



# Substantial Damage Estimator (SDE) User Manual and Workbook

Using the SDE Tool to Perform  
Substantial Damage Determinations

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FEMA

The SDE 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.

# Substantial Damage Estimator (SDE) User Manual



**FEMA**



The SDE 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.



For technical assistance, consult your Regional Office of the Federal Emergency Management Agency (FEMA). The addresses and telephone numbers for the FEMA Regional Offices can be found at: <http://www.fema.gov/regional-operations>.

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## Acronyms and Abbreviations

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ACV	Actual Cash Value
BCA	Benefit-Cost Analysis
BFE	base flood elevation
CAV	Community Assistance Visit
CID	(NFIP) Community Identification Number
CMU	concrete masonry unit
CRS	Community Rating System
CSV	file extension for a file with comma separated values
DDF	depth-damage functions
EIFS	exterior insulation finishing system
FAQs	Frequently Asked Questions
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GB	gigabyte
GIS	geographic information system
GHz	gigahertz
GIS	geographic information system
GPS	global positioning system
HVAC	heating, ventilation, and air-conditioning
ICC	Increased Cost of Compliance
KML	Keyhole Markup Language
KMZ	Compressed KML file
MB	megabyte
MDB	file extension for a Microsoft Access database
NFIP	National Flood Insurance Program
PII	Personal Identifiable Information
POC	point-of-contact
QA	Quality Assurance
SDE	Substantial Damage Estimator
SFHA	Special Flood Hazard Area
WAAS	Wide Area Augmentation System
XLS	file extension for a Microsoft Excel spreadsheet file
XML	file extension for an extensible markup language file



## SECTION 1 INTRODUCTION

The Substantial Damage Estimator (SDE) Version 2.0 Tool was developed by the Federal Emergency Management Agency (FEMA) to assist State and community officials in estimating Substantial Damage to residential and non-residential structures. Communities that participate in the National Flood Insurance Program (NFIP) are required to determine whether damage, of any origin, to structures within a mapped Special Flood Hazard Area (SFHA) meets the criteria for Substantial Damage. The SDE tool allows community officials with limited appraisal or construction backgrounds to develop reasonable estimates of structure values and damage in accordance with the NFIP requirements.

The SDE tool is based on the concept of using damage estimates for individual structure elements to determine whether the structure as a whole is substantially damaged. The SDE tool includes assessment options for residential structures (single-family homes, town or row houses, and manufactured homes) and common non-residential structures (e.g., office buildings, strip malls, restaurants). The SDE tool is intended to be used in conjunction with an industry-accepted construction cost-estimating guide.

Communities participating in the NFIP often have difficulty determining whether structures are substantially damaged. This difficulty is magnified after a major flood or other disaster where a large number of structures have been damaged and there is a need to provide timely Substantial Damage determinations so that reconstruction can begin. Structures located in an 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 SDE tool should not be used for structures designated by State or Federal entities as historic buildings because of their complex valuation.

Use of other FEMA tools or tool 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 are not appropriate because the DDFs were designed to be specific to a particular hazard and do not consider other sources of damage (fire, wind, earthquake, etc.). The DDFs may underestimate the total structure damage. Furthermore, the BCA DDFs are designed to estimate future damage based on regional or national average damage data that do not consider site-specific factors, such as flood durations, and do not calculate damage that is unique to the structure under consideration.

### Substantial Damage

Substantial Damage is defined in the NFIP regulations as “Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred.”

### Special Flood Hazard Area

FEMA defines the SFHA as the land in the floodplain within a community subject to the 1 percent or greater chance of flooding in any given year (i.e., the 100-year flood).

### 1.1 Use of the SDE Tool to Manage Substantial Damage Responsibilities

The SDE tool provides a formalized methodology for collecting and organizing the data required to make defensible determinations that meet the NFIP criteria for Substantial Damage or Substantial Improvement. The data needed to make a determination are identified within the tool. Users can attach documentation, including photographs, property surveys or appraisals, and latitude and longitude coordinates, to the structure assessments to further define the structure being inspected.

The SDE tool provides a single location for storage of data collected as part of the Substantial Damage determinations and allows users to import multiple records from an outside database (tax records, previous Substantial Damage determinations, geographic information system [GIS] data, etc.) at one time using the tool's *Enterprise Import* function. The tool also includes an assignment function and a data export feature, which allow users to create geo-referenced files that can be used to identify and locate properties in the SDE database.

Users are required to make judgments for three separate data fields: the initial construction quality, the depreciation rating of the structure prior to damage, and the percent damage of each of 12 construction elements for residential structures or 7 elements for non-residential structures. After structure assessments are completed in the SDE tool, the community can begin to build a database of damaged structures for specific damage events. As other events cause damage, the community can add new assessments to existing properties from previous SDE inventories or add new assessments for structures not previously damaged. The SDE tool provides data management, recording and organizing the Substantial Damage data while also facilitating quality assurance (QA) reviews of the data entered into the tool.

Although the SDE tool was developed to assist State and community officials with Substantial Damage determinations, its use is not required. However, community officials are strongly encouraged to use the tool when evaluating damaged structures for Substantial Damage.

Ultimately, local officials must make and defend Substantial Damage determinations. The data used in the SDE tool to make the determinations is only as good as the accuracy of the data collected.

The SDE tool formalizes a FEMA-accepted approach for obtaining reasonable Substantial Improvement/Damage determinations for structures. The benefits and limitations of the SDE tool are summarized in Table 1-1.

#### **Non-Residential Buildings**

Non-residential buildings can vary considerably in construction materials and in the complexity of their structural elements, mechanical systems, and plumbing and electrical systems. The SDE tool uses a simplified approach to estimate damage for most non-residential structures. Some non-residential buildings use more unique building materials and construction methods, or have specific uses that may require a more detailed approach to estimating damage.

**Table 1-1: Benefits and Limitations of Using the SDE 2.0 Tool**

Benefits	Limitations
<ul style="list-style-type: none"> <li>• A formalized and organized approach to estimating Substantial Damage and Substantial Improvement</li> <li>• Reasonable and defensible structure values and damage estimates</li> <li>• A FEMA-accepted method for determining Substantial Damage and Substantial Improvement</li> <li>• Demonstrates compliance with the NFIP requirements for Substantial Damage determinations</li> <li>• Structure-specific summary reports that can be included with Substantial Damage determination letters sent to structure owners</li> </ul>	<ul style="list-style-type: none"> <li>• Does not provide exact values of element percent damage</li> <li>• Depends on the local official, not the SDE tool, to provide a consistent method for determining Substantial Damage on a community-wide basis</li> </ul>

### **Substantial Damage and Substantial Improvement Determinations**

Additional information regarding Substantial Damage and Substantial Improvement determinations, including the NFIP requirements and implementation guidance, is available on the FEMA Web site ([www.fema.gov](http://www.fema.gov)) at:

- FEMA 213, Answers to Questions About Substantially Damaged Buildings (1991):  
<http://www.fema.gov/library/viewRecord.do?id=1636>
- FEMA P-758, Substantial Improvement/Substantial Damage Desk Reference (2010):  
<http://www.fema.gov/library/viewRecord.do?id=4160>

The desk reference provides practical guidance and suggested procedures to implement the NFIP requirements for Substantial Damage and Substantial Improvement.

## **1.2 Users of the SDE 2.0 Tool**

Under the NFIP, communities are responsible for evaluating potential Substantial Damage, of any origin, for all structures located within the mapped SFHA. Consequently, the target users of the SDE tool are local officials with responsibility for community adherence to their NFIP-compliant floodplain management ordinance and State officials that provide guidance and technical assistance to communities on the implementation of the NFIP regulations. The SDE tool may also be used by other parties, such as contractors, lending agencies, and potential structure purchasers, to assess the overall percent structure damage and determine a very general estimate of repair costs.

The SDE results are not a substitute for a professional appraisal, an insurance adjustment report, or a detailed cost estimate for repairs prepared by a qualified contractor.

### 1.3 Organization of the SDE 2.0 Tool User Manual

This User Manual follows the basic guidelines below for using the SDE tool to make Substantial Damage or Substantial Improvement determinations:

**Introduction** (Section 1) – Explains the purpose of SDE and who uses it.

**Installation** (Section 2) – Provides guidance on the installation of the SDE tool on the host computer from either an installation CD provided by FEMA or via a download from the FEMA Web site.

**Database Assignment Functions** (Section 3) – Reviews the procedures for making and tracking data collection assignments.

**Creating SDE Assessments** (Section 4) – Guides the use of the tool and the data required to provide a valid Substantial Damage assessment.

**Exporting SDE Data** (Section 5) – Identifies which of the three export options is best for the intended use of the SDE data.

**SDE Reports** (Section 6) – Provides guidance on the available SDE 2.0 reports for the community files and structure owners.

**SDE Field Workbook** (follows User Manual) – Provides guidance on field preparations for SDE data collection and damage assessments for residential and non-residential structure elements.

**Appendices** (follows Field Workbook)

- Appendix A – locations and boundaries for the FEMA Regional Offices.
- Appendix B – forms and checklists to be used in performing SDE damage inspections.
- Appendix C – sample documents, including a letter of introduction for SDE inspections; notices of determination for Substantial Improvement, Substantial Damage, and No Substantial Damage; and guidelines for contact with property owners.
- Appendix D – guidance for preparing a contractor or community estimate of repairs.
- Appendix E – guidance for estimating the percent damage for residential structures.
- Appendix F – guidance for estimating the percent damage for non-residential structures.

#### Use of the SDE Tool

Additional guidance on the use of the SDE tool can be found on the FEMA Web site ([www.fema.gov](http://www.fema.gov)) for the following SDE documents:

- FEMA Substantial Damage Estimator Best Practices:  
<http://www.fema.gov/library/viewRecord.do?id=5929>
- FEMA Substantial Damage Estimator Tool Frequently Asked Questions (FAQs):  
<http://www.fema.gov/frequently-asked-questions>

## SECTION 2 INSTALLATION

This section explains the system requirements to successfully install and run the SDE tool and provides instructions for computers running Microsoft operating systems Windows XP<sup>®</sup>, Windows Vista<sup>®</sup>, Windows 7<sup>®</sup>, and Windows 8<sup>®</sup>.

The SDE tool can be installed from either a FEMA SDE 2.0 CD or a zip file available on the FEMA Web site. Each installation version (CD or download) includes all the files required to run the SDE Version 2.0 Tool. The SDE Version 2.0 Tool was developed using Microsoft .NET 2.0 Framework and should not interfere with other existing applications already loaded on the computer. The SDE Version 2.0 installation file can be found at <http://www.fema.gov/library/viewRecord.do?id=4166>.

### 2.1 System Requirements

Users must have *full local administrative rights* on the host computer where the tool is to be installed or must have someone with administrative rights perform the installation. The requirement of administrative rights for installing the SDE tool is set by the agency, community, or other entity that is responsible for the security and maintenance of the user's computer. In addition, if the user does not have full-time administrative rights, the user must install the application in a folder where local write privileges are granted. This is usually the "My Documents" folder on the root directory of the host computer.

Table 2-1 provides the minimum system requirements to run the SDE tool successfully.

**Table 2-1: Minimum System Requirements to Run the SDE 2.0 Tool**

System Element	Recommendation
Processor	32-bit processor, with a 1 gigahertz (GHz) or faster processor
Framework	.NET ("dot NET") Framework 2.0 If .NET Framework 2.0 is not already installed, the SDE installation routine will attempt to install the Framework on the host computer during the SDE 2.0 installation.
Operating system	Windows XP with Service Pack 3 or later Windows Vista (32-bit or 64-bit) Windows 7 Windows 8
Memory	1 gigabyte (GB) minimum 2 GB or more recommended
Hard disk space	Approximately 60 megabytes (MB) of available hard-disk space If SDE is installed on a network drive, set up in standalone mode.
Display	Super VGA (1,024x768 pixels) or higher resolution video adapter and monitor
Companion tool	Adobe Reader Version XI or higher Other Adobe Reader versions or other programs may work to display the PDF files, but the recommended version of Adobe Reader should be used for the help links in the tool to work as intended.

## 2.2 Installation Steps

Prior to installing SDE 2.0, export and save any existing SDE data (from a SDE Version 1.0 or 1.1 Tool). Uninstall all previous versions of the SDE tool (Versions 1.0 or 1.1) from the host computer using the Windows Add/Remove Programs function.

### Installing using the FEMA SDE 2.0 CD

1. Insert the CD into the computer. Go to My Computer and select the CD drive.
2. Double-click on *setup.exe* as shown in Figure 2-1.

### Installing using a zip file downloaded from the FEMA Web site

1. After opening the FEMA Web site ([www.fema.gov](http://www.fema.gov)), search on “SDE” or use the SDE Web page (<http://www.fema.gov/library/viewRecord.do?id=4166>) to locate the SDE tool download function.
2. Download and unzip the SDE folder. Installation steps vary depending on the host computer setup and the unzip utility installed on the computer.
3. In many cases, users can unzip the folder by right-clicking and selecting the option *Extract All...* from the list of options or by double-clicking the zip folder and selecting the option *Extract all files* from the list of choices displayed. Some users may have an unzip utility installed that activates automatically when they click on the folder.

Double-click on *setup.exe* (Figure 2-1) to install the SDE tool.



Figure 2-1: Setup.exe location

When the *Welcome to the Substantial Damage Estimator 2.0 Setup Wizard* window appears, click *Next* to continue (Figure 2-2).



Figure 2-2: Setup wizard

In the *Select Installation Folder* window, selecting *Everyone* (Figure 2-3) allows anyone who uses the computer to run the SDE tool. Selecting *Just me* allows only the user currently logged on to run the SDE tool. Click *Next* to continue.

**USER NOTE: Windows Vista, Windows 7, and Windows 8 Users** should replace the default installation path with C:\Users\*<user name>*\My Documents\Substantial Damage Estimator 2.0, where *<user name>* is your user name on the computer.

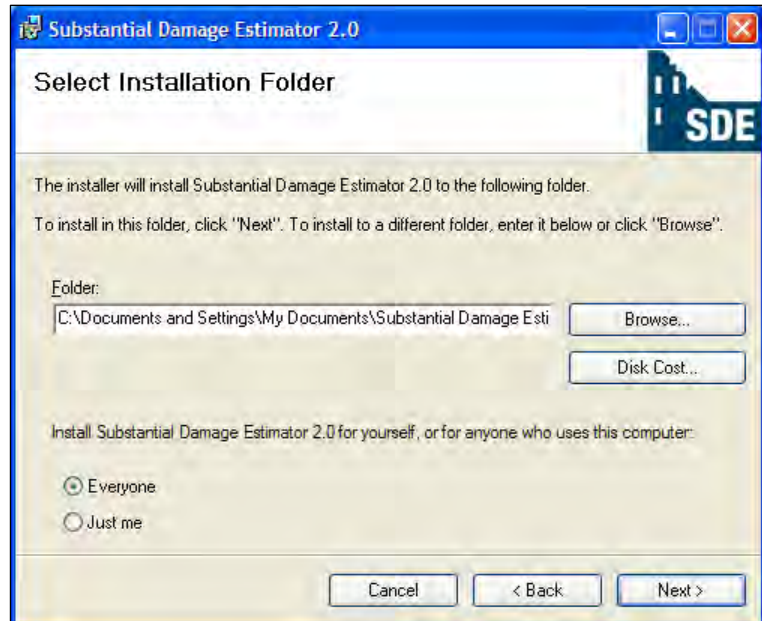


Figure 2-3: Selecting the installation folder

When the *Confirm Installation* window appears, click *Next* to continue (Figure 2-4).

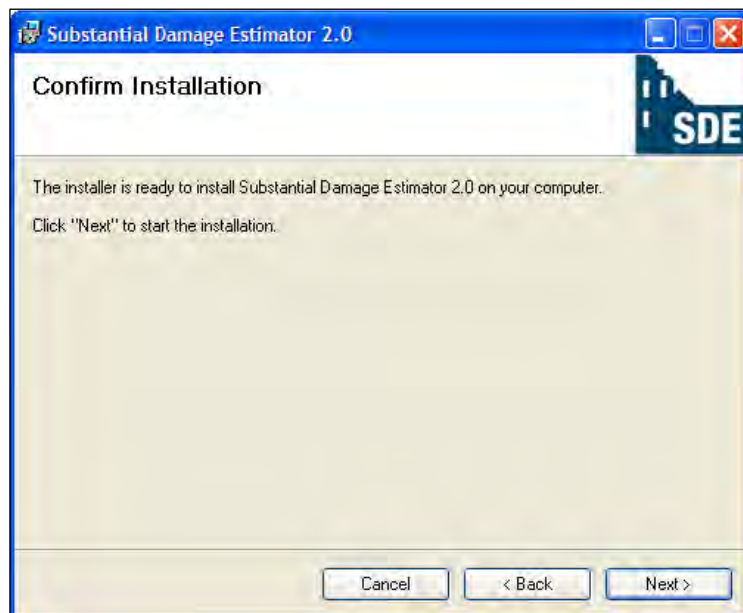


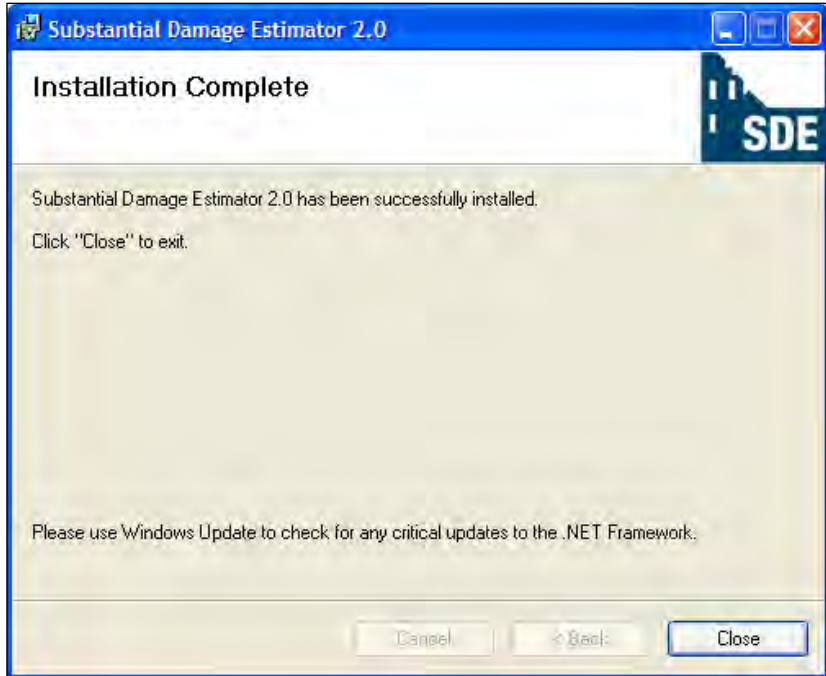
Figure 2-4: Confirming installation

## Installation

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Once the installation is complete, click *Close* (Figure 2-5).

**USER NOTE:** A host computer can only have one installation of the SDE tool.



**Figure 2-5: Completed installation screen**

The installation process will place an SDE icon similar to the one in Figure 2-6 on the host computer desktop. Double-click the icon to run the SDE tool.



**Figure 2-6: The SDE icon**



## 2.3 Selection of the Database Type

The first time the tool is run on the host computer, the *Database Information* window (Figure 2-7) will appear, prompting the user to select the database type. The database type determines whether the user can make or obtain assignments for SDE field data collection.

Select *Server* if you are a supervisor and will be assigning properties to inspectors.

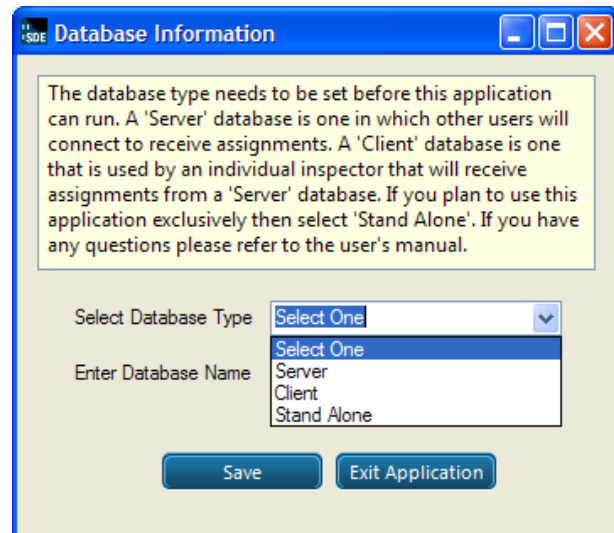
Select *Client* if you are an inspector and will be receiving property assignments.

Select *Stand Alone* if you will not be making or receiving assignments.

After selecting the database type, the user may enter a database name.

The selection of the database type can only be made when opening the tool for the first time after installation. If a database type is not selected when the tool is first opened and the user needs to be able to make or obtain assignments, the user must export the SDE data previously entered (if any), uninstall the SDE tool, reinstall it, and then import the previous SDE data.

See Section 3 for additional information on client and server machines.



**Figure 2-7: Selecting the database type during installation**

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## SECTION 3 DATABASE ASSIGNMENT FUNCTIONS

Similar to the SDE Versions 1.0 and 1.1 Tools, with the SDE Version 2.0 Tool, supervisors can make inspection assignments based on inspector names and then send the assignments to inspectors in the field. This action is performed through the *Database Functions* menu on the *Main Toolbar*. The first time the tool is run after installation, the user must select one of three options for the database type: *Server*, *Client*, or *Stand Alone*. The *Stand Alone* option eliminates the assignment functionality. The *Server* and *Client* options lead the user to either the supervisor or inspector roles, respectively. If the *Stand Alone* option is selected prior to the decision to make assignments, the SDE data recorded up to that point will need to be exported as an SDE database and the SDE tool will need to be removed and then re-installed on the host computer so that the *Client* or *Server* database type can be selected.

### 3.1 Server/Supervisor Instructions

Set up the SDE tool in *Server* mode if the user will be creating/editing inspector information and assigning properties.

1. First, the supervisor sets the database location by clicking on the *Database Functions* menu from the *Main Toolbar*.
2. Once the database location is selected, the tool will create a database file in the database location and will confirm the action. If successful, the supervisor will be able to begin creating inspectors. At a later time, the supervisor may choose to change the location of the database file through the *Database Functions* menu by selecting *Set/Reset Server Database Location*.
3. Inspectors may be entered under the *Assignments* menu, through the *Inspector Functions* submenu. By selecting *Add New Inspector*, the supervisor will be prompted to enter an *Inspector Name*, *Phone Number*, and *Password*. Inspectors will have to provide the same name and password to log in and retrieve assignments. Inspector information may be updated through the *Inspector Functions* submenu at any time.
4. The supervisor may begin assigning properties for data collection after at least one inspector has been created. By selecting the *New Assignments* submenu under the *Assignments* menu, the supervisor can choose to make assignments from existing properties or new properties, or make “batch” assignments for multiple assignments of new or existing properties. The *Existing* and *New 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.
5. Once assignments have been made, the supervisor may review them by selecting the *Search Assignments* function under the *Assignments* menu. This will display all assignments made in the database. Double clicking on an assignment on this screen brings the user to a screen displaying the assignment details, including the *Assignment Status*, *Inspector Name*, *Property Owner Name*, and *Address*. These fields can be edited.

### 3.2 Client/Inspector Instructions

Set up the SDE tool in Client mode if the user is an inspector.

1. To receive assignments, the user must first map to the database location by selecting *Set/Reset Server Database Location* under the *Database Functions* menu.
2. Once the database location has been successfully established, the inspector can synchronize with the database to retrieve assignments (this is the same subset of data created by the server/supervisor instance above) by using the *Inspector Functions* submenu under *Assignments*. If the supervisor has created an inspector profile for the inspector and has made at least one assignment, the inspector may begin the synchronization.
3. Upon notification of successful synchronization, the inspector may then log in through the *Log In* function under the *Inspector Functions* submenu.
4. After logging in, the inspector must select the *Synchronize Assignments* function, under the *Assignments* menu. The tool will display a message informing the inspector of the success of this operation.
5. The *Search Assignments* function under the *Assignments* menu will 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 can edit them as appropriate. 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.

Although the SDE assignment function provides users in the field with the ability to actively receive and complete assignments provided by the supervisor, the functionality is one way. The inspector cannot transmit the assessment data back to the supervisor through the network database. The *Export SDE Data* function may be used to transfer completed assessments from the inspector's computer to the supervisor's computer.

## SECTION 4 CREATING SDE ASSESSMENTS

Users can create assessments using three methods: (1) by importing property data and adding assessment data; (2) by importing existing assessments from another SDE database; or (3) by creating properties and assessments in the tool. Prior to developing any records or assessments, users should familiarize themselves with the use of the tool.

Note that there is a difference between “records” and “assessments” (see text box at right).

**Records** refer to property data entered into the tool before adding the data collected in the field. A record is therefore a partial assessment.

**Assessments** include one or more records for a single structure and include data collected in the field. The term “assessment” is used to describe a complete entry and can be used for a Substantial Damage determination.

**User Manual Formatting Explanation:** To allow readers to easily differentiate between the various elements of the tool, terms that indicate elements of the screen captures are formatted as follows:

- **Bold Lucinda Sans font** is used to indicate which of the seven standard SDE 2.0 menu tabs, as shown in Figure 4-1, should be selected (e.g., Address, Structure/Damage/NFIP Info, Cost, etc.).
- *Italic Lucinda Sans font* is used to indicate SDE tool functions that can be clicked (e.g., “Next,” “OK,” “Submit”), menus, and data fields.

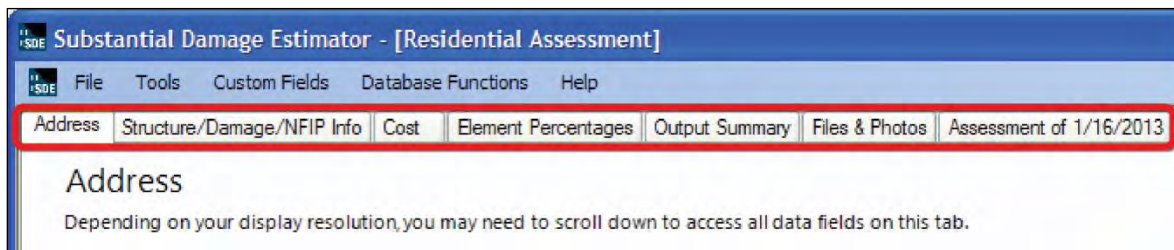
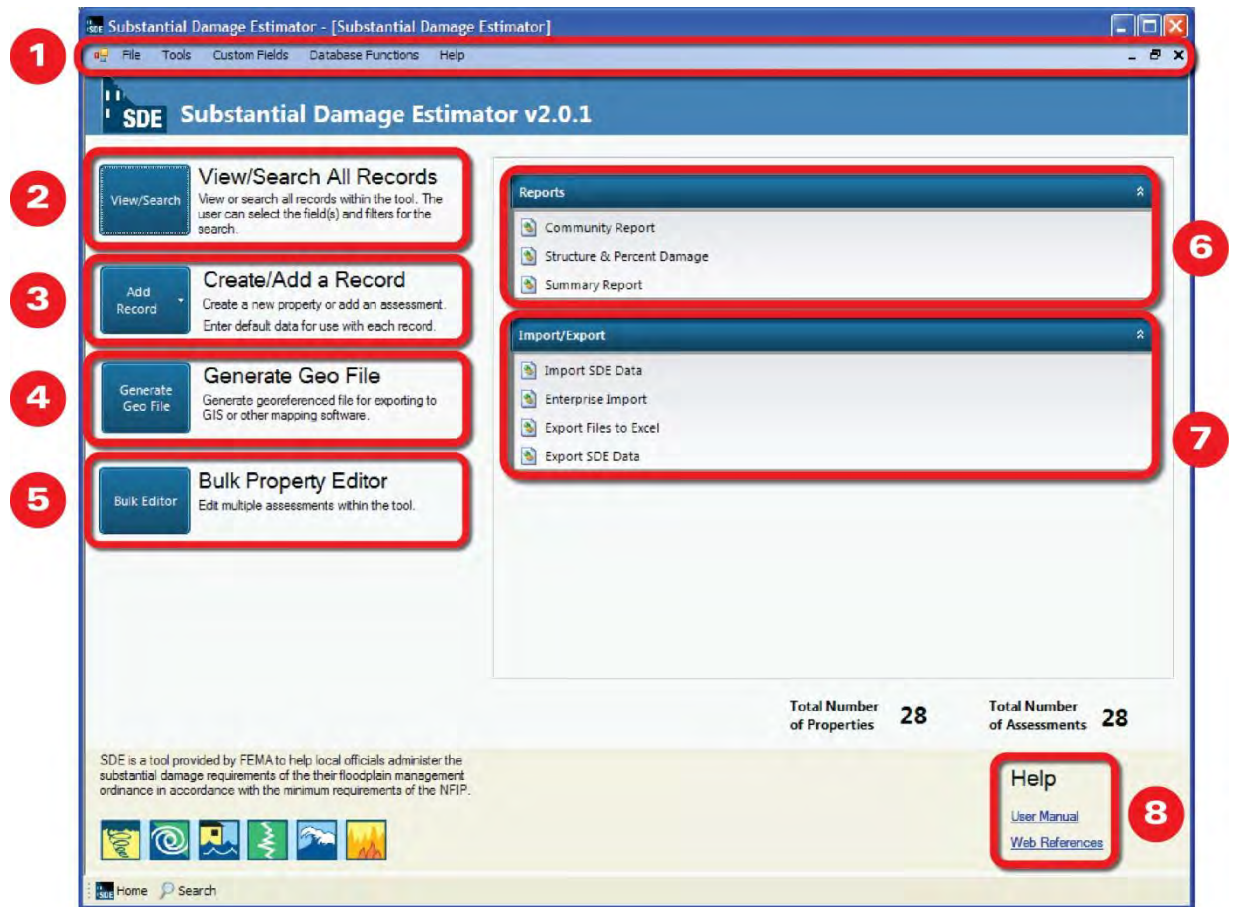


Figure 4-1: SDE Version 2.0 Tool menu tabs

### 4.1 Main Menu Options

Once the SDE tool is installed and the database type selected, the tool will open with the *Main Menu* as shown in Figure 4-2.



**Figure 4-2: Main Menu for SDE Version 2.0 Tool**

Figure 4-2 shows the following *Main Menu* navigation options numbered according to the following list:

**1 Main Toolbar** – This toolbar can be accessed from any screen within the SDE tool, providing the user with access to both basic and specific functions. Many functions in the *Main Toolbar* can also be accessed from the *Main Menu*.

➤ *File*

- Create a new residential or non-residential assessment
- Access and open recent assessments
- Save the current assessment
- Access the *Main Menu* screen
- Exit the tool

➤ *Tools*

- Turn the latitude and longitude validation function on or off
- Import or export completed records or assessments
- Print the SDE *Summary Report* (1 page) or the *Detailed Report* (5 pages) for the current assessment
- Import or export latitude and longitude coordinate data

- Delete all SDE data (this is a new function; see Section 4.2)
- *Custom Fields*
  - Add, edit, or delete custom fields
- *Database Functions*
  - Update the database name
  - Perform an enterprise import of non-SDE data
  - Add a property to the database
  - Set or reset the server database location
- *Assignments*
  - Make or receive assignments, depending on whether the user has selected a “Client,” “Server,” or “Stand-Alone” database type
  - Assignments are discussed in more detail in Section 3
- *Help*
  - Access the online SDE 2.0 User Manual

### Assignments

Whether the user will make or receive assignments dictates the database type selected and must be decided when the tool is first opened after installation (see Section 3 for more information on the use of assignments).

- 2 View/Search All Records** – This function allows the user to view or search all records within the tool based on selected filters for the search. Users can also open a record or assessment to edit or add data.
- 3 Create/Add a Record** – This function allows the user to create a new property or add an assessment to an existing property. The user has the option to:
  - *Create a New Property*
  - *Add a Residential Assessment*
  - *Add a Non-Residential Assessment*
  - *Enter Default Data* (see Section 4.4 on using the new default data function)
- 4 Generate Geo File** – This function generates a georeferenced file for export to geographic or spatial mapping programs. The file is a compressed Keyhole Markup Language (KML) file. For more information, see Section 5.3.
- 5 Bulk Property Editor (New Function)** – This function allows the user to edit and save multiple assessments within the tool based on selected data fields and filters. For more information, see Section 4.6.2.
- 6 Reports** – This function allows the user to generate fixed, pre-defined *Community, Structure & Percent Damage*, or *Summary Reports* for assessments in the SDE database. For more information on reports, see Section 6.
- 7 Import/Export** – This function allows the user to import and export SDE data, perform an enterprise import, and export files to Excel. For more information on importing and exporting, see Sections 4.3 (importing data) and 5.0 (exporting data).

- 8 Help Documentation** – Help documentation references the *SDE 2.0 User Manual* and applicable online references (*Web References*) to assist the user in the assessment process and use of the SDE tool.

### 4.2 Deleting All Existing SDE Data (New Function)

A new function in the SDE 2.0 Tool allows users to clear all records and assessments prior to entering data for a new inspection day, inspection team, community, county or new damage event. The user can remove all data from an active database using the *Delete All SDE Data* function on the *Tools Menu* of the *Main Menu*. Prior to completing the action, the *Warning: Deleting All Records* window shown in Figure 4-3 will appear to prevent inadvertent deletion of data.



**Figure 4-3: Warning window when deleting all records**

When the *Delete All SDE Data* function is selected, all data in the active SDE database will be permanently deleted and cannot be recovered. Consequently, users are strongly encouraged to save existing data by exporting any records and assessments that may be needed in the future prior to selecting “Yes” in this window.

### 4.3 Importing Data

Three options are available for adding data and assessments to the tool:

- Importing SDE data from another SDE database
- Importing non-SDE property data, such as tax information, property lists, or appraisal data, using the *Enterprise Import* function from community databases or Excel files
- Importing latitude and longitude coordinate data

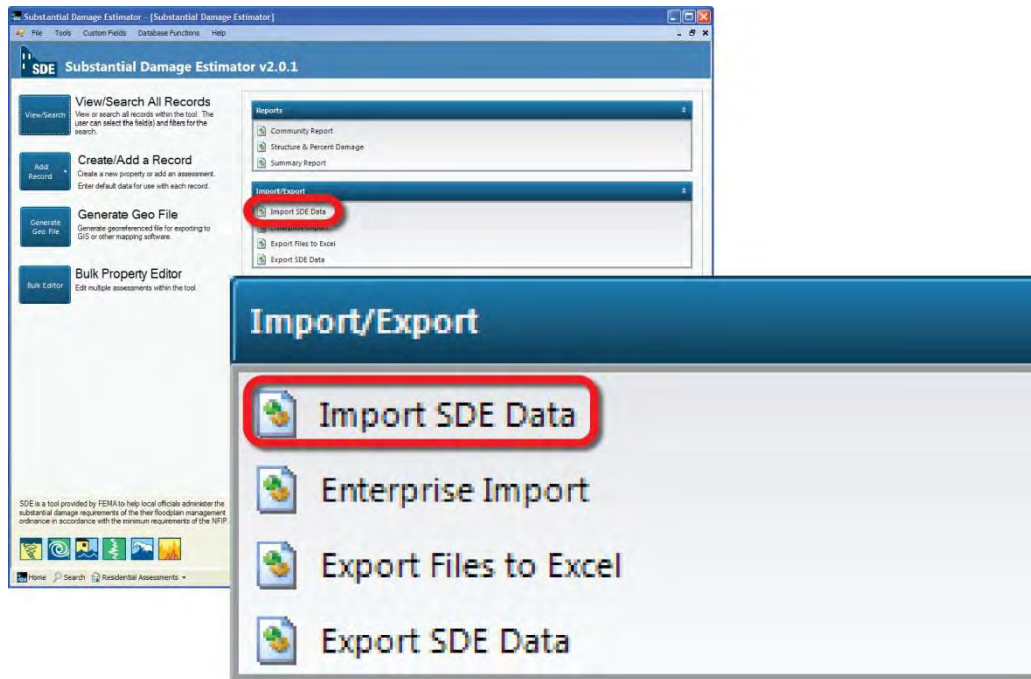
The type of import to use depends on the types of data and database that are available. The import of data from an SDE database is fairly straightforward. Data from a non-SDE database or an Excel file must be imported using the *Enterprise Import* function built into the tool.

