NEW EQUIPMENT & SYSTEM APPROVAL PROFORMA

Ref: *08-08-11-090*

Note: the prompts given below are only a guide to the information required for approval. Dependent on the type of equipment or system that requires approval delete any section that is not applicable or include additional information if necessary. Mandatory fields are marked with an asterisk (*).

1 **Equipment or System to be approved** *

DUAL GAUGE EXPANSION JOINT FOR USE IN 1600 mm / 1435 mm DUAL GAUGE TRACK.

2 **Originator** *

Name: Frank Lander Company: ARTC

3 **Introduction** *

Dual gauge expansion joints are required in two locations on the Port River bridge to cater for differential expansion between the welded 50 kg/m rail and the concrete deck of the structure to which the rails are directly fastened.

4 **Determination of Need** *

A slab track arrangement in which the rails would be fastened directly to the concrete deck of the bridge was considered to be a more stable arrangement than a traditional ballasted deck arrangement on account of the long 385 m radius curve through the structure. Rail designers for the project (Maunsell) then calculated that expansion joints would be required in two locations, one on the slab portion of the structure and one on concrete sleepers.

Each joint would be required to accommodate a movement of +/- 200 mm.

5 **Significant Change or Not** *(as determined by the Manager Standards)* *

This change in equipment or system is assessed as **SIGNIFICANT**

6 **Review Panel** *(as determined by the Manager Standards)* *

- John Furness - Manager Standards
- Tim Calver – Standards & Technical Services Engineer
- Ian Domleo- Senior Track & Civil Engineer

7 **Safety**

The design was carried out by Janus Railway and Civil (Roger Wyatt). The design of the joint rails is similar to the design of the point rails in the widely used SAR and AN designs of fabricated V-crossings.

The design philosophy behind the device is attached. It addresses the need for:

- Continuous wheel support and guidance
- Joint-rail structural considerations
- Support of joint-rails
- The use of canted base plates
- Different requirements for the slab supported and the ballast supported joints
- Cant reducing plates where the expansion joint abuts a turnout
- Confirmation of movement accommodated and the initial set-up
- The compatibility with adjacent systems and equipment.

A risk assessment in accordance with AS4360 was carried out which resulted in several items being incorporated into the Inspection & Test Plan and the Maintenance Plan (both attached).

A third party independent design review was carried out by SKM.

8 **Performance and Suitability**

The Expansion Joint design conforms to the following standards:

ARTC Code of Practice	Section 1 – Rail
	Section 2 – Sleepers & fastenings
	Section 3 – Points & crossings
	Section 5 – Track geometry
	Section 6 – Track lateral stability
ARTC Standards	TCS-06 – Specification for turnouts & diamonds
	TCS-07 – Specification for manufacture of 47 & 53 kg points and crossing components
	TCS-09 – Mixed gauge track
Australian Standards	AS1085 Part 1 – Railway track materials – Steel rails
	AS1085 Part 14 – Railway track materials – Concrete sleepers

Design documentation attached.

(i)	**Use in other rail networks**	
	N/A	
(ii)	**Use in the ARTC network**	
	N/A	
(iii)	**Issues arising from usage of the equipment/system**	
	No impact on train operations or signalling. A detailed inspection and maintenance plan is attached.	
(iv)	**Changes required to infrastructure or systems for use of the equipment**	
	N/A	
9	**Reliability**	
	N/A	
10	**Maintainability**	
	A Maintenance Plan has been prepared covering routine inspections, repair of worn components, replacement of fastenings, and dismantling & reassembly.	
11	**Approval** *	
	DUAL GAUGE EXPANSION JOINT FOR USE IN 1600 mm / 1435 mm DUAL GAUGE TRACK.	
12	**Conditions of Approval** *	
	<<NOTE: Review Panel may add additional Conditions of Approval>>	
13	**Does the Originator accept the additional Conditions of Approval as set by the Review Panel:**	Yes ☐ No ☐ N/A ☐

14	**Sign off**		***ARTC office use only***
	Review Panel:	SAFETY COMMITTEE APPROVED	14/1/08
			Date: 24/12/07
		S.S. Curly	Date: 19/12/07
		Ian Dowler	Date: 18/12/07

PREX STAGE 3 RAIL WORKS – INSPECTION AND TEST PLAN FOR EXPANSION JOINT MANUFACTURE AND INSTALLATION

1 PURPOSE

To ensure that the expansion joints are manufactured and installed in accordance with design details, components are fixed securely and all key geometric requirements are met.

