Serial No. :

Type of Design :

Ministry of Construction

Department of Bridge

Check List for Bridge Design (Steel Plate Girder)

Date :

Project Name :

Project No. :

Section :

Examiner :

CMA-2

Summary of Design

Bridge Name			Design Date				
Road Name			Design by				
Location			Engineer				
GPS Coordinate	N	E	Classification				
Bridge Length			Road Class				
Span Arrangement			Horizontal Alignment				
Carraigeway			Vertical Alignment				
Number of Lanes			Deck Type			Thickness	
Skew Angle			Pavement Type			Thickness	
Structural Type	Superstructure		Bearing Type				
	Substructure		Expansion Joint Type				
			Corrosion Prevention				
Specifications	Design		Ground Condition				
	Construction		Erection Method				
	Materials		River	Name			
Grade of Steel				Width			
				HWL			
				LWL			
Weight of Steel			Road	Name			
Unit Steel Weight				Width			
			Railway	Name			
				Width			

Check List for Bridge Design (Steel Plate Girder)

No.	Item	Content	Reference	Check by Examiner			Result	Note
A	General							
1	Type of Design	1) Indication of type and level of design	A-1-1					
		2) Understanding of purposes of design						
2	Qualification	1) Conformity to requirement						
	of Designer	Academic background						
		Registration/Certificate of qualification						
		Experience						
3	Development Plan	1) Conformity to higher development plan						
		2) Consultation with relevant Authorities						
		3) Instruction of Ministry of Construction						
		4) Instruction of Ministry of Environment						
		5) Instruction of Ministry of Transport						
4	Design Standard	1) Application of suitable design standard	A-4-1					
		2) Application of suitable material standard	A-4-2					
		3) Application of suitable construction standard	A-4-3					
		4) Application of suitable geometric standard						
5	Previous Reports	1) Pre-feasibility study						
		2) Feasibility study						
		3) Environmental Impact Assessment						
		4) Topographic survey						
		5) Geological survey						
6	New technology	1) Application of new technology						

Check List for Bridge Design (Steel Plate Girder)

No.	Item	Content	Reference	Check by Examiner			Result	Note
B	**Design Condition**							
1	Road class	1) Design speed						
		2) Number of lanes						
		3) Width of lane						
		4) Carriageway configuration						
		5) Width of walkway						
2	Natural condition	1) Temperature change	B-2-1					
		2) Rainfall						
		3) Ground condition						
		4) River condition						
		5) Scenic area						
3	Social condition	1) Impact to people						
		2) Land use						
4	Design loads	1) Vehicle load	B-4-1					
		2) Dynamic influence	B-4-2					
		3) Influence of multi-lane loading	B-4-3					
		4) Wind force						
		5) Earthquake						
		6) Combination of loads	B-4-6					
5	Clearance	1) Clearance under bridge						
		2) Clearance above road surface	B-5-2					
6	Pavement	1) Type of pavement						
		2) Thickness of pavement						

Check List for Bridge Design (Steel Plate Girder)

No.	Item	Content	Reference	Check by Examiner			Result	Note
C	**Superstructure**							
1	Basic dimension	1) Bridge length	C-1-1					
		2) Span arrangement	C-1-2					
		3) Structural type	C-1-3					
		4) Support condition						
		5) Skew angle	C-1-5					
2	Main girder	1) Depth of plate girder	C-2-1					
		2) Arrangement of girders	C-2-2					
		3) Thickness of web plate	C-2-3					
		4) Thickness of lower flange						
		5) Thickness of upper flange	C-2-5					
		6) Position of horizontal stiffeners	C-2-6					
		7) Position of vertical stiffeners	C-2-7					
		8) Block size	C-2-8					
3	Cross frame/	1) Arrangement of cross frame						
	Cross beam	2) Type of cross frame						
4	Deck	1) Type of deck						
		2) Grade of reinforcement	C-4-2					
		3) Grade of concrete	C-4-3					
		4) Depth of deck	C-4-4					
		5) Direction of reinforcement						
		6) Size of reinforcement	C-4-6					
		7) Cover						
5	Materials	1) Grade of steel	C-5-1					
		2) Thickness of steel plate	C-5-2					
		3) Grade of high strength bolt	C-5-3					
		4) Block size	C-5-4					
6	Other	1) Slenderness ratio	C-6-1					
		2) HTB hole size/Edge distance	C-6-2					

Check List for Bridge Design (Steel Plate Girder)

No.	Item	Content	Reference	Check by Examiner			Result	Note
D	**Substructure**							
1	Abutment	1) Structural type	D-1-1					
		2) Elevation of bearing seat						
		3) Size of bearing seat	D-1-3					
		4) Support condition						
		5) Approach slab						
2	Pier							
		1) Structural type	D-2-1					
		2) Elevation of bearing seat						
		3) Size of bearing seat						
		4) Support condition						
E	**Ancillary**							
1	Bearing support	1) Type						
		2) Load capacity						
		3) Movement capacity	E-1-3					
		4) Corrosion prevention						
		5) Anchor						
2	Expansion joint	1) Type						
		2) Load capacity						
		3) Movement capacity	E-1-3					
		4) Corrosion prevention						
		5) Anchor						
3	Barrier/Parapet	1) Type						
		2) Height						
4	Drainage	1) Type						
		2) Location						
5	Maintenance facility	1) Type	E-5-1					
		2) Location						

