

# The Track Guy



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## NEWSLETTER

### Nashville, Tennessee

The East Corridor Commuter Rail Project was bid in May for the rehabilitation of the 32 mile line. 28-miles of new CWR, and 22,000 ties will be installed in existing track plus 6 new bridges will be built, 3 rehabbed, 21 culverts and 22 road crossings will be installed. The Bid Results are as follows:

1. Marta Track 14,990,000.
2. Queens City 16,200,000.
3. GW Peoples 16,700,000.



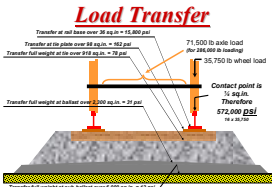
### Railway Engineering

The new "Fundamentals of Railway Engineering" book by Dr. Kerr is an outstanding manual that should be mandatory reading for every person associated with Railroad Track construction, design, inspection, maintenance and operation. This manual explains all aspects of the railroad track structure in easy to understand language. Dr. Kerr (University of Delaware) and Al Wortley (University of Wisconsin) are doing a superb job in educating people within our industry in order to maintain professional standards. Their courses should be mandatory for anyone involved with Quality Control on Railroad Track.



### Track Guy Consultants

#### Trackwork 101



We offer a 1-day training course that will explain the basics of Railroad Track construction and touch on some design issues. You will learn means and methods of Direct Fixation track, Ballasted track, Embedded track and much more. How to properly handle Continuous Welded Rail and how to properly stack rail so the stockpile does not collapse after 2-months. You will learn many definitions and terminology. This seminar will address some technical points that are essential to proper installation. Tools and equipment requirements will be taught. Plenty of time will be set aside for questions. A short video of actual track construction and the steps required to achieve the final product will be shown.



### San Diego, California

The long awaited Oceanside to Escondido (Sprinter) line has finally nailed down a bid date of June 23, 2004. This project has been on the books since 1990. With 34 miles of new track construction while maintaining freight service will present some challenging aspects to this job. *Good luck Yeager/Skanska.*

### San Juan, Puerto Rico



The Tren Urbano Light Rail system is a 100% federally funded turnkey demonstration project. It began over 10 years ago and is not completed yet. It has been plagued with delays, change orders and corruption. Test trains have been running for 2 years and the owner has decided to reinspect the trackwork as if it were a nuclear power plant. A .004 inch (.102mm) feeler gage is used to check the switch point bearing on the riser plates. If the gage fits, the riser plate is

rejected. Delaminated areas the diameter and thickness of a dime are grounds for rejection. The inspectors have lost sight of the intent of procedures and standards to our industry. QA and QC have changed hands so many times it is difficult to determine who is accountable. More details can be found on our website under the tab entitled, "Lessons Learned 1".



### Largo, Maryland



The Addison Road extension of the Washington DC Metro system (WMATA) is the first since the completion of the initial operating system that began some 30-years ago. 106-miles later this extension was procured using the Design/Build approach. A triventure of Lane/Granite/Slattery Skanska (LGS) was the successful bidder and began this fast track project less than 3-years ago. All 3-miles of this double track extension is underground using the cut and cover method of construction. H-piles were driven and steel sheeting was used instead of the conventional wood lagging. The box was poured using a traveler. The invert was poured first. Reinforcing steel was placed for the walls, the traveler mobilized, then reinforcing steel installed for the roof. Walls and roof were poured monolithic and the traveler moved to the next section. Duct banks and walkways were installed and the box backfilled. The Track contractor (Metroplex) began placing the Direct Fixation track using the same gantry system that the Kennedy Rail Link used at Kennedy Airport in Queens, New York.







# 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 is the purpose of the Ballast?

Ballast has many purposes and with out it, the track structure will deteriorate at a much quicker pace and the track can be very unsafe especially in CWR territory.

