Overhead Contact System Constant Tensioning With Spring Devices

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Key Presentation Take-Aways

- Origin of the Constant Tension Spring
- Variable tension/constant tension difference
- Types of tensioning equipment
- Constant Tension Springs (CTS)
- CTS operating principles
- Advantage of CTS
- CTS at Toronto Transit Commission
Variable Tension/Constant Tension

- All wires in tension have sag
- Sag is pronounced with variable tension (VT)
- Radial load increases with VT
- Constant tension controls sag and radial load
Sag in Contact Wire

\[ D = \frac{WS^2}{8T} \]

- \( D = \text{Sag in Feet} \)
- \( W = \text{Weight of wire in lb/ft} \)
- \( S = \text{Span length in ft} \)
- \( T = \text{Tension in lbs} \)
Radial Load in Contact Wire
Variable/Constant Tension

Contact Wire Tension

0°  F = 3,512 lbs
104°  F = 1,109 lbs

Radial Load for 16°

0°  F = 977 lbs
104°  F = 318 lbs

Constant Contact Wire Tension

0°  F = 2,000 lbs
104°  F = 2,000 lbs

Radial Load for 16°

0°  F = 556 lbs
Tensioning Equipment

- Hydraulic tensioners
- Gas tensioners
- Balance weights
- Springs-variable
- Springs-Constant
Tensioning Equipment

Hydraulic

Long Spring

Balance Weight

Short Spring

Gas

Cam/Spiral-Constant Tension
Constant Tension Springs
Origin of Constant Tension Spring

- Designed by Matti Insco Williams student at UMass
- Developed at MBTA, Boston
- Two units Installed 1991 on line B of the Green Line
- Still in service today
Constant Tension Spring Operating Principle

\[ F_{\text{line}} = \frac{T}{R} \]
Cam Movement Over Temperature Range Hot to Cold

Expanded wire at hot temperatures

Contracted wire at low temperatures
Advantage of Constant Tension Springs

• Less Costly
• Easy Installation
• Aesthetically Pleasing
• Simple mounting
• Reduced tension losses
Constant Tension Springs
Toronto Transit Commission

Overlap Transition Clamp

Joint Use Pole-Route
514-Cherry Street
QUESTIONS