Panel IV: Asset Management
A Tool For Our Times

AAPA 2009
Facility Engineering Seminar and Expo
Raymond K. Best, PE, LEED® AP
November 18, 2009
Agenda

- What is Asset Management?
- Common Terminology
- AM Drivers
- Successful Enterprise AM Program
- Implementation – Planning Tools
- AM Planning Tools – Output
- What Are Others Using?
- Discussion / Questions
Asset Management

What is Asset Management?

*The systematic and integrated business practices through which owners optimally manage their built and natural assets, while monitoring their associated performance, risks and expenditures, in order to support missions and organizational goals, typically integrated with varying levels of service over the life cycle of the asset.*
What Does Your Organization Use?

- Real Property Inventory
- GIS Mapping
- Capital Investment Planning System
- CMMS
- BIM
- Sustainability Goals
- LEED® Certification
  - Existing Building Operations & Maintenance (EBOM)
  - New Building
Common Terminology

- **Facility Condition Index**
  \[
  \text{Deferred Maintenance Backlog (\$)} / \text{Plant Replacement Value (\$)} = \text{FCI}
  \]

- **Condition Index**
  - SMS/EMS Rating of Facility

- **Mission Dependency Index (MDI)**

- **MEPs/MAPs/LRMP**
  - 1 YR
  - 5 YR
  - 20 YR

- **Computerized Maintenance Management System (CMMS)**
FCI Values Can Mislead

Replacement Value $140,000
Renewal Requirement $7,000

FCI = \frac{7,000}{140,000} = 5\% \text{ (Good)}

Replacement value $50,000
Renewal Requirement $17,000

FCI = \frac{17,000}{50,000} = 34\% \text{ (Critical)}
FCI Values Can Mislead

- Replace defective brakes: $7,000
- Replace leaky side windows, repair rusted panels: $17,000

Priority based on ratio FCI
Common Terminology

- Client Hierarchy
- Asset Inventory
  - Uniformat II (ASTM 1557E–97)
- Deficiencies / Defects / FIMS
- Work Packaging / WAG / Projects

If you don’t know what you own … how can you manage it?
## Unformat II – ASTM E1557

### ASTM Unformat II Classification for Building Elements (E1557-97)

<table>
<thead>
<tr>
<th>Level 1 Major Group Elements</th>
<th>Level 2 Group Elements</th>
<th>Level 3 Individual Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Substructure</td>
<td>A10 Foundations</td>
<td>A1010 Standard Foundations</td>
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<tr>
<td></td>
<td>A1020 Special Foundations</td>
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<tr>
<td></td>
<td>A1030 Slab on Grade</td>
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<td></td>
<td>A20 Basement Construction</td>
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<tr>
<td></td>
<td>A2010 Basement Excavation</td>
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<tr>
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<td></td>
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<td>B3020 Exterior Windows</td>
<td>B3020 Exterior Doors</td>
</tr>
<tr>
<td></td>
<td>B3050 Other Doors</td>
<td></td>
</tr>
<tr>
<td>C Interiors</td>
<td>C10 Interior Construction</td>
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<tr>
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<td>C1010 Partitions</td>
<td>C1010 Interior Doors</td>
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<tr>
<td></td>
<td>C1020 Stairs</td>
<td>C1020 Stair Construction</td>
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<tr>
<td></td>
<td>C1030 Roof Openings</td>
<td>C1030 Roof Openings</td>
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<tr>
<td>D Services</td>
<td>D10 Conveying</td>
<td>D1010 Elevators &amp; Lifts</td>
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<td>D1020 Escalators &amp; Moving Walks</td>
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<td>D1090 Other Conveying Systems</td>
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<td></td>
<td>D20 Plumbing</td>
<td>D2010 Plumbing Fixtures</td>
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<td>D2020 Domestic Water Distribution</td>
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<td>D2050 Sanitary Waste</td>
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<td>D2040 Rain Water Drainage</td>
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<td>D2090 Other Plumbing Systems</td>
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<td>D30 HVAC</td>
<td>D3010 Energy Supply</td>
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<td>D3020 Heat Generating Systems</td>
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<td>D3040 Distribution Systems</td>
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<td>D3050 Terminal &amp; Package Units</td>
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<td></td>
<td>D3070 Controls &amp; Instrumentation</td>
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<td>D3090 Other HVAC Systems</td>
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<th>Level 4 Sub-Elements</th>
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<td>B3020 Exterior Windows</td>
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<td>B2021 Windows</td>
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<td>B2022 Curtain Walls</td>
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<td>B2023 Storefronts</td>
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<tr>
<td>B3020 Exterior Doors</td>
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<tr>
<td>B2031 Glazed Doors &amp; Entrances</td>
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<tr>
<td>B2032 Solid Exterior Doors</td>
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<tr>
<td>B2033 Revolving Doors</td>
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<tr>
<td>B2034 Overhead Doors</td>
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<tr>
<td>B2039 Other Doors &amp; Entrances</td>
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<tr>
<td>B3010 Roof Coverings</td>
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<tr>
<td>B3011 Roof Finishes</td>
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<tr>
<td>B3012 Traffic Toppings &amp; Paving Membranes</td>
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<tr>
<td>B3013 Roof Insulation &amp; Fill</td>
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<tr>
<td>B3014 Flashings &amp; Trim</td>
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<tr>
<td>B3015 Roof Eaves and Soffits</td>
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<tr>
<td>B3016 Gutters and Downspouts</td>
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<tr>
<td>B3020 Roof Openings</td>
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<tr>
<td>B3021 Glazed Roof Openings</td>
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<tr>
<td>B3022 Roof Hatches</td>
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<td>B3023 Gravity Roof Ventilators</td>
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<td>C1010 Partitions</td>
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<tr>
<td>C1011 Fixed Partitions</td>
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<tr>
<td>C1012 Demountable Partitions</td>
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<tr>
<td>C1013 Retractable Partitions</td>
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<tr>
<td>C1014 Site Built Toilet Partitions</td>
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<tr>
<td>C1015 Site Built Compartment Cubicles</td>
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<tr>
<td>C1016 Interior Bathroom and show</td>
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<tr>
<td>C1017 Interior Windows &amp; Storefronts</td>
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<tr>
<td>C1020 Interior Doors</td>
</tr>
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<td>C1021 Interior Doors</td>
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<tr>
<td>C1022 Interior Door Frames</td>
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<td>C1023 Interior Door Hardware</td>
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<td>C1024 Interior Door Wall Opening Elements</td>
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<td>C1025 Interior Door Sidelights &amp; Transoms</td>
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<tr>
<td>C1026 Interior Hinges &amp; Access Doors</td>
</tr>
<tr>
<td>C1027 Door Painting &amp; Decontam</td>
</tr>
<tr>
<td>C1030 Fabricated Toilet Partitions</td>
</tr>
<tr>
<td>C1031 Fabricated Toilets &amp; Cubicles</td>
</tr>
</tbody>
</table>
Common Terminology