Check List for Bridge Design (Steel Plate Girder)

No.	Item	Content	Reference	Check by Examiner			Result	Note
F	**Drawings**							
	/Material List							
1	Drawings	1) Contents	F-1-1					
		2) Size/Scale	F-1-2					
		3) Location						
		4) Project Title						
		5) Designer's signature/Date						
		6) Checker's signature/Date						
		7) Design condition						
		8) Plan view						
		9) Road alignment						
		10) Girder						
		11) Cross frame/Cross beam						
		12) Deck						
		13) Bar schedule						
		14) Bearing support						
		15) Expansion joint						
		16) Camber diagram						
		17) Construction plan						
2	Material list	1) Size						
		2) Grade						
		3) Quantity						
		4) Steel weight/carriageway area	F-2-4					
		5) Reinforcement/carriageway area	F-2-5					
		6) Paint area/Steel weight						
		6) Recyclable						
G	**Cost Estimate**							
		1) Unit costs						
		2) Cost reduction						

A-1-1 Indication of type and level of design

Level
Plannig
Preliminary
Basic
Detail

A-4-1 Application of suitable design standard

Typical Design Standard
Myanmar Road Bridge Design Standard
AASHTO LRFD Bridge Design Standard
Japan Highway Bridge Design Standard (JHBS)
AASHTO Bridge Design Standard

A-4-2 Application of suitable material standard

Typical Material Standard
Myanmar Industrial Standard
Amerian Standard for Tesiting and Materials (ASTM)
Japan Industrial Standard (JIS)
AASHTO LRFD Bridge Design Standard

A-4-3 Application of suitable construction standard

Typical Construction Standard
Myanmar Road Bridge Construction Standard
AASHTO LRFD Bridge Construction Standard
Japan Highway Bridge Design Standard

B-5-2 Clearance above road surface

Vertical Clarance	Explanation
4.5 m	
Less than 4.5 m	

B-2-1 Temperature change

State/Division	Temperature
Kachin, Sagaing, Chin	-10～+50 Deg
Shan, Kayah, Kayin	-10～+50 Deg
Mandalay, Magway	-10～+50 Deg
Bago, Nay Pyi Taw	-10～+50 Deg
Ayeyarwady, Rakhaine	-10～+50 Deg
Yangon	-10～+50 Deg
Mon, Tanintharyi	0～+50 Deg

B-4-1 Vehicle load

Typical Design Load	Design Standard
HS20	AASHTO
HS25	AASHTO
JBHD B	JHBS

B-4-2 Dynamic influence
(Example of AASHTO LRFD)

Component	IM
Deck Joints—All Limit States	75%
All Other Components:	
• Fatigue and Fracture Limit State	15%
• All Other Limit States	33%

B-4-3 Influence of multi-lane loading (Example of AASHTO LRFD)

Number of Loaded Lanes	Multiple Presence Factors, *m*
1	1.20
2	1.00
3	0.85
>3	0.65

Table 3.4.1-1—Load Combinations and Load Factors

Load Combination Limit State	*DC DD DW EH EV ES EL PS CR SH*	*LL IM CE BR PL LS*	*WA*	*WS*	*WL*	*FR*	*TU*	*TG*	*SE*	Use One of These at a Time				
										EQ	*BL*	*IC*	*CT*	*CV*
Strength I (unless noted)	γ_p	1.75	1.00	—	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—
Strength II	γ_p	1.35	1.00	—	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—
Strength III	γ_p	—	1.00	1.40	—	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—
Strength IV	γ_p	—	1.00	—	—	1.00	0.50/1.20	—	—	—	—	—	—	—
Strength V	γ_p	1.35	1.00	0.40	1.0	1.00	0.50/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—
Extreme Event I	γ_p	γEQ	1.00	—	—	1.00	—	—	—	1.00	—	—	—	—
Extreme Event II	γ_p	0.50	1.00	—	—	1.00	—	—	—	—	1.00	1.00	1.00	1.00
Service I	1.00	1.00	1.00	0.30	1.0	1.00	1.00/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—
Service II	1.00	1.30	1.00	—	—	1.00	1.00/1.20	—	—	—	—	—	—	—
Service III	1.00	0.80	1.00	—	—	1.00	1.00/1.20	γ_{TG}	γ_{SE}	—	—	—	—	—
Service IV	1.00	—	1.00	0.70	—	1.00	1.00/1.20	—	1.0	—	—	—	—	—
Fatigue I—*LL, IM & CE* only	—	1.50	—	—	—	—	—	—	—	—	—	—	—	—
Fatigue II—*LL, IM & CE* only	—	0.75	—	—	—	—	—	—	—	—	—	—	—	—

- Permanent Loads

CR = force effects due to creep
DD = downdrag force
DC = dead load of structural components and nonstructural attachments
DW = dead load of wearing surfaces and utilities
EH = horizontal earth pressure load
EL = miscellaneous locked-in force effects resulting from the construction process, including jacking apart of cantilevers in segmental construction
ES = earth surcharge load
EV = vertical pressure from dead load of earth fill

