

Appendix 5

Drainage Impact Assessment

**S16 Planning Application for
Development of 1 House at TMTL 550, Tuen Mun,
New Territories**

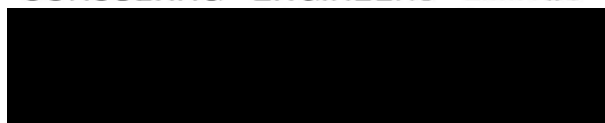
(HT25045)

Drainage Impact Assessment (DIA) Report

July 2025

Prepared & Approved by:	K. C. LEE <i>MICE, MHKIE</i>
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何田顧問工程師有限公司
HO TIN & ASSOCIATES
CONSULTING ENGINEERS LIMITED



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1. Introduction

- 1.1 Ho Tin & Associates Consulting Engineers Limited (HTA) was appointed by the client to prepare a Drainage Impact Assessment (DIA) in support of a S16 Planning Application for changing the land use from recreation into residential use with plot ratio of 0.2 for development of a two storey house at TMTL 550, Tuen Mun, New Territories (the ‘subject site’).
- 1.2 This report presents the DIA for the proposed house development at the subject site.
- 1.3 The objectives of this DIA are to:
- indicate any changes/increase in drainage characteristics due to the proposed development;
 - assess any potential drainage impacts of the existing/planned drainage facilities nearby due to the proposed development; and
 - propose mitigation measures and drainage improvement work, if necessary, to minimize any adverse drainage impact.
- 1.4 The scope of this DIA includes:-
- site description and existing land use;
 - identification of stormwater flow pattern before and after proposed development of the subject site;
 - assessment of impact on the existing drainage facilities due to the proposed development; and
 - proposal of new drainage facilities for the proposed development if found necessary.

2. General Site Description and the Proposed Development

- 2.1 A Site Location Plan is shown in **Figure 1**. The subject site is currently zoned “Recreation” on the Approved Tuen Mun Outline Zoning Plan No. S/TM/41. Its area is about 1,852m². It is located within a parcel of land bounded by Lung Mun Road on the east, Hung Lau on the south, Lung Fu Road on the west and San Shek Wan Road on the north. It is currently a piece of vacant land (please refer to **Figure 2**).

- 2.2 The subject site was previously approved for a holiday camp development and is now proposed to construct a 2-storey house with plot ratio of about 0.2. A Proposed Master Layout Plan is shown in **Figure 3**.

3. Existing Drainage System of the Area

- 3.1 Catchment areas and flow paths of the concerned area is shown in **Figure 4**. The subject site is located at the toe of embankment of Lung Fu Road near the toe of Castle Peak. The subject site would receive surface runoff from the adjacent Catchment A1 and A2 in addition to the rain falling directly onto its area. With respect to the existing topography, total surface runoff of the subject site would flow westward into an existing streamcourse which conveys the surface runoff of the Catchment A3.
- 3.2 A small Catchment A4 is demarcated to identify the stormwater catchment of the proposed access linking between the subject site and San Shek Wan Road.

4. Potential Drainage Impact

- 4.1 Since the subject site would be converted from a campsite into a residential area, the runoff coefficient of the subject site area will then be changed from 0.25 (conservatively a flat grassland (heavy soil) condition is presumed, and for other areas 0.35 is adopted) to 0.95 (for concrete). The subject site discharges and will continue to discharge stormwater into the same location of the existing watercourse in the vicinity at its west side. The flow patterns and the catchment boundaries of the subject area would remain unchanged. Therefore, the increase in surface runoff at the existing watercourse in the vicinity at the west side of the subject site would be solely due to the change in the runoff coefficient of the subject site area after the proposed development.

- 4.2 Referring to the attached **Figure 4**, total catchment area (excluding the subject site) of the existing watercourse at the point of discharge of the subject site

$$= (150,515 + 722 + 6,203) \text{ m}^2 = 157,440 \text{ m}^2$$

$$\text{The subject site area} = 1,852 \text{ m}^2$$

$$\text{Increase in runoff coefficient of the subject site, } C = 0.95 - 0.25 = 0.70$$

Since $Q = 0.278 \times C \times i \times A$, increase in quantity of surface runoff solely due to change in C in all design periods = $[0.70 \times 1,852 / (0.25 \times 1,852 + 0.35 \times 157,440)] \times 100\% = 2.33\%$ which is insignificant.

- 4.3 Detailed calculation for assessment of drainage impact on the existing drainage facilities and streamcourse due to additional runoff generated from the development is shown in the lower part of the **Appendix**. The calculation illustrates that the existing drainage facilities and streamcourse at the downstream of the subject site are capable to collect additional runoff generated from the development without causing any unacceptable drainage impact.
- 4.4 Therefore, it is considered that the proposed development would not cause any unacceptable adverse drainage effects upon the subject area and its surroundings.

5. Proposed Drainage Works

- 5.1 The proposed finished ground levels of the subject development are close to the existing site levels such that no substantial ground levelling nor site formation works would be required. Ground surfaces of the subject site would be generally paved.
- 5.2 Existing flow paths of the catchments in the concerned area would be maintained in general. Surface runoff from the Catchment A1 and A2 flowing onto the subject site would be intercepted by peripheral channels at the subject site boundary. Total surface runoff received from the subject site would be conveyed to a discharge point at the existing streamcourse to the west.
- 5.3 In order to properly manage surface runoff of the subject site, peripheral U-channels with catchpit at corner will be constructed along the subject site boundary. The flows inside the channels will be discharged into a proposed terminal manhole TM with desilting trap located near the western corner of the subject site near the existing streamcourse. A Stormwater Drainage Layout Plan is shown in **Figure 5**. Proposed Outfall Details at the existing watercourse is shown in **Figure 6**.
- 5.4 All surface runoff collected within the subject site would be conveyed to the proposed terminal manhole and from which the collected flow would be discharged into the adjacent existing streamcourse. It should not have implementation problems on construction works and the operation of the drainage.
- 5.5 300mm U-channel is proposed along the western side of the proposed external access to receive surface runoff from the access itself as well as the adjacent area. The channel would discharge into an existing 375mm U-channel abutting on the edge of San Shek Wan Road. It has to notice that because of the existing topography, flows from the same area of the external access road would inevitably flow into the existing 375mm U-channel at

present, hence there would be no change in drainage pattern of the concerned area after the completion of the proposed access road (please refer to the photo below).



