Structural Analysis of Ohio Perpetual Asphalt Pavement

Ohio Perpetual Pavement Committee

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Prepared by

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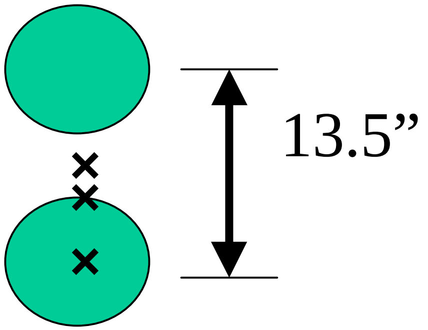
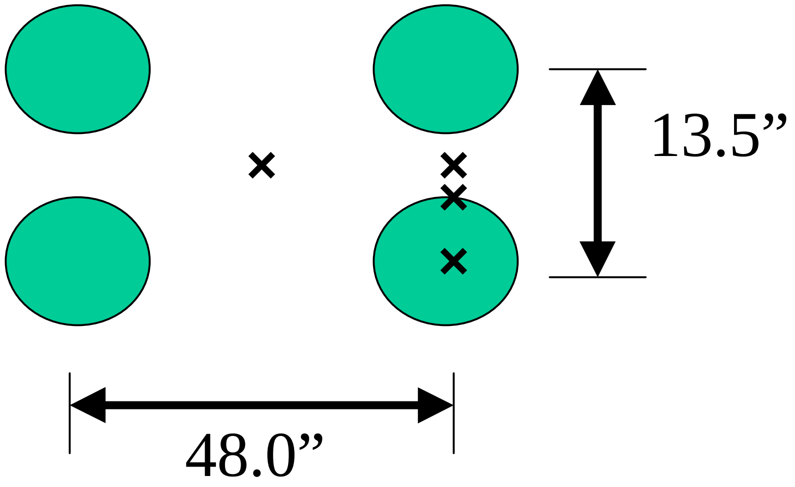
Loading Configuration

(Elastic Analysis)

- **Single Axle**
  - **20 kip**, 22 kip, 42 kip
  - Tire Pressure =100 psi



- **Tandem Axle**
  - **34 kip**, 41 kip
  - Tire Pressure =100 psi



Ohio Perpetual Pavement
- Structure -

Surface	SMA	PG 76-22M	1.5in.
	19 mm Superpave	PG 76-22M	1.75 in.
Intermediate	Asphalt Base (Item 302)	***PG 64-22 or*** ***PG 70-22***	8-18 in.
Fatigue Resistant Layer	***Opt @ 3% Air or*** ***Opt @ 4% Air***	PG 64-22	4 in.
Base	Aggregate Base (Item 304)		6 in.
Subgrade			semi-infinite

Material's Properties (Elastic)

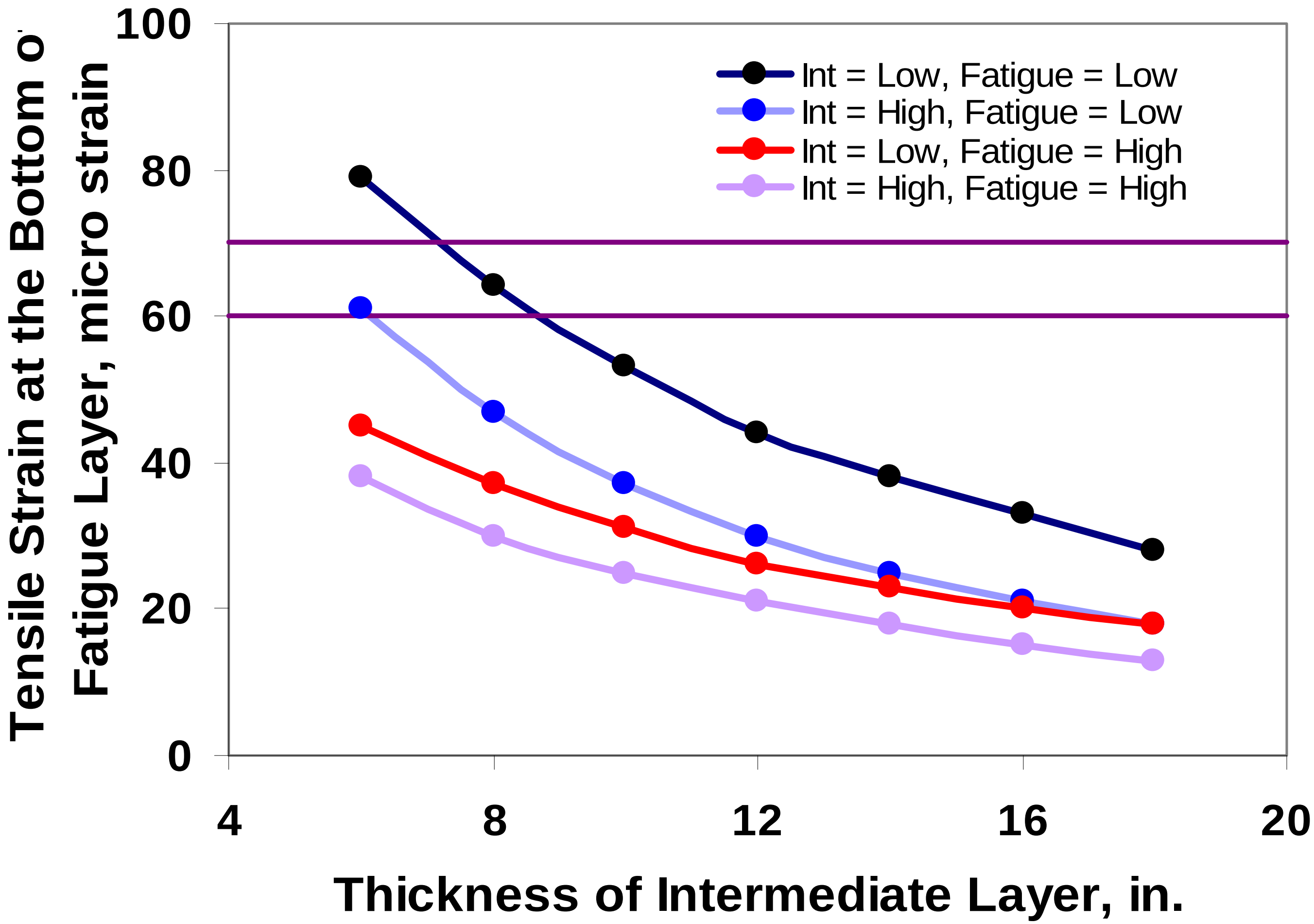
SMA	E = 1,500,000 psi	PR = 0.35
19 mm Superpave	E = 1,500,000 psi	PR = 0.35
Intermediate	E = 500,000 or 1,500,000 psi	***PR = 0.35***
Fatigue Resistant Layer	E = 500,000 or 1,500,000 psi	PR = 0.35
Base	E = 10,000 psi	PR = 0.40
Subgrade	E = 5000 psi	PR = 0.45

Matrix To Study Max T. Strain

Intermediate Asphalt Layer Thickness in.	Intermediate Asphalt Layer Type (ODOT Item 302)			
	Mix with PG 64-22		*Mix with PG 70-22*	
	Fatigue Resistant Layer Type		Fatigue Resistant Layer Type	
	Opt %AC (4% air)	*Opt+0.5% AC (~3% air)*	*Opt %AC (4% air)*	*Opt+0.5% AC (~3% air)*
18				
16				
14				
12				
10				
8				

