

CHAPTER 4: TUTORIAL - WORKED EXAMPLE

The purpose of this chapter is to guide you through a sample data entry exercise. This example is provided for the convenience of the less experienced computer user.

STARTING THE WORKED EXAMPLE

- | | |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Step One | Start Quattro Pro for Windows (QPW). See instructions in Chapter 3. |
| Step Two | Open the desired Benefit-cost program file. See instructions in Chapter 3. For the worked example, open the BC_EXAMP.WB1 file. |
| Step Three | The Sign-On Screen appears after the benefit-cost program is loaded. Adjust the zoom factor if necessary. See instructions in Chapter 3. |
| Step Four | Proceed through the Data Input process, as outlined below in the tutorial example. This example leads you through a sampling of the data input process. |

DATA INPUT

This tutorial will lead you through part of the data entry process for a sample project.

BUILDING ID

Begin Data Entry

Click on **B**uilding in the menu at the top of the screen. Then click on **E**ngineering, and finally, click on **B**uilding Identification.

The following screen appears:

| BUILDING ID | |
|--------------------|-------------------|
| Building Name: | Court House |
| Address: | 1231 St |
| City, State, Zip: | Ekalaka, MT 21345 |
| Analyst: | GLH |
| Run ID: | 123456 |
| Managing Agency: | GSA |
| Contact Person: | Hank Snow |
| Address: | 54321 A St. |
| City, State, Zip: | Denver, CO 54631 |
| Telephone: | 123 654 7898 |

Building Name

PINK BLOCKS (information only): With your mouse, move the cursor to the first pink-colored block, **Building Name**, and click on the cell. Type the name of the building, e.g., **Federal Building**. Press the **Enter** key

IMPORTANT: the cursor must be in the first space on the left inside the pink box.

Address

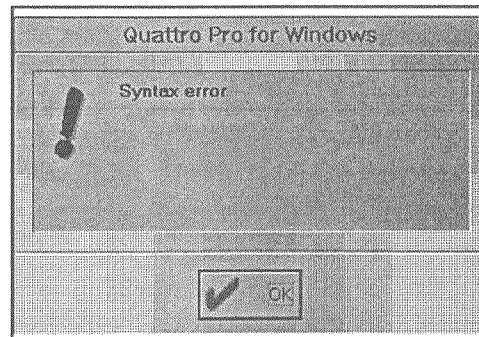
Then, with the mouse or the arrow keys, move the cursor to the street **Address** and enter it in the following way:

'1000 First St

OOPS!

If you forget to start your entry with an apostrophe, ', an error message will be displayed.

Error Message:



Help

The address (and all combinations of numbers and letters **which begin with a number**) **MUST** be entered with a single apostrophe preceding the address, e.g., **'1000 First St.** If not entered this way, a "syntax error" message will appear: click on the **OK** of the error message or press the **Esc** key. Add the apostrophe, then press **Enter**.

City, State, Zip Code

PINK BLOCK (information only): Enter the city, state and zip code for the building: **San Jose, CA 90000.**

Analyst

PINK BLOCK (information only): Enter the name of the person performing this analysis. Enter: **A. Analyst.**

Run ID

PINK BLOCK (information only): Enter a name or number to distinguish this rehabilitation scheme from others which may be analyzed.

Managing Agency

PINK BLOCK (information only): Enter the name of the agency which owns or manages the building.

Contact Person

PINK BLOCK (information only): Enter the name and other information about the building's manager.

BUILDING TYPE

Building Type

GREEN BLOCK (Data input): Enter P (as a CAPITAL letter) in the left GREEN block. The screen will display the corresponding building description (Unreinforced Masonry Bearing Wall) from the list.

If you make a mistake, use the backspace key to erase, and enter the information correctly. If you have already pressed the **Enter** key, use the mouse to point the cursor at the **GREEN** cell and click. Then enter the correct letter.

