

Laboratory Information Management System

FINAL REPORT

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16. Abstract Currently, most state DOT material test results are reported on a micro scale and paper-filed. Each material lot is assessed separately for compliance, penalties, etc. All the test result reports are manually generated, distributed, and filed away individually. The filing processes of approving projects, preparing reports of material test results, and searching relevant closeout paper-documents are quite labor intensive and time-consuming. An intranet-based electronic filing system was developed (Laboratory Information Management System abbreviated as LIMS) to replace the current paper-based filing system. In order for proper implementation a mission statement was first developed, based on which the Laboratory Information Management System was formulated. This system consists of three major components; namely the database (MS SQL based), administrative management interface, and database-driven web application. The input to the database is through either the administrative management interface or the database-driven web application. The administrative management interface provides access to the following program functions: general project information, personnel information, material information, and other administrative tasks such as edit/review lab reports. The pilot scale database-driven web application of LIMS currently contains all the necessary forms for three major construction materials; namely, concrete, soils, and asphalt plus the closeout forms required by FHWA. LIMS will be evaluated by NJDOT as a pilot version for possible future implementation. User's manuals for the administrative management interface and the database-driven web application are available on request.			
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List of Abbreviations and Symbols

BDC	Backup domain controller
DSL	Digital subscriber lines
FHWA	Federal Highway Administration
LIMS	Laboratory Information Management System
NJDOT	New Jersey Department of Transportation
PDC	Primary domain controller
PMS	Pavement Management System

SUMMARY

Currently, most state DOT material test results are applied on a micro scale and paper-filed. Each lot is assessed separately for compliance, penalties, etc. All the test result reports are manually generated, distributed, and paper filed individually. The filing processes of approving projects, preparing material test result reports, and searching relevant closeout paper-documents are quite labor intensive and time-consuming. An intranet-based electronic filing system was developed (Laboratory Information Management System abbreviated as LIMS) to replace the current paper-based filing system.

In order for proper implementation a mission statement was developed, based on which the LIMS was formulated. It is given below.

“To provide a system to create and gather material related business and test information on NJDOT Bureau of Materials’ contractors, suppliers, producers and plants; product mix designs; production quality control; field sampling operations; and laboratory test results via NJDOT Intranet. Also this system should be able to analyze and generate reports based on their collected information and maintain all relevant data documents in a server database. Ideally, this system should facilitate the management of material testing and the project close out process via secured, user-friendly WebPages and graphical interfaces.”

This system consists of three major components: an MS SQL database, an MS Access 2000 administrative management interface, and a database-driven web application. The input to the SQL database is through either the administrative management interface or the database-driven web application. The administrative management interface provides access to and the ability to update information for the following program functions: general project information, personnel information, material information, and other administrative tasks such as edit/review lab reports. The pilot scale database-driven web application of LIMS currently contains all the forms for three major construction materials (i.e., concrete, soils, and asphalt) plus the closeout forms required by FHWA. LIMS has been installed on the NJDOT network, will be evaluated by NJDOT as a pilot version for possible future implementation.

INTRODUCTION

The New Jersey Department of Transportation (NJDOT) took a leadership role in developing research needs for a computerized information management system for material testing results. The NJDOT recognized that the need exists to reduce paperwork; expedite the material approval process; shorten the time between project completion and final closeout, and analyze the functional relationships between material testing data and material performances in order to identify significant trends over time.

Currently, most material test results are reported on a micro scale and paper-filed. There are more than 110 NJDOT forms, reports, memos, labels, and cards in use for material testing. Many of these forms have the same usage with different layouts. Each one of them has to be filed manually. Hence it is a time consuming and labor intensive process. Also, the transfer of these documents among related units of NJDOT causes delays in decision making.

To integrate the operational functionality of material data filing, processing, and transfer, a computerized local/remote Intranet network with an information management system for material testing results is needed. This system should standardize the data entry procedures, define performance evaluation measures, certify material test data, analyze the relationships between testing data and actual material performance, expedite contractor payments including penalties and bonuses, streamline the project closeout process, and generate summary reports. With proper modifications it will also be able to communicate with other NJDOT information systems, such as the Pavement Management System (PMS).

NJDOT LIMS is an integrated materials laboratory test results reporting system. A pilot scale intranet-based information management system was developed, installed, and tested by NJDOT. If fully implemented, a production version of LIMS will connect 20 field offices, 3 regional offices, and the central office in Trenton to transfer information, trail material samples, and periodically replicate the materials database. During an evaluation period, both the current paper-based filing system and the electronic intranet-

based LIMS will work side-by-side as co-existing systems. Eventually, LIMS can replace the current system.

The system was installed at NJDOT on a primary domain controller (PDC) running Windows NT with Microsoft SQL server. The production version of LIMS is expected to connect to three backup domain controllers (BDC) located at three regional offices. Computers running Windows 2000 in field offices were connected to the PDC via a 56K.V90 modem pool and digital subscriber lines (DSL). Figure 1 shows the computer configuration when the system is fully implemented.

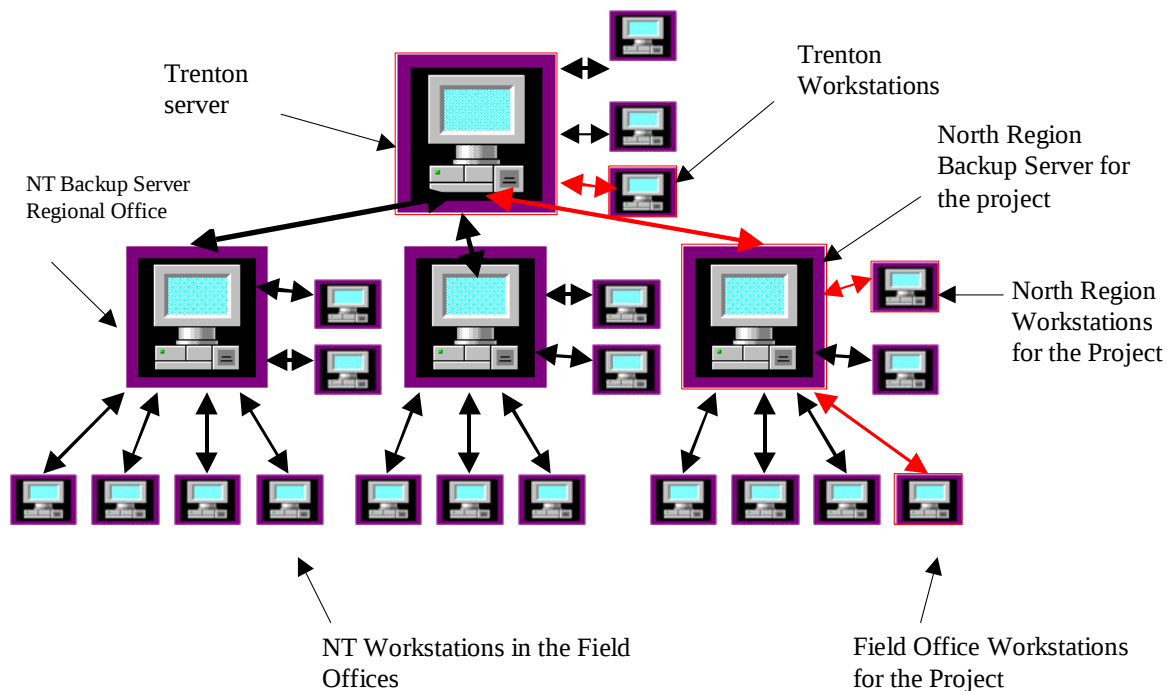


Figure 1. Network Configuration for LIMS

The NJDOT Bureau of Materials will use LIMS. This system consists of three major components (a) database; (b) administrative management interface; and (c) database-driven web application. These three parts compose an NJDOT Intranet network application with which users can create reports; store testing results; and retrieve, display, and transfer information among NJDOT Bureau of Materials staff in Trenton, regional offices, and field offices.

