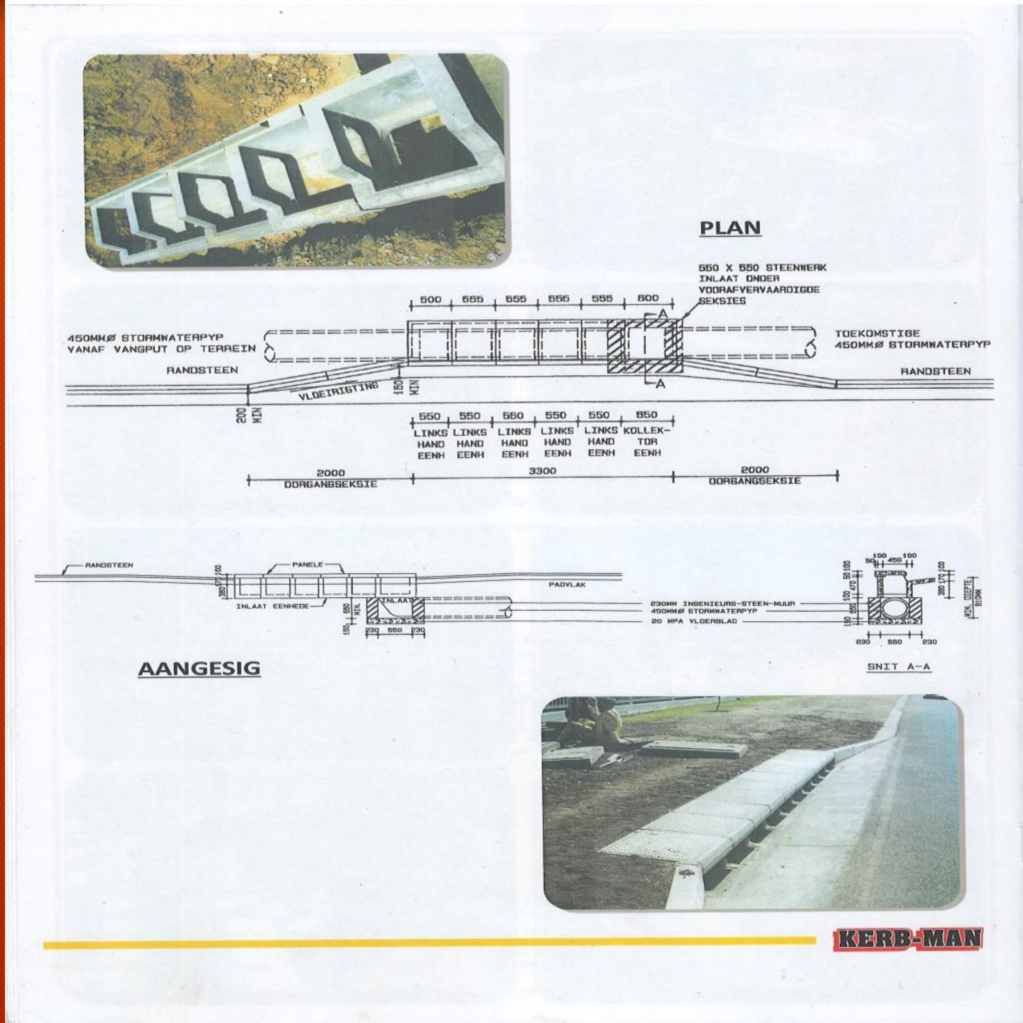
KERB-MASTER

Introduction to the Kerb-Master Stormwater drain

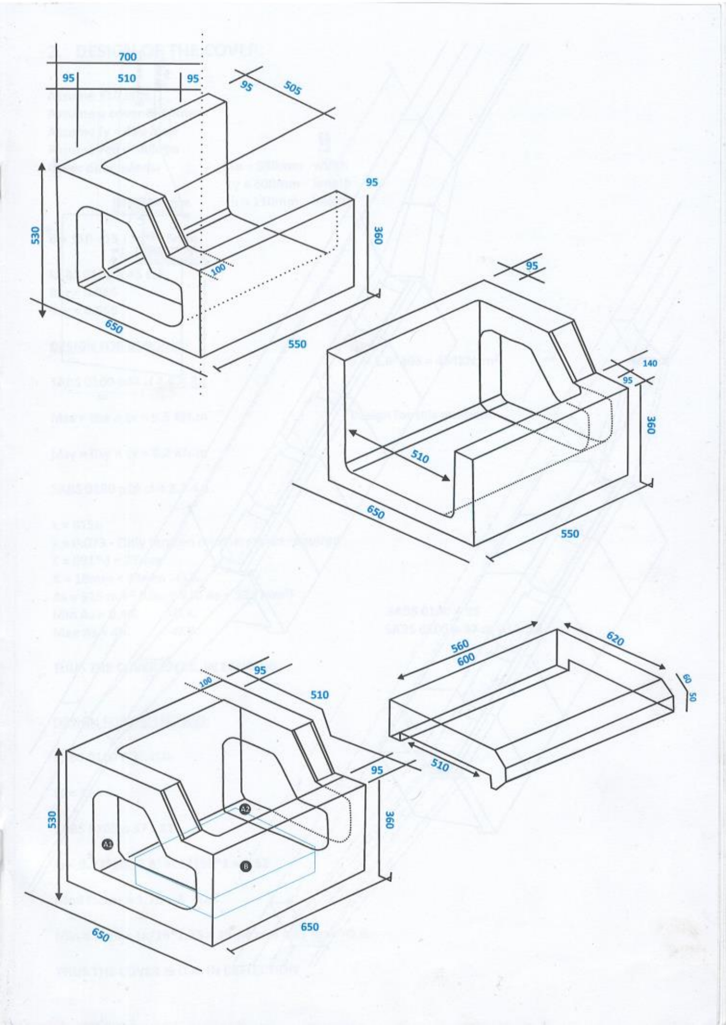
Kerb-master inlet

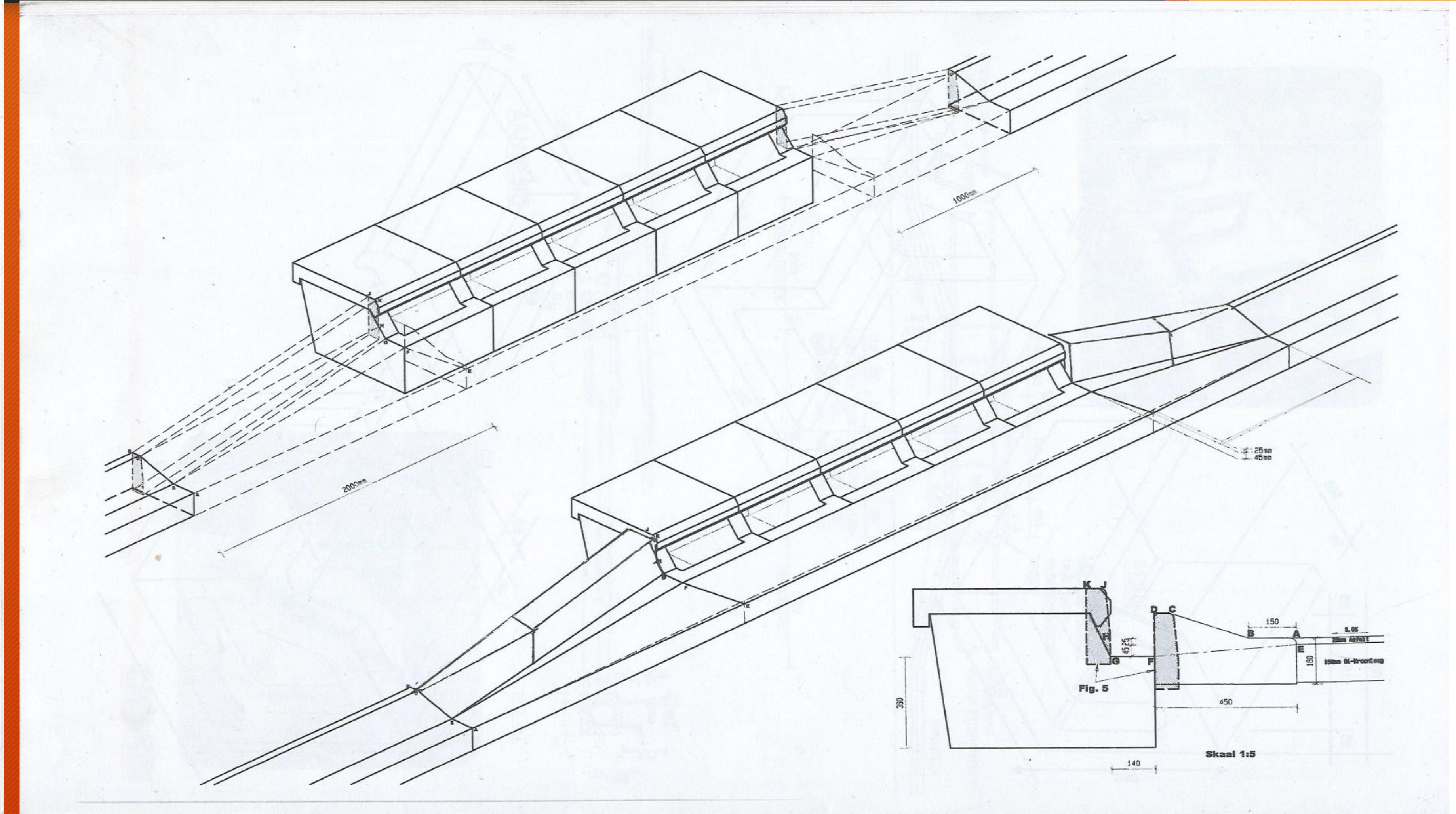
Facts about to the Kerb-Master Inlet

- The Kerb-Master was tested by the CSIR and withstood a point load of 19 tons which is nearly double the normal requirement.
- On the Kerb-Master there is no external metals for rust to play a destructive role.
- The kerb-master having no external metals reduces the vandalism and destruction for salvage of the product.
- The Kerb-master is stronger than its rivals,Its Hydraulically more effective and not prone to blockages.
- Its easily accessible and eliminates the need for a manhole.
