

1995 I-5 Bridge Over Arroyo Pasajero

- March 10, 1995
- Scour Was Cause. El' Niño Blamed!
- 7 People Died

1660

1950

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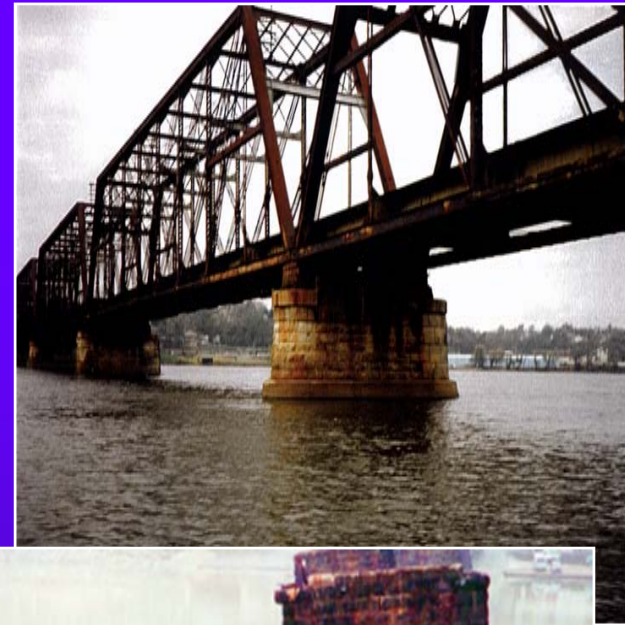
1990

1996

2004

1996 Great Pennsylvania Flood

- Numerous Bridges Collapsed
- Several Bridges Were Closed and Weighed Down
- USGS had Just Begun a 1995 Scour Evaluation Program
- Engineer-Divers Assessed 600 Bridges w/in 3 Months



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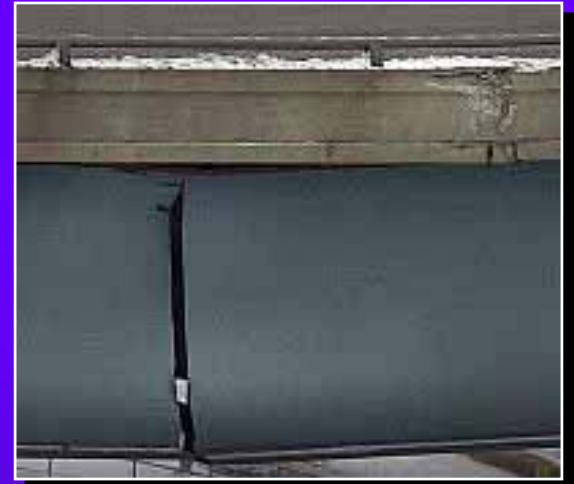
1980

1990

2000

2004

Hoan Bridge Failure



- From Minor to Major Cracks
- NBIS inspection could not determine cause
- Brittle failure from triaxial shear stresses
- Inherent design problem

Inspectors need to know about design issues

I-40 Barge Impact, May 26, 2002



“Majority of bridges do not have pier protection. The bridges that have protection usually only have cells on upstream side in front of the channel piers.”

Roger Wiebusch
U.S.C.G. 05/28/02

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I-40 Barge Impact, May 26, 2002



“Bridge Built in 1967, Prior to vessel Impact Design Code”

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Reconstructed I-40 Bridge



**Vulnerability Assessments now Conducted.
Focus on Impact Critical Bridges.**

The Inspection Process in 21st Century



- Bridge Owners are Responsible for Inspections
 - **Biennial, Fracture Critical, Scour, Underwater, as well as Security**
- Data Collected, Synthesized and Documented
- Focus on Maintenance; Even Moving Towards Preventative Maintenance

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Current NBI Data Reporting Requirements

- Composition Information
- Condition Ratings
- Appraisal Ratings
- Sufficiency Ratings

Used For

- Reporting Conditions of Nation's Roadway Bridges

★ **Safety** ★

- Prioritization for Replacements
- Determining Eligibility for Funding



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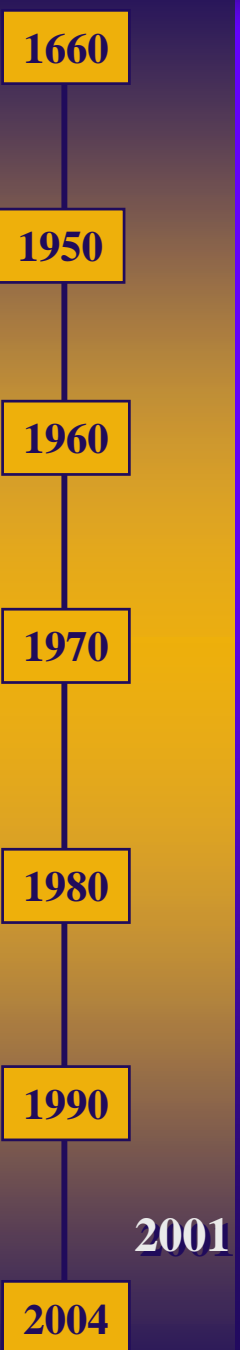
1970

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Composition Information

- Description of Geometry, Location, Service Characteristics, Etc.

Condition Ratings

- **Deck (58), Superstructure (59), Substructure (60), Channel & Channel Protection (62), Culverts (61)**
- **Ten-Point Scale Based on Visual Assessment**
 - 9 – Excellent
 - 8 – Very Good
 - 1 – Imminent Failure
 - 0 – Failed Component



Safety



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Appraisal Ratings

- They are “**Calculated Ratings**”
- Assess the **Functional Adequacy of the Structure**
- Based on “**Level of Service**” and “**Inspection Data**”
- Ratings Developed for:
 - **Structural Evaluation (67)**
 - **Deck Geometry (68)**
 - **Under Clearances (69)**
 - **Bridge Posting (70)**
 - **Waterway Adequacy (71)**
 - **Approach Roadway Alignment (72)**



Sufficiency Ratings

- They are “Performance Measures”
- Best = 100%
- Worst = 0%
- Ratings Consider:
 - (55%) Structural Adequacy Based on 4 NBI Coding Items
 - (30%) Serviceability and Functional Obsolescence
 - (15%) Public Need
 - Reductions – (1%-13%)



B.M.S. – Element Level Data

- ◆ Hundreds of Elements in a Bridge
- ◆ AASHTO has defined CoRe Elements
- ◆ Each Element has “specific language” to define its particular condition state.

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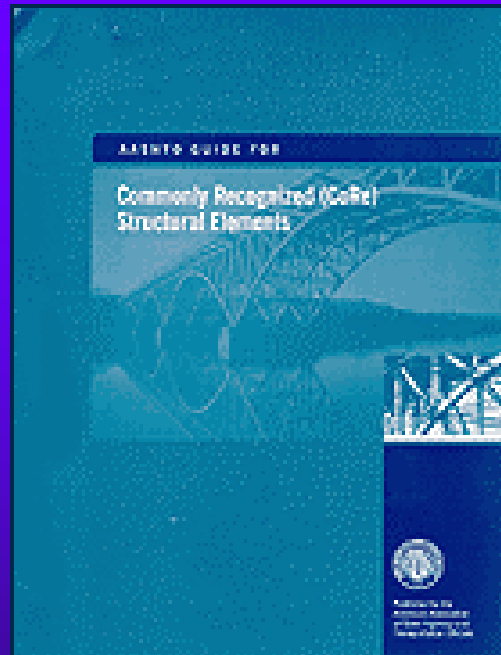
1970

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AASHTO CoRe Elements



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AASHTO Deck Elements

- ◆ “Major Change in the Percentages for Condition State Definitions since 2002”



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AASHTO's New Rating Criteria

Concrete Deck and Slab Elements Distressed Deck Area

<u>Current</u>	<u>Condition State</u>	<u>Old</u>
No distressed repair areas	1	No Defects
< 10%	2	< 2%
> 10% < 25%	3	> 2% < 10%
> 25% < 50%	4	> 10% < 25%
> 50%	5	> 25 %



Result of AASHTO Changes

- ◆ Many Deck Ratings Will Improve Unless Significant Deterioration Has Occurred Since Last Inspection.
- ◆ Inspectors must be aware of this fact, and adjust ratings accordingly.