MS SQL DATABASE

The SQL database stores all administrative information about projects, contractors, suppliers, material mix designs, personnel, laboratories, and field offices. The system administrator of NJDOT LIMS uses the Administrative Management Interface to input all administrative information. The Administrative Management Interface is an Access 2000 application, named 'Lims_2000_Admin.mdb'. This application has functional data entry/retrieval forms linked to the SQL database. Using these forms at the supervisor level, the system administrator can initialize specific records on projects, contractors, and suppliers; enter material mix design data, and enter User ID for authorized users. The SQL database also stores test results for concrete, soils, and asphalt samples.

ACCESS 2000 ADMINISTRATIVE MANAGEMENT INTERFACE

The Main Menu of the Access 2000 Administrative Management Interface provides access to the administrative program functions that allow updating of system information. Figure 2 shows the main menu of this interface. Clicking on any of the option buttons will take the user to the corresponding function. The functions included in this application are:

Edit/Review Project General Information: The project general information menu has three sub-options, namely Projects, Contractors, and Suppliers/Producers. The Projects screen is the default screen when entering into the Project General Information section. By clicking on the function buttons the screen will display information on Projects, Contractors, Suppliers/Producers, or exit the Project General Information section.

Projects - The Projects information screen allows administrators to enter general project information into corresponding data fields, which include project title, DP number, UPC number, project federal ID, and project start date and close out date. Administrators can also select the Data Units (English or Metric scale) to be used for this project, and the region, contractor, and resident engineer from the Region ID, Contractor ID, and names of resident engineers lists.

Contractors - The Contractors information screen allows administrators to view contractor specific information, add a new contractor, delete a contractor, or edit current contractor information. The contractor information saved here will be available on a Contractor Title selection list on the Projects information screen, in order to select a specific contractor for a project.

Suppliers/Producers - The Suppliers/Producers information screen allows administrators to view supplier/producer specific information, add a new supplier/producer, delete a supplier/producer, or edit current supplier/producer information. The supplier/producer information saved here will be available on a Concrete Supplier selection list on the Mix Design information screen, in order to select a specific supplier/producer for mix design materials. The “Add/Edit Plant Location” button on the screen allows the administrator to add or edit plant locations for suppliers/producers with multiple plant locations.

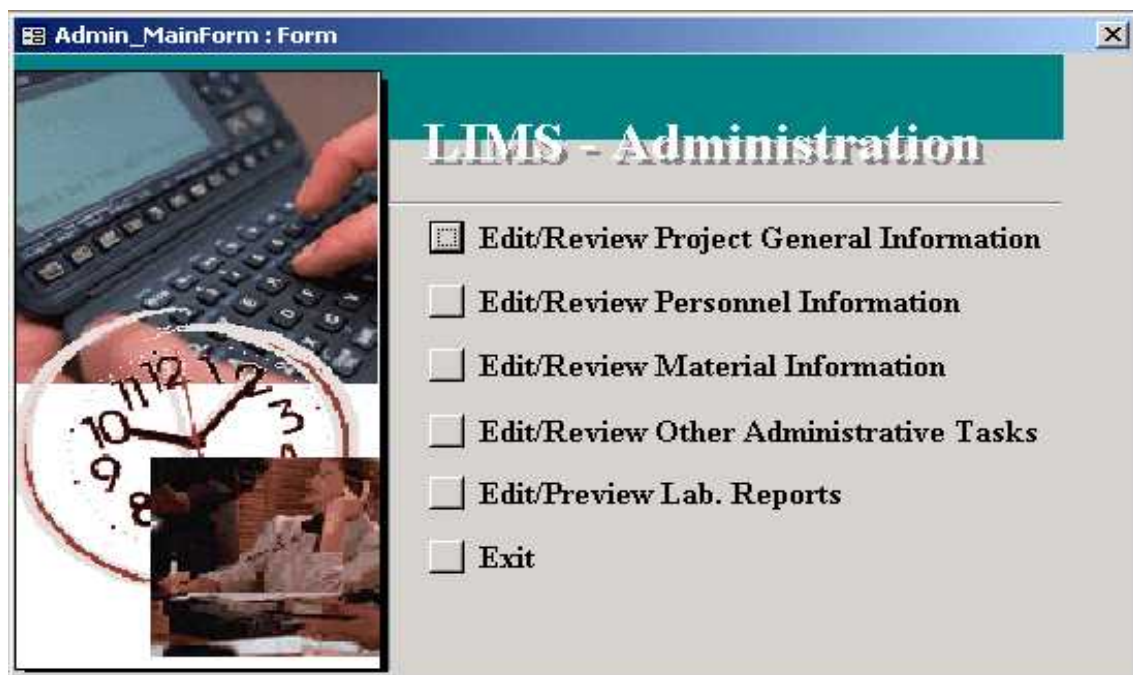


Figure 2. The Main Menu for LIMS Administration Interface

Edit/Review Personnel Information: The Personnel Information section is for administrating LIMS user information. The five sub-options are Groups; Field Offices; Regions; Personnel; and Exit. The Groups screen is the default one when entering into

the Personnel Information section. By clicking the appropriate function button the computer will display information on Groups, Field Offices, Regions, and Personnel, or exit the Personnel Information section. The option will be highlighted in green when the information is displayed.

Groups - There are three system defined user groups in LIMS – Administrators, Supervisors, and Owners (Technicians). Utilizing these three available user groups, the LIMS system will administer security by granting different levels of access to users.

Field Offices - The Field Offices screen allows the administrators to manage field office information by assigning each field office with a unique Office ID. An Office ID is a two-digit ID with the first digit representing region (0 – Trenton; 1 – North; 2 – Central; 3 - South) and the second digit representing office number. For example, Bureau of Materials, Trenton will be assigned Office ID of 00, and the 3rd field office in the northern region will be assigned an Office ID of 13.

Regions - The Regions screen allows the administrators to manage region information by assigning each region a unique Region ID. A Region ID is a one-digit ID representing area (0 – Trenton; 1 – North; 2 – Central; 3 - South).