#### 4.3.1 Importing SDE Data

The purpose of the *Import SDE Data* and *Export SDE Data* functions on the SDE *Main Menu* is to allow data to be imported and exported from multiple computers to create a large inventory of SDE records on a single computer.



To import data, the user must click on the *Import SDE Data* link on the *SDE Main Menu* (Figure 4-4).



**Figure 4-4: Import SDE Data function**

The *Map to Directory* screen will appear. The user must click on the *Select Directory* button to open the *Browse For Folder* window to select a directory for the location of the files (Figure 4-5). Data that have been exported using the SDE tool will be located in a folder titled “SDE Assessments” (usually located on the root directory of the computer). This folder contains subfolders with the individual properties and assessments. The user should select the root folder “SDE Assessments” to import the data from all the subfolders.

Once a folder location is selected and the user clicks *OK*, the assessments will be listed as rows in the table shown on the *Import SDE Data* screen (Figure 4-6). The user can select the assessments to be imported by either clicking *Check All* or checking the box next to each desired property or assessment. Users also have the option of checking *Overwrite Property* or *Overwrite Assessment* to automatically overwrite any duplicate properties or assessments during the import process.

# Creating SDE Assessments

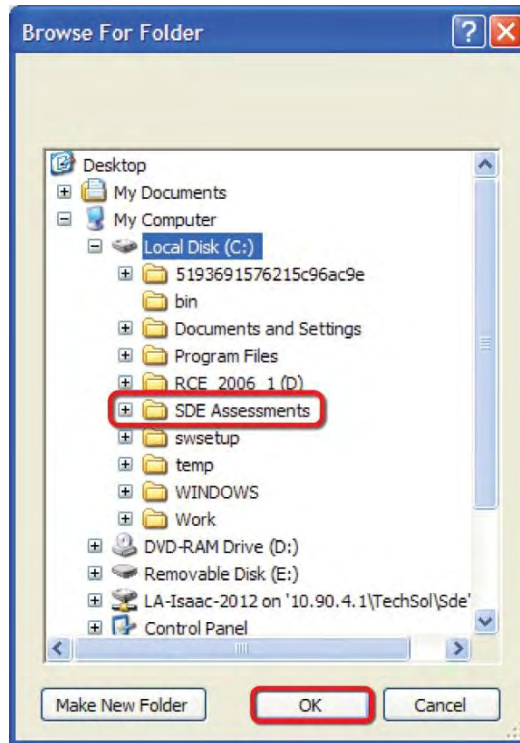


Figure 4-5: SDE Import directory

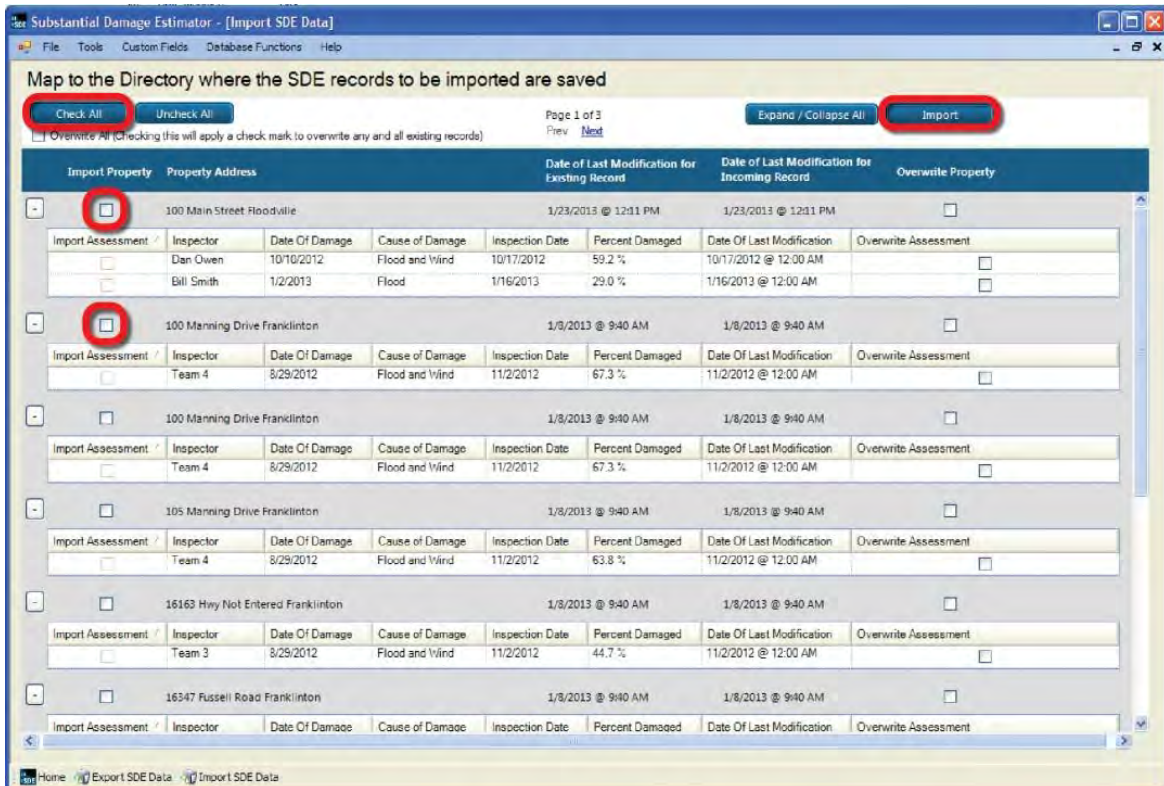


Figure 4-6: Import of individual or all SDE assessment data

Once the import is complete, a window will appear indicating that the files have been successfully imported (Figure 4-7). After importing separate databases from the same inventory, the user should review the data and delete any duplicate records or assessments.



Figure 4-7: Import summary and confirmation

### 4.3.2 Enterprise Import

The *Enterprise Import* function is used to import multiple properties at one time from non-SDE databases. This can be a very useful function for a large number of assessments, and any number of the available fields may be selected for import. By creating an XLS, CSV, XML, or MDB file outside of the tool, the user may list fields for multiple properties. The process is easier if column headers describing the fields are inserted into the file. If users have access to pre-existing databases of property data, these databases can often be easily adapted for import to the SDE tool. The user may choose to import any or all of the fields identified in Table 4-1. An electronic copy of the database to be imported into the SDE tool must be copied to the host computer prior to importing.

**USER NOTE:** Only property-level data can be imported using the *Enterprise Import* function. Assessment data cannot be imported from non-SDE databases.

Table 4-1: SDE Fields for Enterprise Import

1. Owner's First and Last Names	16. Community NFIP ID
2. Lot Number	17. FIRM Panel
3. Parcel Number	18. FIRM Zone
4. Address Lines 1 and 2	19. BFE
5. Street Suffix	20. Suffix
6. Cardinal (N, E, S, W) or quadrant directions (NW, SW, NE, SE) either preceding or following the street name	21. Residential or Non-Residential (structure type)
7. Apartment, Unit, etc.	22. Phone Number
8. City	23. Date of FIRM Panel
9. State	24. Regulatory Floodway (Yes, No, or Possible)
10. County	25. Subdivision
11. Zip (code)	26. First Floor Elevation
12. Year of Construction	27. Datum
13. Longitude	28. Total Square Footage
14. Latitude	29. Custom Fields (maximum of 3 fields)
15. Community Name	

NFIP = National Flood Insurance Program  
 FIRM = Flood Insurance Rate Map  
 BFE = base flood elevation

## Creating SDE Assessments

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A maximum of three custom fields may also be imported using this function. Before entering the *Enterprise Import* screen, the user must create the custom fields in the tool (see Section 4.3.2). If they have not been created, the custom fields will not be imported. Once the user has created the file to import and has populated it with the desired fields, the *Enterprise Import* function may be run.

By selecting the *Get File* button, the user will be prompted to browse and select the appropriate import file from the host computer directories. The tool will then ask the user specific questions regarding the type of file selected for import. For example, if an XLS file is used, the tool will ask the user whether the file contains column headers. Once these and other questions have been answered, a button will appear allowing the user to advance to the importing stage of the function.

The user is then required to map (or identify the relationship) between the data fields in the import file to the corresponding data fields in the SDE tool. Each field within the import file that will be imported must be tied to a SDE data field via the drop-down menus for each field on the *Enterprise Import* screen.

If a field within the file requires parsing (i.e., separation of data from one field in the import file into two fields in SDE) the method in which it should be parsed must also be chosen from a drop-down menu. For example, if the import file contains the full name for the owner in one field, 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 into SDE.

**USER NOTE:** Be careful when using or creating an Excel file and importing it into the SDE tool. Improperly named headers (e.g., two columns that have the same header) or incorrect mapping will cause errors in the import process and the assessments.

Also, if the *Structure Type* information (residential or non-residential) is 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 labels for residential and non-residential must be consistent throughout the source file. If labels are different for different properties in the source document and do not match the data string(s) entered into the SDE tool, the *Enterprise Import* function will not be able to assign a structure type for each property or assessment imported.

Once all the desired fields have been mapped and, if applicable, parsed, the user should select the *Attempt Import* button to finalize the import. The tool will display a message indicating the success of the import, after which the SDE tool will return to the *Main Menu*. After importing data from separate databases into the SDE tool, the user should review the data within the SDE tool and delete duplicate records.

Additional guidance on pre-populating the SDE database and the use of available community data can be found in the *FEMA SDE Best Practices* document (May 2012) at <http://www.fema.gov/library/viewRecord.do?id=5929>.

### 4.3.3 Importing Latitude and Longitude Coordinate Data

Latitude and longitude coordinates can be imported into the tool using the *Import Spreadsheet* function in the *Longitude Latitude Import/Export* submenu under the *Tools* menu. 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 they wish to import. After selecting the desired properties, the user should select the *Import Data* button to execute the command and import the desired data into the tool.

### Guidance for Obtaining GPS Coordinate Data

There are no specific requirements for the level of accuracy of global positioning system (GPS) coordinates obtained during SDE inspections. The general guidance is that the coordinate data must be accurate enough so that someone other than the original SDE inspector can locate the structure in the field or on a GIS map.

The recommended level of accuracy for GPS coordinate data is four decimal places and 10 feet (or 3 meters) horizontally, with a 95 percent level of accuracy. This will facilitate importing and plotting the data on local maps, shareware maps, or fee-based maps available from commercial sources. This level of accuracy is necessary so that the recorded GPS data are valid for only one structure. Less accurate coordinate data may encompass larger areas that include multiple lots and structures even though the data was obtained on an individual lot.

To achieve the above-mentioned level of accuracy, the GPS data should be collected using a Wide Area Augmentation System (WAAS)-enabled, high-sensitivity GPS unit. A WAAS corrects for GPS signal errors caused by ionospheric disturbances, timing, and satellite orbit errors.

The following procedures are recommended to calibrate the GPS unit and verify the accuracy of the data for WAAS and other GPS units.

To verify the calibration of the GPS units:

1. All inspectors should gather in one location each morning to obtain and verify GPS coordinates for that location on each GPS unit.
2. GPS readings should agree within four decimal points for the same location.
3. GPS units that do not match the coordinates obtained by other GPS units during the daily test should be recalibrated.

A potential reception issue can occur when capturing GPS coordinate data in an area of dense foliage or where a thick tree canopy exists near a structure. The foliage may limit the reception of the GPS unit and impair the accuracy of the GPS data. When dense foliage or a thick tree canopy is present, inspectors should either move to a part of the property with a clear line-of-sight to the sky to obtain the GPS data or obtain multiple GPS readings at various locations around the structure (possibly at the four corners) to verify that the readings are consistent.

#### Wide Area Augmentation System (WAAS)

Motor vehicle GPS units, and some hand-held navigation systems, smart phones, or digital cameras with a GPS receiver, may not be WAAS-enabled. Local officials and inspectors should not attempt to use such GPS units to record lot-specific coordinate data. The GPS data obtained from non-WAAS units have been found to be limited, inconsistent, and sometimes unreliable, resulting in GPS coordinate data varying from one lot to several thousand feet away from the actual data collection point.

## 4.4 Using Default Data (New Function)

A function that is very useful and new to the SDE 2.0 Tool is the *Enter Default Data* function (Figure 4-8). This function provides users with the option to pre-populate up to 22 commonly used data fields for each new assessment created in the SDE tool. This function cannot be used for imported records and assessments. This function reduces typographic and consistency errors as well as the amount of data the user must enter for a valid assessment.

The *Enter Default Data* function is accessed from the *Create/Add a Record* function on the *Main Menu*. The user may enter data for any combination of the 22 data fields. Once entered, the default data remains intact and available for new assessments until the user opens the default window to change any or all of the data fields. After adding the default data to a new assessment, the user can overwrite any of the pre-populated data fields.

The screenshot shows a software window titled "Substantial Damage Estimator - [Enter Default Values for Assessments]". The window has a menu bar with "File", "Tools", "Custom Fields", "Database Functions", and "Help".

**Default Values for Address / Structure Information**

- City: Floodville
- State: Colorado
- County: Boulder
- Zip: 14299
- Year of Construction: [empty]
- Datum: NGVD 1929

**Default Values for Damage / Cost Information**

- Date Damage Occurred: 10/10/2012
- Cause of Damage: Flood and Wind
- Duration of Flood: 2 Days
- Geographic Adjustment: 0.95
- Inspector's Name: Dan Owen
- Inspector's Phone: (818) 445-1212
- Date of Inspection: [empty]

**Default Values for NFIP Information**

- NFIP Community Name: Floodville
- NFIP Community ID: 189999
- FIRM Panel Number: 0100
- Suffix: B
- FIRM Zone: AE
- Date of FIRM Panel: 06/15/2005
- Base Flood Elevation: 105.00
- Regulatory Floodway: Possible
- Space for Community Specific Information: [empty text area]

Buttons at the bottom: Clear All Values, Delete, Save.

Figure 4-8: Enter Default Data window

The data options for the *Enter Default Data* function are identified in Table 4-2.

**Table 4-2: SDE 2.0 Tool Default Data Fields**

Information Type	Data Fields	
Address/Structure Information	<ul style="list-style-type: none"> <li>• City</li> <li>• State</li> <li>• County (Parish)</li> </ul>	<ul style="list-style-type: none"> <li>• Zip</li> <li>• Year of Construction</li> <li>• Datum</li> </ul>
Damage Cost Information	<ul style="list-style-type: none"> <li>• Date Damage Occurred</li> <li>• Cause of Damage</li> <li>• Duration of Flood and time units (hours or days)</li> </ul>	<ul style="list-style-type: none"> <li>• Geographic Adjustment</li> <li>• Inspector's Name</li> <li>• Inspector's Phone</li> <li>• Date of Inspection</li> </ul>
NFIP Information	<ul style="list-style-type: none"> <li>• NFIP Community Name</li> <li>• NFIP Community ID</li> <li>• FIRM Panel Number</li> <li>• Suffix</li> <li>• FIRM Zone</li> </ul>	<ul style="list-style-type: none"> <li>• Date of FIRM Panel</li> <li>• BFE</li> <li>• Regulatory Floodway</li> <li>• Community Specific Information (text box)</li> </ul>

NFIP = National Flood Insurance Program  
 FIRM = Flood Insurance Rate Map  
 BFE = base flood elevation

## 4.5 Creating an Assessment

This section describes the steps required to create an assessment. Assessments can be created for either new or existing properties. Assessments can also be imported in large quantities from other SDE databases using the *Import SDE Data* function. Properties can be imported from tax records or other community resources using the *SDE Enterprise Import* function. Users have the option to either use properties in the existing database or enter a new property for a new assessment. A single property may have multiple assessments to record damages from multiple events.

### 4.5.1 Creating a New Property

The SDE tool allows users to create property records that can be selected later to add field-collected data to develop assessments. The user should select *Create a New Property* from the *Create/Add a Record* menu on the *Main Menu*. A single screen will appear with fields for the property data and NFIP information.

### 4.5.2 Creating a New Residential Assessment

Six separate SDE tabs or screens for will be available for assessments of a new property and seven tabs will be available for an assessment of an existing property. The first six tabs (Figure 4-9, from left to right) contain the same assessment information for both new and existing properties.

The first four tabs contain fields for key information. The fifth tab provides the results of the Substantial Damage determination plus options for determining Substantial Damage via other methods. The sixth tab is an interface that allows users to attach documents and photographs to the assessment. The seventh tab (*Assessment of MM/DD/YYYY*) contains a read-only summary of the

## Creating SDE Assessments

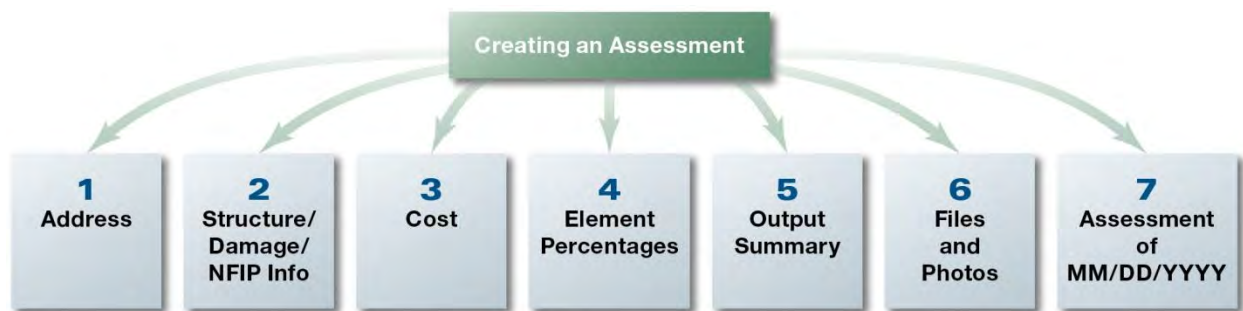
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inspection data collected for the previous assessment. Edits to the data may be made on the first six tabs only.

To create an assessment, the user should select the *Create/Add a Record* button on the *Main Menu* and select the option to *Add a Residential Assessment*. If an existing property is selected, the **Address** tab in the new assessment will be automatically populated with available data. If a *New Property* is selected, the user must fill out the **Address** tab when creating the assessment. If default data has been entered into the tool, the user will have the option of using that default data to pre-populate certain data fields within the assessment.

When a new assessment is created for an existing property, the property data and some of the assessment data are pre-populated for the new assessment. These data can be revised as part of the new assessment. The data fields on the **Cost** and **Element Percentages** tabs must be completed for a valid assessment.

The following sections summarize the data fields on each of the first six tabs. As previously mentioned, the seventh tab contains a read-only summary.



**Figure 4-9: SDE 2.0 Tool tabs for residential and non-residential assessment data**

### 4.5.2.1 Address

The data fields in this tab (shown in Figure 4-10) will be pre-populated if an existing property is selected for the assessment. This tab is the same for both residential and non-residential assessments. The **Address** tab includes:

- **Subdivision Information** – subdivision name, parcel number, lot number, elevation of lowest floor, and elevation datum
- **Community Information** – NFIP Community ID, NFIP community name, and coordinates for latitude and longitude
- **Building Address Information** – homeowner first and last names, address information, and phone number
- **Mailing Address** – same fields as Building Address Information
- **Custom Data Fields** – located at the bottom of the **Address** tab (use is optional)



**Substantial Damage Estimator - [Residential Assessment]**

File Tools Custom Fields Database Functions Help

Address Structure/Damage/NFIP Info Cost Element Percentages Output Summary Files & Photos

### Address

Depending on your display resolution, you may need to scroll down to access all data fields on this tab.

**Subdivision**

Subdivision:

Parcel Number:

Lot Number:

Elev. of Lowest Floor:

Datum:

**Community**

NFIP Community ID:

NFIP Community Name:

Latitude:

Longitude:

**Building Address**

First Name:

Last Name:

Street Number:

Street Name:

Street Suffix:

City:

State:

County:

Zip:

Phone:

Cell Phone:

**Mailing Address**

Check if same as Building Address

First Name:

Last Name:

Street Number:

Street Name:

Street Suffix:

City:

State:

County:

Zip:

Phone:

Care of:

**Custom Fields (Maximum of three)**

Choose a field

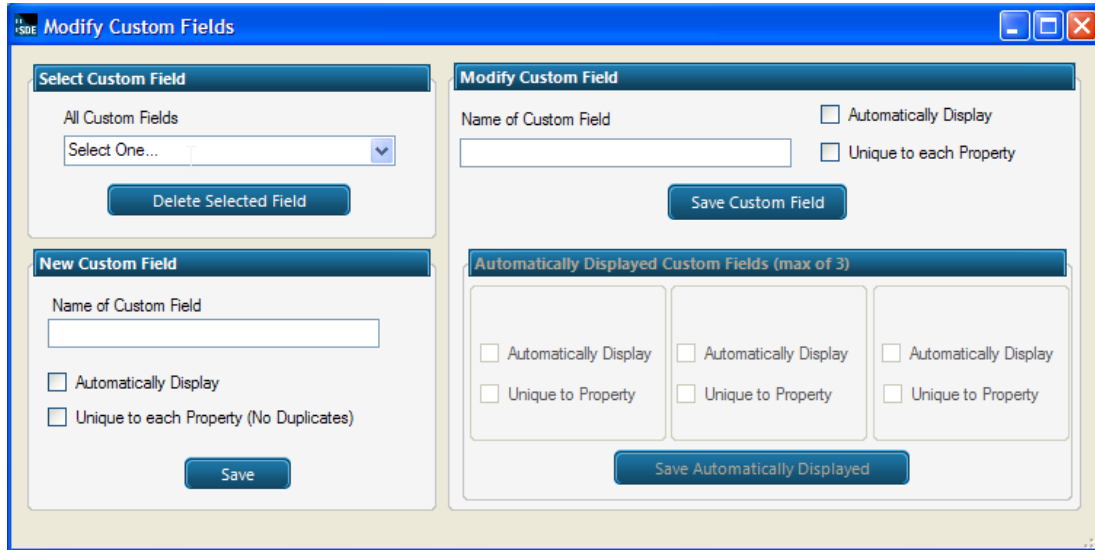
Select a Field

**Figure 4-10: Address tab and custom fields**

Default data can also be used to pre-populate this and other tabs for a new property and assessment. Custom fields can be used to create fields that are not standard inputs in the tool. For example, if Substantial Damage assessments are being performed after a hurricane, the user may wish to create a custom field for “Hurricane Name” so that all assessments for that particular storm are tagged with the name of the storm.

## Creating SDE Assessments

The user can create a maximum of three custom fields through the *Custom Fields* menu on either the *Main Toolbar* or at the bottom of the **Address** tab. When the user selects *Add/Edit/Delete Custom Field* from the *Main Menu*, the tool displays a window (*Modify Custom Fields*) in which the user can delete an existing custom field, create custom fields, or modify custom fields (Figure 4-11). The user can also select to automatically display custom fields and/or make them unique to each property.



**Figure 4-11: Modify custom fields**

If the *Latitude and 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 whether the data entered are within the State where the structure is located.

The **Address** tab also contains a button at the bottom labeled *Carry Over Data From Previous Record*. If selected, this button will automatically pull the subdivision name, NFIP Community ID, structure address street name and suffix, city, State, and zip code from the previous assessment created and include these data in the current assessment.

### 4.5.2.2 Residential Structure/Damage/NFIP Info

This tab includes structure attributes and information, inspector information, NFIP and community information, and damage event information. This tab provides different data fields for structure attributes and information for residential and non-residential (refer to Section 4.5.3) assessments. The other data fields on this tab are the same for both types of assessments. The **Structure/Damage/NFIP Info** tab includes these data fields:

- **Structure Attributes** – drop-down list with the types of residences, foundations, superstructures, roof coverings, exterior finishes, HVAC system (yes or no), and number of stories
- **Structure Information** – year of construction, initial construction quality (drop-down

list), and residence information comment box

- **Damage Information** – date damage occurred, cause of damage, duration of flood (in hours or days), estimated depth of flood above ground, estimated depth of flood above first floor, and comment box for cause of damage (if “other” is selected)
- **No Physical Damage** – checkbox for structures with no apparent physical damage (only available when “Flood” or “Flood and Wind” selected for Cause of Damage)
- **Inspector Information** – name, phone number, and date of inspection
- **NFIP Information** – NFIP Community ID (carried over from the Address Tab), Flood Insurance Rate Map (FIRM) panel number, FIRM panel suffix, date of FIRM panel, FIRM zone, base flood elevation (BFE), and regulatory floodway (yes, no, possible)
- **Community Information** – comment box for community-specific information such as name or number of the declared disaster, use of best available flood data other than the effective Flood Insurance Study, etc.

*Residential assessments* (Figure 4-12) require the user to select a *Residence Type*, after which each element type (*Foundation, Superstructure, Roof Covering*, etc.) must be chosen. The accompanying SDE Field Workbook provides information on the various options for the structure attributes.

**Number of Stories:** The SDE tool includes options for residential structures with either one story or two or more stories. There is no option for one-and-a-half-story residences. However, these structures can be included in the SDE inventory based on the following methodology.

A typical one-and-a-half-story structure includes a full aboveground lower (or first) level with the main living space (kitchen, bathroom, and bedroom) and an upper level that is less than a complete story. This structure type may or may not have a basement. The upper level may also have less floor space and may be finished with bedrooms and a bathroom or left unfinished for storage. The ceilings are lower, and the floor-to-ceiling height varies because the upper level is built directly under the roof, which slopes downward from the peak toward the walls (and forms part of the ceiling). The usable floor space of the upper level is approximately one-third less than the lower level.

Users should select *Two or More Stories* on the **Structure/Damage/NFIP Info** tab. This is because the additional floor space and features (electrical, HVAC, insulation, drywall, and plumbing) will be closer to those of a two-story structure than a one-story structure. Users should use the following approach:

1. Select “*Two or More Stories*” in the “*Story*” data field in the Structure Attributes portion of the **Structure/Damage/NFIP Info** (or second) tab of the SDE.
2. On the **Cost** tab (reviewed in Section 4.5.2.3), enter the dimensions of the lower floor and use 1.5 for the number of stories in the SDE square footage calculator. Using a value of 1.5 instead of 2 for the number of stories will yield a total square footage that is closer to the true square footage for a one-and-a-half-story residence.

**Figure 4-12: Residential Structure, Damage, and NFIP Information tab**

**Construction Quality:** The user must also select the initial (not current) construction quality for the residence from a drop-down menu. The five quality levels range from low to excellent, with excellent involving higher-end or custom-built elements. If the initial construction quality is difficult to determine based on depreciation or damage, the inspector should select between budget, average, and good, unless he or she observes elements that would suggest that the quality level should be either low or excellent. Table 4-3 provides guidance on the quality level options for residential construction.

**Table 4-3: Initial Construction Quality for Residential Construction**

Initial Construction Quality	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 <sup>1</sup>	X		Plain	Limited ornamentation on front elevation	X	
Average <sup>1</sup>	X		Average finish	Some ornamentation on front elevation	X	
Good <sup>1</sup>	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

<sup>1</sup> Quality of construction types used in most homes in subdivisions

The initial construction quality level does not have a direct effect on the Substantial Damage determination, but it does determine which unit cost table should be used for the base cost on the **Cost** tab. Most industry-accepted cost-estimating guides have different unit cost tables, based on the initial construction quality. Users should compare the quality level descriptions in Table 4-3 to the quality levels in the cost-estimating guide being used to verify that the appropriate unit cost tables are used for structure cost.

**Additional Comments:** The user may enter additional comments in two areas of the **Structure/Damage/NFIP Info** tab. The “*Residence Information*” comment box for residential assessments (and the similar “*Structure Information*” comment box for non-residential assessments) can be used to enter any information or commentary specific to the property being assessed. The “*Community Information*” comment box can be used to enter community-specific information, for example to explain an unusual situation about the current structure or flood event. This may include information such as “Flood was estimated by city engineer to be between a 50-year and 100-year event according to the community’s Flood Insurance Study.” Information on the type of mitigation performed within the community in the past or for the structure in question could also be included.

**Cause of Damage:** When *Flood* or *Flood and Wind* are selected as the *Cause of Damage*, users have the option of selecting *No Physical Damage* for structures within an inventory that have no apparent damage or are elevated above the high water mark of the damage event for an area.

Selecting this option reduces the amount of data required to save a valid assessment and the structure will be identified with 0 percent damage in any SDE reports or exports. When using this feature, the *Depth of Flood Above Ground* and the *Depth of Flood Above First Floor* should be entered as 0.01 foot to confirm that there is no physical damage.

### 4.5.2.3 Cost

Although the *Cost Adjustments* portion of the tab varies a little, the data fields in the **Cost** tab (Figure 4-13) are primarily the same for both residential and non-residential assessments. On this tab, the user can enter the square footage, the cost per square foot (unit cost) for the structure, the geographic adjustment factor, unit or lump-sum costs for adjustments (when applicable), and an estimated depreciation rating to determine the replacement value and actual cash value (ACV) of the structure.

**USER NOTE:** For the purposes of this tool, ACV is considered to be the market value of the structure.

Information regarding structure 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.

The **Cost** tab includes:

- **Square Footage** – square footage (using either the calculator or direct entry method), base cost per square foot, and the geographic adjustment factor
- **Cost Adjustments** – modify residence features to match the structure being inspected
- **Additional Adjustments** – for cost adjustments not covered in the cost adjustments above
- **Depreciation Determination** – a depreciation rating between 1 (very poor condition) and 6 (excellent condition) or Other (which opens a text box that requires an explanation for the depreciation percentage used by the inspector)
- **Computed Actual Cash Value** – summation of base cost and all cost adjustments and depreciation percentage

**Substantial Damage Estimator - [Residential Assessment]**


File Tools Custom Fields Database Functions Help

Address Structure/Damage/NFIP Info **Cost** Element Percentages Output Summary Files & Photos

### Cost

Depending on your display resolution, you may need to scroll down to access all data fields on this tab.

**Square Footage**



Calculate or Enter Square Footage

Base Cost per Sq Ft ?

**Total Square Footage 2670**

Geographic Adjustment ?

**Cost \$280,410.08**

**Cost Adjustments**

Adjustments <span style="font-size: small;">?</span>	Quantity	Units	Unit Cost	Item Cost
Roofing	<input type="text" value="1250"/>	Sq Ft	\$ 12.60	<b>\$15,750.00</b>
Heating / Cooling	<input type="text" value="0"/>	Ea	\$ 0.00	<b>\$0.00</b>
Appliances	<input type="text" value="3"/>	Ea	\$ 1,500.00	<b>\$4,500.00</b>
Fireplaces	<input type="text" value="1"/>	Ea	\$ 3,500.00	<b>\$3,500.00</b>
Porch / Breezeways	<input type="text" value="0"/>	Sq Ft	\$ 0.00	<b>\$0.00</b>
Garage	<input type="text" value="420"/>	Sq Ft	\$ 38.95	<b>\$16,359.00</b>

**Additional Adjustments**

Adjustments <span style="font-size: small;">?</span>	Quantity	Unit Cost	Item Cost
Upgraded flooring	<input type="text" value="1750"/>	\$ 8.95	<b>\$15,662.50</b>
<input type="text"/>	<input type="text" value="0"/>	\$ 0.00	<b>\$0.00</b>
<input type="text"/>	<input type="text" value="0"/>	\$ 0.00	<b>\$0.00</b>
<input type="text"/>		\$ 0.00	<b>0</b>
<input type="text"/>		\$ 0.00	<b>0</b>

**Computed Actual Cash Value**

Total Adjustments :	\$52,982.93
Total Replacement Cost :	\$333,393.01
Replacement Cost per Square Foot :	\$124.87

Cost Data Reference

Cost Data Date

Depreciation Rating

Depreciation Percentage

**Computed Actual Cash Value \$288,718.35**

Figure 4-13: Cost tab

## Creating SDE Assessments

**Square Footage:** In the *Square Footage* section of the tab, the user has the option to calculate, directly input, or use the *Enterprise Import* function (Section 4.3.2) to enter the square footage that is required to develop the computed ACV for the structure. To calculate the square footage based on structure dimensions, the user should click on the *Calculate or Enter Square Footage* button, which will open the *Square Foot Calculator* window. Within this window, the user can choose from four structure shapes (i.e., “L” shaped, “T” shaped, rectangular, and “U” shaped) (Figure 4-14).

Shape Used	Total Sq Ft for shape	Edit/View	Delete
L Shape	2670	Edit/View	Delete

Wing / Section	Length	Width	Number of Stories	Total Sq Ft for section
West Wing	60	32	1	1920
East Wing	30	25	1	750

Total Square Footage of this Structure : 2670

Save the Total Square Footage and Close Form

**Figure 4-14: Square Foot Calculator function**

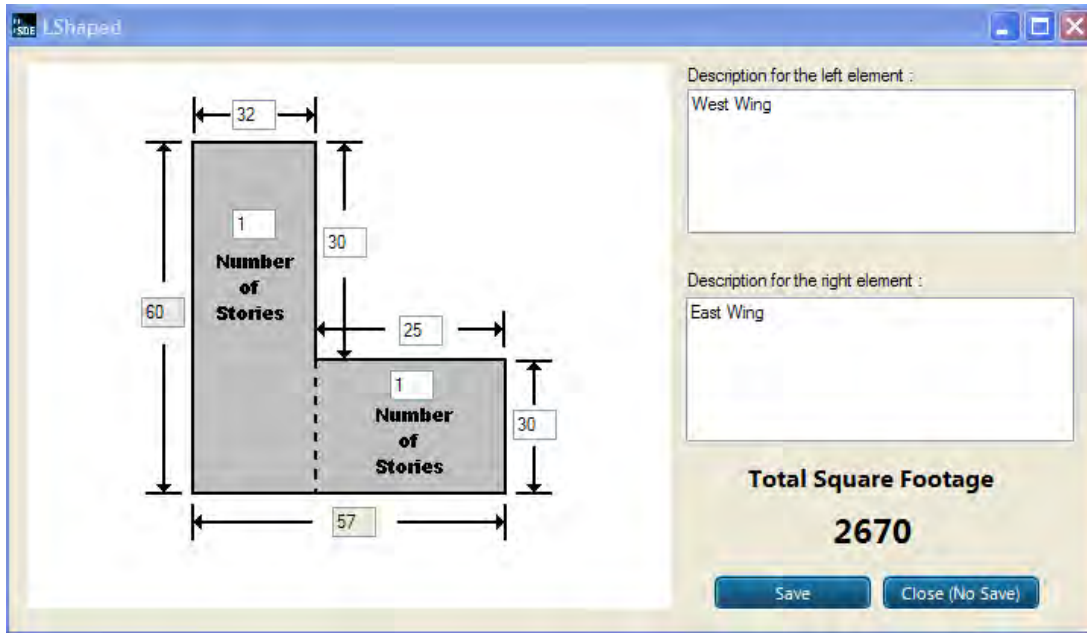
When the user selects a structure shape, another window opens to allow the user to enter the estimated dimensions and the number of stories for the selected shape (Figure 4-15).