2 REFERENCE DRAWINGS

JN0607-20 General Arrangement
JN0607-21 Slab-mounting details
JN0607-22 Common rail plate details
JN0607-23 Dual rail plate details
JN0607-24 Steel support assembly details
JN0607-25 50kgAS rail machining details
JN0607-26 Rail guide details
JN0607-27 Shop and field assembly procedures

3 INSPECTION AND TEST EQUIPMENT

Gauges for track gauge
Steel tape
Rail square
Vernier callipers

4 MANUFACTURING AND INSTALLATION PROCEDURES

4.1 COMPONENT MANUFACTURE

Cut all components and machine as necessary to meet specified tolerances on cross-sectional and longitudinal measurements in accordance with the drawings. (Weld preparation of components is detailed for each of the relevant components.)

4.2 SHOP ASSEMBLY

Assemble components as detailed in the procedure specified on the drawings. This procedure specifies the sequence of assembly and the use of temporary shims to achieve operating clearances. Some welds are specified to be ground flush.

4.3 FIELD ASSEMBLY

4.3.1 Establish survey or other reference marks for determining the alignment of the joint rails and the longitudinal position of the centre of each joint.

4.3.2 Determine required rail lengths at the adopted neutral temperature and to suit the specified positions of the noses of the joint rails. Take temperatures of the rails and bridge structures and determine what adjustments if any are needed to the rail lengths and joint rail nose positions.

4.3.3 Follow the specified field assembly procedures on the drawing. Note that separate procedures are given for the slab-mounted and ballasted joints and that in both cases critical fixing operations are designed to be undertaken after correct alignment and gauge have been established.

5 INSPECTION POINTS

5.1 SHOP ASSEMBLY

5.1.1 Before assembly

Action	Resp.	Init.
Check components for visible flaws or defects		
Check components for straightness and examine contact profile between mating parts to ensure potential tight spots are identified and rectified or marked.		
Check lengths and cross-sectional dimensions are within specified tolerances		

5.1.2 Before welding dual rail inner guide assemblies

Confirm that finished width can be achieved within tolerance		

5.1.3 Before welding outer rail guide assemblies

Confirm joint rails are sitting in contact with the baseplates over full length of baseplates.		
Confirm joint rail pairs are in mutual contact along the centreline of the plain rail sections and that gauge faces are in line		
Confirm temporary packers are installed, particularly at previously marked potential tight spots.		
Check component ends aligned		

5.1.4 Before welding checkrails

Confirm checkrails temporarily held at correct flangeway		

5.1.5 After assembly and after removal of temporary packers

Check each joint rail free to move over designed length of travel		

5.2 FIELD ASSEMBLY

5.2.1 Before construction commences

Confirm validity of survey or reference points for setting out.		
Check temperature records and determination of rail lengths and nose positions		
Check reference marks for positioning joint and joint rails		

5.2.2 Before assembled joint is fixed in position

Confirm alignment of joint rails and gauges of standard and broad gauge track		
Confirm longitudinal positions of support assemblies and squareness across ends of support assemblies		
Confirm noses of joint rails in line with reference marks		
Confirm steel bearers (ballasted joint) are in transverse central position		
Confirm holes in concrete slab are not less than specified depth		

5.2.3 Before joint rails are welded into track

Check joint rails free to move		
Check nose positions correct at set welding gap		

5.2.4 After installation

Check standard and broad track gauges		
Check checkrail flangeways		

5.3 DURING FIRST THREE MONTHS OF OPERATION

Examine wheel/rail contact wear patterns monthly to confirm behaviour conforms with design expectations		
Examine concrete slab in vicinity of baseplates monthly for evidence of spalling which could be related to unacceptable levels of dynamic loading through the joint or at the approach to the joint		
Examine joint rail interfaces for indication of longitudinal movements which could indicate appropriate or inappropriate functioning of the joint.		

PREX STAGE 3 RAIL WORKS – MAINTENANCE PLAN FOR EXPANSION JOINT MANUFACTURE AND INSTALLATION

1 PURPOSE

To ensure that the expansion joints are maintained in a safe and durable condition.

It is envisaged that the following requirements will be incorporated in a larger Maintenance Plan and that responsibilities, inspection frequencies and reporting requirements will be aligned with those for similar equipment.

