



# Bentley Civil Training GDOT: InRoads Quantity Calculations

For InRoads V8i SELECTseries 2 with MicroStation

First Edition

*Learner Name:* \_\_\_\_\_

*Date:* \_\_\_\_\_

*Instructor Name and Contact Information:*

\_\_\_\_\_

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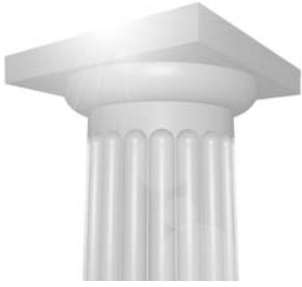
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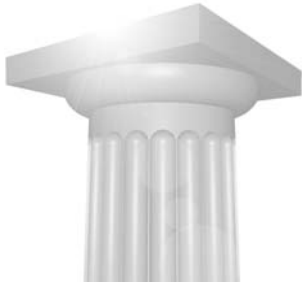
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# Course Overview

## COURSE DESCRIPTION

This course teaches a workflow to use InRoads and the Bentley Quantity Manager to assign pay items to DTM and graphic elements, extract and calculate the design quantities from those elements, and report on the calculated quantity values.

## COURSE OBJECTIVES

After completing this course, you will be able to:

- Assign pay items to DTM and graphic elements.
- Compute quantities from the assigned pay items.
- Create reports on the computed pay item quantities.
- Export computed pay items to AASHTO Trns•port software.
- Maintain pay item database.

## TARGET AUDIENCE

This course is recommended for the following audience(s):

- Engineers and designers who need to calculate design quantities from engineering designs and drawings.

## **PREREQUISITES**

- Working knowledge of Microsoft Windows operating system.
- Experience in road design.
- Working knowledge of MicroStation functionality equivalent to the topics taught in the Bentley Institute Essential MicroStation or Moving to MicroStation courses.
- Working knowledge of InRoads functionality equivalent to the topics taught in the Bentley Institute InRoads Fundamentals course.

## **EXPECTATIONS**

### **WHAT THIS COURSE PROVIDES**

This course provides a workflow to use the Quantity Manager tools to gather pay item quantities and export them to a separate software application such as the AASHTO Trns•port software for processing and preparing bid estimates.

The workflow taught in this course covers how to assign pay items to InRoads and MicroStation elements, compute quantities and extract them to a quantity database, produce reports on the quantities, and export the quantities to the AASHTO Trns•port software.

The training also includes an overview to managing the Pay Item database including how to add, delete, and modify pay item definitions.

### **WHAT THIS COURSE DOES NOT PROVIDE**

This course does not provide a comprehensive review or instruction of the Quantity Manager tools such as payer and funding participation, and funding rules.

This course is not an administration course and therefore does not cover installation and administration topics.

## MODULES INCLUDED

The following modules are included in this course:

- Assigning Quantities
- Computing and Extracting Quantities
- Reporting and Exporting
- Managing the Pay Item Database

## COURSE EXERCISES

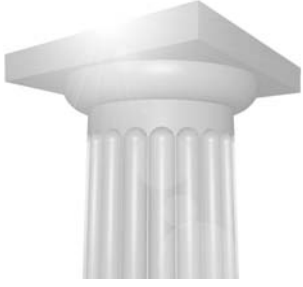
The Exercises for each chapter are independent of one another and can be used without having to complete the exercises in previous chapters. Most exercises use an InRoads project file (\*.rwk). When you load the project file, other supporting files such as surfaces, geometry databases, etc. are loaded.

The folder structure used during the exercises are as follows:

- For practice during the lesson:

*C:\InRoads Training\Quantity Manager Lab\Practice\Practice Lesson #*

Where # is the chapter number.



# Assigning Quantities

## OVERVIEW

This module teaches how to assign pay items and quantities to InRoads DTM and MicroStation graphic elements. Assigning the pay items is the first step in being able to report on, or export, those quantities to external applications such as the AASHTO Trns•port Estimator software.

## PREREQUISITES

- Pay Item Database
- InRoads DTM elements and/or MicroStation graphics

## OBJECTIVES

After completing this module, you will be able to:

- Understand general workflow for computing quantities
- Understand basic principles for how quantities are computed
- Assign pay items to InRoads DTM elements
- Assign pay items to MicroStation graphic elements
- Edit and review assigned pay items
- Create shapes for pay item assignments
- Customize formula used to compute quantities
- Override computed quantities with input values
- Assign “supplemental descriptions” to pay items



## INTRODUCTION TO QUANTITY MANAGER

Quantity Manager is a standalone database application that receives pay item quantity values from Bentley Civil design software such as InRoads and GEOPAK. While the Quantity Manager application has many features, the most important are reporting on the pay item quantities and exporting the quantities to external applications such as the AASHTO Trns•port software. The external applications are commonly used to assign costs to the pay items quantities, prepare bid packages, and more. The Quantity Manager application has similar capabilities to these external applications but those will not be covered during this training.

Two independent software applications make up the quantity calculation and reporting process sometimes referred to as “Quantity Manager”. The first application is the InRoads software which includes an add-in application for quantities. The quantity tools in InRoads are used to:

- Define pay items
- Define pay item formulas
- Assign pay items to InRoads DTM features
- Assign pay items to MicroStation graphics
- Review/Edit pay item assignments
- Create DTM feature shapes from graphics
- Compute quantities from DTM features and graphics
- Create quantity database

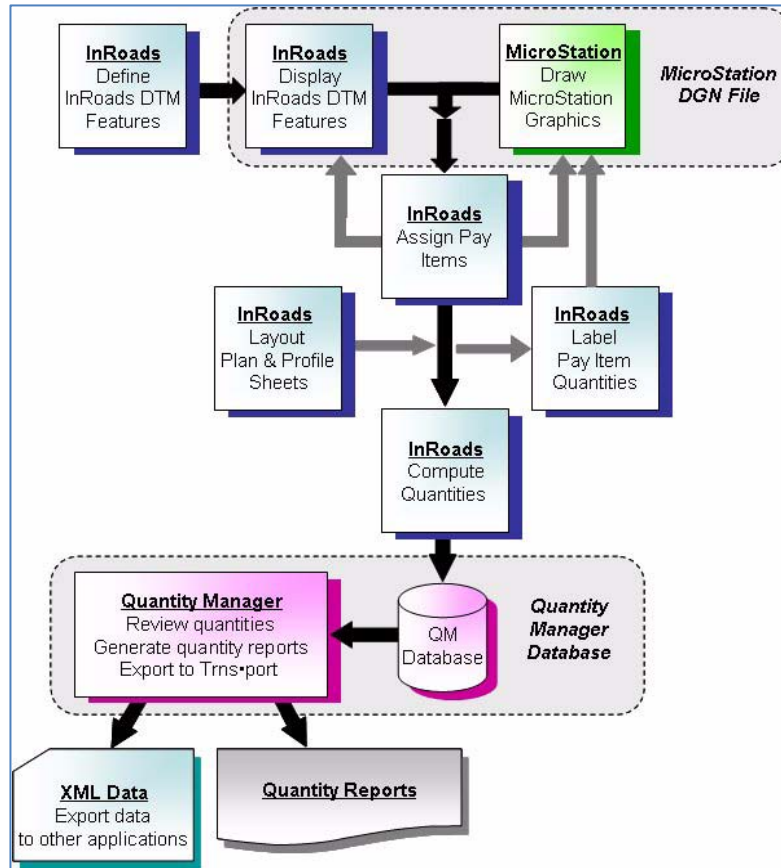
The second application is the Quantity Manager application. This software runs independent of InRoads. Although this application has many advanced capabilities, the workflow introduced in this course will focus on the following core tasks with the Quantity Manager application.

- Read quantity database created by InRoads
- Export quantity information to external applications such as Trns•port
- Create reports on quantity information

## WORKFLOW OVERVIEW

The following workflow is recommended for using the InRoads Quantity add-in application and the Quantity Manager application to compute and report on project pay item quantities.

The underlined, bold text in each box in the workflow diagram indicates which software (MicroStation, InRoads, or Quantity Manager) is used for that task of the workflow.



- Define InRoads DTM features and/or create MicroStation graphics for each element in the project that needs to be quantified.
- Assign pay items to InRoads DTM or MicroStation graphic elements.
- Compute and extract quantities from MicroStation and InRoads. The results are written to a Quantity Manager database.
- Use Quantity Manager application to review, report, and export pay item quantities to external applications such as the AASHTO Trns•port software.

## OPEN MICROSTATION AND INROADS

➤ **Open the GDOT MicroStation workspace**

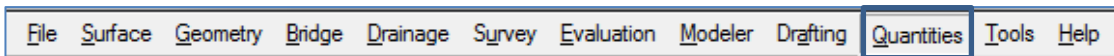
1. Open the GDOT MicroStation workspace by clicking on the yellow icon shown here.



2. Navigate to *C:\InRoads Training\Quantity Manager Lab\Practice\Practice Lesson 02\*.
3. Open the file *Assigning Quantities.dgn*.

➤ **Start InRoads**

1. Open InRoads from the MicroStation menu bar.
2. The Quantities option should appear in the InRoads menu.



## LOADING PROJECT FILES

Before any work can be done, the project files need to be loaded into InRoads. The most common project files required include:

- CAD (.dgn) – Required
- Preference (.xin) – Required
- Pay Item Database (.mdb) – Required
- Geometry (.alg) – Required
- Surface (.dtm) – Optional

### ➤ Open Project File

1. Select **File > Open** from the InRoads menu.
2. Open the Project File *C:\InRoads Training\Quantity Manger Lab\RWK\Practice Lesson 02.rwk*.

This will open the preference file: *GDOT\_Standard V8i\_SS2.xin*

And the geometry file: *Assigning Quantities.alg*

And the design surface: *Assigning Quantities.dtm*

3. Close the Open dialog.

### ➤ Loading the Pay Item Database

1. Select **Quantities > Pay Item Manager** from the InRoads menu.

The Pay Item Manager dialog appears.