- Its safe for pedestrians and children.
- Its easily cleaned and aesthetically pleasing and cost effective.
- The Kerb-Master can be made any length that is required



Kerb-Master drawings





2. DESIGN OF THE COVER:

Assume Y10 bars
Assume a cover of 15mm
Assume fy = 450 Mpa
Assume Fcu = 30 Mpa

Cover dimensions: Lx = 550mm width
Ly = 600mm length
h = 110mm height

d = 110 - 15 - 10 = 85mm

SABS 0100 p 45 t15:
Bsx = 0.065
Bsy = 0.056

DESIGN FOR BENDING:

n = 1.6*303 = 484KN/m²

SABS 0100 p44 cl 4.4.4.2:

Msx = Bsx n Lx = 9.5 KN.m — Design for this moment

Msy = Bsy n Lx = 8.2 KN.m

SABS 0100 p24 cl 4.3.3.4.1:

k = 0156
k = 0.073 - Only tension reinforcement required
Z = 091*d = 77mm
X = 18mm < 43mm -O.K.
As = 315 mm² (Use 5 Y10 As = 393 mm²)
Min As = 0.4% -O.K. SABS 0100 p 95
Max As = 4% -O.K. SABS 0100 p 97 cl 4.11.5.1

THUS THE COVER IS O.K. IN BENDING.

DESIGN FOR DEFLECTION:

SABS 0100 P 36 t10:

f1 = 16

SABS 0100 p 37 t 11:

fs = 0.87*2.1/2.8*315/393*1 = 0.52

Mod factor = 1.75 < 2 - O.K.

Min d reqd = Lx/16*1.75 = 19.64 mm < 85 mm -O.K.

THUS THE COVER IS O.K. IN DEFLECTION

DESIGN FOR SHEAR:

SABS 0100 p 48 eq 5:

v = V/bd

V = the largest reaction at the cover = 13.4 KN

N = 19.6 * 1.6 = 31.36 KN

v = 0.68 Mpa < 0.75 fcu

SABS 0100 p 27 cl 4.3.4.1.2:

vc = 0.81 Mpa

vc > v - O.K. in shear

CONCLUSION:

As the lengths in both the lx and ly directions is the same we can use the same steel in both directions. Thus we use 5 Y10 in each direction.

