SUSTAINMENT MANAGEMENT SYSTEM

U.S. ARMY CORPS OF ENGINEERS

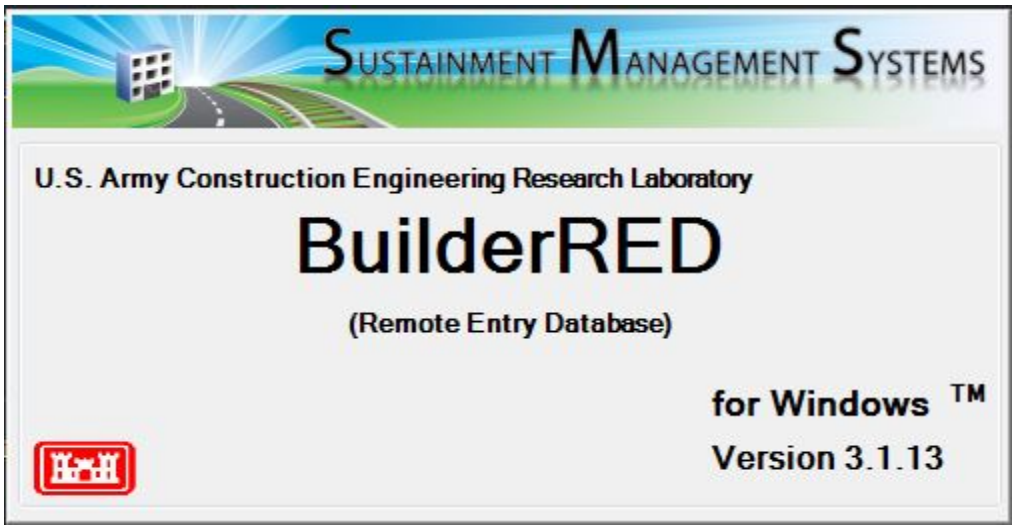
ENGINEER RESEARCH AND DEVELOPMENT CENTER

BRED User Manual

Version 3.1 Non-DOD

BRED Table of Contents

Introduction to BuilderRED



BuilderRED is Remote Entry Database software for collecting and storing building inventory and inspection information electronically. Using BuilderRED for collecting and storing this information instead of pen and paper techniques provides the following advantages to the user:

- Distress definitions are available on screen
- Recorded condition survey data is easily uploaded into the BUILDER database
- Data loading from paper to computer is eliminated, reducing error and saving time
- Previous condition survey data and sample locations are available on-screen
- dropdown lists of the component-sections pertaining to the inspected building are provided
- The condition survey checklists are provided on screen
- Component-section amounts are displayed on-screen
- A tally is provided that informs of the number of samples and amount sampled
- Inventory can be collected for loading into BUILDER
- Inventory can be verified and updated during the condition survey

Because of its numerous advantages over pen and paper techniques, it is strongly recommended that BuilderRED is used to save time and increase the accuracy of the data collected.

System Requirements

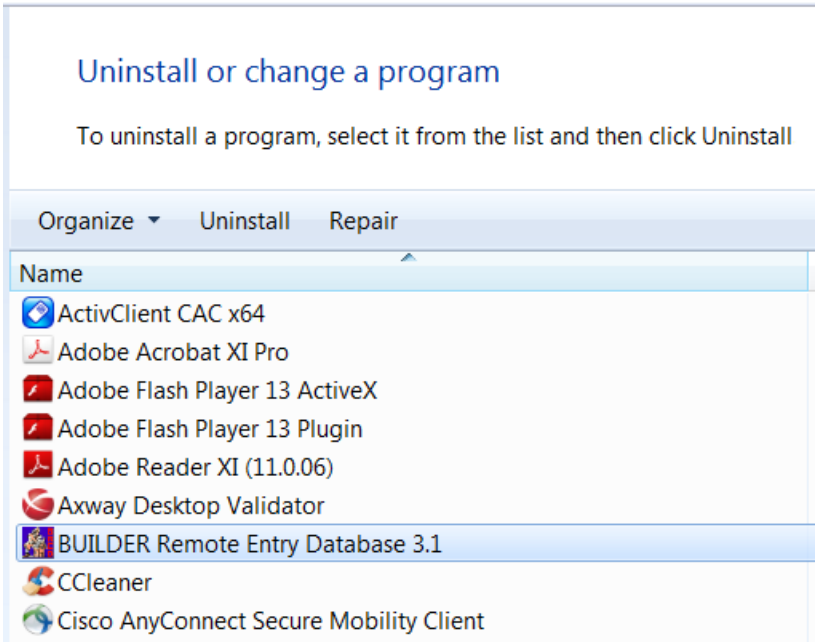
To properly operate BuilderRED, the user will need the following:

- Windows based tablet (NOT the RT version) or laptop
- Floppy drive, zip drive, flash drive, or a mapped network card to transfer data
- Windows 9x, NT, 2000, XP, or Windows 7 operating systems
- 32 Megabytes (MB) of RAM
- 32 MB of hard disk space

Note: For ease of inspection, it is recommended that BuilderRED is run on a Windows based tablet or laptops. However, BuilderRED can also be run on desktop computers.

Installation Instructions

Before BuilderRED version 3.1 is installed, all older versions of the program (prior to version 3.1.8) must be removed first. To remove old versions of BuilderRED, open My Computer >> Control Panel >> Add/Remove Programs.



Highlight "BuilderRED" and click the "Remove" button.

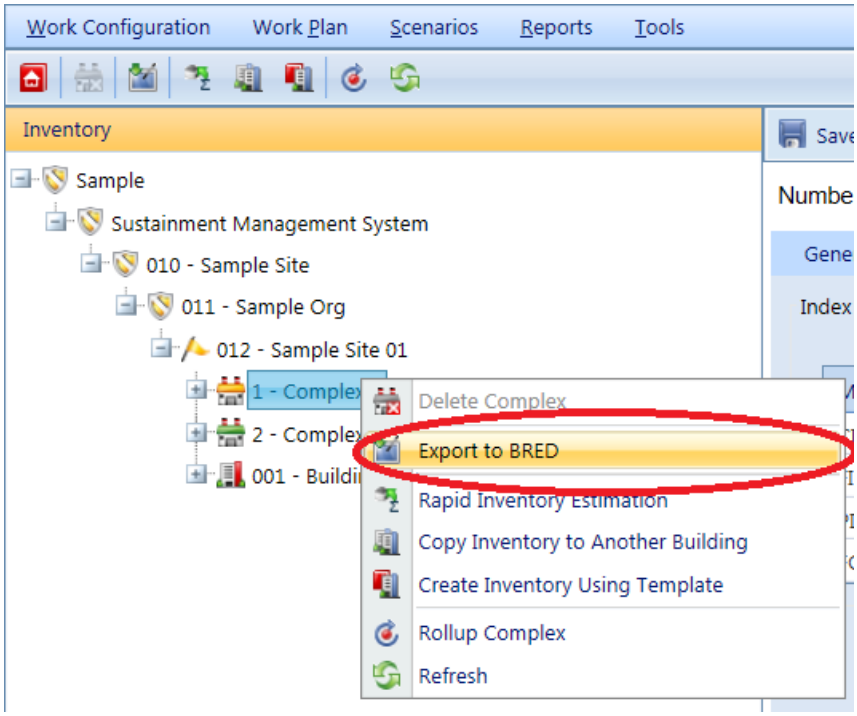
After the old versions have been successfully removed, insert the BuilderRED version 3.1 software and follow installation wizard directions.

Loading Data into BuilderRED

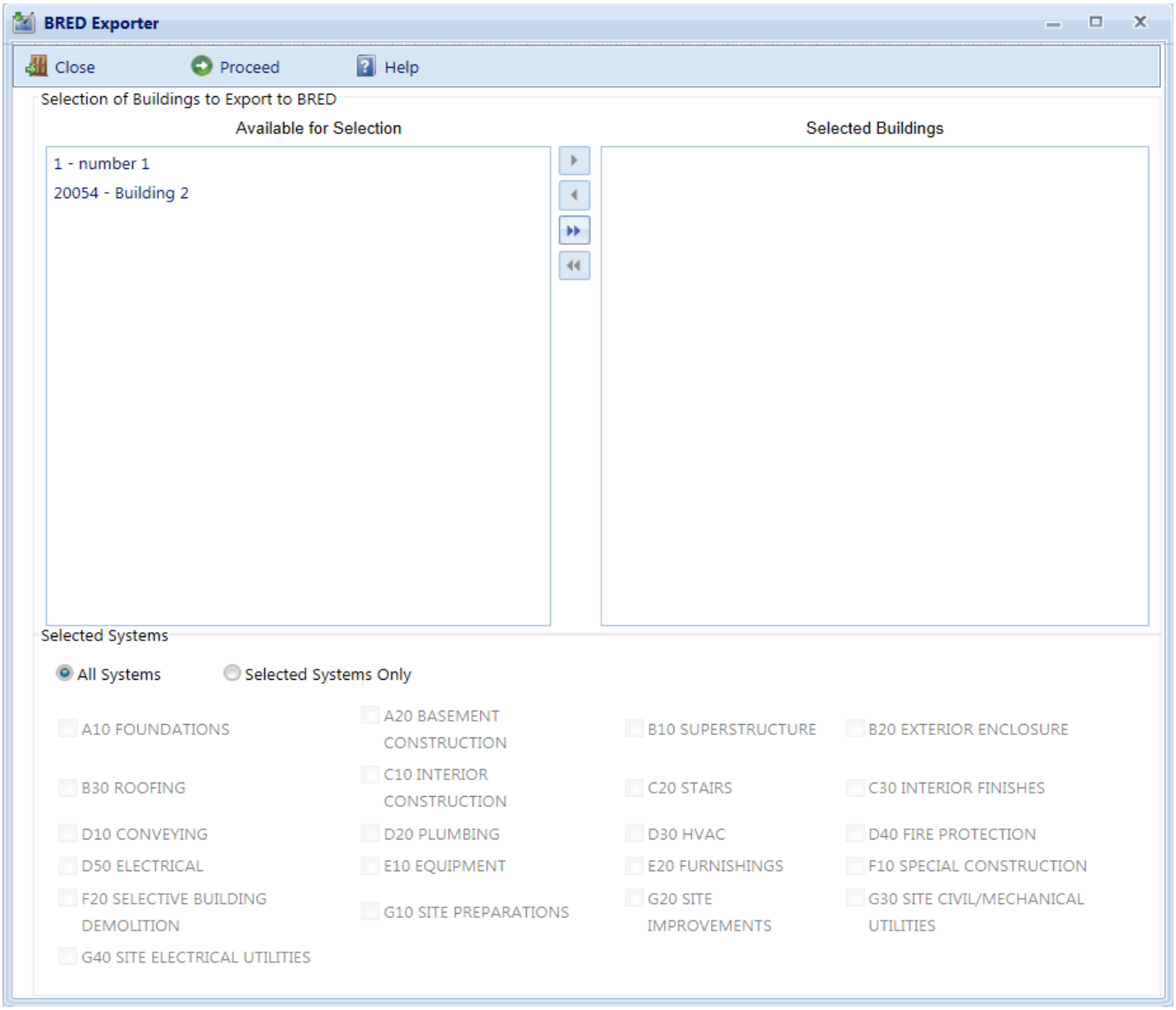
Before the user can record inventory and inspection data in BuilderRED, a database containing necessary information needs to be created in BUILDER version 3.1 and opened in BuilderRED. To do so, the user must first export the desired building and system data from BUILDER.

Exporting a Database from Builder to BuilderRED:

1. Open BUILDER version 3.1.
2. From the inventory tree, navigate to the site level, or below, and right click “Export to BRED” under the Inventory drop down menu.



The "BRED Exporter" window will appear.



3. Choose the desired building(s) to export.

- To add a building(s) to export, highlight the desired building(s) under "Available for Selection" and click the “>” button.
- To remove a building(s) from export, highlight the building(s) under "Selected Buildings" and click the “<” button.
- To export all buildings "Available for Selection" click the ">>" button.
- To remove all "Selected Buildings" click the "<<" button.

4. Choose the desired system(s) to export.

- To select all systems, choose the "All systems" button.
- To select individual systems, select "Selected systems only" and check the boxes of the systems to export.

5. Click the “Proceed” button.

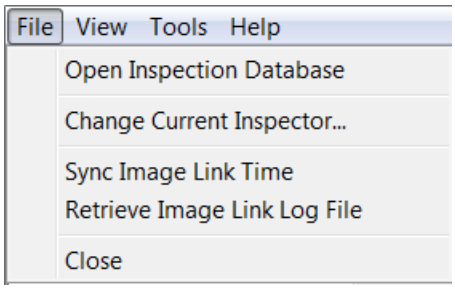
A Microsoft Access database will be created, which is identified by path and name you chose after the export has completed. Normally, the path is your Documents folder, Downloads folder, or Desktop folder, depending on preferences set within Windows. The exported database will contain the inventory and condition assessment data for the selected systems in the buildings in the Selected Buildings list.

After the database has been successfully exported, it is ready for BuilderRED to be run on.

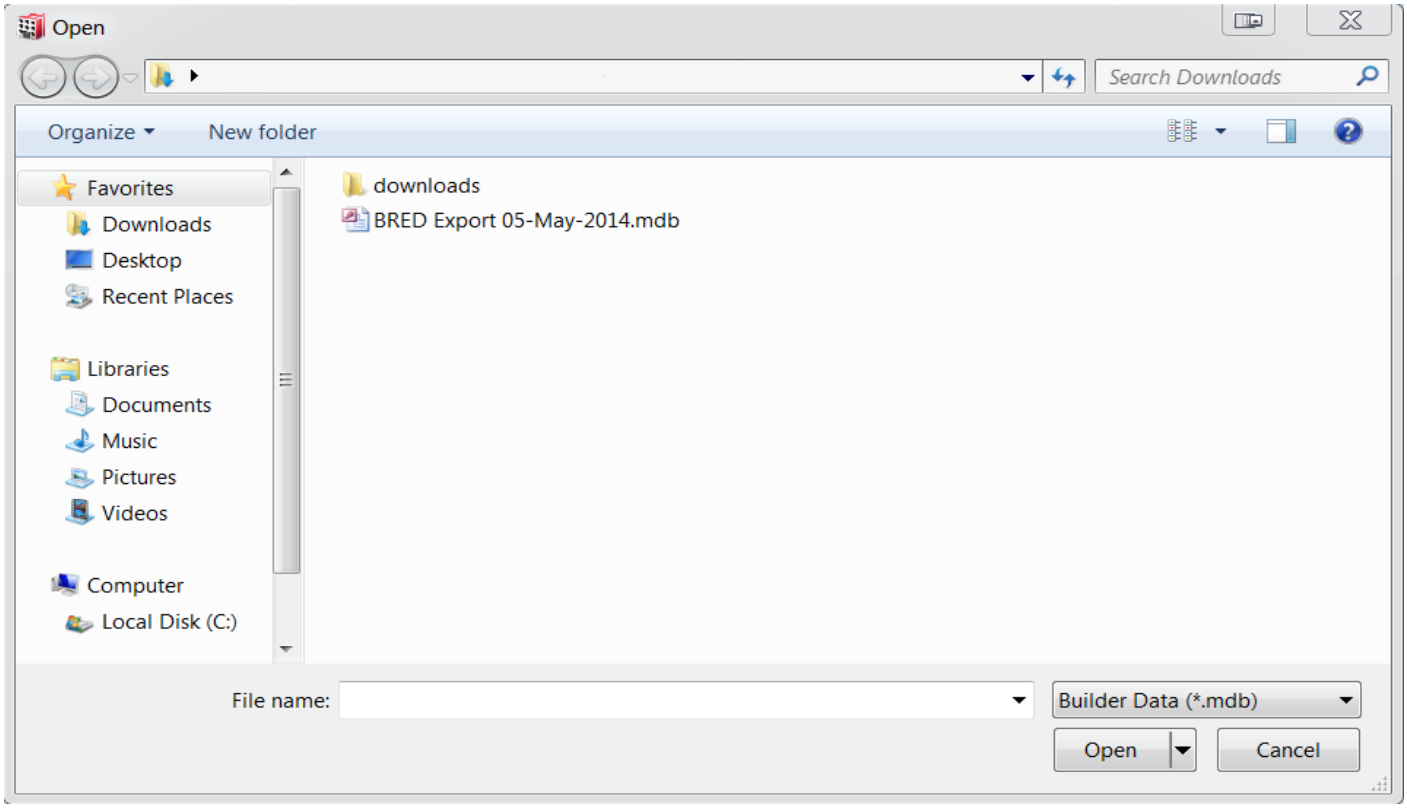
Opening the Database in BuilderRED

To open the database in BuilderRED:

1. Choose “Open Inspection Database” from the "File" menu.



2. Select the exported database with the .mdb extension from the proper location.



3. Click "Open."

   The database will open in BuilderRED, and new inventory and inspection data can be recorded.

It is important to note that many of BUILDER's system files that hold the program data are Microsoft Access databases as well, and therefore have an .mdb extension. Do not get these confused with your database file.

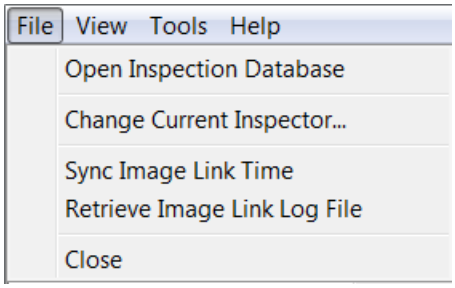
BuilderRED Menu Bar

In BuilderRED, there are four menus located on the menu bar at all times:

- File
- View
- Tools
- Help

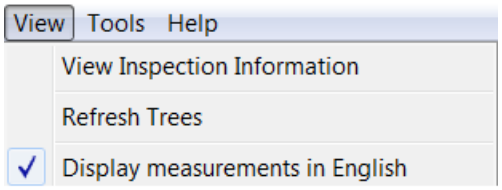
The File menu is used to:

- Open inspection database (BUILDER exported) in BuilderRED
- Change the current inspector
- Close BuilderRED



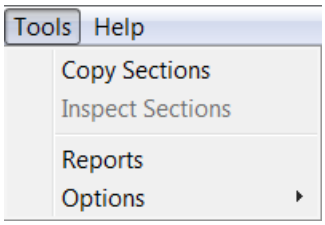
The View menu is used to:

- Change between the inventory and inspection screens
- Refresh the inventory and inspection trees
- Change the units of measure between Metric and English



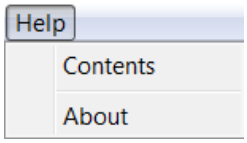
The Tools menu is used to:

- Copy multiple sections from one floor to another
- Add multiple sections to inspect at a sample location



The Help menu is used to:

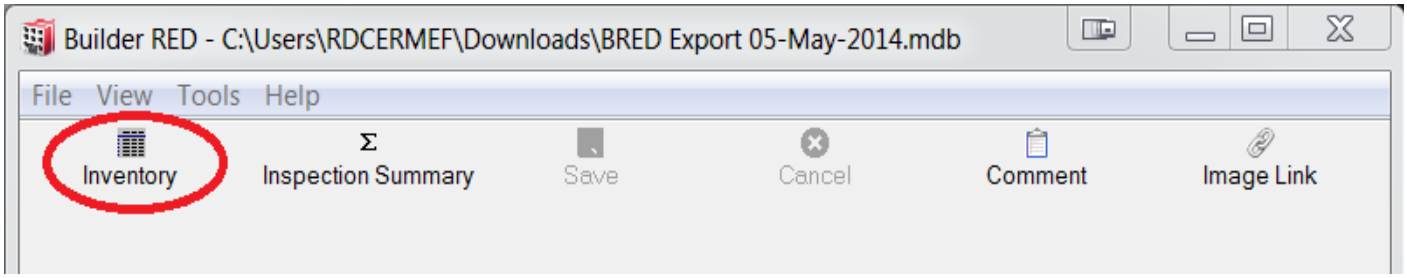
- Open the contents of the BuilderRED help file
- Open the about section of the BuilderRED help file



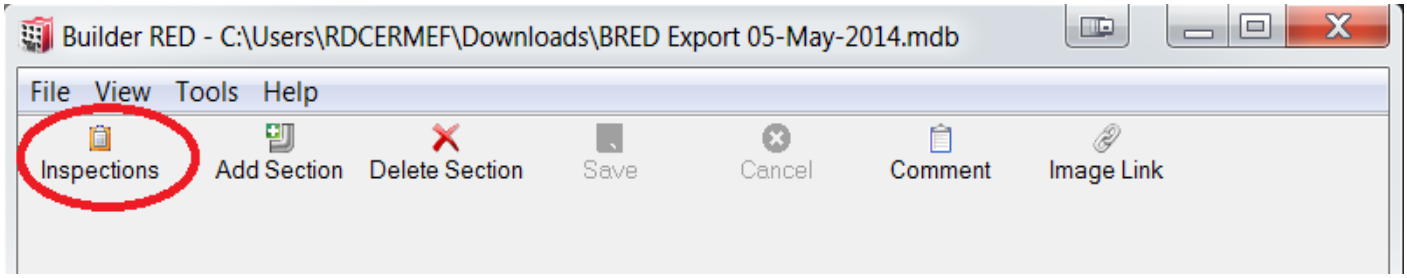
BuilderRED Modes

BuilderRED allows the user to switch between two main operating modes:

- Inventory - Allows the user to view, add, edit, and delete building, system, component, and section data.



- Inspections - Allows the user to view past inspections and create new inspections.



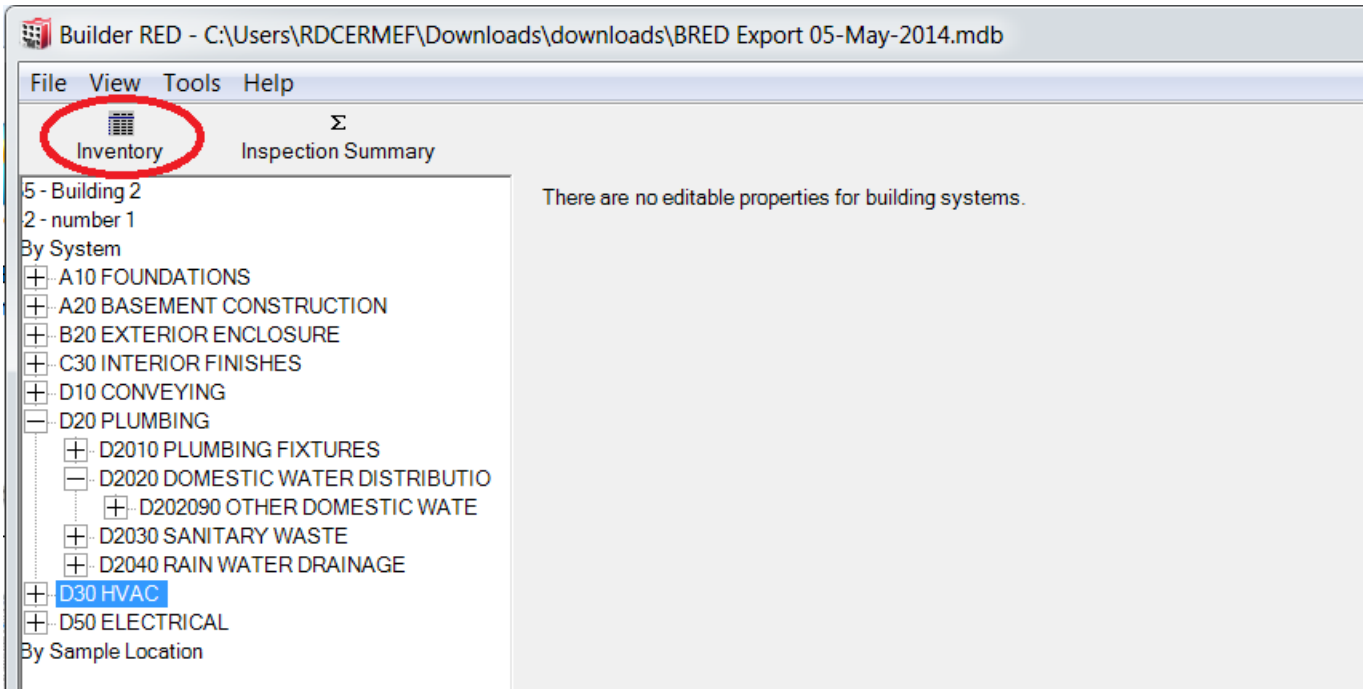
Basics of the Inventory Toolbar and Tree

One advantage of BuilderRED version 3.1 is the ability to collect and edit inventory data in the inventory mode. When collecting inventory data in a building for the first time, it is recommended that the user collect the inventory data first and perform the inspection second, although BuilderRED allows the user to do both simultaneously. If building inventory is already present from a previous audit, the user can view this information and make changes in BuilderRED if necessary.

Operating in Inventory Mode

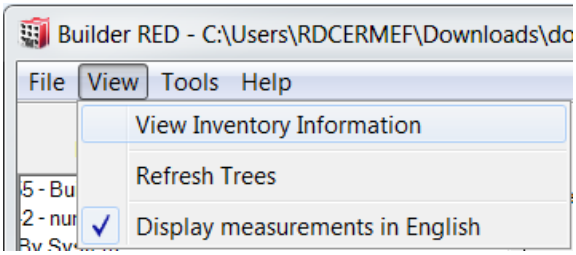
To operate in the inventory mode:

- Select the "Inventory" button on the BuilderRED toolbar.



OR

- Select “View Inventory Information” from the "View" menu

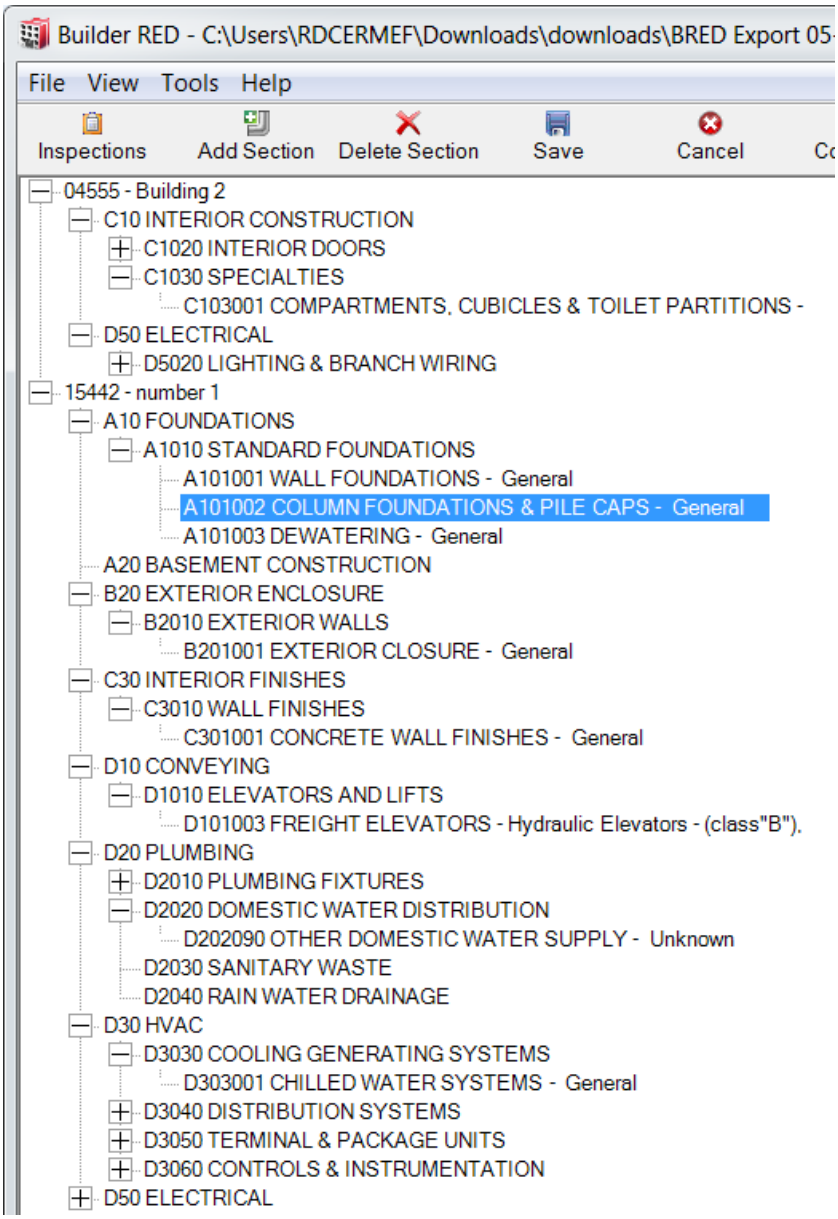


Inventory Toolbar

In Inventory mode, the following toolbar, with minor variations, will appear:

Inventory Tree

In the split window the left side displays the inventory tree, which acts as a map of the inventory in the database.



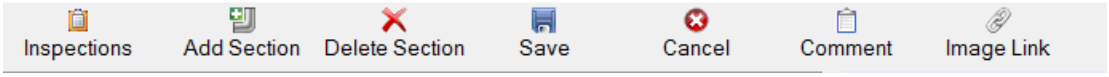
The inventory tree organization is:

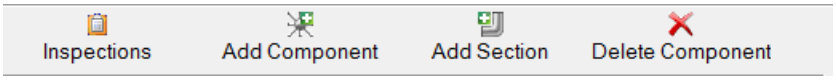
- Building
  - System
    - Component
      - Section

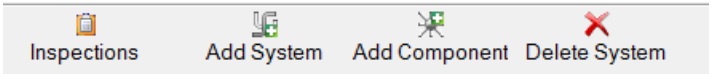
Here, the tree can be expanded by clicking on the "+" next to an inventory level or collapsed by clicking on the "-" next to an inventory level. To select a particular inventory level, left-click on it. The information pertaining to that inventory level will be displayed in the right side of the split screen. Note that above the map is the heading “Inventory” to remind the user that they are in Inventory mode.

Inventory Toolbar Variations

The Inventory Toolbar may appear in three different ways, depending on the user's location in the inventory tree.

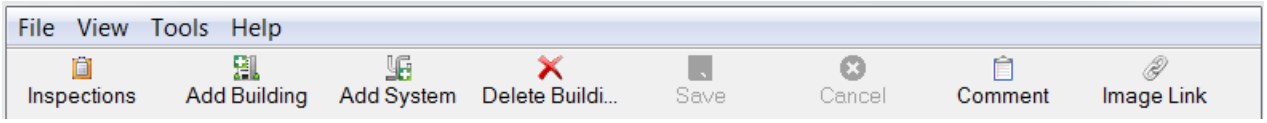






Building Basics

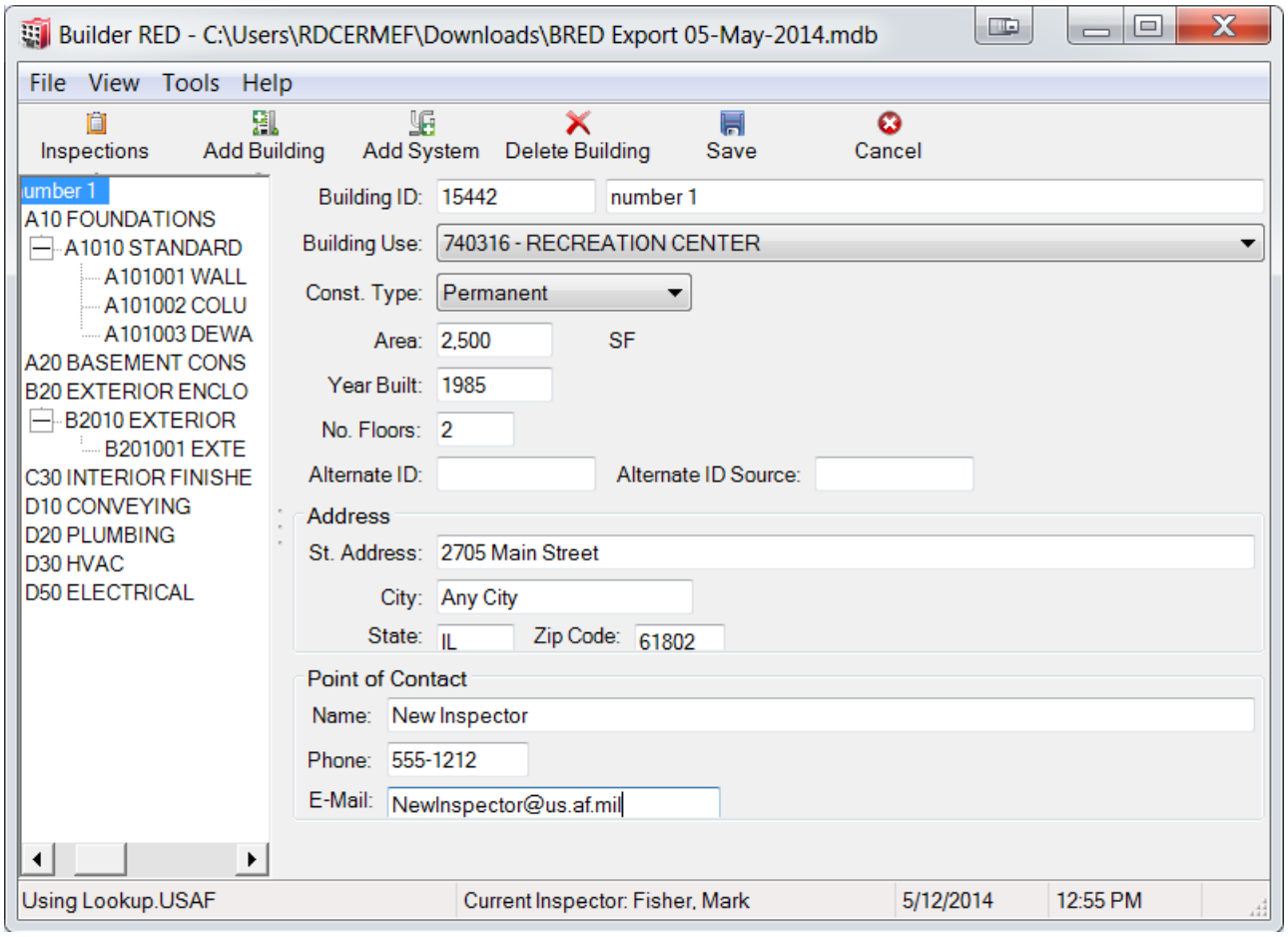
The BuilderRED hierarchy begins with the building level. The tree on the left side of BuilderRED displays each of the buildings in the database opened in BuilderRED. Clicking on a building highlights its name and will offer the following toolbar options:



- Inspection. Click this button to switch to inspection mode.
- Add Building. Click this button to add a new building.
- Add System. Click this button to add a new system
- Delete Building. Click this button to delete a building.
- Edit. Click this button to edit the building information.
- Save. Click this button to save changes made to building information.
- Cancel. Click this button to cancel all changes made to building information since the last save.
- Comments. Click this button to add building comments.

Viewing and Editing Building Information

The tree on the left side of BuilderRED displays each of the buildings in the database. Clicking on a building highlights its name and displays the building information to the right. Building information shown includes the building use, type, address, point of contact, etc. Note that above the building information is the building ID number and building name to remind users where they are on the tree map at all times.



