PRESTRESSED CONCRETE BEAM END REPAIR (FINAL REPORT)

This report, authorized by the transportation director, has been prepared to provide technical information and guidance for personnel in the Michigan Department of Transportation, the FHWA, and other reciprocating agencies. The cost of publishing 50 copies of this report at $7.50 per copy is $374.80 and it is printed in accordance with Executive Directive 1991-6.

Technical Report Documentation Page

1. Report No. Research Report R-1380	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Prestressed Concrete Beam End Repair		5. Report Date January 6, 2000
7. Author(s) Douglas E. Needham, P.E.		6. Performing Organization Code
9. Performing Organization Name and Address Michigan Department of Transportation Construction and Technology Division P.O. Box 30049 Lansing, MI 48909		8. Performing Org Report No. RR-1380
12. Sponsoring Agency Name and Address Michigan Department of Transportation Construction and Technology Division P.O. Box 30049 Lansing, MI 48909		10. Work Unit No. (TRAIS) 11. Contract/Grant No.
15. Supplementary Notes		13. Type of Report & Period Covered Final Report 14. Sponsoring Agency Code

16. Abstract This final report details the construction problems that arose while performing Michigan Department of Transportation's prestressed concrete I-beam (PCI-beam) end repair on three in-service structures, actions taken to correct the problems, the structural condition of the beams after the repair, and a cost comparison between the PCI-beam end repairs with a total superstructure replacement. The three structures that received the PCI-beam end repairs were S05 and S11 of 33171 (NB and SB US-127 over Vine Street) and S07 of 47014 (NB and SB US-23 over Center Road). Problems encountered ranged from cutting position dowels, cutting prestressing strands, improper preparation of the bottom of the beam, lack of bevels on the concrete repair patch corners, improper mixing of the Grade D Latex Modified concrete, to improper placement of the end diaphragms. Although problems were encountered with these first field repairs, they can be resolved with plan modifications, along with increased experience and knowledge of these types of repairs. After performing a cost comparison between the PCI-beam end repairs and a superstructure replacement, we found that the cost for the PCI-beam end repairs ranged from 35 percent to 69 percent the cost of a superstructure replacement.

Therefore, awaiting the long term performance of the PCI-beam end repair, it is apparent that the PCI-beam end repair is economically beneficial when compared to a total superstructure replacement.

17. Key Words	18. Distribution Statement No restrictions. This document is available to the public through the Michigan Department of Transportation.		
19. Security Classification (report) Unclassified	20. Security Classification (Page) Unclassified	21. No of Pages	22. Price

Form DOT F 1700.7 (8-72)

ACKNOWLEDGMENTS

Although many people participated in this project, space and memory will not allow a complete list of everyone's involvement. However, the following people should be mentioned; Roger Till and David Juntunen for project guidance, Larry Pearson and Chris Davis of the Structural Research Unit for performing field inspections, Brighton and Lansing Transportation Service Centers for keeping us up-to-date with the construction schedules of the three bridges, and the Bridge Design Division for drawing the final plan details.

TABLE OF CONTENTS

INTRODUCTION

The majority of Michigan's prestressed concrete I-beams are in "good" condition with one common problem; the beam ends are experiencing more deterioration when compared with the remainder of the beam. Since roughly 60 percent (and rising) of the bridges built today are constructed with prestressed beams, this concerns bridge maintenance engineers. Therefore, the Structural Research Unit initiated a two part research project. The first part developed a prestressed concrete I-beam (PCI-beam) end repair procedure and verified its effectiveness by experimenting with a 1143-mm prestressed I-beam in the laboratory as described in, "Prestressed Concrete Beam End Repair (Interim Report R-1373)," which was published in September 1999. The second part involved performing the PCI-beam end repair on three in-service structures, S05 and S11 of 33171 (NB and SB US-127 over Vine Street) and S07 of 47014 (NB and SB US-23 over Center Road). The construction problems that arose during the field repairs, actions taken to correct these problems, the structural condition of the beam after the repairs, along with a cost comparison between the PCI-beam end repairs and a superstructure replacement are described in this final report.

The repair procedure developed during this project should be performed on prestressed concrete I-beams where the reinforcing steel is exposed or unsound concrete is present. Michigan Department of Transportation is currently evaluating passive cathodic protection systems for PCI-beam ends that are not deteriorated to the point of needing the "overcasting" repair, but could use some protection from further deterioration.

PRELIMINARY FIELD INSPECTIONS

Prior to the start of each project, the PCI-beams on all three structures were inspected for cracks and/or delaminations not located within the influence of the repair procedure. This initial inspection was used to determine if structural damage was caused as a result of the repair.

CONSTRUCTION PROBLEMS

Although the field repairs went rather smoothly, we discovered the following problems during the PCI-beam end repairs: cut position dowels; cut prestressing strands; improper preparation of the bottom of the beam; lack of bevels on the concrete repair patch corners; improper mixing of the Grade D Latex Modified concrete; and improper end diaphragm placement.

On all three structures, the position dowels were removed by air carbon arch gouging in order to replace the elastomeric bearing pads, which should not have occurred. Figure 1 displays a beam end with its position dowel and elastomeric bearing pad removed. The following notes were located in the contract plans to protect the condition of the existing position dowels, "Existing position dowels are to remain in place and care shall be taken not to damage them during

elastomeric pad removal" along with "Neither hand chipping the pier cap nor flame cutting will be allowed for removing existing elastomeric bearings." Even though these statements were located in the contract plans, no attempt was made to remove the existing elastomeric bearing pads without permanently removing the position dowels.

With the position dowels removed, the transverse restraint of the superstructure, along with the longitudinal and transverse restraint of the elastomeric bearing pads are lost (providing the frictional force between the concrete and elastomeric pad is exceeded). Through conversations with various MDOT personnel, along with the FHWA, the main purpose of Michigan's position dowels is to restrain the elastomeric bearing pad and not the beam end. American Association of State Highway and Transportation Officials Standard Specifications for Highway Bridges, 16th Edition (AASHTO Standard) Division 1A, Section 5.2, states that if a mechanical device is used to connect the superstructure to the substructure it shall be designed to resist a horizontal seismic force in each restrained direction equal to 0.20 times the tributary weight (reaction). With the mechanical device, i.e., the position dowel, removed, there is no other consideration of seismic forces required for the design of structural components since Michigan is located in a Category A seismic zone. However, Section 5.3, which states a minimum bearing support length, must still be satisfied. In addition to the seismic requirements, Section 14.6.6.4 of AASHTO Standard under elastomeric pad design states that if the longitudinal force (i.e., temperature force) that causes the elastomeric pad to deform exceeds 20 percent of the minimum vertical force, the pad shall be secured against horizontal movement. Restraints were not placed on the structures to account for the loss of elastomeric pad restraint.

