

District 4 Design Newsletter



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From the Editor's Desk

By: Howard Webb, P.E., District Design Engineer

Oh, how time flies. It seems like only yesterday we were discussing our performance for the 2007/2008 fiscal year. Well, here we are again, at the beginning of a new fiscal year, reflecting on our accomplishment for fiscal year 2008/2009.

We all have a lot to be proud of. We met our targets for Production Complete (87%), Letting (100%) and also for cost (3.2%) and time (3.0) overrun during construction. In addition, we took on the challenge of fast tracking the ARRA (federal stimulus) projects, and we are on track to LET all of these projects by the deadline. Again, we want to thank all, including our consulting partners, for all the hard work that went in to assisting the Department to achieve our production goals.

At the end of each fiscal year, we not only reflect on our accomplishments, but also focus on things we can do better. One of the areas that we will focus on, this year, is reducing the number of change memo after the plans are production complete. Last year we had over 2.2 change memos per project. This is an indication of a lot of rework and duplicate reviews. This year we will concentrate on significantly reducing that number.

As always, we strive for continuous improvement and with assistance from our staff and consulting partners I am sure we will again succeed with meeting the goals of our business plan. Once again, I would like to thank all for such a good year in plans production.

Did you know?

Project managers need to keep their Maintenance of Traffic (MOT) certificates up to date if they want to work on design projects. This certification needs to be updated every four (4) years by taking a MOT refresher training course that is only one-half day. Should you forget to take the refresher course, then you must take a 3 day MOT class if you wish to work on MOT plans.

By the way, these days the MOT plans are called Transportation Management Plans (TMP). Read about this in Chapter 10 of the Plans Preparation Manual (PPM) and here is the link for MOT certification: <http://www.dot.state.fl.us/rddesign/mot/mot.shtm>.

MOT Certification

Administrative Staff

Engineering Support

CADD

Consultant Management

Drainage

Roadway

Structures

Survey

Traffic Design

Utilities

District 4 Quarterly

Design Newsletter

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New and Improved Bridge Bicycle Railings

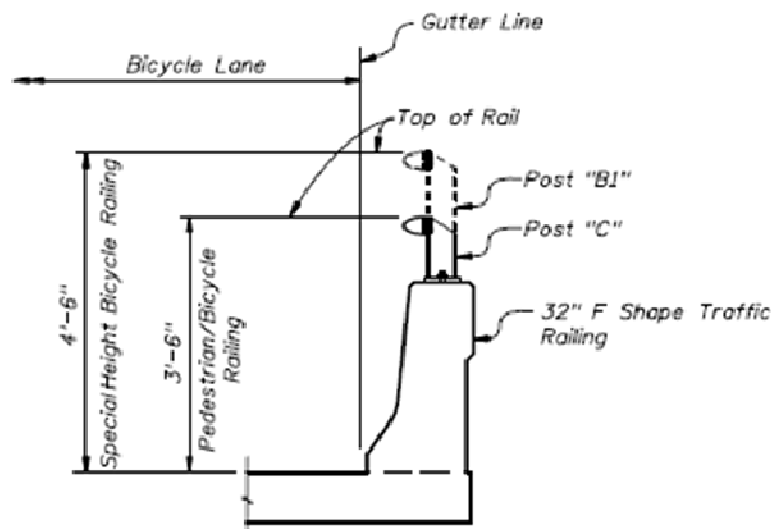
By J. Omar Nunez, Structures Design

The Florida Department of Transportation (FDOT) is improving and expanding its bicycle facilities throughout the state, and our bridges are no exception. Providing safe and comfortable use of bridges to vehicles as well as pedestrians and bicyclists is part of our mission. An important safeguard for pedestrians and bicyclists on bridges is the railing barrier that protects them. New design standards now mandate railings, fences or barriers on a bridge to be lowered to 42 inches high, unless special circumstances apply, in which case it's raised to 54 inches. The new standards follow guidance from the *AASHTO Guide for the Development of Bicycle Facilities, 3rd edition (1999)*, on how to provide comfortable safety measures for bicycle users on bridges and roadways.

