Condition Assessment

Condition Assessment Overview

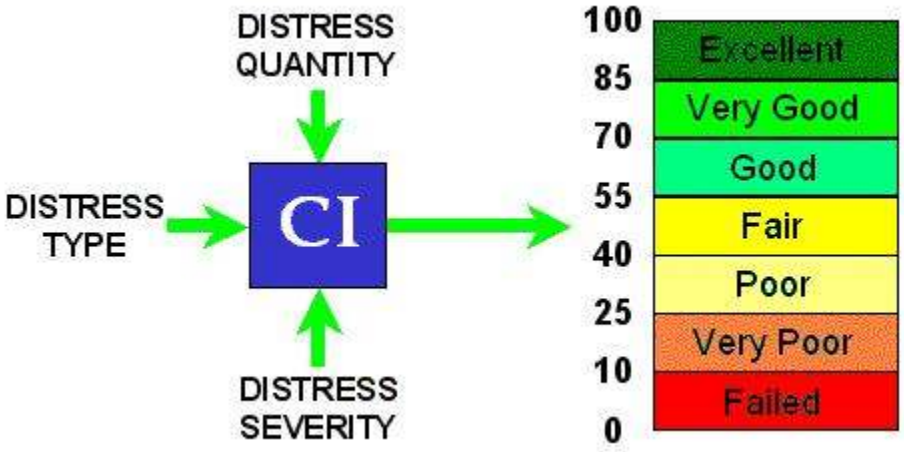
BUILDER offers two condition assessment types, distress surveys and direct ratings, and allows for sampling for both. Neither type yields a detailed engineering assessment, but both types are designed to satisfy facility management data requirements regarding inventory condition and expected work requirements. In keeping with other aspects of BUILDER's design, every effort has been made to speed the process and ease the burden of performing condition assessments.

Included in the BUILDER EMS family is a stand-alone application, BUILDER Remote Entry Database (BRED), which is designed to run on a pen-based electronic clipboard carried by inspectors at the inspection site. Condition assessment data may be entered quickly and easily at the inspection site in BRED and imported to BUILDER after the assessments. Additionally, BUILDER has a rapid inspection tool for quick and easy input of direct condition ratings.

If you have not already done so, you should familiarize yourself with the contents of the Knowledge-Based Condition Assessment Manual for Building Component-Sections. This manual contains descriptions of both types of condition assessment, distress definitions, inspector qualifications, instructions for sampling, and general information about BRED.

Distress Survey Overview

When performing a distress survey, inspectors record information about a component-section by recording the distresses on each subcomponent of the component-section. Each distress is given a severity rating (low, medium, or high) and density range (quantity) based on established criteria. BUILDER uses this inspection information to calculate the Component-Section Condition Index (CSCI), which is then tied to Maintenance and Rehabilitation (M&R) costs to form the basis for M&R planning and budgeting. This process is illustrated by the diagram shown below.



Direct Rating Overview

When performing a direct condition rating, the inspector enters a color rating describing the section's condition according to the diagram shown below.

RATING	DETERIORATION	M&R NEEDS
Green + Green Green –	Minor Deterioration	Routine Maintenance or Minor Repair
Amber + Amber Amber –	Moderate Deterioration	Necessary Repair or Replacement
Red + Red Red-	Significant Deterioration	Major Rehabilitation or Replacement

The rating for the component section is determined by first choosing one of the three color bands (green, amber, or red) that corresponds to the amount of deterioration observed and the M&R needs of the component-section. Then within that color band, one of three ratings is chosen according to whether the observed condition falls at the top, middle, or bottom of the color band. Each color rating is specifically defined in Appendix E of the Condition Assessment Manual. The color rating chosen produces a CSCI, which is calibrated to match the ratings that would result if a distress survey had been done.

Overview of Choosing a Condition Assessment Method

The BUILDER condition assessment process is designed to require the minimal data needed to make good managerial decisions about where attention and resources need to be focused. When a building is new or when inspecting a relatively new component-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 Condition Assessment Manual.

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. Additionally, the feature is able to determine the condition assessments method to perform.

Overview of CSCI Computation

For both condition assessment types, the CSCI is computed by first calculating a deduct value from the assessment data and subtracting the deduct value from 100. The deduct value computation differs for each condition assessment method and is described below.

