

KURSUS PEMERIKSAAN PENILAIAN STRUKTUR MARIN

26 FEBRUARI 2020



**BAHAGIAN
MARITIM
CKIP**

3.

Condition rating Guide Based On Damages

Condition Rating System

The condition rating system are numerical system where a number from 1 to 5 is assigned to each component of the structure based upon observed material defects and the resulting effect on the ability of the component to perform its function in the structural system.

Condition Rating System

Rating	General Definition
1	No damage found and no maintenance required as a result of the inspection.
2	No detected and it is necessary to record the condition for observation purposes.
3	Damage detected are slightly critical and thus it is necessary to implement routine maintenance work.
4	Damage detected is critical and thus it is necessary to implement repair work to carry out a detailed inspection to determine whether any rehabilitation works are required not.
5	Being heavily and critically damaged and possibly affecting the safety of uses, it is necessary to implement emergency temporary repair work immediately or rehabilitation work without delay after the provision of a load limitation traffic sign especially for cargo jetties

Types of facilities / Component of marine Structure

MAIN MARINE COMPONENTS	SECONDARY COMPONENTS
<u>Jetty</u> Pile Pile Cap Beams Short Column Deck Slab Staircase Approach Slab Expansion Joints Fenders Bollard Cat Ladder	<u>Jetty</u> Roof Columns Roof Beams Roof Truss Topping Handrails Pipeline Mechanical and Electrical Component Other Utilities
Slope Protection Pontoon Break Water	

Table 1 – Classification of Components

TYPES OF JETTY/WHARF (OPEN PILE STRUCTURE)