2 REFERENCE DRAWINGS

JN0607-20 General Arrangement
JN0607-21 Slab-mounting details
JN0607-22 Common rail plate details
JN0607-23 Dual rail plate details
JN0607-24 Steel support assembly details
JN0607-25 50kgAS rail machining details
JN0607-26 Rail guide details
JN0607-27 Shop and field assembly procedures

3 MAINTENANCE PROCEDURES

3.1 ROUTINE INSPECTION

During scheduled track maintenance inspections, visually examine the expansion joints looking for evidence of

- Wear or fracture of the noses of the joint rails
- Wear of the checking faces of the checkrails
- Loose or missing bolts, nuts or washers
- Spalling of the concrete under the slab-mounted joint
- Longitudinal movement of the joint rails which could indicate whether or not the joint is functioning correctly
- Excessive wear or fracture of components in the rail guide assemblies.

The frequency of routine inspections should be the same as that adopted for points and crossings generally.

Reporting procedures should be in accordance with established procedures for track inspections.

Instances of component breakage or what might be considered excessive wear should be referred for an engineering inspection.

3.2 REPAIR OF WORN COMPONENTS

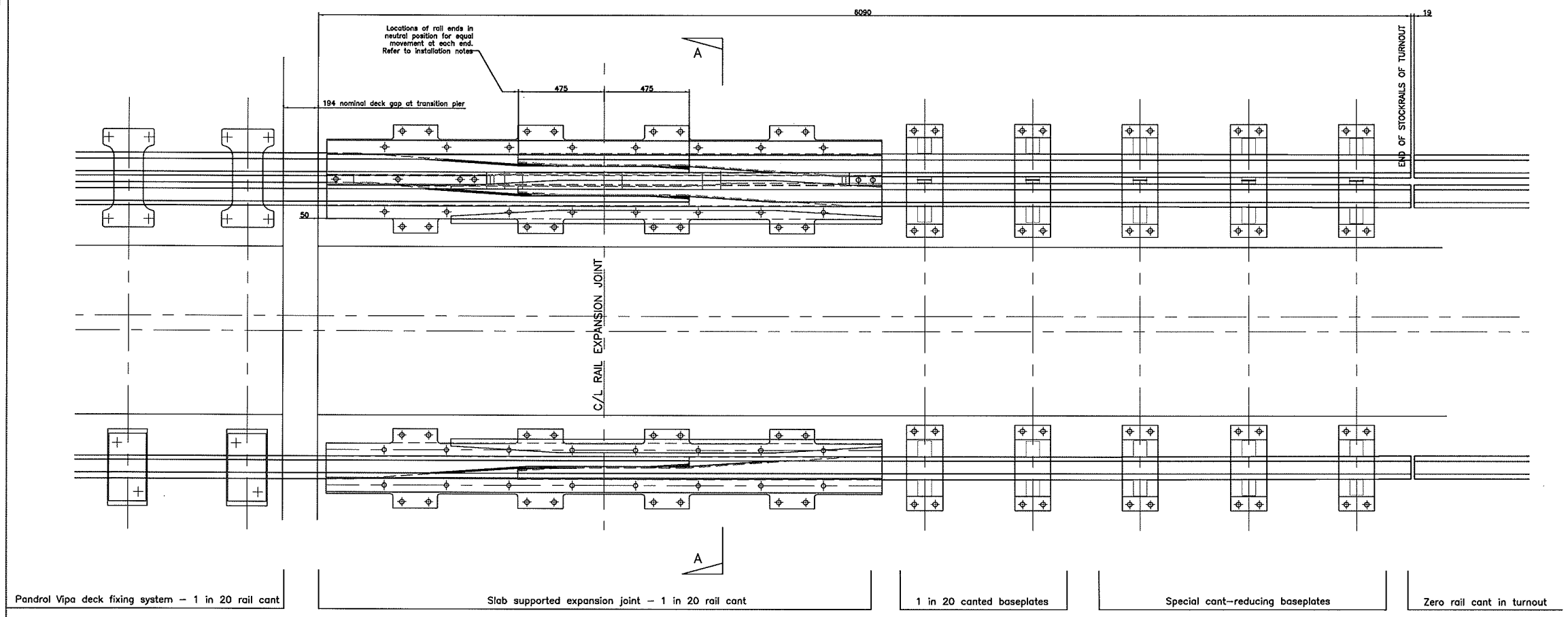
The noses of the joint rails may be built up with weld metal in the same way as V-crossings. Worn checkrails should be replaced.

