

ElmTree System

Engineering Laboratory Management System

Table of contents

- General
- History
- System Requirements
- Implementation
 - System Analysis
 - Installation
 - Start-up
 - Training
 - Support
- Work Flow
 - Overview
 - Administration Setup
 - Departments
 - Business Parties
 - Contacts
 - Project Teams
 - Billing Codes/General Ledger Codes
 - Material Types
 - Tests
 - Organization of Test Data
 - Desktops
 - Project Desktop
 - Dispatch Desktop
 - Lab Management Desktop
 - Projects
 - Work Orders
 - Sample Log-in and Schedule Tests
- Test Reports
 - Reports Groups
 - Standard Reports
 - Issuing Reports
- Management Reports
 - Lab Management
 - Work Load Schedules
- Pricing, Invoicing, and Budgeting
- Accounting Interfaces
 - Accounts Receivable control

ElmTree System

Engineering Laboratory Management System

General

ElmTree System is a full-featured **Engineering Laboratory Management System**. It was developed to provide engineering materials testing laboratories a better way to manage their business. It provides:

Reporting

- Fast and accurate creation
- Reduced cost to prepare and distribute
- Flexible formats
- Compliance with standards
- Automated distribution of reports
- Website, paper, or e-mail distribution
- Minimized time and errors by reducing transcription and hand calculations
- Data Input by technicians and clerical personnel and review by engineers and supervisors
- History of all reports and invoices
- Chain of custody record
- Automated revision tracking of reports

Invoicing

- Automated invoicing
- Automated data export to general ledger accounting systems
- Automated report pricing by client, by project, by multi-project contract or other
- Minimized time and errors
- Flexible pricing by report, by hour, or by other pricing methods
- Flexible invoice formats
- Audit trail

Management

- Dispatch technicians with Work Orders Requests
- Track Samples and tests in progress
- Track technician's productivity
- Track costs of projects vs. budget
- Client contact lists
- Quality control charting
- Histograms of laboratory efficiency

The **ElmTree System** was created by a team of engineers, managers, system analysts, and programmers who are knowledgeable about the operation of an engineering materials testing laboratory. The system addresses compliance with standards, such as ASTM and AASHTO, and has been reviewed by several accreditation agencies. It provides a chain of custody record, fast and accurate reporting and invoicing, and web-based, paper, or e-mail distribution of reports to clients. It can address special client formatting needs and the need for adaptability. The system

is designed to be operated with data input by clerical and technician personnel and with report reviews and quality checks by engineers and managers.

In years of operation for multiple clients, the **ElmTree System** has proven to reduce costs and improve the accuracy and speed of reporting and invoicing. Clients are happier with the service, report quality, and easy-to-understand invoices.

ElmTree provides immediate information access to engineers, supervisors, and management to better serve clients and to more efficiently manage the business. The system provides easy access to data for special reporting such as Statistical Quality Control charting. The system can provide departmental performance measurements, including individual technician utilization, work load scheduling for tests, and turn-around time of samples and reports.

The **ElmTree System** is a full-featured system that covers all normal aspects of the daily operation of a materials testing laboratory:

- Prepare proposals to clients,
- Dispatch technicians,
- Log-in samples and schedule tests,
- Report test results, and
- Invoice clients.

With minimal customization, it can export directly to the company's existing general ledger accounting system. **ElmTree System** can help you operate as a nearly paperless office.

Many standard reports are included in the basic version of **ElmTree**, and these report formats can be customized to your requirements. Additional standardized reports can be added as requested. No amount of standardized reports will cover all testing and reporting possibilities, so **ElmTree** provides for OLE compatible reports which can use other Windows©-compatible programs such as MS© Word or Excel to develop customized reports.

History

The **ElmTree System** was developed in cooperation with Standard Testing & Engineering Co., a highly accredited Engineering Material Testing, Geotechnical and Environmental company founded in 1951. The **ElmTree** standard reports have been reviewed and approved for compliance with appropriate standards through accreditation reviews by the American Association of State Highway and Transportation Officials Accreditation Program (AAP), the International Conference of Building Code Officials Evaluation Service accreditation program (IAS), and the U.S. Army Corps of Engineers validation program.