Distress Survey CSCI Computation

For distress surveys, the combination of distress type, severity level, and density of the subcomponents of the section are used to determine the deduct value for the individual subcomponents. The deduct values for each combination of distress, severity, and density were determined during ERDC-CERL's research effort using rating values from a team of experts.

It should be noted that if more than one distress exists, the sum of the deduct values for the distresses present must be corrected. This is because as additional distress types and/or severity levels occur on the subcomponent, the impact of a given distress on the condition rating becomes less. This correction correlates the expert panel's ratings and the computed indexes. The correction factor is a function of the summed total of the individual deduct values, a minimum individual deduct value, and the number of different distress types and severity level combinations found. The correction factor values were developed from the rating panel data and are applied directly to the deduct value to produce a corrected deduct value.

After all the subcomponent condition indexes are determined for a component-section, the CSCI (or sample unit condition index SUCI if sampling is used) is computed based on the individual subcomponent CI's and their weight factors. If sampling is used, the sample unit indexes for each component-section are aggregated into a CSCI by computing the average of the representative samples weighted by size. All calculations are made at the time an inspection is entered.

Direct Rating CSCI Computation

For direct ratings, the color rating chosen directly corresponds to a deduct value for the component-section. Using this deduct value, the CSCI can be easily computed. If sampling is used for the component section, a sample unit condition index will be computed at each sample location and aggregated into a CSCI by computing the average of the representative samples weighted by size.

Condition Index Roll-Ups

The preceding sections described how a condition index is computed for a component-section after an inspection. The inspection CI's form the basis for computing a current CI for all inventory items in the hierarchy. CSCI's are rolled-up hierarchically to condition indexes for each component (BCCI), system (SCI), the building as a whole (BCI), the site, and the group. Collectively, trends can be monitored, and M&R can be scheduled accordingly.

- **Component CI (BCCI).** For each component, the BCCI is computed by taking the average of its section CI's weighted by replacement cost.
- **System CI (SCI).** For each system, the SCI is computed by taking the average of its component CI's weighted by replacement cost.

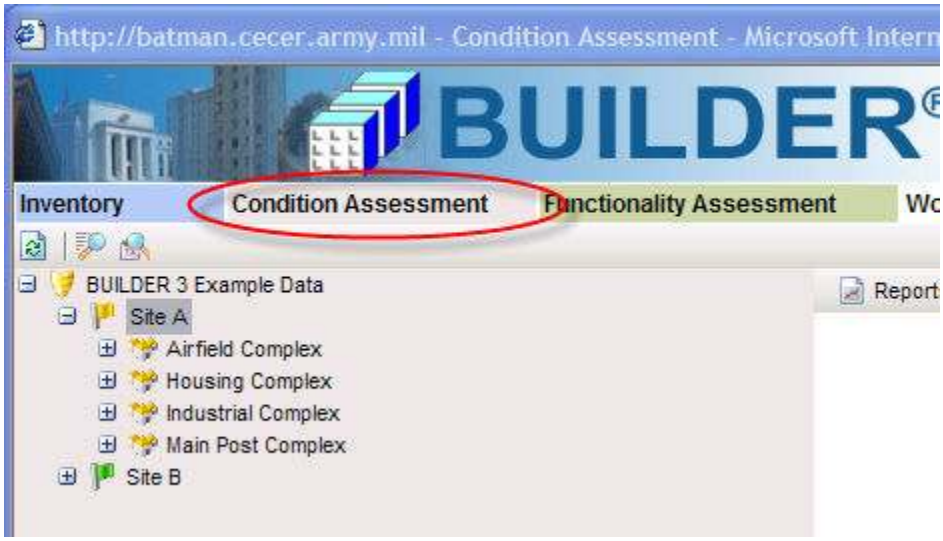
- **Building CI (BCI).** For each building, the BCI is computed by taking the average of its system CI's weighted by replacement cost.
- **Complex CI**. The complex CI is computed by taking the average of the BCI's of each building in the complex weighted by replacement cost.
- **Site CI.** The site CI is computed by taking the average of the BCI's of each building at the site weighted by replacement cost.
- **Group CI.** The group CI is computed by taking the weighted average of the BCI's of each building in the group weighted by replacement cost.

