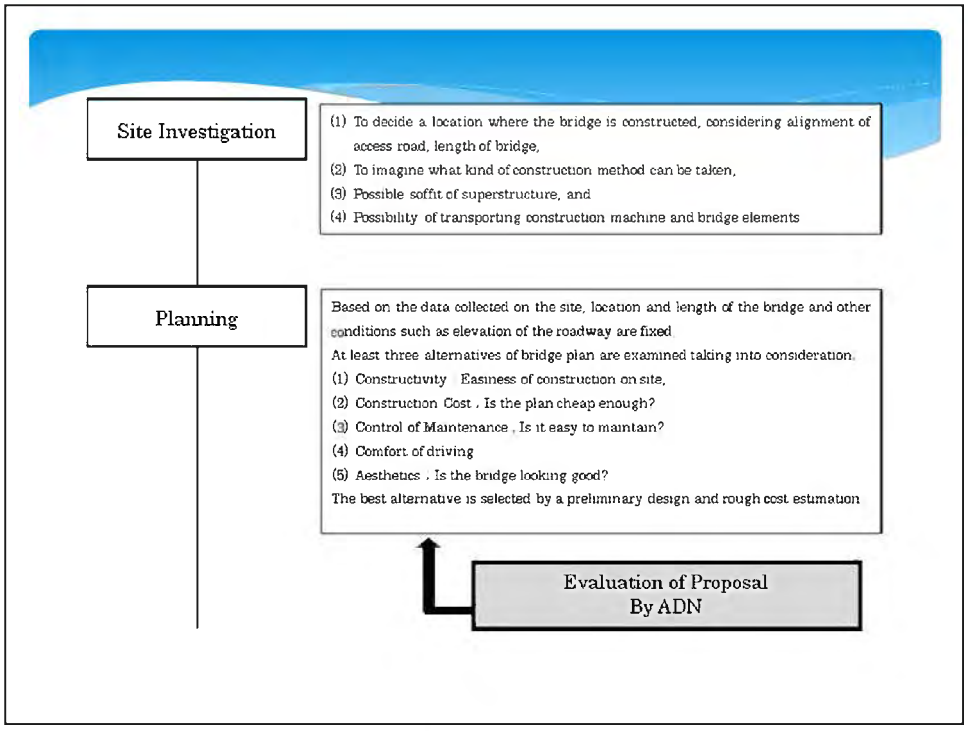
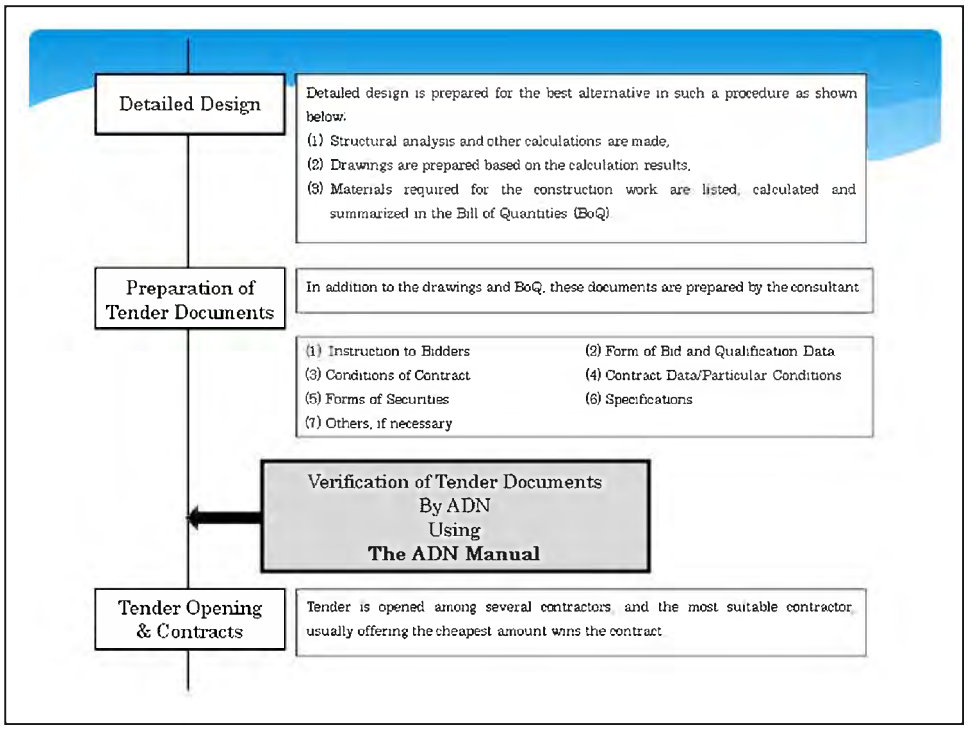
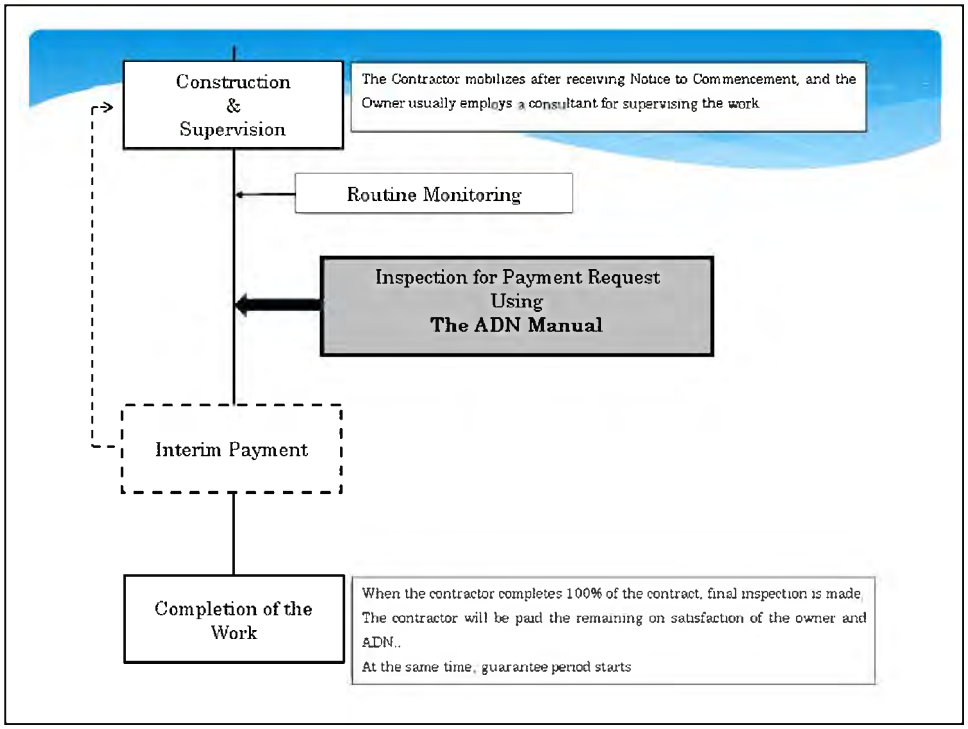
添付資料 8 座学研修教材(橋梁)(英語版)

CLASSROOM LESSON (1)
ON
BRIDGE

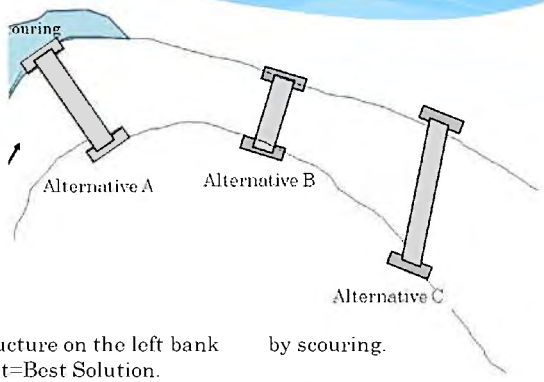
FLOW OF BRIDGE WOK
&
SITE INVESTIGATION




Detailed Design
Detailed design is prepared for the best alternative in such a procedure as shown below:
(1) Structural analysis and other calculations are made,
(2) Drawings are prepared based on the calculation results,
(3) Materials required for the construction work are listed, calculated and summarized in the Bill of Quantities (BoQ)
Preparation of Tender Documents
In addition to the drawings and BoQ, these documents are prepared by the consultant
(1) Instruction to Bidders
(2) Form of Bid and Qualification Data
(3) Conditions of Contract
(4) Contract Data/Particular Conditions
(5) Forms of Securities
(6) Specifications
(7) Others, if necessary
Verification of Tender Documents By ADN Using The ADN Manual
Tender Opening & Contracts
Tender is opened among several contractors and the most suitable contractor usually offering the cheapest amount wins the contract


Construction & Supervision
The Contractor mobilizes after receiving Notice to Commencement, and the Owner usually employs a consultant for supervising the work
Routine Monitoring
Inspection for Payment Request Using The ADN Manual
Interim Payment
Completion of the Work
When the contractor completes 100% of the contract, final inspection is made. The contractor will be paid the remaining on satisfaction of the owner and ADN..
At the same time, guarantee period starts

BRIDGE LOCATION



A: Risk of collapse of substructure on the left bank by scouring.
B: The shortest, the cheapest=Best Solution.
C: Longer the more costly, and skewed bridge is difficult and troublesome to build.

SITE OBSERVATION

1. Is the riverbed dry during construction?
   Or Detour of river flow is required?
2. What kind of construction is possible on site, then?
3. Is there any proper yards for stockpile, office and preparation work?
4. What kind of foundation is supposed?

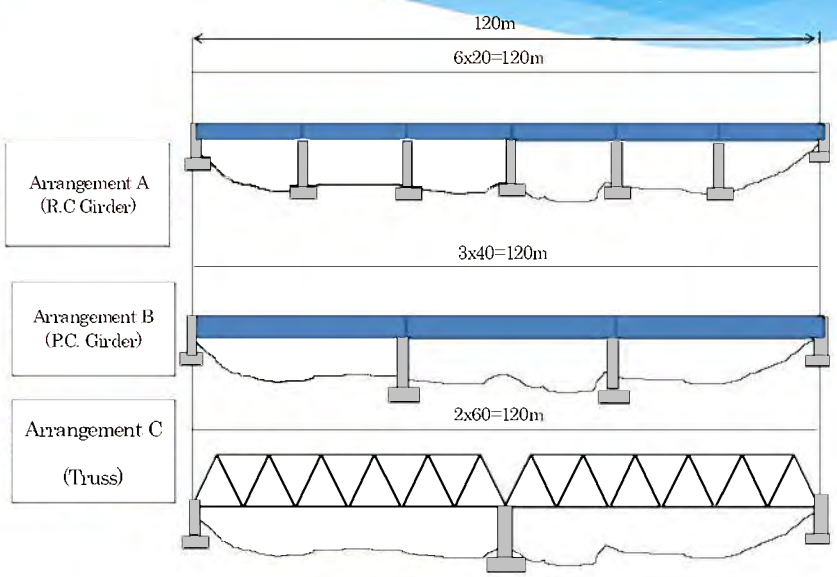
AYASA BR. Erected using temporary supports and crane

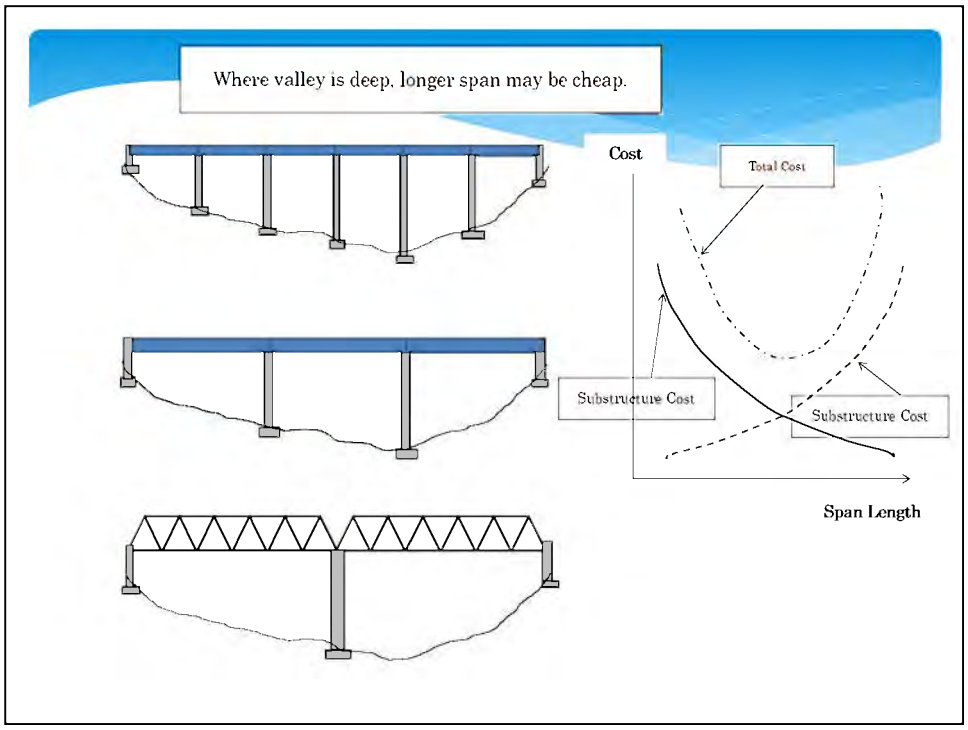
COMORO BR.
PC segments (about 6m long), imported from Indonesia, are stockpiled at a yard close to the site and transported to the site by a trailer.

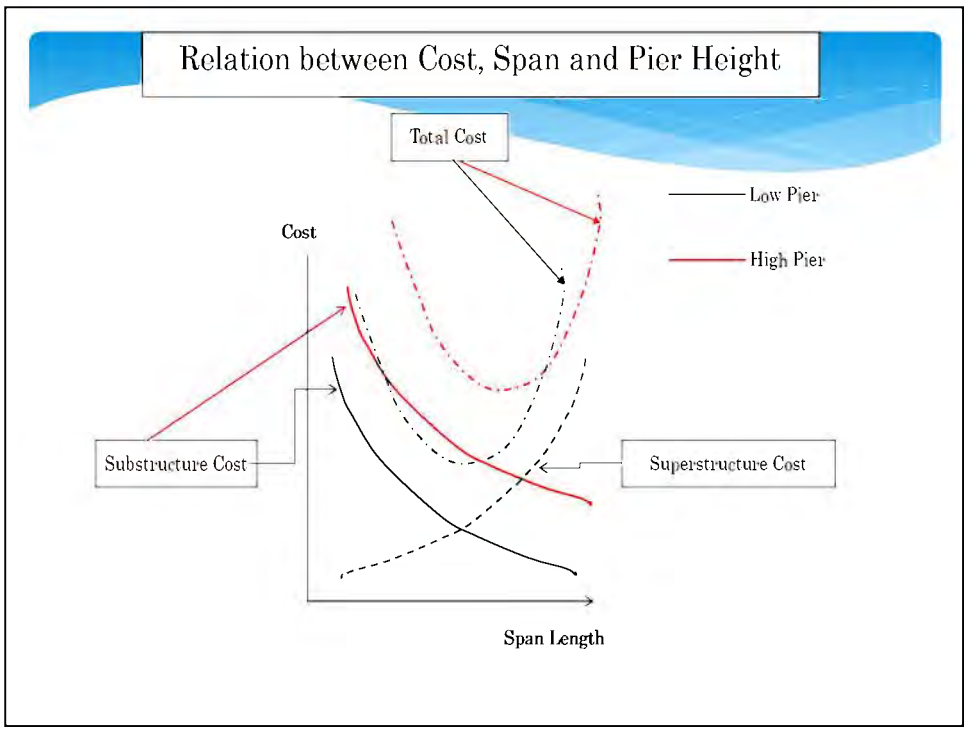
COMORO BR.

Assembled into a girder (40m long) , lifted up, moved laterally, and settled down

Span Arrangement



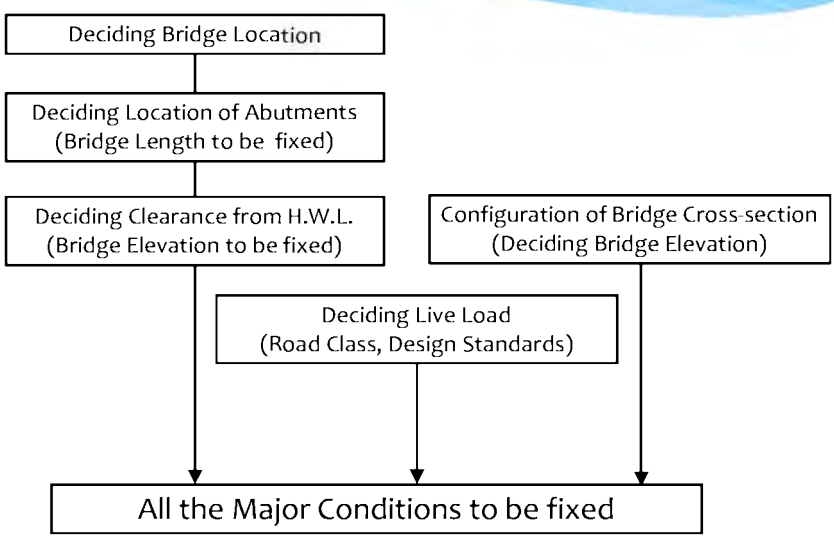

Where valley is deep, longer span may be cheap.
Cost
Total Cost
Substructure Cost
Substructure Cost
Span Length


Relation between Cost, Span and Pier Height
Total Cost
Low Pier
High Pier
Cost
Substructure Cost
Superstructure Cost
Span Length

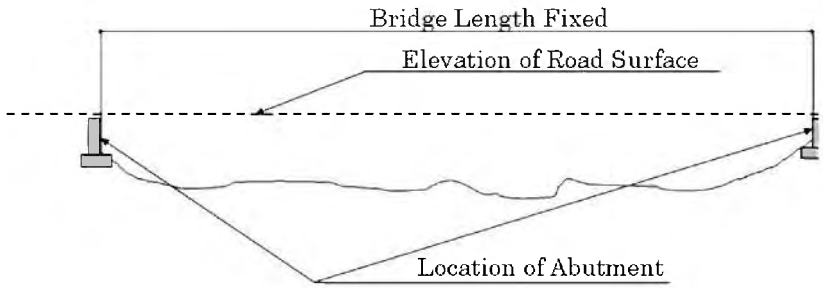
CLASSROOM LESSON (2)
ON
BRIDGE

BRIDGE PLAN
(Superstructure)

SEQUENCE OF BRIDGE PLANNING

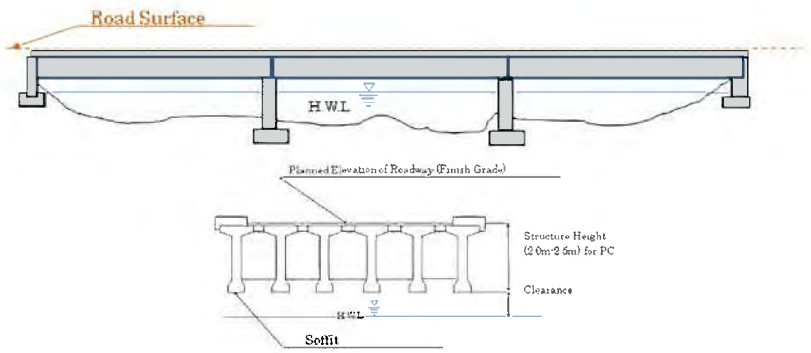


Location of Abutments, Bridge Length

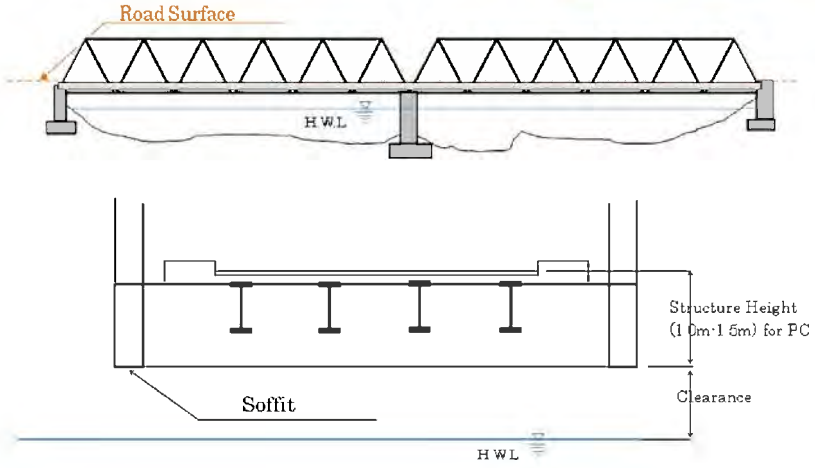


Elevation of Soffit
High Water Level
Elevation of Road Surface

Superstructure: PC Girder (Deck Type)



Superstructure: Steel Truss(Through Type)

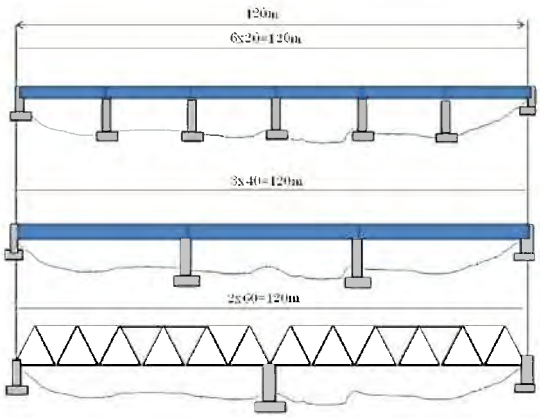


Three Alternatives

Arrangement A
(R.C Girder)

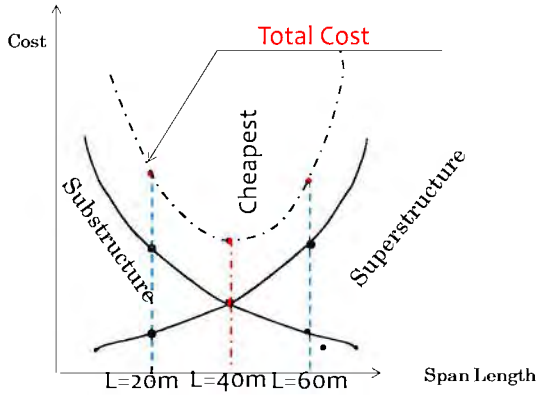
Arrangement B
(P.C. Girder)

Arrangement C
(Truss)

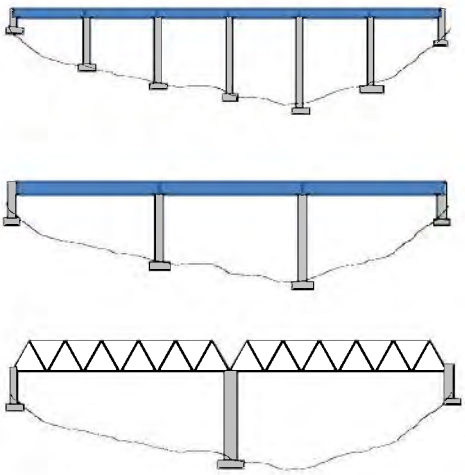


Cost for Superstructure and Substructure

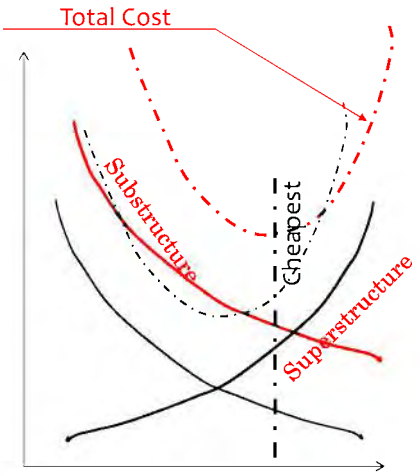
1. The longer the spans are, the higher the cost for superstructure is.
2. The longer the spans are, the cost for substructure is lower because number of piers decrease.



Where a valley is deep, as below;



Where a valley is deep, as below;



Samples of Span Arrangement

Where a river bed is flat, short multi-spans are cheaper.

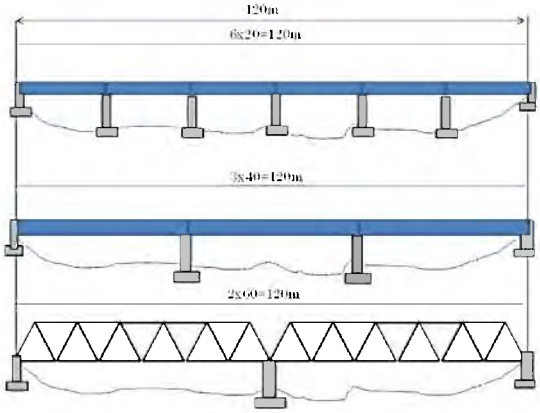
Where a valley is deep, longer spans are cheaper.

Span Arrangement

Arrangement A
(R.C Girder)

Arrangement B
(P.C. Girder)

Arrangement C
(Truss)



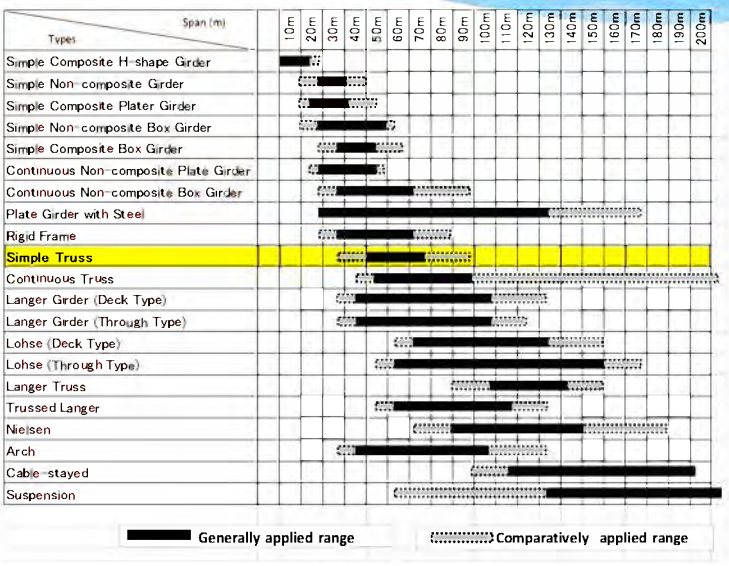
APPLICABLE SPAN LENGTH OF REINFORCED CONCRETE BRIDGE

Type	Applicable Span Length 20	40	60	80	Cross-section of the Bridge
Solid Slab Bridge					
Hollow Slab Bridge					
T-Girder Bridge					

APPLICABLE SPAN LENGTH OF PRESTRESSED CONCRETE BRIDGE

	Cross-section	Erected by	Applicable Span Length (20 / 40 / 60 / 80)
Pretension	Slab Bridge	Crane	
	T-Girder Bridge	Crane	
	T-Girder Bridge	Crane with Temporary Support	
	Composite Girder Bridge	Crane with Temporary Support	
Post-tension	Hollow Slab Bridge	Temporary Support	
	Box Girder Bridge	Temporary Support	

APPLICABLE SPAN LENGTH OF STEEL BRIDGE



SAMPLE PHOTOS OF STEEL BIRIDGE

PLATE GIRDER BRIDGE
(Anti-corrosive steel)

NIELSEN ARCH BRIDGE
(THROUGH TYPE)

TRUSS BRIDGE

ARCH BRIDGE (DECK TYPE)

COMPARISON BETWEEN STEEL BRIDGES & CONCRETE BRIDGES

	STEEL BRIDGE	CONCRETE BRIDGE
(1)CONSTRUCTIVITY	- Most elements prefabricated by > Good quality -Light elements> Heavy equipment no need	- Most work at site> Quality control on site - Launcher or erection girder required
(2)CONSTRUCTION COST	-Import necessary >Expensive	- Material & worker procured locally> Cheap
(3)MAINTENANCE	-Repaint every ten years (Galvanization, antirust	-Rust on rebar inside impossible to find
(4)COMFORT OF DRIVING	-Through type not comfortable	-Comfortable
(5)AESTHETICS	-Beautiful & can be painted into any color	-Not so beautiful

THE END

Next Lecture (3)
On
BRIDGE PLAN
(Substructure)

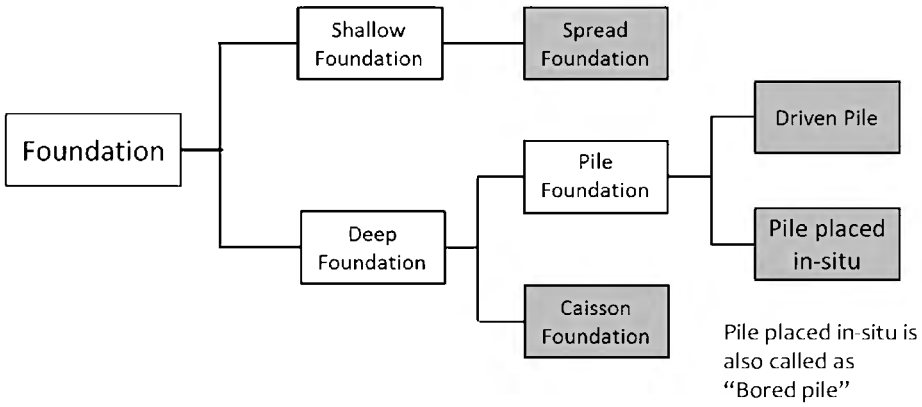
CLASSROOM LESSON (3)
ON
BRIDGE

BRIDGE PLAN
(Substructure, Foundation and Accessories)

PLAN ON FOUNDATION

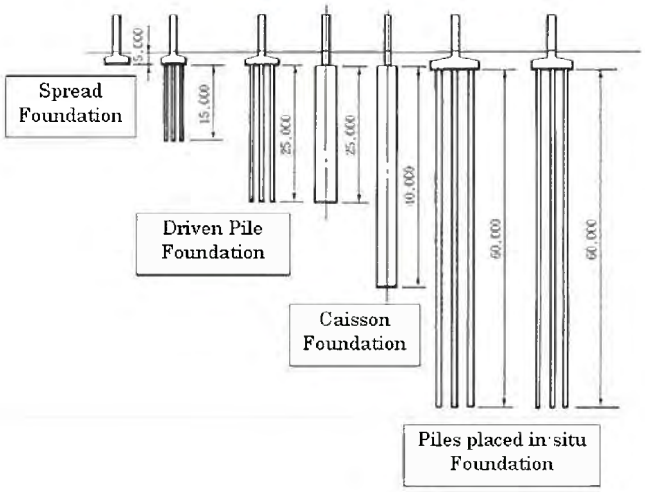
Type of foundation is selected considering terrain, geology, cost and constructivity.

CLASSIFICATION OF FOUNDATION



Pile placed in-situ is also called as "Bored pile"

TYPES OF FOUNDATION



ALPPLICABLE DEPTH OF BEARING LAYER FOR EACH PILE TYPE

In order to know the bearing layer, boring test are carried out.

Tpye	Applicable Depth of Foundation								
	10m	20m	30m	40m	50m	60m	70m	80m	90m
Spread Foundation	——····								
Driven Pile Foundation	————	————	————	————	————	·····			
Pile placed in-situ Foundation	·····	————	————	————	————	·····	·····	·····	·····
Caisson	····	————	————	————	·····	·····	·····		

CRITERIA FOR SELECTING FOUNDATION TYPES

SPREAD FOUNDATION

* Secure and cheap, where bearing layer is shallow (up to 5 or 6m) and strong enough,
* Used only where no fear of scouring, settlement

DRIVEN PILE FOUNDATION

* Steel, PC or RC pile products transported and driven on site,
* Heavy driving machine necessary,
* Applied to deeper bearing layers up to 60m

PILE PLACED IN-SITU FOUNDATION

* Piles constructed on site by digging holes, placing rebars and concrete,
* Applied to deeper bearing layers up to 60m

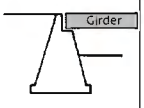
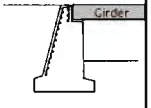
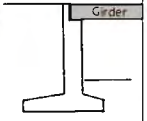
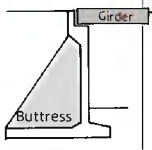
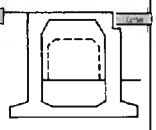
CAISSON FOUNDATION

* Rigid foundation with concrete constructed on site,
* Heavy facilities required,
* Applied to deeper bearing layers up to 40m

PLAN ON SUBSTRUCTURE

Types of abutments and piers are selected considering terrain, sizes of the superstructure, height, river flow, geology, cost and constructivity.

Selection of Abutment Type Depending on the height

	Gravity Type	Semi- Gravity Type	Invert-T Type	Buttress Type	Rigid Frame Type
Types of Abutment					
Applicable Height	H< 5m	4m < H< 6m	5m < H< 10m	10m < H< 15m	H> 15m

Abutment Type	Applicable Height																		
	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m
Gravity Type	———	———	———																
Semi-Gravity Type			———	———															
Invert T Type				———	———	———	———	———											
Buttress Type									———	———	———	———	———						
Rigid Frame Type														———	———	———	———		

Selection of Pier Type Depending on the height

Pier Type	Height (m)			Notes
	10	20	30	
Column / Wall Type	———	———	———	
Rigid Frame Type (1-Story)	5 — 15			
Rigid Frame Type (2-Story)		15 — 25		
Two Column Type	———	15 ···		For Hollow Slab 

Major Accessories of Bridge

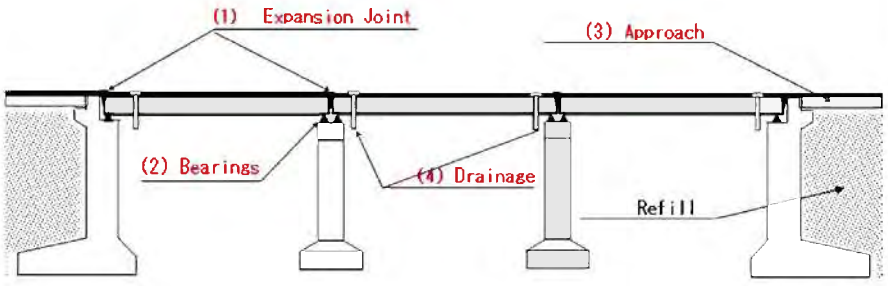
(1) Expansion Joints

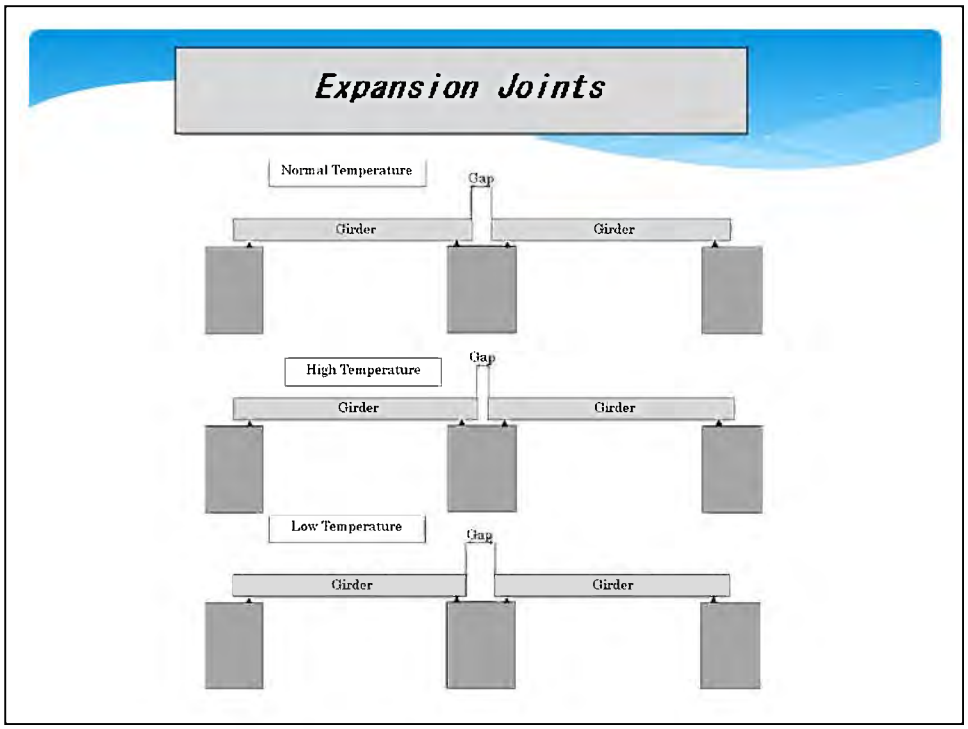
(2) Bearings

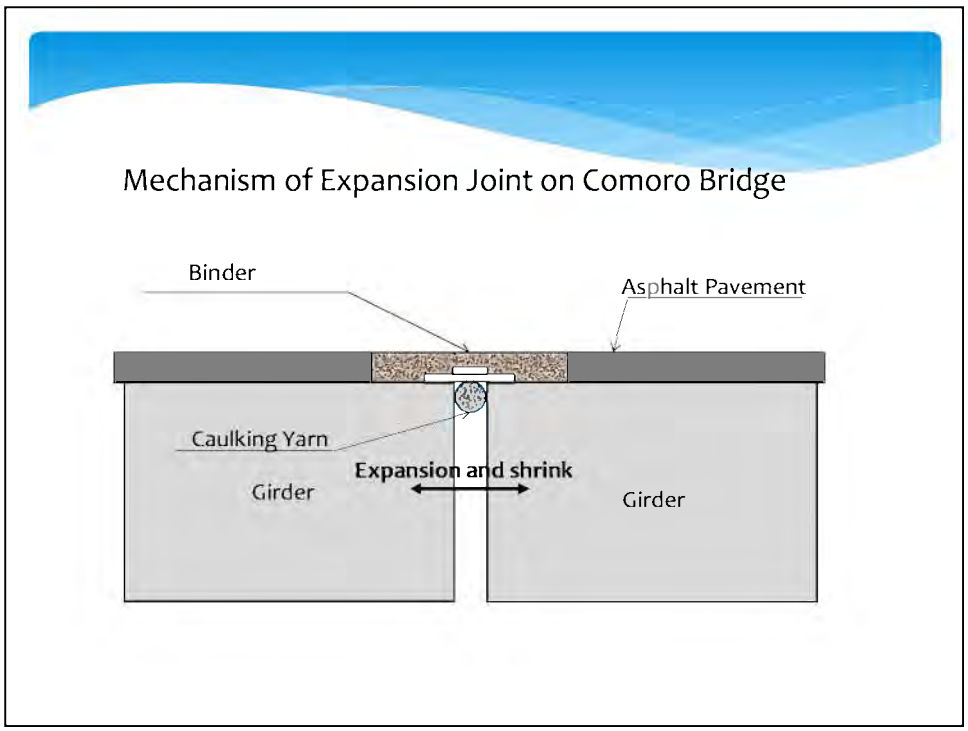
(3) Approach Slab

(4) Drainage

Location of Accessories




Expansion Joints
Normal Temperature
Gap
Girder
Girder
High Temperature
Gap
Girder
Girder
Low Temperature
Gap
Girder
Girder


Mechanism of Expansion Joint on Comoro Bridge
Binder
Asphalt Pavement
Caulking Yarn
Expansion and shrink
Girder
Girder

Bearings and Anchor

Function:

(1) To support the superstructure and transfer the vertical and horizontal reaction forces to the substructure,

(2) To allow longitudinal displacement due to deflection and temperature change,

(3) To allow rotation due to deflection of the superstructure.

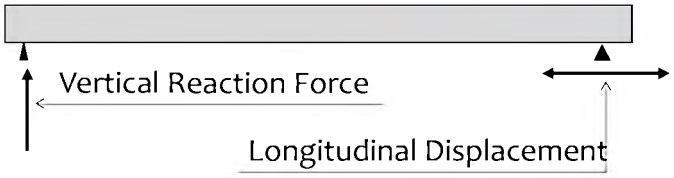
Materials:

(1) Neoprene (Elastomeric bearing pad,

(2) Metal.

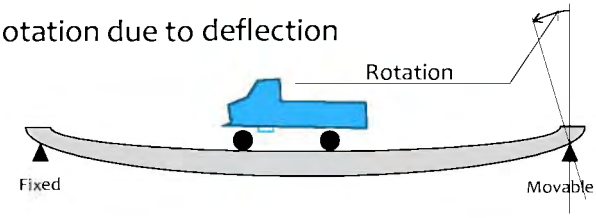
Functions of Bearing

(1) Supporting Vertical Reaction force



(2) Longitudinal displacement due to temperature change

(3) Rotation due to deflection

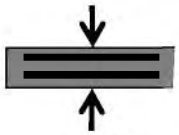


Elastomeric Bearing Pad

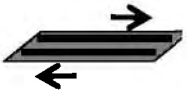
Structure: Sandwich of steel plates and rub

Mechanism of elastomeric bearing:

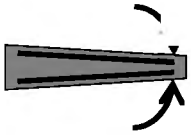
Reaction force

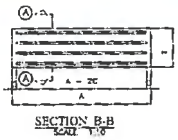


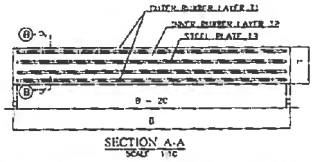
Expansion/Shrink



Rotation





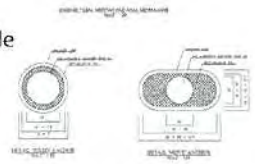


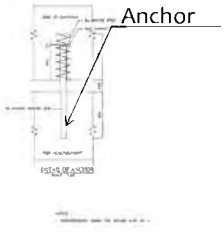
DETAIL ELASTOMERIC BEARING PAD GIRDER 30&40

Bearing Pad used in Comoro Br.