Table 3.4.1-2—Load Factors for Permanent Loads, γ_p

Type of Load, Foundation Type, and Method Used to Calculate Downdrag		Load Factor Maximum	Load Factor Minimum
DC: Component and Attachments		1.25	0.90
DC: Strength IV only		1.50	0.90
DD: Downdrag	Piles, α Tomlinson Method	1.4	0.25
	Piles, λ Method	1.05	0.30
	Drilled shafts, O'Neill and Reese (1999) Method	1.25	0.35
DW: Wearing Surfaces and Utilities		1.50	0.65
EH: Horizontal Earth Pressure			
• Active		1.50	0.90
• At-Rest		1.35	0.90
• *AEP* for anchored walls		1.35	N/A
EL: Locked-in Construction Stresses		1.00	1.00
EV: Vertical Earth Pressure			
• Overall Stability		1.00	N/A
• Retaining Walls and Abutments		1.35	1.00
• Rigid Buried Structure		1.30	0.90
• Rigid Frames		1.35	0.90
• Flexible Buried Structures			
○ Metal Box Culverts and Structural Plate Culverts with Deep Corrugations		1.5	0.9
○ Thermoplastic culverts		1.3	0.9
○ All others		1.95	0.9
ES: Earth Surcharge		1.50	0.75

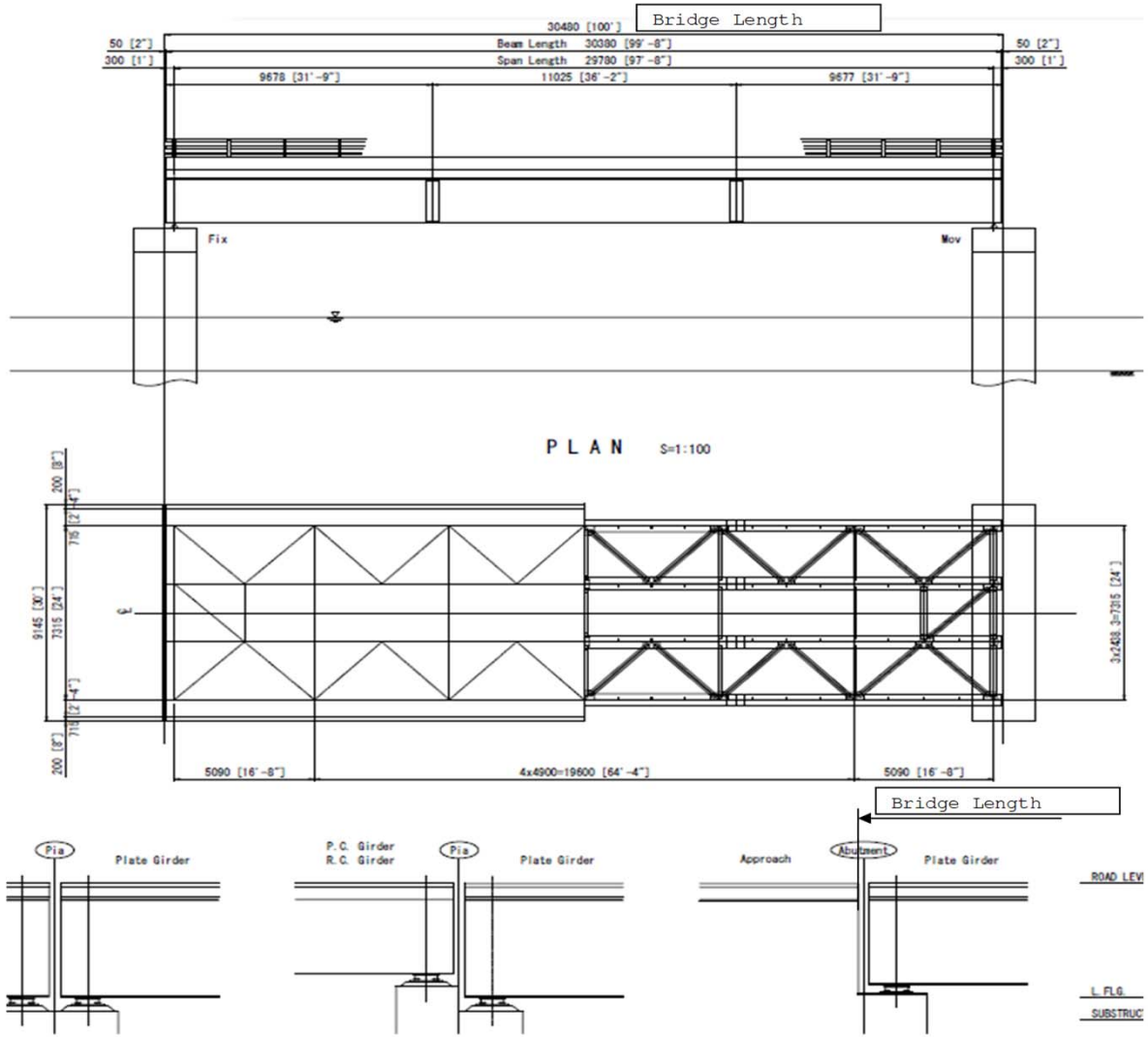
PS = secondary forces from post-tensioning
SH = force effects due to shrinkage