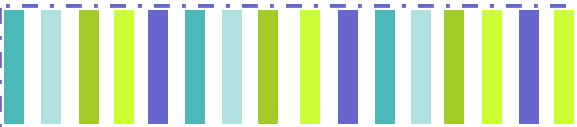
The change in height was made to the *AASHTO LRFD Bridge Design Specifications, 4th Edition (2007)*, Section 13.9.2, to match the *AASHTO Guide for the Development of Bicycle Facilities, 3rd Edition (1999)*. And the Florida Department of Transportation later adopted the 42-inch height requirement and released it with the *2008 FDOT Interim Design Standards*, dated 01/01/2008.

The *2006 Design Standards* set the minimum bicycle railing height at 54 inches, composed by two levels of aluminum bullet railing over a concrete parapet (see *2006 Design Standards, Index 821*). This configuration has been modified in the *2008 Design Standards*, which eliminates the higher bullet railing owing to studies that show additional height past 42 inches does not provide additional safety. And while the concrete barrier that supports the aluminum bullet is unchanged, the posts that hold the bullet railing are shortened.

The new bicycle railing height will provide a comfortable ride for bicycle users without compromising safety. In addition, the lower railing height will also result in a slight cost savings in materials while maintaining industry standards.



Typical section thru bridge deck
Design Standards Index No. 821



Design Welcomes PD&E Project Managers to Consultant Management



Ray Holzweiss - Section 4

Ray Holzweiss was born in Cincinnati, Ohio, but was raised in south Florida. He is a graduate of the University of Florida, Professional Engineer Training Program and the Certified Project Manager Program. Ray has worked in Traffic Operations, as a Project Manager and as the manager of the South Florida Rail Corridor, among other areas. He enjoys sports and is involved activities that involve his faith and church.



Beatriz Caicedo-Maddison - Section 5

My name is Beatriz Caicedo-Maddison. I was born in Cartago, Valle, Colombia SA. When I was growing up, I walked and bicycled to and from school, giving me the independence I needed for my multiple activities and hobbies. Also, my parents took us on many trips within the beautiful country and visited new structures, as they were being built, and scenic roadways. I developed an interest in engineering since then, as well as the desire to protect pedestrians and bicyclists. I studied Civil Engineering and graduated from the University of Cauca Colombia. Later on, I met and married Larry Maddison, a native from Lynnfield Massachusetts. Happily married since then, I attended the University of Central Florida and graduated with a Masters Degree in Environmental Sciences. I have been working with FDOT for about 25 years. Project Development and Environment has been my career. I enjoy traveling around the world. Swimming, and walking are my favorite sports.



Daphne Spanos - Section 5

I am a native Floridian, one of the state's "endangered species" so to speak. I grew up in Miami, Florida and Davie, Florida. I attended the University of Miami where I studied Civil and Environmental Engineering. Even while in high school I knew I wanted to work for the Florida Department of Transportation, because I believed I could help make a difference in the quality of both our natural and man-made environment. As such, I have always been an advocate of preserving the environment through walkable communities, mass transit, and creating places where transportation helps elevate our quality of life and brings choices to people, while not harming our state's fragile ecosystems.

In my spare time, I enjoy baking anything chocolate, visiting historic homes, playing the piano, and attending live musical performances (jazz, classical, bossa nova). Right now, I especially enjoy caring for my newborn son and trying to teach him all that I can. I love learning about other cultures, whether it's sampling new dishes, learning a few words in another language, or learning the song and dance of another place. I have enjoyed experiencing other cultures and new worlds unlike my own in places like Brazil, Greece, Spain, France, Italy, and England. I hope to one day travel to Argentina, Chile, and Peru, and more places around the world! I also enjoy studying the Bible and spending time with family and friends, especially friends who make me laugh!



Patrick Glass - Section 6

Pat Glass was born in Miami and didn't travel very far. Graduate of the University of Florida with a BS in Civil Engineering, his first job was as Martin County's first traffic engineer. After three years as traffic engineer he took a position as Project Manager in District Four's Consultant Management Department, which lasted for 17 years, followed by a five year stint in Planning and Environmental Management. He enjoys motorcycles, most all watersports and occasionally gets involved in aviation.



Radar Tomography

By: Bill Arata, P.S.M., Survey Project Manager

The District 4 Survey Office recently completed a small study to evaluate the use of Radar Tomography (RT). RT is a unique technology where an array of Ground Penetrating Radar (GPR) antennae is mounted on a trailer and towed by a vehicle. An ongoing series of radar pulses are transmitted and received by this system, and it will generate 3-dimensional images of the subsurface. The basic idea is to see and map the underground utilities and features for a project.