Personnel - The Personnel information screen allows administrators to view employee specific information, add a new employee, delete an employee, or edit existing employee information. The employee information saved here will be available on a Resident Engineer selection list on the Projects information screen, in order to select a specific resident engineer for a project. Personnel information will also be used to determine access to information when logging onto the web based report system.

Edit/Review Material Information: The “Edit/Review Material Information” section displays the selection windows for the user to view Concrete and Soil material information, respectively. Once the SUPER PAVE mix design data are available, that information will also be added.

Concrete - The Concrete button on the page will open the “Mix Design Board” screen. The Mix Design Board screen allows administrators to enter additional information on concrete mix designs. The existing concrete mix designs database based on Microsoft FoxPro was imported to the SQL database in this project. Therefore, once the mix

design is selected based on the mix design ID, all the fields in the form used for the concrete cylinder test become available.

Soils - The Soil button on the page will open the “Soil_General” screen. This screen allows administrators to enter or modify information on soil type and soil gradation. Also, it allows specifying information on soil material supplier/producer from the Soil Suppliers sub-form in the same way as suppliers/producers were selected in the “Project_General” form.

Edit/Preview Other Administrative Tasks: The Other Administrative Tasks section allows administrators to manage additional information on the LIMS system including options of adding and editing forms, reports, and serial numbers.

Edit/Review Form List - This interface is for adding and editing Form ID, Approved Date, Form Title, Purpose, and corresponding ASP file name for the web application.

Edit/Review Report List - Report Number is either generated by the application or added by administrators from this interface. A Report Number is a combination of Form ID, DP Number, Report Date, and some other unique identifiers. For concrete cylinders, a report number consists of Form ID, DP Number, report date, lot number and class of concrete.

Review Serial Number List - A Serial Number is automatically generated for each test in the web application processing procedure. Each Serial Number is unique.

Edit/Preview Lab Reports: This interface is under development. It is the place for administrators to generate customized reports such as producer/contractor performance evaluation sheets and project quality control summary reports.

Exit: It allows users to exit the LIMS Administration Interface application.

DATABASE-DRIVEN WEB APPLICATION

LIMS data entry is central to all samples whether they are raw materials, in process, intermediate, or finished products. By LIMS design, the data entry can be done manually (basic information initialization), automatically (calculated and transferred

results), or be triggered (data downloading) by another device. Each sampling process has its own logical life from beginning to the end. All data entry forms in LIMS were created according to their sampling logic, and data fields and form layout were standardized. It is the integrated design of the sampling cycles that makes LIMS a flexible and reliable information management system.

Laboratory supervisors outline the tests to be completed and field engineers and sampling workers correspondingly generate specific worksheets and fill in the necessary information after samples are taken for testing. Each sample is uniquely coded for identification using a user defined sample ID number. Using this ID number, all relevant data about the sample can be retrieved at any stage of the sampling process from any location in the system provided the user has the required authority. The sampling process is initiated when the sample and worksheets are brought to the local laboratory for testing and the identification information has been entered into the LIMS database.

Then samples are tested at a local laboratory or sent to the central laboratory in Trenton. Since all the sampling ID information has been input into the system, the labs can display the required test result form from a computer screen based on the sample ID, and update the test data. LIMS will automatically check the specific limits and calculate the required material data so as to generate Pass/Fail reports, and will calculate the pay factors. If all results pass specification, LIMS will recommend a sample completion status or compliance. Comments are entered in the event that a conditional approval status is assigned to a sample. Once a report is generated, the local and central labs as well as other units of NJDOT will be able to use them for further analysis. Finally, all the sampling data are secured with integrity in the relational SQL database for reliable and flexible retrieval and analysis.

Based on the employee information entered by the administrators, authorized users can log on to the NJDOT LIMS web application through the Intranet network. Figure 3 shows the entrance to NJDOT Intranet portion of LIMS.

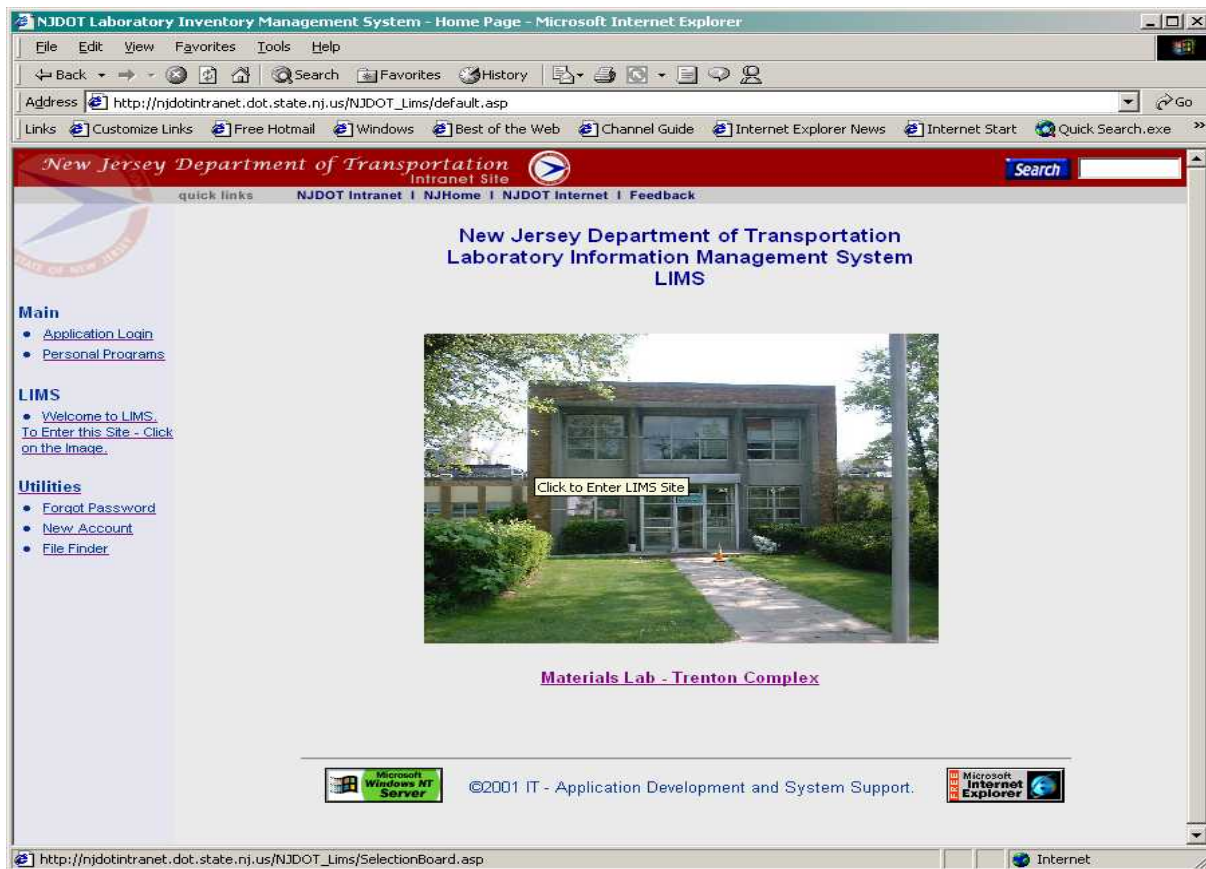


Figure 3. Entrance to NJDOT Intranet LIMS

Construction Materials

The pilot scale LIMS currently contains all the forms for following three major construction materials plus the closeout forms required by FHWA:

- Concrete (cylinders, cores and beams)
- Soils
- Asphalt Concrete

Concrete - Based on tonnage used, fresh concrete is the highest consumed material for NJDOT. Figure 4 is a schematic diagram showing the procedure adopted for testing Portland cement concrete (PCC) cylinders.