- Transient Loads

BL = blast loading
BR = vehicular braking force
CE = vehicular centrifugal force
CT = vehicular collision force
CV = vessel collision force
EQ = earthquake load
FR = friction load
IC = ice load
IM = vehicular dynamic load allowance
LL = vehicular live load
LS = live load surcharge
PL = pedestrian live load
SE = force effect due to settlement
TG = force effect due to temperature gradient
TU = force effect due to uniform temperature
WA = water load and stream pressure
WL = wind on live load
WS = wind load on structure

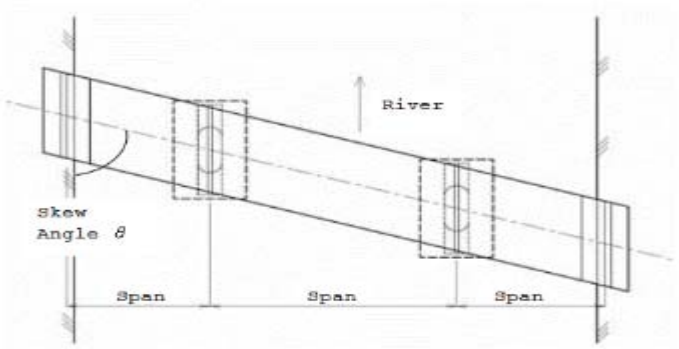
C-1-1 Bridge length

C-1-2 Span arrangement



C-1-5 Skew angle

Recommendation $\theta \geq 75$ deg

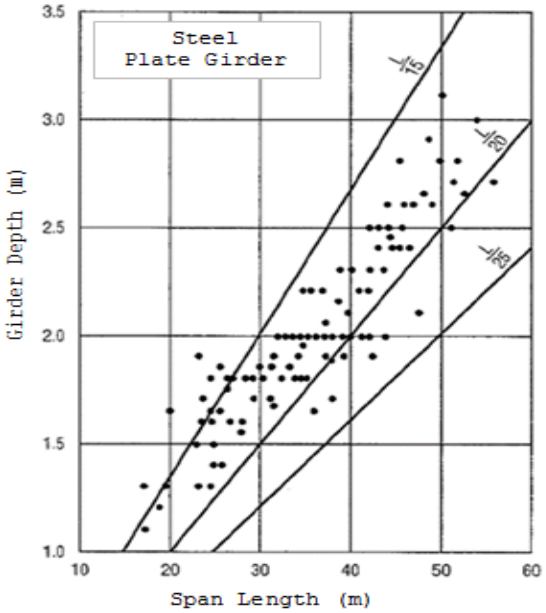


C-1-3 Structural type

Type of Superstructure
Steel Plate Girder (non-composite)
Steel Plate Girder (composite)
Steel Box Girder
Steel Truss
Steel Arch
Steel Cable-stayed Bridge
Steel Suspension Bridge

Structural Type	Span Length (m)																									
	0		10		20		30		40		50		60		70		80		90		100		110		120		130	
RC Box Culvert																										
RC Slab																										
Steel H Girder																										
Steel Plate Girder (Simple Span)																										
Steel Plate Girder (Continuous Span)																										
Steel Box Girder (Simple Span)																										
Steel Box Girder (Continuous Span)																										
Steel Truss (Simple Span)																										
Steel Truss (Continuous Span)																										

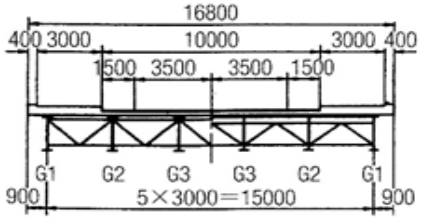
C-2-1 Depth of plate girder



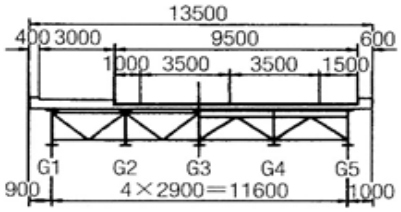
C-2-2 Arrangement of girders

a) Major Trunk Road

Example (1)

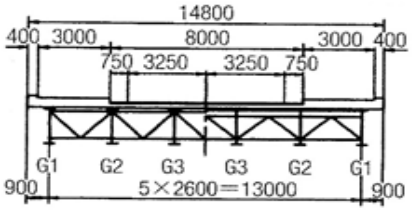


Example (2)

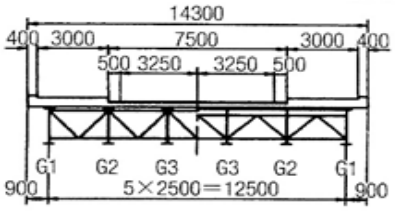


b) Trunk Road

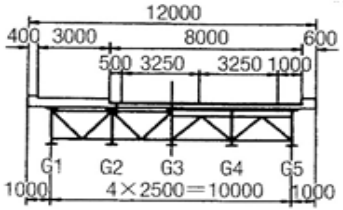
Example (3)