Anchor

Function: Restraining horizontal movement of the superstructure within a limit

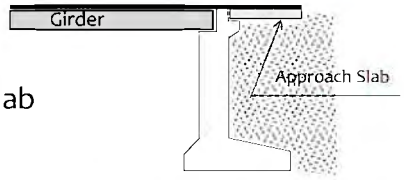




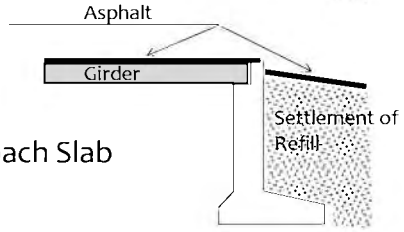
Approach Slab

Function: Countermeasure against elevation gap due to settlement of refill behind abutment

With Approach Slab



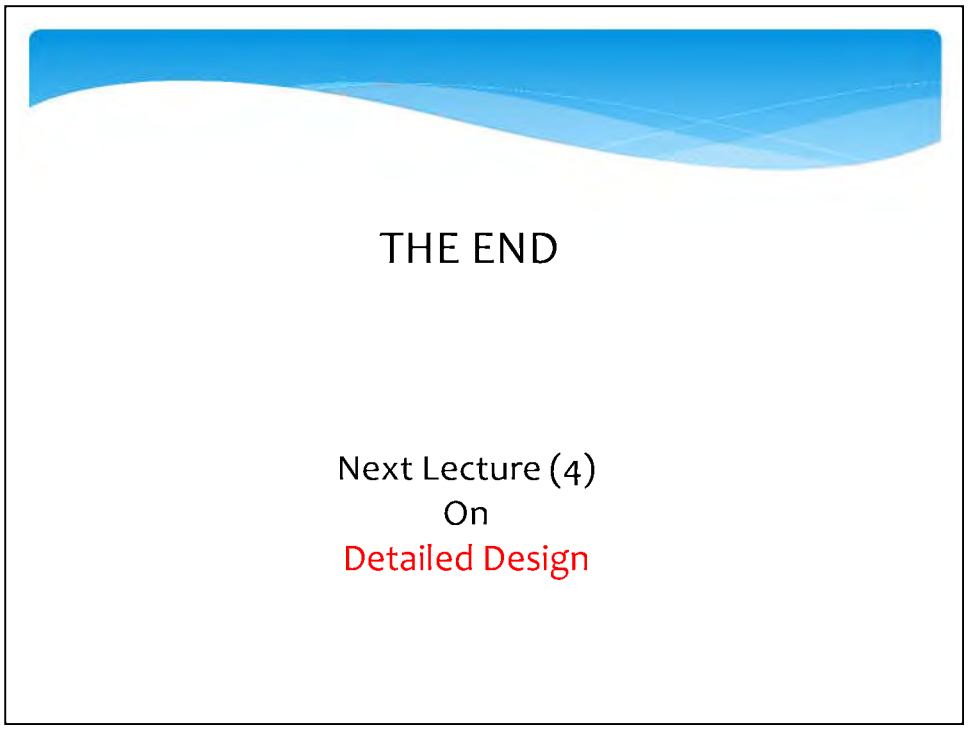
Without Approach Slab



Drainage

On designing drainage system,
consider those below;

(1) Rainfall intensity (mm/hr)
(2) Catchment area (Area of roadsurface:m^2)
(3) Slope of the bridge surface (%)

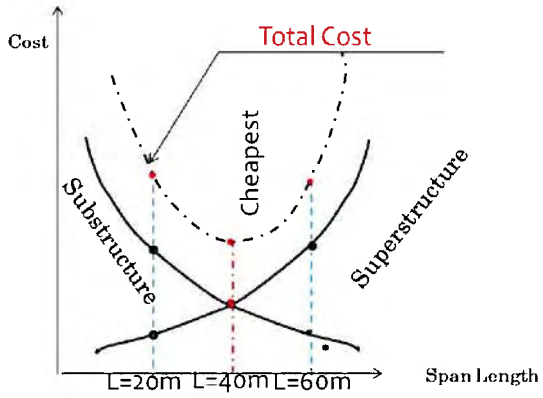

THE END
Next Lecture (4)
On
Detailed Design

CLASSROOM LESSON (4)
ON
BRIDGE

Detailed Design
&
How to Read Bridge Drawings

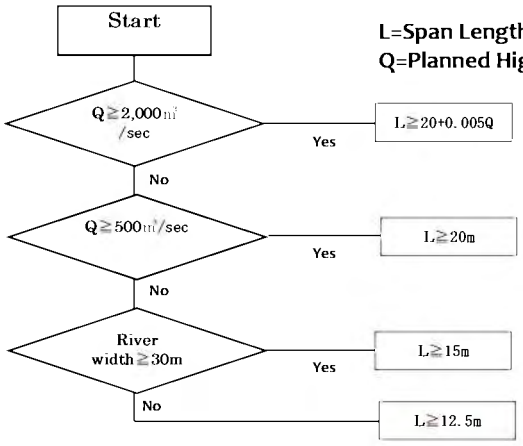
Review of the Past Lesson

If there is no constraint in selecting the most reasonable span length , the idea that the graph below shows can be applied. But actually there are some constraints to decide the span length such as river conditions, difficulties of construction and environment.



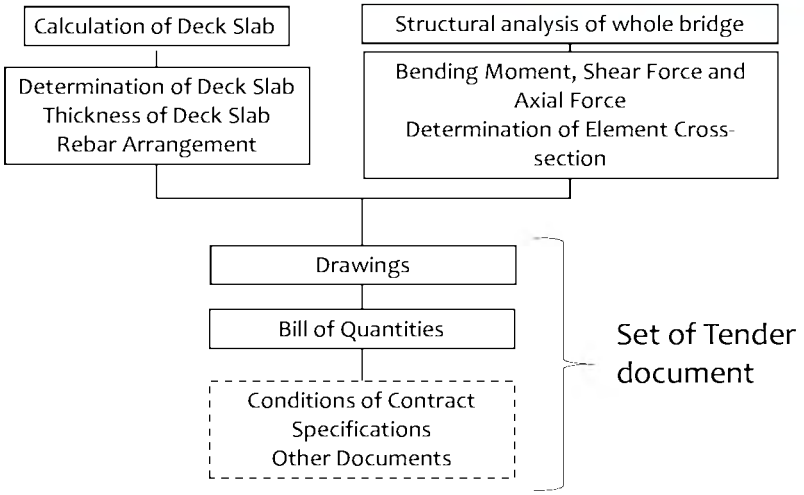
Minimum Span Length to be secured

The Japanese River Control Law specifies the minimum span length to be secured as shown in the flowchart below. This can be applied only to the second class river controlled by local districts, not by the government in Japan.
The Japanese law is so strict that the bridge cost may become higher if you severely take into consideration the law in designing bridges in this country.



L=Span Length (m)
Q=Planned High Discharge (㎥)

Sequences of Detailed Design



Core Technology required by ADN Engineer on Design Calculation

- Core Technology Required by **Consultants** = ability of designing properly.
- Core Technology Required by **ADN Engineers** = ability of verifying design prepared by the **consultant** .
- Usually calculation of deck slab, structural analysis and determination of required cross-section of major elements are implemented using computer and specialized software.
- ADN does not have these software, but no need to buy it. It is completely the consultant's business and their responsibility to make proper design calculation.
- **Therefore it will be enough for the ADN engineers to have knowledge on how design calculation is carried out.**

Input and Output of Design Calculation

Calculation of Deck Slab:	
Input	**Output**
·Weight of Parapet ·Weight of Pavement ·Weight of Deck Slab ·Wheel Load	·Working bending moment ·Required rebar arrangement of deck slab

Structural Analysis of Bridge:	
Input	**Output**
·Dead load (including pave, deck slab, parapet and so on) · Self-weight (assumed) ·Live load (according to the design standard)	·Working forces (bending moment and shear at each element). ·Reaction force at support)

Calculation of Element Cross-section:	
Input	**Output**
·Bending moment and shearing forces ·Strength of materials used for the element	·Required cross-section of the elements

Composition of Bridge Drawings

- Check existence of drawings before verification, for usually a set of drawings of a bridge constitutes of such as shown below;

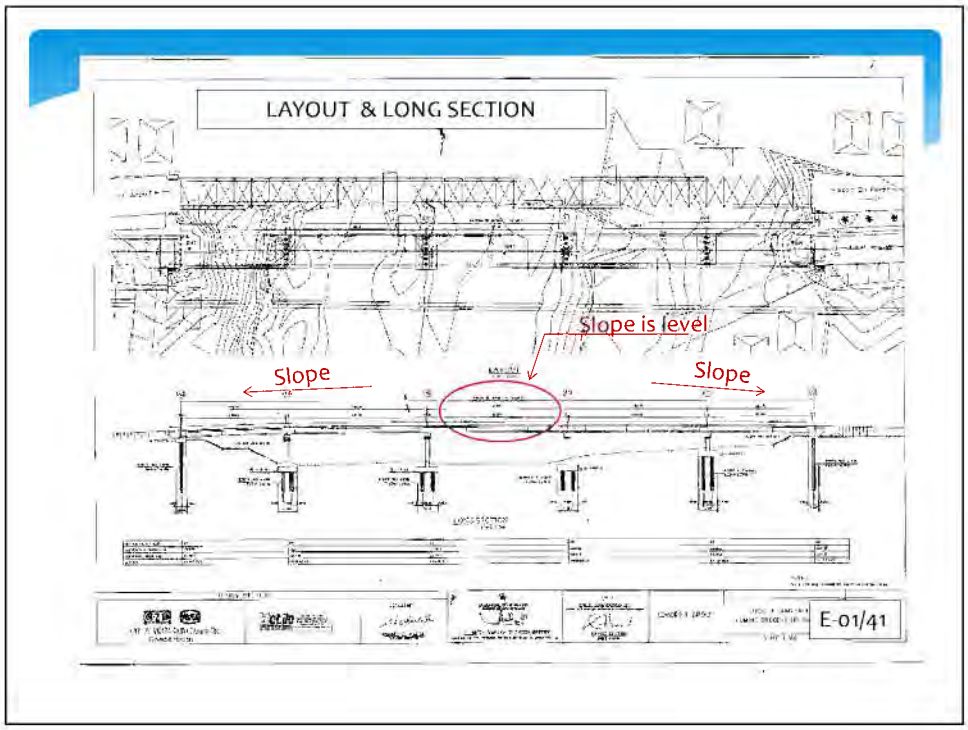
- Location Map
- General View of the Bridge
- Plan and Profile
- Typical Cross-section
- Details of Superstructure
- Details of Substructure
- Details of Foundation
- Ancillaries

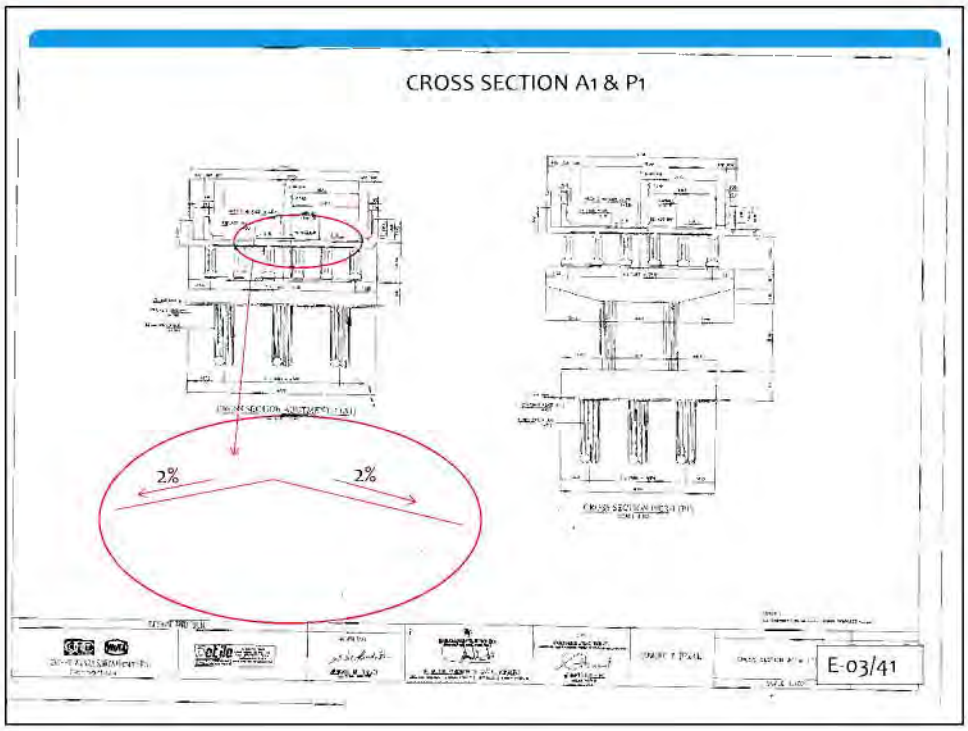
Let us learn how to read drawings using those of Comoro Bridge

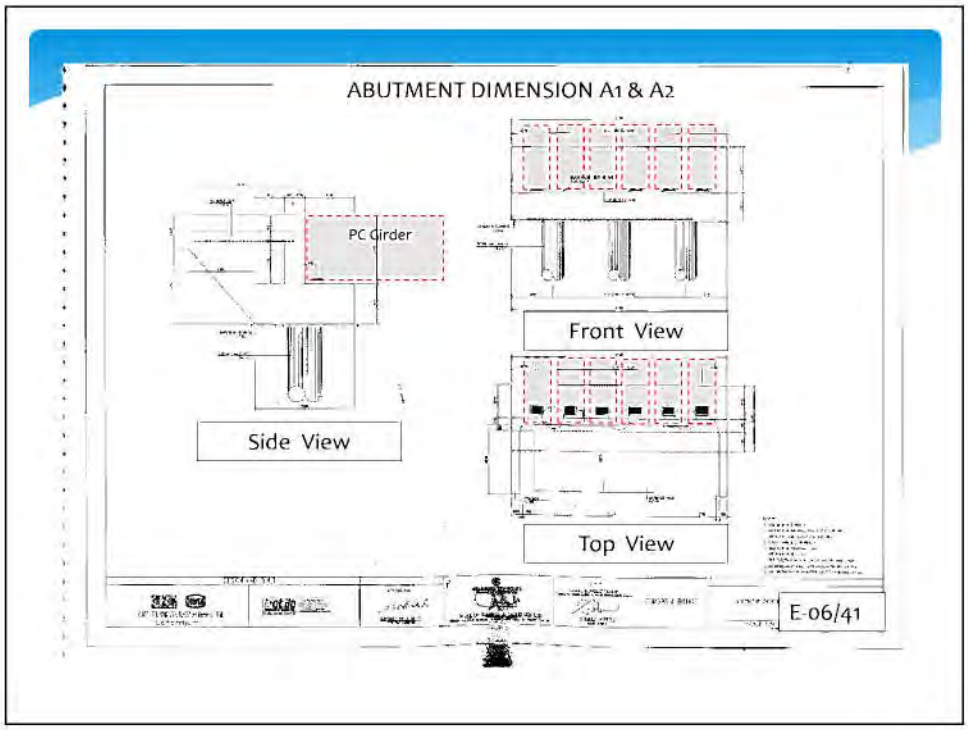
TABLE OF CONTENTS

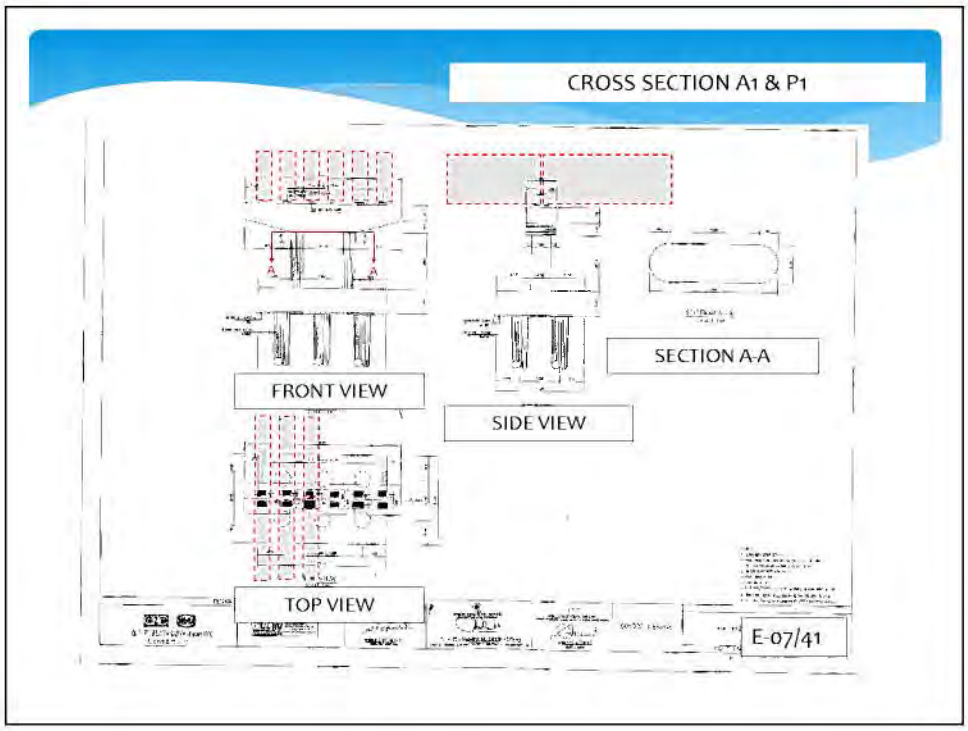
E. Structure

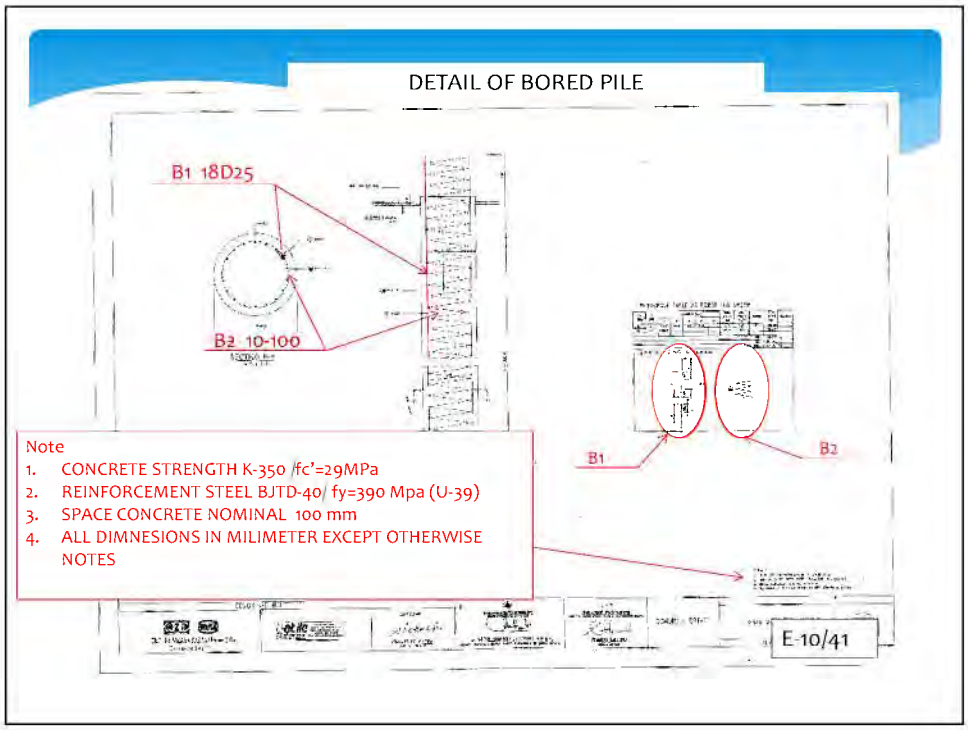
E-01 PLAN AND LONG SECTION BRIDGE
E-02 FRAMING PLAN
E-03 CROSS SECTION at A1, P1-P3, A2
E-06 DIMENSION of A1, P1-P3, A2
E-10 DETAIL OF BORED PILE
E-11 REINFORCEMENT of A1, P1-P3, A2
E-21 DETAIL OF PC GIRDER
E-33 ANCHOR PLACEMENT
E-37 DETAIL OF PARAPET
E-38 EXPANSION JOINT
E-39 DETAIL OF SLOPE PROTECTION
E-40 PLACEMENT OF DECK DRAIN
E-41 CROSS SECTION DECK DRAIN AND WATER FLOW

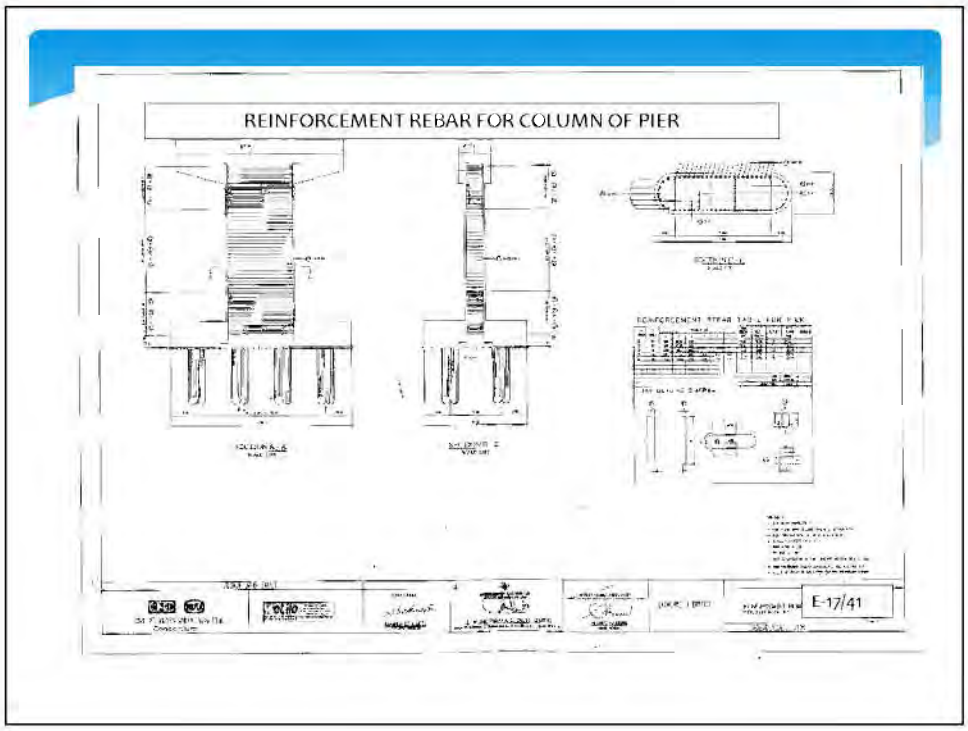

LAYOUT & LONG SECTION
Slope is level
Slope
Slope
E-01/41

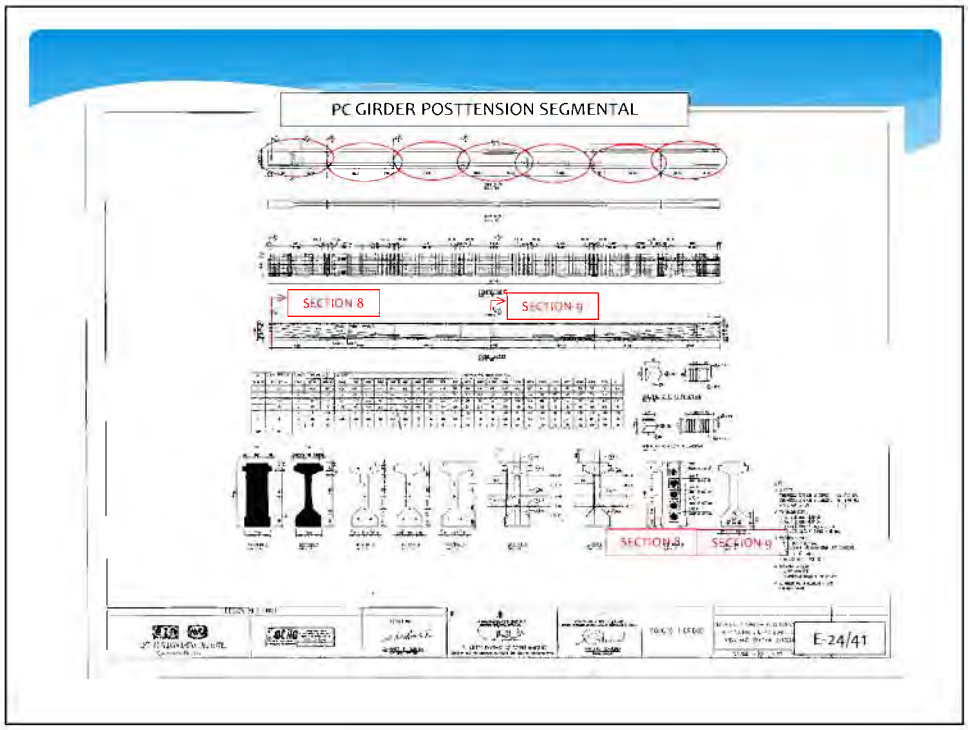

CROSS SECTION A1 & P1
2%
2%
E-03/41

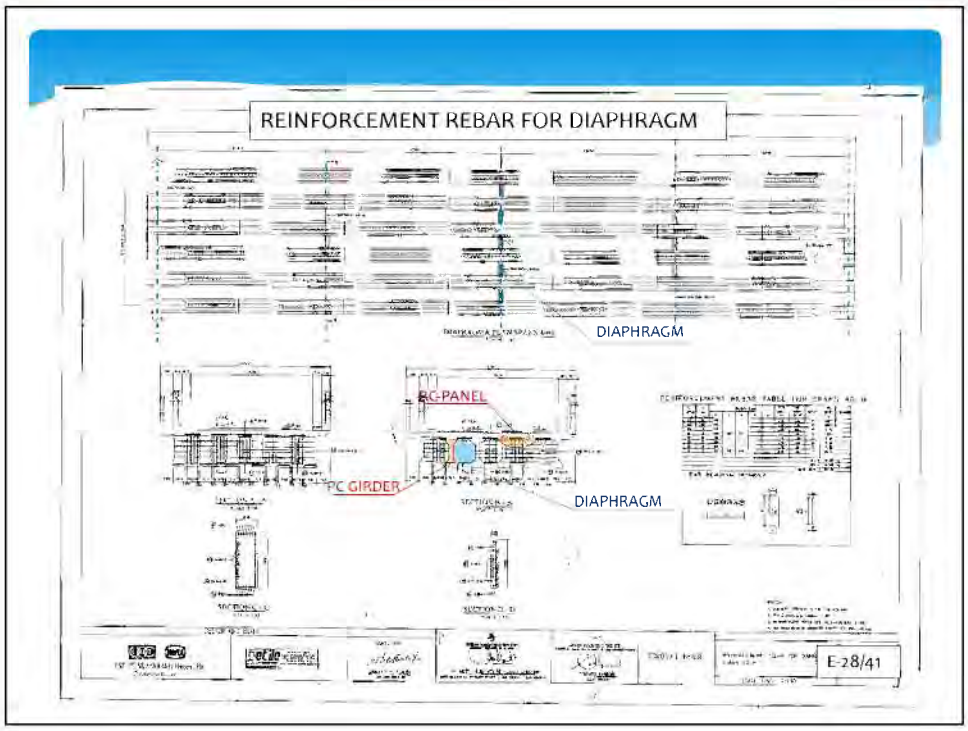

ABUTMENT DIMENSION A1 & A2
PC Girder
Front View
Side View
Top View
E-06/41

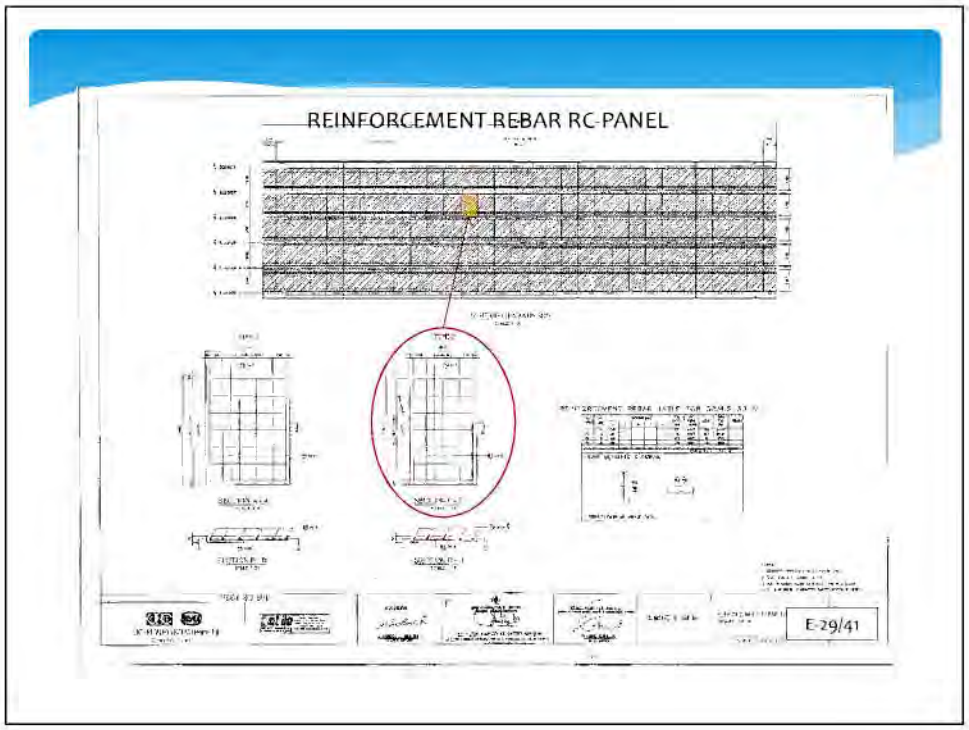

CROSS SECTION A1 & P1
SECTION A-A
FRONT VIEW
SIDE VIEW
TOP VIEW
E-07/41

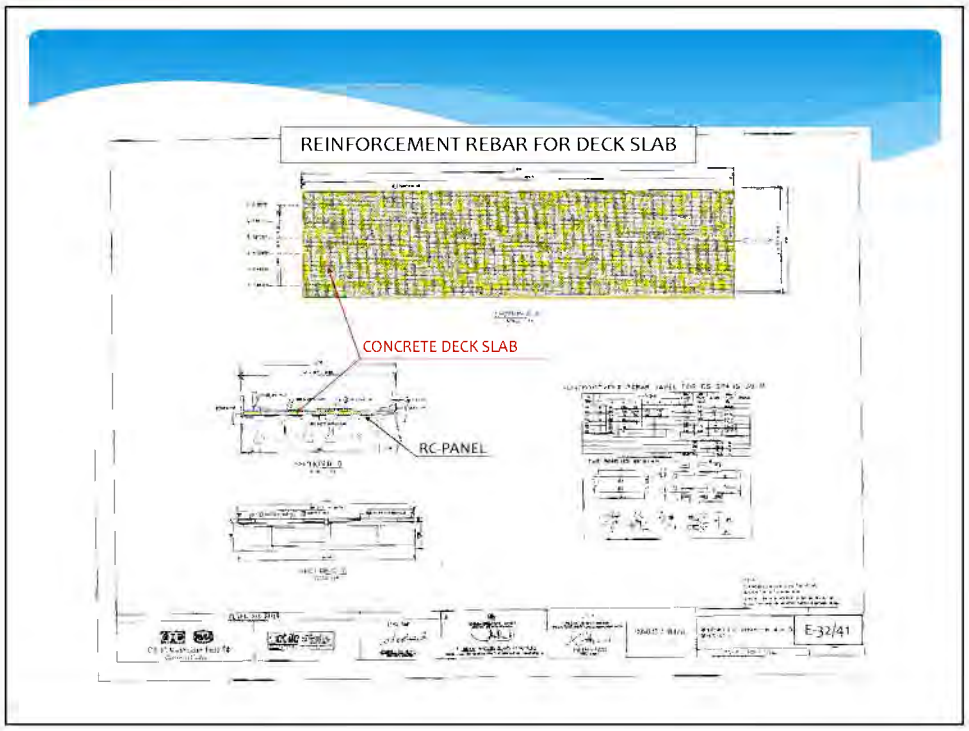

DETAIL OF BORED PILE
B1 18D25
B2 10-100
B1
B2
Note
1. CONCRETE STRENGTH K-350 /fc'=29MPa
2. REINFORCEMENT STEEL BJTD-40/ fy=390 Mpa (U-39)
3. SPACE CONCRETE NOMINAL 100 mm
4. ALL DIMNESIONS IN MILIMETER EXCEPT OTHERWISE NOTES
E-10/41


REINFORCEMENT REBAR FOR COLUMN OF PIER
E-17/41


PC GIRDER POSTTENSION SEGMENTAL
SECTION 8
SECTION 9
E-24/41


REINFORCEMENT REBAR FOR DIAPHRAGM
DIAPHRAGM
RC-PANEL
PC GIRDER
DIAPHRAGM
E-28/41


REINFORCEMENT REBAR RC-PANEL
E-29/41


REINFORCEMENT REBAR FOR DECK SLAB
CONCRETE DECK SLAB
RC-PANEL
E-32/41

THE END

Next Lecture (5)
On
Construction Method
Tender Documents

CLASSROOM LESSON (5)
ON
BRIDGE

Construction Method
&
Tender Documents
(Bidding Documents)

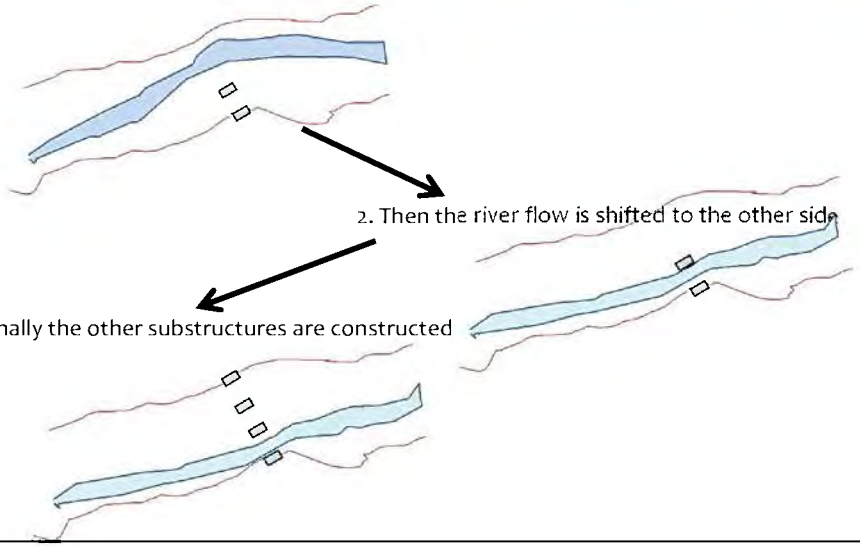
Construction of Substructure

It is preferable to construct foundations and substructures during dry season, when riverbed is available for the construction.
Cofferdam is constructed or main flow is shifted when river flow may obstruct the construction.

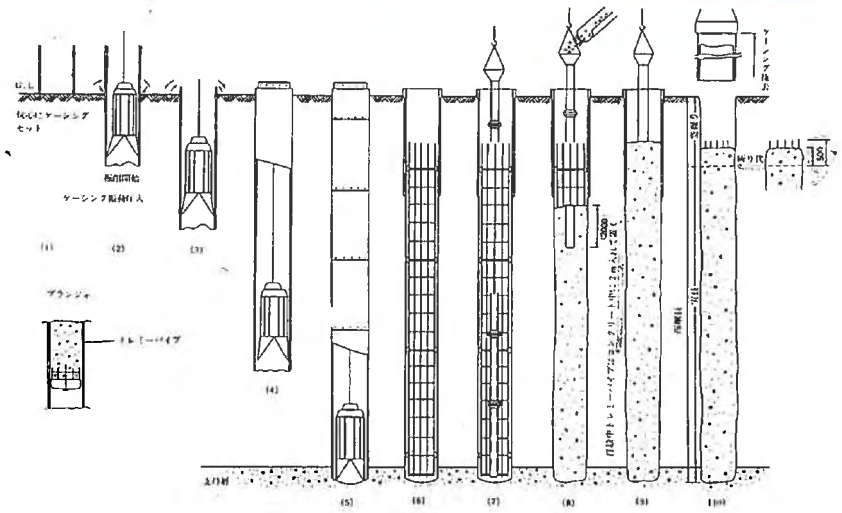
Cofferdam

Shifting River Flow

1. At first substructures are constructed where the riverbed is dry.



Sequences of bored piling



Construction of Bored Piles

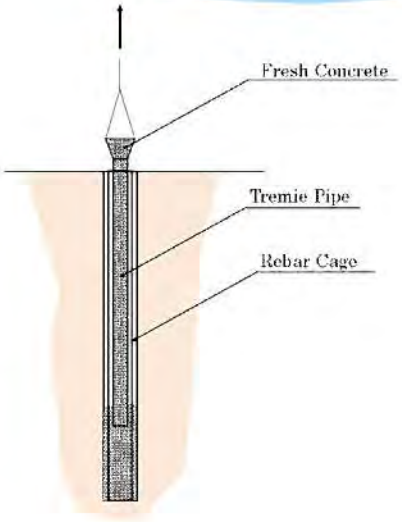
Setting Drilling Machine

Installation of Casing

Inserting Rebar Cage

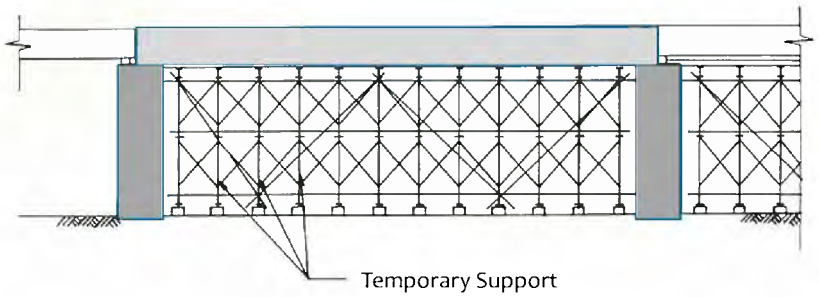
Countermeasure against Segregation of Aggregates

Tremie Pipes

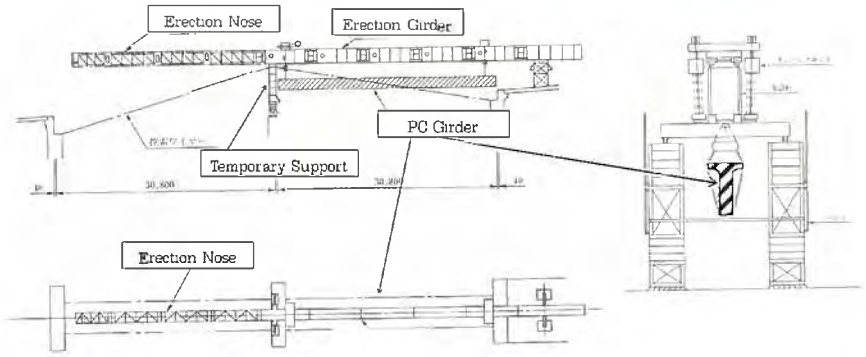


Konstruction of Superstructure

Girder constructed on temporary supports

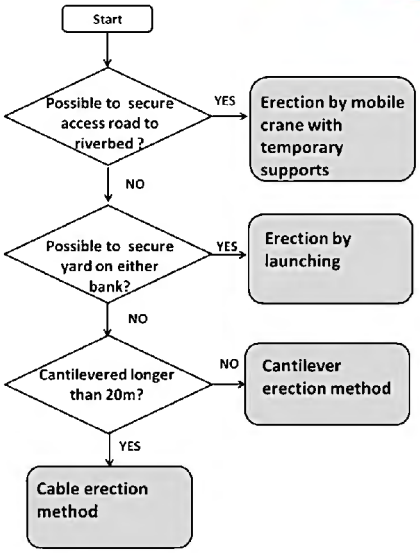


PC Girder suspended between steel erection girder,
And moved longitudinally

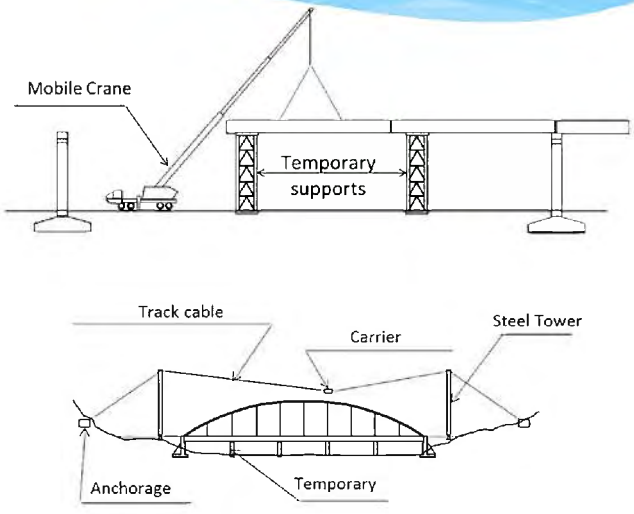


Erection Girder used for Comoro Bridge Construction

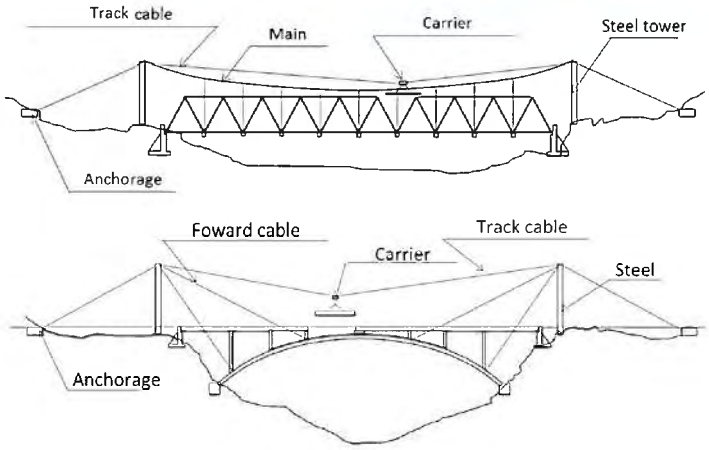
Decision flow of Steel Bridge Erection Method

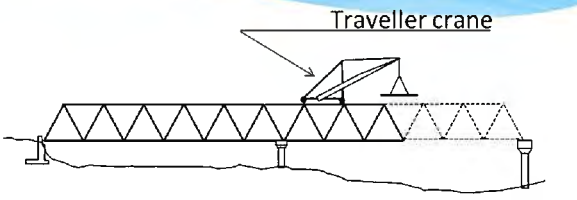


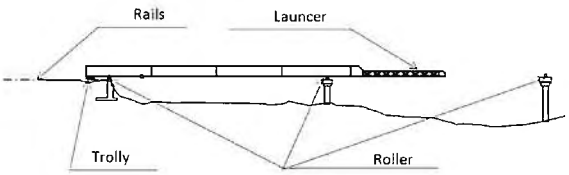
Truss bridges are assembled on temporary supports using truck crane.



