OS-2 (3-89)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION

December 21, 1995

ORIGINAL

IN REPLY REFER TO

Beaver County
T-649
Marion Township
AAR No. 145 802 C
PUC No. M-00870123

RECEIVED
95 DEC 28 AM 10: 56
PA. P.U.C.
INFO. CONTROL DIV.

Mr. John G. Alford, Secretary
Public Utility Commission
P. O. Box 3265
Harrisburg, PA 17105-3265

Attention: Mr. David C. Hart, P.E.

Dear Secretary Alford:

The Department requests that the five span bridge carrying T-649 over the tracks of CSX Transportation, Inc. in Marion Township, Beaver County, be posted for a maximum load limit of 3 tons. The structure is currently posted for 15 tons.

Attached are two copies of a report prepared by SAI Consulting Engineers for CSX Transportation, Inc. via Engineering District 11-0 entitled "NBIS Bridge Inspection Report".

Sincerely,

Thomas M. Shandler

For: M. G. Patel, P.E.,
Director
Bureau of Design

Attachment

BTL

DOCKETED
JAN 16 1996

DOCUMENT FOLDER

Recycled Paper

NBIS BRIDGE INSPECTION REPORT

M-870123

STRUCTURE BMS NUMBER: 04 7210 0649 8302

BRIDGE NAME: T-649 OVER CSX RAILROAD

LOCATION: T-649 OVER CSX RAILROAD
MARION TOWNSHIP
BEAVER COUNTY

INSPECTION DATE: SEPTEMBER 29, 1995

INSPECTED BY: WILLIAM B. SOSKO, C.B.S.I.

PREPARED FOR: CSX RAILROAD (OWNER)
VIA
COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
DISTRICT 11-0

AGREEMENT NUMBER: 115851

BRIDGE POSTING: *POSTING SHOULD BE REDUCED TO 3 TONS*

TABULATION OF COSTS:

INSPECTION AND REPORT PREPARATION:	$2,590.71
RIGGING:	N/A
RAILROAD PERMITS AND/OR FLAGMEN:	1,295.26
TESTING:	N/A
TRAFFIC CONTROL:	N/A
MEETING WITH OWNER:	N/A
TOTAL COST:	$3,885.97

INSPECTION DATA:

BRIDGE INSPECTION NUMBER:	1062
CATEGORY/TYPE:	J-B2
TOTAL MANHOURS:	43

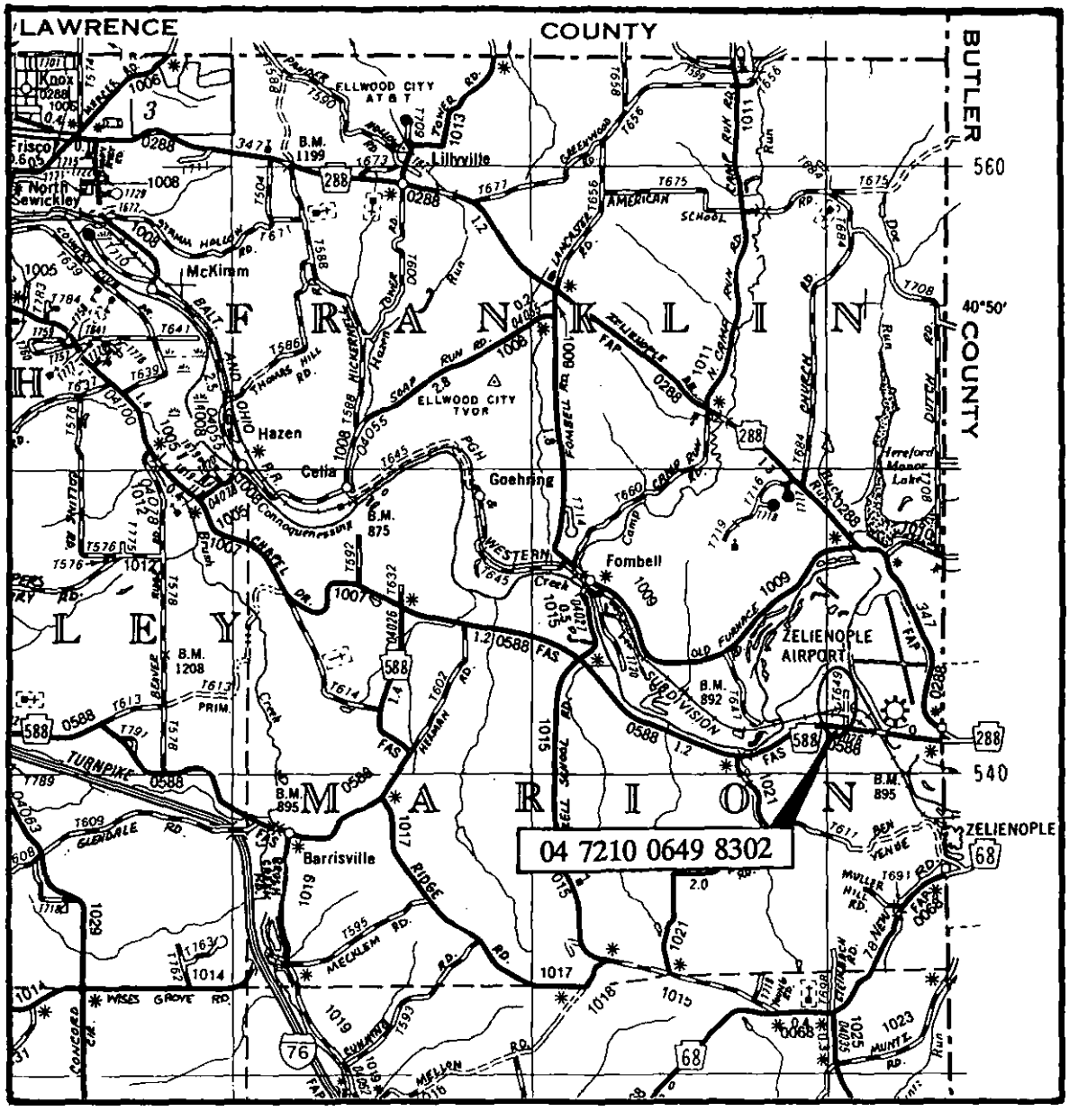
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
DAVID A. MILLER
ENGINEER
030827-E

David A. Miller 12-6-95

SAI CONSULTING ENGINEERS, INC.
300 SIXTH AVENUE
PITTSBURGH, PA 15222

(412) 392-8750

LOCATION MAP



T-649 OVER CSX RAILROAD
MARION TOWNSHIP, BEAVER COUNTY

SOUTH APPROACH

NORTH APPROACH

WEST ELEVATION

EAST ELEVATION

LOAD RATING SUMMARY

The structural analysis of the CSX Bridge resulted in the following ratings with the timber deck being the governing element.

Timber Deck Ratings:

Type of Load	Inventory (Tons)	Operating (Tons)	Analysis Sheet No.
H	2**	3**	6 of 37
HS	4**	6**	6 of 37
ML80	7**	10**	7 of 37

* Rating governed by horizontal shear

Timber Stringer Ratings:

Type of Load	Inventory (Tons)	Operating (Tons)	Analysis Sheet No.
H	13*	18*	21 of 37
HS	25*	33*	21 of 37
ML80	21*	29*	21 of 37

* Rating governed by flexural strength
** Rating governed by shear strength

Timber Stringer S5 of Span 4 is the governing stringer.

LOAD RATING SUMMARY (Continued)

Steel Stringer Ratings (Load Factor):

Type of Load	Inventory (Tons)	Operating (Tons)	Analysis Sheet No.
H	69*	116*	33 of 37
HS	102*	171*	33 of 37
ML80	80*	133*	34 of 37

* Rating governed by flexural strength
** Rating governed by shear strength

For additional information, refer to the structural analysis section of this report.

INTRODUCTION

The CSX Railroad Bridge carries T-649 over the CSX Railroad approximately 500′ from the intersection with S.R. 588. The bridge is located in Marion Township, Beaver County and is owned and maintained by the CSX Railroad.

The structure was built in 1939 and consists of four timber stringer spans and one rolled steel stringer span supported by four timber bents and two timber bent and retaining wall abutments. The bridge roadway consists of a timber plank deck bordered by timber tie curbs and steel angle bridge railings. The overall structure length is 94′-0″ with a bridge roadway width of 12.7′ curb-to-curb and an out-to-out deck width of 13.9′. The bridge is currently posted for a 15-ton single-axle weight restriction.

D-488F (10/93)
PAGE 1

BRIDGE MANAGEMENT SYSTEM
BRIDGE INSPECTION REPORT

BMS Updated by _____ Date _____

Inspection Report for:	STRUCTURE IDENTIFICATION NUMBER	STRUCTURE TYPE
Entire Bridge ☑	A01 [0][4] [7][2][1][0] [0][6][4][9] [8][3][0][2]	Main STEEL STRINGER [1][6][1][0][4]
Main Span(s) only ☐	T-649 over CSX RAILROAD	Approach TIMBER STRINGER [5][9][1][3][6]
Approach Span(s) Only ☐		

INSPECTION BY	CITY ☐ BOROUGH ☐ TOWNSHIP ☑	INSPECTION DATE	TIME STARTED / TIME COMPLETED	WEATHER CONDITIONS
WBS	MARION	9-29-95		SUNNY 70°

E15 APPROACH ROADWAY - COND. RATING [4], Details on Pages 7
Pavement GRAVEL AND DIRT - BROKEN CONCRETE SLABS WERE PLACED (SEE SHT. 4 D488F)
Shoulders GRAVEL AND GRASS MINOR EROSION AT SOUTHWEST CORNER of BRIDGE.
E14 APPR. SLAB Yes ☐ No ☑ Cond.: [N]
C19 RELIEF JOINT Yes ☐ No ☑
Guiderail NO GUIDE RAIL PRESENT - BRIDGE RAILS EXTEND A SHORT DISTANCE ONTO
Drainage NATURAL APPROACH SHOULDERS.

Embank Slope UNPROTECTED SLOPES WITH HEAVY VEGETATION.

BRIDGE SIGNING LOAD LIMIT SIGNS AT BRIDGE, NO CLEARANCE MARKERS OR ADVANCE WARNING.
Leg. & Visibility SOUTHEAST APPROACH SIGN KNOCKED OVER AND DAMAGED.
D15 POSTED LOAD LMTS.: 15 T; Comb.: NONE NR ☐ FR ☐ ANR ☐ AFR ☐
D14 BR LIM 1 TR: NR ☐ FR ☐ ANR ☐ AFR ☐ New wrg surf undr bridge ☐ yes ☐ no
B22 VERT CL SIGNS: Overhead N/A ft. N/A in. NR ☐ FR ☐ ANR ☐ AFR ☐
Under N/A ft. N/A in. NR ☐ FR ☐ ANR ☐ AFR ☐
Clearance Warning (Striped Diagonal) NR RT ☐ FR RT ☐ NR LT ☐ FR LT ☐

E16 WRG. SURFACE [N] N/A (TOPS of TIMBER PLANKS)

E17 DECK - Cond. Rating [6], ~~Details on Pages~~ TIMBER PLANK DECK - THE TIMBER PLANKS ARE NAILED DIRECTLY TO THE TOPS of THE TIMBER STRINGERS (SEE SHT. 4 D488F)
E16A/C19A EXPANSION JOINTS - Number [0], Cond. [N], ~~Details on Pages~~

Median Barrier N/A
Curb-Parapets CURBS CONSIST of 8¼"x4¼" TIMBER TIES WITH AREAS of SPLITS, CHECKS & ROTTING.
Railings STEEL ANGLE RAILS BOLTED TO THE TOPS of THE CURBS IN SPAN 3 AND THE
Sidewalks N/A SIDES of THE FASCIA STRINGERS IN SPANS 1, 2, 4 AND 5. THE
Drains/Scuppers N/A RAILINGS EXHIBIT HEAVY SURFACE RUSTING THROUGHOUT.

E18 SUPERSTRUCTURE - Cond. Rating [7], Details on Pages 6 & 7
Drainage System (Below Deck) N/A
Bearings THE BEARINGS CONSIST OF TIMBER PLATES AND BLOCKS. THE BEARING BLOCK AT S7 SPAN 1 BENT 1 IS NOT SEATED ON THE BENT CAP BEAM. (SEE SHT. 4 D-488F).
Stringers THE TIMBER STRINGERS IN SPANS 1, 2, 4 AND 5 EXHIBIT AREAS of MINOR SPLITTING AND WATER DISCOLORATION BUT NO SIGNIFICANT DETERIORATION WAS NOTED. THE STEEL STRINGERS IN SPAN 3 EXHIBIT AREAS of PAINT PEELING
Girders N/A AND FLAKING WITH HEAVY SURFACE CORROSION. THE TOP EXTERIOR
PORTIONS of THE FASCIA BEAM BOTTOM FLANGES EXHIBIT
SOME MINOR PITTING BUT GENERALLY NO SIGNIFICANT
Floorbeams N/A SECTION LOSS WAS NOTED.

Diaphragms TIMBER END DIAPHRAGMS GENERALLY EXHIBIT NO SIGNIFICANT DETERIORATION.

Trusses N/A

- Portals
- Bracing

E19 PAINT CONDITION 6 5

G09 YEAR PAINTED UNKNOWN

(If Instructed) Dry Film Thickness _____ Mils, Adhesion Class _____; G14 Color _____

Fire Damage NONE

Collision Damage NONE

Inspection Walk N/A

Utility Attachments NONE

E20 SUBSTRUCTURE - Cond. Rating 4, ~~Details on Pages~~

Abutments - Wings THE WINGS CONSIST OF THE STEPPED-OFF PORTIONS OF THE ABUTMENT RETAINING WALLS.

- Bridge Seats NO SIGNIFICANT DETERIORATION NOTED
- Backwalls STACKED TIMBER TIE RETAINING WALLS AGAINST TIMBER BENTS. THE ENDS OF THE TIMBER TIES AT THE EAST AND WEST ELEVATIONS (SEE SHT. 4 D-488F)
- Stems TIMBER BENTS - THE NORTH STEM COLUMNS AND CAP BEAM EXHIBIT SOME MINOR SPLITING BUT NO SIGNIFICANT DETERIORATION (SEE SHT. 4 D-488F)
- Embank-~~Slope-Wall~~ EARTH EMBANKMENTS COVERED WITH SCATTERED VEGETATION AND APPEAR STABLE.
- Footing APPEAR TO BE TIMBER SILLS AND CRIBBING FOUNDATIONS THAT GENERALLY ARE NOT VISIBLE
- Piles N/A
- Scour N/A
- Undermine NONE DETECTED
- Settlement NONE DETECTED

- ~~Piers~~ Bents THE CAP BEAMS TYPICALLY EXHIBIT AREAS OF SPLITTING AND CHECKING. HOWEVER, THE CAP BEAM AT BENT 2 HAS A 5" DIMETER HOLE ROTTED INTO THE
- Caps CENTER OF THE BEAM AT THE EAST ELEVATION. THE HOLE PENETRATES 3'-9± INTO THE CAP BEAM. THE CAP BEAM EXHIBITS SCATTERED SPLITS RANGING ¼" TO ½" WIDE.
- Columns/~~Stems~~ THE COLUMNS AT BENT 2 EXHIBIT VERTICAL SPLITS RANGING ¼" TO ¾" WIDE. THE COLUMNS AT BENT 3 EXHIBIT VERTICAL SPLITS TO ⅜" WIDE.
- Footings THE FOOTINGS APPEAR TO BE TIMBER SILLS ON TIMBER CRIBBING. THE WEST END OF THE TIMBER SILL UNDER COLUMN 1 AT BENT 2 IS HEAVILY
- Piles N/A deteriorated. THE TIMBER IS ROTTED AND HOLLOW TO A DEPTH
- Scour N/A of 5'-0± HORIZONTALLY. COLUMN 1 IS SITUATED 2'-0 FROM THE WEST END OF THE TIE.
- Undermine NONE DETECTED
- Settlement NONE DETECTED

Bridge Seats SEE Caps

TIMBER BENT BRACING CONSISTS OF LATERAL AND LONGITUDINAL TIMBER PLANKS RANGING FROM 2¾"x10" TO 3¾"x7½". THE BOTTOM END OF THE LATERAL BRACING PLANK AT COLUMN 4 BENT 2 IS ROTTED AND BROKEN off.

 STRUCTURE ID 04 12 10 06 49 83 02 INSP. DATE 9-29-95

E21 CHANNEL/CHANNEL PROTECTION - COND. RATING N, Details on Pages _____

Channel Alignment _____

Scour _____

Embank Erosion _____

Chan./Emb. Protection N/A

Debris _____

Vegetation _____

Highwater Mark _____

Streambed Material _____

E22 CULVERTS - Cond. Rating N, Details on Pages _____ Length _____ L.F. _____

Barrel _____

Settlement _____

Headwall N/A

Wings _____

Debris _____

E23 EST. REMAINING LIFE [ ] Comments _____

E24 STRUCTURAL CONDITION - Appraisal Rating 2, Details on Pages _____

HS20 INVENTORY RATING IS 4 TONS — 0-500 ADT & REQUIRES REPLACEMENT.

