IMPROVEMENT OF QUALITY MANAGEMENT FOR HIGHWAY AND BRIDGE CONSTRUCTION AND MAINTENANCE, PHASE II

BRIDGE INSPECTION MANUAL FOR PC BOX GIRDER BRIDGE

(SPECIAL BRIDGE)

2014

Department of Public Works and Highways

Japan International Cooperation Agency

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(SPECIAL BRIDGE)

SEPTEMBER 2014

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

JAPAN INTERNATIONAL COOPERATION AGENCY

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Manila

FOREWORD

Prestressed Concrete (PC) Box Girder Bridge requires special attention because of the structural behavior of the box girder that needs in-depth analysis of its actual conditions.

With the assistance from Japan International Cooperation Agency (JICA), the production of a guidebook titled, **Bridge Inspection Manual for PC Box Girder Bridge**, is of great importance as it discusses guidelines in the actual conduct of the Inventory Inspection, Routine Inspection, Condition Inspection and Geometrical Inspection.

This Manual will undoubtedly improve our engineers' knowledge in obtaining an accurate inventory and condition data which will lead to the formulation of appropriate maintenance measures for this special type of bridge.

I view this Manual beneficial in prolonging the service life of our bridges at its paramount usability towards efficient management of government infrastructure assets.

Our sincerest gratitude to JICA for their technical and funding assistance and the dedicated DPWH personnel who both worked hard in the realization of this Manual.

I enjoin all those concerned to use this as easy reference and proper guide in the conduct of inspection for PC box girder bridges.

ROGELIO L. SINGSON
Secretary

ACKNOWLEDGEMENT

The Special Bridge Inspection Manual for PC Box Girder Bridge is one of several manuals improved by the Japan International Cooperation Agency (JICA) with the Department of Public Works and Highways (DPWH) in the implementation of the Technical Cooperation Project for the Improvement of Quality Management for Highways and Bridge Construction and Maintenance, Phase II (2011-2014).

The JICA Expert Team would like to express its appreciation its heartfelt thanks to the Technical Working Group and Counterpart Working Group members designated for the Project and to the staff of Region II, III VIII and Region XIII who have rendered utmost support to complete this undertaking.

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GLOSSARY OF TERMS

AADT	Annual Average Daily Traffic
API	Agency Performance Indicator
AWP	Annual Works Program
B/C	Benefit/Cost Ratio
BOC	Bureau of Construction
BOD	Bureau of Design
BOE	Bureau of Equipment
BOM	Bureau of Maintenance
BMC	Bridge Maintenance Costs
BMS	Bridge Management System
BIM	Bridge Inspection Manual
BNR	Bridge Needs Ratio
BRF	Bridge Route Factor
COE	Certificate of Exemption
CRF	Capital Recovery Factor
DEO	District Engineering Office
DPD	Development Planning Division
DPWH	Department of Public Works and Highways
ECC	Environmental Compliance Certificate
EMK	Equivalent Maintenance Kilometer
FAP	Foreign Assisted Project
FS	Feasibility Study
GAA	General Appropriations Act
GIS	Geographic Information System
ICC	Investment Coordination Committee
IPRSD	Infrastructure Planning Research and Statistics Division
IQL	Information Quality Level
IRR	Internal Rate of Return
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicator
LFP	Locally Funded Project
LRM	Locational Referencing Method
LRP	Locational Reference Point
LRS	Locational Referencing System
MIS	Monitoring & Information Service

MM	Major Maintenance
MPS	Maintenance Priority Score
MTIDP	Medium Term Infrastructure Development Plan
MTPDP	Medium Term Philippine Development Plan
MTPIP	Medium Term Public Investment Program
MVUC	Motor Vehicle User Charge
MWP	Multi-year Work Program
MYPS	Multi-Year Programming and Scheduling
ND	Network Development
NMPS	Normalized Maintenance Priority Score
NPV	Net Present Value
NPV/C	Net Present Value - Cost Ratio
OIC	Officer In Charge
PMO	Project Management Office
PPI	Process Performance Indicator
PS	Planning Service
PWF	Present Worth Factor
QA	Quality Assurance
QC	Quality Control
RBIA	Road and Bridge Information Application
RDBL	Road Diagram and Bridge List
RIMSS	Road Information and Management Support System
RMMS	Routine Maintenance Management System
RO	Regional Office
ROPDD	Regional Office Planning & Design Division
ROMD	Regional Office Maintenance Division
RPO	Road Program Office
SQL	Standard Query Language
SRSF	Special Road Support Fund

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INSPECTION MANUAL FOR PC BOX GIRDER BRIDGE

1. INTRODUCTION

1.1. Background

The Inspection Manual for PC Box Girder Bridge is one of the manuals developed under the implementation of the DPWH program entitled "Improvement of Quality Management for Highway and Bridge Construction and Maintenance Phase II" of the JICA Technical Cooperation Project (JICA-TCP).

This Manual is designed to establish/formulate inspection procedures, criteria and guidelines specifically for PC Box Girder Bridge which is considered as a special/long span bridge wherein the conduct of inspection activities and/or requirements are not covered in the Bridge Management System (BMS) Manual.

In order to provide the DPWH personnel and other users with the standard method for the assessment and uniform inspection practices throughout the Philippines, Agas-agas Bridge located in Region VIII is selected as a pilot bridge for this purpose. The details of the drawings and prescribed forms in this manual are designed for the above mentioned pilot bridge. In case that other PC Box Girder Bridges are inspected, all applicable provisions in this manual should be adopted and other drawings and forms should be adjusted for each bridge

In comparison, the common features/differences between the BMS Manual and the Special Bridge Inspection Manual for PC Box Girder Bridge are as follows:

- This Manual uses the same procedures established in the present BMS Manual pertaining to the type of material, type of damage, bridge rating criteria, etc., except for special materials and devices (i.e., PC cables and its related devices).
- Descriptions of special materials and devices are added in this manual.
- All descriptions in the BMS Manual originally intended for standard bridges but are also applicable for PC Box Girder Bridges.
- Specific description and drawings applicable for PC Box Girder Bridge but not indicated in the BMS Manual are incorporated herein.

Since this manual is designed with the information or data pertaining to Agas-agas Bridge, the following has been developed:

- Drawings concerning the Inventory, Routine and Condition Inspections are only related to Agas-agas Bridge.
- Inspection Routes for the Routine and Condition Inspections pertain only to Agas-agas Bridge.

- Check Points on Routine and Condition Inspections to specific bridge members of PC Box Girder Bridge.
- Inventory information pertains to Agas-agas Bridge.

On the scope of Routine Inspection for standard bridges, the said activity is conducted in accordance with the Department Order (DO) Nos. 179 series of 1997 and 81 series of 2005. However, PC Box Girder Bridge is classified as a special/long span bridge and as such, there are aspects on the Routine Inspection criteria which are not covered by the aforementioned DOs. Considering the higher degree of importance of special/long span bridge which demands that proper maintenance should be instituted, the development of the Bridge Inspection Manual for PC Box Girder Bridge therefore is essential as it provides the appropriate inspection procedure which is a prerequisite of its routine maintenance needs and addresses the following issues:

- Necessity of early detection of defects as a preventive approach through Routine Inspection
- To avoid loss of lives and properties due to the collapse of the bridge or failure of attributes, etc.
- Be able to interpret some of the complicated behavior of the bridge.
- Avoid the high cost of a major repair and replacement of the bridge.

1.2. Scope of this Manual

The basis in the proper maintenance and management of special/long span bridges initially relies on the availability of its inventory and annual condition information which will provide reference data and track previously reported deterioration of the bridge.

Therefore, along with such intention, the manual presents a guideline in the actual conduct of the Inventory Inspection, Routine Inspection, Condition Inspection and Geometrical Inspection whose purpose is to obtain an accurate inventory and condition data which will lead to the formulation of appropriate maintenance measures needed to ensure efficient and sound operation for management of special/long span bridges.

Since special/long span bridge has unique design and type of structure, it should be managed separately from standard bridges, with medium term management (next 5 years). Likewise, it could not be inspected and repaired by lump sum budget like standard bridge. The duration and cost of inspection and maintenance are also different among special type of bridges.

The specific maintenance management plan includes but not limited to the following:

1. Inspection schedule
2. Planning for Repair Work
3. Budget Estimation
4. Implementation Schedule

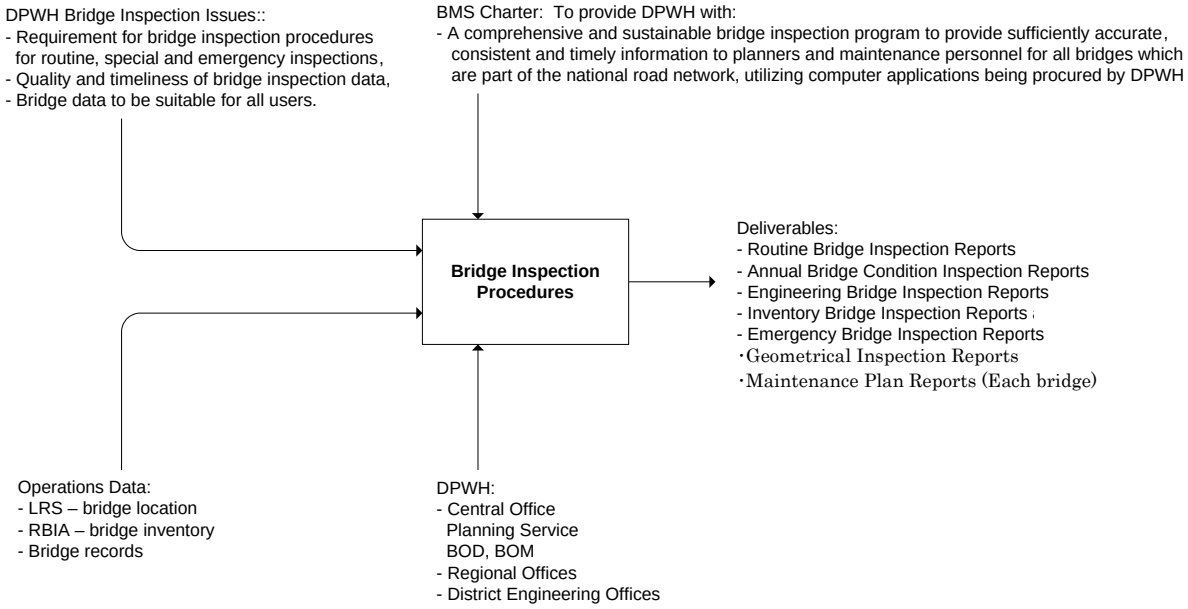
The contents of this manual depict a consistent and proper bridge inspection procedures to ensure that inspection reports for all types of bridge inspections are properly prepared.

The main focus of this bridge inspection manual are: Routine Inspection (Type 1), Condition Inspection (Type 2), Inventory Inspection (Type 5), and Geometrical Inspection (Type 6). These inspections will provide the basic bridge data required to be stored and managed properly. Database is introduced in this manual for the management of Special Bridge Inventory Data.

1.3. Bridge Inspection Requirements

The bridge inspection procedures and requirements are shown in Figure1-1.

Figure 1-1
Bridge Inspection Procedures and Requirements



The types of special bridge inspections undertaken by the DPWH are listed in Table 1.1. Scheduled bridge inspections are those inspections required to be undertaken on a set frequency (e.g. annually, quarterly) to supply data for DPWH functions. Non-scheduled inspections are those inspections undertaken only when required (e.g., an addition of new national bridges or during calamities).

Table 1-1

Types of Special Bridge Inspections

TYPE	NAME	FREQUENCY	METHOD	REMARKS
1	Routine	Quarterly	Visual inspection from ground level	
2	Condition	Annually	Close visual inspection by boat and Bridge Inspection Vehicle (BIV)	Recommended: Inspection by BIV at least once in every three years
3	Engineering	As required	Detail inspection by skilled engineers for bridge repair work	Refer to Bridge Engineering Inspection Manual
4	Emergency	As required	Emergency inspection by skilled engineers	
5	Inventory	Once after construction and after every modification	Data collection from As Built Drawings and construction documents	As Built Drawings data should be collected and attached to Special Bridge Inventory Database
6	Geometrical	Once every three years and as the need arises (after earthquake, typhoon, etc.)	Measure by surveying instrument	Current data should be analyzed with past 3 time data.

The responsible offices tasked to undertake special bridge inspections are summarized in Table 1-2. The specific requirements for those personnel assigned to undertake the bridge inspections are given in Table 1-3.

Table 1-2
Bridge Inspection Responsibility

TYPE	NAME	RESPONSIBILITY	REPORTING
1	Routine	Regional Office BMS Coordinator to be assisted by DEO Accredited Bridge Inspector	Report to PS-CO
2	Condition	Regional Office BMS Coordinator to be assisted by DEO-Accredited Bridge Inspector	Report to PS-CO
3	Engineering	DEO / RO / BOD / BRS / BMS Team and other Entities	Report to PS-CO
4	Emergency	Regional Office to be assisted by DEO maintenance personnel	Report to BOM-CO
5	Inventory	Regional Office to be assisted by DEO-Accredited BI	Report to PS-CO
6	Geometrical	Regional Office to be assisted by DEO-Accredited BI	Report to PS-CO

Table 1-3
Requirements for Bridge Inspection Personnel

TYPE	NAME	PERSONNEL
1	Routine	Accredited Bridge Inspector
2	Condition	Accredited Bridge Inspector
3	Engineering	Accredited Bridge Inspector / Bridge Engineer / Materials Engineer or outsourcing to Private Consultant Company or Entities
4	Emergency	Bridge Engineer and Accredited Bridge Inspector
5	Inventory	Accredited Bridge Inspector
6	Geometrical	Bridge Engineer and Accredited Bridge Inspector

An Accredited Bridge Inspector should meet the following qualifications: (1) be permanent in Status of Appointment, (2) has an experience in design, construction, maintenance and inspection of bridges, and (3) has successfully completed the BMS training course and received accreditation.

The Accredited Bridge Inspector is trained in assessment of the condition of bridge structures through visual inspection defects. However, the Accredited Bridge Inspector can get support and assistance from Bridge Engineers in the Regional and District Engineering Offices concerned in making decision/s or recommendation/s.

Bridge Inspection Type 1 and 2 shall be undertaken by the Regional Office BMS Coordinator to be assisted by DEO Accredited Bridge Inspector because of the complication of structure of Special/long span bridge. They should be Accredited Bridge Inspector.

Bridge Inspection Type 3 of Special Bridge requires a high level of bridge engineering knowledge and will be undertaken by experienced bridge design engineers with the assistance of an Accredited Bridge Inspector and Materials Engineer or be outsourced to Private Consultant Company or Entities.
Bridge Inspection Type 4 shall be undertaken by the Regional Office Bridge Engineer and Accredited Bridge Inspector to be assisted by the Maintenance Engineers from the District Engineering Offices concerned.

Bridge Inspection Type 5 shall be undertaken by the Accredited Bridge Inspector in RO and DEO.

Bridge Inspection Type 6 will require surveying instruments (i.e., Total Station and Level), to be conducted by the Accredited Bridge Inspector and Bridge Engineer in RO and DEO.

The classification of bridges to be categorized into Special Bridge is given in Table 1-4.

Table 1-4
Classification of Special Bridge

BRIDGE TYPE	REQUIREMENT
Prestressed Concrete Extradosed Bridge	Every bridge
Prestressed Concrete Box Girder Bridge	Longest span >60m
Steel Truss Bridge	Longest span >60m
Steel Arch Bridge	Every bridge
Cable-stayed Bridge	Every bridge
Suspension Bridge	Every bridge

These bridges should be inspected with Special Bridge Inspection Manual and be managed separately from standard bridges by a Medium Term Management Plan (5-10 years). The special/long span bridge List in each region should be collected and be listed for management in the Special Bridge Inventory Database.

List of Special/long Span Bridges in Regions II, III, VIII and XIII is attached in Appendix A.

2. GENERAL REQUIREMENTS FOR BRIDGE INSPECTION

2.1. Accuracy

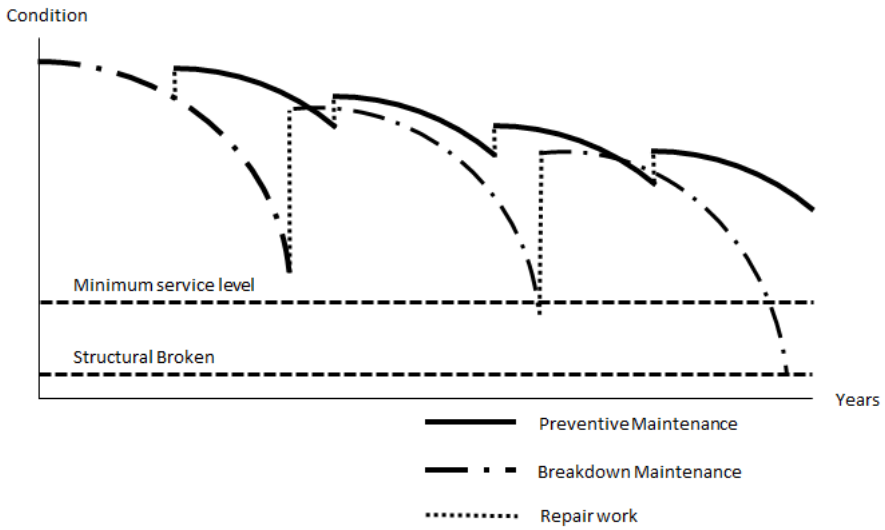
It is important that bridge inspection is thoroughly completed with accuracy as a primary goal. Bridge inspectors should allow sufficient time in undertaking the bridge inspection to collect all data required correctly.

2.2. Proactive Approach to Bridge Inspections

Inspections should not be confined in searching for defects that are clearly visible in the bridges. Inspections should also include anticipating problems and recognizing where these are likely to occur, in order that deterioration of the bridges is prevented. This approach is known as preventive inspection rather than corrective inspection.

There are two views in the maintenance method. One is Breakdown Maintenance. Another is Preventive Maintenance. Structure has been deteriorated during their service period and finally it would be broken. In case of Breakdown Maintenance, structure will be repaired after broken. Therefore, repair cost would be increased and long durability of structure would not be expected. On the other hand, in case of preventive maintenance, defects on structure should be found on the early stage and they will be repaired as the proactive approach. As a result of quick action to defects, repair cost would be hold down and long durability would be expected. Bridge should be properly maintained by the preventive maintenance. In this process, inspection plays the most important role to find defects on the early stage.

Figure 2-1
Deterioration of Structure

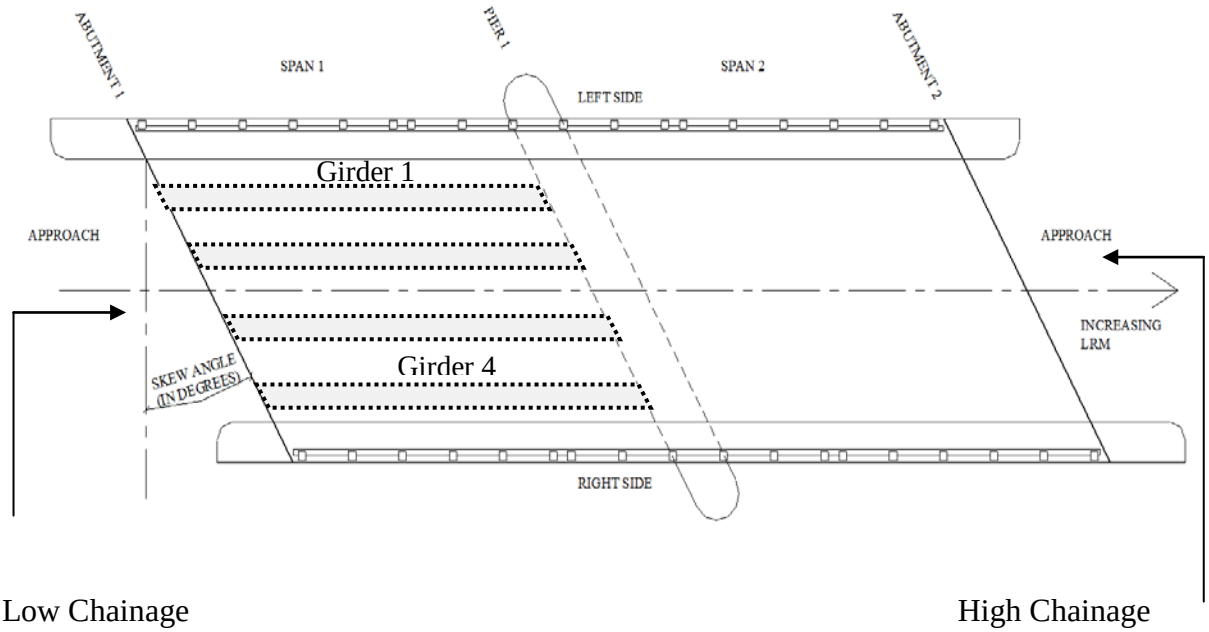


2.3. Bridge Geometry Definition

The standardized geometrical definition in the BMS Manual has been adopted by this Manual which is based on the Local Referencing System (LRS) used by the DPWH. The bridge is assessed in the direction of increasing chainage. Refer to Figure 2-2.

2.3.1. General

Figure 2-2
Bridge Geometry Definition



Low Chainage High Chainage

The following standard abbreviations are adopted to describe a bridge:

HC	-	High Chainage
LC	-	Low Chainage
S	-	Span
P	-	Pier
A	-	Abutment
G	-	Girder

Example, a three (3) span bridge with 4 girders in each span:

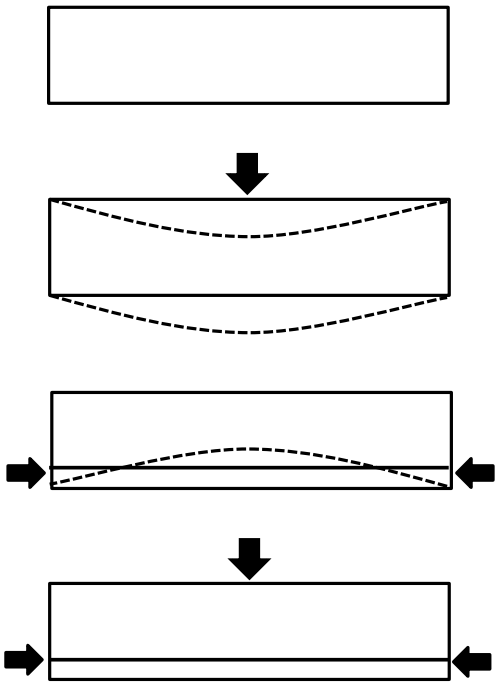
- Abutment 1 (A1) is at the low chainage end of the bridge and Abutment 2 (A2) is at the high chainage end.
- Spans 1 (S1), 2 (S2) and 3 (S3) numbered from the low chainage end of the bridge.
- Piers 1 (P1) and 2 (P2) numbered from the low chainage end of the bridge.
- The first girder on the extreme right hand side (looking in increasing chainage) in Span 1 is designated as Span 1- Girder 4 (S1G4).
- The girder on the extreme left in span 2 is designated as Span 2- Girder 1 (S2 G1).

Abutments 1 and 2 may be named Abutment A and B respectively in DPWH bridge drawings.

2.3.2. PC Box Girder Bridge

Pre-stressing method is used in the concrete structure to counteract a tensile stress by introducing compressive. In the case of pre-stressed concrete, pre-stressing cable is used to provide compressive stress that balances the tensile stress in concrete members to overcome natural weakness in tension of concrete. Pre-stressed concrete bridge is appropriate for long span bridges by this function. Tension in cable and compression in concrete are the most important forces to keep a structure at a stable condition.

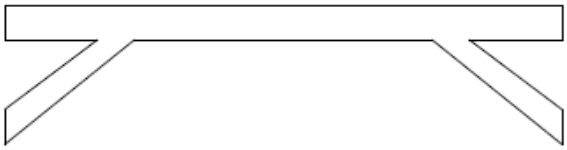
Figure 2-3
Function of Pre-stressed Concrete



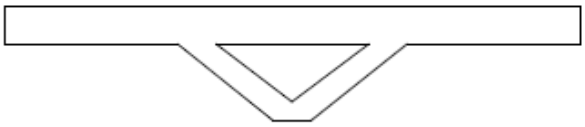
Rigid Frame Bridge is known as Rahmen Bridge, in which the superstructure and substructure components are constructed and connected rigidly as one solid structure, unlike in a standard girder bridge which the girder and the piers are separate structures. Design calculations for Rigid Frame Bridge is more extensive than those of Simple Girder Bridge, due to the rigidity of its intersection. The construction of the intersection is also difficult, so accuracy and attention are required in every stage.

There are many possible shapes and typical styles used; such as the Pi-shaped, the V-shaped and Y-shaped and the continuous span rigid frames.

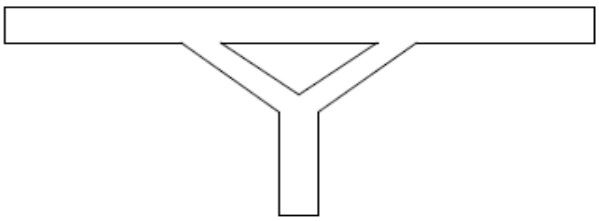
Figure 2-4
Types of Rigid Frame Bridge



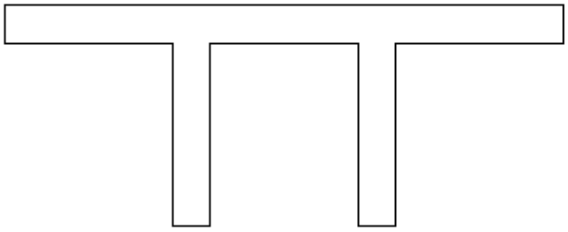
Pi-shaped rigid frame bridge



V-shaped rigid frame bridge



Y-shaped rigid frame bridge

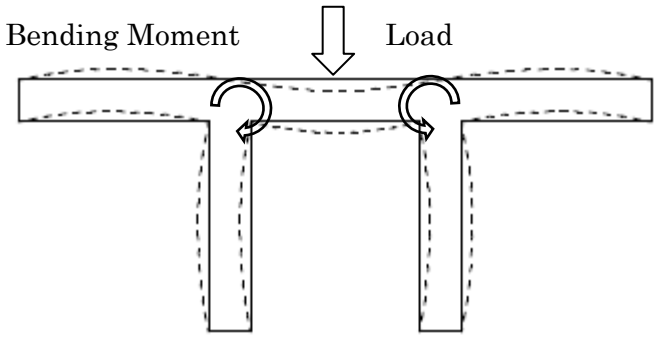


Three continuous span rigid frame bridge

Rigid frame action is characterized by the ability to transfer the bending moment between girder and pier. Deflection and bending moments on girders will transfer to the piers through the intersection. It develops positive and negative moment throughout the structure. In this process, the stress concentration would occur at the intersection and it might cause defects on it. The intersection must be inspected carefully after opening to traffic.

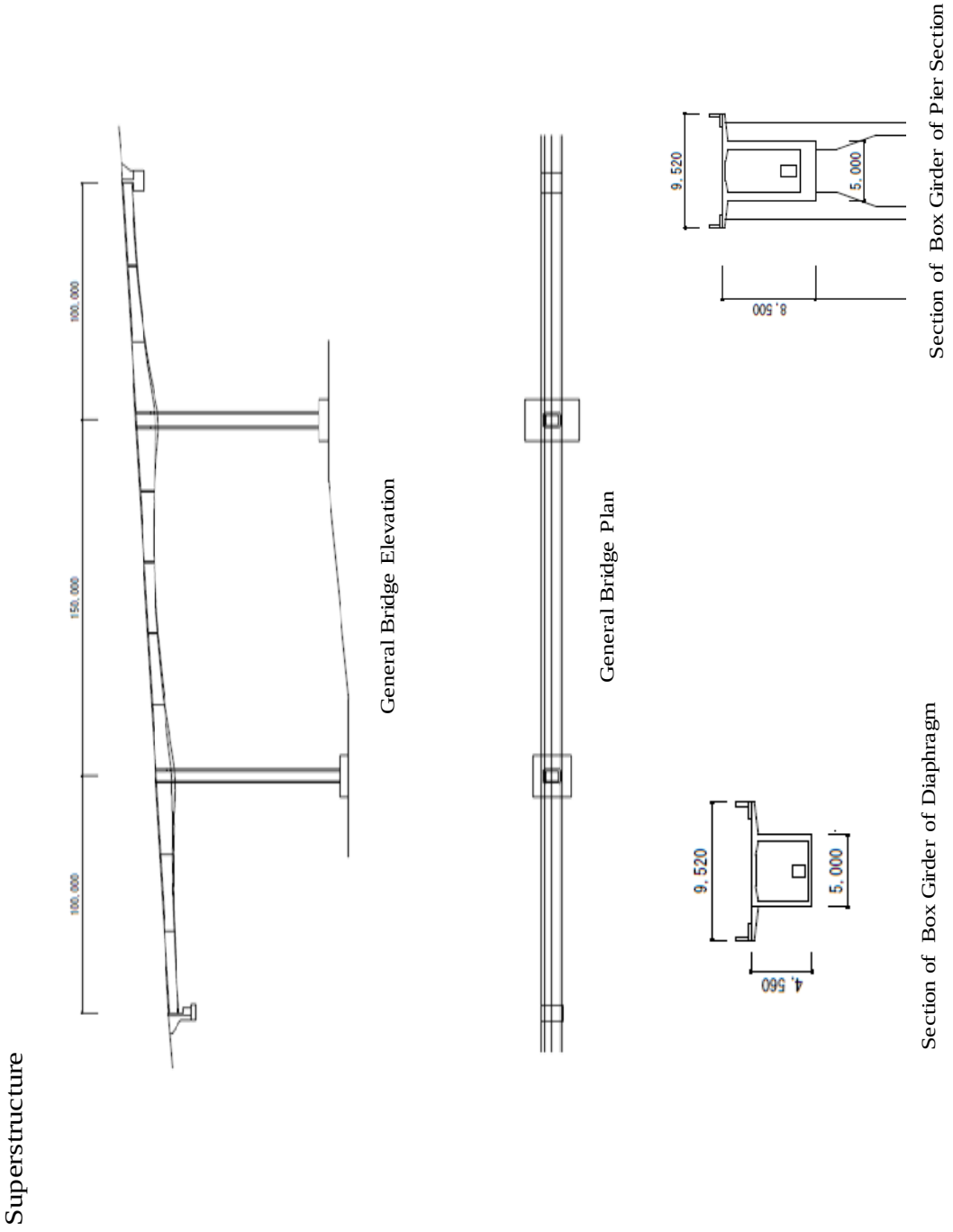
Also this structure can eliminate the expansion joint in the center span. It makes smooth traffic and less maintenance.

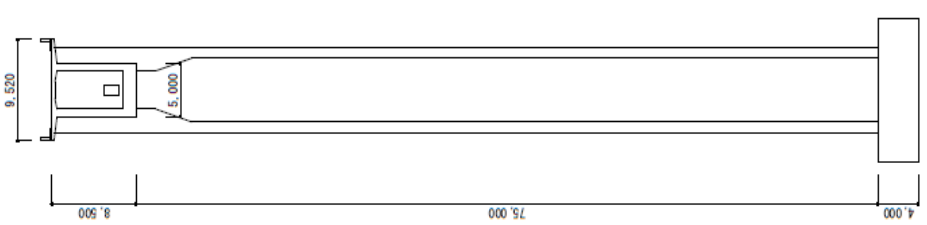
Figure 2-5
Load Distribution System in Rigid Frame Bridge



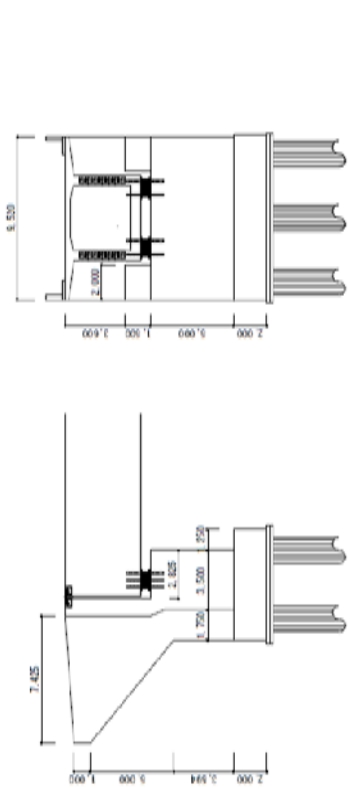
Shown in Figures 2-6, 2-7 and 2-8 are the General Views of Agas-agas Bridge.

Figure 2-6 General View of Agas-agas Bridge (1 of 3)

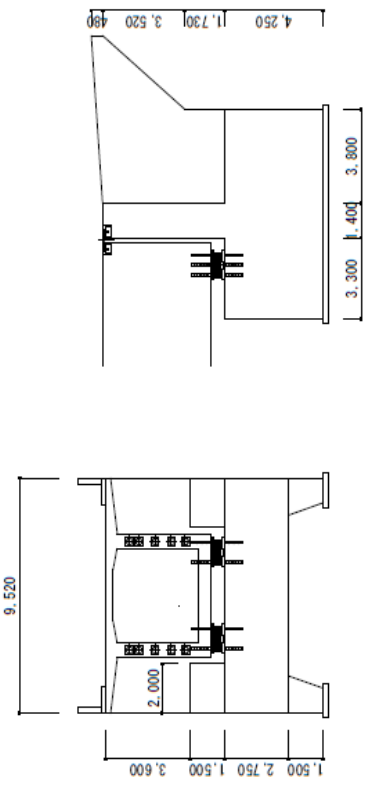




Section of Pier 1



Substructure



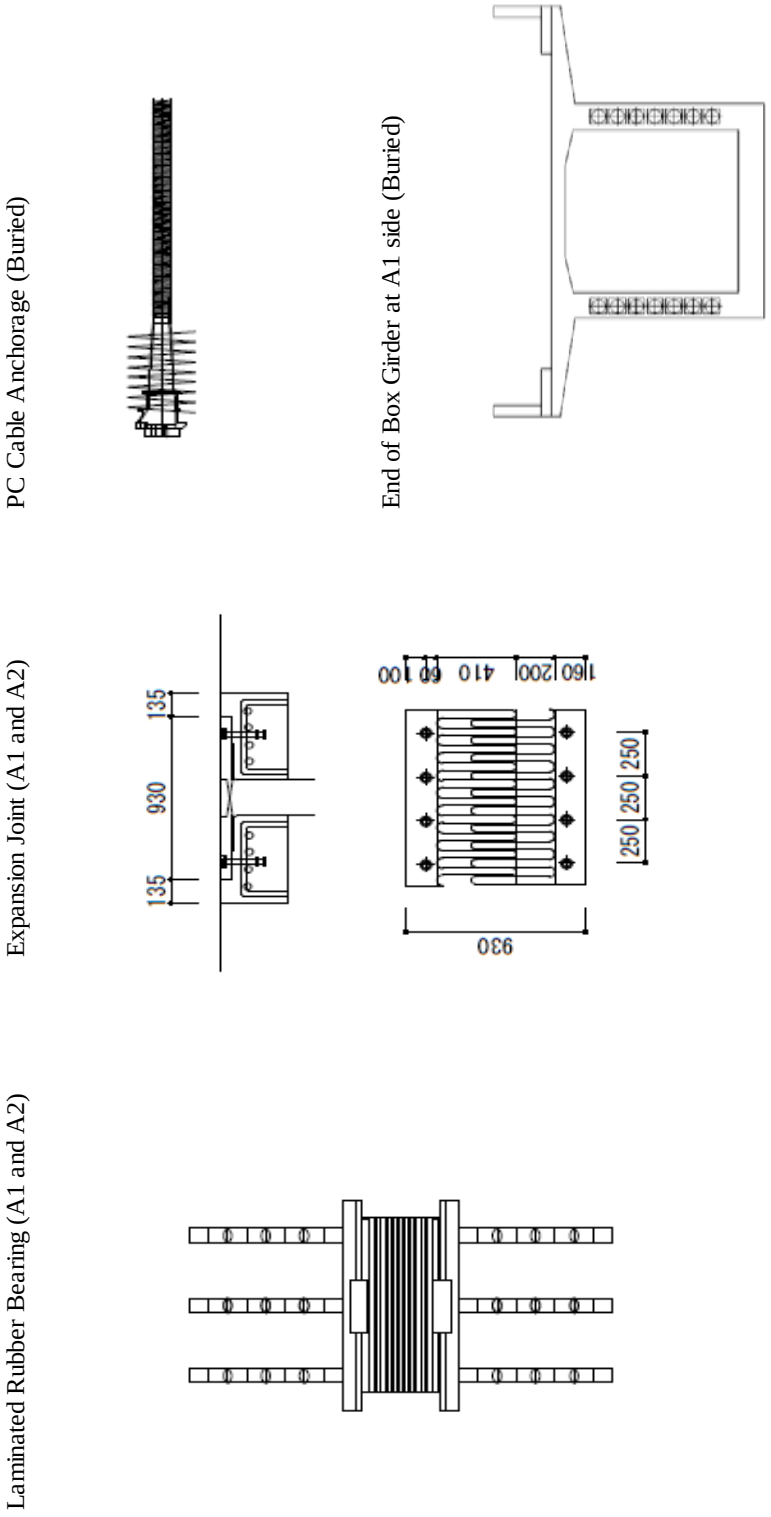
Section and Elevation of Abutment 1

Section and Elevation of Abutment 2

Figure 2-7 General View of Agas-agas Bridge (2 of 3)

Figure 2-8 General View of Agas-agas Bridge (3 of 3)

Bearings, Expansion Joint and PC cable



2.4. Inspection Planning

2.4.1. General

Regular and thorough inspection is essential to develop appropriate programs. Without proper preparation and resources, an inspection can be hampered.

Careful planning is required for the smooth implementation of any inspection program, to get an accurate and complete assessment of the bridge structures, and to ensure cost efficient inspections.

2.4.2. Inspection Program

The first step in planning is to develop an inspection program. This program contains the list of all bridges to be inspected in the Regional or District Engineering jurisdiction and the time frame for the completion. Hence, appropriate resources can be determined to suit the program. Throughout the inspection program, activity should be monitored so that budget and time constraints are met.

Special/long span bridge is a complex structure with complicated design. There are inspection ways, box type shape members or attributes which should be inspected inside, climbable tower and so on. Before going to bridge site, the inspection route and schedule should be planned. Proper numbering of elements and attributes to avoid misinterpretation on the location of the defects is necessary.

When developing an inspection program, external factors should also be considered.

These include:

- Traffic restrictions,
- Access difficulties (e.g., waterways, terrain, buildings, built-up areas, combined bridges),
- Safety of personnel undertaking the inspection,
- Specialized equipment or personnel such as divers that may be needed
- Water level restrictions(i.e., tide level)

If the inspector is not familiar with the site and other external factors, a site visit is important.

2.4.3. Bridge Details and History

Prior to the inspection, the inspector should review all available information relative to :

1. Type of bridge
2. Maintenance history
3. As Built Drawings
4. Previous inspection reports
5. Photographs

Copies of the above-listed information for the bridge should be properly managed and stored in the Regional Office.

In particular, As Built Drawings is important for the understanding of the special/long span bridge. Each bridge has its own unique structure. There is no standard drawing in the special/long span bridge. Before the arrangement of inspection, “As-Built Drawing” should be collected and electronic data should be installed in Special Bridge Inventory Database.

Inspectors should check the As-Built Drawings to confirm the details of the structure and to make check points sheets before the implementation of bridge inspection.

In the absence of “As Built Drawings”, it is recommended to collect bridge data from “Contract drawings” or from documents of past rehabilitation works. In case there is no available bridge data, measurement survey on site for collecting basic bridge data and general drawings for inventory should be done.

Example drawings by measurement survey in Biliran Bridge and Liloan Bridge which have no As Built Drawings, are attached in Appendix B.

The information mentioned above shall be reviewed prior to the inspection, so that the inspector who undertakes the inspection is aware of critical areas, previously encountered problems or unusual features.

A copy of the previous inspection reports and any other relevant information shall be brought to the bridge site for reference during the inspection.

2.4.4. Resource Requirements

In order to perform proper and efficient inspection, appropriate equipment and manpower should be readily available. List of equipment required is included in Table 2-1 and this should be carefully considered prior to inspection. It may also be necessary to arrange specialized equipment on a case-to-case basis. These include scaffolding, bridge inspection vehicle, boats, testing equipment, etc.

Table 2-1
Equipment for Visual Inspection (Routine and Condition Inspection)

1. Safety Vest
2. Safety Shoes
3. Shirt with long sleeves and Pants
4. Hard hat with Flashlight
5. Hand Gloves
6. Hand Mirror for viewing behind bearings, etc.
7. Geologist's Hammer
8. 40-Meter Measuring Tape
9. 3-Meter Measuring Tape
10. Binoculars
11. Crayon and Chalk for marking and for blackboard
12. 35-70 MM Zoom Digital Camera with date feature
13. Inspection Forms
14. Sketch Drawing Forms
15. Copy of previous report
16. First-Aid Kit
17. Bridge Inspection Vehicle (BIV)
18. Shovel and Broom
19. Extension Ladder
20. Boat or Barge
21. Crack Gauge
22. Wire Brush
23. Scotch Tape (inspection for weathering steel)
24. Oxygen Detector

2.4.5. RBIA and Special Bridge Inventory Database

The RBIA is the main depository of DPWH for the information of the inventory and condition data on standard bridges located along national roads. The data inputted in the RBIA should always be assessed for current inventory and condition reports and other relevant data by the inspector who undertakes the inspection. However, it is intended mainly for standard bridges, and not for special/long span bridges. The Inventory information and inspection data of special/long span bridge should be collected and uploaded to the Special Bridge Inventory Database. DPWH Central Office and every Regional Office should manage this database and update it regularly.

Flowchart for the Special Bridge Inventory Database is shown in Appendix C.

In some cases, there are discrepancies between the data in the Database and the actual data of bridges due to modification made (e.g., provision of alternative railings, construction of replacement bridges). The responsible RBIA Regional Coordinators shall ensure that all special/long span bridges are included in the Database and update, if necessary.

2.4.6. Inspection and Sketch Drawing Forms

Inspection for special/long span bridge (e.g., cable stayed, Suspension and so on) is individually produced, because it has unique design compared to standard bridges.

Prior to the conduct of the inspection, the Inspection and Sketch Drawing Forms will be prepared in advance. All available information relative to the bridge can be viewed and printed out from the database. Also data gathered will be uploaded in the database by inspectors and/or coordinators.

The initial data shown shall be checked for correctness during the bridge inspections, and corrections made or missing information added as necessary.

2.5. Safety

2.5.1. General

For the protection and safety of workmen, public and environment, safe work practices are essential on every work site.

The following safety aspects apply to bridge inspection work and must be considered prior to commencement of any inspection:

- Road safety
- Work safety
- Public safety

Health and safety have a high priority at all times during field operations. All statutory rules and regulations and recommended safety practices given in this manual are for general guidance in planning for safety at all the worksites. Common sense should be used in anticipating the particular safety requirements for each and every project to be undertaken.

2.5.2. Road Safety

Working on or near roads is extremely hazardous. The following rules must be explained to, and observed by, all personnel working on or near the roadways:

1. Before commencing inspection at the site ensure that:
   - All personnel are wearing high visibility vests;
   - Every worker knows the direction of traffic running on all the lanes;
   - Every worker knows where to take refuge if a vehicle approaches;
   - Unprotected or unsafe areas and roads are identified to all personnel.

2. Always walk in the direction facing oncoming vehicles. (The vehicles should not come from behind you.)

3. Whenever crossing roads (whether single lane or many), make sure that all the lanes are clear before crossing.

4. When operating any plant or machines on or near a road:
   - Before commencing work make yourself aware of potential hazards such as adjacent roads, overhead power lines, other workers, etc. Always anticipate danger.
   - Never step backwards without looking. Under the noise of your machine, you may not hear the sound of approaching vehicles.
   - Never climb out of a machine without looking in both directions.
   - Never climb out of a machine onto a road or non-protected area.

2.5.3. Work Safety

Work safety must be planned ahead. Before commencing work, the inspector shall observe the following:

1. Be familiar with the full requirements of the inspection work including scaffoldings and access equipment.

2. Ensure that all tools and equipment/machine are available and in good working condition.

3. Prepare any required safety devices and paraphernalia (harnesses, mountain shoes, gloves, earmuffs, eye protection glasses, masks, hard hat, and other related items) necessary for safety of the inspectors.

4. Plan and arrange road closures and suitable traffic management procedures.

5. Identify and locate all the utilities existing at site (e.g. water pipelines, electricity, communication lines, gas pipelines, etc.). If any utilities are affected by inspection process, take measures in advance to protect or relocate it through proper authorities as necessary.

6. Ensure that first aid kit is available at site and that at least one of the personnel is knowledgeable in giving first aid treatment.

7. In the case of very risky situations (i.e. high structures, inside box girder, etc.), inspection is always conducted by pairs.

8. All inspections are carried out in well-ventilated/lighted areas. When inspection is conducted in closed areas, inspection gates should be opened for ventilation beforehand. Also, density of oxygen and detection of harmful gas should be measured. If necessary, prior arrangements for exhaust fans and artificial lighting should be conducted.

   General information about Asphyxia and low oxygen is shown in Appendix D.

9. When inspectors climb ladder, leap gap or walk inspection way in height, safety belt should be tied to rigid frame. Also, inspectors should not climb ladder up behind another person who is climbing ladder forward.

10. Do not allow personnel under the influence of alcohol or any medication which impairs alertness or causes drowsiness to work at site or operate any mechanical equipment.

11. Do not allow any person who is not qualified to carry out a particular task or to operate particular equipment.

12. Generally, all the work should be carried out in compliance with the existing industry's normal standards practice.

2.5.4. Public safety

There are obligations to take all necessary precautions and adequate measures for safety of public in and around the working area. The following steps should be taken to safeguard the public against any injury, loss of life or damage to property:

1. Attend immediately to any damage and deterioration that may cause loss of strength and stability of a structure and thereby may result in injury, loss of life or damage to property.

2. Take steps to support damaged structures against instability and collapse, as well as protect the adjacent properties, plant and utilities from possible damage.

3. Until damaged structures are made safe, close off all access and prohibit their use by the public by setting up suitable fences and barriers. With the assistance of the District Engineering Office, and the police if necessary, arrange to divert the pedestrian and vehicular traffic by alternative routes. Provide warning signs and hazard lights as necessary to caution the public of danger.

4. At the completion of the inspection, clean up all dirt and debris, remove all plant, equipment and materials and restore the facility to public.

2.6. Sketches and Photographic Record

2.6.1. General

An appropriate photographic and sketch record must be compiled for Routine and Condition Inspection Report.

1. Mandatory inventory photographs (front view, side view, and underside).
2. Deficient components and major defects.
3. Undefined components.

The Accredited Bridge Inspector is required to prepare a photographic/ sketch record of each structure. All photographs and sketches must be given a reference and details of the subject matter recorded in the Bridge Inspection Report.

2.6.2. Sketches Record

Sketches of the damage can be made on Sketch Drawing Forms. The sketch should show the necessary plan and elevation views of the attribute to which they pertain. All damages should be located on the sketches by dimensioning their location in reference to the beginning or end of each attribute. For each damage, the Accredited Bridge Inspector should indicate dimensions showing its length, width, depth (if applicable) and also severity of defects. In particular, sketch drawing on the Condition Inspection should record the detail of defects, in order to monitor the deterioration of defects in the future. Forms of sketches drawing for Agas-agas Bridge are attached in this manual.

2.6.3. Photographic Record

The result of an inspection must be reported to the District Engineering Office concerned. The Accredited Bridge Inspector should take photograph any major defects and append photographic prints to the report.

1. The prints should be annotated in accordance with the bridge component designations previously described.
2. Accredited Bridge Inspector must exactly take the photo of entire condition and defects condition on the bridges.
3. During the inspection, inspector must use the blackboard as well as ribbon rods/measuring tape for getting the detailed information.

4. The blackboard should be included in the photograph.

5. The Accredited Bridge Inspector should take photographs to obtain as much information as possible.

6. Photograph of defects must be taken for the worst condition rating.

The information required for Mandatory Inventory Photographs are as follows:

1. Photographic Record

2. Front View (low chainage): One general photograph from top of deck showing alignment, carriageway width, curbs and gutter, and railings.

3. Side View (each span) from upstream: One photograph from side of bridge showing piers, abutments and waterway or roadway.

4. Under the bridge (each span) from upstream: One photograph from under of bridge showing piers, abutments and waterway or roadway.

5. Representative photographs of main superstructure components (i.e. girders), from underneath or side of the structure, used in:
   - The original structure.
   - Any modifications (i.e. widening, lengthening, etc.)

2.7. Inspection Reports and Management of Special Bridge Inspection

2.7.1. Inspection Reports

After the completion of Inspection, various reports should be submitted and stored in Bridge Inventory Condition (BIC) Stand Alone Program and Special Bridge inventory Database. The details of deliverables of report are shown in the chapter of each inspection.

- File the inspection report: Inspection forms, summary sheet, repair record and inspection result.
- Sketch drawings sheet
- Photo record sheet: Assemble photo data and match with sketch drawing sheet

2.7.2. Management of Special Bridge

Special/long span bridges should be managed separately from standard bridges which could be inspected and repaired by lump sum budget. Regional Office and District Engineering

Office should make the Medium Term Management Plan (next 5years); include Budget Estimation, Inspection Schedule, Planning of Routine and Major Maintenance and Implementation Schedule.

Management of Special/Long Span Bridges:

- Special/long span bridge should be managed properly by Medium Term Management Plan (next 5 years)
- Analysis of the result of inspections (Inventory, Routine, Condition, etc.)
- Preparation of the maintenance management plan for each specific bridge
- Estimation of the cost of inspection, routine and major maintenance works, etc.)