3.3 REPLACEMENT OF FASTENINGS

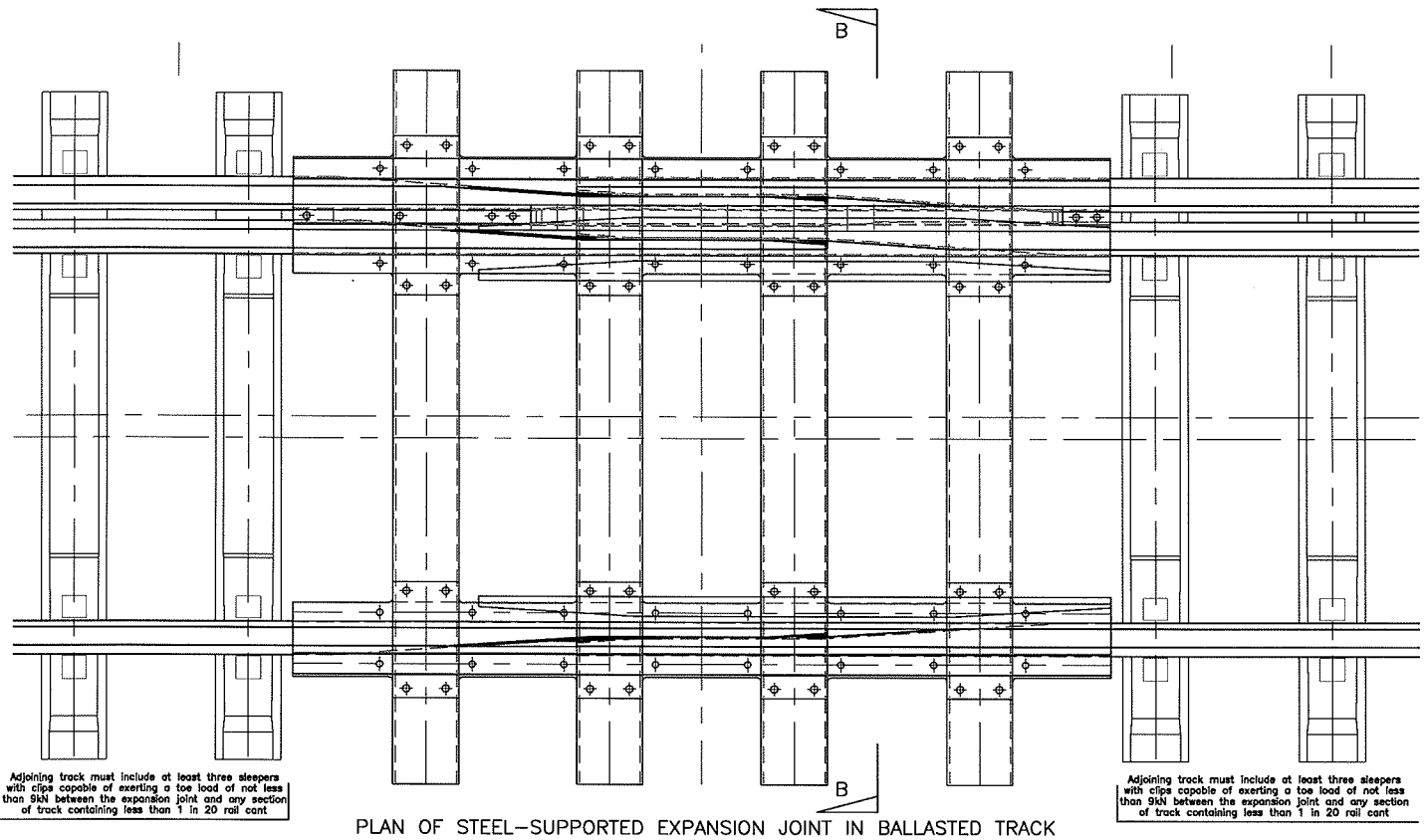
Replace broken or missing bolts, nuts or washers. Nuts on anchor studs in the concrete slab should be tightened to compress the spring washer. Bolts in steel-to-steel connections should be replaced with new Grade 8.8 bolts and be fully tensioned using the part-turn method if found to be loose, broken or missing.