2. From the Pay Item Manager, select **File > Open**.
3. Open the pay item database file *C:\InRoads Training\Quantity Manger Lab\Standards\Pay Items\GDOT(PI#) Quantity Manager Pay Item Database.mdb*.

Because changes will be required to the pay item definitions on a project by project basis, it is necessary that each project have a copy of the master pay item database that is modified to satisfy project specific requirements. The recommended naming scheme for the pay item database is *PI# Quantity Manager Pay Item Database.mdb* (i.e. *1234567 Quantity Manager Pay Item Database.mdb*). GDOT's master pay item database is extracted to *C:\InRoads Data\Standards* when the *InRoadsALL.exe* is run.

4. Click Exit to Exit the Pay Item Manager dialog.

It is not necessary to have the Pay Item Manager dialog visible to use the pay items.

## UNDERSTANDING PAY ITEM CALCULATIONS

Pay items can be assigned to both MicroStation graphics and InRoads DTM features. This flexibility is important because some elements of the project plans will be engineered and designed in InRoads while others will be simple graphics drawn in the plan files. Although the same tools are used to assign, review, and edit pay items on graphic and DTM features, there are a few small differences in how they behave.

Multiple pay items can be assigned to each element. Assigning multiple pay items to a single element allows comprehensive construction quantities to be calculated. For example, a section of guardrail may be constructed from the rail section and an end treatment on each end of the rail section. It might even be required to construct a curb along the rail and pave the area around the end treatment. In this example, multiple pay items are required for the rail section, end treatment, curb, and paving.

This training does not cover how to setup and administer the pay item database. However, having a general understanding of some of the options each pay item can have will help you understand how the quantities are computed. Please refer to the online help for additional assistance with the pay item definitions.

## MEASUREMENT BASIS OF PAY ITEMS

InRoads and the Quantity Manager compute pay items using an each, linear, or area measurement basis.

- Each – The each measurement basis can be applied to any element such as a cell or a line. No additional variables are needed for an each computation since each element is counted.

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**Note** There are options within the Pay Item definition that control how multiple vertices are counted. For example, if an Each measurement basis is assigned to a line string with 5 vertices, is it computed as a quantity of one (element) or five (vertices)?

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- Linear – A linear measurement basis is most commonly applied to elements such as curb, paint strip, guardrail, pipe, and such where a linear quantity is desired. A linear quantity can be calculated from one or more elements. To compute a quantity from a string of multiple elements, the elements must be grouped together as a complex chain. If the elements are not grouped, quantities will be reported individually for each element instead of the sum of all elements being reported as a single quantity.

In some situations it may be desirable to setup a pay item that reports a linear quantity from an individual element such as a point or a cell. For example, assume a standard 18 feet of curb needs to be computed at each guardrail terminator location. The guardrail terminator is defined with a cell and computed as an each element. The curb pay item will be setup as a linear measurement method with a variable that defines the length. A formula associated with the pay item defines that the pay item quantity is calculated by multiplying the variable (assigned a value of 18) by the number of elements (computed from the each measurement basis). The result is a quantity of 18 feet no matter the size of the guardrail terminator.

- Area – The linear measurement basis is used to calculate an area quantity. Area quantities can be calculated from closed elements or from a series of individual elements that form a closed area. To compute an area quantity from multiple elements, the elements must be grouped together as a complex shape. If the elements are not grouped, an error will result and no quantity will be calculated.

---

**Note** InRoads includes a *Shapes Tool* to create DTM feature shapes from multiple graphic elements that are not grouped together as a complex shape. This tool will be discussed later in this training. The MicroStation *Create Region* tool can also be used to create graphic complex shapes from multiple graphic elements.

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- Volume – There is no direct method to measure volumes with the Quantity Manager tools. However, by including a variable in the computation formula that specifies the depth of an area, the volume can be computed based on the calculated area multiplied by the specified depth. Likewise, a volume could be computed from a linear element if the pay item formula included variables for the width and depth.

For example, the formula for computing a volume in cubic yards from a linear element would be

$$(\text{LINEAR} * \text{Width} * \text{Thickness})/27$$

*LINEAR* represents the value computed by InRoads. *Width* and *Thickness* are user defined variables. To compute the volume of concrete in a 4 foot wide, 6 inch deep sidewalk the *Width* is defined as 4 and the *Thickness* as 0.5.

## ROUNDING, QUANTITY FACTOR, AND DEDUCTIONS

InRoads computes the pay item quantity by reading the precise count (each), length, or area from the MicroStation graphics and InRoads DTM features. These quantities will be computed to the maximum number of decimal places the computer is capable of processing. However, in most situations it is more desirable to report quantities to a known and expected number of decimal places. Each pay item definition includes an option to apply rounding to the computed quantities. If enabled, the computed quantities will be rounded to the specified number of decimal places. There are also controls to define if the quantities are rounded up or down.

Each pay item can optionally be multiplied by an “estimate” or quantity factor. When this option is enabled, the calculated pay item will be multiplied by the specified quantity factor. The reported quantity will thus be larger or smaller than the calculated quantity based on the specified value. For example, assume the acceptable practice is to increase the pounds of seed needed to cover an area by 5%. The quantity factor for the seed pay item would be set to 1.05.

InRoads would then calculate the seed area from the elements, apply the quantity formula to the area to determine the pounds of seed required, and then multiply that result by 1.05 to increase it by 5%.

Quantity Manager also includes the ability to subtract a specified quantity from one pay item any time another specific pay item is found within a minimum distance. For example, assume the requirement is to subtract 10 feet from the curb and gutter quantity each time a catch basin is placed in the curb. Two pay items would need to be defined; the catch basin pay item and the curb and gutter pay item. In addition to its other definitions, the curb and gutter pay item would include a deduction of 10 feet each time the catch basin pay item is encountered. The distance for how close the two pay items need to be to each other before the deduction occurs is defined when using the *Compute Quantities* tool.

The following figure shows the curb and gutter pay item. Notice the pay item 668-1100 in the Deduct from Pay Item area. This is the definition that 10 feet will be deducted from the curb and gutter quantity each time the catch basin is encountered.

**Edit Pay Item**

Pay Item Name: < 441-6021 > Apply

Pay Item Code: 441-6021 Close

Description: CONC CURB & GUTTER, 6 IN X 30 IN, T Help

Unit Name: LF

**Quantity Calculation**

Formula: LF

Variables:

| Name | Value |
|------|-------|
|      |       |

Value: 0.00

**Deduct from Pay Item**

Pay Items:

| Pay Item | Deduction |
|----------|-----------|
| 668-1100 | 10.00     |

Value: 10.00

**Measurement**

Mode:  Planarized  Apply Quantity Factor: 0.00

Slope  Apply Rounding Factor: 0.00

Round Up  Round Down

Each pay item also has the option of setting the measurement mode. The measurement mode can be set to either planarized or slope. In the figure above the measurement mode of the curb and gutter is set to planarized. This has the effect of deriving a quantity based on its horizontal position without regard to elevation.

## PAY ITEMS ON INROADS DTM FEATURES

When pay items are assigned to DTM features, the pay item definition is stored in the InRoads \*.dtm files.

### Advantages

- DTM features are less likely to be accidentally modified than MicroStation elements might be.
- DTM features can be redisplayed to the graphics file if the graphics is modified or otherwise lost.

### Disadvantages

- The DTM surface (\*.dtm) file that contains the feature definitions must be loaded to compute quantities. Graphics representing the features from the DTM surface can be displayed in the CAD file but the graphics cannot be used to compute the quantities.
- Pay item assignments are lost if the DTM surface is recreated such as might occur if the Roadway Designer is run again.

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*Note* There is a technique where pay item assignments can be made to InRoads styles. If this technique is used, the features in the DTM surface would have their associated pay items even after recreating the surface so long as the proper styles are used for each feature. However, it is not recommended to use this technique in most situations because it would require a 1:1 relationship between styles and pay item definitions. For example, a common configuration is to have a single style for concrete pipe even though there are many different sizes of pipe. There would be a pay item definition for each size of pipe that is then manually assigned to the feature as necessary. The other option is to create a style for each size of pipe and associate each style with one pay item.

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- Quantity overrides cannot be used. Quantity overrides are the ability to manually specify a quantity value to override the computed value.



## **PAY ITEMS ON MICROSTATION GRAPHICS**

When pay items are assigned to graphics, the pay item definition is stored in the MicroStation DGN file.

### **Advantages**

- DTM surface file does not need to be loaded to compute quantities.
- Quantity overrides can be used to manually specify a quantity value to override the computed value.

### **Disadvantages**

- MicroStation graphics can be easily modified, copied, and deleted without the user understanding that they are affecting the project pay quantities.
- If a MicroStation element that contains a pay item definition is copied, the new element also contains the pay item definition.
- MicroStation elements may not be drawn to the same level of engineering accuracy as InRoads data and thus the computed quantities may not be as accurate as necessary.

## ASSIGNING PAY ITEMS

The *Assign Pay Item* tool from the *InRoads > Quantity* menu is used to assign pay items to graphic and feature elements.

Remember that before a pay item can be assigned to an element the pay item database that contains the pay item definitions must be loaded. In addition, if any DTM features will have pay items assigned to them the DTM surface containing those features must be loaded and the features displayed in the CAD file.

### ➤ Locate Elements for Assigning Quantities

1. Select **Utilities > Saved Views** from the MicroStation menu.
2. Double click on **Area A** in the Saved View dialog box and then left click in the MicroStation window to apply the view.

The CAD view is zoomed to an area showing the roadways, storm drain pipes and inlets, and some guardrail.

The roadway elements are displayed features from the Finished DTM. All of the other elements are MicroStation graphics.

3. Close the Saved Views dialogs.

### ➤ Display DTM Features

1. Select **Surface > View Surface > Features** from the InRoads menu.
2. Set the *Surface* to **Finished**.
3. Select the feature named **Culvert2**. Be sure that no other features are selected.
4. Click **Apply**. Culvert 2 is displayed near the bottom of the screen.
5. Close the View Features dialog.