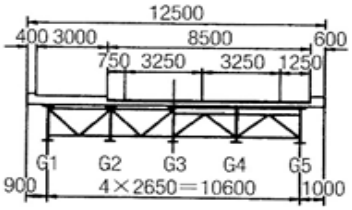
Example (4)



Example (5)

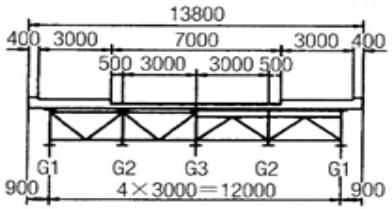


Example (6)

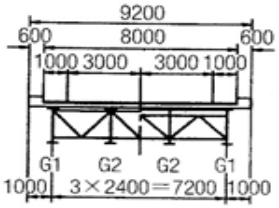


c) Sub-Trunk Road

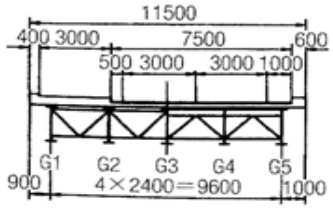
Example (7)



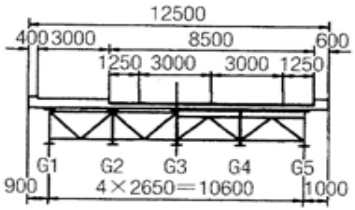
Example (8)



Example (9)



Example (10)



C-2-3 Thickness of web plate

Minimum Thickness of Web of Plate Girder (mm)

Grade / Horizntal Stiffener	SS400 SM400	SM490	SM490Y SM520
Without Stiffener	b/152	b/131	b/124
With 1 Stiffener	b/256	b/221	b/208
With 2 Stiffeners	b/311	b/311	b/293

JHBS

C-2-5 Thickness of upper flange

Minimum Thickness of Upper Flange Plate (mm)

RC Deck Connection	Min. Thickness
Shear Connectors welded on Flange	10

JHBS

C-4-2 Grade of reinforcement

C-4-3 Grade of concrete

C-4-4 Depth of deck

Minimum Thickness of RC Deck (mm)

Deck for Vehicle	160
Deck for Pedestrians	140

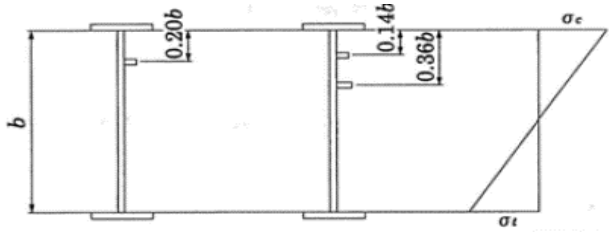
JHBS

C-4-6 Size of reinforcement

Common Practice

Deformed Reinforcement Bar				
D13	D16	D19	D22	D25
D29	D32	D35	D38	D51

C-2-6 Position of horizontal stiffeners



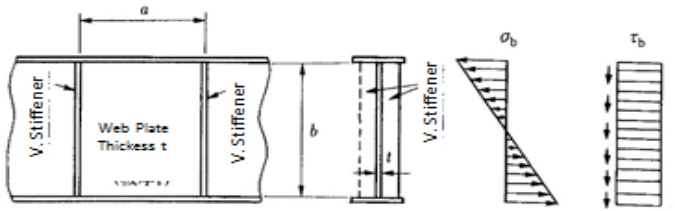
C-2-7

Position of vertical stiffeners

Max. Web Plate Depth without Vertical Stiffener

Grade	SS400 SM400 SMA400W	SMA490	SM490Y SM520 SMA490W	SM570 SMA570W
Max. Web Plate Depth b	70t	60t	57t	50t

t : Plate Thickness



Space of Vertical Stiffeners

C-5-1 Grade of steel

AASHTO Desigination M270 (Equivalent ASTM Designation A709)

Grade	36	50	50S	50W	HPS50W
Max. Plate Thickness	100	100	100	100	100
Min. Tensile Strength (Mpa)	400	450	450	490	490
Min. Yield Strength (Mpa)	248	344	344	344	344

JIS

Thickeness (mm)		6-16	17-40	41-75	76-
SS400	Min. Tensile Strength (Mpa)	400	400	400	400
	Min. Yield Strength (Mpa)	245	235	215	215
SM400, SMA400W	Min. Tensile Strength (Mpa)	400	400	400	400
	Min. Yield Strength (Mpa)	245	235	215	215
SM490	Min. Tensile Strength (Mpa)	490	490	490	490
	Min. Yield Strength (Mpa)	325	315	295	295
SM490Y, SMA490W	Min. Tensile Strength (Mpa)	490	490	490	490
	Min. Yield Strength (Mpa)	365	355	335	325
SM520	Min. Tensile Strength (Mpa)	520	520	520	520
	Min. Yield Strength (Mpa)	365	355	335	325