3. DESIGN OF THE BEAM ITSELF:

Assume cover = 15 mm
Assume R10 steel to be used for tension reinforcing

Dimensions: L = 500 mm
b = 100 mm
d = 100 - 15 - 10 = 75mm
fcu = 30 Mpa

BENDING:

SABS 0100 p 24: M = 1.07 * 1.6 = 1.712 Knm

k = 0.156
k = 0.102

Thus only tension reinforcing required.
z = 0.87*d = 65 mm
x = 22mm < 55 mmthus O.K.
As = 121 mm
Min As % = 0.4%thus O.K. SABS 0100 p95
Max As% = 4%thus O.K. SABS 0100 p 97
Use 2*R10 As = 157 mm

THUS THE BEAM WILL BE O.K. IN BENDING

SHEAR:
Assume R 08 links.
v= 13.4 * 1.6 = 21.44 KN

SABS 0100 p 27:
v = V/bd = 2.86 MPa

SABS 0100 p 27 eq 5:
Use 3 * R10 As = 236 mm²
vc = 1.268 Mpa < v thus provide shear reinforcing.

SABS 0100 p 97:
As/sv = 0.002 bt
sv = 250 mm
Thus provide links @ 250 mm c/c

CONCLUSION:

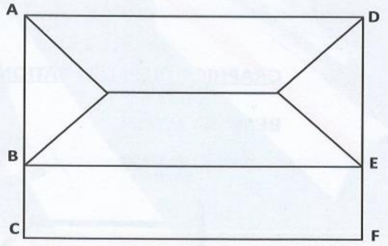
For bending provide 3 * R10 and one R10 carrier bar.
For shear provide links @ 250 mm c/c

STRUCTURAL ANALYSIS

KERBMASTER

1. **STRUCTURAL ANALYSIS:**

LOAD DISTRIBUTION ON THE COVER TO THE BEAM



AD=CF = 550 mm
AB=DE = 350 mm
AC=DF = 600 mm

SABS 0100 p48 fig 10

As the load imposed on the stormwater drain is so pertinent the selfweight of the drain will be ignored. Thus a load of 100 KN will be imposed on a loading area of 0.35*0.6 = 0.21 m^2
The load on the beam A-B is representative of the triangle and given as wlx/3.

A: **ANALYSIS OF THE COVER:**

N: Pointload (KN)
w: Pressure (KN/m)

N = 100 KN — Design parameters
w = 303.03 KN/m^2

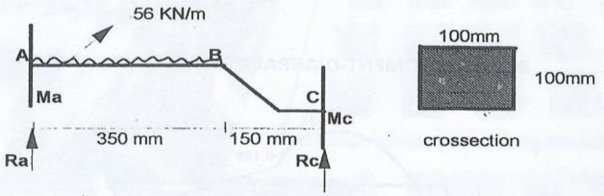
DESIGN THE COVER FOR A PRESSURE OF 303.03 KN/m.

B: **ANALYSIS OF BEAM A-B:**

Load on beam A-B = wlx/3 - see fig 10

lx=0.35 m
W= 476 KN/m^2

Thus load on beam = 56 KN/m



From the anaysis the following results:

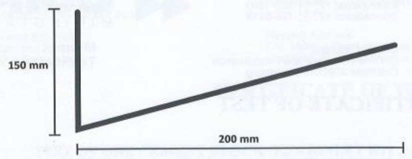
Ra= 13.36 KN
Rc= 6.24 KN

Ma = -1.07 KNm
Mc = 0.76 Knm

THUS DESIGN BEAM A-B FOR
REACTION FORCE: 13.36 KN
BENDING MOMENT: -1.07 Knm

KERB-Master Hydraulics Analysis

C: ANALYSIS OF THE KERB-CHANNEL AT A SLOPE OF 25:



$A = 0.015\ m^2$
$P = 0.4\ m$
$S = 0.466$
$n = 0.012$ (for finished concrete)