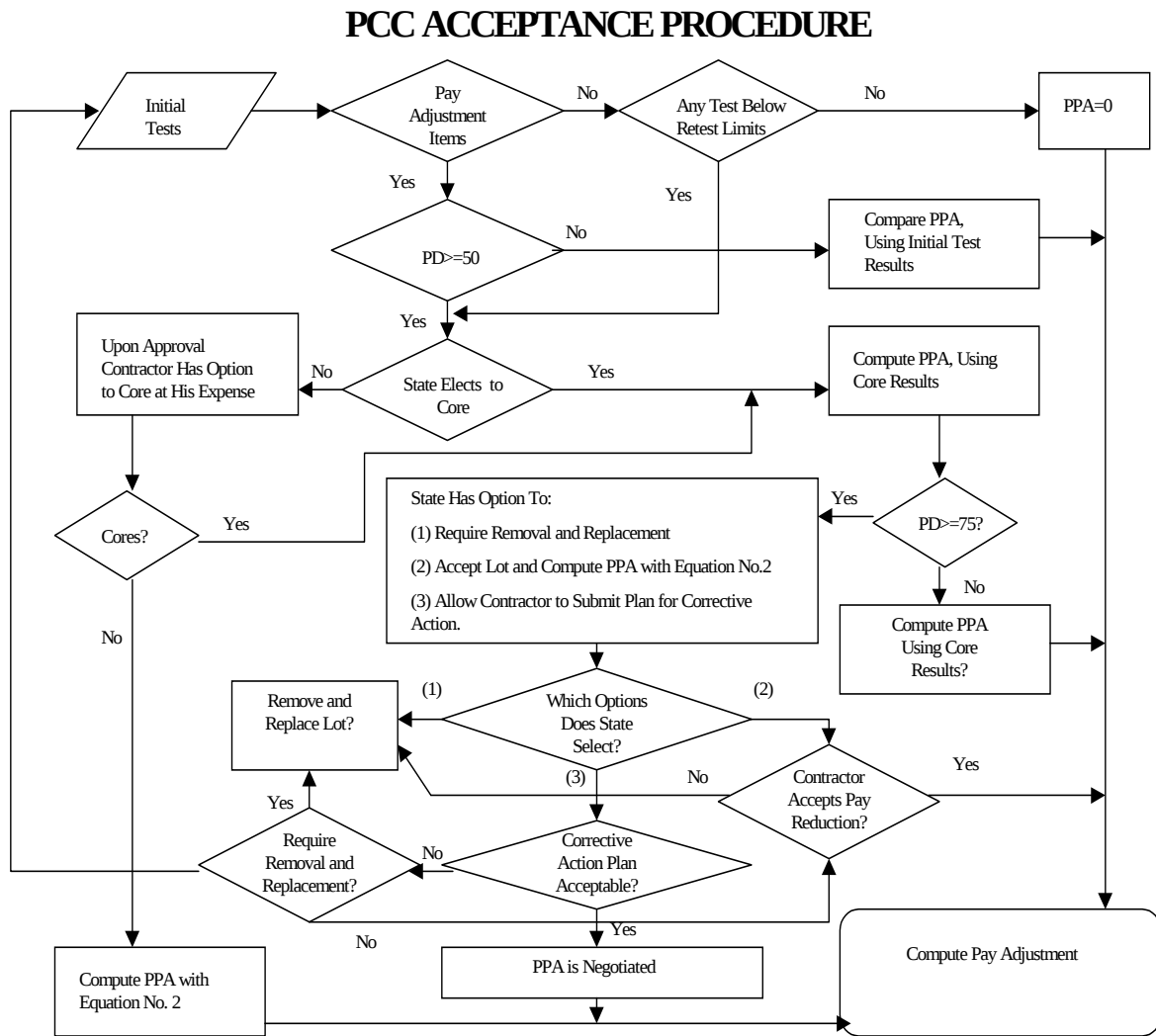


Figure 4. Flow Chart for Concrete Cylinder Tests

As part of the PCC acceptance procedure, Figure 4 shows pay factors for not achieving the specified concrete strength values. The other research issues incorporated in the database include the security of the system. Once an NJDOT employee logs into the LIMS system with their username (name, position and location of the user), the system will assign read, write, edit and delete privileges. For instance a technician entering raw data in a field office can only modify the data entered in that office. Once his or her supervisor approves the data no one is allowed to edit, modify or delete. LIMS essentially implemented the above flow chart in a logical manner and the following section provides the details.

Forms

The NJDOT LB201-CY form includes information on Portland Cement Concrete Cylinder inspection and testing results. The LB201-CY Report ID consists of Form ID (LB-201-CY), DP Number (project identification number), Report Date, Lot Number and Class, and Version Number. Hence the report ID for data shown in Figure 5 will appear as: Form(LB-201-CY)_DP(11111111)_RptDate(10/12/2000)_12A_R0.

Field Office Forms | Central Lab Forms | Full Report Preview | Main Selection Board

LB-201-CY 8/98 NEW JERSEY DEPARTMENT OF TRANSPORTATION Bureau of Materials, Trenton
Construction Maintenance dc
10/10/2001 5:22:39 PM

PORTLAND CEMENT CONCRETE CYLINDER - INSPECTION/TESTING

Project	Route 4 Section 2AE & Route 17 sections 2P & 3G		Region	North Region
Project IDs	DP Number	11111111	UPC Number	
	Federal No.	STP-NH-56(145)		
Contractor	ANSELM I&DECICCO, 23 Hill Street, Newark, NJ			
Supplier	BLUE CIRCLE MATERIALS INC	Location	ALL PLANTS	
Dates Made	Cyls	9/29/2001	Rpt	10/10/2000 (+)
Proposed Use (Type of Constr.)			Type of Mixing	AS PREVIOUS
Total C.M. Placed			Age to Be Tested	28
Class of Concrete	A SLG70/ A (+)	Lot No.	12 (+)	Item No.
Cement Source and Type	AS APPROVED/NEWCEM 70/30 CL A		Pay Item Qty.	
Fine Agg. Source/Location	AMBOY AGGREGATES, SOUTH AMBOY, NJ		LIMS Mix ID:	49
Crse Agg. Source/Location	BLUE CIRCLE, HAMBURG, NJ			
Exact Location of Pour				

(+) Field entry required!
Units: Metric

Tester(s) Business data entry
(First Middle LastName)

Current Report: (Original)

Save
Delete
Reset

Figure 5. LB201-CY General Information Form

There are four sub-forms for the LB201-CY report as described below:

- General Information Form – This is the default screen that displays when retrieving an existing or adding a new report. This form displays general information of a report including Report Unit (Metric or English), Report Version Number (Original or Revised), etc. (See Figure 5).
- Field Office Form – This form displays test results obtained at the field office. Here users need to identify either the Trenton Lab or Regional Lab where subsequent testing will take place. Based on their selection, A Regional Lab Form or Trenton Lab Form will be generated (See Figure 6).