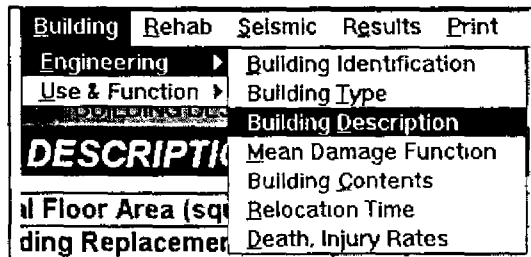
Update Default Data

You **MUST** click on the **UPDATE DEFAULT DATA** button to update the default data presented later in the model. **Otherwise, incorrect default data will be presented for your review, and if not overridden (see below), will be used in the benefit-cost calculation.**

UPDATE DEFAULT DATA

Click button if building type is changed.

Use the mouse to highlight the **B**uilding|**E**ngineering|**B**uilding **D**escription in the menu, or click on the **BuildID** tab at the screen bottom.



BUILDING DESCRIPTION

| BUILDING DESCRIPTION | | | |
|--------------------------------------------|-------------|--|-------------|
| Total Floor Area (square feet): | 20,000 | | Calculated |
| Building Replacement Value per square foot | \$150 | | \$150 |
| Total Building Replacement Value | \$3,000,000 | | \$3,000,000 |
| Number of Stories Above Grade: | 3 | | |
| Date of Construction | 1955 | | |
| Historic Building Controls? | NO | | |

Floor Area

GREEN block (Data entry): Enter **20000** as the total floor area of the building in square feet.

Helpful Hint: The program won't accept numbers which include a dollar sign (\$) or commas. Thus, twenty thousand square feet should be entered **20000** and a cost of \$10,000 should be entered as **10000**; \$ and , appear automatically. If you forget and include a "\$" or a "," the model will respond with a "syntax error" message. Click on the **OK**, then enter correctly the information requested.

Building Value (per Sq. Ft.)

GREEN block (Data entry): Enter **150** as the building replacement value per square foot.

Total Building Value

GREEN block (Data entry): Enter **3000000** as the total building replacement value. The model will display **\$3,000,000**.

Stories

PINK block (Information): Enter **3** as the number of stories above ground in this building.

Date

PINK block (Information): Enter **1955** as the year the building was constructed.

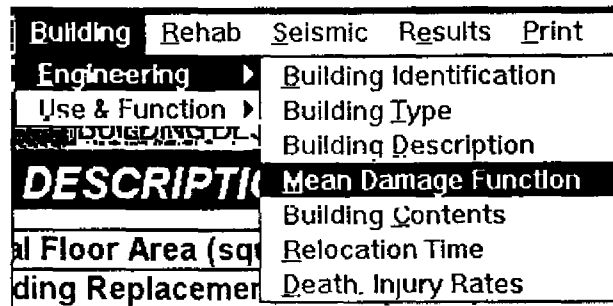
Historic Building

PINK block (Information): Enter **NO**, no historic building controls exist for this structure.

MEAN DAMAGE FUNCTION (% OF BUILDING REPLACEMENT VALUE)

Mean Damage Function

Use the mouse to move the cursor to **Building** on the menu at the top of the screen. Click the left mouse button on **Engineering** and again on **Mean Damage Function**, or click on the **MDF** tab at the screen bottom.



The following screen will appear:

| MEAN DAMAGE FUNCTION (% OF BUILDING REPLACEMENT VALUE) | | | | | | | |
|-----------------------------------------------------------------------------------------|------------------|------------------------|-------|-------|-------|--------|------|
| Court House | 1231 St | Ekalaka, MT 21345 | | | | | |
| Facility Class: Steel Moment Frame | | | | | | | |
| Building Replacement Value: | \$100.00 /sq.ft. | \$10,000 x 1,000 Total | | | | | |
| Demolition Threshold Damage Percentage: 100 | | | | | | | |
| Describe the building's seismic deficiencies: | | | | | | | |
| | | | | | | | |
| DEFAULT ESTIMATES FOR EXISTING BUILDING: | | | | | | | |
| MMI | VI | VII | VIII | IX | X | XI | XII |
| PGA (percent of g) | 4-8 | 8-16 | 16-32 | 32-65 | 65-80 | 80-100 | >100 |
| A Poor | 1.7 | 3.8 | 7.2 | 13.9 | 22.2 | 31.4 | 40.6 |
| B Typical | 0.7 | 1.7 | 3.8 | 7.2 | 13.9 | 22.2 | 31.4 |
| C Seismic Design | 0.0 | 0.7 | 1.7 | 3.8 | 7.2 | 13.9 | 22.2 |
| D Typical California | 1.5 | 3.8 | 5.0 | 6.9 | 17.1 | 23.0 | 33.7 |
| Select Type of Construction (A,B,C,D) from the Table Above OR Enter Your Own Estimates: | | | | | | | |
| D Typical California | 1.5 | 3.8 | 5.0 | 6.9 | 17.1 | 23.0 | 33.7 |
| User Entered Estimate: | | | | | | | |
| Modified MDF: | 1.5 | 3.8 | 5.0 | 6.9 | 17.1 | 23.0 | 33.7 |