Launching from right to left using erection nose
(Erection nose is cut off later)







TENDER DOCUMENTS (BIDDING DOCUMENTS)

Composition of Tender Documents

PART 1-BIDDING PROCEDURE
- Instruction to Bidders
- Bid Data Sheet
- Evaluation and Qualification Criteria
- Bidding Forms
- Eligible Countries

PART 2-WORKS REQUIREMENTS
- Work Requirements
- Scope of Work
- Specifications
- Drawings
- Bill of Quantities

Titles in red are especially important.

PART 3-CONDITIONS OF CONTRACTS AND CONTRACT FORMS
- General Conditions
- Particular Conditions
- Annex to the Particular Conditions – Contract Forms

General Conditions of Contract

Usually "FIDIC" General Conditions of Contract are used. It is very much general and standard for international contract.

Particular Conditions of Contract

Particular data are summarized in "CONTRACT DATA" to help you easily find important data, as shown below;

Conditions	Data
Defect Notification Period	365 days
Performance Security	5 percent of the Accepted Contract Amount
Normal working hours	8 hours per day
Delay damages for the works	0.1% of the Contract Amount
Maximum amount of delay damages	5% of the final Contract Price
Total advance payment	Maximum 15% of the Accepted Contract Amount

Conditions	Data
Percentage of Retention Money	5%
Limit of Retention Money	5% of the Accepted Contract Amount
Minimum Amount of Interim Payment Certificate	1.00% of the Accepted Contract Amount

Bill of Quantifies

	Description
1	General
2	Drainage
3	Earthworks
4	Pavement
5	Structures
6	Reinstatement and Minor Works
7	Daywork
8	

Specifications (RED BOOK)

RED BOOK, 2005 is frequently used for road and bridge works, but AASHTO is often referred. **Section 500** specifies technically Bridge works.

SECTION 500-BRIDGE CONSTRUCTION

ITEM 501 Piling
ITEM 502 Railings
ITEM 503 Timber Structures
ITEM 504 metal Structures
ITEM 505 Reinforcing Steel
ITEM 506 Structural Concrete
ITEM 507 Prestressed Concrete Structures
ITEM 508 Concrete Structures
ITEM 509 Steel Bridges
ITEM 510 Welded Structural Steel
ITEM 511 Treated and Untreated Timber
ITEM 512 Paint

ITEM 506 STRUCTURAL CONCRETE

506.1.2 Classes and Uses of Concrete
Class A: Superstructures, heavily reinforced
substructures, slabs, columns, beams, girders and box culverts

506.2.3 Coarse aggregate
Class A: Grading requirements

506.3 Sampling and Testing of Structural Concrete
One sample consisting of three concrete cylinder test specimens(150x300mm) from each 75cubic meters.

506.4.1 Minimum cement contents, maximum water/cement ratio, consistency range in slump, minimum compressive strength

SECTION 900-MATERIAL DETAILS

Section 900 deals with common materials such as cement, aggregate, rebar and structural metal.

ITEM 901- Hydraulic Cement
ITEM 902-Construction Lime
ITEM 903-Bituminous Materials
ITEM 904-AGGREGATES
ITEM 905-Masonry Units
ITEM 906-Joint Materials
ITEM 907-Concrete, Clay, Plastic and Fiber Pipe
ITEM 908-Metal Pipe
ITEM 909- Concrete Curing Materials and Admixtures
ITEM 910- Paints
ITEM 911- Reinforcing Steel and Wire Rope
ITEM 912-Fence and Guardrail
ITEM 913- Structural Metal
ITEM 914-Treated and Untreated Timber
ITEM 915- Water

CHECKLIST FOR REQUIRED DOCUMENTS TO BE SUBMITED

INFRASTRUCTURE FUND	CHECKLIST A			Verified by	Approved by
Type of Project	General	Objective	Required Documents to be submitted		

Contract No.	RDTL-1000645		Submit Date		
Project Name	TONO IRRIGATION SCHEME		Stage	Verification of Tender Documents	
Implementing Agency					
Check Item	Check Point		Check Date	Check Mark	Remarks
	It is confirmed that all of those documents are submitted by I.M.				Reasons of undelivered
1	Instruction to Bidders		12/06/2013	✔	
2	Form of Bid and Qualification Data/Bidding Documents		12/06/2013	✔	
3	Conditions of Contract		12/06/2013	✔	
4	Contract Data/Particular Conditions		12/06/2013	✔	
5	Bill of Quantity		12/06/2013	✔	
6	Forms of Securities/Security Forms		12/06/2013	✔	
7	Specifications/General Specifications, Technical Specifications		12/06/2013	✔	
8	Drawings		12/06/2013	✔	
9	Others, if necessary				

CHECKLIST FOR CONTRACT CONDITIONS

INFRASTRUCTURE FUND	CHECKLIST B			Verified by	Approved by
Type of Project	General	Objective	Payment Conditions		

Contract No.	RDTL-1000645		Submit Date		
Project Name	TONO IRRIGATION SCHEME		Stage	Verification of Tender Documents	
Implementing Agency					
Check Item	Check Point		Check Date	Check Mark	Remarks
	It is confirmed whether those below are reasonable or not?				Referred Data
1	Time for completion/Construction Period		12/06/2013	✔	To be Advised?
2	Maintenance Period/Defect Notification Period		12/06/2013	✔	90 days (Too short?)
3	Governing Law		12/06/2013	✔	The Law of Democratic Republic of Timor Leste
4	Ruling Language		12/06/2013	✔	English
5	Performance Security/Performance Bond		12/06/2013	✔	10% Bank Guarantee
6	Delay damanges for the Work/Liquidated Damages		12/06/2013	✔	0.1% of Final Contract Price
7	Maximum amount of delay damages		12/06/2013	✔	10% of Final Contract Price
8	Provisional Sum		12/06/2013	✔	N/A
9	Total Advance Payment		12/06/2013	✔	N/A
10	Percentage of Retention		12/06/2013	✔	N/A
11	Limit of Retention Money		12/06/2013	✔	N/A
12	Minimum Amount of Interim Payment Certificates		12/06/2013	✔	N/A

Common Contract Data in the Past Project

Project Name	Tono Irrigation Scheme	Suai-Beaco Highway Road Project	Comoro 2 Bridge	Baer Bridge	ADB Project	Caramlun Irrigation Project	Common Range in the Past Project
Implementing Agency	Ministry of Agreculture	Ministry of Public Works	AND	Ministry of Public Works			
Time for Completion	–	–	270 days	480 days			
Maintenance Period	90 days	365 days	90 days	540 days	365 days		90-540
Governing Law	The Law of Timor Leste	The Law of Timor Leste	The Law of Timor Leste	The Law of Timor Leste	The Law of Timor Leste		The Law of Timor Leste
Ruling Language	English	English	English	English	English		English
Performance Security	10%	5%	5%	10%	5%	7.50%	5-10%
Delay Damage	0.1%/day	0.1%/Day		0.1%/Day	0.1%/Day	0.1%/Day	0.1%/Day
Maximun Amount of Delay Damages	10%	5%		10%	10%		5-10%
Provisional Sum				15%	15%		15%
Total Advance Payment		15%	20%	10%	15%		10-20%
Percentage of Retention		5%	5%	10%	10%		5-10%
Limit of Retention Money		5%		10%	10%		5-10%
Minimum Amount of Interim Payment		1%		5%			1-5%

THE END

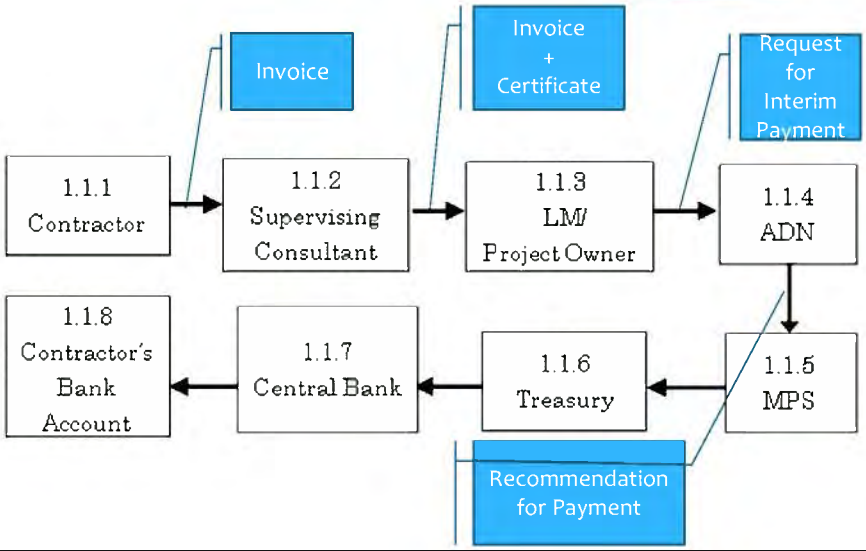
Next Lecture (6)

CLASSROOM LESSON (6)
ON
BRIDGE

Use of ADN-Manual

Regular Inspection and Recommendation for Payment

Flow Chart of Infrastructure Fund Project



SEQUENCES OF INSPECTION FOR INTERIM PAYMENT

1. Document Inspection
   Inspection of documents submitted by LM
2. Site Inspection
   Schedule, Quality Control, Measurement and Remedy
3. Notice of Judgment on Payment
   Recommendation for payment
4. FAQ
   Record of Frequently asked questions and answer

Document Inspection

1. Confirmation of Documents submitted ⇒ Checklist D
2. Confirmation of Payment conditions ⇒ Particular Conditions
3. Calculation in Billing Sheets ⇒ BoQ Digital Data
4. Confirmation of completed works in BoQ ⇒ BoQ Digital Data
5. Confirmation of work schedule ⇒ Monthly Report

Checklist for submitted documents for Payment Request

CTURE	CHECKLIST D			Verified by
oject	Road & Bridge	Objective	Required Documents to be submitted	

No.		Submit Date	
ame		Stage	Inspection of Payment R
ementing Agency			

em	Check Point	Check Date	Check Mark	Reme
	It is confirmed that all of those documents are submitted by LM.			Reasons of
1	Request Letter of Inspection from LV to ADN			
2	Invoice from Contractor to LM/Project Owner			
3	Parts of Contract Document, showing the contract amount and payment conditions			
4	Bill of Quantities showing unit prices and quantities			
5	Certificate for Payment by Supervising Consultant			
6	Approval for Payment by LM			
7	Interim Monthly Certificate			
8	Description of changes, alteration or variations, if any			
9	Digital data of BOQ			

PAYMENT CONDITIONS

Conditions	Data
Defect Notification Period	365 days
Performance Security	5 percent of the Accepted Contract Amount
Normal working hours	8 hours per day
Delay damages for the works	0.1% of the Contract Amount
Maximum amount of delay damages	5% of the final Contract Price
Total advance payment	Maximum 15% of the Accepted Contract Amount
Percentage of Retention Money	5%
Limit of Retention Money	5% of the Accepted Contract Amount
Minimum Amount of Interim Payment Certificate	1.00% of the Accepted Contract Amount

Site Inspection

1. Preparation ⇒ Request Letter for Preparation (Form E)
2. Verification of Schedule ⇒ Monthly Report
3. Quality Control ⇒ Checklist E
4. Measurement of the Work Completed ⇒ Checklist F
5. Remedy ⇒ AND-MANUAL

Section 2: Regular Inspection for Payment & Recommendation for Payment

1. Infrastructure Fund

1.4 Site Inspection

(5) Remedy

When ADN finds some non-conformant or unsatisfactory works, AND shall instruct the remedy.

REQUEST LETTER FOR PREPARATION

(SUBJECT) REQUEST OF PREPARATION FOR SITE INSPECTION

In response to payment request submitted to ADN, ADN informs that ……. …… ADN requests LM to prepare the followings in order to conduct a site inspection properly and orderly.

1. Name of Project
2. Date of Site Inspection
3. Attendants required
1) Supervisor and Engineer(s) in charge from **LM**
2) Supervising **Consultant**(s)
3) Site Manager and Chief Engineer from **Contractor**
4. Preparation at site arranged by LM
1) **Records on Quality Control**
2) Drawings with completed construction included
3) Details of BoQ
4) Measuring Devices, if necessary Destructive Testing
5) Assistants for Measurement

Checklist on Quality Control

INFRASTRUCTURE FUND	CHECKLIST E			Verified by	Approved by
Type of Project	Road & Bridge	Objective	Quality Control		

Contract No.		Submit Date	
Project Name		Stage	Inspection of Payment Request
Implementing Agency			

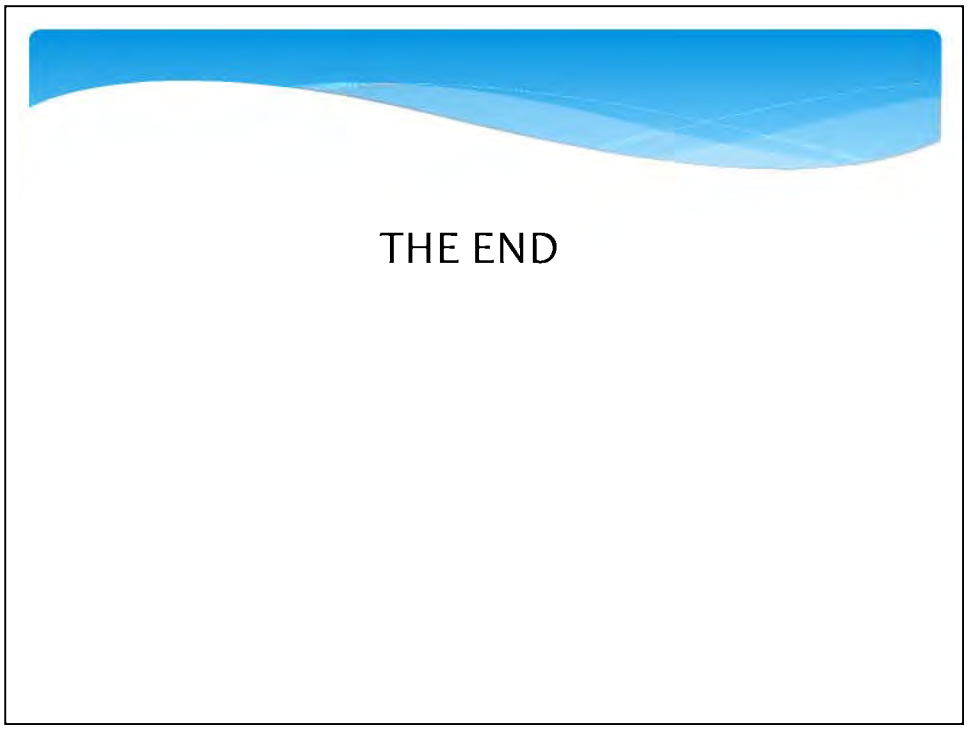
	Check Item	Check Point	Check Date	Check Mark	Referrence
1	Concrete	Compressive Strength at 28th day			Technical Specifications
2		Slump Loss			Technical Specifications
3		Minimum time and minimum percentage design strecgth for removal of forms are specified in 508.3.14 of the Standard Specifications.			MTCPW Standard Specification_ 2005
4	Rebar	Usually deformed bar for concrete reinforcement is used in accodance with AASHTO M 31 (Grade 400)			
5	Weep Holes	Weep holes on walls are usually spaced not more than 2 meters center to center and the diameter is 50mm.			
6	Cement	Portland cement . AASHTO M85 is frequently used for structural concrete.			MTCPW Standard Specification_ 2005
7	Piling	Scope, test piles and load tests are specified in the Standard Specifications Item 501			MTCPW Standard Specification_ 2005
8	Subgrade	Subgrade surface tolerances are specified in 206.3.2 of the Standrd Specifications.			MTCPW Standard Specification_ 2005
8	Subbase	Allowable tolerances are specified in Section 300 of the Standrd Specifications			MTCPW Standard Specification_ 2005
9	Base Course	Allowable tolerances are specified in Section 300 of the Standrd Specifications			MTCPW Standard Specification_ 2005
10					

Checklist on Measurement

Infrastructure Fund	CHECKLIST F			Verified by	Approved by
Type of Project	Road & Bridge	Objective	Measurement		

Contract No.		Submit Date	
Project Name		Stage	Inspection of Payment Request
Implementing Agency			

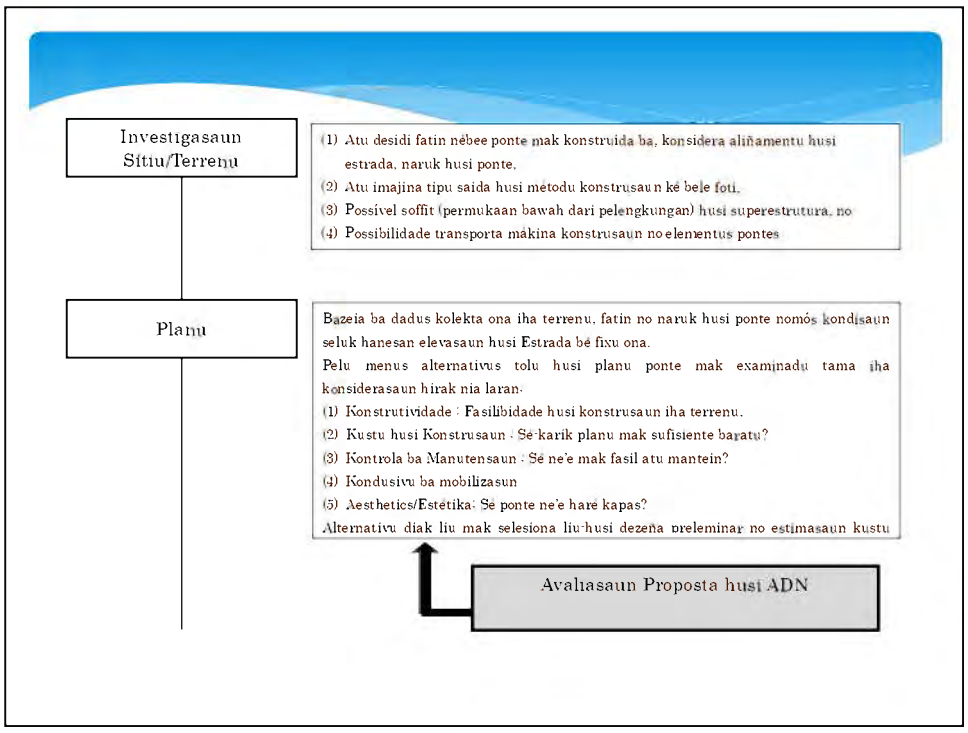
	Check Item	Check Point	Check Date	Check Mark	Referrence
1	Base Course	Measure length and width of the work completed in this period, calculate the base course volume using design thickness of the base			Drawings & Bill of Quantities
2	Pavement	Measure length and width of the work completed in this period, calculate the pavement area			Drawings & Bill of Quantities
3	Drainage Cleaning	Measure length of the draingage cleaning work completed in this period			Drawings & Bill of Quantities
4	StoneMasonry Side Ditch	Measure necessary lengthes of each side and length, culculate the volume of the work completed in this period			Drawings & Bill of Quantities
5	Railings	Measrue total length and number of Guide Post			Drawings & Bill of Quantities
6	Road Marking	Measure total length			Drawings & Bill of Quantities
7	Road Signs	Count number of road signs			Drawings & Bill of Quantities
8	Wing Wall	Measure dimensions and compare with the drawings			Drawings & Bill of Quantities
9	Deck Slab	Measure dimensions and compare with the drawings			Drawings & Bill of Quantities
10	Approach Slab	Measure dimensions and compare with the drawings			Drawings & Bill of Quantities

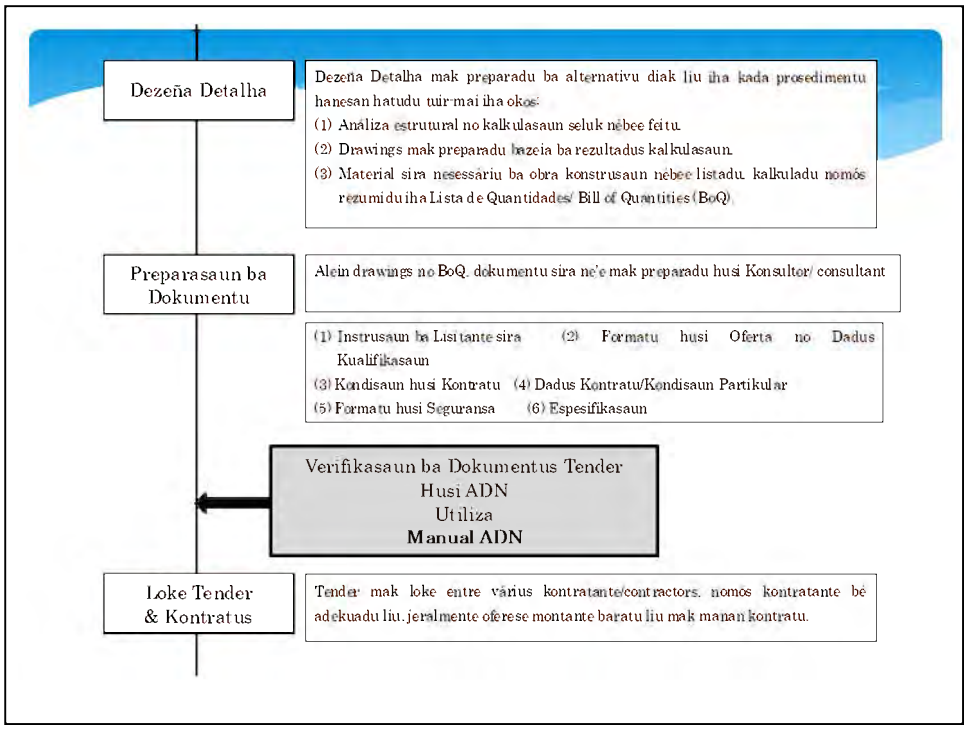

THE END

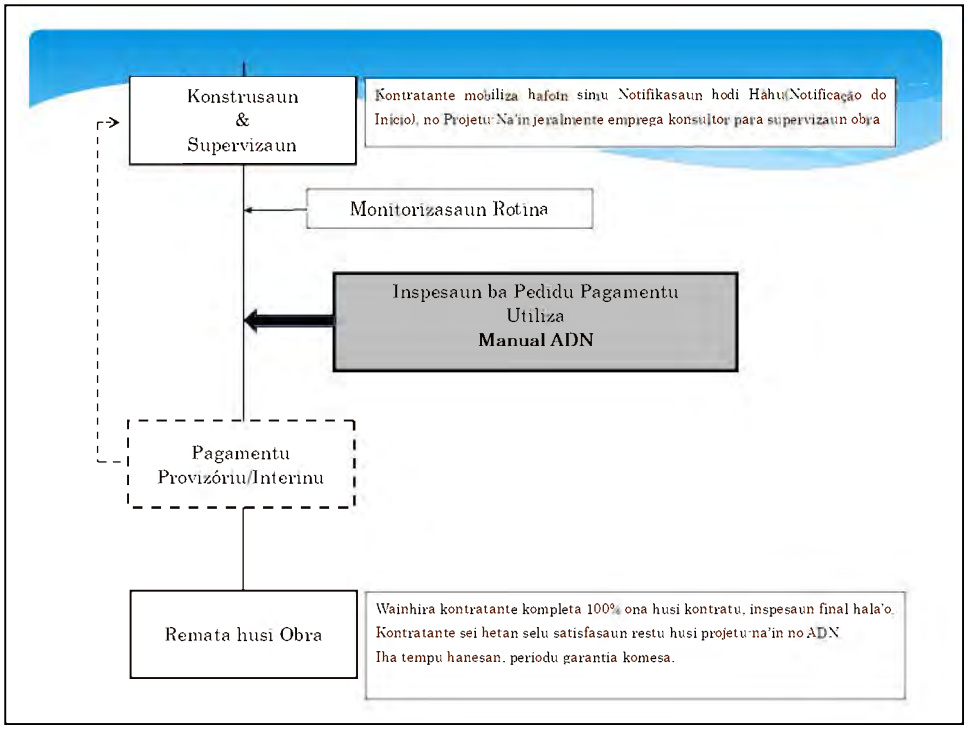
添付資料 9 座学研修教材(橋梁)(テトン語版)

LISAUN SALA de AULA(1)
Kona-ba
PONTE

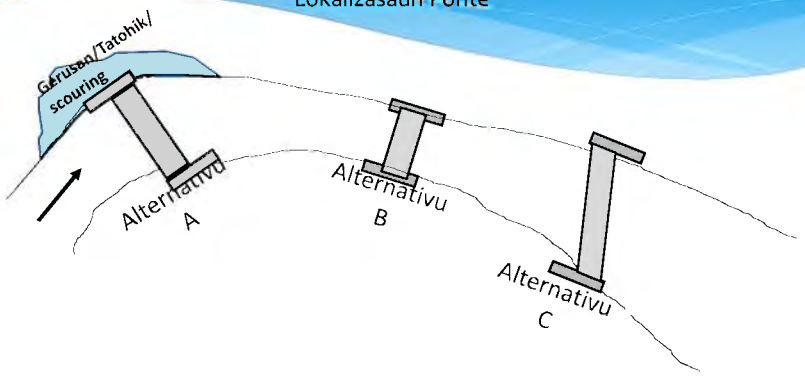
FLUXU HUSI OBRA PONTE
&
INVESTIGASAUN TERRENU




Dezeña Detalha
Dezeña Detalha mak preparadu ba alternativu diak liu iha kada prosedimentu hanesan hatudu tuir mai iha okos:
(1) Análiza estrutural no kalkulasaun seluk nébee feitu.
(2) Drawings mak preparadu hazeia ba rezultadus kalkulasaun.
(3) Material sira nesessáriu ba obra konstrusaun nébee listadu kalkuladu nomós rezumidu iha Lista de Quantidades/ Bill of Quantities (BoQ).
Preparasaun ba Dokumentu
Alein drawings no BoQ, dokumentu sira ne'e mak preparadu husi Konsultor/ consultant
(1) Instrusaun ba Lisitante sira (2) Formatu husi Oferta no Dadus Kualifikasaun
(3) Kondisaun husi Kontratu (4) Dadus Kontratu/Kondisaun Partikular
(5) Formatu husi Seguransa (6) Espesifikasaun
Verifikasaun ba Dokumentus Tender
Husi ADN
Utiliza
Manual ADN
Loke Tender & Kontratus
Tender mak loke entre vários kontratante/contractors, nomós kontratante bé adekuadu liu, jeralmente oferese montante baratu liu mak manan kontratu.


Konstrusaun & Supervizaun
Kontratante mobiliza hafoin simu Notifikasaun hodi Hahu(Notificação do Início), no Projetu Na'in jeralmente emprega konsultor para supervizaun obra
Monitorizasaun Rotina
Inspesaun ba Pedidu Pagamentu
Utiliza
Manual ADN
Pagamentu Provizóriu/Interinu
Remata husi Obra
Wainhira kontratante kompleta 100% ona husi kontratu, inspesaun final hala'o. Kontratante sei hetan selu satisfasaun restu husi projetu na'in no ADN.
Iha tempu hanesan, periodu garantia komesa.

Lokalizasaun Ponte



A: Risku husi kolapsu ba subestrutura iha banku karuk husi Gerusan (Tatohik=Scouring).
B: Badak Liu, Baratu Liu = Solusaun Diak Liu..
C: Naruk liu karu tebes, no Ponte hális nébee ké defisil no problemátika atu harii/konstrui.

OBSERVASAUN TERRENU

1. karik we-mota (riverbed) maran durante konstrusaun?
   ka Rekere Kurva (Detour) ba fluxu mota?
2. Tipu konstrusaun saida mak possivel iha terrenu, tuir-mai?
3. Se iha fatin propriu ruma ba rezervasaun (stockpile),
   edefisiu no preparasaun obra?
4. Tipu fundasaun saida mak sujere?

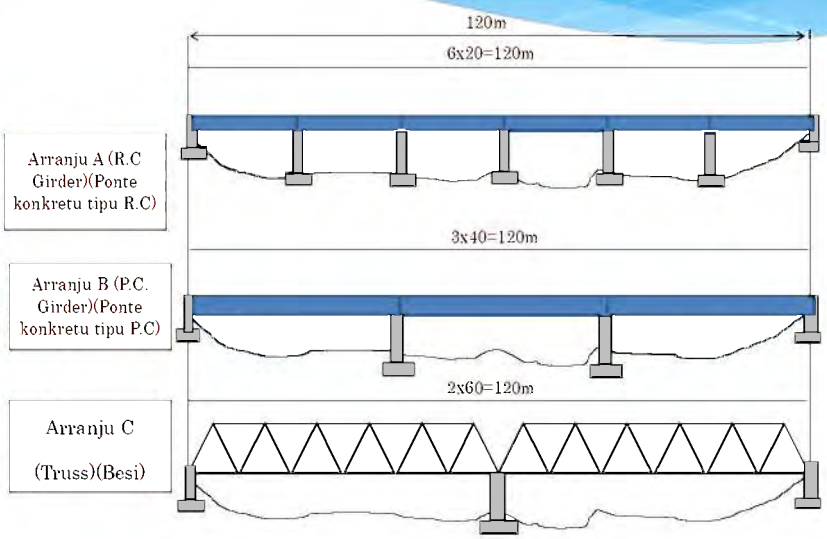
PONTE AYASA . Harik utiliza apoia temporaria no peyangga(katrol/crane)

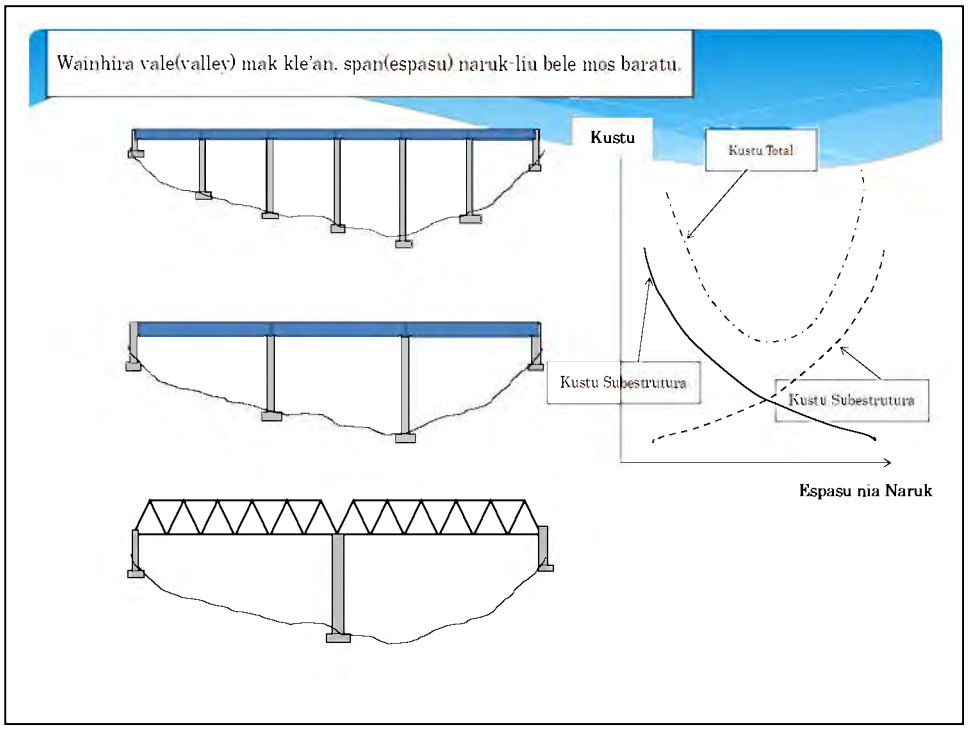
PONTE COMORO.
Segmentasaun PC (aproxima Nanaruk 6m), importada husi Indonesia, mak rezervada iha fatin besik ho terrenu no transportada ba terrenu utiliza kareta trailer.

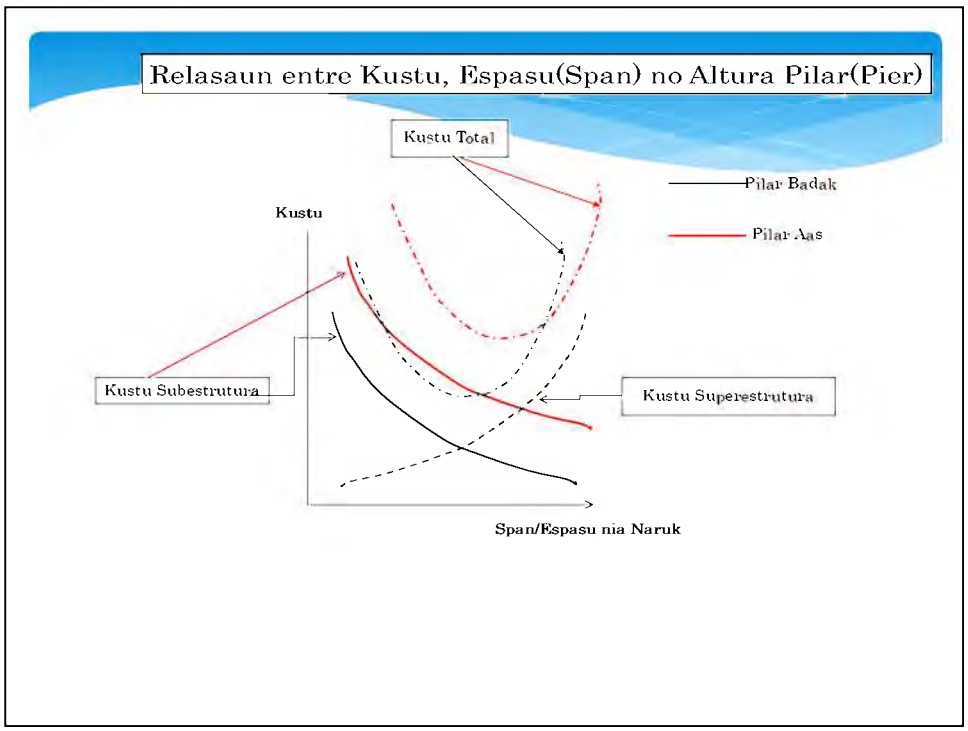
COMORO BR.

Konekta balok fabrika sai ida (Nanaruk 40m) , foti sa'e tiha, muda horizontalmente, no hatun ba okos

Arranju Espasu(Span)



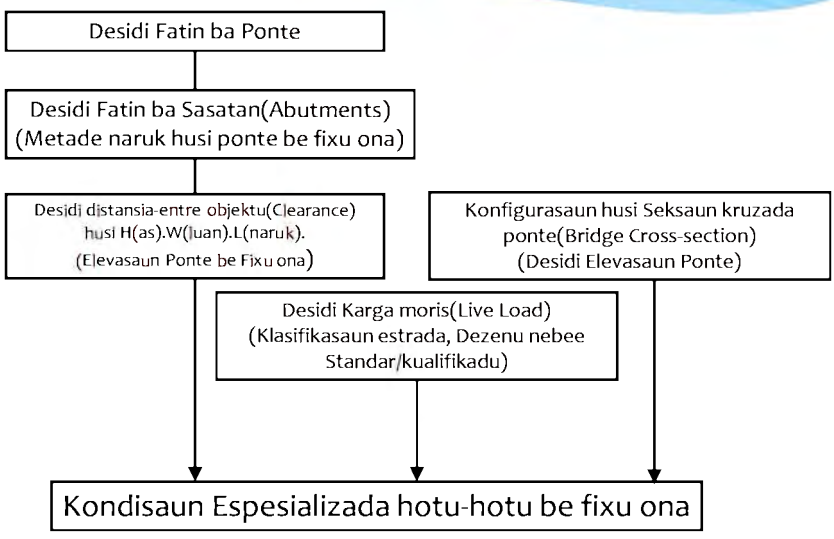

Wainhira vale(valley) mak kle'an. span(espasu) naruk-liu bele mos baratu.
Kustu
Kustu Total
Kustu Subestrutura
Kustu Subestrutura
Espasu nia Naruk


Relasaun entre Kustu, Espasu(Span) no Altura Pilar(Pier)
Kustu Total
Pilar Badak
Pilar Aas
Kustu
Kustu Subestrutura
Kustu Superestrutura
Span/Espasu nia Naruk

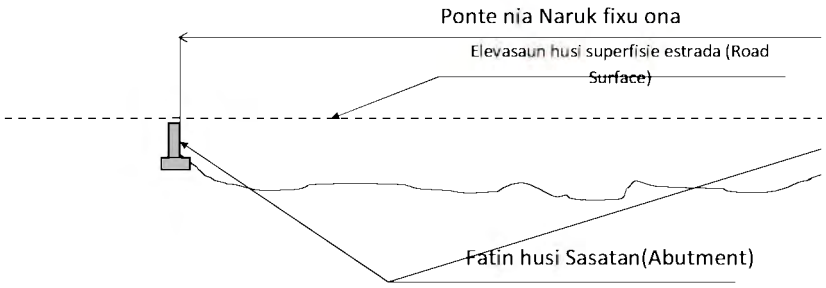
LISAUN SALA de AULA(2)
Kona-ba
PONTE

PLANU PONTE
(Superstructure/Superestrutura)

SEQUENSIA(Urutan) HUSI PLANEAMENTU PONTE

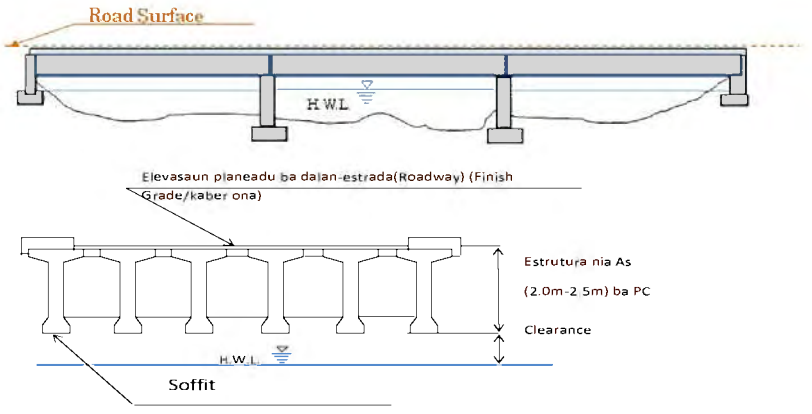


Fatin husi Sasatan(Abutments), Ponte nia Naruk(Bridge Length)

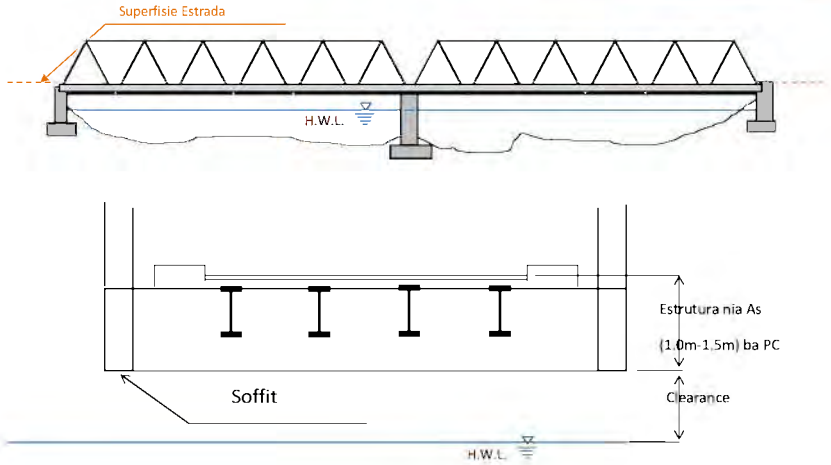


Elevasaun husi Soffit(Superfisie okos husi arku/busur)
Nivel Be nia As(High Water Level)
Elevasaun husi Superfisie Estrada(Road Surface)

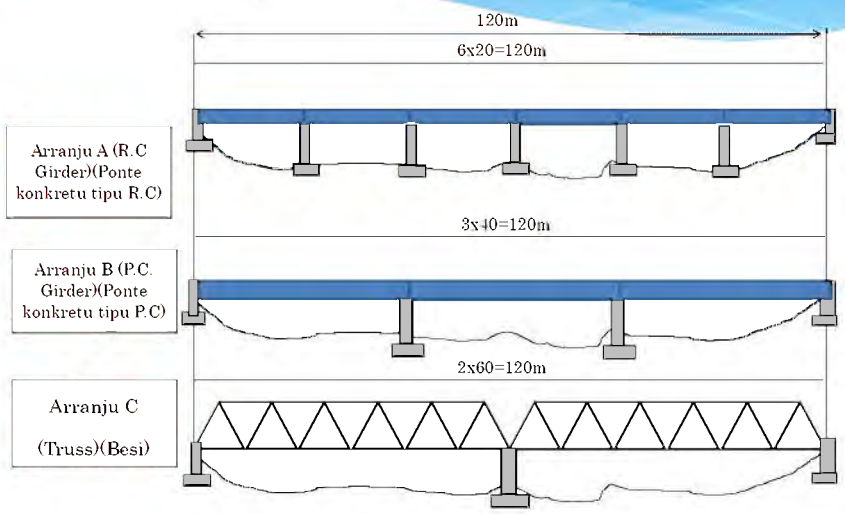
Superestrutura: Balok-prinsipal ka PC Girder (Tipu Dek/Deck)



Superestrutura: Steel Truss
(Tipu Remata;Rampung/Through Type)

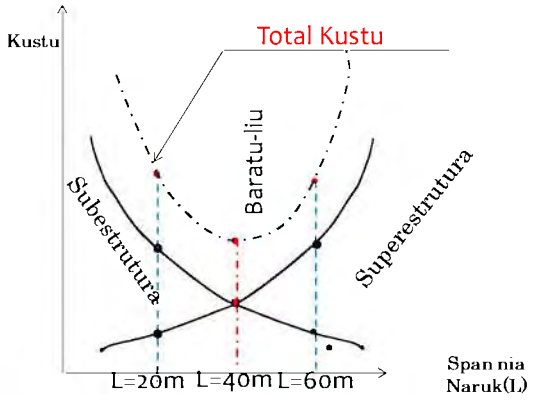


Alternativus Tolu

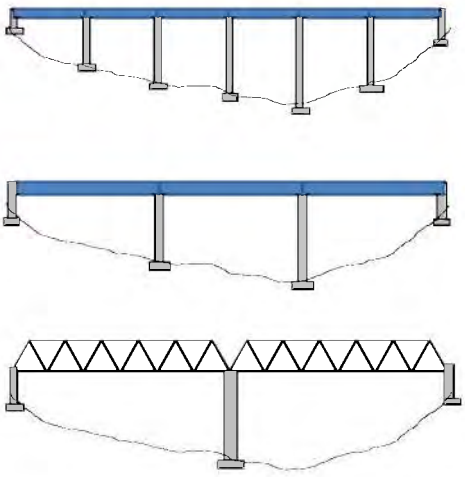


Kustu ba Superestrutura no Subestrutura

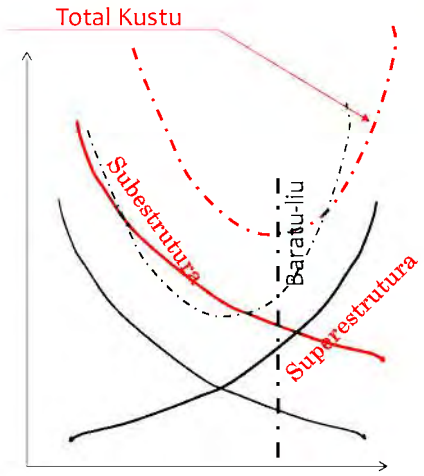
1. Espasu(span) nebee naruk-liu, Kustu nebee as-liu ba superestrutura.
2. Espasu(span) nebee naruk-liu, kustu ba subestrutura mak tun-liu tamba numeru husi pilar(piers) hamenus.