Once the dimensions are entered, the user should click the *Save* button to calculate the total square footage. Dimensions for additional areas for multi-section structures can be added to the previously calculated square footage to calculate the total square footage for the structure. When the user has completed data entry for all sections, they should click the *Save the Total Square Footage and Close Form* button to return to the **Cost** tab. The *Total Square Footage* field will be populated.

To directly enter the total square footage, the user should click the *Calculate or Enter Square Footage* button and then click on the *Enter Total Square Footage Manually* button to open the *Enter Total Square Footage* data field to enter the value for the total square footage from tax records, an appraisal, or another valid source of area data. After entering the square footage, the user should



click the *Save* button and to return to the *Square Foot Calculator* window and click *Save the Total Square Footage* and *Close Form* button to return to the **Cost** tab.



**Figure 4-15: Data entry window for the Square Foot Calculator**

Next, a unit or base cost per square foot is entered for the structure. The *Base Cost per square foot* is entered in the data field at the top of the **Cost** tab. The unit cost can be obtained from an industry-accepted national cost-estimating guide, contractor’s estimates, and community estimates from local structure and repair permits, or professional appraisers.

**Base Cost per Square Foot**

The *Base Cost per square foot* is the cost to replace the structure with a functionally equivalent structure of the same size, style, and construction quality, based on the current cost of labor and materials.

The structure cost requires a *Geographic Adjustment* factor. This factor can be found in a national unit cost-estimating guide and is a base cost multiplier with a value above or below 1.0. This recognizes that structures in some areas of the country are more expensive to build than in other areas. This factor equalizes labor and material costs between areas of high and low construction cost around the country. For unit costs developed based on local data, the *Geographic Adjustment* value entered in this data field should be 1.0.

**USER NOTE:** A *Geographic Adjustment* factor greater than 1.0 indicates higher than national average construction costs, whereas a factor below 1.0 indicates lower than average costs.

**Cost Adjustments:** In the *Cost Adjustments* section, some adjustments, such as fireplaces and porches, are in addition to those included in the base cost of the structure. Other adjustments, such as upgraded roofing or floor covering, are added to the base cost (through adjustments) when the initial construction quality of the item exceeds what is normally found in the initial construction quality selected in the *Structure Information* section of the **Structure/Damage/NFIP**

## Creating SDE Assessments

**Info** tab. The items listed under the *Cost Adjustments* section should involve quantities and unit costs for adjustments in excess of the standard features for the selected type of residence.

**Additional Adjustments:** In the *Additional Adjustments* section, adjustments not listed in the *Cost Adjustments* section can be entered into the fields provided. An industry-accepted cost-estimating guide should be referenced to determine unit or lump-sum costs for additional adjustments.

**Depreciation:** The **Cost** tab also requires the user to enter a depreciation rating of the structure. The SDE tool includes a revised depreciation methodology that is no longer based on the age of the structure. A depreciation rating of 1 to 6 (with 1 being the lowest) is based on the condition of the structure prior to the damage event (Table 4-4). The depreciation ratings have been revised since the previous version of the SDE tool and are based on a U.S. Army Corps of Engineers' methodology. The depreciation ratings for non-residential structures vary based on the number of stories and structure use. The "Other" option can be used to enter a specific depreciation value.

### Depreciation Methodology

The new depreciation methodology described in this manual will only work in the SDE 2.0 Tool. Any assessments developed in either the SDE 1.0 or 1.1 Tool and imported into the SDE 2.0 Tool will retain their original depreciation values.

**Table 4-4: SDE 2.0 Tool Depreciation Ratings – Residential Structures**

Depreciation Rating	Definition	Depreciation
1	<b>Very Poor Condition.</b> The structure is dilapidated and deteriorating. The residence is most likely abandoned.	88.9%
2	<b>Requires Extensive Repairs.</b> The residence can be inhabited, but is in need of extensive maintenance.	66.5%
3	<b>Requires Some Repairs</b> and maintenance.	38.8%
4	<b>Average Condition.</b> There is normal wear on the house, but no signs of major repairs or maintenance needed.	24.2%
5	<b>Above Average Condition.</b> Little visible wear and tear on structure, but it is not considered "brand new." Most functional value is remaining.	13.4%
6	<b>Excellent Condition.</b> Structure was recently built (2 years old or less). There is no visible deterioration. This condition is rare in structure inventories and should be reserved for only "brand new" structures that have all functional value remaining.	2.9%
<b>Other</b>	Determined by inspector (must provide a reason in pop-up <i>Depreciation Explanation</i> window)	Value defined by user

**Computed Actual Cash Value:** The name and effective date of the industry-accepted residential or non-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 tool should be entered in the *Cost Data Reference* and *Cost Data Date* fields in the *Computed Actual Cash Value* section at the bottom of the **Cost** tab. Some estimating guides involve either quarterly or annual cost updates. Consequently, the publication date is vital when specifying the document used as source material.

#### 4.5.2.4 Residential Element Percentages

The fields in this tab are different for residential and non-residential (refer to Section 4.5.3) assessments. The **Element Percentages** tab (Figure 4-16) is used by the inspector to enter the damage percentage, based on a rapid, visual evaluation, for each of the 12 elements in a residence. Table 4-5 lists the 12 elements and their individual components for residential structures in the SDE tool.

For estimating purposes, a structure is divided into general construction categories (e.g., plumbing, foundations, and appliances). The SDE tool uses pre-determined, fixed element percentage for each of these categories based on the attributes of the subject structure.

Item	% Damaged	Element %	Item Cost	Damage Values
Foundation	10	11.9	\$39,673.77	\$3,967.38
Superstructure	25	13.3	\$44,341.27	\$11,085.32
Roof Covering	25	4.3	\$14,335.90	\$3,583.98
Exterior Finish	40	6.9	\$23,004.12	\$9,201.65
Interior Finish	50	13.0	\$43,341.09	\$21,670.54
Doors and Windows	65	15.6	\$52,009.31	\$33,806.05
Cabinets and Countertops	100	4.4	\$14,669.29	\$14,669.29
Floor Finish	100	7.7	\$25,671.26	\$25,671.26
Plumbing	25	8.4	\$28,005.01	\$7,001.25
Electrical	50	4.8	\$16,002.86	\$8,001.43
Appliances	100	4.1	\$13,669.10	\$13,669.10
HVAC	100	5.6	\$18,670.01	\$18,670.01
Total Replacement Cost :			\$333,393.01	
			<b>Total Estimated Damages :</b>	<b>\$170,997.26</b>

**Figure 4-16: Residential Element Percentages tab**

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 the result of the *Element %* multiplied by the *Total Replacement Cost* from the **Cost** tab. The monetary *Damage Values* for each item are determined by multiplying the *Item Cost* by the user-entered *% Damaged* values. The sum of the individual damage values is equal to the *Total Estimated Damages* value.

The input data required from the field inspection include the *% Damaged* of each element listed. These data are determined based on the judgment of the inspector and should be defensible values. The values should be entered as whole numbers between 0 and 100. The *% Damaged* values are the only values that must be provided by the user on this tab.

**Table 4-5: Residential Structure Elements**

<b>Element</b>	<b>Description</b>
1. Foundations	<ul style="list-style-type: none"><li>• Continuous perimeter foundations</li><li>• Footings</li><li>• Piers</li><li>• Foundation-level components not included in other elements</li></ul>
2. Superstructure (wall support system extending from the foundation wall to the roof structure)	<ul style="list-style-type: none"><li>• Exterior wall</li><li>• Sheathing panels</li><li>• Shear panels</li><li>• Bracing panels</li><li>• Structural members that support the roof deck, such as rafters and trusses, but not roof sheathing</li></ul>
3. Roof covering	<ul style="list-style-type: none"><li>• Covering material (shingles, tile, slate, metal roofing, built-up roofing)</li><li>• Roof sheathing</li><li>• Roof flashing</li><li>• Does not include structural framing members that support the roof deck</li></ul>
4. Exterior finish	<ul style="list-style-type: none"><li>• Wall covering system that covers the wall sheathing (e.g., stucco, vinyl or wood siding, brick veneer, stone veneer)</li><li>• Insulation and weather stripping</li></ul>
5. Interior finish	<ul style="list-style-type: none"><li>• Gypsum board, drywall, plaster, or paneling that make up the wall and ceiling surfaces</li><li>• Trim around door and window frames</li><li>• Baseboards</li><li>• Casings</li><li>• Chair rails</li><li>• Ceiling moldings</li></ul>
6. Doors and windows	<ul style="list-style-type: none"><li>• All doors and windows</li><li>• Locks</li><li>• Hinges</li><li>• Frames</li><li>• Handles</li></ul>
7. Cabinets and countertops	<ul style="list-style-type: none"><li>• Built-in, wall-mounted, or isolated cabinets and countertops (kitchens, bathrooms)</li></ul>
8. Floor finish	<ul style="list-style-type: none"><li>• Carpet</li><li>• Hardwood</li><li>• Vinyl composition tile</li><li>• Sheet vinyl</li><li>• Ceramic tile</li><li>• Marble</li><li>• Does not include carpet or re-carpeting installed over finished flooring such as wood or tile</li></ul>

Element	Description
9. Plumbing	<ul style="list-style-type: none"> <li>• Incoming water service (municipal water supply or well service)</li> <li>• Water heater</li> <li>• Water distribution system</li> <li>• Wastewater system</li> </ul>
10. Electrical	<ul style="list-style-type: none"> <li>• Circuit breaker panels and distribution wiring</li> <li>• Outlets</li> <li>• Switches</li> <li>• Receptacles</li> <li>• Lighting</li> <li>• Ceiling and exhaust fans</li> <li>• Electric baseboard heaters</li> </ul>
11. Appliances	All built-in, permanent appliances in the structure
12. HVAC	<ul style="list-style-type: none"> <li>• The system with which conditioned air is distributed throughout the structure; a typical system in residential structures involves a forced-air heating system with duct work</li> <li>• Exterior air conditioning units</li> <li>• Heat pumps</li> <li>• Furnaces</li> </ul>

#### 4.5.2.5 Output Summary

This tab (Figure 4-17) summarizes the computations for structure value and damages as well as the calculated damage percentage. It also includes options that allow the user to select which of three damage estimates and three structure values to use in making the Substantial Damage determination. Two report printing options are at the bottom of the **Output Summary** tab (see Section 6 SDE Reports for details on reports).

**Percent Damaged:** The *Percent Damaged* section of the **Output Summary** tab 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* (usually obtained and paid for by the structure owner) for the structure value, and *Computed Damages*, *Contractor’s Estimate*, and *Community’s Estimate* for the repair/improvement costs.

The three options under the *Value of Building* and *Cost of Repairs/Improvements* boxes permit the user to select the most appropriate sources of data for use in the Substantial Damage determination. The default selections, computed within the SDE tool, are the *Computed ACV* and *Computed Damages*. The calculated *Percent Damaged* and a statement that the structure is either Substantially Damaged or Not Substantially Damaged, is shown near the middle of the upper portion of the tab (outlined in red in Figure 4-17). If the structure has a *Percent Damaged* of 50 percent or higher, then the NFIP requirements for substantially damaged structures apply.

**Substantial Damage Estimator - [Residential Assessment]**

File Tools Custom Fields Database Functions Help

Address Structure/Damage/NFIP Info Cost Element Percentages **Output Summary** Files & Photos

### Output Summary

Depending on your display resolution, you may need to scroll down to access all data fields on this tab.

#### Percent Damaged

To ensure consistency and equity, local officials responsible for substantial damage determinations are strongly encouraged to select only one method each for determining building values and repair costs and to use the selected methods for the entire community. Computed damages based on element percentages within the software can only be derived from a replacement value. You can't use an appraisal or adjusted tax value which are both market values.

Select one from each category

Value of Building

- Computed Actual Cash Value
- Professional Market Appraisal
- Adj. Tax Assessed Value

Cost of Repairs / Improvements

- Computed Damages
- Contractor's Estimate
- Community's Estimate

**Percent Damaged : 59.2 %**  
**Substantially Damaged**

#### Damage Summary

Replacement Cost :	\$333,393.01	Computed Actual Cash Value :	\$288,718.35
Computed Damages :	\$170,997.26	Percent of Existing Improvements and Repairs Pre-Disaster :	0
Depreciation % :	13.40 %	Repair / Reconstruction % :	59.2 %

\* Per FEMA Publication 213, actual cash value may be used as market value

#### Optional User Entered Data

Market Value Determination

Professional Market Appraisal

Professional Market Appraisal : \$310,000.00

Adj. Tax Assessed Value

Tax Assessed Value : \$207,000.00

Factor Adjustment :  1.43

Adjusted Tax Assessed Value : \$296,010.00

Cost of Damage Determination

Contractor's Estimate of Damage

Contractor's Estimate : \$135,000.00

Community's Estimate of Damage

Community's Estimate : \$145,400.00

\*Be sure to SAVE assessment record before generating a report

Print Summary Report for this structure Print Detailed Report for this structure

**Figure 4-17: Output Summary tab**

**Damage Summary:** The *Damage Summary* section carries over the *Replacement Cost*, *Computed Damages*, *Depreciation %*, and *Computed Actual Cash Value* 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 prior to the current damage event. The purpose of this field is to record pre-existing work repair or improvement work to the structure, so that the cumulative determination for the structure can be calculated outside of the tool as needed.

Community officials can use any combination of methods (one from each of the *Value of Building* and *Cost of Repairs* categories) to determine Substantial Damage. Optional data, including appraisal, adjusted tax assessed value, or non-SDE estimates of damages, are entered in the middle portion of the **Output Summary** tab in the section identified as *Optional User Entered Data*.

However, officials are strongly urged to be consistent in their determinations by using the same cost and damages methods on a community-wide basis to ensure that Substantial Damage determinations are prepared and evaluated in a consistent and equitable manner.

**Optional User-Entered Data:** When *Optional User-Entered Data* are being considered the accuracy of this data must be evaluated. This is especially true when the tool indicates that the structure is between 40 percent and 60 percent damaged. The closer the level of repair/improvement costs are to 50 percent of the value of the structure, the greater the precision needs to be in determining Substantial Damage. Situations in which the property owner requests an administrative or judicial review or appeal most likely will occur when the structure is declared substantially damaged and the *Percentage Damaged* falls between 50 percent and 60 percent.

A *Professional Market Appraisal* or an *Adjusted Tax Assessed Value* may be entered in lieu of the *Computed ACV* determined by the SDE tool. If the appraisal value is based on the value of the land and structure, the value of the land must be subtracted from the appraisal value because Substantial Damage is based on structure value only. These two valuation methods are discussed below.

The *Professional Market Appraisal* involves the value of the structure without the land value, as determined by an appraiser licensed within the state where the structure is located. This can be used within the SDE tool in-place of the structure *ACV*.

If the *Adjusted Tax Assessed Value* is based solely on the structure, an adjustment factor may be required to increase the value to market value, because the adjusted tax assessed 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 structure is located. The factor likely will be higher than 1.00 and should be entered with two decimal places (trailing zeros are dropped). For example, to increase the assessed structure value by 43%, input a value of 1.43.

Local officials may use a *Contractor's Estimate of Damage* or a *Community's Estimate of Damage* in lieu of the SDE-computed damages. Contractor estimates should be based on a specific structure, all-inclusive of the work required to put the structure back to its pre-damaged state, and reflect reasonable material and labor costs for the area. Donated or discounted materials and labor must be evaluated at fair market value 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. A community providing its own repair estimate must be able to justify the estimates. Appendix D of the SDE Field Workbook contains a list of recommended construction elements to be included in either contractor or community estimates of repair costs.

#### 4.5.2.6 Files & Photos

The primary function of **Files & Photos** tab (Figure 4-18) is to upload and store digital photographs and electronic files (e.g., maps, drawings, permits, certificates, property surveys,

## Creating SDE Assessments

appraisals) associated with the subject structure that will provide backup information for the Substantial Damage determination. Following the on-screen instructions, the user should select the button labeled *Select Photo/File* and choose the file to be added from the file directory. Once one or more files have been added, select the *Set as Default* checkbox under the file that is desired to be displayed in the *Summary Report* and *Community Report* for that assessment.

**USER NOTE:** Remember that large file sizes can slow down the computer running the SDE tool. For this reason, files exceeding 3 MB are not recommended.

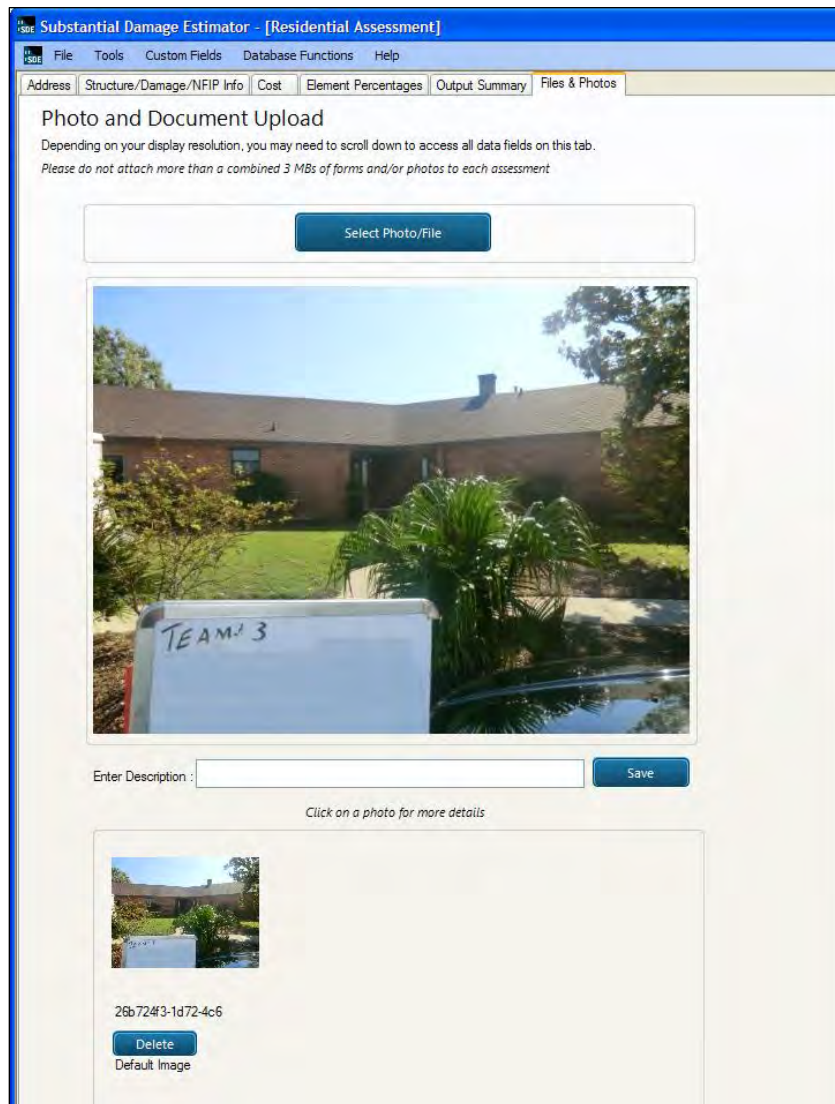


Figure 4-18: Files & Photos tab

### 4.5.3 Creating a New Non-Residential Assessment

To create an assessment, the user should select the *Create/Add a Record* button on the *Main Menu* and select the option to *Add a Non-Residential Assessment*. If an existing property is selected, the **Address** tab in the new assessment will be automatically populated with available data. If a *New Property* is selected, the user must fill out the **Address** tab when creating the assessment. If default



data has been entered into the tool, the user will have the option of using that default data to pre-populate certain data fields within the assessment.

When a new assessment is created for an existing property, the property data and some of the assessment data are pre-populated for the new assessment. These data can be revised as part of the new assessment. The data fields on the **Cost** and **Element Percentages** tabs must be completed for a valid assessment.

The data fields required to complete a valid non-residential assessment are very similar to those required for a residential assessment (See Section 4.5.2). The data fields contained on the **Address**, **Cost**, and **Output Summary** tabs are nearly identical for the two assessment types. For the **Element Percentages** tab, a non-residential assessment requires a damage evaluation of 7 elements, while a residential assessment requires the evaluation of 12 elements. The differences between the data requirements for the two assessment types are contained on the **Structure/Damage/NFIP Info** tab and the **Element Percentages** tab.

For non-residential structures, structure type is not directly used as the basis for determining the appropriate element percentage array within the tool. Instead, *Structure Use* and the *Number of Stories* are the determining factors for the array. For each *Structure Use*, the SDE tool uses representative structure types and their specific characteristics to determine the element percentage arrays. Therefore, although the user does not directly choose the superstructure type, foundation type, etc., these characteristics are assigned based on the representative structures for each use and are, therefore, built into the element percentage arrays. Table 4-6 shows the *Structure Uses* available within the SDE tool.

**Table 4-6: Non-Residential Structure Uses**

<b>Structure Use</b>	<b>1-Story</b>	<b>2 to 4 Stories</b>	<b>5 or More Stories</b>
Apartments	✓	✓	✓
Auditorium	✓		
Commercial retail	✓		
Convenience store	✓		
Courthouse	✓	✓	
Department store	✓	✓	
Fast food restaurant	✓		
Fire station	✓		
Grocery store	✓		
High school		✓	
Hospital	✓	✓	✓
Hotel			✓

Structure Use	1-Story	2 to 4 Stories	5 or More Stories
House of worship	✓		
Industrial		✓	
Long-term care facility	✓	✓	
Mini-warehouse	✓		
Motel	✓	✓	
Municipal building	✓	✓	
Office building	✓	✓	✓
Police station	✓	✓	
Restaurants	✓		
Strip malls	✓		

### 4.5.3.1 Non-residential Structure/Damage/NFIP Info

For non-residential structures, the user should select the *Number of Stories* and *Structure Use*, and then complete the other data fields (Figure 4-19) on the **Structure/Damage/NFIP Info** tab. The list for non-

residential structure uses is limited to 22 options and

based on the number of stories. Although the list could easily exceed 100 different non-residential structure uses, such a large list would be overwhelming and impractical for most SDE users. The current list strikes a balance between too many and too few structure uses while offering a reasonable range of structure heights (number of stories) and functions. Furthermore, the list of elements and the element percentages as part of the entire structure do not vary significantly for the non-residential structure uses beyond those contained on the current lists.

Consider the structure use (whether it is more like a factory, a warehouse, or an office building), the building materials (schools and hospitals have different construction materials than a warehouse), and the variations in quality (warehouses and factories are usually of a lower quality construction than an office building or a house of worship). As an example, the list of non-residential structure uses for a school has the option of either a one-story elementary school or a two- to four-story high school. The best choice for a two-story middle school would be a high school because of its additional features (larger gym, larger auditorium, pool), as well as the number of stories. Similarly, the best choice for a medical office would be an office building rather than a hospital.

**USER NOTE:** Given the limited number of structure use options, users should select the non-residential structure use that best fits the structure being inspected.

Figure 4-19: Non-Residential Structure, Damage, and NFIP Information tab

The non-residential **Structure/Damage/NFIP Info** tab contains the following data fields:

- **Structure Information** – year of construction, number of stories, structure use, sprinkler system (yes or no), conveyance (elevator or escalator, yes or no), initial construction quality (drop-down list allows selection from “low” to “excellent”), and Structure Information (text box for comments)
- **Damage Information** – date damage occurred, cause of damage, duration of flood (in hours or days), depth of flood above ground, depth of flood above first floor, and comment box for cause of damage (if “other” is selected)
- **No Physical Damage** – checkbox for structures with no apparent physical damage (only available when “Flood” or “Flood and Wind” selected for Cause of Damage)
- **Inspector Information** – name, phone number, and date of inspection

## Creating SDE Assessments

- **NFIP Information** – NFIP Community ID (carried over from the Address tab), FIRM panel number, FIRM panel suffix, date of FIRM panel, FIRM zone, BFE, regulatory floodway (yes, no, possible)
- **Community Information** – text box for comments

### 4.5.3.2 Non-Residential Element Percentages

The **Element Percentages** tab (Figure 4-20) is used by the inspector to enter the damage percentage based on a rapid visual evaluation for each of the seven non-residential structural elements.

Item	% Damaged	Element %	Item Cost	Damage Values
Foundation	0	3.7	\$49,241.64	\$0.00
Superstructure	15	30.8	\$409,903.34	\$61,485.50
Roof Covering	15	1.9	\$25,286.25	\$3,792.94
Plumbing	25	4.7	\$62,550.18	\$15,637.54
Electrical	60	26.2	\$348,684.01	\$209,210.41
Interiors	40	21.5	\$286,133.82	\$114,453.53
HVAC	100	11.2	\$149,055.76	\$149,055.76

Total Replacement Cost : \$1,330,855.00

**Total Estimated Damages : \$553,635.68**

**Figure 4-20: Non-Residential Element Percentages**

Table 4-7 lists the elements and their individual components for non-residential structures in the SDE tool.

**Table 4-7: Non-Residential Structure Elements**

<b>Element</b>	<b>Description</b>
1. Foundations	All foundation elements
2. Superstructure	<ul style="list-style-type: none"> <li>• Load-bearing system that extends from the foundation to the roof structure (does not include the foundation)</li> <li>• Structural members that support the roof deck, such as rafters and trusses, but not roof sheathing</li> <li>• Exterior finishes, such as exterior wall, siding, exterior doors, and windows</li> </ul>
3. Roof covering	<ul style="list-style-type: none"> <li>• Covering material (shingles, tile, slate, metal roofing, built-up roofing)</li> <li>• Roof sheathing</li> <li>• Roof flashing</li> <li>• Does not include structural framing members that support the roof deck</li> </ul>
4. Interior	<ul style="list-style-type: none"> <li>• Partitions</li> <li>• Interior doors</li> <li>• Interior surface finishes (wall, floor, and ceiling)</li> </ul>
5. Plumbing	<ul style="list-style-type: none"> <li>• Plumbing fixtures</li> <li>• Water distribution</li> <li>• Wastewater system</li> <li>• Exterior drainage (roof gutters, downspouts)</li> <li>• Fire protection</li> </ul>
6. HVAC	<ul style="list-style-type: none"> <li>• Heating units</li> <li>• Cooling units</li> <li>• Ventilation</li> </ul>
7. Electrical	<ul style="list-style-type: none"> <li>• Electrical wiring system (junction boxes, circuit breaker panels, wiring, outlets, switches, receptacles)</li> <li>• Lighting</li> <li>• Ceiling and exhaust fans</li> <li>• Electric baseboard heaters</li> <li>• Communications</li> <li>• Conveyance</li> <li>• Security systems</li> </ul>

#### 4.5.4 Required Data Fields

When creating an assessment, certain key data fields are required to save a valid assessment. These fields are provided in Table 4-8 for both residential and non-residential assessments. The

## Creating SDE Assessments

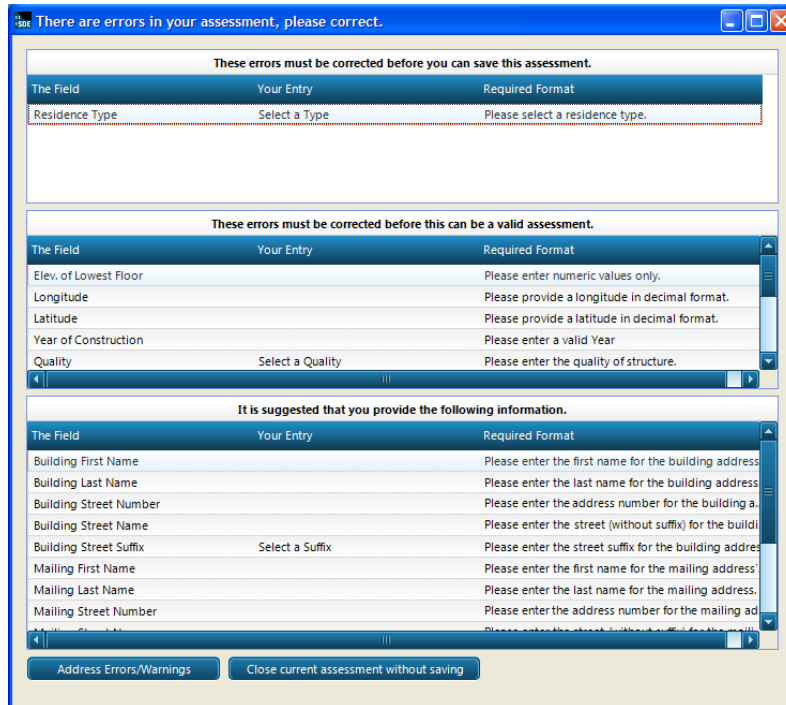
---

only differences between residential and non-residential assessments are the structure attributes and the elements to be evaluated for damage on the **Structure/Damage/NFIP Info** and **Element Percentages** tabs.

**Table 4-8: Required and Suggested Data Fields for Residential and Non-Residential SDE Assessments**

<b>Tool</b>	<b>Fields</b>
Required to Save an Assessment	<ul style="list-style-type: none"> <li>• NFIP Community ID</li> <li>• Date of Inspection</li> </ul> Residential-specific: <ul style="list-style-type: none"> <li>• Residence Type</li> <li>• Story (options: 1 or 2 or more)</li> </ul> Non-Residential-specific: <ul style="list-style-type: none"> <li>• Number of Stories (options: 1, 2–4, 5 or more)</li> <li>• Structure Use</li> </ul>
Required to Save a Valid Assessment (The same fields are required for both residential and non-residential structures)	<ul style="list-style-type: none"> <li>• Elevation of Lowest Floor</li> <li>• Longitude</li> <li>• Latitude</li> <li>• Year of Construction</li> <li>• Initial construction quality</li> <li>• Date Damage Occurred</li> <li>• Cause of Damage</li> <li>• FIRM Panel Number</li> <li>• Date of FIRM Panel</li> <li>• FIRM Zone</li> <li>• BFE</li> <li>• Regulatory Floodway</li> <li>• Base Cost per Square Foot</li> <li>• Depreciation Percentage</li> <li>• Depreciation Explanation (if manual depreciation value is entered)</li> </ul>
Suggested (The same fields are suggested for both residential and non-residential structures)	<ul style="list-style-type: none"> <li>• Building Owner Name and Address Information</li> <li>• Owner Mailing Address</li> <li>• Inspector's Name and Phone Number</li> </ul>

When the key data fields are empty or contain incorrect data and the user attempts to save the assessment, an error window opens to identify the remaining data fields that must be completed to save a valid assessment (Figure 4-21). A scroll bar is available along the right side of each of the three lists when the number of errors exceeds the normal view portion of the window. The user can select *Close current assessment without saving* it or *Address Errors/Warnings*.



**Figure 4-21: Error window identifying incomplete or blank data fields**

If the user selects *Address Errors/Warnings*, red, yellow, or green pushpins (Figure 4-22) will appear next to the data field(s) with incorrect or missing data on the each of the six tabs.

- Red pushpin – the data field is required to save the assessment
- Yellow pushpin – the data field is required for a valid assessment
- Green pushpin – the data field is recommended, but not required

The screenshot shows the 'Substantial Damage Estimator - [Residential Assessment]' application window. The interface is divided into several sections, each with a blue header:

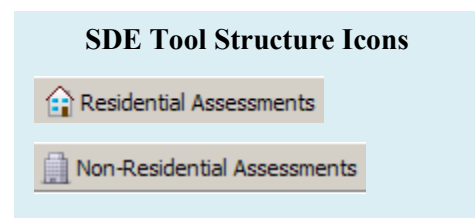
- Structure Attributes:** Contains dropdown menus for Residence Type, Foundation, Superstructure, Roof Covering, Exterior Finish, HVAC System, and Story. A red pin is visible on the Residence Type dropdown.
- Inspector Information:** Contains text input fields for Inspector's Name (Dan Owen), Inspector's Phone ((818) 445-1212), and a date dropdown for Date of Inspection (10/17/2012).
- Structure Information:** Contains text input fields for Year of Construction and Quality (Select a Quality). Both fields have red pins. Below is a text area for Residence Information.
- Damage Information:** Contains a date dropdown for Date Damage Occurred (10/10/2012), a dropdown for Cause of Damage (Flood and Wind), a checkbox for No Physical Damage, a duration input (2 Days), and two text input fields for Depth of Flood Above Ground and Depth of Flood Above First Floor, both with red pins.
- NFIP Information:** Contains text input fields for NFIP Community ID (189999), FIRM Panel Number (0100), Suffix (B), Date of FIRM Panel (06/15/2005), FIRM Zone (AE), Base Flood Elevation (105.00), and a dropdown for Regulatory Floodway (Possible).
- Community Information:** Contains a large text area for Space for Community Specific Information.

The bottom of the window shows a navigation bar with Home, Search, Residential Assessments, and Non-Residential Assessments.

**Figure 4-22: Example of colored pins that identify missing or incomplete data**

## 4.6 Viewing and Editing Assessments

Users may view records or assessments using the *View/Search All Records* or *Bulk Property Editor* functions on the *Main Menu*. In the *View/Search All records* function, residential structures are identified at the left end of the row by a small house icon, while non-residential structures are identified by a small office building icon.





### 4.6.1 View/Search All Records

The *View/Search All Records* function shows rows of partial assessment data, with key data such as structure type, community name, FIRM Panel number, owner name, address, inspection date, inspector name, and percent damaged visible in this view. Clicking on the *Assessment Edit* function opens the entire assessment and shows the number of assessments for each property. The user can edit any data field in the open assessment. The view within *View/Search All Records* function contains 10 assessments per page.

