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DETERIORATION AND COST INFORMATION FOR BRIDGE MANAGEMENT

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COLORADO DEPARTMENT OF TRANSPORTATION
DTD APPLIED RESEARCH AND INNOVATION BRANCH

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16. Abstract

This study applies contract bid tabulations and element-level condition records to develop element-level actions, costs for actions, transition probabilities for models of deterioration of bridge elements, and transition probabilities for improvements to elements due to actions. The information on actions, costs, and transition probabilities is input to a Pontis BMS bridge database.

The study uses transition probabilities for element deterioration to compute the number of years to possible loss of safety in bridges, and to compute the number of years for inspection intervals. It examines variations in costs of actions and deterioration of elements among CDOT regions. A set of software applications was developed to handle bid tabulations, compute costs of actions, compute transition probabilities, and mediate the steps needed for movement of data into and out of Pontis BMS.

Implementation

- Merge the Pontis bridge database with CDOT's *OnSys* bridge database
- Develop procedures for element-level tracking of repair and rehabilitation work on in-service bridges
- Develop tools outside of Pontis for decision support for bridge projects

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Study 87-60 Deterioration and Cost Information for Bridge Management

Executive Summary

Abstract

Study 87-60 uses contract bid tabulations and element-level condition records to develop element-level actions, costs for actions, transition probabilities for models of deterioration of bridge elements, and transition probabilities for improvements to elements due to actions. The information on actions, costs, and transition probabilities is input to a Pontis BMS bridge database.

Study 87-60 applies transition probabilities for element deterioration to compute the number of years to possible loss of safety in bridges, and to compute the number of years for inspection intervals.

Study 87-60 examines variations among CDOT regions of costs of actions and of deterioration of elements.

Study 87-60 developed a set of software applications to handle bid tabulations, compute costs of actions, compute transition probabilities, and mediate the steps needed for movement of data into and out of Pontis BMS.

Overview

Study 87-60 follows several groups of tasks. Study 87-60 begins by marshalling information and methods in DOTs' use of Pontis BMS. Work in Study 87-60 summarizes published reports on actions, costs and deterioration of bridge elements, examines sources of data within CDOT that can be applied to cost computation and deterioration modeling, and reviews related work at other US State DOTs. Study 87-60 collects data from CDOT's Pontis bridge database to identify service-life events for bridge elements, compute transition probabilities for deterioration models, estimate years to potential loss of safety due to deterioration of superstructure elements, and compute intervals for inspection to track specific levels of deterioration. Study 87-60 uses CDOT bid tabulations to compute costs of element-level actions and evaluates costs both as statewide average values and averages within CDOT regions. The study is completed by a set of tasks to import new actions, costs and transition probabilities into Pontis BMS, and apply the Pontis preservation model to identify optimal actions for bridge elements. Throughout these tasks, Study 87-60 develops software applications to move data in and out of Pontis BMS, collect and re-format bid tabulations, and perform computations of costs and transition probabilities.

Findings of Study 87-60

In completing the tasks for Study 87-60, several findings are noted:

The literature review in Task 1 focuses on publications that present actual values of costs and transition probabilities used or developed by US State transportation departments. Few such reports are found. From these few publications, a large set of costs and deterioration-related values are found and reported in Study 87-60 (Task 1 page 7).

CDOT data sources include useful information in bid tabulations for contract work, and in lists of projects that deliver work on bridges. CDOT's Level-of-Service (LOS) management system tracks work effort and costs for a number of actions including repairs to decks, joints and railing. Unit costs derived from LOS data show large variability (Task 2 page 33).

US State DOTs develop costs for element-level actions using sets of bid items that include the materials and operations necessary to furnish repairs and replacements of elements. For some actions, such as replacement of bridge joints, the basis of measurement for bid items is the same as basis of measurement for bridge elements. Average costs for bid items are needed, since a single joint element in Pontis can represent a family of joints having different ranges of movement and different unit costs. Other actions must be assembled from sets of bid items, and units of measurement for bid items must be changed to obtain quantities of bridge elements treated. These conversions employ assumed, representative dimensions of elements. Large lists of costs for Pontis actions are collected from DOTs in Delaware and Louisiana (Task 3 page 40).

US State DOTs develop deterioration models outside of Pontis, and use these models to evaluate potential programs of bridge work. Work of DOTs in Michigan, New York and Ohio are noted.

CDOT's database of element-level condition data spans about 10 years and has more than 200,000 condition reports. The data set is not large enough to populate all condition states for all elements. The 10-year range of data is too short to exhibit transitions in conditions for some elements. Study 87-60 employs a process of grouping elements by similar bridge component and construction material. This approach yields larger data sets for fewer models. An outcome is that similar elements share a single deterioration model (Task 4 page 84, and Task 5 page 97).

Transition probabilities for element deterioration are applied to computing the time to possible loss of safety. The computation is based on the time needed for superstructure elements to reach the poorest condition states. For new bridges (and superstructure elements in best condition) the time to potential loss of safety ranges from more than 40 years for timber superstructure to more than 100 years for prestressed concrete superstructure. For CDOT bridges in service (as of 2008) the median time to potential loss of safety is 87 years (Task 6 page 127).

Transition probabilities for element deterioration are applied to computation of inspection intervals. Inspection intervals are determined for different condition states and for various levels of additional deterioration (that is, amount of change in element-level condition reports). Inspection intervals are shorter for smaller changes in condition reports. Inspection intervals are shorter for elements in good condition (Task 7 page 159).

Costs for actions for bridge elements are computed from CDOT's contract bid tabulations. For some elements, such as joints, railings and bearings, the measurement basis for bid items agrees with the measurement basis for elements. For other elements, such as decks, bid items provide costs on the basis of deck area, but conditions are reported for entire decks. Area-based costs are scaled by the corresponding level of damage for each condition state. For still other elements, sets of two or more bid items are combined in the proportions needed to complete a repair for a representative size of bridge element (Task 8 page 172).

Costs for element-level actions are similar among CDOT regions. Regional variations in costs of actions are often within 10% of statewide average costs (Task 9 page 200).

CDOT's *OnSys* Pontis database required modifications to elements, to definitions of elements, to some element-level condition reports, in addition to newly created information on actions, costs and transition probabilities (Task 10 page 213).

Transition probabilities for improvements to elements due to actions are computed for 71 bridge elements using CDOT element-level condition reports. For other bridge elements, transition probabilities for improvement are set equal to elements of the same bridge component and same material of construction (Task 11 page 221).

The Pontis preservation model recommends only a single intervention (that is, action other than 'Do Nothing') for most CDOT elements, and often recommends an intervention at the poorest condition state only (Task 12 page 227).

Software applications outside of Pontis BMS are useful in identifying element-level actions, computing costs for actions, and computing transition probabilities for deterioration and for improvement. Several software applications are developed in Study 87-60 (Task 13 page 309).

Products of Study 87-60

In the Task 1 literature review, Study 87-60 obtains 108 costs of actions in comparisons among California, Idaho and Oregon, 617 costs of actions for Florida DOT, 360 deterioration values (expressed as mean duration in a condition state) from Florida, and 41 costs for actions from Minnesota DOT.

Study 87-60 reports on data sources within CDOT including the Level-of-Service Management System used by CDOT Maintenance and Operations Branch, the bid tabulations posted by CDOT Construction Contracts Unit, the Pontis BMS database kept by CDOT Staff Bridge Branch and the tabulation of project IDs and Bridge IDs kept by CDOT Staff Bridge Branch.

In the Task 3 review of work at other DOTs, Study 87-60 obtains 36 expected ranges of costs for actions from California DOT, 752 Pontis costs from Delaware DOT and 367 costs from Louisiana DOTD.

In Task 4, Study 87-60 examines condition data in CDOT's *OnSys* bridge database. The database includes 236,000 element-level condition reports for 50,000 elements at 3,700 bridges. Study 87-60 found and corrected errors in condition reports for inspections in years 2001 and 2002. For some inspections,

element quantities were reported to US customary units, instead of SI units. Study 87-60 identifies events in service life of elements from changes to element quantities and conditions. Events include construction and demolition, additions and removals, and deterioration and repairs. Events, once identified and tabulated, guide the use of element condition data in modeling deterioration and evaluating improvements due to actions.

In Task 5, Study 87-60 computes transition probabilities for Markov chain deterioration models for bridge elements. Transition probabilities are computed for bridge elements that are grouped by matching bridge component (deck, superstructure, substructure, etc.), matching material of construction, and matching form of protection. Grouping provides larger populations of records for calibration of transition probabilities.

In Task 6, Study 87-60 computes the time in years to potential loss of safety in bridges due to deterioration of superstructure elements. The computation is applied to bridges in CDOT's *OnSys* database that had element-level inspections in 2008. The results include estimates of time to potential safety loss for 409 bridges with painted steel superstructure, 42 bridges with unpainted steel superstructure, 363 bridges with prestressed concrete superstructure, 327 bridges with reinforced concrete superstructure and 84 bridges with timber superstructure.

In Task 7, Study 87-60 computes inspection intervals for elements as a function of current condition and a selected extent of element transition (deterioration). Inspection intervals are determined for each element, for all condition states and for transitions of 2%, 10% and 20% of element quantity.

In Task 8, Study 87-60 collected 1900 bid tabulations from the public website of the CDOT Construction Contracts Unit and used 612 bid tabulations that included bridge work to compute costs of element-level actions. These bid tabulations yield 1470 evaluations of costs for actions.

In Task 9, Study 87-60 compared costs for actions as statewide average values and as values in CDOT regions.

In Task 10, Study 87-60 re-built CDOT's *OnSys* bridge database for Pontis. The re-built database includes 3750 bridges, 21480 inspection events and 236189 element-level condition records. The re-built database contains, in addition, new actions, new costs for actions, new transition probabilities for deterioration and new transition probabilities for improvements. The re-built database employs corrected element-level condition reports for some inspections in years 2001 and 2002; some inspections were reported in US rather than SI units. The re-built database eliminates excess, unused bridge elements, and fixes errors in definitions of some elements. Cost adjustment factors are extended to the year 2017.

In Task 11, Study 87-60 computed probabilities of improvements for 71 bridge elements and 148 combinations of elements and condition states.

In Task 12, Study 87-60 used Pontis BMS to obtain recommended actions and resulting network-wide conditions of elements from the Pontis preservation model. Pontis was operated with actions, costs, and transition probabilities developed in Study 87-60.

In Task 13, Study 87-60 developed 12 software applications to collect, analyze and reformat data on bridge actions, costs and transition probabilities. Six of the applications provide analytical functions, such as cost computations and determination of transition probabilities. Seven applications are utilities for data collection and preparation.

Implementation Plan

The implementation of products of Study 87-60 could include:

- Merging the Pontis bridge database created in Study 87-60 with CDOT's *OnSys* bridge database.
- Developing procedures for element-level tracking of repair and rehabilitation work on in-service bridges.
- Developing tools outside of Pontis for decision support for bridge projects.

Merging the 87-60 bridge database

Study 87-60 delivers a new Pontis bridge database that has element-level costs, transition probabilities for deterioration and transition probabilities for improvements. The new database is populated with CDOT's on-system bridges, and the database includes a set of corrections to older element-level inspections that were reported in US customary units, instead of metric units. The new database can be merged with CDOT's *OnSys* bridge database. This will provide costs and transition probabilities for CDOT's use, and will overwrite the flawed inspection reports in the *OnSys* database.

Element-level tracking of bridge repairs

CDOT Staff Bridge keeps an Excel workbook listing bridges and the years and costs of projects for repairs and rehabilitations of bridges. The workbook could directly serve the task of providing cost information for Pontis BMS if element-level quantities and costs were recorded. Standard procedures could be developed for examination of project documents to record the bridge elements and quantities affected by projects. Examination of bid tabulations after letting would yield element-level costs. CDOT could develop a manual, a set of standard reporting forms, and software for preparation of input files to Pontis to guide and support element-level tracking of projects and costs.

Decision support

DOTs' decisions to repair, rehabilitate or replace bridges entail consideration of transportation improvement plans, mobility of special loads, and bridge conditions, as well as the constraints of budgets and the impacts of multiple projects in a single region or along a single route. Pontis examines bridge conditions and budget constraints primarily, and can respond to agency policies through agency rules. The larger interactions of DOT plans, mobility goals, and multiple projects are not well addressed. CDOT could develop simple software procedures that apply rules for priorities and constraints in support of decision for bridge projects. These software tools could operate with Pontis data.

Task 1 – Literature Review

Scope

Work in Task 1 collects and reviews published documents on costs of Pontis actions, and deterioration models for Pontis elements. Keyword searches are made in the Transportation Research Information System, in the American Society of Civil Engineers database, Engineering Village database and Scitopia database. The term 'Pontis' is used in most keyword searches. This keeps the focus on publications directly related to Pontis.

Information on costs of Pontis actions are found in publications by Adams and Juni (2003), Sobanjo and Thompson (2001), Milligan (et al. 2006) and Hearn (et al. 2010), A method for determining costs of actions is reported by Demers (et al. 2002). Publications related to deterioration models include Agrawal (et al. 2008), and Sobanjo and Thompson (2001). Publications relating to DOTs' implementation of Pontis include Hale (2007), Mach and Hartman (2008), and Sobanjo and Thompson (2007). Related documents on costs include the US Army Corps cost index system (*Civil* 2010) and the *Primer* (2000) for the Governmental Accounting Standards Board Statement 34.

Costs of actions are also collected from unpublished documents of DOTs. Costs from unpublished sources are reported in Task 3 of Study 87-60.

Costs for Pontis Actions for Bridge Elements

Adams and Juni (2003) report the computation of costs for actions on bridge elements in a study performed for the Minnesota DOT. Adams and Juni propose standard sizes of bridge elements (Table 1). Standard sizes are needed to relate material quantities to element quantities. Costs of actions are listed in Table 2. For each element, one or more actions are named, together with appropriate condition states for use of actions. Adams and Juni report costs in the year 2001. Study 87-60 adjusts these to 2009 costs using the US Army Corps of Engineers cost index for roads, railroads and bridges (*Civil* 2010). Adams and Juni relate their work to the MnDOT Work Management System, a data system intended to collect costs of bridge maintenance by DOT crews in support of Pontis implementation.

Sobanjo and Thompson (2001) report the use of expert elicitation to obtain costs of Pontis actions. Experts are used because cost units of actual work and not compatible with cost units needed for Pontis BMS. Costs from Sobanjo and Thompson are summarized in Table 3. A full list of costs for actions is shown in Table 4. Sobanjo and Thompson report costs in 2003. Study 87-60 converts these to costs in 2009.

Millgan (et al. 2006) report element-level costs in a study of the effects of action costs, failure costs and discount rates on outcomes of Pontis analyses. Costs were collected from DOTs in California, Idaho and Oregon (Table 5).

Costs of actions are reported in NCHRP report 667 (Hearn et al 2010). Unit costs and relations of costs to element condition were developed through combination of records for condition of bridge elements

and records of maintenance activities at bridges. Cost computations were reported for California, Michigan, Oregon and Tennessee. A portion of those findings are shown in Table 6.

Methods for Costs of Actions

Demers (et al. 2002) reports the use of a parametric cost engineering system (PACES) to compute costs for Pontis actions. PACES uses a work breakdown structure (data structure, that is) to represent complete structures, components of structures, elements within components, and materials and parts of elements. The data levels of materials and parts correspond directly to bid items of contracts. The aggregation of bid costs into elements, then components, and then complete structures is the purpose of the work breakdown structure. Demers outlines the application of PACES to bridge elements. Cost values are not presented.

Deterioration Models

Sobanjo and Thompson (2001) used expert elicitation for deterioration modeling for Florida DOT. Experts are used due to the lack of sufficient extent and scope of actual data on element conditions. Mean duration of element groups in condition states are shown in Table 7. Detailed results for elements are shown in Table 8.

Agrawal (el al. 2008) reports the use of Weibull distributions to model time-domain trends in condition ratings in a study of New York State DOT condition data. Agrawal reports that Weibull distributions offer better agreement with observed trends in condition ratings, especially at greater age of elements. Markov chain models of deterioration routinely show slowing deterioration with age.

Pontis and Bridge Programming

Mach and Hartman (2008) report activities by Oregon DOT to use Pontis' outputs for project selection within the existing ODOT practice for bridge program development. Mach and Hartman note several limitations. ODOT does not have sufficient condition data to populate all combinations of elements, condition states and service environments despite many years of ODOT element-level inspections. Costs for Pontis are intended to be typical costs, computed for average or standard sizes of elements. Actual costs vary greatly among bridges and among projects. Pontis actions are ambiguous. An action to 'rehabilitate' a deck, for example, can mean any among several actions.

Sobanjo and Thompson (2007) report a software tool for bridge programming developed for Florida DOT.

Reporting for GASB 34

Hale et al. (2007) report on Alabama DOT's migration from their existing Alabama Bridge Information Management System (ABIMS) to the Pontis bridge management system. ABIMS is an NBI-compatible data system that employs additional data fields (additional to NBIS) to identify types of structural components. The migration from ABIMS to Pontis requires a translation of ABIMS bridge data to element-level representations of structures.

Hale shows a method for computation of bridge conditions that can be used for GASB 34 reporting [*Primer* 2000]. The GASB alternative method for verification of maintenance of bridge networks entails

reporting of condition ratings and the demonstration, over time, that network conditions are not deteriorating. Hale proposes a GASB 34 rating for a network that is computed as

$$GASB\ 34\ Rating = \sum(Individual\ bridge\ deck\ area\ \times Weighted\ rating) \Big/ \sum Deck\ area \qquad \text{Eq. 1}$$

Where

$$Deck\ area = Structure\ length\ \times Structure\ width \qquad \text{Eq. 2}$$

$Weighted\ rating$[1]

$$\begin{aligned} &= (Deck\ condition\ \times 20\%) \\ &+ (Superstructure\ condition\ \times 40\%) \\ &+ (Substructure\ condition\ \times 40\%) \end{aligned} \qquad \text{Eq. 3}$$

and *Deck Condition*, *Superstructure Condition* and *Substructure Condition* are NBI fields 58, 59 and 60.

Table 1 - Standard Sizes of Bridge Elements (Adams and Juni 2003)

No.	Element	Standard Size
106, 107	Steel Open Girder	40” depth
109	Prestressed Concrete Open Girder	36” depth
234	Reinforced Concrete Cap	3’ wide, 3’ deep, 40’ long
205	Reinforced Concrete Column or Shaft	3’ dia x 14’ high
210	Reinforced Concrete Pier Wall	30’ wide, 3’ thick, 15’ high
215	Reinforced Concrete Abutment	50’ wide, 4’ high
313	Fixed Bearing	7” high, 12” x 24” pad
321	Reinforced Concrete Approach Slab	20’ long, 24’ wide
12, 22, 377, 26	Concrete Deck	200’ long, 40’ wide

[1] Using NBI general condition ratings

Table 2 – Element Costs for Actions (adapted from Adams and Juni (2003))

No	Element	Pontis Action (condition state)	Unit Cost $ (2001)	Unit Cost $ (2009)
12	Deck: Concrete, Bare	Add a Protective System (1,2)	6/SF	8.22/SF
		Repair Spalled Areas and Add a Protective System on Entire Deck(3,4,5)	7/SF	10/SF
		Replace Deck (5)	40/SF	55/SF
22	Deck: Conc., Protected w/ Rigid Overlay	Replace Overlay (4)	1.58/SF	2.16/SF
		Replace Overlay (5)	2.25/SF	3.08/SF
		Replace Deck (5)	40/SF	55/SF
26	Deck: Conc., Protected w/ Coated Bars	Repair Spalled Areas and Add or Replace Overlay (3)	0.90/SF	1.23/SF
		Repair Spalled Areas and Add or Replace Overlay (4)	1.58/SF	2.16/SF
		Repair Spalled Areas and Add or Replace Overlay (5)	2.25/SF	3.08/SF
		Replace Deck (5)	40/SF	55/SF
109	Girder: Prestressed Concrete	Replace Unit (4)	825/LF	1130/LF
205	Column/Pile Extension: Reinforced Concrete	Rehab Unit (4)	3,000/EA	4110/EA
210	Pier Wall: Reinforced Concrete	Rehab Unit (4)	1,200/LF	1640/LF
215	Abutment: Reinforced Concrete	Rehab Unit (4)	320/LF	438/LF
234	Pier Cap: Reinforced Concrete	Rehab Unit (4)	240/LF	329/LF
300	Joint: Strip Seal Expansion Joint	Replace Joint (3)	350/LF	481/LF
302	Joint: Compression Joint Seal	Patch/Remove/Reseal/Clean (2)	100/LF	137/LF
311	Bearing: Moveable	Rehab Supports (3)	600/EA	825/EA
		Replace Unit (3)	1,000/EA	1,370/EA
312	Bearing: Enclosed/Conceal	Rehab Unit (2,3)	1,200/EA	1,650/EA
		Replace Unit (3)	2,000/EA	2,750/EA
313	Bearing: Fixed	Clean and Paint or Reset Bearings and/or Rehab Supports (2)	52/EA	71/EA
		Rehab Supports or Bearings (3)	600/EA	825/EA
		Replace Unit (3)	1,000/EA	1,370/EA
320	Approach Slab: Bituminous	Place Overlay (3)	720/EA	986/EA
		Replace Unit (3,4)	20,000/EA	27,500/EA
321	Approach Slab: Concrete	Place Overlay (3)	1,728/EA	2367/EA

No	Element	Pontis Action (condition state)	Unit Cost $ (2001)	Unit Cost $ (2009)
		Replace Unit (3,4)	20,000/EA	27,500/EA
330	Railing: Metal	Clean and Coat (2,3)	35/LF	48/LF
		Rehab Unit (4)	110/LF	151/LF
		Replace Unit (3,4)	110/LF	151/LF
331	Railing: Concrete	Rehab Unit (4)	80/LF	110/LF
		Replace Unit (4)	80/LF	110/LF
333	Railing: Misc., Combination	Replace Unit (3)	190/LF	261/LF
373	Hinge Assembly: Steel, Painted	Replace Paint System (4)	500/EA	687/EA
		Major Rehab Unit (5)	500/EA	687/EA
377	Deck: Conc., w/ Rigid Overlay and Coated Bars	Repair Spalled Areas and Add or Replace Overlay (3)	0.90/SF	1.23/SF
		Repair Spalled Areas and Add or Replace Overlay (4)	1.58/SF	2.16/SF
		Repair Spalled Areas and Add or Replace Overlay (5)	2.25/SF	3.08/SF
		Replace Deck (5)	40/SF	55/SF
382	Cast-In-Place Piling	Clean and Paint Shell (2)	300/EA	412/EA

Table 3 - Florida Cost Elicitation (from Sobanjo and Thompson 2001)

Element	Action	unit	Unit Cost $ (2001)	Unit Cost $ (2009)
12 - Concrete Deck - Bare	Maintain Approach slab	SF	23.31	31.93
	Repair deck and substrate	SF	82.97	113.67
	Repair Potholes	SF	25.88	35.46
13 - Concrete Deck - Unprotected w/ AC Overlay	Maintain Approach slab	SF	19.76	27.07
	Repair Potholes	SF	24.20	33.15
	Repair deck and substrate	SF	19.07	26.13
28 - Steel Deck - Open Grid	Maintain Approach slab	SF	36.58	50.11
	Repair deck and substrate	SF	25.16	34.47
	Repair Potholes	SF	30.46	41.73
29 - Steel Deck - Concrete Filled Grid	Maintain Approach slab	SF	4.23	5.80
	Repair deck and substrate	SF	29.32	40.17
	Repair Potholes	SF	31.85	43.63
38 - Concrete Slab - Bare	Maintain Approach slab	SF	23.24	31.84
	Repair Potholes	SF	10.45	14.32
39 - Concrete Slab - Unprotected w/ AC Overlay	Maintain Approach slab	SF	28.29	38.76
	Repair Potholes	SF	29.75	40.76
98 - Concrete Deck on Precast Deck Panels	Maintain Approach slab	SF	45.54	62.39
	Repair deck and substrate	SF	158.66	217.36
	Repair Potholes	SF	15.30	20.96
99 - Prestressed Concrete Slab (Sonovoid)	Maintain Approach slab	SF	17.15	23.50
	Repair deck and substrate	SF	10.59	14.51
	Repair Potholes	SF	22.62	30.99
102 - Painted Steel Closed Web/Box Girder	Spot Paint	LF	35.03	47.99
104 - P/S Conc Closed Web/Box Girder	Patch Minor Spalls	LF	21.49	29.44
105 - Reinforced Concrete Closed Webs/Box Girder	Patch Minor Spalls	LF	4.22	5.78
107 - Painted Steel Open Girder/Beam	Spot Paint	LF	21.84	29.92
109 - P/S Conc Open Girder/Beam	Clean rebar & patch	LF	46.50	63.71
109 - P/S Conc Open Girder/Beam	Patch Minor Spalls	LF	33.54	45.95
110 - Reinforced Conc Open Girder/Beam	Clean rebar & patch	LF	94.64	129.66
	Patch Minor Spalls	LF	22.16	30.36
	Wash Structure	LF	3.90	5.34
113 - Painted Steel Stringer	Spot Paint	LF	17.04	23.34
144 - Reinforced Conc Arch	Patch Minor Spalls	LF	22.79	31.22
152 - Painted Steel Floor Beam	Spot Paint	LF	21.84	29.92
155 - Reinforced Conc Floor Beam	Patch Minor Spalls	LF	8.82	12.08
204 - P/S Conc Column or Pile	Clean rebar & patch	LF	32.53	44.57
204 - P/S Conc Column or Pile	Patch Minor Spalls	LF	27.64	37.87
205 - Reinforced Conc Column or Pile	Clean rebar & patch	LF	46.96	64.34
	Patch Minor Spalls	LF	34.14	46.77
207 - Hollow Core Pile	Patch Minor Spalls	LF	34.12	46.74
210 - Reinforced Conc Pier Wall	Clean rebar & patch	LF	23.21	31.80
	Patch Minor Spalls	LF	28.67	39.28
215 - Reinforced Conc Abutment	Clean rebar & patch	LF	42.87	58.73
	Patch Minor Spalls	LF	31.99	43.83
220 - Pile Cap/Footing	Clean rebar & patch	LF	34.79	47.66
	Patch Minor Spalls	LF	30.18	41.35
234 - Reinforced Conc Cap	Clean rebar & patch	LF	31.59	43.28
	Patch Minor Spalls	LF	31.29	42.87
241 - Reinforced Concrete Culvert	Patch Minor Spalls	LF	96.48	132.18
298 - Pile Jacket without Cathodic Protection	Clean rebar & patch	LF	4.39	6.01
	Patch Minor Spalls	LF	30.01	41.11
299 - Pile Jacket with Cathodic Protection	Patch Minor Spalls	LF	15.54	21.29
300 - Strip Seal Expansion Joint	Rehab joint	LF	6.00	8.22
	Repair Joint	LF	26.9	36.85
301 - Pourable Joint Seal	Rehab joint	LF	7.92	10.85
	Repair Joint	LF	42.23	57.86
	Replace joint	LF	15.45	21.17
	Replace joint seal	LF	13.29	18.21

Element	Action	unit	Unit Cost $ (2001)	Unit Cost $ (2009)
302 - Compression Joint Seal	Rehab joint	LF	9.10	12.47
	Repair Joint	LF	56.9	77.95
	Replace joint	LF	14.08	19.29
	Replace joint seal	LF	30.98	42.44
303 - Assembly Joint/Seal	Replace joint seal	LF	14.38	19.70
303 - Assembly Joint/Seal (modular)	Rehab joint	LF	8.91	12.21
	Repair Joint	LF	37.71	51.66
304 - Open Expansion Joint	Rehab joint	LF	9.36	12.82
	Repair Joint	LF	46.67	63.94
	Replace joint	LF	9.57	13.11
	Replace joint seal	LF	9.79	13.41
321 - Reinforced Conc Approach Slab w/ or w/o AC Ovly	Clean rebar & patch	LF	42.38	58.06
321 - Reinforced Conc Approach Slab w/or w/o AC Ovly	Patch Minor Spalls	LF	31.78	43.54
331 - Reinforced Conc Bridge Railing	Clean rebar & patch	LF	41.07	56.27
	Patch Minor Spalls	LF	32.06	43.92
	Replace railing	LF	19.93	27.30
333 - Other Bridge Railing	Replace railing	LF	16.73	22.92
334 - Metal Bridge Railing - Coated	Replace railing	LF	14.71	20.15
387 - Fender Dolphin System Prestressed Concrete	Clean rebar & patch	LF	23.78	32.58
	Patch Minor Spalls	LF	34.54	47.32
394 - Abutment Slope Protection Reinforced Concrete	Clean rebar & patch	LF	44.41	60.84
	Patch Minor Spalls	LF	35.49	48.62
	Rehab slope protection	SF	157.81	216.20
396 - Abutment Slope Protection Other Material	Rehab slope protection	SF	38.78	53.13
398 - Drainage Sytem Other Material	Wash Structure	LF	11.31	15.49
399 - Other Expansion Joint	Repair Joint	LF	25.68	35.18
475 - Wingwall/Retaining Wall Reinforced Concrete	Clean rebar & patch	LF	36.27	49.69
	Patch Minor Spalls	LF	32.28	44.22
540 - Open Gearing	Spot Paint	LF	17.04	23.34
541 - Speed Reducers	Spot Paint	LF	17.04	23.34
542 - Shafts	Spot Paint	LF	17.04	23.34
543 - Shaft Bearings and Shaft Couplings	Spot Paint	LF	17.04	23.34
544 - Brakes	Spot Paint	LF	17.04	23.34
546 - Span Drive Motors	Spot Paint	LF	17.04	23.34
550 - Hopkins Frame	Spot Paint	LF	17.04	23.34
560 - Span Locks/Toe Locks/Heel Stops/Tail Locks	Spot Paint	LF	21.84	29.92
561 - Live Load Shoes/Strike Plates/Buffer Cylinders	Spot Paint	LF	21.84	29.92
562 - Counterweight Support	Spot Paint	LF	17.04	23.34
563 - Access Ladder & Platforms	Spot Paint	LF	17.04	23.34
564 - Counterweight	Patch Minor Spalls	LF	30.79	42.18
565 - Trunnion/Straight and Curved Track	Spot Paint	LF	17.04	23.34

Table 4 – Full list of Florida elements, actions and costs (from Sobanjo and Thompson 2001)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
12 - Bare Concrete Deck	1 - No damage	2 - Miscellaneous Maint	2 (SF)	2.74 (SF)
	2 - Distress <= 2%	1 - Repair spalled/delam	5 (SF)	6.85 (SF)
	3 - 2 to 10 % distress	1 - Repair spalled areas	10 (SF)	13.70 (SF)
	4 - 10 to 25% distress	1 - Repair spalled areas	20 (SF)	27.40 (SF)
	5 - Distress over 25%	2 - Replace deck	30 (SF)	41.10 (SF)
13 - Unp Conc Deck/AC	1 - No damage	1 - Miscellaneous Maint	2 (SF)	2.74 (SF)
	2 - Distress <= 2%	1 - Repair potholes	5 (SF)	6.85 (SF)
	3 - 2 to 10% distress	1 - Repair potholes	10 (SF)	13.70 (SF)
		2 - Replac substrate	37.80 (SF)	51.79 (SF)
	4 - 10-25% distress	1 - Repair potholes	20 (SF)	27.40 (SF)
		2 - Repair substrate	37.8 (SF)	51.79 (SF)
	5 - Distress over 25%	1 - Repair substrate	37.8 (SF)	51.79 (SF)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
		2 - Replace deck	31 (SF)	42.47 (SF)
28 - Steel Deck/Open Grid	1 - No corrosion	1 - Miscellaneous Maint	4 (SF)	5.48 (SF)
	2 - Minor deterioration	1 - Surface clean	0.50 (SF)	0.69 (SF)
	3 - Rust formation	1 - Surface clean+restore	1 (SF)	1.37 (SF)
		2 - Rehab connectors	9 (SF)	12.33 (SF)
	4 - Moderate corrosion	1 - Spot blast, clean	10 (SF)	13.70 (SF)
		2 - Rehab connectors	15 (SF)	20.55 (SF)
	5 - Advanced corrosion	1 - Rehab connectors	20 (SF)	27.40 (SF)
		2 - Replace unit	35 (SF)	47.95 (SF)
29 - Steel Deck/Conc Grid	1 - No corrosion	1 - Miscellaneous Maint	4 (SF)	5.48 (SF)
	2 - Minor deterioration	1 - Surface clean	0.50 (SF)	0.69 (SF)
	3 - Rust formation	1 - Surface clean+restore	1 (SF)	1.37 (SF)
		2 - Rehab connectors	10.80 (SF)	14.80 (SF)
	4 - Failed connectors	1 - Spot blast, clean an	12 (SF)	16.44 (SF)
		2 - Rehab connectors	18 (SF)	24.66 (SF)
	5 - Advanced corrosion	1 - Rehab connectors	24 (SF)	32.88 (SF)
		2 - Replace unit	40 (SF)	54.80 (SF)
31 - Timber Deck	1 - No decay	1 - Miscellaneous Maint	2 (SF)	2.74 (SF)
	2 - Minor decay	1 - Rehab and/or protect	6 (SF)	8.22 (SF)
	3 - Some strength loss	1 - Rehab deck	(SF)	(SF)
		2 - Replace deck	10 (SF)	13.7 (SF)
	4 - Major strength loss	1 - Replace deck	10 (SF)	13.7 (SF)
32 - Timber Deck/AC Ovly	1 - No deterioration	1 - Miscellaneous Maint	2 (SF)	2.74 (SF)
	2 - Minor deterioration	1 - Repair potholes	4 (SF)	5.48 (SF)
		2 - Rehab and/or protect	5 (SF)	6.85 (SF)
	3 - Some strength loss	1 - Rehab deck+repair/restore	5 (SF)	6.85 (SF)
		2 - Replace deck & surface	8 (SF)	10.96 (SF)
	4 - Major strength loss	1 - Replace deck & surface	12 (SF)	16.44 (SF)
38 - Bare Concrete Slab	1 - No damage	2 - Miscellaneous Maint	2 (SF)	2.74 (SF)
	2 - Distress <=2%	1 - Repair spalled/delam	5 (SF)	6.85 (SF)
	3 - 2-10% distress	1 - Repair spalled areas	10 (SF)	13.7 (SF)
	4 - 10-25% distress	1 - Repair spalled areas	20 (SF)	27.4 (SF)
	5 - Distress over 25%	2 - Replace deck	30 (SF)	41.1 (SF)
39 - Unp Conc Slab/AC Ovl	1 - No damage	1 - Miscellaneous Maint	2 (SF)	2.74 (SF)
	2 - Distress under 2%	1 - Repair potholes	5 (SF)	6.85 (SF)
	3 - 2-10% distress	1 - Repair potholes	10 (SF)	13.70 (SF)
		2 - Repair substrate & restore	37.80 (SF)	51.79(SF)
	4 - 10-25% distress	1 - Repair potholes	20 (SF)	27.40 (SF)
		2 - Repair substrate	37.80 (SF)	51.79(SF)
	5 - Distress over 25%	1 - Repair substrate	37.80 (SF)	51.79(SF)
		2 - Replace deck	31 (SF)	42.47 (SF)
54 - Timber Slab	1 - No decay	1 - Miscellaneous Maint	5 (SF)	6.85 (SF)
	2 - Minor decay	1 - Rehab and/or protect	0.60 (SF)	0.82 (SF)
	3 - Some strength loss	1 - Rehab deck	(SF)	(SF)
		2 - Replace deck	1 (SF)	1.37 (SF)
	4 - Major strength loss	1 - Replace deck	1 (SF)	1.37 (SF)
55 - Timber Slab/AC Ovly	1 - No deterioration	1 - Miscellaneous Maint	10 (SF)	13.70 (SF)
	2 - Minor deterioration	1 - Repair potholes	20 (SF)	27.40 (SF)
		2 - Rehab and/or protect	2 (SF)	2.74 (SF)
	3 - Some strength loss	1 - Rehab deck and surface	(SF)	(SF)
		2 - Replace deck and surface	3 (SF)	4.11 (SF)
	4 - Major strength loss	1 - Replace deck and surface	3 (SF)	4.11 (SF)
98 - Conc Deck on PC Pane	1 - No Damage	1 - Protective Coating	37.8 (SF)	51.79(SF)
		2 - Miscellaneous Maint 2 (SF)		

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	2 - Distress under 2 %	1 - Spalls & Delams	5 (SF)	6.85 (SF)
	3 - 2-10 % Distress	1 - Spalls & Delams	10 (SF)	13.70 (SF)
		2 - Repair and Protect	12 (SF)	16.44 (SF)
	4 - 10-25 % Distress	1 - Spalls & Delams	20 (SF)	27.40 (SF)
		2 - Repair & Protect	22 (SF)	30.14 (SF)
	5 - Distress over 25 %	1 - Repair & Protect	25 (SF)	34.25 (SF)
		2 - Replace Deck	30 (SF)	41.10 (SF)
99 - PS Conc Slab	1 - No Damage	1 - Miscellaneous Maint 2 (SF)		
	2 - Dist <2%	1 - Repair	5 (SF)	6.85 (SF)
	3 - Dist 2-10%	1 - Repair Spl/Delam	10 (SF)	13.70 (SF)
		2 - Repair and protect	13 (SF)	17.81 (SF)
	4 - Dist 10-25%	1 - Repair Spl/Delam	22 (SF)	30.14 (SF)
		2 - Repair and protect	25 (SF)	34.25 (SF)
	5 - Dist >25%	1 - Repair and protect	34 (SF)	46.58 (SF)
		2 - Replace unit	31 (SF)	42.47 (SF)
101 - Unpnt Stl Box Girder	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	3640 (LF)	4986 (LF)
	3 - Some section loss	1 - Clean & paint	3640 (LF)	4986 (LF)
	4 - Major section loss	1 - Rehab unit	20000 (LF)	27400 (LF)
		2 - Replace unit	1500 (LF)	2055 (LF)
102 - Paint Stl Box Girder	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	3640 (LF)	4986 (LF)
	3 - Rust formation	1 - Spot blast, clean	4200 (LF)	5754 (LF)
	4 - Active corrosion	1 - Spot blast, clean	4200 (LF)	5754 (LF)
		2 - Replace paint system	2800 (LF)	3836 (LF)
	5 - Section loss	1 - Major rehab unit	20000 (LF)	27400 (LF)
		2 - Replace unit	1500 (LF)	2055 (LF)
104 - P/S Conc Box Girder	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	40 (LF)	54.80 (LF)
	3 - Delams/spalls	1 - Clean steel & patch	1000 (LF)	1370 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	3000 (LF)	4110 (LF)
105 - R/Conc Box Girder	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patach	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch,	1000 (LF)	1370 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	610 (LF)	835 (LF)
106 - Unpnt Stl Opn Girder	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	68 (LF)	93.16 (LF)
	3 - Some section loss	1 - Clean & paint	68 (LF)	93.16 (LF)
	4 - Major section loss	1 - Rehab unit	6000 (LF)	8220 (LF)
		2 - Replace unit	900 (LF)	1233 (LF)
107 - Paint Stl Opn Girder	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Surface clean, paint	68 (LF)	93.16 (LF)
	3 - Rust formation	1 - Spot blast,clean & paint	78 (LF)	107 (LF)
	4 - Active corrosion	1 - Spot blast, clean & paint	78 (LF)	107 (LF)
		2 - Replace paint system	52 (LF)	71.24 (LF)
	5 - Section loss	1 - Major rehab unit	6000 (LF)	8220 (LF)
		2 - Replace unit	900 (LF)	1233 (LF)
109 - P/S Conc Open Girder	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	2 - Minor cracks/spalls	1 - Seal cracks minor pa	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean steel & patch,	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	370 (LF)	506.90 (LF)
110 - R/Conc Open Girder	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch,	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	370 (LF)	506.90 (LF)
111 - Timber Open Girder	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab &/or protect	90 (LF)	123.30 (LF)
	3 - Some strength loss	1 - Rehab unit	90 (LF)	123.30 (LF)
		2 - Replace unit	150 (LF)	205.50 (LF)
	4 - Major strength loss	1 - Rehab unit	90 (LF)	123.30 (LF)
		2 - Replace unit	150 (LF)	205.50 (LF)
112 - Unpnt Stl Stringer	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	43 (LF)	58.91 (LF)
	3 - Some section loss	1 - Clean & paint	43 (LF)	58.91 (LF)
	4 - Major section loss	1 - Rehab unit	4000 (LF)	5480 (LF)
		2 - Replace unit	210 (LF)	287.70 (LF)
113 - Paint Stl Stringer	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	43 (LF)	58.91 (LF)
	3 - Rust formation	1 - Spot blast, clean	50 (LF)	68.50 (LF)
	4 - Active corrosion	1 - Spot blast, clean	50 (LF)	68.50 (LF)
		2 - Replace paint system	33 (LF)	45.21 (LF)
	5 - Section loss	1 - Major rehab unit	4000 (LF)	5480 (LF)
		2 - Replace unit	210 (LF)	287.70 (LF)
116 - R/Conc Stringer	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch,	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
	4 - Analysis warranted	2 - Replace unit	270 (LF)	369.90 (LF)
117 - Timber Stringer	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab &/or protect u	68 (LF)	93.16 (LF)
	3 - Some strength loss	1 - Rehab unit	68 (LF)	93.16 (LF)
		2 - Replace unit	114 (LF)	156.18 (LF)
	4 - Major strength loss	1 - Rehab unit	68 (LF)	93.16 (LF)
		2 - Replace unit	114 (LF)	156.18 (LF)
120 - U/Stl Thru Truss/Bot	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	153 (LF)	209.61 (LF)
	3 - Some section loss	1 - Clean & paint	153 (LF)	209.61 (LF)
	4 - Major section loss	1 - Rehab unit	30000 (LF)	41100 (LF)
		2 - Replace unit	800 (LF)	1096 (LF)
121 - P/Stl Thru Truss/Bot	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	153 (LF)	209.61 (LF)
	3 - Rust formation	1 - Spot blast, clean	177 (LF)	242.49 (LF)
	4 - Active corrosion	1 - Spot blast, clean	177 (LF)	242.49 (LF)
		2 - Replace paint system	118 (LF)	161.66 (LF)
	5 - Section loss	1 - Major rehab unit	30000 (LF)	41100 (LF)
		2 - Replace unit	800 (LF)	1096 (LF)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
125 - U/Stl Thru Truss/Top	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	195 (LF)	267.15 (LF)
	3 - Some section loss	1 - Clean & paint	195 (LF)	267.15 (LF)
	4 - Major section loss	1 - Rehab unit	30000 (LF)	41100 (LF)
		2 - Replace unit	900 (LF)	1233 (LF)
126 - P/Stl Thru Truss/Top	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	195 (LF)	267.15 (LF)
	3 - Rust formation	1 - Spot blast, clean	225 (LF)	308.25 (LF)
	4 - Active corrosion	1 - Spot blast, clean	225 (LF)	308.25 (LF)
		2 - Replace paint system	150 (LF)	205.50 (LF)
	5 - Section loss	1 - Major rehab unit	30000 (LF)	41100 (LF)
		2 - Replace unit	950 (LF)	1301.5 (LF)
131 - Paint Stl Deck Truss	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	910 (LF)	1247 (LF)
	3 - Rust formation	1 - Spot blast, clean	1050 (LF)	1438.5 (LF)
	4 - Active corrosion	1 - Spot blast, clean	1050 (LF)	1438.5 (LF)
		2 - Replace paint system	700 (LF)	959 (LF)
	5 - Section loss	1 - Major rehab unit	25000 (LF)	34250 (LF)
		2 - Replace unit	900 (LF)	1233 (LF)
135 - Timber Truss/Arch	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab &/or protect	420 (LF)	575.40 (LF)
	3 - Some strength loss	1 - Rehab unit	420 (LF)	575.40 (LF)
		2 - Replace unit	700 (LF)	959 (LF)
	4 - Major strength loss	1 - Rehab unit	420 (LF)	575.40 (LF)
		2 - Replace unit	800 (LF)	1096 (LF)
140 - Unpnt Stl Arch	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	550 (LF)	753.50 (LF)
	3 - Some section loss	1 - Clean & paint	550 (LF)	753.50 (LF)
	4 - Major section loss	1 - Rehab unit	25000 (LF)	34250 (LF)
		2 - Replace unit	900 (LF)	1233 (LF)
141 - Paint Stl Arch	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	550 (LF)	753.50 (LF)
	3 - Rust formation	1 - Spot blast, clean	630 (LF)	863.10 (LF)
	4 - Active corrosion	1 - Spot blast, clean	630 (LF)	863.10 (LF)
		2 - Replace paint system	420 (LF)	575.40 (LF)
	5 - Section loss	1 - Major rehab unit	25000 (LF)	34250 (LF)
		2 - Replace unit	900 (LF)	1233 (LF)
143 - P/S Conc Arch	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls)	1 - Clean steel & patch,	200 (LF	274 (LF
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	175 (LF)	239.75 (LF)
144 - R/Conc Arch	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch,	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	1700 (LF)	2329 (LF)
146 - Misc Cable Uncoated	1 - No corrosion	1 - Miscellaneous Maint	5000 (EA)	6850 (EA)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	2 - Surface rust	1 - Clean & coat	7500 (EA)	10275 (EA)
	3 - Moderate deterioration	1 - Clean & coat	10000 (EA)	13700 (EA)
	4 - Analysis warranted	1 - Rehab unit and coat	120000 (EA)	164400 (EA)
		2 - Replace unit	160000 (EA)	219200 (EA)
147 - Misc Cable Coated	1 - No corrosion	1 - Miscellaneous Maint	5000 (EA)	6850 (EA)
	2 - Surface rust forming	1 - Clean & Restore Coat	7500 (EA)	10275 (EA)
	3 - Rust prevalent	1 - Clean & Restore Coat	10000 (EA)	13700 (EA)
	4 - Active corrosion	1 - Rehab unit	120000 (EA)	164400 (EA)
		2 - Replace unit	160000 (EA)	219200 (EA)
	5 - Analysis warranted	1 - Rehab unit	120000 (EA)	164400 (EA)
		2 - Replace unit	160000 (EA)	219200 (EA)
151 - Unpnt Stl Floor Beam	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Clean & paint	70 (LF)	95.90 (LF)
	3 - Some section loss	1 - Clean & paint	70 (LF)	95.90 (LF)
	4 - Major section loss	1 - Rehab unit	4000 (LF)	5480 (LF)
		2 - Replace unit	460 (LF)	630.20 (LF)
152 - Paint Stl Floor Beam	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	70 (LF)	95.90 (LF)
	3 - Rust formation	1 - Spot blast, clean	81 (LF)	110.97 (LF)
	4 - Active corrosion	1 - Spot blast, clean	81 (LF)	110.97 (LF)
		2 - Replace paint system	54 (LF)	73.98 (LF)
	5 - Section loss	1 - Major rehab unit	4000 (LF)	5480 (LF)
		2 - Replace unit	460 (LF)	630.20 (LF)
155 - R/Conc Floor Beam	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch,	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	270 (LF)	369.90 (LF)
156 - Timber Floor Beam	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab &/or protect	68 (LF)	93.16 (LF)
	3 - Some strength loss	1 - Rehab unit	68 (LF)	93.16 (LF)
		2 - Replace unit	114 (LF)	156.18 (LF)
	4 - Major strength loss	1 - Rehab unit	68 (LF)	93.16 (LF)
		2 - Replace unit	114 (LF)	156.18 (LF)
161 - Paint Stl Pin/Hanger	1 - No corrosion	1 - Surface clean	200 (EA)	274 (EA)
		2 - Miscellaneous Maint	25 (EA)	34.25 (EA)
	2 - Paint distress	1 - Surface clean	200 (EA)	274 (EA)
		2 - Clean & paint	71 (EA)	97.27 (EA)
	3 - Rust formation	1 - Spot blast, clean	142 (EA)	194.54 (EA)
	4 - Active corrosion	1 - Spot blast, clean	142 (EA)	194.54 (EA)
		2 - Replace paint system	708 (EA)	969.96 (EA)
	5 - Section loss	1 - Major rehab unit	75000 (EA)	102750 (EA)
		2 - Replace unit	100000 (EA)	137000 (EA)
201 - Unpnt Stl Column	1 - No corrosion	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Rust formation	1 - Clean & paint	25 (EA)	34.25 (EA)
	3 - Some section loss	1 - Clean & paint	25 (EA)	34.25 (EA)
	4 - Major section loss	1 - Rehab unit	1000 (EA)	1370 (EA)
		2 - Replace unit	20000 (EA)	27400 (EA)
202 - Paint Stl Column	1 - No corrosion	1 - Surface clean	200 (EA)	274 (EA)
		2 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Paint distress	1 - Surface clean	200 (EA)	274 (EA)
		2 - Clean & paint	25 (EA)	34.25 (EA)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	3 - Rust formation	1 - Spot blast, clean	50 (EA)	68.50 (EA)
	4 - Active corrosion	1 - Spot blast, clean	50 (EA)	68.50 (EA)
		2 - Replace paint system	250 (EA)	342.50 (EA)
	5 - Section loss	1 - Major rehab unit	1000 (EA)	1370 (EA)
		2 - Replace unit	20000 (EA)	27400 (EA)
204 - P/S Conc Column	1 - No deterioration	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Minor cracks/ spalls	1 - Seal cracks minor patch	250 (EA)	342.50 (EA)
	3 - Delams/spalls	1 - Clean steel & patch	500 (EA)	685 (EA)
	4 - Analysis warranted	1 - Rehab unit	5000 (EA)	6850 (EA)
		2 - Replace unit	20000 (EA)	27400 (EA)
205 - R/Conc Column	1 - No deterioration	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	250 (EA)	342.50 (EA)
	3 - Delams/spalls	1 - Clean rebar & patch,	500 (EA)	685 (EA)
	4 - Analysis warranted	1 - Rehab unit	5000 (EA)	6850 (EA)
	4 - Analysis warranted	2 - Replace unit	20000 (EA)	27400 (EA)
206 - Timber Column	1 - No decay	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Minor decay	1 - Rehab &/or protect	600 (EA)	822 (EA)
	3 - Some strength loss	1 - Rehab unit	600 (EA)	822 (EA)
	3 - Some strength loss	2 - Replace unit	1000 (EA)	1370 (EA)
	4 - Major strength loss	1 - Rehab unit	600 (EA)	822 (EA)
	4 - Major strength loss	2 - Replace unit	1000 (EA)	1370 (EA)
207 - P/S Conc Holl Pile	1 - Excellent	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Min Ck/Spl	1 - Seal and patch	250 (EA)	342.50 (EA)
	3 - Exposed Stl	1 - Clean and Patch	300 (EA)	411 (EA)
	4 - Adv Corros	1 - Rehabilitate unit	5000 (EA)	6850 (EA)
	4 - Adv Corros	2 - Replace unit	20000 (EA)	27400 (EA)
210 - R/Conc Pier Wall	1 - No deterioration	1 - Miscellaneous Maint	30 (LF)	41.10 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch	350 (LF)	479.50 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
	4 - Analysis warranted	2 - Replace unit	3000 (LF)	4110 (LF)
211 - Other Mtl Pier Wall	1 - No deterioration	1 - Miscellaneous Maint	25 (LF	34.25 (LF
	2 - Minor deterioration	1 - Rehab unit	1800 (LF)	2466 (LF)
	3 - Moderate deterioration	1 - Rehab unit	1800 (LF)	2466 (LF)
	4 - Major deterioration	1 - Rehab unit	1800 (LF)	2466 (LF)
		2 - Replace unit	3000 (LF)	4110 (LF)
215 - R/Conc Abutment	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch,	150 (LF)	205.50 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	820 (LF)	1123 (LF)
216 - Timber Abutment	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab &/or protect	370 (LF)	506.90 (LF)
	3 - Some strength loss	1 - Rehab unit	370 (LF)	506.90 (LF)
		2 - Replace unit	620 (LF)	849.4 (LF)
	4 - Major strength loss	1 - Rehab unit	370 (LF)	506.90 (LF)
		2 - Replace unit	620 (LF)	849 (LF)
217 - Other Mtl Abutment	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor deterioration	1 - Rehab unit	490 (LF)	671 (LF)
	3 - Moderate deterioration	1 - Rehab unit	490 (LF)	671 (LF)
	4 - Major deterioration	1 - Rehab unit	490 (LF)	671 (LF)
		2 - Replace unit	820 (LF)	1123 (LF)
220 - R/C Sub Pile Cap/Ftg	1 - No deterioration	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Minor cracks/spalls	1 - Seal cracks minor pa	250 (EA)	342.50 (EA)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	3 - Delams/spalls	1 - Clean rebar & patch	500 (EA)	685 (EA)
	4 - Analysis warranted	1 - Rehab unit	5000 (EA)	6850 (EA)
		2 - Replace unit	100000 (EA)	137000 (EA)
230 - Unpnt Stl Cap	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Rust formation	1 - Clean & paint	75 (LF)	102.75 (LF)
	3 - Some section loss	1 - Clean & paint	75 (LF)	102.75 (LF)
	4 - Major section loss	1 - Rehab unit	1000 (LF)	1370 (LF)
		2 - Replace unit	460 (LF)	630.20 (LF)
231 - Paint Stl Cap	1 - No corrosion	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint distress	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean & paint	75 (LF)	102.75 (LF)
	3 - Rust formation	1 - Spot blast, clean	87 (LF)	119.19 (LF)
	4 - Active corrosion	1 - Spot blast, clean	87 (LF)	119.19 (LF)
		2 - Replace paint system	58 (LF)	79.46 (LF)
	5 - Section loss	1 - Major rehab unit	1000 (LF)	1370 (LF)
		2 - Replace unit	460 (LF)	630.20 (LF)
233 - P/S Conc Cap	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams,spalls	1 - Clean steel & patch	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	460 (LF)	630.20 (LF)
234 - R/Conc Cap	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delams/spalls	1 - Clean rebar & patch	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	460 (LF)	630.20 (LF)
235 - Timber Cap	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab &/or protect	90 (LF)	123.30 (LF)
	3 - Some strength loss	1 - Rehab unit	90 (LF)	123.30 (LF)
		2 - Replace unit	150 (LF)	205.50 (LF)
	4 - Major strength loss	1 - Rehab unit	90 (LF)	123.30 (LF)
		2 - Replace unit	150 (LF)	205.50 (LF)
240 - Metal Culvert	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor corrosion	1 - Rehab unit	1500 (LF)	2055 (LF)
	3 - Moderate corrosion	1 - Rehab unit	1500 (LF)	2055 (LF)
	4 - Major corrosion	1 - Rehab unit	1500 (LF)	2055 (LF)
		2 - Replace unit	780 (LF)	1068.6 (LF)
241 - Concrete Culvert	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor deterioration	1 - Rehab unit	300 (LF)	411 (LF)
	3 - Moderate deterioration	1 - Rehab unit	610 (LF)	835 (LF)
	4 - Major deterioration	1 - Rehab unit	910 (LF)	1247 (LF)
		2 - Replace unit	720 (LF)	986 (LF)
243 - Misc Culvert	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor deterioration	1 - Rehab unit	225 (LF)	308.25 (LF)
	3 - Moderate deterioration	1 - Rehab unit	460 (LF)	630.20 (LF)
	4 - Major deterioration	1 - Rehab unit	680 (LF)	931 (LF)
		2 - Replace unit	2700 (LF)	3699 (LF)
290 - Channel	1 - Excellent	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Min Deter	1 - Rep. Banks/Prot	600 (EA)	822 (EA)
	3 - Mod Deter	1 - Rep. Banks/Prot	1000 (EA)	1370 (EA)
		2 - Countermeasures	100000 (EA)	137000 (EA)
	4 - Maj Deter	1 - Countermeasures	300000 (EA)	411000 (EA)
298 - Pile Jacket Bare	1 - Excellent	1 - Miscellaneous Maint	500 (EA)	685 (EA)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	2 - Min Ck/Spl	1 - Seal and patch	200 (EA)	274 (EA)
	3 - Mod Deter	1 - Clean and patch	300 (EA)	411 (EA)
	4 - Maj Deter	1 - Rehabilitate unit	200 (EA)	274 (EA)
		2 - Replace unit	500 (EA)	685 (EA)
299 - Pile Jacket/Cath Pro	1 - Excellent	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Min Ck/Spl	1 - Seal and patch	200 (EA)	274 (EA)
	3 - Mod Deter	1 - Clean and patch	500 (EA)	685 (EA)
	4 - Maj Deter	1 - Rehabilitate unit	200 (EA)	274 (EA)
		2 - Replace unit	1000 (EA)	1370 (EA)
300 - Strip Seal Exp Joint	1 - No leakage	1 - Miscellaneous Maint	4 (LF)	5.48 (LF)
	2 - Minor leakage	1 - Patch/reset/clean	61 (LF)	83.57 (LF)
	3 - Major leakage	1 - Replace gland and patch	50 (LF)	68.50 (LF)
		2 - Replace joint	122 (LF)	167.14 (LF)
301 - Pourable Joint Seal	1 - No deterioration	1 - Miscellaneous Maint	4 (LF)	5.48 (LF)
	2 - Minor leakage	1 - Clean joint and repl	26 (LF)	35.62 (LF)
	3 - Leakage problems	1 - Clean joint; patch	74 (LF)	101.38 (LF)
302 - Compressn Joint Seal	1 - No deterioration	1 - Miscellaneous Maint	4 (LF)	5.48 (LF)
	2 - Minor deterioration	1 - Patch/rem/reseal/cln	30 (LF)	41.10 (LF)
	3 - Major deterioration	1 - Replace gland	46 (LF)	63.02 (LF)
		2 - Replace joint	152 (LF)	208.24 (LF)
303 - Assembly Joint/Seal	1 - No deterioration	1 - Miscellaneous Maint	4 (LF)	5.48 (LF)
	2 - Minor deterioration	1 - Rehab unit	130 (LF)	178 (LF)
	3 - Advanced corrosion	1 - Rehab unit	190 (LF)	260 (LF)
		2 - Replace unit	420 (LF)	575.40 (LF)
304 - Open Expansion Joint	1 - No deterioration	1 - Miscellaneous Maint	4 (LF)	5.48 (LF)
	2 - Minor deterioration	1 - Rehab unit	80 (LF)	110 (LF)
	3 - Advanced corrosion	1 - Rehab unit	180 (LF)	247 (LF)
		2 - Replace unit	304 (LF)	416.48 (LF)
310 - Elastomeric Bearing	1 - No deterioration	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Minor deterioration	1 - Reset bearings	930 (EA)	1274 (EA)
	3 - Major deterioration	1 - Reset bearings	930 (EA)	1274 (EA)
		2 - Replace unit and reset	527 (EA)	721.99 (EA)
311 - Moveable Bearing	1 - No deterioration	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Minor deterioration	1 - Clean & paint	720 (EA)	986 (EA)
	3 - Advanced corrosion	1 - Rehab supports	900 (EA)	1233 (EA)
		2 - Replace unit	527 (EA)	721.99 (EA)
312 - Enclosed Bearing	1 - No deterioration	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Minor deterioration	1 - Rehab unit	1350 (EA)	1850 (EA)
	3 - Bearing failures	1 - Rehab unit	3700 (EA)	5069 (EA)
		2 - Replace unit	527 (EA)	721.99 (EA)
313 - Fixed Bearing	1 - No deterioration	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Minor deterioration	1 - Clean and paint	670 (EA)	918 (EA)
	3 - Advanced corrosion	1 - Rehab supports	1340 (EA)	1836 (EA)
		2 - Replace unit	527 (EA)	721.99 (EA)
314 - Pot Bearing	1 - No deterioration	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Minor deterioration	1 - Rehab supports	1500 (EA)	2055 (EA)
	3 - Advanced corrosion	1 - Rehab bearing device	1500 (EA)	2055 (EA)
		2 - Replace unit	1800 (EA)	2466 (EA)
320 - P/S Conc Appr Slab	1 - No deterioration	1 - Miscellaneous Maint	200 (EA)	274 (EA)
	2 - Minor cracks/spalls	1 - Perform mudjacking	6000 (EA)	8220 (EA)
		2 - Seal Cracks	37.8 (EA)w	51.79(EA)
	3 - Major cracks/spalls	1 - Place overlay	37.8 (EA)	51.79(EA)
		2 - Replace unit	13000 (EA)	17810 (EA)
	4 - Broken/Unstable	1 - Replace unit	13000 (EA)	17810 (EA)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
321 - R/Conc Approach Slab	1 - No deterioration	1 - Miscellaneous Maint	200 (EA)	274 (EA)
	2 - Cracks/spalls	1 - Perform mudjacking	6000 (EA)	8220 (EA)
		2 - Seal Cracks	37.8 (EA)	51.79(EA)
	3 - Major cracks/spalls	1 - Place overlay	37.8 (EA)	51.79(EA)
		2 - Replace unit	13000 (EA)	17810 (EA)
	4 - Broken/Unstable	1 - Replace unit	13000 (EA)	17810 (EA)
330 - Metal Rail Uncoated	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Rust formation	1 - Clean and Coat	25 (LF)	34.25 (LF)
	3 - Active corrosion	1 - Clean and Coat	25 (LF)	34.25 (LF)
		2 - Replace unit	70 (LF)	95.90 (LF)
	4 - Section loss	1 - Rehab unit	129 (LF)	176.73 (LF)
		2 - Replace unit	70 (LF)	95.90 (LF)
331 - Conc Bridge Railing	1 - No deterioration	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Minor cracks/spalls	1 - Seal cracks minor patch	45 (LF)	61.65 (LF)
	3 - Delam/spalls pres	1 - Clean rebar & patch	200 (LF)	274 (LF)
	4 - Analysis warranted	1 - Rehab unit	500 (LF)	685 (LF)
		2 - Replace unit	50 (LF)	68.50 (LF)
332 - Timb Bridge Railing	1 - No decay	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor decay	1 - Rehab and/or	20 (LF)	27.40 (LF)
	3 - Some strength loss	1 - Replace unit	33.5 (LF)	45.895 (LF)
333 - Other Bridge Railing	1 - No deterioration	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Minor cracks/spalls	1 - Rehab unit	45 (LF)	61.65 (LF)
	3 - Major deterioration	1 - Rehab unit	45 (LF)	61.65 (LF)
		2 - Replace unit	60 (LF)	82.20 (LF)
334 - Metal Rail Coated	1 - No corrosion	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Surface rust forming	1 - Clean and Restore	19 (LF)	26.03 (LF)
	3 - Rust prevalent	1 - Clean and Restore	29 (LF)	39.73 (LF)
	4 - Active corrosion	1 - Rehab unit	129 (LF)	176.73 (LF)
		2 - Replace unit	70 (LF)	95.90 (LF)
	5 - Analysis warranted	1 - Rehab unit	129 (LF)	176.73 (LF)
		2 - Replace unit	70 (LF)	95.90 (LF)
386 - Fender/Dolphin Uncoa	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Surf Rust	1 - Clean and paint	(LF)	(LF)
	3 - Minor Loss	1 - Clean and paint	(LF)	(LF)
	4 - Adv Corros	1 - Rehabilitate unit	144 (LF)	197.28 (LF)
		2 - Replace unit	240 (LF)	329 (LF)
387 - P/S Fender/Dolphin	1 - Excellent	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Min Ck/Stl	1 - Seal and patch	45 (LF)	61.65 (LF)
	3 - Exposed Stl	1 - Clean and patch	50 (LF)	68.50 (LF)
	4 - Adv Corros	1 - Rehabilitate unit	500 (LF)	685 (LF)
		2 - Replace unit	240 (LF)	329 (LF)
388 - R/Conc Fender/Dolphi	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Min Ck/Spl	1 - Seal and patch	40 (LF)	54.80 (LF)
	3 - Exposed Stl	1 - Clean and patch	50 (LF)	68.50 (LF)
	4 - Adv Corros	1 - Rehabilitate unit	500 (LF)	685 (LF)
		2 - Replace unit	240 (LF)	329 (LF)
389 - Timber Fender/Dolphi	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Min Defect	1 - Rehab and/or protect	144 (LF)	197.28 (LF)
	3 - Minor Loss	1 - Rehabilitate unit	144 (LF)	197.28 (LF)
		2 - Replace unit	144 (LF)	197.28 (LF)
	4 - Adv Deter	1 - Rehabilitate unit	144 (LF)	197.28 (LF)
		2 - Replace unit	240 (LF)	329 (LF)
390 - Other Fender/Dolphin	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Min Deter	1 - Rehabilitate unit	200 (LF)	274 (LF)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	3 - Mod Deter	1 - Rehabilitate unit	200 (LF)	274 (LF)
		2 - Replace unit	240 (LF)	329 (LF)
	4 - Maj Deter	1 - Rehabilitate unit	200 (LF)	274 (LF)
		2 - Replace unit	240 (LF)	329 (LF)
393 - Blkhd Sewl Metal Unc	1 - Excellent	1 - Miscellaneous Maint	25 (SF)	34.25 (SF)
	2 - Surf Rust	1 - Clean and paint	29 (SF)	39.73 (SF)
	3 - Minor Loss	1 - Clean and paint	44 (SF)	60.28 (SF)
	4 - Adv Corrosion	1 - Rehabilitate unit	5.6 (SF)	7.67 (SF)
		2 - Replace unit	9.3 (SF)	12.74 (SF)
394 - R/Conc Abut Slope Pr	1 - Excellent	1 - Miscellaneous Maint	25 (SF)	34.25 (SF)
	2 - Min Ck/Spl	1 - Seal and patch	55 (SF)	75.35 (SF)
	3 - Exposed Stl	1 - Clean and patch	100 (SF)	137 (SF)
	4 - Adv Corrosion	1 - Rehabilitate unit	2.5 (SF)	3.43 (SF)
		2 - Replace unit	8 (SF)	10.96 (SF)
395 - Timber Abut Slope Pr	1 - Excellent	1 - Miscellaneous Maint	25 (SF)	34.25 (SF)
	2 - Min Defect	1 - Rehab and/or protect	2.5 (SF)	3.43 (SF)
	3 - Minor Loss	1 - Rehabilitate unit	2.5 (SF)	3.43 (SF)
		2 - Replace unit	10 (SF)	13.70 (SF)
	4 - Adv Deter	1 - Rehabilitate unit	2.5 (SF)	3.43 (SF)
		2 - Replace unit	10 (SF)	13.70 (SF)
396 - Other Abut Slope Pro	1 - Excellent	1 - Miscellaneous Maint	25 (SF)	34.25 (SF)
	2 - Min Deter	1 - Rehab and/or Protect	3.22 (SF)	4.41 (SF)
	3 - Mod Deter	1 - Rehabilitate unit	3.22 (SF)	4.41 (SF)
		2 - Replace unit	7 (SF)	9.59 (SF)
	4 - Maj Deter	1 - Rehabilitate unit	3.22 (SF)	4.41 (SF)
		2 - Replace unit	7 (SF)	9.59 (SF)
397 - Drain. Syst Metal	1 - Excellent	1 - Surface clean	200 (EA)	274 (EA)
		2 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Paint dist	1 - Surface Clean	200 (EA)	274 (EA)
		2 - Flush drainage syst	500 (EA)	685 (EA)
	3 - Surf Rust	1 - Spot paint	(EA)	(EA)
		2 - Flush drainage syst	500 (EA)	685 (EA)
	4 - Surf Pits	1 - Spot paint	(EA)	(EA)
		2 - Flush drainage syst	500 (EA)	685 (EA)
	5 - Sect Loss	1 - Rehabilitate unit	600 (EA)	822 (EA)
		2 - Replace unit	820 (EA)	1123 (EA)
398 - Drain. Syst Other	1 - Excellent	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Min Deter	1 - Surface clean	200 (EA)	274 (EA)
		2 - Flush drainage syst	500 (EA)	685 (EA)
	3 - Mod Deter	1 - Surface clean	200 (EA)	274 (EA)
		2 - Flush drainage syst	500 (EA)	685 (EA)
	4 - Maj Deter	1 - Rehabilitate unit	492 (EA)	674.04 (EA)
		2 - Replace unit	820 (EA)	1123 (EA)
399 - Other Expansion Join	1 - Excellent	1 - Miscellaneous Maint	4 (LF)	5.48 (LF)
	2 - Min Deter	1 - Rehabilitate unit	80 (LF)	110 (LF)
	3 - Maj Deter	1 - Rehabilitate unit	180 (LF)	247 (LF)
		2 - Replace unit	304 (LF)	416.48 (LF)
474 - Walls Uncoated	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Surf Rust	1 - Clean and paint	19 (LF)	26.03 (LF)
	3 - Minor Loss	1 - Clean and paint	29 (LF)	39.73 (LF)
	4 - Adv Corrosion	1 - Rehabilitate unit	120 (LF)	164.4 (LF)
		2 - Replace unit	61 (LF)	83.57 (LF)
475 - R/Conc Walls	1 - Excellent	1 - Miscellaneous Maint	35 (LF)	47.95 (LF)
	2 - Min Ck/Spl	1 - Seal and patch	40 (LF)	54.80 (LF)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
	3 - Exposed Stl	1 - Clean and patch	50 (LF)	68.50 (LF)
	4 - Adv Deter	1 - Rehabilitate unit	370 (LF)	506.90 (LF)
		2 - Replace unit	610 (LF)	835 (LF)
476 - Timber Walls	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Min Defect	1 - Rehab and/or Protect	180 (LF)	247 (LF)
	3 - Minor Loss	1 - Rehabilitate unit	180 (LF)	247 (LF)
		2 - Replace unit	305 (LF)	417.85 (LF)
	4 - Adv Deter	1 - Rehabilitate unit	180 (LF)	247 (LF)
		2 - Replace unit	305 (LF)	417.85 (LF)
477 - Other Walls	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Min Deter	1 - Rehabilitate unit	400 (LF)	548 (LF)
	3 - Mod Deter	1 - Rehabilitate unit	400 (LF)	548 (LF)
	4 - Maj Deter	1 - Rehabilitate unit	400 (LF)	548 (LF)
		2 - Replace unit	610 (LF)	835 (LF)
478 - MSE Walls	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Min Deter	1 - Rehabilitate unit	300 (LF)	411 (LF)
	3 - Mod Deter	1 - Rehabilitate unit	300 (LF)	411 (LF)
	4 - Maj Deter	1 - Rehabilitate unit	300 (LF)	411 (LF)
		2 - Replace unit	366 (LF)	501.42 (LF)
487 - Sign Member Horiz	1 - Excellent	1 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint Dist	1 - Surface clean	10 (LF)	13.70 (LF)
		2 - Clean and paint	68 (LF)	93.16 (LF)
	3 - Surf Rust	1 - Spot paint	68 (LF)	93.16 (LF)
	4 - Surf Pits	1 - Clean and paint	68 (LF)	93.16 (LF)
		2 - Replace paint system	52 (LF)	71.24 (LF)
	5 - Sect Loss	1 - Rehabilitate unit	102 (LF)	139.74 (LF)
488 - Sign Member Vertical	1 - Excellent	1 - Surface Clean	10 (LF)	13.70 (LF)
		2 - Miscellaneous Maint	25 (LF)	34.25 (LF)
	2 - Paint Dist	1 - Surface Clean	10 (LF)	13.70 (LF)
		2 - Clean and restore	60 (LF)	82.20 (LF)
	3 - Surf Rust	1 - Spot Paint	68 (LF)	93.16 (LF)
	4 - Surf Pits	1 - Spot Paint	68 (LF)	93.16 (LF)
		2 - Repaint	52 (LF)	71.24 (LF)
	5 - Sect Loss	1 - Rehabilitate unit	102 (LF)	139.74 (LF)
489 - Sign Foundation	1 - Excellent	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Min Ck/Spl	1 - Seal and patch	200 (EA)	274 (EA)
	3 - Exposed Stl	1 - Clean and patch	300 (EA)	411 (EA)
	4 - Adv Corrosion	1 - Rehabilitate unit	1000 (EA)	1370 (EA)
		2 - Replace unit	460 (EA)	630.20 (EA)
495 - Uncoat High Mast L.	1 - Excellent	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Surf Rust	1 - Clean and paint	500 (EA)	685 (EA)
	3 - Minor Loss	1 - Clean and paint	500 (EA)	685 (EA)
	4 - Adv Corrosion	1 - Rehabilitate unit	6000 (EA)	8220 (EA)
496 - Painted High Mast L.	1 - Excellent	1 - Surface clean	200 (EA)	274 (EA)
		2 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Paint Dist	1 - Surface clean	200 (EA)	274 (EA)
		2 - Clean and restore	6000 (EA)	8220 (EA)
	3 - Surf Rust	1 - Spot Paint	500 (EA)	685 (EA)
	4 - Surf Pits	1 - Spot Paint	500 (EA)	685 (EA)
		2 - Repaint	5000 (EA)	6850 (EA)
	5 - Sect Loss	1 - Rehabilitate unit	6000 (EA)	8220 (EA)
497 - Galvan. High Mast L.	1 - Excellent	1 - Surface Clean	200 (EA)	274 (EA)
		2 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Paint Dist	1 - Surface clean	200 (EA)	274 (EA)

Element	Condition State	Action	Cost $ (2003)	Cost $ (2009)
		2 - Clean and restore	6000 (EA)	8220 (EA)
	3 - Surf Rust	1 - Spot Paint	500 (EA)	685 (EA)
	4 - Surf Pits	1 - Spot paint	500 (EA)	685 (EA)
		2 - Repaint	5000 (EA)	6850 (EA)
	5 - Sect Loss	1 - Rehabilitate unit	6000 (EA)	8220 (EA)
498 - Other High Mast L.P.	1 - Excellent	1 - Miscellaneous Maint	500 (EA)	685 (EA)
	2 - Min Deter	1 - Rehabilitate unit	6000 (EA)	8220 (EA)
	3 - Mod Deter	1 - Rehabilitate unit	6000 (EA)	8220 (EA)
	4 - Maj Deter	1 - Rehabilitate unit	6000 (EA)	8220 (EA)
499 - H. M. L. P. Found.	1 - Excellent	1 - Miscellaneous Maint	100 (EA)	137 (EA)
	2 - Min Ck/Spl	1 - Seal and patch	200 (EA)	274 (EA)
	3 - Exposed Stl	1 - Clean and patch	300 (EA)	411 (EA)
	4 - Adv Corrosion	1 - Rehabilitate unit	1000 (EA)	1370 (EA)

Table 5 - Element-Level Costs for Actions (Milligan et al. 2006).

El.	Description	Condition	Action	California DOT	Idaho DOT	Oregon DOT
14	Protected concrete deck / AC overlay			$ / m2		
		2—Distress ⇐2%	Repair potholes/substrate	157	9	150
		3—2–10% distress	Repair potholes/substrate	154	9	150
			Replace substrate/overlay	65	181	250
		4—10–25% distress	Repair potholes/substrate	43	9	150
			Replace substrate/overlay	92	235	250
		5—Distress over 25%	Replace substrate/overlay	57	289	250
			Replace deck	283	241	600
			Failure cost	600	1,200	1,800
107	Paint steel open girder			$ / m		
		1—No corrosion	Surface clean	31	50	2
		2—Paint distress	Surface clean	40	101	2
			Clean and paint	113	425	20
		3—Rust formation	Spot blast, clean, paint	164	638	100
		4—Active corrosion	Spot blast, clean, paint	228	1,276	100
			Replace paint system	198	2,127	320
		5—Section loss	Rehab unit	640	10,000	4,000
			Replace unit	1,197	14,000	15,000
			Failure cost	3,500	42,000	45,000
109	Prestressed concrete open girder			$ / m		
		2—Minor cracks/spalls	Seal cracks & minor patching.	89	564	170
		3—Delams/spalls	Clean steel & patch and/or seal	204	902	300
		4—Analysis warranted	Rehab unit	472	1,127	6,000
			Replace unit	673	2,479	3,000
			Failure cost	3,000	9,000	70,000
121	Painted steel thru truss bottom chord			$ / m		
		1—No corrosion	Surface clean	17	28	10
		2—Paint distress	Surface clean	30	56	10
			Clean and paint	95	237	100
		3—Rust formation	Spot blast, clean, paint	217	415	400
		4—Active corrosion	Spot blast, clean, paint	166	710	400
			Replace paint system	449	1,184	640
		5—Section loss	Rehab unit	880	5,566	8,000

El.	Description	Condition	Action	California DOT	Idaho DOT	Oregon DOT
			Replace unit	2,625	7,792	30,000
			Failure cost	6,778	35,000	90,000
320	Prestressed concrete approach slab			$ / m		
		2—Minor cracks/spalls	Perform mud jacking operations	10	2,500	20,000
		3—Major cracks/spalls	Place overlay	575	10,836	90,000
			Replace unit	1,367	10,034	120,000
		4—Broken/unstable	Replace unit	1,498	10,034	120,000
			Failure cost	11,013	66,000	900,000

Table 6 - Costs of Actions for Michigan DOT (from NCHRP Rpt 668)

Element	Condition Before	Condition After			
		1	2	3	4
12 Concrete Deck- Black Bars / square meter	2	$11.41 Coat $12.81 Repair			
	3	$8.51 Coat $19.15 Repair	$6.94 Repair		
	4		$18.85 Repair	$52.15 Repair	
	5	$67.08 Repair			
13 Concrete Deck With HMA Overlay - No Membrane / square meter	4	$25.60 Repair			
	5	$153 Repair $80.64 Replace			
22 Concrete Deck With Rigid Overlay / square meter	2	$30.08 Repair $84.84 Modify			
	3	$49.72 Coat $35.44 Repair	$13.21 Repair		
	4	$19.41 Repair $56.89 Modify	$17.03 Repair		
	5	$14.07 Repair	$14.58 Repair		
26 Concrete Deck With Coated Bars / square meter	2	$10.79 Repair $154 Replace			
	3	$145 Repair			
106 Unpainted Steel Girder or Beam / meter	2	$79.38 Repair			
	3	$178 Repair			
107 Painted Steel Girder or Beam / meter	2	$51.17 Coat $63.98 Repair $150 Replace			
	3	$14.24 Coat $47.62 Repair	$34.98 Repair		
	4	$131 Repair		$9,660 Coat $18.06 Repair $10,459,239 Modify $309,166 Replace	
	5	$152 Repair			
109 Prestressed Concrete Girder or Beam / meter	2	$550 Repair			
	3	$771,021 Repair	$1,286 Repair		
110 Reinforced Concrete Girder or Beam / meter	2	$39.90 Repair $489 Replace			
	3	$37.79 Repair	$133 Repair $401,771 Replace		
113 Painted Steel Stringer / meter	2	$717 Repair			
	3	$33.10 Repair	$46.74 Repair		
152 Painted Steel Floor Beam / meter	4			$309 Repair	
160 Unpainted Pin and Hanger Assembly / each	2	$3,583 Repair			
	3	$1,836 Repair			

Element	Condition Before	Condition After			
		1	2	3	4
161 Painted Steel Pin and Hanger Assembly / each	2	$57.56 Coat $1,318 Repair			
	3	$1,743 Repair	$381 Repair		
	4	$1,548 Repair			
202 Painted Steel Column or Pile Extension / each	2	$761 Repair			
	3	$922 Repair			
	4			$1,250 Repair	
205 Reinforced Concrete Column or Pile Extension / each	2	$76.75 Coat $4,135 Repair $45,416 Replace			
	3	$6,601 Repair	$1,818 Repair $7,272 Replace		
210 Reinforced Concrete Pier Wall / meter	2	$3,669 Repair			
	3	$1,659 Repair	$267 Repair		
215 Reinforced Conc Abutment / meter	2	$1,090 Coat $4,404 Repair $4,322 Modify $2,648 Replace			
	3	$1,948 Repair	$2,395 Repair $528,490 Replace		
	4		$4,783 Repair		
231 Painted Steel Pier Cap / meter	2	$3,791 Repair			
	3				
	4	$369 Repair			
234 Reinforced Concrete Pier Cap / meter	2	$494 Coat $1,615 Repair $4,894 Modify $2,197 Replace			
	3	$604 Coat $4,024 Repair	$4,298 Repair $2,945 Replace		
	4	$11,444 Repair			
241 Reinforced Concrete Culvert / meter	2	$74,803 Replace			
	3	$25,785 Replace			
310 Elastomeric Bearing / each	2	$500 Repair			
311 Movable Bearing (roller, sliding, etc.) / each	2	$346 Coat $1,105 Repair $1,730 Replace			
	3	$4,250 Repair	$1,359 Repair		
313 Fixed Bearing / each	2	$317 Coat $1,270 Repair $2,922 Replace			
	3	$4,862 Repair			
321 Reinforced Concrete Approach Slab / each	2	$11,388 Repair $35,887 Modify			
	3	$2,963 Coat $19,387 Repair	$25,555 Repair		
	4	$41,527 Replace			
330 Uncoated Metal Bridge Railing / meter	2	$96.92 Repair			
	3	$865 Replace			
331 Reinforced Concrete Bridge Railing / meter	2	$56.34 Coat $729 Repair $385 Modify $40,940 Replace			
	3	$733 Repair	$1,298 Coat $44,341 Repair		

Element	Condition Before	Condition After			
		1	2	3	4
333 Miscellaneous Bridge Railing / meter	2	$362 Repair $2,501 Replace			
	3		$399 Repair $40,093,750 Modify		
357 Pack Rust / each	2	$25,500			
	3	$8,714	$6,750		
358 Deck Cracking Smart Flag - Concrete and Latex Only / each	2	$3,545 Coat $22,500 Repair			
	3	$10,780 Repair $39,656 Replace	$19,387 Repair		
359 Deck Bottom Surface Smart Flag / each	2	$10,040 Repair $62,250 Replace			
	3	$43,875 Repair	$10,294 Repair		
	4	$40,294 Repair	$21,750 Repair	$25,570 Repair $38,041 Modify	
	5	$39,656 Replace		$3,400 Coat	$21,428 Repair
360 Settlement Smart Flag / each	3	$91,846 Repair			
362 Traffic Impact Smart Flag / each	2	$9,722 Repair			
363 Section Loss Smart Flag / each	2	$22,500 Repair			
	3	$924 Coat $14,500 Repair	$8,714 Repair		
	4	$7,631 Coat			
364 Frozen or Deformed Pin and Hanger Smart Flag / each	3	$91,846			
378 False Decking Smart Flag / each	2	$80,625 Repair			
	3	$23,466 Repair			
379 Deck Fascia Smart Flag / each	2	$5,232 Coat $16,000 Repair $39,656 Replace			
	3	$924 Coat $43,875 Repair	$14,500 Repair		
380 Beam Ends in Contact Smart Flag / each	2	$13,977 Repair			
	3	$16,818 Repair	$14,538 Repair		
400 Strip Seal Expansion Joint / meter	2	$36.23 Coat $290 Repair $491 Replace			
	3	$1,234 Repair $425 Replace			
401 Pourable Joint Seal / meter	2	$148 Coat $777 Repair $543 Replace			
	3	$18.01 Coat $511 Repair $885 Replace	$25.01 Coat $275 Repair $651 Replace		
402 Compression Joint Seal / meter	2	$1,078 Repair $562 Replace			
	3	$928 Repair $517 Replace			
403 Assembly Joint/Seal (modular) / meter	2	$2,461 Repair			
	3	$2,699 Repair			
404 Steel Armor Expansion Joint (Open) / meter	2	$3,109 Repair			
	3	$826 Repair $2,112 Replace			
405 Miscellaneous Expansion Joint / meter	3	$837 Repair $643 Replace	$309 Repair		

Element	Condition Before	Condition After			
		1	2	3	4
	3		$89.51 Repair		
411 Block Out Expansion Joint / meter	2	$1,696 Repair			
	3	$625 Repair			

Table 7 - Deterioration Mean Life Values for Element Groups (from Sobanjo and Thompson 2001)

Element Group	Mean Life Out of Condition State (years)					Mean Time to Failure (years)
	1	2	3	4	5	
Decks/Slabs	11.5	8.8	8.1	4.7	3.0	50
Superstructure	17.6	10.4	6.6	4.7	4.0	59
Substructure	18.7	9.2	6.7	4.7		52
Joints	7.4	5.0	2.8			21
Bearings	18.3	12.5	7.8			50
Railing	17.1	13.3	9.0	8.3		64
Movable	7.9	6.9	4.9	4.1		33
Other Elements	17.1	14.6	11.5	6.8		68
Unpainted Steel	17.6	11.9	8.2	5.2		58
Painted Steel	14.0	8.1	7.2	5.2	4.8	55
Prestressed Concrete	25.1	11.5	7.5	4.6		63
Reinforced Concrete	24.0	13.4	9.0	5.8		69
Timber	11.4	9.8	6.1	4.7		44
Other	12.6	10.5	6.9			40
Decks	12.6	9.0	7.4	4.0	2.9	50
Slabs	9.9	8.6	9.1	5.9	3.2	51
Electrical	8.7	6.3	4.2			26
Hydraulic	4.7	4.1	3.0	2.7		21
Mechanical	8.3	7.9	5.7	4.6		37

Table 8 - Detailed list of Element Mean Life in Condition States (from Sobanjo and Thompson 2001)

Element	Mean Life in Condition State (years)				
	CS 1	CS 2	CS 3	CS 4	CS 5
12 Concrete Deck - Bare	20.0	15.0	10.5	4.8	2.5
13 Concrete Deck - Unprotected w/ AC Overlay	9.3	6.3	4.3	2.8	2.3
28 Steel Deck - Open Grid	10.7	6.3	6.3	3.0	3.5
29 Steel Deck - Concrete Filled Grid	15.0	9.7	4.7	5.3	4.0
31 Timber Deck - Bare	10.0	10.0	5.0		
32 Timber Deck - w/ AC Overlay	5.0	3.0	12.0		
38 Concrete Slab - Bare	21.7	16.7	10.0	4.3	2.5
39 Concrete Slab - Unprotected w/ AC Overlay	7.3	4.3	3.3	2.3	2.5
54 Timber Slab	10.0	10.0	5.0		
55 Timber Slab - w/ AC Overlay	5.0	3.0	12.0		
98 Concrete Deck on Precast Deck Panels	18.3	13.0	8.8	4.0	2.3
99 Prestressed Concrete Slab (Sonovoid)	5.3	8.8	15.0	11.0	4.7

Element	Mean Life in Condition State (years)				
	CS 1	CS 2	CS 3	CS 4	CS 5
101 Unpainted Steel Closed Web/Box Girder					
102 Painted Steel Closed Web/Box Girder	10.3	5.8	7.5	5.5	3.7
104 P/S Conc Closed Web/Box Girder	15.3	19.0	12.7	4.0	
105 Reinforced Concrete Closed Webs/Box Girder	30.0	15.0	10.0	6.0	
106 Unpainted Steel Open Girder/Beam	25.0	20.0	10.0	5.0	
107 Painted Steel Open Girder/Beam	11.5	6.3	5.3	4.0	3.5
109 P/S Conc Open Girder/Beam	41.3	16.3	8.0	3.3	
110 Reinforced Conc Open Girder/Beam	22.3	18.8	8.8	5.0	
111 Timber Open Girder/Beam	5.0	15.0	5.0		
112 Unpainted Steel Stringer					
113 Painted Steel Stringer	10.3	7.5	6.5	4.0	3.0
116 Reinforced Conc Stringer	25.0	10.0	5.0		
117 Timber Stringer					
120 Unpainted Steel Bottom Chord Thru Truss					
121 Painted Steel Bottom Chord Thru Truss	11.0	5.0	4.5	4.5	4.0
125 Unpainted Steel Thru Truss (excl. bottom chord)					
126 Painted Steel Thru Truss (excl. bottom chord)	12.0	5.0	4.5	4.5	4.0
131 Painted Steel Deck Truss	12.0	5.0	4.5	4.5	4.0
135 Timber Truss/Arch 4					
140 Unpainted Steel Arch					
141 Painted Steel Arch	13.5	5.0	4.5	4.5	4.5
143 P/S Conc Arch					
144 Reinforced Conc Arch	30.0	10.0	7.5	5.0	
146 Cable - Uncoated (not embedded in concrete)					
147 Cable - Coated (not embedded in concrete)					
151 Unpainted Steel Floor Beam					
152 Painted Steel Floor Beam	13.3	6.3	4.3	3.7	3.3
155 Reinforced Conc Floor Beam	32.5	15.0	7.5	6.0	
156 Timber Floor Beam					
161 Painted Steel Pin and/or Pin and Hanger Assembly	10.0	4.0	3.0	5.0	6.0
201 Unpainted Steel Column or Pile					
202 Painted Steel Column or Pile	10.8	6.3	5.3	4.0	3.0
204 P/S Conc Column or Pile	22.5	8.0	3.8	2.3	
205 Reinforced Conc Column or Pile	27.5	14.0	9.0	4.5	
206 Timber Column or Pile	11.7	4.7	2.7	1.3	
207 Hollow Core Pile	23.3	5.7	3.3	2.3	
210 Reinforced Conc Pier Wall	26.3	12.8	9.0	6.0	
211 Other Material Pier Wall	10.0	5.0	5.0	5.0	
215 Reinforced Conc Abutment	32.5	14.5	10.8	7.8	
216 Timber Abutment	17.5	8.0	5.0	4.0	
217 Other Material Abutment	10.0	5.0	10.0	10.0	
220 Pile Cap/Footing	23.8	10.3	8.8	6.5	
230 Unpainted Steel Cap					
231 Painted Steel Cap	10.0	5.5	4.5	4.5	7.0

Element	Mean Life in Condition State (years)				
	CS 1	CS 2	CS 3	CS 4	CS 5
233 P/S Conc Cap	30.0	15.0	9.0	7.0	
234 Reinforced Conc Cap	31.3	17.5	11.3	6.5	
235 Timber Cap	17.5	8.0	5.0	4.0	
240 Metal Culvert	20.0	7.5	5.0	3.5	
241 Reinforced Concrete Culvert	23.8	14.3	8.8	5.3	
243 Other Culvert					
290 Channel	13.3	13.3	8.3	4.5	
298 Pile Jacket without Cathodic Protection	7.3	7.0	5.0	4.3	
299 Pile Jacket with Cathodic Protection	8.5	5.0	3.5	3.5	
300 Strip Seal Expansion Joint	4.7	2.3	1.3		
301 Pourable Joint Seal	4.8	3.0	1.5		
302 Compression Joint Seal	4.8	2.5	1.8		
303 Assembly Joint/Seal (modular)	5.0	4.5	3.5		
304 Open Expansion Joint	15.0	7.7	3.7		
310 Elastomeric Bearing	32.5	16.3	10.0		
311 Moveable Bearing (roller, sliding, etc.)	15.0	11.3	9.3		
312 Enclosed/Concealed Bearing	15.0	10.0	6.0		
313 Fixed Bearing	18.8	12.5	6.8		
314 Pot Bearing	10.0	12.5	7.0		
320 P/S Concrete Approach Slab w/ or w-o/AC Ovly	20.0	10.0	10.0	10.0	
321 Reinforced Conc Approach Slab w/ or w/o AC Ovly	20.8	17.5	15.0	7.3	
330 Metal Bridge Railing - Uncoated	10.0	5.0	10.0	10.0	
331 Reinforced Conc Bridge Railing	23.8	20.0	15.0	9.8	
332 Timber Bridge Railing	10.0	15.0	5.0		
333 Other Bridge Railing	28.3	18.3	8.3		
334 Metal Bridge Railing - Coated	13.3	8.0	6.7	5.0	4.7
386 Fender Dolphin System Metal Uncoated					
387 Fender Dolphin System Prestressed Concrete	23.3	6.7	6.0	3.3	
388 Fender Dolphin System Reinforced Concrete	22.5	8.0	5.5	4.5	
389 Fender Dolphin System Timber	13.3	8.0	5.0	4.3	
390 Fender Dolphin System Other Material	15.0	10.0	10.0	5.0	
393 Bulkhead/Seawall Metal Uncoated					
394 Abutment Slope Protection Reinforced Concrete	16.3	11.3	10.3	4.7	
395 Abutment Slope Protection Timber					
396 Abutment Slope Protection Other Material	11.8	13.3	7.0	4.0	
397 Drainage System Metal Coated	11.0	8.7	5.3	5.0	4.3
398 Drainage Sytem Other Material	10.0	10.0	8.5	5.5	
399 Other Expansion Joint	10.0	10.0	5.0		
474 Wingwall/Retaining Wall Metal Uncoated	10.0	15.0	10.0	5.0	
475 Wingwall/Retaining Wall Reinforced Concrete	27.5	20.0	11.3	6.7	
476 Wingwall/Retaining Wall Timber	5.0	10.0	15.0	10.0	
477 Wingwall/Retaining Wall Other Material	10.0	15.0	15.0	10.0	
478 Mechanically Stabilized Earth Wall	10.0	27.5			
487 Overlane Sign Structure Horizontal Member Metal Co	15.0	10.0	10.0	6.5	5.5

Element	Mean Life in Condition State (years)				
	CS 1	CS 2	CS 3	CS 4	CS 5
488 Overlane Sign Structure Vertical Member Metal Coat	15.0	10.0	10.0	6.5	5.5
489 Overlane Sign Structure Foundation	37.5	22.5	17.5	7.5	
495 High Mast Light Poles Metal Uncoated	15.0	7.5	3.5	3.0	
496 High Mast Light Poles Metal Coated	15.0	10.0	10.0	5.0	5.0
497 High Mast Light Poles Galvanized	20.0	15.0	15.0	10.0	10.0
498 High Mast Light Poles Other Material	10.0	10.0	10.0	5.0	
499 High Mast Light Pole Foundations	30.0	20.0	12.5	5.0	

Task 1 References

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Task 2 – CDOT Databases and Data Sources

Work in Study 87-60 reviews data sources within Colorado DOT that include

- The Level of Service Management System used by CDOT Maintenance and Operations Branch
- Bid tabulations posted by CDOT Construction Contracts Unit
- Pontis BMS bridge database kept by CDOT Staff Bridge Branch
- Data (a spreadsheet) from CDOT Bridge Branch that relates project IDs to bridge IDs.

The data available from these sources are summarized here.

CDOT Maintenance and Operations Branch

The Colorado DOT Maintenance and Operations Branch uses a maintenance management system (MMS) developed by Cambridge Systematics (*Highway* 1999). The MMS tracks production, costs and conditions in terms of level-of-service grades for nine program areas (Table 9). The program for *structures maintenance* includes evaluations of level of service in ten aspects (Table 10) and employs fourteen work activities to respond to deficiencies.

Data on maintenance work production and unit costs were collected for fiscal years 2001 through 2007. Production summaries are shown in Table 4. Unit costs are shown in Table 5.

Table 9 - CDOT Maintenance Program Areas

Planning and Training
Roadway Surfacing
Roadside Structures
Roadside Appearance
Traffic Services
Structure Maintenance
Snow and Ice Control
Material, Equipment and Buildings
Tunnel Activities

Table 10 - CDOT Structures Maintenance LOS Evaluations

Evaluation	Budgeted Activity	Basis for Level-of-Service (LOS)	LOS Grade
Bridge Inspection	351	Inspection interval	
Bridge Cleaning	352	Percent of deck area with debris	
Bridge Decks	353	Percent of deck area with surface defects	
Bridge Superstructure	354	Percent of element with defects	
Bridge Painting	355	Percent of element requires painting	
Bridge Curbs, Railings	356	Percent of element with defects	
Bridge Bearings	357	Percent of element requiring cleaning, lubrication or painting	
Bridge Substructure	358	Percent of element with defects	
Bridge Approaches, Slopes	360	Percent of slabs and slopes with defects	
Bridge Deck Expansion Joints	364	Percent of elements not secure, misaligned, debris, seepage, other defects	

A	<10%
B	<20%
C	<30%
D	<40%
F	≥40%

For some work activities, the units for maintenance accomplishment are compatible with units for Pontis bridge elements. These unit costs can be used in the Pontis bridge management systems. Other unit costs, having units that are not compatible with Pontis bridge elements, cannot be used. Work activities and units are compared to Pontis element units in Table 3.

Unit costs obtained from MMS data are highly variable. MMS work activities that agree with Pontis actions in basis of measurement are normalized against maximum unit costs for the years 2001 to 2007. Normalized unit costs are plotted in Figure 1. Normalized costs range from 20% to 100% for most activities and from 0% to 100% for some activities. Unit cost values from MMS data may be too variable for use in Pontis BMS.

Table 11 - CDOT Maintenance Work Units and Pontis Units

Activity	Activity Description	Unit	Pontis Element	Pontis Unit
351.00	Bridge Inspection	Each		
352.00	Bridge Cleaning	Each		
353.00	Bridge Deck Repair	Sq yd	Deck Elements	Sq m
353.10	Crack/Joint Seal Rig Brdg Deck	Gal		
353.20	Rotomil Flex Pave Bridge Deck	Sq yd	Deck Elements	Sq m
353.30	Rotomil Rigid Pave Bridge Deck	Sq yd	Deck Elements	Sq m
353.40	Crack Seal Flex Bridge Deck	Gal		
354.00	Bridge Str Maint	Each		
355.00	Bridge Painting	Gals		
356.00	Bridge Rail Repair	Ln ft	Railing elements	m
357.00	Bridge Bearing Mtc	Each	Bearing	ea
358.00	Bridge Sustr Mtce	Each		
360.00	App Slab/Slope Rpr	Each	Approach Slab	ea
364.00	Expansion Joint	Ln ft	Joint elements	m

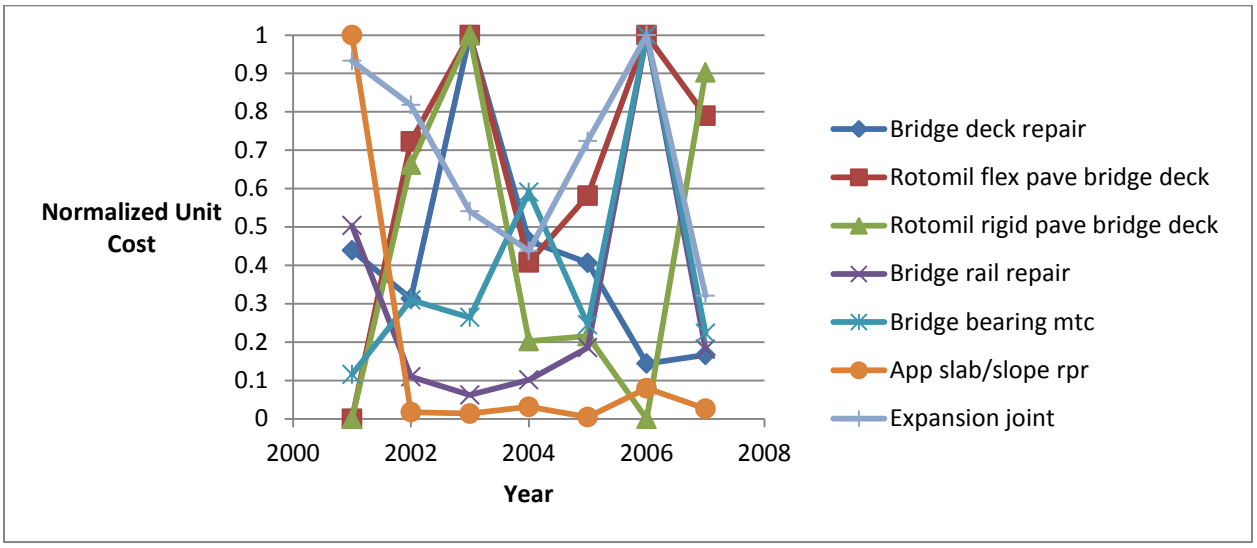

Figure 1 - MMS Normalized Unit Costs

CDOT Construction Contracts Unit

Bid tabulations are available as html files at the website of the CDOT Construction Contracts Unit[2]. Study 87-60 collected more than 1900 bid tabulations for projects for years 1998 through 2008. Study 87-60 uses a listing furnished by CDOT Staff Bridge Branch of projects that include bridge work such as bridge replacements, bridge joint repairs or replacements, bridge superstructure repairs, bridge substructure repairs, bridge bearing replacements and bridge deck replacements.

Bid tabulations provide specific, detailed information on costs and quantities of work, and provide the year of work and the CDOT region for work. Bid items for joints, bearings, railings and pre-fabricated components in general have bases of measurement that agree directly with actions for corresponding Pontis elements. Bid items for asphalt removal, for membranes and for overlays are measured as area, and are easily related to actions for Pontis deck elements.

[2] http://www.dot.state.co.us/bidding/

Table 12 - CDOT Structures Maintenance Production

Activity	Activity Description	Unit	Completed Units by Year						
			2001	2002	2003	2004	2005	2006	2007
351.00	Bridge inspection	Each	2,819	1,840	4,709	3,877	2,293	4,729	2,693
352.00	Bridge cleaning	Each	4,583	2,614	2,149	2,596	3,485	2,768	595
353.00	Bridge deck repair	Sq yd	104,269	71,880	27,546	49,403	67,067	124,791	54,072
353.10	Crack/joint seal rig brdg deck	Gal		195	1,426	840	1,277	196.71	37
353.20	Rotomil flex pave bridge deck	Sq yd		22,792	22,691	50,652	42,287	14,521	6,734
353.30	Rotomil rigid pave bridge deck	Sq yd		14	354	11,116	8,088	0	142
353.40	Crack seal flex bridge deck	Gal		798	3,966	4,491	2,157.57	2,740	75
354.00	Bridge str maint	Each	708	289	472	207	416	356	185
355.00	Bridge painting	Gals	941	908	2,892	1,289	840.45	763	22,863
356.00	Bridge rail repair	Ln ft	19,432	16,392	38,072	28,823	73,861	10,776	6,374
357.00	Bridge bearing mtc	Each	109	24	114	264	377	463	39
358.00	Bridgesustrmtce	Each	119	127	207	527	271	351	177
360.00	App slab/slope rpr	Each	258	582	621	454	5,123	242	513
364.00	Expansionjoint	Lnft	10,921	7.785	10,984	9,836	8,729	8,046	5,478

Table 13 - CDOT Structures Maintenance Unit Costs

Activity	Activity Description	Unit	Unit Costs (year)						
			2001	2002	2003	2004	2005	2006	2007
351.00	Bridge inspection	$/Each	$46.42	$65.18	$37.68	$50.03	$132.04	$89.72	$42.77
352.00	Bridge cleaning	$/Each	$67.73	$116.93	$145.46	$147.39	$188.55	$173.31	$126.39
353.00	Bridge deck repair	$/Sq yd	$48.13	$34.32	$109.62	$50.80	$44.55	$15.79	$18.24
353.10	Crack/jointseal rig brdg deck	$/Gal		$16.28	$13.96	$144.56	$51.40	$77.36	$0.00
353.20	Rotomil flex pave bridge deck	$/Sq yd		$3.99	$5.52	$2.25	$3.21	$5.52	$4.36
353.30	Rotomil rigid pave bridge deck	$/Sq yd		$7.69	$11.61	$2.35	$2.50	$0.00	$10.48
353.40	Crack seal flex bridge deck	$/Gal		$18.56	$12.42	$25.83	$15.35	$16.02	$0.00
354.00	Bridgestrmaint	$/Each	$7,005.50	$948.10	$506.78	$1,507.88	$1,217.91	$1,553.77	$331.75

Activity	Activity Description	Unit	Unit Costs (year)						
			2001	2002	2003	2004	2005	2006	2007
355.00	Bridge painting	$/Gals	$96.30	$100.48	$51.33	$112.02	$138.48	$119.94	$1.44
356.00	Bridge rail repair	$/Ln ft	$38.77	$8.43	$4.78	$7.82	$14.27	$76.96	$13.94
357.00	Bridge bearing mtc	$/Each	$50.79	$136.03	$116.03	$259.34	$107.60	$439.08	$97.90
358.00	Bridge sustr mtce	$/Each	$60373.52	$903.67	$1552.73	$633.73	$1453.27	$1,205.20	$122.25
360.00	App slab/slope rpr	$/Each	$26,147.28	$457.36	$353.74	$814.12	$119.39	$2,079.99	$687.16
364.00	Expansion joint	$/Ln ft	$366.29	$321.16	$212.35	$171.91	$284.23	$392.59	$125.88

Projects often include both bridge work and other work (usually pavements). Bid tabulations include items for direct work, such as furnishing structural components, and for indirect work such as mobilization, project monitoring, field offices, and maintenance of traffic. The indirect costs are shared among bridge and non-bridge direct work. In Study 87-60, ratios of total costs to costs of direct work are computed for each project and kept as a T/D ratio. This ratio is used as a multiplier on bid items for bridge-related work to use direct-work items to estimate total costs.

CDOT bid tabulations are the major source of cost information in Study 87-60. Further information on costs for Pontis actions obtained from bid tabulations is presented in Task 8 and Task 9.

Pontis Bridge Database

The Pontis BMS database contains three tables that are used to collect information on bridges, bridge elements and condition histories for bridge elements. These are:

bridge	A table of bridges IDs, owners, types, years of construction, length ,widths, etc. Much of this information is part of the NBI record.
inspevnt	A table of inspection dates and NBI condition ratings for bridges.
eleminsp	Condition histories for bridge elements.

CDOT Pontis database contains 3,716 structures having more than 50,000 instances of elements (about 14 elements per structure), with 21,480 safety inspections. CDOT's Pontis database has 139 distinct bridge elements. Condition data (inspections) include the years 1997 to 2008. There are more than 236,000 records of element-level conditions.

Element-level condition data are examined, and events in service are identified. Events include element construction and demolition, changes to element quantities by additions and removals, element deterioration and element repairs.

Deterioration events contribute directly to deterioration models developed in Study 87-60. Events in element construction, addition and repair provide a means to identify bridge work in bid tabulations. Events that alter element quantities or improve element condition contribute to interpretation of populations of elements and conditions in calibration of deterioration models.

Study 87-60 builds a separate instance of the CDOT bridge database in Task 10. This new database has CDOT structures and inspection events, a corrected version of condition data, and newly developed values for actions, costs of actions, deterioration transition probabilities and improvement transition probabilities. In creating the new database, many tables are copied from the existing CDOT bridge database.

Project & Bridge Information - CDOT Staff Bridge Branch

CDOT Bridge Branch keeps a spreadsheet that lists bridges included in construction projects. The spreadsheet lists project ID, bridge ID, letting date and general statements of the type of work performed. This list is the chief means of identifying the bid tabulations that include bridge work.

Task 2 References

Highway 1999	*Highway Maintenance Level of Service Manual* (1999). Cambridge Systematics, 78p

Task 3 - Related Work at Transportation Departments in Other US States

Task 3 collects information from US DOTs on deterioration modeling and costs of Pontis actions. For deterioration modeling, DOTs might want to use Pontis to compute values of transition probabilities, but condition data are, at present, insufficient; not all elements, condition states and environments are populated. DOTs in Michigan, New York and Ohio have developed NBI-based deterioration models that assist in evaluations of potential bridge programs.

Costs of actions are obtained from DOTs in California, Delaware and Louisiana. California cost values are approximate. For Delaware and Louisiana, Study 87-60 obtained copies of the spreadsheets used to develop Pontis costs for specific elements, actions and condition states.

Deterioration Modeling

DOTs in Michigan, New York and Ohio have developed modeling capabilities for deterioration of bridge elements (Hearn et al. 2010). These capabilities are outside of Pontis BMS.

Michigan's Bridge Condition Forecasting System (BCFS) uses Markov-chain deterioration models applied to NBI condition ratings. Markov transition probabilities are updated each year with NBI ratings from Michigan DOT's inspections. A basic use of the deterioration model is a prediction of the years of service until a bridge reaches a poor condition, and becomes a candidate for replacement

New York DOT uses a *Bridge Needs Assessment Model* (BNAM) that provides separate deterioration curves for each bridge construction material and DOT region in New York. Deterioration curves indicate the effects of preventive and corrective maintenance, and show significant extension to bridge service life due to maintenance.