3. ROUTINE INSPECTION (TYPE 1)

3.1. Purpose

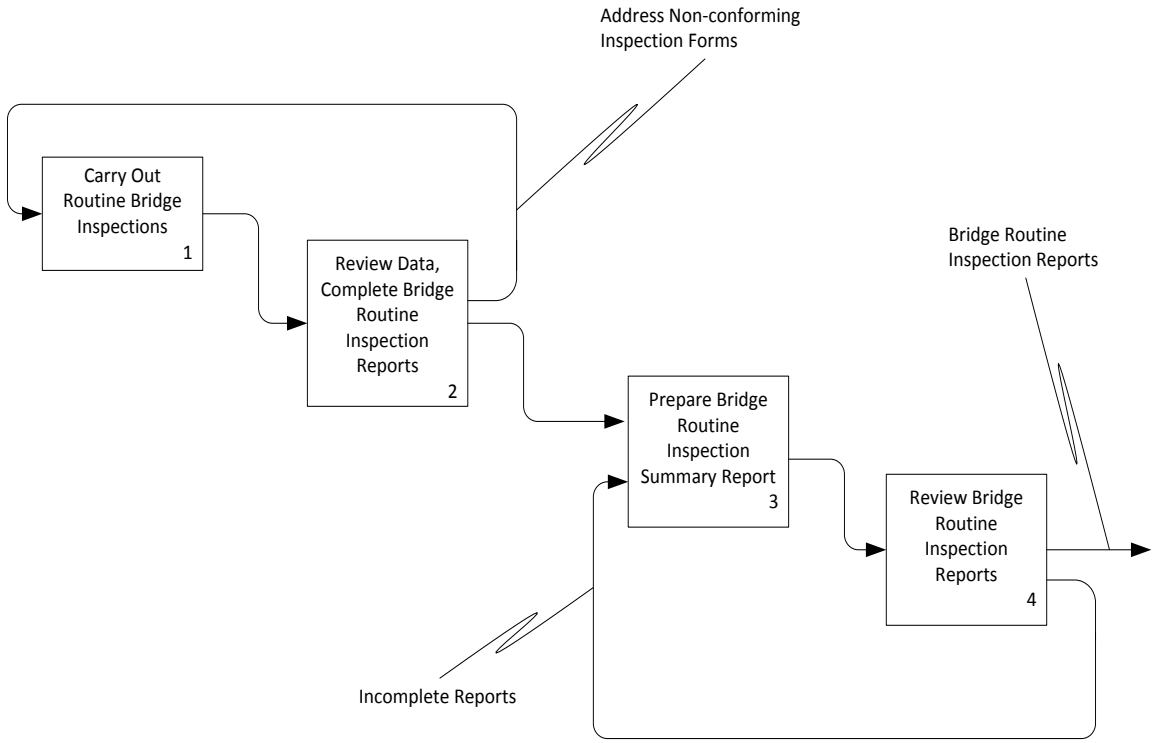
Routine Inspection is essentially a visual inspection that requires assessment of obvious defects on the Special/long span Bridge.

This inspection is necessary to ensure that regular routine maintenance work is being planned and undertaken in accordance to the needs of the bridge. Routine inspection should also detect severe defects that may cause loss of stability of the structure and may result to injury or loss of life and damage to property. Routine inspection is important for taking emergency works to avoid collapse of the bridge and damage to a third party.

3.2. Process

The process for conducting Routine Inspection (Type 1) is shown in Figure 3-1.

Figure 3-1
Routine Inspections (Type 1)



3.3. Procedure

The procedure in accomplishing Routine Inspection Forms and Sketch Drawings by the District Engineering/Regional Office should be straightforward. It involves visual inspection to address several standard items listed on the Inspection Results in Bridge Routine Inspection Form (Type 1).

As a reference, the Bridge Routine Inspection Routes are shown in Figures 3-2 and 3-3 while the Check Points of Routine Inspection are shown in Figures 3-4 and 3-5. Routine inspection forms and sketch drawings of Agas-agas Bridge are shown in Appendix E. The copy of above mentioned documents and the latest routine inspection report should be brought to the site as reference.

In the case of routine inspection, inspectors walk through upper level on pavement and ground level around piers and abutments. Inspectors should find common defects for Routine Maintenance according to the sheet of check points and also severe damage for Emergency Work. Check points of Routine Inspection show typical defects on each attributes which are limited compared with Condition Inspection.

One of the check point is crack on concrete along to PC Cable. It should be investigated carefully corresponding to the width, length, water leakage, efflorescence and so on in the time of Routine Inspection, because it is one of the most portion for the stability of structure.

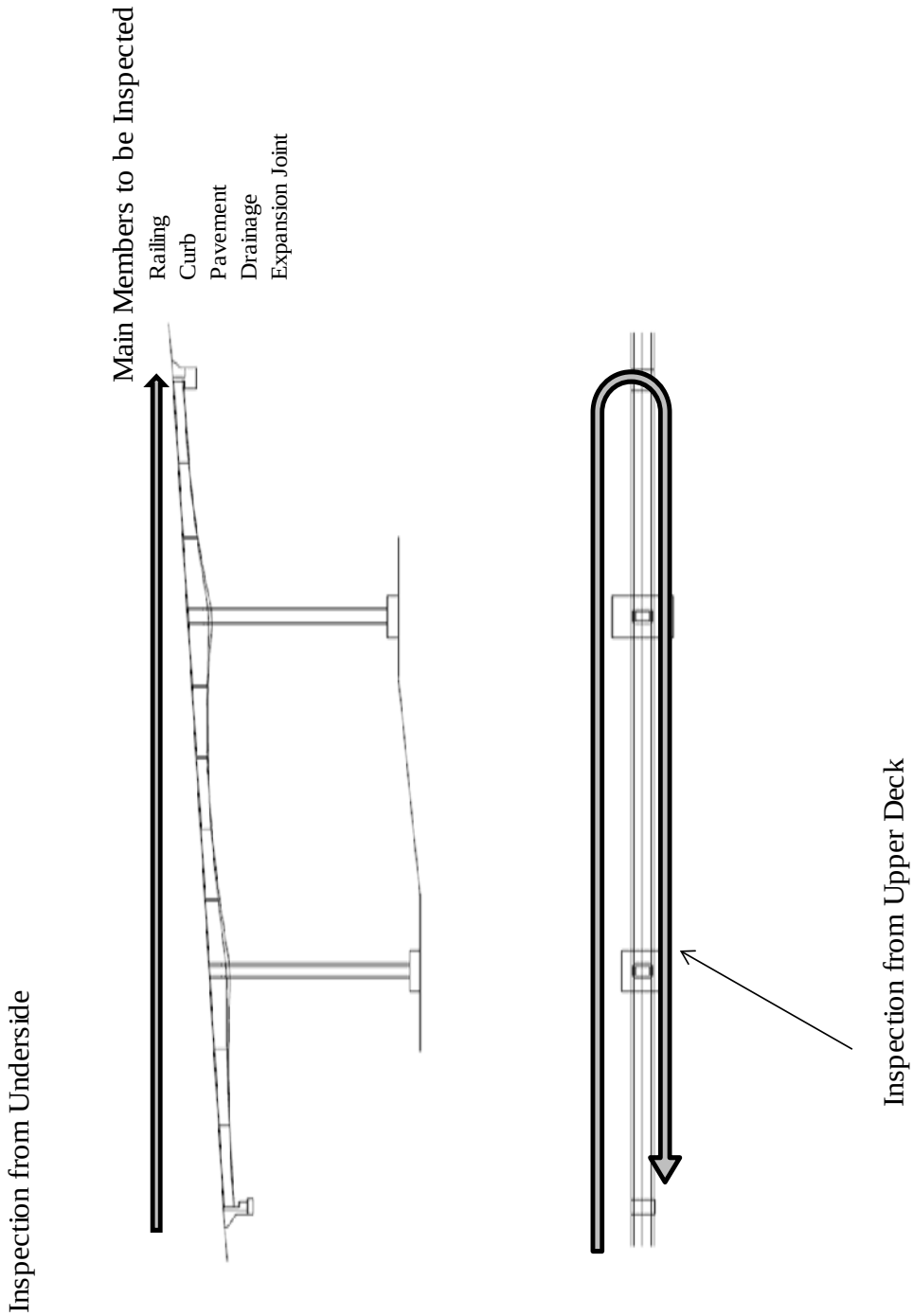
The Bridge Inspector should check the defects and draw them on Sketch Drawings Forms and photographs should be used to document any major defects.

Upon return to office, inspectors select Condition Rating and Required Maintenance Action Plan based on the severity of defects. The result of inspection should be compiled as a deliverable and submitted to concerned offices. If there are any defects that need Emergency Action (EA) as a required maintenance actions, it must be reported immediately to the head of office without waiting for the completion of the written report.

Any changes to the routine maintenance report should be made by amending the copy in RED ink. Should there be any doubt in relation to the bridge condition and required major maintenance, a Condition Inspection of the structure or Emergency Inspection should be immediately undertaken.

Condition Rating for Routine Inspection and Required Maintenance Actions for each defect are shown in Tables 3-1 and 3-2.

Figure 3-2 Routine Inspection Route (1 of 2)



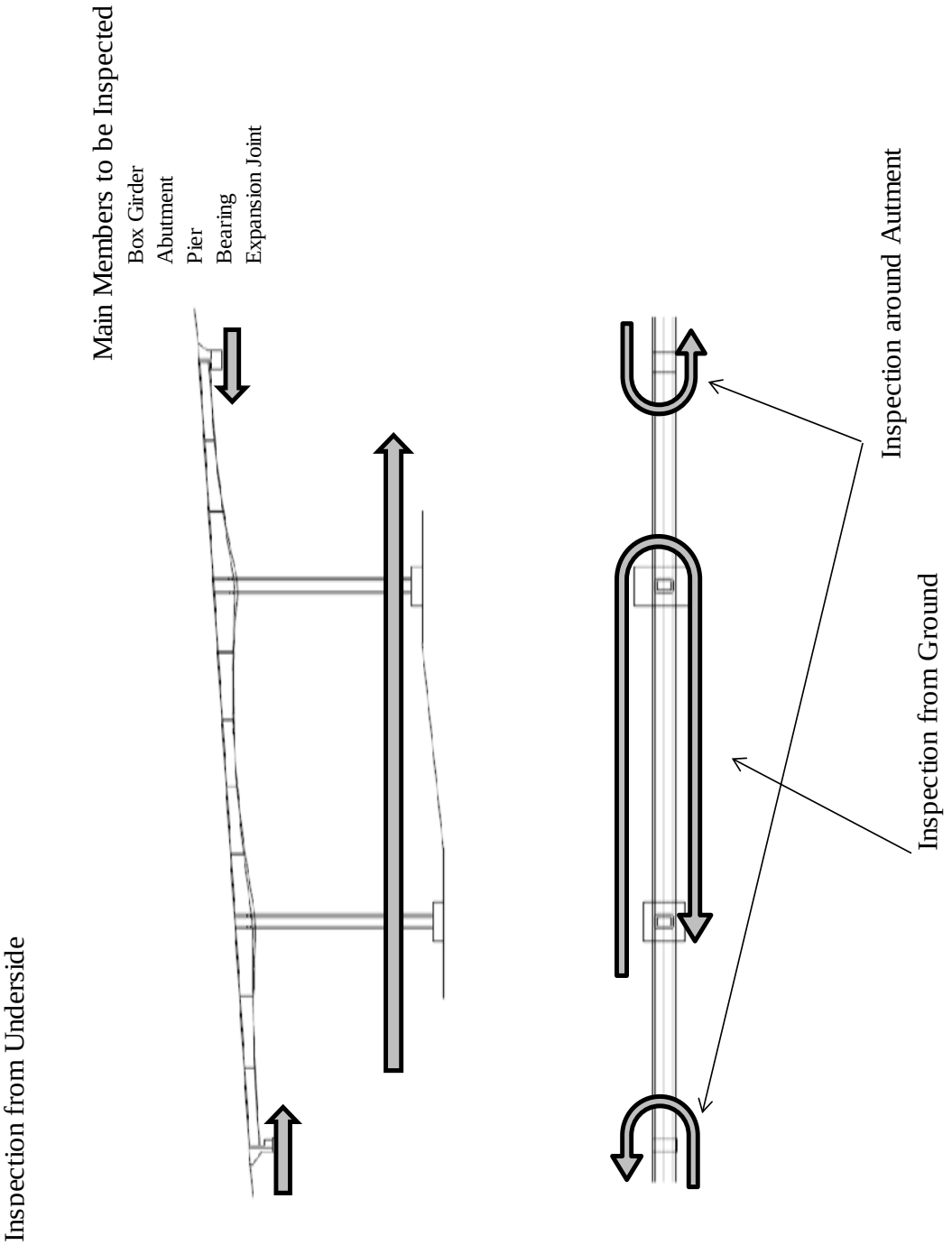


Figure 3-3 Routine Inspection Route (2 of 2)

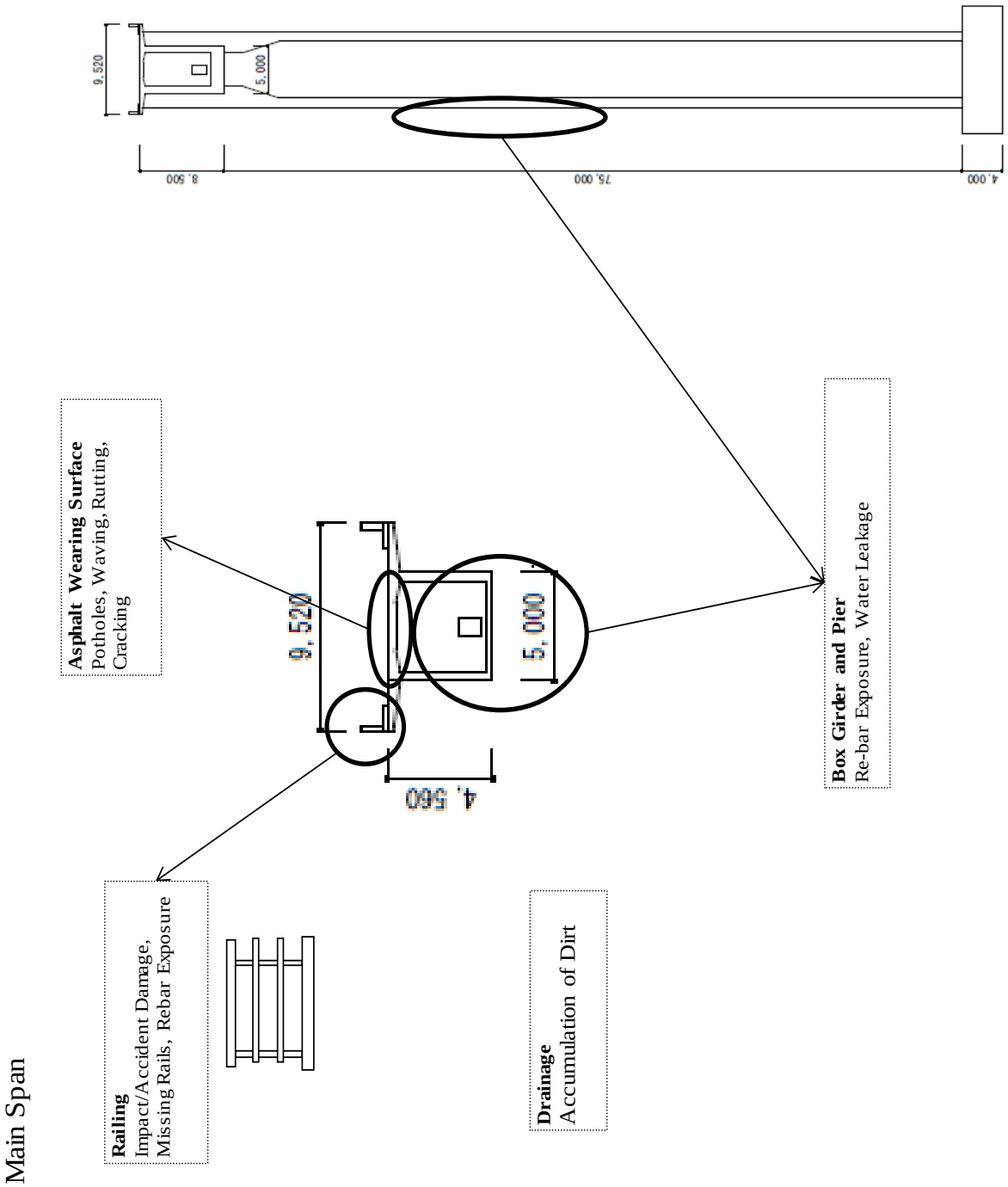


Figure 3-4 Check Points of Routine Inspection (1 of 2)

Figure 3-5 Check Points of Routine Inspection (2 of 2)

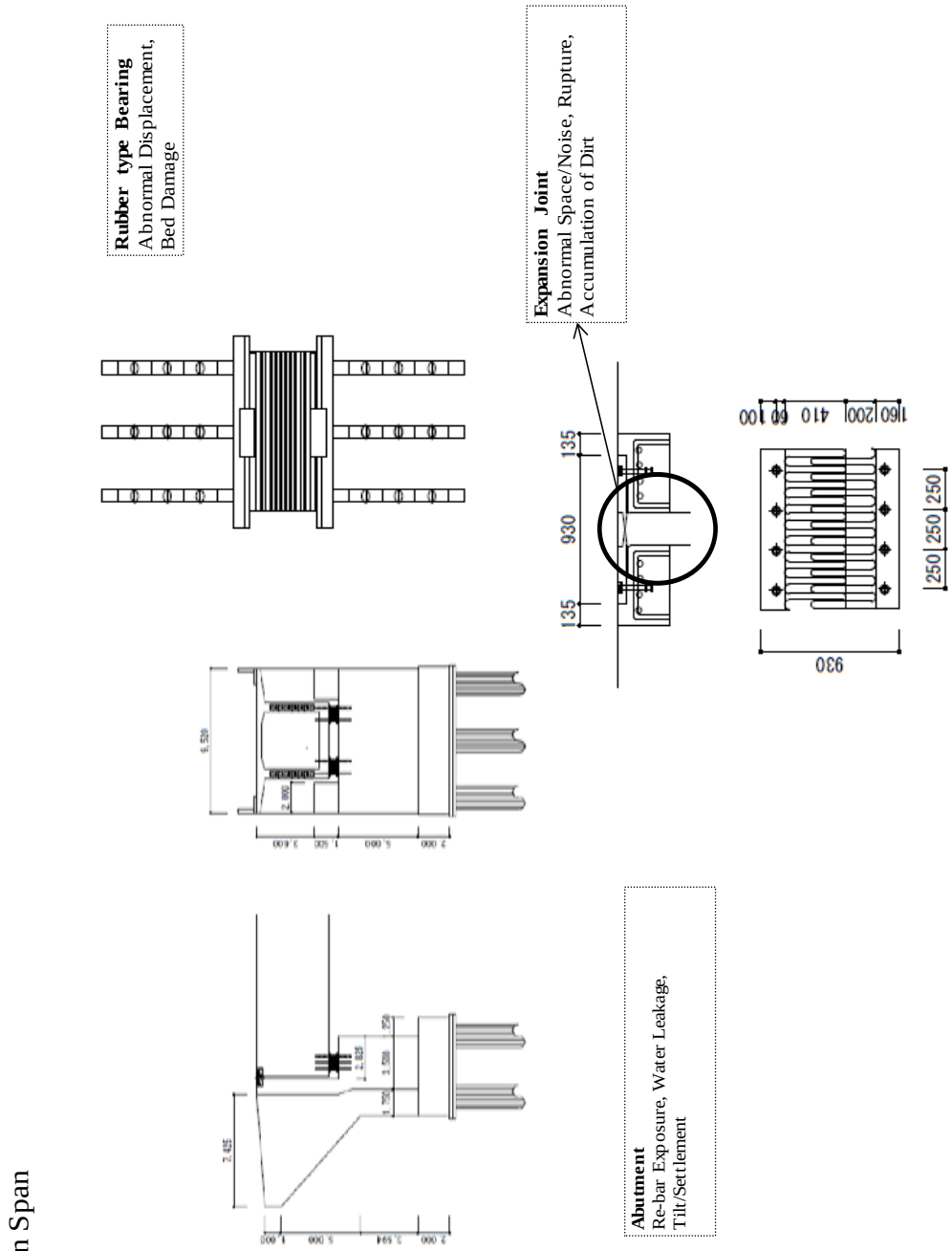


Table 3-1
Condition Rating for Routine Inspection

Rating	Condition
Good	No damage
Fair	Minor damage(s) not affecting the stability of the structure
Poor	Deteriorating damage(s) which should be repaired, as a preventive action
Bad	Severe damage(s) affecting the stability of the structure or has possibility to harm a third party

Table 3-2
Required Maintenance Actions

Required Actions	Condition
M- Monitoring	No repair work and keep monitoring (Damage not progressing or very slow)
RM- Routine Maintenance	Should be maintained by Routine Maintenance
MM- Major Maintenance	Should be repaired by Major Maintenance
EA- Emergency Action	Need to take actions immediately to avoid bridge collapse or harm a third party

3.4. Deliverables

The deliverables of Routine Inspection Report are as follows:

- Routine Inspection Report
  - Bridge Routine Inspection Form(Type1)
  - Summary of Routine Inspection Results
  - Repair Record
  - Inspection Results sheet
- Sketch Drawings sheet
- Photo record sheet (Pictorial Report)

The Bridge Routine Inspection Reports shall be prepared by the Bridge Inspectors. The report shall be checked and reviewed by the Regional Office for completeness and accuracy prior to finalization.

When the Bridge Routine Inspection Report would be completed, accurate and accepted, all the data shall be stored in Special Bridge Inventory Database.

4. CONDITION INSPECTION (TYPE 2)

4.1. Purpose

The purpose of the Condition Inspection is to record defects and rate the condition of special/ long span bridge as a basis for identifying its current maintenance needs, forecasting its future intervention measures and estimating its future funding requirements. Also, the result of Condition Inspection should be used to monitor the deterioration of defects.

4.2. Scope of the Inspection

The Condition Inspection includes:

- Reviewing the existing inventory data of the bridge structure for accuracy.
- Visually inspecting the bridge attributes and record their defects to assess their condition using a standard condition rating system.
- Sketch drawings to monitor the progress and deterioration of defects
- Reporting the condition of each bridge attribute.
- Providing a general condition rating for the structure as a whole.
- Identifying bridges that require an Engineering Inspection (those with an overall condition state of 2 or 3).
- A photographic record of defects.

In Condition Inspection, the inspector should record all details of defects for the assessment of bridge condition using a standard condition rating system and also for the monitoring of progress and deterioration of defects. Therefore, each attribute of the bridge shall be inspected at a distance at least three (3) meters from the surface of the attributes or its equivalent, using binocular as much as possible.

All surfaces of the attributes shall be exposed in good natural or artificial light during the inspection, sufficient to observe fine cracks and other defects on the surfaces. Bearings at the abutments and piers shall be inspected at eye level. The inside of both box girder and tower shall also be inspected closely. The bridge inspection is done visually to cover all parts of the bridge above the ground and water level.

Sketch drawings in Condition Inspection is very important for the analysis of bridge condition and for the monitoring of deterioration of defects. Inspector should sketch carefully the details of defects. Sketch drawing of defects should include the range, length, area and severity of defect as much as possible. When inspectors cannot possibly measure the defects, they can roughly estimate measurement through their engineering judgment.

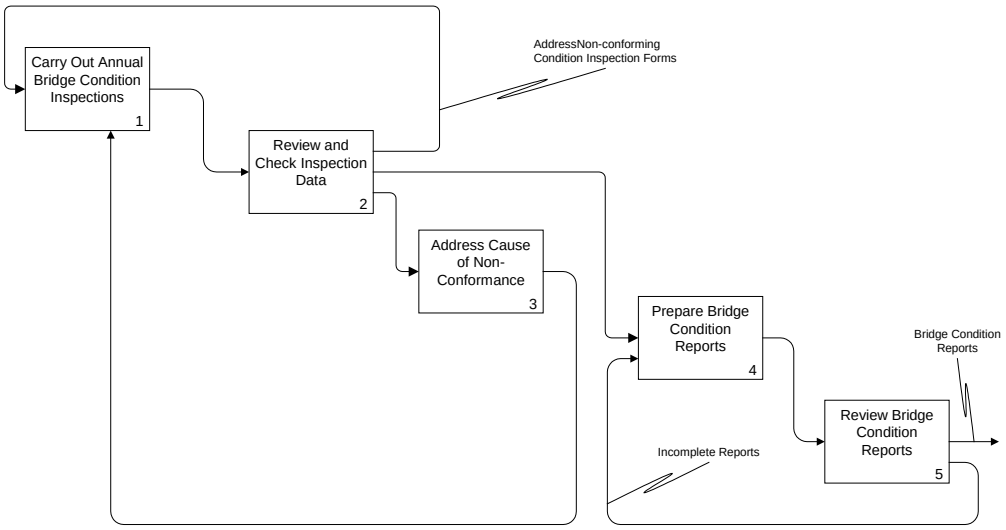
If a previous Engineering Inspection Report is available, the findings on the report will be used in the next Condition Inspection to verify whether these findings remain valid.

4.3. Process

The process for undertaking a Condition Inspection is illustrated in Figure 4-1.

Figure 4-1

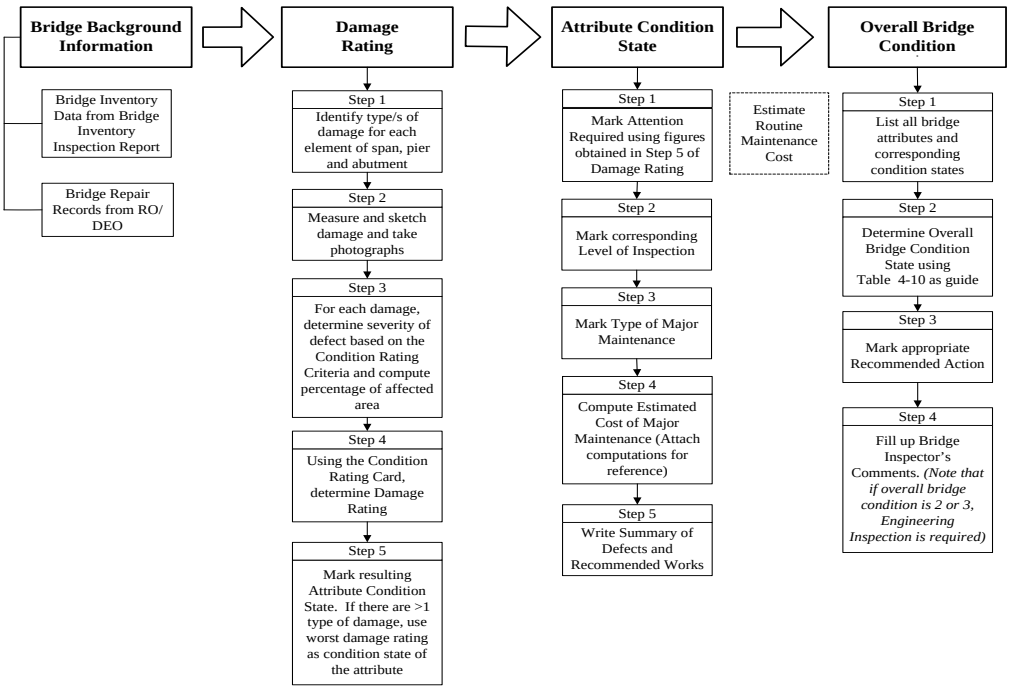
Bridge Condition Inspection



The step-by-step procedure for conducting the Condition Inspection is illustrated in the following flowchart.

Figure 4-2

Flowchart of Bridge Condition Inspection



4.4. Procedure

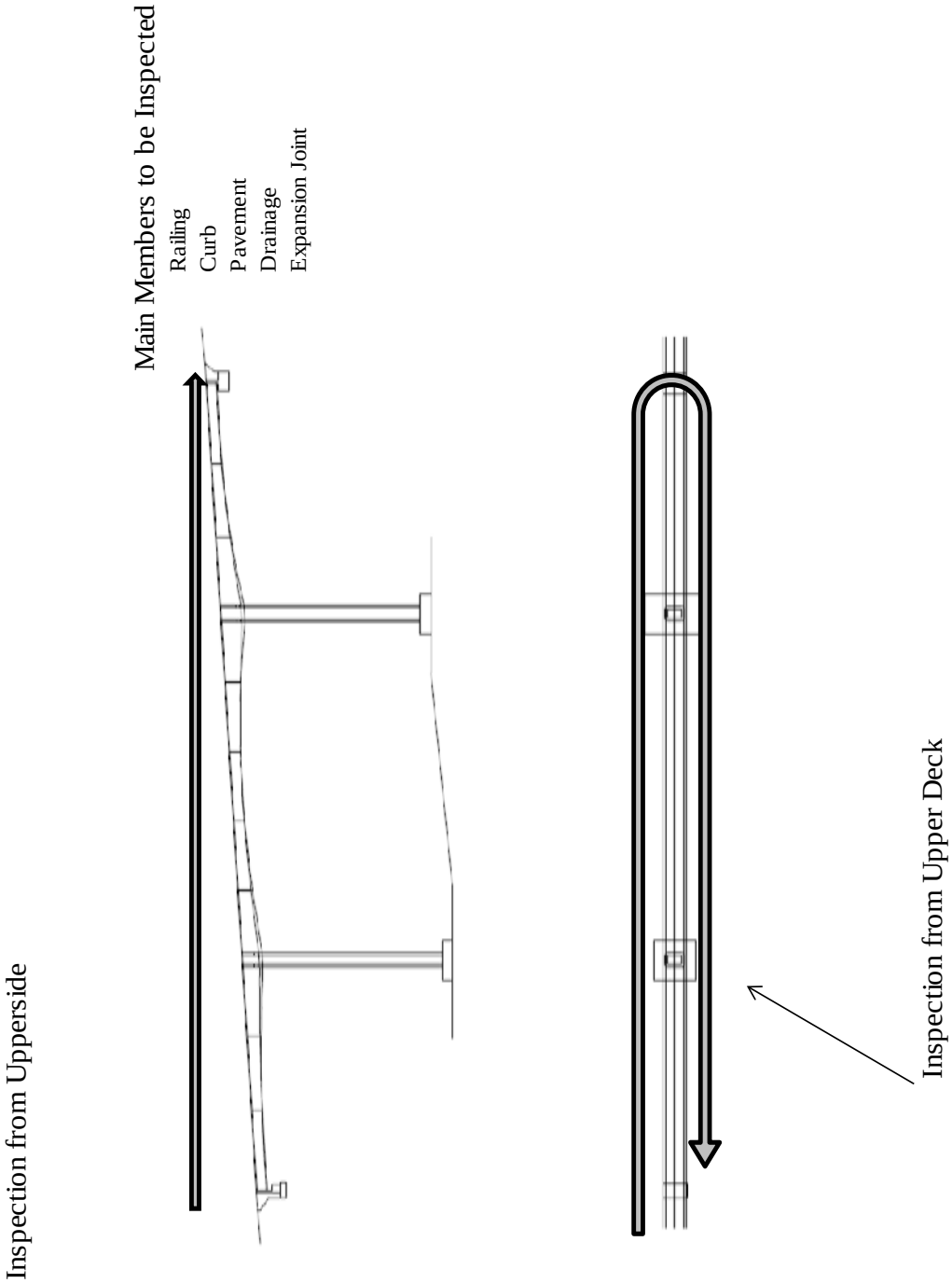
4.4.1. Condition Inspection Form

As a reference, Condition Inspection Forms (CIF) and Sketch Drawings of Agasagas Bridge (pilot project) are shown in Appendix F.

The Bridge Condition Inspection Routes of Agasagas Bridge (Pilot Bridge) are shown in Figures 4-3, 4-4 and 4-5 and the Check Points of the Condition Inspection are shown in Figures 4-6 and 4-7. As a breakdown, the CIF is composed of forms shown in Table 4-1.

Special bridges/long span bridges are complex structures. Before conducting inspection, proper numbering of elements and attributes on the forms should be considered to avoid misinterpretation on its location. During inspection, each attributes shall be numbered/marked for easy identification. Numbering and marking of attributes are shown in Figures 4-8 and 4-9.

Figure 4-3 Condition Inspection Route (1 of 3)



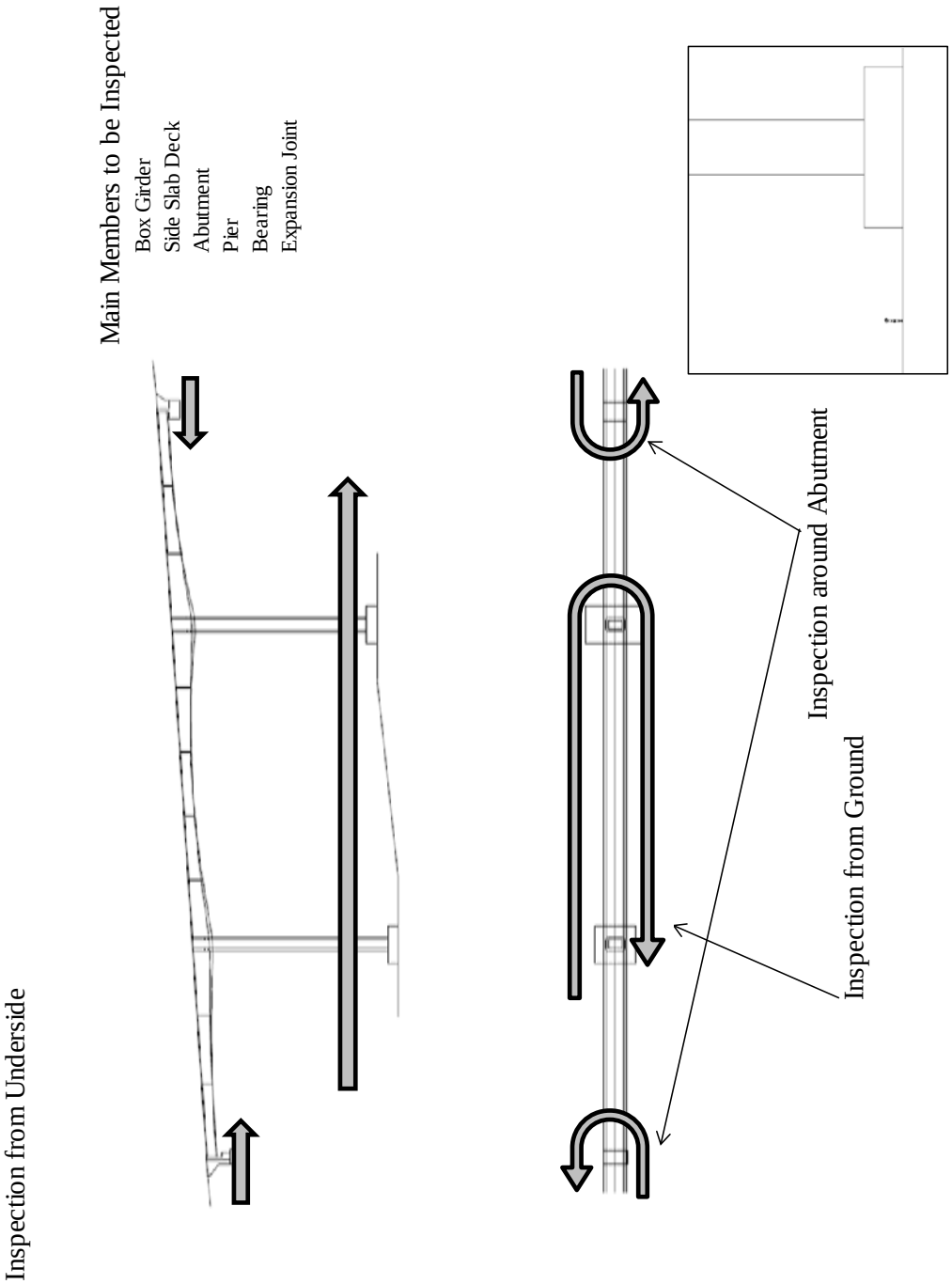


Figure 4-4 Condition Inspection Route (2 of 3)

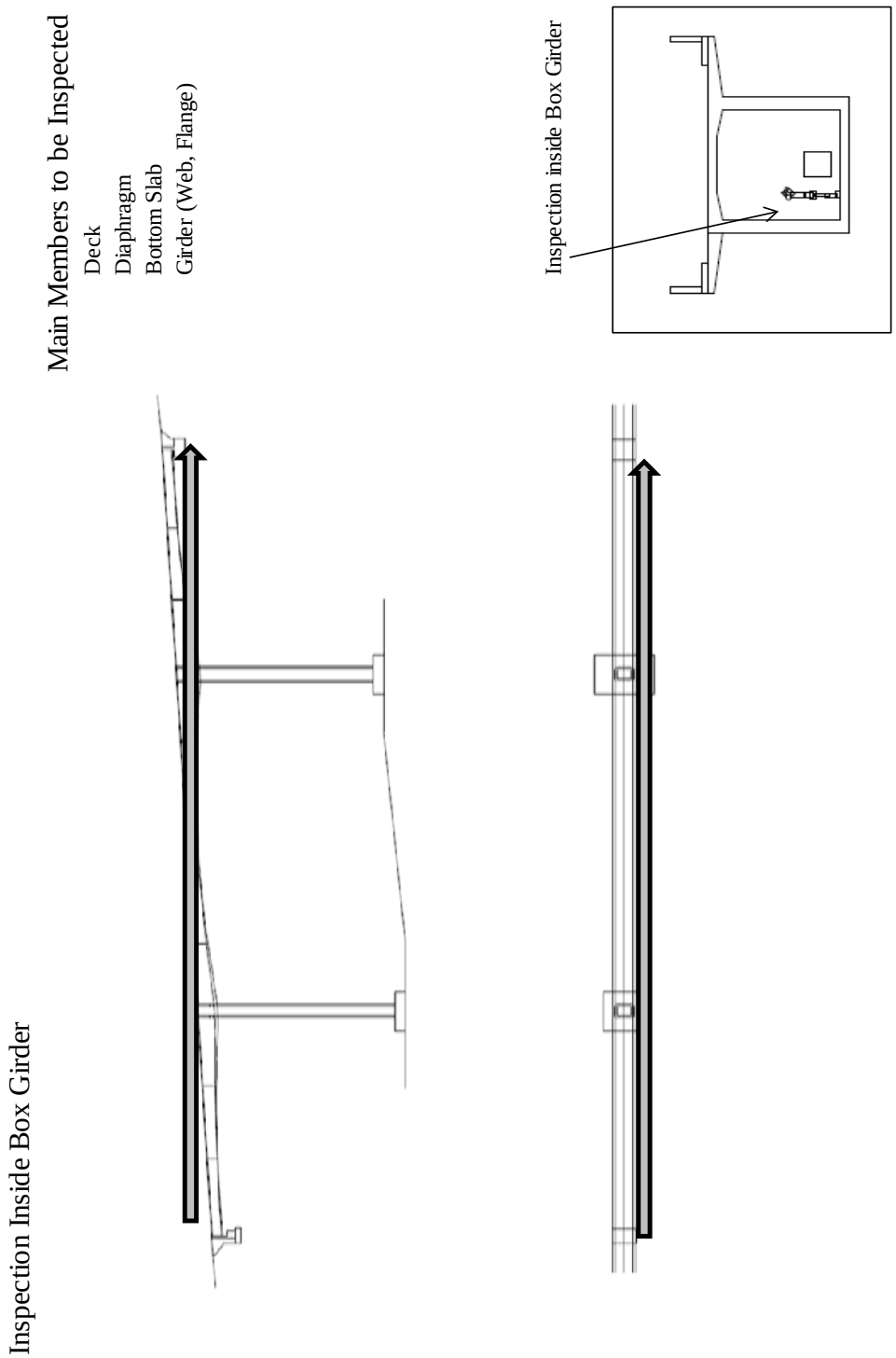
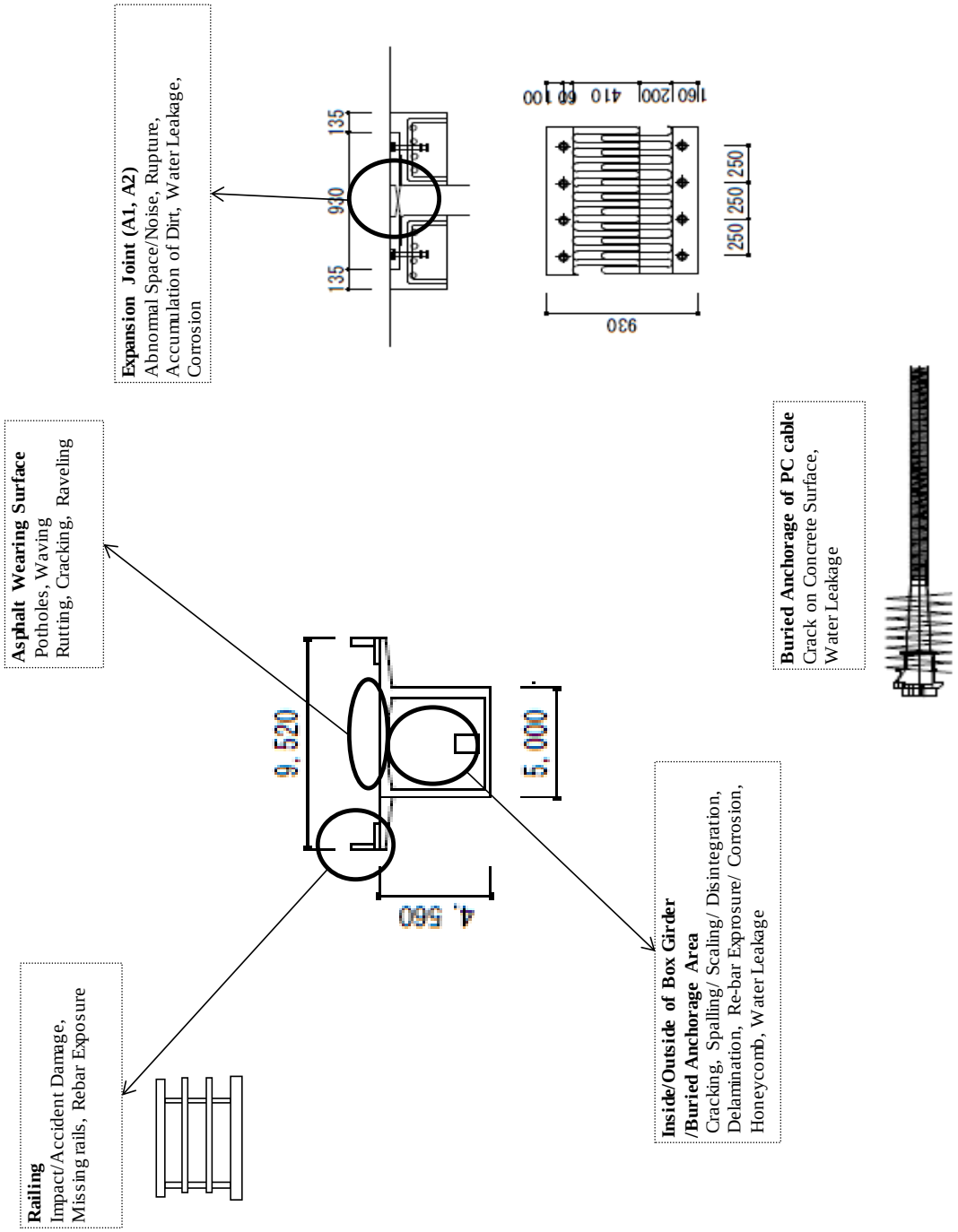


Figure 4-5 Condition Inspection Route (3 of 3)

Figure 4-6 Check Points of Condition Inspection (1 of 2)



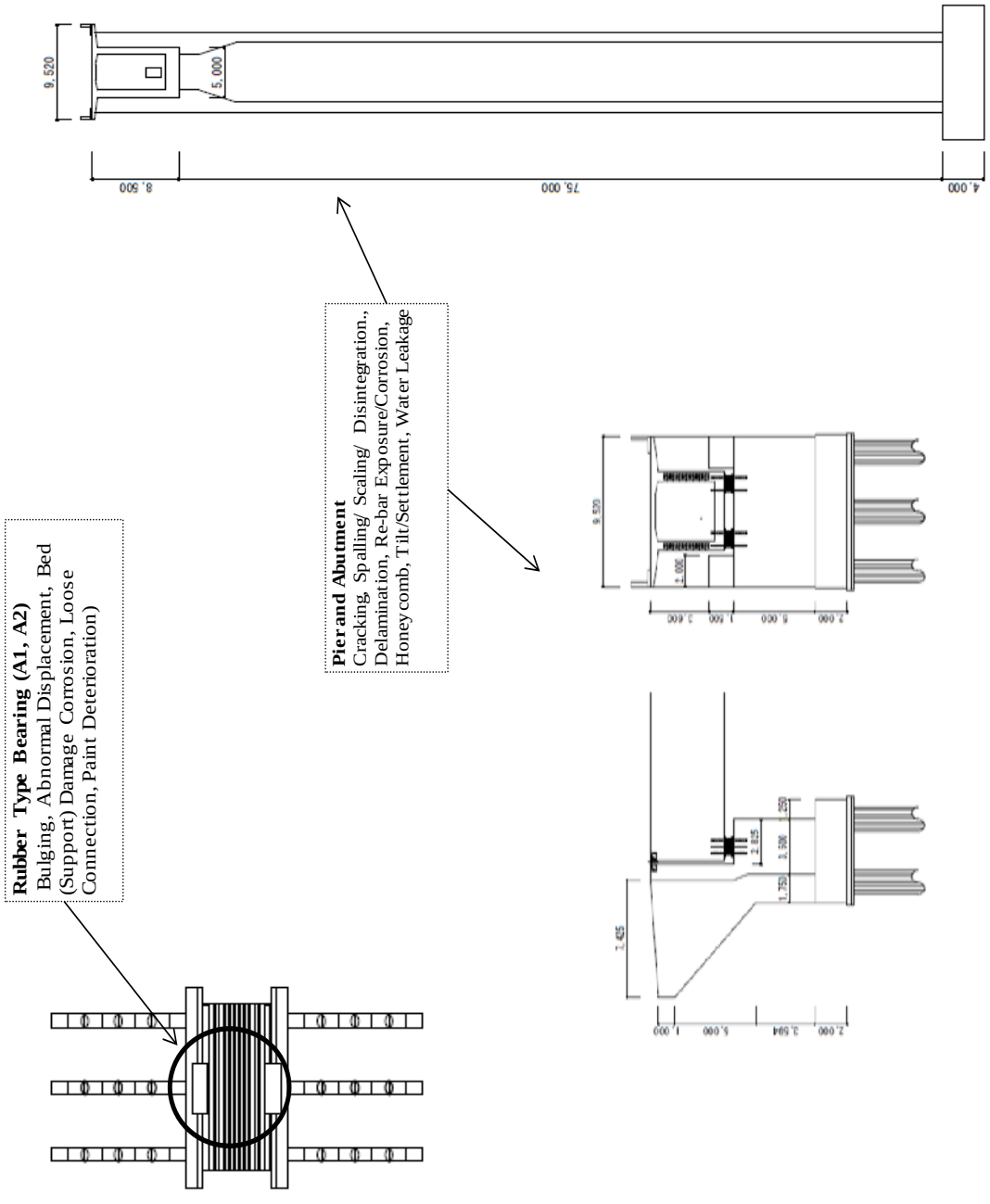
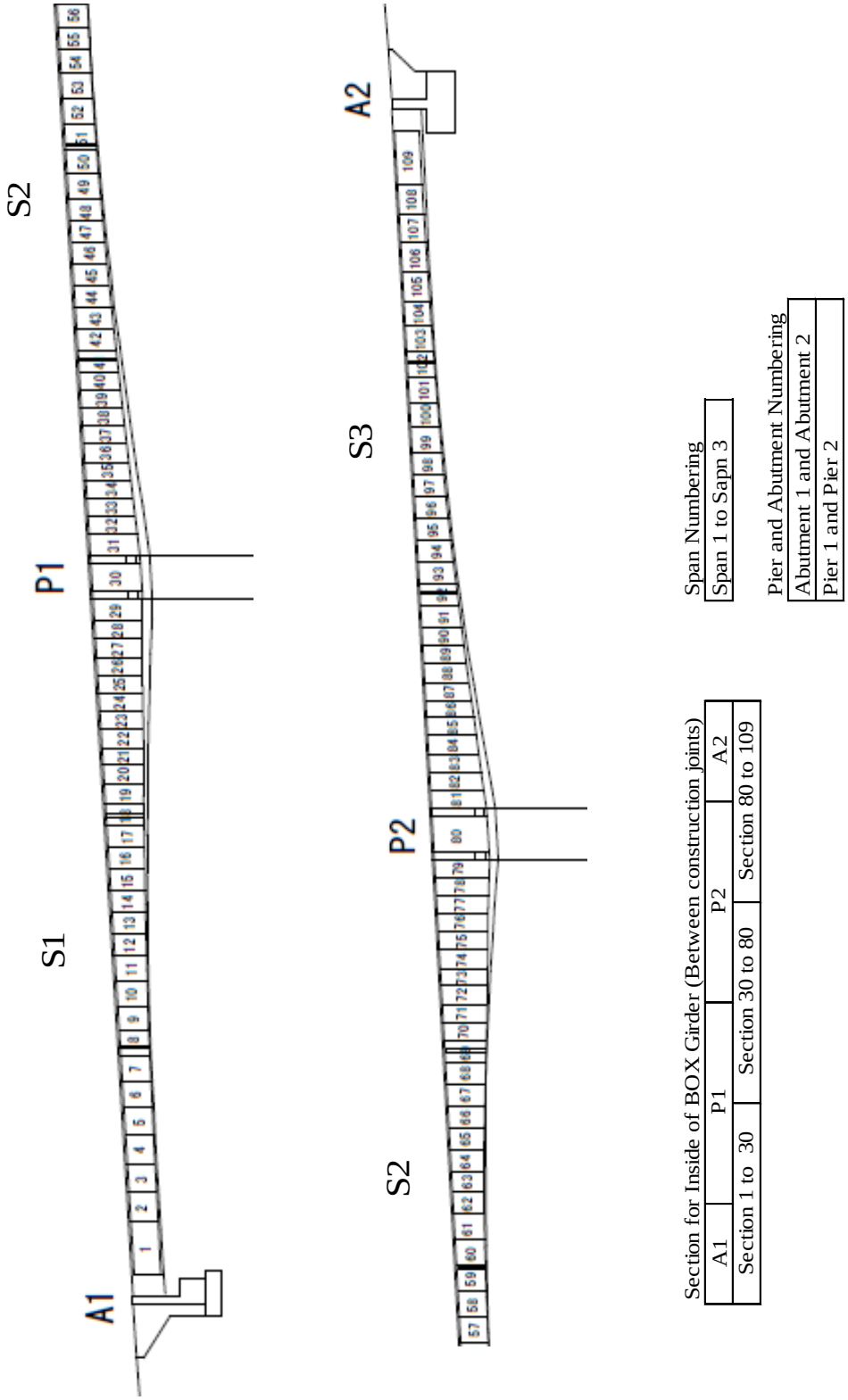


Figure 4-7 Check Points of Condition Inspection (2 of 2)

Figure 4-8 Numbering of Members



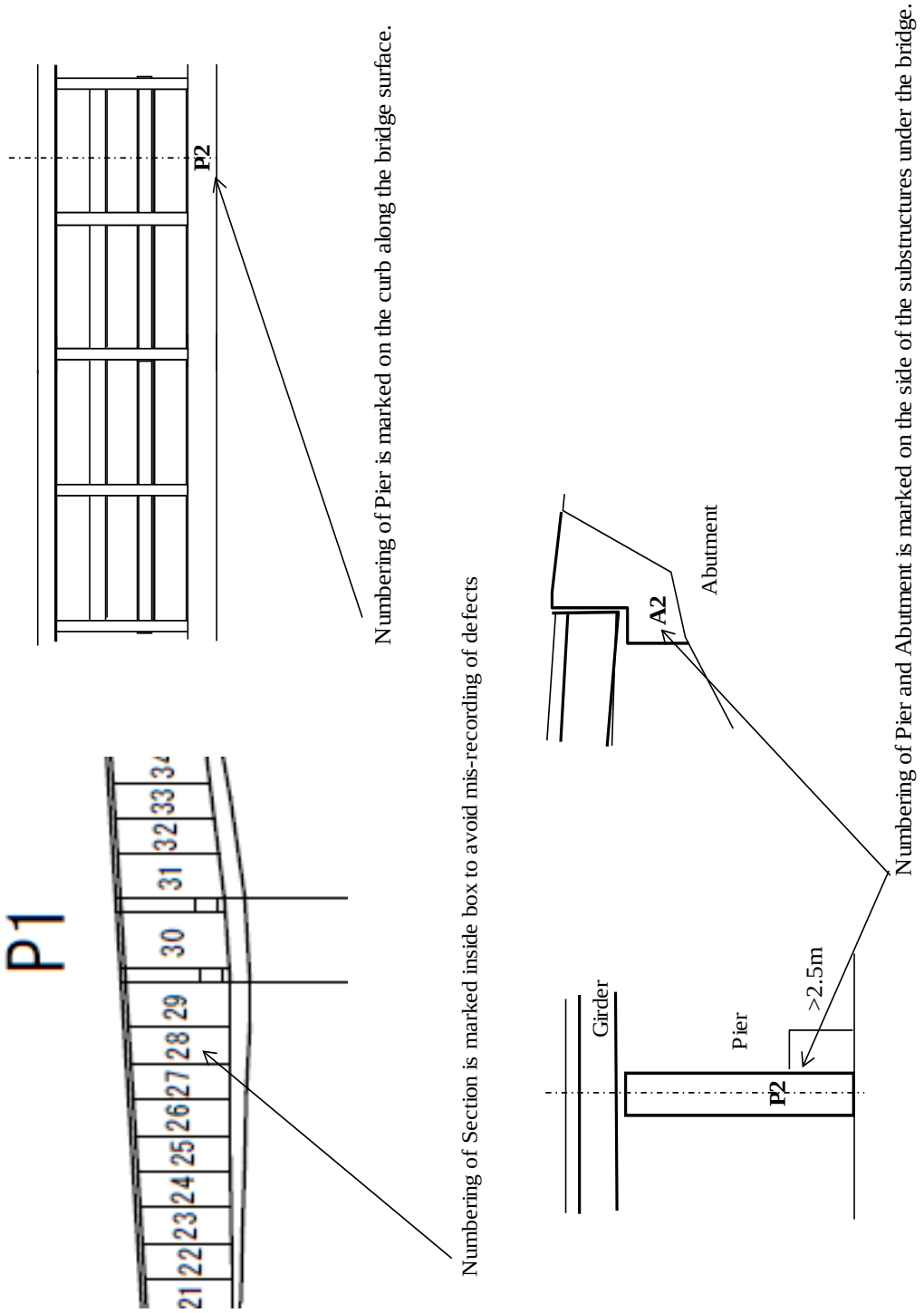


Figure 4-9 Marking of Number of Members

Table 4-1
Composition of Condition Inspection Forms for Agas-agas Bridge

Title of Form	Number of Form
(1) Cover	1
(2) Bridge Location and General Description with Signature	1
(3) Repair Records	1
(4) Summary of Findings/Recommendation	1
(5) Estimated cost of Major Maintenance	1
(6) Span Element - Condition	3
(7) Pier Element - Condition	1
(8) Abutment Element - Condition	4
(9) Span Element - Damage Rating	2
(10) Pier Element - Damage Rating	1
(11) Abutment Element - Damage Rating	2
Total	18

4.4.2. Level of Inspection

The bridge inspector shall indicate the level of inspection undertaken as shown in Table 4-2.

