Development of the Connecticut Product Evaluation Database Application – Phase 1A

Report I

Darrell E. Smith

March 2006

SPR-2239

Report Number
CT-2239-01-06-3

Connecticut Advanced Pavement Laboratory
Connecticut Transportation Institute
University of Connecticut
Storrs, Connecticut

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. CT-2239-01-06-3	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Development of the Connecticut Product Evaluation Database Application		**5. Report Date** March 2006 **6. Performing Organization Code** SPR-2239 Phase 1A
7. Author(s) Darrell E. Smith		**8. Performing Organization Report No.** CAPLAB1-2005
9. Performing Organization Name and Address University of Connecticut Connecticut Transportation Institute 179 Middle Turnpike, U-202 Storrs, Connecticut 06269-5202		**10 Work Unit No.** (TRAIS) N/A **11. Contract or Grant No.** CT-SPR Study No. SPR-2239, Phase 1A
12. Sponsoring Agency Name and Address Connecticut Department of Transportation Office of Research and Materials 280 West Street, Rocky Hill CT 06067-0207		**13. Type of Report and Period Covered** Report 1 January 2004 to March 2006 **14. Sponsoring Agency Code**

15. Supplementary Notes

A study conducted in cooperation with the U.S Department of Transportation, Federal Highway Administration.

16. Abstract

This report documents the development of a product evaluation database management application. The application is designed to be an efficient, convenient, and cost effective alternative to a traditional paper filing system and old non-functioning MS-DOS-based database system. The resulting new application has been implemented and is used daily in operations of the Connecticut Department of Transportation, Office of Research, Product Evaluation section.

17. Key Words Connecticut Product Evaluation Database, ConnPED	**18.Distribution Statement** No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

19. Security Classif. (of report) Unclassified	**20. Security Classif. (of this page)** Unclassified	**21. No. of Pages** 38	**21. Price** N/A
Form DOT F 1700.7 (8-72)	**Reproduction of completed page authorized**		

DISCLAIMER

The contents of this report reflect the views of the author who is responsible for the facts and accuracy of the data presented herein. The contents do not reflect the official views or policies of the Connecticut Department of Transportation, Federal Highway Administration or the University of Connecticut. This report does not constitute a standard, specification or regulation.

The U.S. Government, State of Connecticut, nor the University of Connecticut endorses products or manufacturers. Trade or manufacturer names appear herein only because they are considered essential to the objective of this document.

ACKNOWLEDGMENTS

The author wishes to acknowledge the support of both the Federal Highway Administration and the Connecticut Department of Transportation. The author wishes to acknowledge Ms. Gabriela Ruz for her programming expertise in developing the prototype version of the ConnPED application. The author also wishes to acknowledge Mr. Andrew Mroczkowski, Ms. Dionysia Oliveira, and Mr. Alan Lisitano of the Connecticut Department of Transportation Research Division for providing assistance in developing, testing, and deploying the application.

TABLE OF CONTENTS

TECHNICAL REPORT DOCUMENTATION PAGE..... ii

DISCLAIMER..... iii

ACKNOWLEDGMENTS..... iv

TABLE OF CONTENTS..... v

LIST OF ABBREVIATIONS AND ACRONYMS..... vii

LIST OF FIGURES..... viii

LIST OF TABLES..... ix

INTRODUCTION..... 2

Background..... 2

Objectives..... 3

PRODUCT EVALUATION DATABASE APPLICATION (ConnPED)..... 3

Problem Statement..... 3

Vision Statement..... 4

User Profiles..... 4

Scope of the Project..... 4
Product Evaluation Use Case Scenarios..... 5

Project Goals..... 7
Business Goals..... 7
Design Goals..... 7

Project Requirements..... 8
Business Requirements..... 8
User Requirements..... 8
Product Evaluation Engineer..... 8
Connecticut DOT Personnel..... 9
Operational Requirements..... 9
System Requirements..... 10

ConnPED Application Design..... 10
Architecture Overview..... 10
Object Model Diagram..... 12
Database Design..... 13
Security..... 14
Error Logging..... 14
Program Flow Charts..... 15
User Interface Forms..... 17

FINDINGS AND CONCLUSIONS..... 24

BENEFITS..... 25

PHASE 1A IMPLEMENTATION AND FEEDBACK..... 25

REFERENCES **27**

LIST OF ABBREVIATIONS AND ACRONYMS

AASHTO	American Association of State Highway Transportation Officials
APEL	Approved Product Listing
ConnDOT	Connecticut Department of Transportation
ConnPED	Connecticut Product Evaluation Database
DOIT	Connecticut Department of Information Technology
DOT	Department of Transportation
FWHA	Federal Highway Administration
NTPEP	National Transportation Product Evaluation Program
ODBC	Open Database Connectivity
PDF	Portable Document Format
RLC	Research Liaison Committee
SQL	Structured Query Language
VB.NET	Visual Basic .NET
XML	Extensible Markup Language

LIST OF FIGURES

Figure 1. Use Case Diagram..... 5

Figure 2. Object Model Diagram..... 12

Figure 3. Database Design..... 13

Figure 4. Process Preliminary Product Evaluation Information..... 15

Figure 5. Evaluate Product Process..... 16

Figure 6. View Product Status..... 17

Figure 7. Main Form (Switchboard)..... 18

Figure 8. Product Information Form..... 19

Figure 9. Edit Evaluation Form..... 20

Figure 10. Add/Edit Decisions Form..... 21

Figure 11. Search Form..... 22

Figure 12. Report Viewer Form..... 23

LIST OF TABLES

Table 1. User Profiles and Use Actions..... 4

Table 2. Error Logging..... 15

Table 3. Report Export Formats..... 23

INTRODUCTION

Background

The Division of Research of the Connecticut Department of Transportation (ConnDOT) currently provides product evaluation data to federal clearinghouses/databases. Considerable manual effort is generally required to gather and manipulate the data and information required for input to the national information databases for product evaluation.

ConnDOT provides product evaluation data to the AASHTO National Transportation Product Evaluation Program (NTPEP) and the AASHTO Approved Product Evaluation Listing (APEL). Although there is no federal statutory requirement to participate in these programs, ConnDOT has always supported the concept of sharing resources with other governmental agencies to reduce duplication and improve its decision-making capability, and therefore, has supported both NTPEP and APEL since the inception of both programs.

NTPEP is a nationwide program that was created in the early 1990's to test/evaluate proprietary transportation products, using standard specifications and is of interest to a national audience. The NTPEP program disseminates the results of the test/evaluation to concerned parties. Each product is tested at four different test sites (southwest, southeast, northwest and northeast) thereby accounting for different climates, geographies and other geophysical/environmental factors that occur in the United States. The test results and other information are provided upon request on paper reports or compact disks (CDs). [www.ntpep.transportation.org]

APEL is a nationwide information clearinghouse that provides information about proprietary transportation products that are usable in a particular area or that have unique specifications/characteristics. APEL was first deployed in the late 1990's to help facilitate the sharing of information and resources between the participating state transportation agencies, thereby reducing duplicate testing and allowing faster implementation of innovative products. The evaluation and testing are conducted by the individual state agencies and the information is provided to APEL via the Internet. APEL evolved from the Special Products Evaluation Listing (SPEL), an information clearinghouse that had been in use for many years. {www.apel.transportation.org]

Objectives

The objective of the ConnDOT Research study Phase 1A as published in the study proposal dated November 2003 was:

- Develop a contemporary Connecticut Product Evaluation Database (ConnPED) application to store and maintain all pertinent data related to the product evaluation process in the Connecticut Department of Transportation.

PRODUCT EVALUATION DATABASE APPLICATION (ConnPED)

Problem Statement

The Connecticut Department of Transportation needs to update existing antiquated and non functional product evaluation software and create a centralized data storage solution accessible by all ConnDOT employees.

Vision Statement

The Product Evaluation Database will provide Connecticut Department of Transportation personnel a software interface for collecting and sharing facts, notes, ideas, and decisions involved in the evaluation of proprietary transportation products and store the information in a searchable database.

