



GOVERNMENT OF MALAYSIA  
MINISTRY OF WORKS  
PUBLIC WORKS DEPARTMENT

THE STUDY  
ON  
THE MAINTENANCE AND REHABILITATION  
OF  
BRIDGES  
IN  
MALAYSIA

FINAL REPORT

VOLUME IV  
DRAWINGS




DECEMBER 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

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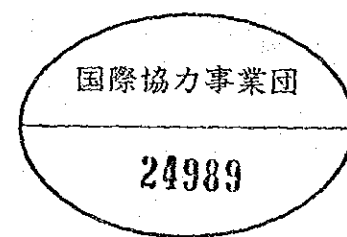
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2) WATER PIPE LINE		13) L.L.N. MARKER	
3) CABLE PIPE LINE		14) WATER PIPELINE MARKER	
4) RAILING		15) REFLECTOR POLE	
5) WING WALL		16) TELEPHONE POST	
6) RETAINING WALL		17) LAMP POST	
7) CONCRETE DRAIN		18) ELECTRIC POST	
8) CUTTING		19) SIGN BOARD	
9) FENCE/GATE		20) MANHOLE	
10) PERMANENT BUILDING		21) HYDRANT	
11) TEMPORARY BUILDING		22) MEAN WATER LEVEL	
		23) HIGH WATER LEVEL	

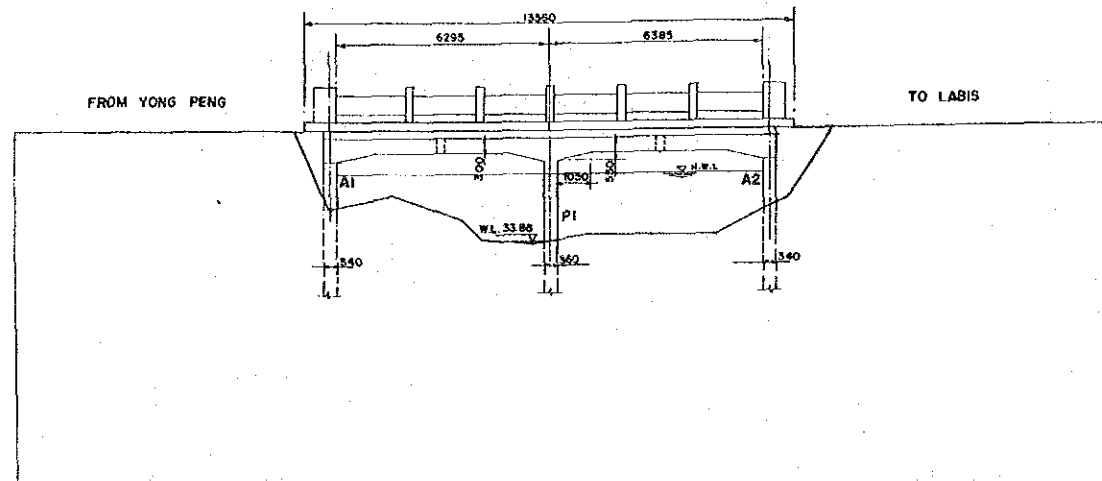


## **1. DETAILED SURVEY DRAWINGS**

## LIST OF DRAWINGS

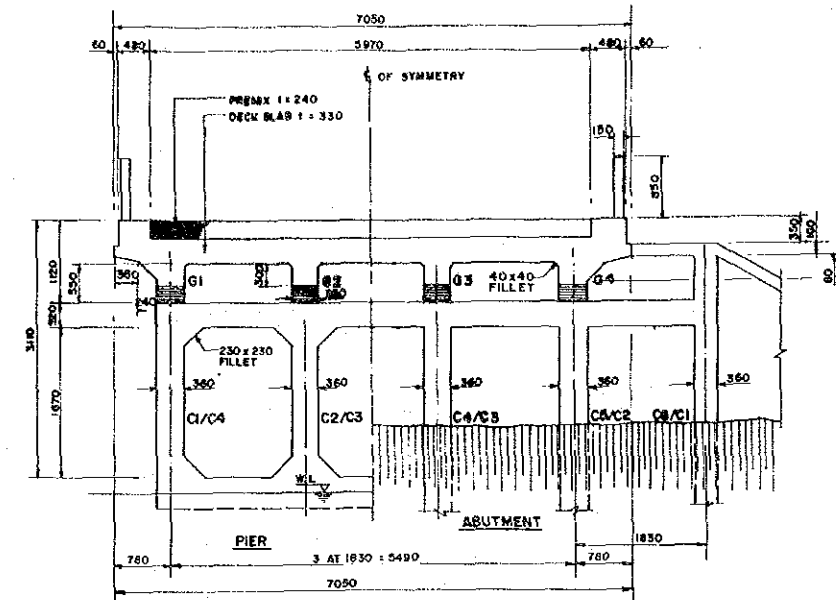
BRIDGE NO.	TITLE OF DRAWING	SCALE	DRAWING NO.
001/149/20 (RCB)	GENERAL VIEW	1:100, 1:50	DSS-1-1
	STRENGTH MEASUREMENT DIAGRAM	1:100, 1:50, 1:10	DSS-1-2
	CRACK DIAGRAM	1:50, 1:40, 1:30, 1:15	DSS-1-3
001/611/40 (SBB)	GENERAL VIEW	1:100, 1:50, 1:20	DSS-2-1
	STRENGTH MEASUREMENT DIAGRAM	1:100, 1:50	DSS-2-2
	CORROSION DIAGRAM (1/4)	NOT TO SCALE	DSS-2-3
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	CORROSION DIAGRAM (3/4)	NOT TO SCALE	DSS-2-5
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003/191/10 (PCB)	GENERAL VIEW	1:200, 1:50	DSS-3-1
	STRENGTH MEASUREMENT DIAGRAM	1:200, 1:50, 1:20	DSS-3-2
	CRACK DIAGRAM (1/3)	1:750, 1:200, 1:150, 1:40	DSS-3-3
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005/208/50 (SBE)	GENERAL VIEW	1:100, 1:50	DSS-4-1
	STRENGTH MEASUREMENT DIAGRAM	1:100, 1:50, 1:20, 1:10	DSS-4-2
	CRACK DIAGRAM (1/2)	1:50, 1:20	DSS-4-3
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005/469/80 (RCS)	GENERAL VIEW	1:100, 1:50	DSS-5-1
	STRENGTH MEASUREMENT DIAGRAM	1:200, 1:75, 1:20	DSS-5-2
	CRACK DIAGRAM (1/2)	1:100, 1:50	DSS-5-3
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059/031/20 (SBC)	GENERAL VIEW	1:100, 1:50	DSS-8-1
	STRENGTH MEASUREMENT DIAGRAM	1:100, 1:50, 1:10	DSS-8-2
	CORROSION AND CRACK DIAGRAM (1/2)	1:50, 1:30, 1:10	DSS-8-3
	CRACK DIAGRAM (2/2)	1:50, 1:20	DSS-8-4
SG. DAMBAI SABAH (SBC)	GENERAL VIEW	1:200, 1:50	DSS-9-1
	STRENGTH MEASUREMENT DIAGRAM (1/2)	1:200, 1:50, 1:10	DSS-9-2
	STRENGTH MEASUREMENT DIAGRAM (2/2)	1:50, 1:20	DSS-9-3
	CORROSION AND CRACK DIAGRAM (1/2)	1:200, 1:50, 1:10	DSS-9-4
	CORROSION AND CRACK DIAGRAM (2/2)	1:200, 1:50, 1:10	DSS-9-5
SG. SAMARAHAN SARAWAK (SBC & RCB)	GENERAL VIEW	1:200, 1:50	DSS-10-1
	STRENGTH MEASUREMENT DIAGRAM	1:200, 1:50, 1:20, 1:10	DSS-10-2
	CORROSION AND CRACK DIAGRAM	NOT TO SCALE	DSS-10-3

**ELEVATION**  
1:100

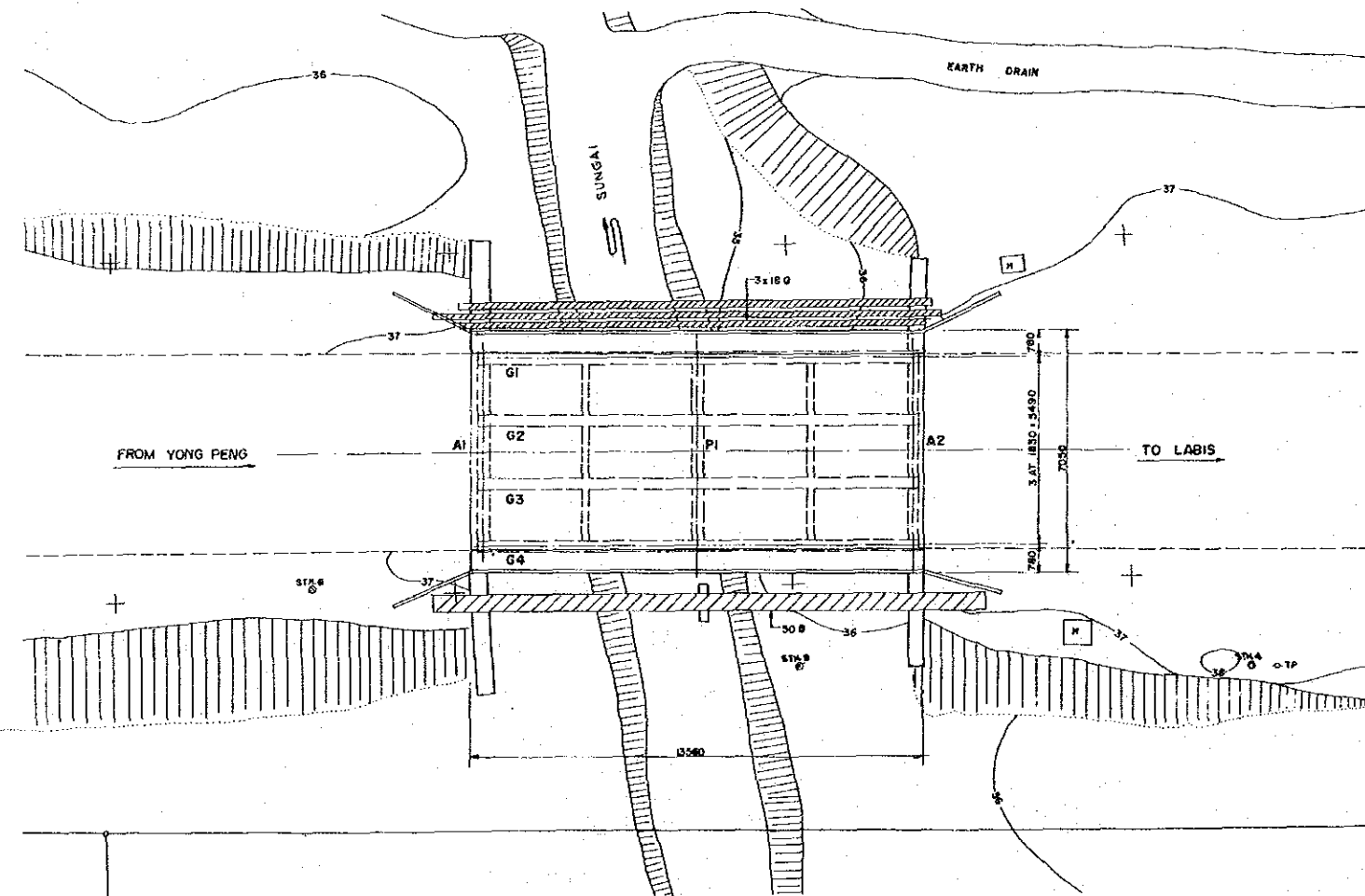


DATUM 27 M	
REDUCED LEVEL IN METRE	DISTANCE IN METRE
0.00	37.18
1.65	37.16
3.04	37.13
4.28	37.14
7.71	37.13
8.70	34.84
10.48	35.24
12.37	34.35
14.39	34.08
16.32	34.04
18.20	34.75
19.54	35.07
22.75	37.07
24.41	37.06
25.68	37.05
27.41	37.03
28.67	37.03
30.37	37.04

**CROSS SECTION**  
1:50

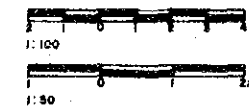


**PLAN**  
1:100



**BRIDGE DATA :**

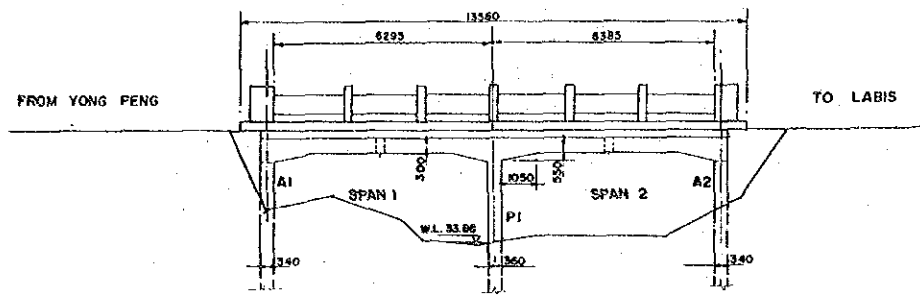
KEY NO :	1/149/20	
STATE :	JOHOR	
DISTRICT :	SEGAMAT	
DESIGN LIVE LOAD :	HA LOADING	
MATERIAL YIELD STRENGTH :	CONCRETE	SUPERSTRUCTURE : DECK 18 N/mm <sup>2</sup> BEAM 14 N/mm <sup>2</sup>
		SUBSTRUCTURE : 11 N/mm <sup>2</sup>
	STEEL	REBAR : 230 N/mm <sup>2</sup>
TYPE OF SUPERSTRUCTURE :	R.C. BEAM W / R.C. SLAB	
TYPE OF SUBSTRUCTURE :	ABUTMENT	R.C. PILE + CROSS HEAD
	PIER	R.C. PILE + CROSS HEAD
YEAR BUILT :	1955 (ESTIMATED)	



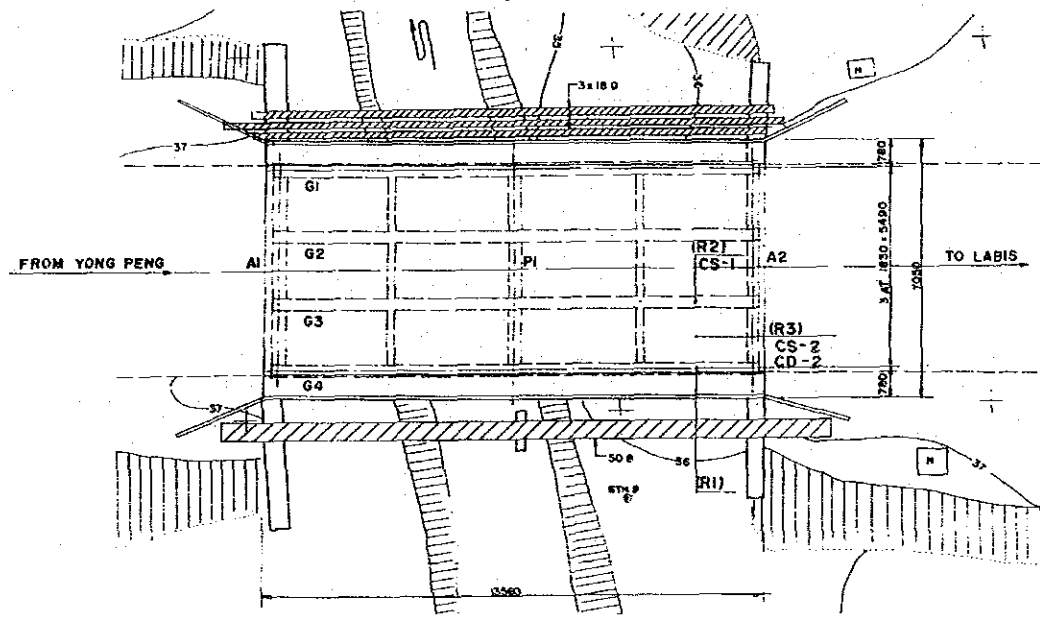
JICA	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	GENERAL VIEW	1/149/20	AS SHOWN	DSS-1-1



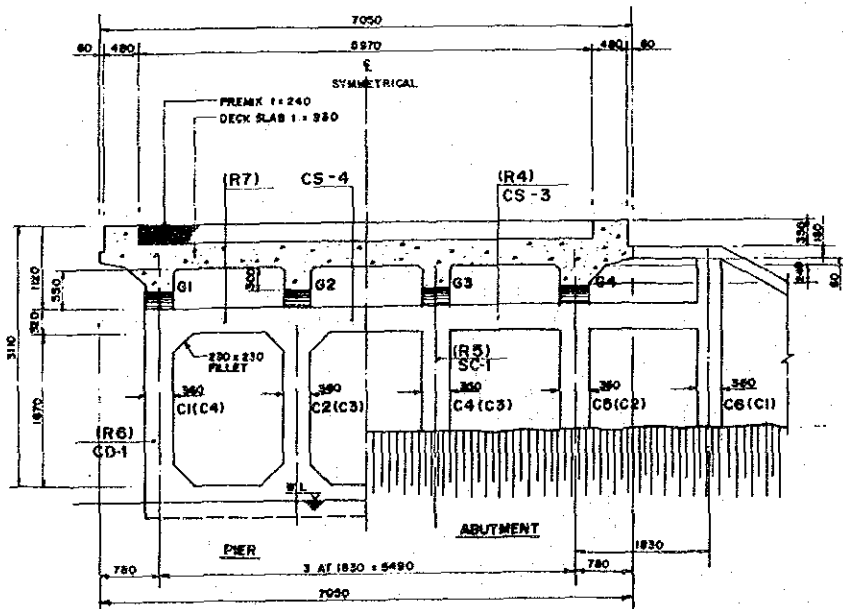
**ELEVATION**  
1:100



**PLAN**  
1:100



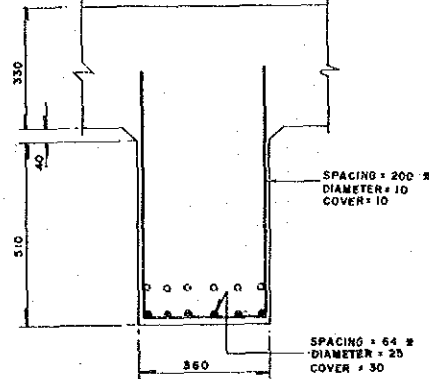
**CROSS SECTION**  
1:50



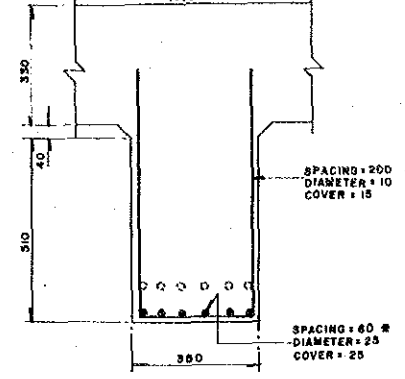
**STRUCTURAL DETAILS**

(LOCATIONS INDICATED BY R1 TO R7 ARE SHOWN IN PLAN AND CROSS-SECTION)

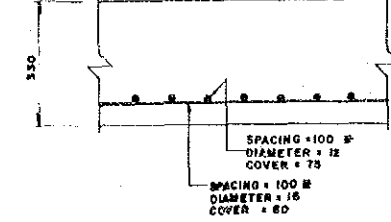
**(R1)**  
(G4 - SPAN 2)  
1:10



**(R2)**  
(G2 - SPAN 2)  
1:10

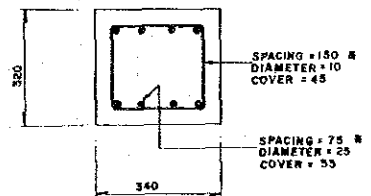


**(R3)**  
(DECK SLAB SPAN 2 BETWEEN G3 - G4)  
1:10



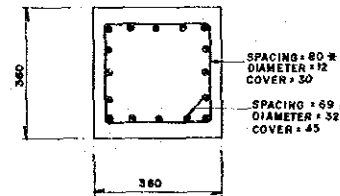
**(R4)**

(A2 - BETWEEN C3 - C4)  
1:10



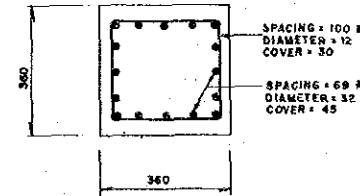
**(R5)**

(A2 - C4)  
1:10



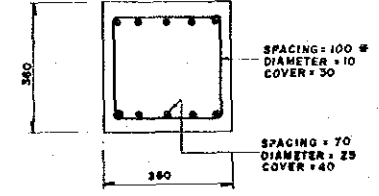
**(R6)**

(P1 - C3)  
1:10



**(R7)**

(1:10)



**TEST RESULTS**

**CONCRETE STRENGTH (UNIT: N/mm<sup>2</sup>)**

LOCATION	MEMBER	U.P.V. ①	S.H. ②
CS-1	G3 - S2	N/A.	14
CS-2	DECK - SPAN 2 - G3/G4	10	18
CS-3	A2 - CROSSHEAD BETWEEN C2 - C3	N/A.	11
CS-4	P1 - CROSSHEAD BETWEEN C2 - C3	N/A.	20

**CARBONATION DEPTH**

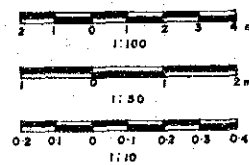
LOCATION	MEMBER	DEPTH (mm)
CD-1	P1 - C4	0
CD-2	DECK SLAB G2-G3/G4	12

**SULPHATE CONTENT (UNIT: %)**

LOCATION	MEMBER	DEPTH (mm)		
		0-20	21-40	41-60
SC-1	P1 - C4	1.85	1.75	1.45

**NOTES:**

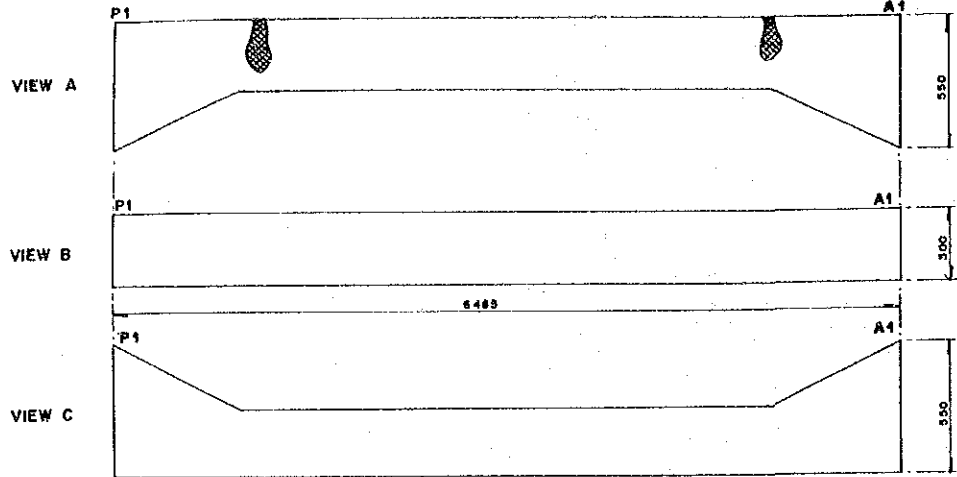
- ① THE STRENGTH WAS MEASURED BY ULTRASONIC PULSE VELOCITY (UPV).
- ② THE STRENGTH WAS MEASURED BY SCHMIDT HAMMER (S.H.).
- ③ REBAR SPACING IS APPROXIMATE ONLY.
- ALL DIMENSIONS ARE IN MM. UNLESS OTHERWISE STATED.



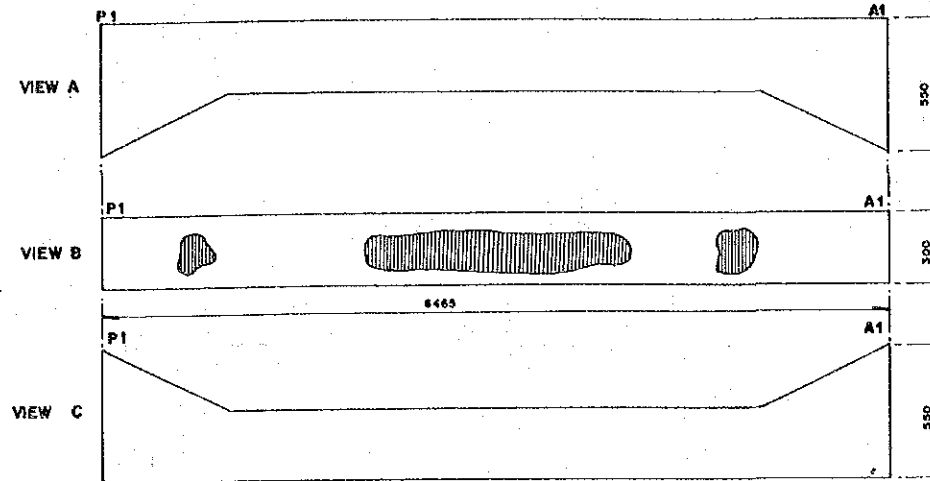
	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	STRENGTH MEASUREMENT DIAGRAM	1/149/20	AS SHOWN	DSS-1-2