### ➤ Assign Pay Item to DTM Feature

1. Select **Quantities > Assign Pay Items** from the InRoads menu.

2. Click the **Pay Item Browse** button. 

The currently loaded Pay Item Database is displayed.

The database provided for this training is organized into hierarchical categories to make it easier to locate the desired pay item.

3. Browse to and select the pay item **550-1360 (Storm Drain Pipe, 36 IN, H 1-10)** from the *544-577 Minor Drainage Structures > Section 550 – Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe* > folder.
4. Click **Add**. The pay item 550-1360 is now listed on the Assign Pay Items dialog.
5. Click **Close** on the Pay Items dialog.
6. Click **Apply** on the Assign Pay Items dialog
7. Locate and click on Culvert2 displayed earlier (blue line) in the lower portion of the view to assign the pay item to this element.

The element highlights to indicate which element the pay item will be assigned to.


8. Click anywhere in the CAD view to accept the highlighted element and assign the pay item.
9. Right Click to return to the Assign Pay Items dialog.

Sometimes it is desirable and necessary to assign more than one pay item to a single element. The pipe culvert that was just assigned a pay item should also have a flared end section at each end of the pipe culvert.

➤ **Add Additional Pay Items to an Element**

1. Select the **Assign Pay Items** tool.
2. Add the pay item **550-4236 (Flared End Section 36 IN, Storm Drain)** from the *544-577 Minor Drainage Structures > Section 550 – Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe* folder.
3. Add a second 550-4236 pay item. It is necessary to add the flared end section pay item twice because one is needed on each end of the pipe.
4. Close the Pay Items dialog.

There are currently three pay items active in the Assign Pay Items tool. If this definition is applied to the culvert processed above, the result would be a duplication of the 550-1360 pay item. One definition from the original assignment and a second from this assignment. Therefore, it is necessary to remove the 550-1360 pay item prior to making the assignment.

5. Highlight the **550-1360** pay item.
6. Click the **Delete Pay Item** button. 
7. Click **Apply** to assign the pay items to the same pipe culvert as in the previous exercise.
8. Remember to click on the element and then click again to accept the highlighted element.

➤ **Assign Pay Item to MicroStation Graphic Element**

1. Delete all active pay items from the Assign Pay Items tool.
2. Add the following pay items that will be used for the guardrail.

*581-725 Miscellaneous items > Section 641 – Guardrail > 641-1200 Guardrail, TP W*

*581-725 Miscellaneous items > Section 641 – Guardrail > 641-5012 Guardrail Anchorage, TP 12*

3. Click Apply and assign the pay items to the two sections of guardrail in the view. The guardrail is displayed in cyan (light blue).
4. Close the Assign Pay Items dialog.

Notice that there is virtually no difference in applying pay items to DTM features and to MicroStation graphics.

## EDITING AND REVIEWING ASSIGNED PAY ITEMS

A pay item assignment can be reviewed or edited using the *Review/Edit Pay Items* tool. The Review/Edit Pay Items dialog displays all elements that have pay items attached (graphic and DTM features) in the current MicroStation drawing and all attached MicroStation references.

The top portion of the dialog displays all of the elements that have pay items attached. The element information display is made up of four columns.

- ID/Name – Displays the name of the feature for DTM elements or an ID for graphic elements. By default, the ID of a graphic element is a unique number assigned by MicroStation to the element. This number is of little value to most users. However, the ID can also be a user specified “name” that identifies the element. The user specified “name” is defined with either the Assign Pay Items or the Review/Edit Pay item tool by entering the desired name in the respective field before assigning the pay item.
- Level/Style – Displays the level for MicroStation graphic elements and the style for InRoads DTM features.
- Cell Name – Displays the name of the cell if the pay item is assigned to a cell.
- Type – Displays the MicroStation element type (line, line string, etc.) for graphic elements and the DTM feature type (random, breakline, etc.) for InRoads DTM features.

When an element is highlighted in the upper portion of the dialog, the pay items assigned to the element are shown in the lower portion of the dialog. The pay items assigned to the element can be modified by adding or deleting pay items from the list. The name assigned to graphic elements can also be modified.

### ➤ Review Assigned Pay Items

1. Select **Quantities > Review/Edit Pay Items**.
2. Highlight the first of the *Guardrail* elements in the top portion of the dialog.
3. Enter **Guardrail** in the *Name* field to assign a name to this element.
4. Add the following pay item to the guardrail elements. Once complete, there should be three pay items assigned to each of the two guardrail elements.  
*581-725 Miscellaneous items > Section 641 – Guardrail > 641-5001 Guardrail Anchorage, TP 1*
5. Click Apply to update the elements.
6. Repeat the previous steps for the other guardrail element.

---

**Note** Another method to review the pay items assigned to a graphic element is with AccuSnap Pop-up information. With the MicroStation Element Selection tool active, hover over an element. A pop-up appears displaying element information including the quantity name and assigned pay item(s). InRoads must be running for the quantity information to be included in the pop-up.

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## PAY ITEMS AND SELECTION SETS

Pay items can be assigned to multiple elements at the same time using the *Assign Pay Items* tool by placing the elements in a MicroStation selection set before activating the *Assign Pay Items* tool.

Similarly, a MicroStation selection set can be used to limit the scope of elements that are included in the display when using the *Review/Edit Pay Items* tool. Only those elements in the selection set that contain pay item assignments are displayed in the Review/Edit Pay Items dialog.

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*Note* Be careful when using selection sets with the Review/Edit Pay Items tool. All elements in the selection set are listed in the dialog even if they do not have a pay item assigned. This allows you to use this tool to assign pay items to previously unassigned elements.

---

### ➤ Review Pay Item Assignments in Selection Set

1. Close the *Review/Edit Pay Items* dialog if it is currently open.
2. Create a MicroStation selection set that includes the two guardrail elements but does not include the pipe element. Other elements can be in the selection set, just not the pipe element.
3. Select the **Review/Edit Pay Items** tool.
4. Review the dialog and see that the guardrail elements are listed but not the pipe element.
5. Close the *Review/Edit Pay Items* dialog.
6. Cancel the selection set by selecting the element selection tool and then clicking in an empty part of the CAD drawing.

## CREATING SHAPES FOR PAY ITEMS

A closed element is required to assign a pay item with an “area” measurement basis. Either MicroStation or InRoads Quantity tools can be used to create a closed element if one does not already exist.

The MicroStation *Create Complex Shape* or *Create Region* tools are used to create a graphic element defining a closed area. Once created, a pay item can be assigned to the graphic element as described previously.

The InRoads *Quantities > Shapes Tool* is used to create a closed DTM feature from graphic elements. The closed feature will be stored in a DTM, not as a graphic element. Although this closed feature is created with a quantity tool, no pay item is immediately assigned to the feature. The pay item is assigned to the feature by displaying the feature and then using the *Assign Pay Item* tool described previously.

Both of these methods can be used to create a closed shape using a *fill/flood* method (multiple non-closed linear elements that together define a closed region) and a *union* method (multiple closed elements that are joined together to create a single larger closed element). Which method you choose depends on where the pay items assignment will be stored: the DTM or graphics.

### ➤ Locate Elements for Assigning Quantities

1. Select **Utilities > Saved Views** from the MicroStation menu.
2. Double click on **Area B** in the Saved View dialog box and then left click in the MicroStation window to apply the view.

The CAD view is zoomed to an area showing the front and back of a sidewalk. The level display for all other graphics have been turned off so that the graphics do not interfere with the area to be flooded.

---

**Note** When using the fill/flood method it is important that no graphic elements pass through the area to be flooded. These graphics would define an undesirable end or closure to the area.

---

3. Close the Saved Views dialogs.

## ➤ Create Sidewalk Feature

1. The graphics for the new shape need to be defined. In this example, the edges of the sidewalk are already drawn using a yellow line. The ends, or beginning and ending station, of the shape have also been drawn using yellow lines. The lines defining the ends of the shape must close the shape. The lines must snap to the end of the existing lines or overlap the existing lines. It is important that no gap exists between the lines.

The result is not a true closed shape but instead a set of linear elements that together appear as a closed shape.

---

**Note** The Shapes Tool has an option to specify beginning and ending station limits to define the boundaries instead of drawing graphic lines. Using the station limits works well if the features follow an alignment. In this situation, the sidewalk does not follow an alignment and is actually almost perpendicular to the main roadway alignment. Therefore, using the station options is not appropriate in this situation.

---

2. Select **Quantities > Shapes Tool** from the InRoads menu.
3. Select the **Fill** option.  
This option specifies that a new closed shape will be constructed from an area defined from existing non-closed elements. The Union option is used to create a new shape by joining together two existing closed elements.
4. Select **Finished** in the *Surfaces* combo box to define the surface where the new closed feature will be stored.
5. Key in Sidewalk in the *Feature Name* box to define the name of the new feature.
6. Select **MAIN\_P\_Sidewalk** from the *Feature Style* combo box to define the style assigned to the new feature.
7. Enable the **Use Dynamics** option.  
When Use Dynamics is enabled, InRoads will highlight closed areas as the cursor moves over them. This option is very useful when defining closed shapes. However, if extensive graphics exist in the view which results in a large number of possible closed shapes this option can make the tool slow so its use should be limited in these situations.
8. Enable the **Exclude from Triangulation** option so that the new feature will not affect the DTM surface triangulation process.
9. Ensure that the **Station** option is disabled.
10. Click **Apply**.

11. Move the cursor over sidewalk area.

The closed area will highlight showing the new shape that will be created.

12. Click (left mouse button) to select the highlighted shape.
13. Click again to accept the highlighted shape. The new shape is written to the DTM and displayed in the graphics file.
14. Reset (right mouse button) to end the shape selection process. Additional shapes could be selected using the same definitions if desired.
15. Close the Shapes Tool dialog.
16. Use the **Assign Pay Items** tool to assign the following pay item to the new Sidewalk Feature.