- Project (Deficiency) Prioritization Algorithm
  - Weighted Score
  - Analytical Hierarchical Processing (AHP)
    - ASTM E1765
  - Maximize Return on Investment
  - Mission Dependency Index
  - Risk to Mission (TEC ARM©)
Common Terminology

- Computerized Maintenance Management Systems (CMMS)
  - Typical Systems
    - IBMmaximo
    - TRIRIGA Operations
    - PWTools
  - Work Order Execution
    - Labor
    - Materials
    - Equipment
  - Financial Component
  - Purchasing Component
Asset Management Drivers

- AM Drivers
    - Mandates AM Plans
    - Life Cycle / Total Cost of Ownership
    - Energy / Water Conservation Goals
    - 5 Guiding Principles Federal Leadership in High Performance and Sustainable Buildings
    - EO 13423+ More Aggressive Goals
    - $$$$ Impacts / Ramifications
Successful AM Program

Planning
- Strategies
- Contingency

Design and Construction
- Capital Program
- Acquisition Process

Disposal
- Excess Facilities
- Outleasing

Demolition
- Centralize/Dispersed
- Consolidation

Real Property Maintenance
- Repair
- Rehabilitation
- Minor Construction

Facility Owner

Community/Gov’t Liaison

Tech Liaison Contractors, Engrs

Financing

Real Estate Contracting

Financial Management

AICUZ

Land Mgmt

Business Ops

Energy/Utilities

Environmental Compliance / Sustainability

Business Ops
Successful AM Program

Investment Planning Tools
- Builder™
- VERTEX™
- TECfms™
- VFA Facility™

Inventory → Assess / Inspect

Analysis

Work Planning

Investment Execution Tools
- IBMmaximo
- TRIRIGA Operations
- PWTools

Work Execution
Successful AM Program

Business Process Analysis
- Codify LAWA Goals/Objectives
- Review Legacy Systems
- Incorporate Airport Master Plan
- Develop Asset Risk to Mission Strategy
- Codify LAWA Business Processes
- Develop Change Management Plan

Software System(s)
- Real Property / Leasing
- Computerized Maintenance Management System
- Condition Assessment / Capital Investment Planning
- Equipment/Parts/Materials Purchasing
- Geographic Information Systems
- Building Information Modeling
- Record Drawings

Technical Support
- Design Development Consulting
- Design Review / Constructability Review
- Sustainability Review
- Assessment Technical Support
- Cost Estimating
- Systems / Building Commissioning