**CRACK DIAGRAM OF GIRDERS**

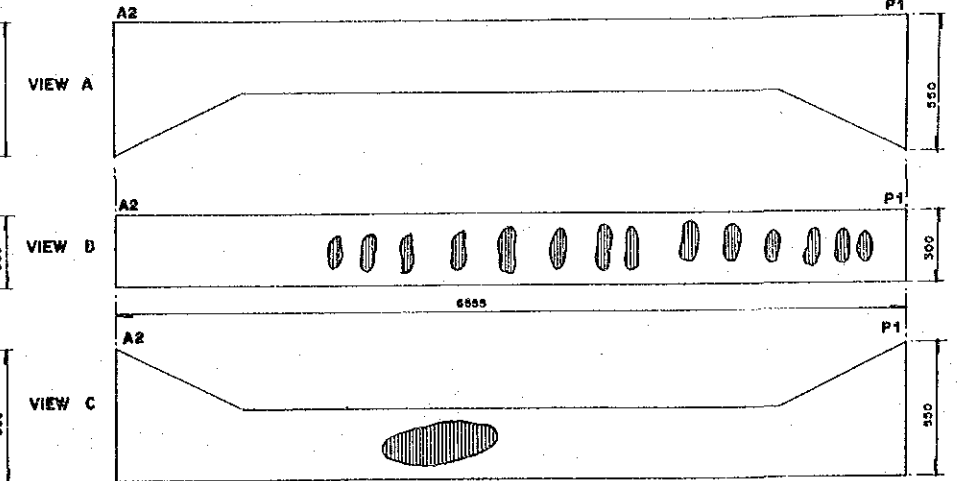
**SPAN 1 - GIRDER 1**  
H:1:30 V:1:18



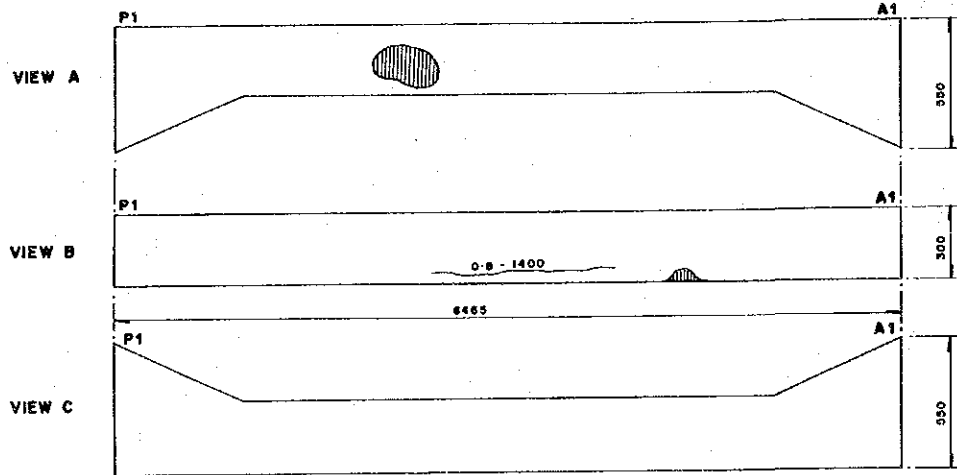
**SPAN 1 - GIRDER 4**  
H:1:30 V:1:18



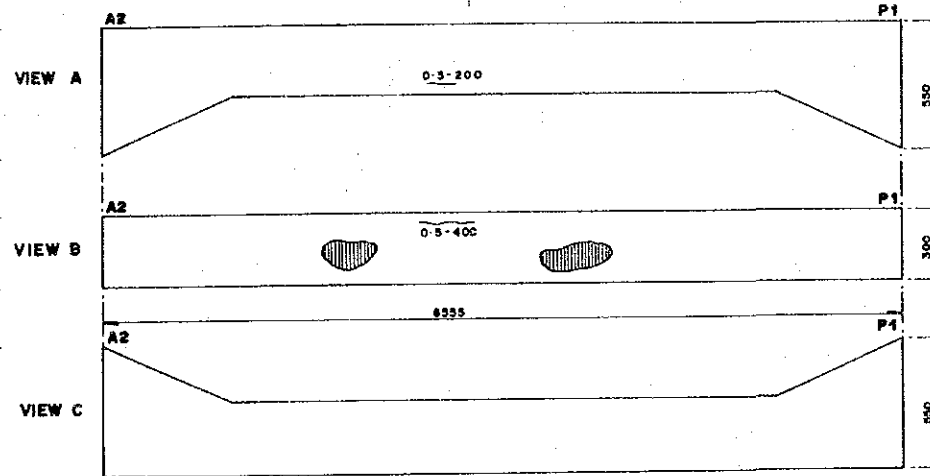
**SPAN 2 - GIRDER 4**  
H:1:30 V:1:18



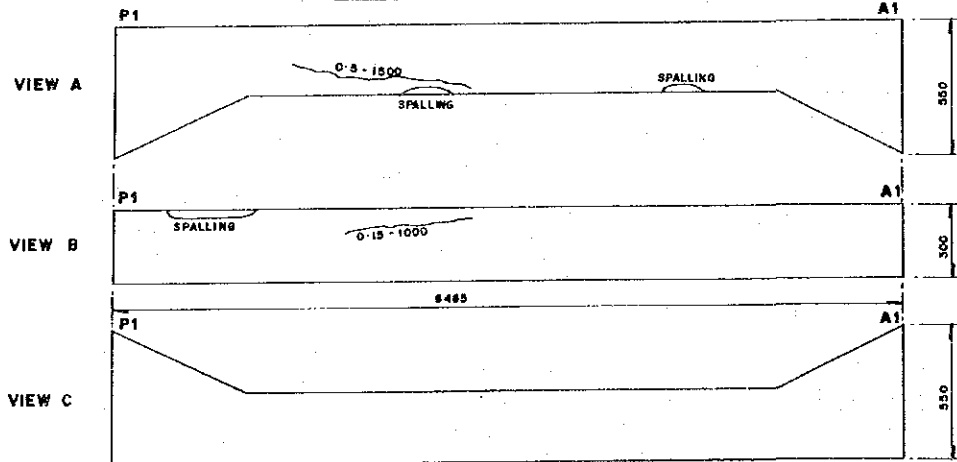
**SPAN 1 - GIRDER 2**



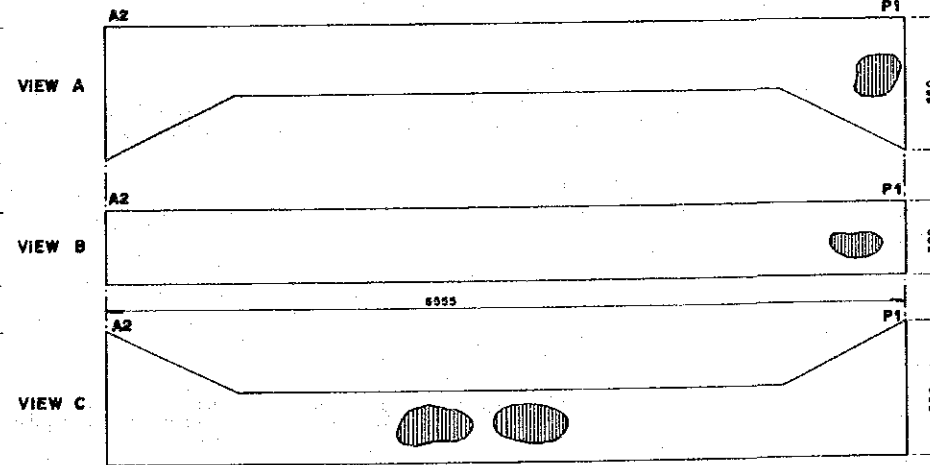
**SPAN 2 - GIRDER 1**



**SPAN 1 - GIRDER 3**

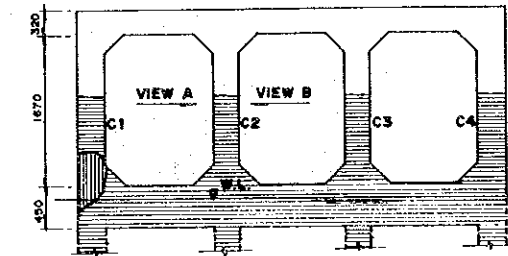


**SPAN 2 - GIRDER 3**

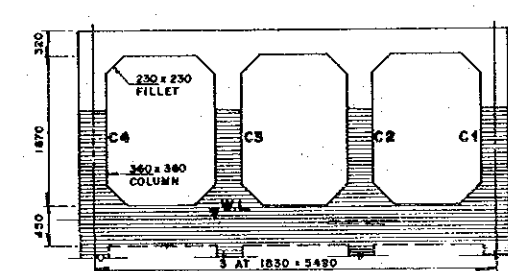


**CRACK DIAGRAM OF PIER**

**PIER 1 (VIEW A-A)** H:1:30 V:1:40



**PIER 1 (VIEW B-B)**



**LEGEND OF DAMAGE (CONCRETE)**

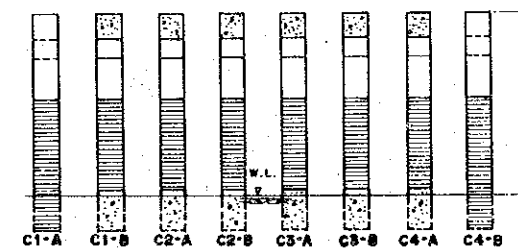
TYPE OF DAMAGES	INDICATION
CRACK	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR/EROSION	
WATER STAIN	
OTHERS	

\* □ - MAXIMUM CRACK WIDTH  
○ - THE LENGTH OF CRACK.

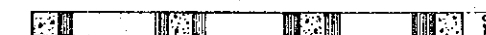
**NOTES:**

- BOTH DECK SLABS I.E. SPAN 1 & 2 ARE IN GOOD CONDITION.
- BOTH ABUTMENTS ARE IN GOOD CONDITION.
- SPAN 2 - GIRDER 2 NOT SHOWN IS STILL IN GOOD CONDITION.

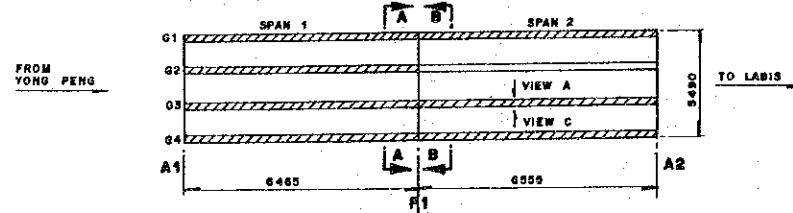
**COLUMN (SIDE VIEW)**



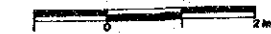
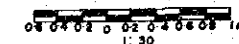
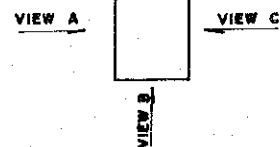
**PIER 1 (SOFFIT OF CROSS-HEAD)**



**KEY MAP**



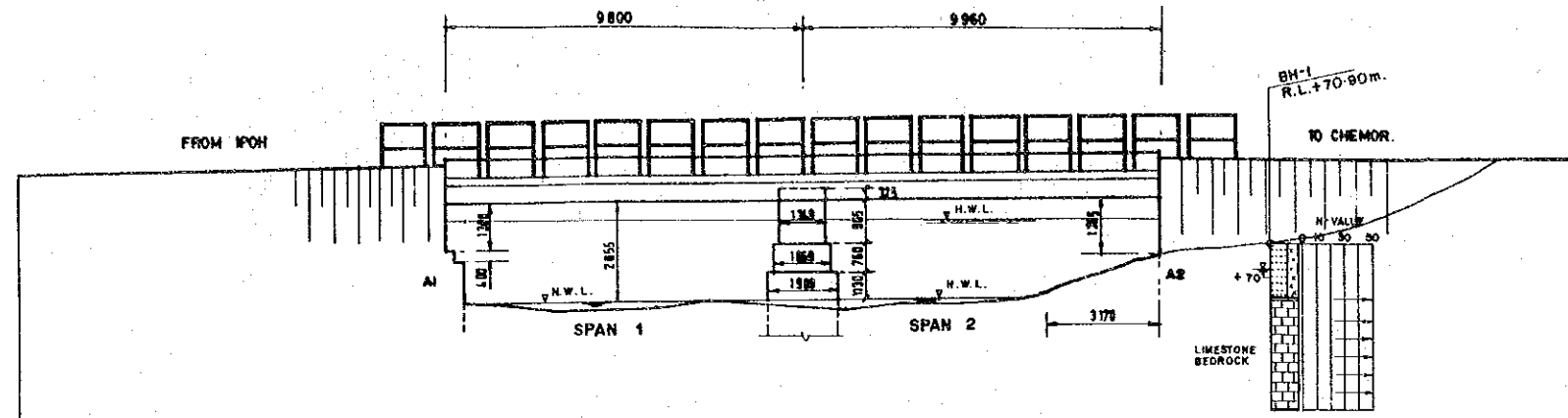
NOTE: CRACK DIAGRAM OF GIRDERS INDICATED BY HZZZ IS SHOWN ABOVE.



	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CRACK DIAGRAM	1/149/20	AS SHOWN	DSS-1-3

**ELEVATION.**

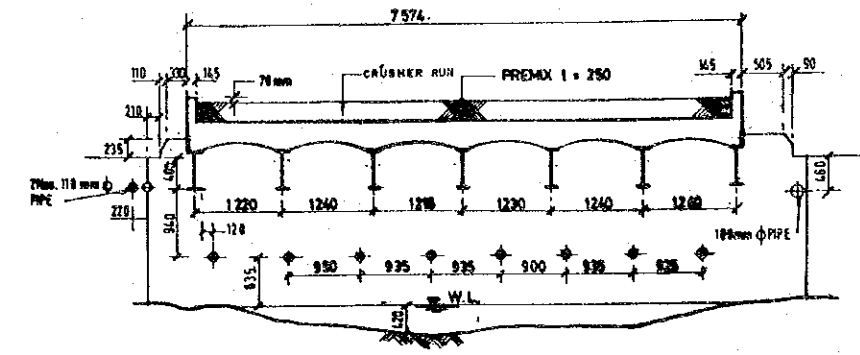
1 : 100



DATUM 66m.	REDUCED LEVEL IN METER.	DISTANCE IN METER.
	6.36	71.43
	7.85	73.13
	9.36	74.86
	10.86	76.63
	12.38	78.52
	13.79	80.55
	15.16	82.75
	16.50	85.05
	18.51	88.57
	21.35	93.44
	23.63	98.77
	24.8	100.59
	25.93	102.92
	28.98	108.57
	30.91	113.56
	32.45	116.92
	33.95	120.54
	35.40	124.35
	37.04	128.37
	41.37	138.59
	43.06	143.95
	44.69	149.56
	46.27	155.45
	48.65	161.75

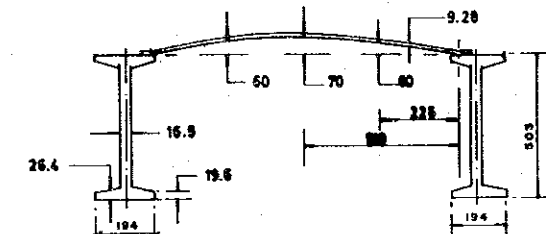
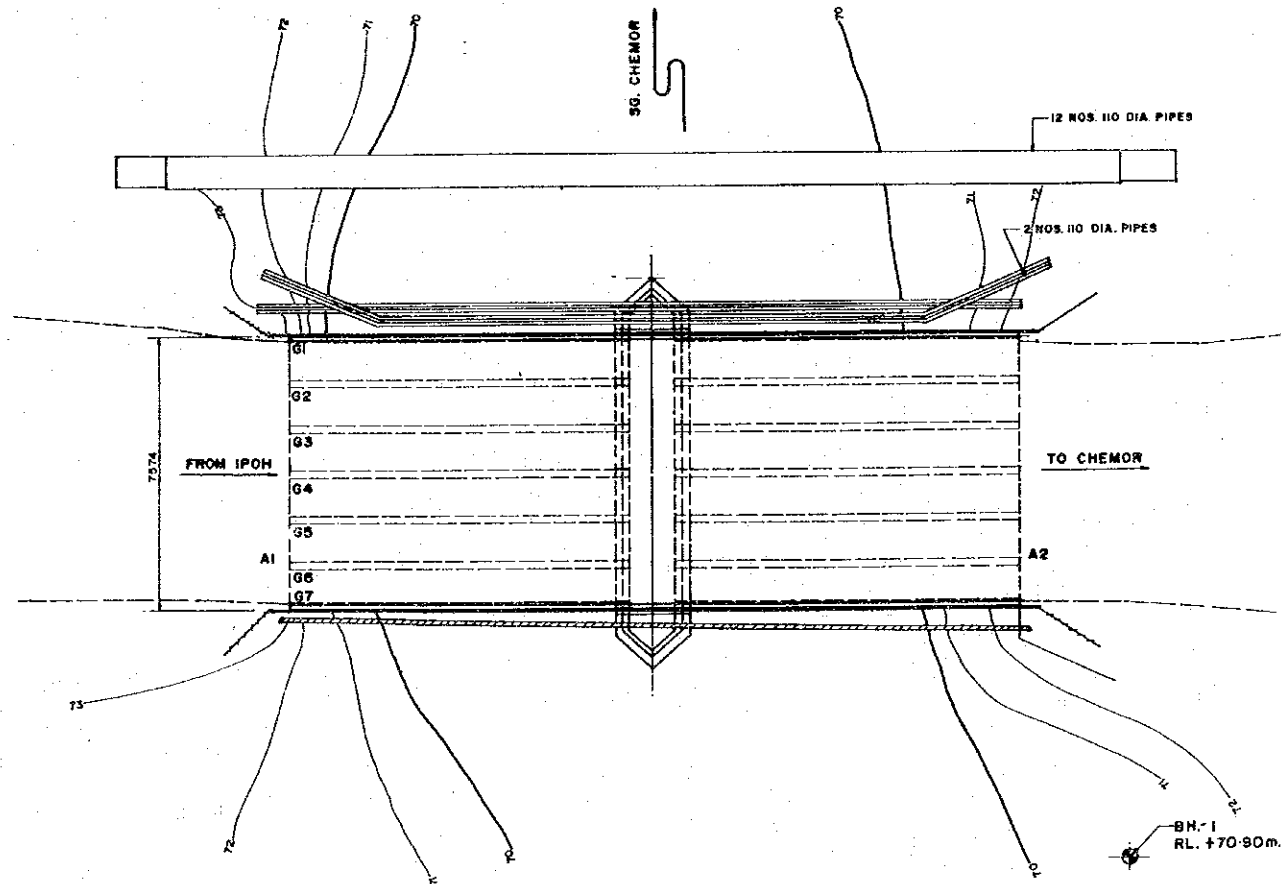
**CROSS SECTION.**

1 : 50



**PLAN.**

1 : 100



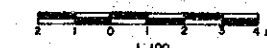
**DETAIL OF STEEL I BEAM.**

1 : 20

NOTE:  
ALL BEAM HEIGHT IS 505 mm. EXCEPT BEAM G7 IS 515 mm.  
ALL FLANGE WIDTH IS 194 mm. EXCEPT BEAM G7 IS 185 mm.

**BRIDGE DATA :**

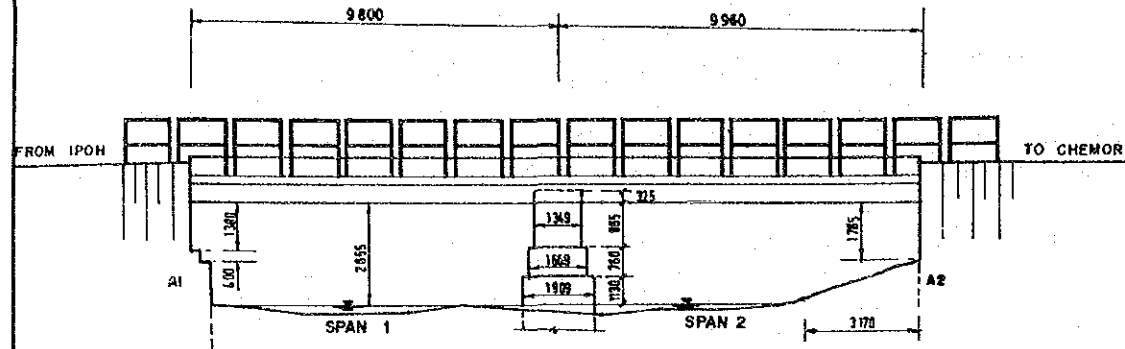
KEY NO :	1 / 611 / 40.	
STATE :	PERAK.	
DISTRICT :	KINTA.	
DESIGN LIVE LOAD :	IM 577 (EQUIVALENT TO HA LOADING)	
MATERIAL YIELD STRENGTH :	CONCRETE	SUPERSTRUCTURE : NOT APPLICABLE
		SUBSTRUCTURE : NOT APPLICABLE
	STEEL	STRUCTURAL STEEL : 230 N/mm <sup>2</sup>
TYPE OF SUPERSTRUCTURE :	STEEL I-BEAM W. / BUCKLE PLATE SLAB	
TYPE OF SUBSTRUCTURE :	ABUTMENT	BRICKWORK (PLASTERED)
	PIER.	BRICKWORK (STEPPED)
YEAR BUILT :	1950 (ESTIMATED)	



	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	GENERAL VIEW	1/611/40	AS SHOWN	DSS-2-1

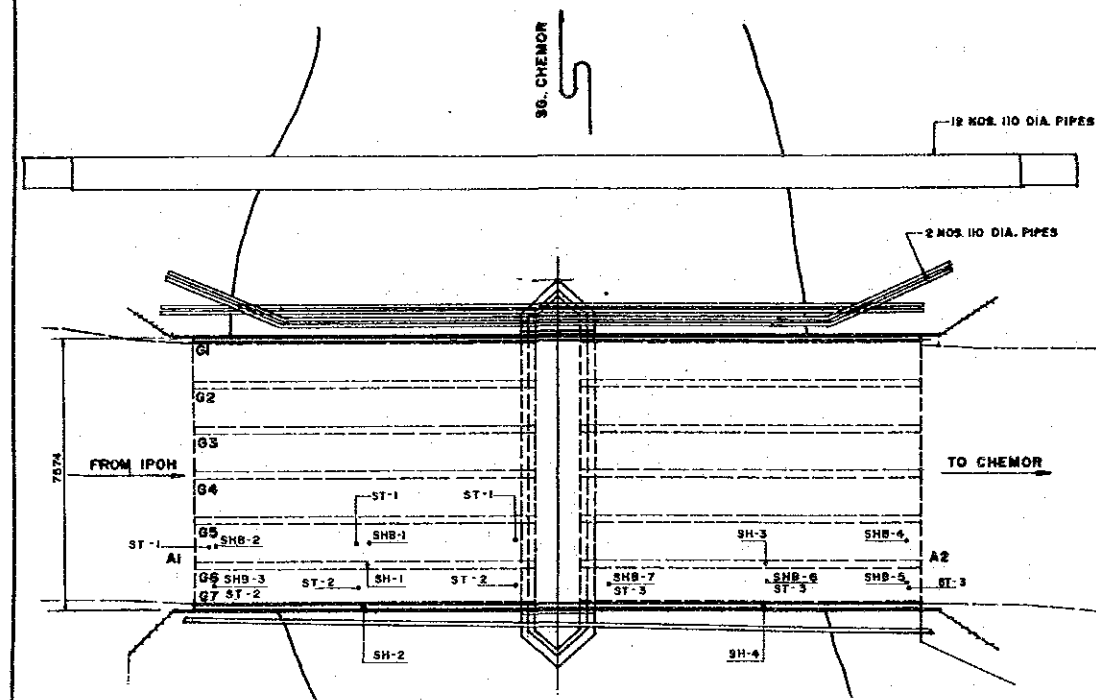
**ELEVATION.**

1 : 100



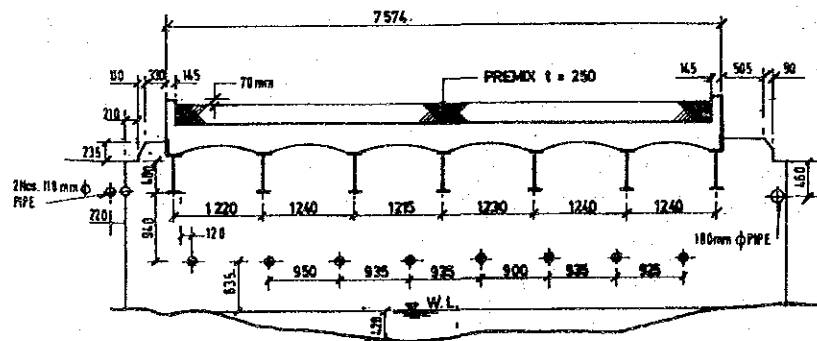
**PLAN**

1 : 100



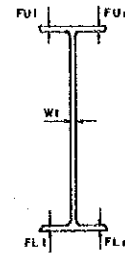
**CROSS SECTION.**

1 : 50



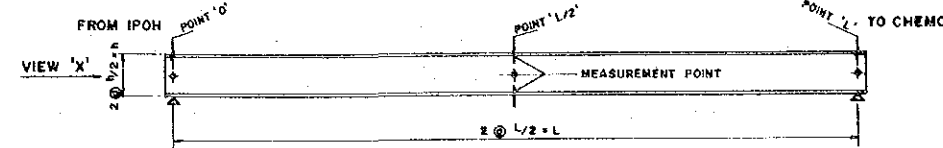
**THICKNESS MEASUREMENT**

**VIEW 'X'**



**STEEL MEMBERS**

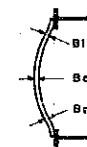
**THICKNESS FOR BEAM**



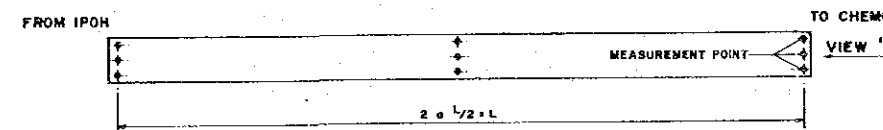
**STEEL THICKNESS FOR BEAM**

MEMBER	POINT	0	L/2	L
G7 SPAN 1	FUL	26.83	25.78	26.31
	FUR	-	-	-
	Wt	14.87	14.83	14.99
	FLI	27.91	20.72	23.77
G6 SPAN 1	FUL	23.92	23.92	27.82
	FUR	26.42	24.47	24.76
	Wt	14.75	14.83	15.16
	FUR	24.79	24.68	25.00
G7 SPAN 2	FUL	-	-	-
	FUR	24.89	25.50	23.44
	Wt	13.93	13.63	13.71
	FLI	24.32	-	25.77
G6 SPAN 2	FUR	27.08	-	24.25
	FUL	25.26	24.40	-
	FUR	25.24	23.77	23.17
	Wt	15.71	15.14	11.50
G6 SPAN 2	FLI	25.00	25.15	25.04
	FLr	24.42	24.22	23.88

**VIEW 'Y'**



**BUCKLE PLATE DETAIL**



**STEEL THICKNESS FOR BUCKLE PLATE**

MEMBER	POINT	0	L/2	L
ST-1 SPAN-1 BETWEEN G6 AND G5	B1	9.21	8.60	8.83
	Bc	9.51	7.92	7.40
	Br	9.91	8.12	7.52
ST-2 SPAN-1 BETWEEN G6 AND G7	B1	8.58	-	-
	Bc	9.10	-	-
	Br	9.28	-	-
ST-3 SPAN-2 BETWEEN G6 AND G7	B1	9.08	8.16	7.12
	Bc	9.61	8.01	7.66
	Br	-	8.07	7.53

**STEEL STRENGTH MEASUREMENT**

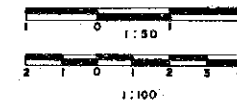
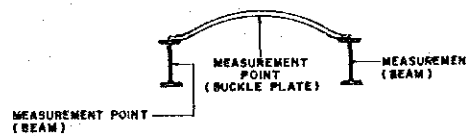
**BUCKLE PLATE**

LOCATION	MEMBER	BRINELL HARDNESS	STRENGTH (N/mm <sup>2</sup> )
SHB-1	SPAN 1 BETWEEN G6 & G6	103	-
SHB-2	SPAN 1 BETWEEN G6 & G6	208	695
SHB-3	SPAN 1 BETWEEN G6 & G7	96	-
SHB-4	SPAN 2 BETWEEN G6 & G6	80	-
SHB-5	SPAN 2 BETWEEN G6 & G7	181	605
SHB-6	SPAN 2 BETWEEN G6 & G7	91	-
SHB-7	SPAN 2 BETWEEN G6 & G7	96	-

**BEAM**

LOCATION	MEMBER	BRINELL HARDNESS	STRENGTH (N/mm <sup>2</sup> )
SH-1	G6 - SPAN 1	112	390
SH-2	G7 - SPAN 1	238	795
SH-3	G6 - SPAN 2	213	695
SH-4	G7 - SPAN 2	100	-

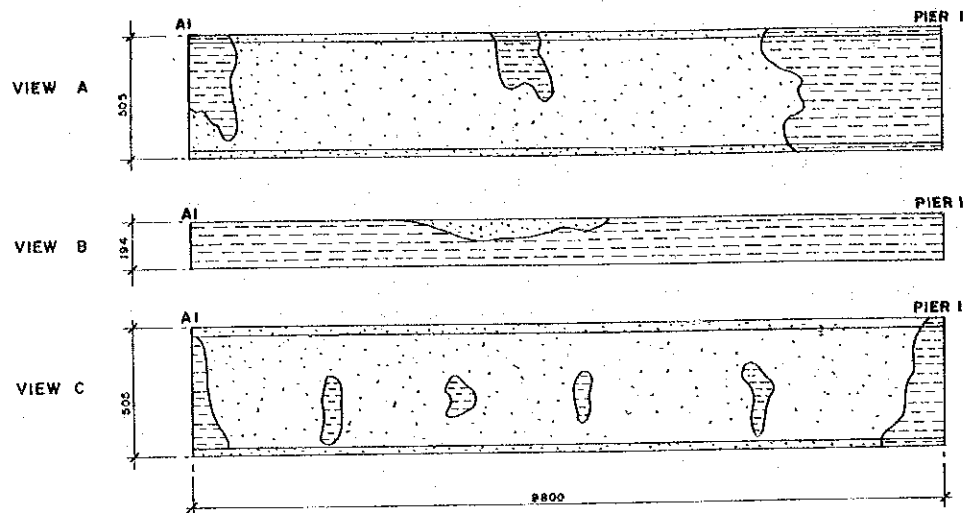
**MEASUREMENT POINT**



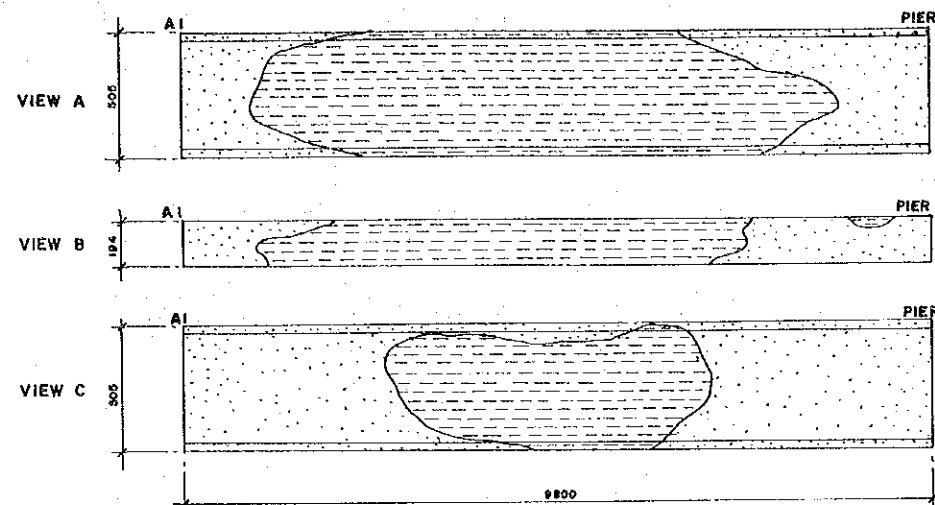
	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	STRENGTH MEASUREMENT DIAGRAM	1/611/40	AS SHOWN	DSS-2-2