E25 DECK GEOMETRY - Appraisal Rating 4, ADT: 10 ADTT: _____ C-C: 12.7'

E26 UNDERCLEAR - VERT. & LATERAL - Appraisal Rating 4, MIN. VERT. 20'-4 LAT. 9'-0

E27 WATERWAY ADEQUACY - Appraisal Rating N, _____

E28 APPR. RDWY. ALIGNMENT - Appraisal Rating 3, SUBSTANTIAL SPEED REDUCTION DUE TO VERTICAL CURVE.

E28A TRAFFIC SAFETY FEATURES

Bridge Railing 3 Transitions 2 Appr. Guiderail 2 Appr. Guiderail Transition 2

Comments _____

E29 BRIDGE POST 0 ML80 OPERATING RATING - 10 TONS

Recalculate IR/OR: Yes ☑ No ☐ Calculation Attached: Yes ☑ No ☐

E30 IR 102 204 807 E31 OR 103 206 810

E29A W06 SCOUR CRITICAL RATING N Based on: ☐ Observed Scour ☐ Scour Calculation

E01 NEXT INSP. FREQ. 12 E03 EQUIP. NEXT INSP. -

E04 SPEC. INSP. TYPE - E05 BY DATE - - - -

Remarks _____

APPROACH ROADWAY (CONTINUED) - IN THE WHEEL PATHS AT BOTH ENDS OF THE BRIDGE TO COMPENSATE FOR DEPRESSIONS AT THE TRANSITIONS, THE APPROACH ROADWAYS ARE DEPRESSED FULL WIDTH ALONG BOTH ENDS OF THE BRIDGE. THE SOUTH ROADWAY IS DEPRESSED UP TO 2" WHILE THE NORTH ROADWAY IS DEPRESSED UP TO 2½".

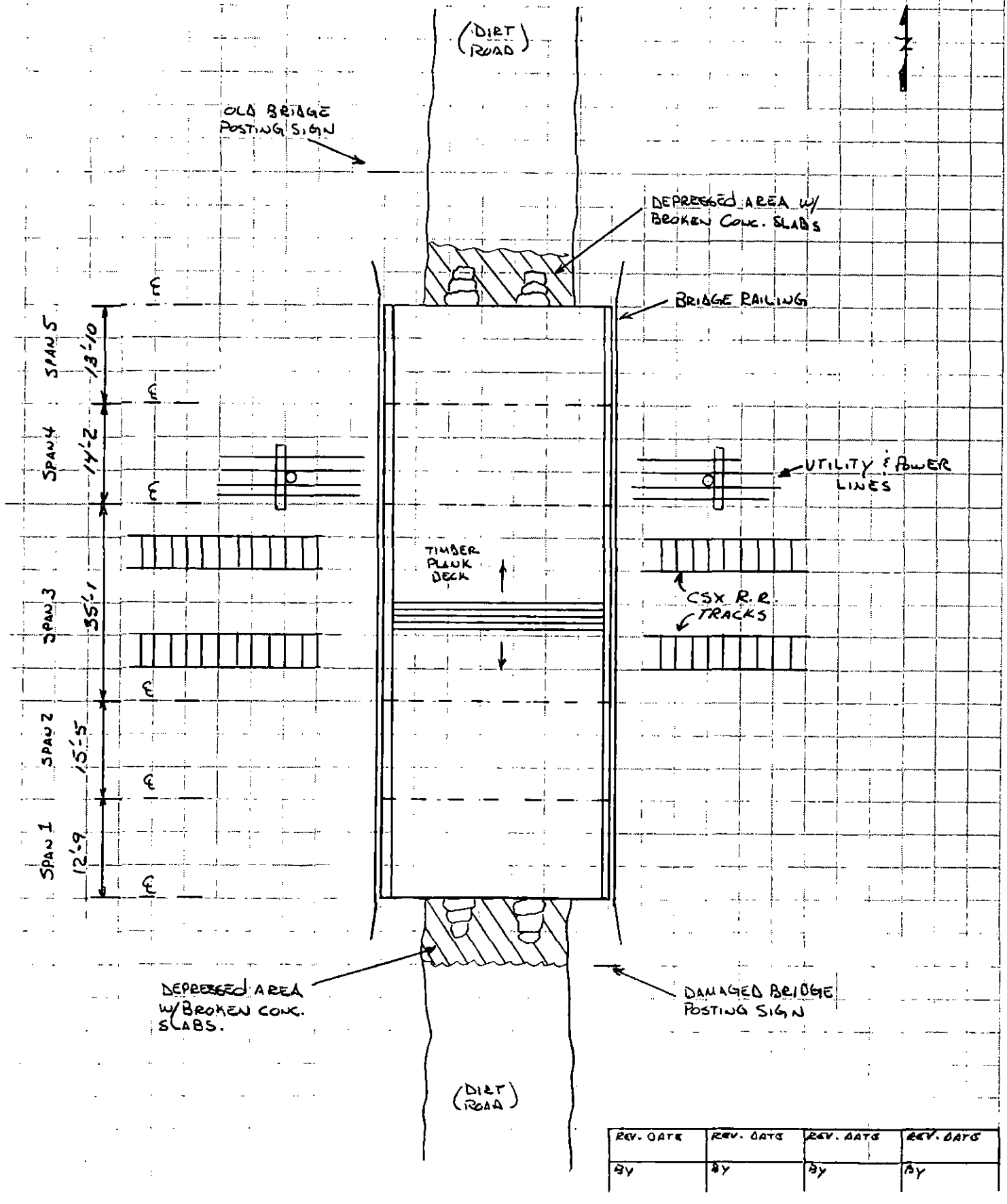
DECK (CONTINUED) - IN SPANS 1, 2, 4 AND 5, THE DECK PLANKS IN SPAN 3 ARE NAILED TO A 2¾" x 10" LONGITUDINAL NAILING PLANK THAT IS IN TURN BOLTED TO THE TOPS OF THE STEEL STRINGER FLANGES. THE DECK PLANKS AT BENTS 2 & 3, AT THE APEX OF THE VERTICAL CURVES, EXHIBIT NUMEROUS SCRAPE MARKS AS A RESULT OF VEHICLES BOTTOMING-OUT. THE PLANKS APPEAR TO BE TIGHT THROUGHOUT THE BRIDGE AND EXHIBIT AREAS OF SPLITTING AND WEAR BUT GENERALLY ARE IN SATISFACTORY CONDITION. THE PLANKS VARY 9" TO 9½" WIDE x 2¾" THICK.

BEARINGS (CONTINUED) - THE SHIM PLATE BENEATH THE BLOCK HAS COMPLETELY ROTTED AWAY RESULTING IN A 1'8" GAP BETWEEN THE BEARING BLOCK AND THE CAP BEAM. THE BEARING BLOCK AT S5 SPAN 2 BENT 2 HAS ROTTED AND SPLIT RESULTING IN A 2" x FULL HEIGHT SLAB SEPARATING FROM THE BLOCK ALONG THE SOUTH FACE OF THE BEARING. THE BEARING BLOCK AT S1 SPAN 4 BENT 3 HAS SPLIT THROUGH ALONG THE SAME LINE WITH THE ANCHOR BOLT SPLITTING THE BLOCK INTO TWO PIECES.

BACKWALLS (CONTINUED) - EXHIBIT HEAVY ROTTED DETERIORATION AND EXPOSED AND DETERIORATED CONNECTION BOLTS AND SPIKES. AT THE NORTH BACKWALL, THE ENDS OF THE TIES HAVE ROTTED AND BECOME HOLLOW TO A DEPTH OF 1'-8 ±. SIMILAR CONDITIONS ARE PRESENT AT THE SOUTH BACKWALL HOWEVER, THE BEAMS HAVE HOLLOWED TO A DEPTH OF 3'-0 ±. THE ROTTING CONDITION IS WORST AT THE TOP TIE AND DECREASES IN SEVERITY DOWNWARD. THE TIMBER TIE BACKS IN BOTH BACKWALLS ARE SEVERELY DETERIORATED. THE TIE BACKS ARE ROTTED AND HOLLOW TO A DEPTH OF 4'-0 ±.

STEMS (CONTINUED) - WAS NOTED. THE SOUTH STEM COLUMNS AND CAP BEAM EXHIBIT SIMILAR SPLITTING; HOWEVER, THE TOP OF COLUMN 2 HAS A 7" WIDE x FULL DEPTH (11½") HOLE ROTTED THROUGH THE TIMBER.

PLAN VIEW



REV. DATE	REV. DATE	REV. DATE	REV. DATE
BY	BY	BY	BY

SAI HIGHWAYS • BRIDGES • CONSTRUCTION MANAGEMENT
CONSULTING ENGINEERS, Inc. Pittsburgh, Pennsylvania

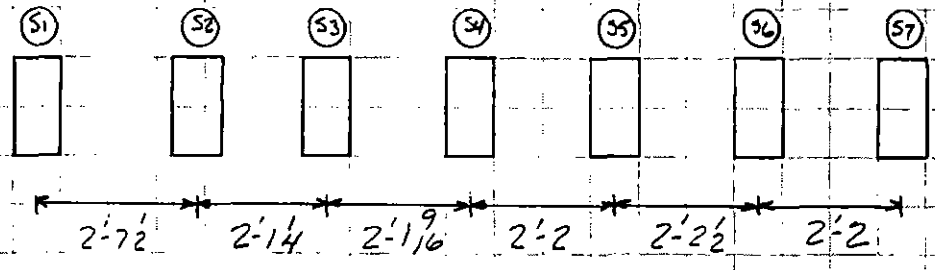
INDEX NO. 6
SHEET NO. 2 OF 3

PROJECT BRIDGE No. 1062 COMP. BY WBS DATE 9-29-95

BMS No. 047210 0649 8302 PROPOSAL OR JOB NO 9501 CHK'D BY _____ DATE _____

CROSS SECTIONS

SPAN #2



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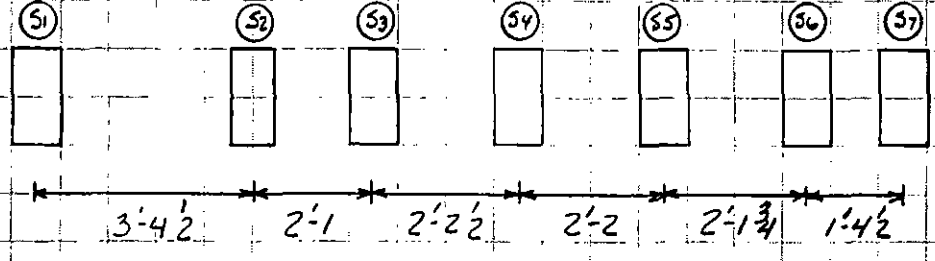
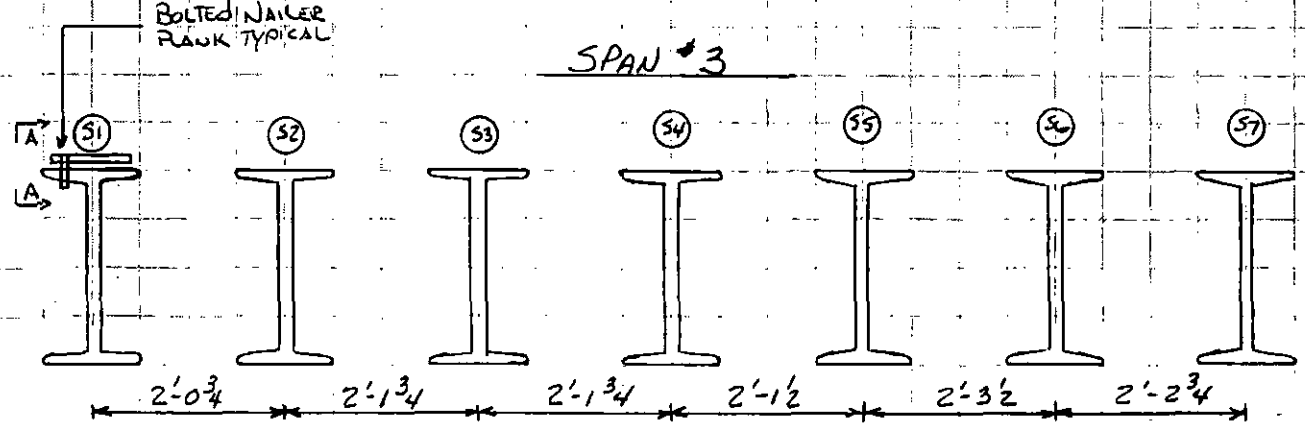
REV. DATE	BY

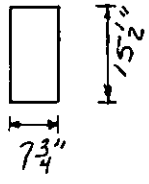
SPAN #2



SPAN #3



SPAN #1 & #2 =



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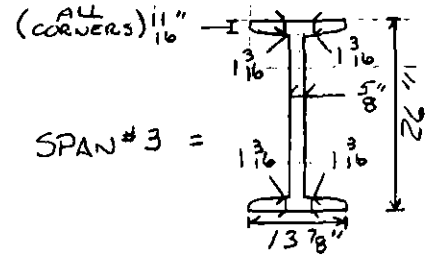
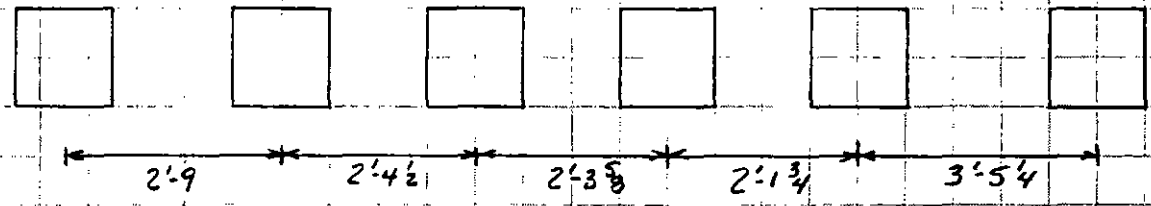
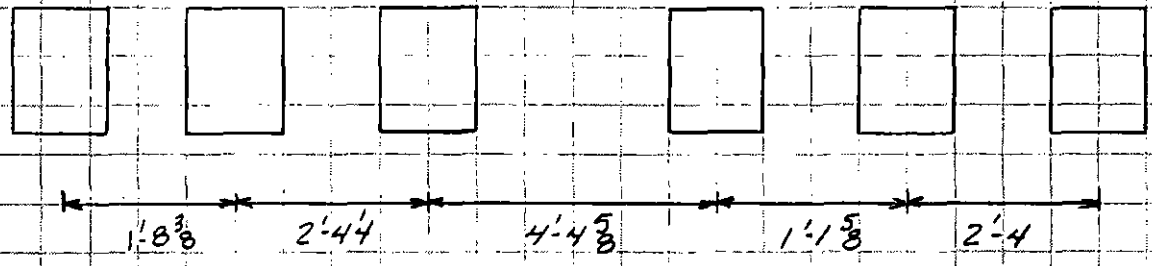


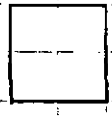
CROSS SECTIONS

SPAN #4



SPAN #5

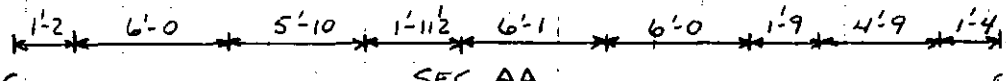


SPAN #4 = 

SPAN #5 = 

(A) DECK PLANKS = 2¾" x 9" TO 9½"
(B) CURB BLOCK = 8¼" x 4¼"
(C) RAILING ANGLES = 3" x 2½" x ¼"
(D) NAILER PLANK = 2¾" x 10"

BRACING MEMBERS FOR BENTS = 2¾" x 10" & 3¾" x 7½" BENT COLUMNS = 11¾" x 12¾" & 12" x 12"



℄ BENT 2 — SEC. AA — ℄ BENT 3

APPROX. NAILER PLATE BOLT SPACINGS
SPAN 3

REV. DATE	REV. DATE	REV. DATE	REV. DATE
BY	BY	BY	BY

INSPECTION RESULTS

The field inspection revealed the following deficiencies (see Inspection Forms D-488F for a complete report):

Critical

- None.

Immediate Attention

- None.

General

- The approach roadways are depressed 2″ to 2½″ at the bridge transitions.
- No guide rail is present at the bridge site.
- Hazard clearance markers, load posting, advance warning signs, and one-lane bridge signs are damaged or missing at the bridge site.
- The timber deck planks exhibit areas of minor splitting. The deck planks at Bent No. 2 and Bent No. 3 exhibit vehicular scrapes.
- The timber curbs exhibit areas of splits, checks, and rotting.
- The steel angle bridge railings are heavily rusted throughout.
- The bearings consist of timber planks and timber blocks. A few of the bearings exhibit rotting and wide splitting. The timber shim plate under the block bearing at S1 in Span 1 at Bent No. 1 has completely rotted away.
- The timber stringers in Spans 1, 2, 4, and 5 exhibit areas of minor splitting and water discoloration.
- The steel stringers in Span 3 exhibit areas of paint peeling and flaking with heavy surface rusting.
- The stacked timber tie backwalls at both abutments exhibit areas of heavy rotted deterioration at the east and west end elevations (wingwalls) and in the tieback members.
- Timber Column No. 2 at the south abutment has a large rotted hole adjacent to the cap beam.