Ohio has worked with the University of Cincinnati to develop deterioration rates based on Ohio's Organizational Performance Index (OPI) data. OPI data include four measures of bridge condition: *General Appraisal*, *Floor Condition*, *Wearing Surface Condition*, and *Paint Condition*. Two rating scales are used (*30 Year* 2009). General appraisal and paint ratings are reported on a 0 to 9 scale; 0 is poor condition and 9 is excellent condition. Floor condition and wearing surface condition are reported on a 4 to 1 scale where 4 is poor condition and 1 is excellent condition. For the 0 to 9 scale, a '4' rating is deficient. For the 4 to 1 scale a '3' rating is deficient. Models for OPI ratings are Markov chains. The outputs are percentages of deficient bridges in the network. Deterioration models are developed for predictions of Ohio statewide conditions, and conditions within each Ohio DOT district.

Actions and Costs of Actions

Detailed information on Pontis actions and costs is collected from DOTs in Delaware and Louisiana. General information on actions and costs is obtained from California DOT.

California DOT

California DOT produces a Bridge Action Matrix (*Bridge* 2009) that lists actions, and ranges of costs for actions. The matrix indicates whether State forces or contract forces usually perform an action, and

relates work to action codes for California's bridge management system and California's integrated maintenance management system. The California action matrix is shown in Table 32.

Pontis Actions and Costs

DOTs' preparation of actions and costs for Pontis BMS follows a process. Actions in maintenance, repair and replacement are identified for bridge elements. Actions include cleaning, painting, patching, etc. as well as removal and replacement of bridge elements. Actions are expressed as sets of bid items. Quantities for contributing bid items are established to yield a selected quantity of element-level action. Costs for actions are computed as sums of costs of contributing bid items. Quantities for actions are translated into quantities for bridge elements by establishing representative sizes of bridge elements. For example, an action for repair of approach slabs is obtained from bid items in units of square yards. The action is translated into an 'each' quantity using assumed size of approach slab and assumed extent of deterioration.

Spreadsheets collected from Delaware DOT and Louisiana DOTD show actions, collections of bid items for actions and representative sizes of bridge elements. Costs are listed for various actions. Costs differ among condition states because poorer conditions require more extensive work.

Actions and Costs – Delaware DOT

Delaware DOT's Pontis actions and costs were obtained in 2009 from Mr. Calvin Weber, the State Bridge Maintenance Engineer. The set of Delaware costs includes 752 entries with 360 distinct unit costs for 70 actions applied to 132 bridge elements. A single action can apply to a group of similar bridge elements. The same action can have different unit costs for different condition states because the condition states have different levels of damage.

Delaware has 34 actions for deck elements (Table 14). Actions provide washing, patching, repairs, (re)placement of overlays, deck rehabilitation and deck replacement. Costs range from $0.10 to $140 per square foot.

Table 14 – Delaware Actions for Decks

Material	Action		Cost $	Unit
Asphalt	Repair Potholes:	CS 2	0.09	SF
	Replace Overlay: Latex		4.23	SF
	Replace Overlay: Micro-Silica		7.94	SF
Composite	Repair Potholes / Rehab:	CS 2	1.12	SF
	Replace Deck:		13.74	SF
Concrete	Repair Potholes:	CS 2	0.09	SF
	Repair Spalled/Delam Areas:	CS 2	0.19	SF
	Repair Spalls and Delaminations:	CS 2	0.19	SF
	Waterproof:		2.35	SF
	Replace Overlay: Micro-Silica		7.05	SF
	Overlay Deck: Micro-Silica		7.34	SF
	Add/Replace Overlay: Micro-Silica		7.34	SF
	Overlay Slab: Micro-Silica		7.34	SF

Material	Action		Cost $	Unit
	Overlay Deck: Latex		9.32	SF
	Add/Replace Overlay: Latex		9.32	SF
	Overlay Slab: Latex		9.32	SF
	Replace Overlay: Latex		9.42	SF
	Deck Repair, 1-3"		36.1	SF
	Replace Deck:		38.61	SF
	Replace Slab:		71.78	SF
	Deck Spall Repair, 3" - Full Depth		73.26	SF
	Clean Rebar and Patch:		125.55	SF
	Minor Patch:		141.62	SF
Steel	Replace Concrete Filler:	CS 3	0.52	SF
	Rehab Connectors:	CS 3	1.32	SF
	Surface Clean:		2.45	SF
	Power Wash and Paint:		13.45	SF
	Replace Paint System:		38.5	SF
	Replace Deck:		45	SF
Timber	Repair Potholes:	CS 2	0.09	SF
	Replace AC Overlay:		3.35	SF
	Replace Deck:		10.39	SF
	Rehab Slab:		19.94	SF
	Replace Slab:		66.36	SF

Delaware actions for superstructure elements include cleaning, greasing, painting, patching, crack injection, repointing, rehabilitation and replacement (Table 15). Diaphragms and pin/hangers are 'each' elements. Costs for actions range from $50 to $3500 each. Beams and trusses are 'feet' elements. Costs range form $15 to $725 per foot. Arches are measured in square feet. Costs for actions range from $124 to $162 per square foot.

Table 15 – Delaware Actions for Superstructure

Material	Action		Cost $	Unit
Concrete	Inject Cracks:	CS 2	49.58	EA
	Waterproof		185.91	EA
	Clean Rebar and Patch:	CS 2	696.34	EA
	Minor Patch:	CS 2	1033.52	EA
	Replace Diaphragm:		3469.84	EA
	Surface Seal Cracks:		24.22	FT
	Inject Cracks:	CS 2	24.79	FT
	Clean Rebar and Patch:	CS 2	45.36	FT
	Minor Patch:	CS 2	67.31	FT
	Replace Unit:		289.26	FT
	Clean Rebar and Patch:		124.30	SF
	Minor Patch:		141.62	SF
	Replace Unit:		162.67	SF

Material	Action		Cost $	Unit
Other	Repoint:		14.86	FT
	Replace:		162.67	FT
Prestressed Concrete	Surface Seal Cracks:		24.22	FT
	Inject Cracks:	CS 2	24.79	FT
	Clean Rebar and Patch:	CS 2	45.36	FT
	Minor Patch:	CS 2	67.32	FT
	Replace Unit:		138.73	FT
Steel	Surface Clean:		79.37	EA
	Power Tool Clean and Paint:	CS 3	103.68	EA
	Clean, Grease and Paint:		165.00	EA
	Replace Paint System:		453.60	EA
	Rehab Supports:		779.01	EA
	Replace Unit:		7265.33	EA
	Surface Clean:		39.19	FT
	Power Tool Clean and Paint:	CS 2	51.20	FT
	Replace Paint System:		224.00	FT
	Major Rehab:		723.17	FT
	Replace Unit:		1122.22	FT
Timber	Replace Diaphragm:		74.67	EA
	Replace Diaphragm:		37.46	FT
	Replace Stringer:		49.78	FT
	Replace Girder:		49.78	FT
	Replace Floor Beam:		49.78	FT

Delaware has 35 actions for substructure elements (Table 16). Actions include cleaning, painting, crack injection, patching, repointing, rehabilitation, and replacement. Footings are 'each' elements. Costs for actions for footings range from $5000 to $80000 each. Other substructure elements are measured in feet. Costs range from $42 to $5200 per foot.

Table 16 – Delaware Actions for Substructure

Material	Action		Cost $	Unit
Concrete	Clean Rebar and Patch:	CS 2	5122.48	EA
	Minor Patch:	CS 2	7602.87	EA
	Replace Unit:		80802.50	EA
	Clean Rebar and Patch:	CS 2	83.77	FT
	Surface Seal Cracks:		95.45	FT
	Inject Cracks:	CS 2	99.16	FT
	Minor Patch:	CS 2	124.34	FT
	Replace:		130.32	FT
	Major Rehab:		545.87	FT
	Replace Crash Wall:		709.49	FT
	Replace Unit:		1577.92	FT
Earth	Clean Rebar and Patch:	CS 2	42.14	FT

Material	Action		Cost $	Unit
	Surface Seal Cracks:	CS 2	49.58	FT
	Minor Patch:	CS 2	158.39	FT
	Replace Unit:		2260.94	FT
Other	Repoint:	CS 2	124.49	FT
	Replace Unit:		1187.28	FT
	Replace:		2734.92	FT
	Replace Jacket		5240.32	FT
Prestressed Concrete	Surface Seal Cracks:		45.59	FT
	Inject Cracks:	CS 2	49.58	FT
	Clean Rebar and Patch:	CS 2	83.77	FT
	Minor Patch:	CS 2	124.34	FT
	Major Rehab:		545.87	FT
	Replace Unit:		1577.92	FT
Steel	Surface Clean:		48.99	FT
	Clean and Paint:	CS 2	49.06	FT
	Power Tool Clean and Paint:	CS 2	64.00	FT
	Replace Paint System:		280.00	FT
	Major Rehab:		545.87	FT
	Replace Unit:		1950.34	FT
Timber	Replace		324.53	FT
	Major Rehab:		545.87	FT
	Replace Cap:		847.69	FT
	Replace Unit:		1335.04	FT

Delaware has 8 actions for culverts that include sealing, patching, repointing, rehabilitation and replacement (Table 17). Costs range from $50 to $1200 per foot.

Table 17 – Delaware Actions for Culverts

Material	Action		Cost $	Unit
Concrete	Seal Cracks:	CS 2	49.58	FT
	Rehab Unit:	CS 3	75.73	FT
	Replace Unit:		246.98	FT
	Clean Rebar and Patch:	CS 2	352.17	FT
	Minor Patch:	CS 2	522.7	FT
Other	Repoint:	CS 2	59.46	FT
	Replace Unit:		1177.23	FT
Steel	Replace Unit:		261.69	FT

Delaware has 5 actions for joints that include cleaning, patching, seal replacement and joint replacement (Table 18). Costs range from $44 to $450 per foot. Actions for bearings include cleaning, rehabilitation and replacement (Table 19). Costs range from $165 to $7300 each. Delaware has 13 actions for railings that include cleaning, crack injection, patching, repointing, rehabilitation and

replacement (Table 20). Costs range from $12 to $420 per foot. Delaware has 14 actions for approach slabs that include cleaning, patching, crack sealing, overlays and replacements (Table 21). Costs range from $700 to $34000 each approach.

The complete Delaware cost table appears in Table 30.

Table 18 – Delaware Actions for Joints

Action	Cost $	Unit
Clean Joint and Replace Seal:	43.77	FT
Replace Gland & Patch Concrete:	46.00	FT
Clean Joint, Patch Spalls, and Replace Seal:	54.71	FT
Replace Joint w/Deck Replacement:	280.32	FT
Replace Joint:	447.87	FT

Table 19 – Delaware Actions for Bearings

Action	Cost $	Unit
Clean, Grease and Paint:	165.00	EA
Rehab Supports:	779.01	EA
Replace Unit:	7265.33	EA

Table 20 – Delaware Actions for Railings

Material	Action		Cost $	Unit
Concrete	Inject Cracks:	CS 2	12.4	FT
	Surface Seal Cracks:		18.04	FT
	Clean Rebar and Patch:	CS 2	33.79	FT
	Minor Patch:	CS 2	53.11	FT
	Replace Parapet:		214.11	FT
Metal	Surface Clean:		17.15	FT
	Power Tool Clean and Paint:	CS 2	22.4	FT
	Replace Paint System:		98	FT
	Major Rehab:		222.79	FT
	Replace Unit:		275.06	FT
Other	Repoint:	CS 2	32.21	FT
	Replace:		422.02	FT
Timber	Replace Bridge Rail:		290.63	FT

Table 21 – Delaware Actions for Approaches

Material	Action		Cost $	Unit
Concrete	Clean Rebar and Patch:	CS 2	703.09	EA
	Minor Patch:	CS 2	1043.53	EA
	Surface Seal Cracks:		1317.15	EA
	AC Overlay		2703.59	EA
	Overlay Approach Slab: Micro-Silica		8216.75	EA
	Overlay Approach Slab: latex		10441.69	EA
	Replace Unit:		33576.64	EA
Prestressed Concrete	Clean Rebar and Patch:	CS 2	703.09	EA
	Minor Patch:	CS 2	1043.53	EA
	Surface Seal Cracks:		1317.15	EA
	AC Overlay		2703.59	EA
	Overlay Approach Slab: Mmicro-Silica		8216.75	EA
	Overlay Approach Slab: Latex		10441.69	EA
	Replace Unit:		33576.64	EA

Louisiana DOTD Actions and Costs

Information on Louisiana Department of Transportation and Development (DOTD) were obtained from Mr. Arthur D'Andrea, Bridge Engineer Administrator. Louisiana DOTD reports 367 costs for 64 basic actions applied to 77 bridge elements.

Louisiana has 15 actions for bridge decks (Table 22). Actions including patching or replacement of asphalt overlays, repairs to structural concrete decks, repainting or repairs to steel decks, replacement of boards in timber decks, and complete replacements of decks in all materials. Costs for actions range from $1.64 to $340 per square foot.

Table 22 – Louisiana Actions for Decks

Material	Action	CS	Cost $	Unit
Asphalt	Replace AC Overlay	3, 4, 5	$3.19	SF
	Repair Potholes	2, 3	$3.46	SF
	Repair Potholes and Substrate	4, 5	$4.01	SF
Concrete	Repair Spalls/Delam	2, 3, 4	$8.37	SF
	Repair Spalls/Delam; Add a Protective Overlay	4	$8.37	SF
	Replace Deck	5	$42.86	SF
Steel	Replace Deck	5	$39.79	SF
	Rehab Connectors	2, 3, 4	$120.00	SF
	Seal Cracks and/or Repair Potholes	2, 3, 4	$160.00	SF
	Clean & Paint; Rehab Connectors; Replace Deteriorated Sections	5	$181.08	SF
	Replace Deteriorated Sections	4	$192.00	SF
	Repair Potholes and Cracks	3, 4	$287.50	SF
	Rehab; Replace Paint System; Replace Surfacing	5	$337.50	SF
Timber	Replace Deteriorated Deck Boards	2	$1.64	SF
	Replace Deck	3	$33.34	SF

Louisiana has 15 basic actions for superstructure elements (Table 23). Actions include cleaning, painting, patching, repair, rehabilitation and replacement. Costs range from $25 to $3700 per linear foot.

Table 23 – Louisiana Actions for Superstructure

Material	Action	CS	Cost $	Unit
Concrete	Clean Steel; Patch and/or Seal	3	$121.88	LF
	Rehab Member	4	$3,253.13	LF
	Replace Member	4	$3,494.83	LF
Prestressed Concrete	Clean Steel; Patch and/or Seal	3	$124.80	LF
	Rehab Member	4	$3,331.20	LF
	Replace Member	4	$3,738.65	LF
Steel	Clean and Paint	2	$24.97	LF
	Surface Clean; Spot Paint Top Coat	2	$24.97	LF
	Hand Tool; Clean; Paint	3	$35.98	LF
	Replace Paint System	4	$328.03	LF
	Rehab Member	4	$2,988.00	LF
	Replace Member	5	$3,158.08	LF
Timber	Rehab and/or Protect Member	2, 3, 4	$35.50	LF
	Replace Member	3, 4	$65.00	LF

Louisiana has 28 actions for substructure elements (Table 24). Actions include cleaning, painting, rehabilitation and replacement. Costs range from $15 to $9000 per linear foot of substructure element and from $125 to $57,000 per each substructure element.

Table 24 – Louisiana Actions for Substructure

Material	Action	CS	Cost $	Unit
Concrete	Clean Steel; Patch and/or Seal	3	$187.20	LF
	Rehab Member	4	$4,996.80	LF
	Replace Member	4	$9,021.53	LF
Prestressed Concrete	Clean Steel; Patch and/or Seal	3	$146.25	LF
	Rehab Member	4	$3,903.75	LF
	Replace Member	4	$6,014.35	LF
Steel	Surface Clean; Spot Paint Top Coat	2	$15.61	LF
	Clean and Paint	2	$15.61	LF
	Hand Tool; Clean; Paint	3	$22.49	LF
	Replace Paint System	4	$205.02	LF
	Rehab Member	3	$1,680.75	LF
	Replace Member	4	$1,973.80	LF
Timber	Rehab and/or Protect Member	2	$74.55	LF
	Replace Member	3	$136.50	LF
Concrete	Clean Steel; Patch and/or Seal	3	$390.00	EA

Material	Action	CS	Cost $	Unit
	Rehab Member	4	$5,590.00	EA
	Replace Member	4	$56,958.00	EA
Prestressed Concrete	Clean Steel; Patch and/or Seal	3	$222.30	EA
	Rehab Member	4	$3,186.30	EA
	Replace Member	4	$29,048.58	EA
Steel	Surface Clean; Spot Paint Top Coat	2	$124.92	EA
	Hand Tool; Clean; Paint	3	$249.84	EA
	Clean and Paint	2, 3	$2,424.40	EA
	Replace Paint System	4	$2,424.40	EA
	Rehab Member	3	$3,636.60	EA
	Replace Member	4	$33,750.00	EA
Timber	Rehab and/or Protect Member	2, 3, 4	$903.25	EA
	Replace Member	3, 4	$3,410.00	EA

Louisiana's 5 actions for culverts include patching, rehabilitation and replacement (Table 25). Costs range from $98 to $ 1350 per linear foot of culvert.

Table 25 – Louisiana Actions for Culverts

Material	Action	CS	Cost $	Unit
Concrete	Clean Rebar; Patch and/or Seal	3	$97.50	LF
	Rehab Culvert	4	$940.00	LF
	Replace Culvert	4	$1,351.61	LF
Metal	Rehab Culvert	2, 3, 4	$226.67	LF
	Replace Culvert	4	$984.54	LF

Louisiana has 5 actions for approaches that provide grinding, mudjacking, overlays, patching and replacement. Costs range from $575 to $30,000 per approach.

Table 26 – Louisiana Actions for Approaches

Material	Action	CS	Cost $	Unit
Concrete	Grind	2	$575.00	EA
	Add AC Overlay	3	$1,521.00	EA
	Underfill Injection; Seal Cracks	3	$7,915.00	EA
	Patch Approach Slab and Add AC Overlay	4	$11,630.00	EA
	Replace Approach Slab	4	$30,220.00	EA

Louisiana has 12 actions for joints that include replacing seals and replacing joints (Table 27). Costs range from $2 to $975 per foot of joint. Seven actions for bearings provide cleaning, painting, resetting, rehabilitation and replacement (Table 28). Costs range from $650 to $7700 per bearing. Eight actions for railings provide cleaning, painting, patching, rehabilitation and replacement (Table 29). Costs range from $11 to $880 per foot of railing.

Table 27 – Louisiana Actions for Joints

Action	CS	Cost $	Unit
Clean Joint	2	$2.00	LF
Clean and Patch or Clean and Reset	2	$5.00	LF
Rehab Unit	2	$22.25	LF
Replace Seal	2	$43.50	LF
Clean Joint and Replace Seal	2	$46.00	LF
Clean Joint, Patch Spalls and Replace Seal	3	$59.13	LF
Replace Seal and/or Patch Spalls	3	$66.00	LF
Replace Gland; Patch Concrete	3	$71.00	LF
Clean Joint; Patch; Reset	2	$109.50	LF
Replace Unit	3	$385.00	LF
Replace Joint	3	$556.50	LF
Replace Gland and/or Patch Spalls	3	$975.00	LF

Table 28 – Louisiana Actions for Bearings

Action	CS	Cost $	Unit
Clean and Paint	2	$650.00	EA
Rehab Supports and Bearings	3	$3,360.00	EA
Rehab Unit	2	$4,200.00	EA
Reset Bearing	2, 3	$4,950.00	EA
Replace Bearing	3	$5,050.00	EA
Replace Member	3	$5,160.00	EA
Replace Unit	3	$7,740.00	EA

Table 29 – Louisiana Actions for Railings

Material	Action	CS	Cost $	Unit
Concrete	Patch Spalls	3	$165.00	LF
	Replace Rail	4	$882.40	LF
Metal	Clean and Coat	2	$11.50	LF
	Replace Unit	3	$32.40	LF
Other	Rehab Rail	2	$58.00	LF
	Replace Rail	3	$115.60	LF
Timber	Rehab Rail	2	$33.00	LF
	Replace Rail	3	$103.38	LF

The complete table of Louisiana DOT actions and costs appears in Table 31.

Table 30 – Delaware Actions and Costs - Full List

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
11	AC Overlay (sf)	Repair Potholes:	CS 2	1	pct	0.09	SF
11	AC Overlay (sf)	Repair Potholes:	CS 3	6	pct	0.53	SF
11	AC Overlay (sf)	Repair Potholes:	CS 4	17	pct	1.50	SF
11	AC Overlay (sf)	Repair Potholes:	CS 5	25	pct	2.20	SF
11	AC Overlay (sf)	Replace Overlay: Latex				4.23	SF
11	AC Overlay (sf)	Replace Overlay: Micro-Silica				7.94	SF
12	Concrete Deck - Bare (sf)	Waterproof:				2.35	SF
12	Concrete Deck - Bare (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
12	Concrete Deck - Bare (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
12	Concrete Deck - Bare (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
12	Concrete Deck - Bare (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
12	Concrete Deck - Bare (sf)	Deck Repair, 1-3"				36.1	SF
12	Concrete Deck - Bare (sf)	Deck Spall Repair, 3" - Full Depth				73.26	SF
12	Concrete Deck - Bare (sf)	Overlay Deck: Latex				9.32	SF
12	Concrete Deck - Bare (sf)	Overlay Deck: Micro-Silica				7.34	SF
12	Concrete Deck - Bare (sf)	Replace Deck:				38.61	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 2	1	pct	0.09	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 3	6	pct	0.53	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 4	17	pct	1.50	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 5	25	pct	2.20	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Replace Overlay: Latex				9.42	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Replace Overlay: Micro-Silica				7.05	SF
13	Concrete Deck - Unprotected w/AC Overlay (sf)	Replace Deck:				39.52	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Potholes:	CS 2	1	pct	0.09	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Potholes:	CS 3	6	pct	0.53	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Potholes:	CS 4	17	pct	1.50	SF

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Potholes:	CS 5	25	pct	2.20	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Replace Overlay: Latex				9.42	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Replace Overlay: Micro-Silica				7.05	SF
14	Concrete Deck - Protected w/AC Overlay (sf)	Replace Deck:				39.52	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Overlay Deck: Latex				10.07	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Overlay Deck: Micro-Silica				8.09	SF
18	Concrete Deck - Protected w/Thin (<1 in) Overlay (sf)	Replace Deck:				42.37	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Overlay Deck: Latex				11.51	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Overlay Deck: Micro-Silica				9.14	SF
22	Concrete Deck - Protected w/Rigid Overlay (sf)	Replace Deck:				46.14	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Add/Replace Overlay: Latex				9.32	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Add/Replace Overlay: Micro-Silica				7.34	SF
26	Concrete Deck - Protected w/Coated Bars (sf)	Replace Deck:				38.61	SF
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 2	1	pct	0.19	SF
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 3	6	pct	1.12	SF
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 4	17	pct	3.18	SF
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 5	25	pct	4.68	SF
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Add/Replace Overlay: Latex				9.32	SF

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Add/Replace Overlay: Micro-Silica				7.34	SF
27	Concrete Deck - Protected w/Cathodic Protection (sf)	Replace Deck:				38.61	SF
28	Steel Deck - Open Grid (sf)	Surface Clean:				2.45	SF
28	Steel Deck - Open Grid (sf)	Power Wash and Paint:				13.45	SF
28	Steel Deck - Open Grid (sf)	Replace Paint System:				38.50	SF
28	Steel Deck - Open Grid (sf)	Rehab Connectors:	CS 3	200		1.32	SF
28	Steel Deck - Open Grid (sf)	Rehab Connectors:	CS 4	300		1.98	SF
28	Steel Deck - Open Grid (sf)	Rehab Connectors:	CS 5	400		2.64	SF
28	Steel Deck - Open Grid (sf)	Replace Deck:				45.00	SF
29	Steel Deck - Concrete Filled Grid (sf)	Surface Clean:				2.45	SF
29	Steel Deck - Concrete Filled Grid (sf)	Power Wash and Paint:				6.77	SF
29	Steel Deck - Concrete Filled Grid (sf)	Replace Paint System:				15.12	SF
29	Steel Deck - Concrete Filled Grid (sf)	Rehab Connectors:	CS 3	200		1.32	SF
29	Steel Deck - Concrete Filled Grid (sf)	Rehab Connectors:	CS 4	300		1.98	SF
29	Steel Deck - Concrete Filled Grid (sf)	Rehab Connectors:	CS 5	400		2.64	SF
29	Steel Deck - Concrete Filled Grid (sf)	Replace Concrete Filler:	CS 3	6	pct	0.52	SF
29	Steel Deck - Concrete Filled Grid (sf)	Replace Concrete Filler:	CS 4	17	pct	1.48	SF
29	Steel Deck - Concrete Filled Grid (sf)	Replace Concrete Filler:	CS 5	25	pct	2.18	SF
29	Steel Deck - Concrete Filled Grid (sf)	Replace Deck:				45.00	SF
31	Timber Deck (sf)	Replace Deck:				10.39	SF
32	Timber Deck w/AC Overlay (sf)	Repair Potholes:	CS 2	1	pct	0.09	SF
32	Timber Deck w/AC Overlay (sf)	Repair Potholes:	CS 3	6	pct	0.53	SF
32	Timber Deck w/AC Overlay (sf)	Replace AC Overlay:				3.35	SF
32	Timber Deck w/AC Overlay (sf)	Replace Deck:				13.74	SF
33	Composite Deck/Slab	Repair Potholes / Rehab:	CS 2	6	pct	1.12	SF
33	Composite Deck/Slab	Repair Potholes / Rehab:	CS 3	17	pct	3.18	SF
33	Composite Deck/Slab	Replace Deck:				38.61	SF
37	Concrete Slab Under Fill (sf)	Minor Patch:				141.62	SF
37	Concrete Slab Under Fill (sf)	Clean Rebar and Patch:				125.55	SF
37	Concrete Slab Under Fill (sf)	Replace Slab:				71.78	SF
38	Concrete Slab - Bare (sf)	Waterproof:				2.35	SF
38	Concrete Slab - Bare (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
38	Concrete Slab - Bare (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
38	Concrete Slab - Bare (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
38	Concrete Slab - Bare (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
38	Concrete Slab - Bare (sf)	Overlay Slab: Latex				9.32	SF
38	Concrete Slab - Bare (sf)	Overlay Slab: Micro-Silica				7.34	SF
38	Concrete Slab - Bare (sf)	Replace Slab:				61.2	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 2	1	pct	0.18	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 3	6	pct	1.06	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 4	17	pct	3.00	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Potholes:	CS 5	25	pct	4.41	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Replace Overlay: Latex				13.06	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Replace Overlay: micro-Silica				9.16	SF
39	Concrete Slab - Unprotected w/AC Overlay (sf)	Replace Slab:				63.02	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Potholes:	CS 2	1	pct	0.18	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Potholes:	CS 3	6	pct	1.06	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Potholes:	CS 4	17	pct	3.00	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Potholes:	CS 5	25	pct	4.41	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	0.01	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	0.03	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	0.04	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Replace Overlay: Latex				13.06	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Replace Overlay: Micro-Silica				9.16	SF
40	Concrete Slab - Protected w/AC Overlay (sf)	Replace Slab:				63.02	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Overlay Slab: Latex				10.07	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Overlay Slab: Micro-silica				8.09	SF
44	Concrete Slab - Protected w/Thin (<1 in) Overlay (sf)	Replace Slab:				64.96	SF
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Overlay Slab: Latex				11.51	SF
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Overlay Slab: Micro-Silica				9.14	SF
48	Concrete Slab - Protected w/Rigid Overlay (sf)	Replace Slab:				68.73	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 2	1	pct	0.19	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 3	6	pct	1.12	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 4	17	pct	3.18	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Repair Spalled/Delam Areas:	CS 5	25	pct	4.68	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Add/Replace Overlay: Latex				9.32	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Add/Replace Overlay: Micro-Silica				7.34	SF
52	Concrete Slab - Protected w/Coated Bars (sf)	Replace Slab:				61.2	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 2	1	pct	0.19	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 3	6	pct	1.12	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 4	17	pct	3.18	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Repair Spalls and Delaminations:	CS 5	25	pct	4.68	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Add/Replace Overlay: Latex				9.32	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Add/Replace Overlay: Micro-Silica				7.34	SF
53	Concrete Slab - Protected w/Cathodic Protection (sf)	Replace Slab:				61.20	SF
54	Timber Slab (sf)	Rehab Slab:				19.94	SF
54	Timber Slab (sf)	Replace Slab:				66.36	SF
55	Timber Slab w/AC Overlay (sf) - No Longer Used	Repair Potholes:	CS 2	1	pct	0.09	SF
55	Timber Slab w/AC Overlay (sf) - No Longer Used	Repair Potholes:	CS 3	6	pct	0.53	SF
55	Timber Slab w/AC Overlay (sf) - No Longer Used	Replace AC Overlay:				3.35	SF
55	Timber Slab w/AC Overlay (sf) - No Longer Used	Rehab Slab:				19.94	SF
55	Timber Slab w/AC Overlay (sf) - No Longer Used	Replace Slab:				69.70	SF
56	Reinforced Concrete Sidewalk (ft)	Surface Seal Cracks:				13.52	FT
56	Reinforced Concrete Sidewalk (ft)	Inject Cracks:	CS 2	0.25	pct	12.40	FT
56	Reinforced Concrete Sidewalk (ft)	Inject Cracks:	CS 3	0.5	pct	24.79	FT
56	Reinforced Concrete Sidewalk (ft)	Inject Cracks:	CS 4	1	pct	49.58	FT
56	Reinforced Concrete Sidewalk (ft)	Minor Patch:	CS 2	1	pct	10.71	FT
56	Reinforced Concrete Sidewalk (ft)	Minor Patch:	CS 3	6	pct	64.29	FT
56	Reinforced Concrete Sidewalk (ft)	Minor Patch:	CS 4	17	pct	182.15	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
56	Reinforced Concrete Sidewalk (ft)	Clean Rebar and Patch:	CS 2	1	pct	7.22	FT
56	Reinforced Concrete Sidewalk (ft)	Clean Rebar and Patch:	CS 3	6	pct	43.32	FT
56	Reinforced Concrete Sidewalk (ft)	Clean Rebar and Patch:	CS 4	17	pct	122.73	FT
56	Reinforced Concrete Sidewalk (ft)	Replace Unit:				219.58	FT
57	Timber Sidewalk (ft)	Replace Sidewalk:				34.63	SF
58	Sidewalk - Other (ft)	Repoint:	CS 2	25	pct	18.58	FT
58	Sidewalk - Other (ft)	Repoint:	CS 3	50	pct	37.16	FT
58	Sidewalk - Other (ft)	Repoint:	CS 4	75	pct	55.74	FT
58	Sidewalk - Other (ft)	Replace Sidewalk:				172.24	FT
59	Reinforced Concrete Curb (ft)	Surface Seal Cracks:				3.14	FT
59	Reinforced Concrete Curb (ft)	Inject Cracks:	CS 2	0.05	ft	2.48	FT
59	Reinforced Concrete Curb (ft)	Inject Cracks:	CS 3	0.1	ft	4.96	FT
59	Reinforced Concrete Curb (ft)	Inject Cracks:	CS 4	0.2	ft	9.92	FT
59	Reinforced Concrete Curb (ft)	Minor Patch:	CS 2	1	pct	2.48	FT
59	Reinforced Concrete Curb (ft)	Minor Patch:	CS 3	6	pct	14.91	FT
59	Reinforced Concrete Curb (ft)	Minor Patch:	CS 4	17	pct	42.24	FT
59	Reinforced Concrete Curb (ft)	Clean Rebar and Patch:	CS 2	1	pct	1.67	FT
59	Reinforced Concrete Curb (ft)	Clean Rebar and Patch:	CS 3	6	pct	10.04	FT
59	Reinforced Concrete Curb (ft)	Clean Rebar and Patch:	CS 4	17	pct	28.46	FT
59	Reinforced Concrete Curb (ft)	Replace Unit:				26.99	FT
60	Curb - Painted Steel (ft)	Surface Clean:				3.27	FT
60	Curb - Painted Steel (ft)	Power Tool Clean and Paint:	CS 3	25	pct	8.27	FT
60	Curb - Painted Steel (ft)	Power Tool Clean and Paint:	CS 4	50	pct	11.2	FT
60	Curb - Painted Steel (ft)	Replace Paint System:				18.67	FT
60	Curb - Painted Steel (ft)	Replace Unit:				34.03	FT
61	Curb - Other (ft)	Surface Seal Cracks:				3.14	FT
61	Curb - Other (ft)	Inject Cracks:	CS 2	0.05	ft	2.48	FT
61	Curb - Other (ft)	Inject Cracks:	CS 3	0.1	ft	4.96	FT
61	Curb - Other (ft)	Inject Cracks:	CS 4	0.2	ft	9.92	FT
61	Curb - Other (ft)	Minor Patch:	CS 2	1	pct	2.48	FT
61	Curb - Other (ft)	Minor Patch:	CS 3	6	pct	14.91	FT
61	Curb - Other (ft)	Minor Patch:	CS 4	17	pct	42.24	FT
61	Curb - Other (ft)	Clean Rebar and Patch:	CS 2	1	pct	1.67	FT
61	Curb - Other (ft)	Clean Rebar and Patch:	CS 3	6	pct	10.04	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
61	Curb - Other (ft)	Clean Rebar and Patch:	CS 4	17	pct	28.46	FT
61	Curb - Other (ft)	Replace Unit:				26.99	FT
62	Reinforced Concrete Median (ft)	Surface Seal Cracks:				12.54	FT
62	Reinforced Concrete Median (ft)	Inject Cracks:	CS 2	0.25	ft	12.40	FT
62	Reinforced Concrete Median (ft)	Inject Cracks:	CS 3	0.5	ft	24.79	FT
62	Reinforced Concrete Median (ft)	Inject Cracks:	CS 4	1	ft	49.58	FT
62	Reinforced Concrete Median (ft)	Minor Patch:	CS 2	1	pct	8.70	FT
62	Reinforced Concrete Median (ft)	Minor Patch:	CS 3	6	pct	52.18	FT
62	Reinforced Concrete Median (ft)	Minor Patch:	CS 4	17	pct	147.83	FT
62	Reinforced Concrete Median (ft)	Clean Rebar and Patch:	CS 2	1	pct	5.86	FT
62	Reinforced Concrete Median (ft)	Clean Rebar and Patch:	CS 3	6	pct	35.15	FT
62	Reinforced Concrete Median (ft)	Clean Rebar and Patch:	CS 4	17	pct	99.6	FT
62	Reinforced Concrete Median (ft)	Replace Unit:				157.2	FT
63	Median - Painted Steel (ft)	Surface Clean:				13.06	FT
63	Median - Painted Steel (ft)	Power Tool Clean and Paint:	CS 3	25	pct	33.07	FT
63	Median - Painted Steel (ft)	Power Tool Clean and Paint:	CS 4	50	pct	44.8	FT
63	Median - Painted Steel (ft)	Replace Paint System:				74.67	FT
63	Median - Painted Steel (ft)	Replace Unit:				136.14	FT
64	Median - Other (ft)	Repoint:	CS 2	25	pct	14.86	FT
64	Median - Other (ft)	Repoint:	CS 3	50	pct	29.73	FT
64	Median - Other (ft)	Repoint:	CS 4	75	pct	44.59	FT
64	Median - Other (ft)	Replace Median:				137.79	FT
65	Drains/ Scuppers (ea)	Clean Drains/Scuppers:				428.98	FT
65	Drains/ Scuppers (ea)	Repair Drains:				2312.5	FT
66	Timber Curb (ft)	Replace Curb:				20.78	FT
67	Steel Sidewalk - Open Grid (sf)	Surface Clean:				12.25	FT
67	Steel Sidewalk - Open Grid (sf)	Power Wash and Paint:				67.25	FT
67	Steel Sidewalk - Open Grid (sf)	Replace Paint System:				192.5	FT
67	Steel Sidewalk - Open Grid (sf)	Rehab Connectors:	CS 3	200		6.60	FT
67	Steel Sidewalk - Open Grid (sf)	Rehab Connectors:	CS 4	300		9.90	FT
67	Steel Sidewalk - Open Grid (sf)	Rehab Connectors:	CS 5	400		13.20	FT
67	Steel Sidewalk - Open Grid (sf)	Replace Deck:				225.00	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Surface Clean:				12.25	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Power Wash and Paint:				33.85	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
68	Steel Sidewalk - Concrete Filled Grid (sf)	Replace Paint System:				75.60	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Rehab Connectors:	CS 3	200		6.60	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Rehab Connectors:	CS 4	300		9.90	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Rehab Connectors:	CS 5	400		13.20	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Replace Concrete Filler:	CS 3	6	pct	2.62	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Replace Concrete Filler:	CS 4	17	pct	7.42	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Replace Concrete Filler:	CS 5	25	pct	10.91	FT
68	Steel Sidewalk - Concrete Filled Grid (sf)	Replace Deck:				225.00	FT
101	Unpainted Steel Closed Web/Box Girder (ft)	Power Tool Clean and Paint:	CS 2	25	pct	51.20	FT
101	Unpainted Steel Closed Web/Box Girder (ft)	Power Tool Clean and Paint:	CS 3	50	pct	102.40	FT
101	Unpainted Steel Closed Web/Box Girder (ft)	Replace Paint System:				224.00	FT
101	Unpainted Steel Closed Web/Box Girder (ft)	Major Rehab:				723.17	FT
101	Unpainted Steel Closed Web/Box Girder (ft)	Replace Unit:				1122.22	FT
102	Painted Steel Closed Web/Box Girder (ft)	Surface Clean:				39.19	FT
102	Painted Steel Closed Web/Box Girder (ft)	Power Tool Clean and Paint:	CS 3	25	pct	51.20	FT
102	Painted Steel Closed Web/Box Girder (ft)	Power Tool Clean and Paint:	CS 4	50	pct	102.40	FT
102	Painted Steel Closed Web/Box Girder (ft)	Replace Paint System:				224.00	FT
102	Painted Steel Closed Web/Box Girder (ft)	Major Rehab:				723.17	FT
102	Painted Steel Closed Web/Box Girder (ft)	Replace Unit:				1122.22	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Surface Seal Cracks:				24.22	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Minor Patch:	CS 2	4.25	pct	67.32	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Minor Patch:	CS 3	8.75	pct	138.59	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Minor Patch:	CS 4	17.5	pct	277.19	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	45.36	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	93.38	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	186.76	FT
104	Prestressed Concrete Closed Web/Box Girder (ft)	Replace Unit:				138.73	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Surface Seal Cracks:				24.22	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
105	Reinforced Concrete Closed Web/Box Girder (ft)	Minor Patch:	CS 2	4.25	pct	67.31	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Minor Patch:	CS 3	8.75	pct	138.59	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Minor Patch:	CS 4	17.5	pct	277.18	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	45.36	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	93.38	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	186.76	FT
105	Reinforced Concrete Closed Web/Box Girder (ft)	Replace Unit:				289.26	FT
106	Unpainted Steel Open Girder/Stringer (ft)	Power Tool Clean and Paint:	CS 2	25	pct	32.00	FT
106	Unpainted Steel Open Girder/Stringer (ft)	Power Tool Clean and Paint:	CS 3	50	pct	64.00	FT
106	Unpainted Steel Open Girder/Stringer (ft)	Replace Paint System:				140.00	FT
106	Unpainted Steel Open Girder/Stringer (ft)	Major Rehab:				321.52	FT
106	Unpainted Steel Open Girder/Stringer (ft)	Replace Unit:				440.09	FT
107	Painted Steel Open Girder/ Stringer (ft)	Surface Clean:				24.50	FT
107	Painted Steel Open Girder/ Stringer (ft)	Power Tool Clean and Paint:	CS 3	25	pct	32.00	FT
107	Painted Steel Open Girder/ Stringer (ft)	Power Tool Clean and Paint:	CS 4	50	pct	64.00	FT
107	Painted Steel Open Girder/ Stringer (ft)	Replace Paint System:				140.00	FT
107	Painted Steel Open Girder/ Stringer (ft)	Major Rehab:				321.52	FT
107	Painted Steel Open Girder/ Stringer (ft)	Replace Unit:				440.09	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Surface Seal Cracks:				26.67	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Minor Patch:	CS 2	4.25	pct	74.13	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Minor Patch:	CS 3	8.75	pct	152.62	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Minor Patch:	CS 4	17.5	pct	305.23	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	49.94	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	102.83	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	205.65	FT
109	Prestressed Concrete Open Girder/Stringer (ft)	Replace Unit:				313.94	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Surface Seal Cracks:				27.07	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Minor Patch:	CS 2	4.25	pct	75.24	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
110	Reinforced Concrete Open Girder/Stringer (ft)	Minor Patch:	CS 3	8.75	pct	154.90	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Minor Patch:	CS 4	17.5	pct	309.80	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	50.69	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	104.36	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	208.73	FT
110	Reinforced Concrete Open Girder/Stringer (ft)	Replace Unit:				451.12	FT
111	Timber Open Girder (ft)	Replace Girder:				49.78	FT
112	Unpainted Steel Stringer (Girder/Floor Beam) (ft)	Power Tool Clean and Paint:	CS 2	25	pct	22.40	FT
112	Unpainted Steel Stringer (Girder/Floor Beam) (ft)	Power Tool Clean and Paint:	CS 3	50	pct	44.80	FT
112	Unpainted Steel Stringer (Girder/Floor Beam) (ft)	Replace Paint System:				98.00	FT
112	Unpainted Steel Stringer (Girder/Floor Beam) (ft)	Major Rehab:				222.79	FT
112	Unpainted Steel Stringer (Girder/Floor Beam) (ft)	Replace Unit:				275.06	FT
113	Painted Steel Stringer (Girder/Floor Beam) (ft)	Surface Clean:				17.15	FT
113	Painted Steel Stringer (Girder/Floor Beam) (ft)	Power Tool Clean and Paint:	CS 3	25	pct	22.40	FT
113	Painted Steel Stringer (Girder/Floor Beam) (ft)	Power Tool Clean and Paint:	CS 4	50	pct	44.80	FT
113	Painted Steel Stringer (Girder/Floor Beam) (ft)	Replace Paint System:				98.00	FT
113	Painted Steel Stringer (Girder/Floor Beam) (ft)	Major Rehab:				222.79	FT
113	Painted Steel Stringer (Girder/Floor Beam) (ft)	Replace Unit:				275.06	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Surface Seal Cracks:				26.67	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Minor Patch:	CS 2	4.25	pct	74.13	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Minor Patch:	CS 3	8.75	pct	152.62	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Minor Patch:	CS 4	17.5	pct	305.23	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	49.94	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	102.83	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	205.65	FT
115	Prestressed Concrete Open Stringer (girder/Floorbeam) (ft)	Replace Unit:				313.94	FT
116	Reinforced Concrete Stringer (ft)	Surface Seal Cracks:				27.07	FT
116	Reinforced Concrete Stringer (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
116	Reinforced Concrete Stringer (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
116	Reinforced Concrete Stringer (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
116	Reinforced Concrete Stringer (ft)	Minor Patch:	CS 2	4.25	pct	75.24	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
116	Reinforced Concrete Stringer (ft)	Minor Patch:	CS 3	8.75	pct	154.90	FT
116	Reinforced Concrete Stringer (ft)	Minor Patch:	CS 4	17.5	pct	309.80	FT
116	Reinforced Concrete Stringer (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	50.69	FT
116	Reinforced Concrete Stringer (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	104.36	FT
116	Reinforced Concrete Stringer (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	208.73	FT
116	Reinforced Concrete Stringer (ft)	Replace Unit:				451.12	FT
117	Timber Stringer (ft)	Replace Stringer:				49.78	FT
120	Unpainted Steel - Thru Truss Bottom Chord (ft)	Power Tool Clean and Paint:	CS 2	25	pct	18.11	FT
120	Unpainted Steel - Thru Truss Bottom Chord (ft)	Power Tool Clean and Paint:	CS 3	50	pct	36.22	FT
120	Unpainted Steel - Thru Truss Bottom Chord (ft)	Replace Paint System:				79.24	FT
120	Unpainted Steel - Thru Truss Bottom Chord (ft)	Major Rehab:				147.25	FT
120	Unpainted Steel - Thru Truss Bottom Chord (ft)	Replace Unit:				204.04	FT
121	Painted Steel - Thru Truss Bottom Chord (ft)	Surface Clean:				13.86	FT
121	Painted Steel - Thru Truss Bottom Chord (ft)	Power Tool Clean and Paint:	CS 3	25	pct	18.11	FT
121	Painted Steel - Thru Truss Bottom Chord (ft)	Power Tool Clean and Paint:	CS 4	50	pct	36.22	FT
121	Painted Steel - Thru Truss Bottom Chord (ft)	Replace Paint System:				79.24	FT
121	Painted Steel - Thru Truss Bottom Chord (ft)	Major Rehab:				147.25	FT
121	Painted Steel - Thru Truss Bottom Chord (ft)	Replace Unit:				204.04	FT
125	Unpainted Steel - Thru Truss Top (ft)	Power Tool Clean and Paint:	CS 2	25	pct	39.04	FT
125	Unpainted Steel - Thru Truss Top (ft)	Power Tool Clean and Paint:	CS 3	50	pct	78.08	FT
125	Unpainted Steel - Thru Truss Top (ft)	Replace Paint System:				170.8	FT
125	Unpainted Steel - Thru Truss Top (ft)	Major Rehab:				270.82	FT
125	Unpainted Steel - Thru Truss Top (ft)	Replace Unit:				433.21	FT
126	Painted Steel - Thru Truss Top (ft)	Surface Clean:				29.88	FT
126	Painted Steel - Thru Truss Top (ft)	Power Tool Clean and Paint:	CS 3	25	pct	39.04	FT
126	Painted Steel - Thru Truss Top (ft)	Power Tool Clean and Paint:	CS 4	50	pct	78.08	FT
126	Painted Steel - Thru Truss Top (ft)	Replace Paint System:				170.8	FT
126	Painted Steel - Thru Truss Top (ft)	Major Rehab:				270.82	FT
126	Painted Steel - Thru Truss Top (ft)	Replace Unit:				433.21	FT
130	Unpainted Steel Thru Truss	Power Tool Clean and Paint:	CS 2	25	pct	57.15	FT
130	Unpainted Steel Thru Truss	Power Tool Clean and Paint:	CS 3	50	pct	114.30	FT
130	Unpainted Steel Thru Truss	Replace Paint System:				250.04	FT
130	Unpainted Steel Thru Truss	Major Rehab:				509.63	FT
130	Unpainted Steel Thru Truss	Replace Unit:				582.84	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
134	Reinforced Concrete Filled Arch (sf)	Minor Patch:				141.62	SF
134	Reinforced Concrete Filled Arch (sf)	Clean Rebar and Patch:				124.30	SF
134	Reinforced Concrete Filled Arch (sf)	Replace Unit:				162.67	SF
144	Reinforced Concrete Arch (ft)	Minor Patch:	CS 2	8.5	pct	79.20	FT
144	Reinforced Concrete Arch (ft)	Minor Patch:	CS 3	17.5	pct	163.05	FT
144	Reinforced Concrete Arch (ft)	Minor Patch:	CS 4	35	pct	326.10	FT
144	Reinforced Concrete Arch (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	53.36	FT
144	Reinforced Concrete Arch (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	109.86	FT
144	Reinforced Concrete Arch (ft)	Clean Rebar and Patch:	CS 4	35	pct	219.71	FT
144	Reinforced Concrete Arch (ft)	Replace Unit:				813.33	FT
145	Arch - Other (ft)	Repoint:				14.86	FT
145	Arch - Other (ft)	Replace:				162.67	FT
151	Unpainted Steel Floorbeam (ft)	Power Tool Clean and Paint:	CS 2	25	pct	22.40	FT
151	Unpainted Steel Floorbeam (ft)	Power Tool Clean and Paint:	CS 3	50	pct	44.80	FT
151	Unpainted Steel Floorbeam (ft)	Replace Paint System:				98.00	FT
151	Unpainted Steel Floorbeam (ft)	Major Rehab:				222.79	FT
151	Unpainted Steel Floorbeam (ft)	Replace Unit:				275.06	FT
152	Painted Steel Floorbeam (ft)	Surface Clean:				17.15	FT
152	Painted Steel Floorbeam (ft)	Power Tool Clean and Paint:	CS 3	25	pct	22.40	FT
152	Painted Steel Floorbeam (ft)	Power Tool Clean and Paint:	CS 4	50	pct	44.80	FT
152	Painted Steel Floorbeam (ft)	Replace Paint System:				98.00	FT
152	Painted Steel Floorbeam (ft)	Major Rehab:				222.79	FT
152	Painted Steel Floorbeam (ft)	Replace Unit:				275.06	FT
154	Prestressed Concrete Floor Beam (ft)	Surface Seal Cracks:				26.67	FT
154	Prestressed Concrete Floor Beam (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
154	Prestressed Concrete Floor Beam (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
154	Prestressed Concrete Floor Beam (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
154	Prestressed Concrete Floor Beam (ft)	Minor Patch:	CS 2	4.25	pct	74.13	FT
154	Prestressed Concrete Floor Beam (ft)	Minor Patch:	CS 3	8.75	pct	152.62	FT
154	Prestressed Concrete Floor Beam (ft)	Minor Patch:	CS 4	17.5	pct	305.23	FT
154	Prestressed Concrete Floor Beam (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	49.94	FT
154	Prestressed Concrete Floor Beam (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	102.83	FT
154	Prestressed Concrete Floor Beam (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	205.65	FT
154	Prestressed Concrete Floor Beam (ft)	Replace Unit:				313.94	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
155	Reinforced Concrete Floor Beam (ft)	Surface Seal Cracks:				27.07	FT
155	Reinforced Concrete Floor Beam (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
155	Reinforced Concrete Floor Beam (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
155	Reinforced Concrete Floor Beam (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
155	Reinforced Concrete Floor Beam (ft)	Minor Patch:	CS 2	4.25	pct	75.24	FT
155	Reinforced Concrete Floor Beam (ft)	Minor Patch:	CS 3	8.75	pct	154.9	FT
155	Reinforced Concrete Floor Beam (ft)	Minor Patch:	CS 4	17.5	pct	309.8	FT
155	Reinforced Concrete Floor Beam (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	50.69	FT
155	Reinforced Concrete Floor Beam (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	104.36	FT
155	Reinforced Concrete Floor Beam (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	208.73	FT
155	Reinforced Concrete Floor Beam (ft)	Replace Unit:				451.12	FT
156	Timber Floor Beam (ft)	Replace Floor Beam:				49.78	FT
160	Unpainted Steel - Pin and/or Pin ans Hanger Assembly (ea)	Clean, Grease and Paint:				165.00	EA
160	Unpainted Steel - Pin and/or Pin ans Hanger Assembly (ea)	Rehab Supports:				779.01	EA
160	Unpainted Steel - Pin and/or Pin ans Hanger Assembly (ea)	Replace Unit:				7265.33	EA
161	Painted Steel - Pin and/or Pin ans Hanger Assembly (ea)	Clean, Grease and Paint:				165.00	EA
161	Painted Steel - Pin and/or Pin ans Hanger Assembly (ea)	Rehab Supports:				779.01	EA
161	Painted Steel - Pin and/or Pin ans Hanger Assembly (ea)	Replace Unit:				7265.33	EA
201	Unpainted Steel - Column or Pile (LF)	Clean and Paint:	CS 2	25	pct	49.06	FT
201	Unpainted Steel - Column or Pile (LF)	Clean and Paint:	CS 3	50	pct	98.13	FT
201	Unpainted Steel - Column or Pile (LF)	Major Rehab:				545.87	FT
201	Unpainted Steel - Column or Pile (LF)	Replace Unit:				1950.34	FT
202	Painted Steel - Column or Pile (LF)	Clean and Paint:	CS 3	25	pct	49.06	FT
202	Painted Steel - Column or Pile (LF)	Clean and Paint:	CS 4	50	pct	98.13	FT
202	Painted Steel - Column or Pile (LF)	Major Rehab:				545.87	FT
202	Painted Steel - Column or Pile (LF)	Replace Unit:				1950.34	FT
204	Prestressed Concrete Column or Pile (LF)	Minor Patch:	CS 2	8.5	pct	124.34	FT
204	Prestressed Concrete Column or Pile (LF)	Minor Patch:	CS 3	17.5	pct	255.99	FT
204	Prestressed Concrete Column or Pile (LF)	Minor Patch:	CS 4	35	pct	511.98	FT
204	Prestressed Concrete Column or Pile (LF)	Clean Rebar and Patch:	CS 2	8.5	pct	83.77	FT
204	Prestressed Concrete Column or Pile (LF)	Clean Rebar and Patch:	CS 3	17.5	pct	172.48	FT
204	Prestressed Concrete Column or Pile (LF)	Clean Rebar and Patch:	CS 4	35	pct	344.95	FT
204	Prestressed Concrete Column or Pile (LF)	Major Rehab:				545.87	FT
204	Prestressed Concrete Column or Pile (LF)	Replace Unit:				1577.92	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
205	Reinforced Concrete Column or Pile (LF)	Minor Patch:	CS 2	8.5	pct	124.34	FT
205	Reinforced Concrete Column or Pile (LF)	Minor Patch:	CS 3	17.5	pct	255.99	FT
205	Reinforced Concrete Column or Pile (LF)	Minor Patch:	CS 4	35	pct	511.98	FT
205	Reinforced Concrete Column or Pile (LF)	Clean Rebar and Patch:	CS 2	8.5	pct	83.77	FT
205	Reinforced Concrete Column or Pile (LF)	Clean Rebar and Patch:	CS 3	17.5	pct	172.48	FT
205	Reinforced Concrete Column or Pile (LF)	Clean Rebar and Patch:	CS 4	35	pct	344.95	FT
205	Reinforced Concrete Column or Pile (LF)	Major Rehab:				545.87	FT
205	Reinforced Concrete Column or Pile (LF)	Replace Unit:				1577.92	FT
206	Timber - Column or Pile (LF)	Major Rehab:				545.87	FT
206	Timber - Column or Pile (LF)	Replace Unit:				1335.04	FT
207	Jacketed Pile	Replace Jacket				5240.32	FT
210	Reinforced Concrete Pier Wall (ft)	Surface Seal Cracks:				95.45	FT
210	Reinforced Concrete Pier Wall (ft)	Inject Cracks:	CS 2	2	ft	99.16	FT
210	Reinforced Concrete Pier Wall (ft)	Inject Cracks:	CS 3	9	ft	446.24	FT
210	Reinforced Concrete Pier Wall (ft)	Inject Cracks:	CS 4	16	ft	793.31	FT
210	Reinforced Concrete Pier Wall (ft)	Minor Patch:	CS 2	8.5	pct	530.62	FT
210	Reinforced Concrete Pier Wall (ft)	Minor Patch:	CS 3	17.5	pct	1092.45	FT
210	Reinforced Concrete Pier Wall (ft)	Minor Patch:	CS 4	35	pct	2184.89	FT
210	Reinforced Concrete Pier Wall (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	357.51	FT
210	Reinforced Concrete Pier Wall (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	736.04	FT
210	Reinforced Concrete Pier Wall (ft)	Clean Rebar and Patch:	CS 4	35	pct	1472.08	FT
210	Reinforced Concrete Pier Wall (ft)	Replace Unit:				2734.92	FT
211	Other Pier Wall (ft)	Repoint:	CS 2	25	pct	124.49	FT
211	Other Pier Wall (ft)	Repoint:	CS 3	50	pct	248.97	FT
211	Other Pier Wall (ft)	Repoint:	CS 4	75	pct	373.46	FT
211	Other Pier Wall (ft)	Replace:				2734.92	FT
213	Concrete Encased Open Girder (ft)	Power Tool Clean and Paint:	CS 3	25	pct	32.00	FT
213	Concrete Encased Open Girder (ft)	Power Tool Clean and Paint:	CS 4	50	pct	64.00	FT
213	Concrete Encased Open Girder (ft)	Replace Paint System:				140.00	FT
213	Concrete Encased Open Girder (ft)	Major Rehab:				321.52	FT
213	Concrete Encased Open Girder (ft)	Replace Unit:				440.09	FT
215	Reinforced Concrete Abutment (ft)	Surface Seal Cracks:				25.64	FT
215	Reinforced Concrete Abutment (ft)	Inject Cracks:	CS 2	1	ft	49.58	FT
215	Reinforced Concrete Abutment (ft)	Inject Cracks:	CS 3	5	ft	247.91	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
215	Reinforced Concrete Abutment (ft)	Inject Cracks:	CS 4	10	ft	495.82	FT
215	Reinforced Concrete Abutment (ft)	Minor Patch:	CS 2	8.5	pct	158.39	FT
215	Reinforced Concrete Abutment (ft)	Minor Patch:	CS 3	17.5	pct	326.10	FT
215	Reinforced Concrete Abutment (ft)	Minor Patch:	CS 4	35	pct	652.21	FT
215	Reinforced Concrete Abutment (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	106.72	FT
215	Reinforced Concrete Abutment (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	219.71	FT
215	Reinforced Concrete Abutment (ft)	Clean Rebar and Patch:	CS 4	35	pct	439.43	FT
215	Reinforced Concrete Abutment (ft)	Replace Unit:				2260.94	FT
216	Timber Abutment (ft)	Replace Cap:				847.69	FT
217	Other Abutment (ft)	Repoint:	CS 2	25	pct	37.16	FT
217	Other Abutment (ft)	Repoint:	CS 3	50	pct	74.32	FT
217	Other Abutment (ft)	Repoint:	CS 4	75	pct	111.48	FT
217	Other Abutment (ft)	Replace:				2260.94	FT
218	MSE Wall (ft)	Surface Seal Cracks:	CS 2	1	ft	49.58	FT
218	MSE Wall (ft)	Surface Seal Cracks:	CS 3	5	ft	247.91	FT
218	MSE Wall (ft)	Surface Seal Cracks:	CS 4	10	ft	495.82	FT
218	MSE Wall (ft)	Minor Patch:	CS 2	8.5	pct	158.39	FT
218	MSE Wall (ft)	Minor Patch:	CS 3	17.5	pct	326.10	FT
218	MSE Wall (ft)	Minor Patch:	CS 4	35	pct	652.21	FT
218	MSE Wall (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	42.14	FT
218	MSE Wall (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	86.77	FT
218	MSE Wall (ft)	Clean Rebar and Patch:	CS 4	35	pct	173.54	FT
218	MSE Wall (ft)	Replace Unit:				2260.94	FT
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Minor Patch:	CS 2	8.5	pct	7602.87	EA
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Minor Patch:	CS 3	17.5	pct	15652.97	EA
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Minor Patch:	CS 4	35	pct	31305.94	EA
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Clean Rebar and Patch:	CS 2	8.5	pct	5122.48	EA
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Clean Rebar and Patch:	CS 3	17.5	pct	10546.28	EA
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Clean Rebar and Patch:	CS 4	35	pct	21092.56	EA
220	Reinforced Concrete Submerged Pile Cap/Footing (ea)	Replace Unit:				80802.50	EA
230	Unpainted Steel Cap (ft)	Power Tool Clean and Paint:	CS 2	25	pct	64.00	FT
230	Unpainted Steel Cap (ft)	Power Tool Clean and Paint:	CS 3	50	pct	128.00	FT
230	Unpainted Steel Cap (ft)	Replace Paint System:				280.00	FT
230	Unpainted Steel Cap (ft)	Major Rehab:				654.38	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
230	Unpainted Steel Cap (ft)	Replace Unit:				3055.18	FT
231	Painted Steel Cap (ft)	Surface Clean:				48.99	FT
231	Painted Steel Cap (ft)	Power Tool Clean and Paint:	CS 3	25	pct	64.00	FT
231	Painted Steel Cap (ft)	Power Tool Clean and Paint:	CS 4	50	pct	128.00	FT
231	Painted Steel Cap (ft)	Replace Paint System:				280.00	FT
231	Painted Steel Cap (ft)	Major Rehab:				654.38	FT
231	Painted Steel Cap (ft)	Replace Unit:				3055.18	FT
233	P/S Concrete Cap (ft)	Surface Seal Cracks:				45.59	FT
233	P/S Concrete Cap (ft)	Inject Cracks:	CS 2	1	ft	49.58	FT
233	P/S Concrete Cap (ft)	Inject Cracks:	CS 3	8	ft	396.66	FT
233	P/S Concrete Cap (ft)	Inject Cracks:	CS 4	16	ft	793.31	FT
233	P/S Concrete Cap (ft)	Minor Patch:	CS 2	8.5	pct	253.43	FT
233	P/S Concrete Cap (ft)	Minor Patch:	CS 3	17.5	pct	521.77	FT
233	P/S Concrete Cap (ft)	Minor Patch:	CS 4	35	pct	1043.53	FT
233	P/S Concrete Cap (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	170.75	FT
233	P/S Concrete Cap (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	351.54	FT
233	P/S Concrete Cap (ft)	Clean Rebar and Patch:	CS 4	35	pct	703.09	FT
233	P/S Concrete Cap (ft)	Replace Unit:				2252.35	FT
234	Reinforced Concrete Cap (ft)	Surface Seal Cracks:				45.59	FT
234	Reinforced Concrete Cap (ft)	Inject Cracks:	CS 2	1	ft	49.58	FT
234	Reinforced Concrete Cap (ft)	Inject Cracks:	CS 3	8	ft	396.66	FT
234	Reinforced Concrete Cap (ft)	Inject Cracks:	CS 4	16	ft	793.31	FT
234	Reinforced Concrete Cap (ft)	Minor Patch:	CS 2	8.5	pct	253.43	FT
234	Reinforced Concrete Cap (ft)	Minor Patch:	CS 3	17.5	pct	521.77	FT
234	Reinforced Concrete Cap (ft)	Minor Patch:	CS 4	35	pct	1043.53	FT
234	Reinforced Concrete Cap (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	170.75	FT
234	Reinforced Concrete Cap (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	351.54	FT
234	Reinforced Concrete Cap (ft)	Clean Rebar and Patch:	CS 4	35	pct	703.09	FT
234	Reinforced Concrete Cap (ft)	Replace Unit:				2252.35	FT
235	Timber Cap	Replace Cap:				847.69	FT
236	Reinforced Concrete Strut (ea)	Surface Seal Cracks:				45.59	FT
236	Reinforced Concrete Strut (ea)	Inject Cracks:	CS 2	1	ft	49.58	FT
236	Reinforced Concrete Strut (ea)	Inject Cracks:	CS 3	8	ft	396.66	FT
236	Reinforced Concrete Strut (ea)	Inject Cracks:	CS 4	16	ft	793.31	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
236	Reinforced Concrete Strut (ea)	Minor Patch:	CS 2	8.5	pct	2027.43	FT
236	Reinforced Concrete Strut (ea)	Minor Patch:	CS 3	17.5	pct	4174.13	FT
236	Reinforced Concrete Strut (ea)	Minor Patch:	CS 4	35	pct	8348.25	FT
236	Reinforced Concrete Strut (ea)	Clean Rebar and Patch:	CS 2	8.5	pct	1365.99	FT
236	Reinforced Concrete Strut (ea)	Clean Rebar and Patch:	CS 3	17.5	pct	2812.34	FT
236	Reinforced Concrete Strut (ea)	Clean Rebar and Patch:	CS 4	35	pct	5624.68	FT
236	Reinforced Concrete Strut (ea)	Replace Unit:				7352.16	FT
237	Timber Strut (ea)	Replace Cap:				204.82	FT
240	Minor Culvert - Steel (ft)	Replace Unit:				261.69	FT
241	Minor Culvert - Concrete	Rehab Unit:	CS 3	1	Sf	75.73	FT
241	Minor Culvert - Concrete	Rehab Unit:	CS 4	3	Sf	227.19	FT
241	Minor Culvert - Concrete	Replace Unit:				246.98	FT
243	Culvert - Other (ft)	Repoint:	CS 2	25	pct	59.46	FT
243	Culvert - Other (ft)	Repoint:	CS 3	50	pct	118.91	FT
243	Culvert - Other (ft)	Repoint:	CS 4	75	pct	178.37	FT
243	Culvert - Other (ft)	Replace Unit:				1177.23	FT
244	Major Culvert - Steel (ft)	Replace Unit:				1881.38	FT
245	Major Culvert - Concrete (ft)	Seal Cracks:	CS 2	1	ft	49.58	FT
245	Major Culvert - Concrete (ft)	Seal Cracks:	CS 3	5	ft	247.91	FT
245	Major Culvert - Concrete (ft)	Seal Cracks:	CS 4	9	ft	446.24	FT
245	Major Culvert - Concrete (ft)	Minor Patch:	CS 2	8.5	pct	522.7	FT
245	Major Culvert - Concrete (ft)	Minor Patch:	CS 3	17.5	pct	1076.14	FT
245	Major Culvert - Concrete (ft)	Minor Patch:	CS 4	35	pct	2152.28	FT
245	Major Culvert - Concrete (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	352.17	FT
245	Major Culvert - Concrete (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	725.06	FT
245	Major Culvert - Concrete (ft)	Clean Rebar and Patch:	CS 4	35	pct	1450.11	FT
245	Major Culvert - Concrete (ft)	Replace Unit:				2203.62	FT
260	Unpainted Steel Sheeting (ft)	Surface Clean:				24.50	FT
260	Unpainted Steel Sheeting (ft)	Power Tool Clean and Paint:	CS 2	25	pct	32.00	FT
260	Unpainted Steel Sheeting (ft)	Power Tool Clean and Paint:	CS 3	50	pct	64.00	FT
260	Unpainted Steel Sheeting (ft)	Replace Paint System:				140.00	FT
260	Unpainted Steel Sheeting (ft)	Major Rehab:				216.58	FT
260	Unpainted Steel Sheeting (ft)	Replace Unit:				547.24	FT
261	Painted Steel Sheeting (ft)	Surface Clean:				24.50	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
261	Painted Steel Sheeting (ft)	Power Tool Clean and Paint:	CS 3	25	pct	32.00	FT
261	Painted Steel Sheeting (ft)	Power Tool Clean and Paint:	CS 4	50	pct	64.00	FT
261	Painted Steel Sheeting (ft)	Replace Paint System:				140.00	FT
261	Painted Steel Sheeting (ft)	Major Rehab:				216.58	FT
261	Painted Steel Sheeting (ft)	Replace Unit:				547.24	FT
262	P/S Concrete Sheeting (ft)	Surface Seal Cracks:				25.64	FT
262	P/S Concrete Sheeting (ft)	Inject Cracks:	CS 2	1	ft	49.58	FT
262	P/S Concrete Sheeting (ft)	Inject Cracks:	CS 3	5	ft	247.91	FT
262	P/S Concrete Sheeting (ft)	Inject Cracks:	CS 4	10	ft	495.82	FT
262	P/S Concrete Sheeting (ft)	Minor Patch:	CS 2	8.5	pct	158.39	FT
262	P/S Concrete Sheeting (ft)	Minor Patch:	CS 3	17.5	pct	326.10	FT
262	P/S Concrete Sheeting (ft)	Minor Patch:	CS 4	35	pct	652.21	FT
262	P/S Concrete Sheeting (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	106.72	FT
262	P/S Concrete Sheeting (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	219.71	FT
262	P/S Concrete Sheeting (ft)	Clean Rebar and Patch:	CS 4	35	pct	439.43	FT
262	P/S Concrete Sheeting (ft)	Replace Unit:				2260.94	FT
264	Timber Sheeting (ft)	Replace				324.53	FT
300	Strip Seal Expansion Joint (ft)	Replace Gland & Patch Concrete:				46.00	FT
300	Strip Seal Expansion Joint (ft)	Replace Joint w/Deck Replacement:				280.32	FT
300	Strip Seal Expansion Joint (ft)	Replace Joint:				447.87	FT
301	Pourable Joint Seal (ft)	Clean Joint and Replace Seal:				43.77	FT
301	Pourable Joint Seal (ft)	Clean Joint, Patch Spalls, and Replace Seal:				54.71	FT
302	Compression Joint Seal (ft)	Replace Gland & Patch Concrete:				46.00	FT
302	Compression Joint Seal (ft)	Replace Joint w/Deck Replacement:				280.32	FT
302	Compression Joint Seal (ft)	Replace Joint:				447.87	FT
303	Assembly Joint Seal (ft)	Replace Gland & Patch Concrete:				46.00	FT
303	Assembly Joint Seal (ft)	Replace Joint w/Deck Replacement:				280.32	FT
303	Assembly Joint Seal (ft)	Replace Joint:				447.87	FT
304	Open Expansion Joint (ft)	Replace Gland & Patch Concrete:				46.00	FT
304	Open Expansion Joint (ft)	Replace Joint w/Deck Replacement:				280.32	FT
304	Open Expansion Joint (ft)	Replace Joint:				447.87	FT
309	Asphaltic Plug Joint (ft)	Clean Joint and Replace Seal:				54.71	FT
309	Asphaltic Plug Joint (ft)	Clean Joint, Patch Spalls, and Replace Seal:				140.11	FT
310	Elastomeric Bearing (ea)	Replace Unit:				7265.33	EA

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
311	Moveable Bearing (roller, sliding, etc.) (ea)	Clean, Grease and Paint:				165.00	EA
311	Moveable Bearing (roller, sliding, etc.) (ea)	Rehab Supports:				779.01	EA
311	Moveable Bearing (roller, sliding, etc.) (ea)	Replace Unit:				7265.33	EA
312	Enclosed/Concealed Bearing (ea)	Clean, Grease and Paint:				165.00	EA
312	Enclosed/Concealed Bearing (ea)	Rehab Supports:				779.01	EA
312	Enclosed/Concealed Bearing (ea)	Replace Unit:				7265.33	EA
313	Fixed Bearing (ea)	Clean, Grease and Paint:				165.00	EA
313	Fixed Bearing (ea)	Rehab Supports:				779.01	EA
313	Fixed Bearing (ea)	Replace Unit:				7265.33	EA
314	Pot Bearing (ea)	Clean, Grease and Paint:				165.00	EA
314	Pot Bearing (ea)	Rehab Supports:				779.01	EA
314	Pot Bearing (ea)	Replace Unit:				7265.33	EA
315	Disk Bearing (ea)	Clean, Grease and Paint:				165.00	EA
315	Disk Bearing (ea)	Rehab Supports:				779.01	EA
315	Disk Bearing (ea)	Replace Unit:				7265.33	EA
320	P/S Concrete Approach Slab (ea)	Surface Seal Cracks:				1317.15	EA
320	P/S Concrete Approach Slab (ea)	Minor Patch:	CS 2	1	pct	1043.53	EA
320	P/S Concrete Approach Slab (ea)	Minor Patch:	CS 3	6	pct	6261.19	EA
320	P/S Concrete Approach Slab (ea)	Minor Patch:	CS 4	17	pct	17740.03	EA
320	P/S Concrete Approach Slab (ea)	Clean Rebar and Patch:	CS 2	1	pct	703.09	EA
320	P/S Concrete Approach Slab (ea)	Clean Rebar and Patch:	CS 3	6	pct	4218.51	EA
320	P/S Concrete Approach Slab (ea)	Clean Rebar and Patch:	CS 4	17	pct	11952.45	EA
320	P/S Concrete Approach Slab (ea)	Overlay Approach Slab: Latex				10441.69	EA
320	P/S Concrete Approach Slab (ea)	Overlay Approach Slab: Mmicro-Silica				8216.75	EA
320	P/S Concrete Approach Slab (ea)	AC Overlay				2703.59	EA
320	P/S Concrete Approach Slab (ea)	Replace Unit:				33576.64	EA
321	Reinforced Concrete Approach Slab (ea)	Surface Seal Cracks:				1317.15	EA
321	Reinforced Concrete Approach Slab (ea)	Minor Patch:	CS 2	1	pct	1043.53	EA
321	Reinforced Concrete Approach Slab (ea)	Minor Patch:	CS 3	6	pct	6261.19	EA
321	Reinforced Concrete Approach Slab (ea)	Minor Patch:	CS 4	17	pct	17740.03	EA
321	Reinforced Concrete Approach Slab (ea)	Clean Rebar and Patch:	CS 2	1	pct	703.09	EA
321	Reinforced Concrete Approach Slab (ea)	Clean Rebar and Patch:	CS 3	6	pct	4218.51	EA
321	Reinforced Concrete Approach Slab (ea)	Clean Rebar and Patch:	CS 4	17	pct	11952.45	EA
321	Reinforced Concrete Approach Slab (ea)	Overlay Approach Slab: latex				10441.69	EA

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
321	Reinforced Concrete Approach Slab (ea)	Overlay Approach Slab: Micro-Silica				8216.75	EA
321	Reinforced Concrete Approach Slab (ea)	AC Overlay				2703.59	EA
321	Reinforced Concrete Approach Slab (ea)	Replace Unit:				33576.64	EA
330	Uncoated Metal Rail (ft)	Power Tool Clean and Paint:	CS 2	25	pct	22.40	FT
330	Uncoated Metal Rail (ft)	Power Tool Clean and Paint:	CS 3	50	pct	44.80	FT
330	Uncoated Metal Rail (ft)	Replace Paint System:				98.00	FT
330	Uncoated Metal Rail (ft)	Major Rehab:				222.79	FT
330	Uncoated Metal Rail (ft)	Replace Unit:				275.06	FT
331	Concrete Bridge Railing (ft)	Surface Seal Cracks:				18.04	FT
331	Concrete Bridge Railing (ft)	Inject Cracks:	CS 2	0.25	ft	12.4	FT
331	Concrete Bridge Railing (ft)	Inject Cracks:	CS 3	0.5	ft	24.79	FT
331	Concrete Bridge Railing (ft)	Inject Cracks:	CS 4	1	ft	49.58	FT
331	Concrete Bridge Railing (ft)	Minor Patch:	CS 2	4.5	pct	53.11	FT
331	Concrete Bridge Railing (ft)	Minor Patch:	CS 3	8.75	pct	103.27	FT
331	Concrete Bridge Railing (ft)	Minor Patch:	CS 4	17.5	pct	206.53	FT
331	Concrete Bridge Railing (ft)	Clean Rebar and Patch:	CS 2	4.25	pct	33.79	FT
331	Concrete Bridge Railing (ft)	Clean Rebar and Patch:	CS 3	8.75	pct	69.58	FT
331	Concrete Bridge Railing (ft)	Clean Rebar and Patch:	CS 4	17.5	pct	139.15	FT
331	Concrete Bridge Railing (ft)	Replace Parapet:				214.11	FT
332	Timber Bridge Rail (ft)	Replace Bridge Rail:				290.63	FT
333	Miscellaneous Bridge Railing (stone parapet) (ft)	Repoint:	CS 2	50	pct	32.21	FT
333	Miscellaneous Bridge Railing (stone parapet) (ft)	Repoint:	CS 3	75	pct	48.31	FT
333	Miscellaneous Bridge Railing (stone parapet) (ft)	Replace:				422.02	FT
334	Coated Metal Bridge Railing (ft)	Surface Clean:				17.15	FT
334	Coated Metal Bridge Railing (ft)	Power Tool Clean and Paint:	CS 3	25	pct	22.40	FT
334	Coated Metal Bridge Railing (ft)	Power Tool Clean and Paint:	CS 4	50	pct	44.80	FT
334	Coated Metal Bridge Railing (ft)	Replace Paint System:				98.00	FT
334	Coated Metal Bridge Railing (ft)	Major Rehab:				222.79	FT
334	Coated Metal Bridge Railing (ft)	Replace Unit:				275.06	FT
361	Scour Smart Flag					862.64	EA
380	Unpainted Steel - Diaphragm (ea)	Surface Clean:				79.37	EA
380	Unpainted Steel - Diaphragm (ea)	Power Tool Clean and Paint:	CS 3	25	pct	103.68	EA
380	Unpainted Steel - Diaphragm (ea)	Power Tool Clean and Paint:	CS 4	50	pct	207.36	EA
380	Unpainted Steel - Diaphragm (ea)	Replace Paint System:				453.6	EA

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
380	Unpainted Steel - Diaphragm (ea)	Replace Unit:				7552.74	EA
381	Painted Steel - Diaphragm (ea)	Surface Clean:				79.37	EA
381	Painted Steel - Diaphragm (ea)	Power Tool Clean and Paint:	CS 3	25	pct	103.68	EA
381	Painted Steel - Diaphragm (ea)	Power Tool Clean and Paint:	CS 4	50	pct	207.36	EA
381	Painted Steel - Diaphragm (ea)	Replace Paint System:				453.6	EA
381	Painted Steel - Diaphragm (ea)	Replace Unit:				7552.74	EA
382	Reinforced Concrete Diaphragm (ea)	Waterproof				185.91	EA
382	Reinforced Concrete Diaphragm (ea)	Inject Cracks:	CS 2	1	ft	49.58	EA
382	Reinforced Concrete Diaphragm (ea)	Inject Cracks:	CS 3	2	ft	99.16	EA
382	Reinforced Concrete Diaphragm (ea)	Inject Cracks:	CS 4	3	ft	148.75	EA
382	Reinforced Concrete Diaphragm (ea)	Minor Patch:	CS 2	8.5	pct	1033.52	EA
382	Reinforced Concrete Diaphragm (ea)	Minor Patch:	CS 3	17.5	pct	2127.83	EA
382	Reinforced Concrete Diaphragm (ea)	Minor Patch:	CS 4	35	pct	4255.65	EA
382	Reinforced Concrete Diaphragm (ea)	Clean Rebar and Patch:	CS 2	8.5	pct	696.34	EA
382	Reinforced Concrete Diaphragm (ea)	Clean Rebar and Patch:	CS 3	17.5	pct	1433.63	EA
382	Reinforced Concrete Diaphragm (ea)	Clean Rebar and Patch:	CS 4	35	pct	2867.27	EA
382	Reinforced Concrete Diaphragm (ea)	Replace Diaphragm:				3469.84	EA
383	Timber Diaphragm (ft)	Replace Diaphragm:				74.67	EA
385	Timber Wingwall Cap (ft)	Replace Diaphragm:				37.46	FT
386	Reinforced Concrete Wingwall Cap (ft)	Surface Seal Cracks:				28.49	FT
386	Reinforced Concrete Wingwall Cap (ft)	Inject Cracks:	CS 2	1	ft	49.58	FT
386	Reinforced Concrete Wingwall Cap (ft)	Inject Cracks:	CS 3	8	ft	396.66	FT
386	Reinforced Concrete Wingwall Cap (ft)	Inject Cracks:	CS 4	16	ft	793.31	FT
386	Reinforced Concrete Wingwall Cap (ft)	Minor Patch:	CS 2	8.5	pct	79.2	FT
386	Reinforced Concrete Wingwall Cap (ft)	Minor Patch:	CS 3	17.5	pct	163.05	FT
386	Reinforced Concrete Wingwall Cap (ft)	Minor Patch:	CS 4	35	pct	326.1	FT
386	Reinforced Concrete Wingwall Cap (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	53.36	FT
386	Reinforced Concrete Wingwall Cap (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	109.86	FT
386	Reinforced Concrete Wingwall Cap (ft)	Clean Rebar and Patch:	CS 4	35	pct	219.71	FT
386	Reinforced Concrete Wingwall Cap (ft)	Replace Unit:				354.09	FT
390	Reinforced Concrete Wingwalls (ft)	Inject Cracks:	CS 2	1	ft	49.58	FT
390	Reinforced Concrete Wingwalls (ft)	Inject Cracks:	CS 3	5	ft	247.91	FT
390	Reinforced Concrete Wingwalls (ft)	Inject Cracks:	CS 4	10	ft	495.82	FT
390	Reinforced Concrete Wingwalls (ft)	Minor Patch:	CS 2	8.5	pct	158.39	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
390	Reinforced Concrete Wingwalls (ft)	Minor Patch:	CS 3	17.5	pct	326.10	FT
390	Reinforced Concrete Wingwalls (ft)	Minor Patch:	CS 4	35	pct	652.21	FT
390	Reinforced Concrete Wingwalls (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	106.72	FT
390	Reinforced Concrete Wingwalls (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	219.71	FT
390	Reinforced Concrete Wingwalls (ft)	Clean Rebar and Patch:	CS 4	35	pct	439.43	FT
390	Reinforced Concrete Wingwalls (ft)	Replace Unit:				845.85	FT
392	Wingwalls - Other (ft)	Repoint:	CS 2	25	pct	37.16	FT
392	Wingwalls - Other (ft)	Repoint:	CS 3	50	pct	74.32	FT
392	Wingwalls - Other (ft)	Replace Unit:				1187.28	FT
393	Concrete Slope Protection (sf)	Repair:				12.73	SF
393	Concrete Slope Protection (sf)	Replace:				8.33	SF
394	Slope Protection (Concrete Block) (sf)	Repoint:				9.94	SF
394	Slope Protection (Concrete Block) (sf)	Replace:				8.33	SF
395	Grouted or Sacked Riprap (sf)					7.93	SF
396	Reinforced Concrete Crash Wall (ft)	Surface Seal Cracks:				27.98	FT
396	Reinforced Concrete Crash Wall (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
396	Reinforced Concrete Crash Wall (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
396	Reinforced Concrete Crash Wall (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
396	Reinforced Concrete Crash Wall (ft)	Minor Patch:	CS 2	8.5	pct	155.54	FT
396	Reinforced Concrete Crash Wall (ft)	Minor Patch:	CS 3	17.5	pct	320.23	FT
396	Reinforced Concrete Crash Wall (ft)	Minor Patch:	CS 4	35	pct	640.47	FT
396	Reinforced Concrete Crash Wall (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	104.8	FT
396	Reinforced Concrete Crash Wall (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	215.76	FT
396	Reinforced Concrete Crash Wall (ft)	Clean Rebar and Patch:	CS 4	35	pct	431.52	FT
396	Reinforced Concrete Crash Wall (ft)	Replace Crash Wall:				709.49	FT
397	Riprap Slope Protection (sf)					6.24	SF
398	Reinforced Concrete Head Wall (ft)	Surface Seal Cracks:				12.82	FT
398	Reinforced Concrete Head Wall (ft)	Inject Cracks:	CS 2	0.5	ft	24.79	FT
398	Reinforced Concrete Head Wall (ft)	Inject Cracks:	CS 3	1	ft	49.58	FT
398	Reinforced Concrete Head Wall (ft)	Inject Cracks:	CS 4	2	ft	99.16	FT
398	Reinforced Concrete Head Wall (ft)	Minor Patch:	CS 2	8.5	pct	47.52	FT
398	Reinforced Concrete Head Wall (ft)	Minor Patch:	CS 3	17.5	pct	97.83	FT
398	Reinforced Concrete Head Wall (ft)	Minor Patch:	CS 4	35	pct	195.66	FT
398	Reinforced Concrete Head Wall (ft)	Clean Rebar and Patch:	CS 2	8.5	pct	32.02	FT

Delaware DOT							
Element	**Name**	**Action**	**Cond**	**Qty**		**Cost, $**	**Unit**
398	Reinforced Concrete Head Wall (ft)	Clean Rebar and Patch:	CS 3	17.5	pct	65.91	FT
398	Reinforced Concrete Head Wall (ft)	Clean Rebar and Patch:	CS 4	35	pct	131.83	FT
398	Reinforced Concrete Head Wall (ft)	Replace:				130.32	FT
399	Apron (Culvert) (sf)					23.41	SF
400	Other Head Wall (ft)	Repoint:	CS 2	25	pct	11.15	FT
400	Other Head Wall (ft)	Repoint:	CS 3	50	pct	22.30	FT
400	Other Head Wall (ft)	Repoint:	CS 4	75	pct	33.44	FT
400	Other Head Wall (ft)	Replace:				233.67	FT

Table 31 – Louisiana DOTD Cost Table

Louisiana DOTD							
No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
10	Asphaltic Concrete Overlay (SF)	Repair Potholes	2, 3			$3.46	SF
10	Asphaltic Concrete Overlay (SF)	Repair Potholes	2		1	$0.03	SF
10	Asphaltic Concrete Overlay (SF)	Repair Potholes	3		6	$0.21	SF
10	Asphaltic Concrete Overlay (SF)	Repair Potholes and Substrate	4, 5			$4.01	SF
10	Asphaltic Concrete Overlay (SF)	Repair Potholes and Substrate	4		17	$0.68	SF
10	Asphaltic Concrete Overlay (SF)	Repair Potholes and Substrate	5		85	$3.41	SF
10	Asphaltic Concrete Overlay (SF)	Replace AC Overlay	3, 4, 5			$3.19	SF
10	Asphaltic Concrete Overlay (SF)	Replace AC Overlay	3		100	$3.19	SF
10	Asphaltic Concrete Overlay (SF)	Replace AC Overlay	4		100	$3.19	SF
10	Asphaltic Concrete Overlay (SF)	Replace AC Overlay	5		100	$3.19	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam	2, 3, 4			$8.37	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam	2		1	$0.08	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam	3		6	$0.50	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam	4		17	$1.42	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4			$8.37	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4		17	$3.72	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5			$45.68	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5		50	$25.14	SF
12	Deck - Concrete - Hardrock - Bare (SF)	Replace Deck	5			$42.86	SF
13	Deck - Concrete - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	2	$0.08	1.25	$0.10	SF
13	Deck - Concrete - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	3	$0.50	1.25	$0.63	SF
13	Deck - Concrete - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	4	$1.42	1.25	$1.78	SF
13	Deck - Concrete - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1.1	$4.09	SF
13	Deck - Concrete - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$25.14	1.1	$27.65	SF
13	Deck - Concrete - Hardrock - w/AC Overlay (SF)	Replace Deck	5	$42.86	1	$42.86	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam	2, 3, 4			$27.00	SF

Louisiana DOTD							
No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam	2		2	$0.54	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam	3		7	$1.89	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam	4		17	$4.59	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4			$27.00	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4		17	$7.59	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5			$27.00	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5		50	$30.59	SF
15	Deck - Concrete - Lightweight - Bare (SF)	Replace deck				$42.86	SF
16	Deck - Concrete - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam	2	$0.54	1.25	$0.68	SF
16	Deck - Concrete - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam	3	$1.89	1.25	$2.36	SF
16	Deck - Concrete - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam	4	$4.59	1.25	$5.74	SF
16	Deck - Concrete - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$7.59	1.1	$8.35	SF
16	Deck - Concrete - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$30.59	1.1	$33.65	SF
16	Deck - Concrete - Lightweight - w/AC Overlay (SF)	Replace Deck	5			$42.86	SF
26	Deck - Concrete - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam	2	$0.08	1.25	$0.10	SF
26	Deck - Concrete - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam	3	$0.50	1.25	$0.63	SF
26	Deck - Concrete - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam	4	$1.42	1.25	$1.78	SF
26	Deck - Concrete - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1.1	$4.09	SF
26	Deck - Concrete - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$8.37	1.1	$25.14	SF
26	Deck - Concrete - Hardrock - w/Coated Rebars (SF)	Replace Deck	5			$47.86	SF
28	Deck - Grid - Open (SF)	Rehab Connectors	2, 3, 4			$120.00	SF
28	Deck - Grid - Open (SF)	Rehab Connectors	2		2	$2.40	SF
28	Deck - Grid - Open (SF)	Rehab Connectors	3		7	$8.40	SF
28	Deck - Grid - Open (SF)	Rehab Connectors	4		17	$20.40	SF
28	Deck - Grid - Open (SF)	Replace Deteriorated Sections	4			$192.00	SF
28	Deck - Grid - Open (SF)	Replace Deteriorated Sections	4		17	$32.64	SF
28	Deck - Grid - Open (SF)	Clean & Paint; Rehab Connectors; Replace Det. Sections	5			$181.08	SF
28	Deck - Grid - Open (SF)	Clean & Paint; Rehab Connectors; Replace Det. Sections	5		17	$30.78	SF
28	Deck - Grid - Open (SF)	Replace Deck	5			$39.79	SF
29	Deck - Grid - Filled (SF)	Rehab Connectors	2	$2.40	1.02	$2.45	SF
29	Deck - Grid - Filled (SF)	Rehab Connectors	3	$8.40	1.2	$10.08	SF
29	Deck - Grid - Filled (SF)	Rehab Connectors	4	$20.40	1.2	$24.48	SF
29	Deck - Grid - Filled (SF)	Replace Deteriorated Sections	4	$32.64	1.07	$34.92	SF
29	Deck - Grid - Filled (SF)	Clean & Paint; Rehab Connectors; Replace Det. Sections	5	$30.78	1.04	$32.01	SF
29	Deck - Grid - Filled (SF)	Replace Deck	5			$44.79	SF
30	Deck-Steel-Orthoptropic (SF)	Seal Cracks and/or Repair Potholes	2, 3, 4			$160.00	SF
30	Deck-Steel-Orthoptropic (SF)	Seal Cracks and/or Repair Potholes	2		2	$3.20	SF
30	Deck-Steel-Orthoptropic (SF)	Seal Cracks and/or Repair Potholes	3		7	$11.20	SF
30	Deck-Steel-Orthoptropic (SF)	Seal Cracks and/or Repair Potholes	4		17	$27.20	SF
30	Deck-Steel-Orthoptropic (SF)	Repair Potholes and Cracks	3, 4			$287.50	SF
30	Deck-Steel-Orthoptropic (SF)	Repair Potholes and Cracks	3		7	$20.13	SF
30	Deck-Steel-Orthoptropic (SF)	Repair Potholes and Cracks	4		17	$48.88	SF
30	Deck-Steel-Orthoptropic (SF)	Rehab; Replace Paint System; Replace Surfacing	5			$337.50	SF

Louisiana DOTD							
No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
30	Deck-Steel-Orthoptropic (SF)	Rehab; Replace Paint System; Replace Surfacing	5		17	$57.38	SF
30	Deck-Steel-Orthoptropic (SF)	Replace Deck	5			$200.00	SF
31	Deck - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deteriorated Deck Boards	2	$1.83	0.9	$1.64	SF
31	Deck - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deteriorated Deck Boards	3	$6.21	0.9	$5.59	SF
31	Deck - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deck	3	$33.34	1	$33.34	SF
31	Deck - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deck	4	$33.34	1	$33.34	SF
32	Deck - Timber - w/AC Overlay (SF)	Replace Deteriorated Deck Boards	2, 3			$36.51	SF
32	Deck - Timber - w/AC Overlay (SF)	Replace Deck	2		5	$1.83	SF
32	Deck - Timber - w/AC Overlay (SF)	Replace Deteriorated Deck Boards	3		17	$6.21	SF
32	Deck - Timber - w/AC Overlay (SF)	Replace Deck	3, 4			$33.34	SF
33	Slab - Concrete - Precast - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	2	$0.08	1.25	$0.10	SF
33	Slab - Concrete - Precast - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	3	$0.50	1.25	$0.63	SF
33	Slab - Concrete - Precast - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	4	$1.42	1.25	$1.78	SF
33	Slab - Concrete - Precast - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1.1	$4.09	SF
33	Slab - Concrete - Precast - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$25.14	1.1	$27.65	SF
33	Slab - Concrete - Precast - Hardrock - w/AC Overlay (SF)	Replace Deck	5	$42.86	1	$42.86	SF
34	Slab - Concrete - Precast - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam	2	$0.54	1.25	$0.68	SF
34	Slab - Concrete - Precast - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam	3	$1.89	1.25	$2.36	SF
34	Slab - Concrete - Precast - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam	4	$4.59	1.25	$5.74	SF
34	Slab - Concrete - Precast - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$7.59	1.1	$8.35	SF
34	Slab - Concrete - Precast - Lightweight - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$30.59	1.1	$33.65	SF
34	Slab - Concrete - Precast - Lightweight - w/AC Overlay (SF)	Replace Deck	5	$42.86	1	$42.86	SF
35	Slab - Concrete - Cast - In - Place - Lightweight - Bare (SF)	Repair Spalls/Delam	2	$0.54	1	$0.54	SF
35	Slab - Concrete - Cast - In - Place - Lightweight - Bare (SF)	Repair Spalls/Delam	3	$1.89	1	$1.89	SF
35	Slab - Concrete - Cast - In - Place - Lightweight - Bare (SF)	Repair Spalls/Delam	4	$4.59	1	$4.59	SF
35	Slab - Concrete - Cast - In - Place - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$7.59	1	$7.59	SF
35	Slab - Concrete - Cast - In - Place - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$30.59	1	$30.59	SF
35	Slab - Concrete - Cast - In - Place - Lightweight - Bare (SF)	Replace Deck	5	$42.86	1	$42.86	SF
36	Slab - Concrete - Precast - Lightweight - Bare (SF)	Repair Spalls/Delam	2	$0.54	1	$0.54	SF
36	Slab - Concrete - Precast - Lightweight - Bare (SF)	Repair Spalls/Delam	3	$1.89	1	$1.89	SF
36	Slab - Concrete - Precast - Lightweight - Bare (SF)	Repair Spalls/Delam	4	$4.59	1	$4.59	SF
36	Slab - Concrete - Precast - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$7.59	1	$7.59	SF
36	Slab - Concrete - Precast - Lightweight - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$30.59	1	$30.59	SF
36	Slab - Concrete - Precast - Lightweight - Bare (SF)	Replace Deck	5	$42.86	1	$42.86	SF
37	Slab - Concrete - Precast - Hardrock -Bare (SF)	Repair Spalls/Delam	2	$0.08	1	$0.08	SF
37	Slab - Concrete - Precast - Hardrock -Bare (SF)	Repair Spalls/Delam	3	$0.50	1	$0.50	SF
37	Slab - Concrete - Precast - Hardrock -Bare (SF)	Repair Spalls/Delam	4	$1.42	1	$1.42	SF
37	Slab - Concrete - Precast - Hardrock -Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1	$3.72	SF
37	Slab - Concrete - Precast - Hardrock -Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$25.14	1	$25.14	SF
37	Slab - Concrete - Precast - Hardrock -Bare (SF)	Replace Deck	5	$42.86	1	$42.86	SF
38	Slab - Concrete - Cast - In - Place - Hardrock - Bare (SF)	Repair Spalls/Delam	2	$0.08	1	$0.08	SF
38	Slab - Concrete - Cast - In - Place - Hardrock - Bare (SF)	Repair Spalls/Delam	3	$0.50	1	$0.50	SF
38	Slab - Concrete - Cast - In - Place - Hardrock - Bare (SF)	Repair Spalls/Delam	4	$1.42	1	$1.42	SF

Louisiana DOTD							
No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
38	Slab - Concrete - Cast - In - Place - Hardrock - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1	$3.72	SF
38	Slab - Concrete - Cast - In - Place - Hardrock - Bare (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$25.14	1	$25.14	SF
38	Slab - Concrete - Cast - In - Place - Hardrock - Bare (SF)	Replace Deck	5	$42.86	1	$42.86	SF
39	Slab - Concrete - Cast - In - Place - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	2	$0.08	1.25	$0.10	SF
39	Slab - Concrete - Cast - In - Place - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	3	$0.50	1.25	$0.63	SF
39	Slab - Concrete - Cast - In - Place - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam	4	$1.42	1.25	$1.78	SF
39	Slab - Concrete - Cast - In - Place - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1.1	$4.09	SF
39	Slab - Concrete - Cast - In - Place - Hardrock - w/AC Overlay (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$25.14	1.1	$27.65	SF
39	Slab - Concrete - Cast - In - Place - Hardrock - w/AC Overlay (SF)	Replace Deck	5	$42.86	1	$42.86	SF
52	Slab - Concrete - Cast-In-Place - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam	2	$0.08	1.25	$0.10	SF
52	Slab - Concrete - Cast-In-Place - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam	3	$0.50	1.25	$0.63	SF
52	Slab - Concrete - Cast-In-Place - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam	4	$1.42	1.25	$1.78	SF
52	Slab - Concrete - Cast-In-Place - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam; Add a Protective Overlay	4	$3.72	1.1	$4.09	SF
52	Slab - Concrete - Cast-In-Place - Hardrock - w/Coated Rebars (SF)	Repair Spalls/Delam; Add a Protective Overlay	5	$8.37	1.1	$25.14	SF
52	Slab - Concrete - Cast-In-Place - Hardrock - w/Coated Rebars (SF)	Replace Deck	5	$47.86	1	$47.86	SF
54	Slab - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deteriorated Deck Boards	2	$1.83	1.25	$2.28	SF
54	Slab - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deteriorated Deck Boards	3	$6.21	1.25	$7.76	SF
54	Slab - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deteriorated Deck Boards	2	$33.34	1.25	$41.68	SF
54	Slab - Timber -Bare (with or without Gravel/Ballast) (SF)	Replace Deteriorated Deck Boards	3	$33.34	1.25	$41.68	SF
55	Slab - Timber - w/AC Overlay (SF)	Replace Deteriorated Deck Boards	2	$1.83	1.51	$2.76	SF
55	Slab - Timber - w/AC Overlay (SF)	Replace Deteriorated Deck Boards	3	$6.21	1.51	$9.37	SF
55	Slab - Timber - w/AC Overlay (SF)	Replace Deck	3	$33.34	1.54	$51.35	SF
55	Slab - Timber - w/AC Overlay (SF)	Replace Deck	4	$33.34	1.54	$51.35	SF
101	Girders - Steel Box - Weathering (LF)	Clean and Paint	2	$12.49	2	$24.97	LF
101	Girders - Steel Box - Weathering (LF)	Clean and Paint	3	$17.99	2	$35.98	LF
101	Girders - Steel Box - Weathering (LF)	Rehab Member	4	$1,494.00	2	$2,988.00	LF
101	Girders - Steel Box - Weathering (LF)	Replace Member	5	$1,579.04	2	$3,158.08	LF
102	Girders - Steel Box - Painted (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	2	$24.97	LF
102	Girders - Steel Box - Painted (LF)	Hand Tool; Clean; Paint	3	$17.99	2	$35.98	LF
102	Girders - Steel Box - Painted (LF)	Hand Tool; Clean; Paint	4	$19.99	2	$39.97	LF
102	Girders - Steel Box - Painted (LF)	Replace Paint System	4	$164.02	2	$328.03	LF
102	Girders - Steel Box - Painted (LF)	Rehab Member	5	$1,494.00	2	$2,988.00	LF
102	Girders - Steel Box - Painted (LF)	Replace Member	5	$1,579.04	2	$3,158.08	LF
104	Girders - Concrete Box - Prestressed (LF)	Clean Steel; Patch and/or Seal	3	$97.50	1.28	$124.80	LF
104	Girders - Concrete Box - Prestressed (LF)	Rehab Member	4	$2,602.50	1.28	$3,331.20	LF
104	Girders - Concrete Box - Prestressed (LF)	Replace Member	4	$2,709.17	1.38	$3,738.65	LF
105	Girders - Concrete Box - Reinforced (LF)	Clean Steel; Patch and/or Seal	3	$97.50	1.25	$121.88	LF
105	Girders - Concrete Box - Reinforced (LF)	Rehab Member	4	$2,602.50	1.25	$3,253.13	LF
105	Girders - Concrete Box - Reinforced (LF)	Replace Member	4	$2,709.17	1.29	$3,494.83	LF
106	Girder - Steel - I - Beam/Plate - Weathering (LF)	Clean and Paint	2	$12.49	1	$12.49	LF
106	Girder - Steel - I - Beam/Plate - Weathering (LF)	Clean and Paint	3	$17.99	1	$17.99	LF
106	Girder - Steel - I - Beam/Plate - Weathering (LF)	Rehab Member	3	$1,494.00	0.9	$1,344.60	LF
106	Girder - Steel - I - Beam/Plate - Weathering (LF)	Rehab Member	4	$1,494.00	1	$1,494.00	LF

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No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
106	Girder - Steel - I - Beam/Plate - Weathering (LF)	Replace Member	4	$1,579.04	1	$1,579.04	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Surface Clean; Spot Paint Top Coat	2			$12.49	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Hand Tool; Clean; Paint	3, 4			$19.99	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Hand Tool; Clean; Paint	3		0.9	$17.99	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Hand Tool; Clean; Paint	4		1	$19.99	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Replace Paint System	4			$164.02	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Rehab Member	5			$1,494.00	LF
107	Girder - Steel - I - Beam/Plate - Painted (LF)	Replace Member	5			$1,579.04	LF
108	Girders - Concrete Channel Prestressed/Reinforced (LF)	Clean Steel; Patch and/or Seal	3	$97.50	0.53	$51.68	LF
108	Girders - Concrete Channel Prestressed/Reinforced (LF)	Rehab Member	4	$2,602.50	0.53	$1,379.33	LF
108	Girders - Concrete Channel Prestressed/Reinforced (LF)	Replace Member	4	$2,709.17	0.32	$866.93	LF
109	Girders - Concrete - Prestressed (LF)	Clean Steel; Patch and/or Seal	3	$97.50	0.85	$82.88	LF
109	Girders - Concrete - Prestressed (LF)	Rehab Member	4	$2,602.50	0.85	$2,212.13	LF
109	Girders - Concrete - Prestressed (LF)	Replace Member	4	$2,709.17	0.43	$1,164.94	LF
110	Girders - Concrete - Reinforced (LF)	Clean Steel; Patch and/or Seal	3	$97.50	0.83	$80.93	LF
110	Girders - Concrete - Reinforced (LF)	Rehab Member	4	$2,602.50	0.83	$2,160.08	LF
110	Girders - Concrete - Reinforced (LF)	Replace Member	4	$2,709.17	0.89	$2,411.16	LF
112	Stringers - Steel - Weathering (LF)	Clean and Paint	2	$12.49	0.34	$4.25	LF
112	Stringers - Steel - Weathering (LF)	Clean and Paint	3	$17.99	0.34	$6.12	LF
112	Stringers - Steel - Weathering (LF)	Rehab Member	3	$1,494.00	0.31	$457.16	LF
112	Stringers - Steel - Weathering (LF)	Rehab Member	4	$1,494.00	0.34	$507.96	LF
112	Stringers - Steel - Weathering (LF)	Replace Member	4	$1,579.04	0.34	$536.87	LF
113	Stringers - Steel - Painted (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	0.34	$4.25	LF
113	Stringers - Steel - Painted (LF)	Hand Tool; Clean; Paint	3	$17.99	0.34	$6.12	LF
113	Stringers - Steel - Painted (LF)	Hand Tool; Clean; Paint	4	$19.99	0.34	$6.80	LF
113	Stringers - Steel - Painted (LF)	Replace Paint System	4	$164.02	0.34	$55.77	LF
113	Stringers - Steel - Painted (LF)	Rehab Member	5	$1,494.00	0.34	$507.96	LF
113	Stringers - Steel - Painted (LF)	Replace Member	5	$1,579.04	0.34	$536.87	LF
116	Stringers - Concrete - Reinforced (LF)	Clean Steel; Patch and/or Seal	3	$97.50	0.46	$44.85	LF
116	Stringers - Concrete - Reinforced (LF)	Rehab Member	4	$2,602.50	0.46	$1,197.15	LF
116	Stringers - Concrete - Reinforced (LF)	Replace Member	4	$2,709.17	0.33	$894.03	LF
117	Stringer/Girder - Timber (LF)	Rehab and/or Protect Member	2, 3, 4			$35.50	LF
117	Stringer/Girder - Timber (LF)	Rehab and/or Protect Member	2		1	$35.50	LF
117	Stringer/Girder - Timber (LF)	Rehab and/or Protect Member	3		1.4	$49.70	LF
117	Stringer/Girder - Timber (LF)	Rehab and/or Protect Member	4		1.8	$63.90	LF
117	Stringer/Girder - Timber (LF)	Replace Member	3, 4			$65.00	LF
120	Steel - Truss - Lower Chord - Weathering (LF)	Clean and Paint	2	$12.49	1.25	$15.61	LF
120	Steel - Truss - Lower Chord - Weathering (LF)	Clean and Paint	3	$17.99	1.25	$22.49	LF
120	Steel - Truss - Lower Chord - Weathering (LF)	Rehab Member	3	$1,494.00	1.13	$1,680.75	LF
120	Steel - Truss - Lower Chord - Weathering (LF)	Rehab Member	4	$1,494.00	1.25	$1,867.50	LF
120	Steel - Truss - Lower Chord - Weathering (LF)	Replace Member	4	$1,579.04	1.25	$1,973.80	LF
121	Steel Truss - Lower Chord (Painted) (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	1.25	$15.61	LF
121	Steel Truss - Lower Chord (Painted) (LF)	Hand Tool; Clean; Paint	3	$17.99	1.25	$22.49	LF

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No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
121	Steel Truss - Lower Chord (Painted) (LF)	Hand Tool; Clean; Paint	4	$19.99	1.25	$24.98	LF
121	Steel Truss - Lower Chord (Painted) (LF)	Replace Paint System	4	$164.02	1.25	$205.02	LF
121	Steel Truss - Lower Chord (Painted) (LF)	Rehab Member	5	$1,494.00	1.25	$1,867.50	LF
121	Steel Truss - Lower Chord (Painted) (LF)	Replace Member	5	$1,579.04	2	$3,158.08	LF
125	Steel-Truss-Through/Pony-Weathering (Excluding Lower Chord) (LF)	Clean and Paint	2	$12.49	2.19	$27.35	LF
125	Steel-Truss-Through/Pony-Weathering (Excluding Lower Chord) (LF)	Clean and Paint	3	$17.99	2.19	$39.39	LF
125	Steel-Truss-Through/Pony-Weathering (Excluding Lower Chord) (LF)	Rehab Member	3	$1,494.00	1.97	$2,944.67	LF
125	Steel-Truss-Through/Pony-Weathering (Excluding Lower Chord) (LF)	Rehab Member	4	$1,494.00	2.19	$3,271.86	LF
125	Steel-Truss-Through/Pony-Weathering (Excluding Lower Chord) (LF)	Replace Member	4	$1,579.04	2.19	$3,458.10	LF
126	Steel Truss - Through/Pony - Painted (Excluding Lower Chord) (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	2.19	$27.35	LF
126	Steel Truss - Through/Pony - Painted (Excluding Lower Chord) (LF)	Hand Tool; Clean; Paint	3	$17.99	2.19	$39.39	LF
126	Steel Truss - Through/Pony - Painted (Excluding Lower Chord) (LF)	Hand Tool; Clean; Paint	4	$19.99	2.19	$43.77	LF
126	Steel Truss - Through/Pony - Painted (Excluding Lower Chord) (LF)	Replace Paint System	4	$164.02	2.19	$359.19	LF
126	Steel Truss - Through/Pony - Painted (Excluding Lower Chord) (LF)	Rehab Member	5	$1,494.00	2.19	$3,271.86	LF
126	Steel Truss - Through/Pony - Painted (Excluding Lower Chord) (LF)	Replace Member	5	$1,579.04	3.5	$5,526.64	LF
130	Steel - Truss - Deck - Truss - Weathering (LF)	Clean and Paint	2	$12.49	1.875	$23.41	LF
130	Steel - Truss - Deck - Truss - Weathering (LF)	Clean and Paint	3	$17.99	1.875	$33.73	LF
130	Steel - Truss - Deck - Truss - Weathering (LF)	Rehab Member	3	$1,494.00	1.69	$2,521.13	LF
130	Steel - Truss - Deck - Truss - Weathering (LF)	Rehab Member	4	$1,494.00	1.88	$2,801.25	LF
130	Steel - Truss - Deck - Truss - Weathering (LF)	Replace Member	4	$1,579.04	1.875	$2,960.70	LF
131	Steel Truss - Deck Truss - Painted (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	1.875	$23.41	LF
131	Steel Truss - Deck Truss - Painted (LF)	Hand Tool; Clean; Paint	3	$17.99	1.875	$33.73	LF
131	Steel Truss - Deck Truss - Painted (LF)	Hand Tool; Clean; Paint	4	$19.99	1.875	$37.48	LF
131	Steel Truss - Deck Truss - Painted (LF)	Replace Paint System	4	$164.02	1.875	$307.53	LF
131	Steel Truss - Deck Truss - Painted (LF)	Rehab Member	5	$1,494.00	1.875	$2,801.25	LF
131	Steel Truss - Deck Truss - Painted (LF)	Replace Member	5	$1,579.04	3	$4,737.12	LF
141	Arch - Steel (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	2.19	$27.35	LF
141	Arch - Steel (LF)	Hand Tool; Clean; Paint	3	$17.99	2.19	$39.39	LF
141	Arch - Steel (LF)	Hand Tool; Clean; Paint	4	$19.99	2.19	$43.77	LF
141	Arch - Steel (LF)	Replace Paint System	4	$164.02	2.19	$359.19	LF
141	Arch - Steel (LF)	Rehab Member	5	$1,494.00	2.19	$3,271.86	LF
141	Arch - Steel (LF)	Replace Member	5	$1,579.04	3.5	$5,526.64	LF
151	Floor Beam - Steel - Weathering (LF)	Clean and Paint	2	$12.49	0.67	$8.37	LF
151	Floor Beam - Steel - Weathering (LF)	Clean and Paint	3	$17.99	0.67	$12.05	LF
151	Floor Beam - Steel - Weathering (LF)	Rehab Member	3	$1,494.00	0.603	$900.88	LF
151	Floor Beam - Steel - Weathering (LF)	Rehab Member	4	$1,494.00	0.67	$1,000.98	LF
151	Floor Beam - Steel - Weathering (LF)	Replace Member	4	$1,579.04	0.67	$1,057.96	LF
152	Floor Beam - Steel - Painted (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	0.67	$8.37	LF
152	Floor Beam - Steel - Painted (LF)	Hand Tool; Clean; Paint	3	$17.99	0.67	$12.05	LF
152	Floor Beam - Steel - Painted (LF)	Hand Tool; Clean; Paint	4	$19.99	0.67	$13.39	LF
152	Floor Beam - Steel - Painted (LF)	Replace Paint System	4	$164.02	0.67	$109.89	LF
152	Floor Beam - Steel - Painted (LF)	Rehab Member	5	$1,494.00	0.67	$1,000.98	LF
152	Floor Beam - Steel - Painted (LF)	Replace Member	5	$1,579.04	0.67	$1,057.96	LF