Performing Condition Assessments

Condition assessments are associated with building component-sections. If you have not already constructed the necessary inventory records, you will be unable to enter condition assessment data. Additionally, you should be familiar with the concepts and procedures described in the Condition Assessment Manual, which contains crucial information regarding distress survey and direct condition rating procedures, condition assessment frequencies, inspector qualifications, distress definitions, and sampling.

It is important to note that with the addition of the Building Status property in Version 3.0 of BUILDER, it is possible to have condition assessment records for non-current buildings. Performing assessments on component-sections in non-current buildings are performed in the same manner as current buildings.

When you are ready to add or edit condition assessment data for a building, select the navigation menu option *Condition Assessment*.



The condition assessment navigation tree will appear. Navigate the tree to the section you wish to perform the condition assessment on. Sections can be selected by system or by sample location on the condition assessment tree. In the example below, the section is selected by system.

Toolbar

- SAVE. Use this button to save the changes that have been made to the condition assessment data.
- NEW. Use this button to create a new condition assessment.
- COPY INSPECTION. Use this button to copy a previous condition assessment. All previous condition assessment data will be copied to a condition assessment for the current date.
- DELETE. Use this button to delete the current condition assessment.
- COMMENT. Use this button to add, edit, and view comments about the condition assessment.
- IMAGES. Use this button to add, view, and delete images of the condition assessment.
- REPORTS. Use this button to launch the Report Selection tool, which gives you access to a list of standard reports relevant to the condition assessment of the section. See Using the Report Viewer for more information.

Condition Assessment Data

Once a component-section is selected, all condition assessments that have been previously recorded for it will be accessible using the dropdown Date field. To view past condition assessment data, choose the date of the assessment from the dropdown list. To create a new inspection click the NEW button in the main toolbar, and enter the required condition assessment data, including:

- **Date.** This field is initially set to the current date. However it can be changed by opening the dropdown field and using the calendar with scroll arrows to select the date from the calendar for the new inspection.
- **Type.** Select the type of condition assessment, either a Distress Survey or a Direct Rating.
- **Method.** Select the condition assessment method, either Not Sampling or Sampling.
- **Inspector** (Read-Only)**.** Displays the name of the current inspector of the section. This field is automatically set to the user logged in to BUILDER.
- **Section Qty** (Read-Only)**.** Displays the actual section quantity as entered in the inventory record.

- **CI** (Read-Only). Displays the condition index of the section based on condition assessment data for the selected date.
- **Painted.** Mark this checkbox if the component-section you are performing the condition assessment on is painted. This checkbox only appears if the section is inventoried as painted.
- **Condition Assessment Type Specific Data.** This data represents the actually condition assessment data that is used to compute the CI's in BUILDER. See Distress Survey Data and Direct Rating Data for more description of the data required for each method.

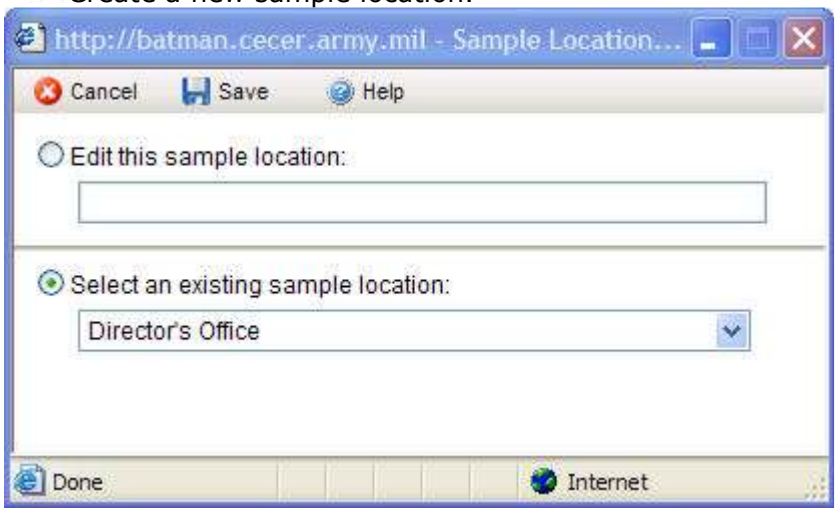
Using Sampling in Condition Assessments

Performing a condition survey inspection 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 or not will be a judgment call made by the inspector based on building size and component-section amount. Sampling rates, above the minimum addressed below, are up to the discretion of the inspector and/or organizational policy. Both sampling and non-sampling approaches can be used in the same building for different component-sections.