User Profiles

The following user types are expected for the Product Evaluation Database application:

Table 1 User Profiles and Use Actions

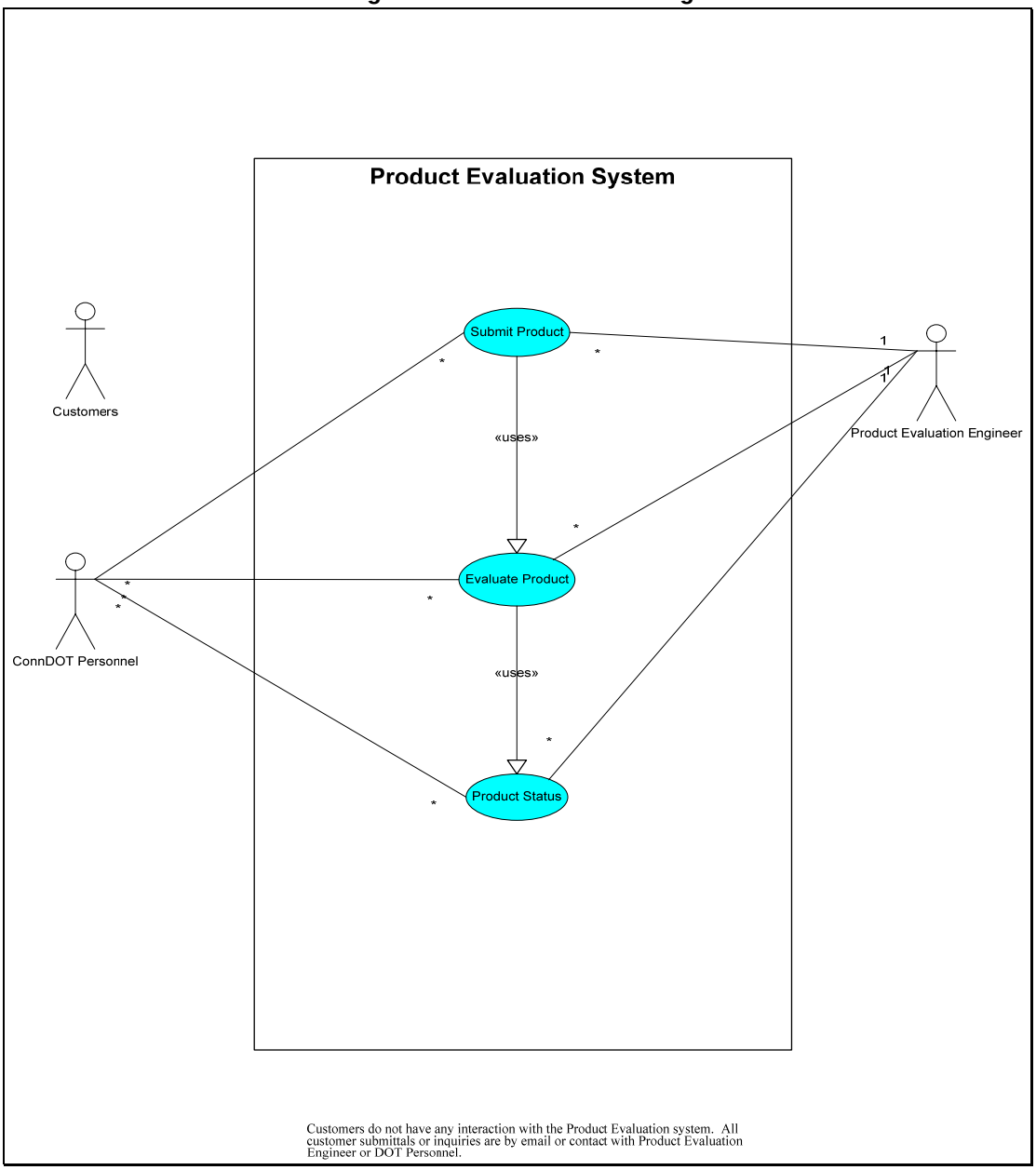
User	**Brief Description of Use Actions**
Product Evaluation Engineer	Enters, retrieves, and modifies all product evaluation information.
Connecticut Department of Transportation Personnel	Personnel with “Manager” access rights have Product Evaluation Engineer use actions. All other personnel can view product information and evaluation status.
Customers	Customers (vendors and manufacturers) do not have direct interaction with the application but product information is provided by customers and entered into the application. Evaluation information (status, results, etc) is provided to the customers.

Scope of the Project

Figure 1 shows the use case diagram that represents the scope of the Product Evaluation application. The three main use cases (Submit Product, Evaluate Product, and Product Status) are illustrated and the user interaction with each case is exposed by the connected lines.

This space was intentionally left blank.

Figure 1. Use Case Diagram



Product Evaluation Use Case Scenarios

Use Case Description: Submit Product (For Evaluation)

Precondition: A customer wants to submit a product to be evaluated by the Connecticut Department of Transportation.

Main Flow of Events:

1. Customer fills out the Product Preliminary Evaluation form and sends it to the Product Evaluation Engineer.
2. The Product Evaluation Engineer enters the preliminary information into the application.
3. Product evaluation Engineer notifies the customer that the product is being considered for evaluation.

Use Case Description: Evaluate Product

Preconditions: A customer has submitted a new product for evaluation by ConnDOT personnel, the product information has been entered into the application, and the Departments Research Liaison Committee (RLC) members have agreed to evaluate the product.

Main Flow of Events:

1. Submitted product is reviewed by Product Evaluation Engineer.
2. Copies of submitted product information are sent to the RLC members.
3. Evaluation committee members meet to discuss the products.
4. Decisions or actions are made on a product.
5. Evaluation information is entered into the application.
6. Reports on product evaluation status are available.

Use Case Description: Product Status

Precondition: The product is either in the process of being evaluated, or has been evaluated by ConnDOT RLC members.

Main Flow of Events:

1. User searches application by product name, product description, manufacturer, or contact person to view or print the status of the evaluation.

Project Goals

The project goals for the Product Evaluation Application are categorized by specific business and design goals.

Business Goals:

The business goal for this application is established in the vision statement with the following additional detail:

- Make product evaluation data electronically accessible to all ConnDOT employees.
- Electronically store all information used in making any decision on a product.
- Provide detailed reports that list all product information, and product status.
- Create summarized product evaluation reports.
- Reduce the “paper trail” involved in the product evaluation process.
- Import pertinent product and evaluation data from non functioning DOS based program (Advanced Revelation) into the application.
- Support data reporting requirements to NTPEP and APEL.

Design Goals:

- Create a scalable database application that does not require the services of a dedicated programmer or a database administrator to maintain the system.
- Store the data in a inexpensive, reliable, user friendly, contemporary database management system.
- Create an application that easily adapts to changes in the business processes.
- Create a user interface that is easy to navigate and comprehend.

Project Requirements

Project requirements for the Product Evaluation application are classified by business, user, operational, and systems requirements.

Business Requirements:

The business requirements for the ConnPED application are discussed in the Business Goals section with the following additional requirement details:

- Product evaluation engineer and managers should be able to assign a product evaluation number to any product entered in the application.
- Users should be able to export the reports to different formats (PDF, text files, Word Documents, Excel, XML, etc) which would facilitate uploading the information to APEL or sharing the data with other departments or state agencies.
- Only the product evaluation engineer and designated managers should be able to alter information in the database.
- Product Evaluation business rules must be adhered to and implemented in the application to ensure data integrity and validation.

User Requirements*:*

User requirements are categorized by user profile types. (See Table 1. - User Profiles and Use actions)

Product Evaluation Engineer

- Add, update, and delete product and evaluation information.
- Administrative access to the application to enable or disable “Management” access for ConnDOT users.
- Electronically store material specifications, product instructions, and pictures with product data.

- View report with time line of actions and decisions for one or all active products.
- Search the data in various ways, for example:
  - By Product Name
  - By Product Description
  - By Manufacturer
  - By Contact Name

Connecticut DOT Personnel

- View product evaluation information and status.
- DOT personnel with “Management” access to the product evaluation application have the same data access and privileges as the product evaluation engineer.

Operational Requirements:

The following operational requirements provide a high-level view of how the ConnPED application will interact with ConnDOT’s network infrastructure.

- The application must work with the existing networking infrastructure.
- Database will be stored on a file server where incremental and full weekly backups occur.
- The application should be able to support multiple users.
- Database access/file permissions have to be set for each user.
- Ensure that product evaluation data is easy to access with or without the use of a front end application.
- Minimize the technical knowledge of database management systems that ConnDOT staff needs to access the database.
- Generate ad hoc queries upon request.

- Local administration privileges are required to install the front end application (user interface) on the computer.