C-5-2 Thickness of steel plate

Applicable Thickness of Steel Plate

grade \ Thickness of Steel Plate (mm)	6	8	16	25	32	40	50	100
SS400		■	■	■	■	■	■	■
SM400A		■	■	■	■			
SM400B		■	■	■	■	■		
SM400C		■	■	■	■	■	■	■
SM490A		■	■	■				
SM490B		■	■	■	■	■		
SM490C		■	■	■	■	■	■	■
SM490YA		■						
SM490YB		■	■	■	■	■		
SM520C		■	■	■	■	■	■	■

JHBS

C-5-3 Grade of high strength bolt

Nominal Resistance of a Slip-critical HT Bolt (kN)

Size \ Grade	F10T	S10T
M20	66	66
M22	82	82
M24	95	95

JHBS

C-5-4 Block size

Common Practice

Max. Length	Max. Height (Width)
12 m	3.5 m

C-6-1 Slenderness ratio

Limiting Slenderness Ration

Member		ℓ / r
Compression	Main Member	120
	Secondary Member	150
Tension	Main Member	200
	Secondary Member	240

JHBS

ℓ : Unbraced length of member (mm)

r : Radius of gyration (mm)

C-6-2 HTB hole size/Edge distance

Maximum Hole Size

Size	Standard	Over Size
M20	22	24
M22	24	28
M24	26	30

AASHTO LRFD

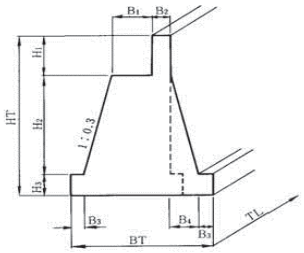
Minimum Edge Distance

Size	Sheared Edge	Rolled Edges of Plate/Shapes
M20	34	26
M22	38	28
M24	42	30

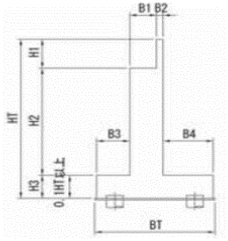
AASHTO LRFD

D-1-1 Structural type

Structural Type
Grabity Type
Inverse T Type
Butress Type
Frame Type



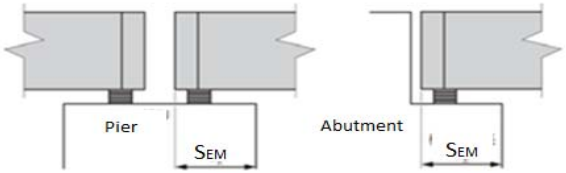
Grabity Type



Inverese T Type

D-1-3 Size of bearing seat

$$S_{EM} \geq 0.7 + 0.005 \times \text{Span}$$

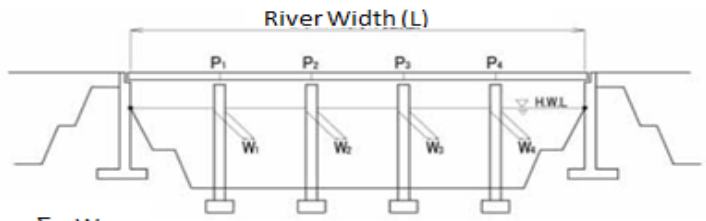


D-2-1 Structural type

Structural Type
Grabity Type
Inverse T Type
Butress Type
Frame Type

D-2-5 Blockage Rate

$$\text{Blockage Rate} \leqq 5\,\%$$



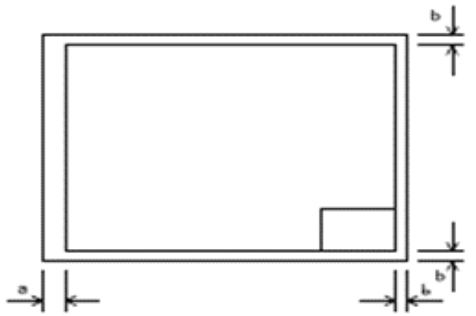
$$\text{Blockage Ratio} = \frac{\sum W}{L} \times 100\ (\%)$$

F-1-1 Contents

No.	Name of drawing	Scale	Necessary Information	
1	Location	1/25,000 ～ 1/50,000	North Direction, Location, Carriageway width	
2	General view	1/50 ～ 1/500	Structural type, Design condition, geological data, location of boring	
3	Alignment plan		Horizontal, Vertical alignment, Coordinates	
4	General view of structure	1/50 ～ 1/500		
5	Detail of superstructure	1/20 ～ 1/100	Main girder, Transverse beam, Cross frame, Floor system, Deck floor, Bearings, Expansion joint, Drainage, Barrier, Inspection way, Camber	
6	Detail of substructure	1/20 ～ 1/100	Abutment, Pier	
7	Detail of foundation	1/20 ～ 1/100	Pile, Well, V Caisson	
8	Detail of temporary works	1/20 ～ 1/100	Retaining wall, Temporary bridge,	