Wainhira vale(valley) mak kle'an, hanesan iha-okos;



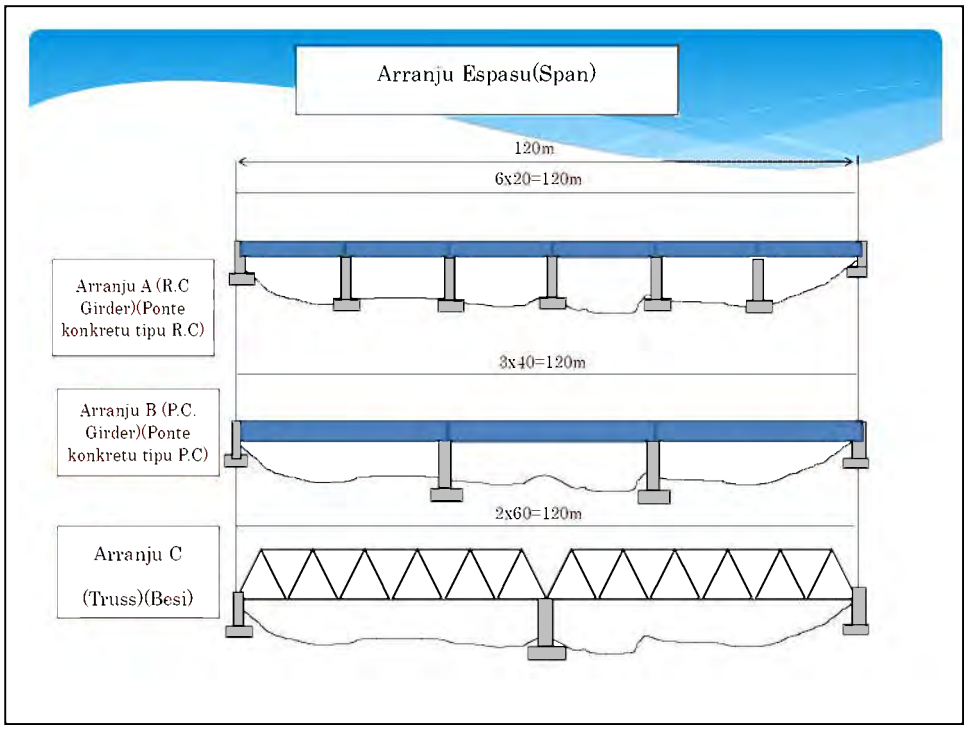
Winhira vale(valley) mak kle'an, hanesan iha-okos:



Amostra(Sample) husi Arranju Espasu(Span Arrangement)

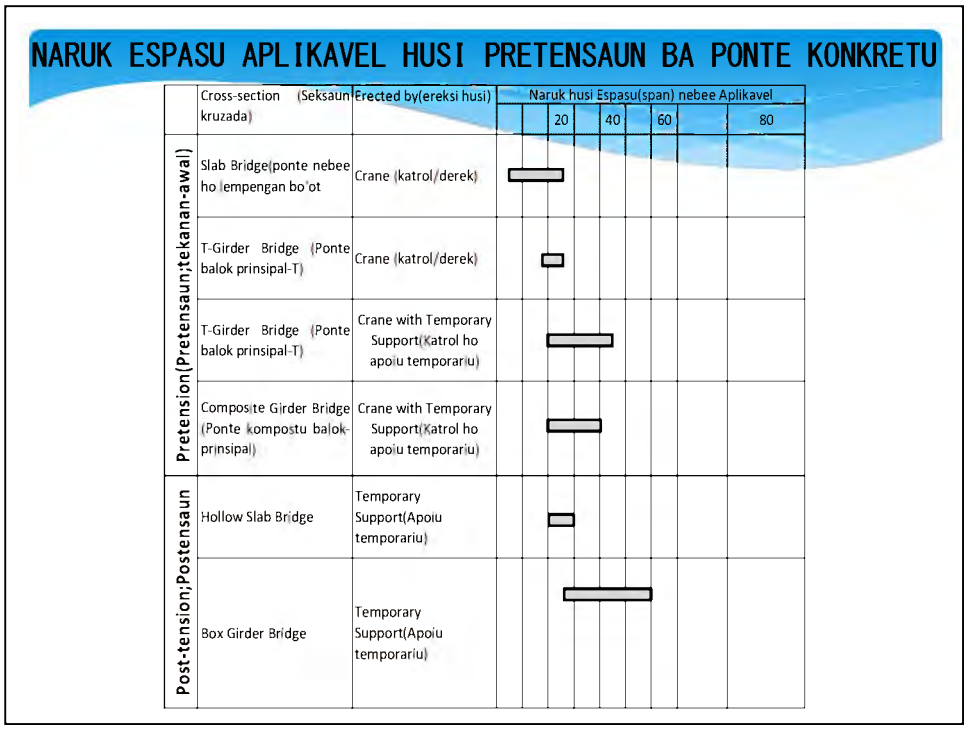
Wainhira vale(valley) mak kle'an, Espasu(span) naruk-liu mak baratu-liu.

Wainhira mota lolon(river bed) mak nivel horizontal/datar, multi-espasu(span)badak mak baratu-liu.



NARUK ESPASU NEBEE APLIKAVEL HUSI PONTE KONKRETU REFORSADA (REINFORCED CONCRETE BRIDGE)

Type(Tipu)	Applicable Span Length(Naruk husi Espasu nebee Aplikavel)								Cross-section of the Bridge (Seksaun Kruzada husi ponte)
			20		40		60		80	
Solid Slab Bridge(Ponte Lempengan/Laje bo'ot solidu)										
Hollow Slab Bridge(Ponte lempengan berongga										
T Girder Bridge (Ponte balok prinsipal T)										


NARUK ESPASU APLIKAVEL HUSI PRETENSAUN BA PONTE KONKRETU
Cross-section (Seksaun kruzada)
Erected by(ereksi husi)
Naruk husi Espasu(span) nebee Aplikavel
20
40
60
80
Pretension(Pretensaun;tekanan-awal)
Slab Bridge(ponte nebee ho lempengan bo'ot
Crane (katrol/derek)
T-Girder Bridge (Ponte balok prinsipal-T)
Crane (katrol/derek)
T-Girder Bridge (Ponte balok prinsipal-T)
Crane with Temporary Support(Katrol ho apoiu temporariu)
Composite Girder Bridge (Ponte kompostu balok-prinsipal)
Crane with Temporary Support(Katrol ho apoiu temporariu)
Post-tension;Postensaun
Hollow Slab Bridge
Temporary Support(Apoiu temporariu)
Box Girder Bridge
Temporary Support(Apoiu temporariu)

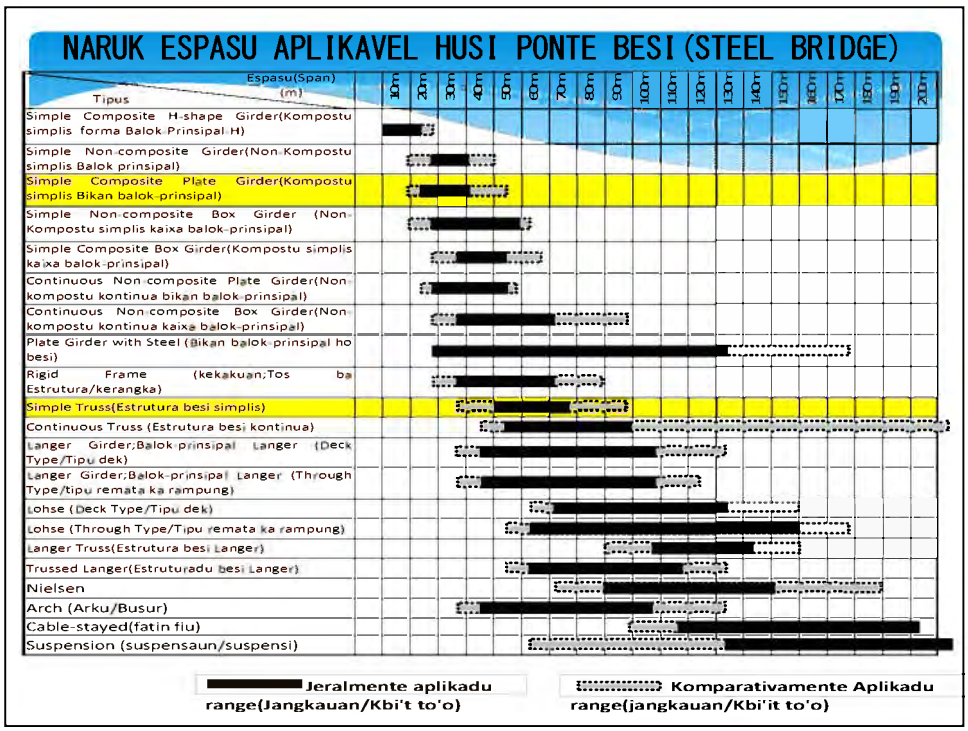

NARUK ESPASU APLIKAVEL HUSI PONTE BESI (STEEL BRIDGE)
Espasu(Span) (m)
Tipus
10m
20m
30m
40m
50m
60m
70m
80m
90m
100m
110m
120m
130m
140m
150m
160m
170m
180m
190m
200m
Simple Composite H-shape Girder(Kompostu simplis forma Balok-Prinsipal-H)
Simple Non-composite Girder(Non-Kompostu simplis Balok prinsipal)
Simple Composite Plate Girder(Kompostu simplis Bikan balok-prinsipal)
Simple Non-composite Box Girder (Non-Kompostu simplis kaixa balok-prinsipal)
Simple Composite Box Girder(Kompostu simplis kaixa balok-prinsipal)
Continuous Non-composite Plate Girder(Non-kompostu kontinua bikan balok-prinsipal)
Continuous Non-composite Box Girder(Non-kompostu kontinua kaixa balok-prinsipal)
Plate Girder with Steel (Bikan balok-prinsipal ho besi)
Rigid Frame (kekakuan;Tos ba Estrutura/kerangka)
Simple Truss(Estrutura besi simplis)
Continuous Truss (Estrutura besi kontinua)
Langer Girder;Balok-prinsipal Langer (Deck Type/Tipu dek)
Langer Girder;Balok-prinsipal Langer (Through Type/tipu remata ka rampung)
Lohse (Deck Type/Tipu dek)
Lohse (Through Type/Tipu remata ka rampung)
Langer Truss(Estrutura besi Langer)
Trussed Langer(Estruturadu besi Langer)
Nielsen
Arch (Arku/Busur)
Cable-stayed(fatin fiu)
Suspension (suspensaun/suspensi)
Jeralmente aplikadu range(Jangkauan/Kbi't to'o)
Komparativamente Aplikadu range(jangkauan/Kbi'it to'o)

FOTO EXEMPLU HUSI PONTE BESI

PLATE GIRDER BRIDGE
(Besi Anti-ferruju)

NIELSEN ARCH BRIDGE
(TIPU REMATA/THROUGH TYPE)

TRUSS BRIDGE

ARCH BRIDGE (DECK TYPE)

KOMPARASAUN ENTRE PONTE BESI (STEEL BRIDGE) & PONTE KONKRETU (CONCRETE BRIDGE)

	STEEL BRIDGE (Ponte Besi)	CONCRETE BRIDGE (Ponte Besi)
(1) CONSTRUCTIVITY (Konstrutividade)	- Elementus maioria husi pré-fabrikadu > Kualidade diak -Elementus kamaan> La persija ekipamentus todan	- Servisu maioria iha terrenu> Kontrolu kualidade iha terrenu - Rekere Lansador(Launcher) ka eresaun(erection)iha balok mestre (girder)
(2) CONSTRUCTION COST (Kustu Konstrusaun)	-Persija importa >Karu	- Material & servisu-na'in bele hetan lokalmente> Baratu
(3) MAINTENANCE (Manutensaun)	-Pinta fila-fila kada tinan sanulu (Galvanizasaun, anti-ferruju)	-Ferruju iha besi barra laran impossivel atu hetan
(4) COMFORT OF DRIVING (Kondusivu ba Mobilizasaun)	-Kona-ba tipu la Kofortável	-Konfortável
(5) AESTHETICS (Estétika)	-Bonitu(kapas) & bele pinta kor oi-oin	-Ladun bonitu(kapas)

FINAL;OBRIGADU
WA'IN

Aprendezajen tuir-mai(3)
Kona-ba
PLANU PONTE (BRIDGE PLAN)
(Subestrutura)

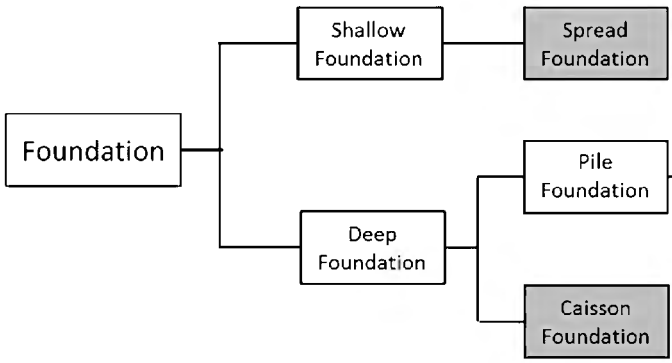
Lisaun Sala de Aula(3)
Kona-ba
PONTE

PLANU BA PONTE
(Subestrutura, Fundasaun no Asessorius)

PLANU SOBRE FUNDASAUN

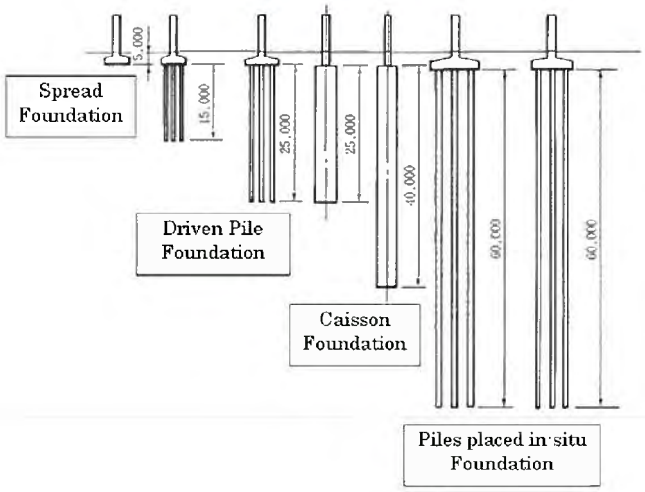
Tipu husi fundasaun/foundation mak selesionadu konsidera tipu-rai/terrain, geolojia, kustu nomos konstrutividade/constructivity.

KLASSIFIKASAUN HUSI FUNDASAUN/FOUNDATION



Pilar kolokadu iha-situ mak mos hanaran nudar "Pilar Furadu(Bored pile)"

TIPU HUSI FUNDASAUN/FOUNDATION



KLEAN NEBEE APLIKAVEL HUSI KAMADA AGUENTADA(BEARING LAYER) BA KADA TIPU PILAR(PILE TYPE)

Para atu hatene kamada/satan aguentada (bearing layer), teste furamentu(boring test) mak hala'o tiha ona.

Tpye	Applicable Depth of Foundation									
	10m	20m	30m	40m	50m	60m	70m	80m	90m	
Spread Foundation										
Driven Pile Foundation										
Pile placed in-situ Foundation										
Caisson										

KRITERIA HODI SELESIONA TIPU FUNDASAUN

FUNDASAUN ESPALHA (SPREAD FOUNDATION)

* Asegura no baratu, mak-nebee kamada aguentada(bearing layer) mak la klean(to'o 5 ka 6m) no forsa nataton,
* Uja de'it wainhira la ta'uk ba tatohik/scouring, Hatur-fatin(settlement)

FUNDASAUN PILAR DIRIJIDA(DRIVEN PILE FOUNDATION)

* Produtu pilar besi/steel, PC ka RC transportada nomos dirijida iha fatin/site,
* Persija deriji makina pezada,
* Aplikada ba satan aguentada ke klean-liu(deeper bearing layers) to'o 60m

PILAR FUNDASAUN KOLOKADU IHA TERRENU(PILE PLACED IN-SITU FOUNDATION)

* Pilar konstruta iha terrenu liu-husi ke'e rai-ku'ak, koloka besi-betaun(rebars) no konkretu,
* Aplikadu ba satan aguentada ke kle'an-liu(deeper bearing layers) to'o 60m

FUNDASAUN KAIXOTE (CAISSON FOUNDATION)

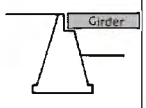
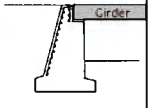
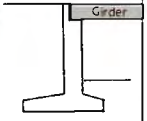
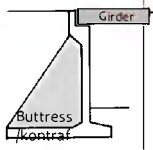
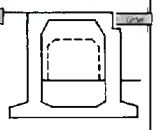
* Fundasaun beku/to'os (Rigid foundation) ho konkretu konstruta iha terrenu(site),
* Rekeridu fasilidades pezadus,
* Aplikadu ba satan aguentada ke kle'an-liu(deeper bearing layers) to'o 40m

PLANU BA SUBESTRUTURA

Typu husi sasatan(abutments) no pilares(piers) mak selesionada konsidera tipu-rai(terrain), medida(sizes) husi superestrutura, as(height), Mota suli(river flow), geolojia, kustu no konstrutividade.

Selesaun Tipu Sasatan(Abutment Type)

Depende ba medida-As(height)

	Gravity Type	Semi- Gravity Type	Invert-T Type	Buttress Type	Rigid Frame Type
Types of Abutment					
Applicable Height	H< 5m	4m < H< 6m	5m<H< 10m	10m < H< 15m	H> 15m

Abutment Type	Applicable Height																	
	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m
Gravity Type	———	———																	
Semi-Gravity Type			———	———															
Invert T Type				———	———	———	———	———											
Buttress Type									———	———	———	———	———						
Rigid Frame Type														———	———	———	———		

Selesiona Tipu Pilar(Pier Type) Depende ba medida-As(height)

Tipu Pilar	Medida-As/Height (m) 10 20 30	Notas
Koluna(Column) / Tipu Moru	———	
Tipu armasaun beku/to'os;Rigid Frame Type (Andar-1)	5 — 15	
Tipu armasaun beku/to'os;Rigid Frame Type (Andar-2)	15 — 25	
Tipu koluna rua(Two Column Type)	15 — ···	For Hollow Slab(ba lempengan berongga 

Asessorius Prinsipais husi Ponte

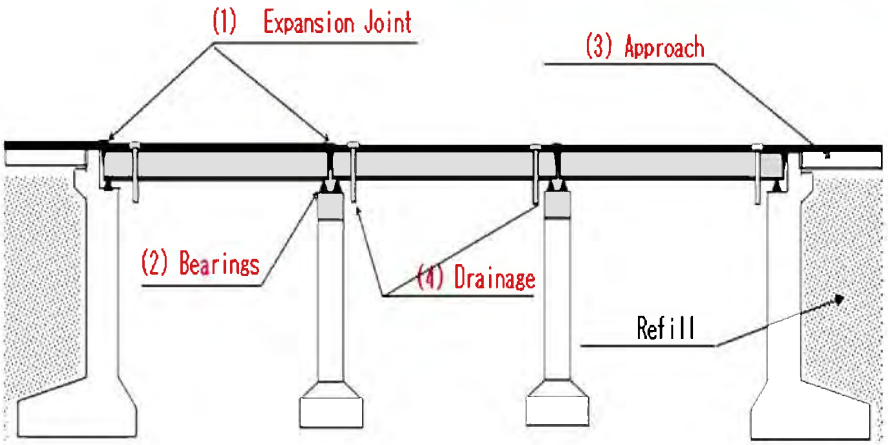
(1) Expansion Joints

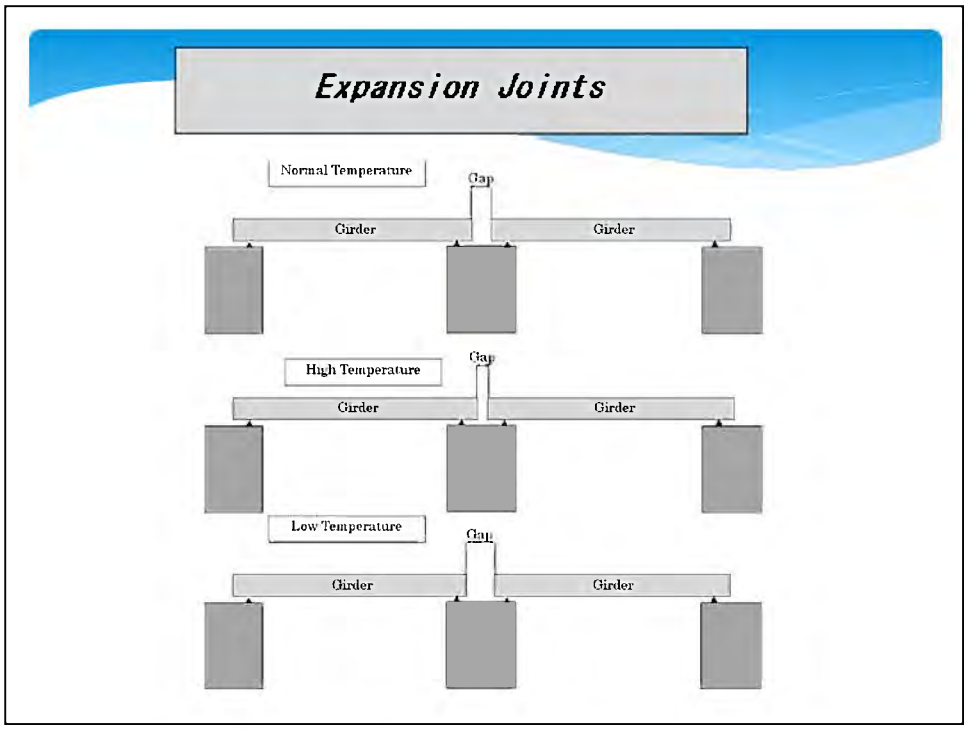
(2) Bearings

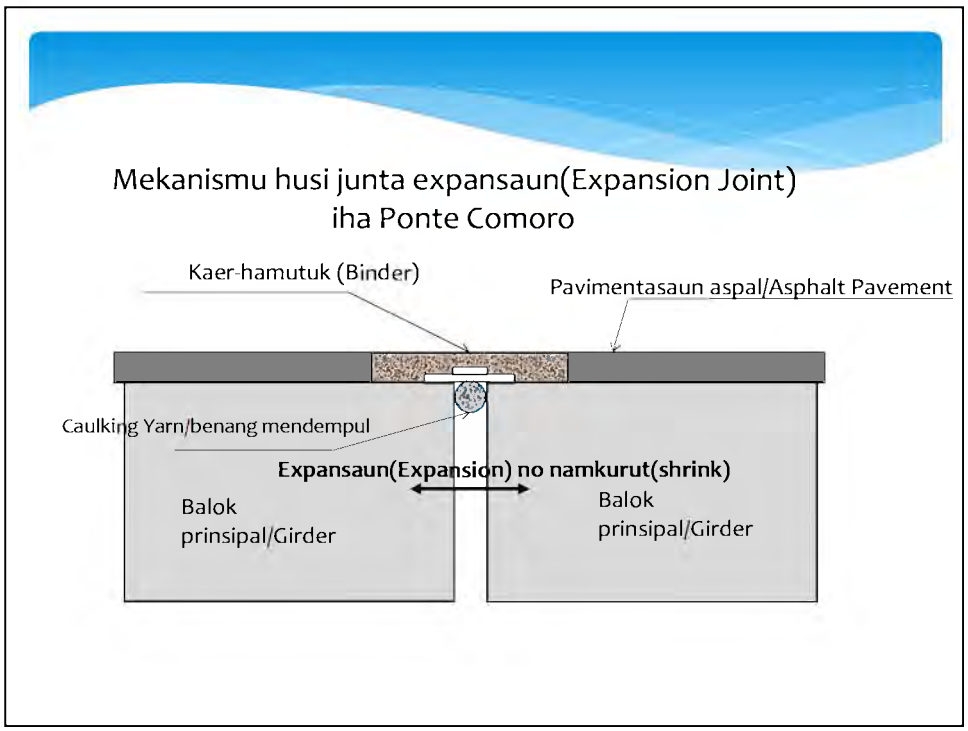
(3) Approach Slab

(4) Drainage

Lokalizasaun ba Asessorius




Expansion Joints
Normal Temperature
Gap
Girder
Girder
High Temperature
Gap
Girder
Girder
Low Temperature
Gap
Girder
Girder


Mekanismu husi junta expansaun(Expansion Joint)
iha Ponte Comoro
Kaer-hamutuk (Binder)
Pavimentasaun aspal/Asphalt Pavement
Caulking Yarn/benang mendempul
Expansaun(Expansion) no namkurut(shrink)
Balok
prinsipal/Girder
Balok
prinsipal/Girder

Aguenta (Bearings) no Ankora (Anchor)

Funsaun:

(1)Atu suporta superestrutura no transfere reaksaun forsa vertikal nomos horizontal ba subestrutura,

(2) Atu permiti deslokamentu longitudinal tamba deflexaun no mudansa temperatura,

(3) Permiti rotasaun tamba deflexaun husi superestrutura.

Materiais:

(1) Neoprene (Elastomeric bearing pad/aguenta bloku,

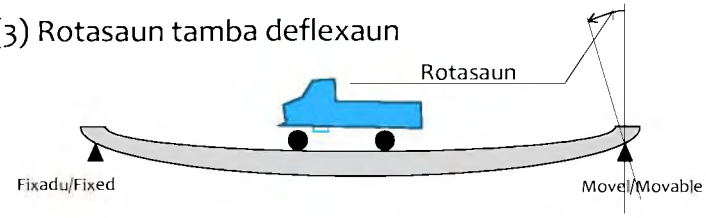
(2) Metal.

Funsaun hirak husi Aguenta/Bearing

(1) Suporta Reaksaun Forsa Vertikal

(2) Deslokasaun Longitudinal tamba mudansa temperatura

(3) Rotasaun tamba deflexaun

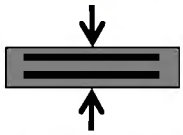


Elastomeric Bearing Pad/ Bloku Aguentamentu

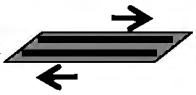
Estrutura: Sandwich/ habit ba bikan besi (steel plates) no borracha

Mekanismu husi borracha(elastomeric) aguentamentu (bearing):

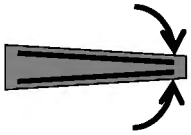
Forsa Reaksaun

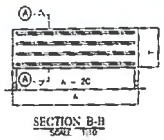


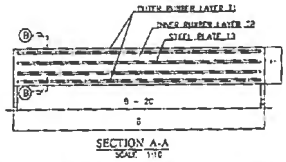
Expansaun/Namkurut (Shrink)



Rotasaun





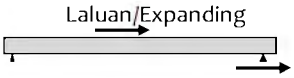


DETAIL ELASTOMERIC BEARING PAD GIRDER 30&40

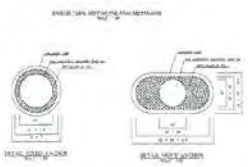
Bloku Aguentamentu (Bearing pad) uza iha ponte comoro.

Ankora (Anchor)

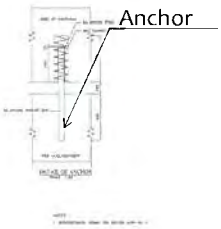
Funsaun: Tahan movimentu horizontal husi superestrutura iha limite nia laran



Parte Fixu Parte Movel



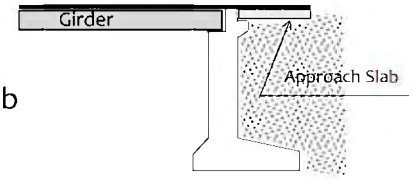
Parte Fixu Parte Movel

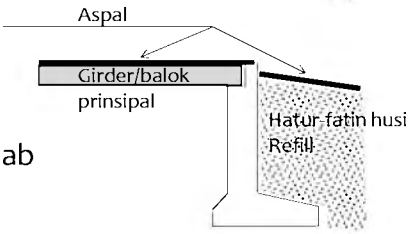


Approach Slab(Lempeng penghubung)

Funsaun: Kontramedida hasoru gap elevasaun tamba hatur-fatin husi refill iha sasatan (abutment) nia kotuk

Ho Approach Slab





Ho Approach Slab

Drenajen

Iha konsepsaun husi sistema drenajen, konsidera buat-hirak iha okos;

(1) Intensidade Udan-ben/Rainfall intensity (mm/hr)

(2) Area Kaptasaun/Catchment area (Area husi superfisie estrada/roadsurface: m^2)

(3) Deklive/Slope husi superfisie ponte/bridge surface (%)

Final

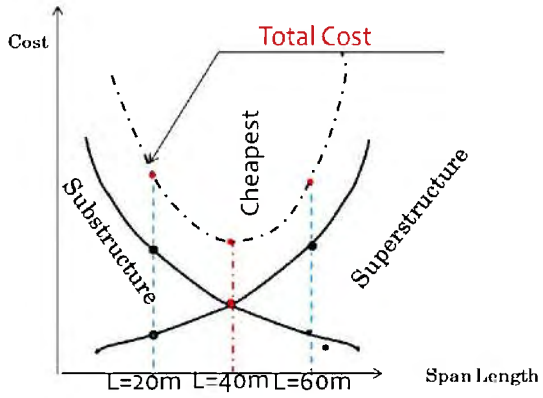
Aprendezajen Tuir-mai (4)
Kona-ba
Dezenhu Detalhu/Detailed Design

LISAUN SALA de AULA (4)
KONA-BA
PONTE

Dezeñu Detalhadu(Detailed Design)
&
Oinsa atu Lê Dezeñu husi Ponte
(How to Read Bridge Drawings)

Revizaun ba Lisaun Liu-ba

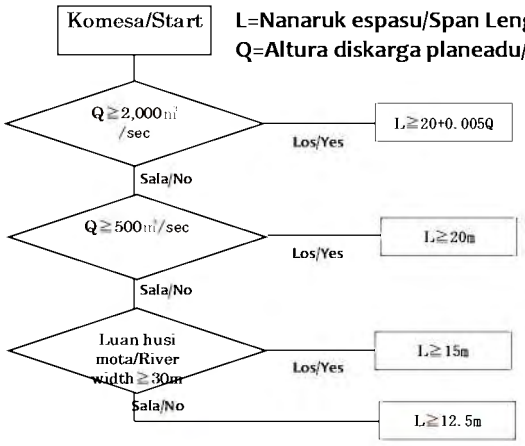
Karik Laiha obstáklu/constraints ba selesaun Nanaruk espasu/span nebee ke mais razoável, idea ne'e gráfiku iha-okos hatudu katak bele aplikadu. Maibe aktualmente iha obstáklu/constraints atu deside Nanaruk espasu/span length haktuir nu'udar kondisaun mota, difikuldades husi konstrusaun no ambiente.



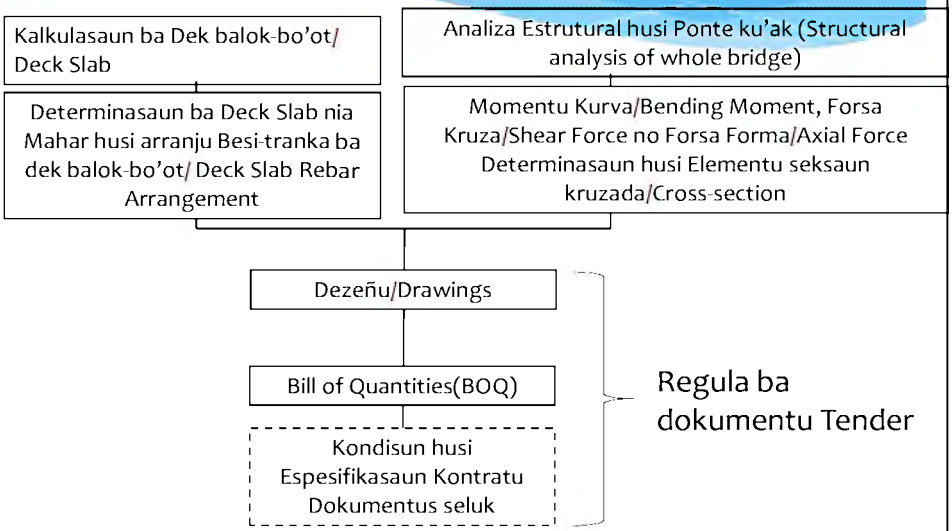
Espasu Nanaruk Mínimu/Minimum Span Length bele assegurada

Lei Japôneza kona-ba Kontrolu Mota espesifika Nanaruk Espasu Mínimu(minimum span length) hodi bele assegurada hanesan hatudu iha fluxugrama/flowchart iha-okos. Ne'e bele aplikada de'it ba klasse segundu mota kontroladu husi distritu lokal, La husi governu iha Japaun/government in Japan.

Lei Japôneza mak previdu/ketat tebes katak kustu ponte bele akuntese aas-liu karik Fortemente hatama iha konsiderasaun lei laran ba sezeñadu ponte iha pais ne'e.



