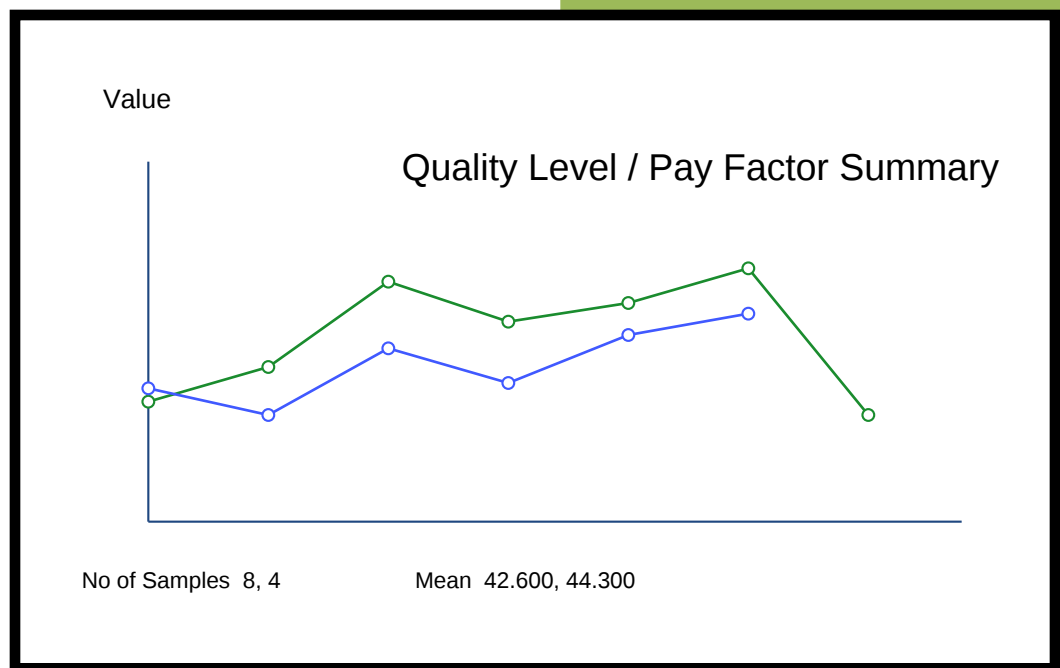


2026

QL-PAY 7.6.1 User's Manual



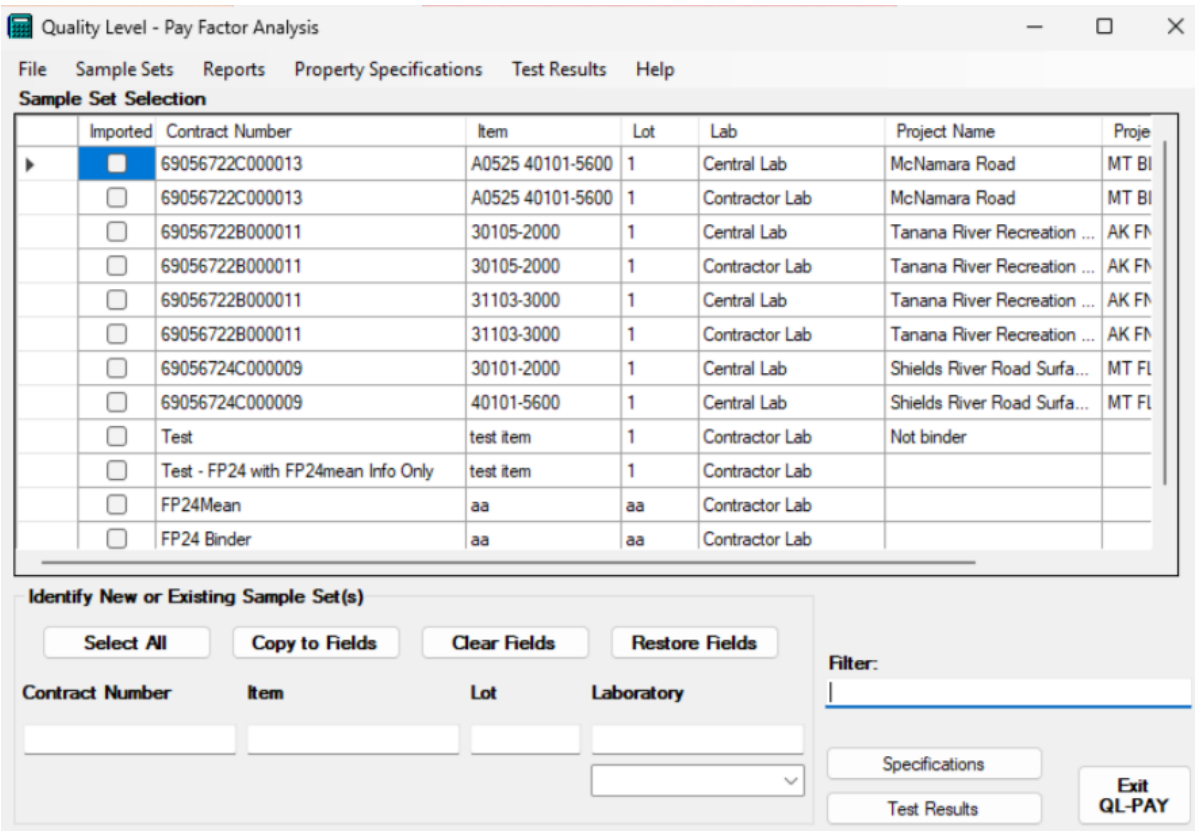
Computer Program for Statistical Evaluation

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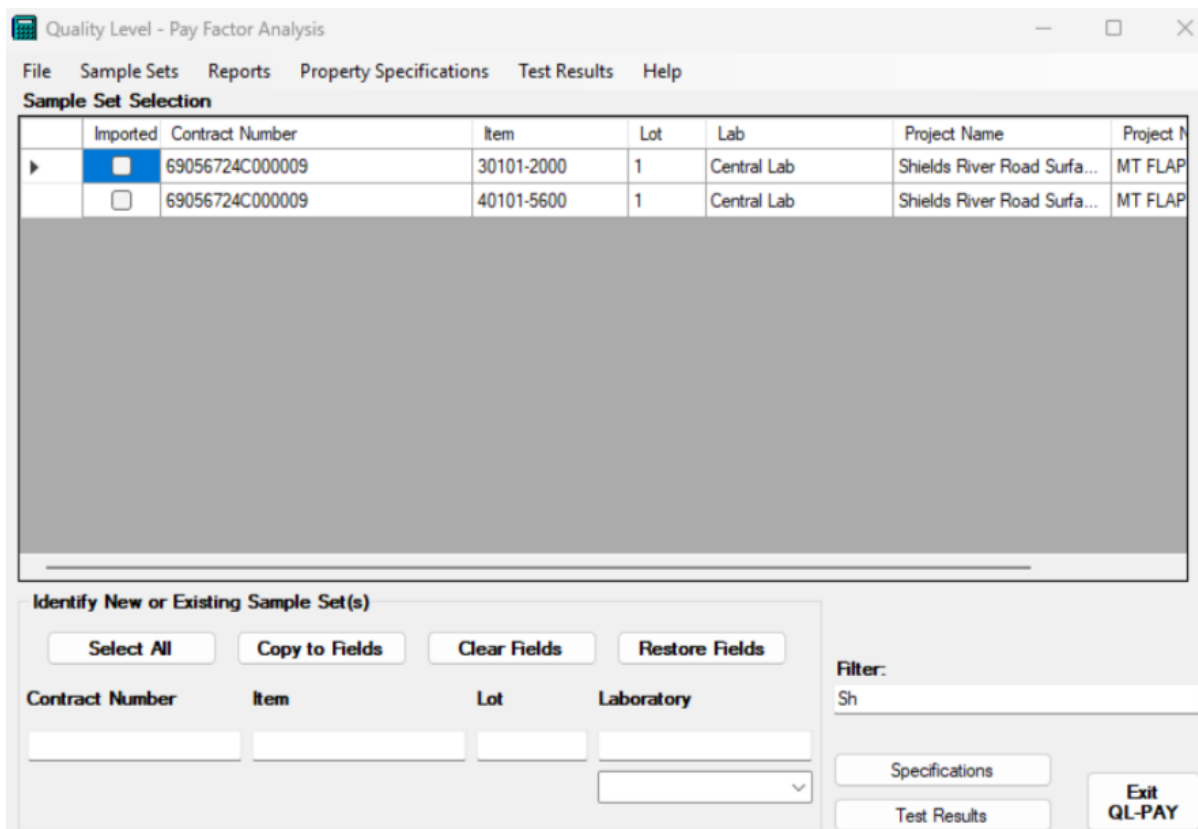
1. Introduction

QL-PAY is a program created to assist in the evaluation of material quality and consistency through statistical analysis. It will determine the quality level, percent within limits, and the pay factor of an item. The program also provides a data verification analysis used to compare data obtained by the contractor to data from the samples sent to the government central laboratory. The program uses the F and t statistics with a significance level of 0.01 for comparison of data samples.