In addition to viewing the building information, the user can edit the building information in BuilderRED if desired. To edit building information:

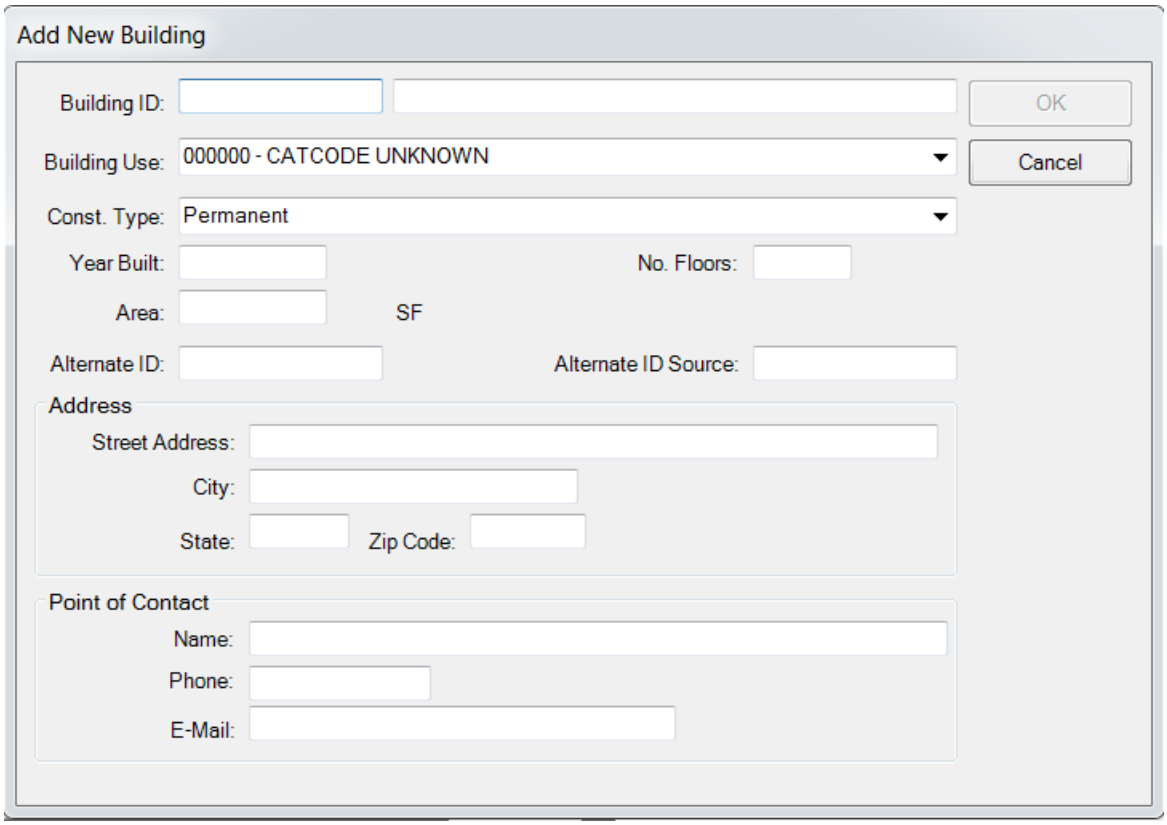
1. Edit the proper building information.
2. Click the "Save" button on the BuilderRED toolbar to save the changes made to the building to the database or click the "Cancel" button to discard the changes to the building.

Adding a Building

To add a new building to the BuilderRED database:

1. Click the "Add Bldg." button on the BuilderRED toolbar.

The “Add New Building” window will appear.

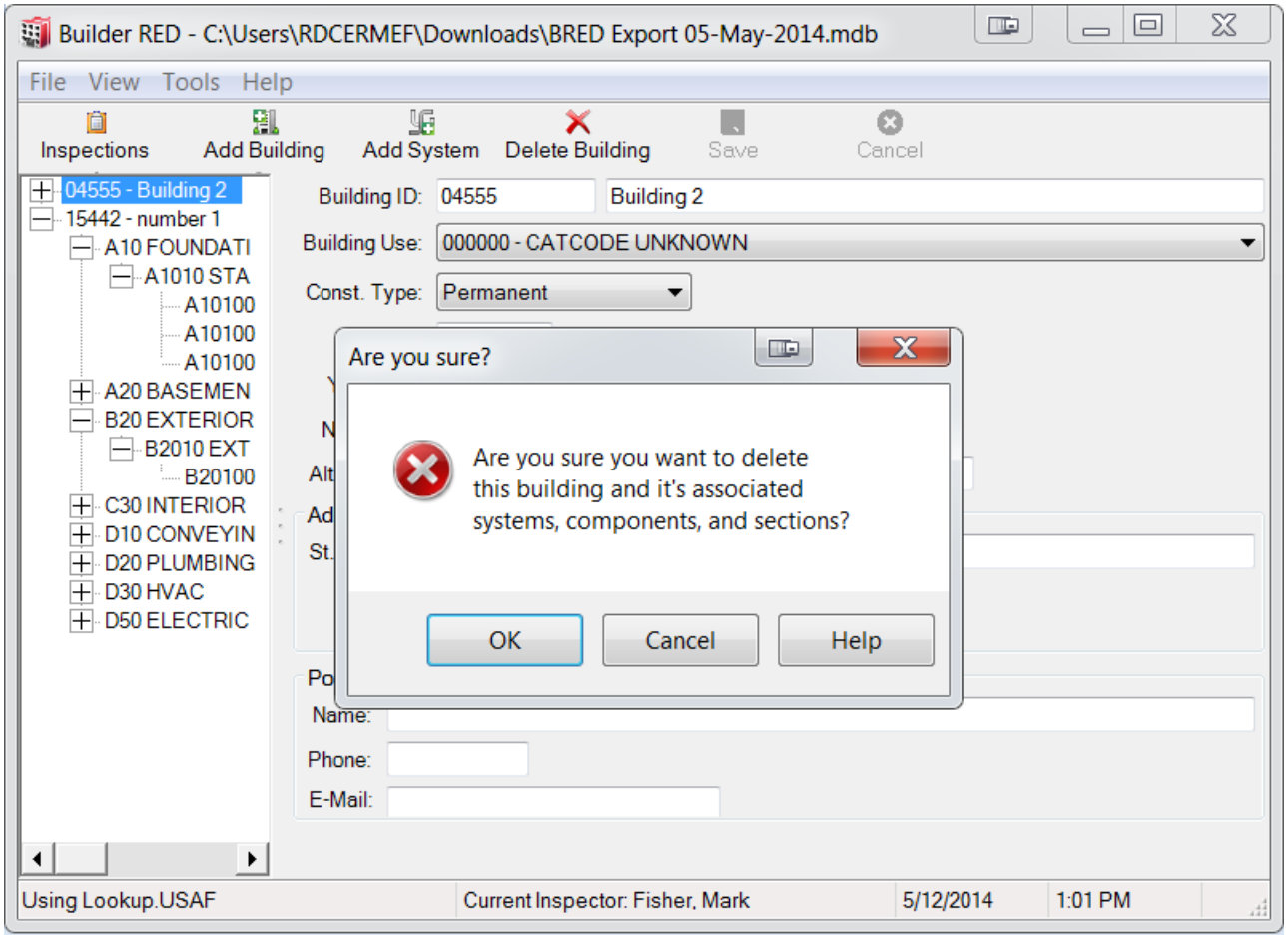


2. Enter the information for the new building. Click on each field in the screen shot above for a complete description of the data that should be entered.
3. Click "OK" to save the new building to the database or click the "Cancel" button to discard the building without saving it to the database. After saving the building, it will appear on the inventory tree.

Deleting a Building

To delete a building from the BuilderRED database:

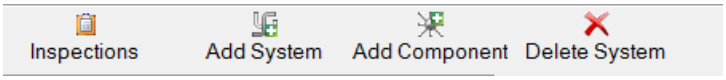
1. Highlight the building for removal in the inventory tree.
2. Click the "Del. Bldg." button on the BuilderRED toolbar. A prompt will appear to confirm the building deletion. It is important to note that deleting the building will delete all the inventory and inspection data associated with that building.



3. Click "OK" to delete the building from the database or click "Cancel" to cancel deleting the building. If "OK" is clicked, the building will be removed from the both the inventory and inspection trees.

System Basics

The system level follows the building level in the BuilderRED hierarchy. There are twelve (12) building systems in BuilderRED, each of which is comprised of components that perform a similar function in the building. Clicking on a system highlights its name and will offer the following toolbar options to the user:



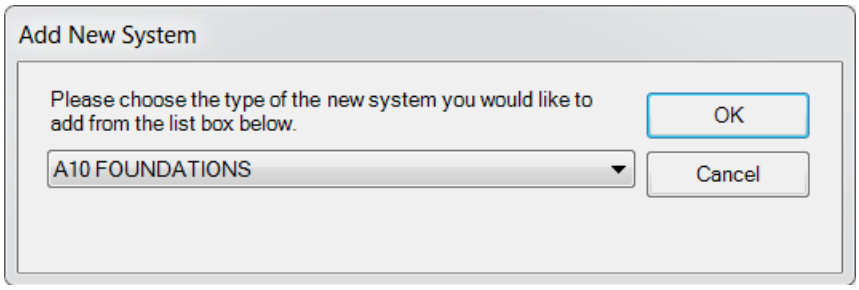
- Inspection.Click this button to switch to inspection mode.
- Add System. Click this button to add new a system.
- Add Component. Click this button to add a new component.
- Delete System. Click this button to delete a system.

Adding a New System

To add a system to a building in BuilderRED:

1. Select the building you wish to add the system to in the inventory tree and click the "Add System" button on the BuilderRED toolbar.

The “Add New System” window will appear.

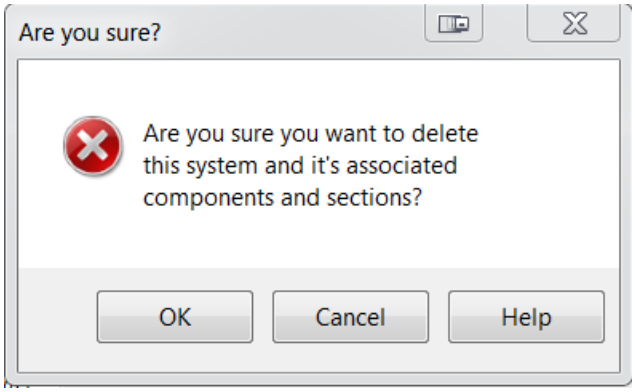


2. Choose the system to add to the building from the dropdown list. Note that each building can contain only one system of each type. The dropdown list for adding a system will display only the system types that do not already exist in the building.
3. Click "OK" to save the new system or click the "Cancel" button to discard the system without saving it to the database. After the saving the system, it will appear in the inventory tree.

Deleting a System

To delete a system from a building in BuilderRED:

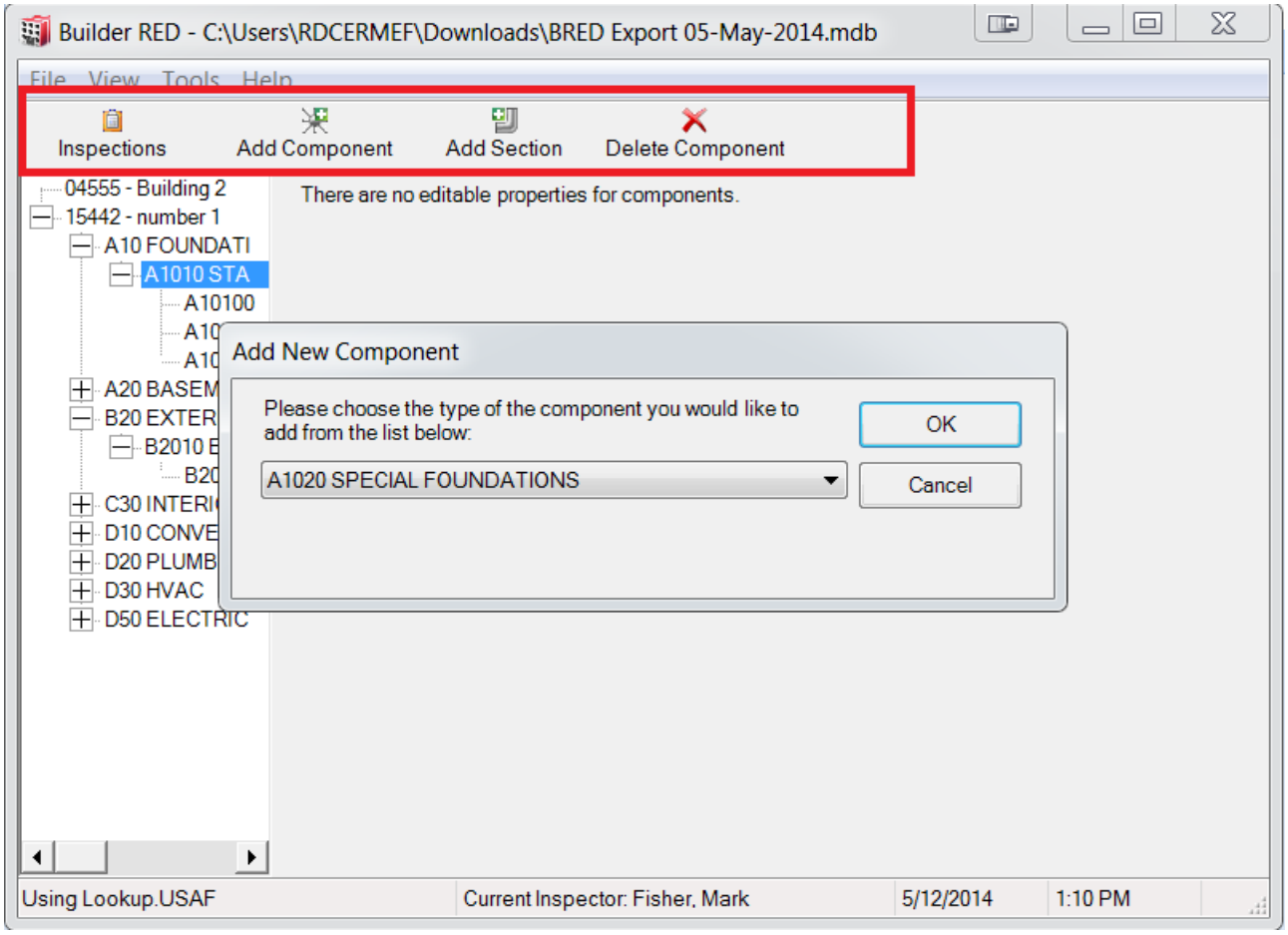
1. Highlight the system for removal in the inventory tree.
2. Click the "Delete System" button on the BuilderRED toolbar. A prompt will appear to confirm the system deletion. It is important to note that deleting the system will delete all the inventory and inspection data associated with that system.



3. Click "OK" to delete the system or click "Cancel" to cancel deleting the system. If "OK" is clicked, the system will be removed from the both the inventory and inspection trees.

Component Basics

The component level follows the system level in the BuilderRED hierarchy. There are numerous components for each system in BuilderRED, each of which is comprised of sections that perform a similar function in the building. Clicking on a component highlights its name and will offer the following toolbar options to the user:



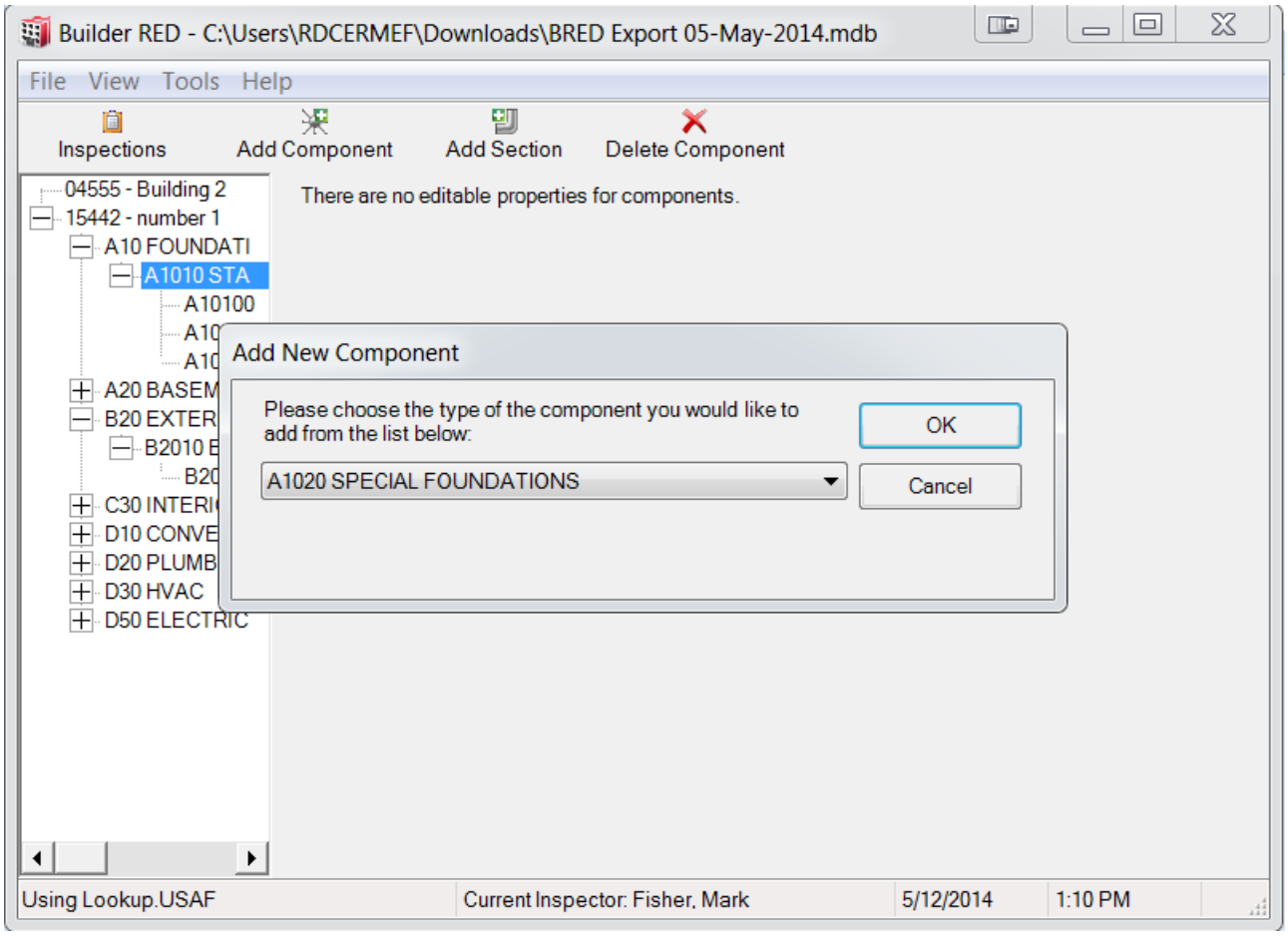
- Inspections. Click this button to switch to inspection mode.
- Add Component. Click this button to add a new component.
- Add Section. Click this button to add a new section.
- Delete Component. Click this button to delete a component.

Adding a New Component

To add a component to a system in BuilderRED:

1. Select the system you would like to add the component to in the inventory tree and click the "Add Comp." button on the BuilderRED toolbar.

The “Add New Component” window will appear.

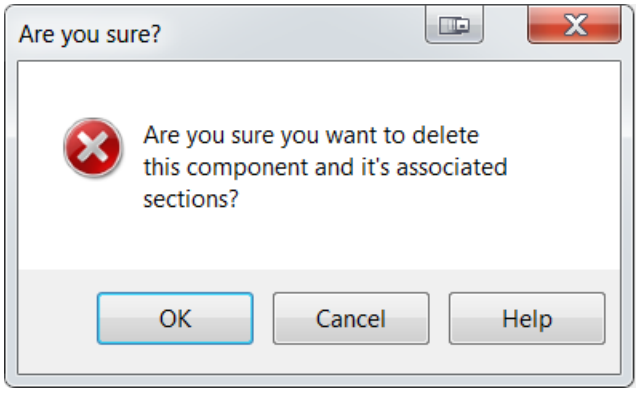


2. Choose the component to add to the system from the dropdown list. It is important to note that each system can contain at most one component of each type. The dropdown list for adding a component will display only the component types that do not already exist for the system.
3. Click "OK" to save the new component or click the "Cancel" button to discard the component without saving it to the database. After the saving the component, it will appear in the inventory tree.

Deleting a Component

To delete a component from a system in BuilderRED:

1. Highlight the component for removal in the inventory tree.
2. Click the "Delete Component." button on the BuilderRED toolbar. A prompt will appear to confirm the component deletion. It is important to note that deleting the component will delete all the inventory and inspection data associated with that component.

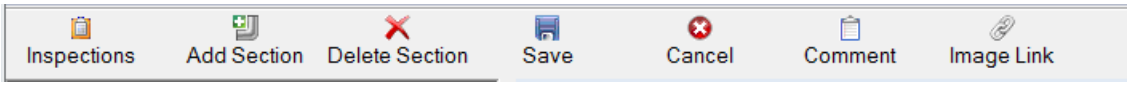


3. Click "OK" to delete the component or click "Cancel" to cancel deleting the component. If "OK" is clicked, the component will be removed from the both the inventory and inspection trees.

Section Basics

The section level follows the component level and is the final level in the BuilderRED hierarchy. A section, or component-section, contains specific information about a particular component: section name, material/equipment category, component type, quantity, year built/renewed, whether or not it is painted, and if so, the last time it was painted. A component can be divided into sections based on one or a combination of the criterion above. See the "Sectioning Process" section below for a complete description of the sectioning procedure.

Clicking on a section highlights its name and will offer the following toolbar options to the user:



- Inspection.Click this button to switch to inspection mode.
- Add Section.Click this button to add a new section.
- Del Section.Click this button to delete a section.
- Edit. Click this button to edit the section information.
- Save.Click this button to save changes made to section information.
- Cancel. Click this button to cancel all changes made to section information since the last save.
- Comments. Click this button to add section comments.
- Section Details. Click this button to add section details.

Sectioning Process

A component can be divided into sections based on:

- Material/equipment category
- Component type
- Component age
- Component location in the building

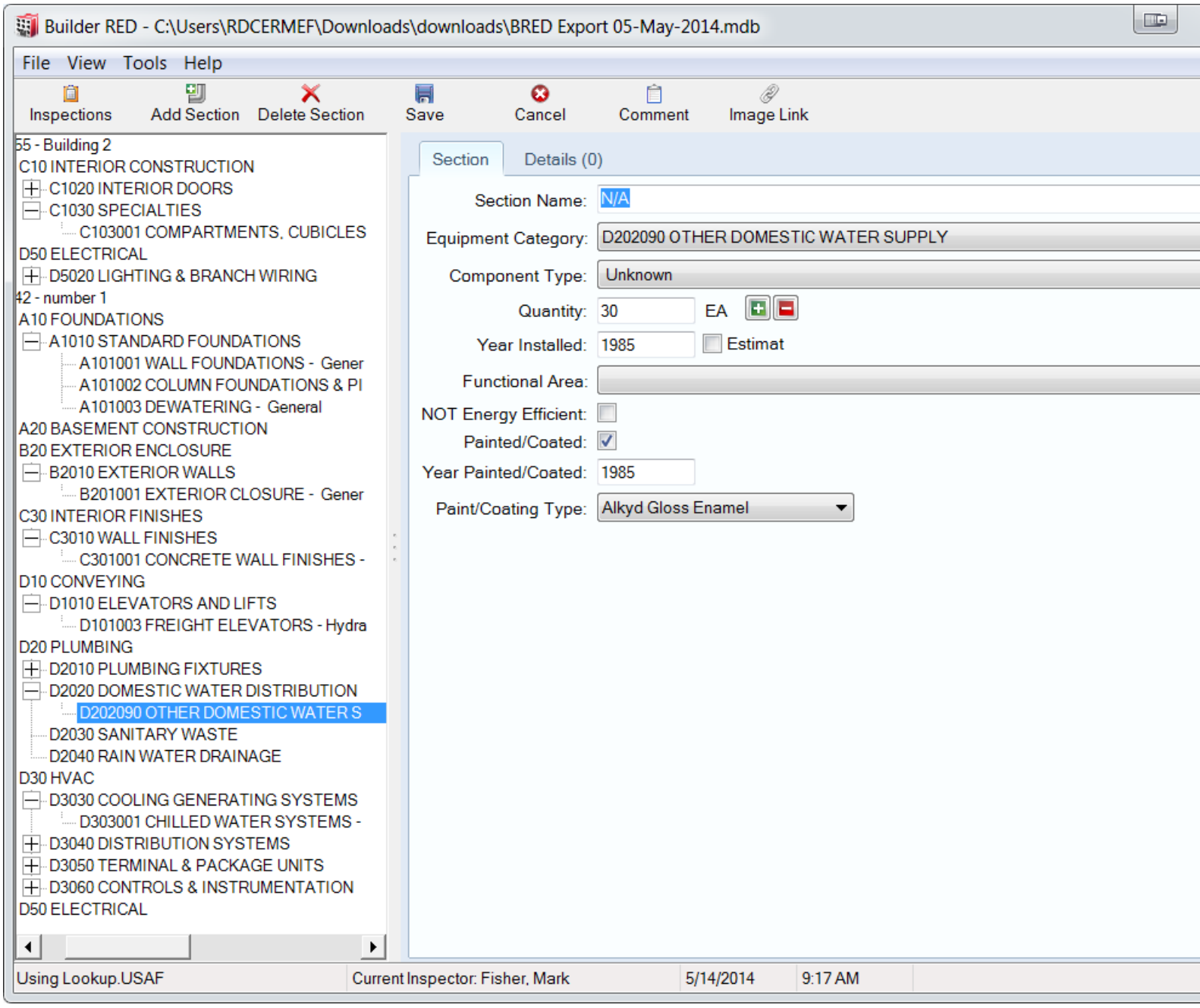
If there are large differences in any of the criteria listed above, a component should be broken into two or more sections. When sectioning, there are a few guidelines that should be followed:

- Generally, it is best to go with as few sections as possible. Because the number of sections created will affect the amount of time spent on data entry and building inspection, it is practical to create a smaller number of larger sections.
- Section only when there are differences in material/equipment category and component type and sufficient quantities exist to warrant separate management units.
- Deterioration and Maintenance and Repair needs, costs, and timing may vary and need to be considered in addition to age, materials, and location within the building.

- There are other, less obvious, reasons for sectioning. You may wish to manage different areas of the building differently based on use or other reasons.
- When sectioning equipment components with multiple units of the same equipment and age, section based on the managerial unit. That is, if it is expected to manage them as essentially one unit , then one section will suffice. However, if it is expected that over time, they will be managed individually, then each should be its own section.
- Section names do NOT have to be unique. If no section name is desired or not necessary, name the section "N/A."
- The sum of the section amounts will equal the component amount.

Viewing and Editing Section Information

The Navigation Tree on the left side of BuilderRED displays each of the buildings in the database opened in Builder RED. Opening the Navigation Tree to the section level and clicking on a section highlights its name and displays the section information to the right. Section information shown includes the material category, component type, quantity, year installed/renewed, etc. Click on each field for a more thorough description of its contents. Note that above the section information is the building ID number, building name, system, component, and section to remind users where they are on the tree map at all times.



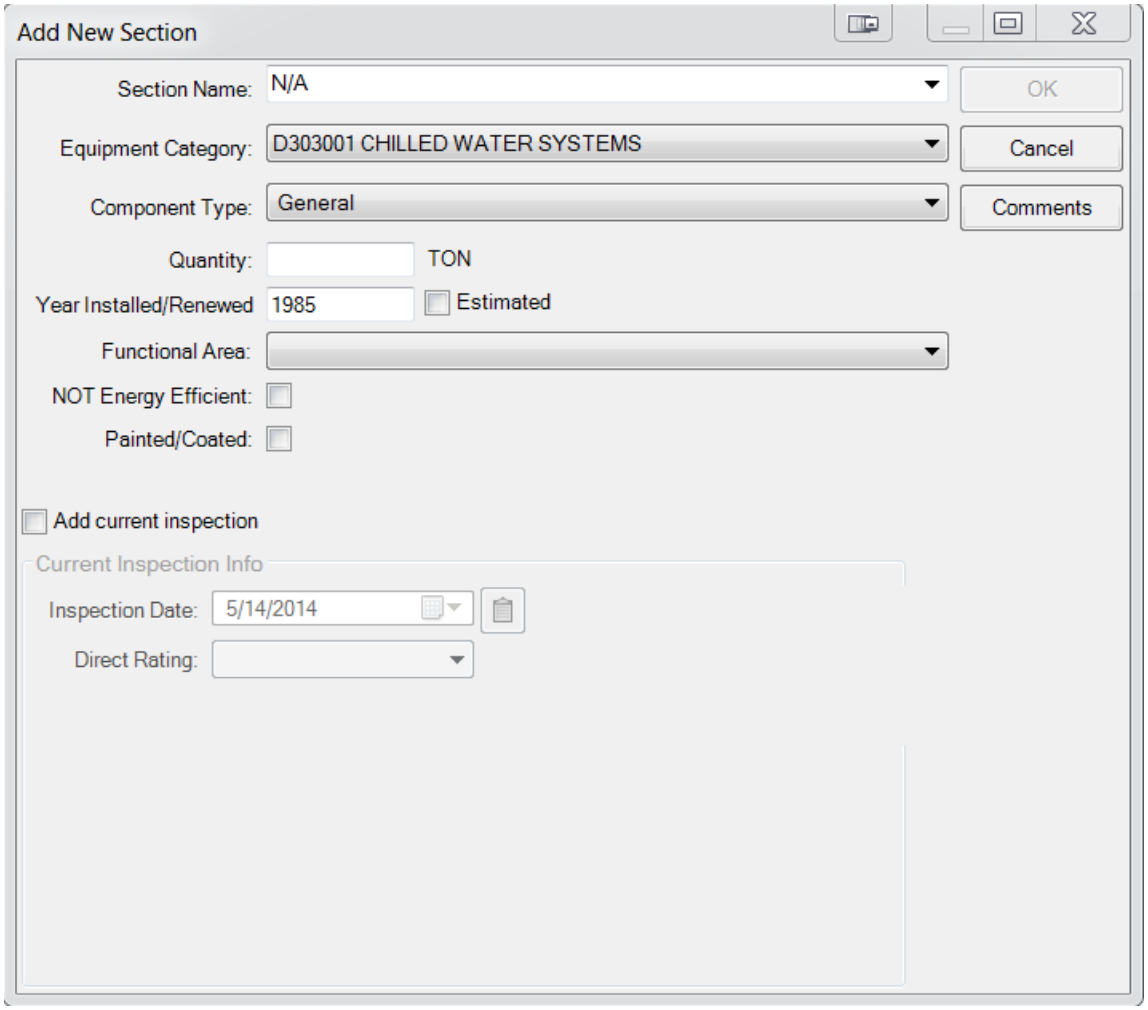
In addition to viewing the section information, you can also edit the information in BuilderRED if necessary. To edit any of the section information fields:

1. Click the "Edit" button on the BuilderRED toolbar.
2. Edit the proper section information.
3. Click the "Save" button on the BuilderRED toolbar to save the changes made to the section to the database or click the "Cancel" button to discard the changes to the section.

Adding a New Section

To add a section to a component using BuilderRED:

1. Select the component you would like to add the section to in the inventory tree and click the "Add Section" button on the BuilderRED toolbar. The “Add New Section” window will appear.



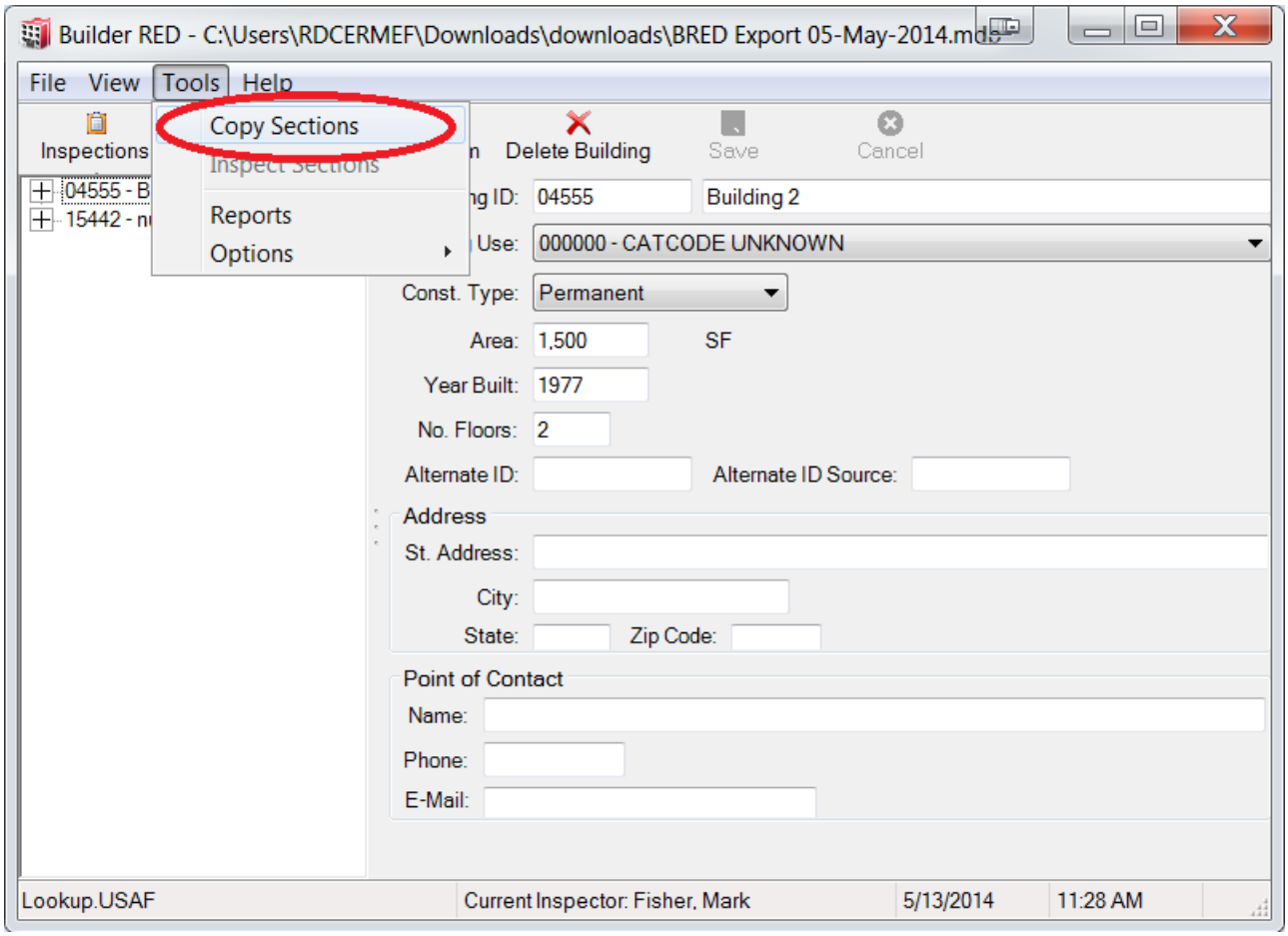
2. Enter the information for the new section. Click on each field in the screen shot above for a complete description of the data that should be entered. For help creating electrical distribution sections, click here .
3. Click "OK" to save the new section to the database or click the "Cancel" button to discard the section without saving it to the database. After saving the section, it will appear on the inventory tree.