**CORROSION DIAGRAM OF GIRDERS (SPAN 1)**

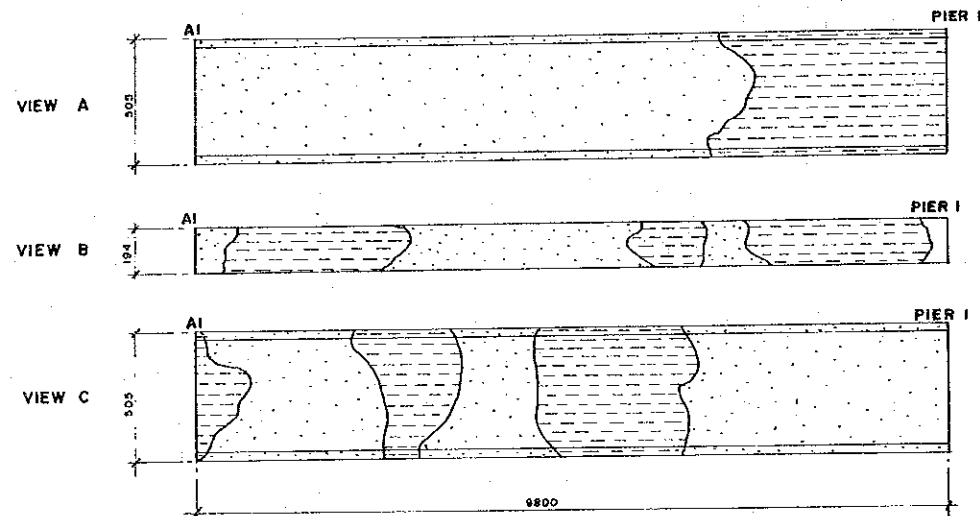
**SPAN 1 - G1**



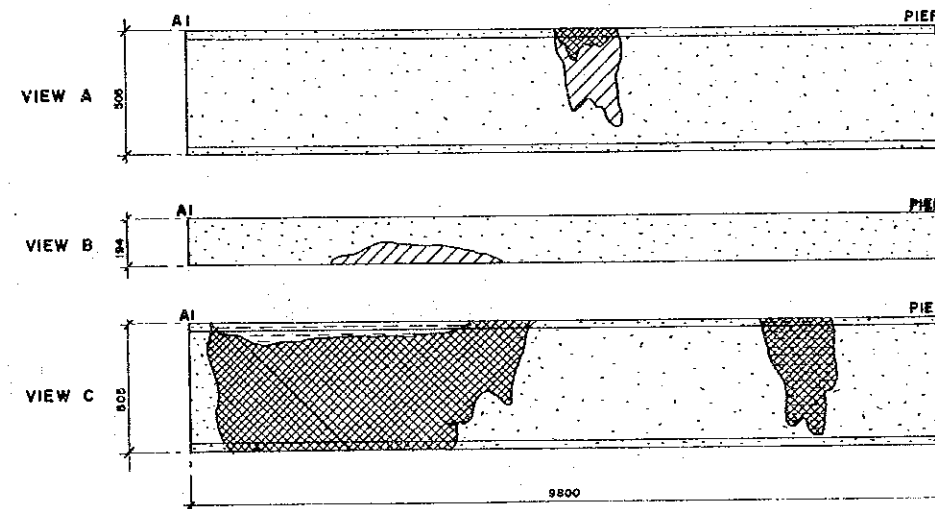
**SPAN 1 - G4**



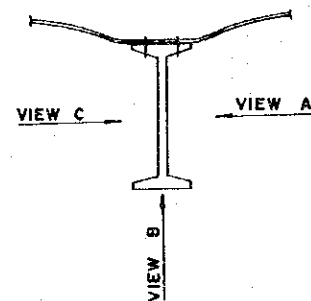
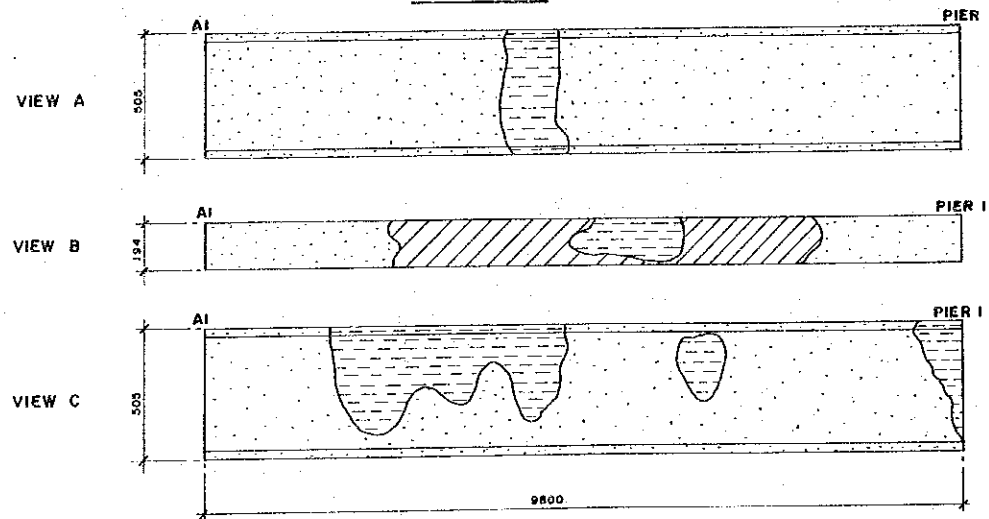
**SPAN 1 - G2**



**SPAN 1 - G5**



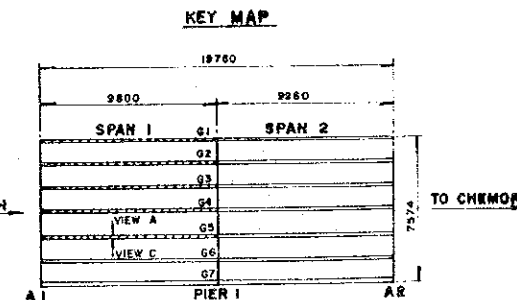
**SPAN 1 - G3**



**LEGEND OF DAMAGE (STEEL)**

TYPE OF DAMAGES	INDICATION
CORROSION	
LAMINATION	
PAINT DETERIORATION	
WATER STAIN	

FROM IPOH

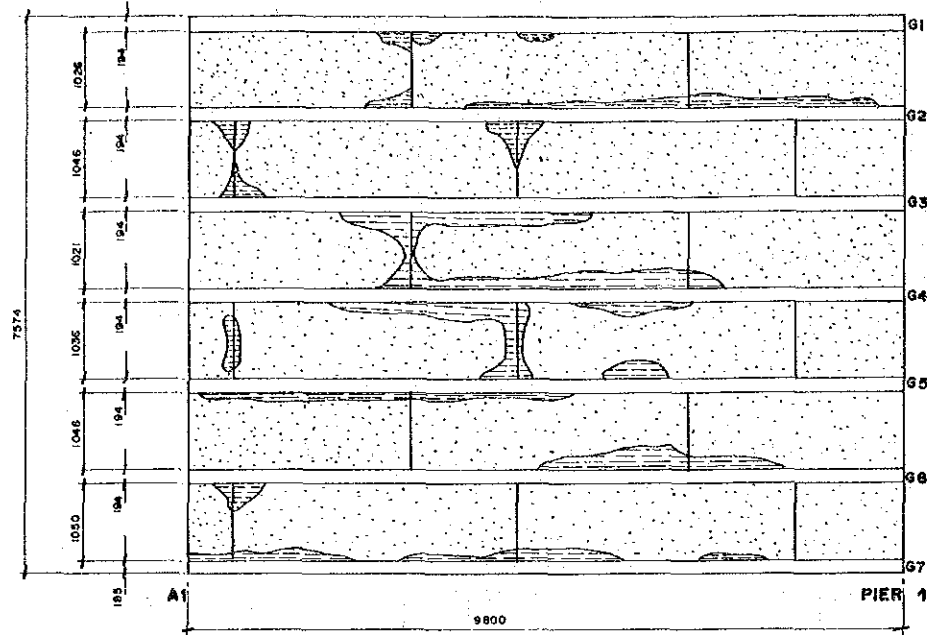


NOTE: LOCATION OF CORROSION DIAGRAM OF GIRDERS INDICATED BY R223 IS SHOWN ABOVE.

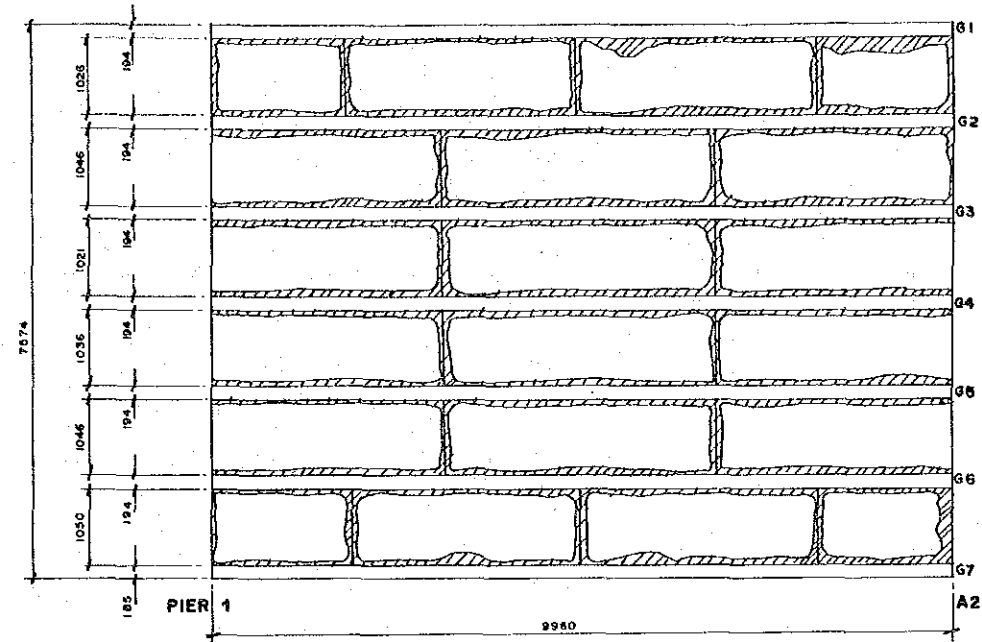
	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CORROSION DIAGRAM (1/4)	1/611/40	NOT TO SCALE	DSS-2-3

**CORROSION DIAGRAM FOR SLAB SOFFIT**

**BUCKLE PLATE (SPAN 1)**  
1:50

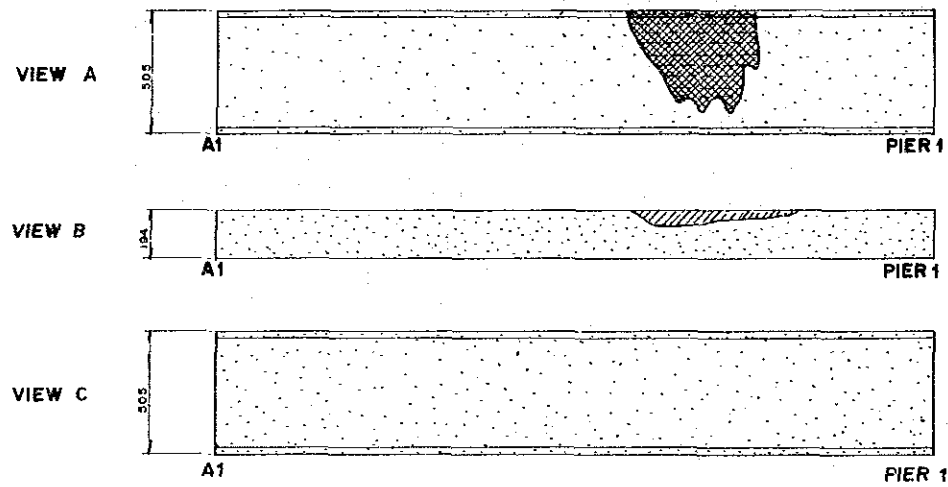


**BUCKLE PLATE (SPAN 2)**  
1:50

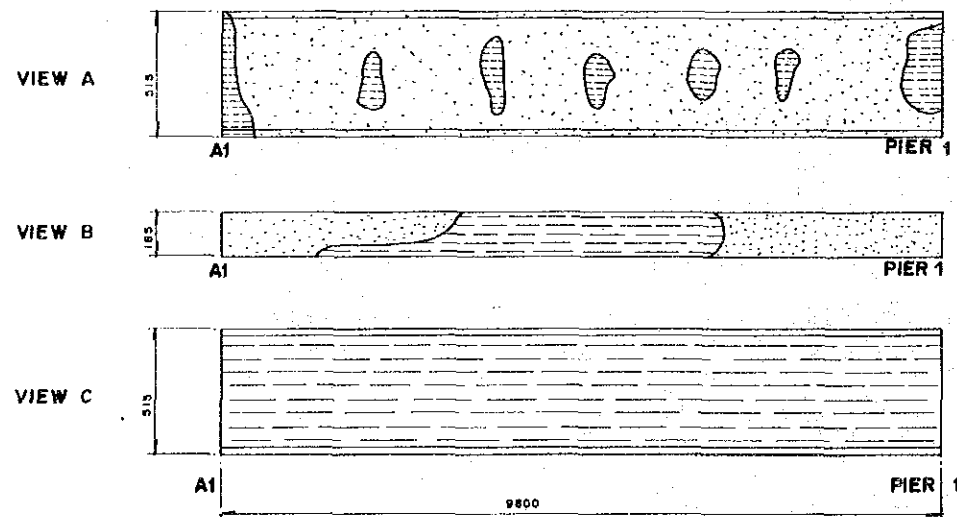


**CORROSION DIAGRAM FOR GIRDERS - SPAN 1**

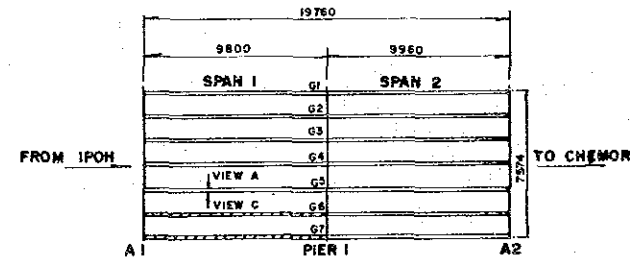
**SPAN 1 - G6**  
H: 1:50 V: 1:15



**SPAN 1 - G7**  
H: 1:50 V: 1:15



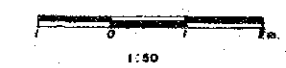
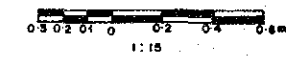
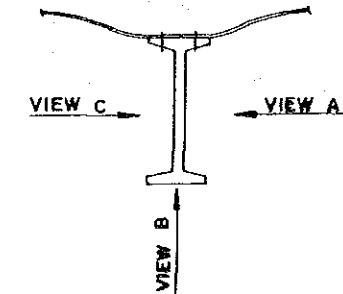
**KEY MAP**



NOTE: LOCATION OF CORROSION DIAGRAM FOR GIRDERS INDICATED BY Hatched IS SHOWN ABOVE.

**LEGEND OF DAMAGE (STEEL)**

TYPE OF DAMAGES	INDICATION
CORROSION	
LAMINATION	
PAINT DETERIORATION	
WATER STAIN	

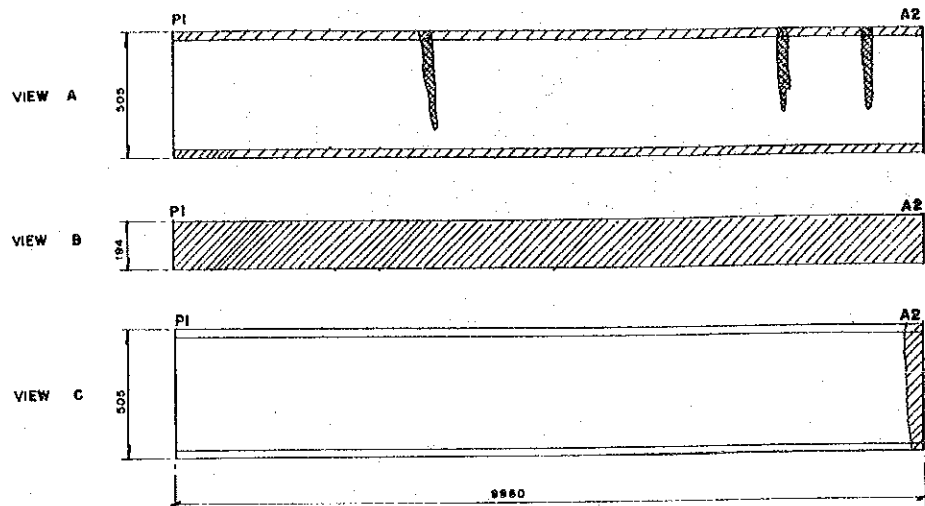


	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CORROSION DIAGRAM (2/4)	1/611/40	AS SHOWN	DSS-2-4

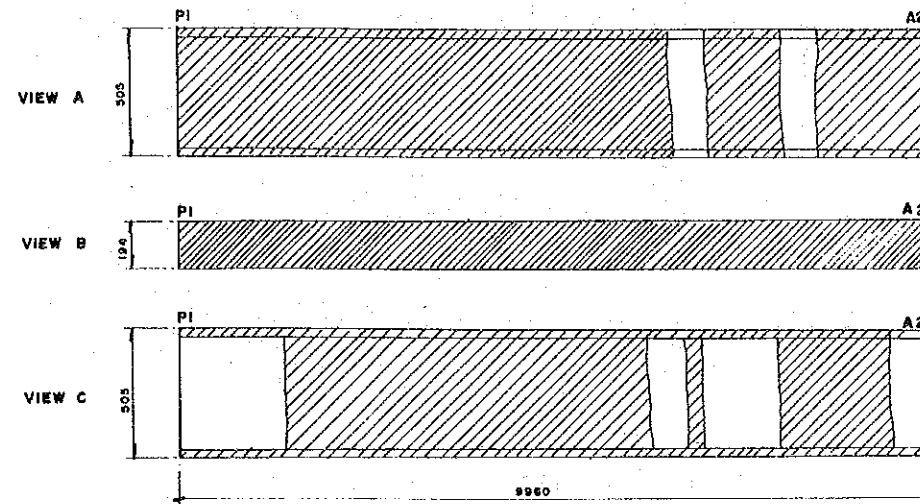


**CORROSION DIAGRAM FOR GIRDERS (SPAN 2)**

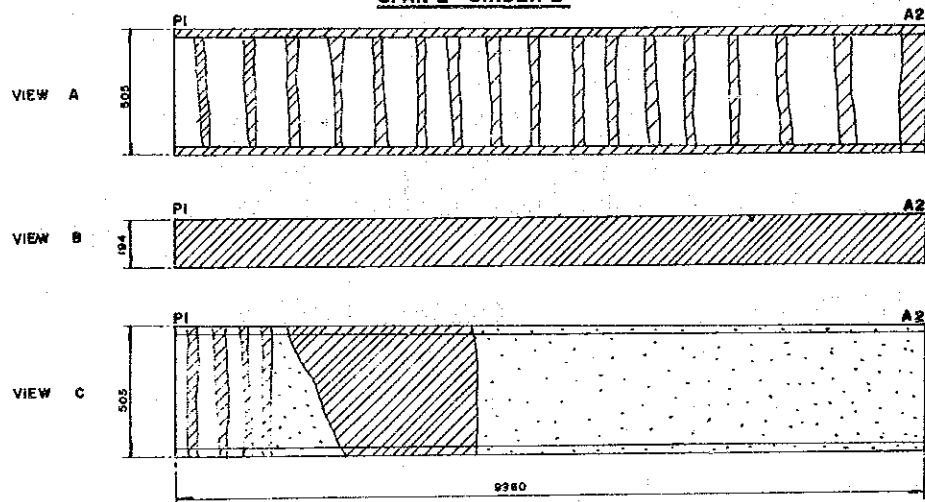
**SPAN 2 - GIRDER 1**



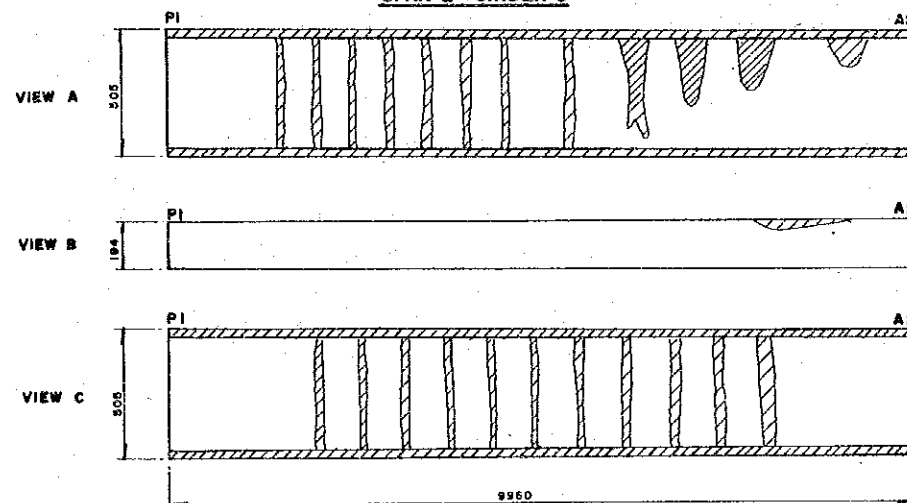
**SPAN 2 - GIRDER 4**



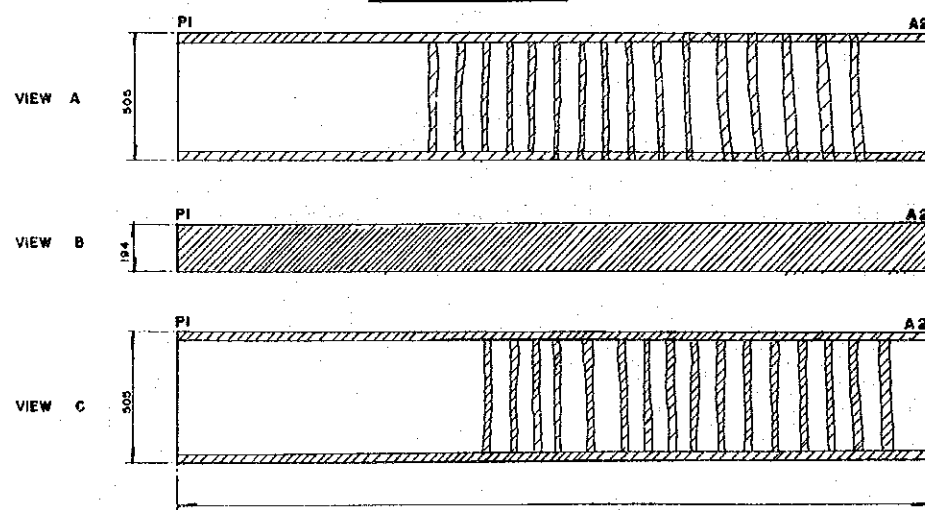
**SPAN 2 - GIRDER 2**



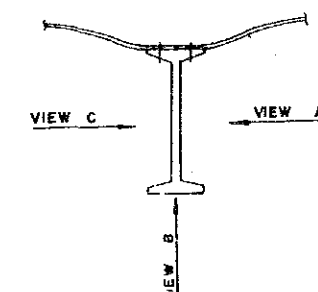
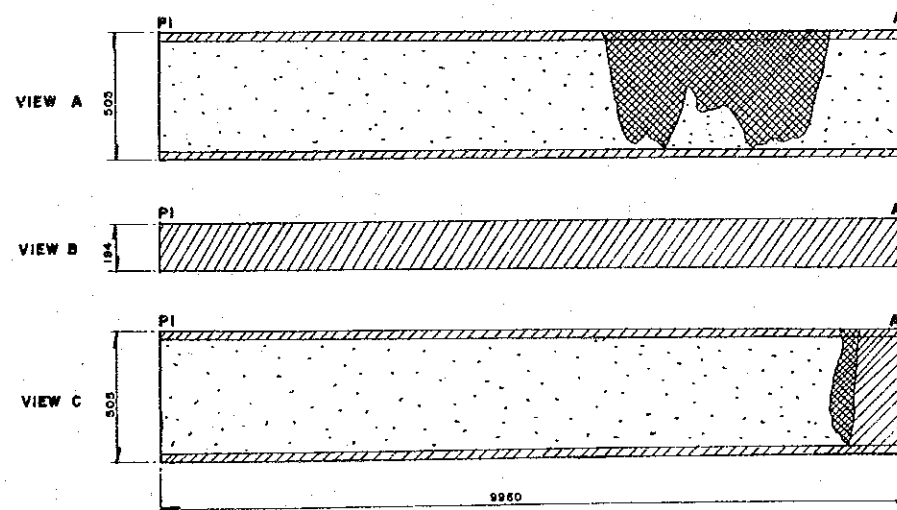
**SPAN 2 - GIRDER 5**



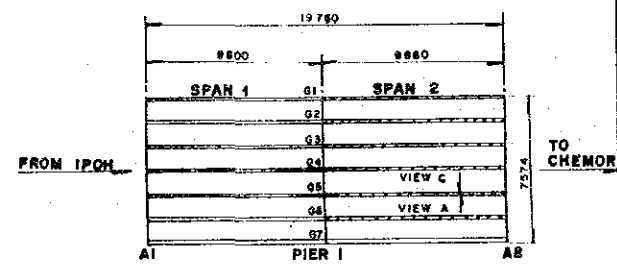
**SPAN 2 - GIRDER 3**



**SPAN 2 - GIRDER 6**



**KEY MAP**



NOTE: LOCATION OF CORROSION DIAGRAM FOR GIRDERS INDICATED BY 'X' IS SHOWN ABOVE.