Table 4-2
Level of Inspection

Full complete inspection	
Partial inspection only as bridge inspection vehicle not available	
Partial inspection for other reason	

It is practical to use Bridge Inspection Vehicle at least once in every three years, due to the limited number of such vehicle in DPWH. Bridge inspector should consider the arrangement of BIV when they make a maintenance plan for special bridges. If a complete inspection is not undertaken, then revisit the bridge and inspect with a Bridge Inspection Vehicle or other required equipment. A countrywide program for the use of the available Bridge Inspection Vehicles should be utilized to ensure optimum result of the inspection.

4.4.2.1 Bridge Inspection Vehicle

Bridge Inspection Vehicle (BIV) is one of the most important inspection equipment used to provide temporary access for inspectors to approach inaccessible area for close inspection, such as high tower, chord, cable and under bridge.

Generally two types of BIV are used in the inspection of bridges. One type is Bucket Type BIV which is also called Aerial Work Platform. This type of BIV is widely used for maintenance and construction of bridge and also for power and telecommunications industries. They can lift inspectors up to high level to inspect tower, cable band chord and etc. Figure 4-14 shows the picture of the Bucket Type BIV.

Figure 4-10
Photos of Bucket Type BIV

Another type of BIV is Telescoping Articulated Platform. This type can carry the inspector underneath the bridge to check girders, bottom of slab and etc. Figure 4-15 shows the picture of Telescoping Articulated Platform Type BIV.

Figure 4-11
Photos of Telescoping Articulated Platform Type BIV

When BIV is used, a designated vehicle operator should accompany the inspection and operate the vehicle. Inspectors should be tied to the rigid frame by safety belt during lifting.

4.4.3. Location and Inventory Data

The bridge inspector shall inspect the bridge and review the Location data included in the CIF. Data required are described in Table 4-3.

Table 4-3
Bridge Location Data

Data Description	Comment
Bridge ID	Unique identification number assigned by the RBIA for each bridge
Bridge Name	The name given to the bridge
Road Name	The name of the road on which the bridge is located.
Road ID	Unique identification number assigned by the RBIA for the road on which the bridge is located
Section ID	The unique identification number assigned by the RBIA to the specific road section containing the bridge
Location	The location (chainage) of the bridge within the road section based on the LRS
Region	Region in which the bridge is located
Engineering District	Engineering District which is responsible for the management and maintenance of the bridge
Province, Congressional District, Municipality and Barangay	The administrative area in which the bridge (i.e. the first abutment) is located.
River Name	The name of the stream crossed by the bridge (where appropriate)

4.4.4. Estimation of Routine Maintenance Costs

The bridge inspector is required to prepare the estimated costs of routine maintenance for the next fiscal year.

The estimated costs of routine maintenance to a bridge shall be based on a review of the actual routine maintenance costs to the bridge in the previous year adjusted based on the inspection of the bridge. The historical costs will be compiled and supplied by the District Engineering Office in which the bridge is located on request. The inspection will be used to determine if the same or different routine maintenance will be required in the next budget year.

The estimated costs for routine maintenance will be used in the planning of the Annual Infrastructure Program for the coming fiscal year.

The definition for routine maintenance is presented in Table 4-4.

Table 4-4
Definition of Routine Maintenance

Definition	Routine Maintenance Activities
All routine and periodic maintenance of bridges undertaken using DPWH routine maintenance funds as defined by RMMS	Works that are urgent to safeguard the bridge and the public; Works not requiring formal design and documentation; and Works that can be undertaken with a maximum MBA allocation of 10 crew days per bridge per year.

Routine maintenance covers minor works to the entire bridge, and includes cleaning, painting, minor repairs, and etc. The standard routine maintenance activities are listed in Table 4-5.

Table 4-5
Routine Maintenance Activities

Act. No.	Description	Unit	Method
60.01	Sweeping and cleaning of bridge deck	sq. m	MBA/MBC
60.02	Patching concrete deck	sq. m	MBA/MBC
60.03	Repairs to concrete bridge elements	crew days	MBA
60.04	Repairs to steel bridge elements	crew days	MBA
60.05	Repairs to Bailey bridge	crew days	MBA
60.06	Repairs to timber bridge	crew days	MBA
60.07	Clearing bridge waterways	crew days	MBA

4.4.5. Repair Record

The bridge inspector is required to report the routine and major maintenance activities undertaken to a bridge after the conduct of the last condition inspection that will include the type, scope and status of maintenance activities. The bridge inspector shall also record observations whether the works undertaken are effective and sufficient.

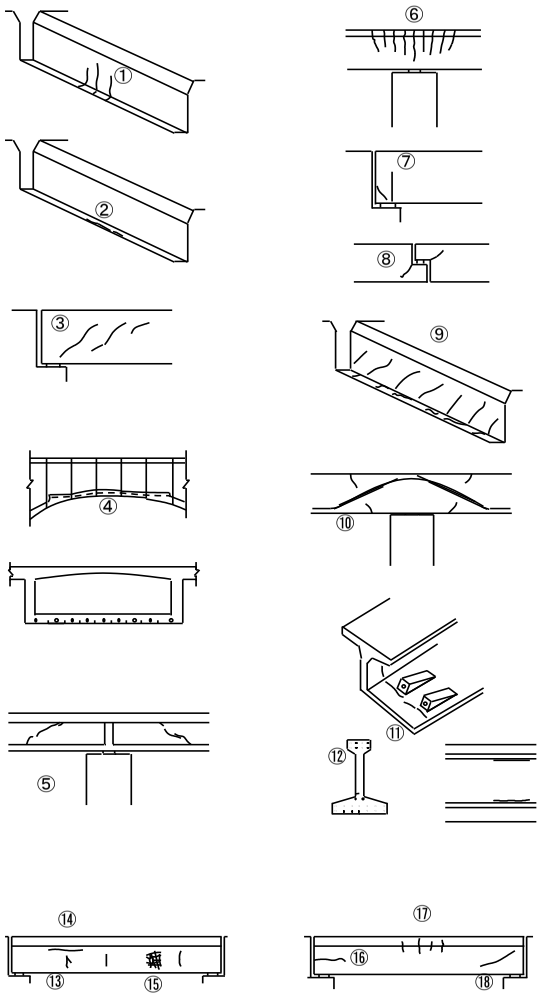
4.4.6. Condition Data Collection

Special bridges like PC Box Girder Bridge have unique attributes and materials which are not defined in the BMS Manual for standard bridges. Bridge Inspectors/Engineers should understand the characteristic and function beforehand by reviewing the As Built Drawings and other related documents.

As a reference, some special attributes of Agas-agas Bridge (Pilot Bridge) are listed in Table 4-6. All other applicable descriptions in the BMS Manual for standard bridge are adopted in this Manual. General pattern of defects in bridges are shown in Figures 4-16, 4-17, 4-18, 4-19, 4-20 and 4-21.

Figure 4-12 General Patterns of Defects (1 of 4)

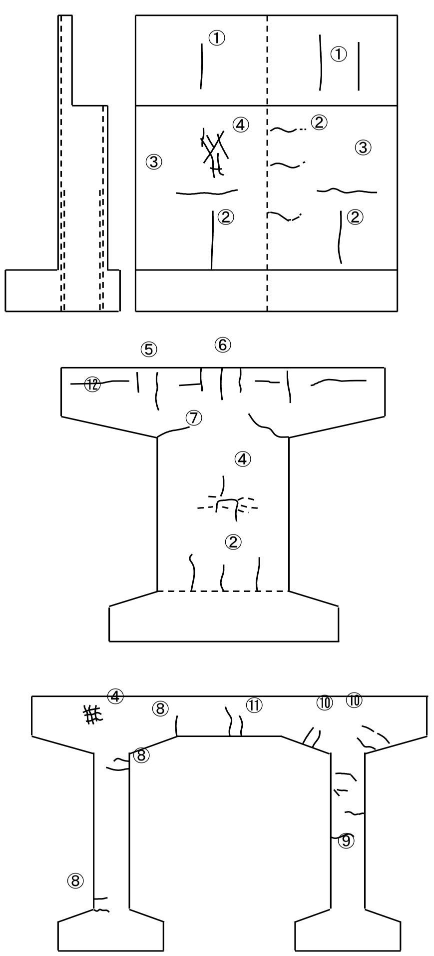
General Patterns of Crack Defects on Prestressed Concrete Bridge



Number	Location	Pattern
1	Span center	Vertical bending crack on bottom and side of girder
2	Span center	Longitudial crack on bottom of girder
3	Supporting point	Diagonal shear crack around supporting point
4	Span center	Crack on lower frange along to Sheath or PC cable
5	Changing point of bending moment	Crack on web along to Sheath or PC cable
6	Supporting point	Crack on upper flange on continuous girder
7	Supporting point	Verical or diagonal bearing crack on supporting point
8	Supporting point	Crack on the corner point of cantilever hinge
9	-	Diagonal crack on the whole of girder
10	Changing point of bending moment	Right angled crack against PC steel
11	Connecting point of PC Steel	Crack around Connecting point of PC cable
12	High density point of PC steel	Crack around PC cable
13	-	Crack on web by regular interval
14	-	Vertical crack on the joint point between girder and web
15	-	Crack like mesh
16	Supporting point	Horizontal crack on supoorting point
17	Span center	Horizontal crack on span center
18	Along to Sheath	Crack along to Sheath or PC cable

Figure 4-13 General Patterns of Defects (2 of 4)

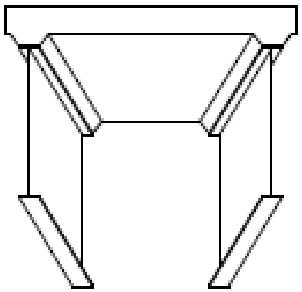
General Patterns of Crack Defects on Abutment and Pier



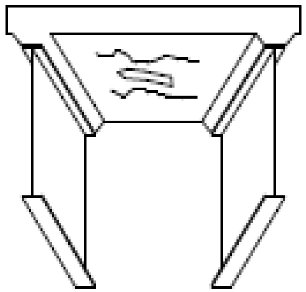
Number	Pattern
1	Crack with regular interval
2	Crack on the concrete casting joint
3	Crack around the changing point of density of reinforcement bar
4	Crack like mesh
5	Crack on topside of overhang beam (coping)
6	Vertical crack on pier center
7	Crack on bottomside of overhang beam(coping)
8	Crack on upper and bottom part of column
9	Crack on column
10	Crack on haunch
11	Bending crack on the span center of beam
12	Horizontal crack on beam

Figure 4-14 General Patterns of Defects (3 of 4)

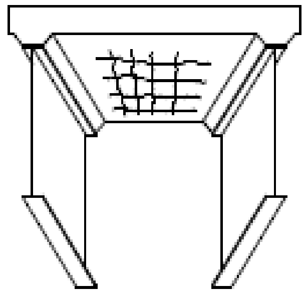
General Patterns of Crack Defects on Concrete Deck



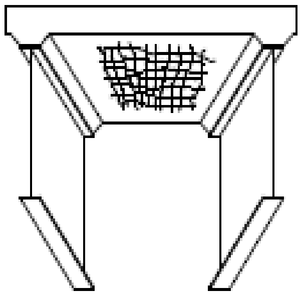
Stage 0
Sound condition



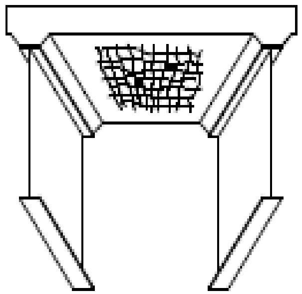
Stage 1
Development of cracks in one direction



Stage 2
Development of cracks in two directions



Stage 3
Cracks develop like a mesh



Stage 4
Water penetrates cracks, spalling

Figure 4-15 General Patterns of Defects (4 of 4)

General Patterns of Crack Defects on Rubber Bearing

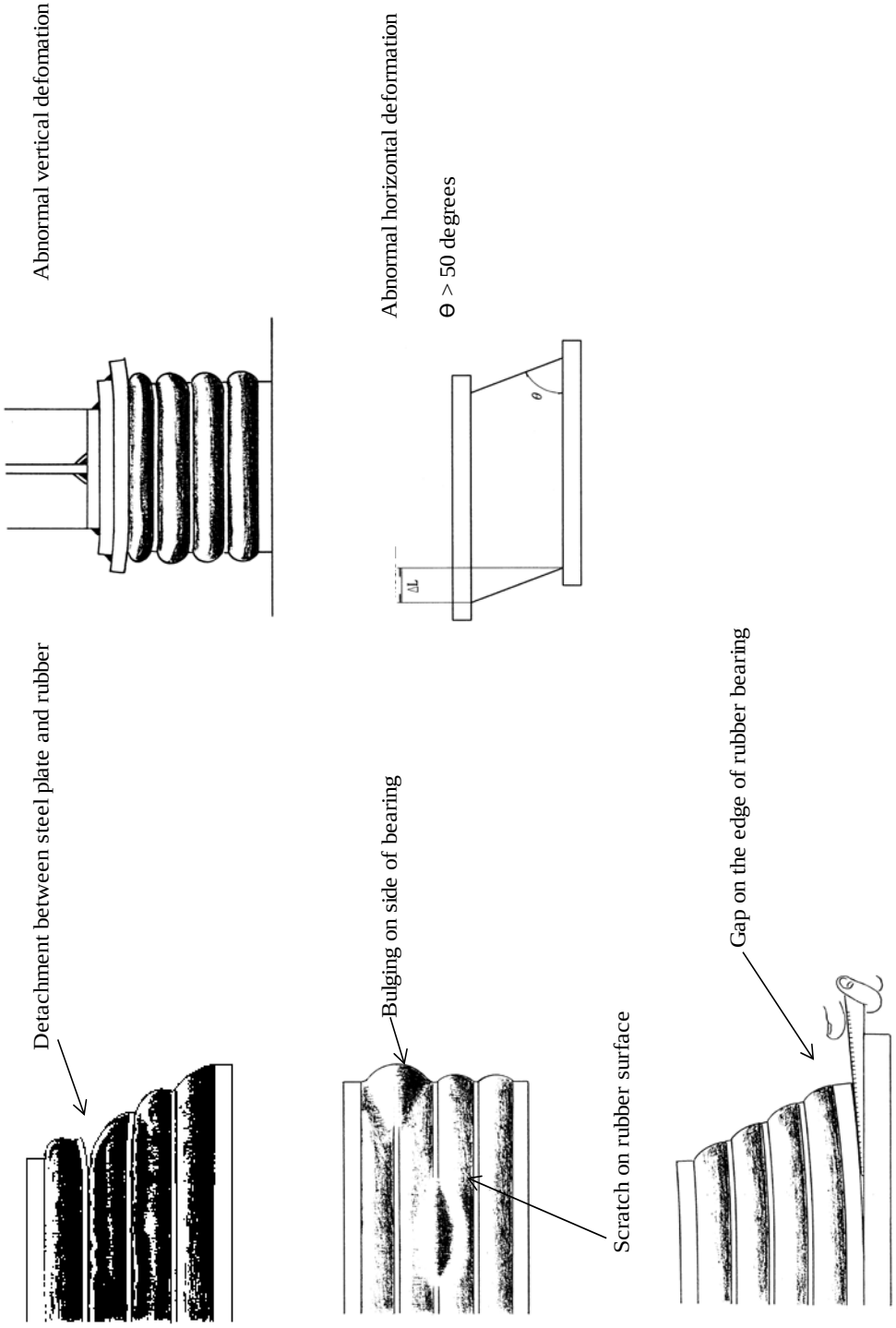


Table 4-6
Special Attributes of Agas-agas Bridge

Element	Attribute	Description
Span	Asphalt Wearing Surface	The asphalt wearing surface is the surface on which vehicle traffic and pedestrian travels. Agas-agas Bridge adopts 40 mm thickness Dense Graded Bituminous Concrete Asphalt on the top layer. Asphalt wearing surface plays an important role to protect the deck slab.
	Water Proofing Layer	Water proofing is quite important to protect deck slab from deterioration by water penetration. Water easily penetrates asphalt wearing surface and reach deck slab. Concrete weak vibration by live load under wet condition. Water proofing should be installed on the deck slab before casting asphalt layer.
Cable	Anchorage inside Concrete Girder	Anchorage is to keep the tension force of PC cable for support of bridge. They are quite important parts for the PC Bridge. They are located inside and outside of concrete girders. they inside girders could not be inspected from outside. Concrete around Anchorages should be carefully inspected. Corrosion and damage of Anchorage is contributory to bridge collapse.
	PC Cable inside Concrete Girder	The cable is the most important attribute for PC Bridge. They put external pre-stressing into the girder for supporting load. They are located inside and outside of concrete girder. Cable inside girders could not be inspected from outside. Concrete member along PC cable should be carefully inspected. Corrosion and damage of cable is contributory to bridge collapse

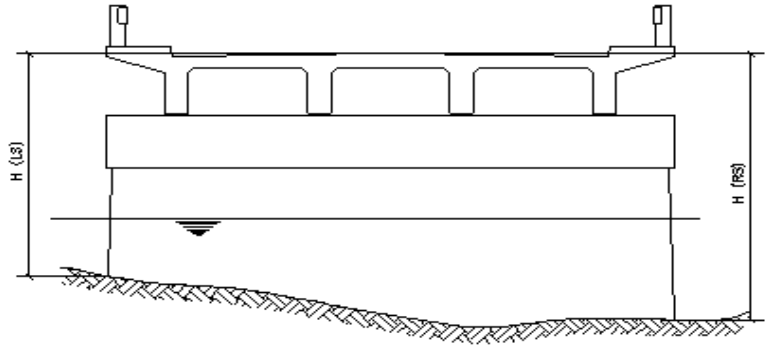
Arrangements of PC Cables in Agas-agas Bridge are shown in Appendix G.

4.4.7. Pier and Abutment Scour Check

Scour checks are made at the piers and abutments in each annual condition survey. These record the level of the ground surface at the piers and abutments. This data will be available to monitor changes in surface levels under bridges over a longer period and therefore will indicate whether erosion or accretion is taking place.

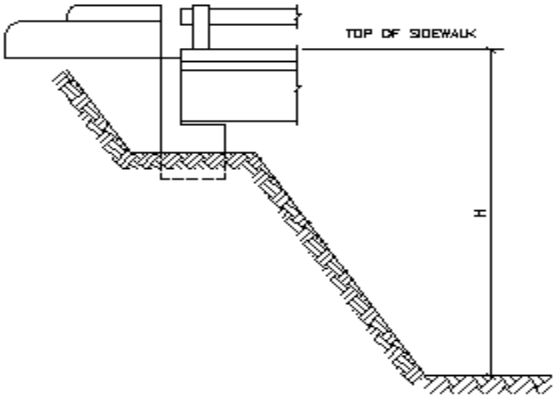
The scour check at a pier is undertaken as shown in Figure 4-16. The bridge inspector is required to measure the height from the top of the concrete deck or parapet to the ground or streambed level on each side of the bridge on the centerline of each pier.

Figure 4-16
Measurement of Pier Scour Check



The scour check at an abutment is undertaken as shown in Figure 4-17. The bridge inspector is required to measure the height from the top of the concrete deck or parapet to the ground or streambed level on each side of the bridge to the natural surface immediately adjacent to the abutment.

Figure 4-17
Measurement of Abutment Scour Check



4.4.8. Condition Rating of Bridge Attributes

The material defect descriptions and the condition rating criteria in BMS will be utilized by the Bridge Inspectors (BI) to assess the defects identified in bridge elements. On the other hand, the Condition Inspection for PC cable, anchorage and the asphalt wearing surface will be undertaken using this Manual.

The condition rating of the bridge attributes will be conducted following the BMS Manual. Additional material defects are specifically described in Appendix H while the corresponding condition rating criteria concerning the same is included in Appendix I.

- Asphalt Wearing Surface

The affected area, length or number will be roughly estimated and using the Condition Rating Card, the attribute damage rating can be obtained. The condition state of the attribute is the worst damage rating. The descriptions cannot possibly cover every situation, and the BIs must rely on their engineering knowledge and judgment to evaluate which condition should apply to the bridge elements inspected.

The BIs shall also compare the defects observed in the attribute with the previous sketch drawings and photograph records to check the progress.

The condition states have been developed to describe the following conditions listed in Table 4-7.

For each defined attribute in the bridge, the Condition Inspection Forms includes a separate section covering that attribute and which is to be completed by the BI. Each section shall be completed to include:

- The condition state of the attribute (see Table 4-7)
- The type of repair required for each attribute
- The estimated cost to undertake the required repair (major maintenance)

All repairs to attributes are classified as major maintenance.

The standard descriptions of major maintenance that may be undertaken for each attribute are:

- Repair damage
- Protective measures
- Strengthen
- Replace
- Other

Only one type of maintenance can be listed for each attribute. When two (2) or more types of maintenance are required to an attribute, all work shall be listed under the type of maintenance with the highest estimated cost.

The BI shall describe in detail the recommended repair works each identified defect in any attribute, providing sketch drawings if necessary.

Table 4-7
Bridge Attribute Condition States

Condition State	Description	Action
0	Attribute is in good condition with little or no deterioration	Keep inspection
1	Attribute shows deterioration of a minor nature to the primary supporting material and is showing first signs of being affected	Keep monitoring
2	Attribute shows advancing deterioration and loss of protection to the supporting material, minor loss of section	Major maintenance is required within 2 years
3	Attribute shows advanced deterioration, loss of effective section to the primary supporting material, and is acting differently to design or is showing signs of overstress	Immediate major maintenance is required

The condition state of each bridge attribute will be used by the BMS to calculate the overall need of the bridge for intervention.

4.4.9. Not Applicable Attributes

There are many instances when the Condition Inspection Forms (CIF) is not completely filled out by the Bridge Inspector due to uncertainties in identifying or locating some attributes of the special bridge.

The Bridge Inspector may feel that an attribute cannot be completed because there is no attribute in the bridge, he/she cannot recognize or find the attributes in the bridge. In this case, the bridge inspector should mark the attributes as not applicable.

4.4.10. Estimation of Major Maintenance Costs

The Bridge Inspector is required to prepare estimated costs of Major Maintenance to correct the defects identified in each bridge for those attributes assessed as having a Condition State 2 or 3.

The estimated costs for Major Maintenance costs will be used to plan programs of major maintenance, upgrading and replacement for all national bridges. It is important that reasonable accuracy cost estimates are prepared, as they will be used to assess if a bridge will be maintained, upgraded or replaced. Even when the Bridge Engineer is confident that the correct action is to replace a bridge, cost estimates to repair the assessed defects must be prepared. The definition for major maintenance is explained in Table 4-8.

Table 4-8
Definition of Major Maintenance

Definition	Major Maintenance
All bridge maintenance undertaken using a specific allocation of funds	All repair works to bridges that are outside the scope of work handled under routine maintenance and which requires a separate allocation of funds. This category would include all works to bridges to prevent deterioration, to address existing damage and to overcome conditions that may impact on the bridges. It would not include any work that would improve the level of service provided by the bridges.

The Bridge Inspector shall prepare an estimated cost for each listed Major Maintenance repair. Separate work sheets shall be used to give details of the recommended major maintenance and the estimated costs of this Major Maintenance for each defined attribute.

These cost estimates shall be prepared as follows:

- For each defect prepare a list of the major activities required for the repair. This list could include items such as scaffolding, removal of damaged concrete, excavation, traffic control, reinforced concrete construction, and the like.

- Costs are estimated for each major activity based on using the material, equipment and labor requirement costs or contract rates. The estimated cost for each activity may be a lump sum.

Each estimated cost must include a reference record on the Condition Inspection Forms (CIF) for easy access to the supporting work sheets. Reference work sheets shall be designated as R-1, R-2, etc. and will be attached to the CIF.

Any bridges where the defects recorded needs some intervention, it will be subjected Engineering Inspection to define the type of intervention required, determine the scope of work and provide accurate cost estimation.

4.5. Sample of Attribute Inspection Forms

For example, the concrete deck slab has 1.20mm wide cracks spaced at an average of 150mm in two directions covering an area of about 10 square meters at Span 1. Span 1 has a dimension of 7 meters width and 10meters span length. Also, Span 1 has 40cm wide water leakage.

In Figure 4-18, the CIF for damage rating of span element, the type of material for the deck attribute is concrete and the defects identified are cracking and water leakage. The severity of cracking is 3-Bad since 1.20mm with an average spacing of 150mm in two directions falls under the criteria of more than 1 mm cracking in two directions spaced at less than 200 mm. The severity of water leakage is 2-Poor since 40cm is under the criteria of more than 20cm wide.

For cracking of concrete of primary components such as deck slab, the severity of damage will be the damage rating, which in this case is **3** regardless of the size of affected area. In the CIF, the damage rating for cracking will then be **Bad**.

For water leakage where the total calculated affected area is 26%, the Condition Rating Card (Figure 4-20) is used to determine the damage rating. The damage rating is 2-Poor since the area affected is within 20~30% of a primary component.

When all the ratings of the observed types of defects for the deck in Span 1 are compared, the worst rating will be the condition state of the deck attribute. The attribute condition state of the deck will then be "**3"** or **Bad** since cracking has the worst rating.

Figure 4-18

Sample Attribute Form (Damage Rating)

Bridge Element: Span 1 **Type of Material: Concrete**
Bridge Attribute: Deck **Type of Damage: Cracking and Water Leakage**

Type of Material		Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
				Unit	%		
DECK							
X Concrete Slab	X	Cracking	**3**	-	-	**Bad**	**3**
		Spalling/Scaling/Disinteg.					
		Rebar exposure/corrosion					
		Honeycomb					
	X	Water leakage	**2**	**Area**	**26**	**Poor**	

The attribute condition state determined will then be specified in the CIF. For example, the condition state of "3" (Attention Required – Immediate) for deck attribute can be marked as shown in Figure 4-19.

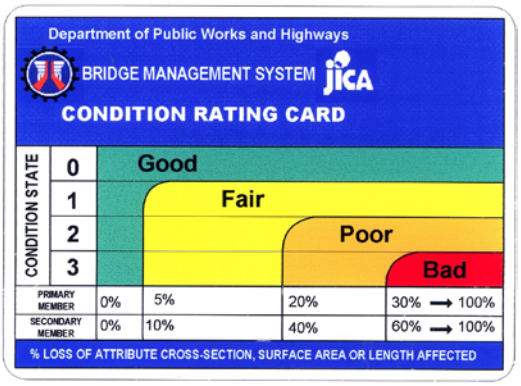
Figure 4-19
Sample Attribute Form (Condition)

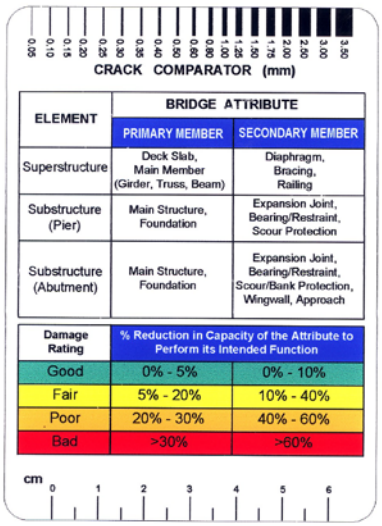
ATTRIBUTE	ATTENTION REQUIRED			LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	REFERENCE
DECK	Immediate	3	X	Fully	X	Repair damage	X	100,000.00	S1
	Within 2 years	2		assessed		Protective measures			
	Within 10 years	1		Partially		Strengthen			
	None	0		assessed		Replace			
	Not Applicable			Not		Other			
				assessed		**Total Estimated Cost**		100,000.00	
SECONDARY MEMBER	Immediate	3		Fully		Repair damage			
	Within 2 years	2		assessed		Protective measures			
	Within 10 years	1		Partially		Strengthen			
	None	0		assessed		Replace			
	Not Applicable		X	Not		Other			
				assessed		**Total Estimated Cost**			

In this case, there are no secondary members attribute for the bridge therefore the box for "Not Applicable" will be marked.

Figure 4-20

Condition Rating Card





4.6. Bridge Condition Assessment

The bridge inspector is required to assess the overall condition of the bridge based on the condition of the bridge components. The summary sheet of the CIF will be completed for the overall condition of the bridge. Data needed for this section are described below:

- ***Overall Condition of the Bridge*** refers to the rating given by the bridge inspector to a certain bridge. The bridge can be evaluated as good, fair, poor or bad. Note that the bridge inspector must rely on his/her engineering knowledge and judgment for the evaluation of the bridges' condition.

  In general, structures described as ***Good*** condition shall be free of defects affecting structural performance, integrity and durability; those described in ***Fair*** condition may have defects which affect the durability; and those described as ***Poor*** condition may have defects which affect the performance and structural integrity of the structure. Those structures described as ***Bad*** shall have major defects and are considered to be beyond repair.

The bridge inspector shall determine the overall condition of the bridge based on the result of the condition rating of the bridge primary components/attributes and secondary component/attributes that affects structural performance such as bearings/restraints. In general, the worst condition state of any primary component and secondary component that affects structural performance will be the overall condition state of the bridge. Guidelines for assistance are included in Table 4.9.

Table 4-9
Guidelines in Assessment of Bridge Condition

Bridge Condition	**Assessment Indicators**
	Primary Components and Secondary Components that Affects Structural Performance (Attribute Condition State)
Good	0
Fair	1
Poor	2
Bad	3

Bridge Condition	**Recommended Countermeasures**	**Remarks**
Good	Routine Maintenance	-
Fair	Major Maintenance (Repair, Protective Works, Strengthening)	Total of Bridge Component
Poor	Major Maintenance or Upgrading	Total of Bridge Component
Bad	Upgrading or Replacement	Total of Bridge Component

- ***Recommended Action to the Bridge*** refers to the level of rehabilitation works needed for the bridge. The recommended measures will be generally based on the overall bridge condition as shown above.

- ***Bridge Inspectors' comment on recommendation***. The bridge inspector shall indicate his comments on the recommended activity for the bridge.

- ***Major reasons for recommendation***. The bridge inspector shall indicate the reason(s) for the recommended activity to the bridge. Up to three (3) reasons can be selected.

- ***Estimated Remaining Bridge Life*** refers to the remaining length of time for which the bridge will remain serviceable.

4.7. Deliverables

The deliverables of Condition Inspection Report are as follows:

- Condition Inspection Report
  - Bridge Condition Inspection Form (Type2)
  - Summary of Condition Inspection Results
  - Repair Record
  - Inspection Results sheet (condition)
  - Inspection Results sheet (damage rating)
- Sketch Drawings sheet
- Photo record sheet (Pictorial Report)
- Supporting information for proposed major maintenance
- Cost estimates for major maintenance

The Bridge Condition Inspection Reports shall be prepared in the respective Regional Office in where the bridge inspectors are based. The reports shall be checked and reviewed in the Central Office for completeness and accuracy prior to finalization.

When the Bridge Condition Inspection Report would be completed, accurate and accepted, all the data shall be stored in Special Bridge Inventory Database.

5. ENGINEERING INSPECTIONS (TYPE 3)

5.1. Purpose

Bridge Engineering Inspection is undertaken as a follow-up to Bridge Condition Inspection when the condition state of 2 or 3 are recorded in any primary component/attribute or in any secondary component that has detrimental effect on the structural performance of the bridge. The purposes of a Bridge Engineering Inspection for PC Box Girder Bridge are as follows:

1) To confirm the results of the Bridge Condition Inspection;
2) To undertake additional investigations in order to evaluate thoroughly noted defects which may include physical testing and/or structural analysis; and also to prepare a documentary record of the observed defects for future design of required major maintenance works;
3) To assess the current bridge structural condition, behavior and capacity;
4) To assess the rate of deterioration and residual life expectancy of the bridge.

5.2. Recommendation

In the Engineering Inspection for standard materials, attributes and so on, "Bridge Engineering Inspection Manual 2014 developed by JICA" should be referred to. However, there is no standard method in the Engineering Inspection for special materials, attributes and so on, like cable, rope, anchorage.

For example, in case of concrete crack along PC cable inside girders. Also when water leakage is observed, there is a possibility that the inside cable is already corroded and should be thoroughly inspected. In this instance, the inspection of Sheath and PC cable inside concrete girder is difficult for the Regional Office.

It is recommended that the Regional Office engage the services of engineering inspection/investigation firms specializing on PC Box Girder Bridge

6. EMERGENCY INSPECTION (TYPE 4)

6.1. Purpose

Emergency Inspection will be undertaken in response to calamities or occurrence of severe damages that may tend to cause substantial damage to any part of the structure. This inspection is required to confirm that the bridge remain safe to commuters following a calamity or any man-made disasters and to determine the necessary work that is required to ensure the safety of the bridge and to restore the function of the bridge.

6.2. Process

There is no general process for emergency inspections as these inspections are ad-hoc inspections undertaken in difficult conditions.

6.3. Procedure

No standard procedure is required for this type of inspection.

6.4. Deliverables

The deliverable will be an Emergency Inspection Report. This will be the form appropriate for the required emergency action.

7. BRIDGE INVENTORY INSPECTIONS (TYPE 5)

7.1. Purpose

The purpose of the Inventory Inspection for PC Box Girder Bridge is to obtain its inventory data primarily for inclusion in the Special Bridge Inventory Database. Bridge inventory data is a standardized series of information that describe the geometry, construction and current function of a bridge.

7.2. Process

The Inventory Inspection for the Special Bridge, is similar to the inventory inspection of standard bridges.

7.3. Procedure

All information collected during the bridge inventory inspection is recorded using the Inventory Inspection Form (IIF). The IIF of Agas-agas Bridge is included in Appendix J.

The IIF is composed of two parts for the Special Bridge Inventory:

- Standard inventory sheet is the same sheet with ordinary bridges in BMS.
  - Inventory Inspection Form (Type 5)
  - The special requirements for inspection.
  - The general bridge data, clearances, geometry, traffic direction, type of bridge, year of construction, public utilities carried by the bridge and detail, if there is lighting provided on the bridge, the type of terrain where the bridge is located, comments if the bridge is unusual, type of construction, substructure type, deck material, wearing surface, drainage, design load and the available drawings.
  - The Bridge Modification Sheet describes the types and materials of any modifications to the bridge.
  - The span/s of the bridge.
  - The pier/s of the bridge.
  - The bridge abutments.

- Additional geometrical data sheet for Special Bridge
  - Measurement of bridge structure (superstructure and substructure)

As Built Drawing are very important for special bridges. There is no standard drawing in special bridge. Each bridge has its own unique structure. “As Built Drawing” should be collected and electronic copy should be installed in the Special Bridge Inventory Database, as one of Inventory Inspection data. In case that there is no available bridge data, measurement survey on site for collecting basic bridge data and general drawings for inventory should be done. All documents pertaining to the past repair works and useful information are also important for future reference, especially when the bridge is due for retrofitting.

7.3.1. Description

Figure 7-1
Photo of Agas-agas Bridge

The Philippine Japan Friendship Highway (PJFH) is undoubtedly the most important trunk line in the country’s Highway Network, linking the four major islands of Luzon, Samar, Leyte and Mindanao. Part of the Highway Network is the Tacloban-Liloan Road covering Mahaplang-Sogod Road Section at Southern Leyte (K1006+200-K1007+700), it is a problem area that experiences land slide at road spot known as Agas-agas. After massive landslide happened on February 2006, the government proposed the construction of Agas-agas Bridge with three (3) span continuous PC Box Girder Rigid Frame Bridge. It is 350 meters span length and piers with 73 and 75 meters high, respectively. The bridge has a carriageway width of 7.32 meters and width of each sidewalk is 1.00 meter.

7.3.2. Inspection Form

The Bridge Inventory Inspection Form (IIF) and attached drawings are prepared specifically for Agas-agas Bridge as shown in Appendix I.

7.3.3 Location and Inventory Data Collection

The bridge inspector shall inspect the bridge and complete the Location and Inventory sections of the IIF. This can generally be completed by checking the appropriate box and by inserting the required names and numbers.

Several parts of the IIF can be completed even without having to go to the bridge site. Note however, that all data shall be verified on site.

Data needed for Location and Geographic Information are described in Table 7-1.

Table 7-1
Bridge Location Data

Data Description	Comment
Bridge ID	Unique identification number assigned by the RBIA for each bridge
Bridge Name	The name given to the bridge
Road Name	The name of the road on which the bridge is located.
Road ID	Unique identification number assigned by the RBIA for the road on which the bridge is located
Section ID	The unique identification number assigned to the specific road section containing the bridge
Location	The location of the bridge within the road section based on the LRS
Region	Region in which the bridge is located
Engineering District	Engineering District which is responsible for the management and maintenance of the bridge
Province, Congressional District, Municipality and Barangay	The administrative area in which the bridge (i.e. the first abutment) is located.
River Name	The name of the stream crossed by the bridge (where appropriate)

The bridge inspector shall take note of any particular requirements to gain access or to inspect all parts of the bridge for use in planning future bridge condition inspections. Check the appropriate boxes in *Special Inspection Requirements*, of the CIF for items such as ladders, inspection vehicles, boats, etc.

A bridge is made up of various inventory elements:

- General,
- Modifications,
- Spans,
- Piers
- Abutments.

7.4 Deliverables

The deliverables of Inventory Inspection Report are as follows:

- The Bridge Inventory Reports
  - A fully completed Bridge Inventory Inspection Form (IIF).
  - Geometrical data sheet for Special Bridge
- As Build Drawings
- Data of repair history
- Inventory photographs

The Bridge Inventory Inspection Reports shall be prepared by the bridge inspectors. The reports shall be checked and reviewed in the Regional Office for completeness and accuracy prior to finalization.

When the Bridge Inventory Inspection Report is completed, accurate and accepted, all the data shall be stored in Special Bridge Inventory Database.

8. BRIDGE GEOMETRICAL INSPECTION (TYPE 6)

8.1. Purpose

The purpose of the Geometrical Inspection for Special Bridge is to obtain data primarily of a basic information of special/long span bridge. Bridge would be moved or deformed by impermissible loading from heavy vehicles or deformed due to a disaster. Deformation, movement, change of alignment of members should be measured regularly. It is useful information for analysis of bridge deformation.

8.2. Procedure

Geometric dimensions of special/long span bridge should be measured every three years using measuring survey equipment, like Total Station.

When severe disasters occurred, like earthquake, typhoon and ship or car collision, Geometrical Inspection should be undertaken in order to confirm the degree of deformation.

Geometrical Inspection methods are shown in Figure 8-1,8-2 and 8-3. As a reference, forms of Geometrical Inspection of Agas-agas Bridge are shown in Appendix K.

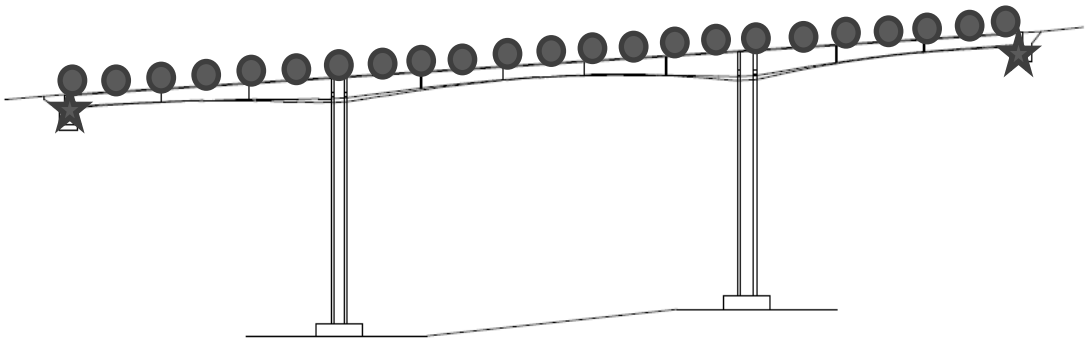
The Geometrical inspection is composed of a three-part measurement survey:

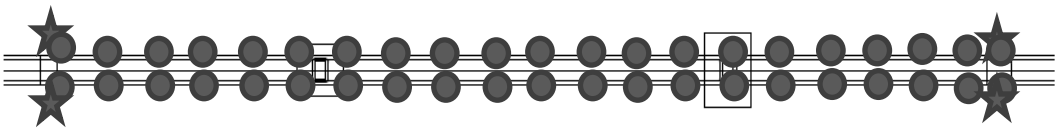
- Leveling of super structure and substructure
  - Elevation of longitudinal alignment of deck surface
  - Elevation of piers and abutments
- Slope of tower and top chord
- Movement of bearing and expansion joint

In case there is an official bench mark that is close to the bridge, it should be used for the leveling of bridge. Likewise, additional bench mark should be established around the bridge during the inspection

The result of Geometrical Inspection should be stored in the Special Bridge Inventory Database. After Geometrical Inspection, Bridge Inspector and Bridge Engineer should analyze and compare the previous year's result. If excessive movement was observed, further investigation such as Engineering Inspection should be conducted in order to determine the appropriate corrective measure to be undertaken.

Figure 8-1
Geometrical Inspection:
Leveling of Abutments and longitudinal alignment of deck surface





● : Leveling measure point for deck surface

★ : Leveling measure point for deck surface

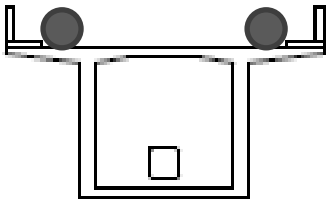
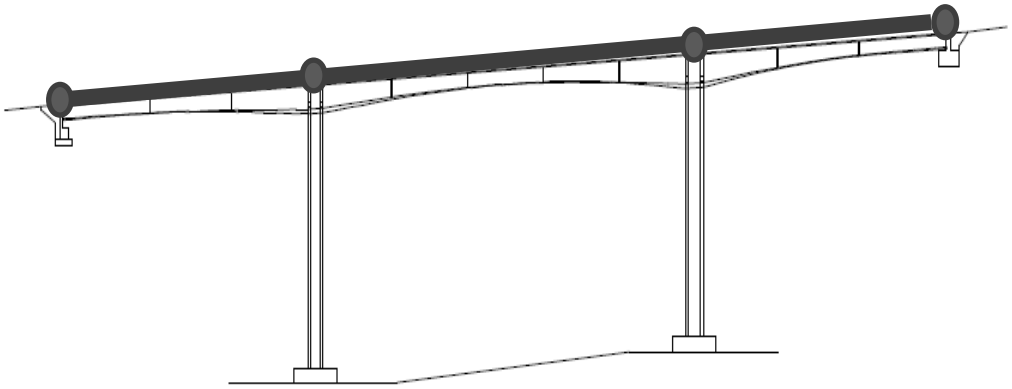
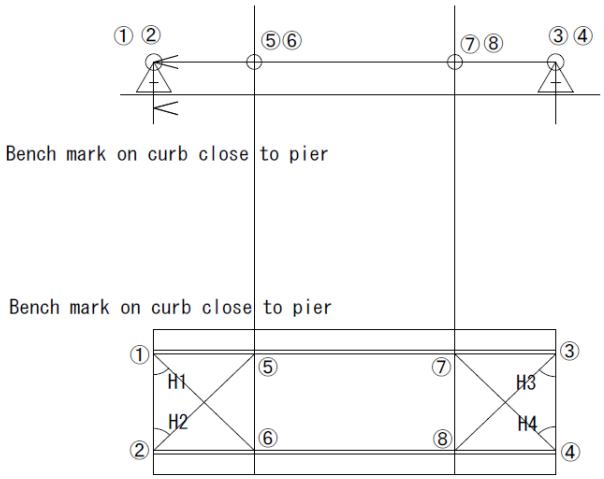


Figure 8-2
Geometrical Inspection:
Slope of PC Box Girder



: Bench mark point

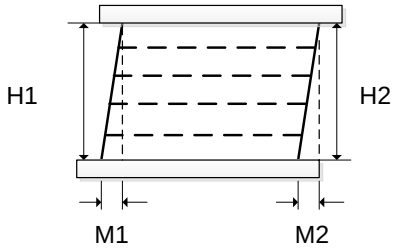
: Measure point



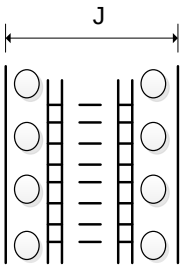
Measure: Angle(Horizontal): H1', H2', H3', H4'

Slope: H1'
H2'
H3'
H4'

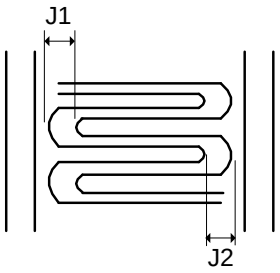
Figure 8-3
Geometrical Inspection: Movement of Bearings and Expansion Joints



Bearing
Measure every bearing (everytime use same marking point)



Rubber Type



Steel Finger Type

J = (J1 +J2) /2

Expansion Joints
Measure 5 selected points in each joint and average (everytime use same marking point)

8.3. Deliverables

The deliverables of Geometrical Inspection Report are as follows:

- The Geometrical Inspection Reports
  - A fully completed geometrical inspection form (IIF).
- Updated Geometrical Inspection (past 3times data)
- Inventory photographs

The Bridge Geometrical Inspection Report shall be prepared by the bridge inspector. The report shall be checked and reviewed in the Regional Office for completeness and accuracy prior to finalization.