*400-461 Pavements > Section 441 – Miscellaneous Concrete > 441-0104 Conc Sidewalk, 4 IN*

---

**Note** Be careful to select the sidewalk *shape* created in the previous step, not the graphic *lines* that the shape was created from. If the incorrect element highlights when selected, click Reset (right mouse button) to select an alternate element.

---



## ASSIGNING LUMP SUM QUANTITIES

Virtually all projects have some pay items that are quantified as a lump sum value. Sometimes the lump sum is assigned to a physical element. For example, the pay item for Traffic Signal Installation (a lump sum quantity) could be assigned to the traffic signal element. In other situations, there may not be an element to assign the pay item to, such as would be the case for a Clearing & Grubbing pay item.

Lump sum pay items could be added directly to the quantity database using the Quantity Manager application. However, the workflow described in this course avoids that method because those manually input quantities cannot be easily regenerated from the core project files (DGN and DTM). Instead, the workflow recommends that all pay items be assigned to either graphic or feature elements so they can be re-extracted whenever necessary.

For lump sum pay items that do not have an existing graphic element such as Clearing & Grubbing, it is recommended that a “dummy” graphic element be created on a non-plotting level. The graphic can be any single element such as a point, line, circle, cell or text. Since the element is not to be drawn on the plan sheet a non-plotting level should be used or the text should be placed outside the plotting limits. The lump sum pay item is assigned to this “dummy” graphic just like any other pay item.

### ➤ Locate Element for Assigning Quantities

1. Select **Utilities > Saved Views** from the MicroStation menu.
2. Double click on **Area C** in the Saved View dialog box and then left click in the MicroStation window to apply the view.
3. The CAD view is zoomed to an area showing the text ‘Clearing & Grubbing Pay Item’.
4. Close the Saved Views dialog.

### ➤ Assign Pay Item to Text

1. Select **Quantities > Assign Pay Items** from the InRoads menu.
2. Enter Clearing & Grubbing in the *Name* field.
3. Delete all active pay items from the Assign Pay Items tool.
4. Add the following pay item that will be used for Clearing.

*201-221 Earthwork > Section 201 –Clearing and Grubbing Right of Way > 201-1500 Clearing & Grubbing- LS*

5. Click **Apply** and assign the pay item to the text ‘Clearing & Grubbing Pay Item’.
6. Click anywhere in the CAD view to accept the highlighted element and assign the pay item.

➤ **Edit Pay Item Quantity**

1. Select **Quantities > Pay Item Manager** from the InRoads menu.
2. Browse to and double click on the pay item

*201-221 Earthwork > Section 201 – Clearing & Grubbing Right of Way > 201-1500 Clearing\_Grubbing -*

3. Select the variable **LumpSum** by clicking on it to highlight it.
4. Enter 1.0 in the Value field to change the LumpSum value from 0 to 1. Be sure to click the TAB key after entering the value to ensure that InRoads reads the new value.

Even though it is a lump sum item it must have a value of 1 in order to compute and report on it.

5. Add {STP-000(00)} to the end of the description such that the description reads CLEARING & GRUBBING –{STP-000(00)}.

There should be no space between the description and the opening curly brace {. Pay Item descriptions that end in a dash require a supplemental description. Supplemental description will be covered in more detail in a later section.

6. Click **Apply** to save the changes and then Close the dialog.

## VARIABLE VALUES IN PAY ITEM QUANTITY FORMULA

All pay items quantities are computed by applying a formula to a value measure by InRoads. The measured value could be a count of the number of elements, the length of one or more elements, or the area of one or more elements. The quantity formula allows more complex quantity calculations than the simple each, linear, and area measurements. For example, when computing the amount (tons) of fertilizer required the following formula could be used.

$$(\text{AREA} * \text{Application Rate}) / 2000$$

Here the measured area is multiplied by the *Application Rate* of fertilizer. The application rate is how many pounds of fertilizer are required per square foot. The result of that calculation is divided by 2000 to convert from pounds to tons.

In this example, the *Application Rate* is a variable that will likely be different on each project and thus needs to be defined on a project by project basis. The variables are defined as part of the pay item definition in the pay item database.

---

**Note** Each pay items formula should be viewed and understood prior to assigning the pay item in order to understand how the item will be quantified. Formulas are viewed and added using the Quantity Formula Manager under the quantity menu in InRoads.

---

### ➤ Locate Elements for Assigning Quantities

1. Select **Utilities > Saved Views** from the MicroStation menu.
2. Double click on **Area B** in the Saved View dialog box and then left click in the MicroStation window to apply the view.  
The CAD view is zoomed to an area showing the sidewalk feature defined previously.
3. Close the Saved Views dialog.

### ➤ Define Variables for Base Pay Item

1. Select **Quantities > Pay Item Manager** from the InRoads menu.
2. Browse to and double click on the pay item  
*201-221 Earthwork > Section 209 – Subgrade Construction > 209-0203 Stabilizer Matl, TP III*  
Notice the variable definitions for Thickness and WeightCFT in the left portion of the Edit Pay Item dialog.
3. Select the **Thickness** variable.
4. Enter 0.5 in the *Value* field to change the thickness of the base to 6 inches or 0.5 feet. Be sure to click the TAB key after entering the value to ensure that InRoads reads the new value.
5. Select the **WeightCFT** variable.
6. Enter 145 in the *Value* field to change the weight per cubic foot of the stabilizer material.

Again, be sure to click the TAB key.

**\*\*\*Important:** Stabilizer Matl may not be required for construction of Sidewalks. It is included here to demonstrate the use of variable values.

7. Click **Apply** to save the changes and then close the dialog.
8. Close the Pay Item Manager dialog.

9. Use the Assign Pay Item tool to assign the **209-0203** pay item to the sidewalk feature created in a previous exercise.

## OVERRIDE COMPUTED QUANTITIES WITH INPUT VALUES

If an element is not drawn at its proper size the resulting quantity from that element will be incorrect. As a general rule all elements should be created or drafted at their actual size so that InRoads can accurately measure the appropriate quantities. There will be some situations where it may not be practical to draw an element to the proper size. For these situations, InRoads allows a quantity override where the desired quantity can be manually input. InRoads will use that quantity value regardless of the elements actual size.

---

*Note* Quantity overrides can only be done on graphic elements. DTM feature elements are always measured at their actual size.

---

### ➤ Locate Elements for Assigning Quantities

1. Select **Utilities > Saved Views** from the MicroStation menu.
2. Double click on **Area A** in the Saved View dialog box and then left click in the MicroStation window to apply the view.

The CAD view is zoomed to an area showing the roadways, a culvert, storm sewer pipes and inlets, and some guardrail.

3. Close the Attach saved view and Saved Views dialogs.

### ➤ Assign Paving Pay Item to Guardrail

For this project, each section of guardrail will have a nominal 10 SY of asphalt pavement to be used around the terminal sections. It would be unnecessarily time consuming to draw each of these shapes. Therefore, the quantity will be applied to the guardrail element and an override value of 10 will be entered to ensure the correct quantity is calculated no matter the length of the guardrail.

1. Select the Review/Edit Pay Items tool.
2. Select one of the two guardrail elements in the dialog.  
Since a name was assigned to these elements previously they are easily located in the list.
3. Add the following pay item to the Pay Items assigned to these elements.

*400-461 Pavements > Section 402 – Hot Mix Recycled Asphaltic Concrete > 402-3113 (Quantity Override) Recycled Asph Conc 12.5 MM Superpave, GP 1 or 2, incl Bitum Matl\_H Lime*

Notice that there are two pay items numbered 402-3113 in this database. While both of these pay items compute a TN value, there is a difference in the formula used by each to compute that value. The standard pay item uses the square foot area calculated by InRoads from the element and multiplies it by the Thickness and Weight then divides it by 2000 to determine the tons. The pay item with (Quantity Override) in its name is designed to be used only when manually overriding the quantities. The formula for this pay item multiplies a manually input quantity by 1.0 to determine the tons. The result is that the keyed in value is the computed TN's. This pay item was created by copying and editing the original 402-3113 pay item and formula and renaming it.

The reason a special formula was needed for this situation is that the guardrail is a linear element, not an area. Therefore, to compute/report a weight value it is necessary to multiply a length times a depth and width to determine the weight. The formula assumes the input value is the length and the width and depth is always 1.0.

4. Select the **402-3113 (Quantity Override)** pay item in the Review/Edit Pay Item dialog.
5. Enable the **Override Measurement** option.
6. Key 10.0 into the *Override Measurement* text box.
7. Click **Apply** to complete the assignment.
8. Select the other Guardrail element in the top portion of the dialog.
9. Assign the **402-3113 (Quantity Override)** pay item with the 10.0 override measurement to this element.
10. Click **Apply** and then **Close** the Review/Edit Pay Item dialog.

---

**Note** When a pay item's formula set up in the master Pay Item database does not satisfy a specific requirement, the pay item can be copied and renamed and assigned a new formula. Formulas are made in the Quantity Formula Manager. Only the pay item name should change, the pay item code must not be changed.

---

## ASSIGNING “SUPPLEMENTAL DESCRIPTIONS” TO PAY ITEMS

The AASHTO Trns•port software has a special functionality called Supplemental Descriptions. This functionality allows one pay item number to be used for different purposes on different projects. Without supplemental descriptions more unique pay items must be defined.

For example, consider the removal of guardrail. There are many different types of guardrail in existence that could need to be removed. For this discussion we will assume there are ten. The cost to remove each type of guardrail is different and therefore a separate bid quantity is needed for each. However, on any one project there is not likely to be more than two or three types of guardrail.

If a unique pay item is setup for each of the ten types of guardrail no supplemental descriptions are needed because each pay item has a unique description. However, some owner/operators choose to setup only two or three pay items and use supplemental descriptions to define what the pay item represents on each project.

