

DH-62-H-103

DESIGN LOADING FOR ELEVATED RAMPS
ROADWAYS AND PARKING AREAS AT T JETTY
DURBAN HARBOUR

December 1990
90122/1.2



ZAI (NATAL) INCORPORATED
Reg. No. 74/03973/21

CONSULTING ENGINEERS, ARCHITECTS,
QUANTITY SURVEYORS, TOWN AND
REGIONAL PLANNERS, ENVIRONMENTAL
PLANNERS, PROJECT MANAGERS

1990.12.13

Deputy Harbour Engineer
Portnet
P O Box 1027
DURBAN
4000

Dear Sirs

RE: DESIGN LOADING FOR ELEVATED RAMPS, ROADWAYS AND PARKING AREAS AT T JETTY
DURBAN HARBOUR

As confirmed in your letter dated 1990.11.28, ZAI have prepared a brief report on the live loads originally allowed in the structural design of the above works and have summarised this information in a format which is simple to relate to actual vehicles.

We trust that this information is adequate for your requirements. Please contact the writer should you have any queries or require any further information.

Yours faithfully
ZAI (NATAL) INCORPORATED

.....
C D ANCKORN : Pr Eng
DIRECTOR

CDA/cb1
1.22/Let

DESIGN LOADING FOR ELEVATED RAMPS, ROADWAYS AND PARKING AREAS AT T JETTY
DURBAN HARBOUR

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DESIGN LOADING FOR ELEVATED RAMPS, ROADWAYS AND PARKING AREAS AT T JETTY -
DURBAN HARBOUR

1. INTRODUCTIONAL TERMS OF REFERENCE

ZAI were requested by Portnet in a letter dated 1990.10.02 to comment on the maximum live loads permitted on the elevated vehicle circulation areas at T jetty and attached a copy of plan showing the positions of the structures for which information is required.

ZAI prepared an estimate of the time that would be required to extract the required loading information from the old microfilm records of the various projects and advised Transnet of this in a letter dated 1990.10.11. This letter apparently went astray but ZAI's proposals were accepted and confirmation to go ahead with the investigation was received in a letter from Transnet dated 1990.11.28.

2. NATURE OF INVESTIGATION

ZAI hold microfilm records of correspondence, calculations and reports relating to the design and construction of the various buildings and structures for which loading information is requested together with microfilm cards of the construction drawings. These records were checked and the relevant information extracted.

3. DETAILS OF ORIGINAL DESIGN LIVE LOADS

3.1 ACCESS BRIDGES TO T JETTY (BRIDGE 2)

The approach bridge to T Jetty including approach ramps and elevated traffic circle was designed to carry Standard Highway Loading as set out in BS 153 Part 3A : 1954. The design live load was type HA Loading as set out in table 1 of BS 153, part of which is reproduced below. In addition allowance was made for an additional knife edge loading of 2 700 lbs/ft (40 206 kg/m).

B.S. 153 : Part 3A : 1954

TABLE 1. HIGHWAY LOADING. TYPE HA
Equivalent U.D.L. to be used in conjunction with the knife edge load. (See Fig. 1).

Loaded length, ft	U.D.L. for beams per linear foot of lane	U.D.L. for longitudinal slabs per linear foot of lane	U.D.L. for transverse slabs and cross girders per linear foot of lane	Loaded length, ft	U.D.L. for beams per linear foot of lane	U.D.L. for longitudinal slabs per linear foot of lane	U.D.L. for transverse slabs and cross girders per linear foot of lane
3	24 200	24 200	22 700	12	4 870	3 250	2 600
4	17 000	17 000	11 800	13	4 540	2 950	2 400
5	12 250	12 250	7 700	14	4 210	2 700	2 300
6	9 660	8 850	5 800	15	3 880	2 500	2 200
7	8 280	6 550	4 600	16	3 550	2 400	2 200
8	7 250	5 200	3 900	17	3 220	2 300	2 200
9	6 440	4 520	3 400	18	2 880	2 250	2 200
10	5 800	4 000	3 100	19	2 540	2 200	2 200
11	5 200	3 600	2 800	20-75	2 200	2 200	2 200

The geometry and loading of the ramps was also checked for use by actual heavy vehicles that were then operating and which were recorded in calculations as:- Diamond T Hauler + 20 T semi-Trailer + 5 T Trailer
Diamond T Hauler + 2 x 10 T Trailers
Thornycroft + 2 x 10 T Trailers

Normal Type HA loading is stated in BS 153 as representing the effect of 3 vehicles each 22 tonnes in weight closely spaced in each of two carriageway lanes followed by 10 tonne and 5 tonne vehicles. For short span members the effects of two 9 tonne wheels 1m apart are allowed for.

