CALTRAIN ELECTRIFICATION

Grade Crossing Activation System Update
OVERVIEW TODAY

• Existing Caltrain grade crossing activation system is Direct Current (DC) based
• FRA requires gates to activate at least 20 seconds prior to the train approaching the crossing
  — JPB requirement is at least 25 seconds
• Grade crossing activation system is a key safety component of the railroad and of an electrified system
OVERVIEW ELECTRIFICATION

• Caltrain Electrification requires Alternating Current (AC) system
  — Cannot have a DC grade crossing system with the overhead contract system which is AC (too much interference)
  — Grade crossings will be modified to AC system
• Balfour Beatty, Inc. (BBI) is responsible for delivering an design-build electrified system with a certified grade crossing activation system
• New Grade Crossing System
  — Design
  — Install
  — Test
TWO SPEED CHECK SOLUTION

• Originated from Association of American Railroads (AAR) typical circuits
• Proposed solution has been developed in coordination with UPRR, FRA, CPUC
• Meets all system safety and regulatory requirements
• Each crossing will need to be individually designed, several already complete
TWO SPEED CATEGORIES

- Each crossing will have two assigned speed categories
  - Max speed to x speed (MAX Category)
  - X speed to 0 mph (Lower Category)

<table>
<thead>
<tr>
<th>Categories</th>
<th>Example Category Speeds*</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Category</td>
<td>79mph to 41mph</td>
<td>Any train traveling between 79-41mph will be in the Max Category</td>
</tr>
<tr>
<td>Lower Category</td>
<td>40mph to 0mph</td>
<td>Any train traveling between 40-0mph will be in the Lower Category</td>
</tr>
</tbody>
</table>

* Some crossings may have different speeds for each category based on track alignment and configuration
• Pre-check – health check (working properly)
• Timing section – detects the speed of the train and sends instruction to gate controller (max or lower category)
• Xing Approach – enough distance prior to the crossing to safety provide the required gate warning time based on the maximum speed (when the gate will start to go down – max or lower category)
• Island Circuit – the actual crossing with the gates down
MAX AUTHORIZED SPEED

• Max authorized speed at a crossing is calculated based on:
  — Alignment
  — Curvature
  — Line of sight
• Speed is picked up by the system in the timing section
• Trains would travel below max speed
  — Accelerating out of a station
  — Decelerating into station
  — Mechanical failure
  — Freight train
  — Heat or other restrictions
OVERALL GATE DOWN TIME

• Gate down time is dependent on
  — Individual crossing speed categories
  — Schedule
    • Which determines the speed (that train will go through a crossing)
    • Station stopping pattern
    • If trains crossing each other at a grade crossing the same

• At stations: system features (e.g. circuit timers, whistle mics) also assist with reducing gate down time
CITY/COUNTY COORDINATION

• Caltrain will review gate down times with municipalities when the analysis for individual crossings become available
  — BBI is currently completing gate down time design and analysis for each crossing. Design build contract so not all crossings will be designed at once
• Traffic mitigation included as part of Electrification is still applicable
WIRELESS SYSTEM

- Existing Positive Train Control (PTC) contract includes implementation of a wireless grade crossing activation system
  - Timing of implementing wireless activation system is still being determined, but most likely post electrification
- Wireless solution requires a significant design effort and is intended to enable gate crossing activation based on actual speed of the train
  - Will also require significant alignment effort with the FRA
- Two Speed Check Solution will be implemented first
- Once there is a wireless grade crossing system, the two speed check solution would be used for non-equipped trains
NEXT STEPS

• BBI to continue individual crossing design and analysis
  – Continue to meet with cities as designs are finalized
• Work with CPUC and municipalities to complete the GO-88b process
BACK-UP SLIDES
ALTERNATIVES CONSIDERED

• Fixed Start Solution
  – Longer average gate down times

• Axle counters for speed detection
  – Not acceptable for maintenance & operations

• Aspect-based speed limits for train approach
  – Not reliable method to determine train speed

Two Speed Check Solution
  – Determined to be best alternative