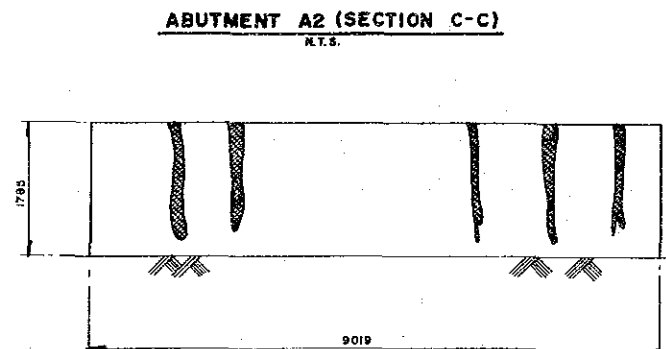
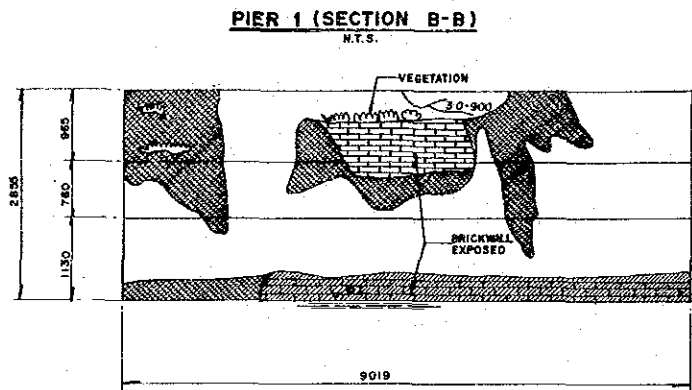
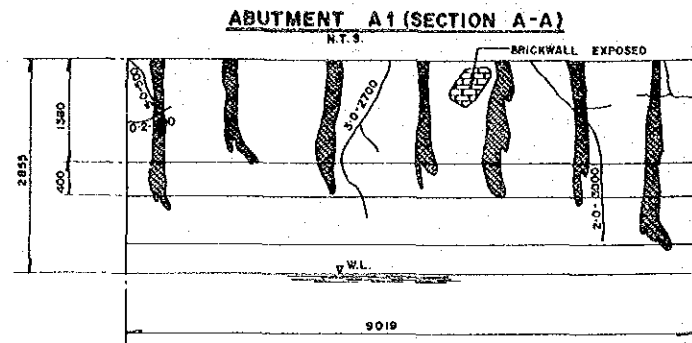
**LEGEND OF DAMAGE (STEEL)**

TYPE OF DAMAGES	INDICATION
CORROSION	
LAMINATION	
CRACK *	
FALLING OFF (BOLT)	xxx
PAINT DETERIORATION	
DEFORMATION / BUCKLING	
WATER STAIN	
OTHERS	

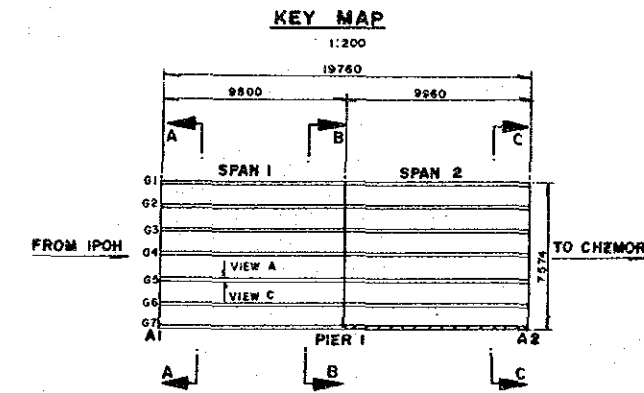
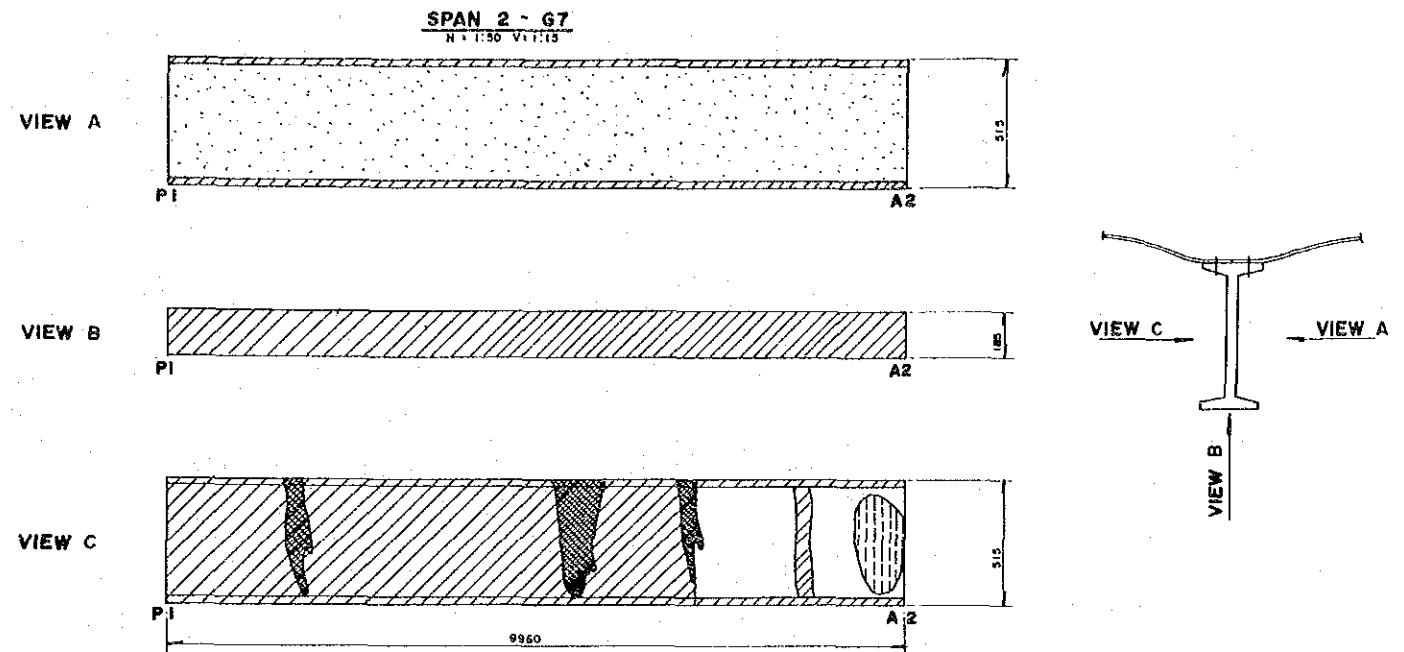
\* THE LENGTH OF CRACK

	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CORROSION DIAGRAM (3/4)	1/611/40	NOT TO SCALE	DSS-2-5

**CRACK DIAGRAM FOR ABUTMENT & PIER**



**CORROSION DIAGRAM FOR GIRDER**



NOTE: LOCATION OF CORROSION DIAGRAM FOR GIRDER INDICATED BY 'x' AS SHOWN ABOVE.

**LEGEND OF DAMAGE (STEEL)**

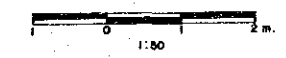
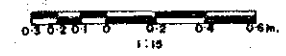
TYPE OF DAMAGES	INDICATION
CORROSION	
LAMINATION	
CRACK #	
FALLING OFF (BOLT)	xxx
PAINT DETERIORATION	
DEFORMATION / BUCKLING	
WATER STAIN	
OTHERS	

\* THE LENGTH OF CRACK

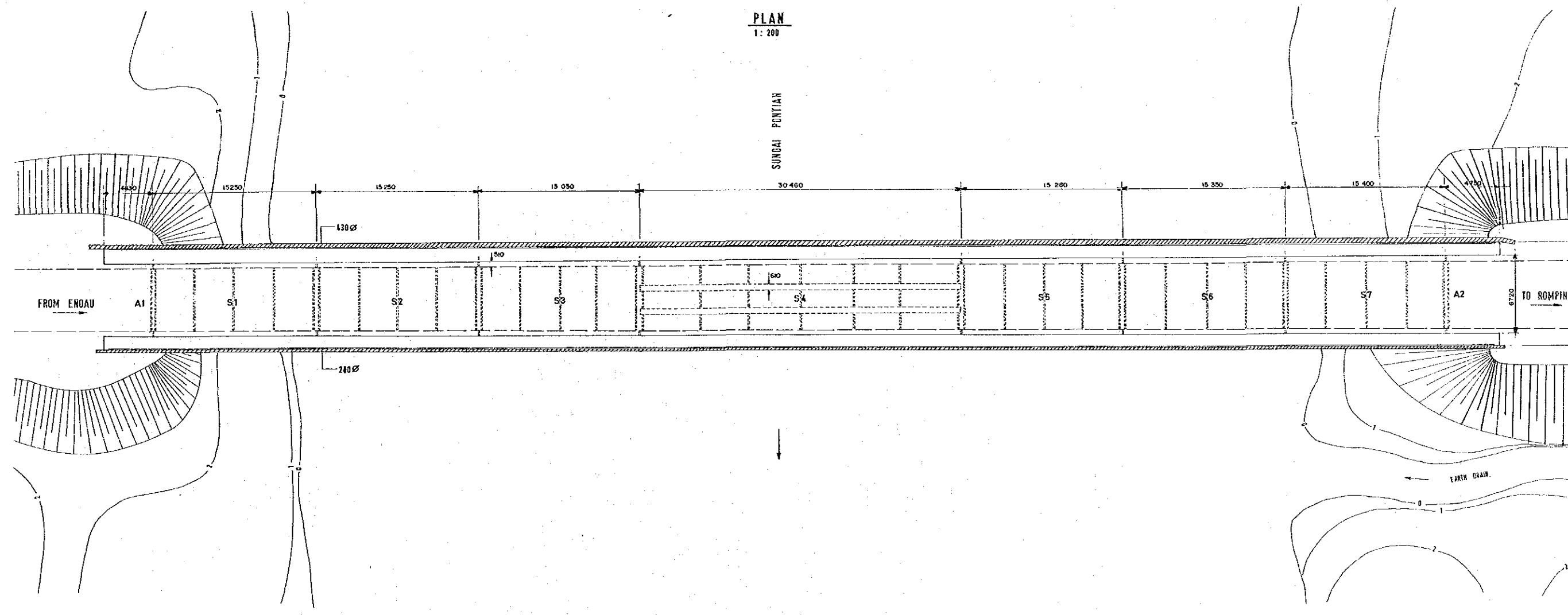
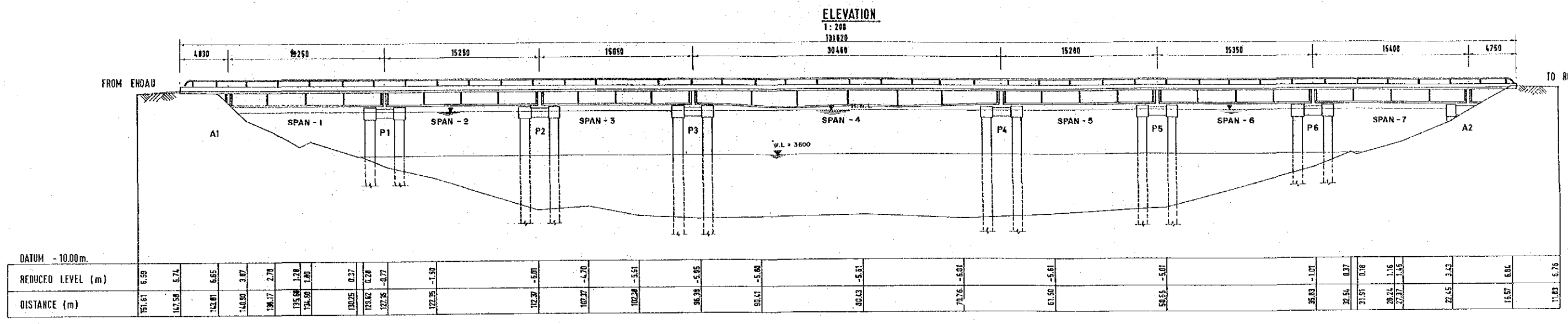
**LEGEND OF DAMAGE (CONCRETE / BRICK)**

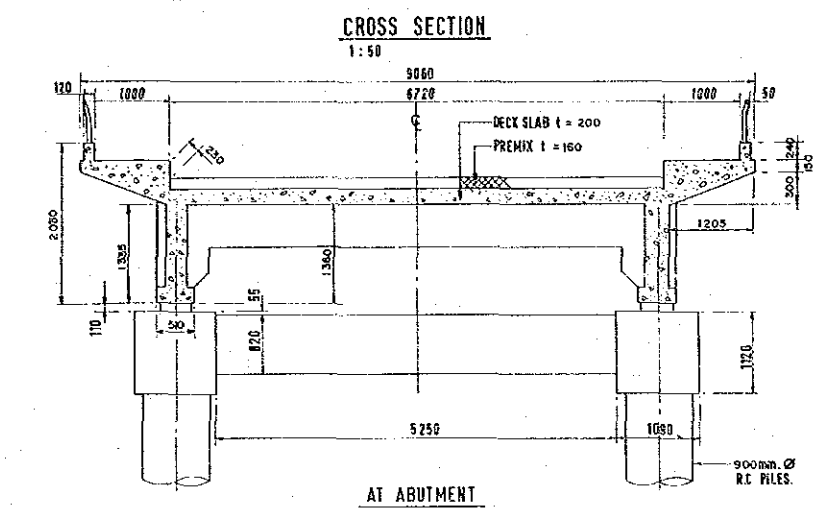
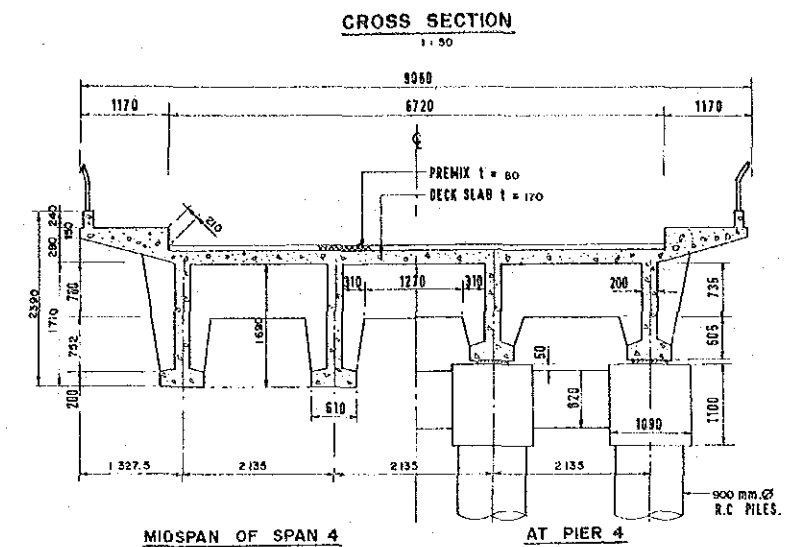
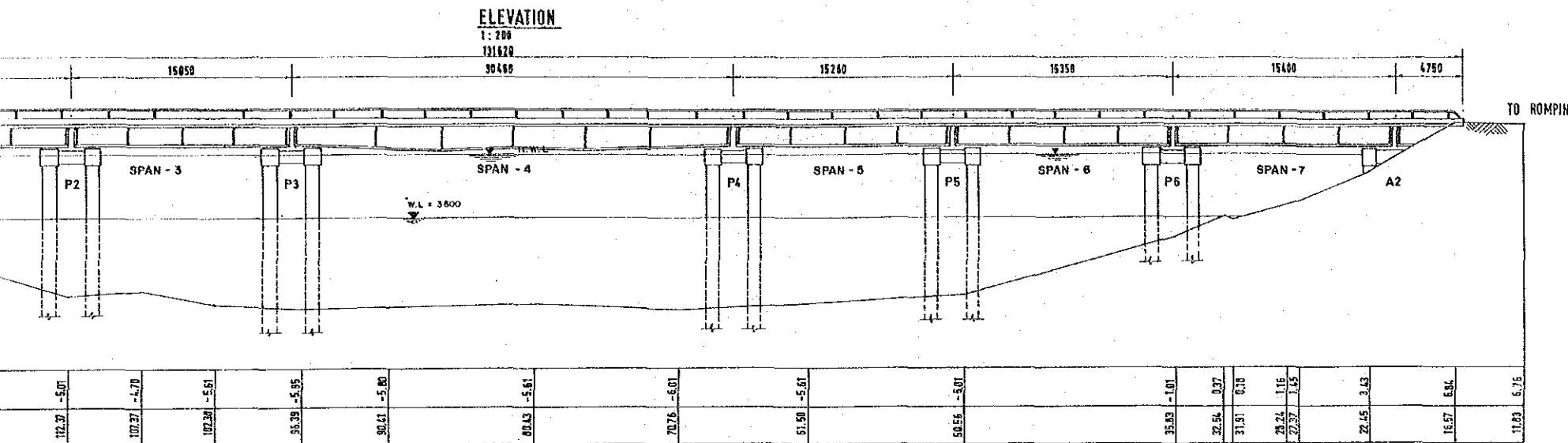
TYPE OF DAMAGES	INDICATION
CRACK #	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR / EROSION	
WATER STAIN	

\* □ MAXIMUM CRACK WIDTH  
○ THE LENGTH OF CRACK

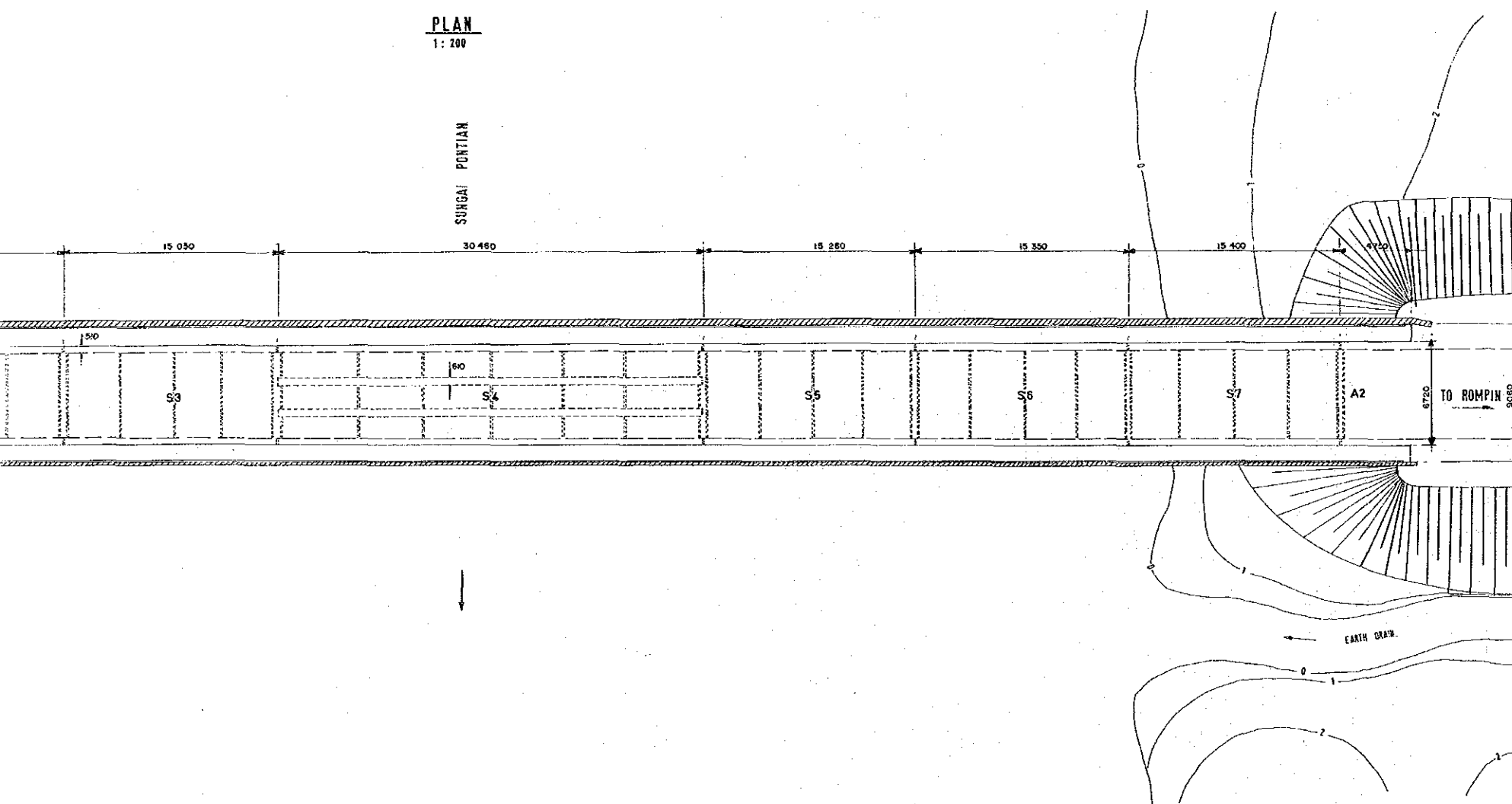


	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CRACK AND CORROSION DIAGRAM (4/4)	1/611/40	AS SHOWN	DSS-2-6





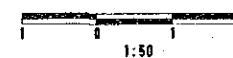
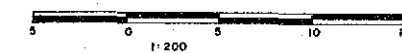
**PLAN**  
1: 200



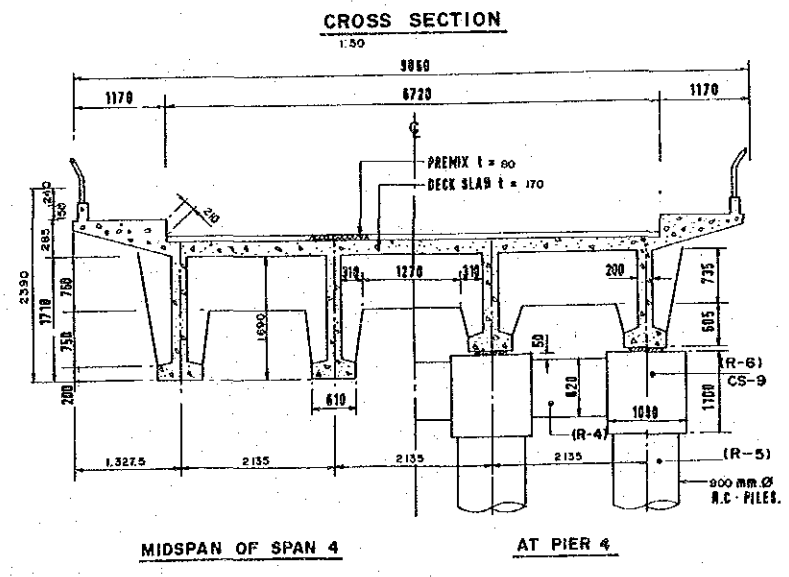
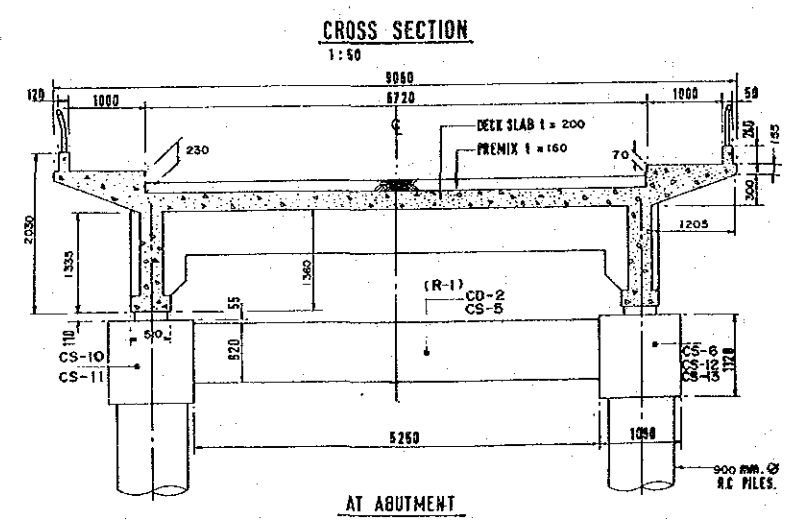
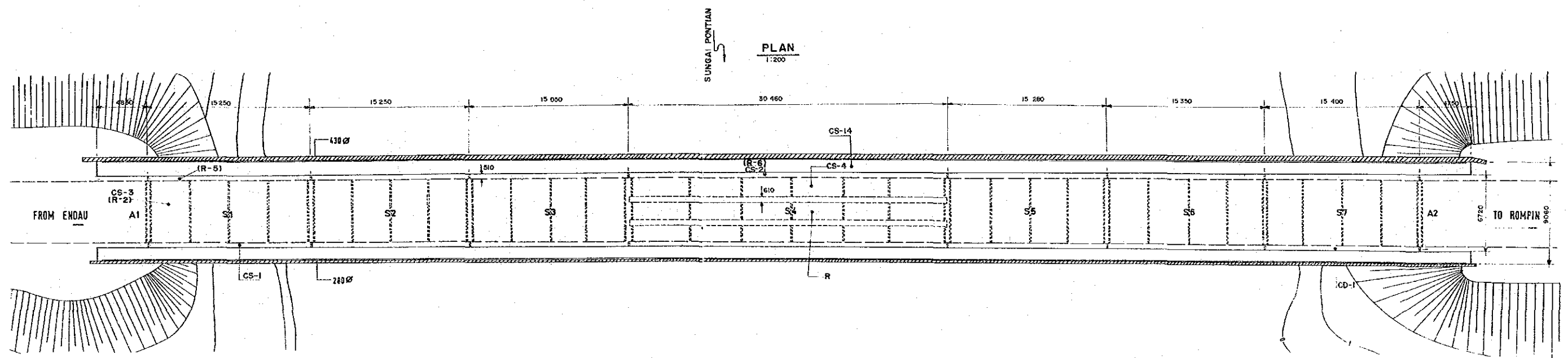
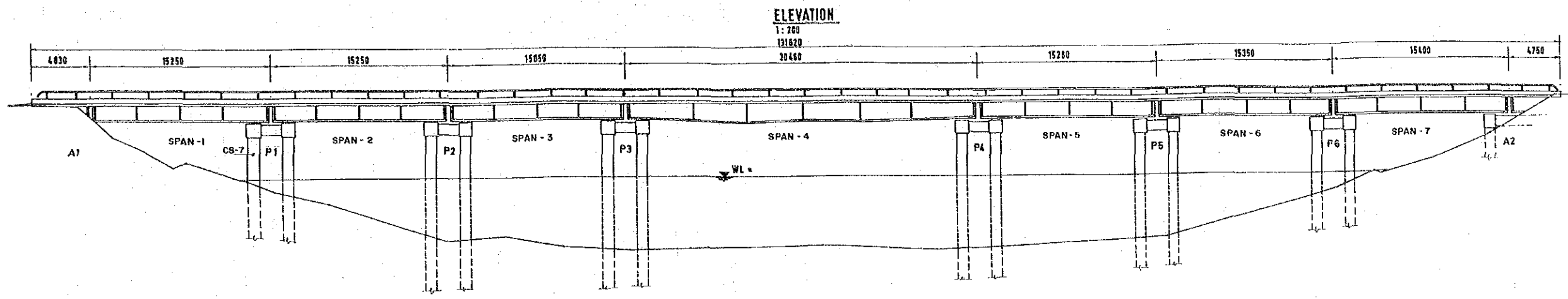
**BRIDGE DATA :**

KEY NO :	3/191/10	
STATE :	PAHANG	
DISTRICT :	ROMPIN	
DESIGN LIVE LOAD :	HA LOADING	
MATERIAL YIELD STRENGTH :	CONCRETE	SUPERSTRUCTURE : DECK 20 N/mm <sup>2</sup> BEAM 25 N/mm <sup>2</sup>
	STEEL	SUBSTRUCTURE : 20 N/mm <sup>2</sup> REBAR : 230 N/mm <sup>2</sup>
TYPE OF SUPERSTRUCTURE :	P.C. I BEAM + R.C. SLAB	
TYPE OF SUBSTRUCTURE :	ABUTMENT	R.C. BANKSEAT
	PIER	R.C. CIRCULAR PILE (HOLLOW) WITH TIE BEAM
YEAR BUILT :	1962 (KNOWN)	

\* RESULT FROM CORE SAMPLING.



JICA	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	GENERAL VIEW	3/191/10	AS SHOWN	DSS - 3-1

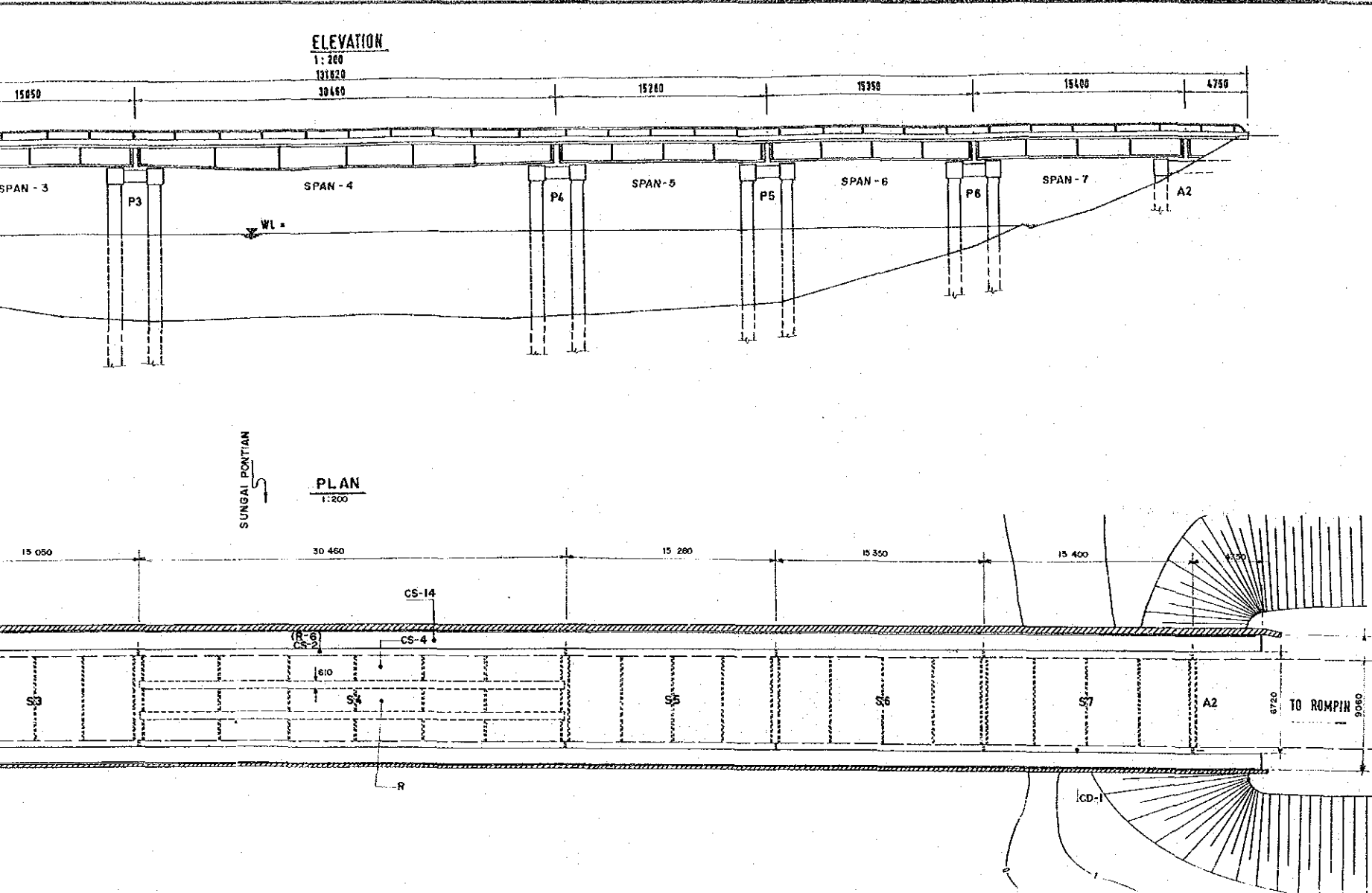


CONCRETE STRENGTH (UNIT : N/mm<sup>2</sup>)

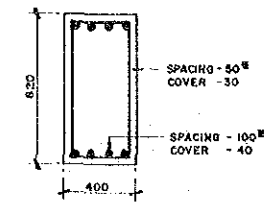
LOCATION	MEMBER	CS. ①	U.P.V. ②	SH. ③
CS-1	G2 - SPAN 1	-	28-82	42
CS-2	G1 - SPAN 4	-	18-14	29
CS-3	DECK SLAB SPAN 1 BETWEEN G1-G2	-	27-90	39
CS-4	DECK SLAB SPAN 4 BETWEEN G1-G2	-	22-30	35
CS-5	A1 - CROSS HEAD	-	22-64	32
CS-6	A2 - G2 - DELETE	-	41-76	50
CS-7	P1 - C1	-	12-90	33-5
CS-8	P4 - C1	-	-	52
CS-9	P4 - C1 (COLUMN HEAD)	-	20-21	27
CS-10	A2 - C1 (a)	-	-	-
CS-11	A2 - C1 (b)	-	-	-
CS-12	A2 - C2	-	-	-
CS-13	A1 - C2	-	-	-
CS-14	LEFT WALKWAY SLAB SPAN 4 (a)	57.0	-	-

NOTES :-  
① - THE STRENGTH WAS MEAS.  
② - THE STRENGTH WAS MEAS.  
③ - THE STRENGTH WAS MEAS.