- Region Lab or Trenton Lab Form – This form displays test results obtained at regional laboratories or at the Trenton lab. (See Figures 7 and 8).
- Full Report Review – This form displays all the information from the above three forms for review. A printer-friendly version is also available with the full report review (See Figure 9).

General Information | [Centra Lab Forms](#) | [Full Report Preview](#) | [Main Selection Board](#)

LB-201-CY 8/98 **PORTLAND CEMENT CONCRETE CYLINDER - INSPECTION/TESTING** Bureau of Materials, Trenton
(Revised) (Field Office)
Report ID: Form(LB-201-CY)_DP(11111111)_RptDate(10/12/2000)_12A_R0 12:59:01 AM

Field Office Testing Results		Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
Time Loaded		7:50					
Time Start to Discharge		8:15					
Time Discharge Complete		8:33					
Mixing Revs / Total Revs		C /					
Total Water Plant & Jobsite (Liter)		1080					
Maximum Water Allowable (Liter)	173	1314.8					
Sample From (Truck No.)		372					
Air Test By (AASHTO T-152)		oh					
Slump Test By (AASHTO T-119)		ph					
Cylinders Molded By (AASHTO T-23)		tb					
Quantity Represented (C.M.)		7.6					
Quantity Rejected (C.M.)							
Seal No. 1	(Go Forward)	246416					
2		246487					
Lab Serial No. 1		800858T					
2		800859T					
Slump (mm)		89.00					
Air Temps. (°C)		10.0					
Conc. Temps. (°C) (ASTM C-1064)		18.3					
E.A. Content (%Corr.)		5.5					

Figure 6. LB201-CY Field Office Form

General Information | Field Office Forms | Full Report Preview | Main Selection Board

LB-201-CY 8/98 **PORTLAND CEMENT CONCRETE CYLINDER - INSPECTION/TESTING** NJIT Construction Office
(North Region Lab.) TANG
Report ID: Form(LB-201-CY)_DP(11111111)_RptDate(9/8/2000)_1A_R0 3:24:10 PM

(Original) Date Rec'd in Lab: Date Tested: Age Tested:

Region Lab. Testing Results	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Report to
Seal No. 1	43566	43677	43557	34578	34567	45633	ATT:Wilson, MichaelA. c/o Region Constr. Engr.
Seal No. 2	34556	35455	23467	32456	33234	34533	Trenton Lab. Bureau of Materials
Lab Serial No. 1	400259N	400261N	400263N	400265N	400267N	400269N	ANSELM&DECICCO 23 Hill Street, Newark, NJ
2	400260N	400262N	400264N	400266N	400268N	400270N	American Concrete, NEWARK, NJ
Cylinder Diameter 1							Notes
Cylinder Diameter 2							
Maximum Load - Lbs. Force 1							
Maximum Load - Lbs. Force 2							
Compressive Strength - PSI 1							
(AASHTO T-22) 2							
Avg. Compressive Strength - PSI							
Type of Break (Go Forward)							
Avg. Compressive Strength - Lot							
Std. Dev. =							
Q =							Pay Adjustment ☐
PPA =							Non Adjustment ☒

Remarks: Cylinder Curing Temperature (First 24 hours) Tester(s):

HIGH 100.0 °F LOW 20.0 °F Reviewed By: (Field Unsigned)

Other Comments: (Selecting...) Title:

Save Reset (Back to top)

Figure 7. LB201-CY Region Lab Form

LB201 Form Centra Lab. Section - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites History

Address http://laptopatng/NJDOT_Lims/LB201/LB201_CY_CentraLab.asp Go Links

General Information | Field Office Forms | Full Report Preview | Main Selection Board

LB-201-CY 8/98 **PORTLAND CEMENT CONCRETE CYLINDER - INSPECTION/TESTING** Bureau of Materials, Trenton
(Trenton Lab.) do
Report ID: Form(LB-201-CY)_DP(11111111)_RptDate(11/12/2000)_22B_R0 2:47:57 PM

(Original) Date Rec'd in Lab: 2/11/2001 Date Tested: 2/15/2001 Age Tested: 28

Centra Lab. Testing Results	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Report to
Seal No. 1	3543532						ANSELM&DECICCO 23 Hill Street, Newark, NJ
Seal No. 2	2352335						Trenton Centra Lab. Bureau of Materials
Lab Serial No. 1	800858T						ATT: Tang, Chi
2	800859T						Notes Complies
Cylinder Diameter 1	4						Pay Adjustment ☒ Non Adjustment ☐
Cylinder Diameter 2	4						
Maximum Load - Lbs. Force 1							
Maximum Load - Lbs. Force 2							
Compressive Strength - PSI 1	6,380.0						
(AASHTO T-22) 2	*7,500.0						
Avg. Compressive Strength - PSI	6,380.0						
Type of Break (Go Forward)							
Avg. Compressive Strength - Lot	6,380.0						
Std. Dev. = 2.00							
Q = 3.177							
PPA = 2.00							

Remarks: Cylinder Curing Temperature (First 24 hours) Tester(s): thgf

HIGH 65.0 °F LOW 40.0 °F Reviewed By: Dennis Carlson (Click to Sign)

Other Comments: (Selecting...) Title: Management

Save Reset (Back to top)

Local intranet

Figure 8. LB201-CY Trenton Lab Form

LB-201-CY 8/98

NJIT Construction Office

TANG

5/5/2008 3:05:26 PM

(Original)