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No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
155	Floor Beam - Concrete - Reinforced (LF)	Clean Steel; Patch and/or Seal	3	$97.50	0.65	$63.38	LF
155	Floor Beam - Concrete - Reinforced (LF)	Rehab Member	4	$2,602.50	0.65	$1,691.63	LF
155	Floor Beam - Concrete - Reinforced (LF)	Replace Member	4	$2,709.17	0.58	$1,571.32	LF
201	Pile Extension/Column - Steel - Weathering (EA)	Clean and Paint	2, 3			$2,424.40	EA
201	Pile Extension/Column - Steel - Weathering (EA)	Clean and Paint	2	$2,424.40	0.9	$2,181.96	EA
201	Pile Extension/Column - Steel - Weathering (EA)	Clean and Paint	3	$2,424.40	1	$2,424.40	EA
201	Pile Extension/Column - Steel - Weathering (EA)	Rehab Member	3	$2,424.40	1.5	$3,636.60	EA
201	Pile Extension/Column - Steel - Weathering (EA)	Rehab Member	4	$3,636.60	1.1	$4,000.26	EA
201	Pile Extension/Column - Steel - Weathering (EA)	Replace Member	4			$33,750.00	EA
202	Pile Extension/Column - Steel - Painted (EA)	Surface Clean; Spot Paint Top Coat	2			$124.92	EA
202	Pile Extension/Column - Steel - Painted (EA)	Hand Tool; Clean; Paint	3	$124.92	2	$249.84	EA
202	Pile Extension/Column - Steel - Painted (EA)	Hand Tool; Clean; Paint	4	$124.92	4	$499.68	EA
202	Pile Extension/Column - Steel - Painted (EA)	Replace Paint System	4			$2,424.40	EA
202	Pile Extension/Column - Steel - Painted (EA)	Rehab Member	5	$2,424.40	1.5	$3,636.60	EA
202	Pile Extension/Column - Steel - Painted (EA)	Replace Member	5			$33,750.00	EA
204	Pile Extension/Column - Concrete - Prestressed (EA)	Clean Steel; Patch and/or Seal	3	$390.00	0.57	$222.30	EA
204	Pile Extension/Column - Concrete - Prestressed (EA)	Rehab Member	4	$5,590.00	0.57	$3,186.30	EA
204	Pile Extension/Column - Concrete - Prestressed (EA)	Replace Member	4	$56,958.00	0.51	$29,048.58	EA
205	Pile Extension/Column - Concrete - Reinforced (EA)	Clean Steel; Patch and/or Seal	3			$390.00	EA
205	Pile Extension/Column - Concrete - Reinforced (EA)	Rehab Member	4			$5,590.00	EA
205	Pile Extension/Column - Concrete - Reinforced (EA)	Replace Member	4			$56,958.00	EA
206	Pile Extension/Column - Timber (EA)	Rehab and/or Protect Member	2, 3, 4			$903.25	EA
206	Pile Extension/Column - Timber (EA)	Rehab and/or Protect Member	2		1	$903.25	EA
206	Pile Extension/Column - Timber (EA)	Rehab and/or Protect Member	3		1.2	$1,083.90	EA
206	Pile Extension/Column - Timber (EA)	Rehab and/or Protect Member	4		1.4	$1,264.55	EA
206	Pile Extension/Column - Timber (EA)	Replace Member	3, 4			$3,410.00	EA
207	Pier - Concrete (EA)	Clean Steel; Patch and/or Seal	3	$390.00	4.83	$1,883.70	EA
207	Pier - Concrete (EA)	Rehab Member	4	$5,590.00	4.83	$26,999.70	EA
207	Pier - Concrete (EA)	Replace Member	4	$56,958.00	6.11	$348,013.38	EA
210	Pier Wall - Concrete (LF)	Clean Steel; Patch and/or Seal	3	$97.50	1.92	$187.20	LF
210	Pier Wall - Concrete (LF)	Rehab Member	4	$2,602.50	1.92	$4,996.80	LF
210	Pier Wall - Concrete (LF)	Replace Member	4	$2,709.17	3.33	$9,021.53	LF
215	Abutment - Concrete (LF)	Clean Steel; Patch and/or Seal	3	$97.50	0.46	$44.85	LF
215	Abutment - Concrete (LF)	Rehab Member	4	$2,602.50	0.46	$1,197.15	LF
215	Abutment - Concrete (LF)	Replace Member	4	$2,709.17	0.83	$2,248.61	LF
216	Abutment - Timber (LF)	Rehab and/or Protect Member	2	$35.50	2.1	$74.55	LF
216	Abutment - Timber (LF)	Rehab and/or Protect Member	3	$49.70	2.1	$104.37	LF
216	Abutment - Timber (LF)	Rehab and/or Protect Member	4	$63.90	2.1	$134.19	LF
216	Abutment - Timber (LF)	Replace Member	3	$65.00	2.1	$136.50	LF
216	Abutment - Timber (LF)	Replace Member	4	$65.00	2.1	$136.50	LF
230	Cap - Steel - Weathering (LF)	Clean and Paint	2	$12.49	1.25	$15.61	LF
230	Cap - Steel - Weathering (LF)	Clean and Paint	3	$17.99	1.25	$22.49	LF
230	Cap - Steel - Weathering (LF)	Rehab Member	3	$1,494.00	1.125	$1,680.75	LF

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No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
230	Cap - Steel - Weathering (LF)	Rehab Member	4	$1,494.00	1.25	$1,867.50	LF
230	Cap - Steel - Weathering (LF)	Replace Member	4	$1,579.04	1.25	$1,973.80	LF
231	Cap - Steel - Painted (LF)	Surface Clean; Spot Paint Top Coat	2	$12.49	1.25	$15.61	LF
231	Cap - Steel - Painted (LF)	Hand Tool; Clean; Paint	3	$17.99	1.25	$22.49	LF
231	Cap - Steel - Painted (LF)	Hand Tool; Clean; Paint	4	$19.99	1.25	$24.98	LF
231	Cap - Steel - Painted (LF)	Replace Paint System	4	$164.02	1.25	$205.02	LF
231	Cap - Steel - Painted (LF)	Rehab Member	4	$1,494.00	1.25	$1,867.50	LF
231	Cap - Steel - Painted (LF)	Replace Member	5	$1,579.04	1.25	$1,973.80	LF
233	Cap - Concrete - Prestressed (LF)	Clean Steel; Patch and/or Seal	3	$97.50	1.5	$146.25	LF
233	Cap - Concrete - Prestressed (LF)	Rehab Member	4	$2,602.50	1.5	$3,903.75	LF
233	Cap - Concrete - Prestressed (LF)	Replace Member	4	$2,709.17	2.22	$6,014.35	LF
234	Cap - Concrete - Reinforced (LF)	Clean Steel; Patch and/or Seal	3			$97.50	LF
234	Cap - Concrete - Reinforced (LF)	Rehab Member	4			$2,602.50	LF
234	Cap - Concrete - Reinforced (LF)	Replace Member	4			$2,709.17	LF
235	Cap - Timber (LF)	Rehab and/or Protect Member	2	$35.50	1.5	$53.25	LF
235	Cap - Timber (LF)	Rehab and/or Protect Member	3	$49.70	1.5	$74.55	LF
235	Cap - Timber (LF)	Rehab and/or Protect Member	4	$63.90	1.5	$95.85	LF
235	Cap - Timber (LF)	Replace Member	3	$65.00	4.5	$292.50	LF
235	Cap - Timber (LF)	Replace Member	4	$65.00	4.5	$292.50	LF
240	Culvert - Metal (LF)	Rehab Culvert	2, 3, 4			$226.67	LF
240	Culvert - Metal (LF)	Rehab Culvert	2		1	$226.67	LF
240	Culvert - Metal (LF)	Rehab Culvert	3		1.25	$283.33	LF
240	Culvert - Metal (LF)	Rehab Culvert	4		1.5	$340.00	LF
240	Culvert - Metal (LF)	Replace Culvert	4			$984.54	LF
241	Culvert - Concrete (LF)	Clean Rebar; Patch and/or Seal	3			$97.50	LF
241	Culvert - Concrete (LF)	Rehab Culvert	4			$940.00	LF
241	Culvert - Concrete (LF)	Replace Culvert	4			$1,351.61	LF
300	Deck Joints - Strip Seal (LF)	Clean Joint	2			$2.00	LF
300	Deck Joints - Strip Seal (LF)	Clean and Patch or Clean and Reset	2			$5.00	LF
300	Deck Joints - Strip Seal (LF)	Replace Gland; Patch Concrete	3			$71.00	LF
300	Deck Joints - Strip Seal (LF)	Replace Joint	3			$556.50	LF
301	Deck Joints - Pourable Seal (LF)	Clean Joint and Replace Seal	2			$46.00	LF
301	Deck Joints - Pourable Seal (LF)	Clean Joint, Patch Spalls and Replace Seal	3			$59.13	LF
301	Deck Joints - Pourable Seal (LF)	Replace Joint	3			$506.50	LF
302	Deck Joints - Compression Seal (LF)	Replace Seal	2			$43.50	LF
302	Deck Joints - Compression Seal (LF)	Replace Seal and/or Patch Spalls	3			$66.00	LF
302	Deck Joints - Compression Seal (LF)	Replace Joint	3			$207.50	LF
303	Deck Joints - Assembly - Modular/Cushion (LF)	Clean Joint	2			$2.00	LF
303	Deck Joints - Assembly - Modular/Cushion (LF)	Clean Joint; Patch; Reset	2			$109.50	LF
303	Deck Joints - Assembly - Modular/Cushion (LF)	Replace Gland and/or Patch Spalls	3			$975.00	LF
303	Deck Joints - Assembly - Modular/Cushion (LF)	Replace Joint	3			$2,575.00	LF
304	Deck Joints - Open Joint (LF)	Rehab Unit	2			$22.25	LF
304	Deck Joints - Open Joint (LF)	Rehab Unit	3			$29.06	LF

Louisiana DOTD							
No	**Element**	**Action**	**Condition**	**Base Cost**	**Factor**	**Cost**	**Unit**
304	Deck Joints - Open Joint (LF)	Replace Unit	3			$385.00	LF
305	Deck Joints - Sliding Plate (LF)	Rehab Unit	2	$22.25	1.5	$33.38	LF
305	Deck Joints - Sliding Plate (LF)	Rehab Unit	3	$29.06	1.5	$43.59	LF
305	Deck Joints - Sliding Plate (LF)	Replace Unit	3	$385.00	1.5	$577.50	LF
306	Deck Joints - Finger (LF)	Rehab Unit	2			$146.00	LF
306	Deck Joints - Finger (LF)	Rehab Unit	3			$292.00	LF
306	Deck Joints - Finger (LF)	Replace Unit	3			$2,990.00	LF
310	Bearings - Elastomeric (EA)	Reset Bearing	2, 3			$4,950.00	EA
310	Bearings - Elastomeric (EA)	Replace Bearing	3			$5,050.00	EA
311	Bearings - Movable (Roller, Sliding, etc.) (EA)	Clean and Paint	2			$650.00	EA
311	Bearings - Movable (Roller, Sliding, etc.) (EA)	Rehab Supports and Bearings	3			$3,360.00	EA
311	Bearings - Movable (Roller, Sliding, etc.) (EA)	Replace Member	3			$5,160.00	EA
312	Bearings - Enclosed/Concealed (Bearing or Seat) (EA)	Rehab Unit	2	$3,360.00	1.25	$4,200.00	EA
312	Bearings - Enclosed/Concealed (Bearing or Seat) (EA)	Rehab Unit	3	$3,360.00	1.5	$5,040.00	EA
312	Bearings - Enclosed/Concealed (Bearing or Seat) (EA)	Replace Unit	3	$5,160.00	1.5	$7,740.00	EA
313	Bearings - Fixed (EA)	Clean and Paint	2	$650.00	1	$650.00	EA
313	Bearings - Fixed (EA)	Rehab Supports and Bearings	3	$3,360.00	0.95	$3,192.00	EA
313	Bearings - Fixed (EA)	Replace Member	3	$5,160.00	0.95	$4,902.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Grind	2			$575.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Grind	2		200 S.F.	$575.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Grind	3		400 S.F.	$1,150.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Underfill Injection; Seal Cracks	3			$7,915.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Add AC Overlay	3			$1,521.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Patch Approach Slab and Add AC Overlay	4			$11,630.00	EA
321	Approach Slab - Concrete - Reinforced (EA)	Replace Approach Slab	4			$30,220.00	EA
322	Relief Joint (LF)	Rehab Unit	2			$48.75	LF
322	Relief Joint (LF)	Rehab Unit	3			$113.33	LF
330	Bridge Rail System - Metal (LF)	Clean and Coat	2			$11.50	LF
330	Bridge Rail System - Metal (LF)	Clean and Coat	3		1.25	$14.38	LF
330	Bridge Rail System - Metal (LF)	Replace Unit	3			$32.40	LF
330	Bridge Rail System - Metal (LF)	Replace Unit	4			$59.20	LF
331	Bridge Rail System - Concrete (LF)	Patch Spalls	3			$165.00	LF
331	Bridge Rail System - Concrete (LF)	Patch Spalls	4			$295.10	LF
331	Bridge Rail System - Concrete (LF)	Replace Rail	4			$882.40	LF
332	Bridge Rail System - Timber (LF)	Rehab Rail	2			$33.00	LF
332	Bridge Rail System - Timber (LF)	Rehab Rail	3			$91.35	LF
332	Bridge Rail System - Timber (LF)	Replace Rail	3			$103.38	LF
333	Bridge Rail System - Combination (LF)	Rehab Rail	2			$58.00	LF
333	Bridge Rail System - Combination (LF)	Rehab Rail	3			$100.00	LF
333	Bridge Rail System - Combination (LF)	Replace Rail	3			$115.60	LF

Table 32- California Maintenance Actions (from *Bridge Action Matrix* 2009)

IMMS Action Code	BMS Action Code	Description	Typical Crew	Typical Unit Cost Range	Units	Typ. Struct Target
H30020	01	Deck-Patch spalls	Bridge Crew	$1300 - $2600	Square Feet	2 years
H30030	02	Deck-Repair Potholes	Bridge Crew	$1300 - $2600	Square Feet	2 years
H30012	03	Deck-Rehab	Contract	$ 20.90 - $74.32	Square Feet	4 years
H30013	04	Deck-Resurface	Contract	$2.32 - $ 16.16	Square Feet	3 years
H30060	05	Deck-Place Overlay	Contract	$1.67 - $15.51	Square Feet	3 years
H30050	06	Deck-Methacrylate	Contract	$1.30	Square Feet	2 years
H30011	07	Deck-Replace	Contract	$55.74 - $92.90	Square Feet	5 years
H30090	09	Deck-Misc.	Bridge Crew or Contract	Varies	Square Feet	3 years
H20010	10	Super-Patch spalls	Bridge Crew	$1300 - $2600	Square Feet	2 years
H20012	11	Super-Rehab	Bridge Crew or Contract	Consult Maint Design	Square Feet	4 years
H20011	12	Super-Replace	Contract	$92.90 - $167.22	Square Feet	5 years
H20013	13	Super-Epoxy Inject	Contract	$152.40	Linear Feet	3 years
NA	14	Super- Strengthen	Contract	$900,000	Each	6 years
H20090	19	Super-Misc.	Bridge Crew or Contract	Varies	Each Item	4 years
H10010	20	Sub-Patch spalls	Bridge Crew	$1300 - $2600	Square Feet	2 years
H10013	21	Sub-Epoxy Inject	Contract	$76.20	Linear Foot	3 years
H10012	23	Sub-Rehab	Bridge Crew or Contract	Consult Maint Design	Each	5 years
H10011	24	Sub-Replace	Contract	Varies	Linear Foot6/EA	5 years
NA	25	Sub-Scour Mitigate	Bridge Crew or Contract	Consult Hydraulics	Each	2 years
H10040	26	Sub-Nav. Protect	Contract	Varies	Each Location	3 years
H10090	29	Sub-Misc.	Bridge Crew or Contract	Varies	Each Item	4 years
H40010	30	Joint Seals - Repair/Clean	Bridge Crew	$47.55 - $82.30	Feet	2 years
H40012	31	Joint Seals - Rehab	Contract	$473-$915	Feet	3 years
H40011	32	Joint Seals - Replace	Bridge Crew or Contract	$47.55 - $82.30	Feet	3 years
		Joint - Asphaltic Plug	Contract	$260	Feet	
		Expansion Dam	Contract	$153	Feet	
H41050	40	Bearings-Clean	Bridge Crew	$300	Each	2 years
H41013	41	Bearings-Reset	Bridge Crew or Contract	$2500 - $5000	Each	2 years
H41012	42	Bearings-Rehab	Bridge Crew or Contract	Consult Maint Design	Each	2 years
H41011	43	Bearings-Replace	Contract	Varies	Each	3 years
H31080	50	Appr. Slab-mudjack	District	$360	Each Slab/lane	2 years
NA	51	Appr. Slab-Repair	District	$840	Each Slab/lane	2 years
H31060	52	Appr. Slab-Overlay	District	$1.67 - $15.51	Square Feet	3 years
H31011	53	Appr. Slab-Replace	District	$17,000	Each Slab/lane	4 years
H50010	60	Railing-Repair	Bridge Crew	$1300 - $2600	Feet	2 years

IMMS Action Code	BMS Action Code	Description	Typical Crew	Typical Unit Cost Range	Units	Typ. Struct Target
H50012	61	Railing-Rehab	Contract	$46 - $610	Feet	2 years
H50011	62	Railing-Replace	Contract	$ 78 - $ 101	Feet	5 years
NA	69	Railing-Misc.	Bridge Crew or Contract	Varies	Each Item	2 years
H91040	70	Seismic-Retrofit	Contract	Varies	Each Site	4 years
H91010	71	Seismic-Maintenance	Bridge Crew or Contract	$2500 - $5000	Each Location	2 years
NA	79	Seismic-Misc. Repair	Bridge Crew	Varies	Each Item	2 years
H90011	80	Bridge-Replace	Contract	$177 - $214	Square Feet	7 years
NA	81	Bridge-Rehab	Contract	$93	Square Feet	5 years
NA	82	Bridge-Collision Damage	Bridge Crew or Contract	$15,000-$200,000	Each	1 year
NA	83	Bridge-Paint ID	Bridge Crew	$500	Each Location	2 years
NA	84	Bridge-Widen	Contract	$186	Square Feet	5 years
NA	89	Bridge-Misc	Bridge Crew or Contract	Varies	Each Item	2 years
H70060	90	Paint-Rigging/Contain	Paint Crew	Varies	Each Set-up	3 years
H70061	91	Paint-Spot Prep/Spot Paint	Paint Crew	$5.00 - $6.00	Square Feet	3 years
H70062	92	Paint-Spot Prep/ Full Paint	Paint Crew or Contract	$7.00 - $10.00	Square Feet	4 years
H70063	93	Paint-Full Prep/Full Paint	Paint Crew or Contract	$31.00- $35.00	Square Feet	5 years
H70069	99	Paint-Misc activities	Paint Crew	Varies	Each Occurance	2 years
NA	MA	Mech/Elect-Clean	M&E Crews	Varies	Each Location	
H80010	MB	Mech/Elect-Repair/Adj.	M&E Crews	Varies	Each Set-up	
H80012	MC	Mech/Elect-Rehab/Upgrade	M&E Crews	Varies	Each Set-up	
H80011	MD	Mech/Elect-Replace	M&E Crews	Varies	Each Set-up	
NA	ME	Mech/Elect-Monitor/Test	M&E Crews	Varies	Each Set-up	
H80090	MZ	Mech/Elect-Misc.	M&E Crews	Varies	Each Item	

Task 3 References

Bridge 2009	*Bridge Action Matrix* (2009). Excel spreadsheet, California Dept. of Trans.
Hearn et al. 2010	Hearn,G., Weykamp,P., Kimball,T., Johnson,B.V., Ramsey,K., D'Andrea,A., and Becker,S. (2010). *Best Practices In Bridge Management Decision-Making*. Scan 07-05, NCHRP Project 20-68A 256p. http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A_07-05.pdf
30 Year 2009	*30 Year Major Bridge Asset Management Plan*. (2009). Ohio Dept of Transportation, 36p.

Task 4 - Data for Deterioration

Task 4 collects and prepares element-level condition data for use in calibration of Markov models of deterioration of bridge elements. The calibration is performed in Task 5. Tasks 4 and 5 together are an open implementation of Pontis' private process to form deterioration models from condition data. Pontis' approach is described in the Pontis Technical Manual (*Technical* 2005)[3]. There are two steps: 1) Reduce condition data to the subset of data for bridge elements in normal service without changes in conditions or quantities due to construction, demolition, or repairs, and; 2) Compute transition probabilities.

Task 4 provides the reduction of data. Task 5 provides the computation of transition probabilities.

Element-Level Condition Data

Data on element-level conditions are collected from the *eleminsp* table of CDOT's Pontis bridge database. CDOT *eleminsp* table has more than 236,000 condition reports for 50,000 element instances for about 3700 structures.

Deterioration models are derived from changes to element conditions; information that is not present in Pontis data. Pontis contains total quantities in condition states. Changes to condition over time are computed as differences among element-level condition reports.

Differences in condition reports (for a single bridge/element instance) can result from deterioration, from repairs, from demolition of elements in whole or part, and from construction of elements in whole or part (Table 33). Condition data from *eleminsp* are processed to find deterioration events, and to separate deterioration from other events. All events are useful, however. Events in *Repair*, *Construction* and *Demolition* are used in identification of actions that have been applied to bridge elements.

Table 33 - Element Events

Event	Δ (Total Quantity)	Δ (Condition State Quantities)
Deterioration	no change	Loss from better condition state and gain in poorer condition state
Repair	no change	Gain in better condition state and loss from poorer condition state
Construction	Increase	Gain in better condition state (usually)
Demolition	Decrease	Loss from poorer condition state (usually)

Computations using element-level condition data begin by moving data from the *eleminsp* table in Pontis BMS to a tab-delimited flat file. This flat file is an input file to software applications for recognition of element events and calibration of transition probabilities for deterioration models. The transfer of element-level condition data from Pontis BMS to an external file employs a software utility developed in Study 87-60 (see Task 13). A portion of the output for a Pontis *eleminsp* table is shown in Table 34.

[3] see Section 4.6

Table 34 - *eleminsp.txt* (portion)

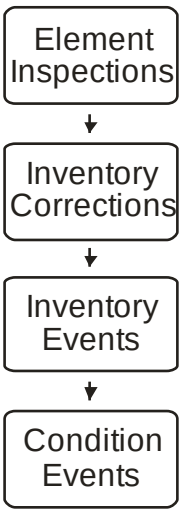
brkey	inspkey	elemkey	envkey	strunitkey	elinspdate	quantity	pctstate1	qtystate1	⋯
A-06-I	02IK	26	1	0	9/11/2002	416.71	100	416.71	⋯
A-06-I	02IK	504	1	0	9/11/2002	1	100	1	⋯
A-06-I	00HH	326	1	0	8/1/2000	2	100	2	⋯
A-06-I	00HH	501	1	0	8/1/2000	1	100	1	⋯
A-06-I	02IK	502	1	0	9/11/2002	1	100	1	⋯
A-06-I	97HA	104	1	0	8/1/1997	224	100	224	⋯
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋱

Element data are processed to identify bridge components and to discover changes in element inventory and element condition. Elements are identified using an enhanced version of the Pontis element definitions file. The enhanced file applies keywords for bridge components, element materials and element protection. These keywords allow grouping and collection of similar elements. A portion of the enhanced file for element definitions is shown in Table 35. Keyword sets are matched to all element records in element inspection data.

Table 35 - Enhanced Element Definitions (portion)

elemkey	elemlong	Component	Material	Protection	⋯
12	Concrete Deck - Bare	Deck	Concrete		⋯
13	Concrete Deck - Unprotected w/ AC Overlay	Deck	Concrete		⋯
14	Concrete Deck - Protected w/ AC Overlay	Deck	Concrete	AC Overlay	⋯
18	Concrete Deck - Protected w/ Thin Overlay	Deck	Concrete	Thin Overlay	⋯
22	Concrete Deck - Protected w/ Rigid Overlay	Deck	Concrete	Rigid Overlay	⋯
23	Concrete Deck - Bare Protected w/Coated Bars	Deck	Concrete	Coated Bars	⋯
⋮	⋮	⋮	⋮	⋮	⋱

Changes to element condition and to element inventory are identified by an application developed in CDOT Study 87-60 called *Element Event*. *Element Event* takes inputs for element inspections, enhanced definitions of elements, and bridge data to perform a suite of data assembly and reporting activities (see Task 13).



Consistency of Element Inventory

Colorado DOT's Pontis data for element inspections shows minor variations in total element quantities among many inspections. There are larger variations for inspections in year 2002 that are probably due to changes in units for reporting. An example of small changes in inventory is shown in Table 36. The table lists total quantity for element 26 at one bridge in four inspections from year 2000 to year 2006. It is likely that element 26 has no real change in quantity; instead there are differences in reported quantities among inspections. For these cases, the *Element Analysis* application computes a moving average of total quantities, retains all records that are within a 2% of the average value, and then replaces all quantity records with the average value. For the records in Table 36, the average quantity is 415 square meters.

Table 36 - Element Quantity Example

Element	Inspection Date	Total Quantity, m^2 (in Pontis)	Total Quantity, m^2 (in Study 87-60)
26	2000/08/01	416	415
26	2002/09/11	416.71	415
26	2004/08/09	414.552	415
26	2006/07/25	414.533	415

An example of large difference in element quantity is shown in Table 37. The table shows element 215, reinforced concrete abutment, for one bridge in five inspections from year 1997 to year 2006. Element quantity is reported in linear meters, and is equal to 27 meters for four of the five inspections. The inspection in 2002 reports a quantity of 90. This is apparently linear feet, since a conversion to whole meters gives 27 meters.

Element Analysis checks differences in element quantities, and applies appropriate unit conversions in linear measure or area measure, as required, to find whether apparent differences in quantities are probably differences in units. Units and quantities are converted in all probable instances.

Table 37 – Element Units Example

			Condition			
Element	Inspection Date	Total Quantity	State 1	State 2	State 3	State 4
215	1997/08/01	27	27	0	0	0
215	2000/08/01	27	27	0	0	0
215	2002/09/11	90	89	1	0	0
215	2004/08/09	27	27.127	0.305	0	0
215	2006/07/25	27	27.127	0.305	0	0

Finding Transitions in Element Conditions

Records from element condition reports are collected and quantity differences among condition states in sequential records are computed. A temporary array, *QD*, is formed. *QD* is ten columns wide. Columns 0 to 4 hold condition reports. Columns 5 to 9 hold forward differences to the next condition report. The structure of the array is shown in Table 38.

Table 38 - Temporary Array *QD*

q_{11}	q_{12}	q_{13}	q_{14}	q_{15}	$q_{21}-q_{11}$	$q_{22}-q_{12}$	$q_{23}-q_{13}$	$q_{24}-q_{14}$	$q_{25}-q_{15}$
q_{21}	q_{22}	q_{23}	q_{24}	q_{25}	$q_{31}-q_{21}$	$q_{32}-q_{22}$	$q_{33}-q_{23}$	$q_{34}-q_{24}$	$q_{35}-q_{25}$
q_{31}	q_{32}	q_{33}	q_{34}	q_{35}	⋯				
⋮									

A transition in element condition is registered if

- The initial quantity in a condition state is at least 2% of the total quantity of the element
- The difference in quantity in one or more condition states to the next inspection is at least 2% of total quantity of element

Deterioration in service is evident as negative differences in element quantities at better condition states with balancing increases in element quantities in poorer condition states. Improvements are evident as positive differences in element quantities in better condition.

Events in Element Service Life

Condition data are examined to identify events in element service life. There are six events associated with changes in element condition or quantity (Table 39). Elements are built and demolished. Elements may have portions added or removed during service. Elements can deteriorate. Elements can be repaired.

Table 39 - Study 87-60 Events in Element Service Life

Event	Note
Build	Original construction of a bridge element.
Addition	Increase in total quantity of an existing element.
Deterioration	Decline in element condition without change in total quantity.
Repair	Improvement to element condition without change in total quantity.
Removal	Decrease in total quantity of an existing element.
Demolition	Complete removal of a bridge element.

There are two events associated with condition data. One is the *Start* of element-level data and the other is the *End* of element-level data. Within the range of element-level data (years 1998 to 2008), service life events are found by comparison of element-level reports from consecutive inspections. Changes in total quantities, and changes in quantities among condition states are computed and examined.

Smart flags have events, too. Service life events for smart flags are listed in Table 40.

Table 40 - Service Life Events for Smart Flags

Event	Note
Set	Initial assignment of a smart flag.
Deterioration	Decline in smart flag condition without change in total quantity.
Respond	Improvement to smart flag condition or reduction in its total quantity. Flag persists.
Fix	Reduction in quantity of smart flag to zero.

Deterioration Events

CDOT data contains 11400 deterioration events for 105 bridge elements. For some elements, not all condition states are present in CDOT data, and some elements have no condition data at all. A summary of elements and counts of deterioration events is shown in Table 42.

Data are needed in all condition states to form models of deterioration. For this purpose, data are grouped in several ways: By construction material, by bridge component, by protection for elements, and by similar bridge component + construction material + element protection. Combined models are applied to all similar elements. The data counts for component/material/protection models are shown in Table 45.

Datasets for Deterioration Modeling

Grouping of bridge elements by bridge component yields eighteen deterioration models for twelve bridge components. Separate models are created for elements in a single group, but having different basis of measurement (Table 43). Separate models are created for elements in a single group, if some elements must be reported as single condition state only (decks, for example), and other elements can be reported more than one condition state. Grouping of bridge elements by construction material yields twenty deterioration models for ten materials (Table 44). Grouping of bridge elements by component + material + protection yields fifty-nine deterioration models (Table 45). Transition probabilities are computed for all these groupings and models in Task 5.

Task 4 References

Technical 2005	*Pontis Bridge Management Release 4.4 Technical Manual* (2005). Cambridge Systematics, 347p.

Table 41 - Status of CDOT Condition Data

Condition Data	Element
Complete[4]	12, 13, 14, 32, 39, 101, 104, 105, 106, 107, 109, 110, 111, 113, 121, 125, 126, 131, 151, 152, 155, 161, 201, 202, 205, 206, 210, 211, 215, 216, 221, 228, 234, 235, 240, 241, 243, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 321, 325, 326, 327, 330, 331, 332, 333, 334, 335, 338, 339, 340, 341, 342, 350, 351, 353, 501, 502, 504, 510, 520
Incomplete[5]	18, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 35, 36, 38, 40, 52, 55, 60, 102, 112, 116, 117, 120, 140, 141, 156, 160, 204, 217, 220, 225, 230, 231, 233, 315, 320, 336, 337, 343
Missing[6]	44, 48, 53, 54, 115, 130, 135, 143, 144, 145, 146, 147, 154, 226, 227, 242, 352, 355, 356, 357, 358, 359, 360, 361, 362, 363, 370, 371, 372, 373, 380, 381, 382, 383, 384, 385, 386, 387, 399, 505, 530, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 630, 631, 640, 650, 651, 652, 660, 661, 662, 663, 690, 691, 692, 693, 694

[4] Data are reported in all condition states.
[5] At least one condition state has no data.
[6] No condition data are reported.

Table 42 - Counts of CDOT Element Condition Data

	Deterioration Events per Condition State				
Element	**1**	**2**	**3**	**4**	**5**
12	154	116	70	36	25
13	760	434	149	58	13
14	326	161	36	7	1
18	1	no data	no data	no data	no data
22	33	12	1	no data	no data
23	147	15	2	no data	no data
24	19	no data	no data	no data	no data
25	22	2	no data	no data	no data
26	456	151	14	3	no data
27	1	1	no data	no data	no data
28	no data	no data	no data	no data	no data
29	1	no data	no data	no data	no data
30	11	6	5	6	no data
31	3	no data	1	no data	
32	111	120	49	12	
35	70	6	no data	no data	no data
36	84	9	no data	no data	no data
38	18	3	2	no data	no data
39	76	29	5	1	1
40	8	4	no data	no data	no data
44	no data	no data	no data	no data	no data
48	no data	no data	no data	no data	no data
52	27	3	no data	no data	no data
53	no data	no data	no data	no data	no data
54	no data	no data	no data	no data	
55	1	no data	no data	no data	
60	31	15	3	3	no data
101	23	15	14	4	
102	43	32	18	7	no data
104	264	117	21	2	
105	72	61	18	2	
106	40	12	4	1	
107	657	684	573	311	37
109	548	156	49	4	
110	746	514	196	39	
111	192	175	40	97	
112	2	1	no data	no data	
113	49	40	40	17	5
115	no data	no data	no data	no data	
116	1	1	no data	no data	

	Deterioration Events per Condition State				
Element	**1**	**2**	**3**	**4**	**5**
117	2	1	1	no data	
120	9	no data	no data	no data	
121	18	23	27	10	3
125	9	1	2	1	
126	19	24	23	9	1
130	no data	no data	no data	no data	
131	1	2	2	1	1
135	no data	no data	no data	no data	
140	3	no data	no data	no data	
141	3	1	2	1	no data
143	no data	no data	no data	no data	
144	7	9	5	1	
145	no data	no data	no data	no data	
146	no data	no data	no data	no data	
147	no data	no data	no data	no data	no data
151	10	1	no data	no data	
152	31	32	40	27	5
154	no data	no data	no data	no data	
155	3	5	5	1	
156	no data	1	no data	no data	
160	2	1	no data	no data	
161	8	6	7	5	
201	8	10	3	1	
202	30	42	36	16	3
204	3	no data	no data	no data	
205	1107	327	168	21	
206	179	190	186	79	
210	889	272	90	4	
211	6	2	1	1	
215	2503	1369	326	17	
216	177	73	13	3	
217	36	25	10	no data	
220	2	no data	no data	no data	
221	37	12	2	1	
225	1	1	no data	no data	
226	no data	no data	no data	no data	
227	no data	no data	no data	no data	
228	1	1	1	1	
230	9	3	1	no data	
231	12	16	9	5	no data
233	15	3	no data	no data	
234	1610	769	421	72	
235	187	111	25	6	
240	90	78	27	6	

	Deterioration Events per Condition State				
Element	**1**	**2**	**3**	**4**	**5**
241	761	662	394	26	
242	no data	no data	no data	no data	
243	6	7	5	1	
300	433	125	82		
301	385	156	39		
302	334	271	127		
303	12	4	1		
304	277	259	100		
305	92	101	62		
306	127	87	30		
307	72	36	13		
308	624	522	202		
309	82	20	9		
310	304	107	27		
311	426	505	68		
312	no data	no data	no data		
313	550	395	34		
314	117	54	11		
315	1	no data	1		
320	4	1	no data	no data	
321	1166	324	25	5	
325	1687	837	168	3	
326	2384	650	101		
327	778	359	54		
330	141	19	14	6	
331	633	264	143	28	
332	125	119	65		
333	391	140	69		
334	1801	625	303	128	48
335	826	129	25		
336	12	4	4	1	no data
337	1	1	no data	no data	
338	1871	1074	543	93	
339	166	147	58	21	
340	390	30	4		
341	433	38	8		
342	60	11	2	1	
343	99	12	1	no data	
350	14	13	11	2	
351	1	2	1	1	
352	no data	no data	no data	no data	
353	3	3	5	3	
355	no data	no data	no data		
356	no data	no data	no data		

	Deterioration Events per Condition State				
Element	**1**	**2**	**3**	**4**	**5**
357	no data	no data	no data	no data	
358	no data	no data	no data	no data	
359	no data	no data	no data	no data	no data
360	no data	no data	no data		
361	no data	no data	no data		
362	no data	no data	no data		
363	no data	no data	no data	no data	
370	no data	no data	no data		
371	no data	no data	no data		
372	no data	no data	no data		
373	no data	no data	no data	no data	
380	no data				
381	no data				
382	no data				
383	no data				
384	no data				
385	no data				
386	no data				
387	no data				
399	no data	no data	no data	no data	no data
501	2381	8			
502	640	2			
504	2356	3			
505	no data	no data			
510	303	2			
520	476	2			
530	no data	no data			
600	no data	no data	no data	no data	no data
601	no data	no data	no data	no data	no data
602	no data	no data	no data	no data	no data
603	no data	no data	no data	no data	no data
604	no data	no data	no data	no data	no data
605	no data	no data	no data	no data	
606	no data	no data	no data	no data	no data
607	no data	no data	no data	no data	no data
608	no data	no data	no data	no data	
609	no data	no data	no data	no data	
610	no data	no data	no data	no data	no data
611	no data	no data	no data	no data	no data
612	no data	no data	no data	no data	no data
613	no data	no data	no data	no data	no data
614	no data	no data	no data	no data	
615	no data	no data	no data	no data	no data
616	no data	no data	no data	no data	

	Deterioration Events per Condition State				
Element	**1**	**2**	**3**	**4**	**5**
617	no data	no data	no data		
618	no data	no data	no data		
619	no data	no data	no data		
620	no data	no data	no data	no data	no data
621	no data	no data	no data	no data	no data
622	no data	no data	no data	no data	no data
623					
624					
625					
626					
627					
630	no data	no data	no data	no data	no data
631	no data	no data	no data	no data	no data
640	no data	no data	no data	no data	no data
650	no data	no data	no data	no data	no data
651	no data	no data	no data	no data	no data
652	no data	no data	no data	no data	no data
660	no data	no data	no data	no data	no data
661	no data	no data	no data	no data	no data
662	no data	no data	no data	no data	no data
663	no data	no data	no data	no data	no data
690	no data	no data	no data	no data	no data
691	no data	no data	no data	no data	no data
692	no data	no data	no data	no data	no data
693	no data	no data	no data	no data	no data
694	no data	no data	no data	no data	no data

Table 43 - Data Counts for Components

		Events Per Condition State				
Element Group	**Elements**	**1**	**2**	**3**	**4**	**5**
Approach:ea	520	476	2	0	0	0
Approach:ea	325 321 320	2857	1162	193	8	0
Bearing:ea	311 313 309 310 314 315	1480	1081	150	0	0
Channel:ea	501 504 510 502	5680	15	7	2	0
Culvert:ea	327 335	1604	488	79	0	0
Culvert:m	241 240 243	857	747	426	33	0
Deck:ea	26 14 13 12 32 39 23 52 36 31 38 60 30 40 24 25 35 22 18 27 55 29	2360	1087	337	126	40
Joint:m	305 308 306 301 302 304 300 303 307	2356	1561	656	3	0
Railing:m	334 333 332 330 331	3091	1167	594	165	48
Sign:ea	342 343	159	23	3	1	0
Substructure:ea	341	433	38	8	0	0

		Events Per Condition State				
Element Group	**Elements**	**1**	**2**	**3**	**4**	**5**
Substructure:ea	326 205 206 202 201 221 204 225 220 228	3752	1233	497	119	3
Substructure:m	215 210 234 216 235 231 217 233 230 211	5444	2643	896	108	2
Superstructure:ea	340	390	30	4	0	0
Superstructure:ea	161 160	10	7	7	5	0
Superstructure:m	104 109 107 110 111 105 106 113 121 126 152 117 112 151 102 120 125 101 141 144 155 140 116 131 156	2752	1908	1080	535	52
Tunnel:m	351 350 353	18	18	17	6	0
Walks:m	338 336 339 337	2050	1226	605	115	0

Table 44 - Data Counts for Element Material

		Events Per Condition State				
Model	**Elements**	**1**	**2**	**3**	**4**	**5**
-:ea	501 504 502 60	5408	28	8	5	0
-:ea	325 326 327 335 311 313 342 343 314 315	6928	2952	465	4	0
-:m	308 301 302 304 351 300 303 307	2138	1375	565	3	0
Appraisal:ea	510 520	779	4	2	0	0
Asphalt:m	306	127	87	30	0	0
Concrete:ea	26 14 340 341 13 12 39 23 52 36 38 40 24 25 35 22 18 27	3025	1014	291	105	40
Concrete:ea	205 321 221 220	2312	663	195	27	0
Concrete:m	215 338 241 210 234 110 331 105 350 353 144 155 116	9113	5016	2157	288	2
Elastomeric:ea	309 310	386	127	36	0	0
Elastomeric:m	305	92	101	62	1	0
Metal:m	334 336 330 337	1955	649	321	135	48
Other:m	333 217 243 211	439	174	85	3	0
Prestressed Concrete:ea	204 320	7	1	0	0	0
Prestressed Concrete:m	104 109 233	827	276	70	6	0
Steel:ea	30 29	12	6	5	6	0
Steel:ea	202 201 225 161 160	49	60	46	22	3
Steel:m	107 240 106 113 121 126 152 112 151 231 102 120 125 101 141 230 140 131	1028	965	782	400	52
Timber:ea	32 31 55	115	120	50	12	0
Timber:ea	206 228	180	191	187	80	0
Timber:m	111 216 235 332 339 117 156	849	627	202	129	0

Table 45 - Data Counts for Component/Material/Protection

		Events Per Condition State				
Element Group	**Elements**	**1**	**2**	**3**	**4**	**5**
Approach:-:ea	325	1687	837	168	3	0
Approach:Appraisal:ea	520	476	2	0	0	0
Approach:Concrete:ea	321	1166	324	25	5	0
Approach:Prestressed Concrete:ea	320	4	1	0	0	0
Bearing:-:ea	311 313 314 315	1094	954	114	0	0
Bearing:Elastomeric:ea	309 310	386	127	36	0	0
Channel:-:ea	501 504 502	5377	13	5	2	0
Channel:Appraisal:ea	510	303	2	2	0	0
Culvert:-:ea	327 335	1604	488	79	0	0
Culvert:Concrete:m	241	761	662	394	26	0
Culvert:Other:m	243	6	7	5	1	0
Culvert:Steel:m	240	90	78	27	6	0
Deck:-:ea	60	31	15	3	3	0
Deck:Concrete:ea	12 38 35	242	125	72	36	25
Deck:Concrete:AC Overlay:ea	14 13 39 36 40	1254	637	190	66	15
Deck:Concrete:Cathodic system:ea	27	1	1	0	0	0
Deck:Concrete:Coated Bars:ea	26 23 52	630	169	16	3	0
Deck:Concrete:Rigid Overlay:ea	25 22	55	14	1	0	0
Deck:Concrete:Thin Overlay:ea	24 18	20	0	0	0	0
Deck:Steel:ea	30 29	12	6	5	6	0
Deck:Timber:ea	31	3	0	1	0	0
Deck:Timber:AC Overlay:ea	32 55	112	120	49	12	0
Joint:-:m	308 301 302 304 300 303 307	2137	1373	564	2	0
Joint:Asphalt:m	306	127	87	30	0	0
Joint:Elastomeric:m	305	92	101	62	1	0
Railing:Concrete:m	331	633	264	143	28	0
Railing:Metal:m	330	141	19	14	6	0
Railing:Metal:Coated:m	334	1801	625	303	128	48
Railing:Other:m	333	391	140	69	1	0
Railing:Timber:m	332	125	119	65	2	0
Sign:-:ea	342 343	159	23	3	1	0
Substructure:-:ea	326	2384	650	101	0	0
Substructure:Concrete:ea	341	433	38	8	0	0
Substructure:Concrete:ea	205 221	1144	339	170	22	0
Substructure:Concrete:m	215 210 234	5002	2410	837	93	2
Substructure:Concrete:Submerged:ea	220	2	0	0	0	0
Substructure:Other:m	217 211	42	27	11	1	0
Substructure:Prestressed Concrete:ea	204	3	0	0	0	0
Substructure:Prestressed Concrete:m	233	15	3	0	0	0
Substructure:Steel:ea	201 225	9	11	3	1	0
Substructure:Steel:m	230	9	3	1	0	0

		Events Per Condition State				
Element Group	**Elements**	**1**	**2**	**3**	**4**	**5**
Substructure:Steel:Painted:ea	202	30	42	36	16	3
Substructure:Steel:Painted:m	231	12	16	9	5	0
Substructure:Timber:ea	206	179	190	186	79	0
Substructure:Timber:m	216 235	364	184	38	9	0
Substructure:Timber:Submerged:ea	228	1	1	1	1	0
Superstructure:Concrete:ea	340	390	30	4	0	0
Superstructure:Concrete:m	110 105 144 155 116	829	590	224	43	0
Superstructure:Prestressed Concrete:m	104 109	812	273	70	6	0
Superstructure:Steel:ea	161 160	10	7	7	5	0
Superstructure:Steel:m	106 112 151 120 125 101 140	96	30	20	6	0
Superstructure:Steel:Painted:m	107 113 121 126 152 102 141 131	821	838	725	383	52
Superstructure:Timber:m	111 117 156	194	177	41	97	0
Tunnel:-:m	351	1	2	1	1	0
Tunnel:Concrete:m	350 353	17	16	16	5	0
Walks:Concrete:m	338	1871	1074	543	93	0
Walks:Metal:m	337	1	1	0	0	0
Walks:Metal:Coated:m	336	12	4	4	1	0
Walks:Timber:m	339	166	147	58	21	0

Task 5 – Calibrate Deterioration Models

Work in Task 5 computes and reports transition probabilities for Markov chain deterioration models for bridge elements. Computations are independent of Pontis and use software applications developed in Study 87-60. Transition probabilities are imported to Pontis BMS in Task 10.

Method

Deterioration models in Pontis BMS are expressed as vectors of transition probabilities.

$$\{T_1 \quad T_2 \quad T_3 \quad T_4 \quad T_5\} \qquad \text{Eq. 4}$$

T_i is the probability that a bridge element or portion of element will remain in condition state i during the next year. Elements variously have 3, 4 or 5 condition states, and so require transition vectors of 3, 4 or 5 values. Pontis requires many deterioration models. Pontis handles as many as 160 elements, each of which can have 4 models; one model for each of four service environments.

Values T_i are computed from total quantities of elements. The quantity of a bridge elements in one condition state is $q_{i,j}$ where the condition state is i and the year is j. The quantity of this same element remaining in condition state i at year $j+1$ is $q_{i,j+1}$. The transition probability is

$$T_i = \frac{q_{i,j+1}}{q_{i,j}} \qquad \text{Eq. 5}$$

Notice that $q_{i,j}$ and $q_{i,j+1}$are not total quantities of bridge elements. Instead these are the starting and ending quantities of bridge elements that are not altered by repair, construction, demolition or any deliberate activity that would change element quantity or condition. For this reason, the identification of events in element service life is essential to computation of transition probabilities in deterioration models.

Total quantities of elements in condition state i at years j and $j+1$ are denoted as $Q_{i,j}$ and $Q_{i,j+1}$. Total quantities are computed as sums element quantities in condition state i from element-level inspection reports for the years j and $j+1$. Changes in total quantity from year j to year $j+1$ may be due to deterioration, construction, demolition or repairs. The quantities needed for Eq. 5 are the quantities of elements allowed to deterioration normally, without changes due to construction, demolition or repair. The quantities needed for deterioration modeling are

$$\begin{aligned} q_{i,j} &= Q_{i,j} - q_{i,Repaired} - q_{i,Demolished} \\ q_{i,j+1} &= Q_{i,j+1} - q_{i,Repaired} - q_{i,Constructed} \end{aligned} \qquad \text{Eq. 6}$$

The quantities $q_{i,Repaired}$, $q_{i,Demolished}$, and $q_{i,Constructed}$ are found by examination of element-level condition data for individual bridges. The process is described in Task 4 and is executed using software described in Task 13. In brief, construction and demolition are recognized by changes in total quantities of elements at individual bridges. Repairs are recognized as improvements to element conditions at individual bridges. Quantities in construction, demolition and repair at individual bridges are summed to get quantities $q_{i,Constructed}$, $q_{i,Demolished}$, and $q_{i,Repaired}$ used in Eq. 6.

Transition probabilities, T_i, are computed for every pair of years j and $j+1$ that are available in element–level condition data. These separate estimates are combined into average values.

Limitations in Condition Data

The element-level condition data used in Study 87-60 includes the years 1998 to 2008. This span, a decade, is less than the median time for transition by deterioration for some elements and condition states. For some elements and condition states, CDOT data offers no instances of transition. Consequently, some transition probabilities, T_i, are equal to 1.0.

Expressing the Outcomes

Pontis BMS uses an expert elicitation for deterioration models that accepts inputs as median life in condition states. median life, M_i, is related to transition probability, T_i as

$$\frac{1}{2} = T_i^{M_i}$$
$$M_i = \frac{ln(1/2)}{ln(T_i)} \qquad \text{Eq. 7}$$

Values for deterioration models are computed as both T_i and M_i for Study 87-60.

Results for Transition Probabilities

Values of transition probabilities and median life in condition states are computed for groups of elements both statewide and within CDOT districts[7].

The deterioration models for elements grouped by bridge component are summarized in Table 49 and listed by CDOT region in Table 52. Deterioration models for elements grouped by material of construction are summarized in Table 50 and listed by CDOT region in Table 53. Deterioration models for elements grouped by component + material + protection are summarized in Table 51 and listed by CDOT region in Table 54.

Comparisons

Comparisons of median life of elements in condition state 1 are shown for elements grouped by bridge component (Table 46), for elements grouped by material of construction (Table 47), and by elements grouped by component + material + protection (Table 48).

Among bridge components, it is found that decks remain in condition state 1 for a median value of 9 years, while superstructures and substructures remain in condition state 1 for 69 years. Among construction materials, prestressed concrete elements remain in condition state 1 for more than 100 years, concrete elements other than decks remain in condition state 1 for 86 years, and steel elements other than decks remain in condition state 1 for 18 years.

[7] Pontis *bridge* table for CDOT identifies regions and maintenance sections in the *district* data field. CDOT data include 15 districts.

Median life varies with type of protection for elements. Among reinforced concrete decks, median life values range from 5 years to more than 100 years for different types of protection. Coated metal elements have longer median life in condition state 1 compared to uncoated elements.

For all comparisons, statewide average values of median life are presented along with minimum and maximum values obtained in data for individual regions of CDOT. Many results show median life greater than 100 years. No such behavior is actually observed. Instead, results showing great longevity for bridge elements indicate that no element transition is observed in the available 10-year period of condition data or that element population in a given condition state is scant.

Table 46 - Median Life (years) in Condition State 1 - Bridge Components

	Median Life CS 1, years		
Component	**Statewide**	**Regional Minimum**	**Regional Maximum**
Deck (m2)	9	2	100+
Superstructure (m)	69	2	100+
Substructure (m)	69	10	100+
Joints (m)	17	1	100+
Railings (m)	49	2	100+

Table 47 - Median Life (years) in Condition State 1 - Bridge Materials

	Median Life CS 1, years		
Material	**Statewide**	**Regional Minimum**	**Regional Maximum**
Concrete (m2)	8	2	100+
Concrete (m)	86	2	100+
Prestressed Concrete (m)	100+	49	100+
Steel (m2)	100+	100+	100+
Steel (m)	18	1	100+
Timber (m2)	7	3	100+
Timber (m)	33	4	100+

Table 48 - Median Life (years) in Condition State 1 - Component + Material + Protection

	Median Life CS 1, years		
Material	**Statewide**	**Regional Minimum**	**Regional Maximum**
Deck:Concrete	19	4	100+
Deck:Concrete:AC Overlay	5	2	100+
Deck:Concrete:Coated Bars	10	1	100+
Deck:Concrete:Rigid Overlay	19	10	100+
Deck:Concrete:Thin Overlay	100+	100+	100+
Deck:Steel	100+	100+	100+
Deck:Timber	100+	100+	100+
Deck:Timber:AC Overlay	7	2	100+
Joint:-:	18	1	100+
Joint:Asphalt:	10	1	100+
Joint:Elastomeric:	3	2	100+
Railing:Concrete:	57	2	100+
Railing:Metal:	33	19	100+
Railing:Metal:Coated	77	5	100+
Railing:Other:	19	1	100+
Railing:Timber:	7	2	100+
Substructure:-:ea	53	6	100+
Substructure:Concrete:ea	40	2	100+
Substructure:Concrete:m	69	9	100+
Substructure:Other:m	29	10	100+
Substructure:Prestressed Concrete:m	100+	100+	100+
Substructure:Steel:ea	12	1	100+
Substructure:Steel:m	100+	13	100+
Substructure:Steel:Painted:ea	1	1	5
Substructure:Steel:Painted:m	6	1	100+
Substructure:Timber:ea	1	1	100+
Substructure:Timber:m	69	21	100+
Superstructure:Concrete:m	100+	10	100+
Superstructure:Prestressed Concrete:m	100+	49	100+
Superstructure:Steel:ea	100+	100+	100+
Superstructure:Steel:m	100+	26	100+
Superstructure:Steel:Painted:m	16	2	86
Superstructure:Timber:m	36	8	100+

Table 49 - Deterioration Models - Bridge Components

		Transition Probabilities, T_i					Mean Life, years				
Model	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Approach:ea	520	1.000					1000				
Approach:ea	325 321 320	0.981	0.990	1.000	1.000		36	69	1000	1000	
Bearing:ea	311 313 309 310 314 315	0.975	0.996	1.000			27	173	1000		
Channel:ea	501 504 510 502	1.000	1.000	1.000			1000	1000	1000		
Culvert:ea	327 335	0.985	0.996	1.000			46	173	1000		
Culvert:m	241 240 243	0.989	0.985	0.998	1.000		63	46	346	1000	
Deck:ea	26 14 13 12 32 39 23 52 36 31 38 60 30 40 24 25 35 22 18 27 55 29	0.926	0.835	0.994	0.996	1.000	9	4	115	173	1000
Joint:m	305 308 306 301 302 304 300 303 307	0.959	0.977	1.000			17	30	1000		
Railing:m	334 333 332 330 331	0.986	0.926	0.963	0.981	1.000	49	9	18	36	1000
Sign:ea	342 343	0.942	1.000	1.000	1.000		12	1000	1000	1000	
Substructure:ea	341	0.995	1.000	1.000			138	1000	1000		
Substructure:ea	326 205 206 202 201 221 204 225 220 228	0.958	0.953	0.992	0.998	1.000	16	14	86	346	1000
Substructure:m	215 210 234 216 235 231 217 233 230 211	0.990	0.989	0.993	0.999	1.000	69	63	99	693	1000
Superstructure:ea	340	0.995	0.994	1.000			138	115	1000		
Superstructure:ea	161 160	1.000	1.000	0.889	1.000		1000	1000	6	1000	
Superstructure:m	104 109 107 110 111 105 106 113 121 126 152 117 112 151 102 120 125 101 141 144 155 140 116 131 156	0.990	0.979	0.991	0.993	1.000	69	33	77	99	1000
Tunnel:m	351 350 353	0.885	1.000	1.000	1.000	0.000	6	1000	1000	1000	
Walks:m	338 336 339 337	0.988	0.989	0.976	1.000	0.000	57	63	29	1000	

Table 50 - Deterioration Models - Bridge Material

		Transition Probabilities					Median Life, years				
Model	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
-:ea	501 504 502 60	0.997	1.000	1.000			231	1000	1000		
-:ea	325 326 327 335 311 313 342 343 314 315	0.976	0.995	1.000			29	138	1000		
-:m	308 301 302 304 351 300 303 307	0.963	0.981	1.000	1.000		18	36	1000	1000	
Appraisal:ea	510 520	0.994	1.000				115	1000			
Asphalt:m	306	0.931	0.977	1.000			10	30	1000		
Concrete:ea	26 14 340 341 13 12 39 23 52 36 38 40 24 25 35 22 18 27	0.921	0.831	0.994	0.996	1.000	8	4	115	173	1000
Concrete:ea	205 321 221 220	0.983	0.970	0.994	1.000		40	23	115	1000	
Concrete:m	215 338 241 210 234 110 331 105 350 353 144 155 116	0.992	0.989	0.987	1.000	1.000	86	63	53	1000	1000
Elastomeric:ea	309 310	0.994	0.995	1.000			115	138	1000		
Elastomeric:m	305	0.796	0.901	1.000	1.000		3	7	1000	1000	
Metal:m	334 336 330 337	0.991	0.921	0.943	0.978	1.000	77	8	12	31	1000
Other:m	333 217 243 211	0.964	0.981	1.000	1.000		19	36	1000	1000	
Prestressed Concrete:ea	204 320	1.000					1000				
Prestressed Concrete:m	104 109 233	0.999	1.000	0.997	1.000		693	1000	231	1000	
Steel:ea	30 29	1.000	0.847	0.974	1.000		1000	4	26	1000	
Steel:ea	202 201 225 161 160	0.568	0.962	0.984	0.994	1.000	1	18	43	115	1000
Steel:m	107 240 106 113 121 126 152 112 151 231 102 120 125 101 141 230 140 131	0.963	0.976	0.992	0.986	1.000	18	29	86	49	1000
Timber:ea	32 31 55	0.907	0.930	0.977	1.000		7	10	30	1000	

		Transition Probabilities					Median Life, years				
Model	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Timber:ea	206 228	0.368	0.920	0.992	1.000		1	8	86	1000	
Timber:m	111 216 235 332 339 117 156	0.979	0.972	0.984	1.000		33	24	43	1000	

Table 51 - Deterioration Models – Component/Material/Protection

		Transition Probabilities					Median, years				
Model	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Approach:-:ea	325	0.979	0.987	1.000			33	53	1000		
Approach:Appraisal:ea	520	1.000					1000				
Approach:Concrete:ea	321	0.983	0.997	1.000	1.000		40	231	1000	1000	
Approach:Prestressed Concrete:ea	320	1.000					1000				
Bearing:-:ea	311 313 314 315	0.958	0.996	1.000			16	173	1000		
Bearing:Elastomeric:ea	309 310	0.994	0.995	1.000			115	138	1000		
Channel:-:ea	501 504 502	1.000	1.000	1.000			1000	1000	1000		
Channel:Appraisal:ea	510	0.989	1.000				63	1000			
Culvert:-:ea	327 335	0.985	0.996	1.000			46	173	1000		
Culvert:Concrete:m	241	0.991	0.993	0.998	1.000		77	99	346	1000	
Culvert:Other:m	243	0.976	0.794	1.000	1.000		29	3	1000	1000	
Culvert:Steel:m	240	0.973	0.971	0.999	1.000		25	24	693	1000	
Deck:-:ea	60	0.997	1.000	1.000			231	1000	1000		
Deck:Concrete:ea	12 38 35	0.965	0.354	0.997	0.978	1.000	19	1	231	31	1000
Deck:Concrete:AC Overlay:ea	14 13 39 36 40	0.879	0.958	0.976	0.998	1.000	5	16	29	346	1000
Deck:Concrete:Cathodic system:ea	27	1.000	1.000				1000	1000			
Deck:Concrete:Coated Bars:ea	26 23 52	0.936	0.991	1.000	1.000		10	77	1000	1000	
Deck:Concrete:Rigid Overlay:ea	25 22	0.965	0.992	1.000			19	86	1000		
Deck:Concrete:Thin Overlay:ea	24 18	1.000					1000				
Deck:Steel:ea	30 29	1.000	0.847	0.974	1.000		1000	4	26	1000	
Deck:Timber:ea	31	1.000		1.000			1000		1000		
Deck:Timber:AC Overlay:ea	32 55	0.905	0.930	0.977	1.000		7	10	30	1000	
Joint:-:m	308 301 302 304 300 303 307	0.963	0.981	1.000			18	36	1000		
Joint:Asphalt:m	306	0.931	0.977	1.000			10	30	1000		
Joint:Elastomeric:m	305	0.796	0.901	1.000	1.000		3	7	1000	1000	
Railing:Concrete:m	331	0.988	0.963	0.977	1.000		57	18	30	1000	
Railing:Metal:m	330	0.979	1.000	1.000	1.000		33	1000	1000	1000	
Railing:Metal:Coated:m	334	0.991	0.919	0.944	0.978	1.000	77	8	12	31	1000
Railing:Other:m	333	0.965	0.990	1.000			19	69	1000		
Railing:Timber:m	332	0.905	0.948	1.000	1.000		7	13	1000	1000	
Sign:-:ea	342 343	0.942	1.000	1.000	1.000		12	1000	1000	1000	
Substructure:-:ea	326	0.987	0.996	1.000			53	173	1000		
Substructure:Concrete:ea	341	0.995	1.000	1.000			138	1000	1000		
Substructure:Concrete:ea	205 221	0.983	0.947	0.994	1.000		40	13	115	1000	
Substructure:Concrete:m	215 210 234	0.990	0.988	0.993	0.998	1.000	69	57	99	346	1000
Substructure:Concrete:Submerged:ea	220	1.000					1000				
Substructure:Other:m	217 211	0.976	0.981	1.000			29	36	1000		
Substructure:Prestressed Concrete:ea	204										
Substructure:Prestressed Concrete:m	233	1.000	1.000				1000	1000			
Substructure:Steel:ea	201 225	0.942	0.944	1.000	1.000		12	12	1000	1000	
Substructure:Steel:m	230	0.994	1.000				115	1000			

		Transition Probabilities					Median, years				
Model	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Substructure:Steel:Painted:ea	202	0.528	0.963	0.985	0.994	1.000	1	18	46	115	1000
Substructure:Steel:Painted:m	231	0.898	0.945	1.000	1.000		6	12	1000	1000	
Substructure:Timber:ea	206	0.367	0.921	0.992	1.000		1	8	86	1000	
Substructure:Timber:m	216 235	0.990	0.995	0.999	1.000		69	138	693	1000	
Substructure:Timber:Submerged:ea	228	1.000			1.000		1000			1000	
Superstructure:Concrete:ea	340	0.995	0.994	1.000			138	115	1000		
Superstructure:Concrete:m	110 105 144 155 116	0.998	0.996	0.982	1.000		346	173	38	1000	
Superstructure:Prestressed Concrete:m	104 109	0.999	1.000	0.997	1.000		693	1000	231	1000	
Superstructure:Steel:ea	161 160	1.000	1.000	0.889	1.000		1000	1000	6	1000	
Superstructure:Steel:m	106 112 151 120 125 101 140	0.995	1.000	1.000	1.000		138	1000	1000	1000	
Superstructure:Steel:Painted:m	107 113 121 126 152 102 141 131	0.957	0.976	0.992	0.981	1.000	16	29	86	36	1000
Superstructure:Timber:m	111 117 156	0.981	0.974	0.969	1.000		36	26	22	1000	
Tunnel:-:m	351	1.000	0.998	1.000	1.000		1000	346	1000	1000	
Tunnel:Concrete:m	350 353	0.881	1.000	1.000	1.000		5	1000	1000	1000	
Walks:Concrete:m	338	0.988	0.989	0.976	1.000		57	63	29	1000	
Walks:Metal:m	337										
Walks:Metal:Coated:m	336	0.995	1.000	1.000	1.000		138	1000	1000	1000	
Walks:Timber:m	339	0.964	0.975	0.999	1.000		19	27	693	1000	

Table 52 - Deterioration Models - Bridge Components – by CDOT Region

					Transition Probability					Median, years				
Component	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Approach	1	5	ea	520	1.000					1000				
Approach	1	5	ea	325 321 320	0.984	0.993	1.000	1.000		43	99	1000	1000	
Approach	1	7	ea	325	1.000					1000				
Approach	2	4	ea	321 325 320	0.903	0.965	1.000			7	19	1000		
Approach	3	2	ea	520	1.000					1000				
Approach	3	2	ea	321 325	0.897	0.815	1.000	1.000		6	3	1000	1000	
Approach	3	6	ea	325 321	0.789	1.000	1.000			3	1000	1000		
Approach	4	1	ea	520	1.000					1000				
Approach	4	1	ea	325 321	0.988	0.994	1.000			57	115	1000		
Approach	5	3	ea	520	1.000					1000				
Approach	5	3	ea	325 321	0.961	0.990	1.000			17	69	1000		
Approach	5	7	ea	520	1.000					1000				
Approach	5	7	ea	325 321	0.989	1.000				63	1000			
Approach	6	1	ea	321 325	1.000	1.000				1000	1000			
Approach	6	8	ea	520	1.000					1000				
Approach	6	8	ea	325 321 320	0.986	0.992	1.000			49	86	1000		
Bearing	1	5	ea	311 313 310 314 309	0.989	0.998	1.000			63	346	1000		
Bearing	1	7	ea	311 313	0.977	1.000				30	1000			

					Transition Probability					Median, years				
Component	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Bearing	2	4	ea	311 313 310 309 314	0.770	0.967	1.000			3	21	1000		
Bearing	3	2	ea	311 313 310 309 314	0.897	0.994	1.000			6	115	1000		
Bearing	3	5	ea	314		1.000	1.000				1000	1000		
Bearing	3	6	ea	311 313 310 309	0.829	1.000				4	1000			
Bearing	3	7	ea	311 313		1.000					1000			
Bearing	4	1	ea	311 313 309 310	0.986	0.999	1.000			49	693	1000		
Bearing	4	5	ea	311 313		1.000					1000			
Bearing	5	2	ea	311 313	1.000					1000				
Bearing	5	3	ea	311 313 310 314 309	0.905	1.000	1.000			7	1000	1000		
Bearing	5	7	ea	311 313 310	0.989	1.000	1.000			63	1000	1000		
Bearing	6	8	ea	311 313 309 310 314 315	0.986	0.989	1.000			49	63	1000		
Channel	1	5	ea	501 502 504 510	1.000	1.000				1000	1000			
Channel	1	7	ea	501 504 502 510	1.000					1000				
Channel	2	4	ea	501 504 502 510	0.998		1.000			346		1000		
Channel	3	2	ea	501 504 510 502	1.000					1000				
Channel	3	6	ea	501 504 502 510	0.994	1.000				115	1000			
Channel	4	1	ea	501 504 510 502	0.999	1.000	1.000			693	1000	1000		
Channel	4	5	ea	501 504 502	1.000					1000				
Channel	5	3	ea	501 502 504 510	1.000					1000				
Channel	5	7	ea	501 502 504 510	0.999	1.000				693	1000			
Channel	6	1	ea	501 504	1.000					1000				
Channel	6	8	ea	501 504 502 510	0.998	1.000	1.000			346	1000	1000		
Culvert	1	2	ea	327	1.000					1000				
Culvert	1	5	ea	327 335	0.993	0.998	1.000			99	346	1000		
Culvert	1	7	ea	327 335	1.000	1.000	1.000			1000	1000	1000		
Culvert	2	4	ea	327 335	0.915	0.983	1.000			8	40	1000		
Culvert	3	2	ea	327 335	0.973	0.987	1.000			25	53	1000		
Culvert	3	6	ea	327 335	0.960	0.984	1.000			17	43	1000		
Culvert	4	1	ea	327 335	0.991	0.999	1.000			77	693	1000		
Culvert	4	5	ea	327 335	1.000	1.000				1000	1000			
Culvert	5	3	ea	335 327	0.974	0.997	1.000			26	231	1000		
Culvert	5	7	ea	327 335	0.983	1.000	1.000			40	1000	1000		
Culvert	6	8	ea	327 335	0.972	0.997	1.000			24	231	1000		
Culvert	1	2	m	240	1.000	0.951	1.000			1000	14	1000		
Culvert	1	5	m	240 241	0.994	0.992	1.000	1.000		115	86	1000	1000	
Culvert	1	7	m	240 241	0.861	0.926	0.989	1.000		5	9	63	1000	
Culvert	2	4	m	241 240 243	0.924	0.969	0.992	1.000		9	22	86	1000	
Culvert	3	2	m	241 240	0.962	0.978	1.000	1.000		18	31	1000	1000	
Culvert	3	6	m	241 240	0.950	0.966	1.000	1.000		14	20	1000	1000	
Culvert	4	1	m	241 240 243	0.994	0.997	0.997	1.000		115	231	231	1000	
Culvert	4	5	m	241	0.957	1.000				16	1000			
Culvert	5	3	m	240 241	0.988	0.979	1.000	1.000		57	33	1000	1000	
Culvert	5	7	m	241 240	0.988	0.968	1.000	1.000		57	21	1000	1000	

					Transition Probability					Median, years				
Component	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Culvert	6	8	m	241 240	0.993	0.999	1.000	1.000		99	693	1000	1000	
Deck	1	5	ea	13 26 14 12 24 60 35 36 32 38 39 23 27 22 25 52 31	0.962	0.969	0.957	0.985	1.000	18	22	16	46	1000
Deck	1	7	ea	32 13 55	0.989	0.945	1.000			63	12	1000		
Deck	2	4	ea	24 32 13 12 35 36 60 39 26 14 25 23 52 22 38 31 30 29	0.739	0.960	0.901	0.997	1.000	2	17	7	231	1000
Deck	3	2	ea	12 13 26 14 32 36 60 39 30 24 23 35 40 52	0.774	0.936	1.000		1.000	3	10	1000		1000
Deck	3	5	ea	26 14 40	0.908	0.949	1.000			7	13	1000		
Deck	3	6	ea	26 14 12 13 39 32 24	0.927	0.332	1.000			9	1	1000		
Deck	4	1	ea	13 14 12 32 26 39 23 52 36 31 38 60 30 40 24	0.958	0.500	0.999	1.000	1.000	16	1	693	1000	1000
Deck	4	5	ea	12 39 13	1.000		1.000			1000		1000		
Deck	5	2	ea	13 32	1.000		1.000			1000		1000		
Deck	5	3	ea	13 12 39 32 38 26 23 14 31 24	0.933	0.978	1.000	1.000		10	31	1000	1000	
Deck	5	7	ea	13 12 32 26 39 38 14	0.951	0.973	1.000		1.000	14	25	1000		1000
Deck	6	1	ea	26 36	0.904	1.000				7	1000			
Deck	6	8	ea	26 13 52 39 23 12 14 30 60 36 25 35 24 38 32 40 22 18	0.944	0.974	0.980	1.000	1.000	12	26	34	1000	1000
Joint	1	5	m	304 308 301 300 302 306 305 307	0.973	0.988	1.000			25	57	1000		
Joint	2	4	m	300 308 301 304 302 305 307 306 303	0.919	0.953	1.000			8	14	1000		
Joint	3	2	m	304 308 303 301 305 302 300 307 306	0.538		1.000	1.000		1		1000	1000	
Joint	3	5	m	304 305 308 307		1.000	1.000				1000	1000		
Joint	3	6	m	304 308 301 306 305 302 300	0.926	0.929	1.000			9	9	1000		
Joint	4	1	m	305 308 306 301 302 304 300 303	0.972	0.996	1.000			24	173	1000		
Joint	4	5	m	304 308	0.888	0.943	1.000			6	12	1000		
Joint	5	3	m	304 308 302 305 300 301	0.988	0.991	1.000			57	77	1000		
Joint	5	7	m	304 308 300 302	0.992	0.997	1.000			86	231	1000		
Joint	6	1	m	300 301 306 308	1.000	1.000				1000	1000			
Joint	6	8	m	300 301 304 308 302 303 305 306 307	0.958	0.968	1.000			16	21	1000		
Railing	1	5	m	334 331 333 330 332	0.994	0.972	0.979	0.967	1.000	115	24	33	21	1000
Railing	1	7	m	332 331	0.961	1.000	1.000			17	1000	1000		
Railing	2	4	m	333 334 331 332 330	0.970		0.984	1.000	1.000	23		43	1000	1000
Railing	3	2	m	334 330 331 333 332	0.630	0.956	0.783	0.974	1.000	2	15	3	26	1000
Railing	3	5	m	331 333	0.755	0.783	0.997	1.000		2	3	231	1000	
Railing	3	6	m	334 333 331 330 332	0.913	0.958	1.000	1.000		8	16	1000	1000	

					Transition Probability					Median, years				
Component	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Railing	4	1	m	334 333 332 330 331	0.994	0.959	0.985	1.000	1.000	115	17	46	1000	1000
Railing	4	5	m	331 334	0.995	1.000	1.000			138	1000	1000		
Railing	5	2	m	331 334 332			1.000					1000		
Railing	5	3	m	334 330 331 333 332	0.991	0.996	0.955	1.000	1.000	77	173	15	1000	1000
Railing	5	7	m	334 331 333 332 330	0.989	0.981	1.000	1.000		63	36	1000	1000	
Railing	6	1	m	334	1.000					1000				
Railing	6	8	m	334 331 333 330 332	0.994	0.807	0.958	0.961	1.000	115	3	16	17	1000
Sign	1	5	ea	343 342	1.000					1000				
Sign	2	4	ea	343 342	0.917	1.000				8	1000			
Sign	4	1	ea	342 343	1.000					1000				
Sign	6	8	ea	343 342	0.928	1.000	1.000	1.000		9	1000	1000	1000	
Substructure	1	5	ea	341	0.994	1.000				115	1000			
Substructure	1	5	ea	205 326 221 202 204 206 201	0.983	0.967	0.996	0.990	1.000	40	21	173	69	1000
Substructure	1	7	ea	206 326	0.867	0.950	0.998	1.000		5	14	346	1000	
Substructure	2	4	ea	341	0.985	1.000				46	1000			
Substructure	2	4	ea	326 206 202 205 228 221 201 220	0.556	0.911	0.984	1.000		1	7	43	1000	
Substructure	3	2	ea	341	0.987	1.000				53	1000			
Substructure	3	2	ea	205 326 206 202 221 220 225 201	0.887	0.958	1.000	1.000		6	16	1000	1000	
Substructure	3	5	ea	326		1.000					1000			
Substructure	3	6	ea	326 205 206 202 201 221	0.683	0.789	0.990	1.000		2	3	69	1000	
Substructure	3	7	ea	326		1.000					1000			
Substructure	4	1	ea	341	0.997	1.000				231	1000			
Substructure	4	1	ea	205 326 206 202 201 221 204 225	0.983	0.976	0.994	1.000		40	29	115	1000	
Substructure	4	5	ea	205 326	1.000	1.000				1000	1000			
Substructure	5	2	ea	326 206		1.000					1000			
Substructure	5	3	ea	341	1.000					1000				
Substructure	5	3	ea	205 326 206 221 201	0.978	0.918	1.000			31	8	1000		
Substructure	5	7	ea	341	1.000	1.000				1000	1000			
Substructure	5	7	ea	326 205 206 202	0.940	0.988	1.000	1.000		11	57	1000	1000	
Substructure	6	1	ea	341	1.000					1000				
Substructure	6	1	ea	326 205	1.000					1000				
Substructure	6	8	ea	341	0.996	1.000	1.000			173	1000	1000		
Substructure	6	8	ea	326 202 221 205 206 201	0.981	0.926	0.993	0.992	1.000	36	9	99	86	1000
Substructure	1	5	m	215 234 210 217 216 235 231	0.994	0.996	0.999	1.000		115	173	693	1000	
Substructure	1	7	m	216 235 215	0.995	0.975	1.000			138	27	1000		
Substructure	2	4	m	215 216 235 234 210 211 217 230 231 233	0.934	0.872	0.983	1.000		10	5	40	1000	
Substructure	3	2	m	215 234 210 216 235 230	0.954	0.957	1.000	1.000		15	16	1000	1000	

					Transition Probability					Median, years				
Component	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
				233 231 217										
Substructure	3	5	m	210 215	0.953	0.983	1.000			14	40	1000		
Substructure	3	6	m	215 210 234 216 235 217	0.952	1.000	0.982	1.000		14	1000	38	1000	
Substructure	3	7	m	215		1.000					1000			
Substructure	4	1	m	215 234 210 216 235 231	0.993	0.994	1.000	1.000		99	115	1000	1000	
Substructure	4	5	m	215 234	0.995	1.000				138	1000			
Substructure	5	3	m	215 234 217 210 216 235 230	0.998	1.000	0.998	1.000		346	1000	346	1000	
Substructure	5	7	m	215 234 216 235 210	0.996	1.000	1.000	1.000		173	1000	1000	1000	
Substructure	6	1	m	215 234	1.000					1000				
Substructure	6	8	m	210 215 234 231 235 233 216 217 211	0.991	0.986	0.989	0.999	1.000	77	49	63	693	1000
Superstructure	1	5	ea	340	1.000					1000				
Superstructure	1	5	ea	160 161		1.000	0.967	1.000			1000	21	1000	
Superstructure	2	4	ea	340	0.982	1.000				38	1000			
Superstructure	2	4	ea	161	1.000					1000				
Superstructure	3	2	ea	340	1.000					1000				
Superstructure	3	2	ea	160 161	1.000					1000				
Superstructure	3	5	ea	160 161		0.750	1.000				2	1000		
Superstructure	3	6	ea	340	1.000					1000				
Superstructure	4	1	ea	340	0.996	1.000				173	1000			
Superstructure	5	3	ea	340	1.000					1000				
Superstructure	5	7	ea	340	1.000					1000				
Superstructure	6	1	ea	340	1.000					1000				
Superstructure	6	8	ea	340	0.995	0.992	1.000			138	86	1000		
Superstructure	6	8	ea	161	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Superstructure	1	5	m	107 109 110 104 101 113 152 106 105 102 111 120 125 151 116 144 155	0.994	0.989	0.996	0.998	1.000	115	63	173	346	1000
Superstructure	1	7	m	111 107	0.988	0.996	1.000	1.000		57	173	1000	1000	
Superstructure	2	4	m	105 111 107 106 109 110 113 121 126 152 144 155 104 102 120 125 151 131 117 156 112	0.905	0.947	0.977	0.998	1.000	7	13	30	346	1000
Superstructure	3	2	m	107 110 109 106 113 121 126 152 104 105 102 112 120 125 151 111 101 141	0.926	0.894	0.981	1.000		9	6	36	1000	
Superstructure	3	5	m	104 105 101 110 102	0.669	1.000	1.000	1.000		2	1000	1000	1000	
Superstructure	3	6	m	104 109 107 106 110 113 121 126 152 111 102	0.922	0.884	0.941	1.000		9	6	11	1000	
Superstructure	3	7	m	107		1.000	1.000				1000	1000		
Superstructure	4	1	m	107 110 111 109 104 105 117 113 121 126 152 106	0.993	0.985	0.996	0.999	1.000	99	46	173	693	1000

					Transition Probability					Median, years				
Component	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
				112 151 141										
Superstructure	4	5	m	107 110	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Superstructure	5	2	m	107 111		1.000	1.000				1000	1000		
Superstructure	5	3	m	107 110 113 121 126 152 109 111 105 106 144 104	0.993	0.994	0.999	1.000		99	115	693	1000	
Superstructure	5	7	m	113 121 126 152 107 131 111 109 104 110	0.990	0.989	0.997	1.000		69	63	231	1000	
Superstructure	6	1	m	109	1.000					1000				
Superstructure	6	8	m	104 107 120 125 151 110 109 102 113 152 105 106 101 121 126 111 144 155 141 140	0.995	0.988	0.991	0.967	1.000	138	57	77	21	1000
Tunnel	1	5	m	350 353	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Tunnel	3	2	m	350		1.000	1.000	1.000			1000	1000	1000	
Tunnel	4	1	m	351 350 353	0.999	0.997	1.000			693	231	1000		
Tunnel	5	3	m	351	1.000	1.000		1.000		1000	1000		1000	
Tunnel	5	7	m	350 353	1.000	1.000				1000	1000			
Walks	1	5	m	338 339	0.996	0.998	1.000	1.000		173	346	1000	1000	
Walks	1	7	m	339 338	0.977	1.000	1.000			30	1000	1000		
Walks	2	4	m	338 339 336	0.963	0.864	0.925	1.000		18	5	9	1000	
Walks	3	2	m	338 337 336 339	0.896	0.911	0.921	1.000		6	7	8	1000	
Walks	3	5	m	338										
Walks	3	6	m	338 339 336	0.940	0.963	0.917	1.000		11	18	8	1000	
Walks	3	7	m	338			1.000	1.000				1000	1000	
Walks	4	1	m	338 336 339	0.990	0.999	0.993	1.000		69	693	99	1000	
Walks	4	5	m	338	0.989	1.000				63	1000			
Walks	5	2	m	338		0.750					2			
Walks	5	3	m	338 339 337 336	0.992	0.998	1.000	1.000		86	346	1000	1000	
Walks	5	7	m	338 339	0.992	0.998	1.000	1.000		86	346	1000	1000	
Walks	6	1	m	338	1.000					1000				
Walks	6	8	m	338 336 339	0.985	0.985	0.994	1.000		46	46	115	1000	

Table 53 - Deterioration Models - Bridge Materials – by CDOT Region

					Transition Probabilities					Mean Life, years				
Material	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
-	1	2	ea	327	1.00					1000				
-	1	5	ea	501 502 504 60	1.00	1.00				1000	1000			
-	1	5	ea	311 313 325 326 327 335 314 343 342	0.987	0.998	1.00			53	346	1000		
-	1	5	m	304 308 301 300 302 307	0.974	0.990	1.00			26	69	1000		

					Transition Probabilities					Mean Life, years				
Material	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
-	1	7	ea	501 504 502	1.00					1000				
-	1	7	ea	326 311 313 327 335 325	0.998	1.00	1.00			346	1000	1000		
-	2	4	ea	501 504 502 60	0.947	1.00	1.00			13	1000	1000		
-	2	4	ea	327 335 325 326 311 313 343 342 314	0.866	0.974	1.00			5	26	1000		
-	2	4	m	300 308 301 304 302 307 303	0.930	0.952	1.00			10	14	1000		
-	3	2	ea	501 504 502 60	1.00					1000				
-	3	2	ea	311 313 325 326 327 335 343 342 314	0.911	0.969	1.00			7	22	1000		
-	3	2	m	304 308 303 301 302 300 307	0.542	0.143	1.00			1	0	1000		
-	3	5	ea	314 326 325		1.000	1.000				1000	1000		
-	3	5	m	304 308 307		1.000	1.000				1000	1000		
-	3	6	ea	501 504 502	0.994	1.000				115	1000			
-	3	6	ea	325 326 327 335 311 313	0.937	0.997	1.000			11	231	1000		
-	3	6	m	304 308 301 302 300	0.906	0.952	1.000			7	14	1000		
-	3	7	ea	311 313 325 326		1.000					1000			
-	4	1	ea	501 504 502 60	1.000	1.000	1.000			1000	1000	1000		
-	4	1	ea	311 313 325 326 327 335 342 343	0.987	0.998	1.000			53	346	1000		
-	4	1	m	308 301 302 351 304 300 303	0.975	0.996	1.000			27	173	1000		
-	4	5	ea	501 504 502	1.000					1000				
-	4	5	ea	311 313 326 327 335	1.000	1.000				1000	1000			
-	4	5	m	304 308	0.888	0.943	1.000			6	12	1000		
-	5	2	ea	311 313 326	1.000					1000				
-	5	3	ea	501 502 504	1.000					1000				
-	5	3	ea	311 313 325 326 335 327 314	0.941	0.999	1.000			11	693	1000		
-	5	3	m	304 308 302 351 300 301	0.987	0.991	1.000	1.000		53	77	1000	1000	
-	5	7	ea	501 502 504	0.999	1.000				693	1000			
-	5	7	ea	327 335 326 311 313 325	0.989	1.000	1.000			63	1000	1000		
-	5	7	m	304 308 300 302	0.992	0.997	1.000			86	231	1000		
-	6	1	ea	501 504	1.000					1000				
-	6	1	ea	325 326	1.000					1000				
-	6	1	m	300 301 308	1.000	1.000				1000	1000			
-	6	8	ea	501 504 502 60	0.997	1.000	1.000			231	1000	1000		
-	6	8	ea	325 326 327 335 311 313 343 342 314 315	0.984	0.989	1.000	1.000		43	63	1000	1000	
-	6	8	m	300 301 304 308 302 303 307	0.963	0.979	1.000			18	33	1000		
Appraisal	1	5	ea	520 510	1.000					1000				
Appraisal	1	7	ea	510	1.000					1000				
Appraisal	2	4	ea	520 510		1.000					1000			
Appraisal	3	2	ea	510 520	1.000					1000				
Appraisal	4	1	ea	510 520	1.000					1000				
Appraisal	5	3	ea	510 520	1.000					1000				
Appraisal	5	7	ea	510 520	1.000					1000				

					Transition Probabilities					Mean Life, years				
Material	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Appraisal	6	8	ea	520 510	1.000					1000				
Asphalt	1	5	m	306	0.951	0.955	1.000			14	15	1000		
Asphalt	2	4	m	306	0.663	1.000				2	1000			
Asphalt	3	2	m	306	0.765	0.993	1.000			3	99	1000		
Asphalt	3	6	m	306	0.500	1.000	1.000			1	1000	1000		
Asphalt	4	1	m	306	0.940	0.989	1.000			11	63	1000		
Asphalt	6	1	m	306	1.000					1000				
Asphalt	6	8	m	306	0.941	0.967	1.000			11	21	1000		
Concrete	1	5	ea	13 26 340 341 14 12 24 35 36 38 39 23 27 22 25 52	0.962	0.966	0.955	0.984	1.000	18	20	15	43	1000
Concrete	1	5	ea	205 321 221	0.991	0.990	1.000	1.000		77	69	1000	1000	
Concrete	1	5	m	215 234 338 331 110 241 210 350 105 353 116 144 155	0.996	0.996	0.998	1.000		173	173	346	1000	
Concrete	1	7	ea	13	1.000					1000				
Concrete	1	7	m	215 331 338 241	0.959	1.000	1.000			17	1000	1000		
Concrete	2	4	ea	24 13 12 340 341 35 36 39 26 14 25 23 52 22 38	0.734	0.963	0.884	0.997	1.000	2	18	6	231	1000
Concrete	2	4	ea	321 205 221 220	0.759	0.948	0.988	1.000		3	13	57	1000	
Concrete	2	4	m	241 105 215 338 234 331 110 144 155 210	0.942	0.890	0.965	1.000		12	6	19	1000	
Concrete	3	2	ea	12 13 340 341 26 14 36 39 24 23 35 40 52	0.775	0.936	1.000		1.000	3	10	1000		1000
Concrete	3	2	ea	205 321 221 220	0.844	0.870	1.000	1.000		4	5	1000	1000	
Concrete	3	2	m	215 234 338 110 241 210 105 331 350	0.956	0.972	0.959	1.000		15	24	17	1000	
Concrete	3	5	ea	26 14 40	0.908	0.949	1.000			7	13	1000		
Concrete	3	5	m	210 215 331 105 110 338	0.685	0.757	0.997	1.000		2	2	231	1000	
Concrete	3	6	ea	26 14 340 341 12 13 39 24	0.931	0.083	1.000			10	0	1000		
Concrete	3	6	ea	205 321 221	0.913	0.962	1.000			8	18	1000		
Concrete	3	6	m	215 338 241 210 234 110 331	0.959	0.914	0.882	1.000		17	8	6	1000	
Concrete	3	7	m	215 338		0.724	1.000	1.000			2	1000	1000	
Concrete	4	1	ea	13 14 12 26 39 23 340 341 52 36 38 40 24	0.958	0.485	0.999	1.000	1.000	16	1	693	1000	1000
Concrete	4	1	ea	205 321 221	0.994	0.997	1.000			115	231	1000		
Concrete	4	1	m	215 234 338 110 210 241 331 105 350 353	0.994	0.996	0.997	1.000		115	173	231	1000	
Concrete	4	5	ea	12 39 13	1.000		1.000			1000		1000		
Concrete	4	5	ea	205	1.000					1000				
Concrete	4	5	m	215 234 331 338 110 241	0.991	1.000	1.000			77	1000	1000		
Concrete	5	2	ea	13			1.000					1000		
Concrete	5	2	m	215 331 338		0.750					2			
Concrete	5	3	ea	13 12 340 341 39 38 26 23 14 24	0.933	0.977	1.000	1.000		10	30	1000	1000	
Concrete	5	3	ea	205 221 321	0.994	0.909	1.000			115	7	1000		

					Transition Probabilities					Mean Life, years				
Material	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Concrete	5	3	m	215 234 338 110 210 241 331 105 144	0.995	0.996	0.980	1.000		138	173	34	1000	
Concrete	5	7	ea	13 12 340 26 39 341 38 14	0.950	0.972	1.000		1.000	14	24	1000		1000
Concrete	5	7	ea	205 321	0.976	1.000	1.000	1.000		29	1000	1000	1000	
Concrete	5	7	m	241 215 234 331 338 210 350 353 110	0.997	0.988	1.000	1.000		231	57	1000	1000	
Concrete	6	1	ea	26 340 341 36	0.904	1.000				7	1000			
Concrete	6	1	ea	321 205	1.000	1.000				1000	1000			
Concrete	6	1	m	215 338 234	1.000					1000				
Concrete	6	8	ea	26 341 13 52 39 23 12 14 340 36 25 35 24 38 40 22 18	0.937	0.974	0.980	1.000	1.000	11	26	34	1000	1000
Concrete	6	8	ea	321 221 205	0.975	0.923	0.993	1.000		27	9	99	1000	
Concrete	6	8	m	210 215 234 338 331 241 110 105 144 155	0.992	0.989	0.988	0.999	1.000	86	63	57	693	1000
Elastomeric	1	5	ea	310 309	0.997	0.997	1.000			231	231	1000		
Elastomeric	1	5	m	305	0.973	0.988	1.000			25	57	1000		
Elastomeric	2	4	ea	310 309	0.984	0.912	1.000			43	8	1000		
Elastomeric	2	4	m	305	0.991	0.966	1.000			77	20	1000		
Elastomeric	3	2	ea	310 309	0.902	0.999	1.000			7	693	1000		
Elastomeric	3	2	m	305	0.834	1.000	1.000	1.000		4	1000	1000	1000	
Elastomeric	3	5	m	305		1.000					1000			
Elastomeric	3	6	ea	310 309		1.000					1000			
Elastomeric	3	6	m	305	1.000	1.000	1.000			1000	1000	1000		
Elastomeric	4	1	ea	309 310	0.997	0.996	1.000			231	173	1000		
Elastomeric	4	1	m	305	0.897	1.000	1.000			6	1000	1000		
Elastomeric	5	3	ea	310 309	1.000	1.000	1.000			1000	1000	1000		
Elastomeric	5	3	m	305	0.998	1.000				346	1000			
Elastomeric	5	7	ea	310	0.983	1.000	1.000			40	1000	1000		
Elastomeric	6	8	ea	309 310	0.996	0.999	1.000			173	693	1000		
Elastomeric	6	8	m	305	0.684	0.884	1.000			2	6	1000		
Metal	1	5	m	334 330	0.996	0.961	0.966	0.955	1.000	173	17	20	15	1000
Metal	2	4	m	334 330 336	0.984		0.974	1.000	1.000	43		26	1000	1000
Metal	3	2	m	334 330 337 336	0.884	0.824	0.976	0.973	1.000	6	4	29	25	1000
Metal	3	6	m	334 330 336	0.887	0.988	0.993			6	57	99		
Metal	4	1	m	334 336 330	0.996	0.955	0.983	1.000	1.000	173	15	40	1000	1000
Metal	4	5	m	334	0.981					36				
Metal	5	2	m	334			1.000					1000		
Metal	5	3	m	334 330 337 336	0.990	0.990	1.000	1.000	1.000	69	69	1000	1000	1000
Metal	5	7	m	334 330	0.991	0.985	1.000			77	46	1000		
Metal	6	1	m	334	1.000					1000				
Metal	6	8	m	334 330 336	0.990	0.725	0.950	0.960	1.000	69	2	14	17	1000
Other	1	5	m	333 217	0.999	1.000	1.000			693	1000	1000		
Other	2	4	m	333 211 217 243	0.793	0.648	1.000	1.000		3	2	1000	1000	

					Transition Probabilities					Mean Life, years				
Material	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Other	3	2	m	333 217	0.500	0.998	1.000			1	346	1000		
Other	3	5	m	333		1.000	1.000				1000	1000		
Other	4	1	m	333 243	0.986	0.967	1.000			49	21	1000		
Other	5	3	m	217 333	0.981	1.000				36	1000			
Other	5	7	m	333	0.987	0.998	1.000			53	346	1000		
Other	6	8	m	333 217 211	0.995	1.000	1.000			138	1000	1000		
Prestressed Concrete	1	5	m	109 104	0.999	1.000	1.000			693	1000	1000		
Prestressed Concrete	2	4	ea	320	1.000					1000				
Prestressed Concrete	2	4	m	109 104 233	0.986	1.000	1.000			49	1000	1000		
Prestressed Concrete	3	2	m	109 104 233	0.994	1.000	1.000	1.000		115	1000	1000	1000	
Prestressed Concrete	3	5	m	104	1.000					1000				
Prestressed Concrete	3	6	m	104 109	1.000					1000				
Prestressed Concrete	4	1	m	109 104	0.999	0.999	1.000			693	693	1000		
Prestressed Concrete	5	3	m	109 104	1.000	1.000				1000	1000			
Prestressed Concrete	5	7	m	109 104	0.999	1.000	1.000			693	1000	1000		
Prestressed Concrete	6	1	m	109	1.000					1000				
Prestressed Concrete	6	8	m	104 109 233	1.000	1.000	0.992	1.000		1000	1000	86	1000	
Steel	1	2	m	240	1.000	0.951	1.000			1000	14	1000		
Steel	1	5	ea	160 161 202 201		0.985	0.985	0.987			46	46	53	
Steel	1	5	m	107 240 101 113 152 106 102 120 125 151 231	0.978	0.986	0.997	0.997	1.000	31	49	231	231	1000
Steel	1	7	m	107 240	0.884	0.929	0.993	1.000		6	9	99	1000	
Steel	2	4	ea	30 29	1.000		0.974	1.000		1000		26	1000	
Steel	2	4	ea	202 161 201	0.735	0.970	0.892	1.000		2	23	6	1000	
Steel	2	4	m	107 106 113 121 126 152 240 102 120 125 151 230 131 231 112	0.885	0.946	0.979	0.994	1.000	6	12	33	115	1000
Steel	3	2	ea	160 202 225 161 201	0.933	1.000		1.000		10	1000		1000	
Steel	3	2	m	107 106 113 121 126 152 102 112 120 125 151 101 230 141 231 240	0.526	0.884	0.985	1.000		1	6	46	1000	
Steel	3	5	ea	160 161		0.750	1.000				2	1000		
Steel	3	5	m	101 102		1.000	1.000	1.000			1000	1000	1000	
Steel	3	6	ea	202 201			1.000	1.000				1000	1000	
Steel	3	6	m	107 106 240 113 121 126 152 102	0.863	0.883	0.956	1.000		5	6	15	1000	
Steel	3	7	m	107		1.000	1.000				1000	1000		
Steel	4	1	ea	30	1.000	1.000		1.000		1000	1000		1000	
Steel	4	1	ea	202 201 225	0.866	0.968	1.000	1.000		5	21	1000	1000	
Steel	4	1	m	107 240 113 121 126 152 106 112 151 231 141	0.971	0.989	0.996	0.996	1.000	24	63	173	173	1000
Steel	4	5	m	107		1.000	1.000	1.000			1000	1000	1000	
Steel	5	2	m	107		1.000	1.000				1000	1000		
Steel	5	3	ea	201	0.948	1.000				13	1000			
Steel	5	3	m	107 113 121 126 152 240 106 230	0.983	0.992	1.000	1.000		40	86	1000	1000	
Steel	5	7	ea	161 202			1.000					1000		

					Transition Probabilities					Mean Life, years				
Material	**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Steel	5	7	m	240 113 121 126 152 107 131	0.970	0.983	0.997	1.000		23	40	231	1000	
Steel	6	8	ea	30	1.000					1000				
Steel	6	8	ea	202 161 201	0.578	0.965	0.992	0.991	1.000	1	19	86	77	1000
Steel	6	8	m	107 231 120 125 151 102 113 152 106 101 121 126 240 141 140	0.985	0.984	0.993	0.966	1.000	46	43	99	20	1000
Timber	1	5	ea	32 31	0.800	0.981	1.000	1.000		3	36	1000	1000	
Timber	1	5	ea	206	0.905	0.901	0.999	1.000		7	7	693	1000	
Timber	1	5	m	332 339 111 216 235	0.987	0.987	0.989	1.000		53	53	63	1000	
Timber	1	7	ea	32 55	0.984	0.945	1.000			43	12	1000		
Timber	1	7	ea	206	0.817	0.935	0.998	1.000		3	10	346	1000	
Timber	1	7	m	111 216 235 332 339	0.987	0.994	1.000	1.000		53	115	1000	1000	
Timber	2	4	ea	32 31	0.902	0.822	1.000	1.000		7	4	1000	1000	
Timber	2	4	ea	206 228	0.485	0.870	0.986	1.000		1	5	49	1000	
Timber	2	4	m	111 216 235 339 332 117 156	0.912	0.885	0.966	1.000		8	6	20	1000	
Timber	3	2	ea	32	0.859	0.965	1.000			5	19	1000		
Timber	3	2	ea	206		0.887	1.000	1.000			6	1000	1000	
Timber	3	2	m	111 216 235 332 339	0.836	0.927	1.000	1.000		4	9	1000	1000	
Timber	3	6	ea	32	0.856	0.965	1.000			4	19	1000		
Timber	3	6	ea	206	0.680	0.949	0.989	1.000		2	13	63	1000	
Timber	3	6	m	216 235 111 339 332	0.968	0.995	1.000	1.000		21	138	1000	1000	
Timber	4	1	ea	32 31	0.908	0.934	0.974	1.000		7	10	26	1000	
Timber	4	1	ea	206	0.926	0.960	0.993	1.000		9	17	99	1000	
Timber	4	1	m	111 216 235 332 339 117	0.986	0.974	0.993	1.000		49	26	99	1000	
Timber	5	2	ea	32	1.000					1000				
Timber	5	2	ea	206		1.000					1000			
Timber	5	2	m	111 216 235 332		1.000					1000			
Timber	5	3	ea	32 31	0.860	1.000	1.000			5	1000	1000		
Timber	5	3	ea	206	0.823	0.542	1.000			4	1	1000		
Timber	5	3	m	339 111 216 235 332	0.997	1.000	1.000	1.000		231	1000	1000	1000	
Timber	5	7	ea	32	0.954	0.975	1.000			15	27	1000		
Timber	5	7	ea	206	0.733	0.977	1.000	1.000		2	30	1000	1000	
Timber	5	7	m	111 216 235 339 332	0.983	0.998	1.000	1.000		40	346	1000	1000	
Timber	6	8	ea	32			1.000					1000		
Timber	6	8	ea	206	0.900		1.000	1.000		7		1000	1000	
Timber	6	8	m	235 339 111 216 332	0.839	0.991	0.974	1.000		4	77	26	1000	

Table 54 - Deterioration Models – Component/Material/Protection – by CDOT Region

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Approach	-		1	5	ea	325	0.979	0.992	1.000			33	86	1000		
Approach	-		1	7	ea	325	1.000					1000				
Approach	-		2	4	ea	325	0.859	0.964	1.000			5	19	1000		
Approach	-		3	2	ea	325	0.850	0.920	1.000			4	8	1000		
Approach	-		3	6	ea	325	0.808	1.000	1.000			3	1000	1000		
Approach	-		4	1	ea	325	0.983	0.993	1.000			40	99	1000		
Approach	-		5	3	ea	325	0.951	0.989	1.000			14	63	1000		
Approach	-		5	7	ea	325	0.987	1.000				53	1000			
Approach	-		6	1	ea	325	1.000					1000				
Approach	-		6	8	ea	325	0.992	0.988	1.000			86	57	1000		
Approach	Appraisal		1	5	ea	520	1.000					1000				
Approach	Appraisal		3	2	ea	520	1.000					1000				
Approach	Appraisal		4	1	ea	520	1.000					1000				
Approach	Appraisal		5	3	ea	520	1.000					1000				
Approach	Appraisal		5	7	ea	520	1.000					1000				
Approach	Appraisal		6	8	ea	520	1.000					1000				
Approach	Concrete		1	5	ea	321	0.991	1.000	1.000	1.000		77	1000	1000	1000	
Approach	Concrete		2	4	ea	321	0.958	0.974	1.000			16	26	1000		
Approach	Concrete		3	2	ea	321	0.918	1.000		1.000		8	1000		1000	
Approach	Concrete		3	6	ea	321	0.955	1.000				15	1000			
Approach	Concrete		4	1	ea	321	0.995	0.998	1.000			138	346	1000		
Approach	Concrete		5	3	ea	321	1.000	1.000				1000	1000			
Approach	Concrete		5	7	ea	321	1.000					1000				
Approach	Concrete		6	1	ea	321	1.000	1.000				1000	1000			
Approach	Concrete		6	8	ea	321	0.971	0.997	1.000			24	231	1000		
Approach	Prestressed Concrete		2	4	ea	320	1.000					1000				
Bearing	-		1	5	ea	311 313 314	0.978	0.999	1.000			31	693	1000		
Bearing	-		1	7	ea	311 313	0.977	1.000				30	1000			
Bearing	-		2	4	ea	311 313 314	0.856	0.972	1.000			4	24	1000		
Bearing	-		3	2	ea	311 313 314	0.895	0.982	1.000			6	38	1000		
Bearing	-		3	5	ea	314		1.000	1.000				1000	1000		
Bearing	-		3	6	ea	311 313	0.829	1.000				4	1000			
Bearing	-		3	7	ea	311 313		1.000					1000			
Bearing	-		4	1	ea	311 313	0.975	0.999	1.000			27	693	1000		
Bearing	-		4	5	ea	311 313		1.000					1000			
Bearing	-		5	2	ea	311 313	1.000					1000				
Bearing	-		5	3	ea	311 313 314	0.856	1.000	1.000			4	1000	1000		

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Bearing	-		5	7	ea	311 313	0.990	1.000	1.000			69	1000	1000		
Bearing	-		6	8	ea	311 313 314 315	0.979	0.986	1.000			33	49	1000		
Bearing	Elastomeric		1	5	ea	310 309	0.997	0.997	1.000			231	231	1000		
Bearing	Elastomeric		2	4	ea	310 309	0.984	0.912	1.000			43	8	1000		
Bearing	Elastomeric		3	2	ea	310 309	0.902	0.999	1.000			7	693	1000		
Bearing	Elastomeric		3	6	ea	310 309		1.000					1000			
Bearing	Elastomeric		4	1	ea	309 310	0.997	0.996	1.000			231	173	1000		
Bearing	Elastomeric		5	3	ea	310 309	1.000	1.000	1.000			1000	1000	1000		
Bearing	Elastomeric		5	7	ea	310	0.983	1.000	1.000			40	1000	1000		
Bearing	Elastomeric		6	8	ea	309 310	0.996	0.999	1.000			173	693	1000		
Channel	-		1	5	ea	501 502 504	1.000	1.000				1000	1000			
Channel	-		1	7	ea	501 504 502	1.000					1000				
Channel	-		2	4	ea	501 504 502	0.999		1.000			693		1000		
Channel	-		3	2	ea	501 504 502	1.000					1000				
Channel	-		3	6	ea	501 504 502	0.994	1.000				115	1000			
Channel	-		4	1	ea	501 504 502	0.999	1.000	1.000			693	1000	1000		
Channel	-		4	5	ea	501 504 502	1.000					1000				
Channel	-		5	3	ea	501 502 504	1.000					1000				
Channel	-		5	7	ea	501 502 504	0.999	1.000				693	1000			
Channel	-		6	1	ea	501 504	1.000					1000				
Channel	-		6	8	ea	501 504 502	0.998	1.000	1.000			346	1000	1000		
Channel	Appraisal		2	4	ea	510	1.000	1.000				1000	1000			
Channel	Appraisal		4	1	ea	510	1.000					1000				
Channel	Appraisal		5	3	ea	510	1.000					1000				
Channel	Appraisal		6	8	ea	510	1.000					1000				
Culvert	-		1	2	ea	327	1.000					1000				
Culvert	-		1	5	ea	327 335	0.993	0.998	1.000			99	346	1000		
Culvert	-		1	7	ea	327 335	1.000	1.000	1.000			1000	1000	1000		
Culvert	-		2	4	ea	327 335	0.915	0.983	1.000			8	40	1000		
Culvert	-		3	2	ea	327 335	0.973	0.987	1.000			25	53	1000		
Culvert	-		3	6	ea	327 335	0.960	0.984	1.000			17	43	1000		
Culvert	-		4	1	ea	327 335	0.991	0.999	1.000			77	693	1000		