Type HA loading is equivalent to approximately 20 units of HB loading for short spans (under 30m) which is equivalent to a vehicle with a maximum axle load of 20 tonnes.

The above loading would thus cater for general use by heavy vehicles but exclude abnormal multi-axle vehicles with axle loads in excess of 20 tonnes.

3.2 L SHED ROOF AND BRIDGE 23

The roof of L Shed and the elevated approach ramps to it were designed originally as parking areas for light passenger vehicles.

The design live load was 80 lbs/ft² (390 kg/m²). Relating this design loading to current loading codes would be equivalent to restricting access on to this roof or approach ramp to light vehicles with a maximum GVM of 3.0 tonnes.

3.3 M SHED ROOF AND SPIRAL ACCESS BRIDGE AT S END (BRIDGE 24)

The upper level of roadway in front of the Ocean Terminal Building, parking area at the South end of the Terminal Building and spiral access ramp at the South end of M shed were designed to cater for an equivalent UDL of 150 lbs/ft² (730 kg/m²) or vehicles with maximum wheel loads of 6000 lbs (2 700 kg) with axle centres of at least 25 ft (7.5m) apart.

This loading would allow for buses or other vehicles with a wheelbase of at least 7.5m with a GVM of up to 11 tonnes or general access for all vehicles with a GVM of up to 5.0 tonnes.

It must be noted that access for vehicles with a GVM of more than 3.0 tonnes must be via the spiral ramp at the South end of M shed and not across bridge 23 and L shed roof at the North end of M shed, ie. vehicles over 3.0 tonnes passing in front of the Ocean Terminal Building must turn at the North end and return and exit via the South spiral ramp.

3.4 RAILWAY RAMP TO M SHED

The railway ramp up to the 1st floor level of M shed was designed to carry South African Railways specified Class 1 loading including an allowance for impact of 15%. (Copy of loading diagram attached, Annexure J). The largest locomotives covered by this loading specification were either 1 No. 240 tonne locomotive with an overall length of 27.5m and with a total load of 163 tonnes from the driving wheels or 2 No. 203 tonne locomotives with an overall length of 44.9m and with a total load of 102 tonnes from each set of driving wheels.

Maximum loading from the trucks is 5.3 tonnes/metre.

4. SUMMARY OF DESIGN LIVE LOADS

The design live load data has been summarised below in the format requested, ie. Maximum allowed axle loads and maximum allowed GVM.

4.1 ACCESS BRIDGE TO T JETTY (BRIDGE 2)

Design live load to BS 153 Part 3A 1954 type HA loading will cater for standard heavy vehicles with a maximum axle load of 20 tonnes but excludes abnormal multi-axle trailers with axle loads in excess of 20 tonnes.

4.2 L SHED ROOF AND BRIDGE 23

Access allowed only to light vehicles with a maximum GVM of 3.0 tonnes.

