A Practical Option for Managing Transit Facility and Infrastructure Assets
Presentation goals

• Overview of RTD’s Asset Management program
  • Public facilities
    – Asset breakdown structure
    – Condition assessments
  • Maintenance facilities
    – Asset breakdown structure
    – Condition assessments
• Bridges and conveyances
  – 3rd party inspections converted to SGR
• Reporting format performance metrics
  – Dashboards
RTD Overview

- Regional Transportation District in Denver, or RTD, started operation in 1972
- RTD has a service area of 2,410 square miles in eight counties
- RTD employs about 2,500 people
- RTD has over 140 bus routes, 80 Park-n-Rides, 10,000 stops
- RTD has approximately 1,200 full size buses, 400 cut-a-way buses, 400 support vehicles.
- RTD has 6 light rail lines, 47 miles of track, 49 stations
- RTD has 174 Light rail vehicles, accessibility services, call-n-Rides, seasonal rides and many other programs
- Fastracks is adding approximately 110 miles of track for light and commuter rail, over 40 new Stations and P-n-Rs along with 29 light rail vehicles and 56 commuter rail vehicles
RTD’s Asset Management program

2010

• Vision
  • Board & SLT Advance created a Strategic Goal for AM

2011

• Program Direction
  • Proof of Concept, Pilot Program, GM Task Goal

2012

• Tactical Planning
  • 3 Year Implementation Plan to follow MAP-21 & PAS55

2013

• Implementation
  • Foundational Policies, Procedures, & Standards

2014

• Results
  • Completion of Rolling Stock, Rail and Facilities Assets

2015

• Input into Strategic Budget Plan for Project Prioritization
  • First Annual Report
Public facilities

• Asset breakdown structure
  – Location centric
    • Group of assets per location
  – Condition assessments
### ABS by Location

<table>
<thead>
<tr>
<th>Asset</th>
<th>Description</th>
<th>Task Codes</th>
<th>Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Task Codes

<table>
<thead>
<tr>
<th>Task</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Groups

<table>
<thead>
<tr>
<th>Groups</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**Note:** The table contains specific codes and descriptions for various tasks and asset groups, which are used to categorize and manage maintenance and repair tasks for different assets and locations. Each task is associated with specific codes, which help in tracking and organizing the work efficiently.
ABS by Location

- Locations
  - 10THOSAGE-
  - I25BROADWAYSTAT-
  - BELLEVIEWSTATION-
  - COLORADOSATION-
  - UNIVERSITYDENVE-
  - LOUISIANAPEARL-
  - LITTLETONMINRAL-
  - FEDERALCENTER-

- Possible Assets
  - DRS
  - GROU
  - LOT
  - LANE
  - PLAT
  - PLAZ
  - STOR
  - STRU
Complex Location

- I-25 & Broadway Light Rail Station PNR
- I25BROADWAYSTAT-DRS
- I25BROADWAYSTAT-GROU
- I25BROADWAYSTAT-LOT
- I25BROADWAYSTAT-PLAT
- I25BROADWAYSTAT-PLAZ
- I25BROADWAYSTAT-STOR
Condition Assessments

From the ABS we come up with groups or systems to be assessed

Each facility will have some or all groups

Score each line which rolls up to the group score then to the location score
Condition Assessments

SGR-PUB-LOT (Parking Lot/Drive Lanes)

5
New construction, no visible defects.

4
Minor Improvement needed. Minimal signs of wear, no major problems, minimal signs of deterioration (less than 20%). Primarily cosmetic, up to 20% of striping needs redone.

3
Needs repair
Minimal signs of wear, no major problems, minimal signs of deterioration (less than 20%). Primarily cosmetic, up to 20% of striping needs redone. Cracking concrete, asphalt gaps under 1/8 inch wide but still vertically flush. Minimal amount of potholes. Settling with shallow grade changes.

2
Needs replaced or extensive repair
Minimal signs of wear, no major problems, minimal signs of deterioration (less than 20%). Primarily cosmetic, up to 20% of striping needs repainted. Parking lot showing significant degradation. Cracks in excess of 1/8 inch wide. Vertical separation of cracks greater than 1/2", Deep and numerous potholes, significant settling or heaving that may affect the drivability of the lot.

1
Critical defects affecting function, health, or safety. Parking lot has damage and degradation affecting the drivability of the lot from potholes, heaving, settling, cracking, and separation of paved sections.