This small study was conducted on a recently completed project with two of our Subsurface Utilities Engineering (SUE) consultants. The purpose was to compare the existing utility locations with the data collected by RT. The existing utility data was collected using more traditional SUE methods. In the radio-frequency electromagnetic method, the utility is toned on site by a technician, traced, and marked on the ground. Test holes may be required to locate a utility when the tone is lost and/or to confirm its precise position and elevation. The marks are surveyed and ultimately an UTEXRDOO.DGN is generated.

For the study, RT was then used to cover the same limits of the project without the data previously gathered. This was a test of RT as a stand-alone tool. During the previous SUE survey twenty three underground utilities were located. The RT found eight. Because of subsurface soil conditions, there were several occasions where RT appeared to lose a utility and the data showed gaps. There were at times significant differences in both the horizontal and vertical location of various utilities. While it did detect some unknown linear features that could be utilities, it did not definitively locate any utilities that were not found by Conventional Subsurface Utility Engineering (SUE) methods.

The accessibility of the RT array is limited by the site conditions and the vehicle from which it operates. For safety reasons, the vehicle and RT array could not enter a sloped drainage swale. The ability of RT to locate underground utilities and objects is a function of their depth, size and the conductivity of surrounding soils. RT can detect both conductive (electric, telephone, etc.) and non-conductive utility materials (PVC, HDPE, etc.) While fresh ground water may not significantly impact the data quality, salt water can have a significant negative effect. As with all GPR systems, objects below the penetration depth of the RT system cannot be detected. Clayey soils or extensive layers of rock or pavement can impact its depth of penetration. RT was not designed to be, and should never be used as the only technology for locating underground utilities on a SUE project.

Raw RT data is processed and analyzed in order to generate 3-dimensional images. Used with existing utility records and other S.U.E. methods this is then interpreted to produce CADD files. Subsurface features can be shown in plan view at various depths, as well as cross section and profile view.

Accompanied by a thorough analysis, RT has the capability to image other subsurface objects, changes in soil types, leaks, voids and cavities. The sub-base of roads or the 3D alignment of pipes can be shown. Its effectiveness is dependent on the immediate environment. The accessibility of vehicle and RT array are limited by topography and vegetation. Since RT is a GPR-based technology and since it was not designed to image very small diameter utilities, all subsurface utilities cannot be located solely using RT. It involves a variety of technical methods and team work between the utility owners, engineers, and surveyors.

The RT system should be considered a tool within the SUE process, and considered a complement (not a replacement) of conventional utility designation and mapping technologies or processes.



Context Sensitive Solutions

(A Conversation with Gerry O'Reilly, Director of Transportation Development)

By: Scott Peterson, P.E., Project Manager

What does Context Sensitive Solutions mean to you?

DOT working with the community and the partners and building transportation infrastructure that fits in with the community and environment. We need to be doing more than saying "I have a book with rules and I have to follow it". It means trying to find and apply solutions that fit within the context of where they are and it's the process you go through during design and talking to people in the community.

What is the history of CSS in the District?

Years ago, I was at a charette in Oregon and was part of a team that developed a manual that attempted to define what flexibility designers had in applying the standards. Later, District 4 led a big campaign and was the driving force to get the TDLC chapter put into the Plans Prep Manual - and that was always thought to be the initial step in putting some numbers around what we are willing to accept and to help people not use the "book" as the excuse not to use CSS techniques.

Aside from major reconstruction projects, do you see a role for CSS in routine RRR projects?

Every time a person has a chance to influence what a piece of infrastructure looks like, they should be thinking about this. It should be just the way we do our business.

Why should the average DOT employee or PM care about CSS?

Because they live in this community. They should have pride in where they live. Everyone has driven down streets and thought "this looks really nice". When they get back to their desk, their brain shouldn't shut off. They should think "I can influence that on the project I am working on". Obviously, some are in a position to influence it more than others, but everyone should care because we all have a chance to influence it.

The only opera house most people could name is the Sydney Opera House. People know it because it looks nice, not because of the beautiful music played in there. It would be nice to think that on a much smaller level we could have people in the community saying "Wow, I can't believe how nice that project looks on Oakland Park Blvd, for example".

How fully do you think CSS principles are embraced in the District?