For large inventories of assessments, users can locate individual assessments by filtering on the following criteria:

- *Structure Type* – Residential, non-residential, or both
- *Inspection Date* – Range of dates
- *Percent Damaged* – Range of percent damage from 0% to 100%
- *Search For* – Enter a value from one of the optional data fields in the Search Fields filter
- *Search Field* – Select one data field from among:
  - *View All Records*
  - *Owner’s Name (first or last)*
  - *Building Address*
  - *City*
  - *NFIP Community Name*
  - *Zip Code*
  - *County*
  - *NFIP Community ID*
  - *FIRM Panel*

**USER NOTE:** Users should click the Clear Filters button before using new filters.

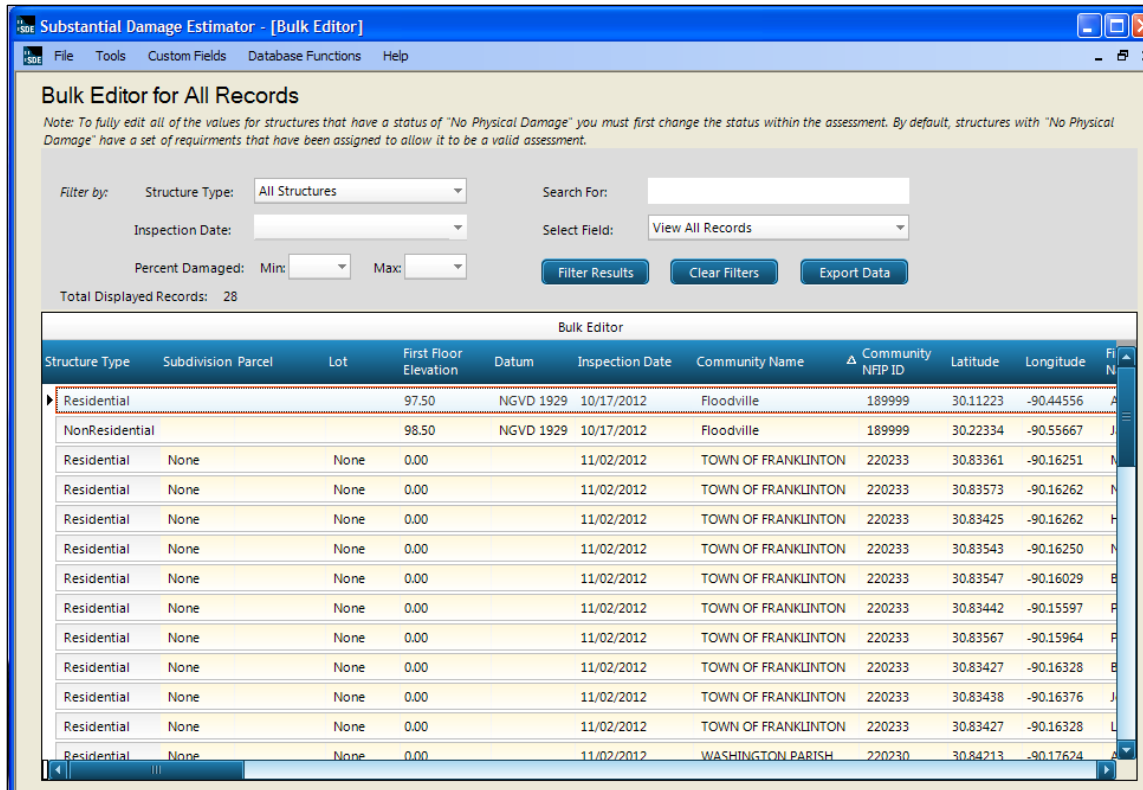
The filters and their parameters can only be used in the *View/Search All Records*, *Bulk Property Editor*, *Community Report*, and *Structure & Percent Damage Report* functions. The filters apply to the current view and are removed when the view is closed or other filters are used.

### 4.6.2 Bulk Property Editor (New Function)

In the SDE 2.0 Tool, the *Bulk Property Editor* allows users to edit all data fields for as many assessments as wanted from a single view. The edits are made directly to the current assessments in the SDE 2.0 database. When the user clicks on the *Bulk Property Editor* function on the *Main Menu*, the view shown in Figure 4-23 appears.

**USER NOTE:** All edits are saved as they are made, and overwritten data is permanently erased from the assessment.

The user has access to each assessment in the active SDE inventory. There is one assessment per row and the scroll bars along the bottom and right side can be used to navigate to a specific data field within a specific assessment. To edit a data field, the user places the cursor on the field to highlight the current data. The edits can be done by either typing over the current data or using the copy and paste functions. Edits must be made one at a time, on a field-by-field and assessment-by-assessment basis.



**Figure 4-23: Bulk Property Editor view**

Data can be sorted by clicking on the column header. The first click sorts the data either numerically (from low to high) or alphabetically (from A to Z). A second click on the column header produces a reverse sort (from high to low or Z to A).

Similar to the filters for the *View/Search All Records* function, the filters on the *Bulk Property Editor* can be used to view assessments by *Structure Type*, *Inspection Date*, a range of *Percent Damaged* values, and *Select Field* to filter by *Owner's Name*, *Building Address*, *City*, *NFIP Community Name*, *Zip Code*, *County*, *NFIP Community ID*, or *FIRM Panel*. The filter parameters are only in effect for the current view and are removed when either new filters are applied or the view is closed or other filters are used. User should click the *Clear Filters* button before using new filters.

The *Bulk Property Editor* function can also be used for QA reviews to check the completeness and consistency of the assessment data recorded in SDE tool. The QA reviews can be accomplished by sorting each data column A to Z and then from Z to A to identify missing data, spelling errors, or other inconsistencies. Some suggested QA reviews include:

- Review the entire database for duplicate records from the current or previous days.

**USER NOTE:** To fully edit all of the values for structures that have a status of *No Physical Damage*, the user must first change the status of the assessment by unchecking the *No Physical Damage* box.

By default, structures designated as *No Physical Damage* have a set of assigned requirements that allow it to be a valid assessment.

- Verify that the correct community name, street names and suffixes, county/parish, State, inspection date, flood information, inspector names and contact information, and NFIP information were entered into the tool and are consistent for all assessments within the same community.

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## SECTION 5 EXPORTING SDE DATA

SDE data can be exported from the *Main Menu* as either a SDE database file or an Excel file (Figure 5-1). Data exported as an SDE database must be imported back into the SDE tool to either view the assessments or make edits. A data export to Excel is basically a one-way data export because data edited within the Excel file cannot be imported back into the SDE tool unless the *Enterprise Import* function is used. A limited amount of data per assessment can also be exported as a georeferenced file for viewing in a geospatial image viewer.

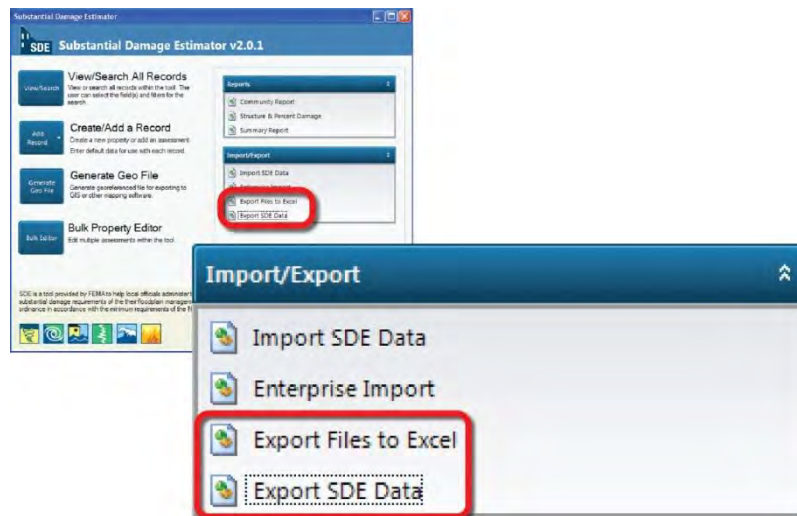


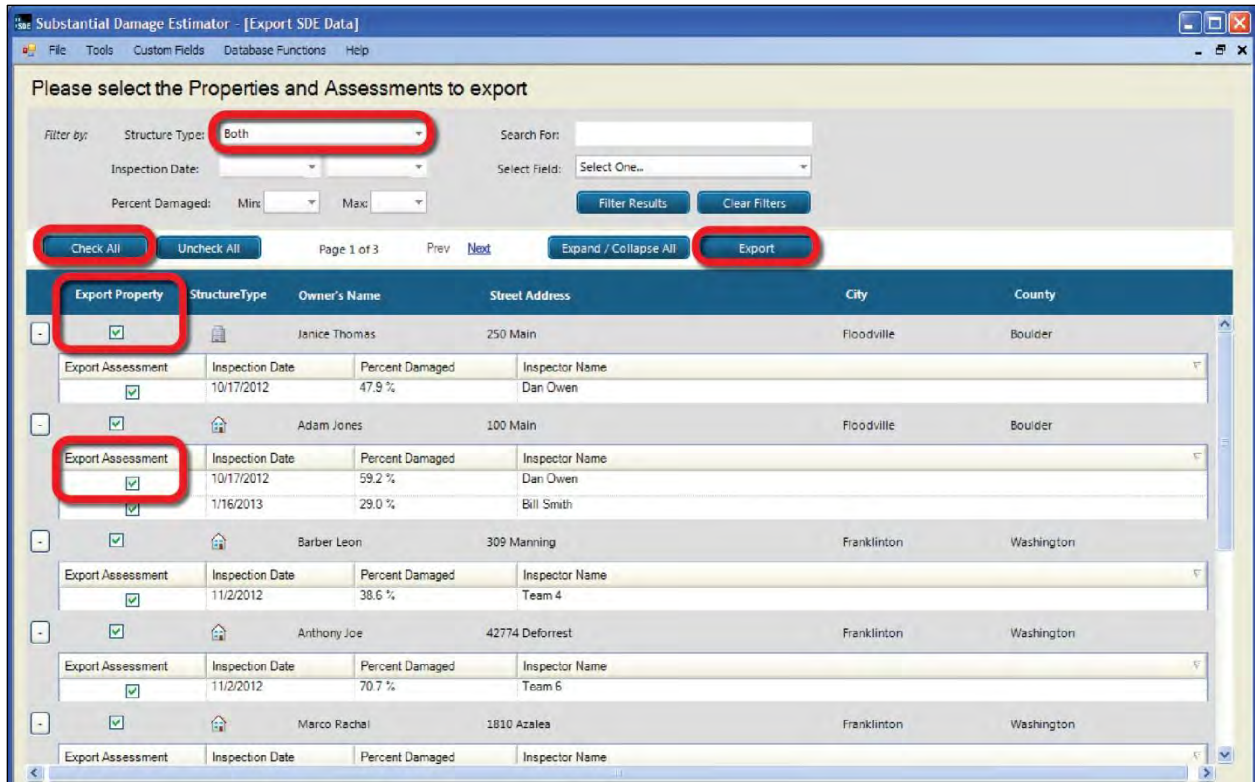
Figure 5-1: Export of SDE data

### 5.1 Exporting SDE Data

The purpose of the *Export SDE Data* function is to allow assessment data to be exported from the tool and imported back into the tool on the same or different computers. To export data, the user must click on the *Export SDE Data* function on the SDE *Main Menu*. This will open a window (Figure 5-2) that provides assessment filter criteria at the top. For large inventories of assessments, filters can be used to identify individual assessments for export by *Structure Type*, *Inspection Date*, a range of *Percent Damaged* values, and *Search For* names or values based on *Owner's Name*, *Building Address*, *City*, *NFIP Community Name*, *Zip Code*, *County*, *NFIP Community ID*, or *FIRM Panel*. The filter parameters are only in effect for the current view and are removed when the view is closed or other filters are used. User should click the *Clear Filters* button before using new filters.

To view specific assessments for export, the user must enter the filter information to view the desired assessments. To view all assessments in the database, the user must select *Both* from the *Structure Type* drop-down menu and leave the other fields blank. Once the filter fields have been entered, the user should click the *Filter Results* button. All the assessments that meet the filter criteria will be available in the export view. The user should either select the *Check All* button for all assessments (and records) or select individual records of property data or assessments using the checkbox at the left end of the record or assessment row to be exported.

## Exporting SDE Data

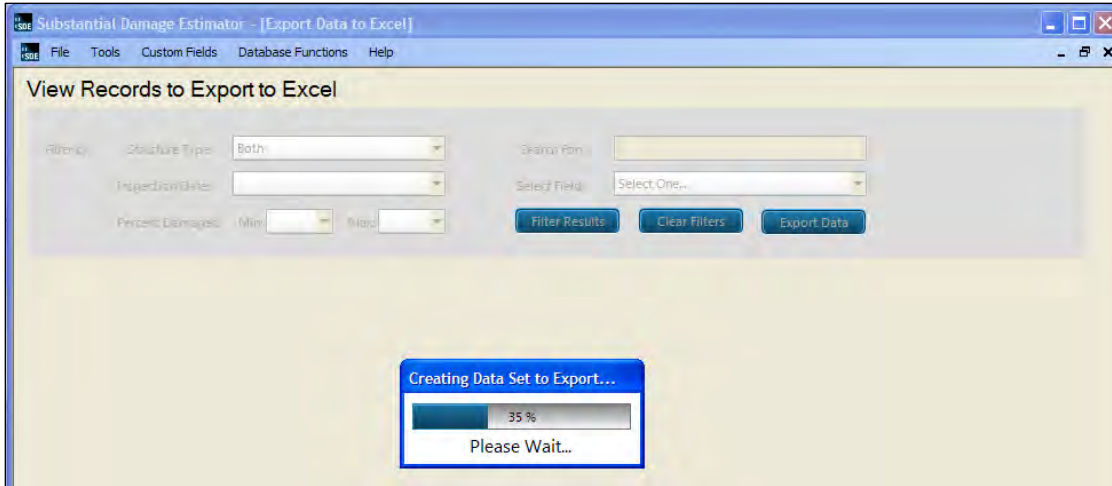


**Figure 5-2: Export SDE Data screen with filter, record, and assessment options**

Once a selection is made and the user clicks the *Export* button, a window will open to allow the user to select a location on the host computer to save the exported file. Once the export is complete, a window will appear showing the file path and confirming that the files have been exported to a new folder called “SDE Assessments.” The user will then be returned to the SDE 2.0 Main Menu.

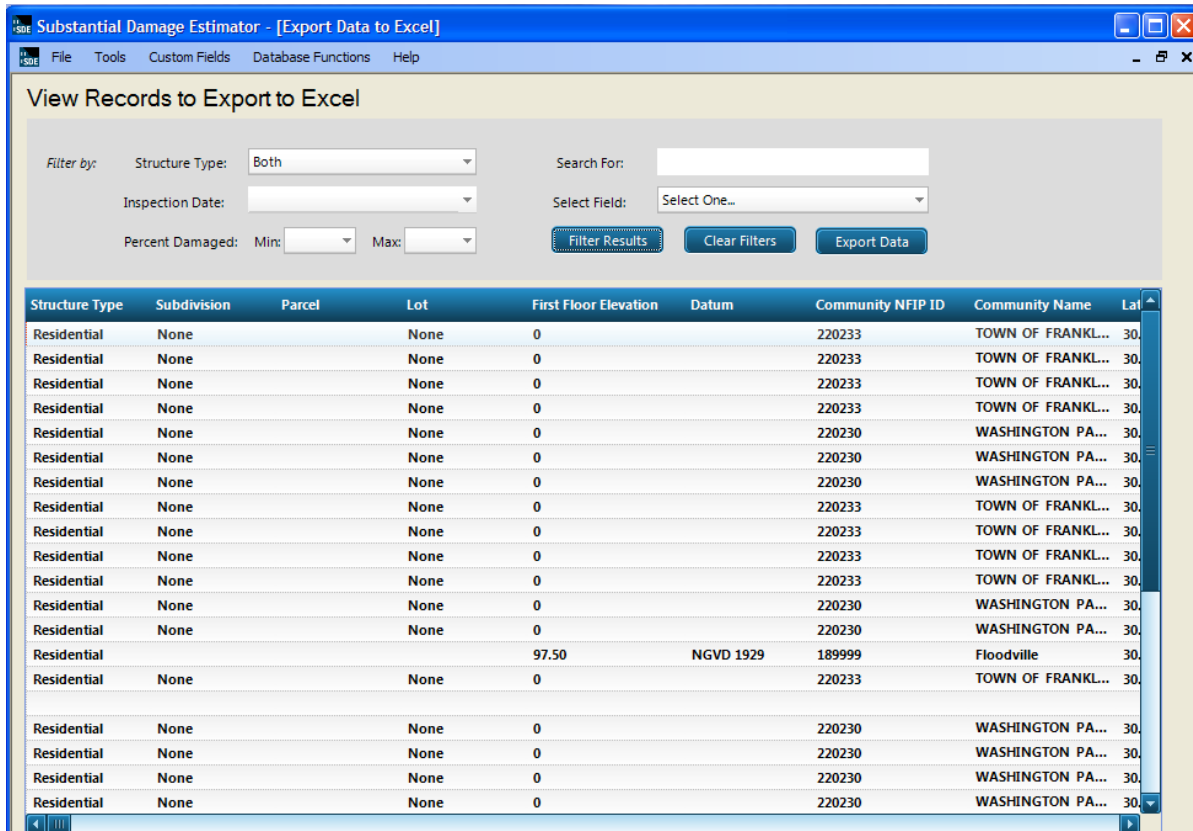
## 5.2 Exporting to Excel

The *Export Files to Excel* function allows the user to export all of the data located in the tool to an XLS file. When the user clicks on this function, a window will open (Figure 5-3) that provides filter criteria at the top for the assessments to be exported. The user must enter the filter information and select *Filter Results* to view the desired records. To view all records in the database, the user must select *Both* from the *Structure Type* drop-down menu. To change the filter results, the user should click on the *Clear Filters* button and enter new filter criteria. Once the filter parameters have been entered and the user clicks the *Filter Results* button, the *Creating Data Set to Export* progress bar will appear.



**Figure 5-3: Export Data to Excel function screen with filter options**

After the export progress bar reaches 100 percent, the assessments (one assessment per row) will appear in the window similar to how the data will appear in the XLS file (Figure 5-4). A scroll bar along the bottom of this screen allows the user to see all of the data fields that will be included in the Excel file. Once the desired records have been filtered, the user can export all of the data shown to an XLS file by selecting the *Export Data* button.



**Figure 5-4: Export Data to Excel function view of assessments and data (prior to exporting)**

## Exporting SDE Data

After the export is complete, a message will appear (Figure 5-5) that confirms the export and identifies the location on the host computer where the Excel file was saved. After selecting *OK*, the user will be returned to the *Main Menu*.

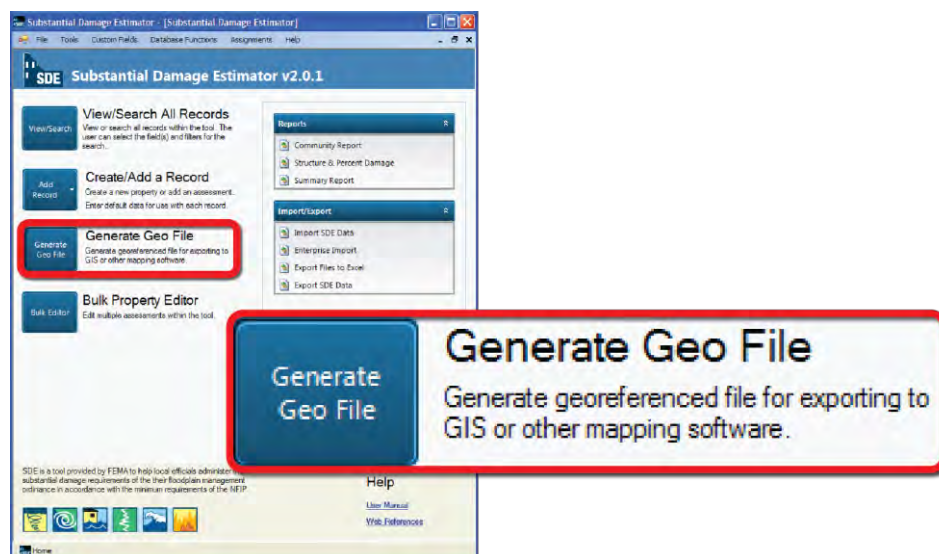


**Figure 5-5: Export Data to Excel confirmation and location of Excel file**

### 5.3 Generating Georeferenced Files

A KML file is an XML-based file that can be used for geographic annotation by a geospatial image viewer. A file with a .KMZ extension is a KML file that has been zipped (or compressed) to reduce the file size.

The SDE tool can generate a KMZ file and format place marks according to the degree of damage to a structure using KMZ's style capabilities. To generate a georeferenced file, click on the *Generate Geo File* function on the *Main Menu* (Figure 5-6), and the KMZ file will be saved to the computer's desktop. A window will open to confirm that the export was successful and display the KMZ file name. Place marks for residential properties appear at their respective latitude and longitude as either not substantially damaged (less than 50 percent damaged) or substantially damaged (50 percent or more damaged). Non-residential properties 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). Place marks are color-coded: green for not substantially damaged, yellow for possibly substantially damaged, and red for substantially damaged structures. Photos of the structures are included in the KMZ file. Limited attributes, such as the address of the structure, are shown in the browser or 2-dimensional visualization tool.

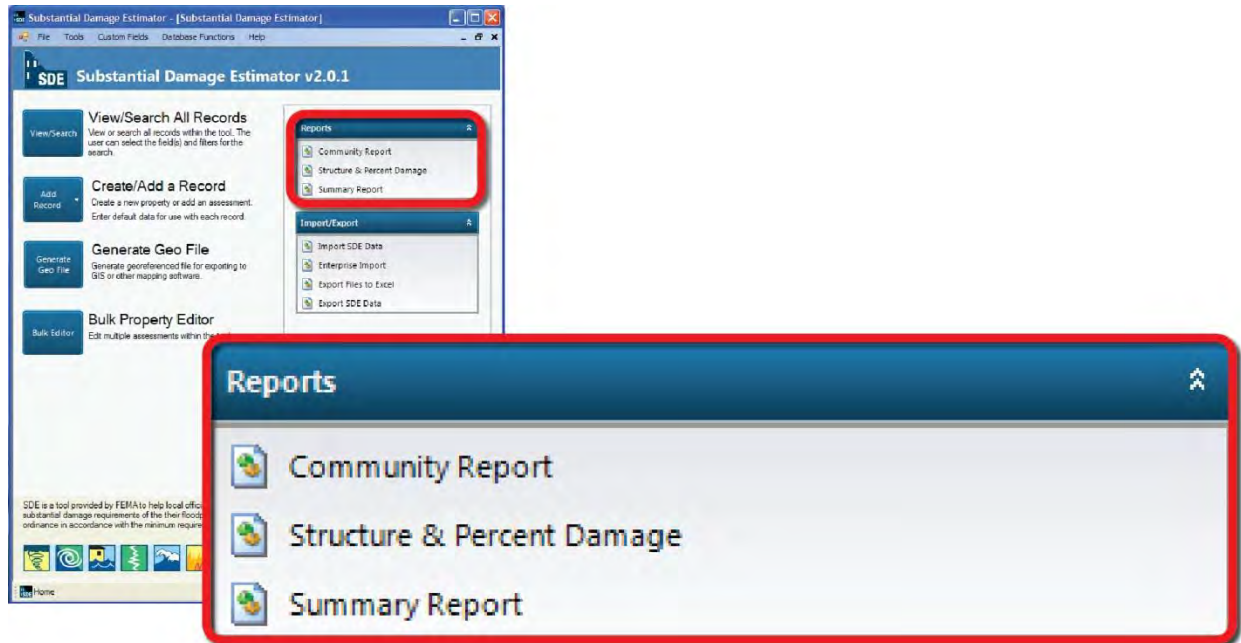


**Figure 5-6: Generate georeferenced file**



## SECTION 6 SDE REPORTS

The SDE tool can generate three primary report types that involve nine options. These reports are pre-defined with a fixed format and can be accessed through the SDE *Main Menu* (Figure 6-1) and the **Output Summary** tab. When the reports are selected in the tool, users have the option to either view or print the reports for all assessments in the inventory or for specific assessments using one or more of the available report filter criteria.



**Figure 6-1: Reports access on the Main Menu**

Table 6-1 identifies the three primary and one secondary report types and their contents.

**Table 6-1: SDE Report Types and Contents**

Report Type	Contents
Community Reports	<ul style="list-style-type: none"> <li>All residential structures</li> <li>All non-residential structures</li> <li>All structures (both residential and non-residential structures)</li> </ul>
Structure & Percent Damage Reports	<ul style="list-style-type: none"> <li>All residential structures</li> <li>All non-residential structures</li> <li>All structures (both residential and non-residential structures)</li> </ul>
Summary Reports (from <i>Main Menu</i> )	<ul style="list-style-type: none"> <li>One-page summary reports for either all residential or all non-residential structures (from the <i>Main Menu</i>)</li> </ul>
Individual Structure Summary Reports (from <b>Output Summary</b> tab)	<ul style="list-style-type: none"> <li>Summary Report (1-page)</li> <li>Detailed Report (5-page)</li> </ul>

### 6.1 The Community and Structure & Percent Damage Reports

The *Community Report* and the *Structure & Percent Damage Report* can be accessed through the *Reports* function of the *Main Menu*. These reports can be filtered beyond residential and non-residential structures to search for specific assessment dates, a range of damage between 0 percent and 100 percent (in 5 percent increments), specific names (owner, city, NFIP community, or county), or specific numeric values (address, zip code, NFIP Community ID). The filter criteria are temporary and will only be active as long as the report is open in the tool. The reports will contain all assessments that meet the filter criteria selected by the user.

The *Community* and *Structure & Percent Damage Reports* can be printed with or without structure photos. The without-structure photos option may be useful for large inventories of more than 200 structures because the data can be filtered or printed faster. In addition, both of these reports can be opened within the SDE tool and quickly scanned to verify that each assessment has at least one structure photograph.

The reports contain all of the structures within the inventory and are sorted numerically by NFIP Community ID and then alphabetically by full property address. The *Community Report* contains the following data:

- Community NFIP Community ID and Name
- Structure Address, Community, State, and Zip Code
- Inspection/Assessment Date
- Owner Name (last, first)
- Basis for Value of Building (Computed Actual Cash Value, Adjusted Tax Assessed Value, or Professional Appraisal) and Building Value
- Basis for Cost of Repairs (Computed Damages, Contractor's Estimate, or Community's Estimate) and Cost of Repairs
- Actual Cash Value of the Building
- Type of Structure
- Percent Damaged
- Default Photograph (if available)

#### Report Sharing

The *Community* and *Structure & Percent Damage* reports should not be shared with structure owners because the reports contain Substantial Damage data on all structures in the SDE inventory. Individual structure SDE data should not be shared with anyone but the structure owner or his or her representative.

The *Structure & Percent Damage Report* contains the following data:

- Community NFIP Community ID and Name
- Structure Address, Community, State, and Zip Code
- Inspection/Assessment Date

- Owner Name (last, first)
- City and State
- County
- Percent Damaged
- Default Photograph (if available)

The *Community* and *Structure & Percent Damage Reports* can be printed and used by community offices as quick references for Substantial Damage determinations and assessments that have been completed in the inventory.

## 6.2 Summary Report

The structure summary reports can be accessed through either the *Main Menu* or the *Print Summary Report for this Structure* button at the bottom of the **Output Summary** tab. The *Summary Reports* accessed from the *Main Menu* allow the batch printing of residential or non-residential 1-page *Summary Reports* based on the available filters. The same 1-page *Summary Report* can also be printed for the specific structure assessment that is open for review or editing from the print button at the bottom of the **Output Summary** tab.

The *Summary Report* involves a single structure and contains the following data organized by section name:

- **Subdivision** – subdivision name, parcel #, lot number, elevation of the lowest floor, and datum
- **Community** – NFIP community name, NFIP Community ID, and latitude and longitude
- **Building Address** – owner name, structure address, and phone number
- **Building Information** – year of construction, structure type, and initial construction quality
- **Damage Information** – date of inspection, inspector information, date of damage, cause of damage, duration of flood and units (hours or days), and estimated depth of flooding above lowest floor
- **NFIP Information** – FIRM panel #, suffix, date of FIRM panel, FIRM zone, BFE, and regulatory floodway
- **Percent Damaged** – value of building, method of structure valuation used for Substantial Damage determination, percent damaged, Substantial Damage determination (not substantially damaged or substantially damaged), value of the cost of repairs/improvements, and method of damages used for Substantial Damage determination
- **Damage Summary** – replacement cost, depreciation percentage, computed structure

value, computed damages, percent of existing improvements and repairs pre-disaster, and repair reconstruction %

- **Optional User Entered Data** (if used) – professional appraisal, tax adjustment factor, adjusted tax assessed value, and contractor’s or community’s estimate of repairs/improvements
- **Signature and Printed Name of Local Official**

### 6.3 Individual Structure Detailed Report

The 5-page *Detailed Report* contains all the data entered into the assessment on the six tabs for the structure that is open for review or editing. The *Print Detailed Report for this structure* button can be found at the bottom of the **Output Summary** tab, to the right of the print button for the 1-page *Summary Report*.

### 6.4 SDE Report Use

Communities are encouraged to share either the 1-page individual structure *Summary Report* or the 5-page individual structure *Detailed Report* with the respective structure owners or their representatives. The reports:

1. Demonstrate that the SDE inspection process is formalized and thorough
2. Identify the elements that were damaged
3. Identify the degree of damage per element
4. Verify community adherence to the NFIP regulations
5. Can support Increased Cost of Compliance claims by structure owners
6. Provide a complete summary of evaluations that can be included with Substantial Damage determination letters to structure owners
7. Help track cumulative Substantial Damage for individual structures from multiple events
8. Can be used as community evidence for Substantial Damage determinations challenged by structure owners
9. Support permit applications for structure repair

# Substantial Damage Estimator (SDE) Workbook

Preparing Structure Inventories  
Using the SDE Tool



**FEMA**



**Substantial  
SDE Damage  
Estimator**

The SDE 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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## SECTION 1 INTRODUCTION

Repairing or improving existing buildings provides a unique opportunity for floodplain management programs to reduce the risk of flood damage to the buildings. More than 21,000 communities currently participate in the NFIP, which requires 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 structures but also for existing structures with proposed Substantial Improvement or repair of Substantial Damage.

This workbook provides guidance, including recommended procedures, on collecting data on structures that may be either Substantially Damaged or Substantially Improved. The workbook is a companion document for the Federal Emergency Management Agency (FEMA) training video, *SDE and Your Community* (2010),<sup>1</sup> and should be used in conjunction with the following:

- Substantial Damage Estimator (SDE) Version 2.0 Tool (2012). The SDE tool was developed by FEMA to help State and local officials determine whether the damage to a structure qualifies as Substantial Damage, as defined in 44 CFR § 59.1, in accordance with local floodplain management ordinances that meet the requirements of the National Flood Insurance Program (NFIP). The data that are collected and entered into the SDE tool can be used to develop an inventory of Substantially Damaged residential and non-residential structures. The SDE tool is available at <http://www.fema.gov/library/viewRecord.do?id=4166>.
- FEMA P-784, *SDE 2.0 User Manual* (2012).<sup>2</sup> The SDE User Manual describes the capabilities of the SDE Version 2.0 Tool and how to use it. The manual is available at <http://www.fema.gov/library/viewRecord.do?id=4166>.
- FEMA P-758, *Substantial Improvement/Substantial Damage Desk Reference* (2010). The Substantial Improvement/Substantial Damage Desk Reference provides practical guidance and suggested procedures to implement the NFIP requirements for Substantial Improvement /Damage. The desk reference is available at <http://www.fema.gov/library/viewRecord.do?id=4160>.

### 1.1 Workbook Purpose and Contents

The purpose of this workbook is to provide guidance on collecting field data to develop an inventory of Substantially Damaged buildings after a damage event or disaster.

The procedures described in this workbook are an expansion of the procedures in the SDE User Manual and SDE training video. This workbook covers the activities required in collecting SDE data and coordinating post-data collection at the community level. The activities are as follows:

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<sup>1</sup> Referred to in this document as the “SDE training video.”

<sup>2</sup> Referred to in this document as the “SDE User Manual.”

- Post-disaster SDE inventory preparations
- SDE field preparations
- Guidance on collecting and recording SDE data
- Attributes for residential and non-residential structures
- Post-determination activities for community officials

### 1.2 Intended Users

This workbook is intended for local officials who are responsible for administering local codes and ordinances, including Substantial Improvement/ Damage requirements, and for State officials who provide NFIP technical assistance to communities. Others who may benefit from the workbook include county/parish officials, consultants, surveyors, and FEMA disaster assistance employees.

Local officials should have a working knowledge of NFIP requirements for Substantially Damaged buildings and be familiar with the SDE tool including data requirements and Damage Inspection Worksheets; guidance on the use of the SDE tool is summarized in Sections 4 and 5. More information is available through the FEMA Regional Office (see Appendix A for contact information).

Users of this workbook are assumed to be familiar with the SDE tool. Information on the use and capabilities of the tool is therefore not included but is available in the SDE User Manual.

### 1.3 Resources

More information on Substantial Damage is available in FEMA's *Answers to Questions about Substantially Damaged Buildings* (1991), a guidance document on complying with NFIP regulations and policy governing Substantially Damaged buildings (available at <http://www.fema.gov/library/viewRecord.do?id=1636>).

FEMA publications are available from the following:

- FEMA Publications Warehouse (1-800-480-2520)
- Online FEMA Library (<http://www.fema.gov/library/>)

### **SECTION 2 POST-DISASTER SDE INVENTORY PREPARATIONS**

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 restart operations, business functions, and other activities and may even be more eager to begin cleanup, repairs, and renovations. Structure owners are not normally aware of NFIP Substantial Damage requirements or the potential impact on structures of the requirements unless they have been through a disaster before, and they may start making repairs or hiring contractors 1 or 2 days after the disaster.

Starting reconstruction before a Substantial Damage inspection has been completed and approved has the potential to result in the following problems:

- Substantially Damaged structures are reconstructed in violation of the local floodplain management ordinance.
- Property owners repair a structure in violation of other local code requirements.
- Reconstruction of structures that were not Substantially Damaged involves a combination of new construction and repairs that equals or exceeds the 50 percent threshold for Substantial Damage or Substantial Improvement.
- Communities have to make structure owners remove all recent repairs and obtain a building permit for repair work. If the recently repaired structure is found to be Substantially Damaged, elevation or removal of the structure may be required.
- Local officials cannot distinguish between undamaged portions of the structure, repairs, and new construction.

Local officials should therefore initiate evaluations for Substantial Damage determinations as soon as possible after the disaster and no later than 2 weeks after the disaster. If this is not possible because of competing recovery interests, excessive amounts of debris, or lack of staff, officials need to alert structure owners in the damaged areas that permits must be obtained (if required by local building codes or floodplain ordinances) or that Substantial Damage determinations must be made before repairs or reconstruction are started.

Before the Substantial Damage inspections are conducted, planning for the inspections will help ensure that they are effective and conducted as efficiently as possible. The five steps involved in Substantial Damage inspection planning are shown in Figure 2-1 and described in this Sections 2.1 through 2.5. The steps can be completed by one person or a small team.



**Figure 2-1: Five steps for post-disaster SDE inventory preparations**

### 2.1 STEP 1: Select a SDE Manager

The community should designate a SDE Manager before Substantial Damage data collection is initiated. Table 2-1 has a list of the SDE Manager's seven key responsibilities and the sections in the workbook where the responsibilities are described.

**Table 2-1: SDE Manager's Responsibilities**

<b>Responsibility</b>	<b>Workbook Section</b>
1. Identify available resources	Section 3.1
2. Notify other community departments, including fire, police, emergency services, planning, and building of the upcoming fieldwork	Section 3.1.1
3. Plan the Substantial Damage field inspections	Section 3.3
4. Organize and train the inspection teams	Section 4.1
5. Supervise field operations	Sections 4.5 and 4.6
6. Ensure follow-up coordination with structure owners is completed	Section 6
7. Coordinate final storage of SDE files	Section 6.3

**Action:** Select an SDE Manager who is familiar with the community. The manager may be a local floodplain management official, chief building inspector, head of the permitting department, or staff member. The SDE Manager should be involved in Steps 2 through 5.

### 2.2 STEP 2: Identify General Limits of the Inventory Area

The next step is to identify the general limits of the inventory area, which may not include all structures damaged during a disaster because not all damaged structures will require a Substantial Damage evaluation (e.g., structures outside the SFHA). There may be more than one area in a community.

**Action:** Delineate the general limits of the inventory area (Figure 2-2) on a community map that has tax parcels or property boundaries and SFHA boundaries (see Section 3.1.2). Only the portions of the community that are in the SFHA should be considered for inspection.

### 2.3 STEP 3: Perform an Initial Screening of Structures in the Inventory Area

When the general limits of the inventory area have been delineated, an initial screening of the structures in the area can be conducted, keeping in mind the following:

- Only structures in the SFHA require evaluation for Substantial Damage.
- 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 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 Substantial Damage declaration.