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Culvert	-		4	5	ea	327 335	1.000	1.000				1000	1000			
Culvert	-		5	3	ea	335 327	0.974	0.997	1.000			26	231	1000		
Culvert	-		5	7	ea	327 335	0.983	1.000	1.000			40	1000	1000		
Culvert	-		6	8	ea	327 335	0.972	0.997	1.000			24	231	1000		
Culvert	Concrete		1	5	m	241	0.995	0.995	1.000	1.000		138	138	1000	1000	
Culvert	Concrete		1	7	m	241	0.935	1.000	1.000			10	1000	1000		
Culvert	Concrete		2	4	m	241	0.934	0.997	0.991	1.000		10	231	77	1000	
Culvert	Concrete		3	2	m	241	0.967	0.984	1.000	1.000		21	43	1000	1000	
Culvert	Concrete		3	6	m	241	0.967	0.933	1.000	1.000		21	10	1000	1000	
Culvert	Concrete		4	1	m	241	0.995	0.996	0.997	1.000		138	173	231	1000	
Culvert	Concrete		4	5	m	241	0.957	1.000				16	1000			
Culvert	Concrete		5	3	m	241	0.990	0.993	1.000	1.000		69	99	1000	1000	
Culvert	Concrete		5	7	m	241	0.993	0.975	1.000			99	27	1000		
Culvert	Concrete		6	8	m	241	0.994	0.999	1.000	1.000		115	693	1000	1000	
Culvert	Other		2	4	m	243		0.794	1.000	1.000			3	1000	1000	
Culvert	Steel		1	2	m	240	1.000	0.951	1.000			1000	14	1000		
Culvert	Steel		1	5	m	240	0.992	0.985	1.000			86	46	1000		
Culvert	Steel		1	7	m	240	0.773	0.915	0.988	1.000		3	8	57	1000	
Culvert	Steel		2	4	m	240	0.908	1.000				7	1000			
Culvert	Steel		3	2	m	240	1.000	0.936	1.000			1000	10	1000		
Culvert	Steel		3	6	m	240		1.000					1000			
Culvert	Steel		4	1	m	240	0.979	1.000	1.000			33	1000	1000		
Culvert	Steel		5	3	m	240	0.977	0.955	1.000	1.000		30	15	1000	1000	
Culvert	Steel		5	7	m	240	0.969	0.952	1.000	1.000		22	14	1000	1000	
Culvert	Steel		6	8	m	240	0.800	0.982	1.000			3	38	1000		
Deck	-		1	5	ea	60	1.000	1.000				1000	1000			
Deck	-		2	4	ea	60		1.000					1000			
Deck	-		4	1	ea	60	1.000	1.000	1.000			1000	1000	1000		
Deck	-		6	8	ea	60	0.997	1.000	1.000			231	1000	1000		
	Concrete		1	5	ea	12 35 38	0.954	0.976	0.884	0.963	1.000	15	29	6	18	1000
Deck	Concrete		2	4	ea	12 35 38	0.963	0.870	0.590	0.979	1.000	18	5	1	33	1000
Deck	Concrete		3	2	ea	12 35	0.839	0.970	1.000			4	23	1000		
Deck	Concrete		3	6	ea	12			1.000					1000		
Deck	Concrete		4	1	ea	12 38	0.933	0.147	1.000	1.000	1.000	10	0	1000	1000	1000
Deck	Concrete		4	5	ea	12			1.000					1000		
Deck	Concrete		5	3	ea	12 38	0.995	0.747	1.000	1.000		138	2	1000	1000	
Deck	Concrete		5	7	ea	12 38	0.905	0.921	1.000			7	8	1000		
Deck	Concrete		6	8	ea	12 35 38	0.984	1.000		1.000		43	1000		1000	
Deck	Concrete	AC Overlay	1	5	ea	13 14 36 39	0.952	0.957	0.972	0.991	1.000	14	16	24	77	1000
Deck	Concrete	AC Overlay	1	7	ea	13	1.000					1000				
Deck	Concrete	AC Overlay	2	4	ea	13 36 39 14	0.669	0.951	1.000	1.000		2	14	1000	1000	

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Deck	Concrete	AC Overlay	3	2	ea	13 14 36 39 40	0.882	1.000	1.000		1.000	6	1000	1000		1000
Deck	Concrete	AC Overlay	3	5	ea	14 40	0.868	0.939	1.000			5	11	1000		
Deck	Concrete	AC Overlay	3	6	ea	14 13 39	0.894	0.083	1.000			6	0	1000		
Deck	Concrete	AC Overlay	4	1	ea	13 14 39 36 40	0.943	0.988	0.985	1.000	1.000	12	57	46	1000	1000
Deck	Concrete	AC Overlay	4	5	ea	39 13	1.000		1.000			1000		1000		
Deck	Concrete	AC Overlay	5	2	ea	13			1.000					1000		
Deck	Concrete	AC Overlay	5	3	ea	13 39 14	0.912	1.000	1.000			8	1000	1000		
Deck	Concrete	AC Overlay	5	7	ea	13 39 14	0.951	1.000	1.000		1.000	14	1000	1000		1000
Deck	Concrete	AC Overlay	6	1	ea	36	1.000					1000				
Deck	Concrete	AC Overlay	6	8	ea	13 39 14 36 40	0.850	0.956	0.976	1.000	1.000	4	15	29	1000	1000
Deck	Concrete	Cathodic system	1	5	ea	27	1.000	1.000				1000	1000			
Deck	Concrete	Coated Bars	1	5	ea	26 23 52	0.975	1.000				27	1000			
Deck	Concrete	Coated Bars	2	4	ea	26 23 52	0.130	1.000				0	1000			
Deck	Concrete	Coated Bars	3	2	ea	26 23 52	0.565	1.000	1.000			1	1000	1000		
Deck	Concrete	Coated Bars	3	5	ea	26	1.000	1.000				1000	1000			
Deck	Concrete	Coated Bars	3	6	ea	26	1.000					1000				
Deck	Concrete	Coated Bars	4	1	ea	26 23 52	0.981	1.000	1.000			36	1000	1000		
Deck	Concrete	Coated Bars	5	3	ea	26 23	1.000	1.000				1000	1000			
Deck	Concrete	Coated Bars	5	7	ea	26	0.981	1.000				36	1000			
Deck	Concrete	Coated Bars	6	1	ea	26	0.832	1.000				4	1000			
Deck	Concrete	Coated Bars	6	8	ea	26 52 23	0.947	0.987	1.000	1.000		13	53	1000	1000	
Deck	Concrete	Rigid Overlay	1	5	ea	22 25	0.974	0.981	1.000			26	36	1000		
Deck	Concrete	Rigid Overlay	2	4	ea	25 22	1.000					1000				
Deck	Concrete	Rigid Overlay	6	8	ea	25 22	0.936	1.000				10	1000			
Deck	Concrete	Thin Overlay	1	5	ea	24	1.000					1000				
Deck	Concrete	Thin Overlay	4	1	ea	24	1.000					1000				
Deck	Concrete	Thin Overlay	6	8	ea	24 18	1.000					1000				
Deck	Steel		2	4	ea	30 29	1.000		0.974	1.000		1000		26	1000	
Deck	Steel		4	1	ea	30	1.000	1.000		1.000		1000	1000		1000	
Deck	Steel		6	8	ea	30	1.000					1000				
Deck	Timber		1	5	ea	31	1.000					1000				
Deck	Timber		4	1	ea	31			1.000					1000		
Deck	Timber	AC Overlay	1	5	ea	32	0.642	0.981	1.000	1.000		2	36	1000	1000	
Deck	Timber	AC Overlay	1	7	ea	32 55	0.984	0.945	1.000			43	12	1000		
Deck	Timber	AC Overlay	2	4	ea	32	0.902	0.822	1.000	1.000		7	4	1000	1000	
Deck	Timber	AC Overlay	3	2	ea	32	0.859	0.965	1.000			5	19	1000		
Deck	Timber	AC Overlay	3	6	ea	32	0.856	0.965	1.000			4	19	1000		
Deck	Timber	AC Overlay	4	1	ea	32	0.908	0.934	0.973	1.000		7	10	25	1000	
Deck	Timber	AC Overlay	5	2	ea	32	1.000					1000				

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Deck	Timber	AC Overlay	5	3	ea	32	0.860	1.000	1.000			5	1000	1000		
Deck	Timber	AC Overlay	5	7	ea	32	0.954	0.975	1.000			15	27	1000		
Deck	Timber	AC Overlay	6	8	ea	32			1.000					1000		
Joint	-		1	5	m	304 308 301 300 302 307	0.974	0.990	1.000			26	69	1000		
Joint	-		2	4	m	300 308 301 304 302 307 303	0.930	0.952	1.000			10	14	1000		
Joint	-		3	2	m	304 308 303 301 302 300 307	0.542	0.143	1.000			1	0	1000		
Joint	-		3	5	m	304 308 307		1.000	1.000				1000	1000		
Joint	-		3	6	m	304 308 301 302 300	0.906	0.952	1.000			7	14	1000		
Joint	-		4	1	m	308 301 302 304 300 303	0.975	0.996	1.000			27	173	1000		
Joint	-		4	5	m	304 308	0.888	0.943	1.000			6	12	1000		
Joint	-		5	3	m	304 308 302 300 301	0.987	0.991	1.000			53	77	1000		
Joint	-		5	7	m	304 308 300 302	0.992	0.997	1.000			86	231	1000		
Joint	-		6	1	m	300 301 308	1.000	1.000				1000	1000			
Joint	-		6	8	m	300 301 304 308 302 303 307	0.963	0.979	1.000			18	33	1000		
Joint	Asphalt		1	5	m	306	0.951	0.955	1.000			14	15	1000		
Joint	Asphalt		2	4	m	306	0.663	1.000				2	1000			
Joint	Asphalt		3	2	m	306	0.765	0.993	1.000			3	99	1000		
Joint	Asphalt		3	6	m	306	0.500	1.000	1.000			1	1000	1000		
Joint	Asphalt		4	1	m	306	0.940	0.989	1.000			11	63	1000		
Joint	Asphalt		6	1	m	306	1.000					1000				
Joint	Asphalt		6	8	m	306	0.941	0.967	1.000			11	21	1000		
Joint	Elastomeric		1	5	m	305	0.973	0.988	1.000			25	57	1000		
Joint	Elastomeric		2	4	m	305	0.991	0.966	1.000			77	20	1000		
Joint	Elastomeric		3	2	m	305	0.834	1.000	1.000	1.000		4	1000	1000	1000	

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Joint	Elastomeric		3	5	m	305		1.000					1000			
Joint	Elastomeric		3	6	m	305	1.000	1.000	1.000			1000	1000	1000		
Joint	Elastomeric		4	1	m	305	0.897	1.000	1.000			6	1000	1000		
Joint	Elastomeric		5	3	m	305	0.998	1.000				346	1000			
Joint	Elastomeric		6	8	m	305	0.684	0.884	1.000			2	6	1000		
Railing	Concrete		1	5	m	331	0.986	0.987	0.990	1.000		49	53	69	1000	
Railing	Concrete		1	7	m	331	0.977	1.000				30	1000			
Railing	Concrete		2	4	m	331	0.795	0.883	0.988	1.000		3	6	57	1000	
Railing	Concrete		3	2	m	331	0.977	0.981	0.962	1.000		30	36	18	1000	
Railing	Concrete		3	5	m	331	0.749	0.750	0.997	1.000		2	2	231	1000	
Railing	Concrete		3	6	m	331	1.000	0.926	1.000	1.000		1000	9	1000	1000	
Railing	Concrete		4	1	m	331	0.988	0.978	1.000	1.000		57	31	1000	1000	
Railing	Concrete		4	5	m	331	0.996	1.000	1.000			173	1000	1000		
Railing	Concrete		5	3	m	331	1.000	1.000	0.784	1.000		1000	1000	3	1000	
Railing	Concrete		5	7	m	331	0.989	0.965	1.000	1.000		63	19	1000	1000	
Railing	Concrete		6	8	m	331	0.996	0.985	0.952	1.000		173	46	14	1000	
Railing	Metal		1	5	m	330	0.964	1.000	1.000			19	1000	1000		
Railing	Metal		2	4	m	330	1.000					1000				
Railing	Metal		3	2	m	330	0.990		1.000			69		1000		
Railing	Metal		4	1	m	330	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Railing	Metal		5	3	m	330	1.000					1000				
Railing	Metal	Coated	1	5	m	334	0.997	0.959	0.964	0.953	1.000	231	17	19	14	1000
Railing	Metal	Coated	2	4	m	334	0.984		0.974	1.000	1.000	43		26	1000	1000
Railing	Metal	Coated	3	2	m	334	0.890	0.824	0.975	0.973	1.000	6	4	27	25	1000
Railing	Metal	Coated	3	6	m	334	0.878	0.988	0.993			5	57	99		
Railing	Metal	Coated	4	1	m	334	0.995	0.954	0.983	1.000	1.000	138	15	40	1000	1000
Railing	Metal	Coated	4	5	m	334	0.981					36				
Railing	Metal	Coated	5	2	m	334			1.000					1000		
Railing	Metal	Coated	5	3	m	334	0.990	0.989	1.000	1.000	1.000	69	63	1000	1000	1000
Railing	Metal	Coated	5	7	m	334	0.991	0.985	1.000			77	46	1000		
Railing	Metal	Coated	6	1	m	334	1.000					1000				
Railing	Metal	Coated	6	8	m	334	0.990	0.725	0.950	0.960	1.000	69	2	14	17	1000
Railing	Other		1	5	m	333	0.999	1.000	1.000			693	1000	1000		
Railing	Other		2	4	m	333	0.700	0.799	1.000			2	3	1000		
Railing	Other		3	2	m	333	0.504	0.998	1.000			1	346	1000		
Railing	Other		3	5	m	333		1.000	1.000				1000	1000		
Railing	Other		4	1	m	333	0.986	0.967	1.000			49	21	1000		
Railing	Other		5	3	m	333	0.984	1.000				43	1000			
Railing	Other		5	7	m	333	0.987	0.998	1.000			53	346	1000		
Railing	Other		6	8	m	333	0.995	1.000	1.000			138	1000	1000		
Railing	Timber		1	5	m	332	0.958	0.949	1.000	1.000		16	13	1000	1000	
Railing	Timber		1	7	m	332	0.957	1.000	1.000			16	1000	1000		
Railing	Timber		2	4	m	332	0.686	0.890	1.000			2	6	1000		

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Railing	Timber		3	2	m	332	0.974	0.535	1.000			26	1	1000		
Railing	Timber		3	6	m	332	0.875	1.000	1.000			5	1000	1000		
Railing	Timber		4	1	m	332	0.924	0.986	1.000			9	49	1000		
Railing	Timber		5	3	m	332	0.962	1.000	1.000	1.000		18	1000	1000	1000	
Railing	Timber		5	7	m	332	0.967	1.000	1.000			21	1000	1000		
Railing	Timber		6	8	m	332	1.000					1000				
Sign	-		1	5	ea	343 342	1.000					1000				
Sign	-		2	4	ea	343 342	0.917	1.000				8	1000			
Sign	-		4	1	ea	342 343	1.000					1000				
Sign	-		6	8	ea	343 342	0.928	1.000	1.000	1.000		9	1000	1000	1000	
Substructure	-		1	5	ea	326	0.992	0.999	1.000			86	693	1000		
Substructure	-		1	7	ea	326	1.000	1.000				1000	1000			
Substructure	-		2	4	ea	326	0.883	0.978	1.000			6	31	1000		
Substructure	-		3	2	ea	326	0.941	0.988	1.000			11	57	1000		
Substructure	-		3	5	ea	326		1.000					1000			
Substructure	-		3	6	ea	326	0.916	1.000	1.000			8	1000	1000		
Substructure	-		3	7	ea	326		1.000					1000			
Substructure	-		4	1	ea	326	0.996	1.000	1.000			173	1000	1000		
Substructure	-		4	5	ea	326	1.000	1.000				1000	1000			
Substructure	-		5	3	ea	326	0.980	1.000	1.000			34	1000	1000		
Substructure	-		5	7	ea	326	0.992	1.000	1.000			86	1000	1000		
Substructure	-		6	1	ea	326	1.000					1000				
Substructure	-		6	8	ea	326	0.990	0.995	1.000			69	138	1000		
Substructure	Concrete		1	5	ea	341	0.994	1.000				115	1000			
Substructure	Concrete		1	5	ea	205 221	0.992	0.986	1.000			86	49	1000		
Substructure	Concrete		1	5	m	215 234 210	0.994	0.995	0.999	1.000		115	138	693	1000	
Substructure	Concrete		1	7	m	215	1.000	1.000				1000	1000			
Substructure	Concrete		2	4	ea	341	0.985	1.000				46	1000			
Substructure	Concrete		2	4	ea	205 221	0.681	0.953	0.989	1.000		2	14	63	1000	
Substructure	Concrete		2	4	m	215 234 210	0.924	0.840	0.975	1.000		9	4	27	1000	
Substructure	Concrete		3	2	ea	341	0.987	1.000				53	1000			
Substructure	Concrete		3	2	ea	205 221	0.676	0.950	1.000			2	14	1000		
Substructure	Concrete		3	2	m	215 234 210	0.953	0.981	1.000	1.000		14	36	1000	1000	
Substructure	Concrete		3	5	m	210 215	0.953	0.983	1.000			14	40	1000		
Substructure	Concrete		3	6	ea	205 221	0.925	0.958	1.000			9	16	1000		
Substructure	Concrete		3	6	m	215 210 234	0.980	1.000	0.981	1.000		34	1000	36	1000	
Substructure	Concrete		3	7	m	215		1.000					1000			
Substructure	Concrete		4	1	ea	341	0.997	1.000				231	1000			
Substructure	Concrete		4	1	ea	205 221	0.994	0.996	1.000			115	173	1000		

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Substructure	Concrete		4	1	m	215 234 210	0.993	0.992	0.999	1.000		99	86	693	1000	
Substructure	Concrete		4	5	ea	205	1.000					1000				
Substructure	Concrete		4	5	m	215 234	0.995	1.000				138	1000			
Substructure	Concrete		5	3	ea	341	1.000					1000				
Substructure	Concrete		5	3	ea	205 221	0.994	1.000	1.000			115	1000	1000		
Substructure	Concrete		5	3	m	215 234 210	0.998	1.000	0.995	1.000		346	1000	138	1000	
Substructure	Concrete		5	7	ea	341	1.000	1.000				1000	1000			
Substructure	Concrete		5	7	ea	205	0.974	1.000	1.000	1.000		26	1000	1000	1000	
Substructure	Concrete		5	7	m	215 234 210	0.996	1.000	1.000	1.000		173	1000	1000	1000	
Substructure	Concrete		6	1	ea	341	1.000					1000				
Substructure	Concrete		6	1	ea	205	1.000					1000				
Substructure	Concrete		6	1	m	215 234	1.000					1000				
Substructure	Concrete		6	8	ea	341	0.996	1.000	1.000			173	1000	1000		
Substructure	Concrete		6	8	ea	221 205	0.977	0.834	0.993	1.000		30	4	99	1000	
Substructure	Concrete		6	8	m	210 215 234	0.991	0.987	0.989	0.998	1.000	77	53	63	346	1000
Substructure	Concrete	Submerged	2	4	ea	220	1.000					1000				
Substructure	Other		1	5	m	217	1.000	1.000				1000	1000			
Substructure	Other		2	4	m	211 217	0.930	0.995	1.000			10	138	1000		
Substructure	Other		3	2	m	217	1.000	1.000				1000	1000			
Substructure	Other		5	3	m	217	0.958	1.000				16	1000			
Substructure	Other		6	8	m	217 211	1.000	0.868				1000	5			
Substructure	Prestressed Concrete		2	4	m	233	1.000					1000				
Substructure	Prestressed Concrete		3	2	m	233	1.000	1.000				1000	1000			
Substructure	Prestressed Concrete		6	8	m	233	1.000	1.000				1000	1000			
Substructure	Steel		1	5	ea	201	1.000	1.000	1.000			1000	1000	1000		
Substructure	Steel		2	4	ea	201	1.000	1.000		1.000		1000	1000		1000	
Substructure	Steel		3	2	m	230	0.500	1.000				1	1000			
Substructure	Steel		5	3	ea	201	0.948	1.000				13	1000			
Substructure	Steel		5	3	m	230	1.000					1000				
Substructure	Steel	Painted	1	5	ea	202		0.981	0.985	0.983			36	46	40	
Substructure	Steel	Painted	1	5	m	231	1.000	1.000				1000	1000			
Substructure	Steel	Painted	2	4	ea	202	0.889	0.977	0.946	1.000		6	30	12	1000	
Substructure	Steel	Painted	2	4	m	231		0.999	1.000				693	1000		
Substructure	Steel	Painted	3	2	ea	202	0.928	1.000		1.000		9	1000		1000	
Substructure	Steel	Painted	3	2	m	231	1.000	0.833	1.000	1.000		1000	4	1000	1000	
Substructure	Steel	Painted	3	6	ea	202			1.000	1.000				1000	1000	
Substructure	Steel	Painted	4	1	ea	202	0.866	0.968	1.000	1.000		5	21	1000	1000	
Substructure	Steel	Painted	4	1	m	231	1.000	1.000				1000	1000			
Substructure	Steel	Painted	5	7	ea	202			1.000					1000		

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Substructure	Steel	Painted	6	8	ea	202	0.084	0.964	0.992	0.989	1.000	0	19	86	63	1000
Substructure	Steel	Painted	6	8	m	231	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Substructure	Timber		1	5	ea	206	0.905	0.901	0.999	1.000		7	7	693	1000	
Substructure	Timber		1	5	m	216 235	0.995	1.000	1.000			138	1000	1000		
Substructure	Timber		1	7	ea	206	0.817	0.935	0.998	1.000		3	10	346	1000	
Substructure	Timber		1	7	m	216 235	0.995	0.970	1.000			138	23	1000		
Substructure	Timber		2	4	ea	206	0.485	0.874	0.986	1.000		1	5	49	1000	
Substructure	Timber		2	4	m	216 235	0.980	0.909	1.000	1.000		34	7	1000	1000	
Substructure	Timber		3	2	ea	206		0.887	1.000	1.000			6	1000	1000	
Substructure	Timber		3	2	m	216 235	0.967	0.969	1.000			21	22	1000		
Substructure	Timber		3	6	ea	206	0.680	0.949	0.989	1.000		2	13	63	1000	
Substructure	Timber		3	6	m	216 235	1.000	1.000				1000	1000			
Substructure	Timber		4	1	ea	206	0.926	0.960	0.993	1.000		9	17	99	1000	
Substructure	Timber		4	1	m	216 235	0.992	1.000	1.000	1.000		86	1000	1000	1000	
Substructure	Timber		5	2	ea	206		1.000					1000			
Substructure	Timber		5	3	ea	206	0.823	0.542	1.000			4	1	1000		
Substructure	Timber		5	3	m	216 235	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Substructure	Timber		5	7	ea	206	0.733	0.977	1.000	1.000		2	30	1000	1000	
Substructure	Timber		5	7	m	216 235	0.995	1.000				138	1000			
Substructure	Timber		6	8	ea	206	0.900		1.000	1.000		7		1000	1000	
Substructure	Timber		6	8	m	235 216	1.000		1.000	1.000		1000		1000	1000	
Substructure	Timber	Submerged	2	4	ea	228	1.000			1.000		1000			1000	
Superstructure	Concrete		1	5	ea	340	1.000					1000				
Superstructure	Concrete		1	5	m	110 105 116 144 155	0.999	0.999	0.994	1.000		693	693	115	1000	
Superstructure	Concrete		2	4	ea	340	0.982	1.000				38	1000			
Superstructure	Concrete		2	4	m	105 110 144 155	0.934	0.989	1.000	1.000		10	63	1000	1000	
Superstructure	Concrete		3	2	ea	340	1.000					1000				
Superstructure	Concrete		3	2	m	110 105	0.994	0.991	0.991	1.000		115	77	77	1000	
Superstructure	Concrete		3	5	m	105 110	1.000	1.000				1000	1000			
Superstructure	Concrete		3	6	ea	340	1.000					1000				
Superstructure	Concrete		3	6	m	110	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Superstructure	Concrete		4	1	ea	340	0.996	1.000				173	1000			
Superstructure	Concrete		4	1	m	110 105	0.999	0.999	1.000	1.000		693	693	1000	1000	
Superstructure	Concrete		4	5	m	110	1.000					1000				
Superstructure	Concrete		5	3	ea	340	1.000					1000				
Superstructure	Concrete		5	3	m	110 105 144	0.998	0.999	1.000	1.000		346	693	1000	1000	
Superstructure	Concrete		5	7	ea	340	1.000					1000				
Superstructure	Concrete		5	7	m	110	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Superstructure	Concrete		6	1	ea	340	1.000					1000				

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Superstructure	Concrete		6	8	ea	340	0.995	0.992	1.000			138	86	1000		
Superstructure	Concrete		6	8	m	110 105 144 155	0.994	0.992	0.977	1.000		115	86	30	1000	
Superstructure	Prestressed Concrete		1	5	m	109 104	0.999	1.000	1.000			693	1000	1000		
Superstructure	Prestressed Concrete		2	4	m	109 104	0.986	1.000	1.000			49	1000	1000		
Superstructure	Prestressed Concrete		3	2	m	109 104	0.994	1.000	1.000	1.000		115	1000	1000	1000	
Superstructure	Prestressed Concrete		3	5	m	104	1.000					1000				
Superstructure	Prestressed Concrete		3	6	m	104 109	1.000					1000				
Superstructure	Prestressed Concrete		4	1	m	109 104	0.999	0.999	1.000			693	693	1000		
Superstructure	Prestressed Concrete		5	3	m	109 104	1.000	1.000				1000	1000			
Superstructure	Prestressed Concrete		5	7	m	109 104	0.999	1.000	1.000			693	1000	1000		
Superstructure	Prestressed Concrete		6	1	m	109	1.000					1000				
Superstructure	Prestressed Concrete		6	8	m	104 109	1.000	1.000	0.992	1.000		1000	1000	86	1000	
Superstructure	Steel		1	5	ea	160 161		1.000	0.967	1.000			1000	21	1000	
Superstructure	Steel		1	5	m	101 106 120 125 151	0.993	1.000	1.000	1.000		99	1000	1000	1000	
Superstructure	Steel		2	4	ea	161	1.000					1000				
Superstructure	Steel		2	4	m	106 120 125 151 112	1.000					1000				
Superstructure	Steel		3	2	ea	160 161	1.000					1000				
Superstructure	Steel		3	2	m	106 112 120 125 151 101	0.974	1.000	1.000	1.000		26	1000	1000	1000	
Superstructure	Steel		3	5	ea	160 161		0.750	1.000				2	1000		
Superstructure	Steel		3	5	m	101		1.000	1.000	1.000			1000	1000	1000	
Superstructure	Steel		3	6	m	106	1.000					1000				
Superstructure	Steel		4	1	m	106 112 151	1.000					1000				
Superstructure	Steel		5	3	m	106	1.000	1.000		1.000		1000	1000		1000	
Superstructure	Steel		6	8	ea	161	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Superstructure	Steel		6	8	m	120 125 151 106 101 140	0.999	1.000	1.000			693	1000	1000		
Superstructure	Steel	Painted	1	5	m	107 113 152 102	0.974	0.986	0.997	0.997	1.000	26	49	231	231	1000
Superstructure	Steel	Painted	1	7	m	107	0.992	0.982	1.000			86	38	1000		
Superstructure	Steel	Painted	2	4	m	107 113 121 126 152 102 131	0.641	0.946	0.979	0.994	1.000	2	12	33	115	1000
Superstructure	Steel	Painted	3	2	m	107 113	0.074	0.819	0.983	1.000		0	3	40	1000	

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
						121 126 152 102 141										
Superstructure	Steel	Painted	3	5	m	102		1.000	1.000				1000	1000		
Superstructure	Steel	Painted	3	6	m	107 113 121 126 152 102	0.822	0.883	0.956	1.000		4	6	15	1000	
Superstructure	Steel	Painted	3	7	m	107		1.000	1.000				1000	1000		
Superstructure	Steel	Painted	4	1	m	107 113 121 126 152 141	0.969	0.989	0.996	0.996	1.000	22	63	173	173	1000
Superstructure	Steel	Painted	4	5	m	107		1.000	1.000	1.000			1000	1000	1000	
Superstructure	Steel	Painted	5	2	m	107		1.000	1.000				1000	1000		
Superstructure	Steel	Painted	5	3	m	107 113 121 126 152	0.982	0.994	0.999	1.000		38	115	693	1000	
Superstructure	Steel	Painted	5	7	m	113 121 126 152 107 131	0.970	0.987	0.997	1.000		23	53	231	1000	
Superstructure	Steel	Painted	6	8	m	107 102 113 152 121 126 141	0.982	0.986	0.993	0.963	1.000	38	49	99	18	1000
Superstructure	Timber		1	5	m	111	0.989	0.991	0.963	1.000		63	77	18	1000	
Superstructure	Timber		1	7	m	111	0.988	0.997	1.000	1.000		57	231	1000	1000	
Superstructure	Timber		2	4	m	111 117 156	0.921	0.940	0.887	1.000		8	11	6	1000	
Superstructure	Timber		3	2	m	111		1.000		1.000			1000		1000	
Superstructure	Timber		3	6	m	111	0.970	1.000	1.000			23	1000	1000		
Superstructure	Timber		4	1	m	111 117	0.987	0.961	0.988	1.000		53	17	57	1000	
Superstructure	Timber		5	2	m	111		1.000					1000			
Superstructure	Timber		5	3	m	111	0.996	1.000				173	1000			
Superstructure	Timber		5	7	m	111	0.983	0.997		1.000		40	231		1000	
Superstructure	Timber		6	8	m	111		1.000	1.000				1000	1000		
Tunnel	-		4	1	m	351		0.996	1.000				173	1000		
Tunnel	-		5	3	m	351	1.000	1.000		1.000		1000	1000		1000	
Tunnel	Concrete		1	5	m	350 353	1.000	1.000	1.000	1.000		1000	1000	1000	1000	
Tunnel	Concrete		3	2	m	350		1.000	1.000	1.000			1000	1000	1000	
Tunnel	Concrete		4	1	m	350 353	0.999	1.000	1.000			693	1000	1000		
Tunnel	Concrete		5	7	m	350 353	1.000	1.000				1000	1000			
Walks	Concrete		1	5	m	338	0.996	0.998	1.000	1.000		173	346	1000	1000	
Walks	Concrete		1	7	m	338	0.972	1.000	1.000			24	1000	1000		
Walks	Concrete		2	4	m	338	0.966	0.875	0.923	1.000		20	5	9	1000	

							Transition probabilities					Mean Life, years				
Model			**Region**	**Section**	**Unit**	**Elements**	**Ti 1**	**Ti 2**	**Ti 3**	**Ti 4**	**Ti 5**	**Mi 1**	**Mi 2**	**Mi 3**	**Mi 4**	**Mi 5**
Walks	Concrete		3	2	m	338	0.901	0.940	0.921	1.000		7	11	8	1000	
Walks	Concrete		3	6	m	338	0.934	0.967	0.941	1.000		10	21	11	1000	
Walks	Concrete		3	7	m	338			1.000	1.000				1000	1000	
Walks	Concrete		4	1	m	338	0.990	0.998	0.992	1.000		69	346	86	1000	
Walks	Concrete		4	5	m	338	0.989	1.000				63	1000			
Walks	Concrete		5	2	m	338		0.750					2			
Walks	Concrete		5	3	m	338	0.992	0.997	1.000	1.000		86	231	1000	1000	
Walks	Concrete		5	7	m	338	0.993	0.998	1.000	1.000		99	346	1000	1000	
Walks	Concrete		6	1	m	338	1.000					1000				
Walks	Concrete		6	8	m	338	0.986	0.984	0.994	1.000		49	43	115	1000	
Walks	Metal	Coated	2	4	m	336	1.000	1.000				1000	1000			
Walks	Metal	Coated	3	2	m	336			1.000					1000		
Walks	Metal	Coated	3	6	m	336	1.000					1000				
Walks	Metal	Coated	4	1	m	336	1.000					1000				
Walks	Metal	Coated	5	3	m	336	0.947	1.000	1.000	1.000		13	1000	1000	1000	
Walks	Timber		1	5	m	339	0.965	0.992	1.000	1.000		19	86	1000	1000	
Walks	Timber		1	7	m	339	0.978	1.000	1.000			31	1000	1000		
Walks	Timber		2	4	m	339	0.848	0.953	1.000	1.000		4	14	1000	1000	
Walks	Timber		3	2	m	339	1.000	0.648	1.000	1.000		1000	2	1000	1000	
Walks	Timber		3	6	m	339		1.000	1.000	1.000			1000	1000	1000	
Walks	Timber		4	1	m	339	0.994	1.000	1.000	1.000		115	1000	1000	1000	
Walks	Timber		5	3	m	339	0.997	1.000	1.000			231	1000	1000		
Walks	Timber		5	7	m	339	0.973	1.000	1.000			25	1000	1000		
Walks	Timber		6	8	m	339		1.000	1.000				1000	1000		

Task 6 – Reliability

The deterioration models developed in Task 5 are applied to estimation of time to occurrence of potential loss of safety in bridge superstructure elements. Deterioration models address bridges elements grouped by component, materials and protection. These groupings are used in Task 6.

A measure of reliability is computed as the number of years from current conditions until a set portion of element reaches its poorest condition. For Task 6, it is assumed that a safety loss is possible when 10% or more of quantity of a superstructure element reaches its poorest condition. Superstructure elements have either 4 or 5 condition states (painted elements have 5 condition states). Separate estimates of reliability are obtained for 4-state and 5-state superstructure elements.

Method

Transition probabilities are obtained from work in Task 5, and applied to assumed initial conditions of bridge elements. Computations for a 4-state element are illustrated here. The deterioration model is put into matrix form as

$$\{p\}_{N+1} = [T]\{p\}_N \qquad \text{Eq. 8}$$

Where $\{p\}_N$ is the vector of percentages of element quantities after N years in service, $[T]$ is the matrix of transition probabilities, and $\{p\}_{N+1}$ is the vector of percentages of element quantities after $N+1$ years in service. The initial vector of element quantities at the start of the process $\{p\}_0$ is set to a desired initial condition for the computation. To determine the years in service until poor condition for an initially new element, Eq. 8 becomes

$$\{p\}_1 = \begin{bmatrix} T_1 & & & \\ 1-T_1 & T_2 & & \\ & 1-T_2 & T_3 & \\ & & 1-T_3 & 1 \end{bmatrix} \begin{Bmatrix} 100\,\% \\ 0 \\ 0 \\ 0 \end{Bmatrix}_0 \qquad \text{Eq. 9}$$

Notice that the transition probability in the condition state 4, the poorest condition in this deterioration model, is set to 1.0. There is no migration of element quantity out of the model.

The computation of element quantities continues for N years until a 10% quantity is obtained in the poorest condition state.

$$\{p\}_N = \begin{bmatrix} T_1 & & & \\ 1-T_1 & T_2 & & \\ & 1-T_2 & T_3 & \\ & & 1-T_3 & 1 \end{bmatrix}^N \begin{Bmatrix} 100\,\% \\ 0 \\ 0 \\ 0 \end{Bmatrix}_0 \qquad \text{Eq. 10}$$

Where $[T]^N$ indicates the matrix of transition probabilities $[T]$ multiplied by itself N times; a power of the matrix. The value of N is the least integer number of years for which

$$p_4 \geq 10\ \%$$ Eq. 11

The same model and method are applied to other starting conditions. To determine the years to poorest condition for element quantities initially in condition state two, the computation is

$$\{p\}_N = \begin{bmatrix} T_1 & & & \\ 1-T_1 & T_2 & & \\ & 1-T_2 & T_3 & \\ & & 1-T_3 & 1 \end{bmatrix}^N \begin{Bmatrix} 0 \\ 100\ \% \\ 0 \\ 0 \end{Bmatrix}_0$$ Eq. 12

In the computations of reliability, transition probabilities are adjusted to avoid unrealistic longevities of some elements in some condition states. The upper bound on transition probabilities is set to 0.9895. This corresponds to a 10% transition of element quantities in a 20-year period. This value is used for element transitions not observed in the 10-year span of condition data used in Study 87-60.

Superstructure:Component Model

Two deterioration models, a 4-state model and a 5-state model, are applied to elements grouped by the single bridge component, *superstructure* (Table 55). Time to potential loss of safety is as long as 107 years for new elements having 5 condition states and as short as 9 years for superstructure elements already in the next-to-poorest condition.

Table 55 - Reliability, Superstructure Component Model

Poorest Condition	Elements	*Starting Condition*			
		1	***2***	***3***	***4***
		Years to 10% Poorest Condition			
4	101 104 105 106 109 110 111 112 116 117 120 125 140 144 151 155 156	94	38	9	-
5	102 107 113 121 126 131 141 152	107	86	53	9

Superstructure:Material Model

Grouping of superstructure elements by construction material yields four models each with four condition states (Table 56). The 5-state model for painted steel elements is unchanged from Table 55. Among the 4-state models, timber elements have the shortest times to poor condition, reinforced concrete elements have longer times, and prestressed concrete elements and unpainted steel elements have the longest time to poor condition. The equal times for prestressed concrete and unpainted steel result from the application of an upper bound on transition probabilities[8]. Unbounded transition probabilities yield longer times to poor condition for prestressed concrete elements.

[8] A requirement of at least 10% quantity transition in 20 years yields an upper bound on transition probabilities.

Table 56 - Reliability, Superstructure Material Model

Material	Poorest Condition	Elements	Starting Condition			
			1	2	3	4
			Years to 10% Poorest Condition			
Concrete	4	105 110 116 144 155	86	37	5	-
Prestressed Concrete	4	104 109	103	49	9	-
Steel	4	101 106 112 120 125 140 151	103	49	9	-
Steel, Painted	5	102 107 113 121 126 131 141 152	107	86	53	9
Timber	4	111 117 156	44	18	3	-

Bridges in Service

The computation of reliability can be applied to bridges in service, that is to bridges with a range of present-day conditions among superstructure elements. Using Eq. 10, apply the current vector of element conditions as $\{q\}_o$, and determine the years N to poor condition. The computation is not linear. That is, the years to poor condition starting from mixed conditions is not a linear combination of the results for the conditions individually. An example is provided here: A bridge has superstructure elements in condition states 1 and 3. The relative quantities of elements are

$$\{p\}_0 = \begin{Bmatrix} 100\,\% - p_3 \\ 0 \\ p_3 \\ 0 \end{Bmatrix} \qquad \text{Eq. 13}$$

The time to poor condition for a range of mixed conditions is plotted in Figure 2. Notice that the quantity in condition state 3 has a strong influence on the time to poor condition.

CDOT Bridges

The years to possible safety loss are computed for CDOT bridges inspected in 2008. Among 409 bridges with painted steel superstructure elements, the median years to safety loss is 71 years, with a minimum value of 1 year and a maximum value of 87 years (Table 57). Among 42 bridges with unpainted steel elements, the median years to potential safety loss is 106 years with a minimum value of 10 years and a maximum value of 106 years (Table 58). Among 363 bridges with prestressed concrete superstructure elements, the median years to potential safety loss is 106, with a minimum value of 51 years and a maximum value of 106 years (Table 60). Among 377 bridges with reinforced concrete superstructure elements, the median years to potential safety loss is 88, with a minimum value of 0 years, and a maximum value of 90 years (Table 60). Among 84 bridges with timber superstructure elements, the median years to potential safety loss is 35 years with a minimum value of 0 years and a maximum value of 46 years (Table 61).

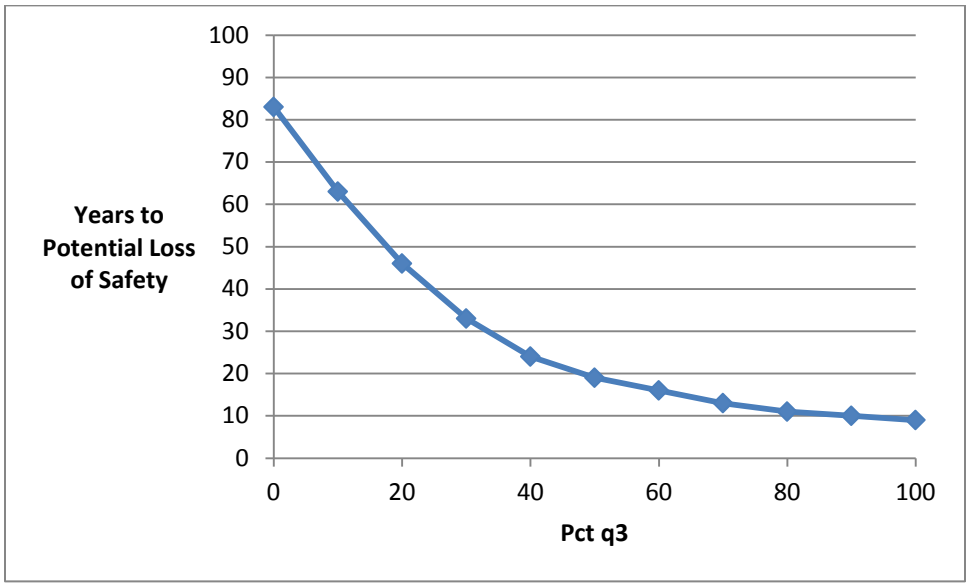


Figure 2 - Reliability for Bridges in Service

Table 57 - Years to Potential Safety Loss, Painted Steel Superstructure

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
B-06-A	107	26	27	29	18	0	30
B-11-A	152	0	26	57	17	0	27
B-11-G	107	45	49	6	0	0	72
B-11-H	107	26	19	44	11	0	37
B-23-C	107	15	75	10	0	0	66
B-24-A	107	5	84	12	0	0	63
C-07-A	107	42	54	3	0	0	73
C-09-P	107	77	1	2	21	0	33
C-10-A	107	75	24	1	0	0	80
C-11-A	107	0	75	25	0	0	58
C-15-I	152	0	8	81	12	0	29
C-15-J	152	11	35	30	16	8	7
C-17-BN	152	0	0	53	40	7	4
C-20-AK	107	0	0	65	35	0	16
C-20-D	107	77	13	7	4	0	70
C-21-G	107	46	40	9	5	0	60
C-22-B	107	62	36	1	1	0	77
C-22-F	107	33	67	0	0	0	73
C-23-D	107	0	67	33	0	0	55
C-23-L	107	0	67	23	9	2	38
D-01-E	107	88	10	2	0	0	83
D-02-A	107	0	55	40	5	0	44
D-02-B	107	0	77	22	1	0	57

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
D-02-F	107	0	82	18	0	0	60
D-09-F	107	52	11	29	8	0	47
D-11-N	107	75	21	4	0	0	79
D-12-F	107	57	36	7	0	0	74
D-13-A	107	0	38	44	19	0	27
D-13-W	107	81	17	1	0	0	82
D-15-AZ	107	97	3	0	0	0	86
D-16-T	107	0	0	95	5	0	34
D-20-AP	107	96	2	2	0	0	84
E-10-A	107	24	74	2	0	0	70
E-13-X	107	79	14	3	3	0	73
E-15-AH	107	0	50	49	1	0	49
E-16-CW	107	5	77	17	1	0	59
E-16-EP	107	44	50	6	0	0	72
E-16-FL	107	34	36	24	6	0	51
E-16-FO	107	26	45	29	0	0	59
E-16-FP	107	10	24	47	19	0	26
E-16-FR	107	66	15	17	1	0	68
E-16-GQ	107	38	42	18	3	0	60
E-16-IM	107	91	4	4	0	0	82
E-16-MO	102	96	4	0	0	0	86
E-16-MR	102	84	11	5	0	0	80
E-16-ND	102	89	8	3	0	0	83
E-16-OO	102	41	38	21	0	0	65
E-16-P	107	94	5	1	0	0	85
E-16-PJ	102	84	12	4	0	0	81
E-16-PM	107	80	18	2	0	0	81
E-16-PW	152	89	9	2	0	0	83
E-16-QR	152	97	3	0	0	0	86
E-17-ABJ	107	100	0	0	0	0	87
E-17-AH	107	49	24	27	0	0	63
E-17-AI	107	65	35	0	0	0	79
E-17-AT	107	59	15	17	5	5	41
E-17-CB	107	83	16	1	0	0	83
E-17-DM	107	52	7	35	6	0	49
E-17-DN	107	41	21	31	7	0	47
E-17-DU	107	10	25	45	20	0	25
E-17-EK	107	0	78	22	0	0	59
E-17-EM	107	0	97	3	0	0	66
E-17-EO	107	0	87	10	3	0	58
E-17-FG	107	31	46	21	2	0	60
E-17-FH	107	48	41	9	1	0	69
E-17-FI	107	59	30	10	1	0	70
E-17-FJ	107	66	22	11	1	0	73

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
E-17-IC	107	39	61	0	0	0	74
E-17-IF	107	56	6	38	0	0	60
E-17-IG	107	49	14	37	0	0	59
E-17-IH	107	72	19	9	0	0	76
E-17-II	107	56	34	9	0	0	73
E-17-IJ	107	88	10	2	0	0	83
E-17-IK	107	45	46	9	0	0	71
E-17-JZ	107	0	95	5	0	0	65
E-17-LE	107	56	32	12	0	0	71
E-17-MF	107	0	84	9	7	0	51
E-17-MY	107	100	0	0	0	0	87
E-17-NB	107	96	4	0	0	0	86
E-17-PB	102	97	3	0	0	0	86
E-17-PD	102	84	12	3	1	0	79
E-17-PO	102	94	4	1	0	0	85
E-17-PP	102	89	10	1	0	0	84
E-17-QN	102	100	0	0	0	0	87
E-17-RT	107	99	1	0	0	0	87
E-17-Z	107	68	32	0	0	0	80
E-17-ZM	107	100	0	0	0	0	87
E-18-AO	107	83	17	1	0	0	82
F-05-C	107	72	18	9	1	0	74
F-05-I	107	98	2	0	0	0	87
F-05-K	107	67	33	0	0	0	79
F-05-L	107	99	1	0	0	0	87
F-05-V	107	100	0	0	0	0	87
F-05-W	107	100	0	0	0	0	87
F-05-X	107	100	0	0	0	0	87
F-05-Y	107	100	0	0	0	0	87
F-06-A	152	17	23	30	30	1	18
F-06-K	107	49	48	1	2	0	72
F-06-L	107	45	49	6	0	0	72
F-06-O	107	66	31	3	0	0	78
F-06-P	107	80	20	0	0	0	82
F-06-R	107	88	11	1	0	0	84
F-06-S	107	98	3	0	0	0	86
F-06-T	107	87	11	1	0	0	83
F-06-U	107	98	2	0	0	0	86
F-07-A	107	71	22	6	0	0	77
F-07-AA	107	77	14	10	0	0	76
F-07-AB	107	65	22	13	0	0	72
F-07-AJ	102	44	26	26	5	0	53
F-07-AS	107	66	19	15	0	0	72
F-08-D	107	31	25	38	6	0	45

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
F-08-F	152	0	0	75	25	0	20
F-08-L	121	72	4	24	0	0	69
F-08-Q	107	99	1	0	0	0	87
F-08-S	107	99	1	0	0	0	86
F-08-T	107	100	0	0	0	0	87
F-09-B	107	50	51	0	0	0	76
F-09-D	107	0	0	100	0	0	39
F-09-H	152	0	0	92	8	0	32
F-09-K	107	0	66	33	0	0	55
F-09-L	107	0	89	9	2	0	59
F-09-O	107	0	85	15	0	0	61
F-09-Z	107	75	25	0	0	0	81
F-10-AA	107	50	50	1	0	0	76
F-10-AB	107	66	34	0	0	0	79
F-10-C	107	0	59	42	0	0	52
F-10-I	107	56	41	2	0	0	75
F-10-L	107	71	29	0	0	0	81
F-10-M	107	59	40	1	0	0	78
F-10-Q	107	95	3	2	0	0	84
F-11-AB	107	45	40	15	0	0	68
F-11-AC	107	59	40	2	0	0	77
F-11-AD	107	49	32	10	9	0	52
F-11-AI	107	0	93	7	1	0	63
F-11-AJ	107	64	35	1	0	0	79
F-11-Q	107	51	34	15	1	0	67
F-11-T	107	100	0	0	0	0	87
F-12-AJ	102	0	60	40	0	0	53
F-16-B	107	63	33	4	0	0	76
F-16-BI	152	80	20	0	0	0	82
F-16-DT	107	59	28	11	1	0	70
F-16-DW	107	0	66	33	1	0	53
F-16-DX	107	44	43	12	1	0	67
F-16-EF	107	90	5	5	1	0	80
F-16-EG	107	82	11	5	2	0	75
F-16-EJ	107	77	15	7	1	0	75
F-16-ER	107	65	26	7	3	0	70
F-16-FL	107	69	23	4	4	0	70
F-16-FU	107	96	3	1	1	0	84
F-16-GD	152	0	90	10	0	0	63
F-16-GG	107	0	89	11	0	0	63
F-16-IK	107	94	6	1	0	0	85
F-16-IL	107	77	22	0	0	0	82
F-16-JN	107	100	0	0	0	0	87
F-16-JO	107	97	3	1	0	0	86

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
F-16-JU	107	86	15	0	0	0	83
F-16-JV	107	76	24	0	0	0	81
F-16-KW	107	30	47	23	0	0	62
F-16-NX	107	100	0	0	0	0	87
F-16-OL	102	100	0	0	0	0	87
F-16-SP	107	100	0	0	0	0	87
F-17-BS	107	33	17	50	0	0	53
F-17-D	107	32	31	38	0	0	57
F-17-F	107	43	38	19	0	0	66
F-17-FS	107	0	100	0	0	0	67
F-17-GA	107	75	20	5	0	0	78
F-17-GO	107	85	6	7	2	0	75
F-17-H	107	88	12	0	0	0	84
F-17-JM	102	98	2	0	0	0	86
F-17-OD	107	100	0	0	0	0	87
F-17-OO	121	100	0	0	0	0	87
F-17-PD	121	100	0	0	0	0	87
F-19-D	107	54	8	39	0	0	59
G-01-D	107	0	88	11	1	0	61
G-04-A	152	0	0	95	5	0	34
G-04-AK	107	97	3	0	0	0	86
G-04-AR	107	97	3	0	0	0	86
G-04-B	107	2	46	52	0	0	49
G-04-R	107	0	88	11	1	0	60
G-08-B	107	51	39	10	1	0	70
G-08-R	107	0	88	8	4	0	56
G-11-F	107	7	34	54	4	0	43
G-11-T	107	40	54	6	0	0	71
G-19-B	107	83	11	5	1	0	78
G-19-F	107	71	21	8	0	0	76
G-22-BB	107	76	24	0	0	0	82
H-01-AA	107	87	12	1	0	0	83
H-01-AC	107	19	51	31	0	0	58
H-01-AD	107	0	78	22	0	0	59
H-01-AH	107	80	16	4	0	0	80
H-01-AI	107	66	34	0	0	0	79
H-01-AJ	107	93	6	1	0	0	85
H-01-I	107	96	4	0	0	0	86
H-01-J	107	95	5	0	0	0	86
H-02-DZ	107	100	0	0	0	0	87
H-02-FD	107	52	45	3	0	0	75
H-02-FE	107	85	15	0	0	0	83
H-02-FF	107	58	25	18	0	0	69
H-02-FG	107	57	34	8	1	0	72

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
H-02-FH	107	94	4	1	0	0	85
H-02-FI	107	88	8	3	1	0	81
H-02-FK	107	62	37	1	0	0	78
H-02-FQ	107	83	15	2	0	0	82
H-02-FR	107	98	0	2	0	0	86
H-02-FU	107	97	2	1	0	0	85
H-02-FW	107	96	2	2	0	0	85
H-02-GD	107	99	1	0	0	0	87
H-02-J	107	88	11	1	0	0	83
H-03-AY	107	0	50	50	1	0	49
H-03-BN	107	100	0	0	0	0	87
H-03-BO	107	92	8	0	0	0	85
H-03-L	107	19	60	21	0	0	61
H-03-X	107	64	28	7	1	0	74
H-04-E	107	27	52	18	3	0	58
H-04-G	107	23	44	32	0	0	58
H-11-A	107	40	55	5	0	0	72
H-11-D	107	43	54	3	1	0	72
H-11-F	107	69	19	12	0	0	74
H-17-W	107	0	62	29	10	0	41
H-18-A	152	0	0	48	45	6	5
I-03-K	107	63	33	4	1	0	75
I-04-K	107	71	25	3	1	0	77
I-04-N	107	96	4	0	0	0	86
I-05-V	121	0	0	100	0	0	39
I-05-W	107	65	31	4	0	0	77
I-06-A	107	82	18	0	0	0	83
I-06-C	107	55	42	3	0	0	76
I-06-U	107	0	45	52	3	0	45
I-06-V	107	100	0	0	0	0	87
I-07-S	107	100	0	0	0	0	87
I-12-B	152	0	45	55	0	0	48
I-15-Y	107	31	14	42	14	0	33
I-17-AE	107	0	34	40	26	0	21
I-17-BI	107	0	30	70	0	0	45
I-17-CO	107	47	9	24	20	0	29
I-17-GN	107	95	2	2	2	0	81
I-17-GQ	107	64	23	9	2	1	64
I-17-GR	107	59	25	15	0	0	71
I-17-HI	107	76	15	9	0	0	77
I-17-JN	102	100	0	0	0	0	87
I-17-LY	121	100	0	0	0	0	87
I-17-O	107	12	56	30	2	0	53
I-17-R	107	30	41	26	3	0	55

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
J-01-C	107	16	64	18	2	0	58
J-04-AT	107	95	5	0	0	0	86
J-04-X	107	0	70	30	0	0	56
J-09-D	121	0	0	94	6	0	33
J-12-A	126	15	35	50	0	0	51
J-15-B	107	30	43	27	0	0	61
J-17-X	107	10	29	30	30	0	19
J-18-AK	107	50	50	0	0	0	76
J-18-AL	107	95	5	0	0	0	86
J-18-B	107	0	99	1	0	0	67
J-18-F	107	100	0	0	0	0	87
J-18-M	152	50	17	25	8	0	47
J-18-S	107	0	87	6	7	0	51
J-18-V	107	0	71	29	0	0	56
J-18-W	107	5	85	9	1	0	63
K-01-C	152	0	50	50	0	0	50
K-05-N	107	91	4	4	0	0	82
K-06-P	107	89	10	0	0	0	84
K-07-A	107	39	35	25	0	0	63
K-07-B	107	23	46	30	2	0	55
K-07-F	107	80	19	1	0	0	82
K-08-C	107	54	25	22	0	0	66
K-10-A	107	39	32	29	0	0	61
K-14-J	107	28	30	24	19	0	30
K-14-L	107	88	6	6	0	0	81
K-15-G	107	8	55	36	2	0	52
K-16-AC	107	86	5	7	1	0	78
K-16-D	107	0	82	17	0	0	60
K-16-G	107	95	5	0	0	0	86
K-16-K	131	0	0	0	95	5	3
K-16-Q	126	0	0	52	40	8	3
K-16-R	107	85	15	0	0	0	83
K-16-V	107	47	18	33	1	0	59
K-16-Y	107	88	12	0	0	0	84
K-16-Z	107	68	31	1	0	0	79
K-17-AC	107	79	21	0	0	0	82
K-17-F	107	46	12	39	3	0	52
K-17-H	107	69	16	14	1	0	71
K-17-I	107	4	52	41	3	0	48
K-18-AC	107	5	36	31	27	0	21
K-18-AE	107	79	11	11	0	0	77
K-18-AX	107	59	28	14	0	0	71
K-18-AY	107	68	14	18	0	0	70
K-18-BI	107	95	5	0	0	0	86

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
K-18-BL	107	98	2	0	0	0	86
K-18-BT	107	47	45	8	0	0	71
K-18-ES	121	93	7	0	0	0	85
K-18-FF	107	100	0	0	0	0	87
K-18-H	107	77	13	10	0	0	76
K-18-L	107	58	16	13	12	0	44
K-18-S	107	0	86	14	0	0	62
K-18-U	107	7	59	24	7	3	36
K-18-W	107	0	91	9	0	0	64
K-18-Z	107	40	35	25	1	0	62
K-19-A	107	46	47	6	0	0	72
K-19-Q	107	40	7	52	1	0	51
K-19-U	107	5	36	57	2	0	45
K-19-V	107	10	48	32	9	0	41
K-19-W	107	36	27	29	7	0	47
K-22-F	107	47	50	3	0	0	74
K-25-L	107	0	0	92	8	0	32
K-27-A	107	95	5	0	0	0	86
L-05-C	107	0	49	51	0	0	50
L-16-C	107	50	49	2	0	0	75
L-18-A	107	42	34	24	0	0	64
L-18-AQ	107	68	17	14	1	0	71
L-18-AU	107	61	25	12	1	0	69
L-18-AW	107	56	33	11	0	0	72
L-18-AX	107	36	52	13	0	0	68
L-18-AY	107	30	54	15	0	0	65
L-18-B	107	2	83	13	2	0	59
L-18-CD	107	98	2	0	0	0	86
L-18-J	107	98	0	2	0	0	85
L-18-K	107	0	94	6	0	0	65
L-18-M	107	37	32	29	2	0	57
L-18-R	107	35	57	8	0	0	69
L-18-W	107	37	37	25	1	0	61
L-19-A	107	0	81	19	0	0	60
L-19-C	152	33	11	28	28	0	21
L-19-G	107	0	0	33	67	0	9
L-20-F	107	10	59	26	4	0	51
L-21-CW	107	96	4	0	0	0	86
L-21-G	107	61	33	6	0	0	75
L-22-A	107	33	51	11	4	0	60
L-22-B	107	99	1	0	0	0	87
L-22-BA	107	0	81	8	11	0	43
L-22-BB	107	100	0	0	0	0	87
L-22-CH	107	0	0	100	0	0	39

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
L-22-H	107	0	52	48	0	0	50
L-22-J	107	0	58	42	0	0	52
L-22-K	152	0	0	85	15	0	26
L-22-R	107	0	88	12	0	0	63
L-24-AB	107	80	20	0	0	0	82
L-24-M	107	0	97	3	0	0	66
L-25-C	107	0	70	30	0	0	56
L-25-D MINOR	107	0	92	8	0	0	64
L-26-AZ	107	57	43	0	0	0	77
L-26-G MINOR	107	21	40	27	12	0	38
L-26-H	107	32	13	54	0	0	51
L-26-I	107	43	51	6	0	0	72
L-27-D	107	0	65	28	7	0	45
L-27-O	107	0	0	100	0	0	39
L-27-P	107	0	89	11	0	0	63
L-28-C	107	0	35	31	31	3	13
L-28-F	107	41	33	25	1	0	60
M-17-A	107	25	53	21	1	0	61
M-17-O	107	14	51	35	0	0	56
M-17-W	107	35	51	12	1	0	65
M-20-A	107	0	54	41	5	0	45
M-21-B	107	0	43	53	4	0	44
M-22-A	107	88	12	0	0	0	84
M-22-AC	107	50	46	2	2	0	71
M-22-AD	107	67	28	5	0	0	77
M-22-K	107	50	35	15	0	0	69
M-22-R	107	0	55	41	4	0	46
M-22-U	107	0	36	54	11	0	34
M-22-Z	107	63	34	3	0	0	77
M-23-I	107	75	25	0	0	0	81
N-16-L	121	0	0	0	92	8	1
N-16-O	107	62	30	8	1	0	74
N-17-AC	107	14	27	53	7	0	40
N-17-AD	107	16	40	41	3	0	49
N-17-AM	107	67	19	13	2	0	69
N-17-BG	107	2	1	93	4	0	36
N-17-BH	107	8	13	70	10	0	33
N-17-BN	107	60	35	5	0	0	75
N-17-BQ	107	98	2	0	0	0	86
N-17-C	107	0	40	51	9	0	36
N-17-D	113	0	0	100	0	0	39
N-17-L	107	37	39	24	0	0	63
N-18-AB	107	89	9	2	0	0	83
N-20-H	107	0	97	3	0	0	66

Bridge ID	Element	2008 Condition, Pct					Safety Loss, Years
		1	2	3	4	5	
N-20-J	107	0	82	16	2	0	57
N-21-F	107	0	25	39	37	0	16
N-26-O	107	100	0	0	0	0	87
N-26-P	107	100	0	0	0	0	87
N-26-Q	107	100	0	0	0	0	87
N-26-R	107	100	0	0	0	0	87
O-03-J	152	0	0	100	0	0	39
O-18-BI	107	50	30	17	3	1	59
O-18-CF	107	96	4	0	0	0	86
O-19-H	152	0	0	78	22	0	22
O-26-A	107	88	12	0	0	0	84
P-06-G	152	0	0	95	5	0	34
P-06-H	121	0	0	100	0	0	39
P-09-L	121	0	40	52	8	0	38
P-16-A	107	51	45	4	0	0	74
P-16-D	107	14	73	12	1	0	63
P-17-F	107	0	89	11	0	0	63
P-17-H	107	0	0	100	0	0	39
P-17-J	107	85	15	0	0	0	83
P-18-Q	107	78	15	7	0	0	78
P-19-AU	107	55	41	3	1	1	70
P-19-AW	107	96	4	0	0	0	86
P-19-AX	107	97	3	0	0	0	86
P-19-BA	107	98	2	1	0	0	86
P-19-G	107	12	49	38	1	0	53
P-19-G MINOR	107	0	0	91	9	0	31
P-20-D	107	69	21	9	0	0	75
P-21-G	107	0	0	100	0	0	39
P-21-H	107	0	86	14	0	0	62
P-21-I	107	55	27	16	2	0	65
P-22-A	107	67	33	0	0	0	79
P-22-C	107	0	69	28	3	0	52
P-22-D	107	52	45	3	0	0	75
P-23-A MINOR	107	0	42	42	15	0	30

Table 58 - Years to Potential Safety Loss, Unpainted Steel Superstructure

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
B-04-F	106	100	0	0	0	106
C-06-R	106	100	0	0	0	106
C-20-AM	106	100	0	0	0	106
D-05-A	106	100	0	0	0	106
E-16-CL	151	98	2	0	0	104
E-16-KC	106	85	15	0	0	93
E-16-KD	106	83	16	1	0	89
F-05-Z	106	100	0	0	0	106
F-08-AH	101	99	0	1	0	104
F-08-AI	101	91	7	2	0	95
F-08-AL	106	96	4	0	0	103
F-08-AM	106	100	0	0	0	106
F-08-AN	106	94	6	0	0	101
F-08-BA	101	97	0	2	0	100
F-08-BC	101	100	0	0	0	106
F-08-BD	106	100	0	0	0	106
F-08-BI	106	98	2	0	0	104
F-11-AO	101	68	11	21	0	47
F-11-AP	101	55	40	5	0	65
F-11-AS	101	99	0	1	0	104
F-11-AT	101	44	49	7	0	57
F-12-AS	101	93	3	2	1	91
F-12-AT	101	97	3	0	0	103
G-03-Q	106	100	0	0	0	106
G-05-J	106	100	0	0	0	106
G-08-B	106	100	0	0	0	106
G-08-H	112	100	0	0	0	106
H-03-BV	106	100	0	0	0	106
H-17-DA	106	100	0	0	0	106
I-06-M	106	0	50	50	0	20
I-17-GK	106	100	0	0	0	106
I-17-GV	106	100	0	0	0	106
I-17-LV	125	97	0	1	2	95
I-17-MJ	106	100	0	0	0	106
I-17-MK	106	100	0	0	0	106
J-16-C	106	100	0	0	0	106
J-18-BK	106	100	0	0	0	106
K-18-EP	106	100	0	0	0	106
L-27-N MINOR	106	100	0	0	0	106
N-17-BP	106	100	0	0	0	106
N-28-M	106	100	0	0	0	106
P-17-H	151	0	0	100	0	10

Table 59 - Years to Potential Safety Loss, Prestressed Concrete Superstructure

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
A-11-J	109	100	0	0	0	106
B-01-B	109	100	0	0	0	106
B-03-H	109	100	0	0	0	106
B-06-V	109	100	0	0	0	106
C-06-D	109	100	0	0	0	106
C-06-S	109	100	0	0	0	106
C-08-W	109	100	0	0	0	106
C-20-AR	109	100	0	0	0	106
C-20-AS	109	100	0	0	0	106
C-20-AT	109	100	0	0	0	106
C-21-BL	109	100	0	0	0	106
C-23-N	109	100	0	0	0	106
D-01-O	109	100	0	0	0	106
D-11-A	104	100	0	0	0	106
D-11-J	109	99	1	0	0	105
D-13-F	109	100	0	0	0	106
D-13-G	109	100	0	0	0	106
D-13-H	109	100	0	0	0	106
D-13-X	109	100	0	0	0	106
D-17-DF	109	100	0	0	0	106
E-15-AL	104	100	0	0	0	106
E-16-DP	109	99	1	0	0	105
E-16-FA	104	98	2	0	0	104
E-16-GS	104	100	0	0	0	106
E-16-JM	109	99	1	0	0	105
E-16-JO	109	96	1	3	0	98
E-16-KY	109	100	0	0	0	106
E-16-LA	109	98	2	0	0	104
E-16-LY	104	100	0	0	0	106
E-16-NF	109	100	0	0	0	106
E-16-NM	109	100	0	0	0	106
E-16-NW	104	99	1	0	0	105
E-16-NX	104	100	0	0	0	106
E-16-ON	104	100	0	0	0	106
E-16-OP	104	98	2	0	0	104
E-16-OQ	104	100	0	0	0	106
E-16-PL	104	98	2	0	0	104
E-16-PY	109	100	0	0	0	106
E-16-RB	104	100	0	0	0	106
E-16-WW	109	100	0	0	0	106
E-17-CC	109	97	1	2	0	99
E-17-ER	109	90	1	4	4	70

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
E-17-ID	109	100	0	0	0	106
E-17-IE	109	100	0	0	0	106
E-17-MJ	109	99	1	0	0	105
E-17-MW	109	100	0	0	0	106
E-17-MX	109	100	0	0	0	106
E-17-MZ	109	100	0	0	0	106
E-17-OZ	104	100	0	0	0	106
E-17-PA	104	100	0	0	0	106
E-17-UF	109	100	0	0	0	106
E-17-UH	109	100	0	0	0	106
E-17-UJ	109	99	1	0	0	105
E-17-UZ	104	100	0	0	0	106
E-17-VR	109	97	3	0	0	103
E-17-WP	104	100	0	0	0	106
E-17-WQ	104	100	0	0	0	106
E-17-WZ	104	100	0	0	0	106
E-17-XX	109	99	1	0	0	105
E-17-ZW	104	100	0	0	0	106
F-05-O	109	100	0	0	0	106
F-05-P	109	100	0	0	0	106
F-05-R	109	100	0	0	0	106
F-06-AA	109	100	0	0	0	106
F-06-AB	109	100	0	0	0	106
F-06-AC	109	100	0	0	0	106
F-06-AD	109	100	0	0	0	106
F-06-AE	109	100	0	0	0	106
F-06-AF	109	100	0	0	0	106
F-06-AG	104	93	7	0	0	99
F-06-AH	109	100	0	0	0	106
F-07-AK	104	73	27	0	0	83
F-07-AL	104	97	3	0	0	103
F-07-AN	104	88	12	0	0	95
F-07-AR	104	97	3	0	0	103
F-07-AT	104	100	0	0	0	106
F-07-AU	104	98	2	0	0	104
F-07-AV	104	95	5	0	0	101
F-07-AW	104	100	0	0	0	106
F-07-AX	104	97	3	0	0	103
F-07-AZ	104	100	0	0	0	106
F-08-AA	104	94	6	0	0	100
F-08-AB	104	88	12	0	0	95
F-08-AC	104	95	5	0	0	101
F-08-AD	104	82	18	0	0	90
F-08-AE	104	98	1	0	0	105

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
F-08-AF	104	98	1	1	0	103
F-08-AG	104	81	19	0	0	90
F-08-AK	104	100	0	0	0	106
F-08-AR	104	96	4	0	0	102
F-08-AS	104	99	1	0	0	105
F-08-AU	104	99	1	0	0	105
F-08-AV	104	97	2	0	0	105
F-08-AW	104	96	4	0	0	102
F-08-AY	104	100	0	0	0	106
F-08-AZ	104	87	13	0	0	94
F-08-BH	104	84	16	0	0	92
F-08-BJ	104	94	6	0	0	100
F-09-AD	109	100	0	0	0	106
F-09-AE	109	100	0	0	0	106
F-09-AF	109	100	0	0	0	106
F-09-AH	109	100	0	0	0	106
F-09-AI	109	100	0	0	0	106
F-09-AL	109	100	0	0	0	106
F-09-J	104	97	4	0	0	103
F-10-AC	109	100	0	0	0	106
F-10-AD	109	99	0	0	0	105
F-10-D	109	100	0	0	0	106
F-10-W	109	100	0	0	0	106
F-10-X	109	100	0	0	0	106
F-10-Y	109	100	0	0	0	106
F-10-Z	109	99	1	0	0	105
F-11-AK	104	88	12	0	0	95
F-11-AL	104	52	48	0	0	70
F-11-AU	104	30	70	0	0	61
F-11-AV	104	49	51	0	0	69
F-11-AW	104	99	1	0	0	105
F-11-AX	104	100	0	0	0	106
F-11-AY	104	100	0	0	0	106
F-11-BF	109	98	1	1	0	102
F-16-DQ	104	100	0	0	0	106
F-16-IO	109	100	0	0	0	106
F-16-JP	109	100	0	0	0	106
F-16-JQ	109	100	0	0	0	106
F-16-KO	109	100	0	0	0	106
F-16-KY	104	100	0	0	0	106
F-16-MJ	104	98	2	0	0	104
F-16-MW	104	100	0	0	0	106
F-16-MX	104	100	0	0	0	106
F-16-NF	104	100	0	0	0	106

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
F-16-NK	104	100	0	0	0	106
F-16-NW	109	100	0	0	0	106
F-16-NY	104	96	4	0	0	103
F-16-NZ	109	100	0	0	0	106
F-16-OB	104	99	1	0	0	105
F-16-OG	104	100	0	0	0	106
F-16-OU	104	100	0	0	0	106
F-16-PL	104	100	0	0	0	106
F-16-PM	104	100	0	0	0	106
F-16-PN	104	99	1	0	0	105
F-16-PO	104	99	2	0	0	104
F-16-QJ	104	99	1	0	0	105
F-16-TR	104	97	3	0	0	103
F-16-TW	104	100	0	0	0	106
F-16-TX	109	100	0	0	0	106
F-16-TY	104	100	0	0	0	106
F-16-TZ	104	100	0	0	0	106
F-17-CO	104	100	0	0	0	106
F-17-DE	104	100	0	0	0	106
F-17-DG	104	100	0	0	0	106
F-17-DK	104	100	0	0	0	106
F-17-FJ	109	100	0	0	0	106
F-17-HJ	104	100	0	0	0	106
F-17-HL	109	100	0	0	0	106
F-17-HM	109	100	0	0	0	106
F-17-HN	109	100	0	0	0	106
F-17-HO	109	100	0	0	0	106
F-17-HS	109	100	0	0	0	106
F-17-HT	109	100	0	0	0	106
F-17-IJ	104	98	2	0	0	104
F-17-IV	109	100	0	0	0	106
F-17-JY	109	99	1	0	0	105
F-17-JZ	109	100	0	0	0	106
F-17-MG	104	100	0	0	0	106
F-17-MQ	109	100	0	0	0	106
F-17-NA	109	100	0	0	0	106
F-17-NB	109	100	0	0	0	106
F-17-NC	109	100	0	0	0	106
F-17-ND	109	100	0	0	0	106
F-17-NE	109	100	0	0	0	106
F-17-NF	109	100	0	0	0	106
F-17-NG	109	100	0	0	0	106
F-17-NH	109	100	0	0	0	106
F-17-NI	109	100	0	0	0	106

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
F-17-NJ	109	100	0	0	0	106
F-17-NO	109	100	0	0	0	106
F-17-NP	104	100	0	0	0	106
F-17-OC	109	100	0	0	0	106
F-17-ON	109	100	0	0	0	106
F-17-PR	109	100	0	0	0	106
F-17-PS	109	100	0	0	0	106
F-17-QA	109	100	0	0	0	106
F-17-QB	109	100	0	0	0	106
F-18-AB	109	100	0	0	0	106
F-18-AC	109	100	0	0	0	106
F-19-M	104	100	0	0	0	106
G-03-P	109	100	0	0	0	106
G-04-AE	104	97	3	0	0	103
G-04-AH	104	100	0	0	0	106
G-04-AL	104	97	3	0	0	104
G-04-AM	109	100	0	0	0	106
G-04-AN	109	100	0	0	0	106
G-04-AS	109	93	0	7	0	86
G-04-BC	109	100	0	0	0	106
G-04-BD	109	100	0	0	0	106
G-04-BE	109	100	0	0	0	106
G-08-K	109	100	0	0	0	106
G-08-S	109	100	0	0	0	106
G-08-T	109	100	0	0	0	106
G-09-I	109	100	0	0	0	106
G-09-J	109	100	0	0	0	106
G-09-K	109	100	0	0	0	106
G-09-L	109	100	0	0	0	106
G-09-M	109	100	0	0	0	106
G-09-O	104	100	0	0	0	106
G-17-AM	104	100	0	0	0	106
G-17-AO	109	100	0	0	0	106
G-17-CE	109	99	0	1	0	104
H-02-EG	109	100	0	0	0	106
H-02-GA	109	100	0	0	0	106
H-02-GN	109	100	0	0	0	106
H-03-BL	109	100	0	0	0	106
H-03-BQ	109	100	0	0	0	106
H-03-BR	109	100	0	0	0	106
H-03-BW	104	100	0	0	0	106
H-04-R	109	98	2	0	0	104
H-04-S	109	100	0	0	0	106
H-04-T	109	100	0	0	0	106

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
H-09-R	109	100	0	0	0	106
H-09-S	109	93	7	0	0	100
H-11-AF	109	100	0	0	0	106
H-16-I	104	100	0	0	0	106
H-17-CJ	109	100	0	0	0	106
H-17-CZ	109	100	0	0	0	106
I-15-AV	109	100	0	0	0	106
I-16-AE	109	100	0	0	0	106
I-17-CD	104	100	0	0	0	106
I-17-CE	104	100	0	0	0	106
I-17-DG	109	98	1	1	0	102
I-17-DH	109	100	0	0	0	106
I-17-DJ	109	97	3	0	0	103
I-17-FJ	104	100	0	0	0	106
I-17-GF	109	99	1	0	0	105
I-17-GL	109	100	0	0	0	106
I-17-GY	109	100	0	0	0	106
I-17-HF	109	100	0	0	0	106
I-17-IX	109	100	0	0	0	106
I-17-IY	109	100	0	0	0	106
I-17-IZ	109	100	0	0	0	106
I-17-JA	109	100	0	0	0	106
I-17-JB	109	100	0	0	0	106
I-17-JC	109	97	3	0	0	103
I-17-JD	109	100	0	0	0	106
I-17-JE	104	100	0	0	0	106
I-17-JG	109	100	0	0	0	106
I-17-JH	104	100	0	0	0	106
I-17-JL	109	100	0	0	0	106
I-17-JM	109	100	0	0	0	106
I-17-JO	109	100	0	0	0	105
I-17-KB	109	100	0	0	0	106
I-17-LR	104	100	0	0	0	106
I-17-LS	104	99	1	0	0	105
I-17-LT	104	93	7	0	0	100
I-17-LU	104	99	1	0	0	104
I-17-LX	104	99	1	0	0	105
I-17-MG	104	100	0	0	0	106
I-17-MH	104	100	0	0	0	106
I-17-NE	109	100	0	0	0	106
I-17-NG	104	100	0	0	0	106
I-17-NH	104	100	0	0	0	106
I-17-NI	104	100	0	0	0	106
I-17-NJ	104	100	0	0	0	106

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
I-17-NK	104	100	0	0	0	106
I-17-NL	104	100	0	0	0	106
I-17-NM	109	99	1	0	0	105
I-17-NN	104	100	0	0	0	106
I-17-NO	104	100	0	0	0	106
I-17-NP	109	100	0	0	0	106
I-17-NQ	104	100	0	0	0	106
I-17-NR	104	100	0	0	0	106
I-17-NU	109	100	0	0	0	106
I-17-NV	109	100	0	0	0	106
I-17-OO	104	100	0	0	0	106
I-17-OP	104	100	0	0	0	106
I-17-OQ	104	100	0	0	0	106
I-19-B	109	85	15	0	0	93
I-25-A	109	100	0	0	0	106
J-05-X	104	99	1	0	0	105
J-17-AA	109	100	0	0	0	106
J-17-AC	109	100	0	0	0	106
J-18-AI	109	100	0	0	0	106
J-18-Q	109	100	0	0	0	106
J-25-E	109	100	0	0	0	106
J-25-F	109	100	0	0	0	106
K-05-BQ	109	100	0	0	0	106
K-15-W	109	100	0	0	0	106
K-16-AP	104	100	0	0	0	106
K-16-CC	109	100	0	0	0	106
K-16-CD	109	100	0	0	0	106
K-16-CG	109	100	0	0	0	106
K-16-CH	109	100	0	0	0	106
K-18-CI	109	99	1	0	0	105
K-18-CJ	109	99	1	0	0	105
K-18-CK	109	99	1	0	0	105
K-18-CL	109	100	0	0	0	106
K-18-EJ	109	100	0	0	0	106
K-18-EL	109	100	0	0	0	106
K-18-EX	104	92	8	0	0	99
K-18-FA	109	100	0	0	0	106
K-18-FB	109	100	0	0	0	106
K-18-FD	109	100	1	0	0	105
K-18-FL	104	88	13	0	0	95
K-18-FN	109	100	0	0	0	106
K-18-FO	109	100	0	0	0	106
K-18-GA	104	100	0	0	0	106
K-18-GB	104	100	0	0	0	106

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
K-18-GC	104	100	0	0	0	106
K-18-GG	104	100	0	0	0	106
K-18-GQ	109	100	0	0	0	106
K-18-HA	109	100	0	0	0	106
K-22-C	109	100	0	0	0	106
L-17-CF	109	100	0	0	0	106
L-17-J	104	96	4	0	0	102
L-18-BD	109	100	0	0	0	106
L-18-BE	104	100	0	0	0	106
L-18-CE	109	97	3	0	0	103
L-19-AV	109	100	0	0	0	106
L-19-E	109	100	0	0	0	106
L-19-R	109	100	0	0	0	106
L-19-T	109	93	7	0	0	99
L-19-X	109	100	0	0	0	106
L-20-A	109	100	0	0	0	106
L-21-CY	109	100	0	0	0	106
L-21-DA	109	100	0	0	0	106
L-21-DB	109	100	0	0	0	106
L-21-DC	109	100	0	0	0	106
L-21-I	109	100	0	0	0	106
L-22-AL	109	96	2	2	0	99
L-22-CI	109	100	0	0	0	106
L-25-F	109	100	0	0	0	106
L-26-BP	109	100	0	0	0	106
L-26-BQ	109	100	0	0	0	106
L-26-BU	109	100	0	0	0	106
L-26-BW	109	100	0	0	0	106
L-27-I	104	100	0	0	0	106
L-28-AQ	109	100	0	0	0	106
M-17-BB	109	99	1	0	0	105
M-17-BE	109	100	0	0	0	106
M-17-BF	104	100	0	0	0	106
M-20-O	109	100	0	0	0	106
M-20-P	109	100	0	0	0	106
M-22-AY	109	99	1	1	0	103
M-23-K	109	100	0	0	0	106
N-17-BR	109	100	0	0	0	106
N-18-AA	109	100	0	0	0	106
N-18-AC	104	100	0	0	0	106
N-18-B	109	100	0	0	0	106
N-18-W	109	100	0	0	0	106
N-18-Y	109	99	1	0	0	105
N-18-Z	109	100	0	0	0	106

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
N-26-T	109	100	0	0	0	106
O-18-CE	109	0	99	1	0	51
O-18-CG	109	68	32	0	0	80
O-18-CH	109	67	33	0	0	79
P-16-B	104	100	0	0	0	106
P-17-AE	104	100	0	0	0	106
P-18-AO	109	100	0	0	0	106
P-18-AX	104	90	10	0	0	97
P-18-Q	109	99	1	0	0	105
P-19-BC	109	100	0	0	0	106
P-19-BE	109	100	0	0	0	106
P-20-T	109	100	0	0	0	106
P-20-U	109	100	0	0	0	106

Table 60 - Years to Potential Safety Loss, Reinforced Concrete Superstructure

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
B-05-A	110	100	0	0	0	90
B-06-S	110	100	0	0	0	90
C-06-M	110	100	0	0	0	90
C-09-AS	110	99	1	0	0	89
C-12-B	110	99	0	1	0	86
D-10-B	110	98	0	1	1	81
D-15-AZ	110	100	0	0	0	90
D-16-T	105	0	97	3	0	37
D-17-AK	110	95	3	2	0	80
D-17-BU	110	96	3	1	0	84
D-20-AH	110	73	27	0	0	68
E-10-D	110	97	3	0	0	87
E-16-DI	110	100	0	0	0	89
E-16-EO	110	83	4	10	3	44
E-16-EP	110	95	2	3	0	78
E-16-EW	110	90	6	4	1	71
E-16-FZ	110	92	4	4	0	74
E-16-GU	110	100	0	0	0	89
E-16-GW	110	96	4	0	0	85
E-16-GX	110	98	2	0	0	88
E-16-GY	110	2	73	23	1	19
E-16-HE	110	100	0	0	0	90
E-16-HF	110	99	1	0	0	88
E-16-HP	105	100	0	0	0	89
E-16-JK	105	93	6	1	0	82

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
E-16-JL	105	89	8	3	0	75
E-16-JN	105	88	11	1	1	75
E-16-JP	105	98	1	1	0	87
E-17-AF	110	100	0	0	0	90
E-17-AS	110	84	11	5	0	65
E-17-BY	110	77	13	10	0	51
E-17-BZ	110	67	30	3	0	59
E-17-EK	110	0	80	9	11	0
E-17-EM	110	0	86	14	0	27
E-17-EX	110	28	62	9	0	36
E-17-EZ	110	98	1	1	0	85
E-17-GE	110	95	3	2	0	82
E-17-GI	110	92	8	0	0	82
E-17-HD	110	98	2	0	0	88
E-17-HG	110	98	1	0	0	89
E-17-HT	110	100	0	0	0	90
E-17-HU	110	100	0	0	0	90
E-17-IN	110	90	3	7	0	67
E-17-IO	110	100	0	0	0	90
E-17-IX	110	100	0	0	0	89
E-17-IY	110	100	0	0	0	89
E-17-JK	105	25	75	0	0	46
E-17-KR	105	85	11	4	0	68
E-17-LN	105	98	2	0	0	87
E-17-Z	110	94	6	0	0	84
E-19-Z	110	100	0	0	0	89
F-05-S	110	100	0	0	0	89
F-07-AC	105	83	17	0	0	75
F-07-AD	110	99	2	0	0	88
F-07-AE	110	100	0	0	0	89
F-07-AF	110	100	0	0	0	89
F-07-AG	110	100	0	0	0	89
F-07-AH	105	87	13	0	0	78
F-07-AI	110	100	0	0	0	89
F-07-AO	105	72	28	0	0	67
F-07-AP	105	50	50	0	0	55
F-07-AQ	105	70	30	0	0	65
F-07-P	110	100	0	0	0	89
F-08-O	110	100	0	0	0	89
F-08-P	110	100	0	0	0	89
F-09-AB	105	0	100	0	0	40
F-10-N	110	100	0	0	0	89
F-10-O	110	100	0	0	0	89
F-10-P	110	100	0	0	0	89

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
F-10-S	110	99	1	0	0	88
F-10-T	110	98	2	0	0	88
F-11-AF	110	100	0	0	0	89
F-11-AG	110	99	1	0	0	88
F-11-AH	110	100	0	0	0	90
F-11-AM	105	80	20	0	0	72
F-11-AN	105	100	0	0	0	89
F-11-AQ	105	90	8	1	0	78
F-11-AR	105	90	10	0	0	80
F-11-AW	110	98	2	0	0	87
F-11-N	110	100	0	0	0	89
F-11-O	110	98	1	1	0	86
F-11-P	110	99	1	0	0	89
F-11-R	110	100	0	0	0	90
F-11-V	110	97	3	0	0	87
F-11-X	110	99	1	1	0	86
F-16-AM	110	96	2	2	0	82
F-16-AS	105	96	4	0	0	86
F-16-AT	105	65	35	0	0	63
F-16-BC	110	93	7	0	0	83
F-16-DA	110	94	1	5	0	74
F-16-DC	110	99	1	0	0	89
F-16-DQ	110	93	4	3	0	77
F-16-DS	110	84	10	6	0	63
F-16-DT	110	100	0	0	0	89
F-16-DU	110	88	3	9	0	59
F-16-EC	110	99	1	0	0	88
F-16-EK	110	99	1	0	0	89
F-16-EL	110	94	3	3	0	79
F-16-EN	110	51	9	37	3	12
F-16-EP	110	100	0	0	0	89
F-16-F	110	65	0	35	0	19
F-16-FH	110	94	0	6	0	73
F-16-FI	110	93	2	5	0	74
F-16-FL	110	100	0	0	0	89
F-16-FY	110	97	2	1	0	85
F-16-GN	110	99	1	0	0	88
F-16-GS	105	50	50	0	0	55
F-16-GT	105	53	47	0	0	56
F-16-HH	105	95	5	0	0	85
F-16-HI	105	93	7	0	0	83
F-16-HJ	110	99	1	0	0	89
F-16-HK	110	100	0	0	0	89
F-16-HL	110	100	0	0	0	90

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
F-16-HM	110	100	0	0	0	90
F-16-HN	110	100	0	0	0	89
F-16-HO	110	100	0	0	0	89
F-16-HQ	105	75	25	0	0	69
F-16-HS	105	52	48	0	0	56
F-16-I	110	87	14	0	0	77
F-16-IC	105	14	84	2	0	41
F-16-NZ	110	100	0	0	0	89
F-16-O	110	98	1	1	0	87
F-16-OB	105	98	2	0	0	88
F-17-AW	105	61	36	3	0	55
F-17-CG	110	98	1	1	0	86
F-17-CO	110	100	0	0	0	89
F-17-DE	110	100	0	0	0	90
F-17-DG	110	100	0	0	0	89
F-17-DK	110	99	1	0	0	89
F-17-DM	110	93	0	2	6	59
F-17-GA	110	94	5	1	0	82
F-17-GO	110	98	2	0	0	88
F-17-KW	105	100	0	0	0	89
F-17-NB	110	100	0	0	0	89
F-17-NG	110	100	0	0	0	89
F-17-Z	110	96	4	0	0	86
G-04-AO	110	100	0	0	0	89
G-08-M	110	98	2	0	0	88
G-09-N	105	100	0	0	0	89
G-11-F	110	48	30	20	2	23
H-01-AF	110	97	2	0	0	86
H-01-AG	110	100	0	0	0	90
H-02-DS	110	98	2	0	0	87
H-02-EM	110	98	2	0	0	87
H-02-EN	110	100	0	0	0	89
H-02-EQ	110	100	0	0	0	89
H-02-ET	110	91	9	0	0	81
H-02-EV	110	97	3	0	0	87
H-02-EW	110	97	3	0	0	87
H-02-EX	110	100	0	0	0	90
H-02-EY	110	100	0	0	0	89
H-02-EZ	110	100	0	0	0	89
H-02-FM	110	99	1	0	0	89
H-02-FN	110	99	1	0	0	88
H-02-FO	110	99	1	0	0	89
H-02-FP	110	99	1	0	0	89
H-02-O	110	100	0	0	0	89

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
H-02-Q	110	100	0	0	0	90
H-03-AZ	110	99	1	0	0	89
H-03-BB	110	98	2	0	0	88
H-03-BC	110	100	0	0	0	89
H-03-BD	110	100	0	0	0	89
H-03-BE	110	100	0	0	0	90
H-03-BI	110	97	2	0	0	86
H-03-BJ	110	100	0	0	0	89
H-03-BY	110	98	2	0	0	88
H-03-BZ	110	100	0	0	0	90
H-03-S	110	97	3	0	0	87
H-04-G	110	0	100	0	0	40
H-04-Z	110	100	0	0	0	89
H-07-H	110	96	4	0	0	86
H-07-I	110	100	0	0	0	89
H-07-J	105	86	14	0	0	77
H-08-H	110	95	5	0	0	85
H-09-A	110	99	1	0	0	89
H-09-Q	105	100	0	0	0	89
H-17-U	110	95	5	0	0	85
I-01-M	110	96	4	0	0	86
I-02-K	110	89	2	6	3	57
I-05-C	110	99	1	0	0	89
I-07-K	110	100	0	0	0	89
I-07-L	105	95	5	0	0	85
I-17-AG	110	100	0	0	0	89
I-17-DP	110	100	0	0	0	89
I-17-DZ	110	98	2	0	0	88
I-17-GL	110	100	0	0	0	89
I-17-GO	105	50	50	0	0	55
I-17-LV	105	100	0	0	0	89
I-18-AW	110	93	7	0	0	83
I-19-AJ	110	100	0	0	0	89
J-01-A	110	100	0	0	0	89
J-15-A	110	100	0	0	0	89
J-17-A	110	99	1	0	0	89
J-17-D	110	100	0	0	0	90
J-18-AE	110	100	0	0	0	89
J-18-AF	110	100	0	0	0	89
J-18-BA	110	98	2	0	0	88
J-18-BD	110	100	0	0	0	90
J-18-G	110	100	0	0	0	89
J-18-I	110	96	4	0	0	86
J-18-J	110	100	0	0	0	89

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
J-18-L	110	100	0	0	0	90
J-18-P	110	100	0	0	0	89
K-05-A	110	98	2	0	0	87
K-05-H	110	98	2	0	0	87
K-05-I	110	100	0	0	0	90
K-05-L	110	100	0	0	0	90
K-16-A	110	89	0	11	0	56
K-16-K	110	91	9	0	0	81
K-16-S	110	94	3	3	0	79
K-17-D	110	95	3	1	0	82
K-18-BY	110	94	6	0	0	84
K-18-BZ	110	100	0	0	0	89
K-18-CD	110	100	0	0	0	90
K-18-CG	110	98	2	0	0	87
K-18-CH	110	98	2	0	0	87
K-18-CN	110	100	0	0	0	89
K-18-CO	110	100	0	0	0	89
K-18-CR	110	100	0	0	0	89
K-18-CT	110	100	0	0	0	89
K-18-CW	110	100	0	0	0	89
K-18-DO	110	100	0	0	0	89
K-18-DP	110	100	0	0	0	89
K-18-EA	110	97	3	0	0	87
K-18-EB	110	100	0	0	0	89
K-18-EN	105	100	0	0	0	89
K-18-EY	110	100	0	0	0	90
K-18-J	110	89	11	0	0	80
K-18-O	110	99	1	0	0	89
K-22-O	110	90	10	0	0	81
K-23-A	110	98	1	1	0	86
K-23-E	110	100	0	0	0	89
K-26-A	110	96	4	0	0	86
K-26-J	110	100	0	0	0	90
L-16-A	110	100	1	0	0	89
L-17-CD	144	88	12	0	0	79
L-17-E	110	100	0	0	0	89
L-17-F	110	97	3	0	0	86
L-18-AV	110	100	0	0	0	89
L-18-AZ	110	98	2	0	0	87
L-18-BA	110	100	0	0	0	89
L-18-BB	110	100	0	0	0	89
L-18-BC	110	99	1	0	0	89
L-18-BF	110	94	6	0	0	83
L-18-BG	110	98	2	0	0	88

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
L-18-BY	110	100	0	0	0	89
L-18-BZ	110	100	0	0	0	89
L-18-CC	110	97	3	0	0	86
L-18-O	110	99	1	0	0	89
L-18-T	110	100	0	0	0	89
L-19-B	144	57	31	12	0	39
L-20-B	144	38	46	15	0	32
L-21-G	110	98	1	1	0	86
L-21-I	110	100	0	0	0	89
L-21-T	110	100	0	0	0	89
L-22-E	110	68	32	0	0	64
L-22-O	110	100	0	0	0	89
L-23-AH	110	98	1	1	0	86
L-23-B	110	91	5	4	0	74
L-23-S	110	96	4	1	0	84
L-24-B	110	96	3	1	0	83
L-24-Z	110	99	0	1	0	86
L-25-C	110	67	0	33	0	20
L-27-AL	110	100	0	0	0	89
L-27-B	110	100	0	0	0	89
L-27-T	110	95	2	2	0	81
L-28-AP	110	98	2	1	0	85
L-28-E	110	99	1	0	0	89
M-17-AN	110	100	0	0	0	89
M-17-AO	110	89	11	0	0	80
M-17-AP	110	100	0	0	0	89
M-17-AQ	110	100	0	0	0	89
M-17-AR	110	100	0	0	0	89
M-17-AS	110	100	0	0	0	89
M-17-AT	110	100	0	0	0	90
M-17-AU	110	100	0	0	0	89
M-17-AX	110	100	0	0	0	89
M-17-AZ	110	100	0	0	0	90
M-17-BA	110	100	0	0	0	89
M-22-AY	110	100	0	0	0	89
M-22-M	110	98	2	0	0	88
M-22-X	110	99	1	0	0	88
M-23-E	110	93	7	0	0	83
M-23-J	110	77	13	9	0	53
N-17-AE	110	100	0	0	0	89
N-17-B	110	100	0	0	0	89
N-17-BJ	110	100	0	0	0	89
N-17-BK	110	100	0	0	0	90
N-17-BL	110	99	1	0	0	88

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
N-17-BO	110	99	1	0	0	88
N-18-A	110	100	0	0	0	90
N-18-E	110	100	1	0	0	89
N-18-G	110	94	7	0	0	83
N-18-U	110	100	0	0	0	89
N-18-X	110	100	0	0	0	89
O-16-A	110	93	1	3	2	70
O-18-AX	110	96	4	0	0	86
O-18-BD	110	99	1	0	0	88
O-18-BE	110	98	2	0	0	88
O-18-BH	110	98	2	0	0	88
O-18-BN	110	98	2	0	0	88
O-18-BU	110	97	3	0	0	87
O-18-BX	110	99	1	0	0	89
O-18-BY	110	97	3	0	0	86
O-18-BZ	110	97	3	0	0	87
O-18-C	110	97	2	1	0	85
O-18-CC	110	100	1	0	0	89
O-18-CD	110	99	1	0	0	89
O-18-CI	110	100	0	0	0	89
O-18-CJ	110	100	0	0	0	90
O-18-CL	110	96	4	0	0	86
O-18-CM	110	99	1	0	0	88
P-17-A	110	94	2	3	0	77
P-17-K	110	95	4	1	0	84
P-18-AD	110	100	0	0	0	90
P-18-BA	110	100	1	0	0	89
P-18-BE	110	100	0	0	0	89
P-18-BF	110	69	28	3	0	60
P-18-BG	110	100	0	0	0	89
P-18-BN	110	100	0	0	0	89
P-18-BO	110	99	1	0	0	89
P-18-BP	110	100	0	0	0	89
P-18-BQ	110	100	0	0	0	89
P-18-BR	110	100	0	0	0	90
P-18-BS	110	100	0	0	0	90
P-19-C	110	100	0	0	0	89
P-19-U	110	100	0	0	0	90

Table 61 - Years to Potential Safety Loss, Timber Superstructure

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
C-08-E	111	77	17	0	6	25
C-21-H	111	74	1	2	24	0
C-22-K	111	96	4	0	0	43
D-04-N	111	63	38	0	0	30
D-09-AB	111	100	0	0	0	46
E-17-EP	111	83	15	2	0	36
F-07-I	111	88	13	0	0	39
F-19-B	111	94	6	0	0	42
F-19-C	111	94	6	0	0	42
F-19-E	111	40	57	0	3	20
F-19-F	111	51	49	0	0	27
F-20-J	111	50	20	0	30	0
F-23-F	111	68	0	0	32	0
H-01-D	111	56	44	0	0	29
H-02-EA	111	88	12	0	0	40
H-11-AA	111	93	7	0	0	42
H-11-AB	111	83	17	0	0	38
H-11-U	111	72	3	0	25	0
H-16-K	111	88	12	0	0	40
H-16-L	111	82	18	0	0	37
H-16-M	111	96	4	0	0	43
I-15-AB	111	100	0	0	0	46
I-15-AK	111	83	14	0	2	34
I-15-AM	111	95	5	0	0	43
I-15-Z	111	98	2	0	0	44
I-16-AA	111	100	0	0	0	46
I-18-G	111	0	64	0	36	0
J-06-C	111	79	19	0	2	33
J-06-D	111	84	16	0	0	38
J-14-C	111	91	6	0	3	37
K-16-W	111	71	29	0	0	33
K-18-AD	111	81	19	0	1	35
K-18-BM	111	94	6	0	0	42
K-18-ES	117	79	10	11	0	27
K-23-B	111	28	15	0	56	0
K-23-C	111	31	13	0	56	0
K-24-A	111	69	3	0	28	0
K-25-C	111	83	17	0	0	38
L-16-AE	111	100	0	0	0	46
L-17-E	111	96	4	0	0	43
L-19-G	156	0	100	0	0	19
L-20-C	111	43	57	0	0	26

Bridge ID	Element	2008 Condition, Pct				Safety Loss, Years
		1	2	3	4	
L-21-A MINOR	111	100	0	0	0	46
L-21-CT	111	83	17	0	0	38
L-21-U	111	97	4	0	0	44
L-22-F	111	71	0	4	25	0
L-24-A MINOR	111	0	0	100	0	4
L-24-B MINOR	111	0	0	0	100	0
L-24-I	111	72	28	0	0	33
L-24-L	111	100	0	0	0	46
L-25-B	111	100	0	0	0	46
L-25-L	111	95	0	0	5	35
L-25-N	111	91	9	0	0	41
L-26-M	111	79	17	0	4	29
L-26-X	111	95	4	0	2	40
L-27-M	111	90	8	0	2	39
L-27-N MINOR	111	33	0	0	67	0
L-27-S	111	71	29	0	0	33
M-20-A	111	59	0	0	41	0
M-20-P MINOR	111	75	25	0	0	34
M-21-D	111	69	30	0	1	30
M-21-J	111	71	29	0	0	33
M-22-N	111	64	36	0	0	31
M-22-T	111	78	22	0	0	35
M-23-A	111	94	6	0	0	42
M-24-A	111	75	25	0	0	34
M-24-C	111	88	13	0	0	39
N-21-B	111	89	11	0	0	40
N-21-H	111	79	21	0	0	36
N-27-B MINOR	111	92	8	0	0	41
O-19-D	111	76	21	2	0	33
O-19-I	111	67	33	0	0	31
O-19-J	111	82	18	0	0	37
O-23-A	111	85	15	0	0	38
O-25-C	111	100	0	0	0	46
O-25-D MINOR	111	83	8	0	8	19
O-25-E MINOR	111	67	33	0	0	31
O-25-F MINOR	111	17	67	0	17	0
O-25-H	111	67	21	4	8	10
O-25-I	111	44	17	0	40	0
P-19-AP	111	88	12	0	0	40
P-19-AS MINOR	111	100	0	0	0	46
P-19-F MINOR	111	46	55	0	0	26
P-19-S MINOR	111	100	0	0	0	46

Task 7 - Inspection Intervals

Inspection intervals can be adjusted so that significant changes to condition will not go unobserved and unreported. 'Significant' is the crux. Pontis deterioration models offer condition states, quantities in condition states and factors, T_i relating transition of quantities as a function of number of cycles (number of years). DOTs can identify threshold quantities for transitions of elements, and set inspection intervals to be able to observe those transition.

In Task 7, inspection intervals are computed as the years expected for deterioration of selected quantities of elements. Inspection intervals are computed for 2%, 10% and 20% transition of element quantity from current condition.

Method

Threshold quantities of deterioration of elements can be selected to trigger close inspection (arms-length), or more frequent inspection, or performance of actions for maintenance. For a given threshold quantity of deterioration, D_i, the inspection interval in years is

$$(1 - D_i) = {T_i}^m$$

Eq. 14

$$m = \frac{ln(1 - D_i)}{ln\,(T_i)}$$

Where D_i is the threshold for transition expressed as a fraction of total quantity of element, T_i is the transition probability and m is the inspection interval.

Intervals are computed for thresholds at 2%, 10% and 20% of element quantities. The computations are completed for bridge elements grouped by component (Table 66), for bridge elements grouped by material of construction (Table 67), and for bridge elements grouped by component + material + protection (Table 68).

Comparisons

Results for inspection intervals for deck elements are collected in Table 62. Intervals are as short as 0.1 years for 2% transition from good condition states and as long as 177 years for 20% transition from poor condition states. Two effects are at work: 1) Transitions of smaller quantities happen more quickly, and; 2) Pontis' Markov chain models routinely exhibit slower deterioration among poor condition states.

Table 62 - Inspection Intervals for Deck Elements

Component	*D*	Inspection Interval, years				
		Condition State				
		1	2	3	4	5
Deck	2%	0.3	0.1	3	4	16
	10%	1.4	0.6	16	23	84
	20%	2.9	1.2	34	48	177

Inspection intervals for 10% transitions in bridge components are shown in Table 63. Intervals are as short as 0.6 years for decks and as long as 109 years for superstructure elements reported by element length. Inspection intervals for 10% transitions in bridge materials are shown in Table 64. Inspection intervals are shown for concrete decks with various protections in Table 65.

