Penyenggaraan Pembentung




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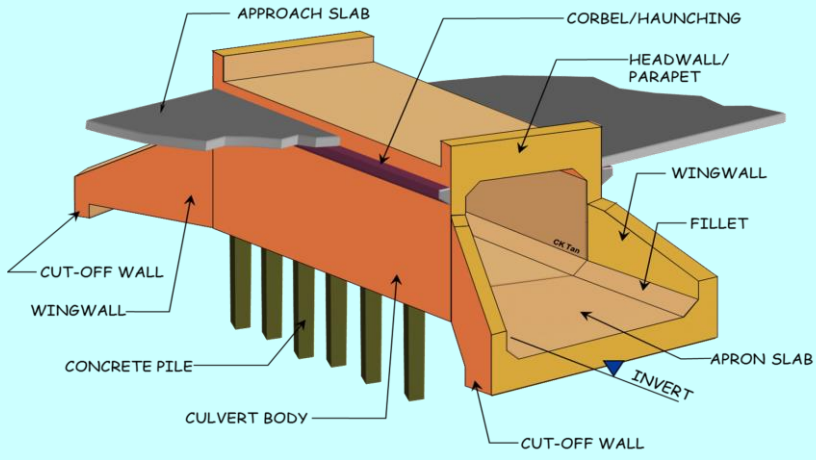
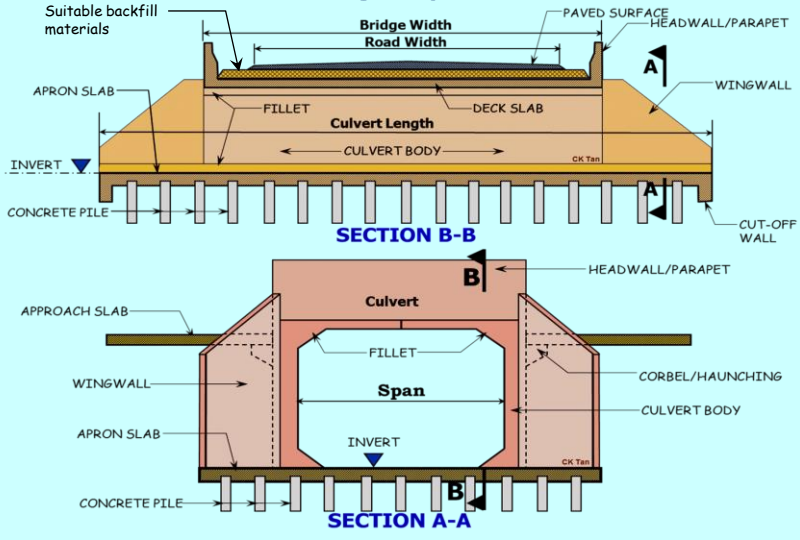
KOMPONEN PEMBENTUNG



TYPICAL 3D-VIEW OF CULVERT COMPONENTS

KOMPONEN PEMBENTUNG



TYPICAL 3D-VIEW OF CULVERT COMPONENTS

Type of Culverts

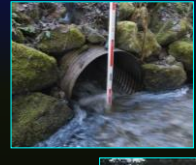
- Butt-ended Precast R.C. Pipe Culvert.
- Spigot And Socket Type Precast R.C. Pipe Culvert.
- Precast R.C. Box Culvert.
  Precast R.C. Bebo Arch Culvert
- Cast In Situ R.C. Box Culvert .
- Corrugated Metal Pipe Culvert.