Tailoring the field inspections to use the available community resources most effectively is recommended, as follows:

- Inspect only structures in the SFHA for damage
- Evaluate a representative sample (5 to 10 percent) of the buildings in a group of buildings with the characteristics that are listed in Section 2.3.2. Perform a complete field inspection if the residential and non-residential structures appear to be less than 35 percent damaged or more than 65 percent damaged. A less detailed inspection can then be performed for the remaining structures that fall into these groups. The documentation for a less detailed inspection may include photographs, SDE data entry, or both. This type of inspection and representative sample should be used only when buildings fall outside the 35 percent to 65 percent damage range.

Include all damaged structures within the SFHA in the inventory for documentation purposes



**Figure 2-2: Delineating the general limits of the inventory area**

The data collected in Step 3 will help define the scope of the field inspection and the number of days that are needed to complete the SDE inventory.

## Post-Disaster SDE Inventory Preparations

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**Actions:** Complete the following two actions for the area(s) that were delineated in Step 2. The action items are described in more detail in Sections 2.3.1 and 2.3.2.

- Collect the following flood information:
  - Depth of flooding
  - Duration of flooding (if applicable)
- Perform a curbside screening of damaged structures
  - Count the total number of damaged structures
  - Approximate the degree of damage to structures, based on the depth of flooding above the lowest floor and duration
  - Refine the boundaries of area(s) needing field inspection

### 2.3.1 Collect Flood Information

The duration and depth of flooding above the lowest floor both 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. The average depth and duration of floodwaters in the damaged area(s) should be obtained, if possible, before the curbside field screening.

### 2.3.2 Perform Curbside Field Screening

A curbside field screening consists of the following actions:

- **Estimate the number of damaged structures:** Estimate the total number of structures that have been damaged by driving through the damaged areas. This value does not need to be an exact count.
- **Evaluate damage to structures:** Determine the approximate percentage of damage by walking or driving by the damaged area(s) (using the community map with Flood Insurance Rate Map [FIRM] data prepared in Step 2). This can be done by the SDE Manager or team. A preliminary evaluation of several representative structures may be necessary to determine the average interior flood depth and extent of damage to buildings in the area (Figure 2-3). Evaluating the damage to structures before they are inspected allows communities to determine where more resources are likely to be needed and where efforts should be focused.



**Figure 2-3: Screening the exterior of a damaged structure**



For planning purposes, use the following criteria to estimate damage based on quick exterior evaluations (but without full SDE inspections):

- **25 percent or less damage:** Damage to a structure is most likely less than 25 percent if the interior flood height was 1 foot or less above the first floor in a given neighborhood, the duration was less than 1 day, floodwater velocities were relatively low (less than 5 feet/second), and the structure and its foundation were generally in good condition. Flood depth can often be approximated by a curbside examination of neighborhoods. If needed, the percent damage can be verified and documented by conducting a few preliminary structure inspections and using the SDE tool.
- **75 percent or more damage:** A structure is likely to be Substantially Damaged if there is obvious exterior damage to the structure, such as a missing roof or missing exterior walls, or the structure has shifted off the foundation and the walls appear to be leaning, indicating the building has experienced significant structural damage.
- **Damage to manufactured housing:** In manufactured housing, interior flood depths of 6 inches or more may result in a total loss. Manufactured housing is generally considered Substantially Damaged if the floors have been inundated because the flooring system provides much of the structural support.
- **Determine whether representative samples are appropriate:** Representative samples can be used for complete Substantial Damage inspections in areas where buildings have the following characteristics:
  1. Same general structure (same number of stories, similar square footage, and same foundation type)
  2. Similar quality
  3. Similar grade
  4. Same first floor elevation (within approximately 0.5 foot)
  5. Similar elevation and similar flood elevation (BFE)
  6. Similar condition
  7. Similar flood conditions (depth within approximately 0.5 foot, duration, and velocity)
  8. Damage that appears to be less than 25 percent or more than 75 percent (for planning purposes)

If all of these conditions exist, using a representative sample for complete Substantial Damage determinations is appropriate. The community should document that all the conditions are met. In addition, some documentation of damage to structures not included in the sample for complete inspection is necessary and could include photographs and an SDE assessment entry.

- **Refine delineation of the SDE inventory area(s):** Based on the curbside screening described above, refine the area(s) to be included in the field inspection using the map

## Post-Disaster SDE Inventory Preparations

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prepared in Step 2. The size of the area with damaged structures affects the time needed to collect the field data. For example, inspecting 25 residential structures dispersed among three subdivisions may take more time than inspecting 40 residential structures in a single subdivision.

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

### 2.4 STEP 4: Define the Scope of the Inventory

After the initial screening described in Step 3 is performed, the scope of the inventory can be determined. The scope is based on the size of inventory area, number of structures, and number of days needed for the inspections.

**Action:** Calculate the number of days it will take to collect the data based on the number of structures to inspect and the number of available inspectors, using two inspectors per team. The inspection rate for non-residential structures is likely to vary depending on the size of the structures (number of stories and square footage) and 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 travel time between structures).

### 2.5 STEP 5: Finalize Planning

#### 2.5.1 Final Plan for Data Collection

Well-planned data collection will increase the efficiency of the inspectors while ensuring the accuracy and consistency of the data.

**Action:** Complete the following three tasks using all of the data collected so far:

- **Task 1.** Divide the identified damage areas among the teams and plan the approximate sequence of inspections using the best available community map that includes 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 in the SFHA with potential damage
  - 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 (avoid different inspection teams inspecting 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:

- Group pilot inspections for up to three residential buildings and up to three non-residential buildings to familiarize the inspectors with SDE Damage Inspection Worksheets and the required data
- Discussion of the increased effort needed for buildings with damage determined to be greater than 25 percent
- Guidance for resident and occupant interaction (Section 4.7)
- Reference to the guidance documents in Appendix E (Residential Structures) and Appendix F (Non-residential Structures) for completing the exterior and interior inspections
- **Task 3.** Identify all of the resources beyond maps that are needed and begin organizing them (Section 3.1).
- **Task 4.** Pre-load available tax or other structure data into the SDE tool to reduce data entry by the inspectors and increase the accuracy of the SDE data.

### 2.5.2 Final Field Plan

The SDE Manager is responsible for developing a final field plan.

**Action:** Develop a final field plan that includes:

1. Quantities and locations of structures to be inspected
2. Delineation of inspection boundaries on a FIRM or community map
3. Sequence of inspections
4. Guidance materials for inspectors
5. Guidance on resident interaction
6. Instructions for obtaining photographs and global positioning system (GPS) coordinates

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## **SECTION 3      SDE FIELD PREPARATIONS**

As described in Section 2.2, the scope of the inventory must be defined before inspection teams are assembled. Preparations for the SDE fieldwork include notifying the local fire, police, and emergency management agencies of the purpose and proposed dates of inspections before ANY field inspections are conducted. 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 Manager should complete these tasks or ensure that they have been completed.

The preparations for the SDE field inspections that are discussed in Section 3 are as follows:

1. Identifying available resources
2. Reviewing community plans
3. Planning for SDE field inspections
4. Planning for resource requirements
5. Identifying sources for unit cost and structure value data
6. Planning for SDE data collection and data entry

### **3.1 Identifying Available Resources**

After reviewing the data requirements in the SDE tool and the SDE User Manual, the SDE Manager should identify the local resources that will be needed to prepare Substantial Damage determinations and where how to find the resources. Local resources include property data, floodplain boundary information, SDE inspectors, and other team members. The potentially available resources are shown in Table 3-1. Not all property and other needed SDE data may be readily available after a disaster. Therefore, it may be worthwhile to meet with the tax assessor as soon as possible to discuss the SDE data needs and the format of the available tax data while also determining how much time the assessor's office requires to provide the data.

In order to determine the number of inspectors who will be needed, the SDE Manager must estimate the size of the inventory, the number of inspections a team can complete per day (20 to 30 per team, depending on structure type and development density), and the target date for completion of the fieldwork. If local staffing resources are insufficient to complete the required number of inspections by a particular date, the SDE Manager should obtain additional staff from the county or nearby communities or extend the completion date.

Identifying available resources also includes (1) selecting the SDE inspection lead, data and QA lead, and emergency management points-of-contact (POCs), (2) reviewing FIRMs and other maps for floodplain and street locations, (3) compiling tax data, and (4) pre-loading available property data into the SDE tool. These tasks are described in the following subsections.

**Table 3-1: Potential Tax Data Used in the SDE Tool**

<b>Category</b>	<b>Data</b>
Owner and structure Location	<ul style="list-style-type: none"> <li>• Owner's first and last name</li> <li>• Owner's telephone number</li> <li>• Community name</li> <li>• Zip code</li> <li>• Official structure address</li> <li>• Owner's mailing address if different from structure address</li> <li>• County name (for multiple county communities)</li> <li>• Lot and parcel number</li> </ul>
Structure information	<ul style="list-style-type: none"> <li>• Date of construction</li> <li>• Date of improvements requiring building permits</li> <li>• Number of dwelling units on the property</li> <li>• Total habitable area (in square feet)</li> <li>• Building use (e.g., single-family home, manufactured housing, commercial use, public building)</li> <li>• Building style (number of stories, with or without basement)</li> <li>• Construction type (e.g., wood frame, masonry)</li> <li>• Attached or detached garage</li> </ul>
Assessed building value	<ul style="list-style-type: none"> <li>• Adjusted tax assessed structure value</li> <li>• Date of last tax adjustment (to verify validity of the adjusted tax assessed value)</li> </ul>

### **3.1.1 Selecting SDE Inspection Lead, Data and QA Lead, and Police and Emergency Management Points-of-Contacts**

In addition to selecting the SDE Manager, the community needs to select the inspection lead, data and quality assurance (QA) lead, and police and emergency management points-of-contact (POCs).

The inspection lead is responsible for carrying out the SDE Manager's directions and for the field equipment (vehicles, GPS units, digital cameras, and safety equipment), the daily location and progress of the inspection teams, and coordination with local officials, including police, emergency management, and other community departments.

The SDE data and QA lead is responsible for the quality and consistency of the SDE data. The size of the inventory may require two data and QA leads. Variations in quality and consistency of the data can affect the credibility of the SDE data.

The police and emergency management POCs should be available to the inspection lead for daily coordination of the locations of the inspection teams. The SDE Manager should explain to the police and emergency management POCs the purpose of the SDE inspections, inspection format

(exterior and interior evaluations of damages), inspection duration per structure, number of teams in the field each day, and letter of introduction the teams will carry and whether the inspectors will have photo or other types of identification.

### 3.1.2 Reviewing FIRMs and Other Community Maps to Prepare Maps Showing Current Floodplain and Street Data

Local officials should be familiar with areas of their community that are 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 the areas of the community, either inside or outside the SFHA that have flooded two or more times.

Flooding can and does occur outside the SFHAs shown on the community's FIRM, for the following reasons:

- The FIRM is outdated and does not reflect increases in stream flow due to rainfall runoff from new development.
- There are structural changes to the channel such as new or replaced bridges, channelization, or flood control projects (e.g., levees, floodwalls, detention basins).
- Development has occurred in areas not previously mapped by FEMA.
- An extreme flood (i.e., 100-year flood) exceeds the mapped boundaries of the SFHA.

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 updated recently. If street data are not accurate on the current FIRMs, it is recommended that the 100-year floodplain delineations from the FIRM are carefully transferred using the SDE tool 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 field data collection.

The NFIP requirements for Substantial Damage determinations involve only the SFHA. Communities are *not* required to evaluate floodprone or repetitive loss structures located outside the SFHA where the floodplain management ordinance does not apply.

The SDE tool can export property locations, based on the coordinates for the latitude and longitude, to a Compressed Keyhole Markup Language (KMZ) file, which can be used in georeferencing programs. The SDE tool can export latitude and longitude coordinates for display on a map using the KMZ file. If the information is in the tool, the KMZ file will contain additional information on properties, such as the level of damage determined by the inspector.

### 3.1.3 Compiling Tax Data

When available, tax information can provide much of the data required for the property data that are entered in the **Address** tab and the **Structure/Damage/NFIP Info** tab in the SDE tool. Reviewing any compiled tax data prior to field deployment can save time in the field while increasing the accuracy and consistency of the data.

## SDE Field Preparations

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When possible, tax data should be sorted alphabetically by street name and then numerically by address to facilitate field use. Tax data may be provided for the entire community (for areas inside and outside the SFHA), or tax data with limited sorting capabilities may be sorted by tax parcel number or the property owner's last name. In these situations, it will be necessary to screen the tax data to find information that is relevant to the SDE inventory area. The tax data that may be used in the SDE tool are shown in Table 3-1. 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 inspection findings.

Some tax printouts contain a simple diagram of the structure's footprint that can be used during the inspection to verify building size, orientation, and location. The format and content of tax information printouts vary among communities. In some communities, printouts are predefined (i.e., no custom printouts or reports are available) and contain significantly more data than required for SDE input.

The most useful tax data are those that can be sorted by street names and for the fields that are necessary to populate the SDE database. If simple one- or two-page printouts are available per structure, they can be attached to one of the two SDE summary reports and put 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 or on a laptop computer as the buildings are inspected.

### 3.1.4 Pre-Loading Available Property Data into the SDE 2.0 Tool

Available SDE data regarding the structures in the SFHA can be pre-loaded into the SDE tool during the preparations for the SDE inspections. Information may include data derived from tax information (see Section 3.1.3), building permits, contractor estimates, or previous internal inspections of buildings. Any data entered into the SDE tool before the inspections will facilitate data collection and creating SDE records of basic property information.

Property data can be pre-loaded into the data fields on the first three tabs of the SDE tool—**Address, Structure/Damage/NFIP Info, and Cost**. A helpful feature in SDE is the ability to import multiple properties into the tool simultaneously using the *Enterprise Import* function (see Section 3 of the SDE User Manual for more information).

Only property data can be pre-loaded into the SDE tool. Assessment data can only be added while an individual property record is open for data entry.

Table 3-2 provides a summary of potentially available data that can be used to develop the SDE inventory.



**Table 3-2: Data Resources to Assist in Substantial Damage Determinations**

<b>Data Resource</b>	<b>Description</b>	<b>Possible Source(s)</b>
Maps	<ul style="list-style-type: none"> <li>• FIRMs</li> <li>• Flood boundary and floodway maps</li> <li>• Other maps of floodprone areas or maps identifying areas of previous flooding</li> </ul>	<ul style="list-style-type: none"> <li>• Community</li> <li>• State NFIP Coordinator</li> <li>• FEMA</li> <li>• Other Federal agencies</li> </ul>
Flood Insurance Study texts or other reports	Flood profiles	<ul style="list-style-type: none"> <li>• Community</li> <li>• State NFIP Coordinator</li> <li>• FEMA</li> </ul>
Newspaper articles or community assessments of previous flooding		<ul style="list-style-type: none"> <li>• Community files</li> <li>• Community library</li> </ul>
Tax parcel maps	Property location and other data that can be cross-referenced to obtain addresses	Tax assessor's office
Street or address maps		<ul style="list-style-type: none"> <li>• Community building department</li> <li>• Planning department</li> </ul>
Tax data	<ul style="list-style-type: none"> <li>• Owner's name and mailing address</li> <li>• Structure address</li> <li>• Date of construction</li> <li>• Building use</li> <li>• Adjusted building values</li> <li>• Square footage</li> <li>• Number of stories</li> <li>• Dates of additions or renovations</li> <li>• Number of years since last tax adjustment</li> </ul>	Tax assessor's office
Professional appraisals		<ul style="list-style-type: none"> <li>• Community building permit files</li> <li>• Insurance claims data</li> </ul>
Permit data	Includes contractor cost estimates for developing unit costs	<ul style="list-style-type: none"> <li>• Community building</li> <li>• Planning department</li> </ul>

FEMA = Federal Emergency Management Agency

FIRM = Flood Insurance Rate Map

NFIP = National Flood Insurance Program

### 3.2 Reviewing Community Plans

The community may have one or more mitigation or emergency action plans that can help identify the areas that are subject to flooding and other natural hazards. These resources may include the Community Rating System (CRS), which is used to track community flooding and damage; emergency management plans, which provide the procedures for responding to a flood during and after the flood; and community mitigation plans, which are used to track the performance of mitigation measures implemented after disasters.

#### 3.2.1 Community Rating System

The NFIP established the CRS to encourage communities to exceed the NFIP minimum requirements in order to reduce flood damage and claims under the NFIP. The CRS is a voluntary program, and communities that are in compliance with NFIP regulations may apply. Participation requires verification that the community is implementing certain activities. Residents who purchase Federal (NFIP) flood insurance can receive between a 5 and 45 percent discount on flood insurance premiums if they live in a community that belongs to the CRS.

A community's CRS plan identifies the natural hazards that affect the community, the areas of the community that are subject to the hazards, and the potential mitigation measures that can be taken to address the hazards. The plan is ranked based on the points that are given for floodplain management activities that the community has undertaken to meet the goals of the NFIP and the CRS.

The discount on NFIP flood insurance premiums is only one of the benefits of CRS participation. Other benefits are improved public safety, reduced damage to property and public infrastructure, avoidance of economic disruption and losses, reduction of human suffering, and protection of the environment.

The CRS has three goals:

- Reduce flood losses
- Facilitate accurate flood insurance ratings
- Promote awareness of flood insurance

As part of the program, communities must identify their floodprone areas, including areas of repetitive flood damage and areas that may be outside designated floodplains and subject to local ponding or drainage problems.

Additional information about the CRS is available on the FEMA CRS Web page, which can be accessed via: <http://training.fema.gov/EMIWeb/CRS/>.

#### 3.2.2 Emergency Management Plans

Typical emergency management plans include planning considerations of warning time, emergency measures to protect the safety of residents and structures, and the local personnel responsible for implementing the emergency measures. Emergency management plans should

include a schedule for periodic reviews and maintenance of the plans. The American Society of Civil Engineers (ASCE) 24-05,<sup>3</sup> the standard for flood damage-resistant design and construction that is referenced by the model building codes, includes requirements and limitations on emergency measures that require human intervention.

A jurisdiction's emergency management plan should:

- Assign responsibilities for carrying out specific actions at projected times and places in an emergency that exceed the capability or routine responsibility of any one agency
- Identify lines of authority and organizational relationships and explain how all actions will be coordinated
- Describe how people and property will be protected in emergencies and disasters
- Identify personnel, equipment, facilities, supplies, and other resources available within the jurisdiction or by agreement with other jurisdictions for use during response and recovery operations
- Identify steps to address mitigation concerns during response and recovery activities

### 3.2.3 Mitigation Plans

At a minimum, community mitigation plans identify the local natural hazards that affect the community, the affected areas, and the community's preferred mitigation measures for reducing future damages. Most communities with mitigation plans are affected by at least riverine or coastal flooding and may be susceptible to additional hazards such as tornadoes, earthquakes, or wildfires. Mitigation plans and the community's Flood Insurance Study (FIS) data (including FIRMs) should be referenced when identifying SDE inventory areas to determine whether damage occurred outside the designated floodplain areas. Damage outside floodplain areas may indicate that the FIRMs need to be updated. The NFIP Substantial Damage requirements apply only to damaged structures within the regulatory floodplain areas.

## 3.3 Organizing SDE Field Inspections

The SDE Manager must plan adequately for an SDE inventory to ensure that that it is accurate and completed in a timely and efficient manner. Planning consists of the following:

- Identifying the activities that will be necessary to complete the SDE inspections. The number, size, and scope of activities will be based on the extent of damage, number of structures to be inventoried, inventory geographic area, and number of staff available to conduct the inspections.
- Planning the sequence of inspections (see Section 3.3.1).
- Determining the number of inspectors that will be required (see Section 3.3.2).

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<sup>3</sup> ASCE, *Flood Resistant Design and Construction*, ASCE Standard 24-05, 2005.

## SDE Field Preparations

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- Organizing the SDE inspection teams (see Section 3.3.3)

### 3.3.1 Sequence of Inspections

The initial sequence of inspections is based on the inventory characteristics (see Section 3.1) and the community's target completion date.

The SDE Manager may decide to have as many inspections as possible completed in one or more large damage areas before the staff moves on to other activities in the following circumstances:

- (1) the community has restrictions on work hours or work days (5 days versus 7 days per week),
- (2) the community requires that the structure owner be present when the inspection is performed,
- or (3) inspection staff are available only for a few weeks.

The community must identify its inspection priorities and list the parameters for the inspections. Parameters include the number of inspection teams, hours worked each day, and the days of the week when inspections will occur. The SDE Manager should consider the following to determine which issue has a higher priority for the community when developing the sequence of inspections:

- Areas with little to no apparent damage so permits for minor repairs can be issued quickly
- Areas where structures have initial estimates of damage between 25 percent and 75 percent of the structure value. Structure owners in these areas will be anxious to begin repairs and may not understand the need for permits.
- Areas where debris and contents have been removed from the structures, which will allow faster inspections.
- Areas with critical facilities that may be a community priority for starting repairs.
- Damage areas with a high density of development and a large number of structures.
- Areas with apparent 75 percent damage or higher, which can have the inspections delayed until more critical areas have been inspected.

### 3.3.2 Determining the Number of Inspectors

After obtaining data for the inventory area and identifying the community priorities and target completion date, the SDE Manager can start to determine the number of inspectors that will be required. The number of inspection teams will be based on available staff, staff experience, and the number of structures to be inspected.

The SDE Manager should assume the following for a two-person inspection team:

- An average of 20 inspections per day in areas with moderate to high structure density (structures are close together), standard residential lot sizes, and at least 65 percent residential structures.

- Up to 30 inspections per day in high density residential areas where lot sizes are small, structures are close together, housing stock is similar, and the depth of flooding above the first floor a relatively consistent
- An average of 10 inspections per day in areas with low density (structures are not close together), structure types are diverse, and the level of damage varies

The SDE Manager should use the following equation to estimate the number of inspection teams that will be needed:

$$\text{Number of inspection teams} = \frac{\text{number of structures to be inspected}}{\div (20 \text{ structures per day}) \times (\text{total number of days available for inspections})}$$

In the number of days available for inspections, the SDE Manager needs to know whether the inspectors will be working 5 or 7 days per week.

### 3.3.3 Organizing the SDE Inspection Teams

The inspection teams will be responsible for collecting and recording the field data required for making SDE determinations. Inspectors will collect data on structure attributes, dimensions, and GPS coordinates and will photograph the structures. Inspectors must be familiar with the SDE data requirements, how to use the SDE tool or the SDE Damage Inspection Worksheets to record the data, and safety precautions for working in and around damaged structures.

Each team should have two inspectors to collect and record data. If staff resources allow, inspectors with damage assessment or construction experience should be paired with less experienced staff. Staff should be physically able to walk from structure to structure and be able to make the evaluations and judgments necessary for evaluating and recording SDE data.

Inspection teams are recommended to consist of two inspectors for the fieldwork associated with SDE inspections for the following reasons:

1. It is generally a good policy to have two-member teams doing most types of fieldwork for safety reasons. If one inspector gets injured or becomes incapacitated because of heat exhaustion or other reasons, the other inspector can call for help.
2. Two inspectors are better able than one to identify structures that are unsafe to enter to collect data on interior damage.
3. It is easier for two-member teams than one inspector to make sure that all of the construction elements (12 for residential structures and 7 for non-residential structures) have been evaluated and the data have been recorded in the SDE tool or on the Damage Inspection Worksheets.
4. Having two inspectors evaluate the percent damaged for each construction element is useful because each inspector may see things slightly differently based on experience. An estimate of the damage percent that is based on a consensus is more defensible than an estimate from one inspector.

## SDE Field Preparations

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5. Two inspectors are needed if structure dimensions need to be field-verified using a tape measure.
6. Two inspectors are needed if coordinating with the structure owner or local officials is required. While one inspector gathers data, the other inspector works with the structure owner or local/state officials to get information or answer questions.
7. Two inspectors will obtain more complete data, thus increasing the quality of the data.
8. Inspections are completed faster with two inspectors instead of one. The two inspectors tend to push each other to move as fast as reasonable to maximize the number of inspections completed per day.
9. One inspector drives to the inventory area while the other inspector navigates.
10. The chance for communications with the SDE Manager is better with two inspector cell phones.

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

The teams should be provided with the following items:

1. Guidance materials and handouts prepared by the SDE Manager
2. Community map showing the SFHA and the identified inspection areas
3. Any collected tax data that can be included on the SDE Damage Inspection Worksheets if not already pre-loaded into the SDE tool
4. Checklist 2 – Field Preparations (field supplies and procedures) in Appendix B; team members should be responsible for gathering and maintaining the required field supplies
5. If possible, a GPS unit that can provide latitude and longitude coordinates at the community's required level of accuracy (see Section 3.3.3 of the SDE User Manual)

### 3.4 Planning for Resource Requirements

The SDE Manager should select someone to be responsible for all field equipment and another person to be in charge of having property data ready for the inspection teams on a daily basis. Depending on the estimated size of the SDE inventory, these responsibilities may involve multiple duties for one person or two people.

If tax or other property data are available for pre-loading into the SDE tool, the data need to be organized based on the sequence of inspections and ready for use by the inspectors at least one day before the inspections. Delays in the preparation of the property data can delay the inspectors and affect the number of inspections that are completed per day and meeting the target completion date.

Field equipment includes vehicles, cell phones or two-way radios, safety equipment, field supplies, and laptop computers (see Checklist 2 in Appendix B). Field supplies include pens,

paper, dry erase board and markers, cameras, GPS units, clipboard, 100-foot tape measure, local and SDE contacts with phone numbers, maps of the inventory areas, letters of introduction, and printed copies of the SDE Damage Inspection Worksheets. The equipment and supplies that need to be regularly maintained, charged, or replenished are listed in Table 3-3.

**Table 3-3: Maintenance of Field Equipment and Supplies**

<b>Item</b>	<b>Recommended Action</b>
Field vehicles	Maintain, including gasoline and fixing flat tires
Laptop computers, cameras, and GPS units	Charge after use every day
Damage Inspection Worksheets, pens, dry erase boards, and markers	Replenish as needed

### 3.5 Identifying Sources of Unit Cost and Structure Value Data

#### 3.5.1 Sources of Unit Cost Data

The default method in the SDE tool for determining the structure value is based on square footage, unit costs, add-ons, and depreciation. The value is provided as a computed Actual Cash Value (ACV). The total area of a structure (in square feet) is multiplied by a unit cost (in \$/square feet) and a geographic factor to develop a base cost for the structure before including add-ons or applying a depreciation value.

Sources of unit cost data include:

- Industry-accepted residential or non-residential cost-estimating guides
- Local permit data for new construction, repairs, or remodeling
- Data developed for nearby jurisdictions
- Local contractor cost estimates
- Professional experience of a community official

If the data from any of the above sources are more than 1 year old, an economic update factor should be used to provide current costs. Industry-accepted cost-estimating guides include the update factor and a geographic adjustment factor. A geographic adjustment factor of 1.0 should be used in the SDE tool when using the other four sources of unit cost data because these sources are based on local costs.

The advantage of using industry-accepted cost-estimating guides is that the unit cost data have been developed by professionals with specialized experience in residential and non-residential cost estimating. These guides include unit cost tables based on the quality of the initial

## SDE Field Preparations

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construction and provide examples of the features and attributes of each construction element. The disadvantage is the price of the cost-estimating guides, which may exceed \$300 per copy.

The advantages of the other four sources of unit cost data are the low cost and the fact that a geographic adjustment factor is not needed. The disadvantages are that the data will need to be obtained and compiled, which can take several days depending on the volume and organization of the data.

### 3.5.2 Structure Values Based on Appraisals or Tax Data

Although structure values can be determined by the SDE tool (see Section 3.5.1 in the SDE User Manual), some communities may want to use professional market appraisals or adjusted tax assessed values. If market appraisals or adjusted tax assessed values are used in the SDE tool, the SDE Manager must verify that the value of the land is not included. In addition, either the community or structure owner must pay the professional appraisers. Most communities allow the use of professional appraisals instead of the ACV if the structure owner agrees to pay the appraisal fee. The option to pay for appraisals should be available to all structure owners so the SDE requirements are administered consistently for all structure owners.

To enter the market appraisal or adjusted tax assessed values in the SDE tool, follow these steps:

- Enter the *Professional Market Appraisal* value in the *Optional User Entered Data* section on the **Output Summary** tab
- Select the *Professional Market Appraisal* radio button in the *Value of Building* section at the top of the **Output Summary** tab screen

Tax assessed values must include a factor that adjusts the assessed value to market value to provide values that are comparable to the ACV. The factor is provided by the tax assessor at the county or parish level. To enter the factor in the SDE tool, follow these steps:

- Enter the *Tax Assessed Value* and *Factor Adjustment* value in the *Optional User Entered Data* section on the **Output Summary** tab
- Select the *Adj Tax Value* radio button in the *Value of Building* section at the top of the **Output Summary** tab screen

The SDE tool does not have a function to pre-load structure values based on appraisals or tax values. Therefore, when structure values will be based on appraisals or tax values, the SDE Manager should prepare a list of addresses and corresponding structure values for the inspectors to take with them into the field so they can enter the data along with the other field assessment data.

If a professional market appraisal or adjusted tax assessed value is used, the following data fields must be completed for a valid assessment (see Section 3.5.4 for more information on required data fields):

- On the **Output Summary** tab, enter the dollar value of *Contractor's Estimate of Damage*, or the *Community's Estimate of Damage*, in the *Cost of Damage Determination* section. Then change



the *Cost of Repairs/Improvements* radio button from *Computed Damages* to *Contractor's Estimate* or *Community's Estimate*.

- On the **Cost** tab, enter \$1 for the *Base Cost per SqFt*.
- On the **Cost** tab, select the *Calculate or Enter Square Footage* button and then complete only one of the following:
  - Select the *Enter Total Square Footage Manually* button on the *Square Footage Calculator* window. Enter 1 or the actual square footage in the *Enter Total Square Footage* field and select *Save* and then select the *Save the Total Square Footage and Close Form* button.
  - Select the appropriate building shape button and enter the building dimensions to calculate the square footage and then select the *Save the Total Square Footage and Close Form* button.
- On the **Cost** tab, select *Other* for the *Depreciation Rating*.
  - Then enter a comment (such as “Used Professional Market Appraisal value of \$xxx from ABC Appraisal Company instead of depreciation”) in the *Depreciation Explanation* box.
  - Then enter 1 for the *Depreciation Percentage*.

### 3.6 Planning for SDE Data Entry

The SDE Manager has two options for entering the data required to make a Substantial Damage determination. Option 1, manual data collection, is a two-step process. The inspector records data manually in the field by writing on the Damage Inspection Worksheets in pen or pencil and then later transfers the data to the SDE tool on a computer in the office. Option 2, direct data entry into the SDE tool on a laptop computer, is a one-step process. The inspector enters data into the SDE tool on a laptop in the field.

Table 3-4 shows a comparison of the advantages and disadvantages of the two options.

If the SDE Damage Inspection Worksheets are used for manual data recordation, the SDE Manager must identify staff to enter the contents of the worksheets into the SDE tool and determine whether they will enter data during the evening of the day the data are collected or the next day. Protocols must be developed to ensure that the data that are collected and entered meet the format and consistency requirements. In addition, if the data entry person finds an error, inconsistency, or data omission, making the corrections may need to wait until the inspectors return from the field the next day.

**Table 3-4. Advantages and Disadvantages of Options 1 and 2 for Entering Data into the SDE Tool**

<b>Advantage / Disadvantage</b>	<b>Option 1: Manual Data Collection</b>	<b>Option 2: Direct Data Entry into the SDE Tool</b>
Advantage	<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Simple</li> <li>• Requires less time per inspection</li> <li>• Avoids need to carry and provide power for laptop computers</li> </ul>	<ul style="list-style-type: none"> <li>• One-step process</li> <li>• Data entry is more accurate</li> <li>• Photos are downloaded and attached to the correct assessment immediately (no photo log needed)</li> <li>• Inspectors can verify that photos are legible in the field</li> <li>• Requires less time to complete assessments (assessments in the SDE tool are completed before the next inspection instead of hours or a day later)</li> <li>• Faster completion of SDE inventory</li> <li>• Avoids having to make copies of blank Damage Inspection Worksheets</li> </ul>
Disadvantage	<ul style="list-style-type: none"> <li>• Requires two steps (recording the data manually on the Data Inspection Worksheets and then entering the data into the SDE tool)</li> <li>• Requires more time to develop full SDE assessments and complete the SDE inventory</li> <li>• Each additional step can adversely affect data quality and consistency, particularly if the inspector and data entry person are different people</li> <li>• Requires a photo log, and therefore more time, to verify that the correct photos are uploaded and attached to each assessment</li> <li>• May require additional data entry staff to enter the data recorded on the worksheets</li> <li>• Requires storage of completed Damage Inspection Worksheets</li> </ul>	<ul style="list-style-type: none"> <li>• Requires taking a laptop computer to the field</li> <li>• Laptops are susceptible to damage (rain, dropping, being stepped, or left behind by inspectors)</li> <li>• Requires a power converter that plugs into a vehicle 12-volt cigarette lighter receptacle to provide sufficient power for the laptop for 8 hours</li> <li>• Requires one laptop per inspection team (with extras in case of computer malfunction or damage)</li> <li>• Requires that SDE data be downloaded at the end of every workday</li> <li>• Data download may not be possible if the laptop is damaged</li> </ul>

## **SECTION 4      GUIDANCE ON COLLECTING AND RECORDING SDE DATA**

The section provides guidance on collecting SDE data. The section begins with SDE calibration inspections, which are used to train the inspectors in collecting SDE data. The aspects of data collection that are discussed involve the structure address, photographs, curbside information, exterior and interior inspections, and interaction with the structure owner.

### **4.1 SDE Calibration Inspections**

In preparation for the inspections, the SDE Manager should take all of the inspectors into the field and conduct one to three calibration 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 calibration inspections is to familiarize inspectors with the SDE data requirements, inspection procedures, and use of the SDE tool. The inspectors need to understand the SDE requirements as well as the expectations of the SDE Manager for the inspections and data collection.

For inspectors with limited building inspection experience, the calibration inspections provide a first-hand view of the construction elements in the SDE tool (12 for residential and 7 for non-residential structures). Through onsite 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 consistently. Each pilot inspection requires approximately 45 to 90 minutes for residential structures and 45 to 120 minutes for non-residential structures, depending on their size and complexity.

Before the calibration inspections, the SDE Manager should review the guidance in Appendices E and F for estimating percent damage by element for residential and non-residential structures, respectively.

During the calibration inspections, the SDE Manager should review the following:

- Field safety requirements, site access procedures, and SDE data requirements
- Residential and non-residential elements on the calibration structures
- Requirement that the percent damage per element should be entered in increments of 5 to 10 percent
- Data that can be ignored (e.g., structure color, lack of maintenance, contents damage)
- Guidelines for estimating damage to the construction elements
- Structure attributes for residential structures and non-residential structures (see Sections 5.1 and 5.2, respectively; see Appendices E and F for guidance on estimating percent damage categories for example residential and non-residential structures, respectively)
- Guidelines for how long each building inspection should take

## Guidance on Collecting and Recording SDE Data

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- Importance of taking the most time and paying the most attention to the structures with damage between 35 and 65 percent (see Section 2)
- Unequal contribution of construction elements to the value of the structure (some elements contribute a greater percentage of the building's value than others, and based on the amount of damage to these elements, inspectors can gauge whether a building is likely to be Substantially Damaged; see Tables 4-1 and 4-2 and Section 4.6.5)

After two or three structures are evaluated as a group, each team should collect data for three to five additional structures on its own. Two-person teams should be encouraged to rotate activities so that each inspector understands the data collection and data entry objectives for the inventory. Team members can take turns identifying structure element percent damage and structure dimensions, recording data, taking photographs, and obtaining GPS coordinates.