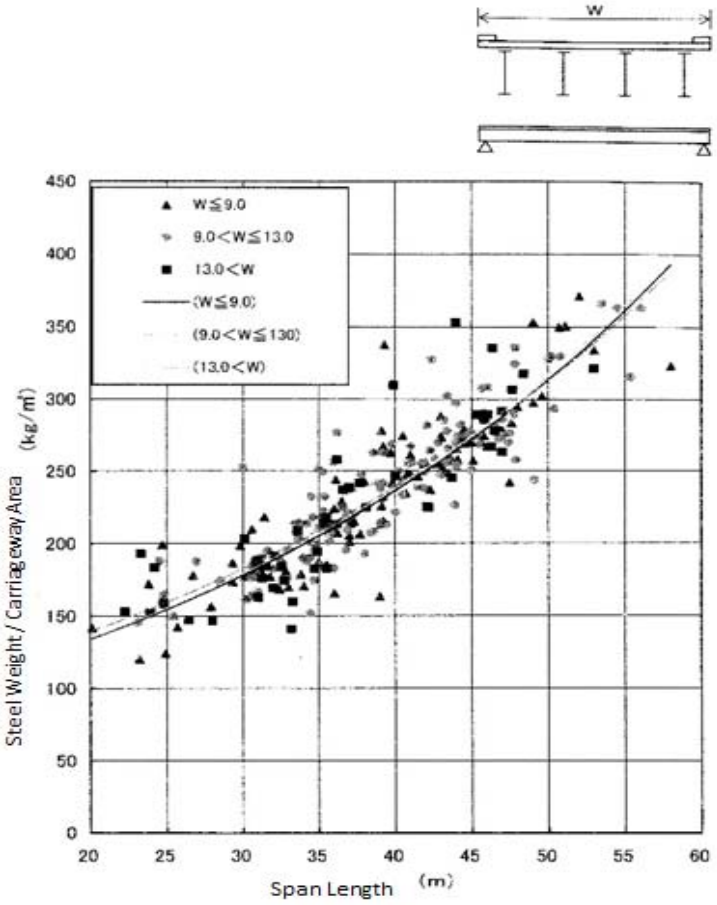
F-1-2 Size/Scale

Size of Drawing is A1

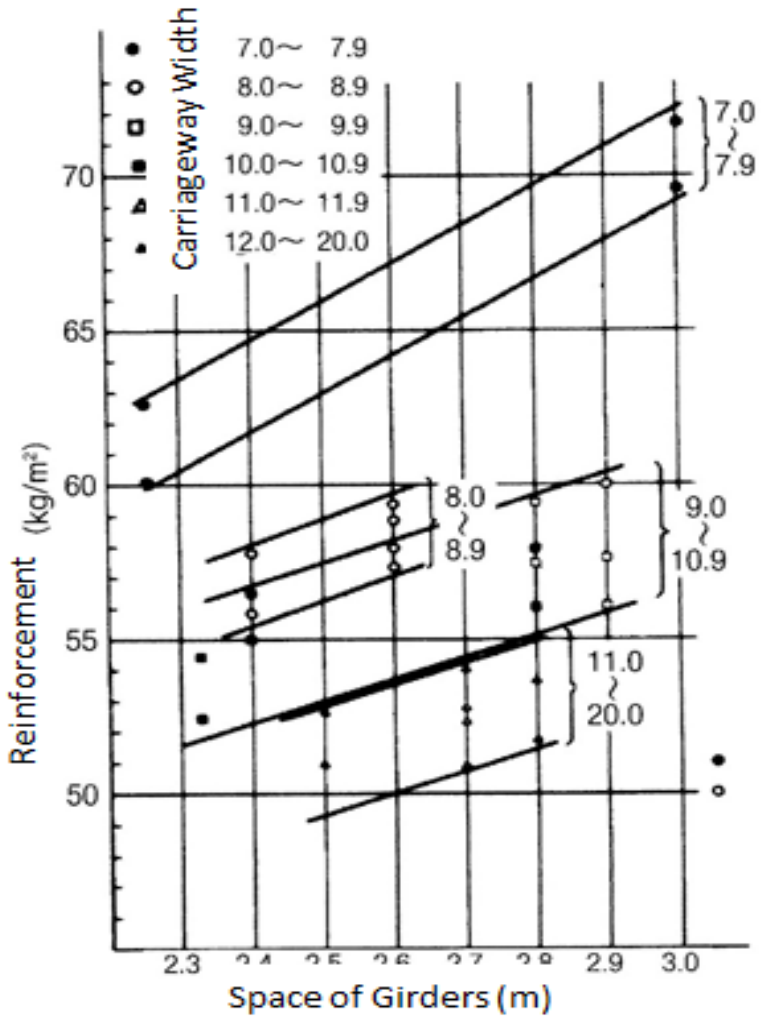


$a \geq 40\ mm$
$b \geq 20\ mm$

F-2-4 Steel weght/carriageway area