Type of Culverts


Precast R.C. Box Culvert


Precast R.C. Box Culvert


Precast R.C. Box Culvert




CMP


Butt-ended Precast R.C. Pipe Culvert


Spigot & Socket Precast R.C. Pipe Culvert


Corrugated Metal Pipe (CMP) Culvert

Type of Culverts

Precast R.C. Bebo Arch Culvert

Cast In-situ R.C. Box Culvert

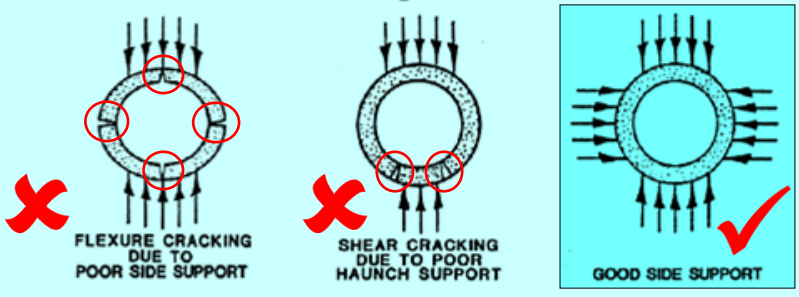
Culvert Installation Issue

- Constructed according to grade, size and type as per construction drawing.
- Alignment based on skew requirement at site.
- Gradient of flow according to design requirement (eg.1:200).
- Type of bedding and backfill materials.
- Road embankment profile. (eg. 1:1.5, 1:2)
- Precast culvert cell quality.
- Type of culvert joint.
- Butt joint width.
- Quality of sealing mortar, joint compound and rubber gasket.
- Inlet and outlet invert level.
- Inlet and outlet embankment quality including the protective system.

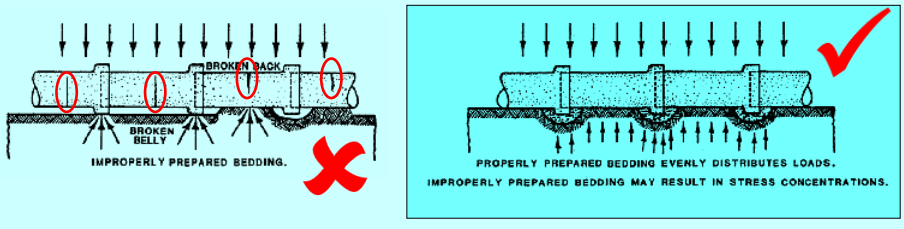
What to look for during inspection of Culvert?

- Look at the culvert invert for signs of abrasion/corrosion.
- Look for open or misaligned joints. Probe for voids behind open joints.
- Look for sign of settlement.
- Look for sedimentation.
- Look for blockage by debris, timber logs or vegetation.
- Look for cracking and spalling.
- Try to detect formation of voids in the embankment surrounding the pipe culvert with tapping of hammer.
- Look for evidence of fill materials inside the culvert that may have migrated through the open joints.
- Look for high water marks within the culvert.
- Look for sign of deformation.
- Look for sign of inadequate flow capacity.

Longitudinal Cracks at Pipe Culvert Caused by Wrong or Poor Compaction Process



Transverse Cracks at Pipe Culvert Caused by Wrong or Poor Compaction Process



Culvert Maintenance Strategies

Strategy	Objective	Work options
Routine maintenance	To keep a culvert in a uniform and safe condition by repairing specific defects as they occur.	• Debris and sediment removal. • Thaw frozen culverts.
Preventive maintenance	More extensive strategy than routine maintenance intended to arrest light deterioration and prevent progressive deterioration.	• Joint sealing. • Invert paving. • Concrete patching. • Scour prevention. • Ditch cleaning, repair. • Mortar repair.
Rehabilitation	Take maximum advantage of the remaining unusable structure in a culvert to build a reconditioned culvert.	• Repair of basically sound endwalls and wingwalls. • Repair of scour. • Invert paving. • Pave streambed. • Stabilize slope. • Install debris collector. • Add apron, cutoff wall. • Improve inlet configuration.
Upgrade to equal replacement	Upgrade to provide service that is equal to that provided by a new structure.	• Add, repair, or replace appurtenant structures. • Line the barrel. • Provide safety grates or safety barriers. • Lengthen the culvert.
Replacement	Provide a completely new culvert with a new service life.	Can be accompanied by: • Realignment. • Hydraulic structural and safety improvements. • Change in culvert shape or material.

