square footage is to create a square footage field and import it using the enterprise import function.

Basement and garage floor space are not always included in the square footage calculation because they may not be considered habitable areas. However, most cost estimating guides will consider a garage to be an additional adjustment and it should be entered within the tool as such. A basement is the foundation of a structure, and therefore is already being considered within the cost. For additional upgrades to the basement floor space, the added value may be accounted for in the adjustment field.

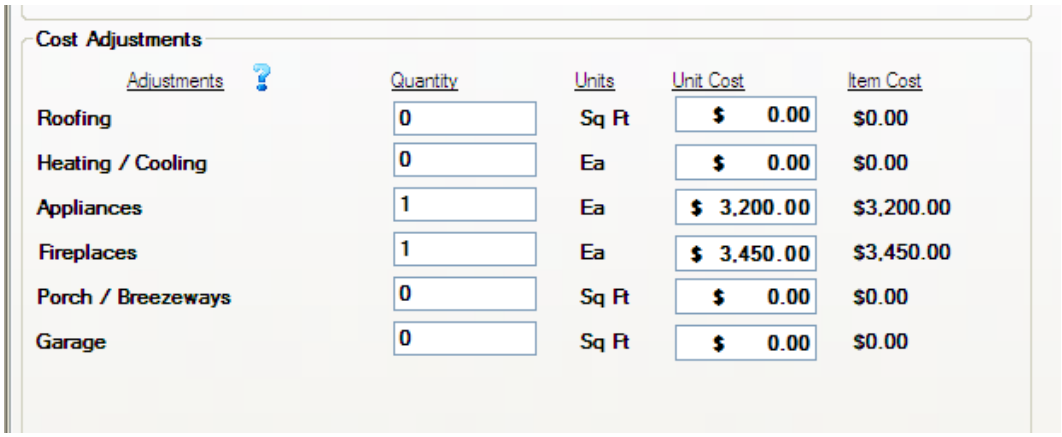
The *Cost per Sq. Ft.* value is the unit cost (without any adjustments) for the type, quality, and style of house identified by the user on the ***Structure/Damage/NFIP Info*** tab and is obtained from an industry-accepted residential cost-estimating guide or locally or regionally developed cost data. *Geographic Adjustment* is also obtained from a cost-estimating guide and adjusts the *Cost* for geographical variations for labor and material costs around the country. It may also be used to adjust the cost based on dates (i.e., year) if appropriate.

The quality of a residence's construction will influence its cost. Since quality can vary within a given type of residence, the square-foot method (i.e., determining unit costs on a square-foot basis) provides different levels of quality for each type of residence. Examining both materials and workmanship is fundamental when determining the overall quality of construction. While the quality of materials and workmanship of individual building elements may vary, the overall quality tends to be consistent for the entire residence.

To assist the user in determining the level of quality, basic descriptions are provided in industry cost-estimating guides for each type of residence at each quality level. These descriptions are not intended to be detailed for a particular residence, but are intentionally general to emphasize the most prominent characteristics of all residences within a given type and quality.

Regardless of the quality and type, the size of the residence will influence its *Cost per square foot.* A small residence may have a higher unit cost than a larger one of the same quality. To account for the differences in cost for varying sizes, residence cost tables should provide costs for a range of sizes at a given quality. Each cost table has parameters that are unique for that particular type of residence.

2. In the *Cost Adjustments* section, some adjustments, such as fireplaces and porches, are in addition to those included in the Cost. Other adjustments, such as roofing or floor covering, are included when the quality of the item exceeds what is normally found in a residence of the quality selected in the *Structure Information* section of the ***Structure/Damage/NFIP Info*** tab. The items listed under the *Cost Adjustments* section shown in Figure 3-25 should involve quantities and unit costs for adjustments in excess of the standard features for the selected type of residence.



Cost Adjustments

Adjustments	Quantity	Units	Unit Cost	Item Cost
Roofing	0	Sq Ft	$ 0.00	$0.00
Heating / Cooling	0	Ea	$ 0.00	$0.00
Appliances	1	Ea	$ 3,200.00	$3,200.00
Fireplaces	1	Ea	$ 3,450.00	$3,450.00
Porch / Breezeways	0	Sq Ft	$ 0.00	$0.00
Garage	0	Sq Ft	$ 0.00	$0.00

Figure 3-25. Residential Adjustments

Most of the adjustments listed on the ***Cost*** tab are based on square footage of the element (i.e., *Porches/Breezeways*). Other adjustment categories involve lump-sum values for items such as *Fireplaces*. The application provides the user with the necessary input fields for each adjustment. An industry-accepted residential cost-estimating guide should be referenced to determine unit and lump-sum costs for adjustments.

It is important that the user understand adjustments and carefully consider whether adjustments should be included in the cost evaluation. If the evaluator is using a very basic cost estimate that does not include the listed adjustments in the unit cost, then the adjustments should be added to the overall building cost. However, if the evaluator is using a price per square foot that is more consistent with the actual building being evaluated, then the cost of the adjustments are likely included in this cost and should, therefore, not be included in addition to the cost derived from the square-foot cost. Including the adjustments in this building value will result in pricing those items twice and inaccurately inflating the value of the structure.

3. In the *Additional Adjustments* section, adjustments (Figure 3-26) not listed in the *Cost Adjustments* section can be entered into the fields provided in this section. These fields can be used when the value of the element of the structure is based on square footage or quantity.

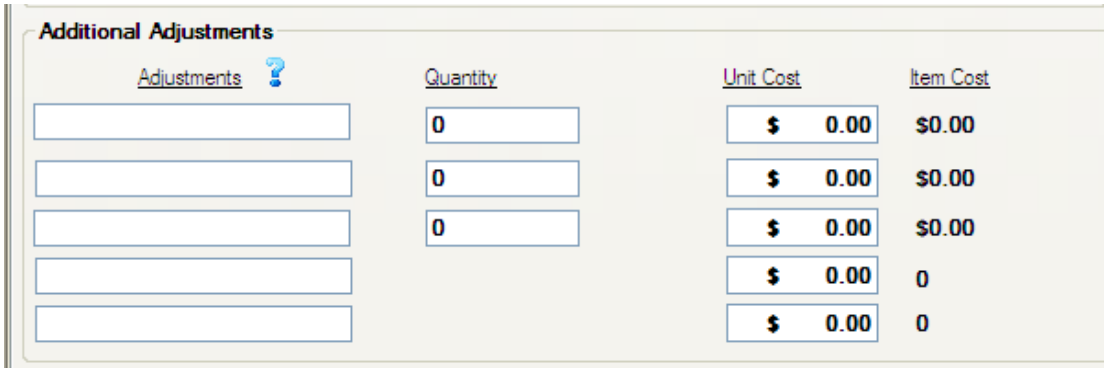


Figure 3-26. Additional and Lump-Sum Adjustments

4. Under the *Computed Actual Cash Value* section (Figure 3-27), the *Total Adjustments* calculations field provides the total cost of the adjustments that were selected in the previous sections of the ***Cost*** tab. The *Total Replacement Cost* is based on the total square footage of the building and represents the sum of the *Cost* and the *Total Adjustments*. The SDE software separates the building into various construction elements and assigns a percentage value to each. Local officials can use this software to determine the percent damage of each element.

   The industry-accepted residential cost-estimating guide, professional appraisal, locally developed and vetted cost data, or other acceptable cost data reference used as the basis for the determinations made within the software should be entered in the *Cost Data Reference* and *Cost Data Date* fields in this section (Figure 3-27). Some estimating guides involve either quarterly or annual cost updates. Therefore, the publication date is vital when specifying the document used as source material.

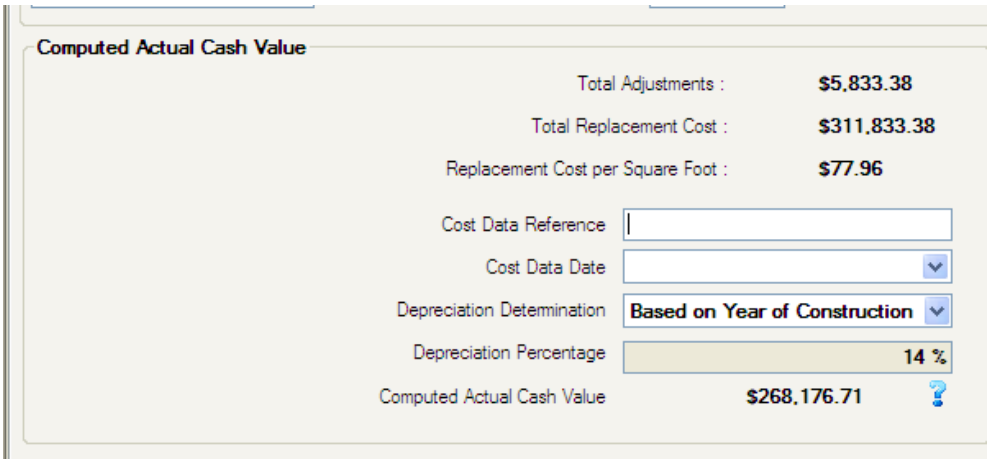


Figure 3-27. Computed Actual Cash Value

Depreciation (Figure 3-27) is often factored into the *Computed ACV* of the building. The lifespan of a structure is dependent on a variety of factors, including the quality of the original construction, building materials used, and maintenance performed on the structure throughout its life. While a higher quality of construction and building materials can lengthen the structure's life span, it is the current condition that primarily determines the depreciation of a structure.

Some building materials, such as roofing and siding, have a shorter lifespan than other components of the structure, such as the foundations or supporting beams. For example, the typical lifespan of a house is 50 years (with zero maintenance), but the typical lifespan of an asphalt shingle roof is only 20 years.

Determining the exact depreciation of a structure can be difficult. However, general guidelines can be followed. The rate of depreciation used in the software is based on guidance from the U.S. Department of Housing and Urban Development, which estimates that houses depreciate at a rate of 1.14 percent per year from the date of construction ("The User Cost of Homeownership," *U.S. Housing Market Conditions Summary,* http://www.huduser.org/periodicals/USHMC/summer2000/summary-2.html). The depreciation continues until the house is no longer habitable. However, few structures receive no maintenance during their lifespan, which is why there are numerous buildings across the country that are a hundred or more years old. Therefore, depreciation is often not a straight-line calculation. The total depreciation of a structure should be reviewed and adjusted to match its current condition by using the date of a major renovation or the general condition of the structure.

Every so often, homes need a major renovation in order to maintain the desired condition of the structure. If a structure undergoes a renovation or restoration, the building's age can be considered much lower than the age based on original construction. In this case, the date of completion for a major renovation project should be used to calculate the structure's age for depreciation instead of the date of its original construction. For example, if a structure originally built in 1900 was completely restored in 2000, the depreciation calculation should be based on an age of 9 years, not 109 years (if the assessment takes place in 2009).

3.4.4.3.1 Structure Condition

Another consideration of how quickly a structure depreciates is the condition in which it is maintained. If homeowners keep up with basic maintenance, the house can stay in great shape. Under these circumstances, straight-line depreciation may not be appropriate. The rate of depreciation will be a combination of condition and structure age since the last major renovation. Structure condition should not be confused with Quality of Construction, which is used to represent the level and quality of workmanship and construction used when the structure was built. Condition, rather, should reflect the status of the structure just before damage occurred. If the structure was not taken care of and maintenance was not performed, the condition will be lower, but if the structure was well maintained, the condition should be higher. This field is not located within the tool as a drop down menu—rather, if structure condition is going to be used to determine the depreciation, the condition should be written in the *Residential Information* field under ***Structure Information***. The following are typical condition descriptions and characteristics and how they correspond to depreciation percentages (the year ranges provided refer to age since last major renovation):

- Excellent Condition (new): These homes are kept in brand new condition; typically homes only remain in this condition for a few years since owners do not constantly replace components (exterior walls, roofing) required to keep the home in this condition. Homes in this condition are generally only 3 percent depreciated.

Figure 3-28. Examples of Excellent Condition

- Good Condition: These homes are well maintained without overt signs of wear and no obvious maintenance needed, but the structure's components have clearly aged. The depreciation of homes in good condition varies based on the age of the structure, but top out at approximately 20 percent.

  0 to 5 years: 3 percent

  5 to 10 years: 7 percent

  10 to 15 years: 11 percent

  15 to 20 years: 14 percent

  20 to 25 years: 17 percent

  25+ years: 20 percent

Figure 3-29. Examples of Good Condition

- Average Condition: These homes are maintained to a certain degree, but some repairs are visibly needed. The structure components are still functional and maintaining the structure's life expectancy; however, some may require replacing in a few years. Structures in average condition typically are not depreciated more than 30 percent.

  0 to 5 years: 5 percent

  5 to 10 years: 9 percent

  10 to 15 years: 13 percent

  15 to 20 years: 18 percent

  20 to 25 years: 23 percent

  25 to 30 years: 26 percent

  30+ years: 30 percent

Figure 3-30. Examples of Average Condition

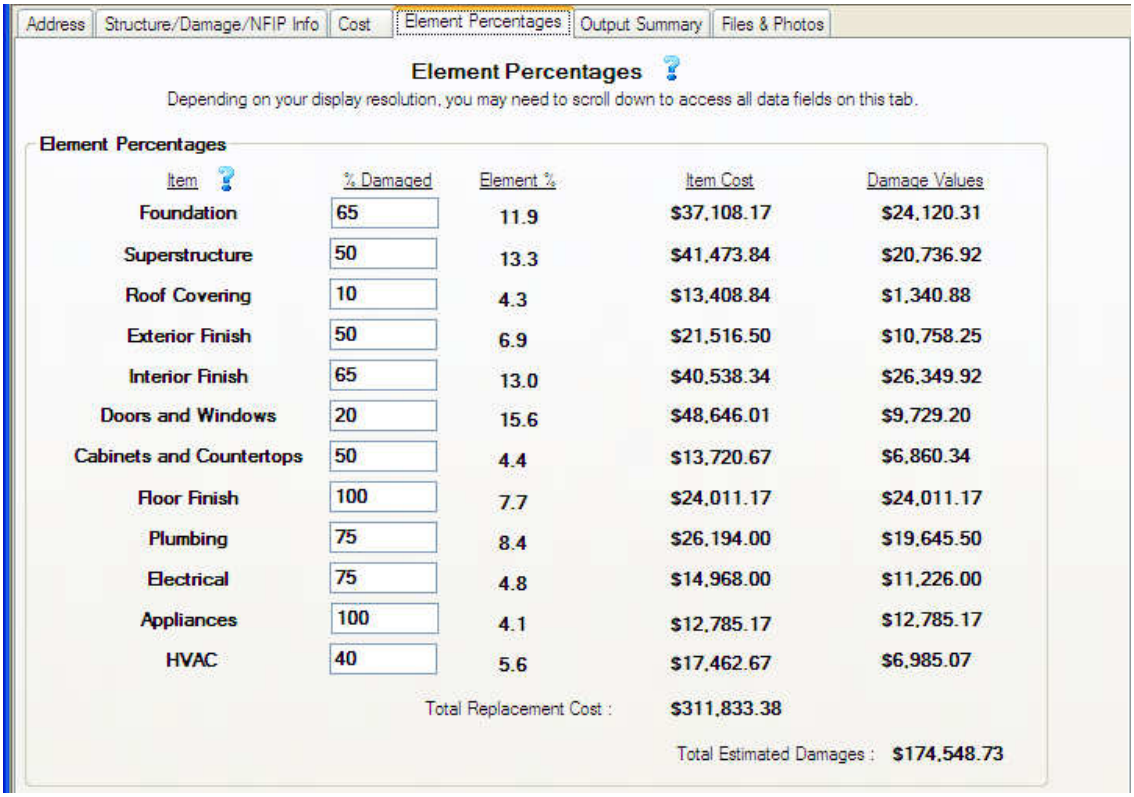
The SDE tool has the option of either the straight-line method (1.14 percent per year) or entering user values for determining depreciation. The drop-down box for the field *Depreciation Determination* allows the user to select "Based on Year of Construction" to have the tool automatically calculate the depreciation based on the 1.14-percent per-year value described above, or "Other" to allow the user to manually enter a depreciation rate. If "Other" is chosen, the user is required to provide a justification explaining the depreciation rate entered. If the pre-damage condition of the structure was used to determine the depreciation rate, the condition and supporting information should be listed in the justification.

Once the depreciation value is determined, the application will automatically adjust the *Total Replacement Cost* to determine the *Computed ACV*. The *Computed ACV* may be used as a reasonable approximation of market value in determining substantial damage (FEMA, 1991). The *Computed ACV* is used as the denominator in the ratio for the substantial damage determination on the ***Output Summary*** tab.

3.4.4.4 Element Percentages Screen

The ***Element Percentages*** tab (Figure 3-31) uses 12 building element categories to assist in determining an amount of *Total Estimated Damages*. This value is the numerator (refer to Section 2.0) of the ratio used to determine whether a structure is substantially damaged, the results for which are shown on the ***Output Summary*** tab.

For estimating purposes, a building is divided into 12 general construction categories (e.g., plumbing, foundations, appliances, etc.). The software allows the element percentage for each of the 12 construction categories to be customized based on the attributes of the subject building. Once the user has completed the information on the ***Structure/Damage/NFIP Info*** tab, the *Element %* for each category is calculated and is populated on the ***Element Percentages*** tab. The *Item Cost* is multiplied by the user-entered *% Damaged* to determine the *Damage Values*. The sum of the individual damage values is equal to the *Total Estimated Damages* value.



Item	% Damaged	Element %	Item Cost	Damage Values
Foundation	65	11.9	$37,108.17	$24,120.31
Superstructure	50	13.3	$41,473.84	$20,736.92
Roof Covering	10	4.3	$13,408.84	$1,340.88
Exterior Finish	50	6.9	$21,516.50	$10,758.25
Interior Finish	65	13.0	$40,538.34	$26,349.92
Doors and Windows	20	15.6	$48,646.01	$9,729.20
Cabinets and Countertops	50	4.4	$13,720.67	$6,860.34
Floor Finish	100	7.7	$24,011.17	$24,011.17
Plumbing	75	8.4	$26,194.00	$19,645.50
Electrical	75	4.8	$14,968.00	$11,226.00
Appliances	100	4.1	$12,785.17	$12,785.17
HVAC	40	5.6	$17,462.67	$6,985.07

Figure 3-31. Percent Breakdown Screen for a Residential Structure

The *Item Cost* (column 4 of Figure 3-31) is the result of the *Element %* multiplied by the *Total Replacement Cost* from the ***Cost*** tab. In the data contained in Figure 3-31, the *Element %* for Foundation is 11.9 percent. This percentage is fixed in the table based on the attributes selected in the ***Structure/Damage/NFIP Info*** tab (i.e., it cannot be changed by the user). The building's *Total Replacement Cost* is $226,409.40, and was carried over onto this tab from the ***Cost*** tab. Therefore, the *Item Cost* for the Foundation construction element is 11.9 percent of $311,426.40, or $37,059.74.

The input data required from the field inspection include the *% Damaged* of each element listed. These data are determined by the inspector in the field and should be a defensible value. The value should be entered as whole number between 0 and 100. If a value less than 1 is entered, for example 0.6, this is 0.6 percent or 0.006. These are the only values that must be supplied by the user on this tab.

3.4.4.5 The Output Summary Screen

The ***Output Summary*** tab (Figure 3-32) summarizes the computations for building value and damages as well as the calculated damage percentage. It also includes option boxes that allow the user to select which damage estimate and building value to use in making the substantial damage determination. Each of the sections on Figure 4-18 is described in detail below.

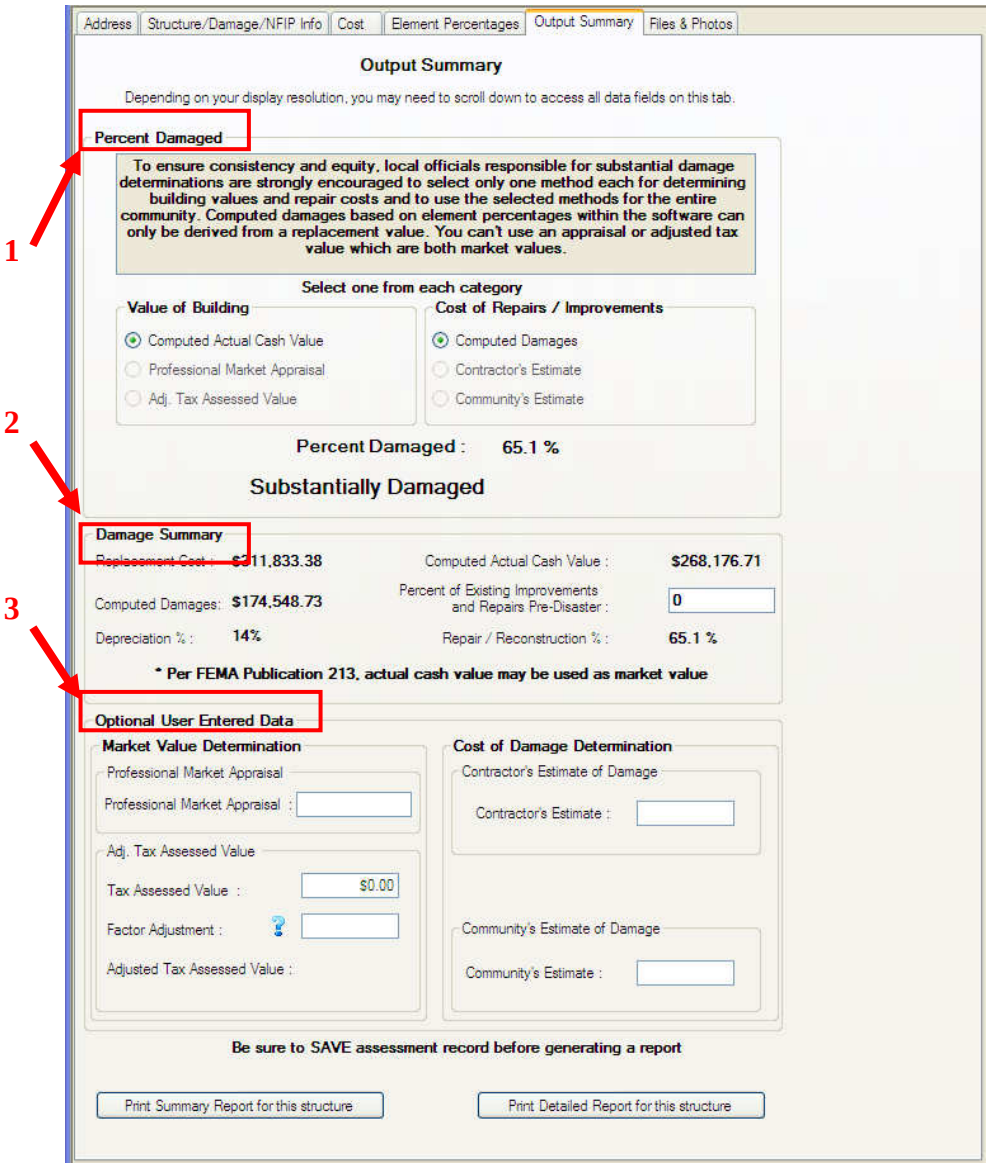


Figure 3-32. Output Summary

1. The *Percent Damaged* section of the ***Output Summary*** tab (Figure 3-32) contains *Value of Building* and *Cost of Repairs/Improvements* fields. Both of these can be calculated using three different methods. These methods include Computed ACV, Adjusted Tax Assessed Value, and Professional Market Appraisal for the building value, and Computed Damages, Contractor's Estimate, and Community's Estimate for the repair/improvement costs. The two option group boxes permit the user to select the most appropriate sources of data for use in the substantial damage determination. The standard selections, computed within the SDE software, are the Computed ACV and Computed Damages. The calculated *Percent Damaged* for the selected methods is shown near the middle of the upper portion of the tab.

   Community officials can use any combination of methods (one from each of the two categories). Optional data are entered in the bottom portion of this tab in the area identified as *Optional User Entered Data*. However, officials are strongly urged to be consistent in their determinations by using a selected method on a community-wide basis to ensure that substantial damage determinations are prepared and evaluated in a consistent and equitable manner.

2. The *Damage Summary* section (Figure 3-33) carries over the Replacement Cost, Computed Damage, Depreciation Percent, and Computed ACV from previous tabs. If available, the user may enter an estimated value for a *Percent of Existing Improvements and Repairs Pre-Disaster*. This value should reflect the percent of the structure that has been renovated, repaired, or improved. The purpose of this field is to record pre-existing work to the structure, so that the cumulative determination for the structure can be calculated outside of the tool as needed.

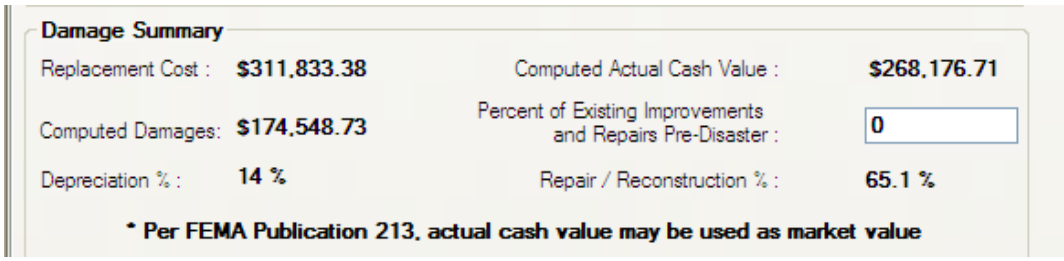


Figure 3-33. Damage Summary

3. When *Optional User-Entered Data* (Figure 3-34) are being considered, the accuracy of the user-entered data must be evaluated. This is especially true when the software indicates that the building is between 40 percent and 60 percent damaged. The closer the level of repair/improvement costs to 50 percent of the value of the building, the greater the precision needs to be in determining substantial damage. Situations where the property owner requests an administrative or judicial review or appeal most likely will occur when the building is declared substantially damaged and the percentage falls between 50 percent and 60 percent.

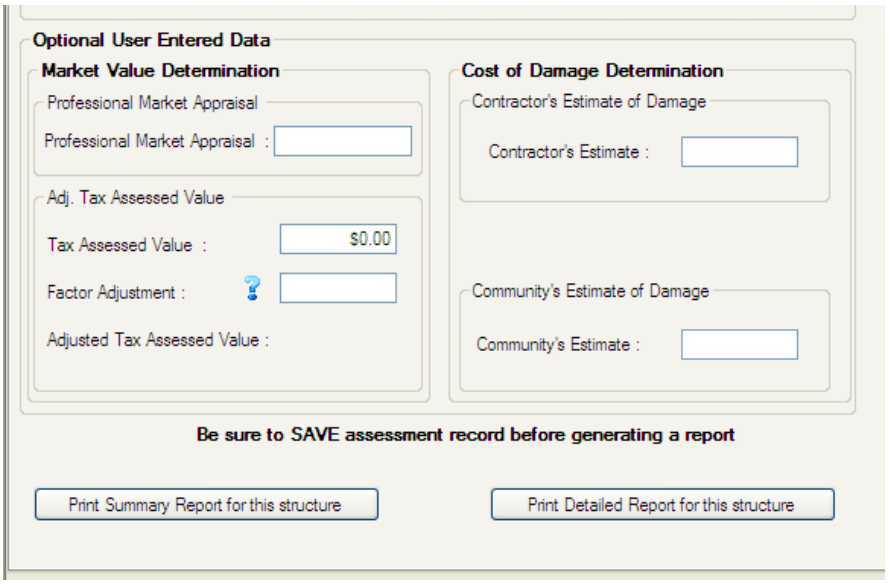


Figure 3-34. Optional User-Entered Data

An adjusted, tax-assessed value or a professional appraisal may be used in lieu of the Computed ACV determined by the SDE software. If the assessed value is based on the value of the land and building, the value of the land should be subtracted.

If the assessed value is based solely on the building, an adjustment may be required to increase the value, since these values tend to be less than Computed ACV or Market Value. This adjustment may be made by using a *Factor Adjustment* in the data field provided, and should be based on the normal adjustment procedures used in the county or community where the building is located. The factor likely will be higher than 1.0 and should be entered as a whole number. For example, if you want to increase the assessed building value by 10 percent, input a value of 1.1.

Officials can also use a contractor's estimate or the community's estimate of repair costs instead of the SDE-computed damages. Contractor estimates should be very specific, all-inclusive of the work required to put the building back to its pre-damage state, and reflect reasonable material and labor costs for the area. Donated or discounted materials and labor must be evaluated at fair market value (FMV) for the area, because the substantial damage determination process requires use of the true cost of repairs. Communities can provide their own repair estimates if the estimates are complete and reflect the general cost of materials and labor for the area. The Community providing its own repair estimate must be willing to stand behind its estimates. The SDE Field Workbook contains a list of recommended construction elements to be included in either contractor or community estimates of repair costs.

3.4.4.6 Files & Photos

The primary function of the ***Files & Photos*** tab (Figure 3-35) is to upload and store photographs and files (e.g., maps and drawings) associated with the subject structure that will provide backup information for the estimate. Following the on-screen instructions, the user should select the button labeled "Select Photo/File" and choose the file to be added. Once one or more files have been added, select the "Default" file under the file that is desired to be displayed in the summary report and community report for that assessment.

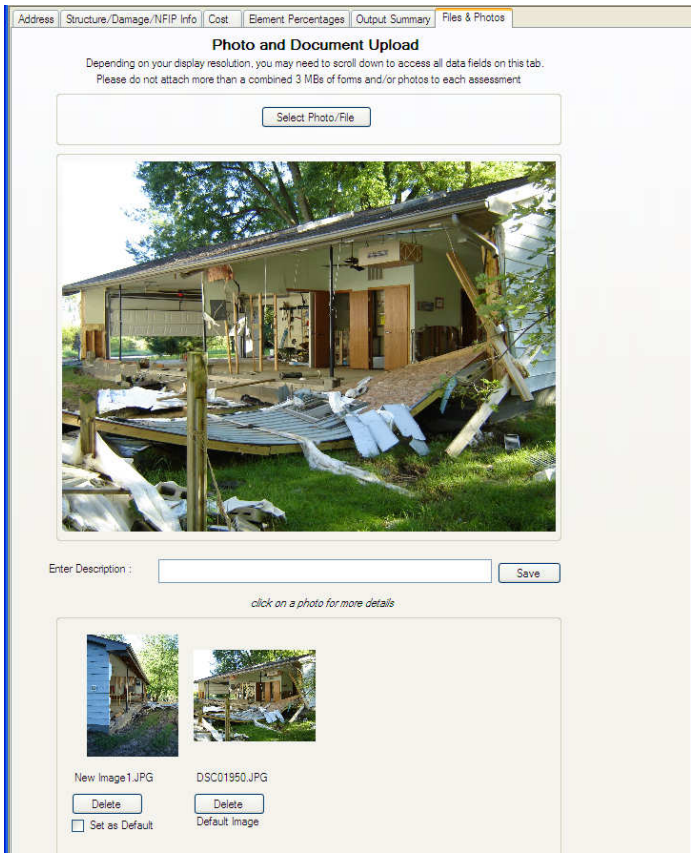


Figure 3-35. Photo and Document Upload

3.4.5 Non-Residential Structures

Upon choosing "Add New Non-Residential Structure" from the main menu, the application will open a screen with six tabs. As in the residential structure portion of the tool, the first four tabs have input fields where the user must provide data in order to determine the percent damage. The tabs are arranged in the order that the user should input the data. The fifth tab (***Output Summary***) provides the results of the substantial damage determination, and the sixth tab (***Files & Photos***) is an interface to allow the user to attach documents and pictures to the record. The following flow chart (Figure 3-36) shows the types of information, by tab, entered into or displayed by the tool to create a record for a property.

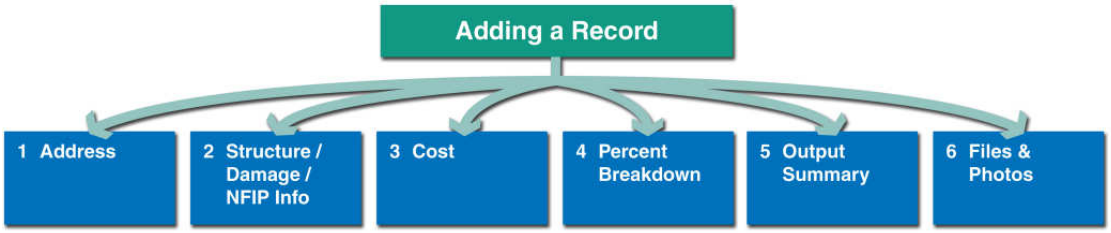


Figure 3-36. Adding a Record for Non-Residential Structures

3.4.5.1 Address Information Screen

The first tab is the ***Address*** tab, where the user enters property owner, occupant, and address information. It is important to get accurate data for location purposes on this tab, including contact information for the occupant or the property owner (which in many cases is not the occupant of the non-residential structure), if any follow-up is later found to be necessary. Figure 3-37 shows the address tab and presents sample data. Each of the sections in the figure is explained in further detail following the figure.

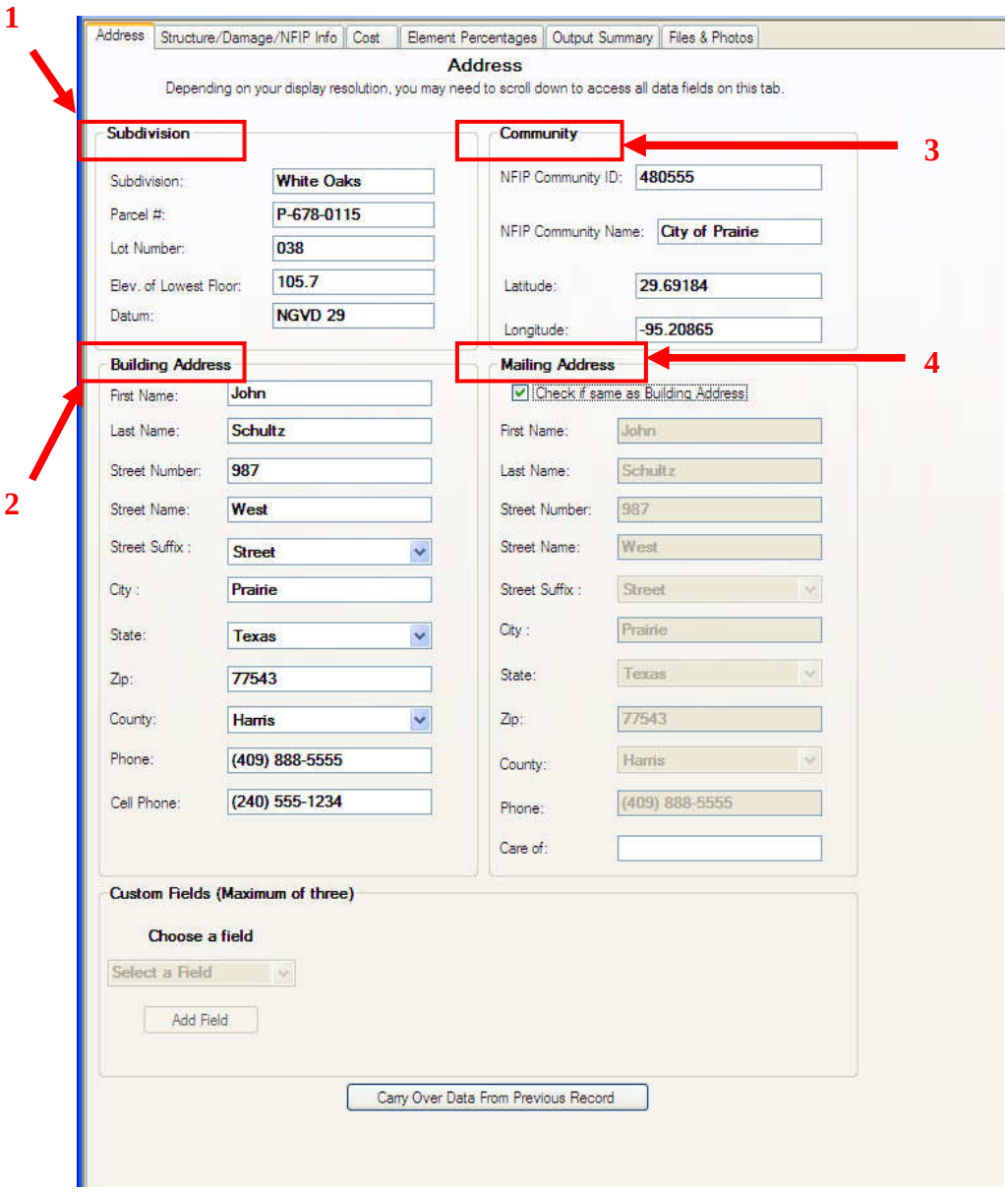


Figure 3-37. Address Information for Non-Residential Structures

1. The *Subdivision* section contains data fields for the subdivision name, community parcel and lot numbers, and the elevation of the first floor along with its reference datum. Parcel and lot number information is generally available from community tax assessment records. The elevation data may be available from community floodplain management or building code enforcement offices.
2. Under the *Building Address* section, the user can enter the property address of the site as well as contact information for the occupant. A pull-down menu for the street suffix is provided to ensure a uniform format can be used for all street types (e.g., Avenue, Boulevard, etc.). If the structure is a rental property, then the resident's information and the structure address should be entered into the *Building Address* section.
3. In the *Community* section, the NFIP CID and community name are entered. SDE Program users should have copies of FIRMs for the affected area before going into the field. This NFIP information is available from the FIRMs. There is also a field for latitude and longitude coordinates, which can be acquired onsite using a handheld GPS device. Accurate latitude/longitude coordinates are essential for GIS mapping, and are required on FEMA mitigation grant applications.
4. If the non-residential structure is not owner occupied, than the owner's name and mailing address may be provided in the *Mailing Address* section. If the owner is the occupant and his/her mailing address is the building address, there is a check box at the top of the *Mailing Address* section that, when checked, will automatically populate the section with data from the *Building Address* section.

The fields that are suggested to be completed on the ***Address*** tab are all within the *Building Address* and *Mailing Address* sections and include the address number, street, street suffix, city, State, zip code, and county. All of these fields will be marked with a green pushpin if they are not completed and the user attempts to save the file; this means that the user may still save the file, but it is highly recommended this information be entered (see Figure 3-38). Fields that are necessary to prepare a complete record and that will be marked with a yellow pushpin if they are empty following a save attempt include: the elevation of the lowest floor, the resident's first and last name, and his/her phone number. The *NFIP CID* is the only field on this page that will be marked with a red pushpin if incomplete or insufficient.