- Ballast allows for water and other liquids to reach the sub-ballast where it is diverted away from the track structure to drainage ditches or under drains. By doing this, the ties will have a much longer life and remain sound as a good support to the rail loads.
- Ballast can reduce frozen conditions and in turn prevent track heave, as long as the ballast is not fouled.
- Ballast absorbs dynamic forces imposed by rolling stock and dissipates impact forces from flat wheels etc.
- Without ballast the rail is free to expand and contract. The ballast locks the ties into the structure and as long as the rail has longitudinal restraint to the ties, then the thermal forces will be contained and pull apart and sun kinks will not occur. This is extremely important with CWR,
- Ballast distributes the load to the sub-ballast and in turn to the sub-grade. The deeper the ballast the less pressure is imposed on the sub structure. The lesser the depth of ballast, the greater the pressure.
- Ballast prolongs tie life significantly.
- Ballast prevents the growth of vegetation. Vegetation within the ballast is extremely detrimental to the success of a free flowing component of the track structure.



### How can you tell what number the frog is?

Turnout numbers represent the distance between 1 unit of change as it pertains to the angle of the turnout. Example: Mark the point on the frog where the spread from gage face to gage face is 4", then mark the point where it is 5". The distance between these 2 lines is the number of the the frog. If it is 8", then you have a #8 frog. This can be done in feet also.



### How much longer is an unrestrained piece of CWR that experiences a +55° temperature change from Philadelphia to Pittsburgh?

$$\Delta L = \Delta T \bullet L \bullet .000078$$

$\Delta L$  is in Inches,  $\Delta T$  in °F, L is in Feet

This is the same equation used to determine what gap to leave when laying rail. Substitute G (gap) for  $\Delta L$ . Note: This coefficient of expansion for rail steel has unit conversion built in. No friction or drag is taken into consideration.

$$\Delta L = 55 \bullet 260mi. \bullet 5280' \bullet .000078$$

$$\Delta L = 5890' \div 12 = \underline{490'}$$

*Believe it or not !!*

### What is "Jerk Rate"?

I was introduced to this term by Mr. Paul Bakis and Mr. Kieren Spillane of Parsons. We had some right of way constraints at the Kennedy Rail Link that required serious attention to Jerk Rate in order to maintain rider comfort. I had to put my 4 decimal point hat on for this one. Jerk Rate is simply a change in unbalance when changing speed by braking or acceleration. This typically occurs in Light Rail Systems. It will affect ride quality if adjustments are not made. If a train begins to brake while the last vehicle or two are still within a curve or spiral, then an evaluation should take place. Reverse curves with different velocity ratings are typical. Braking while approaching a station stop is another area of concern. The parameters and calculations can be very extensive and sometimes may take days to evaluate one curve. We developed a simple program to evaluate a curve quickly as to a "go/no go" scenario so that the process can be quicker and at least identify those curves that require attention. Typically the action is to modify the super elevation rate of change within the spiral or lengthen the change into the body of the curve. An in depth explanation would be to lengthy for this Newsletter.



### What is a "Sun Kink"?

A sun kink is a drastic misalignment of the track structure that occurs quickly and in most cases occurs while rolling stock is moving over the track. Sun Kinks derail trains and are a very serious factor to contend with. I remember Mr. Chuck Stanford telling me that June 21st (first day of summer) was his most anquish day on the railroad. When summer arrives, there are greater swings in the temperature changes. A few causes of sun kinks are as follows:

- Poor or nonexistant ballast shoulders and cribs.
- Improper destressing of the rail.
- Bunching up of rail due to vehicle movement or grades.
- Excessive pumping of track.
- Worn fasteners and rail restraint devices.

Typically 35% of the lateral force is held by the shoulder ballast, 50% by the ballast in the cribs and 15% by the ballast under a tie. Weeken any one of these and the potential for a sun kink increase. Pay attention to your neutral temperature. Pandrol has a VERSE machine capable of non-destructive testing that fits in a large suitcase.



### How high can you stack rail?

It all depends on the load distribution and the soundness of the support system. A pile must be in the shape of a pyramid, which means each layer has one less rail than the one before. You must calculate the presure that will be imposed onto the earth and inturn match the number of supports needed for that particular subgrade. I always use 12 x 12 oak timbers when stacking rail. 1,200 tons in one pile is not uncommon. Note: Fall protection.