Table 63 - Inspection Intervals for Bridge Components

Component	*D*	Inspection Interval, years				
		Condition State				
		1	**2**	**3**	**4**	**5**
Deck	10%	1.4	0.6	16	23	84
Superstructure ea		21	14	0.8	10	
Superstructure m		10	5	12	15	109
Substructure ea		2.5	2.2	13	47	6
Substructure m		11	10	15	70	4
Bearing		4	26	105		
Joint		2.5	4	105		
Railing		8	1.4	3	6	101
Culvert		10	7	54	69	

Table 64 - Inspection Intervals for Bridge Materials

Material	*D*	Inspection Interval, years				
		Condition State				
		1	**2**	**3**	**4**	**5**
Concrete ea	10%	2.7	1.2	35	46	177
Concrete m		26	20	17	22	8
Prestressed Concrete m		149	395	65	26	
Steel ea		52	1	6	26	
Steel m		41	133	88	26	
Painted Steel m		5	9	27	12	231
Timber ea		2.3	3.0	9	52	
Timber m		10	8	14	223	

Table 65 - Inspection Intervals for Concrete Decks by Protection

	Protection	*D*	Inspection Interval, years				
			Condition State				
			1	**2**	**3**	**4**	**5**
Concrete Deck		10%	3	0.1	29	4	52
	AC Overlay		1	2	4	44	31
	Cathodic system		2	2			
	Coated Bars		2	11	33	6	
	Rigid Overlay		3	9	2		
	Thin Overlay		42				

Table 66 - Inspection Intervals – Elements Grouped by Bridge Component

Component	Unit	Elements	Current Condition				
			1	2	3	4	5
			Interval for 2% Transition, years				
Approach	ea	325 321 320	1	2	20	3	
Bearing	ea	311 313 309 310 314 315	1	5	20		
Channel	ea	501 504 510 502	20	6	3		
Culvert	ea	327 335	1	6	32		
Culvert	m	241 240 243	2	1	10	13	
Deck	ea	26 14 13 12 32 39 23 52 36 31 38 60 30 40 24 25 35 22 18 27 55 29	0.3	0.1	3	4	16
Joint	m	305 308 306 301 302 304 300 303 307	0.5	1	20		
Railing	m	334 333 332 330 331	1	0.3	1	1	19
Sign	ea	342 343	0.3	9	1	0.3	
Substructure	ea	341	4	15	3		
Substructure	ea	326 205 206 202 201 221 204 225 220 228	0.5	0.4	2	9	1
Substructure	m	215 210 234 216 235 231 217 233 230 211	2	2	3	13	1
Superstructure	ea	340	4	3	2		
Superstructure	ea	161 160	4	3	0.2	2	
Superstructure	m	104 109 107 110 111 105 106 113 121 126 152 117 112 151 102 120 125 101 141 144 155 140 116 131 156	2	1	2	3	21
Tunnel	m	351 350 353	0.2	7	6	2	
Walks	m	338 336 339 337	2	2	1	20	
			Interval for 10% Transition, years				
Approach	ea	325 321 320	5	11	105	16	
Bearing	ea	311 313 309 310 314 315	4	26	105		
Channel	ea	501 504 510 502	105	31	14		
Culvert	ea	327 335	7	29	166		
Culvert	m	241 240 243	10	7	54	69	
Deck	ea	26 14 13 12 32 39 23 52 36 31 38 60 30 40 24 25 35 22 18 27 55 29	1.4	0.6	16	23	84
Joint	m	305 308 306 301 302 304 300 303 307	2.5	4	105		
Railing	m	334 333 332 330 331	8	1.4	3	6	101

Component	Unit	Elements	Current Condition				
			1	2	3	4	5
Sign	ea	342 343	1.8	48	6	1.5	
Substructure	ea	341	20	80	16		
Substructure	ea	326 205 206 202 201 221 204 225 220 228	2.5	2.2	13	47	6
Substructure	m	215 210 234 216 235 231 217 233 230 211	11	10	15	70	4
Superstructure	ea	340	22	14	8		
Superstructure	ea	161 160	21	14	0.8	10	
Superstructure	m	104 109 107 110 111 105 106 113 121 126 152 117 112 151 102 120 125 101 141 144 155 140 116 131 156	10	5	12	15	109
Tunnel	m	351 350 353	0.8	36	33	12	
Walks	m	338 336 339 337	8	9	4	105	
			Interval for 20% Transition, years				
Approach	ea	325 321 320	11	23	223	35	
Bearing	ea	311 313 309 310 314 315	9	56	223		
Channel	ea	501 504 510 502	223	66	30		
Culvert	ea	327 335	14	61	351		
Culvert	m	241 240 243	20	15	115	146	
Deck	ea	26 14 13 12 32 39 23 52 36 31 38 60 30 40 24 25 35 22 18 27 55 29	2.9	1.2	34	48	177
Joint	m	305 308 306 301 302 304 300 303 307	5.3	10	223		
Railing	m	334 333 332 330 331	16	2.9	6	12	213
Sign	ea	342 343	3.7	102	12	3.2	
Substructure	ea	341	42	168	35		
Substructure	ea	326 205 206 202 201 221 204 225 220 228	5.2	4.7	27	99	12
Substructure	m	215 210 234 216 235 231 217 233 230 211	23	20	33	148	8
Superstructure	ea	340	46	30	17		
Superstructure	ea	161 160	44	30	1.8	21	
Superstructure	m	104 109 107 110 111 105 106 113 121 126 152 117 112 151 102 120 125 101 141 144 155 140 116 131 156	21	10	25	32	231
Tunnel	m	351 350 353	1.8	76	70	26	
Walks	m	338 336 339 337	18	20	9	223	

Table 67 - Inspection Intervals – Elements Grouped by Material

Material	Unit	Elements	Current Condition				
			1	2	3	4	5
			Interval for 2% Transition, years				
-	ea	501 504 502 60	8	11	3		
-	ea	325 326 327 335 311 313 342 343 314 315	1	4	20		
-	m	308 301 302 304 351 300 303 307	1	1	20	1	
Appraisal	ea	510 520	4	2			
Asphalt	m	306	0.3	1	12		
Concrete	ea	26 14 340 341 13 12 39 23 52 36 38 40 24 25 35 22 18 27	0.2	0.1	3	4	16
Concrete	ea	205 321 221 220	1	1	3	11	
Concrete	m	215 338 241 210 234 110 331 105 350 353 144 155 116	2	2	2	2	1
Elastomeric	ea	309 310	3	4	14		
Elastomeric	m	305	0.1	0.2	25	0.3	
Metal	m	334 336 330 337	2	0.2	0.3	1	19
Other	m	333 217 243 211	1	1	34	1	
Prestressed Concrete	ea	204 320	3				
Prestressed Concrete	m	104 109 233	14	36	6	2	
Steel	ea	30 29	5	0.1	1	2	
Steel	ea	202 201 225 161 160	0.04	1	1	3	1
Steel	m	107 240 106 113 121 126 152 112 151 231 102 120 125 101 141 230 140 131	1	1	3	1	21
Timber	ea	32 31 55	0.2	0.3	1	5	
Timber	ea	206 228	0.02	0.2	3	32	
Timber	m	111 216 235 332 339 117 156	1	1	1	20	
			Interval for 10% Transition, years				
-	ea	501 504 502 60	39	58	16		
-	ea	325 326 327 335 311 313 342 343 314 315	4	23	105		
-	m	308 301 302 304 351 300 303 307	3	6	105	6	
Appraisal	ea	510 520	18	8			
Asphalt	m	306	1.5	4	63		

Material	Unit	Elements	Current Condition				
			1	2	3	4	5
Concrete	ea	26 14 340 341 13 12 39 23 52 36 38 40 24 25 35 22 18 27	1.3	0.6	16	22	84
Concrete	ea	205 321 221 220	6	3	17	56	
Concrete	m	215 338 241 210 234 110 331 105 350 353 144 155 116	12	9	8	10	4
Elastomeric	ea	309 310	17	19	75		
Elastomeric	m	305	0.5	1.0	130	1.5	
Metal	m	334 336 330 337	11	1.3	1.8	5	101
Other	m	333 217 243 211	3	5	179	6	
Prestressed Concrete	ea	204 320	14				
Prestressed Concrete	m	104 109 233	70	186	30	12	
Steel	ea	30 29	25	0.6	3	12	
Steel	ea	202 201 225 161 160	0.19	3	6	13	6
Steel	m	107 240 106 113 121 126 152 112 151 231 102 120 125 101 141 230 140 131	3	4	13	7	109
Timber	ea	32 31 55	1.1	1.4	4	25	
Timber	ea	206 228	0.11	1.3	13	168	
Timber	m	111 216 235 332 339 117 156	5	4	6	105	
			Interval for 10% Transition, years				
-	ea	501 504 502 60	83	124	35		
-	ea	325 326 327 335 311 313 342 343 314 315	9	48	223		
-	m	308 301 302 304 351 300 303 307	6	12	223	12	
Appraisal	ea	510 520	39	17			
Asphalt	m	306	3.1	9	133		
Concrete	ea	26 14 340 341 13 12 39 23 52 36 38 40 24 25 35 22 18 27	2.7	1.2	35	46	177
Concrete	ea	205 321 221 220	13	7	36	119	
Concrete	m	215 338 241 210 234 110 331 105 350 353 144 155 116	26	20	17	22	8
Elastomeric	ea	309 310	37	41	160		
Elastomeric	m	305	1.0	2.1	276	3.2	
Metal	m	334 336 330 337	24	2.7	3.8	10	213
Other	m	333 217 243 211	6	12	378	12	
Prestressed Concrete	ea	204 320	30				

Material	Unit	Elements	Current Condition				
			1	2	3	4	5
Prestressed Concrete	m	104 109 233	149	395	65	26	
Steel	ea	30 29	52	1.3	6	26	
Steel	ea	202 201 225 161 160	0.39	6	13	28	12
Steel	m	107 240 106 113 121 126 152 112 151 231 102 120 125 101 141 230 140 131	6	9	29	15	231
Timber	ea	32 31 55	2.3	3.0	9	52	
Timber	ea	206 228	0.22	2.7	28	356	
Timber	m	111 216 235 332 339 117 156	10	8	14	223	

Table 68 - Inspection Intervals – Elements Grouped by Component/Material/Protection

Component	Material	Protection	Unit	Elements	Current Condition				
					1	2	3	4	5
					Interval for 2% Transition, years				
Approach	-		ea	325	1	2	20		
Approach	Appraisal		ea	520	20				
Approach	Concrete		ea	321	1	7	10	2	
Approach	Prestressed Concrete		ea	320	2				
Bearing	-		ea	311 313 314 315	0.5	5	20		
Bearing	Elastomeric		ea	309 310	3	4	14		
Channel	-		ea	501 504 502	20	5	2		
Channel	Appraisal		ea	510	2	1			
Culvert	-		ea	327 335	1	6	32		
Culvert	Concrete		m	241	2	3	9	10	
Culvert	Other		m	243	1	0.1	2	0.3	
Culvert	Steel		m	240	1	1	8	2	
Deck	-		ea	60	5	6	1		
Deck	Concrete		ea	12 38 35	1	0.02	6	1	10
Deck	Concrete	AC Overlay	ea	14 13 39 36 40	0.2	0.5	1	8	6
Deck	Concrete	Cathodic system	ea	27	0.3	0.3			

Component	Material	Protection	Unit	Elements	Current Condition				
					1	2	3	4	5
Deck	Concrete	Coated Bars	ea	26 23 52	0.3	2	6	1	
Deck	Concrete	Rigid Overlay	ea	25 22	1	2	0.3		
Deck	Concrete	Thin Overlay	ea	24 18	8				
Deck	Steel		ea	30 29	5	0.1	1	2	
Deck	Timber		ea	31	1		0.3		
Deck	Timber	AC Overlay	ea	32 55	0.2	0.3	1	5	
Joint	-		m	308 301 302 304 300 303 307	1	1	20		
Joint	Asphalt		m	306	0.3	1	12		
Joint	Elastomeric		m	305	0.1	0.2	25	0.3	
Railing	Concrete		m	331	2	1	1	11	
Railing	Metal		m	330	1	8	6	2	
Railing	Metal	Coated	m	334	2	0.2	0.3	1	19
Railing	Other		m	333	1	2	28		
Railing	Timber		m	332	0.2	0.4	26	1	
Sign	-		ea	342 343	0.3	9	1	0.3	
Substructure	-		ea	326	2	5	20		
Substructure	Concrete		ea	341	4	15	3		
Substructure	Concrete		ea	205 221	1	0.4	3	9	
Substructure	Concrete		m	215 210 234	2	2	3	10	1
Substructure	Concrete	Submerged	ea	220	1				
Substructure	Other		m	217 211	1	1	4		
Substructure	Prestressed Concrete		m	233	6	1			
Substructure	Steel		ea	201 225	0.3	0.3	1	0.3	
Substructure	Steel		m	230	2	1			
Substructure	Steel	Painted	ea	202	0.03	1	1	2	1
Substructure	Steel	Painted	m	231	0.2	0.3	4	2	
Substructure	Timber		ea	206	0.02	0.2	3	32	
Substructure	Timber		m	216 235	2	4	9	4	
Substructure	Timber	Submerged	ea	228	0.3			0.3	
Superstructure	Concrete		ea	340	4	3	2		
Superstructure	Concrete		m	110 105 144 155 116	8	5	1	17	

Component	Material	Protection	Unit	Elements	Current Condition				
					1	**2**	**3**	**4**	**5**
Superstructure	Prestressed Concrete		m	104 109	13	36	6	2	
Superstructure	Steel		ea	161 160	4	3	0.2	2	
Superstructure	Steel		m	106 112 151 120 125 101 140	4	12	8	2	
Superstructure	Steel	Painted	m	107 113 121 126 152 102 141 131	0.5	1	2	1	21
Superstructure	Timber		m	111 117 156	1	1	1	39	
Tunnel	-		m	351	0.3	1	0.3	0.3	
Tunnel	Concrete		m	350 353	0.2	6	6	2	
Walks	Concrete		m	338	2	2	1	37	
Walks	Metal	Coated	m	336	2	2	2	0.3	
Walks	Timber		m	339	1	1	9	8	
					Interval for 10% Transition, years				
Approach	-		ea	325	**5**	8	105		
Approach	Appraisal		ea	520	105				
Approach	Concrete		ea	321	6	37	52	10	
Approach	Prestressed Concrete		ea	320	8				
Bearing	-		ea	311 313 314 315	2	27	105		
Bearing	Elastomeric		ea	309 310	17	19	75		
Channel	-		ea	501 504 502	105	27	10		
Channel	Appraisal		ea	510	10	4			
Culvert	-		ea	327 335	7	29	166		
Culvert	Concrete		m	241	12	14	45	54	
Culvert	Other		m	243	3	0.4	10	2	
Culvert	Steel		m	240	4	4	40	12	
Deck	-		ea	60	24	31	6		
Deck	Concrete		ea	12 38 35	3	0.1	29	4	52
Deck	Concrete	AC Overlay	ea	14 13 39 36 40	1	2	4	44	31
Deck	Concrete	Cathodic system	ea	27	2	2			
Deck	Concrete	Coated Bars	ea	26 23 52	2	11	33	6	
Deck	Concrete	Rigid Overlay	ea	25 22	3	9	2		
Deck	Concrete	Thin Overlay	ea	24 18	42				

Component	Material	Protection	Unit	Elements	Current Condition				
					1	2	3	4	5
Deck	Steel		ea	30 29	25	1	3	12	
Deck	Timber		ea	31	6		2		
Deck	Timber	AC Overlay	ea	32 55	1	1	4	25	
Joint	-		m	308 301 302 304 300 303 307	3	6	105		
Joint	Asphalt		m	306	1	4	63		
Joint	Elastomeric		m	305	0.5	1	130	2	
Railing	Concrete		m	331	9	3	4	58	
Railing	Metal		m	330	5	40	29	12	
Railing	Metal	Coated	m	334	12	1	2	5	101
Railing	Other		m	333	3	10	145		
Railing	Timber		m	332	1	2	136	4	
Sign	-		ea	342 343	2	48	6	2	
Substructure	-		ea	326	8	28	105		
Substructure	Concrete		ea	341	20	80	16		
Substructure	Concrete		ea	205 221	6	2	17	46	
Substructure	Concrete		m	215 210 234	11	9	14	51	4
Substructure	Concrete	Submerged	ea	220	4				
Substructure	Other		m	217 211	4	5	23		
Substructure	Prestressed Concrete		m	233	31	6			
Substructure	Steel		ea	201 225	2	2	6	2	
Substructure	Steel		m	230	9	6			
Substructure	Steel	Painted	ea	202	0.2	3	6	11	6
Substructure	Steel	Painted	m	231	1	2	18	10	
Substructure	Timber		ea	206	0.1	1	13	166	
Substructure	Timber		m	216 235	10	21	48	18	
Substructure	Timber	Submerged	ea	228	2			2	
Superstructure	Concrete		ea	340	22	14	8		
Superstructure	Concrete		m	110 105 144 155 116	43	28	6	90	
Superstructure	Prestressed Concrete		m	104 109	70	185	30	12	
Superstructure	Steel		ea	161 160	21	14	1	10	
Superstructure	Steel		m	106 112 151 120 125 101 140	19	63	42	12	

Component	Material	Protection	Unit	Elements	Current Condition				
					1	2	3	4	5
Superstructure	Steel	Painted	m	107 113 121 126 152 102 141 131	2	4	13	6	109
Superstructure	Timber		m	111 117 156	5	4	3	204	
Tunnel	-		m	351	2	3	2	2	
Tunnel	Concrete		m	350 353	1	33	31	10	
Walks	Concrete		m	338	9	10	4	195	
Walks	Metal	Coated	m	336	12	8	8	2	
Walks	Timber		m	339	3	4	48	44	
					Interval for 20% Transition, years				
Approach	-		ea	325	11	17	223		
Approach	Appraisal		ea	520	223				
Approach	Concrete		ea	321	13	79	110	21	
Approach	Prestressed Concrete		ea	320	17				
Bearing	-		ea	311 313 314 315	5	57	223		
Bearing	Elastomeric		ea	309 310	37	41	160		
Channel	-		ea	501 504 502	223	57	21		
Channel	Appraisal		ea	510	20	8			
Culvert	-		ea	327 335	14	61	351		
Culvert	Concrete		m	241	26	30	96	115	
Culvert	Other		m	243	7	1	21	3	
Culvert	Steel		m	240	8	7	84	26	
Deck	-		ea	60	50	66	12		
Deck	Concrete		ea	12 38 35	6	0.2	62	9	110
Deck	Concrete	AC Overlay	ea	14 13 39 36 40	2	5	9	94	66
Deck	Concrete	Cathodic system	ea	27	3	3			
Deck	Concrete	Coated Bars	ea	26 23 52	3	24	70	12	
Deck	Concrete	Rigid Overlay	ea	25 22	6	19	3		
Deck	Concrete	Thin Overlay	ea	24 18	88				
Deck	Steel		ea	30 29	52	1	6	26	
Deck	Timber		ea	31	12		3		
Deck	Timber	AC Overlay	ea	32 55	2	3	9	52	

Component	Material	Protection	Unit	Elements	Current Condition				
					1	2	3	4	5
Joint	-		m	308 301 302 304 300 303 307	6	12	223		
Joint	Asphalt		m	306	3	9	133		
Joint	Elastomeric		m	305	1	2	276	3	
Railing	Concrete		m	331	19	6	9	124	
Railing	Metal		m	330	10	84	61	26	
Railing	Metal	Coated	m	334	25	3	4	10	213
Railing	Other		m	333	6	22	307		
Railing	Timber		m	332	2	4	289	8	
Sign	-		ea	342 343	4	102	12	3	
Substructure	-		ea	326	17	58	223		
Substructure	Concrete		ea	341	42	168	35		
Substructure	Concrete		ea	205 221	13	4	35	97	
Substructure	Concrete		m	215 210 234	23	19	29	108	8
Substructure	Concrete	Submerged	ea	220	8				
Substructure	Other		m	217 211	9	10	48		
Substructure	Prestressed Concrete		m	233	66	12			
Substructure	Steel		ea	201 225	3	4	12	3	
Substructure	Steel		m	230	20	12			
Substructure	Steel	Painted	ea	202	0.3	6	14	23	12
Substructure	Steel	Painted	m	231	2	4	39	21	
Substructure	Timber		ea	206	0.2	3	28	351	
Substructure	Timber		m	216 235	22	45	103	39	
Substructure	Timber	Submerged	ea	228	3			3	
Superstructure	Concrete		ea	340	46	30	17		
Superstructure	Concrete		m	110 105 144 155 116	91	59	12	191	
Superstructure	Prestressed Concrete		m	104 109	149	392	65	26	
Superstructure	Steel		ea	161 160	44	30	2	21	
Superstructure	Steel		m	106 112 151 120 125 101 140	41	133	88	26	
Superstructure	Steel	Painted	m	107 113 121 126 152 102 141 131	5	9	27	12	231
Superstructure	Timber		m	111 117 156	11	8	7	432	
Tunnel	-		m	351	3	7	3	3	

Component	Material	Protection	Unit	Elements	Current Condition				
					1	2	3	4	5
Tunnel	Concrete		m	350 353	2	70	66	21	
Walks	Concrete		m	338	19	21	9	414	
Walks	Metal	Coated	m	336	25	17	17	3	
Walks	Timber		m	339	6	9	102	93	

Task 8 – Data from CDOT Construction Contracts Unit

CDOT Construction Contracts Unit

Unit costs of Pontis actions are computed from bid tabulations for CDOT projects. The CDOT Construction Contracts Unit posts bid tabulations from 1998 to the present at their internet site[9]. Study 87-60 collected 1,930 bid tabulations from the Construction Contracts Unit's site. In Task 8, bid items are related to Pontis actions, costs for unit quantities of Pontis actions are computed, and costs are adjusted to the year 2009.

Bid Tabulations for Bridge Work

Projects that include bridge work are listed in a spreadsheet that is kept by CDOT Staff Bridge. The spreadsheet relates Project IDs to Bridge IDs, and has brief notes on the work performed. Combining bid tabulations with the CDOT Staff Bridge spreadsheet, Study 87-60 identified 612 projects that include work on bridges (Table 93).

Bid Items

Bid items are related to actions for bridge elements in several ways. Some bid items identify completed actions for elements, and have dimensions for measurement that agree with element dimensions. Examples include removal and replacement of joints (length) and removal and replacement of bearings (each). Some bid items are used in combination, and have dimensions that agree with element dimensions. Examples are items to remove and replace asphalt overlay, in area dimension, for bridge elements also in area dimension. Some bid items are used in combination, and have dimensions that differ from element dimensions. Examples are deck repairs that include reinforcing steel by weight and Portland cement concrete by volume. Quantities for bid items are related to quantities for bridge elements by identifying representative sizes of bridge elements and establishing the material quantities for element units.

CDOT bid items that are used in computation of costs of actions for bridge elements unit are listed in four tables: Table 96 lists bid items that indicate complete actions and that have element dimensions, Table 94 lists bid items that are used in combination and that have element dimensions, Table 97) lists bid items that indicate complete actions and are matched to representative quantities for bridge elements, and Table 95) lists bid items that are used in combination and are matched to representative quantities for bridge elements.

Colorado Costs from Bid Tabulations

The review of bid tabulations from Colorado DOT contains 1470 instances of element-level actions collecting 2411 bid items from 550 contracts between 1996 and 2009. The actions provide repairs and construction of bridge components that include Approaches, Bearings, Culverts, Decks, Drains, Joints, Railings, Substructures and Superstructures (Table 69).

[9] www.coloradodot.info/business/bidding

Table 69 - Colorado DOT Actions from Bid Tabulations

Component	Instances	Actions
Approach	76	Furnish, Overlay, Remove, Repair,
Bearing	54	Furnish
Culvert	16	Clean, Furnish
Deck	488	Furnish, Overlay, Remove, Repair, Sealer,
Drain	75	Clean, Furnish
Joint	282	Furnish, Modify, Remove, Repair, Replace, Reset,
Railing	376	Furnish, Remove, Replace, Reset,
Substructure	1	Furnish
Superstructure	102	Furnish, Erect

Notes on the use of bid items to compute costs of element-level actions for bridge elements begin on page 178. Costs are summarized below. Costs are adjusted to year 2009.

Actions and Costs for Decks

Decks have five Actions: Furnish, Overlay, Remove, Repair and (apply) Sealer. *Furnish* Actions are reported for construction of bare reinforced concrete decks, of reinforced concrete decks with asphalt wearing surface, and of decks with de-icing systems (Table 70).

Table 70 - Colorado DOT Actions from Bid Tabulations

Deck material	Wearing Surface	Action	Instances	Cost, $	Cost Unit
Concrete	Bare	Furnish	79	149.03	SY
	Asphalt Surface	Furnish	54	118.61	SY
		Furnish - Deicing System	1	285282	LS

Overlays of asphalt wearing surfaces on reinforced concrete decks are found in 187 instances (Table 71). Costs range from $10 per square yard for placement of an overlay to $29 per square yard for removal of existing asphalt, installation of waterproofing membrane and placement of a new asphalt overlay. Removal and replacement of asphalt overlay on timber decks has a similar cost at $13 per square yard.

Table 71 - Overlay for Asphalt Wearing Surface

Deck	Wearing Surface	Action		Instances	Cost, $	Cost Unit
Concrete	Asphalt Surface	Overlay		17	10.10	SY
	Asphalt Surface	Overlay	w/ Planing	112	11.18	SY
	Asphalt Surface	Overlay	w/ Membrane	12	27.66	SY
	Asphalt Surface	Overlay	w/ Planing w/ Membrane	46	28.80	SY
Timber	Asphalt Surface	Overlay	w/ Planing	13	13.71	SY

Overlays for concrete wearing surfaces have 8 instances in the bid tabulations with costs ranging from $10 to $64 per square yard (Table 72).

Table 72 - Overlay for Concrete Wearing Surface

Wearing Surface	Action		Instances	Cost, $	Cost Unit
Ultrathin	Overlay	w/ Planing	2	10.33	SY
Concrete surface	Overlay		1	43.20	SY
Concrete HT	Overlay		1	21.92	SY
Concrete DT	Overlay		2	64.67	SY
Concrete	Overlay	w/ Planing	2	24.42	SY

Seven instances of concrete repairs are found in bid tabulations. Some repairs are performed together with overlay Actions (Table 73). Some repairs are stand-alone. Costs range from $24 to $394 per square yard. Repairs costs are also computed from 2009 average bid cost data (*Cost Data* 2010) (Table 74, Table 75). Costs range from $118 to $330 per square yard.

Table 73 - Concrete Deck Repair Costs from Bid Tabulations

Deck	Wearing Surface	Action		Instances	Cost, $	Cost Unit
Concrete	Asphalt Surface	Repair	w/ Planing w/ Membrane	3	24.25	SY
	Asphalt Surface	Repair	Partial Depth	1	100.83	SY
		Repair	Partial Depth	2	166.02	SY
	Asphalt Surface	Repair	w/Overlay	1	393.26	SY

Table 74 - Average 2009 Concrete Deck Repair Costs

		Unit Cost, $		
Repair	Unit	Bare Deck	HBP Patch	HBP Patch + Membrane
Class 1	SY	52.37	104.79	118.34
Class 2	SY	189.69	242.11	255.66
Class 3	SY	277.39	329.81	343.36

Table 75 - Average 2009 Maintenance Bid Item Costs [*Cost Data* 2010]

Item Number	Item	Unit	Average price, $
202-00450	Removal of Portions of Present Structure (Class 1)	SY	52.37
202-00453	Removal of Portions of Present Structure (Class 2)	SY	177.46
202-00460	Removal of Portions of Present Structure (Class 3)	SY	265.16
202-05100	Sandblasting Reinforcing Steel	SY	12.23
515-00120	Waterproofing (Membrane)	SY	13.55
403-00721	Hot Bituminous Pavement (Patching) (Asphalt)	SY	52.42

Approaches

Costs for furnishing approaches range from $53 per square yard for a reinforced concrete approach slab to $381 per square yard for prestressed concrete slabs. Removal of concrete approach slabs costs $20 per square yard. Mudjacking for approach slabs is reported per slab, without a report of slab area. Costs for mudjacking have a mean value of $680 per slab, but are reported as high as $70,000 per slab.

Table 76 - Costs for Approaches.

Component	Material	Action		Cost Unit	Instances	Cost,$
Approach	Concrete	Furnish		SY	27	53.19
	Concrete	Furnish	w/ Remove	SY	32	72.63
	Prestressed Concrete	Furnish		SY	6	380.85

Joints

Costs of replacements of expansion joints range from $185 to $4700 per foot, depending on the range of motion of the joint (Table 77). Bid tabulations yield 198 instances of actions for expansion joints. Replacement of seals in compression joints costs about $50 per foot. Repairs to non-expansion joints costs about $15 per foot.

Table 77 - Costs for Expansion Joints

Component	Range	Action		Instances	Cost, $	Cost Unit
Joint	2 IN	Furnish		53	128.91	FT
	2 IN	Furnish	w/ Remove	26	184.60	FT
	4 IN	Furnish		59	183.11	FT
	4 IN	Furnish	w/ Remove	39	282.06	FT
	6 IN	Furnish		7	765.06	FT
	9 IN	Furnish		5	1083.07	FT
	9 IN	Furnish	w/ Remove	1	2416.23	FT
	12 IN	Furnish		1	2024.90	FT
	12 IN	Furnish	w/ Remove	2	1761.69	FT
	15 IN	Furnish		1	2450.17	FT
	15 IN	Furnish	w/ Remove	3	3015.12	FT
	18 IN	Furnish		1	4682.71	FT

Railings

Reinforced concrete railings cost $80 per foot to furnish and $150 per foot to remove an existing railing and furnish a new concrete railing. For metal railings, the cost to furnish is about $120 per foot whether or not an existing railing is removed (Table 78). Costs for railings by type are shown in Table 79.

Table 78 - Costs for Bridge Railings

Component	Material	Action		Instances	Cost, $	Cost Unit
Railing	Concrete	Furnish		71	79.74	FT
	Concrete	Furnish	w/ Remove	23	148.89	FT
	Metal	Furnish		124	120.50	FT
	Metal	Furnish	w/ Remove	138	121.76	FT
	Steel	Furnish		6	155.05	FT
	Other	Furnish		1	267.31	FT
	Other	Furnish	w/ Remove	2	283.60	FT

Table 79 - Costs for Bridge Railings by Type

Component	Material	Type	Action		Instances	Cost, $	Cost Unit
Railing	Concrete	Ty 4	Furnish		6	69.04	FT
		Ty 4	Furnish	w/ Remove	6	103.15	FT
		Ty 4 spec	Furnish		12	81.03	FT
		Ty 4 spec	Furnish	w/ Remove	5	285.47	FT
		Ty 7	Furnish		35	73.94	FT
		Ty 7	Furnish	w/ Remove	4	112.34	FT
		Ty 7 - 42in	Furnish		1	93.94	FT
		Ty 7 Sect a	Furnish		1	96.53	FT
		Ty 7 spec	Furnish		15	93.11	FT
		Ty 7 spec	Furnish	w/ Remove	5	121.23	FT
		Ty 7R	Furnish	w/ Remove	2	161.94	FT
		Ty 7R Spec	Furnish	w/ Remove	1	248.60	FT
			Furnish		1	276.54	FT
	Metal	10H	Furnish		5	196.13	FT
		10H	Furnish	w/ Remove	1	165.34	FT
		10H spec	Furnish		1	230.42	FT
		10M	Furnish		31	123.51	FT
		10M	Furnish	w/ Remove	9	108.43	FT
		10M Spec	Furnish		3	158.88	FT
		10M Spec	Furnish	w/ Remove	6	204.88	FT
		10R	Furnish		19	132.37	FT
		10R	Furnish	w/ Remove	108	117.61	FT
		10R spec	Furnish		6	137.18	FT
		10R spec	Furnish	w/ Remove	2	244.42	FT
		3R	Furnish		1	142.11	FT
		3R	Furnish	w/ Remove	2	94.85	FT
		3R spec	Furnish		5	67.00	FT
		3R spec	Furnish	w/ Remove	2	100.96	FT
		Ty 10	Furnish		24	98.73	FT
		Ty 10	Furnish	w/ Remove	7	135.23	FT
		Ty 10 spec	Furnish		10	122.16	FT

Component	Material	Type	Action		Instances	Cost, $	Cost Unit
		Ty 3	Furnish		6	122.68	FT
		Ty 3	Furnish	w/ Remove	1	26.89	FT
		Ty 3 spec	Furnish		3	79.87	FT
		Ty 8	Furnish		1	122.65	FT
		Ty 8 spec	Furnish		1	28.46	FT
			Furnish		8	116.27	FT
	Other		Furnish		1	267.31	FT
	Steel	Pedestrian	Furnish		2	131.41	FT
		Steel	Furnish		4	209.54	FT

Drains

Bridge drains are reported as 'each' items in bid tabulations. The mean cost to furnish drains is $3700 each.

Bearings

Bid tabulations have 54 instances of bearings furnished. Costs range from $900 to $11000 per bearing, depending on type of bearing (Table 80).

Table 80 - Costs for Bridge Bearings

Component		Action	Instances	Cost, $	Cost Unit
Bearing		Furnish	7	877.13	EA
	Type I	Furnish	21	1029.24	EA
	Type II	Furnish	3	1462.74	EA
	Type II - Expansion	Furnish	16	2083.32	EA
	Type III	Furnish	7	10927.13	EA

Prestressed Concrete Superstructure

Bid tabulations include 83 instances of furnishing prestressed concrete superstructure. Costs range from $165 to $620 per foot of beam (Table 81).

Table 81 - Costs for Prestressed Concrete Bridge Beams

Component	Material		Action	Instances	Cost, $	Cost Unit
Superstructure	Prestressed Concrete	Box 1700	Furnish	1	322.92	FT
		Box 1725	Furnish	1	322.92	FT
		BT 1070	Furnish	6	172.46	FT
		BT 1600	Furnish	3	193.25	FT
		BT 1830	Furnish	13	211.68	FT
		BT 2130	Furnish	3	299.93	FT
		BT 42	Furnish	13	182.16	FT
		BT 54	Furnish	7	214.12	FT
		BT 63	Furnish	12	191.88	FT
		BT 72	Furnish	9	219.45	FT
		BT 84	Furnish	3	191.40	FT

Component	Material		Action	Instances	Cost, $	Cost Unit
		G54	Furnish	1	164.62	FT
		spec	Furnish	2	223.93	FT
		U Girder	Furnish	9	618.77	FT

Reinforced Concrete Culvert

There are 14 instances of construction of reinforced concrete culverts. Cost is $1490 per foot.

Notes on Use of Bid Items in Actions for Bridge Elements

Notes on the use of bid items to compute costs of element-level actions are provided here.

Deck - Asphalt - Overlay

Bid items contributing to cost of asphalt overlays include a 202 removal item, a 403 paving item and a 515 membrane item (Table 82). Items for removal and for membrane have area dimension and are compatible with area dimension for deck elements. The item for paving has weight dimension. This is converted to area dimension assuming a unit weight of asphalt and a thickness of overlay (Table 83).

These items can be combined as paving only (without removal and membrane), as removal and paving (without membrane), or as removal plus membrane plus paving.

Table 82 - Bid Items for Asphalt Overlay

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Deck	Asphalt Surface	Overlay	SY	202	Rem Asphalt Mat (Planing)	SY	-	1.0
				403	HBP	TON	TON:SY	0.163
				515	Waterproofing (Membrane)	SY	-	1.0

Table 83 - Conversion for Paving Item to Overlay Action

Item	Bid Unit	Action Unit	Conversion
HBP	Ton	SY	403 – HBP by ton, used in 3” overlay on deck $1.0\ [3\ (IN\ SY)] = C\ Ton$ $1.0\left[3\ (IN\ SY)\left(\frac{9\ SF}{SY}\right)\left(\frac{1\ FT}{12\ IN}\right)\left(\frac{145\ LB}{1\ CF}\right)\left(\frac{1\ TON}{2000\ LB}\right)\right] = C\ Ton$ $1.0\ [0.163\ TON] = C\ Ton$

Deck - Concrete - Furnish

Construction of reinforced concrete decks requires a 601 structural concrete item and a 602 reinforcing steel item, and can also include epoxy-coated steel, waterproofing membrane and asphalt paving. Items contributing to an action to furnish reinforced concrete deck are listed in Table 84.

Table 84 - Bid Items to Furnish Reinforced Concrete Deck

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Deck	Concrete	Furnish	SY	403	HBP	TON	TON:SY	0.163
				515	Waterproofing (Membrane)	SY	-	1.0
				601	Concrete CL D (Bridge)	CY	CY:SY	0.222
				602	Reinf Steel	LB	LB:SY	29.9
				602	Reinf Steel (EPOXY)	LB	LB:SY	27.8

Items for structural concrete and for reinforcing steel are converted to deck element area using information from the CDOT Bridge Design Manual [*Bridge* 2009] (Figure 3).

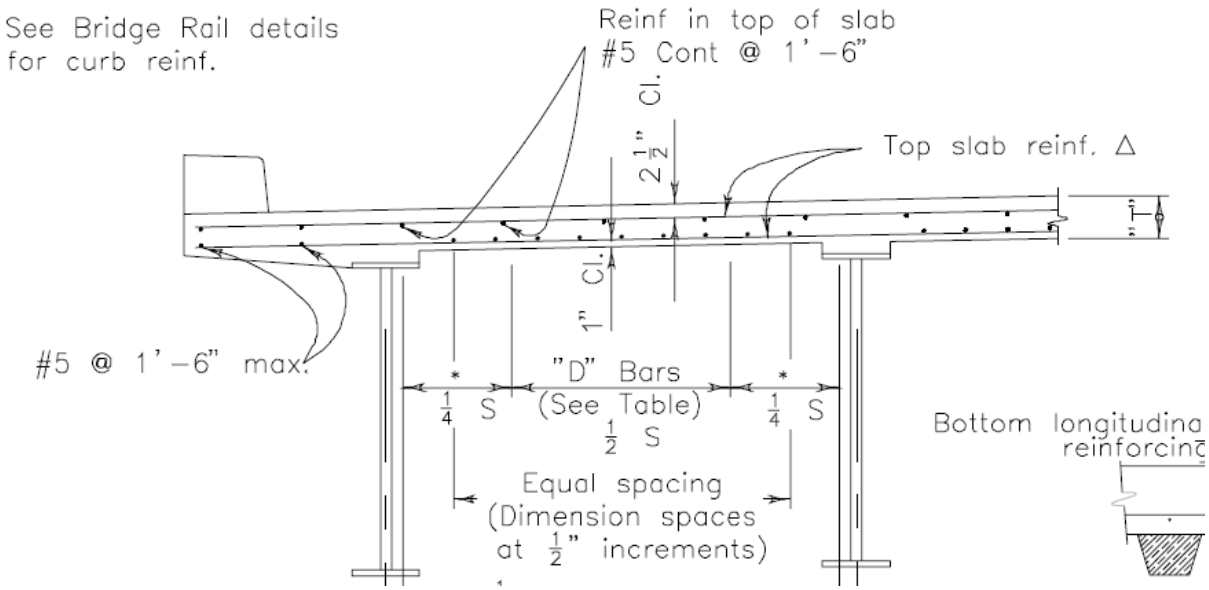


Figure 3 - Reinforced Concrete Deck [*Bridge* 2009]

Assume 8" thick structural slab with epoxy-coated reinforcing steel in top layer and uncoated reinforcing steel in bottom layer. Span of slab is assumed to be 9 ft.

Concrete volume per square yard of bridge deck is

$$C\frac{CF}{SF} = 8\,in\left(\frac{1FT}{12IN}\right)(1FT^2)$$

$$C\frac{CF}{SF} = 0.667\frac{CF}{SF}$$

$$C\frac{CY}{SY} = 0.667\frac{CF}{SF}\left(\frac{1CY}{27CF}\right)\left(\frac{9SF}{1SY}\right)$$

$$C\frac{CY}{SY} = 0.222\frac{CY}{SY}$$

Transverse reinforcement, top mat: #5 at 5.5" transverse, plus #5 at 18" longitudinally.

Transverse reinforcement, bottom mat: #5 at 5.5", plus 7-#5 bars longitudinally (or 7/3 longitudinal bar per SY of deck).

The quantity of epoxy-coated reinforcing per square yard of bridge deck is

Top Mat Transverse

$$\#5\left(\frac{36IN}{5.5IN}\frac{bars}{SY}\right)(3FT\ bar\ length)\left(\frac{1.043LBS}{FT}\right) = 20.5\frac{LBS}{SY}$$

Top Mat Longitudinal

$$\#5\left(\frac{36IN}{18IN}\frac{bars}{SY}\right)(3FT\ bar\ length)\left(\frac{1.043LBS}{FT}\right) = 9.39\frac{LBS}{SY}$$

The quantity of uncoated reinforcing steel per square yard of bridge deck is

Bottom Mat Transverse

$$\#5\left(\frac{36IN}{5.5IN}\frac{bars}{SY}\right)(3FT\ bar\ length)\left(\frac{1.043LBS}{FT}\right) = 20.5\frac{LBS}{SY}$$

Bottom Mat Longitudinal

$$\#5\left(\frac{7}{3}\frac{bars}{SY}\right)(3FT\ bar\ length)\left(\frac{1.043LBS}{FT}\right) = 7.30\frac{LBS}{SY}$$

The bid items to furnish reinforced concrete deck can be combined as deck only, as deck plus asphalt overlay, or as deck plus waterproofing membrane plus asphalt overlay.

Deck - Concrete - Repair

Three classes of repairs to concrete decks are detailed on CDOT structural worksheets [*B-202-1C* 2007 and *B-202-1S* 2007]. Class 1 and Class 2 repairs are partial depth repairs. Class 3 is a full depth repair. Class 2 repairs furnish reinforcing steel in top mats of bridge decks. Class 3 repairs furnish reinforcing steel in both mats of bridge decks. Bid items for concrete deck repairs are shown in Table 85 together with conversion factors for bid items. Repair actions have area units.

Table 85 - Bid Items for Concrete Repair

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conv.	Factor
Deck	Concrete	Repair	SY	202	Rem Asphalt (Planing)	SY	-	
				202	Sandblasting Reinf Steel	SY	-	
				403	HBP	TON	TON:SY	0.163
		Class 1		601	Concrete CL D (Bridge)	CY	CY:SY	0.0111
		Class 2		601	Concrete CL D (Bridge)	CY	CY:SY	0.0208
		Class 3		601	Concrete CL D (Bridge)	CY	CY:SY	0.222
		Class 2 & 3		602	Reinf Steel (Epoxy)	LB	LB:SY	27.8
		Class 3		602	Reinf Steel	LB	LB:SY	29.9

Approach - Concrete - Replace

Bid items for removal and for furnishing approach slabs have area units. These are convert to the 'each' unit needed for approach elements by assuming that slab size is 40ft x 40ft. Bid items for reinforced concrete slabs and prestressed concrete slabs are listed in Table 86. These bid items are used directly for removal of slabs and construction of new slabs. The bid items are combined as 'remove plus furnish' for actions to replace approach slabs.

Table 86 - Bid Items for Approach Slab Removal and Furnishing

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Approach	Concrete	Remove	EA	202	Rem Conc Pavement	SY	SY:EA	178
Approach	Concrete	Furnish	EA	412	Conc Pvmt	SY	SY:EA	178
Approach	Prestressed Concrete	Furnish	SY	618	Prestress Conc Slab	SY	SY:EA	178

Approach - Concrete - Repair

Bid items for mudjacking and for slab jacking correspond to repair actions for approach slabs. Bid items are stated as hours of work or as pounds of material injected. Total costs of bid items are taken directly as 'each' costs of slab repair (Table 87).

Table 87 - Bid Items for Repairs to Approach Slabs

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Approach	Concrete	MudJack	EA	601	Mud Jacking	HOUR	HR:EA	entire
Approach	Concrete	Jacking	EA	601	Slab Jacking	LB	LB:EA	entire

Bearing - Furnish

New and replacement of bearings are furnished by a 512 bearing item (Table 88).

Table 88 - Bid Items for Bearings

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Bearing	Furnish		EA	512	Bearing Device	EA	-	1

Joint - Repair

Bid items for repairs to joints include a 210 reset item and a 210 modify item. The reset item is in linear dimension, and compatible with joint element dimension. The modify item is in 'each' dimension. The item total cost is applied to total joint quantity to get compatible units (Table 89).

Table 89 - Bid Items for Joint Repairs

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Joint		Reset	FT	210	Res Expan Device	LF	-	1
Joint		Modify	EA	210	Modify Bridge Expan Device	EA	EA:LF	entire

Joint - Replace

Bid items to remove and to furnish joints are in length dimension, and are compatible joint elements. Bid items can be used for actions to remove joints, to furnish joints, and to replace (remove + furnish) joints (Table 90).

Table 90 - Bid Items to Remove and Furnish Bridge Joints

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Joint		Remove	FT	202	Rem Exp Device	LF	-	1
Joint		Furnish	FT	518	Expan Device	LF	-	1

Railing - Replace

Bid items to remove and to furnish bridge railing have length dimension, and agree with length dimension for railing elements. Bid items can be used for actions to remove railing, to furnish railing or to replace (remove + furnish) railing (Table 91).

Table 91 - Bid Items for Bridge Railing

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Railing	Metal	Replace	Ft	202	Rem Bridge Railing	LF	-	1
			Ft	606	Brdg Rail	LF	-	1

Superstructure - Prestressed Concrete - Replace

Bid items to furnish prestressed concrete beams have length dimension, agreeing with prestressed concrete beam elements (Table 92).

Table 92 - Bid Items for Prestressed Concrete Beams

Component	Material	Action	Action Unit	Item	Description	Item Unit	Conversion	Factor
Superstructure	Prestressed Concrete	Furnish	FT	618	Prestress Conc I	M	M:FT	0.305

Table 93 - CDOT Bid Tabulations with Bridge Work

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
96041101	C10463R1	DENVER ADAMS, REGION 6	6	URBAN	IM 0704-167	1
96091202	C10604	ARAPAHOE, REGION 6 ADAMS, REGION 6	6	URBAN	HB 2254-053	3
96091908	C11327	ARAPAHOE, REGION 1 ADAMS, REGION 1	1	PLAINS	IM 0704-177	12
97050806	C11328	ARAPAHOE, REGION 1 ADAMS, REGION 1	1	ROLLING	IM 0704-178	13
97100202	C93193	DENVER	6	URBAN	BR 0404-023	1
97100201	C11507	DENVER	6	URBAN	SP 0704-187	4
97101602	C12043	WELD, REGION 4	4	PLAINS	ER 0712-010	5
97110602	C10853	EL PASO	2	ROLLING	BRO C040-006	1
97110603	C11574	WELD, REGION 4	4	ROLLING	NH 0342-027	2
97111303	C11325	CHEYENNE, REGION 1	1	PLAINS	NH 2873-086	2
97120405	C11796	WELD, REGION 4	4	PLAINS	C R400-057	3
97120406	C11202	WELD, REGION 4	4	PLAINS	C 0342-024	5
97121103	C11634	DENVER	6	URBAN	C R600-077	1
97121802	C10177	PUEBLO	2	PLAINS	BR 0251-135	4
98011501	C11979	MORGAN	4	PLAINS	C 0761-170	16
98012202	C11625	KIT CARSON	1	PLAINS	BR 0243-052	2
98021901	C11982	BOULDER, REGION 4	4	ROLLING	C 0361-157	4
98022601	C11668	PITKIN	3	MOUNTAINOUS	HB 0821-045	1
98022602	C11416	DOUGLAS, REGION 1	1	ROLLING	STU 0252-294	1
98022603	C11502	EAGLE	3	MOUNTAINOUS	NH 0702-208	14
98031202	C12060	MOFFAT RIO BLANCO	3	ROLLING	C 0131-038	1
98031201	C11595	ARAPAHOE, REGION 6 JEFFERSON, REGI	6 DOUGLAS, REGION 6	URBAN	NHS 4701-085	5
98031906	C11667	PITKIN	3	ROLLING	SP 0821-044	1
98031903	C12062	GUNNISON	3	MOUNTAINOUS	C 0502-044	2
98032604	C12063	JACKSON	3	ROLLING	C 0141-012	5
98032603	C11594	DENVER ARAPAHOE, REGION 1	6	URBAN	IM 2254-056	9
98032606	C12059	MESA	3	ROLLING	NH 0701-148	10
98040206	C11764	MESA	3	ROLLING	SP 0501-036	1
98040205	C10458	ELBERT	1	PLAINS	IM 0704-065	5
98042301	C11918	ADAMS, REGION 6	6	URBAN	SP 0253-150	4
98043002	C12181	MONTEZUMA	5	MOUNTAINOUS	C 1601-147	2
98043007	C12101	ELBERT	1	ROLLING	STA 086A-029	2
98043001	C11702	BACA	2	PLAINS	SP 2871-027	3
98043006	C11592S	DENVER	6	URBAN	C 0252-311	3
98043005	C12116	EL PASO	2	ROLLING	IM 0252-312	4
98050704	C11038R	MONTROSE, REGION 3	3	URBAN	STA 348A-004	1
98050702	C12053	LOGAN SEDGWICK	4	LEVELING	IM R400-065	14
98051403	C11950	LINCOLN	1	URBAN	STA 071A - 012	1
98051404	C11503	GUNNISON	3	ROLLING	STR 135A-016	1
98051401	C11932	EL PASO	2	URBAN	SP 0252-306	3
98051406	C12105R	SUMMIT	1	MOUNTAINOUS	IM 0702-215	6
98052101	C92965R	MORGAN WASHINGTON	4 LOGAN OTHERS	PLAINS	STA 0631-004	1

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
98052104	C12166	DOUGLAS, REGION 6	6	URBAN	STA R600-102	1
98052808	C11864	MORGAN	4	PLAINS	NH 0342-029	1
98052801	C12055	ADAMS, REGION 6	6	PLAINS	SP 0761-171	7
98060403	C11377	MESA	3	PLAINS	BR 006A-025	1
98060402	C11948	ARAPAHOE, REGION 6	6	URBAN	SP 0831-074	2
98062501	C12200	KIOWA	2	PLAINS	STR 0961-005	3
98062504	C11435R	VARIOUS, REGION 2	2	PLAINS	MC R200-046	9
98070201	C11931	PUEBLO	2	URBAN	SP 0471-021	3
98070207	C12198	CROWLEY	2	PLAINS	STA 0711-012	3
98070204	C12272	WELD, REGION 4	4	ROLLING	C 0142-035	4
98072303	C11065	EAGLE	3	ROLLING	BR 006A-022	1
98080602	C12054R	**** ****	* **** OTHERS	URBAN	MC R600-095	2
98081304	C12188	LARIMER BOULDER, REGION 4	4	ROLLING	STR 2873-095	2
98082701	C12115	LAS ANIMAS	2	ROLLING	IM 0251-145	12
98090304	C93194	JEFFERSON, REGION 6	6	ROLLING	BR 093-1(016)	5
98091701	C12032S	ADAMS, REGION 6	6	URBAN	IM R600-094	10
98092404	C12042	LOGAN	4	ROLLING	ER 0142-034	1
98092403	C11933R	EL PASO	2	URBAN	SP 0252-307	3
98092402	C11850	ELBERT LINCOLN	1	ROLLING	IM 0704-185	11
98100103	C11835	DENVER	6	URBAN	IM 0704-183	3
98100101	C11691	JEFFERSON, REGION 6	6	URBAN	IM 0704-182	6
98100801	C11846	JEFFERSON, REGION 1	1	MOUNTAINOUS	NH 2854-066	1
98101504	C12293	EL PASO	2	ROLLING	DAR C040-016	1
98101502	C12125	CHAFFEE GUNNISON	5	MOUNTAINOUS	C 0502-045	2
98101501	C11917	JEFFERSON, REGION 6	6	PLAINS	NH 4701-087	5
98102202	C11429	MONTROSE, REGION 3	3	ROLLING	BR 090A-003	1
98102901	C12142	PROWERS	2	PLAINS	NH 2871-028	1
98102902	C11951	ADAMS, REGION 6	6	URBAN	SP 0253-153	1
98111201	C12237	EAGLE	3	MOUNTAINOUS	NH 0702-216	10
98111901	C11204	LOGAN	4	PLAINS	NH 0762-038	2
98111902	C11431	GRAND	3	MOUNTAINOUS	BR C530-003	2
98121003	C12297	DENVER	6	URBAN	NH 0061-066	3
98121701	C11349	ADAMS, REGION 6	6	URBAN	BR 2706-029	1
98121703	C12528	PUEBLO	2	PLAINS	IM 0251-154	4
99010703	C11623	FREMONT, REGION 2	2	ROLLING	BRO C140-004	1
99010705	C12029	WELD, REGION 4	4	PLAINS	NH 0342-033	1
99010701	C12529	PUEBLO	2	PLAINS	NH 0503-056	2
99011402	C12530	PUEBLO	2	URBAN	NH 0451-005	1
99011403	C11352	FREMONT, REGION 2	2	MOUNTAINOUS	BR 0503-050	1
99012107	C12190	BOULDER, REGION 4 LARIMER	4	ROLLING	C 2873-096	1
99012106	C10584	JEFFERSON, REGION 1	1	MOUNTAINOUS	BR 0741-006	2
99020402	C12537	PHILLIPS	4	PLAINS	STA 059A-024	1
99021101	C12211	PUEBLO	2	URBAN	IM 0251-147	1
99021801	C12245	MOFFAT	3	ROLLING	NH 0401-014	1

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
99031104	C12353	GUNNISON	3	URBAN	C 0502-047	4
99031802	C12543	JEFFERSON, REGION 6	6	URBAN	CC 0703-253	1
99031804	C11780	PITKIN	3	MOUNTAINOUS	SP 0821-047	2
99040101	C12109	WELD, REGION 4	4	ROLLING	IM 0253-154	1
99040102	C11838	MESA	3	ROLLING	SP 0501-037	1
99040105	C12246	MOFFAT	3	ROLLING	C 0401-015	2
99040103	C12239	MESA	3	MOUNTAINOUS	NH 0701-150	5
99040802	C11720R	PARK, REGION 1	1	ROLLING	STE C540-007	1
99040801	C11923	SUMMIT	1	MOUNTAINOUS	STA 006A-029	5
99041501	C11478	WELD, REGION 4	4	ROLLING	IM 0761-167	10
99050601	C93084	LA PLATA	5	ROLLING	NH(CX) 550-1(005)	5
99050603	C12439R	JEFFERSON, REGION 1 CLEAR CREEK	1	MOUNTAINOUS	STA 0061-067	7
99052003	C11641	EL PASO	2	URBAN	MC 029A-001	1
99052001	C11971	FREMONT, REGION 5	5	MOUNTAINOUS	BR 0503-052	2
99060302	C12014S	SAGUACHE CHAFFEE	5	MOUNTAINOUS	SHE 0502-042	3
99061703	C11351	PARK, REGION 2	2	MOUNTAINOUS	BR 0242-017	1
99062401	C12017	RIO BLANCO	3	ROLLING	STR 0131-037	2
99070805	C12280	JEFFERSON, REGION 6	6	URBAN	IM 0703-245	1
99070808	C12658	WELD, REGION 4	4	ROLLING	NH 0342-034	1
99071502	C11739	CLEAR CREEK	1	MOUNTAINOUS	BR 0403-025	2
99071501	C11857	EL PASO	2	URBAN	BR 0243-054	3
99072901	C12359	BOULDER, REGION 4	4	ROLLING	BR 0361-059	1
99081903	C10786	SEDGWICK	4	PLAINS	C 138A-006	1
99082601	C12183	DENVER	6	URBAN	IMD 0704-183(B)	3
99082602	C11989R	WELD, REGION 4	4	PLAINS	STA C030-018	10
99093001	C93221	ADAMS, REGION 6	6	URBAN	BR 287-3(061)	1
99101402	C11865	WELD, REGION 4 MORGAN	4	ROLLING	NH 0341-046	2
99101401	C11588	WELD, REGION 4	4	ROLLING	IM 0253-142	6
99102101	C10677	BOULDER, REGION 4	4	ROLLING	STR 0361-045	1
99102103	C91044	LINCOLN ELBERT	1	PLAINS	FC-NH(CX) 024-3(036)	2
99102804	C11806	MONTROSE, REGION 3	3	ROLLING	BR 348A-005	1
99102805	C12482	ARAPAHOE, REGION 6	6	URBAN	CC 2254-061	2
99110401	C11803	GRAND		ROLLING	BR 0402-051	1
99111803	C12786	LARIMER	4	ROLLING	STA 2873-103	1
99111801	C13025	PARK, REGION 1	1	ROLLING	NH 2854-080	2
99120202	C12715	CUSTER	2	MOUNTAINOUS	STA 165A-008	2
99120906	C10685	ADAMS, REGION 6	6	URBAN	NH 2873-079	1
99120907	C89075	LAS ANIMAS	2	MOUNTAINOUS	BRS-RS(CX)0012(27)	1
99120903	C12734	GUNNISON	3	MOUNTAINOUS	STA 149A-016	2
99121602	C12310	JEFFERSON, REGION 1	1	MOUNTAINOUS	BR 0403-034	1
99121601	C12023	JEFFERSON, REGION 6	6	URBAN	NH 0062-011	3
10608	C12599	HUERFANO	2	ROLLING	NH 1603-014	3
10610	C12402	YUMA WASHINGTON	4	PLAINS	STR 0343-017	3
11302	C13051	PUEBLO	2	ROLLING	NH 050A-005	3

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11307	M06001R	BOULDER, REGION 6	6	URBAN	M 06-001	5
12007	C13061	MONTROSE, REGION 5	5	MOUNTAINOUS	STA 141A-027	1
12001	C12963	EL PASO	2	ROLLING	IM 0252-329	2
12003	C13048	PUEBLO EL PASO	2	PLAINS	IM 0251-157	4
12005	M02002	PUEBLO		ROLLING	M 02-002	4
12004	M02001	PUEBLO		ROLLING	M 02-001	5
12002	C12731	EAGLE	3	MOUNTAINOUS	IM 0702-222	8
12702	C12583	PUEBLO	2	PLAINS	IM 0251-155	1
12706	C11804	RIO BLANCO	3	ROLLING	BR 0641-010	1
12701	C13057	MINERAL	5	MOUNTAINOUS	STA 149A-018	3
21003	M04001R	WELD, REGION 4		ROLLING	M 04-001	2
21002	M04002	LARIMER WELD, REGION 4		ROLLING	M 04-002	6
21001	M06002	DENVER		URBAN	M 06-002	11
30201	C12718	EL PASO	2	URBAN	C M240-047	1
30903	C11861	TELLER	2	MOUNTAINOUS	BR 067A-010	1
32302	C12317	PROWERS	2	PLAINS	NH 2872-012	2
40602	C12271	PITKIN	3	ROLLING	SP 0821-053	1
40601	C13185	BENT	2	PLAINS	NH 0505-036	4
41302	C13096	FREMONT, REGION 2	2	MOUNTAINOUS	NH 0503-058	4
42003	C12865	JEFFERSON, REGION 6	6	URBAN	NH 0404-036	1
42004	C13240	EL PASO	2	URBAN	NH 0243-062	2
42001	C93222	ADAMS, REGION 6	6	URBAN	IM 2706-030	8
42706	C11581	FREMONT, REGION 2	2	ROLLING	BR 067A-008	3
50401	C11849	ARAPAHOE, REGION 1	1	URBAN	IM 0704-184	9
51101	C13077	DOUGLAS, REGION 1	1	URBAN	STA 0852-085	2
51805	C13009	WASHINGTON	4 MORGAN	PLAINS	NH 0343-020	1
61502	C11543	KIT CARSON	1	PLAINS	STA 3851-012	2
61501	C12636	DOUGLAS, REGION 1	1	ROLLING	IM 0252-324	3
62202	C13092	EAGLE PITKIN	3 GARFIELD	MOUNTAINOUS	STA 0821-057	1
62903	C12541	ARAPAHOE, REGION 6	6	URBAN	SP 2254-062	10
71302	C11805	EAGLE	3	MOUNTAINOUS	BR 006A-028	1
72001	C12362	ELBERT	1	ROLLING	STA 086A-031	1
72004	C12542	DENVER	6	URBAN	IM 0704-191	4
72705	C13298	DOLORES	5	ROLLING	C 6662-007	1
72707	C92312	ADAMS, REGION 1	1	MOUNTAINOUS	BR 0362-018	1
72701	C12414	EL PASO	2	PLAINS	NH 0243-060	5
80301	C12270	PITKIN	3	MOUNTAINOUS	NHB 0821-052	1
80304	C13258	JEFFERSON, REGION 1 CLEAR CREEK	1	MOUNTAINOUS	C 0403-043	2
81001	C12713	MINERAL	5	MOUNTAINOUS	NH 1602-074	1
81002	C12522	DOUGLAS, REGION 1	1	ROLLING	IM 0252-321	1
81003	C11848	JEFFERSON, REGION 1	1	MOUNTAINOUS	NH 2854-068	4
81701	C92911	DENVER	6	URBAN	IM 0252-214	5
82401	C12858	EL PASO	2	URBAN	NH 0851-003	1
83101	C12056	ADAMS, REGION 6	6	URBAN	IMB 0761-172	6

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
92801	C12847	LARIMER	4	ROLLING	NH 2873-104	1
101904	C13247	VARIOUS, REGION 2	2	LEVELING	C R200-101	1
101902	C11582	PUEBLO	2	URBAN	BR 0504-029	4
102606	C11964	EL PASO	2	URBAN	IM 0252-310	4
102602	C12644	LOGAN	4	ROLLING	IM 0762-041	8
110902	C11730	MORGAN	4	PLAINS	BR 144A-018	2
111604	C11990	WASHINGTON	4	PLAINS	STA 0362-019	5
111607	C13510	VARIOUS, REGION 6	6	URBAN	R 600-156	19
120702	C13255	PARK, REGION 1	1	MOUNTAINOUS	NH 2854-084	1
120704	C12685	PROWERS	2	PLAINS	NH 0505-033	2
120703	C13440	EL PASO TELLER	2	PLAINS	NH 0242-033	6
121403	C12238	GARFIELD EAGLE	3	MOUNTAINOUS	NH 0702-217	12
122104	C13556	GRAND	3	MOUNTAINOUS	STA 0402-062	1
122101	C13165	KIT CARSON CHEYENNE, REGION 1	1	ROLLING	STA 059A-027	2
1010403	C13349	DENVER ADAMS, REGION 6	6	ROLLING	STA 0062-014	6
1011102	C11955	EL PASO	2	MOUNTAINOUS	STA 1151-009	3
1011104	C13390	EL PASO	2	URBAN	IM 0252-342	3
1011805	C93200	OTERO	2	PLAINS	BR 050-4(020)	1
1012508	C13008	CLEAR CREEK	1	MOUNTAINOUS	IM 0703-266	2
1020801	C13327	MOFFAT	3	ROLLING	STA 0401-017	1
1020802	C13326	MOFFAT	3	ROLLING	STA 318A-006	1
1021506	C12393	HUERFANO	2	ROLLING	BR 0251-150	1
1022202	C13616	EAGLE SUMMIT	1 CLEAR CREEK	MOUNTAINOUS	IM 0702-236	24
1030801	C13109	JACKSON	3	MOUNTAINOUS	STA 0141-013	1
1041202	C12306	GRAND	3	ROLLING	BR 0402-055	1
1050305	C13552	KIOWA	2	PLAINS	NH 2872-014	2
1051001	C12524	DOUGLAS, REGION 1	1	ROLLING	IM 0252-323	1
1051703	C12305	MONTROSE, REGION 3	3	URBAN	BR 5502-031	1
1051708	C13178	ADAMS, REGION 6	6	PLAINS	BR 0073-005	4
1052403	MM4009	WELD, REGION 4	4	PLAINS	MTCE 04-009 (Str. C-18-J)	1
1052404	MM4010	BOULDER, REGION 4 WELD, REGION 4	4	ROLLING	MTCE 04-010 (STR. D-16-DG)	1
1052407	C13131	TELLER	2	MOUNTAINOUS	NH 0242-031	3
1052405	C12489	CHEYENNE, REGION 1	1	LEVELING	C 0405-023	4
1052408	MM6003R	JEFFERSON, REGION 6	0	URBAN	MTCE 06-003	10
1053101	C12638	ADAMS, REGION 6	6	ROLLING	C 2706-031	3
1071202	C12534	SUMMIT	1	MOUNTAINOUS	STA 009A-022	3
1071904	RR12380	LARIMER	4	URBAN	STA 2873-101	2
1071903	C13498R	CLEAR CREEK	1	MOUNTAINOUS	IM 0703-275	3
1072604	C12319	DOUGLAS, REGION 1	1	ROLLING	STA 0852-082	1
1072601	C12614	ARAPAHOE, REGION 6	6	MOUNTAINOUS	NH 0831-080	3
1072605	C13488	LARIMER	4	MOUNTAINOUS	BR 0341-053	4
1080201	C12507	JEFFERSON, REGION 6	6	ROLLING	C C4701-094	1
1080205	C13485	MESA	3	URBAN	STA 006A-034	1
1080208	C12523	DOUGLAS, REGION 1	1	URBAN	IM 0252-322	2

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
1080904	C13294	ARAPAHOE, REGION 1 DOUGLAS, REGION	1	PLAINS	NH 0831-084	2
1081606	C12390	EL PASO	2	URBAN	IM 0851-002	2
1082301	C13244	DENVER	6	URBAN	IM 0252-336	1
1082304	C13538	OTERO	2	PLAINS	BR 0504-041	1
1083001	C13591	PROWERS BACA	2	ROLLING	BR 089A-010	3
1090602	C13275	ADAMS, REGION 6	6	PLAINS	IM 0761-182	1
1090603	C13539	OTERO	2	RURAL	BR 3501-009	3
1090601	C13736	VARIOUS, REGION 6	6	URBAN	R600-168	24
1100401	C12710	DELTA	3	ROLLING	NH 0501-040	1
1100402	C12829	PUEBLO	2	ROLLING	BR 096A-033	1
1102501	C13369	BOULDER, REGION 4	4	ROLLING	STU 1192-010	5
1120601	MM4011	BOULDER, REGION 4	4	ROLLING	MTCE 04-011	2
1121303	MM6005	DENVER	6	PLAINS	MTCE 06-005	2
2010304	MM4013	LARIMER	4	PLAINS	MTCE 04-013	2
2010305	C13756	SUMMIT EAGLE	1	MOUNTAINOUS	IM 0702-238	14
2011702	C13379	ADAMS, REGION 1 ARAPAHOE, REGION 1	1	PLAINS	BR 0362-023	1
2011704	MM3005	MESA EAGLE	3 GARFIELD	MOUNTAINOUS	MTCE 03-005	25
2012406	C13446	CUSTER	2	ROLLING	STA 069A-018	1
2012410	C13479	EL PASO	2	ROLLING	STA 1151-013	1
2012401	C13356	DENVER	6	URBAN	STA 0704-199	2
2012405	C13353	ARAPAHOE, REGION 6	6	URBAN	STA 2254-063	4
2020706	C13936	LAS ANIMAS	2	RURAL	STA 1604-007	3
2020703	C13352	ADAMS, REGION 6	6	URBAN	STA 0853-044	5
2020702	C13931	HUERFANO	2	ROLLING	IM 0251-159	7
2021401	C13439	PUEBLO	2	URBAN	NH 0504-039	1
2021403	C13354	DENVER	6	ROLLING	STA 2854-087	1
2022102	C12864	ADAMS, REGION 6	6	PLAINS	IM 0761-179	6
2022101	C13932	EL PASO	2	URBAN	IM 0252-358	8
2022111	C13449	EL PASO	2	URBAN	IM 0252-346	10
2022801	C13880	RIO GRANDE MINERAL	5	MOUNTAINOUS	PLH 149A-020	2
2030702	C13551	EAGLE	3 LAKE	MOUNTAINOUS	STA 0241-038	1
2030703	C12394	PUEBLO	2	PLAINS	BR 0251-151	2
2031403	C13380	DOUGLAS, REGION	1	ROLLING	BR 086A-037	1
2032805	C13925	ARCHULETA	5	ROLLING	NH 1602-088	1
2032802	C13866	ROUTT	3	MOUNTAINOUS	STA 131A-028	8
2040401	C12124	CHAFFEE	5	MOUNTAINOUS	BR 0502-046	1
2041101	C13888	LARIMER WELD, REGION 4	4	PLAINS	C R400-128	3
2041803	C13573	ARAPAHOE, REGIO	6	URBAN	NH 2254-064	1
2042505	C12404	LOGAN	4	ROLLING	STA 1131-004	4
2042507	C13906	WELD, REGION 4	4	ROLLING	STA 071A-014	4
2050201	C13788	WASHINGTON LOGAN	4	PLAINS	STA 0631-008	1
2050203	MM6010	DENVER JEFFERSON, REGION	6	URBAN	MTCE 06-010	11
2050901	MM4016	BOULDER, REGION 4 LARIMER	4 WELD, REGION 4	ROLLING	MTCE 04-016	6
2051604	MM4017	WELD, REGION 4	4	ROLLING	MTCE 04-017	2

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2053002	MM4018	WELD, REGION 4	4	PLAINS	MTCE 04-018	1
2053003	C13959	BOULDER, REGION	4	MOUNTAINOUS	STA 1191-017	2
2062005	C13229R	EAGLE	3	MOUNTAINOUS	IM 0702-228	1
2062007	C13733	EL PASO	2	RURAL	NH 0851-005	1
2062701	C13480	EL PASO	2	URBAN	IM 0252-347	1
2062703	C14002	PUEBLO	2	URBAN	IM 0251-161	5
2062704	C13066	DENVER JEFFERSON, REGION	6	URBAN	IM 0703-268	6
2071101	C14046	OURAY	5	ROLLING	NH 5502-041	4
2072501	C13529	BOULDER, REGION 4	4	ROLLING	STU 1192-011	2
2080102	C13804	DENVER	6	URBAN	IM 0252-354	1
2080101	C12287	DOUGLAS, REGION 6 ARAPAHOE, REGION	6	ROLLING	NH 0853-038	2
2080105	C14134	ARCHULETA	5	MOUNTAINOUS	STA 0841-006	6
2081504	C14091	VARIOUS	6	URBAN	R600-193	14
2082203	C13017	CHAFFEE	5	PLAINS	BR 0502-050	1
2082903	C13534	MESA GARFIELD	3	ROLLING	IM 0701-156	2
2090502	MM2009	TELLER	2	ROLLING	MTCE 02-009	1
2090503	C12605	GRAND	3	MOUNTAINOUS	BR 0092-015	1
2091903	C11729	WELD, REGION 4	4	ROLLING	BR 3921-005	1
2101002	C13578	PROWERS	2	PLAINS	BR 385A-013	1
2101003	C13831	ADAMS, REGION 6	6	PLAINS	IM 0761-184	1
2101006	C13393	LARIMER	4	ROLLING	NH 2873-114	4
2101702	MM4028	BOULDER, REGION	4	ROLLING	MTCE 04-028	1
2101701	C13540	EL PASO	2	URBAN	STU R200-107	4
2103101	MM4027	LOGAN WELD, REGION 4	4	PLAINS	MTCE 04-027	3
2111406	MM6015	DENVER JEFFERSON, REGION	6	LEVELING	MTCE 06-015	4
2120502	C13854	CLEAR CREEK JEFFERSON, REGION	1	MOUNTAINOUS	IM 0703-280	5
2120503	MM6021	DENVER	6 JEFFERSON, REGION 6	PLAINS	MTCE 06-021	5
2120501	C13513	PARK, REGION 1	1	MOUNTAINOUS	NH 0242-034	8
2121203	C13278	DENVER	6	URBAN	STA 2873-112	1
2121202	C13355	ARAPAHOE, REGIO	6	URBAN	STA 177A-003	2
2121201	C13494	JEFFERSON, REGION 1	1	MOUNTAINOUS	STA 0741-013	3
3010902	C14305	EAGLE SUMMIT	1	MOUNTAINOUS	IM 0702-241	16
3011605	C14307	WELD, REGION 4	4	ROLLING	STA 060A-009	2
3012302	C14205	EL PASO FREMONT, REGION 2	2	ROLLING	STU 1151-016	1
3013002	C14200	EL PASO	2	DO	NH 0243-066	3
3013005	C14199	LAS ANIMAS	2	ROLLING	STA 012A-038	3
3013001	C13574	ARAPAHOE, REGION 6	6	ROLLING	IM 2254-065	4
3020606	C14235	JEFFERSON, REGI	6	ROLLING	STA 4701-104	2
3020604	C14203	PROWERS	2	ROLLING	NH 0505-038	4
3021303	C14206	HUERFANO	2	ROLLING	NH 1603-019	1
3021302	C14202	OTERO	2	PLAINS	NH 0504-045	2
3022002	C14204	PUEBLO	2	ROLLING	STA 078A-004	1
3022001	C13987	LOGAN	4	PLAINS	STA 1381-005	6
3022701	C13897	DOUGLAS, REGION 1	1	ROLLING	NH 0852-088	1

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3022702	C13398	DOUGLAS, REGION	1	ROLLING	BR 0831-085	1
3022708	C14301	LARIMER	4	ROLLING	NH 2873-126	1
3022704	C13988	PHILLIPS SEDGWICK	4	PLAINS	STA 3852-007	5
3022703	C14207	PROWERS KIOWA	2	PLAINS	STA 3851-015	7
3030605	C14219	MOFFAT JACKSON	3 ROUTT OTHERS	MOUNTAINOUS	STA R300-109	1
3030606	MM3013	GARFIELD	3	MOUNTAINOUS	MTCE 03-013	1
3030603	C13547	PROWERS	2	PLAINS	NH 0505-037	2
3030604	C14218	MESA	3	MOUNTAINOUS	STA 0701-161	4
3031303	C14275	ARAPAHOE, REGIO	1	ROLLING	STA 0362-026	4
3032701	C13094	EL PASO	2	ROLLING	BR 1151-012	1
3032711	C14216	RIO BLANCO	3	URBAN	STA R300-108	1
3032712	C13865	MOFFAT	3	MOUNTAINOUS	STR 0401-018	1
3032708	MM4033	LARIMER WELD, REGION 4	4	ROLLING	MTCE 04-033	2
3032710	C14201	PUEBLO	2	PLAINS	NH 0504-044	3
3032709	C14215	GARFIELD	3	MOUNTAINOUS	IM 0701-160	6
3040302	C12395	HUERFANO	2	MOUNTAINOUS	BR 0251-152	1
3041003	MM3014	GARFIELD	3	MOUNTAINOUS	MTCE 03-014	2
3041004	MM1028	ADAMS, REGION 1	1	ROLLING	MTCE 01-028	2
3041704	C13924	LA PLATA	5	MOUNTAINOUS	NH 1602-087	3
3050107	MM6029	JEFFERSON, REGI	6	URBAN	MTCE 06-029	8
3051502	C12421	PHILLIPS	4	PLAINS	BR 0063-015	1
3051503	MM1024	SUMMIT	1	MOUNTAINOUS	MTCE 01-024	3
3052202	C14244	ADAMS, REGION 6 JEFFERSON, REGION	6	URBAN	STA 0361-072	1
3052901	C13922	SAGUACHE	5	ROLLING	BR 114A-008	1
3060501	C14236	ARAPAHOE, REGION 6	6	URBAN	STA 0881-014	1
3060502	C13919	EAGLE	3	MOUNTAINOUS	BRO C440-005	1
3060503	C14210	EL PASO	2	URBAN	STA 0831-087	8
3061202	C14356R	SAN JUAN	5 OURAY	MOUNTAINOUS	STA 110A-003	1
3061901	C13965	GUNNISON	3	MOUNTAINOUS	STR 135A-022	1
3061902	C14342	LAS ANIMAS	2	PLAINS	STA 012A-039	1
3070303	MM1030	KIT CARSON	1	PLAINS	MTCE 01-030	4
3071701	C12324	JEFFERSON, REGION 6	6	ROLLING	NH 4701-089	1
3072402	C12833	HUERFANO	2	ROLLING	NH 1603-016	1
3072401	C13344	ADAMS, REGION 6	6	URBAN	IM 0253-168	2
3080701	C12606	GRAND	3	MOUNTAINOUS	BR 0402-056	1
3082803	MM4044	MORGAN	0	ROLLING	MTCE 04-044	3
3082805	MM6032	ADAMS, REGION 6 ARAPAHOE, REGION 6	6 JEFFERSON, REGION 6	URBAN	MTCE 06-032	4
3090401	C13553	PROWERS	2	ROLLING	NH 2872-015	3
3110601	C12711	DELTA	3	MOUNTAINOUS	NH 0501-041	1
3110603	C12460	LARIMER	4	MOUNTAINOUS	BR 0341-051	3
3111305	MM1029	EAGLE SUMMIT	1 CLEAR CREEK OTHERS	ROLLING	MTCE 01-029	1
3120402	C14164	EAGLE	3	MOUNTAINOUS	BR 0241-040	1
3121103	C14520	LA PLATA	5	ROLLING	NH 5502-044	1
3121102	C14323	ADAMS, REGION 6	6	PLAINS	IM 0761-188	2

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3121803	C14208	EL PASO TELLER	2 PARK, REGION 2	MOUNTAINOUS	NH 0242-039	15
4010802	C14241	DENVER JEFFERSON, REGION	6	URBAN	STA 0062-015	1
4010805	C14426	CHAFFEE	5	ROLLING	STA 2911-001	1
4010809	C14774	LA PLATA	5	MOUNTAINOUS	NH 5502-045	8
4011502	C14560	LINCOLN	1	PLAINS	IM 0704-203	1
4012908	C12418	CLEAR CREEK	1	MOUNTAINOUS	NH 0403-035	2
4012907	C14587	CLEAR CREEK	1	MOUNTAINOUS	IM 0703-286	7
4020502	C14146	BACA	2	PLAINS	STA 1604-008	6
4021204	C14240	DENVER	6	URBAN	STA 0404-040	1
4021205	MM3015	GARFIELD	0	MOUNTAINOUS	MTCE 03-015	2
4022601	C14700	EAGLE ROUTT	3	MOUNTAINOUS	STA 131A-031	1
4022604	C13967	DOUGLAS, REGION	1	ROLLING	IM 0252-359	1
4022611	C14242	ARAPAHOE, REGIO	6	URBAN	STA 0831-089	1
4022606	C14806	LAS ANIMAS	2	PLAINS	STA 3501-010	3
4022602	C13358	JEFFERSON, REGI	6	ROLLING	STA 391A-001	4
4030401	C14691	JACKSON	3	MOUNTAINOUS	STA 014A-030	1
4030402	C13818	CHEYENNE, REGIO	1	PLAINS	STA 0405-030	2
4030403	C14213	PROWERS	2	ROLLING	NH 2872-016	4
4031104	C14690	GRAND	3	MOUNTAINOUS	STA 009A-023	1
4031102	C14798	VARIOUS, REGION	4	ROLLING	SHE R400-164	2
4031804	C14510	EAGLE	3	MOUNTAINOUS	SHE R300-113	1
4031808	C14209	PUEBLO	2	PLAINS	NH 0504-046	2
4031811	C14464	EL PASO	2	ROLLING	STU M240-081	2
4031810	C14657	DOUGLAS, REGION	1	ROLLING	STA C470-026	3
4032503	C14692	MESA	3	MOUNTAINOUS	STA 0063-016	2
4032504	C14011	GUNNISON	3	MOUNTAINOUS	STA 133A-028	4
4040102	C14706	LARIMER	4	ROLLING	NH 2873-134	6
4040106	MM1039	ADAMS, REGION 1	0	PLAINS	MTCE 01-039	6
4041501	C13472	MONTROSE, REGION 3	3	MOUNTAINOUS	NH 0502-053	1
4041512	C13968	DOUGLAS, REGION	1	ROLLING	IM 0252-360	1
4041504	C14820	BENT	2	PLAINS	NH 0505-039	4
4041506	C14709	WELD, REGION 4	4	ROLLING	STA 2571-008	4
4042902	C14266	BOULDER, REGION WELD, REGION 4	4	ROLLING	SHE 052A-020	3
4051303	C14824	ADAMS, REGION 1	1	ROLLING	BR 0362-028	1
4052001	C14212	PUEBLO	2	ROLLING	STA 165A-010	1
4052002	C13594R	MESA	3	ROLLING	STA 006A-035	2
4052701	C14716	GRAND	3	MOUNTAINOUS	BR 0092-018	1
4060302	C13885B	GARFIELD	3	MOUNTAINOUS	NH 0821-064	1
4060304	C13898	DOUGLAS, REGION	1	ROLLING	NH 0852-089	2
4061001	C14708	BOULDER, REGION 4	4	ROLLING	NH 0361-076	3
4061703	C14795	WASHINGTON	4	ROLLING	STA 0343-023	1
4061704	C14661	PUEBLO	2	URBAN	SHE 096A-036	1
4061708	C11723	LOGAN	4	PLAINS	BR 0063-013	1
4061702	C14613	ADAMS, REGION 6	6	ROLLING	IM 0253-186	2

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4061706	C14372	LOGAN PHILLIPS	4	PLAINS	STA R400-146	3
4070104	C14549	ELBERT	1	ROLLING	STA 086A-040	1
4070105	C13568	MORGAN	4	ROLLING	IM 0761-183	3
4071507	C13496R	LINCOLN	1	PLAINS	BR 0243-063	1
4071506	C13961	JEFFERSON, REGION 1	1	MOUNTAINOUS	BR 0061-073	4
4072901	C14482	DENVER	6	URBAN	IMD 0252-364	2
4072904	M6042	VARIOUS, REGION	0	URBAN	MTCE 06-042	2
4080508	C14980B	GARFIELD SUMMIT	1 EAGLE	MOUNTAINOUS	IM 0702-250	10
4080502	C14948	GARFIELD	3	MOUNTAINOUS	IM 0701-168	16
4081206	C13216	SUMMIT	1	MOUNTAINOUS	STA 0091-016	1
4081901	C14077	WELD, REGION 4	4	ROLLING	C 060A-006	1
4081908	M3017	VARIOUS, REGION	3	MOUNTAINOUS	MTCE 03-017	11
4082603	M6043R	VARIOUS, REGION	6	URBAN	MTCE 06-043R	2
4091607	M3020R	VARIOUS, REGION	3	MOUNTAINOUS	MTCE 03-020R	1
4100702	MM6045	ADAMS, REGION 6 JEFFERSON, REGION	6	URBAN	MTCE 06-045	24
4102102	C12811	WASHINGTON	4	ROLLING	BR 0361-064	2
4102801	C13622	ADAMS, REGION 6	6	URBAN	IM 0253-173	1
4111804	C15007	LINCOLN KIT CARSON	1	PLAINS	IM 0705-074	3
4120202	C15019	LINCOLN	1	PLAINS	STA 0243-069	1
4122308	C14850	PARK, REGION 1	1	MOUNTAINOUS	NH 2854-104	1
4122316	C14992	DOUGLAS, REGION 1	1	URBAN	NH 0831-095	1
4122301	C14619	ADAMS, REGION 6	6	URBAN	STA 0073-006	2
4122302	C14612	ADAMS, REGION 6	6	ROLLING	NH 0853-054	2
4122315	C14627	JEFFERSON, REGI ADAMS, REGION 6	6	ROLLING	STA 095A-007	2
4122310	C14849	CLEAR CREEK	1	MOUNTAINOUS	IM 0703-287	3
5010604	C14914	SAN MIGUEL	5 MONTROSE, REGION 5	MOUNTAINOUS	STA 145A-036	2
5012006	C13923T	LA PLATA	5	ROLLING	BR 151A-007	1
5012002	C14712	WASHINGTON	4	ROLLING	STA 0712-012	2
5012701	C14529	MORGAN	4	PLAINS	STA 0343-022	4
5020305	C14632	ARAPAHOE, REGION 6	6	ROLLING	NH 0881-018	1
5020303	C15039	LAS ANIMAS	2	MOUNTAINOUS	IM 0251-168	2
5020304	C14636	ARAPAHOE, REGION 6	6	ROLLING	NH 2854-101	2
5020306	C14787	OTERO	2	ROLLING	STA 0711-015	5
5021708	C13605	EAGLE	3	MOUNTAINOUS	BR 131A-027	1
5021709	C14819	SUMMIT	1	MOUNTAINOUS	IM 0702-246	1
5021711	C15175	BOULDER, REGION 4	4	ROLLING	STA 0361-078	1
5021707	C15162	BENT	2	ROLLING	NH 0504-048	5
5022403	C15017	FREMONT, REGION 2	2	ROLLING	STA 1151-017	1
5022404	C14211	PUEBLO	2	ROLLING	STA 0961-011	1
5022406	MM3024	GARFIELD	3	MOUNTAINOUS	MTCE 03-024	1
5022407	C14950	DOUGLAS, REGION 1 EL PASO	1	ROLLING	IM 0252-374	1
5030305	C15033	MESA	3	MOUNTAINOUS	STA 141A-028	2
5030307	C14438	LARIMER	4	PLAINS	C 0253-183	2
5030306	C15053	ELBERT ARAPAHOE, REGION 1	1 ADAMS, REGION 1	ROLLING	IM 0704-205	4

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5031001	C15157	EL PASO	2	ROLLING	STA 105A-012	2
5031708	C15060	DENVER	6	PLAINS	C R600-239	1
5031702	C15158	OTERO PUEBLO	2	ROLLING	NH 0504-047	2
5031705	C15032	MESA	3	ROLLING	IM 0701-171	4
5033102	C12560	DENVER	6	URBAN	STE C010-057	1
5033103	C14979	GARFIELD	3	MOUNTAINOUS	CC 0702-249	1
5033101	C14630	DENVER ADAMS, REGION 6	6	ROLLING	NH 2873-131	3
5040704	C14663R	LARIMER BOULDER, REGION 4	4	MOUNTAINOUS	STA 0361-075	2
5040703	C15135	LA PLATA	5	MOUNTAINOUS	HB 140A-003	4
5040707	MM6051R	ADAMS, REGION 6	6	URBAN	MTCE 06-051	4
5042101	C13003	PUEBLO	2	PLAINS	IM 0252-330	1
5042102	C12810	MORGAN	4	ROLLING	BR 0062-013	1
5042107	MM1050	ARAPAHOE, REGION 1	1	URBAN	MTCE 01-050	1
5050502	C15156	EL PASO	2	PLAINS	NH 0243-072	7
5051204	MM6059	JEFFERSON, REGION 6	6	URBAN	MTCE 06-059	10
5051901	C15155R	PITKIN	3	MOUNTAINOUS	HB 0821-075	1
5052603	C14096	WELD, REGION 4	4	ROLLING	BR 0853-050	1
5060908	C15110	MESA	3	MOUNTAINOUS	BR 139A-028	1
5063001	C14620	BOULDER, REGION 6 WELD, REGION 6	6 BROOMFIELD, REGION 6	ROLLING	STA 0073-007	1
5070703	MM6057	JEFFERSON, REGION 1 ARAPAHOE, REGI	0 DENVER OTHERS	URBAN	MTCE 06-057	6
5070704	MM3029	GARFIELD	0	MOUNTAINOUS	MTCE 03-029	17
5072101	MM1048	CLEAR CREEK SUMMIT	1	MOUNTAINOUS	MTCE 01-048	1
5072102	MM6060	JEFFERSON, REGION 6	0	URBAN	MTCE 06-060	1
5081101	C14315	MESA	3	ROLLING	IM 0701-162	4
5081801	C15206	STATEWIDE VARIOUS	6	ROLLING	C R600-246	5
5082505	MM1045R	VARIOUS, REGION 1	1	ROLLING	MTCE 01-045	1
5090103	C15168	ADAMS, REGION 6	6	URBAN	STA R600-244	4
5092201	MM1052	ARAPAHOE, REGION 1	1	URBAN	MTCE 01-052	2
5092901	C14214R	ROUTT	3	MOUNTAINOUS	STR 131A-029	1
5092902	C14081	PUEBLO	2	PLAINS	BR 0251-162	3
5111003	C14584	ADAMS, REGION 1	1	ROLLING	BR 0362-027	1
5121501	C13224R	LARIMER	4	ROLLING	IM C060-030	1
5122201	C15066	ROUTT GRAND	3	MOUNTAINOUS	STA 134A-010	1
6011201	C15174R	DENVER	6	URBAN	IM 0704-206	1
6011203	C14478	ARCHULETA	5	MOUNTAINOUS	NH 1602-096	2
6012602	C15290	CLEAR CREEK	1	MOUNTAINOUS	IM 0703-295	1
6012604	MM6064	ADAMS, REGION 6	6	URBAN	MTCE 06-064	2
6012605	C15144	YUMA	4	PLAINS	STA 0343-025	3
6020205	C15391	OTERO	2	ROLLING	SHE 0504-049	1
6020201	C14942R	JEFFERSON, REGION 1	1	MOUNTAINOUS	NH 2854-106	5
6020901	C15517	EL PASO	2	PLAINS	IM 0252-382	6
6021603	C15195	CLEAR CREEK SUMMIT	1	MOUNTAINOUS	IM 0702-257	2
6030203	C14615	DENVER	6	URBAN	NH 0021-025	1
6030202	C14614	ADAMS, REGION 6	6	ROLLING	IM 0253-187	2

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6030201	C14777	DENVER	6	URBAN	IM R600-224	3
6030906	C14087	CUSTER	2	ROLLING	BR 069A-019	1
6030907	C15160	PUEBLO	2	ROLLING	IM 0252-378	7
6031601	C15217	LAS ANIMAS	2	PLAINS	BR 012A-041	2
6032302	C14617	DENVER	6	URBAN	NH 0021-027	2
6032314	C15067RB	EAGLE	3	MOUNTAINOUS	IM 0702-252	9
6040602	C15429	DOUGLAS, REGION 1	1	ROLLING	IM 0252-381	3
6040606	C15194	BOULDER, REGION 4	4	ROLLING	STA 157A-009	3
6040601	C15562	PUEBLO HUERFANO	2	ROLLING	IM 0251-172	7
6041301	MM1056	SUMMIT	1	ROLLING	MTCE 01-056	1
6042003	C15359	ARAPAHOE, REGION 6 DENVER	6	ROLLING	NH 030A-024	1
6042004	C14635	ADAMS, REGION 6	6	ROLLING	STA 053A-001	1
6051802	C15106	MOFFAT	3	MOUNTAINOUS	BR 0132-016	2
6051801	C13289	BACA PROWERS	2	PLAINS	NH 2871-030	7
6060102	MM3034	VARIOUS, REGION 3	3	MOUNTAINOUS	MTCE 03-034	16
6060806	C15159RB	BACA	2	PLAINS	NH 1604-009	3
6061502	C15365	JEFFERSON, REGION 6	6	ROLLING	NH 0062-021	1
6061501	C14986	SEDGWICK	4	ROLLING	IM 0762-043	2
6062201	C15107R	HINSDALE	3	MOUNTAINOUS	BR 149A-022	1
6062202	C14086	OTERO	2	ROLLING	BR 0504-043	1
6071306	C14829	YUMA	4	PLAINS	BR 3852-009	1
6071304	MM6068	VARIOUS, REGION 6	6	URBAN	MTCE 06-068	3
6072003	C15363	DENVER	6	URBAN	NH 026A-003	1
6072005	MM3036	MESA	3	MOUNTAINOUS	MTCE 03-036	1
6072008	C15634	MORGAN LOGAN	4 SEDGWICK OTHERS	PLAINS	BR R400-203	30
6072708	C14890	JEFFERSON, REGION 6	6	MOUNTAINOUS	BR 2854-105	2
6080305	C12623	WELD, REGION 4	4	PLAINS	IM 0253-160	2
6080309	C14811	JEFFERSON, REGION 6	6	ROLLING	STU M040-011	2
6081002	C15709	STATEWIDE VARIOUS	6	ROLLING	C R600-283	4
20060831	C14930R	RIO BLANCO	3	MOUNTAINOUS	BR 064A-008	1
20060831	C11725	BOULDER, REGION 4	4	MOUNTAINOUS	BR 0361-052	2
20060921	C14551RA-ALT	LAS ANIMAS	2	URBAN	IM 0251-166	10
20060928	C15492	CHAFFEE	5	MOUNTAINOUS	BR 0241-046	2
20061005	C15338	CLEAR CREEK	1	MOUNTAINOUS	IMD 0703-296	1
20061012	MM6074	JEFFERSON, REGION 6	6	URBAN	MTCE 06-074	1
20061019	MM3041	PITKIN	3	MOUNTAINOUS	MTCE 03-041	1
20061102	MM3039	GARFIELD	3	MOUNTAINOUS	MTCE 03-039	2
20061102	C15179B	JEFFERSON, REGION 6	6	ROLLING	IM 0703-291	4
20061109	C15699	DENVER	6	URBAN	IM 0252-384	1
20061116	C15361	ADAMS, REGION 6	6	ROLLING	IM 076A-007	1
20061116	C15785	WELD, REGION 4	4	C 0853-064	1	
20061116	C15065	MESA	3	ROLLING	HB 0701-173	2
20061130	C15435	MESA	3	MOUNTAINOUS	HB 0701-180	1
20061130	C15675	ADAMS, REGION 6	6	URBAN	BR 0021-034	1

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
20061130	C15109	DELTA	3	MOUNTAINOUS	BR 092A-019	1
20061130	MM6077	ADAMS, REGION 6	6 DENVER	URBAN	MTCE 06-077	3
20061207	MM6075	ADAMS, REGION 6	6	URBAN	MTCE 06-075	2
20061207	C13129R	EL PASO	2	URBAN	STU R200-097	4
20061228	C15364	JEFFERSON, REGION 6	6	ROLLING	NH 0062-020	1
20070104	C15943	PUEBLO	2	ROLLING	STA 0961-012	1
20070104	C15671	OTERO	2	PLAINS	STA 109A-017	5
20070111	C15927	GARFIELD	3	MOUNTAINOUS	IM 0702-270	1
20070111	C15669	CROWLEY	2	ROLLING	STA 096A-038	2
20070111	C15784R	OTERO PROWERS	2	PLAINS	BR 109A-018	3
20070111	C15922B	EAGLE	3	IM 0702-269	8	
20070118	C14839	WELD, REGION 4	4	ROLLING	NH 0853-057	2
20070125	C15618	LARIMER	4	DO	NH 0341-070	2
20070125	C15746	WELD, REGION 4	4	IM 0253-194	3	
20070125	C15668	HUERFANO	2	MOUNTAINOUS	STA 069A-021	4
20070201	C15586	WELD, REGION 4	4	ROLLING	NH 0342-044	1
20070208	C15601	JEFFERSON, REGION 1	1	MOUNTAINOUS	NH 0062-023	1
20070308	C16012	DOUGLAS, REGION 1	1	DO	IM0252-388	3
20070308	C16045	ELBERT ARAPAHOE, REGION 1	1	URBAN	MTCE R100-125	5
20070308	C15095	PROWERS BACA	2	PLAINS	STA 089A-011	5
20070315	C15832R	SUMMIT	1	MOUNTAINOUS	IM 0702-262	3
20070322	C15766	JEFFERSON, REGION 1	6	ROLLING	IM 0703-308	7
20070419	C16060	WELD, REGION 4	4	DO	MTCER400-211	1
20070426	C12491-ALT	CHEYENNE, REGION 2	1	DO	NH 0405-025	1
20070426	C15770	PUEBLO	2	PLAINS	SHE 0251-175	2
20070517	C16028	DOUGLAS, REGION 1	1	ROLLING	STA0831-105	2
20070517	C14277	LINCOLN	1	PLAINS	BR 0711-014	4
20070524	C16080	KIT CARSON	1	NH 3851-016	1	
20070524	C13192	WELD, REGION 4	4	ROLLING	IM 0253-164	5
20070607	C16013	SEDGWICK	4	PLAINS	BR 059A-032	1
20070614	C16216	LARIMER	4	URBAN	NH0341-071	2
20070621	C14417	ADAMS, REGION 6	6	URBAN	STU M356-019	1
20070621	C15108	GUNNISON	3	MOUNTAINOUS	BR 114A-011	1
20070712	C15488	LAKE	3	MOUNTAINOUS	HPP 0241-045	1
20070816	C15573	ADAMS, REGION 6	6	URBAN	BR 0253-192	1
20070830	C13141-ALT	PUEBLO	2	ROLLING	BR 0961-008	2
20070906	C16213R	MESA	3	ROLLING	C0701-187	1
20070920	C15852R	GARFIELD	3	MOUNTAINOUS	STA 133A-031	1
20070927	C16378	STATEWIDE VARIOUS	6	ROLLING	C R600 - 300	5
20070927	C16399	DENVER ADAMS, REGION 6	6	URBAN	MTCER600-302	9
20071025	C15879	MESA	3	URBAN	STA 340A-013	1
20071101	C16174	PUEBLO	2	URBAN	C 0504-055	2
20071115	C15676	CHAFFEE	5	MOUNTAINOUS	BR 0241-047	1
20071129	C15549-ALT	LARIMER	4	MOUNTAINOUS	BR0341-069	1

Letting	Contract	Counties	Region	Terrain	Project	Bridge Count
20071129	C14654	WELD, REGION 4	4	ROLLING	BR1192-015	3
20071213	C15576	JEFFERSON, REGION 6	6	ROLLING	BR 0581-008	4
20080110	C13590	EL PASO	2	DO	STUR200-110	4
20080117	C16043R	LA PLATA	5	MOUNTAINOUS	NH 160A-002	1
20080117	C16172	DOUGLAS, REGION 1	1	DO	IM 0252-392	1
20080124	C15514	WELD, REGION 4	4	DO	NH0342-043	1
20080124	C15652	BOULDER, REGION 4	4	URBAN	STA 093A-007	1
20080207	C16617	CONEJOS	5	MOUNTAINOUS	NH 2851-004	1
20080228	C16055	DENVER	6	URBAN	IM0252-393	3
20080228	C16693	VARIOUS, REGION 5	5	MOUNTAINOUS	R500-097	3
20080306	C16272RC	SUMMIT	1	C 0702-274	13	
20080306	C16076B	PUEBLO	2	ROLLING	STU 0251-329	19
20080313	C15877	JEFFERSON, REGION 6	6	DO	STA 072A-030	6
20080313	C16453	EAGLE	3	MOUNTAINOUS	SHE0702-276	12
20080403	C16042A	LA PLATA	5	NH 1602-114	1	
20080403	C15069	PROWERS	2	ROLLING	NH 2871-031	3
20080410	C15666	LA PLATA	5	ROLLING	NH5501-013	2
20080410	C16537	WELD, REGION 4	4	ROLLING	MTCE0142-048	5
20080410	C15555	DOUGLAS, REGION 1	1	ROLLING	IM 0252-383	8
20080417	C16046	KIT CARSON	1	PLAINS	IM 0705-077	5
20080424	C16048	LA PLATA	5	MOUNTAINOUS	NH 5502-059	3
20080605	C15504	LA PLATA	5	MOUNTAINOUS	NH 1602-112	1
20080605	C16641R	CLEAR CREEK	1	MOUNTAINOUS	C0703-337	5
20080626	C16288	EAGLE	3	MOUNTAINOUS	C0702-275	3
20080710	C15564S	DENVER	6	URBAN	CR 600-275	1
20080724	C14373	MORGAN	4	PLAINS	STA R400-147	1
20080731	C15049	PARK, REGION 1	1	MOUNTAINOUS	NH 2854-109	2
20080911	C15809	WELD, REGION 4 MORGAN	4	DO	BR R400-206	4
20081002	C16958	VARIOUS, REGION 5	5	MOUNTAINOUS	MTCE R500-101	1
20081009	C16025	DOUGLAS, REGION 1	1	ROLLING	C0252-390	1
20081009	C16881	ADAMS, REGION 6 JEFFERSON, REGION	6 DENVER	ROLLING	MTCE R600-324	7
20081009	C16808	ARAPAHOE, REGION 6 DOUGLAS, REGION	6 DENVER	ROLLING	IMR600-322	10
20081016	C16586	BOULDER, REGION 4	4	ROLLING	BR 0361-088	1
20081204	C16661	MINERAL	5	MOUNTAINOUS	NH 1602-117	1
20081204	C15916	MONTEZUMA	5	ROLLING	C1601-057	1
20081204	C16996R	GARFIELD	3	MOUNTAINOUS	MTCE0702-286	1
20081211	C16995	MESA	3	DO	C0063-027	1
20081218	C16649A	HUERFANO	2	ROLLING	MTCE R200-152	2
20090709	C17304	GARFIELD	3	URBAN	ES3 0821-087	1
20090723	C15491	SAN JUAN	5	MOUNTAINOUS	BR 5502-053	1
20090813	C17234	DENVER JEFFERSON, REGION	6	URBAN	MTCE R600-345	3
20090903	C16807	ARAPAHOE, REGION 6	6	URBAN	IMR600-321	3

Table 94 - CDOT Bid Items - Combined Use, Element Dimensions

Component	Material	Action	Action Unit	Item	Description	Item Unit	Item Conversion
Deck	Asphlat	Remove	SY	202-00226 to 00240	Rem of Asph Mat (Planing)	SY	-
Deck	Concrete	Repair	SY	202-05100	Sandblasting Reinf Steel	SY	-
Deck	Concrete	Overlay	SY	409-05000 to 05100	Ultrathin Bonded Wearing C	SY	-
Deck	Concrete	Repair	SY	412-05000	Partial Depth Repair of Co	SF	SF:SY
Deck	Membrane	Furnish	SY	515-00120 to 00121	Waterproofing Membrane	SY	-
Deck	Concrete	Sealer	SY	515-00400 to 00410	Concrete Sealer	SY	-
Deck	Concrete	Overlay	SY	519-03000	Thin Bonded Epoxy Overlay	SY	-
Deck	Deicing System	Furnish	SY	614-86758	Anti-Icing Sys	SY	-
Deck	Concrete	Furnish	SY	601-40250	Bridge Deck Finish (Sawed)	M2	M2:SY

Table 95 - CDOT Bid Items - Combined Use, Assumed Element Size

Component	Material	Action	Unit	Item	Description	Item Unit	Item Conversion
Approach	Concrete	Remove	SY	202-00210, 00215	Rem Conc Pavement	SY	-
Deck	Asphalt Surface	Remove	SY	202-00245	Rem Asphalt Mat (Planing)	TON	TON:3IN SY
Deck	Asphalt Surface	Overlay	SY	403-00720 to 36447	HBP (or HMA)	TON	TON:3IN SY
Approach	Concrete	Furnish	SY	412-00800 to 01300	Conc Pvmt (8 IN)	SY	-
Deck	Concrete	Furnish	SY	601-03000	Conc CL D	CY	CY:SY
Culvert	Concrete	Furnish	FT	601-03030	Concrete CL D (Box)	CY	CY:FT
Deck	Concrete	Furnish	SY	601-03030 to 03540	Concrete, D or DT	CY	CY:3IN SY
Deck	Concrete	Furnish	SY	601-03040, 03041	CONCRETE CL D (BRIDGE)	CY	CY:SY
Deck	Concrete	Furnish	SY	601-05540, 06040	Concrete Deck Topping	CY	CY:1IN SY
Approach	Concrete	Mudjack	EA	601-10200, 10250	Mud Jacking	HOUR	HR:EA
Culvert	Concrete	Furnish	FT	602-00000	Reinf Steel	LB	LB:FT
Deck	Concrete	Furnish	SY	602-00000, 00020	Reinf Steel	LB	LB:SY
Deck	Deicing System	Furnish	SY	614-86755	Deicing System	LS	LS:SY
Approach	Prestressed Concrete	Furnish	SY	618-06032 to 06036	Prestress Conc Slab (Depth	SF	SF:SY
Deck	Cathodic Protection	Furnish	SY	619-80000	Cathodic Protection	LS	LS:SY

Table 96 - CDOT Bid Items - Single Use, Element Dimensions

Component	Material	Action	Unit	Item	Description	Item Unit	Item Conversion
Joint		Remove	FT	202-00504	Rem Exp Device	LF	-
Joint		Reset	FT	210-00400	Res Expan Device	LF	-
Joint		Repair	FT	412-14000	Sawing and Sealing Joints	LF	-
Joint	Compression Seal	Furnish	FT	518-00000	Brdg Compress Joint Sealer	M	M:FT
Joint	Asphaltic	Furnish	FT	518-01001	Br Expan Joint (Asphaultic	LF	-
Joint	Expansion	Furnish	FT	518-01002 to 01018	EXPAN DEVICE (0-2 IN)	LF	-
Joint	Elastomeric	Install	FT	518-01104, 01109	Inst Br Expan Device (0-4	LF	-
Joint	-	Remove	FT	518-03000	Saw And Seal Br Joint	M	M:FT
Joint	Rapid Cure Silicone	Furnish	FT	518-03100	Rapid Cure Silicone Jt Sea	LF	-
Railing	Metal	Remove	FT	202-00425	REM BRIDGE RAILING	LF	-
Railing		Reset	FT	210-00425	Res Bridge Railing	LF	-
Railing	Steel	Furnish	FT	514-00200, 01011	Bridge Rail (Steel)	LF	-
Railing	-	Furnish	FT	606-10200	Brdg Rail (Spec)	LF	-
Railing	Metal	Furnish	FT	606-10300 to 10360	BRDG RAIL TY 3	LF	-
Railing	Concrete	Furnish	FT	606-10400 to 10755	BRDG RAIL TY 4	LF	-
Railing	Metal	Furnish	FT	606-10800 to 11033	Brdg Rail Ty 8	LF	-
Bearing	Elastomeric	Furnish	EA	512-00101 to 00103	Bearing Device	Each	-
Superstructure	Prestressed Concrete	Furnish	FT	618-00054 to 01120	Prestress Conc Beam	M	M:FT
Superstructure	Prestressed Concrete	Furnish	FT	618-10000 to 10384	Precast Conc U Girder (Pre	LF	-
Culvert	Concrete	Furnish	FT	603-71812, 72010	Culvert	LF	-

Table 97 - CDOT Bid Items - Single Use, Assumed Element Size

Component	Material	Action	Unit	Item	Description	Item Unit	Item Conversion
Joint	Compression Seal	Remove	EA	202-00520	Rem of Exp Joint Matl	LF	-
Culvert	Concrete	Clean	EA	202-04002	Clean Culvert	EACH	-
Joint		Modify	EA	210-00410	Modify Bridge Expan Device	EACH	-
Superstructure	Steel	Erect	FT	509-08010	Alter-Erect Str Steel	LS:FT	LS:FT
Superstructure	Concrete	Coating	SY	601-40300 to 40302	Struct Conc Coating	M2	M2:SY
Superstructure	Prestressing Steel	Prestress	FT	618-00000	Prestress Steel	MKFT	MKFT:FT

Superstructure	Prestressed Concrete	Furnish	FT	618-01992, 01994	Prestress Conc Box (Depth	SF	SF:LF

Task 8 References

Cost Data 2010	*2009 Cost Data Maintenance Projects* (2010). Colorado DOT, 95p.
Bridge 2009	*Bridge Design Manual* (2009). Colorado DOT, 216 p.
B-202-1C 2007	*Concrete Deck Repair Details Concrete Girder* (2007). Colorado DOT, B-202-1C
B-202-1S 2007	*Concrete Deck Repair Details Steel Girder* (2007). Colorado DOT, B-202-1S

Task 9 – Costs by CDOT Region

Median costs for actions are reported for CDOT regions under Task 9. Bid tabulations show region for each project. If a bid tabulation lacks this information, or if multiple regions are reported, project costs are listed here without region. The greatest difference of costs in regions from median statewide costs are reported as percentages of statewide medians.

Table 99 lists costs for new bridge decks. Table 100 and Table 101 list costs for overlays on decks. Table 102 lists repair costs for decks. Table 103 lists costs for construction or repair of approach slabs. Table 104 lists costs for bridge joints. Table 105 and Table 106 list railing costs. Table 107 lists costs for bridge drains. Table 108 lists costs for bridge bearings. Table 109 lists costs for prestressed concrete superstructure. Table 110 lists costs for reinforced concrete culverts.

Comparisons

Costs of thirty-seven element-level actions are computed as statewide averages and as averages in CDOT regions. Costs are summarized in Table 98. Variations in costs among CDOT regions are small. Regional costs are within 8% of statewide average costs in most cases, and within 10% of statewide average costs for two-thirds of the set of element-level actions.