When the Bridge Geometrical Inspection Report would be completed, accurate and accepted, all the data shall be stored in Special Bridge Inventory Database.

APPENDIX A

LIST OF SPECIAL BRIDGES
IN REGION II, III, VIII AND XIII

List of Special Bridges in Region II

DPWH R.O. II

Bridge ID No.	Name of Bridge	LOCATION						DESCRIPTION						As Built Drawings	Remarks
		Km. Station	Road Section(I.D. No./Name)	Mun./City	Province	Region	District	No. of Span	Total Length (m)	Center Span (m)	Width (m)	Type	Construction Year		
B01113LZ	Magapit Suspension Bridge	K0714+1.272	S00688LZ	Lal-lo	Cagayan	II	CFDEO	3	346.66	256.60	7.315	Suspension	1976	Available	Rehabilitated 2012
B01086LZ	Piggatan Bridge	K0525+831	S00657LZ	Alcala	Cagayan	II	CFDEO	1	74.70	74.70	7.32	Steel Truss	Post 1970	Not known	Strengthened 2005
B01084LZ	Tupang Bridge	K0520+510	S00657LZ	Alcala	Cagayan	II	CFDEO	1	61.80	60.00	7.32	Steel Truss	2008	Not known	-
B02053LZ	Baua Bridge No. 2	K0619+82	S04663LZ	Gonzaga	Cagayan	II	CFDEO	1	129.60	129.00	7.32	Steel Truss	1987	Not known	-
B02040LZ	Pateng Bridge No.2	K0602+616	S04663LZ	Gonzaga	Cagayan	II	CFDEO	1	129.60	129.00	7.32	Steel Truss	1989	Not known	-
B01926LZ	Buntun Bridge	K0486+280	S04170LZ	Tuguegarao City	Cagayan	II	CTDEO	17	1102.65	74.00	6.3	Steel Truss	1970	Not known	-
B01168LZ	Gamu Bridge	K0391+796	S00781LZ	Gamu	Isabela	II	ISDEO	11	443.21	73.88	7.32	Steel Truss	1964	None	-
B01409LZ	Naguilian Bridge	K0382+-1741	S00782LZ	Naguilian	Isabela	II	ISDEO	13	689.60	85.00	7.7	PCBG	1999	None	-
B01200LZ	Ipil Bridge	K0335+867.5	S00812LZ	Echague	Isabela	II	IFDEO	3	124.20	74.15	7.33	Steel Truss	1974	Not known	-
B01204LZ	Jones Bridge	K0355+27	S00821LZ	Jones	Isabela	II	IFDEO	6	362.00	62.50	7.32	Steel Truss	2007	Not known	UK Assisted Bridge
B03367LZ	Disimungal Bridge No. 2	K0391+78	S04745LZ	Nagtipunan	Quirino	II	QDEO	1	62.00	62.00	7.24	Steel Truss	2009	Not known	UK Assisted Bridge
B03368LZ	Gawagan Bridge	K0405+900	S04755LZ	Nagtipunan	Quirino	II	QDEO	1	62.40	60.40	7.28	Steel Truss	2006	None	UK Assisted Bridge

List of Special Bridges in Region III

DPWH R.O. III

Bridge ID No.	Name of Bridge	LOCATION						DESCRIPTION						As Built Drawings	Remarks
		Km. Station	Road Section(I.D. No./Name)	Mun./City	Province	Region	District	No. of Span	Total Length (m)	Center Span (m)	Width (m)	Type	Construction Year		
B01953LZ	Mabalacat-Bamban Bridge	Km. 97+394-Km. 97+572	Manila North Road / R00172LZ / S00426LZ	Mabalacat and Bamban	Pampanga and Tarlac	III	Pampanga 3rd District Engineering Office	1	178.00	-	8.3	Steel Arch Bridge	1998	Available	Need replacement of missing plates,bolts, nuts, and other connection members at both abutments

List of Special Bridges in Region VIII

DPWH R.O. VIII

Bridge ID No.	Name of Bridge	LOCATION						DESCRIPTION						As Built Drawings	Remarks
		Km. Station	Road Section(I.D. No./Name)	Mun./City	Province	Region	District	No. of Span	Total Length (m)	Center Span (m)	Width (m)	Type	Construction Year		
B00025BR	Amambahag Br.	1066+100	S00002BR Biliran Circum. Rd.	Mun. of Culaba	Biliran	VIII	Biliran DEO	1	60.00	60.00	8.80	Steel	2005	None	Single Span
B00057BR	Biliran Br.	1006+1092	S00001BR Leyte-Biliran Rd.	Mun. of Biliran	Biliran	VIII	Biliran DEO	6	252.00	128.80	8.76	Steel	1976	None	Six Span: 31.00-30.00-15.00-128.80-16.00-31.00
B00093LT	Calaguise Br.	989+007	S00113LT Sambulawan Jct-Calaguise-Calubian Rd	Mun. of Villaba	Leyte	VIII	3rdLEDO	3	219.00	73.00	10.10	Steel	-	None	Three Span: 73.00-73.00-73.00
B00551LT	Layog Br	1000+905	S00166LT Daang Maharlika (LT)	Mun. of Mahaplag	Leyte	VIII	5th LEDO	2	148.11	-	-	Steel	1976	None	Two Span: 74.21-73.90
B00552LT	Baliacao Br	1002+852	S00166LT Daang Maharlika (LT)	Mun. of Mahaplag	Leyte	VIII	5th LEDO	1	74.26	74.26	-	Steel	1976	None	Single Span
B00237SM	Palanit Br	685+813	S00001SM Daang Maharlika (SM) (San Isidro-Sn Juanico Br)	Mun. of San Isisdro	N. Samar	VIII	NSED Ist	3	123.00	25.00	9.35	Steel	-	None	Three Span: 73.00-25.00-25.00
B00246SM	Mawo Br	688+740	S00002SM Daang Maharlika (SM) (Sn Isidro-Sn Juanico BR)	Mun. of San Isisdro	N. Samar	VIII	NSED Ist	2	260.00	-	-	Steel	-	None	Two Span: 130.00-130.00
B00359SM	Gandara Br	763+526	S00062SM Daang Maharlika (SM) (Sn Isisdro-Sn Juanico Br)	Mun. of Gandara	Samar	VIII	Samar 1	5	168.00	59.00	-	Steel	1970	None	Five Span: 31.00-31.00-59.00-31.00-16.00
B00387SM	Calbiga Br	-	S00095SM Daang Maharlika (SM) (Sn Isisdro-Sn Juanico Br)	Mun. of Calbiga	Samar	VIII	Samar 2	3	105.36	59.00	-	Steel	1970	None	Three Span: 16.18-79.00-10.18
B00386LT	Marcasa Br	1069+157	S00210LT Jct Himay-angan-Silago-Abuyog Rd	Mun. of San Juan	So. Leyte	VIII	SLED	1	66.80	66.80	-	Concrete	2005	None	Single Span
B00475LT	Maag Br	1120+176	S00240LT Jct Himay-angan-Silago-Abuyog Rd	Mun. of Silago	So. Leyte	VIII	SLED	1	61.25	61.25	-	Steel	2005	None	Single Span
B00586LT	Dampoy Br	1015+687	S00223LT Daang Maharlika (LT)	Mun. of Sogod	So. Leyte	VIII	SLED	3	101.00	74.00	-	Steel	1976	None	Thre Span: 15.00-74.00-12.00
B00616LT	Lilo-an Br	1054+509	S00223LT Daang Maharlika (LT)	Mun. of Lilo-an	So. Leyte	VIII	SLED	3	129.30	-	-	Steel	1977	None	Main Span
B00622LT	Agas-Agas Br	1006+0977	S00223LT Daang Maharlika (LT)	Mun. of Sogod	So. Leyte	VIII	SLED	3	350.00	150.00	9.52	Concrte	2009	None	Three Span: 100.00-150.00-100.00
B00018LT	San Juanico Br	-	S00013LT Daang Maharlika (Sn Juanico North-South Backbone)	City of Tacloban	Leyte	VIII	Tac Dist Engrg. Office	-	2100.00	-	-	Steel	-	None	

List of Special Bridges in Region XIII

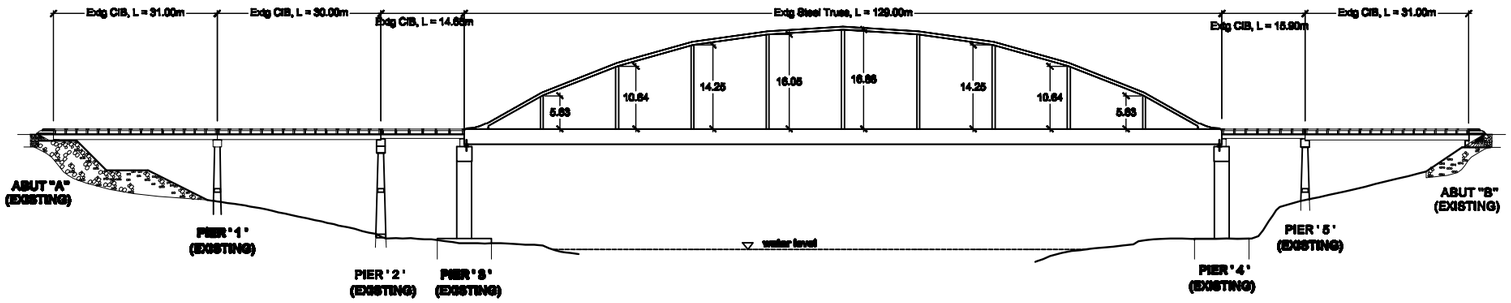
DPWH R.O. XIII

Bridge ID No.	Name of Bridge	LOCATION						DESCRIPTION						As Built Drawings	Remarks
		Km. Station	Road Section(I.D. No./Name)	Mun./City	Province	Region	District	No. of Span	Total Length (m)	Center Span (m)	Width (m)	Type	Construction Year		
-	Diosdado Macapagal Bridge	1243+080	-	Butuan City	Agusan del Norte	XIII	BCDEO	12	882.00	200.00	11.85	Cable Stayed Br.	2003	Available	-
B00879MN	Magsaysay Bridge	1239+159	S00421MN	Butuan City	Agusan del Norte	XIII	BCDEO	5	220.19	128.00	12.52	Steel Truss	1956	None	Repaired 2008
B00820MN	Taguibo Bridge	1230+048	S00419MN	Butuan City	Agusan del Norte	XIII	BCDEO	4	222.00	128.00	8.98	Langer Type Girder	-	None	Repaired 2010
B00602MN	Talacogon Bridge	1321+233.5	S00477MN	Mun. of Talacogon	Agusan del Sur	XIII	ADS 1st	3	123.85	123.85	8.74	Steel Truss	-	None	Repaired 2011
B00896MN	Wawa Bridge	1257+479.81	S00496MN	Mun. of Bayugan	Agusan del Sur	XIII	ADS 1st	5	228.10	75.00	9.33	Steel Truss	1969	None	Repaired 2010
B00700MN	Gamut Bridge	1310+027	S00313MN	Mun. of Tago	Surigao del Sur	XIII	SDS 1st	2	124.00	75.00	8.85	Steel Truss	1971	None	-
B00653MN	Bon-ot Bridge	1226+099	S00313MN	Mun. of Carrascal	Surigao del Sur	XIII	SDS 1st	1	75.00	75.00	8.75	Steel Truss	2003	Available	UK Asisted Bridge
B00671MN	Sibahay Bridge	1261+916	S00313MN	Mun. of Lanuza	Surigao del Sur	XIII	SDS 1st	1	67.00	67.00	8.82	Steel Truss	2002	Available	UK Asisted Bridge