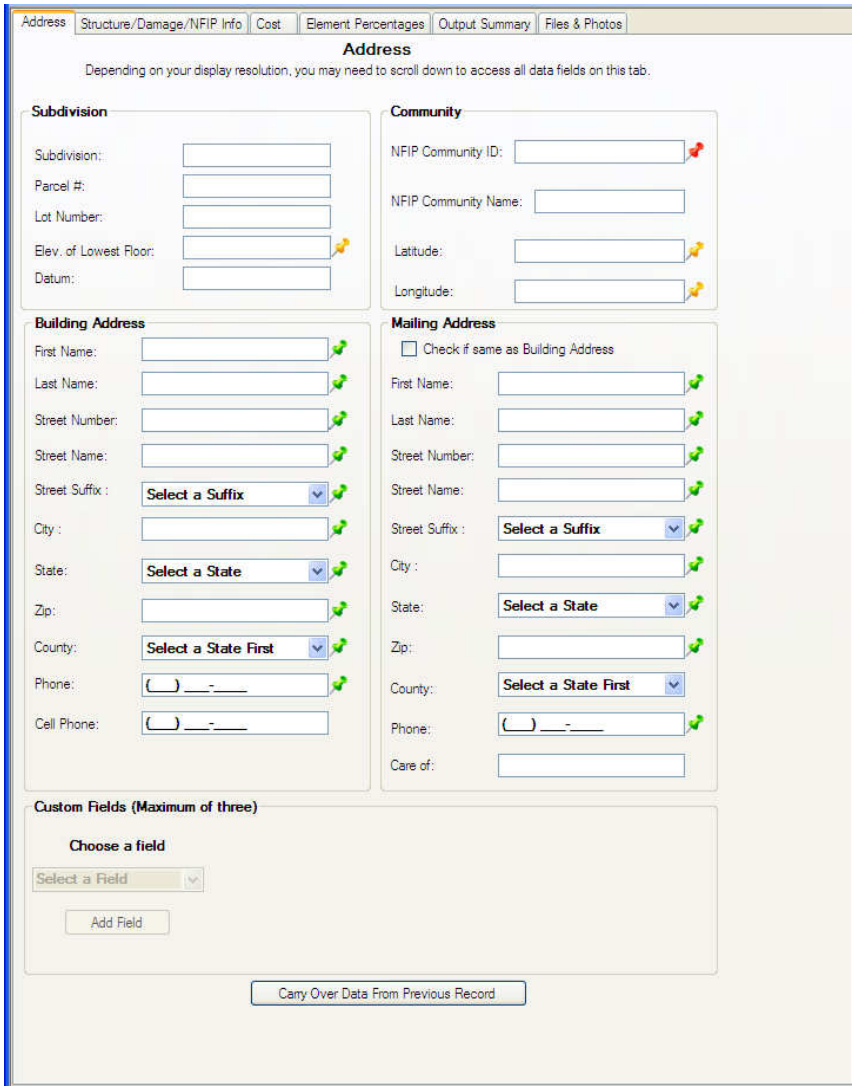


Figure 3-38. Address Tab Required Data for Non-Residential Structures

Data that are not necessary, but can be valuable in helping to identify property location include the subdivision name, property parcel and lot number, and NFIP Community Name.

3.4.5.2 Structure/Damage/NFIP Info

The second tab is titled ***Structure/Damage/NFIP Info***. On this tab, the user provides some basic information about the structure type and the structure's attributes, when and how it was damaged, inspector information, and NFIP FIRM data for the site. Figure 3-39 shows the ***Structure/Damage/NFIP Info*** tab with its sections explained in further detail following the figure.

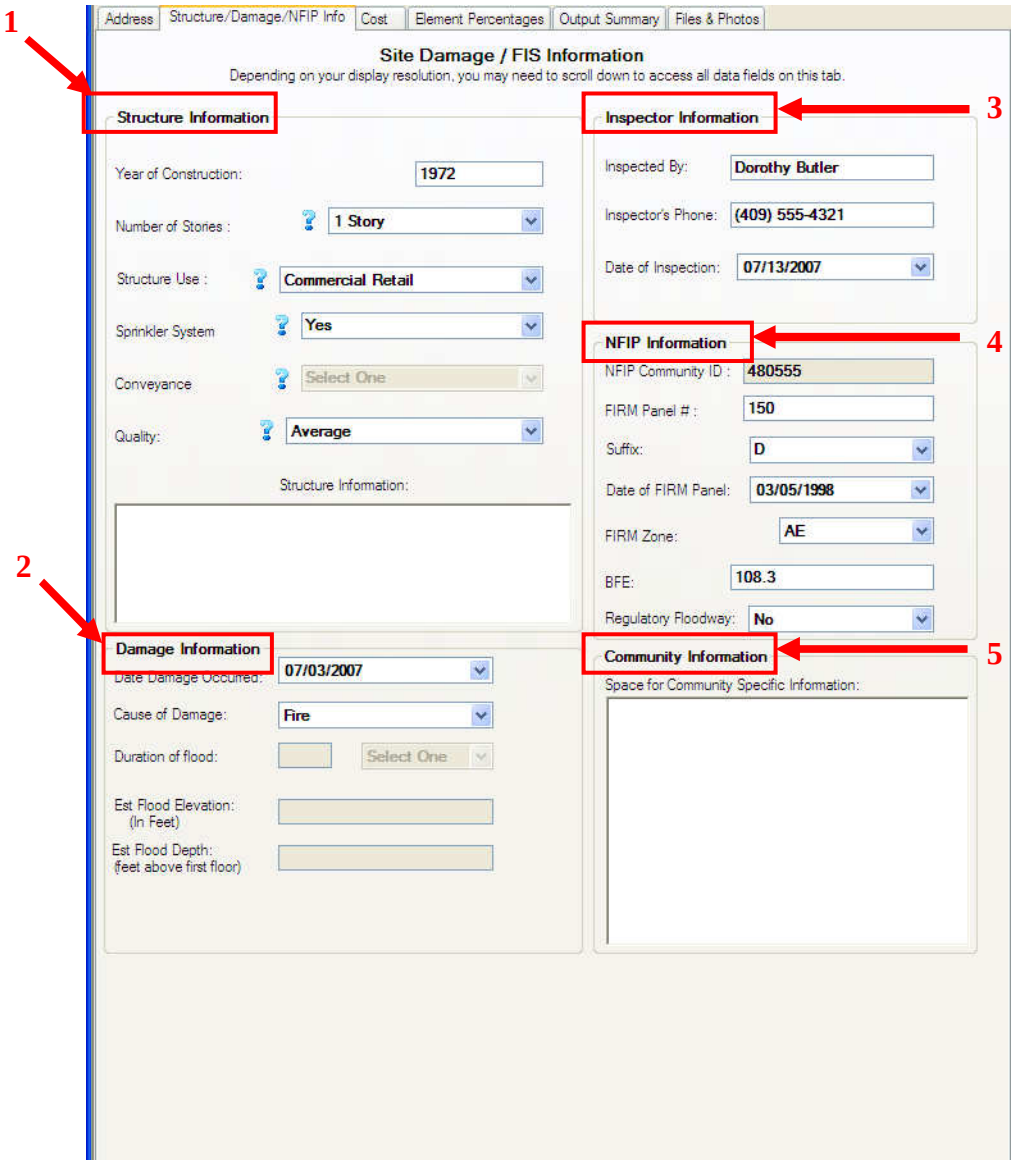


Figure 3-39. Structure/Damage/NFIP Info Tab for Non-Residential Structures

1. Data in the *Structure Information* section characterize the age and quality of construction as well as structure characteristics that should be used to determine the *Total Replacement Cost* value on the ***Cost*** tab. The *Number of Stories*, *Structure Use*, and

existence of a *Sprinkler System* and/or *Conveyance* affects the element percentage array for the subject building used to compute the *Total Estimated Damages* on the ***Element Percentages*** tab. The *Year of Construction* needs to be provided in this section and it needs to be in the full, four-digit format.

For non-residential structures there are six levels of construction quality. The following are the levels of building quality available for non-residential construction:

1. Low	4. Good
2. Budget	5. Excellent
3. Average	

The structure should be evaluated for the quality of building materials used and the level of care used in construction of the building. Buildings typically will fall into the average level of construction, as non-residential structures are typically engineered and a more strict process is used during their construction than for many residential structures. The evaluator will more than likely be deciding whether the building is of Budget, Average, or Good quality. Older buildings that were not engineered may fall into the Low category, and it should be obvious which buildings are Excellent quality based on the fine details, craftsmanship, and quality of hardware, finishes, and fixtures within the building. Similar to the "Housing Quality," the "Non-Residential Construction Quality" does not impact the percentage breakdown percentage arrays, but provides the user a better understanding of the value of the cost for a building and whether the base unit cost should be increased or decreased to reflect the quality of the structure.

2. *Damage Information* to be entered into the tool includes the date and mode of damage. If flood was the mode of damage, the characteristics of the flood at the site should also be noted here.

3. In the *Inspector Information* section, the user should identify himself or herself and provide some other basic information.

4. Within the *NFIP Information* section, the user should record FIRM panel data, the SFHA designation or FIRM zone, the BFE, and whether or not the property is within the regulatory floodway.

   The *NFIP Community ID* cannot be entered in the *NFIP Information* section of this tab; it is copied from the ***Structure/Damage/NFIP Info*** tab. The inventory reports available to the user through the Reports portion of the SDE main menu rely on the identification number as a criteria for sorting the data.

   The *Regulatory Floodway* field contains a pull-down menu with the options of Yes, No, or Possible. This refers to the FEMA-designated floodway from either a FIRM or an FBFM. Clicking "Yes" indicates that the property lies within a FEMA-designated floodway, while "No" indicates that the community does not have a FEMA-designated floodway or the property is not within a floodway. The selection for "Possible" location within the floodway is available because it may be difficult to determine if a building is within the floodway while data are still being collected in the field. Floodway designations should always be verified against the appropriate FEMA map.

5. The *Community Information* section contains a memo (or notes) field where the user can enter community-specific information to explain an unusual situation about the current building or the flood event. This may include information such as "Flood was estimated to be between a 50-year and 100-year event according to the community's Flood Insurance Study." It could also include information on type of mitigation that has occurred in the past within the community or with the building in question.

As with the ***Address*** tab, some data on the ***Structure/Damage/NFIP Info*** tab must be provided to save the record, and other data are necessary to prepare a valid record, but are not required to save it. Figure 3-40 shows the data fields marked with red and yellow pushpins. As the red pushpin indicates, the data field labeled *Date of Inspection* must be populated to save the record. To prepare a valid, complete record, the fields marked with a yellow pushpin (most of the other fields on this tab) must be populated with data.

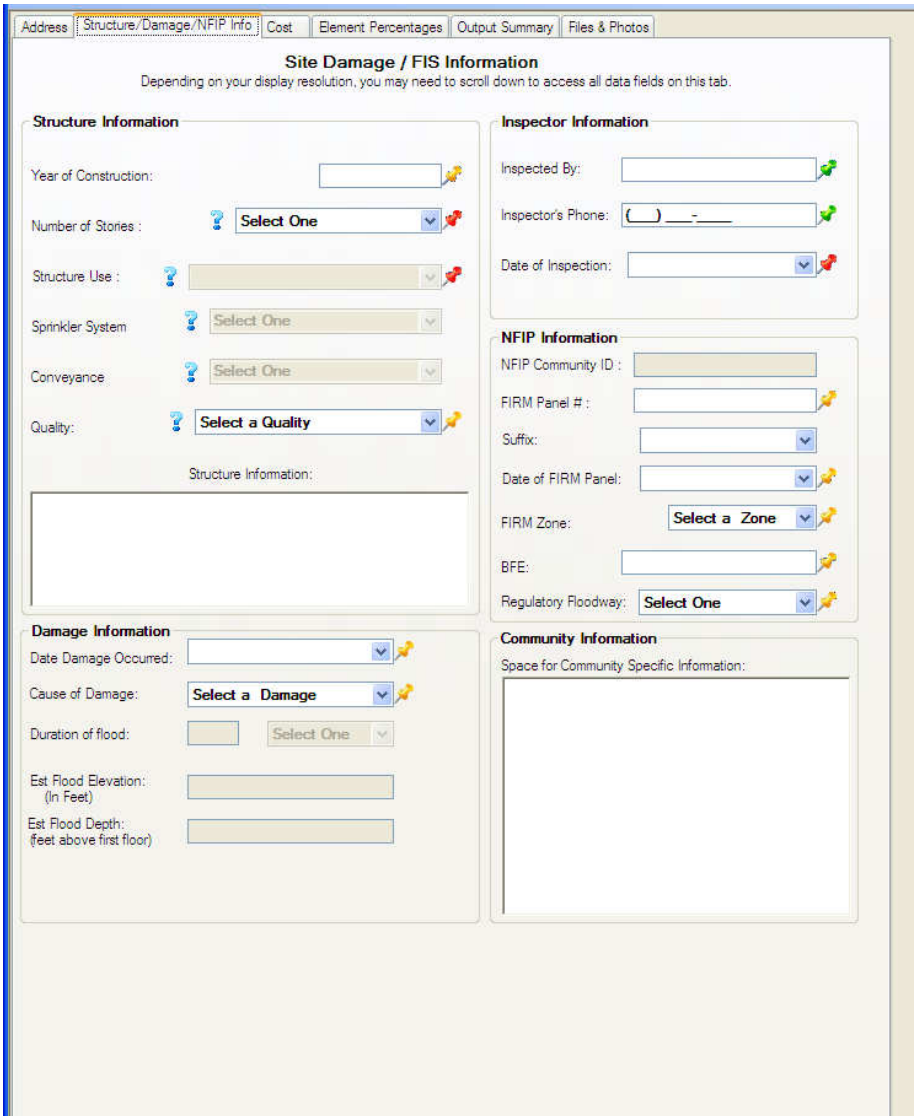


Figure 3-40. Structure/Damage/NFIP Info Tab Required Data for Non-Residential Structures

3.4.5.3 Cost

The third tab is titled ***Cost*** and is shown in Figure 3-41. On this tab, the user enters a square-foot cost for the building, unit or lump-sum costs for adjustments when applicable, and an estimated depreciation percentage in order to determine the replacement value and ACV of the structure. For the purposes of this tool, ACV is considered to be the market value of the structure. Information regarding building unit and adjustment costs is found with appropriate descriptions in industry-accepted cost-estimating guides or may be available as locally developed data.

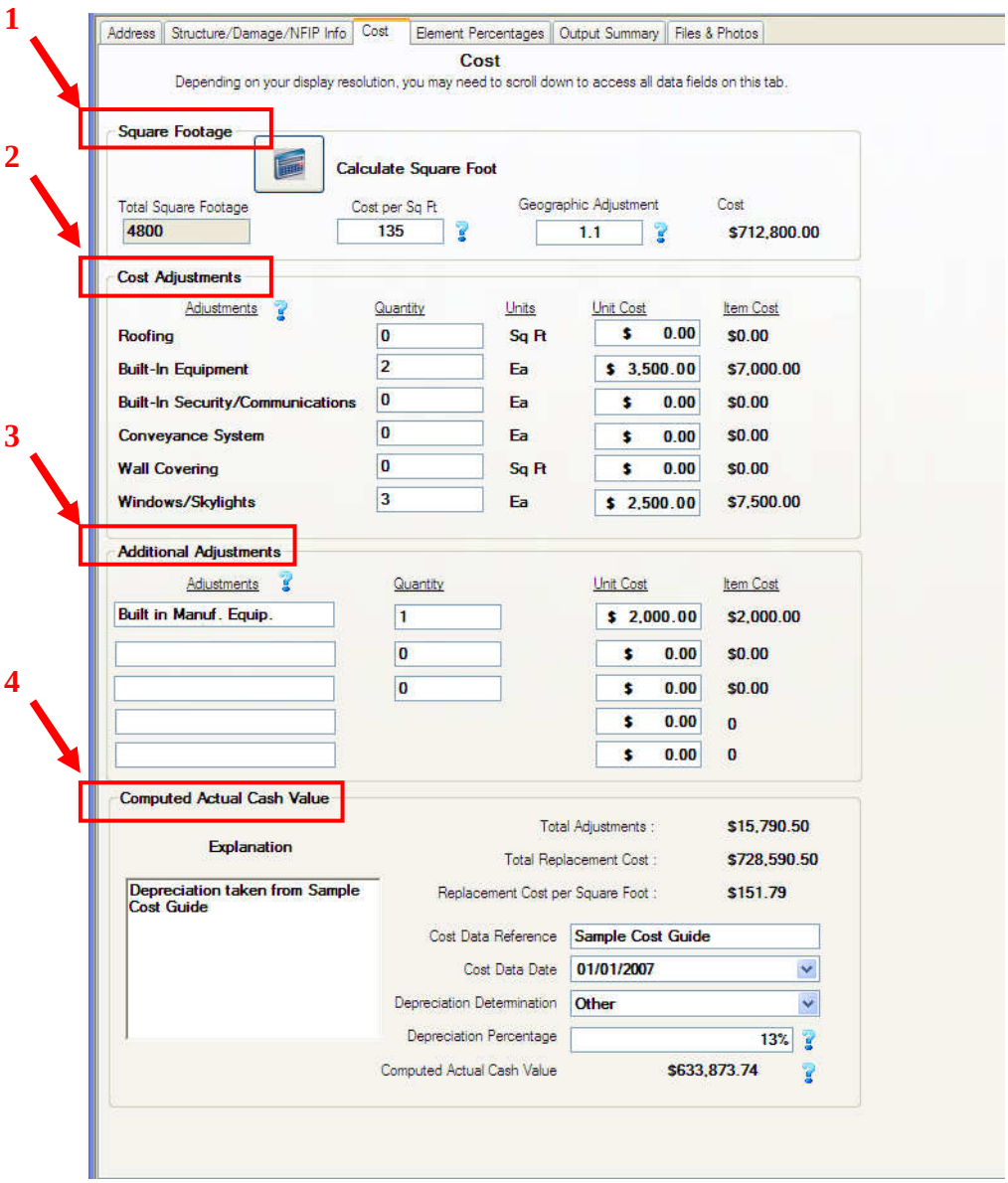


Figure 3-41. Cost for Non-Residential Structures

1. In the *Square Footage* section, the user clicks on the "Calculate Square Feet" button to enter building dimensions, determine the area of the structure, and populate the *Total Square Footage* data field. After clicking on the "Calculate Square Feet" button, a window is brought up where the user must choose from four types of building shapes (Figure 3-42).

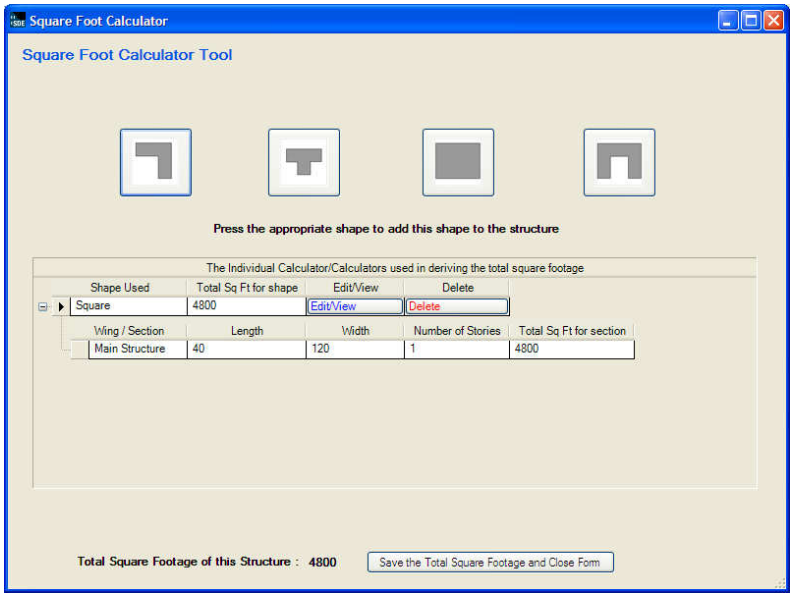


Figure 3-42. Square Foot Calculator Tool for Non-Residential Structures

When a building is selected, another window is brought up where the user enters the specific dimensions and number of stories of the building (Figure 3-43). Once the dimensions are entered, the user should click the "Calculate" button to calculate the total square footage. The user must then click the "OK" button to enter the information into the "Square Foot Calculator Tool" screen. The user should then click the submit button to return to the ***Cost*** tab with the *Total Square Footage* information now populated.

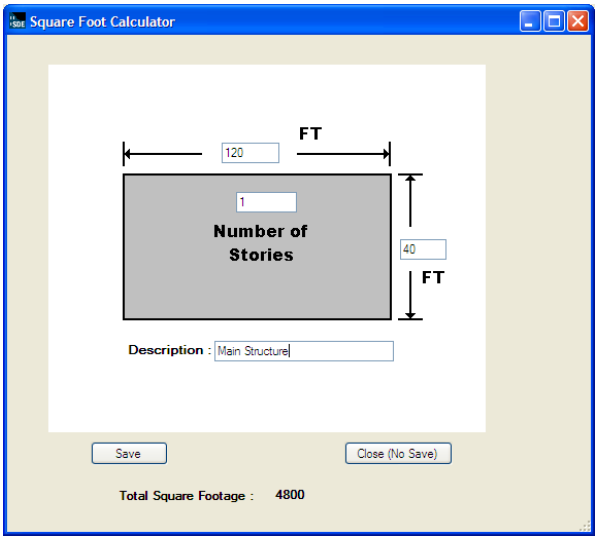


Figure 3-43. Square Foot Calculator Data Entry Screen for Non-Residential Structures

The *Total Square Footage* is based on usable space for the floors above ground and is calculated by multiplying the length times the width times the number of stories above ground (length and width are in units of feet). Users cannot enter *Total Square Footage* without using the calculator to determine an area, which requires that building dimensions be entered.

Basement floor space is not always included in the square footage calculation because it may not be considered a habitable area. A basement is the foundation of a structure, and therefore is already being considered within the cost. For additional upgrades to the basement floor space, the added value may be accounted for in the adjustment field.

The *Cost per Sq. Ft.* is the unit cost for the type, quality, and style of building identified by the user on the ***Structure/Damage/NFIP Info*** tab and is obtained from an industry-accepted cost-estimating guide. However, developing an accurate cost estimate for a non-residential structure will require a thorough review of a cost-estimating guide. Typically these guides involve a more detailed estimate and require a more experienced user than a residential guide. These guides will include costs for various types of buildings. It is important that the user evaluate the cost-estimating guide's categorization of the building instead of trying to directly apply the building classification used in the SDE. Building uses serve as one of the primary selection criteria for the percentage arrays and building classifications in the program, but while this methodology is similar to some estimating guides, it does not hold true for all guides, and the user should select a cost for the structure based upon that particular guide's methodology. It should be noted that if the cost per square foot value entered into the tool is less than $10 per square foot, a warning box will be generated to remind the user that this value should be accurate; FEMA strongly encourages the use of accurate replacement cost values rather than placeholder values.

> Both the Value of Building and the Cost of Repairs/Improvements must be determined using reasonable judgment and industry-accepted methodologies that can withstand regulatory, administrative, and judicial review.

Geographic Adjustment is also obtained from a cost-estimating guide, and this adjusts the *Cost* for date (i.e., year) and geographical variations for labor and material costs around the country. Many of the same publishers for residential guides also produce cost-estimating guides for non-residential purposes. It is important that the user evaluate the multiplying factors using the information provided in the cost-estimating guide for non-residential structures, and not try to use similar guidance provided for residential construction.

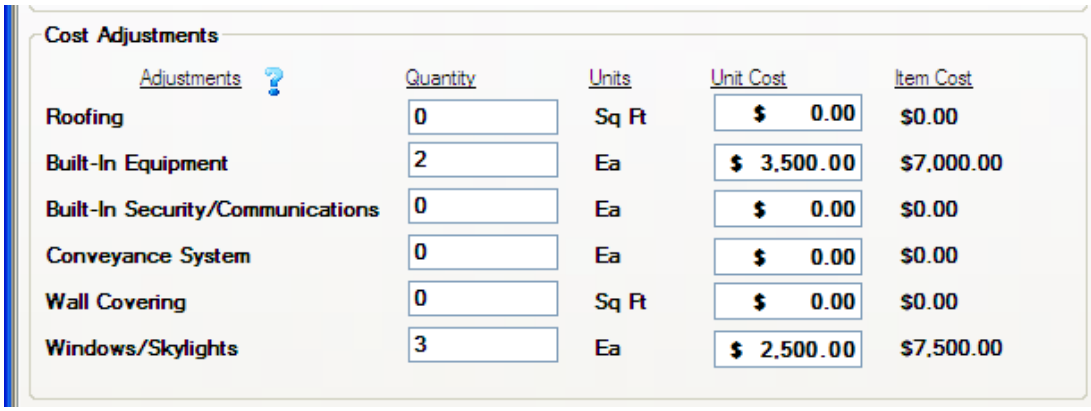
The quality of a building's construction will influence its cost. Since quality can vary within a given type of building, the square-foot method (i.e., determining unit costs on a square-foot basis) provides different levels of quality for each type of building. Examining both materials and workmanship is fundamental when determining the overall quality of construction. While the quality of materials and workmanship of individual building elements may vary, the overall quality tends to be consistent for the entire building.

To assist the user in determining the level of quality, basic descriptions are provided in industry cost-estimating guides for each type of building at each quality level. These

descriptions are not intended to be detailed for a particular building, but are intentionally general to emphasize the most prominent characteristics of all buildings with a given type and quality.

Regardless of the quality and type, the size of the building will influence its cost per square foot. A small building may have a higher unit cost than a larger one of the same quality. To account for the differences in cost for varying sizes, the building cost table should provide costs for a range of sizes at a given quality. Each cost table has parameters that are unique for that particular type of structure.

2. In the *Cost Adjustments* section, some adjustments, such as skylights, are in addition to those included in the ***Cost*** tab. Other adjustments, such as roofing or floor covering, are included when the quality of the item exceeds what is normally found in a structure of the quality selected in the *Quality* field of the ***Structure/Damage/NFIP Info*** tab. The items listed under the *Cost Adjustments* portion of the tab shown in Figure 3-44 should involve quantities and unit costs for adjustments in excess of the standard features for the selected type of building.



Cost Adjustments

Adjustments	Quantity	Units	Unit Cost	Item Cost
Roofing	0	Sq Ft	$ 0.00	$0.00
Built-In Equipment	2	Ea	$ 3,500.00	$7,000.00
Built-In Security/Communications	0	Ea	$ 0.00	$0.00
Conveyance System	0	Ea	$ 0.00	$0.00
Wall Covering	0	Sq Ft	$ 0.00	$0.00
Windows/Skylights	3	Ea	$ 2,500.00	$7,500.00

Figure 3-44. Non-Residential Adjustments

Half of the adjustments listed on the ***Cost*** tab are based on square footage of the element (i.e., roofing). Other adjustment categories involve lump-sum values for items such as built-in equipment. The application provides the user with the necessary input fields for each adjustment. An industry-accepted construction cost-estimating guide should be referenced to determine unit and lump sum costs for adjustments.

It is important that the user understand adjustments and carefully consider whether they should be included in the cost evaluation. If the evaluator is using a very basic cost estimate that does not include the listed adjustments in the unit cost, then the adjustments should be added to the overall building cost. However, if the evaluator is using a price per square foot that is more consistent with the actual building being evaluated, then the cost of the adjustments are likely included in this cost and should, therefore, not be included in addition to the cost derived from the square foot cost. Including the adjustments in this building value will result in pricing those items twice and inaccurately inflating the value of the structure.

3. In the *Additional Adjustments* section, additional adjustments (Figure 3-45) not listed in the *Cost Adjustments* section can be entered into the fields in this section of the ***Cost*** tab when the value of the element of the structure is based on square footage.

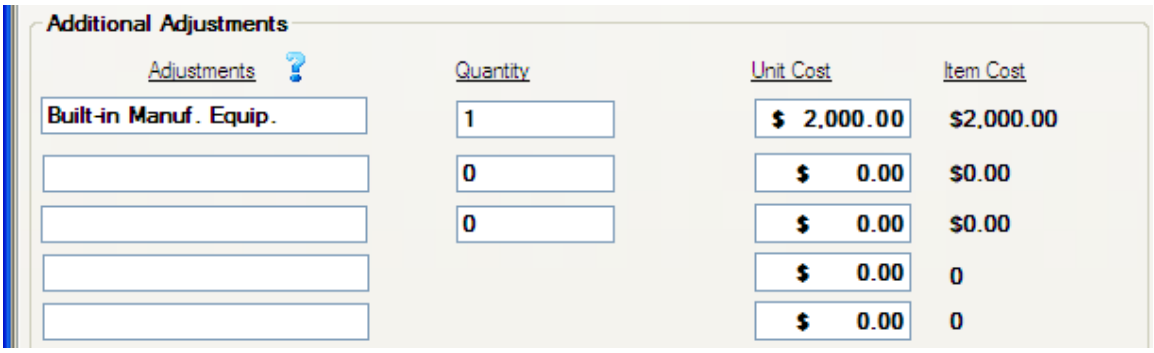


Figure 3-45. Additional and Lump-Sum Adjustments

4. The *Computed Actual Cash Value* section provides the total cost of the adjustments as selected in the previous sections of the ***Cost*** tab. The *Total Replacement Cost* (Figure 3-46) is based on the total square footage of the building and represents the sum of the *Cost* and the *Total Adjustments*. The SDE software separates the building into various construction elements and assigns a percentage value to each. Local officials can use this software to determine the percent damage of each element.

   The industry-accepted cost-estimating guide that was used as the basis for the determinations made within the software should be entered in the *Cost Data Reference* and *Cost Data Date* fields in this section (Figure 3-46). Some estimating guides involve either quarterly or annual cost updates. Therefore, the publication date is vital when specifying the document used as source material.

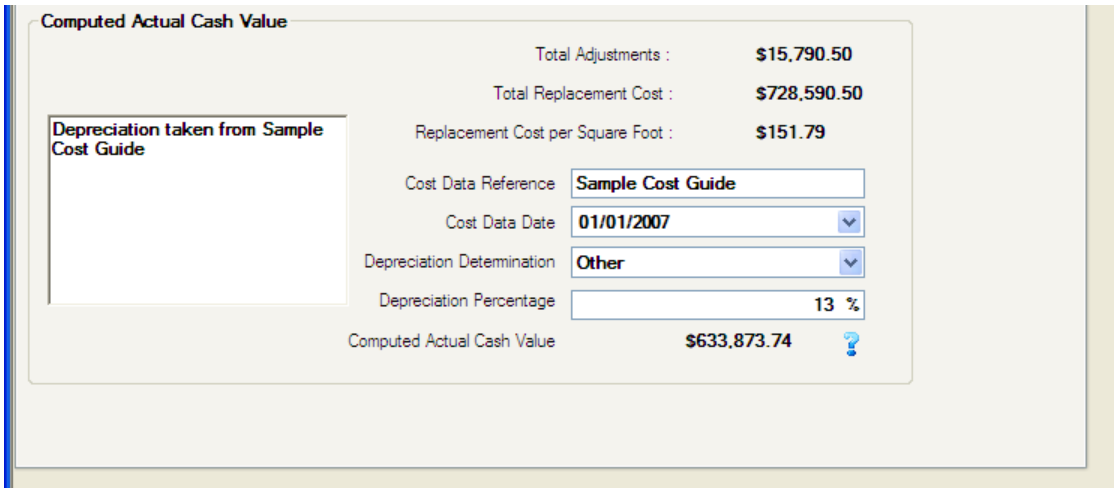


Figure 3-46. Computed Actual Cash Value

Depreciation (Figure 3-46) is often factored into the Computed ACV of the building. The lifespan of a structure is dependent on a variety of factors, including the quality of the original construction, building materials used, and maintenance performed on the structure throughout its

life. While a higher quality of construction and building materials can lengthen the structure's life span, the current condition primarily determines the depreciation rate of a structure.

Some building materials, such as roofing and exterior finish, have a shorter lifespan than other components of the structure, such as the foundations or supporting beams. For example, the typical lifespan of a non-residential structure is 60–65 years (with zero maintenance) but the typical lifespan of a 4-ply built-up roof may be only 20 years.

Determining the exact depreciation of a structure can be difficult. However, general guidelines can be followed. The rate of depreciation used in the software is based on guidance from the U.S. Bureau of Economic Analysis (BEA), which estimates non-residential structures depreciate differently depending on the structure type. For the purposes of the tool, the average rate of depreciation for all types given has been used as the default value; 2.08 percent per year from the date of construction ("BEA Rates of Depreciation, Service Lives, Declining-Balance Rates, and Hulton-Wykoff categories," U.S. BEA, http://www.bea.gov/scb/account_articles/national/wlth2594/tableC.htm). The depreciation continues until the structure is no longer functional. However, few structures receive no maintenance during their lifespan, which is why there are numerous buildings across the country over 100 years old. Therefore, depreciation is often not a straight-line calculation. The total depreciation of a structure should be reviewed and adjusted to match its current condition by using the date of a major renovation or the general condition of the structure.

Every so often, buildings need a major renovation in order to maintain the desired condition of the structure. If a structure undergoes a renovation or restoration, the building's age can be considered much lower than the age based on original construction. In this case, the date of completion for a major renovation project should be used to calculate the structure's age for depreciation instead of the date of its original construction. For example, if a structure originally built in 1900 was completely restored in 2000, the depreciation calculation should be based on an age of 9 years, not 109 years (if the assessment takes place in 2009).

3.4.5.3.1 Structure Condition

Another consideration of how quickly a structure depreciates is the condition in which it is maintained. If property owners keep up with basic maintenance, the structure can stay in great shape. Under these circumstances, straight-line depreciation may not be appropriate. The rate of depreciation will be a combination of condition and structure age since the last major renovation. The following are typical condition descriptions and characteristics and how they correspond to depreciation percentages (the year ranges provided refer to age since last major renovation):

- Excellent Condition (new): These structures are kept in brand new condition; typically homes only remain in this condition for a few years since owners do not constantly replace components (exterior walls, roofing) required to keep the structure in this condition. Structures in this condition are generally only 3 percent depreciated.
- Good Condition: These structures are well maintained without overt signs of wear and no obvious maintenance needed, but the structure's components have clearly aged. The depreciation of structures in good condition varies based on the age of the structure, but top out at approximately 20 percent.

  0 to 5 years: 3 percent

5 to 10 years: 7 percent

10 to 15 years: 11 percent

15 to 20 years: 14 percent

20 to 25 years: 17 percent

25+ years: 20 percent

- Average Condition: These structures are maintained to a certain degree, but some repairs are visibly needed. The structure components are still functional and maintaining the structure's life expectancy; however, some may require replacing in a few years. Structures in average condition typically are not depreciated more than 30 percent.

  0 to 5 years: 5 percent

  5 to 10 years: 9 percent

  10 to 15 years: 13 percent

  15 to 20 years: 18 percent

  20 to 25 years: 23 percent

  25 to 30 years: 26 percent

  30+ years: 30 percent

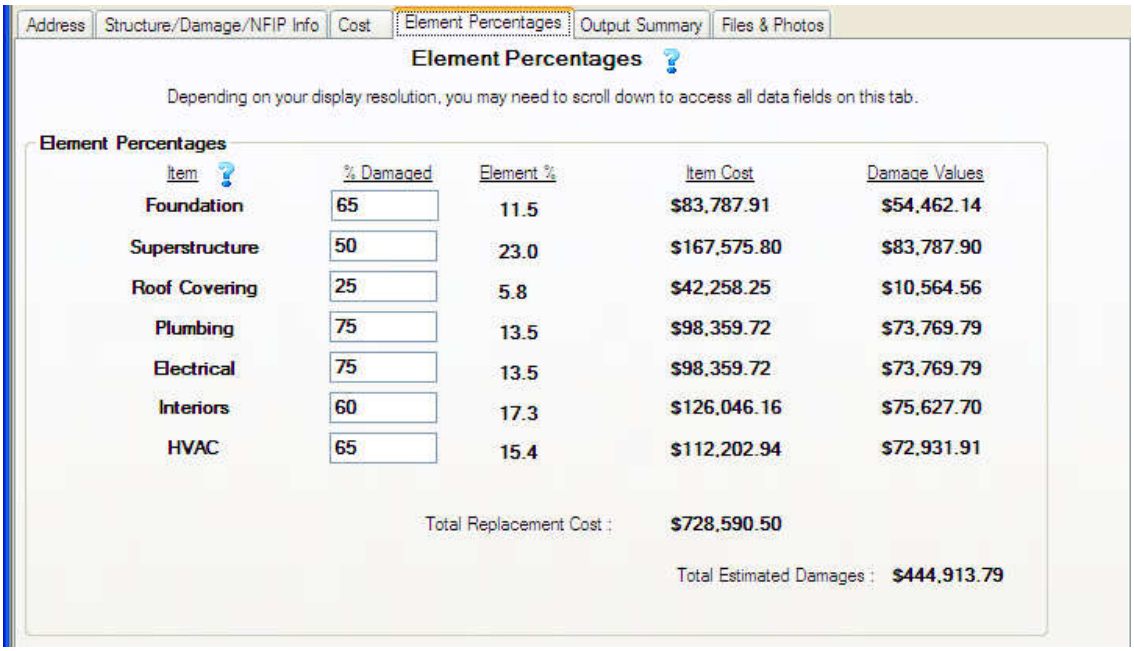
The SDE tool has the option of either using the straight-line method (2.08 percent per year) or entering user values for determining depreciation. The drop-down box for the field *Depreciation Determination* allows the user to select "Based on Year of Construction" to have the tool automatically calculate the depreciation based on the 2.08 percent per year value described above, or "Other" to allow the user to manually enter a depreciation rate. If "Other" is chosen, the user is required to provide a justification explaining the depreciation rate entered. If the pre-damage condition of the structure was used to determine the depreciation rate, the condition and supporting information should be listed in the justification.

Once the depreciation value is determined, the application will automatically adjust the *Total Replacement Cost* to determine the *Computed ACV*. The *Computed ACV* may be used as a reasonable approximation of market value in determining substantial damage (FEMA, 1991). The *Computed ACV* is used as the denominator in the ratio for the substantial damage determination on the ***Output Summary*** tab.

3.4.5.4 Element Percentages Screen

The ***Element Percentages*** tab (Figure 3-47) uses construction categories derived from industry-accepted cost-estimating guides to assist in determining an amount of *Total Estimated Damages*. This value is the numerator (refer to Section 2.0) of the ratio used to determine whether a structure is substantially damaged, the results for which are shown on the ***Output Summary*** tab.

For estimating purposes, a non-residential building is divided into seven general construction categories (e.g., plumbing, foundations, electrical, etc.). Once the user has completed the information on the ***Structure/Damage/NFIP Info*** tab, the *Element %* for each category is calculated and is populated on the ***Element Percentages*** tab. Each *Item Cost* is multiplied by the user-entered *% Damaged* value to determine the monetary *Damage Values*. The sum of the individual damage values is equal to the calculated *Total Estimated Damages* value.