In this example three pay items for removal of guardrail have been set up. All three have the same base pay item number and have exactly the same description. The only difference is the last character of the pay item number. This numbering scheme is just one example of how pay items can be setup.

- 610-1055A – REM GUARDRAIL
- 610-1055B – REM GUARDRAIL
- 610-1055C – REM GUARDRAIL

If only one style of guardrail needs to be removed on the project, only pay item 610-1055 is used and no supplemental description is required. However, if two styles of guardrail (metal and concrete) needed to be removed, both pay item 610-1055A and 610-1055B are required. If they were both left with the same description it would be difficult for someone viewing the resulting quantities to determine which type of guardrail removal belongs to which pay item.

One solution for this would be to edit the description of the pay item to include specific information such as shown below.

- 610-1055A – REM OF METAL GUARDRAIL
- 610-1055B – REM OF CONCRETE GUARDRAIL

The problem with this approach occurs when the quantity data is exported to the AASHTO Trns•port software. The Trns•port software requires that both the pay item number and the pay item description be identical to the master definition of those pay items within its database. Therefore, altering the description as shown will not work.

Instead, the description is altered as shown below. Enclosing the modified or “supplemental” portion of the description in curly braces {} tells the Quantity Manager software how to process this data.

- 610-1055A – REM OF GUARDRAIL{Metal}
- 610-1055B – REM OF GUARDRAIL{Concrete}

Quantity Manger will break the description into two items when it passes the data to Trns•port. The first is the standard, unaltered description. The second is the supplemental description enclosed in the curly braces. This data is now in exactly the format the Trns•port software expects.

---


**Note** Adding supplemental descriptions to pay items is a project specific requirement. Therefore it is necessary that each project have a copy of the master pay item database that is modified to satisfy project specific requirements. All pay items whose descriptions end in a dash (-) require a supplemental description. Without the supplemental description, the pay item will not import into Trns\*port / CES.

---

➤ **Adding Supplemental Descriptions**

1. Select **Quantities > Pay Item Manager** to open the pay item database.
2. Locate the following pay item  
*581-725 Miscellaneous items > Section 610 – removal of Miscellaneous Roadway Items > 610-9000A REM SIGN, STA -*
3. Double click on the pay item to open the Edit Pay Item dialog.
4. Click in the **Description** field.
5. Add {200+00 LT} to the end of the description.

Remember: There should be no space between the description and the opening curly brace {.

6. Click **Apply** to save the change.
7. Click the **Next** button, , in the Edit Pay Item dialog box to move to pay item **610-9000B**.
8. Click in the **Description** field.
9. Add {250+00 RT} to the end of the description.
10. Click **Apply** to save the change.
11. Close the Edit Pay Item dialog.
12. Review the updated descriptions in the Pay Item Manager dialog.
13. Close the Pay Item Manager dialog.
14. Close MicroStation and InRoads.

---

**Note** Since the pay item number is not being changed, supplemental descriptions can be added to the pay item description at any time before or after assigning the pay item to elements. It may be easier to assign the supplemental descriptions to the pay items prior to assigning the pay item to the elements to ensure that the proper pay item is assigned to the element.

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## MODULE SUMMARY AND REVIEW

### SUMMARY

You are now able to:

- Understand general workflow for computing quantities
- Understand basic principles for how quantities are computed
- Assign pay item(s) to InRoads DTM elements
- Assign pay item(s) to MicroStation graphic elements
- Edit and Review assigned pay items
- Create shapes for pay item assignments
- Customize formula used to compute quantities
- Override computed quantities with input values
- Assign “supplemental descriptions” to pay items

### QUESTIONS

Before beginning the next Section, let’s evaluate what you have learned.

1. How many pay items can be assigned to a single element?
2. Which tool or tools can be used to assign pay items? *(Select all that apply)*
  - A - Pay Item Manager
  - B - Shapes Tool
  - C - Assign Pay Items
  - D - Review/Edit Pay Items
  - E - Quantity Manager
3. Can a quantity override value be assigned to all pay items?
  - True
  - False

## ANSWERS

1. How many pay items can be assigned to a single element?

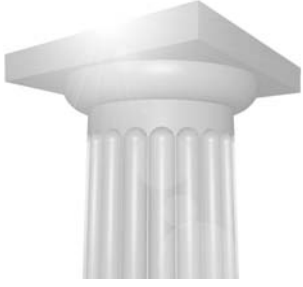
**Multiple** - A large number of pay items can be assigned to each element.

2. Which tool or tools can be used to assign pay items? *(Select all that apply)*

**C and D** -The Assign Pay Items and Review/Edit Pay Items tools are used to assign pay items to graphic and DTM elements. The Pay Item Manager is used to edit the pay items definitions but they cannot be assigned directly from the manager. The Shapes tool is used to create DTM shape features that could have pay items assigned to them but it cannot directly assign the pay item. The Quantity Manager application is used to create reports and export quantities but not to assign the pay items.

3. Can a quantity override value be assigned to all pay items?

**No** - Quantity overrides can only be applied to pay items assigned to graphic elements. Pay items assigned to DTM elements cannot include quantity overrides.



# Computing and Extracting Quantities

## OVERVIEW

This module teaches how to compute and extract quantities from InRoads DTM elements and MicroStation graphics. The elements are extracted to a database which can be reviewed using the Quantity Manager application.

## PREREQUISITES

- Pay Item Database
- InRoads Alignment
- InRoads DTM elements or MicroStation graphics that have assigned pay items

## OBJECTIVES

After completing this module, you will be able to:

- Extract quantities from elements that have pay items assigned
- Extract quantities for the entire project or select areas
- Review extracted quantities in Quantity Manager application

## COMPUTE ALL QUANTITIES

Quantities are calculated and extracted using the *Compute Quantities* tool in InRoads. This tool will extract quantities from all visible graphics (master file and attached reference files) and all loaded DTM surfaces.

Quantities for the entire project can be extracted all at once, or you can selectively compute quantities for specific areas defined by a MicroStation Fence.

The results of the quantity calculation are written to a database file. The database can be reviewed, edited, and reports generated for the data using the Quantity Manager application.

Before calculating any quantities the project files must be loaded. Quantities can only be computed from graphic elements that are visible in the current DGN file or attached reference files. Quantities from DTM feature elements can only be computed when the DTM surface is loaded in InRoads. An active alignment is required from which the quantity location (station and offset) is computed. The Pay Item database must also be loaded.

### ➤ Start InRoads

1. Close MicroStation and InRoads if they are still running from the previous session.
2. Start InRoads and MicroStation.
3. Set the directory to *C:\InRoads Training\Quantity Manger Lab\Practice\Practice Lesson 03\*.
4. Open the file *Compute Quantities.dgn*.

### 1. Open Project File

1. Select **File > Open** from the InRoads menu.
2. Open the Project File *C:\InRoads Training\Quantity Manger Lab\RWK\Practice Lesson 03.rwk*.

This will open the preference file: *GDOT\_Standard V8i\_SS2.xin*

And the geometry file: *Compute Quantities.alg*

And the design surface: *Compute Quantities.dtm*

### 2. Loading the Pay Item Database

1. Select **Quantities > Pay Item Manager** from the InRoads menu.

The Pay Item Manager dialog appears.

2. From the Pay Item Manager, select **File > Open**.
3. Open the pay item database file *C:\InRoads Training\Quantity Manger Lab\Standards\Pay Items\GDOT(PI#) Quantity Manager Pay Item Database..*
4. Click Exit to Exit the Pay Item Manager dialog.

The *Compute Quantities* tool extracts and computes quantities from MicroStation elements and InRoads features. The *Include* parameters on the dialog define which of the pay items are calculated. There are three Include parameters: Pay Items, Features, and Graphic Elements.

- Pay Items – When set to All, pay quantities are computed for all pay items. When set to Selected, pay quantities are only computed for the pay items enabled on the Pay Item tab.
- Features – When set to All, pay quantities are computed for all DTM features. When set to Selected, pay quantities are only computed for the DTM features enabled on the Features tab
- Graphic Elements – When set to All, pay quantities are computed for all graphic elements. When set to Selection Set, pay quantities are only computed for the graphic elements in the active MicroStation selection set. The selection set must be defined before activating the Compute Quantities tool.

If your Pay Item database has deduction pay items setup, enable the *Deduction Tolerance* option and define the maximum distance between the pay items for a deduction to be calculated.

### 3. Compute quantities for entire project

1. Select **Quantities > Compute Quantities** from the InRoads menu.
2. Set the *Alignment* name to **I-598 EB**.

The beginning and end station of each quantity are computed from this alignment.

3. Set the *Mode* to **All**.

The All mode will compute all quantities in the current DGN and DTM files.

4. Click the **Browse** button to the right of the *Database* field.
5. Browse to the folder *C:\InRoads Training\Quantity Manger Lab\Practice\Practice Lesson 03\* and enter the filename *Quantity Output.mdb*.
6. Click **Save**.
7. Click **Apply**.

The quantities are calculated and written to the database.

8. Close the Compute Quantities dialog.

A copy of each element from which a pay quantity is calculated is written to the graphic file when the *Highlight Element* option is enabled on the Compute Quantities dialog. These items will be depicted on the Level: **QTYS\_P\_Quantities-Line**. The highlighted elements are an easy, visual method to review which elements are quantified. The highlighted elements are all written to a single MicroStation level so they will be easy to cleanup. We will cover the cleanup process later in this training.

## REVIEWING QUANTITIES IN THE QUANTITY MANAGER

The quantity database output from InRoads is reviewable using the Quantity Manager application.