Copy Sections

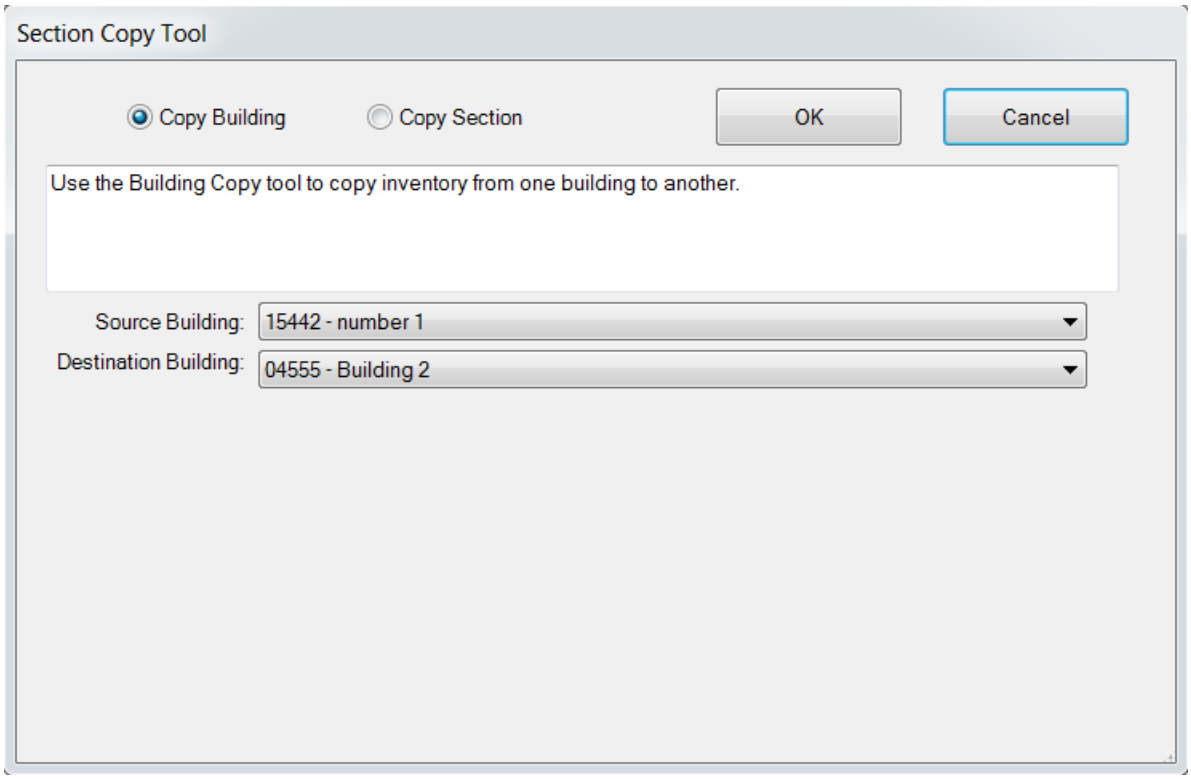
BuilderRED allows the user to copy pre-existing sections from one area of a building to another by using the "Copy Sections" tool. An example of when to use this tool is in a multistory building with similar or identical inventory from floor to floor. The first floor can be inventoried and then copied to other floors, saving time and reducing cost of the inventory process.

To copy sections in BuilderRED:

1. Select "Copy Inspections" under the "Tools" menu. Note that the "Copy Sections" tool can only be selected while in inventory mode.



2. The “Section Copy Tool” window will appear.

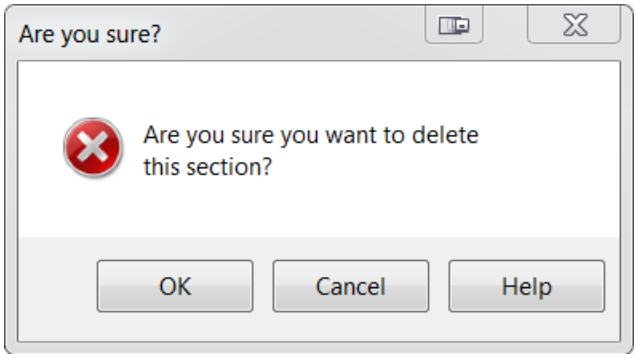


3. Enter the appropriate information. Click on each field for a description of the data that should be entered.
4. Click "OK" to copy and save the new sections to the database or click the "Cancel" button to close the "Section Copy Tool" without saving the sections to the database. After saving, all of the copied sections will appear in inventory tree.

Deleting a Section

To delete a section from a component in BuilderRED:

1. Highlight the section for removal in the inventory tree.
2. Click the "Delete Section" button on the BuilderRED toolbar. A prompt will appear to confirm the section deletion. It is important to note that deleting the component will delete all the inventory and inspection data associated with that component.



3. Click "OK" to delete the section or click "Cancel" to cancel deleting the section. If "OK" is clicked, the section will be removed from the both the inventory and inspection trees.

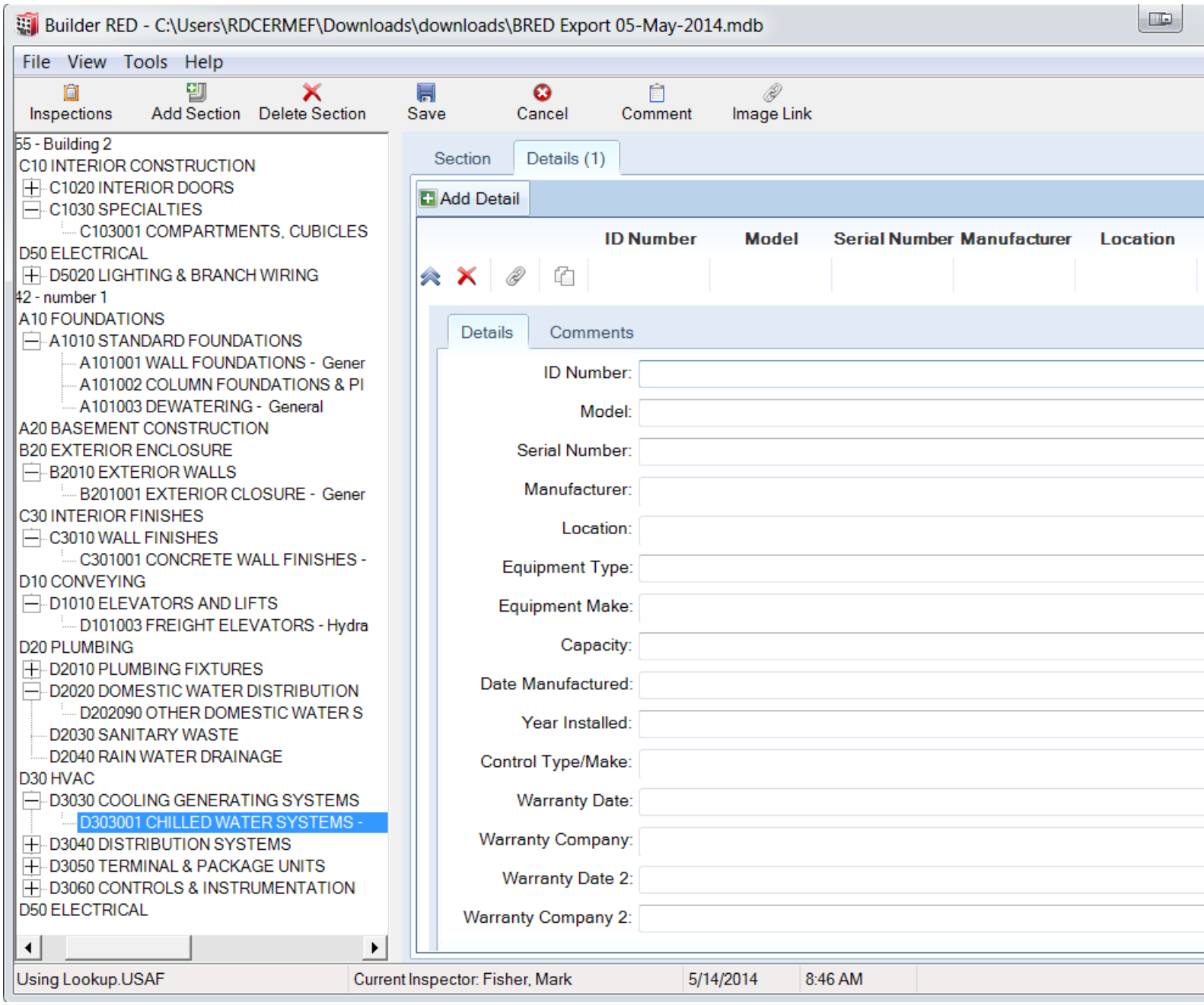
Section Details

Many times, additional inventory information for a section can be recorded. This is especially true for equipment components (e.g. HVAC or electrical components). Recording this information as often as possible is strongly recommended and will be a valuable asset for later inspections. Typically, the information recorded in the section details can be found on the section's panel or nameplate.

To record the equipment's details in BuilderRED:

1. Click on the "Section Details" button on the Builder RED toolbar.

The "Equipment for (section name)" window will appear.



2. Enter the section's information. Click on each field for a more thorough description of its contents.
3. Click "Save" to save the section details to the section or click the "Cancel" button to discard the section details without saving them to the section.
4. Click "Close" to exit the window.

Electrical Distribution Component Types

When adding a new electrical distribution section, use the chart below to choose the correct "Component Type."

Electrical Category	*Facility Type*
1	Parking Garage (Underground Parking)
2	Parking Garage
3	Garage (Auto Sales)
	Motel (2 or more stories)
	Warehouse
	Church
4	School (High, Middle, Jr. High)
	Apartment (8 or more stories)
	Factory (2 or more stories)
	College Dormitory (4 or more stories)
	Garage (Repair)
	Store, Department (1 story)
5	Racquetball Court
	Motel (1 story)
	Funeral Home
	Aircraft Hangar
	Courthouse (1 story)
	Rink (Hockey/Indoor Soccer)
6	School (Elementary)
	Community Center
	Fire Station (2 or more stories)
	Gymnasium
	Movie Theater
	Indoor Swimming Pool
	Courthouse (2 or more stories)
	Library
	Social Club
	College Dormitory (1-3 stories)
	College Laboratory
7	School (Vocational)
	Hotel
	Store, Department (2 or more stories)
	Office Building (5-11 stories)
	Factory (1 story)
8	Apartment (1-11 stories)
	Jail
	Supermarket
	Office Building (1-4 stories)
9	Medical Offices
	Fire Station (1 story)
	Nursing Home
	Hospital (4 or more stories)
	Town Hall (2 or more stories)
	Warehouse (Mini)
	Post Office
	Hospital (1-3 stories)
10	Bus Terminal
	Office Building (11 or more stories)
11	Telephone Exchange
11	Apartment (Luxury)
	Police Station
	Town Hall (1 story)
	College Building
12	Country Club

Basics of the Inspection Toolbar and Tree

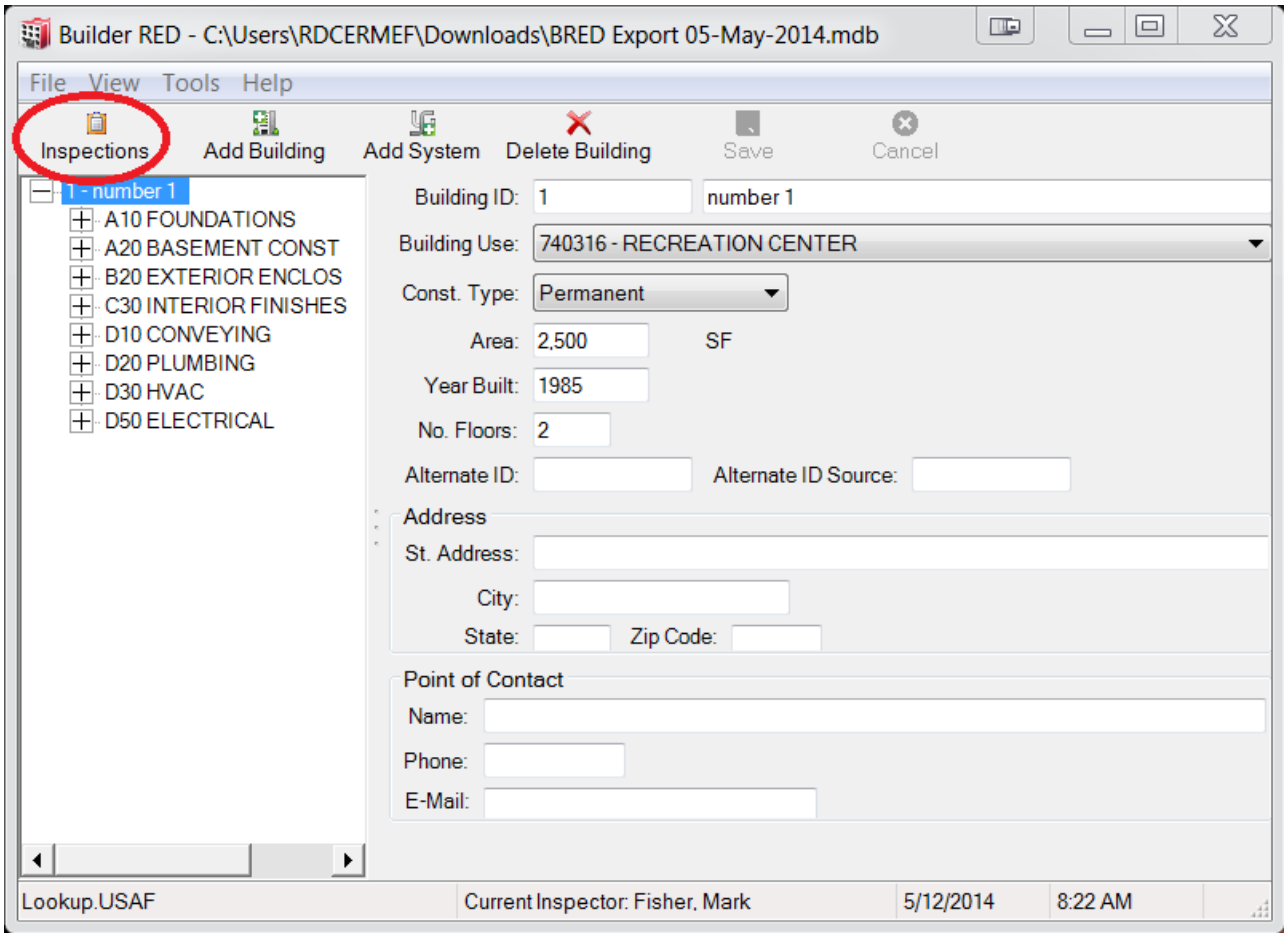
The inspection process is an integral part of the Building Management System. With the data from the inspections, the condition of sections, components, systems, and buildings as a whole can be computed in BUILDER. After the condition has been assessed, the maintenance and repair of the installation can be planned.

While in inspection mode in BuilderRED, the user can record new inspection data for individual component-sections. Additionally, BuilderRED allows the user to view previous inspection data for sections and to determine the change in condition since the last evaluation.

Operating in Inspection Mode

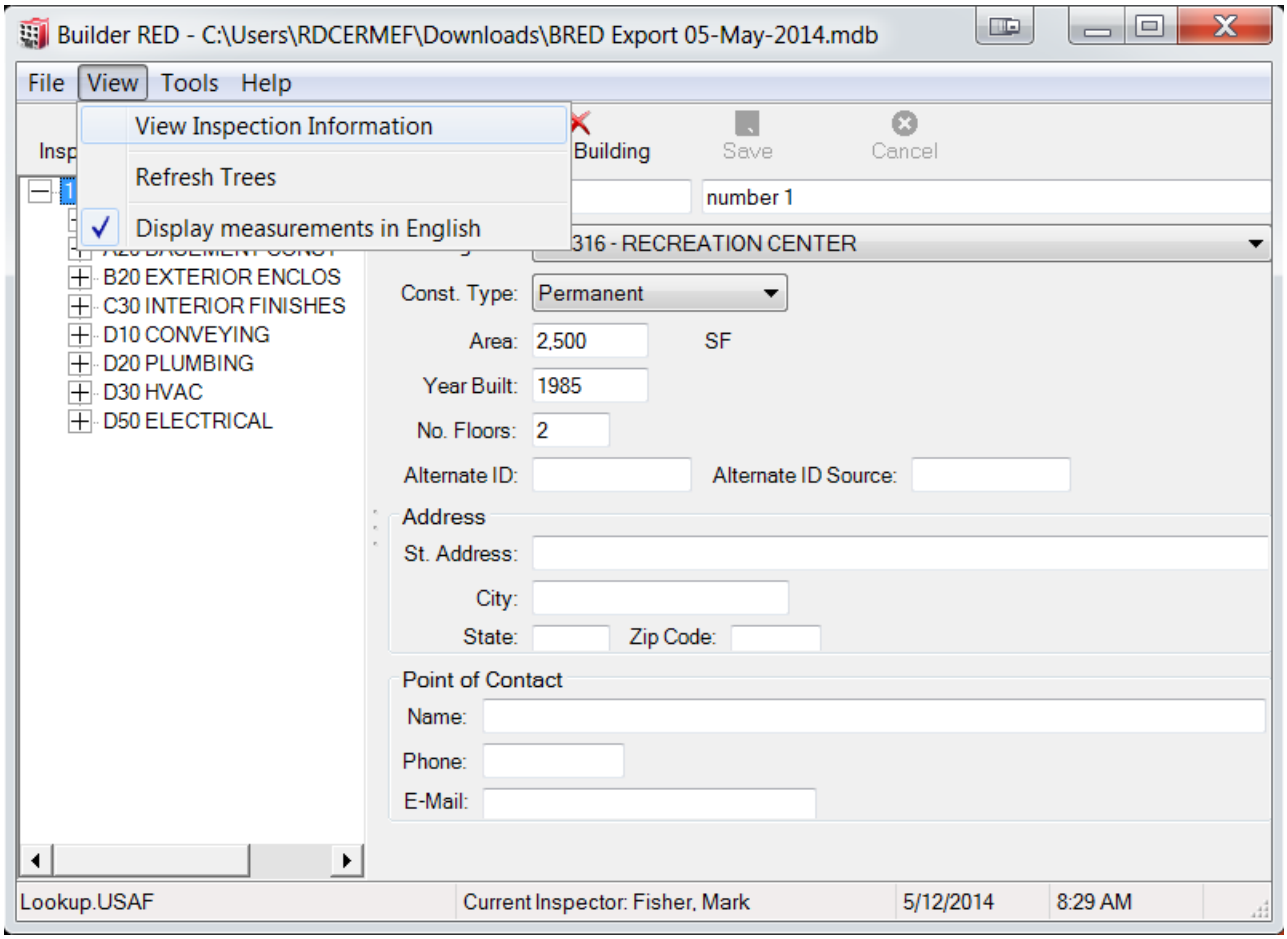
To operate in the inspection mode:

- Select the "Inspection" button on the BuilderRED toolbar.



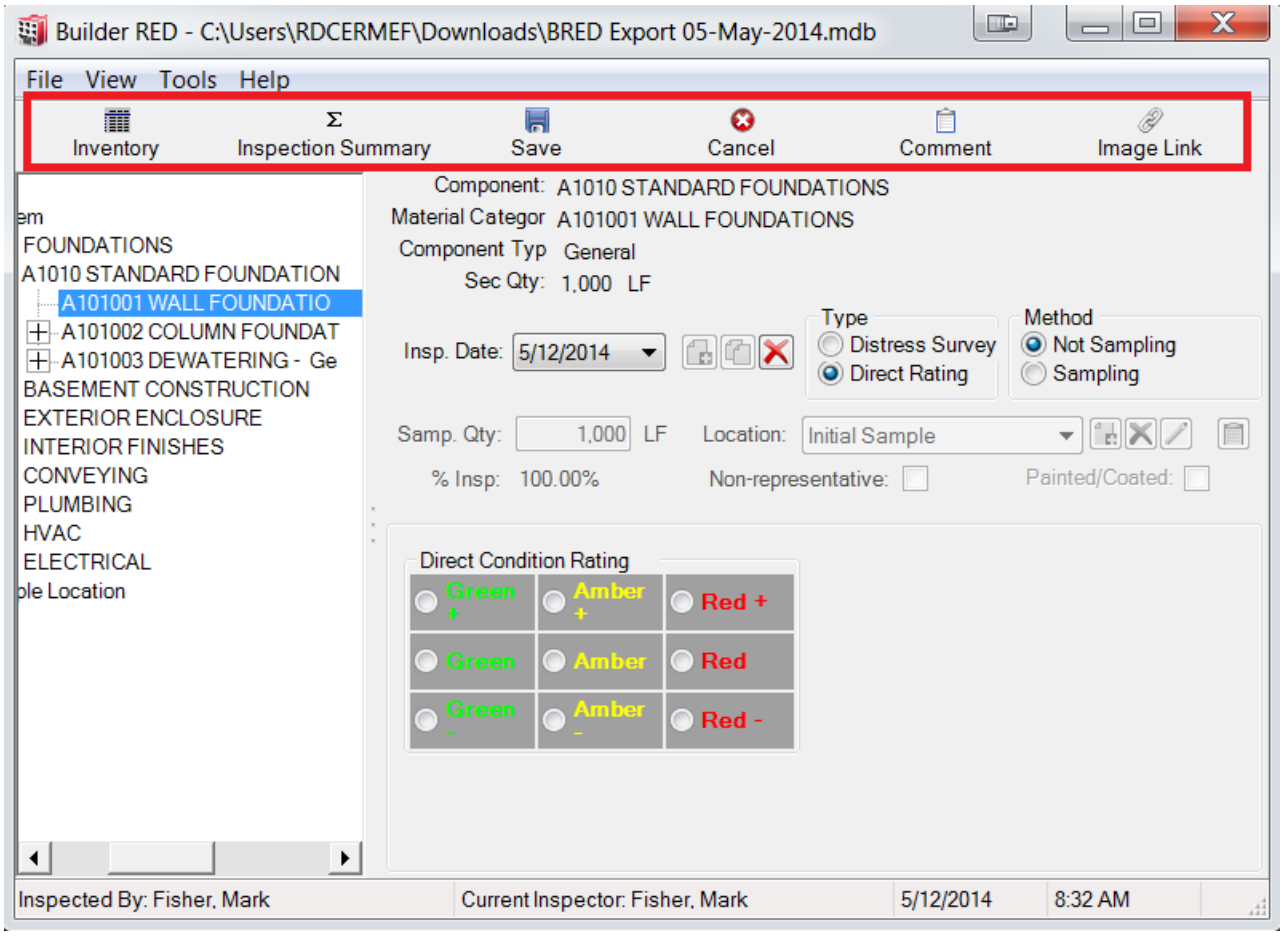
OR

- Select “View Inspection Information” from the "View" menu.



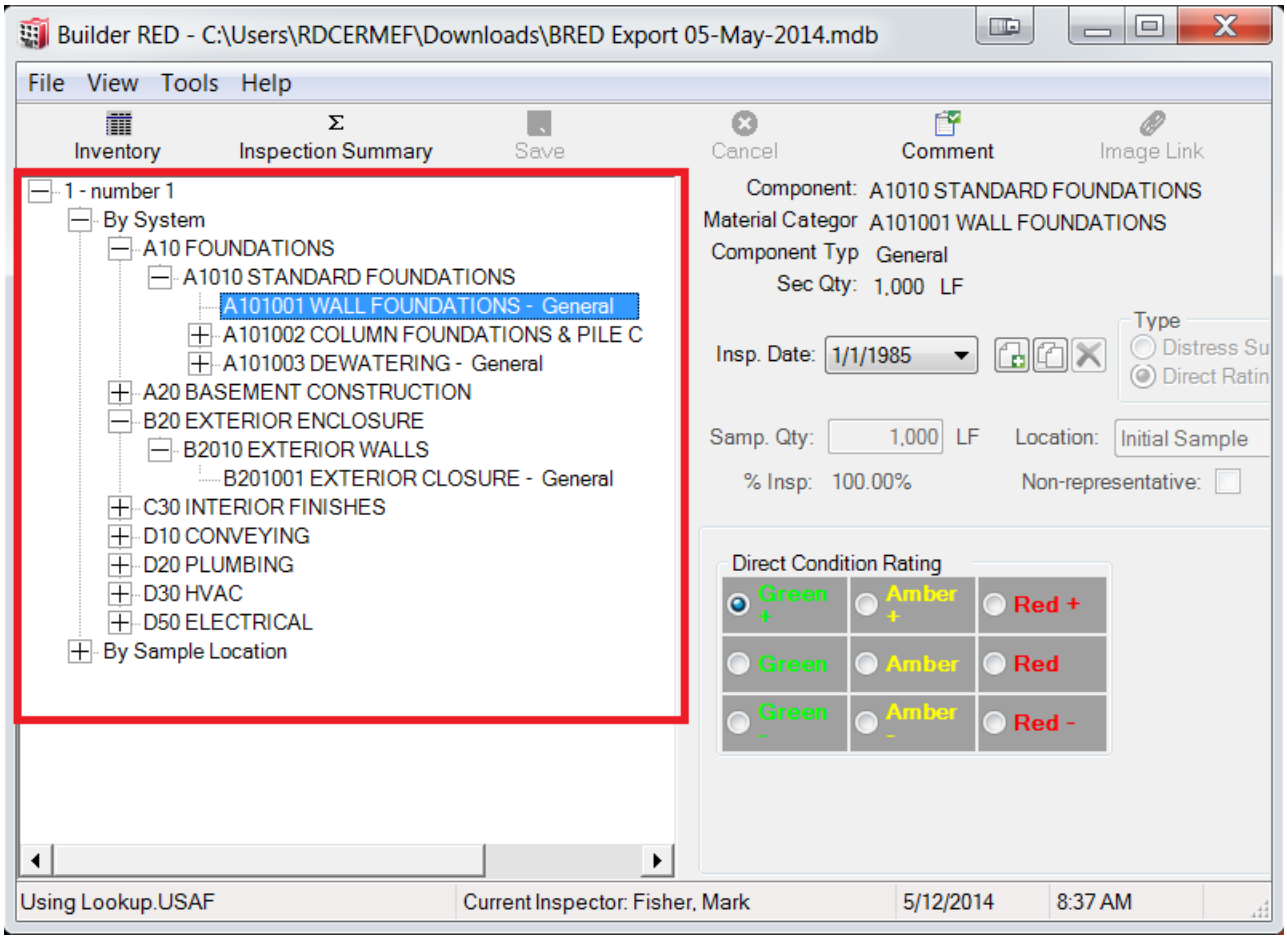
Inspections Toolbar

In inspection mode, the following toolbar, with minor variations, will appear:



Inspection Tree

In the split window the left side displays the inspection tree, which acts as a map of the inspection data in the database.



The inspection tree organization is:

- Building
  - By System
    - System
      - Component
      - Section
        - Sample Location
  - By Sample Location
    - Sample location
    - Component
      - Section

Here, the tree can be expanded by clicking on the "+" next to an inspection level or collapsed by clicking on the "-" next to an inspection level. To select a particular inspection level, right-click on it. The information pertaining to that inspec-

tion level will be displayed in the right side of the split screen. Note that above the map is the heading “Inspection” to remind the user that they are in Inspection mode.

Inspection Toolbar Variations

The inspection toolbar may appear in four different ways, depending on the user's location in the inspection tree. Click on each toolbar option above for description of each function.

Choosing and Changing the Inspector

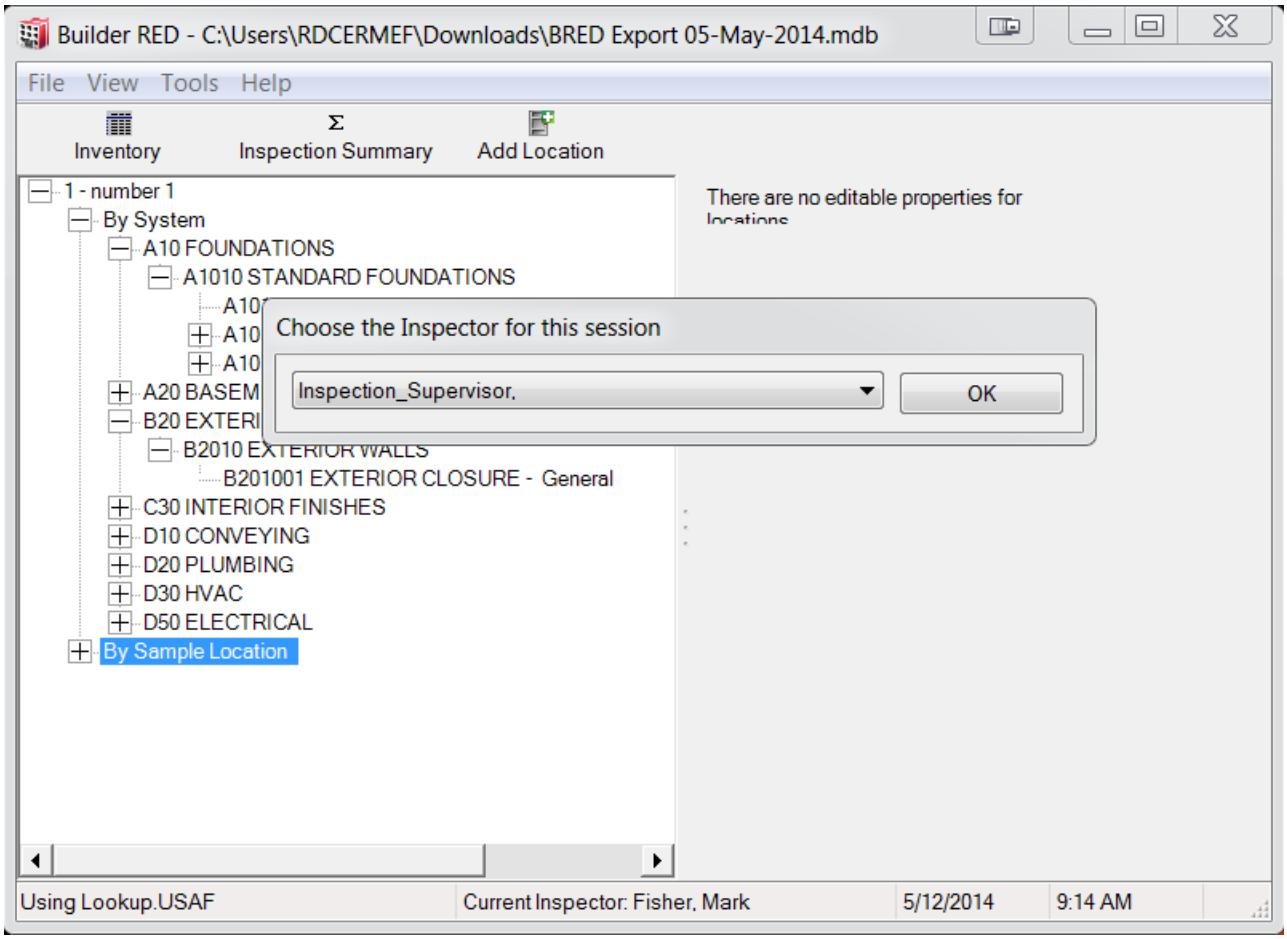
Before inspections can be performed in BuilderRED, an inspector must be chosen. In BuilderRED, there are two ways to choose an inspector:

- The first time inspection mode is chosen, you will be automatically prompted to choose an inspector

OR

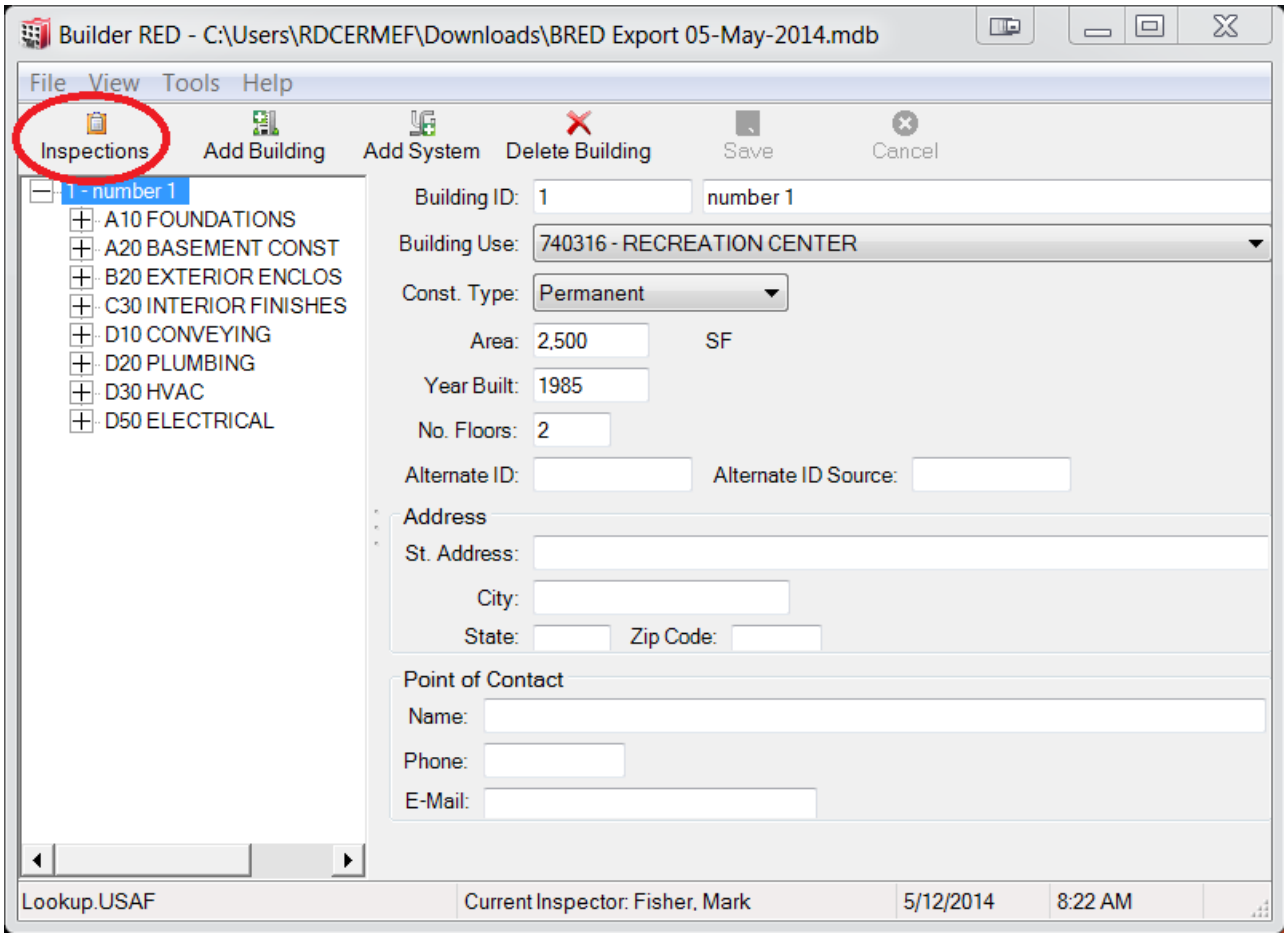
- At any time, you can select "Change Current Inspector" from the "File" menu

In both cases, the "Choose the Inspector" window will appear,



and you can choose an existing inspector from the list or create a new inspector. To choose an existing inspector from the dropdown list, simply click on the name of the desired inspector and click the "OK" button.