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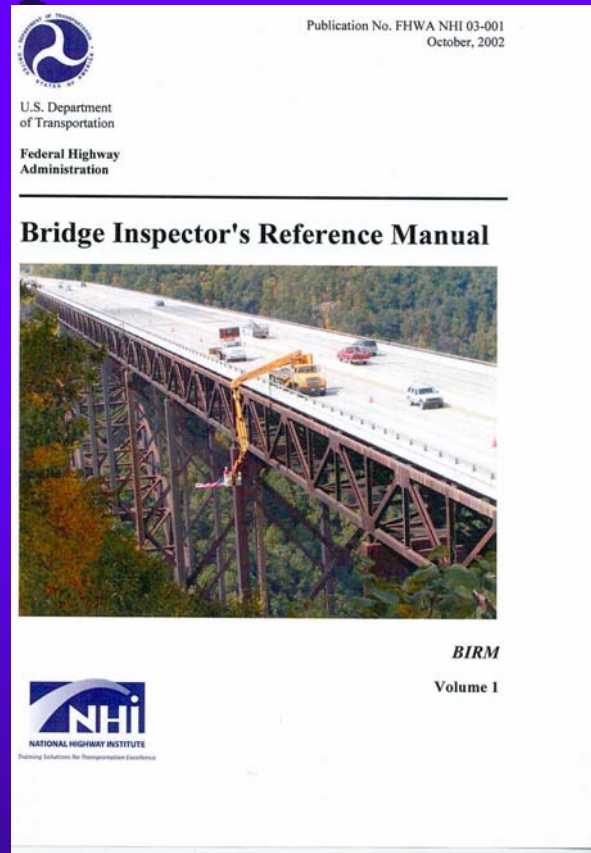
2004

Future Trends

- **B.I.R.M. Published**
- **NBIS Updates**
- **NBI Updates**
- **Greater NDT / BMS Use**
- **Proactive StateDOT's**
- **Additional Focus on Ancillary Structures**



Bridge Inspector's Reference Manual



www.nhi.fhwa.dot.gov/material.asp

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NBIS – Proposed Rulemaking

- National Bridge Inspection Standards
 - Last Updated in 1988
- Notice of Proposed Rulemaking, Since March 2002
- Comment Period Closed November 10, 2003
- FHWA Evaluating Comments
- Unknown Implementation Date

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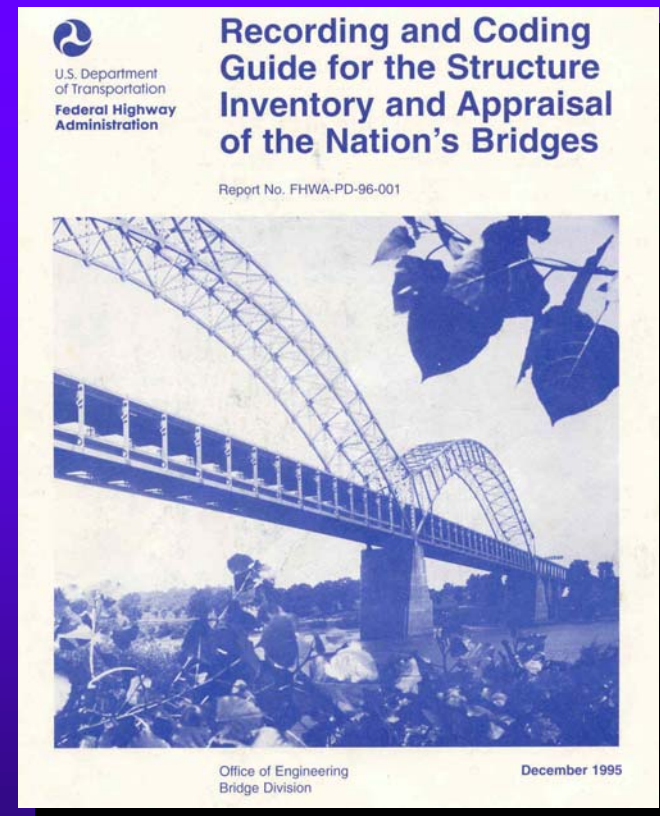
1980

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NBI Updates with Coding Guide

- Recording and Coding Guide for the Structure Inventory and Appraisal for the Nation's Bridges – Last Updated in 1995
- Major Rewrite/Update Currently Underway
 - Started in July 2000 (FHWA Office of Bridge Technology)
 - Presented at the 2002 AASHTO T-18 Meeting
 - Unknown Implementation Date



Coding Guide Updates (Con't.)

- Goals for the Re-Write Effort
 - A new format for the guide
 - Simplified language for the inspectors with graphics
 - New rating scheme - **move from element level criteria into a guide which supports “Bridge Management System” principles**
 - Guidance on emerging technologies
 - Guidance for non-destructive evaluation

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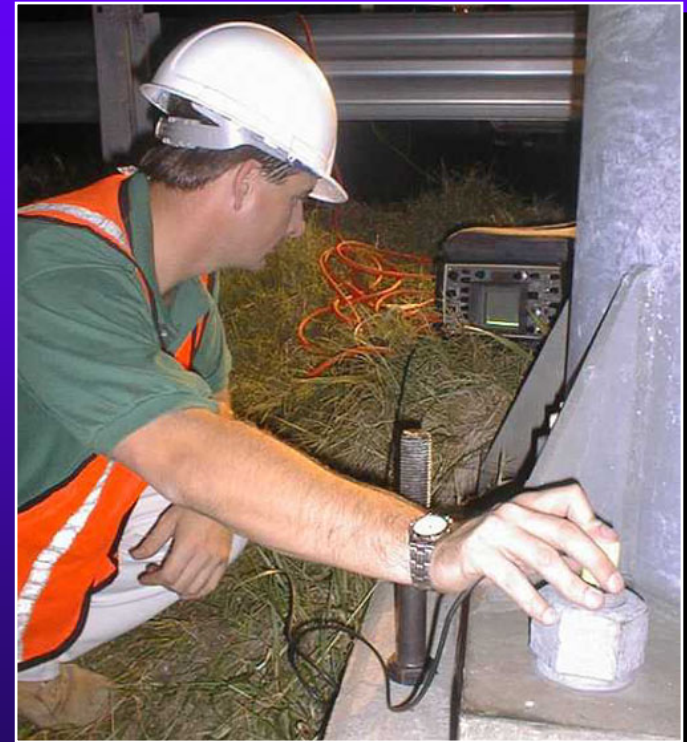
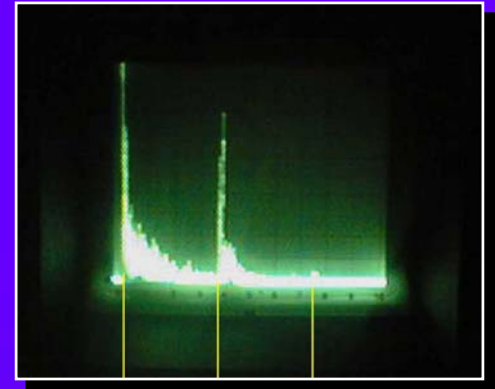
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Greater NDT / BMS Use

- Need for Better Data to Make **Life-Cycle Cost Decisions**
- Element Level Inspections With **Quantification of Conditions**
- Better **Non-Destructive Evaluation/Testing Techniques**
 - Advanced bridge deck inspections
 - Embeddable sensors
 - Advanced fatigue crack detection technology



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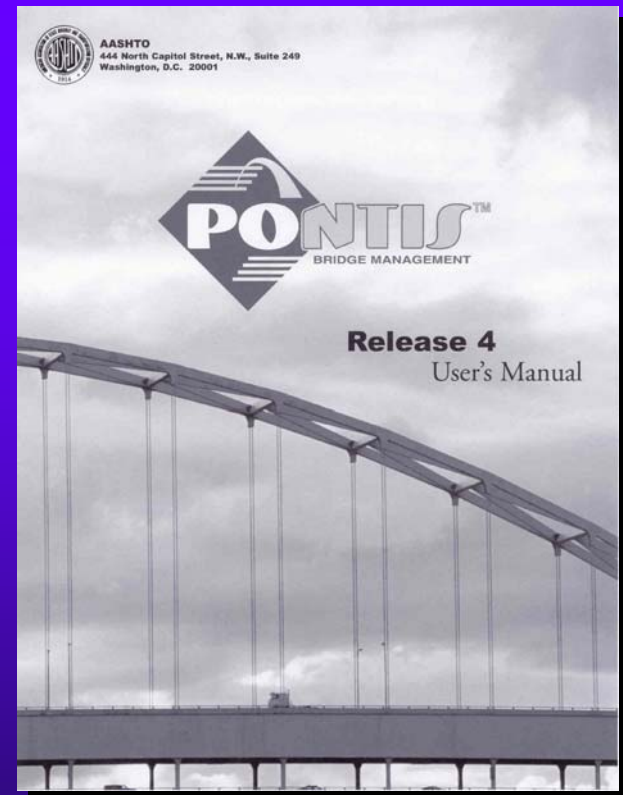
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Greater NDT / BMS Use (Con't.)