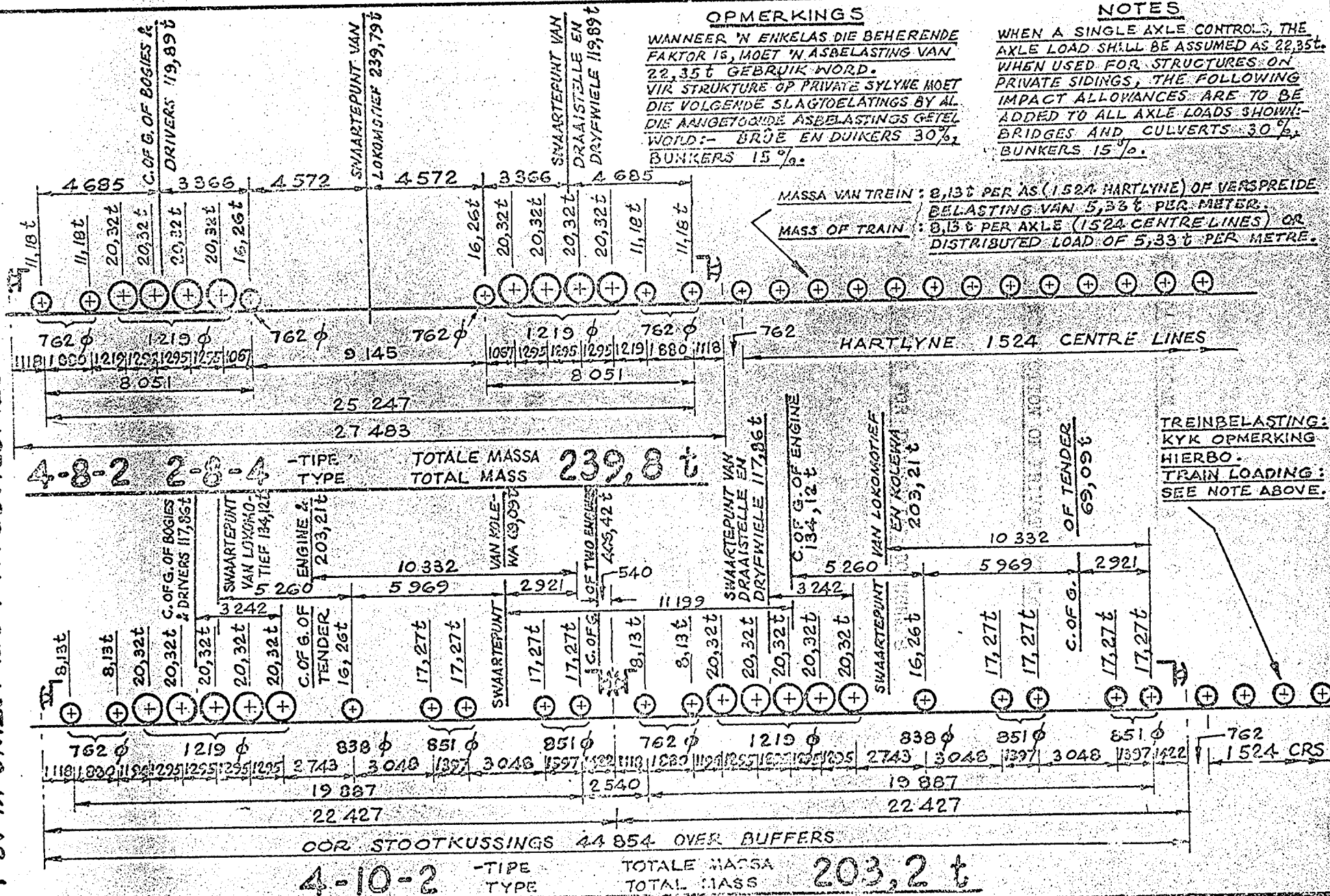
4.3 M SHED ROOF AND SPIRAL ACCESS BRIDGE AT S END (BRIDGE 24)

Access allowed to all vehicles with a maximum GVM of 5.0 tonnes and buses or other commercial vehicles with a maximum axle load of 5.5 tonnes with axles at a minimum of 7,5m centres.