3.4 DISMANTLING AND RE-ASSEMBLY OF A JOINT

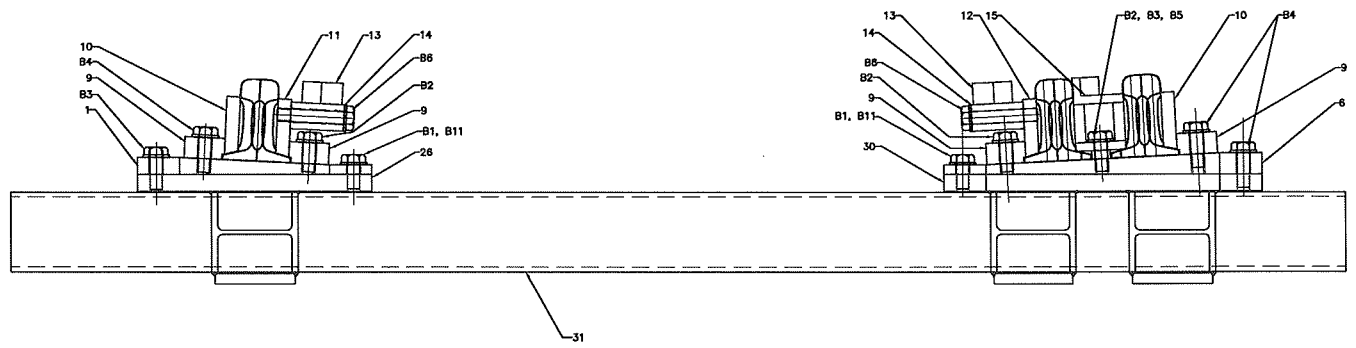
If the joint must be dismantled, reference should be made to the drawings and to the Inspection and Test Plan for the joint to ensure that re-assembly is carried out correctly.



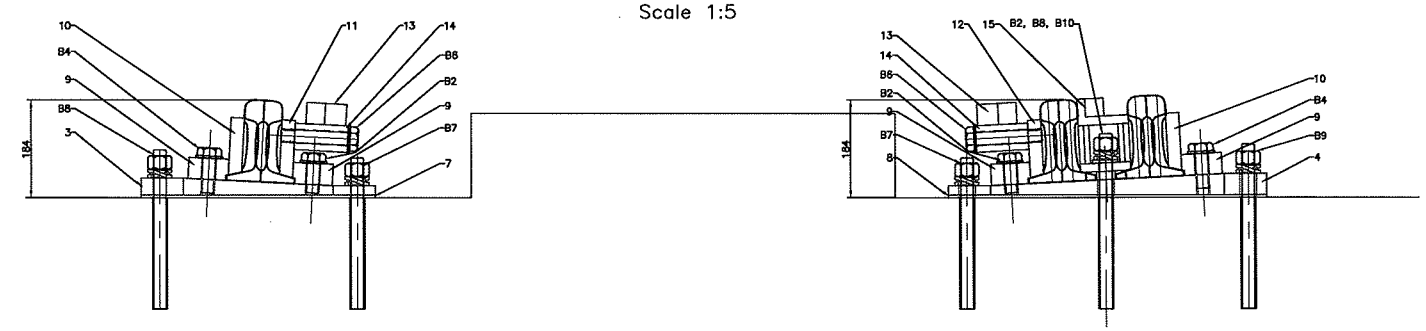
PLAN OF SLAB–SUPPORTED EXPANSION JOINT
(Adjacent to turnout with uncanted rails)
Scale 1:10



PLAN OF STEEL–SUPPORTED EXPANSION JOINT IN BALLASTED TRACK
Scale 1:10



SECTION B–B
Scale 1:5



SECTION A–A
Scale 1:5

NOTE:
The joint is drawn Right Handed with the facing rails pointing to the RH end as viewed from the common rail side. If a LH unit is required then components designated (H) in the drawings need to be supplied to the opposite hand from that shown on the drawings.

REVISION	DATE	DESCRIPTION

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A	21-2-07	Issued for construction

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SCALE	As noted
DESIGNED	RAW
DRAWN	RAW
CHECKED	RAW
APPROVED	
DATE	Nov. '06

PORT RIVER EXPRESSWAY
STAGE 3 RAIL WORKS
RAIL EXPANSION JOINT
GENERAL ARRANGEMENT

ISSUE	A
SHEET SIZE	A0

JN0607–20