Table 98 - Costs for Element-Level Actions

Component	Material		Action		Count	Cost, $	Cost Unit	Cost Range
Deck	Concrete	Bare	Furnish		79	149.03	SY	0.6%
		Asphalt Surface	Furnish		54	118.61	SY	6%
			Overlay		17	10.10	SY	8%
				w/ Planing	112	11.18	SY	0.5%
				w/ Membrane	12	27.66	SY	10%
				w/ Planing w/ Membrane	46	28.80	SY	2%
		Concrete DT	Overlay		2	64.67	SY	18%
		Concrete	Overlay	w/ Planing	2	24.42	SY	60%
		Asphalt Surface	Repair	w/ Planing w/ Membrane	3	24.25	SY	10%
	Timber	Asphalt Surface	Overlay	w/ Planing	13	13.71	SY	13%
Approach	Concrete		Furnish		27	53.19	SY	10%
				w/ Remove	32	72.63	SY	11%
	Prestressed Concrete		Furnish		6	380.85	SY	16%
Joint		2 IN	Furnish		53	128.91	FT	1.5%
				w/ Remove	26	184.60	FT	4%
		4 IN	Furnish		59	183.11	FT	12%
				w/ Remove	39	282.06	FT	3%
		6 IN	Furnish		7	765.06	FT	2%
		9 IN	Furnish		5	1083.07	FT	10%
Railing	Concrete		Furnish		71	79.74	FT	3%
				w/ Remove	23	148.89	FT	6%
	Metal		Furnish		124	120.50	FT	1%
				w/ Remove	138	121.76	FT	1%
	Steel		Furnish		6	155.05	FT	31%
Bearing	Type I		Furnish		28	1005.63	EA	8%
	Type II		Furnish		3	1462.74	EA	13%
	Type II - Expansion		Furnish		16	2083.32	EA	11%

Component	Material		Action		Count	Cost, $	Cost Unit	Cost Range
	Type III		Furnish		7	10927.13	EA	1%
Superstructure	Prestressed Concrete	BT 1070	Furnish		6	172.46	FT	31%
		BT 1830	Furnish		13	211.68	FT	8%
		BT 42	Furnish		13	182.16	FT	12%
		BT 54	Furnish		7	214.12	FT	9%
		BT 63	Furnish		12	191.88	FT	3%
		BT 72	Furnish		9	219.45	FT	6%
		BT 84	Furnish		3	191.40	FT	0.3%
		U Girder	Furnish		9	618.77	FT	18%
Culvert	Concrete		Furnish		14	1489.12	FT	17%

Decks

Table 99 - Colorado DOT – Deck Furnish – by Region

Deck material	Wearing Surface	Action	Region	Instances	Cost, $	Cost Unit	Deviation
Concrete	Bare	Furnish	all	79	149.03	SY	0.6%
			1	19	160.11	SY	
			2	17	153.54	SY	
			3	9	142.82	SY	
			4	13	155.18	SY	
			5	2	153.32	SY	
			6	19	139.46	SY	
Concrete	Asphalt Surface	Furnish	all	54	118.61	SY	6%
			1	13	112.01	SY	
			2	15	46.44	SY	
			3	8	191.75	SY	
			4	12	125.34	SY	
			6	6	41.48	SY	

Table 100 - Overlay for Asphalt Wearing Surface – By Region

Deck	Wearing Surface	Action		Region	Instances	Cost, $	Cost Unit	Deviation
Concrete	Asphalt Surface	Overlay		all	17	10.10	SY	8%
				1	3	11.22	SY	
				2	4	7.20	SY	
				3	1	6.34	SY	
				4	2	17.80	SY	
				5	1	9.89	SY	
				6	5	11.88	SY	
				-	1	8.53	SY	
			w/ Planing	all	112	11.18	SY	0.5%
				1	18	12.10	SY	
				2	22	10.53	SY	
				3	27	10.65	SY	
				4	8	11.25	SY	
				5	7	10.91	SY	
				6	30	11.49	SY	
			w/ Membrane	all	12	27.66	SY	10%
				1	1	20.34	SY	
				2	4	22.93	SY	
				4	4	38.39	SY	
				6	3	40.08	SY	
			w/ Planing w/ Membrane	all	46	28.80	SY	2%
				1	10	33.06	SY	
				2	9	31.50	SY	
				3	5	21.62	SY	
				4	8	31.56	SY	
				5	1	26.47	SY	
				6	12	24.60	SY	

Deck	Wearing Surface	Action		Region	Instances	Cost, $	Cost Unit	Deviation
				-	1	36.71	SY	
Timber	Asphalt Surface	Overlay	w/ Planing	all	13	13.71	SY	13%
				1	2	18.88	SY	
				2	8	12.25	SY	
				3	1	34.39	SY	
				4	2	15.48	SY	

Table 101 - Overlay for Concrete Wearing Surface - by Region

Wearing Surface	Action		Region	Instances	Cost, $	Cost Unit	Deviation
Ultrathin	Overlay	w/ Planing	6	2	10.33	SY	-
Concrete surface	Overlay		2	1	43.20	SY	-
Concrete HT	Overlay		3	1	21.92	SY	-
Concrete DT	Overlay		all	2	64.67	SY	18%
			-	1	80.99	SY	
			3	1	48.35	SY	
Concrete	Overlay	w/ Planing	all	2	24.42	SY	60%
			3	1	3.72	SY	
			2	1	45.11	SY	

Table 102 - Concrete Deck Repair Costs from Bid Tabulations - by Region

Deck	Wearing Surface	Action		Region	Instances	Cost, $	Cost Unit	Dev.
Concrete	Asphalt Surface	Repair	w/ Planing w/ Membrane	all	3	24.25	SY	10%
				4	1	24.25	SY	
				2	2	29.49	SY	
Concrete	Asphalt Surface	Repair	Partial Depth	6	1	100.83	SY	-
Concrete		Repair	Partial Depth	1	2	166.02	SY	-
Concrete	Asphalt Surface	Repair	w/Overlay	4	1	393.26	SY	-

Approaches

Table 103 - Costs for Approaches by Region

Component	Material	Action		Region	Instances	Cost,$	Cost Unit	Dev.
Approach	Concrete	Furnish		all	27	53.19	SY	10%
				1	4	50.73	SY	
				2	4	42.86	SY	
				3	4	125.96	SY	
				4	4	46.04	SY	
				5	1	40.66	SY	
				6	10	55.30	SY	
			w/ Remove	all	32	72.63	SY	11%
				1	9	58.98	SY	

Component	Material	Action		Region	Instances	Cost,$	Cost Unit	Dev.
				2	3	88.27	SY	
				3	3	211.13	SY	
				4	6	45.10	SY	
				6	11	89.95	SY	
	Prestressed Concrete	Furnish		all	6	380.85	SY	16%
				1	2	419.64	SY	
				4	2	466.80	SY	
				6	2	132.82	SY	

Joints

Table 104 - Costs for Expansion Joints - by Region

Component	Range	Action		Region	Instances	Cost, $	Cost Unit	Deviation
Joint	2 IN	Furnish		all	53	128.91	FT	1.5%
				1	11	121.45	FT	
				2	12	142.78	FT	
				3	4	108.15	FT	
				4	11	125.51	FT	
				5	4	163.95	FT	
				6	7	136.87	FT	
				-	4	127.32	FT	
		Furnish	w/ Remove	all	26	184.60	FT	4%
				1	13	184.06	FT	
				2	3	249.65	FT	
				3	4	204.22	FT	
				4	3	97.36	FT	
				6	1	161.04	FT	
				-	2	122.88	FT	
	4 IN	Furnish		all	59	183.11	FT	12%
				1	10	176.62	FT	
				2	14	169.46	FT	
				3	6	181.75	FT	
				4	10	174.40	FT	
				5	1	191.61	FT	
				6	17	197.11	FT	
				-	1	1487.85	FT	
		Furnish	w/ Remove	all	39	282.06	FT	3%
				1	10	248.42	FT	
				2	5	191.53	FT	
				3	3	219.01	FT	
				4	3	341.00	FT	
				5	1	174.27	FT	
				6	15	304.14	FT	
				-	2	346.22	FT	
	6 IN	Furnish		all	7	765.06	FT	2%

Component	Range	Action		Region	Instances	Cost, $	Cost Unit	Deviation
				1	1	765.06	FT	
				6	6	799.26	FT	
	9 IN	Furnish		all	5	1083.07	FT	10%
					1	1083.07	FT	
					1	1573.74	FT	
					3	988.32	FT	
		Furnish	w/ Remove		1	2416.23	FT	-
	12 IN	Furnish			1	2024.90	FT	-
		Furnish	w/ Remove	6	2	1761.69	FT	-
	15 IN	Furnish		3	1	2450.17	FT	-
		Furnish	w/ Remove	3	3	3015.12	FT	-
	18 IN	Furnish		6	1	4682.71	FT	-

Railings

Table 105 - Costs for Bridge Railings - by Region

Component	Material	Action		Region	Instances	Cost, $	Cost Unit	Deviation
Railing	Concrete	Furnish		all	71	79.74	FT	3%
				1	15	89.53	FT	
				2	11	77.57	FT	
				3	5	127.33	FT	
				4	3	64.51	FT	
				5	1	182.46	FT	
				6	36	75.16	FT	
			w/ Remove	all	23	148.89	FT	6%
				1	3	189.56	FT	
				2	5	92.06	FT	
				6	14	167.52	FT	
				-	1	285.47	FT	
Railing	Metal	Furnish		all	124	120.50	FT	1%
				1	15	98.99	FT	
				2	39	120.38	FT	
				3	18	136.56	FT	
				4	26	105.62	FT	
				5	9	153.97	FT	
				6	17	127.09	FT	
			w/ Remove	all	138	121.76	FT	1%
				1	23	108.43	FT	
				2	51	127.74	FT	
				3	17	113.46	FT	
				4	23	135.33	FT	
				5	13	106.95	FT	

Component	Material	Action		Region	Instances	Cost, $	Cost Unit	Deviation
				6	11	159.58	FT	
Railing	Steel	Furnish		all	6	155.05	FT	31%
				2	2	136.48	FT	
				3	1	162.20	FT	
				4	1	100.62	FT	
				6	2	351.07	FT	
Railing	Other	Furnish		2	1	267.31	FT	-
			w/ Remove	6	2	283.60	FT	-

Table 106 - Costs for Bridge Railings by Type – by Region

Component	Material	Type	Action		Region	Instances	Cost, $	Cost Unit	Dev.
Railing	Concrete	Ty 4	Furnish		all	6	69.04	FT	6%
					2	1	53.73	FT	
					6	5	76.96	FT	
				w/ Remove	all	6	103.15	FT	15%
					2	1	195.40	FT	
					6	5	102.70	FT	
Railing	Concrete	Ty 4 spec	Furnish		all	12	81.03	FT	4%
					1	1	82.31	FT	
					2	3	76.76	FT	
					3	2	104.99	FT	
					6	6	88.40	FT	
				w/ Remove	all	5	285.47	FT	1%
					6	4	276.71	FT	
					-	1	285.47	FT	
Railing	Concrete	Ty 7	Furnish		all	35	73.94	FT	7%
					1	10	81.20	FT	
					2	5	124.74	FT	
					3	1	127.33	FT	
					4	2	58.96	FT	
					5	1	182.46	FT	
					6	16	70.72	FT	
				w/ Remove	all	4	112.34	FT	21%
					1	1	148.89	FT	
					2	1	73.03	FT	
					6	2	169.06	FT	
Railing	Concrete	Ty 7 - 42in	Furnish		1	1	93.94	FT	
Railing	Concrete	Ty 7 Sect a	Furnish		6	1	96.53	FT	
Railing	Concrete	Ty 7 spec	Furnish		all	15	93.11	FT	17%
					1	3	136.95	FT	
					2	1	293.26	FT	
					3	2	161.01	FT	
					4	1	68.71	FT	
					6	8	84.87	FT	
				w/ Remove	all	5	121.23	FT	26%

Component	Material	Type	Action		Region	Instances	Cost, $	Cost Unit	Dev.
					2	3	92.06	FT	
					6	2	228.46	FT	
Railing	Concrete	Ty 7R	Furnish	w/ Remove	all	2	161.94	FT	12%
					1	1	189.56	FT	
					6	1	134.32	FT	
Railing	Concrete	Ty 7R Spec	Furnish	w/ Remove	1	1	248.60	FT	
Railing	Concrete		Furnish		2	1	276.54	FT	
Railing	Metal	10H	Furnish		all	5	196.13	FT	6%
					2	3	196.13	FT	
					6	2	236.36	FT	
			Furnish	w/ Remove	4	1	165.34	FT	
Railing	Metal	10H spec	Furnish		6	1	230.42	FT	
Railing	Metal	10M	Furnish		all	31	123.51	FT	2.4%
					1	5	123.51	FT	
					2	8	110.26	FT	
					3	7	130.43	FT	
					4	8	107.00	FT	
					5	2	147.92	FT	
					6	1	182.24	FT	
				w/ Remove	all	9	108.43	FT	8%
					1	3	105.72	FT	
					2	3	117.66	FT	
					3	2	161.82	FT	
					6	1	98.01	FT	
Railing	Metal	10M Spec	Furnish		all	3	158.88	FT	53%
					2	3	113.86	FT	
					3	3	283.27	FT	
					4	5	111.69	FT	
				w/ Remove	all	6	204.88	FT	13%
					2	2	284.62	FT	
					3	2	232.59	FT	
					4	1	104.06	FT	
					6	1	152.03	FT	
Railing	Metal	10R	Furnish		all	19	132.37	FT	7%
					1	1	170.84	FT	
					2	7	162.41	FT	
					3	1	263.91	FT	
					4	4	108.78	FT	
					5	1	153.97	FT	
					6	5	113.60	FT	
				w/ Remove	all	108	117.61	FT	1.5%
					1	19	111.66	FT	
					2	39	127.90	FT	
					3	13	108.45	FT	
					4	16	128.00	FT	
					5	12	106.76	FT	
					6	9	170.46	FT	
Railing	Metal	10R spec	Furnish		all	6	137.18	FT	18%

Component	Material	Type	Action		Region	Instances	Cost, $	Cost Unit	Dev.
					2	1	120.38	FT	
					4	1	173.94	FT	
					5	2	205.82	FT	
					6	2	65.23	FT	
				w/ Remove	4	2	244.42	FT	
Railing	Metal	3R	Furnish		2	1	142.11	FT	
				w/ Remove	2	2	94.85	FT	
Railing	Metal	3R spec	Furnish		all	5	67.00	FT	7%
					2	2	75.21	FT	
					3	1	72.94	FT	
					4	1	49.10	FT	
					5	1	67.00	FT	
				w/ Remove	all	2	100.96	FT	16%
					2	1	78.73	FT	
					5	1	123.18	FT	
Railing	Metal	Ty 10	Furnish		all	24	98.73	FT	4%
					1	5	97.97	FT	
					2	8	118.90	FT	
					3	2	126.39	FT	
					4	7	80.95	FT	
					5	1	101.63	FT	
					6	1	151.76	FT	
				w/ Remove	all	7	135.23	FT	8%
					1	1	140.63	FT	
					2	3	127.74	FT	
					4	3	176.84	FT	
Railing	Metal	Ty 10 spec	Furnish		all	10	122.16	FT	14%
					1	2	106.50	FT	
					2	3	112.11	FT	
					3	2	112.06	FT	
					5	1	181.34	FT	
					6	2	233.76	FT	
Railing	Metal	Ty 3	Furnish		all	6	122.68	FT	13%
					2	2	134.29	FT	
					3	1	55.96	FT	
					5	1	100.92	FT	
					6	2	168.62	FT	
				w/ Remove	2	1	26.89	FT	
Railing	Metal	Ty 3 spec	Furnish		all	3	79.87	FT	72%
					1	1	72.71	FT	
					2	1	79.87	FT	
					3	1	251.97	FT	
Railing	Metal	Ty 8	Furnish		6	1	122.65	FT	
Railing	Metal	Ty 8 spec	Furnish		1	1	28.46	FT	
Railing	Metal		Furnish		1	8	116.27	FT	
Railing	Other		Furnish		2	1	267.31	FT	
Railing	Steel	Pedestrian	Furnish		all	2	131.41	FT	17%
					3	1	162.20	FT	

Component	Material	Type	Action		Region	Instances	Cost, $	Cost Unit	Dev.
					4	1	100.62	FT	
Railing	Steel	Steel	Furnish		all	4	209.54	FT	27%
					2	2	136.48	FT	
					6	2	351.07	FT	

Drains

Table 107 - Costs for Bridge Drains - by Region

	Action	Region	Instances	Cost, $	Cost Unit	Deviation
Drain	Furnish	1	12	3710.52	EA	40%
		2	16	3836.85	EA	
		3	8	2063.23	EA	
		4	10	3322.84	EA	
		6	27	7009.26	EA	

Bearings

Table 108 - Costs for Bridge Bearings – by Region

Component	Type	Action	Region	Instances	Cost, $	Cost Unit	Deviation
Bearing	Type I	Furnish	all	28	1005.63	EA	8%
			1	5	1891.40	EA	
			2	7	972.02	EA	
			3	1	1573.74	EA	
			4	3	709.60	EA	
			6	12	1060.51	EA	
Bearing	Type II	Furnish	all	3	1462.74	EA	13%
			2	1	1844.14	EA	
			4	1	1036.68	EA	
			6	1	1462.74	EA	
Bearing	Type II - Expansion	Furnish	all	16	2083.32	EA	11%
			1	1	3590.40	EA	
			2	1	1855.44	EA	
			3	2	4410.36	EA	
			6	12	2077.72	EA	
Bearing	Type III	Furnish	all	7	10927.13	EA	1%
			2	2	10917.21	EA	
			3	1	11638.20	EA	
			6	4	11201.00	EA	

Prestressed Concrete Superstructure

Table 109 - Costs for Prestressed Concrete Bridge Beams - by Region

Component	Material	Type	Action	Region	Instances	Cost, $	Cost Unit	Dev.
Superstructure	Prestressed Concrete	Box 1700	Furnish	6	1	322.92	FT	
Superstructure	Prestressed Concrete	Box 1725	Furnish	6	1	322.92	FT	
Superstructure	Prestressed Concrete	BT 1070	Furnish	all	6	172.46	FT	31%
				2	2	185.89	FT	
				3	1	164.37	FT	
				5	1	466.06	FT	
				6	2	80.92	FT	
Superstructure	Prestressed Concrete	BT 1600	Furnish	2	3	193.25	FT	
Superstructure	Prestressed Concrete	BT 1830	Furnish	all	13	211.68	FT	8%
				1	1	171.55	FT	
				2	1	211.68	FT	
				3	1	252.23	FT	
				4	3	194.72	FT	
				5	1	422.19	FT	
				6	6	218.88	FT	
Superstructure	Prestressed Concrete	BT 2130	Furnish	6	3	299.93	FT	
Superstructure	Prestressed Concrete	BT 42	Furnish	all	13	182.16	FT	12%
				1	1	202.57	FT	
				2	3	192.09	FT	
				3	1	199.79	FT	
				4	5	151.34	FT	
				5	1	441.49	FT	
				6	2	158.87	FT	
Superstructure	Prestressed Concrete	BT 54	Furnish	all	7	214.12	FT	9%
				1	2	193.76	FT	
				2	1	232.76	FT	
				4	1	233.47	FT	
				6	3	141.15	FT	
Superstructure	Prestressed Concrete	BT 63	Furnish	all	12	191.88	FT	3%
				1	4	187.61	FT	
				2	4	204.56	FT	
				3	1	233.24	FT	
				4	3	173.78	FT	
Superstructure	Prestressed Concrete	BT 72	Furnish	all	9	219.45	FT	6%
				1	1	179.01	FT	
				2	5	219.45	FT	
				3	2	236.18	FT	
				5	1	319.50	FT	

Component	Material	Type	Action	Region	Instances	Cost, $	Cost Unit	Dev.
Superstructure	Prestressed Concrete	BT 84	Furnish	all	3	191.40	FT	0.3%
				2	2	190.40	FT	
				6	1	191.40	FT	
Superstructure	Prestressed Concrete	G54	Furnish	1	1	164.62	FT	
Superstructure	Prestressed Concrete	spec	Furnish	6	2	223.93	FT	
Superstructure	Prestressed Concrete	U Girder	Furnish	all	9	618.77	FT	18%
				1	1	1578.10	FT	
				2	2	429.50	FT	
				6	5	618.78	FT	

Reinforced Concrete Culvert

Table 110 - Costs for Reinforced Concrete Culvert - by Region

Component	Material	Action	Region	Instances	Cost $	Cost Unit	Dev.
Culvert	Concrete	Furnish	all	14	1489.12	FT	17%
			1	1	1264.63	FT	
			2	2	3921.51	FT	
			3	4	1643.24	FT	
			4	4	1340.80	FT	
			5	3	1445.81	FT	

Task 10 – Inputs to Pontis Preservation Model

Inputs to Pontis BMS from Study 87-60 include transition probabilities for element deterioration, transition probabilities for improvements to elements after actions, types and costs of actions, and cost indices for years 1999 and later.

Work in Task 10 re-builds CDOT's bridge database to include new data on deterioration and costs, together with corrected values for elements and element-level condition data. Pontis 4.1 distribution offers a blank working database. Study 87-60 begins with this blank, renames it to *Study 87-60*, moves some tables from CDOT's *OnSys* database, edits other tables from CDOT's *OnSys* database and then moves them, and creates new tables for deterioration models, element-level actions, and costs of actions.

Study 87-60 Pontis Database

The bridge database for Study 87-60 has 155 bridge elements, 1157 combinations of elements, condition states and actions, 3,750 bridges, 21,480 inspection events and 236,189 records of element-level inspections. The database uses the same transition probabilities for all four service environments. The database for Study 87-60 has a single user, called *Pontis*. This affords full weight to elicitation data for the one user.

The database for Study 87-60 was assembled table by table using Pontis' data interchange facility. Table order is important. The first tables moved from CDOT's *OnSys* database are *bridge*, *elemdefs* and *costindx*. CDOT's *bridge* table is moved without change. CDOT's *elemdefs* table is edited to reduce the number of elements and to eliminate elements with data errors. Specifically, Pontis will optimize the preservation model with not more than 160 elements. CDOT's *OnSys* database has 198 elements. Elements can be defined with five or fewer condition states. Several CDOT elements are defined with 9 condition states. This may indicate an attempt to record NBI-compatible values as condition ratings. The deleted elements are listed in Table 112. An updated version of the *costindx* table extends inflation factors from 1999 to 2017 using the costs indexes of the US Army Corps of Engineers [*Civil* 2010].

Tables for *roadway*, *inspevnt* and *mrractdf* are input next. MRR actions for Study 87-60 are listed in Table 111. Tables for *eleminsp*, *expactc*, *expactn*, *expcndu* and *expcnduc* are input after that. The *eleminsp* table is edited to correct element quantities that are in US customary units, instead of metric units. The correction of units in element-level condition reports is performed in Task 4.

Expert Elicitation

Values of costs and transition probabilities computed in Study 87-60 are added to the Pontis database using the Pontis facility for expert elicitation. Data from elicitation can be entered using Pontis Data Interchange (PDI). Work in study 87-60 automates this process. Values for costs and for transition probabilities and collected into files in PDI format, and then imported to Pontis using the PDI facility. Data imported in this way are all associated with the single user called *Pontis*. When Pontis BMS is directed to use expert data only in the preservation model, the Study 87-60 values are used.

Pontis Data Interchange

The Pontis Data Interchange (PDI) facility is used to collect element, bridge, roadway and inspection data from CDOT's *OnSys* database and to load these data together with cost and deterioration data into the new database for Study 87-60.

The PDI facility can be difficult to use. PDI has no recovery operation if incoming data records have missing or ambiguous entries. On the first error, PDI aborts an entire transaction. If an entire data table is presented in one transaction (this is the default for PDI files generated by Pontis) then no records are transferred. Oddly, Pontis-generated files sometimes have errors, and won't import successfully. Work in Study 87-60 found that if each data record is presented as a separate transaction, errors are not avoided, but they are identified at specific locations in PDI files. This allows examination and correction of errors, and eventual successful import of all data.

Tables Created for Study 87-60 Bridge Database

A set of tables for transition probabilities, element-level actions, and costs of actions are created for the Study 87-60 database. Tables are named here. Listings for tables appear afterwards.

actypdfs – Identification of MRR actions (Table 113). Actions numbered 00 to 60 are developed in Study 87-60. Other actions are copied from CDOT's *OnSys* database.

expactc – Actions and unit costs of actions for all elements and condition states (Table 114).

expactn – Transition probabilities for deterioration and for actions for all elements and condition states (Table 115).

expenduc – Failure costs for all elements (Table 116).

expcondu – Expert weights.

mrractdf - Actions for all elements and condition states (Table 117).

Table 111 - Study 87-60 Actions for Elements

Action	Short Name	Long Name
0	Do Nothing	Do Nothing
11	Repair	Concrete - Class 1
12	Repair	Concrete - Class 2
13	Repair	Concrete - Class 3
14	Repair	Concrete + Asphalt
15	Repair	Concrete + Asphalt + Membrane
16	Repair	Prestressed Concrete
17	Repair	Steel
18	Repair	Timber
19	Repair	Other
21	Overlay	Asphalt

Action	Short Name	Long Name
22	Overlay	Asphalt + Membrane
23	Overlay	Concrete
31	Replace	Concrete
32	Replace	Prestressed Concrete
33	Replace	Joint
34	Replace	Railing
35	Replace	Bearing
36	Replace	Steel
37	Replace	Timber
38	Replace	Other

Table 112 - Deleted *OnSys* Elements

Element No.	Element Name
601	Foundation
602	Steel - Painted Monotubes
608	Concrete - Column
609	Concrete Caison
610	Anchor Bolts
611	Base Plate
612	Base Weld, Gusset Welds
613	Concrete Guard Railing Protection
614	Metal Guard Railing Protection
615	Steel - Fatigue
616	Steel Sign and Signal Str.-Bolted Splice Conn.-Pai
617	Steel Sign and Signal Str.-Bolted Splice Conn.-Unp
618	Steel Sign and Signal Str.-Welded. Conn.-Painted
619	Steel Sign and Signal Str.-Welded. Conn.-Unpainted
620	Column - Steel
621	Column - Prestressed Concrete
622	Column - Reinforced Concrete
623	unknown
624	unknown
625	unknown
626	unknown
627	unknown
630	Bolted Upper Connection and Splice
631	Welded Upper Connection and Splice
640	Frame/Mast Arm
650	Protective System - Paint

Element No.	Element Name
651	Protective System - Galvanizing
652	Protective System - Weathering Steel Patina
660	Guardrail Protection - Concrete
661	Guardrail Protection - Steel
662	Sign Lighting
663	Steel Catwalk
690	Traffic Impact - Signal Mast Arm or Sign Frame
691	Traffic Impact - Poles/Columns
692	Traffic Impact - Guardrail
693	Fatigue

Table 113 - actypdfs

tkey	atypenum	atypeshort	atypelong	atypcat	atypeelig	paircode
00	0	Do Nothing	Do Nothing	0	0	-1
11	11	Repair	Concrete Class 1	1	0	-1
12	12	Repair	Concrete Class 2	1	0	-1
13	13	Repair	Concrete Class 3	1	0	-1
14	14	Repair	Concrete + Asphalt	1	0	-1
15	15	Repair	Concrete + Asphalt + Membrane	1	0	-1
16	16	Repair	Prestressed Concrete	1	0	-1
17	17	Repair	Steel	1	0	-1
18	18	Repair	Timber	1	0	-1
19	19	Repair	Other	1	0	-1
21	21	Overlay	Asphalt	1	0	-1
22	22	Overlay	Asphalt + Membrane	2	0	-1
23	23	Overlay	Concrete	2	0	-1
24	24	Scour	Scour Remediation	2	0	-1
25	25	Seismic	Seismic Retrofit	2	0	-1
26	26	Fatigue	Fatigue Remediation	2	0	-1
31	31	Replace	Concrete	3	0	-1
32	32	Replace	Prestressed Concrete	3	0	-1
33	33	Replace	Joint	3	0	-1
34	34	Replace	Railing	3	0	-1
35	35	Replace	Bearing	3	0	-1
36	36	Replace	Steel	3	0	-1
37	37	Replace	Timber	3	0	-1
38	38	Replace	Other	3	0	-1
40	40	Furnish	Concrete	4	0	-1
43	43	Part Paint	Zone/ Partial paint	7	0	-1
41	41	Min Repair	Element Repair	4	0	-1
50	50	Crib	Temporary Cribbing	5	0	-1
60	60	App Sl & S	Appr Slab and Slope	4	0	-1

tkey	atypenum	atypeshort	atypelong	atypcat	atypeelig	paircode
-1	-1	Missing	Missing Value	0	0	-1
2	2	Signs	Sign Install & Repr	4	_	-1
20	20	Debri	Debri & Veg Control	4	_	-1
30	30	Railing	RAilin Rep & Repl	4	_	-1
51	51	Vis. Insp	Visual Inspection	6	_	-1
52	52	Cln & Wash	Cleaning and Washing	4	_	-1
53	53	Br Dk Rpr	Bridge Deck Repair	4	_	-1
54	54	Suprstr	Superstructure	4	_	-1
55	55	Cln & Pnt	Clean and Paint Br	4	_	-1
56	56	Curb & Rl	Curbs and Rail	4	_	-1
57	57	Bearings	Bearings	4	_	-1
58	58	Substr	Substructure	4	_	-1
6	6	App Sl & S	Appr Slab and Slp P	4	_	-1
64	64	Exp Jts	Expansion Joints	4	_	-1
98	98	Misc Br Wk	Misc Bridge Work	4	_	-1
99	99	Eng Wk	Mtc Requiring Eng.	4	_	-1

Table 114 – expactc (portion)

userkey	elemkey	envkey	skey	akey	unitcost
1	12	1	1	0	0
1	12	1	2	0	0
1	12	1	2	1	1.24
1	12	1	3	0	0
1	12	1	3	1	23
1	12	1	3	2	39
1	12	1	4	0	0
1	12	1	4	1	83
1	12	1	4	2	39
1	12	1	4	3	178
1	12	1	5	0	0
1	12	1	5	1	277
1	12	1	5	2	39
1	12	1	5	3	178
1	13	1	1	0	0.00
1	13	1	2	0	0.00
1	13	1	2	1	2.39
1	13	1	3	0	0.00
1	13	1	3	1	11.95
1	13	1	3	2	13.15
1	13	1	4	0	0.00
1	13	1	4	1	29.88
1	13	1	4	2	13.15
1	13	1	4	3	142.25
1	13	1	5	0	0.00

userkey	elemkey	envkey	skey	akey	unitcost
1	13	1	5	1	119.54
1	13	1	5	2	13.15
1	13	1	5	3	142.25

Table 115 - *expactn* (potion)

userkey	elemkey	envkey	skey	akey	prob1	prob2	prob3	prob4	prob5	medyears
1	12	1	1	0	87.06	12.94	0	0	0	5
1	12	1	2	0	0	95.76	4.24	0	0	16
1	12	1	2	1	50	50	0	0	0	-2
1	12	1	3	0	0	0	97.64	2.36	0	29
1	12	1	3	1	0	50	50	0	0	-2
1	12	1	3	2	0	50	50	0	0	-2
1	12	1	4	0	0	0	0	99.8	0.2	346
1	12	1	4	1	100	0	0	0	0	-2
1	12	1	4	2	100	0	0	0	0	-2
1	12	1	4	3	100	0	0	0	0	-2
1	12	1	5	0	0	0	0	0	96.59	20
1	12	1	5	1	0	0	100	0	0	-2
1	12	1	5	2	0	0	100	0	0	-2
1	12	1	5	3	100	0	0	0	0	-2
1	13	1	1	0	87.06	12.94	0	0	0	5
1	13	1	2	0	0	95.76	4.24	0	0	16
1	13	1	2	1	50	50	0	0	0	-2
1	13	1	3	0	0	0	97.64	2.36	0	29
1	13	1	3	1	0	50	50	0	0	-2
1	13	1	3	2	0	50	50	0	0	-2
1	13	1	4	0	0	0	0	99.8	0.2	346
1	13	1	4	1	100	0	0	0	0	-2
1	13	1	4	2	100	0	0	0	0	-2
1	13	1	4	3	100	0	0	0	0	-2
1	13	1	5	0	0	0	0	0	96.59	20
1	13	1	5	1	0	0	100	0	0	-2
1	13	1	5	2	0	0	100	0	0	-2
1	13	1	5	3	100	0	0	0	0	-2
1	14	1	1	0	87.06	12.94	0	0	0	5
1	14	1	2	0	0	95.76	4.24	0	0	16
1	14	1	2	1	100	0	0	0	0	-2
1	14	1	3	0	0	0	97.64	2.36	0	29
1	14	1	3	1	100	0	0	0	0	-2
1	14	1	3	2	100	0	0	0	0	-2
1	14	1	4	0	0	0	0	99.8	0.2	346
1	14	1	4	1	0	0	50	50	0	-2
1	14	1	4	2	0	0	50	50	0	-2

userkey	elemkey	envkey	skey	akey	prob1	prob2	prob3	prob4	prob5	medyears
1	14	1	4	3	100	0	0	0	0	-2
1	14	1	5	0	0	0	0	0	96.59	20
1	14	1	5	1	0	0	0	50	50	-2
1	14	1	5	2	0	0	0	50	50	-2
1	14	1	5	3	100	0	0	0	0	-2

Table 116 - expenduc (portion)

userkey	elemkey	envkey	weight	faliagcyco	failuserco	avgscale	eff_date
1	12	1	999	2770	2770	1	2009/01/01
1	13	1	999	1423	1423	1	2009/01/01
1	14	1	999	1614	1614	1	2009/01/01
1	35	1	999	2770	2770	1	2009/01/01
1	38	1	999	2770	2770	1	2009/01/01
1	36	1	999	1423	1423	1	2009/01/01
1	39	1	999	1423	1423	1	2009/01/01
1	40	1	999	1614	1614	1	2009/01/01

Table 117 - mrractdf (portion)

elemkey	skey	akey	tkey	modelflag	actnum	actshort	actlong	paintflag	wholeflag	notes
12	1	0	0	1	0	Do Nothing	Do Nothing	0	1	-1
12	2	0	0	1	0	Do Nothing	Do Nothing	0	1	-1
12	2	1	11	1	1	Repair	Repair Concrete Class 1	0	1	-1
12	3	0	0	1	0	Do Nothing	Do Nothing	0	1	-1
12	3	1	12	1	1	Repair	Repair Concrete Class 2	0	1	-1
12	3	2	23	1	2	Overlay	Overlay Concrete	0	1	-1
12	4	0	0	1	0	Do Nothing	Do Nothing	0	1	-1
12	4	1	13	1	1	Repair	Repair Concrete Class 3	0	1	-1
12	4	2	23	1	2	Overlay	Overlay Concrete	0	1	-1
12	4	3	31	1	3	Replace	Replace Concrete	0	1	-1
12	5	0	0	1	0	Do Nothing	Do Nothing	0	1	-1
12	5	1	13	1	1	Repair	Repair	0	1	-1

							Concrete Class 3			
12	5	2	23	1	2	Overlay	Overlay Concrete	0	1	-1
12	5	3	31	1	3	Replace	Replace Concrete	0	1	-1

Task 10 References

Civil 2010	*Civil Works Construction Cost Index System.* (2010). US Army Corps of Engineers, EM 1110-2-1304, 46p.

Task 11 – Element Improvement Probabilities

Probabilities for improvements to elements as a result of actions are computed in Task 11. The transition probabilities for improvements are computed from element-level condition reports before and after actions are taken. Improvement probabilities are assembled in the *expactn* table for import to Pontis BMS using the Pontis data interchange facility.

Method

Improvements to elements are computed from element-level condition data. Processing of condition histories reveals events in service life that include construction, demolition, modification, deterioration and repairs (see Task 4). Examples of *Repair* events for bridge elements are shown in Table 118.

Repair event are recognized as improvements to conditions of elements in consecutive reports of element-level conditions. Repair quantities are computed as

$$\{r\}_i = \{q\}_{i+1} - \{q\}_i$$

Where $\{q\}_i$ is the element-level condition report for inspection cycle i, $\{q\}_{i+1}$ is the element-level condition report for the next inspection cycle, and $\{r\}_i$ is a vector of differences in quantities between the two condition reports. The vector $\{r\}_i$ is identified as a repair if the sum of elements of the vector is zero, and if the leading non-zero element is positive.

Repair events are reported for pairs of condition states. Each vector $\{r\}_i$ has only two non-zero elements. When differences of condition reports $\{q\}_i$ and $\{q\}_{i+1}$ yield three or more non-zero elements, the differences are decomposed into two or more repair events, $\{r\}_i$, that are pairwise improvements to condition of elements.

Improvement probabilities are based on the quantity in the poor condition state that is repaired. The condition state is identified by the negative element in $\{r\}_i$. An example is provided. In Table 118, bridge A-15-A has repair to a painted steel beam. The condition reports and repair quantities are

$$\{q\}_{1999} = \begin{Bmatrix} 20 \\ 127 \\ 99 \\ 1 \\ 0 \end{Bmatrix} \qquad \{q\}_{2001} = \begin{Bmatrix} 20 \\ 180 \\ 46 \\ 1 \\ 0 \end{Bmatrix} \qquad \{r\}_{2001} = \begin{Bmatrix} 0 \\ 53 \\ -53 \\ 0 \\ 0 \end{Bmatrix}$$

The repair is applied to beam quantities in condition state 3. There are 99m of beam in condition state 3 when repairs are applied. The result of repair is a distribution of these 99m as 53m in condition state 2 and 46m in condition state 3. Improvement probabilities are computed with the initial quantity in condition state 3 as the basis. The improvement probabilities are

$$\{P\} = \begin{Bmatrix} 0 \\ 54 \\ 46 \\ 0 \\ 0 \end{Bmatrix}$$

Results

CDOT's condition data yield improvement probabilities for 71 elements and 148 element/condition state pairs (Table 119). Not all elements and condition states are represented. Missing entries are filled with values for similar elements. That is, unpainted steel elements are grouped, and values of improvement probabilities are shared; painted steel elements are grouped; prestressed concrete elements are grouped, etc. Some element/condition state pairs are absent from condition reports even after elements are examined by groups. For most absent values, improvement probabilities are assumed to be 50% of element quantity remaining in the initial condition state and 50% of element quantity improved by one condition states. For elements reported entirely in one condition state, as decks are, improvement probabilities are assumed to be 100% of element quantity improved by one condition state.

Table 118 - Repair Events for Bridge Elements

Bridge ID	Element	Element	Year	Event	Unit	Condition & Quantity				
						1	2	3	4	5
A-11-I	327	Culvert Wingwalls	2002	Condition	each	2	2			
			2004	*Repair*		1	-1			
				Condition		3	1			
				Improvement	pct	50	50			
A-15-A	107	Painted Steel Open Girder/Beam	1997	Condition	m	142	5	99	1	
			1999	*Det*		-122	122			
				Condition		20	127	99	1	
			2001	*Repair*			53	-53		
				Condition		20	180	46	1	
				Improvement	pct		54	46		
A-15-R	308	Construction/Non-Expansion Joint	1999	Condition	m		29.1			
			2001	*Repair*		29.1	-29.1			
				Condition		29.1				
				Improvement	pct	100	0			
A-15-U	215	Reinforced Conc Abutment	2003	Condition	m	18.7	2.1			
			2005	*Repair*		2.1	-2.1			
				Condition		20.8				
				Improvement	pct	100	0			
A-17-AB	321	Reinforced Conc Approach Slab w/ or w/o AC Ovly	2001	Condition	each	1	1			
			2002	*Repair*		1	-1			
				Condition		2				
				Improvement	pct	100	0			
A-17-AE	110	Reinforced Conc Open Girder/Beam	2001	Condition	m	99	3			
			2003	*Repair*		2.6	-2.6			
				Condition		101.6	0.4			
				Improvement	pct	89	13			

Table 119 - Transition Probabilities for Improvements

No	Name	Condition Before Repair	Improvement Probability, pct				
			1	2	3	4	5
12	Concrete Deck – Bare	2	100	0	0	0	0
		3	0	100	0	0	0
		4	100	0	0	0	0
		5	0	0	0	100	0
13	Concrete Deck - Unprotected w/ AC Overlay	4	100	0	0	0	0
		5	0	0	100	0	0
14	Concrete Deck - Protected w/ AC Overlay	2	100	0	0	0	0
		3	100	0	0	0	0
22	Concrete Deck - Protected w/ Rigid Overlay	2	100	0	0	0	0
		5	0	100	0	0	0
23	Concrete Deck - Bare Protected w/Coated Bars	2	100	0	0	0	0
		3	0	100	0	0	0
27	Concrete Deck - Protected w/ Cathodic System	2	100	0	0	0	0
30	Steel Deck - Corrugated/Orthotropic/Etc.	2	100	0	0	0	0
		3	0	100	0	0	0
		4	0	0	100	0	0
32	Timber Deck - w/ AC Overlay	2	100	0	0	0	0
		3	100	0	0	0	0
		4	0	100	0	0	0
60	Railroad Deck	2	100	0	0	0	0
		3	0	100	0	0	0
		4	0	0	100	0	0
101	Unpainted Steel Closed Web/Box Girder	3	85	0	15	0	0
		4	100	0	0	0	0
106	Unpainted Steel Open Girder/Beam	2	85	15	0	0	0
107	Painted Steel Open Girder/Beam	2	34	66	0	0	0
		3	0	54	46	0	0
		4	0	0	100	0	0
		5	0	0	0	80	20
109	P/S Conc Open Girder/Beam	2	100	0	0	0	0
		3	0	27	73	0	0
		4	80	0	0	20	0
110	Reinforced Conc Open Girder/Beam	2	90	10	0	0	0
		3	2	98	0	0	0
		4	61	39	0	0	0
111	Timber Open Girder/Beam	2	56	44	0	0	0
		3	94	0	6	0	0
		4	4	96	0	0	0
145	Other Arch	2	32	68	0	0	0
161	Painted Steel Pin and/or Pin and Hanger Assembly	2	100	0	0	0	0
		3	100	0	0	0	0
201	Unpainted Steel Column or Pile Extension	3	0	100	0	0	0
202	Painted Steel Column or Pile Extension	2	88	12	0	0	0
		3	100	0	0	0	0
		4	100	0	0	0	0
		5	0	0	0	50	50
205	Reinforced Conc Column or Pile Extension	2	100	0	0	0	0
		3	0	100	0	0	0
		4	100	0	0	0	0
206	Timber Column or Pile Extension	2	25	75	0	0	0
		3	89	0	11	0	0
		4	92	0	0	8	0
215	Reinforced Conc Abutment	2	100	0	0	0	0
		3	100	0	0	0	0
216	Timber Abutment	2	100	0	0	0	0
217	Other Material Abutment	2	100	0	0	0	0
		3	0	100	0	0	0
220	Reinforced Conc Submerged Pile Cap/Footing	2	50	50	0	0	0

No	Name	Condition Before Repair	Improvement Probability, pct				
			1	2	3	4	5
228	Timber Submerged Pile	2	17	83	0	0	0
230	Unpainted Steel Cap	2	100	0	0	0	0
231	Painted Steel Cap	2	100	0	0	0	0
		3	0	42	58	0	0
		4	70	0	0	30	0
234	Reinforced Conc Cap	4	100	0	0	0	0
		5	23	0	11	67	0
235	Timber Cap	3	30	0	70	0	0
		4	0	100	0	0	0
240	Unpainted Steel Culvert	2	62	38	0	0	0
		3	0	100	0	0	0
		4	100	0	0	0	0
241	Reinforced Concrete Culvert	2	81	19	0	0	0
		3	0	100	0	0	0
		4	72	6	0	21	0
243	Other Culvert	2	47	53	0	0	0
304	Open Expansion Joint	2	100	0	0	0	0
		3	100	0	0	0	0
		4	0	100	0	0	0
305	Elastomeric Flex-Type Joint	2	100	0	0	0	0
		3	0	4	96	0	0
		4	0	0	100	0	0
306	Asphaltic Plug Expansion Device	2	100	0	0	0	0
		3	100	0	0	0	0
310	Elastomeric Bearing	2	83	17	0	0	0
		3	0	100	0	0	0
311	Moveable Bearing (roller	3	0	100	0	0	0
313	Fixed Bearing	2	50	50	0	0	0
321	Reinforced Conc Approach Slab w/ or w/o AC Ovly	2	100	0	0	0	0
		3	100	0	0	0	0
		4	100	0	0	0	0
325	Slope	2	50	50	0	0	0
		3	0	100	0	0	0
		4	0	0	100	0	0
326	Bridge WIngwalls	2	100	0	0	0	0
		3	0	50	50	0	0
327	Culvert Wingwalls	2	50	50	0	0	0
		3	0	100	0	0	0
330	Metal Bridge Railing - Uncoated	3	100	0	0	0	0
331	Reinforced Conc Bridge Railing	2	100	0	0	0	0
		3	98	0	2	0	0
		4	100	0	0	0	0
332	Timber Bridge Railing	2	95	5	0	0	0
		3	100	0	0	0	0
		4	0	28	72	0	0
333	Other Bridge Railing	2	50	50	0	0	0
		3	0	21	79	0	0
334	Metal Bridge Railing - Coated	2	100	0	0	0	0
		3	100	0	0	0	0
		4	100	0	0	0	0
		5	0	0	48	0	52
336	Metal Curbs/Sidewalks - Coated	2	100	0	0	0	0
		3	100	0	0	0	0
338	Concrete Curbs/Sidewalks	2	100	0	0	0	0
		3	100	0	0	0	0
		4	100	0	0	0	0
339	Timber Curbs/Sidewalks	2	54	46	0	0	0
		3	0	19	81	0	0
		4	100	0	0	0	0
340	Concrete Coating (Superstructure)	2	100	0	0	0	0

No	Name	Condition Before Repair	Improvement Probability, pct				
			1	2	3	4	5
342	Sign Attachment to Bridge	2	100	0	0	0	0
		4	100	0	0	0	0
350	Tunnel (Formed Concrete Lined)	2	100	0	0	0	0
		3	100	0	0	0	0
351	Tunnel (Unlined/Unsupported)	2	100	0	0	0	0
		4	0	82	0	18	0
355	Steel Diaphragms Smart Flag	2	100	0	0	0	0
356	Steel Fatigue	3	100	0	0	0	0
357	Pack Rust	3	0	50	50	0	0
358	Deck Cracking	2	100	0	0	0	0
		3	100	0	0	0	0
359	Soffit of Concrete Deck or Slab	4	0	0	100	0	0
		5	0	0	0	100	0
360	Settlement	3	100	0	0	0	0
361	Scour	2	100	0	0	0	0
361	Scour	3	100	0	0	0	0
362	Traffic Impact	2	100	0	0	0	0
		3	22	0	78	0	0
370	Traffic Impact (Substructure) Smart Flag	2	100	0	0	0	0
371	Traffic Impact (Deck) Smart Flag	2	100	0	0	0	0
		3	55	0	45	0	0
399	Alkali-Silica Reactivity (ASR) Smart Flag	3	100	0	0	0	0
		4	0	20	0	80	0
		5	0	0	0	6	94
501	Channel Condition	2	100	0	0	0	0
		3	100	0	0	0	0
		4	100	0	0	0	0
510	Waterway Adequacy	3	100	0	0	0	0
520	Approach Roadway Alignment	2	100	0	0	0	0
600	General Remarks	2	100	0	0	0	0

Task 12 – Run Pontis Scenarios

The Pontis preservation model is operated with element costs and transition probabilities developed from CDOT data. Work in Task 12 operates Pontis to obtain results for bridge preservation, and reports the Pontis outcomes.

Actions for Preservation

The version of CDOT's bridge database created in Study 87-60 applies three actions to most elements. These are *Do Nothing*, *Repair* and *Replace*. Deck elements have at least four actions. These are *Do Nothing*, *Repair*, *Overlay* and *Replace*. Reinforced concrete decks have six actions: *Do Nothing*, *Repair Class 1*, *Repair Class 2*, *Repair Class 3* and *Replace*. Repair actions are adapted to the type of construction material. Overlay actions are adapted to various bare decks, asphalt-covered decks, membrane + asphalt decks, and decks with rigid overlays. Examples of systems of actions and condition states are listed in Table 121.

Costs for Actions

Costs for actions are computed from CDOT bid tabulations and are adjusted for use in Pontis. Costs for repair and overlay actions for decks are scaled to the defined level of damage for each condition state. Repair costs for steel elements and prestressed elements, other than decks, are estimated as a portion of replacement costs. Costs for approach slabs are collected from bid tabulations on *area* basis and converted to *each* basis using a representative size of approach. Costs for replacement of bridge substructures are estimated as a portion of new bridge costs. Failure costs are set one order of magnitude greater that the largest action cost for each element.

Transition Probabilities

Transition probabilities for deterioration of bridge elements are computed from element-level condition records in Task 5. Some transition probabilities are modified for use in the Pontis preservation model. A maximum value for transition probabilities in poorest condition states is set at 0.966, a value that gives a 20-year median duration of an element in poorest condition.

Transition probabilities for improvements to elements are computed from element-level condition records in Task 11, and used in the Pontis preservation model without modification.

Outcomes of Pontis' Preservation Model

The outcomes of the Pontis preservation model are shown in three tables. Table 122 shows the interventions recommended by Pontis for bridge elements. An intervention is an action for maintenance, repair or replacement of bridge elements.

Table 122 lists 171 interventions recommended by Pontis for 127 bridge elements (smart flags, and work-completion elements are not counted among bridge elements). For 97 bridge elements, Pontis recommends interventions only for the poorest condition state. For 91 bridge elements, replacement is the only recommended intervention, and it is recommended only in the poorest condition state.

Interventions are recommended for 17 elements at condition state 2 and for 31 elements at condition state 3 (some elements are in both groups).

Table 124 lists recommended actions for all elements and condition states, together with transition probabilities, improvement probabilities, costs and optimum quantities for elements in condition states. The *Do Nothing* action is recommended for two-thirds of all element/condition state pairs. Optimum conditions for elements are listed for groups of elements in Table 120. The preservation model would place a third of all elements at condition state 3 or poorer. For deck elements, more than 40% would be at condition 3 or poorer. For substructure elements, seventy-five percent would be at condition state 3 or poorer.

Table 125 lists detailed outputs of the Pontis preservation model.

Table 120 - Element Conditions from Preservation Model

	Condition Percent				
	1	**2**	**3**	**4**	**5**
All elements	29	35	29	6	1
Deck elements	56	4	22	19	0
Superstructure	31	43	23	0	3
Substructure	7	18	68	7	0
Joint	11	89	0	0	0
Bearing	0	100	0	0	0
Railing	40	60	0	0	0

Table 121 - Elements, Conditions and Actions

Element	Condition	Action	Action Type	Action
12	1	0	0	Do Nothing
	2	0	0	Do Nothing
		1	11	Repair Concrete Class 1
	3	0	0	Do Nothing
		1	12	Repair Concrete Class 2
		2	23	Overlay Concrete
	4	0	0	Do Nothing
		1	13	Repair Concrete Class 3
		2	23	Overlay Concrete
		3	31	Replace Concrete
	5	0	0	Do Nothing
		1	13	Repair Concrete Class 3
		2	23	Overlay Concrete
		3	31	Replace Concrete
14	1	0	0	Do Nothing
	2	0	0	Do Nothing
		1	15	Repair Concrete + Asphalt + Membrane
	3	0	0	Do Nothing

Element	Condition	Action	Action Type	Action
		1	15	Repair Concrete + Asphalt + Membrane
		2	22	Overlay Asphalt + Membrane
	4	0	0	Do Nothing
		1	15	Repair Concrete + Asphalt + Membrane
		2	22	Overlay Asphalt + Membrane
		3	31	Replace Concrete
	5	0	0	Do Nothing
		1	15	Repair Concrete + Asphalt + Membrane
		2	22	Overlay Asphalt + Membrane
		3	31	Replace Concrete
104	1	0	0	Do Nothing
	2	0	0	Do Nothing
		1	16	Repair Prestressed Concrete
	3	0	0	Do Nothing
		1	16	Repair Prestressed Concrete
		2	32	Replace Prestressed Concrete
	4	0	0	Do Nothing
		1	16	Repair Prestressed Concrete
		2	32	Replace Prestressed Concrete

Table 122 -Actions Recommend by Pontis Preservation Model

	Element	Condition		Action	Poorest State?
12	Concrete Deck - Bare sq.m.	5	Distress over 25%	Overlay Concrete	Y
13	Concrete Deck - Unprotected w/ AC Overlay sq.m.	5	Distress over 25%	Overlay Asphalt	Y
14	Concrete Deck - Protected w/ AC Overlay sq.m.	5	Distress over 25%	Overlay Asphalt + Membrane	Y
18	Concrete Deck - Protected w/ Thin Overlay sq.m.	2	Distress <= 2%	Repair Concrete Class 1	
		3	2-10% distress	Repair Concrete Class 2	
		5	Distress over 25%	Overlay Concrete	Y
22	Concrete Deck - Protected w/ Rigid Overlay sq.m.	5	Distress over 25%	Overlay Concrete	Y
23	Concrete Deck - Bare Protected w/Coated Bars sq.m.	5	Distress over 25%	Overlay Concrete	Y
24	Conc Deck w/ Thin (<1 inch) Overlay, Coated Bars sq.m.	2	Distress <= 2%	Repair Concrete Class 1	
		3	2-10% distress	Repair Concrete Class 2	
		5	Distress over 25%	Overlay Concrete	Y
25	Concrete Deck - Rigid Overlay Protected w/Coated Bar sq.m.	4	Distress 10-25%	Overlay Concrete	
		5	Distress over 25%	Overlay Concrete	Y
26	Concrete Deck - Protected w/ Coated Bars sq.m.	5	Distress over 25%	Overlay Concrete	Y
27	Concrete Deck - Protected w/ Cathodic System sq.m.	3	2 to 10% distress	Repair Concrete Class 2	
		5	Distress over 25%	Overlay Concrete	Y
28	Steel Deck - Open Grid sq.m.	2	Minor deterioration	Repair Steel	
		3	Rust formation	Repair Steel	
		5	Advanced corrosion	Replace Steel	Y
29	Steel Deck - Concrete Filled Grid sq.m.	5	Advanced corrosion	Replace Steel	Y
30	Steel Deck - Corrugated/ Orthotropic /Etc. Sq.m.	5	Major section loss	Replace Steel	Y
31	Timber Deck – Bare sq.m.	4	Major strength loss	Repair Timber	Y
32	Timber Deck - w/ AC Overlay sq.m.	4	Major strength loss	Overlay Asphalt	Y
35	Precast Panel Concrete Deck - Bare sq.m.	5	Distress over 25%	Overlay Concrete	Y
36	Precast Panel Concrete Deck w/ AC Overlay sq.m.	5	Distress over 25%	Overlay Asphalt	Y
38	Concrete Slab - Bare sq.m.	5	Distress over 25%	Overlay Concrete	Y
39	Concrete Slab - Unprotected w/ AC Overlay sq.m.	5	Distress over 25%	Overlay Asphalt	Y
40	Concrete Slab Protected w/ AC Overlay sq.m.	5	Distress over 25%	Overlay Asphalt + Membrane	Y

	Element	Condition		Action	Poorest State?
44	Concrete Slab - Protected w/ Thin Overlay sq.m.	2	Distress under 2%	Repair Concrete Class 1	
		3	2-10% distress	Repair Concrete Class 2	
		5	Distress over 25%	Overlay Concrete	Y
48	Concrete Slab - Protected w/ Rigid Overlay sq.m.	2	Distress under 2%	Repair Concrete Class 1	
		3	2-10% distress	Repair Concrete Class 2	
		5	Distress over 25%	Overlay Concrete	Y
52	Concrete Slab - Protected w/ Coated Bars sq.m.	5	Distress over 25%	Overlay Concrete	Y
53	Concrete Slab - Protected w/ Cathodic System sq.m.	2	Distress under 2%	Repair Concrete Class 1	
		3	2-10% distress	Repair Concrete Class 2	
		5	Distress over 25%	Overlay Concrete	Y
54	Timber Slab sq.m.	3	Some strength loss	Replace Timber	
		4	Major strength loss	Repair Timber	Y
55	Timber Slab - w/ AC Overlay sq.m.	4	Major strength loss	Overlay Asphalt	Y
60	Railroad Deck ea.	4	Analysis warranted	Repair Other	
		5	Service impacted	Replace Other	Y
101	Unpainted Steel Closed Web/Box Girder m.	4	Major section loss	Repair Steel	Y
102	Painted Steel Closed Web/Box Girder m.	5	Section loss	Replace Steel	Y
104	P/S Conc Closed Web/Box Girder m.	4	Analysis warranted	Replace Prestressed Concrete	Y
105	Reinforced Concrete Closed Webs/Box Girder m.	3	Delams/spalls	Repair Concrete Class 2	
		4	Analysis warranted	Replace Concrete	Y
106	Unpainted Steel Open Girder/ Beam m.	4	Major section loss	Replace Steel	Y
107	Painted Steel Open Girder/ Beam m.	4	Active corrosion	Repair Steel	
		5	Section loss	Replace Steel	Y
109	P/S Conc Open Girder/Beam m.	4	Analysis warranted	Repair Prestressed Concrete	Y
110	Reinforced Conc Open Girder/ Beam m.	3	Delams/spalls	Repair Concrete Class 2	
		4	Analysis warranted	Repair Concrete Class 3	Y
111	Timber Open Girder/ Beam m.	3	Some strength loss	Repair Timber	
		4	Major strength loss	Repair Timber	Y
112	Unpainted. Steel Stringer m	4	Major section loss	Replace Steel	Y
113	Painted Steel Stringer m.	5	Section loss	Replace Steel	Y
115	P/S Conc Stringer m.	3	Delams/spalls	Repair Prestressed Concrete	
		4	Analysis warranted	Replace Prestressed Concrete	Y
116	Reinforced Conc Stringer m.	2	Minor cracks/spalls	Repair Concrete Class 1	
		3	Delams/spalls	Repair Concrete Class 2	
		4	Analysis warranted	Replace Concrete	Y
117	Timber Stringer m.	4	Major strength loss	Replace Timber	Y
120	Unpainted Steel Bottom Chord Thru Truss m.	4	Major section loss	Replace Steel	Y
121	Painted Steel Bottom Chord Thru Truss m.	5	Section loss	Replace Steel	Y
125	Unpainted Steel Thru Truss (excl. bottom chord) m.	4	Major section loss	Replace Steel	Y
126	Painted Steel Thru Truss (excl. bottom chord m.	5	Section loss	Replace Steel	Y
130	Unpainted Steel Deck Truss m.	2	Minor corrosion	Repair Steel	
		3	Some section loss	Repair Steel	
		4	Major section loss	Replace Steel	Y
131	Painted Steel Deck Truss m.	5	Section loss	Replace Steel	Y
135	Timber Truss/Arch m.	2	Minor decay	Repair Timber	
		3	Some strength loss	Repair Timber	
		4	Major strength loss	Replace Timber	Y
140	Unpainted Steel Arch m.	4	Major section loss	Replace Steel	Y
141	Painted Steel Arch m.	5	Section loss	Replace Steel	Y
143	P/S Conc Arch m.	3	Delams/spalls	Repair Prestressed Concrete	
		4	Analysis warranted	Replace Prestressed Concrete	Y
144	Reinforced Conc Arch m.	3	Delams/spalls	Repair Concrete Class 2	
		4	Analysis warranted	Replace Concrete	Y
145	Other Arch m.	2	Minor deterioration	Repair Other	

	Element	Condition		Action	Poorest State?
		3	Moderate deteriorati	Repair Other	
		4	Major deterioration	Replace Other	Y
146	Cable - Uncoated (not embedded in concrete) m.	2	Surface rust	Repair Steel	
		3	Moderate deteriorati	Repair Steel	
		4	Analysis warranted	Replace Steel	Y
147	Cable - Coated (not embedded in concrete) m.	3	Rust prevalent	Repair Steel	
		4	Active corrosion	Repair Steel	
		5	Analysis warranted	Replace Steel	Y
151	Unpainted Steel Floor Beam m.	4	Major section loss	Replace Steel	Y
152	Painted Steel Floor Beam m.	5	Section loss	Replace Steel	Y
154	P/S Conc Floor Beam m.	3	Delams/spalls	Repair Prestressed Concrete	
		4	Analysis warranted	Replace Prestressed Concrete	Y
155	Reinforced Conc Floor Beam m.	3	Delams/spalls	Repair Concrete Class 2	
		4	Analysis warranted	Replace Concrete	Y
156	Timber Floor Beam m.	4	Major strength loss	Replace Timber	Y
160	Unpainted Steel Pin and/or Pin and Hanger Assembly ea	3	Some section loss	Repair Steel	
		4	Major section loss	Replace Steel	Y
161	Painted Steel Pin and/or Pin and Hanger Assembly ea				
201	Unpainted Steel Column or Pile Extension ea	4	Major section loss	Replace Steel	Y
202	Painted Steel Column or Pile Extension ea.	5	Section loss	Replace Steel	Y
204	P/S Conc Column or Pile Extension	4	Analysis warranted	Replace Prestressed Concrete	Y
205	Reinforced Conc Column or Pile Extension ea	4	Analysis warranted	Repair Concrete Class 3	Y
206	Timber Column or Pile Extension ea	4	Major strength loss	Repair Timber	Y
210	Reinforced Conc Pier Wall km.	4	Analysis warranted	Replace Concrete	Y
211	Other Material Pier Wall m.	4	Major deterioration	Replace Other	Y
215	Reinforced Conc Abutment m.	4	Analysis warranted	Replace Concrete	Y
216	Timber Abutment m.	4	Major strength loss	Replace Timber	Y
217	Other Material Abutment m.	4	Major deterioration	Replace Other	Y
220	Reinforced Conc Submerged Pile Cap/Footing ea	4	Analysis warranted	Replace Concrete	Y
221	Reinforced Conc Pile Cap/Footing ea	4	Analysis warranted	Replace Concrete	Y
225	Unpainted Steel Submerged Pile ea	4	Major section loss	Replace Steel	Y
226	P/S Conc Submerged Pile ea	4	Analysis warranted	Replace Prestressed Concrete	Y
227	Reinforced Conc Submerged Pile ea	4	Analysis warranted	Replace Concrete	Y
228	Timber Submerged Pile ea	4	Major strength loss	Replace Timber	Y
230	Unpainted Steel Cap m.	4	Major section loss	Replace Steel	Y
231	Painted Steel Cap m.	5	Section loss	Replace Steel	Y
233	P/S Conc Cap m.	4	Analysis warranted	Replace Prestressed Concrete	Y
234	Reinforced Conc Cap m.	4	Analysis warranted	Repair Concrete Class 3	Y
235	Timber Cap m.	4	Major strength loss	Repair Timber	Y
240	Unpainted Steel Culvert m.	4	Major corrosion	Repair Steel	Y
241	Reinforced Concrete Culvert	4	Major deterioration	Repair Concrete Class 3	Y
242	Timber Culvert m.	4	Major deterioration	Replace Timber	Y
243	Other Culvert m.	4	Major deterioration	Replace Other	Y
300	Strip Seal Expansion Joint m.	3	Major leakage	Repair Other	Y
301	Pourable Joint Seal m.	3	Leakage problems	Repair Other	Y
302	Compression Joint Seal m.	3	Major deterioration	Repair Other	Y
303	Assembly Joint/Seal	3	Advanced corrosion	Repair Other	Y
304	Open Expansion Joint m.	3	Advanced corrosion	Repair Other	Y
305	Elastomeric Flex-Type Joint m.	3	Signs of failure	Replace Other	Y
306	Asphaltic Plug Expansion Device m.	3	Failed	Repair Other	Y
307	Modular Expansion Joint m.	3	Failure	Repair Other	Y
308	Construction/Non-Expansion Joint m.	3	Major deterioration	Repair Other	Y
309	Elastomeric Bearing with Teflon ea	3	Major deterioration	Replace Other	Y
310	Elastomeric Bearing ea	3	Major deterioration	Repair Other	Y
311	Moveable Bearing (roller, sliding, etc.) ea	3	Advanced corrosion	Repair Other	Y

	Element	Condition		Action	Poorest State?
312	Enclosed/Concealed Bearing ea	3	Bearing failures	Replace Other	Y
313	Fixed Bearing ea	3	Advanced corrosion	Replace Other	Y
314	Pot Bearing ea	3	Advanced corrosion	Replace Other	Y
315	Disk Bearing ea	3	Advanced corrosion	Replace Other	Y
320	P/S Concrete Approach Slab w/ or w-o/AC Ovly ea	2	Minor cracks/spalls	Repair Prestressed Concrete	
		3	Major cracks/spalls	Repair Prestressed Concrete	
		4	Broken/Unstable	Replace Prestressed Concrete	Y
321	Reinforced Conc Approach Slab w/ or w/o AC Ovly ea	4	Broken/Unstable	Repair Concrete Class 3	Y
325	Slope, Slope Protection, Berms ea	3	Major damage	Repair Other	Y
326	Bridge Wingwalls ea	3	Major deterioration	Replace Concrete	Y
327	Culvert Wingwalls ea	3	Major deterioration	Repair Concrete Class 2	Y
330	Metal Bridge Railing - Uncoated m.	4	Section loss	Replace Other	Y
331	Reinforced Conc Bridge Railing m.	3	Delam/spalls pres	Repair Concrete Class 2	
		4	Analysis warranted	Repair Concrete Class 3	Y
332	Timber Bridge Railing m.	3	Some strength loss	Repair Timber	Y
333	Other Bridge Railing m.	3	Major deterioration	Replace Other	Y
334	Metal Bridge Railing - Coated m.	5	Analysis warranted	Replace Steel	Y
335	Culvert Headwalls ea	3	Heavy damage	Replace Concrete	Y
336	Metal Curbs/Sidewalks - Coated m.	5	Analysis warranted	Replace Steel	Y
337	Metal Curb/Sidewalk - Uncoated m.	4	Section loss	Replace Steel	Y
338	Concrete Curbs/Sidewalks m.	3	Delam/spalls pres	Repair Concrete Class 2	
		4	Analysis warranted	Repair Concrete Class 3	Y
339	Timber Curbs/Sidewalks m.	4	Advanced decay	Repair Timber	Y
340	Concrete Coating (Superstructure) ea.	3	Over 20% surf damage	Replace Other	Y
341	Substructure Concrete Coating ea	3	Over 20% surf damage	Replace Other	Y
342	Sign Attachment to Bridge ea	4	Severe deterioration	Repair Other	Y
343	Pole Attachment to Bridge ea	4	Severe deterioration	Replace Other	Y
350	Tunnel (Formed Concrete Lined) m.	4	Severe deterioration	Replace Concrete	Y
351	Tunnel (Unlined/Unsupported) m.	4	Severe deterioration	Repair Other	Y
352	Tunnel (Unlined/Supported) m.	2	Minor deterioration	Repair Other	
		3	Moderate deteriorati	Repair Other	
		4	Severe deterioration	Replace Other	Y
353	Tunnel (Shotcrete Lined) m.	4	Severe deterioration	Replace Concrete	Y
355	Steel Diaphragms Smart Flag ea	3	Ineffective	Replace Steel	Y
356	Steel Fatigue ea	3	Severe fatigue damag	Replace Steel	Y
357	Pack Rust ea	2	Minor pack rust	Repair Steel	
		3	Moderate pack rust	Repair Steel	
		4	Severe pack rust	Replace Steel	Y
358	Deck Cracking ea	4	Unsealed cracks exis	Replace Concrete	Y
359	Soffit of Concrete Deck or Slab ea	4	Soffit lt rust/spall	Replace Concrete	
360	Settlement ea	3	Sig settlement	Repair Other	Y
361	Scour ea	3	Scour serious	Repair Other	Y
362	Traffic Impact ea	3	Analysis warranted	Replace Other	Y
363	Section Loss ea	2	Sec loss OK	Repair Other	
		3	Analysis warranted	Repair Other	
		4	Load/serv affected	Replace Other	Y
370	Traffic Impact m.	3	Analysis warranted	Replace Other	Y
371	Traffic Impact (Deck) m.	3	Analysis warranted	Replace Other	Y
372	False Bent/Temporary Support ea	3	Foundation nonfunct.	Replace Other	Y
373	Substructure Pack Rust ea	2	Minor pack rust	Repair	
		3	Moderate pack rust	Repair	
380	Completed Deck Repair ea	1	Work Done		
381	Completed Superstructure Repair ea				
382	Cleaning and Painting of Bridge ea				
383	Rail Repair ea				

	Element	Condition		Action	Poorest State?
384	Bearing Repair ea				
385	Substructure Repair ea				
386	Approach Slab or Slope Protection Repair ea				
387	Expansion Joint Repair ea				
399	Alkali-Silica Reactivity (ASR)	2	Deck	Repair Concrete Class 1	
		3	Superstructure	Repair Concrete Class 2	
		5	Wingwalls	Replace Concrete	Y
501	Channel Condition ea				
502	Channel Prot. Material and Condition ea				
504	Bank Condition ea				
505	Debris ea				
510	Waterway Adequacy ea				
520	Approach Roadway Alignment ea				
530	Approach Guardrail Adequacy ea.				
600	General Remarks ea				

Table 123 - Optimum Conditions for Elements

No	Name	Condition		Opt Pct
12	Concrete Deck - Bare sq.m.	1	No damage	93.32
13	Concrete Deck - Unprotected w/ AC Overlay sq.m.	4	10-25% distress	92.02
14	Concrete Deck - Protected w/ AC Overlay sq.m.	4	10-25% distress	99.6
18	Concrete Deck - Protected w/ Thin Overlay sq.m.	1	No damage	99.86
22	Concrete Deck - Protected w/ Rigid Overlay sq.m.	3	Distress 2-10%	91.02
23	Concrete Deck - Bare Protected w/Coated Bars sq.m.	3	2 to 10 % distress	99.86
24	Conc Deck w/ Thin (<1 inch) Overlay, Coated Bars sq.m.	1	No damage	99.86
25	Concrete Deck - Rigid Overlay Protected w/Coated Bar sq.m.	3	Distress 2-10%	99.86
26	Concrete Deck - Protected w/ Coated Bars sq.m.	3	Distress 2-10%	99.86
27	Concrete Deck - Protected w/ Cathodic System sq.m.	1	No damage	99.93
28	Steel Deck - Open Grid sq.m.	1	No corrosion	88.18
29	Steel Deck - Concrete Filled Grid sq.m.	1	No corrosion	99.86
30	Steel Deck - Corrugated/ Orthotropic /Etc. Sq.m.	1	No deterioration	99.93
31	Timber Deck – Bare sq.m.	1	No decay	99.86
32	Timber Deck - w/ AC Overlay sq.m.	3	Some strength loss	73.36
35	Precast Panel Concrete Deck - Bare sq.m.	1	No damage	93.32
36	Precast Panel Concrete Deck w/ AC Overlay sq.m.	4	10-25% distress	99.6
38	Concrete Slab - Bare sq.m.	1	No damage	93.32
39	Concrete Slab - Unprotected w/ AC Overlay sq.m.	4	10-25% distress	99.6
40	Concrete Slab Protected w/ AC Overlay sq.m.	4	10-25% distress	99.6
44	Concrete Slab - Protected w/ Thin Overlay sq.m.	1	No damage	88.18
48	Concrete Slab - Protected w/ Rigid Overlay sq.m.	1	No damage	88.18
52	Concrete Slab - Protected w/ Coated Bars sq.m.	3	2-10% distress	99.86
53	Concrete Slab - Protected w/ Cathodic System sq.m.	1	No damage	88.18
54	Timber Slab sq.m.	2	Minor decay	48.38
55	Timber Slab - w/ AC Overlay sq.m.	1	No deterioration	84.13
60	Railroad Deck ea.	1	No distress	99.7
101	Unpainted Steel Closed Web/Box Girder m.	2	Minor corrosion	87.66
102	Painted Steel Closed Web/Box Girder m.	3	Rust formation	98.43
104	P/S Conc Closed Web/Box Girder m.	1	No deterioration	99.8
105	Reinforced Concrete Closed Webs/Box Girder m.	2	Minor cracks/spalls	99.21
106	Unpainted Steel Open Girder/ Beam m.	2	Minor corrosion	99.86
107	Painted Steel Open Girder/ Beam m.	3	Rust formation	99.21
109	P/S Conc Open Girder/Beam m.	1	No deterioration	99.9
110	Reinforced Conc Open Girder/ Beam m.	2	Minor cracks/spalls	95.79
111	Timber Open Girder/ Beam m.	1	No decay	57.26
112	Unpainted. Steel Stringer m	2	Minor corrosion	99.86
113	Painted Steel Stringer m.	3	Rust formation	98.43
115	P/S Conc Stringer m.	2	Minor cracks/spalls	88.18
116	Reinforced Conc Stringer m.	1	No deterioration	99.6

No	Name	Condition		Opt Pct
117	Timber Stringer m.	1	No decay	96.32
120	Unpainted Steel Bottom Chord Thru Truss m.	2	Minor corrosion	99.86
121	Painted Steel Bottom Chord Thru Truss m.	3	Rust formation	98.43
125	Unpainted Steel Thru Truss (excl. bottom chord) m.	2	Minor corrosion	99.86
126	Painted Steel Thru Truss (excl. bottom chord m.	3	Rust formation	98.43
130	Unpainted Steel Deck Truss m.	1	No corrosion	88.18
131	Painted Steel Deck Truss m.	3	Rust formation	98.43
135	Timber Truss/Arch m.	1	No decay	88.18
140	Unpainted Steel Arch m.	2	Minor corrosion	99.86
141	Painted Steel Arch m.	3	Rust formation	98.43
143	P/S Conc Arch m.	2	Minor cracks/spalls	88.18
144	Reinforced Conc Arch m.	2	Minor cracks/spalls	99.21
145	Other Arch m.	1	No deterioration	82.69
146	Cable - Uncoated (not embedded in concrete) m.	1	No corrosion	88.18
147	Cable - Coated (not embedded in concrete) m.	2	Surface rust forming	88.18
151	Unpainted Steel Floor Beam m.	2	Minor corrosion	99.86
152	Painted Steel Floor Beam m.	3	Rust formation	98.43
154	P/S Conc Floor Beam m.	2	Minor cracks/spalls	88.18
155	Reinforced Conc Floor Beam m.	2	Minor cracks/spalls	99.21
156	Timber Floor Beam m.	1	No decay	96.32
160	Unpainted Steel Pin and/or Pin and Hanger Assembly ea	1	No corrosion	99.86
161	Painted Steel Pin and/or Pin and Hanger Assembly ea	5	Section loss	100
201	Unpainted Steel Column or Pile Extension ea	3	Some section loss	97.5
202	Painted Steel Column or Pile Extension ea.	4	Active corrosion	63.42
204	P/S Conc Column or Pile Extension	3	Delams/spalls	32.61
205	Reinforced Conc Column or Pile Extension ea	3	Delams/spalls	68.01
206	Timber Column or Pile Extension ea	3	Some strength loss	89.2
210	Reinforced Conc Pier Wall km.	3	Delams/spalls	43.75
211	Other Material Pier Wall m.	3	Moderate deteriorati	93.72
215	Reinforced Conc Abutment m.	3	Delams/spalls	43.75
216	Timber Abutment m.	3	Some strength loss	76.86
217	Other Material Abutment m.	3	Moderate deteriorati	93.72
220	Reinforced Conc Submerged Pile Cap/Footing ea	1	No deterioration	97.89
221	Reinforced Conc Pile Cap/Footing ea	3	Delams/spalls	68.01
225	Unpainted Steel Submerged Pile ea	3	Surface pitting	97.5
226	P/S Conc Submerged Pile ea	3	Delams/spalls	32.61
227	Reinforced Conc Submerged Pile ea	3	Delams/spalls	32.61
228	Timber Submerged Pile ea	1	No decay	97.89
230	Unpainted Steel Cap m.	2	Rust formation	88.67
231	Painted Steel Cap m.	4	Active corrosion	49.51
233	P/S Conc Cap m.	2	Minor cracks/spalls	49.72
234	Reinforced Conc Cap m.	3	Delams/spalls	43.75
235	Timber Cap m.	3	Some strength loss	83.26
240	Unpainted Steel Culvert m.	3	Moderate corrosion	93.22
241	Reinforced Concrete Culvert	3	Moderate deteriorati	66.95
242	Timber Culvert m.	3	Moderate deteriorati	32.61
243	Other Culvert m.	3	Moderate deteriorati	96.73
300	Strip Seal Expansion Joint m.	2	Minor leakage	96.32
301	Pourable Joint Seal m.	2	Minor leakage	96.32
302	Compression Joint Seal m.	2	Minor deterioration	96.32
303	Assembly Joint/Seal	2	Minor deterioration	96.32
304	Open Expansion Joint m.	2	Minor deterioration	65.6
305	Elastomeric Flex-Type Joint m.	1	No deterioration	82.9
306	Asphaltic Plug Expansion Device m.	2	Significant damage	73.36
307	Modular Expansion Joint m.	2	Minor deterioration	96.32
308	Construction/Non-Expansion Joint m.	2	Minor deterioration	96.32
309	Elastomeric Bearing with Teflon ea	2	Minor deterioration	54.4
310	Elastomeric Bearing ea	2	Minor deterioration	54.4
311	Moveable Bearing (roller, sliding, etc.) ea	2	Minor deterioration	99.6
312	Enclosed/Concealed Bearing ea	2	Minor deterioration	48.38
313	Fixed Bearing ea	2	Minor deterioration	91.05

No	Name	Condition		Opt Pct
314	Pot Bearing ea	2	Minor deterioration	91.05
315	Disk Bearing ea	2	Minor deterioration	91.05
320	P/S Concrete Approach Slab w/ or w-o/AC Ovly ea	1	No deterioration	99.86
321	Reinforced Conc Approach Slab w/ or w/o AC Ovly ea	3	Major cracks/spalls	78.45
325	Slope, Slope Protection, Berms ea	2	Moderate damage	61.05
326	Bridge Wingwalls ea	2	Minor deterioration	76.24
327	Culvert Wingwalls ea	2	Moderate deteriorati	99.6
330	Metal Bridge Railing - Uncoated m.	2	Rust formation	96.68
331	Reinforced Conc Bridge Railing m.	1	No deterioration	98.8
332	Timber Bridge Railing m.	2	Minor decay	62.41
333	Other Bridge Railing m.	2	Minor cracks/spalls	77.56
334	Metal Bridge Railing - Coated m.	1	No corrosion	89.49
335	Culvert Headwalls ea	2	Moderate damage	78.7
336	Metal Curbs/Sidewalks - Coated m.	2	Surface rust forming	87.67
337	Metal Curb/Sidewalk - Uncoated m.	1	No corrosion	88.18
338	Concrete Curbs/Sidewalks m.	1	No deterioration	98.8
339	Timber Curbs/Sidewalks m.	3	Loss of strength	93.59
340	Concrete Coating (Superstructure) ea.	1	Under 5% surf damage	54.4
341	Substructure Concrete Coating ea	2	5-20% surf damage	87.67
342	Sign Attachment to Bridge ea	3	Moderate deteriorati	49.67
343	Pole Attachment to Bridge ea	3	Analysis warranted	49.67
350	Tunnel (Formed Concrete Lined) m.	2	Minor deterioration	99.39
351	Tunnel (Unlined/Unsupported) m.	1	Minimal deterioratio	99.93
352	Tunnel (Unlined/Supported) m.	1	Minimal deterioratio	88.18
353	Tunnel (Shotcrete Lined) m.	2	Minor deterioration	99.86

Table 124 - Summary of Pontis Results for Bridge Preservation

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
12	Concrete Deck - Bare sq.m.	1	No damage	>>0	Do Nothing		96.42	3.58				0.68	93.32	1,662.00	1,662.00
		2	Distress <= 2%	>>0	Do Nothing			50.00	50.00			1.64	6.68		
		3	2 to 10 % distress	>>0	Do Nothing				99.30	0.70		1.80			
		4	10 to 25% distress	>>0	Do Nothing					97.79	2.21	31.72			
		5	Distress over 25%	>>2	Overlay Concrete	39.00				50.00	50.00	103.31			
13	Concrete Deck - Unprotected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing		87.06	12.94				0.06		1,476.32	1,476.32
		2	Distress <= 2%	>>0	Do Nothing			95.76	4.24			0.08			
		3	2 to 10% distress	>>0	Do Nothing				97.64	2.36		0.17	7.80		
		4	10-25% distress	>>0	Do Nothing					99.30	0.70	0.53	92.02		
		5	Distress over 25%	>>2	Overlay Asphalt	13.64			100.00			13.80	0.18		
14	Concrete Deck - Protected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing		87.06	12.94				0.29		1,674.47	1,674.47
		2	Distress <= 2%	>>0	Do Nothing			95.76	4.24			0.40			
		3	2 to 10% distress	>>0	Do Nothing				97.64	2.36		0.88			
		4	10-25% distress	>>0	Do Nothing					99.30	0.70	2.73	99.60		
		5	Distress over 25%	>>2	Overlay Asphalt + Membrane	35.72				50.00	50.00	70.68	0.40		
18	Concrete Deck - Protected w/ Thin Overlay sq.m.	1	No damage	>>0	Do Nothing		99.93	0.07				0.03	99.86	2,873.78	2,873.78
		2	Distress <= 2%	>>1	Repair Concrete Class 1	1.29	50.00	50.00				2.49	0.14		
		3	2-10% distress	>>1	Repair Concrete Class 2	23.86		50.00	50.00			47.82			
		4	10-25% distress	>>0	Do Nothing					93.30	6.70	92.52			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	161.38			
22	Concrete Deck - Protected w/ Rigid Overlay sq.m.	1	No damage	>>0	Do Nothing		96.42	3.58				0.02		2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing			99.20	0.80			0.04	7.96		
		3	Distress 2-10%	>>0	Do Nothing				99.93	0.07		0.32	91.02		
		4	Distress 10-25%	>>0	Do Nothing					93.30	6.70	23.22	0.95		
		5	Distress over 25%	>>2	Overlay Concrete	40.46		100.00				40.50	0.06		
23	Concrete Deck - Bare Protected w/Coated Bars	1	No damage	>>0	Do Nothing		93.30	6.70						2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing			99.10	0.90						
		3	2 to 10 % distress	>>0	Do Nothing				99.93	0.07		0.01	99.86		
		4	10 to 25% distress	>>0	Do Nothing					99.93	0.07	1.08	0.14		
		5	Distress over 25%	>>2	Overlay	40.46				50.00	50.00	78.24			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	sq.m.				Concrete										
24	Conc Deck w/ Thin (<1 inch) Overlay, Coated Bars sq.m.	1	No damage	>>0	Do Nothing		99.93	0.07				0.03	99.86	2,873.78	2,873.78
		2	Distress <= 2%	>>1	Repair Concrete Class 1	1.29	50.00	50.00				2.49	0.14		
		3	2-10% distress	>>1	Repair Concrete Class 2	23.86		50.00	50.00			47.82			
		4	10-25% distress	>>0	Do Nothing					93.30	6.70	92.52			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	161.38			
25	Concrete Deck - Rigid Overlay Protected w/Coated Bar sq.m.	1	No damage	>>0	Do Nothing		96.42	3.58				0.06		2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing			99.20	0.80			0.15			
		3	Distress 2-10%	>>0	Do Nothing				99.93	0.07		1.08	99.86		
		4	Distress 10-25%	>>2	Overlay Concrete	40.46			50.00	50.00		78.24	0.14		
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	148.39			
26	Concrete Deck - Protected w/ Coated Bars sq.m.	1	No damage	>>0	Do Nothing		93.30	6.70						2,873.78	2,873.78
		2	Distress <=2%	>>0	Do Nothing			99.10	0.90						
		3	Distress 2-10%	>>0	Do Nothing				99.93	0.07		0.01	99.86		
		4	10-25% distress	>>0	Do Nothing					99.93	0.07	1.08	0.14		
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	78.24			
27	Concrete Deck - Protected w/ Cathodic System sq.m.	1	No damage	>>0	Do Nothing		99.93	0.07					99.93	2,873.78	2,873.78
		2	Distress <=2%	>>0	Do Nothing			99.93	0.07			0.64	0.07		
		3	2 to 10% distress	>>1	Repair Concrete Class 2	23.86		50.00	50.00			46.14			
		4	10-25% distress	>>0	Do Nothing					93.30	6.70	92.52			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	161.38			
28	Steel Deck - Open Grid sq.m.	1	No corrosion	>>0	Do Nothing		93.30	6.70				8.51	88.18	1,860.18	1,860.18
		2	Minor deterioration	>>1	Repair Steel	3.72	50.00	50.00				14.84	11.82		
		3	Rust formation	>>1	Repair Steel	18.60		50.00	50.00			49.00			
		4	Moderate corrosion	>>0	Do Nothing					93.30	6.70	111.29			
		5	Advanced corrosion	>>2	Replace Steel	186.03	100.00					194.13			
29	Steel	1	No corrosion	>>0	Do Nothing		99.93	0.07					99.86	1,860.18	1,860.18

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Deck - Concrete Filled Grid sq.m.	2	Minor deterioration	>>0	Do Nothing			84.09	15.91			0.68	0.14		
		3	Rust formation	>>0	Do Nothing				97.37	2.63		0.89			
		4	Failed connectors	>>0	Do Nothing					99.93	0.07	2.58			
		5	Advanced corrosion	>>2	Replace Steel	186.03	100.00					186.04			
30	Steel Deck - Corrugated/ Orthotropic /Etc. Sq.m.	1	No deterioration	>>0	Do Nothing		99.93	0.07					99.93	1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing			84.09	15.91			0.68	0.07		
		3	Rust formation	>>0	Do Nothing				97.37	2.63		0.89			
		4	Moderate deteriorati	>>0	Do Nothing					99.93	0.07	2.58			
		5	Major section loss	>>2	Replace Steel	186.03	100.00					186.04			
31	Timber Deck – Bare sq.m.	1	No decay	>>0	Do Nothing		99.93	0.07					99.86	1,860.18	1,860.18
		2	Minor decay	>>0	Do Nothing			93.30	6.70			0.71	0.14		
		3	Some strength loss	>>0	Do Nothing				99.93	0.07		1.24			
		4	Major strength loss	>>1	Repair Timber	46.51			50.00	50.00		89.93			
32	Timber Deck - w/ AC Overlay sq.m.	1	No deterioration	>>0	Do Nothing		90.57	9.43				1.94		1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing			93.30	6.70			2.96	24.97		
		3	Some strength loss	>>0	Do Nothing				97.72	2.28		5.16	73.36		
		4	Major strength loss	>>2	Overlay Asphalt	13.64		100.00				16.46	1.67		
35	Precast Panel Concrete Deck - Bare sq.m.	1	No damage	>>0	Do Nothing		96.42	3.58				0.71	93.32	2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing			50.00	50.00			1.70	6.68		
		3	2-10% distress	>>0	Do Nothing				99.70	0.30		1.87			
		4	10-25% distress	>>0	Do Nothing					97.79	2.21	32.91			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	107.18			
36	Precast Panel Concrete Deck w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing		87.06	12.94				0.11		1,476.32	1,476.32
		2	Distress <= 2%	>>0	Do Nothing			95.76	4.24			0.15			
		3	2 to 10% distress	>>0	Do Nothing				97.64	2.36		0.33			
		4	10-25% distress	>>0	Do Nothing					99.80	0.20	1.04	99.60		
		5	Distress over 25%	>>2	Overlay Asphalt	13.64				50.00	50.00	26.99	0.40		
38	Concrete Slab - Bare sq.m.	1	No damage	>>0	Do Nothing		96.42	3.58				0.71	93.32	2,873.78	2,873.78
		2	Distress <=2%	>>0	Do Nothing			50.00	50.00			1.70	6.68		
		3	2-10% distress	>>0	Do Nothing				99.70	0.30		1.87			
		4	10-25% distress	>>0	Do Nothing					97.79	2.21	32.91			
		5	Distress over 25%	>>2	Overlay	40.46				50.00	50.00	107.18			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Concrete										
39	Concrete Slab - Unprotected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing		87.06	12.94				0.11		1,476.32	1,476.32
		2	Distress under 2%	>>0	Do Nothing			95.76	4.24			0.15			
		3	2-10% distress	>>0	Do Nothing				97.64	2.36		0.33			
		4	10-25% distress	>>0	Do Nothing					99.80	0.20	1.04	99.60		
		5	Distress over 25%	>>2	Overlay Asphalt	13.64				50.00	50.00	26.99	0.40		
40	Concrete Slab Protected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing		87.06	12.94				0.29		1,674.47	1,674.47
		2	Distress under 2%	>>0	Do Nothing			95.76	4.24			0.40			
		3	2-10% distress	>>0	Do Nothing				97.64	2.36		0.88			
		4	10-25% distress	>>0	Do Nothing					99.80	0.20	2.73	99.60		
		5	Distress over 25%	>>2	Overlay Asphalt + Membrane	35.72				50.00	50.00	70.68	0.40		
44	Concrete Slab - Protected w/ Thin Overlay sq.m.	1	No damage	>>0	Do Nothing		93.30	6.70				2.95	88.18	2,873.78	2,873.78
		2	Distress under 2%	>>1	Repair Concrete Class 1	1.29	50.00	50.00				5.15	11.82		
		3	2-10% distress	>>1	Repair Concrete Class 2	23.86		50.00	50.00			50.23			
		4	10-25% distress	>>0	Do Nothing					93.30	6.70	92.52			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	161.38			
48	Concrete Slab - Protected w/ Rigid Overlay sq.m.	1	No damage	>>0	Do Nothing		93.30	6.70				2.95	88.18	2,873.78	2,873.78
		2	Distress under 2%	>>1	Repair Concrete Class 1	1.29	50.00	50.00				5.15	11.82		
		3	2-10% distress	>>1	Repair Concrete Class 2	23.86		50.00	50.00			50.23			
		4	10-25% distress	>>0	Do Nothing					93.30	6.70	92.52			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	161.38			
52	Concrete Slab - Protected w/ Coated Bars sq.m.	1	No damage	>>0	Do Nothing		93.30	6.70						2,873.78	2,873.78
		2	Distress under 2%	>>0	Do Nothing			99.10	0.90						
		3	2-10% distress	>>0	Do Nothing				99.93	0.07		0.01	99.86		
		4	10-25% distress	>>0	Do Nothing					99.93	0.07	1.08	0.14		
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	78.24			
53	Concrete Slab -	1	No damage	>>0	Do Nothing		93.30	6.70				2.95	88.18	2,873.78	2,873.78
		2	Distress under 2%	>>1	Repair	1.29	50.00	50.00				5.15	11.82		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Protected w/ Cathodic System sq.m.				Concrete Class 1										
		3	2-10% distress	>>1	Repair Concrete Class 2	23.86		50.00	50.00			50.23			
		4	10-25% distress	>>0	Do Nothing					93.30	6.70	92.52			
		5	Distress over 25%	>>2	Overlay Concrete	40.46				50.00	50.00	161.38			
54	Timber Slab sq.m.	1	No decay	>>0	Do Nothing		93.30	6.70				4.31	48.38		
		2	Minor decay	>>0	Do Nothing			93.30	6.70			7.51	48.38		
		3	Some strength loss	>>2	Replace Timber	9.00	100.00					13.10	3.24		
		4	Major strength loss	>>1	Repair Timber	46.51			50.00	50.00		100.72			
55	Timber Slab - w/ AC Overlay sq.m.	1	No deterioration	>>0	Do Nothing		90.57	9.43				4.29	84.13	1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing			93.30	6.70			6.55	15.87		
		3	Some strength loss	>>0	Do Nothing				97.72	2.28		11.43			
		4	Major strength loss	>>2	Overlay Asphalt	13.64			50.00	50.00		36.44			
60	Railroad Deck ea.	1	No distress	>>0	Do Nothing		99.70	0.30					99.70	1,276.08	1,276.08
		2	Minor distress	>>0	Do Nothing			99.93	0.07				0.30		
		3	Moderate distress	>>0	Do Nothing				99.93	0.07		0.30			
		4	Analysis warranted	>>1	Repair Other	21.29			100.00			21.57			
		5	Service impacted	>>2	Replace Other	127.73	100.00					127.73			
101	Unpainted Steel Closed Web/Box Girder m.	1	No corrosion	>>0	Do Nothing		99.50	0.50					12.27		
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.08	87.66		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		5.90	0.07		
		4	Major section loss	>>1	Repair Steel	426.49	100.00					426.50			
102	Painted Steel Closed Web/Box Girder m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		
		5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
104	P/S Conc Closed Web/Box	1	No deterioration	>>0	Do Nothing		99.90	0.10					99.80	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.93	0.07			0.48	0.20		
		3	Delams/spalls	>>0	Do Nothing				99.70	0.30		34.76			
		4	Analysis warranted	>>2	Replace	612.52	100.00					612.53			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Girder m.				Prestressed Concrete										
105	Reinforced Concrete Closed Webs/Box Girder m.	1	No deterioration	>>0	Do Nothing		99.80	0.20			0.24			6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.60	0.40		6.21		99.21		
		3	Delams/spalls	>>1	Repair Concrete Class 2	40.83		50.00	50.00		83.60		0.79		
		4	Analysis warranted	>>2	Replace Concrete	612.52	100.00				612.75				
106	Unpainted Steel Open Girder/ Beam m.	1	No corrosion	>>0	Do Nothing		99.50	0.50				0.01		6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.12	99.86		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		8.86	0.14		
		4	Major section loss	>>2	Replace Steel	639.74	100.00					639.75			
107	Painted Steel Open Girder/ Beam m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				2.51		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			5.45			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		16.97	99.21		
		4	Active corrosion	>>1	Repair Steel	106.62			100.00			122.79	0.79		
		5	Section loss	>>2	Replace Steel	639.74	100.00					642.13			
109	P/S Conc Open Girder/Beam m.	1	No deterioration	>>0	Do Nothing		99.90	0.10					99.90	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.93	0.07			0.40	0.10		
		3	Delams/spalls	>>0	Do Nothing				99.70	0.30		28.62			
		4	Analysis warranted	>>1	Repair Prestressed Concrete	408.35	80.00			20.00		504.45			
110	Reinforced Conc Open Girder/ Beam m.	1	No deterioration	>>0	Do Nothing		99.80	0.20				0.13	3.83	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.60	0.40			3.26	95.79		
		3	Delams/spalls	>>1	Repair Concrete Class 2	40.83	2.00	98.00				43.87	0.38		
		4	Analysis warranted	>>1	Repair Concrete Class 3	408.35	61.00	39.00				409.63			
111	Timber Open Girder/ Beam m.	1	No decay	>>0	Do Nothing		98.09	1.91				2.37	57.26	1,276.08	1,276.08
		2	Minor decay	>>0	Do Nothing			97.37	2.63			8.58	41.58		
		3	Some strength loss	>>1	Repair Timber	21.29	94.00		6.00			24.84	1.16		
		4	Major strength loss	>>1	Repair Timber	85.16	4.00	96.00				93.09			
112	Unpainted.	1	No corrosion	>>0	Do Nothing		99.50	0.50				0.01		6,432.30	6,432.30

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Steel Stringer m	2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.12	99.86		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		8.86	0.14		
		4	Major section loss	>>2	Replace Steel	639.74	100.00					639.75			
113	Painted Steel Stringer m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		
		5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
115	P/S Conc Stringer m.	1	No deterioration	>>0	Do Nothing		93.30	6.70				53.52		6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			93.36	88.18		
		3	Delams/spalls	>>1	Repair Prestressed Concrete	40.83		50.00	50.00			162.85	11.82		
		4	Analysis warranted	>>2	Replace Prestressed Concrete	612.52	100.00					663.50			
116	Reinforced Conc Stringer m.	1	No deterioration	>>0	Do Nothing		99.80	0.20				0.17	99.60	6,121.06	6,121.06
				>>1	Repair Concrete Class 1	2.26	50.00	50.00				4.47			
		3	Delams/spalls	>>1	Repair Concrete Class 2	40.83		50.00	50.00			82.02			
		4	Analysis warranted	>>2	Replace Concrete	612.52	100.00					612.68			
117	Timber Stringer m.	1	No decay	>>0	Do Nothing		98.09	1.91				4.85	96.32	1,276.08	1,276.08
		2	Minor decay	>>0	Do Nothing			97.37	2.63			17.52	3.68		
		3	Some strength loss	>>0	Do Nothing				96.90	3.10		50.74			
		4	Major strength loss	>>2	Replace Timber	127.73	100.00					132.35			
120	Unpainted Steel Bottom Chord Thru Truss m.	1	No corrosion	>>0	Do Nothing		99.50	0.50				0.01		6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.12	99.86		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		8.86	0.14		
		4	Major section loss	>>2	Replace Steel	639.74	100.00					639.75			
121	Painted Steel Bottom Chord	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Thru Truss m.	5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
125	Unpainted Steel Thru Truss (excl. bottom chord) m.	1	No corrosion	>>0	Do Nothing		99.50	0.50				0.01		6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.12	99.86		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		8.86	0.14		
		4	Major section loss	>>2	Replace Steel	639.74	100.00					639.75			
126	Painted Steel Thru Truss (excl. bottom chord m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		
		5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
130	Unpainted Steel Deck Truss m.	1	No corrosion	>>0	Do Nothing		93.30	6.70				97.52	88.18	6,432.30	6,432.30
		2	Minor corrosion	>>1	Repair Steel	42.65	50.00	50.00				170.11	11.82		
		3	Some section loss	>>1	Repair Steel	106.62		50.00	50.00			358.25			
		4	Major section loss	>>2	Replace Steel	639.74	100.00					732.63			
131	Painted Steel Deck Truss m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		
		5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
135	Timber Truss/Arch m.	1	No decay	>>0	Do Nothing		93.30	6.70				19.48	88.18	1,276.08	1,276.08
		2	Minor decay	>>1	Repair Timber	8.52	50.00	50.00				33.98	11.82		
		3	Some strength loss	>>1	Repair Timber	21.29		50.00	50.00			71.55			
		4	Major strength loss	>>2	Replace Timber	127.73	100.00					146.29			
140	Unpainted Steel Arch m.	1	No corrosion	>>0	Do Nothing		99.50	0.50				0.01		6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.12	99.86		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		8.86	0.14		
		4	Major section loss	>>2	Replace	639.74	100.00					639.75			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Steel										
141	Painted Steel Arch m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		
		5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
143	P/S Conc Arch m.	1	No deterioration	>>0	Do Nothing		93.30	6.70				53.52		6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			93.36	88.18		
		3	Delams/spalls	>>1	Repair Prestressed Concrete	40.83		50.00	50.00			162.85	11.82		
		4	Analysis warranted	>>2	Replace Prestressed Concrete	612.52	100.00					663.50			
144	Reinforced Conc Arch m.	1	No deterioration	>>0	Do Nothing		99.80	0.20				0.24		6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.60	0.40			6.21	99.21		
		3	Delams/spalls	>>1	Repair Concrete Class 2	40.83		50.00	50.00			83.60	0.79		
		4	Analysis warranted	>>2	Replace Concrete	612.52	100.00					612.75			
145	Other Arch m.	1	No deterioration	>>0	Do Nothing		93.30	6.70				27.51	82.69	1,276.08	1,276.08
		2	Minor deterioration	>>1	Repair Other	8.52	32.00	68.00				47.98	17.31		
		3	Moderate deteriorati	>>1	Repair Other	21.29		50.00	50.00			84.28			
		4	Major deterioration	>>2	Replace Other	127.73	100.00					153.93			
146	Cable - Uncoated (not embedded in concrete) m.	1	No corrosion	>>0	Do Nothing		93.30	6.70				97.52	88.18	6,432.30	6,432.30
		2	Surface rust	>>1	Repair Steel	42.65	50.00	50.00				170.11	11.82		
		3	Moderate deteriorati	>>1	Repair Steel	106.62		50.00	50.00			358.25			
		4	Analysis warranted	>>2	Replace Steel	639.74	100.00					732.63			
147	Cable - Coated (not embedded in concrete) m.	1	No corrosion	>>0	Do Nothing		93.30	6.70				55.91		6,432.30	6,432.30
		2	Surface rust forming	>>0	Do Nothing			93.30	6.70			97.52	88.18		
		3	Rust prevalent	>>1	Repair Steel	42.65		50.00	50.00			170.11	11.82		
		4	Active corrosion	>>1	Repair Steel	106.62			50.00	50.00		358.25			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		5	Analysis warranted	>>2	Replace Steel	639.74	100.00					692.99			
151	Unpainted Steel Floor Beam m.	1	No corrosion	>>0	Do Nothing		99.50	0.50				0.01		6,432.30	
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			0.12	99.86		
		3	Some section loss	>>0	Do Nothing				99.93	0.07		8.86	0.14		
		4	Major section loss	>>2	Replace Steel	639.74	100.00					639.75			
152	Painted Steel Floor Beam m.	1	No corrosion	>>0	Do Nothing		95.76	4.24				3.63		6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing			97.64	2.36			7.91			
		3	Rust formation	>>0	Do Nothing				99.20	0.80		24.62	98.43		
		4	Active corrosion	>>0	Do Nothing					98.09	1.91	178.13	1.57		
		5	Section loss	>>2	Replace Steel	639.74	100.00					643.20			
154	P/S Conc Floor Beam m.	1	No deterioration	>>0	Do Nothing		93.30	6.70				53.52		6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			93.36	88.18		
		3	Delams/spalls	>>1	Repair Prestressed Concrete	40.83		50.00	50.00			162.85	11.82		
		4	Analysis warranted	>>2	Replace Prestressed Concrete	612.52	100.00					663.50			
155	Reinforced Conc Floor Beam m.	1	No deterioration	>>0	Do Nothing		99.80	0.20				0.24		6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.60	0.40			6.21	99.21		
		3	Delams/spalls	>>1	Repair Concrete Class 2	40.83		50.00	50.00			83.60	0.79		
		4	Analysis warranted	>>2	Replace Concrete	612.52	100.00					612.75			
156	Timber Floor Beam m.	1	No decay	>>0	Do Nothing		98.09	1.91				4.85	96.32	1,276.08	1,276.08
		2	Minor decay	>>0	Do Nothing			97.37	2.63			17.52	3.68		
		3	Some strength loss	>>0	Do Nothing				96.90	3.10		50.74			
		4	Major strength loss	>>2	Replace Timber	127.73	100.00					132.35			
160	Unpainted Steel Pin and/or Pin and Hanger Assembly ea	1	No corrosion	>>0	Do Nothing		99.93	0.07				0.04	99.86	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing			99.93	0.07			2.85	0.14		
		3	Some section loss	>>1	Repair Steel	106.62		50.00	50.00			206.17			
		4	Major section loss	>>2	Replace Steel	639.74	100.00					639.78			
161	Painted	1	No corrosion	>>0	Do Nothing		99.93	0.07						6,432.30	6,432.30

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Steel Pin and/or Pin and Hanger Assembly ea	2	Paint distress	>>0	Do Nothing			99.93	0.07						
		3	Rust formation	>>0	Do Nothing				89.09	10.91					
		4	Active corrosion	>>0	Do Nothing					96.59	3.41				
		5	Section loss	>>0	Do Nothing						100.00		100.00		
201	Unpainted Steel Column or Pile Extension ea	1	No corrosion	>>0	Do Nothing		94.39	5.61			50.50		1.22	129,683.38	
		2	Rust formation	>>0	Do Nothing			94.39	5.61		95.39		1.22		
		3	Some section loss	>>0	Do Nothing				99.93	0.07	180.18		97.50		
		4	Major section loss	>>2	Replace Steel	12,968.34	100.00				13,016.44		0.07		
202	Painted Steel Column or Pile Extension ea.	1	No corrosion	>>0	Do Nothing		50.00	50.00				127.45	0.76	129,683.38	129,683.38
		2	Paint distress	>>0	Do Nothing			96.22	3.78			140.16	10.07		
		3	Rust formation	>>0	Do Nothing				98.50	1.50		325.06	25.37		
		4	Active corrosion	>>0	Do Nothing					99.40	0.60	1,405.77	63.42		
		5	Section loss	>>2	Replace Steel	12,968.34	100.00					13,089.73	0.38		
204	P/S Conc Column or Pile Extension	1	No deterioration	>>0	Do Nothing		93.30	6.70				2,977.96	32.61	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			5,194.49	32.61		
		3	Delams/spalls	>>0	Do Nothing				93.30	6.70		9,060.80	32.61		
		4	Analysis warranted	>>2	Replace Prestressed Concrete	12,968.34	100.00					15,804.85	2.18		
205	Reinforced Conc Column or Pile Extension ea	1	No deterioration	>>0	Do Nothing		98.28	1.72				123.18	23.72	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing			94.81	5.19			480.31	7.86		
		3	Delams/spalls	>>0	Do Nothing				99.40	0.60		941.83	68.01		
		4	Analysis warranted	>>1	Repair Concrete Class 3	8,652.47	100.00					8,769.80	0.41		
206	Timber Column or Pile Extension ea	1	No decay	>>0	Do Nothing		50.00	50.00				264.89	1.43	43,262.37	43,262.37
		2	Minor decay	>>0	Do Nothing			91.70	8.30			291.31	8.60		
		3	Some strength loss	>>0	Do Nothing				99.20	0.80		466.34	89.20		
		4	Major strength loss	>>1	Repair Timber	2,884.16	92.00			8.00		3,373.33	0.78		
210	Reinforced Conc Pier Wall km.	1	No deterioration	>>0	Do Nothing		99.00	1.00				21.43	30.63	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing			98.79	1.21			128.32	25.31		
		3	Delams/spalls	>>0	Do Nothing				99.30	0.70		657.20	43.75		
		4	Analysis warranted	>>2	Replace Concrete	5,318.72	100.00					5,339.14	0.31		
211	Other Material Pier	1	No deterioration	>>0	Do Nothing		97.64	2.36				6.56	2.78	53,222.06	53,222.06