INSPECTION RESULTS (Continued)

- The timber bent caps exhibit areas of splitting and checking. A large hole is rotted into the east end of the cap beam at Bent No. 2.

- The timber bent columns exhibit areas of vertical splitting ranging from 1/4″ to 3/4″ in width.

- The west end 5′-0″ ± of the sill timber at Bent No. 2 is heavily rotted and deteriorated.

Fracture Critical Members

- None.

Traffic Control/Inspection Vehicle

- None.

SETTLEMENT OF SOUTH APPROACH ROADWAY

EROSION OF SOUTHWEST ROADWAY EMBANKMENT

DAMAGED BRIDGE POSTING SIGN AT SOUTH APPROACH

SETTLEMENT OF NORTH APPROACH ROADWAY

VEHICULAR SCRAPE HACKS IN TIMBER DECKING ABOVE BENT NO. 2

GENERAL VIEW OF TIMBER STRINGER SPAN

GENERAL VIEW OF STEEL STRINGER SPAN 3 AND TIMBER BENT NOS. 2 AND 3

SPLITS AND CHECKS IN COLUMNS OF BENT NO. 2

DECAYED AND SPLIT SILL OF BENT NO. 2

DECAY AND ROT IN BENT NO. 2 CAP BEAM

NOTE: 5″-DIAMETER X 3′-9″-LONG HOLE IN END OF CAP BEAM

SPLITS AND CHECKS IN COLUMNS OF BENT NO. 3

GENERAL VIEW OF SOUTH ABUTMENT

SPLITS, CHECKS, AND HOLE ROTTED IN COLUMN OF SOUTH ABUTMENT

GENERAL VIEW OF NORTH ABUTMENT

TYPICAL ROTTED TIE-BACK TIMBER AT NORTH ABUTMENT

ROTTED RETAINING WALL TIMBERS AT NORTH ABUTMENT - EAST SIDE

RECOMMENDATIONS

Immediate Repairs

- A letter transmitted November 7, 1995 to the attention of Mr. Carl Medors of CSX Transportation from SAI Consulting Engineers, Inc. recommended that the bridge be immediately posted for three (3) tons.

Improvement Needs

Maintenance Items

- Regrade and raise the approach roadway transitions.
- Install an approach guide rail system continuous across the bridge in accordance with current PaDOT standards.
- Install proper bridge signing at the site.
- Clean and paint the steel stringers.

Rehabilitation Items

- Replace the rotted and deteriorated bearing blocks and shim plates.
- Replace the heavily deteriorated section of footing timber under Column No. 1 at Bent No. 2.

Replacement Items

- None.

Load Posting

- In place at 15 tons.
- Recommend structure be posted for three (3) tons.

Signs Needed

- Hazard clearance markers.
- Weight limit.
- Advance weight limit.

RECOMMENDATIONS (Continued)

- One-lane bridge.

Special Investigation Needs

- During future inspections, monitor the north and south backwall timbers for additional deterioration and possible problems.

Estimated Maintenance / Repair Activity Costs

Priority Code:

0 - Prompt action required.
1 - High Priority, as soon as work can be scheduled.
2 - Priority, review work plan, adjust schedule if needed.
3 - Add to scheduled work.
4 - Routine Structural, can be delayed until funds are available
5 - Routine Non- structural, can be delayed until programmed.

Bridge Inspection No. 1062

Inspection Date : September 29, 1995

Description of Activity	Item No.	Location	Unit	Quan.	Unit Cost	Total Cost	Priority
Approach Roadway:							
Raise Pavement	RDPAVMT	L N R L F R	S.Y.	10	$40	$400	3
Repair / Replace Pavement Relief Joint	RDRLFJT	L N R L F R	S.Y.		$250	$0	
Repair / Reconstruct Shoulders	RDSHLDR	L N R L F R	S.Y.		$60	$0	
Improve Drainage - Off Bridge	RDDRAIN	L N R L F R	Ea.		$2,000	$0	
Connect Guide Rail to Bridge	RDGDERL	L N R L F R	Ea.	4	$1,000	$4,000	1
Replace Load Limit & One Lane Br. Sign	RDLDSGN	N R L F	Ea.	6	$200	$1,200	0
Replace Clearance Signs	RDCLSGN	L N R L F R	Ea.	4	$200	$800	1
Cut Brush to Clear Signs	RDBRUSH	L N R L F R	Ea.		$150	$0	
Replace Approach Slab	A744201	L N R L F R	S.Y.		$150	$0	
Clean & Flush:							
Deck	A743101	—	E.B.		$400	$0	
Scupper / Downspouting	B743101	1 2 3 4 5 0	E.B.		$275	$0	
Bearing / Bearing Seat	C743102	1 2 3 4 5 0	E.B.		$300	$0	
Horizontal Steel Surfaces	D743102	1 2 3 4 5 0	E.B.		$200	$0	
Deck:							
Repair / Replace Bitum. Deck W. Surfac	BITWRGS	1 2 3 4 5 0	S.Y.		$25	$0	
Repair / Replace Timber Deck	B744301	1 2 3 4 5 0	S.Y.		$100	$0	
Repair / Replace Open Steel Grid	C744302	1 2 3 4 5 0	S.Y.		$400	$0	
Repair Concrete Deck	D744303	1 2 3 4 5 0	S.Y.		$200	$0	
Repair / Replace Concrete Sidewalk	E744303	1 2 3 4 5 0	S.Y.		$120	$0	
Repair / Replace Concrete Curb / Parape	F744303	1 2 3 4 5 0	S.Y.		$300	$0	
Deck Joints:							
Reseal	A743301	N 1 2 3 0 F	L.F.		$10	$0	
Repair / Reseal	A744101	N 1 2 3 0 F	L.F.		$20	$0	
Repair / Rehab. Compression Seal	B744102	N 1 2 3 0 F	L.F.		$28	$0	
Repair / Rehab. Modular Dam	C744102	N 1 2 3 0 F	L.F.		$150	$0	
Repair / Rehab. Steel Dam	D744102	N 1 2 3 0 F	L.F.		$55	$0	
Repair / Rehab. Other Types of Dams	E744102	N 1 2 3 0 F	L.F.		$50	$0	
Railing:							
Repair / Replace Bridge Parapet	RLGBRPR	N 1 2 3 0 F	L.F.		$97	$0	
Repair / Replace Structure - Mounted	RLGSTRM	N 1 2 3 0 F	L.F.	188	$93	$17,484	1
Repair / Replace Pedestrian	RLGPEDN	N 1 2 3 0 F	L.F.		$63	$0	
Repair / Replace Median Barrier	RLGMEDB	1 2 3 4 5 0	L.F.		$51	$0	

Estimated Maintenance / Repair Activity Costs

Bridge Inspection No. 1062

Description of Activity	Item No.	Location	Unit	Quan.	Unit Cost	Total Cost	Priority
Deck Drain:							
Replace Scupper Grate	DRNGRAT	123450	Ea.		$200	$0	
Install / Drain Scupper	B744401	123450	Ea.		$600	$0	
Repair / Replace Downspouting	C744402	N123F0	Ea.		$800	$0	
Bearings:							
Lubricate	A74305	N123F0			$250	$0	
Replace Steel	B744501	N123F0	Ea.		$1,650	$0	
Reset Expansion	C744502	N123F0	Ea.		$900	$0	
Reconstruct Pedestal / Seat	D744503	N123F0	Ea.		$2,000	$0	
Timber:							
Repair / Replace Stringer	A744601	123450	Ea.		$660	$0	
Replace Timber Bearing Blocks	B744601	1245	Ea.	15	$200	$3,000	3
Steel:							
Repair / Replace Stringer	A744602	123450	Ea.		$8,000	$0	
Repair / Replace Floorbeam	B744602	123450	Ea.		$9,750	$0	
Repair Girder	C744602	123450	Ea.		$9,750	$0	
Repair / Replace Diaph. / Lateral Bracing	D744602	123450	Ea.		$1,000	$0	
Reinforced Concrete / Concrete:							
Repair / Replace Stringer	A744603	123450	Ea.		$7,000	$0	
Repair / Replace Diaphragm	B744603	123450	Ea.		$2,100	$0	
Repair / Replace Other Members	C744603	123450	Ea.		$7,000	$0	
Truss:							
Strengthen / Repair / Replace Members	A744701	123450	Ea.		$5,000	$0	
Modify Portal	B744701	123450	Ea.		$2,000	$0	
Tighten / Flame shorten Members	C744702	123450	Ea.		$350	$0	
Painting:							
Superstructure - Spot	A743201	123450	E.B.		$3,500	$0	
Substructure - Spot	B743201	N1230F	E.B.		$750	$0	
Superstructure - Full	C743201	3	S.F.	2000	$10	$20,000	5
Substructure - Full	D743201	N1230F	E.B.		$1,500	$0	

Estimated Maintenance / Repair Activity Costs

Bridge Inspection No. 1062

Description of Activity	Item No.	Location	Unit	Quan.	Unit Cost	Total Cost	Priority
Abutment - Wing - Pier, etc. :							
Repair / Replace Backwall	A744801	L N R L F R	C.Y.		$0	$0	
Repair Abutments	B744802	L N R L F R	C.Y.		$1,200	$0	
Repair / Replace Wingwall	C744802	L N R L F R	C.Y.		$1,200	$0	
Repair Bents	D744802	2	Ea.	1	$3,000	$3,000	1
Underpin Footing	E744803	N 1 2 3 0 F	C.Y.		$600	$0	
Point Masonry	F744804	N 1 2 3 0 F	L.F.		$10	$0	
Repair / Replace Abutment Slopewall	A745101	L N R L F R	S.Y.		$50	$0	
Construct New Abutment Slopewall	B745102	L N R L F R	C.Y.		$50	$0	
Pile Repair	A745901	N 1 2 3 0 F	Ea.		$1,200	$0	
Erosion Control:							
Repair / Construct Stream Bed Paving	A745301	UP UN DN	C.Y.		$300	$0	
Rock Protection	B745301	UP UN DN	C.Y.		$30	$0	
Backfill Scour Hole	C745301	UP UN DN	C.Y.		$40	$0	
Repair / Construct Stream Deflector	D745302	UP UN DN	C.Y.		$52	$0	
Remove Vegetation / Debris	ECREMVG	UP UN DN	C.Y.		$13	$0	
Remove Deposits	ECREMDP	UP UN DN	C.Y.		$11	$0	
Culvert:							
Repair / Replace Headwall	A745201	IN OUT	S.Y.		$360	$0	
Repair / Replace Wingwall	A745201	IN OUT	S.Y.		$360	$0	
Repair / Replace Apron / Cut-off Wall	B745202	IN OUT	S.Y.		$360	$0	
Repair Barrel	C745203	-------	S.Y.		$500	$0	

Total $49,884

LOCATION AND UNIT LEGEND		
N	---	Near
F	---	Far
1,2,3,ETC	---	Span or Pier Number
O	---	Other
LNR	---	Near Left or Right
LFR	---	Far Left or Right
UP	---	Upstream
UN	---	Under
DN	---	Downstream
IN	---	Inlet
OUT	---	Outlet
E.B.	---	Each Bridge (Site)

BMS GENERAL DATA
* = MIN. INFORMATION REQUIRED BY FHWA

BRIDGE INSPECTION No. 1062

	* CO	SR	SEG	OFF	SD	CD	LD	* BORDER ST	* %DK	* BORDER	* BRDG SR
OLD SR ID	04	7210	0649	S302							
NEW SR ID											

* AGCY SUBM	* LOCATION	* LATITUDE DEG	MIN	* LONGITUDE DEG	MIN	* CTY/BOR CODE	* FIPS CODE	* BNDY CODE	PSU-PUC NUMBER
P02	PRK302 W OLD FURNACE ST	40	476	80	101	210		N	M-870123

DESIGN NUMBER	DRAWING NUMBER	ADD DRAW	SHOP DRAWINGS NUMBER	NUMBER	NUMBER	NUMBER	* YEAR BUILT	* LAST TYPE	* RECON YEAR	FED FND	DESN EXCN
		0					1939	000	0000	0	

* OWNER/PRINCIPAL CUSTODIAN AND	CODE	LEG ACT NUMBER	* MAINTENANCE RESPONSIBILITY	* MAINTENANCE CODE 1	2	3	4	5	* TOLL
CSX RAILROAD	27		CSX RAILROAD	271					3

* TYPE SERV	TEMP STRC	* CRIT FAC	* APPR PAV WDTH	* APPR RDWY WDTH	* BRDG RDWY WDTH	FLRD	* BRDG DECK WDTH	* SIDEWALK TYPE & WIDTH LEFT		RIGHT		* DETOUR LENGTH	CURVE HORZ	VERT	SCH BUS	PUB TRAN
12			010	011	012.0	0	013.2	1	00.0	1	00.0	99	0	0	0	0
			008	010	012.7		013.9		00.7		00.7					

BMS FEATURES INTERSECTED DATA

SR ID: 047210064983O2 * = MIN. INFORMATION REQUIRED BY FHWA

REF	STATE SR	ROUTE ID SEG	SEG	* FEATURE DESCRIPTION	* ON OR UNDER	* TRAF ROUTE	* DIR	* RTE SGN	* DESN SERV	* SKEW ANGLE	* MEDIAN
A				W OLD FURNAC	1	000	0	5	1	90	0 00
B				CSX RR 355-A	2	NNN	N	N	N	90	N 00

NO LANE	NO ELECT TRACKS	NAME STAT	AAR NUMBER	RAILROAD MILEPOST	* ADM JUR	* HWY SYS	NHS	* FUNC CLAS	STATE NET	NAT NET	MIN LEFT	* LAT CL RIGHT
01	00				9	11	0	09	0	0	00.0	00.0
02	00	1 02	145802C	0035.4	N	NN	0	NN	0	0		08.0 09.0

TTL LEFT	HORZ CL RIGHT	MIN VERT CL LEFT FT	IN	RIGHT FT	IN	VRT CL >10' LEFT FT	IN	RIGHT FT	IN	* DEF HWY	* ADT	* ADT YEAR	ADTT	ADTT YEAR	ADTT %	VT SGN
	10.0 12.7			99 20	99 04			99 20	99 04	0 0	000010	1994 1995			05 L00	0

* FHWA FEATURES INTERSECTED	* FHWA FACILITY CARRIED	* NO LANES
CSX RAILROAD	W-OLD FURNACE RD	01 00

BMS STRUCTURE DATA

SR ID: 042100649302 * = MIN. INFORMATION REQUIRED BY FHWA

HIST SIGN: S COV BRDG: N EST CUM TK FAT LIFE: 000000 NO DK JNT: 00

			* STRUCTURE TYPE																		
D	S	* MAIN		* APPROACH		CULVT	STRUCT	NI	M	SP	G	STEEL TYPES				CUM TK	DATE	DK
L	L	FHWA	DEPT	FHWA	DEPT	LNGTH	LENGTH	LT	LENG		M	1	2	3	4	TRAF	EST	TP
0		302	16104	720	50804	00000	00097	Y	0087									02
					59136		94		35									

SPAN		* SPANS, NUMBER AND LENGTH (MAIN & APPROACH)										FR	CR	CR RAT	* WS	* WS
TYPE	TTL	NO	LENG	NO	LENG	NO	LENG	NO	LENG	NO	LENG	GR	NO	FACTOR	TYP	THCK
MAIN	01	01	0037	00	0000	00	0000	00	0000	00	0000	6		4883	NNN	NN
		00	0000	00	0000	00	0000	00	0000	00	0000				700	
APPR	02	02	0030	00	0000	00	0000	00	0000	00	0000	9		9993	700	NN
	04	00	0000	00	0000	00	0000	00	0000	00	0000					
		01	0013	01	0015	02	0014									

REL		EXP JT TYPES				BEARING TYPE FLD LT PROB								STRANDS TENSION						
JT	FRM RBR	1	2	3	4	1	2	3	4	SPL	SUPER	F'CI	F'C	1	2	3	4	1	2	3

	VAC	V LOC	V TYPE					CNT	FLD	ABT	FND	PIER TYPE				PIER FD SP				L	PR
DRAP	PROC	1	2	1	2	3	4	UTIL	L	L	SPL	N	F	N	F	1	2	3	4	CAP	TIE	SUB
												99		PP		13			P			