APPENDIX B

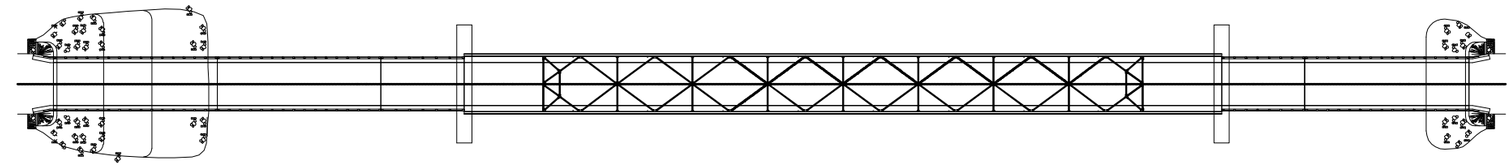
EXAMPLE DRAWINGS BY MEASURE SURVEY IN BILIRAN BRIDGE AND LILOAN BRIDGE

MEASURE SURVEY OF BILIRAN BRIDGE



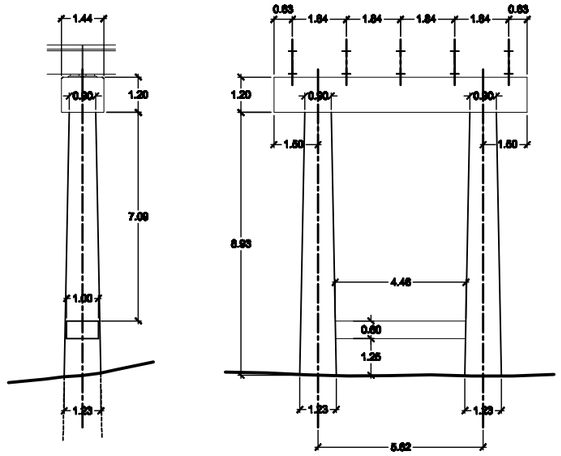
GENERAL ELEVATION

SCALE : 1:500 m



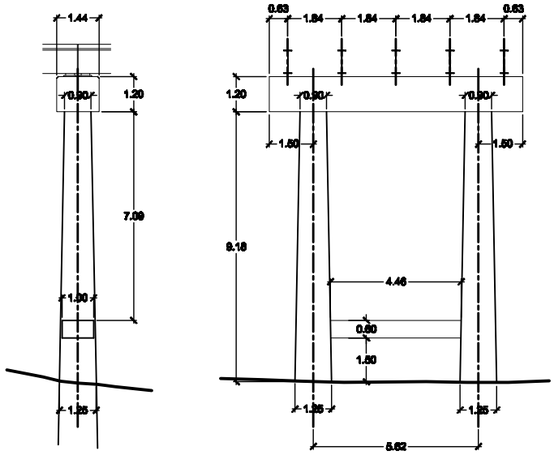
GENERAL PLAN

SCALE : 1:500 m



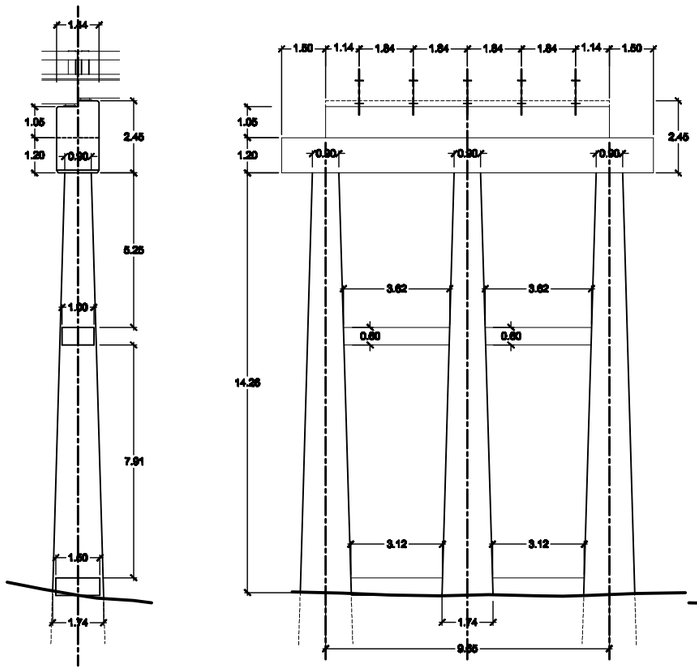
DETAIL OF PIER 5

Scale 1 : 100 mts



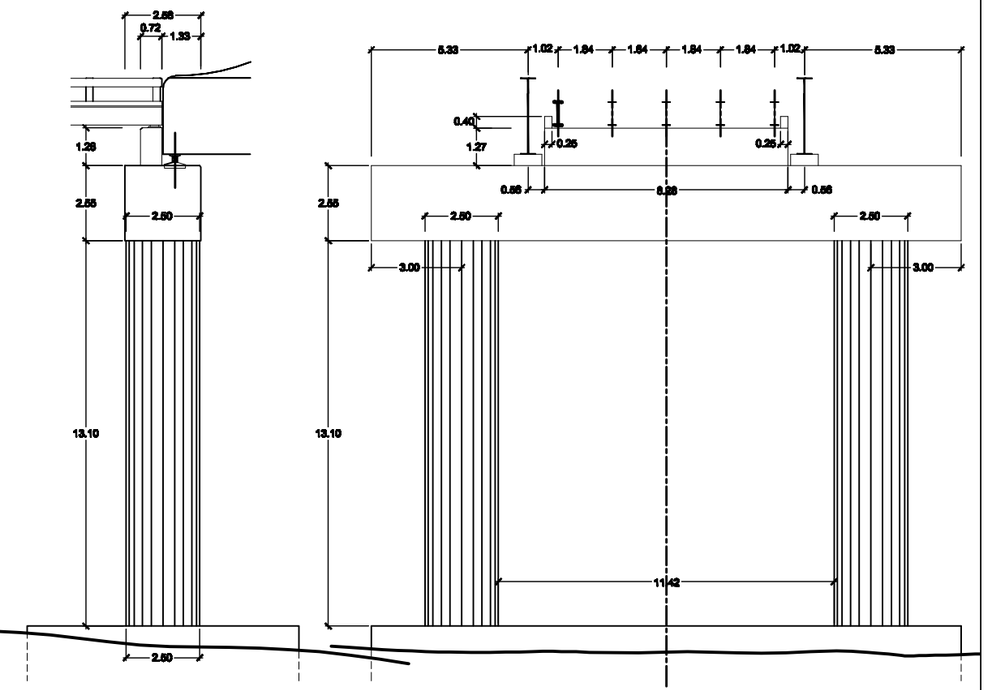
DETAIL OF PIER 1

Scale 1 : 100 mts



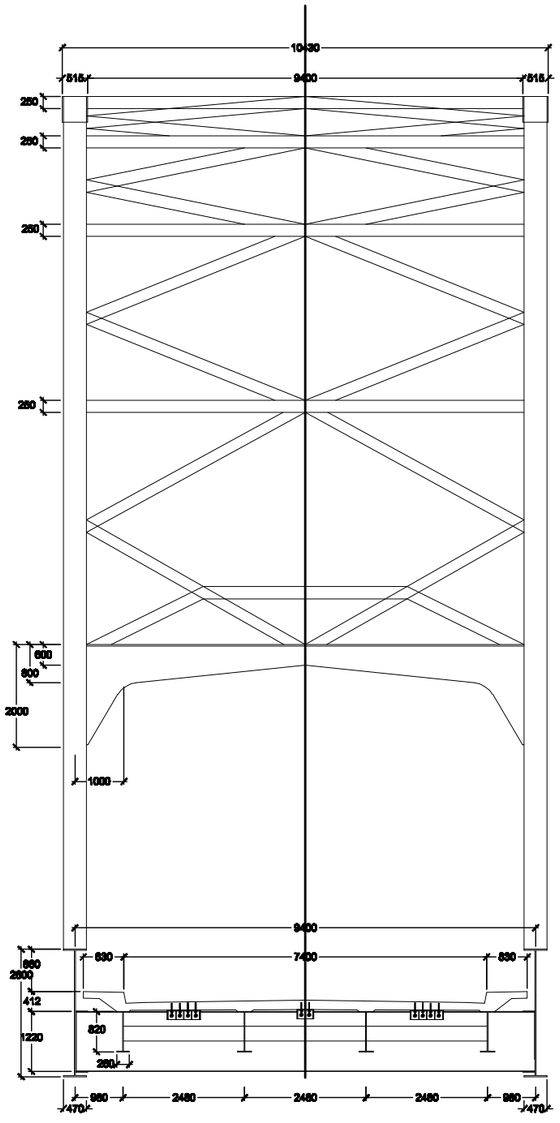
DETAIL OF PIER 2

Scale 1 : 100 mts



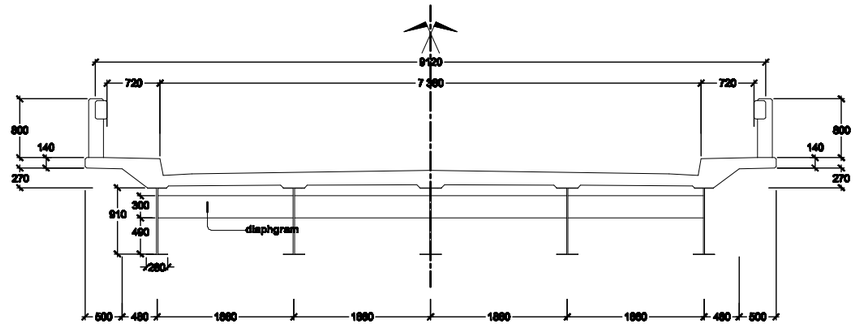
DETAIL OF PIER 3 & 4

Scale 1 : 100 mts



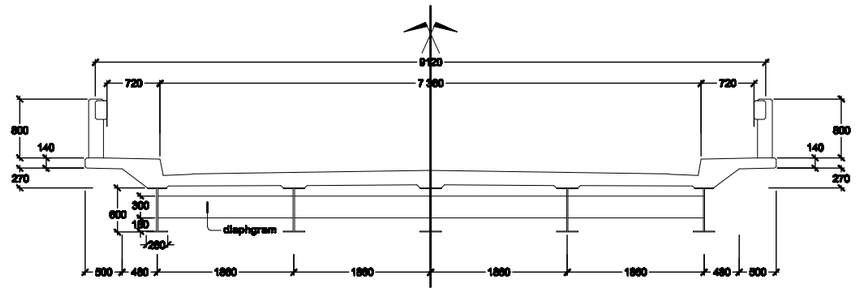
SECTION STEEL TRUSS SPAN

Scale 1:40 mtr



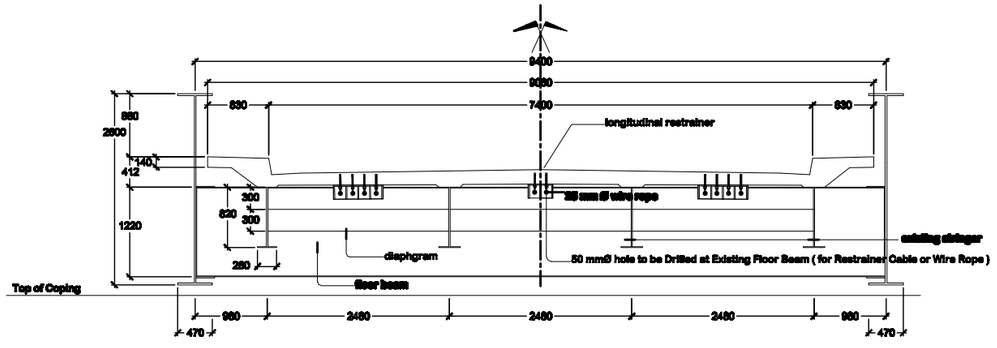
SECTION of SPAN 1 & SPAN 2 & SPAN 6

Scale 1:40 mtr



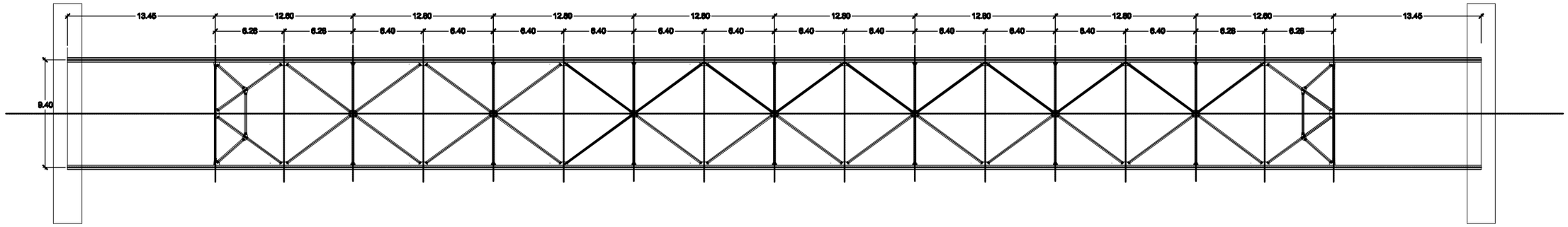
SECTION of SPAN 3 & SPAN 5

Scale 1:40 mtr



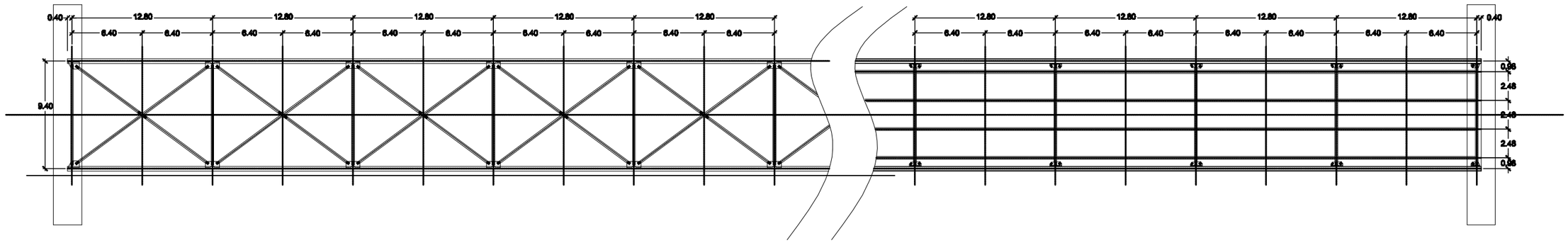
SECTION STEEL TRUSS SPAN

Scale 1:40 mtr



TOP LATERAL BRACING

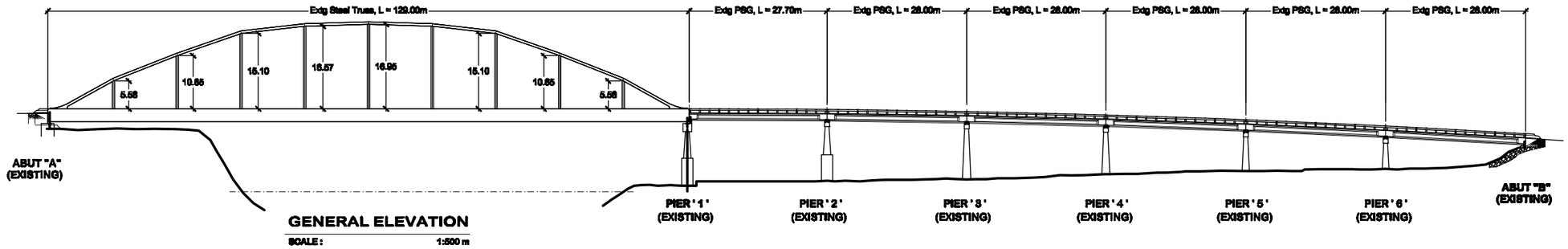
Scale 1 : 200 mts



BOTTOM LATERAL BRACING

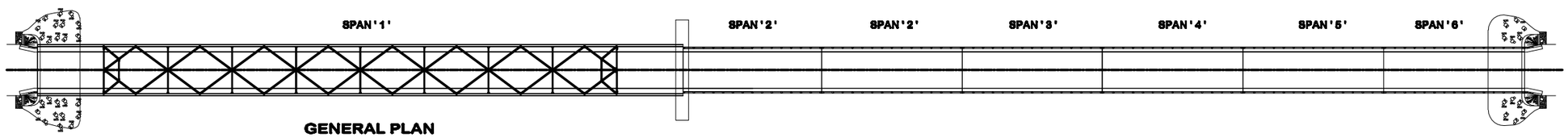
Scale 1 : 200 mts

MEASURE SURVEY OF LILOAN BRIDGE



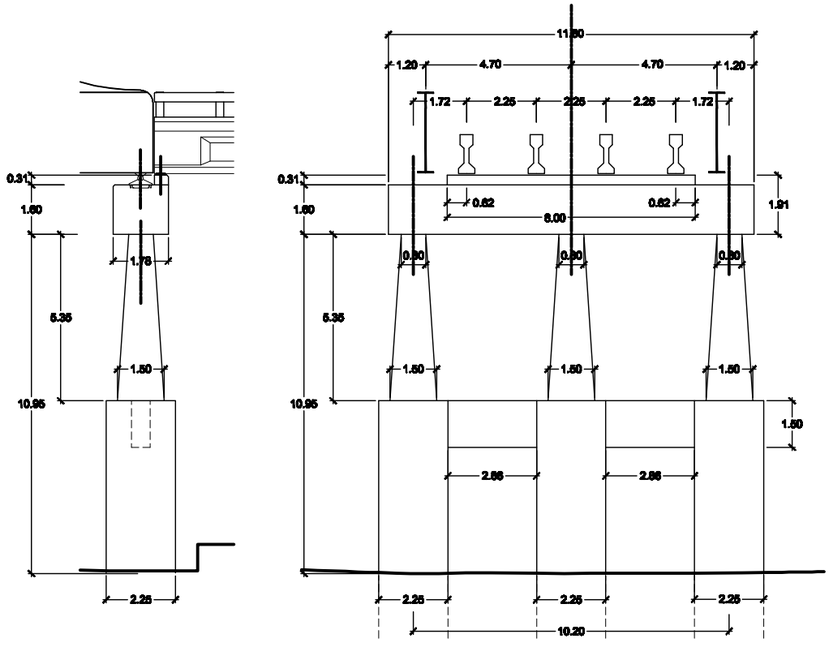
GENERAL ELEVATION

SCALE : 1:500 m



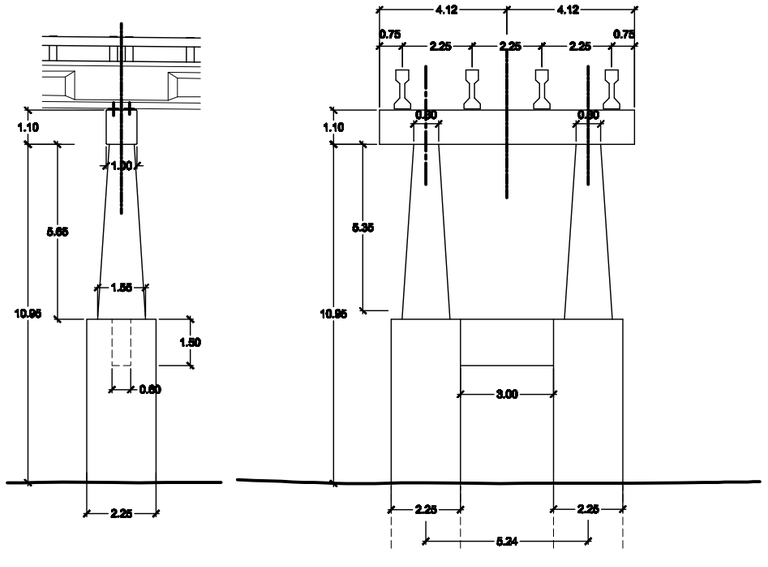
GENERAL PLAN

SCALE : 1:500 m



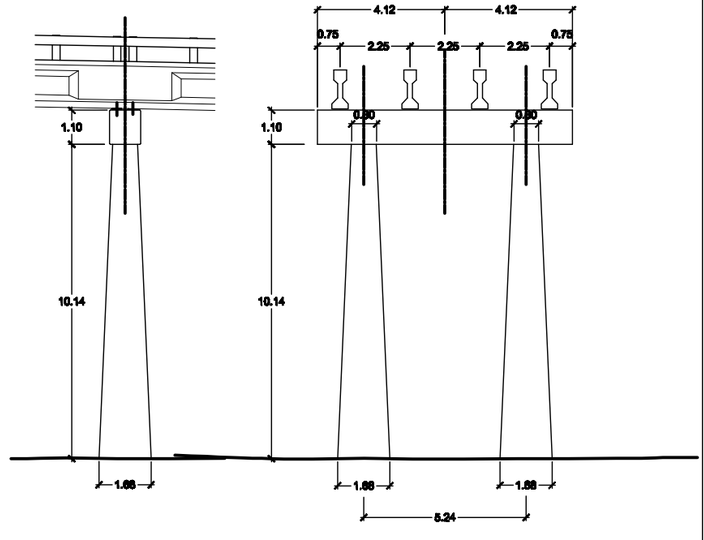
DETAIL OF PIER 1

Scale 1 : 100 mts



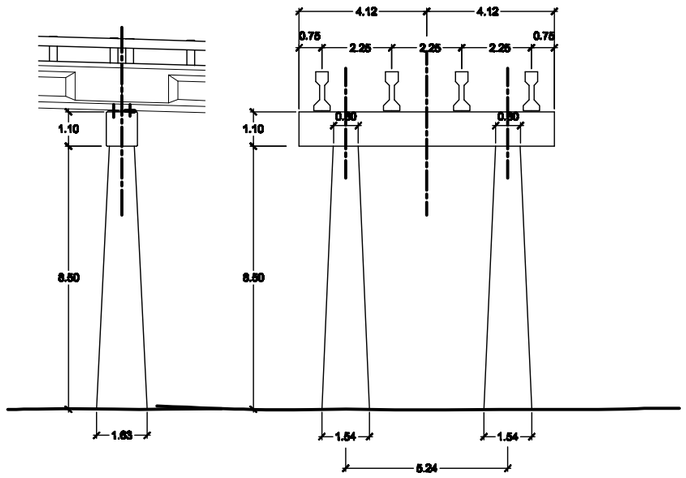
DETAIL OF PIER 2

Scale 1 : 100 mts

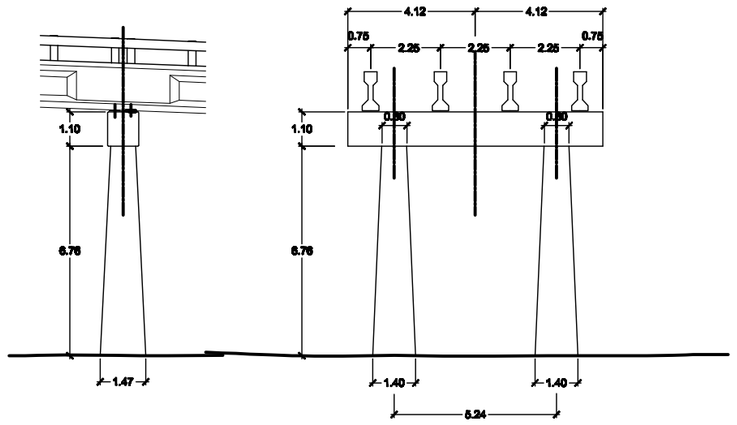


DETAIL OF PIER 3

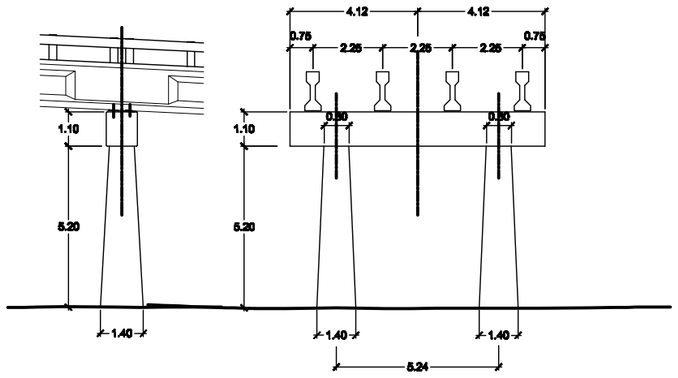
Scale 1 : 100 mts



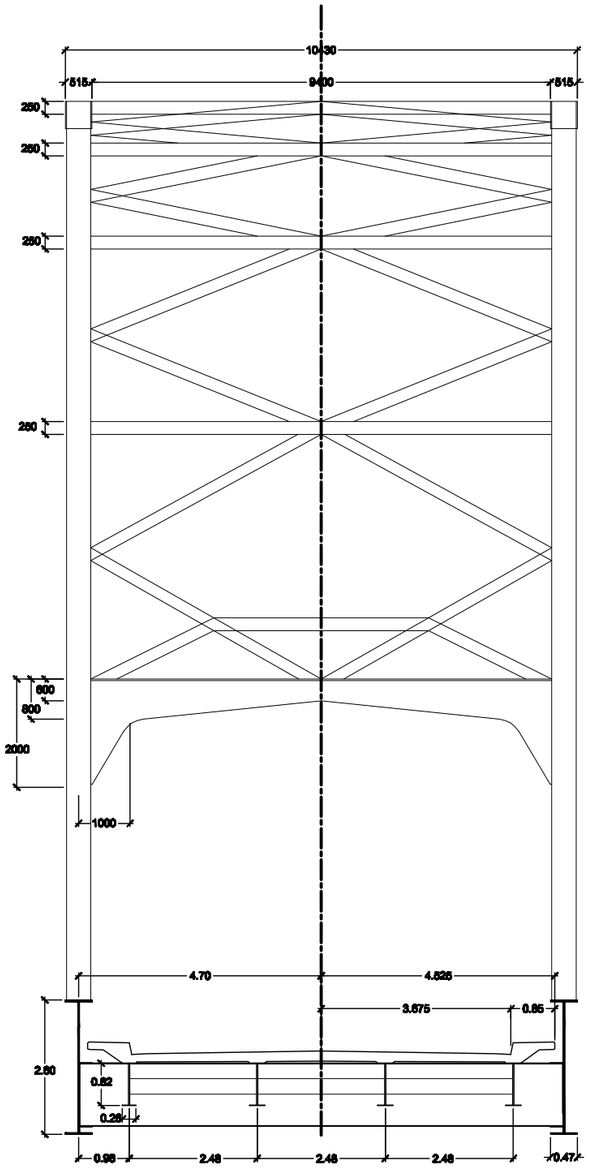
DETAIL OF PIER 4
Scale 1 : 100 mts



DETAIL OF PIER 5
Scale 1 : 100 mts

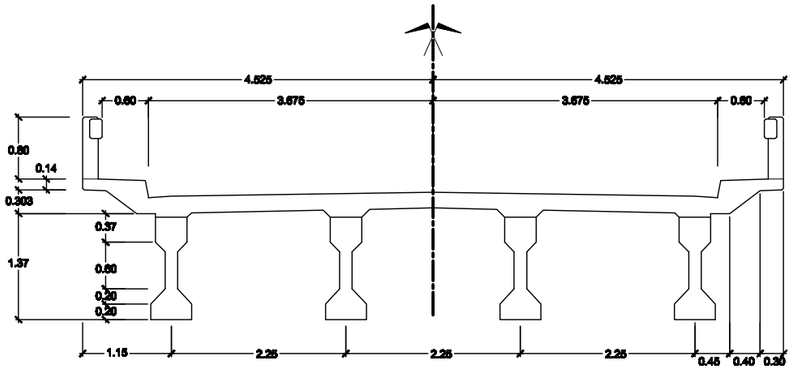


DETAIL OF PIER 6
Scale 1 : 100 mts



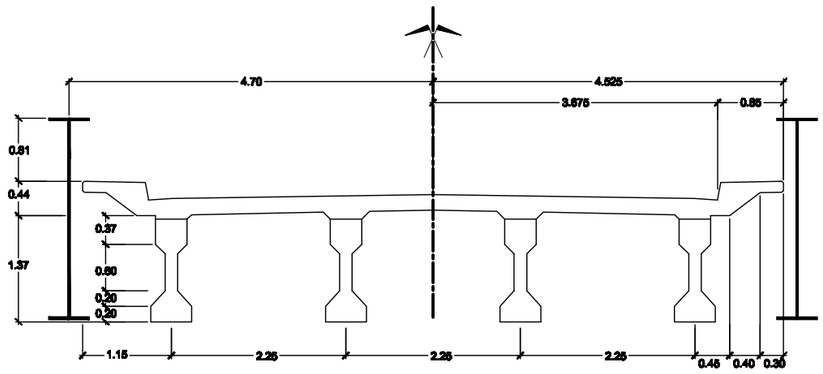
SECTION STEEL TRUSS SPAN

Scale 1:80 mtr



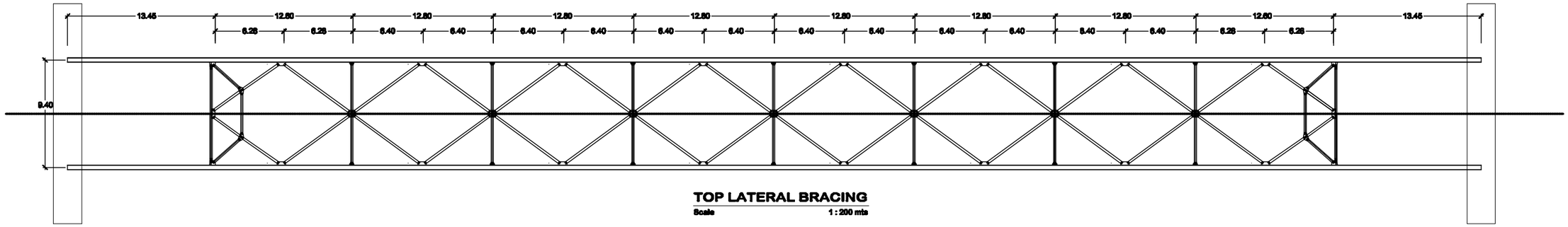
SECTION of SPAN 2 to SPAN 7

Scale 1:40 mtr



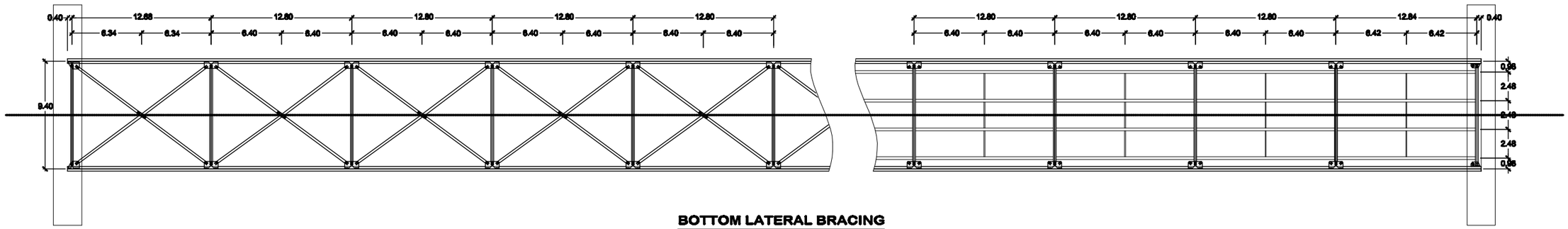
SECTION of MAIN SPAN

Scale 1:40 mtr



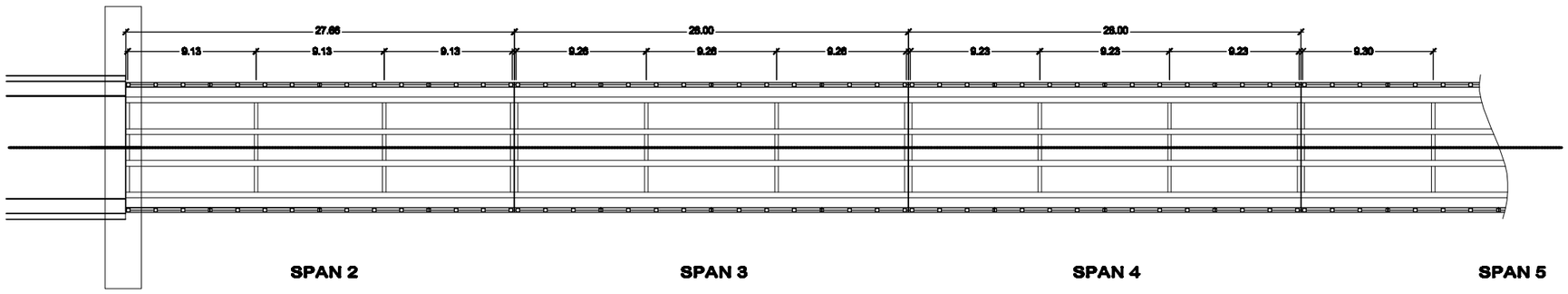
TOP LATERAL BRACING

Scale 1 : 200 mts



BOTTOM LATERAL BRACING

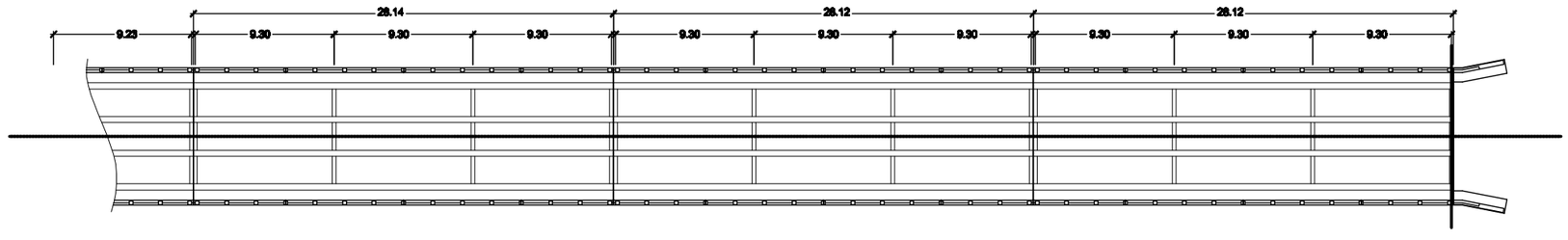
Scale 1 : 200 mts



SPAN 2 SPAN 3 SPAN 4 SPAN 5

SPACING OF CONCRETE DIAPHGRAM

Scale 1 : 200 mts

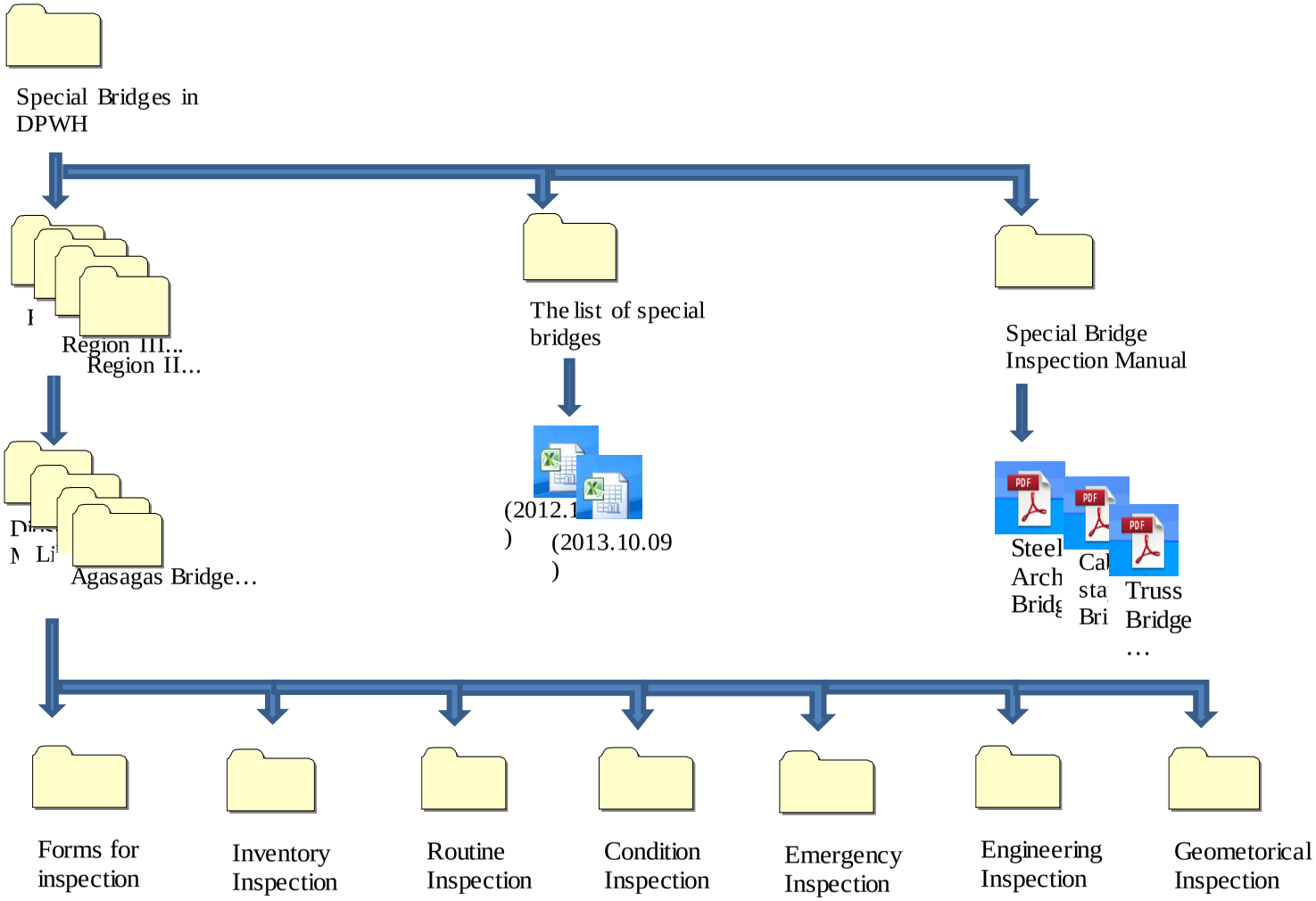


SPAN 5 SPAN 6 SPAN 7

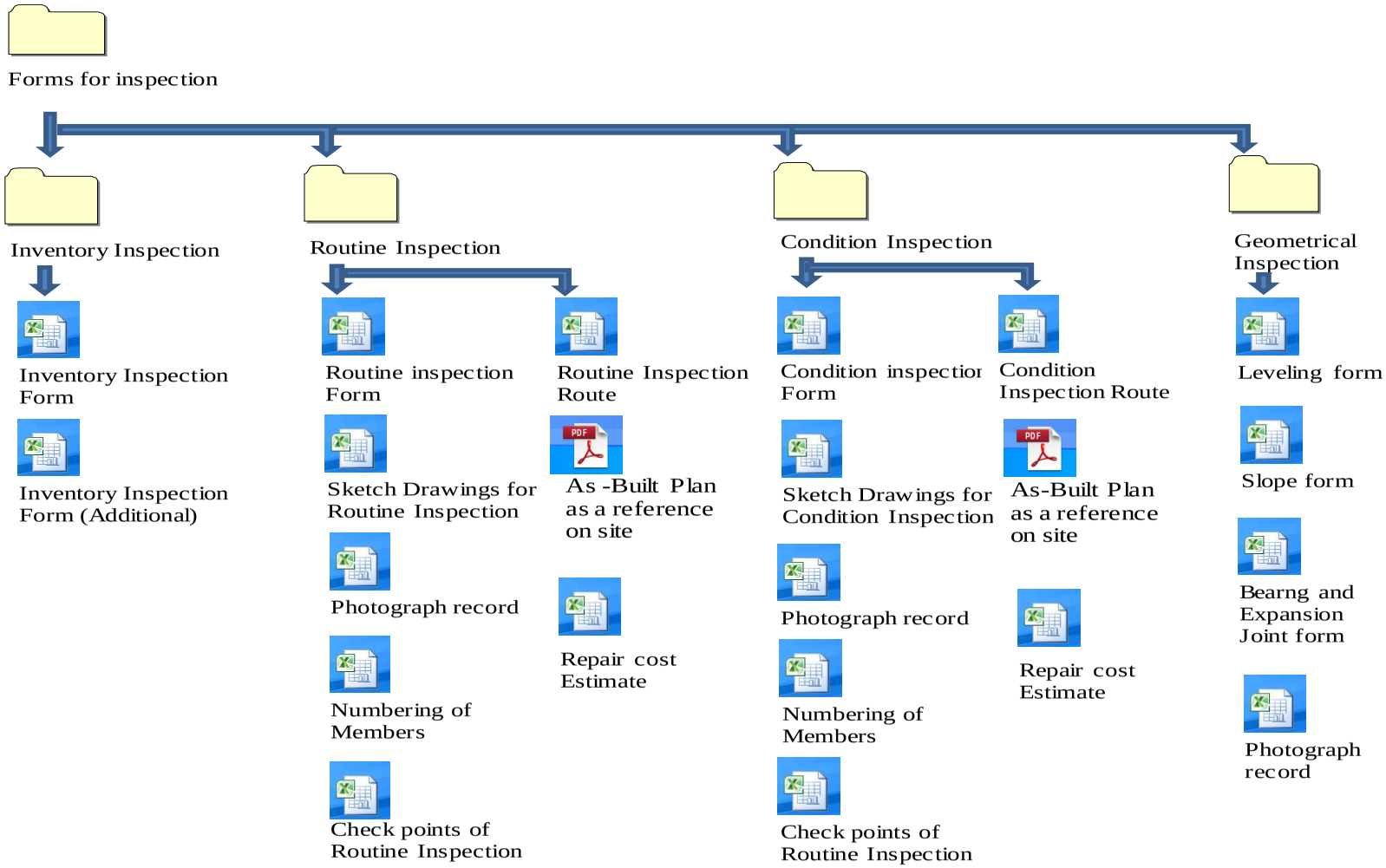
APPENDIX C

FLOWCHART
FOR SPECIAL BRIDGE
INVENTORY DATABASE

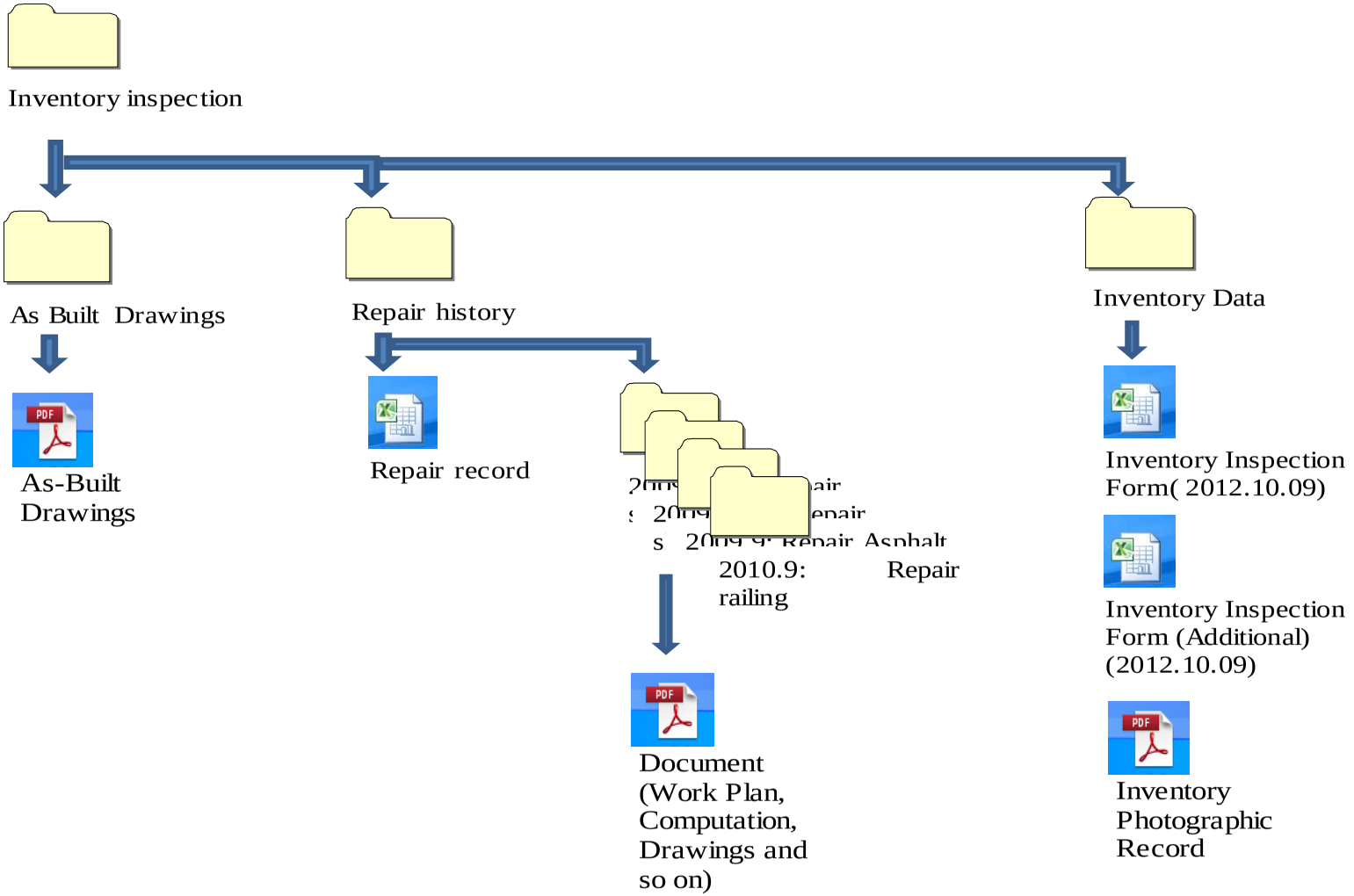
Appendix C
Special Bridge Inventory Database (1 of 5)



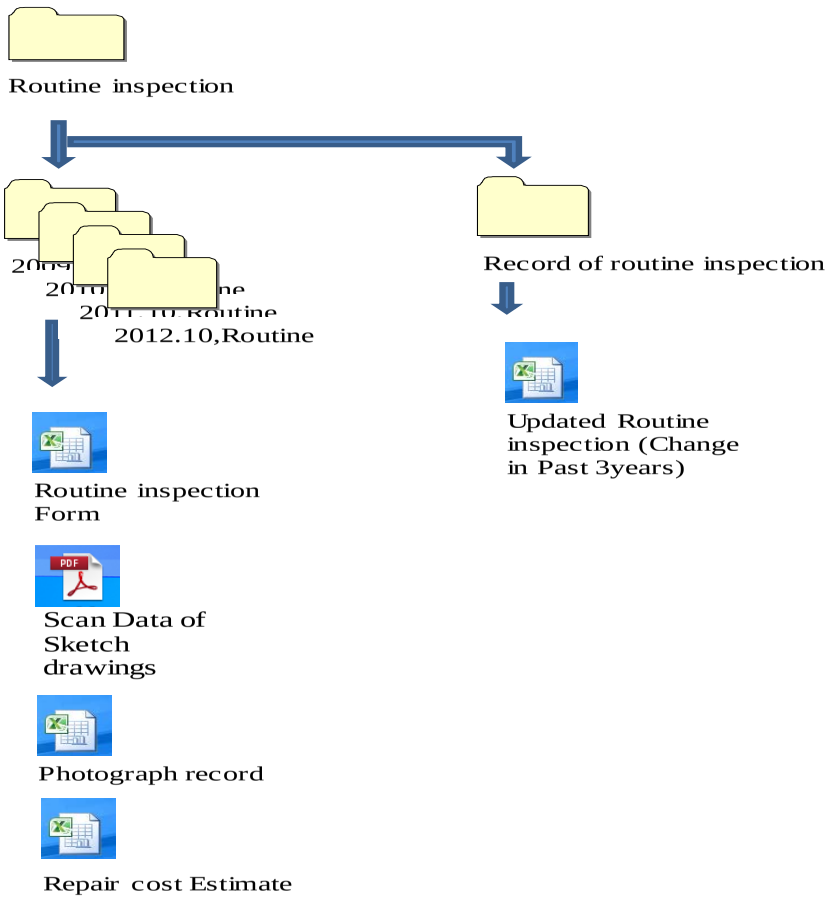
Appendix C
Special Bridge Inventory Database (2 of 5)

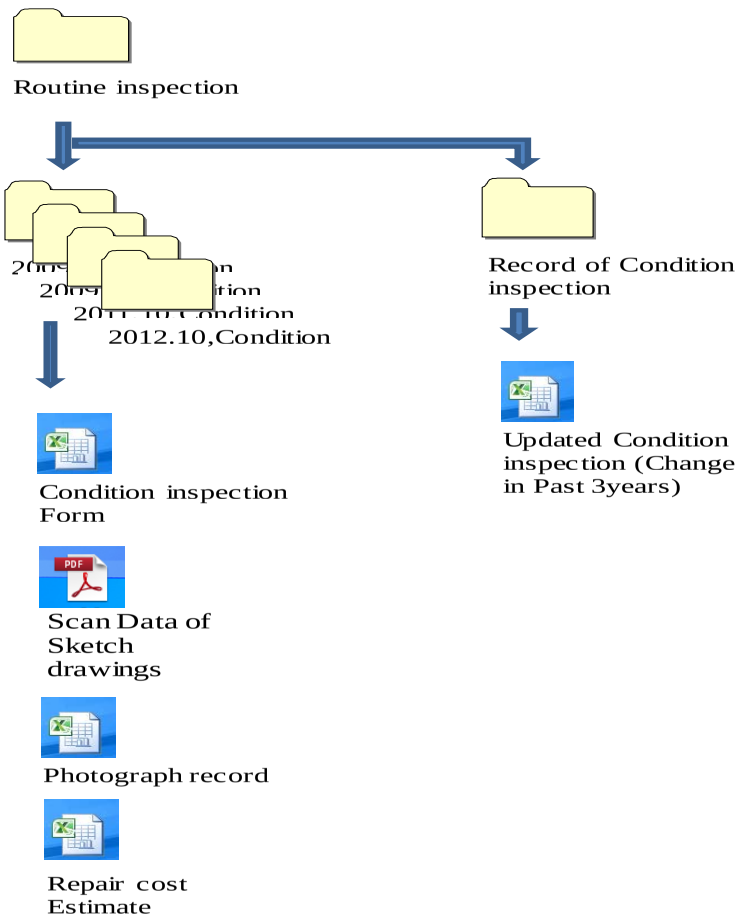


Appendix C
Special Bridge Inventory Database (3 of 5)

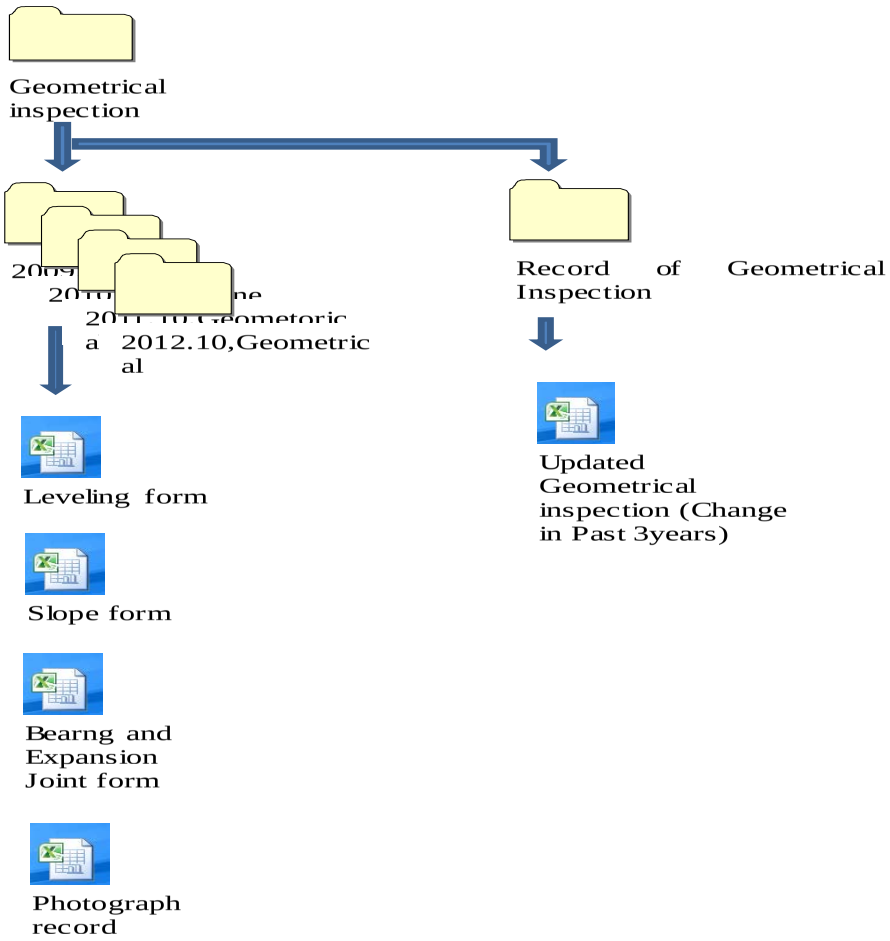


Appendix C
Special Bridge Inventory Database (4 of 5)





Appendix C
Special Bridge Inventory Database (5 of 5)



APPENDIX D

ASPHYXIA AND LOW OXYGEN

Appendix D

Asphyxia and Low Oxygen

When inspectors enter into a hollow portion of a bridge member like box girder, tower, box shape chord and so on, oxygen density in these members should be detected first. Normally, the volume of oxygen level in the air is 20.90%. Any depletion of this normal oxygen level in the air must be treated with concern. As a minimum, 19.50% concentration should be maintained and be defined as workable oxygen level. Atmosphere containing less than 18% oxygen level on the other hand should be defined as potentially dangerous for humans.

Asphyxia or asphyxiation as a result of oxygen depletion can take place on a gradual or sudden basis. It is a little known fact that inhalation of a gas containing low oxygen can result in immediate unconsciousness or rapid death.

Table D-1
Signs and Symptoms of Asphyxia

Oxygen content of air	Signs and symptoms of Asphyxia
18-19.5%	May affect physical and intellectual performance without person's knowledge
15-18%	Decreased ability to work strenuously. May impair coordination and induce early symptoms in persons with coronary pulmonary or circulatory problem.
12-15%	Respiration and pulse increase, impaired coordination, perception and judgment occur.
10-12%	Respiration further increases in rate and depth, poor judgment and bluish lips occur.
8-10%	Mental failure, nausea, vomiting, fainting, unconscious, an ash-colored face, blue lips.
6-8%	Loss of consciousness within a few minutes, resuscitation possible if carried out immediately
0-6%	Loss of consciousness almost immediate, death ensues, brain damage even if rescued

Usually there is little risk of low oxygen in the areas inside bridge members. However, some situations like accumulation of dirty water, vegetation, carcass of animals, dropping of birds, cause depletion of oxygen inside bridge members. Therefore, inspector should prepare gas

detector before inspection and be trained correct in the use of detection equipment. A typical oxygen depletion detector should be calibrated in air so that 20.9 % volume oxygen is displayed in clean air environments. And usually, the detector has an alarm system when oxygen is below 19.5% and 18%. Inspectors in an area where an oxygen depletion risk exists should evacuate immediately once device emit a low oxygen alarm. When oxygen density is low inside the members, windows should be kept opened for more than one day and measured again. When oxygen density is still low, another solution like installation of ventilation by fan should be considered.

APPENDIX E

BRIDGE ROUTINE INSPECTION FORM AND SKETCH DRAWINGS

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

BRIDGE ROUTINE INSPECTION FORM (TYPE 1)

AGAS-AGAS BRIDGE

Deprtment of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

FOR

AGASAGAS BRIDGE (PC BOX GIRDER BRIDGE)

BRIDGE ROUTINE INSPECTION FORM (TYPE 1)

LOCATION

BRIDGE ID	
Bridge Name	Agas-agas Bridge
Road Name	
Road ID	
Section ID	
Location	

Region	
Province	
Congressional District	
Engineering District	
Municipality	
Barangay	
River Name	

Insert Name, Position, Signature and Date of Signing
Initial all other pages

BRIDGE DESCRIPTION

Type of Bridge	
Superstructure	
Substructure	
Foundation	
Total Number of Span	
Total Number of Abutment	
Total Number of Pier	

Date of Routine Inspection	
ACCOMPLISHED BY:	
SUBMITTED BY:	

Summary of Routine Inspection Results

Bridge ID. | **Bridge Name** | **Agas-agas Bridge**

Bridge Members	Feb 2015		May 2015		Aug 2015		Nov 2015	
	Routine Rating	Required Action	Routine Rating	Required Action	Routine Rating	Required Action	Routine Rating	Required Action
PC Box Girder								
Concrete Slab								
Expansion Joint								
Railing								
Drainage System								
Signage								
Abutment								
Pier								

Note: The worst condition rating should be selected and its corresponding action for each bridge member as shown in the Inspection Results

REPAIR RECORD

Bridge ID.		Bridge Name	Agas-agas Bridge

ROUTINE MAINTENANCE

	DATE	ROUTINE MAINTENANCE			IMPLEMENTATION				INSPECTOR COMMENTS
		TYPE	SCOPE	COST	START	COMPLETION	DURATION	STATUS	
Main Bridge PC Box Girder A1 to A2									

LEGEND:

TYPE OF MAINTENANCE

- **A** - Repair damage
- **B** - Protective measures
- **C** - Strengthen
- **D** - Replace
- **E** - None

ROUTINE MAINTENANCE ACTIVITY

- **A** - Sweeping and cleaning
- **B** - Repairs to Pavement
- **C** - Repairs to concrete component
- **D** - Repairs to steel component
- **E** - Painting bridge components
- **F** - Replace/install bolts
- **G** - Others (Specify)

Inspection Results

Bridge ID. | **Bridge Name** **Agas-agas Bridge**

From Bridge Roadway Level S1 (A1～P1)

Bridge members	Defects	Routine Rating				Action		
		Left		Right				
		Number of defects	Rating	Number of defects	Rating	Action	Left	Rght
Asphalt Wearing Surface	Potholes					Patching and Cleaning		
	Waving							
	Rutting							
	Cracking							
	Raveling							
	Others							
Expansion Joint	Accumulation of Dirt					Sweeping and Cleaning of Bridge Deck		
	Abnormal space/noise, Rupture							
Sidewalk	Unevenness					Patching and Cleaning		
	Cracking							
	Others							
Railing	Impact/Accident Damage					Repairs to steel component Cleaning of steel component Repainting		
	Missing Railings							
	Corrosion							
	Paint Peel off							
	Others							
Drainage System	Accumulation of Dirt					Sweeping and Cleaning of Drainage		
Signage	Improper Signage					Cleaning of Signage, Signage marking correction,Replacement /transfer of signage		
	Incorrect Location Visibility							
	Not Good Condition							
	Unclear Lettering							

Note: The Defect item defined as "Others" refers to the presence of trash, soil debris, graffiti, posters and lush vegetation.

From Ground Level under the bridge S1(A1～P1)

Bridge members	Defects	Routine Rating				Action		
		Left		Right				
		Number of defects	Rating	Number of defects	Rating	Action	Left	Rght
Abutment	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
	Settlement							
Pier	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
	Settlement							
Bearing	Abnormal displacement							
	Bed damage							
Deck Slab	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
Box Girder	Rebar Exposure					Repairs to concrete component		
	Water Leakage							

Note: Attach sketch of the defects.

Routine Maintenance Rating

Routine rating	Condition
Good	No damage
Fair	Minor damage(s) not affecting the stability of the structure
Poor	Deteriorating damage(s) which should be repaired, as a preventive action
Bad	Severe damage(s) affecting the stability of the structure or has possibility to harm a third party

Routine Maintenance Action Required

Routine Maitenance Action Required	Condition
M: Monitoring	No repair work and keep monitoring (Damage not progressing or very slow)
RM: Routine Maintenance	Should be maintained by Routine Maintenance
MM: Major Maintenance	Should be repaired by Major Maintenance
EA: Emergency Action	Need to take actions immediately to avoid bridge collapse or harm a third party

Note: EA should be written by Red ink

Remarks

Inspection Results

Bridge ID. | **Bridge Name** **Agas-agas Bridge**

From Bridge Roadway Level S2 (P1～P2)

Bridge members	Defects	Routine Rating				Action		
		Left		Right				
		Number of defects	Rating	Number of defects	Rating	Action	Left	Rght
Asphalt Wearing Surface	Potholes					Patching and Cleaning		
	Waving							
	Rutting							
	Cracking							
	Raveling							
	Others							
Expansion Joint	Accumulation of Dirt					Sweeping and Cleaning of Bridge Deck		
	Abnormal space/noise, Rupture							
Sidewalk	Unevenness					Patching and Cleaning		
	Cracking							
	Others							
Railing	Impact/Accident Damage					Repairs to steel component Cleaning of steel component Repainting		
	Missing Railings							
	Corrosion							
	Paint Peel off							
	Others							
Drainage System	Accumulation of Dirt					Sweeping and Cleaning of Drainage		
Signage	Improper Signage					Cleaning of Signage, Signage marking correction,Replacement /transfer of signage		
	Incorrect Location Visibility							
	Not Good Condition							
	Unclear Lettering							

Note: The Defect item defined as "Others" refers to the presence of trash, soil debris, graffiti, posters and lush vegetation.

From Ground Level under the bridge S2(P1～P2)

Bridge members	Defects	Routine Rating				Action		
		Left		Right				
		Number of defects	Rating	Number of defects	Rating	Action	Left	Rght
Abutment	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
	Settlement							
Pier	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
	Settlement							
Bearing	Abnormal displacement							
	Bed damage							
Deck Slab	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
Box Girder	Rebar Exposure					Repairs to concrete component		
	Water Leakage							

Note: Attach sketch of the defects.

Routine Maintenance Rating

Routine rating	Condition
Good	No damage
Fair	Minor damage(s) not affecting the stability of the structure
Poor	Deteriorating damage(s) which should be repaired, as a preventive action
Bad	Severe damage(s) affecting the stability of the structure or has possibility to harm a third party

Routine Maintenance Action Required

Routine Maitenance Action Required	Condition
M: Monitoring	No repair work and keep monitoring (Damage not progressing or very slow)
RM: Routine Maintenance	Should be maintained by Routine Maintenance
MM: Major Maintenance	Should be repaired by Major Maintenance
EA: Emergency Action	Need to take actions immediately to avoid bridge collapse or harm a third party

Note: EA should be written by Red ink

Remarks

Inspection Results

Bridge ID. | **Bridge Name** **Agas-agas Bridge**

From Bridge Roadway Level S3(P2～A2)

Bridge members	Defects	Routine Rating				Action		
		Left		Right				
		Number of defects	Rating	Number of defects	Rating	Action	Left	Rght
Asphalt Wearing Surface	Potholes					Patching and Cleaning		
	Waving							
	Rutting							
	Cracking							
	Raveling							
	Others							
Expansion Joint	Accumulation of Dirt					Sweeping and Cleaning of Bridge Deck		
	Abnormal space/noise, Rupture							
Sidewalk	Unevenness					Patching and Cleaning		
	Cracking							
	Others							
Railing	Impact/Accident Damage					Repairs to steel component Cleaning of steel component Repainting		
	Missing Railings							
	Corrosion							
	Paint Peel off							
	Others							
Drainage System	Accumulation of Dirt					Sweeping and Cleaning of Drainage		
Signage	Improper Signage					Cleaning of Signage, Signage marking correction,Replacement /transfer of signage		
	Incorrect Location Visibility							
	Not Good Condition							
	Unclear Lettering							

Note: The Defect item defined as "Others" refers to the presence of trash, soil debris, graffiti, posters and lush vegetation.

From Ground Level under the bridge S3(P2～A2)

Bridge members	Defects	Routine Rating				Action		
		Left		Right				
		Number of defects	Rating	Number of defects	Rating	Action	Left	Rght
Abutment	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
	Settlement							
Pier	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
	Settlement							
Bearing	Abnormal displacement							
	Bed damage							
Deck Slab	Rebar Exposure					Repairs to concrete component		
	Water Leakage							
Box Girder	Rebar Exposure					Repairs to concrete component		
	Water Leakage							

Note: Attach sketch of the defects.

Routine Maintenance Rating

Routine rating	Condition
Good	No damage
Fair	Minor damage(s) not affecting the stability of the structure
Poor	Deteriorating damage(s) which should be repaired, as a preventive action
Bad	Severe damage(s) affecting the stability of the structure or has possibility to harm a third party

Routine Maintenance Action Required

Routine Maitenance Action Required	Condition
M: Monitoring	No repair work and keep monitoring (Damage not progressing or very slow)
RM: Routine Maintenance	Should be maintained by Routine Maintenance
MM: Major Maintenance	Should be repaired by Major Maintenance
EA: Emergency Action	Need to take actions immediately to avoid bridge collapse or harm a third party

Note: EA should be written by Red ink

Remarks

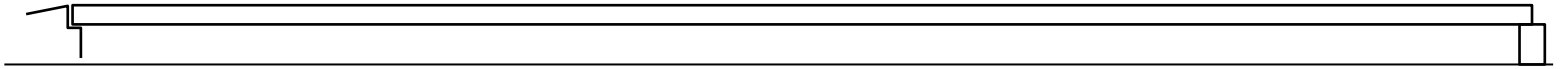
Sketch Drawings for Routine Inspection

NOTE: Print in A3 size for usage at site

Sketch of Bridge Routine Inspection from Bridge Surface (1 of 4)
Agas-agas Bridge

Palo Side

Panaon side

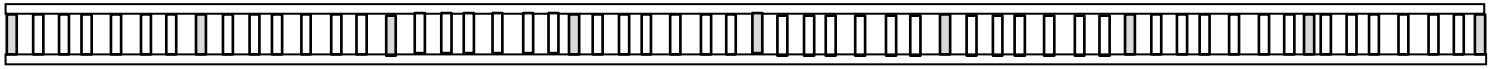


A1

P1

Railing

Impact/Accident Damage, Missing Railings, Corrosion, Paint Peel-off and Others (refers to the presence of Trash, Graffiti, Posters and Lush Vegetation.)



Asphalt Wearing Surface, Drainage, Expansion Joint and Signage

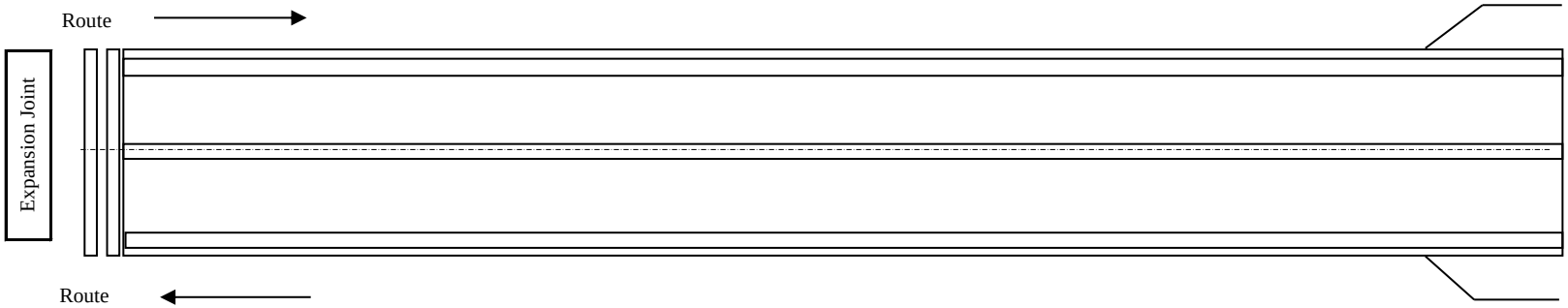
Asphalt Wearing Surface: Potholes, Waving, Rutting, Cracking, Raveling and Others

Sidewalk: Unevenness, Cracking and Others

Drainage & Expansion Joint: Accumulation of Dirt, Abnormal Space/Noise

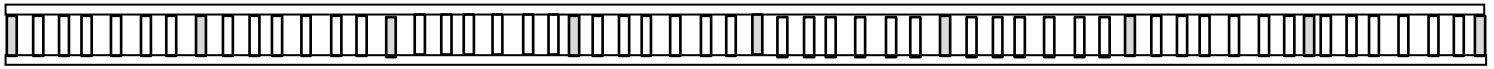
Signage: Improper Signage, Incorrect Location Visibility, Not Good Condition, Unclean Lettering

Route

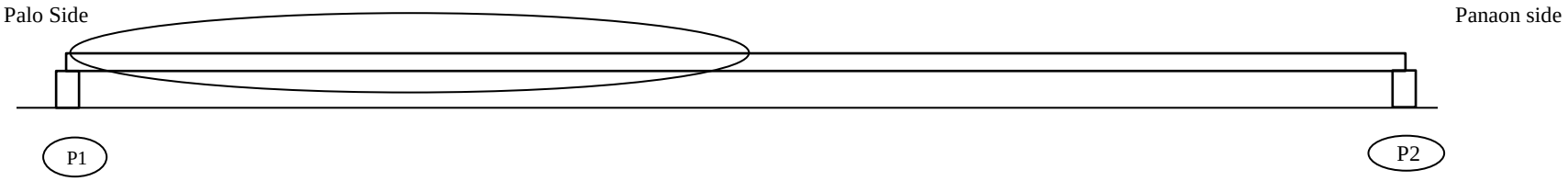


Route

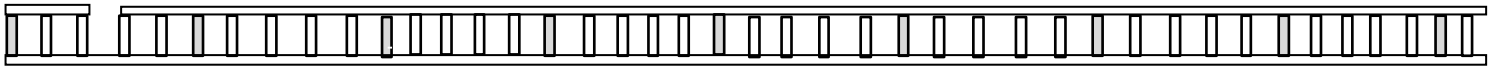
Railing



Sketch of Bridge Routine Inspection from Bridge Surface (2 of 4)
Agas-agas Bridge

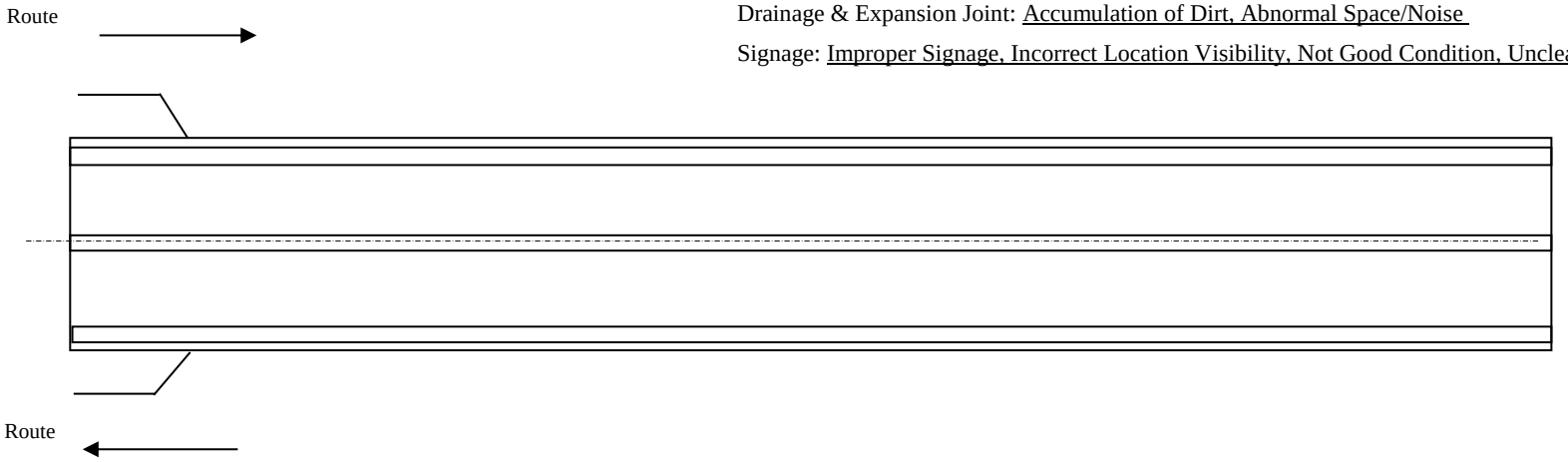


Railing — Impact/Accident Damage, Missing Railings, Corrosion, Paint Peel-off and Others (refers to the presence of Trash, Graffiti, Posters and Lush Vegetation.)

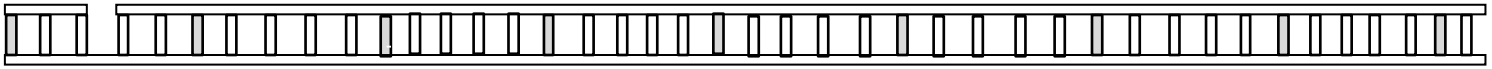


Asphalt Wearing Surface, Drainage, Expansion Joint and Signage

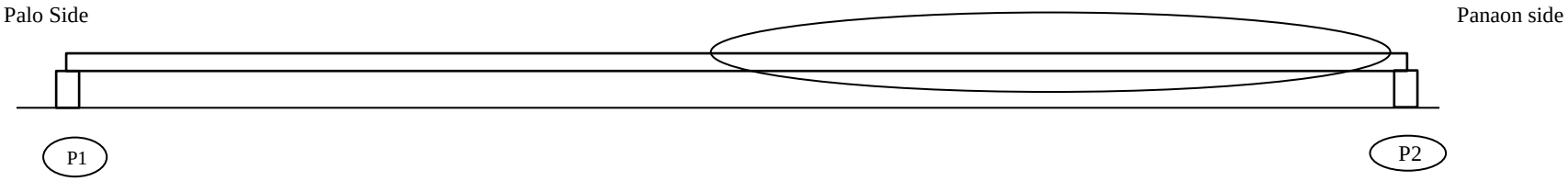
Asphalt Wearing Surface: Potholes, Waving, Rutting, Cracking, Raveling and Others
Sidewalk: Unevenness, Cracking and Others
Drainage & Expansion Joint: Accumulation of Dirt, Abnormal Space/Noise
Signage: Improper Signage, Incorrect Location Visibility, Not Good Condition, Unclean Lettering



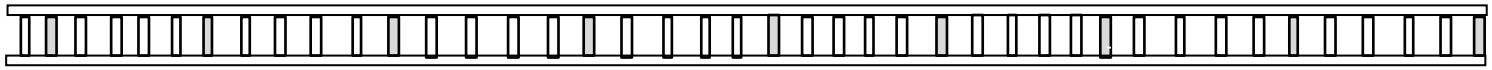
Railing



Sketch of Bridge Routine Inspection from Bridge Surface (3 of 4)
Agas-agas Bridge

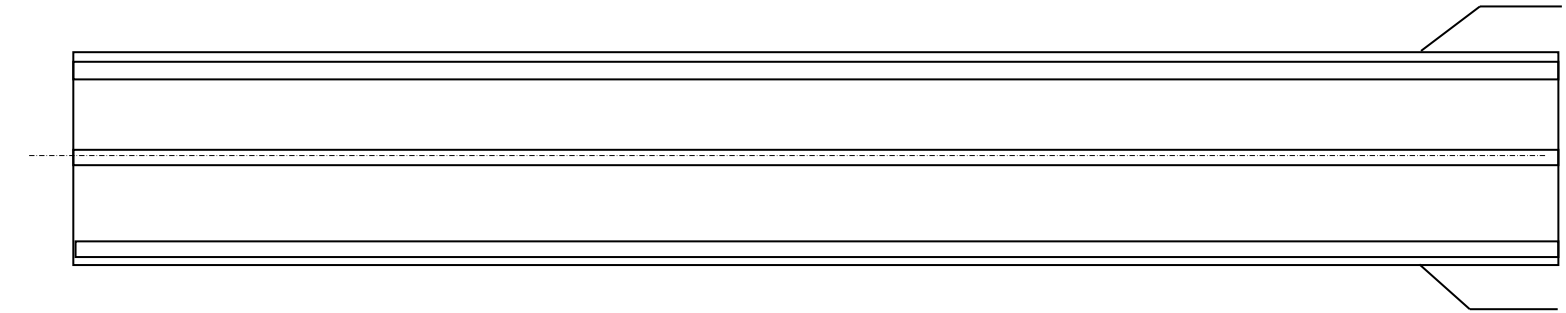


Railing — Impact/Accident Damage, Missing Railings, Corrosion, Paint Peel-off and Others (refers to the presence of Trash, Graffiti, Posters and Lush Vegetation.)

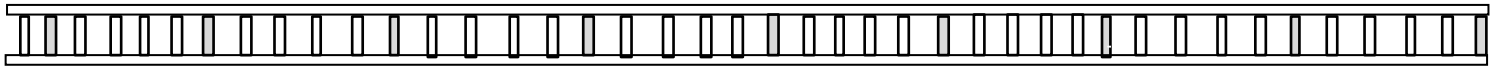


Asphalt Wearing Surface, Drainage, Expansion Joint and Signage

Asphalt Wearing Surface: Potholes, Waving, Rutting, Cracking, Raveling and Others
Sidewalk: Unevenness, Cracking and Others
Drainage & Expansion Joint: Accumulation of Dirt, Abnormal Space/Noise
Signage: Improper Signage, Incorrect Location Visibility, Not Good Condition, Unclean Lettering



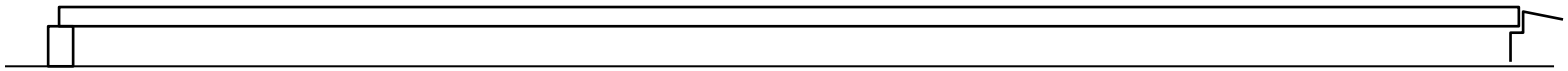
Railing



Sketch of Bridge Routine Inspection from Bridge Surface (4 of 4)
Agas-agas Bridge

Palo Side

Panaon side

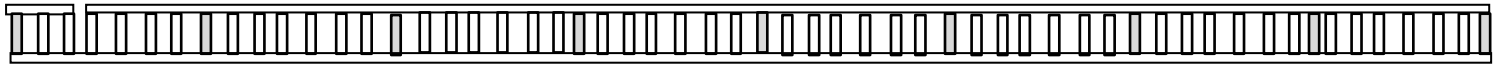


P2

A2

Railing

Impact/Accident Damage, Missing Railings, Corrosion, Paint Peel-off and Others (refers to the presence of Trash, Graffiti, Posters and Lush Vegetation.)



Asphalt Wearing Surface, Drainage, Expansion Joint and Signage

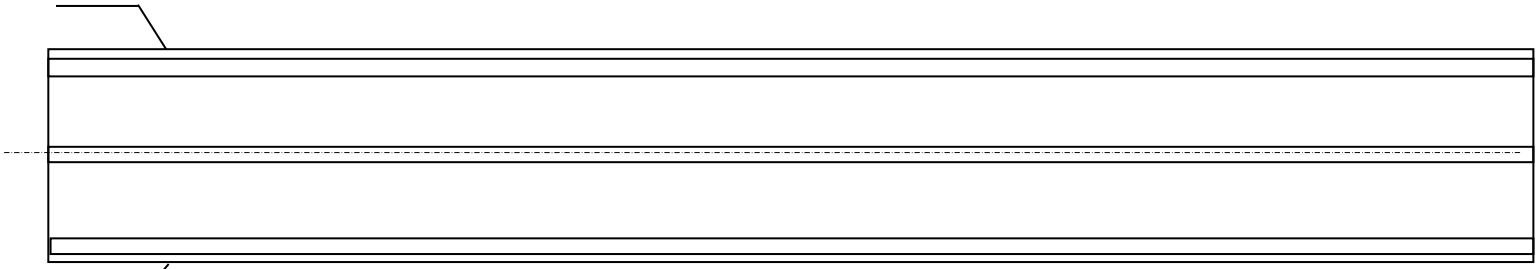
Asphalt Wearing Surface: Potholes, Waving, Rutting, Cracking, Raveling and Others

Sidewalk: Unevenness, Cracking and Others

Drainage & Expansion Joint: Accumulation of Dirt, Abnormal Space/Noise

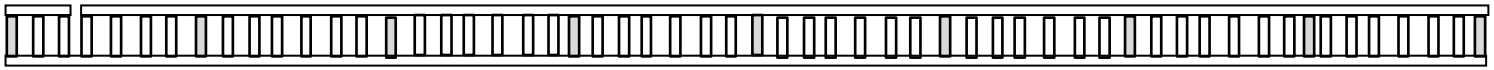
Signage: Improper Signage, Incorrect Location Visibility, Not Good Condition, Unclean Lettering

Route

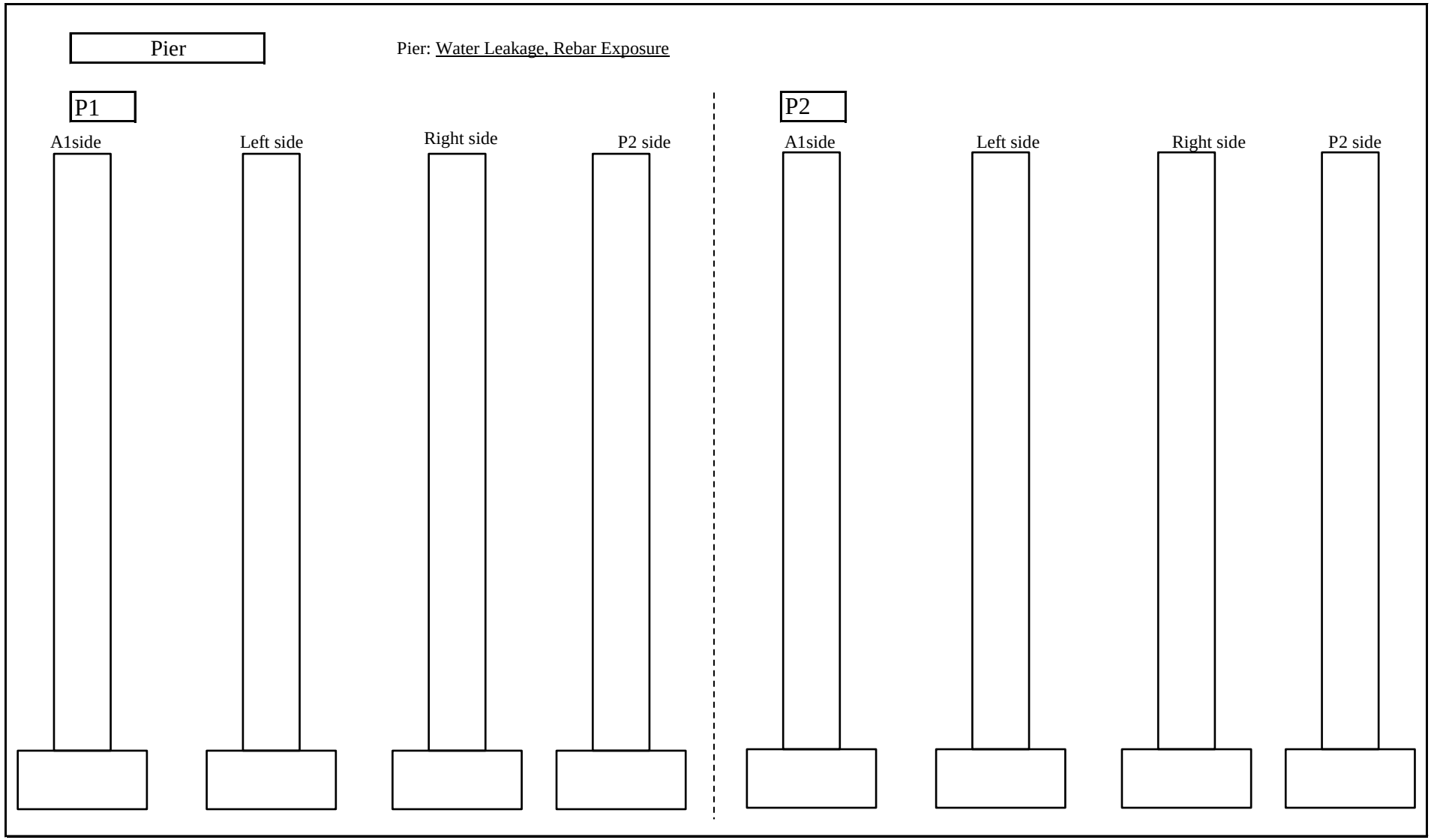


Route

Railing



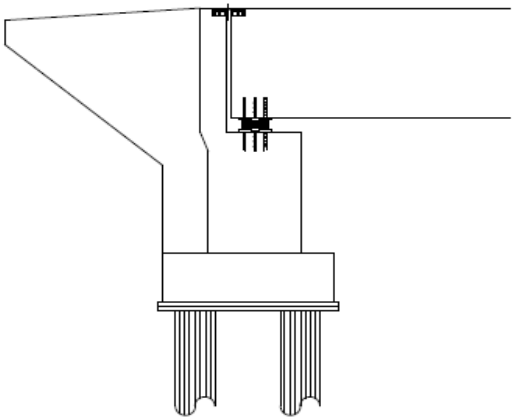
Sketch of Bridge Routine Inspection from Ground Level (1 of 3)
Agas-agas Bridge

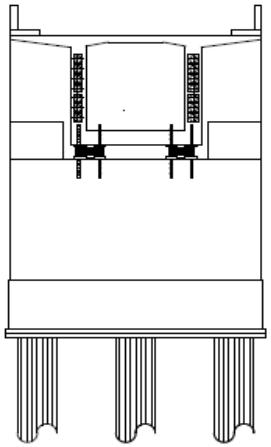


Sketch of Bridge Routine Inspection from Ground Level (2 of 3)
Agas-agas Bridge

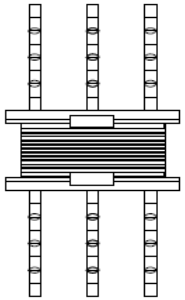
Abutment	Abutment and Pier: Rebar Exposure, Settlement and Water Leakage
Bearing	Rubber Type Bearing: Abnormal Displacement, Bed Damage