Additional Data Required for Condition Assessments Using Sampling

In addition to the data described in Performing Condition Assessments, the following data is also required for condition assessments that are performed using sampling:

- **Sample Qty.** Enter the quantity of the section inspected at the current sample location.
- **% Inspected** (Read-Only)**.** Displays the total percentage of the section that has been inspected for the current inspection date. This value is calculated by summing the sample quantities of all sample locations and dividing by the section quantity.
- **Sample.** Displays the location name of the sample. The buttons adjacent to this field allows you to:
  - Create a new sample location.



You can create the new location from existing sample locations or create a new sample location.

-  Edit the current sample location name.
-  Delete the current sample name.
-  Add comments regarding the current sample.

- **Non-Representative.** Mark this checkbox if the condition of the current sample is not representative of the component-section as a whole. Representative samples are those that are in a "typical" condition for the component-section as a whole. This 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. This can be either significantly better or worse condition. Non-representative samples are considered isolated and thus have less of an influence on the condition index than representative samples.

Representative Sample Creation and Selection

- 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 (square meters) or linear feet (meters).
- When part of the building (i.e. specific room) 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, (e.g. sample five of 25 interior doors as five separate samples).
- 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. There will be situations when this is not possible or practical.
- Ensure that all samples are properly identified as to location, including room number or name, if applicable, (think of the next person – can he/she easily find this location?).
- When sampling is used for a given condition survey inspection cycle, either the distress survey or the direct condition rating approach may be used for a given component-section. However, do not combine the methods for a given component-section (i.e. distress survey for one sample and direct condition rating for another sample).

Minimum Representative Sample Quantities

- The numbers of representative (as to condition) 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 (as to condition) samples to be taken of a specific component-section with the unit-of-measure of square feet (square meters) or linear feet (meters) 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.

Sampling Suggestions

- 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.

Using the Rapid Inspection Method

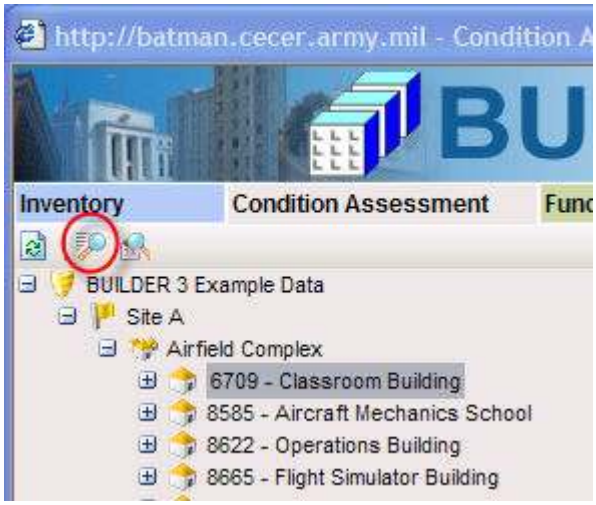
In an effort to speed the data input process, BUILDER offers a rapid inspection method feature for rapidly creating direct condition assessment records. Here are some examples of situations in which the feature might be used:

1. You have just renovated a family housing complex, and multiple systems have been completely replaced in every house. You need to record these new conditions in your BUILDER database.
2. You have just completed your BUILDER inventory, have very limited resources for a physical inventory but have staff members who are intimately knowledgeable of conditions in most of your buildings.
3. You structured your BUILDER inventory so that every door, window, room wall/floor/ceiling, etc. is identified as a component-section (see the inventory