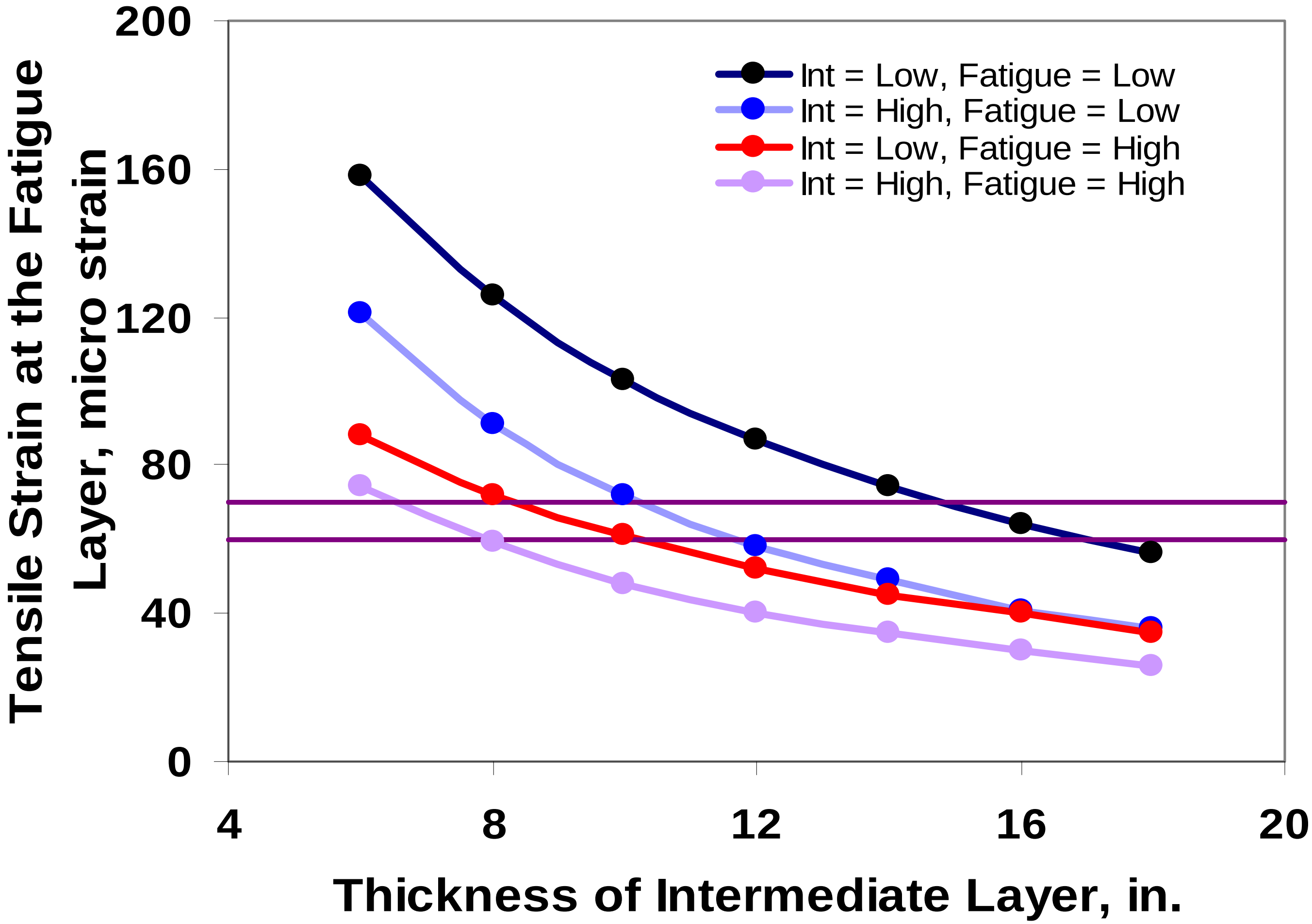
Linear Elastic Analysis

(20 kip Single Axle)



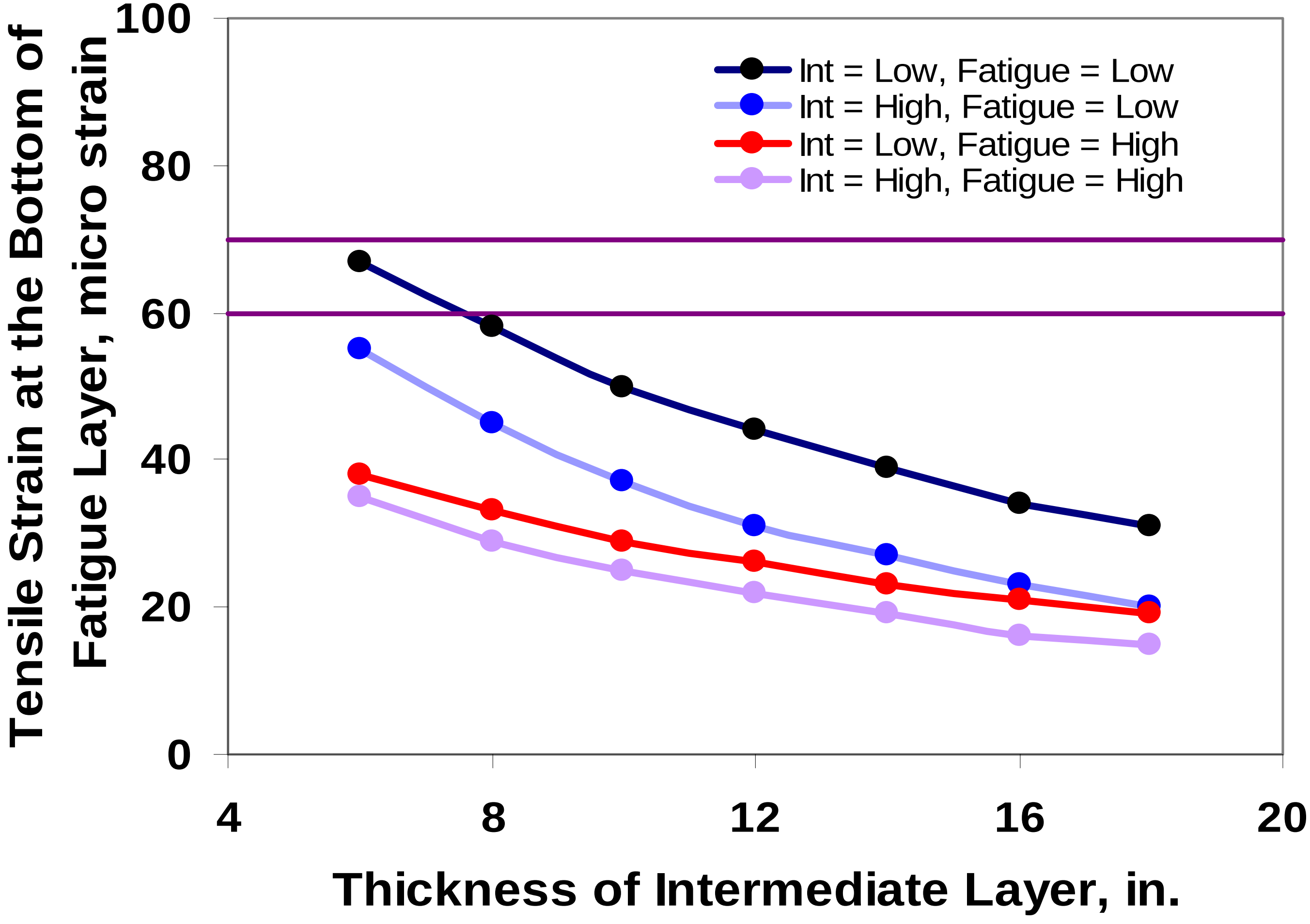
Linear Elastic Analysis

(42 kip Single Axle)