Item	% Damaged	Element %	Item Cost	Damage Values
Foundation	65	11.5	$83,787.91	$54,462.14
Superstructure	50	23.0	$167,575.80	$83,787.90
Roof Covering	25	5.8	$42,258.25	$10,564.56
Plumbing	75	13.5	$98,359.72	$73,769.79
Electrical	75	13.5	$98,359.72	$73,769.79
Interiors	60	17.3	$126,046.16	$75,627.70
HVAC	65	15.4	$112,202.94	$72,931.91

Figure 3-47. Element Percentages for a Non-Residential Structure

The *Item Cost* (column 4 of Figure 3-47) is the result of the *Element %* multiplied by the *Total Replacement Cost*. In the data contained in Figure 3-47, the *Element %* for Foundations is 11.5 percent. This percentage is fixed in the table (i.e., it cannot be changed by the user). The total replacement cost is $239,582.70 and was carried over onto this tab from the ***Cost*** tab. Therefore, the *Item Cost* for the Foundation/Basements construction element is 11.5 percent of $730,950.00, or $84.059.25.

The input data required from the field inspection includes the *% Damaged* of each element listed. These data are determined by the inspector in the field and should be a defensible value. The value should be entered as whole number between 0 and 100. If a value less than 1 is entered, for example 0.6, this is 0.6 percent or 0.006. These are the only values that must be supplied by the user on this tab.

3.4.5.5 The Output Summary Screen

The ***Output Summary*** tab (Figure 3-48) summarizes the computations for building value and damages, as well as the calculated damage percentage. It also includes option boxes that allow the user to select which damage estimate and building value to use in making the substantial damage determination.

1. The *Percent Damaged* section of the ***Output Summary*** tab (Figure 3-48) contains a *Value of Building* and a *Cost of Repairs/Improvements* value. Both of these can be calculated using three different methods. These methods include Computed ACV, Adjusted Tax Assessed Value, and Professional Appraisal for the building value, and Computed Damages, Contractor's Estimate, and Community's Estimate for the repair/improvement costs. The two option group boxes permit the user to select the most appropriate sources of data for use in the substantial damage determination. The standard selections, computed within the SDE software, are the Computed ACV and Computed Damages. The calculated *Percent Damaged* for the selected methods is shown near the middle of the upper portion of the tab.

   Community officials can use any combination of methods (one from each of the two categories). Optional data are entered in the bottom portion of this tab in the area identified as *Optional User-Entered Data*. However, officials are strongly urged to be consistent in their determinations by using a selected method on a community-wide basis, to ensure that substantial damage determinations are prepared and evaluated in a consistent and equitable manner.

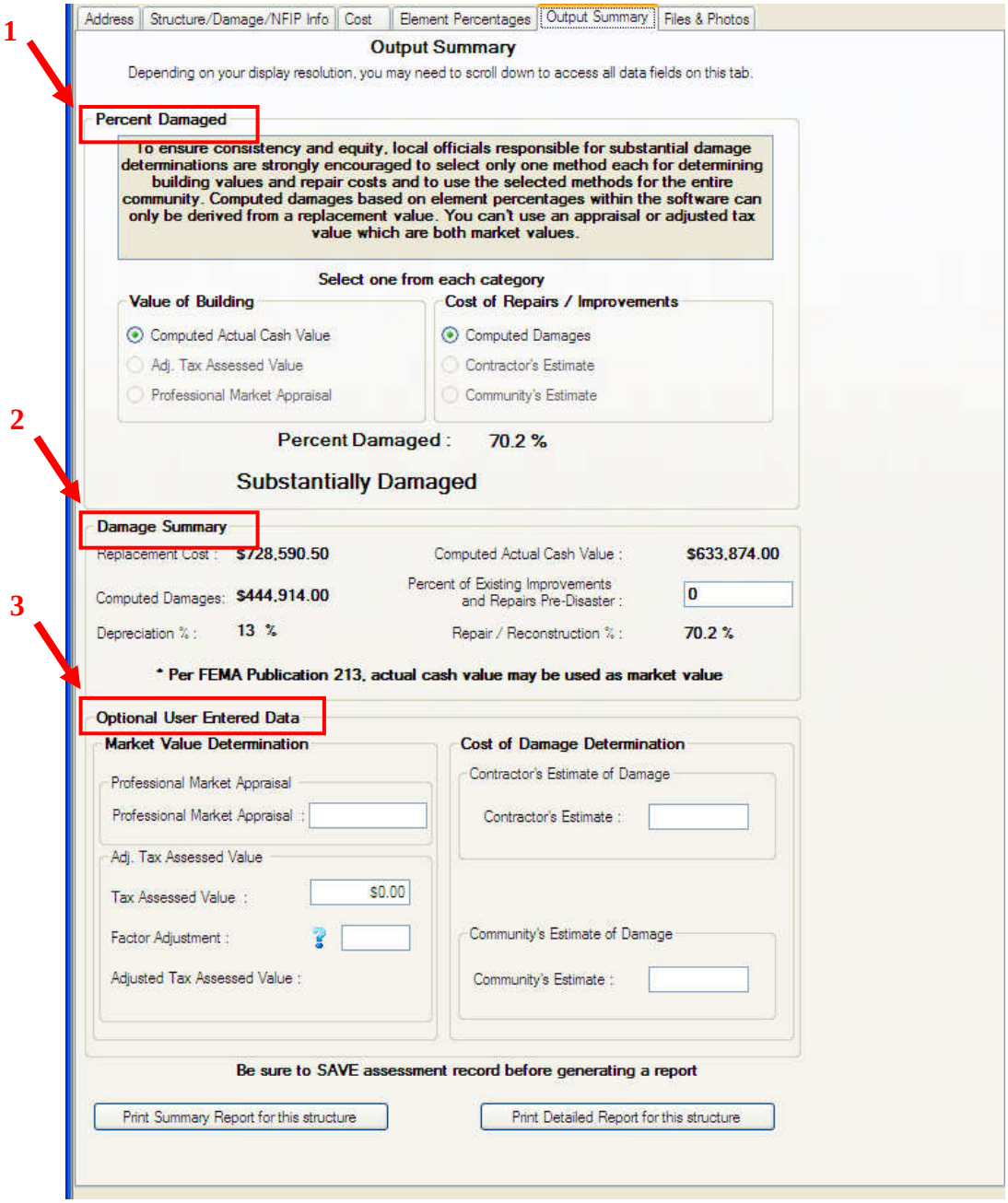


Figure 3-48. Output Summary

2. The *Damage Summary* section (Figure 3-49) carries over the *Replacement Cost*, *Computed Damage*, *Depreciation %*, and *Computed ACV* from previous tabs. If available, the user may enter an estimated value for a *Percent of Existing Improvements and Repairs Pre-Disaster*.

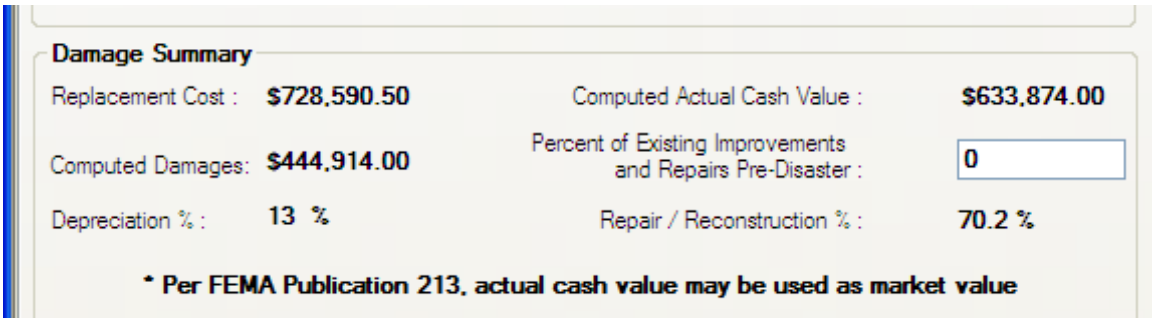


Figure 3-49. Damage Summary

3. When *Optional User-Entered Data* (Figure 3-50) are being considered, the accuracy of the user-entered data must be evaluated. This is especially true when the software indicates that the building is between 40 percent and 60 percent damaged. The closer the level of repair/improvement costs approach 50 percent of the value of the building, the greater the precision needs to be in determining substantial damage. Situations where the property owner requests an administrative or judicial review or appeal most likely will occur when the building is declared substantially damaged and the percentage falls between 50 percent and 60 percent.

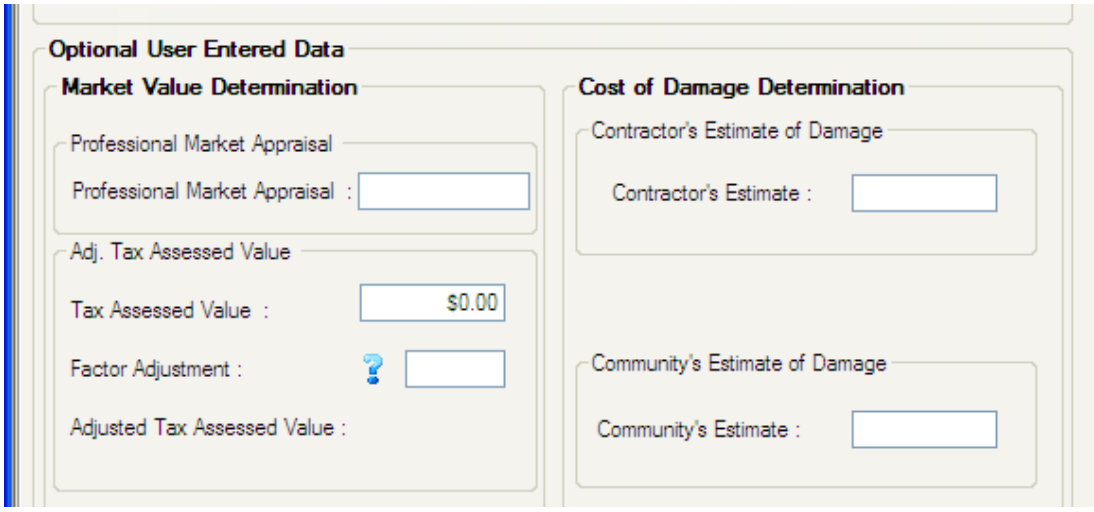


Figure 3-50. Optional User-Entered Data

An adjusted, tax-assessed value or a professional appraisal may be used in lieu of the Computed ACV determined by the SDE software. If the assessed value is based on the value of the land and building, the value of the land should be subtracted.

If the assessed value is based solely on the building, an adjustment may be required to increase the value, since these values tend to be less than Computed ACV or Market Value. This adjustment may be made by using a *Factor Adjustment* in the data field provided, and should be

based on the normal adjustment procedures used in the county or community where the building is located. The factor likely will be higher than 1.0 and should be entered as a whole number. For example if you want to increase the assessed building value by 10 percent, input a value of 1.1.

Officials can also use a contractor's estimate or the community's estimate of repair costs instead of the SDE-computed damages. Contractor estimates should be very specific, all-inclusive of the work required to put the building back to its pre-damage state, and reflect reasonable material and labor costs for the area. Donated or discounted materials and labor must be evaluated at FMV for the area, because the substantial damage determination process requires use of the true cost of repairs. Communities can provide their own repair estimates if the estimates are complete and reflect the general cost of materials and labor for the area and the community is willing to stand behind its estimates. The SDE Field Workbook contains a list of recommended construction elements to be included in either contractor or community estimates of repair costs.

When all the information has been entered for this structure, the user can click on the "Print Summary Report" button at the bottom of the tab to view and print the summary report for the structure.

3.4.5.6 Files & Photos

The primary function of the ***Files and Photos*** tab (Figure 3-51) is to upload and store photographs and files (e.g., maps and drawings) associated with the structure in question that will provide backup information for the estimate. Any file or photo can be set as the "default," so that when the summary report is generated, the default is displayed.

Figure 3-51. Photo and Document Upload

3.5 IMPORT/EXPORT OF DATA

The *Import SDE 1.0 Data, Export SDE 1.0 Data, Enterprise Import,* and *Export to Excel* options on the SDE Main Menu (Figure 3-52) allow the user to import or export data tables in the application.

Figure 3-52. Import/Export Function

Import/Export SDE 1.0 Data

The purpose of the SDE 1.0 Data Import and Export functions is to allow data to be imported and exported from multiple computers to create a large inventory of records from the current version. After merging separate databases from the same inventory, the data should be reviewed to delete duplicate records.

To export data, the user must click on the "Export SDE 1.0 Data" link on the SDE Main Menu. This will bring up a screen which lists all the records that are available on that computer. The first column in the table consists of check boxes that the user can check individually to select a subset of records. The user may also click on the "Check All" button if all records are to be exported. Once a selection is made and the user clicks the "Export SDE 1.0 Data" button, a window will pop-up allowing the user to select a location where files are to be exported. Once complete, the user will see a window indicating the files have been exported. The user will then be returned to the main menu screen. Exported data are sent to the location selected, in a folder created by the "SDE Assessments" tool.

When importing records, the user must click on the "Import SDE 1.0 Data" button on the SDE Main Menu. This will bring up a blank screen where the user must click on the "Select Directory" button to open a window where the user can then select the location of the files. Data that have been exported using the tool will be located in a folder titled "SDE Assessments." This folder contains subfolders containing the individual properties and assessments, but the user should select the root folder "SDE Assessments" to import the data in the subfolders. Once a selection is made and the user clicks "OK," the files will be listed in the table and the user can select the files to be imported. Individual files can be selected or the entire grouping in the same manner as when exporting. Once complete, the user will see a window indicating that the files have been successfully imported.

Enterprise Import

The Enterprise Import function is used to import multiple properties at one time. This can be a very useful function for large amounts of assessments, and any number of the available fields may be selected for importation. By creating an XLS, CSV, XML, or MDB file, the user may list

fields for multiple properties. The process is made easier if headers describing the fields are inserted into the file. If users have access to pre-existing databases of property data, these can often be easily adapted for the tool. The user may choose to import any of the following fields:

- Owner's name
- Lot Number
- Parcel Number
- Address
- Post Geographical Direction (such as 1600 Pennsylvania Avenue, NW, Washington, D.C.)
- City
- State
- County
- Zip Code
- Year of Construction
- Longitude
- Latitude
- Community Name
- NFIP Community ID
- FIRM Panel
- FIRM Zone
- Date of FIRM Panel
- BFE
- Structure Type (Residential or Non-Residential)
- Phone Number
- Regulatory Floodway (Yes, No, or Possible)
- First Floor Elevation
- Datum
- Total Square Footage

A maximum of two custom fields may also be imported using this function. Before entering the Enterprise Import screen, the user must create the custom fields both in the tool (see Section 3.4.2) and for properties within the file containing the property data. If this has not been done, the user will be unable to import custom fields. Once the user has created the file to import and populated it with the desired fields, the Enterprise Import function may be run.

1. By selecting the "Get File" button, the user will be prompted to browse to and select the appropriate file.
2. The tool will then ask the user questions specific to the type of file selected to import. For example, if an XLS file is used, the tool will ask the user whether the file contains column headers. Once these questions have been answered, a button will appear allowing the user to advance to the importing stage of the function.
3. The user is required to map the fields located in the file to those within the tool. For each field that the user intends to import data for, the field within the file must be chosen from the drop-down menu.

4. If a field within the file requires parsing, this must also be chosen from a drop-down. For example, if a user enters the full name for the owner in one field within the file to be imported, the tool requires the user to identify the parsing as "[First] [Last]" in either the *Owner's First Name* or *Owner's Last Name* fields, so that the data may be imported properly.
5. Once all desired fields have been mapped and, if applicable, parsed, the "Attempt Import" button may be selected to finalize the import. The tool will display a message to inform the user as to the success of the import, after which the tool will return to the main menu.

Note: The user should be especially careful when creating the excel file and importing it to SDE. If headers are improperly named (e.g., two columns have the same header) or are mapped to the wrong field, there will be errors in the import process and structures may have incorrect information. Also, if the Structure Type information (residential or non-residential) is to be imported, the user must specify the naming convention for residential versus non-residential structures in the *Residential or Non-Residential* field of the Enterprise import screen. The user must be sure that the same labels for residential and non-residential are consistent throughout the source file. If labels are different for different properties in the source document and do not match the string(s) entered into the SDE software, the Enterprise Import function will not be able to assign a structure type for properties with different strings.

Export to Excel

The "Export to Excel" function allows the user to export all of the data located in the tool to an XLS file. Once the "Export to Excel" function has been selected, the user will see a screen displaying the details loaded within the tool. By selecting the "Export Data" function, the user can easily export all of the data shown to an XLS file. A message will appear displaying the location in which the file was saved, and then the user will be returned to the main menu.

Longitude/Latitude Import and Export

By selecting "Longitude/Latitude Import" from the "Tools" menu, the user will be able to choose to either import or export latitude and longitude data. By selecting "Create Spreadsheet," the user is directed to a screen showing all of the properties within the local database. Of the information shown here, only the *Latitude* and *Longitude* are changeable fields, if importing back into SDE is desired. Selecting the "Create Excel Spreadsheet" button will create a spreadsheet with latitude and longitude information for each property. If this information is not provided within the tool for any properties, they will show up as blank cells within the spreadsheet.

Latitude and longitude can be brought back into the tool using the "Import Spreadsheet" function in the "Longitude/Latitude Import" submenu. This function will direct users to a screen where they can select "Map to Excel Spreadsheet" to choose the spreadsheet with the data to be imported. This will show all of the records in the spreadsheet and allow users to check each property that they wish to import coordinates for. Once the desired properties have been selected, the "Import Data" button will execute the command and import the desired data into the tool.

3.6 DATABASE FUNCTIONS AND ASSIGNMENTS

SDE 1.0 is equipped with the ability to send assignments to inspectors in the field. This is performed through the database functions within the tool. The first time the program is run after installation, the user has the option of selecting the database type as a Client, Server, or Standalone. The Standalone option withdraws the machine from the assignment functionality. The Client and Server options will direct the user to either the inspector or supervisor roles, respectively.

Server/Supervisor Instructions

Set up SDE in Server mode if you will be creating/editing inspector information and assigning properties to them.

1. The first step for the supervisor is to set the database location (note: this is not the entire database for this instance of SDE—it is a subset containing only the data related to the assignments, inspector information, and the relevant property data, which will be shared with the client/inspector). This is done by first clicking on the "Assignments" menu from the main toolbar.
2. Once the "Assignments" menu is selected for the first time, the supervisor will be prompted to set the database location. A location that is accessible to both the supervisor and inspectors should be used.
3. Once the database location is selected, the tool will create a database file in the location, and will inform the user as to the success of the operation. If successful, the supervisor will then be able to begin creating inspectors. At a later time the supervisor may choose to change the location of the database file through the Assignment menu by selecting "Set Database Location."
4. Inspectors may be created under the Assignment menu, through "Client Functions." By selecting "Add New Client," the supervisor will be prompted to enter a Client Name, Phone Number, and Password. Inspectors will have to identify the appropriate name and enter this password to login and retrieve assignments. Inspector information may be updated through the "Client Functions" submenu at any time.
5. Once at least one inspector has been created, the supervisor may begin assigning properties for assessment. By selecting the "New Assignments" submenu under "Assignments," the supervisor can choose to make assignments from existing properties, new properties, or as "batch" assignments for multiple assignments of existing properties. The new and existing property assignment functions allow the supervisor to make one assignment at a time, while the batch assignment function allows the supervisor to make multiple assignments to multiple inspectors.
6. Once assignments have been made, they may be reviewed by selecting the "Search Assignments" function under the "Assignments" menu. This will display all assignments made in the database by listing the inspector's name and the Owner and Address information for each assignment. Double clicking on an assignment in this screen will bring the user to a screen displaying the assignment details, showing the *Assignment Status*, *Property Data*, and *NFIP Information*. These fields may be edited.

Client/Inspector Instructions

Set up SDE in Client mode if you are an inspector.

1. To receive assignments, you will first have to map to the database location. Do this by selecting "Set/Reset Server Database Location" under the "Database Functions" menu. Once the database location has been successfully established, the Client can synchronize with the database to retrieve assignments (this is the same subset of data created by the server/supervisor instance above). If the supervisor has created an inspector profile for the inspector and has made at least one assignment, the inspector may begin the synchronization.
2. Select "Synchronize Inspectors" from the "Inspector Functions" submenu under "Assignments." A window will appear displaying the location of the database that was previously selected. The inspector should verify that the location is correct before selecting the "Perform Synchronization" button.
3. Upon notification of successful synchronization, the inspector may then log in through the "Log In" function under the "Inspector Functions" submenu.
4. Once the inspector has successfully logged in, he/she must select the "Synchronize Assignments" function, under the "Assignments" menu. The tool will display a message informing the inspector as to the success of this operation.
5. The "Search Assignments" under the "Assignments" menu should now display any assignments that the supervisor has given to the inspector. By double-clicking on an assignment, the inspector can view the assignment details, and may edit them accordingly. The inspector may then select either the "Save and Close" button to exit back to the main menu or the "Open Current Assessment" button to begin entering the assessment data on the assigned property.
6. The inspector can run "Synchronize Assignments" at any time to update the assignment database with assessment status changes, which can then be viewed by the supervisor.
7. If the supervisor adds new assignments or changes assignments for the inspector, the "Synchronize Assignments" function can be executed again to retrieve the new list of assignments.

While this provides users in the field the ability to actively receive and complete assignments provided by the supervisor, this functionality is limited to the assigning of properties for assessment only. The inspector cannot transmit the assessment back to the Client through the network database; however, the Import SDE feature may be used to accomplish this.

3.7 REPORTS

The software contains 10 reports that are accessed through the main menu screen (Figure 3-9) and the ***Output Summary*** tab:

1. A Community Report for all residential structures
2. A Community Report for all non-residential structures
3. A Community Report for substantially damaged residential structures

4. A Community Report for substantially damaged non-residential structures
5. A Structure and Percent Damage Report for all residential structures
6. A Structure and Percent Damage Report for all non-residential structures
7. A Structure and Percent Damage Report for substantially damaged residential structures
8. A Structure and Percent Damage Report for substantially damaged non-residential structures
9. A Summary Report for all residential structures
10. A Summary Report for all non-residential structures

Samples of the computer-generated reports are presented in Appendix B.

For the community inventory reports, users can request only those structures that are substantially damaged for Reports 3 and 4. A report for an individual building can be printed using the "Print Summary Report" button at the bottom of the ***Output Summary*** tab. Detailed and summary reports for the current assessment can also be accessed through the "Tools" menu at the top of the program screen. All of the other reports are available through the main menu in the Reports subsection by using the drop-down list provided.

The Community Report and the Structure and Percent Damage Report offer an option to either view (left button) or print (right button) the report. Users cannot alter the pre-set sort categories for the two reports. The reports contain all of the buildings within the inventory and are sorted in the following order:

1. Numerically by NFIP CID
2. Alphabetically by street name

The SDE Community Report provides the following data:

- NFIP CID and name
- Owner first and last names, building address, State, and zip code
- Basis for value of building (computed ACV, adjusted tax assessed value, or professional appraisal)
- Basis for cost of repairs (computed damages, contractor's estimate, or community estimate)
- Computed ACV and damages of the structure
- Type of structure
- Percent damaged
- Assessment date
- Default attachment, if applicable

The SDE Structure and Percent Damage Report provides the following data:

- NFIP CID and name

- Owner first and last name
- Building address
- Building city and State
- County
- Percent damaged
- Assessment date
- Default attachment, if applicable

3.8 GENERATE A GEOREFERENCED FILE

A Keyhole Markup Language (KML) file is an XML-based file that can be used for geographic annotation by a geospatial image viewer. A KMZ file is a KML file(s) zipped up and labeled *.KMZ.

The tool is equipped with the ability to generate a KMZ file and formats placemarks according to degree of damage of a structure using KMZ's style capabilities. Placemarks for residential properties will show up as either not substantially damaged (less than 50 percent damaged) or substantially damaged (50 percent or more damaged). Non-residential properties will display as one of three types: not substantially damaged (0–40 percent damaged), possibly substantially damaged (40–60 percent damaged), or substantially damaged (greater than 60 percent damaged). Placemarks will be color-coded: green for not substantially damaged, yellow for possibly substantially damaged, and red for substantially damaged. Photos of the structures would be included in the KMZ file. Limited attributes, such as the address of the structure, would be shown in the Earth browser or 2-D visualization tool.

SECTION FOUR TECHNICAL ASSISTANCE

Technical assistance on the SDE software may be obtained from the Mitigation Division Director of the local FEMA Regional Office for the user's State (Appendix A). As indicated in this user's manual, standard terms and definitions for construction may be found in an industry-accepted residential cost-estimating guide.

APPENDIX A

FEMA REGIONAL OFFICE LOCATIONS

FEMA Regions

FEMA

REGION I

Federal Emergency Management Agency, 99 High Street, 6th Floor, Boston, MA 02110
(617) 956-7506

REGION II

New Jersey and New York
Federal Emergency Management Agency, Suite 1337, 26 Federal Plaza, New York, NY 10278-0002
(212) 680-3600

Puerto Rico and Virgin Islands
Mailing address:
Federal Emergency Management Agency, Caribbean Division, PO Box 70105, San Juan, PR 00936-0105

Physical address:
Federal Emergency Management Agency, New San Juan Office Bldg, 159 Calle Chardon, 6th Floor, Hato Rey, PR 00918
(787) 296-3500

REGION III
Federal Emergency Management Agency, 615 Chestnut Street, One Independence Mall, Sixth Floor, Philadelphia, PA 19106-4404
(215) 931-5608

REGION IV
Federal Emergency Management Agency, 3003 Chamblee Tucker Road, Atlanta, GA 30341
(770) 220-5200

REGION V
Federal Emergency Management Agency, 536 South Clark St., 6th Floor, Chicago, IL 60605
(312) 408-5500

REGION VI
Federal Emergency Management Agency, FRC 800 North Loop 288, Denton, TX 76209-3698
(940) 898-5399

REGION VII
Federal Emergency Management Agency, 9221 Ward Parkway, Suite 300, Kansas City, MO 64114-3372
(816) 283-7063

REGION VIII
Federal Emergency Management Agency, Denver Federal Center, Building 710, Box 25267, Denver, CO 80255-0267
(303) 235-4800

REGION IX
Federal Emergency Management Agency, 1111 Broadway, Suite 1200, Oakland, CA 94607-4052
(510) 627-7100

REGION X
Federal Emergency Management Agency, Federal Regional Center, 130 228th Street, Southwest, Bothell, WA 98021-8627
(425) 487-4600

APPENDIX B

SAMPLE USER-GENERATED REPORTS

APPENDIX B.1

EXAMPLE OF ONE-PAGE INDIVIDUAL BUILDING SUMMARY

Substantial Damage Estimator

Subdivision

Subdivision	White Oaks	Elev. of Lowest Floor	202 ft.
Parcel #	001		
Lot Number	157	Datum	NAVD

Community

NFIP Community Name	Denver		
NFIP Community ID #	976129		
Latitude	39.78546431	Longitude	-102.541233

Building Address

Owner's Name	Adams, John
Street Address	192 Executive Boulevard
City	Denver
County	Denver
State	Colorado
Zip	21976
Phone	(321) 564-3515

Building Information

Date of Construction	2002
Use	Motel
Quality	Average

Damage Information

Year of Inspection	8/30/2008	Date of Damage	8/19/2008	Structure Information
Inspected by	John Smith	Cause of Damage	Flood	
Inspector Phone	(555) 123-7238	Duration of Flood	2 Hours	
		Est. depth above lowest floor	.5	

NFIP Information

Firm Panel #	Suffix	Date of FIRM Panel	Firm Zone	BFE	Regulatory Floodway
6521	A	12/10/2000	X	0.0	No

Percent Damaged

Value of Building	Percent Damaged	Cost of Repairs/Improvements
$618,800.00	17.5 %	$108,086.00
Computed Actual Cash Value	**Not Substantially Damaged**	Computed Damages

Damage Summary

Replacement Cost	$680,000.00	Computed Damages	$108,086.00
Depreciation %	9 %	Percent of Existing Improvements and Repairs Pre-Disaster	0 %
Computed Actual Cash Value*	$618,800.00	Repair/Reconstruction %	17.5 %

*** Per FEMA Publication 213, Actual Cash Value may be used as Market Value.**

Optional User Entered Data

Professional Appraisal		Contractor's Estimate of Repairs/Improvements
Tax Assessment	$0.00	
Factor Adjustment	0 %	Community's Estimate of Repairs/Improvements
Adjusted Tax Assessed Value		

Authorized Local Official : _____ **Authorized Local Official :** _____

Signature — Printed Name

Wednesday, October 21, 2009 — **Page 1 of 1**

APPENDIX B.2

EXAMPLE OF AN INDIVIDUAL BUILDING DETAILED REPORT

Substantial Damage Estimator

Subdivision

Subdivision	Greenville	**Elev. of Lowest Floor**	
Parcel #	024		102.5 ft.
Lot Number	159	**Datum**	NAVD

Community

NFIP Community Name			
Latitude	35.42517	**Longitude**	-76.06213

Building Address

Owner's Name	Anne, Mary
Street Address	674 Main Street
City	Middletown
County	Hyde
State	North Carolina
Zip	27824
Phone	(555) 678-4512

Mailing Address

Owner's Name	Anne, Mary
Street Address	674 Main Street
City	Middletown
County	Not Selected
State	Not Selected
Zip	27824
Phone	(555) 678-4512
Care Of	

Monday, November 02, 2009 **Page 1 of 5**

Substantial Damage Estimator

Site, Damage, and FIS Information

Year of Construction 1994
Date of Damage 8/24/2004
Residence Information
Type Single Family Residence
Foundation Slab - on - Grade
Super Structure Stud-framed (Standard)
Roofing Shingles - Asphalt or Wood (Standard)
Quality Average
Date of Inspection 9/2/2004
Inspected by John Smith
Inspector Phone (240) 555-1231

Cause of Damage Wind
Duration of Flood

Exterior Finish Siding or Stucco (Standard)
HVAC Heating and/or Cooling
Story One Story (Standard)
Est. Flood Elevation

NFIP Community ID

451324

Firm Panel #	Suffix	Date of FIRM Panel	Firm Zone	BFE	Regulatory Floodway
14012351	None	01/26/1998	None	0.0	No

Community Specific Information

Monday, November 02, 2009 Page 2 of 5

Substantial Damage Estimator

Square Footage

Total Sq. Ft.	2800	Base Cost	$238,000.00	Base Cost Per Sq. Ft.	$85.00
Geographic Adjustment	1				

Cost Adjustments

	Quantity	Units	Unit Cost	Item Cost
Roofing	0	Sq Ft	$0.00	$0.00
Heating / Cooling	0	Ea	$0.00	$0.00
Appliances	2	Ea	$1,000.00	$2,000.00
Fireplaces	1	Ea	$1,200.00	$1,200.00
Porch / Breezeways	0	Sq Ft	$0.00	$0.00
Garage	0	Sq Ft	$0.00	$0.00

Additional Adjustments

0	Sq. Ft:	$0.00	$0.00
0	Sq. Ft:	$0.00	$0.00
0	Sq. Ft:	$0.00	$0.00
			$0.00
			$0.00

Total Adjustments *	$3,200.00
Total Replacement Cost	$241,200.00
Replacement Cost Per Square Foot	$86.14

* Total Adjustment calculation includes the Geographical Adjustment.

Computed Actual Cash Value

Name of Reference Document		Publication Date
Depreciation Determination	Based on age of structure	
Depreciation Percentage	17 %	
Computed Actual Cash Value	$239,693.00	
Other Depreciation Explanation		

Please enter explanation of "Other" selection in box above.

Monday, November 02, 2009 Page 3 of 5

Substantial Damage Estimator

Element Percentages

	% Breakdown	Item Cost	% Damage	Damage Values
Foundation	7.8	$18,813.60	0	$0.00
Superstructure	15.8	$38,109.60	20	$7,621.92
Roof Covering	4.3	$10,371.60	100	$10,371.60
Exterior Finish	6.9	$16,642.80	20	$3,328.56
Interior Finish	13	$31,356.00	10	$3,135.60
Doors and Windows	15.5	$37,386.00	60	$22,431.60
Cabinets and Countertops	4.4	$10,612.80	0	$0.00
Floor Finish	7.7	$18,572.40	0	$0.00
Plumbing	8.4	$20,260.80	0	$0.00
Electrical	4.8	$11,577.60	20	$2,315.52
Appliances	4.1	$9,889.20	0	$0.00
HVAC	0	$0.00	0	$0.00
	100%		Total Estimated Damages	
	Total Replacement Cost	$241,200.00		$49,204.80

Monday, November 02, 2009

Page 4 of 5

Substantial Damage Estimator

Percent Damaged

Value Determination	Percent Damaged	Cost Determination
Computed Actual Cash Value	24.9 %	Computed Damages
	Not Substantially Damaged	

Damage Summary

Replacement Cost	$241,200.00	Total Estimated Damages	$49,204.80
Depreciation Percentage	17 %	Percent of Existing Improvements and Repairs Pre-Disaster	1 %
Computed Actual Cash Value	$239,693.00	Repair/Reconstruction Percentage	24.9 %

* Per FEMA Publication 213, Actual Cash Value may be used as Market Value.

Optional User Entered Data

Professional Appraisal		Contractor's Estimate
Adjusted Tax Value		
Tax Assessed Value	$0.00	Community's Estimate
Factor Adjustment	0	
Adjusted Tax Assessed Value		

Authorized Local Official : _____

Signature (Date)

Authorized Local Official : _____

Print Name (Date)

Monday, November 02, 2009 Page 5 of 5

APPENDIX B.3

EXAMPLE OF COMMUNITY REPORT

SDE Community Report

Community Name ID : 654321

123 Main Square, White Oaks, Maryland 21702

Assessment of : 2/18/2002

Owner Name Percent Damaged	Basis for Value of Building	Basis for Cost of Repairs	Actual Cash Value of Home	Type of Structure
Wilson, Wilber	Computed Actual Cash Value	Computed Damages	$124,500.00	Single Family Residence
60.2 %	$124,500.00	$75,000.00		

Assessment of : 2/20/2003

Owner Name Percent Damaged	Basis for Value of Building	Basis for Cost of Repairs	Actual Cash Value of Home	Type of Structure
Wilson, Wilber	Computed Actual Cash Value	Computed Damages	$209,160.00	Single Family Residence
72.3 %	$209,160.00	$151,200.00		

11/12/2009 12:00:00 AM

Page 1 of 1

APPENDIX B.4

EXAMPLE OF STRUCTURE AND PERCENT DAMAGE REPORT

SDE Property and Percent Damaged Report

Community Name ID : 654321 **Community Name :**

123 Main Square, White Oaks, Maryland 21702

Assessment of : 2/18/2002

Owner Name	City & State	County	Percent Damaged
Wilson, Wilber	White Oaks, MD	Frederick	60.2 %

Assessment of : 2/20/2003

Owner Name	City & State	County	Percent Damaged
Wilson, Wilber	White Oaks, MD	Frederick	72.3 %

11/12/2009 12:00:00 AM

Page 1 of 1

APPENDIX C
REFERENCES

Federal Emergency Management Agency (FEMA), 1991. *Answers to Questions about Substantially Damaged Buildings*, FEMA Publication No. 213.

Federal Emergency Management Agency (FEMA), 2007. *Interim Guidance for State and Local Officials, Increased Cost of Compliance Coverage*, FEMA Publication No. 301.

Federal Emergency Management Agency (FEMA), 2010a. *Substantial Damage Estimator*, Version 1.0 software.

Federal Emergency Management Agency (FEMA), 2010b. *SDE Field Workbook*, FEMA Publication No. P-784.

Federal Emergency Management Agency (FEMA), 2010c. *SDE and Your Community*. FEMA training video.

Federal Emergency Management Agency (FEMA), 2010c. *Substantial Improvement/Substantial Damage Desk Reference*. FEMA Publication No. P-758.

Substantial Damage Estimator (SDE) Workbook

Preparing Structure Inventories Using the SDE Software Program

FEMA

Substantial Damage Estimator

The SDE software is a tool to help local officials administer the Substantial Damage requirements of their floodplain management ordinances in keeping with the minimum requirements of the NFIP.