QL-PAY 7 home screen with the Filter box.

The Filter box narrows the Sample Set Selection list while the user types. It searches the Contract Number, Item, Lot, Laboratory, Project Name, and Project Number fields. Clearing the Filter box restores the full list.



Sample Set Selection screen after typing text in the Filter box.

2. Getting Started

2.1. Menu Functions

2.1.1. File

A. Database

QL-PAY 7 stores sample set data in a QL-PAY 7 database file. The default database file name is qlpay7.db.

B. Export Directory

When exporting data from the program, a transfer file will be established in the specified directory. The data from the QL-PAY program is exported as a .XML that can be read by another user.

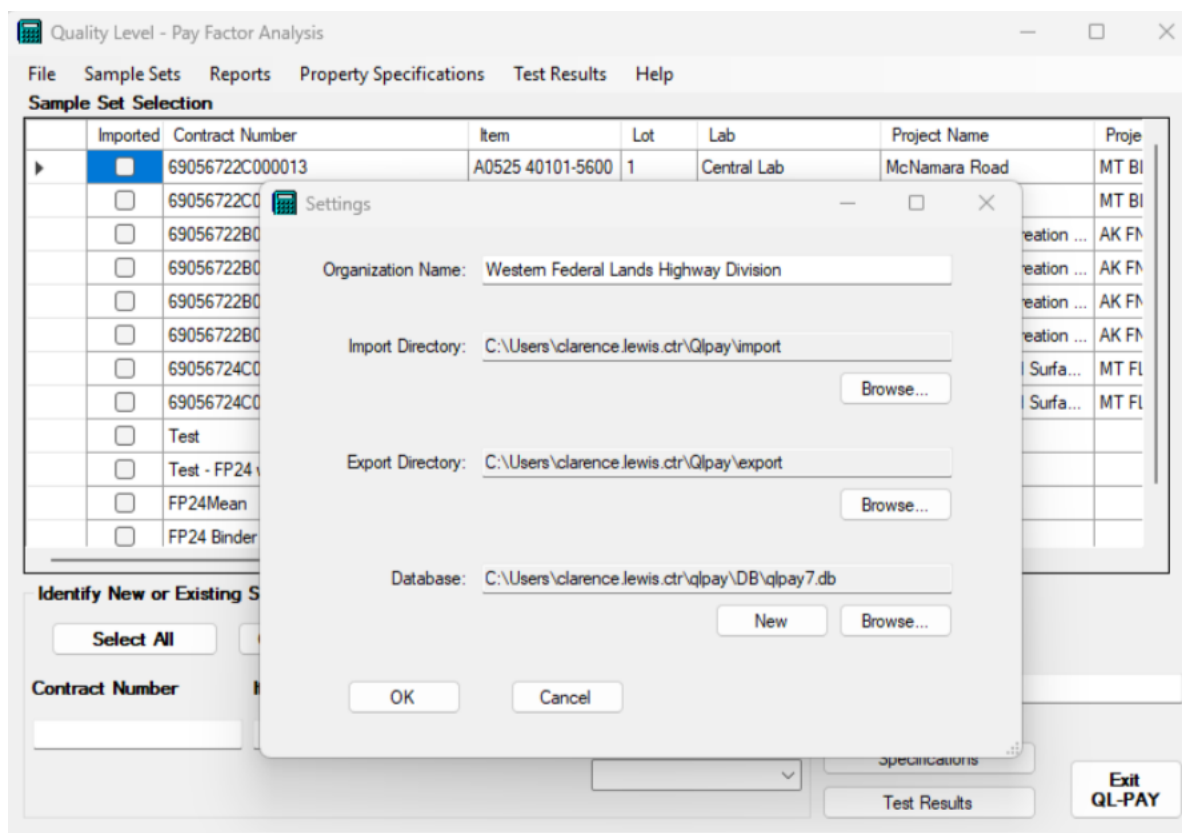
C. Import Directory

This specifies the default location for the transfer files to import.

On initial setup, QL-PAY creates default folders under the user's Qlpay folder. The default folders are Qlpay\import, Qlpay\export, and Qlpay\DB.

D. Settings

The Settings window allows the user to update the Organization Name, Import Directory, Export Directory, and active Database file.

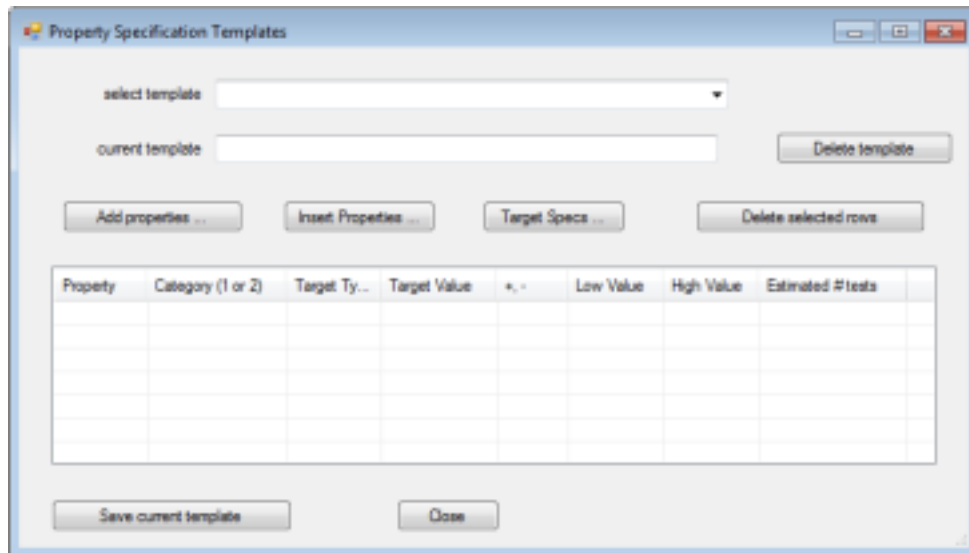


QL-PAY 7 Settings window.

- a. Organization Name: The organization name will appear on generated reports.
- b. Import Directory: The default folder used when importing XML transfer files.
- c. Export Directory: The folder where QL-PAY saves exported XML transfer files.
- d. Database: The active QL-PAY 7 database file. The user can browse to an existing QL-PAY 7 database or create a new one.

E. Property Specifications Templates

Prior to inputting data, property specifications will need to be provided. Users can create a custom template to aid in classifying property sets.