SGR-PUB-PLAT (Rail Platform)

5
New construction, no visible defects.

4
Minor Improvement needed. Minimal signs of wear, no major problems, minimal signs of deterioration.

3
Needs repair
Deterioration exists, but functioning as designed. Cracking concrete, asphalt or concrete gaps under 1/2" inch but still vertically flush.

2
Needs replaced or extensive repair
Defects are critical and/or widespread, repairs are necessary in several areas. Cracks in excess of 1/8 inch wide. Vertical separation of cracks greater than 1/2", especially if they present a trip hazard.

1
Critical defects affecting function, health, or safety.
Maintenance Facilities

• Asset breakdown structure
• Building is the asset
  – Use systems level reporting
• No equipment included just systems
### ABS by Location

Equipment is grouped into systems.
Condition Assessments

- From the ABS we come up with groups or systems to be assessed
- Each facility will have some or all groups
- Score each line which rolls up to the group score then to the location score

<table>
<thead>
<tr>
<th>Date</th>
<th>Location Rating</th>
<th>Inspector Names</th>
</tr>
</thead>
</table>
| 1. Roof
2. Mechanical
3. Structural
4. Surfaces
| 5. Shell
6. Mechanical
7. Structural
8. Surfaces
| 9. Parking Lots
10. Mechanical
11. Structural
12. Surfaces
| 13. Grounds/Landscape
14. Mechanical
15. Structural
16. Surfaces
| 17. Wash Bay/Fuel Island
18. Mechanical
19. Structural
20. Surfaces
| 21. Parking Garage
22. Mechanical
23. Structural
24. Surfaces
| 25. Admin Office/Breakroom
26. Mechanical
27. Structural
28. Surfaces
| 29. Maintenance Shop
30. Mechanical
31. Structural
32. Surfaces
| 33. Storeroom/Parts Storage
34. Mechanical
35. Structural
36. Surfaces
| 37. Elevator/Stairs
38. Mechanical
39. Structural
40. Surfaces
| 41. Notes
42. |

13
## Condition Assessments

### Rating Area: Maintenance Shop Mechanical

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>New construction, no visible defects.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Minor improvement needed.</td>
<td>Minimal signs of wear, no major problems, minimal signs of deterioration. Cosmetic defects, no corrosion.</td>
</tr>
<tr>
<td>3</td>
<td>Needs repair.</td>
<td>Some deterioration exists, cosmetically “fair”, but functioning as designed. Surface rust only.</td>
</tr>
<tr>
<td>2</td>
<td>Needs replaced or extensive repair.</td>
<td>Defects are critical and/or widespread, repairs are necessary in several areas.</td>
</tr>
<tr>
<td>1</td>
<td>Critical defects affecting function, health, or safety. Needs replaced.</td>
<td></td>
</tr>
</tbody>
</table>

### Rating Area: Building Grounds Mechanical

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>New construction, no visible defects.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Minor improvement needed.</td>
<td>Minimal signs of wear, no major problems, minimal signs of deterioration. Primarily cosmetic defects having no corrosion but faded paint.</td>
</tr>
<tr>
<td>3</td>
<td>Needs repair.</td>
<td>Surface rust and peeling paint. Some deterioration exists, cosmetically “fair”, but functioning as designed.</td>
</tr>
<tr>
<td>2</td>
<td>Needs replaced or extensive repair.</td>
<td>Defects are critical and/or widespread. Repairs are necessary in several areas.</td>
</tr>
<tr>
<td>1</td>
<td>Critical defects affecting function, health, or safety. Needs replaced.</td>
<td></td>
</tr>
</tbody>
</table>
Bridges and Conveyances

- 3rd party inspections converted to SGR for both
  - Using inspection scores and grouping them into systems
- Performance of conveyances in development
  - Full service contract for conveyances
  - Calls for service
  - Entrapments larger consideration
  - Inspection items
# Bridge Assessment