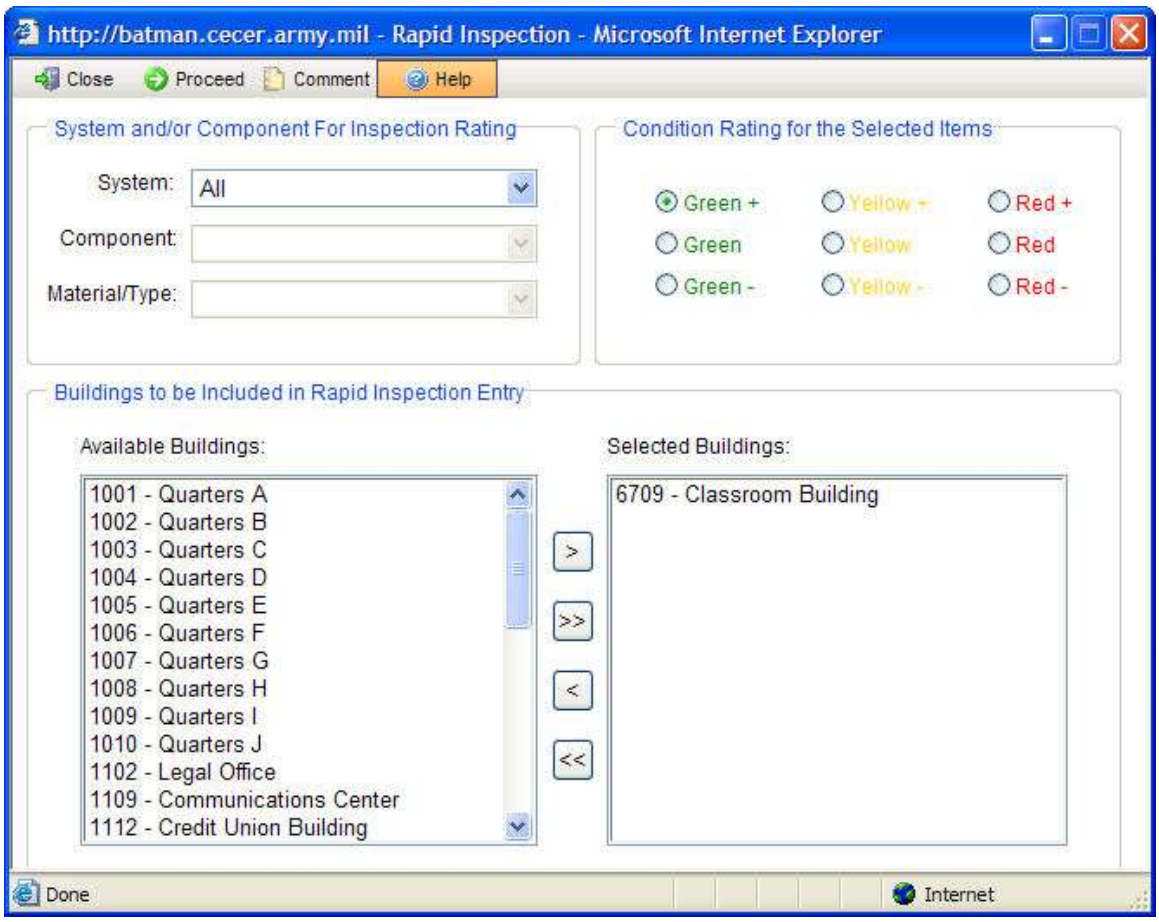
for 1131 Administration Building in the Example database as an illustration of this). Now that you have to perform an assessment, you find that every door, window, room wall/floor/ceiling, etc. must have its own inspection record but you want to do a quick walk through of the building and record component ratings for everything.

In all of these situations, you want to input condition ratings for systems or components for which you already know the rating. This is when Rapid Inspection can be very handy.

To launch the Rapid Inspection window, select the smallest organizational item in the condition assessment tree that contains all of the buildings that the rapid inspection will be used in, click the *Rapid Inspection* button from the inspection toolbar menu.



The Rapid Inspection window will appear:



The following data are required before the rapid inspection process can proceed:

- **System and/or Component for Inspection Rating**. Select the system for which inspections are to be created from the dropdown list. If you do not specify a component, then every component-section belonging to that kind of system in a selected building(s) will have an assessment created for it. However, if you specify a component but not a Material/Type, then every component-section belonging only to that kind of component in a selected building(s) will have an assessment created for it. Finally, if you specify a Material/Type, then every component-section of that material and type in a selected building(s) will have an assessment created for it.
- **Condition Rating for the Selected Items.** Select a Condition Rating for all of the inspections to be created.
- **Buildings to be Included in Rapid Inspection Entry.** Select the buildings for which condition assessments are to be created by using the arrow keys to build the list of Selected Buildings from the Available Building list.