Standard Testing & Engineering Co. has recognized a decrease in overall costs of between one and two percent since adopting the **ElmTree System**. The time to calculate and prepare reports for signature and issuing at the peak season has dropped from five work days to one. For client invoices, time required preparing and inputting into the accounting system has decreased from five to seven work days each month of clerical and management staff to one work day. Typographical errors on test reports and invoices have been almost eliminated.

ElmTree uses Best Laboratory Practice in “worksheet” input screens and reports. The analysts and developers are experienced in reading and applying testing standards in fine detail. For example, **ElmTree** reads data to the proper precision and accurately rounds off results according to ASTM standards.

ElmTree was developed to enable an engineering materials testing laboratory to offer the best service to their clients at a competitive cost. An extensive “system analysis” of the testing laboratory business and procedures identified many areas for improvement:

Eliminate errors due to transcription from sample log-in through invoicing

Eliminate errors due to manual calculations and duplicate calculations

Minimize effort for report preparation and distribution

Minimize time and errors to price reports or work orders

Minimize time and errors to prepare, send and post invoices

Report test results quicker

Give clients reports by fax, e-mail, or web-site access

Give clients & project parties' quicker access to signed reports

Give clients Quality Control Charting with test results

Give clients and lab management monthly summary of billed vs. budget

Provide flexible billing methods

For third party billing for failed tests

For time and materials pricing

For unit pricing for reports

Provide direct invoice input into a general ledger accounting system

System Requirements

ElmTree operates on a web-enabled application server with a SQL database server. The user interface can be set up from any high speed internet-accessible Windows© 2000 or newer operating system computer. The user interface is seamless and appears to be operating on the desktop. All data is stored in a fully redundant, high-availability Data Center facility.

For a hosted application, ElmTree System will provide the hosted application and database servers at a secure, professional network center for your use for an agreed number of concurrent users for a quarterly charge. **ElmTree** will provide all necessary software to these servers to operate the system.

If desired, the ElmTree System can be hosted on the client's own application and database servers. **ElmTree** can provide guidance on the necessary hardware and software to operate the system.

Implementation

It is recommended that the **ElmTree System** be implemented in phases. This will allow time for training of employees, customizing report formats, programming an export to the general ledger accounting system, and developing confidence in the system.

System Analysis

The first phase is to analyze the current business methods and procedures, to identify areas to improve efficiency or reliability, and to understand how the **ElmTree System** can interface.

Installation

As long as the computers being used for **ElmTree System** have access to a high-speed Internet connection, installation requires only a small program loaded onto the computers. The **ElmTree System** application and database servers handle all other hardware needs.

Startup

The startup requires setup of clients, business parties, pricing codes, project information and company site, department and employee information. Setup can be done all at once or in stages as projects become active. If standard report formats are used, then only the logo and address information require setup to be ready to begin.

If customized report formats are required to keep an existing look or create a new look, the **ElmTree** team can do this. The system is built using object-oriented software and can develop components to be reused in multiple reports.

Training

Training is the key element of **ElmTree's** success. The **ElmTree System** is a full-featured application to manage an engineering materials testing laboratory. It requires training to implement the system and dedication by management to implement change. The **ElmTree** team is dedicated to the success of the system and will provide necessary training and technical support. It has been previously demonstrated that clerical personnel are able to learn the system fairly quickly with the right management and **ElmTree** support. The savings, the client oriented features, and the management tools are great reasons to learn the complete system and use it to its fullest.

Training is recommended in three stages:

1. The clerical and management staff receive an introduction and initial training to perform the startup functions listed above. The staff will also learn how to set up projects and produce reports. At this point, the staff will be ready to begin using the **ElmTree System's** basic functions.
2. The staff will learn how to price individual reports or to price time and materials for work orders and produce individual invoice copies. They will also learn how to produce summary invoices on a regular basis, for example weekly or monthly. If the

company has selected a direct tie into the general ledger accounting system, then the accounting staff will learn how to post invoices directly.

3. The staff will learn about the management and quality control features that **ElmTree System** can produce.

Support

The **ElmTree** team is available for questions by phone or e-mail. There will be questions as the staff explores the features of the program. There may also be requests for report changes, new reports, or new features to meet the unique needs of the company or the clients. The **ElmTree** team can provide this support.