We have very few people on one extreme who would say "The standards are the standards. I'm not varying a thing or people will get killed because it's not safe". The other side would be TDLC extremists. We have more people drifting towards that end of the scale, but I accept that because in order to get people to change you need some of that. The vast majority of the district is near the median or slightly below. The bell curve definitely needs to shift more towards the CSS side of things, but how we try and move that curve is a big issue. We can't force things on people. We have to try and change the culture without sacrificing good quality design that stays within the budget.

What are some of the challenges in implementing CSS?

The biggest issue is the way we train engineers. They are logical thinking problem solvers and the whole basis of highway design is based on manuals, procedures, and books. However, a lot of context sensitive solutions come from an artistic, more creative point of view. Engineers come into DOT and the type of training they get is related to the standards and the plans prep manual and they think "if I follow that cookbook, I get a good design". Well, there's a piece in the cookbook that's missing for a good design - if good is at least partially measured by what the community thinks of the project when we're finished.

Context Sensitive Solutions Continued

Any suggestions how we can incorporate more CSS into our projects?

We could do a better job of working with the MPO's and the locals, who have specific money for enhancements, and merge that with our projects so we could extend the life of the pavement and at the same time incorporate the enhancements.

One of the biggest problems we have is not talking to people early enough. Compared to other agencies, we are probably one of the best production machines in the country. We identify projects in the 5 year work program and it's a conveyor belt - they roll through and they fall off. It is vitally important to go out early and identify key community people and associations we should be talking to - because these people work on completely different time frames - they don't always recognize our production schedules, so it's important to do that leg work as early as possible.

Lessons Learned:

Negotiating Two Distinct Projects Under One Design Contract

By: Joseph Marzi, P.E. and Jose Velarde, P.E.

Due to the budget constraints brought on by the current economy, the Department has encouraged consultants to partner together on specific projects for the benefit of distributing more work into the consultant community.

Recently, we participated in two negotiations and have determined the need for more discussion on what are considered reasonable guidelines with our consultants. The first project was negotiated as two contracts with separate consultants, because the two segments were in different corridors. It was not feasible to share information readily for both projects. However, the second case is unique to the Department and needs more of an explanation.

The second project was an urban 3-R project. The prime consultant's intent is to design the first segment with the sub-consultant designing the second segment. This project is separated by several LAP projects being done by others. We identified both segments as in the same corridor and considered it as one project with two FM's numbers, which would likely be let as one construction contract.

The consultants approached the estimated hours as two separate productions because of the two plan sets for each submittal. Even though, both consultants used a reasonable hourly range of lower-middle range estimates for their specific project. We believed there was a duplication of effort between both jobs that could be avoided. For example under task 3.1.1 (Community Awareness Plan), the consultants each requested 24 hours for their respective task. The basis for staff hour range is within the low range of 16 to 24 hours. But, the problem with this logic is the Department is being charged 48 hours for total effort. We approached this task as one effort for 24 hours total and reduced the hours to 12 and 12 for each part. This method reduced the shared staff hours significantly and thus compelled the project team to become more cost-effective. We reviewed each task this way. Some task required more hours than a typical project because of the separate delivery submittals for each section.

Another factor taken into consideration is the additional coordination time the project manager (PM) would need with the project team. Having a smaller-size project with another consultant lends itself to a higher probability of inefficiencies and risks for the PM. It is important that we are conscientious of the PM's concerns during negotiations.

One lesson learned is to communicate expectations for staff hours early on with the consultant and not wait until the negotiation phase. Some questions to ask:

- Are the two projects close enough to control and be considered in the same corridor?
- What are the consultants' expectations for project control?
- How can we balance out the consultants added risks with the budget constraints?

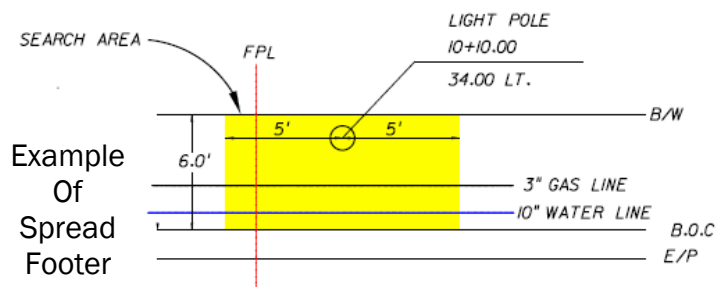
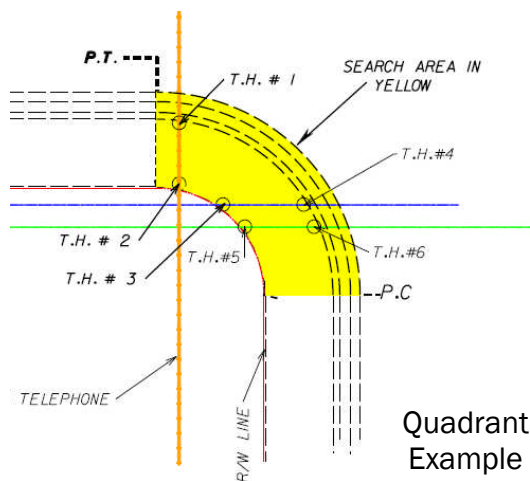
It's a difficult balance between the Department encouraging consultant partnering on projects and consultants accepting additional risk. This issue will require more discussions within the Department and our consultants on what are reasonable guidelines for future projects, if we are to follow along this path.