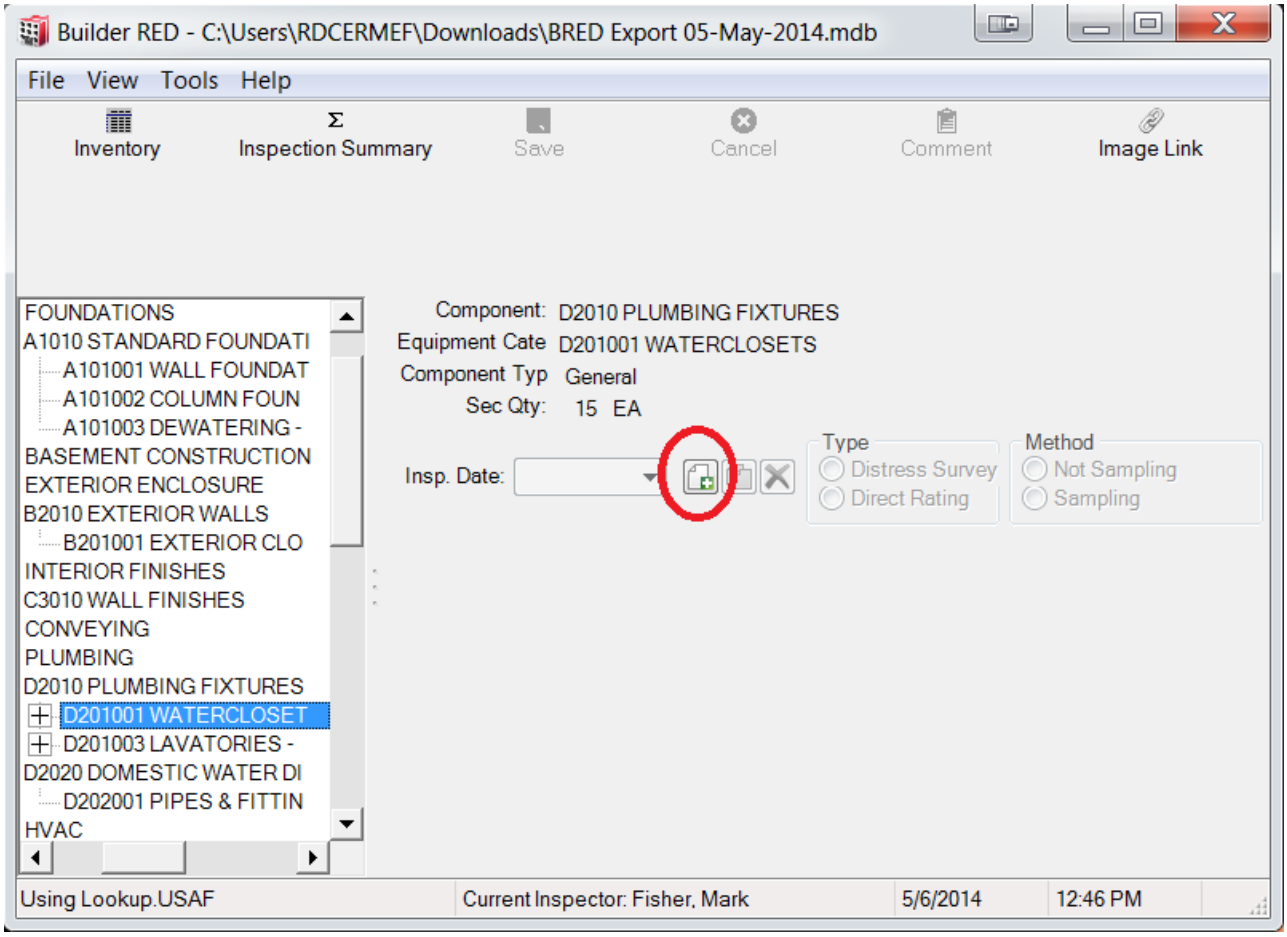
Inspection Mode



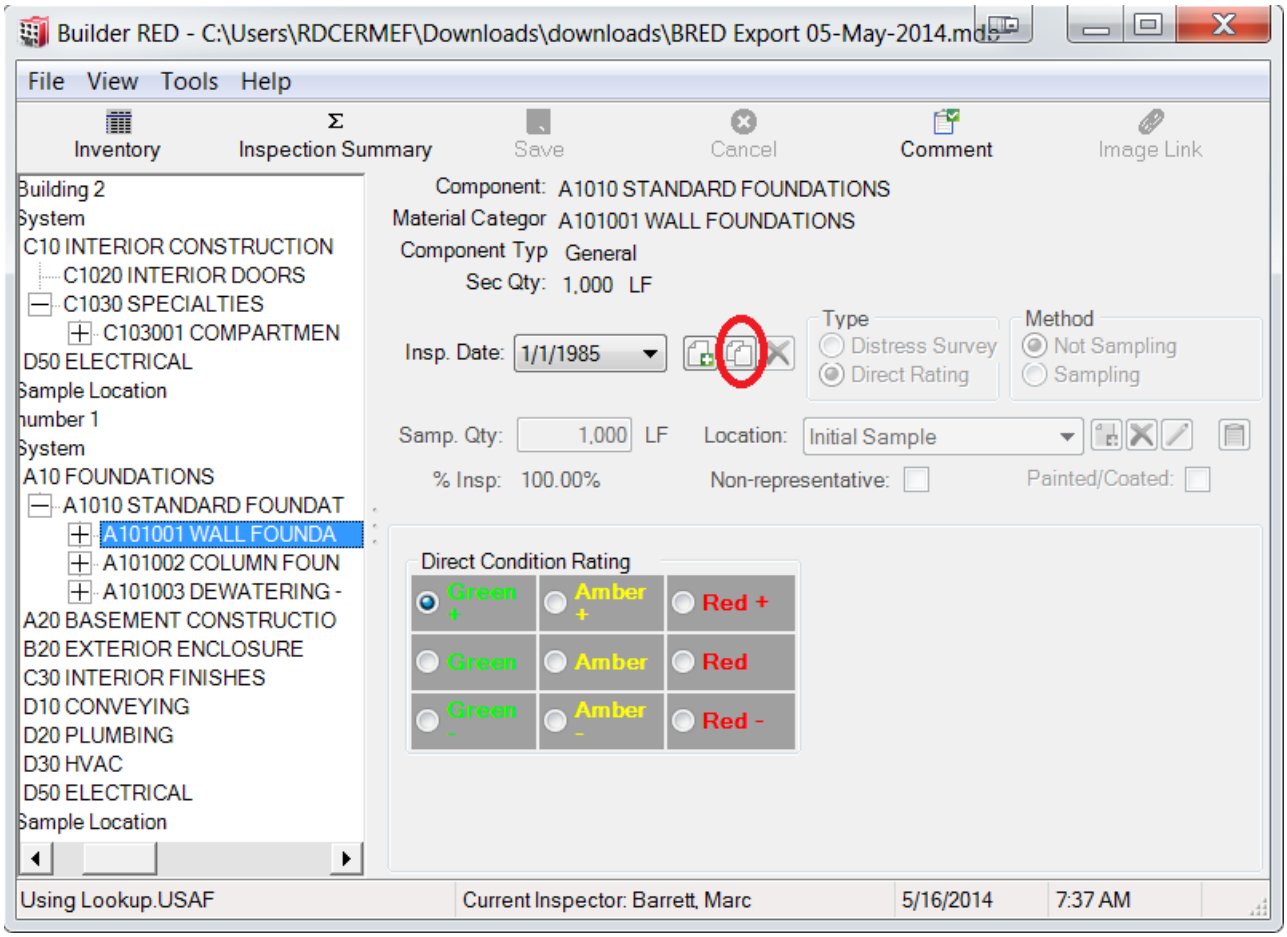
Clicking on the "Inspection" button will switch the mode BuilderRED is operating in from inventory to inspection. While in inspection mode, the user can create new inspections of sections or view past inspection information. For more information about inspection mode, see "Basics of the Inspection Toolbar and Tree".

New Inspection

Clicking the "New Inspection" button creates a blank, new inspection for the current date for the section selected in the inspection tree.



Copy Inspection



Click the "Copy Inspection" button to copy the inspection data from the most recent inspection of a section to a new, editable inspection.

Inspection Types

There two types of inspections, or condition assessments, that can be performed in BuilderRED:

- Distress Surveys

The distress survey is the most accurate, reproducible, and consistent condition assessment type. It provides a detailed record of what's wrong with the component-section through a visual assessment of each subcomponent present in the desired component-section. The distress types, their severity levels, and their density are recorded for each sub-component.

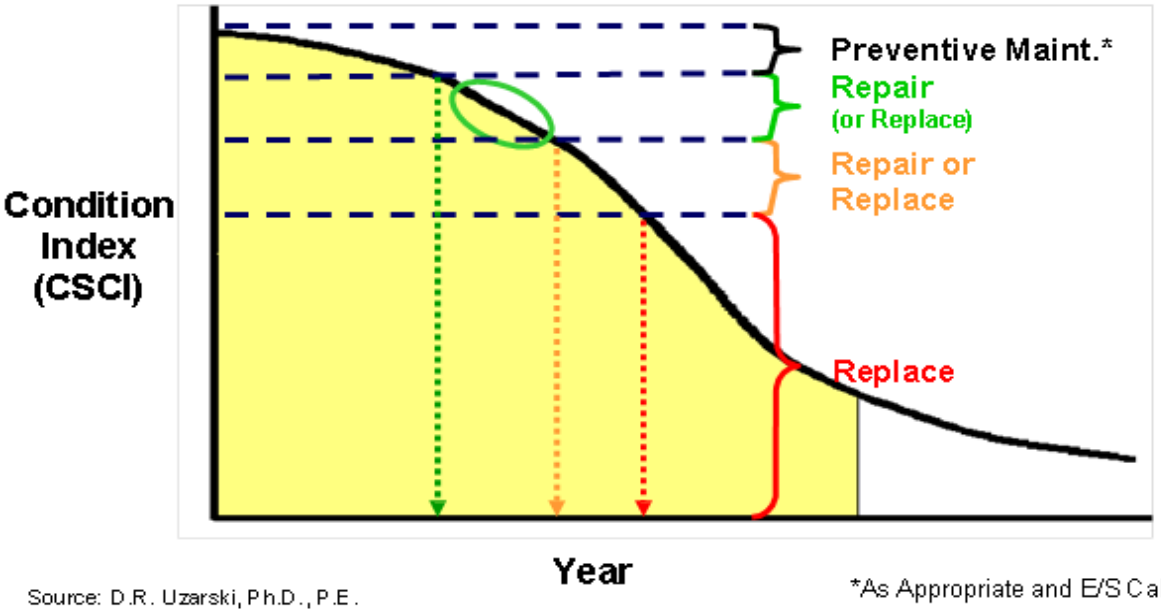
- Direct Ratings

The direct condition rating assessment is a less accurate, but much quicker type for performing a condition assessment. It involves visually inspecting each section as a whole, evaluating it against a set of rating criteria, and selecting the appropriate rating for the overall section.

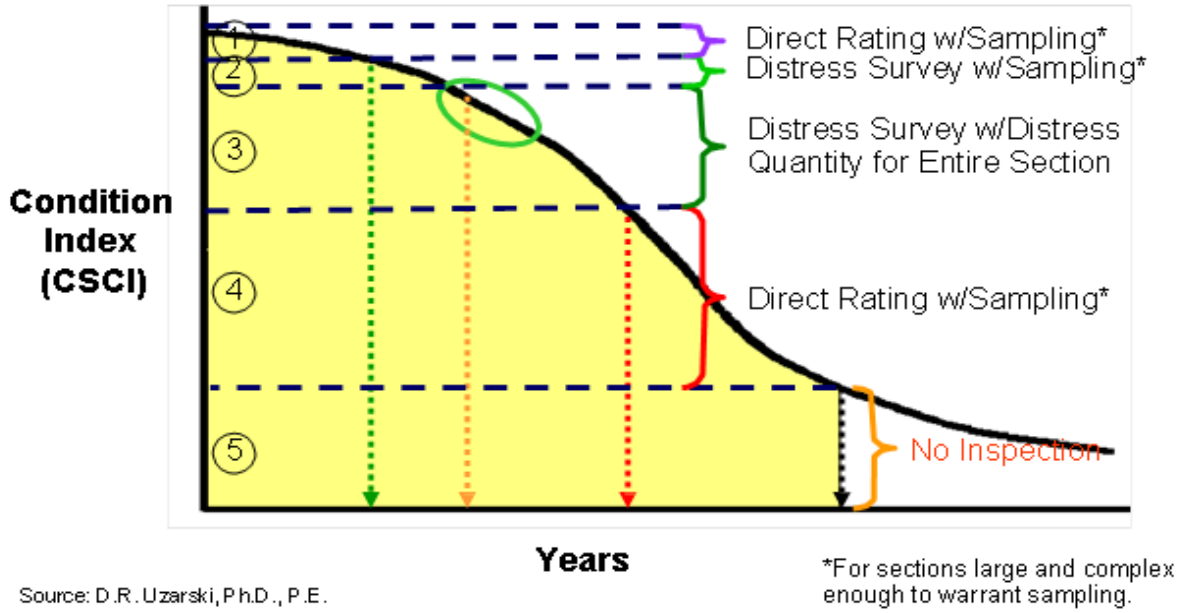
Choosing the Type of Condition Survey

Although both condition assessment types can be used for the same objective, there are some factors that need to be considered when selecting the appropriate type. When a building is new or when inspecting a relatively new section with a long expected service life, using a direct condition rating will probably be sufficient. As a component-section begins to deteriorate, more data can be gathered during the inspection using a distress survey. When the inspection data or condition index trend indicates a problem requiring some type of work effort, an off-line development of project specifications can carry the burden of collecting more detailed data. The goal is to inspect more often and concentrate project development efforts on the M&R work for which you are most likely to allocate resources. More detail is provided in the Knowledge-Based Condition Assessment Manual, which is included with the BUILDER program.

In general, where on the life cycle curve the section is at the time of inspection can be used to determine the type of assessment that should be performed. The figure below displays the type of sustainment/restoration (i.e. work) needs based on condition.



The figure below matches a suggested condition survey inspection type to condition in support of those work needs.



Summarizing the figures:

- Direct ratings with sampling should be performed in the preventative maintenance region of the component-section condition index (CSCI) curve.

- Distress surveys with sampling should be performed in the preventative repair region of the CSCI curve.
- Distress surveys for the entire component-section should be performed in the repair or replace region of the CSCI curve.
- Direct ratings with sampling or no inspect should be performed in the replace region of the CSCI curve, depending on how low the CSCI is.

Knowledge-Base Inspection Scheduling Tool

New to BUILDER 3.1 is the Knowledge-Based Inspection Scheduling tool. The tool is designed to select from your entire inventory a subset of component-sections that should be considered for inclusion in the next round of condition assessments and determines the condition assessments type to perform on those sections based on standards you can set. This tool can be used in BUILDER to create the list of sections to inspect and types of assessments to perform on them and used during your assessments using the BuilderRED software. For more information about the Knowledge-Based Inspection Scheduling tool consult the BUILDER 3.1 help file.

Inspecting by Sampling or Not Sampling

When performing condition assessments, you can perform inspections by:

- **Sampling.** Condition assessments by sampling do not inspect the entire component-section, rather just a percentage of it. See the "**When Sampling Should be Used**" section below for a complete description of when to sample condition assessments.
- **Not Sampling.**Condition surveys by not sampling inspect the entire component section. See the "**When Not Sampling Should be Used**" section below for a complete description of when to not sample condition assessments.

When Sampling Should be Used

Performing a condition assessment by sampling should be done when the component-section is large, complex, and/or discontinuous. In a practical sense, this means that the entire component-section is not readily viewable. The decision to sample will be a judgment call made by the inspector based on building size and component-section amount. Sampling rates (above the minimum) are up to the discretion of the inspector and/or organizational policy. Both sampling and not sampling approaches can be used in the same building for different component-sections.

General examples of when sampling is desirable include, but are limited to:

- Any component-section with the unit-of-measure "each"
- A quantity greater than one and each one well separated from another
- Component-sections spread over several rooms
- Exterior walls on all but the smallest of buildings

Representative and Non-Representative Samples

Condition assessment samples may be representative or non-representative. Representative samples are those that are in a "typical" condition for the component-section as a whole. This, however, does not mean that they are exactly in the same condition; some variation is expected. Non-representative samples are those that are not in typical condition for the component-section as a whole (i.e. in significantly better or worse condition).

When performing condition surveys by sampling, each sample must be marked as representative or non-representative. For a detailed explanation of determining if samples are representative or non-representative, click here.

Minimum Representative Sample Quantities

After the representative samples have been chosen, they are ready to be inspected. A minimum number of samples must be inspected for each section as follows:

- The numbers of representative samples to be taken of a specific component-section with the unit-of-measure of "each" are:

    - One (1) sample when the component-section quantity is 1-4.
    - Two (2) samples when the component-section quantity is 5-9.
    - At least three (3) samples when the component-section quantity is 10 or more.
    - AND a minimum of 10% of the component-section quantity.
- The number of representative samples to be taken of a specific component-section with the unit-of-measure of square feet or linear feet are:
    - One (1) sample when the number of potential samples is 1-4.
    - Two (2) samples when the number of potential samples is 5-9.
    - At least three (3) samples when the number of potential samples is 10 or more.
    - AND a minimum of 10% of the component-section quantity.

Specific Sampling Suggestions

Some specific examples of sample locations are:

- Specific rooms inside of a building (e.g. “Room 110”), where all of the various component-sections in that room would be sampled (e.g. ceiling, walls, wall finish, floor, floor covering, light fixtures, etc.).
- Exterior wall locations (e.g. “North Wall,” etc.), where all component-sections included in that wall would be sampled (e.g. wall surface, doors, windows, awnings, lights, etc.).
- A component-section consisting of ten roof ventilating fans (all ten are the same), samples could be “Fan 1”, “Fan 2”, etc.
- Interior doors denoted by room number (e.g. a hallway has many doors leading to rooms, so select the requisite number of doors with each door being a sample).
- Specific structural columns, beams, frames, trusses.
- A specific component-section (e.g. fireplace) with a quantity greater than one, but still a small number (e.g. two or three) and they are geographically separated such that they cannot be inspected together. Inspect each one as a sample with a specific location. All need to be inspected to be in conformance with the minimum sample quantity addressed above.
- If an entire component-section happens to be co-located at a defined sample location where other component-sections were sampled (e.g. a fireplace in a room selected for sampling of walls, ceiling, flooring, etc.), that component-section can either be included in the sample location or simply inspected without sampling.
- In general, do what makes sense, but ensure that the rules are followed.

When Not Sampling Should be Used

Performing a condition survey inspection by not sampling should be done when the component-section is small, simple, and/or continuous. In a practical sense, this means that the entire component-section is readily viewable. The decision not to sample will be a judgment call made by the inspector based on building size and component-section amount. Both sampling and not sampling approaches can be used in the same building for different component-sections.

General examples of when not sampling is desirable include, but are limited to:

- Any component-sections with the unit of measure "each" and only one exists or they are clustered together
- Roof sections
- Chimneys
- All component-sections in very small buildings

Representative or Non-Representative

Samples may be representative or non-representative. Representative samples are those that are in a "typical" condition for the component-section as a whole. This, however, does not mean that they are exactly in the same condition; some variation is expected. Non-representative samples are those that are not in typical condition for the component-section as a whole (i.e. in significantly better or worse condition).

The designation as representative or not will affect the condition index. Non-representative samples are considered isolated and thus have less of an influence on the condition index than representative samples. Representative sample locations and sample sizes are determined by the layout of the given building.

Representative Sample Creation and Selection

A few simple rules to follow when creating and selecting representative samples:

- A general walk through of the building is recommended prior to selecting samples to ensure that they are representative.
- Use discreet building discontinuities (e.g. entire rooms, wall corners) to help delineate sample boundaries, especially when the quantity has a unit of measure of square feet or linear feet.
- When an area of the building is selected for sampling, it is recommended, but not required, that all of the component-sections present at that location be inspected as part of the sample (e.g. all component-sections for all systems found in a room).
- Specific component-sections with a unit-of-measure of "each" should most often be sampled individually.
- Sample sizes for component-sections with a unit-of-measure of "each" need not be restricted to one.
- Sample sizes are often situation specific. Try to have them of approximate equal size, but be practical.
- Ensure that all samples are properly identified as to location, including room number or name.
- When sampling is used for a given condition survey inspection cycle, either the distress survey or the direct condition rating approach must be used for a given component-section.

Non-Representative Sampling Rules

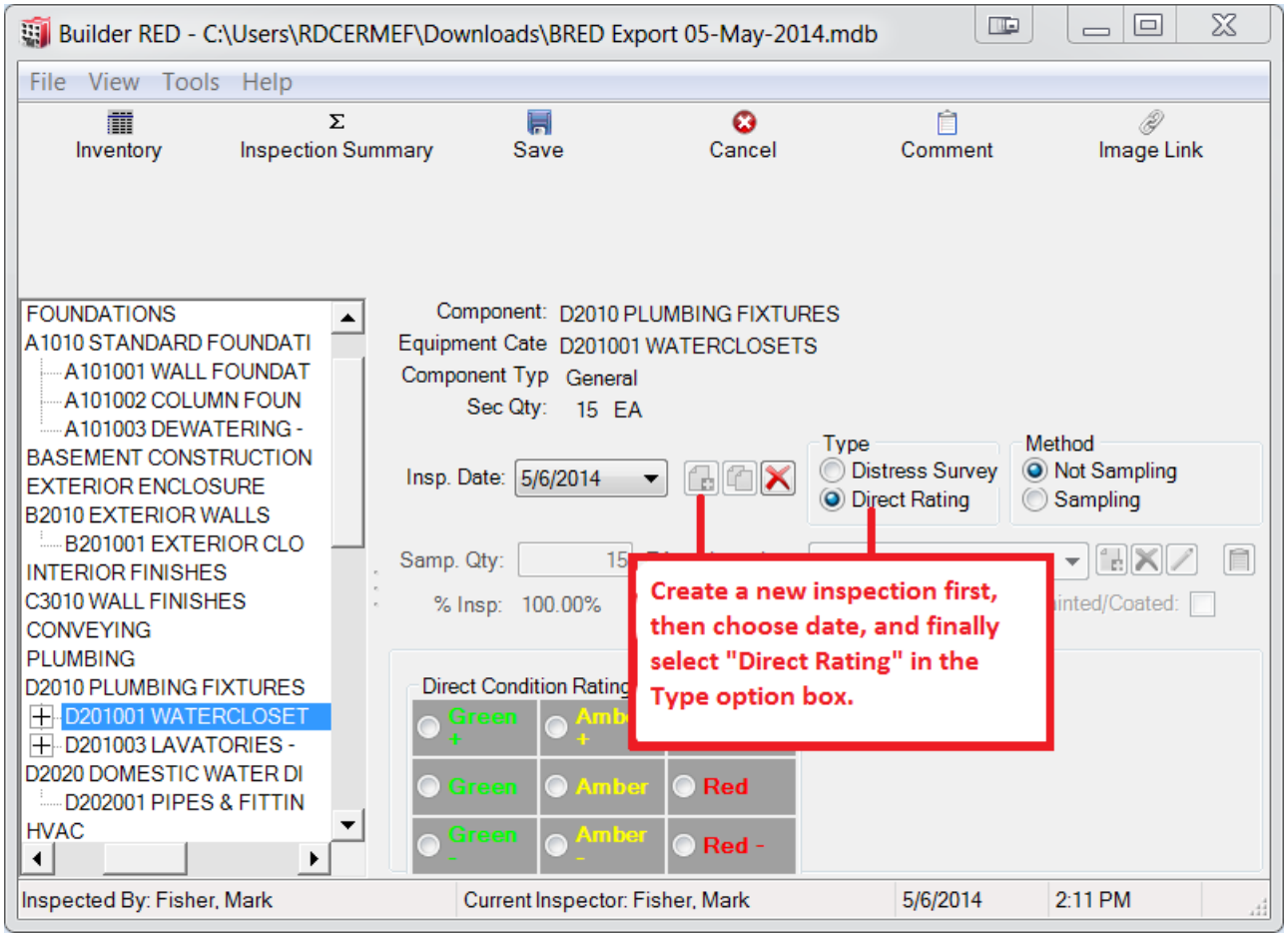
A few simple rules to follow when inspecting non-representative samples:

- Inspect non-representative component-sections in addition to the required representative sample quantity amounts.
- Ensure that the non-representative samples are designated as such.

Performing Direct Ratings

A direct rating involves visually inspecting each component-section or sample, evaluating that item against a set of rating criteria, and selecting the appropriate rating. It is important to note that direct ratings give an overall evaluation of a section and do not reflect the condition of any specific sub component. To perform a direct rating condition survey:

1. Create a new inspection (or copy an old inspection) and select the "Direct Rating" option in the "Type" box.



1. Determine the appropriate color rating for the component-section or sample:
   - Red - Serious condition problems; major M&R is needed.
   - Amber - Condition is generally adequate; M&R would be prudent and make economic sense.
   - Green - Condition is good; minor maintenance, repair, or preventive maintenance may be needed but major M&R is not.
2. Determine the appropriate level of the color rating:
   - High (+) - the best condition within the color rating.

- Middle - the middle condition within the color rating.
- Low (-) - the worst condition within the color rating.

The chart below can be used to help determine the rating:

Rating	SRM Needs	Rating Definition
Green (+)	Sustainment consisting of possible preventive maintenance (where applicable).	Entire component-section or component-section sample free of observable distress.
Green	Sustainment consisting of possible preventive maintenance (where applicable) and minor repairs (corrective maintenance) to possibly few or some subcomponents.	No component-section or sample serviceability* or reliability* reduction. not all, minor (non-critical) subcomponents may suffer from slight degrada major (critical) subcomponents may suffer from slight degradation.
Green (-)		Slight or no serviceability or reliability reduction overall to the component- sample. Some, but not all, minor (non-critical) subcomponents may suffer degradation or more than one major (critical) subcomponent may suffer fr degradation.
Amber (+)	Sustainment or restoration to any of the following: Minor repairs to several subcomponents; or Significant repair, rehabilitation, or replacement of one or more subcomponents, but not enough to encompass the component-section as a whole; or Combinations thereof.	Component-section or sample serviceability or reliability is degraded, but a very few, major (critical) subcomponents may suffer from moderate deteri perhaps a few minor (non-critical) subcomponents suffering from severe de
Amber		Component-section or sample serviceability or reliability is definitely impai but not a majority, major (critical) subcomponents may suffer from modera deterioration with perhaps many minor (non-critical) subcomponents suffe severe deterioration.
Amber (-)		Component-section or sample has significant serviceability or reliability los subcomponents may suffer from moderate degradation or a few major (crit subcomponents may suffer from severe degradation.
Red (+)	Sustainment or restoration required consisting of major repair, rehabilitation, or replacement to the component-section as a whole.	Significant serviceability or reliability reduction in component–section or s majority of subcomponents are severely degraded and others may have var of degradation.
Red		Severe serviceability or reliability reduction to the component-section or sa that it is barely able to perform. Most subcomponents are severely degrad
Red (-)		Overall component-section degradation is total. Few, if any, subcomponer salvageable. Complete loss of component-section or sample serviceability.

4. Enter paint/coating rating data if the component section is painted or coated.
5. Click the "Save" button in the toolbar to save the inspection data for the section to the database. If you wish to discard the inspection data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

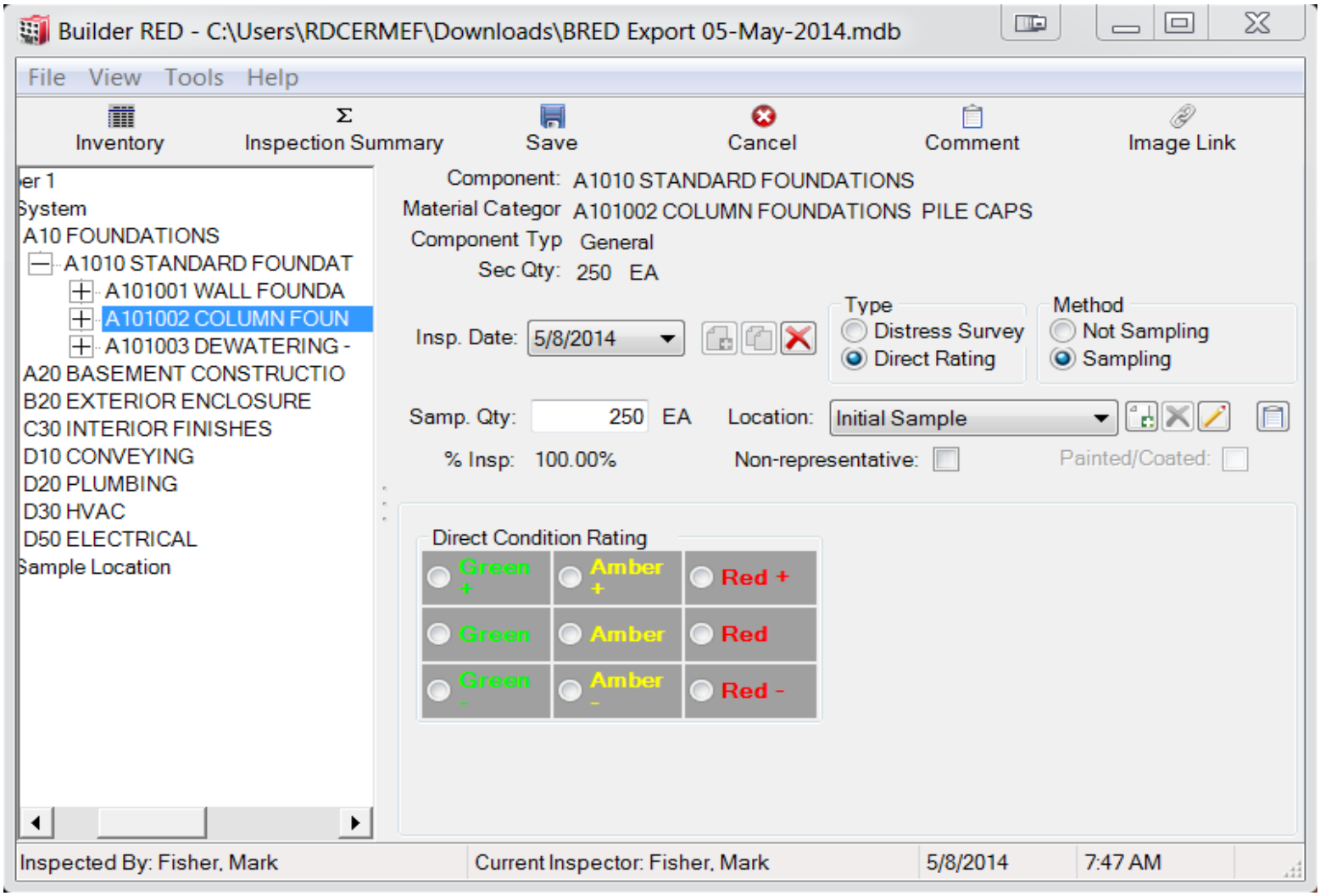
It is important to note that direct ratings can be performed using sampling or not sampling. See Direct Ratings by Sampling and Direct Ratings by Non-Sampling for a complete description of the data that should be entered for each method. Also of note is that the user has 5 days from the inspection date to edit the inspection data. The time the data is editable is called "The 5-day window."

Direct Ratings by Sampling

To create a direct rating by sampling:

1. Select the component-section to inspect by highlighting it on the tree map.
2. Create a new inspection (or copy an old inspection) and select "Direct Rating" as the type of inspection and "Sampling" option as the method of inspection.

3. Enter the inspection information. Click on each field below for a description of the data that should be entered.



4. Enter paint/coating rating data if the component section is painted or coated.
5. Click the "Save" button in the toolbar to save the inspection data for the section to the database. If you wish to discard the inspection data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

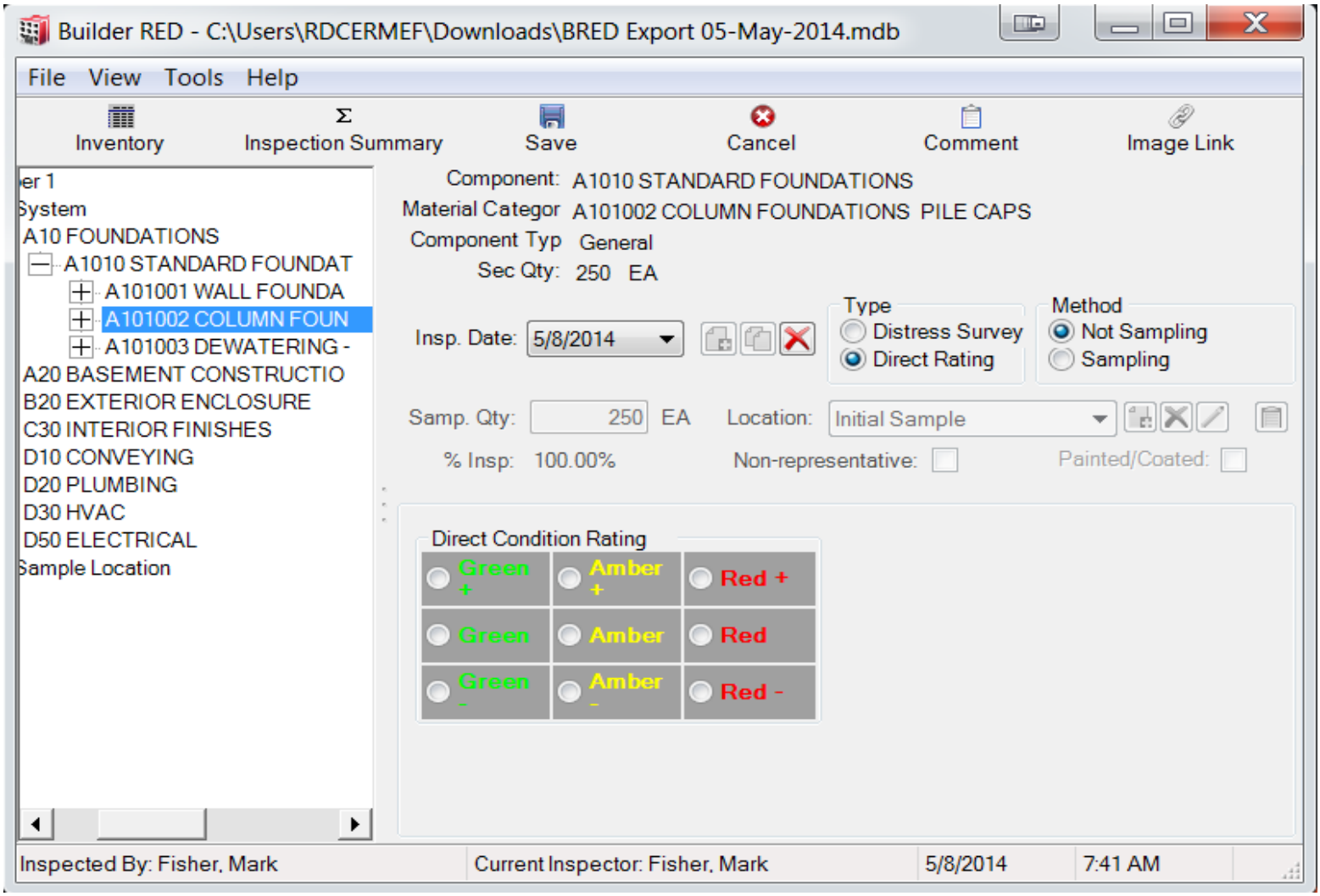
It is important to note that the user has 30 days from the inspection date to edit the inspection data. The time the data is editable is called "The 30-day window."