PURPLE BLOCKS (Carry over): The model displays information entered on the first screen in **PURPLE** blocks. If any of this information is incorrect, return to the data entry screens, **Building ID** and **Building Description** and make necessary changes there.

Demolition Threshold

GREEN block (Data input): Enter **65** as the percentage of damage, relative to the building replacement value, at which the structure would be demolished and replaced rather than repaired.

Building Seismic Deficiencies

PINK block (Information): Enter **See Smith & Brown report for seismic performance engineering evaluation**. This comment box can be used to annotate building deficiencies or to reference information sources about the building.

Default Estimates

ORANGE BLOCKS (Default): The model displays default estimates for the estimated damage, as a percentage of the building replacement value, expected to occur in various MMI bins. For reference, four different mean damage functions are shown.

Construction Type

GREEN BLOCK (Data input): Enter **B**, for typical construction, in the **GREEN** block. This selects "typical" as the default mean damage function most appropriate for the building under consideration.

User Entered Estimate

BLUE BLOCKS (Override default): In this example, leave these blocks empty.

However, when entering information on actual projects, the model will produce better results with building-specific information.

Modified MDF

YELLOW Blocks (Results): The model displays calculated values for the mean damage function modified for the demolition threshold entered above.

Tutorial Note

To perform a complete benefit-cost analysis of a real project, additional data entries are required. These entries are accessed, like those described above, by clicking on the menu headers and filling in the requested information.

Each data entry is described in detail in Chapter 5. However, this tutorial covers only a sample of the total data entries.

The following section of this tutorial describes the **Results** section, with the remaining data entries already completed.

BENEFIT-COST RESULTS

Click the mouse on **Results**, then click on **Benefit-Cost Results** to view the results calculated by the model.

| BENEFIT COST RESULTS | | |
|---------------------------------|-----------------------------------|-------------------|
| Federal Building | 1000 First Street | San José CA 90000 |
| Facility Class: | Unreinforced Masonry Bearing Wall | |
| Project Description: | 0 | |
| A. ECONOMIC PARAMETERS : | | |
| Discount Rate: | 7 | percent |
| Planning Period | 30 | years |
| Present Value Coefficient: | 12.41 | |

A. ECONOMIC PARAMETERS

Discount Rate

GREEN block (Data input): Enter 7 for the discount rate.

Planning Period

GREEN block (Data input): Enter 30 years for the planning period.

Present Value Coefficient

YELLOW block (Calculated results): The model displays **12.41** as the **Present Value Coefficient**, the present value of \$1 per year in benefits received over the project useful lifetime period.

**B. SUMMARY OF DAMAGES AND ECONOMIC LOSSES
(excluding the value of life)**

| B. SUMMARY OF DAMAGES AND ECONOMIC LOSSES: | | | | |
|---------------------------------------------------|-----------------|-----------------|-----------------|----------------------------------|
| | Annual Expected | Annual Avoided | Annual Residual | Present Value of Damages Avoided |
| Building Damages | \$47,879 | \$32,504 | \$15,174 | \$403,348 |
| Contents Damages | \$7,870 | \$5,392 | \$2,478 | \$68,988 |
| Relocation Expenses | \$0 | \$0 | \$0 | \$0 |
| Rental Income Losses | \$7,549 | \$3,736 | \$3,813 | \$46,368 |
| Value of Lost Services | \$10,806 | \$7,936 | \$2,870 | \$98,478 |
| Total Damages and Losses | \$73,904 | \$49,568 | \$24,336 | \$615,090 |