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Contoh Pemasangan Debris Trap at Inlet

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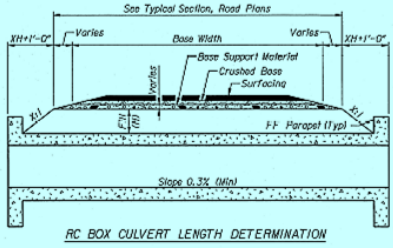
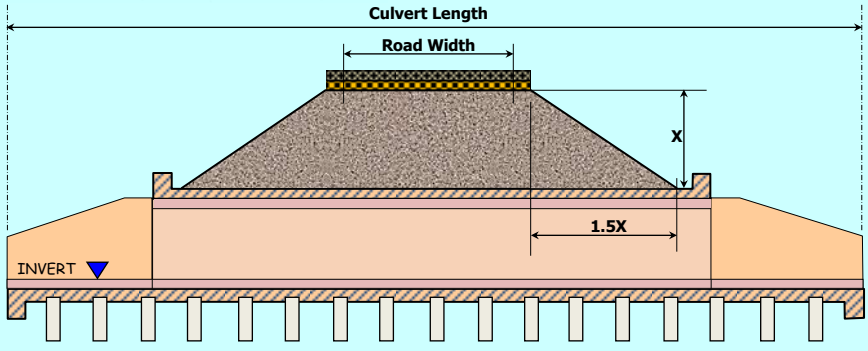
Cara Untuk Menentukan Panjang Pembentung



Keberkesanan pembentung bergantungkan kepada:-

- Classification according to usage based on loading requirement.
- Type of bedding and backfill materials.
- Pipe diameter/Span as per discharge requirement of Q50.
- Effective length.



Typical Sectional View

Penyenggaraan Concrete Parapet dan Steel Railing

Penyenggaraan Concrete Parapet dan Steel Railing

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Type of Parapet

- Concrete new jersey parapet.
- Partial precast facial and partial cast in-situ concrete parapet.
- Masonry type parapet.
- Concrete base with steel railing.
- Aluminum steel railing.
- W-beam guard railing type.

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Type of Parapet




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Type of Parapet



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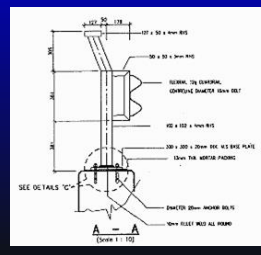
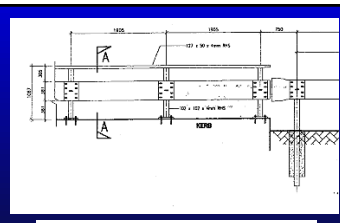
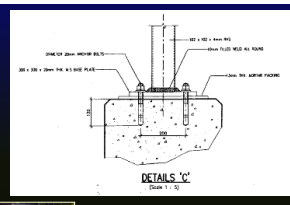
Type of Parapet







What to look for during inspection of Parapet?

- Look for cracks, delamination and spalling.
- Look any sign of misalignment or tilting.
- Look paint deterioration and corrosion.
- Look for loose connection of nuts.
- Look for any collapse due impact of vehicles.
- Look for any loss of anchor bolts.
- Look for any missing members.
- Checking of the parapet height.

Jenis Kerja Pembaikan dan Penyenggaraan Parapet?

- Cleaning with water jet to all contaminated surface of concrete parapet.
- Patching with shrinkage compensated mortar to all spalled surface.
- Sealing of all worn out expansion gap with polysulphide sealant.
- V-groove patching with shrinkage compensated mortar to all cracks.
- Repainting of all corroded steel railing members.
- Replacement of all collapsed steel railing caused by impact damage.
- Replacement of all lost and badly corroded bolts and nuts of steel railing.

Penyenggaraan Expansion Joint




Apakah yang anda perlu ketahui?




