Streetcar and Light Rail Characteristics
Street Running: Alignment Options
DUS 1– LRT from DUS to Park Avenue to 38th Avenue
DUS 2– LRT from DUS to 20th Street to 38th Avenue
All routes explored for alternate LRT alignments
# Light Rail vs Streetcar

## Decision Issues

<table>
<thead>
<tr>
<th>Light Rail</th>
<th>Streetcar</th>
</tr>
</thead>
</table>
| **Purpose** | High capacity and demand  
Strong peak ~ commuters  
Multiple lines/same corridor | Moderate capacity and demand  
Steady all day demand  
Discreet routes ~ less demand |
| **Capacity** | 1-4 car trains ~ 125 pass/car  
• 2-2.5 min ~ max frequency  
• 12,000 – 15,000 pass/hr | 1 streetcar ~ 120 pass/car *(can operate in 2-car consists if needed)*  
• 5 min ~ max frequency *(could be more frequent if needed)*  
• 1,440 psgs/hr *(5,760 max)* |
| **Design** | Exclusive or semi-exclusive right-of-way *(limited mixed flow)*  
• Single track in short distances if needed  
• Reliable schedules  
• Achieve max speed ~ 55 mph | Exclusive, semi-exclusive, or mixed-flow with traffic  
• Schedule includes delay  
• Street speed max ~ 30-35 mph  
• *Can reach 45 mph if conditions allow* |
## Light Rail and Streetcar Operation
### Common Characteristics

<table>
<thead>
<tr>
<th>Light Rail and Streetcar</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power</strong></td>
<td>Electric ~ overhead wire ~ 650 - 750 Vdc</td>
</tr>
<tr>
<td><strong>Track</strong></td>
<td>Same ~ standard gauge typical, others possible</td>
</tr>
</tbody>
</table>
| **Vehicles**             | Length ~ varies based on demand:  
  Streetcars ~ 50 -110+ feet;  Light Rail ~ 80 - 95 feet  
  Width/Height:  7.5 to 10 ft wide, 10 to 13 ft high  
  Articulated ~ bendable joint(s) ~ sections:  
  Streetcars ~ multiple, up to 6;  Light Rail ~ 2 to 3  
  Older and "historic" streetcars *not* articulated  
  Low floor vehicles ~ trend for new vehicles in most cities |
| **Environment**          | Block length ~ limits train size/number of cars  
  *With short blocks ~ 1 or 2 car trains max* |
| **Fare Payment**         | Off vehicle ticket machines ~ most systems  
  *Some on-board purchase ~ streetcar operation* |
# Light Rail and Streetcar Service
## Typical Differences

<table>
<thead>
<tr>
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<th><strong>Light Rail</strong></th>
<th><strong>Streetcar</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right-of-Way</strong></td>
<td>primarily exclusive</td>
<td>primarily mixed-flow</td>
</tr>
<tr>
<td><strong>Geometry/curves</strong></td>
<td>min radius ~ &gt;85 ft</td>
<td>min radius ~ &lt;60 ft</td>
</tr>
<tr>
<td><strong>Operating Rationale</strong></td>
<td>limited-stop/express - regional rapid transit</td>
<td>local/limited-stop - line haul or feeder</td>
</tr>
<tr>
<td><strong>Station Spacing</strong></td>
<td>1/2 to 1 mile or more</td>
<td>2-3 blocks to 1/2 mile</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>with 1+ mile station spacing ~ 50 - 60 mph</td>
<td>limited by close station spacing ~ 25 - 35 mph (45 mph max)</td>
</tr>
<tr>
<td><strong>Mode of Access</strong></td>
<td>park/ride, bus, bike, walk</td>
<td>same</td>
</tr>
<tr>
<td><strong>Seats / Standees</strong></td>
<td>64/61 ~ 125 per car</td>
<td>30/90 ~ 120 per car</td>
</tr>
<tr>
<td><strong>Trains / Capacity</strong></td>
<td>1 to 4 cars / 125 to 500</td>
<td>1 to 2 cars / 120-240</td>
</tr>
<tr>
<td><strong>Peak Passengers</strong></td>
<td>1,000-7,500 per hour</td>
<td>1,440-5,760 per hour</td>
</tr>
</tbody>
</table>
# Light Rail and Streetcar Service