SECTION ONE INTRODUCTION 1-1
1.1 Workbook Purpose and Contents 1-1
1.2 Important Assumptions 1-2

SECTION TWO BACKGROUND INFORMATION: SUBSTANTIAL DAMAGE AND SDE SOFTWARE 2-1
2.1 Review of NFIP Regulations and Substantial Damage Requirements 2-1
2.1.1 Review of the NFIP Requirements for Substantial Damage 2-1
2.1.2 What Does Substantial Damage Mean? 2-2
2.1.3 Substantial Improvement 2-2
2.1.4 Implications of Substantial Damage and Substantial Improvements 2-2
2.2 Review of the SDE Software 2-3
2.2.1 Advantages of the SDE Software 2-4
2.2.2 Significant Construction Elements 2-5

SECTION THREE PRE-DISASTER PLANNING 3-1
3.1 Prepare Community Policy and Action Plan 3-1
3.1.1 Select SDE Coordinator 3-2
3.1.2 Community SDE Policy 3-3
3.1.3 Develop an Action Plan 3-4
3.2 Identify Available Resources 3-4
3.3 Review FIRMs and Other Community Maps 3-6
3.4 Tax Data 3-6
3.5 Review the Building Stock 3-8
3.6 Pre-Enter Available Data Into SDE Software 3-8

SECTION FOUR AFTER THE DISASTER: FIVE STEPS TO PLANNING THE SUBSTANTIAL DAMAGE INVENTORY 4-1
4.1 Step A: Select SDE Coordinator 4-1
4.2 Step B: Identify General Limits of Impacted Area(s) 4-2
4.3 Step C: Perform a Curbside Review of Buildings to Be Included in Inventory 4-3
4.4 Step D: Define the Scope of the Inventory 4-6
4.5 Step E: Final Planning 4-6

SECTION FIVE FIELD PREPARATIONS 5-1
5.1 Inspection Teams 5-1
5.2 Pilot SDE Inspections 5-2
5.3 Addresses 5-2
5.3.1 Tax Parcel Identification Numbers 5-3
5.3.2 Address Board 5-3
5.4 Photographs 5-3
5.5 Resident Interaction 5-4
5.6 Preparing for Data Entry into SDE Software 5-4
5.6.1 Who Will Enter Data into SDE Software 5-5
5.6.2 When Data Will Be Entered 5-5
5.6.3 Multiple Data Sets 5-5

SECTION SIX SDE FIELD INSPECTION AND DATA COLLECTION 6-1
6.1 Residential Structure Attributes 6-1

6.1.1 Foundation Types 6-1
6.1.2 Superstructure Types 6-3
6.1.3 Roofing 6-8
6.1.4 Exterior Finish Types 6-9
6.1.5 Heating, Ventilation, And Air-Conditioning 6-12
6.2 Non-Residential Structures 6-12
6.2.1 Number of Stories 6-12
6.2.2 Structure Use 6-13
6.2.3 Fire Suppression Systems 6-14
6.2.4 Conveyance 6-14
6.2.5 Building Types 6-14
6.3 Record General Data 6-17
6.3.1 Curbside Information 6-17
6.3.2 Exterior Inspections 6-17
6.3.3 Interior Inspection 6-17
6.4 Exterior Inspections 6-17
6.4.1 Measuring Building Dimensions 6-17
6.4.2 Exterior Damage 6-18
6.5 Interior Inspections 6-20
6.5.1 Verify Stability 6-20
6.5.2 Use Set Inspection Routine 6-20
6.5.3 General Inspection Guidelines 6-20
6.5.4 Upgrades or Custom-Designed Items 6-21
6.5.5 Interior Damage to Look for 6-21
6.6 Completing SDE Data Entry 6-21
6.6.1 SDE Report 6-21
6.6.2 File Folders for SDE Inventory Data 6-24

SECTION SEVEN POST-DETERMINATION ACTIVITIES 7-1
7.1 Substantial Damage Determination Letters 7-1
7.2 Revising SDE Determinations Based on Property Owner Data 7-2

Figures

Figure 3-1. Planning Is an Important Part of the Process 3-1
Figure 4-1. Identify General Limits of Impacted Areas. 4-2
Figure 4-2. Exterior Screening of the Structure 4-5
Figure 6-1. Foundation Types 6-2
Figure 6-2. Hardboard/Siding 6-3
Figure 6-3. Masonry 6-4
Figure 6-4. Insulating Concrete Form 6-5
Figure 6-5. Common Brick 6-6
Figure 6-6. Superstructure Types 6-7
Figure 6-7. Roof Coverings 6-8
Figure 6-8. Brick Veneer 6-10
Figure 6-9. Exterior Insulation Finishing System 6-11

Tables

Table 2-1. Benefits and Limitations of SDE Software 2-5
Table 2-2. Residential Building Elements in the SDE Software 2-6
Table 2-3. Non-Residential Building Elements in the SDE Software 2-8
Table 3-1. Data Resources to Assist in Substantial Damage Determinations 3-5
Table 3-2. Tax Data Used in the SDE Software 3-7
Table 4-1. SDE Coordinator Responsibilities 4-2
Table 6-1. Non-Residential Structure Uses in the SDE Program 6-13
Table 6-2. Construction Details for One-Story Building Types 6-15
Table 6-3. Construction Details for Two- to Four-Story Building Types 6-16
Table 6-4. Construction Details for Five- or More Story Building Types 6-16

Appendices

Appendix A References

Appendix B Forms and Checklists

Blank SDE Damage Inspection Worksheets – Single/Multi-Family
Blank SDE Damage Inspection Worksheets – Manufactured Homes
Blank SDE Damage Inspection Worksheets – Non-residential Buildings
Checklist 1 – Pre-Disaster Planning
Checklist 2 – Field Preparations
Photo Log

Appendix C Sample Documents

Letter of Introduction
NOTICE OF DETERMINATION – No Substantial Damage
NOTICE OF DETERMINATION – Substantial Damage
Recommended Guidelines for Contact with Property Owners

Appendix D List of Recommended Construction Elements to be Included in a Contractor or Community Estimate of Repairs
- Residential Structures
- Non-Residential Structures

Appendix E Guidance for Estimating Percent Damage for Residential Structures

Appendix F Guidance for Estimating Percent Damage for Non-Residential Structures

SECTION ONE INTRODUCTION

This workbook provides guidance and recommended procedures for collecting data for substantially damaged structures. The workbook is a companion document for the Federal Emergency Management Agency (FEMA) training video, *SDE and Your Community* (FEMA, 2010c) and should be used in conjunction with the following:

- FEMA's *Substantial Damage Estimator (SDE)* Version 1.0 software.

  The SDE software was developed to assist State and local officials in determining substantial damage (SD) in accordance with a local floodplain management ordinance meeting the requirements of the National Flood Insurance Program (NFIP). Collecting data during the evaluation process and entering it into the SDE software provides an inventory of substantially damaged residential and non-residential structures.

- FEMA's SDE User's Manual.

  The SDE User's Manual discusses the use and capabilities of the SDE Version 1.0 software.

- FEMA's *Substantial Improvement/Substantial Damage Desk Reference* (FEMA P-758, 2010d).

  When buildings undergo repair or improvement, it is the one time your floodplain management program can reduce the risk of flood damage to these existing buildings. More than 20,500 communities participate in the NFIP by adopting and enforcing regulations and codes that apply to development in Special Flood Hazard Areas (SFHAs). Local floodplain management regulations and codes contain minimum NFIP requirements not only for new buildings and structures, but also for existing buildings and structures with proposed "substantial improvement" (SI) or repair of "substantial damage." This Desk Reference is designed for local officials who are responsible for the administration of local codes and ordinances, including the SI/SD requirements. It also is intended for State officials who provide technical assistance to communities on the NFIP.

1.1 WORKBOOK PURPOSE AND CONTENTS

The procedures discussed in this workbook expand on procedures discussed in the SDE User's Manual and outlined in the SDE video (*SDE and Your Community*) by focusing on field evaluations and data collection as well as planning for SD determination work prior to a damage event. The primary goal of the workbook is to provide guidance for developing an inventory of substantially damaged buildings after a damage event and/or disaster.

The workbook covers the activities required before, during, and after the SDE software is used. These activities include:

- Pre-disaster planning and Preparation for an SDE-based inventory of potentially substantially damaged structures
- Guidelines for training inspection teams about how to conduct field inspections of damaged structures

- Assistance in effectively using community resources to increase the efficiency of the field inspectors and reduce their workload by using existing data that is relevant for SD determinations
- Community department and outside agency coordination
- Resident coordination
- Post-disaster SDE data collection (refer also to SDE Video)
- Use of the SDE software (refer also to User's Manual)
- Post-SD determination follow-up with property owners

Additional information regarding substantial damage may be found in FEMA Publication No. 213, *Answers to Questions about Substantially Damaged Buildings* (FEMA, 1991). This publication is a guidance document on NFIP regulations and policy governing substantially damaged buildings. For copies of FEMA Publications, call 1-800-480-2520 or use the Web-based, searchable FEMA Library to locate specific publications. The FEMA Library is currently accessible at the following URL: http://www.fema.gov/library/index.jsp. A full list of references is provided as Appendix A.

1.2 IMPORTANT ASSUMPTIONS

It is assumed that users of this workbook are familiar with the SDE software. Therefore, specific information regarding the use and capabilities of the software are not included in this workbook. Users should refer to the SDE User's Manual. Copies of the SDE software, User's Manual, and video can also be obtained from the FEMA Publications Warehouse via the above telephone number or from the FEMA Online Library.

SECTION TWO BACKGROUND INFORMATION: SUBSTANTIAL DAMAGE AND SDE SOFTWARE

2.1 REVIEW OF NFIP REGULATIONS AND SUBSTANTIAL DAMAGE REQUIREMENTS

After a disaster (e.g., flood, wind, fire, mudslide, earthquake), communities participating in the NFIP are required under their floodplain management ordinance to determine whether the damages to structures meet the ordinance definition of SD. This requirement applies to all structures within the SFHA or 100-year floodplain. The enforcement of the SI/SD requirement is described in the NFIP regulations (44 CFR 60.3).

2.1.1 Review of the NFIP Requirements for Substantial Damage

Local officials should review 44 CFR 59.1 of the NFIP regulations and their own floodplain management ordinance to understand the SD requirements for their community. The SI/SD Desk Reference (FEMA P-758) is also a vital reference for understanding NFIP requirements. Another reference document is the FEMA publication *Answers to Questions about Substantially Damaged Buildings (*FEMA Publication No. 213, 1991*)*. The construction of any new residential or non-residential structure in a SFHA that replaces a destroyed or demolished structure must meet the local floodplain management ordinance requirements for new construction. Additionally, any structure in an SFHA undergoing SI must be brought into compliance with local floodplain management ordinance requirements even if original construction occurred prior to the community's adoption of their floodplain management ordinance (which would have occurred when it became a participating NFIP community).

SD determinations are only required for structures located within a SFHA designated on a Flood Insurance Rate Map (FIRM) or other FEMA-approved map with 100-year floodplain boundary delineations. A FEMA-approved map refers to a map prepared by the community, county, regional planning authority, State, or other Federal agency that FEMA has reviewed and accepted through a FEMA issued Best Available Data letter.

➔ **NOTE:** Local codes may have additional provisions for SD determinations after a disaster.

2.1.2 What Does Substantial Damage Mean?

SD is defined in the NFIP regulations as:

> *"Damage of any origin sustained by a structure whereby the cost of restoring the structure to its pre-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred."*

This means that if it would cost 50 percent or more of the pre-damage market value to return the house to its original condition, the building is considered substantially damaged. SD occurs when the ratio of the cost of repairs for a building to the market value of the building equals or exceeds 50 percent.

$$\frac{\text{Cost of Improvement or Cost to Repair to Pre-Damage Condition}}{\text{Market Value of Building}} \geq 50\ \%$$

Note that the formula uses the value of the repairs or improvements, which is not a market value. The replacement value is the cost to replace an item or structure at its pre-loss condition, which is different than the appraisal or adjusted tax value. The local codes may have a threshold less than 50 percent and may also require SD determinations and other evaluations in a post-disaster situation.

> ➔ **NOTE:** One of the keys for determining SD and separating damage from poor maintenance (e.g., peeling paint, rotted eaves) is to consider the repairs necessary to get the building up to local code requirements and to its pre-damage condition.

Uninhabitable vs. Substantially Damaged Buildings

It is important to understand the difference between uninhabitable and substantially damaged structures. A structure may be declared temporarily uninhabitable due to a lack of water or electricity, while overall damages are significantly less than 50 percent of the structure value. While an uninhabitable structure may not be substantially damaged, a substantially damaged structure will most likely be uninhabitable.

2.1.3 Substantial Improvement

The term "substantial" can also apply to improvements made to an undamaged building. Improvements that exceed 50 percent of the pre-improvement building value are considered to be SIs.

Under circumstances where two types of improvements (i.e., repairs and new construction) are made to a structure and the combined total of these improvements is equal to or greater than 50 percent of the pre-improvement building value, the structure is considered to be substantially improved. Although developed to support SD determinations, the tool can also be used to assist State and local officials with SI determinations.

2.1.4 Implications of Substantial Damage and Substantial Improvements

Buildings within the SFHA or 100-year floodplain that are either substantially damaged or substantially improved must be brought into compliance with the minimum requirements of the

community's floodplain management ordinance. If a structure is rebuilt in violation of the community's floodplain management ordinance and is not elevated to or above the base flood elevation (BFE) or 100-year flood elevation (or floodproofed if non-residential), the flood insurance premiums for that structure will be significantly higher than those for a compliant structure. Additionally, if a community does not properly enforce its ordinance, it is at risk of being put on probation or suspension from the NFIP. Probation results in an annual fee to community policy holders while suspension has more dire consequences including the loss of NFIP-backed flood insurance for all community property owners.

Requirements for Residential Structures

All residential structures that are substantially damaged must be elevated to or above the BFE, and meet other applicable local floodplain management ordinance requirements. Other options available to homeowners are relocation of the damaged structure (prior to the start of reconstruction) to an area outside the SFHA or demolition of the structure on the site.

Requirements for Non-Residential Structures

Owners of non-residential structures that are substantially damaged have the option to either floodproof all areas below the BFE or elevate the structure to or above the BFE. Similar to residential structures, property owners can also relocate the building to an area outside the SFHA or demolish the building on the site.

Increased Cost of Compliance

If a structure is substantially damaged, compliance with the NFIP regulations may require that the structure be elevated or moved. The additional repair/reconstruction costs for elevating a structure or moving it outside the SFHA may be covered under the NFIP's Increased Cost of Compliance (ICC) coverage. Property owners can only receive an ICC claims payment if the local floodplain administrator has determined that their structure has been substantially damaged due to flooding. Information on the ICC is available through FEMA's *Increased Cost of Compliance Fact Sheet* (Spring/Summer 2008) and the *Increased Cost of Compliance Brochure* (FEMA Publication No. F-663, March 2007) both of which can be found in the Web-based FEMA Library. The report generated by the SDE software can be used as documentation for the ICC grant application in conjunction with a letter from the community.

2.2 REVIEW OF THE SDE SOFTWARE

The SDE software is based on regulatory requirements of the NFIP and is provided free of charge as a tool for those responsible for preparing SD determinations. Use of the software is not mandatory. The software can be used for either residential or non-residential structures. The SDE software is intended for use in conjunction with industry-accepted cost-estimating guides. It is

anticipated that local building officials or other persons knowledgeable with construction costs and practices will use the approach outlined in the software and accompanying User's Manual.

The data used in the SDE software are collected in the field and recorded manually on the SDE Damage Inspection Worksheets (blank SDE Damage Inspection Worksheets can be found in Appendix B of this workbook or in the Appendices of the SDE User's Manual). After entering the field data into the SDE software, users will develop an inventory of structures within the SFHA that have been evaluated for SD. This inventory can be used in future disasters to identify areas of repetitive damage within the community.

2.2.1 Advantages of the SDE Software

The SDE software provides a formalized approach to obtain reasonable estimates of SD for buildings. This tool assists State and local officials in using FEMA-accepted approaches to estimate the value of a building and determine costs to repair/reconstruct a building. From this information, a percent damaged/improvement value can be calculated to establish a SI/SD determination for each residence. The program is a valuable tool since the "…enforcement of the substantial improvement requirement as defined in the NFIP regulations (44 CFR 59.1) frequently becomes a major concern for local officials after a community has experienced serious damage as a result of a flood or other disaster" (FEMA, 1991).

Use the SDE for:

- Single-family residences and manufactured housing
- Non-residential structures[1]
- To meet the data requirements in support of ICC claims. The individual structure reports generated from the SDE software can be used as the basis for receiving an ICC claim payment.
- Exception: Buildings designated by State or Federal entities as historic buildings and appearing in the National Register of Historic Places or on a similar State register are exempt from the SD requirements of the NFIP. Properties eligible for these registries may also be exempt.

The benefits and limitations of the SDE software are summarized below in Table 2-1.

[1] Though non-residential structures that are five or more stories can be assessed to determine the range of percent damage using the SDE, given the complexity of these buildings, a more detailed analysis of the damage will often be necessary. However, a more detailed analysis of damage will be required to determine a discrete percent damage.

Table 2-1. Benefits and Limitations of SDE Software

SDE Provides:	SDE Does Not Provide:
• A formalized approach to estimating SD • Reasonable and defendable building values and damage estimates • A method acceptable to FEMA	• Exact answers • A consistent approach for determining SD on a community-wide basis (this depends upon the local official using the software)

➔ **NOTE:** Non-residential buildings can vary considerably in construction materials and in the complexity of their structural elements, mechanical systems, and plumbing systems. The SDE is designed to provide the user with a simplified approach that will provide a basic damage estimate for most non-residential structures. Some non-residential buildings utilize more unique building materials, construction methods, or specific uses that may require a more detailed approach to determine the precise measure of damage.

2.2.2 Significant Construction Elements

2.2.2.1 Residential Structures

Element percentages are the percent of the building value that each element comprises; this value varies and is dependent on the attributes of each element. Percentages in the software will change to reflect the chosen attributes. However, of the 12 construction elements included in the Damage Inspection Worksheet, five construction elements (exterior finish, foundation, interior finish, doors and windows, and superstructure) typically have the most impact on a damage determination due to their relative value. It is important to consider the element percentages because if these five major elements are not significantly damaged, the structure will not be substantially damaged even if all the other elements are significantly damaged. Alternatively, if the structure has severe foundation, superstructure, interior finish, and door and window damage, the structure is likely to be substantially damaged even if all the other elements experienced little or no damage.

➔ **REMEMBER**: Because of their relative weight in the percentage calculation, if the foundation, superstructure, interior finish, doors and windows, or exterior finish are not significantly damaged, the structure will most likely not be substantially damaged.

Table 2-2 lists each of the 12 elements used for residential structures in the SDE software.

Table 2-2. Residential Building Elements in the SDE Software

Building Component	Description
Foundations	• Continuous perimeter foundations • Footings • Piers • Foundation-level components not included in other elements
Superstructure	The wall support system that extends from the foundation wall to the roof structure. The superstructure includes: • Exterior wall • Sheathing panels • Shear panels • Bracing panels • Structural members that support the roof deck, such as rafters and trusses, but not roof sheathing
Roof Covering	• Covering material (shingles, tile roofing, metal roofing, built-up roofing) • Roof sheathing • Roof flashing • Does not include structural framing members that support the roof deck
Exterior Finish	• Wall covering system that covers the wall sheathing (e.g., stucco, vinyl or wood siding, brick veneer, stone veneer) • Insulation and weather stripping
Interior Finish	• Gypsum board, drywall, plaster, or paneling that make up the wall surfaces • Trim around door frames • Baseboards • Casings • Chair rails • Ceiling moldings
Doors & Windows	• All doors and windows • Locks • Hinges

Building Component	Description
	• Frames • Handles
Cabinets and Countertops	• Basic countertops and cabinets
Floor Finish	• Any material used to finish the floor surface inside the structure. This includes carpet, hardwood, vinyl composition tile, sheet vinyl, floor cover, ceramic tile, and marble, but does not include carpet or re-carpeting installed over finished flooring such as wood or tiling.
Plumbing	• Incoming water service (municipal water supply or well service) • Water heater • Water distribution piping • Wastewater system
Electrical	This element includes any circuit breaker panels and distribution wiring, outlets, switches, receptacles, and lighting.
Appliances	• All built-in appliances in the structure.
Heating, Ventilation, and Air Conditioning	This element includes the system with which air is transferred through the structure. The typical system in residential structures is a forced-air heating system with ductwork.

Non-Residential Structures

For non-residential structures, the SDE software uses seven building elements as shown in Table 2-3. Given the limited number of elements, each of them carries a significant weight when determining SD. Depending on the particular building type (characterized primarily by number of stories and building use), the superstructure and interior elements have relatively high element percentages and thus a larger influence on the damage determination. However, for some structures the heating, ventilation, and air-conditioning (HVAC), electrical, and plumbing elements can also represent the largest portions of the overall building value and therefore have a major impact on the percent damage determination. Table 2-3 shows the seven building elements used for non-residential buildings in the SDE software as well as corresponding constituents included as part of each element.

Table 2-3. Non-Residential Building Elements in the SDE Software

General Building Element	Constituents Included in Overall Element
Foundation	All Foundation Elements
Superstructure	The structure's load bearing system that extends from the foundation (but does not include the foundation) to the roof structure. The superstructure includes structural members that support the roof deck, such as rafters and trusses, but not roof sheathing.
Roofing	• Covering material (shingles, tile roofing, metal roofing, built-up roofing) • Roof sheathing • Roof flashing • Does not include structural framing members that support the roof deck
Interiors	• Partitions • Interior Doors • Surface Finishes (wall, floor, ceiling)
Plumbing	• Plumbing Fixtures • Water Distribution • Exterior Drainage • Fire Protection
HVAC	• Heating Units • Cooling Units • Ventilation
Electrical	• Electrical Wiring • Communications • Conveyance (elevators and escalators) • Lighting • Security

SECTION THREE PRE-DISASTER PLANNING

After a disaster, local officials are faced with an overwhelming amount of critical work needed to help their community get back to normal. Local officials should have a working knowledge of the NFIP requirements for substantially damaged buildings and be familiar with the SDE software (including the data requirements and the use of the Damage Inspection Worksheets); these items are summarized here.

Figure 3-1. Planning Is an Important Part of the Process.

There are several important actions that community officials can perform ***before*** a disaster occurs to facilitate SD evaluations ***after*** the event. These include:

1. Preparing community policy and action plan (Section 3.1).
2. Identifying available data resources needed to make SD determinations (Section 3.2).
3. Reviewing and organizing community maps of floodprone or repetitive loss areas (Section 3.3).
4. Compiling and reviewing relevant tax data (Section 3.4).
5. Identifying the residential and non-residential structure types and building characteristics within the floodprone areas of the community (Section 3.5).
6. Entering any available data into the SDE software before the disaster (Section 3.6).

The suggested actions are described in detail below and will assist the community in completing their SD evaluations faster and more efficiently, thereby facilitating faster completion of the determinations.

A checklist of the recommended pre-disaster planning activities discussed below is contained in Appendix B. For more information, contact your FEMA regional office. Contact information for regional offices can be found in Appendix A of the User's Manual or online at www.fema.gov.

3.1 PREPARE COMMUNITY POLICY AND ACTION PLAN

After a disaster, community officials will be handling a multitude of urgent tasks. Any pre-planning that can be accomplished will greatly facilitate response time.

3.1.1 Select SDE Coordinator

If possible, select an SDE Coordinator each year. This person should optimally be an official familiar with the community and familiar (or tasked with becoming familiar) with the NFIP, the local floodplain management ordinance, and the SDE requirements and software. Ideally this person would also have, or gain, experience performing SD structure inspections. If a single person is not available to take on this responsibility, several individuals could comprise an SDE Team.

The SDE Coordinator responsibilities can include:

1. *Being the local NFIP / SDE expert.*

   The SDE Coordinator should become familiar with the NFIP regulations, the local floodplain management ordinance, the SDE software, and the reference materials available.

2. *Staff training.*

   The SDE Coordinator should understand the SDE requirements sufficiently to be able to train office staff and field inspection teams.

3. *Organizing a SDE data collection and data entry program.*

   The SDE Coordinator can assist the community in making the decisions outlined below in Section 3.1.2 (Community SDE Policy), including:

   - Determining what type of SDE inventory the community wants to keep (i.e., only substantially damaged homes and non-residential buildings or all buildings located in SFHA)
   - Deciding whether photographs of each structure are to be taken
   - Deciding how staffing will be handled after a disaster
   - Determining what kind of filing system would best meet the needs of the community
   - Defining the policy on resident and occupant interaction to be used by inspector teams during field inspections

4. *Planning and implementing the SD field inspections.*

   The SDE Coordinator can plan and implement the field inspection program after a disaster (refer to Section 4.2, Step A for more detail of SDE Coordinator responsibilities related to this topic).

5. *Ensuring proper follow-up and filing of collected data.*

   The SDE Coordinator should make sure the SDE inventory and follow-up is conducted in a proper and thorough manner, is adequately documented, and that the filing system is working well.

The SDE Coordinator does not necessarily need to be the field coordinator (refer to Section 4.2), although this workbook assumes that it will be the same person. If two people staff the position, the overall coordinator could be responsible for training, NFIP compliance, resident and occupant coordination, data entry, and signing of the SDE reports and determination letters. The

field coordinator could be responsible for field preparations, route planning, data collection, data quality and consistency, and completion of all field activities.

3.1.2 Community SDE Policy

There are many decisions that will need to be made prior to sending inspection teams into the field after a disaster. Many of these decisions can be made in advance and recorded for implementation after a disaster. The following section describes some of the decisions that can be made in advance. In certain instances, the reader will be referenced to another section in this workbook that presents additional or more complete information on the topic.

Photographs
Community officials should decide approximately how many photographs to take per damaged structure inspected as part of the SDE field inspection program as well as the maximum resolution for photographs. As described in Section 5.4, taking photographs will slow the rate of the inspections and will require additional record keeping. However, the photographs are an important source of documentation should property owners have questions about a determination or challenge the community's findings.

Determine a Filing System
It is recommended that a file be kept for each structure within the SFHA inspected as part of the SDE field inspection program. A standard list of materials to be added to the file should be identified. Refer to Section 6.5 for more information.

Staffing After a Disaster
After a disaster, staff will be needed to perform the field inspections (Section 5.1) and staff will be needed to perform the data entry (Section 6.5). A staffing plan should be developed ahead of time to record from where this disaster staff will be drawn. The plan can then be referred to and used immediately following a disaster.

Additionally, a policy should be developed as to who will enter the data into the SDE software. It is generally most efficient to use office staff to enter the data into the SDE software (instead of having the field inspection teams enter their own data), but some communities do not have sufficient staff to divide these functions.

Define Policy on Entry Procedures for Inspecting Structures
Determine the procedures that SD inspectors will use for entering houses and non-residential structures. These procedures should be decided in advance of a disaster. In cases of significant damage, many structures will be unoccupied immediately after the event and should therefore be available for inspection. A Letter of Introduction should be left at the property as a record of the visit. In instances of minor damage, the structures may still be occupied or, in the case of non-residential structures, the structures may be in use. Most local codes allow health and safety inspections by community representatives.

Inspections should be:

- Performed during normal business hours
- By appointment, for structures that are occupied or in use
- Based on a reasonable cause – potential health, safety, or SD concerns

- Conducted in a professional manner, using as few invasive measures as possible (i.e., removal of walls, ceilings, or flooring to check for damage or mold growth)

Inspectors should carry identification. As a minimum, inspectors should carry both a Letter of Introduction from the community and a photo identification badge. The Letter of Introduction should be issued on community letterhead and explain the purpose of the inspection and list the name and telephone number of a community contact to further discuss the inspection. A sample Letter of Introduction is included in Appendix C. Communities may want to include a list of permit requirements with the Letter of Introduction.

Alert relevant emergency response departments. Prior to the start of the inspections, the local and county police, fire, and emergency services departments should be contacted to inform these agencies of the purpose and proposed dates of the inspections.

Ask permission. If present during the inspection, owners and/or occupants should be asked for permission before the inspectors enter a structure. Inspectors should not enter locked structures or structures where the owner has refused permission. The location of such structures should be reported to the proper community officials for further action.

3.1.3 Develop an Action Plan

A brief post-disaster action plan, listing key activities and responsible parties, can be prepared, reviewed, and finalized ahead of time. This plan does not need to be elaborate and may consist only of a bulleted list of basic activities, in order of their performance, and the names and telephone numbers of community staff that will be responsible for the activities. The contacts and telephone numbers for fire, police, and emergency management at the local, county, and State level should be included in this list. If neighboring counties or communities will be providing assistance, a copy of the mutual aid agreement, specifying the level of effort and responsibilities of all parties, can be included with the action plan.

3.2 IDENTIFY AVAILABLE RESOURCES

After reviewing the SDE software and User's Manual to understand the data needs (refer to Section 2.2), community officials should identify the local resources needed to prepare SD determinations and should know where to find these data when needed. Possible available resources are shown in Table 3-1.

Some of the data below may not be readily available when needed after a disaster. In those cases, determine in advance who has the data and the quickest way to obtain it.

Advance planning can effectively shorten response time after a disaster. For instance, the adjusted tax data may be within a larger database that contains information beyond what is needed for SDE data entry. In this situation, it will be worthwhile to meet beforehand with the tax assessor to discuss the data requirements and to determine how the necessary data should be requested when it is needed (refer also to Section 3.4, Tax Data). Some States may dictate what data must be used for property values.

Table 3-1. Data Resources to Assist in Substantial Damage Determinations

Data		Possible Source(s)
Maps	✓ FIRMs or DFIRMs ✓ Flood Boundary and Floodway Maps (FBFMs) ✓ Other maps of floodprone areas or maps identifying areas of previous flooding	Community, State NFIP Coordinator, FEMA or other Federal agencies
Flood Insurance Study (FIS) texts or other reports	✓ Flood Profiles	Community, State NFIP Coordinator, or FEMA
Newspaper articles or community assessments of previous flooding		Community files or a community library
Tax parcel maps	✓ Property location and other data that can be cross-referenced to obtain addresses	Tax assessor's office
Street or address maps		Community building or planning department
Tax data	✓ Owner's name & mailing address ✓ Structure address ✓ Date of construction ✓ Adjusted building values ✓ Square footage ✓ Number of stories ✓ Dates of additions or renovations ✓ Number of years since last tax adjustment	Tax assessor's office
Professional appraisals		Community building permit files or insurance claims data
Permit data	Including contractor cost estimates for developing unit costs	Community building or planning department

3.3 REVIEW FIRMS AND OTHER COMMUNITY MAPS

Local officials should be familiar with areas of their community that are either floodprone or repetitive loss areas. *Floodprone* refers to all areas within the SFHA on the community's FIRM or other flood inundation maps prepared by Federal, State, or local agencies. *Repetitive loss areas* are those areas of the community, either inside or outside of the SFHA, that have previously flooded two or more times.

It is important to note that flooding can and does occur outside of the SFHAs shown on the community's FIRM and can happen for several reasons. The FIRM may be outdated and not reflect increases in stream flow due to rainfall runoff from new development. There may be structural changes to the channel such as new or replaced bridges, channelization, or flood control projects (levees, floodwalls, detention basins, etc.). Development may have also occurred in areas not previously mapped by FEMA. Also, an extreme flood (i.e., >100-year flood) will likely exceed the mapped boundaries of the SFHA.

➔ **REMEMBER**: The NFIP requirements for SD determinations only involve the SFHA. Communities are <u>not</u> required to evaluate floodprone or repetitive loss structures located outside the SFHA where the floodplain management ordinance does not apply.

<u>Prepare Up-to-Date Community Maps Showing Floodplain and Street Data</u>
Because the primary intent of the FIRM is to show the limits of the 100-year floodplain, street data (i.e., names and locations) may not be current or accurate on the maps, particularly if the FIRMs are older and have not been recently updated. If street data are not accurate on the current FIRMs, it is recommended that the 100-year floodplain delineations from the FIRM be carefully transferred onto another community map with accurate street or property information. Maps with structure locations, addresses, or tax parcel boundaries are the most useful for verifying structure locations during the field data collection phase. It will also be beneficial to highlight any known areas of past flooding on this map to identify repetitive loss areas. Carefully and thoroughly prepared community maps will save staff crucial time after a disaster. An added feature to the SDE program is the ability to export property locations to a KMZ file, which can be used in georeferencing programs. Using the latitude and longitude of properties, the SDE tool will export properties to a program that can display them on a map through the KMZ file created. If the information is within the tool, the KMZ file will contain additional information on properties, such as their level of damage determined by the inspector.

3.4 TAX DATA

When available, tax information can be useful for providing much of the data required for the ***Address*** tab and the ***Structure/Damage/NFIP Info*** tab of the SDE software (refer also to Section 2.2). A review of any compiled tax data prior to field deployment can save time in the field while increasing the accuracy and consistency of the data collected. When possible, the tax data should be sorted alphabetically by street name and then numerically by address to facilitate field use. The tax data used in the SDE software are shown in Table 3-2. Tax data, however, should never be used as a substitute for a physical inspection. Instead, the inspector should verify any available tax data with the finding of the inspection.

Some tax printouts may contain a simple diagram of the structure's footprint that can be used during the field inspection to verify building size, orientation, and location.

Table 3-2. Tax Data Used in the SDE Software

Owner and Structure Location	Owner's first and last names	Official structure address
	Owner telephone number	Owner's mailing address (if different than structure address)
	Community name	County name (for multiple county communities)
	Zip code	Lot and parcel number
Structure Information	Date of construction	Building use (single family home, manufactured housing, commercial use, public building, etc.)
	Date of improvements requiring building permits	Building style (number of stories, with or without basement)
	Number of dwelling units on the property	Construction type (wood frame, masonry, etc.)
	Total habitable area (in square feet)	Attached or detached garage
Assessed Building Value	Adjusted tax assessed structure value	Date of last tax adjustment (to verify validity of the adjusted tax assessed value)

Format and Content of Available Tax Data

The format and content of tax information printouts vary among communities. In some communities, the printouts may be pre-defined (i.e., no custom printouts or reports are available) and may contain significantly more data than required for the SDE input.

If possible, sort the data into a usable format, such as alphabetically by street name, then numerically by address number. Tax data on building characteristics should be checked for accuracy while in the field.

In other cases, the data provided may be sorted by tax parcel number, the owner's last name, or provided for the entire community or county. It will then be necessary to screen the tax data to find information for the areas to be included in the SDE inventory.

Tax data that can be sorted by street names and for only those fields necessary to populate the SDE database are the most useful. If simple 1- or 2-page printouts are available per structure,

these can be placed into individual file folders identified by address labels. The folders can then be organized by street name and address and taken to the field as a verification tool. As an alternative to using file folders in the field, the inspectors can record the address data (if available) on the Damage Inspection Worksheets as the buildings are inspected. Once the data entry is complete, the SDE summary printout and copies of community and resident/occupant correspondence can be added to the structure's folder (Section 6.5).

3.5 REVIEW THE BUILDING STOCK

Residential Structures

Using a map with SFHA delineations (FIRM or other community map), walk or drive through the floodplain to identify and record the housing stock for various subdivisions and neighborhoods. Structure type, size, value, and housing quality tend to be similar within a neighborhood. For example, although possible, it is unlikely that an excellent quality house would be adjacent to a low or fair quality house. For a given neighborhood (excluding vacation areas), houses tend to be either in the same quality category or one category above or below each other (i.e., fair and low or fair and average). Similarly, housing types (single family, town and row, and manufactured) tend to be consistent within a subdivision. While house values and sizes may vary due to a mixture of one- and two-story homes, these usually are within given ranges for total square footage, unit costs, and market values.

For known areas of flooding, it is recommended that the community record the general housing quality information. This is a good idea because the severity of the disaster may make it difficult to assess the quality later on. Housing quality data can be collected by manually recording it on SDE Damage Inspection Worksheets or by photographing or videotaping the homes of the area on a home-by-home and block-by-block basis.

Non-Residential Structures

As with residential structures, non-residential structures in the SFHA can be inventoried in a pre-disaster environment. Information including building use, size, value, and quality can be collected. Unlike residential subdivisions, non-residential structures located in the same vicinity are not necessarily similar in quality, and varying degrees of quality, as well as the numbers of stories and total square footage, can significantly affect ranges of unit costs and market values.

Regardless of structure type, it might be possible to upload and analyze the building stock using GIS tools and databases. A walkthrough may increase accuracy or provide additional verification, but some communities will have these data electronically, which would facilitate the process.

3.6 PRE-ENTER AVAILABLE DATA INTO SDE SOFTWARE

Any available information regarding the structures located within the SFHA can be entered into the SDE software in the planning phase. Information may include data derived from tax information (refer to Section 3.4), building permits, contractor estimates, or internal inspections of buildings. Any data pre-entered into the SDE will facilitate determinations once a flood or other disaster occurs.

Data can be pre-entered into the data fields on the first three tabs of the SDE software—***Address***, ***Structure/Damage/NFIP Info*** and ***Base Cost***. A new feature in SDE is the ability to import

multiple properties into the program at once, using the Enterprise Import function (see the SDE User's Manual for more information). The SD determination cannot be computed until after the disaster occurs and the damages are observed, estimated, and recorded. Refer to Section 2.2 (or the SDE User's Manual) for more information.

SECTION FOUR AFTER THE DISASTER: FIVE STEPS TO PLANNING THE SUBSTANTIAL DAMAGE INVENTORY

This section addresses actions that can be taken by property owners after a disaster and actions that should be undertaken by an individuals or small groups to prepare for the SDE field inspections. Sections 5.0 and 6.0 address the actual field preparations and SDE field inspections.

Local officials should initiate SD determinations as soon as possible after the disaster, but definitely within 2 weeks. After recovering from the initial shock of the disaster, homeowners will be anxious to begin salvaging and reconstructing their homes. Non-residential property owners and occupants will want to continue operations, business functions, etc., and may even be more eager to begin cleanup, repairs, and renovations. If reconstruction begins without local review and approval, several problems can occur:

- Substantially damaged structures may be reconstructed in violation of the local floodplain management ordinance.
- Property owners may have repaired a structure in violation of other local code requirements.
- Reconstruction of structures that were less than substantially damaged may involve a mixture of new construction and repairs that combine to equal or exceed the 50 percent threshold for SD or SI.
- It may be difficult for local officials to separate repairs or new construction from undamaged portions of the structure.

The following five steps need to be taken to plan an effective SD inspection for a community. These steps can be accomplished by a single individual or by a small team. Careful attention to each of these steps will result in an efficient and well-planned field inspection. Each step provides Background information and Action items, as appropriate.

4.1 STEP A: SELECT SDE COORDINATOR

Background

Before collecting SD data, the community should designate a SDE coordinator if it has not already done so (refer to Section 3.1). The Pre-Disaster Checklist (Appendix B) and Table 4-1 below define the SDE Coordinator responsibilities.

Table 4-1. SDE Coordinator Responsibilities

Responsibility	For more information, refer to:
Coordinate available resources	Section 3.2
Notify other community departments, including fire, police, emergency services, planning, and building of the upcoming fieldwork	Section 3.1
Plan the SD inventory	Remainder of this Section
Organize and train the inspection teams	Section 5.1 and 5.2
Supervise field work	Section 6.0
Supervise data entry into the SDE software	Sections 3.6, 5.6, and 6.5
Ensure proper follow-up procedures are followed	Section 7.0
Supervise final storage of files	Section 7.0

Action
Select a coordinator familiar with the community. The coordinator may be a local floodplain management official, the chief building inspector, the head of the permitting department, or a staff member. The SDE Coordinator should be involved in the following Steps.

4.2 STEP B: IDENTIFY GENERAL LIMITS OF IMPACTED AREA(S)

Background
It is important to understand that not all structures damaged during a disaster will require SD evaluations. Structures that lie outside the SFHA will not require evaluations.

Figure 4-1. Identify General Limits of Impacted Areas.

Action
The general area of damage should be delineated on a community map—one showing tax parcel or property boundaries—on which the SFHA boundaries are shown (see Section 3.3). Only those portions of the community located within the SFHA boundaries will be considered for inspection.

4.3 STEP C: PERFORM A CURBSIDE REVIEW OF BUILDINGS TO BE INCLUDED IN INVENTORY

Background
The workload can often be significant for local officials after a disaster. It is important to remember the following facts about the SDE requirements:

- Only structures located within the SFHA require evaluation for SD.
- A building that is damaged to 55 percent of its building value is not treated differently than a building that is damaged to 90 percent of its building value in terms of floodplain development regulations; they are both considered substantially damaged in terms of the SD requirements and are required to be brought into compliance with local floodplain development regulations.
- Similarly, a building that is damaged to 45 percent of its building value is not treated differently than a building damaged to only 10 percent of its value in terms of floodplain development regulations. Neither building will be subject to rebuilding requirements triggered by a SD declaration.

Based on the above facts, it is recommended that the field inspection be tailored to use the community resources most effectively as follows:

- Only damaged structures within the SFHA should be inspected.
- When dealing with a group of buildings of generally the same structure and foundation type, quality, and condition located at a similar grade level (and with a similar BFE) that experienced similar flood conditions (depth, duration and velocity), only a representative sample (5–10 percent) of buildings needs to be evaluated via a complete field inspection if it appears the properties are either less than 25 percent damaged or more than 75 percent damaged. A less detailed inspection can then be performed on the majority of the properties that fall into these groups. The documentation for a less detailed inspection can include photographs, an SDE data entry, or both. This type of inspection and representative sample should only be used when structures fall outside of the 25 to 75 percent damage range.