Cargo Jetty



**Operational
Jetty**



Container Jetty



Passenger Jetty



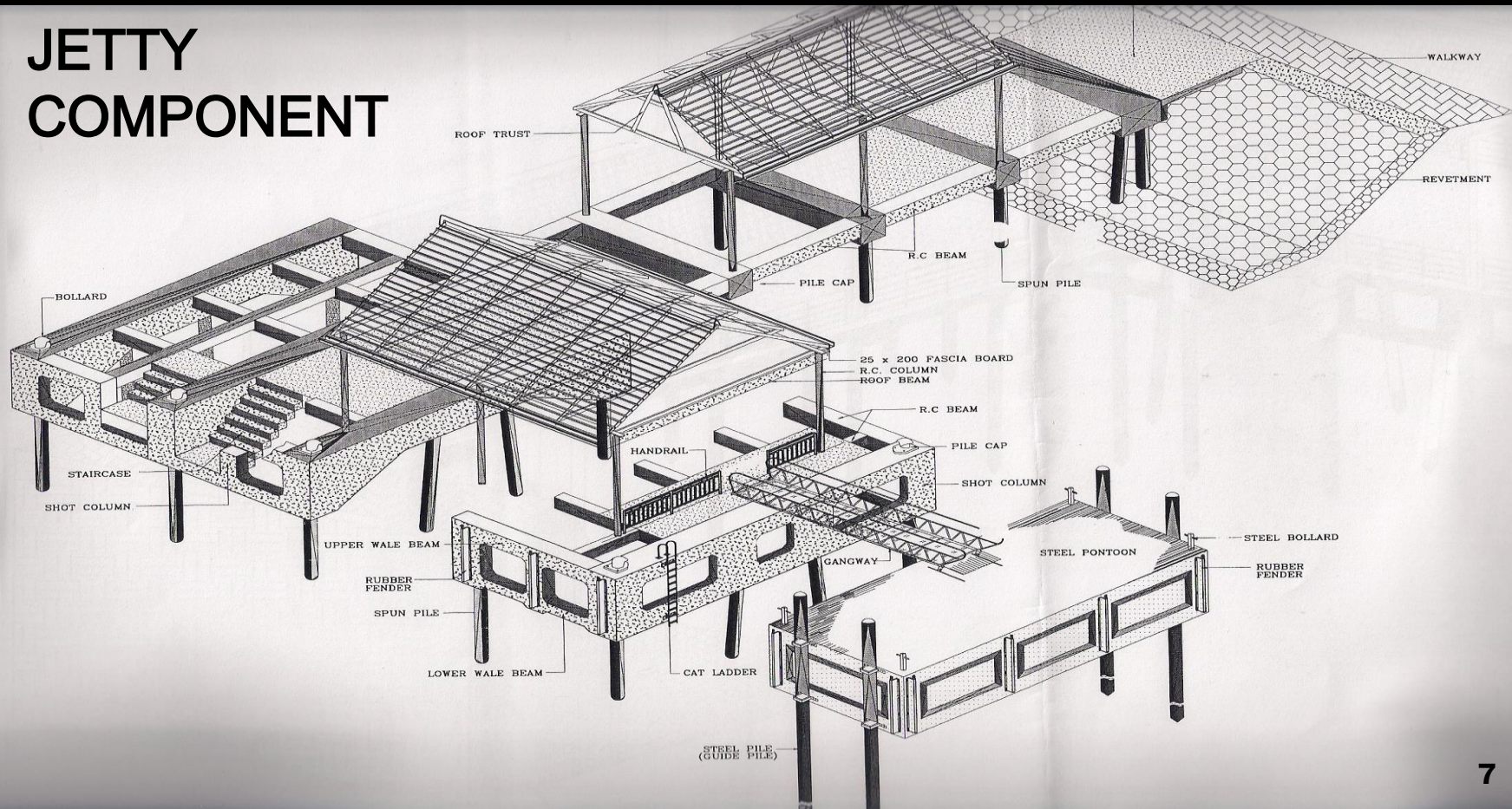
**Petrochemical
Jetty**



Fishery Jetty



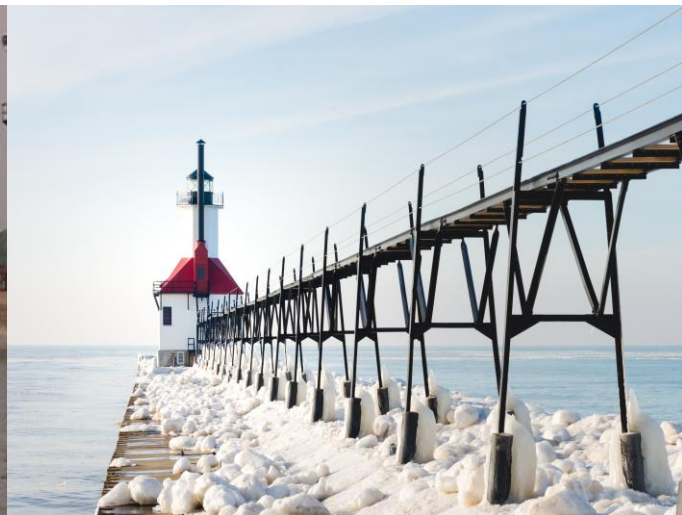
JETTY COMPONENT



APPROACH JETTY



CATWALK



BOLLARD



Capacity : 20T – 150T



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FENDER



GANGWAY



DOPLHINS



SLIPWAY / RAMP



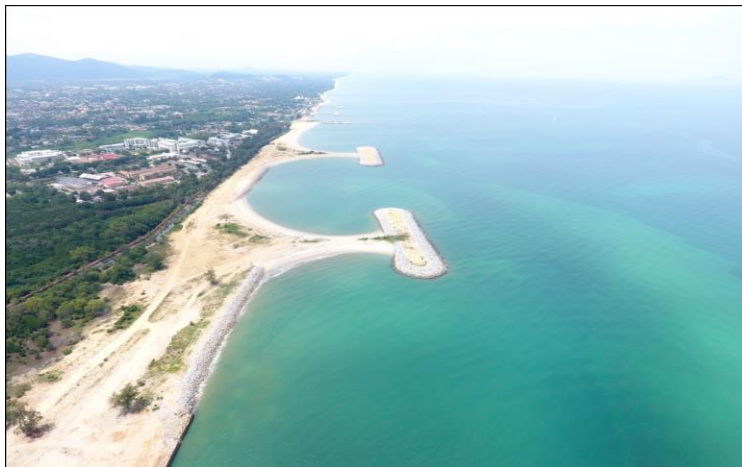
PONTOON



WHARF/ BERTH



BREAKWATER