SUE Requirements

By: Robert Hughan, P.L.S., District 4 Surveyor

The SUE consultant, working directly with the Design Engineer of Record (EOR), must clear all sites i.e. quadrants for mast arms, light pole locations, catch basin locations, etc. To help complete this task, the following process will be followed:

- Working directly with the Design EOR, the SUE consultant will create Design boundary shapes for each type of utility investigation based on scope of project. (See red border in drawings below.)
- Designate all tonable and non-tonable utilities running through the above areas using standard designation equipment and Ground Penetrating Radar (GPR) to determine where the utilities are located (Show the verified utility information at any location that intersects the boundary borders.)
- If the GPR identifies any area that may contain a utility; a letter must be sent to the District 4 Survey Office along with a dgn file showing the utility designates and the GPR line
- Staff hours will be provided for potholes/locates work on the designates and the GPR lines to determine if a utility exists. Holes on the GPR indications will be paid for even though no utility is found (a dry hole)
- Pothole all utilities as per the drawings below.
- All locate/pothole information along with the type, size and utility owner information must be placed on a CD/DVD with X, Y & Z coordinates. This file must be PEDD's (signed & sealed) by the PLS in charge of the field work and delivered to the District IV Survey Office for placement on the District IV GIS.
- If a utility is identified but cannot be physically found, that needs to be identified on the design boundary and the EOR and Utility owner need to be notified of this issue.
- Keep the lines of communication open with the EOR. When in doubt, talk with EOR about the intent of the search and location process.



Valuable Reminder from the Utility Office

By: Tim Brock, P.E., District Four Utility / Value Engineer

We have come across some valuable reminders during an ongoing project that will help us avoid making repetitive, costly mistakes, and keep us in good favor with our partners:

1. Do not place mast arm foundations solely on the basis of utility designate information. Action for this lesson...our survey department has developed specific subsurface survey work order requirements for performing site specific surveys for this type of construction effort...to assist our partners in producing a conflict free contract plan-set.
2. Once the "free and clear" location has been determined for the specific construction effort (such as a mast arm foundation or drainage structure) the design team must ensure the structure is placed in the specified 'clear' location, and it remains in the clear location regardless of other constraints. This is accomplished by placing an additional emphasis on the utility conflict matrix to keep it current **through production complete** and making it available to our CEI/Operation Staff prior to advertisement of the contract.
3. The utility conflict matrix must identify and resolve all potential conflicts (including service laterals) where we expect to have excavation and/or other type of construction activities that could impact the utility facility.

We must continue to emphasize the partnership between the design community and the utility agencies. Relationships based on trust bear more fruit. Improved trust generates increased profits by helping us get it right the first time - which translates to fewer redesigns (saving time and money) and less aggravation for everyone during construction.

Utility agencies are our partners. By working together with our partners, we can produce more cost efficient services to our customers (the citizens of Florida). This synergistic approach enables us to deliver construction contracts that are free and clear of any conflict (utility and/or otherwise) *during the design phase*. Once we feel we have the most cost effective solution in place for the corridor improvements...we will then advertise and **hire** a contractor to build our creation.

Every project is an opportunity to strengthen our partnerships which in turn, enable us to produce conflict free construction contracts....*during design*. We must deal with all utility conflict situations **during design...not construction**. We spend a great amount of time and money during design to develop a conflict free set of plans. The fundamental point to remember from this reminder: Continue the development of the utility conflict matrix thru production and deliver it to our FDOT construction/CEI partners during the design/construction handoff meeting.