  ➔ **NOTE:** All damaged structures should be included in the inventory for documentation purposes.

Adequate preparation will result in an efficient and effective field inspection process. The data collected in Step C will help define the scope of the field inspection and the amount of time (in days) necessary to complete the SDE inventory.

Action
The following information should be gathered for the area(s) of the community identified in Step B. Each action item is described in more detail below.

1. Collect Information
   - Depth of flooding
   - Duration of flooding (if applicable)
2. Perform Curbside Field Screening
   - Count the total number of damaged structures
   - Approximate the degree of damage to structures, including depth of flooding above the lowest floor (if applicable)
   - Refine the boundaries of area(s) needing field inspection

[1] Collect Information:

The duration of flooding and the depth of flooding above the lowest floor affect the amount of damage. A structure with a flood depth of 5 feet and duration of 0.5 day may have less damage than a structure that had only 1 foot of water for 4 days. Before performing the curbside field screening, if possible, note the average depth and duration of flood waters in the damaged area(s).

[2] Perform Curbside Field Screening:

- *Count Damaged Structures:* Count the total number of structures that have been damaged. The structure count need not be exact and can be obtained by driving through the damaged areas.

  In order to have complete information after a disaster, local officials should include every building within the SFHA in their SDE inventory, regardless of the extent of damage.

- *Evaluate Damage to Structures:* To determine the approximate degree of damage, the SDE Coordinator (or team) will need to walk or drive by the damaged area(s) (using the community map with FIRM data prepared in Step B). It may be necessary to perform a preliminary evaluation of several sample buildings to determine the average interior flood depth and extent of damage to buildings in the area. Evaluating the damage to structures at an early stage before complete inspections are performed allows communities to determine where more resources are likely to be needed and where they should focus their efforts.

Figure 4-2. Exterior Screening of the Structure.

Use the following criteria to aid in determining the approximate damage determination:

- *To determine 25 percent or less damage*
  If the interior flood height only reached a level of 1 foot or less above the first floor in a given neighborhood, the duration was less than one day, floodwater velocities were relatively low (less than 5 feet/second), and the structure and its foundation were generally in good condition, it is likely that the damage to the structure will be less than 25 percent. Approximating the flood depth can often be accomplished from curbside examination of neighborhoods. If needed, perform a few preliminary structure inspections and use the SDE to verify and document the percent damage.
- *To determine 75 percent or more damage*
  If there is obvious exterior damage to the structure, such as a missing roof and missing sides of the structure or if the structure has shifted off of its foundation and its walls appear to be leaning (indicating the building has experienced significant structural damage), it is likely that the structure is substantially damaged.
- *For damage to manufactured housing*
  For manufactured housing, interior flood depths of 6 inches or more can result in a total loss of the structure. Once flooring systems in manufactured housing are inundated, the structure is generally considered substantially damaged. Newer manufactured homes may be constructed to enhanced standards and could be more flood-damage-resistant.

- *Determine Whether Representative Samples are Appropriate:* As previously described, representative samples can be used for complete SD inspection when working in areas where buildings have similar characteristics, were exposed to similar flood conditions, and appear to be damaged outside of the 25 to 75 percent range. In order to use samples, buildings have to be at approximately the same grade with their first floor elevations within approximately 0.5 foot of each other and have experienced approximately the same depth of flooding (within approximately 0.5 foot). Additionally, the structures should be similar (same number of stories, similar square footage, same quality, and same foundation type) and should have experienced the same general flooding conditions (depth, velocity, and duration). If all of these conditions exist, then using a representative

sample for complete SD determinations is appropriate. However, some documentation of damage to structures not included in the sample for complete inspection is necessary and might include photographs and an SDE entry.

- *Refine Delineation of Field Inspection Area(s):* Based on the curbside screening described above, delineate the area(s) to be included in the field inspection using the map prepared in Step B. The area over which the damaged structures are spread will affect the time spent collecting the field data. For example, it may require more time to inventory 25 residential structures spread among three subdivisions than to inspect 40 residential structures in a single area.

  The field inspection map should differentiate those areas with structures damaged 25 percent or more to allow the most time for the inspection of these structures.

4.4 STEP D: DEFINE THE SCOPE OF THE INVENTORY

Background
After performing the initial screening described in Step C, the scope (size and duration in days) of the inventory can be determined.

Action
Use the guidelines shown in Table 4-2 to calculate the scope of the inventory for residential structures.

Based on the number of inspectors available to perform the fieldwork, and using two members per team, calculate the number of days it will take to complete the fieldwork.

The inspection rate for non-residential structures is likely to vary depending on the size of the structure (number of stories, square footage) as well as the complexity of the building (shape, utility systems). After several inspections, the inspectors should have a sense for the time needed to complete an inspection (exclusive of time travel between structures).

4.5 STEP E: FINAL PLANNING

Background
A well-planned data collection effort will increase the efficiency of the inspectors while ensuring the accuracy and consistency of the data itself.

Action
Using all the information gathered, the SDE Coordinator should perform the following tasks:

Task 1. Subdivide the identified damage areas into team areas and plan the approximate sequence of inspections using the best available community map that also shows the SFHA boundaries. The route and team assignments can be made on a block-by-block, neighborhood, or subdivision basis. When laying out a data collection route, it is important to ensure that:

- Assignments include all areas within the SFHA with potential SD
- There are no gaps in data collection (particularly at the end of a block where buildings face a cross street)

- There are no overlaps in data collection (different inspection teams inspect the same property)
- The route is determined in a logical sequence to reduce travel time and facilitate data collection and entry

Task 2. Prepare guidance and any training materials (including an adequate supply of Damage Inspection Worksheets) for the inspectors. Training should include the following:

- Group pilot inspections for up to three homes and up to three non-residential buildings to familiarize the inspectors with SDE Damage Inspection Worksheets and the required data
- Greater efforts should be anticipated for buildings with damages determined to be greater than 25 percent
- Guidance for resident and occupant interaction (Appendix C)
- Use copies of Tables 6-1 and 6-2 as guidance for completing the exterior and interior inspections

Task 3. Identify resources (flood maps, street maps, tax data, etc.) that will be needed and, if possible, begin assembling. Ideally, the SDE Coordinator will already have collected these data, as described in Sections 3.2 through 3.5.

Final Field Plan

The SDE Coordinator should have a final field plan containing the following elements:

- Number and location of buildings to be inspected
- Delineation of areas to be inspected
- Sequence of inspections
- Guidance materials for inspectors
- Identify whether photos will be required

SECTION FIVE FIELD PREPARATIONS

Before assembling inspection teams and performing field training, the scope of the inventory should already have been defined as described in Section 4.2. Before beginning ANY field inspections, notify the local fire, police, and emergency management agencies of the purpose and proposed dates of inspections. It is also recommended that the community issue a press release providing the reasons for the inspections, the inspection process, hours of operation, and a community contact. The SDE Coordinator should either do these tasks or ensure that they have been completed.

5.1 INSPECTION TEAMS

It is recommended that individual inspection teams consist of two inspectors for the following reasons:

1. Two people will be needed if structure dimensions are to be field-verified using a tape measure.
2. Two-member teams are also useful for ensuring that information for all 12 construction elements for residential structures and 7 construction elements for non-residential structures required for an SDE determination have been evaluated and recorded on the Damage Inspection Worksheets.
3. It is better to have two staff evaluate the "percent damaged" for each of the construction elements since each person evaluating damage will tend to look at things from a slightly different perspective based on their past experience. An estimate of the percent damaged based on a team consensus will be more reasonable and defendable than an estimate from a single person.
4. It's generally a good policy to have two-member teams doing most types of field work for safety reasons.

For multiple teams, designations should be assigned by number (1, 2, 3, etc.), alpha character (A, B, C, etc.), or color (Red, Green, Blue, etc.). The team designation will help to distinguish between the field supplies, photographs (if required), and data collection areas (checked off on a map).

Materials and Field Equipment

Each team should be provided with the following items:

- Guidance materials and handouts prepared by the SDE Coordinator
- Copy of community map (with FIRM data) with inspection areas identified
- Any collected tax information that can be included on the SDE Damage Inspection Worksheets
- Copy of the Checklist #2 (field supplies and procedures) located in Appendix B (Team members should be responsible for gathering and maintaining the required field supplies)
- If possible, a GPS device with latitude and longitude capabilities

5.2 PILOT SDE INSPECTIONS

In preparation for the inspections, the SDE Coordinator should take all the inspectors in the field and conduct from one to three pilot inspections each for residential and non-residential structures with various levels of damage. These structures can be the first entries in the SDE inventory. The purpose of the pilot inspections is to familiarize the inspectors with the inspection procedures and the data required for completing the Damage Inspection Worksheets. For those with limited building inspection experience, the inspections will provide a first-hand view of the construction elements (12 for residential and 7 for non-residential) listed on the SDE Damage Inspection Worksheets. Through on-site discussions, the inspection teams will also get a feel for how to estimate the percent damage for each element. In addition, the inspection teams will learn how to evaluate damage on a consistent basis. Each pilot inspection will require approximately 45 to 90 minutes for residential structures and 45 to 120 minutes for non-residential structures depending on size and complexity of the structures.

Field Training

During the Pilot Inspections, the SDE Coordinator should be sure to include the following:

Guidelines for estimating damage to the construction elements
Refer to Sections 6.3 and 6.4.

Guidelines for how long each building should take
Refer to Section 4.2.4. Stress importance of taking the most time and attention to those buildings in the 25 percent to 75 percent damage range.

Review the guidelines for significant construction elements (Section 2.2.3)
It is important to remind inspectors that some construction elements make up a greater portion of the building's worth than others so that based on the amount of damage to these elements, inspectors can gauge whether a building is likely to be substantially damaged.

Accuracy issue
Those buildings with damages in the 25 to 75 percent range will require more effort and precision than buildings that are on the lower and upper ends of the SD scale. In fact, it is recommended that officials consider a second or independent evaluation for structures where the initial determination is between 45 and 55 percent damaged for residential structures, and 40 to 50 percent for non-residential structures. Appeals of SD determinations tend to occur more frequently for buildings in this range than any others. An independent evaluation of damage might include a cost estimate for repairs provided a local official (other than the initial SD inspector) or a contractor. Appendix D includes a list of items that should be evaluated for damage and inclusion in a cost-to-repair estimate.

5.3 ADDRESSES

Addresses are important because they are the simplest and most common identifiers for a structure. The use of addresses is a familiar and easy way to sort structures and track data. However, inspectors should be aware that not every property will have an address posted on the structure or mailbox. Although this is more common in rural areas, it can also occur in urban areas. The lack of address may be due to the age of a structure, local custom, lack of a 9-1-1 emergency call system, or the lack of a local requirement for posting addresses. In these

situations, it will be necessary to use either a community address map or tax parcel number map to identify and distinguish specific structures in the inventory.

Due to their importance, addresses should be used for all recorded data items associated with the inventory including the Damage Inspection Worksheet, photographs and photo logs, and the SDE data entry.

5.3.1 Tax Parcel Identification Numbers

Sometimes it is necessary to cross reference tax data that contain an official address with a map containing tax parcel identification numbers. This process can be confusing and time consuming. Therefore, it is recommended that the address numbers be transferred to the field copy of the tax map prior to field deployment. This will save the effort of constantly referring to the tax printouts for the addresses.

While unique, tax parcel numbers can involve many digits and be difficult for manual tracking or sorting of the data. As the volume of data collected increases, it may become easy for inspectors and data entry staff to become confused regarding specific structures or data. Therefore, it is preferable to use address data whenever possible.

5.3.2 Address Board

One method to verify the structure location is to include an “address board” in the photograph of the structure. To do this, one of the inspectors holds a hand-written address (number and street name) on a dry-erase board (or on an 8½-inch by 11-inch paper tablet) in a lower corner of the photograph. Using a dry-erase board can save time by writing the street name at the beginning of a street and then just changing the address number for each successive house. Whichever method is used (paper or dry-erase board), a black marker should be used on a white background to ensure that the information stands out against the house in the photograph.

Be sure that:

- The address number is large enough to be visible in the printed photograph
- The “address board” does not block out too much of the background to make the building indistinguishable from neighboring buildings

5.4 PHOTOGRAPHS

The SDE version 1.0 software allows users to attach photographs and other electronic documents to property records. Therefore, it is recommended that inspectors take at least one photograph per structure. Ideally, a curbside view of the front or side of the structure will be obtained along with photographs of the construction elements to help document observed damage. However, multiple photographs for each structure can be very time consuming to obtain, record, and process. Therefore, the SDE field coordinator should determine ahead of time the type, quantity, and resolution of photographs desired for each structure. Determining a maximum resolution for photographs ahead of time is important in order to avoid memory space and photograph processing issues.

Photo Log

As the photographs are taken in the field, they should be recorded on a photo log to ensure that the inspectors are able to match an individual photograph to a specific structure. A sample photo log is included in Appendix B. A new photo log should be started for each day or each new memory card used. At a minimum, a photo log should include the following data:

1. Team designation
2. Date
3. Community name (only if multiple communities are involved)
4. Memory card designation (if multiple cards are being used)
5. Photograph number
6. Address or location

5.5 RESIDENT INTERACTION

Contact between inspectors and residents or building occupants will be almost impossible to avoid while data collection occurs. Residents and building occupants will naturally be curious or even suspicious of the objectives of the inspections. Therefore, the SDE field coordinator should set guidelines for interactions with residents and building occupants. A list of Recommended Guidelines for Contact with Residents and Building Occupants is contained in Appendix C.

- When an inspector encounters a locked building or is refused entry by a property owner or occupant, he or she should record the address, a telephone number for the owner (if available), and the problem encountered, and move on to the next inspection. Inspectors should always verify that they have permission to enter a property before doing so.
- Lengthy conversations with occupants should be avoided since these will lower the inspection rate and quickly become repetitive. Instead, the inspectors should provide a brief, pre-determined response stating that the post-disaster inspections are required by the community's floodplain management ordinance.
- Comments or additional questions should be directed to the point of contact identified in the Letter of Introduction discussed in Section 3.1.2 and Appendix C.
- **An inspector should not discuss the potential impact of SD determinations, various types of disaster aid, or a potential buyout program.** However, the inspectors can and should explain local permit requirements for rebuilding, particularly if repairs are underway. For more information, go to www.fema.gov.

5.6 PREPARING FOR DATA ENTRY INTO SDE SOFTWARE

Traditionally, SDE inspectors have preferred the use of hard copy Damage Inspection Worksheets in the field for data collection. Field data entry into a portable computer can slow the inspection rate, distract the inspectors, and lead to inconsistent data entries. However, if the community has the resources to equip field teams with compact, durable laptops, some inspectors may prefer recording data electronically during the inspection. The decision of whether to use a laptop in the field is up to the SDE field coordinator.

The following section provides some guidance for data entry after field work and assumes that the hard copy worksheets were used for field data collection.

5.6.1 Who Will Enter Data into SDE Software

If possible, office support staff should enter data into the SDE software (though field inspectors can do this if staff is unavailable). When multiple inspection teams are used, the data entry staff will be able to maintain data consistency and can flag incomplete or questionable data for further explanation or review by the inspectors.

5.6.2 When Data Will Be Entered

Data entry can be completed at the end of each day, the day following the data collection, or after all data have been collected. The recommended procedure for data entry is for support staff to enter the data the day following the data collection. This will allow the inspectors to proceed without interruptions and therefore finish their inspections faster.

5.6.3 Multiple Data Sets

To speed up the data entry process, the SDE data can be entered into two or more computers simultaneously and then merged into a single community file after the data collection process. This procedure is discussed in the *Import/Export* section of the SDE User's Manual.

A data entry person with even moderate typing skills should be able to keep pace with up to three inspection teams on a day after basis. Until all buildings are entered into the SDE software, the Damage Inspection Worksheets should be grouped together by team and date and retained to facilitate questions or editing.

SECTION SIX SDE FIELD INSPECTION AND DATA COLLECTION

After reviewing the SDE data requirements (Section 2.2), preparing an inspection plan and finishing the pilot inspections (Section 5.2), the SDE data collection effort is ready to begin.

Using the community street map with the SFHA boundaries and the planned route for data collection, the teams can start their inspections and manual recording of the data. A designated inspection sequence (exterior inspection followed by an interior inspection) will minimize data errors and omissions.

It is important for the SDE Coordinator to know the general location of the inspectors on a daily basis in case he or she needs to meet them in the field or if a property owner or occupant calls to complain. At the end of the day, the inspectors can either highlight or check off streets or areas where data collection has been completed.

6.1 RESIDENTIAL STRUCTURE ATTRIBUTES

Residential structures include both site-built homes and manufactured housing. Single-family homes, townhomes, and manufactured housing are not distinguished within the computations in the tool, although the user does have to select which type of home is being evaluated. For manufactured housing, the building element percentage array remains constant (the default values) because additional structure attributes (details of the structure being evaluated that are recorded through the SDE software) are not available for selection, with the exception of the foundation. Residential structure attributes are found on the ***Structure/Damage/NFIP Info*** tab within the SDE software.

6.1.1 Foundation Types

There are six different foundation types for residential structures within the SDE tool. Because varying costs are associated with these foundation types, the selection of a particular foundation will affect the foundation element's percentage. Furthermore, the superstructure element is directly affected by variations in foundation type. Floor framing materials have to be adjusted with respect to the foundation type, which changes the superstructure element percentage based on the type of foundation selected. It is important for the user to understand that percentages for various structure elements are not fixed values, but rather vary based on the combination chosen for the structure being assessed.

The foundation types are illustrated in Figure 6-1 and include:

- **Continuous Wall with Slab** – This system consists of low concrete or masonry perimeter stem walls supported on footings and connected to a raised slab, which may be at or above grade.
- **Piers and Posts** – This system is often seen on manufactured housing, and consists of placing the structure on multiple small piers or posts that are shallowly embedded into the ground. The quality of this foundation has a wide range, from code-compliant systems with proper embedment and connections, to systems that are blocks with little to no embedment and gravity loads providing connections.

- **Crawlspace** – A shallow, unfinished space beneath the floor of the building, crawlspace can give access to ductwork, plumbing, and other utilities, but can also bring dampness and mold problems. Crawlspace foundation elements generally include spread footings and either piers or posts.
- **Piles** – This type of foundation supports an elevated structure and consists of multiple columns driven into the ground and embedded several feet below grade. For the purposes of the software, piles includes both timber and precast concrete type piles.
- **Slab-on-Grade** – For this type of foundation, the lowest floor of the house is formed by a concrete slab that sits directly on the ground.
- **Basement** – For the purposes of the SDE tool, a basement is a below-grade enclosure. All sides of the foundation are enclosed with at least one side below grade.[2] The basement can be either finished or unfinished.

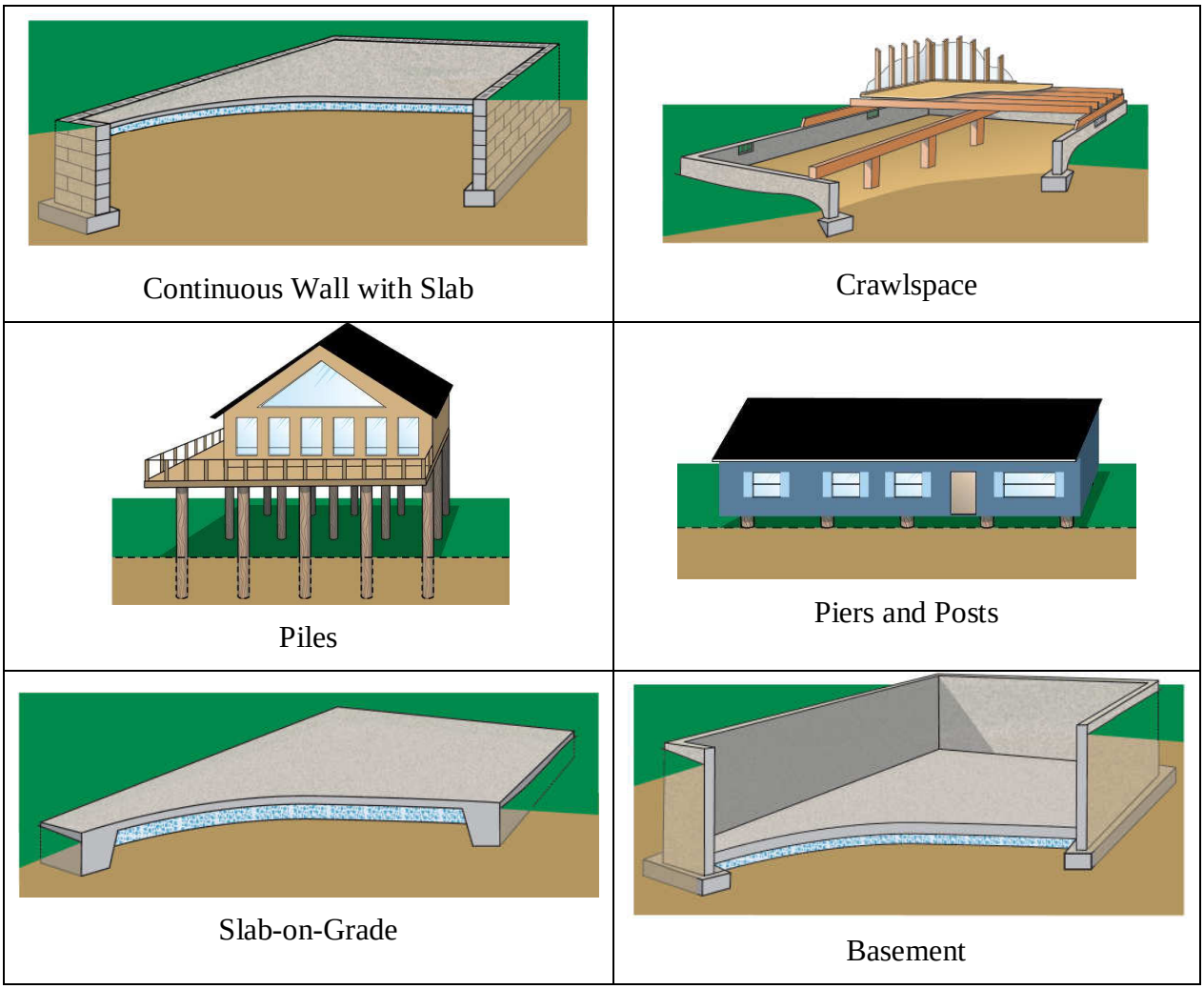


Figure 6-1. Foundation Types

[2] The definition of basement for NFIP floodplain management purposes has the enclosure below grade on all sides.

6.1.2 Superstructure Types

The superstructure criteria are used to evaluate the primary framing above the foundation. This consists of all of the framing that provides structural support and a load path between the foundation and the roof. For the purposes of the SDE tool, the following categories can be applied to residential structures and represent the majority of residential superstructure types:

- **Stud-Framed** – This common superstructure type involves using wood or steel members to structurally frame a building and carry loads from the roof to the foundation. Stud-framing is very common and can be used in many combinations, depending on the exterior finishing system. Sheathing is often connected to the exterior of the stud-frames as an initial layer (Figure 6-2).

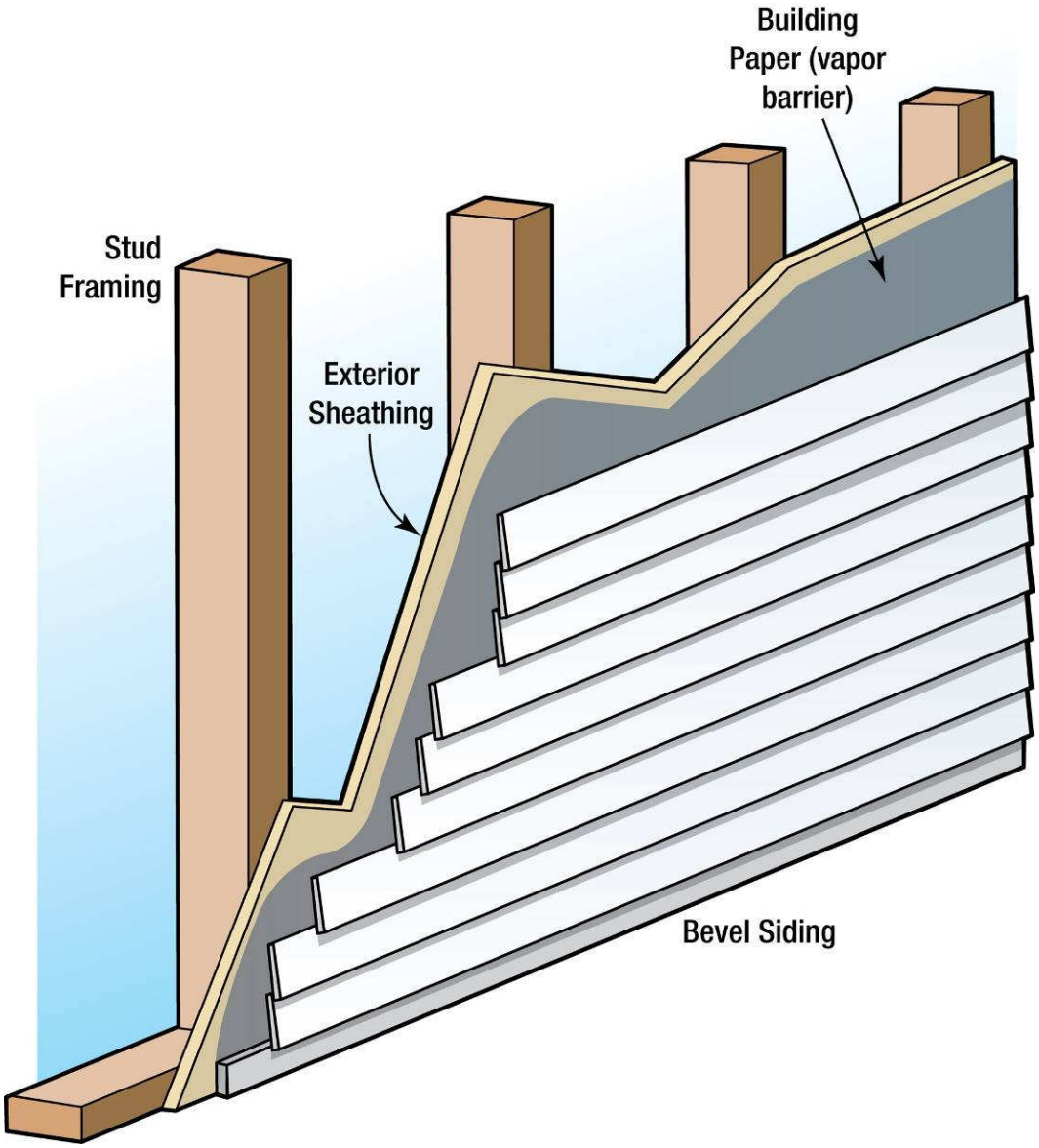


Figure 6-2. Stud-Framed

- **Masonry** – Concrete Masonry Units (CMUs) are stacked and mortared together to make up the exterior wall and provide the exterior structural system. The interior system can be either wood-framed or constructed of additional CMU wall systems. The systems can be either unreinforced or reinforced using steel rods. This superstructure type may have no exterior finish, leaving the block exposed. Likewise, traditional cement-based stucco, Exterior Insulation Finishing System (EIFS), or other exterior finishes may be attached to the CMU walls (Figure 6-3).

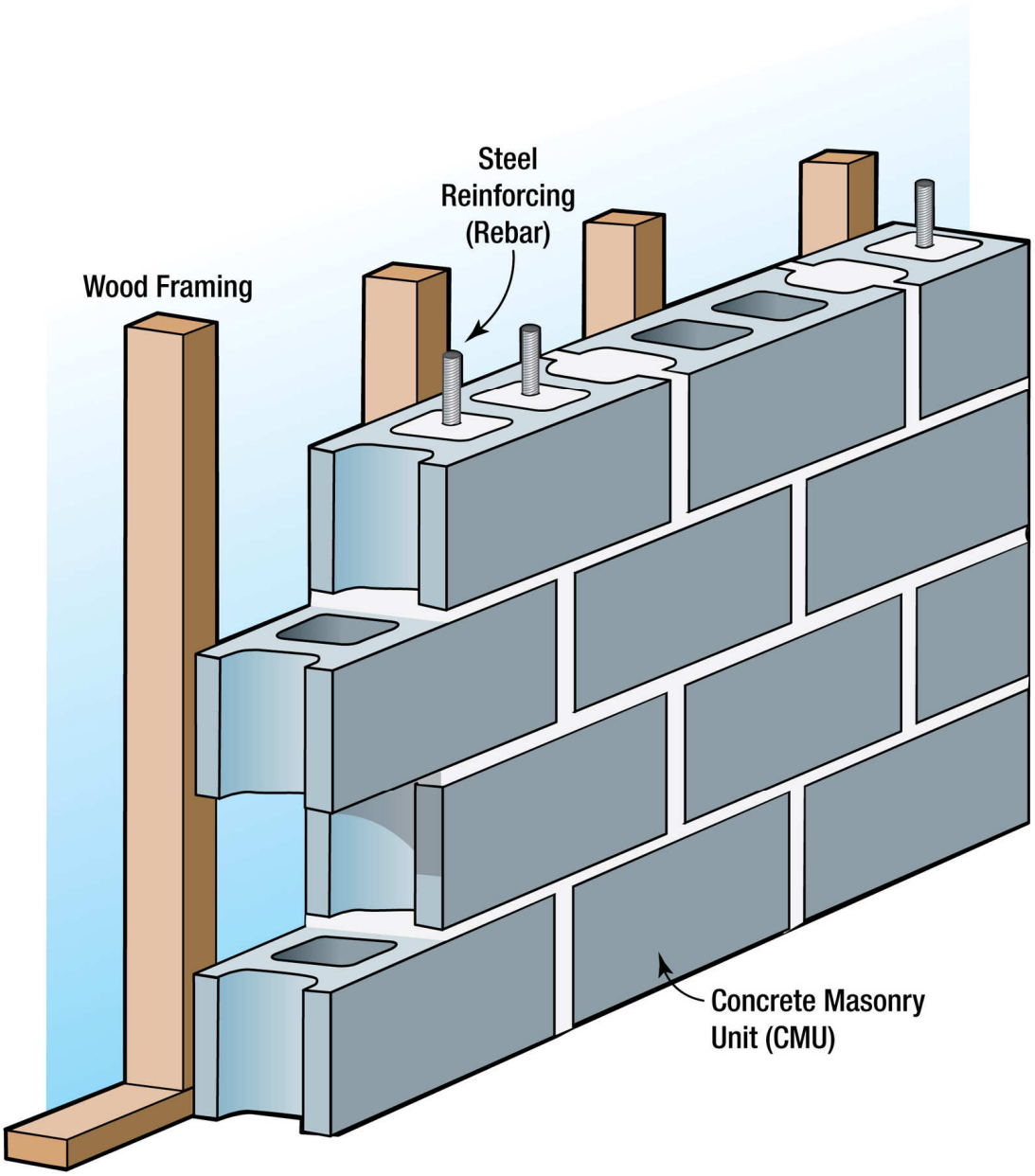


Figure 6-3. Masonry

- **Insulating Concrete Form (ICF)** – This building system uses a synthetic insulation forming system filled with concrete. This system can be used as the exterior wall and structural system for a house (Figure 6-4), though it is common for exterior finish to be applied to the wall for aesthetic reasons and to provide water resistance.

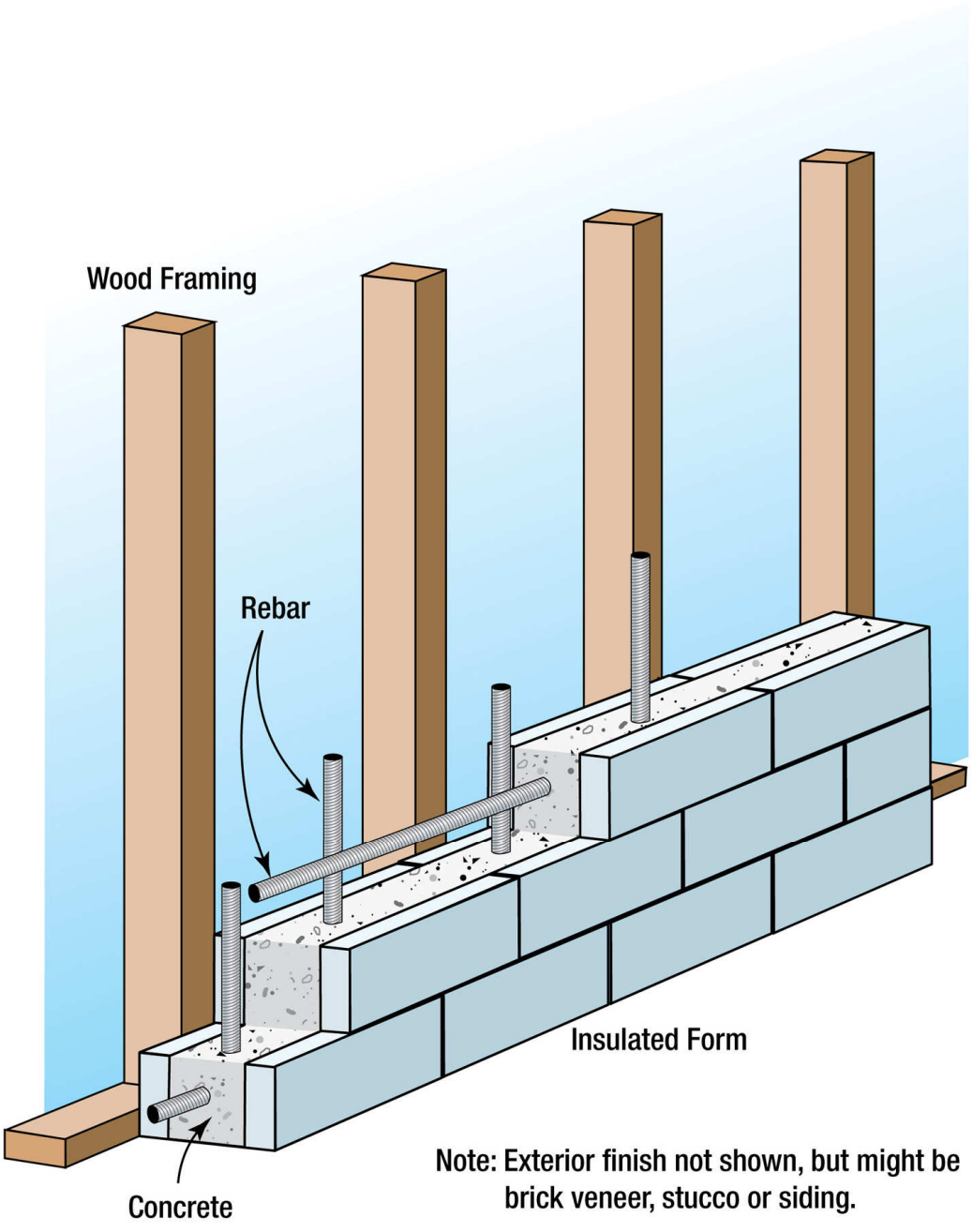


Figure 6-4. Insulating Concrete Form

- **Common Brick** – Brick units are stacked and mortared together to make up the exterior wall and provide the exterior structural system. The interior system can be either wood-framed or constructed of additional brick-wall systems. The systems can be either unreinforced or reinforced using steel rods (Figure 6-5).

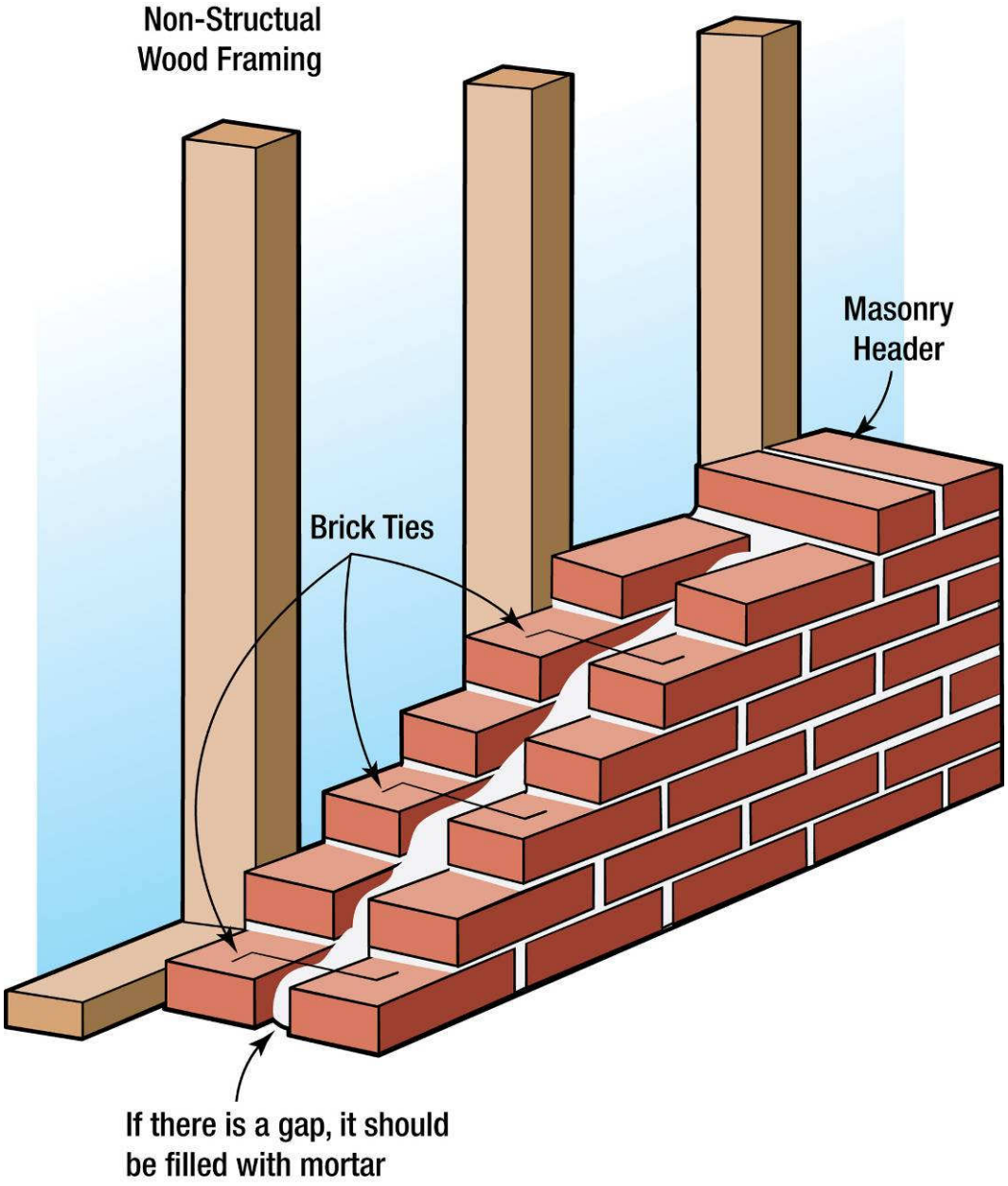


Figure 6-5. Common Brick

- Examples of each of these types of framing/exterior finish combinations are shown in Figure 6-6. Several of these structures are in various stages of construction or have been damaged. However, their damaged or under-construction states allow a visible cross-section of an exterior wall or a pre-finish depiction, which better illustrates some of these superstructure types.