TEST RE:

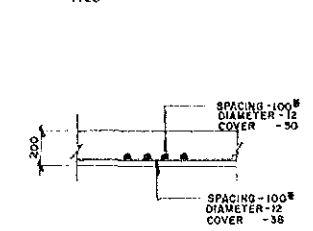


(R-1)  
(A1 - CROSSHEAD)  
1:20

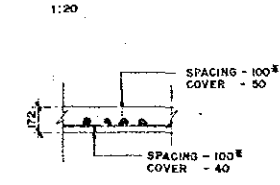


STRUCTURAL DETAILS  
(NOTE: LOCATIONS INDICATED BY R1-R6 ARE SHOWN IN PLAN & CROSS SECTION.)

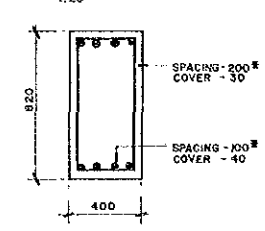
(R-2)  
(DECK SLAB - SPAN 1)  
1:20



(R-3)  
(DECK SLAB - SPAN 4)  
1:20



(R-4)  
(P1 - CROSSHEAD)  
1:20

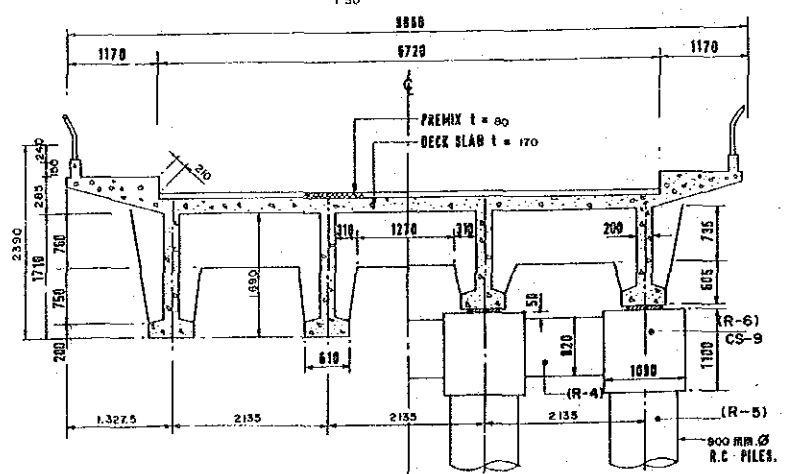


(R-5)  
(G1 - SPAN 1)  
PRESTRESS BEAM (PCB)  
35 COVER AT SOFFIT

(R-6)  
(G1 - SPAN 4)  
PRESTRESS BEAM (PCB)  
35 COVER AT SOFFIT

NOTE:  
REBAR SPACING SHOWN IN THE DRAWING IS APPROXIMATE ONLY.

CROSS SECTION  
1:50



CONCRETE STRENGTH (UNIT: N/mm<sup>2</sup>)

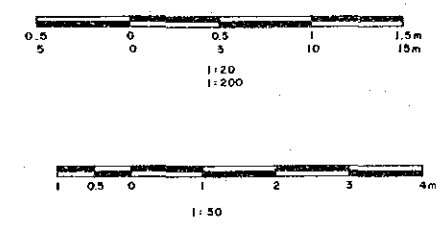
LOCATION	MEMBER	C.S. ①	U.P.V. ②	SH. ③
CS-1	G2 - SPAN 1	-	26.82	42
CS-2	G1 - SPAN 4	-	16.14	29
CS-3	DECK SLAB SPAN 1 BETWEEN G1-G2	-	27.90	39
CS-4	DECK SLAB SPAN 4 BETWEEN G1-G2	-	22.30	35
CS-5	A1 - CROSS HEAD	-	22.64	32
CS-6	A2 - G2 - DELETE	-	41.74	50
CS-7	P1 - C1	-	12.90	33.5
CS-8	P4 - C1	-	-	52
CS-9	P4 - C1 (COLUMN HEAD)	-	20.21	27
CS-10	A2 - C1 (a)	-	-	-
CS-11	A2 - C1 (b)	-	-	-
CS-12	A2 - C2	-	-	-
CS-13	A1 - C2	-	-	-
CS-14	LEFT WALKWAY SLAB SPAN 4 (g)	57.0	-	-

TEST RESULTS

CARBONATION DEPTH

LOCATION	MEMBER	DEPTH (mm)
CD-1	G2 - SPAN 7	0
CD-2	A2 CROSS HEAD BETWEEN G1-G2	0

- NOTES:-
- ① - THE STRENGTH WAS MEASURED BY CORE SAMPLING AND LAB TEST.
  - ② - THE STRENGTH WAS MEASURED BY ULTRASONIC PULSE VELOCITY (UPV)
  - ③ - THE STRENGTH WAS MEASURED BY SCHMIDT HAMMER (SH)



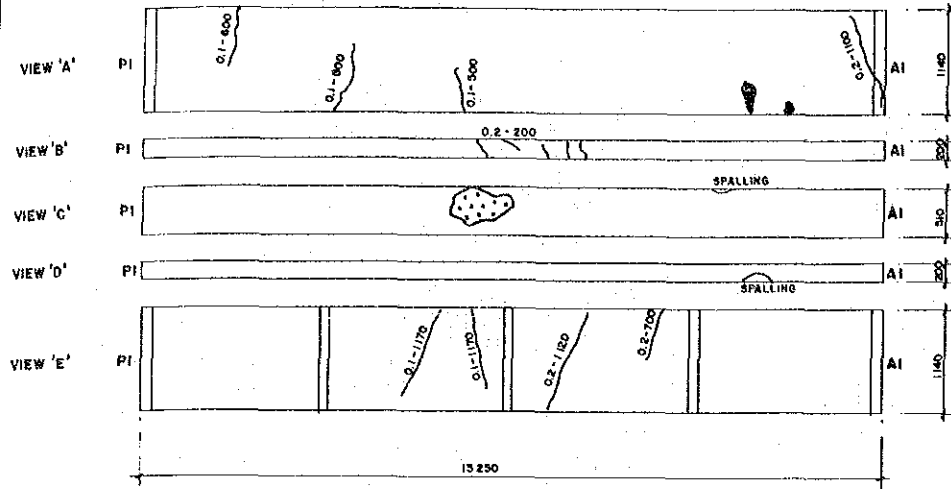
THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
STRENGTH MEASUREMENT DIAGRAM	3/191/10	AS SHOWN	DSS-3-2



**CRACK DIAGRAM OF GIRDERS**

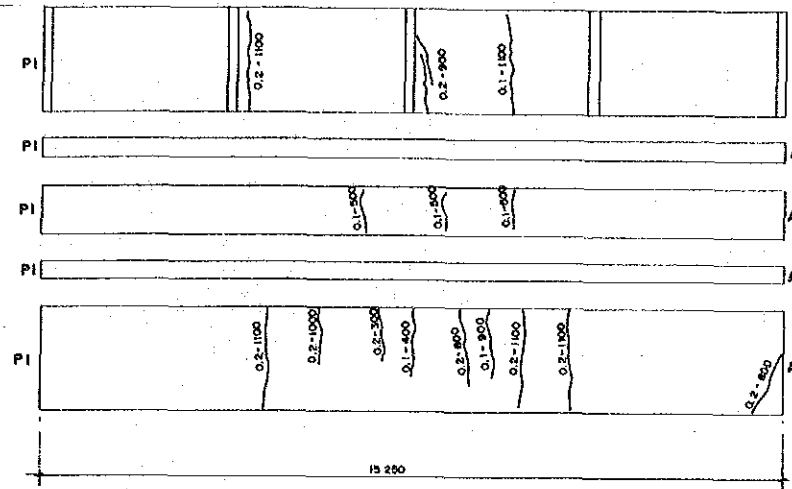
**SPAN 1 - GIRDER 1**

1:75  
1:40



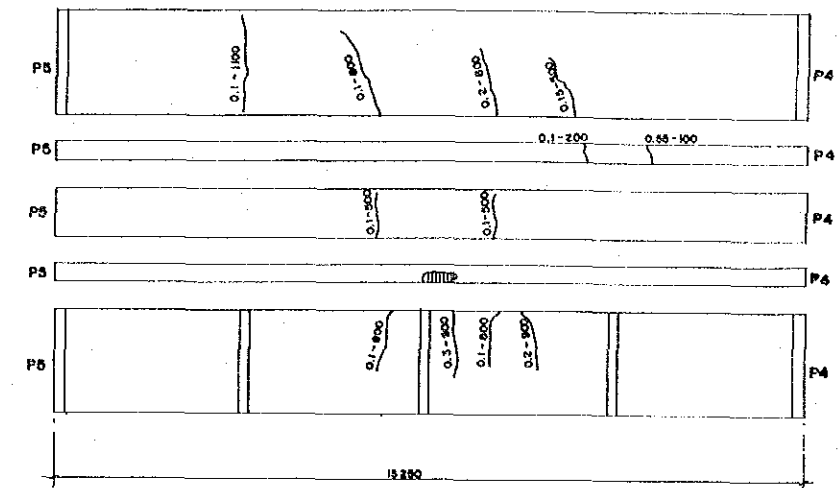
**SPAN 1 - GIRDER 2**

1:75  
1:40



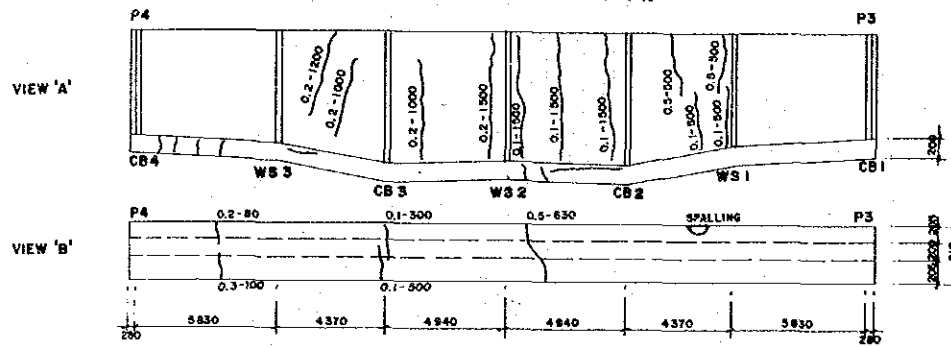
**SPAN 5 - GIRDER 1**

1:75  
1:40



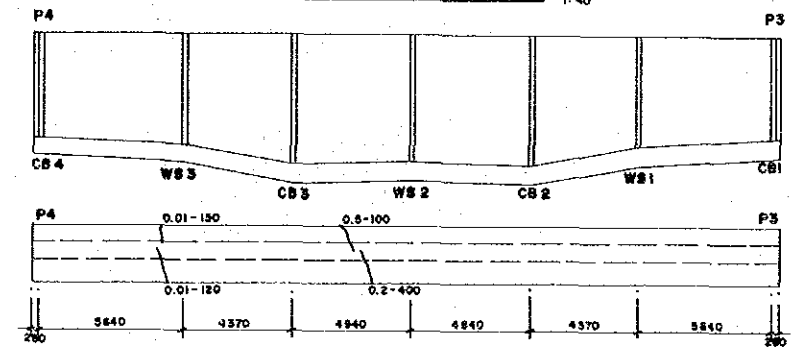
**SPAN 4 (MIDSPAN) - GIRDER 1**

1:150  
1:40



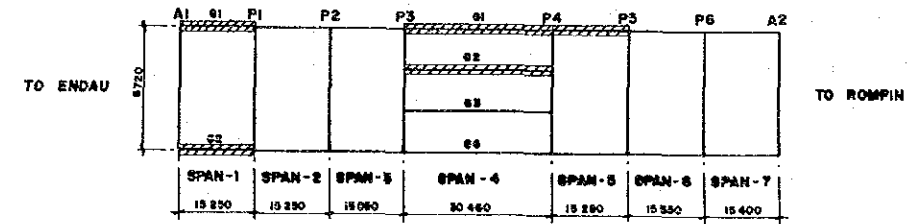
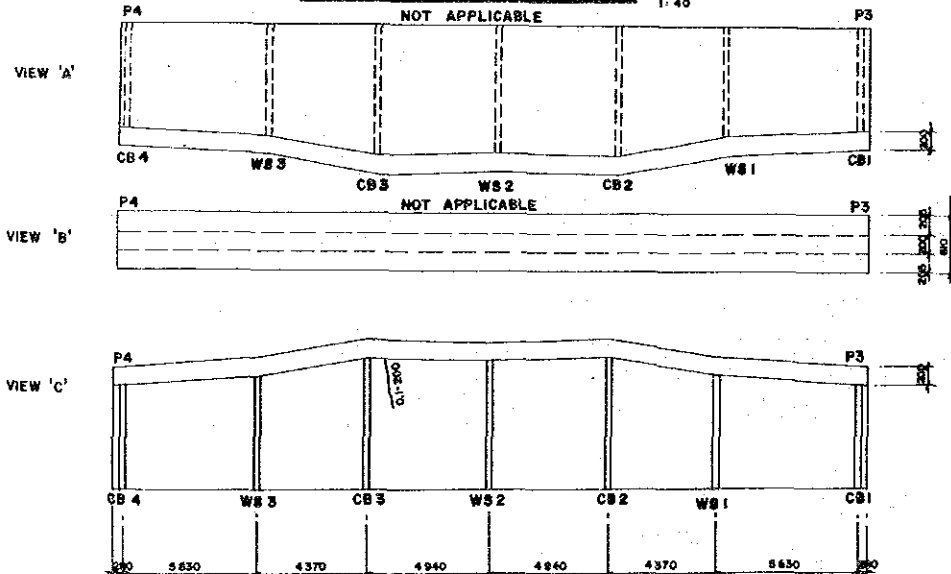
**SPAN 4 (MIDSPAN) - GIRDER 2**

1:150  
1:40



**SPAN 4 (MIDSPAN) - GIRDER 4**

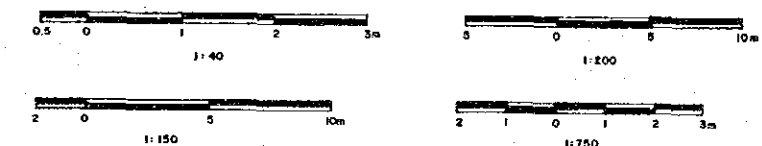
1:150  
1:40



**KEY MAP OF CRACK DIAGRAM**

H: 1:750  
V: 1:200

NOTE: CRACK DIAGRAM OF BEAMS INDICATED BY [Hatched] IS SHOWN IN THE DRAWING.



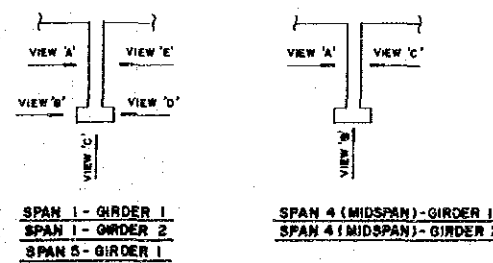
**LEGEND OF DAMAGE (CONCRETE)**

TYPE OF DAMAGES	INDICATION
CRACK #1	
FLAKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR/EROSION	
WATER STAIN	
OTHERS	

#1 O THE LENGTH OF CRACK  
O MAXIMUM CRACK WIDTH

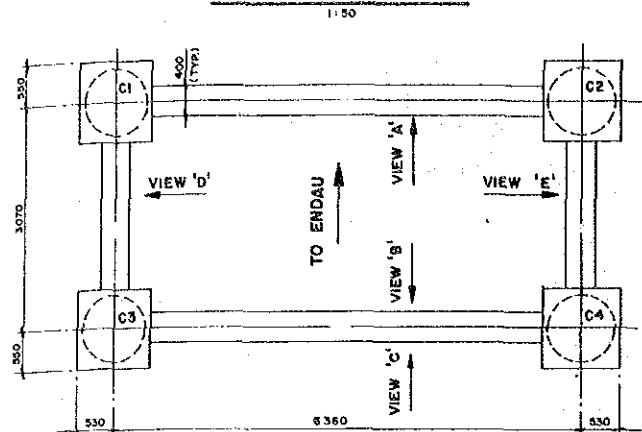
**NOTES:**

- ALL DECK SLABS ARE IN GOOD CONDITION.
- ALL CROSS-BEAMS IN SPAN 1, 2, 3, 4, 5, 6 & 7 ARE IN GOOD CONDITION.
- ALL CROSS-BEAMS ARE 200mm THK. UNLESS OTHERWISE SHOWN.
- 1140mm x CB1 & CB7  
1240mm x CB2, CB3 & WS2  
1450mm x WS1 & WS3.
- CORROSION DIAGRAM FOR SPAN 2, 3, 6 & 7 REPRESENTED BY SPAN 5.
- SPAN 4 - GIRDER 3 & GIRDER 4 CANNOT BE INSPECTED DUE TO ELECTRICITY CABLE.
- SPAN 5 - GIRDER 2 CANNOT BE INSPECTED DUE TO ELECTRICITY CABLE.
- CB - CROSS BEAM  
WS - WEAR STIFFENER

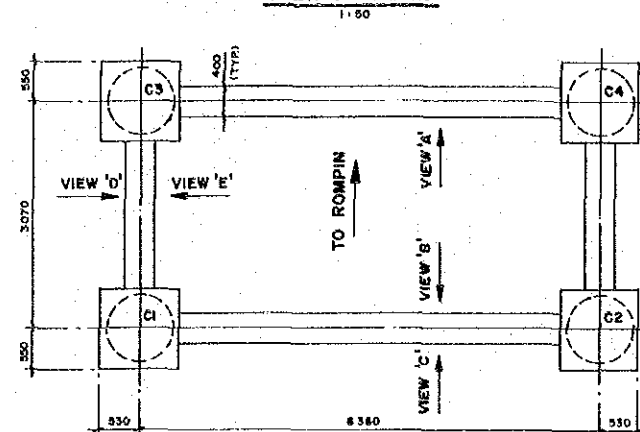


**CRACK DIAGRAM OF SUBSTRUCTURE**

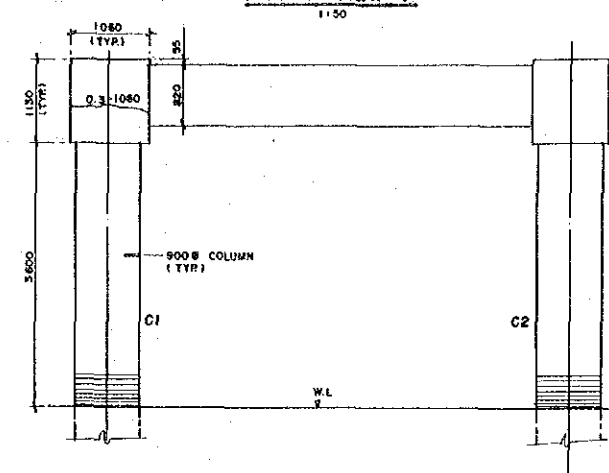
**ABUTMENT A1 - PLAN**



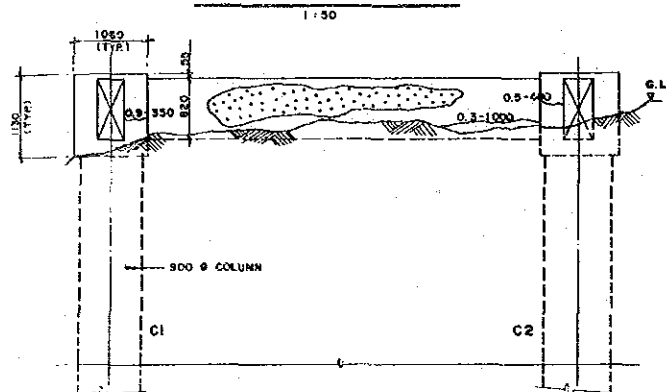
**PIER 1 - PLAN**



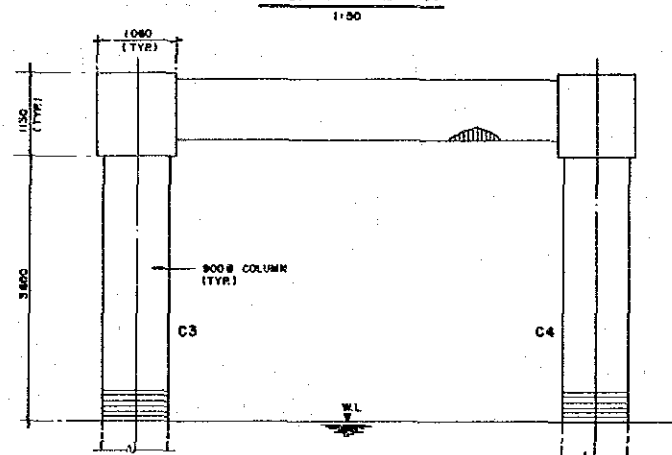
**PIER 1 - VIEW C**



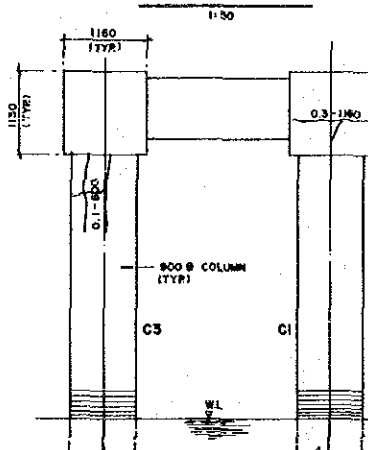
**ABUTMENT A1 - VIEW A**



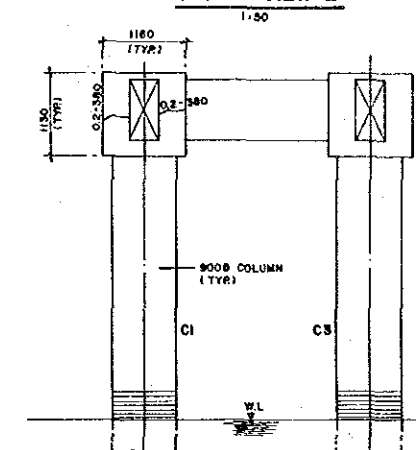
**PIER 1 - VIEW A**



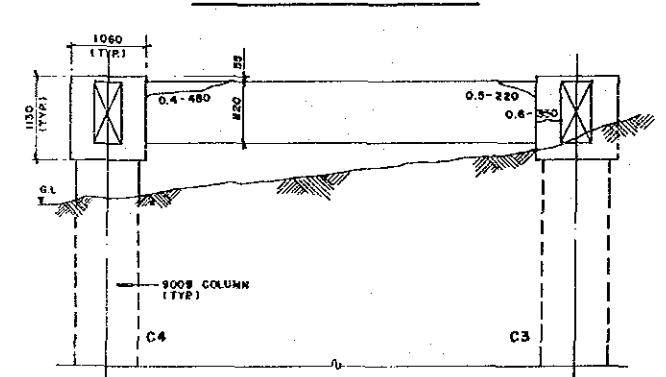
**PIER 1 - VIEW D**



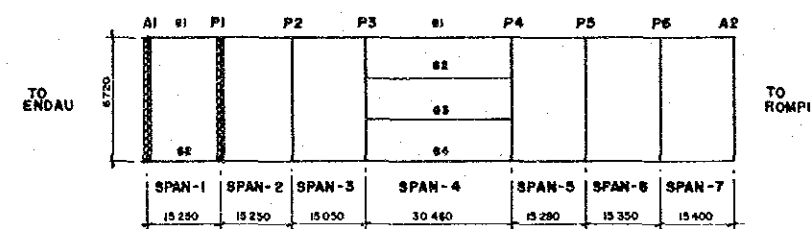
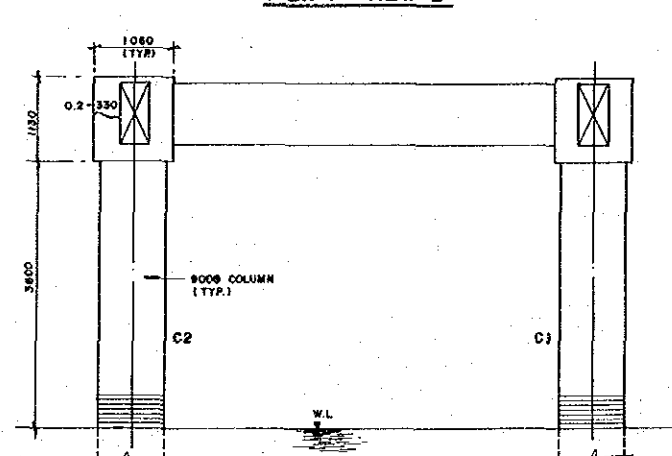
**PIER 1 - VIEW E**



**ABUTMENT A1 - VIEW B**



**PIER 1 - VIEW B**



**KEY MAP OF CRACK DIAGRAM**

H = 1:750  
V = 1:200

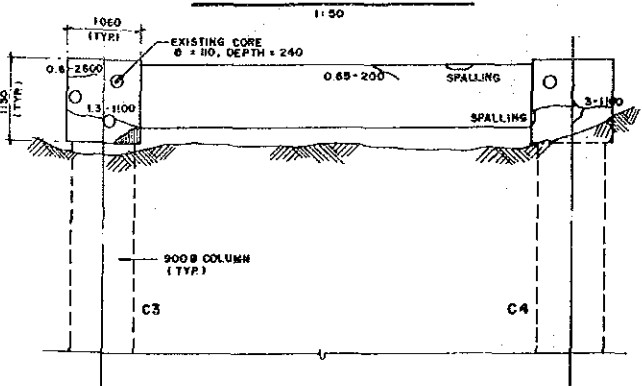
NOTE: CRACK DIAGRAM OF SUBSTRUCTURES INDICATED BY IS SHOWN IN THE DRAWING.