BMS UTIL, HYDRO & POSTING DATA

SR ID: 047210064983O2 * = MIN. INFORMATION REQUIRED BY FHWA

REF	UTILITY OCCUPANCIES NAME OF COMPANY AND ADDRESS	LICENSE NUMBER	DATE ISSUED	WGHT KIPS

HYDROLOGY AND NAVIGATION

STREAM NAME	DRAIN AREA	VERT CLEAR	DESIGN FLOOD MAGNIT	DESIGN FLOOD FRQ	DESIGN FLOOD ELEV	DESIGN FLOOD VEL	MAX ELEV	W.S. YEAR	FISH	* Y/N	* VERT CL	* LIFT VERT
										O	000	

POSTING DATA

* HORZ CLR	NAV PRT	SCR DPTH	* C/P A	SPC LMT	WT LT	COMB LT	1ST DT POSTED	LAST DT POSTED	DT CLOSE ALL TRAF	REASON	FLD COND	SPEC COND	IMP ACT
0000			P	0	15		043086	043086		B			

02/13/9[redacted] P02 COMMONWEALTH OF PENNSYLVANIA PAGE NO: 5
PROGRAM ID: P4575130 DEPARTMENT OF TRANSPORTATION REPORT ID: BMSIS180
SCREEN: "AE" BRIDGE MANAGEMENT SYSTEM

BMS INSPECTION DATA

SR ID: 047210064983O2 * = MIN. INFORMATION REQUIRED BY FHWA

NBIS FQ: 12 INSP BY: 1 FLINS: EQUP: SP INSP: BY DATE: HVPL: Y

* DATE INSP	INSP TP	INSP BY	INSP MAN-HOUR ENG	INSP MAN-HOUR RIG	INSP MAN-HOUR OFF	CRAN HR	INSPECTION COST ENG	INSPECTION COST RIG	INSPECTION COST OFFICE	NAME CONSULTANT	HIRED BY
092995	2	8	0016		027.0		$2591.	1295		$ 1062 SAI J B2	1
062194	2	8	0011		011.0		0941			$ 4040 WIDMER J B1	1
100689	2	8					0606			$ MACKIN ENGR CO	1
102688	2	8					2003			$ MACKIN ENGR CO	1

* APPR SLAB	* APPR RDWY	DK WS	* DECK	* SUP STR	* PAINT	* SUB STR	* CHAN	* CUL	* REM LIFE	* STR CON	* DK GM	* UN CL	* WAT WAY	* APR ALGN	* SAFE FEAT	* BRDG POST	* SCR CR
✓	✓	✓	6	✓	65	4	✓	✓		2	✓	4	✓	3	✓✓✓✓	✓	✓
N	4	N	(7)	7	(76)	(6)	N	N	23	(5)	4	(6)	N	(4)	3222	0	N
N	4	N	7	7	76	7	N	N	26	5	4	6	N	4	3222	0	
N	4	N	7	7	99	7	N	N	26	5	4	6	N	4		2	

* INV RATING LOADS 1	2	3	4	5	* OPR RATING LOADS 1	2	3	4	5	RATE METH	TYPE MEM	FAT CAT	LOAD TYPE	STRESS RANGE	AASHTO SPECS	AASHTO MANUAL
102	204	807			103	206	810			✓		✓			91	✓
(110)	(217)	(812)			(115)	(223)	(818)			1S	5	N			(89)	83
110	217	812			115	224	818			1						
110	217	812			115	224	818									

BMS PROPOSED IMPROVEMENTS

SR ID: 047210064983O2 * = MIN. INFORMATION REQUIRED BY FHWA

* YR IMPR COST EST	* TYPE WORK	* TYPE SERV	* IMPROV LGTH STRUC + RDWY	STRUCT IMPR LGTH	BRDG WDTH	* RDWY WDTH	* DESIGN LOAD	* NO LANES
1990	001	1	000150	000097	013.2	012.0	5	02

* FUTURE ADT	* YEAR ADT	* ADJ RDWY YEAR	* IMPR TYPE
000010	2012	1994 (1995)	1

ESTIMATED COSTS FOR PROPOSED IMPROVEMENTS IN THOUSANDS

SPAN TYPE	TYPE WORK	* DECK	OVRD	* SUPSTR	OVRD	* SUBSTR	OVRD	* SPAN TOTAL
MAIN	001	00000		00000		00013		000013
APPROACH								

* PREL ENG	OVRD	CONST ENG	OVRD	APPR RDWY	OVRD	* DEMO	OVRD	* OTHER	OVRD
00006		00004		00027		00000		00004	

TOTAL TYPE WORK COST: 000054 REV IND: TOTAL REPLACE COST: 000288 OVRD:

BMS REPAIR & PAINTING

SR ID: 047210064983O2

REPAIR DATA

REF	YEAR	DRAWING NUMBER	TYPE WORK	REPAIR COST	PGM	REPAIR DESCRIPTION

PAINTING DATA

REF	YEAR	TONS STEEL	EST AREA SURFACE	NUMBER COATS	GALLONS PAINT	FIN COL NUMBER	TYPE CLEAN	PAINT TYP	PAINT EXT	PAINT THICK	PAINT COST

BMS PROPOSED MAINTENANCE ACTIVITIES

SR ID: 04721006498302

FHWA FEATURE INTERSECTED: CSX RAILROAD

INSPECTION DATE	MAINT DEF PTS	CO RANK	MAJ IMPROV PROJ STATUS
092995	031.0	0314	

ACTIVITY ID	ACTIVITY DESC	LOC	UNIT	EST QTY	EST COST	OV RD PR	PRG D/C	INSP DATE	OV RD	MTE CD	PB YR
RDPAVMT	RAISE ROADWAY	LNR LFR	SY	00010		3		092995			
RDGDERL	APPROACH RAIL	LNR LFR	EA	00001		2		092995			
RLGBRPR	REPLACE RAILING	N1230F	L.F.	00188		4		092995			
RDLDSGN	LOAD LIMIT SIGNS	LNRLFR	EA	00002		0		092995			
RDCLSGN	INSTALL SIGNS	LNRLFR	EA	00004		1		092995			
A743201	PAINT	12345O	EB	00001		4		092995			

For revisions to Screen "AH,"
see estimated maintenance/repair
activity costs chart included in this report.

BMS FRACTURE CRITICAL DATA

SR ID: 047210064980302

INSP DATE: MAIN GROUP: 6 CRF: 4883 TOTAL CRF: 23
INSP FREQ: APPR GROUP: 9 CRF: 9993 TOTAL CRF: 30

SPAN NO	FRACT CRITICAL MEMBER	FRACT CRITICAL DETAIL	FRAC CATG	CONDITION

BMS SCOUR/UNDERWATER INSPECTION DATA

SR ID: 047210064983O2

INS DT: INS TP: UW INS DT: UW INS TP: FQ(R): FQ(I):
STR BED MATL: SCR CR:

NO UNIT: INSP COST: NAME CONSUL: HIRED BY:

SUB UNIT	F T	W D	O R	U I	OBS DPH	CAL 100	CAL 500	C M	INSPECTION FINDINGS	P C

Structure BMS Number: 04 7210 0649 8302
Bridge Name: T-649 Over CSX Railroad
Inspection Date: September 29, 1995
Bridge Inspection No.: 1062

STRUCTURAL ANALYSIS

BRIDGE INSPECTION
DISTRICT 11-0
LOAD FACTOR ANALYSIS AND STRUCTURAL RATING SUMMARY

BMS I.D. # 04 7210 0649 8302

STANDARD SPEC. FOR HWY BRIDGES: AASHTO "1991" INTERIMS.

I-649 OVER CSX RAILROAD (SAI BR. INSP. No. 1062)

	Inventory Rating Factor (Tons)	Operating Rating Factor (Tons)
H-20	0.14(2.75T) / 0.7(13.9T) *	0.18(3.66T) / 0.94(18.8T) *
HS-20	0.14(4.94T) / 0.7(25.0T)	0.18(6.59T) / 0.94(33.9T)
ML-80	0.21(7.98T) / 0.58(21.7T)	0.28(10.63T) / 0.78(29.5T)

Structural components that govern ratings: TIMBER PLANK DECK - SHEAR

* NEXT GOVERNING RATING: SPAN 4 - STRINGER S5 - MOMENT

Prepared by: DCT 10 / 25 / 95

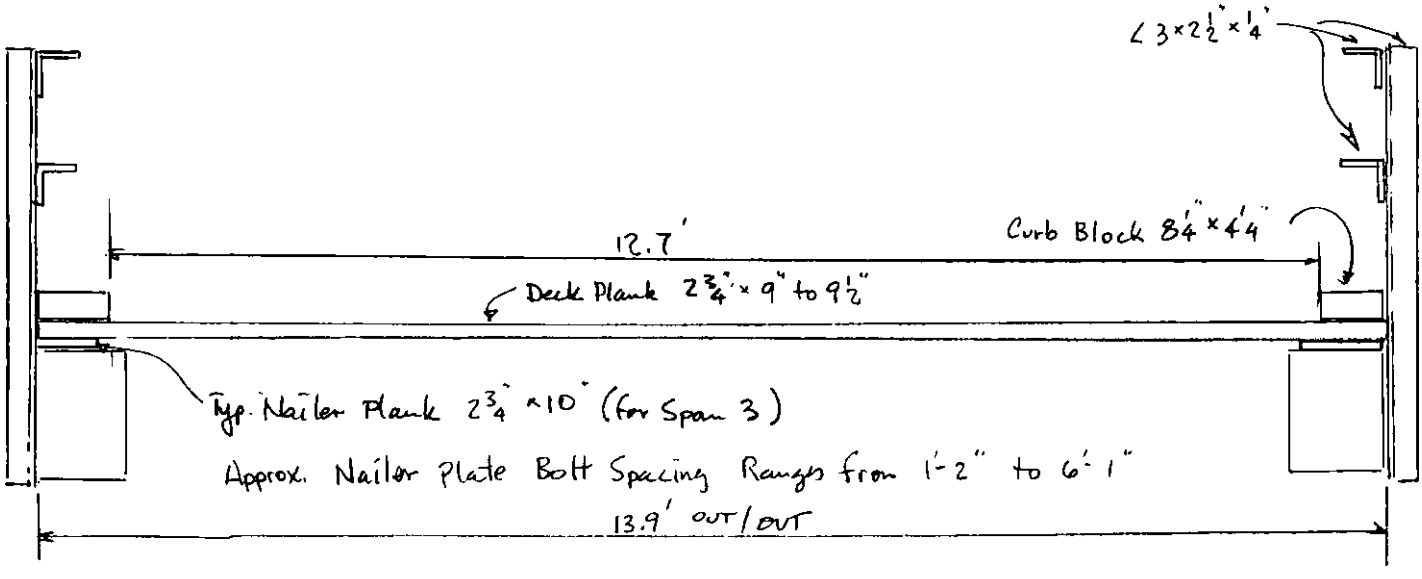
Checked by: AA 10 / 25 / 95

WOODEN SPANS

SPAN	SPAN LENGTH	BEAM SIZE	I	Beam Spacing
1	12'-9"	15½ Dp × 7¾"	2405 in⁴	Ranges from 2'-1¼" to 2'-7½"
2	15'-5"	" "	"	" " 1'-4½" to 3'-4½"
4	14'-2"	11½" × 11½"	1457.5 in⁴	" " 2'-1¾" to 3'-5¼"
5	13'-10"	13¾" × 11¾"	2545.5 in⁴	" " 1'-1⅝" to 4'-4⅝"

STEEL SPAN

3	35'-1"	26WF144	4983.4 in⁴	Ranges from 2'-0¾" to 2'-3½"



(REFERENCE: INSPECTION REPORT BY S.A.I. '95').

DEAD LOADS:

Assume 0.05 K/C.F. for all Wood.

Planking: $2\frac{3}{4}$" WT/□' = $\left(\frac{2.75"}{12}\right)(0.05^{K}/_{C.F.}) = 0.011\ ^{K}/_{S.F.}$

Curb WT/FT = $\frac{(8.25" \times 4.25")}{144}(0.05^{K}/_{C.F.}) = 0.012^{K}/_{L}$

Railing $(0.0045^{K}/_{L})(2) = 0.009^{K}/_{L}$

Post L3×2½×¼ @ 7' spacing @ 4' ∴ WT/FT = $0.003^{K}/_{L}$

Beam Wt.:

Span 1 & 2 $\left(\frac{15.5" \times 7.75"}{144}\right)(0.05^{K}/_{C.F.}) = 0.042^{K}/_{L}$

Span 4 $\left(\frac{11.5" \times 11.5"}{144}\right)(0.05^{K}/_{C.F.}) = 0.046^{K}/_{L}$

Span 5 $\left(\frac{13.75" \times 11.75"}{144}\right)(0.05^{K}/_{C.F.}) = 0.056^{K}/_{L}$

Span 3 26WF144 $= 0.144^{K}/_{L}$

Deck Plank Analysis:

$W_{DL} = \left(\frac{9"}{12}\right)(0.011^{K}/_{S.F.}) = 0.008^{K}/_{L}$

Stringer Analysis:

Curb, Rail & Post $= \frac{2(0.012^{K}/_{L} + 0.009^{K}/_{L} + 0.003^{K}/_{L})}{7 \text{ beams}}$

$= 0.007^{K}/_{L}$

Planking $0.011^{K}/_{S.F.}$

WOOD PROPERTIES (AASHTO Table 13.2.1A White Oak)

Planking: Assume $F_b = 1350$psi $f_{hv} = 110$ psi (No. 1 - Northeast Lumber)

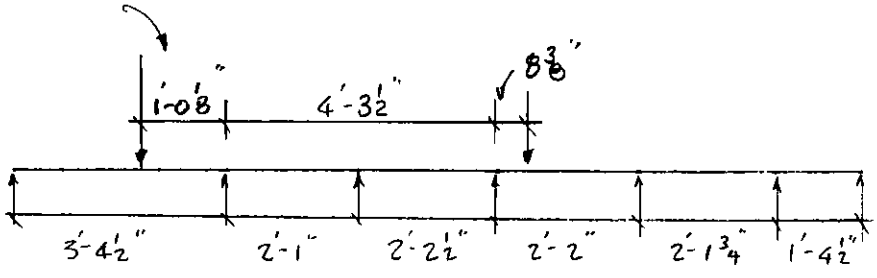
Timber Beams: $F_b = 1{,}400$ psi $f_{hv} = 105$ psi (Select Structural - Beams & Stringers).

Operating $F_b = 1.33\ F_{b(inv)}$ (M.M.1.B. 5.4.7).

Planking Analysis:

Analyze Planking as Continuous: Reduce center to center span length as mentioned in AASHTO 3.25.1.2
In addition the load can be distributed based on Tire Contact Area (AASHTO 3.30)

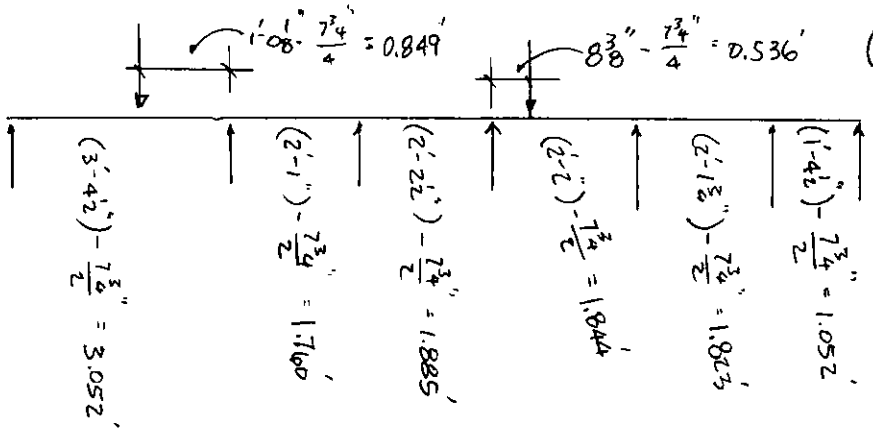
$(3'-4\frac{1}{2}'' + \frac{7\frac{3}{4}''}{2} - 8\frac{1}{4}'' - 24'') \cdot 12.125''$ (curb, wheel dist. from curb)



Span 2

The beam dimension width = $7\frac{3}{4}'' = 0.646'$

Reduced Span Length = clear span + $\frac{1}{2}$ beam width



(Wheel Location from actual location to effective location).