Operational Requirements for joints:-

- Possess good riding characteristics.
- Not a skid hazard or danger.
- Silent and vibration free.
- Be properly sealed and water tight.
- Capable of absorbing various types and range of movement ,vibration and loading without being extruded or expelled from its original position.
- Riding surface of joint must be able to withstand wear & tear and be durable against attack form any petroleum products.
- Facilities easy inspection, maintenance and repair.

Installation Issue

- Detail method statement.
- Detail drawing as per site condition.
- Detail Material Specifications.
- Material Test Reports.
- Traffic Management Plan (TMP).
- Supervision.
- Product Warranty.
- Full Detail Installation Report
- Transfer of technology.

Adakah warranty itu penting?

Cambridge Dictionary

A written promise from a company to repair or replace a product that develops a fault within a particular period of time, or to do a piece of work again if it is not satisfactory.

Warranty Issue

- Duration of warranty.
- Type of warranty.
- How to warrant the warranty.
- Default in not full filling the warranty.
- Penalty for not full filling the warranty.

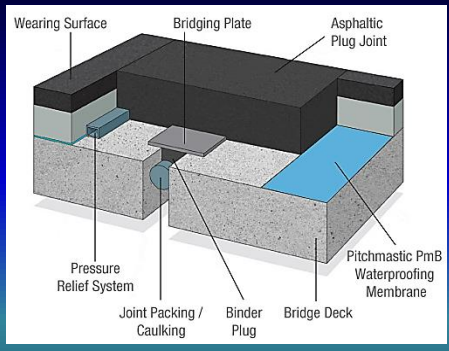
Contoh - Warranty Contents

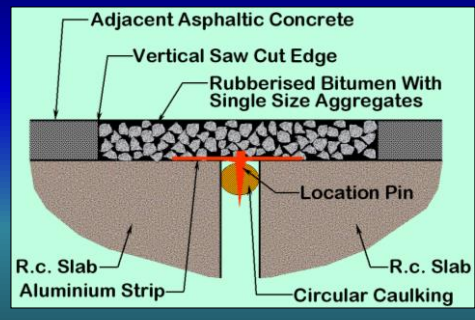
- All movement joints shall be warranted against all defects and malfunction from the date of completion of the installation.
- All defects occurring during the warranty period are to be made good by the Contractor or the manufacturer. The warranty is to be provided jointly and severally by the Contractor and the Manufacturer.

Maintenance Issue

- What type of maintenance shall be provided during the warranty durations?
- How the maintenance be carried out according to the method statement?
- What is the maintenance process?
- Which component is under replacement warranty?
- Which component is under wear and tear process?
- Who shall oversee the overall maintenance process?
- How many cycle of inspection shall be carried out per year?
- Who should be doing the reporting about the defects found?
- Who should verified the maintenance done?