Cutting the prestressing stands at the concrete repair patch limit was the next encountered problem. In order to eliminate a feather edge of the concrete patch material, the repair detail specifies a 13 mm deep saw cut at removal limits (bottom flange only). These cuts were made using a hand-held circular saw with a diamond tip blade starting at the top of the bottom flange and projecting downward. It appeared that no measures were taken to limit their depth. This resulted in some cuts about 64 mm deep, roughly five times the depth as specified in the contract plans. With only 50 mm of clear cover for the prestressing strands, it is apparent that the prestressing strands would be severed at this depth, refer to Figure 2. Even after numerous reminders to the Contractor not to damage the strands, this was a reoccurring problem on all three structures. All of the cut strands were located within the effective shear depth. The effective shear depth is the distance from the beam end where the reaction force in the direction of the applied shear introduces compression into the region. Therefore, due to the conservative nature of the design and the proximity of the damaged strands to the beam end, it was decided to not risk further damage to the beam by repairing the strands.

As previously described, the repair detail specifies a 13 mm deep saw cut at removal limits (bottom flange only) in order to eliminate a feather edge of the concrete patch material. Although an attempt to create these saw cuts to the sides of the bottom flange was made, little to no attempt was made to create them to the underside of the bottom flange. This lack of preparation resulted in a feather edge. In addition to the lack of durability, the feather edge is

aesthetically unpleasing since the patch limits vary on the beam ends. Also, the forms were not placed flush with the bottom flange, which resulted in about a 3 mm lip on the underside of the beam. Refer to Figure 3 for a profile of the patch limits.

Along the lines of eliminating a feather edge, the PCI-beam end repair specifies a bevel edge along all exterior corners of the patch (i.e., vertically along the web and horizontally along the lower portion near the bottom flange). Although this detail is displayed clearly in the contract plans, only some of the patches received the required bevel. Some patches only received a bevel along the vertical exterior corner of the web, Figure 4, and some patches only received the proper bevel detail on the horizontal lower portion of the patch near the bottom flange, Figure 5.

Mixing problems with the Grade D Latex Modified concrete were encountered even though a concrete mobile mixer was used. Possible explanations could be a low shoot angle during the mixing process or a blocked gate. Even though most of the mixing problems were resolved prior to placing the concrete, in some cases they were not. Figure 6 displays the improper mixing (and vibration) of the Grade D Latex Modified concrete. The patch surfaces where aggregate was exposed was hand patched for aesthetic purposes.

As stated in the contract plans, there were two different options for the Contractor to reinstall the end diaphragms. On two of the three structures, neither option was used. The first option according to the contract plans is to construct the end diaphragm using a one on one haunch up from the top of the bottom flange then extending parallel to the top of pier to the adjacent beam. The second option is to extend a line between the top of the bottom flange and omit the haunch. In the second option, the added concrete quantity is not included in the pay item. These options are specified for ease of future bridge inspections. For two of the structures, S05 and S11 of 33171, the end diaphragm was cast directly on top of the pier cap using thin lumber as spacers between the bottom of the patch and the top of the pier, refer to Figure 7. This makes future inspection of the beam ends impossible.

The penetrating epoxy concrete sealer, as specified in the contract plans, proved to be an esthetically unpleasing topcoat, refer to Figure 8. The epoxy based sealer was chosen over the silane and siloxane based sealers due to its anticipated increased service life. In the past, the epoxy based sealer was reserved for applications where it was not visible to the motoring public, i.e., top of pier caps. However, for this project it was specified to be placed the on the exterior surface of the fascia beams as well as the beam ends that did not receive the repair.

MONTHLY INSPECTIONS

Part two of this research project includes monthly inspections of the PCI-beams for a period of one year following the repairs. Through these inspections, we will be able to determine if any structural damage occurred to the beams as a result of the repairs. After six months of inspection, only two additional cracks were found on S11 of 33171. These longitudinal cracks

are located on the underside of the east fascia beam flange, span 2. One crack, 900 mm long, is located on the north end and the other crack, 300 mm long, is located on the south end of the beam. Both cracks initiated under the concrete overcast patch and extend into the unrepaired concrete. It is apparent that the cracks are a result from the construction activity due to their longitudinal orientation. The monthly (or bimonthly) monitoring will continue until August 2000. At that time, an addendum to this report will be generated stating the one year performance of the beams. This future addendum will be generated to expedite the publishing of this report.

PLAN REVISIONS

Due to the problems encountered during the field repair of the PCI-beam ends, the following revisions to the standard detail sheet for the PCI beam end repair have been made.

- ***Use one repair method for PCI-beams with and without an end block.***
  By eliminating the detail for beams without and end block, the bottom flange will have added protection against future chloride infiltration.

- ***Add the following plan note - "25 mm (1") max depth saw cut at removal limits (bottom flange only)(do not cut prestressing strands)"***
  This should eliminate the problems associated with cutting the prestressing strands.

- ***Extend the patch 75 mm below the bottom flange.***
  This will eliminate the problems associated with the feather edge along with not placing the forms flush with the bottom of the beam.

- ***Use an acrylic based concrete sealer in lieu of the penetrating epoxy sealer.***
  By switching to an acrylic based sealer the coating will be esthetically pleasing.

Refer to Appendix A for the revised plan details.

COST COMPARISON

We were fortunate to have both a PCI-beam end repair procedure (S05 & S11 of 33171) and a superstructure replacement (S06 & S12 of 33171) included in the same job. Therefore, we were able to perform a direct cost comparison between the two operations. The superstructure replacement was performed on two structures similar in size and location as the structures with the PCI-beam end repairs. The total deck areas for the superstructure replacement and the PCI-beam end repairs are roughly 1025 m^2 and 900 m^2, respectively.