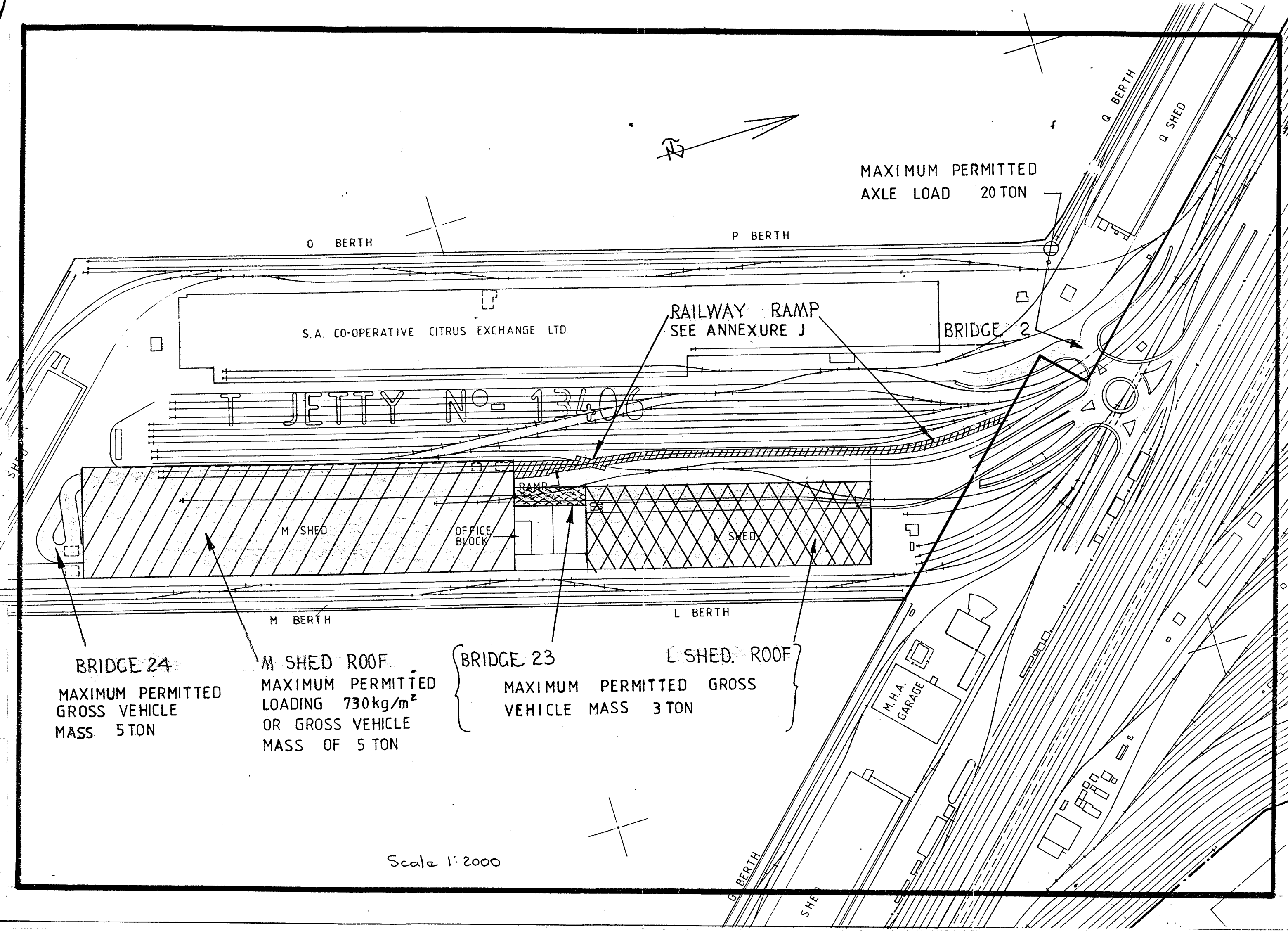
4.4 RAILWAY RAMP TO M SHED

Designed in accordance with South African Railways specified Class 1 loading as defined in Annexure J (Ref Page 5).

BELASTINGDIAGRAM: BELASTING KLAS I
LOADING DIAGRAM: CLAS I LOADING



BY LAE
ANNEXURE



S.A. CO-OPERATIVE CITRUS EXCHANGE LTD.

T JETTY NO- 13406

RAILWAY RAMP
SEE ANNEXURE J

BRIDGE 2

M SHED

OFFICE
BLOCK

L SHED

M BERTH

L BERTH

BRIDGE 24

MAXIMUM PERMITTED
GROSS VEHICLE
MASS 5 TON

M SHED ROOF

MAXIMUM PERMITTED
LOADING 730 kg/m^2
OR GROSS VEHICLE
MASS OF 5 TON

BRIDGE 23

MAXIMUM PERMITTED GROSS
VEHICLE MASS 3 TON

L SHED. ROOF

M.H.A.
GARAGE

Scale 1:2000

MAXIMUM PERMITTED
AXLE LOAD 20 TON

92006

22 January 1992

Port Engineer
Portnet
P.O. Box 1027
DURBAN
4000

Attention: Mr Tony Dicks

Dear Sir

Re: POWER BOAT RACE : LOADING ON M SHED ROOF

We refer to the telephone discussion between yourself and our Mr Notcutt and confirm the following:

1. You required us to attend a meeting at the Ocean Terminal on Friday 17 January 1992 at 1.30 pm in connection with the proposed erection of stands on the roof of "M" Shed.
2. ZAI would provide information relating to the capacity of the structure to carry loads but would not assume responsibility for the design of the stands.
3. ZAI would liaise with Mr Guy Baxter of Andrzej Kiepiela Enterprises.
4. ZAI would invoice Portnet for their work but would not spend more than 10 hours on such work.

Yours faithfully
ZAI (NATAL) INCORPORATED

J M Pet : PrEng
MANAGING DIRECTOR

JMP/jp
Portnet.Let

92006

22 January 1992

Andrzej Kiepiela Enterprises
PO Box 618
Durban
4000

Attention: Mr G Baxter

Re: OCEAN TERMINAL : POWER BOAT RACE

We refer to the meeting held at the Ocean Terminal on Friday 17 January 1992 when the construction of stands on various sections of the existing building was discussed. We confirm that we provided you with the following information:

1. The permitted load which may be applied on the passenger walkway may not exceed 490 kg/m².
2. The permitted load which may be applied on the open areas adjacent the terminal building may not exceed 730 kg/m²
3. Vehicles with a gross mass in excess of 3 tons may not travel across "L" Shed roof.
4. Vehicles with a gross mass up to 5 tons may use the spiral ramp to get on to "M" Shed roof.
5. The base plates of scaffolding should be supported on timber runners to avoid damage to roof surfaces.