Asphaltic Plug Joint



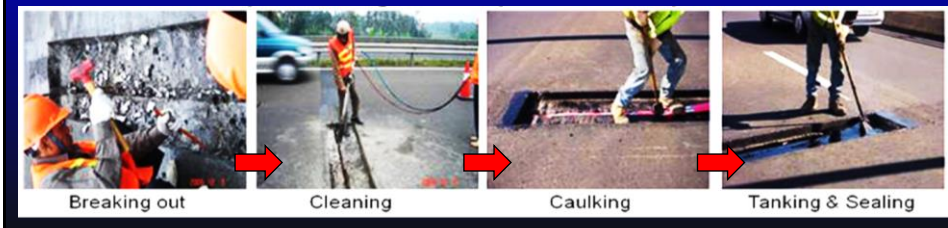


Typical 3D and Sectional View of Asphaltic Plug Joint

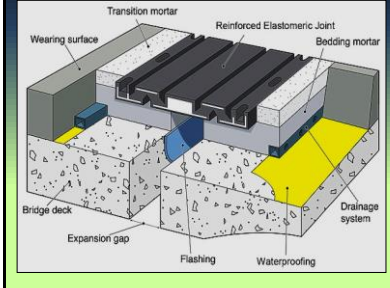
Asphaltic Plug Joint

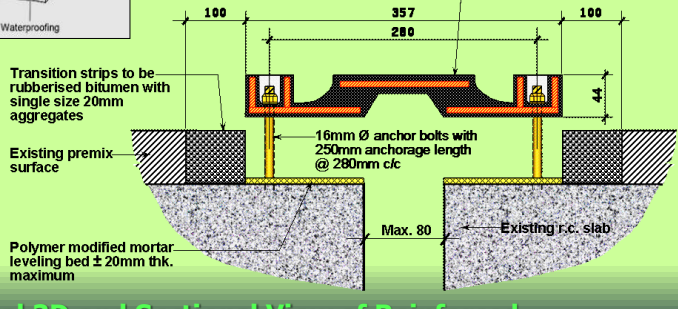
No	Type of Expansion Joint	Components	Type of defects	Causes of defects	Items to be considered prior to installation
1	Asphaltic Plug Joint	• Asphaltic Plug Joint Gap Plate • Circular Caulking • Locating Pin • Pressure Relief System (optional) • Binder coat	• Bleeding • Spalling • Settlement • Leaking • Longitudinal dan transverse Cracks • Debonding • Delamination • Rutting • Raveling • Shoving/Pushing • Segregation	• Poor mix proportion. • Poor surface preparation of the substrate. • Water intrusion. • Poorly cut adjacent premix. • Tension cracks caused by oversize expansion gap. • Reflective cracks caused by gap plate. • Loss of asphalt binder. • Loss of fine and coarse aggregates. • Un-control vehicle speed and breaking force.	• Installation Depth 50→75mm • Installation Width ± 500mm • Installation Length • Expansion Gap <50mm • Traffic Flow • Speed Limit • HGV Count (Similar to AADT) • Installation condition • Installation procedure • Working Temperature Range • Radius of Any Bend • Maximum Gradient • Maximum Skew Angle <25°

Asphaltic Plug Joint Replacement Sequence



Reinforced Elastomeric Joint





Typical 3D and Sectional View of Reinforced Elastomeric Joint

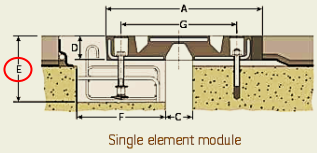
Reinforced Elastomeric Joint

No	Type of Expansion Joint	Components	Type of defects	Causes of defects	Items to be considered prior to installation
2	Reinforced Elastomeric Joint	• Reinforced Elastomeric Joint • Transition Epoxy Mortar • Anchor Bolts • Polymer Modified Bedding Mortar • Rubberised Anchor Bolt Cap • Flashing (optional) • Drainage System (optional)	• Wearing of elastomer top surface • Rupture and tear-off • Delamination of elastomer/ metal plate interface • Exposed reinforce plates • Loosen anchor bolts • Corrosion of anchor bolts • Breaking and cracking of transition epoxy mortar • Joint lift caused anchor bolt failures • Water leak • Anchor bolt cover pad missing • Debris in the grooves	• Poor mix proportion of transition epoxy mortar. • Poor installation of anchor bolts. • Poorly cut adjacent premix. • Wrong finished level of elastomer and transition epoxy mortar • Tension cracks of elastomeric runner caused by oversized expansion gap. • Unchecked defective products. • Debonding of transition epoxy mortar. • Poor surface preparation of the substrate for bedding mortar. • Debris restrict joint movement. • Un-control vehicle speed and breaking force.	• Installation Depth 40→110mm • Installation Width 500→1100mm • Installation Length usually 1000mm/module • Expansion Gap 80→200mm • Anchor bolt length 250→330mm • Finished level of elastomer and transition epoxy mortar • Traffic Flow • Speed Limit • HGV Count (Similar to AADT) • Installation condition • Radius of Any Bend • Maximum Gradient • Maximum Skew Angle <25°

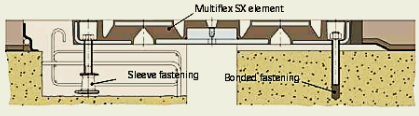
Reinforced Elastomeric Joint

Technical data sheet

There are two different designs, the single module joint and the bridged joint. They have different movement capacities.