Figure 6-6. Superstructure Types

6.1.3 Roofing

Roofing as a structure attribute within the SDE tool refers only to roof coverings. Common roof coverings used throughout the United States were evaluated in comparison to a standard shingled-roof covering. Examples of various roof coverings are shown in Figure 6-7. Storm events with high winds often cause roof covering damage.

Asphalt Shingle Roof

Tile Roof

Slate Roof

Standing Seam Metal Roof

Figure 6-7. Roof Coverings

For the purposes of the SDE, the following roof coverings can be selected for residential assessments (see Figure 6-7 for examples):

- Shingles (Asphalt or Wood) – This is the most common type of roof covering in the United States. The shingles are installed in overlapping arrangements. Shingles can have different wind resistance ratings, but are also very dependent on their fasteners for proper resistance.
- Clay Tile – Clay tiles are often placed in parallel rows, with each row overlapping the row below it in order to hide the fastener and prevent water intrusion.
- Slate – Slate roof coverings are less common than most roof coverings because of high costs. Slate roofing can appear similar to clay tile, but with different material properties.
- Standing Seam (Metal) – These roofs are composed of metal panels that are crimped together to form the roof covering. They typically have long life spans and good durability.

6.1.4 Exterior Finish Types

The exterior finish system's primary contribution to a structure is typically weather-proofing and aesthetics. Exterior finish is non-structural by nature, and therefore not required if the wall material can provide sufficient weather protection. For example, some older homes may have structural walls composed of brick, which serves as both a structural support system and exterior finish. Newer construction may have CMU walls with no exterior finish. All types of exterior finish preferably have a waterproof barrier between them and the sheathing or other structural element. Within the SDE software, the following exterior finish selections are provided as structure attributes:

- **Siding/Stucco** – Vinyl siding, wood siding, and stucco are common forms of exterior finish. For either vinyl or wood siding, strips of material are placed in layers and connected to wall sheathing (see Figure 6-2). Stucco is generally applied to masonry structures and consists of layers of plaster material.
- **Brick Veneer** – A brick veneer is applied to the exterior sheathing of a stud-framed or masonry building (see Figure 6-8). The bricks are attached using brick ties nailed to the exterior sheathing. Most brick veneers have air space between the inside face of the brick and the exterior sheathing.

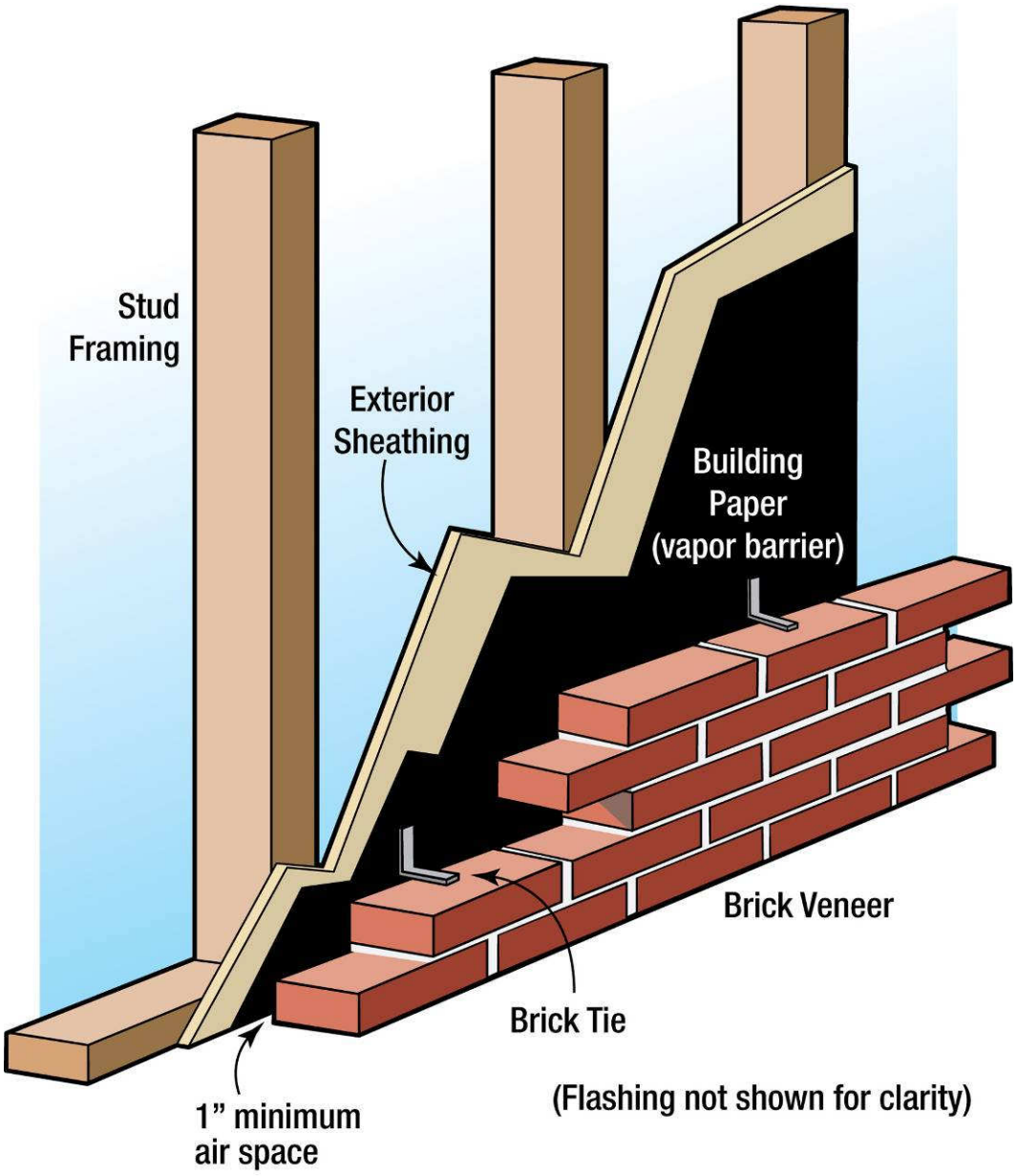


Figure 6-8. Brick Veneer

- **EIFS** – An EIFS is a system of synthetic materials attached to the exterior sheathing of a stud-framed building. The system consists of rigid insulation with a mesh lathe over which a synthetic stucco finish is applied. A tinted top coat and paint are applied to the stucco finish to provide protection for the system (Figure 6-9).

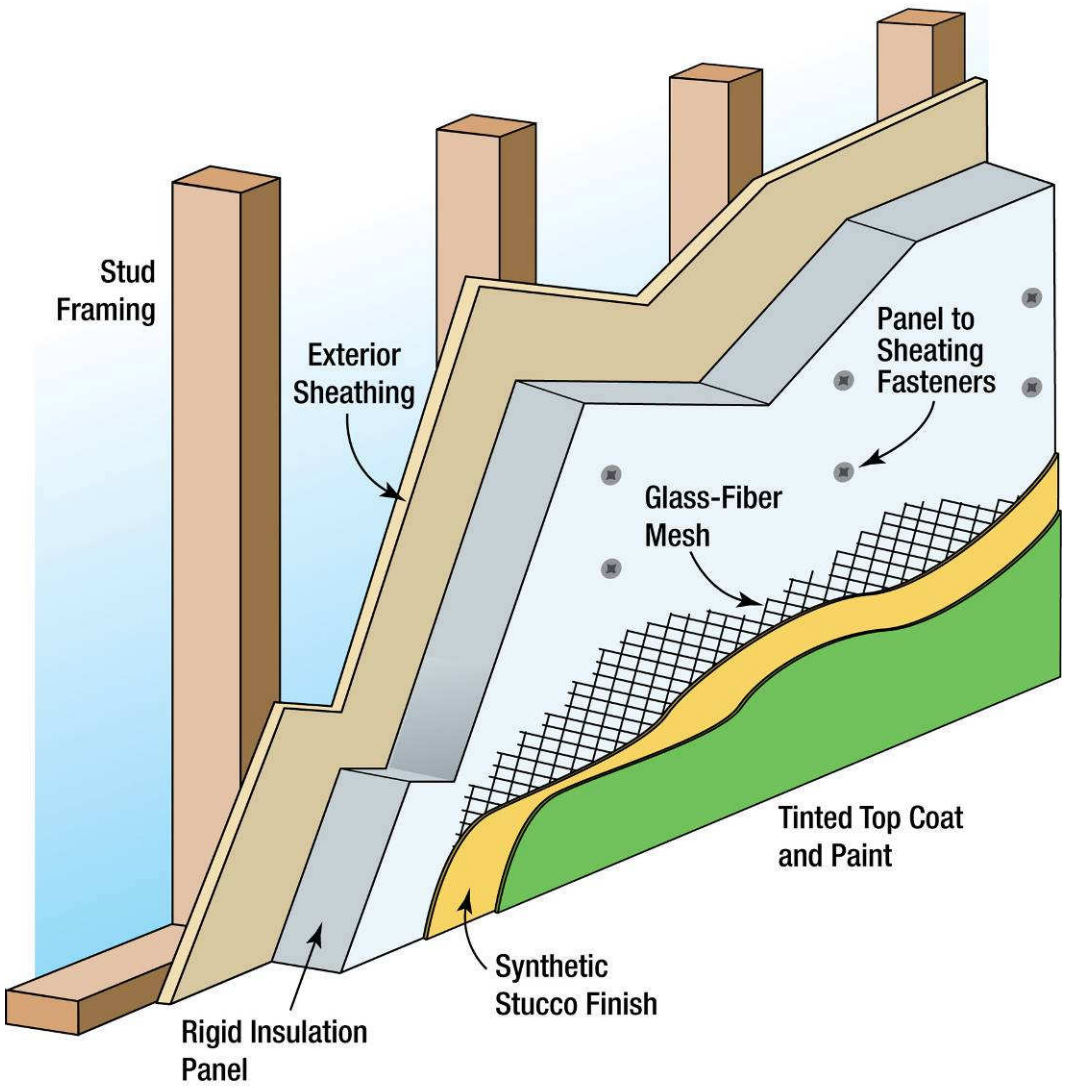


Figure 6-9. Exterior Insulation Finishing System

- **None (common brick or structural)** – This option should be selected when either common brick is used (brick units are stacked and mortared together to make up the exterior wall and provide the exterior structural system) or when another structural material (such as CMU or ICF) was used for both the wall and the exterior finish (see Figure 6-5).

6.1.5 Heating, Ventilation, And Air-Conditioning

In some areas of the United States, residential structures do not have HVAC systems. This is especially true in warmer or mild climates. To account for this, the SDE provides an option to select no HVAC for a structure. The default within the program is to assume that an HVAC system does exist. An analysis of costs for a single system (i.e., heating or cooling alone) versus a combined system providing both heating and cooling showed that the costs were relatively similar. Therefore, within the software, the user has the option to choose either the presence of some type of system (whether it provides both heating and cooling or only one of them) or no type of system. Note that this does not include window units for air-conditioning, which are considered contents.

6.2 NON-RESIDENTIAL STRUCTURES

The ability to assess non-residential structures is a new option in the SDE program. While the program offers a simplified approach to damage assessment, non-residential buildings can vary considerably in construction materials and in the complexity of their structural elements, mechanical systems, and plumbing systems. The SDE offers a simplified approach that provides a basic damage estimate for most non-residential structures. Some non-residential buildings utilize more unique building materials, construction methods, or specific uses that may require a more detailed approach to determine a precise measure of damage. Furthermore, while non-residential structures of five or more stories can be assessed to determine the range of percent damage using the SDE, a more detailed analysis of damage is required to determine a discrete percent damage. For larger or more complex buildings, it is recommended that custom damage determinations be completed by a contractor, appraiser, or an individual experienced in damage estimation.

The SDE is similar for residential and non-residential structures, but there are some notable differences in the required data entries, due in large part to the way the element percentage arrays were derived for each set of structures (residential versus non-residential). Following is a description of the structure information that must be provided to adequately characterize non-residential structures for use with the program.

6.2.1 Number of Stories

For the purposes of the SDE program, non-residential structures are grouped into three categories: one-story buildings, two- to four-story buildings, and five- or more story buildings. The user must provide this information about the structure to move on to subsequent data entry requirements within the program. The number of stories is important because subsequent building characteristic selections and the element percentage arrays depend on this data point. The software captures the most common building types, but does not provide for every possible combination of number of stories and building use. If after selecting the number of stories the software does not provide an exact match for the subject building use, it is recommended that the user select the building type closest to the building's actual attributes.

6.2.2 Structure Use

For non-residential structures, construction type is not directly used as the basis for determining the appropriate element percentage array within the software. Instead, structure use and the number of stories are the determining factors for the array. However, for each building use, representative building types were selected to determine the element percentage arrays for which specific building characteristics had to be assigned. Therefore, although the user does not directly choose the superstructure type, foundation type, etc., these characteristics were selected in order to develop the representative structures for each use and are therefore built into the element percentage arrays. Table 6-1 shows the structure uses available within the SDE program.

Table 6-1. Non-Residential Structure Uses in the SDE Program

Structure Use	1 Story	2-4 Stories	5 or More Stories
Apartments	✓	✓	✓
Auditorium	✓		
Commercial Retail	✓		
Convenience Store	✓		
Courthouse	✓	✓	
Department Store	✓	✓	
Elementary School	✓		
Fast Food Restaurant	✓		
Fire Station	✓	✓	
Grocery Store	✓		
High School		✓	
Hospital	✓	✓	✓
Hotel			✓
House of Worship	✓		
Industrial		✓	
Long-Term Care Facility	✓	✓	
Mini-Warehouse	✓		
Motel	✓	✓	
Municipal Building	✓	✓	
Office Building	✓	✓	✓
Police Station	✓	✓	
Restaurant	✓		
Strip Mall	✓		

6.2.3 Fire Suppression Systems

Fire suppression systems also have a significant effect on the element percentage array and specifically affect the plumbing element. While it is assumed that five- or more story buildings always have a suppression system, the user must choose this feature for the two other categories. The default within the program is to assume this feature does not exist for one-story and two- to four-story buildings.

6.2.4 Conveyance

Because the presence or absence of conveyance systems, which include escalators and elevators, can affect the electrical element percentage significantly, there is an option within the SDE program to note whether a conveyance system exists for a two- to four-story building. The default within the program is to assume this feature does not exist for two- to four-story buildings.

For one-story and five- or more story buildings, the user does not need to select whether conveyance exists. For one-story buildings, there can be no conveyance, and for five- or more story buildings, it is assumed there is always conveyance considered in the element percentage arrays for those buildings.

6.2.5 Building Types

The building types available for SDE non-residential assessments cover a broad category of buildings and consider more than simply the wall or roof construction type. For example, the requirements that a hospital will demand of an HVAC system is very different than that of a warehouse, and the amount of bathrooms in a hotel would be very different than in an elementary school. However, it is also useful for the user to understand what materials and construction types constitute each building type within the tool. Table 6-2, Table 6-3, and Table 6-4 identify the basic construction methods used to establish each building type category. For some of the building uses, more than one representative building was used to determine the element percentages. In those cases, the use is listed two times with differing characteristics identified.

Table 6-2. Construction Details for One-Story Building Types

1-STORY COST MODEL DETAILS				
BUILDING USE	EXTERIOR FINISH	SUPERSTRUCTURE	FLOOR AREA (SF)	ROOF SUPPORT
Commercial/ Industrial Factory	*CMU*	*CMU/Steel Frame*	*30,000*	*Steel Joist*
Convenience Store	*Wood Siding*	*Wood Frame*	*4,000*	*Wood Truss*
Department Store No. 1	*Brick Veneer*	*CMU/Steel Frame*	*110,000*	*Steel Joist*
Department Store No. 2	*Brick Veneer*	*Reinforced Concrete Frame*	*110,000*	*Precast Concrete*
Fire/Police Station	*Brick Veneer*	*CMU/Steel Frame*	*6,000*	*Steel Joist*
Motel	*Brick Veneer*	*Wood Frame*	*8,000*	*Wood Truss*
Office Building	*EIFS*	*Metal Studs and Steel Joists*	*7,000*	*Steel Joist*
Restaurant No. 1	*Wood Siding*	*Wood Frame*	*5,000*	*Wood Truss*
Restaurant No. 2	*Brick Veneer*	*CMU/Steel Frame*	*5,000*	*Steel Joist*
Strip Mall No. 1	*CMU*	*Steel Joists*	*20,000*	*Wood Truss*
Strip Mall No. 2	*Split Face Concrete Block*	*Steel Frame*	*18,000*	*Steel Joist*
Apartment Building	*Wood Siding*	*Wood Frame*	*7,500*	*Wood Truss*
Elementary School	*Brick Veneer*	*CMU*	*45,000*	*Steel Joist*
Courthouse	*Limestone*	*Reinforced Concrete Frame*	*30,000*	*Cast-In-Place Concrete*
Grocery Store	*Brick Veneer*	*Steel Frame*	*32,000*	*Steel Joist*
Large Grocery Store	*Brick Veneer*	*Steel Frame*	*60,000*	*Steel Joist*
Mini-Warehouse	*CMU*	*Steel Frame*	*20,000*	*Precast Concrete*
Hospital	*Brick Veneer*	*Steel Frame*	*18,500*	*Steel Joist*

Table 6-3. Construction Details for Two- to Four-Story Building Types

2-4 STORY COST MODEL DETAILS				
BUILDING USE	EXTERIOR WALL TYPE	STRUCTURAL SYSTEM	FLOOR AREA (SF)	ROOF SUPPORT
High School	*Brick Veneer*	*Reinforced Concrete Frame*	*130,000*	*Cast-in-Place Concrete*
Police Station	*Limestone*	*CMU*	*11,000*	*Steel Joist*
Apartment Building	*Brick Veneer*	*CMU/Steel Frame*	*22,500*	*Steel Joist*
Courthouse	*Brick Veneer*	*Steel Frame*	*60,000*	*Cast-in-Place Concrete*
Hospital No. 1	*Brick Veneer with Structural Facing Tile*	*Reinforced Concrete Frame*	*55,000*	*Cast-in-Place Concrete*
Hospital No. 2 (deep foundation)	*Brick Veneer*	*Reinforced Concrete Frame*	*55,000*	*Cast-in-Place Concrete*
Department Store	*Brick Veneer*	*Steel Frame*	*95,000*	*Steel Joist*
Office Building No. 1	*Brick Veneer*	*CMU/Steel Frame*	*20,000*	*Steel Joist*
Office Building No. 2	*Glass & Metal Curtain Wall*	*Reinforced Concrete Frame*	*20,000*	*Cast-in-Place Concrete*
Motel	*Decorative Concrete Block*	*Precast Concrete*	*49,000*	*Precast Concrete*
Industrial	*Brick Veneer*	*Reinforced Concrete Frame*	*90,000*	*Cast-in-Place Concrete*

Table 6-4. Construction Details for Five- or More Story Building Types

5+ STORY COST MODEL DETAILS				
BUILDING USE	EXTERIOR WALL TYPE	STRUCTURAL SYSTEM	FLOOR AREA (SF)	ROOF SUPPORT
Hotel	*Brick Veneer*	*CMU/Steel Frame*	*135,000*	*Steel Joist System*
Apartment Building	*Brick Veneer*	*CMU/Steel Frame*	*60,000*	*Steel Joist System*
Hospital	*Brick Veneer*	*CMU/Steel Frame*	*200,000*	*Steel Joist System*
Office Building No. 1	*Precast Concrete Panel*	*Steel Frame*	*80,000*	*Steel Joist System*
Office Building No. 2	*Precast Concrete Panel*	*Steel Frame*	*80,000*	*Steel Joist System*
Office Building No. 3	*Glass and Metal Curtain Walls*	*Steel Frame*	*80,000*	*Steel Joist System*

6.3 RECORD GENERAL DATA

After arriving at a house, the inspectors should take and log a photograph (a curbside view of the front or side of the structure) and then record the basic data for the property on the Damage Inspection Worksheets.

6.3.1 Curbside Information

Much of the information on the first 1–2 pages of the worksheets can be completed curbside including entries in the *Building Address*, *Structure Attributes* (residential only), *Structure Information*, *Inspector Information*, and *NFIP Information* Sections.

6.3.2 Exterior Inspections

A detailed description of how to measure building dimensions (*Structure Information* Section) and what to look for during the exterior inspection is included in Section 6.3 and Table 6-5 (for residential buildings). Information including the building dimensions (*Structure Information*) as well as items related to exteriors within the *Adjustments* (e.g., porches and decks), *Damage Information* (exterior depth of flooding), *Percent of Damage Field Estimate*, and *Description of Damage* Sections will be gathered during the exterior inspection.

6.3.3 Interior Inspection

A more detailed description of what to look for during the interior inspection is included in Section 6.4 and Table 6-6 (for residential buildings). Information for items in the *Structure Attributes* (residential only) and *Structure Information* Sections (quality of construction) as well as items related to interiors within the *Adjustments*, *Percent of Damage Field Estimate*, *Condition of the Structure*, and *Description of Damage* Sections is gathered during the interior inspection.

6.4 EXTERIOR INSPECTIONS

After recording the basic data, the inspectors can estimate the structure area and perform an exterior inspection by walking around the entire exterior of the structure. The inspector should use the field inspection worksheets, located in Appendix B, to record data while performing the inspection. The worksheets contain fields that correspond to fields in the SDE software, so that data entry after the assessment has been performed can be done easily and accurately.

6.4.1 Measuring Building Dimensions

Before beginning the inspection, measure the building dimensions using a measuring tape (Overall Dimensions of building footprint in *Structure Information* Section). Exact dimensions are not required and small changes in shape, such as bay windows, extended entrances, or fireplace pads, can be ignored.

Four common building shapes are provided on the worksheet for site-built residences and non-residential structures, with boxes where the user can enter dimensions. Rectangle, “L,” “U,” and “T” shape buildings are shown on the SDE Damage Inspection Worksheets.

When recording building dimensions, it may not be necessary to measure each side of a house. Inspectors that feel comfortable with the approach can visually estimate the general building length and width dimensions.

6.4.2 Exterior Damage

Table 6-5 presents the damaged items to look for while completing the exterior inspection of a residential building and can be photocopied for use by the inspectors.

The inspection team should evaluate the exterior construction elements for residential and non-residential construction to determine the percent damage estimate. This estimate should be based on a visual inspection of each element. When more than one inspector is present, a percent breakdown should be mutually agreed upon by the team. Appendix E provides further guidance on estimating percent damage for residential structures.

One of the key factors for determining SD and separating damage from poor maintenance (i.e., peeling paint, worn interior floor finishes) is to consider the repairs necessary to get the structure up to local code requirements and its pre-damage condition.

➔ **REMEMBER**: Because of their relative weight in the percentage calculation for residential structures, if the foundation, superstructure, interior finish, plumbing, or exterior finish is not significantly damaged, the structure will most likely not be substantially damaged.

➔ **REMEMBER**: Homes that are within the 45 to 55 percent damage range should be more carefully inspected than those that are clearly either less or more damaged. The same is true for non-residential structures over a wider range—approximately 40 to 60 percent.

Table 6-5. Specific Features to Evaluate During Exterior Inspections of Residential Buildings

Item	Description
Depth of flooding	Examine all sides of the house (this will verify the initial assessment of the flood depth recorded for the basic data).
Obvious roof damage	• Missing shingles or roof sheathing movement • Destruction of exterior walls
Less obvious roof damage	• Warping of the roof sheathing due to lost or damaged shingles • Viewed with the use of a ladder or by stepping back from the house and looking at the roof surface for ripples and sunken or raised areas. This type of damage may require replacement of a significantly larger portion of the roof sheathing and shingles than an initial inspection revealed.
Foundation damage	Settlement, lateral movement, or cracking that affects structural stability.
Post, pier, or column damage and an evaluation of the first floor stability	For homes with crawlspaces.
Exterior wall damage	Holes or damage affecting the structural stability of the home.

6.5 INTERIOR INSPECTIONS

It is important for inspectors to remember at ALL TIMES that they are inside someone else's home or in the case of non-residential buildings, on someone else's property. The inspectors should always verify that they have permission to enter the property. Appropriate care and respect should be demonstrated during the inspections. The inspector should use the field inspection worksheets, located in Appendix B, to record data while performing the inspection. The worksheets contain fields that correspond to fields in the SDE software, so that data entry after the assessment has been performed can be done easily and accurately.

6.5.1 Verify Stability

Due to possible structural deficiencies, extreme caution should be exercised when entering damaged buildings. The inspectors must first verify that the floor of the building is stable enough to support their combined weight. Foundation settlement, high flood depths, and damage to floor joists can significantly weaken a floor. For structures built on crawlspaces or other elevated foundations, this can be checked during the exterior inspection phase.

6.5.2 Use Set Inspection Routine

It is recommended that a set procedure also be used for the interior inspection to avoid missing any rooms or damage. For instance, in residential structures, inspectors may want to start on the first floor with either the utility rooms (that house hot water tank, washer or dryer, furnace, etc.) or the kitchen and then work their way through the home on a room-by-room basis.

6.5.3 General Inspection Guidelines

Not all elements that get wet are 100 percent damaged. As an example, drywall and insulation in a house that was flooded for short duration to a depth of 2 feet above the first floor will only need the area removed below a height of 3 to 4 feet (flood depth plus wicking). Similarly, unless broken or permanently contaminated, plumbing pipes and fixtures can be flushed out with disinfectant, cleaned on the outside, and used again. Depending on the depth of flooding, some built-in appliances may only require minor repairs.

An important aspect of inspecting a structure is determining the damage to its support framework. If possible, the studs and foundation should be inspected for damage. Invasive procedures, such as tearing back wallpaper or drywall, should be kept to a minimum. Inspectors should try to locate areas that are already exposed.

> ➔ **NOTE**: For short duration floods, the interior depth of flooding above the first floor (and therefore, the extent of interior damages) may be less than the exterior flood depth.

6.5.4 Upgrades or Custom-Designed Items

For residential structures, any significant upgrades in flooring, interior finishes, kitchen cabinets and countertops, appliances, or custom-designed interiors should be noted on the Damage Inspection Worksheets and evaluated under the *Adjustments* section of the software.

For non-residential structures, interior adjustments could include built-in security or communications systems, conveyance (elevator/escalator) systems, skylights, floor and wall coverings, and built-in appliances or equipment. These items should be noted in the *Adjustments* section of the Damage Inspection Worksheets for non-residential structures.

6.5.5 Interior Damage to Look for

The inspection team can evaluate the interior construction elements from the SDE percent breakdown section for both residential and non-residential structures. The estimate of the percent damage should be based on a visual inspection of each element. When more than one inspector is present, a percent breakdown should be mutually agreed upon by the team.

Table 6-6 summarizes the type of interior damage to look for in residential buildings, and how to evaluate it, for the interior construction elements. Additionally, Appendix E provides further guidance on estimating percent damage for residential structures.

6.6 COMPLETING SDE DATA ENTRY

After the Damage Inspection Worksheets are completed, the SDE software can be used to determine SD. The format of the worksheets generally follows the layout of the software to facilitate efficient data entry.

➔ **REMEMBER**: Refer to the SDE User's Manual and the SDE Video for assistance in completing the data entry.

6.6.1 SDE Report

After the data have been entered and the methods for determining structure value (computed actual cash value, adjusted tax assessed value, or professional appraisal) and the cost of repairs (computed damages, contractor estimate, or community estimate) have been selected, a summary report for the structure can be printed. The SDE Coordinator should review the printed copy and then sign and date it. This printout is often the official determination for the building, and should be kept on file for future use.

Table 6-6. Specific Features to Evaluate During Interior Inspections for Residential Buildings

Element	Damage Evaluation	What to Look For
Foundation	Damage that is significant enough to affect the overall structural stability of the foundation.	Settlement, lateral displacement, or cracking not visible from the exterior. This is especially important for homes with basement or crawlspace foundations.
Superstructure	Damage that either currently or in the future could affect the structural stability of the building including the wall support systems as well as roof trusses and framing.	*Wall Support Systems* Deformation or distortion of the structural frame that is not visible from the exterior. *Roof Support Systems* For intact ceilings: look for sagging, water marks, dripping water, or other damage that may indicate truss or roof framing damage. For removed ceilings: view the truss and roof framing for damage.
Roof Covering	Damage to the roof sheathing, shingles/tiles, flashing, or other elements that are part of the roof covering.	Sagging, water marks and dripping water could indicate roof covering damage. Also, look for daylight entering through holes in the roof or warped sheathing not visible from the outside.
Interior Finish	Damage should be evaluated for a height of up to 1 foot above the interior high water mark. For two-story houses with similar square footage on each floor, the first floor will account for approximately 50 percent of the total quantity of these items in the house. All wet insulation and drywall should be removed and disposed of properly.	Damaged, broken, or warped interior walls or framing (windows, doorways, or closets) studs. It is assumed that all painted, stained, papered, or paneled surfaces touched by floodwaters will at least require cleaning, sanding, and resurfacing.
Doors and Windows	Depending on the flood duration, these items will require either a small amount of cleanup plus paint/stain or total replacement due to warping.	Damaged, broken, warped, or removed doors and windows.
Cabinets-Countertops	Depending on the flood duration, these items will either require a small amount of clean up, sanding, and new stain or paint for cabinets or total replacement due to warping. For kitchens with	Damaged, broken, warped, or removed cabinets and countertops.

	upper and lower cabinets, it will probably be necessary to replace both sets of cabinets to ensure matching of styles, material, and color to make the home marketable.	

Table 6-6. Specific Features to Evaluate During Interior Inspections for Residential Buildings (continued)

Element	Damage Evaluation	What to Look For
Floor Finish	With the exception of ceramic and marble tile, almost all floor coverings and sub-flooring that get wet will need to be replaced.	Discolored, warped, cut, damaged, broken, or missing flooring.
Plumbing	With the exception of broken fixtures or sections of pipe, many of these items can be flushed out with disinfectant, cleaned on the outside, and used again.	Cracked, dented, misaligned, leaking, broken, or missing sections of pipe or fixtures such as toilets, sinks, tub, and showers. Contamination of water supplies.
Electrical	Depending on the depth of flooding, there may only be a need to replace fixtures such as outlets, switches, lights, or a junction/fuse box below a certain flood elevation.	Corroded, exposed, disconnected, broken, missing, or non-functioning items and fixtures.
Built-in Appliances, and Heating – Cooling/HVAC	Depending on the depth of flooding, these may require only a cleanup with disinfectant plus a small amount of repairs or may require total replacement.	Damaged, water logged, broken, non-functioning, or removed appliances or heating-cooling units.

6.6.2 File Folders for SDE Inventory Data

If file folders are used, the contents for each structure inventoried should include the following:

1. A signed and dated copy of the SDE individual structure report (1-page summary or 4-page detailed report)
2. Photographs including captions with address or location, date, and team name
3. Tax data used to determine the location, address, habitable square footage, or structure value
4. Letter of Determination
5. Submittals and correspondence from property owners
6. Insurance claims data (if available)
7. Professional appraisal (if available)
8. Contractor's estimate of repairs (if available)
9. Community's estimate of repairs (if available)

The contents of the file folder will be used to support determinations appealed by property owners that become involved in a formal judicial review.

General File Folder

In addition, a general file folder for the disaster can be prepared to include the following:

1. Community Floodplain management ordinance
2. Sections of the applicable local code relevant to SD
3. Newspaper articles
4. Community press releases
5. Post-disaster photographs
6. Rainfall and stream gage data
7. Official estimates of the flood frequency
8. Copy of the Letter of Introduction used during the inspections
9. List or inventory of damaged structures
10. Community assessments of the disaster
11. Maps showing flooded and inventoried areas.

SECTION SEVEN POST-DETERMINATION ACTIVITIES

After all the data are collected, recorded, and finalized, the community must initiate follow-up activities to distribute and enforce the results of the SD determinations. The community should consider the following activities:

1. Finalize and store the SDE data.
2. Inform other community officials about the determinations and the NFIP requirements for reconstructing substantially damaged buildings.
3. Prepare a press release to explain the determination process and the implications of the determinations.
4. Prepare and distribute a "substantial damage determination letter" with the name and telephone number of a community contact (sample determination letters are presented in Appendix C). The letter should indicate that the determination was required under the community's floodplain management ordinance and should specify that all rebuilding, improvements, or new construction within the regulatory floodplain require a community permit.
5. Post notices of either SD or unsafe conditions on homes.
6. Identify publications from FEMA, the Red Cross, and State or local agencies that provide guidance on rebuilding after a disaster.
7. Identify potential mitigation measures for both the community and individual residents.
8. Identify and activate appeal procedures.
9. Notify the State NFIP Coordinator's office of the results of the SD determinations and determine what, if any, additional activities are required.

➔ **NOTE**: At a minimum, the community should perform activities 1, 2, 4, and 5 above.

7.1 SUBSTANTIAL DAMAGE DETERMINATION LETTERS

The substantial damage determination letters should involve a consistent format and be mailed to all residents within the inventory, including those without SD. Sample letters for both SD and no substantial damage determinations are provided in Appendix C. These samples are provided as guidance and their use is encouraged but not required.

The mailings should occur after all data are collected and the individual determinations have been signed and dated by the community official. The community should determine enforcement procedures for handling letters that return unopened. It may be necessary to visit these buildings to verify that reconstruction has not started without the proper permits.

Non-Substantially Damaged Structures

For structures that are ***not substantially damaged***, the owners should be notified that building permits will be required for rebuilding activities. The community should include a copy of the necessary permits and a list of permit fees with the notification letter as well as the appropriate community department to contact for questions.

Substantially Damaged Structures
If a home is ***substantially damaged***, the letter should state this and the community should offer a meeting to explain the options for rebuilding.

7.2 REVISING SDE DETERMINATIONS BASED ON PROPERTY OWNER DATA

Upon receipt of the notification letter, some property owners may submit additional or more detailed information than was used by the community during the determination process. The community must evaluate these data and determine if it is appropriate to revise it in the existing determination. If the determination changes as a result of the new data, the enforcement of the SD requirements will be based on the new determination. While all property owners should be allowed the option to submit new data and request a revised determination, the community is not required to revise all determinations based on the results of one re-evaluation. Nor is the community required to reimburse property owners for professional appraisals if an existing determination is reversed based on an appraisal paid for by the property owner.

The community should always keep thorough documentation on record for any reversals of SD determinations. This documentation should include all supporting materials (e.g., contractor's estimate, property appraisal, SDE records) used to justify the reversal and should clearly illustrate the reason the initial determination was reversed. Because enforcement of the SD regulations is a key part of a community's floodplain management responsibilities under the NFIP, a review of SD determinations (and determination reversals) may be conducted as part of a Community Assistance Visit (CAV). CAVs are periodically conducted by State floodplain management or FEMA officials to assess a community's compliance with NFIP-required floodplain management enforcement. In order for a community to remain in good standing with the NFIP, the community must show it is adequately enforcing these regulations. Communities that do not retain good standing with the program are subject to probation or suspension from the program, which can have dire consequences for the community's residences and business owners with property in the SFHA. These consequences include the loss of availability of federally backed flood insurance and limited Federal disaster aid following declared flood events (i.e., no aid for the permanent repair or reconstruction of insurable buildings in SFHAs).

APPENDIX A

REFERENCES

REFERENCES

Federal Emergency Management Agency (FEMA), 1991. *Answers to Questions about Substantially Damaged Buildings,* FEMA Publication No. 213.

Federal Emergency Management Agency (FEMA), 2006a. *The ABC's of Returning to Flooded Buildings*, Hurricane Katrina Recovery Advisory No. 4.

Federal Emergency Management Agency (FEMA), 2006b. *Initial Restoration for Flooded Buildings*, Hurricane Katrina Recovery Advisory No. 2.

Federal Emergency Management Agency (FEMA), 2007. *Increased Cost of Compliance Brochure,* FEMA Publication No. F-663. March 2007.

Federal Emergency Management Agency (FEMA), 2008. *Increased Cost of Compliance Fact Sheet,* Spring/Summer 2008.

Federal Emergency Management Agency (FEMA), 2010a. *Substantial Damage Estimator,* Version 1.0 software.

Federal Emergency Management Agency (FEMA), 2010b. *SDE User's Manual*, FEMA Publication No. P-784.

Federal Emergency Management Agency (FEMA), 2010c. *SDE and Your Community*. FEMA training video.

Federal Emergency Management Agency (FEMA), 2010d. *Substantial Improvement/Substantial Damage Desk Reference*. FEMA Publication No. P-758.