- 5.6 There is no change in the drainage paths of the area of the external access, i.e. the concerned existing 375mm U-channel has been conveying surface runoff from the same area of the access road, except an U-channel will be provided along the access road to properly manage the surface runoff after the subject development. Hence, it also should not have implementation problems on construction works and the operation of the drainage. Besides, the subject proposed development including the external access road would be subject to Buildings Ordinance. Drainage and road drainage plan of the subject proposed development shall be submitted to all relevant government departments via the Buildings Department's central processing mechanism for approval at the later detail design stage.
- 5.7 Details of proposed drainage provisions shall follow relevant details shown in Government departments' Standard Drawings as follows:

Proposed Drainage Provisions	Standard Drawings	Drawing No. & Title
Terminal manhole with trap	DSD Standard Drawings	DS 1091A - Terminal Manhole Type T2_1
Catchpit	CEDD Standard Drawings	C 2405/1 to /5 – Standard Catchpit Details
U-channel		C2409J – Details of Half-round and U-channels
Channel cover / grating		C2412E – Cover Slab and Cast Iron Grating for Channels

6. Hydraulic Calculation

6.1 Assessment criteria is based on the recommendation set out in the Stormwater Drainage Manual (Fifth edition, Jan 2018) (SDM) and its Corrigendum No. 1/2022, 1/2024 and 2/2024 issued by DSD. Design Return Period of 50 years (recommended for ‘Main Rural Catchment Drainage Channel’ in SDM) is adopted.

6.2 The corresponding runoffs under rainfall intensity for various return period are worked out with reference to Rational Method. Brandy-Williams method is used in calculation of the time of concentration. A uniformly distributed rainfall with an intensity is determined by the Intensity-Duration-Frequency. With referenced to Table 3a - Storm Constants for different return periods of HKO Headquarters from SDM, the rainfall profiles are derived based on the following equation:

$$i = \frac{a}{(t + b)^c}$$

where i = mean rainfall intensity (mm/hr)
 t = duration time of concentration (min)
 a, b and c = storm constants given in Table below

Table : Storm Constants

Return Period (years)	50
a	505.5
b	3.29
c	0.355

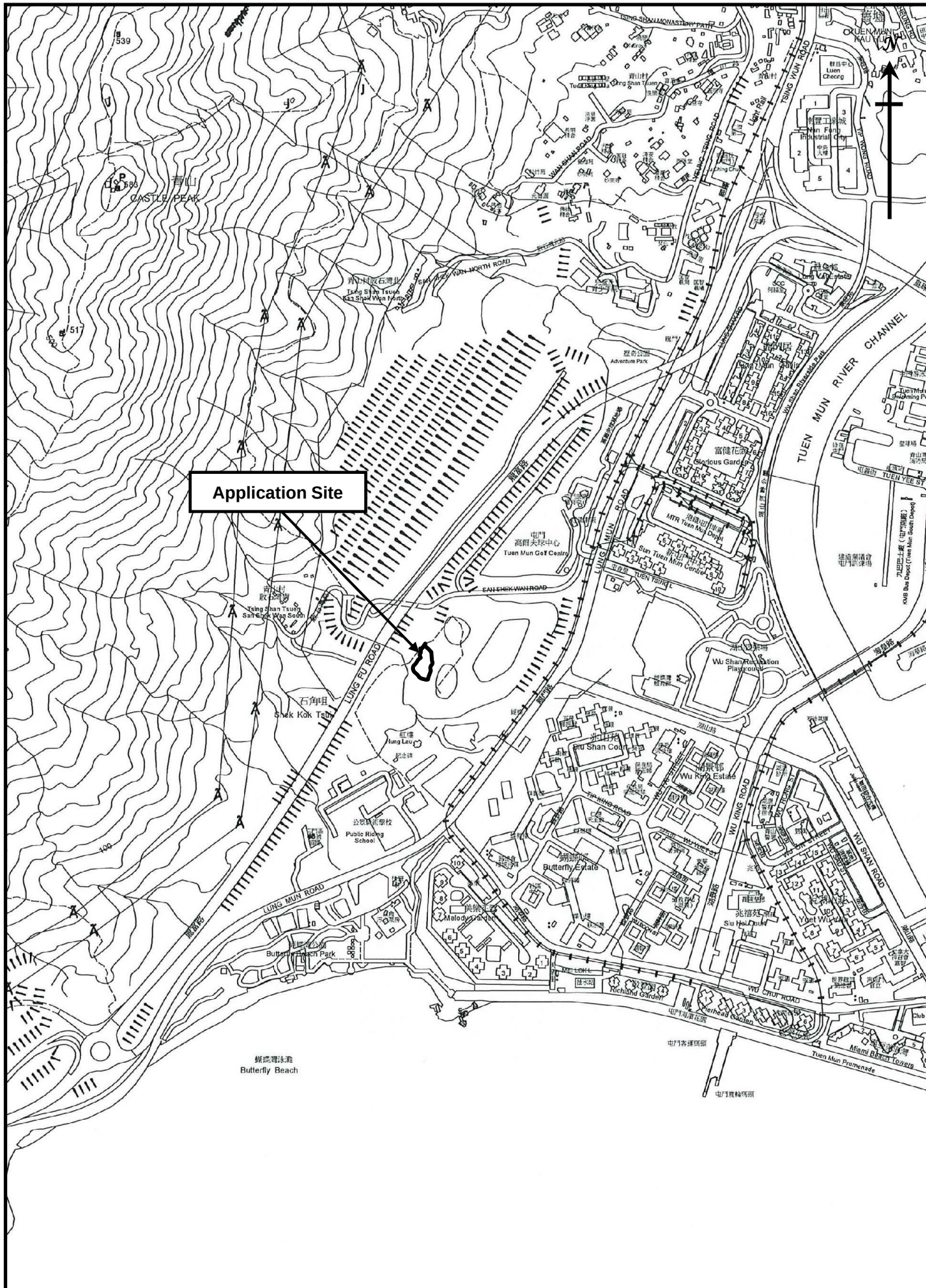
A 16.0% rainfall increase is adopted in the hydraulic calculation to cater for effects due to climate change in accordance with the table 28 with projection to End of 21st Century as stipulated in the item (e) and (k) of the SDM - Corrigendum No. 1/2022. Besides, taking into consideration of design allowance in End of 21st Century, a further 12.1% rainfall increase is incorporated into the hydraulic assessment.

