Design of East Link Aerial Guideway
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East Link Extension Overview

Length: 14 miles

Rider projection:
50,000 daily by 2030

Budget: $2.8 billion (2010$)

Start of Service:
Targeted 2023
East Link Extension Timeline

2006-2011: Planning and environmental review
2011-2015: Final design (we are here)
2015-2022: Construction
Targeted 2022: Testing & pre-operations
Targeted 2023: East Link in service
Project Packages
South Bellevue

- Serves south Bellevue in a trench along Bellevue Way and an at-grade alignment along 112th Ave
- Stations at South Bellevue and East Main
- Approximately 7,000 daily boardings (2030)
South Bellevue Station (~30%)
Downtown Bellevue

- Serves downtown Bellevue and medical district and Wilburton area
- Tunnel and elevated alignment
- Stations at Bellevue Transit Center and at Hospital Station
- Approximately 8,500 daily boardings (2030)
Bellevue Transit Center Station (~30% design)
Bel-Red

- At-grade, elevated and retained cut alignment
- Stations at 120th and 130th Ave NE
- Planning for future development and street improvements
- Approximately 7,000 daily boardings (2030)
Overlake

- Stations at Overlake Village and the Overlake Transit Center
- Bike/Pedestrian bridges at both stations
- Approximately 5,500 daily boardings (2030)
Aerial Guideway

- 9,400 ft of Aerial Guideway
Structure Type Selection

• Precast Prestressed Concrete Tubs
  – Cost
  – Dual Track / Single Track
  – Aerial Station
  – Construction Access
  – Availability
Key Design Criteria

• 100 year life
• AASHTO LRFD
• Rail/Structure Interaction
  – Continuous Welded Rail
  – Non-linear Rail Fasteners
  – Rail Break, 2” gap
• Seismic
  – Operating Design Earthquake (ODE) 150 yrs, elastic
  – Maximum Design Earthquake (MDE) 2500 yrs, life safety, plastic hinging
• Vibration and Deflection Control
  – Frequency 3.0 hz
  – LL Deflection L/1000
Analysis – Global Model
Analysis – Rail/Structure

Girder

Nonlinear Fastener (typ)

Rail

East Link Extension
Stiffness Adjustment

- Column heights
- Column diameter
Axial Stress in Rail under Thermal Loading (ksi)

- Peak stresses occur over expansion joints

Longitudinal Force in Rail Fastener under Thermal Loading (k)

- Non-linear analysis shows “slipping” of fasteners when force limit is reached
- Stiffer fasteners at crossover

Typical fastener force limit
Rail Break

- Rail Break at joint
- Measure rail movement
East Link Structure Types

- Simple Span Prestressed Tub
- Long Span CIP Segmental Concrete
- Continuous Prestressed Tub at Stations
- Continuous Post Tensioned Tub at NE 116th
- Prestressed I Girder
- Sequential Excavation Method Tunnel
- Trench
Dual Track

- Precast Prestressed Tubs
- Octagon column
- Shear Blocks
- Slack Restrainers
- Elastomeric Bearings
Dual Track Bent

East Link Extension
Single Track
Bent at Center Platform Station
Long Span at I90 and I405

• Cast in Place
  Balanced Cantilever

East Link Extension
Balanced Cantilever at I405
Cut and Cover vs SEM Tunnel

- Traffic Impacts
- Temporary Decking
- Business Access
- Utility Impacts
- Shorter Construction Duration
Sequential Excavation Method
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