A1

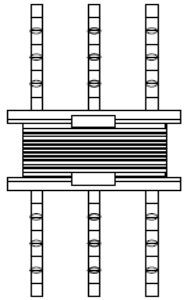




Left side



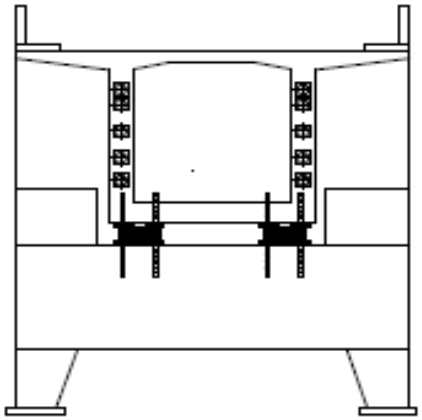
Right side

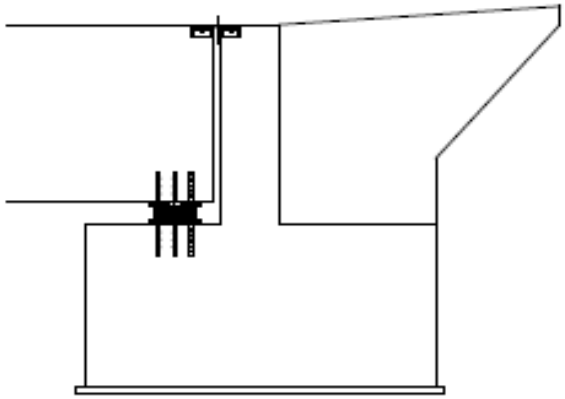


Sketch of Bridge Routine Inspection from Ground Level (3 of 3)
Agas-agas Bridge

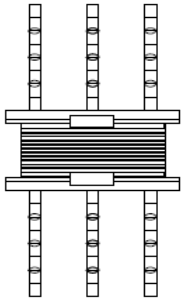
Abutment	Abutment and Pier: Rebar Exposure, Settlement and Water Leakage
Bearing	Rubber Type Bearing: Abnormal Displacement, Bed Damage

A2

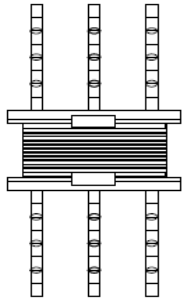




Left side



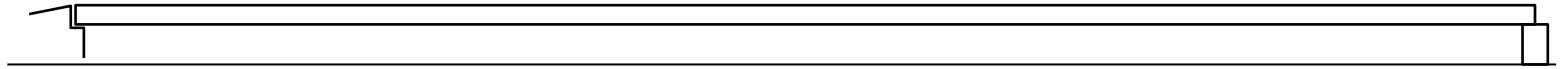
Right side



Sketch of Bridge Routine Inspection from Bridge Surface (2 of 4)
Agas-agas Bridge

Palo Side

Panaon side



A1

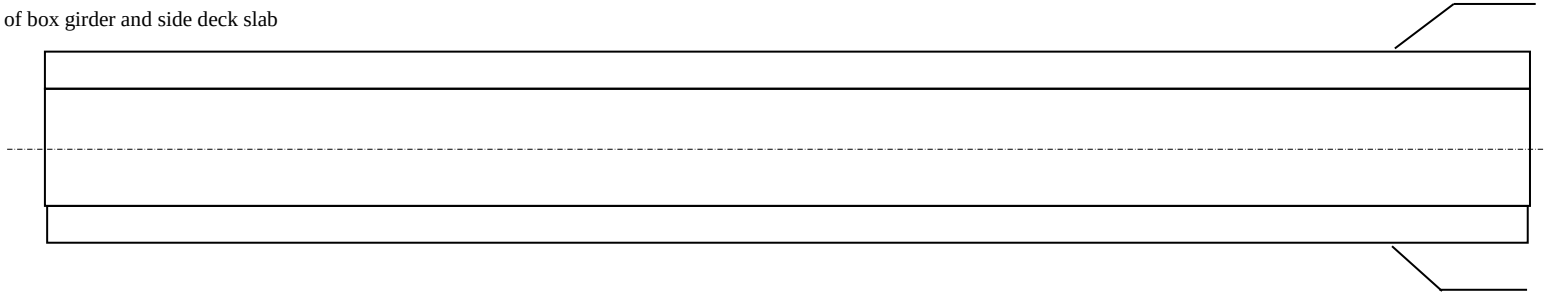
P1

Box Girder and Side Deck Slab

Box Girder and Pier: Re-bar Exposure, Water Leakage

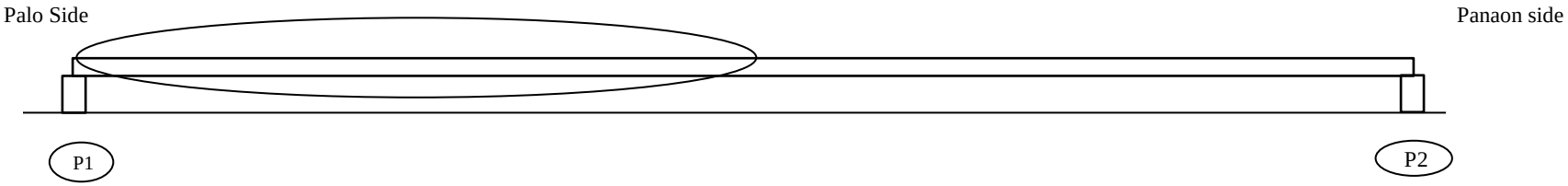
Web (Left side)

Bottom of box girder and side deck slab



Web (Right side)

Sketch of Bridge Routine Inspection from Bridge Surface (2 of 4)
Agas-agas Bridge

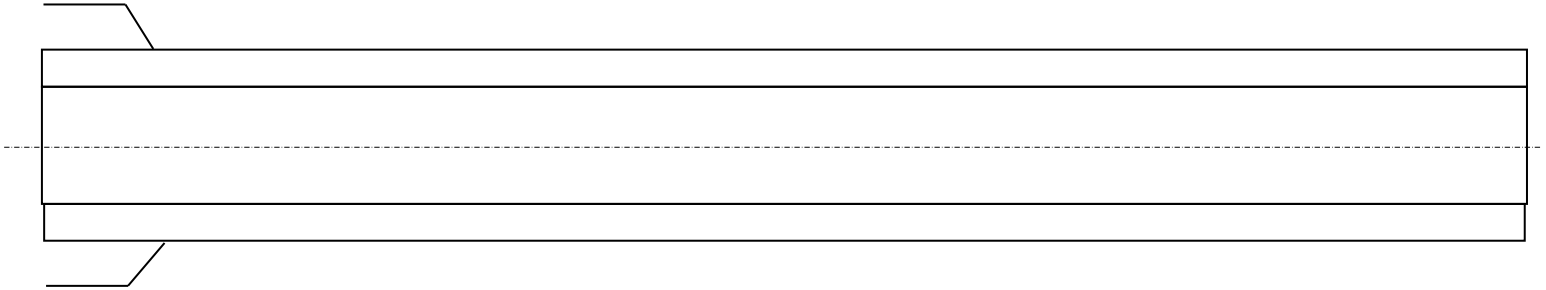


Box Girder and Side Deck Slab

Box Girder and Pier: Re-bar Exposure, Water Leakage

Web (Left side)

Bottom of box girder and side deck slab

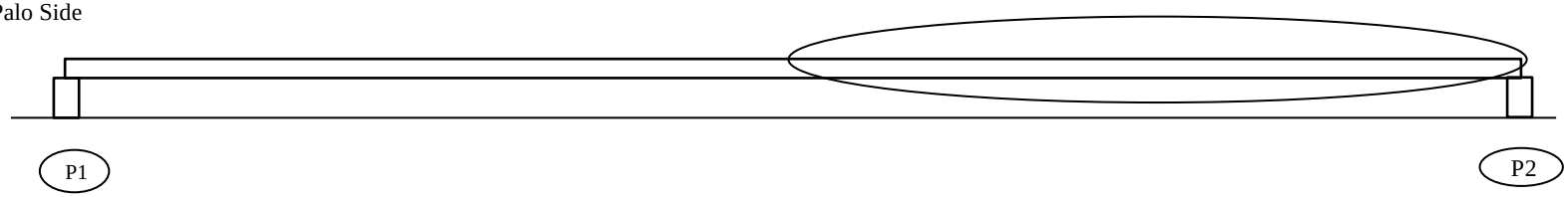


Web (Right side)

Sketch of Bridge Routine Inspection from Bridge Surface (2 of 4)
Agas-agas Bridge

Palo Side

Panaon side

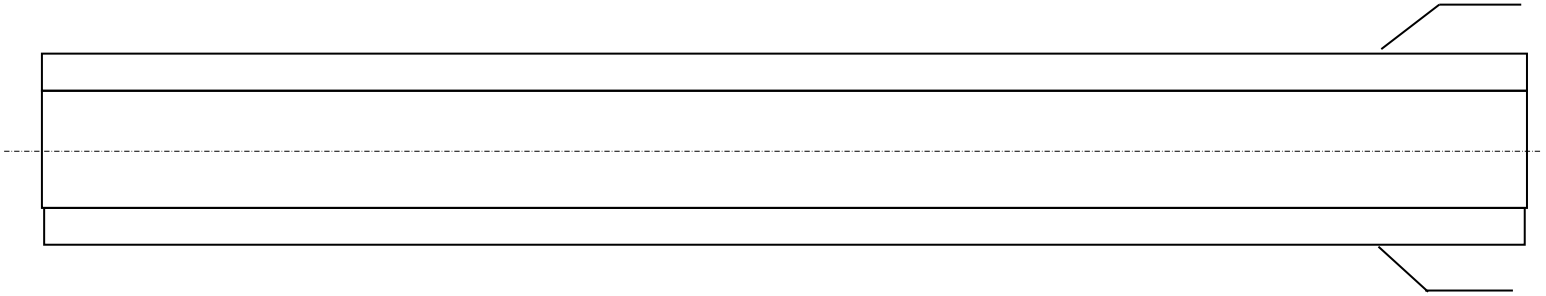


Box Girder and Side Deck Slab

Box Girder and Pier: Re-bar Exposure, Water Leakage

Web (Left side)

Bottom of box girder and side deck slab

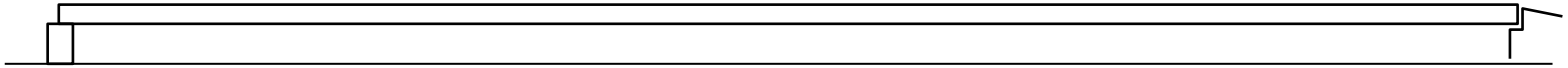


Web (Right side)

Sketch of Bridge Routine Inspection from Bridge Surface (2 of 4)
Agas-agas Bridge

Palo Side

Panaon side



P2

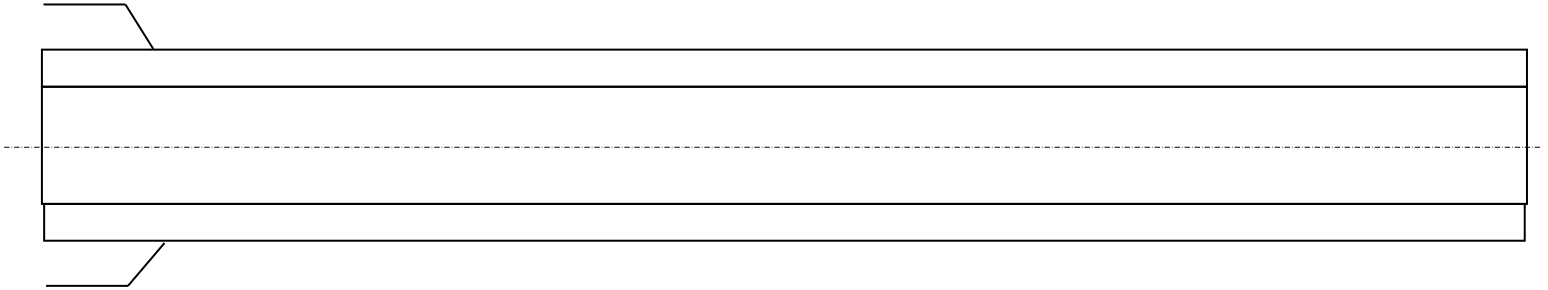
A2

Box Girder and Side Deck Slab

Box Girder and Pier: Re-bar Exposure, Water Leakage

Web (Left side)

Bottom of box girder and side deck slab



Web (Right side)

APPENDIX F

BRIDGE CONDITION INSPECTION FORM AND SKETCH DRAWINGS

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

BRIDGE CONDITION INSPECTION FORM (TYPE 2)

AGAS-AGAS BRIDGE

Deprtment of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

FOR

AGASAGAS BRIDGE (PC BOX GIRDER BRIDGE)

BRIDGE CONDITION INSPECTION FORM (TYPE 2)

LOCATION

BRIDGE ID	
Bridge Name	Agas-agas Bridge
Road Name	
Road ID	
Section ID	
Location	

Region	
Province	
Congressional District	
Engineering District	
Municipality	
Barangay	
River Name	

BRIDGE DESCRIPTION

Type of Bridge	
Superstructure	
Substructure	
Foundation	
Total Number of Span	
Total Number of Abutment	
Total Number of Pier	

Date of Routine Inspection	
ACCOMPLISHED BY:	
SUBMITTED BY:	

Insert Name, Position, Signature and Date of Signing
Initial all other pages

REPAIR RECORD

Bridge ID.		Bridge Name	Agas-agas Bridge

MAJOR MAINTENANCE

DATE	MAJOR MAINTENANCE			IMPLEMENTATION				INSPECTOR COMMENTS
	TYPE	SCOPE	COST	START	COMPLETION	DURATION	STATUS	

ROUTINE MAINTENANCE

DATE	ROUTINE MAINTENANCE			IMPLEMENTATION				INSPECTOR COMMENTS
	TYPE	SCOPE	COST	START	COMPLETION	DURATION	STATUS	

LEGEND:

MAJOR MAINTENANCE TYPE

- **A** - Repair damage
- **B** - Protective measures
- **C** - Strengthen
- **D** - Replace
- **E** - None

ROUTINE MAINTENANCE ACTIVITY

- **A** - Sweeping and cleaning
- **B** - Repairs to pavement
- **C** - Repairs to concrete component
- **D** - Repairs to steel component
- **E** - Painting bridge components
- **F** - Replace/install bolts
- **G** - Others (Specify)

SUMMARY

Bridge ID.		Bridge Name	Agas-agas Bridge

BRIDGE CONDITION

OVERALL CONDITION

Good	
Fair	
Poor	
Bad	

RECOMMENDED ACTION

Routine maintenance only	
Major maintenance	
Upgrading	
Replacement	
Emergency repair work	

REASONS FOR RECOMMENDATION

Bridge inadequate for traffic	
Bridge alignment	
Flooding	
Safety	
Bridge Deterioration	
Scour and erosion	
Excessive maintenance required	
Inadequate load capacity	
No bridge - bridge required	
Other	

Up to three (3) options may be selected.

BRIDGE INSPECTOR COMMENT

TYPE OF BRIDGE

Special Bridge	

ESTIMATED REMAINING BRIDGE LIFE

Years	

Remaining life of bridge shall be assessed in the range of 0-50 years

BRIDGE SURVEYED?

Yes	
No	

LEVEL OF INSPECTION

Complete inspection	
Partial inspection only:	
BIV not available	
Other reason	

REASON FOR NO SURVEY

Bridgeworks in progress	
Access restricted	
Affected by natural disaster	
No reason	
Other, insert reason	

ROUTINE MAINTENANCE

This section requires the bridge inspector to provide cost estimates for the routine maintenance of the entire bridge for the following budget year.

Routine maintenance activity		Estimated Cost
Sweeping and cleaning	P	
Repairs to pavement	P	
Repairs to concrete component	P	
Repairs to steel component	P	
Painting bridge components	P	
Re;lace/install bolts	P	
Others(Specify)	P	
Total Estmated Cost	**P**	

SUMMARY

Bridge ID. | **Bridge Name** Agas-agas Bridge

MAJOR MAINTENANCE

This section requires the bridge inspector to provide cost estimates for the major maintenance of the entire bridge

Element	No.	place	Estimated cost	Type and recommended works
SPAN NO.	1	A1 - P1		
SPAN NO.	2	P1 - P2		
SPAN NO.	3	P2 - A2		
PIER NO.	1	P1		
PIER NO.	2	P2		
ABUTMENT	1	A1		
ABUTMENT	2	A2		

Element	No.	place	Estimated cost	Type and recommended works

TOTAL ESTIMATED COST:

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

Span Element-Condition

SPAN ELEMENT - CONDITION

SPAN No.	1	A1-P1	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED		LEVEL OF INSPECTION	TYPE OF MAJOR MAINTENANCE	ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
DECK	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
MAIN MEMBER	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
SECONDARY MEMBER	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
LEFT RAILING	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
RIGHT RAILING	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
ASPHALT WEARING SURFACE	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		

Total Cost:

SPAN ELEMENT - CONDITION

SPAN No.	2	P1-P2	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED		LEVEL OF INSPECTION	TYPE OF MAJOR MAINTENANCE	ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
DECK	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
MAIN MEMBER	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
SECONDARY MEMBER	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
LEFT RAILING	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
RIGHT RAILING	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
ASPHALT WEARING SURFACE	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		

Total Cost:

SPAN ELEMENT - CONDITION

SPAN No.	3	P2-A2	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED		LEVEL OF INSPECTION	TYPE OF MAJOR MAINTENANCE	ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
DECK	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
MAIN MEMBER	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
SECONDARY MEMBER	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
LEFT RAILING	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
RIGHT RAILING	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		
ASPHALT WEARING SURFACE	Immediate	3	Fully assessed	Repair damage		
	Within 2 years	2		Protective measures		
	Within 10 years	1	Partially assessed	Strengthen		
	None	0		Replace		
	Not Applicable		Not assessed	Other		
				Total Estimated Cost		

Total Cost:

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

Pier Element-Condition

PIER ELEMENT - CONDITION

PIER No.	P1	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED		LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
MAIN STRUCTURE	Immediate	3	Fully assessed		Repair damage			
	Within 2 years	2			Protective measures			
	Within 10 years	1	Partially assessed		Strengthen			
	None	0			Replace			
	Not Applicable		Not assessed		Other			
					Total Estimated Cost			

Total Cost:

PIER No.	P2

ATTRIBUTE	ATTENTION REQUIRED		LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
MAIN STRUCTURE	Immediate	3	Fully assessed		Repair damage			
	Within 2 years	2			Protective measures			
	Within 10 years	1	Partially assessed		Strengthen			
	None	0			Replace			
	Not Applicable		Not assessed		Other			
					Total Estimated Cost			

Total Cost:

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

Abutment Element-Condition

ABUTMENT ELEMENT - CONDITION (1/4)

ABUTMENT No.	A1	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED			LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
MAIN STRUCTURE	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
FOUNDATION	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
EXPANSION JOINT	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
BEARING	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
LEFT WING WALL	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			

ABUTMENT ELEMENT - CONDITION (2/4)

ABUTMENT No.	A1	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED			LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
RIGHT WING WALL	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
BRIDGE APPROACH	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			

ABUTMENT ELEMENT - CONDITION (3/4)

ABUTMENT No.	A2	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED			LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
MAIN STRUCTURE	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
FOUNDATION	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
EXPANSION JOINT	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
BEARING	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
LEFT WING WALL	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			

ABUTMENT ELEMENT - CONDITION (4/4)

ABUTMENT No.	A2	Bridge ID		Bridge Name	Agas-agas Bridge

ATTRIBUTE	ATTENTION REQUIRED			LEVEL OF INSPECTION		TYPE OF MAJOR MAINTENANCE		ESTIMATED COST (P)	DESCRIBE DEFECTS AND RECOMMENDED WORKS
RIGHT WING WALL	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			
BRIDGE APPROACH	Immediate	3		Fully assessed		Repair damage			
	Within 2 years	2				Protective measures			
	Within 10 years	1		Partially assessed		Strengthen			
	None	0				Replace			
	Not Applicable			Not assessed		Other			
						Total Estimated Cost			

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

Span Element-Damage Rating

Bridge ID | **Bridge Name** | **Agas-agas Bridge**

Span Element - Damage Rating

SPAN No. 1

Type of Material	Type of Damage	Severity of Defect	Affected Unit	Affected %	Damage Rating	Attrib. Cond. State
DECK						
Concrete Slab	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					
SECONDARY MEMBER (SM) / OTHER MEMBER (OM)						
Concrete Diaphgram	Cracking	SM / OM		SM / OM	SM / OM	SM / OM
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					

Type of Material	Type of Damage	Severity of Defect	Affected Unit	Affected %	Damage Rating	Attrib. Cond. State
MAIN MEMBER						
Concrete PC Box Girder	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					
LEFT RAILING (LR) / RIGHT RAILING (RR)						
Concrete	Mising rails	LR / RR		LR / RR	LR / RR	LR / RR
	Rebar exposure/corrosion					
	Impact/Accident damage					
	Cracking/Spalling					
ASPHALT WEARING SURFACE						
Asphalt	Potholes					
	Waving					
	Rutting					
	Cracking					
	Raveling					

SPAN No. 2

Type of Material	Type of Damage	Severity of Defect	Affected Unit	Affected %	Damage Rating	Attrib. Cond. State
DECK						
Concrete Slab	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					
SECONDARY MEMBER (SM) / OTHER MEMBER (OM)						
Concrete Diaphgram	Cracking	SM / OM		SM / OM	SM / OM	SM / OM
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					

Type of Material	Type of Damage	Severity of Defect	Affected Unit	Affected %	Damage Rating	Attrib. Cond. State
MAIN MEMBER						
Concrete PC Box Girder	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					
LEFT RAILING (LR) / RIGHT RAILING (RR)						
Concrete	Mising rails	LR / RR		LR / RR	LR / RR	LR / RR
	Rebar exposure/corrosion					
	Impact/Accident damage					
	Cracking/Spalling					
ASPHALT WEARING SURFACE						
Asphalt	Potholes					
	Waving					
	Rutting					
	Cracking					
	Raveling					

Bridge ID | **Bridge Name** Agas-agas Bridge

SPAN No. 3

Span Element - Damage Rating

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
DECK						
Concrete Slab	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					
SECONDARY MEMBER (SM) / OTHER MEMBER (OM)						
SM OM		SM OM			SM OM	SM OM
Concrete Diaphgram	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
MAIN MEMBER						
Concrete PC Box Girder	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Water leakage					
LEFT RAILING (LR) / RIGHT RAILING (RR)						
LR RR		LR RR		LR RR	LR RR	LR RR
Concrete	Mising rails					
	Rebar exposure/corrosion					
	Impact/Accident damage					
	Cracking/Spalling					
ASPHALT WEARING SURFACE						
Asphalt	Potholes					
	Waving					
	Rutting					
	Cracking					
	Raveling					

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

Pier Element-Damage Rating

Bridge ID | **Bridge Name** | **Agas-agas Bridge**

Pier Element - Damage Rating

PIER No.	**P1**

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
MAIN STRUCTURE						
Concrete	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Tilt/Settlement					

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		

PIER No.	**P2**

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
MAIN STRUCTURE						
Concrete	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honeycomb					
	Tilt/Settlement					

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

Abutment Element-Damage Rating

ABUTMENT No.	A1

Bridge ID | **Bridge Name** | **Agas-agas Bridge**

Abutment Element - Damage Rating

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
MAIN STRUCTURE						
Concrete	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honecomb					
	Tilt/Settlement					
FOUNDATION						
Concrete	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honecomb					
	Tilt/Settlement					
BEARING						
Rubber	Bulging					
	Abnormal displacement					
	Bed (support) damage					

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
EXPANSION JOINT						
Rubber	Water leakage					
	Abnormal space/noise					
	Difference in elevation					
	Displacement					
	Rupture					

LEFT WING WALL (LW) / RIGHT WING WALL (RW)

LW	RW		LW	RW		LW	RW		LW	RW	LW	RW	LW	RW
		Concrete			Cracking									
					Delamination/Disinteg.									
					Rebar exposure/corrosion									

BRIDGE APPROACH

		Embank-ment		Material loss										
				Depression										
		None												

Assessment of Bridge Approach will be limited to 6.0 meter length.

ABUTMENT No.	A2

Bridge ID | **Bridge Name** | **Agas-agas Bridge**

Abutment Element - Damage Rating

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
MAIN STRUCTURE						
Concrete	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honecomb					
	Tilt/Settlement					
FOUNDATION						
Concrete	Cracking					
	Spalling/Scaling/Disinteg.					
	Delamination					
	Rebar exposure/corrosion					
	Honecomb					
	Tilt/Settlement					
BEARING						
Rubber	Bulging					
	Abnormal displacement					
	Bed (support) damage					

Type of Material	Type of Damage	Severity of Defect	Affected		Damage Rating	Attrib. Cond. State
			Unit	%		
EXPANSION JOINT						
Rubber	Water leakage					
	Abnormal space/noise					
	Difference in elevation					
	Displacement					
	Rupture					

LEFT WING WALL (LW) / RIGHT WING WALL (RW)

LW	RW		LW	RW		LW	RW		LW	RW	LW	RW	LW	RW
		Concrete			Cracking									
					Delamination/Disinteg.									
					Rebar exposure/corrosion									

BRIDGE APPROACH

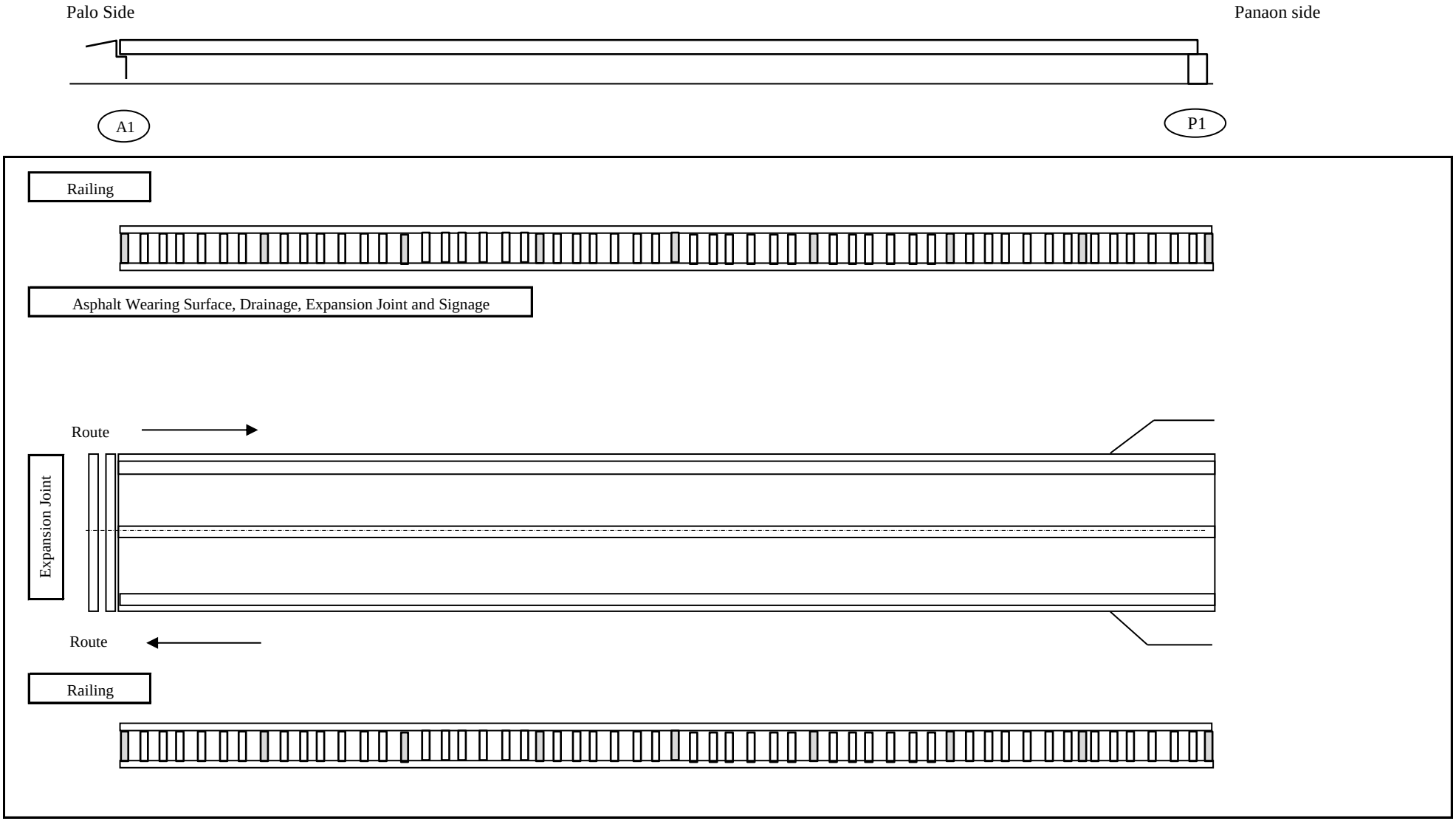
		Embank-ment		Material loss										
				Depression										
None														

Assessment of Bridge Approach will be limited to 6.0 meter length.

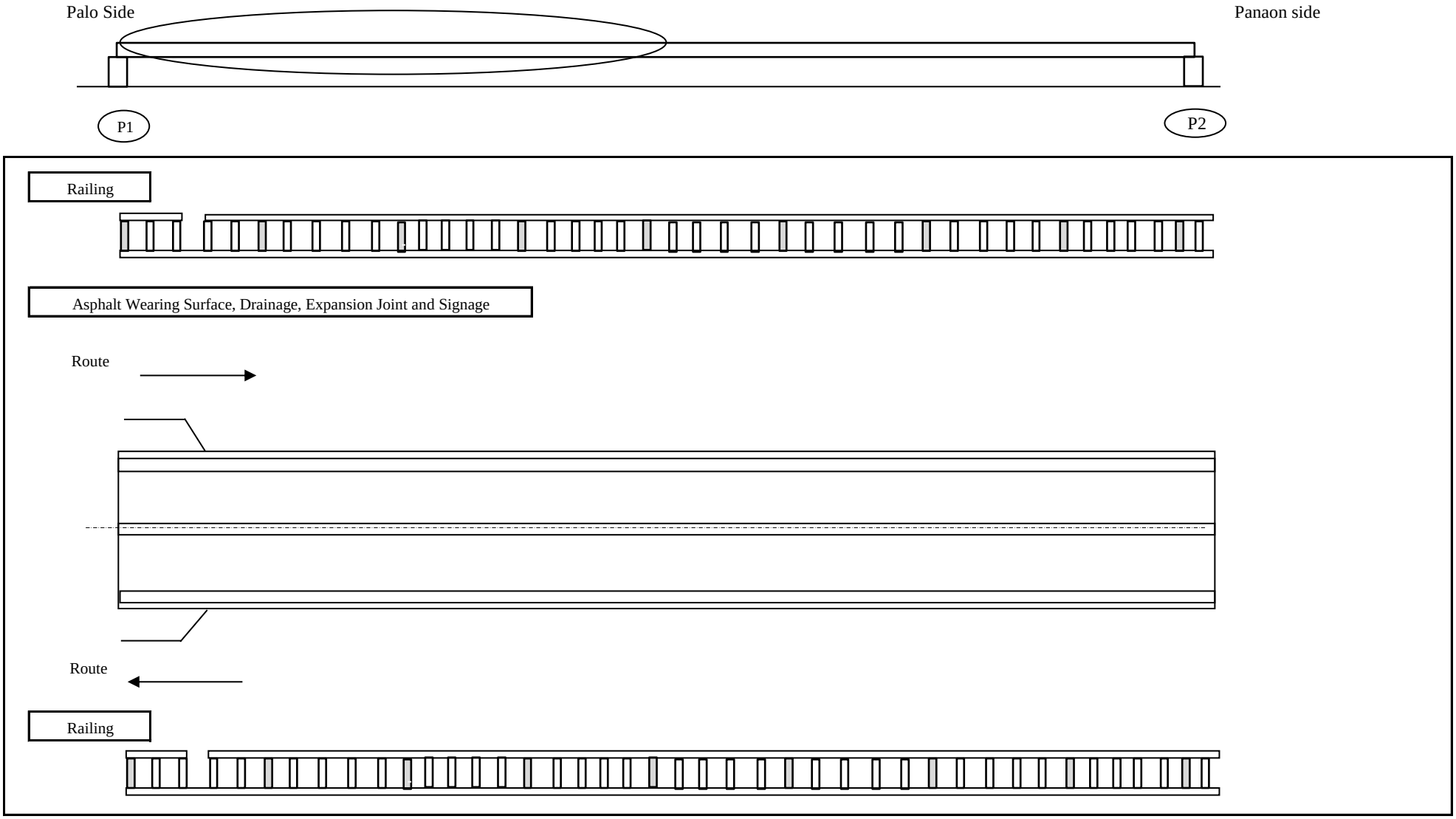
Sketch Drawings for Condition Inspection

NOTE: Print on A3 size for usage at site

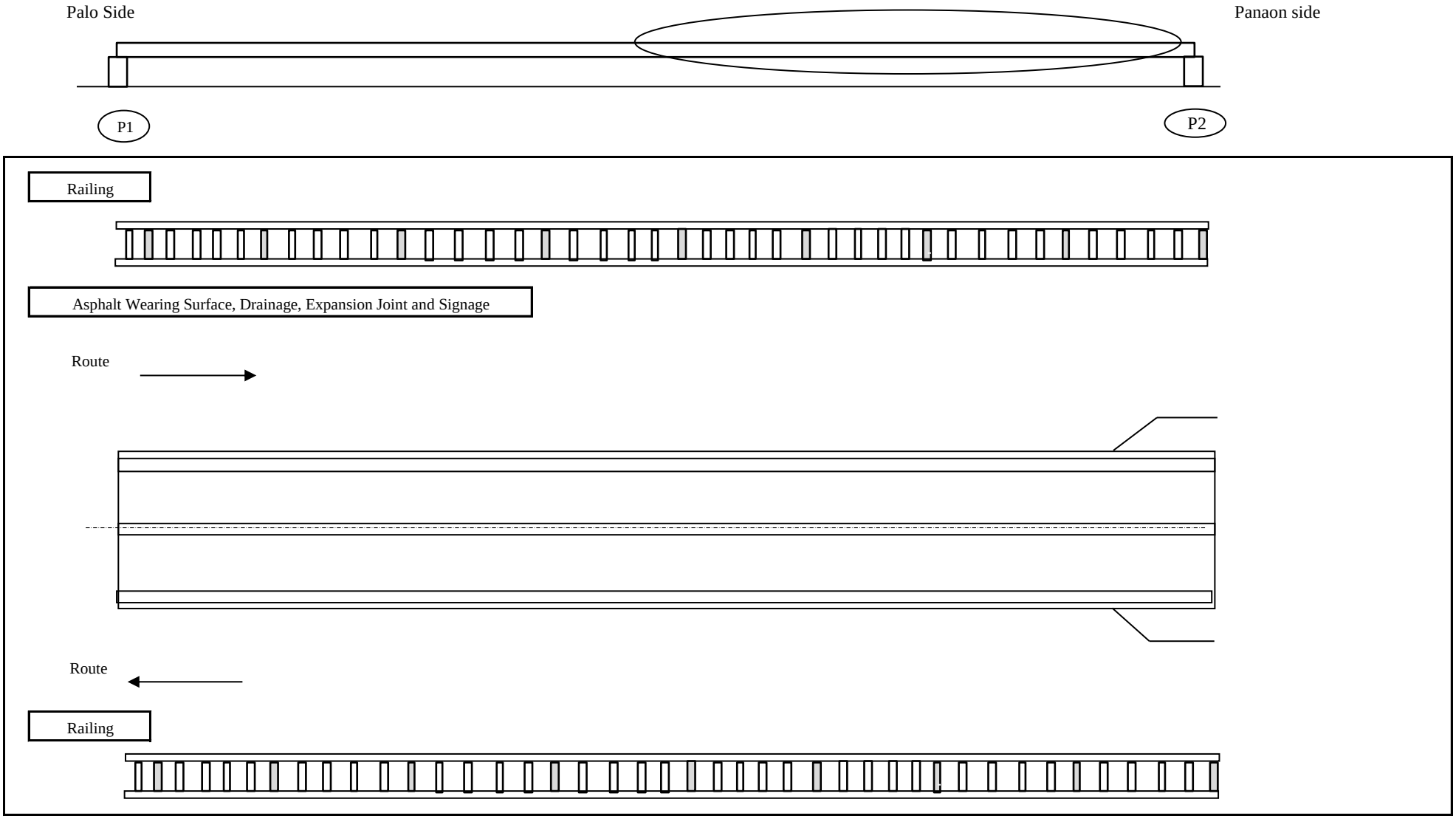
Sketch of Bridge Condition Inspection from Bridge Surface (1 of 4)
Agas-agas Bridge



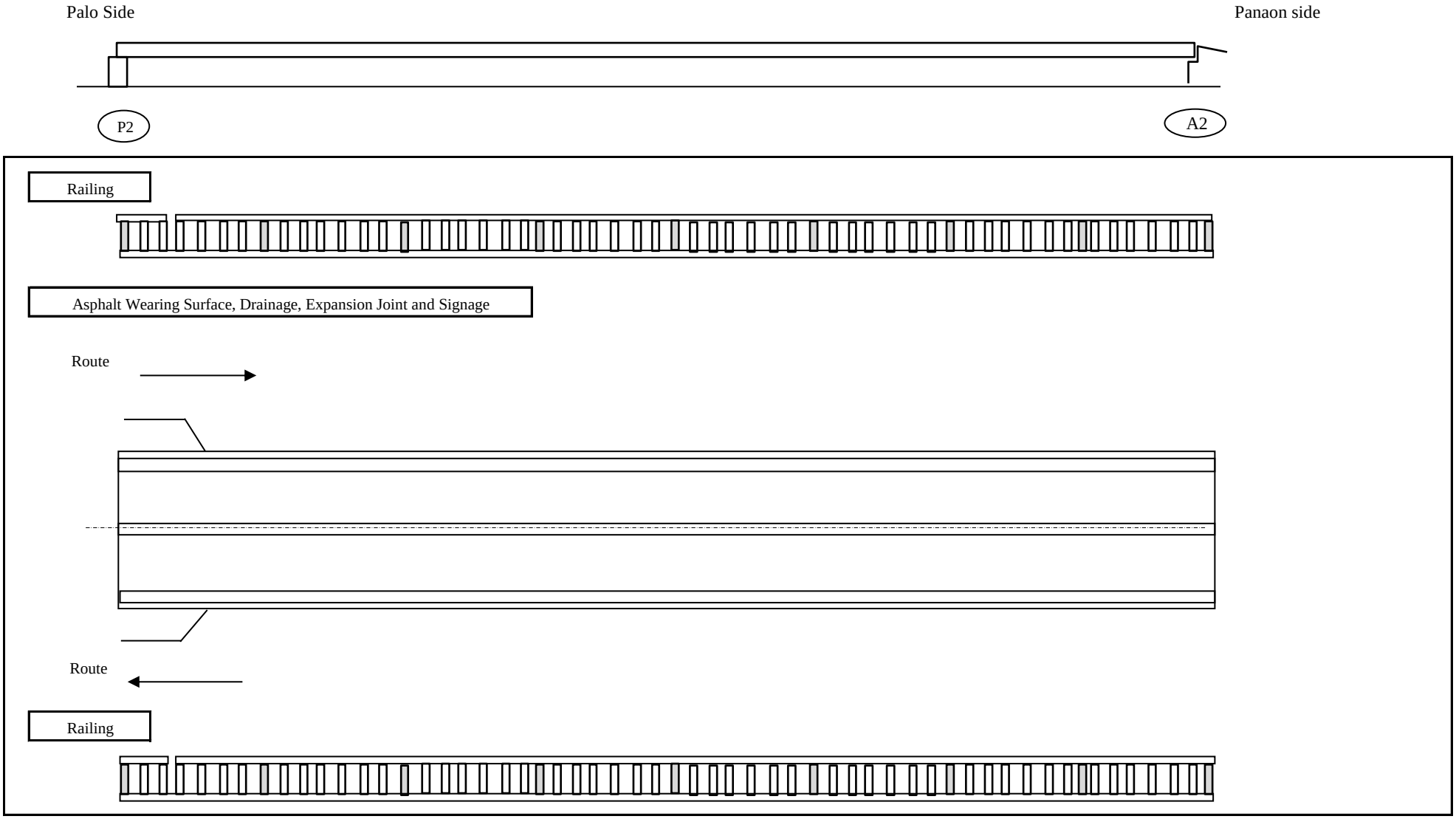
Sketch of Bridge Condition Inspection from Bridge Surface (2 of 4)
Agas-agas Bridge



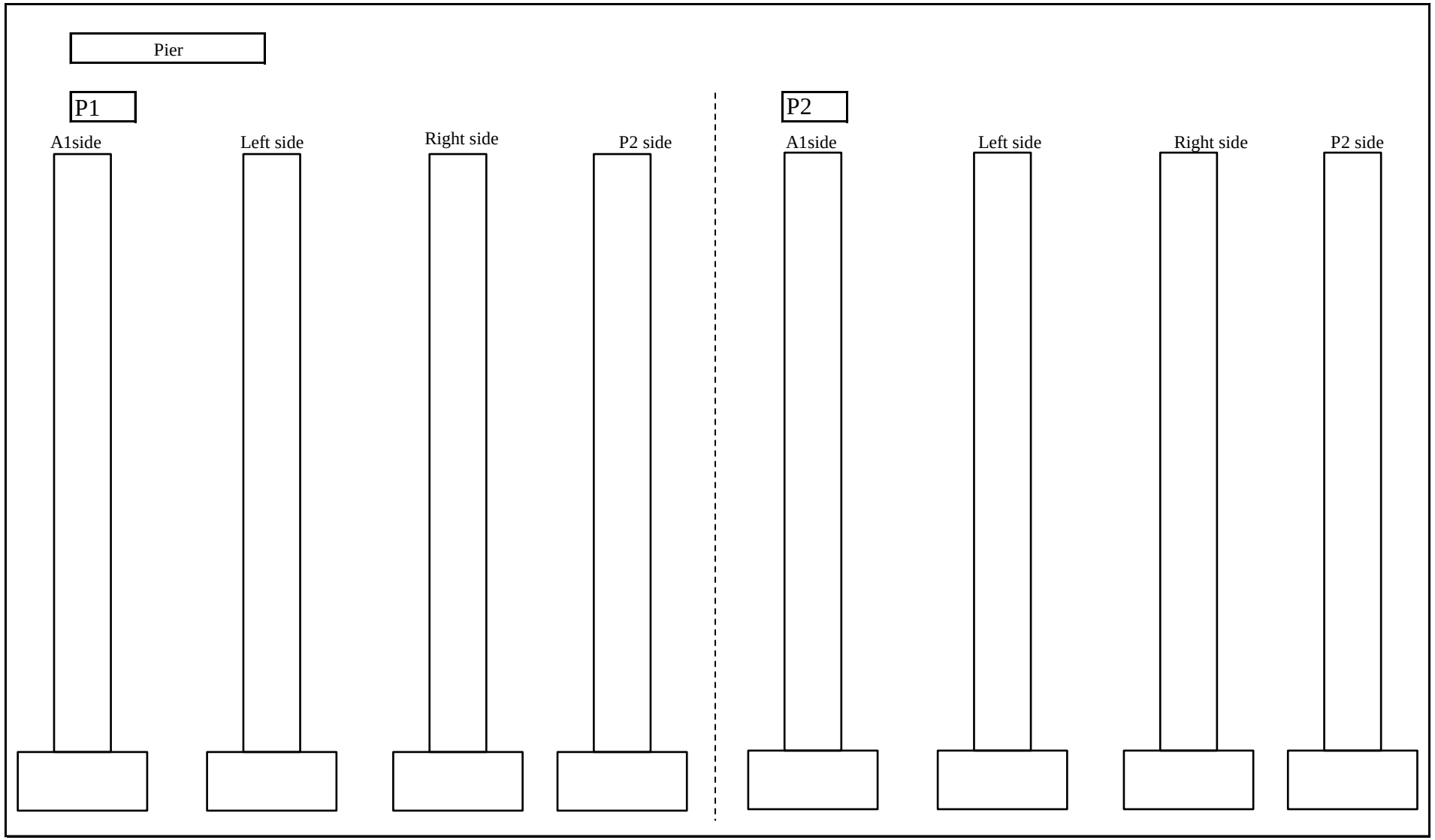
Sketch of Bridge Condition Inspection from Bridge Surface (3 of 4)
Agas-agas Bridge



Sketch of Bridge Condition Inspection from Bridge Surface (4 of 4)
Agas-agas Bridge



Sketch of Bridge Condition Inspection from Ground Level (1 of 3)
Agas-agas Bridge

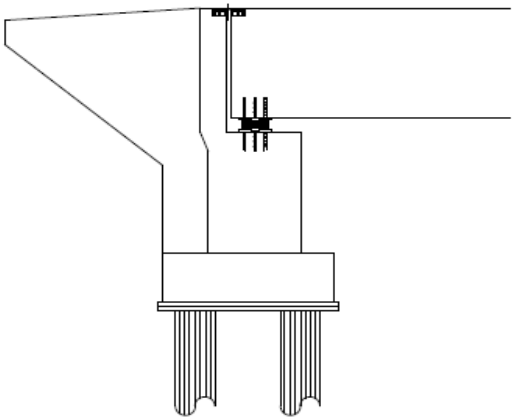


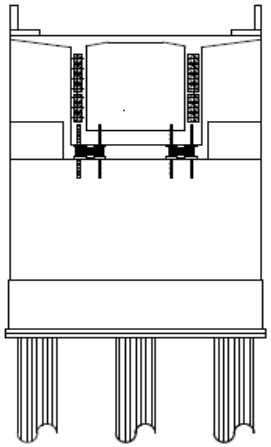
Sketch of Bridge Routine Inspection from Ground Level (2 of 3)
Agas-agas Bridge

Abutment

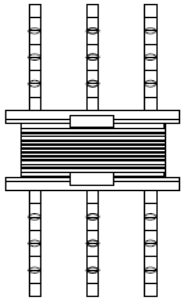
Bearing

A1

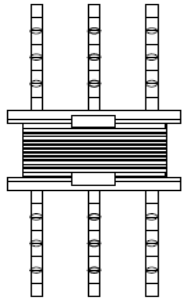




Left side



Right side

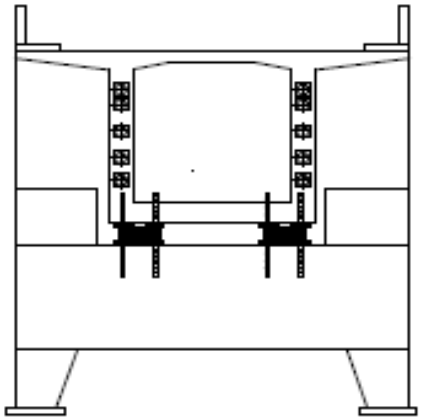


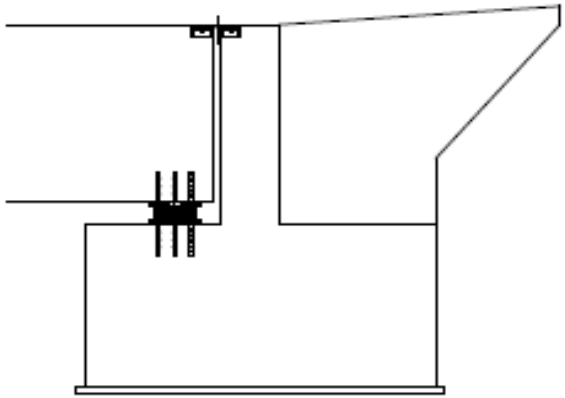
Sketch of Bridge Routine Inspection from ground level (3 of 3)
Agas-agas Bridge

Abutment

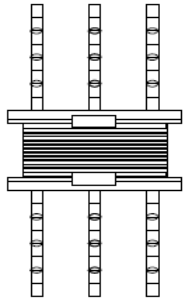
Bearing

A2

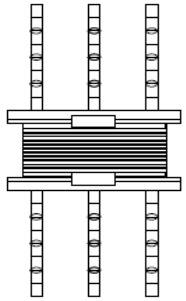




Left side



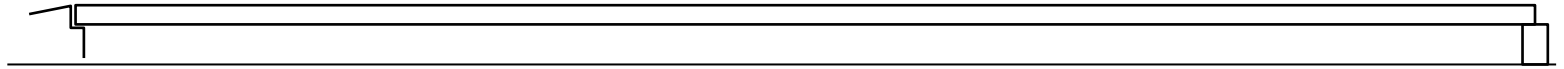
Right side



Sketch of Bridge Condition Inspection from ground level or BIV (1 of 4)
Agas-agas Bridge