**LEGEND OF DAMAGE (CONCRETE)**

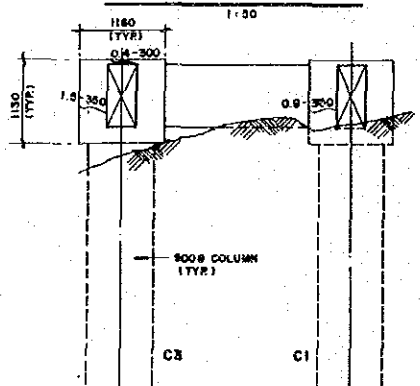
TYPE OF DAMAGES	INDICATION
CRACK	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR/EROSION	
WATER STAIN	
OTHERS	

Ø THE LENGTH OF CRACK  
□ MAXIMUM CRACK WIDTH

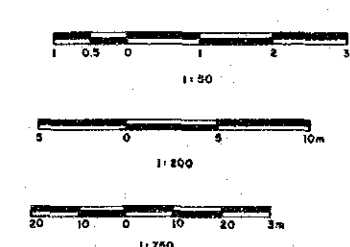
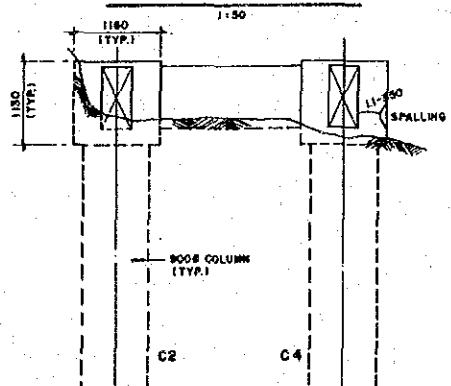
**ABUTMENT A1 - VIEW C**



**ABUTMENT A1 - VIEW D**



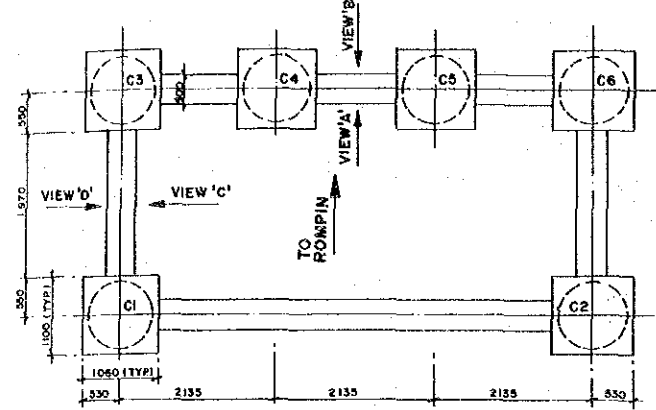
**ABUTMENT A1 - VIEW E**



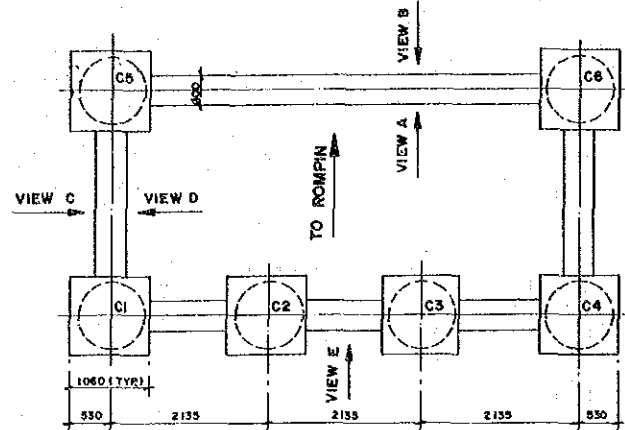
	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CRACK DIAGRAM (2/3)	3/191/10	AS SHOWN	DSS-3-4

**CRACK DIAGRAM OF PIERS**

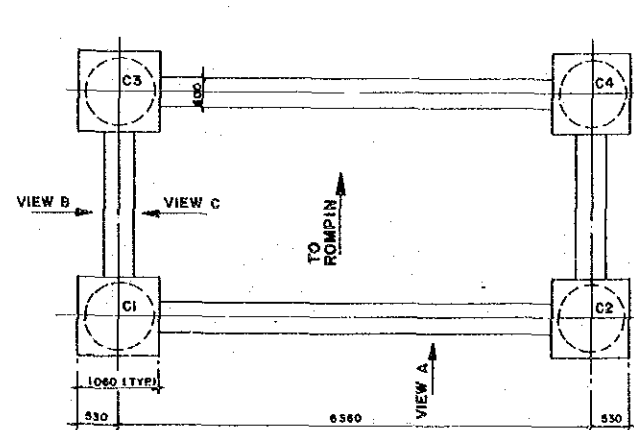
**PIER 3 - PLAN**  
1:50



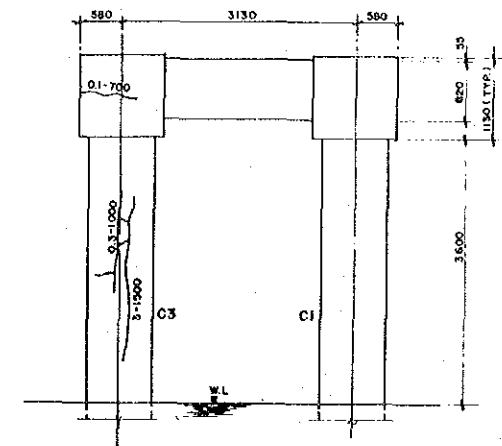
**PIER 4 - PLAN**  
1:50



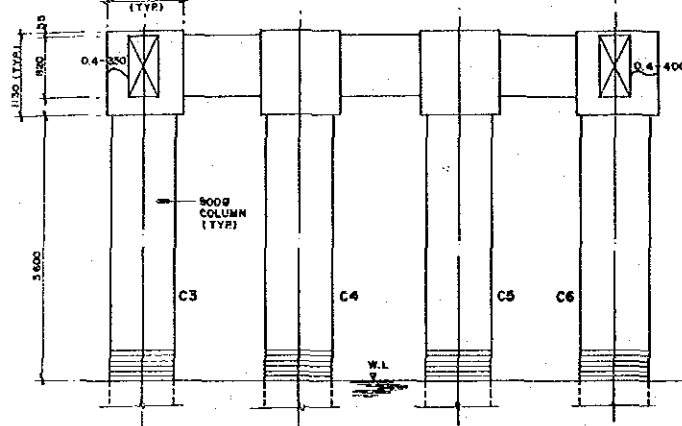
**PIER 5 - PLAN**  
1:50



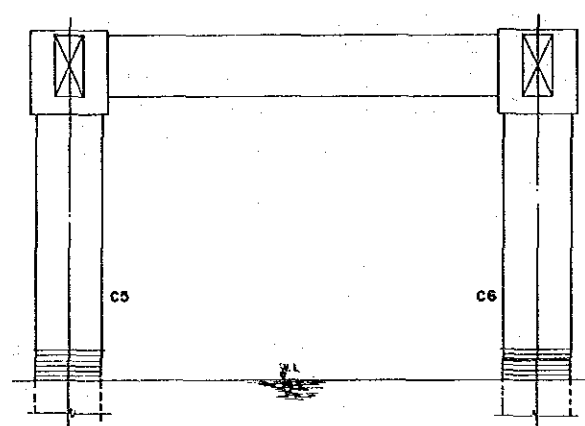
**PIER 5 - VIEW B**  
1:50



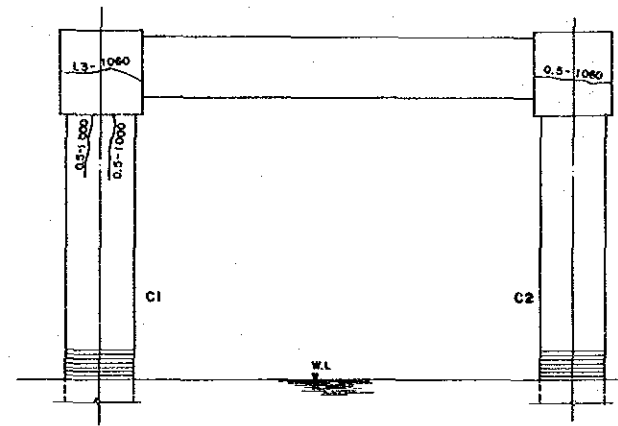
**PIER 3 - VIEW A**  
1:50



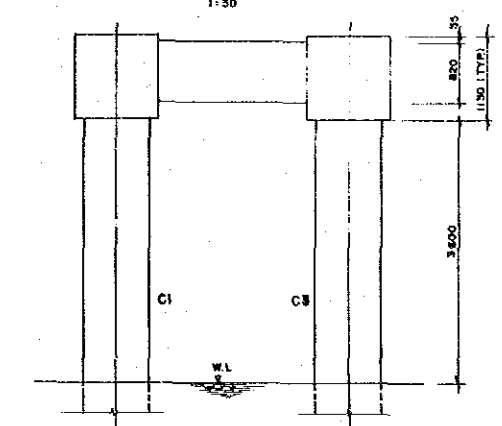
**PIER 4 - VIEW A**  
1:50



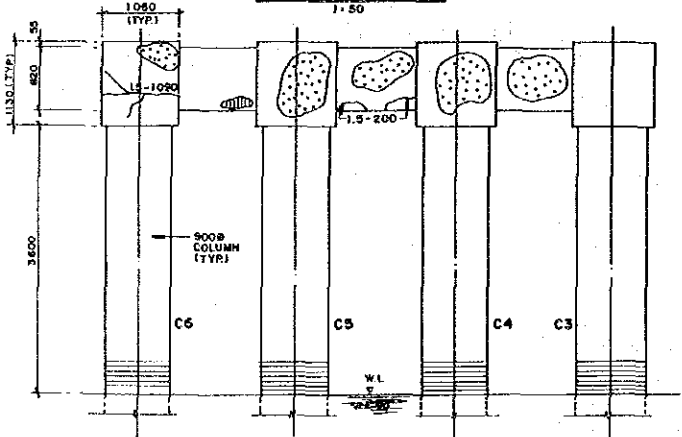
**PIER 5 - VIEW A**  
1:50



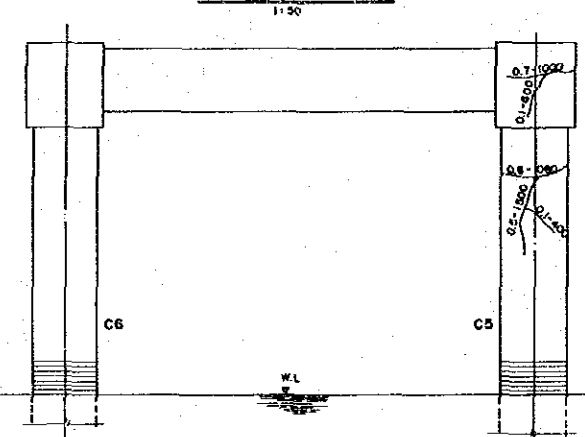
**PIER 5 - VIEW C**  
1:50



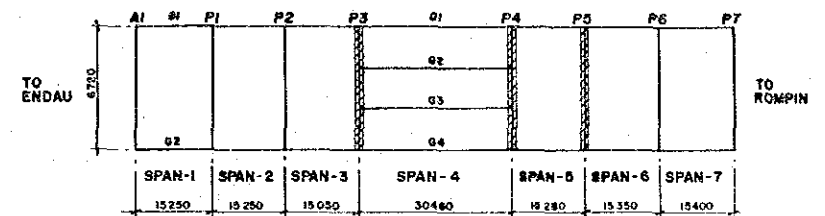
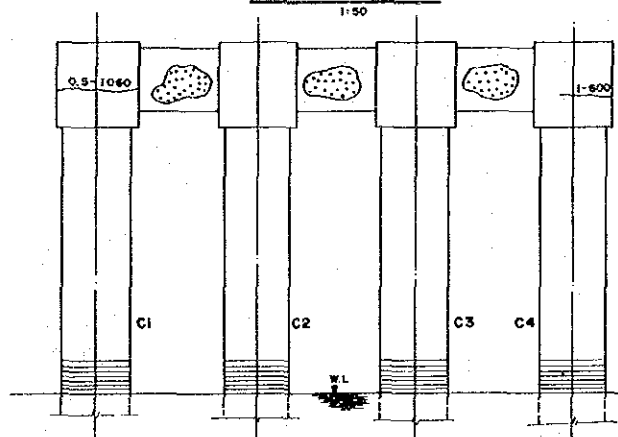
**PIER 3 - VIEW B**  
1:50



**PIER 4 - VIEW B**  
1:50



**PIER 4 - VIEW E**  
1:50



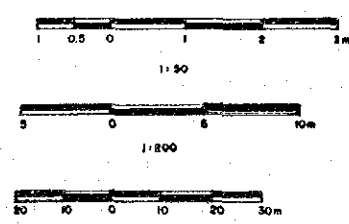
**KEY MAP OF CRACK DIAGRAM**

NOTE: CRACK DIAGRAM OF PIERS INDICATED BY IS SHOWN IN THE DRAWING.

**LEGEND OF DAMAGE (CONCRETE)**

TYPE OF DAMAGES	INDICATION
CRACK #1	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR / EROSION	
WATER STAIN	
OTHERS	

Ø THE LENGTH OF CRACK  
□ MAXIMUM CRACK WIDTH



**JICA**

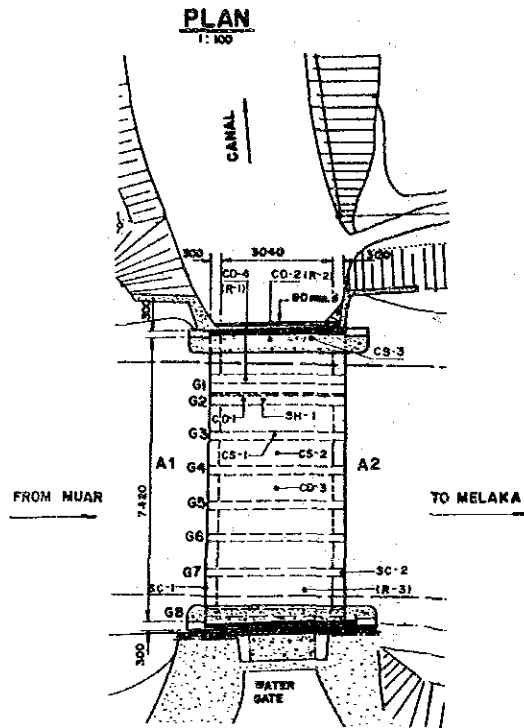
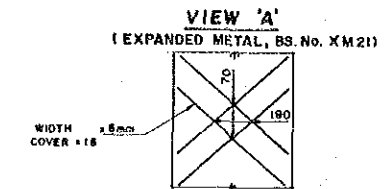
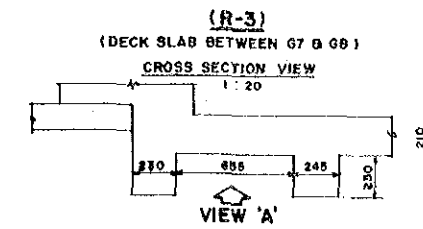
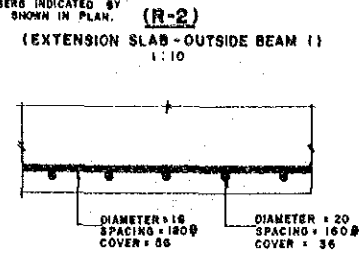
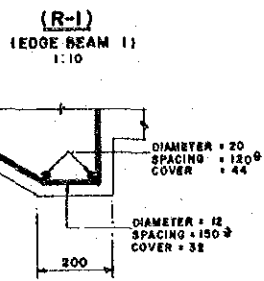
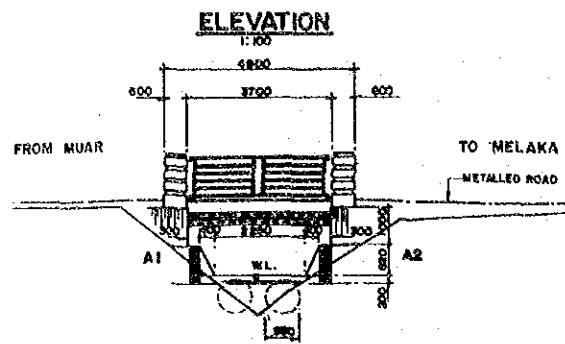
THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA

TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
CRACK DIAGRAM (3/3)	3/191/10	A3 SHOWN	DSS-3-5



**STRUCTURAL DETAILS**

NOTE: LOCATION OF MEMBERS INDICATED BY R1-R5 ARE ALSO SHOWN IN PLAN.



**TEST RESULTS**

**CONCRETE STRENGTH BY SCHMIDT HAMMER**

LOCATION	MEMBER	STRENGTH (N/mm <sup>2</sup> )
CS-1	G3 WEB	24
CS-2	DECK SLAB BETWEEN G3 & G4	34
CS-3	DECK SLAB OUTSIDE G1	<10

**CARBONATION DEPTH**

LOCATION	MEMBER	DEPTH (mm)
CD-1	G2 (HORIZONTAL)	16
CD-2	DECK SLAB (BOTTOM) OUTSIDE G1	>75
CD-3	DECK SLAB (BOTTOM) BETWEEN G4 & G5	65
CD-4	G1 (BOTTOM)	25

**SULPHATE CONTENT (UNIT: %)**

LOCATION	MEMBER	DEPTH (mm)		
		0-20	21-40	41-60
SC-1	ABUTMENT A1 (LHS)	0.16	0.11	0.24
SC-2	ABUTMENT A2 (RHS)	2.45	2.06	1.35

**THICKNESS MEASUREMENT**

STEEL THICKNESS (ENCASED STEEL BEAM) mm.

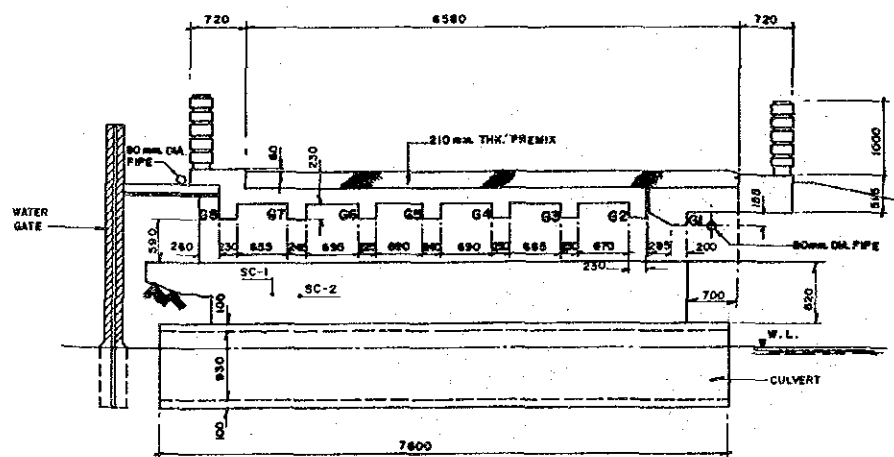
BEAM NO.	POINT	O	L/2	L
G2	FU1	-	-	-
	FUF	-	-	-
	WT	-	-	-
	FL1	-	-	-
	FLF	9.46	-	9.64

**STEEL STRENGTH MEASUREMENT**

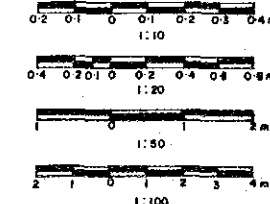
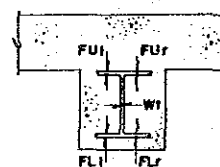
STEEL HARDNESS/STRENGTH (ENCASED STEEL BEAM)

LOCATION	MEMBER	BRINELL HARDNESS	STRENGTH (N/mm <sup>2</sup> )
SH-1	G2 BOTTOM FLANGE	126	425

**CROSS - SECTION**



**TYP. ENCASED STEEL BEAM**

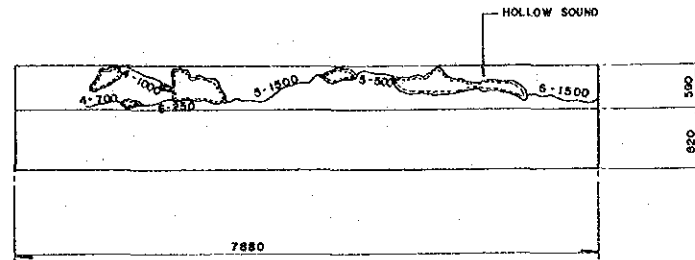


\* - REBAR SPACING SHOWN ON DRAWING IS APPROXIMATE ONLY.

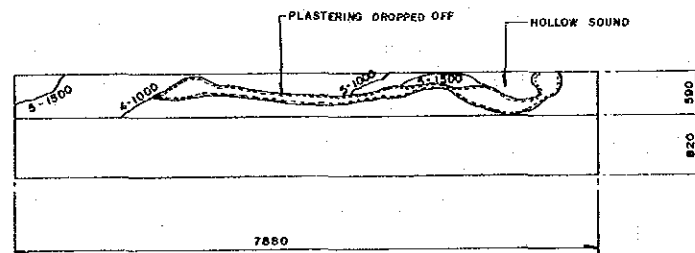
	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	STRENGTH MEASUREMENT DIAGRAM	5 / 208 / 5	AS SHOWN	DSS - 4 - 2

**CRACK DIAGRAM OF ABUTMENT**

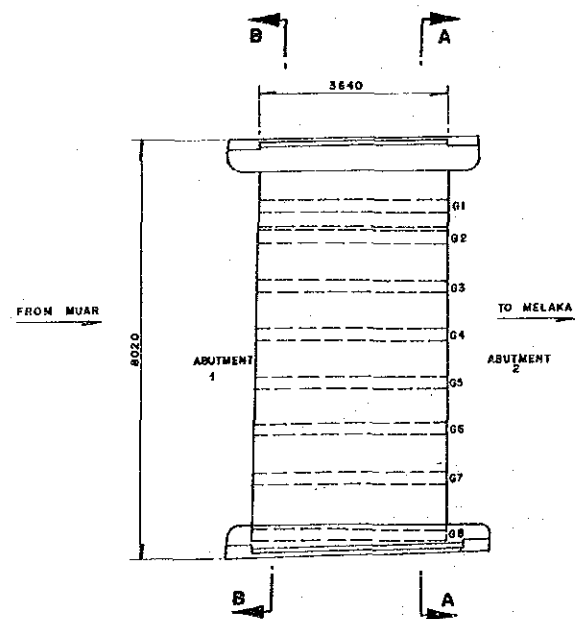
**SECTION A-A  
(ABUTMENT 2)**  
1:50



**SECTION B-B  
(ABUTMENT 1)**  
1:50



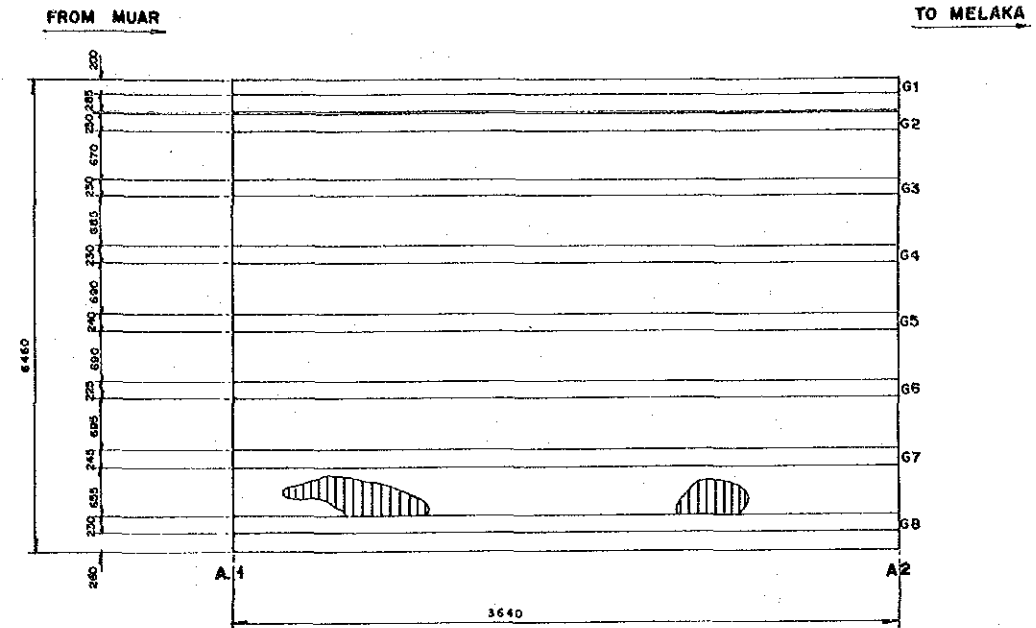
**KEY MAP**  
N.T.S.



**NOTES:-**  
1) BOTH ABUTMENTS ARE MASONRY WITH CEMENT MORTAR PLASTERING.  
2) CRACK AND FLACKING ARE ON THE PLASTERING SURFACE ONLY.

**CRACK DIAGRAM OF DECK SLAB SOFFIT**

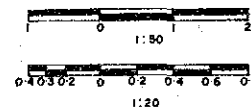
**DECK SLAB SOFFIT**  
H: 1:20 V: 1:50



**LEGEND OF DAMAGE (CONCRETE)**

TYPE OF DAMAGES	INDICATION
CRACK #	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR/EROSION	
WATER STAIN	
OTHERS	

\* □ - MAXIMUM CRACK WIDTH  
○ - LENGTH OF CRACK

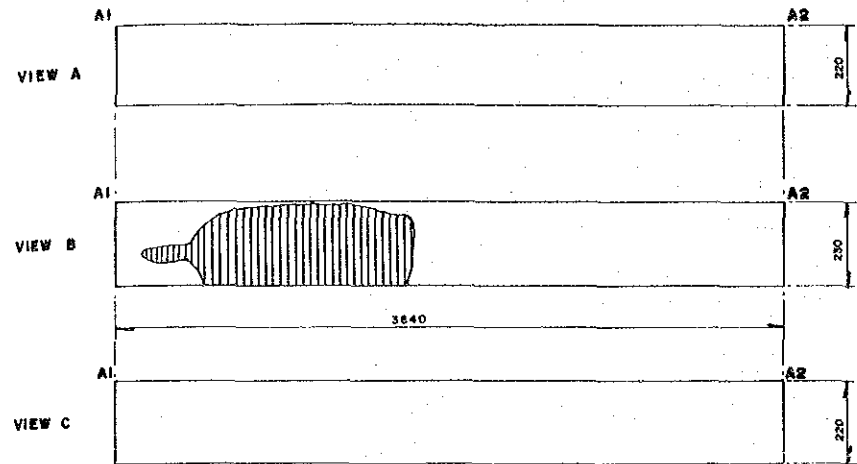


	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CRACK DIAGRAM (1/2)	5 / 208 / 50	AS SHOWN	DSS - 4-3

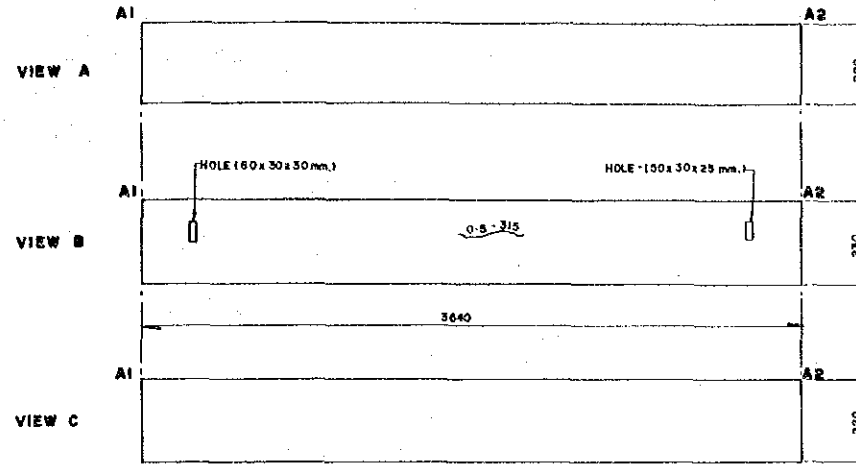


**CRACK DIAGRAM OF GIRDERS**

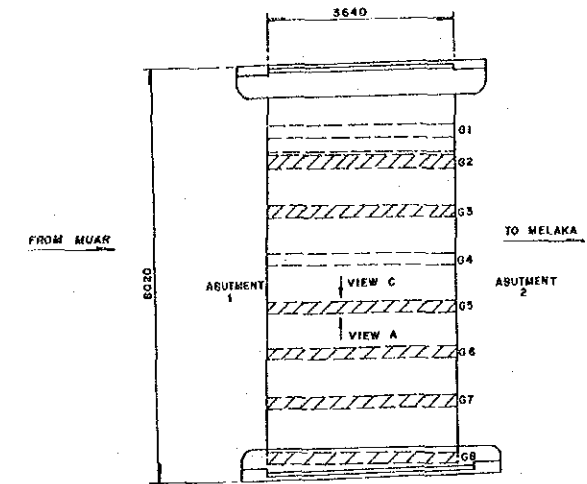
**GIRDER 2**  
H=1:20 V=1:10



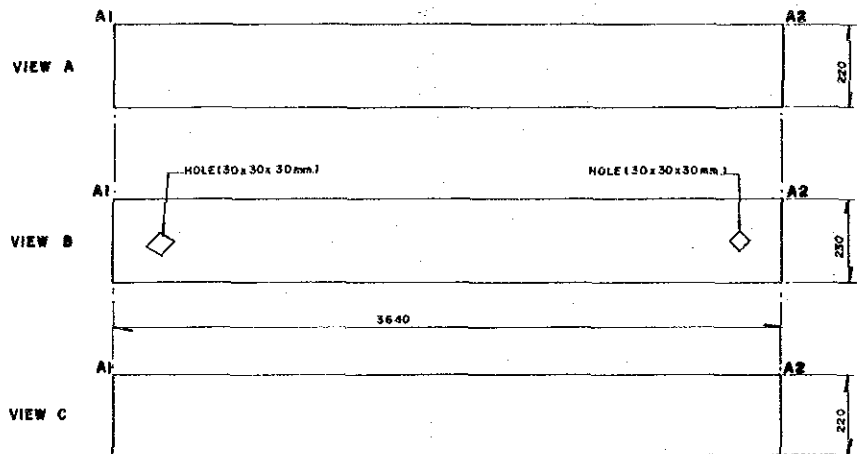
**GIRDER 3**  
H=1:20 V=1:10



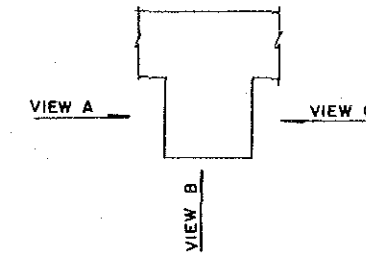
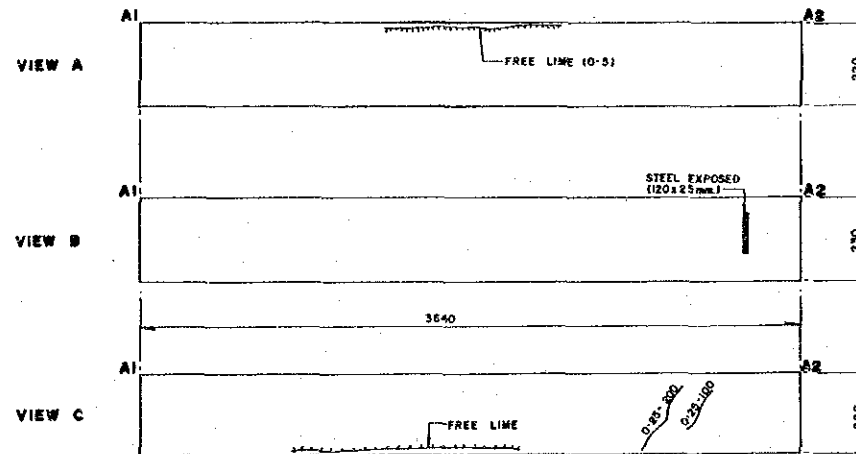
**KEY MAP**  
N.T.S.