System Requirements:

These are additional constraints from a system perspective:

- Application has to meet specifications defined by the Connecticut Department of Information Technology.
- The application should not require any additional user credentials other than the credentials needed to logon on the ConnDOT Windows network.
- Microsoft® Outlook® is needed to send email to contacts.
- An internet browser is required to view the HTML help.
- An active internet connection is required to view web site links and the Connecticut Department of Transportation Approved Product List.
- Disk storage space is required to save specifications, instructions and picture files.

ConnPED Application Design

The following descriptions, diagrams, flow charts, and illustrations represent a high level presentation of the design of the ConnPED application.

Architecture Overview:

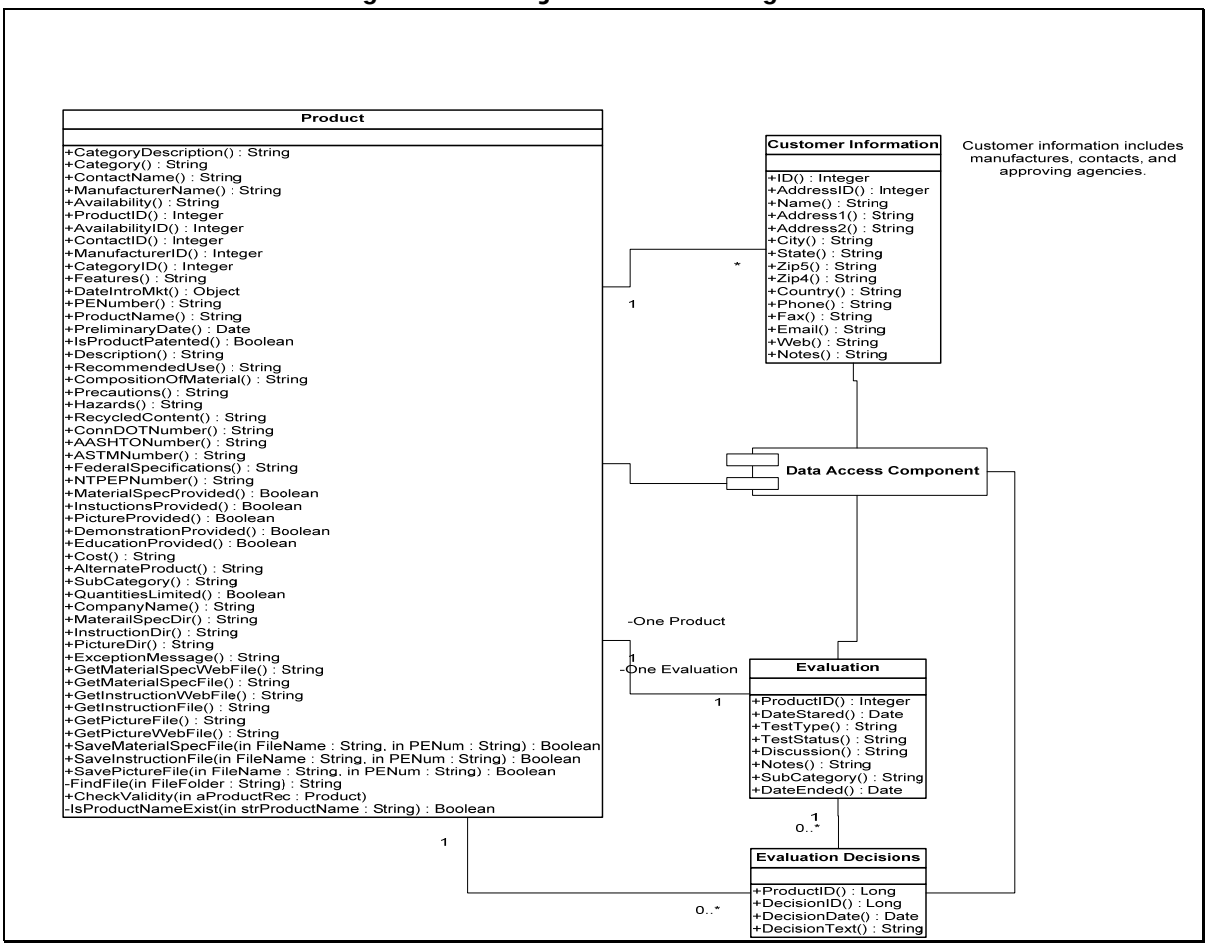
The ConnPED application consists of a front end application developed using VB.NET. Visual Basic 6.0 was used to develop the prototype ConnPED application. Converting the prototype to VB.NET object oriented programming language offered the best scenario for rapid development and deployment without losing efficiency and code

reuse. Microsoft Access® 2003 was used as the backend database because of its relatively inexpensive cost, its potential for portability, and end user maintainability. The database backend can be converted to a more robust database management system application (Oracle or SQL Server 2000) simply by upsizing the database and changing the data access layer (See Figure 2.). The front end application is available locally (installed on local computers running Microsoft® Windows® operating systems) to internal Connecticut Department of Transportation Microsoft Windows clients. The backend database resides on a file server in the Office of Research and Materials.

This space was intentionally left blank.

Object Model Diagram:

Figure 2. Object Model Diagram

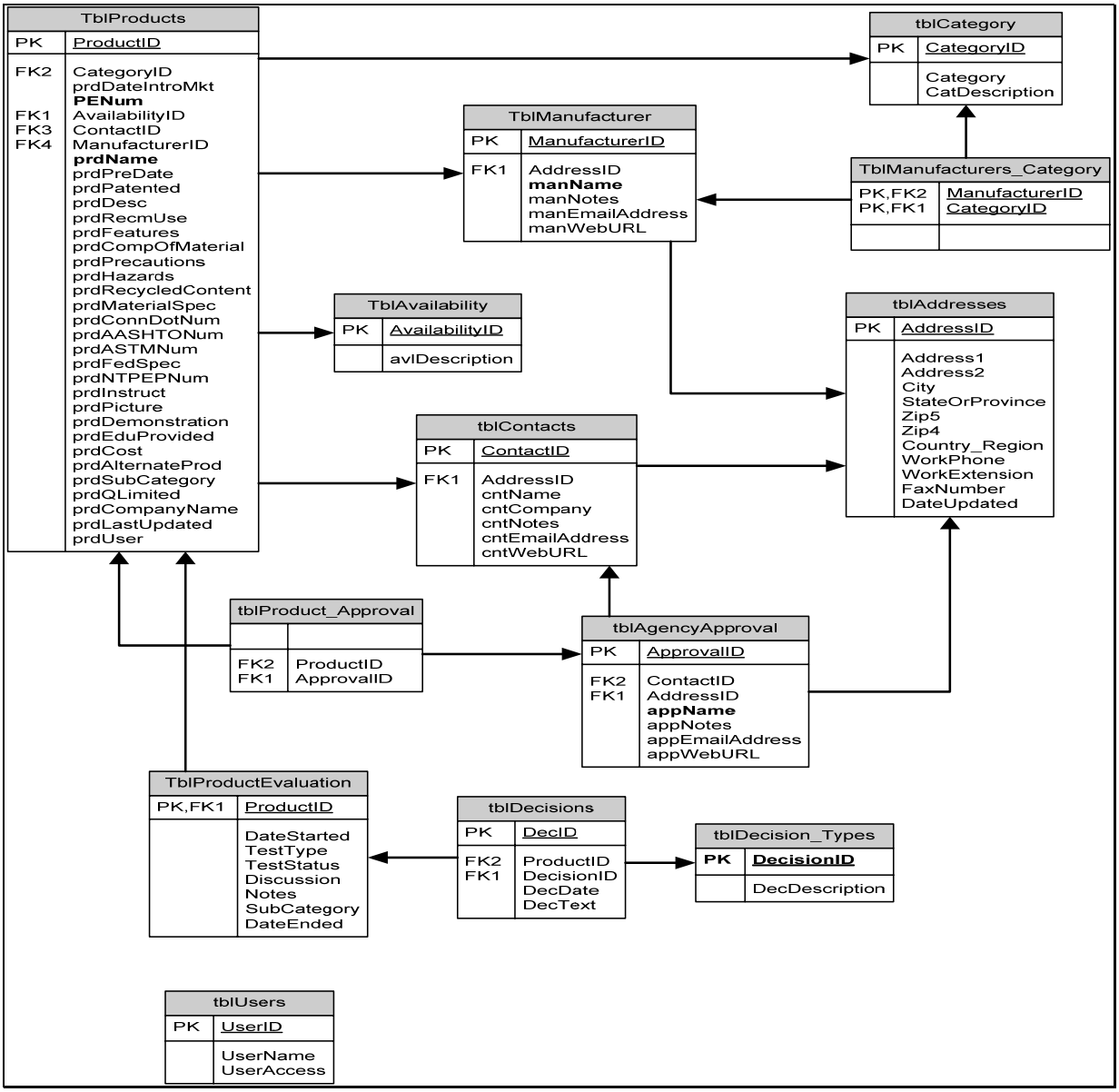


The object model diagram represents the consolidated static structure of the object oriented logical design of the ConnPED application. There are five main components or objects (Product, Customer Information, Data Access Components, Evaluation, and Evaluation Decisions). Products are entered into the system and are associated with one evaluation object. Products and evaluations can be associated with zero or many decisions. Customer information is a consolidated object for all contacts, manufacturers, and approving agencies.