Palo Side

Panaon side



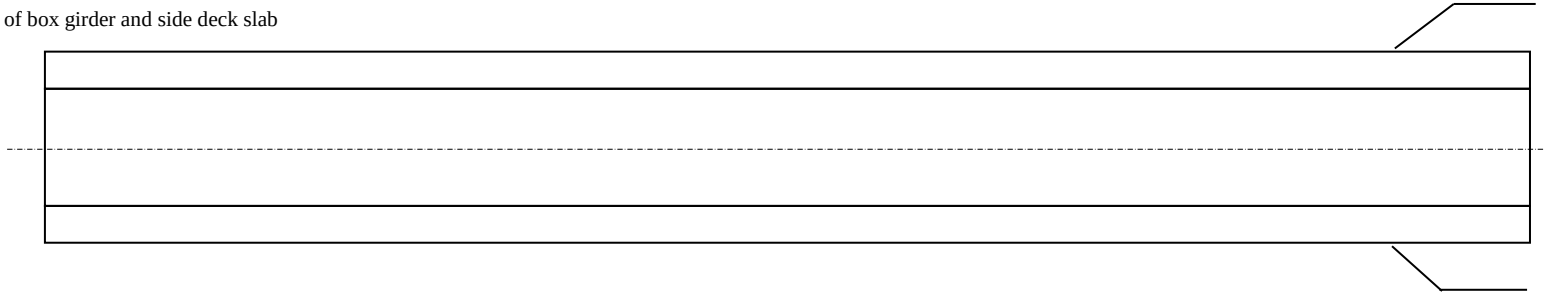
A1

P1

Box Girder and Side Deck Slab

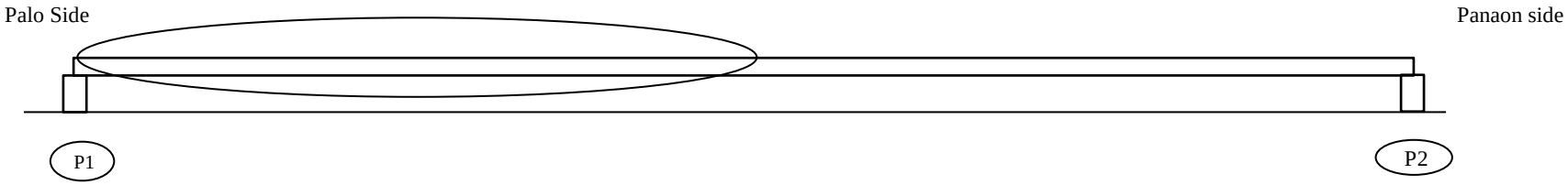
Web (Left side)

Bottom of box girder and side deck slab



Web (Right side)

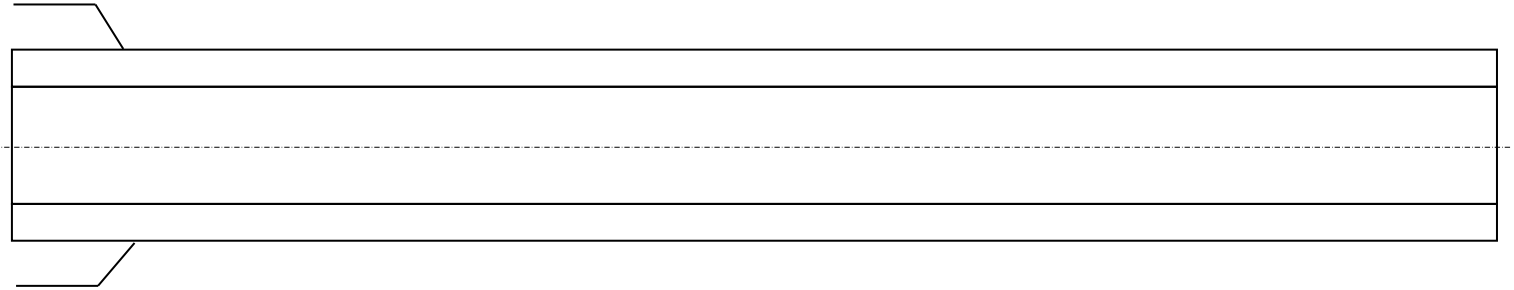
Sketch of BridgeCondition Inspection from ground level or BIV (2 of 4)
Agas-agas Bridge



Box Girder and Side Deck Slab

Web (Left side)

Bottom of box girder and side deck slab

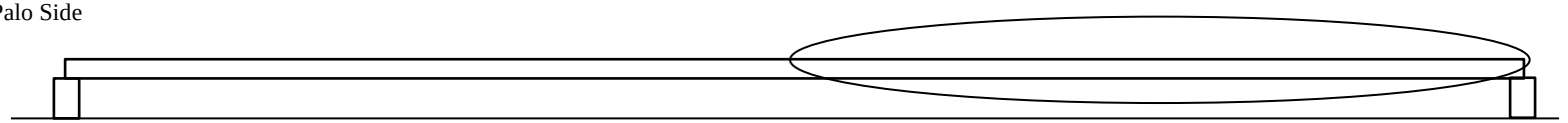


Web (Right side)

Sketch of BridgeCondition Inspection from ground level or BIV (3 of 4)
Agas-agas Bridge

Palo Side

Panaon side



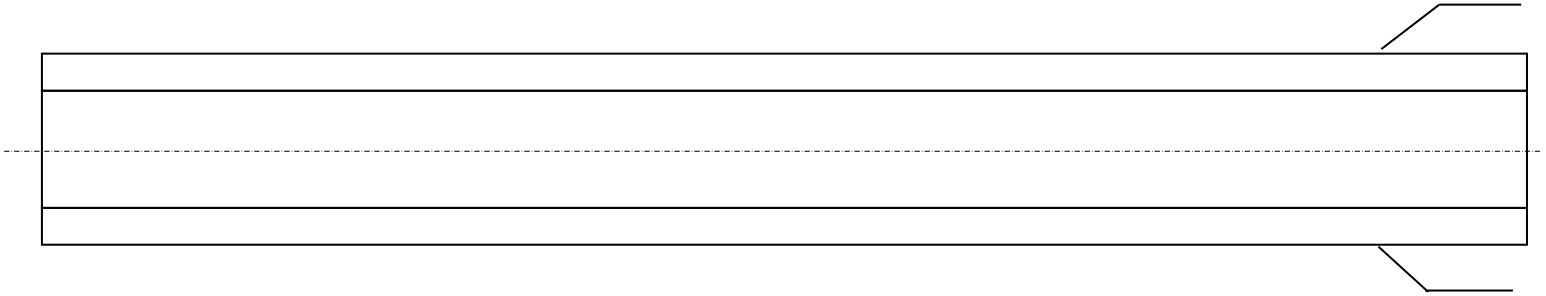
P1

P2

Box Girder and Side Deck Slab

Web (Left side)

Bottom of box girder and side deck slab

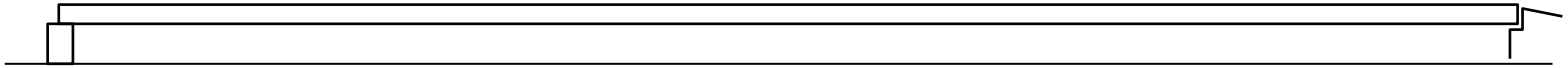


Web (Right side)

Sketch of BridgeCondition Inspection from ground level or BIV (4 of 4)
Agas-agas Bridge

Palo Side

Panaon side



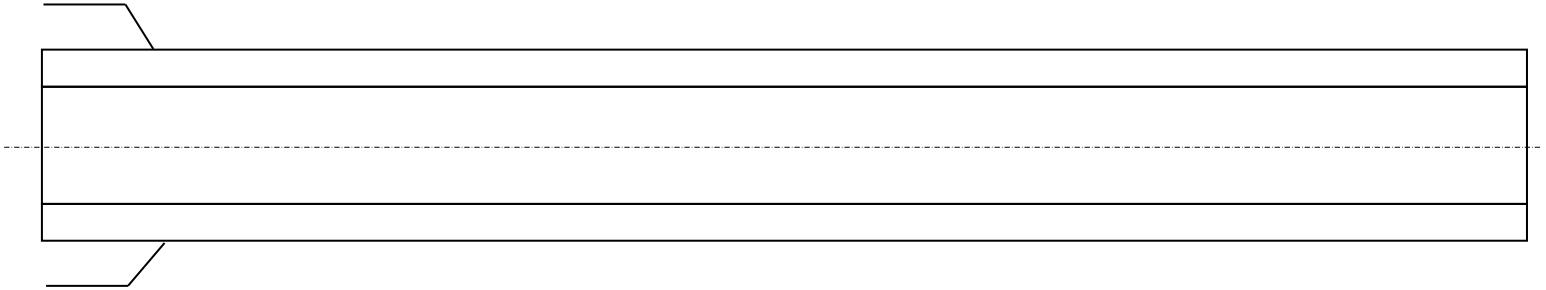
P2

A2

Box Girder and Side Deck Slab

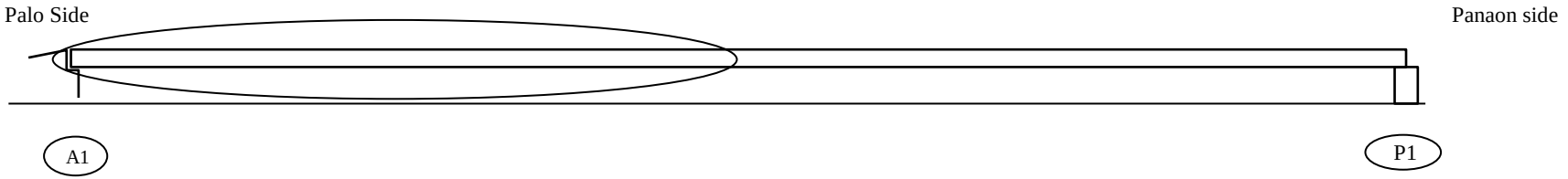
Web (Left side)

Bottom of box girder and side deck slab



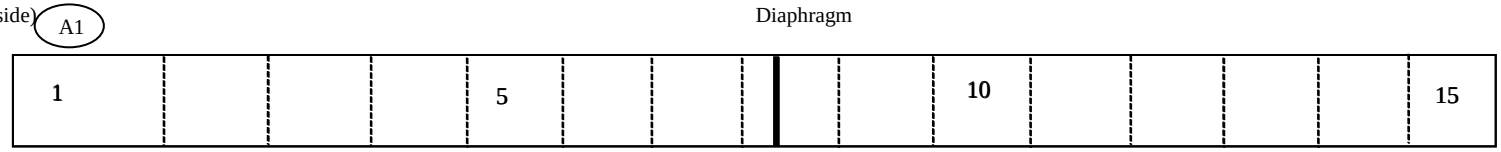
Web (Right side)

Sketch of Bridge Condition Inspection from insidebox (1 of 7)
Agas-agas Bridge

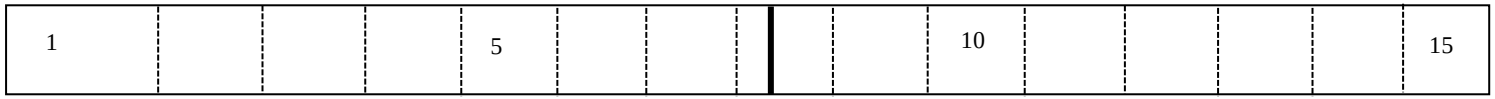


Box Girder and Side Deck Slab

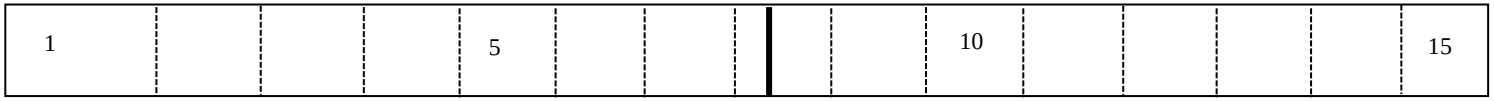
Web (Left side)



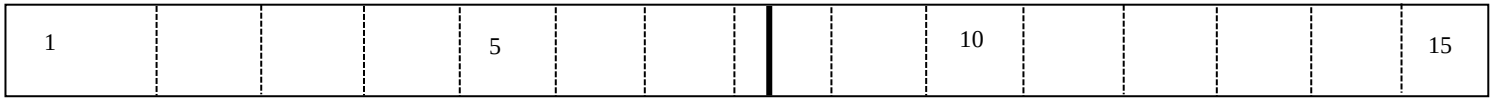
Slab



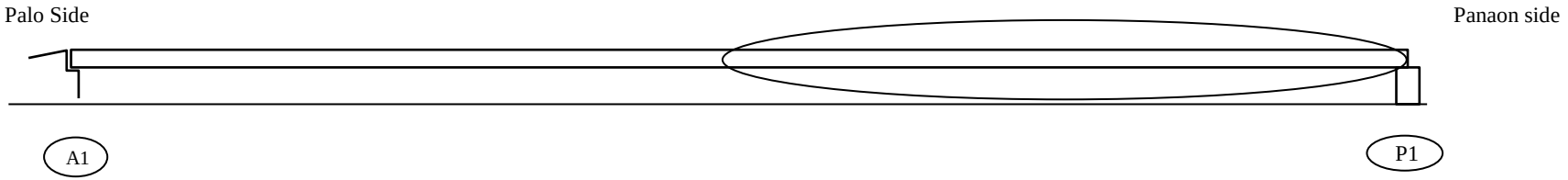
Bottom



Web (Right side)

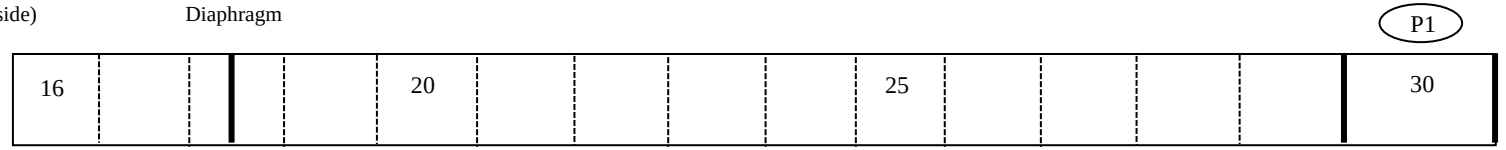


Sketch of Bridge Condition Inspection from insidebox (2 of 7)
Agas-agas Bridge



Box Girder and Side Deck Slab

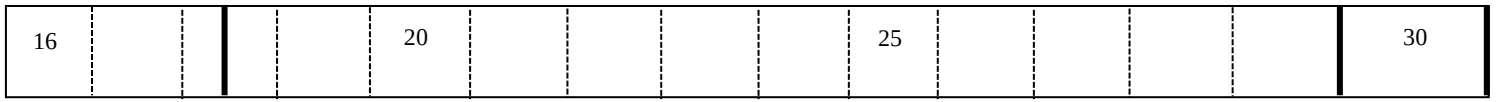
Web (Left side) Diaphragm



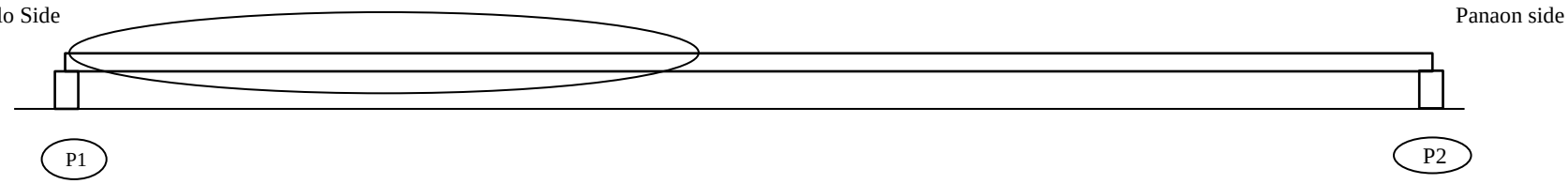
Slab

Bottom

Web (Right side)

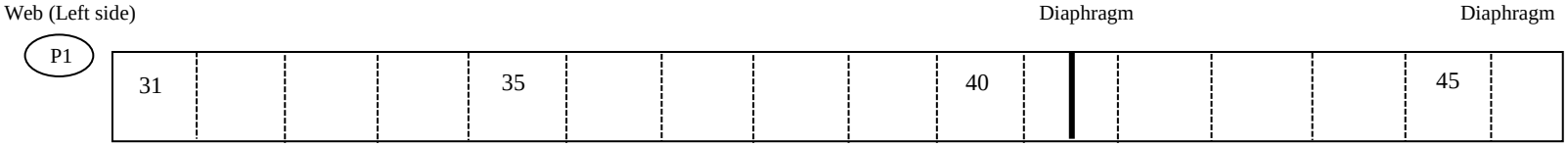


Sketch of Bridge Condition Inspection from insidebox (3 of 7)
Agas-agas Bridge

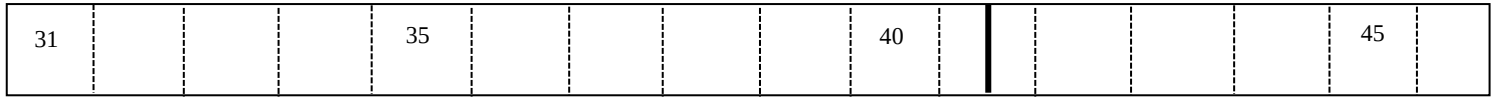


Box Girder and Side Deck Slab

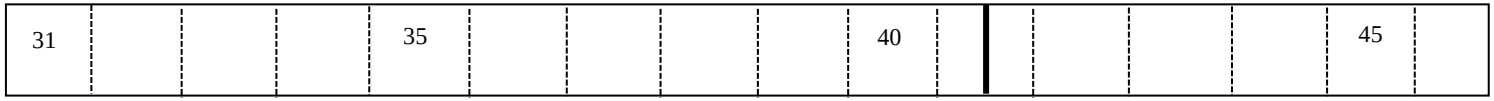
Web (Left side)



Slab

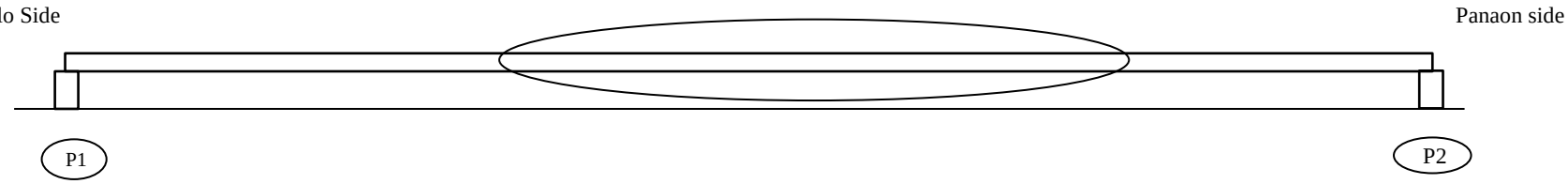


Bottom



Web (Right side)

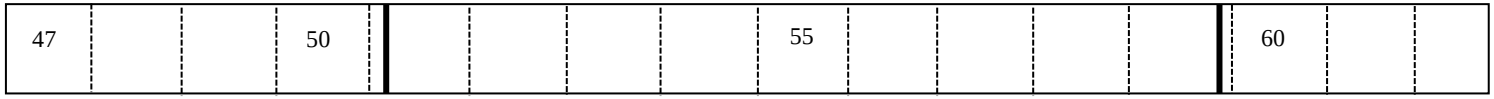
Sketch of Bridge Condition Inspection from insidebox (4 of 7)
Agas-agas Bridge



Box Girder and Side Deck Slab

Web (Left side)

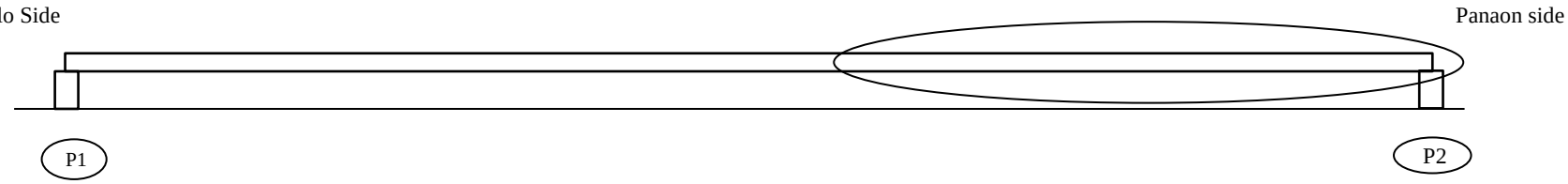
Slab



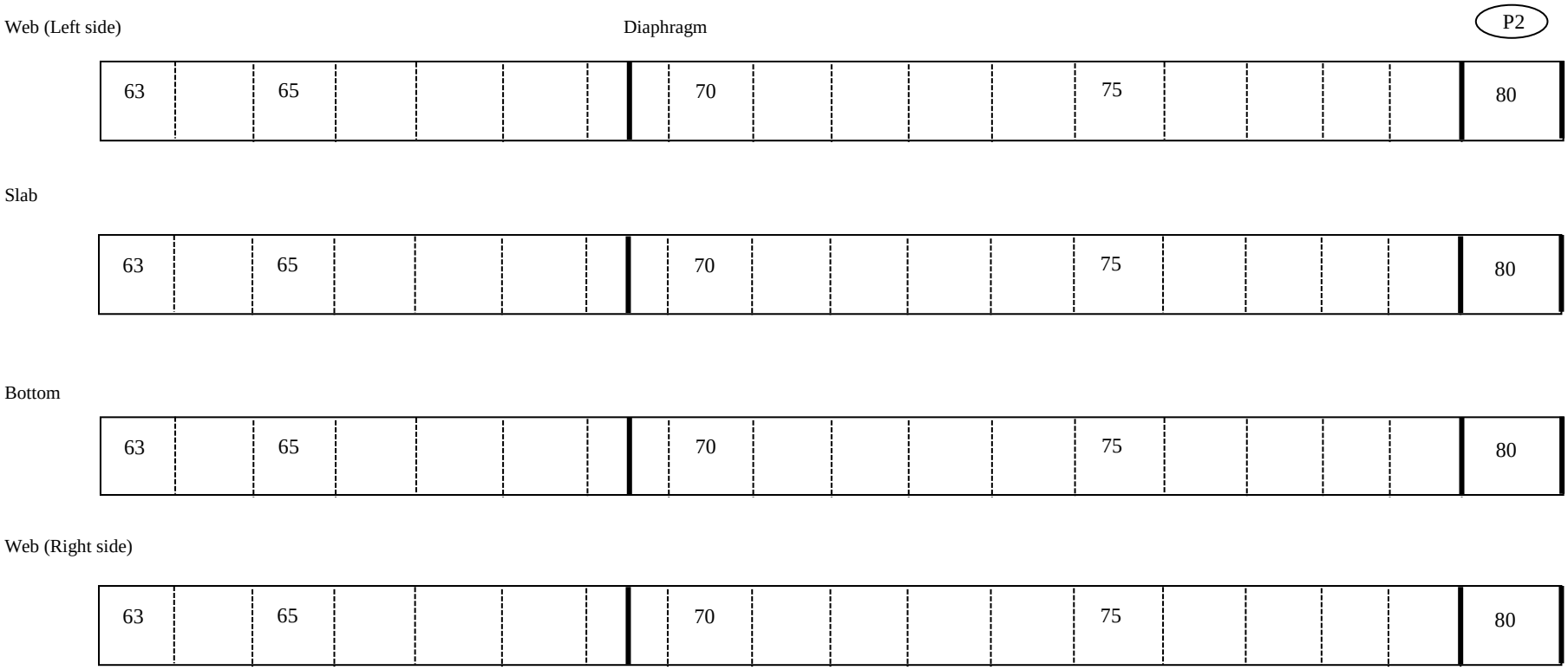
Bottom

Web (Right side)

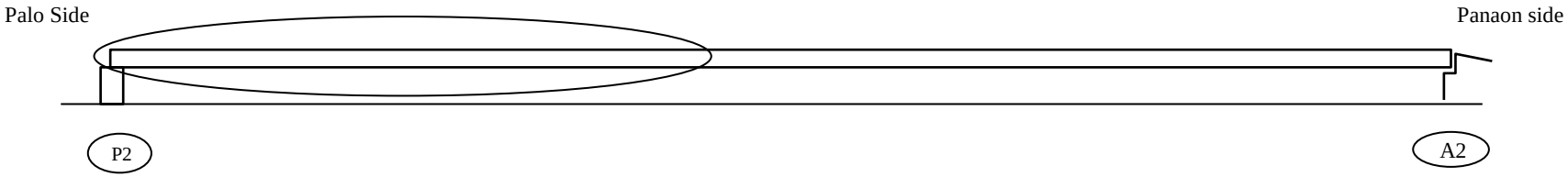
Sketch of Bridge Condition Inspection from insidebox (5 of 7)
Agas-agas Bridge



Box Girder and Side Deck Slab



Sketch of Bridge Condition Inspection from insidebox (6 of 7)
Agas-agas Bridge



Box Girder and Side Deck Slab

Web (Left side)

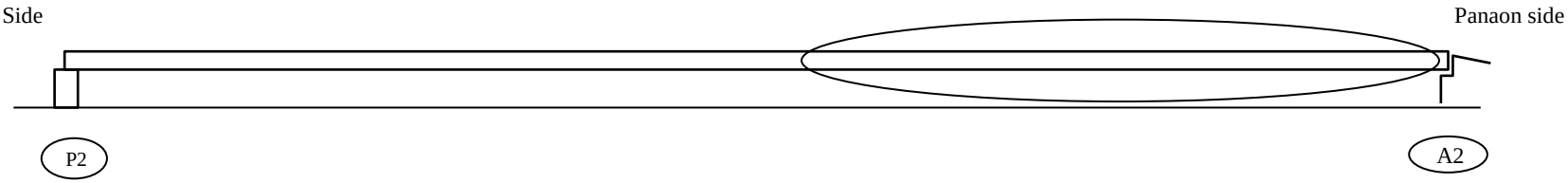
Diaphragm

Slab

Bottom

Web (Right side)

Sketch of Bridge Condition Inspection from insidebox (7 of 7)
Agas-agas Bridge



Box Girder and Side Deck Slab

Web (Left side) Diaphragm A2

Slab

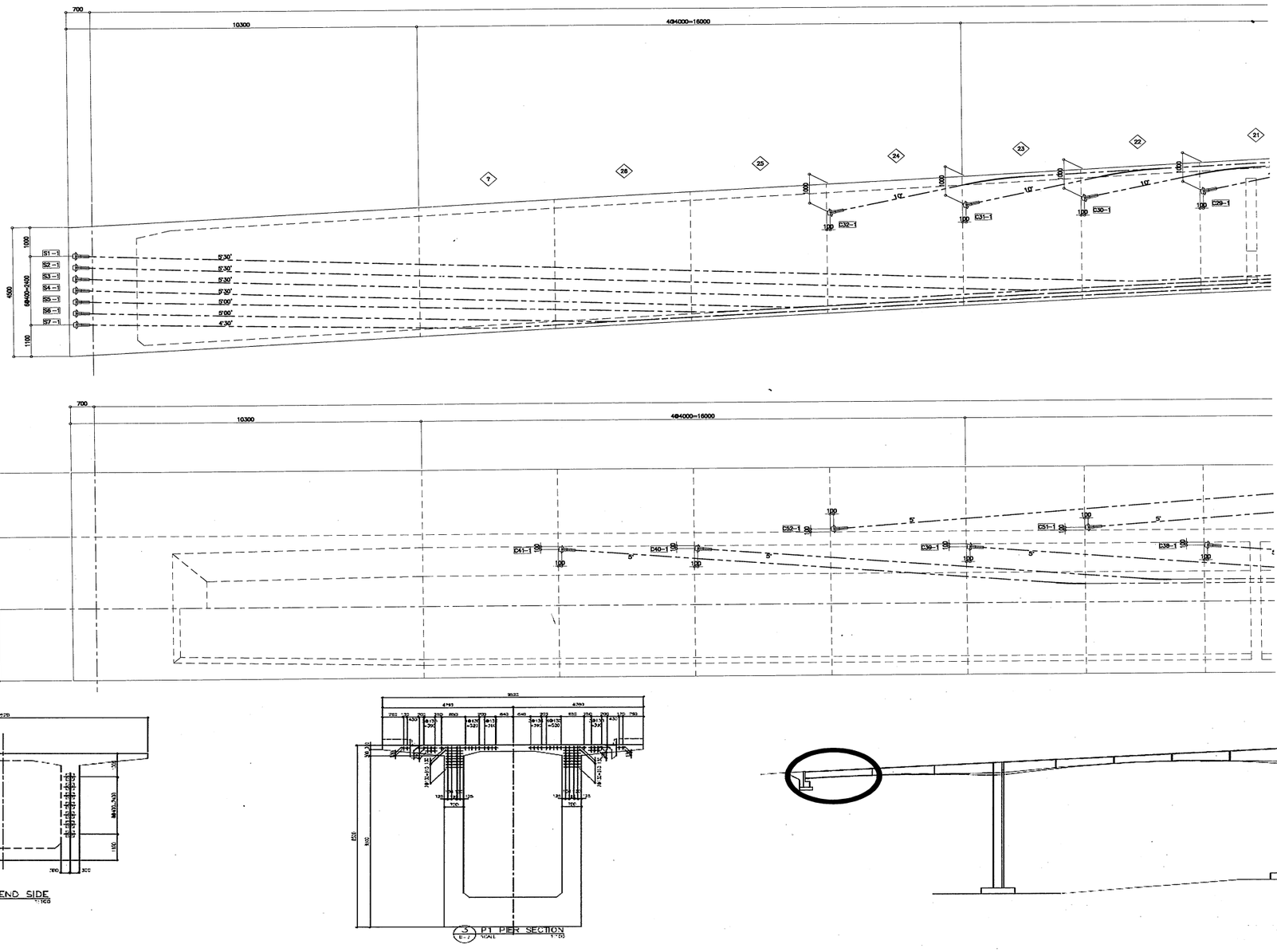
Bottom

Web (Right side)

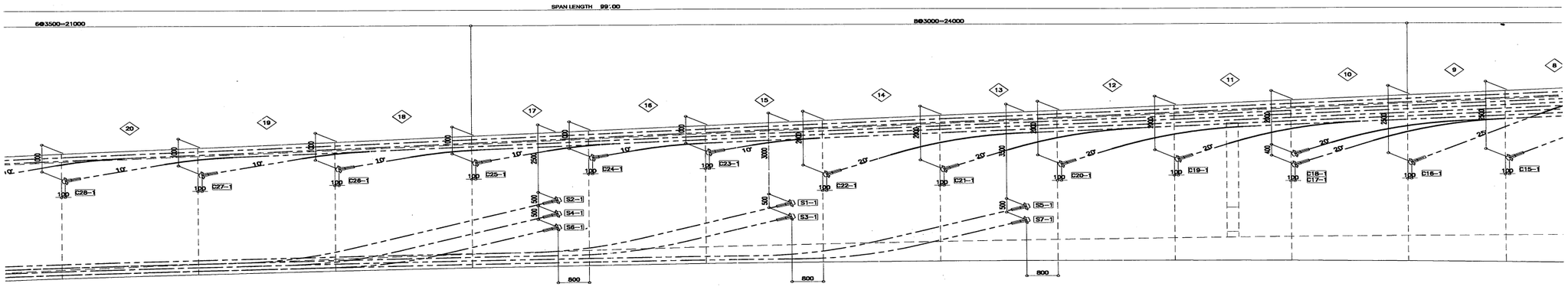
APPENDIX G

Arrangement of PC Cable

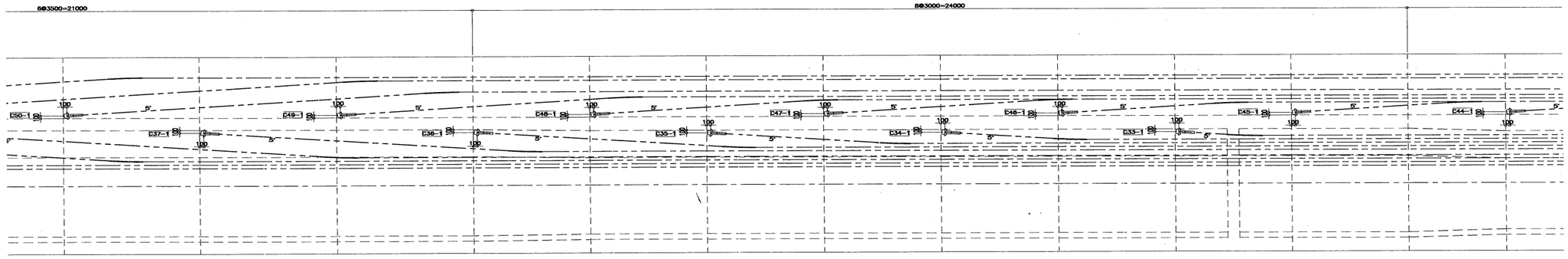
Arrangement of PC Cable
Agas-agas Bridge

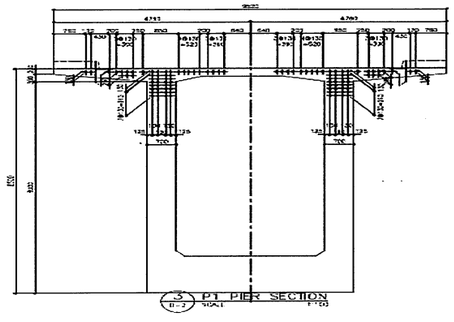


Arrangement of PC Cable
Agas-agas Bridge



2 / D-2 SIDE ELEVATION
SCALE 1:100





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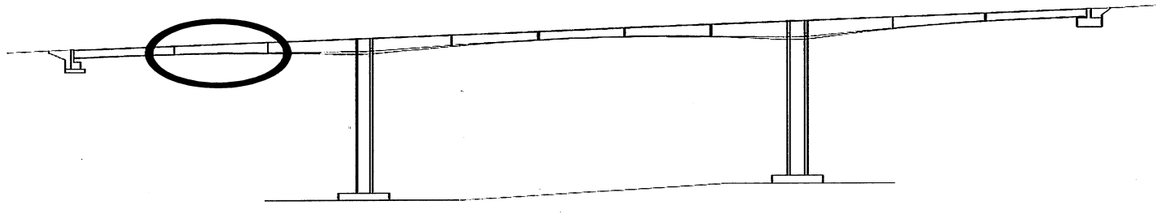
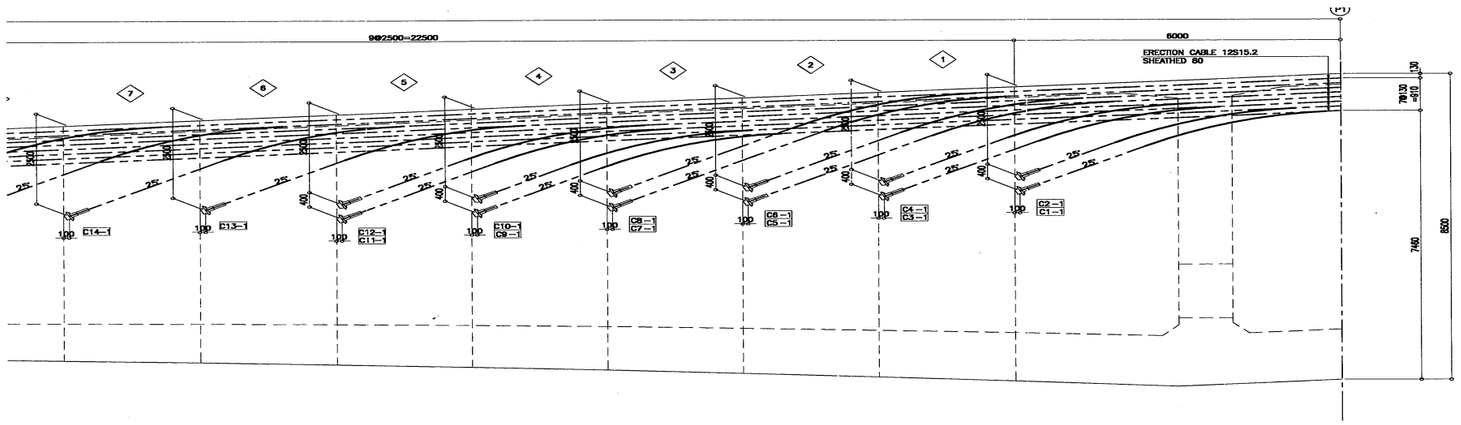
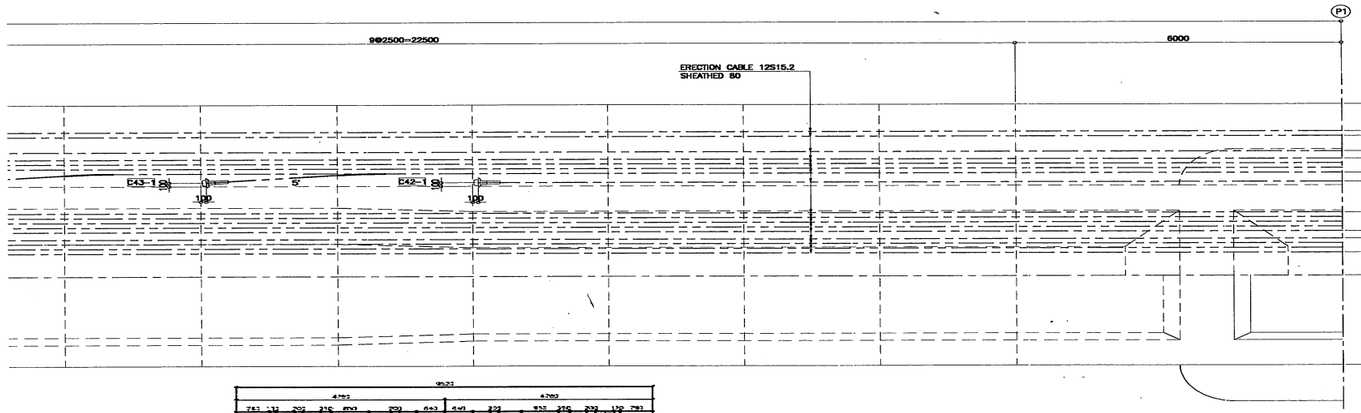
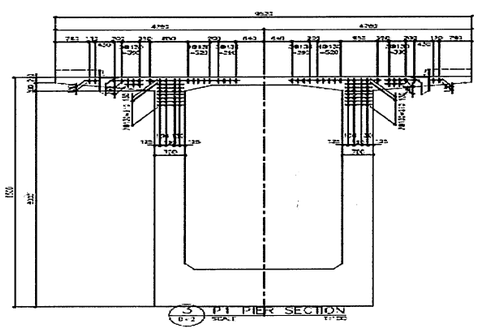
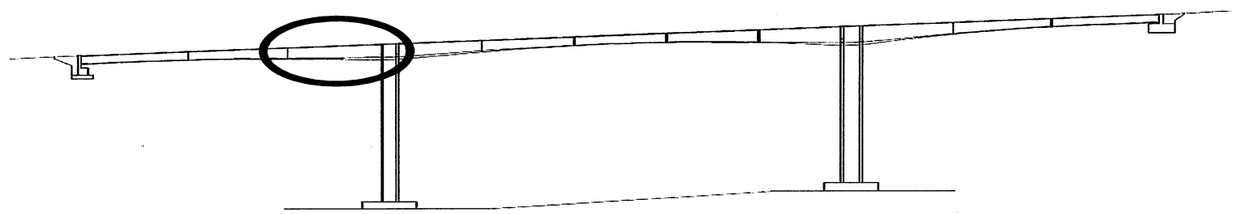


Arrangement of PC Cable
Agas-agas Bridge

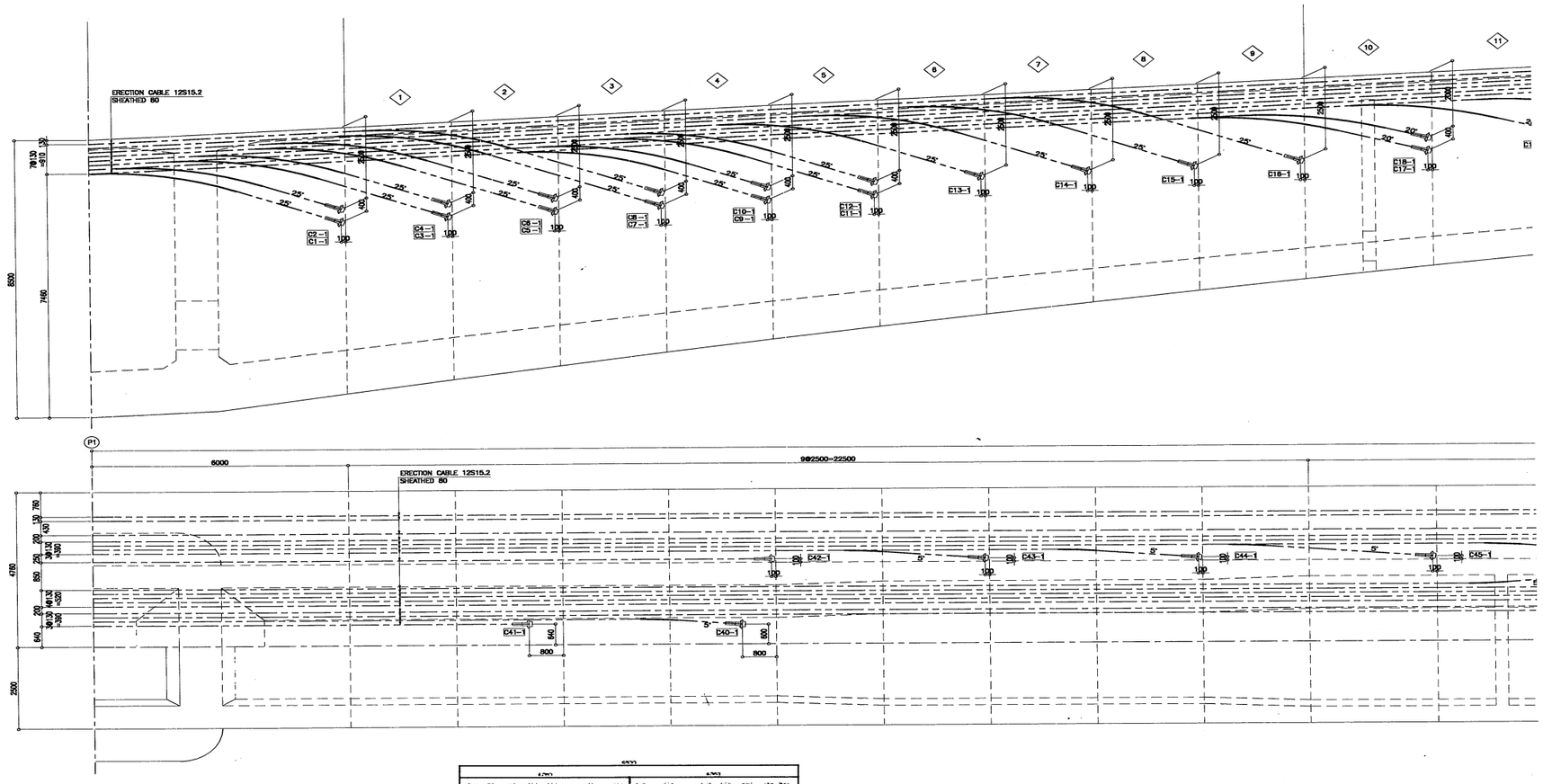


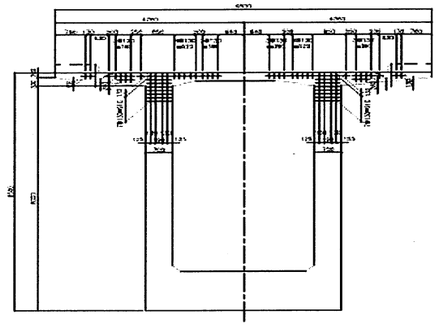


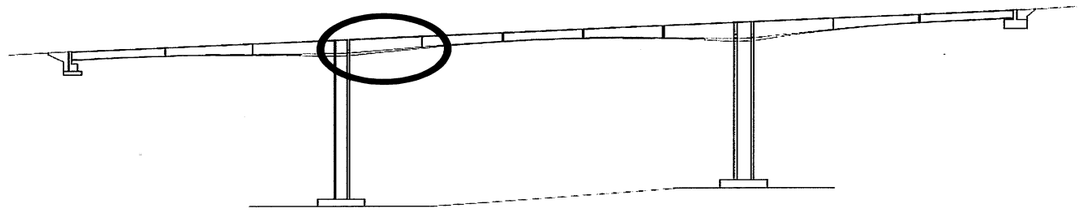




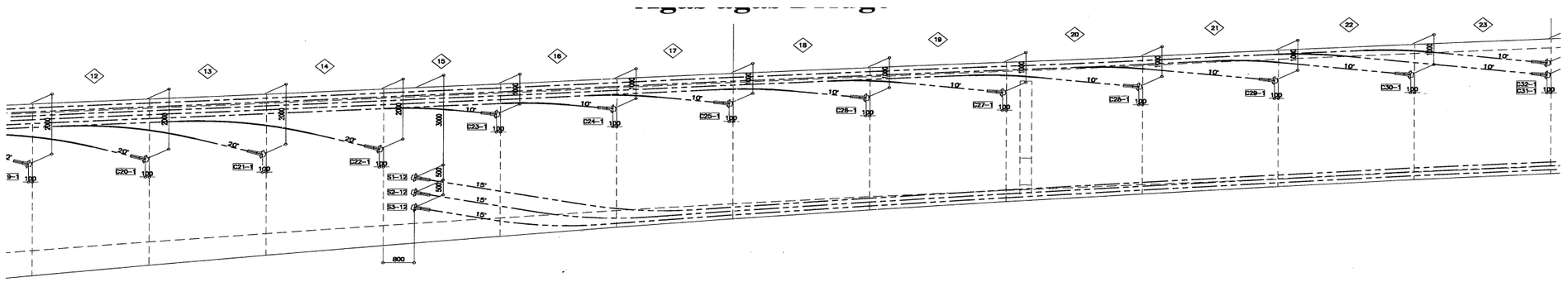
Arrangement of PC Cable
Agas-agas Bridge



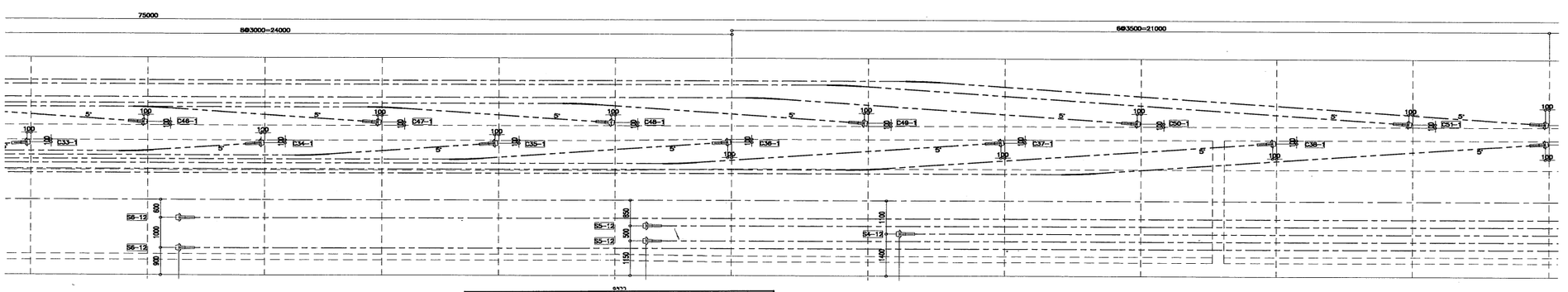


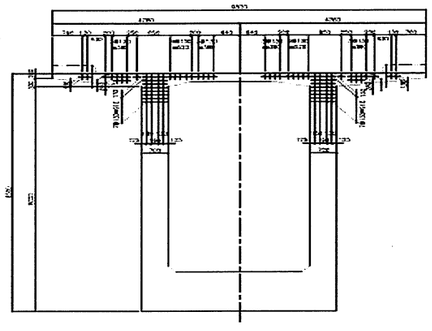


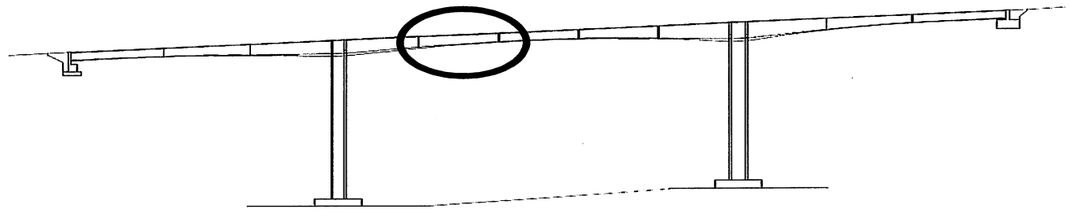
Arrangement of PC Cable
Agas-agas Bridge