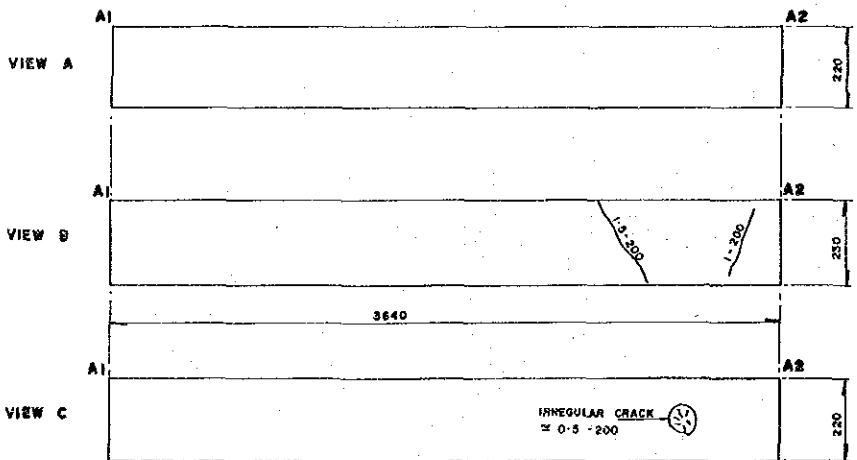
**GIRDER 5**  
H=1:20 V=1:10



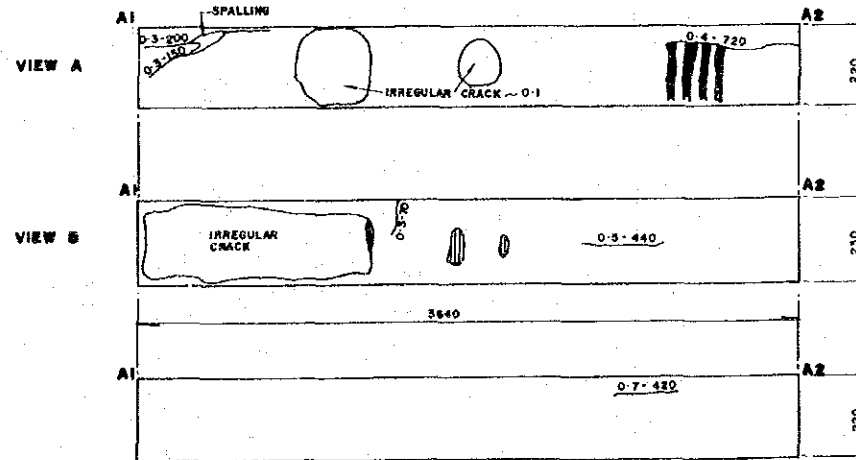
**GIRDER 6**  
H=1:20 V=1:10



**GIRDER 7**  
H=1:20 V=1:10



**GIRDER 8**  
H=1:20 V=1:10



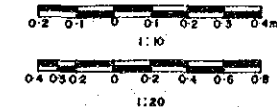
**LEGEND OF DAMAGE (CONCRETE)**

TYPE OF DAMAGES	INDICATION
CRACK #	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR/EROSION	
WATER STAIN	
OTHERS	

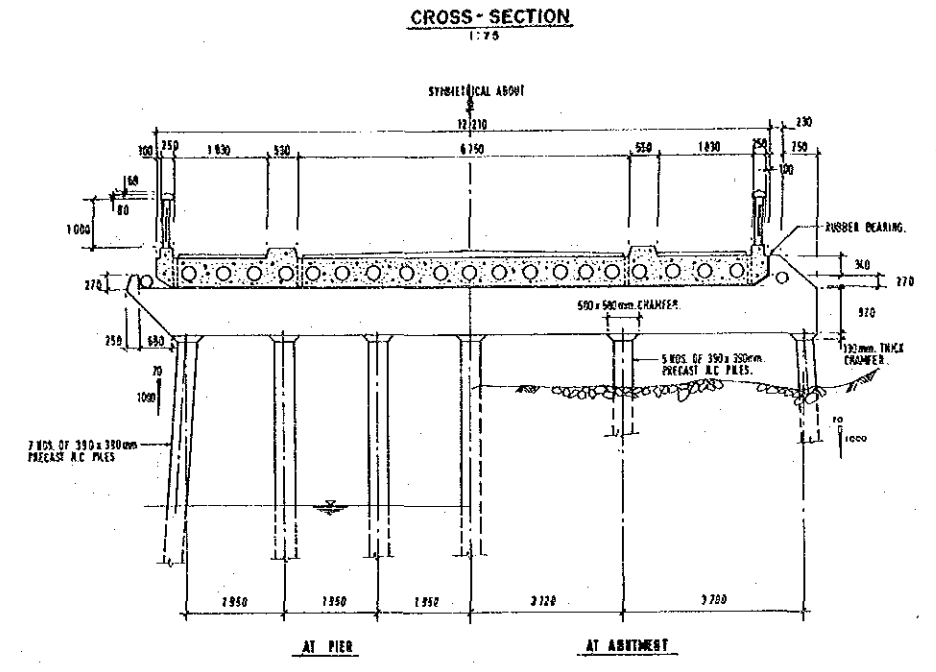
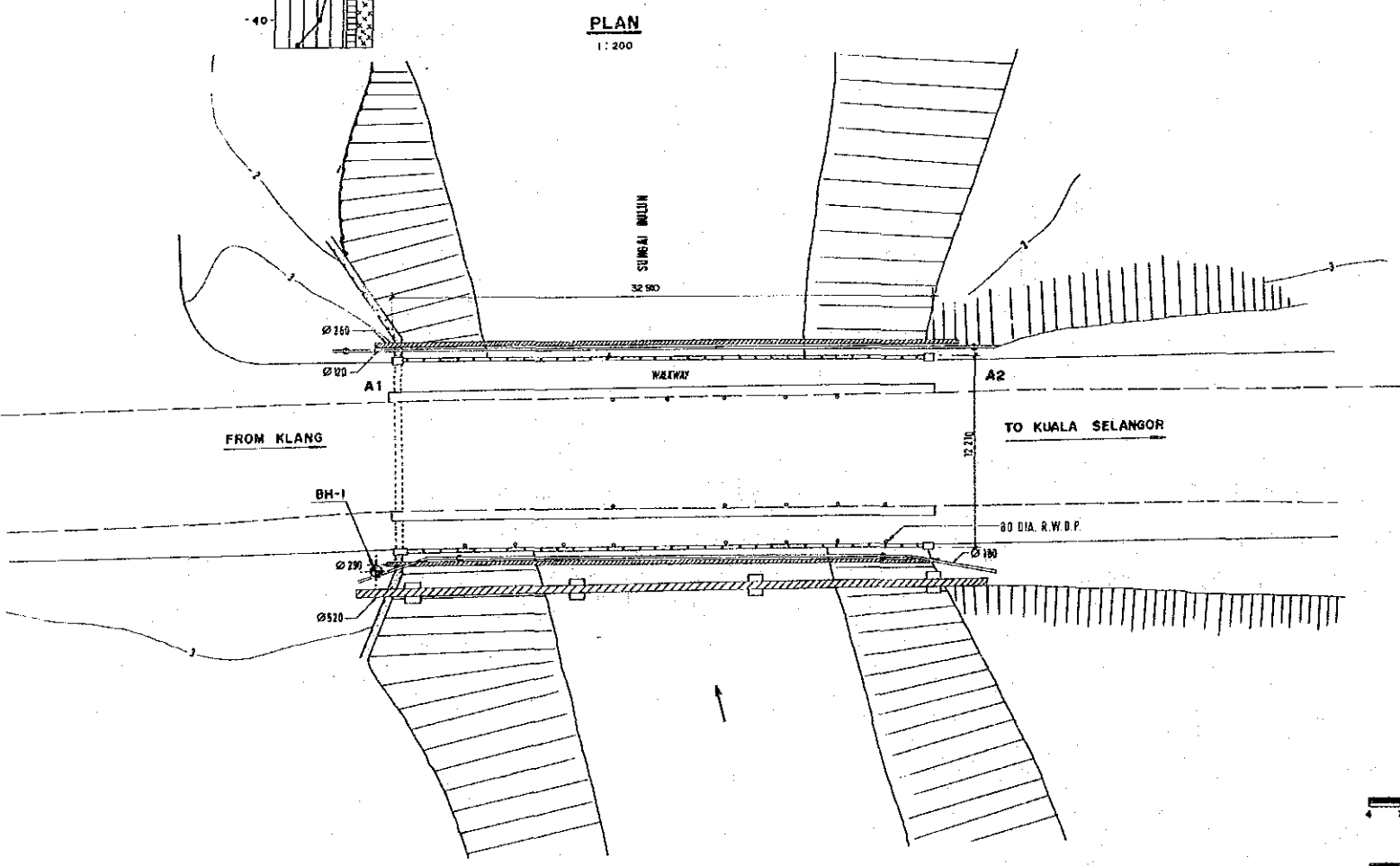
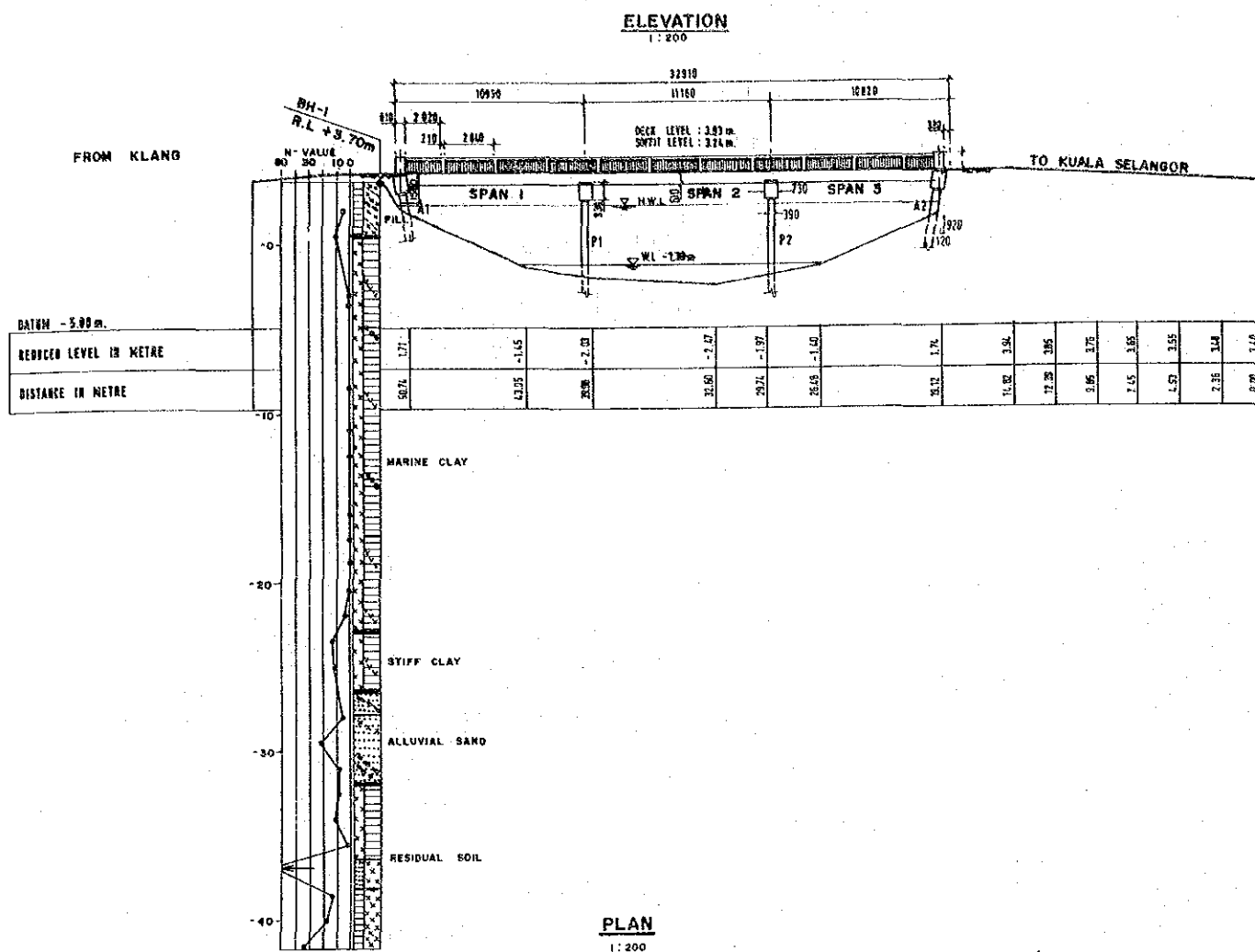
# □ MAXIMUM CRACK WIDTH  
○ ○ LENGTH OF CRACK

**NOTE:**

- GIRDER 1 & 4 ARE IN GOOD CONDITION.
- LOCATION OF CRACK DIAGRAM INDICATED BY 622 IS SHOWN ABOVE IN KEY MAP.

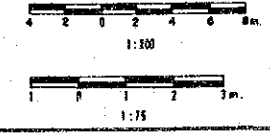


	<b>THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA</b>				
	TITLE OF DRAWING		BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CRACK DIAGRAM (2/2)		5/208/50	AS SHOWN	DSS-4-4



**BRIDGE DATA:**

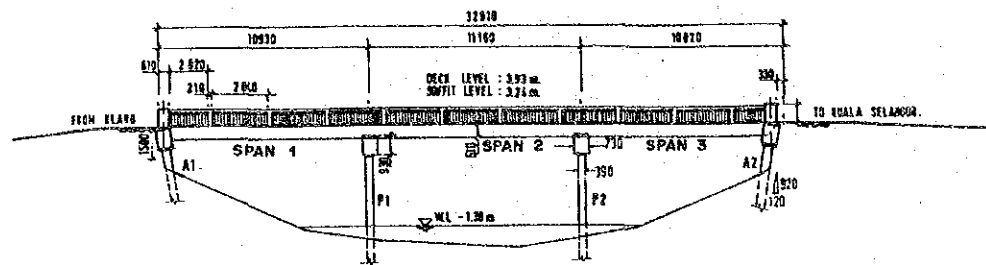
KEY NO :	5 / 469 / 80	
STATE :	SELANGOR	
DISTRICT :	KUALA SELANGOR	
DESIGN LIVE LOAD :	HA LOADING	
MATERIAL YIELD STRENGTH	CONCRETE	SUPERSTRUCTURE : DECK 20 N/mm <sup>2</sup>
		SUBSTRUCTURE : 20 N/mm <sup>2</sup>
	REBAR	230 N/mm <sup>2</sup>
TYPE OF SUPERSTRUCTURE :	SIMPLY SUPPORTED VOIDED SLAB	
TYPE OF SUBSTRUCTURE :	ABUTMENT	BANK SEAT
	PIER	PILE BENT
YEAR BUILT :	1969 (ESTIMATED)	



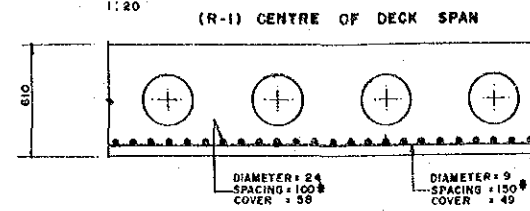
	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	GENERAL VIEW	5 / 469 / 80	AS SHOWN	DSS-5-1

### STRUCTURAL DETAILS

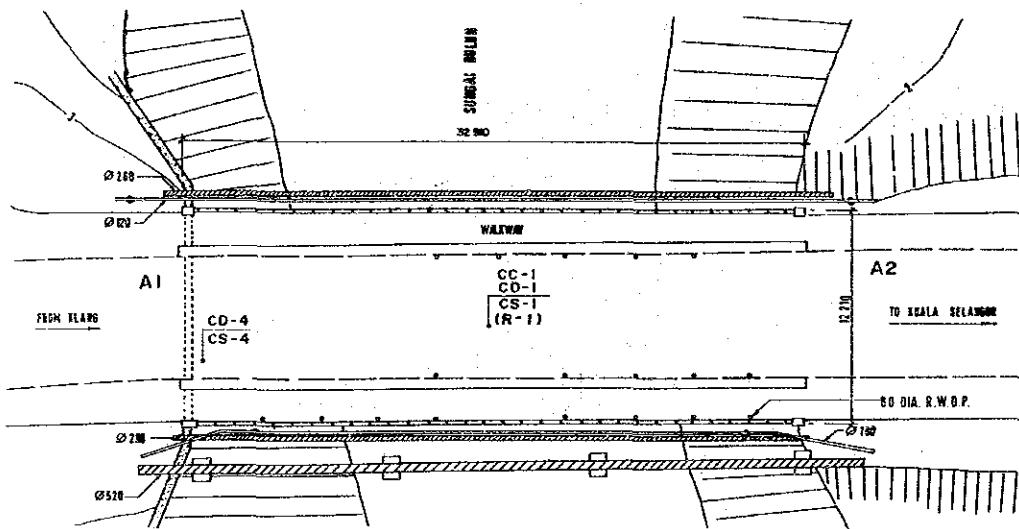
**ELEVATION**  
1:200



**REBAR SPACING, DIAMETER AND COVER**  
1:20



**PLAN**  
1:200



### TEST RESULTS

**CONCRETE STRENGTH BY SCHMIDT HAMMER**

LOCATION	MEMBER	STRENGTH (N/mm <sup>2</sup> )
CS-1	SLAB SOFFIT AT SPAN 2	24
CS-2	PILE 6 AT PIER 1	37
CS-3	ABUTMENT 1/CAPPING BEAM	55
CS-4	SLAB SOFFIT AT SPAN 1	51

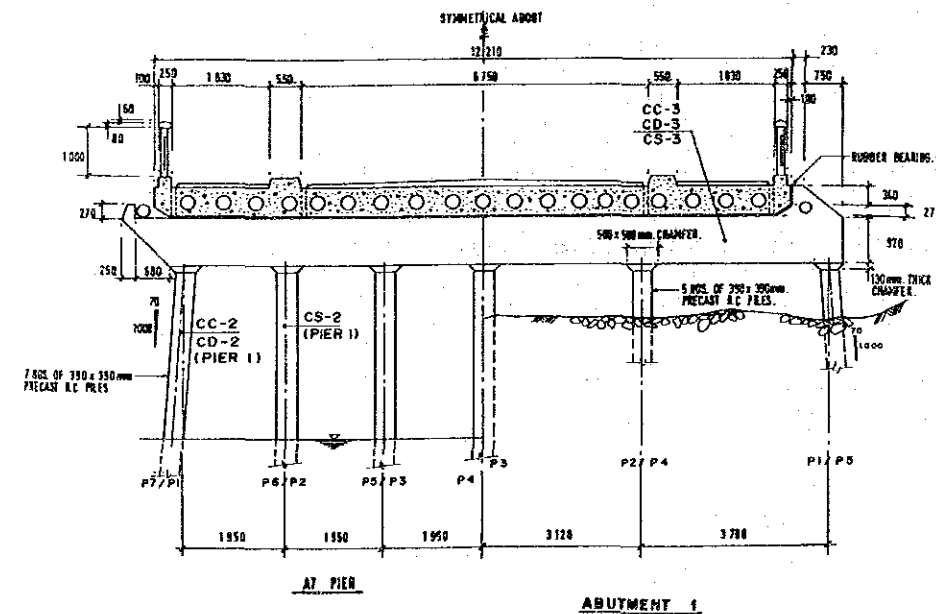
**CARBONATION DEPTH**

LOCATION	MEMBER	DEPTH (mm)
CD-1	SLAB SOFFIT AT SPAN 2	30
CD-2	PILE 7 AT PIER 1	3
CD-3	ABUTMENT 1/CAPPING BEAM	3
CD-4	SLAB SOFFIT AT SPAN 1	5

**CHLORIDE CONTENT (UNIT : %)**

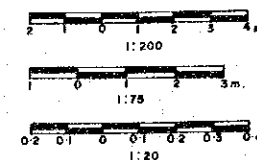
LOCATION	MEMBER	DEPTH (mm)		
		0-20	21-40	41-60
CC-1	SLAB AT SPAN 2	< 0.01	< 0.01	< 0.01
CC-2	PILE 7 AT PIER 1	2.81	1.25	2.06
CC-3	ABUTMENT 1	0.06	< 0.01	0.66

**CROSS SECTION**  
1:75



**NOTES :**

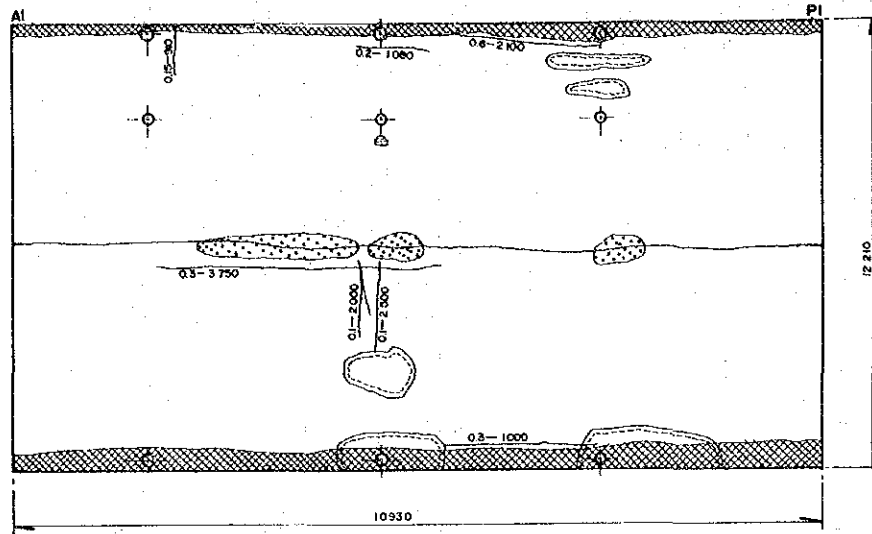
1. ALL DIMENSION IN MM UNLESS OTHERWISE STATED.
2. LOCATION INDICATED BY (R-1) IS ALSO INDICATED ON PLAN.
3. ⌀ - REBAR SPACING SHOWN IN THE DRAWING IS APPROXIMATE ONLY.



