

Delaware T² Center

T² Center Staff

Dr. Ardeshir Faghri
Director, Delaware Center
for Transportation

Larry Klepner
T² Program Coordinator

Alan Kercher, P.E.
T² Center Consultant

Wanda Taylor
Program Assistant

Sandi Wolfe
Secretary

University of Delaware Engineering Outreach

Kathleen Werrell
Assistant Dean

Joe Tanner
Coordinator

DelDOT Liaison

Dan LaCombe
Research Coordinator

Federal Highway Administration Liaison

Dan Sanayi
Transportation Specialist

Important Telephone Numbers

T² Center:
302-831-6241
Fax: 302-831-0674

**Workshop Registration
Information: 302-831-8302**

Kercher Engineering, Inc.
302-894-1098
Fax: 302-894-1099

TRAVEL-LOG

Volume XIX

Issue 1

Winter 2008

Roadway Quality Management Program Part 3

Importance of Quality Contracts and Specifications

Written by: Alan Kercher, P.E., T² Center Consultant

Over the years, the T² consultant has worked as an expert witness investigating many failed construction projects. Virtually all of them had one thing in common – poorly prepared contract documents. Although it is impossible to prepare a perfect set of contract documents and to perfectly inspect a construction project, a quality set of contract documents and a thorough inspection program will go a long way to minimize problems during construction. Part 3 of this series will discuss contract documents and Part 4 will discuss inspection.

In order to properly maintain any roadway system, all required pavement maintenance and rehabilitation or other activities such as utility work within the right-of-way must be properly constructed. Additionally, new roads must meet reasonably high quality standards. A poorly built road can deteriorate quickly and thereby become a money pit that will drain the municipality of precious funds for many years to come. Since these additional maintenance problems must be added to the already strained maintenance budget, the results could be financially devastating. Therefore, any successful roadway quality management program must include well-prepared contract documents and thorough inspection to ensure that all new roads, as well as, preventive maintenance and rehabilitation projects, are properly constructed.

The importance of contract documents and construction inspection cannot be overstated. We do not live in a perfect world, and mistakes do happen and errors are made. Also, some contractors have a tendency to take advantage when possible. Although it may be hard to believe, short-cuts in construction happen way too often. This “short-cut” phenomenon is similar to drivers speeding when there is no one enforcing the speed limit. There must be a safety net to protect the taxpayers. Contract documents and construction inspection will help to ensure that the taxpayers receive a dollar’s worth of goods and services for every dollar spent.

(continued on pg. 2)

Roadway Quality Management Program

(continued from page 1)

Fair Market Value

Poorly prepared contract documents create an un-level playing field. Inferior documents make it easier for a contractor to submit an extremely low bid in order to secure the contract, but then perform inferior work or write as many change orders as possible to make a profit on the project. At the very least, inferior contract documents can lead to poorly constructed infrastructure that will require more maintenance, but could also lead to very costly reconstruction due to premature failures, as well as, possible litigation of claims for monetary damages that could be submitted by the contractor.

It is very important to realize that there is a fair market value for any project to be constructed properly. The best long term policy is to require that work be performed correctly. However, it will require that agencies pay the fair market price. Well-prepared contract documents along with thorough inspection will definitely help to level the playing field so that quality-conscious contractors can submit an honest bid on a project and have a reasonable expectation of winning the bid.

Project Variables

No two construction projects are identical. They are influenced by many factors which change from one project to another. Some of the factors include:

Owner's project team - owner's representatives, engineers, inspectors and testing personnel

Weather – temperatures, precipitation and wind

Construction site – subsurface conditions including types of soils, rock, underground drainage characteristics and buried utilities; topography; surface drainage; above-ground utilities; existing structures

Contractors – variables include the level of experience and knowledge of the personnel assigned to

the project, especially the site superintendents; sub-contractor utilization; coordination with utility companies; types of materials used and material suppliers; type of equipment used; new technologies

Simply put, not all project teams are equal, not all contractors are equal and not all construction sites are equal. Therefore, not all contract documents can be the same. As such, it is imperative that all of the unique requirements for a project be fully captured in order to create a well-prepared set of contract documents.