6.3 Hydraulic assessment is enclosed in the **Appendix**. 10% reduction in flow area has been incorporated to cater for potential deposition of sediment in stormwater channels and pipes as recommended in the SDM. The proposed channels and underground drainage are designed to cater for the estimated runoff under the designed rainstorms. With respect to the calculation, the proposed stormwater drainage system is capable to cater for the surface runoff without causing any adverse drainage impacts on the subject site and its surroundings.

- 6.4 Since all drainage would have sufficient spare capacity, no water backup will occur at the upstream under rainstorms of 50-year (or lower) return periods.

7. Conclusion

- 7.1 The subject site was previously approved for a holiday camp development and is now proposed to erect a 2-storey house with plot ratio of about 0.2. Only minor land levelling works would be required at the subject site.
- 7.2 Existing flow paths of the adjacent upstream areas of the subject site, i.e. Catchment A1, A2, A3 and A4, would be maintained in general. The subject site therefore would not cause any blockage to the flows of its adjacent areas.
- 7.3 Peripheral U-channels will be constructed along the subject site boundary to receive surface runoff from the adjacent areas in addition to avoid surface runoff running outside onto the surroundings. The flow inside the channels will be discharged via a purportedly constructed terminal manhole into the existing streamcourse. The existing streamcourse is checked to have sufficient capacity to convey the total flow of the concerned areas.
- 7.4 In addition, proposed U-channels will also be constructed to receive surface runoff on the proposed access road and the collected surface runoff will be properly conveyed to the existing 375mm U-channel abutting on the edge of San Shek Wan Road instead of uncontrolled overland flow toward the same existing 375mm U-channel as present.
- 7.5 In conclusion, the subject proposed development would not cause any adverse drainage impact onto the area.



Location Plan

(Extract of Survey Sheet Nos. 5-SE & 6-SW)

Figure 1

1:10000



羅迅測計師行

Lawson David & Sung

SURVEYORS LIMITED

Property Consultants • Planning • Valuers • Auctioneers
Estate Agency Licence No. C-006328

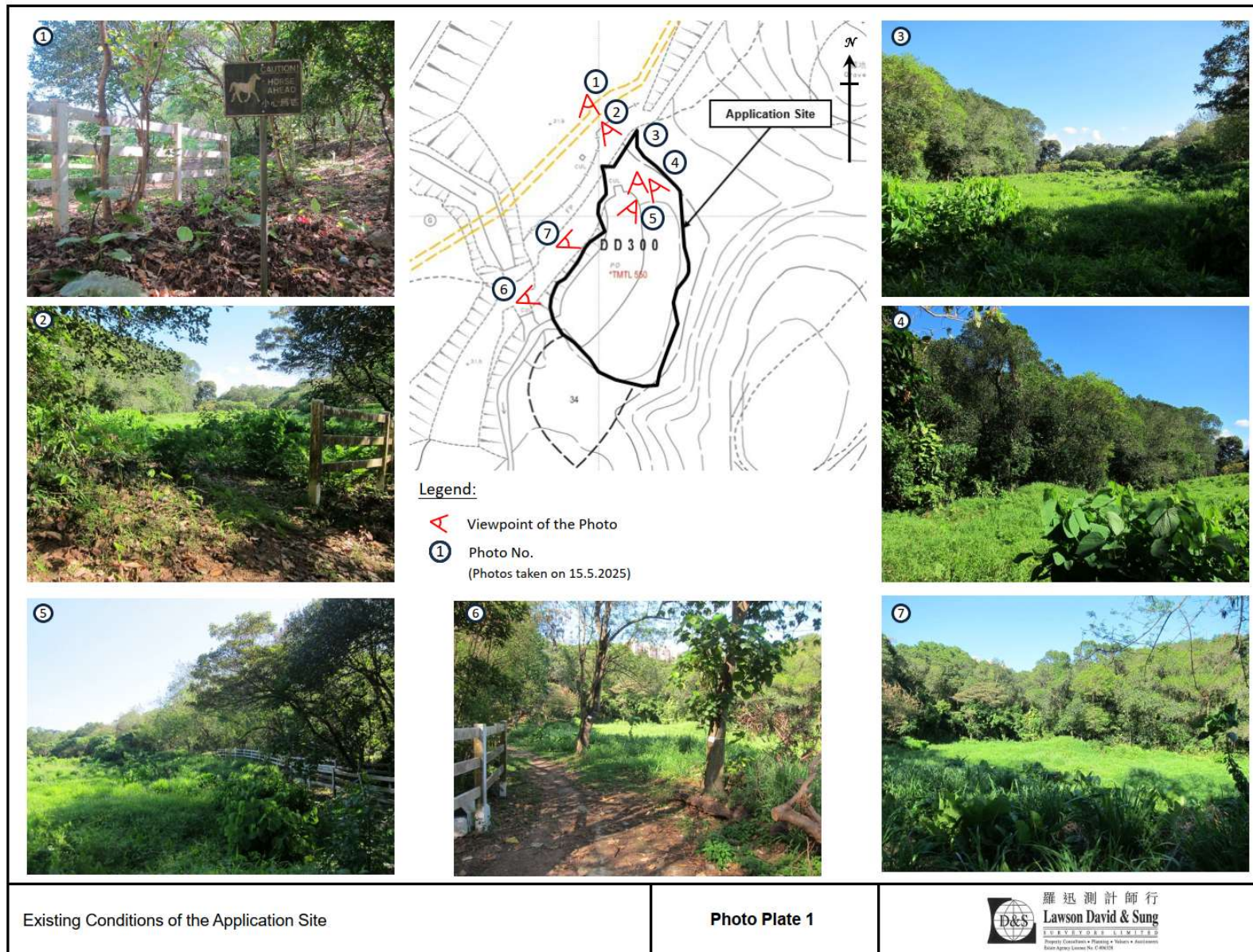


Figure 2 – Conditions of the Application Site on 15 May 2025



LEGEND:

----- SUBJECT SITE BOUNDARY

----- CATCHMENT BOUNDARY

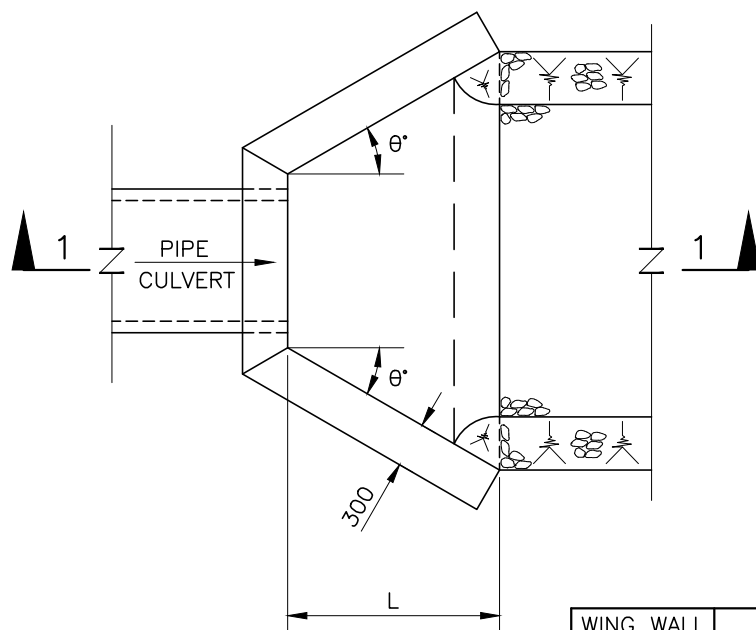
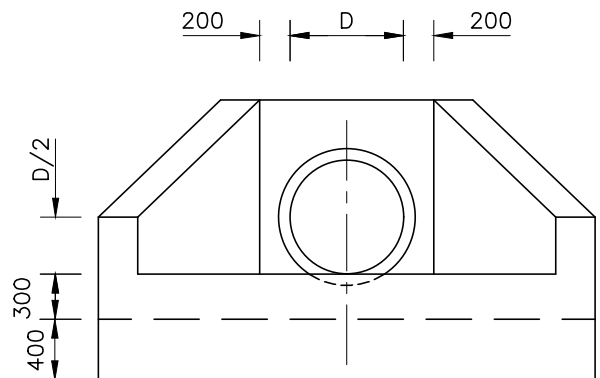
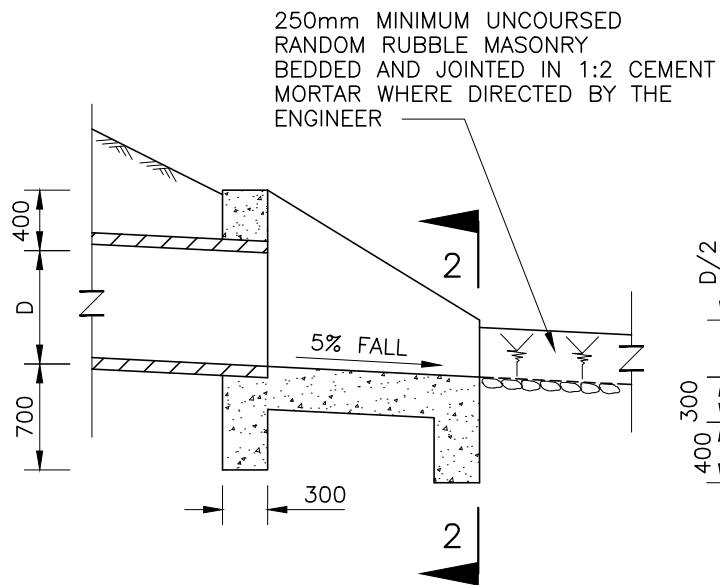
PROJECT
S16 PLANNING APPLICATION FOR
TML 550, TUEN MUN, N.T.

TITLE
EXISTING DRAINAGE FLOW PATHS
AND CATCHMENT AREAS

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SCALE
1 : 4000 - A3

DRAWING No.
FIGURE 4



NOTES :

1. CONCRETE : GRADE 30D/20

WING WALL FLARE θ°	DIAMETER OF PIPE CULVERT D			
	450-750	900-1200	1350-1650	1800-1950
	L			
0°	1800	2400	3000	3600
30°	1400	1800	2300	2700
45°	1200	1500	1900	2300