Using the tabulation of bids obtained from the December 4, 1998, letting, along with the contract

plan quantities, we determined the total bid cost for the repair and for the superstructure replacement from three contractors. Note that the contract award was received by the first contractor. Refer to Figure 9 for a breakdown of the bid items, quantities, and unit prices. The range in bids for the PCI-beam end repair are described below.

1. Midwest Bridge - $307,775
2. CA Hull - $361,476
3. Hardman Construction - $558,408

Two of the three bids were below the engineers estimate of $412,733.

The range of bids for the superstructure replacement are as follows. The contract award was received by the first contractor. Refer to Figure 10 for a breakdown of the bid items, quantities, and unit prices.

1. Midwest Bridge - $867,164
2. CA Hull - $964,794
3. Hardman Construction - $814,506

All three estimates exceeded the engineers estimate of $746,098.

As can be seen for the bid prices, the PCI-beam end repair ranges from 35 percent to 69 percent the cost of the superstructure replacement. Therefore, awaiting the long term performance of the PCI-beam end repair, it is apparent that the PCI-beam end repair is economically beneficial when compared to a total superstructure replacement.

Although we cannot directly compare the PCI-repair cost of S07 of 47014 to a superstructure replacement on the same job, we will include the range of bids from the December 4, 1998, letting for information only. The contract award was received by the first contractor. Refer to Figure 11 for a breakdown of the bid items, quantities, and unit prices. The total deck area for these PCI-beam end repairs was roughly 950m^2.

1. Interstate Highway - $593,508
2. Ajax Paving - $655,908
3. Angleo Iafrate - $589,859
4. Tony Angelo - $621,188

All four estimates exceeded the engineers estimate of $411,392.

CONCLUSIONS

Although problems were encountered with these first field repairs, they can be resolved with the modifications made to the plan sheets along with increased experience and knowledge of these types of repairs. Performing this repair, along with replacing the deck joint, should extend the service life of the structures at least 30 to 40 years. Comparing the cost of the PCI-beam end repair to that of a similar structures superstructure replacement on the same job, we discovered that the PCI-beam end repair is economically beneficial when compared to a total superstructure replacement.

FIGURES

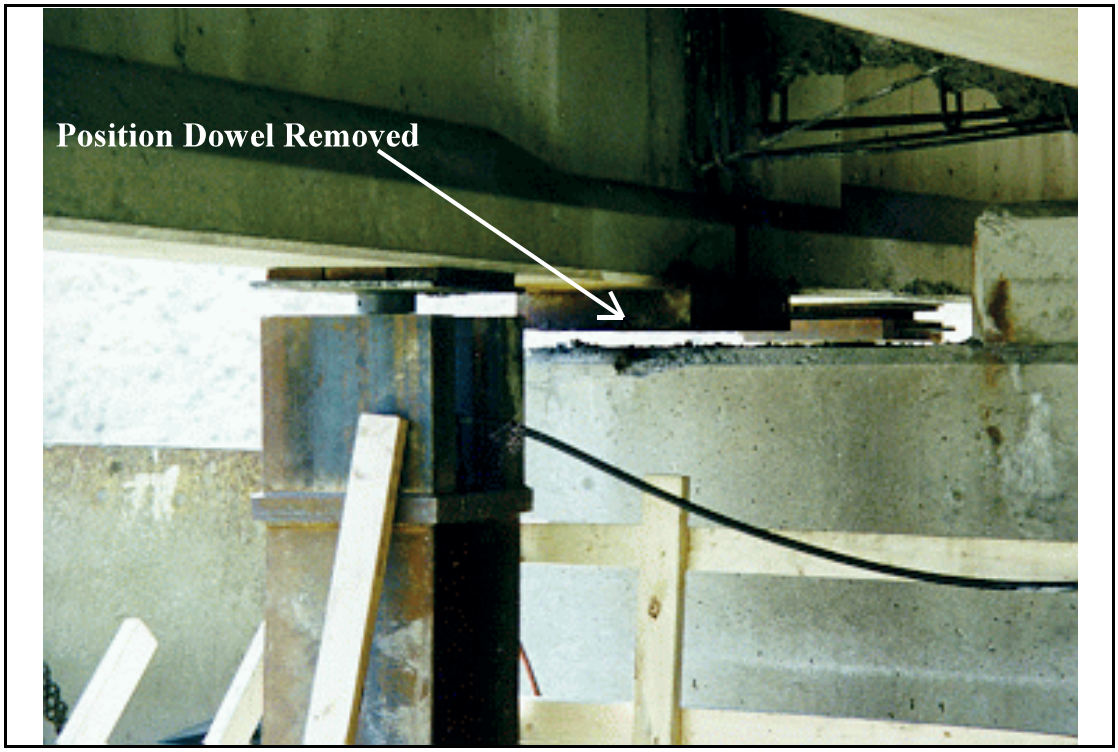


Figure 1 - Position dowel removed.

Figure 2 - Prestressing strands cut.

Figure 3 - Feather edge on bottom flange.

Figure 4 - Bevel only along vertical exterior corner of web.

Figure 5 - Bevel only on horizontal lower portion near bottom flange.