Sekuênsia husi Dezenu Detalhadu/Sequences of Detailed Design



Teknolojia Prinsipal(Core Technology) rekeridu husi Enjeñeiru ADN
Iha Kalkulasaun Dezeñu

- Teknolojia prinsipal rekeridu husi **Consultants** = abilidade ba Deseñu propriu/designing properly.
- Teknolojia prinsipal rekeridu husi **Enjeñeirus ADN** = abilidade ba verifikasaun dezeñu prepara ona husi **consultant** .
- Normalmente kalkulasaun ba deck slab, análiza estrutura no determinasaun seksaun kruzada/cross-section ke rekeridu husi elementus maioria mak implementada utiliza komputador no software espesializada.
- ADN laiha software hirak ne'e, maibbe la persija atu sosa. Ida-ne'e mak kompletamente asuntus husi consultant nia no sira nia responsabilidade atu halo kalkulasaun dezeñu propriu.
- **Entaun ida-ne'e sei bele sufisiente ba enjiñeiru ADN sira hodi hetan koñesementu iha oinsa ba kalkulasaun deseñu nebee ke hala'o.**

Kontribuisaun (Input) no Rezultadu(Output) husi Kalkulasaun Dezeñu

Calculation of Deck Slab:	
Input	**Output**
·Weight of Parapet ·Weight of Pavement ·Weight of Deck Slab ·Wheel Load	·Working bending moment ·Required rebar arrangement of deck slab

Structural Analysis of Bridge:	
Input	**Output**
·Dead load (including pave, deck slab, parapet and so on) · Self-weight (assumed) ·Live load (according to the design standard)	·Working forces (bending moment and shear at each element), ·Reaction force at support)

Calculation of Element Cross-section:	
Input	**Output**
·Bending moment and shearing forces ·Strength of materials used for the element	·Required cross-section of the elements

Kompozisaun husi Dezeñu Ponte

- Revista exist ê nsia husi dezeñu(drawings) antes verifikasaun, para normalmente set dezeñu ida (drawings) husi ponte ida konstitui ba hanesan hatudu iha-okos;

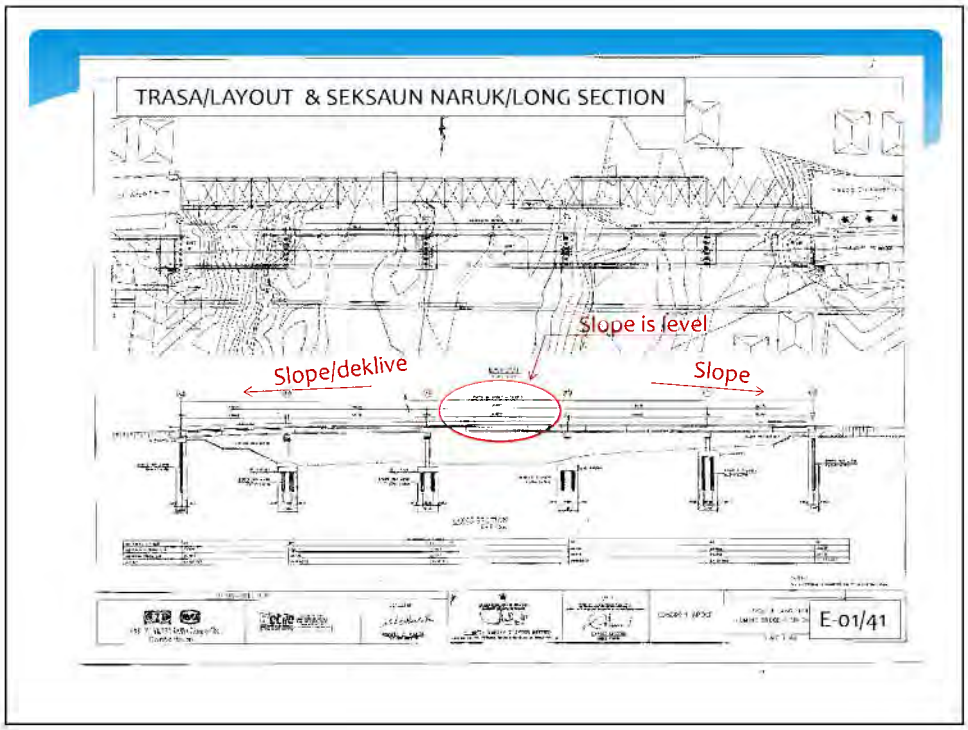
- Mapa Alokalizasaun/Location Map
- Vizaun jeral husi ponte/General View of the Bridge
- Planu no Perfil/Plan and Profile
- Tipika husi Seksaun-kruzada/Typical Cross-section
- Detalhu husi Superestrutura/Details of Superstructure
- Detalhu husi Subestrutura/Details of Substructure
- Detalhu husi Fundasaun/Details of Foundation
- Fornese suporta-esensial;Auxiliarius/Ancillaries

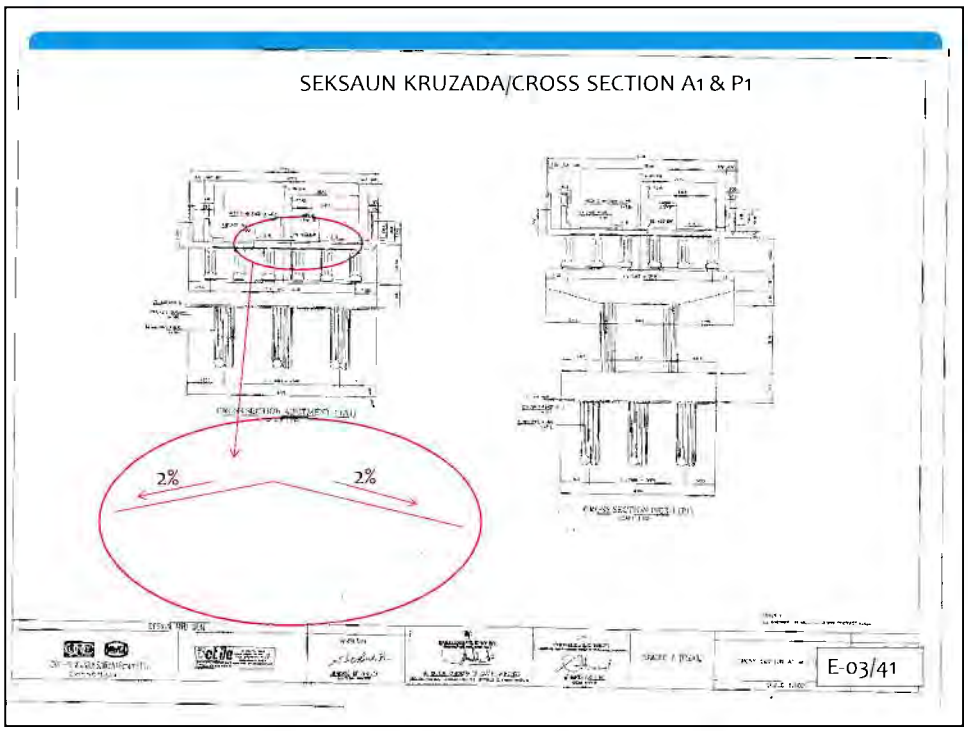
Mai ita aprende oinsa atu lê/hatene Dezeñu/drawings utiliza buat-hirak husi Ponte Comoro

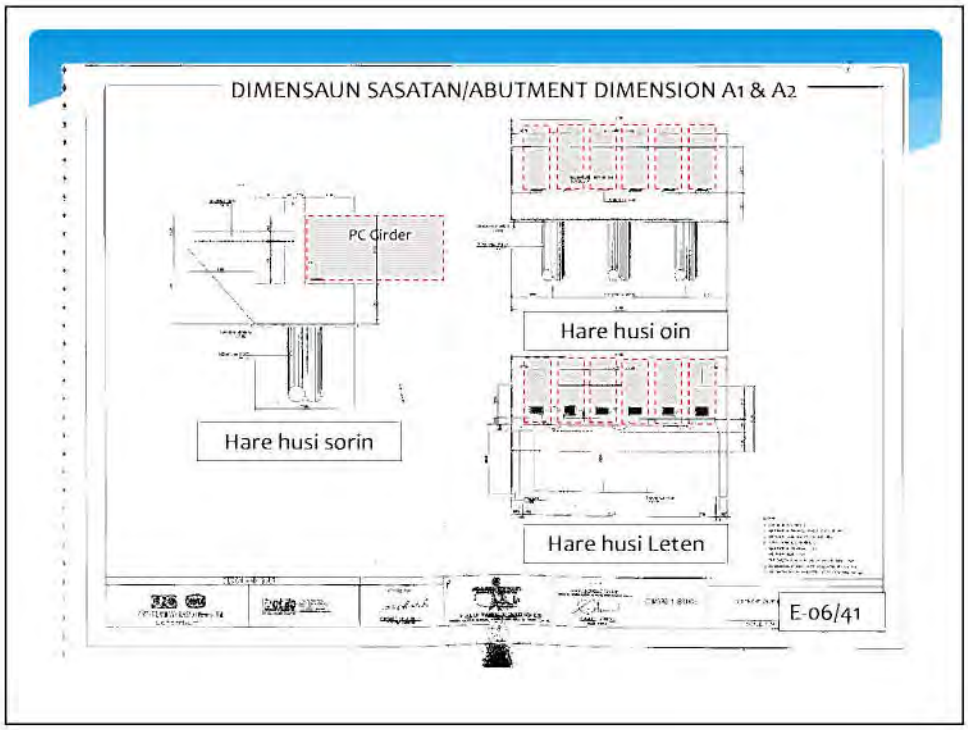
TABELA HUSI KONTEÚDUS

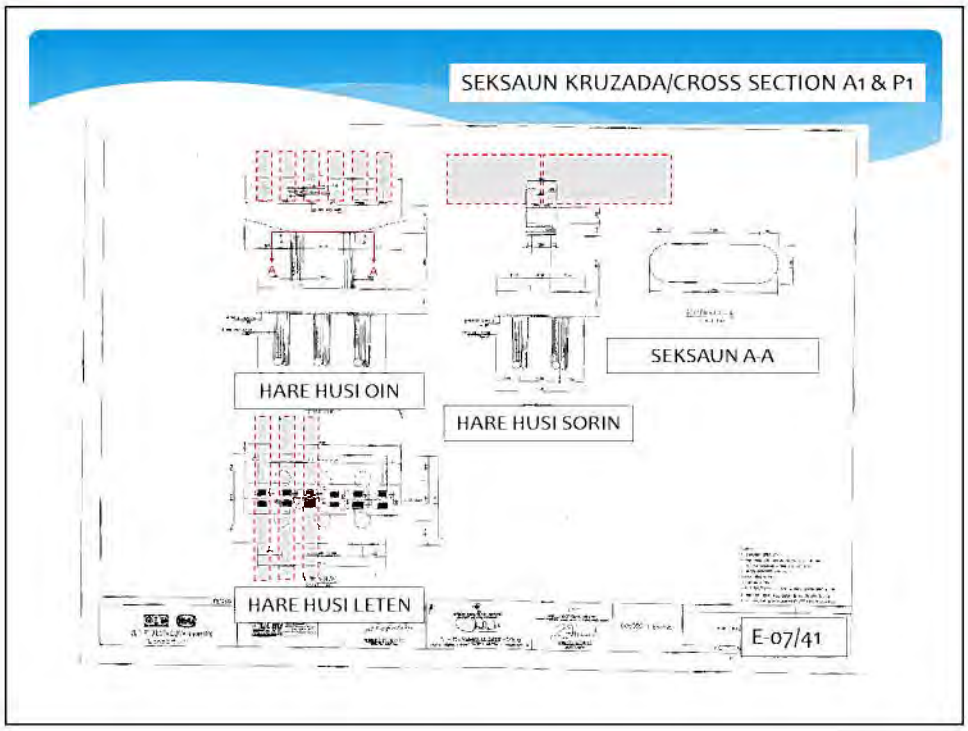
E. Estrutura/Structure

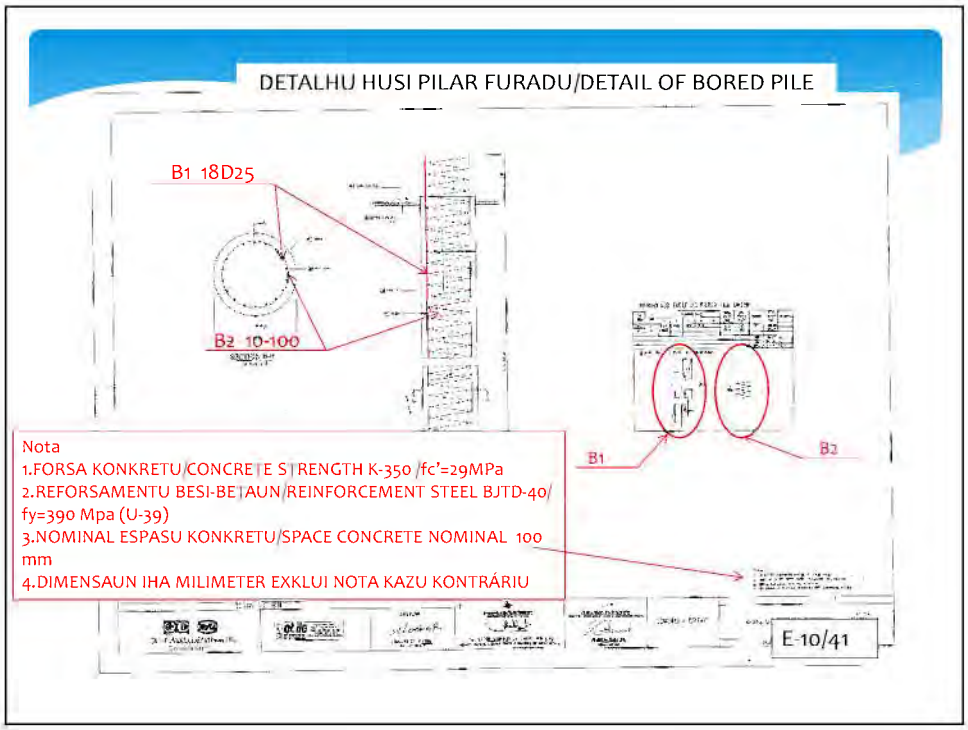
E-01 PLANU NO SEKSAUN NARUK HUSI PONTE / PLAN AND LONG SECTION BRIDGE
E-02 ENKUADRAMENTU PLANU/FRAMING PLAN
E-03 SEKSAUN KRUZADA/CROSS SECTION iha A1, P1-P3, A2
E-06 DIMENSAUN/DIMENSION husi A1, P1-P3, A2
E-10 DETALHU HUSI PILAR FURADA/DETAIL OF BORED PILE
E-11 REFORSA/REINFORCEMENT husi A1, P1-P3, A2
E-21 DETALHU HUSI BALOK-PRINSIPAL PC/DETAIL OF PC GIRDER
E-33 KOLOKASAUN BA ANKORA/ANCHOR PLACEMENT
E-37 DETALHU HUSI HUSI MORU-DEFEZA/DETAIL OF PARAPET
E-38 JUNTA EXPANSAUN/EXPANSION JOINT
E-39 DETALHU HUSI PROTESAUN DEKLIVE/DETAIL OF SLOPE PROTECTION
E-40 KOLOKASAUN HUSI DRENA DEK/PLACEMENT OF DECK DRAIN
E-41 SEKSAUN KRUZADA HUSI DRENA DEK NO SASULI BEE/ CROSS SECTION DECK DRAIN AND WATER FLOW

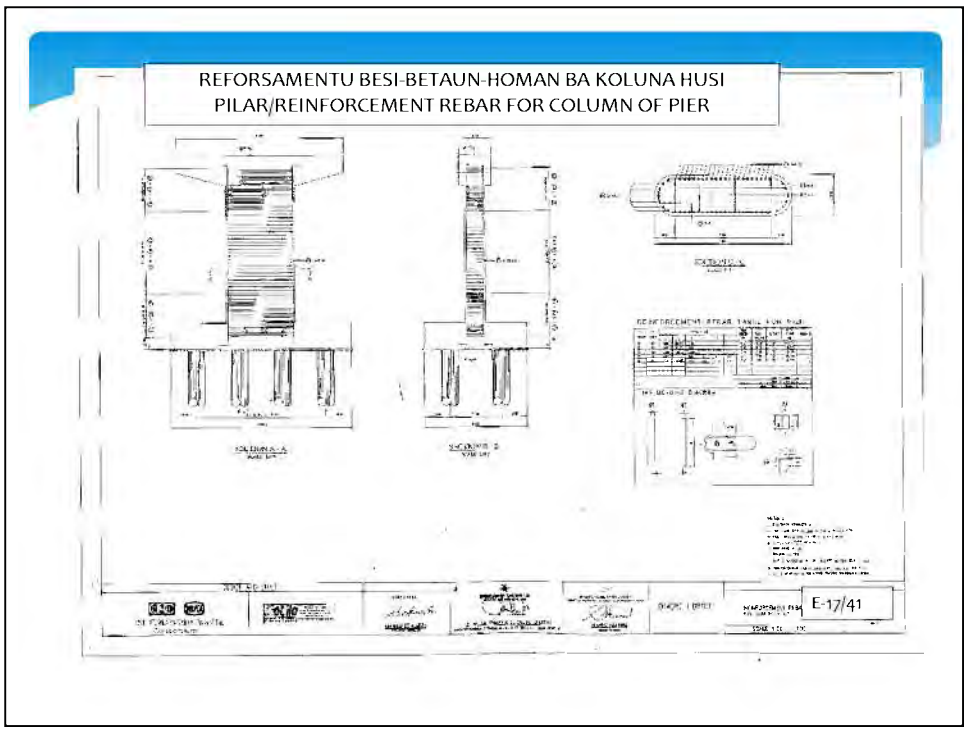

TRASA/LAYOUT & SEKSAUN NARUK/LONG SECTION
Slope is level
Slope/deklive
Slope
E-01/41


SEKSAUN KRUZADA/CROSS SECTION A1 & P1
2%
2%
E-03/41

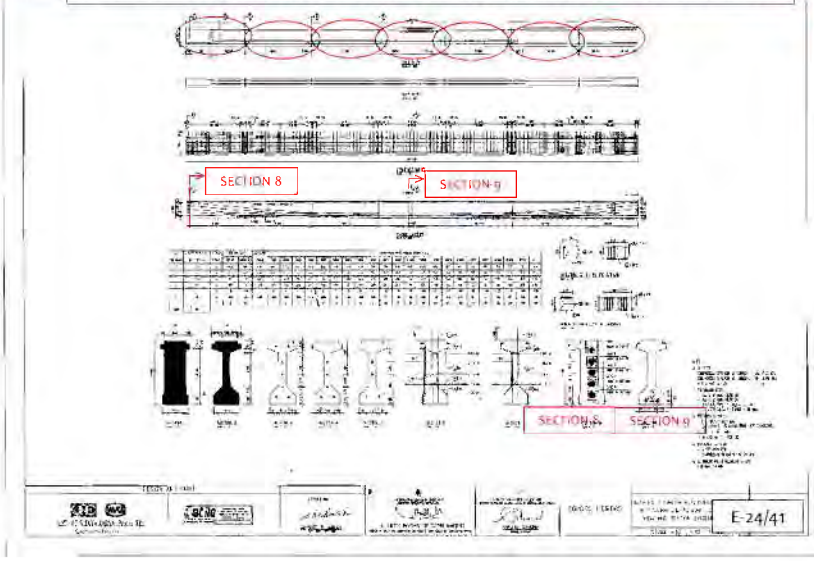

DIMENSAUN SASATAN/ABUTMENT DIMENSION A1 & A2
PC Girder
Hare husi oin
Hare husi sorin
Hare husi Leten
E-06/41


SEKSAUN KRUZADA/CROSS SECTION A1 & P1
SEKSAUN A-A
HARE HUSI OIN
HARE HUSI SORIN
HARE HUSI LETEN
E-07/41

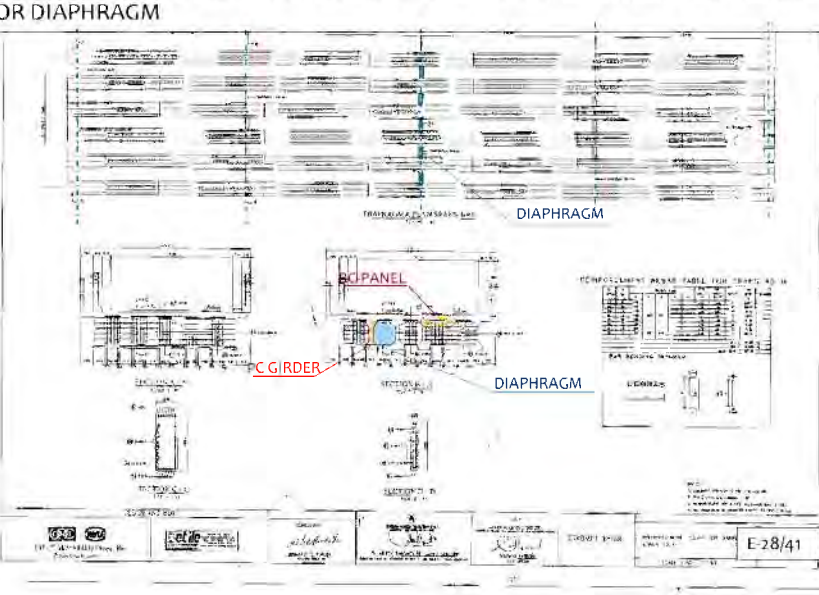

DETALHU HUSI PILAR FURADU/DETAIL OF BORED PILE
B1 18D25
B2 10-100
B1
B2
Nota
1.FORSA KONKRETU/CONCRETE STRENGTH K-350 /fc'=29MPa
2.REFORSAMENTU BESI-BETAUN/REINFORCEMENT STEEL BJTD-40/ fy=390 Mpa (U-39)
3.NOMINAL ESPASU KONKRETU/SPACE CONCRETE NOMINAL 100 mm
4.DIMENSAUN IHA MILIMETER EXKLUI NOTA KAZU KONTRÁRIU
E-10/41

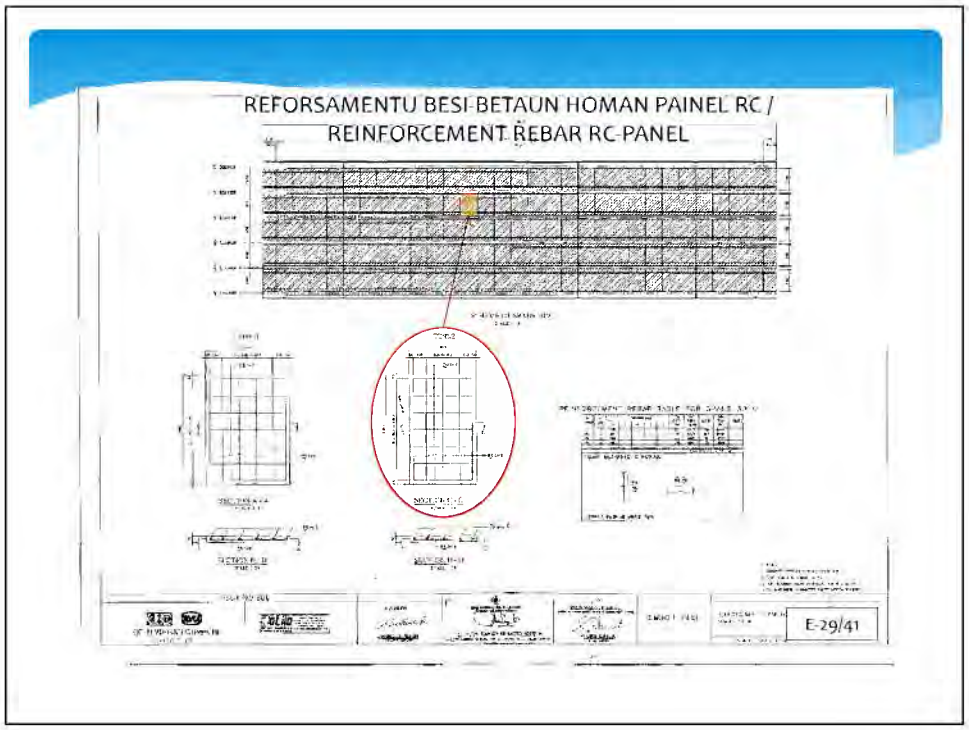

REFORSAMENTU BESI-BETAUN-HOMAN BA KOLUNA HUSI PILAR/REINFORCEMENT REBAR FOR COLUMN OF PIER
E-17/41

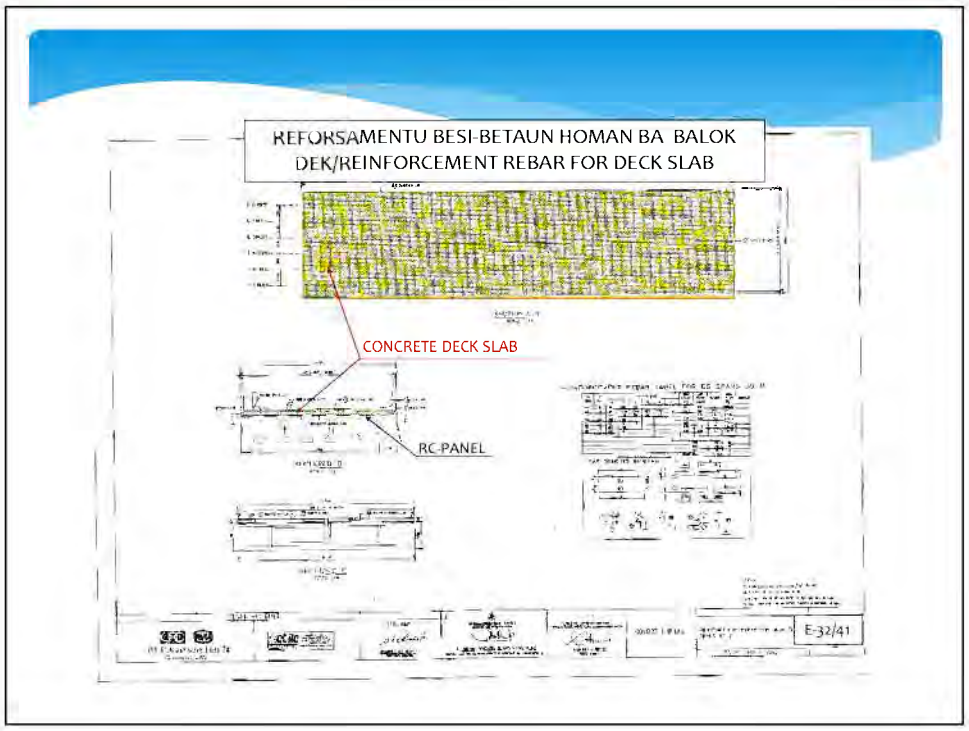
SEGMENTAL BALOK-PRINSIPAL PC POS-TENSAUN/ PC GIRDER POSTTENSION SEGMENTAL



REFORSAMENTU BESI-BETAUN HOMAN BA DIAFRAGMA/REINFORCEMENT REBAR FOR DIAPHRAGM




REFORSAMENTU BESI-BETAUN HOMAN PAINEL RC /
REINFORCEMENT REBAR RC-PANEL
E-29/41


REFORSAMENTU BESI-BETAUN HOMAN BA BALOK
DEK/REINFORCEMENT REBAR FOR DECK SLAB
CONCRETE DECK SLAB
RC-PANEL
E-32/41

FINAL

Aprendezajen tuir-mai (5)
Kona-ba
Metodu Konstrusaun/Construction Method
Dokumentus Tenderizasaun/Tender Documents

Lisaun Klasse-Laran(5) kona-ba PONTE

Métodu Konstrusaun
&
Dokumentus Tenderizasaun
(Dokumentus Lisitasaun)

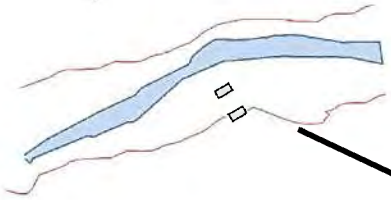
Konstrusaun ba Subestrutura

Ida ne'e mak preferável atu konstrui fundasaun no subestruturas durante tempu bailoro, wainhira mota suli-fatin/riverbed mak disponível ba konstrusaun.
Protesaun diriji liña bee/Cofferdam mak konstrukta ona ká sasulin prinsipal mak háses ona karik sasulin mota bele interompe konstrusaun.

Protesaun liña bee suli/Cofferdam

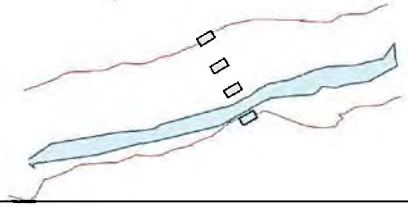
Háses Mota nia Sasulin

1. konstrui tiha subestruturas iha dahuluk wainhira mota sulin fatin/riverbed maran.

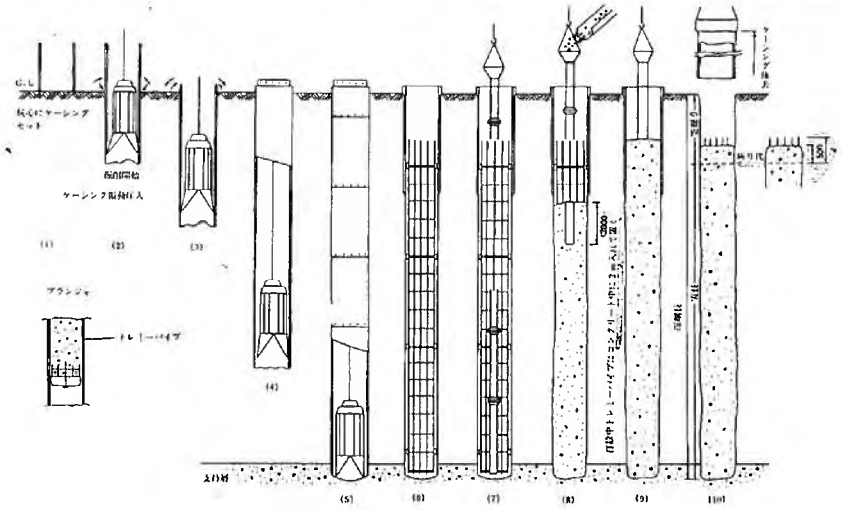


2. Hafoin háses tiha mota nia sasulin ba parte seluk

3. Ikus-liu konstrui/harii subestruturas seluk



Pilar Furamentu/cor tuir-tuir malu



Konstrusaun ba Pilares Furamentu

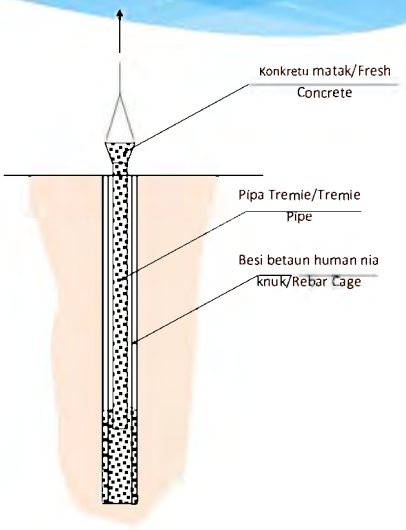
Mákina Hatur Furamentu

Instalasaun Tubu ba revestimentu posu/Casing

Hatama Knuk besi betaun homan/Rebar Cage

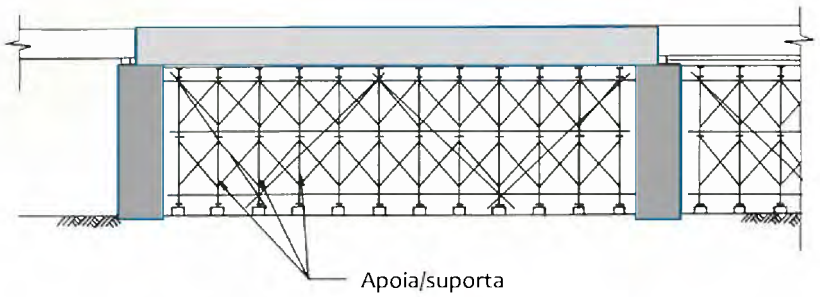
Rezolvementu Hasoru Haketak-malu husi Agregadu/massa

Pipa Tremie

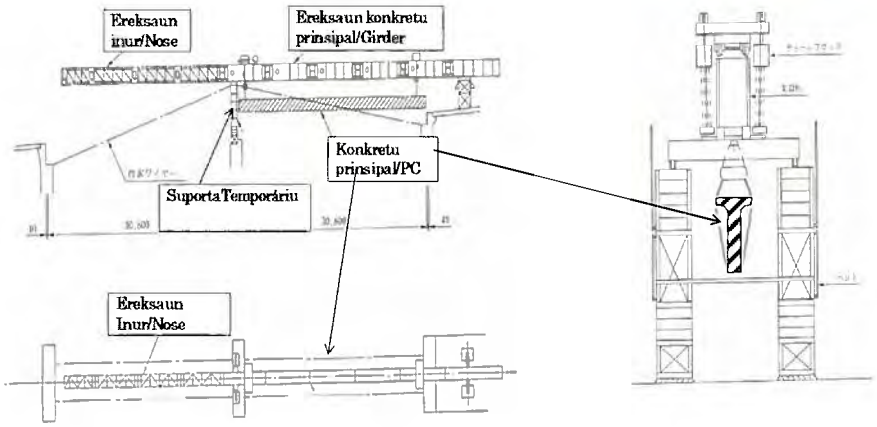


Konstrusaun ba Superestrutura

Konkretu Prinsipal/Girder konstrui ona iha Apoia/suporta temporária nia leten

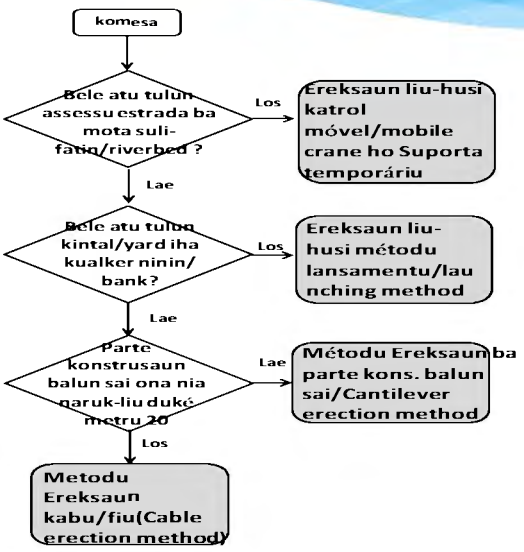


Konkretu-prinsipal/PC Girder suspensa;tara-balânsu entre Besi Ereksaun Konkretu-prinsipal, No muda longitudinalmente tiha

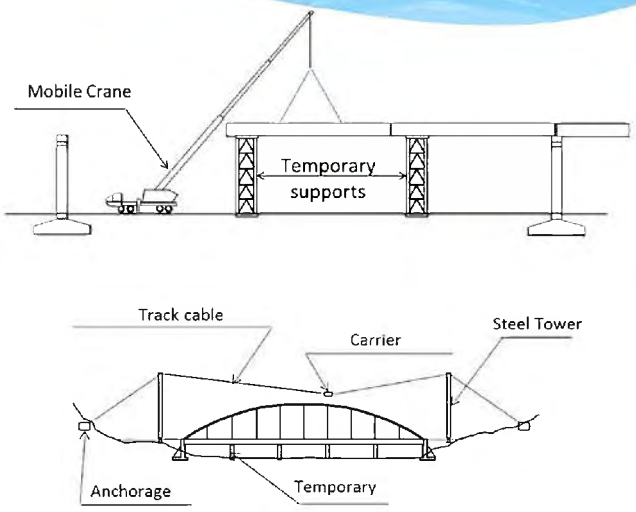


Ereksaun Konkretu-prinsipal uza tiha ona ba Konstrusaun Ponte Comoro

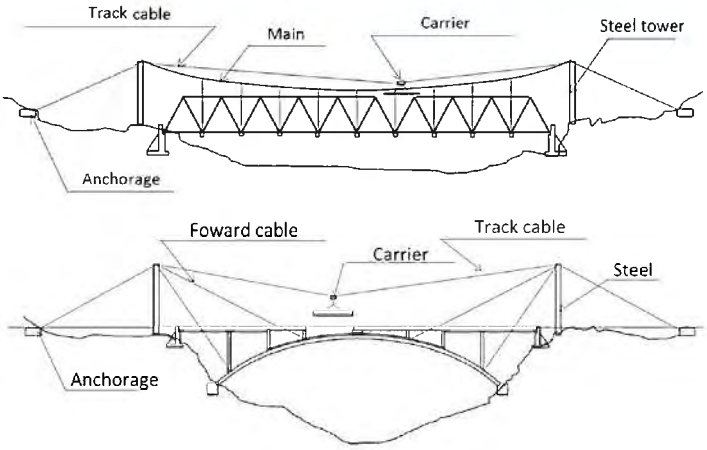
Desizaun sasulin husi Métodu ba Besi Ereksaun Ponte

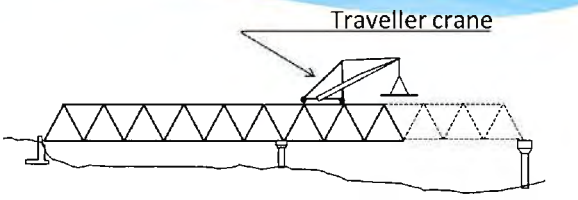


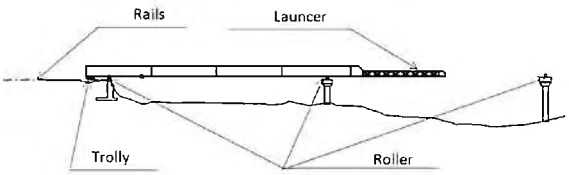
Ponte Besi/Truss bridges mak junta tiha iha suporta temporária leten utiliza katrol kamiñaun/truck crane.



Lansamentu hosi kwanan ba karuk utiliza inur ereksaun/erection nose
(Inur Ereksaun liu-tiha mak ko'a)







DOkUMENTUS TENDERIZASAUN (DOKUMENTUS LISITASAUN)

Kompozisaun ba Dokumentus Tenderizasaun

PARTE1-PROSEDIMENTU LISITASAUN
- Instrusaun ba Lisitante/Instruction to Bidders
- Folla Dadus Oferta/Bid Data Sheet
- Kritéria Avaliasaun no Kualifikasaun
- Formulário Lisitasaun/Bidding Forms
- País Elejível/Eligible Countries

PARTE 2-REKEREMENTUS OBRA
- Rekerementu Obra/Work Requirements
- Âmbitu husi Obra/Scope of Work
- Espesifikasaun/Specifications
- Desenu/Drawings
- Lista Kuantidades/Bill of Quantities

Títulu iha kor-mean espesialmente importante.

PARTE 3-KONDISAUN HUSI KONTRATU NO FORMATUS kONTRATU
- Kondisaun Jéral/General Conditions
- Kondisaun Espesífiku/Particular Conditions
- Aneksu ba Kondisaun Espesífiku/Particular Conditions – Formatu Kontratu/Contract Forms

Kondisaun Jéral husi Kontratu

Normalmente Kondisaun Jéral“FIDIC” husi Kontratu mak utilizada. Nia mak jéral tebes no estandariza ba kontratu internasional.

Kondisaun Espesífika husi Kontratu

Dadus Espesífika/Particular data mak rezumidu iha "DADUS KONTRATU/CONTRACT DATA" atu tulun ita-bo'ot fasil hetan dadus importante, hanesan hatudu iha okos;

Kondisaun sira	Dadus
Periódu Notifikasaun ba Estragu/Defect Notification Period	Loron 365
Garantia ba Exekusaun/Performance Security	Porsentu 5 husi Montante Kontratu Nebee Aseita
Oras Servisu Normal	Oras 8 kada loron
Demora Hadi'a Estragu ba Obra/Delay Damages for the works	0.1% husi Montante Kontratu
Montante Máximu husi Demora Hadi'a Estragu	5% husi Presu Kontratu Final
Pagamentu Adiantadu Total/Total advance payment	Máximu 15% husi Montante Kontratu nebee Aseita

Kondisaun sira	Dadus
Porsentu husi Orsamentu Retensaun/ Percentage of Retention Money	5%
Limitasaun husi Orsamentu Retensaun/Limit of Retention Money	5% husi Montante Kontratu nebee Aseita/ the Accepted Contract Amount
Montante Minimu husi Sertifikadu Pagamentu Provizóriu/Minimum Amount of Interim Payment Certificate	1.00% husi Montante Kontratu nebee Aseita/the Accepted Contract Amount

Lista Kuantidades/Bill of Quantifies

	Deskrisaun
1	Jeneralidade/General
2	Drenajen/Drainage
3	Obra suru/aterru rai etc(Earthworks)
4	Pavimentu;superfisie nahe aspal(Pavement)
5	Estruturas/Structures
6	Restabelesimentu no Obras kaman/Reinstatement and Minor Works
7	Servisu Lor-loron/Daywork
8	

Espesifikasaun (Iha LIVRU MEAN)

LIVRU MEAN, 2005 mak frequentamente uza ba obras estrada no ponte, maibe AASHTO mak referidu beibeik. **Seksaun 500** espesifika téknikamente ba obra Ponte.

SESAUN 500-KONSTRUSAUN PONTE/BRIDGE CONSTRUCTION

ITEM 501 Monta-pilar/Piling
ITEM 502 Halo Lutu /Railings
ITEM 503 Estrutura Ai-balok/Timber Structures
ITEM 504 Estrutura besi Baja/metal Structures
ITEM 505 Besi Reforsamentu/Reinforcing Steel
ITEM 506 Estruturas Konkretu;betaun/Structural Concrete
ITEM 507 Estika-metin Estrutura Konkretu/Prestressed Concrete Structures
ITEM 508 Estruturas Konkretu/Concrete Structures
ITEM 509 Ponte besi/Steel Bridges
ITEM 510 Estrutural Solda Besi /Welded Structural Steel
ITEM 511 Ai-balok Tratadu no La tratadu/Treated and Untreated Timber
ITEM 512 Pinta/Paint

ITEM 506 KONKRETU ESTRUTURAL/STRUCTURAL CONCRETE

506.1.2 Klassefikasaun no Utilizasaun husi Konkretu
Klasse A: Superestruturas, todan husi subestruturas reforsada, konkretu-bo'ot/slabs,kolunas/columns, balok-diriji/beams, Balok-prinsipal/girders no kaixa baleta/box culverts

506.2.3 Massa grossu;kasar/Coarse aggregate
Klasse A: Rekerementus hatetuk/Grading requirements

506.3 Amostrasaun/Sampling no Teste husi Estruturasaun Konkretu/Testing of Structural Concrete
Amostra ida kompostu teste selindru ba korpu(isin)tolu (150x300mm) hosi 75 metrus kúbiku ba ida-idak/One sample consisting of three concrete cylinder test specimens(150x300mm) from each 75cubic meters.

506.4.1 Konteúdu Sementi Mínimu(Minimum cement contents), bee maximu/rasio sementi(maximum water/cement ratio), alkansamentu resistênsia iha frakeza(consistency range in slump), Forsa Ábitu-toos mínimu(minimum compressive strength)

SESAUN 900-DETALLU HUSI MATERIAL/MATERIAL DETAILS

Sesaun 900 hafahe ho materiais komún hanesan sementi, agregadu;massa, besi-betaun homan no estrutura métal/baja.

