Standards-Based Qualification Systems: Rail Car Technicians - TCRP Project E-7

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Enormous Training Needs in Transit

Up to 88 Percent of Today’s Total Transit Workforce Will Have to Be Hired and Trained in the Next 10 Years

Source: TLC based on data from US DOT, US DOL
US Transit Invests Less than 1 Percent Of Payroll in Human Capital

Public Transportation Behind the Curve on Training Investment

*Estimated by the Transportation Learning Center based on a 2010 survey of the transit industry
Federal Transit Investment in Human Capital: 0.1% of Physical Capital

- Annual federal investment in transit workforce development (NTI, Innovative Workforce Programs) in MAP-21 – **Total $12 million**
- Annual federal investment in physical capital – **Total $9.6 billion**
Developing Industry-wide Training Standards

40+ Agencies and Local Unions Working Together: Sponsored by APTA and National Transit Unions

Maintenance Technicians
1. Transit Bus
2. Rail Car
3. Signals
4. Elevator-Escalator
5. Rail Traction Power

Plus:
6. Bus Operator

All Training Standards Adopted by APTA
## Work Tasks and Learning Objectives

<table>
<thead>
<tr>
<th>Maintenance Occupations</th>
<th>Courses</th>
<th>Modules</th>
<th>Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus Technician</td>
<td>7</td>
<td>186</td>
<td>1,551</td>
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<tr>
<td>Rail Car</td>
<td>42</td>
<td>177</td>
<td>1,346</td>
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<tr>
<td>Rail Signals</td>
<td>27</td>
<td>86</td>
<td>467</td>
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<tr>
<td>Traction Power</td>
<td>17</td>
<td>36</td>
<td>232</td>
</tr>
<tr>
<td>Transit Elevator/Escalator</td>
<td>39</td>
<td>243</td>
<td>567</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>132</strong></td>
<td><strong>728</strong></td>
<td><strong>4,163</strong></td>
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</table>
# Rail Car Technician Training Standards

<table>
<thead>
<tr>
<th>Topic Area</th>
<th>Courses</th>
<th>Modules</th>
<th>Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fundamental Skills</strong></td>
<td>17</td>
<td>70</td>
<td>478</td>
</tr>
<tr>
<td>1. Couplers</td>
<td>2</td>
<td>7</td>
<td>168</td>
</tr>
<tr>
<td>2. Trucks &amp; Axles</td>
<td>2</td>
<td>17</td>
<td>211</td>
</tr>
<tr>
<td>3. Propulsion &amp; Dynamic Braking</td>
<td>2</td>
<td>5</td>
<td>91</td>
</tr>
<tr>
<td>4. Auxiliary Inverters &amp; Batteries</td>
<td>2</td>
<td>9</td>
<td>34</td>
</tr>
<tr>
<td>5. Friction Brakes</td>
<td>2</td>
<td>11</td>
<td>82</td>
</tr>
<tr>
<td>6. HVAC</td>
<td>2</td>
<td>14</td>
<td>80</td>
</tr>
<tr>
<td>7. Current Collection &amp; Distribution</td>
<td>2</td>
<td>11</td>
<td>54</td>
</tr>
<tr>
<td>8. Car Body</td>
<td>2</td>
<td>7</td>
<td>64</td>
</tr>
<tr>
<td>9. Doors</td>
<td>2</td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>10. Communication Systems</td>
<td>2</td>
<td>6</td>
<td>67</td>
</tr>
<tr>
<td>11. CBTC (ATP - ATO)</td>
<td>2</td>
<td>8</td>
<td>52</td>
</tr>
<tr>
<td>12. Diagnostics and Troubleshooting</td>
<td>3</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>42</strong></td>
<td><strong>177</strong></td>
<td><strong>1346</strong></td>
</tr>
</tbody>
</table>
E-7 Project

E-7: Builds on Industry Training Standards To Build a National System of Qualification

• Standardized Curriculum
• Sharing and Validating Training Courseware
• Quality Training – through Train-the-Trainer
• Effective Mentoring – through Mentor Training
• Integration of Classroom & On-the-Job Learning
• Assessment – Written and Hands-On
• National Credential Management System
• Apprenticeship and Basis for College Credit
National and Local Qualification System