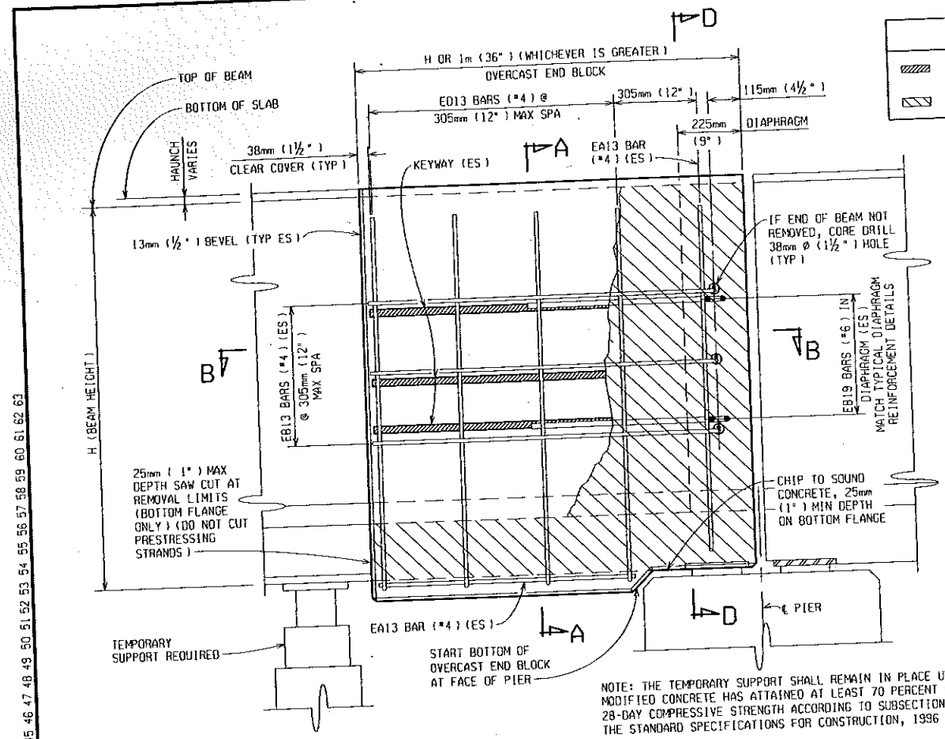
Figure 6 - Exposed aggregate.

Figure 7 - End diaphragm too close to top of pier.

Figure 8 - Appearance of concrete penetrating epoxy sealer.

APPENDIX A

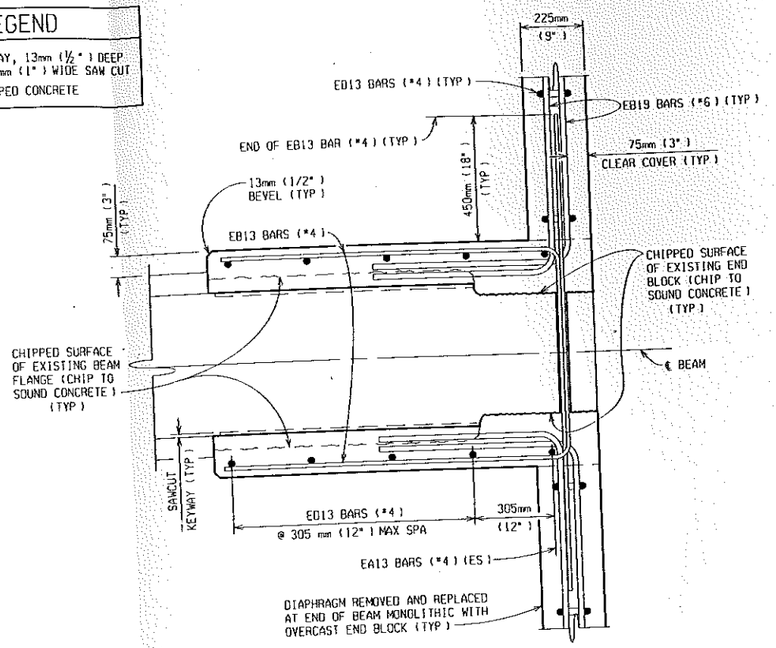
REVISIONS			
NO.	DESCRIPTION	DATE	BY



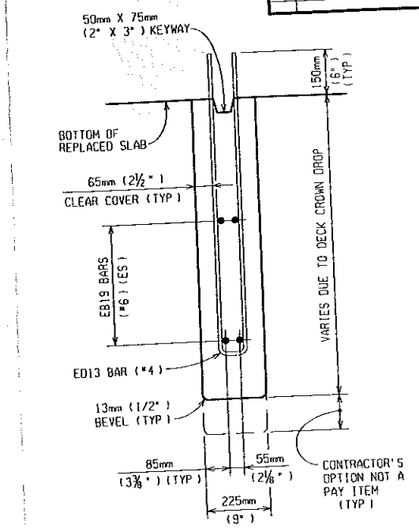
NOTE: THE TEMPORARY SUPPORT SHALL REMAIN IN PLACE UNTIL THE LATEX MODIFIED CONCRETE HAS ATTAINED AT LEAST 70 PERCENT OF ITS MINIMUM 28-DAY COMPRESSIVE STRENGTH ACCORDING TO SUBSECTION 701.03.F.6 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, 1996 EDITION.

BEAM END ELEVATION

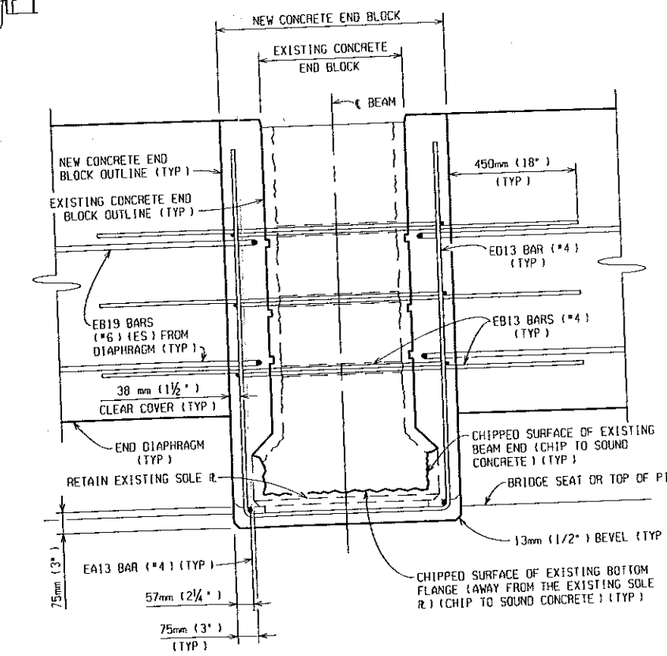
(SITUATION AT PIER IS SHOWN. SITUATION AT ABUTMENT WITH INDEPENDENT BACKWALL IS SIMILAR)