You may also enter a comment to be recorded with every inspection created by clicking the COMMENT button in the toolbar . When all data has been entered, clicking the PROCEED button will initiate the rapid inspection process. If you do not wish to perform the rapid inspection, click the CLOSE button in the toolbar.

For the examples discussed above, here is how this feature may have been used:

1. You know that all of the roofs were rebuilt in the family housing complex. Select all of the houses, select Roofing as the system, and select G+ as the rating. Clicking PROCEED will create an inspection record with condition rating G+ for every component-section in the roofing system of every selected house.
2. Have each staff member sit down sequentially with BUILDER to do the following process: Select sets of buildings within his/her expertise that all have the same known condition for certain systems or components. Use the Rapid Inspection feature to create inspections as appropriate. If two staff members happen to input records for the same component-section, the later rating will overwrite the earlier rating if the ratings are done on the same day. (BUILDER allows only one inspection record per day per component-section.)
3. You have scanned the interior doors in your walk-through of the building, and they are all in good condition (rating G). Your inventory has 50 interior door component-sections, each door identified with the room it is in. Use rapid inspection by selecting the building, selecting Interior Construction/Interior Doors, and selecting condition rating G. Clicking PROCEED will automatically create 50 inspection records, one for each interior door component-section.

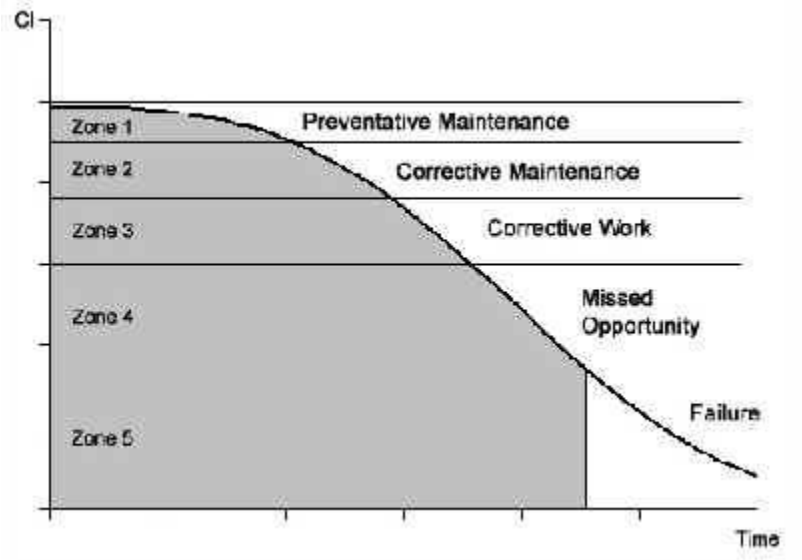
Knowledge-Based Inspection Scheduling

The Knowledge-Based Inspection (KBI) feature in BUILDER 3.0 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. Additionally, the feature is able to determine the type of condition assessments to perform. The selection algorithm is based on pieces of data (knowledge) associated with the component section that are compared with user-defined parameters.

Note: Please refer to the Condition Assessment Manual for an explanation of the Knowledge-Based Inspection Principles.

Determining When to Perform a Condition Assessment

As stated above, the KBI feature needs to compare knowledge about the component-section with user-defined parameters to determine when condition assessment are to be performed. These parameters are input when creating a standard and must be input for each of the five condition zones shown in the figure below. See the Condition Assessment Manual for explanation of each condition zone.



The user-defined parameters for the KBI feature and include:

- **CI Lower Bound**. The lower bound of the CI range of the condition zone. Providing the lower bound for each zone breaks the condition curve as shown above.
- **Maximum Inspection Interval.** The maximum amount of time, in years, between condition assessments in each condition zone.
- **Number of Inspections in Zone.** The maximum number of condition assessments that should be performed in each condition zone.
- **Degradation Factor.** The ratio of the maximum relative rate of deterioration to the expected rate of deterioration when a condition assessment is triggered. That is, if the deterioration rate were set to 2, any measured deterioration rate greater than twice the expected rate would trigger another inspection.