Work Flow

Overview

The Design of the **ElmTree System** is intended for ease of use, flexibility, and accuracy. The system covers the entire range of daily activities of a materials testing laboratory. It helps prepare proposals and start up new projects by establishing report and invoice distribution, pricing, and material specifications in the database. The system also tracks dispatch requests, logs in samples and tracks scheduled tests, draws up test reports, prepares individual invoices for each observation report or test report, generates summary invoices by project, and tracks project billing vs. budget. **ElmTree** can interface directly into the general ledger accounts receivable system.

ElmTree has standardized reports that cover 80% - 90% of the reporting activity in an average materials testing laboratory. Additional reports can be developed as needed. Reports can be sent by paper, fax, e-mail, or posted to a website for client access.

A few of the features of the **ElmTree System** are described in the following sections.

Administrative Setup

ElmTree's "Process Assistant" will walk through the initial setup, or each item can be selected from the menu.

Site Defaults: An **ElmTree Site** is the location of each office, which can be a physical location or just an organizational grouping of Departments. Site information includes the site logo, the header box to be printed at the top of all reports and invoices, the site_name and address, date and time format, and other system default settings.

Departments: Department data includes all department-specific definitions, as well as all employee definitions and security access information for the employees assigned to the departments.

Business Parties: Business parties are clients, vendors, architects or other entities that have contact with an **ElmTree System** project. All Business Parties contain two levels, the general or group level and the division level. These are helpful when dealing with multiple divisions of the same company. For example the City of Toledo is at the Group level, and Public Works Department or Engineering Department is at the Division level. The Division level could also handle multiple open-ended contracts of the same company, as in the City of Toledo (Group level) with its 2003-2004 yearly contract and 2004-2005 yearly contract (Division level).

Within a project, Business Parties can be given assignments such as "Client," "Engineer," or "Owner." They have default addresses for mailing reports and for mailing invoices. This is ideal for keeping track of work done for clients over several projects, or using "indefinite delivery" or "yearly open-ended" contracts. A client accounting code is given for each client at the division level that can be used directly by the general ledger accounting system.

Contacts: A Contact is an *individual person* within a business party. For example, John Smith works for the City of Toledo as an engineer. The Contacts feature provides easy access to such information as Mr. Smith's telephone numbers, address, e-mail, birthday, etc. **ElmTree** allows assignments of contacts to projects in various positions, distinguishing that Mr. Smith may be the project manager for one project and the on-site representative for another.

Project Teams: Project Teams are used to define report and invoice distribution and to provide easy access to contact phone numbers.

Billing codes: Billing codes serve to set up pricing for tests, reports, or work orders. The initial code setup may be used to further define client- or project-specific pricing.

Material Types: Material types are used in navigation of test reports.

Tests: Test setup defines input screens, report formats and default billing codes for each test. Each test also includes the "record of validation". Tests are added in a modular basis that allows third party developers to develop tests for use within the **ElmTree System**.

The above setup defaults can be changed as the need arises, such as the addition of a new employee, a new department, or a new test.

Organization of Test Data

ElmTree data is organized as follows:

- All Invoices are assigned to Reports
- All Reports are assigned to Samples
- All Samples are assigned to Work Orders
- All Work Orders are assigned to Projects
- All Projects are assigned to Clients (Division and Group Levels)

Desktops

ElmTree System Desktops are starting points for the everyday work of setting up projects, dispatching technicians, logging in samples, inputting test results, and reporting results. Desktops are used to select a specific project and find the results of a series of samples. There are many features built into all **ElmTree** desktops to make life easier, such as sort, find, filter, drag-and-drop, and show-only selections.

Project Desktop: The Project Desktop is the common starting screen for the daily work of logging work orders and samples, inputting test results data, issuing and pricing reports, and generating invoices. Clients and projects are listed down the left side of the desktop in a tree format. The detailed information is shown in a spreadsheet format on the right side of the desktop. The type of data shown in the spreadsheet can be controlled by a click on a client or project. The method of sorting the spreadsheet data can be controlled by clicking the top of the column or by selecting "sort" from a right mouse click. Locate an individual report by left clicking on a particular test listed on the spreadsheet. Create a new work order, log in a new

sample, or prepare a new report by right mouse clicks.

Dispatch Desktop: The Dispatch Desktop allows for assigning technicians to specific projects and for performing specific tests to keep track of the requests and the technician's time. It helps prevent missing sampling events and under-scheduling technicians. Technicians and Projects and Tests can be selected by "drag-and-drop" or "Quick Type" methods.