REVETMENT



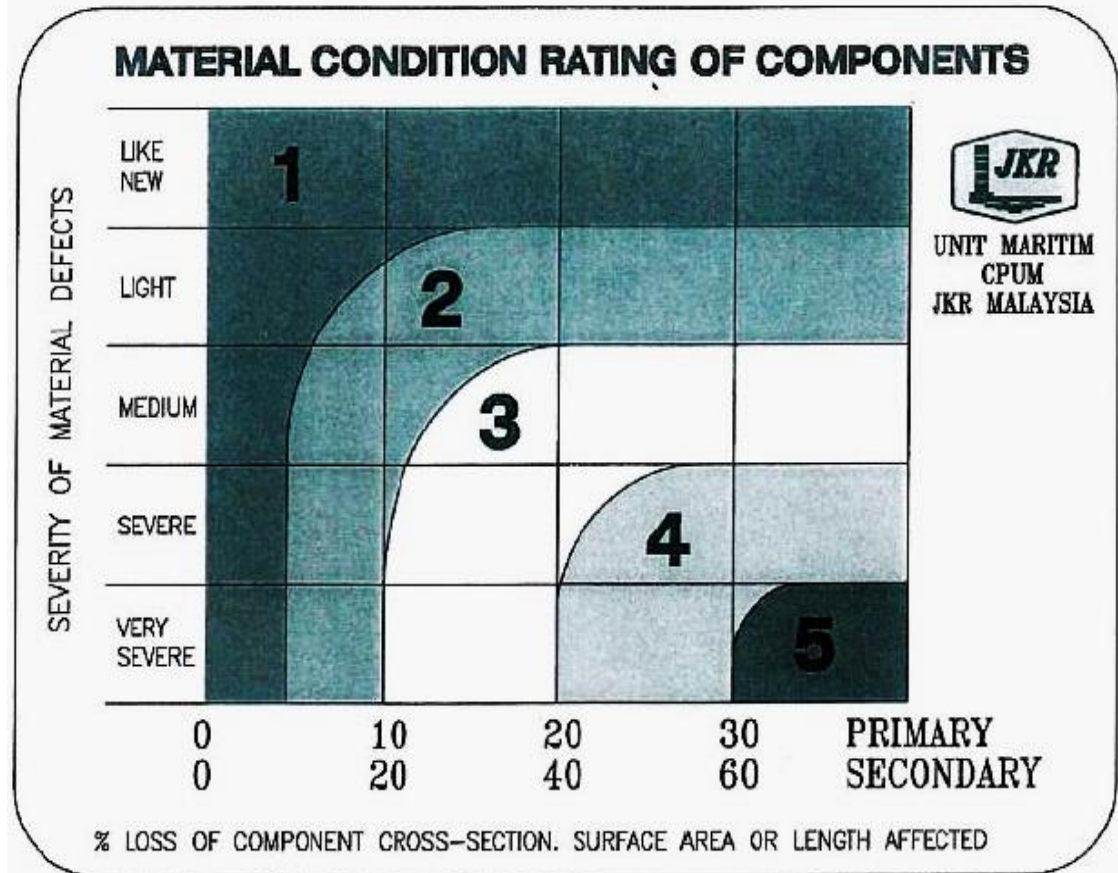
Performance Condition Rating System

TABLE 2

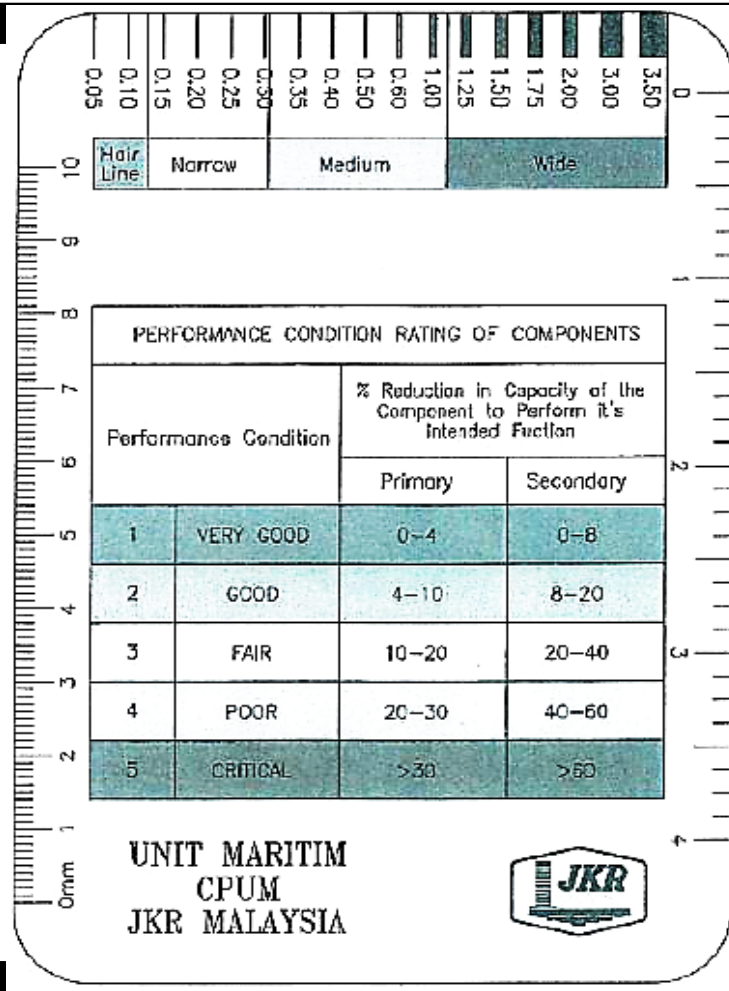
Rating	Performance Condition of Components	Guideline for Approximate Reduction in the Capacity of the Component to Perform its Intended Function	
		Main Marine Components	Secondary Components
1	Very Good	0 to 4%	0 to 8%
2	Good	4 to 10%	8 to 20%
3	Fair	10 to 20%	20 to 40%
4	Poor	20 to 30%	40 to 60%
5	Critical, Inadequate	Over 30%	Over 60%