## Element Inspection Report

<table>
<thead>
<tr>
<th>Elm/En</th>
<th>Description</th>
<th>Units</th>
<th>Total Qty</th>
<th>% in 1</th>
<th>% in 2</th>
<th>% in 3</th>
<th>% in 4</th>
<th>% in 5</th>
<th>% in 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/1</td>
<td>Bare Concrete Deck</td>
<td>(SF)</td>
<td>4,013</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>121/1</td>
<td>P/S/I Thru Truss/Bot</td>
<td>(LF)</td>
<td>634</td>
<td>79 %</td>
<td>500 %</td>
<td>14 %</td>
<td>90 %</td>
<td>34 %</td>
<td>2 %</td>
</tr>
<tr>
<td>126/1</td>
<td>P/S/I Thru Truss/Top</td>
<td>(LF)</td>
<td>684</td>
<td>79 %</td>
<td>500 %</td>
<td>21 %</td>
<td>134 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>141/1</td>
<td>Paint S/I Arch</td>
<td>(LF)</td>
<td>361</td>
<td>94 %</td>
<td>341 %</td>
<td>6 %</td>
<td>20 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>152/1</td>
<td>Paint S/I Floor Beam</td>
<td>(LF)</td>
<td>1,185</td>
<td>100 %</td>
<td>1,181</td>
<td>0 %</td>
<td>4 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>161/1</td>
<td>Paint S/I Pin/Hanger</td>
<td>(EA)</td>
<td>20,100</td>
<td>100 %</td>
<td>20 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>210/1</td>
<td>R/Conc Pier Wall</td>
<td>(LF)</td>
<td>24,100</td>
<td>100 %</td>
<td>24 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>234/1</td>
<td>R/Conc Cap</td>
<td>(LF)</td>
<td>56</td>
<td>71 %</td>
<td>40 %</td>
<td>29 %</td>
<td>16 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>307/1</td>
<td>Modular Expansion Jt</td>
<td>(LF)</td>
<td>45,100</td>
<td>100 %</td>
<td>45 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>310/1</td>
<td>Elastomeric Bearing</td>
<td>(EA)</td>
<td>10</td>
<td>60 %</td>
<td>6 %</td>
<td>40 %</td>
<td>4 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>333/1</td>
<td>Other Bridge Railing</td>
<td>(LF)</td>
<td>634,100</td>
<td>100 %</td>
<td>634 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>341/1</td>
<td>Substr Conc Coating</td>
<td>(EA)</td>
<td>1,100</td>
<td>100 %</td>
<td>1 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>356/1</td>
<td>Deck Cracking SmFlag</td>
<td>(EA)</td>
<td>1,100</td>
<td>100 %</td>
<td>1 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
<tr>
<td>600/1</td>
<td>Geni Remarks</td>
<td>(EA)</td>
<td>1,100</td>
<td>100 %</td>
<td>1 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
<td>0 %</td>
</tr>
</tbody>
</table>

## Abutments

- R/Conc Abutment
- Elastomeric Bearing
- Elastomeric Bearing (Teflon)
- Fixed Bearing
- Disk Bearing
- Moveable Bearing
- Pot Bearing

## Arches/Suspension Rods

- Paint Steel Arch
- Paint Steel Pin/Hanger
- Unpainted Steel Arch

## Caps

- Paint Steel Cap

## Culverts

- Concrete Culvert
- Channel Cond
- ChannProtMatCond
- Coated Metal Curb/SW
- Pole Attachment
- Conc Curb/SW
- RR Deck

## Expansion Joints

- Compression Joint Seal
- Construction Non-Exp Joint
- Open Expansion Joint
- Modular Expansion Joint
- Pourable Joint Seal
- Strip Seal Expansion Joint

## Girders/Beams

- Open Girder
- P/S/I Thru Truss/Bottom
- Paint Steel Floor Beam
- Paint Steel Stringer
- Paint Steel Open Girder
- Unpainted Steel Floor Beam
- P/S Conc Open Girder
- Superstr Conc Coating
- P/S Conc Box Girder

## Headwalls/Wingwalls

- Wingwalls
- Culvert Headwalls
- Culvert Wingwalls
- Concrete Pile Cap/Ft
- Substr Conc Coating

## Pillars/Piers/Columns

- R/Conc Pier Wall
- Paint Steel Column
- Other Bridge Railing

## Railings

- Railing (Concrete)
- Metal Rail Coated
**Conveyances Age Based**

<table>
<thead>
<tr>
<th>ASSET AGE (YEARS)</th>
<th>SGR SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 1</td>
<td>5.0</td>
</tr>
<tr>
<td>2 – 4</td>
<td>4.5</td>
</tr>
<tr>
<td>5 – 10</td>
<td>4.0</td>
</tr>
<tr>
<td>11 – 17</td>
<td>3.5</td>
</tr>
<tr>
<td>18 – 24</td>
<td>3.0</td>
</tr>
<tr>
<td>25 – 30</td>
<td>2.5</td>
</tr>
<tr>
<td>31 – 33</td>
<td>2.0</td>
</tr>
<tr>
<td>34 – 36</td>
<td>1.5</td>
</tr>
<tr>
<td>37 or more</td>
<td>1.0</td>
</tr>
</tbody>
</table>