APPENDIX B

FORMS AND CHECKLISTS

- Blank SDE Damage Inspection Worksheets – Single/Multi-Family
- Blank SDE Damage Inspection Worksheets – Manufactured Homes
- Blank SDE Damage Inspection Worksheets – Non-residential Buildings
- Checklist 1 – Pre-Disaster Planning
- Checklist 2 – Field Preparations
- Photo Log

SDE DAMAGE INSPECTION WORKSHEET
Single-Family, Row, or Townhouse Site Built Residences

Subdivision Information:

Subdivision: _____ Parcel # _____ Lot # _____

Elevation of lowest floor: _____ Datum: _____

Community Information:

NFIP Community Name: _____ *NFIP Community ID:* _____

Latitude: _____ Longitude: _____

Building Address:

Owner's First Name: _____ Last Name: _____

Building Address #: _____ Street: _____ Suffix: _____

City: _____ State: _____ Zip: _____

Phone #: _____ County: _____

Mailing Address:

Mailing Address#: _____ Street: _____ Suffix: _____

City: _____ State: _____ Zip: _____

Phone #: _____ County: _____

Care of: _____

Structure Attributes:

Style: 1-story _____ 2-story _____ More than 2 stories _____

Foundation: Continuous Wall w/ Slab _____ Piles _____ Crawlspace _____
Slab-on-Grade _____ Basement _____

Superstructure: Stud-Framed _____ Masonry _____ ICF _____ Common Brick _____

Roof Covering: Shingles (Asphalt or Wood) _____ Clay Tile _____ Slate _____
Standing Seam (Metal Roof) _____

Exterior Finish (Type) _____

HVAC: Yes _____ No _____

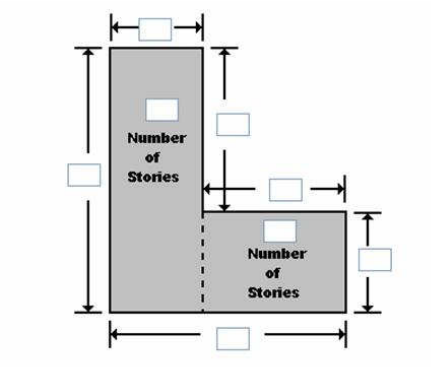
Structure Information:

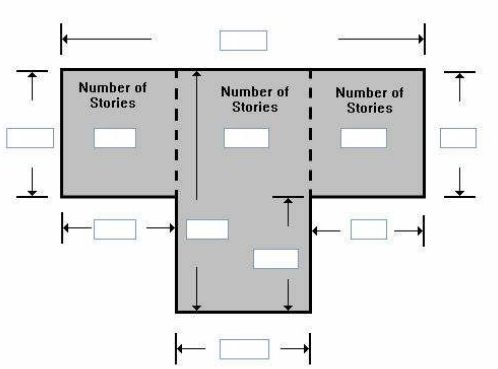
Year of Construction: _____

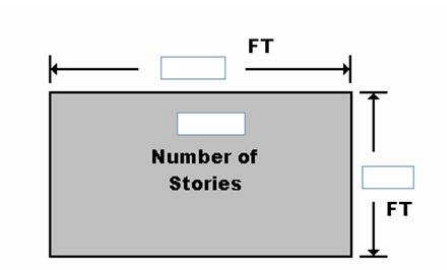
Quality of Construction: Low _____ Budget _____ Average _____ Good _____
Excellent _____

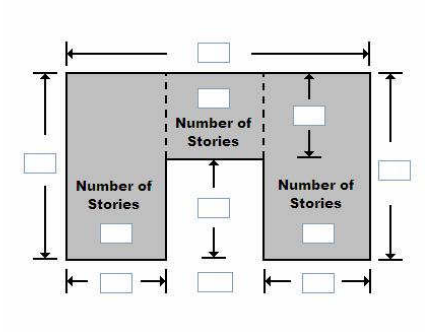
Condition of Structure: Average _____ Good _____ Excellent _____

Overall Dimensions of building footprint: _____









Damage Information:

Date Damaged Occurred: _____

Cause of Damage: Fire _____ Flood _____ Seismic _____ Wind _____ Other _____

Duration of Flood: _____ hours or _____ days

Est. Flood Elevation (ft.) _____ Est. Flood Depth (ft. above first floor) _____

Flood Depth above Lowest Floor: Exterior Walls _____ ft Interior Walls _____ ft

Inspector Information:

Name of Inspector: _____

Date of Inspection: _____ Time of Inspection: _____

Phone Number of Inspector *(including area code):* _____

NFIP Information:

NFIP Community I.D.# _____ FIRM Panel #: _____

FIRM Suffix: _____ Date of FIRM Panel: _____ FIRM Zone: _____

BFE (NGVD): _____Regulatory Floodway: Yes _____ No _____ Potential _____

Adjustments:

Roof: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Heating/Cooling: Description _____ Quantity (Each) _____ Unit Cost _____

Appliances: Description _____ Quantity (Each) _____ Unit Cost _____

Fireplaces: Description _____ Quantity (Each) _____ Unit Cost _____

Porch/Breezeways: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Garage: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Additional Adjustments;

Adjustment: _____ Quantity _____ Units _____ Unit Cost _____

Adjustment: _____ Quantity _____ Units _____ Unit Cost _____

Adjustment: _____ Quantity _____ Units _____ Unit Cost _____

PERCENT OF DAMAGE FIELD ESTIMATE *(for single/multi-family site built homes)*

_____ % Foundations
_____ %Superstructure (Framing/Masonry)
_____ % Roof Covering
_____ % Exterior Finish
_____ % Interior Finish
_____ % Doors and Windows
_____ % Cabinets/Countertops
_____ % Floor Finish
_____ % Plumbing
_____ % Electrical
_____ % Appliances
_____ % Heating/Cooling (HVAC)

Condition of Structure: *(Check one)*

____Inundation damage only ____Minor structural damage ____Major structural damage
____Partially collapsed ____Structure moved off foundation ____Totally destroyed/collapsed

Description of Damage: *(Answer yes or no)*

Plumbing: Exposed _____ In need of repair _____

HVAC/Electrical: Submerged _____ Damaged _____ Repair _____ Replace _____

Use numbers from the right to describe the condition of items C through F:

(C) Foundation _____	1. No visible damage	5. Dislodged/Destroyed
(D) Exterior walls _____	2. Settlement/cracked	6. Submerged
(E) Interior walls _____	3. Partially missing	7. Include all of the above
(F) Roof _____	4. Sagging	8. Other (explain) _____

SDE DAMAGE INSPECTION WORKSHEET
Manufactured Homes

Subdivision Information:

Subdivision: _____ Parcel # _____Lot # _____

Elevation of lowest floor: _____ Datum:_____

Community Information:

NFIP Community Name: _____ *NFIP Community ID:*_____

Latitude: _____ Longitude: _____

Building Address:

Owner's First Name: _____ Last Name: _____

Building Address #: _____Street:_____ Suffix:_____

City: _____State: _____ Zip: _____

Phone #: _____County:_____

Mailing Address:

Mailing Address#:_____ Street:_____Suffix:_____

City: _____State: _____ Zip: _____

Phone #: _____County:_____

Care of:_____

Structure Attributes:

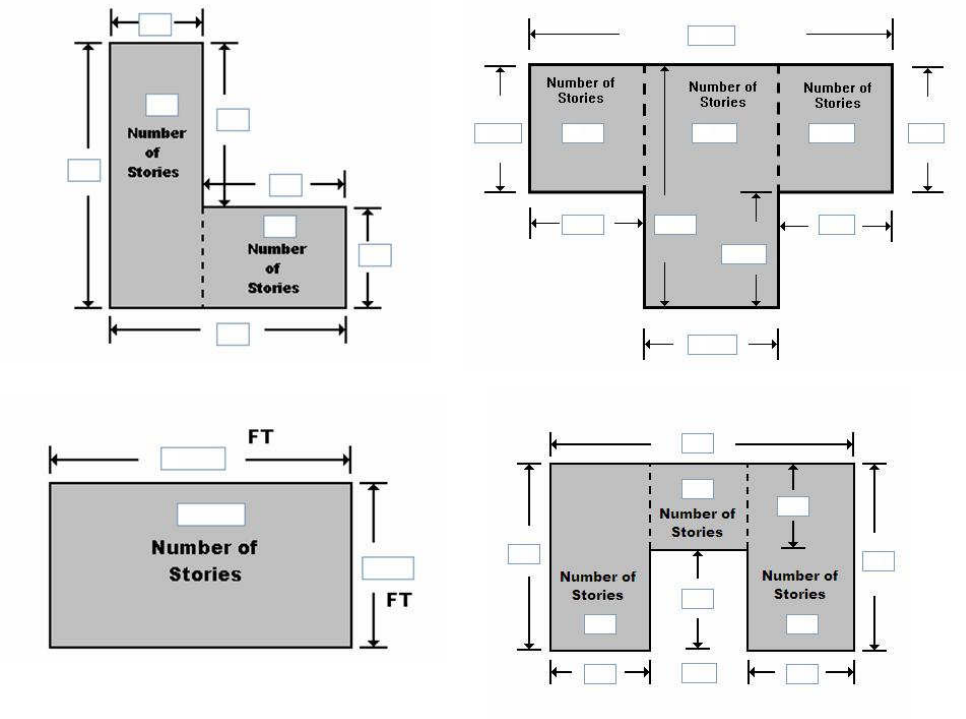
Foundation: Continuous Wall w/ Slab, or Piers and Posts _____ Piles _____ Crawlspace _____

Structure Information:

Year of Construction: _____

Quality of Construction: Low _____ Budget _____ Average _____ Good _____ Excellent _____
Condition of Structure: Average _____ Good _____ Excellent _____

Overall Dimensions of building footprint: _____



Damage Information:

Date Damaged Occurred: _____

Cause of Damage: Fire _____ Flood _____ Seismic _____ Wind _____ Other_____

Duration of Flood: _____hours or _____days

Est. Flood Elevation (ft.) _____ Est. Flood Depth (ft. above first floor) _____

Flood Depth above Lowest Floor: Exterior Walls _____ft Interior Walls _____ft

Inspector Information:

Name of Inspector: _____

Date of Inspection: _____ Time of Inspection: _____

Phone Number of Inspector *(including area code):* _____

NFIP Information:

NFIP Community I.D.# _____ FIRM Panel #: _____

FIRM Suffix: _____Date of FIRM Panel:_____ FIRM Zone: _____

BFE (NGVD): _____Regulatory Floodway: Yes _____ No _____ Potential _____

Adjustments:

Roof: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Heating/Cooling: Description _____ Quantity (Each) _____ Unit Cost _____

Appliances: Description _____ Quantity (Each) _____ Unit Cost _____

Fireplaces: Description _____ Quantity (Each) _____ Unit Cost _____

Porch/Breezeways: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Garage: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Additional Adjustments:

Adjustment: _____ Quantity _____ Units _____ Unit Cost _____

Adjustment: _____ Quantity _____ Units _____ Unit Cost _____

Adjustment: _____ Quantity _____ Units _____ Unit Cost _____

PERCENT OF DAMAGE FIELD ESTIMATE *(for manufactured homes)*

_____ % Foundations
_____ %Superstructure (Framing/Masonry)
_____ % Roof Covering
_____ % Exterior Finish
_____ % Interior Finish
_____ % Doors and Windows
_____ % Cabinets/Countertops
_____ % Floor Finish
_____ % Plumbing
_____ % Electrical
_____ % Appliances
_____ % Heating/Cooling (HVAC)

Condition of Structure: *(Check one)*

____Inundation damage only ____Minor structural damage ____Major structural damage

____Partially collapsed ____Structure moved off foundation ____Totally destroyed/collapsed

Description of Damage: *(Answer yes or no)*

Plumbing: Exposed _____ In need of repair _____

HVAC/Electrical: Submerged _____ Damaged _____ Repair _____ Replace _____

Use numbers from the right to describe the condition of items C through F:

(C) Foundation _____	1. No visible damage	5. Dislodged/Destroyed
(D) Exterior walls _____	2. Settlement/cracked	6. Submerged
(E) Interior walls _____	3. Partially missing	7. Include all of the above
(F) Roof _____	4. Sagging	8. Other (explain) _____

SDE DAMAGE INSPECTION WORKSHEET
Non-Residential Buildings

Subdivision Information:

Subdivision: _____ Parcel # _____ Lot # _____

Elevation of lowest floor: _____ Datum: _____

Community Information:

NFIP Community Name: _____ *NFIP Community ID:* _____

Latitude: _____ Longitude: _____

Building Address

Owner's First Name: _____ Last Name: _____

Building Address #: _____ Street: _____ Suffix: _____

City: _____ State: _____ Zip: _____

Phone #: _____ County: _____

Mailing Address

Mailing Address#: _____ Street: _____ Suffix: _____

City: _____ State: _____ Zip: _____

Phone #: _____ County: _____

Care of: _____

Structure Information

Year of Construction: _____

Number of Stories: 1 _____ 2 through 4 _____ 5 or more _____

Structure Use:

Department Store _____	Motel _____	Restaurant _____
Commercial Retail _____	Strip Mall _____	Conv. Store _____
Fire/Police Station _____	Elementary School _____	Apartments _____
Courthouse _____	Grocery Store _____	Mini Warehouse _____
Hospital _____	Long-term Care Facility _____	Auditorium _____
House of Worship _____	Fast Food Restaurant _____	Municipal Bldg. _____
Office Buildings _____	Hotel _____	High School _____
Industrial _____		

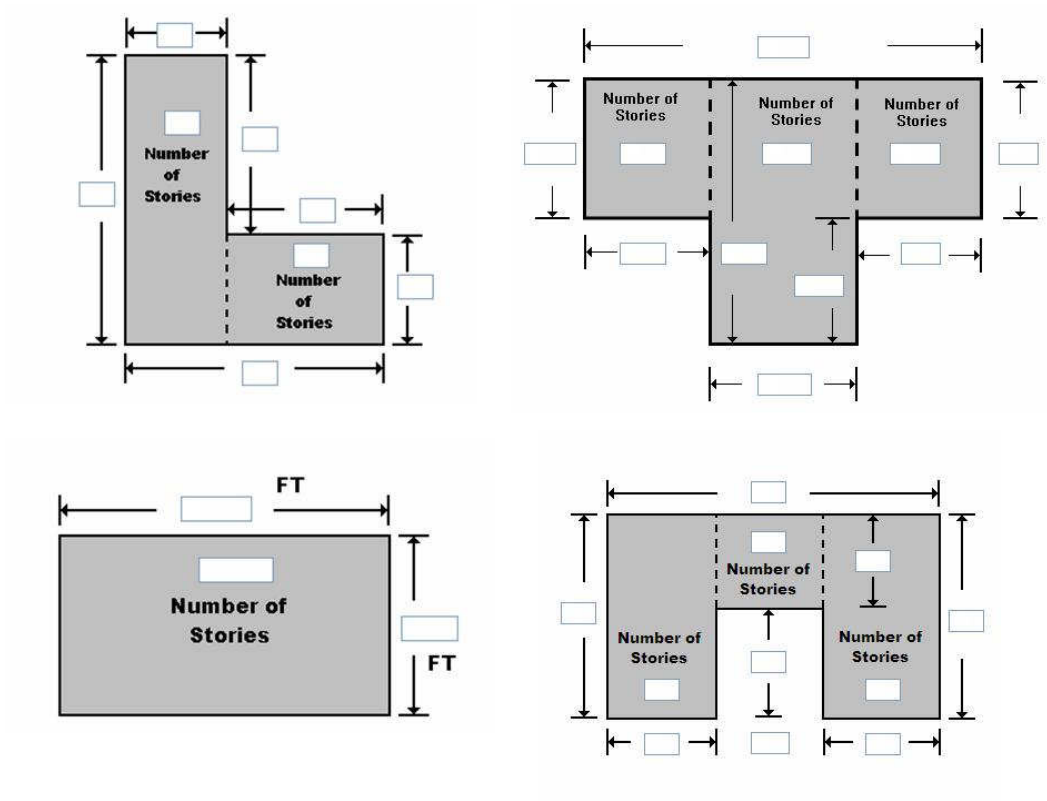
Sprinkler System: Yes_____ No_____

Conveyance: Yes_____ No_____

Quality of Construction: Low _____ Budget _____ Average _____ Good _____ Excellent _____

Condition of Structure: Average _____ Good _____ Excellent _____

Overall Dimensions of building footprint:



Damage Information

Date Damaged Occurred: _____

Cause of Damage: Fire _____ Flood _____ Flood & Wind _____ Seismic _____ Wind _____

Duration of Flooding: _____ hours or _____ days

Est. Flood Elevation (ft.) _____Est. Flood Depth (ft. above first floor)_____

Flood Depth above Lowest Floor: Exterior Walls _____ft Interior Walls _____ft

Inspector Information

Name of Inspector: _____

Date of Inspection: _____ Time of Inspection: _____

Phone Number of Inspector *(including area code):* _____

NFIP Information

NFIP Community I.D.# _____ FIRM Panel #: _____

FIRM Suffix: _____ Date of FIRM Panel: _____ FIRM Zone: _____

BFE (NGVD): _____Regulatory Floodway: Yes _____ No _____ Potential _____

Adjustments

Built-In Equipment: Description _____ Quantity (Each) _____ Unit Cost _____

Roofing: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Built-In Security/Communications: Description _____ Quantity (Each) _____ Unit Cost _____

Conveyance System: Description _____ Quantity (Each) _____ Unit Cost _____

Wall Covering: Description _____ Quantity (Sq. Ft.) _____ Unit Cost _____

Window/Skylights: Description_____ Quantity (Each) _____ Unit Cost _____

Additional Adjustments

Description_____ Quantity (Each) _____ Unit Cost _____

Description_____ Quantity (Each) _____ Unit Cost _____

Description_____ Quantity (Each) _____ Unit Cost _____

Description_____ Quantity (Each) _____ Unit Cost _____

PERCENT OF DAMAGE FIELD ESTIMATE *(for non-residential buildings)*

_____ % Foundations

_____ %Superstructure

_____ % Roof Covering

_____ % Plumbing

_____ % Electrical

_____ % Interiors

_____ % HVAC

Condition of Structure: *(Check one)*

____Inundation damage only ____Minor structural damage ____Major structural damage

____Partially collapsed ____Structure moved off foundation ____Totally destroyed/collapsed

Description of Damage: *(Answer yes or no)*

Plumbing: Exposed _____ In need of repair _____

HVAC/Electrical: Submerged _____ Damaged _____ Repair _____ Replace _____

Use numbers from the right to describe the condition of items C through F:

(C) Foundation _____	1. No visible damage	5. Dislodged/Destroyed
(D) Exterior walls _____	2. Settlement/cracked	6. Submerged
(E) Interior walls _____	3. Partially missing	7. Include all of the above
(F) Roof _____	4. Sagging	8. Other (explain) _____

Checklist 1 – Pre-Disaster Planning

(page 1 of 2)

	Need	Completed	Item
1.	_____	_____	Review NFIP requirements for substantial damage.
2.	_____	_____	Review SDE software and User's Manual to understand the data requirements.
3.	_____	_____	Select a SDE Coordinator.
4.	_____	_____	Review the building quality definitions and determine the building qualities and types for the floodprone areas of the community.
5.	_____	_____	Research and develop unit costs for residential and non-residential structures in the community. Resources include industry-accepted cost-estimating guides, building permit data, discussions with local contractors or realtors, adjusted tax data, guidance from adjacent communities, or personal experience with residential and non-residential cost estimating.
6.	_____	_____	Identify flood maps to use for substantial damage determinations. This includes FIRMS, FBFMs, FIS text, community maps showing previously flooded areas, and other flood studies by federal or state agencies.
7.	_____	_____	Identify street or address maps.
8.	_____	_____	Identify tax parcel maps.
9.	_____	_____	Transfer SFHA (or 100-year floodplain) and floodway boundaries from FIRM and FHBM to street, address, or tax parcel map.
10.	_____	_____	Identify type, location, and community contact for tax data that applies to substantial damage determinations. Any or all of the following data will be useful: owner name, building address, type of house, non-residential building use, year of construction, square footage, number of stories, adjusted building values, number of years since last tax adjustment, and dates of additions or renovations.
11.	_____	_____	Pre-enter available SDE data into the software.

Checklist 1 – Pre-Disaster Planning

(page 2 of 2)

	Need	Completed	Item
12.	_____	_____	Prepare a Letter of Introduction.
13.	_____	_____	Develop a substantial damage action plan listing basic activities and responsible departments.
14.	_____	_____	_____ _____
15.	_____	_____	_____ _____
16.	_____	_____	_____ _____
17.	_____	_____	_____ _____

Procedures to Review

	Need	Completed	
1.	_____	_____	Determine entry procedures for entering locked or occupied buildings.
2.	_____	_____	_____ _____
3.	_____	_____	_____ _____
4.	_____	_____	_____ _____

Checklist 2 – Field Preparations

(page 1 of 2)

	Need	Have	Item
1.	_____	_____	Flood maps – FIRMs, FBFMs, FEMA Flood Recovery maps, or other floodplain or flood risk maps.
2.	_____	_____	Tax or address map with 100-year flood boundaries.
3.	_____	_____	Route map – showing proposed areas and sequence for data collection.
4.	_____	_____	Tax data – homeowner/building owner name, address, and zip code, mailing address and zip code, number of stories, dimensions, or habitable square footage (if available).
5.	_____	_____	SDE Damage Inspection worksheets.
6.	_____	_____	Photo ID badge.
7.	_____	_____	Letter of Introduction with community Point of Contact (name and telephone number).
8.	_____	_____	Clip boards, pens/pencils, steno pad or writing tablet, highlighter.
9.	_____	_____	100-ft tape measure (to obtain or verify structure dimensions).
10.	_____	_____	Address board.
11.	_____	_____	Hard hat, gloves, safety glasses, steel-toe shoes, and flashlight.
12.	_____	_____	Cell phones, walkie-talkies, or pagers.
13.	_____	_____	Camera, film (or diskettes/memory cards), and extra batteries.
14.	_____	_____	Copies of blank photo logs.
15.	_____	_____	Verify that police, fire, and emergency management agencies have been advised of inspections.

Checklist 2 – Field Preparations

(page 2 of 2)

	Need	Have	Item
16.	_____	_____	_____
			_____
17.	_____	_____	_____
			_____
18.	_____	_____	_____
			_____

Procedures to Review

	Need	Completed	
1.	_____	_____	SDE data requirements.
2.	_____	_____	Housing quality and non-residential building quality.
3.	_____	_____	SDE inspection procedures.
4.	_____	_____	Data collection route.
5.	_____	_____	Guidelines for interaction with residents and building occupants.
6.	_____	_____	Procedures for dealing with locked or occupied buildings.
7.	_____	_____	_____
			_____
8.	_____	_____	_____
			_____

PHOTO LOG

Team ID Name/Number: _____

Date: _____/_____/_____

Memory Stick No.	Photo No.	Address / Description

APPENDIX C

SAMPLE DOCUMENTS

- NOTICE OF DETERMINATION – Substantial Improvement
- NOTICE OF DETERMINATION – Substantial Damage
- NOTICE OF DETERMINATION – No Substantial Damage
- Recommended Guidelines for Contact with Property Owners

Sample Letter to Notify Property Owners
of a Determination that Work Constitutes Substantial Improvement

NOTICE OF SUBSTANTIAL IMPROVEMENT DETERMINATION
(RESIDENTIAL)

Dear Property Owner:

We have reviewed your recent application for a permit to [describe proposed improvement/addition] your existing home that is located in a mapped Special Flood Hazard Area. As required by our floodplain management regulations and/or building code, we have determined that the proposed work constitutes substantial improvement of the building. This determination is based on a comparison of the cost estimate of the proposed work to the market value of the building (excluding land value). When the costs equal or exceed 50 percent of the market value of the building, the work is substantial improvement.

As a result of this determination, you are required to bring the building into compliance with the flood damage-resistant provisions of the regulations and/or code [cite pertinent sections].

We would be pleased to meet with you and your designated representative (architect/builder) to discuss how to bring your home into compliance. There are several aspects that must be addressed to achieve compliance. The most significant requirement is that the lowest floor, as defined in the regulations/code, must be elevated to or above the base flood elevation (BFE) [or the elevation specified in the regulations/code]. You may wish to contact your insurance agent to understand how raising the lowest floor higher than the minimum required elevation can reduce National Flood Insurance Program (NFIP) flood insurance premiums.

Please resubmit your permit application along with plans and specifications that incorporate compliance measures. Construction activities that are undertaken without a proper permit are violations and may result in citations, fines, or other legal action.

Sample Letter to Notify Property Owners
of a Determination that Work Constitutes Repair of Substantial Damage

NOTICE OF SUBSTANTIAL DAMAGE DETERMINATION
(RESIDENTIAL)

Dear Property Owner:

We have reviewed your recent application for a permit to repair your existing home that was damaged by [insert cause of damage]. The building is located in a mapped Special Flood Hazard Area. As required by our floodplain management regulations and/or building code, we have determined that the building has been substantially damaged. This determination is based on a comparison of the cost estimate of the work required to restore the building to its pre-damage condition to the market value of the building (excluding land value). When the cost to repair equals or exceeds 50 percent of the market value of the building, the work is repair of substantial damage.

As a result of this determination, you are required to bring the building into compliance with the flood damage-resistant provisions of the regulations and/or code [cite pertinent sections].

We would be pleased to meet with you and your designated representative (architect/builder) to discuss how to bring your home into compliance. There are several aspects that must be addressed to achieve compliance. The most significant requirement is that the lowest floor, as defined in the regulations/code, must be elevated to or above the base flood elevation (BFE) [or the elevation specified in the regulations/code]. You may wish to contact your insurance agent to understand how raising the lowest floor higher than the minimum required elevation can reduce National Flood Insurance Program (NFIP) flood insurance premiums.

If the damage was caused by flooding and if you have a flood insurance policy from the NFIP, you should contact your adjuster to discuss the Increased Cost of Compliance (ICC) coverage. This coverage may provide a claim payment to help pay for work required to bring your home into compliance. Your adjuster can explain that the ICC claim may also be used to pay certain costs associated with demolishing and rebuilding your home, or moving your home to a site outside of the floodplain.

Please resubmit your permit application along with plans and specifications that incorporate compliance measures. Construction activities that are undertaken without a proper permit are violations and may result in citations, fines, or other legal action.

Sample Letter to Notify Property Owners
of a Determination that Work does NOT Constitute Repair of Substantial Damage

NOTICE OF DETERMINATION (RESIDENTIAL)

Dear Property Owner:

We have reviewed your recent application for a permit to repair your existing building that was damaged by [insert cause of damage]. The building is located in a mapped Special Flood Hazard Area. As required by our floodplain management regulations and/or building code, we have determined that the work proposed to repair the damage does not constitute repair of substantial damage. This determination is based on a comparison of the cost estimate of the work required to restore the building to its pre-damage condition to the market value of the building.

Please be advised that we will make another determination if you elect to perform work other than what is necessary to repair the damage, such as additional renovations or upgrades or building an addition. Construction activities that are undertaken without a proper permit are violations and may result in citations, fines, or other legal action.

Recommended Guidelines for Contact with Property Owners

1. The objectives of the inspections are to accurately collect the data required for the substantial damage determinations as fast as possible and move on to the next building.

2. Remember that you are entering someone's home or in the case of non-residential structures, their property or place of business, on official City business. Therefore, conduct yourself in a professional manner and be respectful of personal property. Many of these owners and occupants have suffered significant financial losses.

3. The inspections should be conducted between the hours of ____ AM and ___ PM in accordance with the hours discussed in the City's Letter of Introduction dated _____.

4. Due to the extensive damages, many of the homes and buildings may be unoccupied. Therefore, you will have little or no contact with many of the occupants as you complete your inspections.

5. When approached by a property owner or occupant, verify that the building being inspected is theirs and then hand them a Letter of Introduction. In general, property owners and occupants will be curious and possibly suspicious of the inspections. Explain that you are only there to inspect for damage and record the required data.

6. Property owners and occupants with additional questions should call the Point of Contact identified in the Letter of Introduction. Try to avoid lengthy conversations as much as possible. Many of the conversations will become repetitive and will unnecessarily slow down the rate of inspections.

7. Unless specifically directed to by the SDE field coordinator, do not try to explain the substantial damage determination process, what the results might mean for the property owner, or any state or federal buyout or other post-disaster grant or funding program.

8. Under the SDE field coordinator's direction, explain that building permits may be required for any reconstruction, repairs, or new construction in the aftermath of the disaster. Also, any reconstruction, repairs, or new construction without a proper permit may be considered as non-compliant construction and could result in daily fines and/or removal of the non-compliant construction.

9. For locked properties or properties where the owner or occupant is present and refuses to allow you inside, simply record the address, a name and telephone number (if available), the reason for no entry, and then hand the owner or occupant a Letter of Introduction before moving on to the next home.

10. Before entering a building, verify that the floor is safe to walk on, and then enter carefully. Refrain from pulling pieces of plaster, tearing out drywall or ceilings, or tearing back wallpaper or drywall unless absolutely necessary for the assessment of the damages on the percent breakdown section of the *Damage Inspection Worksheet*.

APPENDIX D

LIST OF RECOMMENDED CONSTRUCTION COMPONENTS THAT MAY BE INCLUDED IN A CONTRACTOR OR COMMUNITY ESTIMATE OF REPAIRS

- Residential Structures
- Non-Residential Structures

List of Recommended Elements to be Included

In a Contractor or Community Estimate of Repairs

ALL STRUCTURES

Address or Location:_____

Community:_____

ITEMS THAT MUST BE INCLUDED (check box on left if present):

All structural elements, including:

- ❑ 1. Foundations (e.g., Spread or continuous foundation footings, perimeter walls, etc.)
- ❑ 2. Monolithic or other types of concrete slabs
- ❑ 3. Bearing walls, tie beams, trusses
- ❑ 4. Joists, beams, subflooring, framing, ceilings
- ❑ 5. Interior non-bearing walls
- ❑ 6. Exterior finishes (e.g., brick, stucco, siding)
- ❑ 7. Windows and exterior doors
- ❑ 8. Roofing, gutters, and downspouts
- ❑ 9. Hardware
- ❑ 10. Attached decks and porches
- ❑ 11.
- ❑ 12. _____
- ❑ 13. _____
- ❑ 14. _____
- ❑ 15. _____

All interior finish elements, including:

- ❑ 1. Floor finishes (e.g., hardwood, ceramic vinyl, linoleum, stone, and wall-to-wall carpet over subflooring)
- ❑ 2. Bathroom tiling and fixtures
- ❑ 3. Wall finishes (drywall, painting, stucco, plaster, paneling, and marble)
- ❑ 4. Built-in cabinets (kitchen, utility, entertainment, storage, and bathroom)
- ❑ 5. Interior doors
- ❑ 6. Interior finish carpentry
- ❑ 7. Built-in bookcases and furniture
- ❑ 8. Hardware
- ❑ 9. Insulation
- ❑ 10. _____

List of Recommended Elements to be Included

In a Contractor of Community Estimate of Repairs

RESIDENTIAL STRUCTURES (continued)

ITEMS THAT MUST BE INCLUDED (check box on left if present):

All utility and service equipment, including:

- ❑ 1. HVAC equipment
- ❑ 2. Plumbing fixtures and piping
- ❑ 3. Electrical wiring, outlets, and switches
- ❑ 4. Light fixtures and ceiling fans
- ❑ 5. Security systems
- ❑ 6. Built-in appliances
- ❑ 7. Central vacuum systems
- ❑ 8. Water filtration, conditioning, or recirculation systems
- ❑ 9. Sprinkler system
- ❑ 10. Conveyance (elevators, escalators)
- ❑ 11.
- ❑ 12.

ITEMS THAT MAY BE EXCLUDED:

- ❑ 1. Trash removal and clean-up
- ❑ 2. Costs to temporarily stabilize a building so that it is safe to enter and evaluate
- ❑ 3. Costs to obtain or prepare plans and specifications
- ❑ 4. Land survey costs
- ❑ 5. Permit fees and inspection fees
- ❑ 6. Carpeting and re-carpeting installed over finished flooring such as wood or tiling
- ❑ 7. Outside improvements, including landscape, irrigation, sidewalks, driveways, fences, yard lights, swimming pools, pool enclosures, and detached accessory structures
- ❑ 8. Costs required for minimum necessary work to correct existing violations of health, safety, and sanitary codes
- ❑ 9. Plug-in appliances such as washing machines and stoves
- ❑ 10.
- ❑ 11.
- ❑ 12.
- ❑ 13.
- ❑ 14.
- ❑ 15.

APPENDIX E

GUIDANCE FOR ESTIMATING PERCENT DAMAGE FOR RESIDENTIAL STRUCTURES

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Basic Flooding Model Assumptions:

1) **Medium height freshwater flooding - limited duration. No high-velocity action; no wave action.**
2) **A 1-story house (without a basement) is used for this example house to establish the Categories of Work percentages of total costs.**