This space was intentionally left blank.

Database Design:

Figure 3. Database Design



The database diagram illustrates the physical design of all the tables in the ConnPED application. Database optimization is attempted by using indexes and implementing a level of data normalization. Some of the indexes are illustrated using the PK and FK symbols which

represent primary and foreign keys. Primary and foreign keys are used in table relationships illustrated with the arrows connecting the table diagrams. Database normalization is strived for by eliminating redundant address data (Contact, manufacturer, and approving agencies) and creating one table to store address information. To ensure the quality of data stored in the database, data integrity rules are implemented and data validation will follow the product evaluation business rules.

Security:

Security for the ConnPED application primarily relies on ConnDOT's Microsoft Windows® network authentication and file access authorization. The ConnPED application examines the authenticated user credentials (username) and looks up the user's access level in the database user table (tblUsers). If the username is not in the user table the user is assigned an access level of "user". Users with "user" access cannot make any changes to the data. The Access database is secured with file access permission on the operation system level. All Connecticut Department of Transportation personnel have read access to the database but anyone who has "manager" access rights is granted read/write access and can add, edit or modify the data.

Error Logging:

Error logs will be maintained on a per-client computer basis. Each local installation of the application will maintain an error log. Each error message will be appended to an error log file which will contain the information in the following table.

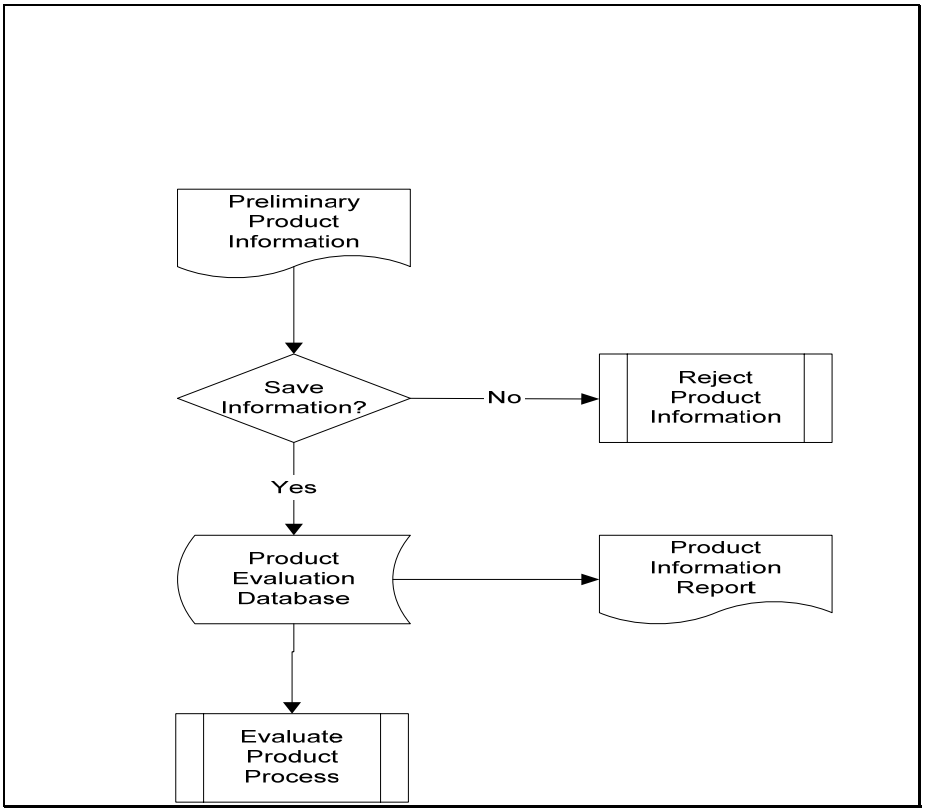
Table 2. Error Logging

Name	Meaning
Date\Time	Date and time error was generated
Error Code	Error Number associated with the error
Error Message	Human-readable, such as "Problem accessing the Database" or any system generated error message.

Program Flow Charts:

The following flow charts represent a high level representation of the ConnPED application.

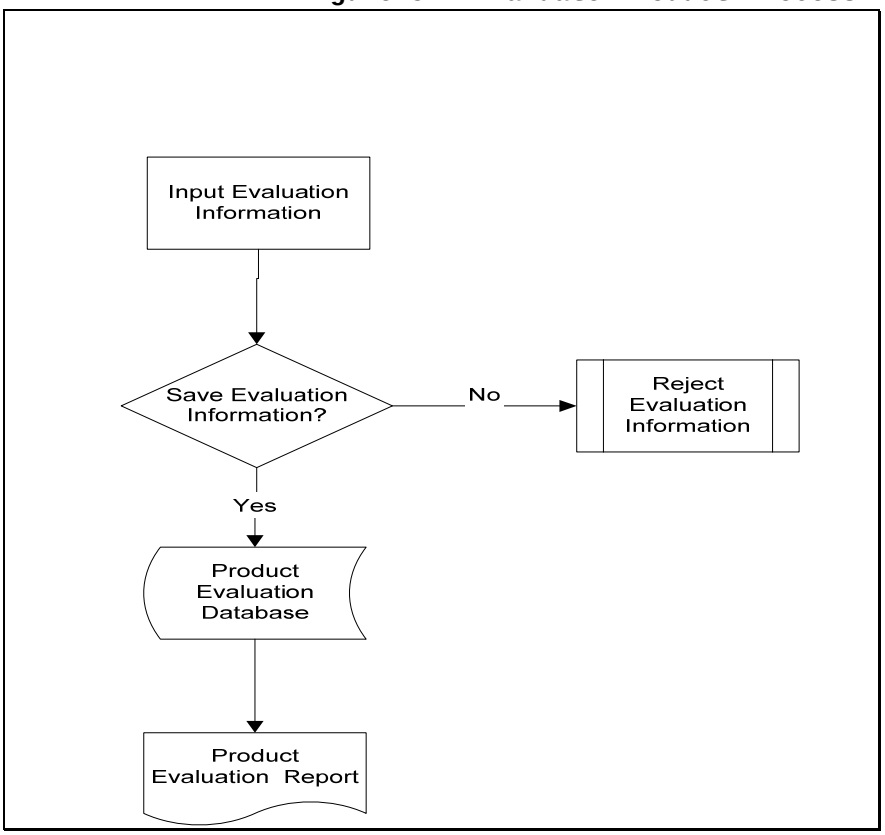
Figure 4. Process Preliminary Product Evaluation Information



Product information is submitted via email or postal mail by manufacturers, suppliers, or state employees, using the Preliminary Information for Product Evaluation form (See Appendix A and B). For a

more detailed look at this process see “Project Scope Use Case Description *Submit a Product for Evaluation”.*