Experience Pays

Since all projects are not created equally, contract documents cannot be created equally. Developing contract documents is not a simple cut and paste endeavor. It requires not only engineering knowledge but construction experience. Therefore, contract documents cannot be mass produced using untrained personnel spitting out “cookie-cutter” documents. They must be developed by experienced, knowledgeable personnel who take a fresh view of each project.

Whether municipalities decide to use in-house personnel or outside consultants, the preparers must have the requisite knowledge and experience to prepare in-depth contract documents. The preparer must be looking for the unique characteristics and identifying and clearly defining the specific requirements that will make the project successful. Basic knowledge of public works projects is simply not sufficient.

The Contract

The following is a brief overview of the parts of a contract. A contract typically contains three main parts:

1. Bidding and Contractual Documents

Bidding and contractual documents include the bid-



Importance of Quality Contracts and Specifications

Quick Case Study

The following is an example of extremely poor construction. Due to use of improper backfill material and lack of adequate compaction, a sink hole quickly occurred. Unfortunately, inadequate investigation and design prior to preparing the contract documents along with poorly prepared contract documents and no inspection made it legally difficult for the municipality to determine fault and rectify the problems. The contractor stated that the documents and the design were faulty. He stated that he only did what he was told to do. A partial list of potential factors included possible high water table; poor soil conditions; inadequate pavement design; type of backfill to be used; method and level of compaction; and type of pipe and inlet box connections (joint seals).



Figure 1

Shows the street and curb is sinking not only at the curb but along the pipe trench.



Figure 2

Shows the soil behind the curb sinking and that grass was not properly established.

Unfortunately, the T² Consultant receives many calls for projects similar to this case. Not every problem can be eliminated by utilizing quality contract documents, but many problems can be prevented or more easily resolved when a project is well-thought out and expectations are clearly defined.



(continued from page 2)

ding notice (advertisement), instructions to bidders, scope-of-work, bid proposal, bonding/security requirements, non-collusion affidavit and the contract “agreement.”

Since the success of any construction project is communication, it is strongly recommended that a pre-bid meeting be held during the bidding period. The main goal of this meeting is to carefully explain:

- intent (goals) of the owner
- details of the scope-of-work, especially clarifying complex issues such as utility coordination or important technical issues such as allowing for proper curing of a recycled pavement base course prior to paving over it with hot mix asphalt
- review the intended schedule
- identify potential issues such as planned community events, detours, maintenance of traffic, etc. that could influence the contractor’s cost
- allow bidders to ask questions so that everyone can hear the answers

It is recommended that this meeting be mandatory and that the minutes of the meeting should become an addendum to the bidding documents.

2. Conditions of the Contract

The conditions part of the contract establishes the rights, responsibilities and relationships of all the parties involved in the contract. This part of the contract typically contains two sections: General conditions and Supplemental conditions. General conditions, commonly referred to as the “boiler plate,” are generic in nature spelling out many legal items including the owners’ and contractors’ responsibilities; bonding and insurance requirements; payments to the contractor; suspension of work and termination. Supplemental conditions modify or expand the general conditions as necessary to meet the unique requirements of a project.

These first two parts of the contract documents set the ground rules for how the contract will be bid

and administered once the contract is awarded. In order to minimize disputes with the contractor, careful planning is required when creating these documents. Some of the concepts that must be carefully dealt with include: changed conditions and change orders; exculpatory clauses; liquidated damages; notices; payment; scope-of-work; suspension of work. The municipality’s legal counsel should provide guidance in these areas.

3. Technical Specifications

The specifications are basically the cookbook instructions for the contractor. Elements of a specification include describing the minimum requirements for the quality of materials and workmanship, as well as, how the work is to be measured and paid for.

Although there are different types of specifications, the most commonly used format for municipal public works projects is the DOT standard specifications. When using the DOT standard specifications, all the specifications will become part of the contract documents. Therefore, a separate set of special provisions are required to modify or add to specific parts of the “boiler-plate” standards to meet the unique requirements of an individual project.

Another variation of standard specifications that is commonly used is to include only the specific sections of the standard specifications. The sections are retyped and modified by the preparer, if necessary to meet the unique requirements of an individual project. This way, a special provisions section is not needed. The intent is to provide only the information needed for the specific project.