Asset Assessments
- Inventory (Uniform II, ASTM E1557)
- Condition Assessments (Requirement, LMS, Parametric Economic)
- Maintenance Forecasting
- System Failure Analysis
- Maintenance Action Plan / Long Range Maintenance Plan
- Asset Recapitalization Plan

Enterprise Facilities Management Program
AM Planning Tools

- Software Planning/Analysis Tools – Three (3) Options
  - Requirements Based “Traditional”
    - TECfms™
    - VFA Facility™ (VFA)
    - AMS (ISES)
    - Comet (Parsons)
  - Engineered (Sustainment) Management Systems
    - Builder™
    - VERTEX®
  - Economic
    - Whitestone MARS
AM Planning Tools

- Component Degradation Algorithm
  - Engineered Management Systems
    - Builder™
    - VERTEX™

- Component Degradation Algorithm
  - Whitestone MARS
  - Geometric Depreciation

- Component Degradation Algorithm
  - ViaFacility
  - Parsons Comet
  - (Straight-line Depreciation)

- Component Degradation Algorithm
  - TEC™
AM Planning Tools – Output

- Component Inventory

### TEC Inc. Berth 603 Inventory Report

<table>
<thead>
<tr>
<th>Inventory Description</th>
<th>Uniformat</th>
<th>Quantity</th>
<th>Units</th>
<th>Install Year</th>
<th>Eff. Age</th>
<th>Rem. Life</th>
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<tbody>
<tr>
<td>G30 Site Mechanical Utilities</td>
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<tr>
<td>G3030 Storm Sewer ($553,625)</td>
<td>Storm Sewer</td>
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<td>EA</td>
<td>1980</td>
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<td>Storm Sewer Cutoff</td>
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<td>G90 Other Site Construction</td>
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<td>G9030 Other Site Construction ($0)</td>
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<td>Berth 603 Crane Rail</td>
<td>Railroad Spurs</td>
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<td>H1010 Substructure ($6,596,250)</td>
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<td>Berth 603 Sheet Pile Caisse</td>
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<td>H1030 Deck ($4,221,600)</td>
<td>Deck</td>
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<td>H1040 Mooring &amp; Berthing System ($553,625)</td>
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<td>Berth 603 Fender System</td>
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<td>Berth 603 Mooring Bollards</td>
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<td>Berth 603 Mooring Cleats</td>
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<td>H5010 Civil/Mechanical Utilities ($527,700)</td>
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<td>4.00</td>
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<td>Berth 603 Water Vaults</td>
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<td>H5020 Electrical Utilities ($527,700)</td>
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<td>Berth 603 2400 V Vaults</td>
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## 5 Year Maintenance Action Plan (MAP)