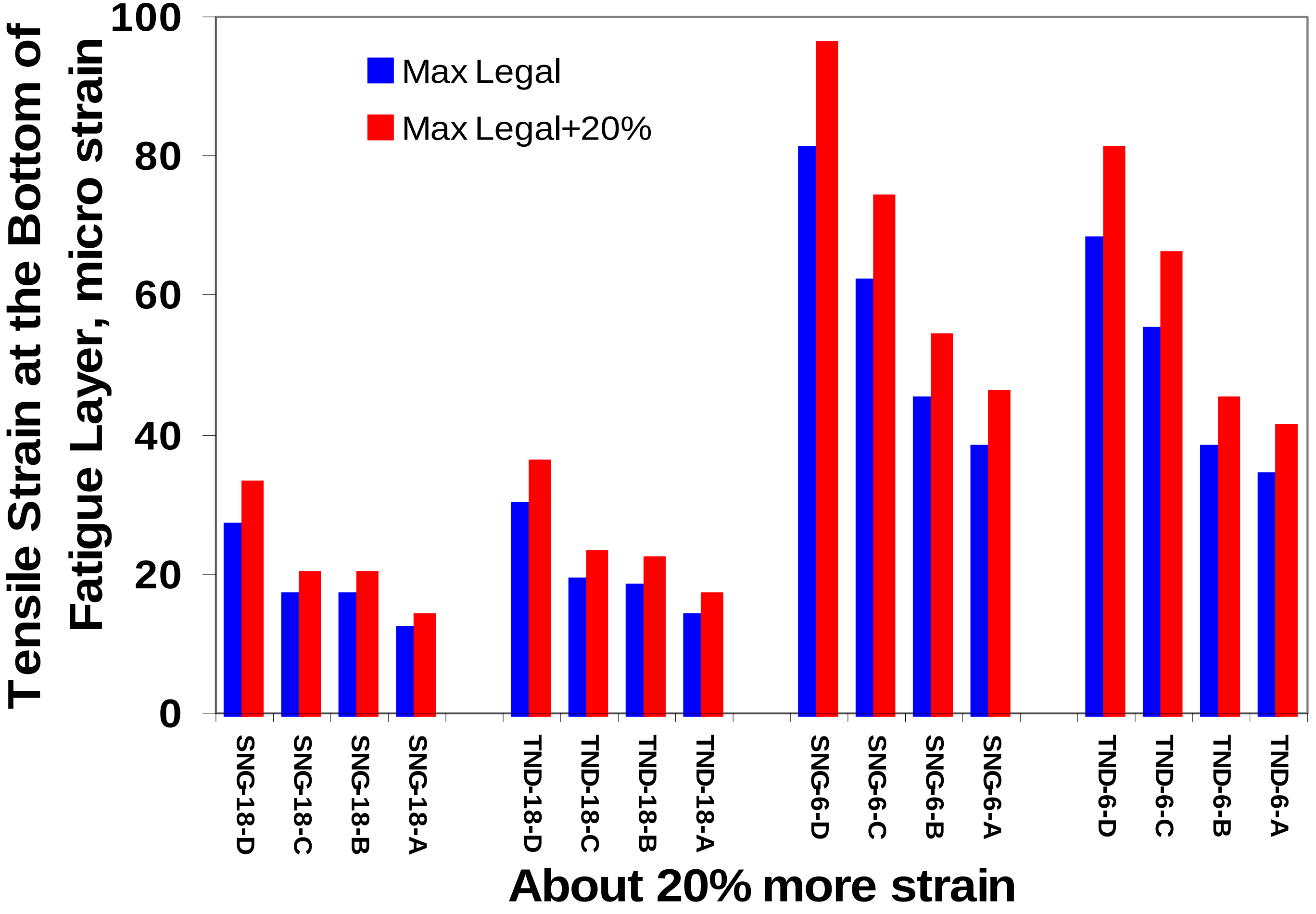


Linear Elastic Analysis

(34 kip Tandem Axle)