The data from all the inspection teams from the first day should be reviewed as a group exercise to identify data issues and consistency, verify completeness, review estimates of percent damage, and evaluate photograph quality.

The SDE Manager should stress that data collection and data entry is a team effort and that everyone will approach it differently based on his or her own experience. Inspections are not a competition to see which team can complete the most inspections.

Each inspection team should review another team's data entries for consistency and quality to obtain a better understanding of the data requirements and potential data consistency issues.

The first 3 days are critical to the quality of the SDE inventory. Maximizing data quality and efficiency requires that the SDE Manager and inspectors all be "on the same page."

Inconsistencies and other problems with data collection can quickly multiply and require hours or days of revisions.

### **4.2 Structures with 35 to 65 Percent Damage**

Structures with damage from 35 to 65 percent require more effort and precision than buildings with damage below 35 percent or above 65 percent. In fact, it is recommended that officials consider a second or independent evaluation for structures in which the initial determination is between 35 and 65 percent damage. Appeals of Substantial Damage determinations tend to occur more frequently for buildings in the range of 35 to 65 of percent damage. An independent evaluation of damage may include a cost estimate for repairs provided by a local official (other than the initial Substantial Damage 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.

### **4.3 Structure Address**

The structure address is important because it is the simplest and most common identifier of a structure. Addresses are a familiar and easy way to sort structures in the SDE tool and track Substantial Damage data. However, not every structure has an address posted on the structure or mailbox, particularly in rural areas. The address may be missing because of the age of the

structure, local custom, lack of a 9-1-1 emergency call system in the area, or lack of a local requirement for posting addresses. If the address is missing, a community address map or tax parcel number map must be used to identify structures in the inventory. Because of their importance, addresses should be used for all structures and photographs in the inventory.

### 4.3.1 Lack of Posted or Marked Addresses

For a structure without a posted address, the procedure described in this section is recommended to identify the structure when attaching GPS data and structure photographs to the SDE assessment. Attaching structure photographs or GPS coordinates to an assessment after many inspections have been completed is extremely difficult, and errors may require returning to the field to verify data or re-collect data for structures that have already been inventoried.

A temporary structure ID number in the SDE tool can be used for new properties and assessments as an interim aid until more complete structure information is available. A properly managed temporary structure identification system consists of three types of data for each structure: photographs, GPS coordinates, and a temporary structure ID number. These data ensure that the SDE Manager, inspectors, and other local officials are discussing the same structure in the post-data-collection environment.

The temporary structure ID number can be developed and used as follows:

1. Organize inspection staff into teams.
2. Deploy each team to a defined geographic area.
3. Assign a range of ID numbers to each inspection team before starting the fieldwork. For example, Team 1 could use the 1000 series of numbers for all structures they encounter without posted addresses. The first structure would be recorded as “Structure 1001 plus the street name” and the next as “Structure 1002” and so on. Team 2 would use “Structure 2001 and the street name” for their first structure followed by “Structure 2002,” while Team 3 would use the 3001 series, and so on.
4. Photograph each structure.
5. Record available street names and other similar information.
6. Record accurate GPS coordinates for each structure.

Temporary ID numbers are entered into the SDE tool as follows:

- Enter the temporary ID number in the “*Street Number*” data field under *Building Address* on the **Address** tab

If the structure address is available after the inspectors return from the field, the temporary ID number can be replaced with the address.

### 4.3.2 Address Board

Depending on the preferences of the SDE Manager, a white dry erase board with the actual address number or temporary ID number, street name, suffix (e.g., street, boulevard, road), team

## Guidance on Collecting and Recording SDE Data

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number, and inspection date can be placed so that it appears in one of the lower corners of the structure photograph. This information will provide a cross reference between the photograph and the SDE assessment. A black marker should be used on the white dry erase board to ensure that the address stands out in the photograph. The address board should take up less than 20 percent of the photograph. If more than photograph is obtained for the structure, the address board should appear in each photograph.

When using an address board, inspectors should ensure that:

- The address number is large enough to be visible in a printed photograph
- The address board does not block so much of the background that the building is indistinguishable from neighboring buildings or key features of the building are not visible (e.g., foundation, high water marks, visible damage)

### 4.3.3 Tax Parcel Identification Numbers

It may be necessary to cross reference tax data and tax parcel ID numbers that contain an official address with a map containing tax parcel boundaries in order to show addresses relative to property locations. This is necessary to provide the inspectors with addresses for the properties that are found in the field. Cross referencing can be confusing and time consuming. To avoid having to refer constantly to the tax printouts for addresses, the address numbers should be transferred to the field copy of the tax map prior to the field deployment.

Tax parcel ID numbers can involve a long string of digits, and long numbers are difficult to track and sort manually. As the volume of collected data increases, inspectors and data entry staff may become confused about particular structures or data. Using address data is therefore preferable to tax parcel ID numbers whenever possible.

## 4.4 Photographs

The SDE tool allows users to attach digital photographs and electronic documents to the property records and assessments. Inspectors should take at least one photograph of every structure. Ideally, the inspector will photograph a curbside view of the front or side of the structure and the elements with significant damage to be used as documentation. However, taking, recording, and processing multiple photographs for each structure can be time consuming.

High resolution photographs can slow down the operating speed of the SDE tool especially when there are a lot of photographs. The higher (better) the resolution of the photograph, the larger the digital file. The larger the digital files and the more photographs attached per inspection, the larger the SDE database becomes, and the slower the SDE tool may operate. For communities with a large number of inspections (> 200 assessments), lower resolution photographs ( $\leq 3$  MB file size) are recommended. Although individual photograph file sizes may not seem large, the collective size will increase as more assessments are added and the inventory increases.

The following procedures are recommended for digital photographs to avoid larger photograph file sizes:

- Review the manufacturer's instructions for the digital camera to learn how to set the image resolution and size
- Set the digital image to 640 pixels wide by 480 pixels high (640 x 480)
- Verify every day that the resolution has not changed, especially if the camera ran out of power and had to be recharged
- Save photographs as JPGs or JPEGs because these formats include compression, which keeps the file size small. Make sure the every file with a photograph is 3 MB or less.

Digital photographs that are not checked in the field may be determined to be unusable after returning from the field. The photographs may be too dark or washed out by sunlight; may have been taken too far from the structures; or have dense foliage on the top, front, or sides of a structure that obscures structure features and renders the structure indistinguishable from similar nearby structures.

Inspectors should try to frame the photograph so the structure fills most of the frame and is readily recognizable to the structure owner or anyone else who views the structure from the point where the photograph was taken. Taking photographs from the curbside or driveway of the structure is recommended. The purpose of taking one or two photographs per structure is to provide a reference for the structure being inspected, not to record all of the damage.

The following procedures for photographs are recommended:

1. Obtain corner views of the structure to show two sides in each view. In this manner, all four sides of a rectangular structure can be captured in only two photographs.
2. When heavy vegetation is present, take additional photographs or close-ups where the structure outline extends beyond the edges of the photograph. Taking photographs of more than one side of the structure may also help.
3. For elevated structures, include in the photograph an object such as a vehicle, a person such as the other inspector, or a nearby structure at ground level to provide the elevation of the structure.
4. Photograph any visible high water marks on the structure or debris lines on an adjacent fence or vegetation.
5. Take the photograph from a different angle if bright sunshine is a problem.
6. As a routine procedure, **review the photographs before leaving the structure to ensure that the photographs are adequate.** This will avoid having to return to the site for better photographs.

Figure 4-1 shows two views of the same structure and a high water mark, structure displacement, and some of the damage.



**Figure 4-1: Two views of the same structure showing a high water mark, structure displacement, and some of the damage**

As the photographs are taken, they should be attached to the assessment in the SDE tool. If a laptop computer will not be used in the field for direct entry of SDE data and photos, inspectors should use the address board (see Section 4.2.2) and a photo log to ensure that they will be able to match photographs to the correct structure. A sample photo log is included in Appendix B. A new photo log should be started every day or each new photo memory card used. A photo log should include at a minimum of the following data:

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



### 4.5 Curbside Information

After arriving at a structure, the inspector should photograph a curbside view of the front or side of the structure, log the photograph, and record basic data for the property on a Damage Inspection Worksheet (Appendix B) or in the SDE tool on a laptop computer. Much of the information in the first and second SDE tabs can be completed curbside, including entries in the *Building Address*, *Structure Attributes* (residential only), *Structure Information*, *Inspector Information*, and *NFIP Information* sections.

### 4.6 Exterior Inspections

Data collected during the exterior inspection include the building dimensions (*Structure Information*), information about exterior-related items in *Adjustments* (e.g., porches, decks), and *Damage Information* (e.g., exterior depth of flooding).

After recording the basic data, the inspector should estimate the structure area and perform an exterior inspection by walking around the entire exterior of the structure. The inspector should record the data on a Damage Inspection Worksheet (Appendix B) or in the SDE tool on a laptop computer.

#### 4.6.1 Building Dimensions

Before beginning the inspection, the inspectors should measure the dimensions of the building using a measuring tape. Exact dimensions are not required and minor variations such as bay windows, extended entrances, or fireplace pads can be ignored.

Four common building shapes for residential and non-residential structures are provided in the SDE tool and on the Damage Inspection Worksheets. The building shapes are L, T, rectangle, and U and are shown in the *Square Foot Calculator* on the **Cost** tab in the SDE tool, and on the SDE Damage Inspection Worksheets.

#### 4.6.2 Exterior Damage

The inspector should evaluate the exterior elements of residential and non-residential structures to estimate the percent damage of each element. When more than one inspector is present, the percent breakdown should be agreed upon by the team. Appendices E and F provide further guidance on estimating percent damage for structures.

Table 4-1 contains the features that should be evaluated for damage during the exterior inspection.

One of the key factors in distinguishing between damage and poor maintenance (e.g., peeling paint, worn interior floor finishes) is the consideration of the repairs that would be necessary to make the structure compliant with local code requirements and to return it to its pre-damage condition.

A residential structure will most likely not be determined Substantially Damaged if the foundation, superstructure, interior finish, plumbing, and exterior finish are not significantly damaged because of the relative weight of these elements in the percentage calculation.

**Table 4-1: Features to Evaluate during Exterior Inspections of Structures**

<b>Item</b>	<b>Required Evaluation</b>
Depth of flooding	Examine all sides of the structure
Obvious roof damage	Observe the roof for: <ul style="list-style-type: none"><li>• Missing shingles or roof covering</li><li>• Roof sheathing movement</li></ul>
Less obvious roof damage	Observe the roof for warping of the roof sheathing due to lost or damaged shingles, viewed from a ladder or by stepping back from the structure and looking at the roof surface for ripples and sunken or raised areas. This type of damage may require replacement of a significantly large portion of the roof sheathing and shingles.
Foundation damage	Examine the foundation for settlement, lateral movement, or cracking that affects structural stability
Post, pier, or column damage and an evaluation of the first floor stability	Examine these elements for structures built on a continuous wall with slab, crawlspace, piles, and piers and posts foundation types
Exterior wall damage	Observe for holes or damage affecting the superstructure

### 4.7 Interior Inspections

When inspecting a residential building, inspectors need to remember **AT ALL TIMES** that they are inside someone's home or when inspecting non-residential buildings, that they are on someone's property. Inspectors should always verify that they have permission to enter the property. Appropriate care and respect for the structure and contents should be demonstrated during the inspections.

The aspects of interior inspections that are discussed in this section are structure stability, inspection routine, inspection guidelines, upgrades or custom-design items, and interior damage.

Residential structures that are within the 35 to 65 percent damage range should be more carefully inspected than those that are clearly less or more damaged. The same is true for non-residential structures over a wider range—approximately 40 to 60 percent.

#### 4.7.1 Structure Stability

Extreme caution should be exercised when entering damaged buildings because of the possibility of structural deficiencies. Inspectors must first verify that the floor of the building is stable enough to support their combined weight. Foundation settlement, high flood depths, floor warping, and damage to floor joists can significantly weaken a floor. Stability can be evaluated during the exterior inspection in structures built on crawlspaces or other elevated foundations.

### 4.7.2 Inspection Routine

A set procedure is recommended for the interior inspection to avoid missing any rooms or damage. For instance, in residential structures, inspectors could start on the first floor in the utility room (which has the hot water tank, washer or dryer, furnace, or other appliances) or the kitchen, and then work their way through the home room by room. In non-residential structures, inspectors could start at the front entrance and move clockwise room by room.

### 4.7.3 Guidelines for Evaluating Damage

Not all elements that get wet will be 100 percent damaged. For example, in a house that was flooded for a short period to a depth of 2 feet above the first floor, the drywall and insulation of the interior walls only needed to be removed below 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 require only 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 and done only with the owner's permission. Inspectors should try to locate areas that are already exposed.

### 4.7.4 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 SDE Damage Inspection Worksheets and in the *Adjustments* section on the **Cost** tab of the tool.

For non-residential structures, interior adjustments can 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 on the SDE Damage Inspection Worksheets and in the *Adjustments* section on the **Cost** tab of the tool.

### 4.7.5 Interior Damage

The inspection team should evaluate the interior construction elements identified on the SDE **Element Percentages** tab 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, the percent damage should be agreed upon by the team. Table 4-2 summarizes the type of interior damage to look for and how to evaluate it based on the interior construction elements. Appendices E and F provide further guidance on estimating percent damage for residential and non-residential structures.

## 4.8 SDE Determinations

When all of the data necessary to save a complete assessment have been entered into the SDE tool, the SDE determination is made by the SDE tool. The percent damage for the structure will be shown on the Output Summary tab. Users may revise data for any data fields in the

## Guidance on Collecting and Recording SDE Data

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assessment by using the View/Search All Records function on the Main Menu and selecting the Edit function to open and edit a specific assessment.

When the SDE field lead or SDE Manager has determined that the assessments do not require any additional edits, the assessments can be considered final.

### **4.9 Structure Owner Interaction**

Encountering residents or building occupants is common during inspections. Residents and occupants are naturally curious or even suspicious of the inspection objectives. Therefore, the SDE Manager should set guidelines for interactions with residents and building occupants. The manager should develop a written list of guidelines for contact with residents and building occupants and review it with the inspectors. See Appendix C for example guidelines for interactions with residents. The SDE Manager should review the interaction guidelines with the inspectors prior to the start of inspections and provide a hard copy of the guidelines to each team.

**Table 4-2: Features to Evaluate during Interior Inspections of Structures**

<b>Element</b>	<b>Description</b>	<b>What to Look For</b>
Foundation (residential and non-residential structures)	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 basements or crawlspace foundations.
Superstructure (residential and non-residential structures)	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.	<ul style="list-style-type: none"> <li>• Wall support system: Deformation or distortion of the structural frame that is not visible from the exterior</li> <li>• Roof support system:                             <ul style="list-style-type: none"> <li>– For intact ceilings, look for sagging, water marks, dripping water, or other damage that may indicate truss or roof framing damage</li> <li>– For removed ceilings, view the truss and roof framing for damage</li> </ul> </li> </ul>
Roof covering (residential and non-residential structures)	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 exterior
Interior finish (residential) Interiors (non-residential)	<p>Damage should be evaluated for a height up to 2 feet above the interior high water mark.</p> <p>For two-story homes with similar square footage on each floor, the first floor accounts for approximately 50 percent of the total quantity of these interior finish items in the house</p> <p>It is assumed that all painted, stained, papered, or paneled surfaces touched by floodwaters will at least require cleaning, sanding, and resurfacing.</p>	<p>Damaged, broken, or warped interior walls or framing studs (windows, doors, or closets).</p> <p>All wet insulation and drywall should be removed and disposed of properly.</p>
Doors and windows (residential only)	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

**Table 4-2: Features to Evaluate during Interior Inspections of Structures (cont.)**

<b>Element</b>	<b>Description</b>	<b>What to Look For</b>
Cabinets and countertops (residential only)	Depending on the flood duration, these items will either require a small amount of cleanup, sanding, and new stain or paint for cabinets or total replacement due to warping.	Damaged, broken, warped, mold-covered or removed cabinets and countertops.
Floor finish (residential only)	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 (residential and non-residential structures)	With the exception of broken fixtures or sections of pipe, many of these items can be flushed 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 (residential and non-residential structures)	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 (residential only)	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.
HVAC (residential and non-residential structures)	Depending on the depth of flooding, this 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 heating-cooling units.

## SECTION 5      STRUCTURE ATTRIBUTES

After reviewing the SDE data requirements (see Section 3 of the User's Manual), preparing an inspection plan, and completing the calibration inspections (Section 4.1), the SDE Manager can initiate the data collection.

This section contains information on the structure attributes in residential and non-residential structures that must be evaluated for a Substantial Damage determination.

### 5.1 Residential Structure Attributes

Residential structures include both site-built homes and manufactured housing. Single-family homes, townhomes, and manufactured housing are not distinguished in the SDE tool, although the user must select which type of building is being evaluated. Residential structure attributes for the other structures are entered on the **Structure/Damage/NFIP Info** tab in the SDE tool.

#### 5.1.1 Foundation Types

The SDE tool has six foundation types for residential structures. Because foundations types have varying costs, the foundation type affects the foundation element's percentage contribution of the foundation to the value of the structure. Furthermore, floor framing materials vary with foundation type, and floor framing materials therefore also affect the superstructure element percentage. The user must understand that percentages for structure elements are not fixed but instead vary based on the combination of elements.

The foundation types are described as follows and shown in Figure 5-1:

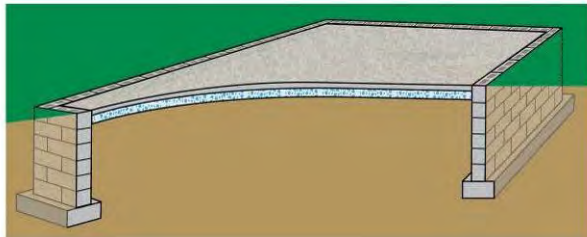
- **Continuous wall with slab** – This system consists of low concrete or masonry perimeter stem walls supported on footings and connected to a raised slab, which may be at or above grade.
- **Basement** – For the purposes of the SDE tool, a basement is a below-grade enclosure. All sides of the foundation are enclosed with at least one side below grade.<sup>4</sup> The basement can be finished or unfinished.
- **Crawlspace** – A shallow, unfinished space beneath the floor of the building can provide access to ductwork, plumbing, and other utilities but can also lead to dampness and mold. Crawlspace foundation elements generally include spread footings and 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 purposes of the SDE tool, piles includes both timber and precast concrete type piles.
- **Slab-on-grade** – In this type of foundation, the lowest floor of the house is formed by a concrete slab that sits directly on the ground.

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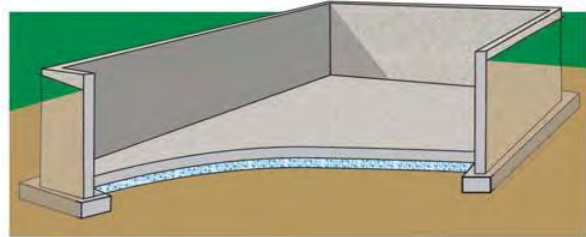
<sup>4</sup> The definition of basement for NFIP floodplain management purposes has the enclosure below grade on all sides.

## Structure Attributes

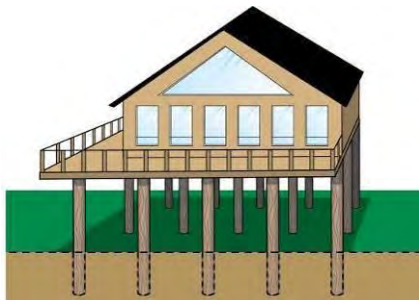
- **Piers and posts** – This system is often seen on manufactured housing and consists of placing the structure on multiple small piers or posts that are shallowly embedded into the ground. These foundations vary widely in quality, from code-compliant systems with proper embedment and connections, to systems that are blocks with little to no embedment and gravity loads providing connections between the structure and the foundation.



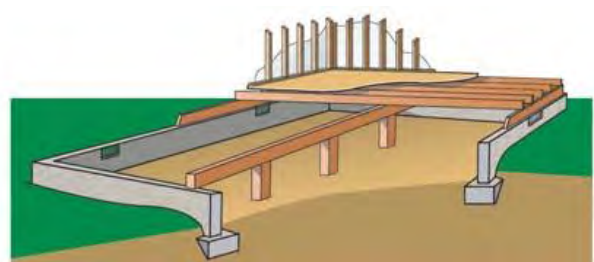
Continuous wall with slab



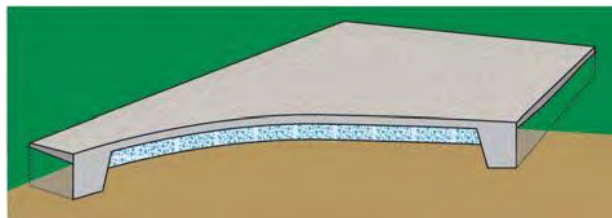
Basement



Piles



Crawlspace



Slab-on-grade



Piers and posts

**Figure 5-1: Foundation types**

### 5.1.2 Superstructure Types

The superstructure consists of all of the framing that provides structural support and a load path between the foundation and the roof. For the purpose of the SDE tool, the following superstructure 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 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 exterior layer (see Figure 5-2).



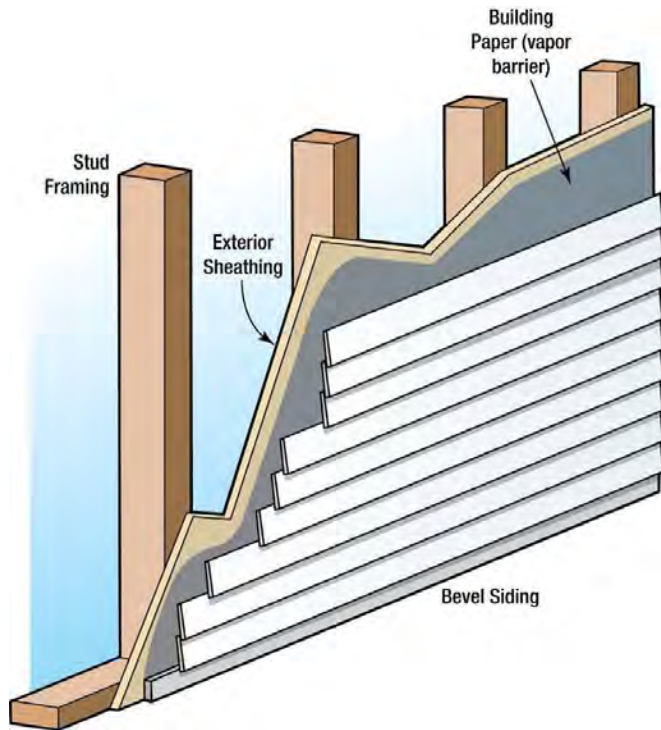


Figure 5-2: Stud-framed superstructure

- **Common brick** – Brick units are stacked and mortared together to make up the exterior wall and provide the exterior structural system (see Figure 5-3). The interior system can be wood-framed or constructed of additional brick-wall systems. These systems can be unreinforced or reinforced using steel rods.
- **Masonry** – Concrete masonry units (CMUs) are stacked and mortared together to make up the exterior wall and provide the exterior structural system (see Figure 5-4). The interior system can be wood-framed or constructed of additional CMU wall systems. The systems can be unreinforced or reinforced using steel rods. This superstructure type may have no exterior finish, leaving the block exposed, or traditional cement-based stucco, exterior insulation finishing system (EIFS), or other exterior finishes may be attached to the CMU walls.

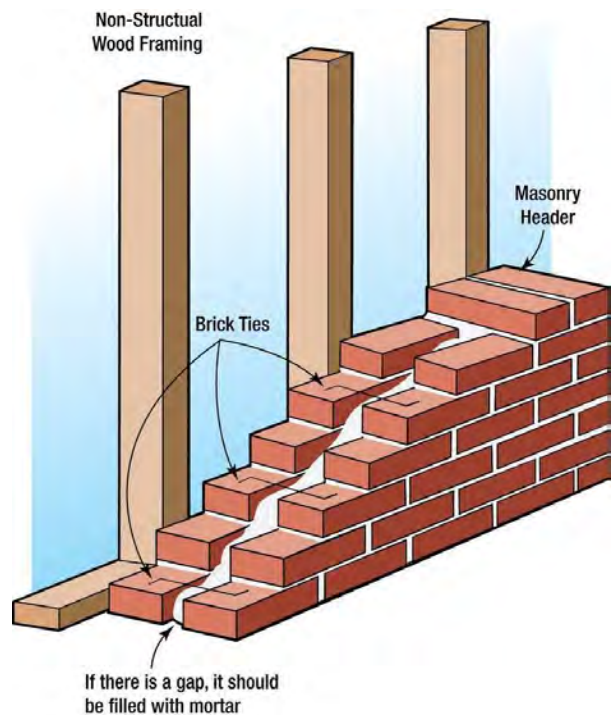


Figure 5-3: Common brick superstructure

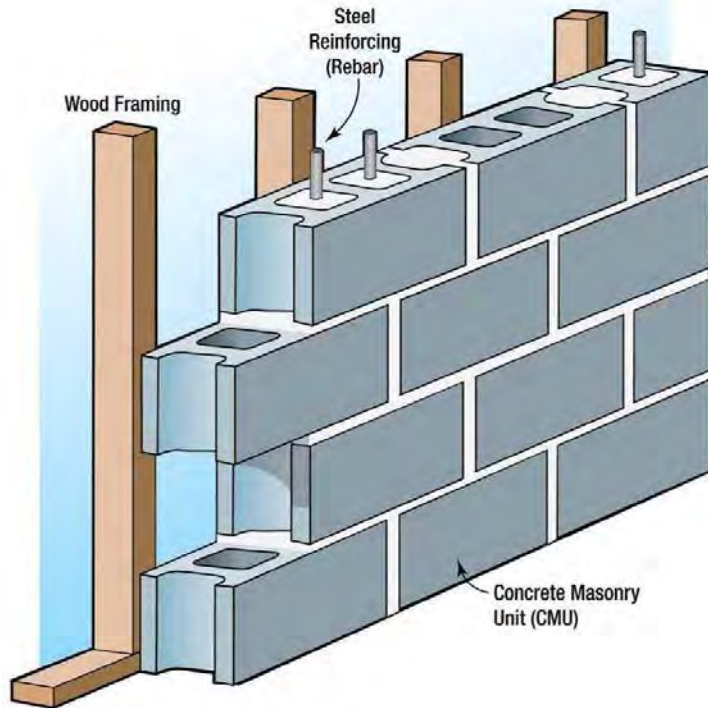


Figure 5-4: Masonry superstructure

- **Insulating concrete form (ICF)** – This building system uses a synthetic insulation-forming system filled with concrete (see Figure 5-5). This system can be used as the exterior wall and structural system for a house, although it is common for the exterior finish to be applied to the wall for aesthetic reasons and to provide water resistance.

Examples of these superstructure types are shown in Figure 5-6. The structures in the figure are in various stages of construction or have been damaged. The damaged or under-construction states provide a visible cross section of an exterior wall or a refinish depiction.

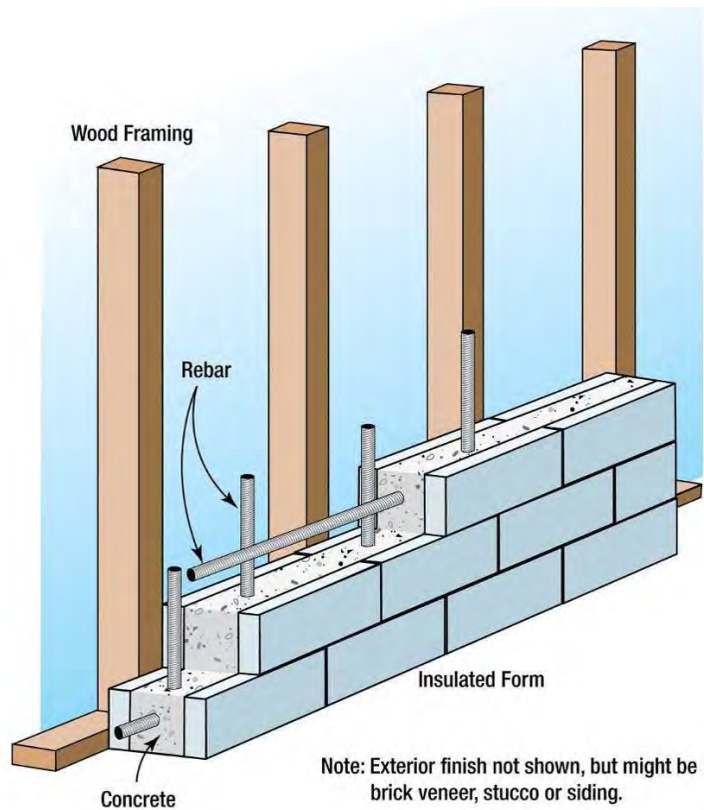


Figure 5-5: Insulating concrete form superstructure



Common brick



Masonry



Stud-framed



Insulating concrete form

**Figure 5-6: Superstructure types with damage or in an unfinished state**

### 5.1.3 Roofing

Roofing as a structure attribute in the SDE tool refers only to roof coverings.

Common roof coverings used throughout the United States were compared to a standard shingled-roof covering. If the roof coverings were similar in performance and cost, they were considered standard shingle to reduce the number of roofing options. Storm events with high winds often cause damage to roof coverings.

The roof coverings shown in Figure 5-7 and described below can be selected in the SDE tool for residential structures.

- **Shingles (asphalt, wood, or fiberglass)** – This is the most common type of roof covering in the United States. Shingles are installed in overlapping arrangements. Shingles can have different wind resistance ratings but are also 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.
- **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.
- **Slate** – Slate roof coverings are less common than most roof coverings because of high costs. Slate roofing can appear similar to clay tile but has different material properties.



Asphalt shingle roof



Clay tile roof



Standing seam metal roof



Slate roof

**Figure 5-7: Types of roof coverings**

### 5.1.4 Exterior Finish Types

The exterior finish system's primary contributions to a structure are weatherproofing and aesthetics. An exterior finish is non-structural and therefore not required if the wall material provides sufficient weather protection. For example, some older homes may have structural walls composed of brick and serve as both a structural support system and exterior finish. Newer construction may have CMU walls with no exterior finish. All types of exterior finishes preferably have a waterproof barrier between them and the sheathing or other structural element. The following exterior finish selections are provided in the SDE tool as *Structure Attributes*:

- **Brick veneer** – A brick veneer is applied to the exterior sheathing of a stud-framed or masonry building (see Figure 5-8). 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.
- **None (common brick or structural)** – This option should be selected when common brick is used (brick units are stacked and mortared together to make up the exterior structural system and the exterior finish) or when another structural material (such as CMU or ICF) is used for both the exterior wall and the exterior finish (see Figure 5-9).

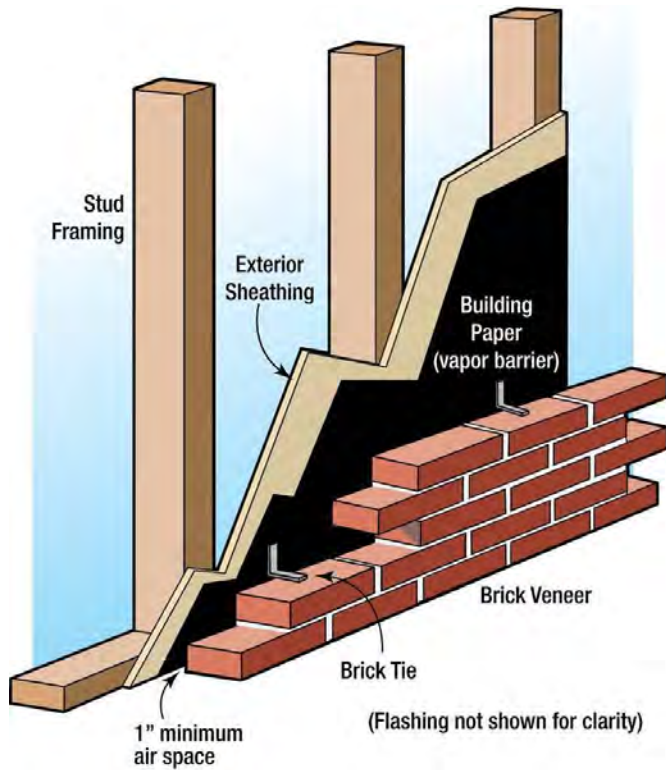


Figure 5-8: Brick veneer

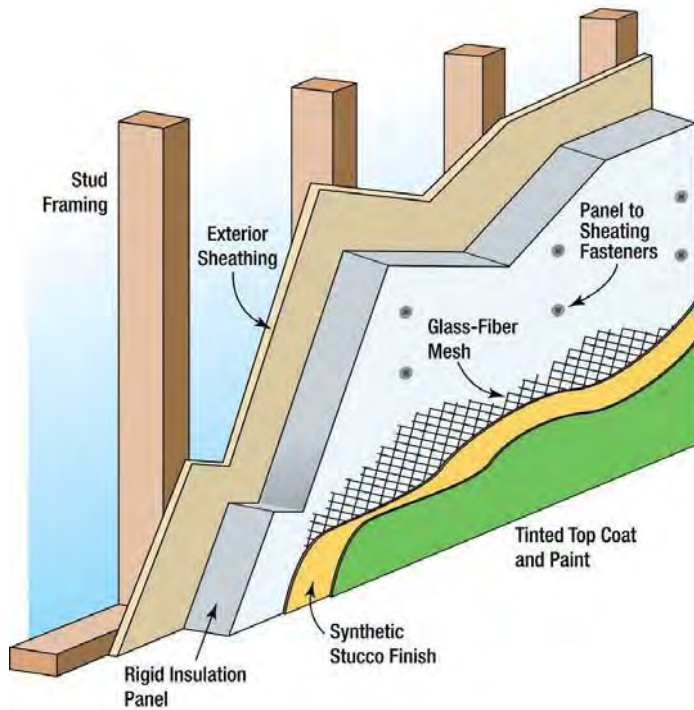


Figure 5-9: Exterior insulation finishing system

### 5.1.5 Heating, Ventilation, and Air-Conditioning

Residential structures in some areas of the United States do not have heating, ventilation, and air-conditioning (HVAC) systems, especially in warmer or mild climates. The SDE tool includes an

## Structure Attributes

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option for no HVAC, but the default is that residential structures have an HVAC system. The costs for a single system (i.e., heating or cooling alone) and a combined system that provides both heating and cooling are similar enough for the purposes of SDE. The user can select some type of HVAC system (both heating and cooling or only one of them) or no type of system.

Window air-conditioning units are not included as a structure attribute but are considered contents.

### 5.2 Non-Residential Structure Attributes

Non-residential buildings vary considerably in construction materials and in the complexity of their structural elements, mechanical systems, and plumbing systems. The SDE tool offers a simplified approach that provides a basic damage estimate for most non-residential structures. Some non-residential buildings have unique building materials or construction methods or have 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 tool, a more detailed analysis of damage is required to determine a more precise percent damage. For larger or more complex buildings, custom damage determinations by a contractor, appraiser, or an individual experienced in damage estimation are recommended.

The SDE tool is similar for residential and non-residential structures, but there are some notable differences in the required data entries largely because of the way the element percentages are derived. The following sections describe the structure information that must be provided to adequately characterize non-residential structures in the SDE tool.