SECTION B-B

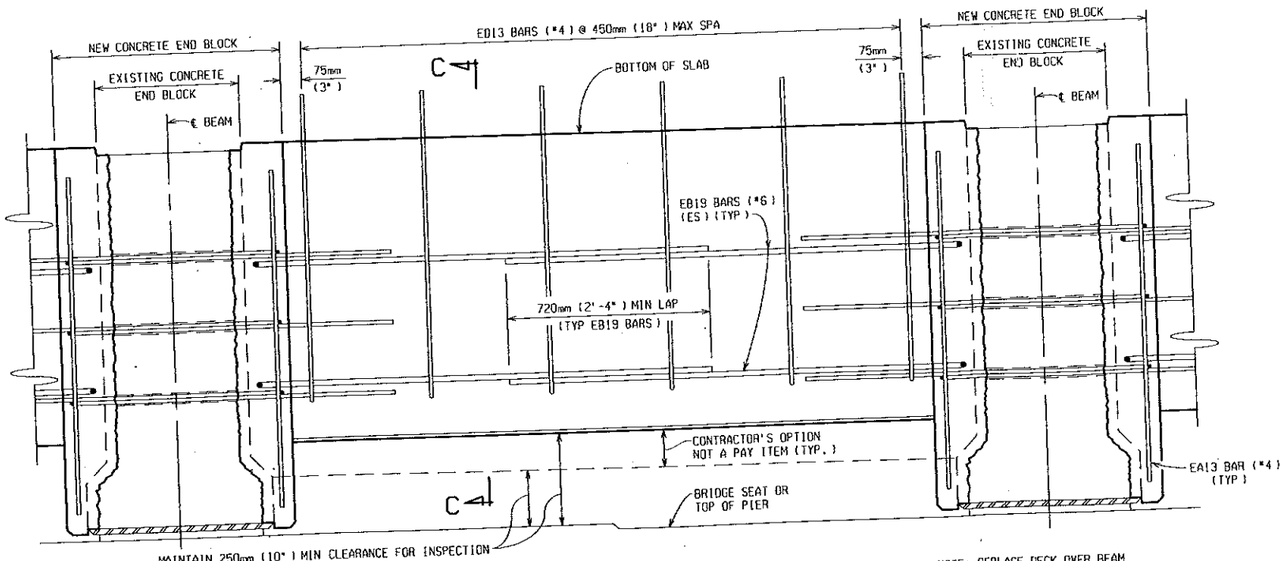


SECTION C-C



SECTION A-A

(ED13 BARS IN DIAPHRAGMS NOT SHOWN)



NOTE: REPLACE DECK OVER BEAM END REPAIR AREA.

SECTION D-D (DIAPHRAGM ELEVATION)

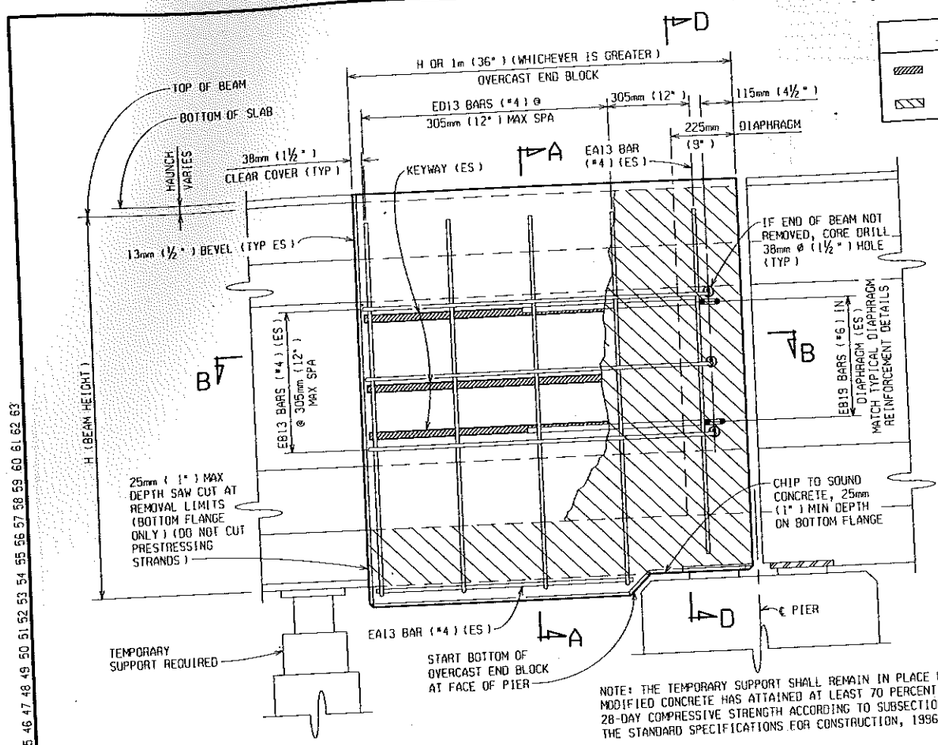
(SHOWING STEEL REINFORCEMENT)

MDOT Michigan Department of Transportation	PCI-BEAM END REPAIR DETAILS (WITH EXISTING END BLOCKS)				
	DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
	10/12/99	OF		JILDEH	1 OF 2

CONTROL SECTION JOB NO. OF JOB NO.

DRAWN BY: Larry R. Bailey DATE: 11-19-97 CHECKED BY: G. Lawson DATE: 11-24-97 CORRECTED BY: G LAWSON DATE: 10-12-99