- Gain a Better Understanding of:
 - **Deterioration** causes and rates
 - Effectiveness of **maintenance and preservation programs**
 - Relationships between **bridge condition and load carrying capacity**
 - Models for **network and project-level decision support**



Data Input Into a Bridge Management System (BMS)

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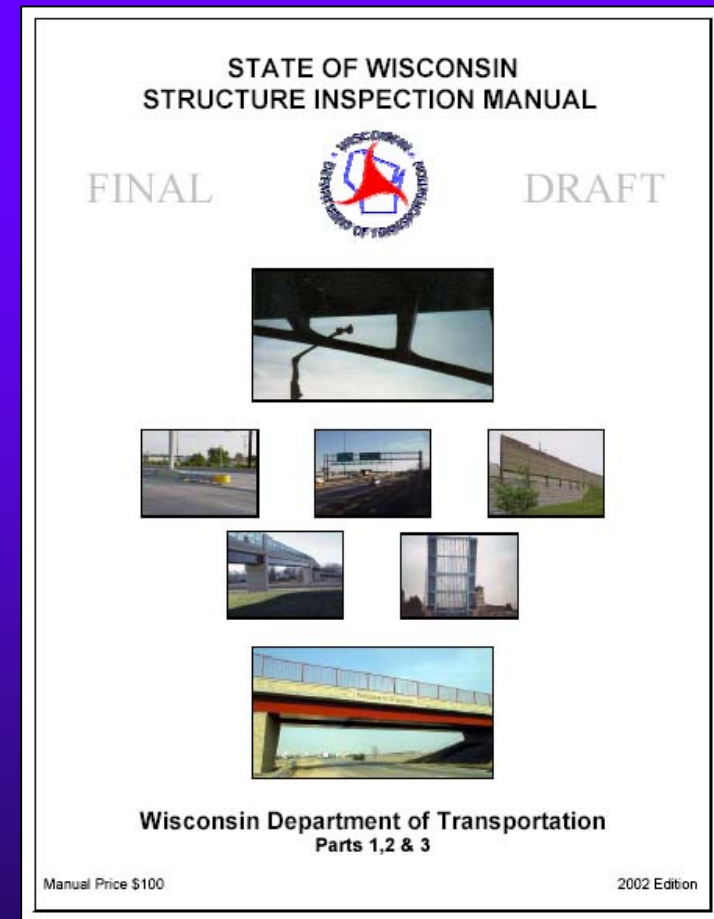
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Proactive State Highway Departments

- All Required to Have Documented Inspection Policies and Follow USDOT (FHWA) Requirements.
- Follow AASHTO Guidelines
- Additionally, Majority Have Internal Manuals and Guidelines.



WisDOT Structure Inspection Manual

- Qualifications
- Emergency Notification Requirements
- Proactively Includes NDT/BMS
- Proactively Involves All Structures

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Element 911: Priority Maintenance Actions (P.95)

- ◆ C.S. 1 – Action Completed
- ◆ C.S. 2 – Safety Action
- ◆ C.S. 3 – Needed Response
- ◆ C.S. 4 – Urgent Response



Element 911: Priority Maintenance Actions



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Railway Companies

- All Required to Have Documented Inspection Policies and Follow USDOT (FRA) Mandates.
- Additionally, Majority Have Internal Manuals and Follow AREMA Guidelines.



Conclusions - Evolution of Policies

Bridge Inspections are moving from the historical safety (only) inspections to inspections which include:

→ **Safety** and

→ the collection of data necessary to support a **“Bridge Management System”** to be used for future network bridge life-cycle cost analysis with an increased emphasis on facility maintenance, **extending bridge service life** over replacement

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Bridge Safety Inspections



1967

2004

Inspections for
Bridge Safety

+

Data Collection for Bridge
Management

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Worldwide State-of-the-Art Bridge Management Systems (B.M.S.)

By
Terry Browne, P.E.
Collins Engineers, Inc.

January 16, 2004
Columbia, Missouri
Midwest Transportation Consortium

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Numerous Structure Failures Around the World



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Basis For Our Discussion

- Annual International Bridge Management Conferences
- 2001 BRIME Report
- Personal International Experience

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Bridge Inspection Systems (B.I.S.)

- Traditional Practices – Produced Information Without Prioritization
- Resultant Organizations are “Data Rich and Information Poor” (DRIP)

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Bridge Management Systems (B.M.S.)

- Establishes a Computerized System Program
- Develops a Systematic Approach to Prioritizing the Allocation of Funds to Construction and Maintenance
- Centralizes and Condenses Pertinent Information

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Conditions Established for Ratings

1. Advanced Deterioration
2. Deteriorating
3. Fair / Mid-Life
4. Good
5. New

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Importance Ratings Established

A - Critical Access – To and Within Terminal

B - High Revenue Generation

C - Medium Value Revenue Generation

D - Low Revenue Generation

E - Not in Use

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Who Utilizes B.M.S.?

- **Railway and Highway Departments in Over 40 States in America**
- **Over 28 Countries around World**

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Who Utilizes B.M.S.?

- Belgium
- Canada
- Norway
- Columbia
- Croatia
- Denmark
- Finland
- France
- Germany
- Honduras
- Hungary
- Indonesia
- Ireland
- Japan
- Mexico
- Mexico
- Norway
- Poland
- Portugal
- Saudi Arabia
- Slovenia
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
- United Kingdom (U.K.)
- United States (U.S.)
- Venezuela
- Zambia

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Who Really Uses B.M.S. To Its Fullest Potential?

- Fraction of Owners



B.I.S. vs. B.M.S.

B.I.S.

- Global Approach (Parts)
- Focus on Safety and Maintenance

B.M.S.

- Element Based Approach (Units)
- Focus on Safety, Maintenance, Budgeting, and Planning

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Advantages of B.M.S.

- **Powerful Tool**
- **Empowers Manager**
- **Element Specific**

Disadvantages of B.M.S.

- Technology Can be Overwhelming
- Garbage In = Garbage Out

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Most Common B.M.S.

- PONTIS
- BRIDGIT
- DANBRO
- Custom Designed Systems

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Condition State Levels

- Typically, 1 - 4

Most Advanced B.M.S. Software

PONTIS

- According to the BRIME (Bridge Management in Europe) Report Published in 2001.
- Oracle Database (Typical).
- Used by 40 States and Many Other Countries.

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But, Do You Really Need the Most Advanced System?



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B.M.S. Provides Historic Information

- **Date, Type, Cost, and Maintenance Work Location**
- **Work Method**
- **Contractor Used**

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B.M.S. Provides Prediction Models

- Only a Few Softwares, Such as PONTIS, Have Capabilities to Predict Future Deterioration Rates and Costs.
- DANBRO Philosophy is Not to Try to Predict Future.