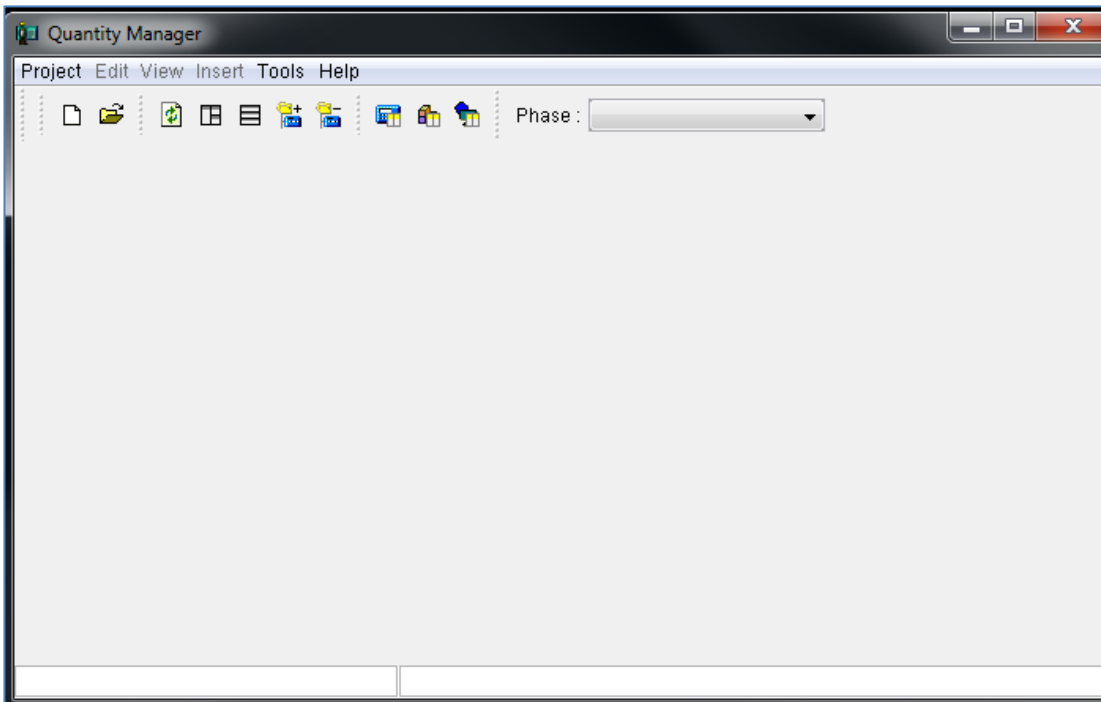
### 4. Open the Quantity Database

1. Select **Quantities > Quantity Manager** from the InRoads menu.

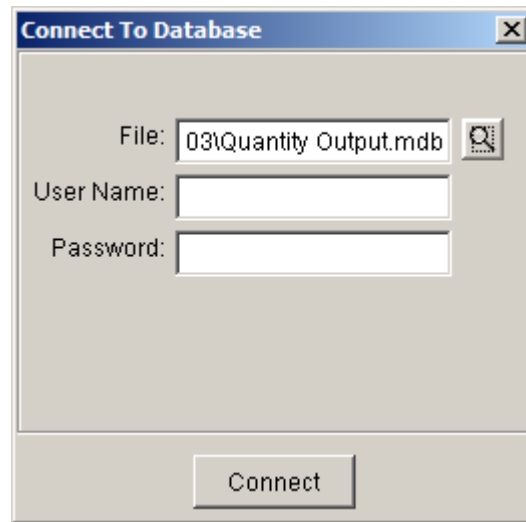
The Quantity Manager application is started. Be patient because it takes some time for the Quantity Manager application to start.

Quantity Manager is an independent application from MicroStation and InRoads. Watch in the Windows task bar (typically at the bottom of the screen) for a Quantity Manager Application icon.

2. Once Quantity Manager has started, make it the active application by clicking the Quantity Manager icon in the Windows task bar. When Quantity Manager is first opened, the dialog is essentially blank.



3. Click the **Open** button on the Quantity Manager dialog.  
The Connect to Database dialog appears.

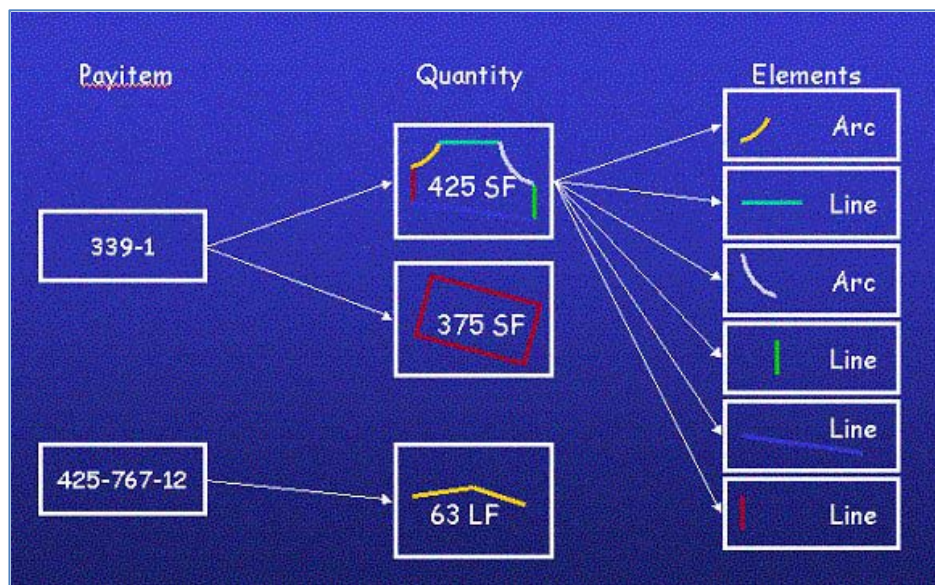


4. Click the **Browse** button on the Connect to Database dialog.
5. Browse to and select the file *C:\InRoads Training\Quantity Manger Lab\Practice\Practice Lesson 03\Quantity Output.mdb*.
6. Click **Open** to open the *Quantity Output.mdb*.
7. Click **Connect**.

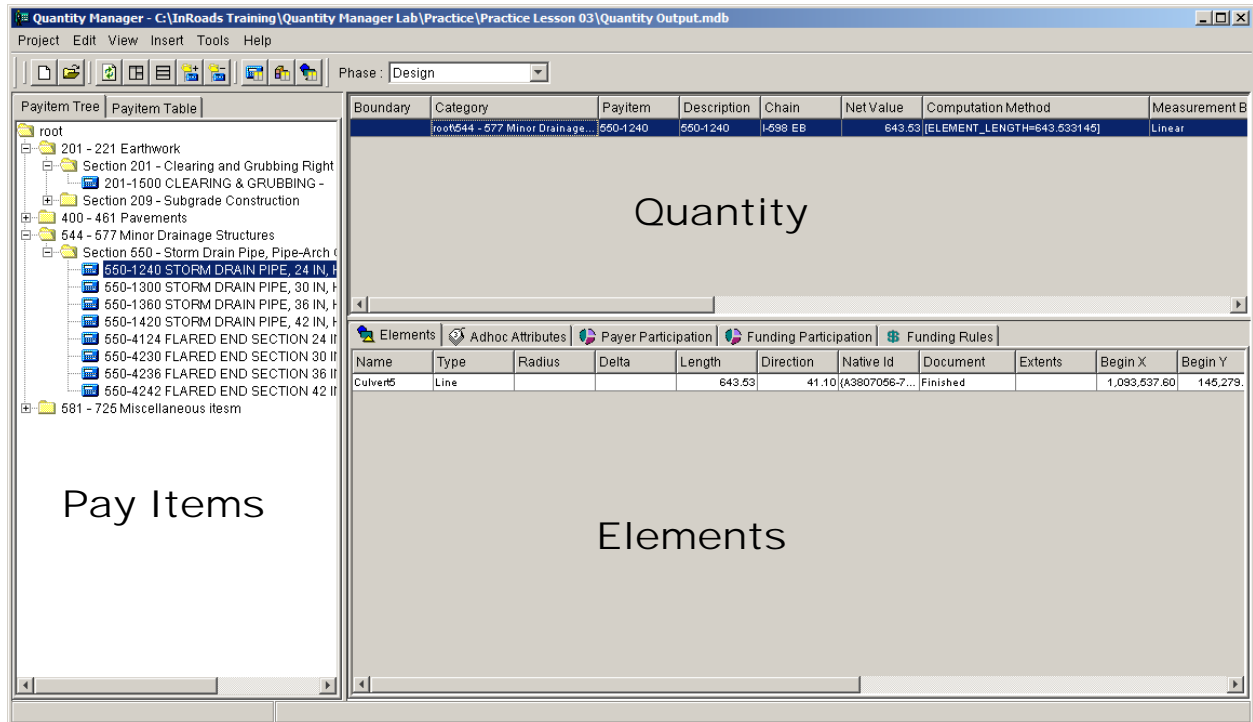
There is not a User Name or Password on the database files created by InRoads.

The Quantity Manager dialog updates to show the quantity data.

For each pay item, the database has multiple records of quantities, and for each quantity, there are multiple records of elements. This relationship is depicted graphically below.



This hierarchical relationship is also represented in the user interface of the Quantity Manager application, which is organized into three tables, allowing the user to examine data at any level - by pay item, by quantity or by element.



The Pay Items pane on the left displays the same hierarchical list of pay items as existed in the Pay Item database. The only difference is that this list is limited to only those pay items that exist in the computed data. Browse through the list and select one or more pay items to review the quantity calculations in the Quantity pane.

The Pay Item pane can also be displayed as a flat list by selecting the Pay Item Table tab.



Once one or more pay items is selected (highlighted), the quantity assignments appear in the Quantity pane in the upper right. A few of the columns of data that might be useful to review include:

- Pay Item – Pay item number.
- Net Value – This is the final quantity reported for the pay item. The net value is calculated by subtracting the Deduction Value from the Rounded Value.
- Measurement Value – The actual measurement with no formulas, adjustments, or rounding applied. For example, when doing pavement computations, the measurement is the square feet (or square meters) of the closed shape representing pavement.
- Computed Value – If a formula was utilized, this field is the result of the computation. Using the pavement example, a formula utilizing the square feet and computing tons could be utilized. In this case, the tonnage is the computed value.
- Rounded Value – Rounded quantity based on the computed value. This is also sometimes referred to as the gross quantity.
- Deduction Value – Quantity to be deducted from the rounded quantity when a deduction pay item is located within a minimum distance of the pay item being computed.