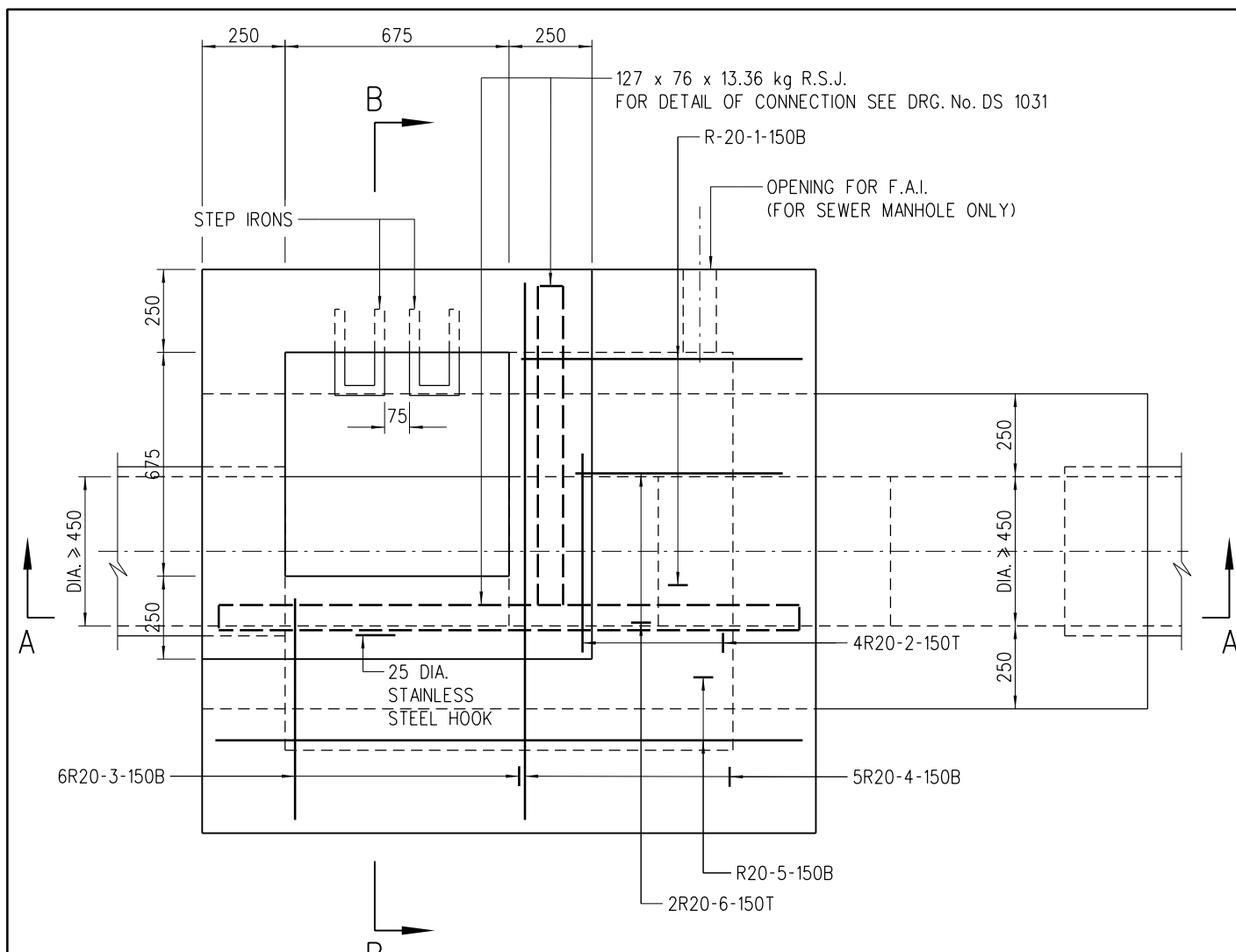
PROJECT
S16 PLANNING APPLICATION FOR
TMTL 550, TUEN MUN, N.T.

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HO TIN & ASSOCIATES
CONSULTING ENGINEERS LIMITED

TITLE
OUTFALL DETAILS

SCALE
N. T. S.

DRAWING No.
FIGURE 6



NOTES:

- ALL DIMENSIONS ARE IN MILLIMETRES.
- NOTATION OF : THE SEQUENCE OF DESCRIPTION OF IDENTIFICATION MARKS ON DRAWINGS FOR STEEL REINFORCING BARS REINFORCEMENT FOR CONCRETE WORK IS AS FOLLOWS (NUMBER, TYPE, SIZE, MARK, SPACING, LOCATION OR COMMENT)
- B DENOTES GRADE 500B RIBBED REINFORCEMENT.
- R DENOTES GRADE 250 PLAIN REINFORCEMENT.
- PIPE DIAMETER : EQUAL OR GREATER THAN 450 mm
- NORMAL RANGE : 1750 TO 4250 mm (MEASURED FROM ROAD LEVEL TO LOWEST INVERT)
OF DEPTH
- USED IN : STORMWATER DRAIN AND SEWER
- JUNCTION : POSITION OF JUNCTION TO BE DETERMINED IN EACH INDIVIDUAL CASE. CHANNELS IMMEDIATELY UNDER ACCESS TO MANHOLE SHOULD BE AVOIDED.
- TOP TREATMENT : SEE DRAWING No. DS 1032
- STEP IRON : SEE DRAWING No. DS 1043
- FOUNDATION : FOUNDATION OF MANHOLE VARIES WITH SITE CONDITION. THEREFORE, IT SHOULD BE DETERMINED ON SITE BY THE ENGINEER.
- CONCRETE MIX : GRADE 30/20
- DIAMETER OF F.A.I. NORMALLY 100 mm
- MINIMUM COVER AT END OF BARS 40 mm
- COVER AND FRAME NOT SHOWN ON PLAN FOR CLARITY.
- RECESS WITH SQUARE STEEL ROD SHALL BE PROVIDED AT TOP OF MANHOLE CHAMBER FOR INSTALLING MONITORING DEVICE(S).
DETAILS REFER TO DSD STANDARD DRAWING NO. DS 1099.

PLAN

A	NOTE 16 ADDED	ORIGINAL SIGNED	2.8.2022
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016
REV.	DESCRIPTION	SIGNATURE	DATE