ITEM 901- Sementi Hidráuliku/Hydraulic Cement
ITEM 902-Konstrusaun ba Ahur/Construction Lime
ITEM 903-Materiais Bitumen/Bituminous Materials
ITEM 904-AGREGADU;MASSA/AGGREGATES
ITEM 905-Unidades Plester/Masonry Units
ITEM 906-Materiais Junta/Joint Materials
ITEM 907-Konkretu/Concrete, Rai-tahu/Clay, Plástika no Pipa fibra/Fiber Pipe
ITEM 908-Pipa Métal;besi/Metal Pipe
ITEM 909- Materiais Kura Konkretu/Concrete Curing Materials no Mixtura /Admixtures
ITEM 910- Pinta/Paints
ITEM 911- Besi Reforsamentu/Reinforcing Steel no Tali fiu/Wire Rope
ITEM 912-Lutu/Fence no Lutu seguransa estrada ninin/ Guardrail
ITEM 913- Estrutura Métal;besi/Structural Metal
ITEM 914-Ai-balok tratadu no la tratadu/Treated and Untreated Timber
ITEM 915- Bee/wee

LISTA-VERIFIKASAUN/CHECKLIST BA SUBMETE DOKUMENTUS REKERIDU

FUNDU INFRAESTRUTURA	Lista-verifikasaun A/CHECKLIST A			Verifikadu/a husi	Aprovada/u husi
Tipu husi Projetu	Jeneralidade	Objetivu	Submete Dokumentus rekeridus		

No.Kontratu	RDTL-1000645		Data submisaun	
Naran husi Projetu	SKEMA IRRIGASAUN TONO		Faze	Verifisaun ba Dokumentus Tenderizasaun
Ajênsia Implementador				

Item husi Verifikasaun	Pontu Verifikasaun	Data Verifika	Marka Verifika	Observasaun
	Hirak ne'e konfirmadu katak dokumentus hotu-hotu submete ona husi Liña Ministerial(LM).			Razaun husi La-entrega
1	Instrusaun ba Lisitante sira/Bidders	12/06/2013	✓	
2	Formulário husi Oferta/Bid no Data Kualifikasaun/Dokumentus Lisitasaun	12/06/2013	✓	
3	Kondisaun husi Kontratu	12/06/2013	✓	
4	Data Kontratu/Kondisaun Partikular sira	12/06/2013	✓	
5	Lista Kuantidades/Bill of Quantity	12/06/2013	✓	
6	Formas husi Seguransa/Formatu Seguransa(Security Forms)	12/06/2013	✓	
7	Espesifikasaun/Espesifikasaun Jeneralidade, Espesifikasaun Téknika	12/06/2013	✓	
8	Dezeñu/Drawings	12/06/2013	✓	
9	Seluk-seluk tan, karik nesessáriu			

Lista-Verifikasaun/CHECKLIST BA KONDISAUN KONTRATU

FUNDU INFRAESTRUTURA	LISTA-VERIFIKASAUN B/ CHECKLIST B			Verifikadu a husi	Aprovada/u husi
Tipu husi Projetu	Jeneralidade	Objetivu	Kondisaun Pagamentu sira		

No.Kontratu	RDTL-1000645		Data Submete	
Naran husi Projetu	ESKEMA IRRIGASAUN TONO		Faze	Verifikasaun ba Dokumentus Tenderizasaun
Ajênsia Implementador				

Item husi verifikasaun	Pontu Revista/verifika	Data Verifika	Marka Verifika	Observasaun
	Ida-nc'e konfirmadu karik buat hirak iha okos mak razoável ka lae?			Data Refferida
1	Tempu para kompleta Períodu Konstrusaun	12/06/2013	✓	Sei fo hanoin/To be Advised?
2	Períodu Manutensaun/Períodu Notifikasaun ba Defeitu/aat	12/06/2013	✓	Loron 90 (Badak liu/Too short?)
3	Lei Governu nian	12/06/2013	✓	Lei husi República Democrática de Timor Leste
4	Regulamentu ba Lingua	12/06/2013	✓	Inglês
5	Garantia ba Exekusaun(Performance Security)/ Garantia ba Exekusaun Di'ak(Perfirmance Bond)	12/06/2013	✓	10% Garantia iha Banku
6	Demora Hadi'a Estagu ba Obra(Delay damages for the Work)/Multas(Liquidated Damages)	12/06/2013	✓	0.1% husi Presu Kontratu Final
7	Montante Máximu husi Demora Hadi'a Estragu(Maximum amount of delay damages)	12/06/2013	✓	10% husi Presu Kontratu Final
8	Montante Klausula parte husi kontratu(Provisional Sum)	12/06/2013	✓	La Aplikável(N/A)
9	Pagamentu Adiantamentu Total(total advance payment)	12/06/2013	✓	La Aplikável(N/A)
10	Porsentajen husi Retensaun(Percentage of Retention)	12/06/2013	✓	La Aplikável(N/A)
11	Limitasaun husi Orsamentu Retensaun(Limit of Retention Money)	12/06/2013	✓	La Aplikável(N/A)
12	Montante Minimu husi Sertifikadu Pagamentu Provizoriu(Min Amount of Interim Payment Certificates)	12/06/2013	✓	La Aplikável(N/A)

Dadus Kontratu Bai-bain iha Projetu Passadu

Naran husi Projetu	Eskema Irrigasaun Tono	Projetu Altu Estrada Suai-Beaço	Ponte Comoro 2	Ponte Baer	Projetu ADB	Projetu Irrigasaun Caraulun	Alkansamentu Kómun iha Projetu Passadu
Ajênsia Implementador	Ministériu de Agrikultura	Ministériu das Obras Públikas	ADN	Ministériu das Obras Públikas			
Tempu para Kompleta	-	-	Loron 270	Loron 480			
Períódu Manutensaun	Loron 90	Loron 365	Loron 90	Loron 540	Loron 365		90-540
Lei Governu nian	Lei husi Timor Leste	Lei husi Timor Leste	Lei husi Timor Leste	Lei husi Timor Leste	Lei husi Timor Leste		Lei husi Timor Leste
Regulamentu Língua	Inglês	Inglês	Inglês	Inglês	Inglês		Inglês
Garantia ba Exekusaun	10%	5%	5%	10%	5%	7.50%	5-10%
Demora hadi'a estragu	0.1%/Loron	0.1%/Loron		0.1%/Loron	0.1%/Loron	0.1%/Loron	0.1%/Loron
Montante Máximu husi Demora hadi'a Estragu	10%	5%		10%	10%		5-10%
Montante Klausula/ Provisional Sum				15%	15%		15%
Total Pagamentu Adiantadu/Advance Payment		15%	20%	10%	15%		10-20%
Porsentajen husi Retensaun		5%	5%	10%	10%		5-10%
Limitasaun husi Orsamentu Retensaun		5%		10%	10%		5-10%
Montante Mínimu ba Pagamentu Provizóriu		1%		5%			1-5%

Fínal

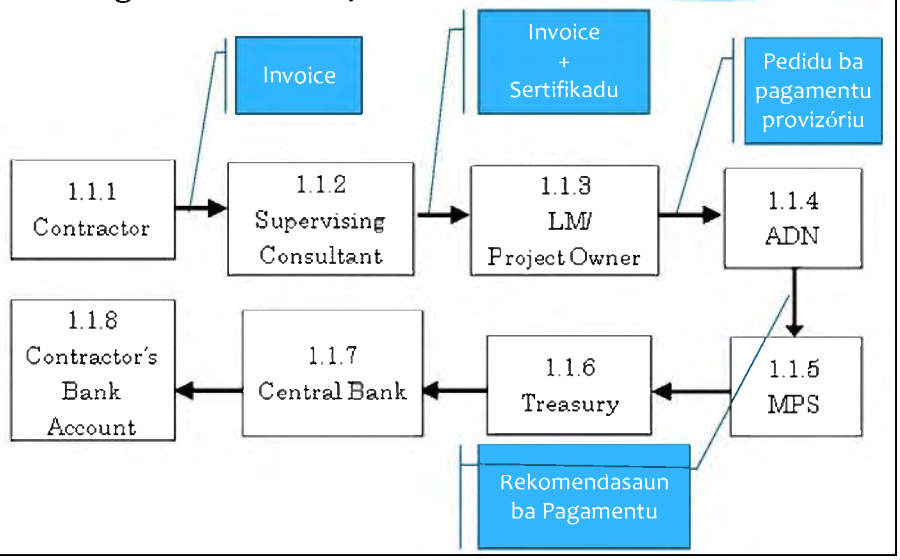
Aprendezajen Tuir-mai(6)

LISAUN SALA-LARAN(6)
KONA-BA
PONTE

Utilizasaun ba Manual-ADN

Inspesaun Regular no Rekomendasaun ba Pagamentu

Fluxograma husi Projetu Fundus Infraestruturas



SEQUÊNSIA HUSI INSPESAUN BA PAGAMENTU PROVIZÓRIU

1. Dokumentu Inspesaun
   Inspesaun ba dokumentus ne'ebe hatama ona husi LM
2. Inspesaun Terrenu
   Orário, Kontrolu Kualidade, Sukat-medida no Remédiu
3. Notifika ba ajustamentu kona-ba Pagamentu
   Rekomendasaun ba pagamentu
4. FAQ
   Rejista/hakerek ba Frequentamente husu perguntas no respostas.

Dokumentus Inspesaun

1. Konfirmasaun ba Dokumentus ne'ebe hatama ona ⇒ Checklist D
2. Konfirmasaun ba kondisaun pagamentu ⇒ Kondisaun Partikular
3. Kalkulasaun iha Folla Lisitasaun ⇒ Dadus Digital BoQ nian
4. Konfirmasaun ba obra kompleta ona iha BoQ ⇒ BoQ Digital Data
5. Konfirmasaun ba Orário Obra ⇒ Relatóriu Menssal

Checklist ba dokumentus ne'ebe hatama ona husi Pedidu Pagamentu

FUNDUS INFRAESTRUTURE	CHECKLIST D			Verifikadu husi	Aprovadu husi
Tipu husi Projetu	Estrada & Ponte	Objetivu	Dokumentus ne'ebe rekere atu hatama		

Nomeru Kontratu		Data Hatama	
Projetu nia Naran		Faze	Inspesaun ba Pedidu Pagamentu
Ajensia Implementador			

Item Verifika/Inspesaur	Pontu Revista	Data Revista	Marka Revista	Observasaun
	Konfirma katak dokumentus hirak ne'e hatama ona husi LM.			Razaun La Entrega
1	Karta Pedidu Inspesaun husi LM ba ADN			
2	Invoice husi Kontraktor ba LM/Projetu Na'in.			
3	Partes husi Dokumentu Kontratu, hatudu montante kontratu no kondisaun pagamentu sira			
4	Bill of Quantities hatudu presu unidade no kuantidade			
5	Sertifikadu ba Pagamentu husi Konsultan Supervizaun			
6	Aprovasaun ba pagamentu husi LM			
7	Sertifikadu Menssal Provizoriu/Interim Monthly Certificate			
8	Deskrisaun husi mudansa/truka, alterasaun ka diferensia, karik iha			
9	Dadus Digital husi BOQ			

KONDISAUN PAGAMENTU

Kondisaun sira	Dadus
Periódu Notifikasaun ba Estragu/Defect Notification Period	Loron 365
Garantia ba Exekusaun/Performance Security	Porsentu 5 husi Montante Kontratu Nebee Aseita
Oras Servisu Normal	Oras 8 kada loron
Demora Hadi'a Estragu ba Obra/Delay Damages for the works	0.1% husi Montante Kontratu
Montante Máximu husi Demora Hadi'a Estragu	5% husi Presu Kontratu Final
Pagamentu Adiantadu Total/Total advance payment	Máximu 15% husi Montante Kontratu nebee Aseita
Porsentu husi Orsamentu Retensaun/ Percentage of Retention Money	5%
Limitasaun husi Orsamentu Retensaun/Limit of Retention Money	5% husi Montante Kontratu nebee Aseita/ the Accepted Contract Amount
Montante Minimu husi Sertifikadu Pagamentu Provizóriu/Minimum Amount of Interim Payment Certificate	1.00% husi Montante Kontratu nebee Aseita/the Accepted Contract Amount

Inspesaun Terrenu

1. Preparasaun ⇨ Karta Pedidu ba Preparasaun (Formatu E)

2. Verifikasaun ba Orário ⇨ Relatóriu Menssal
3. Kontrol Kualidade ⇨ Checklist E

1. Sasukat ba Obra Kompleta ona ⇨ Checklist F

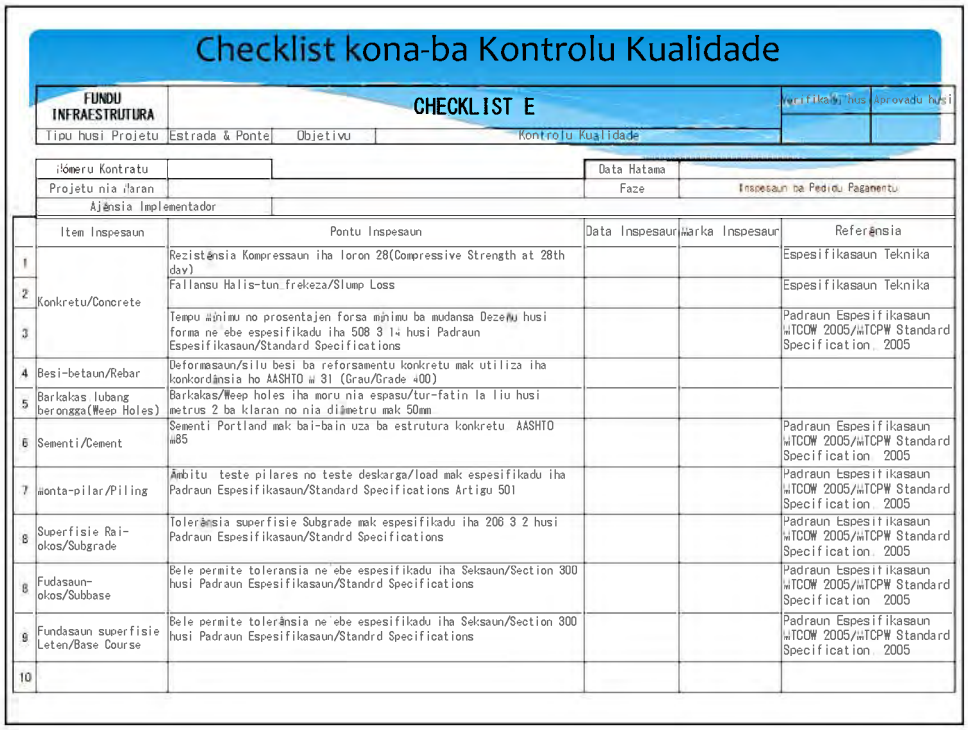
2. Remédiu ⇨ MANUAL-AND
   Seksaun 2: Inspesaun Regular ba Pagamentu & Rekomendasaun ba Pagamentu
   1. Fundus Infraestrutura
   1.4 Inspesaun Terrenu
   (5) Remédiu/Rekoperasaun
   Wainhira ADN hetan buat ruma la-konfirmadu ka obra la-satisfatóriu, AND tenke haruka para hadi'a.

REQUEST LETTER FOR PREPARATION

(SUBJECT) REQUEST OF PREPARATION FOR SITE INSPECTION

In response to payment request submitted to ADN, ADN informs that
…….
…… ADN requests LM to prepare the followings in order to conduct a site inspection properly and orderly.

1. Name of Project
2. Date of Site Inspection
3. Attendants required
1) Supervisor and Engineer(s) in charge from **LM**
2) Supervising **Consultant**(s)
3) Site Manager and Chief Engineer from **Contractor**
4. Preparation at site arranged by LM
1) **Records on Quality Control**
2) Drawings with completed construction included
3) Details of BoQ
4) Measuring Devices, if necessary Destructive Testing
5) Assistants for Measurement

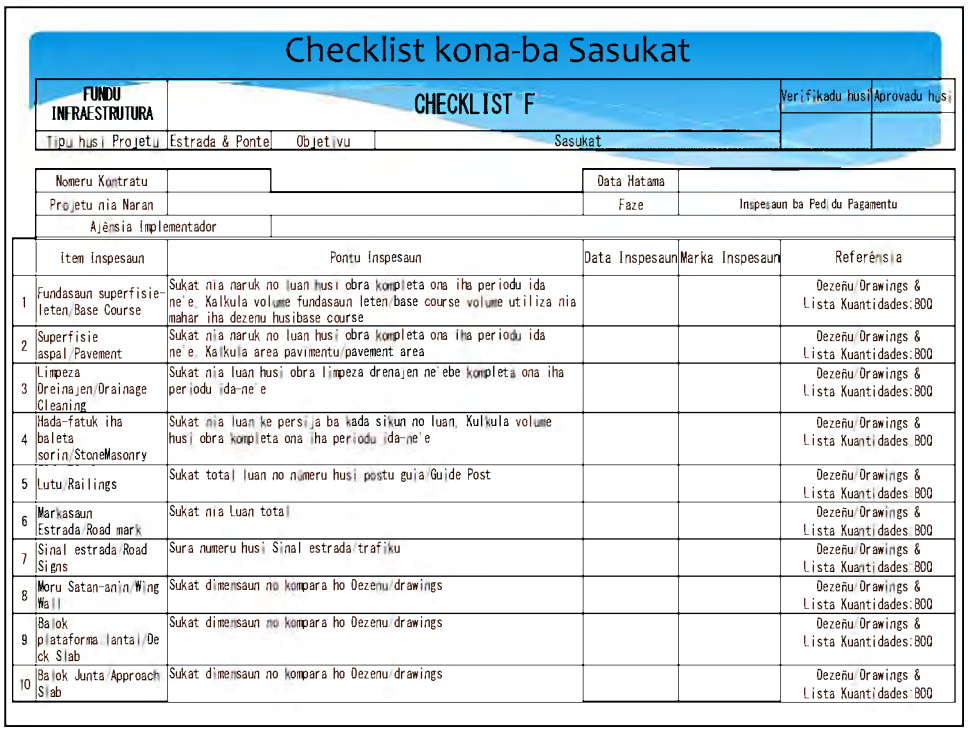


Checklist kona-ba Kontrolu Kualidade

FUNDU INFRAESTRUTURA	CHECKLIST E			Verifikadu husi	Aprovadu husi
Tipu husi Projetu	Estrada & Ponte	Objetivu	Kontrolu Kualidade		

Nómeru Kontratu		Data Hatama	
Projetu nia naran		Faze	Inspesaun ba Pedidu Pagamentu
Ajênsia Implementador			

	Item Inspesaun	Pontu Inspesaun	Data Inspesaun	Marka Inspesaun	Referênsia
1	Konkretu/Concrete	Rezistênsia Kompressaun iha loron 28(Compressive Strength at 28th day)			Espesifikasaun Teknika
2		Fallansu Halis-tun frekeza/Slump Loss			Espesifikasaun Teknika
3		Tempu minimu no prosentajen forsa minimu ba mudansa Dezeñu husi forma ne'ebe espesifikadu iha 508 3 14 husi Padraun Espesifikasaun/Standard Specifications			Padraun Espesifikasaun MTCOW 2005/MTCPW Standard Specification 2005
4	Besi-betaun/Rebar	Deformasaun/silu besi ba reforsamentu konkretu mak utiliza iha konkordânsia ho AASHTO M 31 (Grau/Grade 400)			
5	Barkakas lubang beronga(Weep Holes)	Barkakas/Weep holes iha moru nia espasu/tur-fatin la liu husi metrus 2 ba klaran no nia diâmetru mak 50mm			
6	Sementi/Cement	Sementi Portland mak bai-bain uza ba estrutura konkretu AASHTO M85			Padraun Espesifikasaun MTCOW 2005/MTCPW Standard Specification 2005
7	Monta-pilar/Piling	Âmbitu teste pilares no teste deskarga/load mak espesifikadu iha Padraun Espesifikasaun/Standard Specifications Artigu 501			Padraun Espesifikasaun MTCOW 2005/MTCPW Standard Specification 2005
8	Superfisie Rai-okos/Subgrade	Tolerânsia superfisie Subgrade mak espesifikadu iha 206 3 2 husi Padraun Espesifikasaun/Standrd Specifications			Padraun Espesifikasaun MTCOW 2005/MTCPW Standard Specification 2005
8	Fudasaun-okos/Subbase	Bele permite toleransia ne'ebe espesifikadu iha Seksaun/Section 300 husi Padraun Espesifikasaun/Standrd Specifications			Padraun Espesifikasaun MTCOW 2005/MTCPW Standard Specification 2005
9	Fundasaun superfisie Leten/Base Course	Bele permite tolerânsia ne'ebe espesifikadu iha Seksaun/Section 300 husi Padraun Espesifikasaun/Standrd Specifications			Padraun Espesifikasaun MTCOW 2005/MTCPW Standard Specification 2005
10					

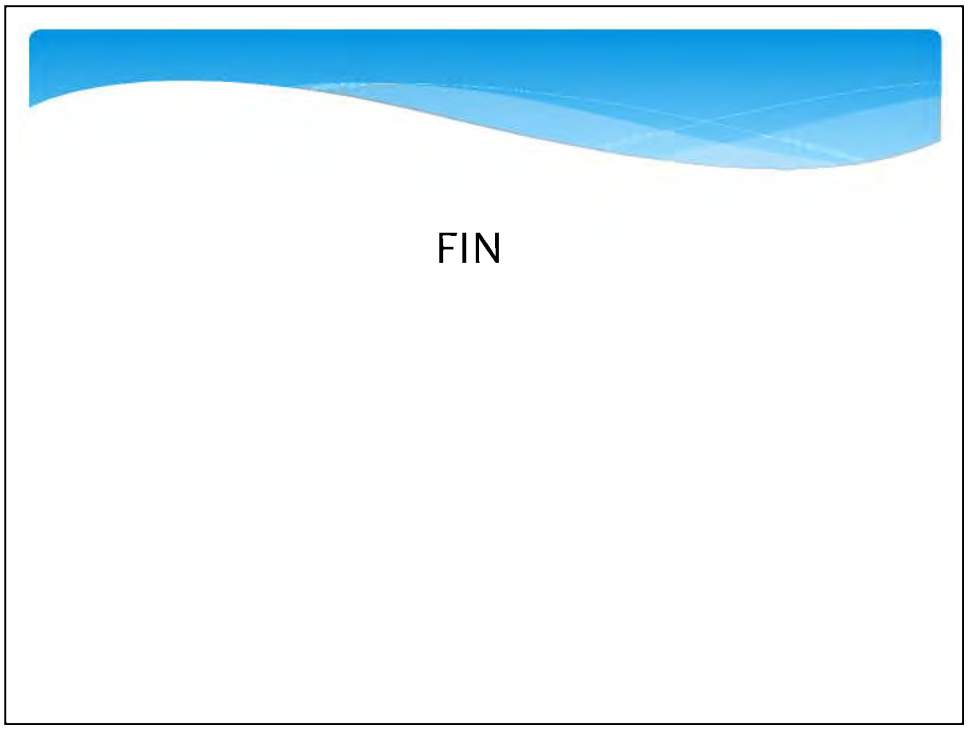


Checklist kona-ba Sasukat

FUNDU INFRAESTRUTURA	CHECKLIST F			Verifikadu husi	Aprovadu husi
Tipu husi Projetu	Estrada & Ponte	Objetivu	Sasukat		

Nomeru Kontratu		Data Hatama	
Projetu nia Naran		Faze	Inspesaun ba Pedidu Pagamentu
Ajênsia Implementador			

	Item Inspesaun	Pontu Inspesaun	Data Inspesaun	Marka Inspesaun	Referênsia
1	Fundasaun superfisie-leten/Base Course	Sukat nia naruk no luan husi obra kompleta ona iha periodu ida ne'e. Kalkula volume fundasaun leten/base course volume utiliza nia mahar iha dezenu husibase course			Dezeñu/Drawings & Lista Kuantidades:BOQ
2	Superfisie aspal/Pavement	Sukat nia naruk no luan husi obra kompleta ona iha periodu ida ne'e. Kalkula area pavimentu/pavement area			Dezeñu/Drawings & Lista Kuantidades:BOQ
3	Limpeza Dreinajen/Drainage Cleaning	Sukat nia luan husi obra limpeza drenajen ne'ebe kompleta ona iha periodu ida-ne'e			Dezeñu/Drawings & Lista Kuantidades:BOQ
4	Hada-fatuk iha baleta sorin/StoneMasonry	Sukat nia luan ke persija ba kada sikun no luan, Kulkula volume husi obra kompleta ona iha periodu ida-ne'e			Dezeñu/Drawings & Lista Kuantidades:BOQ
5	Lutu/Railings	Sukat total luan no numeru husi postu guia/Guide Post			Dezeñu/Drawings & Lista Kuantidades:BOQ
6	Markasaun Estrada/Road mark	Sukat nia Luan total			Dezeñu/Drawings & Lista Kuantidades:BOQ
7	Sinal estrada/Road Signs	Sura numeru husi Sinal estrada/trafiku			Dezeñu/Drawings & Lista Kuantidades:BOQ
8	Moru Satan-anin/Wing Wall	Sukat dimensaun no kompara ho Dezenu/drawings			Dezeñu/Drawings & Lista Kuantidades:BOQ
9	Balok plataforma lantai/Deck Slab	Sukat dimensaun no kompara ho Dezenu/drawings			Dezeñu/Drawings & Lista Kuantidades:BOQ
10	Balok Junta/Approach Slab	Sukat dimensaun no kompara ho Dezenu/drawings			Dezeñu/Drawings & Lista Kuantidades:BOQ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添付資料 10 座学研修教材(道路)(英語版)

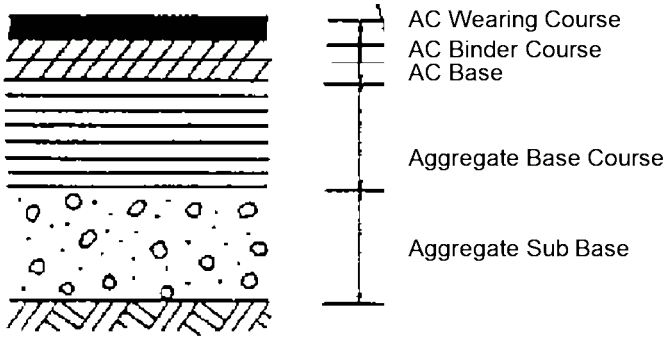
Planning of Road (1)

11th May 2013

Pavement Structure Category

Source: Pavement Design Manual 2008 in ADN Wiki Database

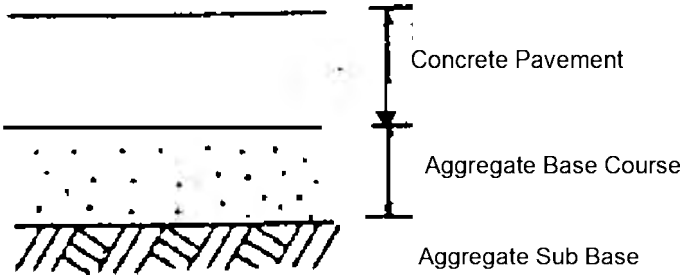
1.Flexible ; Bituminous-type of pavement



Pavement Structure Category

Source: Pavement Design Manual 2008 in ADN Wiki Database

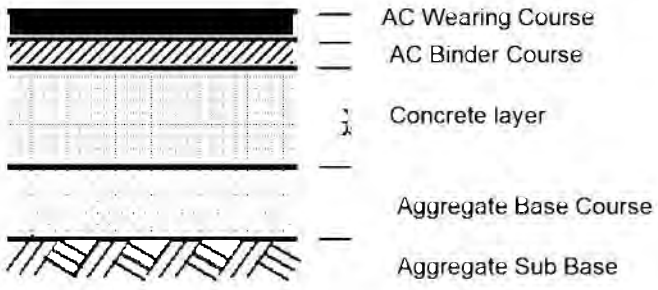
2.Rigid ; Portland Cement Concrete



Pavement Structure Category

Source: Pavement Design Manual 2008 in ADN Wiki Database

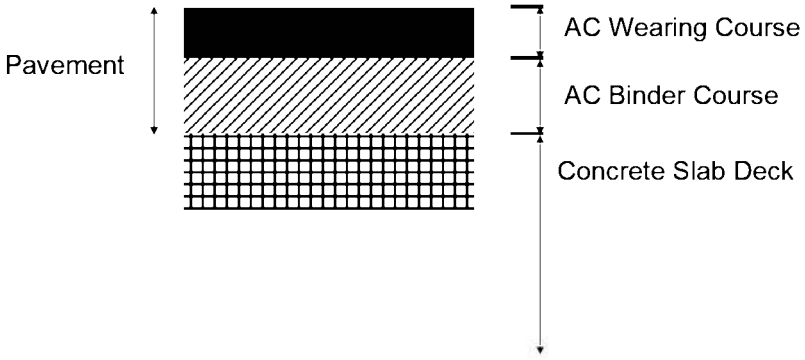
3.Composite ;



Pavement Structure Category

Source: Pavement Design Manual 2008 in ADN Wiki Database

4.Bridge ;



MOISTURE ENVIRONMENT

- The moisture regime associated with a pavement has a major influence on the performance of the pavement.
- The stiffness/strength of unbound materials and subgrades is heavily dependent on the moisture content of the materials.

TEMPERATURE ENVIRONMENT

- The temperature environment has a major influence on the performance of pavements surfaced with asphalt wearing surfaces.
- Asphalt becomes stiff and brittle at low temperatures while it is soft and elastic at higher temperature.

SUBGRADE

- The support provided by the subgrade is the most important factor in determining pavement design thickness, composition and performance.
- The subgrade strength is dependent on the conditions at construction and during service.
- Soil type, density and moisture content largely determine subgrade strength.
- The aim of subgrade evaluation is to estimate a value of subgrade support to use in design.

FIELD DETERMINATION OF SUBGRADE CBR

- Subgrade condition and design parameters should be assessed from subsurface investigations.
- As a minimum, subsurface investigations and laboratory testing of the subgrade should provide the following results:

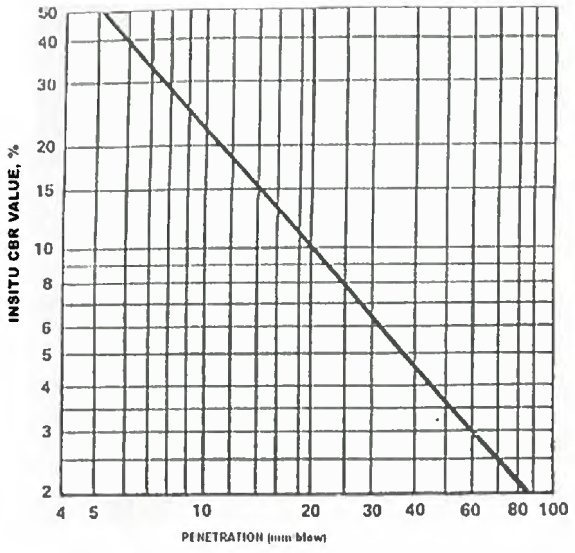
(1) 4 day soaked CBR.

(2) Particle size distribution.

(3) Plastic limits, liquid limits and plasticity index (PI), if applicable.

(3) At least one dynamic cone penetrometer (DCP) test per test pit.

CORRELATION CBR VS PENETRATION TEST



TYPICAL PRESUMPTIVE DESIGN CBR VALUES

TYPE OF SOILS	SOIL CLASSIFICATION	CBR VALUES, %	
		WELL DRAINAGE	POOR DRAINAGE
• Highly Plastic Clay	CH	5	2 – 3
• Silt			
• Silty Clay	ML	5	2 – 3
• Sandy Clay	CL		
• Sand	SC	6 – 7	4 – 5
	SW, SP	15 - 20	-

PAVEMENT MATERIALS

- The choice of materials for any particular application should be based on considerations of structural requirements, economics, durability, workability and experiences.
- According to their function, materials for flexible pavement can be classified into the following groups, such as;

  1). Soil subgrade

  2). Granular materials

  3). Bituminous material.

GRANULAR MATERIALS

- Granular materials consist of natural gravel and sand or crushed rocks which have a grading that makes them mechanically stable, workable and able to be compacted.
- Granular materials can be classified into three (3) categories, such as:
  1). Coarse aggregate
  2). Fine aggregate
  3). Filler

BITUMINOUS MATERIAL

- Bituminous materials is materials which have function as bounding agent for flexible pavement and produced from petroleum industry and/or rock asphalt produced from natural deposit.
- Bituminous materials can be classified into five categories as follows:
  (1) Petroleum asphalt
  (2) Emulsified asphalt
  (3) Cut back asphalt
  (4) Modified asphalt
- The selection of the using of each category based on the pavement type, traffic volume, construction method and construction cost considerations.

Petroleum Asphalt

- Petroleum Asphalt is a bituminous residue of crude oil after its lighter components have been removed through atmospheric and vacuum distillation.
- For some types of crude oil, other processes are necessary for obtaining all the types of petroleum asphalt.
- Air blowing to asphalt or mixing hard and soft types of asphalt is adopted for the case.
- The process varies depending on the type of crude oil production methods.

Petroleum Asphalt

REQUIREMENTS OF PETROLEUM ASPHALT

PARAMETER	TEST METHOD	ASPHALT GRADE				
		40-50	60-70	85-100	120-150	200-300
• PENETRATION	AASHTO T49	Min. 40 Max. 50	Min. 60 Max. 70	Min. 85 Max. 100	Min. 120 Max. 150	Min. 200 Max. 300
• FLASH POINT	AASHTO T48	Min. 232 Max. -	Min. 232 Max. -	Min. 232 Max. -	Min. 218 Max. -	Min. 177 Max. -

Emulsified Asphalt

- Emulsified asphalt is usually an emulsion composed of relatively soft straight asphalt, an emulsifying agent, a stabilizer and water.
- According to their particle changes, emulsified asphalt is classified as:

  (a). Cationic emulsified asphalt

  (b). Anomic emulsified asphalt

Emulsified Asphalt

Cutback Asphalt

- Cutback asphalt is liquid petroleum products, produced by fluxing an asphalt base with suitable petroleum distillates, to be used in the treatment of pavement surface.
- Combination of asphalt cement and petroleum solvent.
- Based on curing time, cutback asphalt can be classified into two types; such as;
  (a). Medium curing time type (MC)
  (b). Raid curing time type (RC)

Cutback Asphalt

Modified Asphalt

- Modified Asphalt is asphalt which materials such as rubber and resin added in attempt to improve viscosity at 60o C, toughness, teracity and temperature susceptibility.
- Modified asphalt is also semi-blown asphalt which is treated by a blowing process and Polymer modified Cationic Emulsified Asphalt.

Modified Asphalt

Thin asphalt overlays, polymer-modified mix.

LIME FOR SOILS STABILISATION

- Lime is materials such as quick lime, hydrate lime, either high calcium, dolomite or magnesium lime for use in stabilization of soils.
- Quick lime and hydrate lime act upon clay soils and may render such soils suitable for highway construction and for other load bearing applications, in most cases, lime causes finely divided clay particle which improves load bearing properties and subsequently the lime treated soil hardens by chemical reaction.

LIME FOR SOILS

DESIGN TRAFFIC

- Detailed procedures depend on the type of traffic data available, the pavement type being designed and the design method adopted.
- Features of traffic that largely determine performance are:
  (1) The number of axles passes
  (2) The axle loadings
  (3) The axle configurations
- The standard axle is defined as a single axle with dual wheels that carries a load of 8, 20 ton.

CONSTRUCTION AND MAINTENANCE CONSIDERATIONS

- Several construction and maintenance considerations must be taken into account in pavement design because they can influence the type of surfacing which adopted, the base and sub base material requirements or even fundamental choice of pavement type.

EXTENT AND TYPE OF DRAINAGE

- Special drainage provisions may be provided, including sub surface drains or porous drainage layers.
- In high rainfall regions or areas subject to high ground water levels, the use of a properly design designed drainage layer under near a granular pavement may be an effective means to remove water which has infiltrated through the surface, shoulders or from beneath the pavement.

AVAILABILITY OF EQUIPMENT

- The pavement type must be compatible with the equipment which is available for construction.
- For large projects it may be economical to import the required equipment, but in remote areas the locally available equipment will affect the choice of pavement type and composition.
- Sometimes, if a number of small jobs are to be constructed in a short period within the same region, the number of available economic alternatives can be increased.

Next Schedule

2nd Road Class Room Lesson;
Explanation of Drawings
(1) Drawing List
(2) Location Map
(3) Plan & Profile
(4) Cross Section
(5) Design Speed

3rd Road Class Room Lesson
(1) Road Structures
(2) Soil Condition

Planning of Road (2)

18th May 2013

- The road network is extensive, **road standards** are generally **poor**. **Road width** are generally **narrow (3.5 to 5.5 meters)** and require vehicles to move off the pavement to pass other vehicles. **Vertical and horizontal alignments** are poor, limiting **travel speeds** and **sight distance**. Inadequate drainage exacerbates road damage.

- **Rural Transport**
- Roads provide access to the rural parts of the country, where the majority of the poor live. They link rural communities to markets, services, and participation in the wider society.
- Connections with the southern economic zone cross a mountainous and midland area, which includes steep lands of **unstable rock** and **poor soils** that are highly susceptible to **erosion** and **landslides.**
- **Today's topics are Road Width & Landslide.**

Road Width

[Class-A Road]

- 1.0 m road shoulder + **7.0 m** travelled way + 1.0 m road shoulder = Total width **9.0** m (Funded by JICA)
- Class-A Road applies to National Road in Timor-Leste.

[Class-B Road]

- 1.0 m road shoulder + **6.0** m travelled way + 1.0 m road shoulder = Total width **8.0** m
- Class-B Road applies to National Road (Mountainous) in Timor-Leste. (Funded by World Bank, ADB, JICA)

[Class-C Road]

- 1.0 m road shoulder + **4.5** m travelled way + 1.0 m road shoulder = Total width **6.5** m
- Class-C Road applies to Local Road at narrow existing road in Timor-Leste.

Maubisse-Turiscai Road Rehabilitation Project

- Maubisse-Turiscai Road applies to Class-C Road standard due to existing narrow road width and widening about 2.0 m for existing road, 1.0 m road shoulder + 2.5 m travelled way + 1.0 m road shoulder = Total width 4.5 m.

- Existing road has many small curve lines, and new horizontal alignment has short-cut at small curve lines

Coarse Aggregate in Maubisse-Turiscai

- Issue of coarse aggregate is whether aggregate is easy to be soil, which is more than 30 % of Method for rock slaking test and more than 50 % of Method for rock crushed test.

White stone seems to be hard and no problem for coarse aggregate. It is better to do test.

Landslide in Maubisse-Turiscai

- There is a land slide area in Maubisse-Turiscai, which slope is protected by gabion. We propose to pay attention low-angle cut and cut speed.
- Source of Landslide explanation is “Slope Protection Guideline 2008”, saved in ADN Wiki Server, as following next sheets.

Type of Landslide

- Three general types of land slides are most commonly encountered in highways:

(1) Movement involving **surface** material

(2) Movement involving **deep seated soft soils**

(3) Movement involving **rock strata**

Survey on Landslide

- Desk Study
- Reconnaissance Survey
- Detailed Survey
- Topography Survey
- Geotechnical Survey
- **Drain Survey**
- Environmental Survey
- **Slope Failure Survey**

Drainage Survey

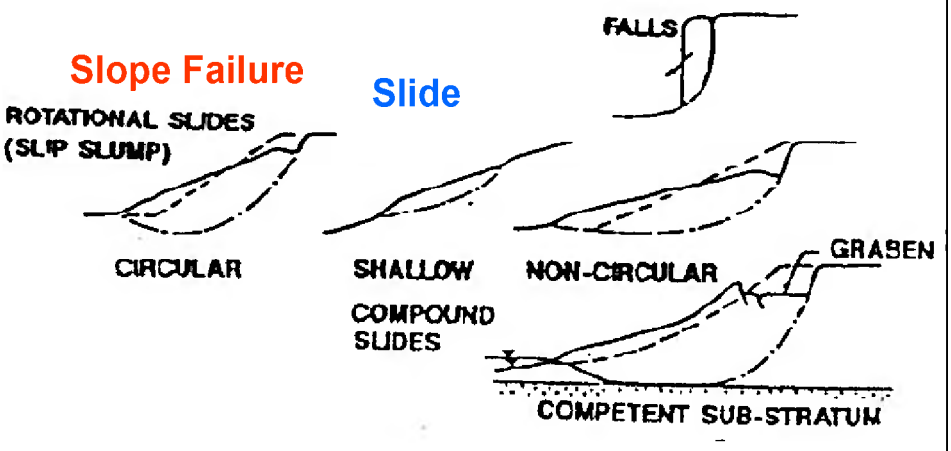
(1) Design concept of the drainage system within problems area
(2) Rainfall intensity
(3) Estimation of catchment area
(4) Type of land use and environment condition

Type of Landslide

(1) Landslide --- **Slower** Movement
(2) Mass Movement --- Take place **suddenly**
(2)-1. Slope Failure --- at Slope
(2)-2. Mudflow or Debris Flow (Sabo) --- at Sabo area

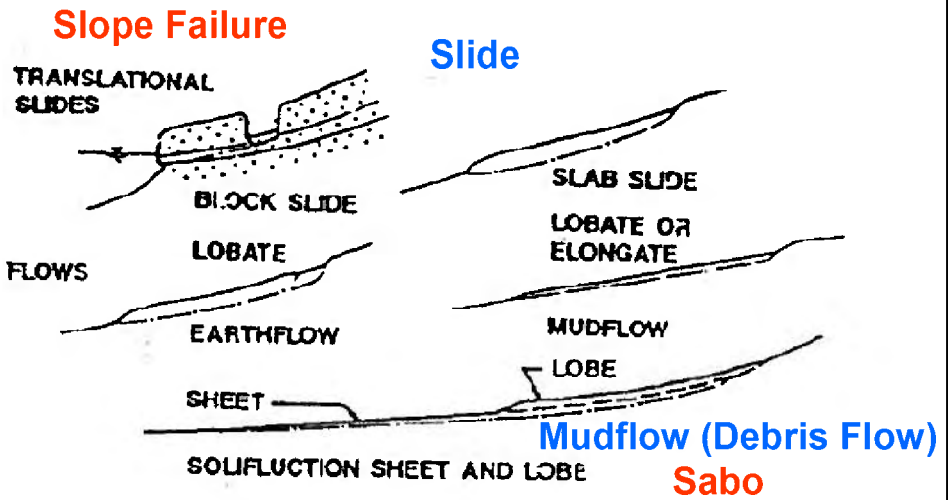
In Japan, Landslide are distinguished between 1) Landslide, 2) Slope Failure and 3) Debris Flow.