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B.M.S. Provides Information on Costs

- **Maintenance**
- **Major Construction**
- **Inspection**

**(U.K. and Sweden Include Financial
Consequences of Disruption.)**

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B.M.S. Provides Prioritization and Maintenance / Repair Option Decisions

- **Program Recommendation Based on Cost-Benefit Ratio**
- **Engineer's Judgment**

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Custom Designed Systems

**“Allows Client Ability To Pick
Needed Features”**

Common For Highway Ancillary Structures and Port Terminals

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Facilities Management, Maintenance Prioritization and GIS Coordination

The screenshot shows the VPA - Waterfront software interface. The main window is titled "FACILITY INFORMATION" and displays the Virginia Port Authority logo and a list of terminals: Norfolk International Terminal, Newport News Marine Terminal, Portsmouth Marine Terminal, and Virginia Island Port. A "Facility Master" window is open, showing "FACILITY COMPONENTS" for "Terminal/Facility: NIT-CB1". It lists components: 110 Dock 1, 120 Deck Wearing Surface I, and 130 Deck Walk I. A "Component Assessment: Form" window is also open, showing "COMPONENT ASSESSMENT and REPAIR RECOMMENDATIONS" for "PMT Wharf Station 25-75 to 31+60". It displays assessment data for "1. FAILURE" and "2. ADV. DETECTION" with repair sub-totals of \$74,500.00 and \$0.00 respectively. The bottom status bar shows "Report: 510 of 618".

GIS - Terminal Data

- Orthorectified Aerial Photographs as Base
- Boundary Surveys
- Internal Parcel Identification
- State Plan Coordinate System/Geodetic Survey Control Network
- Every Facility as a Polygon with Unique Name and Alpha-Numeric Facility Code
- Topographic Data as Available

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GIS - Facility Maintenance Data

- Facility Importance
- Facility Condition
- Current Permit Status for Each Dredging Polygon
- Photos of Each Facility
- Link to Digital Files of Record Drawings / As-Built Drawings for Each Facility

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GIS – Structural Load Capacity Ratings

- Structural Calculations
- Structural Capacity Maps for Equipment and Material Loadings

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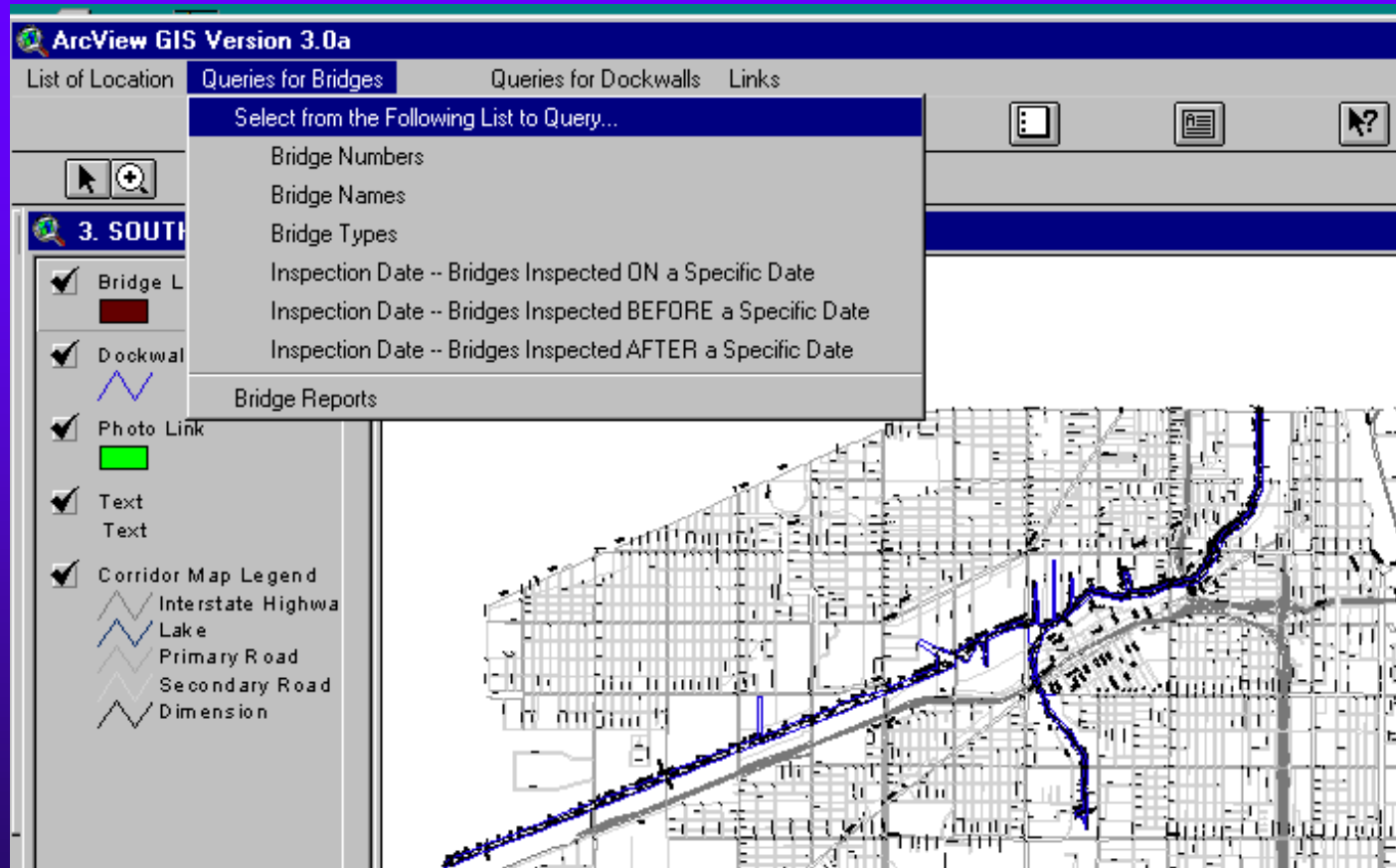
2004



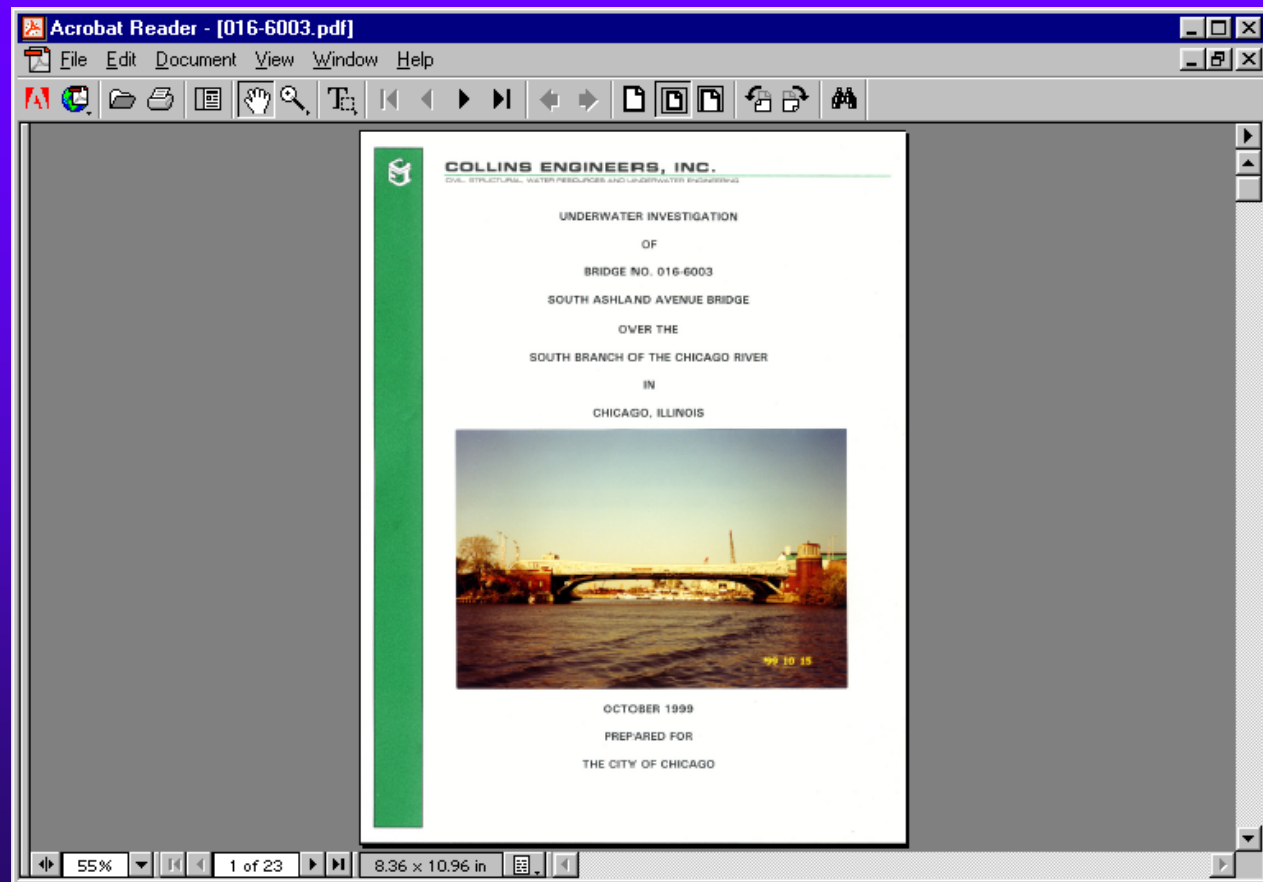
Additional GIS Information Derived from Assessment