NEW JERSEY DEPARTMENT OF TRANSPORTATION
Construction & Maintenance

PORTLAND CEMENT CONCRETE CYLINDER - INSPECTION/TESTING

Project	Route 4 Section 2AE & Route 17 sections 2P & 3G					Region: North Region
Project IDs	DP Number: 11111111		UPC Number: 0909099		Federal No: STP-NH-56(145)	
Contractor	ANSELM & DECICCO, 23 Hill Street, Newark, NJ					
Supplier	American Concrete, NEWARK, NJ					
Dates Made	Cyls. 3/4/2002		Rpt. 9/8/2000			
Proposed Use (Type of Construction)	Cement Concrete		Type of Mixing: TRANSIT			
Total C.Y. Placed	3.8		Age to Be Tested: 28			
Class of Concrete	AAE(H/E)	(Class Used: A)	Lot No. 1		Item No. 2	
Cement Source and Type	ESSROC TYPE II				Pay Item Quantity: 1	
Fine Agg. Source and Location	AMBOY AGGREGATES BLENDED SAND (TYPE C, MT, S, OR R)				Mix ID: 26	
Crse Agg. Source and Location	MILLINGTON QUARRY, MILLINGTON, NJ				Mix SN: N00007	
Exact Location of Pour	DFGSDGSDGSDGSDGSDG					
Time Loaded					Report to ATT: Wilson, Michael A. c/o Full Report Constr. Engr. Trenton Lab. Bureau of Materials ANSELM & DECICCO 23 Hill Street, Newark, NJ American Concrete, NEWARK, NJ Notes	
Time Start to Discharge						
Time Discharge Complete						
Mixing Revs / Total Revs						
Total Water Plant & Jobsite (Gal)						
Maximum Water Allowable (Gal)						
Sample From (Truck No.)						
Air Test By (AASHTO T-152)						
Slump Test By (AASHTO T-119)						
Cylinders Molded By (AASHTO T-23)						
Quantity Represented (C.Y.)						
Quantity Rejected (C.Y.)						
Seal No. 1	43566	43677	43557	34578	34567	45633
Seal No. 2	34556	35455	23467	32456	33234	34533
Slump (inches)						
Air Temps. (°F)						
Conc. Temps. (°F) (ASTM C-1064)						
E.A. Content (%Corr.)						
Water Cement Ratio (W/C)						
A.E. Admixture Dosage:	W.R. GRACE - DARAVAIR 1000				oz/CY	
Chemical Admixture #1 & Dosage	W.R. GRACE - WRDA HVCOL				oz/CY	
Chemical Admixture #2 & Dosage					oz/CY	
Chemical Admixture #3 & Dosage					oz/CY	
Plant Inspector						
Date Rec'd in Lab		Date Tested		Age Tested		
Lab Serial No. 1	400259N	400261N	400263N	400265N	400267N	400269N
Lab Serial No. 2	400260N	400262N	400264N	400266N	400268N	400270N
Cylinder Diameter 1						
Cylinder Diameter 2						
Maximum Load - Lbs. Force 1						
Maximum Load - Lbs. Force 2						
Compressive Strength (PSI)						
(AASHTO T-22)						
Avg. Compressive Strength (PSI)						
Type of Break						
Avg. Compressive Strength - Lot		Std. Dev. =		Q =	PPA =	
Remarks: Cylinder Curing Temperature (First 24 hours) HIGH: 100.0 °F LOW: 20.0 °F Other Comments:						Cases to Notify: * Average strength takes the higher value when value differences are equal to or greater than 600 psi. * 10% below class design strength * Below retest limit Pay Adjustment Item ☐ Non Pay Adjustment Item ☒

Field Office Tester(s):

Field Office Reviewer:

Region Lab. Tester(s):

Region Lab. Reviewer:

Figure 9. LB201-CY Full Report Form

Soils - The LB-269 form includes information on Soils inspection and testing. It is used to generate the summary report for soils (LB-135). LB-269 Report ID consists of Form ID (LB-269), DP Number, Report Date, Soil Type and Sample Number. Hence a typical report ID will appear as:

Form (LB-269)_DP (88888888)_RptDate (4/2/2002)_AggType (I-3)_SampleNo (201)

Forms

There are three sub-forms of the LB-269 report as described below.

- General Information – This is the default screen that displays when retrieving an existing or adding a new report. This form displays general information and a portion of field soil tests. (See Figure 10).
- Field Office/Region Lab Test Form – This form displays results of tests performed by the field office or the regional office laboratory. The test results are shown automatically after all the required fields have been filled. (See Figure 11).
- Full Report Review – This form displays all the information from the above two forms for reviewing purposes. A printer-friendly version is also available with full report review. (See Figure 12).

Region Lab Forms | Full Report Preview | Main Selection Board

LB-269

NEW JERSEY DEPARTMENT OF TRANSPORTATION
FIELD ANALYSIS OF SOIL AGGREGATE

Bureau of Materials, Trenton
tpjsopr
4/15/2002 10:15:58 AM

Project	Rt. 1 & 9 SEC. 2AL				
Producer	Passaic Crushed Stone, Pompton Lakes, NJ				
DP Number	88888888	Type Of Material	I-3		
Date Tested(+)	4/2/2002	Station	2+558		
Sample No.(+)	201	Offset:	25 m		
Date Sampled	3/29/2002	Lane	Right		
Propose Use	subbase	Elevation/Depth	10		
Quantity	525				
Wt. Soil and Pan	5847	(gms)			
Dry Soil and Pan	5798	(gms)			
Moisture Loss	49	(gms)	+No. 4	-No. 4 Reduced	
Wt. of Pan	166	(gms)	Wt. Before Washing(Dry)	2558	(gms) 689 (gms)
Wt. of Dry Soil(Dwy)	5632	(gms)	Wt. After Washing(Dry)	2548	(gms) 647 (gms)
Moisture Content %	0.87		Wash Loss	10	(gms) 42 (gms)
A Dry Weight (+No. 4 Portion)	2558	(gms)	H = Reduced Sample	689	(gms)
B Dry Weight (-No. 4 Portion)	3058	(gms)			
C Dry Weight (Total Sample)	5616	(gms)			
D Wt. of + No. 4 after washing & sieving	2544	(gms)			
E (A-D) Add to -No. 4 Portion	14	(gms)			
F (B+E) Corrected -No. 4 Portion	3072	(gms)			

(+) Field entry required!

Save
Delete
Reset

Figure 10. LB-269 General Information Form

LB-269

FIELD ANALYSIS OF SOIL AGGREGATE - (Region Lab)

Bureau of Materials, Trenton

Report ID: Form(LB-269)_DP(88868888)_RptDate(4/2/2002)_AggType(I-3)_SampleNo(201)

tpjsopr
4/15/2002 10:27:44 AM

Sieve Analysis				
Sieve	Accumulated Wt.	(% Retained × F) +	(D) =	Total Acc. Wt. Retained
No. 8/2.36	214	(0.311 × 3072) +	2544 =	3499
No. 16/1.18	358	(0.52 × 3072) +	2544 =	4141
No. 60/300μ	490	(0.720 × 3072) +	2544 =	4765
No. 100/150μ	558	(0.81 × 3072) +	2544 =	5032
No. 200/75μ	678	(0.984 × 3072) +	2544 =	5567
Pan	11			
Total	689			

Sieve	Accumulated Wt.	% Retained	% Passing	Specifications	
				Min	Max
4 inch/100	0	0	100	100	100
2 inch/50					
1 1/2 inch/37.5					
1 inch/25					
3/4 inch/19	1584	28.1	72	63	100
1/2 inch/12.5					
3/8 inch/9.5					
No. 4/4.75	2544	45.2	55	33	100
No. 8/2.36	3499				
No. 16/1.18	4141				
No. 60/300μ	4765	84.6	15	5	35
No. 100/150μ	5032				
No. 200/75μ	5567	98.85	1.2	0	8

StockPile ☐

Sampled By

Tested By

Checked By (Sign now)

Title

Save

Reset

Remarks CC:

Team Leader:

Project File ☐

Test results: C ☒ NC ☐ US ☐

Figure 11. LB-269 Field Office/Region Lab Form

LB-269

NEW JERSEY DEPARTMENT OF TRANSPORTATION
FIELD ANALYSIS OF SOIL AGGREGATE

Bureau of Materials, Trenton
 upjsopr
 4/15/2002 10:37:43 AM

Project	Rt. 1 & 9 SEC. 2AL		
Producer	Passaic Crushed Stone., Pompton Lakes, NJ		
DP Number	88888888	Type Of Material	I-3
Date Tested	4/2/2002	Station	2+558
Sample No.	201	Offset:	25 m
Date Sampled	5/29/2002	Lane	Right
Propose Use	subbase	Elevation/Depth	10
Quantity	525		
Wt. Soil and Pan (gms)	5847		
Dry Soil and Pan (gms)	5798		
Moisture Loss (gms)	49		
Wt. of Pan (gms)	166	Wt. Before Washing (Dry)(gms)	+ No. 4 2558 - No. 4 Reduced 689
Wt. of Dry Soil (Dw)(gms)	5632	Wt. After Washing (Dry)(gms)	2548 647
Moisture Content %	0.87	Wash Loss (gms)	10 42

A	Dry Weight (+No. 4 Portion) (gms)	2558		
B	Dry Weight (-No. 4 Portion) (gms)	3058		
C	Dry Weight (Total sample) (gms)	5616		
D	Wt. of +No. 4 after Washing & Seiving (gms)	2544	H=Reduced Sample (gms)	689
E	(A-D) Add to -No. 4 Portion (gms)	14		
F	(B+E) Corrected -No. 4 Portion (gms)	3072		

Sieve Analysis					
Sieve	Accumulated Wt.	Total Acc. Wt. Retained			
No. 8/2.36	214	3499			
No. 16/1.18	358	4141			
No. 50/300µ	498	4755			
No. 100/150µ	558	5032			
No. 200/75µ	678	5557			
Pan	11				
Total	689				
Sieve	Accumulated Wt.	% Retained	% Passing	Specifications	
				Min	Max
4 inch/100	0	0	100	100	100
3/8 inch/9.5					
2 inch/50					
1 1/2 inch/37.5					
1 inch/25					
3/4 inch/19	1584	28.1	72	60	100
1/2 inch/12.5					
No. 4/4.75	2544	45.2	55	30	100
No. 8/2.36	3499				
No. 16/1.18	4141				
No. 50/300µ	4765	84.6	15	5	35
No. 100/150µ	5032				
No. 200/75µ	5567	98.85	1.2	0	8

Remarks CC: Sampled By:
 Tested By:
 Checked By:
 Team Leader: Project File ☐ Test Status: C

Legend For Test Comply: C - Complies; NC Non-complying; CS - Complies but is subject to testing after compaction

Figure 12. LB-269 Full Report Form

Based on the LB-269 forms, the LB-135 summary report is generated at the end of each week for all soil types for a given project. The data for the report is retrieved from the LB-269 forms and summarized by the project (DP Number), Soil Type and the week ending date to generate the LB-135 report (See Figure 13).

[LB135 Report Selection](#) | [Main Selection Board](#)

Weekly report data searching result is empty. Display a sample report sheet only.

LB-135 NJIT Construction Office
tang
12:07:20 PM

**NEW JERSEY DEPARTMENT OF TRANSPORTATION
WEEKLY REPORT OF MATERIAL ANALYSIS**

Project	(Project_Title)	Report No	(RptNo_By Week)
DP No.	88888888	Sheet No.	(Sheet No.)
Type of Material	I-3	Week Ending	4/12/2002
Contractor	(Contractor_Title)	Federal #	(Project_Federal_ID)

						Sieve Size(&Passing)								Region:	(ID)	
Date Taken	Sample No	Station	Lane	Propose Use	Source & location	1 1/2"	3/4"	No4	No8	No16	No50	No100	No200	M.C (%)	Legend	Oper.
(Date_Rpt_made)	(Sample_Number)	(Station)	(Baseline)	(AreaRep)	"Supplier_Location"											
Type I-3 Requirements																

Remarks		Distribution	Regional Office
			(Lastname, Firstname Initial.)
			Supervisor Construction Engineer
			(Contractor_Title)
			(Project File)
Quantity to Date:			

Submitted by		Legend: C : Conforms to grading requirements of specifications NC: Does not conform to grading requirements of specifications CS: Conforms but subject to test after compaction
Reviewed By		

Figure 13. LB-135 Summary Report Example

Asphalt Concrete - The LB-68 form for asphalt includes information on layer thickness, specific gravity and void content of bituminous concrete cores. LB68 Report ID consists of Form ID (LB-68), DP Number, Report Date, Lot Number, Lift, Type, and the Revision Number. Hence a typical report ID will appear as:

Form (LB-68)_DP(11111111)_RptDate(1/1/2000)_LotNo(10)_Lift(S)_Type(OS)_R2.

Forms

There are three sub-forms of the LB-68 report as shown below:

- General Information — This is the default screen that displays when retrieving an existing or adding a new report. This form displays general information including Report Units (Metric or English), Report Version (Original or Revised), etc. (See Figure 14.)
- Trenton Lab Form – This form displays test results performed by the Trenton lab. (See Figure 15.)
- Summary Sheet – This form displays summary information of a specific sample. It will highlight the specification that the sample fails to meet. A printer-friendly version is also available with full report review (See Figure 16).

Based on the LB-68 form, the LB-68 Summary Sheet is generated. The summary sheet consists of summarized information of a test sample, as well as the testing criteria for validating/accepting the sample.

LB-68 Form Project Information Section - Microsoft Internet Explorer

Trenton Lab Forms | Summary Sheet | Main Selection Board

LB-68

NEW JERSEY DEPARTMENT OF TRANSPORTATION
Construction Maintenance

North Region Lab VP
12/21/2001 10:31:14 PM

Thickness, Specific Gravity and Void Content of Bituminous Concrete Cores

Project: Route 4 Section 2AE & Route 17 sections 2P & 3G Region: North Region

Project IDs: DP Number 11111111 UPC Number 0909099 Federal No. STP-NH-56(145)

Contractor: ANSELM & DECICCO, 23 Hill Street, Newark, NJ

Supplier: Mix

Paving Contractor:

Purpose of Use:

Report Date: 6/15/1985 (+) Date Cut: 7/15/1986 Size: (megagram)

Lot No.: 27 (+) Item No.: Lift: base (+) Type: base (+)

(+) Field entry required!
Units: Metric

Tester(s): Jvis (First Middle LastName)

Current Report: (Original)

Save Delete Reset

Figure 14. LB-68 General Information Form

LB-68 Form Lab. Section - Microsoft Internet Explorer

Address: http://nctip-tang/lms_spp2/LB68/LB68_RegionLab.asp

Google Search Web Search Site PageRank PageInfo Up Highlight

Customize Search Yahoo! Companion Sign in My Yahoo! Yahoo! Mail Finance News Travel Links