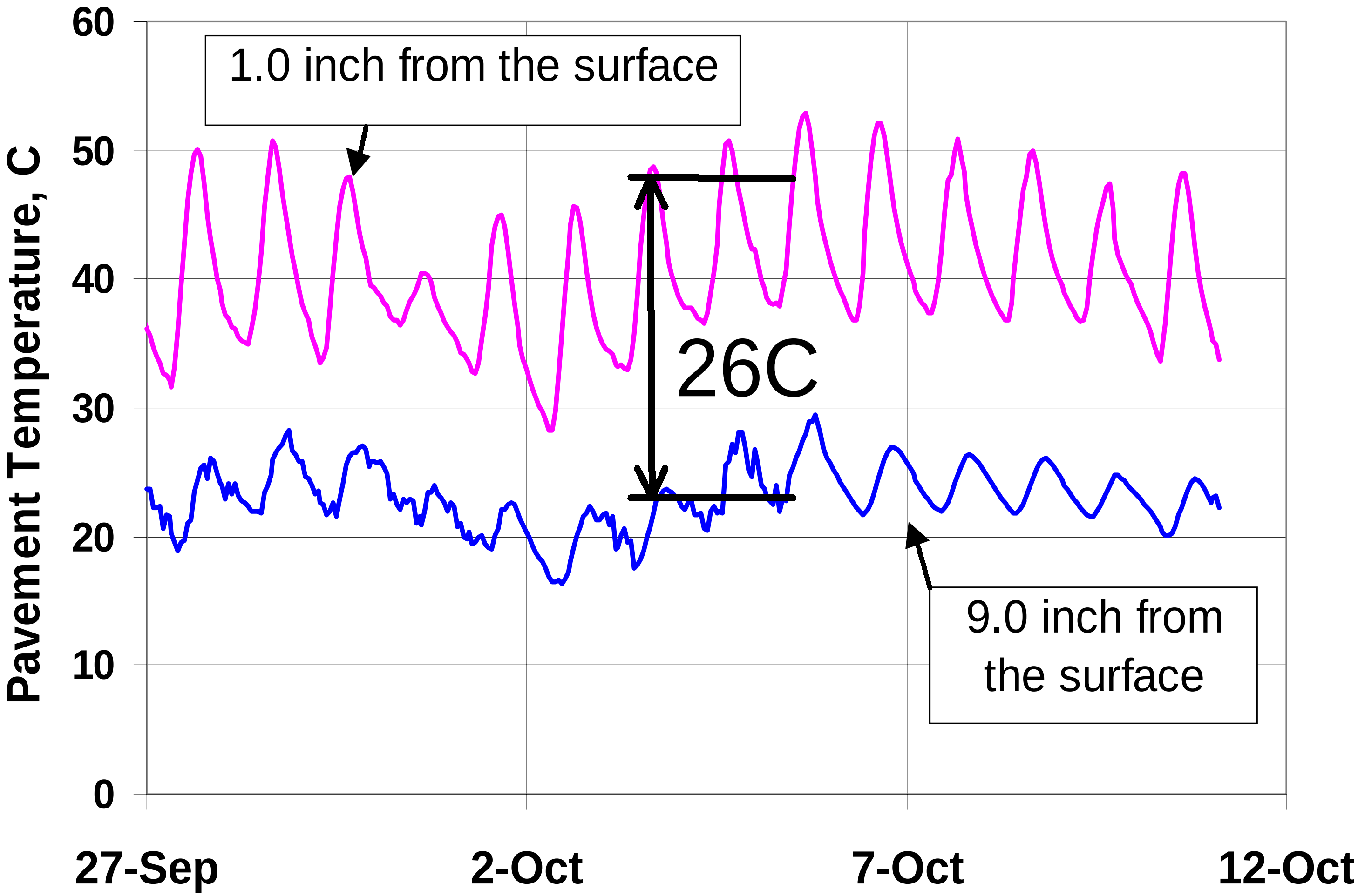


Effects of 20% Over Legal Loads



Temperature Gradient in Pavement

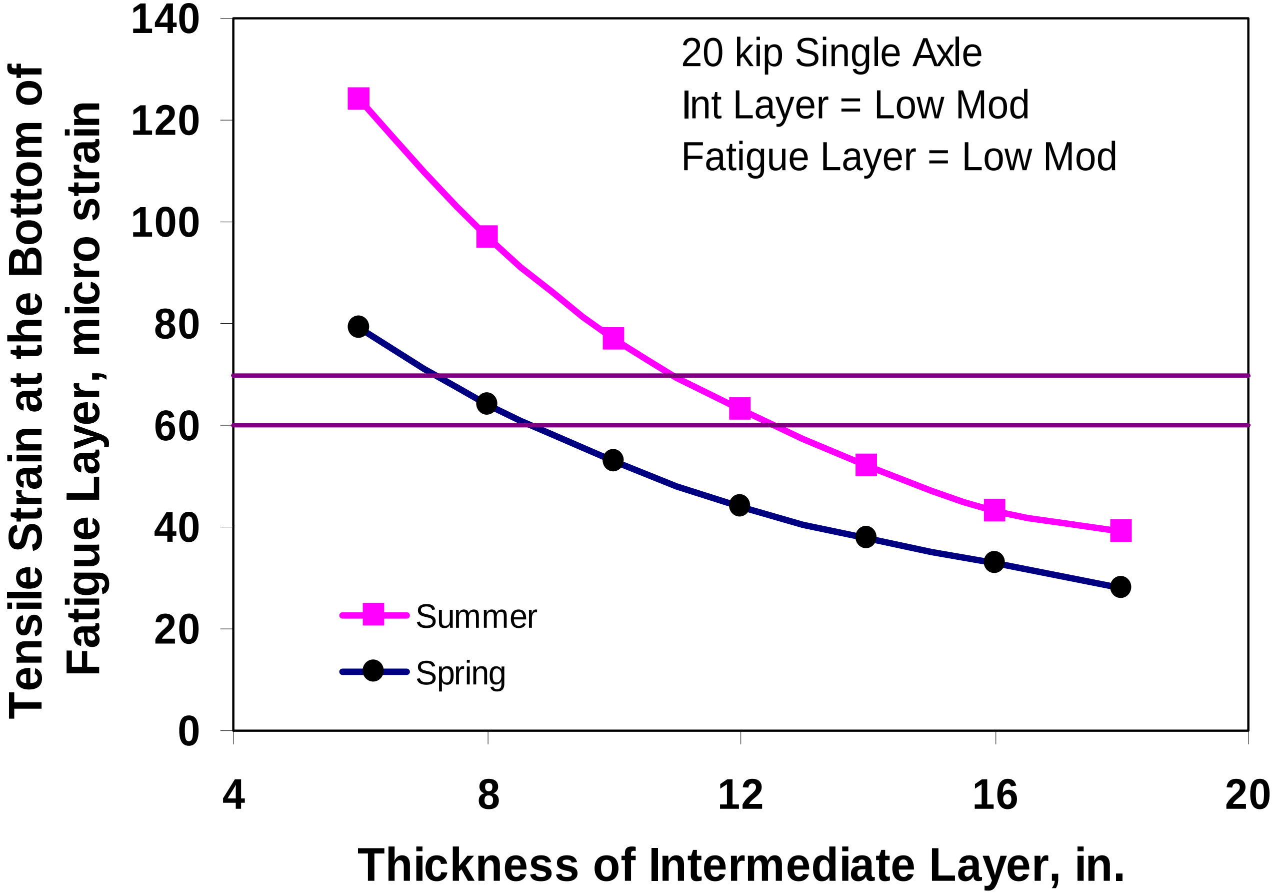
390110 (J10): SPS-1, year 1997 Data



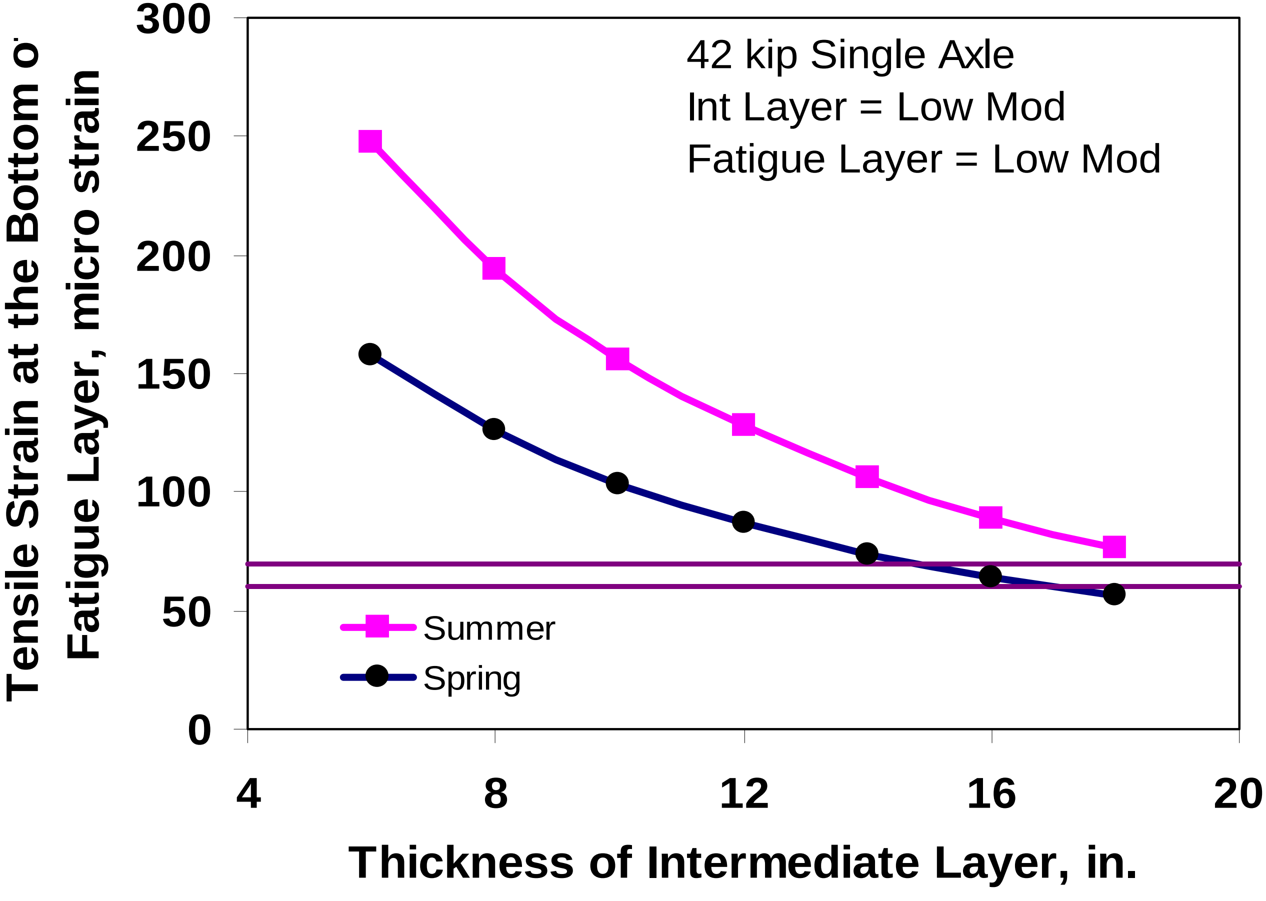
Consideration of Temperature Gradient During Summer

Top 3.25 in. →	Reduce Modulus by 1/7.5
Next 4.0 in. →	Reduce Modulus by 1/4.0
Below 7.25 in. →	No Change in Modulus