## Typical Differences

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<thead>
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<th>Streetcar</th>
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<tbody>
<tr>
<td><strong>Function</strong></td>
<td>high capacity, high demand</td>
<td>moderate capacity, moderate demand</td>
</tr>
<tr>
<td><strong>Route Design</strong></td>
<td>multiple lines/routes over common tracks</td>
<td>discreet lines/routes</td>
</tr>
<tr>
<td><strong>Service Plan</strong></td>
<td>accommodate high peak demand</td>
<td>moderate demand throughout day</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>track signals, traffic signal pre-emption</td>
<td>on-site, with traffic signals, <em>or signal priority</em></td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>full depth ~ 3 to 6 ft. utilities relocated</td>
<td>shallow slab ~ 12 to 18 in. minor/no utility relocation</td>
</tr>
<tr>
<td><strong>Communication</strong></td>
<td>duct bank required</td>
<td>no duct bank</td>
</tr>
<tr>
<td><strong>Grade separation</strong></td>
<td>moderate to extensive</td>
<td>minor</td>
</tr>
</tbody>
</table>
# Light Rail and Streetcar Service

## City by City Examples

<table>
<thead>
<tr>
<th>Type</th>
<th>Operating Characteristics</th>
</tr>
</thead>
</table>
| Streetcar| ▪ Primarily in-street operation  
           ▪ Some exclusive ROW |
| Light Rail| ▪ Primarily exclusive right-of-way ~ streets and corridors  
            ▪ Moderate to extensive grade separation ~ short elevated or underground sections |
| Hybrid   | ▪ Includes streetcar and light rail attributes  
           ▪ Single cars and multi-car trains  
           ▪ Subway or elevated in CBD or other activity centers  
           ▪ Exclusive surface ROWs and mixed-flow sections  
           ▪ Design/Operating constraints ~ based on most restrictive element in system (e.g. tight curves on street sections) |
# Light Rail and Streetcar Service
## City by City Examples

<table>
<thead>
<tr>
<th>Streetcar</th>
<th>Light Rail</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toronto</td>
<td>Denver</td>
<td>Boston – Green Line</td>
</tr>
<tr>
<td>Denver – Welton segment</td>
<td>Los Angeles – Blue, Green, Yellow</td>
<td>Cleveland – Blue/Green</td>
</tr>
<tr>
<td>Pittsburgh – Allentown</td>
<td>San Diego</td>
<td>Philadelphia – Subway/Surface</td>
</tr>
<tr>
<td>Philadelphia – Media, Sharon Hill, Girard</td>
<td>San Jose</td>
<td>Pittsburgh</td>
</tr>
<tr>
<td>Portland</td>
<td>Sacramento</td>
<td>San Francisco – Muni Metro</td>
</tr>
<tr>
<td>Tacoma</td>
<td>Calgary</td>
<td></td>
</tr>
<tr>
<td>New Orleans</td>
<td>Edmonton</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Portland – Blue, Red, Yellow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salt Lake</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Houston</td>
<td></td>
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<tr>
<td></td>
<td>Dallas</td>
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<td></td>
<td>Saint Louis</td>
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<td>Minneapolis</td>
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<td>Baltimore</td>
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<td>Jersey City</td>
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<tr>
<td></td>
<td>Newark</td>
<td></td>
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<tr>
<td></td>
<td>Buffalo</td>
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</table>
Streetcar Examples

**Toronto**
Traditional Streetcar
- Center street alignment
- Std and artic vehicles
- In-street boarding above
- High floors – non-ADA

**Portland**
Neo-traditional Streetcar
- Side alignment
- Articulated vehicles
- Curbside boarding
- Low floors – ADA OK

**Paris**
High-Capacity Streetcar
- Street median alignment
- Multi-articulated vehicles
- Platform boarding
- Low floors – ADA OK
Hybrid Streetcar/Light Rail Examples

**Hannover**
- Downtown subway
- Street median and mixed-flow sections
- Multi-articulated vehicles and low/high stairs
- Singles to 3-car trains
- High platforms subway & selected surface stops

**Boston**
- Downtown subway
- Street median and mixed-flow sections
- Articulated and low-floor vehicles
- Singles to 3-car trains
- Low platforms in subway and surface

**San Francisco**
- Downtown subway
- Street median and mixed-flow sections
- Articulated vehicles
- Singles to 3-car trains
- High platforms subway & selected surface stops
**Light Rail Examples**

- **Salt Lake**
  - High floor vehicles
  - Exclusive ROW
  - 1-4 car trains

- **Portland**
  - Low and high floor vehicles
  - Exclusive ROW
  - 1-2 car trains

- **Houston**
  - Low floor vehicles
  - Primarily Exclusive ROW
  - 1-2 car trains
Light Rail – Street Running Example: Portland Interstate MAX
Light Rail – Street Running Example: Portland Interstate Max
Modern Streetcar Example: Portland
Modern Streetcar Example: Portland
Modern Streetcar Example: Tacoma