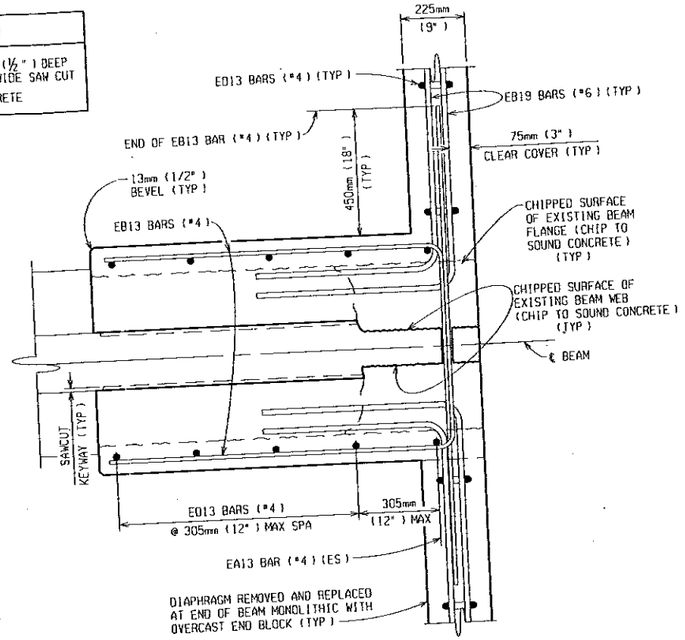
FILE NAME: pcibeamrepair.dgn



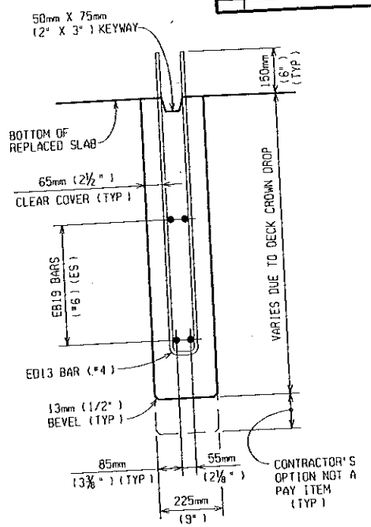
BEAM END ELEVATION

(SITUATION AT PIER IS SHOWN. SITUATION AT ABUTMENT WITH INDEPENDENT BACKWALL IS SIMILAR)

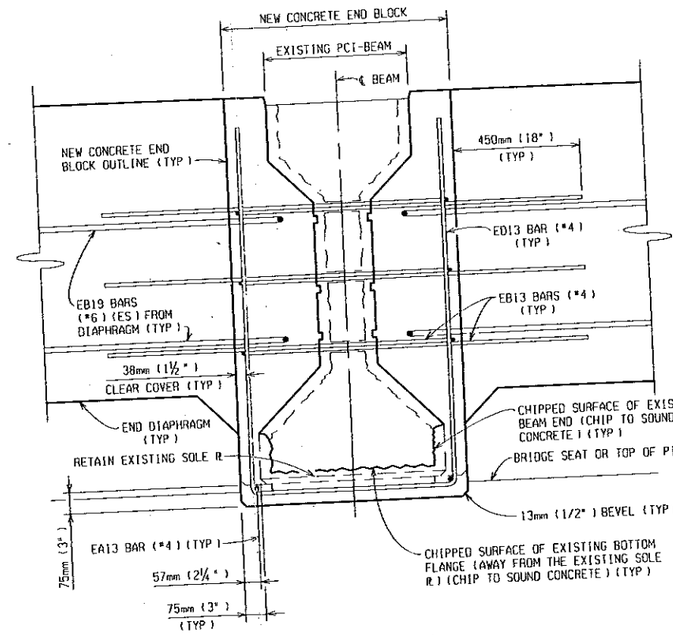
NOTE: THE TEMPORARY SUPPORT SHALL REMAIN IN PLACE UNTIL THE LATEX MODIFIED CONCRETE HAS ATTAINED AT LEAST 70 PERCENT OF ITS MINIMUM 28-DAY COMPRESSIVE STRENGTH ACCORDING TO SUBSECTION 701.03.F.6 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, 1996 EDITION.



SECTION B-B

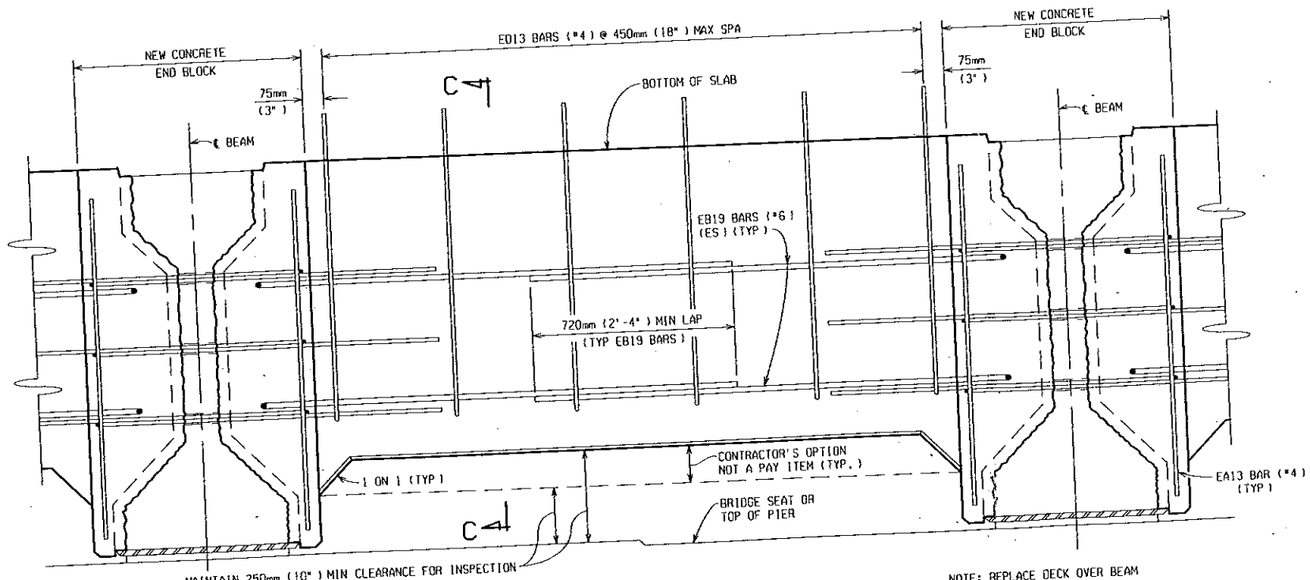


SECTION C-C



SECTION A-A

(ED13 BARS IN DIAPHRAGMS NOT SHOWN)



SECTION D-D (DIAPHRAGM ELEVATION)

(SHOWING STEEL REINFORCEMENT)

NOTE: REPLACE DECK OVER BEAM END REPAIR AREA.