Direct Ratings by Not Sampling

To create a direct rating by not sampling:

1. Select the component-section to inspect by highlighting it on the tree map.
2. Create a new inspection (or copy an old inspection) and select "Direct Rating" as the type of inspection and "Not Samplings" option as the method of inspection.

3. Enter the inspection information. Click on each field below for a description of the data that should be entered.



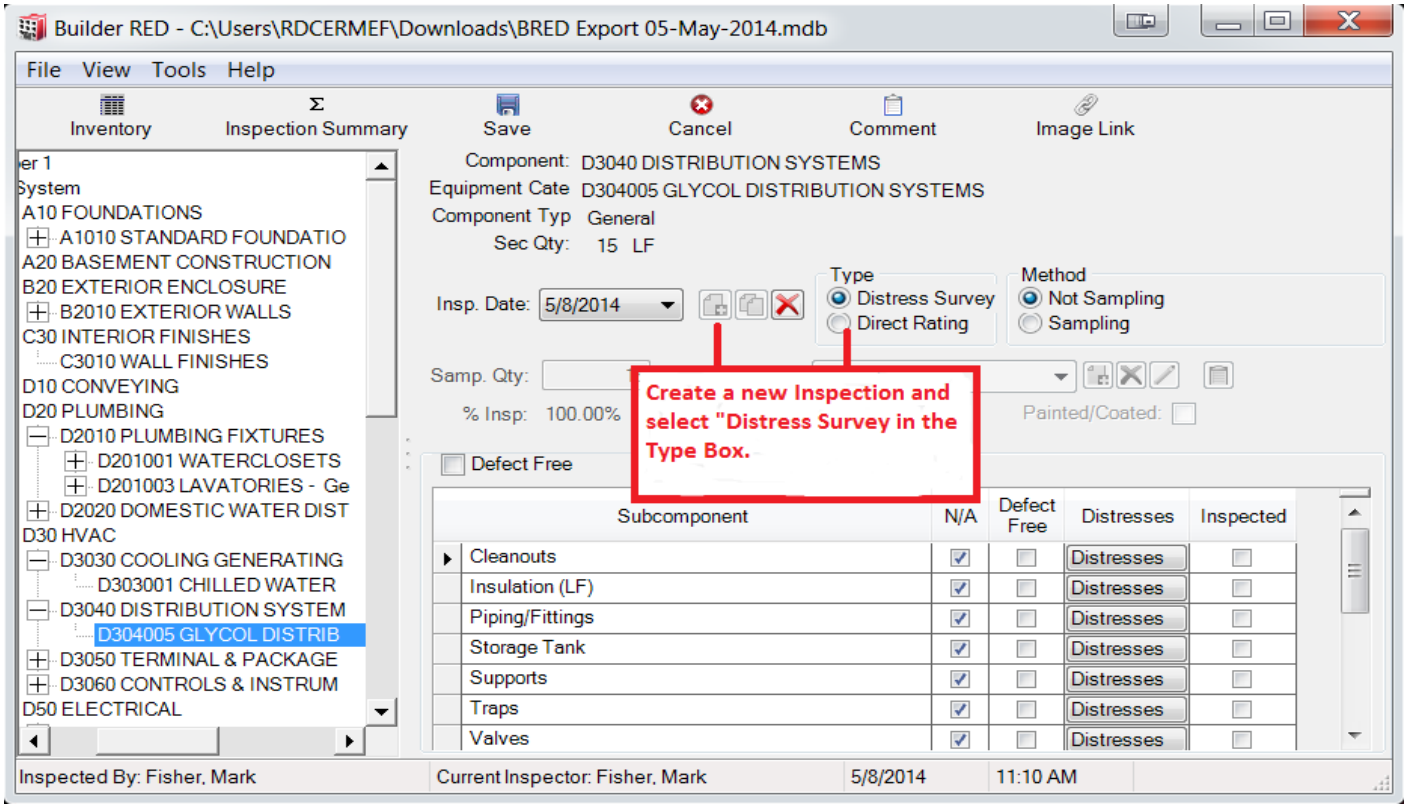
4. Enter paint/coating rating data if the component section is painted or coated.
5. Click the "Save" button in the toolbar to save the inspection data for the section to the database. If you wish to discard the inspection data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

It is important to note that the user has 5 days from the inspection date to edit the inspection data. The time the data is editable is called "The 5-day window."

Performing Distress Surveys

A distress survey involves visually inspecting each subcomponent present in the section and recording the distress types, their severity levels, and their quantity or density present. To perform a distress survey condition survey:

1. Create a new inspection (or copy an old inspection) and select the "Distress Survey" option in the "Type" box.



2. Inspect each subcomponent present in the section by recording distresses present for each subcomponent. The distress definitions, with complete definition, can be in:
   - Distress Survey Definitions
   - Built-up Roofing Distress Survey Definitions
   - Single Ply Roofing Distress Survey Definitions
   - Shingled Roofing Distress Survey Definitions

3. Enter paint/coating rating data if the component section is painted or coated.
4. Click the "Save" button in the toolbar to save the inspection data for the section to the database. If you wish to discard the inspection data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

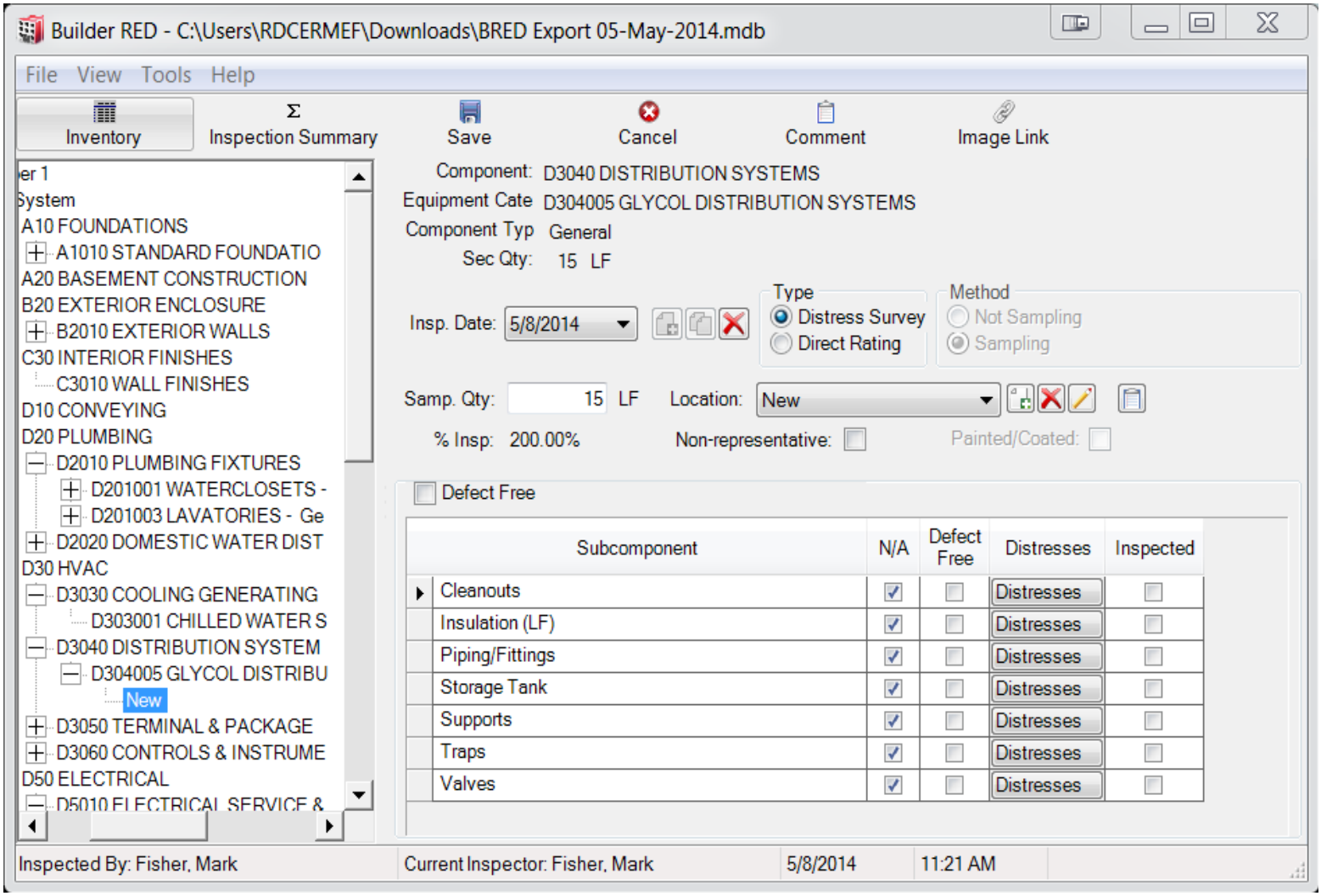
It is important to note that direct ratings can be performed using sampling or not sampling. See Distress Surveys by SamplingDistress Surveys by Non-Sampling and for a complete description of the data that should be entered for each method.

Also of note is that the user has 5 days from the inspection date to edit the inspection data. The time the data is editable is called "The 5-day window."

Distress Surveys by Sampling

To create a distress survey by sampling:

1. Select the component-section to inspect by highlighting it on the tree map.
2. Create a new inspection (or copy an old inspection) and select "Distress Survey" as the type of inspection and "Sampling" option as the method of inspection.
3. Enter the inspection information. Click on each field below for a description of the data that should be entered.



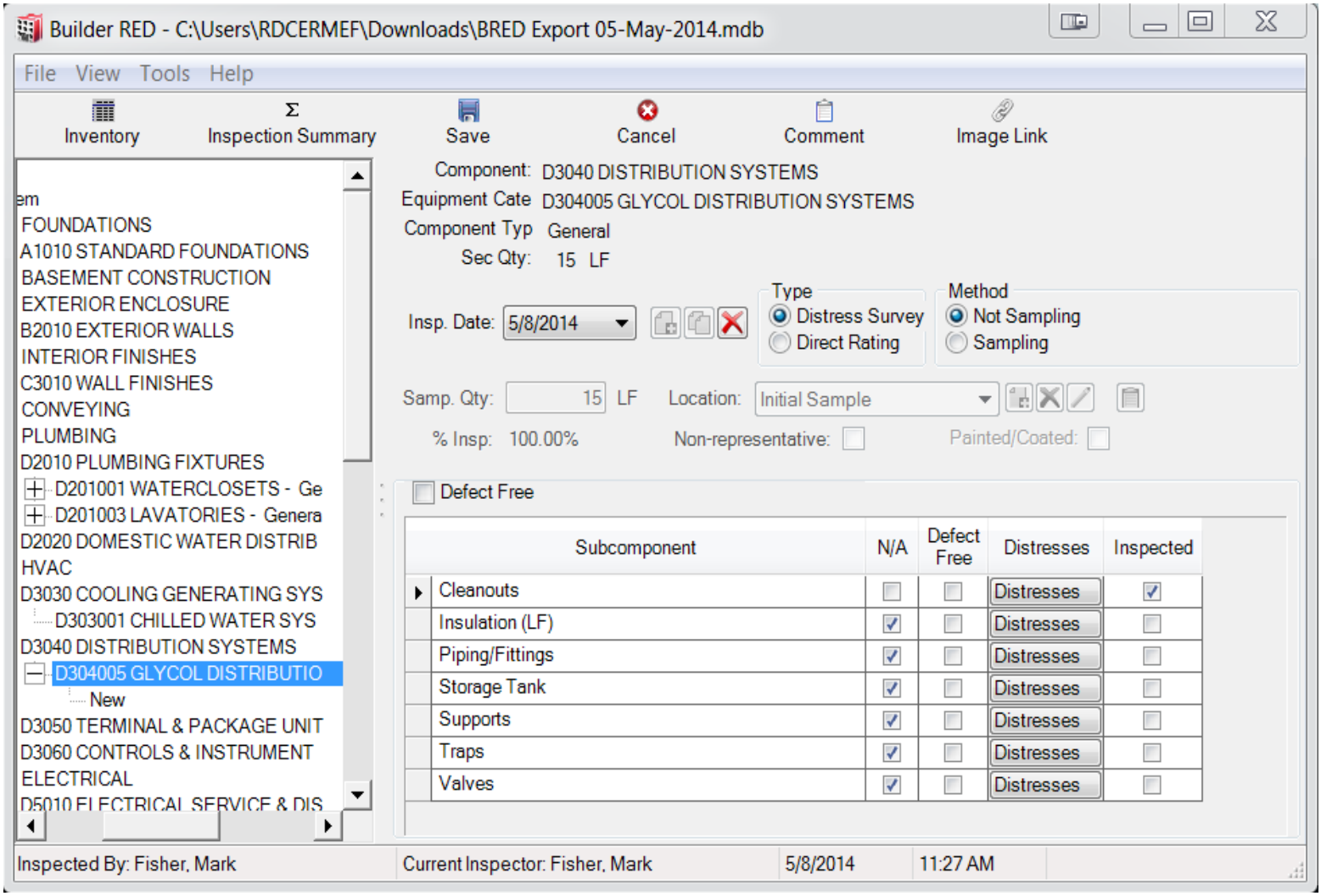
4. Enter paint/coating rating data if the component section is painted or coated.
5. Click the "Save" button in the toolbar to save the inspection data for the section to the database. If you wish to discard the inspection data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

It is important to note that the user has 5 days from the inspection date to edit the inspection data. The time the data is editable is called "The 5-day window."

Distress Surveys by Not Sampling

To create a distress survey by not sampling:

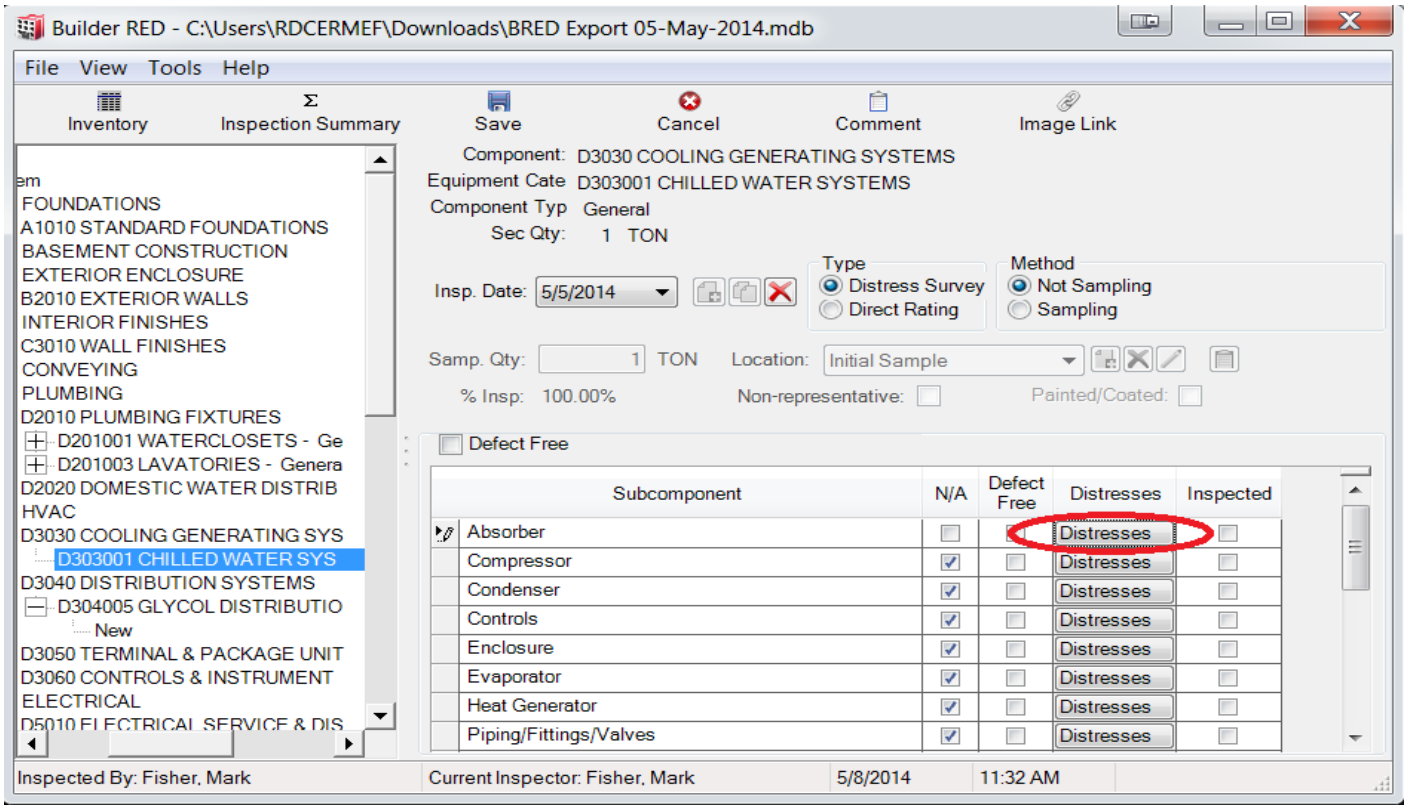
1. Select the component-section to inspect by highlighting it on the tree map.
2. Create a new inspection (or copy an old inspection) and select "Distress Survey" as the type of inspection and "Not Sampling" option as the method of inspection.
3. Enter the inspection information. Click on each field below for a description of the data that should be entered.



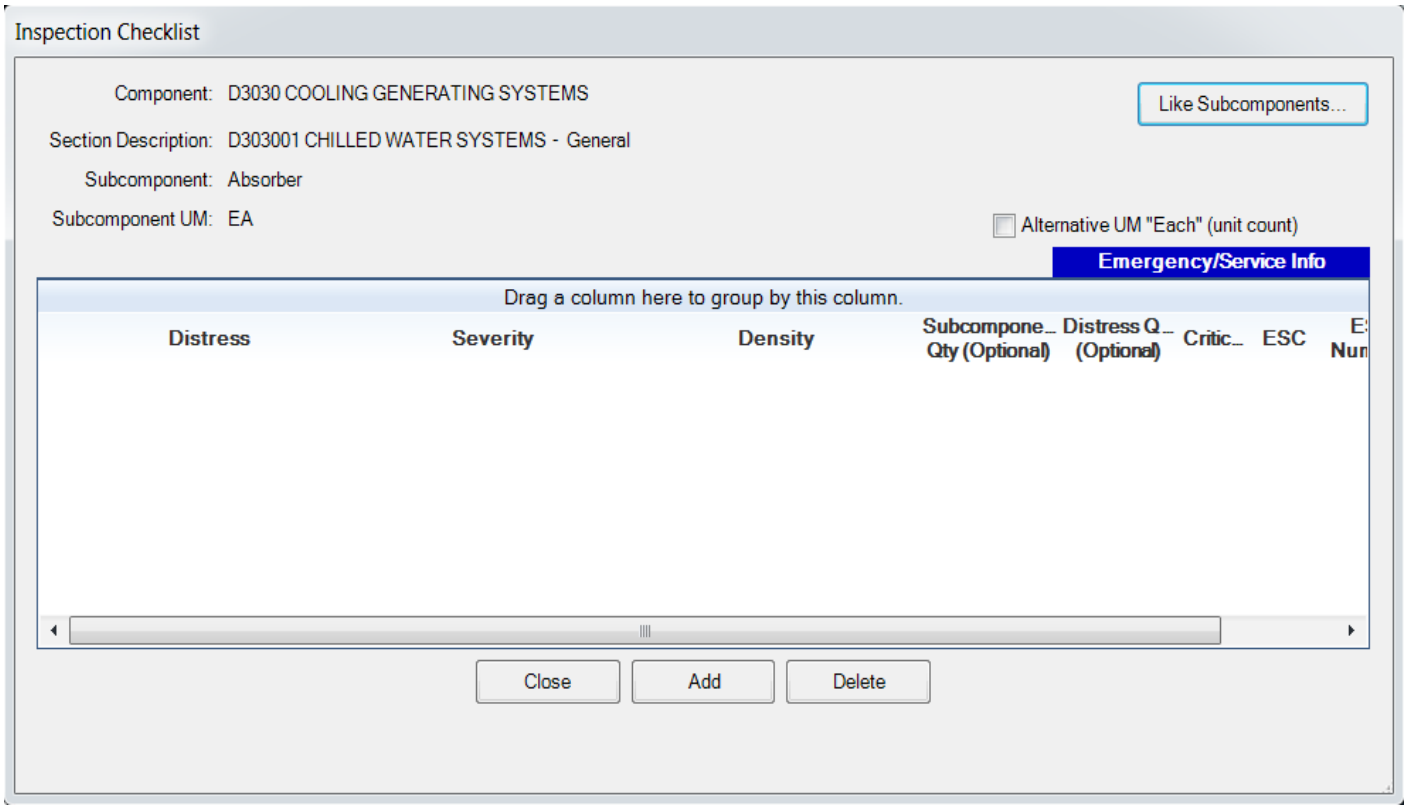
4. Enter paint/coating rating data if the component section is painted or coated.
5. Click the "Save" button in the toolbar to save the inspection data for the section to the database. If you wish to discard the inspection data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

It is important to note that the user has 5 days from the inspection date to edit the inspection data. The time the data is editable is called "The 5-day window."

Inspection Checklist



Clicking on the "Distresses" button will open the "Inspection Checklist" window. In this window, distresses data for the subcomponent selected subcomponent will appear and distresses can be added or deleted to the subcomponent. Click on each field and button for a detailed explanation of its contents or function.


Inspection Checklist
Component: D3030 COOLING GENERATING SYSTEMS
Like Subcomponents...
Section Description: D303001 CHILLED WATER SYSTEMS - General
Subcomponent: Absorber
Subcomponent UM: EA
Alternative UM "Each" (unit count)
Emergency/Service Info
Drag a column here to group by this column.
Distress
Severity
Density
Subcompone... Qty (Optional)
Distress Q... (Optional)
Critic...
ESC
Close
Add
Delete

Performing Paint Ratings

Sections that are painted or coated are usually, but not always, evaluated separately from the component-section itself. Paint include the various items used to preserve the substrate and/or provide aesthetics, while coatings are intended to include such items as varnishes, stains, and water seals and serve the same purposes as paints.

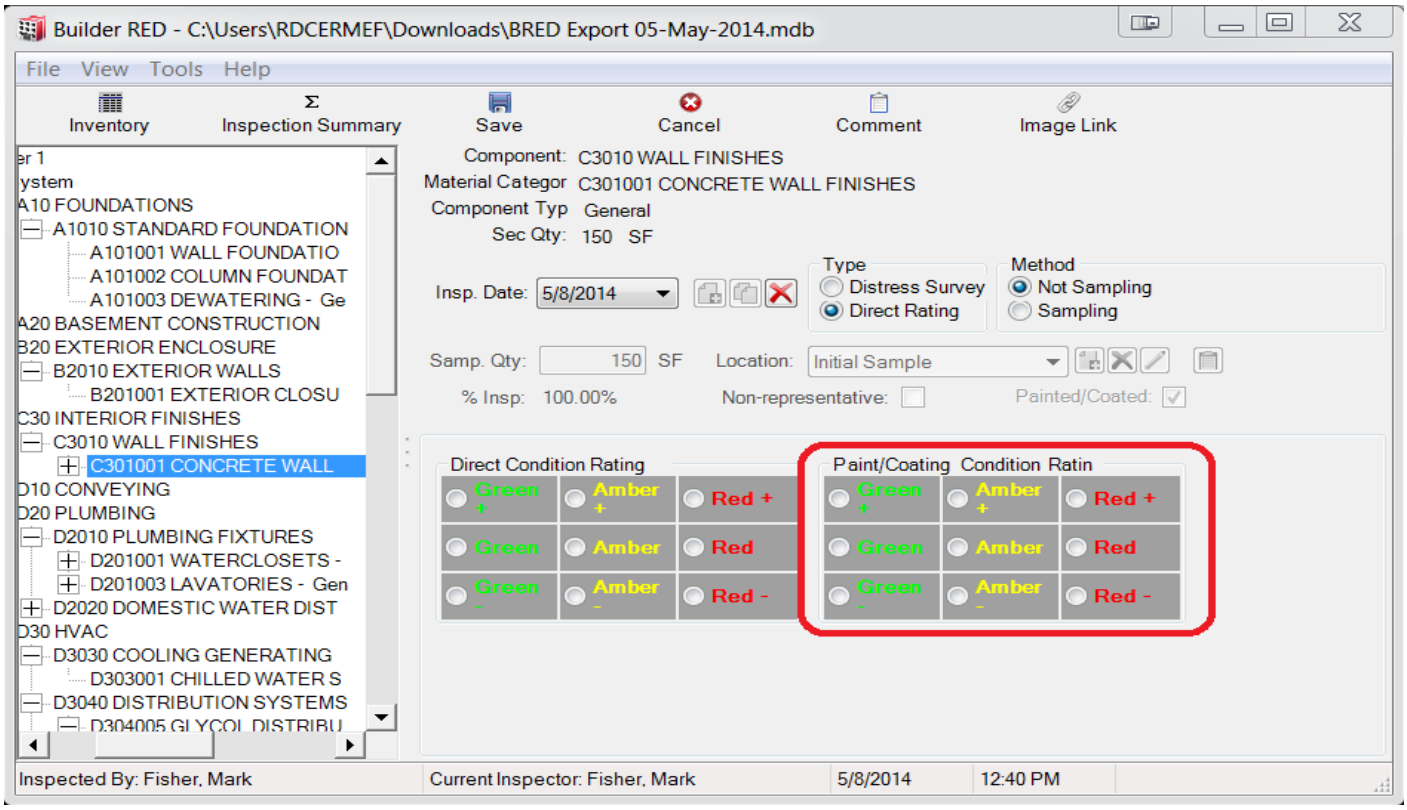
Paint/coating ratings are based on the direct condition rating approach. Ratings of "Green," "Amber," and "Red" are used along with (+) and (-). This direct approach is used with both distress surveys and direct condition types of condition assessments. The paint rating definitions are based on the percent of paint/coating deteriorated shown in the figure below:

Rating	% Deteriorated	Relative Amount Deteriorated
Green (+)	0.00 – 0.03	Up to about 1"x 4" in a 8'x 10' area; 1/32" in a 10' length; or 3 in 10,000
Green	0.03 – 0.10	Between about 1"x 4" and 1"x 12" in a 8'x 10' area; 1/32" and ⅛" in a 10' length; or 3 and 10 in 10,000
Green (-)	0.10 – 0.30	Between 1"x 12" and 3"x 12" in a 8'x 10' area; ⅛" and ⅜" in a 10' length, or 1 and 3 in 1000
Amber (+)	0.30 – 1.00	Between 3"x 12" and 10"x 12" in a 8'x 10' area; ⅜" and 1¼" in a 10' length; or 3 and 10 in 1000
Amber	1.00 – 3.00	Between 10"x 12" and 18"x 18" in a 8'x 10' area; 1¼" and 3¾" in a 10' length; or 1 and 3 in 100
Amber (-)	3.00 – 10.0	Between 1'x 2½' and 1'x 8' in a 8'x 10' area; 3¾" and 12" in a 10' length; or 3 and 10 in 100
Red (+)	10.0 – 17.0	Between 1'x 8' and 1¾'x 8' in a 8'x 10' area; 1' and 1¾' in a 10' length; or 10 and 17 in 100
Red	17.0 – 33.0	Between 1¾'x 8' and 3⅓'x 8' in a 8'x 10' area; 1¾' and 3⅓' in a 10' length; or 17 and 33 in 100
Red (-)	33.0 - 100	Greater than 1/3 of area, length, or amount

Paint Ratings for Direct Ratings

When performing a direct condition rating, component-section paint or coating in its entirety is rated. To perform the paint rating:

1. Choose the correct paint rating for the overall component section. The "% Deteriorated" in the table shown above is to be based on the painted portions only.



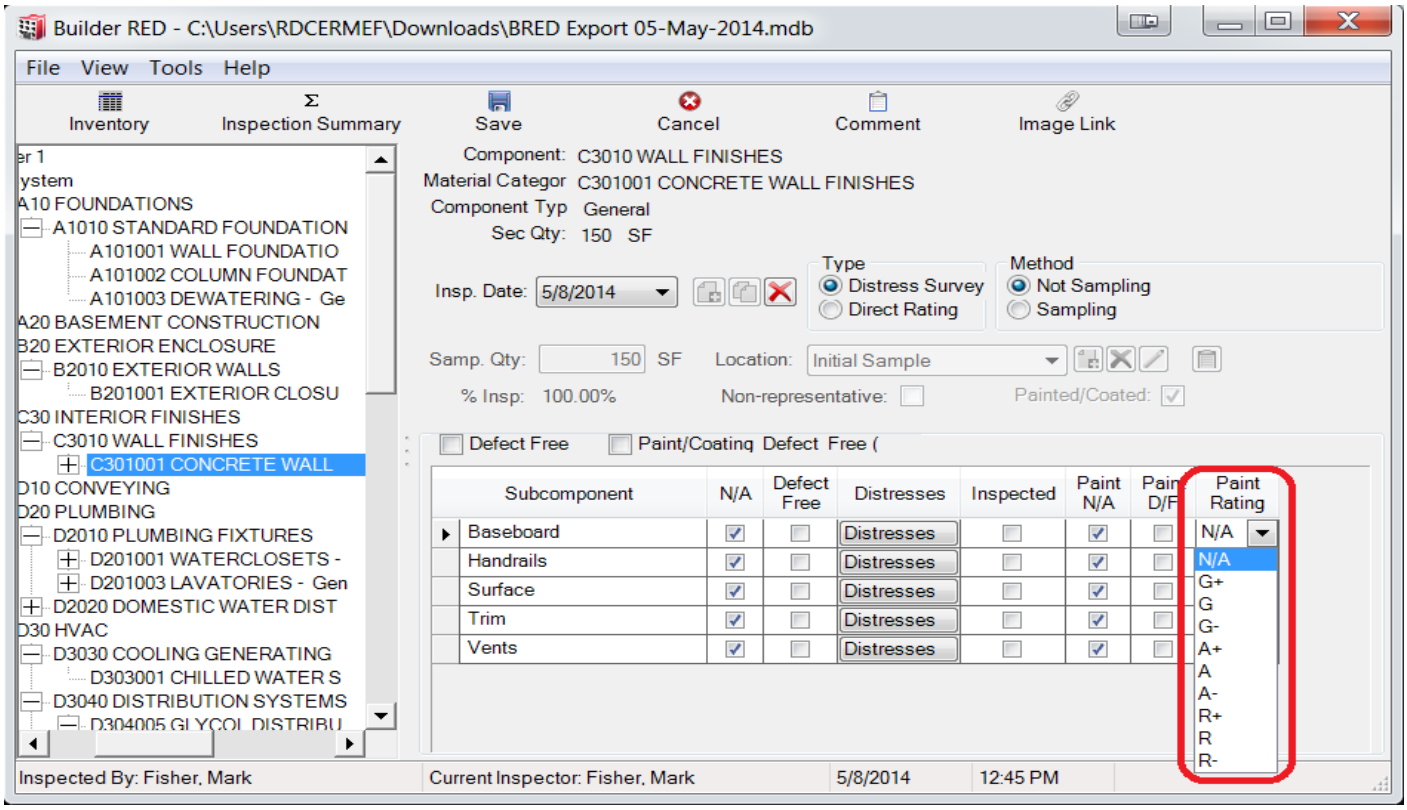
2. Click the "Save" button in the BuilderRED toolbar to save the paint/coating rating data for the section to the database. If you wish to discard the paint/coating rating data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

Paint Ratings for Distress Surveys

When performing a distress survey, each painted/coated subcomponent shall be rated. To perform the paint rating:

1. For each inspected subcomponent:
   - Choose the correct paint rating (using the chart above) from the "Paint Rating" dropdown list.
   - Mark the "Paint D/F" checkbox if the subcomponent's paint/coating has no visible deterioration or damage of the paint/coating.
   - Mark the "Paint N/A" checkbox if the subcomponent is not painted.

For each subcomponent not inspected, make sure the "Paint N/A" is checked.



2. Click the "Save" button in the BuilderRED toolbar to save the paint/coating rating data for the section to the database. If you wish to discard the paint/coating rating data without saving it to the database, click the "Cancel" button in the BuilderRED toolbar.

Frequency of Inspections

Traditionally, the frequency of condition survey inspections is set on some sort of a fixed schedule. They may be two year, three year, or something else based on facility importance, available funding, policy and doctrine, and other factors. Unfortunately, some component-sections will be inspected too often and others will not be inspected often enough. The knowledge-based condition survey inspection (KBCSI) approach abandons the fixed schedule approach in favor of a flexible one based on supporting the criteria below.

Scheduling Criteria

- Building Importance

Logically, the buildings that are most important should demand more attention than the buildings that are least important. Importance is measured by the mission dependency index (MDI). If a MDI analysis has not been performed, building use can be used as a surrogate metric.

- Component-Section Importance

Also, logically the component-sections that are most important or critical to building usefulness should demand more attention than the component sections that are least important. A metric for measuring component-section criticality is currently under development at ERDC-CERL. In the interim, building system can be used as the variable.

- Service Life

All other factors being equal, component-sections with shorter service lives need to be inspected more often than those with longer lives because less change is expected from year to year.

- Remaining Service Life

Remaining service life (RSL) is important when the component resides in zones 1 and 5. In zone 1, if the RSL is long, inspection is needed less often than if it is short. Also, in zone 4, condition survey inspections should be scheduled at specific points prior to RSL going to zero.

- Maintenance Life

Component-sections with shorter maintenance lives need to be inspected more often than those with longer lives because less change is expected from year to year. If the frequency is too far apart, it's possible to slip by the "sweet spot" between condition surveys.

- Remaining Maintenance Life

The remaining maintenance life (RML) will set the timing for condition surveys. RML minus one year is a key time for performing a condition survey inspection. Also, as the IMPACT program (developed by ERDC-CERL) and deployed with BUILDER will recommend work needs in future years which can them be imported back into BUILDER. This

forms the basis for the long range work plan. Scheduled year minus one year should be a condition survey inspection with distress quantities.

- Rate of Deterioration

Component-sections that are rapidly deteriorating need to be inspected more often, especially if the rate is greater than expected.

- Specific Distress Tracking

A past condition survey inspection may have revealed a particular distress type and severity level that require somewhat frequent inspection to track how fast the density is growing (if at all) or the elevation to a higher severity level.

- Condition Zone

As discussed above, the condition zone serves to determine the type of condition survey to perform. It also affects frequency when viewed with RML and RSL.

- Condition Standards

Standards affect condition zone range, building importance, and component-section importance, which in turn affect condition assessment frequency.