- National Apprenticeship (and College Credit) → Local Apprenticeship and College Credit
- National Skill Validation (hands-on & written) → Local Skills Validation and Grandparenting
- National Credential Management System → Local Training and Assessment Records
- National Mentor Training → Local Mentor Training
- National Framework for On-the-Job Learning → On-the-job Learning with Mentoring
- National Train the Trainer → Local Train the Trainer
- Standards-based National Courseware → Customized Classroom Training
- National Training Consortium → Local Training Partnerships and Work Groups
- National Training Standards and Curriculum → Skills Gap Analysis and Validation of Courseware
- National Training Committee → Local Training Committee

National Qualification System

Customized Local Training Delivery
Industry Training Standards

• Developed as a Joint Consensus by SMEs on National Industry Training Committee
• Comprehensive Scope across all technologies and variations
• Designed for Local Customization to local fleets, technologies, job classifications and practices
• Easily Navigated by instructors, technicians and maintenance managers
National Training Standards & Systems

• Sponsored Nationally by APTA and Transit / Passenger Rail Labor
• Supported by Transportation Learning Center
• Staffed by Subject Matter Experts –
  • Maintenance Managers and Trainers from agencies
  • Top Frontline Technicians nominated by labor
• Initial Rail Car Training Standards fully funded by US DOL and FTA
• E-7 Project funded by TCRP
Standards-Based Qualification System

- **Apprentice Technician:** Basic & Generic Skills
  - Basic – Level 100
  - Training & Validation: Classroom & Written
  - Training & Validation: Hands-on & OJT

- **Journeyperson:** Inspection & Maintenance
  - Intermediate – Level 200/250
  - Training & Validation: Classroom & Written
  - Training & Validation: Hands-on & OJT

- **Master Technician:** Troubleshooting & Diagnostics
  - Advanced - Level 300
  - Training & Validation: Classroom & Written
  - Training & Validation: Hands-on & OJT

System of Progressive Learning and Validation

TRANSPORTATION LEARNING CENTER
Curriculum and Courseware

• *Training Standard updated and aligned to courseware progression* by the E-7 Project

• *Rail Car Specific Introductions* ("primers") for each of the 12 Rail Car Subsystems

• *Validation Tool* developed for aligning local training materials and OEM manuals to national training standards

• *Courseware Validation against the standards has been conducted* in a number of agencies
National Train-the-Trainer for Rail Car

- Technical Requirements Identified within E-7 project

- Train-the-Trainer Course developed by the Transit Elevator-Escalator Training Consortium can be adapted for accelerated development of Rail Car TTT course

- TCRP F-19 Project on Training and Certifying Vehicle Maintenance Trainers Can be Applied Here
Framework for On-the-Job Learning

• On-the-Job Learning – often poorly coordinated with classroom learning
• Competency checklists guide the learner on the job
• Experienced technicians trained as mentors support learners in the field
  → Enhanced coordination between learning in the classroom and on the job
• OJL Support needed from basic 100 level skills through occupation-specific level 200 skills and advanced level 300 skills
Mentor Training System

- Mentor Training Requirements scoped by E-7 Panel
- Mentor Training Manual developed for Rail Car Environment under E-7
- Mentor Training has been delivered locally with very positive results
Assessment System: Written & Hands-On

- **Banks of Assessment Questions** developed for each of the 12 Subsystems: up to 87 questions for each subsystem area
- **Written and Hands-On Tests** are both important. They answer different questions, with basic fees for each
- **Internet-Based Assessments** are primary, with paper & pencil assessments as a backup (and oral testing option)
- **Learners progress from one level to the next by training & satisfactory completion of assessments**
- **Assessments jointly administered** to increase reliability and workforce confidence – piloted in 6 agencies
- **Written tests only for basic skills (level 100), and Hands-On only for advanced troubleshooting at the 300 level**
Credential Management System

• Developed to track training history and assessment history of all Rail Vehicle Technicians in participating systems
• Uses industry-standard internet-based database
• Generates certification within each of the 12 subsystems and across subsystems
Rail Car Technician Apprenticeship

- Developed by National Training Committee and E-7 Panel
- Approved by US DOL - June 2013
- National Technical Committee is the Rail Car Training Committee
- Transportation Center Board of Directors acts as National Policy Committee
- Implementation through local joint committees
- Local registered apprenticeship can open doors for college credit – ongoing national & local effort
Rail Vehicle Technician
National and Local Qualification System