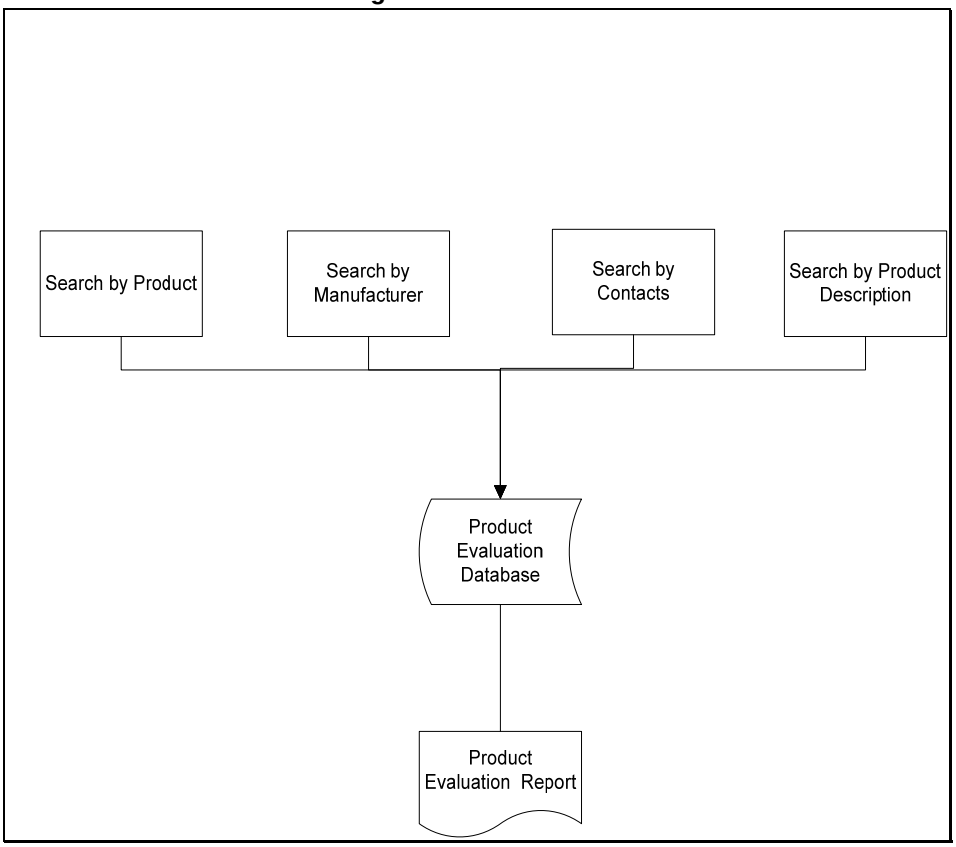
Figure 5. Evaluate Product Process



(See Project Scope: Use Case Description - *Evaluate Product*.

This space was intentionally left blank.

Figure 6. View Product Status



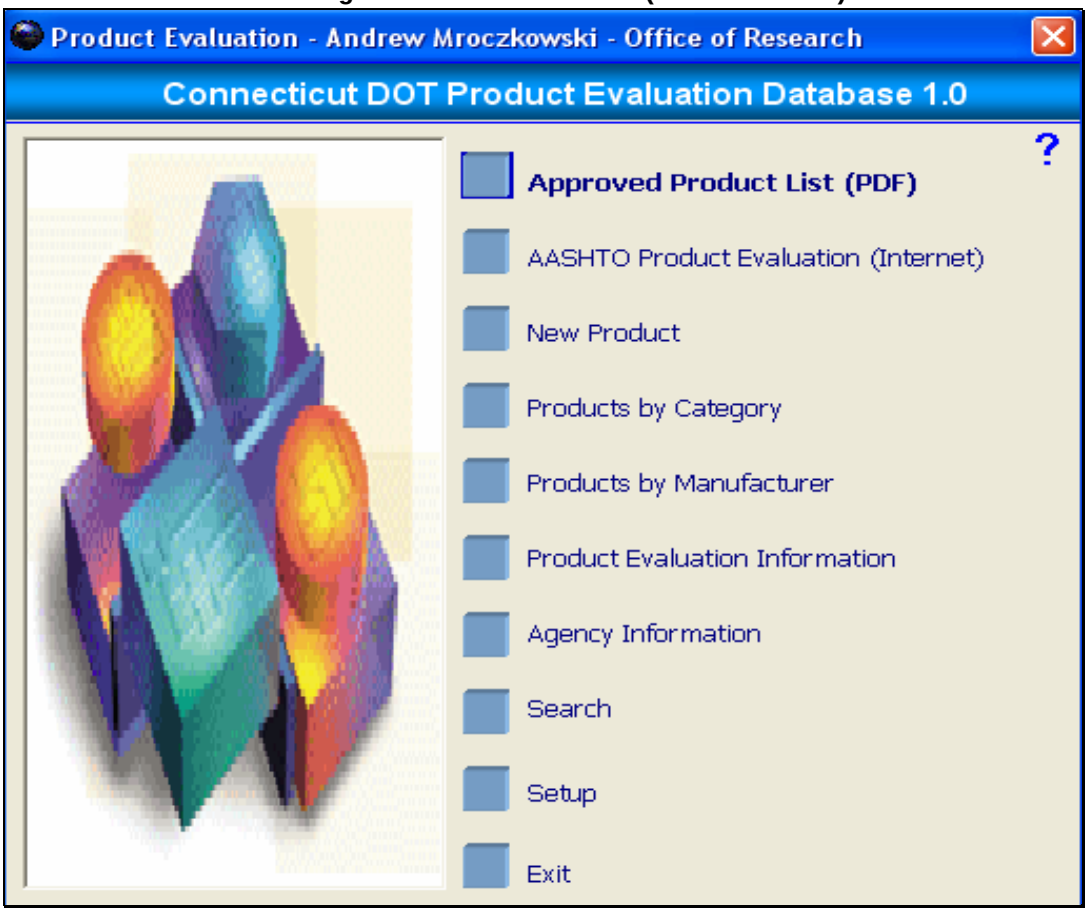
Users can search the application for product status by product name, product description, manufacturers and contacts. (See Project Scope: Use Case Description – Product Status.)

User Interface Forms:

The user interface (front end application) provides a visual means for users to interact with the ConnPED application data. The following are some of the primary forms from the ConnPED application. For a more detailed look at all the forms and screens in this application please refer to the "Product Evaluation Users Manual 1.0"

This space was intentionally left blank.

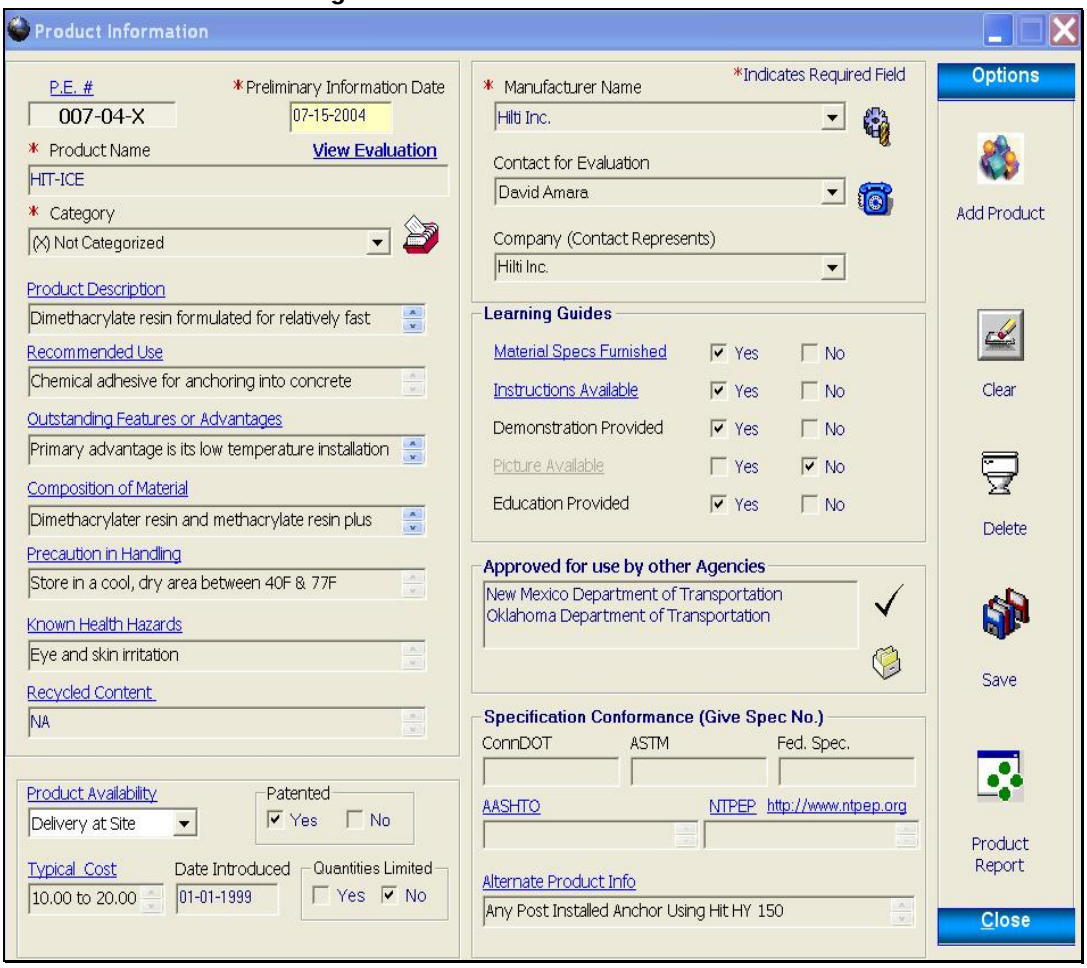
Figure 7. Main Form (Switchboard)



From the Switchboard Form the user can access other forms that allow adding, editing, searching, and printing product, manufacturer, contact, agency, and evaluation information.