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Wall m.	2	Minor deterioration	>>0	Do Nothing			98.09	1.91			20.41	3.43		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		73.71	93.72		
		4	Major deterioration	>>2	Replace Other	5,318.72	100.00					5,324.97	0.07		
215	Reinforced Conc Abutment m.	1	No deterioration	>>0	Do Nothing		99.00	1.00				21.43	30.63	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing			98.79	1.21			128.32	25.31		
		3	Delams/spalls	>>0	Do Nothing				99.30	0.70		657.20	43.75		
		4	Analysis warranted	>>2	Replace Concrete	5,318.72	100.00					5,339.14	0.31		
216	Timber Abutment m.	1	No decay	>>0	Do Nothing		99.00	1.00				0.53	7.69	17,740.69	17,740.69
		2	Minor decay	>>0	Do Nothing			99.50	0.50			3.18	15.37		
		3	Some strength loss	>>0	Do Nothing				99.90	0.10		34.86	76.86		
		4	Major strength loss	>>2	Replace Timber	1,772.91	100.00					1,773.42	0.08		
217	Other Material Abutment m.	1	No deterioration	>>0	Do Nothing		97.64	2.36				6.56	2.78	53,222.06	53,222.06
		2	Minor deterioration	>>0	Do Nothing			98.09	1.91			20.41	3.43		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		73.71	93.72		
		4	Major deterioration	>>2	Replace Other	5,318.72	100.00					5,324.97	0.07		
220	Reinforced Conc Submerged Pile Cap/Footing ea	1	No deterioration	>>0	Do Nothing		99.93	0.07				59.26	97.89	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			4,280.78	1.02		
		3	Delams/spalls	>>0	Do Nothing				93.30	6.70		7,467.01	1.02		
		4	Analysis warranted	>>2	Replace Concrete	12,968.34	100.00					13,024.78	0.07		
221	Reinforced Conc Pile Cap/Footing ea	1	No deterioration	>>0	Do Nothing		98.28	1.72				184.62	23.72	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing			94.81	5.19			719.89	7.86		
		3	Delams/spalls	>>0	Do Nothing				99.40	0.60		1,411.61	68.01		
		4	Analysis warranted	>>2	Replace Concrete	12,968.34	100.00					13,144.19	0.41		
225	Unpainted Steel Submerged Pile ea	1	No corrosion	>>0	Do Nothing		94.39	5.61				50.50	1.22	129,683.38	129,683.38
		2	Rust formation	>>0	Do Nothing			94.39	5.61			95.39	1.22		
		3	Surface pitting	>>0	Do Nothing				99.93	0.07		180.18	97.50		
		4	Major section loss	>>2	Replace Steel	12,968.34	100.00					13,016.44	0.07		
226	P/S Conc Submerged Pile ea	1	No deterioration	>>0	Do Nothing		93.30	6.70				2,977.96	32.61	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			5,194.49	32.61		
		3	Delams/spalls	>>0	Do Nothing				93.30	6.70		9,060.80	32.61		
		4	Analysis warranted	>>2	Replace	12,968.34	100.00					15,804.85	2.18		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Prestressed Concrete										
227	Reinforced Conc Submerged Pile ea	1	No deterioration	>>0	Do Nothing		93.30	6.70				2,977.96	32.61	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing			93.30	6.70			5,194.49	32.61		
		3	Delams/spalls	>>0	Do Nothing				93.30	6.70		9,060.80	32.61		
		4	Analysis warranted	>>2	Replace Concrete	12,968.34	100.00					15,804.85	2.18		
228	Timber Submerged Pile ea	1	No decay	>>0	Do Nothing		99.93	0.07				19.75	97.89	43,262.37	43,262.37
		2	Minor decay	>>0	Do Nothing			93.30	6.70			1,426.93	1.02		
		3	Some strength loss	>>0	Do Nothing				93.30	6.70		2,489.00	1.02		
		4	Major strength loss	>>2	Replace Timber	4,322.78	100.00					4,341.59	0.07		
230	Unpainted Steel Cap m.	1	No corrosion	>>0	Do Nothing		99.40	0.60				4.54	10.34	53,222.06	53,222.06
		2	Rust formation	>>0	Do Nothing			99.93	0.07			42.24	88.67		
		3	Some section loss	>>0	Do Nothing				93.30	6.70		3,051.66	0.93		
		4	Major section loss	>>2	Replace Steel	5,318.72	100.00					5,323.04	0.06		
231	Painted Steel Cap m.	1	No corrosion	>>0	Do Nothing		89.09	10.91				0.37	0.32	53,222.06	53,222.06
		2	Paint distress	>>0	Do Nothing			94.39	5.61			0.54	0.62		
		3	Rust formation	>>0	Do Nothing				99.93	0.07		1.02	49.51		
		4	Active corrosion	>>0	Do Nothing					99.93	0.07	73.63	49.51		
		5	Section loss	>>2	Replace Steel	5,318.72	100.00					5,319.07	0.03		
233	P/S Conc Cap m.	1	No deterioration	>>0	Do Nothing		99.93	0.07				0.58	49.72	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing			99.93	0.07			42.21	49.72		
		3	Delams,spalls	>>0	Do Nothing				93.30	6.70		3,049.50	0.52		
		4	Analysis warranted	>>2	Replace Prestressed Concrete	5,318.72	100.00					5,319.28	0.03		
234	Reinforced Conc Cap m.	1	No deterioration	>>0	Do Nothing		99.00	1.00				14.29	30.63	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing			98.79	1.21			85.55	25.31		
		3	Delams/spalls	>>0	Do Nothing				99.30	0.70		438.13	43.75		
		4	Analysis warranted	>>1	Repair Concrete Class 3	3,545.81	100.00					3,559.42	0.31		
235	Timber Cap m.	1	No decay	>>0	Do Nothing		99.00	1.00				0.35		17,740.69	17,740.69
		2	Minor decay	>>0	Do Nothing			99.50	0.50			2.12	16.65		
		3	Some strength loss	>>0	Do Nothing				99.90	0.10		23.27	83.26		
		4	Major strength loss	>>1	Repair Timber	1,181.93		100.00				1,183.95	0.08		
240	Unpainted Steel Culvert m.	1	No deterioration	>>0	Do Nothing		97.27	2.73				8.63	3.41	51,043.38	51,043.38
		2	Minor corrosion	>>0	Do Nothing			97.15	2.85			24.39	3.27		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		3	Moderate corrosion	>>0	Do Nothing				99.90	0.10		67.06	93.22		
		4	Major corrosion	>>1	Repair Steel	3,402.89	100.00					3,411.11	0.09		
241	Reinforced Concrete Culvert	1	No deterioration	>>0	Do Nothing		99.10	0.90				3.09	13.75	51,043.38	51,043.38
		2	Minor deterioration	>>0	Do Nothing			99.30	0.70			20.21	19.13		
		3	Moderate deteriorati	>>0	Do Nothing				99.80	0.20		164.18	66.95		
		4	Major deterioration	>>1	Repair Concrete Class 3	3,402.89	73.00	6.00		21.00		4,257.87	0.17		
242	Timber Culvert m.	1	Sound condition	>>0	Do Nothing		93.30	6.70				390.71	32.61	17,014.46	17,014.46
		2	Minor decay	>>0	Do Nothing			93.30	6.70			681.52	32.61		
		3	Moderate deteriorati	>>0	Do Nothing				93.30	6.70		1,188.78	32.61		
		4	Major deterioration	>>2	Replace Timber	1,701.45	100.00					2,073.60	2.18		
243	Other Culvert m.	1	No deterioration	>>0	Do Nothing		97.64	2.36				18.34	2.87	51,043.38	51,043.38
		2	Minor deterioration	>>0	Do Nothing			79.37	20.63			57.10	0.33		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		70.90	96.73		
		4	Major deterioration	>>2	Replace Other	5,104.34	100.00					5,121.81	0.07		
300	Strip Seal Expansion Joint m.	1	No leakage	>>0	Do Nothing		96.22	3.78				51.84		5,955.06	5,955.06
		2	Minor leakage	>>0	Do Nothing			98.09	1.91			120.24	96.32		
		3	Major leakage	>>1	Repair Other	170.14		50.00	50.00			434.19	3.68		
301	Pourable Joint Seal m.	1	No deterioration	>>0	Do Nothing		96.22	3.78				51.84		5,955.06	5,955.06
		2	Minor leakage	>>0	Do Nothing			98.09	1.91			120.24	96.32		
		3	Leakage problems	>>1	Repair Other	170.14		50.00	50.00			434.19	3.68		
302	Compression Joint Seal m.	1	No deterioration	>>0	Do Nothing		96.22	3.78				51.84		5,955.06	5,955.06
		2	Minor deterioration	>>0	Do Nothing			98.09	1.91			120.24	96.32		
		3	Major deterioration	>>1	Repair Other	170.14		50.00	50.00			434.19	3.68		
303	Assembly Joint/Seal	1	No deterioration	>>0	Do Nothing		96.22	3.78				740.66		85,072.30	85,072.30
		2	Minor deterioration	>>0	Do Nothing			98.09	1.91			1,717.80	96.32		
		3	Advanced	>>1	Repair	2,430.64		50.00	50.00			6,202.85	3.68		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
			corrosion		Other										
304	Open Expansion Joint m.	1	No deterioration	>>0	Do Nothing		96.22	3.78				22.92	33.15	5,955.06	5,955.06
		2	Minor deterioration	>>0	Do Nothing			98.09	1.91			53.16	65.60		
		3	Advanced corrosion	>>1	Repair Other	170.14	100.00					191.97	1.25		
305	Elastomeric Flex-Type Joint m.	1	No deterioration	>>0	Do Nothing		79.37	20.63				588.25	82.90	5,955.06	5,955.06
		2	Minor deterioration	>>1	Repair Other	170.14	100.00					730.45	17.10		
		3	Signs of failure	>>2	Replace Other	595.51	100.00					1,155.82			
306	Asphaltic Plug Expansion Device m.	1	No cracks or leakage	>>0	Do Nothing		93.30	6.70				36.93	24.97	5,955.06	5,955.06
		2	Significant damage	>>0	Do Nothing			97.72	2.28			64.42	73.36		
		3	Failed	>>1	Repair Other	170.14	100.00					205.32	1.67		
307	Modular Expansion Joint m.	1	No deterioration	>>0	Do Nothing		96.22	3.78				740.66		85,072.30	85,072.30
		2	Minor deterioration	>>0	Do Nothing			98.09	1.91			1,717.80	96.32		
		3	Failure	>>1	Repair Other	2,430.64		50.00	50.00			6,202.85	3.68		
308	Construction/Non-Expansion Joint m.	1	No deterioration	>>0	Do Nothing		96.22	3.78				17.28		1,981.56	1,981.56
		2	Minor deterioration	>>0	Do Nothing			98.09	1.91			40.09	96.32		
		3	Major deterioration	>>1	Repair Other	56.72		50.00	50.00			144.75	3.68		
309	Elastomeric Bearing with Teflon ea	1	No deterioration	>>0	Do Nothing		99.40	0.60				21.52	45.33	21,786.81	21,786.81
		2	Minor deterioration	>>0	Do Nothing			99.50	0.50			200.40	54.40		
		3	Major deterioration	>>2	Replace Other	2,178.68	100.00					2,199.18	0.27		
310	Elastomeric Bearing ea	1	No deterioration	>>0	Do Nothing		99.40	0.60				7.49	45.33	10,478.42	10,478.42
		2	Minor deterioration	>>0	Do Nothing			99.50	0.50			69.71	54.40		
		3	Major deterioration	1>>	Repair Other	698.56		100.00				764.96	0.27		
311	Moveable Bearing (roller, sliding, etc.) ea	1	No deterioration	>>0	Do Nothing		95.76	4.24				53.33		21,786.81	21,786.81
		2	Minor deterioration	>>0	Do Nothing			99.60	0.40			116.06	99.60		
		3	Advanced corrosion	>>1	Repair Other	1,452.45		100.00				1,563.00	0.40		
312	Enclosed/Concealed Bearing ea	1	No deterioration	>>0	Do Nothing		93.30	6.70				1,042.37	48.38	21,786.81	21,786.81
		2	Minor	>>0	Do Nothing			93.30	6.70			1,818.22	48.38		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
			deterioration												
		3	Bearing failures	>>2	Replace Other	2,178.68	100.00					3,171.54	3.24		
313	Fixed Bearing ea	1	No deterioration	>>0	Do Nothing		95.76	4.24				36.96	8.59	10,478.42	10,478.42
		2	Minor deterioration	>>0	Do Nothing			99.60	0.40			80.42	91.05		
		3	Advanced corrosion	>>2	Replace Other	1,047.84	100.00					1,083.04	0.36		
314	Pot Bearing ea	1	No deterioration	>>0	Do Nothing		95.76	4.24				398.83	8.59	113,083.91	113,083.91
		2	Minor deterioration	>>0	Do Nothing			99.60	0.40			867.91	91.05		
		3	Advanced corrosion	>>2	Replace Other	11,308.39	100.00					11,688.27	0.36		
315	Disk Bearing ea	1	No deterioration	>>0	Do Nothing		95.76	4.24				398.83	8.59	113,083.91	113,083.91
		2	Minor deterioration	>>0	Do Nothing			99.60	0.40			867.91	91.05		
		3	Advanced corrosion	>>2	Replace Other	11,308.39	100.00					11,688.27	0.36		
320	P/S Concrete Approach Slab w/ or w-o/AC Ovly ea	1	No deterioration	>>0	Do Nothing		99.93	0.07				125.07	99.86	701,327.70	701,327.70
		2	Minor cracks/spalls	>>1	Repair Prestressed Concrete	4,672.75	50.00	50.00				9,035.45	0.14		
		3	Major cracks/spalls	>>1	Repair Prestressed Concrete	11,680.84		50.00	50.00			30,518.32			
		4	Broken/Unstable	>>2	Replace Prestressed Concrete	70,087.12	100.00					70,206.25			
321	Reinforced Conc Approach Slab w/ or w/o AC Ovly ea	1	No deterioration	>>0	Do Nothing		98.28	1.72				1.31	3.19	97,729.39	97,729.39
		2	Cracks/spalls	>>0	Do Nothing			99.70	0.30			5.12	18.30		
		3	Major cracks/spalls	>>0	Do Nothing				99.93	0.07		90.23	78.45		
		4	Broken/Unstable	>>1	Repair Concrete Class 3	6,516.83	100.00					6,518.08	0.05		
325	Slope, Slope Protection, Berms ea	1	No damage	>>0	Do Nothing		97.92	2.08				493.90	38.16	97,729.39	97,729.39
		2	Moderate damage	>>0	Do Nothing			98.70	1.30			1,678.06	61.05		
		3	Major damage	>>1	Repair Other	6,516.83		100.00				8,115.18	0.79		
326	Bridge Wingwalls ea	1	No deterioration	>>0	Do Nothing		98.70	1.30				152.32	23.46	97,729.39	97,729.39
		2	Minor deterioration	>>0	Do Nothing			99.60	0.40			736.61	76.24		
		3	Major deterioration	>>2	Replace Concrete	9,775.01	100.00					9,920.09	0.30		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
327	Culvert Wingwalls ea	1	Minor deterioration	>>0	Do Nothing		98.50	1.50				120.41		97,729.39	97,729.39
		2	Moderate deteriorati	>>0	Do Nothing			99.60	0.40			520.73	99.60		
		3	Major deterioration	>>1	Repair Concrete Class 2	6,516.83		100.00				7,012.83	0.40		
330	Metal Bridge Railing - Uncoated m.	1	No corrosion	>>0	Do Nothing		97.92	2.08				0.02	3.25	4,087.62	4,087.62
		2	Rust formation	>>0	Do Nothing			99.93	0.07			0.08	96.68		
		3	Active corrosion	>>0	Do Nothing				99.93	0.07		5.66	0.07		
		4	Section loss	>>2	Replace Other	408.76	100.00					408.78			
331	Reinforced Conc Bridge Railing m.	1	No deterioration	>>0	Do Nothing		98.79	1.21				4.55	98.80	2,925.66	2,925.66
		2	Minor cracks/spalls	>>0	Do Nothing			96.22	3.78			23.30	1.20		
		3	Delam/spalls pres	>>1	Repair Concrete Class 2	48.77	98.00		2.00			54.05			
		4	Analysis warranted	>>1	Repair Concrete Class 3	195.10	100.00					199.43			
332	Timber Bridge Railing m.	1	No decay	>>0	Do Nothing		90.57	9.43				44.37	34.35	1,359.08	1,359.08
		2	Minor decay	>>0	Do Nothing			94.81	5.19			67.83	62.41		
		3	Some strength loss	>>1	Repair Timber	90.75	100.00					133.01	3.24		
333	Other Bridge Railing m.	1	No deterioration	>>0	Do Nothing		96.42	3.58				21.88	21.66	2,925.66	2,925.66
		2	Minor cracks/spalls	>>0	Do Nothing			99.00	1.00			52.35	77.56		
		3	Major deterioration	>>2	Replace Other	292.57	100.00					313.41	0.78		
334	Metal Bridge Railing - Coated m.	1	No corrosion	>>0	Do Nothing		99.10	0.90				2.83	89.49	4,087.62	4,087.62
		2	Surface rust forming	>>0	Do Nothing			91.70	8.30			18.53	9.70		
		3	Rust prevalent	>>1	Repair Steel	26.97	100.00					29.67	0.81		
		4	Active corrosion	>>1	Repair Steel	68.47	100.00					71.17			
		5	Analysis warranted	>>2	Replace Steel	408.76	100.00					411.46			
335	Culvert Headwalls ea	1	Minor damage	>>0	Do Nothing		98.50	1.50				170.63	20.99	97,729.39	97,729.39
		2	Moderate damage	>>0	Do Nothing			99.60	0.40			737.91	78.70		
		3	Heavy damage	>>2	Replace Concrete	9,775.01	100.00					9,937.54	0.31		
336	Metal Curbs/Sidewalks - Coated m.	1	No corrosion	>>0	Do Nothing		99.50	0.50					12.27	4,087.62	4,087.62
		2	Surface rust	>>0	Do Nothing			99.93	0.07				87.67		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
			forming												
		3	Rust prevalent	>>0	Do Nothing				99.93	0.07		0.08	0.06		
		4	Active corrosion	>>0	Do Nothing					99.93	0.07	5.66			
		5	Analysis warranted	>>2	Replace Steel	408.76	100.00					408.76			
337	Metal Curb/Sidewalk - Uncoated m.	1	No corrosion	>>0	Do Nothing		93.30	6.70				61.67	88.18	4,087.62	4,087.62
		2	Rust formation	>>1	Repair Steel	26.97	50.00	50.00				107.57	11.82		
		3	Active corrosion	>>1	Repair Steel	68.47		50.00	50.00			228.54			
		4	Section loss	>>2	Replace Steel	408.76	100.00					467.50			
338	Concrete Curbs/Sidewalks m.	1	No deterioration	>>0	Do Nothing		98.79	1.21				1.77	98.80	2,925.66	2,925.66
		2	Minor cracks/spalls	>>0	Do Nothing			98.91	1.09			9.05	1.20		
		3	Delam/spalls pres	>>1	Repair Concrete Class 2	48.77	100.00					50.45			
		4	Analysis warranted	>>1	Repair Concrete Class 3	195.10	100.00					196.78			
339	Timber Curbs/Sidewalks m.	1	No decay	>>0	Do Nothing		96.42	3.58				0.25	2.61	1,359.08	1,359.08
		2	Minor decay	>>0	Do Nothing			97.47	2.53			0.60	3.70		
		3	Loss of strength	>>0	Do Nothing				99.90	0.10		1.78	93.59		
		4	Advanced decay	>>1	Repair Timber	90.26	100.00					90.50	0.09		
340	Concrete Coating (Superstructure) ea.	1	Under 5% surf damage	>>0	Do Nothing		99.50	0.50				0.54	54.40	549.86	549.86
		2	5-20% surf damage	>>0	Do Nothing			99.40	0.60			5.96	45.33		
		3	Over 20% surf damage	>>2	Replace Other	54.99	100.00					55.51	0.27		
341	Substructure Concrete Coating ea	1	Under 5% surf damage	>>0	Do Nothing		99.50	0.50				0.07	12.27	549.86	549.86
		2	5-20% surf damage	>>0	Do Nothing			99.93	0.07			0.76	87.67		
		3	Over 20% surf damage	>>2	Replace Other	54.99	100.00					55.06	0.06		
342	Sign Attachment to Bridge ea	1	No deterioration	>>0	Do Nothing		94.39	5.61				0.04	0.62	5,187.34	5,187.34
		2	Minor deterioration	>>0	Do Nothing			99.93	0.07			0.07	49.67		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		4.79	49.67		
		4	Severe deterioration	>>1	Repair Other	345.82	100.00					345.85	0.03		
343	Pole Attachment to	1	No deterioration	>>0	Do Nothing		94.39	5.61				0.05	0.62	5,187.34	5,187.34

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	Bridge ea	2	Minor deterioration	>>0	Do Nothing			99.93	0.07			0.10	49.67		
		3	Analysis warranted	>>0	Do Nothing				99.93	0.07		7.18	49.67		
		4	Severe deterioration	>>2	Replace Other	518.73	100.00					518.78	0.03		
350	Tunnel (Formed Concrete Lined) m.	1	Minimal deterioratio	>>0	Do Nothing		87.06	12.94				0.22	0.54	15,562.01	15,562.01
		2	Minor deterioration	>>0	Do Nothing			99.93	0.07			0.30	99.39		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		21.54	0.07		
		4	Severe deterioration	>>2	Replace Concrete	1,556.20	100.00					1,556.41			
351	Tunnel (Unlined/Unsupported) m.	1	Minimal deterioratio	>>0	Do Nothing		99.93	0.07					99.93	15,562.01	15,562.01
		2	Minor deterioration	>>0	Do Nothing			99.80	0.20			0.67	0.07		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		17.34			
		4	Severe deterioration	>>1	Repair Other	1,037.47		82.00		18.00		1,252.78			
352	Tunnel (Unlined/Supported) m.	1	Minimal deterioratio	>>0	Do Nothing		93.30	6.70				237.23	88.18	15,562.01	15,562.01
		2	Minor deterioration	>>1	Repair Other	103.75	50.00	50.00				413.81	11.82		
		3	Moderate deteriorati	>>1	Repair Other	259.37		50.00	50.00			871.50			
		4	Severe deterioration	>>2	Replace Other	1,556.20	100.00					1,782.17			
353	Tunnel (Shotcrete Lined) m.	1	Minimal deterioratio	>>0	Do Nothing		87.06	12.94				0.22		15,562.01	15,562.01
		2	Minor deterioration	>>0	Do Nothing			99.93	0.07			0.30	99.86		
		3	Moderate deteriorati	>>0	Do Nothing				99.93	0.07		21.54	0.14		
		4	Severe deterioration	>>2	Replace Concrete	1,556.20	100.00					1,556.41			
355	Steel Diaphragms Smart Flag ea	1	Good condition	>>0	Do Nothing		93.30	6.70				2,154.53	93.72	51,147.12	51,147.12
		2	Minor damage	>>1	Repair Steel	1,705.98	100.00					3,758.17	6.28		
		3	Ineffective	>>2	Replace Steel	5,117.82	100.00					7,170.01			
356	Steel Fatigue ea	1	Fatigue prone	>>0	Do Nothing		93.30	6.70				306.26	48.38	34,132.66	34,132.66

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		2	Fatigue damage	>>0	Do Nothing			93.30	6.70			534.21	48.38		
		3	Severe fatigue damag	>>2	Replace Steel	640.12	100.00					931.83	3.24		
357	Pack Rust ea	1	Pack rust staining	>>0	Do Nothing		93.30	6.70				97.52	88.18	6,401.17	6,401.17
		2	Minor pack rust	>>1	Repair Steel	42.65	50.00	50.00				170.11	11.82		
		3	Moderate pack rust	>>1	Repair Steel	106.62		50.00	50.00			358.25			
		4	Severe pack rust	>>2	Replace Steel	640.12	100.00					733.01			
358	Deck Cracking ea	1	Minor cracks	>>0	Do Nothing		93.30	6.70				42.41	93.72	2,873.78	2,873.78
		2	Minor-mod cracks	>>0	Do Nothing			93.30	6.70			73.97	6.28		
		3	Mod-severe cracks	>>0	Do Nothing				93.30	6.70		129.03			
		4	Unsealed cracks exis	>>2	Replace Concrete	184.67	100.00					225.06			
359	Soffit of Concrete Deck or Slab ea	1	Soffit OK	>>0	Do Nothing		93.30	6.70				42.41	32.61	2,873.78	2,873.78
		2	Soffit-minor distres	>>0	Do Nothing			93.30	6.70			73.97	32.61		
		3	Soffit cracked	>>0	Do Nothing				93.30	6.70		129.03	32.61		
		4	Soffit lt rust/spall	>>2	Replace Concrete	184.67	100.00					225.06	2.18		
		5	Soffit sev rust/spal	>>0	Do Nothing						96.59	2,334.10			
360	Settlement ea	1	Settlement stable	>>0	Do Nothing		93.30	6.70				4,139.71	48.38	129,683.38	129,683.38
		2	Minor settlement	>>0	Do Nothing			93.30	6.70			7,220.93	48.38		
		3	Sig settlement	>>1	Repair Other	8,652.47	100.00					12,595.54	3.24		
361	Scour ea	1	Scour under control	>>0	Do Nothing		93.30	6.70				4,139.71	48.38	129,683.38	129,683.38
		2	Scour developing	>>0	Do Nothing			93.30	6.70			7,220.93	48.38		
		3	Scour serious	>>1	Repair Other	8,652.47	100.00					12,595.54	3.24		
362	Traffic Impact ea	1	Imp damage repaired	>>0	Do Nothing		93.30	6.70				6,204.60	48.38	129,683.38	129,683.38
		2	Imp damage OK	>>0	Do Nothing			93.30	6.70			10,822.74	48.38		
		3	Analysis warranted	>>2	Replace Other	12,968.34	100.00					18,878.22	3.24		
363	Section Loss ea	1	Sec loss repaired	>>0	Do Nothing		93.30	6.70				97.52	88.18	6,401.17	6,401.17
		2	Sec loss OK	>>1	Repair Other	42.65	50.00	50.00				170.11	11.82		
		3	Analysis warranted	>>1	Repair Other	106.62		50.00	50.00			358.25			
		4	Load/serv affected	>>2	Replace Other	640.12	100.00					733.01			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
370	Traffic Impact m.	1	Damage repaired	>>0	Do Nothing		93.30	6.70				6,204.60	48.38	129,683.38	129,683.38
		2	Strength unaffected	>>0	Do Nothing			93.30	6.70			10,822.74	48.38		
		3	Analysis warranted	>>2	Replace Other	12,968.34	100.00					18,878.22	3.24		
371	Traffic Impact (Deck) m.	1	Damage repaired	>>0	Do Nothing		93.30	6.70				88.35	48.38	2,873.78	2,873.78
		2	Strength unaffected	>>0	Do Nothing			93.30	6.70			154.12	48.38		
		3	Analysis warranted	>>2	Replace Other	184.67	100.00					268.83	3.24		
372	False Bent/Temporary Support ea	1	Foundation sound	>>0	Do Nothing		93.30	6.70				1,786.92	48.38	37,348.81	37,348.81
		2	Foundation damaged	>>0	Do Nothing			93.30	6.70			3,116.95	48.38		
		3	Foundation nonfunct.	>>2	Replace Other	3,734.88	100.00					5,436.92	3.24		
373	Substructure Pack Rust ea	1	Pack rust staining	>>0	Do Nothing		93.30	6.70				514.76		6,401.17	6,401.17
		2	Minor pack rust	>>1	Repair	42.65		100.00				897.89	100.00		
		3	Moderate pack rust	>>1	Repair	106.62			100.00			2,244.63			
		4	Severe pack rust	>>0	Do Nothing					96.59		5,199.07			
380	Completed Deck Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
381	Completed Superstructure Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
382	Cleaning and Painting of Bridge ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
383	Rail Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
384	Bearing Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
385	Substructure Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
386	Approach Slab or Slope Protection Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
387	Expansion Joint Repair ea	1	Work Done	>>0	Do Nothing		93.30							0.00	0.00
399	Alkali-Silica Reactivity (ASR)	1	Ignored	>>0	Do Nothing		93.30	6.70				2.95	88.18	2,873.78	2,873.78
		2	Deck	>>1	Repair Concrete Class 1	1.29	50.00	50.00				5.15	11.82		
		3	Superstructure	>>1	Repair Concrete Class 2	23.86	100.00					26.67			
		4	Substructure	>>0	Do Nothing					96.59	3.41	76.14			
		5	Wingwalls	>>2	Replace	184.67	100.00					187.48			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Concrete										
501	Channel Condition ea	1	Channel Condition	>>0	Do Nothing		99.93	0.07						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
502	Channel Prot. Material and Condition ea	1	Channel Protection	>>0	Do Nothing		99.93	0.07						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
504	Bank Condition ea	1	Bank Condition	>>0	Do Nothing		99.93	0.07						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
505	Debris ea	1	Debris	>>0	Do Nothing		93.30	6.70						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
510	Waterway Adequacy ea	1	Waterway Adequacy	>>0	Do Nothing		98.91	1.09						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
520	Approach Roadway Alignment ea	1	AppchRdwayAlign	>>0	Do Nothing		99.93	0.07						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
530	Approach Guardrail Adequacy ea.	1	AppdhGuardAdqcy	>>0	Do Nothing		93.30	6.70						0.00	0.00
		2	N/A	>>0	Do Nothing			96.59							
600	General Remarks ea	1	GOOD	>>0	Do Nothing		93.30	6.70						0.00	0.00
		2	SATISFACTORY	>>0	Do Nothing			96.59	3.41						
		3	FAIR	>>0	Do Nothing				93.30	6.70					
		4	POOR	>>0	Do Nothing					93.30	6.70				
		5	CRITICAL	>>0	Do Nothing						96.59				

Table 125 - Details of Pontis Preservation Results

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
12	Concrete Deck - Bare sq.m.	1	No damage	>>0	Do Nothing	0.00	96.42	3.58	0.00	0.00	0.00	0.68	93.32	1,662.00	1,662.00
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	50.00	50.00	0.00	0.00	1.64	6.68		
				1	Repair Concrete Class 1	1.24	50.00	50.00	0.00	0.00	0.00	2.35			
		3	2 to 10 % distress	>>0	Do Nothing	0.00	0.00	0.00	99.70	0.30	0.00	1.80	0.00		
				1	Repair Concrete Class 2	23.00	0.00	100.00	0.00	0.00	0.00	24.56			
				2	Overlay Concrete	39.00	0.00	100.00	0.00	0.00	0.00	40.56			
		4	10 to 25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	97.79	2.21	31.72	0.00		
				1	Repair Concrete Class 3	83.00	0.00	0.00	50.00	50.00	0.00	98.97			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				2	Overlay Concrete	39.00	0.00	0.00	50.00	50.00	0.00	54.97			
				3	Replace Concrete	178.00	100.00	0.00	0.00	0.00	0.00	178.65			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	203.01	0.00		
				1	Repair Concrete Class 3	277.00	0.00	0.00	0.00	50.00	50.00	341.31			
				>>2	Overlay Concrete	39.00	0.00	0.00	0.00	50.00	50.00	103.31			
				3	Replace Concrete	178.00	100.00	0.00	0.00	0.00	0.00	178.65			
13	Concrete Deck - Unprotected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00	0.00	0.06	0.00	1,476.32	1,476.32
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	95.76	4.24	0.00	0.00	0.08	0.00		
				1	Repair Concrete + Asphalt	2.48	50.00	50.00	0.00	0.00	0.00	2.54			
		3	2 to 10% distress	>>0	Do Nothing	0.00	0.00	0.00	97.64	2.36	0.00	0.17	7.80		
				1	Repair Concrete + Asphalt	12.40	0.00	50.00	50.00	0.00	0.00	12.52			
				2	Overlay Asphalt	13.64	0.00	50.00	50.00	0.00	0.00	13.76			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.80	0.20	0.53	92.02		
				1	Repair Concrete + Asphalt	31.00	100.00	0.00	0.00	0.00	0.00	31.05			
				2	Overlay Asphalt	13.64	100.00	0.00	0.00	0.00	0.00	13.69			
				3	Replace Concrete	147.58	100.00	0.00	0.00	0.00	0.00	147.63			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	108.60	0.18		
				1	Repair Concrete + Asphalt	124.02	0.00	0.00	100.00	0.00	0.00	124.18			
				>>2	Overlay Asphalt	13.64	0.00	0.00	100.00	0.00	0.00	13.80			
				3	Replace Concrete	147.58	100.00	0.00	0.00	0.00	0.00	147.63			
14	Concrete Deck - Protected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00	0.00	0.29	0.00	1,674.47	1,674.47
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	95.76	4.24	0.00	0.00	0.40	0.00		
				1	Repair Concrete + Asphalt +	2.48	100.00	0.00	0.00	0.00	0.00	2.76			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Membrane										
		3	2 to 10% distress	>>0	Do Nothing	0.00	0.00	0.00	97.64	2.36	0.00	0.88	0.00		
				1	Repair Concrete + Asphalt + Membrane	12.40	100.00	0.00	0.00	0.00	0.00	12.68			
				2	Overlay Asphalt + Membrane	35.72	100.00	0.00	0.00	0.00	0.00	36.00			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.80	0.20	2.73	99.60		
				1	Repair Concrete + Asphalt + Membrane	31.00	0.00	0.00	50.00	50.00	0.00	32.71			
				2	Overlay Asphalt + Membrane	35.72	0.00	0.00	50.00	50.00	0.00	37.43			
				3	Replace Concrete	167.43	100.00	0.00	0.00	0.00	0.00	167.71			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	173.80	0.40		
				1	Repair Concrete + Asphalt + Membrane	124.02	0.00	0.00	0.00	50.00	50.00	158.98			
				>>2	Overlay Asphalt + Membrane	35.72	0.00	0.00	0.00	50.00	50.00	70.68			
				3	Replace Concrete	167.43	100.00	0.00	0.00	0.00	0.00	167.71			
18	Concrete Deck - Protected w/ Thin Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00	0.00	0.03	99.86	2,873.78	2,873.78
		2	Distress <= 2%	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	5.27	0.14		
				>>1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	2.49			
		3	2-10% distress	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	48.40	0.00		
				>>1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	47.82			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	64.42			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	92.52	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	152.95			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	107.30			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.70			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	335.15	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	408.30			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	161.38			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.70			
22	Concrete Deck - Protected w/ Rigid Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	96.42	3.58	0.00	0.00	0.00	0.02	0.00	2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	99.20	0.80	0.00	0.00	0.04	7.96		
				1	Repair Concrete Class 1	1.29	100.00	0.00	0.00	0.00	0.00	1.31			
		3	Distress 2-10%	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	0.32	91.02		
				1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	24.03			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	40.63			
		4	Distress 10-25%	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	23.22	0.95		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	97.32			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	51.67			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.69			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	223.95	0.06		
				1	Repair Concrete Class 3	287.38	0.00	100.00	0.00	0.00	0.00	287.42			
				>>2	Overlay Concrete	40.46	0.00	100.00	0.00	0.00	0.00	40.50			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.69			
23	Concrete Deck - Bare Protected w/Coated Bars	1	No damage	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	0.00	0.00	2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	99.10	0.90	0.00	0.00	0.00	0.00		
				1	Repair Concrete Class 1	1.29	100.00	0.00	0.00	0.00	0.00	1.29			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	sq.m.	3	2 to 10 % distress	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	0.01	99.86		
				1	Repair Concrete Class 2	23.86	0.00	100.00	0.00	0.00	0.00	23.86			
				2	Overlay Concrete	40.46	0.00	100.00	0.00	0.00	0.00	40.46			
		4	10 to 25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	1.08	0.14		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	86.63			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	40.98			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.67			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	258.66	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	325.16			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	78.24			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.67			
24	Conc Deck w/ Thin (<1 inch) Overlay, Coated Bars sq.m.	1	No damage	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00	0.00	0.03	99.86	2,873.78	2,873.78
		2	Distress <= 2%	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	5.27	0.14		
				>>1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	2.49			
		3	2-10% distress	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	48.40	0.00		
				>>1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	47.82			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	64.42			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	92.52	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	152.95			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	107.30			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.70			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	335.15	0.00		
				1	Repair Concrete	287.38	0.00	0.00	0.00	50.00	50.00	408.30			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Class 3										
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	161.38			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.70			
25	Concrete Deck - Rigid Overlay Protected w/Coated Bar sq.m.	1	No damage	>>0	Do Nothing	0.00	96.42	3.58	0.00	0.00	0.00	0.06	0.00	2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	99.20	0.80	0.00	0.00	0.15	0.00		
				1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	1.39			
		3	Distress 2-10%	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	1.08	99.86		
				1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	24.45			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	41.05			
		4	Distress 10-25%	0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	79.00	0.14		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	123.89			
				>>2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	78.24			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.73			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	323.20	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	395.31			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	148.39			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.73			
26	Concrete Deck - Protected w/ Coated Bars sq.m.	1	No damage	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	0.00	0.00	2,873.78	2,873.78
		2	Distress <=2%	>>0	Do Nothing	0.00	0.00	99.10	0.90	0.00	0.00	0.00	0.00		
				1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	1.29			
		3	Distress 2-10%	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	0.01	99.86		
				1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	23.87			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	40.47			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	1.08	0.14		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	86.63			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	40.98			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.67			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	258.66	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	325.16			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	78.24			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.67			
27	Concrete Deck - Protected w/ Cathodic System sq.m.	1	No damage	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00	0.00	0.00	99.93	2,873.78	2,873.78
				1	Add a protective system	180.00	100.00	0.00	0.00	0.00	0.00	180.01			
		2	Distress <=2%	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00	0.00	0.64	0.07		
				1	Repair Concrete Class 1	1.29	100.00	0.00	0.00	0.00	0.00	1.30			
				2	Add a protective system	180.00	0.00	100.00	0.00	0.00	0.00	180.61			
		3	2 to 10% distress	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	46.91	0.00		
				>>1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	46.14			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	62.74			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	92.52	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	152.14			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	106.49			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.68			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	335.15	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	408.30			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	161.38			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.68			
28	Steel Deck - Open Grid sq.m.	1	No corrosion	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	8.51	88.18	1,860.18	1,860.18
		2	Minor deterioration	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	16.31	11.82		
				>>1	Repair Steel	3.72	50.00	50.00	0.00	0.00	0.00	14.84			
		3	Rust formation	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	50.65	0.00		
				>>1	Repair Steel	18.60	0.00	50.00	50.00	0.00	0.00	49.00			
				2	Replace Steel	53.82	100.00	0.00	0.00	0.00	0.00	61.92			
		4	Moderate corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	111.29	0.00		
				1	Repair Steel	46.51	0.00	0.00	50.00	50.00	0.00	122.85			
				2	Replace Steel	186.03	100.00	0.00	0.00	0.00	0.00	194.13			
		5	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	299.44	0.00		
				1	Repair Steel	186.03	0.00	0.00	0.00	50.00	50.00	331.49			
				>>2	Replace Steel	186.03	100.00	0.00	0.00	0.00	0.00	194.13			
29	Steel Deck - Concrete Filled Grid sq.m.	1	No corrosion	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00	0.00	0.00	99.86	1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	84.09	15.91	0.00	0.00	0.68	0.14		
				1	Repair Steel	3.72	50.00	50.00	0.00	0.00	0.00	4.05			
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	97.37	2.63	0.00	0.89	0.00		
				1	Repair Steel	18.60	0.00	50.00	50.00	0.00	0.00	19.35			
				2	Replace Steel	8.00	100.00	0.00	0.00	0.00	0.00	8.01			
		4	Failed connectors	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	2.58	0.00		
				1	Repair Steel	46.51	0.00	0.00	50.00	50.00	0.00	48.16			
				2	Replace Steel	186.03	100.00	0.00	0.00	0.00	0.00	186.04			
		5	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	292.00	0.00		
				1	Repair Steel	186.03	0.00	0.00	0.00	50.00	50.00	275.86			
				>>2	Replace Steel	186.03	100.00	0.00	0.00	0.00	0.00	186.04			
30	Steel Deck - Corrugated/ Orthotropic /Etc. Sq.m.	1	No deterioration	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00	0.00	0.00	99.93	1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	84.09	15.91	0.00	0.00	0.68	0.07		
				1	Repair Steel	3.72	100.00	0.00	0.00	0.00	0.00	3.73			
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	97.37	2.63	0.00	0.89	0.00		
				1	Repair Steel	18.60	0.00	100.00	0.00	0.00	0.00	19.24			
				2	Replace Steel	10.76	100.00	0.00	0.00	0.00	0.00	10.77			
		4	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	2.58	0.00		
				1	Repair Steel	46.51	0.00	0.00	100.00	0.00	0.00	47.36			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				2	Replace Steel	186.03	100.00	0.00	0.00	0.00	0.00	186.04			
		5	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	292.00	0.00		
				1	Repair Steel	186.03	0.00	0.00	0.00	50.00	50.00	275.86			
				>>2	Replace Steel	186.03	100.00	0.00	0.00	0.00	0.00	186.04			
31	Timber Deck – Bare sq.m.	1	No decay	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		0.00	99.86	1,860.18	1,860.18
		2	Minor decay	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		0.71	0.14		
				1	Repair Timber	3.72	50.00	50.00	0.00	0.00		4.06			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		1.24	0.00		
				1	Repair Timber	18.60	0.00	50.00	50.00	0.00		19.53			
				2	Replace Timber	10.38	100.00	0.00	0.00	0.00		10.39			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		203.58	0.00		
				>>1	Repair Timber	46.51	0.00	0.00	50.00	50.00		89.93			
				2	Replace Timber	186.03	100.00	0.00	0.00	0.00		186.04			
32	Timber Deck - w/ AC Overlay sq.m.	1	No deterioration	>>0	Do Nothing	0.00	90.57	9.43	0.00	0.00		1.94	0.00	1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		2.96	24.97		
				1	Repair Timber	3.72	100.00	0.00	0.00	0.00		5.56			
				2	Rehab and/or protect unit	23.36	0.00	100.00	0.00	0.00		26.18			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	97.72	2.28		5.16	73.36		
				1	Repair Timber	18.60	100.00	0.00	0.00	0.00		20.44			
				2	Overlay Asphalt	13.64	100.00	0.00	0.00	0.00		15.48			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		135.98	1.67		
				1	Repair Timber	46.51	0.00	100.00	0.00	0.00		49.33			
				>>2	Overlay Asphalt	13.64	0.00	100.00	0.00	0.00		16.46			
				3	Replace Timber	186.03	100.00	0.00	0.00	0.00		187.87			
35	Precast Panel Concrete Deck	1	No damage	>>0	Do Nothing	0.00	96.42	3.58	0.00	0.00	0.00	0.71	93.32	2,873.78	2,873.78
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	50.00	50.00	0.00	0.00	1.70	6.68		
				1	Repair Concrete	1.29	50.00	50.00	0.00	0.00	0.00	2.44			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	- Bare sq.m.				Class 1										
		3	2-10% distress	>>0	Do Nothing	0.00	0.00	0.00	99.70	0.30	0.00	1.87	0.00		
				1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	25.56			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	42.16			
		4	10-25% distress	>>0	Do Nothing					97.79	2.21	32.91	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	102.67			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	57.02			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	185.35			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	285.29	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	354.10			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	107.18			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	185.35			
36	Precast Panel Concrete Deck w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00	0.00	0.11	0.00	1,476.32	1,476.32
		2	Distress <= 2%	>>0	Do Nothing	0.00	0.00	95.76	4.24	0.00	0.00	0.15	0.00		
				1	Repair Concrete + Asphalt	2.48	50.00	50.00	0.00	0.00	0.00	2.61			
		3	2 to 10% distress	>>0	Do Nothing	0.00	0.00	0.00	97.64	2.36	0.00	0.33	0.00		
				1	Repair Concrete + Asphalt	12.40	0.00	50.00	50.00	0.00	0.00	12.63			
				2	Overlay Asphalt	13.64	0.00	50.00	50.00	0.00	0.00	13.87			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.80	0.20	1.04	99.60		
				1	Repair Concrete + Asphalt	31.00	0.00	0.00	50.00	50.00	0.00	31.65			
				2	Overlay Asphalt	13.64	0.00	0.00	50.00	50.00	0.00	14.29			
				3	Replace Concrete	147.58	100.00	0.00	0.00	0.00	0.00	147.69			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	120.73	0.40		
				1	Repair	124.02	0.00	0.00	0.00	50.00	50.00	137.37			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Concrete + Asphalt										
				>>2	Overlay Asphalt	13.64	0.00	0.00	0.00	50.00	50.00	26.99			
				3	Replace Concrete	147.58	100.00	0.00	0.00	0.00	0.00	147.69			
38	Concrete Slab - Bare sq.m.	1	No damage	>>0	Do Nothing	0.00	96.42	3.58	0.00	0.00	0.00	0.71	93.32	2,873.78	2,873.78
				1	Add a protective system	55.22	100.00	0.00	0.00	0.00	0.00	55.90			
		2	Distress <=2%	>>0	Do Nothing	0.00	0.00	50.00	50.00	0.00	0.00	1.70	6.68		
				1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	2.44			
		3	2-10% distress	>>0	Do Nothing	0.00	0.00	0.00	99.70	0.30	0.00	1.87	0.00		
				1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	25.56			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	42.16			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	97.79	2.21	32.91	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	102.67			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	57.02			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	185.35			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	285.29	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	354.10			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	107.18			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	185.35			
39	Concrete Slab - Unprotected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00	0.00	0.11	0.00	1,476.32	1,476.32
		2	Distress under 2%	>>0	Do Nothing	0.00	0.00	95.76	4.24	0.00	0.00	0.15	0.00		
				1	Repair Concrete + Asphalt	2.48	50.00	50.00	0.00	0.00	0.00	2.61			
		3	2-10% distress	>>0	Do Nothing	0.00	0.00	0.00	97.64	2.36	0.00	0.33	0.00		
				1	Repair Concrete +	12.40	0.00	50.00	50.00	0.00	0.00	12.63			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Asphalt										
				2	Overlay Asphalt	13.64	0.00	50.00	50.00	0.00	0.00	13.87			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.80	0.20	1.04	99.60		
				1	Repair Concrete + Asphalt	31.00	0.00	0.00	50.00	50.00	0.00	31.65			
				2	Overlay Asphalt	13.64	0.00	0.00	50.00	50.00	0.00	14.29			
				3	Replace Concrete	147.58	100.00	0.00	0.00	0.00	0.00	147.69			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	120.73	0.40		
				1	Repair Concrete + Asphalt	124.02	0.00	0.00	0.00	50.00	50.00	137.37			
				>>2	Overlay Asphalt	13.64	0.00	0.00	0.00	50.00	50.00	26.99			
				3	Replace Concrete	147.58	100.00	0.00	0.00	0.00	0.00	147.69			
40	Concrete Slab Protected w/ AC Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00	0.00	0.29	0.00	1,674.47	1,674.47
		2	Distress under 2%	>>0	Do Nothing	0.00	0.00	95.76	4.24	0.00	0.00	0.40	0.00		
				1	Repair Concrete + Asphalt + Membrane	2.48	50.00	50.00	0.00	0.00	0.00	2.81			
		3	2-10% distress	>>0	Do Nothing	0.00	0.00	0.00	97.64	2.36	0.00	0.88	0.00		
				1	Repair Concrete + Asphalt + Membrane	12.40	0.00	50.00	50.00	0.00	0.00	13.01			
				2	Overlay Asphalt + Membrane	35.72	0.00	50.00	50.00	0.00	0.00	36.33			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.80	0.20	2.73	99.60		
				1	Repair Concrete + Asphalt + Membrane	31.00	0.00	0.00	50.00	50.00	0.00	32.71			
				2	Overlay Asphalt + Membrane	35.72	0.00	0.00	50.00	50.00	0.00	37.43			
				3	Replace Concrete	167.43	100.00	0.00	0.00	0.00	0.00	167.71			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	173.80	0.40		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Concrete + Asphalt + Membrane	124.02	0.00	0.00	0.00	50.00	50.00	158.98			
				>>2	Overlay Asphalt + Membrane	35.72	0.00	0.00	0.00	50.00	50.00	70.68			
				3	Replace Concrete	167.43	100.00	0.00	0.00	0.00	0.00	167.71			
44	Concrete Slab - Protected w/ Thin Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	2.95	88.18	2,873.78	2,873.78
		2	Distress under 2%	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	7.78	11.82		
				>>1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	5.15			
		3	2-10% distress	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	50.55	0.00		
				>>1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	50.23			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	66.83			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	92.52	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	154.09			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	108.44			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	335.15	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	408.30			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	161.38			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
48	Concrete Slab - Protected w/ Rigid Overlay sq.m.	1	No damage	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	2.95	88.18	2,873.78	2,873.78
		2	Distress under 2%	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	7.78	11.82		
				>>1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	5.15			
		3	2-10% distress	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	50.55	0.00		
				>>1	Repair Concrete	23.86	0.00	50.00	50.00	0.00	0.00	50.23			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Class 2										
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	66.83			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	92.52	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	154.09			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	108.44			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	335.15	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	408.30			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	161.38			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
52	Concrete Slab - Protected w/ Coated Bars sq.m.	1	No damage	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	0.00	0.00	2,873.78	2,873.78
				1	Add a protective system	180.00	100.00	0.00	0.00	0.00	0.00	180.00			
		2	Distress under 2%	>>0	Do Nothing	0.00	0.00	99.10	0.90	0.00	0.00	0.00	0.00		
				1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	1.29			
				2	Add a protective system	180.00	0.00	100.00	0.00	0.00	0.00	180.00			
		3	2-10% distress	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	0.01	99.86		
				1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	23.87			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	40.47			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	1.08	0.14		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	86.63			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	40.98			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.67			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	258.66	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	325.16			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	78.24			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	184.67			
53	Concrete Slab - Protected w/ Cathodic System sq.m.	1	No damage	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	2.95	88.18	2,873.78	2,873.78
				1	Add a protective system	180.00	100.00	0.00	0.00	0.00	0.00	182.81			
		2	Distress under 2%	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	7.78	11.82		
				>>1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	5.15			
				2	Add a protective system	180.00	0.00	100.00	0.00	0.00	0.00	184.90			
		3	2-10% distress	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	50.55	0.00		
				>>1	Repair Concrete Class 2	23.86	0.00	50.00	50.00	0.00	0.00	50.23			
				2	Overlay Concrete	40.46	0.00	50.00	50.00	0.00	0.00	66.83			
		4	10-25% distress	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	92.52	0.00		
				1	Repair Concrete Class 3	86.11	0.00	0.00	50.00	50.00	0.00	154.09			
				2	Overlay Concrete	40.46	0.00	0.00	50.00	50.00	0.00	108.44			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
		5	Distress over 25%	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	335.15	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	50.00	50.00	408.30			
				>>2	Overlay Concrete	40.46	0.00	0.00	0.00	50.00	50.00	161.38			
				3	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
54	Timber Slab sq.m.	1	No decay	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		4.31	48.38		
		2	Minor decay	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		7.51	48.38		
				1	Repair	3.72	50.00	50.00	0.00	0.00		9.35			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
			Timber												
		3	Some strength loss	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		18.07	3.24		
				1	Repair Timber	18.60	0.00	50.00	50.00	0.00		28.42			
				>>2	Replace Timber	9.00	100.00	0.00	0.00	0.00		13.10			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		213.50	0.00		
				>>1	Repair Timber	46.51	0.00	0.00	50.00	50.00		100.72			
				2	Replace Timber	186.03	100.00	0.00	0.00	0.00		190.13			
55	Timber Slab - w/ AC Overlay sq.m.	1	No deterioration	>>0	Do Nothing	0.00	90.57	9.43	0.00	0.00		4.29	84.13	1,860.18	1,860.18
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		6.55	15.87		
				1	Repair Timber	3.72	50.00	50.00	0.00	0.00		8.88			
				2	Rehab and/or protect unit	2.00	0.00	100.00	0.00	0.00		8.24			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	97.72	2.28		11.43	0.00		
				1	Repair Timber	18.60	0.00	50.00	50.00	0.00		27.17			
				2	Overlay Asphalt	13.64	0.00	50.00	50.00	0.00		22.21			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		154.36	0.00		
				1	Repair Timber	46.51	0.00	0.00	50.00	50.00		69.31			
				>>2	Overlay Asphalt	13.64	0.00	0.00	50.00	50.00		36.44			
				3	Replace Timber	186.03	100.00	0.00	0.00	0.00		190.11			
60	Railroad Deck ea.	1	No distress	>>0	Do Nothing	0.00	99.70	0.30	0.00	0.00	0.00	0.00	99.70	1,276.08	1,276.08
		2	Minor distress	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00	0.00	0.00	0.30		
				1	Repair Other	1.70	100.00	0.00	0.00	0.00	0.00	1.70			
		3	Moderate distress	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	0.30	0.00		
				1	Repair Other	8.52	0.00	100.00	0.00	0.00	0.00	8.52			
				2	Replace Other	127.61	100.00	0.00	0.00	0.00	0.00	127.61			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	27.32	0.00		
				>>1	Repair Other	21.29	0.00	0.00	100.00	0.00	0.00	21.57			
				2	Replace	127.73	100.00	0.00	0.00	0.00	0.00	127.73			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Other										
		5	Service impacted	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	200.41	0.00		
				1	Repair Other	85.16	0.00	0.00	0.00	50.00	50.00	156.27			
				>>2	Replace Other	127.73	100.00	0.00	0.00	0.00	0.00	127.73			
101	Unpainted Steel Closed Web/Box Girder m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.00	12.27		
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.08	87.66		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		42.69			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		5.90	0.07		
				1	Repair Steel	106.62	85.00	0.00	15.00	0.00		107.47			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00		640.13			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		810.23	0.00		
				>>1	Repair Steel	426.49	100.00	0.00	0.00	0.00		426.50			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
102	Painted Steel Closed Web/Box Girder m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
104	P/S Conc Closed Web/Box Girder m.	1	No deterioration	>>0	Do Nothing	0.00	99.90	0.10	0.00	0.00		0.00	99.80	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.48	0.20		
				1	Repair Prestressed Concrete	40.83	50.00	50.00	0.00	0.00		41.06			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.70	0.30		34.76	0.00		
				1	Repair Prestressed Concrete	102.09	0.00	50.00	50.00	0.00		118.87			
				2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		612.53			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		961.17	0.00		
				1	Repair Prestressed Concrete	408.35	0.00	0.00	50.00	50.00		716.62			
				>>2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		612.53			
105	Reinforced Concrete Closed Webs/Box Girder m.	1	No deterioration	>>0	Do Nothing	0.00	99.80	0.20	0.00	0.00	0.24		0.00	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.60	0.40	0.00	6.21		99.21		
				1	Repair Concrete Class 1	699.90	50.00	50.00	0.00	0.00	702.97				
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	98.19	1.81	88.75		0.79		
				>>1	Repair Concrete Class 2	40.83	0.00	50.00	50.00	0.00	83.60				
				2	Replace Concrete	612.52	100.00	0.00	0.00	0.00	612.75				
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59	961.37		0.00		
				1	Repair Concrete Class 3	408.35	0.00	0.00	50.00	50.00	739.99				
				>>2	Replace Concrete	612.52	100.00	0.00	0.00	0.00	612.75				
106	Unpainted Steel Open Girder/ Beam m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.01	0.00	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.12	99.86		
				1	Repair Steel	42.65	85.00	15.00	0.00	0.00		42.68			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		8.86	0.14		
				1	Repair Steel	106.62	0.00	50.00	50.00	0.00		110.90			
				2	Replace Steel	100.00	0.00	0.00	0.00	0.00					
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.43	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		735.39			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
107	Painted Steel Open Girder/ Beam m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	2.51	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	5.45	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	16.97	99.21		
				1	Repair Steel	42.65	0.00	54.00	46.00	0.00	0.00	52.89			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	642.51			
		4	Active corrosion	0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	126.40	0.79		
				>>1	Repair Steel	106.62	0.00	0.00	100.00	0.00	0.00	122.79			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	642.13			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,008.61	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	80.00	20.00	642.38			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	642.13			
109	P/S Conc Open Girder/Beam m.	1	No deterioration	>>0	Do Nothing	0.00	99.90	0.10	0.00	0.00		0.00	99.90	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.40	0.10		
				1	Repair Prestressed Concrete	89.27	100.00	0.00	0.00	0.00		89.28			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.70	0.30		28.62	0.00		
				1	Repair Prestressed Concrete	40.83	0.00	27.00	73.00	0.00		60.84			
				2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		612.53			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		861.74	0.00		
				>>1	Repair Prestressed Concrete	408.35	80.00	0.00	0.00	20.00		504.45			
				2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		612.53			
110	Reinforced Conc Open Girder/ Beam m.	1	No deterioration	>>0	Do Nothing	0.00	99.80	0.20	0.00	0.00		0.13	3.83	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.60	0.40	0.00		3.26	95.79		
				1	Repair Concrete Class 1	112.50	90.00	10.00	0.00	0.00		112.92			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	98.19	1.81		48.10	0.38		
				>>1	Repair Concrete Class 2	40.83	2.00	98.00	0.00	0.00		43.87			
				2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.64			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		774.50	0.00		
				>>1	Repair Concrete Class 3	408.35	61.00	39.00	0.00	0.00		409.63			
				2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.64			
111	Timber Open	1	No decay	>>0	Do Nothing	0.00	98.09	1.91	0.00	0.00		2.37	57.26	1,276.08	1,276.08
		2	Minor decay	>>0	Do Nothing	0.00	0.00	97.37	2.63	0.00		8.58	41.58		

No	Name	Condition		Action		Direct Cost $	T_i 1	2	3	4	5	Long Term Cost $	Opt Pct	Failure Cost $ Agency	User
	Girder/ Beam m.			1	Repair Timber	8.52	56.00	44.00	0.00	0.00		13.38			
		3	Some strength loss	0	Do Nothing	0.00	0.00	0.00	96.90	3.10		25.67	1.16		
				>>1	Repair Timber	21.29	94.00	0.00	6.00	0.00		24.84			
				2	Replace Timber	127.61	100.00	0.00	0.00	0.00		129.87			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		168.54	0.00		
				>>1	Repair Timber	85.16	4.00	96.00	0.00	0.00		93.09			
				2	Replace Timber	127.73	100.00	0.00	0.00	0.00		129.99			
112	Unpainted. Steel Stringer m	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.01	0.00	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.12	99.86		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		42.71			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		8.86	0.14		
				1	Repair Steel	106.62	0.00	50.00	50.00	0.00		110.90			
				2	Replace Steel	426.40	100.00	0.00	0.00	0.00		426.41			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.43	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		735.39			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
113	Painted Steel Stringer m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
115	P/S Conc Stringer m.	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		53.52	0.00	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		93.36	88.18		
				1	Repair Prestressed Concrete	112.50	50.00	50.00	0.00	0.00		182.45			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		187.07	11.82		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				>>1	Repair Prestressed Concrete	40.83	0.00	50.00	50.00	0.00		162.85			
				2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		663.50			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,008.06	0.00		
				1	Repair Prestressed Concrete	408.35	0.00	0.00	50.00	50.00		801.90			
				>>2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		663.50			
116	Reinforced Conc Stringer m.	1	No deterioration	>>0	Do Nothing	0.00	99.80	0.20	0.00	0.00		0.17	99.60	6,121.06	6,121.06
		2	Minor cracks/spalls	0	Do Nothing	0.00	0.00	99.60	0.40	0.00		4.55	0.40		
				>>1	Repair Concrete Class 1	2.26	50.00	50.00	0.00	0.00		4.47			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	98.19	1.81		87.28	0.00		
				>>1	Repair Concrete Class 2	40.83	0.00	50.00	50.00	0.00		82.02			
				2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.68			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		961.31	0.00		
				1	Repair Concrete Class 3	408.35	0.00	0.00	50.00	50.00		739.20			
				>>2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.68			
117	Timber Stringer m.	1	No decay	>>0	Do Nothing	0.00	98.09	1.91	0.00	0.00		4.85	96.32	1,276.08	1,276.08
		2	Minor decay	>>0	Do Nothing	0.00	0.00	97.37	2.63	0.00		17.52	3.68		
				1	Repair Timber	8.52	50.00	50.00	0.00	0.00		19.17			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	96.90	3.10		50.74	0.00		
				1	Repair Timber	21.29	0.00	50.00	50.00	0.00		53.80			
				2	Replace Timber	127.61	100.00	0.00	0.00	0.00		132.23			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		204.66	0.00		
				1	Repair Timber	85.16	0.00	0.00	50.00	50.00		172.35			
				>>2	Replace Timber	127.73	100.00	0.00	0.00	0.00		132.35			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
120	Unpainted Steel Bottom Chord Thru Truss m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.01	0.00	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.12	99.86		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		42.71			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		8.86	0.14		
				1	Repair Steel	106.62	0.00	50.00	50.00	0.00		110.90			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00		640.13			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.43	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		735.39			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
121	Painted Steel Bottom Chord Thru Truss m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
125	Unpainted Steel Thru Truss (excl. bottom chord) m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.01	0.00	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.12	99.86		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		42.71			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		8.86	0.14		
				1	Repair Steel	106.62	0.00	50.00	50.00	0.00		110.90			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00		640.13			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.43	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		735.39			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
126	Painted Steel Thru Truss (excl. bottom chord	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
	m.			1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
130	Unpainted Steel Deck Truss m.	1	No corrosion	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		97.52	88.18	6,432.30	6,432.30
		2	Minor corrosion	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		174.04	11.82		
				>>1	Repair Steel	42.65	50.00	50.00	0.00	0.00		170.11			
		3	Some section loss	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		365.13	0.00		
				>>1	Repair Steel	106.62	0.00	50.00	50.00	0.00		358.25			
				2	Replace Steel	426.40	100.00	0.00	0.00	0.00		519.29			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,091.88	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		946.02			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		732.63			
131	Painted Steel Deck Truss m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
135	Timber Truss/Arch m.	1	No decay	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		19.48	88.18	1,276.08	1,276.08
		2	Minor decay	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		34.77	11.82		
				>>1	Repair Timber	8.52	50.00	50.00	0.00	0.00		33.98			
		3	Some strength loss	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		72.92	0.00		
				>>1	Repair Timber	21.29	0.00	50.00	50.00	0.00		71.55			
				2	Replace Timber	127.61	100.00	0.00	0.00	0.00		146.17			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		217.48	0.00		
				1	Repair	85.16	0.00	0.00	50.00	50.00		188.90			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Timber										
				>>2	Replace Timber	127.73	100.00	0.00	0.00	0.00		146.29			
140	Unpainted Steel Arch m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.01	0.00	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.12	99.86		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		42.71			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		8.86	0.14		
				1	Repair Steel	106.62	0.00	50.00	50.00	0.00		110.90			
				2	Replace Steel	426.40	100.00	0.00	0.00	0.00		426.41			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.43	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		735.39			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
141	Painted Steel Arch m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
143	P/S Conc Arch m.	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		53.52	0.00	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		93.36	88.18		
				1	Repair Prestressed Concrete	49.21	50.00	50.00	0.00	0.00		119.16			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		187.07	11.82		
				>>1	Repair Prestressed Concrete	40.83	0.00	50.00	50.00	0.00		162.85			
				2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		663.50			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,008.06	0.00		
				1	Repair Prestressed	408.35	0.00	0.00	50.00	50.00		801.90			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Concrete										
				>>2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		663.50			
144	Reinforced Conc Arch m.	1	No deterioration	>>0	Do Nothing	0.00	99.80	0.20	0.00	0.00		0.24	0.00	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.60	0.40	0.00		6.21	99.21		
				1	Repair Concrete Class 1	147.64	50.00	50.00	0.00	0.00		150.71			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	98.19	1.81		88.75	0.79		
				>>1	Repair Concrete Class 2	40.83	0.00	50.00	50.00	0.00		83.60			
				2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.75			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		961.37	0.00		
				1	Repair Concrete Class 3	408.35	0.00	0.00	50.00	50.00		739.99			
				>>2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.75			
145	Other Arch m.	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		27.51	82.69	1,276.08	1,276.08
		2	Minor deterioration	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		48.02	17.31		
				>>1	Repair Other	8.52	32.00	68.00	0.00	0.00		47.98			
		3	Moderate deterioration	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		84.72	0.00		
				>>1	Repair Other	21.29	0.00	50.00	50.00	0.00		84.28			
				2	Replace Other	127.61	100.00	0.00	0.00	0.00		153.81			
		4	Major deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		224.52	0.00		
				1	Repair Other	85.16	0.00	0.00	50.00	50.00		198.61			
				>>2	Replace Other	127.73	100.00	0.00	0.00	0.00		153.93			
146	Cable - Uncoated (not embedded in concrete) m.	1	No corrosion	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		97.52	88.18	6,432.30	6,432.30
		2	Surface rust	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		174.04	11.82		
				>>1	Repair Steel	42.65	50.00	50.00	0.00	0.00		170.11			
		3	Moderate deterioration	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		365.13	0.00		
				>>1	Repair Steel	106.62	0.00	50.00	50.00	0.00		358.25			
				2	Replace Steel	426.40	100.00	0.00	0.00	0.00		519.29			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,091.88	0.00		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		946.02			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		732.63			
147	Cable - Coated (not embedded in concrete) m.	1	No corrosion	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	55.91	0.00	6,432.30	6,432.30
		2	Surface rust forming	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	97.52	88.18		
		3	Rust prevalent	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	174.04	11.82		
				>>1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	170.11			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	693.37			
		4	Active corrosion	0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	362.60	0.00		
				>>1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	358.25			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	692.99			
		5	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,055.41	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	927.15			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	692.99			
151	Unpainted Steel Floor Beam m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00		0.01	0.00	6,432.30	
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.12	99.86		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		42.71			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		8.86	0.14		
				1	Repair Steel	106.62	0.00	50.00	50.00	0.00		110.90			
				2	Replace Steel	426.40	100.00	0.00	0.00	0.00		426.41			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.43	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		735.39			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.75			
152	Painted Steel Floor Beam m.	1	No corrosion	>>0	Do Nothing	0.00	95.76	4.24	0.00	0.00	0.00	3.63	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	97.64	2.36	0.00	0.00	7.91	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80	0.00	24.62	98.43		
				1	Repair Steel	42.65	0.00	50.00	50.00	0.00	0.00	58.14			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	643.58			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	98.09	1.91	178.13	1.57		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	203.18			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	1,009.60	0.00		
				1	Repair Steel	426.49	0.00	0.00	0.00	50.00	50.00	817.65			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	643.20			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
154	P/S Conc Floor Beam m.	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		53.52	0.00	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		93.36	88.18		
				1	Repair Prestressed Concrete	850.00	50.00	50.00	0.00	0.00		919.95			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		187.07	11.82		
				>>1	Repair Prestressed Concrete	40.83	0.00	50.00	50.00	0.00		162.85			
				2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		663.50			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,008.06	0.00		
				1	Repair Prestressed Concrete	408.35	0.00	0.00	50.00	50.00		801.90			
				>>2	Replace Prestressed Concrete	612.52	100.00	0.00	0.00	0.00		663.50			
155	Reinforced Conc Floor Beam m.	1	No deterioration	>>0	Do Nothing	0.00	99.80	0.20	0.00	0.00		0.24	0.00	6,121.06	6,121.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.60	0.40	0.00		6.21	99.21		
				1	Repair Concrete Class 1	1,488.68	50.00	50.00	0.00	0.00		1,491.75			
		3	Delams/spalls	0	Do Nothing	0.00	0.00	0.00	98.19	1.81		88.75	0.79		
				>>1	Repair Concrete Class 2	40.83	0.00	50.00	50.00	0.00		83.60			
				2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.75			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		961.37	0.00		
				1	Repair Concrete Class 3	408.35	0.00	0.00	50.00	50.00		739.99			
				>>2	Replace Concrete	612.52	100.00	0.00	0.00	0.00		612.75			
156	Timber Floor Beam m.	1	No decay	>>0	Do Nothing	0.00	98.09	1.91	0.00	0.00		4.85	96.32	1,276.08	1,276.08
		2	Minor decay	>>0	Do Nothing	0.00	0.00	97.37	2.63	0.00		17.52	3.68		
				1	Repair Timber	8.52	50.00	50.00	0.00	0.00		19.17			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	96.90	3.10		50.74	0.00		
				1	Repair Timber	21.29	0.00	50.00	50.00	0.00		53.80			
				2	Replace	127.61	100.00	0.00	0.00	0.00		132.23			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
			Timber												
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		204.66	0.00		
				1	Repair Timber	85.16	0.00	0.00	50.00	50.00		172.35			
				>>2	Replace Timber	127.73	100.00	0.00	0.00	0.00		132.35			
160	Unpainted Steel Pin and/or Pin and Hanger Assembly ea	1	No corrosion	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		0.04	99.86	6,432.30	6,432.30
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		2.85	0.14		
				1	Repair Steel	42.65	50.00	50.00	0.00	0.00		44.03			
		3	Some section loss	0	Do Nothing	0.00	0.00	0.00	89.09	10.91		241.43	0.00		
				>>1	Repair Steel	106.62	0.00	50.00	50.00	0.00		206.17			
				2	Replace Steel	426.40	100.00	0.00	0.00	0.00		426.44			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,006.45	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		829.37			
				>>2	Replace Steel	639.74	100.00	0.00	0.00	0.00		639.78			
161	Painted Steel Pin and/or Pin and Hanger Assembly ea	1	No corrosion	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00	0.00	0.00	0.00	6,432.30	6,432.30
		2	Paint distress	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00	0.00	0.00	0.00		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	89.09	10.91	0.00	0.00	0.00		
				1	Repair Steel	42.65	100.00	0.00	0.00	0.00	0.00	42.65			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00	0.00	640.12			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	96.59	3.41	0.00	0.00		
				1	Repair Steel	106.62	0.00	0.00	50.00	50.00	0.00	106.62			
				2	Replace Steel	639.74	100.00	0.00	0.00	0.00	0.00	639.74			
		5	Section loss	>>0	Do Nothing	0.00	0.00	0.00	0.00	0.00	100.00	0.00	100.00		
				1	Rehab unit	426.49	0.00	0.00	0.00	0.00	100.00	426.49			
				2	Replace unit	639.74	0.00	0.00	0.00	0.00	100.00	639.74			
201	Unpainted Steel Column or Pile Extension ea	1	No corrosion	>>0	Do Nothing	0.00	94.39	5.61	0.00	0.00	50.50		1.22	129,683.38	
		2	Rust formation	>>0	Do Nothing	0.00	0.00	94.39	5.61	0.00	95.39		1.22		
				1	Repair Steel	8,652.47	50.00	50.00	0.00	0.00	8,721.95				
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	180.18		97.50		
				1	Repair Steel	8,652.47	0.00	100.00	0.00	0.00	8,743.33				
				2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00	13,016.44				
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59	20,399.68		0.07		
				1	Repair Steel	8,652.47	0.00	0.00	50.00	50.00	14,937.36				
				>>2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00	13,016.44				
202	Painted Steel Column or Pile Extension ea.	1	No corrosion	>>0	Do Nothing	0.00	50.00	50.00	0.00	0.00	0.00	127.45	0.76	129,683.38	129,683.38
		2	Paint distress	>>0	Do Nothing	0.00	0.00	96.22	3.78	0.00	0.00	140.16	10.07		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	98.50	1.50	0.00	325.06	25.37		
				1	Repair Steel	8,652.47	100.00	0.00	0.00	0.00	0.00	8,773.86			
				2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00	0.00	13,089.73			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.40	0.60	1,405.77	63.42		
				1	Repair Steel	8,652.47	100.00	0.00	0.00	0.00	0.00	8,773.86			
				2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00	0.00	13,089.73			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	20,467.11	0.38		
				1	Repair Steel	8,652.47	0.00	0.00	0.00	50.00	50.00	15,555.95			
				>>2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00	0.00	13,089.73			
204	P/S Conc Column or Pile Extension	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		2,977.96	32.61	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		5,194.49	32.61		
				1	Repair Prestressed Concrete	8,652.47	50.00	50.00	0.00	0.00		12,544.60			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		9,060.80	32.61		
				1	Repair Prestressed Concrete	8,652.47	0.00	50.00	50.00	0.00		15,441.55			
				2	Replace Prestressed Concrete	12,968.34	100.00	0.00	0.00	0.00		15,804.85			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		22,965.07	2.18		
				1	Repair Prestressed Concrete	8,652.47	0.00	0.00	50.00	50.00		20,494.74			
				>>2	Replace Prestressed Concrete	12,968.34	100.00	0.00	0.00	0.00		15,804.85			
205	Reinforced Conc Column or Pile Extension ea	1	No deterioration	>>0	Do Nothing	0.00	98.28	1.72	0.00	0.00		123.18	23.72	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	94.81	5.19	0.00		480.31	7.86		
				1	Repair Concrete Class 1	8,652.47	100.00	0.00	0.00	0.00		8,769.80			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.40	0.60		941.83	68.01		
				1	Repair Concrete Class 2	8,652.47	0.00	100.00	0.00	0.00		9,109.97			
				2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		13,085.67			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		16,492.68	0.41		

No	Name	Condition		Action		Direct Cost $	T_i 1	2	3	4	5	Long Term Cost $	Opt Pct	Failure Cost $ Agency	User
				>>1	Repair Concrete Class 3	8,652.47	100.00	0.00	0.00	0.00		8,769.80			
				2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		13,085.67			
206	Timber Column or Pile Extension ea	1	No decay	>>0	Do Nothing	0.00	50.00	50.00	0.00	0.00		264.89	1.43	43,262.37	43,262.37
		2	Minor decay	>>0	Do Nothing	0.00	0.00	91.70	8.30	0.00		291.31	8.60		
				1	Repair Timber	2,884.16	25.00	75.00	0.00	0.00		3,155.34			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	99.20	0.80		466.34	89.20		
				1	Repair Timber	2,884.16	89.00	0.00	11.00	0.00		3,157.58			
				2	Replace Timber	4,323.13	100.00	0.00	0.00	0.00		4,575.44			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		5,913.88	0.78		
				>>1	Repair Timber	2,884.16	92.00	0.00	0.00	8.00		3,373.33			
				2	Replace Timber	4,322.78	100.00	0.00	0.00	0.00		4,575.09			
210	Reinforced Conc Pier Wall km.	1	No deterioration	>>0	Do Nothing	0.00	99.00	1.00	0.00	0.00		21.43	30.63	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	98.79	1.21	0.00		128.32	25.31		
				1	Repair Concrete Class 1	3,545.81	50.00	50.00	0.00	0.00		3,617.13			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.30	0.70		657.20	43.75		
				1	Repair Concrete Class 2	3,545.81	0.00	50.00	50.00	0.00		3,919.91			
				2	Replace Concrete	5,319.09	100.00	0.00	0.00	0.00		5,339.51			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,369.44	0.31		
				1	Repair Concrete Class 3	3,545.81	0.00	0.00	50.00	50.00		6,401.56			
				>>2	Replace Concrete	5,318.72	100.00	0.00	0.00	0.00		5,339.14			
211	Other Material Pier Wall m.	1	No deterioration	>>0	Do Nothing	0.00	97.64	2.36	0.00	0.00		6.56	2.78	53,222.06	53,222.06
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91	0.00		20.41	3.43		
				1	Repair Other	3,545.81	50.00	50.00	0.00	0.00		3,558.65			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		73.71	93.72		
				1	Repair Other	3,545.81	0.00	50.00	50.00	0.00		3,590.64			
				2	Replace	5,319.09	100.00	0.00	0.00	0.00		5,325.34			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Other										
		4	Major deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,356.41	0.07		
				1	Repair Other	3,545.81	0.00	0.00	50.00	50.00		6,116.93			
				>>2	Replace Other	5,318.72	100.00	0.00	0.00	0.00		5,324.97			
215	Reinforced Conc Abutment m.	1	No deterioration	>>0	Do Nothing	0.00	99.00	1.00	0.00	0.00		21.43	30.63	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	98.79	1.21	0.00		128.32	25.31		
				1	Repair Concrete Class 1	3,545.81	100.00	0.00	0.00	0.00		3,566.23			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.30	0.70		657.20	43.75		
				1	Repair Concrete Class 2	3,545.81	100.00	0.00	0.00	0.00		3,566.23			
				2	Replace Concrete	5,319.09	100.00	0.00	0.00	0.00		5,339.51			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,369.44	0.31		
				1	Repair Concrete Class 3	3,545.81	0.00	0.00	50.00	50.00		6,401.56			
				>>2	Replace Concrete	5,318.72	100.00	0.00	0.00	0.00		5,339.14			
216	Timber Abutment m.	1	No decay	>>0	Do Nothing	0.00	99.00	1.00	0.00	0.00		0.53	7.69	17,740.69	17,740.69
		2	Minor decay	>>0	Do Nothing	0.00	0.00	99.50	0.50	0.00		3.18	15.37		
				1	Repair Timber	1,181.93	100.00	0.00	0.00	0.00		1,182.44			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	99.90	0.10		34.86	76.86		
				1	Repair Timber	1,181.93	0.00	50.00	50.00	0.00		1,200.05			
				2	Replace Timber	1,773.03	100.00	0.00	0.00	0.00		1,773.54			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		2,784.02	0.08		
				1	Repair Timber	1,181.93	0.00	0.00	50.00	50.00		2,043.12			
				>>2	Replace Timber	1,772.91	100.00	0.00	0.00	0.00		1,773.42			
217	Other Material Abutment m.	1	No deterioration	>>0	Do Nothing	0.00	97.64	2.36	0.00	0.00		6.56	2.78	53,222.06	53,222.06
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91	0.00		20.41	3.43		
				1	Repair Other	3,545.81	100.00	0.00	0.00	0.00		3,552.06			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		73.71	93.72		
				1	Repair	3,545.81	0.00	100.00	0.00	0.00		3,565.25			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Other										
				2	Replace Other	5,319.09	100.00	0.00	0.00	0.00		5,325.34			
		4	Major deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,356.41	0.07		
				1	Repair Other	3,545.81	0.00	0.00	50.00	50.00		6,116.93			
				>>2	Replace Other	5,318.72	100.00	0.00	0.00	0.00		5,324.97			
220	Reinforced Conc Submerged Pile Cap/Footing ea	1	No deterioration	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		59.26	97.89	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		4,280.78	1.02		
				1	Repair Concrete Class 1	8,652.47	50.00	50.00	0.00	0.00		10,719.41			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		7,467.01	1.02		
				1	Repair Concrete Class 2	8,652.47	0.00	50.00	50.00	0.00		14,247.36			
				2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		13,024.78			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		20,407.35	0.07		
				1	Repair Concrete Class 3	8,652.47	0.00	0.00	50.00	50.00		18,411.69			
				>>2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		13,024.78			
221	Reinforced Conc Pile Cap/Footing ea	1	No deterioration	>>0	Do Nothing	0.00	98.28	1.72	0.00	0.00		184.62	23.72	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	94.81	5.19	0.00		719.89	7.86		
				1	Repair Concrete Class 1	8,652.47	50.00	50.00	0.00	0.00		9,083.24			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.40	0.60		1,411.61	68.01		
				1	Repair Concrete Class 2	8,652.47	0.00	50.00	50.00	0.00		9,667.60			
				2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		13,144.19			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		20,517.21	0.41		
				1	Repair Concrete Class 3	8,652.47	0.00	0.00	50.00	50.00		15,584.67			
				>>2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		13,144.19			
225	Unpainted Steel Submerged Pile ea	1	No corrosion	>>0	Do Nothing	0.00	94.39	5.61	0.00	0.00		50.50	1.22	129,683.38	129,683.38
		2	Rust formation	>>0	Do Nothing	0.00	0.00	94.39	5.61	0.00		95.39	1.22		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Steel	8,652.47	50.00	50.00	0.00	0.00		8,721.95			
		3	Surface pitting	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		180.18	97.50		
				1	Repair Steel	8,652.47	0.00	50.00	50.00	0.00		8,783.71			
				2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00		13,016.44			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		20,399.68	0.07		
				1	Repair Steel	8,652.47	0.00	0.00	50.00	50.00		14,937.36			
				>>2	Replace Steel	12,968.34	100.00	0.00	0.00	0.00		13,016.44			
226	P/S Conc Submerged Pileea	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		2,977.96	32.61	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		5,194.49	32.61		
				1	Repair Prestressed Concrete	8,652.47	50.00	50.00	0.00	0.00		12,544.60			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		9,060.80	32.61		
				1	Repair Prestressed Concrete	8,652.47	0.00	50.00	50.00	0.00		15,441.55			
				2	Replace Prestressed Concrete	12,968.34	100.00	0.00	0.00	0.00		15,804.85			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		22,965.07	2.18		
				1	Repair Prestressed Concrete	8,652.47	0.00	0.00	50.00	50.00		20,494.74			
				>>2	Replace Prestressed Concrete	12,968.34	100.00	0.00	0.00	0.00		15,804.85			
227	Reinforced Conc Submerged Pile ea	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		2,977.96	32.61	129,683.38	129,683.38
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		5,194.49	32.61		
				1	Repair Concrete Class 1	8,652.47	50.00	50.00	0.00	0.00		12,544.60			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		9,060.80	32.61		
				1	Repair Concrete Class 2	8,652.47	0.00	50.00	50.00	0.00		15,441.55			
				2	Replace Concrete	12,968.34	100.00	0.00	0.00	0.00		15,804.85			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		22,965.07	2.18		
				1	Repair Concrete Class 3	8,652.47	0.00	0.00	50.00	50.00		20,494.74			
				>>2	Replace	12,968.34	100.00	0.00	0.00	0.00		15,804.85			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Concrete										
228	Timber Submerged Pile ea	1	No decay	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		19.75	97.89	43,262.37	43,262.37
		2	Minor decay	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		1,426.93	1.02		
				1	Repair Timber	2,884.16	17.00	83.00	0.00	0.00		4,015.45			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		2,489.00	1.02		
				1	Repair Timber	2,884.16	0.00	50.00	50.00	0.00		4,749.12			
				2	Replace Timber	4,323.13	100.00	0.00	0.00	0.00		4,341.94			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		6,804.70	0.07		
				1	Repair Timber	2,884.16	0.00	0.00	50.00	50.00		6,137.23			
				>>2	Replace Timber	4,322.78	100.00	0.00	0.00	0.00		4,341.59			
230	Unpainted Steel Cap m.	1	No corrosion	>>0	Do Nothing	0.00	99.40	0.60	0.00	0.00		4.54	10.34	53,222.06	53,222.06
		2	Rust formation	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		42.24	88.67		
				1	Repair Steel	3,545.81	100.00	0.00	0.00	0.00		3,550.13			
		3	Some section loss	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		3,051.66	0.93		
				1	Repair Steel	3,545.81	0.00	50.00	50.00	0.00		5,019.28			
				2	Replace Steel	5,319.09	100.00	0.00	0.00	0.00		5,323.41			
		4	Major section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,354.63	0.06		
				1	Repair Steel	3,545.81	0.00	0.00	50.00	50.00		7,534.26			
				>>2	Replace Steel	5,318.72	100.00	0.00	0.00	0.00		5,323.04			
231	Painted Steel Cap m.	1	No corrosion	>>0	Do Nothing	0.00	89.09	10.91	0.00	0.00	0.00	0.37	0.32	53,222.06	53,222.06
		2	Paint distress	>>0	Do Nothing	0.00	0.00	94.39	5.61	0.00	0.00	0.54	0.62		
		3	Rust formation	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	1.02	49.51		
				1	Repair Steel	3,545.81	0.00	42.00	58.00	0.00	0.00	3,546.59			
				2	Replace Steel	5,319.09	100.00	0.00	0.00	0.00	0.00	5,319.44			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	73.63	49.51		
				1	Repair Steel	3,545.81	70.00	0.00	0.00	30.00	0.00	3,567.10			
				2	Replace Steel	5,318.72	100.00	0.00	0.00	0.00	0.00	5,319.07			
		5	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	8,350.98	0.03		
				1	Repair Steel	3,545.81	0.00	0.00	0.00	50.00	50.00	6,114.08			
				>>2	Replace Steel	5,318.72	100.00	0.00	0.00	0.00	0.00	5,319.07			
233	P/S Conc Cap m.	1	No deterioration	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		0.58	49.72	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		42.21	49.72		
				1	Repair	3,545.81	50.00	50.00	0.00	0.00		3,566.19			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Prestressed Concrete										
		3	Delams,spalls	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		3,049.50	0.52		
				1	Repair Prestressed Concrete	3,545.81	0.00	50.00	50.00	0.00		5,018.24			
				2	Replace Prestressed Concrete	5,319.09	100.00	0.00	0.00	0.00		5,319.65			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,351.17	0.03		
				1	Repair Prestressed Concrete	3,545.81	0.00	0.00	50.00	50.00		7,531.44			
				>>2	Replace Prestressed Concrete	5,318.72	100.00	0.00	0.00	0.00		5,319.28			
234	Reinforced Conc Cap m.	1	No deterioration	>>0	Do Nothing	0.00	99.00	1.00	0.00	0.00		14.29	30.63	53,222.06	53,222.06
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	98.79	1.21	0.00		85.55	25.31		
				1	Repair Concrete Class 1	3,545.81	50.00	50.00	0.00	0.00		3,593.36			
		3	Delams/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.30	0.70		438.13	43.75		
				1	Repair Concrete Class 2	3,545.81	0.00	50.00	50.00	0.00		3,795.21			
				2	Replace Concrete	5,319.09	100.00	0.00	0.00	0.00		5,332.70			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		6,732.07	0.31		
				>>1	Repair Concrete Class 3	3,545.81	100.00	0.00	0.00	0.00		3,559.42			
				2	Replace Concrete	5,318.72	100.00	0.00	0.00	0.00		5,332.33			
235	Timber Cap m.	1	No decay	>>0	Do Nothing	0.00	99.00	1.00	0.00	0.00		0.35	0.00	17,740.69	17,740.69
		2	Minor decay	>>0	Do Nothing	0.00	0.00	99.50	0.50	0.00		2.12	16.65		
				1	Repair Timber	1,181.93	50.00	50.00	0.00	0.00		1,183.11			
		3	Some strength loss	>>0	Do Nothing	0.00	0.00	0.00	99.90	0.10		23.27	83.26		
				1	Repair Timber	1,181.93	30.00	0.00	70.00	0.00		1,197.55			
				2	Replace Timber	1,773.03	100.00	0.00	0.00	0.00		1,773.37			
		4	Major strength loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		2,241.70	0.08		
				>>1	Repair	1,181.93	0.00	100.00	0.00	0.00		1,183.95			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Timber										
				2	Replace Timber	1,772.91	100.00	0.00	0.00	0.00		1,773.25			
240	Unpainted Steel Culvert m.	1	No deterioration	>>0	Do Nothing	0.00	97.27	2.73	0.00	0.00		8.63	3.41	51,043.38	51,043.38
		2	Minor corrosion	>>0	Do Nothing	0.00	0.00	97.15	2.85	0.00		24.39	3.27		
				1	Repair Steel	3,402.89	62.00	38.00	0.00	0.00		3,416.81			
		3	Moderate corrosion	>>0	Do Nothing	0.00	0.00	0.00	99.90	0.10		67.06	93.22		
				1	Repair Steel	3,402.89	0.00	100.00	0.00	0.00		3,426.12			
				2	Replace Steel	5,104.34	100.00	0.00	0.00	0.00		5,112.56			
		4	Major corrosion	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		6,454.09	0.09		
				>>1	Repair Steel	3,402.89	100.00	0.00	0.00	0.00		3,411.11			
				2	Replace Steel	5,104.34	100.00	0.00	0.00	0.00		5,112.56			
241	Reinforced Concrete Culvert	1	No deterioration	>>0	Do Nothing	0.00	99.10	0.90	0.00	0.00		3.09	13.75	51,043.38	51,043.38
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.30	0.70	0.00		20.21	19.13		
				1	Repair Concrete Class 1	3,402.89	81.00	19.00	0.00	0.00		3,408.93			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.80	0.20		164.18	66.95		
				1	Repair Concrete Class 2	3,402.89	0.00	100.00	0.00	0.00		3,422.14			
				2	Replace Concrete	5,104.34	100.00	0.00	0.00	0.00		5,107.28			
		4	Major deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		7,233.13	0.17		
				>>1	Repair Concrete Class 3	3,402.89	73.00	6.00	0.00	21.00		4,257.87			
				2	Replace Concrete	5,104.34	100.00	0.00	0.00	0.00		5,107.28			
242	Timber Culvert m.	1	Sound condition	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		390.71	32.61	17,014.46	17,014.46
		2	Minor decay	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		681.52	32.61		
				1	Repair Timber	1,134.29	50.00	50.00	0.00	0.00		1,644.94			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		1,188.78	32.61		
				1	Repair Timber	1,134.29	0.00	50.00	50.00	0.00		2,025.02			
				2	Replace Timber	1,701.45	100.00	0.00	0.00	0.00		2,073.60			
		4	Major deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		3,013.02	2.18		
				1	Repair Timber	1,134.29	0.00	0.00	50.00	50.00		2,688.00			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				>>2	Replace Timber	1,701.45	100.00	0.00	0.00	0.00		2,073.60			
243	Other Culvert m.	1	No deterioration	>>0	Do Nothing	0.00	97.64	2.36	0.00	0.00		18.34	2.87	51,043.38	51,043.38
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	79.37	20.63	0.00		57.10	0.33		
				1	Repair Other	3,402.89	47.00	53.00	0.00	0.00		3,439.92			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		70.90	96.73		
				1	Repair Other	3,402.89	0.00	50.00	50.00	0.00		3,463.85			
				2	Replace Other	5,104.34	100.00	0.00	0.00	0.00		5,121.81			
		4	Major deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		8,027.97	0.07		
				1	Repair Other	3,402.89	0.00	0.00	50.00	50.00		5,875.92			
				>>2	Replace Other	5,104.34	100.00	0.00	0.00	0.00		5,121.81			
300	Strip Seal Expansion Joint m.	1	No leakage	>>0	Do Nothing	0.00	96.22	3.78	0.00			51.84	0.00	5,955.06	5,955.06
		2	Minor leakage	>>0	Do Nothing	0.00	0.00	98.09	1.91			120.24	96.32		
				1	Repair Other	170.14	50.00	50.00	0.00			252.10			
		3	Major leakage	0	Do Nothing	0.00	0.00	0.00	96.59			786.30	3.68		
				>>1	Repair Other	170.14	0.00	50.00	50.00			434.19			
				2	Replace Other	595.51	100.00	0.00	0.00			644.89			
301	Pourable Joint Seal m.	1	No deterioration	>>0	Do Nothing	0.00	96.22	3.78	0.00			51.84	0.00	5,955.06	5,955.06
		2	Minor leakage	>>0	Do Nothing	0.00	0.00	98.09	1.91			120.24	96.32		
				1	Repair Other	170.14	50.00	50.00	0.00			252.10			
		3	Leakage problems	0	Do Nothing	0.00	0.00	0.00	96.59			786.30	3.68		
				>>1	Repair Other	170.14	0.00	50.00	50.00			434.19			
				2	Replace Other	595.51	100.00	0.00	0.00			644.89			
302	Compression Joint Seal m.	1	No deterioration	>>0	Do Nothing	0.00	96.22	3.78	0.00			51.84	0.00	5,955.06	5,955.06
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91			120.24	96.32		
				1	Repair Other	170.14	50.00	50.00	0.00			252.10			
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59			786.30	3.68		
				>>1	Repair Other	170.14	0.00	50.00	50.00			434.19			
				2	Replace Other	595.51	100.00	0.00	0.00			644.89			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
303	Assembly Joint/Seal	1	No deterioration	>>0	Do Nothing	0.00	96.22	3.78	0.00			740.66	0.00	85,072.30	85,072.30
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91			1,717.80	96.32		
				1	Repair Other	2,430.64	50.00	50.00	0.00			3,601.48			
		3	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	96.59			11,233.08	3.68		
				>>1	Repair Other	2,430.64	0.00	50.00	50.00			6,202.85			
				2	Replace Other	8,507.23	100.00	0.00	0.00			9,212.71			
304	Open Expansion Joint m.	1	No deterioration	>>0	Do Nothing	0.00	96.22	3.78	0.00			22.92	33.15	5,955.06	5,955.06
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91			53.16	65.60		
				1	Repair Other	170.14	100.00	0.00	0.00			191.97			
		3	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	96.59			563.46	1.25		
				>>1	Repair Other	170.14	100.00	0.00	0.00			191.97			
				2	Replace Other	595.51	100.00	0.00	0.00			617.34			
305	Elastomeric Flex-Type Joint m.	1	No deterioration	>>0	Do Nothing	0.00	79.37	20.63	0.00			588.25	82.90	5,955.06	5,955.06
		2	Minor deterioration	0	Do Nothing	0.00	0.00	90.57	9.43			733.96	17.10		
				>>1	Repair Other	170.14	100.00	0.00	0.00			730.45			
		3	Signs of failure	0	Do Nothing	0.00	0.00	0.00	96.59			1,450.22	0.00		
				1	Repair Other	170.14	0.00	4.00	96.00			1,254.85			
				>>2	Replace Other	595.51	100.00	0.00	0.00			1,155.82			
306	Asphaltic Plug Expansion Device m.	1	No cracks or leakage	>>0	Do Nothing	0.00	93.30	6.70	0.00			36.93	24.97	5,955.06	5,955.06
		2	Significant damage	>>0	Do Nothing	0.00	0.00	97.72	2.28			64.42	73.36		
				1	Repair Other	170.14	100.00	0.00	0.00			205.32			
		3	Failed	0	Do Nothing	0.00	0.00	0.00	96.59			575.74	1.67		
				>>1	Repair Other	170.14	100.00	0.00	0.00			205.32			
				2	Replace Other	595.51	100.00	0.00	0.00			630.69			
307	Modular Expansion Joint m.	1	No deterioration	>>0	Do Nothing	0.00	96.22	3.78	0.00			740.66	0.00	85,072.30	85,072.30
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91			1,717.80	96.32		
				1	Repair Other	2,430.64	50.00	50.00	0.00			3,601.48			
		3	Failure	0	Do Nothing	0.00	0.00	0.00	96.59			11,233.08	3.68		
				>>1	Repair	2,430.64	0.00	50.00	50.00			6,202.85			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Other										
				2	Replace Other	8,507.23	100.00	0.00	0.00			9,212.71			
308	Construction/Non-Expansion Joint m.	1	No deterioration	>>0	Do Nothing	0.00	96.22	3.78	0.00	17.28			0.00	1,981.56	1,981.56
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	98.09	1.91	40.09			96.32		
				1	Repair Other	56.72	50.00	50.00	0.00	84.04					
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59	261.89			3.68		
				>>1	Repair Other	56.72	0.00	50.00	50.00	144.75					
				2	Replace Other	198.16	100.00	0.00	0.00	214.62					
309	Elastomeric Bearing with Teflon ea	1	No deterioration	>>0	Do Nothing	0.00	99.40	0.60	0.00			21.52	45.33	21,786.81	21,786.81
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.50	0.50			200.40	54.40		
				1	Repair Other	1,452.45	50.00	50.00	0.00			1,558.14			
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59			3,438.57	0.27		
				1	Repair Other	1,452.45	0.00	50.00	50.00			2,595.25			
				>>2	Replace Other	2,178.68	100.00	0.00	0.00			2,199.18			
310	Elastomeric Bearing ea	1	No deterioration	>>0	Do Nothing	0.00	99.40	0.60	0.00			7.49	45.33	10,478.42	10,478.42
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.50	0.50			69.71	54.40		
				1	Repair Other	698.56	83.00	17.00	0.00			715.77			
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59			1,384.46	0.27		
				1>>	Repair Other	698.56	0.00	100.00	0.00			764.96			
				2	Replace Other	1,047.84	100.00	0.00	0.00			1,054.97			
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.60	0.40			116.06	99.60		
				1	Repair Other	1,452.45	50.00	50.00	0.00			1,533.12			
		3	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	96.59			2,853.27	0.40		
				>>1	Repair Other	1,452.45	0.00	100.00	0.00			1,563.00			
				2	Replace Other	2,178.68	100.00	0.00	0.00			2,229.48			
312	Enclosed/Concealed Bearing ea	1	No deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00			1,042.37	48.38	21,786.81	21,786.81
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	93.30	6.70			1,818.22	48.38		
				1	Repair Other	1,452.45	50.00	50.00	0.00			2,814.81			
		3	Bearing failures	0	Do Nothing	0.00	0.00	0.00	96.59			4,333.16	3.24		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Other	1,452.45	0.00	50.00	50.00			3,828.82			
				>>2	Replace Other	2,178.68	100.00	0.00	0.00			3,171.54			
313	Fixed Bearing ea	1	No deterioration	>>0	Do Nothing	0.00	95.76	4.24	0.00			36.96	8.59	10,478.42	10,478.42
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.60	0.40			80.42	91.05		
				1	Repair Other	698.56	50.00	50.00	0.00			754.46			
		3	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	96.59			1,677.10	0.36		
				1	Repair Other	698.56	0.00	50.00	50.00			1,252.66			
				>>2	Replace Other	1,047.84	100.00	0.00	0.00			1,083.04			
314	Pot Bearing ea	1	No deterioration	>>0	Do Nothing	0.00	95.76	4.24	0.00			398.83	8.59	113,083.91	113,083.91
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.60	0.40			867.91	91.05		
				1	Repair Other	7,538.93	50.00	50.00	0.00			8,142.21			
		3	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	96.59			18,099.43	0.36		
				1	Repair Other	7,538.93	0.00	50.00	50.00			13,518.81			
				>>2	Replace Other	11,308.39	100.00	0.00	0.00			11,688.27			
315	Disk Bearing ea	1	No deterioration	>>0	Do Nothing	0.00	95.76	4.24	0.00			398.83	8.59	113,083.91	113,083.91
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.60	0.40			867.91	91.05		
				1	Repair Other	7,538.93	50.00	50.00	0.00			8,142.21			
		3	Advanced corrosion	0	Do Nothing	0.00	0.00	0.00	96.59			18,099.43	0.36		
				1	Repair Other	7,538.93	0.00	50.00	50.00			13,518.81			
				>>2	Replace Other	11,308.39	100.00	0.00	0.00			11,688.27			
320	P/S Concrete Approach Slab w/ or w-o/AC Ovly ea	1	No deterioration	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		125.07	99.86	701,327.70	701,327.70
		2	Minor cracks/spalls	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		9,977.25	0.14		
				>>1	Repair Prestressed Concrete	4,672.75	50.00	50.00	0.00	0.00		9,035.45			
		3	Major cracks/spalls	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		31,601.49	0.00		
				>>1	Repair Prestressed Concrete	11,680.84	0.00	50.00	50.00	0.00		30,518.32			
				2	Replace Prestressed Concrete	70,087.12	100.00	0.00	0.00	0.00		70,206.25			

No	Name	Condition		Action		Direct Cost $	T_i 1	2	3	4	5	Long Term Cost $	Opt Pct	Failure Cost $ Agency	User
		4	Broken/Unstable	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		110,149.74	0.00		
				1	Repair Prestressed Concrete	46,724.40	0.00	0.00	50.00	50.00		94,694.48			
				>>2	Replace Prestressed Concrete	70,087.12	100.00	0.00	0.00	0.00		70,206.25			
321	Reinforced Conc Approach Slab w/ or w/o AC Ovly ea	1	No deterioration	>>0	Do Nothing	0.00	98.28	1.72	0.00	0.00		1.31	3.19	97,729.39	97,729.39
		2	Cracks/spalls	>>0	Do Nothing	0.00	0.00	99.70	0.30	0.00		5.12	18.30		
				1	Repair Concrete Class 1	651.68	100.00	0.00	0.00	0.00		652.93			
		3	Major cracks/spalls	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		90.23	78.45		
				1	Repair Concrete Class 2	1,629.21	100.00	0.00	0.00	0.00		1,630.46			
				2	Replace Concrete	9,775.01	100.00	0.00	0.00	0.00		9,776.26			
		4	Broken/Unstable	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		12,345.31	0.05		
				>>1	Repair Concrete Class 3	6,516.83	100.00	0.00	0.00	0.00		6,518.08			
				2	Replace Concrete	9,775.01	100.00	0.00	0.00	0.00		9,776.26			
325	Slope, Slope Protection, Berms ea	1	No damage	>>0	Do Nothing	0.00	97.92	2.08	0.00			493.90	38.16	97,729.39	97,729.39
		2	Moderate damage	>>0	Do Nothing	0.00	0.00	98.70	1.30			1,678.06	61.05		
				1	Repair Other	6,516.83	50.00	50.00	0.00			7,551.23			
		3	Major damage	0	Do Nothing	0.00	0.00	0.00	0.97			184,443.57	0.79		
				>>1	Repair Other	6,516.83	0.00	100.00	0.00			8,115.18			
				2	Replace Other	9,775.01	100.00	0.00	0.00			10,245.45			
326	Bridge Wingwalls ea	1	No deterioration	>>0	Do Nothing	0.00	98.70	1.30	0.00			152.32	23.46	97,729.39	97,729.39
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.60	0.40			736.61	76.24		
				1	Repair Concrete Class 1	6,516.83	100.00	0.00	0.00			6,661.91			
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59			15,475.23	0.30		
				1	Repair Concrete Class 2	6,516.83	0.00	50.00	50.00			11,592.08			
				>>2	Replace Concrete	9,775.01	100.00	0.00	0.00			9,920.09			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
327	Culvert Wingwalls ea	1	Minor deterioration	>>0	Do Nothing	0.00	98.50	1.50	0.00			120.41	0.00	97,729.39	97,729.39
		2	Moderate deterioration	>>0	Do Nothing	0.00	0.00	99.60	0.40			520.73	99.60		
				1	Repair Concrete Class 1	6,516.83	50.00	50.00	0.00			6,822.18			
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59			12,800.49	0.40		
				>>1	Repair Concrete Class 2	6,516.83	0.00	100.00	0.00			7,012.83			
				2	Replace Concrete	9,775.01	100.00	0.00	0.00			9,889.70			
330	Metal Bridge Railing - Uncoated m.	1	No corrosion	>>0	Do Nothing	0.00	97.92	2.08	0.00	0.00		0.02	3.25	4,087.62	4,087.62
		2	Rust formation	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.08	96.68		
				1	Repair Other	26.97	50.00	50.00	0.00	0.00		27.02			
		3	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		5.66	0.07		
				1	Repair Other	68.47	100.00	0.00	0.00	0.00		68.49			
				2	Replace Other	408.76	100.00	0.00	0.00	0.00		408.78			
		4	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		641.62	0.00		
				1	Repair Other	271.82	0.00	0.00	50.00	50.00		469.20			
				>>2	Replace Other	408.76	100.00	0.00	0.00	0.00		408.78			
331	Reinforced Conc Bridge Railing m.	1	No deterioration	>>0	Do Nothing	0.00	98.79	1.21	0.00	0.00		4.55	98.80	2,925.66	2,925.66
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	96.22	3.78	0.00		23.30	1.20		
				1	Repair Concrete Class 1	19.51	100.00	0.00	0.00	0.00		23.84			
		3	Delam/spalls pres	0	Do Nothing	0.00	0.00	0.00	97.72	2.28		54.64	0.00		
				>>1	Repair Concrete Class 2	48.77	98.00	0.00	2.00	0.00		54.05			
				2	Replace Concrete	292.57	100.00	0.00	0.00	0.00		296.90			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		373.54	0.00		
				>>1	Repair Concrete Class 3	195.10	100.00	0.00	0.00	0.00		199.43			
				2	Replace Concrete	292.57	100.00	0.00	0.00	0.00		296.90			
332	Timber Bridge Railing m.	1	No decay	>>0	Do Nothing	0.00	90.57	9.43	0.00			44.37	34.35	1,359.08	1,359.08

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		2	Minor decay	>>0	Do Nothing	0.00	0.00	94.81	5.19			67.83	62.41		
				1	Repair Timber	90.75	95.00	5.00	0.00			134.13			
		3	Some strength loss	0	Do Nothing	0.00	0.00	0.00	96.59			210.66	3.24		
				>>1	Repair Timber	90.75	100.00	0.00	0.00			133.01			
				2	Replace Timber	135.91	100.00	0.00	0.00			178.17			
333	Other Bridge Railing m.	1	No deterioration	>>0	Do Nothing	0.00	96.42	3.58	0.00			21.88	21.66	2,925.66	2,925.66
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	99.00	1.00			52.35	77.56		
				1	Repair Other	195.10	50.00	50.00	0.00			230.45			
		3	Major deterioration	0	Do Nothing	0.00	0.00	0.00	96.59			478.39	0.78		
				1	Repair Other	195.10	0.00	21.00	79.00			441.40			
				>>2	Replace Other	292.57	100.00	0.00	0.00			313.41			
334	Metal Bridge Railing - Coated m.	1	No corrosion	>>0	Do Nothing	0.00	99.10	0.90	0.00	0.00	0.00	2.83	89.49	4,087.62	4,087.62
		2	Surface rust forming	>>0	Do Nothing	0.00	0.00	91.70	8.30	0.00	0.00	18.53	9.70		
		3	Rust prevalent	0	Do Nothing	0.00	0.00	0.00	94.39	5.61	0.00	30.48	0.81		
				>>1	Repair Steel	26.97	100.00	0.00	0.00	0.00	0.00	29.67			
				2	Replace Steel	408.76	100.00	0.00	0.00	0.00	0.00	411.46			
		4	Active corrosion	0	Do Nothing	0.00	0.00	0.00	0.00	97.79	2.21	74.95	0.00		
				>>1	Repair Steel	68.47	100.00	0.00	0.00	0.00	0.00	71.17			
				2	Replace Steel	408.76	100.00	0.00	0.00	0.00	0.00	411.46			
		5	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	644.08	0.00		
				1	Repair Steel	271.82	0.00	0.00	48.00	0.00	52.00	489.18			
				>>2	Replace Steel	408.76	100.00	0.00	0.00	0.00	0.00	411.46			
335	Culvert Headwalls ea	1	Minor damage	>>0	Do Nothing	0.00	98.50	1.50	0.00			170.63	20.99	97,729.39	97,729.39
		2	Moderate damage	>>0	Do Nothing	0.00	0.00	99.60	0.40			737.91	78.70		
				1	Repair Concrete Class 1	6,516.83	50.00	50.00	0.00			6,949.52			
		3	Heavy damage	0	Do Nothing	0.00	0.00	0.00	96.59			15,491.28	0.31		
				1	Repair Concrete Class 2	6,516.83	0.00	50.00	50.00			11,601.01			
				>>2	Replace Concrete	9,775.01	100.00	0.00	0.00			9,937.54			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
336	Metal Curbs/Sidewalks - Coated m.	1	No corrosion	>>0	Do Nothing	0.00	99.50	0.50	0.00	0.00	0.00	0.00	12.27	4,087.62	4,087.62
		2	Surface rust forming	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00	0.00	0.00	87.67		
		3	Rust prevalent	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07	0.00	0.08	0.06		
				1	Repair Steel	26.97	100.00	0.00	0.00	0.00	0.00	26.97			
				2	Replace Steel	408.76	100.00	0.00	0.00	0.00	0.00	408.76			
		4	Active corrosion	>>0	Do Nothing	0.00	0.00	0.00	0.00	99.93	0.07	5.66	0.00		
				1	Repair Steel	68.47	0.00	0.00	50.00	50.00	0.00	71.20			
				2	Replace Steel	408.76	100.00	0.00	0.00	0.00	0.00	408.76			
		5	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.95	614.97	0.00		
				1	Repair Steel	271.82	0.00	0.00	0.00	50.00	50.00	469.19			
				>>2	Replace Steel	408.76	100.00	0.00	0.00	0.00	0.00	408.76			
337	Metal Curb/Sidewalk - Uncoated m.	1	No corrosion	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		61.67	88.18	4,087.62	4,087.62
		2	Rust formation	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		110.18	11.82		
				>>1	Repair Steel	26.97	50.00	50.00	0.00	0.00		107.57			
		3	Active corrosion	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		232.94	0.00		
				>>1	Repair Steel	68.47	0.00	50.00	50.00	0.00		228.54			
				2	Replace Steel	408.76	100.00	0.00	0.00	0.00		467.50			
		4	Section loss	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		695.64	0.00		
				1	Repair Steel	271.82	0.00	0.00	50.00	50.00		603.31			
				>>2	Replace Steel	408.76	100.00	0.00	0.00	0.00		467.50			
338	Concrete Curbs/Sidewalks m.	1	No deterioration	>>0	Do Nothing	0.00	98.79	1.21	0.00	0.00		1.77	98.80	2,925.66	2,925.66
		2	Minor cracks/spalls	>>0	Do Nothing	0.00	0.00	98.91	1.09	0.00		9.05	1.20		
				1	Repair Concrete Class 1	19.51	100.00	0.00	0.00	0.00		21.19			
		3	Delam/spalls pres	0	Do Nothing	0.00	0.00	0.00	97.64	2.36		51.35	0.00		
				>>1	Repair Concrete Class 2	48.77	100.00	0.00	0.00	0.00		50.45			
				2	Replace Concrete	292.57	100.00	0.00	0.00	0.00		294.25			
		4	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		371.10	0.00		
				>>1	Repair Concrete Class 3	195.10	100.00	0.00	0.00	0.00		196.78			
				2	Replace Concrete	292.57	100.00	0.00	0.00	0.00		294.25			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
339	Timber Curbs/Sidewalks m.	1	No decay	>>0	Do Nothing	0.00	96.42	3.58	0.00	0.00		0.25	2.61	1,359.08	1,359.08
		2	Minor decay	>>0	Do Nothing	0.00	0.00	97.47	2.53	0.00		0.60	3.70		
				1	Repair Timber	9.34	54.00	46.00	0.00	0.00		9.73			
		3	Loss of strength	>>0	Do Nothing	0.00	0.00	0.00	99.90	0.10		1.78	93.59		
				1	Repair Timber	22.82	0.00	19.00	81.00	0.00		24.30			
				2	Replace Timber	135.91	100.00	0.00	0.00	0.00		136.15			
		4	Advanced decay	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		171.55	0.09		
				>>1	Repair Timber	90.26	100.00	0.00	0.00	0.00		90.50			
				2	Replace Timber	135.91	100.00	0.00	0.00	0.00		136.15			
340	Concrete Coating (Superstructure) ea.	1	Under 5% surf damage	>>0	Do Nothing	0.00	99.50	0.50	0.00			0.54	54.40	549.86	549.86
		2	5-20% surf damage	>>0	Do Nothing	0.00	0.00	99.40	0.60			5.96	45.33		
				1	Repair Other	36.31	100.00	0.00	0.00			36.83			
		3	Over 20% surf damage	0	Do Nothing	0.00	0.00	0.00	96.59			86.79	0.27		
				1	Repair Other	36.31	0.00	50.00	50.00			65.58			
				>>2	Replace Other	54.99	100.00	0.00	0.00			55.51			
341	Substructure Concrete Coating ea	1	Under 5% surf damage	>>0	Do Nothing	0.00	99.50	0.50	0.00			0.07	12.27	549.86	549.86
		2	5-20% surf damage	>>0	Do Nothing	0.00	0.00	99.93	0.07			0.76	87.67		
				1	Repair Other	36.31	50.00	50.00	0.00			36.71			
		3	Over 20% surf damage	0	Do Nothing	0.00	0.00	0.00	96.59			86.37	0.06		
				1	Repair Other	36.31	0.00	50.00	50.00			62.89			
				>>2	Replace Other	54.99	100.00	0.00	0.00			55.06			
342	Sign Attachment to Bridge ea	1	No deterioration	>>0	Do Nothing	0.00	94.39	5.61	0.00	0.00		0.04	0.62	5,187.34	5,187.34
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.07	49.67		
				1	Repair Other	345.82	100.00	0.00	0.00	0.00		345.85			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		4.79	49.67		
				1	Repair Other	345.82	0.00	50.00	50.00	0.00		348.13			
				2	Replace Other	518.73	100.00	0.00	0.00	0.00		518.76			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
		4	Severe deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		655.16	0.03		
				>>1	Repair Other	345.82	100.00	0.00	0.00	0.00		345.85			
				2	Replace Other	518.73	100.00	0.00	0.00	0.00		518.76			
343	Pole Attachment to Bridge ea	1	No deterioration	>>0	Do Nothing	0.00	94.39	5.61	0.00	0.00		0.05	0.62	5,187.34	5,187.34
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.10	49.67		
				1	Repair Other	345.82	50.00	50.00	0.00	0.00		345.89			
		3	Analysis warranted	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		7.18	49.67		
				1	Repair Other	345.82	0.00	50.00	50.00	0.00		349.29			
				2	Replace Other	518.73	100.00	0.00	0.00	0.00		518.78			
		4	Severe deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		814.26	0.03		
				1	Repair Other	345.82	0.00	0.00	50.00	50.00		596.31			
				>>2	Replace Other	518.73	100.00	0.00	0.00	0.00		518.78			
350	Tunnel (Formed Concrete Lined) m.	1	Minimal deterioratio	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00		0.22	0.54	15,562.01	15,562.01
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.30	99.39		
				1	Repair Concrete Class 1	103.75	100.00	0.00	0.00	0.00		103.96			
		3	Moderate deteriorati	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		21.54	0.07		
				1	Repair Concrete Class 2	259.37	100.00	0.00	0.00	0.00		259.58			
				2	Replace Concrete	1,556.20	100.00	0.00	0.00	0.00		1,556.41			
		4	Severe deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		2,442.84	0.00		
				1	Repair Concrete Class 3	1,037.47	0.00	0.00	50.00	50.00		1,788.97			
				>>2	Replace Concrete	1,556.20	100.00	0.00	0.00	0.00		1,556.41			
351	Tunnel (Unlined/Unsupported) m.	1	Minimal deterioration	>>0	Do Nothing	0.00	99.93	0.07	0.00	0.00		0.00	99.93	15,562.01	15,562.01
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.80	0.20	0.00		0.67	0.07		
				1	Repair Other	103.75	100.00	0.00	0.00	0.00		103.76			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		17.34	0.00		
				1	Repair	259.37	0.00	50.00	50.00	0.00		267.95			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Other										
				2	Replace Other	1,556.20	100.00	0.00	0.00	0.00		1,556.21			
		4	Severe deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		2,163.50	0.00		
				>>1	Repair Other	1,037.47	0.00	82.00	0.00	18.00		1,252.78			
				2	Replace Other	1,556.20	100.00	0.00	0.00	0.00		1,556.21			
352	Tunnel (Unlined/Supported) m.	1	Minimal deterioration	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		237.23	88.18	15,562.01	15,562.01
		2	Minor deterioration	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		423.36	11.82		
				>>1	Repair Other	103.75	50.00	50.00	0.00	0.00		413.81			
		3	Moderate deterioration	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		888.22	0.00		
				>>1	Repair Other	259.37	0.00	50.00	50.00	0.00		871.50			
				2	Replace Other	1,556.20	100.00	0.00	0.00	0.00		1,782.17			
		4	Severe deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		2,650.54	0.00		
				1	Repair Other	1,037.47	0.00	0.00	50.00	50.00		2,301.28			
				>>2	Replace Other	1,556.20	100.00	0.00	0.00	0.00		1,782.17			
353	Tunnel (Shotcrete Lined) m.	1	Minimal deterioration	>>0	Do Nothing	0.00	87.06	12.94	0.00	0.00		0.22	0.00	15,562.01	15,562.01
		2	Minor deterioration	>>0	Do Nothing	0.00	0.00	99.93	0.07	0.00		0.30	99.86		
				1	Repair Concrete Class 1	103.75	50.00	50.00	0.00	0.00		103.99			
		3	Moderate deterioration	>>0	Do Nothing	0.00	0.00	0.00	99.93	0.07		21.54	0.14		
				1	Repair Concrete Class 2	259.37	0.00	50.00	50.00	0.00		269.77			
				2	Replace Concrete	1,556.20	100.00	0.00	0.00	0.00		1,556.41			
		4	Severe deterioration	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		2,442.84	0.00		
				1	Repair Concrete Class 3	1,037.47	0.00	0.00	50.00	50.00		1,788.97			
				>>2	Replace Concrete	1,556.20	100.00	0.00	0.00	0.00		1,556.41			
355	Steel Diaphragms Smart Flag ea	1	Good condition	>>0	Do Nothing	0.00	93.30	6.70	0.00			2,154.53	93.72	51,147.12	51,147.12
		2	Minor damage	0	Do Nothing	0.00	0.00	93.30	6.70			3,797.39	6.28		
				>>1	Repair Steel	1,705.98	100.00	0.00	0.00			3,758.17			

No	Name	Condition		Action		Direct Cost $	T_i 1	2	3	4	5	Long Term Cost $	Opt Pct	Failure Cost $ Agency	User
		3	Ineffective	0	Do Nothing	0.00	0.00	0.00	93.30			12,900.03	0.00		
				1	Repair Steel	3,411.97	0.00	50.00	50.00			8,616.52			
				>>2	Replace Steel	5,117.82	100.00	0.00	0.00			7,170.01			
356	Steel Fatigue ea	1	Fatigue prone	>>0	Do Nothing	0.00	93.30	6.70	0.00			306.26	48.38	34,132.66	34,132.66
		2	Fatigue damage	>>0	Do Nothing	0.00	0.00	93.30	6.70			534.21	48.38		
				1	Repair Steel	1,705.98	50.00	50.00	0.00			2,106.26			
		3	Severe fatigue damage	0	Do Nothing	0.00	0.00	0.00	93.30			5,184.63	3.24		
				1	Repair Steel	3,411.97	100.00	0.00	0.00			3,703.68			
				>>2	Replace Steel	640.12	100.00	0.00	0.00			931.83			
357	Pack Rust ea	1	Pack rust staining	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		97.52	88.18	6,401.17	6,401.17
		2	Minor pack rust	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		174.04	11.82		
				>>1	Repair Steel	42.65	50.00	50.00	0.00	0.00		170.11			
		3	Moderate pack rust	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		365.15	0.00		
				>>1	Repair Steel	106.62	0.00	50.00	50.00	0.00		358.25			
				2	Replace Steel	640.12	100.00	0.00	0.00	0.00		733.01			
		4	Severe pack rust	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,090.21	0.00		
				1	Repair Steel	426.49	0.00	0.00	50.00	50.00		946.20			
				>>2	Replace Steel	640.12	100.00	0.00	0.00	0.00		733.01			
358	Deck Cracking ea	1	Minor cracks	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		42.41	93.72	2,873.78	2,873.78
		2	Minor-mod cracks	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00		73.97	6.28		
				1	Repair Concrete Class 1	53.95	100.00	0.00	0.00	0.00		94.34			
		3	Mod-severe cracks	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70		129.03	0.00		
				1	Repair Concrete Class 2	196.08	100.00	0.00	0.00	0.00		236.47			
				2	Replace Concrete	184.67	100.00	0.00	0.00	0.00		225.06			
		4	Unsealed cracks exist	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		393.74	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	50.00	50.00		456.01			
				>>2	Replace Concrete	184.67	100.00	0.00	0.00	0.00		225.06			
359	Soffit of Concrete Deck or Slab ea	1	Soffit OK	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	42.41	32.61	2,873.78	2,873.78
		2	Soffit-minor distress	>>0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	73.97	32.61		
				1	Repair Concrete	53.95	50.00	50.00	0.00	0.00	0.00	109.37			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Class 1										
		3	Soffit cracked	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	129.03	32.61		
				1	Repair Concrete Class 2	196.08	0.00	50.00	50.00	0.00	0.00	292.76			
				2	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	225.06			
		4	Soffit lt rust/spall	0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	348.97	2.18		
				1	Repair Concrete Class 3	287.38	0.00	0.00	100.00	0.00	0.00	410.28			
				>>2	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	225.06			
		5	Soffit sev rust/spall	>>0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	2,334.10	0.00		
				1	Repair Concrete Class 3	0.00	0.00	0.00	100.00	0.00	0.00				
				2	Replace Concrete	100.00	0.00	0.00	0.00	0.00	0.00				
360	Settlement ea	1	Settlement stable	>>0	Do Nothing	0.00	93.30	6.70	0.00			4,139.71	48.38	129,683.38	129,683.38
		2	Minor settlement	>>0	Do Nothing	0.00	0.00	93.30	6.70			7,220.93	48.38		
				1	Repair Other	8,652.47	50.00	50.00	0.00			14,062.97			
		3	Sig settlement	0	Do Nothing	0.00	0.00	0.00	93.30			27,745.57	3.24		
				>>1	Repair Other	8,652.47	100.00	0.00	0.00			12,595.54			
				2	Replace Other	12,968.34	100.00	0.00	0.00			16,911.41			
361	Scour ea	1	Scour under control	>>0	Do Nothing	0.00	93.30	6.70	0.00			4,139.71	48.38	129,683.38	129,683.38
		2	Scour developing	>>0	Do Nothing	0.00	0.00	93.30	6.70			7,220.93	48.38		
				1	Repair Other	8,652.47	100.00	0.00	0.00			12,595.54			
		3	Scour serious	0	Do Nothing	0.00	0.00	0.00	93.30			27,745.57	3.24		
				>>1	Repair Other	8,652.47	100.00	0.00	0.00			12,595.54			
				2	Replace Other	12,968.34	100.00	0.00	0.00			16,911.41			
362	Traffic Impact ea	1	Imp damage repaired	>>0	Do Nothing	0.00	93.30	6.70	0.00			6,204.60	48.38	129,683.38	129,683.38
		2	Imp damage OK	>>0	Do Nothing	0.00	0.00	93.30	6.70			10,822.74	48.38		
				1	Repair Other	8,652.47	100.00	0.00	0.00			14,562.35			
		3	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	93.30			33,328.88	3.24		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Other	8,652.47	22.00	0.00	78.00			23,978.22			
				>>2	Replace Other	12,968.34	100.00	0.00	0.00			18,878.22			
363	Section Loss ea	1	Sec loss repaired	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		97.52	88.18	6,401.17	6,401.17
		2	Sec loss OK	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		174.04	11.82		
				>>1	Repair Other	42.65	50.00	50.00	0.00	0.00		170.11			
		3	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		365.15	0.00		
				>>1	Repair Other	106.62	0.00	50.00	50.00	0.00		358.25			
				2	Replace Other	640.12	100.00	0.00	0.00	0.00		733.01			
		4	Load/serv affected	0	Do Nothing	0.00	0.00	0.00	0.00	96.59		1,090.21	0.00		
				1	Repair Other	426.49	0.00	0.00	50.00	50.00		946.20			
				>>2	Replace Other	640.12	100.00	0.00	0.00	0.00		733.01			
370	Traffic Impact m.	1	Damage repaired	>>0	Do Nothing	0.00	93.30	6.70	0.00			6,204.60	48.38	129,683.38	129,683.38
		2	Strength unaffected	>>0	Do Nothing	0.00	0.00	93.30	6.70			10,822.74	48.38		
				1	Repair Other	8,652.47	100.00	0.00	0.00			14,562.35			
		3	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	93.30			33,328.88	3.24		
				1	Repair Other	8,652.47	0.00	50.00	50.00			22,797.55			
				>>2	Replace Other	12,968.34	100.00	0.00	0.00			18,878.22			
371	Traffic Impact (Deck) m.	1	Damage repaired	>>0	Do Nothing	0.00	93.30	6.70	0.00			88.35	48.38	2,873.78	2,873.78
		2	Strength unaffected	>>0	Do Nothing	0.00	0.00	93.30	6.70			154.12	48.38		
				1	Repair Other	196.08	100.00	0.00	0.00			280.24			
		3	Analysis warranted	0	Do Nothing	0.00	0.00	0.00	93.30			605.70	3.24		
				1	Repair Other	287.38	55.00	0.00	45.00			448.89			
				>>2	Replace Other	184.67	100.00	0.00	0.00			268.83			
372	False Bent/Temporary Support ea	1	Foundation sound	>>0	Do Nothing	0.00	93.30	6.70	0.00			1,786.92	48.38	37,348.81	37,348.81
		2	Foundation damaged	>>0	Do Nothing	0.00	0.00	93.30	6.70			3,116.95	48.38		
				1	Repair Other	2,489.92	50.00	50.00	0.00			4,825.39			
		3	Foundation nonfunct.	0	Do Nothing	0.00	0.00	0.00	93.30			9,598.72	3.24		

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
				1	Repair Other	2,489.92	0.00	50.00	50.00			6,563.70			
				>>2	Replace Other	3,734.88	100.00	0.00	0.00			5,436.92			
373	Substructure Pack Rust ea	1	Pack rust staining	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00		514.76	0.00	6,401.17	6,401.17
		2	Minor pack rust	0	Do Nothing	0.00	0.00	93.30	6.70	0.00		941.19	100.00		
				>>1	Repair	42.65	0.00	100.00	0.00	0.00		897.89			
		3	Moderate pack rust	0	Do Nothing	0.00	0.00	0.00	93.30	6.70		2,326.56	0.00		
				>>1	Repair	106.62	0.00	0.00	100.00	0.00		2,244.63			
				2	Replace	640.12	0.00	0.00	100.00	0.00		2,778.13			
		4	Severe pack rust	>>0	Do Nothing	0.00	0.00	0.00	0.00	96.59		5,199.07	0.00		
				1	Repair	426.49	0.00	0.00	0.00	100.00		5,378.61			
				2	Replace	640.12	0.00	0.00	0.00	100.00		5,592.24			
380	Completed Deck Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
381	Completed Superstructure Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
382	Cleaning and Painting of Bridge ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
383	Rail Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
384	Bearing Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
385	Substructure Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
386	Approach Slab or Slope Protection Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
387	Expansion Joint Repair ea	1	Work Done	>>0	Do Nothing	0.00	93.30					0.00	0.00	0.00	0.00
399	Alkali-Silica Reactivity (ASR)	1	Ignored	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	2.95	88.18	2,873.78	2,873.78
		2	Deck	0	Do Nothing	0.00	0.00	93.30	6.70	0.00	0.00	6.27	11.82		
				>>1	Repair Concrete Class 1	1.29	50.00	50.00	0.00	0.00	0.00	5.15			
		3	Superstructure	0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	28.56	0.00		
				>>1	Repair Concrete Class 2	23.86	100.00	0.00	0.00	0.00	0.00	26.67			
				2	Replace Concrete	40.46	100.00	0.00	0.00	0.00	0.00	43.27			
		4	Substructure	>>0	Do Nothing	0.00	0.00	0.00	0.00	96.59	3.41	76.14	0.00		
				1	Repair Concrete Class 3	86.11	0.00	20.00	0.00	80.00	0.00	145.11			
				2	Replace	184.67	100.00	0.00	0.00	0.00	0.00	187.48			

No	Name	Condition		Action		Direct Cost $	T_i					Long Term Cost $	Opt Pct	Failure Cost $	
							1	2	3	4	5			Agency	User
					Concrete										
		5	Wingwalls	0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	359.17	0.00		
				1	Repair Concrete Class 3	287.38	0.00	0.00	0.00	6.00	94.00	459.59			
				>>2	Replace Concrete	184.67	100.00	0.00	0.00	0.00	0.00	187.48			
501	Channel Condition ea	1	Channel Condition	>>0	Do Nothing	0.00	99.93	0.07				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
502	Channel Prot. Material and Condition ea	1	Channel Protection	>>0	Do Nothing	0.00	99.93	0.07				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
504	Bank Condition ea	1	Bank Condition	>>0	Do Nothing	0.00	99.93	0.07				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
505	Debris ea	1	Debris	>>0	Do Nothing	0.00	93.30	6.70				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
510	Waterway Adequacy ea	1	Waterway Adequacy	>>0	Do Nothing	0.00	98.91	1.09				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
520	Approach Roadway Alignment ea	1	AppchRdwayAlign	>>0	Do Nothing	0.00	99.93	0.07				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
530	Approach Guardrail Adequacy ea.	1	AppdhGuardAdqcy	>>0	Do Nothing	0.00	93.30	6.70				0.00	0.00	0.00	0.00
		2	N/A	>>0	Do Nothing	0.00	0.00	96.59				0.00	0.00		
600	General Remarks ea	1	GOOD	>>0	Do Nothing	0.00	93.30	6.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		2	SATISFACTORY	>>0	Do Nothing	0.00	0.00	96.59	3.41	0.00	0.00	0.00	0.00		
		3	FAIR	>>0	Do Nothing	0.00	0.00	0.00	93.30	6.70	0.00	0.00	0.00		
		4	POOR	>>0	Do Nothing	0.00	0.00	0.00	0.00	93.30	6.70	0.00	0.00		
		5	CRITICAL	>>0	Do Nothing	0.00	0.00	0.00	0.00	0.00	96.59	0.00	0.00		

Task 13 – Automation

Work in Task 13 of Study 87-60 developed a set of software applications to assist in retrieval and analysis of data from Pontis and CDOT's bid tabulations, and assist in formatting of cost and deterioration values into the tables and structures needed for the Pontis bridge database. All software applications are developed in Microsoft Visual C++[10], and are compatible with personal computers running Microsoft Windows operating systems.