- **Geotechnical Data**
- **Stormwater Drainage Basins and Master Plans**
- **Utility Systems**

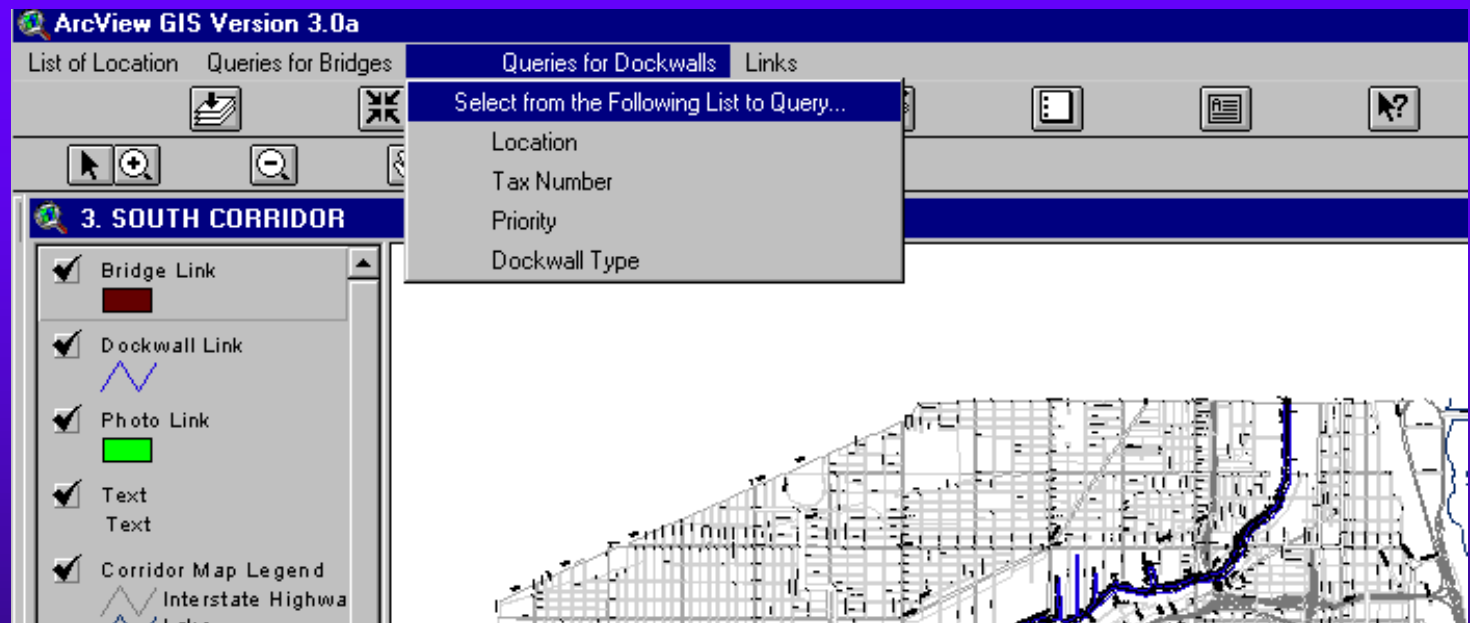
Chicago River Program – “Queries for Bridges Tab”



Chicago River Program – “Structure Report”



Chicago River Program – “Queries for Dockwalls Tab”



Document Impact Events

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VPA - Waterfront

File Edit View Insert Format Records Tools Window Help

Component Assessment: Form

ENT ASSESSMENT and REPAIR RECOMMENDATIONS

Component: **INT-CB1: 270 Storm Sewer Penetration 1** Optimp **A** Yr to Rep **1** Include ☒

Qty **0.0** Overall Assessment: **1** Failure Total Estimated Repair Cost **\$68,000.00**

Qty	Unit	Rep #	Description	Rep Qty	Unit	Unit Cost	Est Repair Cost
30000						30,000.00	30,000.00
25000						25,000.00	25,000.00
10000						5,000.00	5,000.00
						0.00	0.00
						0.00	0.00
						0.00	0.00
						0.00	0.00
						0.00	0.00
						0.00	0.00

ASSESSMENTS

VIRGINIA PORT AUTHORITY

WATERFRONT FACILITIES

☐ Repair Cost - Assessment Input

☐ Repair Cost - Assessment Summary Review

☒ Assessment Ratings

Norfolk International Terminals

Newport News Marine Terminal

Portsmouth Marine Terminal

Virginia Inland Port

Return to VPA Main Menu

Return to MAIN MENU

dition Assessment Ratings

1

ndition **Failure**

Form View

Start Calendar - Microsoft O... VPA - Waterfront Microsoft Word - Docu...

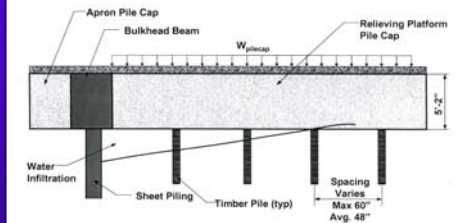
FLTR

5:08 PM



Pile Cap Analysis

Analyze pile cap as a beam spanning between piles with Live Load and HS20 Loading. Shear ok by inspection, check Ultimate Moment Capacity.



Section Looking East

Clear Span Between Pile
Span = 5 ft

Width of Pile Cap
b = 24 in

Assume 3" cover on steel
Cover = 3 in

Pile Cap Depth
PCD = 62 in

$d = PCD - \text{Cover}$
 $d = 59 \text{ in}$

Area of Steel - The plans did not indicate the steel in the Cap - Assume Min. Temp & Shrink Steel (0018)
 $A_s = .0018 \cdot b \cdot d$
 $A_s = 2.55 \text{ sq in}$

Dead Load of the Cap + Slab DL
 $DL = PCD \cdot b \cdot 150 + DL_{10}$
 $DL = 12' \cdot 24' \cdot 150 + DL_{10}$
 $DL = 2.86 \text{ K / ft}$

Assume a Dead Load Factor of 1.3

FactoredDL = 1.3 DL
FactoredDL = 3.72 K / ft

Incident Management Plan (IMP)

- Procedures for Immediate Accidental Impact Incident Notification
- Procedures for Post-Event Assessment
(Rapid Damage Assessment, Detailed Damage Assessment, and Final Engineering Evaluation)
- Required Action Plans



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PONTIS B.M.S.