This space was intentionally left blank.

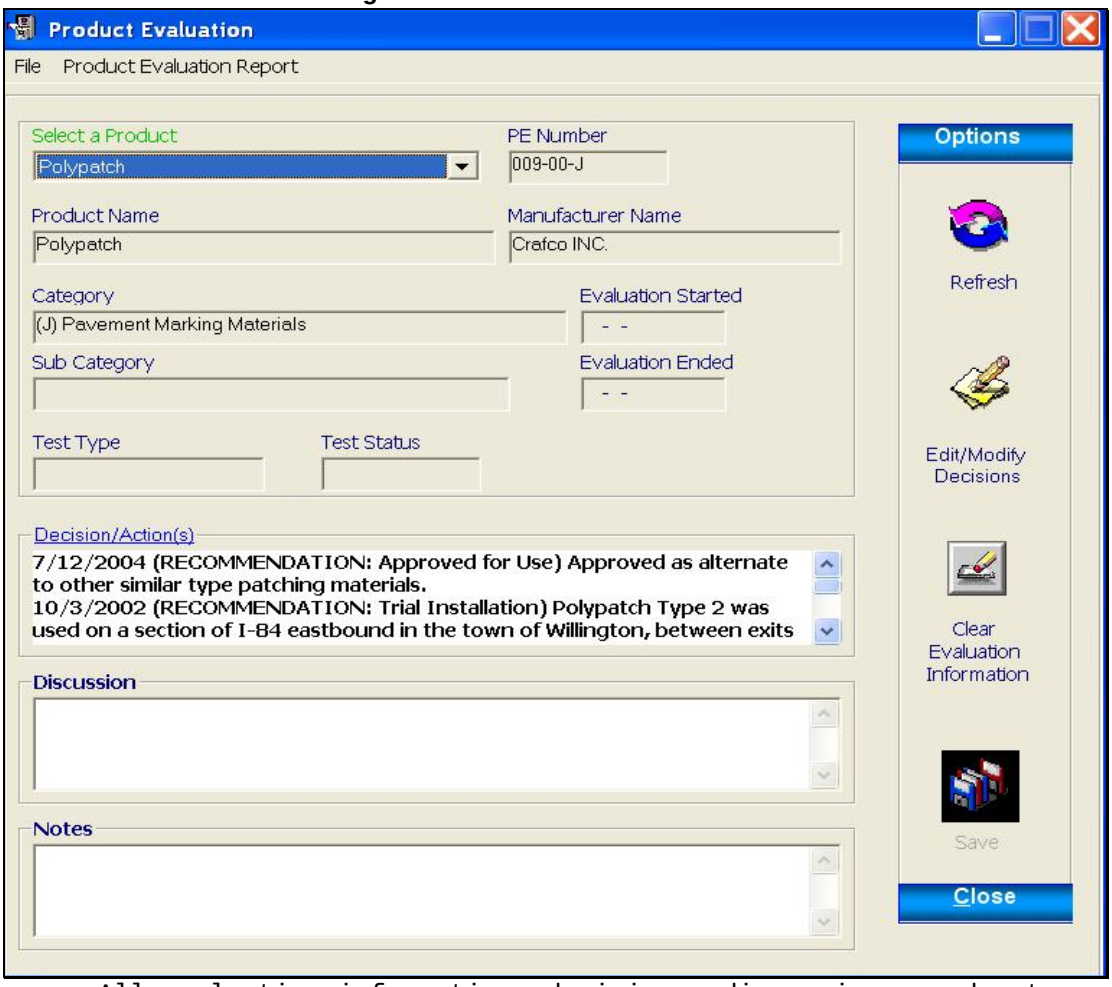
Figure 8. Product Information Form



From the Product Information Form a user can view add, edit, print, or delete all product information. The user can also view the evaluation information, view the National Transportation Product Evaluation Program web site, and attach files to the product.

This space was intentionally left blank.

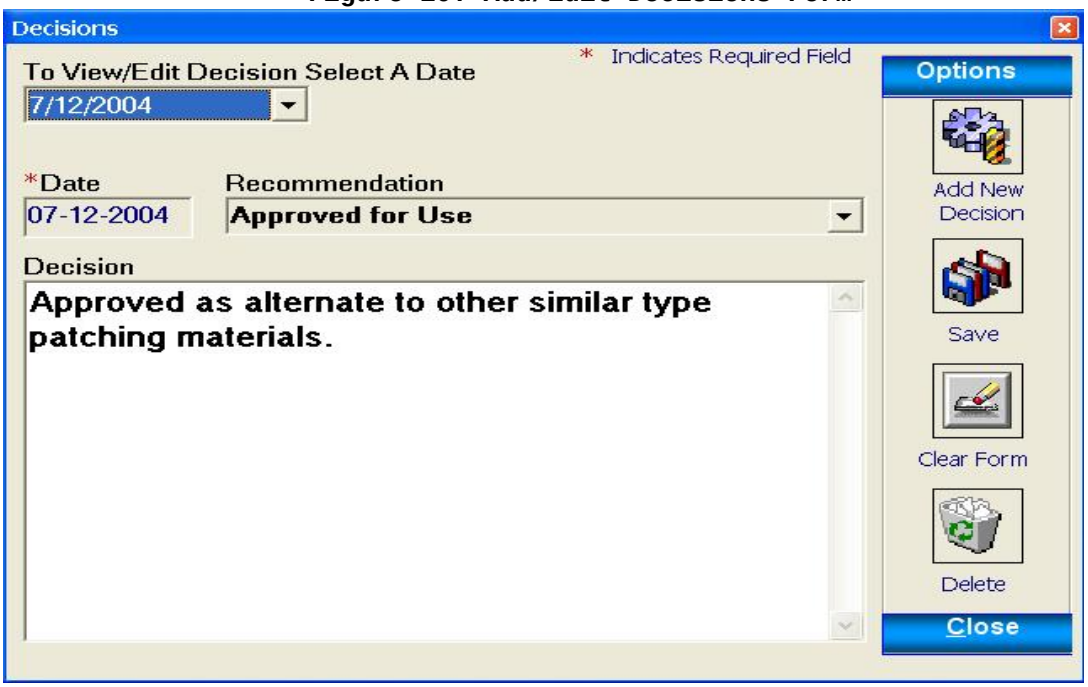
Figure 9. Edit Evaluation Form



All evaluation information, decisions, discussions, and notes are added, updated, or deleted on the Edit Evaluation form.

This space was intentionally left blank.