Based on the projected CI of the component-section, the KBI feature determines which range the component-section is in, and how many inspections to perform in that range. It then calculates the time between inspections to accomplish this. This interval is compared to the maximum inspection interval, and the lesser of the two becomes the allowable inspection interval.

When the time since the last inspection becomes greater than the allowable interval between condition assessments, the component-section is flagged for inclusion into the next round of assessments. In addition, if the rate of deterioration of the CI seen by the last condition assessment is greater than the allowable rate of deterioration determined by the deterioration factor discussed above, the component-section will also be flagged for inclusion into the next round of assessments.

Determining the Type of Condition Assessment to Perform

Once the KBI program selects the subset of recommended component-sections for inclusion into the next round of assessments, it must determine the method that will

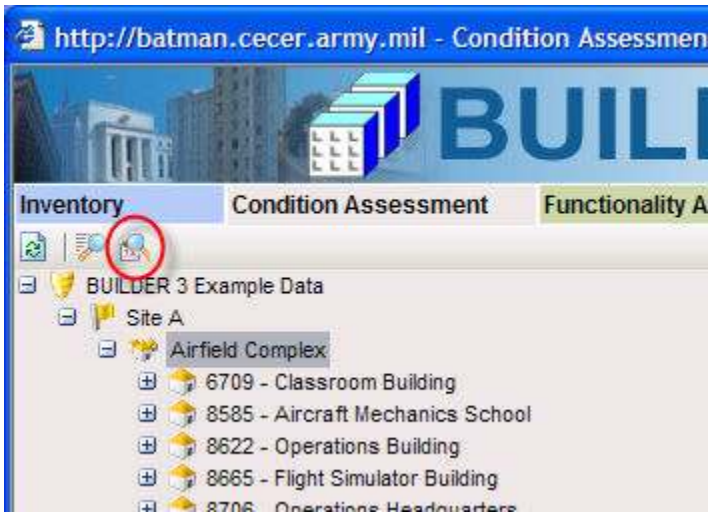
be used for each condition assessment. Based on the CI range that the component is projected to be in, the general guidelines below apply.

Range	Procedure
1	Direct
2	Distress
3	Distress
4	Direct
5	Direct

In some instances, a more detailed level of condition assessment may be warranted regardless of the guidelines recommended above. If a more detailed assessment was performed previously, the same method will be recommended again for zones 1 - 3. This means, for example, if the component-section is still in range 1 and the previous condition assessment method was a distress survey, the KBI program would recommend a distress survey be performed.

Using the KBI Feature in BUILDER 3.0

To use the KBI feature in BUILDER, click the *Inspection Scheduling* button from the inspection navigation toolbar.



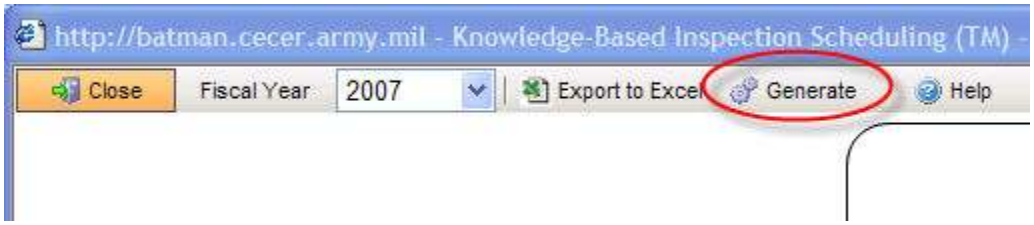
The Knowledge-Based Inspection Scheduling window will appear.