Basic Type of **Mass Movement** on Clay Slope



(For Slope Failure Survey)

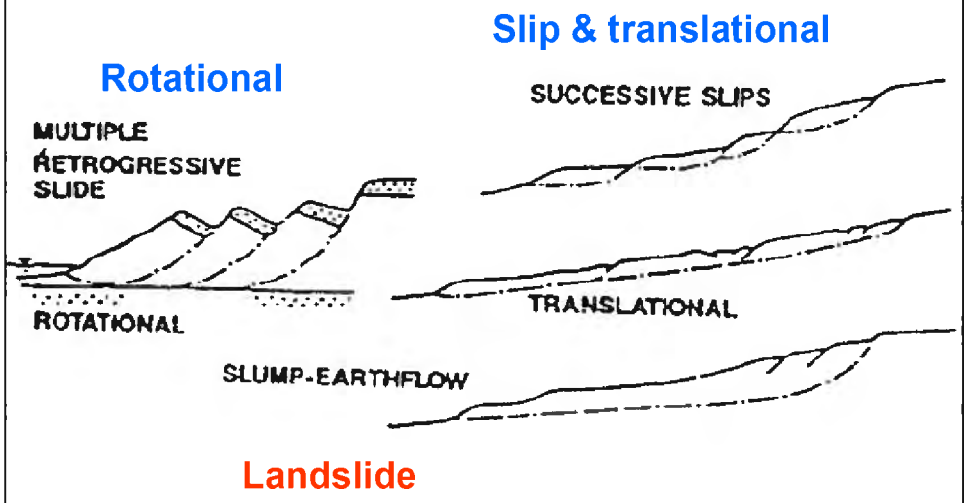
Basic Type of **Mass Movement** on Clay Slope (Contin.)



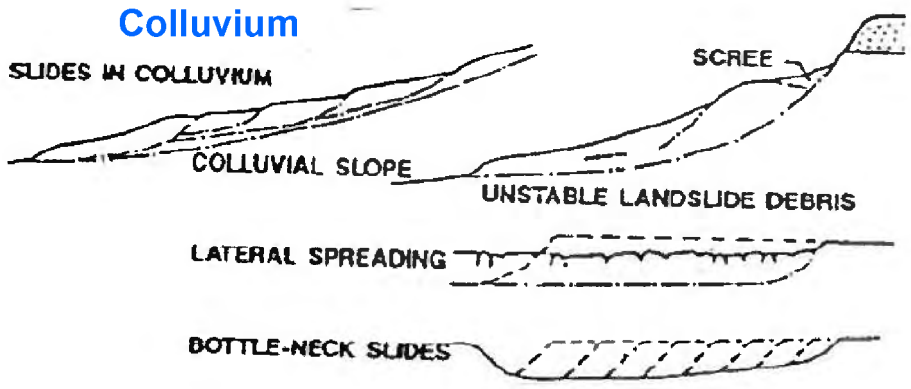
Mudflow (Debris Flow)

Sabo

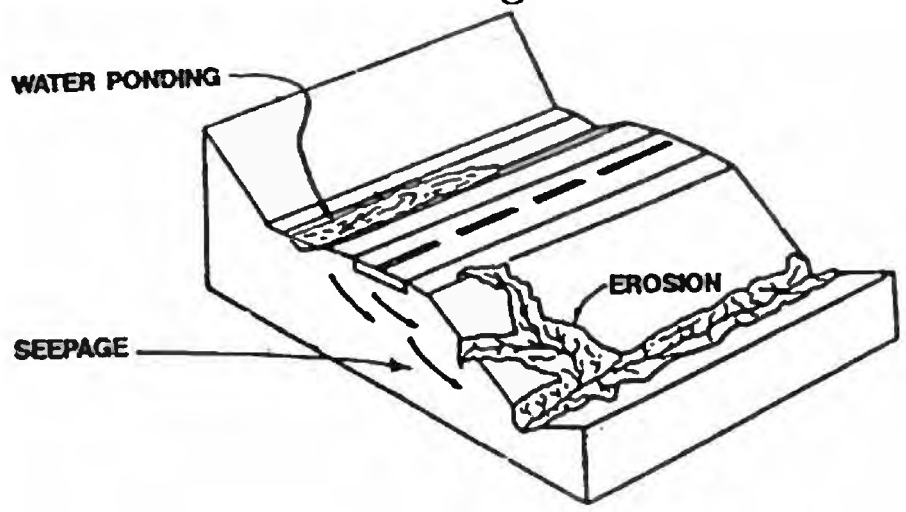
Typical **Landslide**



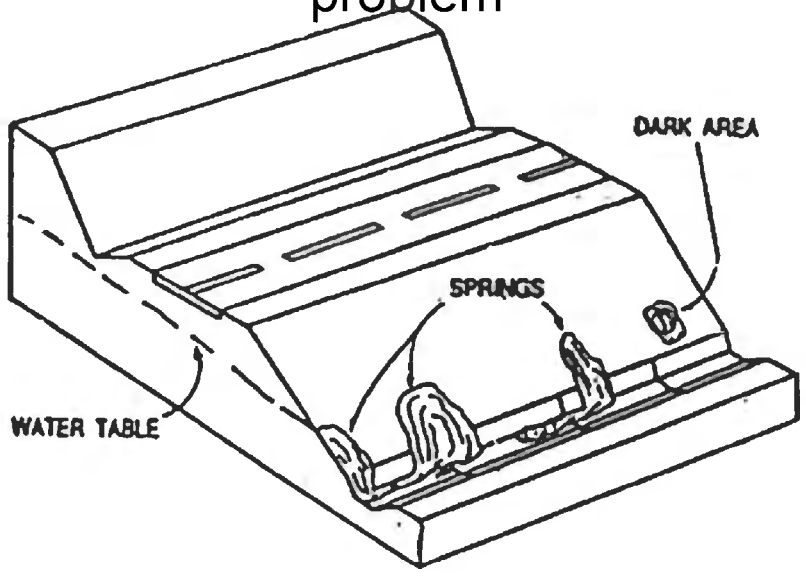
Typical **Landslide** (contin.)



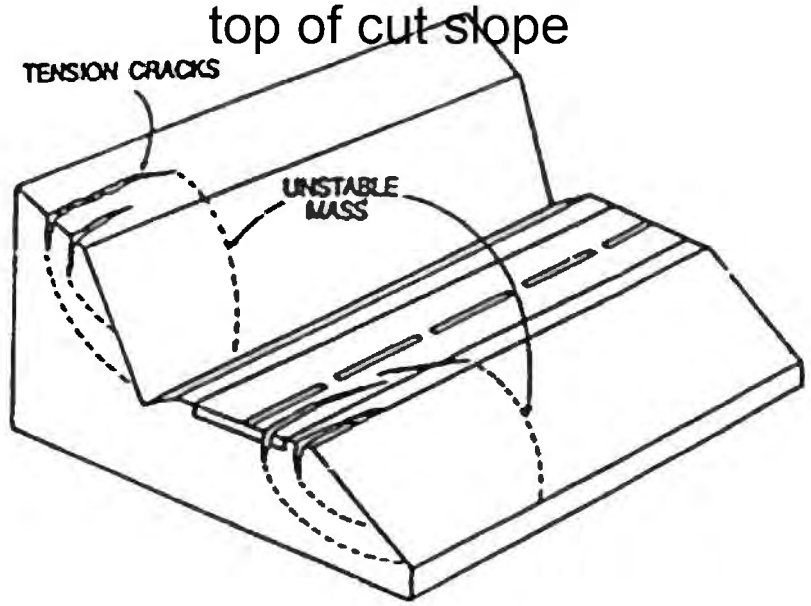
Typical Landslide due to poor drainage



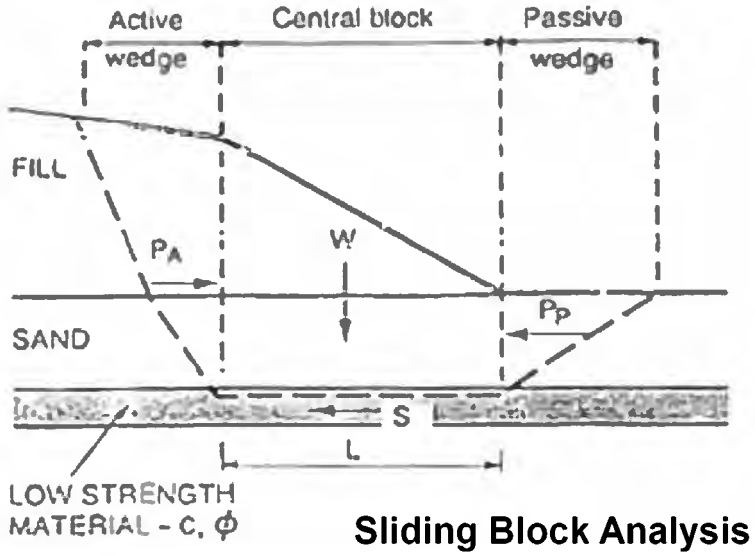
Typical Slope Failure due to spring problem



Development of Tension Crack at top of cut slope

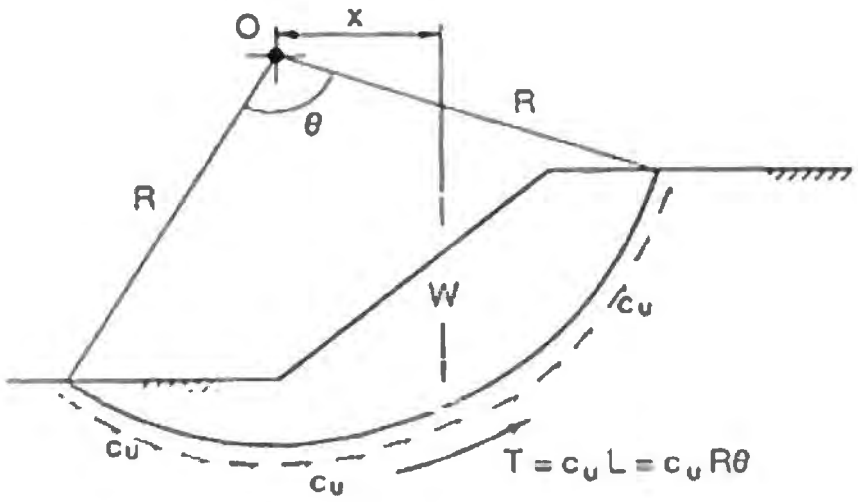


Slope Stability Analysis (1)



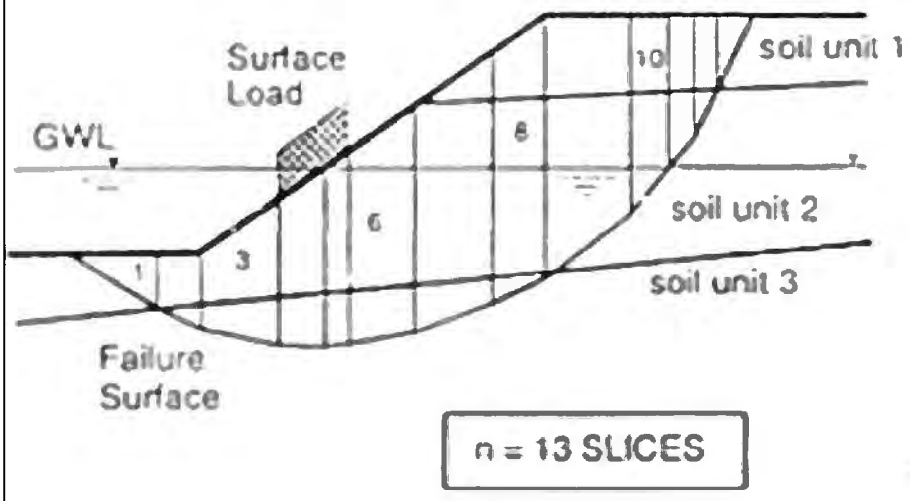
Sliding Block Analysis

Slope Stability Analysis (2)



Circular Surface Analysis

Slope Stability Analysis (3)

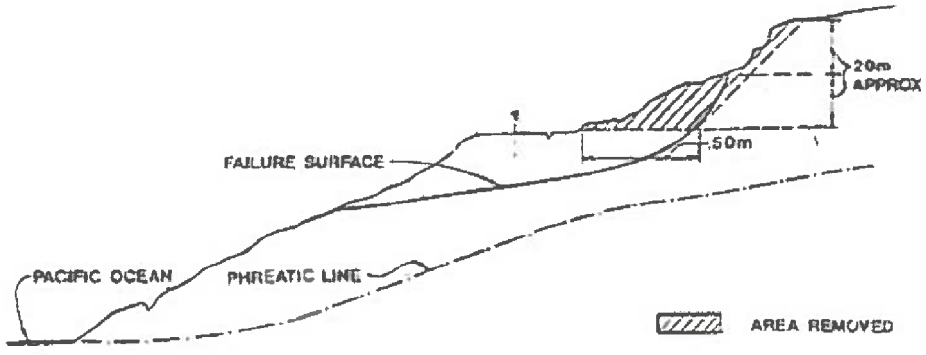


Slice Method

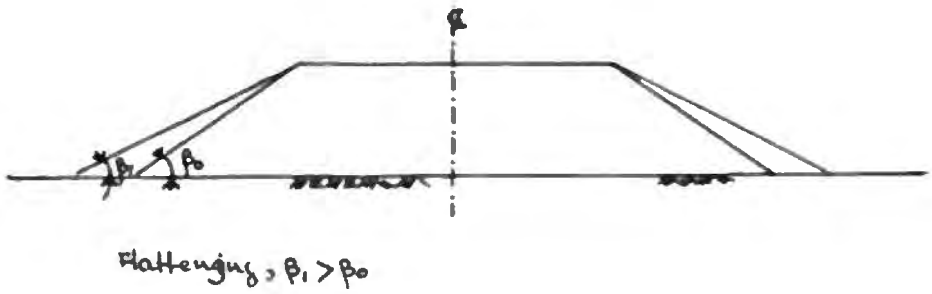
Slope Protection Method

(1) Unloading
(2) Construction of Drainage System
(3) Construction of Retaining Structures
(4) Other Methods

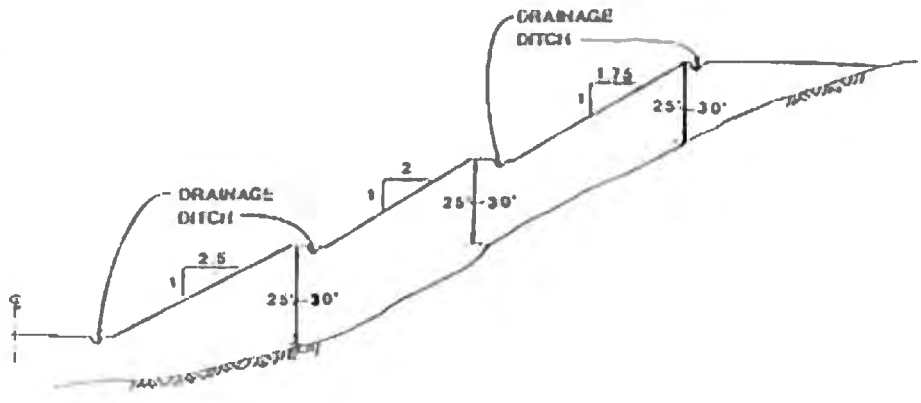
Removing Material from Slope Head



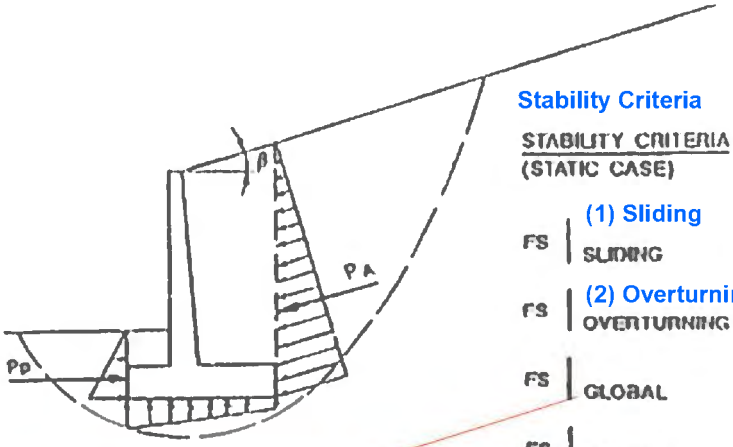
Slope Flattening in Embankment Slope



Terracing in Slopping Ground



Requirement for Safety Factor on Retaining Wall



Stability Criteria

STABILITY CRITERIA
(STATIC CASE)

(1) Sliding

FS | SLIDING ≥ 1.5

(2) Overturning

FS | OVERTURNING ≥ 2.0

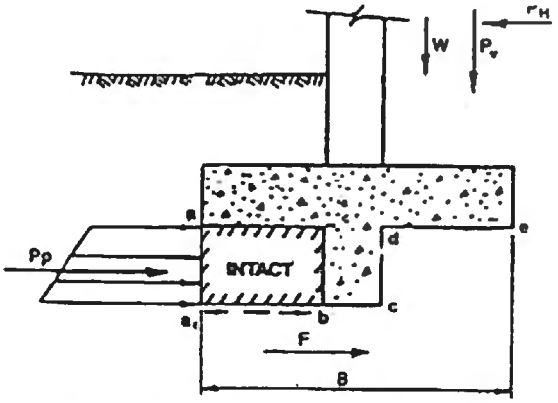
FS | GLOBAL ≥ 1.2 - 1.5

FS | BEARING CAPACITY ≥ 3.0

(3) Bearing Capacity

Consideration of Landslide

Gravity and Cantilever Retaining Wall



C =SHEAR STRENGTH OF FOUNDATION SOIL
Pp=PASSIVE RESISTANCE
δ =FRICTION ANGLE-CONCRETE ON SOIL
Fs=FACTOR OF SAFETY
Ca=ADHESION-CONCRETE ON SOIL

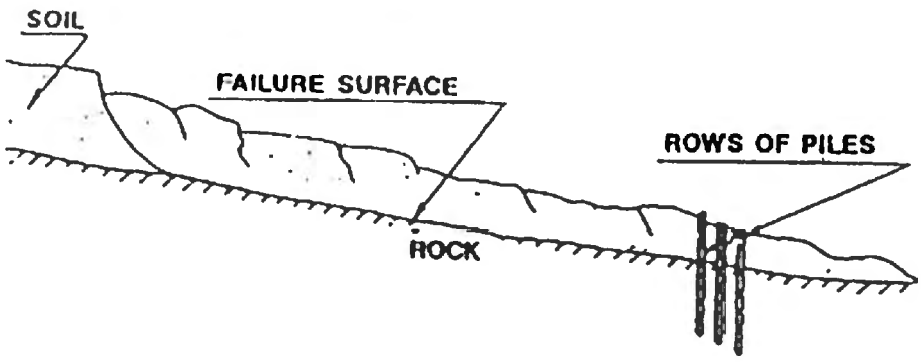
RESISTANCE AGAINST SLIDING ON KEYED FOUNDATIONS

COHESIVE SOILS $F=(W+P_V)\ \tan\delta + C_a(B-\overline{a_1b}) + C\ (\overline{a_1b}) + P_p$

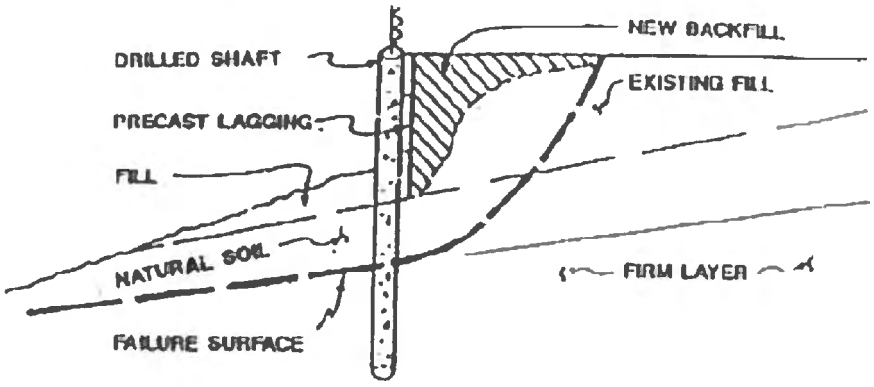
GRANULAR SOILS $F=(W+P_V)\ \tan\delta + P_p$

$F_s = F/P_H$ (SLIDING)

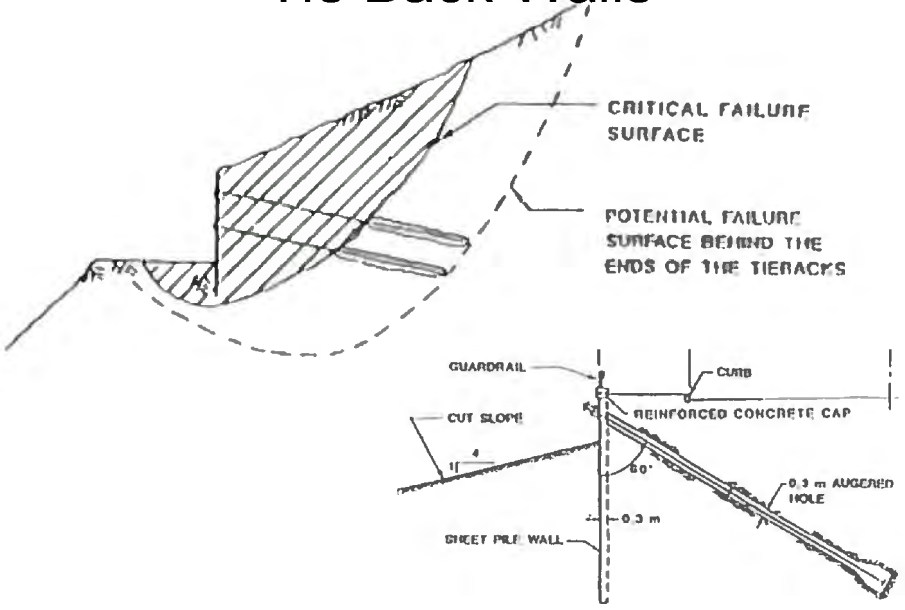
Driven Piles to Stabilize Slope



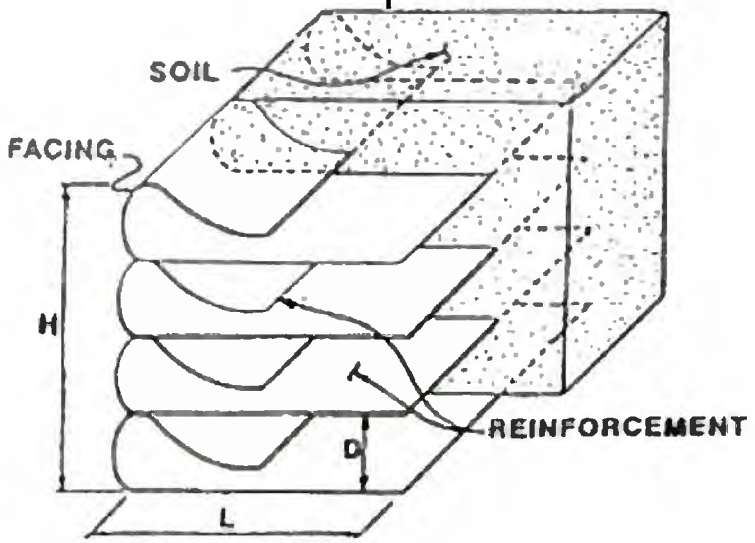
Drilled Shaft Wall



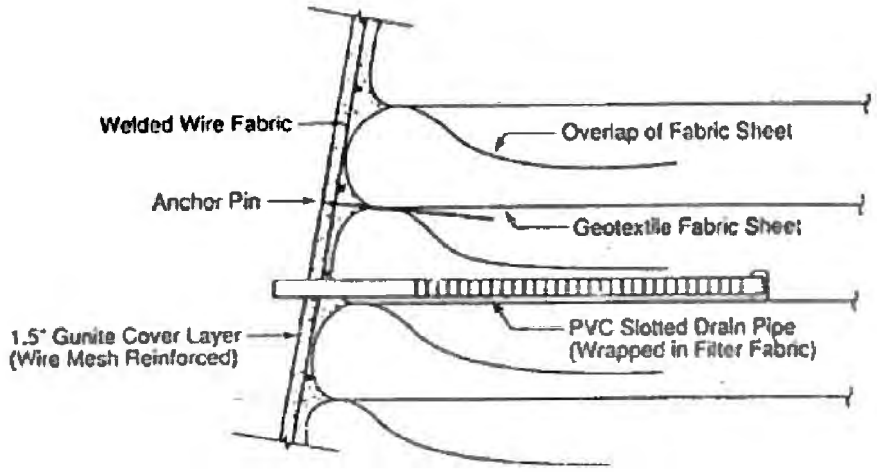
Tie Back Walls



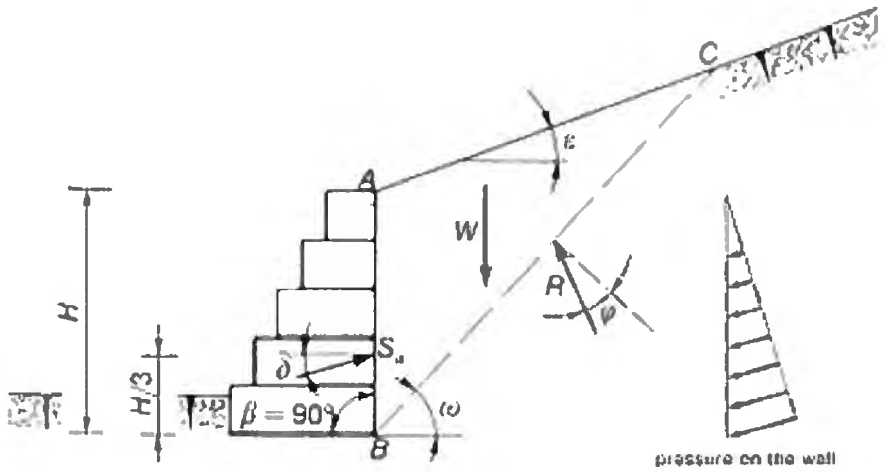
Geo-Synthetic Fiber Reinforced Slope



Geotextile Wall Detail

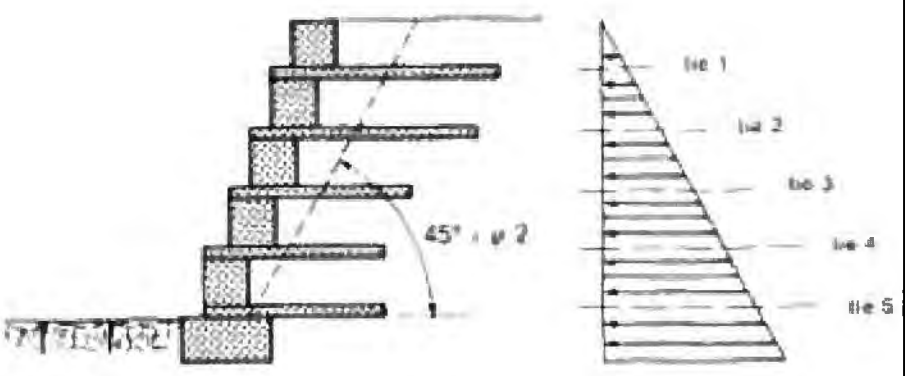


Gabion Retaining Structure



Flexibility Type

Soil Reinforcement Gabion



Flexibility Type

Next Schedule

3rd Road Class Room Lesson

Explanation of Drawings

(1) Drawing List, (2) Location Map, (3) Plan & Profile, (4) Cross Section, (5) Design Speed,

4th Road Class Room Lesson

(1) Road Structures (Culvert)

(2) Road Structures (Pipe)

Planning of Road (3)

1st Jun 2013

Verification of Drawings

ADN staffs must verify tender drawings through view point of following items, using ADN manual checklist page 9, (8) Drawings, P59, Checklist A, and Checklist C2.

Today's Lesson:
(1) Design Speed
(2) Drawing List,
(3) Location Map,
(4) Plan & Profile,
(5) Cross Section,

(1) Design Speed

- Design speed is a selected speed used to determine the various geometric features of the roadway. The assumed design speed should be a logical one with respect to the **topography**, anticipated **operating speed**, the adjacent **land use**, and the **functional classification** of the highway.

Design Speed in Japan

Type of Roadway	Classification	Grade	Design Speed		Traffic Volume (vehicles/day)			
					> 30,000	30,000–20,000	20,000–10,000	< 10,000
Highway / Express Way	1	1	120	100	Flat			
		2	100	80	Mountainous	Flat		
		3	80	60		Mountainous		Flat
		4	60	50				Mountainous
	2	1	80	60	Exclusive National Road			
		2	60	40	Urban			

(Source: Express Highway Design Standard of NEXCO, Japan)

(2) Drawing List

- Check the drawing list requiring the coincident of BoQ.
- Usually drawings of road have these contents as below:

1) Location Map
2) Plan & Profile
3) Cross Section
4) Structure of Road

Suai – Beaco Highway Road Project Drawings List

A. General
B. Typical Cross Section
C. Alignment Layout and Curve Data
D. Plan & Profile
E. Structure (includes Bridge)
F. Drainage
G. Standard (Traffic Sign, Lighting, etc.)

(3) Location Map

Consider below, seeing Location Map

(1) Detail Design require the coincidence of Feasibility study or Master Plan.

(2) Check the land use, environmental & social impact, interference obstacles, note on construction and flood at site survey.

(3) Check the land acquisition and Right of Way (ROW).

(4) Check the area of landslide or another issue of soil condition.

(4) Plan & Profile

A. Sight Distance

B. Super-elevation

C. Radius of Horizontal Curve

D. Clothoid Curve

E. Vertical Slope

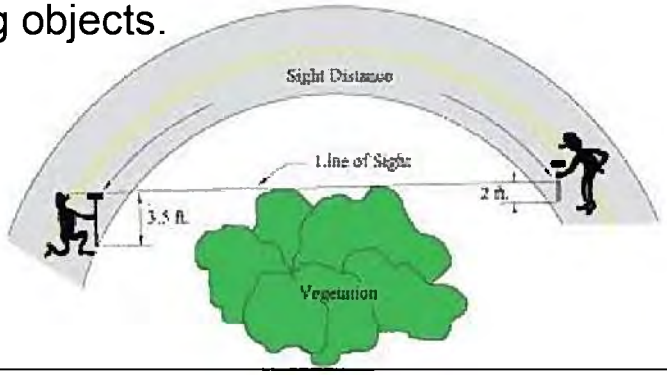
F. Radius of Vertical Curve

G. Note of bad profile design

H. Note of bad combination of vertical Curve and Horizontal Curve

A. Sight Distance

Sight distance available from a point is the actual distance along the road surface, over which a driver from a specified height above the carriage way has visibility of stationary or moving objects.



Sight Distance in Japan

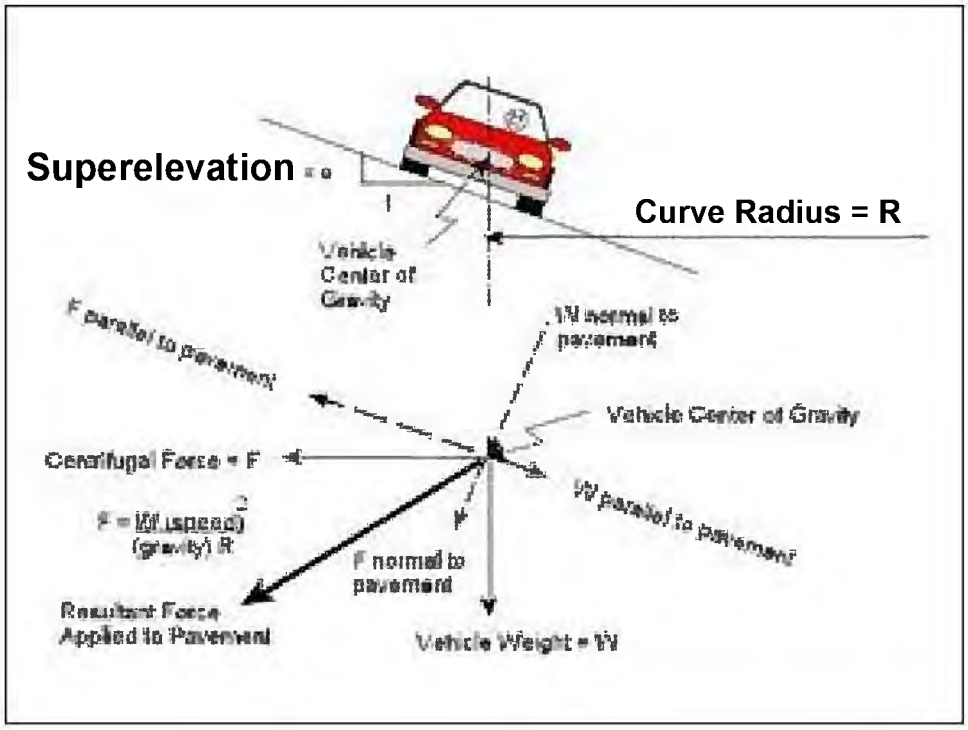
Design Speed (km/h)	Traffic Speed (km/h)	Idle running time (sec)	Friction coefficient	Stopping sight distance (m)	Sight Distance (m)
120	102	2.5	0.29	212	210
100	85	2.5	0.3	154	160
80	68	2.5	0.31	100	110
60	54	2.5	0.33	72	75
50	45	2.5	0.35	54	55

(source: Express Highway Design Standard of NEXCO, Japan)

B. Superelevation

(1) Superelevation is the rotation of the pavement on the approach to and through a horizontal curve.

(2) Superelevation is intended to assist the driver by counteracting the lateral acceleration produced by tracking the curve.

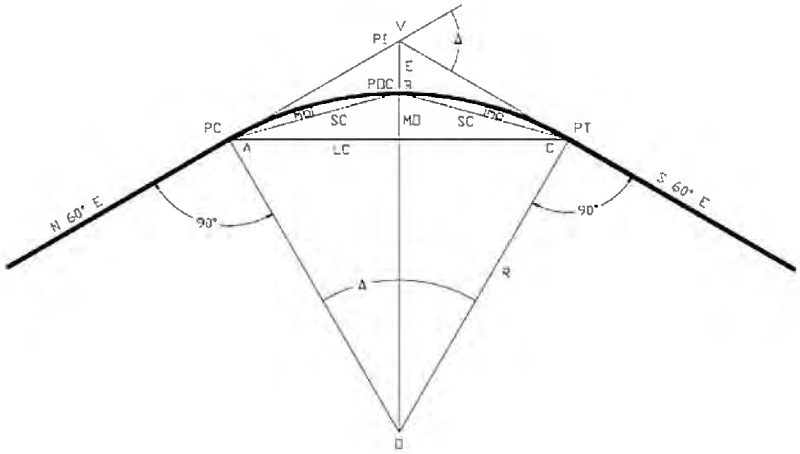


Superelevation in Japan

Design Speed	120 km/h	100 km/h	80 km/h	60 km/h	50 km/h	Superelevation (%)
Radius of Curve (m)	1,140 > > 1,040	870 > > 960	630 > > 710	350 > > 390	240 > > 270	6.00%
	1,380 > > 1,540	1,060 > > 1,200	790 > > 900	440 > > 500	300 > > 350	5.00%
	1,740 > > 1,980	1,360 > > 1,560	1,030 > > 1,190	570 > > 660	400 > > 460	4.00%
	2,310 > > 2,750	1,820 > > 2,180	1,400 > > 1,680	780 > > 940	540 > > 650	3.00%
	> 3,390	> 2,700	> 2,090	> 1,170	> 810	2.00%

(source: Express Highway Design Standard of NEXCO, Japan)

C. Radius of Horizontal Curve

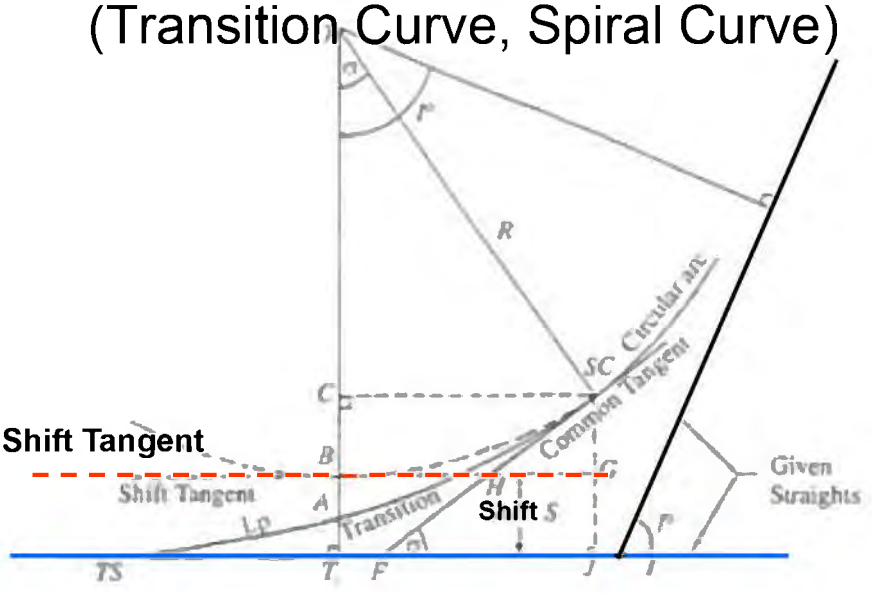


Radius of Horizontal Curve in Japan

Design Speed	Desirable Minimum Radius of Curve	Minimum Radius of Curve	
		Superelevation = 8 %	Superelevation = 6 %
120	1,000	630	710
100	700	410	460
80	400	250	280
60	200	140	150
50	150	90	100

(source: Express Highway Design Standard of NEXCO, Japan)

D. Clothoid Curve (Transition Curve, Spiral Curve)

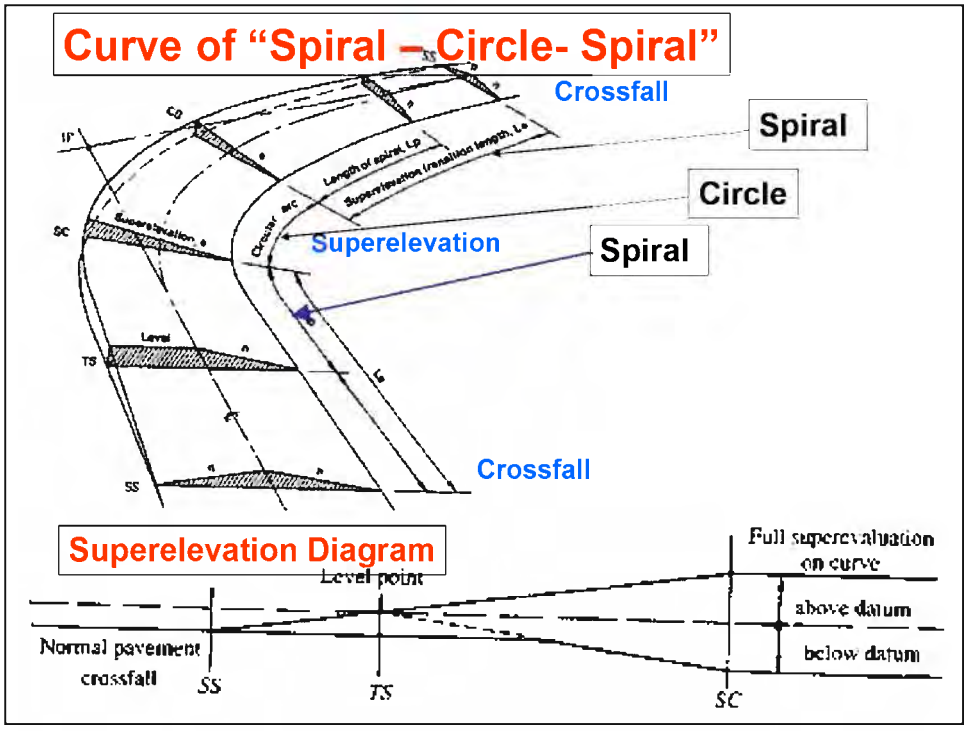


Purpose of Clothoid Curve (Transition Curve, Spiral Curve)

(1) Provides path for vehicle to move from straight to a circular curve

(2) Improved appearance of curve to driver due to smooth steering

(3) Allows introduction of superelevation and pavement widening

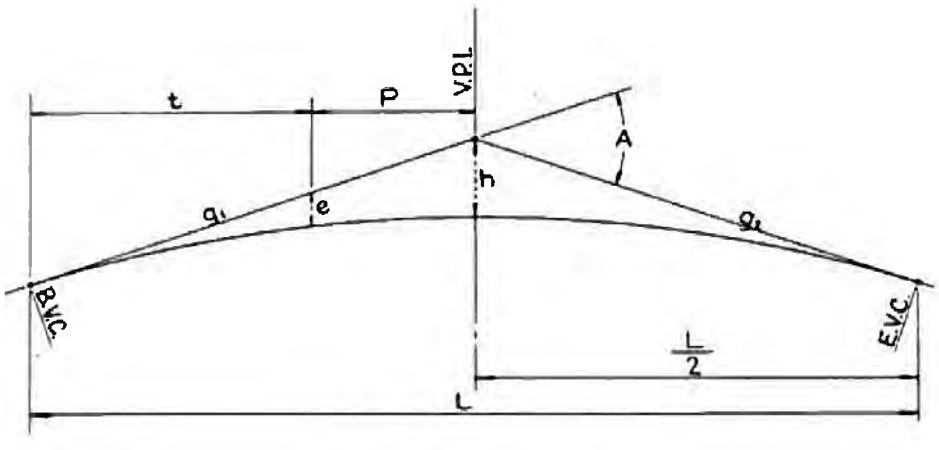


E. Vertical Slope

Design Speed (km/h)	Maximum Grade (Vertical Slope) (%)
120	2
100	3
80	4
60	5
50	6

(source: Express Highway Design Standard of NEXCO, Japan)

F. Radius of Vertical Curve



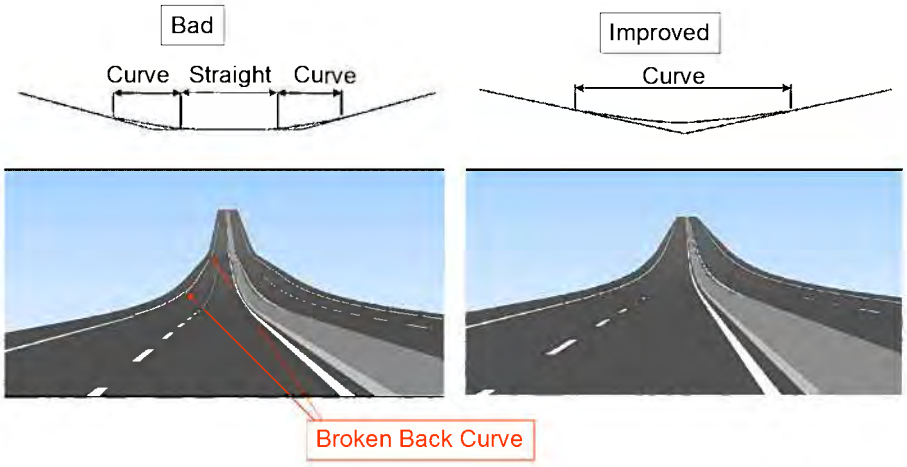
h = Vertical distance from point of intersection to the curve.
L = Vertical curve length.