➤ **Review the Quantity Data**

1. Expand the pay item tree to view the 544-577 Minor Drainage Structures > Section 550 – Storm Drain Pipe, Pipe-Arch Culverts, and Side Drain Pipe section.
2. Select all of the pipe culvert pay items.
3. Review the **Quantity** pane.  
Notice that there are five pipe quantities assigned to four different pay items. The 36” pay items has two pipe definitions.
4. Exit the Quantity Manager.

## CLEARING HIGHLIGHTED GRAPHIC ELEMENTS

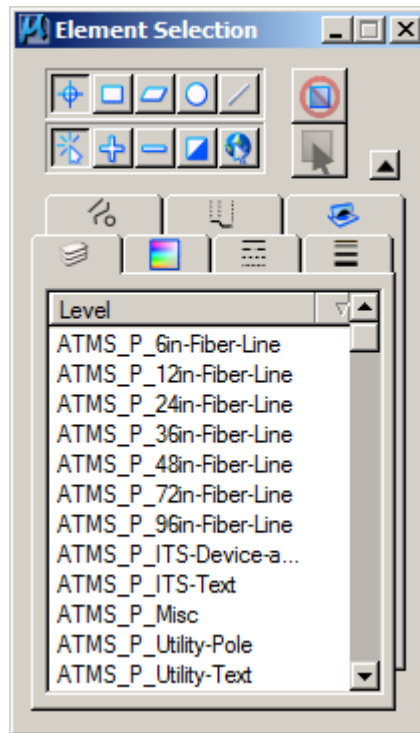
When quantities are calculated in InRoads, a graphic representation of them can optionally be created. This graphic is very helpful in identifying which elements have quantities assigned to them and ensuring that the quantities are being computed from the desired elements.

Before processing the quantity calculation again, the highlighted elements should be deleted from the MicroStation DGN file. Since all of the graphics are written to a single level, it is easy to delete them.

There are many different techniques in MicroStation that could be used to delete the highlighted elements. The procedure below is just one procedure that can be used.

### ➤ Clearing Highlighted Element Graphics

1. Return to the MicroStation session.
2. Select the MicroStation **Element Selection** tool.
3. Click the **down arrow** in the lower right corner of the Element Selection dialog to expand the dialog options if they are not already expanded.



4. Select the **Level** tab in the Element Selection dialog.
5. Browse to and select the level where the highlighted element graphics are displayed. For this lab, select the level **QTYS\_P\_Quantities-Line**.  
All of the elements are put into a selection set.
6. Click the **Delete** tool in MicroStation to delete the graphics.
7. Close MicroStation and InRoads.

## MODULE REVIEW

### SUMMARY

You are now able to:

- Extract quantities from elements that have pay items assigned
- Review extracted quantities in Quantity Manager application

### QUESTIONS

Before beginning the project task, let's evaluate what you have learned.

1. What user name and password must be used to open a quantity database from InRoads in the Quantity Manager application?
2. True or False - you can review the quantity calculation for an element inside InRoads using the Review/Edit Pay Items tool?

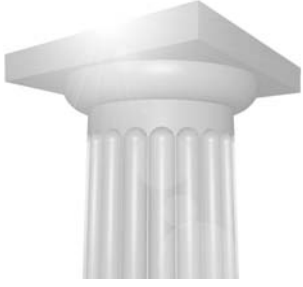
## ANSWERS

1. What user name and password must be used to open a quantity database from InRoads in the Quantity Manager application?

**None** - The user name and password fields should be left blank when opening a quantity database generated from InRoads.

2. True or False - you can review the quantity calculation for an element inside InRoads using the Review/Edit Pay items tool?

**False** - Quantity calculations are written to the quantity database by InRoads but there is no way to review those quantities from within the InRoads product. The quantity values are reviewed from the Quantity Manager application.



# Reporting and Exporting

## OVERVIEW

This module teaches how to produce reports on the pay items in the Quantity Manager database and optionally export that data to an external application such as the AASHTO Trns•port Estimator software suite.

## PREREQUISITES

- Quantity Manager database populated with extracted pay items.

## OBJECTIVES

After completing this module, you will be able to:

- Create standard reports from Quantity Manager.
- Export Quantity Manager data to XML format required by the AASHTO Trns•port software suite.

## QUANTITY REPORTS

Quantity Manager includes a variety of standard report formats for creating output to review quantity information. Depending on the report format, it can be output for printing or into a comma separated (CSV) file that can be subsequently loaded into a spreadsheet for further analysis and processing.

The data included in a Quantity Manager report is based on the quantity items displayed in the Quantity pane (upper right) of the Quantity Manager window. Therefore, to create a report on all quantities, they must all be displayed in the Quantity pane. This is accomplished by selecting all of the pay items in the Pay Item pane on the left. The **View > Expand Category Quantities** option makes selecting all quantities easier. When this option is enabled and a pay item category or folder is selected in the Pay Item pane, all sub categories and all pay items below the selected folder are automatically selected. This means that when the Expand Category Quantities option is enabled, all you need to do is select the top pay item category named *root* and all pay items and thus all quantities below it will be selected.

Quantity reports are created by selecting Tools > Reports > Create. The Create Report dialog appears from which you can select the desired Report Style and specify the name of the report file. There are many Report Styles delivered with the Quantity Manager application. Some that you might find most useful are described below.

- Sample Pay Item Summary Report – This report is a summary listing of each pay item and the total quantity of that pay item. The report is available for both a CSV and an HTML output. Use the CSV output to send the report to a spreadsheet and the HTML output for a quick on screen review and print report.
- Sample Pay Item Summary Sorted by Chain - Station – This CSV formatted report is a summary listing of each quantity sorted by its station location along the chain. The quantity values are broken down by their respective pay item.

These are only a couple of the standard reports delivered with the Quantity Manager but they are representative of the type of data that can be generated. In addition, custom reports can be defined as necessary. Creating custom reports will not be discussed in this training.

### ➤ Start Quantity Manager

1. Close MicroStation, InRoads and the Quantity Manager if they are still running from the previous session.
2. Start Quantity Manager from the InRoads section of the Start menu.

Quantity Manager can be started from within InRoads (*Quantity > Quantity Manager*) or directly from the Windows Start menu by selecting Start>All Programs>Bentley>InRoads Group V8i (Select Series 2) > Quantity Manager.

➤ **Open the Quantity Database**

1. Click the **Open** button on the Quantity Manager dialog.

The Connect to Database dialog appears.

2. Click the **Browse** button on the Connect to Database dialog.
3. Browse to and select the file *C:\InRoads Training\Quantity Manger Lab\Practice\Practice Lesson 04\Quantity Output.mdb*.
4. Click **Open**.
5. Click **Connect**.

➤ **Select Quantities to be Included in Report**

1. Select **Design** from the *Phase* pick list at the top of the Quantity Manager dialog.

The Phase named Design was specified when the quantities were calculated in InRoads and thus all of the quantities are associated with this phase of work. If an alternate phase is selected, no quantities will exist. Some reports do not allow the use of the ALL PHASES option so it is best to select the Design phase.

2. Verify that the **Expand Category Quantities** option is enabled by selecting the *View* menu. When enabled, a check mark will appear next to the *Expand Category Quantities* option. If not enabled, select *Expand Category Quantities* to enable it.
3. Select **root** in the Pay Item pane on the left portion of the dialog box.

The Quantity pane (upper right) should list all of the quantities in the project.

➤ **Create Quantity Report**

1. Select Tools > Reports > Create.

The Create Report dialog appears.

2. Select **Sample Pay Item Summary Report (HTML)** from the *Report Style* pick list.
3. Click the **Browse** button next to the *Report File Name* field.
4. Browse to the folder *C:\InRoads Training\Quantity Manger Lab\Practice\Practice Lesson 04\* and enter the file name **Quantity Summary.html**.
5. Click **Open**.
6. Click **Create**.

The report file is generated and automatically displayed on screen.

7. Review the report.
8. Close the Internet Explorer dialog displaying the report.
9. Close the Create Report dialog.

## EXPORTING QUANTITY MANAGER DATA TO AASHTO TRNS•PORT

Quantity information can be easily exported to the AASHTO Trns•port software suite for additional processing.

The quantity data is exported into a XML formatted file that can be subsequently imported by the AASHTO Trns•port software.

### TRNS•PORT SOFTWARE REQUIREMENTS

Quantity Manager allows the user to develop his own naming conventions for phases, funding rules, etc. However, if the data is to be eventually imported into AASHTO Trns•port, it will not import if the rules of Trns•port are not followed. These restrictions are detailed in the table below.

| Entity   | Restriction   |
|--|---|
| Project Name                                   | Less than or equal to 13 characters.  |
| Funding Source                                 | Fund source list be used exclusively and no "made up" fund source or payers.  |
| Default Fund Source                            | Fund source list be used exclusively and no "made up" fund source or payers.  |
| Funding Rules                                  | Must be named numeric > 1 and < 9999.   |
| Export Phase                                   | Export phase must be named "DesignEstimate" and not "Design" or "Preliminary" or "asDesigned" or other names.<br>This is because Trns•port must know this comes from design, and not a bid estimate or a final estimate or something else.  |
| Payitem Description, Unit, Unit Cost, Lump Sum | Any modification to the payitem's description, unit, unit cost, lump sum attributes in QM will not be inherited in Trns•port as Trns•port houses the authoritative definition. So a user should not import a payitem from Trns•port and change the description in QM, or if they do, it will not change what is in Trns•port. |
| Payitem  | Every pay item must be an official item, as opposed to one created in design. Users should not create a payitem which does not exist in Transport as it will be rejected by Trns•port.  |
| Quantity                                       | The maximum item quantity supported by Trns•port is 999,999,999.999.  |
| Lump Sum                                       | True lump sum items must have a quantity of 1   |



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**Note** Similar to reports, the data included in an export from Quantity Manager is based on the quantity items displayed in the Quantity pane (upper right) of the Quantity Manager dialog. Therefore, to export all quantities, they must all be displayed in the Quantity pane. This is accomplished by selecting all of the pay items in the Pay Item pane on the left. To make selecting all quantities easier enable the *View > Expand Category Quantities* option. When this option is enabled and a pay item category or folder is selected in the Pay Item pane, all sub categories and all pay items below the selected folder are automatically selected. This means that when the Expand Category Quantities option is enabled, all you need to do is select the top pay item category named *root* and all pay items and thus all quantities below it will be selected.