Toolbar

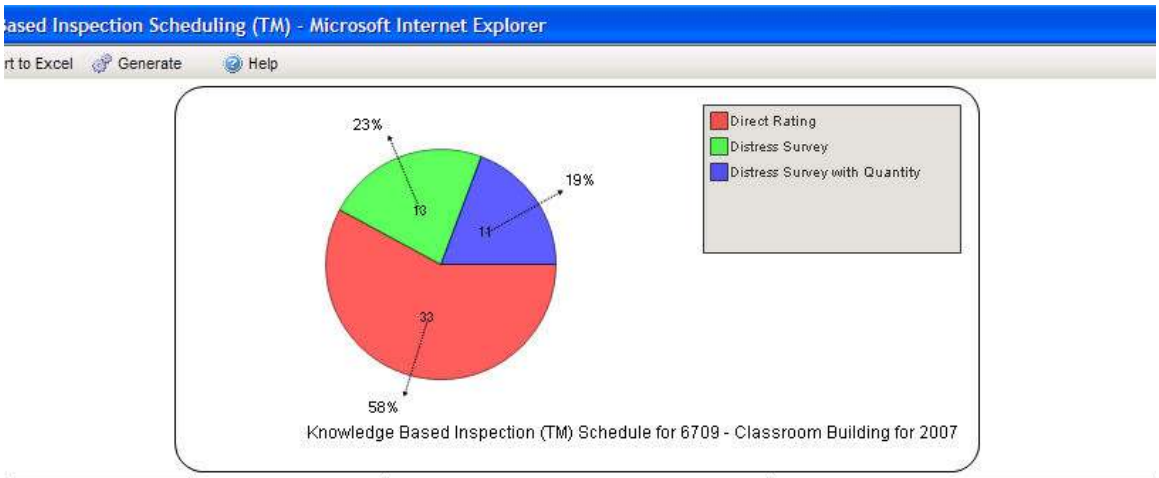
- CLOSE. Use this button to close the Knowledge-Based Inspection Scheduling window.
- EXPORT TO EXCEL. Use this button to export the current inspection schedule to a Microsoft Excel spreadsheet.
- GENERATE ITEMS. Use this button to generate a new inspection schedule.

Creating an Inspection Schedule

To create a Knowledge-Based Inspection Schedule click the GENERATE button in the toolbar.



The Generate Inspection Schedule window will appear. Using the policy sequence defined in the site data, the KBI Schedule will be generated and shown in the window. The schedule can then be exported to a Microsoft Excel spreadsheet by clicking the EXPORT TO EXCEL button in the toolbar. It is important to note that generating a new inspection schedule will delete the current inspection schedule.



System	Component	Section	Inspection Type
Electrical	Distribution	Electrical Category 8	Direct Rating
Electrical	Lighting Fixtures	Fluorescent Exterior, 2'x2' U-3- T-12	Direct Rating
Electrical	Lighting Fixtures	Fluorescent Interior	Distress Survey with Quantity
Electrical	Lighting Fixtures	Incandescent Interior	Distress Survey with Quantity
Electrical	Lighting Fixtures	Warning Interior	Distress Survey with Quantity
Electrical	Panels	Panelboard 100-200 AMP	Distress Survey
Exterior Circulation	Exterior Ramp	Concrete	Direct Rating
Exterior Circulation	Exterior Stair/Step	Concrete Steps	Direct Rating
Exterior Circulation	Walkway	Concrete Non-Elevated	Direct Rating
Exterior Closure	Exterior Ceiling	Concrete	Distress Survey
Exterior Closure	Exterior Door	Glass Personnel	Direct Rating
Exterior Closure	Exterior Door	Metal Personnel	Direct Rating
Exterior Closure	Exterior Wall	Masonry	Direct Rating
Exterior Closure	Exterior Window	Metal Casement	Direct Rating
Exterior Closure	Exterior Window	Metal Fixed	Distress Survey
Fire Suppression	Fire/Smoke Alarm	System Automatic	Distress Survey
HVAC	Air Handling Unit	Central Station 12000-14000 CFM	Distress Survey with Quantity
HVAC	Air Handling Unit	Modular <3 Tons	Distress Survey with Quantity
HVAC	Cooling Unit/Plant	Air Conditioner Thru-Wall <25000 BTUH	Distress Survey with Quantity
HVAC	Cooling Unit/Plant	Compression, Reciprocating 25 TN, air cooled	Distress Survey with Quantity
HVAC	Cooling Unit/Plant	Heat Pump Residential 4-5 Tons	Distress Survey with Quantity