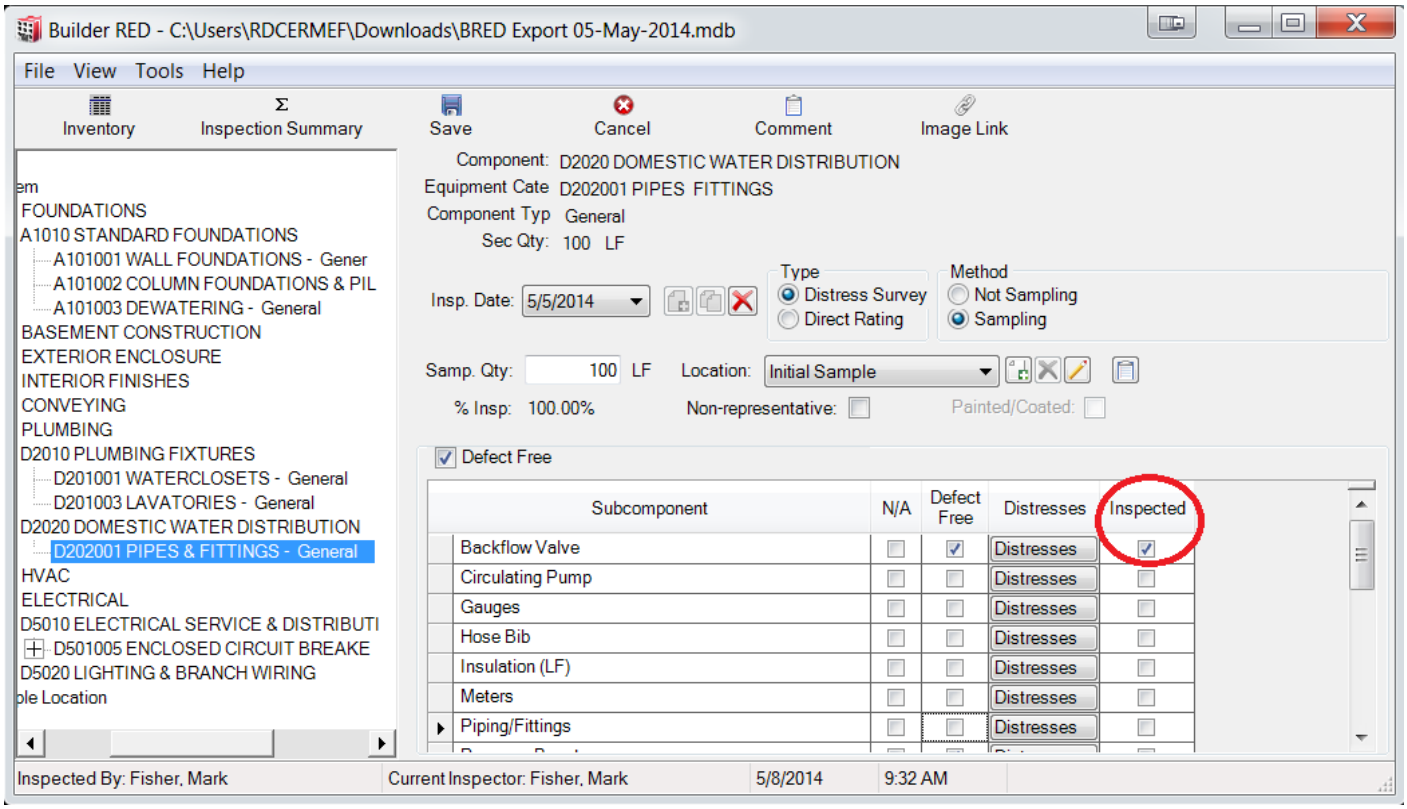
- Maximum Time-Frame between Condition Surveys

Applying the above criteria may result in specific component-sections not getting a condition survey inspection for several years. This criteria assures that no more than a certain number of years transpires between condition surveys.

Creating Knowledge-Based Condition Survey Inspection Plans

New to BUILDER 3.0 is the Knowledge-Based Inspection Scheduling tool. The tool is designed to select from your entire inventory a subset of component-sections that should be considered for inclusion in the next round of condition assessments and determines the condition assessments type to perform on those sections based on any or all of the criteria described above. This tool can be used in BUILDER to create the list of sections to inspect and types of assessments to perform on them and used during your assessments using the BuilderRED software. For more information about the Knowledge-Based Inspection Scheduling tool consult the BUILDER 3.0 help file.

Inspected



This checkbox displays if the subcomponent has been inspected. A checkmark here indicates that the subcomponent is either defect free or has a known distress(es). This checkbox will automatically check for a subcomponent after defect free has been marked or a distress has been declared for it.

Built-Up Roofing Distress Survey Definitions

General Notes

1. These definitions are applicable to built-up (BUR) roofing surfaces and flashing components.
2. Where multiple severity levels are present for a given distress record each separately.
3. Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/BRED. If distress densities are recorded, distress quantities will be blank in BUILDER/BRED.
4. If during the course of the inspection additional occurrences are found of distress-severity combinations, adjust the quantity or density as necessary.
5. To estimate density when distress quantities are not recorded, follow the density definitions for the individual distresses. However, for use in BUILDER, density may be estimated since density ranges are used, not the precise density value. Generalized visual cues are offered below, but may not be applicable for certain distresses.

Density (%)	Visual Cue (when applicable)
>0-0.1%	Difficult to notice even by careful observation, especially if spotty. (up to about 1"x 12" in a 8'x 10' area; ⅛" in 10' length; or 1 in 1000)
>0.1-1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10"x 12" in a 8'x 10' area; 1¼" in 10' length; or 1 in 100)
>1-5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1'x 4' in a 8'x 10' area; 6" in 10' length; or 1 in 20)
>5-10%	Easily noticeable even if spotty; more than a mere fraction. (up to about 1'x 8' in a 8'x 10' area; 1' in 10' length; or 1 in 10)
>10-25%	Readily noticeable, but less than ¼ of area, length, or amount.
>25-50%	Very noticeable, but less than ½ of area, length, or amount.
>50-<100%	Overwhelmingly noticeable; greater than ½ of area, length, or amount.
100%	Entire area, length, or amount.

6. These distress definitions are reproduced from Membrane and Flashing Condition Indexes for Built-Up Roofs, Volume II: Inspection and Distress Manual, USACERL Technical Report M-87/13 by Shahin, Bailey, and Brotherson.

Distress Summary Listing

1. (BUR) Base Flashing
2. (BUR) Metal Cap Flashing
3. (BUR) Embedded Edge Metal
4. (BUR) Flashed Penetrations
5. (BUR) Pitch Pans
6. (BUR) Interior Drains and Roof Level Scuppers
7. (BUR) Blisters
8. (BUR) Ridges
9. (BUR) Splits
10. (BUR) Holes
11. (BUR) Surface Deterioration
12. (BUR) Slippage
13. (BUR) Patching
14. (BUR) Debris and Vegetation
15. (BUR) Improper Equipment Supports
16. (BUR) Ponding

Single Ply Roofing Distress Survey Definitions

General Notes

1. These definitions are applicable to Single Ply roofing surfaces and flashing components.
2. Where multiple severity levels are present for a given distress record each separately.
3. Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/BRED. If distress densities are recorded, distress quantities will be blank in BUILDER/BRED.
4. If during the course of the inspection additional occurrences are found of distress-severity combinations, adjust the quantity or density as necessary.
5. To estimate density when distress quantities are not recorded, follow the density definitions for the individual distresses. However, for use in BUILDER, density may be estimated since density ranges are used, not the precise density value. Generalized visual cues are offered below, but may not be applicable for certain distresses.

Density (%)	Visual Cue (when applicable)
>0-0.1%	Difficult to notice even by careful observation, especially if spotty. (up to about 1"x 12" in a 8'x 10' area; ⅛" in 10' length; or 1 in 1000)
>0.1-1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10"x 12" in a 8'x 10' area; 1¼" in 10' length; or 1 in 100)
>1-5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1'x 4' in a 8'x 10' area; 6" in 10' length; or 1 in 20)
>5-10%	Easily noticeable even if spotty; more than a mere fraction. (up to about 1'x 8' in a 8'x 10' area; 1' in 10' length; or 1 in 10)
>10-25%	Readily noticeable, but less than ¼ of area, length, or amount.
>25-50%	Very noticeable, but less than ½ of area, length, or amount.
>50-<100%	Overwhelmingly noticeable; greater than ½ of area, length, or amount.
100%	Entire area, length, or amount.

6. These distress definitions are reproduced from Membrane and Flashing Condition Indexes for Single-Ply Membrane Roofs-Inspection and Distress Manual, USACERL Technical Report FM-93/11 by Bailey, Brotherson, Tobiasson, Foltz, and Knehans.

Distress Summary Listing

8. (SP) Splits
9. (SP) Ridges
10. (SP) Holes, Cuts, and Abrasions
11. (SP) Defective Seams
12. (SP) Surface Coating Deterioration
13. (SP) Membrane Deterioration
14. (SP) System Securement Deficiencies
15. (SP) Membrane Support Deficiencies
16. (SP) Patching
17. (SP) Debris and Vegetation
18. (SP) Improper Equipment Supports
19. (SP) Ponding

Shingled Roofing Distress Survey Definitions

General Notes

1. These definitions are applicable to shingled roofing surfaces and flashing components.
2. Where multiple severity levels are present for a given distress record each separately.
3. Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/BRED. If distress densities are recorded, distress quantities will be blank in BUILDER/BRED.
4. If during the course of the inspection additional occurrences are found of distress-severity combinations, adjust the quantity or density as necessary.
5. To estimate density when distress quantities are not recorded, follow the density definitions for the individual distresses. However, for use in BUILDER, density may be estimated since density ranges are used, not the precise density value. Generalized visual cues are offered below, but may not be applicable for certain distresses.

Density (%)	Visual Cue (when applicable)
>0-0.1%	Difficult to notice even by careful observation, especially if spotty. (up to about 1"x 12" in a 8'x 10' area; ⅛" in 10' length; or 1 in 1000)
>0.1-1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10"x 12" in a 8'x 10' area; 1¼" in 10' length; or 1 in 100)
>1-5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1'x 4' in a 8'x 10' area; 6" in 10' length; or 1 in 20)
>5-10%	Easily noticeable even if spotty; more than a mere fraction. (up to about 1'x 8' in a 8'x 10' area; 1' in 10' length; or 1 in 10)
>10-25%	Readily noticeable, but less than ¼ of area, length, or amount.
>25-50%	Very noticeable, but less than ½ of area, length, or amount.
>50-<100%	Overwhelmingly noticeable; greater than ½ of area, length, or amount.
100%	Entire area, length, or amount.

6. These distress definitions are reproduced from ROOFER: Steep Roofing Inventory Procedures and Inspection and Distress Manual for Asphalt Shingle Roofs, CERL Technical Report 99/100 by David M. Bailey.

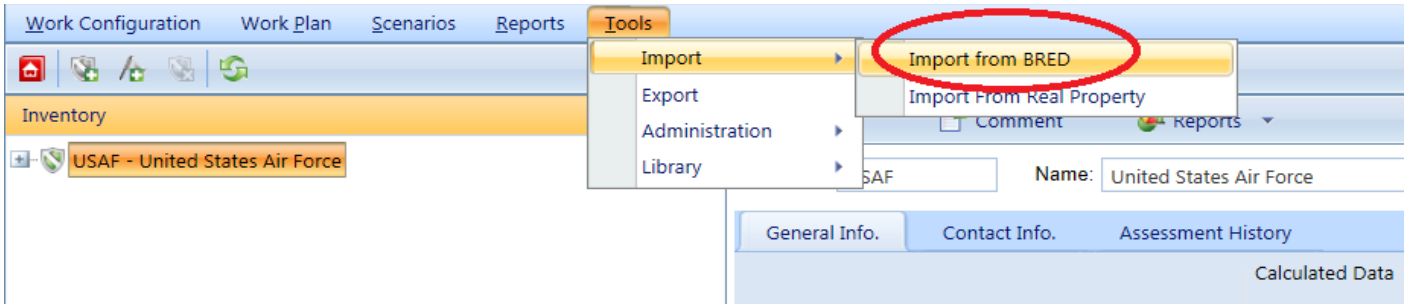
Distress Summary Listing

9. (SR) Pitch Pans
10. (SR) Interior Gutters
11. (SR) Age Deterioration
12. (SR) Holes/Splits/Missing Shingles
13. (SR) Unsealed/Unlocked Tabs
14. (SR) Lumps/Ridges/Sags
15. (SR) Exposed Fasteners
16. (SR) Stains/Rust/Fungus/Mildew
17. (SR) Debris and Vegetation
18. (SR) Patching
19. (SR) Improper Equipment Supports

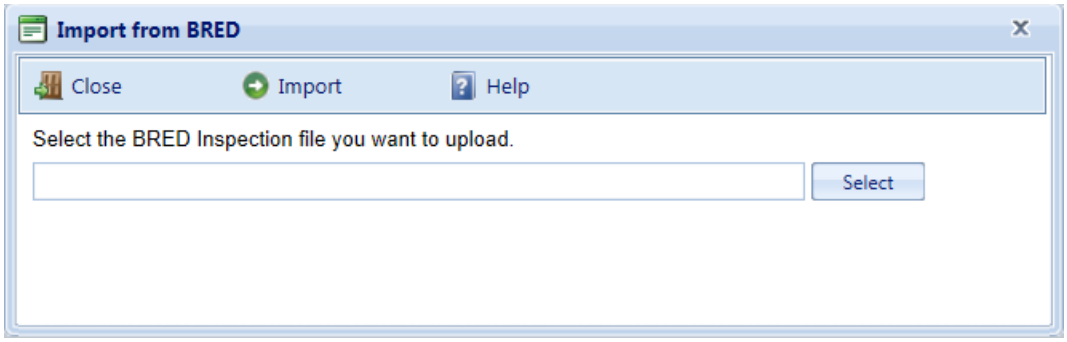
Importing Data from BuilderRED to BUILDER

After, the user has finished adding, editing, and deleting inventory and inspection data, the updated database must be imported back into BUILDER version 3.0 to assess the condition of the installation and plan maintenance and repair of the installation. To Import Database Information into BUILDER from Builder RED:

1. Save all changes to the database in BuilderRED.
2. Open BUILDER version 3.1.
3. Select Tools >> Import >> Import from BRED from the navigation menu.



The BRED Imported window will appear.



4. Locate the database you wish to import using the “Browse” button or simply enter the full path and file name in the text box and click the “Import” button. All changes to the database will be imported into BUILDER.

Animal/Insect Damaged

Definition:

Subcomponent has been gnawed, chewed, scratched, bitten, or otherwise damaged by animals, birds, and/or insects. Evidence includes holes, droppings, nests, sawdust, shavings, and particle matter indicating the presence of animals, birds, and/or insects.

Notes:

1. Nests, per se, may not indicate animal/insect damage, but indicate the past or a current presence of animals, birds, or insects. Nests should be recorded under "Moisture/Debris Contaminated".
2. Damage may be internal. Therefore, if clues indicate animal, bird, or insect damage, the subcomponent should be sounded with a hammer or mallet. A hollow sound may indicate internal damage.
3. If damage includes staining, record "Stained" in addition to "Animal/Insect Damaged." If the only damage is staining, only record "Stained" and do not record "Animal/Insect Damaged."
4. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the animal/insect damage a leak has also occurred, record the severity level as High and the distress type "Leaks," as well.
5. If the animals, birds, or insects causing the damage are still present, record as High severity.
6. If the subcomponent unit-of-measure is "Each," estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes).
7. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and animal/insect damage has occurred to subcomponents where the logical repair would be the replacement of a unit (e.g. wood deck member, fan belt) the measurement quantity will be that entire unit even though the animal/insect damage may only encompass portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
8. Assign only one severity level to a given logical replacement area, length, or quantity measured as described in 7 above.

Severity Levels:

Low - Distress exists, but damage is superficial.

Medium - Distress exists, but not superficial, nor raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The passage of animals, birds, or insects is possible and/or likely, but prevention is required.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Termite damage
- Pet scratches
- Rodent holes
- Fecal contamination
- Carpenter bee holes
- Animal pathways in insulation
- Screen in roof ventilator displaced and holed by animal in order to gain access to attic
- Bent roof ventilator blade caused by animal gaining access to attic
- Animal hole under security fence

Blistered

Definition:

Round or elongated raised areas of the subcomponent surface that are generally filled with air.

Note: "Blistered" is a special case of deterioration. When present, record "Blistered" instead of "Deteriorated."

Severity Levels:

Low - The raised areas are noticeable by vision or touch.

Medium - Blistered area has begun to show deterioration.

High - Blisters are broken or worn through.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Floor covering with raised area that is "soft" when walked on.
- Wall covering (wallpaper) with air pocket.

Broken

Definition:

Subcomponent has been fractured, shattered, or otherwise separated into two or more pieces and one or more of those pieces are missing or if the pieces are all present the separation is resulting in the loss of operability to this or other subcomponents.

Notes:

1. Care must be taken to differentiate between "Broken," "Cracked," "Damaged," "Operationally Impaired," and "Missing." The differentiation between "Broken" and "Cracked" are the missing pieces or loss of operability associated with "Broken." "Broken" provides greater problem specificity and should be used instead of "Damaged," when applicable. "Operationally Impaired" should be recorded instead of "Broken" if operability is lost, but there is no true separation of pieces or if a separation is unknown. Missing pieces as a result of fracturing denotes "Broken," whereas missing parts without fracturing denotes "Missing."
2. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the fracturing a leak has occurred, record the severity level as High and the distress type "Leaks," as well.
3. If the subcomponent unit-of-measure is "Each" estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
4. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and the logical repair would be the replacement of a unit (e.g. ceiling tile, window pane, etc.) the measurement quantity will be that entire unit even though the actual broken quantity may only encompass a portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
5. Assign only one severity level to a given logical repair or replacement area, length, or quantity measured as described in 4 above.

Severity Levels:

Medium - Distress exists.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent or component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Shattered window pane
- Wire separated from connector
- Ceiling tile separated into two pieces with the one piece missing

Capability/Capacity Deficient

Definition:

Component serviceability is lacking due to insufficient capacity, technical obsolescence, or lack of compliance to applicable codes. This can be due to poor original design, alterations, changes in component demand, and/or changes in building use.

Notes:

1. Capability/Capability Deficient" is defined at the component level, but sometimes it is apparent at the system level (e.g. HVAC) or in a building functional area (e.g. kitchen). However, since inspection is performed on component-sections at the subcomponent level, "Capability/Capacity Deficient" should be applied to all applicable component-sections and their applicable subcomponents. This is done by using functional areas as the another basis for component-section identification.
2. Consider "Capability/Capacity Deficient" in a broad context (e.g. meeting Americans with Disabilities Act (ADA) requirements, building use demands, etc.)

3. Only rate component-sections actually present in the building, not those that may be required but never installed or constructed.
4. Check for problems with other components/subcomponents to ensure that other, more appropriate, distress types are not the true cause of the perceived deficiency.
5. This distress will be eliminated in a future version of BUILDER. Component-section functionality metrics are under development and when completed this distress will be superseded by those in a functionality assessment procedure.

Severity Levels:

Low - Distress exists, but superficial. Mission or quality-of-life rarely affected.

Medium - Distress exists, but not superficial, nor raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Violation of law.
- Adversely affects mission or quality-of-life for an extended period of time.

Measurement:

Affected Area, Length, or Quantity

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- HVAC ductwork does not extend into an office
- HVAC unit size too small for cooling demand
- Furnace cannot adequately heat office in winter
- Pipe size too small for proper water flow
- Wheelchair ramp too steep
- Poor room lighting
- Door undersized for a wheelchair

Clogged

Definition:

Obstruction within a subcomponent that is disrupting the intended flow of air, other gasses, or liquids.

Notes:

1. "Clogged" applies to such items as pipes, drains, valves, ducts, troughs, gutters, filters, and other "enclosed (totally or partially)" subcomponents used to channel liquids and/or gasses.
2. The measurement amount and density are based on the subcomponent length, area, or quantity, not on the degree of blockage for that amount. The degree of blockage is used to determine severity level.
3. Sometimes, the extent of a clogged item is unknown (e.g. how much of a length of pipe is clogged?). If unknown, estimate a reasonable amount or density of the subcomponent length or area.
4. If blockage is due to corrosion, debris or vegetation, or dirt, record the distress type “Corroded,” “Moisture/Debris/Mold Contaminated, ” or “Stained/Dirty,” respectively, in addition to “Clogged.” If those distresses are present, but the flow is unaffected, do not record, “Clogged.”

Severity Levels:

Low - Distress exists, but superficial.

Medium - Distress exists, but not superficial, nor raised to the level of High.

High - Any of the following exists:

- Health, life/safety, or security problems.
- Flow is severely restricted.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Length or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Waste water pipe that will not drain or drains slowly
- Downspout with little flow and water spilling over gutter

- Low water flow from faucet (not due to low water pressure)
- Reduced air flow from duct due to presence of foreign matter

Corroded

Definition:

Subcomponent is wearing away, disintegrating, flaking, lensing, and/or scaling due to the effects of chemical, electrochemical, or electrolytic attack.

Notes:

1. "Corroded" is a special case of deterioration. When present, record "Corroded" instead of "Deteriorated."
2. Any staining of the surrounding area (e.g. rust streaks) will also be recorded as "Stained."
3. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the corroding a leak has also occurred, record the severity level as High and the distress type "Leaks," as well.
4. Record "Clogged," in addition if corrosion is causing clogging.
5. Paints and coatings that are failing to provide a protective coating, but NOT inventoried with the subcomponent, are included in the "Corroded" distress type at Low severity. Paints and coatings, inventoried with the subcomponent, that are failing to protect the subcomponent shall be given a separate paint/coating rating.
6. Do not record Low severity levels for paint or coatings and higher severity levels for the subcomponent at the same locations.
7. If the unit-of-measure of the subcomponent is "Each," estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
8. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and corrosion has occurred to subcomponents where the logical repair would be the replacement of a unit (e.g. metal panel) the measurement quantity will be that entire unit even though the corrosion may only encompass portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
9. Assign only one severity level to a given logical replacement area, length, or quantity measured as described in 8 above.
10. If the corrosion is desirable (e.g. patina on copper), "Corroded" will not be recorded.

Severity Levels:

Low - Any of the following exists:

- Corrosion exists, but can usually be brushed off.
- Deterioration superficial.
- Paint or protective coating (e.g. PVC) has failed and corrosion has begun (only when paint is not rated separately).

Medium - Flaking, lensing, and/or scaling exist, but not raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Spotty brown rust on metal roofs
- Brown water from internal pipe corrosion
- Rusty pipe supports
- Failure of the galvanized coating on a corrugated steel sheet wall

Cracked

Definition:

Subcomponent has been fractured. Separation into two or more pieces may or may not have occurred. Crack width may be variable and faulting may be present. There is no loss of operability to the subcomponent or component-section.

Notes:

1. A hairline crack is defined as having a width so small as to be very tight.
2. Care must be taken to differentiate between "Cracked," "Broken," "Damaged," and "Deteriorated." "Cracked" implies that the fractured pieces are intact, whereas "Broken" implies that some of the resulting cracked pieces are missing or a loss of operability. Fracturing may possibly be caused by a specific event which suggests the distress type "Damaged." However, record as "Cracked." Likewise, fracturing can occur as a consequence of weathering,

humidity change, and sustained or repeated loading over long periods suggesting "Deteriorated." However, record "Cracked."

3. "Cracked" and the distress types "Broken" and/or "Damaged" can occur together in the same subcomponent-section, but only independently at different locations (e.g. different ceiling tiles in the same component-section).
4. If the fractured pieces are faulted, record the distress type "Displaced" also.
5. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the crack a leak has occurred, record the severity level as High and the distress type "Leaks," also.
6. Density is determined from dividing total crack length by the subcomponent surface area or length, as appropriate.
7. If the subcomponent unit-of-measure is "Each" estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10). If multiple cracks exist at different severity levels, record at the highest level.
8. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and cracking has occurred in subcomponents where the logical repair would be the replacement of a unit (e.g. ceiling tile, window pane, pipe section, etc.) the measurement quantity will be that entire unit even though the actual crack may only encompass portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
9. Assign only one severity level to a given logical replacement area, length, or quantity measured as described in 8) above.

Severity Levels:

Low - Hairline cracks which may or may not divide the subcomponent into pieces. If distinct pieces exist, they are held tightly together.

Medium - Crack width greater than hairline and the subcomponent has been divided into pieces with clear separation, but not raised to the level of High.

High - Any if the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Fractured sidewalk, masonry wall, window, or ceiling tile with all pieces present
- Fractured pipe from frozen water

Damaged

Definition:

Dents, chips, gouges, tears, rips, distortion, rupture, etc. resulting from impact (e.g. vehicles), fire, flood, or other means associated with specific events.

Notes:

1. Care must be taken to differentiate between "Damaged," "Animal/Insect Damage," "Broken," "Cracked," and "Moisture/Debris Contaminated." Those other distress types imply a greater specificity and should be recorded, if applicable, instead of "Damaged."
2. "Damaged," "Animal/Insect Damage," "Broken," "Cracked," and/or "Moisture/Debris Contaminated" can occur within the same subcomponent, but only independently at different locations (e.g. different locations on the same wall.)
3. If displacement has occurred along with the damage, record the distress type "Displaced" also. If the damage event has only resulted in a displacement, record "Displaced" instead of "Damaged."
4. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the specific damage event a leak has occurred, record the severity level as High and the distress type "Leaks," also.
5. If the subcomponent unit-of-measure is "Each" estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
6. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and damage has occurred to subcomponents where the logical repair would be the replacement of a unit (e.g. ceiling tile, window pane, pipe section, etc.) the measurement quantity will be that entire unit even though the actual damage may only encompass portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
7. Assign only one severity level to a given logical replacement area, length, or quantity measured as described in 6 above.
8. If the damage is the result of liquids other than water (e.g. oil), record "Damaged" and clarify with a comment.
9. Tiny isolated dents, chips and gouges at extremely low density (difficult to see or even find) should not be recorded.

Severity Levels:

Low - Distress exists, but superficial.

Medium - Distress exists, but not superficial, nor raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Dent in metal column from collision with forklift
- Dent and hole in metal wall from impact of a forklift tine
- Scratches and chips in masonry wall from vehicle impact
- Dents in gutters from ladders
- Gouges in walls from abuse
- Deformation of roof from flying debris or hail
- Scratched, chipped, frayed, and/or holed ceiling tile from poor handling
- Hole in wall from hammer
- Carpeted wall torn from snag with passing sharp or pointed object
- Wall corner gouged or distorted from collision with a heavy object
- Charred wood column from fire

Deteriorated

Definition:

The natural degradation of the subcomponent through normal usage and/or environmental exposure. This may involve disintegration, erosion, delamination, weathering, checks, warps, bumps, raveling, flaking, pitting, spalling, wear, etc. and/or a change in properties (e.g. brittle). Included are a wearing away and/or thinning of coatings (e.g. paint, varnish, polyvinyl (PVC), etc.)

Notes:

1. "Corroded" and "Rotted" are special cases of "Deteriorated." When they are present, they should be recorded instead of "Deteriorated." Sometimes, "Cracked" and "Moisture/Debris Contaminated" may be a special case of "Deteriorated." Record the distress type "Cracked" or "Moisture/Debris Contaminated" instead of the distress type "Deteriorated" when cracks or contamination are present, respectively.
2. If displacement is occurring along with the natural degradation, record the distress type "Displaced," as well.
3. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the degradation a leak has occurred, record the severity level as High and the distress type "Leaks," also.
4. Paints and coatings that are degraded, but NOT inventoried with the subcomponent, are included in the "Deteriorated" distress type at Low severity. Paints and coatings, inventoried with the subcomponent, that are degraded shall be given a separate paint/coating rating.
5. Do not record Low severity levels for paint or coatings and higher severity levels for the subcomponent at the same locations.
6. If the subcomponent unit-of-measure is "Each" estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
7. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and deterioration has occurred to subcomponents where the logical repair would be the replacement of a unit (e.g. ceiling tile, door, wood cladding sheet, etc.) the measurement quantity will be that entire unit even though the actual deterioration may only encompass a portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
8. Assign only one severity level to a given logical replacement area, length, or quantity measured as described in 7 above.

Severity Levels:

Low - Either of the following exists:

- Distress exists, but superficial.
- Painted or coated surface worn, chipped, blistered, etc. (only when the paint is not being rated separately).

Medium - Distress exists, but not superficial, nor raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals or birds (and possibly insects) is possible and/or likely.

- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Delamination of brick faces
- Splits in wood members
- Brittle and cracked caulking
- Worn or raveled carpeting
- Warped flooring
- Peeling wallpaper
- Spalled concrete
- Weathered wood deck

Displaced

Definition:

Subcomponent has been moved, deflected, shifted, bulged, rotated, faulted, or settled from its intended position. This may be due to a specific event (e.g. earthquake, collision, failure of another subcomponent, etc.), plastic deformation, or consolidation over time.

Notes:

1. "Displaced" is a special case of either "Damaged" or "Deteriorated." It can be used together or separately from them. This should be used together with "Damaged" only when the subcomponent has been shifted from its normal position and the subcomponent is otherwise damaged. Distortion of the subcomponent either through being damaged or deteriorated does not, in itself, constitute being displaced. If the specific event causing the movement resulted in no other damage, record "Displaced" not "Damaged."

2. "Displaced" should be used together with "Deteriorated" if one or more subcomponent parts have moved and the distress type "Deteriorated," is apparent also.
3. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the displacement a leak has occurred, record the severity level as High and the distress type "Leaks," also.
4. Where displacement has resulted in cracking or vice versa, record the distress type "Cracked," as well.
5. A loose subcomponent may sag due to its weight. In these cases, record "Loose" instead of "Displaced."
6. "Displaced" may possibly occur to an entire component-section or to a subcomponent with other subcomponents attached to it. If so, record first to the primary subcomponent. Then, only record for other subcomponents if they have moved relative to the primary subcomponent.

Severity Levels:

Low - Distress exists, but magnitude of movement is slight.

Medium - Distress exists, but not slight, nor raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Leaning chimney or flue
- Uneven sidewalk
- Parapet movement
- Steps separated from building

- Sagging roof truss
- Dislodged door frame
- Open seams or joints in ductwork or gutters
- Light pole leaning after hit by truck
- Bulge in masonry wall resulting from brick unit expansion from moisture
- Floor with excessive deflection
- Sagging ceiling tiles
- Column out-of-plumb

Distress Survey Definitions

General Notes

1. These distresses are intended to apply generically to all subcomponents that collectively form building component-sections.
2. Structural component-sections and subcomponents must be viewed from a loss of structural integrity perspective. A severity level of High must be recorded should the presence of any distress type compromise the structural integrity of the component-section or subcomponent.
3. High severity must be recorded for any distress type, regardless of density, that is resulting in an unacceptable health, life/safety, or security risk.
4. There are two general rules. One is that if a certain distress type is a special case of another distress type, only record the special case. Two, if a certain distress type results from the existence of another distress, record both. Pay particular attention to the notes provided for each distress definition. They often address the application of these rules.
5. Where multiple severity levels are present for a given distress type on a given subcomponent, record each separately, unless stated otherwise for a given distress type.
6. Distress quantities or distress density may be recorded. If distress quantities are recorded, density ranges will be computed in BUILDER/BRED. If distress densities are recorded, distress quantities will be blank in BUILDER/BRED.
7. Some of the distress definitions described herein make note of a "replacement unit." Certain component-sections are a collection of units. Examples of this are tiles (ceiling, floor, etc.). If the logical work action for these units is to replace some or all of them (e.g. a cracked ceiling tile will be replaced), then the distress quantity and/or density should reflect the area, length, or quantity of the distressed units rather than the distress itself.
8. If during the course of the inspection additional occurrences are found of distress-severity combinations for a given component-section subcomponent or subcomponent sample (if sampling), adjust the distress quantity or distress density as necessary.
9. Density ranges, when recorded instead of distress quantities, can be estimated as described below.

Density (%)	Visual Cue (when applicable)
>0-0.1%	Difficult to notice even by careful observation, especially if spotty. (up to about 1"x 12" in a 8'x 10' area; ⅛" in 10' length; or 1 in 1000)
>0.1-1%	Somewhat noticeable, but easily missed by casual observation, especially if spotty; Careful observation usually needed, if spotty. (up to about 10"x 12" in a 8'x 10' area; 1¼" in 10' length; or 1 in 100)
>1-5%	Noticeable, even by casual observation, but still only a mere fraction. (up to about 1'x 4' in a 8'x 10' area; 6" in 10' length; or 1 in 20)
>5-10%	Easily noticeable even if spotty; more than a mere fraction. (up to about 1'x 8' in a 8'x 10' area; 1' in 10' length; or 1 in 10)
>10-25%	Readily noticeable, but less than ¼ of area, length, or amount.
>25-50%	Very noticeable, but less than ½ of area, length, or amount.
>50-<100%	Overwhelmingly noticeable; greater than ½ of area, length, or amount.
100%	Entire area, length, or amount.

10. Some subcomponents have a unit of measure of "Each." Distress densities may apply to the entire unit or a unit portion as indicated in the definitions below. Density must first be applied to an entire unit and then applied across multiple units, if present. For example, if a fan belt has been chewed by a rodent, the distress density for that unit would be 100% regardless of how much of the belt has been chewed. But if there are three belts present and the other two are free of distress, the density will drop to 33%.
11. Distresses for built-up, single-ply, and asphalt shingle roofing (membrane, flashing, etc.) shall follow the ROOFER EMS definitions provided in Appendices B through D. Densities may be estimated or distress quantities may be recorded.

Distress Summary Listing

19. Operationally Impaired
20. Overheated
21. Patched
22. Rotten
23. Stained

Efflorescence

Definition:

Soluble salts encrusted on the surface of masonry, concrete, or plaster subcomponents caused by moisture leaching free alkalies from mortar or concrete. Efflorescence is typically seen as a white powdery coating.

Severity Levels:

Low - Coating is noticeable and easily brushed off, but the surface is visible.

Medium - Either of the following exists:

- Coating is not easily brushed off.
- Surface is obscured.

Measurement:

Affected Area, Length, or Quantity

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Example:

- White powder on brick or concrete masonry

Electrical Ground Inadequate or Unintentional

Definition:

Unintentional connection of very low resistance causing a short circuit or a high resistance connection resulting in inadequate grounding.

Notes:

1. "Electrical Ground Inadequate or Unintentional" is a special case of impaired operations. When present, record "Electrical Ground Inadequate or Unintentional" instead of "Operationally Impaired."
2. Record additional distress types, if known, should they be contributing to this distress. These may include "Corroded," "Loose," "Damaged," etc.

Severity Levels:

High - Distress exists

Measurement:

Total Subcomponent Area, Length, or Quantity

Density:

100% (automatic)

Distress Examples:

- Lightning arrestor disconnected or broken
- Connector insulated by paint
- Open or no ground at outlet for interior wiring

Holes

Definition:

Drilling, punching or penetration of a subcomponent for an intended purpose. Penetration depth may be partial or complete.