Lab Management Desktop: The Lab Management Desktop permits lab managers to have a quick glance at all tests. Tests can be viewed by status, such as scheduled, working, signed, or billed. Tests can also be viewed by material type, such as concrete or asphalt.

Projects

ElmTree System makes it quick and easy to set up new Projects with "drag and drop" setup screens.

ElmTree can set up a new project in three to five minutes for an existing client.

ElmTree tracks three key pieces of information for setting up new projects: a) distribution of reports and invoices, b) project pricing and budgets, and c) project specification for the materials to be tested.

ElmTree also tracks the requirements as to who needs to sign the reports, whether a pass or fail needs to be shown on the test, and contract information for project participants. Projects can be given a budget that can be compared to actual billed-to-date at any time. Projects are given a file number or project number, which is used directly by the accounting general ledger system.

ElmTree's Project Notes can retain copies of all the specifications, project instructions, and other necessary information for the projects and can be accessed throughout the system from project setup to test reporting.

Project Teams are set up with the Business Parties and Contacts involved in the project, and these team members can be assigned roles such as Architect, Engineer, Contractor, or other. These team members are integrated into distribution lists for each individual report. Also defined is the primary billing party, who normally receives the invoices, and the alternate billing party, for when a second party is billed for certain items like failed tests.

Work Orders

ElmTree System uses the concept of work orders to group a series of activities and samples together for ease of entry and billing purposes. A work order may be a single trip to a job site where several tests are run and several samples are taken. For example, several field soil nuclear densities and several sets of concrete cylinders for compressive strength may be logged on the same work order where project can be selected and basic field information will be inputted only

once. The work order could also be several trips to the job site during the day that should be combined into one work order and one trip charge.

Sample Log-in and Schedule Test

In **ElmTree**, all reports are assigned to samples, all samples to work orders, all work orders to projects, and all projects to clients. To log in a sample, the user first opens the work order that contains the Client and Project and then lists the samples in the work order screen. From there you can schedule tests and navigate directly to the data-input screen for the specific test to enter data and generate reports.

Test Reports

The Reports are described in details below. Additional Reports can and will be added as required. The reports are reviewed for compliance with ASTM's or AASHTO's latest test standards. Reports can be modified into a new standard report or completely customized based on requirements. Special reports for gathering historic test data can be created with data exports or customized design.

The **ElmTree System** is designed to be a growing system, as complete as possible for managing an Engineering Laboratory; however it is not feasible to generate all possible input and output forms for all tests. In order to provide the flexibility needed to cover all test report types and formats, **ElmTree** provides:

1. A selection of standard data based-driven reports that will handle 90% of the typical reporting requirements for a construction materials laboratory in concrete, soils, asphalt, and construction inspection services.
2. An ability to easily develop as needed additional hard-coded, database-driven reports and integrates these into the **ElmTree System**.
3. An ability to use OLE-compatible programs such as MS Word©, Excel, or other Windows©-compatible program for user developed reports which are issued and saved in the **ElmTree System** and use the **ElmTree** invoicing functions.

Test Reports are created in two parts, input screens and output test reports. The input screens contain the data gathered from sample log-in, and test-specific data, and any user comments. These input screens calculate the results from raw data and present the results with the proper precision. The output report formats can be customized. The report formats are built in a modular form using "object oriented" programming. This allows the easy development of an overall standard layout for a company or department and the variability of specific test report's contents and layout. This greatly reduces the cost and speeds the implementation of the **ElmTree System**.

Report Groups

Test reports can be easily developed and added to the **ElmTree System** and organized into categories called material types as an organizational aid for quick access. These categories are just for convenience and do not restrict the use of reports in any way. For example, Sieve Analysis may be in the "soil" category but can be used for concrete or asphalt just as well.