The accompanying sketch No. diagrammatically illustrates some of the information given above.

Yours faithfully
ZAI (NATAL) INCORPORATED



J M Pet : PrEng
MANAGING DIRECTOR

JMP/jp

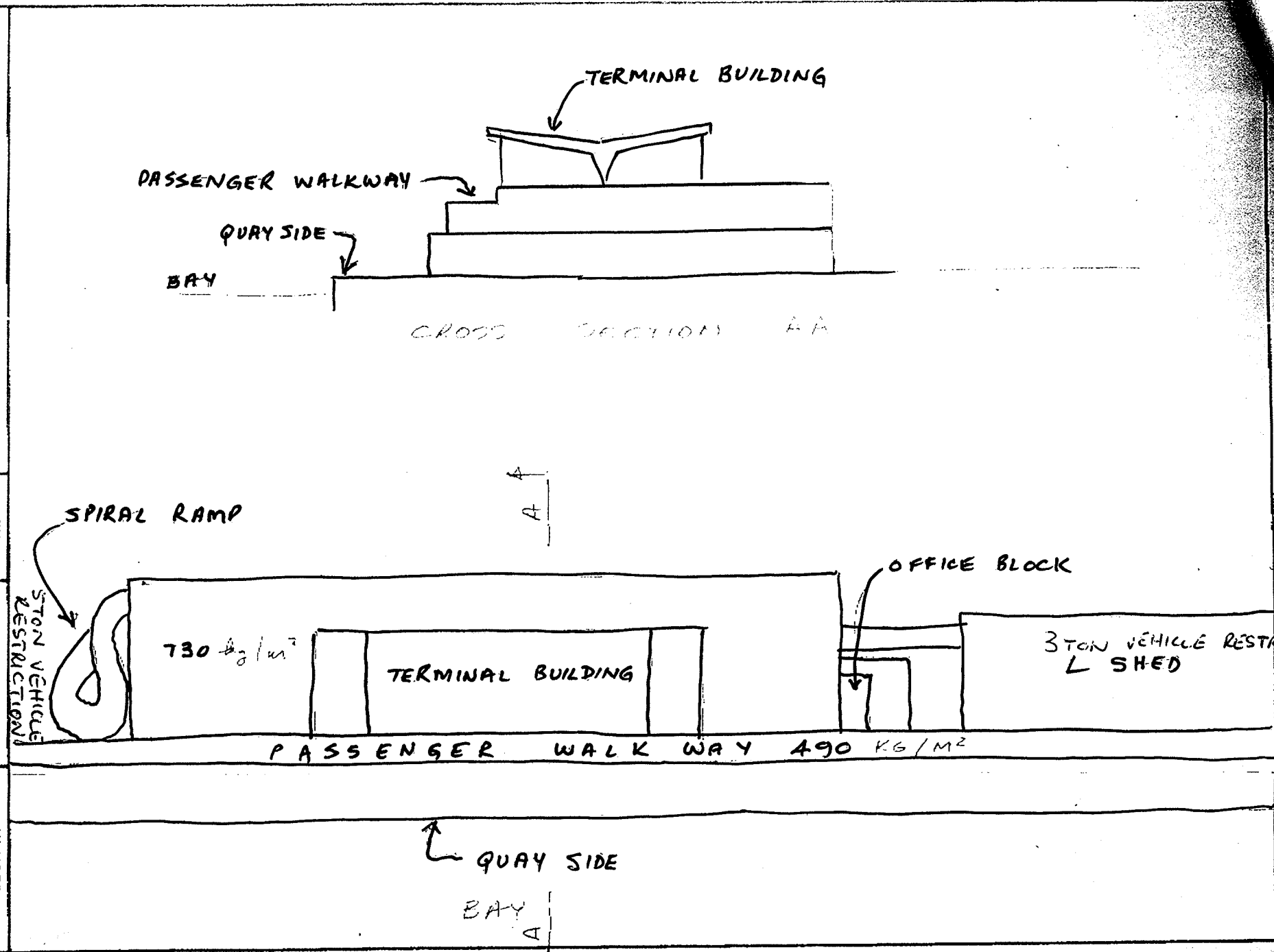
c.c. Portnet - Mr T Dicks

050003

CALCULATION SHEET

24.01.92 09:01

2A1



M SHED, DOCKLAND
ROOF LOAD CAPACITY

BY
DATE
21/1/92

PROJ. No.

NUMBER