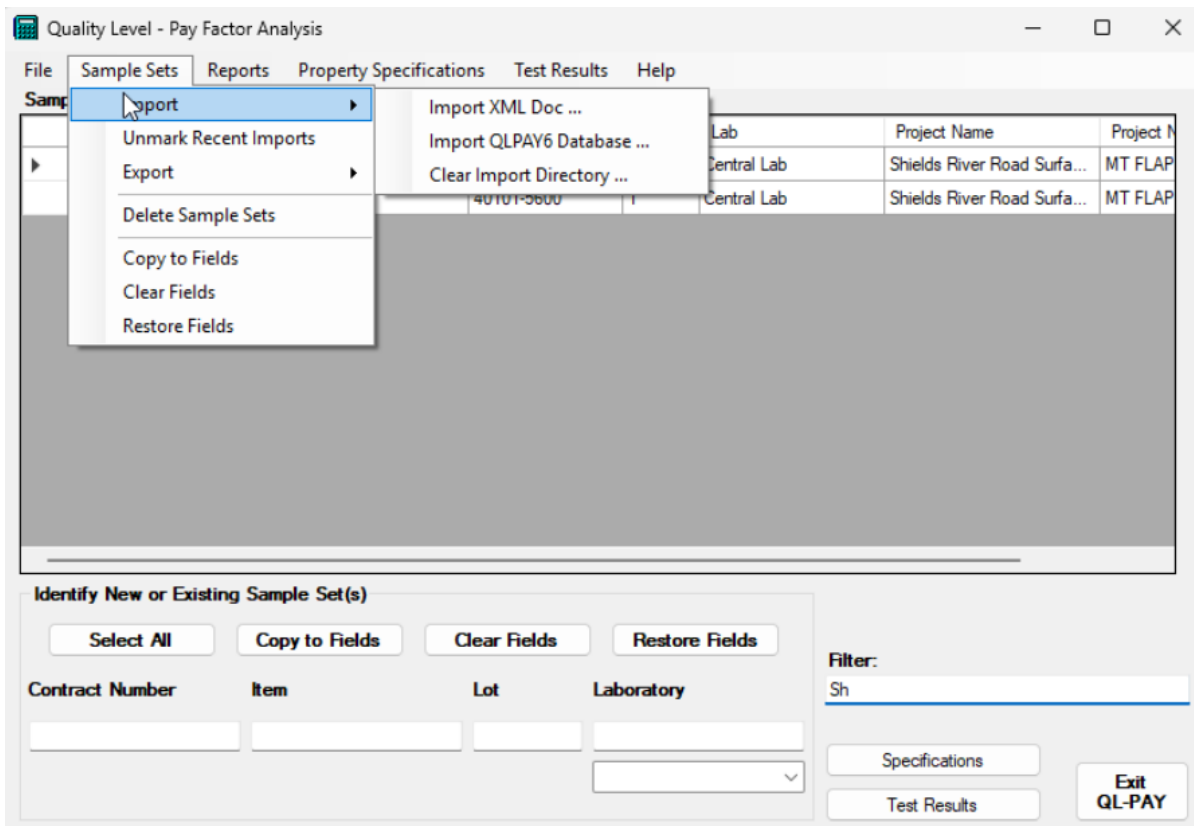


Property specification template window.

This tab within the file menu allows new templates to be established that can be reused from the user's computer. These templates can be found when setting up projects under 'Property Specifications.' See Section 3.5 Creating a New Target Specification Template for more detailed instruction.

2.1.2. Sample Sets

A. Import



View of the QL-PAY 7 sample set import menu functions.

a. Import XML Doc ...

The user can import XML transfer files into QL-PAY using this option. The XML file is usually placed in the import directory defined in Settings.

During import, QL-PAY checks for differences between the imported lot information and the lot information already in the user's database.

The user is notified of conflicts and can decide whether to continue. See Section 5.1 Import for more detailed instructions.

b. Import QLPAY6 Database ...

This option imports data from a QL-PAY 6 .qdb database file by converting it to XML and then importing it through the normal import process.

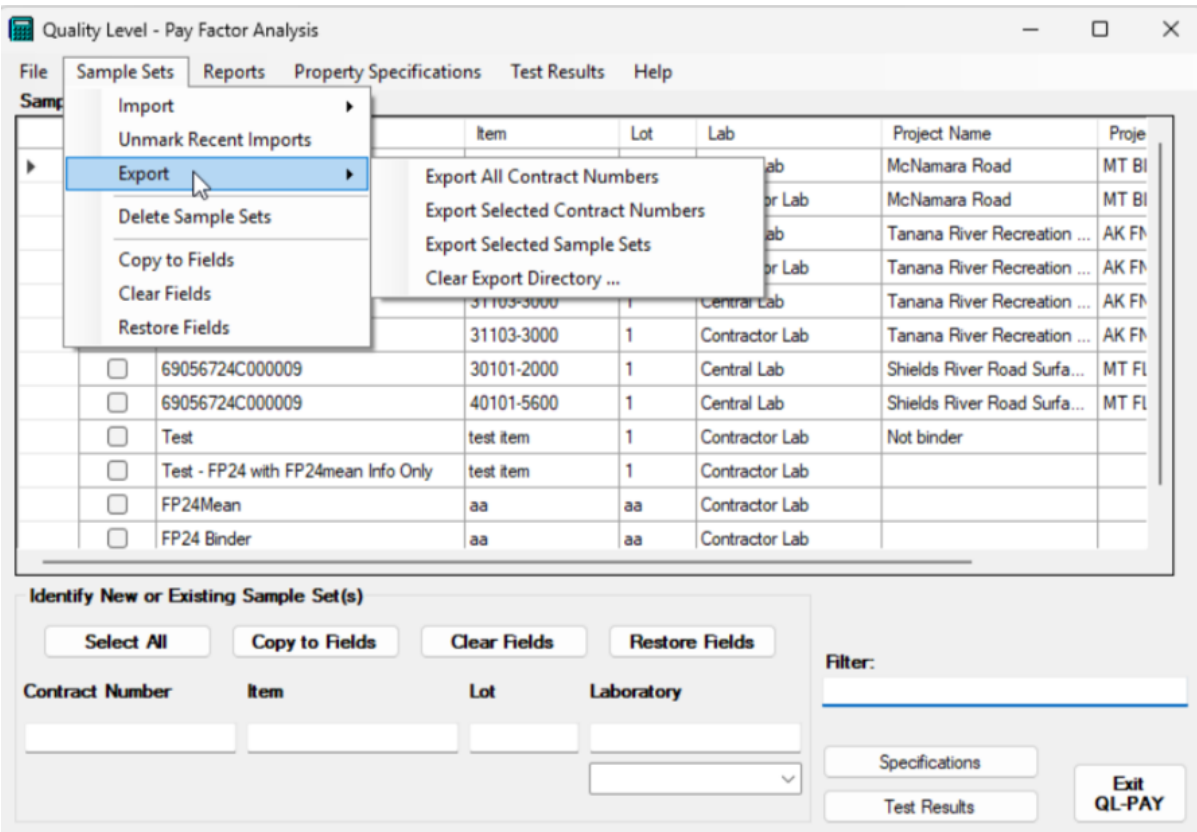
c. Clear Import Directory ...

This function provides the user with the ability to delete XML transfer files from the import directory.

B. Unmark Recent Imports

Upon transfer into QL-PAY, the imported sample sets are denoted with a check mark under the 'Imported' column heading. The check marks will remain in the column until QL-PAY is closed, unless they are removed by the user during the session.

C. Export



View of the QL-PAY 7 sample set export menu functions.

In QL-PAY 7, export menu options are organized by contract number or by selected sample sets.

a. Export All Contract Numbers

All sample set data for all contract numbers in QL-PAY is exported to a transfer file in the export directory.

b. Export Selected Contract Numbers

This allows the user to export the sample set files associated with the selected contract number or contract numbers.

c. Export Selected Sample Sets

This function exports only sample sets selected by the user to the export directory.

d. Clear Export Directory ...

This function provides the user with the ability to delete XML transfer files from the export directory.

D. Delete Sample Sets

The user can delete the sample sets by highlighting the appropriate sample sets. See Section 3.4 Deleting an Existing Sample Set for further instruction.

E. Copy to Fields

When a sample set is selected, the user can copy the Contract Number, Item, Lot, and Laboratory into the ·Identify new or existing sample set· fields to minimize entering project information multiple times for the same project.

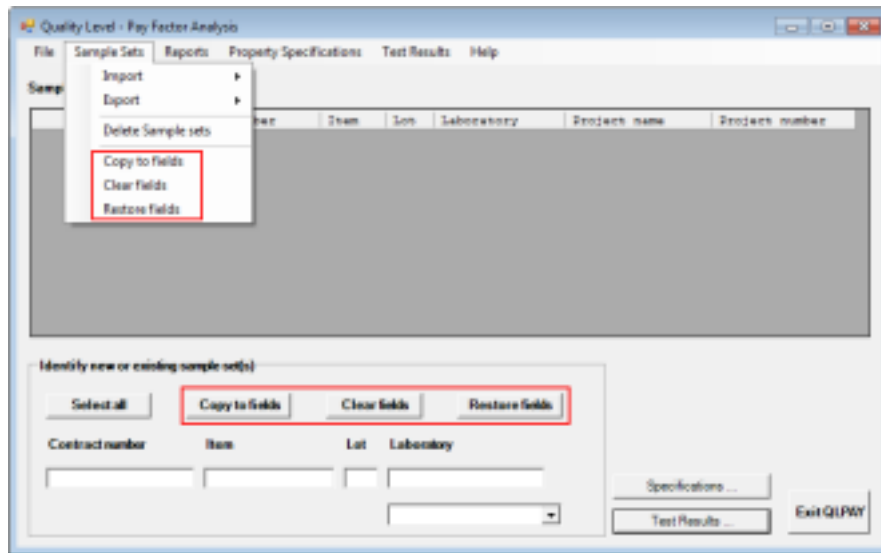
F. Clear Fields

When information has been entered in the ·Identify new or existing sample set· fields, it can be cleared by selecting this option.