TERMINAL MANHOLE TYPE T2_1

DRAINAGE SERVICES DEPARTMENT

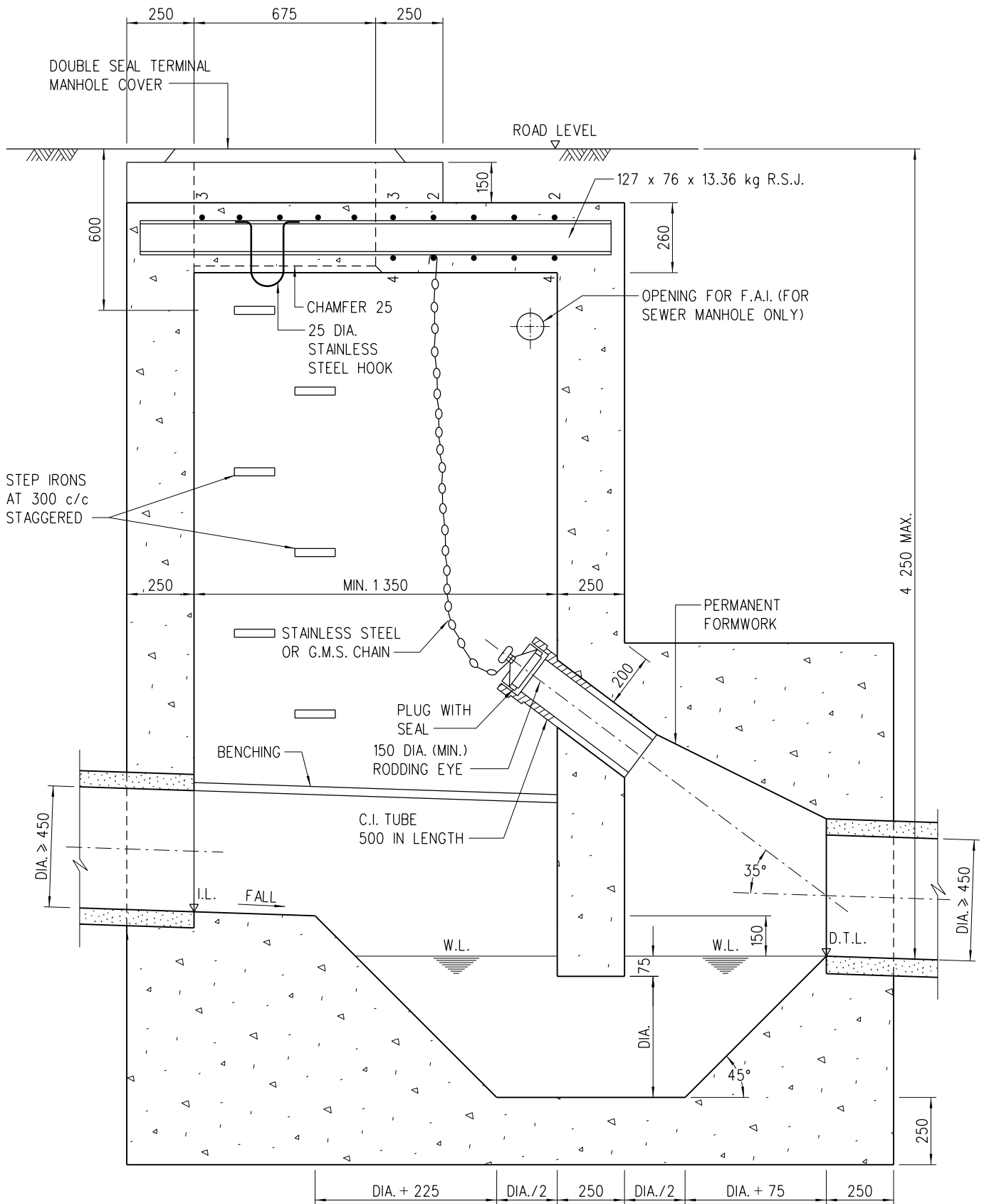
REFERENCE

DRAWING No.

SCALE

1 : 20

DS 1091A
(SHEET 1 OF 3)



SECTION A-A

A	NOTE 16 ADDED	ORIGINAL SIGNED	2.8.2022
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016
REV.	DESCRIPTION	SIGNATURE	DATE

TERMINAL MANHOLE
TYPE T2_1

DRAINAGE SERVICES DEPARTMENT

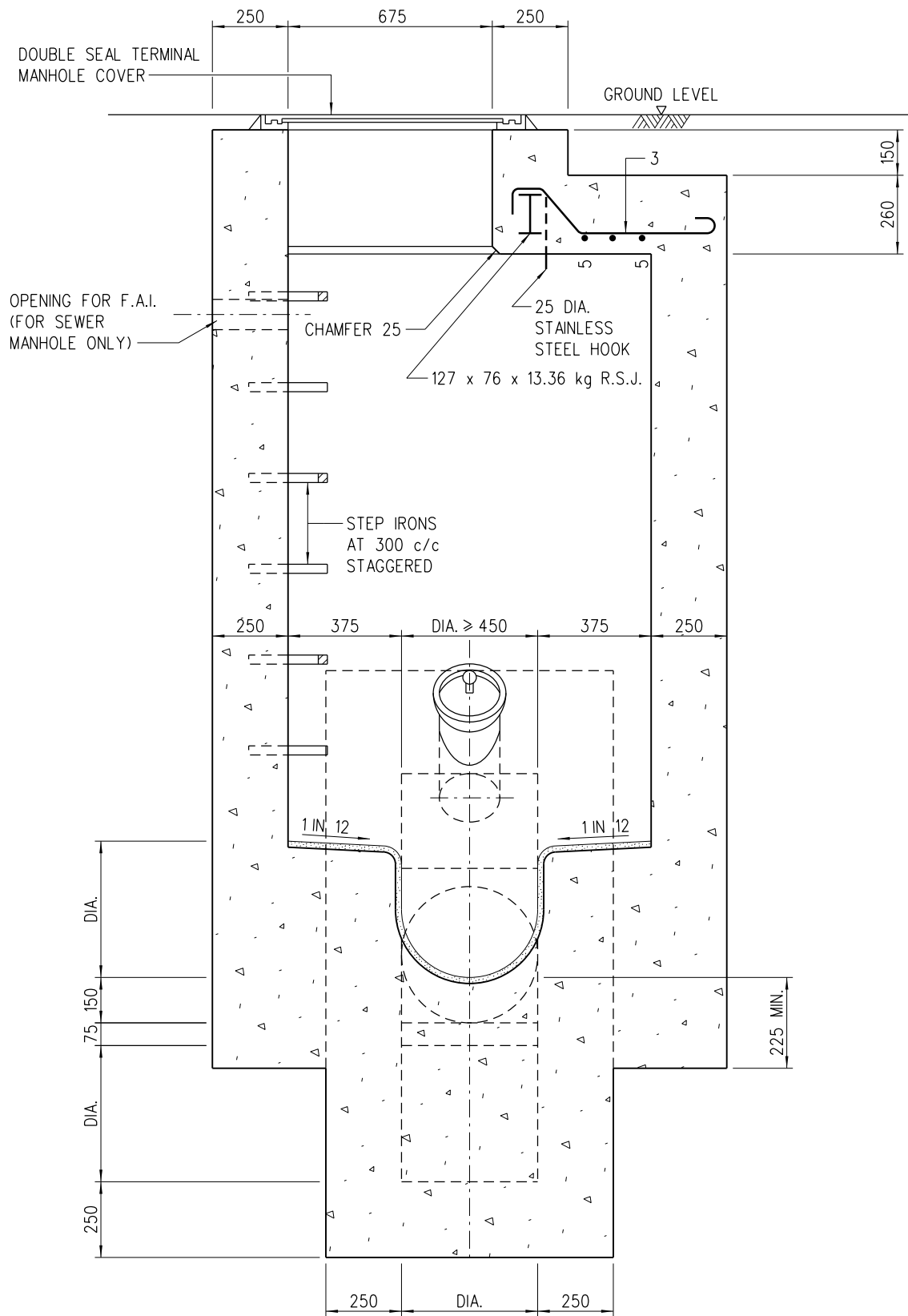
REFERENCE

DRAWING No.