Tire Contact Area = 0.01 P $0.01\,(16{,}000^{\#}) = 160\,in^2$ (H20) $(103\,in^2)$ (MLBO)

Rectangle Area 1/2.5 ∴ $8 \times 20''$ $6.4'' \times 16''$

Length of distribution = $\frac{20''}{12} = 1.667'$ $\frac{16''}{12} = 1.333'$

Load $w_{H20} = \frac{16^{K}}{1.667'} = 9.598\ ^{K}/_{'}$ $w_{MLBO} = \frac{10.3^{K}}{1.333'} = 7.727\ ^{K}/_{'}$

PROJECT T-649 over CSX Rail Road. COMP. BY DCT DATE: 10/17/95
SAI Br. No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

Analysis of Wood Deck Planking :

$kip := 1000 \cdot lbf$ $ksi := 1000 \cdot \frac{lbf}{in^2}$ $fbwood := 1350 \cdot psi$ $vhallow := 110 \cdot psi$

$thick := 2.75 \cdot in$ thick = thickness of the floor planking
$width := 9.0 \cdot in$ Width = Width of individual planking
$spanlength := 3.375 \cdot ft$ spanlength = span length being investigated

Planking Moment and Shears: (Ref. to Staad III Output)

Dead Loads:

$Mdl := 0.007 \cdot kip \cdot ft$ $Vdl := 0.014 \cdot kip$

Live Loads:

$Vh20 := 13.12 \cdot kip$ $Mh20 := 4.82 \cdot kip \cdot ft$

$Vhs20 := 13.12 \cdot kip$ $Mhs20 := 4.82 \cdot kip \cdot ft$

$Vml80 := 8.52 \cdot kip$ $Mml80 := 3.31 \cdot kip \cdot ft$

$S := \frac{width \cdot thick^2}{6}$ $S = 11.34 \cdot in^3$ $Av := width \cdot thick$ $Av = 24.75 \cdot in^2$

Allowables:

$Mallow := fbwood \cdot S$ $Mallow = 1.28 \cdot kip \cdot ft$

$Vallow := \frac{2}{3} \cdot vhallow \cdot Av$ $Vallow = 1.81 \cdot kip$ (Horizontal Shear Allowable)

PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 9/11/95
SAT Br. No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

Moment Rating Factors:

H20: $IRF := \frac{Mallow - Mdl}{Mh20}$ $IRF = 0.26$ $IRF \cdot 20 = 5.27$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mh20}$ $ORF = 0.35$ $ORF \cdot 20 = 7.01$ tons

HS20: Same as H20 $IRF \cdot 36 = 9.48$ tons

$ORF \cdot 36 = 12.62$ tons

ML80: $IRF := \frac{Mallow - Mdl}{Mml80}$ $IRF = 0.38$ $IRF \cdot 37.74 = 14.47$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mml80}$ $ORF = 0.51$ $ORF \cdot 37.74 = 19.27$ tons

Horizontal Shear Rating Factors:

H20: $IRF := \frac{Vallow - Vdl}{Vh20}$ $IRF = 0.14$ $IRF \cdot 20 = 2.75$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vh20}$ $ORF = 0.18$ $ORF \cdot 20 = 3.66$ tons

HS20: Same as H20 $IRF \cdot 36 = 4.94$ tons

$ORF \cdot 36 = 6.59$ tons

PROJECT T-649 OVER CSX Railroad COMP. BY DCT DATE: 10/17/95

SAI. Br. No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

ML80: $IRF := \frac{Vallow - Vdl}{Vml80}$ $IRF = 0.21$ $IRF \cdot 37.74 = 7.98$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vml80}$ $ORF = 0.28$ $ORF \cdot 37.74 = 10.63$ tons

```
*****************************************************
*                                                   *
*           S T A A D - III                         *
*           Revision 19.0a                          *
*           Proprietary Program of                  *
*           RESEARCH ENGINEERS, Inc.                *
*           Date=    OCT 23, 1995                   *
*           Time=     9:16:45                       *
*                                                   *
*      USER ID: SAI CONSULTING ENGINEERS, INC.      *
*****************************************************
```

8/37

AA 10-25-95

```
 1. STAAD PLANE TIMBER PLANKING
 2. INPUT WIDTH 72
 3. UNIT FEET KIP
 4. JOINT COORDINATES
 5. 1 0. 0. 0.; 2 2.203 0. 0.; 3 3.052 0. 0.; 4 4.812 0. 0.; 5 6.698 0. 0.
 6. 6 7.234 0. 0.; 7 8.541 0. 0.; 8 10.364 0. 0.; 9 11.416 0. 0.
 7. MEMBER INCIDENCES
 8. 1 1 2; 2 2 3; 3 3 4; 4 4 5; 5 5 6; 6 6 7; 7 7 8; 8 8 9
 9. UNIT INCHES KIP
10. MEMBER PROPERTY AMERICAN
11. 1 TO 8 PRI YD 2.75 ZD 9.
12. CONSTANTS
13. E 1100. ALL
14. SUPPORTS
15. 1 PINNED
16. 3 TO 5 7 TO 9 FIXED BUT FX MZ
17. LOAD 1 DEAD LOAD
18. MEMBER LOAD
19. 1 TO 8 UNI Y -0.008 <-- k/ft should be kip/in (divide results by 12 for DL).
20. LOAD 2 16K WHEEL LOAD
21. JOINT LOAD
22. 2 6 FY -16.
23. UNITS FEET KIPS
24. LOAD 3 DISTRIBUTED WHEEL LOAD H20 & HS20
25. MEMBER LOAD
26. 1 UNI Y -9.598 1.370 2.203 0.
27. 2 UNI Y -9.598 0. 0.833 0.
28. JOINT LOAD
29. 6 FY -16.0
30. LOAD 4 DISTRIBUTED WHEEL LOAD ML80
31. MEMBER LOAD
32. 1 UNI Y -7.727 1.536 2.203 0.
33. 2 UNI Y -7.727 0.0 0.667 0.
34. JOINT LOAD
35. 6 FY -10.3
36. UNITS INCHES KIPS
37. PERFORM ANALYSIS
```

P R O B L E M S T A T I S T I C S

9/37

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 9/ 8/ 7
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 4, TOTAL DEGREES OF FREEDOM = 19
SIZE OF STIFFNESS MATRIX = 95 DOUBLE PREC. WORDS
REQUIRED DISK SPACE = 12.02 MB, TOTAL EXMEM = 3.01 MB

++ PROCESSING ELEMENT STIFFNESS MATRIX. 9:16:46
++ PROCESSING GLOBAL STIFFNESS MATRIX. 9:16:46
++ PROCESSING TRIANGULAR FACTORIZATION. 9:16:47
++ CALCULATING JOINT DISPLACEMENTS. 9:16:47
++ CALCULATING MEMBER FORCES. 9:16:47

38. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS) STRUCTURE TYPE = PLANE 10/37

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00061
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.02935
	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.02865
	4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.01862
2	1	0.00000	-0.00408	0.00000	0.00000	0.00000	0.00039
	2	0.00000	-0.31672	0.00000	0.00000	0.00000	0.02333
	3	0.00000	-0.26591	0.00000	0.00000	0.00000	0.02200
	4	0.00000	-0.18133	0.00000	0.00000	0.00000	0.01449
3	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00025
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.02335
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.01957
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.01349
4	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00008
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00371
	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00270
	4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00198
5	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00002
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00916
	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00942
	4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00600
6	1	0.00000	-0.00014	0.00000	0.00000	0.00000	-0.00003
	2	0.00000	-0.07267	0.00000	0.00000	0.00000	-0.00682
	3	0.00000	-0.07360	0.00000	0.00000	0.00000	-0.00687
	4	0.00000	-0.04716	0.00000	0.00000	0.00000	-0.00441
7	1	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00610
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00617
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00395
8	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00003
	2	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00129
	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00131
	4	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00084
9	1	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
	2	0.00000	0.00000	0.00000	0.00000	0.00000	0.00060
	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00061
	4	0.00000	0.00000	0.00000	0.00000	0.00000	0.00039

SUPPORT REACTIONS -UNIT KIPS INCH STRUCTURE TYPE = PLANE 11/37

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
1	1	0.00	0.12	0.00	0.00	0.00	0.00
	2	0.00	2.59	0.00	0.00	0.00	0.00
	3	0.00	2.87	0.00	0.00	0.00	0.00
	4	0.00	1.78	0.00	0.00	0.00	0.00
3	1	0.00	0.30	0.00	0.00	0.00	0.00
	2	0.00	17.80	0.00	0.00	0.00	0.00
	3	0.00	16.89	0.00	0.00	0.00	0.00
	4	0.00	11.09	0.00	0.00	0.00	0.00
4	1	0.00	0.13	0.00	0.00	0.00	0.00
	2	0.00	-6.90	0.00	0.00	0.00	0.00
	3	0.00	-6.13	0.00	0.00	0.00	0.00
	4	0.00	-4.13	0.00	0.00	0.00	0.00
5	1	0.00	0.19	0.00	0.00	0.00	0.00
	2	0.00	14.57	0.00	0.00	0.00	0.00
	3	0.00	14.39	0.00	0.00	0.00	0.00
	4	0.00	9.31	0.00	0.00	0.00	0.00
7	1	0.00	0.18	0.00	0.00	0.00	0.00
	2	0.00	4.94	0.00	0.00	0.00	0.00
	3	0.00	4.99	0.00	0.00	0.00	0.00
	4	0.00	3.20	0.00	0.00	0.00	0.00
8	1	0.00	0.16	0.00	0.00	0.00	0.00
	2	0.00	-1.41	0.00	0.00	0.00	0.00
	3	0.00	-1.43	0.00	0.00	0.00	0.00
	4	0.00	-0.91	0.00	0.00	0.00	0.00
9	1	0.00	0.03	0.00	0.00	0.00	0.00
	2	0.00	0.41	0.00	0.00	0.00	0.00
	3	0.00	0.41	0.00	0.00	0.00	0.00
	4	0.00	0.26	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE 12/37

ALL UNITS ARE -- KIPS INCH

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
1	1	1	0.00	0.12	0.00	0.00	0.00	0.00
		2	0.00	0.09	0.00	0.00	0.00	0.37
	2	1	0.00	2.59	0.00	0.00	0.00	0.00
		2	0.00	-2.59	0.00	0.00	0.00	68.37
	3	1	0.00	2.87	0.00	0.00	0.00	0.00
		2	0.00	5.13	0.00	0.00	0.00	35.86
	4	1	0.00	1.78	0.00	0.00	0.00	0.00
		2	0.00	3.37	0.00	0.00	0.00	26.52
2	1	2	0.00	-0.09	0.00	0.00	0.00	-0.37
		3	0.00	0.17 DL	0.00	0.00	0.00	-0.98 DL
	2	2	0.00	-13.41	0.00	0.00	0.00	-68.37
		3	0.00	13.41	0.00	0.00	0.00	-68.28
	3	2	0.00	-5.13	0.00	0.00	0.00	-35.86
		3	0.00	13.12 H20	0.00	0.00	0.00	-57.86 H20
	4	2	0.00	-3.37	0.00	0.00	0.00	-26.52
		3	0.00	8.52 MLBO	0.00	0.00	0.00	-39.71 MLBO
3	1	3	0.00	0.12	0.00	0.00	0.00	0.98
		4	0.00	0.05	0.00	0.00	0.00	-0.15
	2	3	0.00	4.38	0.00	0.00	0.00	68.28
		4	0.00	-4.38	0.00	0.00	0.00	24.31
	3	3	0.00	3.77	0.00	0.00	0.00	57.86
		4	0.00	-3.77	0.00	0.00	0.00	21.68
	4	3	0.00	2.57	0.00	0.00	0.00	39.71
		4	0.00	-2.57	0.00	0.00	0.00	14.57
4	1	4	0.00	0.08	0.00	0.00	0.00	0.15
		5	0.00	0.10	0.00	0.00	0.00	-0.38
	2	4	0.00	-2.51	0.00	0.00	0.00	-24.31
		5	0.00	2.51	0.00	0.00	0.00	-32.56
	3	4	0.00	-2.37	0.00	0.00	0.00	-21.68
		5	0.00	2.37	0.00	0.00	0.00	-31.86
	4	4	0.00	-1.56	0.00	0.00	0.00	-14.57
		5	0.00	1.56	0.00	0.00	0.00	-20.68
5	1	5	0.00	0.09	0.00	0.00	0.00	0.38
		6	0.00	-0.04	0.00	0.00	0.00	0.04
	2	5	0.00	12.06	0.00	0.00	0.00	32.56
		6	0.00	-12.06	0.00	0.00	0.00	45.02
	3	5	0.00	12.02	0.00	0.00	0.00	31.86
		6	0.00	-12.02	0.00	0.00	0.00	45.46
	4	5	0.00	7.75	0.00	0.00	0.00	20.68
		6	0.00	-7.75	0.00	0.00	0.00	29.16
6	1	6	0.00	0.04	0.00	0.00	0.00	-0.04
		7	0.00	0.09	0.00	0.00	0.00	-0.32

MEMBER END FORCES STRUCTURE TYPE = PLANE 13/37

ALL UNITS ARE -- KIPS INCH

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	2	6	0.00	-3.94	0.00	0.00	0.00	-45.02
		7	0.00	3.94	0.00	0.00	0.00	-16.75
	3	6	0.00	-3.98	0.00	0.00	0.00	-45.46
		7	0.00	3.98	0.00	0.00	0.00	-16.94
	4	6	0.00	-2.55	0.00	0.00	0.00	-29.16
		7	0.00	2.55	0.00	0.00	0.00	-10.86
7	1	7	0.00	0.09	0.00	0.00	0.00	0.32
		8	0.00	0.08	0.00	0.00	0.00	-0.26
	2	7	0.00	1.00	0.00	0.00	0.00	16.75
		8	0.00	-1.00	0.00	0.00	0.00	5.16
	3	7	0.00	1.01	0.00	0.00	0.00	16.94
		8	0.00	-1.01	0.00	0.00	0.00	5.21
	4	7	0.00	0.65	0.00	0.00	0.00	10.86
		8	0.00	-0.65	0.00	0.00	0.00	3.34
8	1	8	0.00	0.07	0.00	0.00	0.00	0.26
		9	0.00	0.03	0.00	0.00	0.00	0.00
	2	8	0.00	-0.41	0.00	0.00	0.00	-5.16
		9	0.00	0.41	0.00	0.00	0.00	0.00
	3	8	0.00	-0.41	0.00	0.00	0.00	-5.21
		9	0.00	0.41	0.00	0.00	0.00	0.00
	4	8	0.00	-0.26	0.00	0.00	0.00	-3.34
		9	0.00	0.26	0.00	0.00	0.00	0.00

********** END OF LATEST ANALYSIS RESULT **********

39. FINISH

********** END OF STAAD-III **********

**** DATE= OCT 23,1995 TIME= 9:16:49 ****

Span 2 - Stringer (S2) Analysis

Timbers =

$$\text{Avg Spacing} = \left(\frac{3.375' + 2.083'}{2}\right) = 2.729'$$

$$\text{Moment Distribution Factor (One Lane)} = \frac{S}{4.0} = \frac{2.729'}{4.0(2)} = 0.341 \text{ lanes}$$

Shear Dist. Factor = $0.5\,(0.6 \text{ whls} + 2(0.341 \text{ lanes})) = 0.641 \text{ whls}/2 = 0.321$ lanes.
(AASHTO 13.3.1)

Live Load Moments (Based on AASHTO Table of Moments - 1.0 lanes dist. Factor).

$M_{H20} = 120.0^{k'}$ $(\ell = 15')$
$128.0^{k'}$ $(\ell = 16')$

$\therefore M_{H20} = 0.341\,(123.3^{k'}) = \underline{42.0^{k'}}$

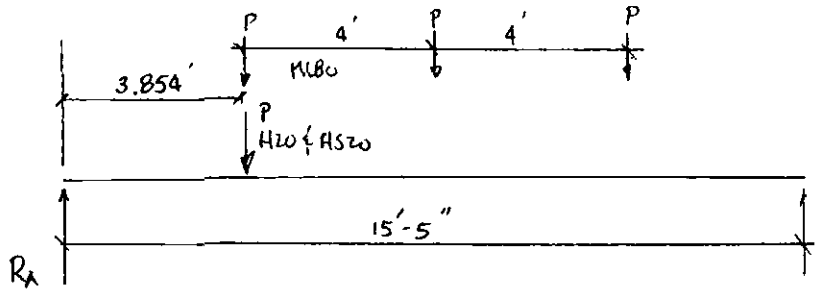
$M_{HS20} =$ Same as H20 $= \underline{42.0^{k'}}$

$M_{ML80} = 149.35^{k'}$ $(\ell = 15')$
$164.8^{k'}$ $(\ell = 16')$

$M_{ML80} = 0.341\,(155.79^{k'}) = \underline{53.12^{k'}}$

Span 2 - Stringer (S2)

Compute Live Load Shear: (AASHTO 13.3.1)



$P_{MLBO} = 20.6^k$

$P_{H20} = 32^k$

Place wheels 3D or $\frac{1}{4}\ell$ away from support, whichever is smaller.

$3(15.5") = 46.5" = 3.875'$
$\frac{1}{4}(15.417') = 3.854'$ ← governs.