When utilizing standard specifications, too often, special provisions necessary to adequately address specific needs of a project are not included or are inadequate. Similarly, when project-specific specifications (without special provisions) are used, modifications necessary to meet the unique requirements of a project are not made. As stated earlier, it is imperative for municipalities to ensure that the personnel they have selected, either internally within the agency or an outside consultant, be familiar with

(continued on page 5)



(continued from page 4)

the unique requirements of the specific project, as well as, having sufficient in-depth knowledge and experience.

Project Review

Prior to receiving the bids from contractors, the municipalities typically hold the upper hand. If they make changes to the bidding documents, competitive forces will hopefully result in fair market value for the cost of the change. However, once the project has been awarded, the contractor usually has the advantage when changes are made. The contractor can try to claim additional compensation due to a variety of reasons. So, in effort to minimize potential problems and costs during construction, the contract documents should be carefully and thoroughly reviewed.

Three key components of the review process should be:

Constructability review - a review from the contractor's point of view – has all the information

been provided necessary to properly construct each element? Potential problems to look for include potential site (spatial) conflicts; conflicts between the drawings and the specifications and conflicts within the drawings or the specifications; missing or incorrect construction details; missing or incorrect specifications.

Bid-ability review – a review from the bidder's point of view – has all the information been provided necessary to bid the project? Potential problems to look for include missing or conflicting bidding instructions; missing or incorrect bid items and quantities; improperly defining measurement of pay items and method of payment.

Claims prevention review – identify conflicts, missing information, etc. necessary to eliminate change orders. The reviewer should read the contract assuming everything has gone wrong and should be looking for ways to protect the municipality during litigation.

2008 Roadway Management Conference

The 16th Annual Roadway Management Conference will take place from March 31, 2008, to April 2, 2008, at the Oglebay Resort & Conference Center in Wheeling, WV. The T² Centers in Delaware, Maryland, Pennsylvania, Virginia, and West Virginia host this annual conference on a rotating basis. Delaware will be hosting the conference next year.

Each Roadway Management Conference deals with issues that you face every day. Here is a sampling of the sessions we will present:

- ABC's of Concrete
- Bridge Maintenance and Inspection
- Chainsaw Blade Sharpening
- Innovative GPS Uses
- Safety Circuit Rider Programs
- Urban Forestry – Choosing and Planting Street Trees
- Are your Work Zones Accessible?
- Better Communications
- Full Depth (Pavement) Reclamation
- Media Relations and Crisis Communication
- Snow Fighters' Toolbox
- Working With Difficult People

Also there will be on-site demonstrations and pre-conference workshops.

We have set the conference fee at \$150 (if registered before March 3, 2008). It includes all sessions, the bus tour, a reception, and other meals. The pre-conference workshops cost \$50.00.

For additional information, the conference brochure can be viewed on the T² Center website. The address is <http://www.engr.udel.edu/outreach/t2/index.html>, then click on the Roadway Management Conference.



New Asset Management Software is coming to Delaware Municipalities

Over the past 15 years, the T² Center Consultant has implemented pavement management systems for approximately one-third of Delaware's communities using the Road Surface Management System (RSMS) software program developed by the New Hampshire T² Center. The good news is that not only is RSMS being upgraded but so is Sign Inventory Management System (SIMS) and Drainage Management System (DrainsMS) along with the development of a GPS/GIS based asset inventory collection system and several other asset modules.

The New Hampshire T² Center has created a public-private partnership named PWS Solutions to develop the next generation of GIS and GPS compatible public works asset management and safety assessment software. The PWS Solutions software offers easy to use, intuitive tools to rapidly collect, assess, and manage public works assets, including roadways, drainage, and utilities in a sustainable manner.