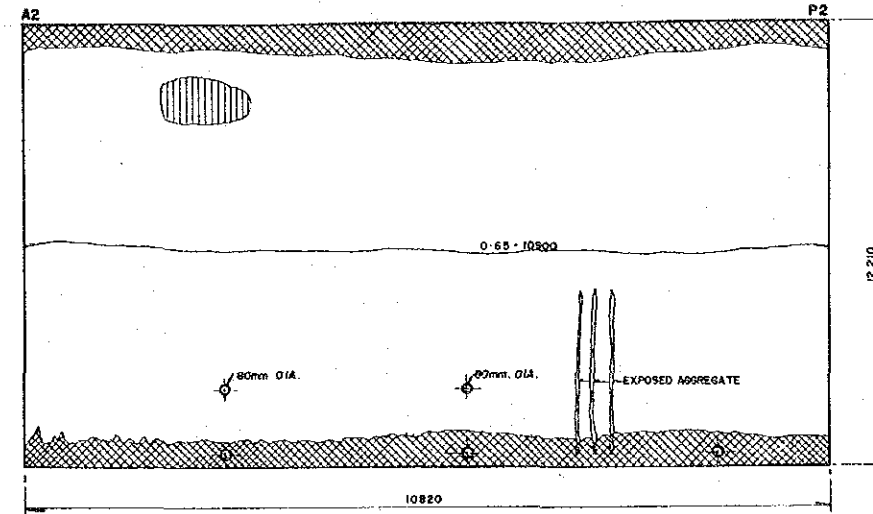
<b>JICA</b>	<b>THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA</b>			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	STRENGTH MEASUREMENT DIAGRAM	5/469/80	AS SHOWN	DSS - 5 - 2

CRACK DIAGRAM FOR DECK SLAB

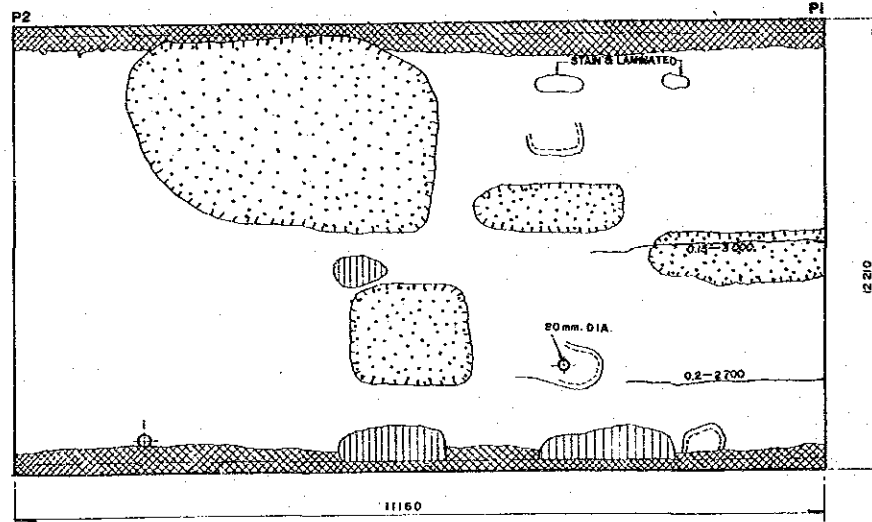
DECK SLAB SPAN 1  
1:50  
1:100



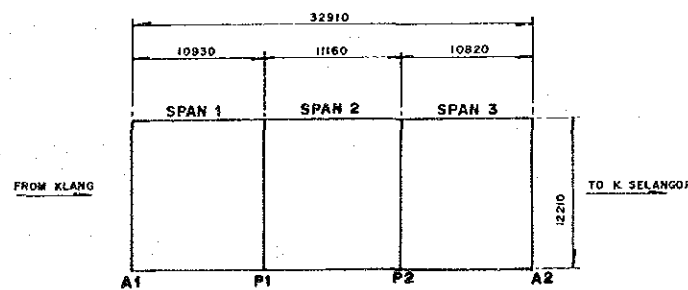
DECK SLAB SPAN 3  
1:88



DECK SLAB SPAN 2  
1:50  
1:100



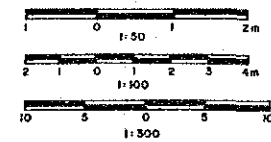
KEY MAP  
1:300



LEGEND OF DAMAGE (CONCRETE)

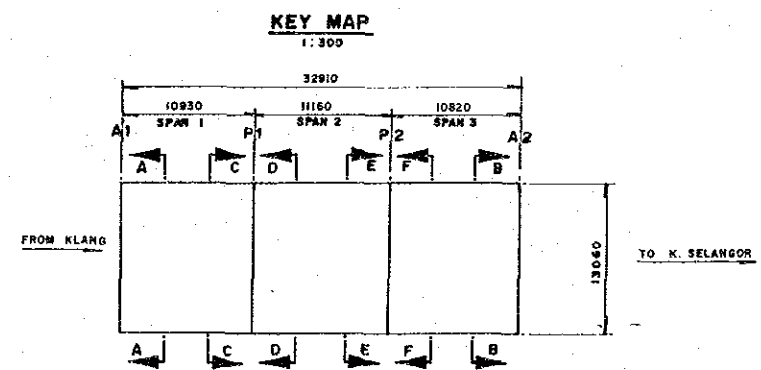
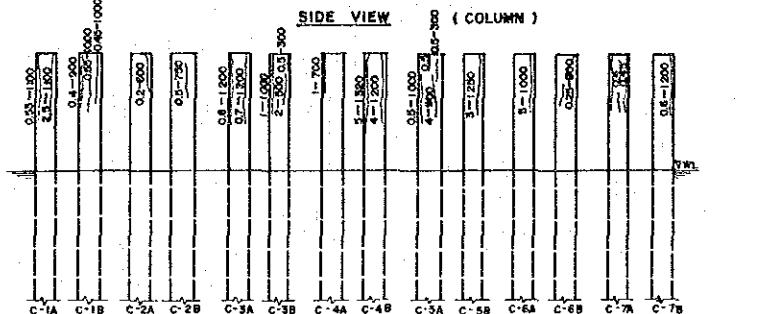
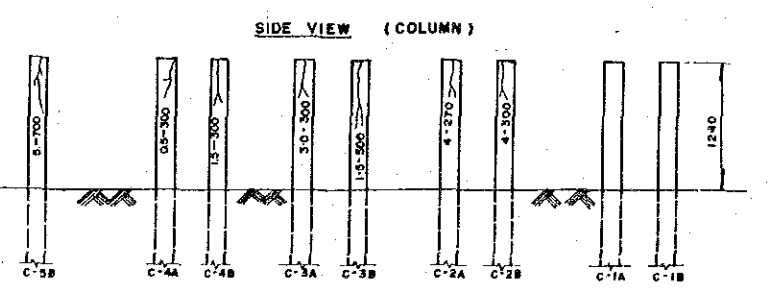
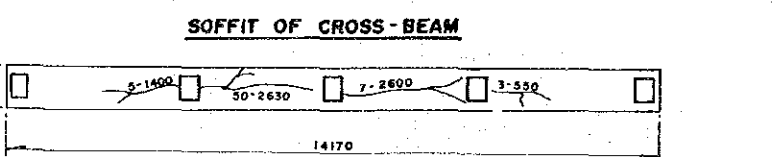
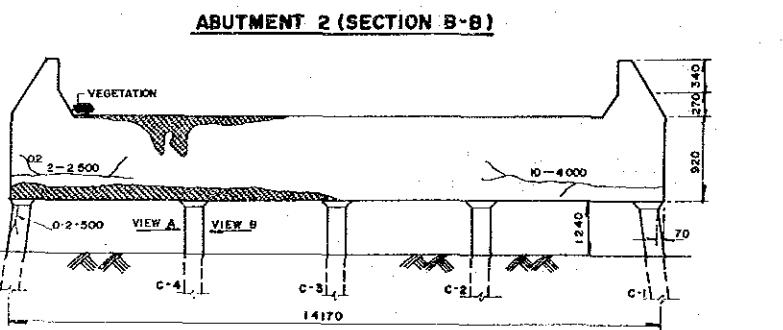
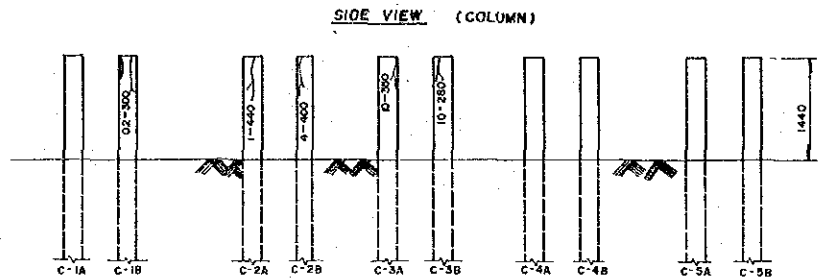
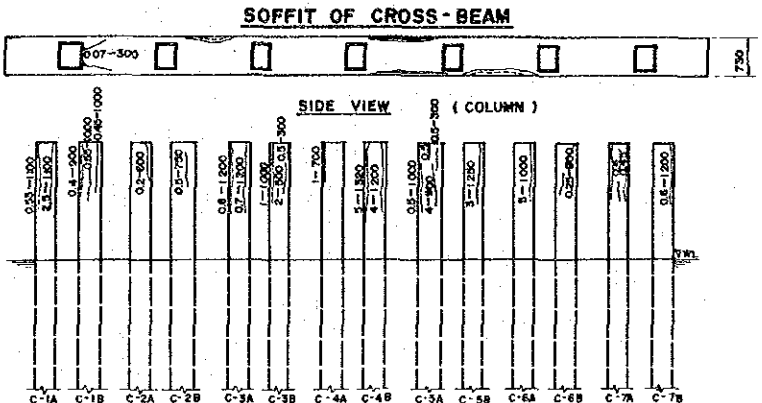
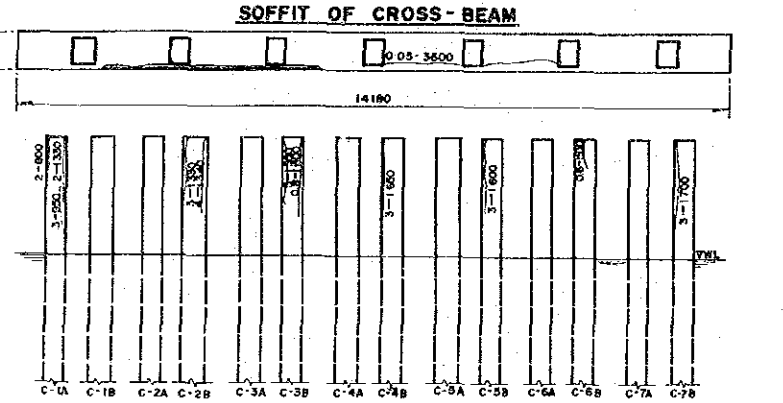
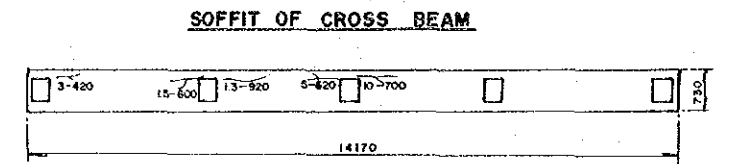
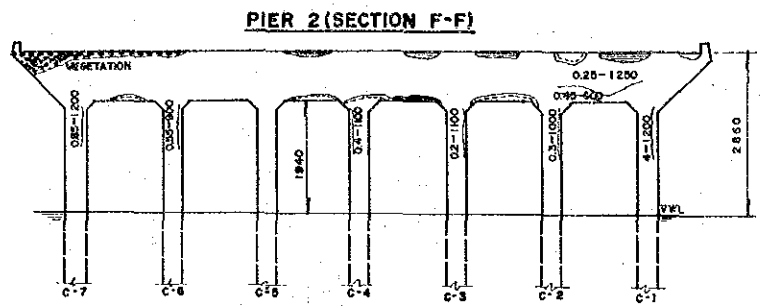
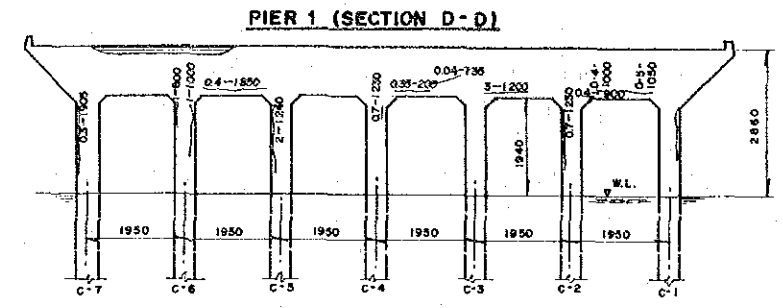
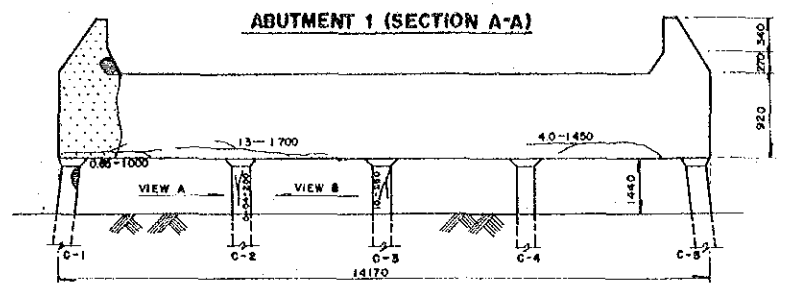
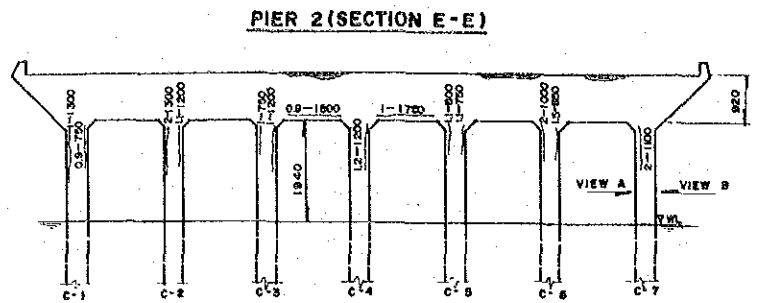
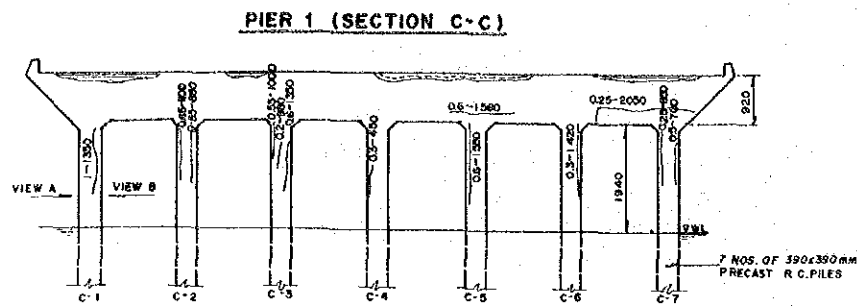
TYPE OF DAMAGES	INDICATION
CRACK	☐-○
FLACKING	▭
REBAR EXPOSURE	▨
FREE LIME	▩
HONEY COMB	▧
WEAR/EROSION	▦
WATER STAIN	▨
OTHERS	○

☐ THE LENGTH OF CRACK  
○ MAXIMUM CRACK WIDTH



JICA	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	CRACK DIAGRAM (1/2)	5/469/80	AS SHOWN	DSS-5-3

**CRACK DIAGRAM FOR ABUTMENTS AND PIERS**

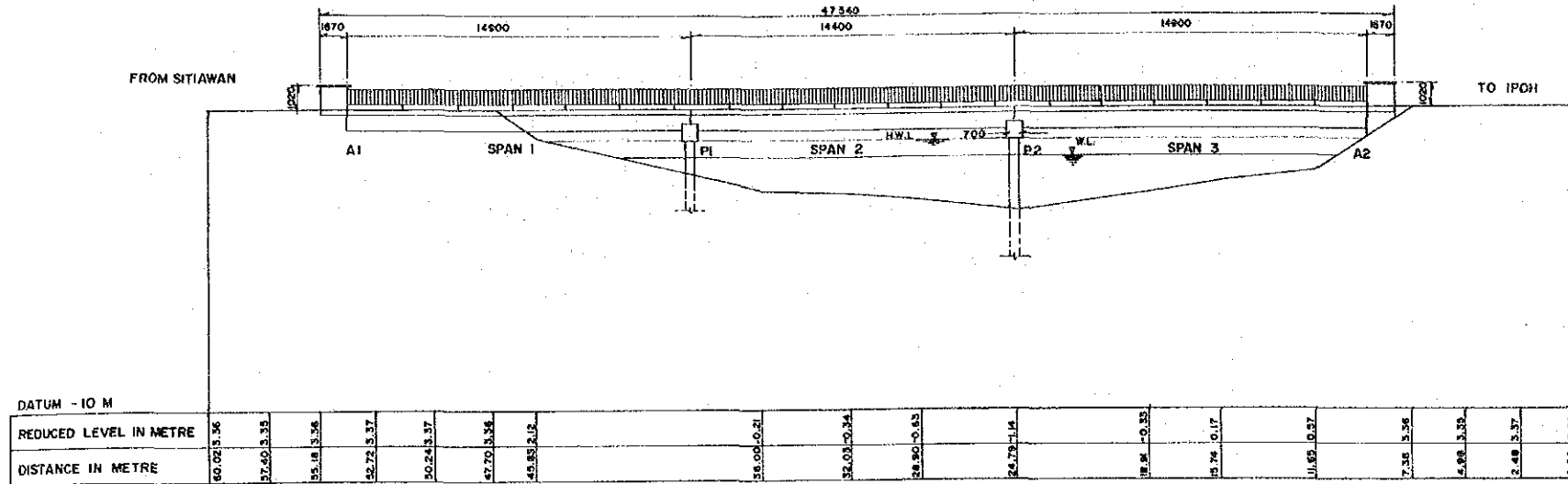


**LEGEND OF DAMAGE (CONCRETE)**

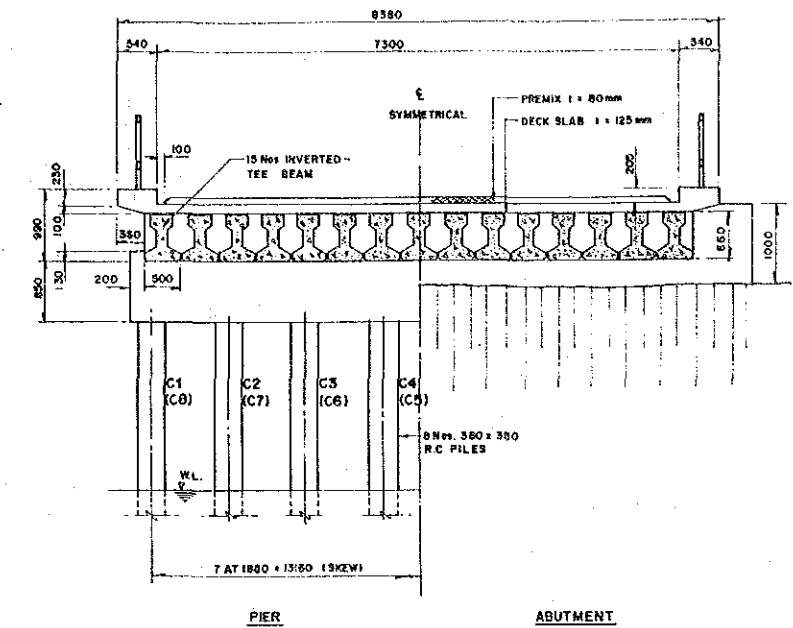
TYPE OF DAMAGES	INDICATION
CRACK *	
FLACKING	
REBAR EXPOSURE	
FREE LIME	
HONEY COMB	
WEAR/EROSION	
WATER STAIN	
OTHERS	

\* O THE LENGTH OF CRACK  
O MAXIMUM CRACK WIDTH

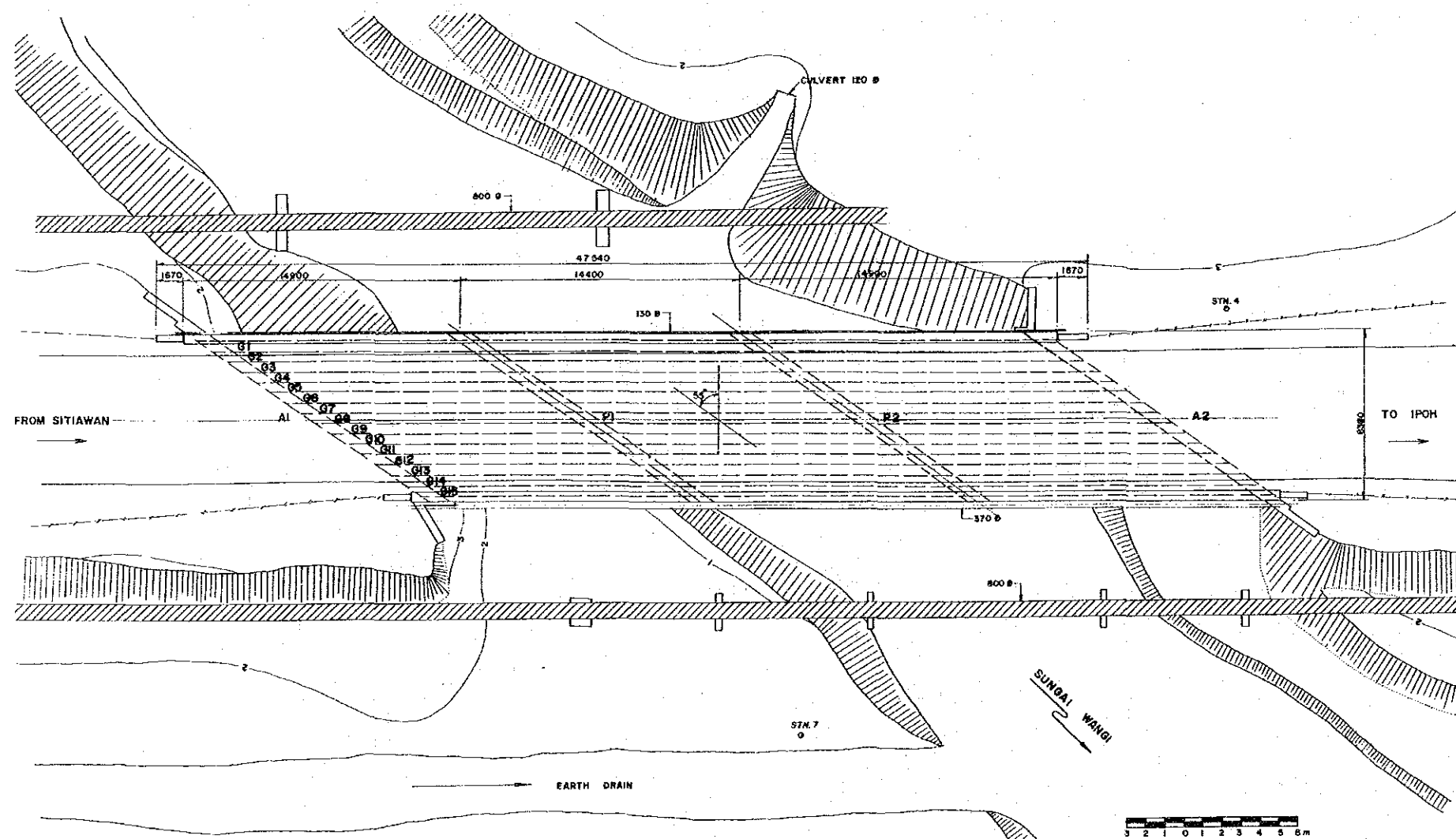
**ELEVATION**  
1:150



**CROSS SECTION**  
1:50



**PLAN**  
1:150



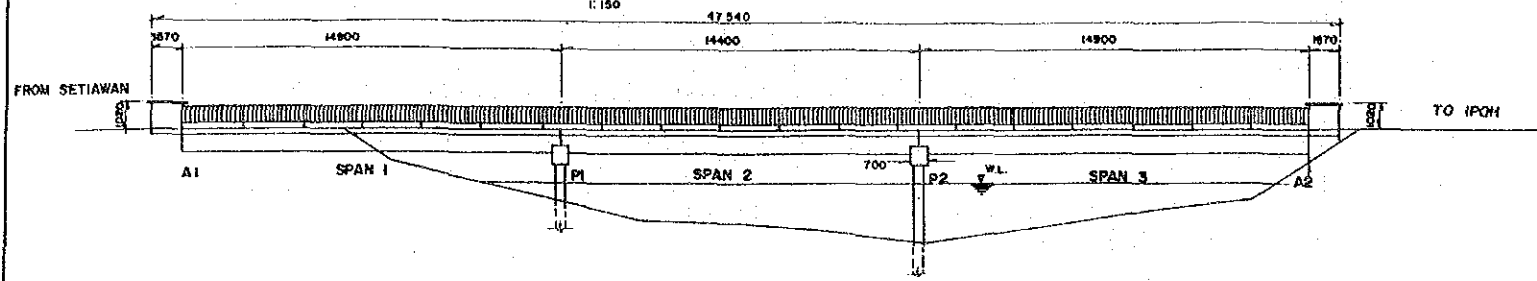
**BRIDGE DATA :**

KEY NO :	5/638/80	
STATE :	PERAK	
DISTRICT :	MANJUNG	
DESIGN LIVE LOAD :	HA LOADING	
MATERIAL YIELD STRENGTH	CONCRETE	SUPERSTRUCTURE : BEAM 25 N/mm <sup>2</sup>
		SUBSTRUCTURE : 20 N/mm <sup>2</sup>
	REBAR	230 N/mm <sup>2</sup>
TYPE OF SUPERSTRUCTURE :	INVERTED T-BEAM / R.C. SLAB	
TYPE OF SUBSTRUCTURE :	ABUTMENT	R.C. BANKSEAT
	PIER	R.C. PILE + CROSS HEAD.
YEAR BUILT :	1972 (ESTIMATED)	

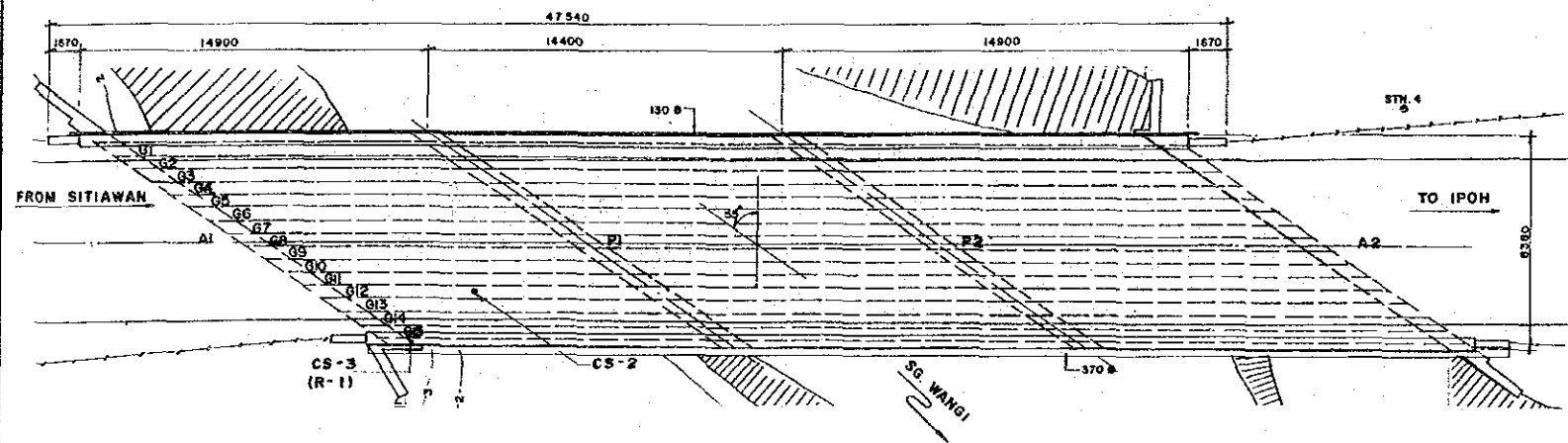
JICA	THE STUDY ON THE MAINTENANCE AND REHABILITATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	GENERAL VIEW	5/638/80	AS SHOWN	DSS-6-1



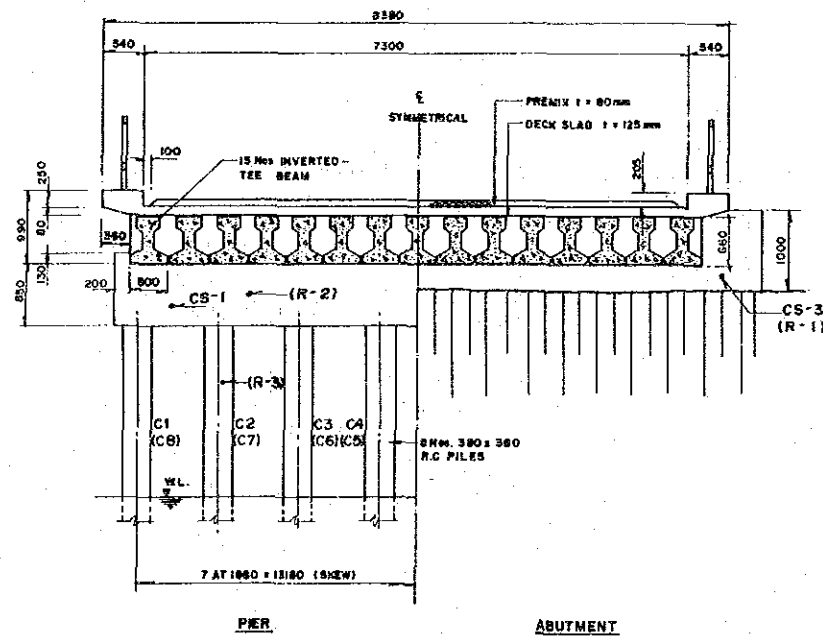
**ELEVATION**  
1:150



**PLAN**  
1:150



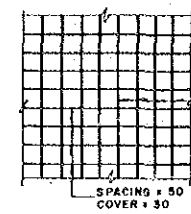
**CROSS-SECTION**  
1:50



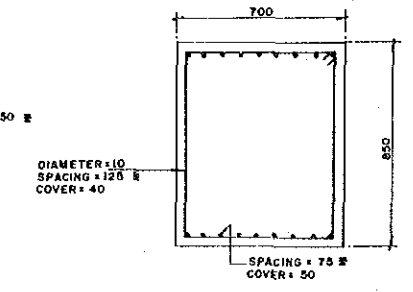
**STRUCTURAL DETAILS**

(LOCATIONS INDICATED BY R-1, R-2, R-3 ARE SHOWN ON PLAN AND CROSS-SECTION)

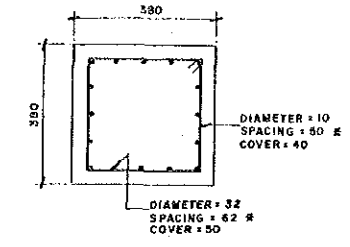
**(R-1)**  
**(A1 - WALL)**  
1:10



**(R-2)**  
**(P1 - BETWEEN C6-C7)**  
1:15



**(R-3)**  
**(P1-C7)**  
1:10



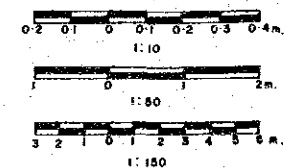
**TEST RESULTS**

**CONCRETE STRENGTH (UNIT: N/mm<sup>2</sup>)**

LOCATION	MEMBER	S. N.
CS-1	P1 - CROSSHEAD	48
CS-2	G12 - SPAN 1	35
CS-3	A1 - WALL	36

**NOTES:**

1. THE CONCRETE STRENGTH WAS MEASURED BY SCHMIDT HAMMER (S.H.)
2. REBAR SPACING SHOWN IN THE DRAWING IS APPROXIMATE ONLY.



	THE STUDY ON THE MAINTENANCE AND REMEDIATION OF BRIDGES IN MALAYSIA			
	TITLE OF DRAWING	BRIDGE NAME / NO.	SCALE	DRAWING NO.
	STRENGTH MEASUREMENT DIAGRAM	5/636/80	AS SHOWN	DSS-6-2