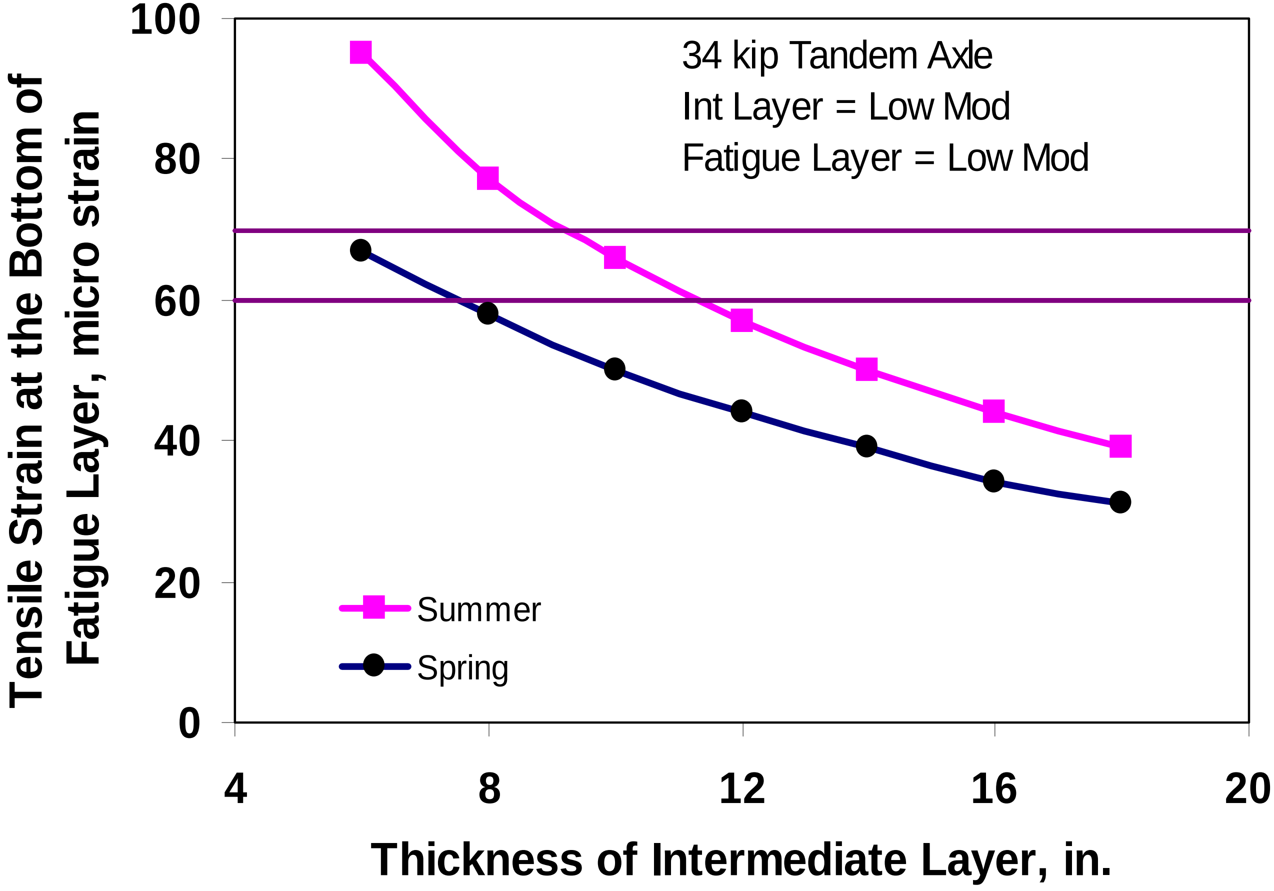
Summer Effects



Summer Effects

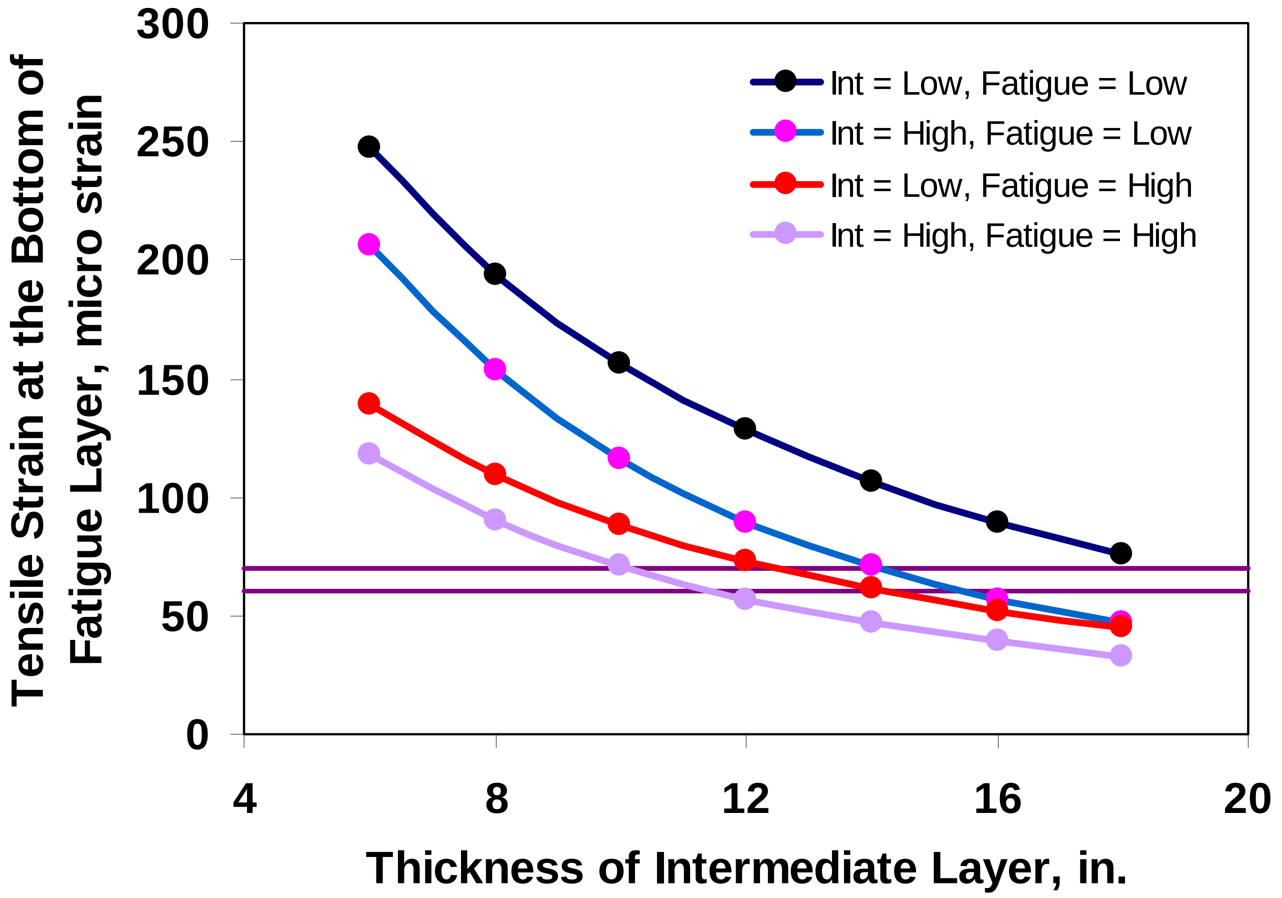


Summer Effects



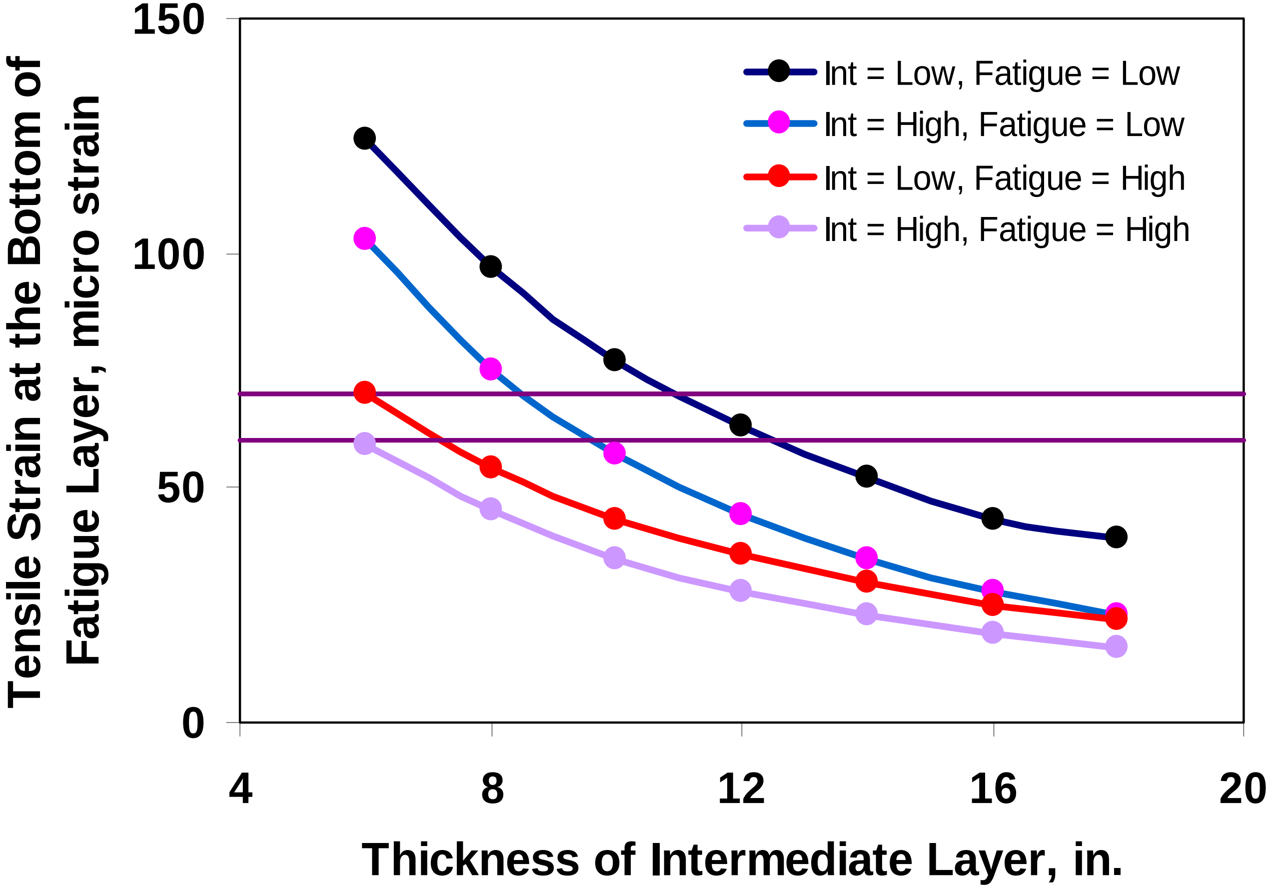
