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Migrating CoRe Element Data To The New AASHTO Specification

Designing and Implementing An Automated Tool

Overview

- Chronology
- Issues
- Considerations
- Solution
- Next Steps

Chronology

- Pontis CoRe Elements Specified for Pontis 2.0
  - Over 10 years ago
- Covered An Expected Standard Set Of Structural Elements
  - Accessible, maintainable, easy to quantify
  - Intended to be interpreted and applied consistently across agencies
- Elements Specifications Were Not Always Followed
- Agencies Defined A Host Of Custom Elements And Flags
  - Physical and operational

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Chronology (continued)

- Measurement Units Have Been A Continuing Issue
  - Training, rounding problems and operational obstacles
- 'Whole' Elements Have Been Partitioned In Some Inventories
  - Decks
- Minor Adjustments To CoRe Language Has Been Made By T-18 In Past
- Element Actions Often Associated With Agency Maintenance Management Systems

Chronology (continued)

- Pontis Software Has Followed CoRe Specification Throughout
- New Pontis Version (**5.1.2**) Will Support The New AASHTO Specification
  - Display-only access to previous history

Issues

- Consistency Of Data Collection And Reporting
- Disagreement On Condition State Language
- Conflation Of Protective System And Actual Element Condition
- Inability To Track Both Separately
- Single Path Of Deterioration Implied By The State Definitions
- Unnecessary Differentiation Of Condition States Between Classes Of Elements
  - Some with 3, some 4, some 5 – reasons now unclear

Problem Statement

- Implement The New AASHTO Element Specification Nationwide
  - Preserve the substantial inspection data collection investment
  - Implement protective systems separate from elements themselves
  - Implement effective measurement of defect flags and associate with specific elements
  - Enforce a consistent # of 4 condition states
  - Support the ability to report National Bridge Elements reliably (NBE)
  - Support bridge management activities (BME)
  - Provide for customized agency defined elements (ADE)

Problem Statement (continued)

- States Now Manage A Huge Array Of Element Condition Data
  - Probably More Than 20M Rows Of Data
  - Represents Millions Of Inspection Program Hours
- Individual State Agencies Do Not Have The Resources To Migrate These Data
- An Automated Tool Is Required To Support The Conversion And Strengthen Adoption Nationwide

Key Considerations

- Each Agency Has Collected Data To Its Own Standards
- Any Data Migration Must Be Flexible To Accommodate Individual Agency Practice
  - Particularly agency defined elements and variations for CoRe specification
- Migration Logic Should Be Configurable
- Migration Process Must Be Testable And Repeatable
- Migration Results Must Be Understandable And Believable
- Migration Process Should Establish The Initial Relationship Of Elements To Protective Systems And Defect Flags

Key Considerations (continued)

- **System Must**
  - Be Interactive
  - Permit What-If Development Of Migration Rules
  - Run In Windows (XP and Win7)
  - Have A Minimal Installation Process
  - Be Configurable And Extensible
- **System Must NOT**
  - Be A Black-Box Closed Application
    - *The Engineer's Judgment Must Be Central*
  - Require Agencies To Hold A Pontis License
  - Even Require A Database

Solution

- Separate User Interface And Migration Engines
- Program Runs In Batch And Interactive Modes
- All Migration Processes Controlled Through Logic Rules
  - Rules are accessible for user adjustment and extension to other elements/situations
- Assumes Configurable Set Of CoRe Element Information Is Used For Input
- Assumes Configurable Set of AASHTO Element Information Will Be Generated

Interfaces

- Command-Line
  - Runs From Command Prompt (DOS Prompt)
  - Classic batch utility approach
- Interactive Windows Program
  - Tabbed Organization
  - Specific activities on each tab
  - Settings accessible from user interface
  - On screen help and diagnostic messages
  - Selective processing of elements and rules for What-If analysis
- ***Both Interfaces Use The Exact Same Migration Engine.***

Command-Line Program

- All Input As Part Of The Command
  - Or
- Program Controlled Through Parameter Files
- Not Interactive
- All Results Available In Xml And Text Files
- Diagnostic Messages Written To Log Files
- Rudimentary Help
- Suitable For Automating Mass Migration

Interactive User Interface

Interactive User Interface

CoRe Element Data Review

Data Management Actions

Migration Actions

Interactive User Interface

Rules

```
TRANSFORM("D.1.3.1", "D.1.3.1, Timber, Example Deck 6 - Grid Deck Elements
Only");
SCOPE (ELEM_LIST, 31, 54);
EXCEPTION(101,"Runtime exception when trying to apply rule D.1.3.1");
//RAE - 7/21/11 - checked
CASE WHEN (THIS=31)
    THEN
        ASSIGN_QUANT(31)  = QUANTITY(THIS);
         ASSIGN_PCT(31, 1) = PCT(THIS, 1);
         ASSIGN_PCT(31, 2) = PCT(THIS, 2);
         ASSIGN_PCT(31, 3) = PCT(THIS, 3);
         ASSIGN_PCT(31, 4) = PCT(THIS, 4);
    ELSE
        ASSIGN_QUANT(54)  = QUANTITY(THIS);
         ASSIGN_PCT(54, 1) = PCT(THIS, 1);
         ASSIGN_PCT(54, 2) = PCT(THIS, 2);
         ASSIGN_PCT(54, 3) = PCT(THIS, 3);
         ASSIGN_PCT(54, 4) = PCT(THIS, 4);
END;
```

Next Steps

- Integrate NBE Rollup Logic
- Integrate Automated Defect Flag And Protective System Element Generation
- Finalize Rules
  - Consensus Decision
- Distribute To Community

Thank You!

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