PCI-BEAM END REPAIR DETAILS (WITHOUT EXISTING END BLOCKS)

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
10/12/99	OF		JILDEH	1 OF 2

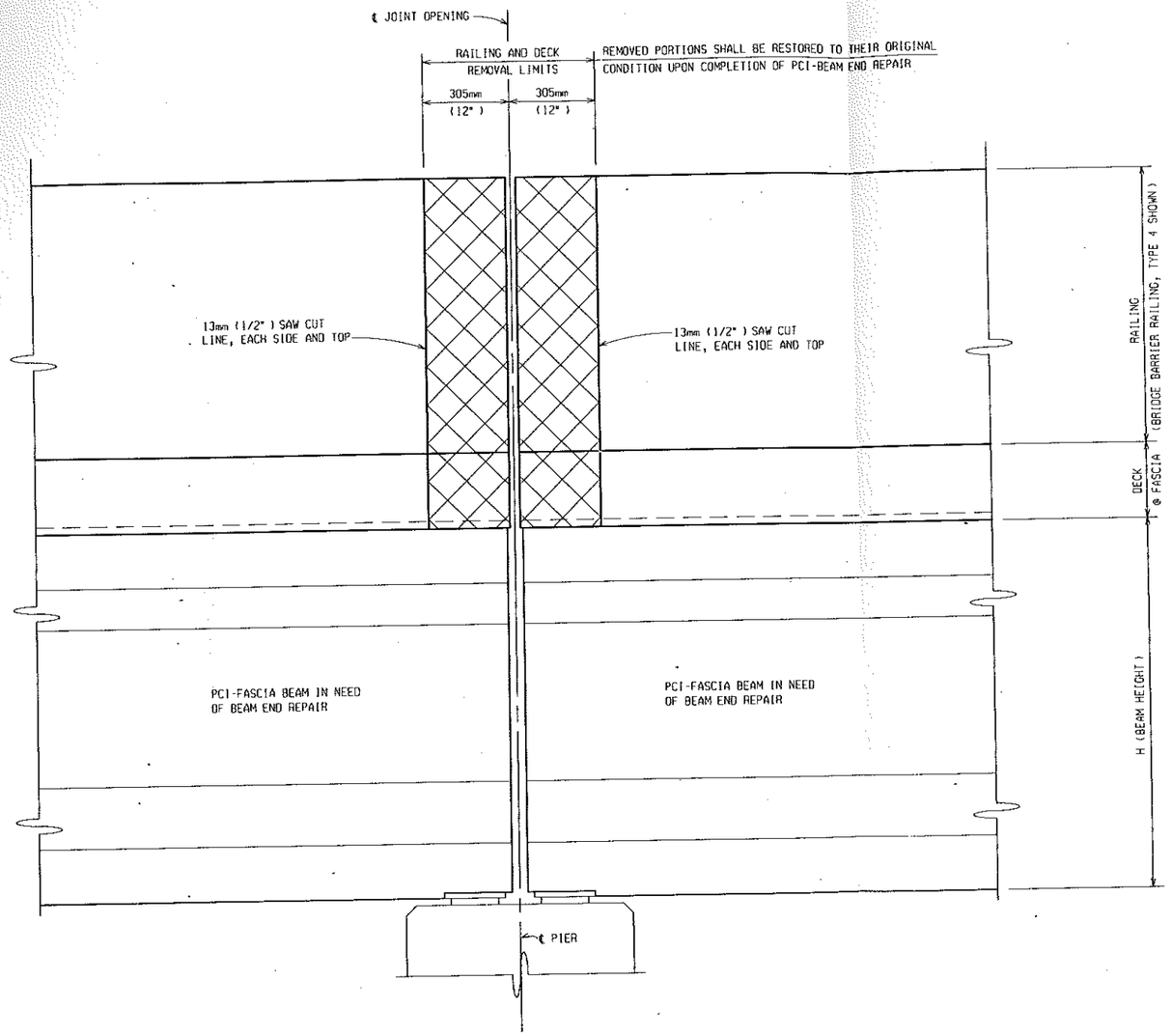
MDOT Michigan Department of Transportation

DATE: 10-12-99 CORRECTED BY: G LAWSON
DATE: 11-24-97 CHECKED BY: G. Lawson
DRAWN BY: Larry A. Bailey DATE: 11-19-97 CHECKED BY: Larry A. Bailey
FILE NAME: npcibeam.dgn

SECTION

CONTROL SECTION | OF | JOB NO. | SH. NO.

REVISIONS			
NO.	DESCRIPTION	DATE	BY



ELEVATION OF FASCIA SHOWING SLAB AND RAILING REMOVAL LIMITS

(BRIDGE BARRIER RAILING, TYPE 4 IS SHOWN. SITUATION USING OTHER RAILING TYPES, INCLUDING RAILINGS ON BRUSH BLOCKS OR SIDEWALKS , IS SIMILAR)

▨ DENOTES REMOVAL LIMITS REQUIRED FOR PROPER PLACEMENT OF CONCRETE DURING EXTERIOR PORTION OF FASCIA BEAM END REPAIR.

PORTION OF RAILING, BRUSH BLOCK OR SIDEWALK (IF REQUIRED, AND SLAB SHALL BE REMOVED AS SHOWN, ONLY IF EXTERIOR SIDE OF FASCIA BEAM WILL RECEIVE PCI-BEAM END REPAIR.

DURING REMOVAL, CARE SHALL BE TAKEN TO AVOID DAMAGING THE EXISTING STEEL REINFORCEMENT IN THE RAILING, BRUSH BLOCK OR SIDEWALK IF REQUIRED, AND PORTION OF SLAB. ONCE THE PCI-FASCIA BEAM REPAIR IS COMPLETED, THE EXPOSED STEEL REINFORCEMENT SHALL BE CLEANED, STRAIGHTENED AND RECAST INTO PROPOSED CONCRETE, NOT PAID FOR SEPARATELY BUT INCLUDED IN THE BID ITEM "CONCRETE, GRADE D".

STEEL RAILING POSTS, TUBES AND ATTACHMENT HARDWARE REQUIRING REMOVAL, SHALL BE SALVAGED AND REINSTALLED, NOT PAID FOR SEPARATELY BUT INCLUDED IN THE BID ITEM "CONCRETE, GRADE D".

REMOVAL AND REPLACEMENT LIMITS MAY BE INCREASED AT THE CONTRACTORS EXPENSE.