Summer Effects (42 kip Single)

(27-70% increased Tensile Strain)



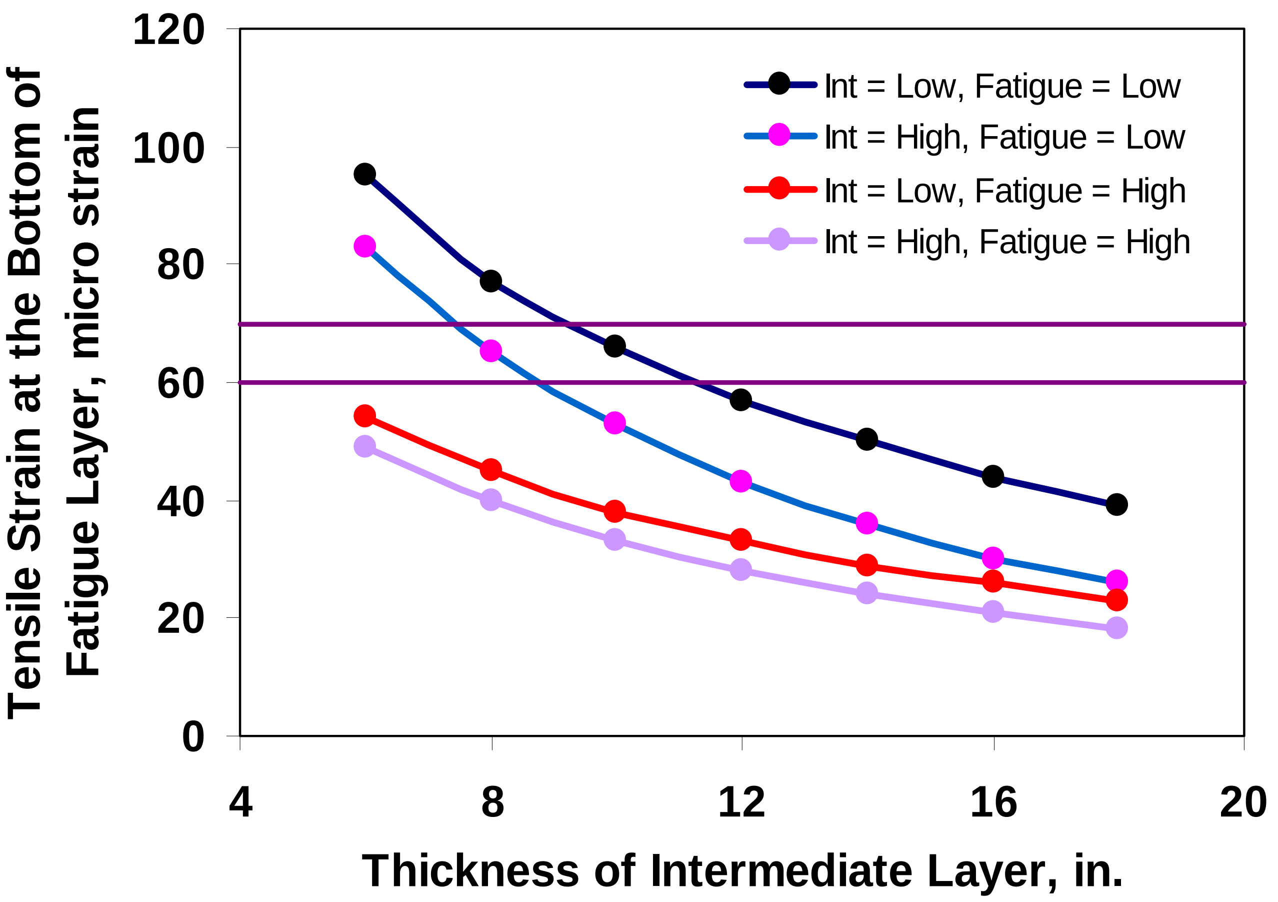
Summer Effects (20 kip Single)

(22-69% increased Tensile Strain)