H20 & HS20 $\quad R_A = \left(\frac{11.563'}{15.417'}\right)(P) = 0.75P$

MLBO $\quad R_A = \left(\frac{11.563' + 7.563' + 3.563'}{15.417'}\right)P = 1.472P$

$V_{H20} = V_{HS20} = 0.321 \text{ lanes } (0.75)(32^k) = 7.70^k$

$V_{MLBO} = 0.321 \text{ lanes } (1.472)(20.6^k) = 9.73^k$

Dead Load:

$w_{DL} = 0.011^k/_{S.F.}(2.729') + 0.042^k/_{l} + 0.007^k/_{l}$
$= 0.079^k/_{l}$

PROJECT T-649 OVER CSX Railroad COMP. BY DCT DATE: 10/17/95
SAI BR.No. 1062 BMS.No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

Analysis of Timber Stringer (Span 2 Stringer S2) :

$kip := 1000 \cdot lbf$ $ksi := 1000 \cdot \frac{lbf}{in^2}$ $fbwood := 1400 \cdot psi$ $vhallow := 105 \cdot psi$

$Depth := 15.5 \cdot in$ Depth = Depth of Beam
$width := 7.75 \cdot in$ Width = Width of Beam
$spanlength := 15.4167 \cdot ft$ spanlength = span length being investigated

Moment and Shears:

Dead Loads: $wdl := 0.079 \cdot \frac{kip}{ft}$

$Mdl := \frac{wdl \cdot spanlength^2}{8}$ $Vdl := \frac{wdl \cdot spanlength}{2} - (3 \cdot Depth) \cdot wdl$

$Mdl = 2.35 \cdot kip \cdot ft$ $Vdl = 0.3 \cdot kip$

Live Loads:

$Vh20 := 7.7 \cdot kip$ $Mh20 := 42.0 \cdot kip \cdot ft$

$Vhs20 := 7.7 \cdot kip$ $Mhs20 := 42.0 \cdot kip \cdot ft$

$Vml80 := 9.73 \cdot kip$ $Mml80 := 53.12 \cdot kip \cdot ft$

$S := \frac{width \cdot Depth^2}{6}$ $S = 310.32 \cdot in^3$ $Av := width \cdot Depth$

$Av = 120.13 \cdot in^2$

Allowables:

$Mallow := fbwood \cdot S$ $Mallow = 36.2 \cdot kip \cdot ft$

$Vallow := \frac{2}{3} \cdot vhallow \cdot Av$ $Vallow = 8.41 \cdot kip$ (Horizontal Shear Allowable)

PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 10/17/95
SAI Br. No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

Moment Rating Factors:

H20: $IRF := \frac{Mallow - Mdl}{Mh20}$ $IRF = 0.81$ $IRF \cdot 20 = 16.12$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mh20}$ $ORF = 1.09$ $ORF \cdot 20 = 21.81$ tons

HS20: Same as H20 $IRF \cdot 36 = 29.02$ tons

$ORF \cdot 36 = 39.26$ tons

ML80: $IRF := \frac{Mallow - Mdl}{Mml80}$ $IRF = 0.64$ $IRF \cdot 37.74 = 24.05$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mml80}$ $ORF = 0.86$ $ORF \cdot 37.74 = 32.54$ tons

Horizontal Shear Rating Factors:

H20: $IRF := \frac{Vallow - Vdl}{Vh20}$ $IRF = 1.05$ $IRF \cdot 20 = 21.05$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vh20}$ $ORF = 1.41$ $ORF \cdot 20 = 28.26$ tons

HS20: $IRF := \frac{Vallow - Vdl}{Vhs20}$ $IRF = 1.05$ $IRF \cdot 36 = 37.9$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vhs20}$ $ORF = 1.41$ $ORF \cdot 36 = 50.87$ tons

INDEX NO. _____

SHEET NO. 18 OF 37

PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 10/17/95

SAI Br. No. 1062 BMS. No. 04 720 0649 8302 CHK'D BY AA DATE 10-25-95

ML80: $IRF := \frac{Vallow - Vdl}{Vml80}$ $IRF = 0.83$ $IRF \cdot 37.74 = 31.44$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vml80}$ $ORF = 1.12$ $ORF \cdot 37.74 = 42.2$ tons

SPAN 4 - STRINGER (S5)

(TIMBER)

Avg Spacing : $\left(\frac{2.146' + 3.438'}{2}\right) = 2.79'$ Span Length = 14'-2"

DISTRIBUTION FACTORS:

Moment: $\frac{S}{4.0} = \frac{2.79'}{4(2)} = 0.349$ lanes

Shear: $0.5(0.6 \text{ wheels} + 2(0.349 \text{ lanes})) = 0.649 \text{ whl}/2 = 0.325$ lanes.
(AASHTO 13.3.1).

Live Loads:

Moment: (Based on AASHTO Table of Moments 1.0 lanes Dist. Factor).

$M_{H20} = M_{HS20} \cdot 113.3^{k'}(0.349 \text{ lanes}) = 39.5^{k'}$

$M_{ML80} = 136.5^{k'}(0.349 \text{ lanes}) = 47.6^{k'}$

Shear: (AASHTO 13.3.1). Place wheels 3D from support $= 3\left(\frac{11.5}{12}\right) = 2.81'$

$V_{H20} = V_{HS20} = 0.325 \text{ lanes}\left(\frac{14.167' - 2.81'}{14.167'}\right)(32^k) = 8.34^k$

$V_{ML80} = 0.325 \text{ lanes}\left(\frac{11.357' + 7.357' + 3.357'}{14.167'}\right)(20.6^k) = 10.43^k$

DEAD LOAD

$W_{DL} = 0.011^{K/}_{1'}(2.79') + 0.046^{K/}_{1} + 0.007^{K/}_{1}$
$= 0.084^{K/}_{1}$

Impact = 1.30

PROJECT I-649 over CSX Railroad COMP. BY DCT DATE: 10/17/95
SAT BR. No. 1062 BMS No. 04 7210 0649 B302 CHK'D BY AA DATE 10-25-95

Analysis of Timber Stringer (Span 4 Stringer S5) :

$kip := 1000 \cdot lbf$ $ksi := 1000 \cdot \frac{lbf}{in^2}$ $fbwood := 1400 \cdot psi$ $vhallow := 105 \cdot psi$

$Depth := 11.5 \cdot in$ Depth = Depth of Beam
$width := 11.5 \cdot in$ Width = Width of Beam
$spanlength := 14.167 \cdot ft$ spanlength = span length being investigated

Moment and Shears:

Dead Loads: $wdl := 0.084 \cdot \frac{kip}{ft}$

$Mdl := \frac{wdl \cdot spanlength^2}{8}$ $Vdl := \frac{wdl \cdot spanlength}{2} - (3 \cdot Depth) \cdot wdl$

$Mdl = 2.11 \cdot kip \cdot ft$ $Vdl = 0.35 \cdot kip$

Live Loads:

$Vh20 := 8.34 \cdot kip$ $Mh20 := 39.5 \cdot kip \cdot ft$

$Vhs20 := 8.34 \cdot kip$ $Mhs20 := 39.5 \cdot kip \cdot ft$

$Vml80 := 10.43 \cdot kip$ $Mml80 := 47.6 \cdot kip \cdot ft$

$S := \frac{width \cdot Depth^2}{6}$ $S = 253.48 \cdot in^3$ $Av := width \cdot Depth$ $Av = 132.25 \cdot in^2$

Allowables:

$Mallow := fbwood \cdot S$ $Mallow = 29.57 \cdot kip \cdot ft$

$Vallow := \frac{2}{3} \cdot vhallow \cdot Av$ $Vallow = 9.26 \cdot kip$ (Horizontal Shear Allowable)

PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 10/17/95
SAI Be. No. 1062 BMS. No. 04 720 0649 8302 CHK'D BY AA DATE 10-25-95

Moment Rating Factors:

H20: $IRF := \frac{Mallow - Mdl}{Mh20}$ $IRF = 0.7$ $IRF \cdot 20 = 13.91$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mh20}$ $ORF = 0.94$ $ORF \cdot 20 = 18.85$ tons

HS20: Same as H20 $IRF \cdot 36 = 25.03$ tons

$ORF \cdot 36 = 33.93$ tons

ML80: $IRF := \frac{Mallow - Mdl}{Mml80}$ $IRF = 0.58$ $IRF \cdot 37.74 = 21.78$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mml80}$ $ORF = 0.78$ $ORF \cdot 37.74 = 29.51$ tons

Horizontal Shear Rating Factors:

H20: $IRF := \frac{Vallow - Vdl}{Vh20}$ $IRF = 1.07$ $IRF \cdot 20 = 21.35$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vh20}$ $ORF = 1.43$ $ORF \cdot 20 = 28.68$ tons

HS20: $IRF := \frac{Vallow - Vdl}{Vhs20}$ $IRF = 1.07$ $IRF \cdot 36 = 38.43$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vhs20}$ $ORF = 1.43$ $ORF \cdot 36 = 51.62$ tons

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PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 10/17/95

SAI. Be No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

ML80: $IRF := \frac{Vallow - Vdl}{Vml80}$ $IRF = 0.85$ $IRF \cdot 37.74 = 32.22$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vml80}$ $ORF = 1.15$ $ORF \cdot 37.74 = 43.27$ tons

SPAN 5 - STRINGER (S3) (TIMBER)

Avg Spacing = $\left(\frac{2.354' + 4.385'}{2}\right) = 3.370'$ Span Length = 13'-10"

DISTRIBUTION FACTORS:

Moment = $\frac{S}{4.0} = \frac{3.370'}{4(2)} = 0.421$ lanes.

Shear = $0.5\left(0.6 \text{ wheels} + 2(0.421 \text{ lanes})\right) = 0.721 \text{ whls}/2 = 0.361$ lanes.
(AASHTO 13.3.1)

Live Loads:

Moment: (Based on AASHTO Table of Moments D.F. = 1.0 lanes)

$M_{H20} = M_{HS20} = 0.421 \text{ lanes}\,(110.67^{k'}) = 46.6^{k'}$

$M_{ML80} = 0.421 \text{ lanes}\,(131.32^{k'}) = 55.3^{k'}$

Shear: (AASHTO 13.3.1) Place wheels 3D away from support = $3\left(\frac{13.75"}{12}\right) = 3.44'$

$V_{H20} = V_{HS20} = 0.361 \text{ lanes}\,(32^{k})\left(\frac{13.83' - 3.44'}{13.83'}\right) = 8.7^{k}$

$V_{ML80} = 0.361 \text{ lanes}\,(20.6^{k})\left(\frac{10.396' + 6.396' + 2.396'}{13.83'}\right) = 10.3^{k}$

DEAD LOADS:

$w_{DL} = 0.011^{k}/\square' (3.37') + 0.056^{k}/' + 0.007^{k}/'$
$= 0.100^{k}/'$

PROJECT T-649 OVER CSX Railroad COMP. BY DCT DATE: 10/17/95
SAI BR. No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

Analysis of Timber Stringer (Span 5 Stringer S3) :

$kip := 1000 \cdot lbf$ $ksi := 1000 \cdot \frac{lbf}{in^2}$ $fbwood := 1400 \cdot psi$ $vhallow := 105 \cdot psi$

$Depth := 13.75 \cdot in$ Depth = Depth of Beam
$width := 11.75 \cdot in$ Width = Width of Beam
$spanlength := 13.83 \cdot ft$ spanlength = span length being investigated

Moment and Shears:

Dead Loads: $wdl := 0.100 \cdot \frac{kip}{ft}$

$Mdl := \frac{wdl \cdot spanlength^2}{8}$ $Vdl := \frac{wdl \cdot spanlength}{2} - (3 \cdot Depth) \cdot wdl$

$Mdl = 2.39 \cdot kip \cdot ft$ $Vdl = 0.35 \cdot kip$

Live Loads:

$Vh20 := 8.7 \cdot kip$ $Mh20 := 46.6 \cdot kip \cdot ft$

$Vhs20 := 8.7 \cdot kip$ $Mhs20 := 46.6 \cdot kip \cdot ft$

$Vml80 := 10.3 \cdot kip$ $Mml80 := 55.3 \cdot kip \cdot ft$

$S := \frac{width \cdot Depth^2}{6}$ $S = 370.25 \cdot in^3$ $Av := width \cdot Depth$

$Av = 161.56 \cdot in^2$

Allowables:

$Mallow := fbwood \cdot S$ $Mallow = 43.2 \cdot kip \cdot ft$

$Vallow := \frac{2}{3} \cdot vhallow \cdot Av$ $Vallow = 11.31 \cdot kip$ (Horizontal Shear Allowable)

PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 10/n/95
SAI Br. No. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

Moment Rating Factors:

H20: $IRF := \frac{Mallow - Mdl}{Mh20}$ $IRF = 0.88$ $IRF \cdot 20 = 17.51$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mh20}$ $ORF = 1.18$ $ORF \cdot 20 = 23.63$ tons

HS20: Same as H20 $IRF \cdot 36 = 31.52$ tons

$ORF \cdot 36 = 42.53$ tons

ML80: $IRF := \frac{Mallow - Mdl}{Mml80}$ $IRF = 0.74$ $IRF \cdot 37.74 = 27.85$ tons

$ORF := \frac{Mallow \cdot 1.33 - Mdl}{Mml80}$ $ORF = 1$ $ORF \cdot 37.74 = 37.58$ tons

Horizontal Shear Rating Factors:

H20: $IRF := \frac{Vallow - Vdl}{Vh20}$ $IRF = 1.26$ $IRF \cdot 20 = 25.2$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vh20}$ $ORF = 1.69$ $ORF \cdot 20 = 33.78$ tons

HS20: $IRF := \frac{Vallow - Vdl}{Vhs20}$ $IRF = 1.26$ $IRF \cdot 36 = 45.36$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vhs20}$ $ORF = 1.69$ $ORF \cdot 36 = 60.8$ tons

PROJECT T-649 over CSX Railroad COMP. BY DCT DATE: 10/17/95
SAI BR. NO. 1062 BMS. No. 04 7210 0649 8302 CHK'D BY AA DATE 10-25-95

ML80: $IRF := \frac{Vallow - Vdl}{Vml80}$ $IRF = 1.06$ $IRF \cdot 37.74 = 40.16$ tons

$ORF := \frac{Vallow \cdot 1.33 - Vdl}{Vml80}$ $ORF = 1.43$ $ORF \cdot 37.74 = 53.84$ tons

SPAN 3 - STEEL STRINGERS

Span Length = 35'-1"
7 Stringers with spacing ranging from 2'-0¾" to 2'-3½"
2¾" Deck Planking
8¼" × 4¼" Curb Blocks
2-L3×2½×¼" Railings
L3×2½×¼" Post @ 7' Spacing

ANALYZE STRINGER (S6)

Avg. Spacing = $\left(\frac{2.29' + 2.23'}{2}\right) = 2.26'$

DEAD LOADS:

$w_{DL} = 0.011^{k}/_{in}\,(2.26') + 0.007^{k}/_{in} = 0.032^{k}/_{in}$

↑ Deck ↑ Curb & Rails

Live Load Distribution Factors

Moment: $\frac{S}{4} < \frac{2.26'}{4(2)} = 0.283$ lanes.

Shear: 0.50 lanes.

Deflection: 1 lane / 7 beams = 0.143 lanes.

Section Properties:

(Based on Inspection Measurements by SAI '95 Inspection Report)

24WF144: $A = 42.38\,in^2$ t_f : ($m = 1.272"$ $n = 0.725"$)
$d = 25.88\,in$ $I = 4983.4\,in^4$
$t_w = 0.610\,in$
$b_f = 13.73\,in$

BRIDGE ANALYSIS AND RATING (BAR7)

PROGRAM P4353000 10/18/95 11:41
VERSION 7.5 LAST UPDATED 12/06/94 DOCUMENTATION 12/94

INPUT: T649.DAT AA 10-25-95

STRUCTURE ID - - T649 OVER CSX RAILROAD

BRIDGE TYPE	SLC LEVEL	LIVE LANES	LIVE LOAD	IMPACT OUTPUT	GAGE FACTOR	PASS DIST	CONC DIST	FATIGUE	DECK SPEC	REDIST DIR
GGG	0		H	3	0.00	0.0	0.0			

BRIDGE CROSS SECTION AND LOADING

DECK WIDTH	OVERHANG OR SPACING	CL OF GIRDER OR TRUSS TO CURB	ROADWAY WIDTH	DISTRIBUTION FACTORS SHEAR	MOMENT	DEFLECT
0.00	2.26	0.00	0.00	0.500	0.283	0.143

SLAB THICKNESS	HAUNCH	DEAD LOADS DL1	DL2	F'C	N	SYMMETRY
0.00	0.00	0.032	0.000	0.000	0.	Y

STRINGER DL1	FLOORBEAM DL1
0.000	0.000

SPAN LENGTHS (SIMPLE)

SPAN # 1
LENGTH 35.08

STEEL MEMBER PROPERTIES

GF SN	SPAN RANGE	TYP E	WF BM M OF I OR VRT LEG	WF BM AREA OR HRZ LEG	FLANGE OR ANGLE THICK	FLANGE WIDTH	V AR	WF BM OR WEB PLATE DEPTH	WEB THICK
G 1	17.54	W	4983.40	42.38	0.7250	13.730		25.88	0.6100

TPW	TPT	BPW	BPT	COMP	FY	FY TOP	FY BOT	CG TOP	CG BOT
0.00	0.0000	0.00	0.0000	N	30.0	0.0	0.0	0.000	0.000

LATERAL BRACE POINTS AND STIFFENER SPACINGS

BG OR FG CODE	SPAN	COD E	NO. OF SPCS	SPACING	COD E	NO. OF SPCS	SPACING	COD E	NO. OF SPCS	SPACING	COD E	NO. OF SPCS	SPACING
BG	1	T	1	1.33	T	1	6.00	T	1	5.83	T	1	1.96
		T	1	6.08	T	1	6.00	T	1	1.75	T	1	4.75
FG	1	T	1	1.33	B	1	35.08		0	0.00		0	0.00
			0	0.00		0	0.00		0	0.00		0	0.00

DEFAULT VALUES

SLC LEVEL	GAGE DISTANCE	PASSING DISTANCE
I	6.0	4.0

G I R D E R A N A L Y S I S

DEAD LOADS ACTING ON GIRDER

INPUT DL1	GIRDER WEIGHT	SLAB WEIGHT	FL BEAM WEIGHT	STRINGER WEIGHT	FL BEAM DL1	STRINGER DL1	TOTAL DL1	TOTAL DL2
0.032	0.144	0.000	0.000	0.000	0.000	0.000	0.176	0.000

NOTE: IF A SECTION DOES NOT MEET FLANGE OR WEB BUCKLING CRITERIA OF CURRENT AASHTO SPECIFICATIONS FOR LOAD FACTOR METHOD, THE RATING FACTORS ARE REPRINTED AS 888.88. THIS INDICATES THAT THERE IS A POTENTIAL FATIGUE PROBLEM.