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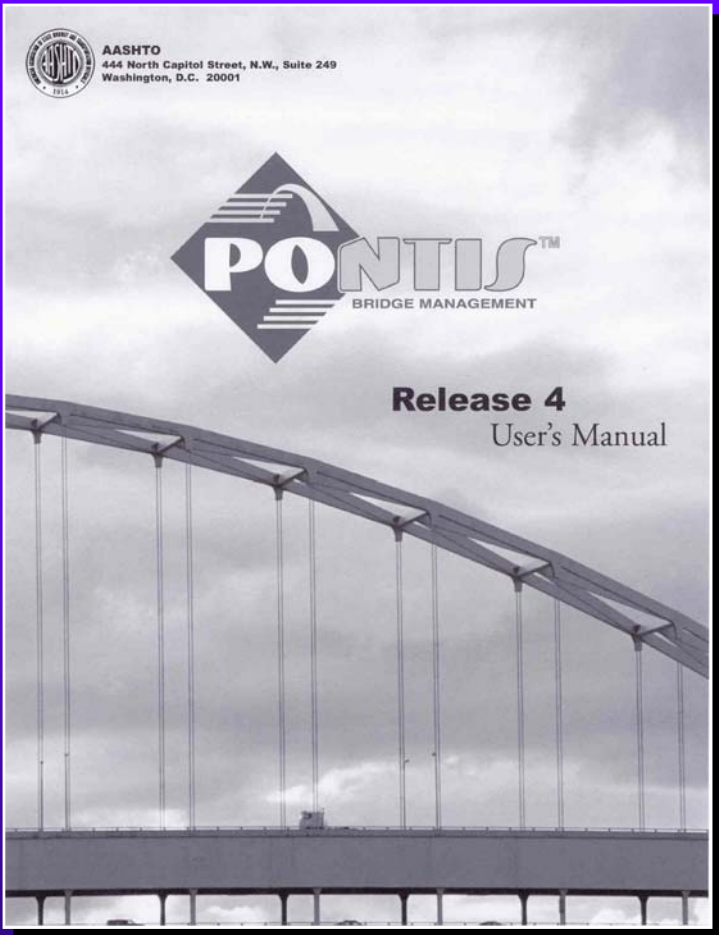
1960

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Michigan Department of Transportation

Bridge Inspection Report 11015-B01-4

Pontis Bridge ID: 11111015000B014 Struc Num: 783 Location: 2.5 MI NE OF NEW BUFFALO

Agency / Consultant: Collins Inspection Date: 08/22/2000 Insp Key: WBGQ

Facility: I-94 Inspector Name: Conroy Insp Freq: 24 UW Meth: 1 Equip: -1 2

Feature: GALIEN R Brg Length-Width: 59.4 17.0 3 Scour (113)

SAFETY, APPRAISAL, AND GENERAL NOTES

Brig	Rail	Appr	Rail	Watr	Appr	Temp	H
Rail	Tr	Rail	Term	Adeq	Align		Ld
(36A)	(36R)	(36C)	(36D)	(71)	(72)		Hit
1	1	1	1	6	8		

NBI INSPECTION

Item	Rating	Comments
1. Surface	4	20% patched and spalled. Heavy longitudinal cracks and map cracking with delam.
2. Expansion Jts	3	Header concrete is spalled and cracked.
3. Joints	3	Seals are deficient. Header conc. is spalled and cracked.
4. Railings	5	Conc. parapet E side scaling entire length. Rust stained cracks and small spalls w/exposed rebar.
5. Approach Pavt	6	Some cracking and patching along reference lines. Heavy break up in bit on N approach.
6. Deck (NBI Item 58)	6	Spots of rust w/ hvy rust at deck drains. Fascias have spalls and leached stained cracks. 3' diameter bulge in SIP in N section. Cracking of exposed concrete w/eff.
7. Stringer (Superst) (NBI Item 59)	5	<10% overall rust. Heavy scale on beam ends over piers. 15 LF of spall on E fascia.
8. Paint	4	Heavy rust on fascia beams and flanges.
9. Paint at Jts	2	Temp. support under BM 1W @ P15. Heavy corrosion and medium scale at joints.
10. Bearings	4	Steel plates rusty. Some section loss. Heavy corrosion and scale of bearings at fascia beams.
11. Abutments	6	A few vertical cracks. Erosion of sand from under concrete at N bank.
12. Piers	5	S pier: com cracks and spalls on col 1W & 2W. Cap has spalls and delams. N Pier: com cracks in most columns.
13. Channel	6	-1
14. Culvert	-	-1

CREW RECOMMENDATIONS

Priority	Comments
Deck Patch	H Patch concrete deck
Appr Pavt	-1
Jt Repair	H Replace joints
Rail Repr	-1
Detailed Inspect	M Inspect beam ends with snoper.
Zone Pt	-1
Subst Repr	-1
Slope Repr	-1
Brush Cut	-1
Other	-1

CONTRACT RECOMMENDATIONS

Priority	Comments
Bridge Repl	-1
Super Repl	-1
Deck Repl	-1
Deck Ovly	-1
Widening	-1
Full Paint	-1
Zone Paint	-1
Pin/Hanger	-1
Substr Repr	-1
Other	-1

PONTIS B.M.S. (Cont'd.)

Pontis for Windows - Version 3.2

File Edit View Tools Window Help

Bridge Inspection - Edit

Bridge: 010001 Find Inspection: 07/01/1997 Metric English Reports

1 Condition 2 Notes 3 Appraisal 4 Descrip. 5 Custom 6 Schedule

NEEL Rating: Deck (58): Not Applicable Culvert (62): Minor Deterioration
 Superstructure (59): Not Applicable Waterway (71): Above Minimum
 Substructure (60): Not Applicable Unrepaired spalls: -1.0 sq.m.
 Channel (61): Minor Damage Review Required: ☐

Quantity Percent

State: 2 Minor deterioration

241 / 3 104 0 0 0 0
 Concrete Culvert 104 sq.
 290 / 3 -1 0 0 0 0
 Channel (sq.) -1 sq.
 361 / 3 -1 0 0 0 0
 Score Sheet Flag (sq.) -1 sq.