G. Restore Fields

The restore function will re-establish the data that was entered previously into the editable fields.

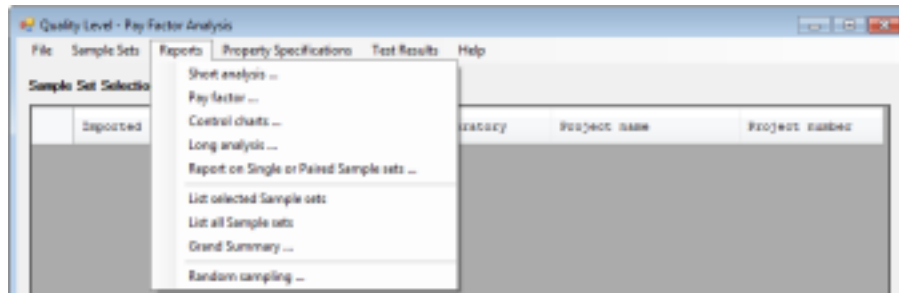
Note: Copy/Clear/Restore fields can be found in the ·sample sets· menu function or they can also be located as buttons in the ·Identify new or existing sample set· box in the lower portion of the home screen.



Copy/Clear/Restore fields locations on the home screen.

2.1.3. Reports

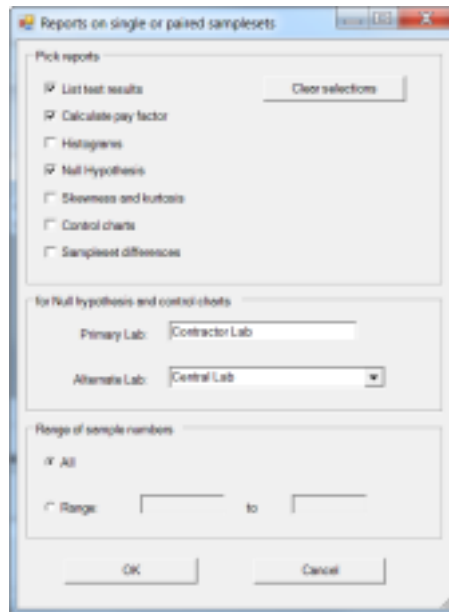
The pull down menu from the 'Reports' tab provides options to select various pre selected report types. See Section 4 Reports for a detailed explanation of the report components.



Reports menu function on the home screen.

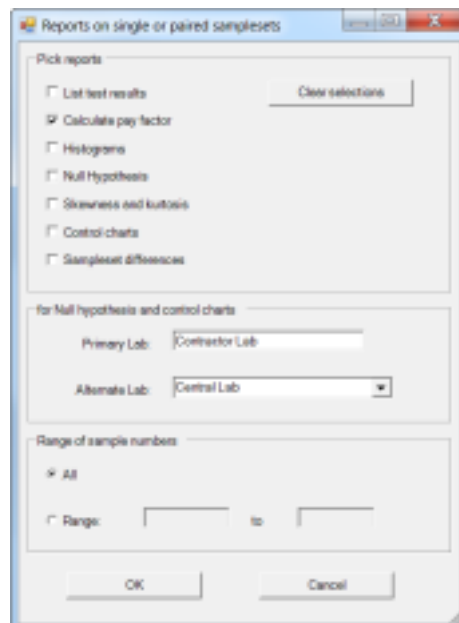
A. Short Analysis

The short analysis compiles the test result values with the pay factor and null hypothesis analysis. The generated report will include a listing of the test results, pay factor analysis, and null hypothesis for the selected sample set.



Short analysis short cut report selection.

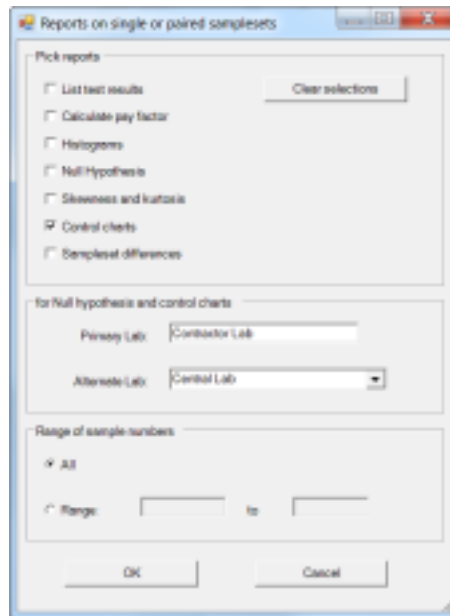
B. Pay Factor



The pay factor report will generate a report with the pay factor for the sample set.

Pay factor short cut report selection.

C. Control Charts



Control Charts show a comparison of the test results with the specification limits.

Control chart short cut report selection.

D. Long Analysis

The long analysis includes a listing of the test result values, pay factor analysis, histograms, null hypothesis, skewness and kurtosis, and control charts for the selected sample set.

Long analysis short cut report selection.

Note: The previous four report selections (A-D) are a pre-selected specialized report short cut. By choosing these particular reports, a report will be generated with the data pertaining to the specific report.

E. Report on Single or Paired Sample Sets

This report option brings up the selection box to allow the user to manually select the combination of reports to run on the sample sets.

F. List Selected Sample Sets

This creates a list of the identifying information for the sample set that is selected. G. List All Sample Sets

This function creates a list of the identifying information for all of the sample sets that are inputted in the QL-PAY database.

H. Grand Summary

A report is produced that includes the summary of all of the properties in the selected sample sets, along with the option to include an analysis of the sample sets and/or histograms of the data.

I. Random Sampling

A report is generated at the user's discretion to produce random numbers using the project information of the selected sample set. The random numbers can be established by an item quantity or by roadway stationing of the project using the parameters in the report options. See Section 6.1 Generating Random Number Reports for specific instructions regarding random sampling.

2.1.4. Property Specifications

A ·property set· is an asset of properties pertaining to a lot specified by Contract Number, Item Number, and Lot Number. This set contains one or more ·Properties and Specifications· for the various items on a project that need to be tracked through QL PAY. These property sets are applied to the different labs that are performing tests for the specific properties.

Due to the program design, the user must provide a specific project name and project number to be able to select properties. However, when any changes are made to the property set information, the changes are applied to all the labs that are connected to the particular property set.

2.1.5. Test Results

Test Results menu on the home screen.

The ·Test Results· tab directs the user to a window for entering test results specific to the selected sample set. The user can choose to exclude certain samples, delete samples, and generate reports from this window. Verify the appropriate laboratory has been selected prior to entering results.

Window for entering test results.

2.1.6. Help

Help drop down menu on the home screen.

A. Help on Menus and Forms

This help function will give you the basic information related to menus and forms within the QL-PAY database.

B. About QL-PAY

The version and build number of the QL-PAY program being used are displayed under this option.

3. Setting Up a Project

3.1. Using the Contract

To determine how an item will be accepted, each Section of the contract has an Acceptance Subsection and Sampling, Testing, and Acceptance Requirements Tables that will denote how the material will be evaluated. If it is stated that a particular material will be evaluated under Subsection 106.05, QL-PAY will be used for statistical analysis to determine the pay factor for the material. Generally speaking, the items governed by statistical evaluation procedures are Aggregate Courses, Treated Aggregate Courses, Asphalt Concrete, and Structural Concrete.

Example Section 301. · UNTREATED AGGREGATE COURSES

301.08 Acceptance. See Example Table 301-1 for sampling, testing, and acceptance requirements; including the category for quality characteristics.

Aggregate gradation and surface course plasticity index will be evaluated under Subsection 106.05. Other aggregate quality properties will be evaluated under Subsections 106.02 and 106.04.

Example Section 301. Untreated Aggregate Courses Acceptance subsection.