Chart Legend

National Framework:
- Fully Developed
- Under Development
- Future Work

Local Implementation:
- Ongoing

National Qualification System

- National Apprenticeship (and College Credit)
- National Skill Validation (hands-on & written)
- National Credential Management System
- National Mentor Training
- National Framework for On-the-Job Learning
- National Train the Trainer
- Standards-based National Courseware
- National Training Consortium
- National Training Standards and Curriculum
  - National Training Committee

Customized Local Training Delivery

- Local Apprenticeship and College Credit
- Local Skills Validation and Grandparenting
- Local Training and Assessment Records
- Local Mentor Training
- On-the-job Learning with Mentoring
- Local Train the Trainer
- Customized Classroom Training
- Local Training Partnerships and Work Groups
- Skills Gap Analysis and Validation of Courseware
- Local Training Committee
National Qualification System Across Transit Technical Occupations

Chart Legend:
- Fully Developed
- Under Development
- Pending/Future Work

Elevator-Escalator:
- National Apprenticeship (and College Credit)
- National Skill Validation (Hands-on & written)
- National Credential Management System
- National Mentor Training
- National Framework for On-the-Job Learning
- National Train the Trainer
- Standards-Based National Courseware
- National Training Consortium
- National Training Standards/Curriculum (2006-2010)
- National Training Committee

Signals:
- National Apprenticeship (and College Credit)
- National Skill Validation (Hands-on & written)
- National Credential Management System
- National Mentor Training
- National Framework for On-the-Job Learning
- National Train the Trainer
- Standards-Based National Courseware
- National Training Consortium
- National Training Standards/Curriculum (2006-2010)
- National Training Committee

Rail Vehicle:
- National Apprenticeship (and College Credit)
- National Skill Validation (Hands-on & written)
- National Credential Management System
- National Mentor Training
- National Framework for On-the-Job Learning
- National Train the Trainer
- Standards-Based National Courseware
- National Training Consortium
- National Training Standards/Curriculum (2006-2010)
- National Training Committee/E-7 Panel (2008-2014)

Traction Power:
- National Apprenticeship (and College Credit)
- National Skill Validation (Hands-on & written)
- National Credential Management System
- National Mentor Training
- National Framework for On-the-Job Learning
- National Train the Trainer
- Standards-Based National Courseware
- National Training Consortium
- National Training Standards/Curriculum (2006-2010)
- National Training Committee

Bus Maintenance:
- National Apprenticeship (and College Credit)
- National Skill Validation (written on - ASE)
- National Credential Management System
- National Mentor Training
- National Framework for On-the-Job Learning
- National Train the Trainer
- Standards-Based National Courseware
- National Training Consortium
- National Training Standards/Curriculum (2004-2010)
- National Training Committee

National Training Consortium Start Dates:
- 2010
- 2013
- 2014
- Pending
- Pending
Next Steps: Implementing Standards-Based Training and Apprenticeship Systems Locally for Incumbents and New Hires

• Based on New Industry-wide Standards
• Building Local Apprenticeship Joint Programs
• Validating and Sharing Courseware
• With Trained Instructors
• With Trained Mentors
• Seeking College Credit based on national apprenticeship

→ New Consortium Proposal with Multiple Transit Rail & Commuter Rail Agencies for a cost-share with FTA and FRA
Implementing Standards-Based Learning: Next and Future Steps

• Expand the network of standards-based training throughout the industry: Beyond Elevator-Escalator, Signals, and Rail Car to include Bus, Traction Power and new areas like Facilities and Track and Wayside Maintenance
How Do We Know It Works?

1. Participating Techs and Supervisors tell us it’s great, they’re learning a lot
2. Technicians are increasing their knowledge and skill – based on pre- and post-training assessments.
3. Equipment is Much More Reliable – better for customer satisfaction and safety
   • Elevator-Escalator data from the 5-agency Training Consortium
   • Bus data
     • SEPTA – MDBF, Savings of millions of dollars annually
     • CDTA Albany – skilled workforce → in-sourcing, more reliable buses
     • SamTrans: 22K+ MDBF for a bus fleet up to 14 years old
4. Savings on parts and labor (per agency computer records) that far exceed agency investments in standards-based training
   • Detailed study of SEPTA, CDTA – Metrics of Success report
5. Agency ROI for Standards-Based Training Investments:
   • Average annual ROI >550 percent after startup at SEPTA, with conservative assumptions (only 15 percent of gains due to training)