General Information | Summary Sheet | Main Selection Board | Print Version

LB-68 ANALYSIS OF ASPHALT (Trenton Lab.) North Region Lab SM 11:31:37 PM

Report ID: Form(LB-68)_DP(11111111)_RptDate(6/12/1979)_LotNo(26)_Lift(B)_Type(of)_R0

(Original)

CORE No.	SERIAL No.	RECEIVE DATE	COMPLETE DATE	STATION	LANE	OFF SET	THICKNESS (mm)	BULK SP. GR.	X	DM	AIR VOIDS %
126					+						ZL ZU
127					+						
128					+						
129					+						
130					+						
							AVERAGE				

RETEST DATE CUT

CORE No.	SERIAL No.	RECEIVE DATE	COMPLETE DATE	STATION	LANE	OFF SET	THICKNESS (mm)	BULK SP. GR.	X	DM	AIR VOIDS %
					+						QL QU
					+						
					+						
					+						
					+						
							AVERAGE				

Notes: Tester(s) Save

Done Local intranet

Figure 15. LB-68 Trenton Lab Form

General Information | Trenton Lab. Forms | Main Selection Board | Print Version

LB-68 NEW JERSEY DEPARTMENT OF TRANSPORTATION Bureau of Materials Bureau of Materials, Trenton tjsopr 4/29/2002 5:53:58 PM

Thickness, Specific Gravity and Void Content of Bituminous Concrete Cores

PROJECT	Route 4 Section 2AE & Route 17 sections 2P & 3G		
Lift	S	B=Base or S=Surface	
Type	OS	ML=Mainline & New Shoulders	OS=Old Shoulders
LotSize (Square Meters)			LotSize (megagrams) 738

LOT NO	10
Core No.	Thickness (mm)
46	45
47	48.0
48	50.0
49	50.0
50	73.0
R46	29
R47	67
R48	59
R49	54
R50	50

Air Voids	36.9
37.3	
37.8	
37.8	
37.0	
10.0	
30.0	
15.0	
35.0	
20.0	

Avg. Voids	STD S	QL	QU
22.7	23.00062	0.82	-0.70
PDL	PDU	PD total	
20.98	74.37	95.35	
Average Thickness	52.50		
Average Gmb	3.093		

Lift	Type	Limits	Equation Number	C1	C2	PPAv	Formula	Non-Compliance
SURFACE	Mainline & New Shoulders	PD < 10	S1					
SURFACE		10 <= PD < 30	S2					
SURFACE		PD >= 30	S3					
SURFACE		PD < 10	S4					
SURFACE	OLD Shoulders	10 <= PD < 50	S5	1	2	-194.8		
SURFACE		PD >= 50	S6					

Comments:

Retest option at PD>=30 for mainline (5 more cores?)
Retest option at PD>=50 for all shoulders (5 more cores?)
If the Department elects not to take additional cores, the pay adjustment stands regardless of the PD and PFv is calculated using equation B1 or B2 or S2 or S5.
If the Department takes the additional five cores and PD<75 then PFv is calculated using B1 or B2 or B3 or B4 or S1 or S2 or S3 or S4 or S5 or S6 as indicated by type of construction and the PD from the ten cores.

Removal and Replacement: If the additional core option is exercised and the set of 10 tests show that PD>=75, the Department may require removal and replacement at the Contractor's expense.
If the Department does not require removal, the contractor may elect to leave the lot in place and accept payment based on the set of 10 cores and appropriate equation as per PD and type of construction or remove and replace at no cost to the Department.

Save

Figure 16. LB-68 Summary Sheet

All the required close out forms have been incorporated into the LIMS System. This feature will help users to process closeout of projects effectively and efficiently. Only administrators are authorized to create closeout forms. However, supervisors are authorized to create the LB-23 form, which contains soil information. All other users may open, view, and print the closeout forms. The following Close Out Forms are currently available in the LIMS System: Form LB95-A, Form LB95-Electrical, Form LB95-Landscape, Form LB95-Soil, Form LB317, Form LB23 (see Figure 17), Form LB212, Form LB96 (see Figure 18, close out letter form).

[illegible]

21

Close Out Forms | [Exceptions Failures](#) | [Print Version](#)

LB-96

James Weinstein
COMMISSIONER

Federal Highway Administrator
840 Bear Tavern Road
Suite 310
West Trenton, NJ 08628

DEPARTMENT OF TRANSPORTATION
BUREAU OF MATERIALS ENGINEERING & TESTING
P.O. Box 607
TRENTON, NJ 08625-0607

IN REPLY PLEASE REFER TO:

Project: Route 4 Section 2AE & Route 17 sections 2P & 3G
FP#: STP-NH-56(145)
County:
Region: North Region
Date:

This is to certify that:

The results of the tests on acceptance samples for the referenced project indicate that the materials incorporated in the construction work and the construction operations controlled by sampling and testing were in conformity with the approved plans and specifications, and that such results compare favorably with the results of the independent assurance sampling and testing.

Exceptions to the plans and specifications concerning materials are explained on the back hereof.

Chief, Bureau of Materials
Engineering and Testing

Figure 18. LB-96 Close Out Letter to FHWA

[Close Out Forms](#) | [LB-96](#) | [Print Version](#)

EXCEPTIONS OR FAILURES

(Attachment to LB-96 Close Out Letter)

The following materials (items) failed to comply with NJDOT Plans and Specifications.
Corrective action was taken by the Resident Engineer and /or Resident Materials Engineer

<u>Item No.</u>	<u>Lot No.</u>	<u>Description</u>	<u>Comments</u>
101	15	wall (BM)	Penalized as per Spec.
		No More Records Exist!	

Figure 19. LB-96 - Exceptions or Failures Report

DEPARTMENT OF TRANSPORTATION
BUREAU OF MATERIALS ENGINEERING & TESTING
P.O. Box 607
TRENTON, NJ 08625-0607

James P. Fox
Commissioner

Federal Highway Administrator
 840 Bear Tavern Road
 Suite 310
 West Trenton, NJ 08628

IN REPLY PLEASE REFER TO:

Project: Route 4 Sec.2 AE & route 17 sections 2P & 3G
 FP#: STP-NH-56(145)
 County:
 Region: North Region
 Date:

This is to certify that:

The results of the tests on acceptance samples for the referenced project indicate that the materials incorporated in the construction work and the construction operations controlled by sampling and testing were in conformity with the approved plans and specifications, and that such results compare favorably with the results of the independent assurance sampling and testing.

Exceptions to the plans and specifications concerning materials are explained on the back hereof.

Chief, Bureau of Materials
Engineering and Testing

Figure 20. Sample of Closeout Letter

CONCLUSIONS

The implementation of LIMS can significantly reduce paper-work loads and provides the capability to organize relevant materials data rapidly. It also shortens the time between project completion and the final closeout procedure mandated by the Federal Highway Administration (FHWA) for federally funded projects. LIMS and its concept have a great potential to be a showcase for the nation, and to be adopted by other transportation agencies for management of materials and laboratory test data.