Translate

Print 07/01/1997 104 0 0 0 0

Switching to Metric Display Pontis Access Remote (pontis) EDIT OFF

Pontis for Windows - Version 3.2

File Edit View Tools Window Help

Desktop - Inspection

Count Save Find Select Clear Refresh Notes

Layout: Default Layout

Filter: All Rows

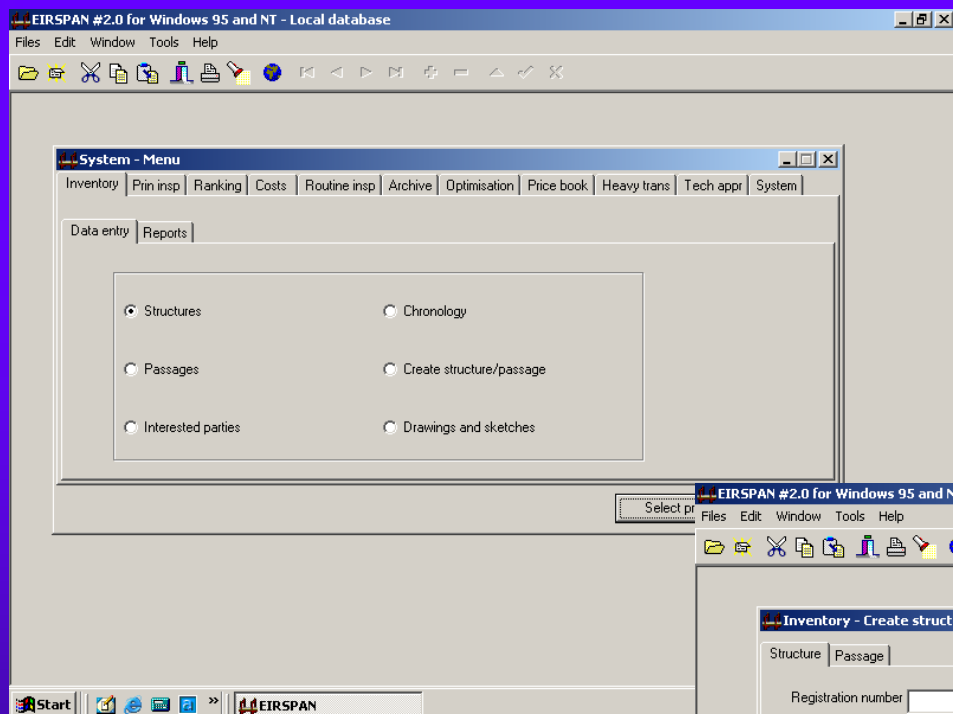
Rows 1 to 20 of 20

Bridge ID	Feature Intersected	Dist	City	Route	KmPost	Own	Maint.
010001	CRESTWOOD WATERWAY	01 - Bartow	(01) Charlotte	00041	24.4	State Highway Agency	State Highway Agency
010003	MYRTLE SLOUGH	01 - Bartow	(01) Charlotte	00074	4.4	County Hwy Agency	County Hwy Agency
010004	ALLIGATOR CREEK	01 - Bartow	(01) Charlotte	00765	8.5	County Hwy Agency	County Hwy Agency
010005	ALLIGATOR CREEK	01 - Bartow	(01) Charlotte	07554	0.0	County Hwy Agency	County Hwy Agency
010006	N FORK ALLIGATOR CREEK	01 - Bartow	(01) Charlotte	07554	3.2	County Hwy Agency	County Hwy Agency
010007	MYRTLE SLOUGH	01 - Bartow	(01) Charlotte	00764	1.1	County Hwy Agency	County Hwy Agency
010008	SHELL CREEK	01 - Bartow	(01) Charlotte	00764	4.9	County Hwy Agency	County Hwy Agency
010009	PRAIRIE CREEK	01 - Bartow	(01) Charlotte	00764	6.2	County Hwy Agency	County Hwy Agency
010010	SMALL CREEK	01 - Bartow	(01) Charlotte	00074	0.6	County Hwy Agency	County Hwy Agency
010011	TIDAL CREEK	01 - Bartow	(01) Charlotte	07764	0.0	County Hwy Agency	County Hwy Agency
010012	ROBERTS ISLAND CANAL	01 - Bartow	(01) Charlotte	00765	2.3	County Hwy Agency	County Hwy Agency
010013	GULF ACRES	01 - Bartow	(01) Charlotte	00765	8.5	County Hwy Agency	County Hwy Agency
010014	ALLIGATOR CREEK	01 - Bartow	(01) Charlotte	00768	1.7	County Hwy Agency	County Hwy Agency
010015	SHELL CREEK	01 - Bartow	(01) Charlotte	00031	13.4	State Highway Agency	State Highway Agency
010016	SHELL CREEK DRAINAGE	01 - Bartow	(01) Charlotte	CB-74	10.5	County Hwy Agency	County Hwy Agency
010017	DARCOCK DRAINAGE	01 - Bartow	(01) Charlotte	00074	0.0	County Hwy Agency	County Hwy Agency
010018	MYRTLE SLOUGH	01 - Bartow	(01) Charlotte	00031	16.4	State Highway Agency	State Highway Agency
010019	CORAL CREEK	01 - Bartow	(01) Charlotte	00771	0.1	County Hwy Agency	County Hwy Agency
010020	MYRTLE SLOUGH	01 - Bartow	(01) Charlotte	00074	4.2	County Hwy Agency	County Hwy Agency
010021	BUTTERFORD WATERWAY	01 - Bartow	(01) Charlotte	00771	6.5	County Hwy Agency	County Hwy Agency

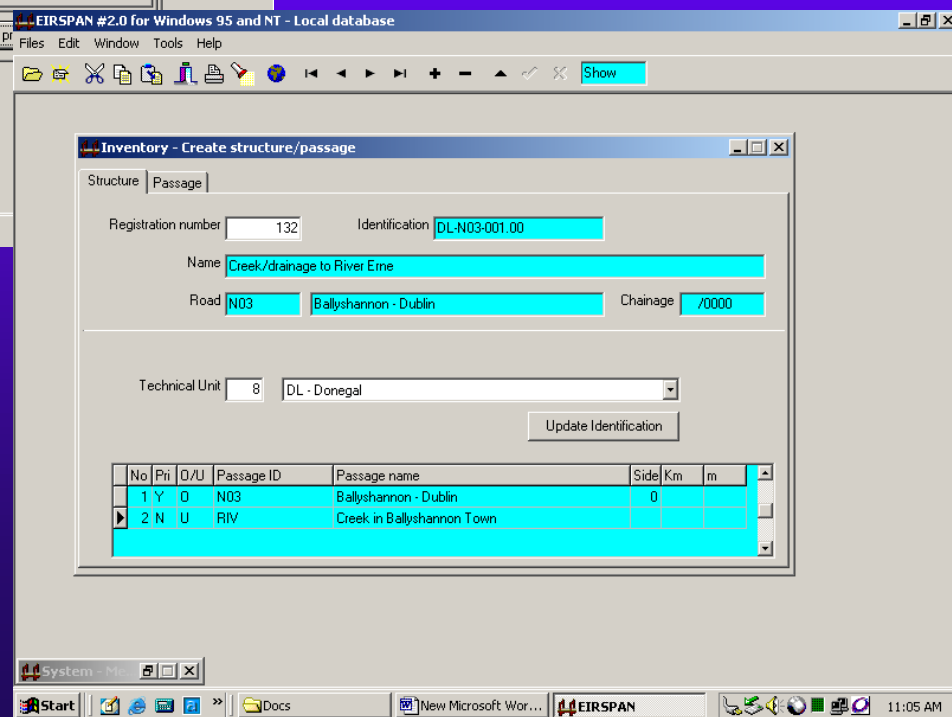
Ready Pontis Access Remote (pontis) N/A 10/03/2001 4:12

DANBRO B.M.S.

Create/Modify/Lookup
Structure



Create Structure



DANBRO B.M.S. (Cont'd.)

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data | Technical data | Passages | Miscellaneous | Remark

Road: N03 Ballyshannon - Dublin

Chainage: /0000 Technical unit: 8 DL - Donegal

Plate and distance: 814 678

Year of construction/reconstr: /

Dir. of kmt. on primary road (N/S/E/W): E

Access equipment needed: 0 Nothing

Data collected: Date: 2001.09.30 Initials: CEI

Region: 8 DL - Donegal

← Create Passage One

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Create structure/passage

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Number: 2 Passage type: 31 River Primary passage (Y/N): N O/U: U

Passage identification: RIV

Look up: Name: Creek in Ballyshannon Town

Roadside (national roads only): Km: m: Plate: Distance:

Structure number: Name:

Create Passage Two →

DANBRO B.M.S. (Cont'd.)

Administrative
Structure Data

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data | Technical data | Passages | Miscellaneous | Remark

Road: N03 Ballyshannon - Dublin

Chainage: /0000 Technical unit: 8 DL - Donegal

Plate and distance: 814 678

Year of construction/reconstr: /

Dir. of kmt. on primary road (N/S/E/W): E

Access equipment needed: 0 Nothing

Data collected: Date: 2001.09.30 Initials: CEI

Region: 8 DL - Donegal

Technical Data 1

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data | Technical data | Passages | Miscellaneous | Remark

Technical data 1 | Technical data 2 | Technical data 3 | Technical data 4

Geometry:

Number of spans	2	Width of footway right (m)	1.70
Min span length (m)	0.95	Width of carriageway (m)	9.00
Max span length (m)	0.95	Width of kerb-to-kerb (m)	9.00
Overall length (m)	2.42	Width of approach (m)	9.00
Width out-to-out (m)	29.75	Area (m2)	72.00
Width of median (m)		Bridge curved (Y/N)	N
Width of footway left (m)	1.85	Skew (deg)	10

DANBRO B.M.S. (Cont'd.)

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erme

Administrative data Technical data Passages Miscellaneous Remark

Technical data 1 Technical data 2 Technical data 3 Technical data 4

Superstructure, principal type :

Standard design (Y/N) ☒ Y

Design of cross section 65 Pipe

Design of elevation 43 Pipe Culvert

Material of primary members 21 Reinforced concrete, precast

Superstructure, secondary type (if applicable) :

Standard design (Y/N) ☐

Design of cross section ☐

Design of elevation ☐

Material of primary members ☐

System - Me

Start Docs New Microsoft Wor... EIRSPAN

← Technical Data 2

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erme

Administrative data Technical data Passages Miscellaneous Remark

Technical data 1 Technical data 2 Technical data 3 Technical data 4

Substructure :

Abutment :

Type 91 Not applicable

Material 91 Not applicable

Foundation 91 Not applicable

Pier :

Type 91 Not applicable

Material 91 Not applicable

Foundation 91 Not applicable

System - Me

Start Docs New Microsoft Wor... EIRSPAN 11:09 AM

Technical Data 3 →

DANBRO B.M.S. (Cont'd.)