Example Table 301-1

Sampling, Testing, and Acceptance Requirements

Example Table 301-1 Sampling, Testing, and Acceptance requirements for Untreated Aggregate Courses.

3.2. Creating a Sample Set

Initial view when opening QL-PAY.

A. Enter data in the ·Identify New or Existing Sample Set· fields: Contract Number, Item, Lot, and Laboratory.

Completed project data entered in the sample set box.

Note: Typically, there will be a ·Central Lab· and ·Contractor Lab· sample set for each item. Make sure the drop down menu is not highlighted when moving on to the next step or it will not copy over to become a sample set.

a. Click on ·Specifications· to proceed once all fields are completed. This window can be accessed from either the ·Specifications· button on the lower right of the home screen or the menu icon stating ·Property Specifications·.

Selecting specifications once sample set data is entered.

B. Specifications

Initial view after opening the specifications window.

a. Enter the Project Name and Number.

Entered project name and number.

Note: The project name and number must be identical for all files associated with the particular project, i.e. Item 401 and Item 301 sample sets.

b. Select the appropriate template from the drop down menu under ·Property Specifications·.

Drop down menu for the property specifications template.

By selecting a template, the majority of the specification has already been entered into the program and only minor changes will need to be completed. See the next page for a view of the property specifications template.

Choosing a property specifications template.

c. If there is not a template specified for the item to be evaluated, property specifications can be added manually by using the ·Add Properties· tool and individually selecting the properties required for analysis from the ·Select a Property· window.

Process for selecting individual properties.

d. When using templates, there may be additional properties in the property specifications templates than are shown in the sampling and testing requirements of the contract. The additional properties can be removed in two ways, either by highlighting the row to delete and select the button that states ·Delete selected rows· or the user can press the delete button on the keyboard.

Deleting highlighted property specifications.

C. Providing Target Specifications to Match the Contract

a. To input specification targets, highlight the property in the lower table and click on the ·Target Specs· button.

Highlighted property prior to selecting target specs.

This will bring up a new window to enter the specifications for the particular property.

Target specification window.

b. Select the criticality level for the target specification. The criticality level (category) defines the lowest acceptable quality level a material can reach and still receive the contract price. The category is broken into two levels which are stated in the Sampling, Testing and Acceptance Requirements Table within each section of the contract. Category I and II are based on acceptable quality levels of 95 percent and 90 percent, respectively. For additional information, see Subsection 106.05 in the specifications.

c. Determine the testing parameters for each property and select the appropriate specification type, i.e. min, max, etc. When the appropriate button is selected, the corresponding fields on the right will be highlighted to enter data. Each field will need to be filled with data from either the sampling and testing specification, material specification or a mix design.

i. +/- dev: By selecting this option, the contract requires a target value and an allowable deviation be set for each individual property. ii. Min: A minimum parameter is used when the contract states that a lower specification limit is required for the property.

iii. Max: The maximum value will be used when the specification specifies an upper limit for the property.

iv. Mean: When using the ·mean· target specification, the program establishes the mean of the inputted data as the target value. If the mean exceeds the maximum specification limit or is lower than the minimum specification limit, the program will automatically set the target value at the maximum or minimum specification limit as appropriate.

v. Info: By selecting the info button, the particular property will only be displayed in the reports for informational purposes. These properties will not be used when calculating a pay factor.

AC-m target specifications window completed.

Note: Estimate the number of tests that will be taken throughout the project and enter in the appropriate field. This number can be changed at a later date if the number of tests increases or decreases. The final number of tests taken should be reflected under each property at the completion of the item.

Note: The reports will not include a pay factor or percent within limits (PWL) if the estimated number of tests for a particular item is not entered.

d. After the target specifications are entered, click ·OK· and proceed to adjusting the remainder of the properties. The completed specifications window is shown on the following page.

Target Specifications adjusted per contract requirements.

e. When finished entering all of the properties, click ·Save and Close·.

Note: The specifications window has three options for leaving the window: ·Save·, ·Save and Close·, and ·Quit·. Each function has a separate outcome.

Save: If the user selects ·Save·, the data that has been entered will be saved, but the specifications window will not close.

Save and Close: By selecting ·Save and Close·, the data that has been entered will be saved and the specifications window will close.

Quit: If the user presses ·Quit·, none of the changes made to the specifications will be saved and it will resort back to the data that was entered prior to opening the specification set and close the window.

3.3. Creating a Secondary Lab Sample Set in the same Lot

A. From the home screen of the QL-PAY program, press the ·Clear Fields· button located in the ·Identify New or Existing Sample Set(s)· box.

B. Highlight the sample set to create a secondary lab and select the ·Copy to Fields· button.

This will copy the project information to be used for the new sample set.

After selecting Copy to Fields, the sample set information is transferred.

C. In the ·Laboratory· drop down menu, choose ·Central Lab·.

View after selecting copy to fields and the Central Lab.

D. Click on ·Specifications·. The specifications should be identical to the original sample set.

Select ·Save and Close· once the property specifications have been reviewed for accuracy.

3.4. Deleting an Existing Sample Set

To delete a sample set, highlight the sample set to delete and click on the **Sample Sets** drop down menu.

Deleting an existing sample set.

From there, select **Delete Sample sets** · **Yes**.

Deletion confirmation.

3.5. Creating a New Target Specification Template

A. Go to **File** · **Property Spec. Templates**.

Selecting the property specification template function.

B. Under the **Current Template** field, type the title the new template will be named.
Creating a new template.

C. Select **Add Properties**. Highlight the properties to be included in the template and click
OK.

Selecting a property.

D. To rearrange the order of the properties within the new template, drag and drop the property in the desired location.

E. When all properties and locations have been set in the template, select **Save Current Template** and then **Close**.

Steps to save and close the property specification template.

F. The template will now be available to select under the specifications window, when creating a new sample set.

G. This process can also be used to edit existing templates by selecting a template on the **Property Spec. Templates** page instead of creating a new one.

Note: Templates that are created by the user are only stored on the user's computer and will not transfer to another user.

3.6. Inputting Test Results

A. Highlight the sample set that the user has test results for.

Highlighted sample set.

B. The test results can be accessed from two locations on the home screen. The user can either select the **Test Results** button at the lower right of the window or use the **Test Results** menu drop down.

Options to access the test results screen.

C. Begin entering the test result data, starting with Sample #1. Make sure to include consecutive sample numbers when entering in the test result data, i.e. 1,2,3,4, etc. and do not skip lines.

Note: Three test results are needed before a statistical analysis can be computed.

a. When entering test results, review the testing requirements for the appropriate number of decimal places to record.

View of consecutive test results being entered.

b. Select the 'Exclude' box, if there are test results for a sample number that the user does not want to include in the analysis.

Note: When entering a verifying lab's test results, make certain to enter the appropriate sample number which correlates to the contractor's sample, i.e. 3 and 3. This will allow QL PAY to compare corresponding sample splits throughout the analysis process.

4. Reports

QL-PAY has the option to generate a combination of reports comparing the test results that have been entered for the project sample sets. The report selection can be accessed from two places within the program. From the home screen of QL-PAY, the reports can be obtained through the drop down menu under 'Reports.'

Selecting the reports menu from the home screen.

If the user is in the test results screen, the reports can be obtained by selecting the 'Reports' drop down menu.

Selecting the reports menu from the test results screen.

Once the reports function has been chosen, the following is the main screen that will be used to generate an array of reports covering the sample set data that has been selected.

Report selections.

4.1. List Test Results

By selecting 'list test results' in a report, QL-PAY will format all of the test results entered within the sample set into a legible list.

Selection of list test results report.

This report allows the user to review the entered data for accuracy and any discrepancies. See below for a sample printout of the listed test results report.

Listed test results from QL-PAY report.

Note: An asterisk (*) will be displayed adjacent to the sample number for any test result that has been excluded from the analysis. The user must save the file prior to running the report for the exclusion not to be considered in the analysis.

4.2. Calculate Pay Factor

The pay factor report will list the Percent Within Limits (PWL) and pay factor for each property that is being evaluated in the sample set.

Selection of calculate pay factor report.

Throughout the testing, the report will produce a projected final pay factor based on the current quality level and the estimated number of tests. A final pay factor will be reported when the number of inputted test results equals the estimated number of tests.

Quality levels and pay factors QL-PAY report.

4.3. Histograms

A histogram shows where the data resides and how many results lie between specific values.

Selection of histogram report.