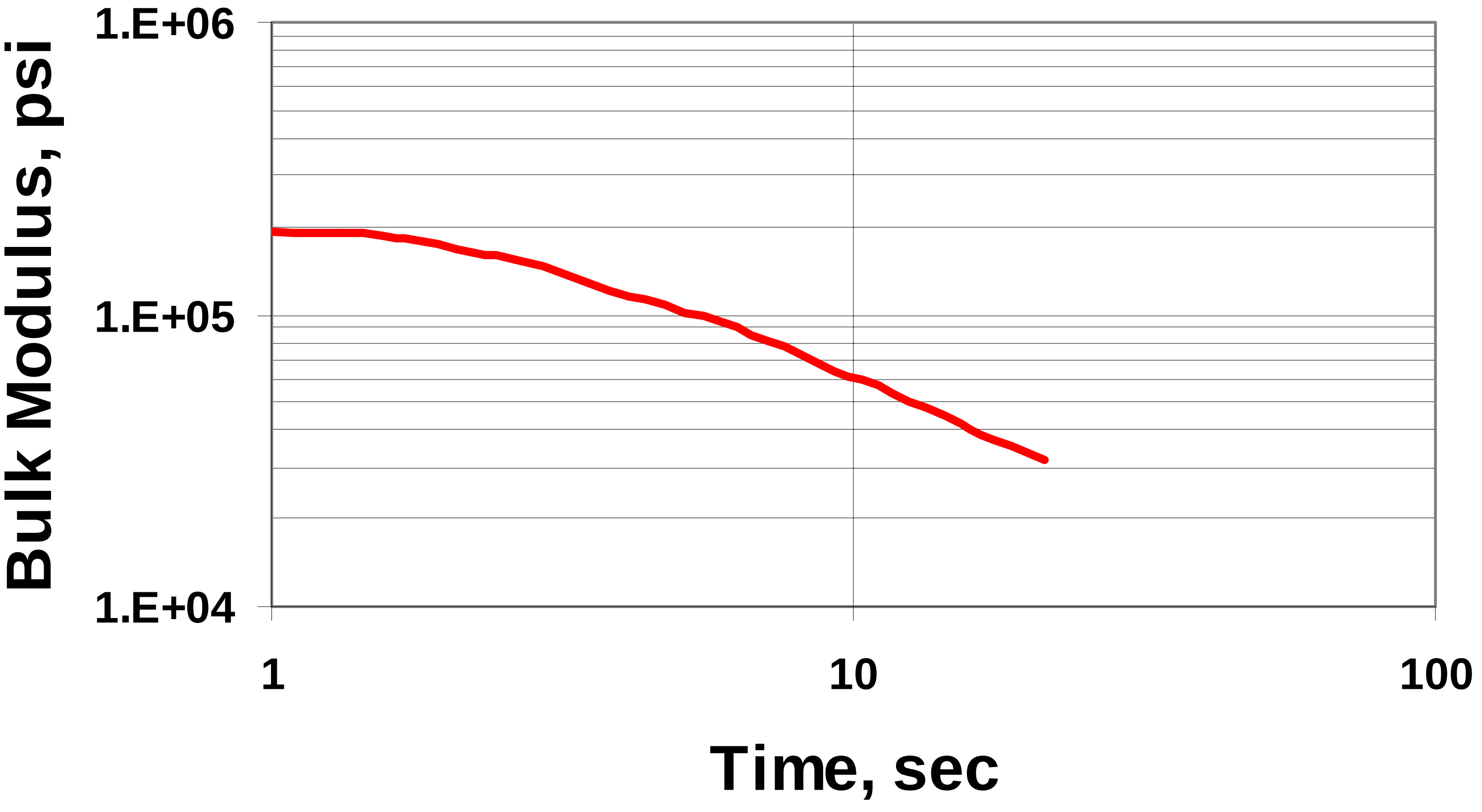
Summer Effects (34 kip Tandem)

(20-51% increased Tensile Strain)



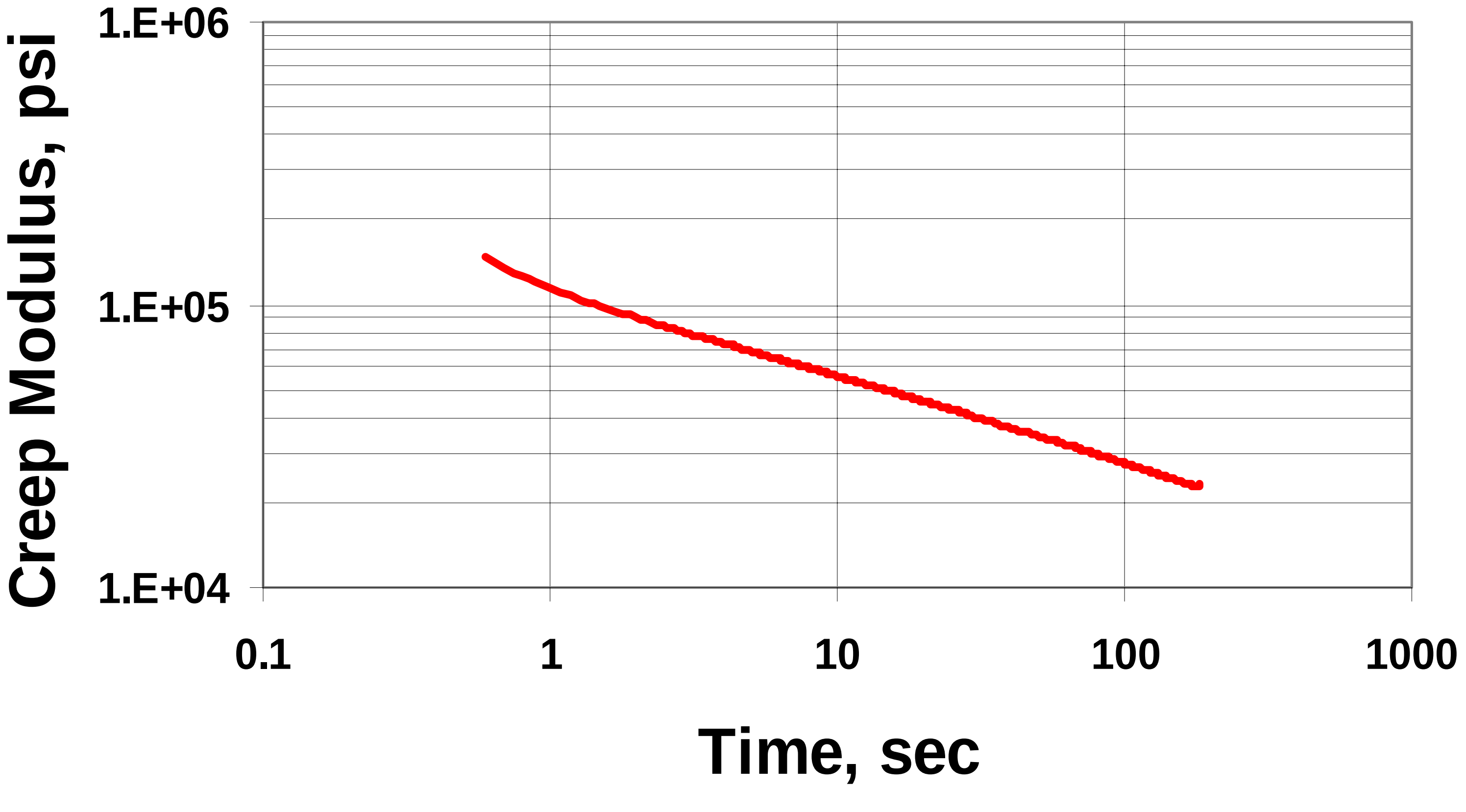
Material's Properties (Visco-Elastic)

