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NEWSLETTER

Camden, New Jersey, **REBID**

The Delaware River Port Authority (PATCO) placed another offering for renewal of some of their interlockings. 11 interlockings will be upgraded. 2 are in the tunnel and 9 are at grade. Also surfacing, lining, tamping, shoulder cleaning and vac truck work will be performed. Minimal electrical signal, power and negative work is also part of this contract. The re-bid date was November 4th. The Bid results are as follows:

1. Balfour Beatty Rail 12,300,000.
2. Railroad Construction 18,600,000.
3. Railworks 18,800,000.



Railway Engineering

We had a great experience at the University of Wisconsin in October at the Railway Engineering 2004 conference. The speakers were outstanding and a lot was learned by all. Al Wortley continues to provide the necessary engineering classes that all in the industry need.



Track Guy Consultants

Track Guy Consultants has prepared a paper for AREMA consideration for presentation at the next conference in September. Direct Fixation Track is a popular form for Light Rail and Transit companies. There are 2 basic methods of construction, "top down" or "bottom up". The industry seems to be very strong on their views and will always offer bad examples. The difference between the two methodologies are as significant as the differences between Democrat and Republican and the discussions can be just as intense as a Political debate. You either believe in it or you don't. We will also unveil a third form of methodology and design that will please both the Freight guys and the Light Rail guys. We are confident that our paper will be accepted by the committee and look forward to making the presentation. Stay turned for further updates. We are offering our Trackwork 101 course on March 21, 2005 at the Hilton Garden Inn in Canonsburg, PA (SW of Pittsburgh). If you have not received your registration form please call or e-mail. It will be a full day of energy packed discussions about the History, Design, Construction and Maintenance of Railroad Track. For more information and the agenda, just call John. Please register before January 15, 2005.



Charlotte Line Section Bid

- | | |
|-------------------|-------------|
| Herzog | 123,465,200 |
| Archer Western | 125,915,000 |
| Lane Construction | 153,360,000 |

Nashville, Commuter, **REBID**

- Queens City 10,811,600.
- Marta Track 11,453,200.
- Delta 12,148,700

Spotlight, Design Build Projects

Using the Design/Build approach to contract procurement is a fast way to get a system built. Typically an owner will advertise for a specific integrated system to be designed and built by one entity. This usually is a group of companies sometimes called a consortium. Using the basic



D/B method will put much more responsibility on the owner. The owner should take on the role of Quality Control (QC) and Quality Assurance (QA). The owner should also have the final say on approving designs. However, the owner must be prepared for change orders because the approval process may take to long and delay construction activities. The turn around on drawings must be very quick. The only time that I would recommend giving the QA/QC responsibility to the Consortium is if the Operations (O) and Maintenance (M) are included in the RFQ, hence the anagram DBOM. This sheds a whole new light on the project. Since the contractor now must maintain what they build, they will be more willing to include high end products and take extra care in the construction. There are many fine examples of DBOM projects that have produced outstanding results. Projects like; Hudson-Bergen, JFK Rail Link, South Jersey LRT and the Hiawatha are perfect examples of what to do right. They all had their bumps in the road, but at the end of the day they were all success stories. Tren Urbano seems to not fall in this category and further examination may be in order. When we get into a true DBOM, the owner must learn how to "let go". Pre-qualification is an absolute necessity and that process must be very strict with some mandatory requirements built in. Some owners may have a problem with DBOM because they may lose some control, but if they write a good contract and trust the company building the job then all will work out in the end. Just ask New Jersey Transit and the Port Authority of NY&NJ how they feel about DBOM. They did it right and we need to learn from them. There have been books written about Design Build and we can not cover everything in this short Newsletter, but it is this writers opinion that QA and QC are the most important activities of this process and it is easy for Contractor and Owner to deviate from this requirement. There absolutely must be checks and balances from the very beginning. This and Safety must play the most important roles for pre-qualification. Feedback will be greatly appreciated on this topic. Please e-mail or call. Thanks.



Ask The Track Guy



This is where you, the reader get to ask questions about Railroad Track engineering, design, construction, maintenance or anything to do with Trackwork. Simply write or e-mail a question and we will answer in a timely manner. Some questions will be published here.

What does Rail do when it gets hot or cold and where do the forces go?