Figure 10. Add/Edit Decisions Form

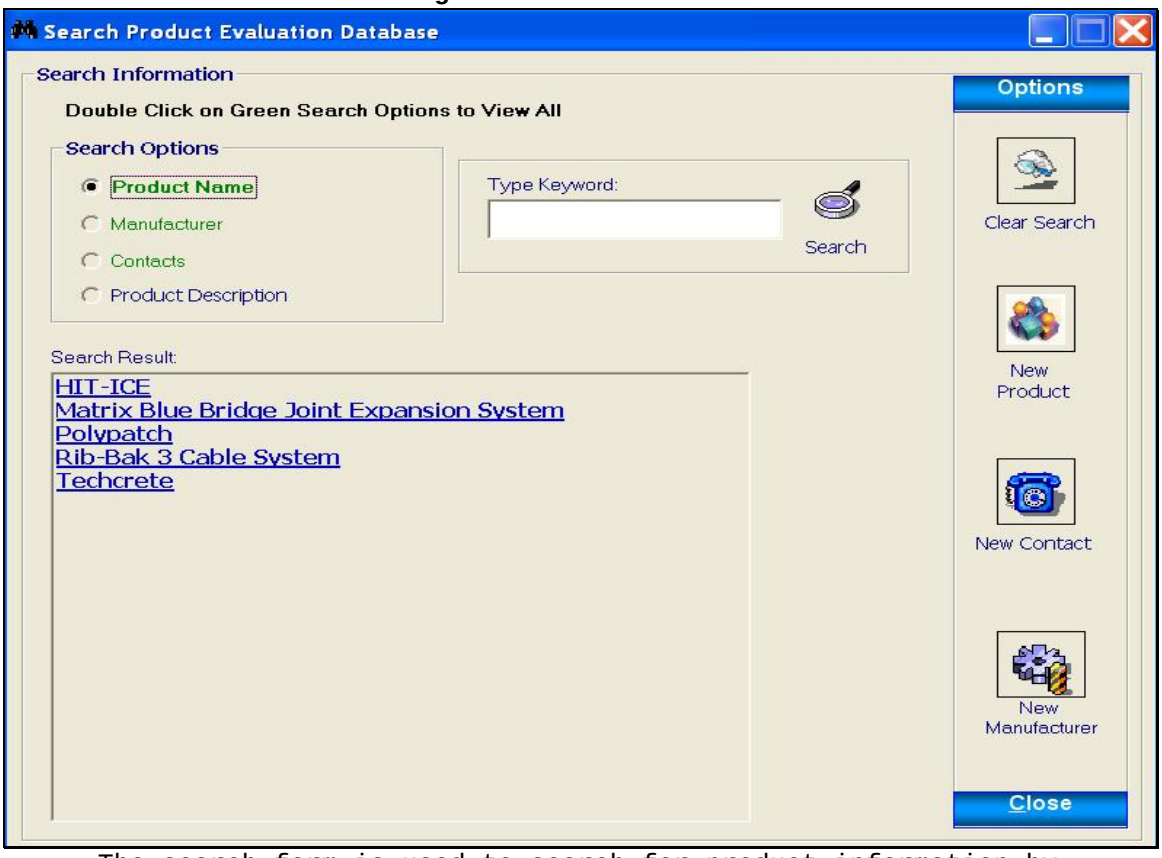


Decision or actions are added using the Add/Edit Decisions form. Decision or actions are associated with a date and one of the following recommendations:

1. Approved for Use
2. Approved for use on municipal or other non-ConnDOT systems.
3. Approved for Use by Special Provision
4. Pending further information, i.e. from applicant.
5. Pending for further study.
6. Rejected.
7. Trial Installation.

This space was intentionally left blank.

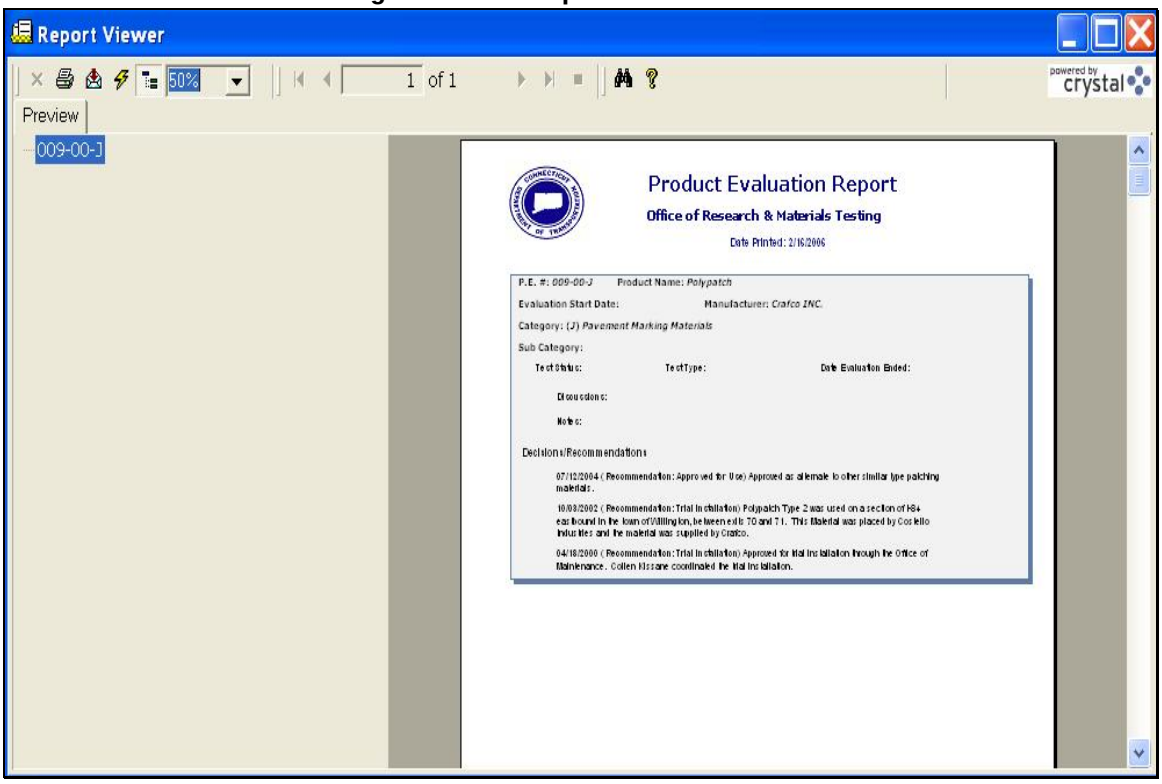
Figure 11. Search Form



The search form is used to search for product information by product name, manufacturer, contacts, or product description. The user can also view all products or view all products associated with a manufacturer or a contact.

This space was intentionally left blank.

Figure 12. Report Viewer Form



The Report Viewer form allows the user to view or print reports generated by the ConnPED application. The reports can also be exported to the following file formats:

Table 3 Report Export Formats

1. PDF	2. Crystal Reports
3. HTML 3.2	4. HTML 4.0
5. Excel 97-2000	6. Excel 97-2000 Data only
7. Microsoft Word	8. ODBC
9. Record Style (Comma no space)	10. Record Style (comma with spaces
11. Report Definition	12. Separated Values
13. Tab Separated Text	14. Text
15. XML	

FINDINGS AND CONCLUSIONS

The goals and requirements as stated in the design goals and project requirements section of the report were met with a few exceptions and/or issues.

Technical Issues:

1. One of the Business goals was to import archived data from ConnDOT's Advanced Revelation application used to store evaluation information in the past. Advanced Revelation uses a proprietary filing system called "Linear Hash" and requires conversion utilities to export the data to Oracle®, Microsoft® SQL Server, or Microsoft Access®. As of the writing of this document, Connecticut Department of Transportation has not converted the data for input into the ConnPED application.
2. The ConnPED application is scalable but expansion is not free from cost. If upsizing (convert from Access to a more robust client server database) is needed the services of a programmer and/or a database administrator will be required to update the data access component. The Office of Research does not currently have a programmer or database administrator readily available for any future modification to the application.

Organizational Issues:

1. The prototype version of the ConnPED front end was initially created in Visual Basic 6.0. The Connecticut Department of Information Technology (DOIT) has designated Visual Basic 6.0 as a "Transitional" language and should not be used to create new applications. In this project, the ConnPED application was converted to VB.NET, an "Acceptable" programming language as defined by DOIT. A considerable amount of time was spent on

training and then converting the application to the VB.NET programming language.

2. A data entry person may be needed to enter current and archived product and evaluation information stored in ConnDOT's paper filing system.

BENEFITS

The primary benefit in creating and implementing the ConnPED application is cost savings to the State of Connecticut realized through greater efficiencies in retrieving information and generating reports, and by a reduction in required in-State testing of proprietary products. Additional benefits include:

1. Electronic sharing of information/and resources to all AASHTO member-states via APEL and NTPEP, and to other Connecticut state agencies.
2. Electronic accessibility and availability of product evaluation information to ConnDOT employees.

PHASE 1A IMPLEMENTATION AND FEEDBACK

The ConnPED application was installed on the product evaluation engineer's computer and several other computers in ConnDOT's Office of Research and Materials. The database was installed on one of their file servers with file access permissions assigned to all ConnDOT users.

Feedback from the ConnDOT employees has been positive, with one exception. The product evaluation engineer and ConnDOT employees are delighted with the applications ease of use, interface design, storage capabilities, ability to print report to different formats, and upgrade potential. The only negative feedback raised, not related to the technical and organizational issues, is the lack of access to ConnPED

outside of ConnDOT. Reports can be generated in PDF in ConnPED and can be emailed to customers or posted on the ConnDOT website. This issue will be addressed in Phase 2A of the Development of The ConnPED application.