Single element module



Double element module

Type	Design	Movement	Dimensions							Weight of one element (kg/m)
			Length	A	D	G	C	E	F	
SX 80	single	±40	2000	275	42	220	50	195	213	27
SX 100	single	±50	2000	355	46	280	60	200	238	35
SX 120	single	±60	2000	390	53	300	70	190	257	29
SX 160	single	±80	2000	470	78	370	90	200	288	87
SX180	single	±90	2000	500	82	400	100	210	298	96
SX 200	double	±100	2000	895	60	795	110	220	452	128
SX 220	double	±110	2000	800	69	700	120	230	400	152
SX 250	double	±125	2000	1040	69	940	135	230	512	244
SX 270	double	±135	2000	890	78	790	150	245	431	179
SX 320	double	±160	1250	1275	82	1165	220	320	588	244
SX 350	double	±175	1000	1105	100	980	220	335	502	318

Dimensions in mm

Reinforced Elastomeric Joint

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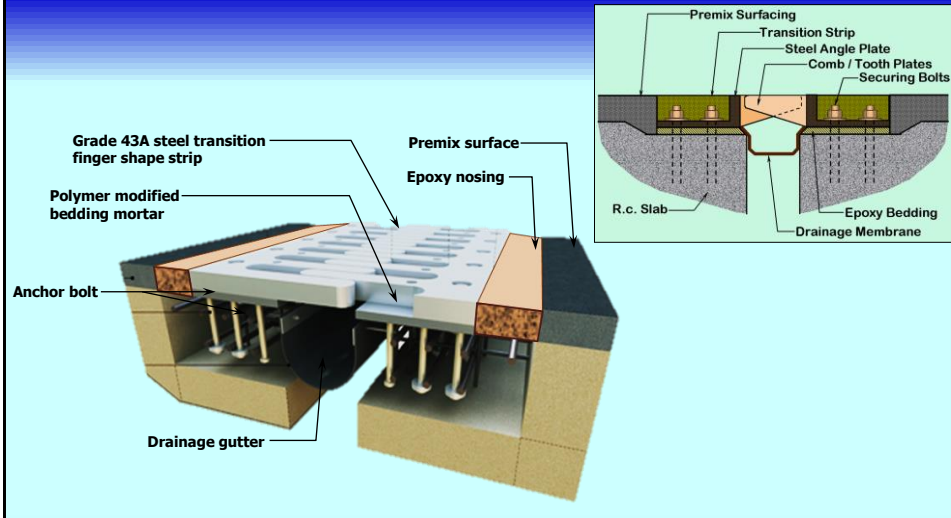
Cantilever Comb Or Tooth Joint