As we know, when steel gets hot it expands and when it gets cold it will contract. When rail gets hot it will be in compression and when cold, in tension. This basic premise must be remembered throughout the analysis. The neutral temperature is that temperature where rail is neither expanding or contracting. This temperature varies from region to region and from Railroad to Railroad. When the rail temperature is higher than the neutral temperature, it will try and expand to the least resistance. The first choice is longitudinal where the forces are controlled by the clips or rail anchors holding against the ties and in turn held by the ballast. If the ties are spaced in accordance with the forces and size of rail, then the internal forces are restrained and the rail does not move through the fasteners. The next path of resistance is lateral. The friction between the bottom of the tie and the ballast takes about 15% of that force. The friction between the sides of the tie and the ballast will take about 50% of the force and the remainder (35%) is withheld by the ballast at the end of the ties. The next direction for relief of force is vertical. The shear weight of the ties, rail, ballast and OTM will control this direction. Now that we have restrained the forces (about 2,000 pounds per 1° of temperature change) we can carry the analysis one step further. When a 1,000' piece of rail wants to expand, it will try to do this over the cross section of the rail which is 13.67sq.in. (for 140# rail). This will calculate to .78" for every 10° of temperature change. The perimeter of a 1,000' piece of rail is 372,000sq.in. for 140# rail and therefore if we spread that .78" over 372,000 sq.in. we get .00002" which is almost impossible to measure, let alone see. Even for a 100° temperature change it is 7.8" longitudinal or a .00002" swell. Bottom line is that if the forces are restrained, then the rail will swell up ever so slightly. There are others that believe that the molecules get more dense. Just remember that rail **should not slip** through the fasteners **due to temperature**. We will discuss the dynamics of rail creep next quarter. Learn more at Trackwork 101.

What happened in Puerto Rico?

We will state facts only, no opinions.

History: There were 3 transportation studies done between 1967 and 1993. From 1993 to 1996 was the environmental permitting stage. In 1994 a contract was signed with DMJM to bring the design to the 30% stage. In 1996 they awarded a contract for the construction of the Tren Urbano System. At that time the system was to be opened by the fall of 2001. A procurement method called hybrid turnkey was chosen. Later it became known as a modified Design, Build, Operate, Maintain (DBOM). In a presentation given in May of 1999 at the Commuter Rail Conference in Toronto, they proclaimed a \$300 million savings and improved quality due to the choice of this procurement method. Seven separate Design/Build contracts were awarded

in 1996 and 1997 for the complete construction of the Tren Urbano system. The anticipated ridership was to be 115,000/day.



Construction: Construction was in full swing by 1998. This was expected to be a 4-year stage with completion by the end of 2000,

based on the original schedule presented to the FTA. The guideway was awarded in 7 pieces ranging from 1.7km to 3.6km in length. The total system was to be 17km of double track, 14 stations, 40% at grade, 55% elevated and 5% tunnel. Post-tensioned segmental was used for the guideway. Standard direct fixation track, concrete tie ballasted track with 115# rail was the design of the track. Nothing special or out of the ordinary.

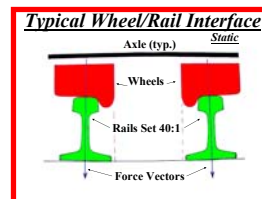
Quality: Each Contractor was to be responsible for their own Quality Assurance and Quality Control. Tren Urbano was to monitor Quality Control. The responsibilities for QA/QC changed during the course of the construction. The procurement method chosen was proclaimed to "improve quality due to a 10 year commitment".

Time: In 1994 Tren Urbano told the FTA that this project would be completed by 1998. In 1996 it was to be July, 2001. In 1999 it was to be May, 2002. In 2001 it was to be Sept, 2003. In 2002 it was to be Sept, 2004. The system is still not open for revenue service as of this writing.

Price: In 1994 it was to be \$770m. In 1996, \$1.25b. In 1999, \$1.654b. In 2001, \$2.036b. In 2002, \$2.19b. Today it is expected that the Tren Urbano system will have cost \$2,500,000,000.

Why is rail canted inward?

In the US, rail is canted (sloped) inward toward the centerline of the track. On almost all properties that cant is 40:1. This means that a 6" tall rail canted 40:1 will have a 1/8" offset from being vertical. Furthermore, if both bases of the rails were held and the head of the rails moved to vertical the gauge would be 1/4" wider (a good thing to remember when pre-plating ties). The tread on the typical railroad wheel is sloped 20:1. With the combined cants, the rail car will not "hunt" and therefore stays centered when on straight track. The weight of the train (force vector) in the static condition would transfer the



weight through the web of the rail. If the rail and wheels were not canted, then the train would continually wander back and forth bumping off each rail. Even worse, if the rail were canted outward by more than 26° from center, the wheel could

"ride up" and derail. This is extreme and dynamic forces must be lateral. I have seen this condition in new track with very high superelevation. Learn more at Trackwork 101.