Table 2 – Performance Condition Rating of Components

Performance Condition Rating System



Performance Condition Rating System



CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

CRACK

Hairline cracks	< 0.1mm wide.	Rating 1
Narrow cracks	0.1mm to 0.3mm wide.	Rating 2
Medium cracks	0.3mm to 1.0mm wide	Rating 3
Wide cracks	1.0 mm wide	Rating 4

**Prestressed
reinforced
mass &
masonry
(CONCRETE)**

For mass concrete and masonry members
a rating of 4 shall be given if the crack
width is greater than 3mm wide.

CRITERIA FOR CLASIFICACION SEVERITY OF DAMAGES

SPALLING

CONCRETE REINFORCEMENT

Light	Spalled area measuring less than 150mm in any direction or less than 25mm in depth.	Rating 1
Medium	Spalled area measuring between 150mm to 300mm in any direction or between 25mm. and 50mm in depth.	Rating 2
Severe	Spalled area measuring between 300mm to 600mm in any direction or between 50mm and 100mm in depth.	Rating 3
Very Severe	Spalled area measuring more than 600mm in any direction or greater than 100mm in depth.	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

SPALLING

PRESTRESSED (CONCRETE)

Light	Spalled area measuring less than 25mm in any direction or less than 25mm in depth.	Rating 1
Medium	Spalled area measuring between 25mm to 50mm in any direction or between 25mm and 50mm in depth. No lost in cross-sectional area.	Rating 2
Severe	Spalled area measuring between 50mm to 100mm in any direction or between 50mm and 100mm in depth. Loss cross-sectional area is large.	Rating 3
Very Severe	Spalled area measuring more than 100mm in any direction or greater than 100mm in depth. Existence of further spalling and possibility of worsening.	Rating 4

CRITERIA FOR CLASIFICACION SEVERITY OF DAMAGES

SPALLING

**REINFORCEMENT
(CONCRETE)**



CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

CORROSION

reinforced (CONCRETE)

Light	Light rust stain on the concrete surface	Rating 1
Medium	Exposed reinforcement with uniform light rust. Loss of reinforcing steel section less than 10%	Rating 2
Severe	Exposed reinforcement with heavy rusting and localized pitting. Loss of reinforcing steel section between 10% and 20%;	Rating 3
Very Severe	Exposed reinforcement with very heavy rusting and pitting. Loss of reinforcing steel section over 20%;	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

CORROSION

**reinforced
(CONCRETE)**



CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

WEAR AND ABRASION

**Prestressed
reinforced
mass &
masonry
(CONCRETE)**

Light	Section loss up to 25mm in depth with some loss of coarse aggregate	Rating 1
Medium	Section loss between 25mm and 50mm depth, loss of aggregate and large area of reinforcement.	Rating 2
Severe	Section loss between 50mm and 100mm depth, loss of aggregate and exposure of reinforcement.	Rating 3
Very Severe	Section loss in excess of 100mm depth and extends over a large area	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

MATERIAL DETERIORATION

**Prestressed
reinforced
mass &
masonry
(CONCRETE)**

Light	Loss of section up to 25mm in depth with some loss of coarse aggregate;	Rating 1
Medium	Loss of section between 25mm and 50mm deep with considerable loss of coarse aggregate and exposure of reinforcement.	Rating 2
Severe	Section loss between 50mm and 100mm depth, loss of aggregate and exposure of reinforcement.	Rating 3
Very Severe	Section loss in excess of 100mm depth and extends over a large area	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

HONEYCOMBING (SURFACE DEFECT)

reinforced (CONCRETE)