Notes:

1. Do not record "Holes" along with the distress types "Animal/Insect Damaged," "Broken," "Corroded," "Damaged," "Deteriorated," "Missing," or "Rotten." The presence of holes determines the severity levels for those distress types.
2. Do not record if holes are not in plain view or do not degrade the subcomponent.
3. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the penetration a leak has occurred, record the severity level as High and the distress type "Leaks," as well.
4. Holes resulting from missing fasteners shall not be recorded if the fastener should be replaced. Record "Missing" for the fasteners instead.
5. Do not count pinholes, unless density is sufficient to be noticeable or a leak has occurred.
6. Clusters of four (4) or more Low severity holes shall count as one (1) Medium severity hole.
7. Weep holes shall not be recorded.

Severity Levels:

Low - Partial depth penetration.

Medium - Either of the following:

- Clusters of Low severity holes.
- Distress exists, but not raised to the level of High.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The penetration is adversely affecting the operation of another subcomponent, the parent component-section, or another component-section.
- The subcomponent is unusable.

Measurement:

Number of Holes

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Number of Holes

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Pipe penetration that is not sealed
- Former anchor holes for signs since removed
- Permanently secured door with door lock removed, but hole for lock remains

Leaks

Definition:

The unwanted entry, passage, or escape of gas or liquid.

Notes:

1. If the leaking gas or liquid is a biological (e.g. herbicide, pesticide, etc.), chemical (e.g. volatile, flammable, explosive, corrosive, etc.), or radioactive hazard, High severity shall be recorded. Also, notify for immediate corrective

action.
2. "Leaks" may be recorded without any other distresses.
3. Do not record "Leaks" in conjunction with "Animal/Insect Damaged," "Broken," "Corroded," "Cracked," "Damaged," "Deteriorated," "Displaced," "Holes," "Loose," "Missing," or "Rotten" unless the subcomponent is a tank, pipe, container, trough, pressure vessel or sealant. The loss of liquids or gas (or the gain from a vacuum loss) from those subcomponents as a result of those distresses is the trigger for "Leaks."
4. Leaks from cracks, joints, etc. should be measured as the crack or joint length, etc.

Severity Levels:

Low - Distress exists, but superficial.

Medium - Distress exists, but not raised to the level of High.

High - Any of the following exists:

- Health, life/safety, or security problems.
- Steady rate of flow and loss of air, gas, water, or other liquid of significant concern.
- Pressure or vacuum loss apparent and adversely affecting usage.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the leakage.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- Overall component-section, component, or system usage is adversely affected by liquid or gas loss.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Water dripping from hot water heater or pipe connection
- Air escaping from compressed air line
- Boiler tubes dripping water into firebox
- Water dripping from rain gutter

- Leaky faucet
- Loss of seal in a thermopane window causing the window to fog
- Water entering during a storm through failed sealant joint between window and wall

Loose

Definition:

Subcomponent or subcomponent parts are not secured tightly to one or more other subcomponents. Also, one or more fasteners (i.e. bolts, screws, pins, nails and/or rivets) are not tight (torqued to a proper tension).

Notes:

1. If subcomponent is loose due to being "Broken" or "Damaged" do not report "Loose."
2. 2) Fasteners are not considered subcomponents. If any fasteners are loose, record the subcomponent being fastened as “Loose” at Low severity. Estimate density based on the number of similar fasteners needed.
3. If the entire subcomponent is loose, record with a density of 100% at either Medium or High severity, as applicable. Any missing fasteners should be recorded as "Missing."
4. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of being loose a leak has occurred, record the severity level as High and the distress type "Leaks," as well.
5. Subcomponents firmly attached to a loose subcomponent are not loose.

Severity Levels:

Low - Fasteners are loose, but subcomponent is tight.

Medium - Subcomponent is loose, but not raised to the level of *High*.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Loose bolts holding light fixture to wall
- Roof or wall panels flapping in wind
- Non-secured stair railing
- Slackened guy wire
- Squeaky floor or stair when walked or stepped on
- Nail or screws popping out of drywall panel
- Raised nails or screws in a deck or flooring

Missing

Definition:

Subcomponent and/or subcomponent parts including fasteners (i.e. bolts, screws, pins, nails and/or rivets) are required, but absent due to removal, dislodgement, or deterioration.

Notes:

1. If a subcomponent or subcomponent parts are missing resulting in a hole, record "Missing." Do not record "Holes" for this subcomponent. The distress type "Holes" may be valid for the subcomponent to which this subcomponent was attached. See "Holes" definition.
2. If the entire subcomponent is missing and needed, record "Missing" with a density of 100% at either Medium or High severity, as applicable.
3. Fasteners are not considered subcomponents. If any fasteners are missing, record the subcomponent being fastened as “Missing” at Low severity. Estimate density based on the number of similar fasteners needed.
4. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the missing sub-component a leak has occurred, record the severity level as High and the distress type "Leaks," as well.

Severity Levels:

Low - Fasteners are missing.

Medium - Portion of or entire subcomponent absent, but not raised to the level of *High*.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Holes where fasteners are currently required
- Ceiling tiles removed and never replaced
- Exhaust fan removed, but still needed
- Missing pin in a hinge
- Missing pop rivet from sheet metal panel
- Handrail removed and never replaced
- Ladder rung was loose and fell out

Moisture/Debris Contaminated

Definition:

The unintended presence of foreign material, vegetation, water and/or other liquid.

Note:

1. The presence of moisture, debris, sand, etc. does not necessarily constitute “Moisture/Debris/Mold Contaminated.” The presence must exceed the amount normally expected through typical usage. Cleaning efforts would need to exceed those normally expected from routine housekeeping.

2. “Moisture/Debris/Mold Contaminated” is a special case of either “Damaged” or “Deteriorated.” When present, use “Moisture/Debris/Mold Contaminated” instead of either “Damaged” or “Deteriorated.”
3. After debris, mold, mildew, etc. removal or cleaning, record “Stained/Dirty” instead of “Moisture/Debris/Mold Contaminated,” if staining remains.
4. If the foreign material is dirt, record “Stained/Dirty” instead of “Moisture/Debris/Mold Contaminated.”
5. The distress type “Clogged” should be used in addition to “Moisture/Debris/Mold Contaminated” if the presence of leaves, etc. in drains, gutters, downspouts, troughs, screens, etc. is affecting water or air flow.
6. If the unit-of-measure of the subcomponent is “Each,” estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
7. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and moisture/debris contamination has occurred to subcomponents where the logical repair would be the replacement of a unit (e.g. room carpeting) the measurement quantity will be that entire unit even though the actual contamination may only encompass portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
8. Assign only one severity level to a given logical repair or replacement area, length, or quantity measured as described in 6) above.

Severity Levels:

Low - Distress exists and damage is superficial.

Medium - Subcomponent is wet or contaminated, but not raised to the level of High

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Cannot be cleaned, dried, or made useable.
- Other subcomponents may be damaged.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B} \times 100$ = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Gutters filled with leaves
- Trash on roof

- The presence of leaves in air handling unit coils
- Leaves present on insect screen to air intake vent
- Wet insulation
- Flood or water damage
- Bird, animal, or insect nest
- Grass growing in cracks in sidewalk
- Moss growing on side of building
- Unintended vines growing up downspout
- Mold or mildew growing on wall

Noise/Vibration Excessive

Definition:

Equipment noise and/or vibration in excess of normal or acceptable levels.

Severity Levels:

Medium - Noise or vibration can be corrected through adjustment.

High - Noise or vibration can only be corrected through replacement of one or more parts.

Measurement:

Each

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Quantity

B = Total Quantity of Subcomponent

Distress Examples:

- Wobbly or squeaky ceiling fan
- HVAC compressor motor with unusual whine
- Transformer with noisy "hum."

Operationally Impaired

Definition:

Subcomponent does not operate properly or at all due to improper installation or construction, misalignment, binding, over tightening, malfunctioning, part failure, or repair/maintenance practices.

Notes:

1. "Operationally Impaired" only applies to subcomponents of components normally associated with "operating." These include, but are not limited to, equipment, doors, windows, light fixtures, etc.
2. If impairment is caused by "Damage," "Corroded," "Animal/Insect Damage," "Rotted," or other distress types, record those distress types at the appropriate severity levels in addition to "Operationally Impaired." "Operationally Impaired" shall not be used with the distress type "Broken." "Operationally Impaired" is recorded used instead of "Broken" if operability is lost, but there is no true separation of pieces or if a separation is unknown.
3. Often, it may appear that the component-section as a whole (e.g. air handling unit) or a component-section unit (e.g. one door out of two) is operationally impaired. Care must be taken to assign "Operationally Impaired" to the appropriate subcomponent(s).
4. If the component-section is a unit that would normally be replaced if it did not operate properly (e.g. residential hot water heater, sump pump, etc.), record "Operationally Impaired" for all of the subcomponents at the appropriate severity level.

Severity Levels:

Low - Subcomponent does not operate ideally.

Medium - Impairment is significant, but not raised to the level of High.

High - Either of the following exists:

- Health, life/safety or security problem.
- No operation of the component-section or a component-section unit

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Door difficult to close due to high humidity or improperly hung
- Door rattles in breeze
- Window cannot be opened due to over painting

- Window will not stay open
- Bumper installed in incorrect location
- Failed AC compressor
- Improper bend (too sharp) in lightning down conductor
- Sump pump does not work
- No hot water from hot water heater
- Exhaust fan blowing air in wrong direction

Overheated

Definition:

Temperature exceeds normal or acceptable levels.

Notes:

1. If excessive heat has resulted in fire or other damage, the distress type, "Damaged" shall also be recorded at the applicable severity level.
2. If excessive heat has resulted in discoloration, the distress type "Stained/Dirty" shall also be recorded.
3. If evidence exists of overheating, but the subcomponent is not overheated at the time of the condition survey, ensure the problem that caused the overheating has been corrected. If uncertain, record "Overheated" at the appropriate severity level.
4. If evidence (e.g. damage or stains) exists of past overheating, but the overheating no longer exists, do not record "Overheated."

Severity Levels:

Medium - Excessively warm, but otherwise poses no health, life/safety, or operating problem.

High - Excessively warm or hot and poses a health, life/safety, or operating problem.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Excessively warm electrical circuit breaker
- Evidence of heat damage around heater
- Discolored flue

Patched

Definition:

An obvious localized repair to the subcomponent.

Notes:

1. Patched" at Medium and High severities is a special case of deterioration. When present, record "Patched" instead of "Deteriorated."
2. The patch must be obvious. Patches that exist, but are virtually invisible will not be recorded.
3. Patched areas may also experience other distresses unrelated to the performance of the patch itself. Record "Animal/Insect Damaged," "Cracked," "Damaged," or "Stained," as applicable and if present, as well.
4. If a temporary patch has been placed to rectify any other distress type, record that distress type at one severity level lower than it would be without the temporary patch. Record in addition to "Patched."
5. If a patch is recorded as High severity, also record the underlying distress type and severity level for the subcomponent.

Severity Levels:

Low - Permanent patch exists and there is no deterioration.

Medium - Any of the following exists:

- Permanent patch is deteriorated.
- A material mismatch was used to make the patch.
- A temporary patch exists.

High - Patch has failed.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Plaster repair of wall with poor workmanship
- Mastic to repair roof leak
- Pipe collar intended to repair pipe crack or hole
- Substitute prefabricated wall panel
- Color mismatch to replacement parts (when subcomponents are in plain sight)
- Isolated ceiling tile replacement of a different material
- Plywood covering over door or window
- Spackled area or holes in wall, but not painted over

Rotten

Definition:

Fungal or bacterial decay or decomposition resulting in softness, sponginess, disintegration, loss of strength, and/or distortion of the subcomponent.

Notes:

1. "Rotten" is a special case of deterioration. When present, record "Rotten" instead of "Deteriorated."
2. Subcomponent may or may not be accompanied by a musty odor depending on the moisture state at the time of the condition survey.
3. If the unit-of-measure of the subcomponent is "Each," estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
4. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and rotting has occurred to subcomponents where the logical repair would be the replacement of a unit (e.g. window sill, wood cladding, etc.) the measurement quantity will be that entire unit even though the actual rotting may only encompass a portion of that unit. If the subcomponent can be patched, the measurement quantity will only encompass the area to be potentially patched.
5. Assign only one severity level to a given logical repair or replacement area, length, or quantity measured as described in 4) above.
6. If the subcomponent is a tank, pipe, container, trough, pressure vessel, or sealant and as a result of the rot a leak has occurred, record the severity level as High and the distress type "Leaks," as well.

Severity Levels:

Medium - Distress exists.

High - Any of the following exists:

- Health, life/safety, security, or structural integrity problems.
- Other subcomponents, component-sections, equipment, furnishings, material, or other building contents may be damaged from the entry of rain, snow, wind, groundwater, etc.
- A leak has resulted in a tank, pipe, container, trough, pressure vessel, or sealant.
- The undesired passage of animals, birds, or insects is occurring.
- The operation of another subcomponent, the parent component-section, or another component-section is adversely affected.
- The subcomponent is unusable.

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Spongy roof deck
- Decayed soffit and fascia
- Wood column end loss of due to water emersion

Stained/Dirty

Definition:

Subcomponent discoloration resulting from liquids, graffiti, smudges, mildew, mold, moss, algae, soot, dirt, animal waste, or other sources.

Notes:

1. “Stained/Dirty” will not be recorded if normal housekeeping will rectify the problem. Normal housekeeping includes regular or routine vacuuming, dusting, mopping, wiping, etc.
2. “Stained/Dirty” will be recorded if “special” cleaning is needed, including filter cleaning or replacement.
3. If discoloration is due to excessive heat, record “Stained/Dirty” and also record "Overheated,” if applicable.
4. If discoloration is due to efflorescence, the record the distress type “Efflorescence” instead of “Stained/Dirty.”
5. If mildew, mold, moss, or algae exist, record “Moisture/Debris/Mold Contaminated” instead of “Stained/Dirty.” Only record “Stained/Dirty” if these contaminates have been removed, but a stain remains.

6. If the foreign material is other than dirt (e.g. leaves, vegetation, etc., record "Moisture/Debris/Mold Contaminated" instead of "Stained/Dirty."
7. The distress type "Clogged" should be used in addition to "Stained/Dirty" if the presence of dirt in screens, filters, coils, etc. is affecting air flow.
8. If discoloration is due to corrosion, the actual corroded area will be recorded as "Corroded" at the appropriate severity level, but the remaining area will be recorded as "Stained/Dirty."
9. Stains caused by animals, birds, or insects will be recorded as "Stained/Dirty" and not "Animal/Insect Damage."
10. If color mismatch exists due to a subcomponent part replacement, record "Patched" instead of "Stained/Dirty."
11. If surface is stained or dirty and painted (with paint inventoried as such), do not record "Stained/Dirty" for the section itself, but rate the paint according the definitions in Appendix F.
12. If the unit-of-measure of the subcomponent is "Each," estimate the density if the subcomponent is repairable or 100% if it must be replaced. (See General Notes #10).
13. If the subcomponent unit-of-measure is square feet (square meters) or linear feet (meters) and staining has occurred to subcomponents where the logical repair is the replacement of a unit (e.g. a ceiling tile), the measurement area will be that entire unit even though the actual stain may only encompass a portion of that unit.

Severity Levels:

Low - Distress exists

Measurement:

Affected Area, Length, or Quantity, as appropriate

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = Affected Area, Length, or Quantity

B = Total Area, Length, or Quantity of Subcomponent

Distress Examples:

- Graffiti spray painted on wall
- Bird droppings
- Rust streaks
- Smudges on wall
- Localized ceiling tile discoloration due to past roof leak
- Widespread ceiling tile discoloration due to smoke, fumes, etc.
- Greasy/oily film on walls in a garage
- Excessively dirty floors in building that has been vacant for years

- Dirty filter reducing air flow
- Dirty cooling coils reducing air flow in an air handling unit

(BUR) Base Flashing

***Definition**:*

Base flashing is one or more piles of material extend from the roof surface up onto vertical or inclined surface providing a watertight termination of the membrane.

Severity Levels:

Low - Any of the following conditions:

- Loss of surfacing on mineral-surfaced sheets or other poor appearance (including patching) but no apparent deterioration of felts.
- Top of base flashing is less than 6 in. above the roof surface.
- Flashing has permanent repairs.

Medium - Any of the following conditions:

- Slippage, wrinkling, blistering, or pulling of base flashing material.
- Loss of surfacing with some deterioration of felts but no holes, splits, or tears.
- Grease, solvent, or oil drippings on the base flashing but no deterioration of felts.
- Flashing has temporary repairs.

High - Any of the following conditions:

- Holes, split tears in flashing caused by deterioration or physical damage.
- Exposed gaps at the top of the base flashing which are not covered by counter-flashing or open side laps in the flashing which allow water to channel behind them.
- Grease, solvent, or oil drippings on the base flashing with deterioration of the felts.

Measurement:

Measure lineal feet of base flashing having the above conditions. Holes, open side laps, and seams count as 1 ft each. If an area of the base flashing is at medium severity and holes are closer than 6 in., count that entire length of distressed base flashing as high severity.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of base flashing defects (ft)

B = total length of flashed perimeter of roof section being rated including flashings for penthouses, courtyards, and curbed projections)

(BUR) Blisters

Definition:

Blisters are round or elongated raised areas of the membrane which are filled with air.

Note: Blisters and ridges are difficult to differentiate at the low and medium severity levels. The rating error will be insignificant because of the similarity in the deduct curves. At high severity, however, it is important to distinguish between the two distresses due to their different leak potentials.

Severity Levels:

Low - The raised areas are noticeable by vision or feel. The surfacing is still in place and the felts are not exposed

Medium - The felts are exposed or show deterioration.

High - The blisters are broken.

Measurement:

Measure the length and width of the blister in lineal feet and calculate the area (length times width). If the distance between individual blisters is less than 5 ft., measure the entire affected area in sq ft.

Note: When large quantities of this problem are present (especially on large roofs,), the representative sampling technique can be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of membrane blisters (sq ft)

B = total area of roof section being rated (sq ft)

(BUR) Debris And Vegetation

Definition:

Foreign objects on the roof which could damage or puncture the membrane, the growth of vegetation on the roof, and/or the accumulation of solvent and oil drippings on the roof.

Severity Levels:

Medium - Any of the following conditions:

- The collection of foreign objects which are not removed from the roof during the inspection.
- Grease, solvent, or oil drippings on the roof which is causing degradation of the roof membrane.
- Evidence of vegetation, but not penetrating the felts.

High - Any of the following conditions:

- Grease, solvent, or oil drippings on the roof which is causing degradation to the roofing system.
- Vegetation roots that have penetrated the felts.

Measurement:

Measure square feet of affected area. Each isolated case of debris and vegetation of less than 1 sq ft in area should be counted as 1 sq ft.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of debris and vegetation (sq ft)

B = total area of roof section being rated (sq ft)

(BUR) Embedded Edge Metal

Definition:

Formed strip of metal at the roof edge which continues down the vertical part of the wall to form a fascia or drip. This stripped-in flashing provides a finished termination for the roofing membrane. A formed vertical projection (gravel stop) may be incorporated to prevent loose aggregate from rolling or washing off the roof. Exterior and interior gutter in a built-in trough of metal or other material which collects water from the roof and carries it to a downspout.

Note: A raised roof edge which is not stripped in, is rated as metal cap flashing and not embedded edge metal.

Severity Levels:

Low - The entire length of embedded edge metal flashings is rated low severity as a minimum due to the maintenance problems associated with it.

Medium - Any of the following conditions:

- The joints in embedded edge metal flashings are rated medium severity as minimum due to the maintenance problems associated with them.
- Nails under the stripping felts are backing out.
- Corrosion of the metal.

- Loose or lifted metal flange without deterioration of the stripping felts.
- The entire length of interior gutter is rated medium severity as a minimum due to the maintenance problems and high potential for leak damage associated with its presence.

High - Any of the following conditions:

- Stripping felts are missing or loose.
- Splits in the stripping felts above the metal joints.
- Holes have occurred through the metal.
- Loose or lifted metal flange with deterioration of the stripping felts.
- Holes or joint movement is present in the interior gutter.

Measurement:

Measure lineal feet of embedded edge metal flashing having the above conditions. Each split above a joint is counted as one foot. As a method of sampling the joints, determine to total number of joints by dividing the total length of embedded edge metal flashing by the length of edge metal sections (normally 10 ft). Every fourth joint should be inspected for splits in the stripping felts. Count the number of inspected joints that are high severity and multiply by 4 to determine the total lineal feet of high severity joints. All other joints are rated medium severity. Multiply the number of inspected joints not rated high severity by 4 to determine the total lineal feet of medium severity joints.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of embedded edge metal flashing defects (ft)

B = total length of flashed perimeter of roof section being rated (including flashings for penthouses, courtyards and curbed projections)

(BUR) Flashed Penetrations

Definition:

Open pipes, plumbing vent stacks, flues, ducts, continuous pipes, guy wires, drain sumps, and other penetrations through the roof membrane (excluding pitch pans but including metal curbing for hatches and ventilators, where the flange is stripped into the membrane).

Severity Levels:

Low - Either of the following conditions:

- Flashing sleeve is deformed.
- Opening in the penetration or flashing is less than 6 in. above the roof surface.

Medium - Any of the following conditions:

- Edge of stripping felts is exposed but there is no apparent felt deterioration.
- Top of flashing sleeve is not sealed or has not been rolled down into an existing plumbing vent stack.
- The sleeve or umbrella is open or no umbrella is present (where required).
- Metal is corroded.

High - Any of the following conditions:

- Flashing sleeve or metal curb has been installed with no stripping felts
- Flashing sleeve or metal curb is cracked, broken, or corroded through.
- No flashing sleeve is present.
- Penetration is not sealed at the membrane level.

Measurement:

Count each distressed flashed penetration as one linear ft at the highest severity level which exists. For metal curbs and ducts with greater than 1 ft of perimeter, count the actual length (in feet) of distressed perimeter.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = lineal feet of distressed flashed penetrations

B = total length of flashed perimeter of roof section being rated (including flashings for penthouses, courtyards and curbed projections)

(BUR) Holes

Description:

A membrane hole is any visible opening which extends through all membrane layers. Holes can be of various sizes and shapes, and can be located anywhere on the roof surface.

Severity Levels:

High - All holes in the membrane are considered high severity due to their high leak potential.

Measurement:

Count the total number of holes in the membrane, If the distance between two holes is less than 1 ft., count them as one hole.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = number of membrane holes

B = total area of roof section being rated (sq ft)

(BUR) Improper Equipment Supports

Definition:

Improper equipment supports or pipes, conduits, and mechanical equipment supports (wood sleepers, channels, etc) that are placed directly on the membrane below the equipment. Repairing this distress may require replacing the surrounding insulation and membrane.

Severity Levels:

Low - All improper equipment supports are rated low severity as a minimum due to the maintenance problems associated with them.

Medium - Any of the following defects:

- Movement of the support has displaced the membrane, but has not cut or punctured it.
- Equipment is bolted through the membrane but the membrane is sealed and watertight.

High - Any of the following defects:

- Movement of the support has cut or punctured the roof membrane.
- The equipment is bolted through the membrane and the membrane is not sealed, allowing water to penetrate.

Measurement:

Measure square feet of each improper equipment support. The minimum dimensions for the length and width of a support shall be 1 ft.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of improper equipment supports (sq ft)

B = total area of roof section being rated (sq ft)

(BUR) Interior Drains And Roof Level Scuppers

Definition:

A drain is a penetration at the roof membrane which allows water to flow from the roof surface into a piped drainage system. The drain fixture at the roof has a flange and/or clamping arrangement to which the roofing membrane is attached. A roof level scupper is a channel through a parapet or raised roof edge which is designed for peripheral drainage of the roof.

Note: Stripping felts around scuppers should be carefully inspected for holes at corners.

Severity Levels:

Low - Bitumen has flowed into the drain leader but the drain is not clogged.

Medium - Any of the following conditions:

- Stripping felts are exposed but there is no apparent deterioration of felts.
- Strainer is broken or missing.
- Scupper shows loss of paint or protective coating or start of metal corrosion.

High - Any of the following conditions:

- Stripping felts have holes or are deteriorated.
- Clamping ring is loose or missing from drain body or bolts are missing.
- Drain is clogged.
- Scupper metal is broken or holes have occurred through the metal.

Measurement:

Each distressed drain and scupper should be counted once at the highest severity level which exists.

Density:

$\frac{A}{B}$ x 100= Problem Density

A = number of distressed interior drains and roof level scuppers

B = total length offlashed perimeter of roof section being rated (including flashings for penthouses, courtyards and curbed projections)

(BUR) Metal Cap Flashing

Definition:

Metal cap flashing includes counterflashing and any sheet metal coping cap which serves as part of the counterflashing or the cover over a detail such as a roof area divider, equipment curb, raised roof edge, or an expansion joint (including the rubber bellows of an expansion joint).

Note: Counterflashing is the material, usually sheet metal, which protects the top termination of base flashing and sheds water away from it. Counterflashing should be free to expand and contract.

Severity Levels:

Low -Any of the following conditions:

- Loss of paint or protective coating or start of metal corrosion.
- Metal coping cap is deformed and allows water to pond on the top.
- Counterflashing is deformed but still performing its function.
- Counterflashing has been sealed to the base flashing.

Medium - Any of the following conditions:

- Corrosion holes have occurred through the metal on a vertical Surface.
- Metal coping cap has loose fasteners, failure of soldered or sealed joints, open joints, or loss of attachment.
- Sealant at reglet or top of counterflashing is missing or no longer functioning, allowing water to channel behind counterflashing.
- Counterflashing is loose at the top, allowing water to channel behind it.
- Counterflashing does not extend over top of base flashing.

High - Any of the following conditions:

- Metal coping cap or counterflashing is missing or displaced from its original position.
- Corrosion holes have occurred through the metal on a horizontal surface.
- Metal coping cap has mission joint covers where joint covers were originally installed.

Measurement:

Measure lineal feet of metal cap flashing having the above conditions. For individual defects (i.e., joints, holes) count as one foot minimum.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of metal cap flashing defects (ft)

B = total length of flashed perimeter of roof section being rated (including flashings for penthouses, courtyards, and curbed projections)

(BUR) Patching

Description:

Patching is a localized temporary or permanent repair of the membrane using dissimilar materials. Repairs made with similar materials are not counted as patches; distresses associated with these repairs should be recorded in the appropriate category and not as patching distresses.

Severity Levels:

Low - All patches that are not made with similar materials as that of the original construction are rated as low severity as a minimum.

Medium - All patches made with temporary materials (i.e., duct tape, caulking, and sealants) are rated medium severity as a minimum.

High - Other distresses of high severity are present within the patched area (count as patching distress only).

Measurement:

Measure square feet of each patch having the above conditions.

When large quantities of this problem are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of patching (sq ft)

B = total area of roof section being rated (sq ft)

(BUR) Pitch Pans

Definition:

A pitch pan is a flanged metal sleeve placed around a roof-penetrating element and filled with a sealer**.**

Severity Levels

Low - Pitch pans are rated low severity as a minimum due to the maintenance problems associated with them.

High - Any of the following conditions:

- Metal corrosion.
- Sealing material is below metal rim.
- Stripping felts are exposed or deteriorated.
- Sealing material has cracked or separated from pan or penetration.

Measurement:

Each distressed pitch pan should be counted once at the highest severity level which exists.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = number of distressed pitch pans

B = total length of flashed perimeter of roof section being rated (including flashings for penthouses, courtyards, and curbed projections)

(BUR) Ponding

Definition:

Standing water is present or there is evidence of ponding by the presence of staining. Water which remains after 48 hr. is considered ponded water.

Severity Levels:

Low - Ponding is rated low severity due to the maintenance problems associated with it.

Measurement:

Measure square feet of affected area.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of ponding (sq ft)

B = total area of roof section being rated (sq ft)

(BUR) Ridges

Definition:

Ridges are long, narrow (usually less than 3 in.), raised portions of the roof membrane. Their maximum height is about 2 in. Usually ridges occur directly above the insulation board joints and run perpendicular or parallel to the felts. They include all the plies and therefore are generally stiffer than blisters.

Note: Blisters and ridges are difficult to differentiate at the low and medium severity. The rating error will be insignificant because of the similarity in the deduct curves. However at the high severity, it is important to distinguish between the two distresses due to their different leak potentials.

Severity Levels:

Low - The ridges are noticeable but the felts are not exposed.

Medium - The ridges are raised and clearly visible. The surfacing on the ridge is gone and the top felt is exposed.

High - Either of the following conditions:

- Open breaks have developed in the ridge.
- Felt deterioration has progressed through the top ply. exposing underlying plies.

Measurement:

Measure lineal feet of ridges running in all directions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total length of membrane ridges (ft)

B = total area of roof section being rated (sq ft)

(BUR) Slippage

Description:

Slippage is a downslope lateral movement of felt plies. Slippage usually occurs on roofs with slopes greater than ¼ in./ft.

Severity Levels:

Low - Less than 2 in. of slippage has occurred, evidenced by the presence of narrow bare strips perpendicular to the slope.

Note: Low severity slippage requires inspection at 6 month intervals.

High - More than 2 in. of slippage has occurred. There is evidence of humping and wrinkling.

Measurement:

Measure square feet of affected roof area. The affected area extends from the high point on the slope where bare felts are noticeable, down to the low point of the slope or the area where humping and wrinkling are noticeable.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total affected area of roof (sq ft)

B = total area of roof section being rated (sq ft)

(BUR) Splits

Definition:

Splits are tears that extend through all membrane felts. They vary in length from a few feet to the length of the roof and in width from a hair-line crack to more than 1 in. Splits generally occur directly above the joints between the long sides of insulation boards and run in the direction the felts were installed.

Severity Levels:

High - An unrepaired split or a repaired split which has started to re-open.

Measurement:

Measure lineal feet of split.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total length of membrane splits (ft)

B = total area of roof section being rated (sq ft)

(BUR) Surface Deterioration

Description:

A built-up roofing membrane will generally have one of the following types of surfacing: Aggregate surface, mineral surface-cap or smooth surface-coated. The membrane surface may show any of the following distressed condition:

- Lack of top surface or coating.
- Alligatoring (interconnected hairline cracks that resemble alligator hide).

- Lack of adhesion between the membrane plies.

Note: Walkways are treated as part of the membrane surfacing.

Severity Levels:

Low - Any of the following conditions:

- On aggregate surfaced roofs, the aggregate is not embedded or is poorly embedded but the felts remain covered with aggregate.
- Open edge laps or fishmouths.
- On smooth surfaced roofs, there is evidence of crazing of top surface with hairline cracks (alligatoring).
- Walkways shows loss of surfacing, loss of adhesion, cracks, blistering or cracked coating.

Medium - Any of the following conditions:

- On aggregate surfaced roofs, the aggregate is displaced and the top coat of bitumen is exposed.
- On mineral surfaced-cap sheet roofs, the mineral granules have come off the cap sheet, exposing the underlying felt.
- On smooth surfaced roofs, no surface coating exists or there is a loss of surface coating.
- On smooth surfaced roofs, alligator cracks extend down through the bitumen to the top felt.

High - Any of the following conditions:

- On aggregate surfaced roofs, the aggregate cover has been displaced and the bitumen pour coat is deteriorated, leaving the underlying felts exposed. The felts may be deteriorated.
- On mineral surfaced-cap sheet roofs, the cap sheet felt is deteriorated.
- On smooth surfaced roofs, alligator cracks extend down through one or more plies.
- Shrinking of the walkway has torn the membrane below it.

Measurement:

Measure square feet of each affected area and rate at highest severity level which exists.

Note: When large quantities of this problem are present (especially on large roofs), the representative sampling technique can be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of surface deterioration (sq ft)

B = total area of roof section being rated (sq ft)

(SP) Base Flashing-Coated Metal

Definition:

Base flashing material is composed of membrane-coated metal. The metal extends from the roof surface upwards above the plane of the membrane providing a watertight termination of the membrane.

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or light corrosion.
- Distortion of joint covers.
- Top of flashing is less than 6 in. above the roof surface.
- Exposed fasteners.

Medium - Any of the following defects:

- Joint cover is unbonded to metal base flashing, but does not allow water to penetrate.
- Coated metal base flashing fasteners are loose.
- Coated metal base flashing has pulled away from the wall or curb or has lifted up but top termination is watertight.
- Crazing or eroding of the joint cover material that has not worn through and does not allow water to penetrate.
- Coated metal base flashing has repairs made with dissimilar materials.

High - Any of the following conditions:

- Holes in metal base flashing.
- Hole in joint cover or unbonding of joint cover from metal base flashing, allowing water to penetrate.
- Exposed gaps at top termination of the base flashing.
- Coated metal base flashing has pulled away from the wall or curb or has lifted up, allowing water to penetrate (rate full section of metal, normally a 10-ft length).

Measurement:

Measure length (ft) of base flashing having the above conditions. Holes, open side laps, and seams count as 1 ft each. Each joint cover having a hole is counted as 1 ft. As a method of sampling the joint covers for ballasted systems, determine the total number of existing joints by dividing the total length of coated metal base flashing by the length of metal sections (usually 10 ft). Every fourth joint should be inspected for defects in the cover strip. Count the number of inspected joints having a specific defect and multiply by 4 to determine the total length of the defect.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of base flashing defects (ft)

B = total length of flashed perimeter of roof section being rated (including perimeter flashings and flashings for penthouses, courtyards, and curbed projections)

(SP) Base Flashing-Membrane Material

Definition:

Base flashing is composed of membrane material or other flexible material. The base flashing extends from the roof surface upward above the plane of the membrane to provide a watertight termination of the membrane.

Severity Levels:

Low - Any of the following defects:

- Light crazing or eroding of the base flashing.
- Top of the base flashing is less than 6 in. above the membrane
- Nailing strip or flashing batten with exposed fasteners is less than 6 in above the roof surface.
- Seam or side lap is open less than ½ in.
- Flashing has repairs with compatible materials.

Medium - Any of the following defects:

- Crazing or eroding of the base flashing that has worn through to a reinforcement or scrim sheet or down to another layer of different color, or has resulted in obvious loss of sheet thickness.
- Slippage, wrinkling, blistering, pulling, unbonding, or bridging of base flashing material that does not allow water to penetrate.
- The presence of solvents, oil, or other chemicals with deterioration of the base flashing but does not allow water to penetrate.
- Flashing has repairs made with dissimilar materials.
- Seam or side lap is open more than ½ in. but does not allow water to penetrate the flashing.
- Loose or missing termination bar where no counterflashing is used.
- Loose or missing nailing strip.

High - Any of the following defects:

- Crazing or eroding of the base flashing that has worn through the flashing allowing water to penetrate.
- Holes, splits, or tears in base flashing, allowing water to penetrate.
- Exposed gaps at top of the base flashing.
- Seam or side lap is open through its entire width, allowing water to penetrate the flashing.
- Holes through the base flashing caused by solvent, oil, or other chemicals.

Measurement:

Measure length (ft) or base flashing having the above conditions. Holes, open side laps, and seams count as 1 ft each.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of base flashing defects (ft)

B = total length of flashed perimeter of roof section being rated (including perimeter flashings and flashings for penthouses, courtyards, and curbed projections)

(SP) Debris and Vegetation

Definition:

Debris and vegetation includes the presence of foreign objects, vegetation, fungal growth, solvents, oils, or other chemicals that could damage, puncture, or degrade the membrane.

Notes:

1. Accumulation of oils and grease can present a significant fire hazard and should be reported immediately.
2. Do not rip out vegetation that is growing into the waterproofing systems, as that may allow water to penetrate.

Severity Levels:

Medium - Any of the following defects:

- Vegetation that has not penetrated the membrane.
- Degradation of the membrane caused by solvents, oil, or other chemicals.
- Foreign materials that are not removed from the roof during the inspection.