GIRDER SECTION PROPERTIES

	DEPTH	GROSS AREA	MOMENT OF INERTIA	C BOTTOM	SECTION MODULUS TOP	SECTION MODULUS BOTTOM
NON-COMPOSITE	25.88	42.38	4983.40	12.94	385.12	385.12

* GIRDER - LIVE LOAD H20 *

MAXIMUM REACTIONS

SUPPORT	DL1	DL2	+(LL+I)	-(LL+I)	I.F.
1	3.1	0.0	22.6	0.0	1.30

NOTE: ALL SUPPORT REACTIONS AND END SHEARS IN EACH SPAN DUE TO A LIVE LOAD ARE CALCULATED BASED ON AASHTO ARTICLE 3.23.1 AS INTERPRETED IN SOL 431-93-05.

UNFACTORED MOMENTS AND SHEARS

SPAN 1 - LIVE LOAD IMPACT FACTORS : POS MOM 1.30 NEG MOM 0.00

X	DL1 MOMENT	DL2 MOMENT	+(LL+I) MOMENT	-(LL+I) MOMENT	DL1 SHEAR	DL2 SHEAR	+(LL+I) SHEAR	-(LL+I) SHEAR	I.F.
0.00	0.0	0.0	0.0	0.0	3.1	0.0	22.6	0.0	1.30
	SIMULT SHEAR		0.0	0.0	SIMULT MOM		0.0	0.0	
3.51	9.8	0.0	42.3	0.0	2.5	0.0	12.1	-1.2	1.30
	SIMULT SHEAR		12.1	0.0	SIMULT MOM		42.3	37.2	
7.02	17.3	0.0	74.4	0.0	1.9	0.0	10.6	-2.4	1.30
	SIMULT SHEAR		10.6	0.0	SIMULT MOM		74.4	66.1	
10.52	22.8	0.0	96.0	0.0	1.2	0.0	9.1	-3.5	1.30
	SIMULT SHEAR		9.1	0.0	SIMULT MOM		96.0	86.7	

14.03	26.0	0.0	107.4	0.0	0.6	0.0	7.7	-4.7	1.30
	SIMULT	SHEAR	7.7	0.0	SIMULT	MOM	107.4	99.2	
17.54	27.1	0.0	108.5	0.0	0.0	0.0	6.2	-6.2	1.30
	SIMULT	SHEAR	6.2	0.0	SIMULT	MOM	108.5	108.5	

STRENGTHS AND LOAD FACTOR RATINGS

SPAN 1

X	MAX MOM STRENGTH	SERVICE STRENGTH	SHEAR STRENGTH	RATING FACTORS IR	OR
0.00	853.5 C	770.2	259.3	5.22 V	8.70 V
3.51	853.5 C	770.2	259.3	9.17 T	15.28 T
7.02	853.5 C	770.2	259.3	5.16 T	8.60 T
10.52	853.5 C	770.2	259.3	3.96 T	6.60 T
14.03	853.5 C	770.2	259.3	3.52 T	5.87 T
17.54	853.5 C	770.2	259.3	3.48 T	5.80 T

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* GIRDER - LIVE LOAD HS20 *
****

MAXIMUM REACTIONS

SUPPORT	DL1	DL2	+(LL+I)	-(LL+I)	I.F.
1	3.1	0.0	28.5	0.0	1.30

NOTE: ALL SUPPORT REACTIONS AND END SHEARS IN EACH SPAN DUE TO A LIVE LOAD ARE CALCULATED BASED ON AASHTO ARTICLE 3.23.1 AS INTERPRETED IN SOL 431-93-05.

UNFACTORED MOMENTS AND SHEARS

SPAN 1 - LIVE LOAD IMPACT FACTORS : POS MOM 1.30 NEG MOM 0.00

X	DL1 MOMENT	DL2 MOMENT	+(LL+I) MOMENT	-(LL+I) MOMENT	DL1 SHEAR	DL2 SHEAR	+(LL+I) SHEAR	-(LL+I) SHEAR	I.F.
0.00	0.0	0.0	0.0	0.0	3.1	0.0	28.5	0.0	1.30
	SIMULT	SHEAR	0.0	0.0	SIMULT	MOM	0.0	0.0	
3.51	9.8	0.0	58.9	0.0	2.5	0.0	16.8	-1.2	1.30
	SIMULT	SHEAR	16.8	0.0	SIMULT	MOM	58.9	37.2	
7.02	17.3	0.0	99.2	0.0	1.9	0.0	14.1	-2.4	1.30
	SIMULT	SHEAR	14.1	0.0	SIMULT	MOM	99.2	66.1	
10.52	22.8	0.0	124.0	0.0	1.2	0.0	11.8	-3.5	1.30
	SIMULT	SHEAR	11.8	0.0	SIMULT	MOM	124.0	86.7	
14.03	26.0	0.0	132.4	0.0	0.6	0.0	9.4	-4.7	1.30
	SIMULT	SHEAR	9.4	0.0	SIMULT	MOM	132.3	99.3	
17.54	27.1	0.0	129.3	0.0	0.0	0.0	7.1	-7.1	1.30
	SIMULT	SHEAR	-6.8	0.0	SIMULT	MOM	124.1	124.1	

STRENGTHS AND LOAD FACTOR RATINGS

SPAN 1

	MAX MOM	SERVICE	SHEAR	RATING FACTORS

X	MAX MOM STRENGTH	SERVICE STRENGTH	SHEAR STRENGTH	RATING FACTORS IR	OR
0.00	853.5 C	770.2	259.3	4.14 V	6.90 V
3.51	853.5 C	770.2	259.3	6.59 T	10.98 T
7.02	853.5 C	770.2	259.3	3.87 T	6.44 T
10.52	853.5 C	770.2	259.3	3.07 T	5.11 T
14.03	853.5 C	770.2	259.3	2.86 T	4.76 T
17.54	853.5 C	770.2	259.3	2.92 T	4.87 T

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* GIRDER - LIVE LOAD ML80 *
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MAXIMUM REACTIONS

SUPPORT	DL1	DL2	+(LL+I)	-(LL+I)	I.F.
1	3.1	0.0	28.4	0.0	1.30

NOTE: ALL SUPPORT REACTIONS AND END SHEARS IN EACH SPAN DUE TO A LIVE LOAD ARE CALCULATED BASED ON AASHTO ARTICLE 3.23.1 AS INTERPRETED IN SOL 431-93-05.

UNFACTORED MOMENTS AND SHEARS

SPAN 1 - LIVE LOAD IMPACT FACTORS : POS MOM 1.30 NEG MOM 0.00

X	DL1 MOMENT	DL2 MOMENT	+(LL+I) MOMENT	-(LL+I) MOMENT	DL1 SHEAR	DL2 SHEAR	+(LL+I) SHEAR	-(LL+I) SHEAR	I.F.
0.00	0.0	0.0	0.0	0.0	3.1	0.0	28.4	0.0	1.30
	SIMULT SHEAR		0.0	0.0	SIMULT MOM		0.0	0.0	
3.51	9.8	0.0	69.5	0.0	2.5	0.0	19.8	-0.8	1.30
	SIMULT SHEAR		19.8	0.0	SIMULT MOM		69.5	23.9	
7.02	17.3	0.0	119.6	0.0	1.9	0.0	17.0	-2.2	1.30
	SIMULT SHEAR		17.0	0.0	SIMULT MOM		119.6	60.8	
10.52	22.8	0.0	153.1	0.0	1.2	0.0	14.3	-4.2	1.30
	SIMULT SHEAR		9.9	0.0	SIMULT MOM		150.1	103.8	
14.03	26.0	0.0	175.3	0.0	0.6	0.0	11.5	-6.5	1.30
	SIMULT SHEAR		7.1	0.0	SIMULT MOM		161.2	136.9	
17.54	27.1	0.0	178.0	0.0	0.0	0.0	8.8	-8.8	1.30
	SIMULT SHEAR		4.3	0.0	SIMULT MOM		153.9	153.9	

STRENGTHS AND LOAD FACTOR RATINGS

SPAN 1

X	MAX MOM STRENGTH	SERVICE STRENGTH	SHEAR STRENGTH	RATING FACTORS IR	OR
0.00	853.5 C	770.2	259.3	4.15 V	6.91 V
3.51	853.5 C	770.2	259.3	5.58 T	9.30 T
7.02	853.5 C	770.2	259.3	3.21 T	5.35 T
10.52	853.5 C	770.2	259.3	2.48 T	4.14 T
14.03	853.5 C	770.2	259.3	2.16 T	3.60 T
17.54	853.5 C	770.2	259.3	2.12 T	3.54 T

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* GIRDER - LIVE LOAD P-82 *

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MAXIMUM REACTIONS

SUPPORT	DL1	DL2	+(LL+I)	-(LL+I)	I.F.
1	3.1	0.0	40.6	0.0	1.30

NOTE: ALL SUPPORT REACTIONS AND END SHEARS IN EACH SPAN DUE TO A LIVE LOAD ARE CALCULATED BASED ON AASHTO ARTICLE 3.23.1 AS INTERPRETED IN SOL 431-93-05.

UNFACTORED MOMENTS AND SHEARS

SPAN 1 - LIVE LOAD IMPACT FACTORS : POS MOM 1.30 NEG MOM 0.00

X	DL1 MOMENT	DL2 MOMENT	+(LL+I) MOMENT	-(LL+I) MOMENT	DL1 SHEAR	DL2 SHEAR	+(LL+I) SHEAR	-(LL+I) SHEAR	I.F.
0.00	0.0	0.0	0.0	0.0	3.1	0.0	40.6	0.0	1.30
	SIMULT SHEAR		0.0	0.0	SIMULT MOM		0.0	0.0	
3.51	9.8	0.0	101.6	0.0	2.5	0.0	29.0	-1.0	1.30
	SIMULT SHEAR		29.0	0.0	SIMULT MOM		101.6	31.4	
7.02	17.3	0.0	175.3	0.0	1.9	0.0	25.0	-2.8	1.30
	SIMULT SHEAR		25.0	0.0	SIMULT MOM		175.3	79.7	
10.52	22.8	0.0	229.1	0.0	1.2	0.0	21.0	-5.5	1.30
	SIMULT SHEAR		15.6	0.0	SIMULT MOM		221.2	136.1	
14.03	26.0	0.0	263.0	0.0	0.6	0.0	17.0	-9.1	1.30
	SIMULT SHEAR		11.6	0.0	SIMULT MOM		239.2	191.5	
17.54	27.1	0.0	269.0	0.0	0.0	0.0	13.1	-13.1	1.30
	SIMULT SHEAR		-7.7	0.0	SIMULT MOM		229.3	229.3	

STRENGTHS AND LOAD FACTOR RATINGS

SPAN 1

X	MAX MOM STRENGTH	SERVICE STRENGTH	SHEAR STRENGTH	RATING FACTORS IR	OR
0.00	853.5 C	770.2	259.3	2.91 V	4.84 V
3.51	853.5 C	770.2	259.3	3.82 T	6.37 T
7.02	853.5 C	770.2	259.3	2.19 T	3.65 T
10.52	853.5 C	770.2	259.3	1.66 T	2.77 T
14.03	853.5 C	770.2	259.3	1.44 T	2.40 T
17.54	853.5 C	770.2	259.3	1.40 T	2.34 T

R A T I N G S U M M A R Y

MEMBER: GIRDER

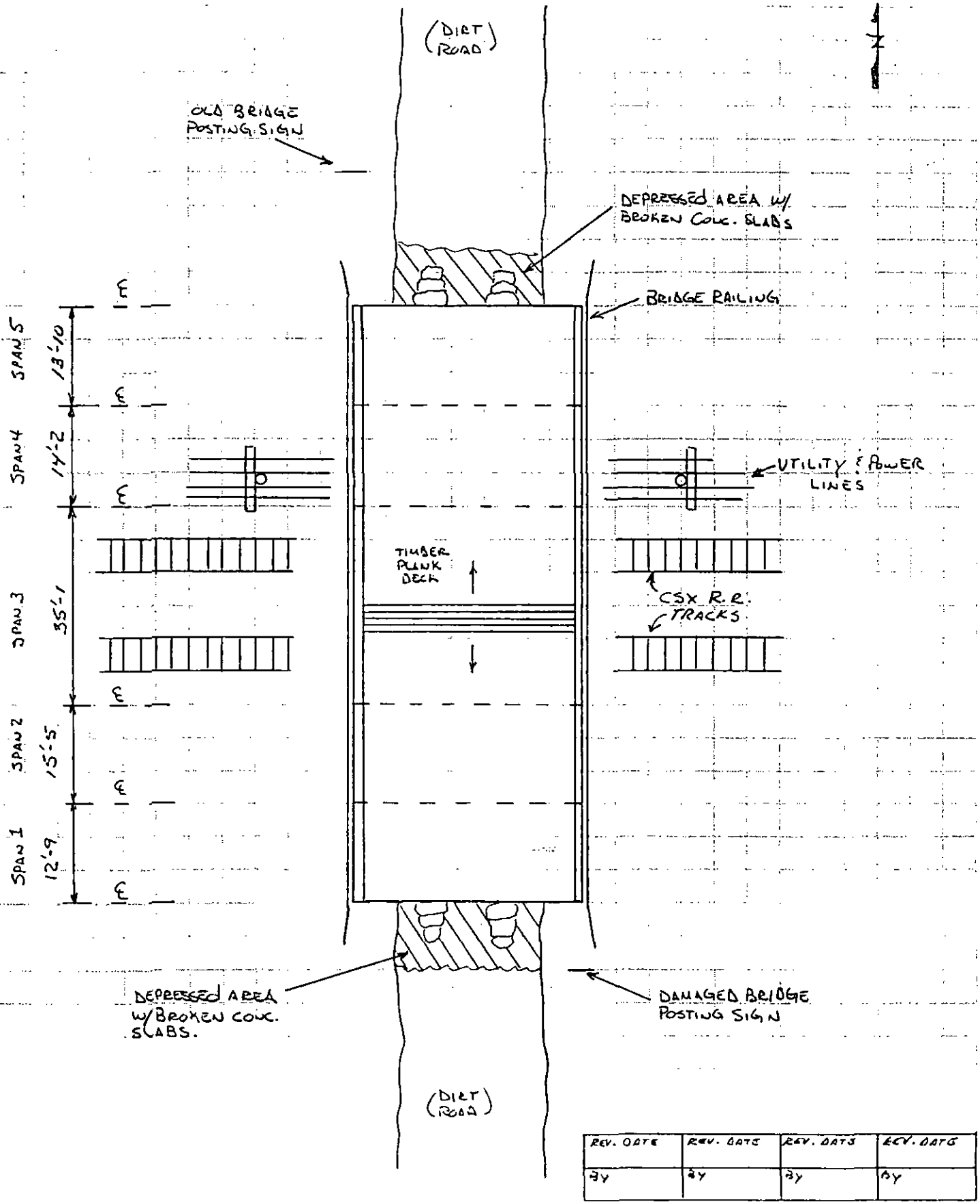
LOAD		LOAD FACTOR RATING FACTOR	TONS	X	SPAN
H20	IR (DESIGN)	3.48 T	69.6	17.54	1
	OR (DESIGN)	5.80 T	116.1	17.54	1
HS20	IR (DESIGN)	2.86 T	102.9	14.03	1
	OR (DESIGN)	4.76 T	171.5	14.03	1

ML80	IR (DESIGN)	2.12	T	80.1	17.54	1
	OR (DESIGN)	3.54	T	133.5	17.54	1
P-82	IR (DESIGN)	1.40	T	143.2	17.54	1
	OR (DESIGN)	2.34	T	238.7	17.54	1