PWS Software Suite will consist of the following Asset Modules:

- ***PWS Tracker (Asset Inventory Collection System)***
- ***PWS RSMS (Roadway Surface Management System)***
- ***PWS DrainsMS (Drains Management System)***
- ***PWS SIMS (Signs Management System)***
- ***PWS Safety Advisor (Road Safety Audits)***

Features of *PWS Software Suite* include:

- Easy to use, intuitive GIS interface
 - Import shapefiles, raster images, drawing files, Google Earth map files (kml/kmz), existing assets, and other common base map objects
 - Create/edit/export new shape files for each asset class
- Rapid “relative positioning” data collection technology
 - Speeds data collection by direct point and click collection of assets based on base map features (e.g. location at street corner) – GPS use is optional!
- GPS support for precision positioning
 - Automatically track data collection positioning using most GPS devices, including *PWS Tablet* (laptop), which is available pre-bundled with *PWS* software
- Reporting tools for GASB34, NPDES Phase II, and ADA compliance
- Multi-year budget forecasting
- Wizard feature for custom data collection applications
- Support for multiple users and simultaneous data collection sessions

PWS Software Suite is built upon the decades of experience that the PWS Solutions community has in working with municipalities nationwide to develop solutions to real-world public works problems – from rapidly developing a critical asset inventory, to prioritizing maintenance based on safety and overall benefits, to developing multi-year budget forecasts, to compliance reporting. Best of all, the *PWS Software Suite* will provide users with a set of easy-to-use public works asset management tools.

PWS Software Suite will be released this coming spring. Since the Delaware T² Center Consultant is involved with development of the software, training will be offered as soon as testing of the software is completed. The next several issues of the *Travel Log* will contain articles discussing the capabilities of the different modules.



Other Upcoming Events

February 5-6, 2008 Best Practices for Concrete Pavement

March 31 - April 2, 2008 2008 Roadway Management Conference

April 22 - 24, 2008 Urban Drainage Design

June 17 - 20, 2008 HEC-RAS River Analysis Systems

Workshops under Development:

Drainage Management System for Local Governments using PWS DrainsMS
Pavement Management System for Local Governments using PWS RSMS

For up-to-date information, visit our website at www.engr.udel.edu/outreach/t2/index.html.

Most T² Center events are free to state and local transportation agencies in Delaware.
For more information, contact us at 302-831-6241.

T² Center Request Form

___ Please add my name to the T² Travel-Log mailing -- subscriptions are free

___ I have an idea for a future newsletter article on the topic of _____

___ I would like to submit a newsletter article, please contact me.

___ Please consider these topics for future training sessions

Name: _____

Address: _____

Municipality: _____

Please return this form to:

Delaware T² Center
Delaware Center for Transportation
360 DuPont Hall
University of Delaware
Newark, DE 19716

Delaware T² Center
 Delaware Center for Transportation
 360 DuPont Hall
 University of Delaware
 Newark, DE 19716



The University of Delaware is committed to assuring equal opportunity to all persons and does not discriminate on the basis of race, color, gender, religion, ancestry, national origin, sexual orientation, veteran status, age or disability in its educational programs, activities, admissions, or employment practices as required by Title IX of the Educational Amendments of 1972, Sections 503 and 504 of the Rehabilitation Act of 1973, Titles VI and VII of the Civil Rights Act of 1964, the Americans with Disabilities Act, Executive Orders 11246 and 11375, and other applicable statutes. Inquiries concerning Title IX, Section 503 and 504 compliance, Executive Order 11246 and information regarding campus accessibility and Title VI should be referred to the Affirmative Action Director, 305 Hullihen, 302/831-2835, 302/831-4563 (TDD).

Delaware T² Center

The Technology Transfer (T²) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual state departments of transportation. Its purpose is to interchange the latest state-of-the-art technology into terms understood by local and state highway or transportation personnel.

The Delaware T² Center Travel-Log is published semi-annually by the Delaware Technology Transfer Center at the University of Delaware. T² Center articles also appear semi-annually in the TransSearch - the newsletter of the Delaware Center for Transportation. Any opinions, findings conclusions or recommendations presented in this newsletter are those of the authors and do not necessarily reflect views of the University of Delaware, Delaware Department of Transportation, or the Federal Highway Administration. Any product mentioned in the newsletter is for information purposes only and should not be considered a product endorsement.

INSIDE THIS ISSUE

Roadway Quality Management Program Part 3 - Importance of Quality Contracts and Specifications	1
Importance of Quality Contracts and Specifications <u>Quick Case Study</u>	3
2008 Roadway Management Conference	5
New Asset Management Software is coming to Delaware Municipalities	6
Other Upcoming Events	7