High - Any of the following defects:

- Vegetation that has penetrated the membrane.
- Degradation of the membrane caused by solvent, oils, or other chemicals allowing water to penetrate.

Measurement:

Measure square feet of debris and vegetation having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of debris and vegetation (sq ft)

B = total area of roof section being rated (sq ft)

(SP) Defective Seams

Definition:

Defective seams include incomplete, damaged, or weak seams that join two sheets of a membrane.

Note: For EDPM and polyvinyl chloride (PVC) membranes, all field seams should have lap sealant at the edges. All other membranes should have lap sealant at cut edges of seams that have exposed reinforcement material.

Severity Levels:

Low - Any of the following defects:

- Missing lap sealant at field seam (EPDM) and PVC membranes only).
- Missing lap sealant at field seam which has exposed reinforcement material at seam edge (usually at end laps and field-cut edges of sheets).
- Seam is open less than ½ in.
- Wrinkling at seam that is watertight.
- Seam intersections (e.g., T-joints) on EPDM that do not have a patch covering them.
- Blisters within the seam.

Medium - Any of the following defects:

- Seam is open ½ in. or more, but does not allow water to penetrate the membrane.
- Pinch wrinkle at seam.

High - Any of the following conditions:

- Seam is open through is entire depth, allowing water to penetrate.
- Fishmouths, wrinkles, or bunches at the seam that allow water to penetrate.

Measurement:

- For exposed membranes (no overlying ballast), inspect all seams visually.
- For ballasted roofs, check field seams at five different locations on the roof section. Clear ballast from 5 ft of the seam at each location that clean the exposed seam with a whisk broom. If all checked seams are without defects, assume the remaining field seams are satisfactory. If any defects are found, use the following sampling technique:
    - For roof sections with sheet widths of 10 ft or less, inspect 2 percent of the total length of field seams (2 ft every 100 ft of seam). For roof sections having sheet widths greater than 10 ft, inspect 4 percent of the total length of field seams (2 ft every 50 ft of seam). Measure length of each specific seam defect found.
    - Extrapolate to determine the total length of seam defects for the entire roof section from the total length of defect found. When 2 percent of the seams are inspected, multiply the actual defect length by 50 to compute

total length of defect. When 4 percent of the seams are inspected, multiply actual defect length by 25 to compute total length of defect.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total length of defective seams (ft)

B = total area of roof section being rated (sq ft).

(SP) Embedded Edge Metal

Definition:

Embedded edge metal is a formed strip of metal at the edge of the roof that continues down the vertical part of the wall to form a fascia or drip edge. This stripped-in flashing provides a finished termination for the roofing membrane. On all but coated-metal flashing systems, the metal is placed on top of the membrane, and fastened to the deck through it. To make the area watertight, the metal is covered with membrane or flashing material (i.e., it is stripped in). Coated metal systems have their edge metal placed before the membrane. The membrane is adhered to the top of the coated metal, thereby eliminating the need to have it stripped in. A formed vertical projection (gravel stop) may be incorporated to prevent ballast from rolling or washing off the roof. Exterior and interior gutters, which are embedded in the membrane, are considered embedded edge metal. (an interior gutter is a built-in trough of metal or other material that collects water from the roof and carries it to a drain or downspout.)

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or light corrosion.
- Termination battens have exposed fasteners.
- Stripping material is open less than ½ in.
- Distortion of joint covers.
- For coated metal edge flashings that are not stripped in, membrane is open less than ½ in.

Medium - Any of the following defects:

- Joint cover is unbonded to embedded edge metal, but does not allow water to penetrate.
- Nails under stripping material are backing out.
- Stripping material is crazing, checked, or cracked.
- Stripping material is open more than ½ in., but edge metal fasteners are not exposed.
- Loose or lifted metal with deterioration of the stripping material.
- Embrittled joint stripping material.
- The entire length of interior gutter is rated medium as a minimum due to the potential for leak damage.
- For coated metal edge flashing that are not stripped in, membrane is open more that ½ in. but does not allow water to penetrate.

High - Any of the following conditions:

- The stripping material is missing or open and edge metal fasteners are exposed, or stripping material has holes, cuts or tears, allowing water to penetrate.
- Hole in joint cover or unbonding of joint cover from embedded edge metal, allowing water to penetrate.

- Holes through the metal.
- Holes associated with loose or lifted embedded edge metal.
- Holes in interior gutter.
- For coated metal edge flashing that are not stripped in, membrane is open allowing water to penetrate.

Measurement:

Each split above a joint is counted as 1 ft. As a method of sampling the embedded edge metal joints for ballasted systems, determine the number of joints by dividing the total length of embedded edge metal flashing by the length of the edge metal sections (often 10 ft). Gravel should be moved at every fourth joint and the stripping material inspected for splits. Count the number of inspected joints having a specific defect and multiply by four to determine the total length of the defect.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of embedded edge metal flashing defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings and flashings for penthouses, courtyards, and curbed projections)

(SP) Flashed Penetrations

Definition:

This category includes pipes, plumbing vent stacks, flues, ducts, conduits, guy wires, drain sumps, and other penetrations through the roof membrane (excluding pitch pans but including metal curbing for hatches and ventilators, where the metal flange is stripped into the membrane or, in the case of some coated metal flashing systems, the membrane is adhered to the top of the coated metal flange, thereby eliminating the need to have it stripped in).

Severity Levels:

Low - Any of the following defects:

- Flashing sleeve is deformed.
- Stripping material, boot, or membrane (for coated metal flashing sleeves) is open less than ½ in.
- Top of flashing is less than 6 in. above the membrane.

Medium - Any of the following defects:

- Stripping material is crazing, checked, or cracked.
- Stripping material, boot, or membrane (for coated metal flashing sleeves) is open more than ½ in. but does not allow water to penetrate the flashing.
- Top of flashing sleeve or boot is not sealed or is not rolled down into the existing plumbing vent stack.
- Clamping band is loose or missing (where required).
- Umbrella is open or no umbrella is present (where required).
- Corrosion of metal or delamination of coating.

High - Any of the following conditions:

- Stripping material has holes, cuts, or tears.
- Stripping material, boot, or membrane (for coated metal flashing sleeves) is open, allowing water to penetrate.
- Holes, cuts, or tears in flashing sleeve or metal curb.
- No flashing sleeve present.
- Incompatible flashing material has been used.

Measurement:

Count each small distressed flashed penetration as 1 ft at the highest severity level present. For metal curbs and ducts with more than 1 ft of perimeter, measure the length (in ft) of the distressed perimeter.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of distressed flashed penetration (ft)

B = total length of flashed perimeter of roof section being rated (including perimeter flashings and flashings for penthouses, courtyards, and curbed projections)

(SP) Holes, Cuts, and Abrasions

Definition:

Holes and cuts are membrane distresses caused by physical abuse from tools, traffic, debris, gravel, wind, etc., or manufacturing defects such as pinholes. Holes and cuts can be of various shapes and sizes. Abrasion is physical damage that has roughened or worn the membrane surface.

Severity Levels:

Low - Surface scratches or abrasions with no significant loss of membrane thickness.

Medium - Cuts, gouges, or abrasions with loss of membrane thickness but not fully penetrating the membrane.

High - Any of the following defects:

- Holes, cuts, gouges, or abrasions that penetrate the membrane.
- Holes, through the membrane caused by underlying mechanical fasteners.

Measurement:

Count the total number of scratches, gouges, holes, and cuts in the membrane. If the distance between distresses is less than 1 ft, count the distresses as one. If the distress is longer than 1 ft, measure the length. Measure area of abrasion in square feet.

When large quantities of this problem are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total number and/or length of membrane scratches, gouges, holes, and cuts (ft) or total area of abrasion (sq ft).

B = total area or roof section being rated (sq ft).

(SP) Improper Equipment Supports

Definition:

Improper equipment supports or pipes, conduits, and mechanical equipment supports (wood sleepers, channels, etc) that are placed directly on the membrane below the equipment. Repairing this distress may require replacing the surrounding insulation and membrane.

Severity Levels:

Low - All improper equipment supports are rated low severity as a minimum due to the maintenance problems associated with them.

Medium - Any of the following defects:

- Movement of the support has displaced the membrane, but has not cut or punctured it.
- Equipment is bolted through the membrane but the membrane is sealed and watertight.

High - Any of the following defects:

- Movement of the support has cut or punctured the roof membrane.
- The equipment is bolted through the membrane and the membrane is not sealed, allowing water to penetrate.

Measurement:

Measure square feet of each improper equipment support. The minimum dimensions for the length and width of a support shall be 1 ft.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of improper equipment supports (sq ft)

B = total area of roof section being rated (sq ft)

(SP) Interior Drains and Roof Level Scuppers

Definition:

A drain is a penetration of the roof membrane that allows water to flow into a piped drainage system. The drain fixture at the roof has a flange and/or clamping arrangement to which the roofing membrane is attached. A scupper is a channel through a parapet or raised roof edge that is designed to drain the roof. Roof-level scuppers are for primary drainage. Elevated (overflow) scuppers are for emergency drainage.

Note: Most single-ply roofing systems do not require stripping material around the drain.

Severity Levels:

Low - Any of the following defects:

- Field seam within 1 ft of a drain or roof-level scupper.
- Stripping material or membrane is open less than ½ in.

Medium - Any of the following defects:

- Crazing material is crazing, checked, or cracked.
- Stripping material or membrane is open ½ in. or more, but does not allow water to penetrate.
- Strainer is broken or missing
- Scupper shows loss of protective coating or start of metal corrosion.
- Drain has a field seam in the clamming ring.

High - Any of the following conditions:

- Stripping material has holes, cuts or tears, allowing water to penetrate.
- Stripping material or membrane is open, allowing water to penetrate.
- Clamping ring is loose or missing from drain or bolts are missing.
- Drain is clogged.
- Scupper is broken or contains holes.
- Holes, cuts, tears, or abrasions through the membrane within 2 ft of the drain or scupper.

Measurement:

Each distressed drain and scupper should be counted once at the highest severity level present.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = number of distressed interior drains and scuppers (ft)

B = total length of flashing on roof section being rated (including perimeter flashings and flashings for penthouses, courtyards, and curbed projections)

(SP) Membrane Deterioration

Definition:

This category includes erosion or crazing or the membrane. Erosion is the wearing away of the membrane surface creating a rough texture. Crazing is hairline cracking of the membrane.

Severity Levels:

Low - Light crazing of the membrane surface.

Medium - Crazing or eroding of the membrane surface that has worn through to a reinforcement or scrim sheet or down to another layer of different color, or has resulted in obvious loss of sheet thickness.

High - Crazing or eroding of the membrane surface that has worn through the membrane allowing water to penetrate.

Measurement:

Measure the square feet of each affected area and rate at the highest severity level present.

When large quantities of this problem are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of membrane deterioration (ft)

B = total area of roof section being rated.

(SP) Membrane Support Deficiencies

Definition:

The surface on which the membrane rests may not be smooth and continuous. For fully adhered membranes, partially adhered membranes, partially adhered membranes, and mechanically attached membranes, this category includes warping, bowing, or shrinking of insulation boards. For ballasted membranes, it includes displaced insulation boards. Localized absence of membrane support may be due to missing components below.

Note: Mechanical fasteners and loose insulation boards are rated as System Securement Deficiencies.

Severity Levels:

Low - Any of the following defects:

- Membrane tension caused by warping or bowing of substrate.
- Uneven joints or gaps more than ½ in. wide, but less than 2 in. between insulation boards.

Medium - Any of the following defects:

- Uneven joints or gaps more than 2 in. wide between insulation boards or absence of substrate support for width of 2 in. or more.
- For ballasted systems, insulation boards have been displaced.
- Lumps indicating presence of foreign material between membrane and substrate.

Measurement:

- Measure square feet of membrane having the above conditions.
- When many of these deficiencies are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of membrane support distress (ft)

B = total area of roof section being rated (sq ft).

(SP) Metal Cap Flashing

Definition:

Metal cap flashing includes any sheet metal that serves to counterflash or cover a detail such as a parapet, firewall, roof area divider, equipment curb, raised roof edge, or an expansion joint, protecting the top termination of the base flashing and shedding water away from it. The metal cap flashing should be free to expand and contract.

Note: Note all single plys are installed with counterflashing to protect the top of the base flashing

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or corrosion without holes.
- Top of counterflashing or metal coping is deformed and allows water to pond on the top.
- Metal cap flashing is deformed but still performing its function.
- Metal cap flashing has been sealed to base flashing

Medium - Any of the following defects:

- Corrosion has caused holes in the metal on a sloping or vertical surface.
- Metal cap flashing has loose fasteners, failure or soldered or sealed joints, or loss of attachment.
- Metal cap flashing has rough edges that are in contact with the base flashing.

High - Any of the following conditions:

- Metal cap flashing is missing or displaced from its original position.
- Corrosion has caused holes in the metal on a horizontal surface.
- Metal cap flashing has open joints or missing joint covers where covers were originally installed.
- Sealant at reglet or top of counterflashing is missing or no longer functional, allowing water to channel behind it.
- Counterflashing is loose at the top allowing water to channel behind it.
- Metal cap flashing does not extend over top of the base flashing.

Measurement:

Measure length (ft) or metal cap flashing having the above conditions. Individual defects (i.e., joints, holes) count as 1 ft minimum.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of metal cap flashing defects (ft)

B = total length of flashed perimeter of roof section being rated (including perimeter flashings and flashings for penthouses, courtyards, and curbed projections)

(SP) Patching

Description:

Patching is a localized temporary or permanent repair of the membrane using dissimilar materials. Repairs made with similar materials are not counted as patches; distresses associated with these repairs should be recorded in the appropriate category and not as patching distresses.

Severity Levels:

Low - All patches that are not made with similar materials as that of the original construction are rated as low severity as a minimum.

Medium - All patches made with temporary materials (i.e., duct tape, caulking, and sealants) are rated medium severity as a minimum.

High - Other distresses of high severity are present within the patched area (count as patching distress only).

Measurement:

Measure square feet of each patch having the above conditions.

When large quantities of this problem are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of patching (sq ft)

B = total area of roof section being rated (sq ft)

(SP) Pitch Pans

Definition:

A pitch pan is a flanged metal sleeve placed around a roof penetration element and filled with a sealer. For pitch pans on ethylene-propylene-diene monomer (EPDM) and Hydalon roofing systems, stripping materials should cover the sides of the metal pan and terminate within the pan below the sealer.

Severity Levels:

Low - All pitch pans are low severity at a minimum due to maintenance requirements.

Medium - Any of the following defects:

- Stripping material is crazing, checked, or cracked.
- Stripping material or membrane (on coated metal pitch pans) is open more than ½ in. but does not allow water to penetrate the flashing.
- Loss of protective coating or corrosion of metal.
- For EPDM and Hypalon, stripping material is not covering the top of the metal pan or does not terminate below the sealer.

High - Any of the following conditions:

- Stripping material has holes, cuts, or tears, allowing water to penetrate through.
- Edge of stripping material or membrane (on coated metal pitch pans) is open, allowing water to penetrate.
- Sealer is below the metal rim, allowing ponding in the pan.
- Sealer has cracked or separated from the pan or penetration.
- Corrosion through the metal pan.

Measurement:

Each distressed pitch pan should be counted once at the highest severity level present.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = number of distressed pitch pans (ft)

B = total length of flashing on roof section being rated (including perimeter flashings and flashings for penthouses, court-yards, and curbed projections)

(SP) Ponding

Definition:

Ponding includes standing water or evidence of standing water by the presence of staining or accumulation of debris. Water that remains longer than 48 hr is considered ponded water.

Severity Levels:

Low - General Ponding is rated low severity.

Medium - Any of the following defects:

- Ponding caused by wrinkles or folds in the membrane that blocks drainage.
- Ponding caused by warping or bowing of the substrate beneath the membrane.

Measurement:

Measure square feet of affected area.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of ponding (sq ft)

B = total area of roof section being rated (sq ft)

(SP) Ridges

Definition:

Ridges are long, narrow (usually less than 3 in.), raised portions of the roof membrane. Usually ridges occur directly above the insulation board joints.

Severity Levels:

Low - All ridges are rated low severity as a minimum.

High - Open breaks have developed in the ridge allowing water to penetrate.

Measurement:

Measure length of ridges running in all directions. When many ridges are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total length of membrane ridges (ft)

B = total area or roof section being rated (sq ft)

(SP) Splits

Definition:

Splits are cracks or tears that extend through the membrane. They vary in length from a few inches to the length of the roof and in width from hair-line to more than 1 in.

Severity Levels:

High - All splits in the membrane are considered high severity due to their leak potential.

Measurement:

Measure length of split.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total length of membrane splits (ft).

B = total area or roof section being rated (sq ft).

(SP) Surface Coating Deterioration

Definition:

Surface coating deterioration includes wear, blistering, or peeling of any surface coating applied for fire protection (such as adhesive coating and sand on an EPDM membrane) or solar reflectivity, but not waterproofing.

Severity Levels:

Low - Color of underlying membrane can be seen through the coating or membrane has lost protection (for membrane with coating protection that does not have sand or mineral matter embedded).

Medium - Membrane area has lost the sand or mineral matter portion of the coating protection (for membrane with coating protection that has sand or mineral matter embedded).

Measurement:

Measure the square feet of each affected area and rate at the highest severity level present.

When large quantities of this problem are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of surface coating deterioration (ft)

B = total area of roof section being rated.

(SP) System Securement Deficiencies

Definition:

For fully adhered membranes, system securement deficiencies include membrane areas (including blisters) that are unattached to the substrate. For mechanically attached membranes, this category includes failed mechanical fasteners. For partially adhered membranes, the category includes membrane that is not adhered at points of attachment. For ballasted membranes, the membrane has areas where ballast is missing or displaced.

Notes:

1. Holes in the membrane caused by mechanical fasteners are rated as Holes.
2. If ballast is redistributed by the inspector to cover bare areas, the areas should not be counted as defects.
3. For defect definitions, “building perimeter” is area within 10 ft of a roof edge. These areas experience high wind uplift pressures.

Severity Levels:

Low - Any of the following defects:

- For fully adhered systems, an area of unattached membrane substrate of 2 sq ft or less.
- For ballasted systems, a bare area of 4 sq ft or less.

Medium - Any of the following defects:

- For fully adhered systems, an area of unattached membrane substrate of greater than 2 sq ft but less than 100 sq ft (less than 25 sq ft at building perimeter).
- For mechanically attached systems, an isolated mechanical fastener that has lost its attachment capability or backed out causing bridging of the membrane.
- For partially adhered systems, an isolated point of attachment that has lost adherence.
- For ballasted systems, a bare area of greater than 4 but less than 100 sq ft (less than 25 sq ft at building perimeter).

High - Any of the following conditions:

- For fully adhered systems, an area of unattached membrane or substrate 100 sq ft of greater (25 sq ft at building perimeter).
- For mechanically attached systems, adjacent mechanical fasteners that have lost their attachment capability or backed out causing bridging of the membrane.
- For partially adhered systems, adjacent points of attachment that have lost adherence.
- For ballasted systems, a bare area of 100 sq ft or greater (25 sq ft at building perimeter).

Measurement:

Measure square feet of membrane having the above conditions. For mechanically fastened and partially adhered systems, count the effective area of unattached membrane.

When large quantities of this problem are present, the representative sampling technique may be used.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of attachment defects (ft)

B = total area of roof section being rated (sq ft).

(SR) Age Deterioration

Definition:

Age deterioration includes clawing and curling of the shingles, and exposure of the shingle felt/mat due to excessive loss of granules, all of which indicate brittleness. Normally, these are not localized problems but are general conditions found on large areas of the roof, such as individual roof exposures, or the entire roof. The occurrence of these problems indicate aging and reduced service life. Clawing is the turning under of the tab corners of the shingle and curling is the turning up of the tab corners.

Severity Levels:

Low - Any of the following defects:

- Loss of granular surfacing on shingle, but the reinforcement felt or mat is not exposed.
- Erosion of material around the edge of the shingle, normally found less than 1/4 inch from the edge.

Medium - Any of the following defects:

- Corners of the shingle are turned under or up (that is, clawing or curling).
- Loss of granular surfacing on shingle that results in bare spots and exposes reinforcing felt or mat.
- Loss of delamination of loil on loil-surfaced shingle.

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) having age deterioration defects.

B = total area of roof section being rated (sq ft).

(SR) Debris and Vegetation

Definition:

This category includes any of the following items:

- Foreign objects on the roof that could cause damage or puncture the shingles or flashing.
- The growth of vegetation on the roof.
- Accumulation of solvent or oil drippings on the roof.

Severity Levels:

Medium - Any of the following defects:

- Collection of foreign objects or vegetation on the field of the roof.
- Grease, solvent, or oil drippings on the roof but no apparent degradation or the roofing system.
- Evidence of branches making contact with the roof shingles.

High - Any of the following defects:

- Grease, solvent, or oil drippings on the roof that have caused degradation of the roofing shingles.
- Vegetation roots that have penetrated the roof shingles.

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) debris and vegetation defects.

B = total area of roof section being rated (sq ft).

(SR) Edge Metal

Definition:

Formed edge of metal, often referred to as drip edge, placed along eaves and rakes and covered by shingles. The edge metal allows water to drip way from the vertical surfaces and protects underlying building components.

Note: In some cases edge metal may not have been installed. If no edge metal exists for the roof section and there is no evidence that the edge metal was originally installed, do not count its absences as a distress.

Severity Levels:

Medium - Missing or displaced section of edge metal (where originally installed).

Measurement:

Measure length (ft) of edge metal flashing having the conditions described above. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of edge metal defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Exposed Fasteners

Definition:

Shingle fasteners are visible in the field of the roof.

Note: If a shingle fastener has backed out , count it as a hole

Severity Levels:

Medium - A fastener is exposed but not backed out.

Measurement:

Measure the number of exposed fasteners. Individual exposed fasteners count as 1 sq ft minimum. If more than one exposed fastener is found in an area of 1 sq ft, count the distressed area as 1 sq ft.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of exposed fasteners (sq ft) having defects.

B = total area of roof section being rated (sq ft).

(SR) Flashed Penetrations

Definition:

Flashing for open pipes, plumbing vent stacks, attic vents, flues, ducts, continuous pipes, guy wires, and other roof penetrations that require a deck flange integrated into the shingles.

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or corrosion
- Flashing sleeve is deformed.
- Top of flue is less than 5 in. above the roof surface on the upslope side.

Medium - Any of the following defects:

- Exposed fastener in flashing.
- The sleeve or umbrella is open or no umbrella is present (where required).

High - Any of the following defects:

- Edge of deck flange on upslope side of penetration is exposed or visible.
- Edge of deck flange on downslope side of penetration is not overlapping shingles or is sealed to underlying shingles.
- Top of flashing sleeve is not sealed or has not been rolled down into existing plumbing vent stack.
- Flashing sleeve is cracked, broken, or corroded through.
- No flashing sleeve is present.

Measurement:

Count each distressed flashed penetration as 1 ft at the highest severity level present.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of flashed penetrations defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Holes/Splits/Missing Shingles

Definition:

This category of distresses is characterized by holes, splits, cracks, or visible tears in the shingle reinforcing felt or mat, or missing shingles or tabs.

Severity Levels:

Medium - Any of the following defects:

- Holes, splits, or cracks that do not extend down to the underlayment or substrate.
- Misaligned shingle resulting in partial loss of coverage but no exposed underlayment or substrate.
- Missing shingle, but no exposed underlayment or substrate.

High - Any of the following defects:

- Holes or splits that extend down to the underlayment or substrate.
- Misaligned shingle, resulting in exposed underlayment or substrate.
- Missing shingle, resulting in exposed underlayment or substrate.
- Exposed fastener that has backed out. (Note: if fastener has not backed out, count as exposed fastener distress, not a hole).

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) having holes/splits/missing shingle defects.

B = total area of roof section being rated (sq ft).

(SR) Improper Equipment Supports

Definition:

This distress category includes pipe, conduit, and mechanical equipment supports (wood sleepers, channels, etc.) that are placed directly on the roof surface with no protective pad or placed at an insufficient height to allow for maintaining the roofing system below the equipment. Repairing this type of distress may require replacing the surrounding roofing system.

Note: Termination for guy wires are to be rated as flashed penetration distresses.

Severity Levels:

Medium - The equipment is bolted through the shingles and the bolts appear to be sealed.

High - Any of the following defects:

- The support has caused movement or damage to the shingles.
- The equipment is bolted through the shingles and the bolts do not appear to be sealed.

Measurement:

Measure square feet of each improper equipment support. The minimum dimension for length and width of a support shall be 1 foot.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total area of improper equipment supports (sq ft).

B = total area of roof section being rated (sq ft).

(SR) Interior Gutters

Definition:

An interior gutter is a built-in trough of metal or other material that collects water from the roof and carries it to a drain or downspout.

Severity Levels:

Low - Entire length of interior gutter is rated low severity, as a minimum, due to the maintenance problems and high potential for leak damage associated with its presence.

High - Any of the following defects:

- Clogged gutter or drain.
- Holes or open seams in interior gutter.

Measurement:

Measure entire length of gutter having the conditions described above. For clogged gutters, count lineal feet of clogging material. For clogged drain, count as 1 ft. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of gutter defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Lumps/Ridges/Sags

Definition:

Lumps, ridges, or sags are present on the surface of the roof.

Note: If other problems exist in the areas that exhibit lumbing, sagging, or ridging, record them under the appropriate distresses.

Severity Levels:

Medium - Any of the following defects:

- Lumps or ridges that do not appear to be caused by unevenness in the supporting substrate or underlying flashing component (i.e., wrinkles in the underlying felt).
- Lumps, ridges, or sags caused by unevenness in the supporting substrate or underlying flashing component.

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) having lumps/ridges/sages defects.

B = total area of roof section being rated (sq ft).

(SR) Metal Apron Flashing

Definition:

Roof-to-wall sheet metal flashing used at the upslope and downslope sides of chimneys, dormers, curbs, and other projections. Apron flashing should be placed at the downslope side of the projection with the edge of the deck flange exposed. The metal apron at the upslope side of the projection should have the edge of the deck flange covered by overlaying shingles. A projection that is wider than 2 ft should have a saddle-shaped cricket that diverts water around the projection.

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or corrosion.
- Vertical height is less than 4 in. high.

Medium - Any of the following defects:

- Absence of cricket on upslope side of penetration that is wider than 2 ft.
- Exposed fastener in flashing.

High - Any of the following defects:

- Edge of deck flange on upslope side of penetration is exposed or visible.
- Edge of deck flange on downslope side of penetration is not overlapping shingles or is sealed to underlying shingles.
- Holes, splits, or cracks in metal flashing.
- Metal flashing is open at vertical corner.
- No apron flashing exists.

Measurement:

Measure length (ft) of metal apron flashing having the conditions described above. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of flashing defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Metal Cap Flashing

Definition:

Metal cap flashing includes counterflashing and any sheet metal coping cap that serves as part of the counterflashing or cover over a detail such as roof area divider, equipment curb, expansion joint, step flashing, ridge, or hip. Metal cap flashing protects the top termination of the vertical flashing (step flashing or metal apron flashing) and sheds waters away from it. It should be free to expand and contract. Properly lapped exterior siding or cladding can perform the function of metal cap flashing.

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or corrosion.
- Metal coping cap is deformed, allowing water to pond on the top.
- Counterflashing is deformed but still functioning.
- Counterflashing has been sealed to the step flashing.
- Exposed fasteners on horizontal surfaces of metal cap flashing.

Medium - Any of the following defects:

- Corrosion holes are present in the metal on a vertical surface.
- Metal coping cap has loose fasteners, failure of soldered or sealed joints, open joints, or loss of attachment.

High - Any of the following defects:

- Metal coping cap or counter flashing was not installed, or is missing or displaced from its original position, allowing water to channel behind it.
- Corrosion holes are present in the metal on a horizontal surface.
- Metal coping cap has missing joint covers (where originally installed).
- Sealant at reglet or top of counterflashing is missing or no longer functioning, allowing water to channel behind counterflashing.
- Counterflashing, exterior siding, or cladding does not extend over the top of the step flashing or apron flashing.

Measurement:

Measure length (ft) of metal cap flashing having the conditions described above. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of metal cap flashing defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Patching

Definition:

Roof repairs were previously made using dissimilar materials such as mastics or shingles of a different color or design.

Severity Levels:

Low - Replacement shingle does not match appearance or composition of original adjacent shingles.

Medium - Shingle replacement patch is composed of dissimilar materials such as mastic, roofing felts, or coatings.

High - Shingle replacement patch composed of dissimilar materials, that have other high severity distresses (i.e., holes, splits, and cracks).

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) having patching defects.

B = total area of roof section being rated (sq ft).

(SR) Pitch Pans

Definition:

A pitch pan is a flanged sleeve with an open bottom that is placed around a roof penetration and filled with a bituminous, polymeric, or grout sealant to seal the area around the penetration.

Severity Levels:

Medium - Top rim of pitch pan is not level on all sides.

High - Any of the following defects:

- Holes, splits, or cracks in metal.
- Sealing material is below metal rim.
- Sealing material has cracked or separated from pan or penetration.
- Edge of deck flange on upslope side of penetration is exposed.
- Edge of deck flange on downslope side of penetration is not overlapping shingles or is sealed to underlying shingles.

Measurement:

Count each distressed pitch pan once at the highest severity level present.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = number of distressed pitch pans (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Ridge/Hip Shingles

Definition:

Portions of shingles (usually one tab width) that are cut from a full 3-tab shingle and laid perpendicular to the hip or ridge, providing a finished watershedding cap. Note: Ridge and Hip Shingles are treated as flashings because they provide protection of the roofing system at the termination of adjoining roof planes.

Severity Levels:

Medium - Any of the following defects:

- Holes, splits, or cracks not extending down to the underlayment or substrate.
- Misaligned shingle resulting in partial loss of coverage but no exposed underlayment or substrate.
- Missing shingle, but no exposed underlayment or substrate.
- Exposed fasteners that has not backed out.

High - Any of the following defects:

- Holes or splits that extend down to the underlayment or substrate.
- Misaligned shingle resulting in exposed underlayment or substrate.
- Missing shingle resulting in exposed underlayment or substrate.
- Exposed fastened that has backed out.

Measurement:

Measure lineal feet of exposure of ridge or hip shingle tabs having the conditions described above. Round total quantity to next higher whole foot. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of ridge or hip shingles having defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Ridge/Hip Vents

Definition:

Any device installed on and along the roof ridge or hip for the purpose of ventilating the underside of the roof deck.

Severity Levels:

Medium - Missing component of vent assembly (i.e., end caps, baffles, etc.).

High - Any of the following defects:

- Missing or loose section of ridge or hip vent.
- Holes, splits, or cracks in ridge or hip vent.
- Missing cap shingle on roof vent.

Measurement:

Measure length (ft) of ridge/hip vent flashing having the conditions described above. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of ridge/hip vent flashing defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Stains/Rust/Fungus/Mildew

Definition:

The shingle surface shows evidence of stains, rust, fungus, or mildew.

Note: If the appearance is unacceptable, corrective treatments can be applied, such as cleaning with trisodium hypochlorate or installing zine strips.

Severity Levels:

Low - Evidence of stains, rust, fungus, or mildew.

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) having stains/rust/fungus/mildew defects.

B = total area of roof section being rated (sq ft).

(SR) Step Flashing

Definition:

Individual pieces of metal flashing material used to flash vertical walls, chimneys, dormers, and other projections. The pieces range from 7 to 10 in. long and have a 90-degree bend with a horizontal and a vertical leg. The pieces are individually placed at the end of each course of shingles where the roof meets a vertical surface. They are overlapped and "stepped up" the slope, and are fastened through the horizontal surface to the deck. Step flashing should be used only to flash a vertical surface that runs up a slope, and not across the slope.

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or corrosion of step flashing.
- Overlay roof system shingles are not step flashed.
- Coverages of less than one step flashing unit per shingle course exists.

Medium - Any of the following defects:

- Vertical leg of step flashing is less than in. high.
- Bent, deformed, or wide gaps in vertical leg of step flashing.
- Loose or displaced step flashing
- Vertical joints between step flashing pieces have been sealed closed.
- Continuous "L" flashing exists instead of incremental step flashing.

High - Any of the following defects:

- Holes exists in the step flashing.
- No vertical flashing exists.
- Top edge of step flashing is exposed, allowing water to penetrate behind flashing.

Measurement:

Measure length (ft) of step flashing having the conditions described above. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of step flashing defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

(SR) Unsealed/Unlocked Tab

Definition:

For a seal-down shingle, a lack of adhesion between the tab of a shingle and underlying shingles indicates an unsealed condition. Displacement or damage to a lock-down shingle that results in the loss of its interlocking mechanism indicates an unlocked condition.

Note: For seal-down shingles, use a trowel or fingers and gently try to lift tab. Any adherence of the shingle tab to underlying shingles should be judged as adequate. Test several adjacent shingles in three or four randomly selected areas of the roof. If any shingles are found to be unsealed, use the sampling method to determine the quantity of the affected area.

Severity Levels:

Medium - Any of the following defects:

- The tab of a shingle, that is designed to be sealed down is unsealed.
- A lock-down shingle is not interlocked.

Measurement:

Measure the exposed area (sq ft) of shingles having the above conditions.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = total exposed area of shingles (sq ft) unsealed/unlocked defects.

B = total area of roof section being rated (sq ft).

(SR) Valley Flashing

Definition:

Roof valley flashings are formed when two sloping sections intersect to form a “V”. Water from both sections of roof runs through the valley making it especially vulnerable to deterioration and leakage. Valley flashings for asphalt shingles may be of three types: (1) open valleys lined with sheet metal or mineral-surfaced asphalt roll (composition) material, (2) closed cut valleys having shingles on one side of the valley cut on an angle parallel with the valley, and (3) woven valleys lined with interwoven asphalt shingles form the adjoining roof sections. All three types of valley flashings should have underlying asphalt roll material.

Severity Levels:

Low - Any of the following defects:

- Loss of protective coating or corrosion on metal open valley flashing.
- No fabricated “V” crimp (vertical ridge) in center of metal open valley flashing.

Medium - Any of the following defects:

- Loss of surfacing with exposure of felts in valley flashing.
- Unsealed laps in open composition valley flashing.
- Holes, splits, or cracks in valley flashing not extending down to the underlayment.
- Loose or missing valley shingles with no underlayment or substrate exposed.
- Edges of valley shingles are sealed (in open or closed valleys).
- Exposed fasteners within 12 in. of centerline of closed or woven valley.

High - Any of the following defects:

- Holes or splits in valley flashing with underlayment or substrate exposed.
- Loose or missing valley shingles with underlayment or substrate exposed.
- Exposed fastener within 12 in. of centerline of open valley.

Measurement:

Measure length (ft) of valley flashing having the conditions described above. Individual defects count as 1 ft minimum. If the distance between distresses is less than 1 ft, count the distresses as one.

Density:

$\frac{A}{B}$ x 100 = Problem Density

A = length of valley flashing defects (ft)

B = total length of flashing on roof section being rated (including perimeter flashings such as flashing, edge metal, ridge and hip shingles, and valley flashings; and curb flashings around large penetrations such as dormers and skylights).

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EMS Center of Expertise for BuilderRED 3.0

The EMS Center of Expertise for Builder was created in 1999 to provide a full range of customer support to Builder users. Services include:

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- Software customization for specific organization requirements

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