RATING FACTOR CODES:
T - TOP STEEL STRESS/STRENGTH GOVERNS
B - BOTTOM STEEL STRESS/STRENGTH GOVERNS
C - CONCRETE STRESS/STRENGTH GOVERNS
R - REINFORCEMENT STRESS/STRENGTH GOVERNS
V - SHEAR STRESS/STRENGTH GOVERNS
S - SERVICEABILITY STRENGTH GOVERNS
I - MOMENT-SHEAR INTERACTION GOVERNS
F - SECTION DOES NOT MEET FLANGE PROJECTION/THICKNESS RATIO CRITERIA
W - SECTION DOES NOT MEET WEB DEPTH/THICKNESS RATIO CRITERIA

MAX MOM STRENGTH CODES:
C - SECTION IS COMPACT
B - SECTION IS BRACED NON-COMPACT
U - SECTION IS UNBRACED NON-COMPACT
T - SECTION IS IN TRANSITION BETWEEN COMPACT AND BRACED NON-COMPACT

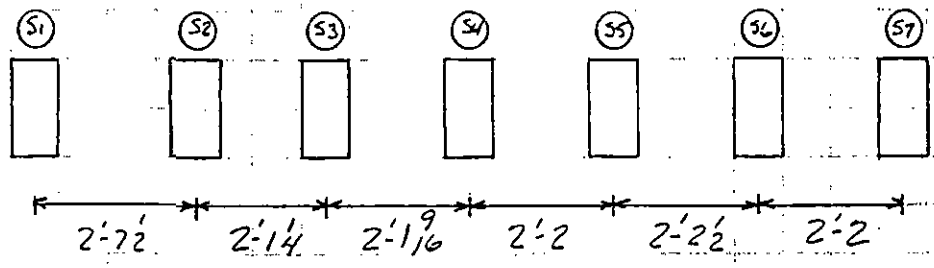
PLAN VIEW



REV. DATE	REV. DATE	REV. DATE	REV. DATE
BY	BY	BY	BY

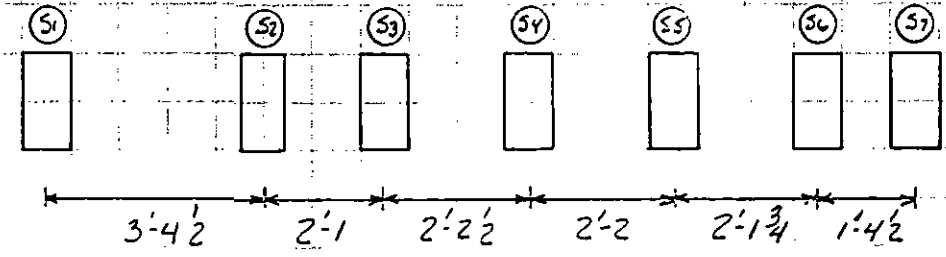
CROSS SECTIONS

SPAN #1

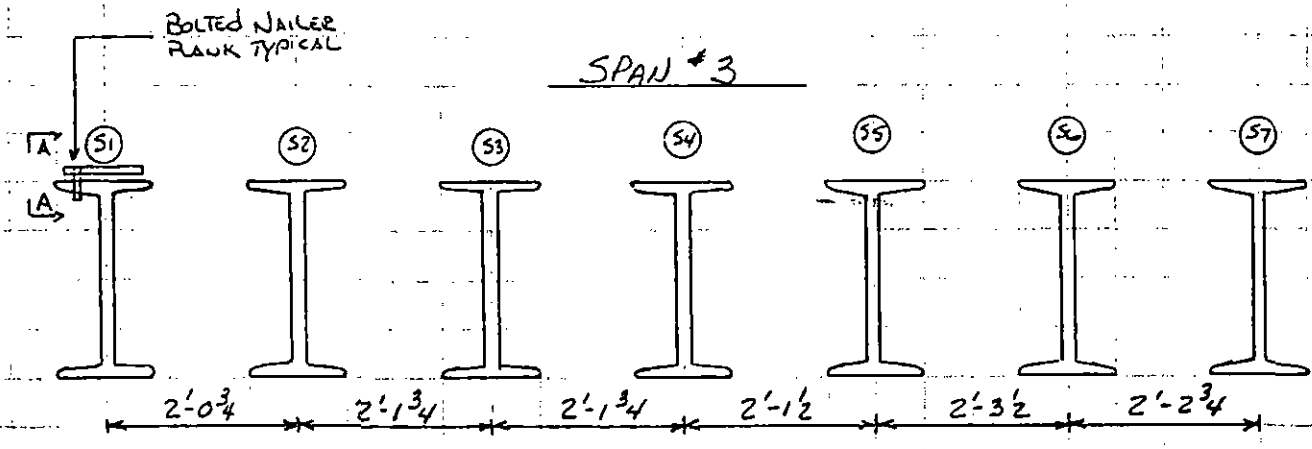


REV. DATE	BY
REV. DATE	BY
REV. DATE	BY
REV. DATE	BY

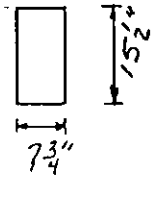
SPAN #2



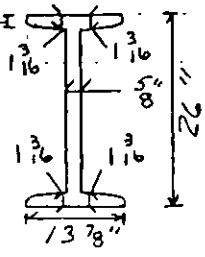
SPAN #3



SPAN #1 & #2 =

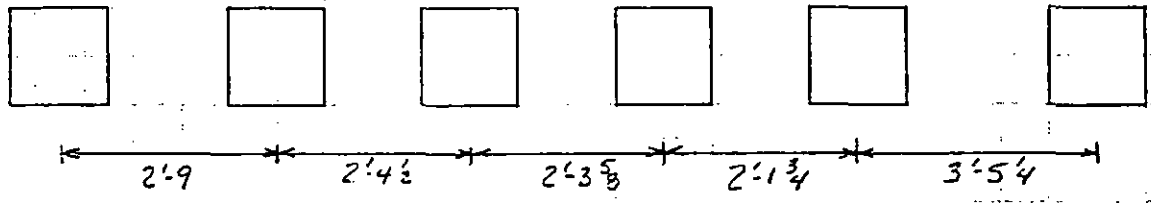


SPAN #3 =

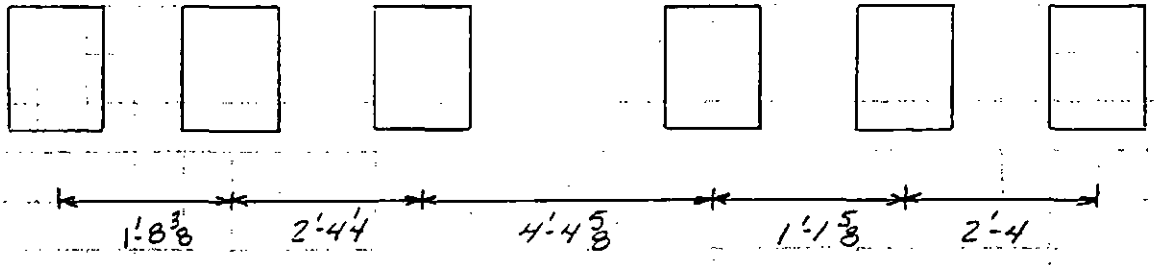


CROSS SECTIONS

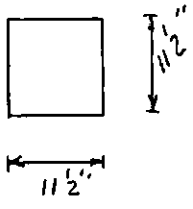
SPAN #4



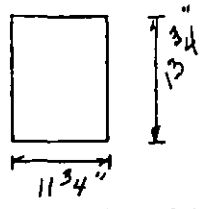
SPAN #5



SPAN #4 =



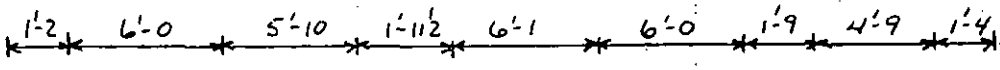
SPAN #5 =



(A) DECK PLANKS = 2¾" x 9" TO 9½"
(B) CURB BLOCK = 8¼" x 4¼"
(C) RAILING ANGLES = 3" x 2½" x ¼"
(D) NAILER PLANK = 2¾" x 10"

BRACING MEMBERS FOR BENTS = 2¾" x 10" & 3¾" x 7½"

BENT COLUMNS = 11¾" x 12¾" & 12" x 12"



℄ BENT 2

SEC. AA

APPROX. NAILER PLATE BOLT SPACINGS
SPAN 3

℄ BENT 3

REV. DATE	REV. DATE	REV. DATE	REV. DATE
BY	BY	BY	BY

ADDITIONAL INFORMATION

SHEET "AB"
PAGE 1

PADOT
Engineering Dist. 11-0
45 Thoms Run Road
Bridgeville, PA 15017-2853

Dear Mr. Ekiert,

As a result of the latest inspection by SAI CONSULTING ENGRS., the following action was taken by _____, for the bridge described below.

County: BEAVER; Road Name: T-649 (WEST ROAD)
BMS I.D. No.: 04 7210 0649 8302 (CSX RAILROAD BRIDGE)
Type of Structure: 5 SPAN STEEL AND TIMBER STRINGER BRIDGE
Other Descriptive Features: TIMBER SUBSTRUCTURE

The Inspection Report recommends the appropriate signing be placed/replaced/removed immediately. (See Page 2)

The Signs Required are:

3	Bridge R12-1-2		
4	Weight Limit	3	Tons R12-1
	Except Combinations		Tons R12-4
	Miles R12-1-1		
	Bridge Limited to One Truck		
	Narrow Bridge W5-2		
2	One Lane Bridge W5-3		
	Bridge Closed		
	Barricades (Type III)		
	No Trespassing		
2	Clearance Markers Right W16-2R		
2	Clearance Markers Left W16-2L		
	Elevation Signs		
	Speed Limit		Miles Per Hour

**Municipality Representative - Please check (YES) or (NO)

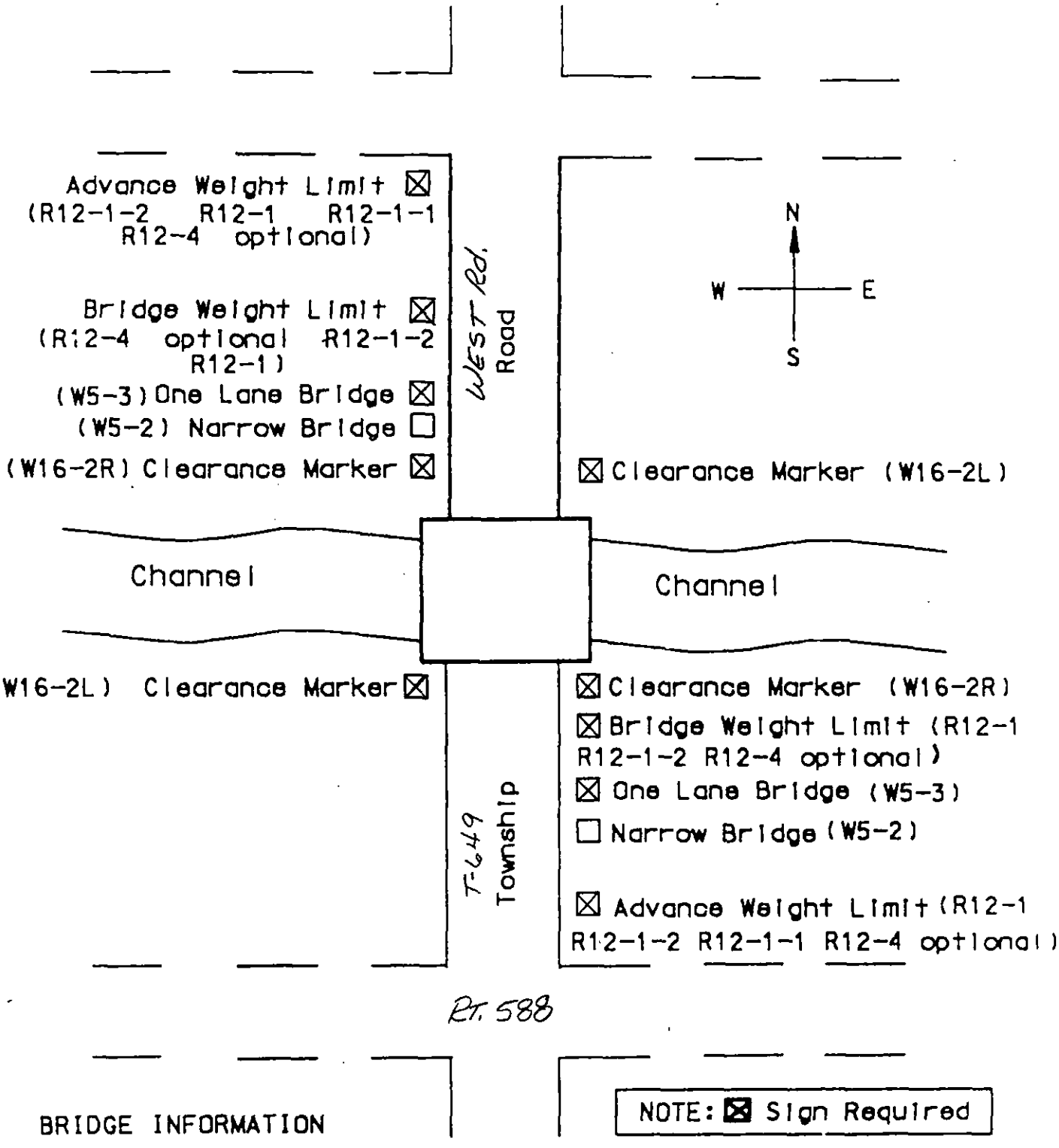
The bridge was posted previously, but according to the Engineer's recommendation, the posted weight limit needs to be reduced.
Was action taken? YES ( ) NO ( )

The appropriate signing was placed on (date)_____
Municipality Representative Signature _____

* If there are any questions, please contact Ron Todorowski, Local Bridge Posting Coordinator, at 429-4914.

* Upon completion of the proper signing, please sign and date this form and return it to the District Office.

Required Bridge Signs



NOTE: ☒ Sign Required

BRIDGE INFORMATION

B.M.S. Number 04 7210 0649 8302
Municipality Name MARION TWP. BEAVER COUNTY
Carrying Twp Road T-649 (WEST ROAD)
Bridge Type 5 SPAN STEEL AND TIMBER STRINGER
(CSX RAILROAD BRIDGE)

LIST OF ADDITIONAL DATA ITEMS REQUIRED BY FEDERAL HIGHWAY ADMINISTRATION

BMS No. 04 7210 0649 8302 9-29-95

BMS	FHWA			
	Item 92	Critical Feature Inspections (Yes or No & Frequency)		
		A. Fracture Critical Details	N — —	
		B. Underwater Inspection	N — —	
		C. Other Special Features	N — —	
	Item 93	Critical Feature Inspection Date (Mo. & Yr.)		
		A. Fracture Critical Details	— — — —	
		B. Underwater Inspection	— — — —	
		C. Other Special Features	— — — —	
A04 A	Item 98A	Border Bridge State Code	(N/A)	
A04 B	98B	% Share	(N/A)	
A04 C	Item 99	Border State Bridge No.	(N/A)	
C07 A	Item 112	NBIS Bridge Length Yes ✓ No —		
E29 A	Item 113	Scour Critical Bridge 6		

Rev. Date	Rev. Date	Rev. Date	Rev. Date	Rev. Date	Rev. Date
By	By	By	By	By	By

SAI HIGHWAYS • BRIDGES • CONSTRUCTION MANAGEMENT
CONSULTING ENGINEERS, Inc.
300 Sixth Avenue • Pittsburgh, Pennsylvania 15222-2511 • (412) 392-8750

NOVEMBER 7
~~September 15~~, 1995

CSX Transportation
500 Water Street
Jacksonville, FL 32202

Attention: Mr. Carl Medors

RE: NBIS Bridge Inspections
Beaver County, PA
Roadway Bridge (T-649) over CSX's P&W Subdivision Mainline at
Milepost BG-35.59
(CSXT Bridge #355A/D.O.T. #BO 145-802C)

Gentlemen:

As I discussed with Mr. Dave Taubken of your Pittsburgh office, SAI Consulting Engineers, Inc. recently completed the field inspection and structural analysis of the above-referenced bridge under our contract with the Pennsylvania Department of Transportation.

Due to the capacity of the timber deck, ***the bridge posting should be reduced immediately from 15 tons to three tons.***

The posting should be put into effect immediately to reduce the possibility of overstressing the structure and causing subsequent damage to the bridge. Affected parties that regularly use the bridge, such as school buses, utility companies, maintenance vehicles, delivery trucks, etc., should be notified of the change in posting.

Following the posting of the bridge, please contact Mr. Ron Todorowski, PaDOT Local Bridge Inspection Coordinator, at (412) 429-4914 and inform him of the date and the actual weight limit of the posting.

If you have any questions or require additional information, please contact me at (412) 392-8771.

Very truly yours,

Glenn D. Stickel
Project Manager

GDS:crc
cc: L. Ruzzi - PaDOT District 11-0
D. A. Miller
Reading File (3)
Design File 9501\csx.ltr