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Prior to exporting data for Trns•port, the project properties need to be defined. These properties are part of the data Trns•port expects to receive. The project properties are defined by selecting *Project > Properties*.

➤ **Define Project Properties**

1. Select **Project > Properties**.
2. Complete the dialog with the following information

*Project Number:* **1234567**

*Description:* **I-598 Reconstruction**

*Unit System:* **English**

*Spec Year:* **01**

*The spec year must be two digits to import into Trns\*port/CES*

*Project Chain:* **I-598 EB**

*Begin Station:* **154+24.74**

*End Station:* **471+20.38**

*Begin Mile Post:* **Leave Blank**

*End Mile Post:* **Leave Blank**

*Latitude:* **Leave Blank**

*Longitude:* **Leave Blank**

3. Click **OK**.

➤ **Export Quantity Data**

1. Verify that the **View > Expand Category Quantities** option is enabled.
2. Select **root** in the Pay Item pane.
3. Select **Project > Export > Export**.

The Export dialog appears.

4. Select **aecXML** from the *Export Style* pick list.

The aecXML format is the correct format for transferring data to the AASHTO Trns•port software.

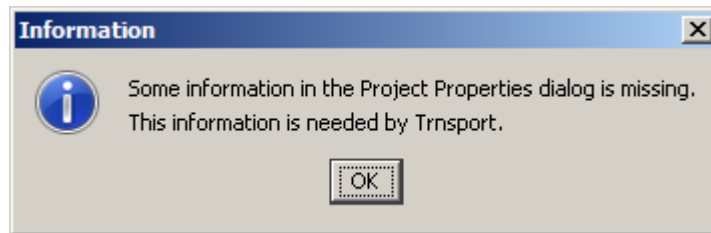
5. Ensure that the *Rename Phase As* option is enabled and set to **DesignEstimate**.

The Trns•port software expects the phase to be named DesignEstimate.

6. Click the **Browse** button next to the Document File Name field.
7. Browse to the folder C:\InRoads Training\Quantity Manger Lab\Practice\Practice Lesson 04\ and enter the file name **1234567.xml**.
8. Click **Open**.
9. Click **Export**.

A file formatted in the proper XML syntax for importing into the AASHTO Trns•port suite of software is created.

10. Click **OK** to the following message.



11. Close the Export dialog.
12. Close the Quantity Manager.

## IMPORTING QUANTITY MANAGER DATA INTO AASHTO TRNS\*PORT

This section provides basic instruction to import a Quantity Manager XML file into Trns\*port/CES. It is not a comprehensive review or instruction of the Trns\*port/CES tools. For further information or to troubleshoot Trns\*port/CES problems please refer to the Trns\*port help menu or contact solutions center for Trns\*port/CES support.

1. Open Trns\*port /CES
2. Select Utilities > Upload File > Process I/O File.
3. Browse to the Quantity Manager XML file and click Open.
4. In the Save Process I/O File As dialog, select the **QPJIPORTDIR** folder.

Trns\*port/CES requires the file to be in the QPJIPORTDIR folder in order to import.

5. Select File > Run Process...
6. Click on 'Import Job from XML' and click OK.
7. Match the setting shown below.

Import Data Options

Page 1

Estimator (Trns\*port Format)      Filename: 1234567.xml

Design (aecXML Format)

Import All Prices

**Options for Import From Estimator**

Job Control Group for add: RDWYDESG

If job does not exist in CES, click Submit to import the file.  
If job already exists in CES, select an option before submitting:

Keep existing job data and update it with data from the import file  
WARNING: If item line numbers have been reassigned so they are different in Estimator than in CES, or items were deleted in one module but not the other, the item information will be incorrectly updated unless one of the Delete options below is selected.

Delete existing item data for jobs that will be loaded by this process

Delete all existing job data for jobs that will be loaded by this process  
WARNING: This option will delete data elements that are not included in the import file.

Submit    Parameters    Cancel

8. Click Submit.

9. Once the import process has completed you may open the job in Trns\*port/CES and review the imported items.
10. If subsequent Quantity Manager Projects with the same project number are to be exported, it is best to add a character to the project number, i.e. project number 1234567 should be 1234567D for Drainage items, or 12345667L for Landscape items.
11. For the second project 1234567D, import the project into CES using steps 2-8 above. When both projects are to be combined into one project, highlight the original or base project by clicking on the job number and then click the File Menu and then Import “Job Items from CES Job.” Highlight the appropriate job to combine into the original (base) project and click OK. For the next popup, click Do Not Combine Items Quantities and click OK. A popup window that indicates the job imported successfully will appear – click the OK button.
12. Once the import process has completed you may open the base job in Trns\*port/CES and review the imported items.
13. Repeat with as many subsequent projects as needed.

## MODULE REVIEW

### SUMMARY

You are now able to:

- Create standard reports from Quantity Manager
- Export Quantity Manager data to XML format required by the AASHTO Trns•port software suite.

### QUESTIONS

Before continuing, let's evaluate what you have learned.

1. Which tool should be used to transfer quantity data from Quantity Manager to the AASHTO Trns•port software suite?  
**A** - File > Export  
**B** - Tools > Reports  
**C** - Either of the above
2. What is the benefit of using the *Enable Quantity Categories* option?
3. Can quantity data be edited directly in the Quantity Manager application?

## ANSWERS

1. Which tool should be used to transfer quantity data from Quantity Manager to the AASHTO Trns•port software suite?

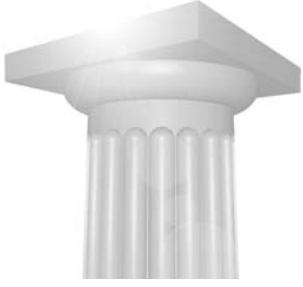
**A** - The File > Export tool is used to transfer data to other applications such as Trns•port. The File > Reports tool is used to generate printable reports or spreadsheet data from the quantity database.

2. What is the benefit of using the *Enable Quantity Categories* option?

The Enable Quantity Categories option automatically selects all sub-categories and pay items in the Pay Item pane. When this option is disabled, you would need to select each and every pay item in the list before creating reports or exporting the data.

3. Can quantity data be edited directly in the Quantity Manager application?

**Yes**, but it is not recommended. Technically pay items and quantities can be added, deleted, and modified directly in the Quantity Manager application. However, doing so does not update the source data in InRoads from which the quantities were originally generated. The workflow described in this training recommends that quantity data only be defined and edited in InRoads. The Quantity Manager application should be used only to create reports and export the data to the Trns•port software.



# Managing Pay Item Database

## OVERVIEW

This module teaches how to add, modify, and delete pay item definitions in the Pay Item Database.

## PREREQUISITES

- Pay Item Database

## OBJECTIVES

After completing this module, you will be able to:

- Add new pay items to the Pay Item database
- Remove obsolete pay items from the Pay Item database
- Edit existing pay items in the Pay Item database

## ADDING NEW PAY ITEMS

The following procedure is used to add a new pay item to the database.

1. Select **Quantities > Pay Item Manager** from the InRoads menu.
2. Select **File > Open** from the Pay Item Manager dialog.
3. Browse to and open the proper Pay Item Manager database.
4. Locate and select the category where the new item will be placed. For example, if you are adding a new Granite Curb item, select the category *400-461 Pavements>Section 437 – Granite Curb*.
5. Select **File > New > Pay Item** from the Pay Item Manager dialog. The Edit Pay Item dialog appears.
6. Enter the **pay item number** in both the *Pay Item Name* and the *Pay Item Code* fields.  
If your master pay item database is stored in the Trns•port software suite, the Item number must be entered exactly the same as it is defined in Trns•port.
7. Enter the **description** in the *Description* field.  
If your master pay item database is stored in the Trns•port software suite, the description must be entered exactly the same as it is defined in Trns•port.
8. Enter the **unit name** in the *Unit Name* field.  
If your master pay item database is stored in the Trns•port software suite, the unit name must be entered exactly the same as it is defined in Trns•port.
9. Select the matching unit from the **Formula** pick list.  
InRoads uses this formula to calculate the quantity from the InRoads or MicroStation elements.
10. Click **Apply** to save the changes to the Pay Item Manager database.



## EDITING EXISTING PAY ITEMS

1. Select **Quantities > Pay Item Manager** from the InRoads menu.
2. Select **File > Open** from the Pay Item Manager dialog.
3. Browse to and open the proper Pay Item Manager database.
4. Locate and select an existing item in the database.
5. Right click on the item and select **Edit** from the pop up menu.

The Edit Pay Item dialog appears.

6. **Make the necessary changes to the Pay Item definition.**

If your master pay item database is stored in the Trns•port software suite, the pay item code, description, and unit name must be entered exactly the same as it is defined in Trns•port

The description can be modified with a supplemental description as described earlier in this course and still satisfy the requirements of the Trns•port software.

7. Click **Apply** to save the changes to the Pay Item Manager database.

## REMOVING PAY ITEMS

1. Select **Quantities > Pay Item Manager** from the InRoads menu.
2. Select **File > Open** from the Pay Item Manager dialog.
3. Browse to and open the proper Pay Item Manager database.
4. Locate and select an existing item in the database.
5. Right click on the item and select **Delete** from the pop up menu.
6. When prompted, select **OK** to confirm the deletion of the pay item.