| | |
|-------------------------------------------------------------------------------------|------------------|
| PRESENT VALUE OF TOTAL DAMAGES AND ECONOMIC LOSSES AVOIDED: | \$615,090 |
| TOTAL COSTS OF THE SEISMIC REHABILITATION PROJECT: | \$560,000 |
| TOTAL BENEFITS MINUS TOTAL COSTS WITHOUT THE VALUE OF AVOIDED INJURIES & DEATHS: | \$55,090 |
| BENEFIT COST RATIO WITHOUT THE VALUE OF AVOIDED INJURIES & DEATHS. | 1.10 |

YELLOW blocks (Calculated results): The model displays calculated values for the annual expected, annual avoided, and annual residual damages and losses; and the present value of damages avoided for building and contents damages, relocation expenses, rental income losses and the value of lost services.

Avoided Losses

In the individual **YELLOW** blocks, the model displays the calculated results of the model. The first amount, **\$615,090**, is the present value of the damages and economic losses excluding the value of life, which would be avoided if the proposed rehabilitation project is undertaken. **This value is the calculated benefits of the seismic rehabilitation project.**

Project Cost

The second amount, **\$560,000**, is the total cost of the proposed rehabilitation project.

Net Benefits

The third amount, **\$55,090**, is the value of the net benefits of the proposed project (total benefits minus total costs).

Benefit-Cost Ratio

The last number, **1.10**, is the ratio of net benefits to net costs, excluding the value of life, for the proposed rehabilitation project.

C. VALUE OF INJURIES AND DEATHS

| C. VALUE OF INJURIES AND DEATHS: | | | | |
|-------------------------------------------------------------------------------|------------------------|-----------------------|------------------------|----------------------------------|
| Value of Avoiding a Minor Injury: | \$1,000 | | | |
| Value of Avoiding a Serious Injury: | \$10,000 | | | |
| Statistical Value of Life: | \$1,700,000 | | | |
| | Annual Expected Number | Annual Avoided Number | Annual Residual Number | Present Value of Damages Avoided |
| Minor Injuries | 5.66E-02 | 5.09E-02 | 5.66E-03 | \$632 |
| Serious Injuries | 1.72E-02 | 1.70E-02 | 1.72E-04 | \$2,111 |
| Deaths | 7.08E-03 | 7.07E-03 | 7.08E-06 | \$149,136 |
| | | | Total Value | \$151,879 |
| PRESENT VALUE OF TOTAL DAMAGES, ECONOMIC LOSSES, DEATHS AND INJURIES AVOIDED: | | | | \$766,969 |
| TOTAL BENEFITS MINUS TOTAL COSTS WITH THE VALUE OF AVOIDED INJURIES & DEATHS: | | | | \$206,969 |
| BENEFIT COST RATIO WITH THE VALUE OF AVOIDED INJURIES & DEATHS: | | | | 1.37 |

Minor Injury

GREEN block (Data input): The model displays \$1,000 as the value of a minor injury. In this example, do not change this value.

Major Injury

GREEN block (Data input): The model displays \$10,000 as the value of avoiding a serious injury. Do not change this value.

Statistical Life

GREEN block (Data input): The model displays \$1,700,000 as the value of a statistical life. In this example, do not change this value.

YELLOW blocks (Calculated results): The model displays calculated values for the annual expected, annual avoided, and annual residual costs; and the present value of damages avoided for minor injuries, major injuries, and statistical life.

Avoided Losses

In the individual **YELLOW** blocks, the model displays the calculated results of the model. The first amount, \$766,969, is the present value of the damages and economic losses including the value of life, which would be avoided if the proposed rehabilitation project is undertaken. **This value is the calculated benefits in the benefit-cost model of the seismic rehabilitation project when the value of casualties avoided is included.**

Project Cost

The second amount, \$206,969, is the total net benefit of the project (benefits minus costs) including the value of life.

Benefit-Cost Ratio

The third number, 1.37, is the **benefit-cost ratio** including the value of life.

**To Exit From
the Tutorial**

To exit from the tutorial, click on **File**, then click on **Quit**.