These charts allow for easier viewing of data in a graphical manner.

Plotted histogram for #8 sieve in the sample set.

4.4. Null Hypothesis

The null hypothesis can only be used when two labs are being compared.

Selection for generating the Null Hypothesis report.

When comparing the contractor lab to the central lab, the results should be similar but not identical. The null hypothesis is computed at a 0.01 significance level.

The null hypothesis generates two analyses: independent and paired. An independent analysis compares the contractor's test results that do not have corresponding government results with the results that have been recorded to date from the central lab. A paired analysis compares the corresponding contractor and government test results. The t statistic is used as a comparison of the mean values of the individual properties within the sample sets. The F statistic is used to analyze the variance of the data. Computed F and t values based on the inputted data are compared to critical F and t values that have been established using standard statistical methods.

Two key questions to ask when reviewing the null hypothesis report are: 1) Are the Means similar?

a. This is answered using the t statistic.

2) Are the variances similar?

a. This is answered using the F statistic.

Null hypothesis report from QL-PAY.

4.5. Skewness and Kurtosis

Skewness and Kurtosis are parameters used to determine if the data is normally distributed.

Selection of Skewness and Kurtosis report.

The following is an example of how a skewness and kurtosis report would appear in QL-PAY.

Skewness and kurtosis report from QL-PAY.

4.6. Control Charts

The set of control charts produced by QL-PAY depicts the data in relation to the specification limits. If an alternate lab has been selected, both sets of data will be plotted.

Selection for generating a control chart report.

These charts are beneficial in evaluating the consistency between the two labs and can assist in evaluating the data if a bias exists. These charts are also valuable to use as production charts to help in visually assessing the consistency of the specific product or process.

Control chart from a QL-PAY report.

4.7. Sample Set Differences

The sample set differences report shows the actual difference between the contractor and the central lab value on a sample by sample basis. The report will show differences for only those samples where a contractor and a central lab value exist. This report can only be used if a primary and an alternate lab are selected.

Selection showing the sample set differences report.

The +/- shows the numerical representation of the data viewed in the control charts if the two labs are selected. A sample of the printout for the sample set differences report is shown on the next page.

Report showing the sample set differences.

4.8. Primary and Alternate Lab Selection

QL-PAY allows for the test results from the contractor's lab to be compared with the results from an alternate lab. An alternate lab selection is mandatory if the `·null hypothesis·` or `·sampleset differences·` report options are selected.

Report specifications for lab comparison.

The primary lab will be affiliated with the sample set selected prior to selecting the reports function. Most times, the primary lab will be established as the contractor lab and the alternate lab will be the central lab for comparison purposes.

4.9. Range of Sample Numbers

When using any of the report functions, the user can choose to use the entire set of test results in the sample set or select a range of data values to include in the analysis. The report selection page is automatically set to include all of the test results. If the user wants to generate a report including a range of test results, the `·Range·` button must be selected and the appropriate range entered in the fields.

Specifying a range of sample numbers.

5. Importing/Exporting

When importing or exporting data files from QL-PAY, each file has a specific number sequence associated with the day it was created. The file name format is `qlpf+YY+mm+dd+nnn.xml`. For example, the file below would look like `qlpf+12+01+26+001.xml`; therefore, it was the first file created on January 26, 2012.

5.1. Import

A. Find the location the imported files are being pulled from by looking in the **Imported Files Directory**.

Imported files directory.

B. Save the file to be imported in the above file directory.

C. Go to **Sample Sets** > **Import** > **Import XML Doc ...** A window will open showing the files available to be imported. To import an existing QL-PAY 6 database, go to **Sample Sets** > **Import** > **Import QLPAY6 Database ...** and select the QL-PAY 6 .qdb file.

Importing a sample set.

D. Select the file(s) to be imported and select **Open**. A screen shot is shown on the following page.

Selecting files to import from the file directory.

E. QL-PAY will analyze the existing and new lot(s) to be imported. This import process can be time consuming.

a. Existing Lots: A lot that has different test results than the existing lot in the user's database. When importing an existing lot, the test results in the file being imported will overwrite the results already in the QL-PAY database. QL-Pay will not warn the user prior to overwriting the results.

If the properties of existing lots do not match the lots to be imported, QL-PAY will notify the user during the import process. A new version of a lot with more properties than the home lot cannot be imported. The home lot is the lot that exists in the user's QL-PAY database at the time of importing. A screen shot of the user notification in the import window is shown on the following page.

User notification of import lot with properties not in home lot.

In this case, the user will need to cancel the import session and either add the properties boxed in red to the home lot, or delete the entire home lot and then import the new version of the lot again.

The user will also be notified when property specifications do not match between the home lot and the new version of the lot to be imported. QL PAY will use home values for the conflicting property specifications if the lot is imported. See the screen shot on the following page.

User notification of import version with property specification conflicts.

b. New Lots: A lot that does not already exist in the user's database. QL-PAY will prompt the user to Import or Skip each new lot in the file. If all new lots need to be imported, check the **Import All New Lots** (box 1 below). If the user does not want to import a specific lot, select **Skip this Lot** (box 3 below).

Importing lot selection window.

F. The sample sets will have been brought into the QL-PAY viewing window and will be seen with a check-mark in the imported column.

Recently imported sample sets showing the imported check-marks.

When the user ends the current session in the program, the imported files will no longer be check-marked. To remove the check-marks prior to ending the session, go to ·Sample Sets· ·Unmark recent imports·.

Selection for unmarking recent imports.

5.2. Export

Sample sets can be exported from QL-PAY in three separate ways: all contract numbers, selected contract numbers, or selected sample sets.

- a. All Contract Numbers: This exports all sample sets in the QL-PAY database.
- b. Selected Contract Numbers: This exports the sample sets associated with the selected contract number or contract numbers.
- c. Selected Sample Sets: This exports only the individual sample set or sample sets the user has selected.

A. Select the appropriate exporting function needed by going to ·Sample Sets· ·Export· ·Export _____·. A screen shot of the export menu is shown on the following page.

Exporting sample set functions.

B. The data set(s) will be saved in a single file and sent to the export directory. This file can

now be stored on the computer or sent electronically to be used by others.

Exported file directory.

Note: Even if multiple sample sets are exported at one time, there will only be one file created. Files will accumulate in the export directory until removed by the user.

6. Random Sampling

The random sampling function of QL-PAY is used to generate random numbers by quantity and stationing for use on the project. The contract requires certain items to be sampled at a specific frequency, thus calling for random sample numbers to be generated. QL-PAY is set up with stratified random sampling. This results in the random numbers being distributed throughout the entire sample section rather than constrained to a small portion of the sample area.

6.1. Generating Random Number Reports

6.1.1. By Quantity

A. Select the ·Sample Set· the user wants to generate a ·Random Number Report· for. B. Open the Random Sampling function by selecting ·Reports· and then ·Random Sampling·.

Process to open the random sampling function.

C. Select the Interval Type as ·By Quantity·.

D. Enter the appropriate data from the contract documents into the open fields. For this example, the contract calls for 18,000 tons of 401 Asphalt Concrete Pavement, Gyratory mix with a sampling frequency of 1 per 700 tons, thus 26 random numbers would be needed. The random sampling window is shown on the following page.

View of random sampling data entry.

E. Select ·Generate·. A PDF report will appear with the generated random numbers. An example report is shown below.

Generated random number report.

Note: QL-Pay may generate reports not totaling the number of tests needed per the specifications. If this happens, adjustments may need to be made to the sample interval to generate the appropriate number of samples.

F. The report can be saved by using the ·save as· function in the generated PDF file. Menu functions in Adobe Acrobat to save the random number report.

6.1.2. By Roadway Station

A. Select the ·Sample Set· the user wants to generate a ·Random Number Report· for. B. Open the Random Sampling function by selecting ·Reports· and then ·Random Sampling·.

Process to open the random sampling function.

C. Select the Interval Type as ·By Roadway Station· using the appropriate project units. D. Enter the appropriate data from the contract documents. For this example, the contract calls for 18,000 tons of 401 Asphalt Concrete Pavement, Gyratory mix with a sampling frequency of 1 per 700 tons, thus 26 random numbers will be needed.

a. Generally, projects will be paved in two lanes and two lifts. To ensure that samples are taken from each lane and lift, there will be four reports generated with an equally distributed combination of bottom/top and left/right.