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<tr>
<th>Asset Name</th>
<th>Deficiency Title</th>
<th>Sec. Year</th>
<th>Deficiency Score</th>
<th>Package Score</th>
<th>Package Number</th>
<th>Package Name</th>
<th>Raw Total Cost</th>
<th>Inflated Total Cost</th>
<th>Status</th>
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<tr>
<td>1st Street County Office Building</td>
<td>Replace VFD on Air Handling Unit</td>
<td>2009</td>
<td>10.00</td>
<td>7.50</td>
<td>2 - AF</td>
<td>Replace Selected HVAC Units</td>
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<td>Old Court Elementary School</td>
<td>Roofed failed intact</td>
<td>2009</td>
<td>10.00</td>
<td>8.00</td>
<td>6 - AF</td>
<td>Refresh Brick and Mortar</td>
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<td>Old Court Elementary School</td>
<td>Open northern light well</td>
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<td>Small General Projects</td>
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<td>Historic County Jail</td>
<td>Interior paint</td>
<td>2013</td>
<td>10.00</td>
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<td>Paint and Paint</td>
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<td>10.00</td>
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<td>Refresh Brick and Rock Walls</td>
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<td>JohnsonMatthews Central System needs reser</td>
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<td>9.00</td>
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<td>2 - AF</td>
<td>Improved HVAC Controls</td>
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<td>Middlesex County Office Building</td>
<td>Failed windows</td>
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<td>Refresh Windows and Doors</td>
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<td>6.00</td>
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<td>Refresh Windows and Doors</td>
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<td>2012</td>
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<td>6.00</td>
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<td>Refresh Windows Doors Stairs</td>
<td>$1,033.21</td>
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<td>Historic County Jail</td>
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<td>2013</td>
<td>9.00</td>
<td>6.00</td>
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<td>Refresh Windows Doors Stairs</td>
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<td>Historic County Jail</td>
<td>ADA</td>
<td>2000</td>
<td>8.50</td>
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<td>7 - AF</td>
<td>Replace Plumbing</td>
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<td>Old Court Elementary School</td>
<td>ADA Bathrooms</td>
<td>2009</td>
<td>8.50</td>
<td>8.50</td>
<td>6 - AF</td>
<td>Upgrade ADA</td>
<td>$23,500.98</td>
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<td>General District Court House</td>
<td>ADA bathrooms</td>
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<td>8.50</td>
<td>8.25</td>
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<td>Replace for ADA</td>
<td>$11,876.34</td>
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<td>Dallas House</td>
<td>Existing bathrooms</td>
<td>2009</td>
<td>8.10</td>
<td>8.70</td>
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<td>Refresh Bathrooms</td>
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<td>Coach Court House</td>
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<td>Replace Bathrooms</td>
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<td>Failed central boiler and heating system</td>
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<td>Replace HVAC</td>
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<td>7 - AF</td>
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<td>$5,613.01</td>
<td>Active - Pre Work Exception Board</td>
<td>1</td>
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<tr>
<td>General District Court House</td>
<td>Storage tanks</td>
<td>2009</td>
<td>8.00</td>
<td>8.25</td>
<td>3 - AF</td>
<td>Replace for ADA</td>
<td>$91.44</td>
<td>$119.73</td>
<td>Active - Pre Work Exception Board</td>
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<tr>
<td>1st Street County Office Building</td>
<td>Open panels</td>
<td>2010</td>
<td>8.00</td>
<td>4.40</td>
<td>2 - AF</td>
<td>Improve Electrical Safety</td>
<td>$151.00</td>
<td>$185.82</td>
<td>Active - Pre Work Exception Board</td>
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<td>Middlesex County Office Building</td>
<td>Panel covers</td>
<td>2010</td>
<td>8.00</td>
<td>3.60</td>
<td>1 - AF</td>
<td>Improve Electrical Safety</td>
<td>$275.00</td>
<td>$334.30</td>
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<td>General District Court House</td>
<td>Fire doors held open</td>
<td>2010</td>
<td>8.00</td>
<td>6.00</td>
<td>3 - AF</td>
<td>Repair Hardware</td>
<td>$73.16</td>
<td>$91.50</td>
<td>Active - Pre Work Exception Board</td>
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AM Planning Tools – Output

- Investment Analysis

Capital Investment Requirements
Terminal XXX

- Sum of Deferred Maintenance
- Sum of Recap ESL
- Sum of Maintenance
AM Planning Tools – Output

- Investment Analysis

Capital Investment Requirements
Wharf XXXX

- Sum of Deferred Maintenance
- Sum of Recap ESL
- Sum of Maintenance
AM Planning Tools – Output

- Investment Analysis

Capital Investment – Uniformat Breakout

Wharf XXX

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<tr>
<th>Building Sitework</th>
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</table>

- Sum of Deferred Maintenance
- Sum of RecapESL
- Sum of Maintenance

2009 | 2015 | 2022 | 2030
AM Planning Tools – Output

Prioritized Code Compliance and Maintenance Projects USCG District 1
Target Project Cost Range $25K - Maximum Cost

25% Funding Increase Equates to a 200% Risk Reduction

Projects Requiring Client Focus

Total Bought Risk per Project Cost and Total Funds for USCG District 1 Code Compliance and Maintenance Projects

Total Projects CC and M: 1496
CC and M Budget: $18,500,000

*Multiplied by a factor of 10000

Note: Projects grouped by Prioritization Ranking
AM What Are Others Using?

- **Terminal Operators**
  - Planning
    - TECfms™
- **USMC**
  - Planning
    - Builder™
    - TECfms™
  - Work Execution
    - USMCMax
- **USAF**
  - Planning
    - Builder™
    - VERTEX™
  - Work Execution
    - IWIMS
- **US Navy**
  - Planning
    - Builder™
    - VERTEX™
  - Work Execution
    - IBMmaximo
- **USCG**
  - Planning
    - TECfms™
    - VERTEX™
    - VFAFacility™
    - TEC ARMR™
  - Work Execution
    - IBMmaximo
Asset Management

Discussion / Questions
Contact Information

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TEC Capabilities

TEC Services

- AM System Consulting
- Condition Assessments
- Information Management
  - TECfms™
  - TEC ARMR™
- LEED® EBOM Certification
- Energy Studies
- EBCx

- Facilities and Master Planning
- Building Information Modeling (BIM)
- A/E Design
  - Architecture
  - Mechanical / Electrical / Plumbing
- Construction Phase Services
Asset Management Drivers

- 5 Guiding Principles Federal Leadership in High Performance and Sustainable Buildings
  ◦ Employ Integrated Design Principles
  ◦ Optimize Energy Performance
  ◦ Protect and Conserve Water
  ◦ Enhance Indoor Environmental Quality
  ◦ Reduce Environmental Impact of Materials