Minimum Vertical Curve Length (VC)

Design Speed (km/h)	Minimum Vertical Curve Length (m)
120	100
100	85
80	70
60	50
50	40

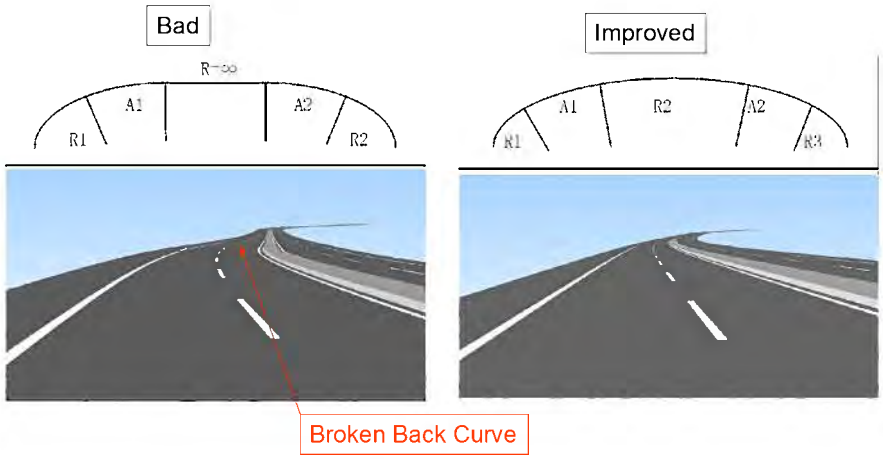
(source: Express Highway Design Standard of NEXCO, Japan)

G. Note of bad profile design



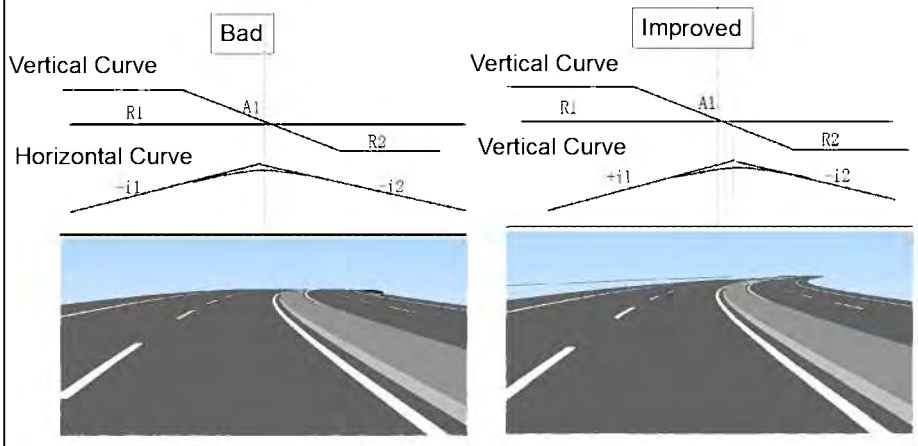
(source: Express Highway Design Standard of NEXCO, Japan)

H. Note of bad Alignment Layout design



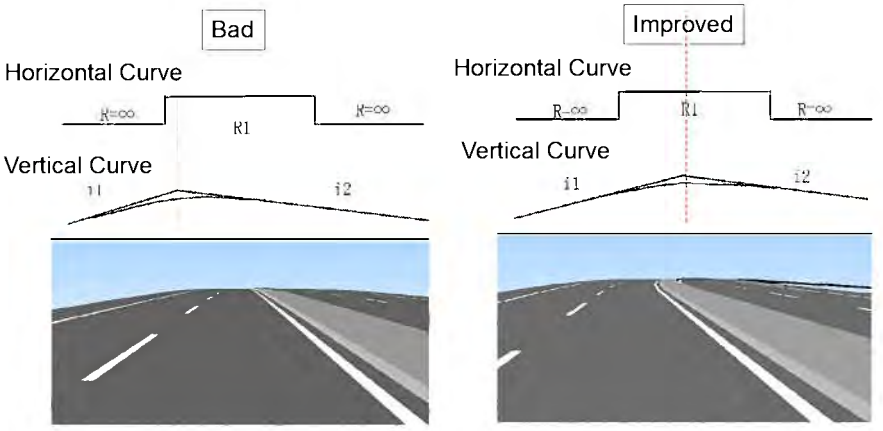
(source: Express Highway Design Standard of NEXCO, Japan)

I. Note of bad combination of vertical Curve and Horizontal Curve



(source: Express Highway Design Standard of NEXCO, Japan)

J. Note of bad combination of vertical Curve and Horizontal Curve



(source: Express Highway Design Standard of NEXCO, Japan)

(5) Cross Section

1) Road width
2) Pavement type (AC / DBST)
   AC: Asphalt Concrete
   DBST: Double Bituminus
3) Slope Angle on Cut Area / Fill Area / Embankment Area
4) ROW (Right of Way)
5) Drainage
6) Guardrail

(6) Structure of Road

1) Proposed Bridge / Existing Bridge
2) Proposed Box Culvert / Existing Box Culvert
3) Proposed RCP / Existing RCP (Pipe)
4) Proposed Drainage / Existing Drainage
5) Electric Pole / Telephone Pole
6) Water Supply Pipe
7) Traffic Light
8) Guardrail / Concrete Barrier

Next Schedule

4th Road Class Room Lesson
Analysis, Design, Re-bar, Dimension on
(1) Road Structures (Culvert)
(2) Road Structures (Retaining Wall)

5th Road Class Room Lesson
Construction of Road, Pavement

Planning of Road (4)

8th Jun 2013

Verification of Drawings

ADN staffs must verify tender drawings through view point of following items, using ADN manual checklist page 9, (8) Drawings, P59, Checklist A, and Checklist C2.

Today's Lesson:
(1) Soil Condition
(2) Design of Retaining Wall & Re-bar
(3) Design of Box Culvert
(4) Landslide

(1) Soil Condition

1) Drained Strength of **Cohesive Soils (Clay)**

Long-term effective stress strength parameters, c' and φ', of clays should be evaluated by slow consolidated drained direct shear box tests, consolidated drained (CD) trialxial tests, or consolidated undrained (CU) triaxial tests with pore pressure measurements.

Where;

c' : Cohesion of soil

φ': Angle of internal friction of drained soil (degrees)

(1) Soil Condition (contin.)

2) Drained Strength of **Granular Soils (Sand)**

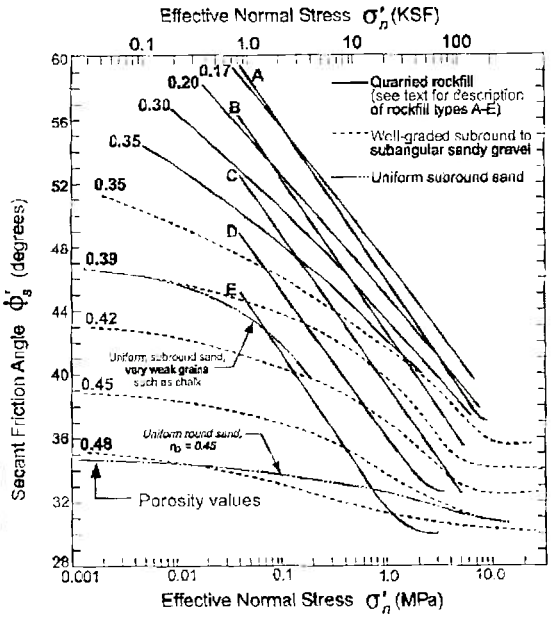
The drained friction angle of granular deposits should be evaluated by correlation to the results of SPT (Standard Penetration Test: N-value) testing, CPT (Cone Penetration Test) testing, or other relevant in-situ tests.

N = SPT blow count corrected for hammer efficiency (blows/ft, or blows/30 cm)

[foot = 30.48 cm]

- For **gravels** and **rock** fill materials where SPT testing is not reliable.
- This figure should be used.

Rock Fill Grade	Particle Unconfined Compressive Strength (ksf)
A	>4610
B	3460–4610
C	2590–3460
D	1730–2590
E	≤1730



(source: AASHTO LRFD BRIDGE DESIGN SPECIFICATION 10.18, 2010)

(2) Design of Retaining Wall

Foundation of Retaining Wall

- Spread Footings

Spread footings shall be proportioned and designed such that the supporting soil or rock provides adequate nominal resistance, considering both the potential for adequate bearing strength and the potential for settlement.

1. Overturning (Eccentricity)
2. Sliding
3. Uplift
4. Overall stability (Bearing strength & settlement)
5. loss of lateral support (Landslide)

Bearing Depth

- Where the potential for scour, erosion or undermining exists, spread footings shall be located to bear below the maximum anticipated depth of scour, erosion, or underminings.

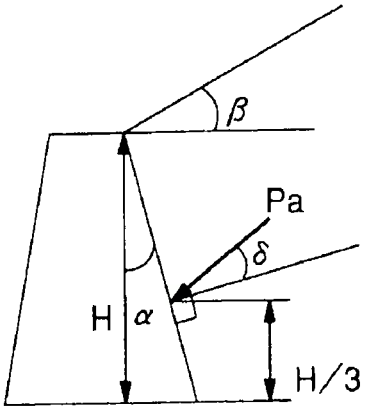
Bearing Layer

- **Sandy soil and gravel layers** may be regarded as good-quality **bearing layers** if their N value (SPT) is approximately equal to or larger than **30.**
- Regarding small retaining wall, Bearing layers of **Sandy soil and gravel layers** may be **20** of STP.
- **Cohesive soil layers** may be supposed to be good-quality bearing layers, if the N value is approximately equal to or larger than **20**. Unconfined compression strength Qu is more than about 0.4 N/mm2.

(source: Specifications for Highway Bridges Part IV Substructures, Japan)

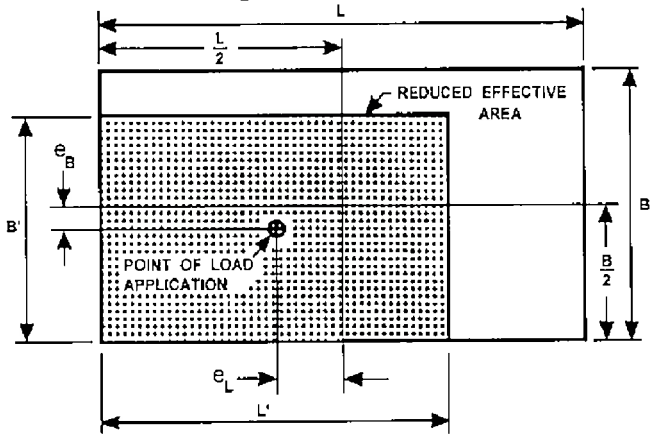
Stability Analysis of Retaining Wall

- Earth Pressure of Coulomb Theory



Effective Footing Dimensions

- The reduced dimensions for an eccentrically loaded rectangular footing are shown in figure.



Settlement of Spread Footing

Foundation settlements should be estimated using computational methods based on the results of laboratory or in-situ testing, or both.

Total settlement includes elastic, consolidation, and secondary components.

Elastic settlement is instantaneous deformation as the soil is loaded.

Consolidation settlement is the most important deformation consideration in cohesive soil deposits.

Secondary settlement is of principal concern in highly plastic or organic soil deposits

Bearing Resistance of Spread Footings

- The position of the **groundwater** table can significantly influence the bearing resistance of soils.
- In general, the **submergence** of soils will reduce the effective shear strength of cohesionless (or granular) materials, as well as the long-term shear strength of cohesive (clay) soils.

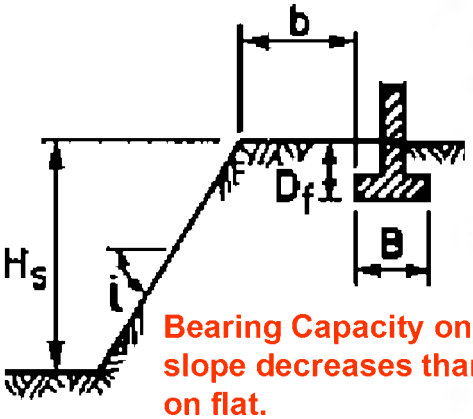
Bearing Resistance of Spread Footings (contin.)

- The bearing resistance formulation provided in bellow equations is the complete formulation.

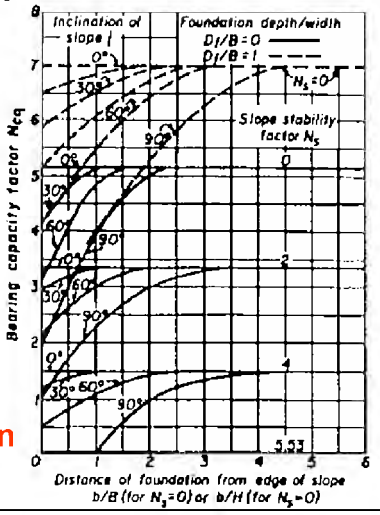
$$q_n = cN_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5\gamma \quad BN_{\gamma m} C_{w\gamma}$$

Considerations for Footings on Slopes

Modified Bearing Capacity Factors should be used at near slope.



Bearing Capacity on slope decreases than on flat.



Driven Piles

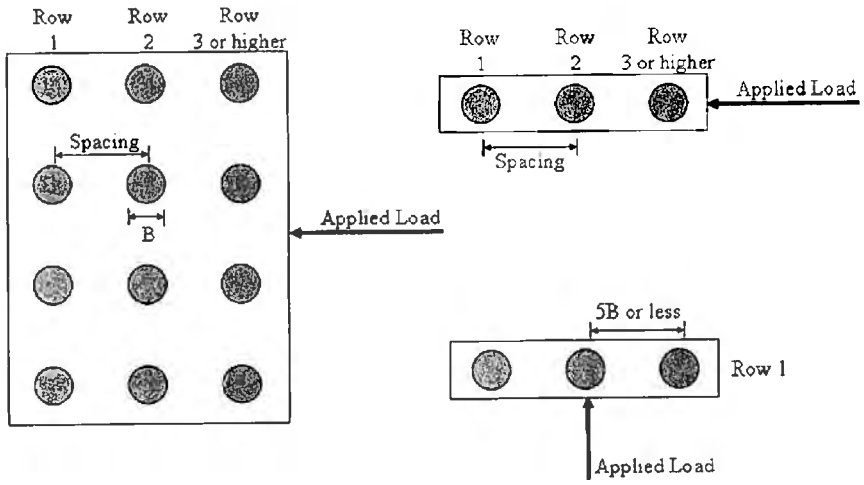
Driven piling should be considered in the following situations:

1) When spread footings **cannot be founded on rock, or on competent soils** at a reasonable cost,
2) At locations where soil conditions would normally permit the use of spread footings but the potential exists for **scour**, liquefaction or lateral spreading, in which case driven piles bearing on suitable materials below susceptible soils should be considered for use **as a protection** against these problems,
3) Where right-of-way or other **space limitations** would not allow the use spread footings, or
4) Where an unacceptable amount of **settlement** of spread footings may occur.

Minimum Pile Spacing, Clearance, and Embedment into Cap

- Center-to-center pile spacing should not be less than 30.0 in. or 2.5 pile diameters.
- The distance from the side any pile to the nearest edge of the pile cap shall not be less than 9.0 in.
- The tops of piles shall project at least 12.0 in. into the pile cap after all damaged material has been removed.

Definition of Loading Direction and Spacing for Group Effects of Piles



Determination of Nominal Bearing Resistance for Piles

1) Static Load Test
2) Dynamic Testing
3) Wave Equation Analysis
4) Dynamic Formula
5) **Static Analysis** **---Design Report**

(Bearing Resistance of Piles) = (Resistance Factor) x ((Pile Tip Resistance) + (Pile Side Resistance))

Using SPT or CPT data **---Design Report**

Drilled Shafts

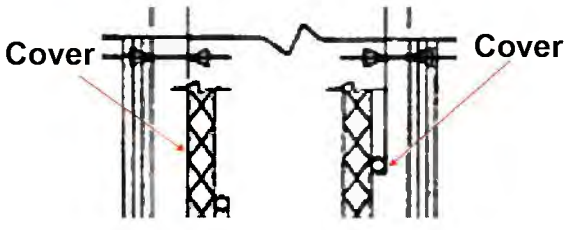
Drilled shafts may be an economical alternative to spread footing or pile foundations, particularly when spread footings can not be founded suitable soul or rock strata **within a reasonable depth** or when driven piles are **not viable**.

Drilled shafts may be an economical alternative to spread footings where **scour depth** is large. Drill shafts may also be considered to **resist high lateral or axial loads**, or when deformation tolerances are small.

Re-Bar (Reinforcement Bar)

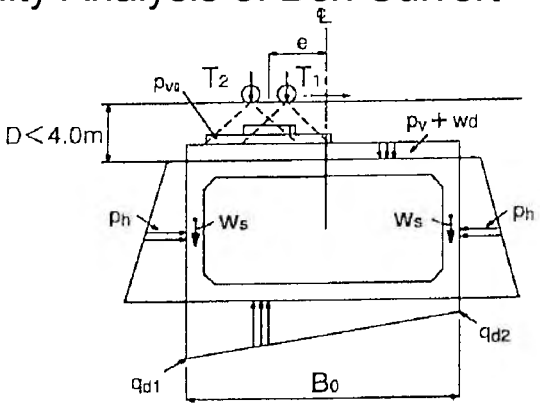
Cover : The least distance between the surface of the reinforcement and the outer surface of the concrete. Check Drawings.

Spacer (Cover Block) : Device that maintains reinforcement in proper position, also a device for keeping wall forms apart at a given distance before and during concreting.



(3) Design of Box Culvert

- Stability Analysis of Box Culvert



Box Culvert is more stable than retaining wall on earth pressure.

Failure Mode of Box Culvert

Existing Box Culvert was washed out during flood.

At Upstream of Bidau River in Dili

The reason is small cross section of Box Culvert against debris during flood.
Width of new box culvert needs minimum 3.00 m because existing tributary width is 3.00 m.

(4) Landslide

Landslide is in Maubisse on National Road A02.

Landslide is in Dili on National Road A01.

Gabion works 15 Year's ago due to Landslide

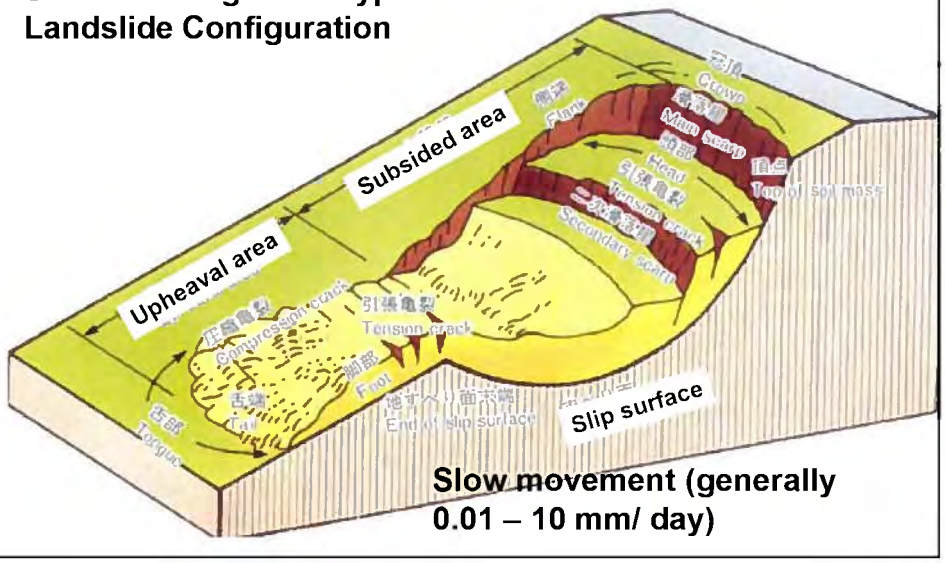
Landslide started again gradually.

Landslide closed 70 % of road width.

(source: JICA long-term expert Dr. Kazama)

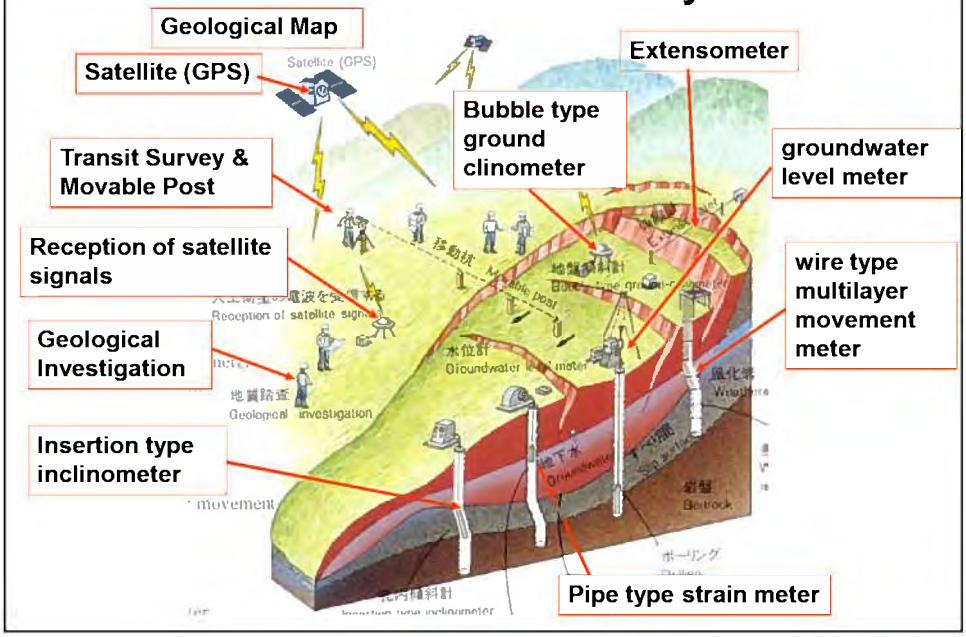
Mechanism of Landslides

Schematic Figure of Typical Landslide Configuration

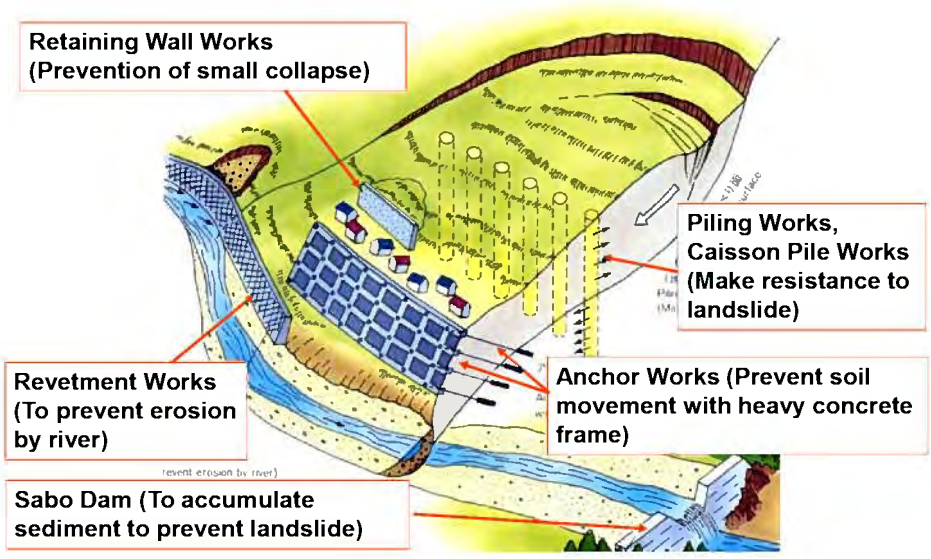


Slow movement (generally 0.01 – 10 mm/ day)

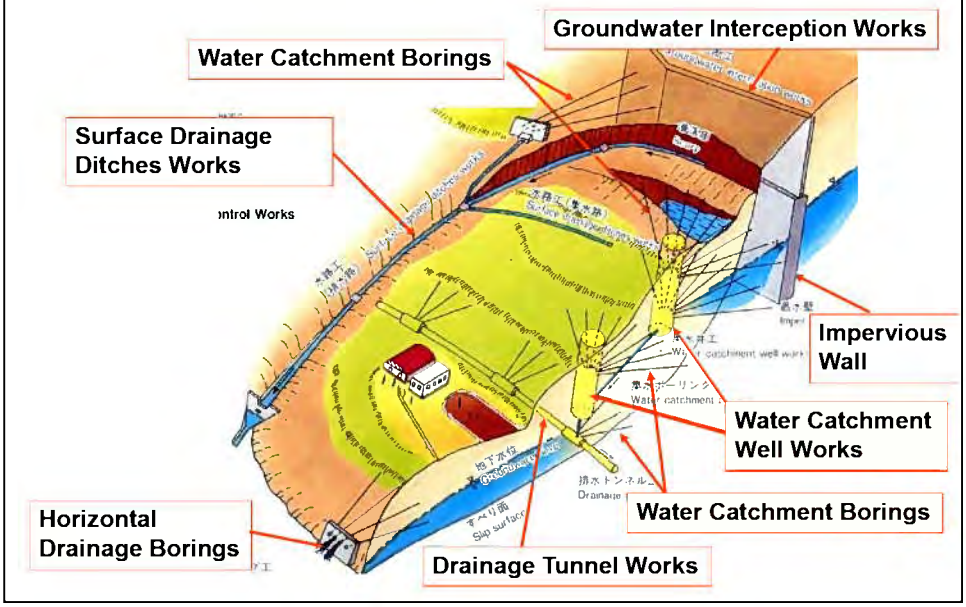
Landslide Survey



Restraint Works to Mechanically Stop Landslide



Control Works Mainly Aiming at Water Control

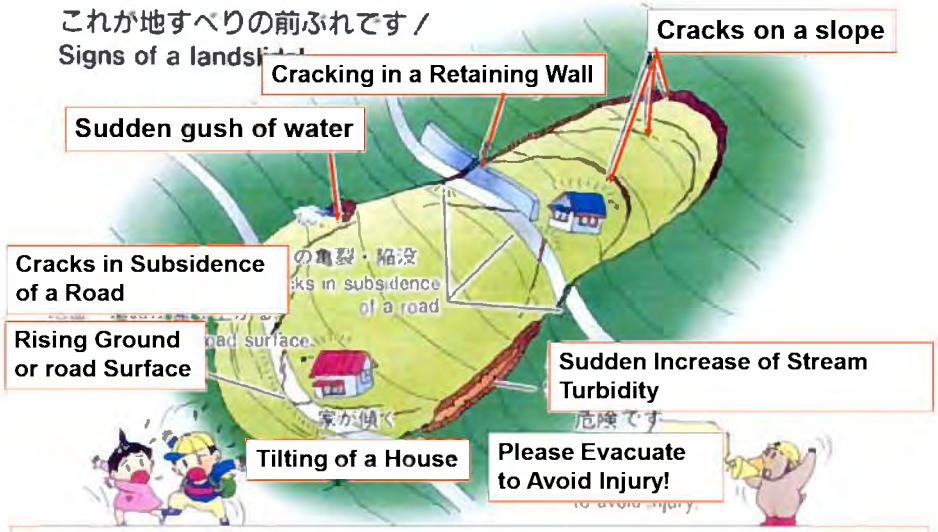


Jizukiyama Landslide in Japan, 1990

Landslide Disaster 1990

After Completion of Prevention Works

Signs of a Landslide



Activities which may cause or aggravate a landslide are restricted within landslide-threatened areas

Next Schedule

5th Road Class Room Lesson

Construction of Road, Pavement

6th Road Class Room Lesson

Construction of Road Structure (Retaining Wall, Gabion, Box Culvert)

Planning of Road (5)

22nd Jun 2013

Verification of Drawings

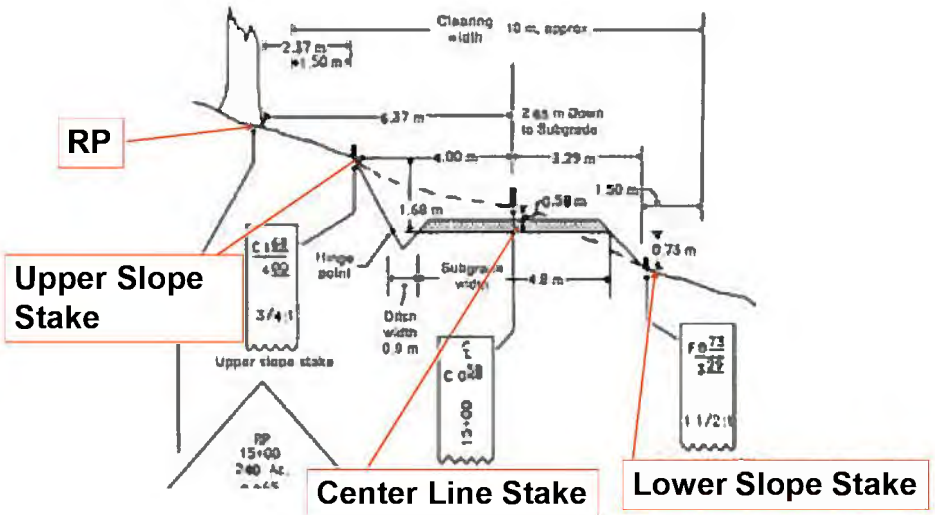
ADN staffs must verify tender drawings through view point of following items, using ADN manual checklist.

Today's Lesson:
(1) Construction & Payment of Road
(2) Construction & Payment of Pavement

Construction Staking

- Prior to the construction activity, the design information has to be moved from plan to the ground. This is accomplished by staking.
- **Stakes** is wooden pile, about 50 cm length.
- Stakes are used by the equipment operator in locating where to begin cutting.
- In order to relocate the stakes (centerline, slope stakes), it is helpful to establish **reference points (RP)** outside the clearing limits. Reference points should be set at least 3 to 5 meters behind the uphill clearing limits.

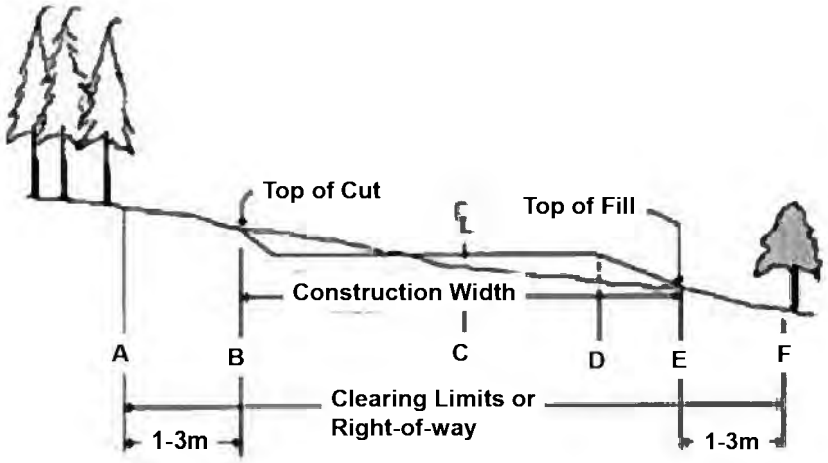
- The use of RP's (Reference Points) or slope stakes for proper excavation is shown in bellow figure.



Clearing and Grubbing of the Road Construction Area

- Preparing the road **right-of-way** or **construction area** is referred to as clearing and grubbing.
- During the clearing phase, tree are felled. Grubbing refers to the clearing and removal of stumps and organic debris.
- **Trees** should be felled and cleared a minimum of **1 to 3 m** from the top of the cut or toe of fill.
- The logs can be decked outside the construction area or skidded away.

- Clearing limits in relation to road bed widths, significant quantities of organic materials are removed between B and E.



Payment of Clearing and Grubbing

Pay Item number	Description	Unit of Measurement
201(1)	Clearing and Grubbing	Hectare
201(2)	Clearing and Grubbing	Lump Sum
201(3)	Individual Removal of Trees, Small	Each
201(4)	Individual Removal of Trees, Large	Each

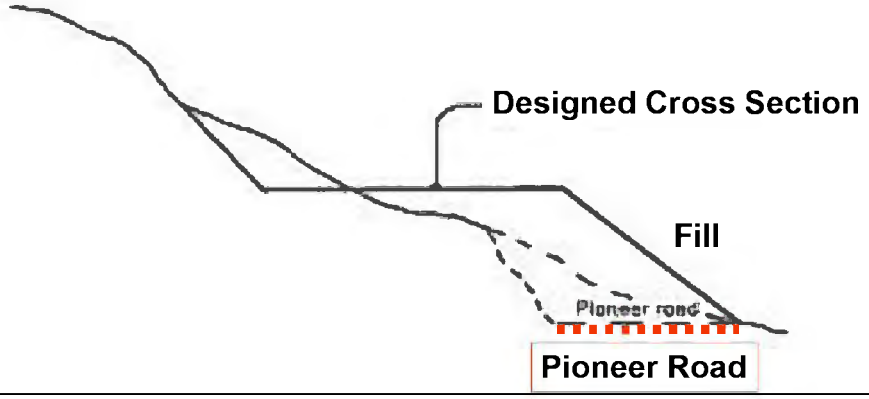
(source: MTCPW Standard Specifications, 2005)

Pioneer Road

- During the grubbing phase, or preparation phase, a pioneer road is often constructed to facilitate equipment access, logging equipment movement, and delivery of construction materials, such as culverts.
- This is often the case when construction activities are under way at several locations. If pioneer roads are constructed, they are often built at the top of the construction width and are usually nothing more than a bull dozer trail.

- When considerable side hill fill construction is planned, the dozer trail should be located at the **toe** or **base** of the proposed fill.

  Pioneer road at bottom of proposed fill provides a bench for holding fill material of completed road.



Break Up & Reclaim

- Road Reclaimer: Breaking up, reclaiming, recycling or milling

Payment of Removal of Structures and Obstructions

Pay Item number	Description	Unit of Measurement
202(1)	Removal of Structures and Obstructions	Lump Sum
202(2)	Removal of Structures and Obstructions (specific)	Each
202(3)	Removal of pavement, side walks, curbs, etc.	Square meter
202(4)	Removal of	Linear meter

(source: MTCPW Standard Specifications, 2005)

Bulldozer in Road Construction

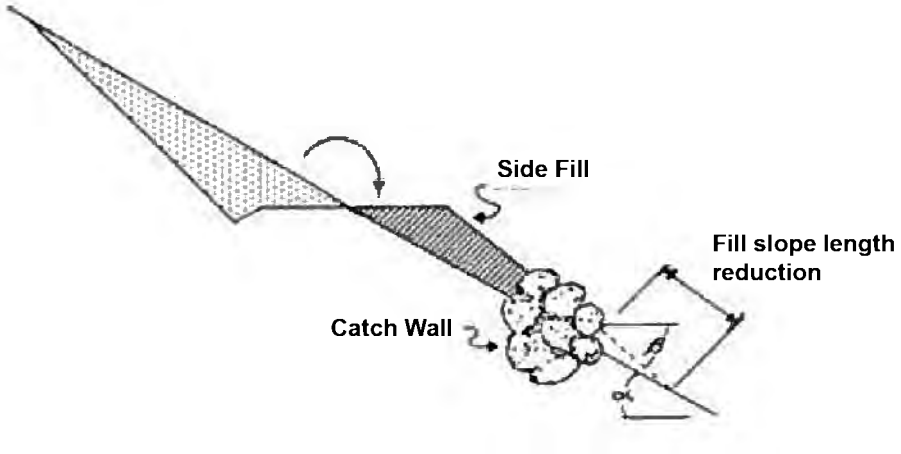
- Probably the most common piece of equipment in forest road construction is the bulldozer equipped with straight or U-type blades.
- These are probably the **most economical** pieces of equipment when material has to be moved a **short distance**.
- The economic haul or push distance for a bulldozer with a straight blade is from **17 to 90 meters** depending on grade.

Earthmoving Equipment

Hydraulic Excavator (Power Shovel) in Road Construction

- The hydraulic excavator is a relatively new technology in forest road construction.
- This machine basically operates by digging, swinging and depositing material.
- Mass balance along the centerline is limited to the reach of the excavator, typically about 15 to 20 meters.

- Fill slope length is reduced by means of catch wall at toe of fill.



Payment of Excavation

Pay Item number	Description	Unit of Measurement
203(1)	Unsuitable excavation	Cubic meter
203(2)	Surplus Common Excavation	Cubic meter
203(3)	Surplus Rock Excavation	Cubic meter
203(4)	Surplus unclassified Excavation	Cubic meter

(source: MTCPW Standard Specifications, 2005)

Payment of Structure Excavation

Pay Item number	Description	Unit of Measurement
204(1)	Structure Excavation	Cubic meter
204(2)	Bridge Excavation	Cubic meter
204(3)	Foundation Fill	Cubic meter
204(4)	Excavation ordered below Plan elevation	Cubic meter
204(5)	Shoring, cribbing, and related work	Lump sum
204(6)	Pipe culverts and drain excavation	Cubic meter

(source: MTCPW Standard Specifications, 2005)

Payment of Embankment

Pay Item number	Description	Unit of Measurement
205(1)	Embankment	Cubic meter
205(2)	Selected. Borrow for topping	Cubic meter
205(3)	Selected Borrow for topping	Cubic meter
205(4)	Earth Berm	Meter

(source: MTCPW Standard Specifications, 2005)

Building Base Courses

- Road base courses require the right grade, slope, thickness, materials and compaction.

Payment of Subgrade Preparation

Pay Item number	Description	Unit of Measurement
206(1)	Subgrade preparation (Common material)	Square meter
206(2)	Subgrade preparation (Existing material)	Square meter
206(3)	Subgrade preparation (Unsuitable material)	Square meter

Payment of Compaction Equipment and Density Control Strips

No payment.

(source: MTCPW Standard Specifications, 2005)

Payment of Overhaul

Pay Item number	Description	Unit of Measurement
208(1)	Overhaul	Cubic-meter-kilometer
208(2)	Overhaul of Borrow, Case 1	Cubic-meter-kilometer

Payment of Aggregate Subbase Course

Pay Item number	Description	Unit of Measurement
301	Aggregate Subbase Course	Cubic meter

Payment of Aggregate Base Course

Pay Item number	Description	Unit of Measurement
302	Aggregate Base Course	Cubic meter

Payment of Crushed Aggregate Base Course

Pay Item number	Description	Unit of Measurement
303	Crushed Aggregate Base Course	Cubic meter

Payment of Lime Stabilized Road Mix Base Course

Pay Item number	Description	Unit of Measurement
304	Lime Stabilized Road Mix Base Course/ (New or Salvaged) Soil-Aggregate	Cubic meter

Payment of Portland Cement Road Mix Base Course

Pay Item number	Description	Unit of Measurement
305	Portland Cement Road Mix Base Course / (New or Salvaged) Soil-Aggregate	Cubic meter

Payment of Asphalt Stabilized Road Mix Base Course

Pay Item number	Description	Unit of Measurement
306	Asphalt Stabilized Road Mix Base Course/ (New or Salvaged) Soil-Aggregate	Cubic meter

Payment of Portland Cement Treated Plant Mix Base Course

Pay Item number	Description	Unit of Measurement
307	Portland Cement Treated Plant Mix Base Course / (New or Salvaged) Soil-Aggregate	Cubic meter

Paving

You have to consider plant production capabilities, haul truck units, route distance, paving width, thickness and speed.

Payment of Aggregate Surface Course

Pay Item number	Description	Unit of Measurement
401	Aggregate Surface Course	Cubic meter Compacted in place
401(1)	Gravel Surface Course	Cubic meter Compacted in place
401(2)	Crushed Aggregate Surface Course	Cubic meter Compacted in place

Payment of Bituminous Concrete Surface Course, Hot-Laid

Pay Item number	Description	Unit of Measurement
411	Bituminous Concrete Surface Course, Hot-Laid	Tonne

Payment of Portland Cement Concrete Pavement

Pay Item number	Description	Unit of Measurement
412(1)	PCC Pavement (Plain)	Square meter
412(2)	PCC Pavement (Reinforced)	Square meter

Next Schedule

6th Road Class Room Lesson

Construction of Road Structure (Retaining Wall, Gabion, Box Culvert)