The random sample data entry window for roadway stationing is shown on the next page.

Random sampling data entry for roadway station.

Note: When entering the data in the fields, make sure to specify which lane the random numbers are generated for.

E. Select ·Generate·. A PDF report will appear with the generated random numbers. Generated random number report.

Note: QL-Pay may generate reports not totaling the number of tests needed per the specifications. If this happens, adjustments may need to be made to the sample interval to generate the appropriate number of samples.

F. The report can be saved by using the ·save as· function in the generated PDF file. Menu functions in Adobe Acrobat to save the random number report.

7. Examples

This section will take the user through five different examples:

The contract pages used for the QL-PAY setup examples are not specific to any project and should only be used for the following examples.

7.1. Section 301 Aggregate Courses Example

7.1. Section 301 Aggregate Courses Example

This example will go through the process of setting up the sample set for 301 Aggregate Base Grading D.

TASK ORDER AWARD Contract No. DTFH70-99-D-0001

_____ River Contractors, Inc.

Solicitation No. DTFH70-08-R-00021 P.O. Box 223

West Glacier, MT 59936

MT PRA GLAC 10(64)

ASTER FALLS LOOKOUT ROAD AWARD DATE: March 10, 2015

Example Section 301. · UNTREATED AGGREGATE COURSES

Material

301.02 Conform to the following Subsections:

Subbase, base, and surface course aggregate 703.05

Water 725.01(c)

301.08 Acceptance. See Example Table 301-1 for sampling, testing, and acceptance requirements; including the category for quality characteristics.

Aggregate gradation and surface course plasticity index will be evaluated under Subsection 106.05.

Other

aggregate quality properties will be evaluated under Subsections 106.02 and 106.04.

(a) Aggregate gradation. The upper and lower specification limits are equal to the calculated mean of all

test results plus or minus the allowable deviations shown in Example Table 703-2 and Example Table 703- 3, except as follows:

(1) If the calculated mean value for a tested sieve exceeds the maximum gradation value shown in Example Table 703-2 or 703-3, the upper specification is equal to the maximum gradation value plus the allowable deviation, and the lower specification is equal to the maximum gradation value minus the allowable deviation.

(2) If the calculated mean value for a tested sieve is less than the minimum gradation value shown in

Example Table 703-2 or 703-3, the upper specification is equal to the minimum gradation value plus the allowable deviation and the lower specification is equal to the minimum gradation value minus the allowable deviation.

Example Table 301-1

Sampling, Testing, and Acceptance Requirements

Example Section 703. · AGGREGATE

703.05 Subbase, Base, and Surface Course Aggregate.

(a) General. Furnish hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel conforming the following:

- (1) Los Angeles abrasion, AASHTO T 96 50 percent max.
- (2) Soundness of aggregate using sodium sulfate, 12 percent loss max.

AASHTO T 104 (5 cycles)

- (3) Durability index (coarse), AASHTO T 210 35 min.
- (4) Durability index (fine), AASHTO T 210 35 min.
- (5) Fractured faces, ASTM D5821 50 percent min.
- (6) Without organic matter and lumps or balls of clay

(b) Subbase or base aggregate. In addition to Subsection 703.05(a), conform to the following:

- (1) Gradation Example Table 703-2
- (2) Liquid limit, AASHTO T 89 25 max.

Example Table 703-2

Target Value Ranges for Subbase and Base Gradation

() The value in the parentheses is the allowable deviation ($\pm$) from the target values.

Initial view when opening QL-PAY.

A. Enter data in the ·Identify New or Existing Sample Set· fields

a. Contract Number: This can be found on the front cover of the contract. For this example it is DTFH70-99-D-0001.

b. Item: Place the Item Number in this field. This example will begin with 301 Aggregate Base Grading D (30101-2000).

c. Lot: Generally speaking, there is only one lot for each item; therefore, the sample sets will always begin with Lot ·1·.

d. Lab: Determine the lab the user will be using for the test results. Typically, there will be a ·Central Lab· and ·Contractor Lab· sample set for each item.

View after entering data into the sample set box.

B. Specifications

a. Click on ·Specifications·.

Selecting property specifications.

b. Enter the Project Name and Number from the contract cover page into the corresponding fields.

Project Name and Number under the specifications window.

c. Select the appropriate template from the drop down menu under ·Property Specifications·. For this example, choose FP-14, 301- Base, Grading D. By selecting this template, the majority of the specification has already been entered into the program and only minor changes will need to be completed.

View after entering project name and number and selecting the template.

C. Adjusting Property Specifications to Match Contract

a. After opening the specifications dialog box and selecting a template, the Sampling, Testing, and Acceptance Requirements will be needed to finish inputting the correct data.

b. To adjust the properties, highlight the property in the lower table to adjust and click on the ·Target Specs· button.

Highlight the property and select Target Specs.

This will bring up a new window to enter the testing parameters for the particular property. Determine the testing parameters for each property and select the appropriate target specifications, i.e. min, max, etc.

In this example, highlight the ·3/4 inch· property in the lower table and select ·Target Specs·. Each field that is not grayed out will need to be filled in with data from either the sampling and testing specification, material specification or the mix design.

View of the Target Specifications window.

i. The criticality level is found in Example Table 301-1 under category. The $\frac{3}{4}$ · sieve is a category 2.

ii. The target specification for the $\frac{3}{4}$ · sieve is the mean. This is found in the Acceptance Subsection of 301 Untreated Aggregate Courses. The allowable deviation and the low/high value can be found under Example Table 703-2 Target Value Ranges for Subbase and Base Gradation. The values have already been entered in to the fields as part of the template but the user should verify that the values correlate with the specifications in the contract.

c. The estimated number of tests needs to be the actual number of tests that will be taken throughout the project. This number can be changed at a later date if the number of tests increases or decreases, but the final number of tests taken should be reflected under each property at the completion of the item. To determine the number of tests, divide the contract quantity for the item by the sampling frequency and use that value for all of the estimated number of tests. For this example, the contract requires 10,000 tons and the sampling frequency is 1 per 1000 tons (from Example Table 301-1); therefore, the estimated number will be 10 tests for this project.

$\frac{3}{4}$ · sieve entered target specs.

d. After the target specifications are entered, click ·OK· and proceed to adjusting the remainder of the properties.

e. Due to using the template, there are additional properties in the property specifications than are called for in the sampling and testing requirements. The additional properties can be removed in two ways, either by selecting the row to delete and select the button that states ·Delete selected rows· or the user can press the ·delete· key on the keyboard.

Deleting the selected property specification.

For this example remove the SE and SE/P property specifications.

f. When finished entering all of the properties, click **Save and Close**. This is shown on the following page.

View of completed target specifications prior to selecting **Save & Close**.

Note: If the user presses **Quit**, none of the changes made to the specifications will be saved and it will resort back to the data that was entered prior to opening the specification set.

D. Creating a Secondary Lab Sample Set in the same Lot

a. From the home screen of the QL-PAY program, press the **Clear Fields** button located in the **Identify New or Existing Sample Set(s)** box or in the Sample Sets drop down menu. This is shown on the following page.

Operating the clear fields function.

b. Highlight the sample set to create a secondary lab and select the **Copy to Fields** button. This will copy the project information to be used for the new sample set.

Selecting copy to fields after highlighting sample set.

c. In the **Laboratory** drop down menu, choose **Central Lab**.

View after selecting copying fields and Central Lab.

d. Click on **Specifications**. The specifications should be identical to the original sample set. Once the property specifications have been reviewed for accuracy, select **Save and Close**.

View of copied target specifications for the Central Lab.

e. QL-PAY is now set up to handle all of the 30101 sampling and testing for the project.

E. Entering Test Results

a. Highlight the sample set that the user has test results for.

b. Select the **Test Results** button at the lower right of the window or the **Test Results** drop down menu.

Locations that can be selected to enter test results.

c. Begin entering the test result data, starting with Sample #1. Make sure to include consecutive sample numbers when entering in the test result data, i.e. 1,2,3,4, etc.

View of consecutive test results being entered.

d. Three test results are needed before a statistical analysis can be computed.

e. When entering test results for the central lab on split samples, make sure the test numbers match the corresponding contractor test result sample number or the analysis will not be valid.

f. Select **Save and Close** when all of the test results have been entered into the program. F. Calculating Pay Factor

a. Highlight the sample set for the contractor's lab and select the **Pay factor** under the reports drop down menu.