#### 5.2.1 Number of Stories

For the purposes of the SDE tool, non-residential structures are divided into three categories for number of stories: one-story buildings, two- to four-story buildings, and five-story or more buildings. The user must provide the number of stories to proceed to other data entry fields.

The number of stories is important because subsequent building characteristic selections and the element percentage arrays depend on this data point. The SDE tool captures the most common building types but does not provide for every possible combination of number of stories and building use. If the SDE tool does not provide an exact match for the subject building use after the number of stories has been selected, the user is recommended to select the building type closest to the building's actual attributes.

#### 5.2.2 Structure Use

For non-residential structures, construction type is not used directly as the basis for determining the element percentage array. Instead, structure use and the number of stories are the determining factors for the array. For each building use, the SDE tool uses representative building types and the building characteristics to determine the element percentage arrays. Therefore, although the user does not choose the superstructure type, foundation type, and other characteristics, these characteristics are assigned based on the representative structures for each use and are therefore

built into the element percentage arrays. Table 5-1 shows the structure uses and number of stories that are available in the SDE tool.

**Table 5-1: Non-Residential Structure Uses and Number of Stories in the SDE Tool**

Structure Use	Number of Stories			Structure Use	Number of Stories		
	1	2 to 4	5 or More		1	2 to 4	5 or More
Apartments	✓	✓	✓	Hotel			✓
Auditorium	✓			House of worship	✓		
Commercial retail	✓			Industrial		✓	
Convenience store	✓			Long-term care facility	✓	✓	
Courthouse	✓	✓		Mini-warehouse	✓		
Department store	✓	✓		Motel	✓	✓	
Elementary school	✓			Municipal building	✓	✓	
Fast food restaurant	✓			Office building	✓	✓	✓
Fire station	✓			Police station	✓	✓	
Grocery store	✓			Restaurant	✓		
High school		✓		Strip mall	✓		
Hospital	✓	✓	✓				

The structure uses available for SDE non-residential assessments cover a broad range of buildings and consider more than the wall or roof construction type. For example, the demands of a hospital on an HVAC system are very different than those of a warehouse, and the number of bathrooms in a hotel is very different than in an elementary school. However, it is also useful for the user to understand the types of materials and construction that constitute each structure use in the SDE tool. Tables 5-2, 5-3, and 5-4 list the basic construction materials used to establish each structure use. For some of the building uses, more than one representative building is used to determine the element percentages. In these cases, the use is listed twice with the different characteristics of the representative buildings.

**5.2.3 Selecting a Best Fit Structure Use for Non-Residential Structures**

The 22 uses for non-residential structures in the SDE tool may not contain all the structure uses in an inspection area. The list of uses could easily exceed 100, but such a lengthy list would be overwhelming and impractical for most SDE tool users, especially those without a background in non-residential construction or inspection. The current list strikes a balance between too many and too few uses while offering a reasonable range of structure heights (number of stories) and functions. Furthermore, the list of elements and the element percentages as part of the entire structure do not vary significantly for the non-residential structure uses beyond those in the current lists.

## Structure Attributes

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**Table 5-2: Construction Details for One-Story Buildings**

<b>Structure Use</b>	<b>Exterior Finish</b>	<b>Superstructure</b>	<b>Floor Area (square feet)</b>	<b>Roof Support</b>
Apartment building	Wood siding	Wood frame	7,500	Wood truss
Commercial/industrial factory	CMU	CMU/steel frame	30,000	Steel joist
Convenience store	Wood siding	Wood frame	4,000	Wood truss
Courthouse	Limestone	Reinforced concrete frame	30,000	Cast-in-place concrete
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
Elementary school	Brick veneer	CMU	45,000	Steel joist
Fire/police station	Brick veneer	CMU/steel frame	6,000	Steel joist
Grocery store	Brick veneer	Steel frame	32,000	Steel joist
Hospital	Brick veneer	Steel frame	18,500	Steel joist
Mini-warehouse	CMU	Steel frame	20,000	Precast concrete
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



**Table 5-3: Construction Details for Two- to Four-Story Buildings**

<b>Structure Use</b>	<b>Exterior Wall Type</b>	<b>Structural System</b>	<b>Floor Area (square feet)</b>	<b>Roof Support</b>
Apartment building	Brick veneer	CMU/steel frame	22,500	Steel joist
Courthouse	Brick veneer	Steel frame	60,000	Cast-in-place concrete
Department stores	Brick veneer	Steel frame	95,000	Steel joist
High school	Brick veneer	Reinforced concrete frame	130,000	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
Industrial	Brick veneer	Reinforced concrete frame	90,000	Cast-in-place concrete
Motel	Decorative concrete block	Precast concrete	49,000	Precast concrete
Office building No. 1	Brick veneer	CMU/steel frame	20,000	Steel joist
Office building No. 2	Glass and metal curtain wall	Reinforced concrete frame	20,000	Cast-in-place concrete
Police station	Limestone	CMU	11,000	Steel joist

**Table 5-4: Construction Details for Buildings with Five or More Stories**

<b>Structure Use</b>	<b>Exterior Wall Type</b>	<b>Structural System</b>	<b>Floor Area (square feet)</b>	<b>Roof Support</b>
Apartment building	Brick veneer	CMU/steel frame	60,000	Steel joist system
Hospital	Brick veneer	CMU/steel frame	200,000	Steel joist system
Hotel	Brick veneer	CMU/steel frame	135,000	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

**Users should select the structure use that fits the structure being inspected best.** The following should be considered: structure use (whether the use is more like a factory, a warehouse, or an office building), building materials (schools and hospitals have different construction materials than a warehouse), and variations in quality (warehouses and factories are usually of a lower quality construction than an office building or house of worship). For example, the options for a school are a one-story elementary school and a two- to four-story high school. The best choice for a two-story middle school would be a high school because of its additional features compared to an elementary school (larger gym, larger auditorium, pool), as well as the number of stories. Similarly, the best choice for a medical office would be an office building rather than a hospital.

### **5.2.4 Fire Suppression/Sprinkler Systems**

A fire suppression system, referred to as a sprinkler system in the SDE tool, has a significant effect on the element percentage array and affects the plumbing element. Users should assume that five-story and taller buildings have a sprinkler system. The default value in the SDE tool is no sprinkler system in one-story and two- to four-story buildings, so the user must select this attribute for buildings with fewer than five stories.

### **5.2.5 Conveyance**

Because conveyance systems, which include escalators and elevators, can affect the electrical element percentage significantly, the SDE tool has an option for conveyance systems in a two- to four-story building. The default in the SDE tool is no conveyance system in two- to four-story buildings.

The user does not need to select conveyance for one-story and five-story or more buildings. One-story buildings do not have conveyance, and five-story or more buildings are assumed to have conveyance, which is considered in the element percentage arrays for those buildings.

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## SECTION 6 POST-DETERMINATION ACTIVITIES

After all the data are collected, recorded, and finalized (by determining that the assessments do not require any additional or revised data), the community must initiate follow-up activities to distribute and enforce the results of the Substantial Damage determinations. The community should conduct the following activities:

1. Inform other community officials about the determinations and the NFIP requirements for reconstructing Substantially Damaged buildings.
2. Prepare a press release to explain the determination process and the implications of the determinations.
3. Prepare and distribute a “determination letter” with the name and telephone number of a community contact (see Appendix C for sample determination letters). The letter should state that the determination was required under the community’s floodplain management ordinance and should specify that all rebuilding, improvements, or new construction in the regulatory floodplain requires a community permit.
4. Post notices of Substantial Damage or unsafe conditions on structures as appropriate.
5. Identify publications from FEMA, the American Red Cross, and State or local agencies that provide guidance on rebuilding after a disaster.
6. Identify potential mitigation measures for both the community and individual residents.
7. Identify and activate appeal procedures.
8. Notify the State NFIP Manager’s office of the results of the Substantial Damage determinations and determine what, if any, additional activities are required.
9. Store the SDE data.

At a minimum, the community should complete activities 1, 2, 3, 4, and 9

### 6.1 Substantial Damage Determination Letters

Determination letters should have the same format and be mailed to all residents and building owners in the inventory, including those without Substantial Damage. Sample letters for both Substantial Damage and Non-Substantial Damage determinations are provided in Appendix C. The samples are provided as guidance, and using them is encouraged but not required.

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

#### 6.1.1 Non-Substantially Damaged Structures

As mentioned above, owners of structures that are determined not to be Substantially Damaged should be notified of the determination. The letter of determination should include a reminder

## Post-Determination Activities

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that building permits are required for repairs and reconstruction and a list of necessary permits and permit fees, along with contact information for relevant community departments.

### **6.1.2 Substantially Damaged Structures**

The community should request a meeting with the owners of Substantially Damaged structures to explain the NFIP Substantial Damage requirements and discuss the structure owners' options for rebuilding. The date and location of the meeting should be included in the determination letter.

## **6.2 Revising Substantial Damage Determinations Based on Structure Owner Data**

Some property owners may submit additional or more detailed information than was used during the determination process after they have received the determination letter. The community must evaluate the information and determine whether revising the existing determination is appropriate. If the determination is revised, enforcement of the Substantial Damage requirements will be based on the new determination.

All property owners have the option of submitting new data and requesting a revised determination, but the community is not required to revise determinations based on the results of the re-evaluation. In addition, the community is not 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 keep thorough documentation on record for any reversals of Substantial Damage determinations. The documentation should include all supporting materials used to justify the reversal (e.g., contractor's estimate, property appraisal, SDE records) and should clearly document the reason the initial determination was reversed. Because enforcement of the Substantial Damage regulations is a key part of a community's floodplain management responsibilities under the NFIP, a review of Substantial Damage determinations (and determination reversals) may be conducted as part of a Community Assistance Visit (CAV). CAVs are conducted periodically by State floodplain management or FEMA officials to assess a community's compliance with NFIP-required floodplain management enforcement.

For a community to remain in good standing with the NFIP, the community must show that 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. Consequences include the loss 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).

### 6.3 Storage of Final SDE Data

After the SDE inspections have been completed, the SDE Manager must determine the process and format for storing the work generated by the SDE inventory project. SDE data storage should not be started until after the Substantial Damage determination letters have been sent to the structure owners and the appeal process (if any) has been completed. The items to consider for SDE data storage include:

- Storage of electronic data (i.e., the SDE database). At a minimum, the final SDE database file should be exported from the SDE tool and stored on a CD or DVD. If the community decides to leave the SDE data on a computer, a backup of the data should be made by copying the data to blank media.
- Electronic backups should also be made of all other project-generated guidance, forms, SDE reports, form letters, and individual determination letters, including:
  1. Unit cost tables, including source and date
  2. Guidelines for resident interaction
  3. Checklists for pre-disaster planning and field preparations
  4. Permit requirements in effect at the time of the Substantial Damage determinations
  5. PDF versions of the individual 5-page SDE determination reports and the community-wide reports
  6. Copies of the form letters used for introduction and determinations
  7. Copies of the final, individual determination and appeal resolution letters or forms
  8. Public hearing or appeal meeting notes and resolutions

If the inspection data were recorded manually on the SDE Damage Inspection Worksheets, the SDE Manager should determine whether the hard copy data should be retained in addition to the electronic version discussed above. If the hard copies of the inspection forms are retained, the SDE Manager may want these to be retained for a set period (6 or 12 months) before being destroyed.

Both the electronic and hard copy data contain Personal Identifiable Information (PII) that the community has an obligation to protect and ensure that the data does not become public. Therefore, the SDE Manager may want to consider encrypting the electronic files containing any PII data and shredding any hard copies of SDE inspections or other data when these data are no longer required.

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Appendix A  
FEMA Regional Office Locations

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**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  
 26 Federal Plaza, Suite 1337  
 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) 931-5500

**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  
 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) 283-7061

**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

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Appendix B  
Forms and Checklists

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## **Appendix B: Forms and Checklists**

Blank SDE Damage Inspection Worksheets – Single/Multi-Family / Manufactured Homes

Blank SDE Damage Inspection Worksheets – Non-residential Buildings

Checklist 1 – Post-Disaster Planning

Checklist 2 – Field Preparations

Photo Log

# Residential

## SDE DAMAGE INSPECTION WORKSHEET

**Single-Family, Town or Row House (Site Built Residences), or Manufactured House**

Address: \_\_\_\_\_

### **SDE ADDRESS Tab**

#### **Subdivision Information**

Subdivision: \_\_\_\_\_ Parcel Number: \_\_\_\_\_

Lot Number: \_\_\_\_\_ Elevation of Lowest Floor: \_\_\_\_\_ Datum: \_\_\_\_\_

#### **Community Information**

NFIP Community ID: \_\_\_\_\_ NFIP Community Name: \_\_\_\_\_

Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_

#### **Building Address**

Owner First Name: \_\_\_\_\_ Owner Last Name: \_\_\_\_\_

Street Number: \_\_\_\_\_ Street Name: \_\_\_\_\_ Street Suffix: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

County: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

#### **Mailing Address**

**Check here if same as above: \_\_\_\_\_**

First Name: \_\_\_\_\_

Last Name: \_\_\_\_\_

Street Number: \_\_\_\_\_ Street Name: \_\_\_\_\_ Street Suffix: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

County: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_



Care of: \_\_\_\_\_

**SDE STRUCTURE / DAMAGE / NFIP INFO Tab**

**Structure Attributes**

Residence Type:  Single Family  Town or Row House  Manufactured House

Foundation:  Continuous Wall w/Slab (Standard)  Basement  Crawlspace  
 Piles  Slab-on-Grade  Piers and Posts

Superstructure:  Stud-Framed (Standard)  Common Brick  ICF  Masonry

Roof Covering:  Shingles – Asphalt, Wood (Standard)  Clay Tile  Standing Seam (Metal)  
 Slate

Exterior Finish:  Siding or Stucco (Standard)  Brick Veneer  EIFS  
 None – common brick, structural

HVAC System:  Heating and/or Cooling  None

Story:  One Story (Standard)  Two or More Stories

**Structure Information**

Year of Construction: \_\_\_\_\_

Quality of Construction:  Low  Budget  Average  Good  Excellent

Residence Information (if needed): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Damage Information**

Date Damage Occurred (mm/dd/yyyy): \_\_\_\_\_

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

Cause of Damage (if "Other" is selected): \_\_\_\_\_

No Physical Damage (check here if none): \_\_\_\_\_

Duration of Flood: \_\_\_\_\_ Hours \_\_\_\_\_ Days

**SDE STRUCTURE / DAMAGE / NFIP INFO Tab**

Depth of Flood Above Ground (estimated to nearest 0.5 foot): \_\_\_\_\_

Depth of Flood Above First Floor (estimated to nearest 0.5 foot): \_\_\_\_\_

***Inspector Information:***

Inspector's Name: \_\_\_\_\_

Inspector's Phone: \_\_\_\_\_ Date of Inspection (mm/dd/yyyy): \_\_\_\_\_

***NFIP Information***

FIRM Panel Number: \_\_\_\_\_ Suffix: \_\_\_\_\_ Date of FIRM Panel (mm/dd/yyyy): \_\_\_\_\_

FIRM Zone: \_\_\_\_\_ Base Flood Elevation: \_\_\_\_\_

Regulatory Floodway: \_\_\_ Yes \_\_\_ No \_\_\_ Possible

***Community Information (if needed):*** \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**COST Tab**

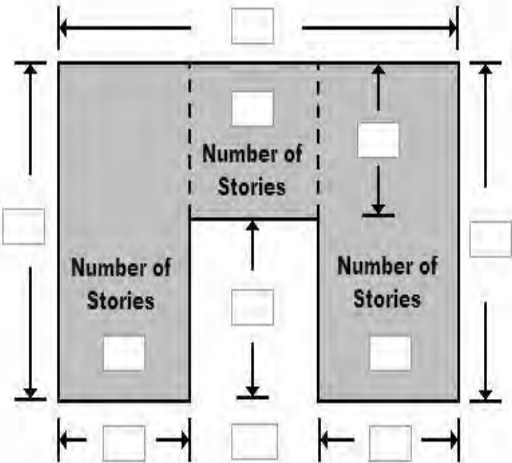
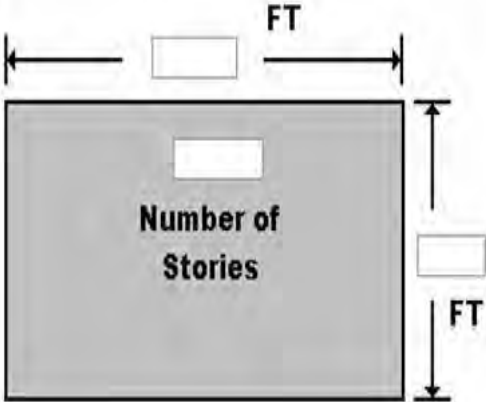
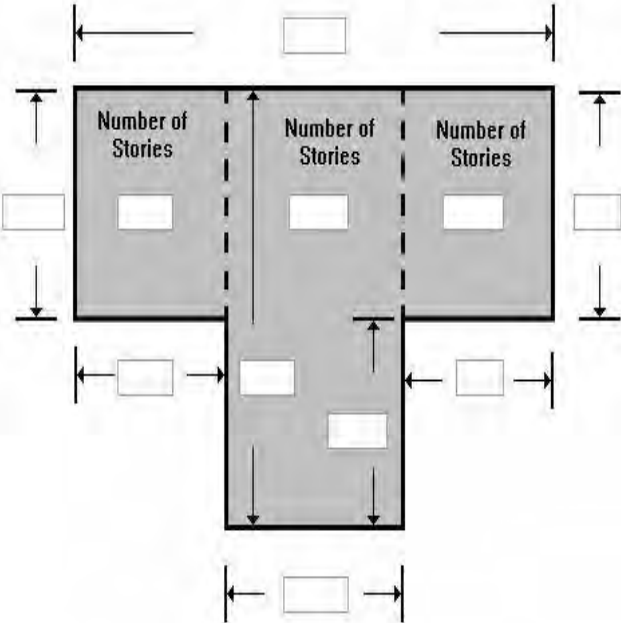
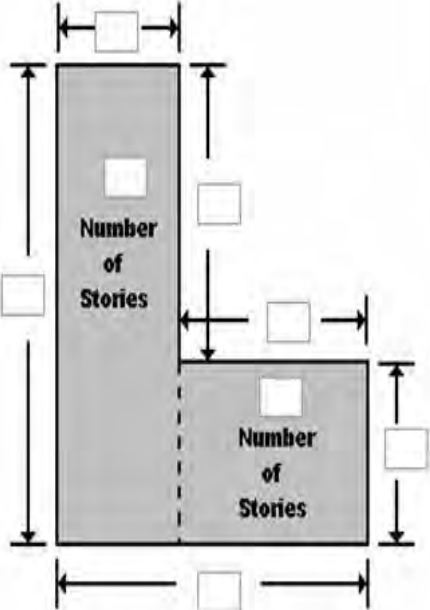
***Square Footage***

Calculate (on next page) or Enter Square Footage

Total Square Footage (if available): \_\_\_\_\_

**COST Tab**

Select appropriate diagram of structure footprint and enter structure dimensions and the number of stories:



**COST Tab**

**Base Cost per Sq Ft:** \_\_\_\_\_ **Geographic Adjustment:** \_\_\_\_\_

**Adjustments**

<b><u>Single-Family House</u></b>	<b><u>Quantity</u></b>	<b><u>Units</u></b>	<b><u>Unit Cost</u></b>	<b><u>Item Cost</u></b>
Roofing		Sq Ft		
Heating / Cooling		Each		
Appliances		Each		
Fireplaces		Each		
Porch / Breezeways		Sq Ft		
Garage		Sq Ft		
<b><u>Manufactured House</u></b>	<b><u>Quantity</u></b>	<b><u>Units</u></b>	<b><u>Unit Cost</u></b>	<b><u>Item Cost</u></b>
Expando		Sq Ft		
Carport		Sq Ft		
Open Porch		Sq Ft		
Enclosed Porch		Sq Ft		
Decks		Each		
Skirting		Sq Ft		
Fireplaces		Each		

**COST Tab**

***Additional Adjustments***

<u>Adjustments</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Item Cost</u>

**Cost Data Reference** (source or name): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Cost Data Date:** \_\_\_\_\_

**Depreciation Rating:**

\_\_\_ 1. Very Poor Condition \_\_\_ 2. Requires Extensive Repairs \_\_\_ 3. Requires Some Repairs  
\_\_\_ 4. Average Condition \_\_\_ 5. Above Average Condition \_\_\_ 6. Excellent Condition \_\_\_ 7. Other

Depreciation Percentage (if 'Other' selected for Depreciation Rating): \_\_\_\_\_

Depreciation Explanation (if 'Other' selected for Depreciation Rating): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**ELEMENT PERCENTAGES Tab**

***Element Percentages***

Residence Type: \_\_\_\_ Single-Family (SF) House \_\_\_\_ Manufactured House (MH)

<u>Item</u>	<u>% Damaged</u>	<u>Element %</u>	<u>Item Cost</u>	<u>Damage Values</u>
Foundation (SF only)				
Superstructure				
Roof Covering				
Exterior Finish				
Interior Finish				
Doors and Windows				
Cabinets and Countertops				
Flood Finish				
Plumbing				
Electrical				
Appliances				
HVAC				
Skirting / Forms Piers (MH only)				

**SDE OUTPUT SUMMARY Tab - Optional User Entered Data**

**Professional Market Appraisal:** \_\_\_\_\_

**Tax Assessed Value:** \_\_\_\_\_ **Factor Adjustment:** \_\_\_\_ **Adjusted Tax Assessed Value:** \_\_\_\_\_

**Contractor's Estimate of Damage:** \_\_\_\_\_

**Community's Estimate of Damage:** \_\_\_\_\_

# Non-Residential

## SDE DAMAGE INSPECTION WORKSHEET

Address: \_\_\_\_\_

### SDE ADDRESS Tab

#### **Subdivision Information**

Subdivision: \_\_\_\_\_ Parcel Number: \_\_\_\_\_

Lot Number: \_\_\_\_\_ Elevation of Lowest Floor: \_\_\_\_\_ Datum: \_\_\_\_\_

#### **Community Information**

NFIP Community ID: \_\_\_\_\_ NFIP Community Name: \_\_\_\_\_

Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_

#### **Building Address**

Owner First Name: \_\_\_\_\_

Owner Last Name: \_\_\_\_\_

Street Number: \_\_\_\_\_ Street Name: \_\_\_\_\_ Street Suffix: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

County: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

#### **Mailing Address**

**Check here if same as above:** \_\_\_\_\_

First Name: \_\_\_\_\_

Last Name: \_\_\_\_\_

Street Number: \_\_\_\_\_ Street Name: \_\_\_\_\_ Street Suffix: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_

County: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_ Cell Phone: \_\_\_\_\_

Care of: \_\_\_\_\_

**SDE STRUCTURE / DAMAGE / NFIP INFO Tab**

***Structure Information***

Year of Construction: \_\_\_\_\_ Number of Stories: \_\_\_ 1 Story \_\_\_ 2 thru 4 \_\_\_ 5 or more

Structure Use: \_\_\_\_\_

Sprinkler System: \_\_\_ Yes \_\_\_ No      Conveyance: \_\_\_ Yes \_\_\_ No

Residence Type: \_\_\_ Single Family \_\_\_ Town or Row House \_\_\_ Manufactured House

Quality of Construction: \_\_\_ Low \_\_\_ Budget \_\_\_ Average \_\_\_ Good \_\_\_ Excellent

Structure Information (if needed): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

***Damage Information***

Date Damage Occurred (mm/dd/yyyy): \_\_\_\_\_

Cause of Damage: \_\_\_ Fire \_\_\_ Flood \_\_\_ Flood and Wind \_\_\_ Seismic \_\_\_ Wind \_\_\_ Other

Cause of Damage (if 'Other' is selected): \_\_\_\_\_

\_\_\_\_\_

No Physical Damage (check here if none): \_\_\_\_\_

Duration of Flood: \_\_\_\_\_ Hours      \_\_\_\_\_ Days

Depth of Flood Above Ground (estimated to nearest 0.5 foot): \_\_\_\_\_

Depth of Flood Above First Floor (estimated to nearest 0.5 foot): \_\_\_\_\_

***Inspector Information:***

Inspector's Name: \_\_\_\_\_

Inspector's Phone: \_\_\_\_\_ Date of Inspection (mm/dd/yyyy): \_\_\_\_\_



**SDE STRUCTURE / DAMAGE / NFIP INFO Tab**

***NFIP Information:***

FIRM Panel Number: \_\_\_\_\_ Suffix: \_\_\_\_\_ Date of FIRM Panel (mm/dd/yyyy): \_\_\_\_\_

FIRM Zone: \_\_\_\_\_ Base Flood Elevation: \_\_\_\_\_

Regulatory Floodway: \_\_\_ Yes \_\_\_ No \_\_\_ Possible

***Community Information (if needed):*** \_\_\_\_\_

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**COST Tab**

***Square Footage***

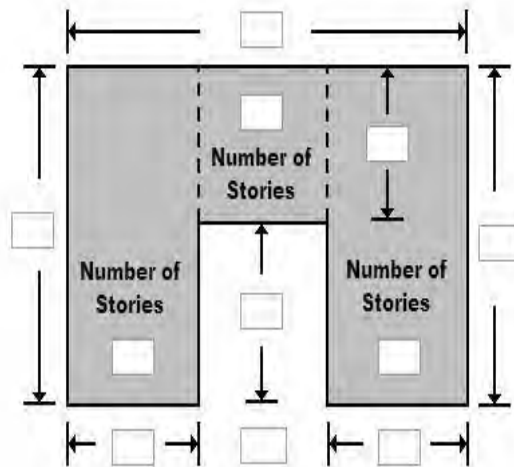
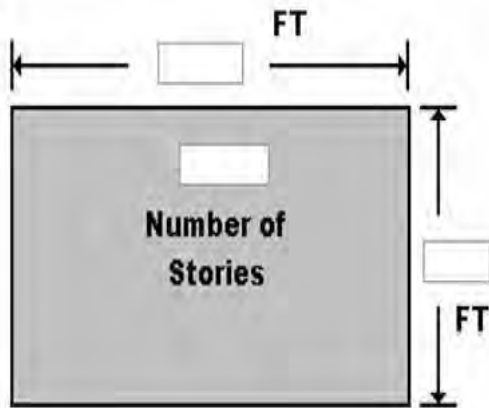
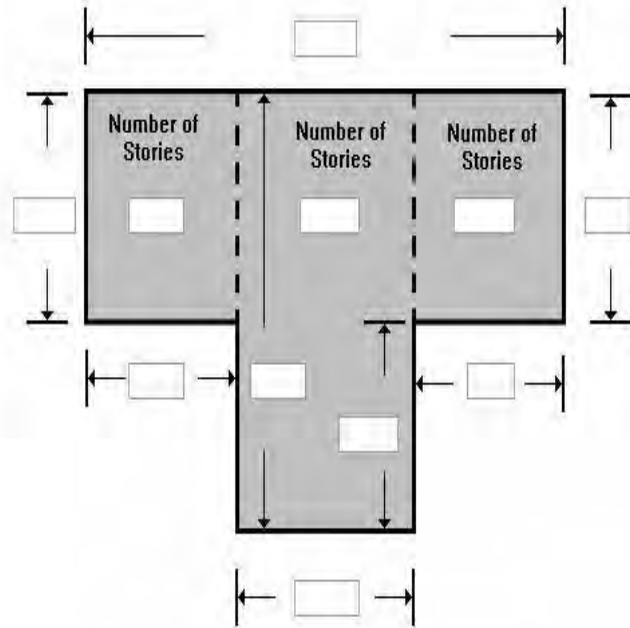
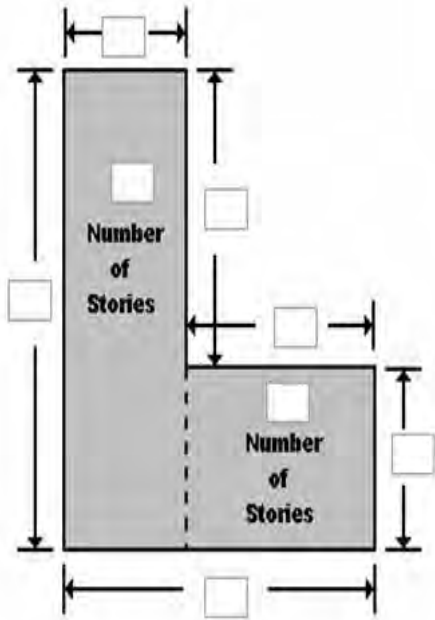
Calculate (on next page) or Enter Square Footage

Total Square Footage (if available): \_\_\_\_\_

Base Cost per Sq Ft: \_\_\_\_\_ Geographic Adjustment: \_\_\_\_\_

**COST Tab**

Select appropriate diagram of structure footprint and enter structure dimensions and the number of stories:



**COST Tab**

***Adjustments***

<u>Adjustments</u>	<u>Quantity</u>	<u>Units</u>	<u>Unit Cost</u>	<u>Item Cost</u>
Roofing		Sq Ft		
Built-in Equipment		Each		
Built-in Security / Communications		Each		
Conveyance System		Each		
Wall Covering		Sq Ft		
Windows / Skylights		Each		

***Additional Adjustments***

<u>Adjustments</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Item Cost</u>

**Cost Data Reference** (source or name): \_\_\_\_\_

\_\_\_\_\_

**Cost Data Date:** \_\_\_\_\_

**Depreciation Rating:**

\_\_\_ 1. Very Poor Condition \_\_\_ 2. Requires Extensive Repairs \_\_\_ 3. Requires Some Repairs  
\_\_\_ 4. Average Condition \_\_\_ 5. Above Average Condition \_\_\_ 6. Excellent Condition \_\_\_ 7. Other

Depreciation Percentage (if 'Other' selected for Depreciation Rating): \_\_\_\_\_

Depreciation Explanation (if 'Other' selected for Depreciation Rating): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

**ELEMENT PERCENTAGES Tab**

***Element Percentages***

<u>Item</u>	<u>% Damaged</u>	<u>Element %</u>	<u>Item Cost</u>	<u>Damage Values</u>
Foundation				
Superstructure				
Roof Covering				
Plumbing				
Electrical				
Interiors				
HVAC				

## Checklist 1 - Post-Disaster Planning

	Need	Completed	Item
1.	_____	_____	<p><b>Brief all elected officials as soon as possible after the event.</b></p> <p>Source:</p> <ul style="list-style-type: none"> <li>• FEMA P-758, <i>Substantial Improvement/Substantial Damage Desk Reference</i>, Chapter 7 (May 2010)</li> </ul>
2.	_____	_____	<p><b>Select an SDE Manager.</b></p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Section 2.1 (April 2013)</b></li> </ul>
3.	_____	_____	<p><b>Review NFIP requirements for Substantial Damage and Substantial Improvement.</b></p> <p>Sources:</p> <ul style="list-style-type: none"> <li>• NFIP Regulations</li> <li>• FEMA P-758, <i>Substantial Improvement/Substantial Damage Desk Reference</i> (May 2010)</li> <li>• FEMA 213, <i>Answers to Questions About Substantially Damaged Buildings</i> (May 1991)</li> </ul>
4.	_____	_____	<p><b>Review SDE tool and User Manual to understand the SDE data requirements.</b></p> <p>Sources:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE User Manual</i>, Section 3.0 (April 2013)</b></li> <li>• FEMA <i>SDE Best Practices</i> (May 2012)</li> <li>• FEMA Substantial Damage Estimator Tool Frequently Asked Questions</li> </ul>
5.	_____	_____	<p><b>Identify floodplain maps to review the boundaries of the SFHA.</b></p> <p>Data may include FIRMs, FBFMs, FIS reports, community maps showing previously flooded areas, and flood studies by State or other Federal agencies.</p> <p>Sources:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Sections 2.0 and 3.1 (April 2013)</b></li> <li>• Community NFIP coordinator</li> </ul>

## Checklist 1 – Post-Disaster Planning

Need	Completed	Item
6.	_____	<p><b>Identify type, location, and community contacts for tax or GIS data for structures within the SDE inventory area that are potentially Substantially Damaged.</b></p> <p>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.</p> <p>Sources:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE User Manual</i>, Sections 3.2 and 3.3 (April 2013)</b></li> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Section 3.1 (April 2013)</b></li> </ul>
7.	_____	<p><b>Identify community street, address, or tax maps for delineating the boundaries of the SFHA.</b></p> <p>This will help delineate the maximum limits of the SDE inventory area while also showing addresses or lot locations.</p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Sections 2.2 and 2.5 (April 2013)</b></li> </ul>
8.	_____	<p><b>Transfer SFHA boundaries from floodplain map to street, address, or tax map.</b></p> <p>Using the effective FIRM for the community, transfer the SFHA boundaries to a base map with named streets and either addresses or lot boundary lines. This will delineate the maximum limits of the SDE inventory to narrow the focus of the inspections while avoiding areas outside the SFHA.</p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Sections 3.1 (April 2013)</b></li> </ul>
9.	_____	<p><b>Perform a curbside review of structures within the SDE inventory area.</b></p> <p>This helps the SDE Manager understand the scope and extent of the inventory area as well as the initial construction quality, size, and type of structures that will require inspections.</p> <p>Source:</p>

## Checklist 1 - Post-Disaster Planning

Need	Completed	Item
10.	_____	<p style="text-align: center;">_____</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Section 2.3 (April 2013)</b></li> </ul> <p><b>Identify the property and structure access procedures for locked or occupied structures.</b></p> <p>These procedures should be written and well defined; the elected officials and community legal counsel should then review and approve them to ensure that the procedures are legal and defensible. As a minimum, these procedures should include guidance on owner/resident interaction, and requirements for entering open property and structures when owners/residents are not present or when occupants are present but refuse entry to the structure or property. In addition, inspectors with permission to enter a structure need to verify that the structure is structurally stable and safe to enter.</p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Sections 4.6 and 4.7 (April 2013)</b></li> </ul>
11.	_____	<p style="text-align: center;">_____</p> <p><b>Pre-enter available SDE property data into the SDE tool.</b></p> <p>This data must be cross-referenced to a FIRM, address, or tax map so that the inspectors know which structure and property record are being inspected. Once the data are uploaded into SDE, it will create property records. After the inspection is complete and the field data are entered, the records become SDE assessments.</p> <p>Sources:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE User Manual</i>, Sections 3.2 and 3.3 (April 2013)</b></li> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Section 3.1 (April 2013)</b></li> </ul>
12.	_____	<p style="text-align: center;">_____</p> <p><b>Identify the number and names of inspectors required for the inventory and form the inspection teams.</b></p> <p>The number of inspectors and inspection teams will determine the potential daily rate of inspections and a target completion date.</p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Section 3.3.2 (April 2013)</b></li> </ul>

## Checklist 1 – Post-Disaster Planning

Ne

13. \_\_\_\_\_ Identify inspection areas that may require permission or special access.
- Industrial parks, factories, private or gated subdivisions, islands, airports, school campuses, and other areas may require permission or other advance coordination to gain access to the property and structures.
14. \_\_\_\_\_ Identify the proposed sequence of SDE inspections.
- Decide which subdivisions, neighborhoods, or areas will be inspected first, then next, and so on. The sequence will depend on the number of inspectors, their availability during the inspection process, the number of structures to inspect, and the proposed completion date of the inspections. The sequence may be revised as issues arise due to other post-disaster activities that may restrict or limit the inspection teams.
- Source:
- FEMA P-784, *SDE Field Workbook*, Section 3.3 (April 2013)
15. \_\_\_\_\_ Prepare a list of local contacts for all project personnel and local agencies.
- This list should include, as a minimum, the SDE Manager, a responsible community official, inspectors, office staff, and the police, fire, and emergency management contacts.
- Source:
- FEMA P-784, *SDE Field Workbook*, Section 3.4 (April 2013)
16. \_\_\_\_\_ Research, obtain, or develop unit costs for determining reasonable structure values 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.
- Sources:
- FEMA P-784, *SDE User Manual*, Section 3.4.2.3 (April 2013)
  - FEMA P-784, *SDE Field Workbook*, Section 3.5 (April



## Checklist 1 - Post-Disaster Planning

Need	Completed	Item
		2013)
17.	_____	<p><b>Prepare a Letter of Introduction on community letterhead.</b></p> <p>The letter will be handed to occupants by the inspectors as they prepare to enter a new property. This should include, as a minimum, a brief discussion on the intent and scope of the SDE inspections, the normal work hours and days, the option of the structure owner or resident to refuse entry to the property or the structure, and provides the name, telephone number, and e-mail address of the SDE Manager or local official in charge of the SDE inventory.</p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Appendix E (April 2013)</b></li> </ul>
18.	_____	<p><b>Make Substantial Damage determinations for structures located in the SFHA.</b></p> <p>Sources:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-784, <i>SDE User Manual</i>, Section 4.5 (April 2013)</b></li> <li>• <b>FEMA P-784, <i>SDE Field Workbook</i>, Section 4 (April 2013)</b></li> </ul>
19.	_____	<p><b>After Substantial Damage determinations are complete, issue permits for repair and reconstruction</b></p> <p>Source:</p> <ul style="list-style-type: none"> <li>• <b>FEMA P-758, <i>Substantial Improvement/Substantial Damage Desk Reference</i> , Chapter 7 (May 2010)</b></li> </ul>
20.	_____	
21.	_____	
22.	_____	
23.	_____	
24.	_____	
25.	_____	

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## Checklist 2 – Field Preparations

	Need	Have	Item
1.	_____	_____	Flood maps such as 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, including homeowner/building owner name, address, and zip code, mailing address and zip code, number of stories, and dimensions or habitable square footage (if available).
5.	_____	_____	Copies of blank SDE Damage Inspection Worksheets.
6.	_____	_____	Copies of blank photo logs (if needed).
7.	_____	_____	Photo ID badges for inspectors.
8.	_____	_____	Letter of Introduction with community point of contact (name and telephone number).
9.	_____	_____	Clip boards, pens/pencils, steno pad or writing tablet, highlighter.
10.	_____	_____	100 ft tape measure (to obtain or verify structure dimensions).
11.	_____	_____	Address board and dry erase markers.
12.	_____	_____	Hard hat, gloves, safety glasses, steel-toe and steel-shank shoes, and flashlight.
13.	_____	_____	Cell phones or walkie-talkies.
14.	_____	_____	Digital camera, primary and alternate memory cards, and extra batteries.
15.	_____	_____	Verification that police, fire, and emergency management agencies have been advised of SDE inspections.
16.	_____	_____	Laptop computers with SDE tool installed and power cords for use and re-charging in field vehicles.
17.	_____	_____	
18.	_____	_____	

	Need	Have	Item
19.	_____	_____	
20.	_____	_____	
21.	_____	_____	
22.	_____	_____	
23.	_____	_____	
24.	_____	_____	
25.	_____	_____	

Procedures to review with inspectors prior to the start of data collection

	Need	Completed	Item
1.	_____	_____	Field safety procedures for dealing with extreme temperatures, wild and domestic animals, driving, parking, and what to do in case of an accident.
2.	_____	_____	SDE data collection and recording requirements.
3.	_____	_____	Guidance on identifying initial construction quality for both residential and non-residential structures.
4.	_____	_____	SDE inspection procedures for residential structures.
5.	_____	_____	SDE inspection procedures for non-residential structures.
6.	_____	_____	Guidance on selecting the depreciation rating.
7.	_____	_____	Data collection routes and sequence.
8.	_____	_____	Guidelines for interaction with structure owners and occupants.
9.	_____	_____	Procedures for dealing with locked or occupied buildings.
10.	_____	_____	
11.	_____	_____	
12.	_____	_____	
13.	_____	_____	



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APPENDIX C  
Sample Documents

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## **Appendix C: Sample Documents**

Letter of Introduction

NOTICE OF DETERMINATION – Substantial Improvement

NOTICE OF DETERMINATION – Substantial Damage

NOTICE OF DETERMINATION – Work Does Not Constitute Repair of Substantial Damage

Recommended Guidelines for Interaction with Structure Owners by SDE Inspectors

*Sample Letter of Introduction for SDE Inspections*

**City of Floodville**

Department of Building Inspections

1212 River Road

Floodville, NY 14008

September 8, 2013

Dear Structure Owner or Occupant:

The bearer of this letter is on official business for the City of Floodville during the hours between 8:00 AM and 6:00 PM, Monday through Saturday.