REFERENCES

1. Oliveira, Dionysia F. “Phase 1A Development of Connecticut Product Evaluation Database (ConnPED) Application”, Connecticut Department of Transportation, November 2003.

2. “2710B Analyzing Requirements and Defining Microsoft .NET Solution Architectures”, Microsoft Press, 2003.

3. Revelation Software. Retrieved January 25, 2006, from http://www.revelation.com/revelation.nsf

4. Connecticut Department of Information Technology, “Application Development Domain Technical Architecture Version 2.5”, May 8 2003. Retrieved November 2005, from http://www.ct.gov/doit/lib/doit/Application_Architecture_5_8_2003.pdf

5. Smith, Darrell E. “Product Evaluation Database 1.0 Users Manual”, Connecticut Department of Transportation, February 2005.

Appendix A. Preliminary Information for Product Evaluation Page 1

CONNECTICUT DEPARTMENT OF TRANSPORTATION

PRELIMINARY INFORMATION FOR PRODUCT EVALUATION

			Reference #
			P. E. #
1. Product Name: Test Product 1			Date: 7/30/2004
Manufacturer:			Patented: YES \ NO
Address:			
	Phone: ( )		
City:	State:	Zip:	
2. Contact for Evaluation:		Company:	
Address:			
	Phone: ( )		
City:	State:	Zip:	
3. Product Description:			
4. Recommended Use:			
5. Outstanding Features or Advantages:			
6. General Composition of Material (Attach MSDS):			
Precautions in Handling:			
Known Health Hazards:			
7. Recycled Content (Give Certified Percentages and Explanation):			
8. Material Specs Furnished by Manufacturer:		Yes	No
Drawing, Picture or Sketch Furnished by Manufacturer:		Yes	No
9. Specification Conformance (Give Spec No.)			
ConnDOT			
AASHTO	ASTM	Fed. Spec.	
10. Approved for Use by Other Authorities or Agencies (List Agency, Name and Phone # of			
Contact Person):			

Instructions:

1. Complete this application form for each product. Please be concise.
2. ANSWER ALL QUESTIONS. (Do not only refer to attachments.)
3. Where a question is not applicable, enter "N/A"

Appendix B. Preliminary Information for Product Evaluation Page 2

4 Attach engineering, technical, cost, test and safety data.

5. Attach verification of ownership of the legal rights to the proprietary item or process. Verification may consist of a copy of the patent (cover page is sufficient), copyright, license, or other pertinent document.

6. Return 10 identical collated copies of the above described information packet to the Division of Research (address on next page)

PRELIMINARY INFORMATION FOR PRODUCT EVAUATION (CONT.) Page 2

11. **Are instructions for installation, application or use available?**				
	Yes	No	**Copy Attached**	**To Be Mailed**
Can a demonstration be provided?			Yes	No
Are educational courses or movies availab			**Yes**	**No**
L2. **Availability of Product:**	**Seasonal**		**Non-seasonal**	**Delivery at Site**
13. **Are quantities limited:**			Yes	No
14. **Typical Cost:**				
15. **When introduced on market?**				
16. **Alternate for what product?**				

STATEMENT OF CONDITIONS FOR NEW PRODUCT EVALUATION

Evaluations will be conducted only on fully developed products, materials or processes for which specific uses are indicated and for which Preliminary Information has been properly submitted.

All product evaluations will be conducted in accordance with applicable laboratory testing and field evaluation criteria as determined by ConnDOT staff.

Acceptance of a product evaluation by ConnDOT is in no way a commitment to purchase, recommend or specify the product investigated.

Product samples for laboratory testing shall be provided by the manufacturer or his representative at no cost to ConnDOT.

If a field evaluation is deemed necessary, the following will apply:

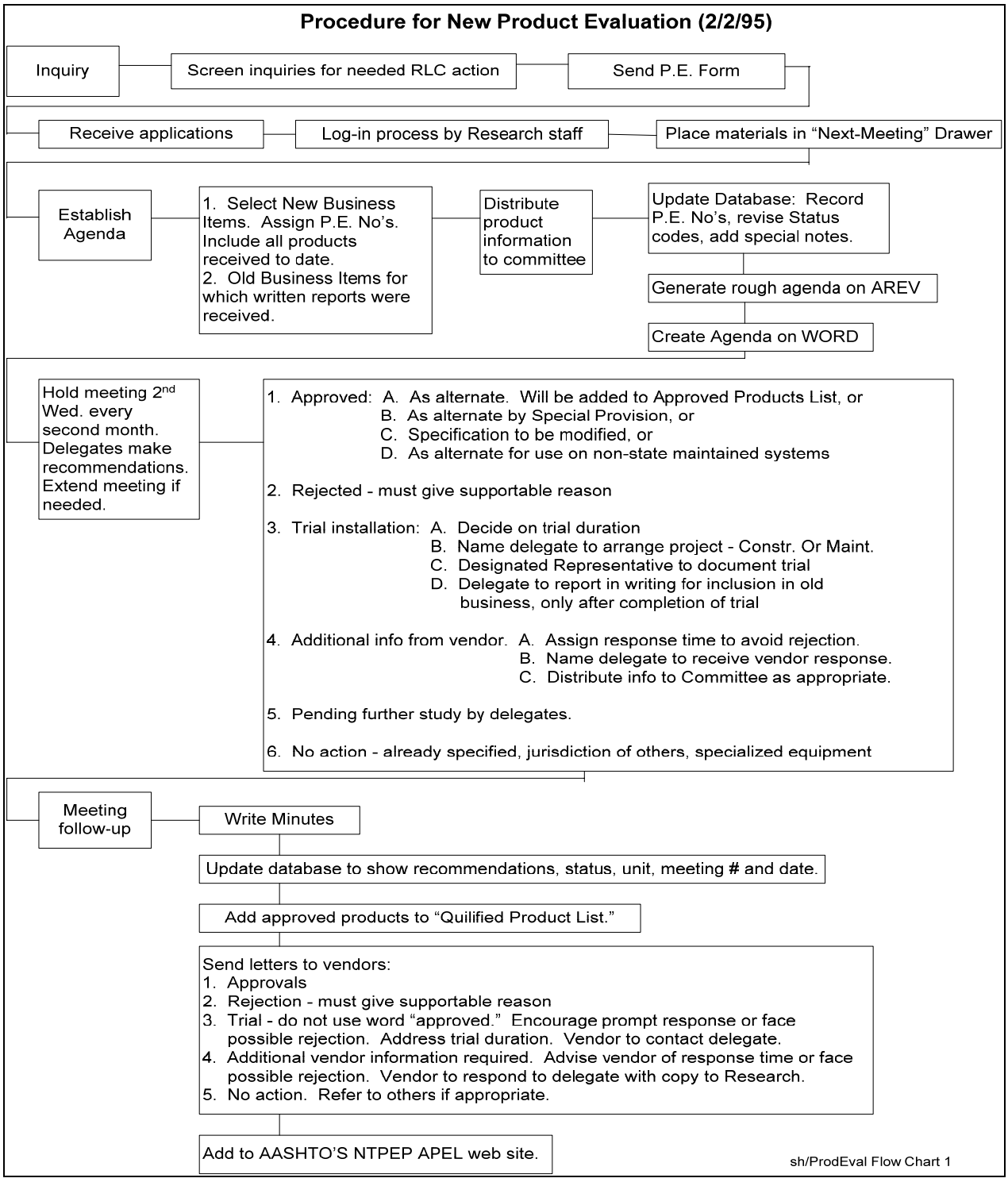
A. Material for an adequate number of test installations shall be provided by the manufacturer or his representative at no cost to ConnDOT.

B. Equipment necessary for the installation shall be the responsibility of the manufacturer or his representative, provided such equipment is not available through ConnDOT.

C. The manufacturer or his representative is required to be present when the product is installed at the test site and to provide technical assistance to those involved with the installation.

The Division of Research or the unit designated by the Research Liaison Committee will document the results of laboratory and/or field evaluations. The Department reserves the right to limit the use of all findings for promotional purposes by the manufacturer.

_____ 7/30/2004

Signature Manufacturer's Authorized Agent Date

Appendix C. Product Evaluation Process Flow Chart