Light	Honeycombing covering in area less than 150mm in any direction.	Rating 1
Medium	Honeycombing covering an area between 150mm to 300mm in any direction.	Rating 2
Severe	Honeycombing covering an area between 300mm to 600mm in any direction.	Rating 3
Very Severe	Honeycombing covering an area greater than 600mm in any direction.	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

POP OUTS (SURFACE DEFECT)

reinforced (CONCRETE)

Light	Pop-outs leaving holes up to 25mm in diameter.	Rating 1
Medium	Pop-outs leaving holes between 25mm and 50mm in diameter.	Rating 2
Severe	Pop-outs leaving holes between 50mm and 100mm in diameter.	Rating 3
Very Severe	Pop-outs leaving holes greater than 100mm in diameter.	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

DELAMINATION (SURFACE DEFECT)

reinforced (CONCRETE)

Light	Delaminated area measuring less than 150mm in any direction.	Rating 1
Medium	Delaminated area measuring 150mm to 300mm in any direction.	Rating 2
Severe	Delaminated area measuring 300mm to 600mm in any direction.	Rating 3
Very Severe	Delaminated area measuring more than 600mm in any direction.	Rating 4

CRITERIA FOR CLASIFICACION SEVERITY OF DAMAGES

CORROSION

(STEEL)

Light	Loose rust formation and pitting in the paint surface. No noticeable section loss.	Rating 1
Medium	Loose rust formation with scales or flakes forming. Definite areas of rust are noticeable Up to 10% section loss.	Rating 2
Severe	Stratified rust with pitting of the metal surface. Between 10% to 20% section loss.	Rating 3
Very Severe	Extensive rusting with local perforation or rusting through. In excess of 20% section loss.	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

FRACTURE

(STEEL)

Cracks that are parallel with the direction of stress are usually not very serious; however, those perpendiculars to the direction of stress are very serious.

In either case, cracks in steel should generally be considered serious, as a parallel crack may for a number of reasons turn into a perpendicular crack. Therefore, no severity description for cracks is given. Any crack should be carefully noted and record as to its specific location in the member, and member in the structure. The length, width (if possible) and direction of crack should also be recorded.

If detected, rating shall be 4.

CRITERIA FOR CLASIFICACION SEVERITY OF DAMAGES

LOOSE CONNECTIONS

Connections of Primary Components

Light	Up to 10% of fasteners loose or missing	Rating 1
Medium	10% to 20% of fasteners loose or missing	Rating 2
Severe	20% to 30% of fasteners loose or missing	Rating 3
Very Severe	Over 30% of fasteners loose or missing	Rating 4

(STEEL)

Connections of Secondary Components

Light	Up to 20% of fasteners loose or missing	Rating 1
Medium	20% to 40% of fasteners loose or missing	Rating 2
Severe	40% to 60% of fasteners loose or missing	Rating 3
Very Severe	Over 60% of fasteners loose or missing	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

PERMANENT DEFORMATIONS

(STEEL)

As permanent deformations may be critical to the integrity of the member and/or structure, no classification of severity is given.

Photographs and measurements of the amount and extent of deformation shall be taken and recorded for analysis.

Hence, if permanent deformations are detected, rating shall be 4. However, the location of deformation in the member, and member in the structure, should be recorded.

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

PAINT DETERIORATION

(STEEL SURFACES)

Light	if < 10% of surfaces area appearance exposed to cracks, peels, bulging or rust	Rating 1
Medium	if 10% to 20% of surfaces area appearance exposed to cracks, peels, bulging or rust	Rating 2
Severe	if 20% to 30% of surfaces area appearance exposed to cracks, peels, bulging or rust	Rating 3
Very Severe	if >30% of surfaces area appearance exposed to cracks, peels, bulging or rust	Rating 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

ABNORMAL VIBRATION/ DEFLECTION

There is no accurate severity level than could be assigned for this phenomenon. If detected the rating should be ranked as 4.

TILT/ SETTLEMENT

Any tilt or settlement observed should be reported immediately and the rating ranked as 4

TILT/ SETTLEMENT

Any abnormal movement observed should be reported immediately and the rating ranked as 4

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

WATER LEAK

EXPANSION JOINT

Light	None	Rating 1
Medium	<25% - 50% of surface area	Rating 2
Severe	25% - 50% of surface area	Rating 3
Very Severe	>50% of surface area	Rating 4

For severity level the following is adopted for monolithic Pier/Abutment or Pier Head but limited to 0.1m below for the bearing shelf.

CRITERIA FOR CLASIFICATION SEVERITY OF DAMAGES

WATER LEAK

**EXPANSION
JOINT**