As a result of the flooding that occurred between September 3 and 4, 2013, City staff will be inspecting buildings throughout the community for evidence of Substantial Damage. This evaluation is required by our Floodplain Management Ordinance dated April 8, 2005. These inspections apply to all structures within the 100-year floodplain as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), Panels 0100 through 0350 for Floodville dated June 19, 2008.

The inspectors will require approximately 30 minutes for a residential inspection and from 30 to 90 minutes for non-residential buildings to inspect for interior and exterior damage. They will record the required information used by the Floodville Department of Building Inspections for making Substantial Damage determinations. After the City has completed the determination process, a written determination will be mailed to the owners of the inspected structures.

Please be advised that all repairs, reconstruction, and new construction are subject to the provisions of the Floodville Building Code and may require a permit. Construction activities conducted without a proper permit may be considered non-compliant and may result in daily fines and/or the removal of the non-compliant construction.

If you refuse admittance to the inspectors, your address will be provided to our City Attorney for processing of a formal legal request to inspect the structure during normal business hours.

Questions regarding the inspection process may be directed to me or Mr. William Jones of the Department of Building Inspections at 888-999-1212 between the hours of 7:30 AM and 5:00 PM, Monday through Friday or e-mailed to [william.jones@floodville.ny.gov](mailto:william.jones@floodville.ny.gov).

Sincerely,

Lisa Donaldson, Chief Inspector  
Department of Building Inspections  
888-999-0000  
[lisa.donaldson@floodville.ny.gov](mailto:lisa.donaldson@floodville.ny.gov)

## ***Substantial Improvement***

### *Sample Letter to Notify Structure Owner of Determination*

#### **NOTICE OF SUBSTANTIAL IMPROVEMENT DETERMINATION**

Dear [name of structure owner]:

The City of Floodville has reviewed your recent application for a permit to [*describe proposed improvement/addition*] for the existing residential structure located at [insert structure address], Floodville, NY 14056.

It has been determined that this structure is located within a mapped Special Flood Hazard Area on the Flood Insurance Rate Map (FIRM), Panel 0150, with an effective date of June 19, 2008. 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 cost of improvements equals or exceeds 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 City regulations and/or code [cite pertinent sections].

We would be pleased to meet with you and your designated representative (architect/builder) to discuss the requirements and potential options for bringing the 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] on the FIRM. 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.

Sincerely,

Lisa Donaldson, Chief Inspector  
Department of Building Inspections  
888-999-0000  
lisa.donaldson@floodville.ny.gov

## ***Substantial Damage***

*Sample Letter to Notify Structure Owner of Determination*

### **NOTICE OF SUBSTANTIAL DAMAGE DETERMINATION**

Dear [name of structure owner]:

The City of Floodville has reviewed your recent application for a permit to repair [*describe proposed improvement/addition*] for the existing residential structure located at [insert structure address], Floodville, NY 14056. These repairs are required due to flood damage from the storms of July 26-28, 2013.

It has been determined that this structure is located within a mapped Special Flood Hazard Area on the Flood Insurance Rate Map (FIRM), Panel 0150, with an effective date of June 19, 2008. As required by our floodplain management regulations and/or building code, we have determined that the proposed repairs constitute Substantial Damage for the structure. This determination is based on a comparison of the cost estimate of the proposed cost of repairs to the pre-damage market value of the structure (excluding land value). When the cost of repairs equals or exceeds 50 percent of the pre-damage market value of the structure, the damages are considered Substantial Damage.

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

We would be pleased to meet with you and your designated representative (architect/builder) to discuss the requirements and potential options for bringing the 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] on the FIRM. 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.

Sincerely,

Lisa Donaldson, Chief Inspector  
Department of Building Inspections  
888-999-0000  
lisa.donaldson@floodville.ny.gov

**Work does NOT Constitute Repair of Substantial Damage**  
*Sample Letter to Notify Property Owner of Determination*

**NOTICE OF DETERMINATION**

Dear [name of structure owner]:

The City of Floodville has reviewed your recent application for a permit to repair [*describe proposed improvement/addition*] for the existing residential structure located at [insert structure address], Floodville, NY 14056. These repairs are required due to flood damage from the storms of July 26-28, 2013.

It has been determined that this structure is located within a mapped Special Flood Hazard Area on the Flood Insurance Rate Map (FIRM), Panel 0150, with an effective date of June 19, 2008. As required by our floodplain management regulations and/or building code, we have determined that the proposed repair work does not constitute Substantial Damage for this structure. This determination is based on a comparison of the cost estimate of the proposed cost of repairs to the pre-damage market value of the structure (excluding land value). When the cost of repairs equals or exceeds 50 percent of the pre-damage market value of the structure, the damage is considered Substantial Damage.

Please be advised that we may need to make another determination if you elect to perform work other than that described and defined in your current permit application. This could include additional renovations or upgrades or building an addition. Construction activities that are undertaken without a proper permit are violations of the City building code and may result in citations, fines, or other legal action.

Let me know if you have any questions on this matter.

Sincerely,

Lisa Donaldson, Chief Inspector  
Department of Building Inspections  
888-999-0000  
lisa.donaldson@floodville.ny.gov

## **Recommended Guidelines for Interaction with Structure Owners by SDE Inspectors**

1. The objectives of the SDE inspections are to accurately collect the data required for the Substantial Damage determinations through rapid visual inspections and then move on to the next structure. The initial inspections may require more than 30 minutes for a residential structure. After the first five or so residential inspections, the inspection time should be 15 minutes or less, as the inspectors gain experience and feel more comfortable with the inspections.
2. Remember that you are entering someone's home, structure, 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, Monday through Friday (Monday through Saturday), until all required structures have been inspected. This is in accordance with the inspection guidance provided in the community Letter of Introduction that you will be carrying during the inspection period.
4. Due to the extensive damage, many of the homes and buildings may be unoccupied. Our community legal counsel has determined that we can enter open, unoccupied structures. The structure must be unlocked and open, without any signs or other visible postings forbidding trespassing on the property or within the structure. Therefore, you may have little or no contact with many of the occupants as you complete the inspections.
5. When approached by a property owner or occupant, verify that the building being inspected is theirs and then hand them a community 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. The Letter of Introduction should be handed out to anyone who requests information about the inspections, including the "why" and under "what authority."
6. If you feel threatened in any manner, return to your vehicle and call the police and then the SDE Manager with the address and type of threat.
7. 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.
8. Unless specifically directed by the SDE Manager, 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.
9. Under the SDE Manager'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 conducted without a proper permit may be considered non-compliant construction and could result in daily fines and/or removal of the non-compliant construction.

10. 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 structure.
11. 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*.

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Appendix D  
Guidance for a Contractor or Community Estimate of Repairs

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**Required and 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)
- 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. \_\_\_\_\_

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

*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, paint, stucco, plaster, paneling, tile, 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. \_\_\_\_\_
- 11. \_\_\_\_\_
- 12. \_\_\_\_\_
- 13. \_\_\_\_\_
- 14. \_\_\_\_\_
- 15. \_\_\_\_\_

**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 service panel, 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. \_\_\_\_\_
- 10. \_\_\_\_\_
- 11. \_\_\_\_\_
- 12. \_\_\_\_\_
- 13. \_\_\_\_\_
- 14. \_\_\_\_\_
- 15. \_\_\_\_\_

**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 on top of the sub-flooring or finished floor
- 7. Outside improvements, including landscape, irrigation, sidewalks, driveways, fences, yard lights, swimming pools, pool enclosures, and detached accessory structures costs required for minimum necessary work to correct existing violations of health, safety, sanitary or building codes
- 8. Plug-in appliances such as washing machines and stoves
- 9. \_\_\_\_\_
- 10. \_\_\_\_\_
- 11. \_\_\_\_\_
- 12. \_\_\_\_\_
- 13. \_\_\_\_\_
- 14. \_\_\_\_\_
- 15. \_\_\_\_\_

Appendix E  
Guidance for Estimating Percent Damage for Residential Structures

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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.

Foundation		Damage Threshold			
		0-25%	25-50%	50-75%	Over 75%
Description	Continuous perimeter foundations, footings, and piers for internal beams and floor loads. Footing depth averages between 30 inches and 42 inches 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.	<p>Water level does not rise to the level of the bottom of the first floor of the structure.</p> <p>No scouring at the footings.</p>	<p>Water level rises just above first floor level.</p> <p>Limited scouring at the footings.</p>	<p>Water level is 4-7 feet against the outside of the building.</p> <p>Limited scouring at the footings.</p> <p>Soils are saturated and unstable</p>	<p>Water level is 7 feet or higher against the outside of the building.</p> <p>Limited scouring at the footings.</p> <p>Foundation is notably cracked and/or displaced. Structure has been knocked off its foundation.</p>
		<p>Some undermining but no visible cracking at concrete slab.</p>	<p>Soils are saturated.</p> <p>Undermining of the concrete slab, especially at corners - hairline cracks only.</p>	<p>Cracks noted on or along the foundation walls.</p> <p>Significant undermining of the concrete slab – significant cracking is visible.</p>	<p>Portions of the foundation are damaged or missing</p> <p>Significant undermining of the concrete slab - major cracking and separation of the concrete slab.</p>
	Common Damages	<p>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.</p>	<p>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.</p>	<p>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.</p>	<p>Settlement noted at the footings, due to erosion or unstable soils. Foundation wall damage – sections of the walls are cracking, displaced, and missing, causing an inherent instability to the support for the house. Use caution when approaching or entering the house.</p>
	Special Considerations for Coastal/High Velocity Floods	<p>Coastal floods may show more evidence of scouring at the supports - the foundation system may be better designed to resist this scouring action.</p> <p>High velocity floodwaters may create erosion/scouring that the building has not been designed to resist.</p>			

Superstructure (Wood Frame/Masonry)		0- 25%	25-50%	50-75%	Over 75%
Description	<p>The wall support systems that extend from the foundation wall to the roof structure. Superstructures include 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.</p>	<p>Water level does not rise to the level of the bottom of the first floor of the structure.</p>	<p>Water level rises just above first floor level.</p>	<p>Water level is up to 3 feet high on the first floor level.</p>	<p>Water is over 3 feet high on the first floor level of the house.</p>
	<p>Wood frame construction: Lightweight lumber or metal studs Interior wall framing (without sheathing) Typical exterior structural panel wall sheathing is plywood or hardboard</p>	<p>No damage to the roof framing.</p>	<p>Damage to the roof framing is limited.</p>	<p>Some damages to exterior walls.</p>	<p>Significant damages to exterior walls.</p>
	<p>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.)</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>
<p>Special Considerations for Coastal/High Velocity Floods</p>	<p>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, because they are already designed to resist higher wind conditions.</p>				

Roof Covering		0- 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.	<p>Minor wind damage to the roof coverings.</p> <p>Main surface areas are unaffected.</p> <p>Flashings are intact.</p> <p>No damages to the roof sheathing.</p>	<p>Some damaged areas of the roof from high-winds or damages from debris.</p> <p>Some sections of the roof covering are missing or loose.</p> <p>Some damages to the flashings.</p> <p>Minimal damage to the roof sheathing.</p>	<p>Significant damaged areas of the roof from high winds or damages from debris.</p> <p>Significant sections of the roof covering are missing or loose.</p> <p>Damages to the flashings allow some water infiltration at joints and roof penetrations.</p> <p>Significant damage to the roof sheathing - some areas of the sheathing will need replacement.</p>	<p>Large damaged areas of the roof from high winds or damages from debris.</p> <p>Major sections of the roof covering are missing or loose.</p> <p>Damages to the flashings allow significant water infiltration at joints and roof penetrations.</p> <p>Major damage to the roof sheathing - most of the roof sheathing will need replacement.</p>
	Threshold Markers				
	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	<p>Coastal areas have higher wind conditions requiring additional roof covering requirements.</p> <p>Damages to these roof coverings would indicate a higher percent of damages, because they are designed to resist higher wind conditions.</p> <p>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.</p>			

Exterior Finish		0-25%	25-50%	50-75%	Over 75%
Description	<p>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.</p> <p>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.</p>	<p><b>Threshold Markers</b></p> <p>Water level is less than 6 inches above the lowest floor level.</p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p>Water level is between 6 and 18 inches above the lowest floor level.</p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p>Water level is between 18 inches and 3 feet above the lowest floor level.</p> <p>The duration of the floodwaters is more than 12 hours.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>The duration of the floodwaters is more than 12 hours.</p>
	<b>Common Damages</b>	<p>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.</p>	<p>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 during '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.</p>	<p>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 is 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 substrate. 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 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 materials. Damaged house trim work will require replacement, especially at door and window casings.</p>	<p>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 is 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 substrate. Damaged house trim 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.</p>
	<b>Special Considerations for Coastal/High Velocity Floods</b>	<p>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 and exterior finishes, and from subsequent water infiltration. This will increase the percent of damages.</p>			

Interior Finish		0-25%	25-50%	50-75%	Over 75%
Description	<p>Interior finish includes the gypsum board, drywall, plaster, or paneling that makes up the wall surfaces. It also includes trim around door frames, baseboards, casings, chair rails, and ceiling moldings.</p> <p>Materials include low-grade wood/plastic composites, soft woods, and hard woods. Finishes include paint, stain, or varnish.</p> <p>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).</p>	<p><b>Threshold Markers</b></p> <p>Water level does not rise to the level of the first floor structure.</p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p>Water level rises just above the first floor level.</p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p>Water level is up to 3 feet above the first floor level.</p> <p>The duration of the floodwaters is more than 12 hours.</p>	<p>Water is more than 3 feet above the first floor level of the house.</p> <p>The duration of the floodwaters is more than 12 hours.</p>
		<p><b>Common Damages</b></p> <p>Wicking of the water and high moisture conditions into the finished materials at the subflooring 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.</p>	<p>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 need to 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.</p>	<p>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, window sills 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.</p>	<p>Water staining and damages at the baseboards, and 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, window sills 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, 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.</p>
	<p><b>Special Considerations for Coastal/High Velocity Floods</b></p>	<p>Damage to the interior finishes are more likely during high-wind conditions due to the loss of protection from missing roof coverings and exterior finishes, and from 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.</p>			

Doors and Windows		0-25%	25-50%	50-75%	Over 75%
<b>Description</b>	<p>This section includes all doors and windows of a structure, as well as locks, hinges, frames, and handles. 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.</p> <p>(This section does not include paint or stain.)</p>	<p><b>Threshold Markers</b></p> <p>Water level rises just to the floor structure of the first floor level.</p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p>Water level is just above the first floor.</p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p>Water rises to at least 12 inches above the first floor level.</p> <p>The duration of the floodwaters is more than 12 hours.</p>	<p>Water rises more than 12 inches above the first floor level.</p> <p>The duration of the floodwaters is more than 12 hours.</p>
	<b>Common Damages</b>	<p>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).</p>	<p>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).</p>	<p>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).</p>	<p>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.</p>
	<p><b>Special Considerations for Coastal/High Velocity Floods</b></p>	<p>Wind-driven rain in coastal areas will have a damaging effect on the quality of exterior doors and windows.</p>			

Cabinets and Countertops		0-25%	25-50%	50-75%	Over 75%
Description	<p>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.</p> <p>Paint-grade cabinets are the baseline because they can be painted to match upper wall cabinets, when they are repairable, to return the house to pre-disaster conditions.</p> <p>Damaged cabinets with hardwood face-frames, doors, and drawers will require replacement based on the depth of flooding above the floor. Therefore, if the flood depth only damages the base cabinet and countertops, the percent damage will be 60% or less.</p>	<p><b>Threshold Markers</b></p> <p>Water level is less than 4 inches above the finished floor level.</p>	<p>Water level is between 4 and 12 inches above the finish floor level.</p> <p>Flood duration is short - no prolonged exposure to water or contaminants.</p>	<p>Water level is between 1 foot and 3 feet above the finish floor level.</p> <p>Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.</p>	<p>Water level is more than 3 feet above finish floor level.</p> <p>Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.</p>
	<p><b>Common Damages</b></p> <p>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.</p>	<p>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.</p>	<p>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.</p>	<p>Replace base cabinets and upper 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.</p>	

Floor Finish		0-25%	25-50%	50-75%	Over 75%
Description	<p>Materials for floor finish include: carpet, hardwood, vinyl composition tile, sheet vinyl, floor cover, ceramic tile, and marble. Sub-flooring is also included.</p> <p>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.</p>	<p><b>Threshold Markers</b></p> <p>Water level does not rise to the level of the bottom of the first floor structure.</p> <p>No damages to the floor sheathing.</p>	<p>Water level rises just to the first floor level.</p> <p>Water level inundates the sub-flooring but does not rise to the finish floor materials.</p> <p>Minimal damage to the floor sheathing.</p>	<p>Water level is above the first floor.</p> <p>Water level inundates above the sub-flooring and finish floor materials.</p> <p>Significant damage to the floor sheathing - some areas of the sheathing will need replacement.</p>	<p>Water level is well above the first floor.</p> <p>Water level inundates above the sub-flooring and finish floor materials.</p> <p>Major damage to the floor sheathing - most of the floor sheathing will need replacement.</p>
	<p><b>Common Damages</b></p> <p>No damage is anticipated in the floor finish system at this water level.</p>	<p>The sub-flooring may be damaged or delaminated by high-humidity conditions, and may need to be repaired or replaced.</p>	<p>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 subfloor.</p>	<p>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.</p>	
	<p><b>Special Considerations for Coastal/High Velocity Floods</b></p>	<p>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 and exterior finishes, and from subsequent water infiltration. This will significantly increase the percent of damages.</p>			



Plumbing		0-25%	25-50%	50-75%	Over 75%
<b>Description</b>	<p>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.</p> <p>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.</p>	<p><b>Threshold Markers</b></p> <p>Water level is less than 6 inches above the lowest floor level.</p>	<p>Water level is between 6 inches and 18 inches above the lowest floor level.</p> <p>Flood duration is short - no prolonged exposure to water or contaminants.</p>	<p>Water level is between 18 inches and 3 feet above the lowest floor level.</p> <p>Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.</p>
	<p><b>Common Damages</b></p>	<p>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.</p>	<p>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.</p>	<p>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.</p>	<p>All plumbing fixtures will backflow into the house. Septic contamination will occur. The water heater will need to be replaced.</p>
	<p><b>Special Considerations for Coastal/High Velocity Floods</b></p>	<p>Houses in coastal areas may have additional plumbing fixtures and piping on the exterior of the house.</p>			

Electrical		0-25%	25-50%	50-75%	Over 75%
Description	<p>100- to 200-amp electrical service providing circuit breaker panels and distribution wiring. Basic wiring (15/20 amp) for outlets, switches, receptacles, and lighting; 25- to 60-amp wiring systems for outlets for a washer, dryer, stove, and refrigerator.</p> <p>(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.</p>	<p>Water level is less than 12 inches above the finished floor level.</p> <p>Minor electrical components and limited wiring are inundated but remain below normal receptacle height.</p>	<p>Water level is between 12 inches and 18 inches above the finish floor level.</p> <p>A significant number of wiring components and limited wiring are inundated, floodwaters above the normal receptacle height.</p>	<p>Water level is between 18 inches and 3 feet above the lowest floor level.</p> <p>A significant number of wiring components and a significant amount of wiring is inundated - floodwaters above normal wall switch height.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>Most of the wiring components and a significant amount of wiring are inundated - floodwaters above normal wall switch height.</p>
	Common Damage Details	<p>If the main electrical power source is located in the basement, the panel will 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.</p>	<p>Modern Romex wiring that is inundated only for short durations (without wetting the ends/joints/terminations) can be dried and reused. Older nonmetallic 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.</p>	<p>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.</p>	<p>Modern Romex wiring that is inundated only for long durations should be replaced. Older nonmetallic 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.</p>

Appliances		0- 25%	25-50%	50-75%	Over 75%
Description	Common, built-in appliances that would be included are the dishwasher, hot water tank, and some stoves.	<p>Water level is less than 6 inches above the finished floor level.</p> <p>Water level is in the floor area of the appliances but not into the equipment operating system.</p> <p>The appliances may be cleaned and reconditioned.</p>	<p>Water level is between 6 inches and 12 inches above the finished floor level.</p> <p>Water level is in the floor area of the appliances and into the equipment operating system.</p> <p>Some of the appliances will need to be replaced.</p>	<p>Water level is between 12 inches and 18 inches above the finish floor level.</p> <p>Water level is in the floor area of the appliances and into the equipment operating system.</p> <p>Most of the appliances will need to be replaced.</p>	<p>Water level is between 18 inches and 3 feet above the finish floor level.</p> <p>Water level is in the floor area of the appliances and into the equipment operating system.</p> <p>All of the appliances will need to be replaced.</p>
		<p>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.</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>

HVAC		0- 25%	25-50%	50-75%	Over 75%
Description	<p>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.</p> <p>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. Ducts with water infiltration 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.</p> <p>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.</p>	<p>Water level is less than 6 inches above the lowest floor level.</p> <p>Water level is in the lower ducts but not into the air handler or equipment operating system.</p> <p>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 will need to be replaced.</p>	<p>Water level is between 6 inches and 12 inches above the finish floor level.</p> <p>Water level is into the lower ducts and the air handler, but not into the equipment operating system.</p> <p>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 will need to be replaced.</p>	<p>Water level is between 12 inches and 3 feet above the finish floor level.</p> <p>Water level is into the lower ducts, air handler, and the equipment operating system.</p> <p>The fuel-fired equipment (burners/controls) is inundated.</p> <p>The condenser unit needs to be replaced.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>Water level is into the duct distribution system, air handler, and the equipment operating system.</p> <p>The fuel-fired equipment (burners/controls) is inundated.</p> <p>The condenser unit needs to be replaced.</p>
	Common Damages	<p>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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>	<p>If 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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>	<p>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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>	<p>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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>

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

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**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.

Foundation		Damage Threshold				
		0- 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 building. Use caution when approaching or entering the building.
<b>Special Considerations for Coastal/High Velocity Floods</b>		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.				

Superstructure (Wood Frame/Masonry)		0-25%	25-50%	50-75%	Over 75%
Description	<p>The wall support systems that extend from the foundation wall to the roof structure. Superstructures include 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.</p> <p>Wood frame construction: Lightweight lumber or metal studs Interior wall framing (without sheathing) Typical exterior structural panel wall sheathing is plywood or hardboard</p> <p>Masonry construction: Typically concrete or CMUs, with steel reinforcement. Typical exterior covers are stucco, siding (aluminum, vinyl, or wood), and masonry veneer</p>	<p>Water level does not rise to the level of the bottom of the first floor of the structure.</p> <p>No damage to the roof framing.</p> <p>No wind damage to the superstructure.</p>	<p>Water level rises just above first floor level.</p> <p>Damage to the exterior walls is limited.</p> <p>Damage to the roof framing is limited.</p>	<p>Water level is up to 3 feet high on the first floor level.</p> <p>Some damage to exterior walls.</p> <p>Some damage to sections of the roof framing.</p>	<p>Water is over 3 feet high on the first floor level of the building.</p> <p>Significant damage to exterior walls.</p> <p>Significant damage to the main portion or multiple sections of the roof framing. Pressurization and failure of framing connections.</p>
		<p>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.</p>	<p>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.</p>	<p>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.</p>	<p>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.</p>
	<p>Special Considerations for Coastal/High Velocity Floods</p>	<p>Coastal areas have higher wind conditions requiring additional exterior wall structural panels, shear walls, and braced wall panels.</p> <p>Damages to these wall structural systems would indicate a higher percent of damages, because they are already designed to resist higher wind conditions.</p>			



Roof Covering		0-25%	25-50%	50-75%	Over 75%
<p>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.</p>	<b>Threshold Markers</b>	<p>Minor wind damage to the roof coverings.</p> <p>Main surface areas are unaffected.</p> <p>Flashings are intact.</p> <p>No damages to the roof sheathing.</p>	<p>Some damaged areas of the roof from high winds or damages from debris.</p> <p>Some sections of the roof covering are missing or loose.</p> <p>Some damages to the flashings.</p> <p>Minimal damage to the roof sheathing.</p>	<p>Significant damaged areas of the roof from high winds or damages from debris.</p> <p>Significant sections of the roof covering are missing or loose.</p> <p>Damages to the flashings allow some water infiltration at joints and roof penetrations.</p> <p>Significant damage to the roof sheathing - some areas of the sheathing will need replacement.</p>	<p>Large damaged areas of the roof from high winds or damages from debris.</p> <p>Major sections of the roof covering are missing or loose.</p> <p>Damages to the flashings allow significant water infiltration at joints and roof penetrations.</p> <p>Major damage to the roof sheathing - most of the roof sheathing will need replacement.</p>
	<b>Common Damages</b>	<p>Roof covering mostly intact. Some minor damage - some torn or loose parts of covering in limited areas.</p>	<p>Some areas where the roof was damaged by high winds. Several small areas of exposed roof sheathing as a result of missing/damaged covering.</p>	<p>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.</p>	<p>Major areas of the roof where the shingles/tile are missing, allowing rainwater to freely enter the building below. Significant damage to roof covering and roof sheathing from strong winds or windborne debris penetrating the roof assembly.</p>
<p><b>Special Considerations for Coastal/High Velocity Floods</b></p>		<p>Coastal areas have higher wind conditions requiring additional roof covering requirements. Damages to these roof coverings would indicate a higher percent of damages, because they are designed to resist higher wind conditions.</p> <p>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.</p> <p>It is also possible that the local building code will require that the entire roof covering be removed and replaced.</p>			

Interiors		0-25%	25-50%	50-75%	Over 75%
Description	<p>Interiors include the partitions, interior doors, and surface finishes (for walls, floors, and ceilings). Materials include low-grade wood/plastic composites, soft woods, and hard woods. Finishes include paint, stain, or varnish.</p> <p>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).</p> <p><b>NOTE: 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.</b></p>	<p><b>Water level does not rise to the level of the first floor structure.</b></p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p><b>Water level rises just above the first floor level.</b></p> <p>The duration of the floodwaters is limited - less than 12 hours.</p>	<p><b>Water level is up to 3 feet above the first floor level.</b></p> <p>The duration of the floodwaters is more than 12 hours.</p>	<p><b>Water is more than 3 feet above the first floor level of the building.</b></p> <p>The duration of the floodwaters is more than 12 hours.</p>
	Common Damages	<p>Wicking of the water and high moisture conditions into the finished materials at the subflooring 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.</p>	<p>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 need to 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 cabinet bases in bathrooms may require repainting.</p>	<p>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, window sills 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 upper and lower paint-grade cabinets should be repainted where lower cabinets were repaired or replaced.</p>	<p>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, window sills 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 upper and lower cabinets, where these are paint-grade cabinets.</p>
	Threshold Markers	<p>Damages to the interior finishes are more likely during high-wind conditions due to the loss of protection from missing roof coverings and exterior finishes, and from 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.</p>			
Special Considerations for Coastal/High Velocity Floods					

Plumbing		0-25%	25-50%	50-75%	Over 75%
Description	<p>The plumbing system includes the incoming water service (municipal water supply or well service), the water heater, water distribution piping, fire protection system, 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.</p> <p>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 building through the sewer lines. Verify the condition of the potable water supply to determine if it can provide a safe water supply.</p>	<p>Water level is less than 6 inches above the lowest floor level.</p>	<p>Water level is between 6 inches and 18 inches above the lowest floor level.</p> <p>Flood duration is short - no prolonged exposure to water or contaminants.</p>	<p>Water level is between 18 inches and 3 feet above the lowest floor level.</p> <p>Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>Flood duration is longer than 12 hours - prolonged exposure to water and contaminants.</p>
		Common Damages	<p>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.</p>	<p>Floor drains, shower drains, bathtubs, and toilets can backflow into the building. Septic contamination is likely. Water heaters may need to be replaced.</p>	<p>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.</p>
	Special Considerations	<p>The plumbing systems in place in the buildings may vary significantly, and damage thresholds should account for the situation of the building being assessed.</p>			

Electrical		0-25%	25-50%	50-75%	Over 75%
<b>Description</b>	<p>Consists of all electrical components on the property site, such as electrical wiring, communications, conveyance, lighting, and security.</p> <p>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 will significantly affect the percent damage to this element. For this example, equipment is assumed to be on the first floor. In multi-story buildings where equipment is on floors higher than where the flooding is occurring, these percent damage estimates would be significantly lower.</p>	<p>Water level is less than 12 inches above the finished floor level.</p> <p>Minor electrical components and limited wiring are inundated but remain below normal receptacle height.</p>	<p>Water level is between 12 inches and 18 inches above the finish floor level.</p> <p>A significant number of wiring components and limited wiring are inundated, and floodwaters are above the normal receptacle height.</p>	<p>Water level is between 18 inches and 3 feet above the lowest floor level.</p> <p>A significant number of wiring components and a significant amount of wiring is inundated - floodwaters are above normal wall switch height.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>Most of the wiring components and a significant amount of wiring are inundated - floodwaters are above normal wall switch height.</p>
		<b>Common Damage Details</b>	<p>If the main electrical power source is located in the basement, the panel will 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.</p>	<p>Modern Romex wiring that is inundated only for short durations (without wetting the ends/joints/terminations) can be dried and reused. Older nonmetallic 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.</p>	<p>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.</p>
<b>Special Considerations</b>		<p>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.</p>			

HVAC		0-25%	25-50%	50-75%	Over 75%	
Description	Threshold Markers	<p>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 building.</p> <p>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. Ducts with water infiltration 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.</p> <p>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.</p>	<p>Water level is less than 6 inches above the lowest floor level.</p> <p>Water level is in the lower ducts but not into the air handler or equipment operating system.</p> <p>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.</p> <p>Minor to no damage to exterior HVAC components.</p>	<p>Water level is between 6 inches and 12 inches above the finished floor level.</p> <p>Water level is into the lower ducts and the air handler, but not into the equipment operating system.</p> <p>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.</p> <p>Minor to some damage to exterior HVAC components.</p>	<p>Water level is between 12 inches and 3 feet above the finish floor level.</p> <p>Water level is into the lower ducts, air handler, and the equipment operating system.</p> <p>The fuel-fired equipment (burners/controls) is inundated.</p> <p>The condenser unit needs to be replaced.</p> <p>Some damage to some exterior HVAC components. Some components may have connection failures and some became windborne debris.</p>	<p>Water level is more than 3 feet above the lowest floor level.</p> <p>Water level is into the duct distribution system, air handler, and the equipment operating system.</p> <p>The fuel-fired equipment (burners/controls) is inundated.</p> <p>The condenser unit needs to be replaced.</p> <p>Significant damage to many exterior HVAC components. Components may have connection failures and components became windborne debris.</p>
		Common Damages	<p>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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>	<p>If 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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>	<p>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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>	<p>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), the ducts should be replaced. All ducts that are being reused will require cleaning.</p>