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data Technical data Passages Miscellaneous Remark

Technical data 1 Technical data 2 Technical data 3 Technical data 4

Details

Type of parapet	10	No parapet
Type of guard rail	0	No guard rail
Type of wearing surface	21	Dense bitumen macadam
Type of expansion joint	50	No joint device
Type of fixed bearings on supports	91	Not applicable
Type of free bearings on supports	91	Not applicable
Type of fixed bearings in girders	91	Not applicable
Type of free bearings in girders	91	Not applicable

System - Microsoft Windows 95

Start | My Computer | Documents and Settings | My Recent Documents | New Microsoft Word Document | EIRSPAN

← Technical Data 4

Passage Data (for
Passages 1 and 2)



EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data Technical data Passages Miscellaneous Remark

Passage number 2 Type 31 River

Primary passage (Y/N) N O/U U Passage id RIV Side Km m Plate Dist

Road name Creek in Ballyshannon Town

Design load/Clearance Load capacity

Design load

Load distribution class

Technical standard used

Vertical clearance (m): L LM 0.35 RM 0.30 R

System - Microsoft Windows 95

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DANBRO B.M.S. (Cont'd.)

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data Technical data Passages Miscellaneous Remark

Int. parties:

Owner	7	Donegal County Council
Co-operator	7	Donegal County Council
Inspection responsible	53	Collins Engineering, Inc.
Designer/Consultant		

Geographical position:

Latitude Y: 361294.298 Longitude X: 187990.833 Altitude m

Technical documents ☐

Technical installations 0 No technical installation

System - Microsoft Windows 95

Start | My Computer | Internet Explorer | EIRSPAN

← Miscellaneous Data

Structure Remarks →

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Inventory - Structures

Structure: 132 DL-N03-001.00 Creek/drainage to River Erne

Administrative data Technical data Passages Miscellaneous Remark

Remark:

This is a twin concrete culvert pipe. Clearances are from the top of the pipe to the waterline.

System - Microsoft Windows 95

Start | My Computer | Internet Explorer | EIRSPAN

11:10 AM

DANBRO B.M.S. (Cont'd.)

EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Principal inspection - Inspection

Structure DL-N03-001.00 Creek/drainage to River Erne

Inspection Components: Overview Components: Details Photos

Inspection

Date 2001.09.30 Weather Rain Temperature 16 Initials CEI

Year for next inspection 2005

Traffic AADT 4247

Light vehicles 95 % Heavy vehicles 5 %

Remark Although this inspection was performed from the outside of the culvert pipes, it is a complete inspection.

System - Microsoft Windows 95

Start | My Computer | Documents and Settings | My Recent Documents | My Computer | New Microsoft Word Document | EIRSPAN

← Inspection Information

Component Details
(1 Through 14)



EIRSPAN #2.0 for Windows 95 and NT - Local database

Files Edit Window Tools Help

Principal inspection - Inspection

Structure DL-N03-001.00 Creek/drainage to River Erne

Inspection Components: Overview Components: Details Photos

Component number 1 Bridge surface

Condition rating 0 Maintenance rating + Special inspection No. of photos 1

Damage

Damage type

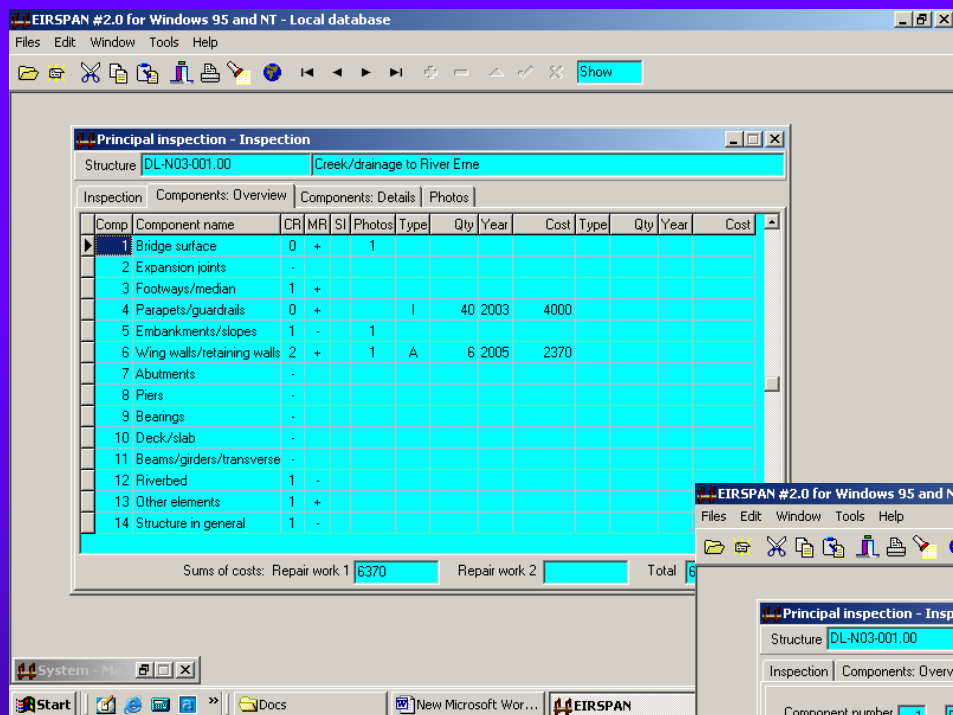
Repair 1 Type Qty Unit Year Cost

Repair 2 Type Qty Unit Year Cost

System - Microsoft Windows 95

Start | My Computer | Documents and Settings | My Recent Documents | My Computer | New Microsoft Word Document | EIRSPAN 11:06 AM

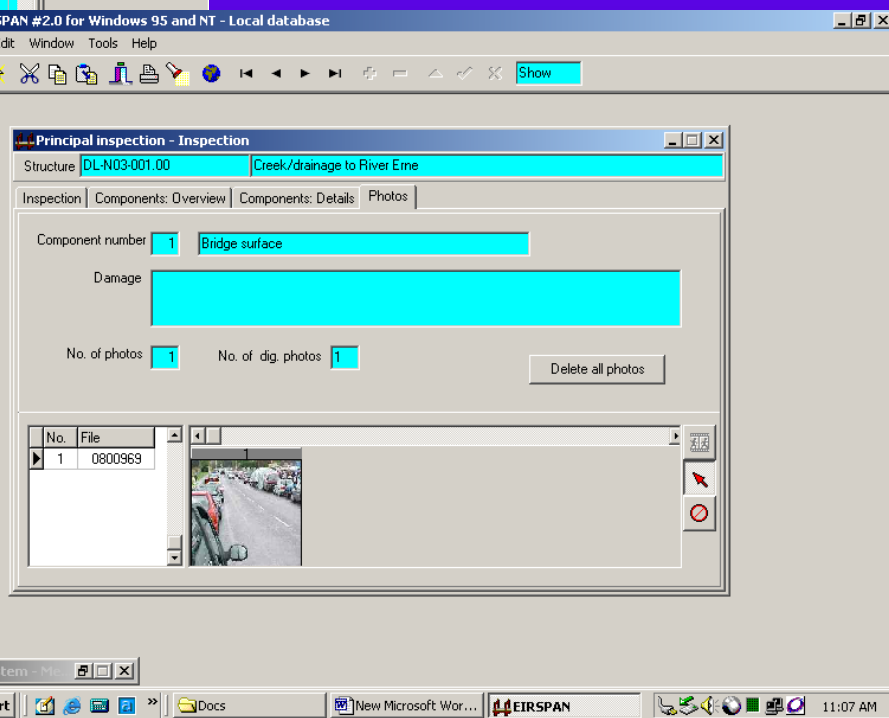
DANBRO B.M.S. (Cont'd.)



Component Overview
(Categories 1-14)



Component Photos
(1-14)



1660

1950

1960

1970

1980

1990

2004

Example of Posted Bridge - Germany



1660

1950

1960

1970

1980

1990

2004

1660

1950

1960

1970

1980

1990

2004

Load Posted due to Floor Beams



1660

1950

1960

1970

1980

1990

2004

Temporary Shoring with New Columns



1660

1950

1960

1970

1980

1990

2004

Temporary Supports with Hangers



1660

1950

1960

1970

1980

1990

2004

Retrofit Beams Supported by Hangers



Presentation Wrap-Up

- ◆ United States Bridge Inspection Program
- ◆ Worldwide Structure Management Systems

1660

1950

1960

1970

1980

1990

2004

Consortium Discussions



For more information, contact
tbrowne@collinsengr.com