- Conveyances are scored based on age using a 25 years EUL
- Refurbishment (replacing the controllers) restarts the ELU
- Currently working on performance metrics
Performance Tracking

• Facilities mostly condition and age
• Reporting format performance metrics
  – Calls for service
  – Cost (not available on Bridges and conveyances)
    • Cost per sq ft
  – Labor hours (not available on Bridges and conveyances)
  – Energy usage
Dashboards

• Reporting is software agnostic

• RTD AM and SGR uses Oracle Business Intelligence Enterprise Edition (OBIEE 11.5) for reporting & analysis
  – ETLs (Extract, Transform and load process) from multiple software databases to a central data warehouse
Facilities Age Based

Report 1.2.1 (State of Good Repair Rating for Facilities): Report shows Overall SGR Score for facilities by Location.

- Overall Score
  - BO-BUILDING-SGR: 3.9
  - DS-BUILDING-SGR: 3.9
  - EL-BUILDING-SGR: 4.0
  - EM-BUILDING-SGR: 3.4
  - LO-BUILDING-SGR: 3.3
  - MA-BUILDING-SGR: 3.4
  - PL-BUILDING-SGR: 3.0
  - RC-BUILDING-SGR: 4.0

No Results

The specified criteria didn’t result in any data. This is often caused by applying filters and/or selections that are too restrictive or that contain incorrect values. Please check your Analysis Filters and try again. The filters currently being applied are shown below.

- CATEGORY is equal to / is in FACILITY
- ETL_CONTROL is equal to / is in C

Refresh
Parking Lot & Drive Lanes
Bridges

SGR Rail Infrastructure Dashboard

1.1.1-Overall Bridge Score
Condition Score, Age Indicator

1.1.2-Bridge Score by Asset
Category | Asset | Description | Condition Score | Age
--- | --- | --- | --- | ---
LOW-BRIDGE | LRT BRIDGE OVER 15TH STREET | 4.0 | 4.6
LRT BRIDGE OVER ALAMEDA AVENUE | 2.7 | 4.3
LRT BRIDGE OVER ARAPAHOE ROAD | 3.5 | 4.7
LRT OVER BIG DRY CREEK | 4.0 | 4.5
LRT BRIDGE OVER BROADWAY | 3.8 | 4.7
LRT BRIDGE OVER BELLEVUE AVENUE | 3.9 | 4.7
LRT BRIDGE OVER BELLEVUE VIEW AVENUE | 3.6 | 4.7
LRT BRIDGE OVER BOMDAH ROAD | 4.0 | 4.7
LRT BRIDGE OVER CHERRY CREEK | 3.8 | 4.3
LRT BRIDGE OVER CHERRY CREEK | 3.9 | 4.7
LRT BRIDGE OVER COLFAX AVE | 3.9 | 4.6
LRT BRIDGE OVER COLUMBUS YARD & LIMATILLA S | 4.4 | 4.9
LRT BRIDGE OVER COUNTYLINE ROAD | 3.8 | 4.7
LRT BRIDGE OVER DARTMOUTH AVE | 3.9 | 4.5
LRT BRIDGE OVER HAMPOIN AVE | 3.7 | 4.5
LRT BRIDGE OVER 6TH AVENUE AT UNION AVE | 3.9 | 4.9
LRT BRIDGE OVER 8TH AVENUE AT INDIANA ST | 3.9 | 4.9
LRT BRIDGE FLORYER RR SOUTH OF IOWA AVE | 4.0 | 4.5
LRT BRIDGE OVER IOWA AVE | 3.9 | 4.6
LRT BRIDGE FLORYER ABOVE KALAMATH | 3.7 | 4.7
LRT BRIDGE OVER LEE GULCH | 4.0 | 4.5
LRT BRIDGE OVER MINERAL AVE | 3.9 | 4.5

1.2.1-Bridge Score by Asset-Graphs
Condition Score

Age Indicator
Summary

• Able to use template and lessons learned from Bus and Rail assessments
• Used location based reporting along with asset level
• More difficult to find valid performance metrics
• Data not as easy to capture
Thank You

• Jim Sutton Manager, Asset Management
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• Chuck Austin Supervisor, State of Good Repair
  – chuck.austin@rtd-denver.com