Standard Reports

ElmTree System has many reports already designed and in use with more being developed regularly. These reports can be formatted to meet a particular Testing Laboratory's needs. A list of these reports includes:

Concrete

- Concrete Compression
- Concrete Compression-Contractor Made Cylinders
- Drilled Cores

Flexural Strength-Center Point
Flexural Strength-Third Point
Grout Compressive Strength
Mortar Compressive Strength
Mortar Preconstruction Lab Evaluation
Splitting Tensile

Soils

Atterberg Limits
Moisture-Density Relationship, Modified & Standard Effort
Moisture-Density Relationship, Modified & Standard Effort, with Atterberg limits
Moisture-Density Relationship, Modified & Standard Effort, with Sieve analysis
Moisture-Density Relationship, Modified & Standard Effort, with Soil Class
Moisture-Density Relationship, SABC
Soil Class
Nuclear Densities
Sieve Analysis

Observation and general

General Inspection
General Observation
Shop Fabrication
Free Form report using Excel or Word

Issuing Reports

ElmTree can issue reports to the laboratory's clients by paper, by fax, by e-mail, and by posting to a central website. The website creates the reports in a .pdf format for posting. The system can post electronically signed reports where it is allowed by state engineering regulations.

Management Reports

Lab Management: The **ElmTree System** is able to provide several standard management reports to help management operate an efficient operation. A few of these are:

- Project billed-to-date invoice totals
- Budget vs. Actual invoiced by project
- Status of samples and tests in system
- Report by test type on length of time from log-in to test date to report date.

Special reports can be generated by use of SQL language report generators such as Crystal Reports.

Work Load Schedules: **ElmTree System** tracks the status of all samples and all tests scheduled as “Scheduled”, “Working”, “Signed”, “Billed”, or “Revised”. No Samples are “lost” and the system maintains the progress tracking of each individual sample. Technician resources can be scheduled efficiently by using a list of tests to be performed in the lab. Management can track the efficiency of the technician and the clerical staff by Sample Date Analysis. This feature is a series of charts and graphs showing days between status changes.

For concrete cylinders and beams, a daily “Break Sheet” can be produced showing all specimens to be broken that day, with spaces for entering the results directly into the break sheet form or screen. Reports can then be prepared for review and signature from the quick entry break form.

For field densities the results can be entered directly into the data entry screen by the technician in the field or by clerical personnel from written work sheets. Reports will be prepared and readied for review and signature.

ElmTree System has decreased turn-around time from sampling to reporting from several days to same day reporting with a completely reviewed report.

Pricing and Invoicing and Budgets

ElmTree System uses the billing codes that are associated with the general ledger accounting system. For example, for testing the compressive strength of a concrete cylinder, the billing code might be C401 and the price might be \$15 per cylinder. When the signed report is issued, a billing copy of the report is also issued with the unit pricing and extensions shown.

If a report is prepared or charge occurs outside the **ElmTree System**, the **ElmTree** invoicing system can still handle the outside charges the same way it handles the automatic charges of the reports. A product code and price is entered into the system in a spreadsheet-type format and is included in the summary invoice prepared by **ElmTree**.

The pricing of the units can be set at several levels. There is a standard default price list. There can be a standard price list for a particular client or client's division (or indefinite delivery contract.) There can be a price list for each project. And, of course, there can be an individual price assigned to an individual report. **ElmTree** remembers these and will assign the proper price to the report.

ElmTree System can print a summary invoice at any time to send to the client and to send to the general ledger accounting system. These can be customized to meet specific needs. Along with the summary invoices, **ElmTree** can show the billing to date of any project, by summary or by product code. A project-summary report is available that provides a comparison of actual billed this period to actual billed-to-date to the project's budget. Billing code category can show such reports. These can be especially useful on "not-to-exceed" projects.

ElmTree cuts the time spent on generating invoices down to a minimum, saving time and money. **ElmTree** cuts the number of mistakes and reduces the number of unhappy clients.

Accounting Interfaces

The invoice information from **ElmTree** has been directly linked to some commonly used general ledger accounting programs and can be linked to others as required. The data ties into most computerized accounting systems with minimal programming effort. Appropriate reviews and checks are in place to assure that the billing is correct. There is no duplicate entry required, eliminating another source of errors and wasted time. **ElmTree** then relies on the accounting system to handle the Accounts Receivable and General Ledger functions.

Accounts Receivable Control: The accounting of departmental staff can put clients into three levels of concern, usually for slow payment. The first and default level is "OK," which allows all functions to proceed smoothly for all projects for that client. The second level is "Alert" and at this level the staff handling the data input for the reports or new projects see that this is a client of concern, but they will still be able to do all functions. The third level is "Hold," placing a hold on most new activity for this client. This allows the management to have some control over slow-paying or non-paying clients in all of their locations.