- Bulk Modulus -



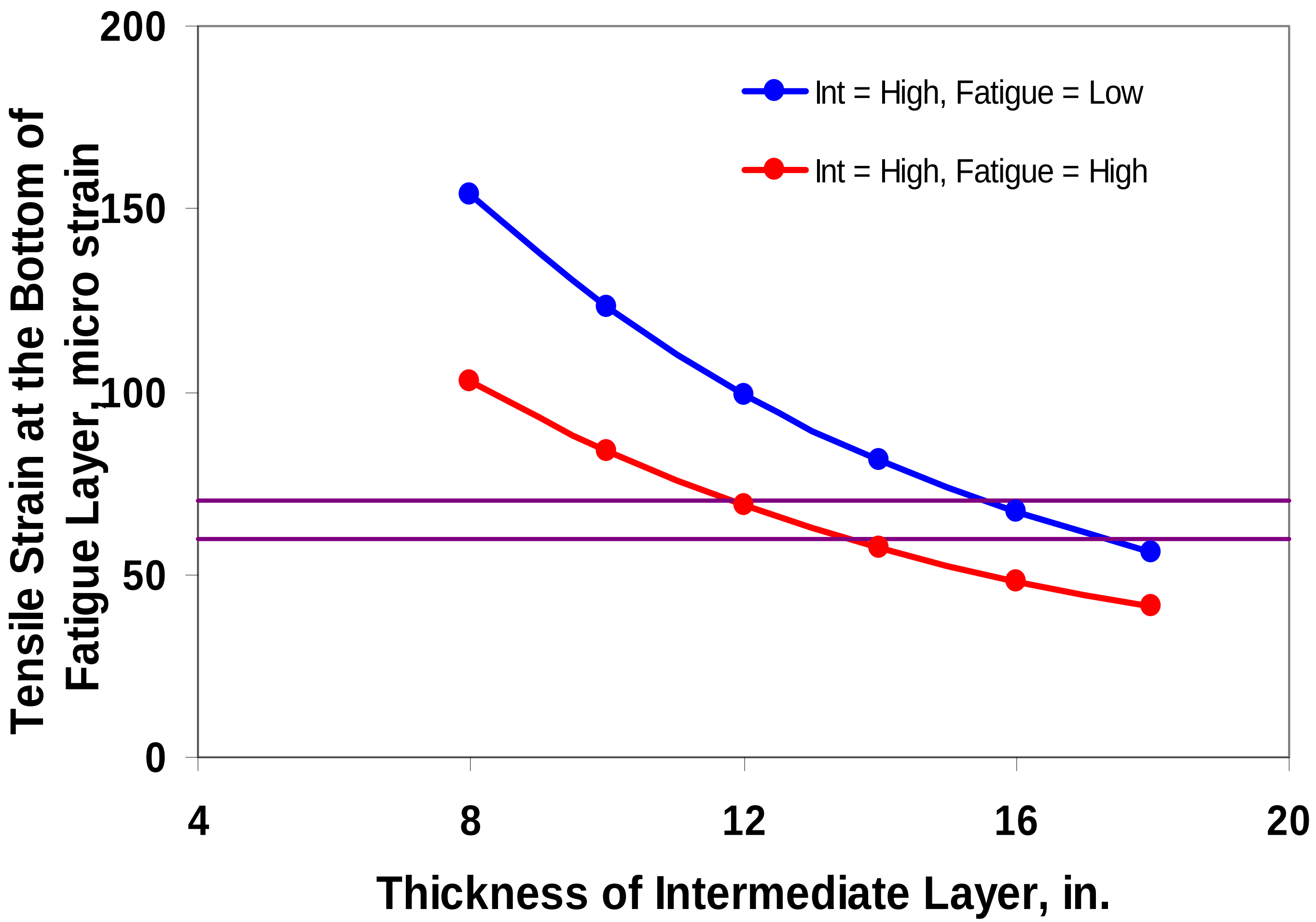
Material's Properties (Visco-Elastic)

- Creep Modulus -



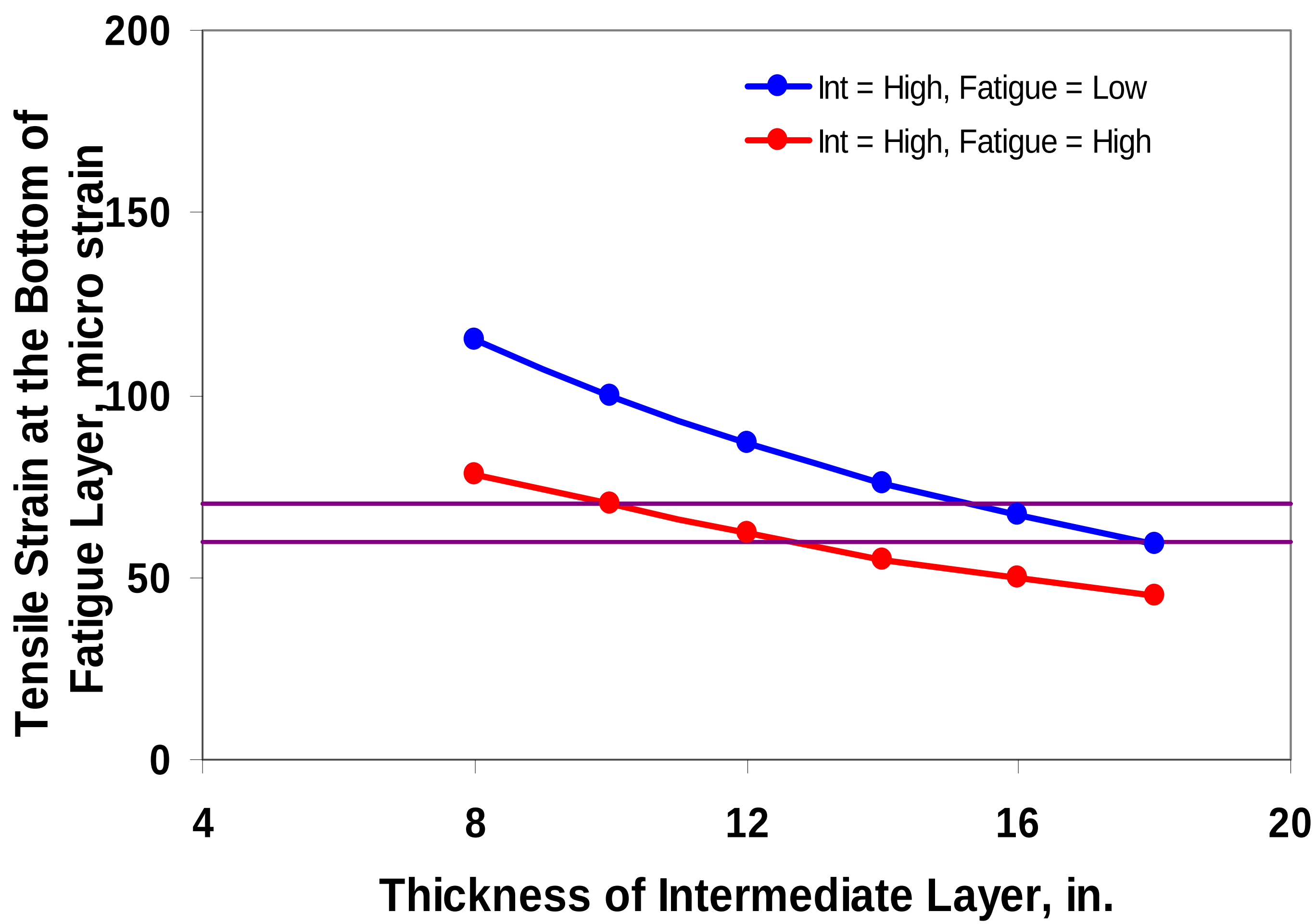
Visco Elastic Analysis

(20 kip Single Axle)



Visco Elastic Analysis

(34 kip Tandem Axle)



Elastic vs. ViscoElastic Analyses