Most computational work in Study 87-60 is performed outside of Pontis BMS. Data sets external to Pontis are kept as tab-delimited text files. The creation and use of these text files, and their eventual re-composition into Pontis tables are handled by software applications developed in Task 13.

Software applications are presented in two categories: Data analysis applications, and Data utilities.

Data Analysis Applications

Bid Item Review - An application to read html bid tabulations, assemble bid items into element-level actions, and compute unit costs for actions.

Element Analysis - An application to check element-level condition data for inconsistent units, and to correct inconsistent values of quantities and percentages in condition states.

Element Deterioration - An application to compute transition probabilities for Markov-chain deterioration models composed of elements individually or in groups selected by users.

Element Event - An application to discover changes in element-level condition reports and identify the (apparent) sources of change as events in construction, demolition, deterioration and repair.

Elicitation Information - An application to form, edit and assign transition probabilities for deterioration and for improvement in a format similar to Pontis' elicitation module.

MRR Action Editor - An application to, edit and assign MR&R actions for elements and condition states in a format similar to Pontis' configuration module.

Data Utilities

Add Column - A utility for column-wise concatenation of selected columns from two tables for matching (row) records.

Bid Rename - A utility to rename html files containing CDOT bid tabulations so that file names identify the year, month and day of letting.

Build PDI Transaction - A utility to convert tab-delimited text fields into Pontis PDI import files complete with header strings, PDI definitions, and transactions for data.

[10] http://msdn.microsoft.com/en-us/visualc/default

Table Utility - A utility for display, filtering and compilation of tab-delimited text files to identify and extract summaries of data.

NBI Reader - A utility to read txt files of NBI data, extract user-selected fields and output these as tab-delimited text files.

PDI to Tab Table - A utility to convert Pontis PDI files into tab-delimited, flat text files; intended for PDI files containing single Pontis tables.

Status of Software Applications

Software applications developed for Study 87-60 are functioning applications with limited capacity for recovery from errors, and little testing for response to incorrect inputs or unanticipated actions by users. Several applications, especially the applications for analysis of data, require specialized input files that are generated by data utilities and by other analysis applications.

Intermediate Files in Study 87-60

Study 87-60 creates a number of intermediate files that contain data from Pontis and from bid tabulations, and that are used in cost evaluation, deterioration modeling and improvement modeling. Notes on these intermediate files appear here. Most of these files are tab-delimited flat files with field headings. These are data files are presented as rows with data entries separated by tab characters. These files can be parsed into columns using the tab characters. The first row in the file is the set of labels for data fields.

Action Summary - A tab-delimited file that relates project IDs and bridge IDs to generic actions for bridge components (see Table 127).

Bid Item Definitions – A tab-delimited file that relates bid items to keywords for bridge component, construction material, and type to element-level actions (see Table 128).

Bridge - A tab-delimited version of the Pontis bridge table. This file is created from the PDI output of the Pontis bridge table and reformatted using the *PDI-To-Tab-Table* utility created for Study 87-60.

Cost Detail - A tab-delimited file that lists the assignments of bid items to actions for bridges (see Table 129).

Deterioration Model – A tab-delimited file that lists elements and groups of elements, their counts in condition states, and their transition probabilities and median life in condition states (see Table 130).

Element Condition – A corrected version of element-level condition data from Pontis' *eleminsp* table (see Table 131).

Element Cost Detail - A tab-delimited file that lists costs and basis for costs for bridge elements with contributing bid items, costs and quantities, and conversion factors to relate quantities of bid items to quantities of actions for bridge elements (see Table 132).

Element Cost Summary - A tab-delimited file that lists costs and basis for element-level actions (see Table 133). Costs are assembled from contributing bid items (bid items listed in *Element Cost Detail*).

Element Definitions - A tab-delimited file that lists the contents of Pontis' *elemdefs* table augmented by identification of bridge component, material, form and protection (see Table 134).

Element Event Summary - A tab-delimited file that lists service life events for bridge elements. Events include construction, demolition, deterioration and repairs (see Table 135).

Element Life Summary – A tab-delimited file that lists bridge IDs, bridge elements, and the range of years that elements are present at bridges (see Table 136).

General Cost - A tab-delimited file that lists bid items grouped by type of work and unit of measurement (see Table 137).

Job Summary - A tab-delimited flat file that lists project IDs, ratios of total to direct costs for projects, and cost index factors (see Table 138). Cost index factors depend on project year and are taken from the US Army Corps Construction Cost Index Factors [*Civil* 2010].

MRR Actions – A tab-delimited file that lists names and ID numbers for MR&R actions (Table 139).

MRR Actions Output - A tab-delimited file that shows elements, conditions and actions (see Table 140).

Project Summary – A tab-delimited file that relates projects IDs, and summary data for projects to html listings of bid tabulations (see Table 141).

Roadway - A tab-delimited version of Pontis' roadway table. This file is created from the PDI output of the Pontis roadway table and reformatted using the *PDI-To-Tab-Table* utility created for Study 87-60. The content is identical to Pontis' content for this table.

The input/output relations among intermediate files is shown in Table 126.

Table 126 - Creators and Users of Intermediate Files

Intermediate File	Generated by …	Input to …
Action Summary	CDOT Staff Bridge info	Element Event Bid Item Review
Bid Item Definitions	Bid Item Review	Bid Item Review
Bridge	Pontis PDI & PDI-To-Table	Element Deterioration Element Event
Cost Detail	Bid Item Review	
Deterioration Model	Element Deterioration	Elicitation Info
Element Condition	Element Analysis	Element Event
Element Cost Detail	Bid Item Review	
Element Cost Summary	Bid Item Review	
Element Definitions	Pontis PDI & Study 87-60 editing	Element Event

Intermediate File	Generated by …	Input to …
		Element Deterioration Elicitation Info MRR Action Editor
Element Event Summary	Element Event	Element Deterioration Bid Item Review
Element Life Summary	Element Event	
General Cost	Bid Item Review	
Job Summary	Bid Item Review	
MRR Actions	Spreadsheet	MRR Action Editor
MRR Action Output	MRR Action Editor	PDI Transaction
Project Summary	CDOT Staff Bridge Info	Bid Item Review
Roadway	Pontis PDI & PDI-To-Table	Element Deterioration

Notes on Software Applications for Analysis of Data

Applications for *Element Event*, *Bid Item Review*, *Element Deterioration*, *Elicitation Information*, and *MRR Action Editor* are useful to ongoing processing of bid tabulations for Pontis, and in continuing updating of transition probabilities for element deterioration and for improvements. The application for *Element Analysis* provided a correction to CDOT's element-level condition reports. This correction, now complete, might not recur.

Element Event

The *Element Event* application uses element-level condition records to identify events in service life. Events include construction, demolition, deterioration and repairs. The beginning and end of data (that is, of condition records) are reported. The events are used in other applications to calibrate deterioration models, and to relate projects and bid tabulations to changes in quantity or condition of specific bridge elements. *Element Event* uses events in repairs to compute the improvement transition probabilities for individual events in repairs to elements.

The inputs to *Element Event* are the corrected condition records from *Element Analysis* (p. 326), the list of actions from *Bid Item Review* (p. 315), the Pontis bridge table and the enhanced definitions of bridge elements. Element Event has three tabs: One for input/output, one to analyze condition records and one to relate projects and bid tabulations to events for elements.

Element Event:Files Tab

The Files tab of the *Element Event* application provides for input and input/output of records. The inputs are Element Condition (Table 131), Action Summary (Table 127), Element Definitions (Table 134), and Bridge table. The input/outputs are the Event Summary (Table 135) and Life Summary (Table 136). Both summaries are adapted to successive runs for addition of records. Existing Event or Life summary files from previous work sessions can be opened, loaded, and expanded in subsequent work sessions.

Element Event:Service Life Tab

The Service Life tab of the *Element Event* application shows the presence and duration of bridge elements, and the events in service life derived from condition records (Figure 5). The upper data grid

shows data from the Life Summary. These include element numbers, quantities, start and end years for condition data and years that elements were built and demolished.

The lower data grid shows events in service life. Events include construction, demolition, additions, removals, repairs and deterioration. The changes to element quantites are shown in the corresponding condition states. For example, a repair event is reported as reductions in element quantities in poor condition states and increases in quantites in better condition states.

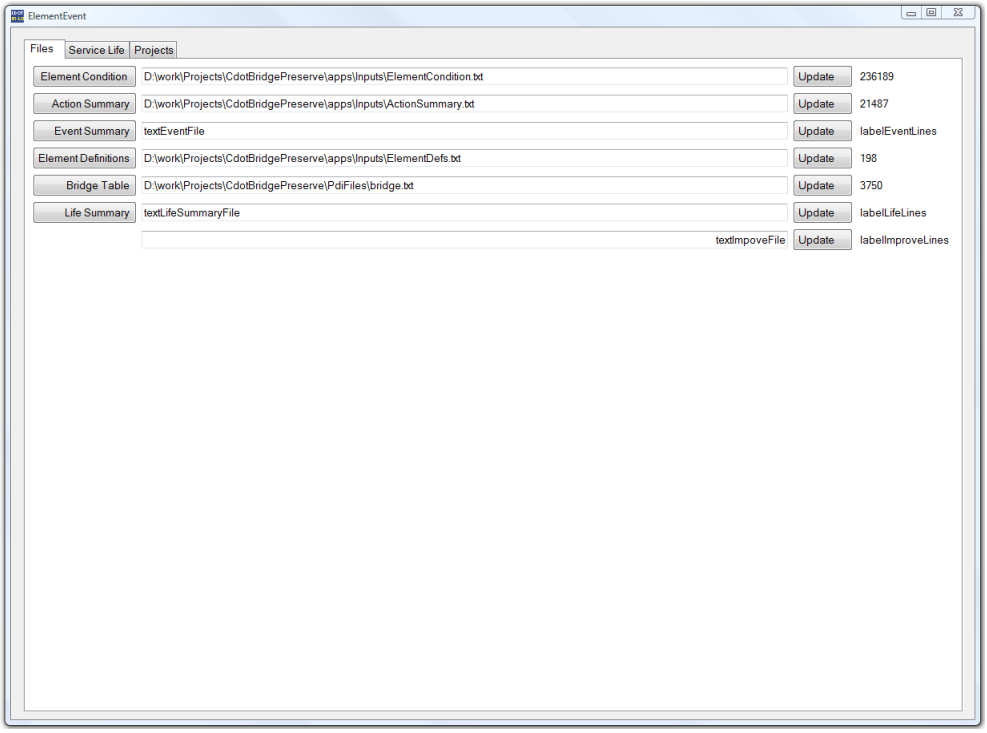

Figure 4 - Element Event Files Tab

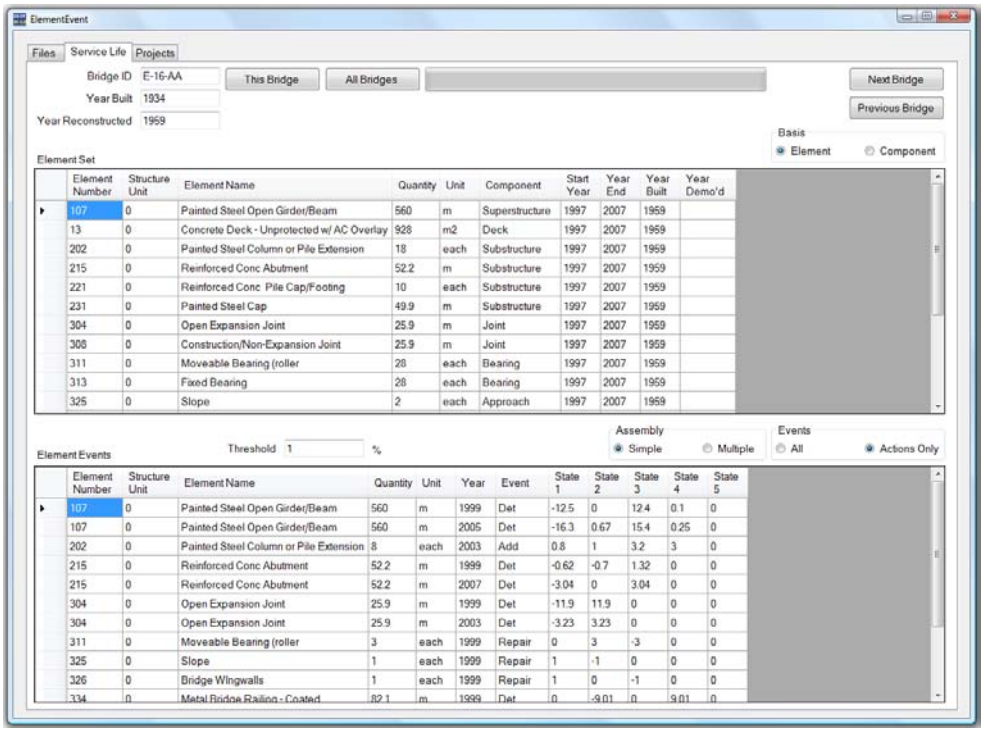

Figure 5 - Element Event Service Life Tab

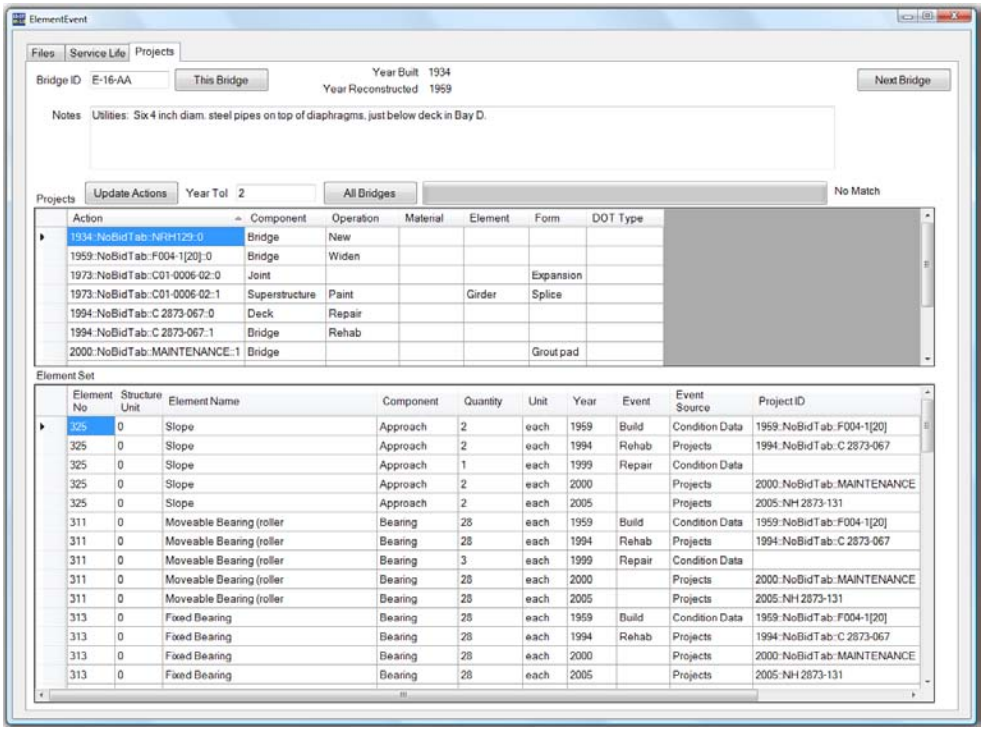

Figure 6 - Element Event Project Tab

Element Event:Project Tab

The Project Tab of the *Element Event* application relates known projects to events for bridge elements. Comparisons are made between records of the Action Summary and events discovered in element-level condition records. For each bridge, all records in the Action Summary contribute to the set of events for elements. Actions that match with events derived from condition records are linked directly to those events. In the tab, the upper data grid lists known actions for a bridge. The lower data grid shows all events for elements of the bridge, and identifies the source of each event as from actions or from condition data.

Bid Item Review

Bid Item Review is an application to read bid tabulations and help users identify element-level actions and costs. The application assembles bid items, allows users to specify conversion of units and basis, and sums costs after conversion of units. The application maintains a database of bid items that have been assembled into actions, and offers default (previously assigned) sets of bid items to form element-level actions. Users can accept, modify or reject these default sets of items.

The application has tabs for input/output, for keywords to relate bid items to element-level actions, for assignment of bid items, and for computation of costs of element-level actions.

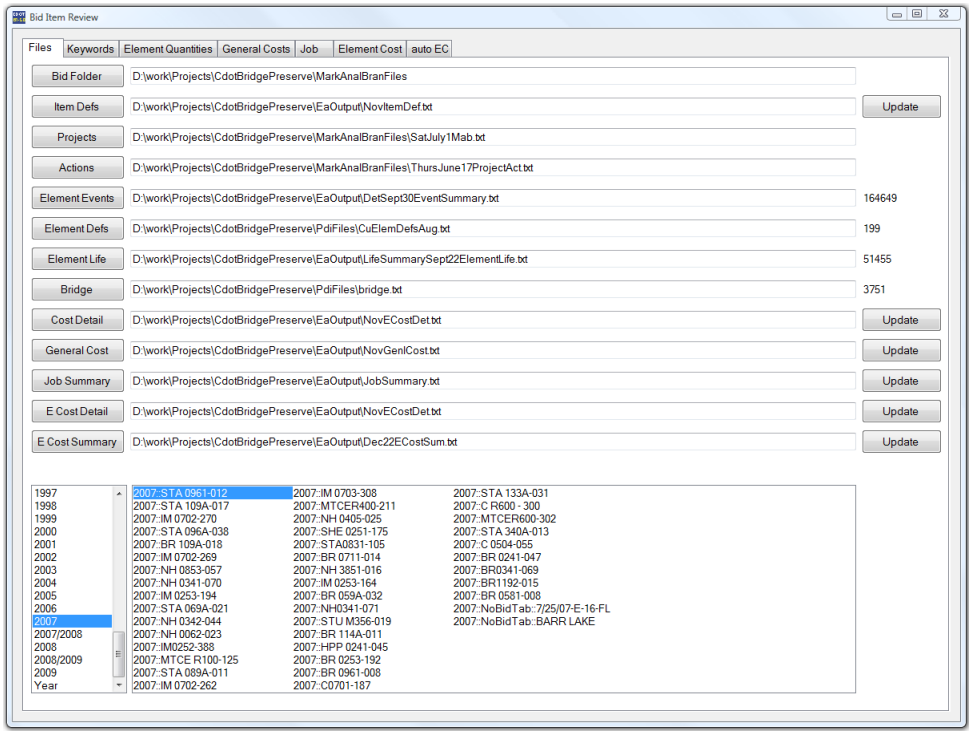

Figure 7 - Bid Item Reviewer - Files Tab

Bid Item Review:Files Tab

Bid Item Review uses a collection of bid tabulations, and seven input files. The application expects bid tabulations as html files available in a set of directories with a common root directory (Figure 8). The input files are *Project Summary* (Table 141), *Action Summary* (Table 127), *Element Events* (Table 135),

Element Definitions (Table 134), and *Life Summary* (Table 136) from the *Element Event* application. Input/Output files (that is, files that are created and updated in the application) include *Bid Item Definitions* (Table 128), *Cost Detail* (Table 129), *General Cost* (Table 137), *Job Summary* (Table 138), *Element Cost Detail* (Table 132) and *Element Cost Summary* (Table 133).

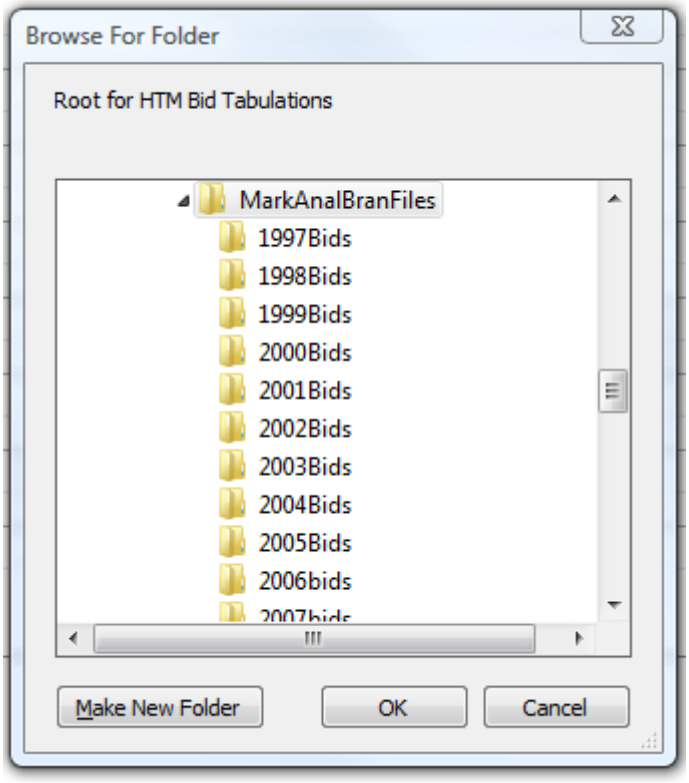

Figure 8 - Directory Tree for html Files of Bid Tabulations

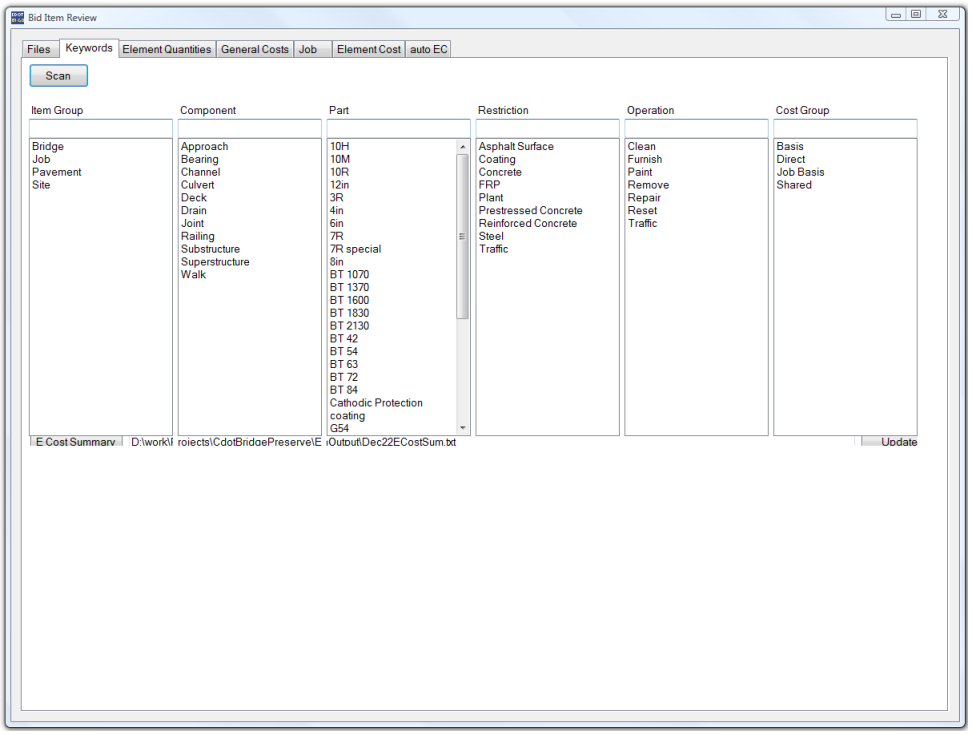

Figure 9 - Bid Item Review - Keywords Tab

Bid Item Review:Keywords Tab

The Keywords tab manages descriptive terms for bridge elements and actions. These terms are used to link bid items to bridge elements and actions for elements. This tab allows users to add, edit and delete keywords in six descriptor fields. The lists of keywords displayed in this tab are used to populate drop-down menus in other tabs so that standard keywords are assigned to bid items and actions. Control of keywords by this tab promotes the use of standard keywords, minimizes typographical errors and allows for efficient searching, filtering and retrieval of related bid items, bridge elements and actions.

Bid Item Review:Element Quantities Tab

The Element Quantities tab displays, for a single project, the bid item tabulation and bridge-related actions. By comparing bid items to actions, users can assign keywords to bid items. These keyword assignments are stored as definitions for bid items, and are used in assembly of costs of element-level actions.

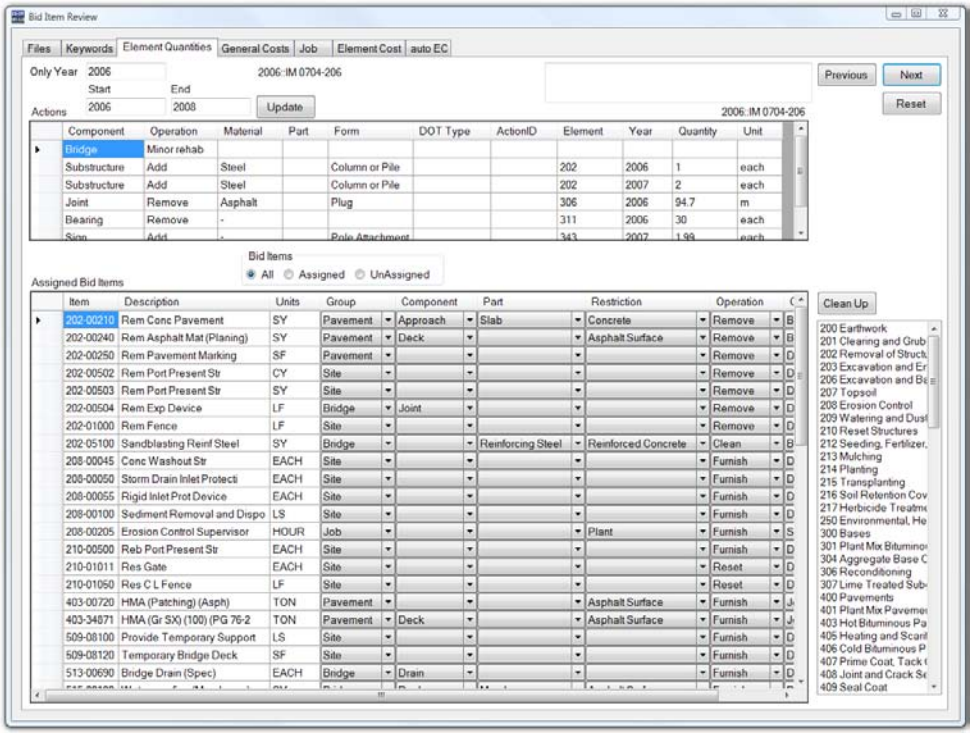

Figure 10 - Bid Item Review – Element Quantities Tab

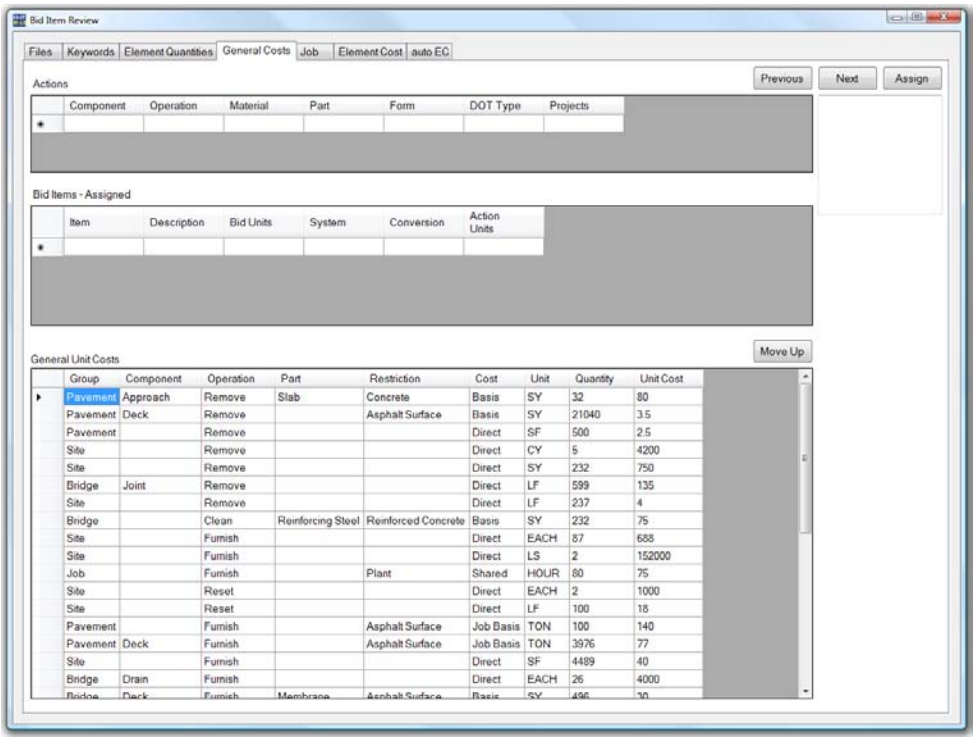

Figure 11 - General Costs Tab

Bid Item Review:General Costs Tab

The General Costs tab computes and displays sums of quantities and costs for bid items that agree in type of work and basis of measurement. Types of work are identified by keywords assigned by users. For examples, the General Costs tab combines all pavement-related items, and reports subtotals for items measured by tons, items measured by square yards, items measured by gallons and items measured by hours. Subtotals like this indicate general categories of costs in projects.

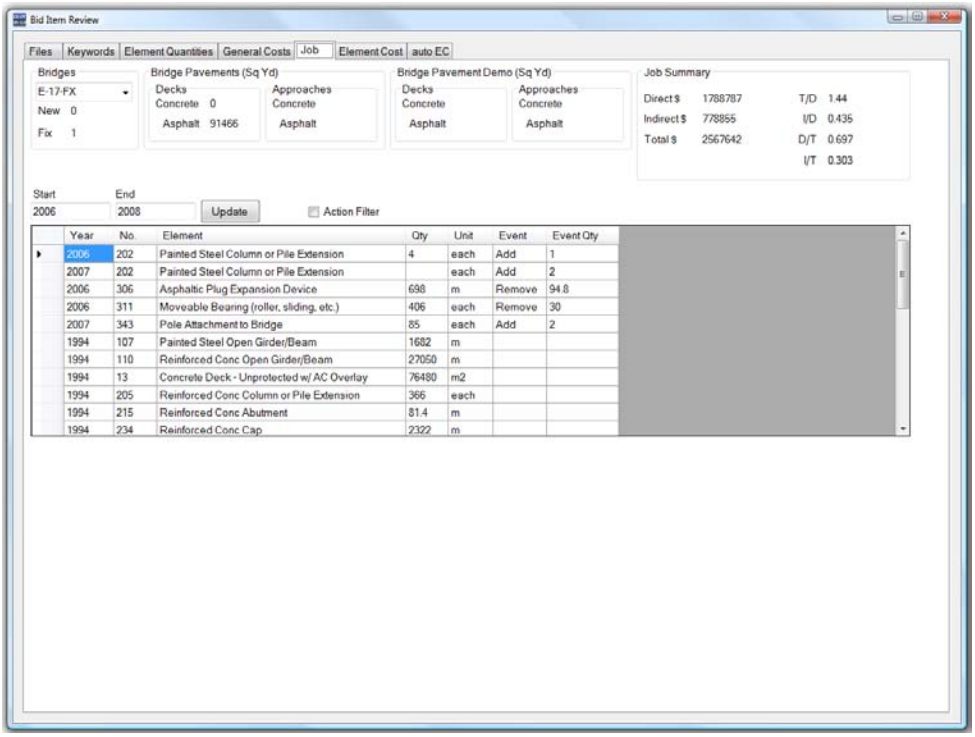

Figure 12 - Job Tab

Bid Item Review:Job Tab

The Job tab provides a separation of project costs into bridge and non-bridge (generally pavement) work. The separation provides a basis for assignment of costs of project management, maintenance of traffic and sitework to bridge and non-bridge activities. The Job tab displays the ratio of total costs of projects to costs of direct work items; the difference being the costs of traffic control, mobilization, and contractors' management and field offices.

Bid Item Review:Element Cost

The Element Cost tab allows users to assemble bid items into actions for elements, to provide conversion factors for bid items so that actions have a single basis of measurement, and to relate bid items to bridge elements. The Element Cost tab computes and stores unit costs of element-level actions.

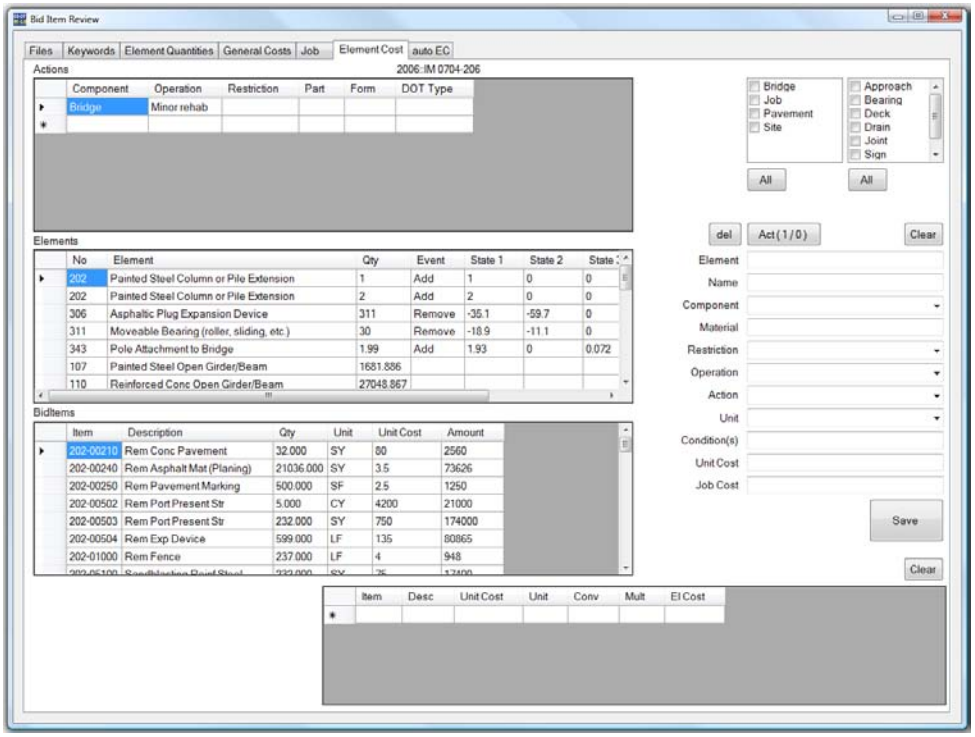

Figure 13 - Element Cost Tab

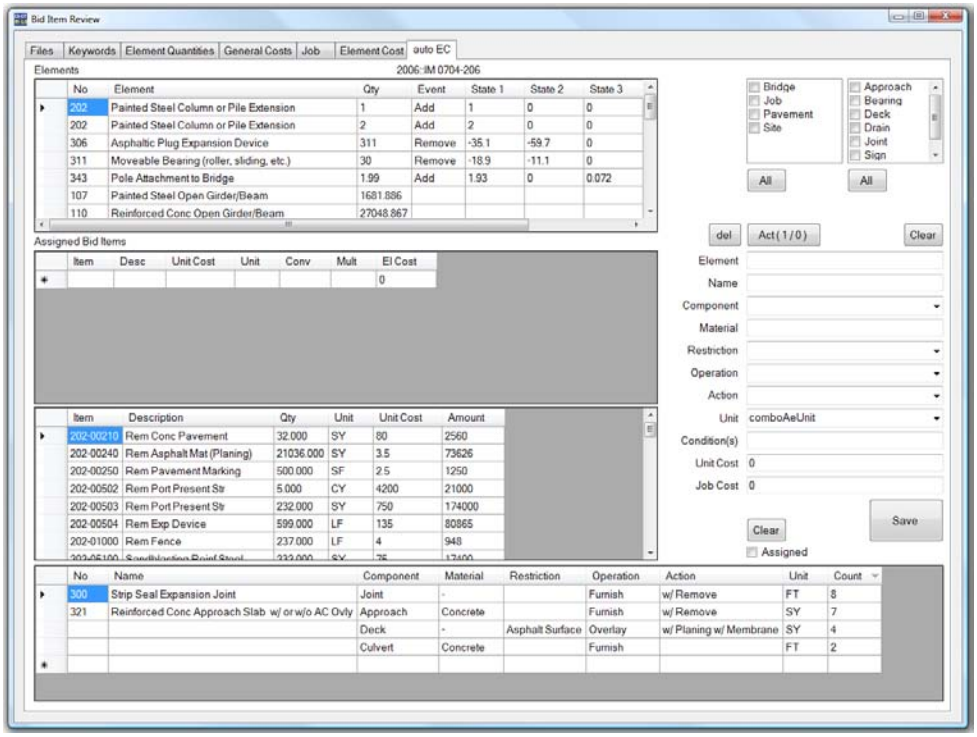

Figure 14 - Auto EC Tab

Bid item Review:Auto EC Tab (Automatic Element Cost)

The Auto EC tab applies users' previous assignments of bid items to form preliminary assignments of bid items to actions and to bridge elements. The preliminary assignments are reviewed by users for acceptance, modification or rejection. Previous factors for conversion of units from bid items to element actions are retrieved as well. Users can accept or modify conversion factors. After acceptance and/or editing of bid items and conversion factors, the user directs *Bid Item Review* to save the actions, bid items and costs.

Element Deterioration

The *Element Deterioration* application uses element-level condition records to compute transition probabilities for deterioration models. The application is adapted to grouping elements to obtain larger populations of condition records in models. Grouping of elements is directed by the user. The application has three active tabs and a fourth, informational tab. *Element Deterioration* collects condition information from the element events summary (deterioration is one of the service life events listed), and applies bridge data and roadway data to group elements for deterioration models.

Element Deterioration:Files Tab

The Files Tab provides input/output for the *Element Deterioration* application (Figure 15). Inputs to *Element Deterioration* include Element Events (Table 135), the Pontis bridge table, the Pontis roadway table, and Element Definitions (Table 134). The primary output is the Deterioration Model file (Table 130). Two other outputs, for Data and for Transition values, are used in checking and diagnostics for deterioration modeling. The 'htm' output file provides a version of the deterioration model file that is readable on web browsers.

Element Deterioration:Filters Tab

The Filters tab of the *Element Deterioration* application allows users to select the parameters for grouping element-level condition records into populations for computation of transition probabilities (Figure 16). Filters are provided for element attributes, bridge inventory attributes, and route inventory attributes. Available filters are shown in upper listboxes. Enforced filters are listed in lower listboxes. Users move filters from upper to lower listboxes as desired.

Each filter is a basis for grouping of condition records into multiple populations. A filter on element *Material* groups records of the same construction material, but separates records of different materials. A filter on bridge *Owner* groups records for bridges with the same (NBI) owner, but separates records with different owners. A filter on roadway *Level-Of-Service* groups records for bridges of the same route type, but separates records of different routes type.

Multiple filters may be applied. Filters applied simultaneously for element *Material* and bridge *Owner* will group condition records if both material and owner match, and will separate records if either material or owner is different.

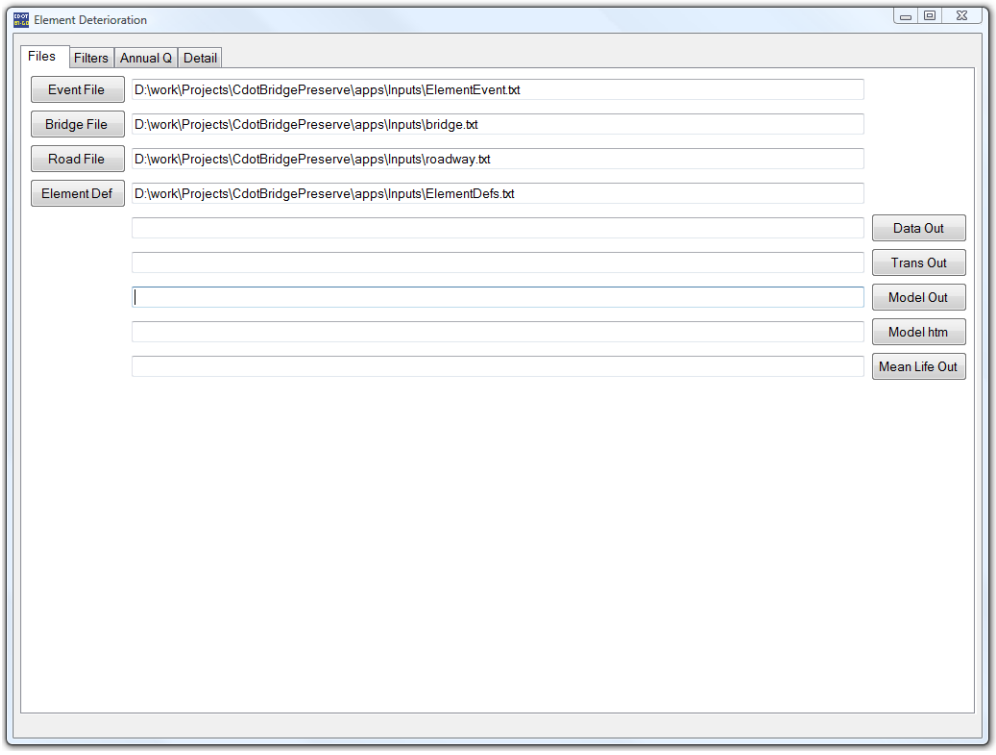

Figure 15 - Element Deterioration Files Tab

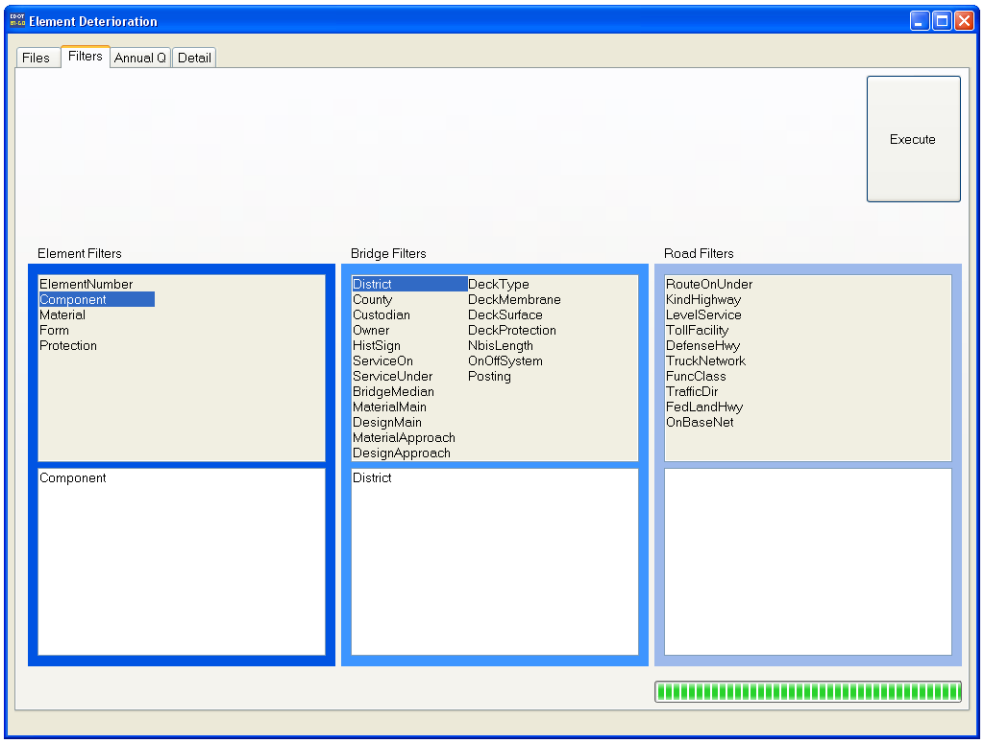

Figure 16 - Element Deterioration Filters Tab

Element Deterioration:Annual Q Tab

The Annual Q tab of the *Element Deterioration* application displays the available populations of element condition records, and the outcomes of computations of transition probabilities (Figure 17). Populations can include elements with different basis of measurement. Pontis uses four bases: *Area, Length, Each* and *Entire*. Computations of transition probabilities are made separately for separate basis of measurement. The Annual Q tab provides automated computation of transition probabilities for all current populations, that is, for populations established by current filters.

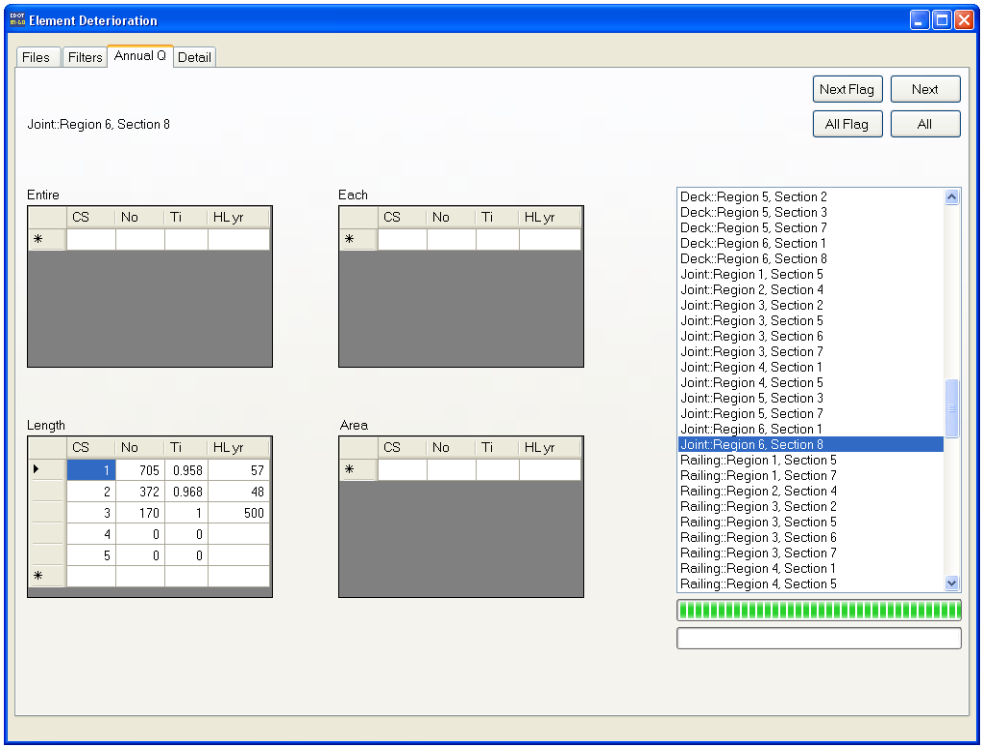

Figure 17 - Element Deterioration Annual Q Tab

Element Deterioration:Detail Tab

The Detail tab of the *Element Deterioration* application shows events for individual instances of bridge elements. An instance is the existence of a single element at a single bridge. Each instance can have events related to deterioration, to repairs, to construction or demolition of portions of elements, etc. Each event is a computing point for transition probabilities. The details of such instance-based computations of transition probabilities are shown in this tab. The Details tab was developed in an experiment with instance-based (and therefore project-level) calibration of Pontis deterioration models. This development is not complete.

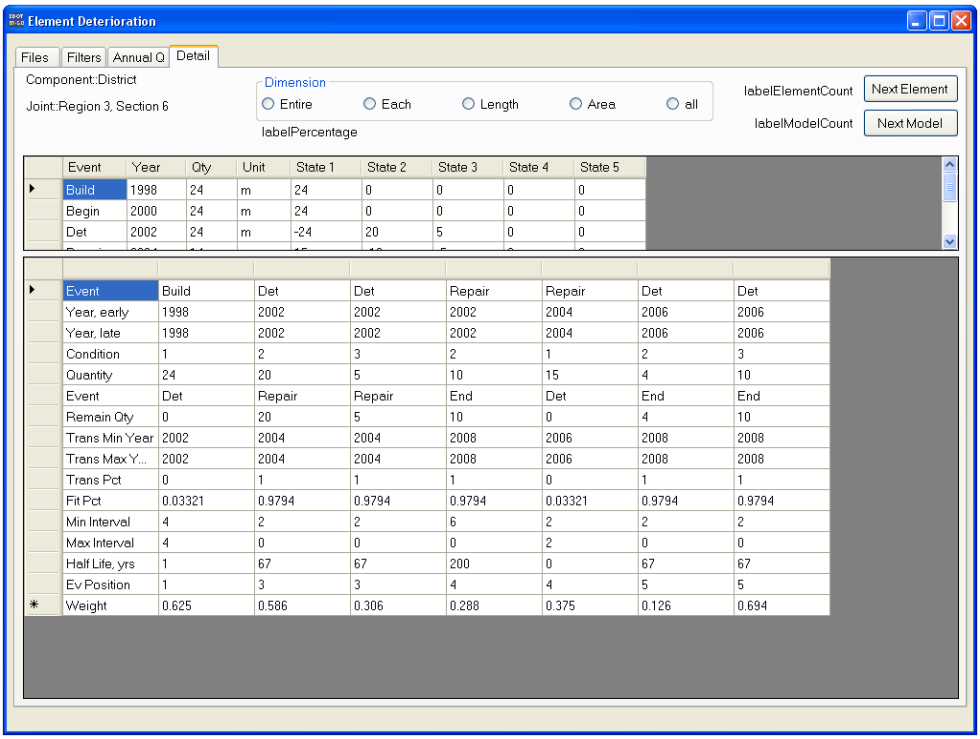

Figure 18 - Element Deterioration Detail Tab

Elicitation Info

The *Elicitation Info* application combines findings on deterioration probabilities and improvement probabilities to form matrices needed for the Pontis table *expactn* (Figure 19). The application uses inputs on improvements to elements and improvements to groups of elements, both generated by the *Element Event* application. Groups of elements are formed for elements with matching bridge component, construction material and protection. Many elements have direct association with projects, and direct evidence of improvement probabilities. Some elements don't have associated projects. For these elements, improvement probabilities are taken as average values within groups of similar elements.

Elicitation Info does not produce an output file. Elicitation Info helps users assemble data for the *expactn* table. Values in the data grid can be cut and pasted into Excel.

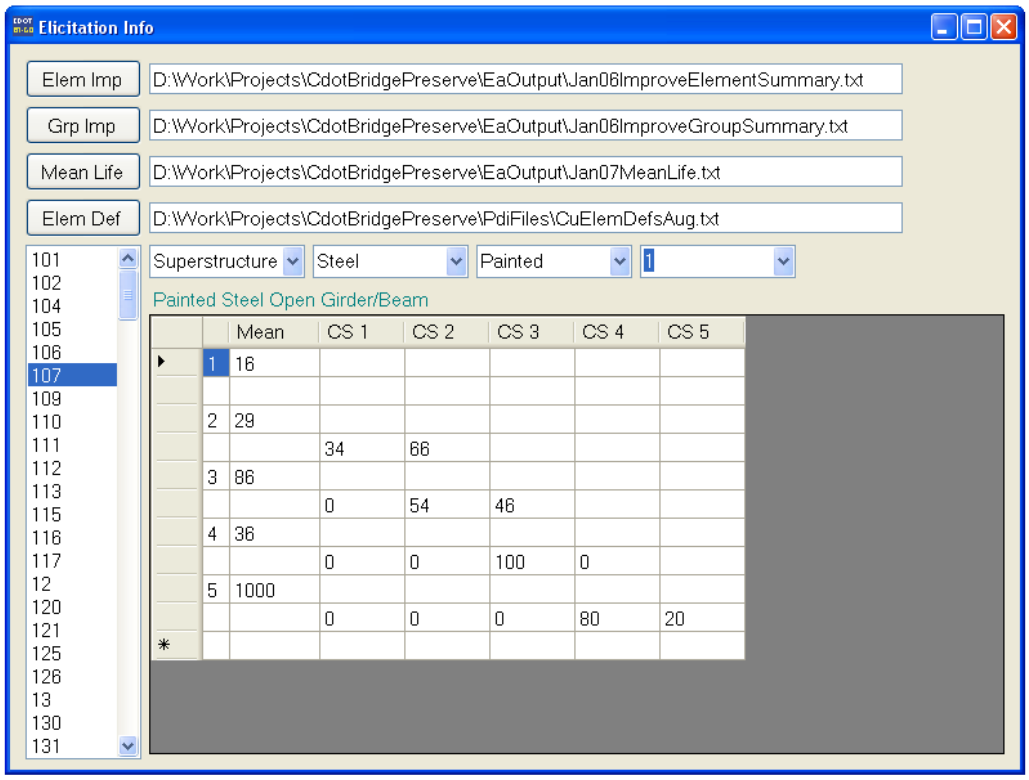

Figure 19 - Elicitation Info Application

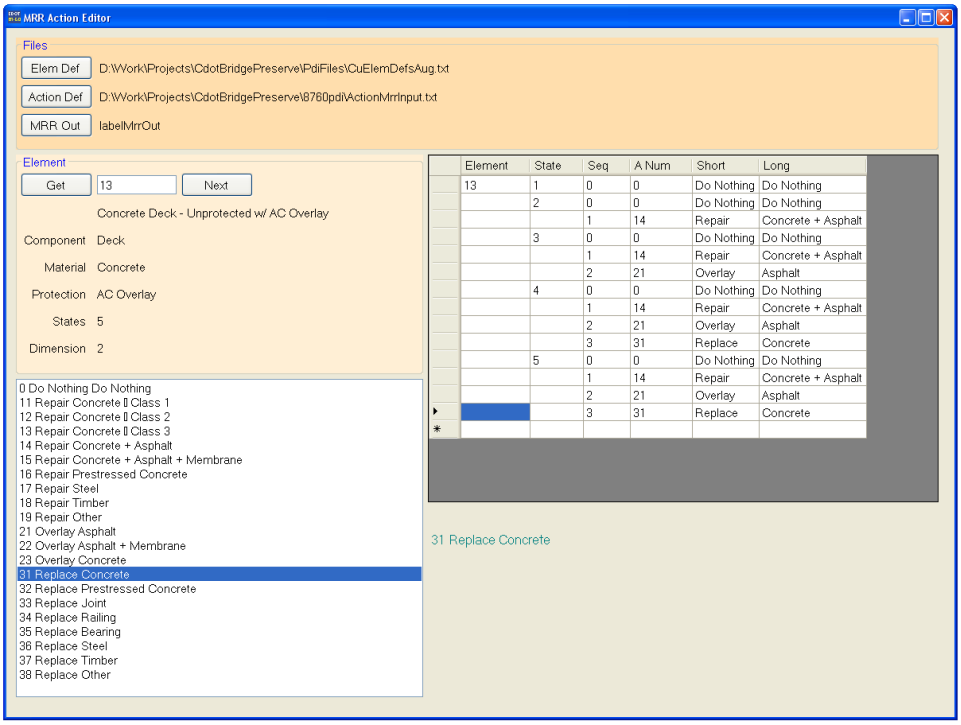

Figure 20 - MRR Action Editor

MRR Action Editor

The *MRR Action Editor* allows users to relate actions to specific bridge elements and condition states (Figure 20). Inputs to the editor are Element Definitions, and MRR Action Definitions. Defined actions are used here and applied in the configuration module of Pontis BMS. Users select bridge elements, and the editor fills the MR&R grid with the element, its condition states and its feasible actions for each condition state. "Do Nothing" actions are filled automatically. Users edit the MR&R information by highlighting actions in the listbox, and clicking rows in the MR&R grid to assign the action to condition states. The output is a flat file of all element/condition/action combinations (Table 140). The flat file is converted to PDI format in subsequent processing.

Element Analysis

The *Element Analysis* application examines element-level condition records, detects variations in element total quantities, and checks whether variations in element quantities are proportional to changes in units, specifically from metric units to US customary units (Figure 21). The *Element Analysis* application corrects for changes in units, and outputs corrected files for element-level condition reports.

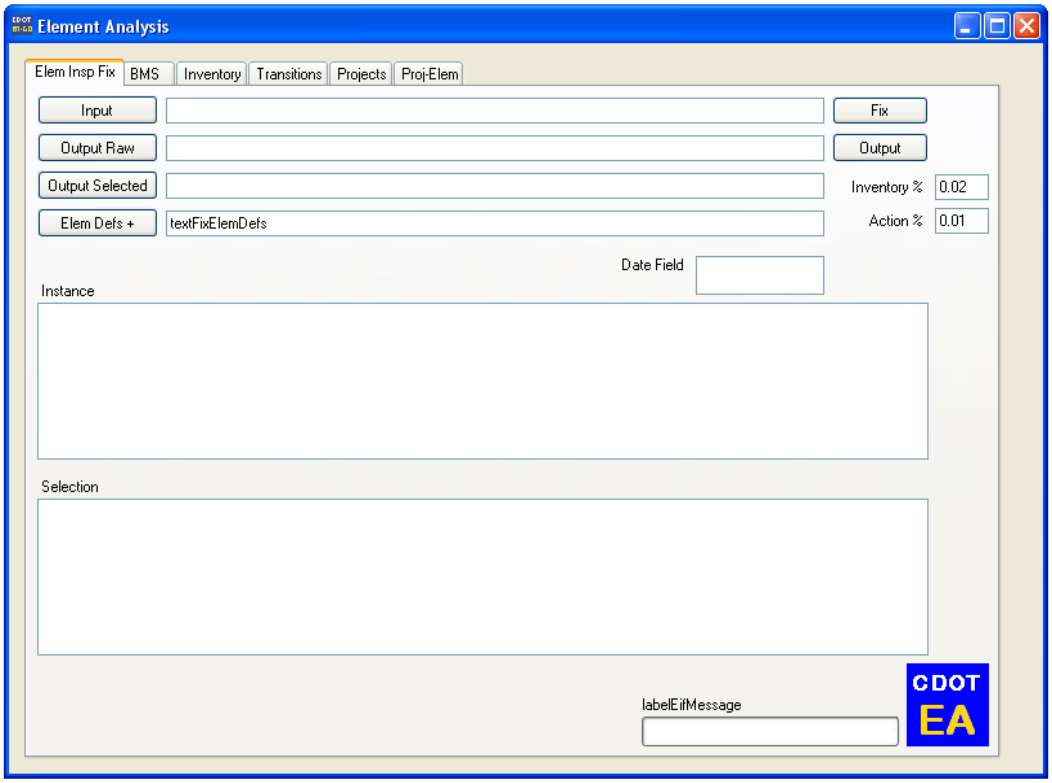

Figure 21 - Element Analysis

The input to *Element Analysis* is the *eleminsp* table from Pontis BMS, in a tab-delimited table form created in Study 87-60. The output file contains a subset of data fields from *eleminsp* selected by the user. Typically, the output file is set to contain bridge ID, element ID, structure unit, inspection ID, inspection data, element quantities in condition states and element percentages in condition states. The output file is the Element Condition file used in the application for element events.

Notes on Software Utilities

A set of utilities are developed in Study 87-60 to re-format data tables as these are collected from Pontis, used in computation of transition probabilities and costs for actions, and then returned to Pontis.

PDI-To-Tab-Table Utility

Pontis BMS software provides a module for export of tables from the Pontis database as Pontis Data Interchange (PDI) files. PDI files are made into tab-delimited text files using a *PDI-To-Tab-Table* (PTTT) utility developed in Study 87-60 (Figure 22). The utility operates on PDI files containing individual Pontis tables. Output tab-delimited files have the complete data of the original Pontis table. The first row in the output file is the set of names of data fields. Data field names are collected from the Definitions section of PDI files. For PDI files containing multiple tables, this utility converts only the table that appears first in the Definitions section.

Figure 22 - PDI To Tab Table Utility

Add Column Utility

Add Column is a utility to combine two tab-delimited tables with field names in first lines (Figure 23). The routine creates an expanded version of Table One, matches each record in Table One to a record in Table Two using a single field from each table. The match fields are selected in the two combination boxes. The output uses the first record in Table Two that matches the specified field in Table One. Multiple records are not generated.

Bid Rename Utility

The *Bid Rename* utility is used during collection of html listings of bid item tabulations from the website of CDOT's Construction Contract Unit. Files names at the CDOT site are generated (apparently) as month and date of bid opening plus a sequence number (01, 02, 03, …). For Study 87-60, these files are renamed using the year of letting as a prefix. Then files are grouped into subdirectories by year.

Input to the utility is a directory containing html files. The upper checked listbox of the interface allows users to include or exclude specific files for processing. The default is to rename all files that match a "*.html" filtering criterion. Files are renamed with a file prefix set by the user. The prefix is normally a year identification.

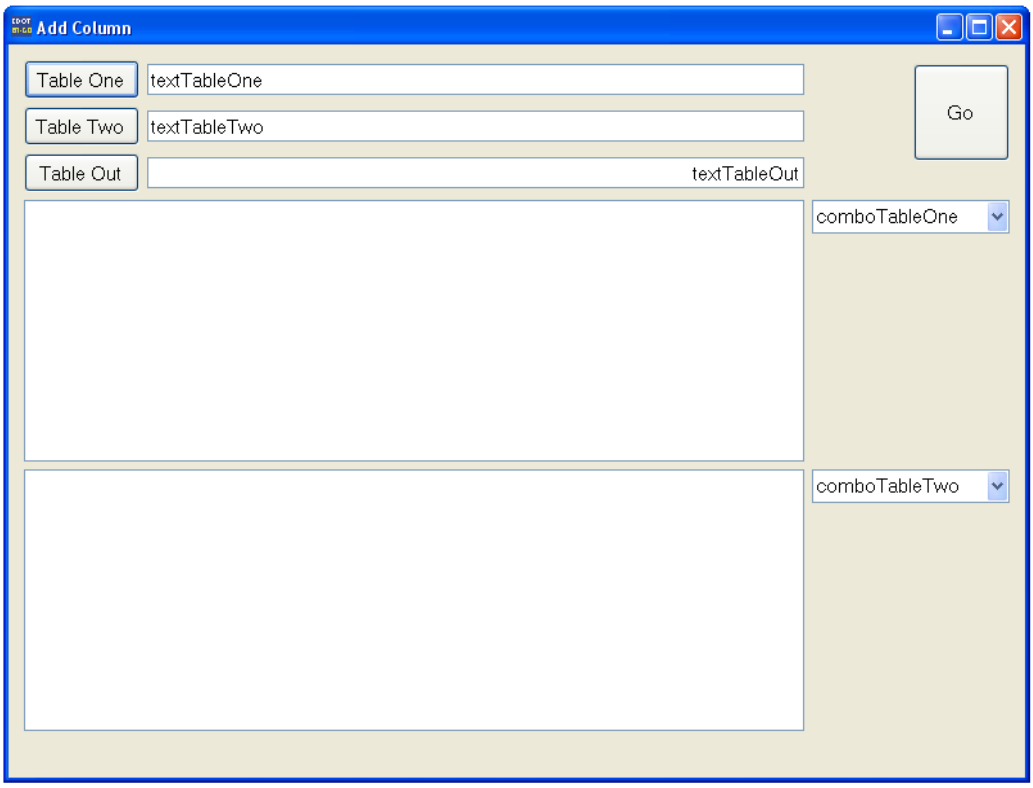

Figure 23 – Add Column Utility

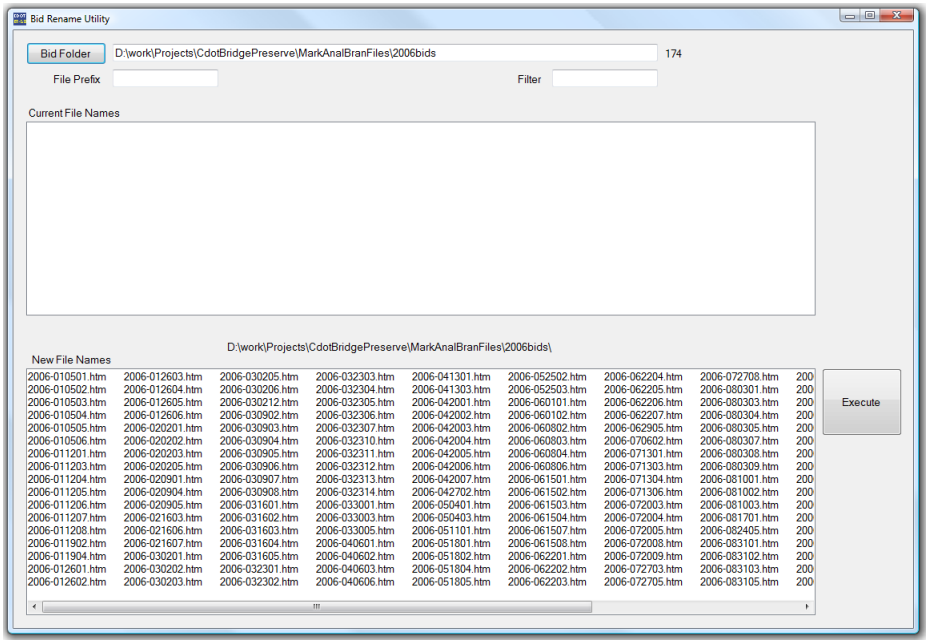

Figure 24 - Bid Rename Utility

Build PDI Transaction

Build PDI Transaction is a utility that creates PDI files for import to Pontis BMS (Figure 25). The costs, actions, deterioration models and improvement models developed in Study 87-60 are sent into Pontis as

PDI files created by this utility. Each data import is called a transaction (Pontis' terminology). PDI files generated by Pontis present a single transaction for each complete table. The *Build PDI Transaction* application presents each data record as a transaction, providing simple error location and correction, as necessary.

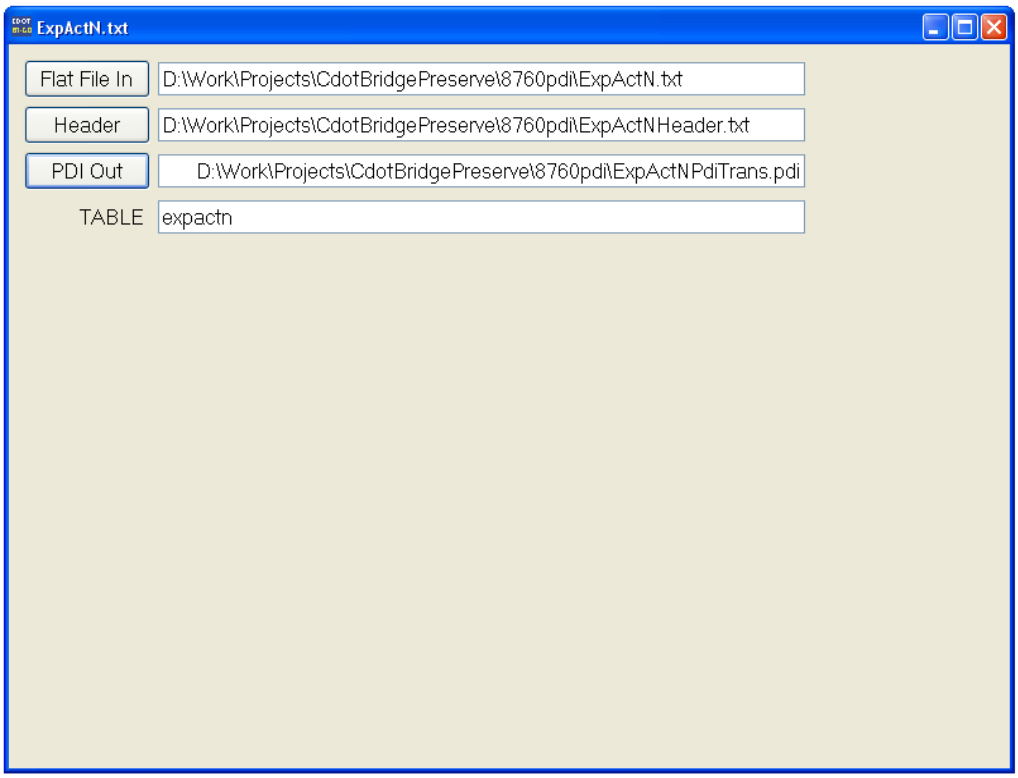

Figure 25 - Build Pdi Transaction

Table Utility

The *Table* utility assists in viewing and summarizing the contents of tab-delimited flat files (Figure 26). The *Table* utility allows users to select which fields to view, how to combine records with matching values in selected fields, and how to filter records for specified values of fields. The *Table* utility can report minimum values, maximum values or mean values for fields in groups of combined records. The min/max/mean capability is useful in aggregating costs of actions.

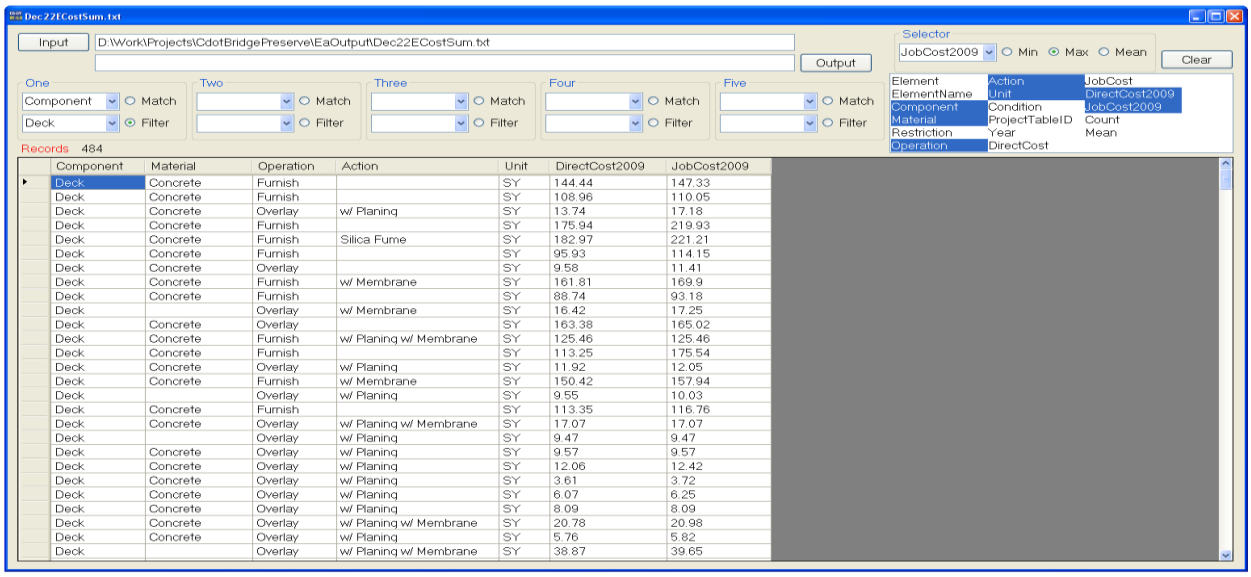

Figure 26 - Table Utility

NBI Reader Utility

The *NBI Reader* utility extracts specific fields from NBI files, and outputs these as tab-delimited flat files with field headings (Figure 27). The *NBI Reader* operates on fixed format ASCII files of NBI data available from the USDOT FHWA[11]. Users identify fields to extract using the column positions given in Appendix E of the NBI coding guide [*Recording* 1995]. Users provide field names for output. The *NBI Reader* processes all records in an NBI data file and outputs a single tab-delimited field for all NBI fields or for any subset of NBI fields, as directed by the user.

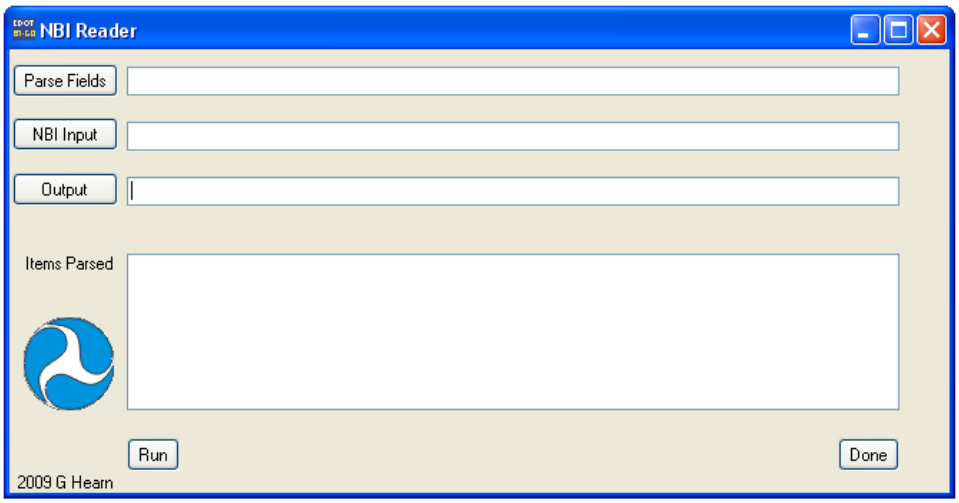

Figure 27 - NBI Reader Utility

[11] http://www.fhwa.dot.gov/bridge/nbi/ascii.cfm

Task 13 References

Civil 2010	*Civil Works Construction Cost Index System* – Revised Tables (2010). US Army Corps of Engineers, EM 1110-2-1304, 46p.
Recording 1995	Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (1995). USDOT FHWA, FHWA-PD-96-001, 124p.

Table 127 - Actions Summary File (sample)

Project Table ID	Action Table ID	Bridge ID	Component	Action	Material	Element	Form
2007:IM 0253-194	2007:IM 0253-194:1	C-17-AS	Deck	Repair			
2007:IM 0702-262	2007:IM 0702-262:4	F-12-S	Deck	Repair		Curb	
2007:IM 0702-262	2007:IM 0702-262:4	F-12-Y	Deck	Repair		Curb	
2007:MTCER600-302	2007:MTCER600-302:0	E-16-MR	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-HC	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-IC	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-KS	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-NY	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-OZ	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-PO	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	E-17-UW	Joint	Repair			Expansion
2007:MTCER600-302	2007:MTCER600-302:0	F-16-DP	Joint	Repair			Expansion
2007:STA 133A-031	2007:STA 133A-031:0	G-08-B	Deck	Replace			
2008:BR R400-206	2008:BR R400-206:0	D-18-BN	Joint	Replace			
2008:BR R400-206	2008:BR R400-206:0	D-18-BO	Joint	Replace			
2008:BR R400-206	2008:BR R400-206:0	D-20-AC	Joint	Replace			
2008:BR R400-206	2008:BR R400-206:0	E-18-AM	Joint	Replace			

Table 128 - Bid Item Definitions File (sample)

Item	Description	Unit	Group	Component	Part	Restriction	Action	Cost	Material	Form	DOT Type
512-00101	BEARING DEVICE (TYPE I)	EACH	Bridge	Bearing			Furnish	Basis			
514-01011	Bridge Rail (Steel)	M	Bridge	Railing			Furnish	Direct			
518-00000	BRDG COMPRESS JOINT SEALER	M	Bridge	Joint			Furnish	Direct			
518-01004	EXPAN DEVICE (0-100 MM)	M	Bridge	Joint	4in		Furnish	Basis			

Table 129 - Cost Detail File (sample)

Item	Description	Quantity	Unit	UnitCost	Amount	Group	Component	Part	Restriction	Action	Cost	Year	ProjectTableID
518-00000	Brdg Compress Joint Sealer	69	LF	64	4416	Bridge	Joint	Seal		Furnish	Basis	2006	2006:IM 0703-291
518-00000	Brdg Compress Joint Sealer	72	LF	120	8640	Bridge	Joint	Seal		Furnish	Basis	2006	2006:STU M040-011
518-00000	Brdg Compress Joint Sealer	40	LF	250	10000	Bridge	Joint	Seal		Furnish	Basis	2007	2007:BR 0581-008
518-00000	Brdg Compress Joint Sealer	16	LF	225	3600	Bridge	Joint	Seal		Furnish	Basis	2007	2007:MTCER600-302
518-01004	EXPAN DEVICE (0-100 MM)	94	M	500	47000	Bridge	Joint	4in		Furnish	Basis	1997	1997:BR 0404-023
518-01004	EXPAN DEVICE (0-100 MM)	64.4	M	450	28980	Bridge	Joint	4in		Furnish	Basis	1998	1998:BR 093-1(016)
518-01004	EXPAN DEVICE (0-100 MM)	196.1	M	475	93147.5	Bridge	Joint	4in		Furnish	Basis	1998	1998:IM 0704-183
518-01004	EXPAN DEVICE (0-100 MM)	81	M	440.95	35716.95	Bridge	Joint	4in		Furnish	Basis	1998	1998:IM 0704-185
518-01004	EXPAN DEVICE (0-100 MM)	17	M	3000	51000	Bridge	Joint	4in		Furnish	Basis	1998	1998:MC R600-095
518-01004	EXPAN DEVICE (0-100 MM)	33	M	465.35	15356.55	Bridge	Joint	4in		Furnish	Basis	1998	1998:SP 0252-307
518-01004	EXPAN DEVICE (0-100 MM)	27	M	380	10260	Bridge	Joint	4in		Furnish	Basis	1998	1998:SP 0761-171

Table 130 - Deterioration Model File (sample shown transposed)

Model	Deck:-:	Deck:Concrete:	Deck:Concrete:AC Overlay	Superstructure:Concrete:	Superstructure:Prestressed Concrete:
Dimension	0	0	0	2	2
Elements	60	12 38 35	14 13 39 36 40	110 105 144 155 116	104 109
Count 1	31	242	1254	829	812
Count 2	15	125	637	590	273
Count 3	3	72	190	224	70
Count 4	3	36	66	43	6
Count 5	0	25	15	0	0
Ti 1	0.997	0.965	0.879	0.998	0.999
Ti 2	1	0.354	0.958	0.996	1
Ti 3	1	0.997	0.976	0.982	0.997
Ti 4	0	0.978	0.998	1	1
Ti 5	0	1	1	0	0
Median 1	231	19	5	346	693
Median 2	1000	1	16	173	1000
Median 3	1000	231	29	38	231
Median 4		31	346	1000	1000
Median 5		1000	1000		

Table 131 - Element Condition File (sample)

brkey	elemkey	strunitkey	elinspdate	quantity	qtystate1	qtystate2	qtystate3	qtystate4	qtystate5	Year	Month	Day	ElementSet	InventorySet	ServiceSet
A-06-I	104	0	8/1/1997	223.2	223.2	0.0	0.0	0.0	0.0	1997	8	1	0	0	0
A-06-I	104	0	8/1/2000	223.2	223.2	0.0	0.0	0.0	0.0	2000	8	1	0	0	0
A-06-I	104	0	9/11/2002	223.2	223.2	0.0	0.0	0.0	0.0	2002	9	11	0	0	0
A-06-I	104	0	8/9/2004	223.2	223.2	0.0	0.0	0.0	0.0	2004	8	9	0	0	0
A-06-I	104	0	7/25/2006	223.2	223.2	0.0	0.0	0.0	0.0	2006	7	25	0	0	0
A-06-I	215	0	8/1/1997	27.3	27.3	0.0	0.0	0.0	0.0	1997	8	1	1	1	1
A-06-I	215	0	8/1/2000	27.3	27.3	0.0	0.0	0.0	0.0	2000	8	1	1	1	1
A-06-I	215	0	9/11/2002	27.3	27.0	0.3	0.0	0.0	0.0	2002	9	11	1	1	1
A-06-I	215	0	8/9/2004	27.3	27.0	0.3	0.0	0.0	0.0	2004	8	9	1	1	1
A-06-I	215	0	7/25/2006	27.3	27.0	0.3	0.0	0.0	0.0	2006	7	25	1	1	1

Table 132 - Element Cost Detail File (sample shown transposed)

Element	302		14							
Element Name	Compression Joint Seal		Concrete Deck - Protected w/ AC Overlay							
Component	Joint		Deck			Deck		Railing	Railing	
Material	-		Concrete					Metal	Metal	
Restriction	4 IN		Asphalt Surface			Asphalt Surface		Ty 10	10R	
Operation	Furnish		Furnish			Overlay		Furnish	Replace	
Action	w/ Remove		Two mats epoxy coated			w/ Membrane			w/ Remove	
Unit	FT		SY			SY		FT	FT	
Condition										
Unit Cost	305.15		185.42			15.58		67	220.5	
Job Cost	524.86		318.93			17.29		74.37	224.91	
Item	202-00504	518-01004	403-00720	602-00020	601-03040	403-33721	515-00120	606-11000	202-00425	606-11010
Item Description	Rem Exp Device	Br Expan Device (0-4 In)	HBP (Patching) (Asph)	Reinf Steel (Epoxy)	Conc CL D (Bridge)	HBP (Gr S) (75) (PG 58-28)	Waterproofing (Membrane)	Brdg Rail Ty 10	Rem Bridge Railing	Brdg Rail Ty 10R
Item Unit	LF	LF	TON	LB	CY	TON	SY	LF	LF	LF
Item Unit Cost	45.15	260	145	0.7	550	46.5	8	67	28.5	192
Item Conversion	-	-	TON:3IN SY	LB:SY	CY:SY	TON:3IN SY	-	-	-	-
Item Conv Factor	1	1	0.163	56.7	0.222	0.163	1	1	1	1
Item Element Cost	45.15	260	23.635	39.69	122.1	7.5795	8	67	28.5	192
Project Table ID	2002: IM 0702-238	2002: IM 0702-238	2002: IM 0702-238	2002: IM 0702-238	2002: IM 0702-238	2002: BR 0362-023	2002: BR 0362-023	2002: BR 0362-023	2002: STA 069A-018	2002: STA 069A-018

Table 133 - Element Cost Summary (sample shown transposed)

Element	39	14	331	105	14	306	334
Element Name	Concrete Slab - Unprotected w/ AC Overlay	Concrete Deck - Protected w/ AC Overlay	Reinforced Conc Bridge Railing	Reinforced Concrete Closed Webs/Box Girder	Concrete Deck - Protected w/ AC Overlay	Asphaltic Plug Expansion Device	Metal Bridge Railing - Coated
Component	Deck	Deck	Railing	Superstructure	Deck	Joint	Railing
Material	Concrete	Concrete	Concrete	Prestressed Concrete	Concrete	Asphalt	Metal
Restriction	Asphalt Surface	Asphalt Surface	Ty 7 spec		Asphalt Surface	2 IN	10R
Operation	Overlay	Furnish	Furnish	Furnish	Overlay	Furnish	Furnish
Action	w/ Planing w/ Membrane	w/ Membrane			w/ Planing	w/ Remove	w/ Remove
Unit	SY	SY	FT	FT	SY	FT	FT
Condition							
Project Table ID	2005: STA 0711-015	2005: BR 131A-027	2005: BR 131A-027	2005: BR 131A-027	2005: IM 0702-246	2005: IM 0702-246	2005: NH 0504-048
Year	2005	2005	2005	2005	2005	2005	2005
Direct Cost	33.52	179.16	80	300.64	9.25	175	174.5
Job Cost	33.52	182.74	81.6	306.65	9.62	182	174.5
Direct Cost 2009	38.25	204.42	91.28	343.03	10.55	199.68	199.1
Job Cost 2009	38.25	208.51	93.11	349.89	10.97	207.66	199.1

Table 134 – Element Definitions Input File (sample shown transposed)

DOT	Colorado	Colorado	Colorado	Colorado	Colorado	Colorado
elemkey	23	26	27	28	29	30
ecatkey	6	6	6	6	6	6
etypkey	6	6	6	6	6	6
matlkey	4	7	7	7	7	7
paircode	57	57	57	57	57	57
elemnum	23	26	27	28	29	30
coreflag	0	1	1	1	1	1
smartflag	0	0	0	0	0	0
parent	-1	-2	-2	-2	-2	-2
useparmdls	0	0	0	0	0	0
elemshort	Bare Conc Dk w/Brs	Conc Deck/ Coatd Bars	Conc Deck/ Cathodic	Steel Deck/Open Grid	Steel Deck/Conc Grid	Corrug/ Orthotpc Deck
elemlong	Concrete Deck - Bare Protected w/Coated Bars	Concrete Deck - Protected w/ Coated Bars	Concrete Deck - Protected w/ Cathodic System	Steel Deck - Open Grid	Steel Deck - Concrete Filled Grid	Steel Deck - Corrugated/ Orthotropic/Etc.
Component	Deck	Deck	Deck	Deck	Deck	Deck
Material/Basis	Concrete	Concrete	Concrete	Steel	Steel	Steel
Form				Open Grid	Concrete Filled Grid	Corrugated/ Orthotropic
Protection	Coated Bars	Coated Bars	Cathodic system			
Dimension	2	2	2	2	2	2
statecnt	5	5	5	5	5	5
eachflag	1	1	1	1	1	1
paintflag	0	0	0	1	1	1
scaleshort	Scale	Ovly Depth	Ovly Depth	Scale	Scale	Scale
scaleunit	-1	inches	inches	-1	-1	-1
elemweight	1	6	6	6	6	6
scalemet	-1	mm	mm	-1	-1	-1
docrefkey	232001 -10-25 10: 50:41.5150004	261999 -11-18 09:46: 52.3020006	271999 -11-18 09:46: 52.3020007	281999 -11-18 09:46: 52.3020008	291999 -11-18 09:46: 52.3020009	301999 -11-18 09:46: 52.30200010

Table 135 - Element Event summary File (sample shown transposed)

Bridge ID	D-15-BP	D-15-G	D-15-G	D-15-G	D-15-G	D-15-G	D-15-G	D-15-H	D-15-H MINOR	D-15-H MINOR
Element Number	241	13	325	330	333	334	334	241	241	334
Structure Unit	0	0	0	0	0	0	0	0	0	0
Element Name	Reinforced Concrete Culvert	Concrete Deck - Unprotected w/ AC Overlay	Slope, Slope Protection, Berms	Metal Bridge Railing - Uncoated	Other Bridge Railing	Metal Bridge Railing - Coated	Metal Bridge Railing - Coated	Reinforced Concrete Culvert	Reinforced Concrete Culvert	Metal Bridge Railing - Coated
Quantity	18.92	460.71	1.00	37.10	36.90	36.80	73.76	29.10	23.91	12.00
Units	m	m2	each	m	m	m	m	m	m	m
Year	2005	2007	2003	2007	2007	2007	2007	2005	2001	2001
Month	6	9	10	9	9	9	9	8	3	3
Day	9	25	23	25	25	25	25	8	1	1
Event	Deteriorate	Deteriorate	Repair	Remove	Deteriorate	Remove	Deteriorate	Repair	Deteriorate	Repair
State1	-1.53	-460.71	0.00	-0.12	-36.90	-18.59	-51.21	29.13	-1.91	12.06
State2	0.00	460.71	1.00	0.00	36.90	-18.29	0.00	-27.19	0.96	0.00
State3	1.53	0.00	-1.00	0.00	0.00	0.00	32.92	-1.94	0.96	-12.06
State4	0.00	0.00	0.00	-37.00	0.00	0.00	14.94	0.00	0.00	0.00
State5	0.00	0.00	0.00	0.00	0.00	0.00	3.35	0.00	0.00	0.00
Event Source	Condition Data	Condition Data	Condition Data	Condition Data	Condition Data	Condition Data	Condition Data	Condition Data	Condition Data	Condition Data
Event Action ID										
Event Project ID										
Element ID	D-15-BP: 241:0	D-15-G: 13:0	D-15-G: 325:0	D-15-G:330:0	D-15-G: 333:0	D-15-G: 334:0	D-15-G: 334:0	D-15-H: 241:0	D-15-H MINOR: 241:0	D-15-H MINOR: 334:0

Table 136 - Element Life Summary File (sample)

Bridge ID	Element Number	Structure Unit	Element Name	Quantity	Unit	Component	Start Year	End Year	Built Year	Removed Year	Element Set	Start Row	End Row	Smart Flag	Element ID
J-27-K	110	0	Reinforced Conc Open Girder/Beam	61.3	m	Superstructure	1995	2007	1961		39787	0	4	0	J-27-K: 110:0
J-27-K	13	0	Concrete Deck - Unprotected w/ AC Overlay	182.1	m2	Deck	1995	2007	1961		39788	5	9	0	J-27-K: 13:0
J-27-K	14	0	Concrete Deck - Protected w/ AC Overlay	182.2	m2	Deck	1995	1995	1961	1995	39789	10	10	0	J-27-K: 14:0
J-27-K	210	0	Reinforced Conc Pier Wall	13.4	m	Substructure	1995	2007	1961		39790	11	15	0	J-27-K: 210:0
J-27-K	215	0	Reinforced Conc Abutment	17.1	m	Substructure	1995	2007	1961		39791	16	20	0	J-27-K:215:0
J-27-K	304	0	Open Expansion Joint	17.0	m	Joint	1995	1995	1961	1995	39792	21	21	0	J-27-K: 304:0
J-27-K	308	0	Construction/ Non-Expansion Joint	17.1	m	Joint	2001	2007	2001		39793	22	26	0	J-27-K: 308:0
J-27-K	325	0	Slope, Slope Protection, Berms	2.0	each	Approach	1995	2007	1961		39794	27	31	0	J-27-K: 325:0
J-27-K	326	0	Bridge WIngwalls	4.0	each	Substructure	1995	2007	1961		39795	32	36	0	J-27-K: 326:0
J-27-K	334	0	Metal Bridge Railing - Coated	42.7	m	Railing	1995	2007	1961		39796	37	41	0	J-27-K: 334:0
J-27-K	338	0	Concrete Curbs /Sidewalks	42.7	m	Walks	1995	2007	1961		39797	42	46	0	J-27-K: 338:0
J-27-K	358	0	Deck Cracking	1.0	each	Deck	2001	2003	2001	2003	39798	47	49	1	J-27-K: 358:0
J-27-K	359	0	Soffit of Concrete Deck or Slab	1.0	each	Deck	1995	2007	1995		39799	50	54	1	J-27-K: 359:0
J-27-K	501	0	Channel Condition	1.0	each	Channel	1995	2007	1961		39800	55	59	0	J-27-K: 501:0
J-27-K	504	0	Bank Condition	1.0	each	Channel	1995	2007	1961		39801	60	64	0	J-27-K: 504:0

Table 137 - General Cost File (sample)

Group	Component	Part	Restriction	Action	Cost	Quantity	Unit	UnitCost	Amount	Year	ProjectTableID
Pavement				Furnish	Direct	136600	SY	2.49	340400	2000	2000:STR 0343-017
Pavement			Asphalt Surface	Furnish	Job Basis	65890	TON	38.7	2553000	2000	2000:STR 0343-017
Pavement		Slab	Concrete	Furnish	Basis	1150	SY	73.5	84520	2000	2000:STR 0343-017
Site				Furnish	Direct	3645	CY	9.88	36010	2000	2000:STR 0343-017
Site				Remove	Direct	72	SY	125	9000	2000	2000:STR 0343-017
Site				Furnish	Direct	291	EACH	116	33630	2000	2000:STR 0343-017
Bridge	Railing	3R		Furnish	Basis	492	LF	35	17220	2000	2000:STR 0343-017
Bridge	Railing	10R		Furnish	Basis	41	LF	230	9430	2000	2000:STR 0343-017
Site				Furnish	Direct	1785	LF	10.5	18680	2000	2000:STR 0343-017

Table 138 - Job Summary File (sample)

ProjectTableID	Year	TotalToDirect	CostIndex
2000:NH 1603-014	2000	1.14	1.389
2000:STR 0343-017	2000	1.01	1.389
2000:NH 050A-005	2000	1	1.389
2000:M 06-001	2000	1.08	1.389
2000:STA 141A-027	2000	1.02	1.389
2000:IM 0252-329	2000	1.17	1.389
2000:M 02-002	2000	1.23	1.389
2000:M 02-001	2000	1	1.389
2000:IM 0702-222	2000	1.18	1.389
2000:IM 0251-155	2000	1.23	1.389

Table 139 - MRR Action File

Action	Short	Long
0	Do Nothing	Do Nothing
11	Repair	Concrete – Class 1
12	Repair	Concrete – Class 2
13	Repair	Concrete – Class 3
14	Repair	Concrete + Asphalt
15	Repair	Concrete + Asphalt + Membrane
16	Repair	Prestressed Concrete
17	Repair	Steel
18	Repair	Timber
19	Repair	Other
21	Overlay	Asphalt
22	Overlay	Asphalt + Membrane
23	Overlay	Concrete
31	Replace	Concrete
32	Replace	Prestressed Concrete
33	Replace	Joint
34	Replace	Railing
35	Replace	Bearing
36	Replace	Steel
37	Replace	Timber
38	Replace	Other

Table 140 - MRR Action Output File

elemkey	skey	akey	tkey	modelflag	actnum	actshort	actlong	paintflag	wholeflag	notes
12	1	0	0		0	Do Nothing	Do Nothing		1	
12	2	0	0		0	Do Nothing	Do Nothing		1	
12	2	1	23		23	Overlay	Concrete		1	
12	3	0	0		0	Do Nothing	Do Nothing		1	
12	3	1	23		23	Overlay	Concrete		1	
12	3	2	11		11	Repair	Concrete - Class 1		1	
12	4	0	0		0	Do Nothing	Do Nothing		1	
12	4	1	23		23	Overlay	Concrete		1	
12	4	2	12		12	Repair	Concrete - Class 2		1	
12	4	3	31		31	Replace	Concrete		1	
12	5	0	0		0	Do Nothing	Do Nothing		1	
12	5	1	23		23	Overlay	Concrete		1	
12	5	2	13		13	Repair	Concrete - Class 3		1	
12	5	3	31		31	Replace	Concrete		1	

Table 141 - Project Summary Input File (sample, shown transposed)

Letting No.	4080508	5051204	20060921	20081009
Contract Id	C14980B	MM6059	C14551RA-ALT	C16808
Counties	GARFIELD SUMMIT	JEFFERSON, REGION 6	LAS ANIMAS	ARAPAHOE, REGION 6 DOUGLAS, REGION
Letting Date	8/5/2004	5/12/2005	9/21/2006	10/9/2008
Region	1 EAGLE	6	2	6 DENVER
Letting Time	10:00 AM	10:00 AM	10:00 AM	10:00 AM
Contract Time	11/30/04 COMPLETION DATE	15 WORK DAYS	670 WORK DAYS	60 WORK DAYS
Terrain	MOUNTAINOUS	URBAN	URBAN	ROLLING
Project	IM 0702-250	MTCE 06-059	IM 0251-166	IMR600-322
Contract Description	IM 0702-250 I-70 Culvert Repairs (Alternate B)	C 470 BRIDGE AND APPROACH TO BRIDGE OVERLAY AT VARIOUS LOCATIONS	PROJECT: IM 0251-166 - MULTIPLE A	PROJECT NO. IMR600-322
Bridge Count	10	10	10	10
Component Count	1	2	1	1
Form Count	1	2	1	1
Operation Count	1	3	1	1
Element Count	1	2	1	1
DOT Type Count	1	1	1	1
Route Count				
Bridge Length	240	2450	0	1970
Road Length	0	0	0	0
Project Length	240	2450	0	0
Year	2004	2005	2006	2008
Month	8	5	9	10
Day	5	12	21	9
Note				
Project Table ID	2004:IM 0702-250	2005:MTCE 06-059	2006:IM 0251-166	2008:IMR600-322
Project Htm File	2004-080508B.htm	2005-051204.htm	2006-092101.htm	2008-100905.htm