Selecting the pay factor report for the contractor's lab.

b. The reports menu will appear. By selecting the 'Pay factor' report, the 'Calculate pay factor' button should already be checked. If not, select only the pay factor button and then select 'OK.'

Pay factor report selection.

c. QL-PAY will produce a PDF report calculating the pay factor for the test results that have been entered under the sample set. When the estimated number of tests have been completed, QL-PAY will note that the testing has been completed and the final pay factor value.

The view below shows the final pay factor for Aster Falls Lookout Road. When using the 'mean' property specification, QL-PAY will adjust the target value to the mean of the samples unless the target value falls outside of the range in the contract specifications. This is shown when comparing the 'Actual target value' column to the 'Mean' column.

Pay factor report printout with 3/8" sieve out of specification limit.

When reviewing the 3/8" sieve, the contract specifications state the range for the target value is between 51.0 and 82.0. After all of the sampling was completed, the mean for the 3/8" sieve was 47.39. This value is outside of the property specification; therefore, QL-PAY automatically sets the target value to the lowest value (51.00) within the specification range. This change can be seen highlighted in red in the above QL-PAY report.

Note: The 'Calculate Pay Factor' report was selected for example purposes only. For more information on other available reports see Section 4 Reports.

7.2. Section 401

Asphalt Concrete Pavement by
Gyratory Mix Design Method - Control Strip

Example

7.2. Section 401 Asphalt Concrete Pavement by Gyratory Mix Design Method -Control Strip

Example

This example will go through the process of setting up the sample sets for the control strip of 401 Asphalt Concrete Pavement, Gyratory Mix.

TASK ORDER AWARD Contract No. DTFH70-99-D-0001

_____ River Contractors, Inc.

Solicitation No. DTFH70-08-R-00021 P.O. Box 223

West Glacier, MT 59936

MT PRA GLAC 10(64)

ASTER FALLS LOOKOUT ROAD AWARD DATE: March 10, 2015

Example Section 401. - ASPHALT CONCRETE PAVEMENT BY GYRATORY MIX DESIGN METHOD Material

401.02 Conform to the following Subsections:

Antistrip additive 702.05

Asphalt binder 702.01

Asphalt concrete aggregate 703.07

Mineral filler 725.05

401.12 Production Start-Up Procedures.

(b) Control strip. Provide 7 days notice before beginning production of an asphalt concrete mix.

On the first day of production, produce sufficient asphalt concrete mix to construct a 1000-foot (300-meter) long control strip, one-lane wide, and at the designated lift thickness. Construct the control strip on the project at an approved location.

Construct the control strip using asphalt concrete mix production, lay-down, and compaction procedures intended for the entire mix. Cease production after construction of the control strip until the asphalt concrete mix and the control strip are evaluated for acceptance.

(1) Mixture. Take and test at least three control strip asphalt concrete mix samples and evaluate according to Subsection 401.17. The asphalt concrete mix is acceptable if all test results are within specification limits for asphalt content and VMA; and the calculated pay factor for asphalt content, VMA, and gradation is 0.90 or greater.

(2) Compaction. Compact according to Subsection 401.14. Take nuclear gauge density readings behind each roller pass to determine the roller pattern necessary to achieve required density.

Take nuclear gauge density readings and cut and test core samples according to Table 401-8. Density is acceptable if the core density pay factor is 0.90 or greater. Furnish the CO with documented nuclear gauge readings correlated to core specific gravities.

Repeat the control strip process until an acceptable control strip is produced. See Subsection 106.01 for the disposition of material in unacceptable control strips. Accepted control strips may remain in place and will be accepted and measured as a part of the completed pavement. Tests used for the control strip will not be included in the evaluation for payment according to Subsection 106.05. When a control strip is verified and accepted, full production may begin.

Use these start-up procedures when producing material from a different plant or when resuming production after a termination of production due to unsatisfactory quality according to Subsection 106.05.

Example Section 401. · ASPHALT CONCRETE PAVEMENT BY GYRATORY MIX DESIGN METHOD 401.17 Acceptance. See Table 401-8 for sampling, testing, and acceptance requirements. Aggregate quality properties will be evaluated under Subsections 106.02 and 106.04.

Mineral filler, antistripping additives, and WMA additives will be evaluated under Subsections 106.02 and 106.03.

Asphalt content, VMA, and core density will be evaluated under Subsection 106.05. Pavement roughness will be evaluated under Subsection 106.04. Asphalt binder will be evaluated under Subsections 106.03 and 106.04.

Evaluations will consider the following:

- (a) Asphalt content. The upper and lower specification limits are the approved JMF target value plus or minus 0.4 percent;
- (b) VMA. The lower specification limit is the value shown in Example Table 401-1. After the JMF has been verified according to Subsections 401.03 and 401.12, use the Contractor's combined coarse and fine bulk specific gravity of aggregate G_{sb} values to calculate VMA on field produced asphalt concrete mix samples;
- (c) Density (core). The lower specification limit is 91.0 percent of the maximum specific gravity (density) determined according to AASHTO T 166 and T 209.

The percent compaction will be determined using the average maximum specific gravity (AASHTO T 209) from all samples tested each day;

- (d) Pavement roughness. The evaluation for pavement will be made after all defective areas are addressed.

See Subsection 401.16(g); and

- (e) Asphalt binder. The pay factor is determined from Table 401-7.

Construction of the HMA or WMA pavement course will be evaluated under Subsections 106.02 and 106.04.

Example Table 401-1

Gyratory Asphalt Concrete Mix Design Requirements, AASHTO R 35

Example Table 401-8

Sampling, Testing and Acceptance Requirements

Production Start-up (control strip)

Example 401 Superpave Hot Asphalt Concrete Mix Design.

Initial view when opening QL-PAY.

A. Enter data in the 'Identify New or Existing Sample Set' fields

a. Contract Number: This can be found on the front cover of the contract. For this example it is DTFH70-99-D-0001.

b. Item: Place the Item Number in this field. This example will begin with 401 Asphalt Concrete Pavement, Gyratory Mix (40101-1000).

c. Lot: To distinguish between production testing and the control strip, set the Lot as 'TS1,' for test strip 1. By labeling the Lot as 'TS1,' the user has the opportunity to create a sequence of additional sample sets if multiple test strips are required.

d. Laboratory: Select 'Contractor Lab' in the drop down menu. The 'Contractor Lab' is typically used for a control strip, due to the testing being completed on-site.

View after entering data into the sample set box.

B. Specifications

a. Click on 'Specifications.'

Selecting property specifications.

b. Enter the Project Name and Number from the contract cover page into the corresponding fields.

Project Name and Number under the specifications window.

c. Select the appropriate template from the drop down menu under 'Property Specifications.' For this example, choose FP-14, 401 'Gyratory Method (3/4 inch nominal maximum)' 'Control Strip'. By selecting this template, the majority of the specification has already been entered into the program and only minor changes will need to be completed. The screen view of the template selection is shown on the following page.

View after entering project name and number and selecting the template.

C. Adjusting Property Specifications to Match Contract

a. After opening the specifications dialog box and selecting a template, the Sampling, Testing, and Acceptance Requirements along with information from the asphalt mix design will be needed to finish inputting the correct data.

b. To adjust the properties, highlight the property in the lower table to adjust and click on the 'Target Specs' button. This will bring up a new window to enter the testing parameters for the particular property. Determine the testing parameters for each property and select the appropriate target specifications, i.e. min, max, etc. This is shown on the following page.

Highlight the property and selecting Target Specs.

In this example, highlight the '1/2' property in the lower table and select 'Target Specs.' Each field that is not grayed out will need to be filled in with data from either the sampling and testing specification, material specification or the mix design.

View of the target specifications window.

i. The criticality level is found in Example Table 401-2 under category. 1/2 inch gradation is a category 2.

ii. The target specification for 1/2 inch gradation is +/- dev. The allowable deviation can be found in the Section 703. For this example, the values stated in the mix design will be assumed to be accurate. The target value will be the value stated in the mix design. In this case, using the mix design, the target value is 83.0 and the allowable deviation is 4.

c. The estimated number of tests is established in the specifications for the construction of the control strip. For a control strip, the specifications state there will be 3 mix samples and 5 core samples taken for evaluation.

1/2 entered target specs.

d. After the target specifications are entered, click **OK** and proceed to adjusting the remainder of the properties.