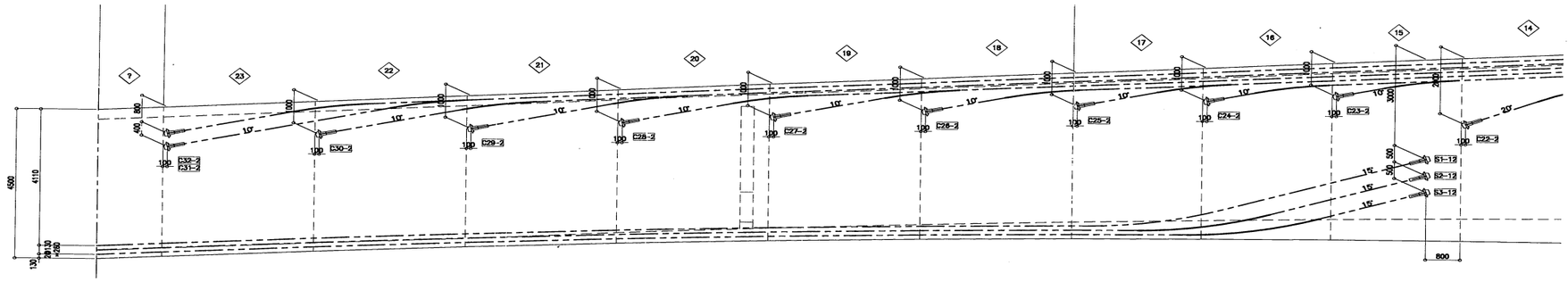
2 D–3 SIDE ELEVATION
SCALE 1:100

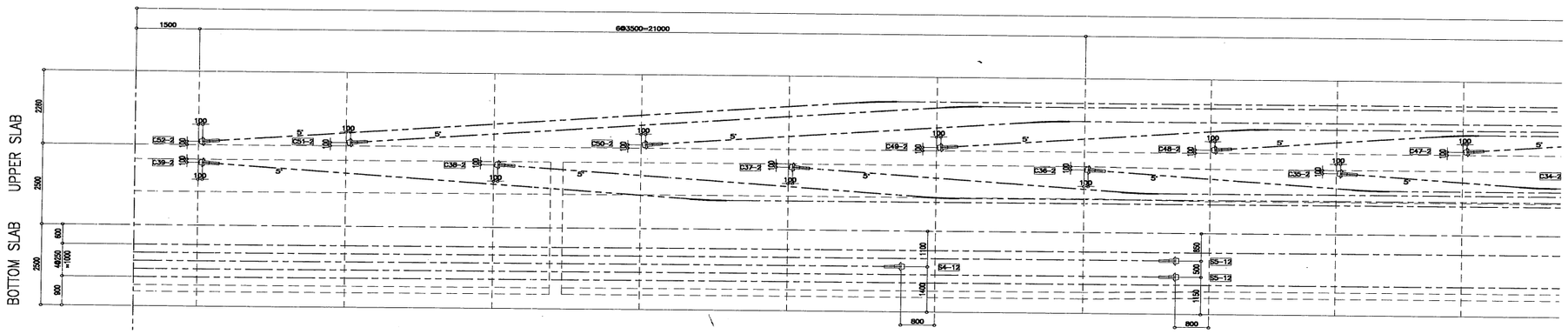


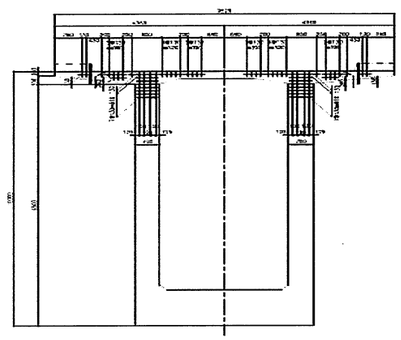


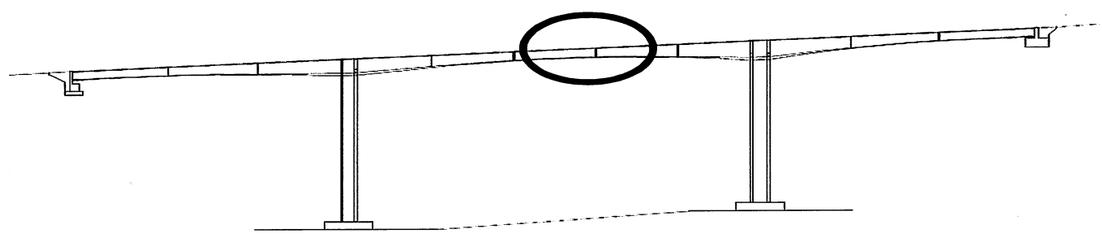


Arrangement of PC Cable
Agas-agas Bridge

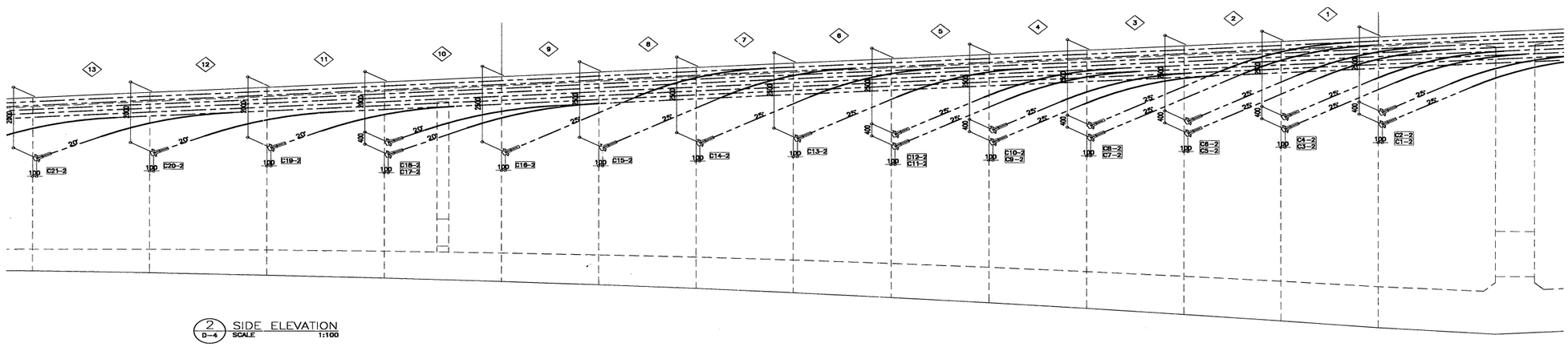




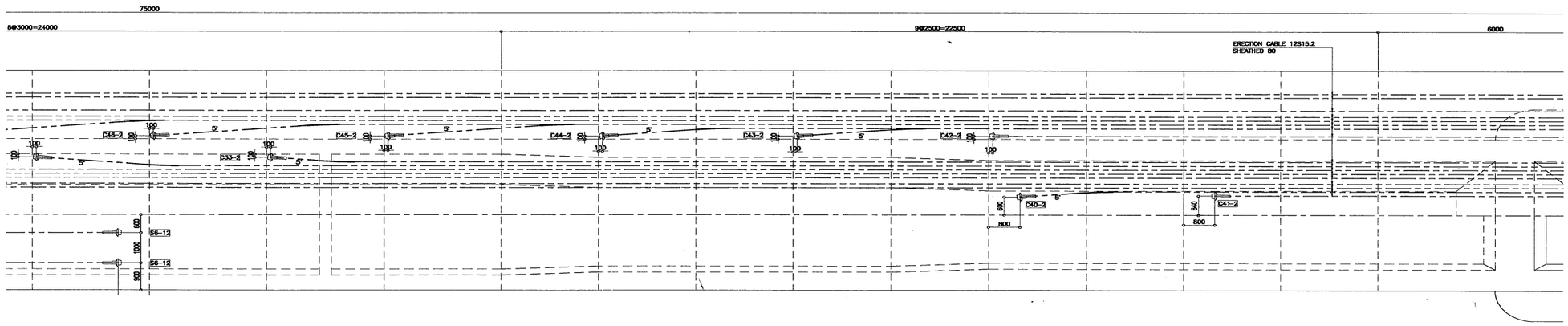


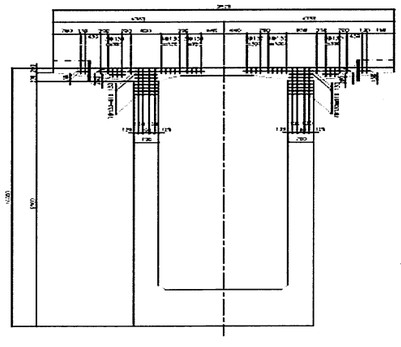


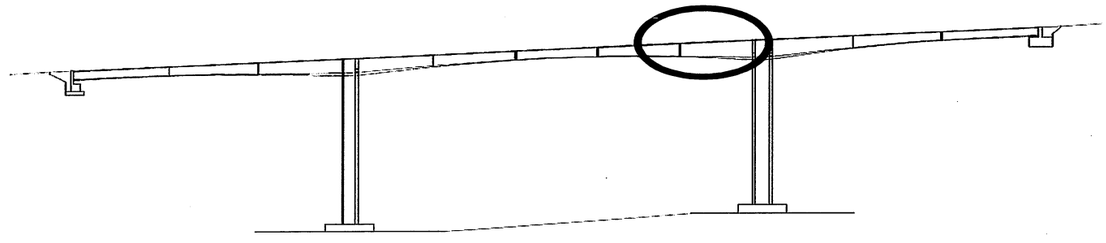
Arrangement of PC Cable
Agas-agas Bridge



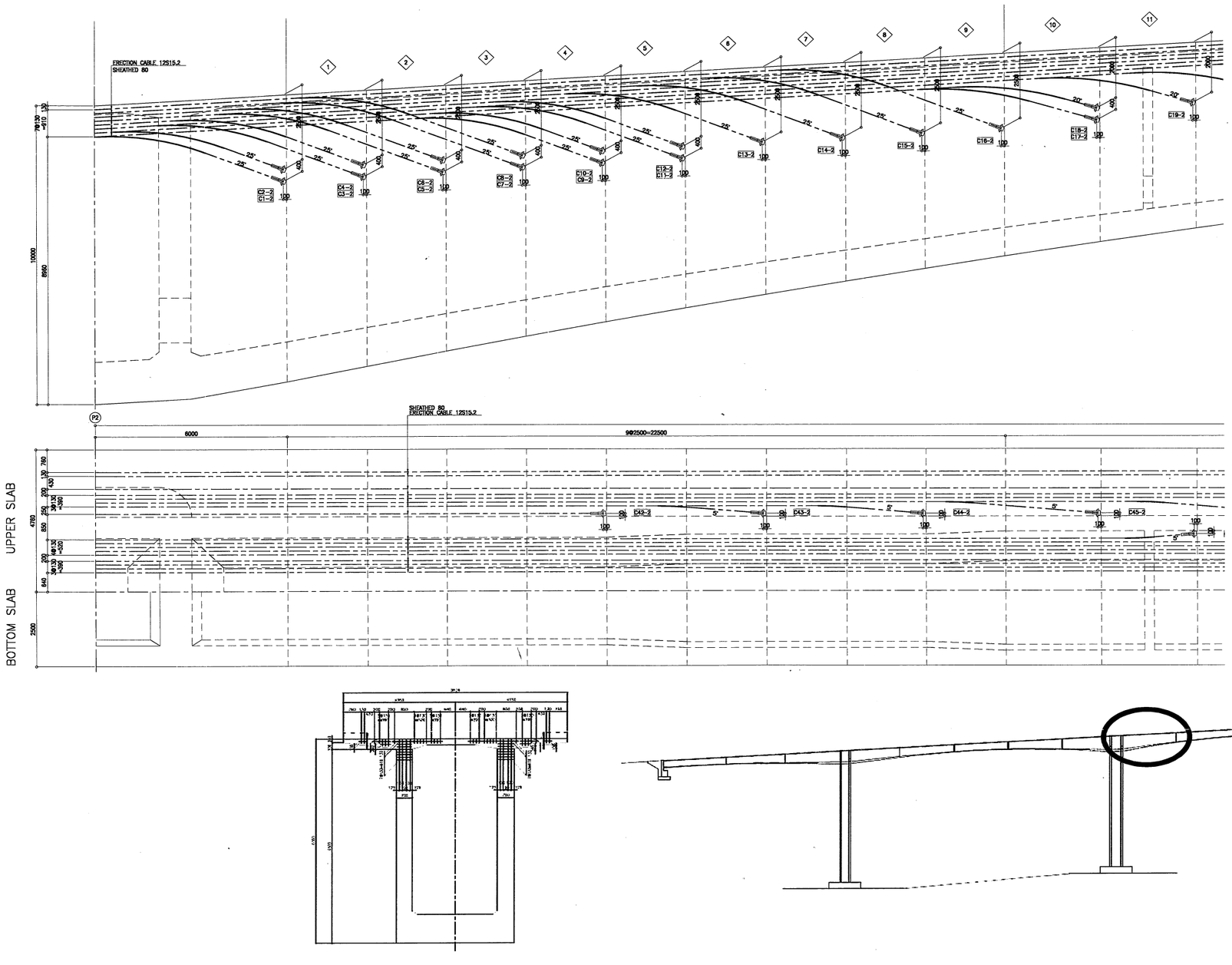
2 SIDE ELEVATION
D–4 SCALE 1:100



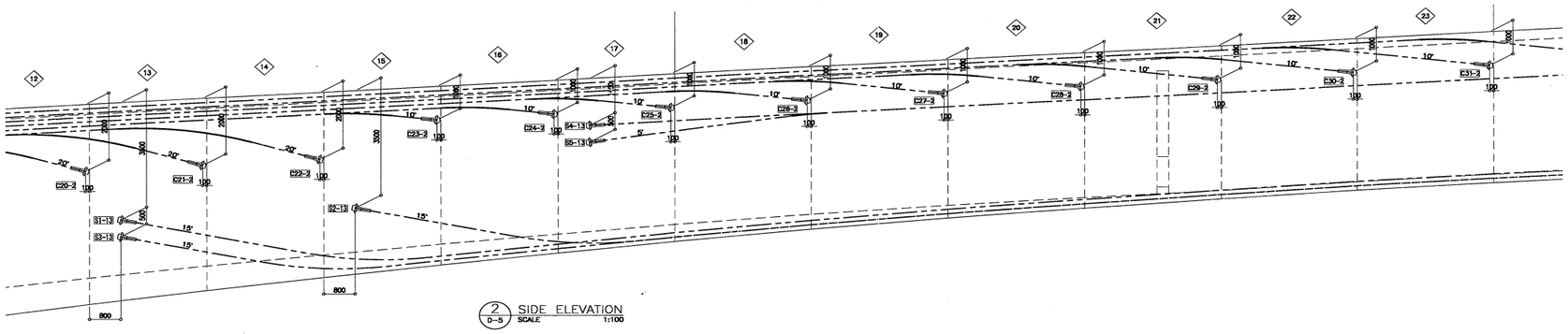




Arrangement of PC Cable
Agas-agas Bridge

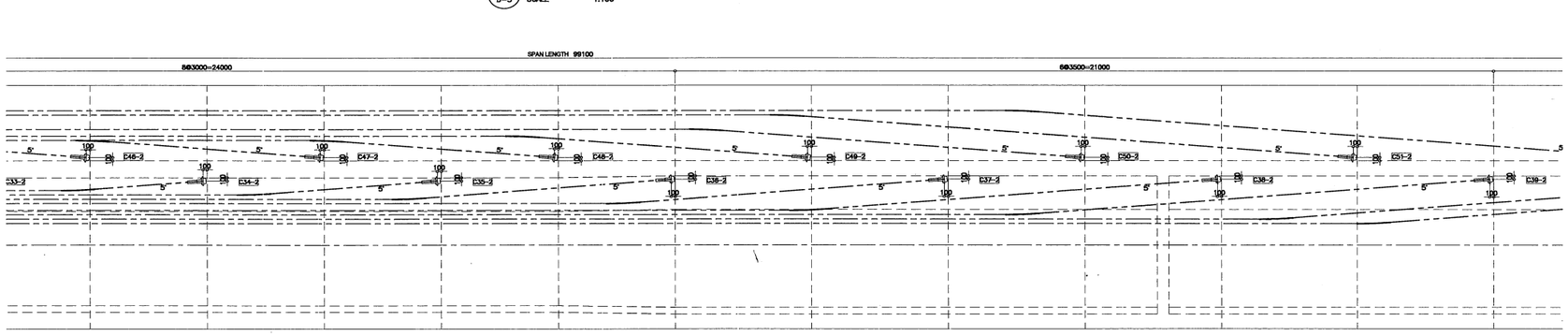


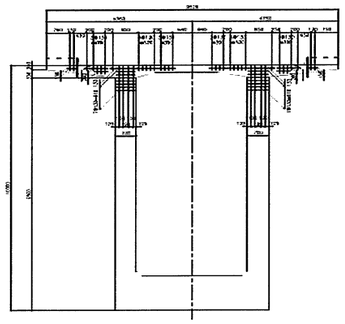
Arrangement of PC Cable
Agas-agas Bridge

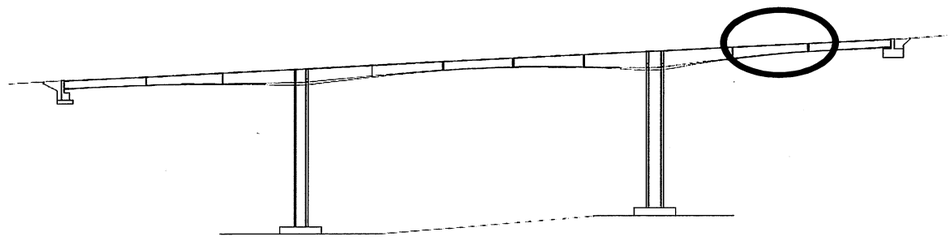


2 SIDE ELEVATION
D-5 SCALE 1:100

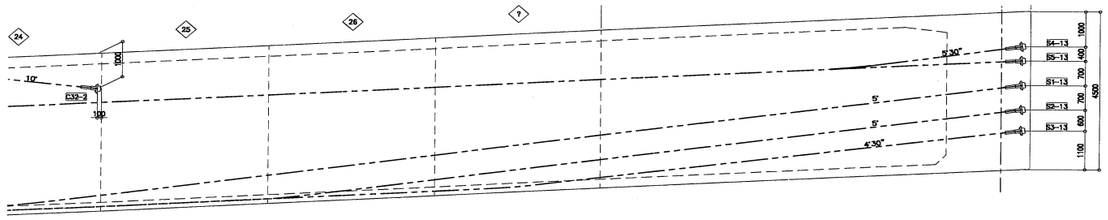
1 P L A N
D-5 SCALE 1:100

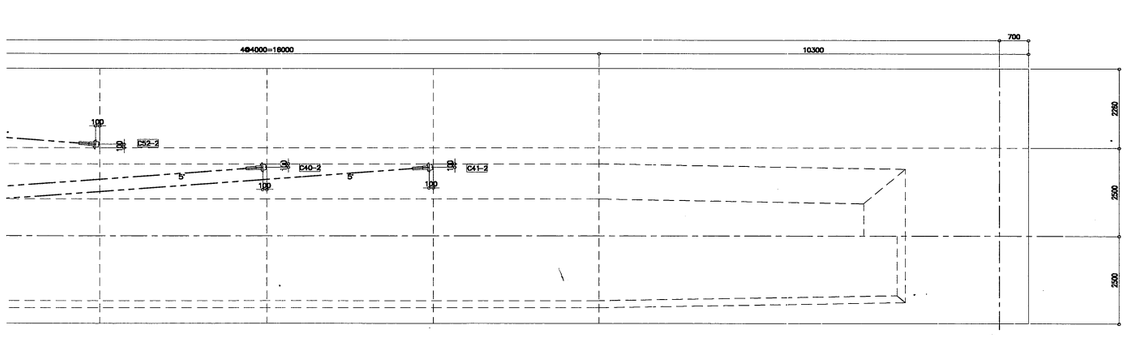


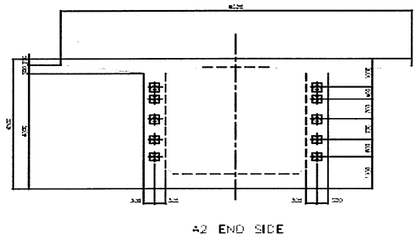


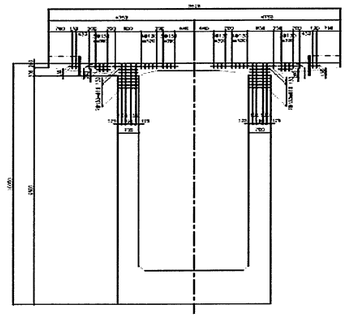


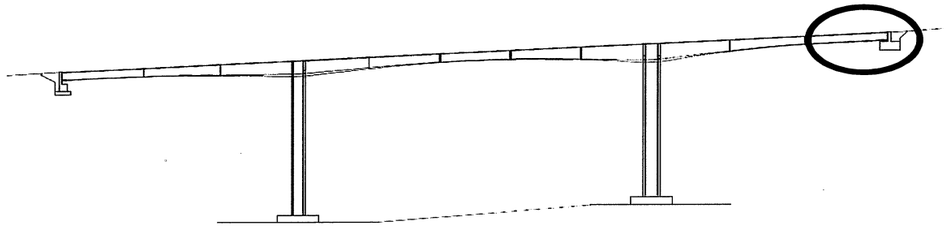
Arrangement of PC Cable
Agas-agas Bridge











APPENDIX H

Additional Material Defects on Special Bridge

Appendix H

Additional Material Defects on Special Bridge

1. GENERAL

This appendix describes the defects that are normally found in Asphalt Wearing Surface. Each defect is described and the causes producing it are identified.

2. ASPHALT WEARING SURFACE

The asphalt wearing surface is the surface on which vehicle traffic and pedestrian travel. Agas-agas Bridge adopts 40 mm thickness Dense Graded Bituminous Concrete Asphalt. Asphalt wearing surface plays an important role to protect the deck slab.

Defects on asphalt wearing surface are often due to poor composition of asphalt, lack of quality control, improper application procedure, and/or destructive/harsh environment.

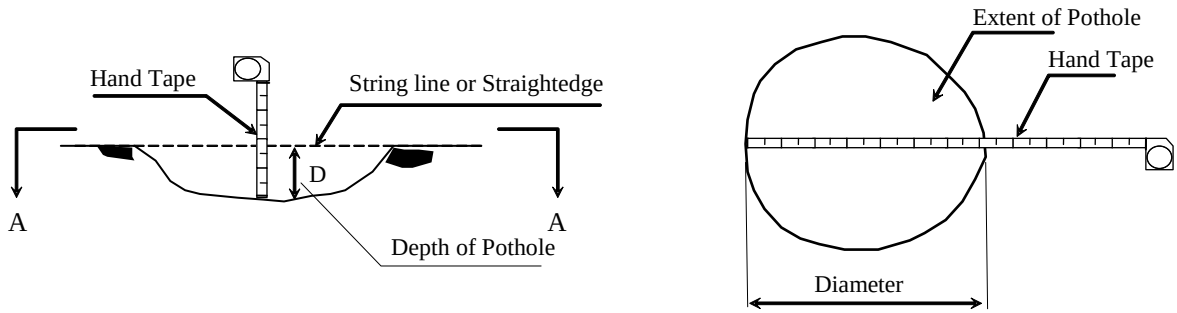
The following defects commonly found on Asphalt Wearing Surface are as follows:

- Potholes
- Shoving
- Rutting
- Cracking
- Raveling

2.1. Potholes

Potholes are bowl-shaped holes in the pavement caused by the penetration of water through the pavement due to heavy rains and breaking up of the pavement due to subsequent traffic action. Pavements already deteriorated with defects such as alligator cracking and raveling are prone to the occurrence of potholes.

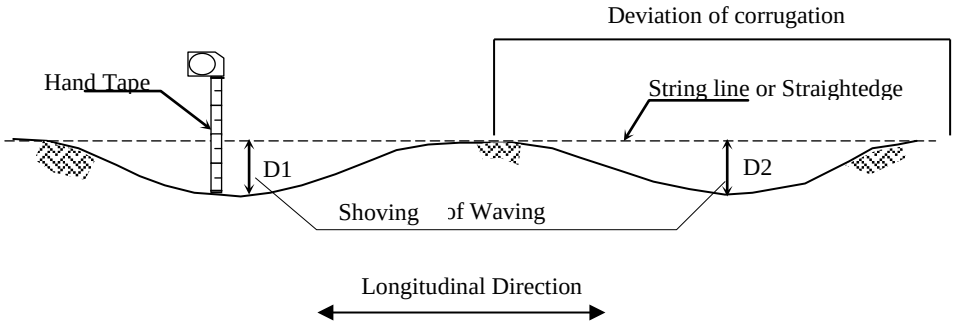
Figure H-1
Method of Measuring Potholes



2.2. Shoving

Shoving is defined as the unevenness of the roughness on the carriageway surface along the longitudinal direction of the road. This deformation, as it progresses, will lead to an increasingly severe impact loading under traffic, particularly at joints. It is usually the result of the combined effects of traffic and warm weather. Blisters are formed in the surface during warm weather while traffic normally prevents them from rising.

Figure H-2
Measurement of Waving Depth and Corrugation

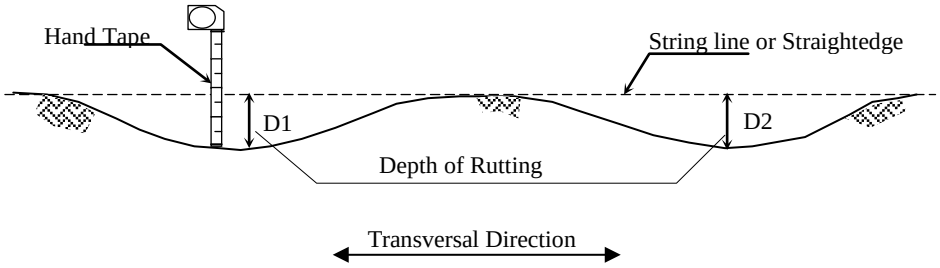


2.3. Rutting

Rutting is defined as the unevenness on the carriageway surface in the transverse direction of the road. This deformation is caused by continuous heavy wheel loads passing along the carriageway in the longitudinal direction.

Rutting progresses rapidly in warm weather and does indicate failure of the surfacing materials. The main effect is that it prevents water to drain from the carriageway and in some severe cases, prevent vehicles from leaving the rut affected depressed areas, causing a temporary loss of control on the vehicle. In some instances, the combined effect with rain makes braking extremely difficult with a strong possibility of the vehicle aquaplaning.

Figure H-3
Measurement of Rutting Depth



2.4. Cracking

A crack is a linear fracture extending partially or completely through the pavement. Cracking in pavements may be caused by any or a combination of the following factors: the action of vehicular wheel loading, poor quality of material, compaction, placement and drainage. It also includes temperature susceptibility of the asphalt cement binder and reflection cracks, due to the extension of cracks on the surface below the pavement.

Cracks are distinguished by its appearance and direction. The following types of cracks are commonly observed on the pavement surface:

- Longitudinal
- Transverse
- Alligator

Longitudinal cracks are roughly parallel to the direction of the traffic and may be situated at or near the center of the wheel tracks, centerline of roadway, mid-lane or along pavement edges.

Transverse cracks are approximately at to the pavement centerline and may extend partially or completely across the pavement.

Alligator cracks form a network of multi-sided polygons or blocks resembling the skin of an alligator. The block sizes typically range from 50mm to 500mm. They may occur anywhere in the pavement surface and may be accompanied by depressions in the surface. For this type of crack, the Condition Rating such as the severity of defect and condition state will be determined only by measuring its area.

2.5. Raveling

Raveling is one of the abrasions of Bituminous Pavements. It is defined as the loss of the wearing surface exposing the aggregates. Rough surface is caused by the segregation of course aggregates from the mixture.

APPENDIX I

Condition Rating Criteria on Special Bridge

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

BRIDGE CONDITION RATING CRITERIA

BRIDGE ELEMENT	**SPAN**	BRIDGE ATTRIBUTE	**ASPHALT WEARING SURFACE**

MATERIAL TYPE	COND. STATE	GENERAL CONDITION	SEVERITY OF DEFECT	
			TYPE OF DAMAGE	CONDITION
Asphalt	**0 - Good**	The pavement is generally in good condition.	1 Potholes	Slight and shallow potholes or no damage
			2 Waving	< 10mm in depth or no damage/defects
			3 Rutting	< 10mm in depth or no damage/defects
			4 Cracking	If alligator cracks area measuring <= 5% or no crack
			5 Raveling	< 10mm in depth or no damage/defects
	1 - Fair	Minor damage in area, depth and numbers of potholes, unevenness, rutting and cracking which reduces the pavement function and durability.	1 Potholes	Holes measuring < 200mm in any direction or 10mm - 30mm in depth
			2 Waving	10mm - 20mm in depth and corrugation < 30mm in deviation
			3 Rutting	10mm - 20mm in depth
			4 Cracking	If alligator cracks area measuring > 5% to < 10%
			5 Raveling	10mm - 20mm in depth
	2 - Poor	Severe damage in area, depth and numbers of potholes, unevenness, rutting and cracking which causes hindrance for smooth traffic, pavement function and durability.	1 Potholes	Holes measuring 200mm-400mm in any direction or 30mm-50mm in depth
			2 Waving	20mm - 30mm in depth and corrugation > 30mm in deviation
			3 Rutting	20mm - 30mm in depth
			4 Cracking	If alligator cracks area measuring > 10% to < 20%
			5 Raveling	20mm - 30mm in depth
	3 - Bad	Very severe damage in area, depth and numbers of potholes, unevenness, rutting and cracking which causes total hindrance for smooth traffic, pavement function and durability.	1 Potholes	Holes measuring > 400mm in any direction or > 50mm in depth
			2 Waving	> 30mm in depth
			3 Rutting	> 30mm in depth
			4 Cracking	If alligator cracks area measuring > 20%
			5 Raveling	> 30mm in depth

APPENDIX J

Inventory Inspection Form

Department of Public Works and Highways

INVENTORY INSPECTION FORM (TYPE 5)

LOCATION

BRIDGE ID	B00622LT
Bridge Name	Agas-agas Bridge
Road Name	Tacloban-Liloan Road
Road ID	
Section ID	
Location	Mahaplang-Sogod

Region	VIII
Province	So. Leyte
Congressional District	
Engineering District	SLED DEO
Municipality	
Barangay	
River Name	Agas-agas

Date of Field Inspection	

Total No. of Span: **3**

Total No. of Abutment: **2**

Total No. of Pier: **2**

Accomplished by:	**Submitted by:**

Insert Name, Position, Signature and Date of Signing
Initial all other pages

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

INVENTORY

SPECIAL INSPECTION REQUIREMENTS

Boat	
Bridge inspection vehicle	X
Ladder	X
Binoculars	X
Safety Belt / Harness	X
Geologist Hammer	X
Oxygen meter	X
Camera	X
Hard Hat with Headlight	X
Other (meter tape, safety shoes, gloves, total station)	X
None	
Note any unusual requirements:	

Up to three (3) options may be selected.

TYPE OF BRIDGE

Standard Bridge	
Special Bridge	X

Special bridges are major or complex bridges and require additional inventory information outside the RBIA.

GENERAL BRIDGE TYPE

☒ Concrete ☐ Steel ☐ Bailey ☐ Timber

GENERAL BRIDGE DATA

Posted load limit?		Yes	
		No	
If yes, give limit (tons)			
Height clearance?	Over (bridge structure over), (m)	Yes	
		No	X
If yes, give clearances (m)	Under (road under bridge), (m)	Yes	
		No	X
Maximum bridge height (m)			

NAVIGATION CLEARANCES

Horizontal, (m)	
Vertical, (m)	

BRIDGE GEOMETRY

Overall length, (m)		**350.00**
Overall width, (m)		**9.52**
Number of lanes		**2**
Number of spans		**3**
Width of carriageway, (m)		
Width of island(s), (m)		
Width of shoulder, (m)	Left	
	Right	
Sidewalk width, (m)	Left	
	Right	

TRAFFIC DIRECTION

Two way	X
One way in direction of increasing chainage	
One way in direction of decreasing chainage	

Bridge ID	B00622LT	**Bridge Name**	Agas-agas Bridge

YEAR OF CONSTRUCTION OF BRIDGE

Year of construction	Year known	
	Spanish era (1600-1899)	
	American era (1899-1941)	
	Japanese era (1941-1945)	
	1945 – 1970	
	Post 1970	**X**
Insert year if known	**2009**	

END OF WARRANTY PERIOD

Insert year of end of warranty period	

PUBLIC UTILITIES CARRIED

Utility Identification No.	1	2	3	4	5	6
Electricity						
Gas						
Telephone						
Oil, fuel						
Water						
Sewage						
Other						

PUBLIC UTILITIES DETAIL

Description for each utility, listed by Utility Identification No.

1.	LHS	
	Under	
	RHS	
	Other	
2.	LHS	
	Under	
	RHS	
	Other	
3.	LHS	
	Under	
	RHS	
	Other	
4.	LHS	
	Under	
	RHS	
	Other	
5.	LHS	
	Under	
	RHS	
	Other	
6.	LHS	
	Under	
	RHS	
	Other	

LIGHTING TO BRIDGE

Yes	**X**	No	

INTERVAL OF LIGHT POLES

Left, (m)	
Right, (m)	

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

TERRAIN CROSSED

Sea (exposed)	
Estuary (salt water)	
River or waterway (fresh water)	
Canal	
Railway	
Road	
Open ground	X
Swamp	
Other	

Up to three (3) types of terrain may be selected.

BRIDGE COMMENTS

BRIDGE TYPE OF CONSTRUCTION

Type of Construction Identification No.	1	2	3
Girder			
Box girder	X	X	X
Slab			
Voided slab			
Demountable (Bailey type)			
Truss			
Trestle			
Cable stayed			
Suspension			
Arch			
Portal frame			
Other structure	X	X	X
Spillway/Overflow			

Most structures are of only one type of construction.
Some bridges are of more than one type of construction; these shall be listed in order of importance.

MAIN MEMBER MATERIAL

Type of Construction Identification No.	1	2	3
Timber			
Steel			
Concrete	X	X	X
Masonry			
Other			

SUBSTRUCTURE TYPE

Concrete	X
Steel	
Masonry	
Gabion	
Timber	
Other	
Not known	

DECK MATERIAL

Timber	
Steel	
Concrete	X
Masonry	
Other	

DECK WEARING SURFACE

Asphaltic concrete	X
Other	
None	

DECK DRAINAGE

Scuppers through deck	
Piped drainage	X
Other	
None	

DESIGN LOAD

Available?	Yes	
	No	
If yes, insert as:	Not known	X

% of MS18

DESIGN DRAWINGS

Available?	Yes	
	No	
	Not known	X

If yes, insert location

AS-BUILT DRAWINGS

Available?	Yes	X
	No	
	Not known	

If yes, insert location

Regional Office VIII, Planning Division

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

BRIDGE MODIFICATION SHEET

MODIFICATION TYPE

Bridge widened?	Yes	
If yes, complete below	No	X
Year of widening		
Bridge strengthened?	Yes	
If yes, complete below	No	X
Year of strengthening		
Bridge retrofitted?	Yes	
If yes, complete below	No	X
Year of seismic retrofitting		
Bridge lengthened?	Yes	
If yes, complete below	No	X
Year of lengthening		

SUPERSTRUCTURE WIDENING FORM

Widened left side	
Widened right side	
Widened both sides	

SUPERSTRUCTURE WIDENING DETAIL

Same detail/material as existing bridge	
Same detail/modified material	
Different details	

SUPERSTRUCTURE WIDENING TYPE

Cantilever box girder	
Girder	
Box girder	
Slab	
Voided slab	
Demountable (Bailey type)	
Truss	
Trestle	
Cable stayed	
Suspension	
Arch	
Portal frame	
Other structure	

SUPERSTRUCTURE WIDENING MATERIAL

Timber	
Steel	
Concrete	
Masonry	
Other	

TYPE OF PIER WIDENING

Widening original piers	
Bored pile bents	
Driven pile bents	
Coping widening	
Other	

TYPE OF ABUTMENT WIDENING

Widening original abutments	
Bored pile bents	
Driven pile bents	
Coping widening	
Other	

PIER/ABUTMENT WIDENING MATERIAL

Timber	
Steel	
Concrete	
Masonry	
Other	

TYPE OF STRENGTHENING

Main member reinforcement	
Deck reinforcement	
Additional piers	
Substructure reinforcement	
Other	

TYPE OF SEISMIC RETROFIT

Sleeves to columns	
Lateral restraints	
Longitudinal restraints	
Beam continuity	
Deck continuity	
Other	

TYPE OF LENGTHENING

Low chainage end, original and widening	
Low chainage end, widened part only	
High chainage end, original and widening	
High chainage end, widened part only	

No. of spans added	

MODIFICATION COMMENTS

Insert comments about unusual modifications to bridges:

No modification yet

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

GENERAL SPAN INFORMATION

Span Number	**1**
Length of span, (m)	**100**
Skew (in Degrees)	
Number of main members	**1**

MAIN MEMBER TYPE

Girder - Also complete girder form	X
Cantilever girder continuous	
Cantilever girder with suspended span	
Slab	
Voided slab	
Demountable (Bailey type)	
Through truss	
Deck truss	
Cable supported	
Arch (Chord)	
Stiffening Girder	

GIRDER FORM

I beam	
Channel beam	
Rectangular beam	
Tee beam	
Box girder	**X**
Built-Up (Plate) girder	

MAIN MEMBER MATERIAL

Timber	
Steel	
Concrete	X
Masonry	
Other	

MAIN MEMBER PRESTRESSED?		
	Yes	X
	No	
	Not known	

CONTINUITY

	L	**H**
Fixed		
Continuous		X
Simply supported		
Movable	X	
Not supported		
Not supported		
Not known		

L Low chainage end
H High chainage end

SECONDARY MEMBER TYPE

Transverse/longitudinal girders	X
Floor Beam	
Other	
None	

SECONDARY MEMBER MATERIAL

Masonry	
Concrete	X
Steel	
Timber	
Other	

SECONDARY MEMBER PRESTRESSED?		
	Yes	X
	No	
	Not known	

OTHER MEMBER TYPE

Diaphragms	X
Bracings	
Stringers	
Lower Laterals	
Other	
None	

DECK MATERIAL

Timber	
Steel	
Concrete	**X**
Masonry	
Other	

RAILING TYPE	**L**	**R**
Concrete wall		
Concrete wall and top rail		
Concrete posts and rails	X	X
Steel posts and rails		
Aluminium posts and rails		
Timber posts and rails		
Masonry wall		
Guardrail (metal)		
Pre-cast railing with fence		
Other		
None		

L Left side
R Right side

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

GENERAL SPAN INFORMATION

Span Number	**2**
Length of span, (m)	**150**
Skew (in Degrees)	
Number of main members	**1**

MAIN MEMBER TYPE

Girder - Also complete girder form	**X**
Cantilever girder continuous	
Cantilever girder with suspended span	
Slab	
Voided slab	
Demountable (Bailey type)	
Through truss	
Deck truss	
Cable supported	
Arch (Chord)	
Stiffening Girder	

GIRDER FORM

I beam	
Channel beam	
Rectangular beam	
Tee beam	
Box girder	**X**
Built-Up (Plate) girder	

MAIN MEMBER MATERIAL

Timber	
Steel	
Concrete	X
Masonry	
Other	

MAIN MEMBER PRESTRESSED?	Yes	
	No	**X**
	Not known	

CONTINUITY

	L	H
Fixed		
Continuous	X	X
Simply supported		
Movable		
Not supported		
Not supported		
Not known		

L Low chainage end
H High chainage end

SECONDARY MEMBER TYPE

Transverse/longitudinal girders	X
Floor Beam	
Other	
None	

SECONDARY MEMBER MATERIAL

Masonry	
Concrete	X
Steel	
Timber	
Other	

SECONDARY MEMBER PRESTRESSED?	Yes	X
	No	
	Not known	

OTHER MEMBER TYPE

Diaphragms	X
Bracings	
Stringers	
Lower Laterals	
Other	
None	

DECK MATERIAL

Timber	
Steel	
Concrete	**X**
Masonry	
Other	

RAILING TYPE	**L**	**R**
Concrete wall		
Concrete wall and top rail		
Concrete posts and rails	X	X
Steel posts and rails		
Aluminium posts and rails		
Timber posts and rails		
Masonry wall		
Guardrail (metal)		
Pre-cast railing with fence		
Other		
None		

L Left side
R Right side

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

GENERAL SPAN INFORMATION

Span Number	**3**
Length of span, (m)	**100**
Skew (in Degrees)	
Number of main members	**1**

MAIN MEMBER TYPE

Girder - Also complete girder form	**X**
Cantilever girder continuous	
Cantilever girder with suspended span	
Slab	
Voided slab	
Demountable (Bailey type)	
Through truss	
Deck truss	
Cable supported	
Arch (Chord)	
Stiffening Girder	

GIRDER FORM

I beam	
Channel beam	
Rectangular beam	
Tee beam	
Box girder	**X**
Built-Up (Plate) girder	

MAIN MEMBER MATERIAL

Timber	
Steel	
Concrete	X
Masonry	
Other	

MAIN MEMBER PRESTRESSED?	Yes	**X**
	No	
	Not known	

CONTINUITY	**L**	**H**
Fixed		
Continuous	X	
Simply supported		
Movable		**X**
Not supported		
Not supported		
Not known		

L Low chainage end
H High chainage end

SECONDARY MEMBER TYPE

Transverse/longitudinal girders	**X**
Floor Beam	
Other	
None	

SECONDARY MEMBER MATERIAL

Masonry	
Concrete	X
Steel	
Timber	
Other	

SECONDARY MEMBER PRESTRESSED?	Yes	X
	No	
	Not known	

OTHER MEMBER TYPE

Diaphragms	X
Bracings	
Stringers	
Lower Laterals	
Other	
None	

DECK MATERIAL

Timber	
Steel	
Concrete	**X**
Masonry	
Other	

RAILING TYPE	**L**	**R**
Concrete wall		
Concrete wall and top rail		
Concrete posts and rails	X	X
Steel posts and rails		
Aluminium posts and rails		
Timber posts and rails		
Masonry wall		
Guardrail (metal)		
Pre-cast railing with fence		
Other		
None		

L Left side
R Right side

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

GENERAL ABUTMENT DATA

Abutment Number	**1**
Abutment height, (m)	**5.0**
Abutment height case	**1**

ABUTMENT TYPE

Solid wall	X
Spill through	
Pile bent	
Reinforced earth	
Diaphragm wall	
None (cantilever superstructure)	
None (superstructure on ground)	
Other	
Not known	

ABUTMENT MATERIAL

Concrete	**X**
Steel	
Timber	
Masonry	
Gabions	
Other	

ABUTMENT FOUNDATION

Spread footing	
Bored pile	**X**
Driven piles	
Caisson	
Diaphragm wall	
Other	
Not known	

BEARING TYPE

Elastomeric pad	X
Pot bearing	
Steel plate	
PTFE coated plate	
Metal rocker	
Monolithic	
Other	
None	
Not known	

LATERAL RESTRAINT TYPE

Concrete	
Steel	
Cables or bolts	X
Other	
Not known	
None	

LONGITUDINAL RESTRAINT TYPE

Concrete	
Steel	
Cables or bolts	**X**
Other	
Not known	
None	

EXPANSION JOINT TYPE

Continuous deck	
Steel plate	**X**
Rubber	
None	
Other	
None	

SCOUR PROTECTION

Dumped riprap	
Grouted riprap	
Gabions or mattresses	
Concrete	
Steel sheet piling	
Concrete sheet piling	
Other	
None	X
Not known	

SLOPE PROTECTION

Dumped riprap	
Grouted riprap	
Gabions or mattresses	
Concrete	
Paving	
Rubble Concrete	
Sheet Piles	
Other	
None	X

ABUTMENT COMMENTS

Insert comments about unusual bridge abutments:

BMS – Inventory Inspection (Type 7) Form

Bridge ID	B00622LT	Bridge Name	Agas-agas Bridge

Abutment Number	1

WING WALL TYPE	L	R
Solid wall	X	X
Reinforced earth		
Protected slope		
Other		
None		

WING WALL MATERIAL	L	R
Concrete	X	X
Masonry		
Timber		
Gabions or mattresses		
Other		

WING WALL FOUNDATION TYPE	L	R
Spread footing		
Bored piles		
Driven piles		
Other		
None (attached to abutment)	X	X
Not known		

WING WALL LENGTH

Left, (m)	6.00
Right, (m)	6.00

BRIDGE APPROACH

Overall length of approach, (m)	7.425

TYPE OF APPROACH

At grade	
Embankment up to 3.0 meters high, no retaining structures	
Embankment in excess of 3.0 meters high, no retaining structures	
Embankment up to 3.0 meters high, retained at road shoulders	
Embankment in excess of 3.0 meters high, retained at road shoulders	X

BRIDGE APPROACH COMMENTS

Insert comments about unusual or long bridge approaches:

GENERAL ABUTMENT DATA

BMS – Inventory Inspection (Type 7) Form

Bridge ID B00622LT **Bridge Name** Agas-agas Bridge

Abutment Number	**2**
Abutment height, (m)	**5.00**
Abutment height case	**1**

ABUTMENT TYPE

Solid wall	**X**
Spill through	
Pile bent	
Reinforced earth	
Diaphragm wall	
Other	
None (cantilever superstructure)	
None (superstructure on ground)	
Not known	

ABUTMENT MATERIAL

Concrete	**X**
Steel	
Timber	
Masonry	
Gabions	
Other	

ABUTMENT FOUNDATION

Spread footing	
Bored pile	**X**
Driven piles	
Caisson	
Diaphragm wall	
Other	
Not known	

BEARING TYPE

Elastomeric pad	X
Pot bearing	
Steel plate	
PTFE coated plate	
Metal rocker	
Monolithic	
Other	
None	
Not known	

LATERAL RESTRAINT TYPE

Concrete	X
Steel	
Cables or bolts	
Other	
Not known	
None	

LONGITUDINAL RESTRAINT TYPE

Concrete	
Steel	
Cables or bolts	**X**
Other	
Not known	
None	

EXPANSION JOINT TYPE

Continuous deck	
Steel plate	**X**
Rubber	
None (open gap)	
Other	
None	

SCOUR PROTECTION

Dumped riprap	
Grouted riprap	
Gabions or mattresses	
Concrete	
Steel sheet piling	
Concrete sheet piling	
Other	
None	X
Not known	

SLOPE PROTECTION

Dumped riprap	
Grouted riprap	
Gabions or mattresses	
Concrete	
Paving	
Rubble Concrete	
Sheet Pile	
Other	
None	X

ABUTMENT COMMENTS

Insert comments about unusual bridge abutments:

BMS – Inventory Inspection (Type 7) Form

Bridge ID	B00622LT	Bridge Name	Agas-agas Bridge

Abutment Number	2

WING WALL TYPE	L	R
Solid wall	X	X
Reinforced earth		
Protected slope		
Other		
None		

WING WALL MATERIAL	L	R
Concrete	X	X
Masonry		
Timber		
Gabions or mattresses		
Other		

WING WALL FOUNDATION TYPE	L	R
Spread footing		
Bored piles		
Driven piles		
Other		
None (attached to abutment)	X	X
Not known		

WING WALL LENGTH

Left, (m)	6.00
Right, (m)	6.00

BRIDGE APPROACH

Overall length of approach, (m)	7.425

TYPE OF APPROACH

At grade	
Embankment up to 3.0 meters high, no retaining structures	
Embankment in excess of 3.0 meters high, no retaining structures	
Embankment up to 3.0 meters high, retained at road shoulders	
Embankment in excess of 3.0 meters high, retained at road shoulders	X

BRIDGE APPROACH COMMENTS

Insert comments about unusual or long bridge approaches:

APPENDIX K

Geometrical Inspection Form

Department of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

GEOMETRICAL INSPECTION FORM (TYPE 6)

AGAS-AGAS BRIDGE

Deprtment of Public Works and Highways

BRIDGE MANAGEMENT SYSTEM

FOR

AGAS-AGAS BRIDGE

GEOMETRICAL INSPECTION FORM (TYPE 6)

LOCATION

BRIDGE ID	
Bridge Name	Agas-agas Bridge
Road Name	
Road ID	
Section ID	
Location	

Region	
Province	
Congressional District	
Engineering District	
Municipality	
Barangay	
River Name	

SUMMARY

COMMENTS:

Insert Name, Position, Signature and Date of Signing
Initial all other pages

Bridge ID.		Bridge Name	Agas-agas Bridge

Leveling

Element	Place		2014	2017	Difference	Remark
A1	Left					
	Right					
A2	Left					
	Right					
AGAS						
Longitudal Alignment	1	Left				
Longitudal Alignment	2	Left				
Longitudal Alignment	3	Left				
Longitudal Alignment	4	Left				
Longitudal Alignment	5	Left				
Longitudal Alignment	6	Left				
Longitudal Alignment	7	Left				
Longitudal Alignment	8	Left				
Longitudal Alignment	9	Left				
Longitudal Alignment	10	Left				
Longitudal Alignment	11	Left				
Longitudal Alignment	12	Left				

Element	No.	place	2014	2017	Difference	Remark
Longitudal Alignment	13	Left				
Longitudal Alignment	14	Left				
Longitudal Alignment	15	Left				
Longitudal Alignment	1	Right				
Longitudal Alignment	2	Right				
Longitudal Alignment	3	Right				
Longitudal Alignment	4	Right				
Longitudal Alignment	5	Right				
Longitudal Alignment	6	Right				
Longitudal Alignment	7	Right				
Longitudal Alignment	8	Right				
Longitudal Alignment	9	Right				
Longitudal Alignment	10	Right				
Longitudal Alignment	11	Right				
Longitudal Alignment	12	Right				
Longitudal Alignment	13	Right				
Longitudal Alignment	14	Right				
Longitudal Alignment	15	Right				

Bridge ID.		Bridge Name	Agas-agas Bridge

Vertical Slope

Mesure	Place	2014 (original)	2017	Difference	Remark	Element	No.	2014 (original)	2017	Difference	Remark
Angle (Horizontal)	H1										
	H2										
	H3										
	H4										

AGAS

Bridge ID. | **Bridge Name** | **Agas-agas Bridge**

Bearing

	Mesure		Place		2014 (original)	2017	Difference	Remark
AGAS	A1	Left	H1	A1 side				
			H2	A2 side				
			H3	Left				
			H4	Right				
			Ave					
			M1	A1 side				
			M2	A2 side				
			M3	Left				
			M4	Right				
			Ave					
		Right	H1	A1 side				
			H2	A2 side				
			H3	Left				
			H4	Right				
			Ave					
			M1	A1 side				
			M2	A2 side				
			M3	Left				
			M4	Right				
			Ave					

	Mesure		Place		2014 (original)	2017	Difference	Remark
	A2	Left	H1	A1 side				
			H2	A2 side				
			H3	Left				
			H4	Right				
			Ave					
			M1	A1 side				
			M2	A2 side				
			M3	Left				
			M4	Right				
			Ave					
		Right	H1	A1 side				
			H2	A2 side				
			H3	Left				
			H4	Right				
			Ave					
			M1	A1 side				
			M2	A2 side				
			M3	Left				
			M4	Right				
			Ave					