			Damage Threshold			
Foundation			**0 to 25%**	**25-50%**	**50-75%**	**Over 75%**
Description	**Continuous perimeter foundations, footings, and piers for internal beams and floor loads. Footing depth averages between 30" and 42" below ground level. Materials include unreinforced cast-in-place concrete, unreinforced masonry or concrete masonry units (CMUs), concrete slab on grade or raised slab construction.**	**Threshold Markers**	**Water level does not rise to the level of the bottom of the first floor of the structure.**	**Water level rises just above first floor level.**	**Water level is 4-7 feet against the outside of the building.**	**Water level is 7 feet or higher against the outside of the building.**
			No scouring at the footings.	**Limited scouring at the footings.**	**Limited scouring at the footings.**	**Limited scouring at the footings.**
			Some undermining but no visible cracking at concrete slab.	**Soils are saturated.**	**Soils are saturated and unstable**	**Foundation is notably cracked and/or displaced. Structure has been knocked off its foundation.**
				Undermining of the concrete slab, especially at corners - hairline cracks only.	**Cracks noted on or along the foundation walls.**	**Portions of the foundation are damaged or missing**
					Significant undermining of the concrete slab - significant cracking is visible.	**Significant undermining of the concrete slab - major cracking and separation of the concrete slab**.
		Common Damages	Short-term inundation to limited heights. Limited scouring and erosion - low flow and low velocity floodwaters. No noticeable cracking of the masonry or displacement of the foundation walls.	Short-term inundation - Foundation is inundated with flood waters but for a limited duration. Limited scouring or undermining of the foundation or footings is found. Minor cracking from some settlement but no displacement, heaving or discontinuities of the structural support systems.	Floodwaters extend over the top of the foundation system - significant inundation for over 12 hours. Some cracking of the masonry/concrete foundation walls. Some damages to the foundation wall from debris or settlement noted.	Settlement noted at the footings, due to erosion or unstable soils. Foundation wall damage - sections of the walls cracking, displaced and missing, causing an inherent instability to the support for the house. Use caution when approaching or entering the house.
	Special Considerations for Coastal/High Velocity Floods		**Coastal floods may have more evidence of scouring at the supports - the foundation system may be better designed to resist this scouring action.** **High velocity floodwaters may create erosion/scouring that the building has not been designed to resist.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Superstructure (Wood Frame/Masonry)			0 to 25%	25-50%	50-75%	Over 75%
Description	**The wall support systems that extend from the foundation wall to the roof structure. Superstructure includes the exterior wall sheathing panels, shear panels, or braced wall panels. This section also includes structural members that support the roof (rafters and trusses), but does not include the roof sheathing.** **Wood frame construction:** Lightweight lumber or metal studs Interior wall framing (without sheathing) Typical exterior structural panel wall sheathing is plywood or hardboard Typical exterior wall covers are stucco, siding (aluminum, vinyl, or wood), and masonry veneer **Masonry construction:** Load bearing walls using unreinforced masonry (URM) and reinforced block or brick Typical exterior covers are stucco, siding (aluminum, vinyl, or wood), and masonry veneer (Reinforced concrete construction should be categorized under masonry.)	Threshold Markers	**Water level does not rise to the level of the bottom of the first floor of the structure.** **No damage to the roof framing.**	**Water level rises just above first floor level.** **Damage to the exterior walls is limited** **Damage to the roof framing is limited.**	**Water level is up to 3 feet high on the first floor level.** **Some damages to exterior walls.** **Significant damage to sections of the roof framing.**	**Water is over 3 feet high on the first floor level of the house.** **Significant damages to exterior walls.** **Significant damage to the main portion or multiple sections of the roof framing.**
		Common Damages	Minor damage to portions of the wall structure. Wall studs and sheathing suffered minor damage by contact with debris or from floodwater pressures against the structure. Minor missing or damaged sections of the roof structure. No deformation or distortion of the structural frame is evident.	Some missing sections or open damage to portions of the wall structure. Wall studs and sheathing suffered some damage by contact with debris or from floodwater pressures against the structure. Some missing or damaged sections of the roof structure. No deformation or distortion of the structural frame is evident.	Missing sections or open damage to significant portions of the wall structure. Wall studs and sheathing damaged by contact, collision, or piercing with debris or from floodwater pressures against the structure. Significant missing or damaged sections of the roof structure. Some deformation or distortion of the structural frame is evident.	Missing exterior wall(s) or open damage to large portions of the wall structure. Wall studs and sheathing damaged by contact, collision, or piercing with debris or from floodwater pressures against the structure. Large missing or damaged sections of the roof structure. Significant deformation or distortion of the structural frame is evident.
	Special Considerations for Coastal/High Velocity Floods		**Coastal areas have higher wind conditions requiring additional exterior wall structural panels, shear walls and braced wall panels. Damages to these wall structural systems would indicate a higher percent of damages, since they are already designed to resist higher wind conditions.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Roof Covering			0 to 25%	25-50%	50-75%	Over 75%
Description	Roofing includes a lightweight composition shingle, tile roofs, metal roofs, or a built-up roof with gravel or rock cover material. Roofing does not include structural framing members such as rafters or prefabricated trusses that support the roof deck. The roof sheathing and flashing is included in this section.	Threshold Markers	**Minor wind damage to the roof coverings.**	**Some damaged areas of the roof from high-winds or damages from debris.**	**Significant damaged areas of the roof from high winds or damages from debris.**	**Large damaged areas of the roof from high winds or damages from debris.**
			Main surface areas are unaffected.	**Some sections of the roof covering are missing or loose.**	**Significant sections of the roof covering are missing or loose.**	**Major sections of the roof covering are missing or loose.**
			Flashings are intact.	**Some damages to the flashings.**	**Damages to the flashings allow some water infiltration at joints and roof penetrations**	**Damages to the flashings allow significant water infiltration at joints and roof penetrations.**
			No damages to the roof sheathing	**Minimal damage to the roof sheathing.**	**Significant damage to the roof sheathing - some areas of the sheathing will need replacement.**	**Major damage to the roof sheathing - most of the roof sheathing will need replacement.**
		Common Damages	Roof shingles or tiles mostly intact. Some minor damage to roof shingles - some torn or loose shingles in limited areas.	Some areas where the roof shingles were damaged by high winds. Several small areas of exposed roof sheathing as a result of missing/damaged shingles.	Some areas where the roof shingles were damaged by high winds. Several small areas of exposed roof sheathing as a result of missing/damaged shingles. Some damage to the roof covering and sheathing due to debris falling or penetrating the roof assembly.	Major areas of the roof where the shingles/tile are missing, allowing rainwater to freely enter the house below. Significant damage to roof covering and roof sheathing from strong winds or windborne debris penetrating the roof assembly.
	Special Considerations for Coastal/High Velocity Floods		**Coastal areas have higher wind conditions requiring additional roof covering requirements.** **Damages to these roof coverings would indicate a higher percent of damages, since they are designed to resist higher wind conditions.** **Damages to the roofing are more likely during high-wind conditions due to the loss of protection from missing roof coverings and water infiltration. This will increase the percent of damages.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Exterior Finish		0 to 25%	25-50%	50-75%	Over 75%
Description **The wall covering system that covers the wall sheathing, as well as insulation and weather stripping. This includes the water resistant materials and the finish materials: Stucco, Siding (aluminum, vinyl, or wood), Masonry, Stone veneer.** **Insulation is installed at the flooring beneath the lowest floor level and throughout the walls and ceilings. Types of insulation include: fiberglass wall and ceiling insulation, blown wall and ceiling insulation, and rigid wall insulation.**	**Threshold Markers**	**Water level is less than 6 inches above the lowest floor level.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level is between 6 and 18 inches above the lowest floor level.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level is between 18 inches and 3 feet above the lowest floor level.** **The duration of the floodwaters is more than 12 hours.**	**Water level is more than 3 feet above the lowest floor level.** **The duration of the floodwaters is more than 12 hours.**
	Common Damages	Water staining, contamination and damages on some of the exterior wall finishes. 'Clean and repair' process is likely. Brick and stone veneer walls, stucco walls and 'cultured stone' walls may need some water removal techniques to allow drying of the interior materials and wall cavities. Verify adherence of the finish materials to the wall substrate. A limited amount of the siding materials may require replacement as needed. No damage or replacement of the insulation system is necessary, except where water and high moisture conditions have caused the insulation to fall loose within the crawlspace sub-flooring.	Damages/losses to some areas of the exterior wall surfaces, in addition to water staining and contamination. Some repairs are required at damaged locations prior or 'clean and repair' process. Brick and stone veneer walls, stucco walls and 'cultured stone' walls may need some water removal techniques to allow drying of the interior materials and wall cavities. Verify adherence of the finish materials to the wall substrate. Damaged house trim work will require replacement. Water damage to the insulation in the sub-flooring above the crawlspace or basement levels. Damage to insulation is evident and insulation often has fallen loose. This insulation should be removed and replaced.	Damages/losses to significant sections of the exterior wall surfaces, in addition to water staining and contamination. Significant repairs are required at damaged locations prior to 'clean and repair' process. Replacement of some sections of the exterior siding are required. Brick and stone veneer walls, stucco walls and 'cultured stone' walls may need some water removal techniques to allow drying of the interior materials and wall cavities. Verify adherence of the finish materials to the waWater damage to the insulation in the sub-flooring above the crawlspace or basement levels. This insulation should be removed and replaced. Water saturation of wall insulation may be found in the lowest section of the exterior walls. Contaminants in the flood waters are cause for removal and replacement of lower sections of the saturated insulation. Clean, sanitize and dry the structural systems before re-installing.ll materials. Damaged house trim work will require replacement, especially at door and window casings.	Damages/losses to major sections of the exterior wall surfaces, in addition to water staining and contamination. Major repairs are required at damaged locations prior to 'clean and repair' process. Replacement of large sections of the exterior siding are required. Brick and stone veneer walls, stucco walls and 'cultured stone' walls may need some water removal techniques to allow drying of the interior materials and wall cavities. Verify adherence of the finish materials to the wall materials. Damaged house trim work will require replacement, especially at door and window casings. Water damage to the insulation in the sub-flooring above the crawlspace or basement levels. This insulation should be removed and replaced. Water saturation of wall insulation requires the removal of all of the insulation from the damaged sections of the exterior walls. Contaminants in the flood waters are cause for removal and replacement of lower sections of the saturated insulation. Clean, sanitize and dry the structural systems before re-installing.
Special Considerations for Coastal/High Velocity Floods		**The salt, erosion, and winds in coastal areas will have a damaging effect on the quality of exterior wall finishes. Damages to exterior finishes are more likely during high-wind conditions due to the loss of protection from missing exterior finishes and water infiltration. Damages to the insulation are more likely during high-wind conditions due to the loss of protection from missing roof coverings, exterior finishes and subsequent water infiltration. This will increase the percent of damages.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Interior Finish			0 to 25%	25-50%	50-75%	Over 75%
Description	**Interior finish includes the gypsum board, drywall, plaster or paneling that make up the wall surfaces, trim around door frames, baseboards, casings, and chair rails, ceiling moldings, interior door, cabinet, garage, and window handles, locks, and hinges exterior door handles, hinges, and locks.** **Materials include low grade wood/plastic composites, soft woods, and hard woods Finishes include paint, stain, or varnish This item also covers any exterior and interior painted surfaces. This includes all interior painted surfaces, but not the building or repairs of the underlying surfaces. This also includes those exterior siding materials (and trim work) that need to be painted, but not those that have inherent coloring within the materials themselves (brick, stucco, EIFS).**	Threshold Markers	**Water level does not rise to the level of the first floor structure.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level rises just above the first floor level.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level is up to 3 feet above the first floor level.** **The duration of the floodwaters is more than 12 hours.**	**Water is more than 3 feet above the first floor level of the house.** **The duration of the floodwaters is more than 12 hours.**
		Common Damages	Wicking of the water and high moisture conditions into the finished materials at the sub-flooring and at the bottom of the walls. Water staining and damages possible at baseboard and the casings at the bottoms of door openings. Some adjustment/repair/ replacement may be necessary. No damages anticipated on door, cabinet and window hardware. The baseboards and the bottom of the door casings may need to be cleaned and painted.	Water staining and damages likely at the baseboard and the casings at the bottoms of door openings. Some adjustment/repair/replacement may be necessary. Water damage at the lowest levels of the wall assembly - lower wall and trim may be removed and replaced. Minor damages anticipated on door, cabinet and window hardware. After repairs to surfaces, the lower wall finishes, baseboards and door casings will need to be primed and repainted. The bottoms of the cabinet bases in the kitchen and bathrooms may require repainting.	Water staining and damages at the baseboards and the casings at door openings need to be replaced. Water damage at the lowest levels of the wall assembly - wall and trim, windowsills and window aprons, wall paneling, wainscoting and chair rails require removal and replacement. Wall surfaces should be removed to a height of 4 feet. Some damages anticipated on door, cabinet and window hardware. Some replacement needed. After repairs to surfaces, the entire wall finishes, baseboards and door and window casings will need to be primed and repainted. along with the vanity cabinets in the bathrooms. Both the upper and lower paint grade kitchen cabinets should be repainted where the lower cabinets were repaired or replaced.	Water staining and damages at the baseboards, running trim and casings at door and window openings need to be replaced. Water damage at all the levels of the wall assembly - wall and trim, windowsills and window aprons, wall paneling, wainscoting and chair rails require removal and replacement. Wall surfaces should be removed to a height of 8 feet. Significant damages anticipated on door, cabinet and window hardware. Some replacement needed. After repairs to surfaces, the entire wall finishes, baseboards and door and window casings and window sashes will need to be primed and repainted along with the vanity cabinets in the bathrooms. Repaint both the upper and lower kitchen cabinets, where these are paint-grade cabinets.
	Special Considerations for Coastal/High Velocity Floods		**Damages to the interior finishes are more likely during high-wind conditions due to the loss of protection from missing roof coverings, exterior finishes and subsequent water infiltration. The salt, erosion, and winds in coastal areas will have a damaging effect on the quality of exterior hardware. This will significantly increase the percent of damages.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Doors and Windows			0 to 25%	25-50%	50-75%	Over 75%
Description	**This section includes all doors and windows of a structure. Assumptions are hollow core doors with low-cost hardware for low, fair, and average quality construction, raised-panel hardwood veneer with good quality hardware for good or excellent quality construction.** **(This section does not include paint or stain.)**	Threshold Markers	**Water level rises just to the floor structure of the first floor level.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level is just above the first floor.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water rises to at least 12 inches above the first floor level.** **The duration of the floodwaters is more than 12 hours.**	**Water rises more than 12 inches above the first floor level.** **The duration of the floodwaters is more than 12 hours.**
		Common Damages	Bottoms of some interior doors may be deformed, delaminated or have some swelling damages. Doors may need adjustment and/or repairs to close and latch properly. No impact on normal sill-height windows. Damages may be found at floor-level windows (hopper windows, awning windows and floor-to-ceiling windows).	Bottoms of interior and exterior doors may be deformed, delaminated or have some swelling damages. Doors may need adjustment and/or repairs to close and latch properly. No impact on normal sill-height windows. Damages may be found at floor-level windows (hopper windows, awning windows and floor-to-ceiling windows).	Bottoms of interior and exterior doors will be deformed, delaminated or have some swelling damages. Interior doors will likely need replacement. Exterior doors may need adjustment, repairs or replacement. No impact on normal sill-height windows. Repairs or replacements may be needed at floor-level windows (hopper windows, awning windows and floor-to-ceiling windows).	Bottoms of interior and exterior doors will be deformed, delaminated or have some swelling damages. Interior and exterior doors will likely need replacement. Deformation or other damages will be found at normal sill-height windows. Replacement will be necessary at floor-level windows (hopper windows, awning windows and floor-to-ceiling windows). Replacement may be necessary for other windows.
	Special Considerations for Coastal/High Velocity Floods		**Wind-driven rain in coastal areas will have a damaging effect on the quality of exterior doors and windows.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Cabinets and Countertops			0 to 25%	25-50%	50-75%	Over 75%
Description	**The basic cabinets for bathroom vanities and kitchens include 'paint-grade' cabinets made of a fiberboard or plywood material. The countertop is laminated plastic or a manmade 'cultured stone' surface.** **'Paint-grade' cabinets are the baseline since they can be painted to match upper wall cabinets, when they are repairable, to return the house to pre-disaster conditions.** **Damaged cabinets with hardwood face-frames, doors and drawers will require replacement of both the base cabinets and upper wall cabinets, to allow return to the pre-disaster condition. Hardwood cabinets will require replacement (at 100% value) when water is above 12 inches above finish floor.**	Threshold Markers	**Water level is less than 4 inches above the finished floor level.**	**Water level is between 4 and 12 inches above the finish floor level.** **Flood duration is short - no prolonged exposure to water or contaminants.**	**Water level is between 1 foot and 3 feet above the finish floor.** **Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.**	**Water level is more than 3 feet above finish floor level.** **Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.**
		Common Damages	Base cabinets have minimal water damage. Swelling and deterioration of manufactured case goods, especially cabinet bases, sides and drawers using engineered wood products. Bathroom vanity cabinets and kitchen base cabinets may need cleaning, sanitizing and limited repairs. Repainting will be required to match upper cabinets in kitchen.	Base cabinets of particleboard or medium density fiberboard need to be replaced. Repaint to match upper cabinets in kitchen. Wood and plywood base cabinets may need cleaning, sanitizing and some repairs at cabinet base. Repainting will be required to match upper cabinets in kitchen.	Replace base cabinets. Water damage and exposure is prolonged - deformation, delamination and warping of cabinet base drawers and doors. Water contains debris and contaminants. The countertops may need to be replaced.	Replace base cabinets and wall cabinets. Water damage and exposure is prolonged - deformation, delamination and warping of cabinet base drawers and doors. Water contains debris and contaminants. The countertops will need to be replaced.

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Floor Finish		0 to 25%	25-50%	50-75%	Over 75%
Description: **Materials for floor finish include: carpet, hardwood, vinyl composition tile, sheet vinyl, floor cover, ceramic tile, and marble. Subflooring is also included.** **Carpeting, hardwood flooring, vinyl flooring tiles and sheet vinyl are typically replaced after water inundation. Brick, stone and clay tile floor can be cleaned, sanitized and reused. These types of floors may have areas where the mortar setting compound has broken loose. These tiles should be replaced. The floor sheathing is included in this Category of Work, as compared to the Superstructure Category.**	**Threshold Markers**	**Water level does not rise to the level of the bottom of the first floor structure.**	**Water level rises just to the first floor level.**	**Water level is above the first floor.**	**Water level is well above the first floor.**
			Water level inundates the sub-flooring but does not rise to the finish floor materials.	**Water level inundates above the sub-flooring and finish floor materials.**	**Water level inundates above the sub-flooring and finish floor materials.**
		No damages to the floor sheathing	**Minimal damage to the floor sheathing.**	**Significant damage to the floor sheathing - some areas of the sheathing will need replacement.**	**Major damage to the floor sheathing - most of the floor sheathing will need replacement.**
	Common Damages	No damage is anticipated in the floor finish system at this water level.	The sub-flooring may be damaged or delaminated by high-humidity conditions. Repairs or replace may be necessary	The sub-flooring may be damaged or delaminated by water inundation. Floor covering will need removal, drying, sanitizing and replacement, depending upon the type of floor covering. Carpets (with padding) should be removed and replaced. Wood floors will need to be replaced. Ceramic tiles and stone flooring may be re-used if they are still secured to the substrate. Sheet vinyl and vinyl tiles will need to be replaced to facilitate drying and repair of damages of the sub-floor.	The sub-flooring may be damaged or delaminated by water inundation. Floor covering may need removal, drying, sanitizing and replacement, depending upon the type of floor covering. Carpets (with padding) should be removed and replaced. Wood floors will need to be replaced.. Ceramic tiles and stone flooring may be re-used if they are still secured to the substrate. Sheet vinyl and vinyl tiles will need to be replaced to facilitate drying and repair of damages of the sub-floor.
Special Considerations for Coastal/High Velocity Floods		**Damages to the floor finishes and floor sheathing are more likely during high-wind conditions due to the loss of protection from missing roof coverings, exterior finishes and subsequent water infiltration. This will significantly increase the percent of damages.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Plumbing			0 to 25%	25-50%	50-75%	Over 75%
Description	**The plumbing system includes the incoming water service (municipal water supply or well service), the water heater, water distribution piping and the wastewater system. Wastewater will be conveyed away from the structure by either a connection to the municipal sewer system or a septic system.** **When floodwaters saturate the soils, septic systems may be unable to discharge their waste, causing a back-up of the septic systems. If floodwaters rise above the level of the municipal sewer manhole covers, the sewage can back-up into the house through the sewer lines. Verify the condition of the potable water supply to determine if it can provide a safe water supply.**	Threshold Markers	**Water level is less than 6 inches above the lowest floor level.**	**Water level is between 6 inches and 18 inches above the lowest floor level.** **Flood duration is short - no prolonged exposure to water or contaminants.**	**Water level is between 18 inches and 3 feet above the lowest floor level.** **Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.**	**Water level is more than 3 feet above the lowest floor level.** **Flood duration is longer than 12-hours - prolonged exposure to water and contaminants.**
		Common Damages	Floor drains can backflow into the house. Under floor (or under slab) plumbing systems should be purged, cleaned and sanitized. Any materials that might contain remnants of waste materials or other contaminants in the floodwaters will require replacement.	Floor drains, shower drains bathtubs and toilets can back flow into the house. Septic contamination is likely. The water heater may need to be replaced.	Floor drains, shower drains, bathtubs, toilets, bathroom sinks, utility sinks and toilets will backflow into the house. Septic contamination will occur. The water heater will need to be replaced.	All plumbing fixtures will backflow into the house. Septic contamination will occur. The water heater will need to be replaced.
	Special Considerations for Coastal/High Velocity Floods		**Houses in coastal areas may have additional plumbing fixtures and piping on the exterior of the house.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Electrical			0 to 25%	25-50%	50-75%	Over 75%
Description	**100-200 amp electrical service providing circuit breaker panels and distribution wiring. Basic wiring (15/20 amp) for outlets, switches, receptacles and lighting, 25-60 amps wiring systems outlets for a washer, dryer, stove, and refrigerator.** **(A minimum number of outlets and lighting fixtures, sometimes quantified by local building code, begin to increase in number and application as the quality level of the residence increases.) The basic approach listed here is for slab-on-grade or elevated houses; crawlspace and basement houses will have higher damage levels more quickly due to the main panel and horizontal wiring runs located below the lowest floor level.**	Threshold Markers	**Water level is less than 12 inches above the finished floor level.** **Minor electrical components and limited wiring are inundated but remain below normal receptacle height.**	**Water level is between 12 inches and 18 inches above the finish floor level.** **A significant number of wiring components and limited wiring are inundated, floodwaters above the normal receptacle height.**	**Water level is between 18 inches and 3 feet above the lowest floor level.** **A significant number of wiring components and a significant amount of wiring is inundated - floodwaters above normal wall switch height.**	**Water level is more than 3 feet above the lowest floor level.** **Most of the wiring components and a significant amount of wiring is inundated - floodwaters above normal wall switch height.**
		Common Damage Details	If the main electrical power source is located in the basement, the panel would need to be replaced. All outlets (receptacles, switches and lights) located in the basement should be replaced. All receptacles, switches and outlets located above the flood water high mark can be left in place and reused.	Modern Romex wiring that is inundated only for short durations (without wetting the ends/joints/terminations) can be dried and reused. Older non-metallic cable (with impregnated braided sheathings) should be replaced when wetted. When chemical contaminants are suspected in the floodwaters, all inundated electrical wiring and components will require replacement.	Modern Romex wiring that is inundated only for short durations while wetting the ends/joints/terminations should be replaced. Older non-metallic cable (with impregnated braided sheathings) should be replaced when wetted. When chemical contaminants are suspected in the floodwaters, all inundated electrical wiring and components will require replacement.	Modern Romex wiring that is inundated only for long durations should be replaced . Older non-metallic cable (with impregnated braided sheathings) should be replaced when wetted. When chemical contaminants are suspected in the floodwaters, all inundated electrical wiring and components will require replacement.

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

Appliances			0 to 25%	25-50%	50-75%	Over 75%
Description	Common appliances that would be included are the clothes washer and dryer and dishwasher.	Threshold Markers	**Water level is less than 6 inches above the finished floor level.**	**Water level is between 6 inches and 12 inches above the finished floor level.**	**Water level is between 12 inches and 18 inches above the finish floor level.**	**Water level is between 18 inches and 3 feet above the finish floor.**
			Water level is in the floor area of the appliances but not into the equipment operating system.	**Water level is in the floor area of the appliances and into the equipment operating system.**	**Water level is in the floor area of the appliances and into the equipment operating system.**	**Water level is in the floor area of the appliances and into the equipment operating system.**
			The appliances may be cleaned and reconditioned.	**Some of the appliance will need to be replaced.**	**Most of the appliances will need to be replaced.**	**All of the appliances will need to be replaced.**
		Common Damages	If appliances (water heater, clothes washer/dryer) are located in the basement or under the floor spaces, these should be replaced. Appliances at or above the first-floor level should be cleaned and reconditioned, as needed. Gas-fired appliances should be checked by a service technician to verify whether the gas burners and controls and electric wiring systems were compromised. Replacement may be required.	If appliances (water heater, clothes washer/dryer) are located in the basement or the under floor spaces, these should be replaced. Appliances at or above the first-floor level should be cleaned and reconditioned, as needed. Gas-fired appliances should be checked by a service technician to verify whether the gas burners and controls and electric wiring systems were compromised. Replacement may be required. The clothes dryer and dishwasher systems and controls will likely be inundated and may require replacement.	All appliances located at or above the first-floor level should be cleaned and reconditioned, as needed. Gas-fired appliances should be checked by a service technician to verify whether the gas burners and controls and electric wiring systems were compromised. Replacement may be required. The clothes dryer and dishwasher systems and controls will be inundated and need to be replaced.	All appliances at or above the first-floor level should be cleaned and reconditioned, as needed. Gas-fired appliances should be checked by a service technician to verify whether the gas burners and controls and electric wiring systems were compromised. Replace as necessary. The clothes dryer, washing machine, and dishwasher systems and controls will be inundated and need to be replaced.

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR RESIDENTIAL PROPERTIES

HVAC			0 to 25%	25-50%	50-75%	Over 75%
Description	**The base HVAC system is a forced-air heating system (furnace) with ductwork. The air handler system is located inside the thermal barrier of the house.** **The percent damaged will be less for a boiler. A boiler system has a sealed piping system to distribute the heat while the furnace uses a duct system. Water infiltration in the ducts will need to be cleaned, repaired and re-insulated. By contrast, a boiler piping system only needs to have the distribution piping clean and re-insulated. Note: Old duct and HVAC insulation may contain asbestos - use appropriate caution and adjust the costs for removal, if found.** **A gas-fired or oil-fired furnace located in a basement or crawlspace will require replacement of the furnace assembly as soon as 12 inches of floodwaters are present. This will require an adjustment of the percent damaged to 75%, as soon as the water reaches the firebox level of this heating equipment. A central air conditioner or heat pump will have a ducted air distribution system. The outside condenser unit(s) will require reconditioning after any flooding condition**	Threshold Markers	**Water level is less than 6 inches above the lowest floor level.** **Water level is in the lower ducts but not into the air handler or equipment operating system.** **The condenser unit may be reconditioned if the water level is less than 6 inches from the bottom of the appliance. If the condenser unit is located below the flood level, it needs to be replaced.**	**Water level is between 6 inches and 12 inches above the finished floor level.** **Water level is into the lower ducts and the air handler, but not but not into the equipment operating system.** **The condenser unit may be reconditioned if the water level is up to 12 inches from the bottom of the appliance. If the condenser unit is located below the flood level, it needs to be replaced.**	**Water level is between 12 inches and 3 feet above the finish floor level.** **Water level is into the lower ducts, air handler and into the equipment operating system.** **The fuel-fired equipment (burners/controls) has been inundated.** **The condenser unit is needs to be replaced.**	**Water level is more than 3 feet above the lowest floor level.** **Water level is into the duct distribution system, air handler and into the equipment operating system.** **The fuel-fired equipment (burners/controls) has been inundated.** **The condenser unit is needs to be replaced.**
		Common Damages	If HVAC equipment (furnace, air handler, heat pump) are located in the basement or the under floor areas, the equipment should be reconditioned or replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.	Portions of the HVAC equipment (furnace, air handler, heat pump) are located in the basement or the under floor areas, the equipment should be reconditioned or replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.	Portions of the HVAC equipment (furnace, air handler, heat pump) should be replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.	All HVAC equipment (furnace, air handler, heat pump) should be replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.

APPENDIX F

GUIDANCE FOR ESTIMATING PERCENT DAMAGE FOR NON-RESIDENTIAL STRUCTURES

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR NON-RESIDENTIAL PROPERTIES

Basic Flooding Model Assumptions:

1) **Medium height freshwater flooding - limited duration. Some high-velocity action; possible wave action.**
This guidance represents a starting point for inspectors to perform assessments on non-residential buildings. Because of the wide range of structure types, this guidance should be used as a rough estimation for a typical 1-story convenience store. Any variation from that should take into consideration the potential differences in each element.

2) **The damage evaluation guidance in this should be taken as possible or likely indicators of the respective level of damage, but is not a definite representation of damage to a structure after a flood and wind event. Not all threshold markers may need to be met to achieve the level of damage indicated.**

			Damage Threshold			
Foundation			**0 to 25%**	**25-50%**	**50-75%**	**Over 75%**
Description	**Continuous perimeter foundations, footings, and piers for internal beams and floor loads. Materials include masonry or concrete masonry units (CMUs) or piles.**	**Threshold Markers**	**Water level rises just above first floor level.** **No scouring around foundation.** **Some undermining but no visible cracking at concrete slab.**	**Water level is 4-7 feet against the outside of the building.** **Limited scouring around foundation.** **Soils are saturated.** **Undermining of the foundation, especially at corners - hairline cracks only.**	**Water level is 7-10 feet against the outside of the building.** **Limited scouring around foundation.** **Soils are saturated and unstable** **Cracks noted on or along the foundation walls.** **Significant undermining of the foundation - significant cracking is visible**.	**Water level is more than 10 feet against the outside of the building.** **Limited scouring around foundation.** **Foundation is notably cracked and/or displaced. Structure has been knocked off its foundation.** **Portions of the foundation are damaged or missing** **Significant undermining of the foundation - major cracking and separation of the foundation**.
		Common Damages	Short-term inundation to limited heights. Limited scouring and erosion - low flow and low velocity floodwaters. No noticeable cracking of the masonry or displacement of the foundation walls.	Short-term inundation - Foundation is inundated with flood waters but for a limited duration. Limited scouring or undermining of the foundation or footings is found. Minor cracking from some settlement but no displacement, heaving or discontinuities of the structural support systems.	Floodwaters extend over the top of the foundation system - significant inundation for over 12 hours. Some cracking of the masonry/concrete foundation walls. Some damages to the foundation wall from debris or settlement noted.	Settlement noted at the footings, due to erosion or unstable soils. Foundation wall damage - sections of the walls cracking, displaced and missing, causing an inherent instability to the support for the house. Use caution when approaching or entering the house.
	Special Considerations for Coastal/High Velocity Floods		**Coastal floods may have more evidence of scouring at the supports - the foundation system may be better designed to resist this scouring action.** **High velocity floodwaters may create erosion/scouring that the building has not been designed to resist.**			

GUIDANCE FOR ESTIMATING PERCENT DAMAGE CATEGORIES USING THE SUBSTANTIAL DAMAGE ESTIMATOR (SDE) FOR NON-RESIDENTIAL PROPERTIES

Superstructure (Wood Frame/Masonry)		0 to 25%	25-50%	50-75%	Over 75%
Description	**The wall support systems that extend from the foundation wall to the roof structure. Superstructure includes the exterior wall sheathing panels, shear panels, or braced wall panels. This section also includes structural members that support the roof, but does not include roof sheathing.** **Wood frame construction:** Lightweight lumber or metal studs Interior wall framing (without sheathing) Typical exterior structural panel wall sheathing is plywood or hardboard **Masonry construction:** Typically concrete or concrete masonry units (CMU), with steel reinforcement. Typical exterior covers are stucco, siding (aluminum, vinyl, or wood), and masonry veneer	**Threshold Markers**	**Water level does not rise to the level of the bottom of the first floor of the structure.** **No damage to the roof framing.** **No wind damage to the superstructure.**	**Water level rises just above first floor level.** **Damage to the exterior walls is limited** **Damage to the roof framing is limited.**	**Water level is up to 3 feet high on the first floor level.** **Some damages to exterior walls.** **Some damage to sections of the roof framing.**	**Water is over 3 feet high on the first floor level of the building.** **Significant damages to exterior walls.** **Significant damage to the main portion or multiple sections of the roof framing. Pressurization and failure of framing connections.**
		Common Damages	Minor damage to portions of the wall structure. Wall studs and sheathing suffered minor damage by contact with debris or from floodwater pressures against the structure. Minor missing or damaged sections of the roof structure. No deformation or distortion of the structural frame is evident.	Some missing sections or open damage to portions of the wall structure. Wall studs and sheathing suffered some damage by contact with debris or from floodwater pressures against the structure. Some missing or damaged sections of the roof structure. No deformation or distortion of the structural frame is evident.	Missing sections or open damage to some portions of the wall structure. Wall studs and sheathing damaged by contact, collision, or piercing with debris or from floodwater pressures against the structure. Some missing or damaged sections of the roof structure. Some deformation or distortion of the structural frame is evident.	Missing exterior wall(s) or open damage to large portions of the wall structure. Wall studs and sheathing damaged by contact, collision, or piercing with debris or from floodwater pressures against the structure. Large missing or damaged sections of the roof structure. Significant deformation or distortion of the structural frame is evident.
	Special Considerations for Coastal/High Velocity Floods	**Coastal areas have higher wind conditions requiring additional exterior wall structural panels, shear walls and braced wall panels.** **Damages to these wall structural systems would indicate a higher percent of damages, since they are already designed to resist higher wind conditions.**			

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Roof Covering		0 to 25%	25-50%	50-75%	Over 75%
Roofing includes a lightweight composition shingle, tile roofs, metal roofs, or a built-up roof with gravel or rock cover material. Roofing does not include structural framing members such as rafters or prefabricated trusses that support the roof deck. The roof sheathing and flashing is included in this section.	**Threshold Markers**	**Minor wind damage to the roof coverings.**	**Some damaged areas of the roof from high-winds or damages from debris.**	**Significant damaged areas of the roof from high winds or damages from debris.**	**Large damaged areas of the roof from high winds or damages from debris.**
		Main surface areas are unaffected.	**Some sections of the roof covering are missing or loose.**	**Significant sections of the roof covering are missing or loose.**	**Major sections of the roof covering are missing or loose.**
		Flashings are intact.	**Some damages to the flashings.**	**Damages to the flashings allow some water infiltration at joints and roof penetrations**	**Damages to the flashings allow significant water infiltration at joints and roof penetrations.**
		No damages to the roof sheathing	**Minimal damage to the roof sheathing.**	**Significant damage to the roof sheathing - some areas of the sheathing will need replacement.**	**Major damage to the roof sheathing - most of the roof sheathing will need replacement.**
	Common Damages	Roof covering mostly intact. Some minor damage - some torn or loose parts of covering in limited areas.	Some areas where the roof was damaged by high winds. Several small areas of exposed roof sheathing as a result of missing/damaged covering.	Some areas where the roof was damaged by high winds. Several small areas of exposed roof sheathing as a result of damaged covering Some damage to the roof covering and sheathing due to debris falling or penetrating the roof assembly.	Major areas of the roof where the shingles/tile are missing, allowing rainwater to freely enter the house below. Significant damage to roof covering and roof sheathing from strong winds or windborne debris penetrating the roof assembly.
Special Considerations for Coastal/High Velocity Floods		**Coastal areas have higher wind conditions requiring additional roof covering requirements.** **Damages to these roof coverings would indicate a higher percent of damages, since they are designed to resist higher wind conditions.** **Damages to the roofing are more likely during high-wind conditions due to the loss of protection from missing roof coverings. This will increase the percent of damages.** **It is also possible that the local building code will require that the entire roof covering be removed and replaced.**			

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Interior Finish		0 to 25%	25-50%	50-75%	Over 75%
Description	**Interior finish includes the gypsum board, drywall, plaster or paneling that make up the wall surfaces, trim around door frames, baseboards, casings, and chair rails, ceiling moldings, interior door, cabinet, and window handles, locks, and hinges exterior door handles, hinges, and locks.** **Materials include low grade wood/plastic composites, soft woods, and hard woods** **Finishes include paint, stain, or varnish** **This item also covers any exterior and interior painted surfaces. This includes all interior painted surfaces, but not the building or repairs of the underlying surfaces - those would be included in the Interior Finish COW. This also includes those exterior siding materials (and trim work) that need to be painted, but not those that have inherent coloring within the materials themselves (brick, stucco, EIFS).** NOTE: For non-residential structures with multiple stories will receive less damage to this element than single story structures, as the majority of interior finish for multi-story structures will likely not be on the ground floor.	**Water level does not rise to the level of the first floor structure.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level rises just above the first floor level.** **The duration of the floodwaters is limited - less than 12 hours.**	**Water level is up to 3 feet above the first floor level.** **The duration of the floodwaters is more than 12 hours.**	**Water is more than 3 feet above the first floor level of the house.** **The duration of the floodwaters is more than 12 hours.**
Common Damages		Wicking of the water and high moisture conditions into the finished materials at the sub-flooring and at the bottom of the walls. Water staining and damages possible at baseboard and the casings at the bottoms of door openings. Some adjustment/repair/ replacement may be necessary. No damages anticipated on door, cabinet and window hardware. The baseboards and the bottom of the door casings may need to be cleaned and painted.	Water staining and damages likely at the baseboard and the casings at the bottoms of door openings. Some adjustment/repair/replacement may be necessary. Water damage at the lowest levels of the wall assembly - lower wall and trim may be removed and replaced. Minor damages anticipated on door, cabinet and window hardware. After repairs to surfaces, the lower wall finishes, baseboards and door casings will need to be primed and repainted. The bottoms of the cabinet bases in the kitchen and bathrooms may require repainting.	Water staining and damages at the baseboards and the casings at door openings need to be replaced. Water damage at the lowest levels of the wall assembly - wall and trim, windowsills and window aprons, wall paneling, wainscoting and chair rails require removal and replacement. Wall surfaces should be removed to a height of 4-feet. Some damages anticipated on door, cabinet and window hardware. Some replacement needed. After repairs to surfaces, the entire wall finishes, baseboards and door and window casings will need to be primed and repainted. along with the vanity cabinets in the bathrooms. Both the upper and lower paint grade kitchen cabinets should be repainted where the lower cabinets were repaired or replaced.	Water staining and damages at the baseboards, running trim and casings at door and window openings need to be replaced. Water damage at all the levels of the wall assembly - wall and trim, windowsills and window aprons, wall paneling, wainscoting and chair rails require removal and replacement. Wall surfaces should be removed to a height of 8-feet. Significant damages anticipated on door, cabinet and window hardware. Some replacement needed. After repairs to surfaces, the entire wall finishes, baseboards and door and window casings and window sashes will need to be primed and repainted along with the vanity cabinets in the bathrooms. Repaint both the upper and lower kitchen cabinets, where these are paint-grade cabinets.
	Special Considerations for Coastal/High Velocity Floods	**Damages to the interior finishes are more likely during high-wind conditions due to the loss of protection from missing roof coverings, exterior finishes and subsequent water infiltration. The salt, erosion, and winds in coastal areas will have a damaging effect on the quality of exterior hardware. This will significantly increase the percent of damages.**			

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Plumbing			0 to 25%	25-50%	50-75%	Over 75%
Description	**The plumbing system includes the incoming water service (municipal water supply or well service), the water heater, water distribution piping and the wastewater system. Wastewater will be conveyed away from the structure by either a connection to the municipal sewer system or a septic system.** **When floodwaters saturate the soils, septic systems may be unable to discharge their waste, causing a back-up of the septic systems. If floodwaters rise above the level of the municipal sewer manhole covers, the sewage can back-up into the house through the sewer lines. Verify the condition of the potable water supply to determine if it can provide a safe water supply.**	Threshold Markers	**Water level is less than 6 inches above the lowest floor level.**	**Water level is between 6 inches and 18 inches above the lowest floor level.** **Flood duration is short - no prolonged exposure to water or contaminants.**	**Water level is between 18 inches and 3 feet above the lowest floor level.** **Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.**	**Water level is more than 3 feet above the lowest floor level.** **Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.**
		Common Damages	Floor drains can backflow into the building. Under floor (or under slab) plumbing systems should be purged, cleaned and sanitized. Any materials that might contain remnants of waste materials or other contaminants in the floodwaters will require replacement.	Floor drains, shower drains bathtubs and toilets can back flow into the building. Septic contamination is likely. Water heaters may need to be replaced.	Floor drains, shower drains, bathtubs, toilets, bathroom sinks, utility sinks and toilets will backflow into the building. Septic contamination will occur. Water heaters will need to be replaced.	All plumbing fixtures will backflow into the building. Septic contamination will occur. Water heaters will need to be replaced.
	Special Considerations		**The plumbing system in place in the building may vary significantly, and damage thresholds should account for the situation of the building being assessed.**			

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Electrical			0 to 25%	25-50%	50-75%	Over 75%
Description	**Consists of all electrical components on the property site.** **A minimum number of outlets and lighting fixtures, sometimes quantified by local building code, begin to increase in number and application as the quality level of the structure increases. Structure type will also affect the amount of fixtures, wiring, and electrical equipment in the building, and therefore would significantly affect the percent damage to this element. For this example, equipment is assumed to be on first floor. In multi-story buildings where equpiment is on floors higher than where the flooding is occuring, these percent damage estimates would be significantly lower.**	Threshold Markers	**Water level is less than 12 inches above the finished floor level.** **Minor electrical components and limited wiring are inundated but remain below normal receptacle height.**	**Water level is between 12 inches and 18 inches above the finish floor level.** **A significant number of wiring components and limited wiring are inundated, floodwaters above the normal receptacle height.**	**Water level is between 18 inches and 3 feet above the lowest floor level.** **A significant number of wiring components and a significant amount of wiring is inundated - floodwaters above normal wall switch height.**	**Water level is more than 3 feet above the lowest floor level.** **Most of the wiring components and a significant amount of wiring is inundated - floodwaters above normal wall switch height.**
		Common Damage Details	If the main electrical power source is located in the basement, the panel would need to be replaced. All outlets (receptacles, switches and lights) located below grade should be replaced. All receptacles, switches and outlets located above the flood water high mark can be left in place and reused.	Modern Romex wiring that is inundated only for short durations (without wetting the ends/joints/terminations) can be dried and reused. Older non-metallic cable (with impregnated braided sheathings) should be replaced when wetted. When chemical contaminants are suspected in the floodwaters, all inundated electrical wiring and components will require replacement.	Modern Romex wiring that is inundated only for short durations while wetting the ends/joints/terminations should be replaced. Older non-metallic cable (with impregnated braided sheathings) should be replaced when wetted. When chemical contaminants are suspected in the floodwaters, all inundated electrical wiring and components will require replacement.	Modern Romex wiring that is inundated only for long durations should be replaced. Older non-metallic cable (with impregnated braided sheathings) should be replaced when wetted. When chemical contaminants are suspected in the floodwaters, all inundated electrical wiring and components will require replacement.
	Special Considerations		**The electrical system in place and its location with respect to the building may vary significantly, and damage thresholds should account for the situation of the building being assessed.**			

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HVAC			0 to 25%	25-50%	50-75%	Over 75%
Description	**The base HVAC system is a forced-air heating system (furnace) with ductwork. The air handler system is located inside the thermal barrier of the house.** **The percent damaged will be less for a boiler. A boiler system has a sealed piping system to distribute the heat while the furnace uses a duct system. Water infiltration in the ducts will need to be cleaned, repaired and re-insulated. By contrast, a boiler piping system only needs to have the distribution piping clean and re-insulated. Note: Old duct and HVAC insulation may contain asbestos - use appropriate caution and adjust the costs for removal, if found.** **A gas-fired or oil-fired furnace located in a basement or crawlspace will require replacement of the furnace assembly as soon as 12 inches of floodwaters are present. This will require an adjustment of the percent damaged to 75%, as soon as the water reaches the firebox level of this heating equipment. A central air conditioner or heat pump will have a ducted air distribution system.** **The outside condenser unit(s) will require reconditioning after any flooding conditions.**	Threshold Markers	**Water level is less than 6 inches above the lowest floor level.**	**Water level is between 6 inches and 12 inches above the finished floor level.**	**Water level is between 12 inches and 3 feet above the finish floor level.**	**Water level is more than 3 feet above the lowest floor level.**
			Water level is in the lower ducts but not into the air handler or equipment operating system.	**Water level is into the lower ducts and the air handler, but not but not into the equipment operating system.**	**Water level is into the lower ducts, air handler and into the equipment operating system.**	**Water level is into the duct distribution system, air handler and into the equipment operating system.**
			The condenser unit may be reconditioned if the water level is less than 6 inches from the bottom of the appliance. If the condenser unit is located below the flood level, it needs to be replaced.	**The condenser unit may be reconditioned if the water level is up to 12 inches from the bottom of the appliance. If the condenser unit is located below the flood level, it needs to be replaced.**	**The fuel-fired equipment (burners/controls) has been inundated.**	**The fuel-fired equipment (burners/controls) has been inundated.**
					The condenser unit is needs to be replaced.	**The condenser unit is needs to be replaced.**
			Minor to no damage to external HVAC components.	**Minor damage to some exterior HVAC components.**	**Some damage to some exterior HVAC components. Some components may have connection failures and became windborne debris.**	**Significant damage to many exterior HVAC components. Components may have connection failures and became windborne debris.**
		Common Damages	If HVAC equipment (furnace, air handler, heat pump) are located in the basement or the under floor areas, the equipment should be reconditioned or replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.	Portions of the HVAC equipment (furnace, air handler, heat pump) are located in the basement or the under floor areas, the equipment should be reconditioned or replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.	Portions of the HVAC equipment (furnace, air handler, heat pump) should be replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.	All HVAC equipment (furnace, air handler, heat pump) should be replaced. Water-inundated duct insulation should be removed and replaced. If the duct insulation is integral to the ducts (duct board or secured interior duct liners) these ducts should be replaced. All ducts that are being reused will require cleaning.