Typical 3D and Sectional View of Cantilever Comb Or Tooth Joint

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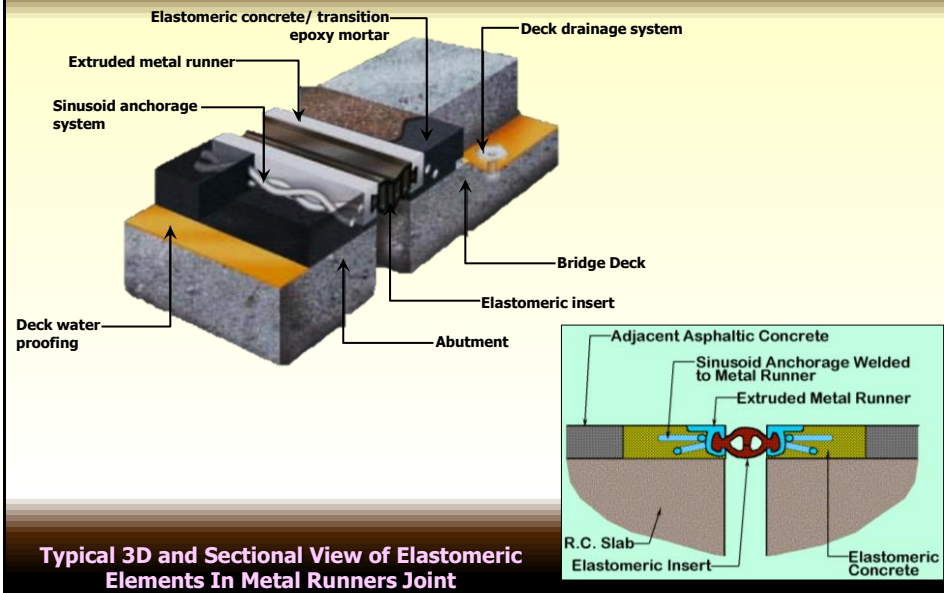
Cantilever Comb Or Tooth Joint

No	Type of Expansion Joint	Components	Type of defects	Causes of defects	Items to be considered prior to installation
1	Cantilever Comb Or Tooth Joint	• Grade 43A steel transition finger shape strip • Anchor bolt • Epoxy nosing • Drainage gutter • Polymer Modified Bedding Mortar (needed as per site condition)	• Steel transition finger broken or fracture • Loosen anchor bolts • Corrosion of anchor bolts • Breaking and cracking of transition epoxy mortar • Water leak • Debris in the grooves and gutter	• Poor mix proportion of transition epoxy mortar. • Poor installation of anchor bolts. • Poorly cut adjacent premix. • Wrong finished level of steel strip finger. • Unchecked defective products. • Debonding of transition epoxy mortar. • Poor surface preparation of the substrate for bedding mortar. • Debris restrict joint movement.	• A special and pre-designed of bridge deck where the joint seated • Installation Depth • Installation Length • Installation Width • Expansion Gap • Module Width and Length • Anchor bolt size and length • Installation procedure • Radius of Any Bend • Maximum Gradient • Maximum Allowable Skew Angle

Cantilever Comb Or Tooth Joint

Elastomeric Elements In Metal Runners Joint



Typical 3D and Sectional View of Elastomeric Elements In Metal Runners Joint

Elastomeric Elements In Metal Runners Joint

No	Type of Expansion Joint	Components	Type of defects	Causes of defects	Items to be considered prior to installation
1	Elastomeric Elements In Metal Runners Joint	• Elastomeric concrete • Deck drainage system(optional) • Sinusoid anchorage system • Extruded metal runner • Elastomeric insert • Deck water proofing	• Rupture of elastomeric insert • Delamination, spalling breaking and cracking of transition epoxy mortar • Water leak • Debonding form adjacent premix • Debris in the grooves	• Poor mix proportion of transition epoxy mortar. • Poor installation of sinusoid anchorage system. • Poorly cut adjacent premix. • Wrong finished level of extruded metal runner • Unchecked defective products. • Poor surface preparation of the substrate for bedding mortar. • Debris restrict joint movement. • breaking force.	• A special and pre-designed of bridge deck where the joint seated • Installation Depth • Installation Length • Installation Width • Expansion Gap • Module Width and Length • Installation procedure • Radius of Any Bend • Maximum Gradient • Maximum Allowable Skew Angle

Repair Process for Elastomeric Elements In Metal Runners Joint




Kandungan Laporan Pemeriksaan Kejadian

- **Pastikan data-data atau maklumat berikut terkandung dalam penyediaan laporan kerosakan:-**
  - Structure number
  - Date and time of occurrence
  - Inspector Name
  - Type of defects
  - Related photographs
  - Dimensional sketches


Terima Kasih
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