$V = ¾\ R\ S½\ /n = 6.37\ m/s$

$Q = A, {*} V = 0.096\ m^3/s$

D: ANALYSIS WITH KERBMASTER AT A SLOPE OF 3%:

$A2 = 01257\ m^2$
$P = 1.637\ m$
$R = 0.0768\ m$
$S = 0.03$
$n = 0.012$ (for finished concrete)

$V = R¾\ S½\ /n = 2.61\ m/s$

$Q = A * V = 0.33\ m^3/s$

Thus the KERBMASTER will be capable of handling the water mass.

E: ANALYSIS WITH THE KERBMASTER AT A SLOPE OF 25:

$A = 01257\ m^2$
$P^2 = 1.637\ m$
$R = 0.0768m$
$n = 0.012$ (finished concrete)
$S = 0.466$

$V = R¾\ S/n = 10.28\ m/s$

$Q = A * V = 1.29\ m^3/s$

Thus the KERBMASTER will also be able to handle this water mass.

F: CONCLUSION:

According to the Manning Equation this stormwater unit will be able to handle the amount of water even with a slope gradient of 25.

Note that this analysis was made with the following in mind:

1. This stormwater unit is part of secondary and tertiary systems which are designed for a storm with a 5-10 year return period.
2. We analysed this using Manning's channelflow concept.
3. We analysed this under ideal circumstances.
4. The water is flowing unhindered.

KERBMASTER HYDRAULIC ANALYSIS:

A: ABBREVIATIONS:

- A1: Cross-sectional area of the channel alongside the kerbing
- A2: Cross-sectional area of the stormwater catchpit
- P: Wetted perimeter
- R: A/P
- Q: Mass waterflow in m^3/s
- V: Velocity of the water mass in m/s
- n: Manning's constant
- S: Slope of the channel

B: INTRODUCTION:

Roads are built with kerbing to allow for the control of stormwater. Stormwater must be removed from the road surface as quickly and effectively as possible. Therefore the concept of channelflow is used to assist the design procedure. For this reason we have also used channelflow to do our hydraulic design.

KERB-MAN

CERTIFICATES OF TESTS

Hoisting Technology and Mechanical Testing Services

CSIR MININGTEK

Telephone: (011) 482-1300
Telefax: (011) 726-6418
Interbet: http://www.csir.co.za

International +27 11 482-1300
International +27 11 726-6418

Private Bag X28
Auckland Park
2006 South Africa

Delivery Address:
Cnr. Menton Road and Frost Avenue
Cottesloe 2092 Johannesburg

Mining Technology

CERTIFICATE OF TEST

TEST OF ONE CEMENT BLOCK (KERBINLET K1) Application Received : 03.08.19

Certificate No. : T06680

C.O.D

Date of Test : 03.08.19

SUBMITTED BY

Messrs Kerbman t/a Kerbman Stormwater Systems cc
P O Box 4995
LUIPAARDSVLEI
1743

INTRODUCTION

At the request of Messrs Kerbman t/a Kerbmaster Stormwater Systems c.c, one cement block (kerbinlet K1) was submitted for testing.

TEST PROCEDURE

Test concerning this Kerbinlet (K1) was done to determine failure point of the support structure. The specimen was installed between the upper and the lower platens of a 8896kN (1000sh ton) Mohr & Federhaff compressive testing machine. A gradually increasing compressive load was then applied to the assembly until failure occurred.

TEST RESULTS

Maximum load carried : 634,98kN

Mode of failure : The structure failed.

Attached is a load deformation graph that was recorded from the machine during test,

COTTESLOE, the 03.08.20

TESTING OFFICER:

ENGINEER:

Hoisting Technology and Mechanical Testing Services

CSIR MININGTEK

Telephone: (011) 482-1300
Telefax: (011) 726-6418
Interbet: http://www.csir.co.za

International +27 11 482-1300
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TESTING OFFICER:

ENGINEER:

This Certificate of Test relates only to the samples or components tested and is issued subject to the conditions of the CSIR. Please see overleaf for Conditions of Issue of Test Certificates

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