SCALE

1 : 20

DS 1091A
(SHEET 2 OF 3)



SECTION B-B

A	NOTE 16 ADDED	ORIGINAL SIGNED	2.8.2022
	NEW ISSUE	ORIGINAL SIGNED	13.1.2016
REV.	DESCRIPTION	SIGNATURE	DATE

**TERMINAL MANHOLE
TYPE T2_1**

DRAINAGE SERVICES DEPARTMENT

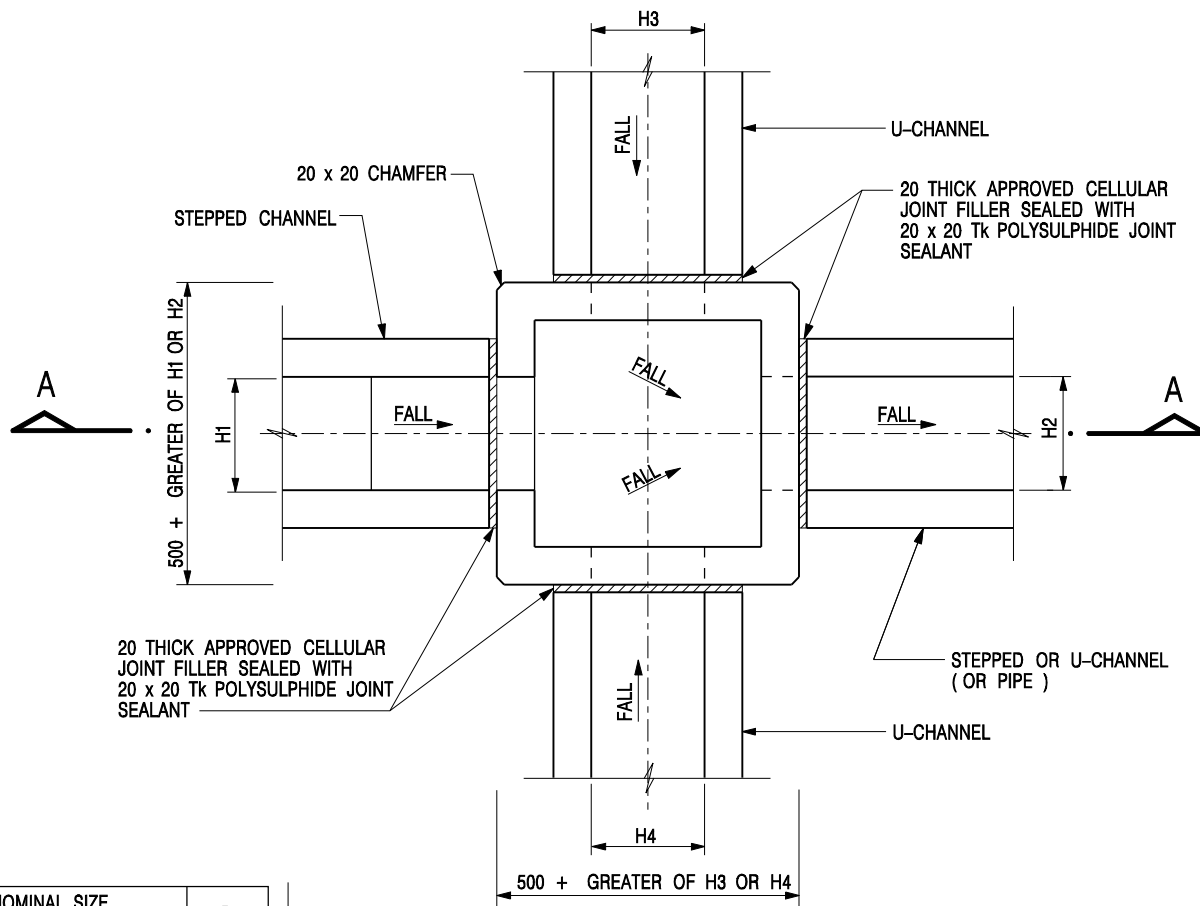
REFERENCE

DRAWING No.

SCALE

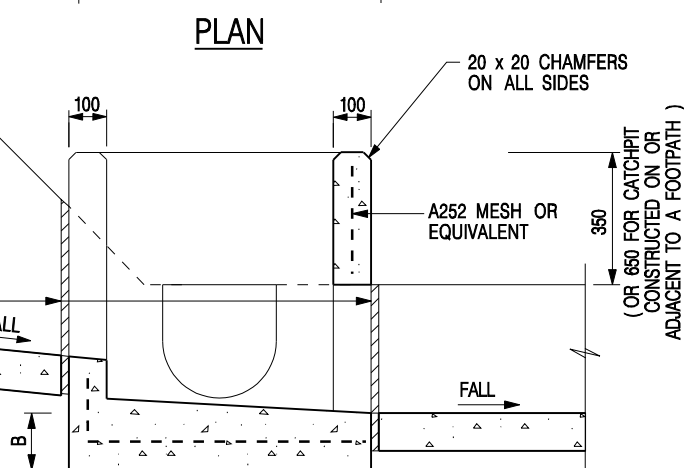
1 : 20

DS 1091A
(SHEET 3 OF 3)



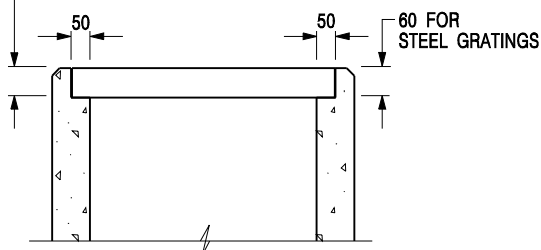
NOMINAL SIZE (LARGEST OF H1, H2, H3 & H4)	B
300 - 600	150
675 - 900	175

20 THICK APPROVED CELLULAR JOINT FILLER SEALED WITH 20 x 20 Tk POLYSULPHIDE JOINT SEALANT



SECTION A - A

DEPTH OF RECESS AND DETAILS OF PRECAST CONCRETE COVERS (SEE STD. DRG. NO. C2407)