F-2-5 Reinforcement/carriageway area



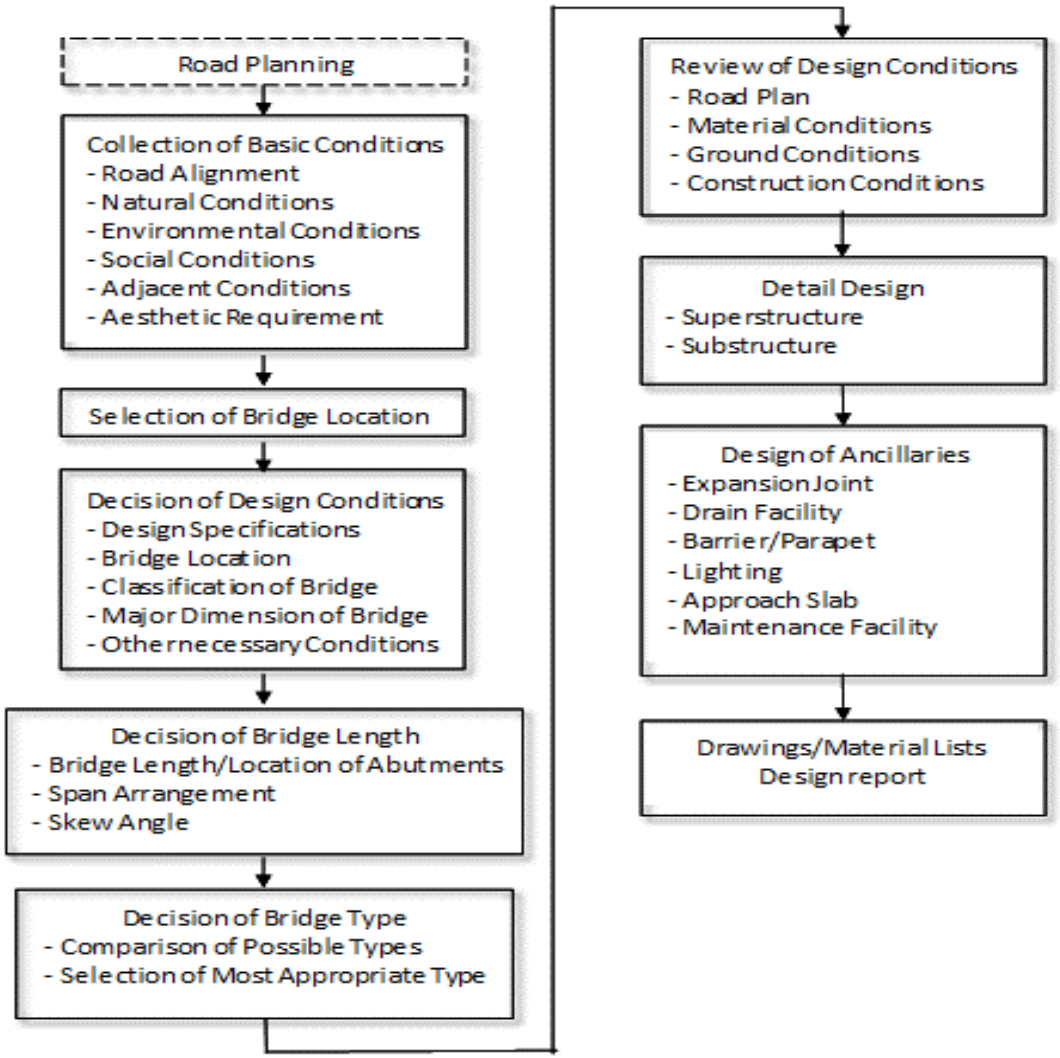


Figure 1 Flow of Planning

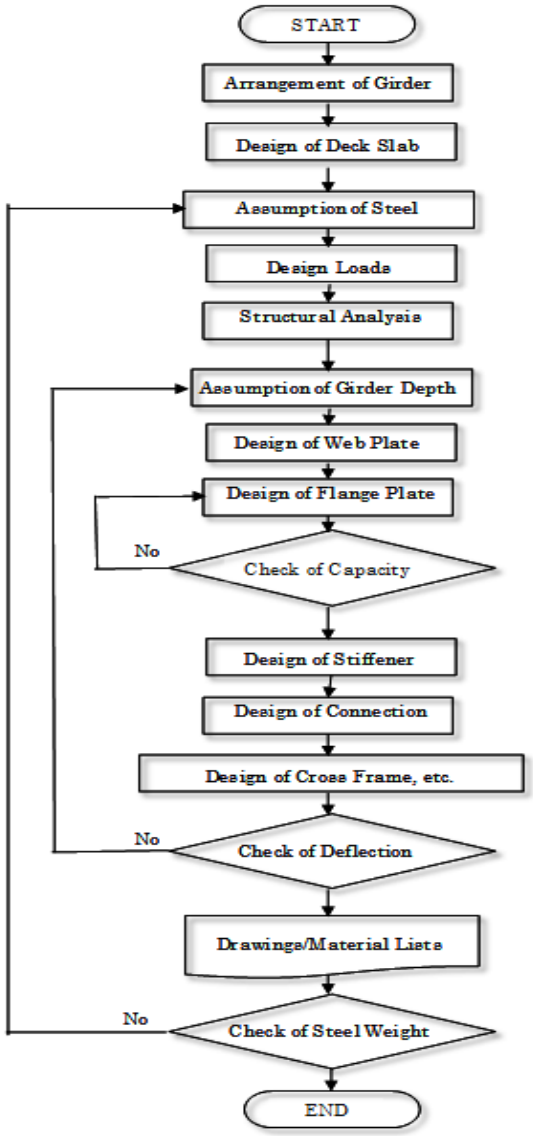


Figure 2 Flow of Design