MISCELLANEOUS QUANTITIES

ea	Support, Column, Temp
LS	Structures, Rem Portions *
m3	Hand Chipping, Other Than Deck **
m2	Bearing, Elastomeric, mm
kg	Reinforcement, Steel, Epoxy Coated
m3	Conc, Grade D Latex Modified
m3	Conc, Grade D

* TO REMOVE DIAPHRAGMS AND ELASTOMERIC PADS
** BEAM END REMOVAL

NOTES:

[NOTE TO DESIGNER: THIS BEAM END REPAIR SHOULD BE USED WHEN THE REINFORCING STEEL IS EXPOSED OR UNSOUND CONCRETE IS PRESENT. IF THE BEAM END IS NOT SEVERELY DETERIORATED, THEN A CONCRETE SEALER SHALL BE APPLIED TO THE BEAM END, NOT LESS THAN TWICE THE BEAM DEPTH.]

[NOTE TO DESIGNER: THE DESIGNER MUST CHECK AND MAINTAIN VERTICAL CLEARANCE OVER COMPLETE USABLE SHOULDER AND TRAFFIC LANES.]

[NOTE TO DESIGNER: THE TEMPORARY SUPPORT MUST BE DESIGNED TO CARRY BOTH DEAD LOAD AND LIVE LOAD.]

IF THE CONTRACTOR ELECTS TO REPAIR MORE THAN ONE BEAM END AT A TIME, WORK SHALL NOT BE DONE ON THE SAME END OF ANY ADJACENT BEAM OR AT THE OPPOSITE END OF THE BEAM BEING REPAIRED.

ES DENOTES EACH SIDE

USE HAND HELD 15 kg (30#) MAX. PNEUMATIC HAMMER TO CHIP BEAM END AND REMOVE DIAPHRAGM, EXCEPT AROUND THE STRANDS WHERE ONLY HAND MAULS OR 7 kg (15#) PNEUMATIC HAMMERS WILL BE ALLOWED.

"HAND CHIPPING OTHER THAN DECK" WILL NOT REQUIRE REMOVAL OF SOUND CONCRETE AS SPECIFIED IN SUBSECTION 712.03.D2 OF STANDARD SPECIFICATIONS FOR CONSTRUCTION, 1996 EDITION.

EXISTING SMOOTH CONCRETE SURFACE WITHIN THE PATCH LIMITS SHALL BE ROUGHENED TO LIGHTLY EXPOSE THE AGGREGATE PRIOR TO THE PLACEMENT OF THE PATCH MATERIAL. THIS WORK SHALL BE PAID FOR AS "CONCRETE, GRADE D, LATEX MODIFIED".

ADHESIVE ANCHOR #13 BARS INTO 38 mm Ø HOLES IN BEAM WEB. THE COST OF DRILLING HOLES TO PLACE STEEL REINFORCEMENT AND ADHESIVE ANCHORING WILL BE INCLUDED IN THE PAYMENT FOR "REINFORCEMENT, STEEL, EPOXY COATED." ADHESIVE SHALL BE CHOSEN FROM THE CURRENT QUALIFIED PRODUCTS LIST FOR ADHESIVE SYSTEMS FOR STRUCTURAL ANCHORS AND LANE TIES.

DRILLING OF HOLES SHALL NOT BE PERMITTED, EXCEPT AS NOTED.

REPLACE ELASTOMERIC PADS AS SHOWN ON THE PLANS.

THE ELASTOMERIC BEARING PAD SHALL BE REPLACED PRIOR TO PLACING THE LATEX MODIFIED CONCRETE.

EXISTING SOLE PLATE AND BEARING PLATE SHALL NOT BE REMOVED DURING REPAIR.

THE EXPOSED AREAS OF THE EXISTING BEARING, PRESTRESSING (BONDED AND DEBONDED) STRANDS, REINFORCING STEEL IN THE REPAIR AREA, AND SOLE PLATES NOT IN CONTACT WITH THE ELASTOMERIC BEARING PAD SHALL BE HAND-TOOL CLEANED AND COATED WITH A BRUSH APPLIED ALUMINUM FILLED MASTIC BEFORE RECASTING CONCRETE. THIS WORK SHALL BE PAID FOR AS "HAND CHIPPING OTHER THAN DECK".

NEITHER HAND CHIPPING THE PIER CAP NOR FLAME CUTTING WILL BE ALLOWED FOR REMOVING EXISTING ELASTOMERIC BEARINGS.

THE COST OF THE WORK AND MATERIALS REQUIRED TO FORM THE DIAPHRAGMS AND OVERCAST END BLOCK WILL NOT BE PAID FOR SEPARATELY, BUT WILL BE INCLUDED IN THE PAYMENT FOR "CONCRETE, GRADE D, LATEX MODIFIED."

USE LATEX MODIFIED CONCRETE, F'c = 31.5 MPa (4500 PSI) (WITH 26 A COARSE AGG.)

CAST END DIAPHRAGM AND OVERCAST END BLOCK MONOLITHIC.

ALL NEW STEEL REINFORCEMENT SHALL BE EPOXY COATED, GRADE 400.

ALL REQUIRED SAW CUTTING (INCLUDING KEYWAYS IN BEAM WEB) WILL NOT BE PAID FOR SEPARATELY BUT WILL BE INCLUDED IN PAYMENT FOR "HAND CHIPPING, OTHER THAN DECK".

THE LIMITS OF THE CONCRETE SEALER SHALL INCLUDE THE OUTSIDE FACE FOR THE FULL LENGTH OF THE FASCIA BEAMS AND ALL SURFACES OF ALL BEAM ENDS NOT BEAING REPAIRED FOR A LENGTH NOT LESS THAN TWICE THE BEAM DEPTH. REFER TO SPECIAL PROVISION FOR CONCRETE SURFACE SEALERS FOR PRODUCT INFORMATION AND SURFACE PREPARATION.

MDOT Michigan Department of Transportation

PCI-BEAM END REPAIR DETAILS

DATE	CONT. SEC.	JOB NO.	DESIGN UNIT	SHEET
10/12/99	OF		JILDEH	2 OF 2

DATE: 10-12-99 | CHECKED BY: G. Lawson | DATE: 11-24-97 | CORRECTED BY: G LAWSON | DATE: 11-19-97 | DRAWN BY: Larry R. Bailey | FILE NAME: mocbeam.rpr