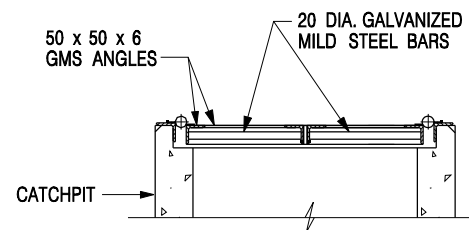
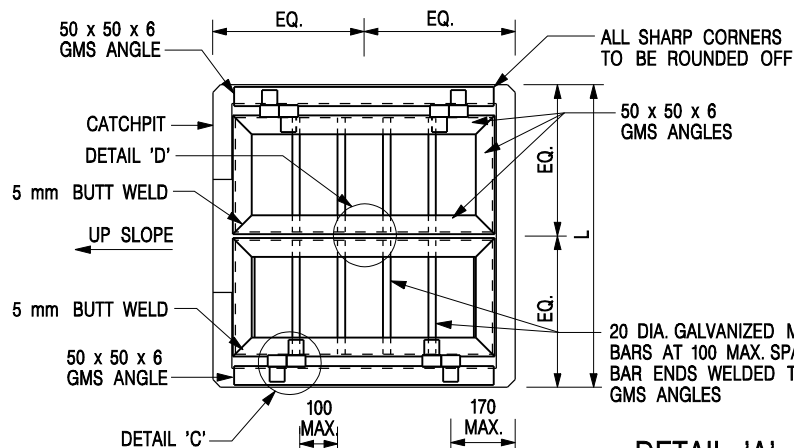
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. REFER TO SHEET 5 FOR OTHER NOTES.

ALTERNATIVE TOP SECTION FOR PRECAST CONCRETE COVERS / GRATINGS

STANDARD CATCHPIT DETAILS (SHEET 1 OF 5)

-	FORMER DRG. NO. C2405J.	Original Signed	03.2015
REF.	REVISION	SIGNATURE	DATE
 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT			
SCALE 1 : 20		DRAWING NO. C2405 /1	
DATE JAN 1991			

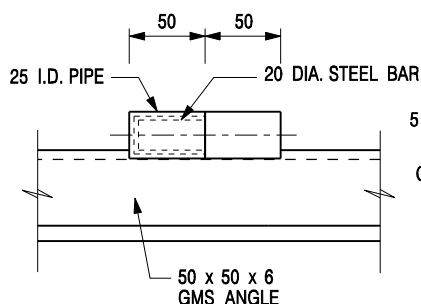


SECTIONAL ELEVATION

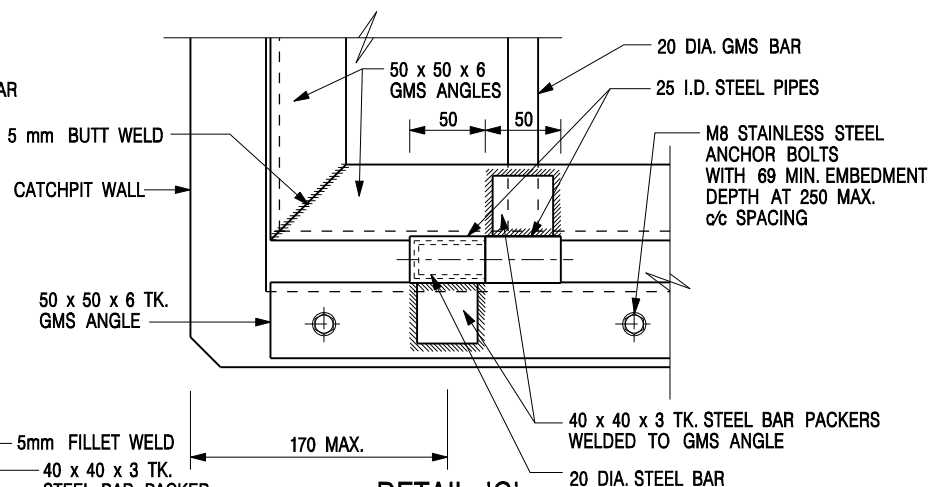
DETAIL 'A'

(DETAILS OF DOUBLE SIDE OPENING STEEL GRATING FOR L > 900mm)

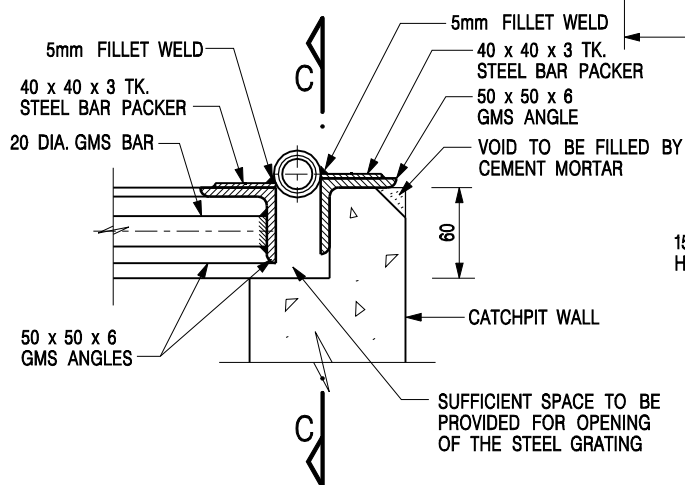
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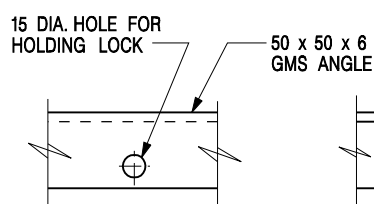
SECTION C - C



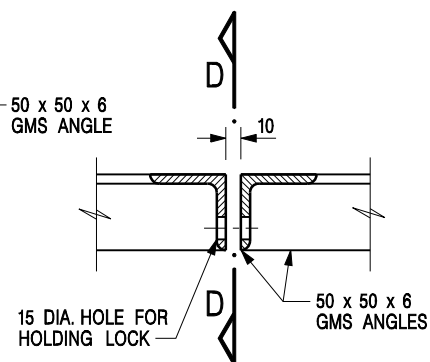
DETAIL 'C'
(DETAILS OF HINGE)
SCALE 1 : 5



SECTIONAL ELEVATION
(DETAIL 'C')



SECTION D - D



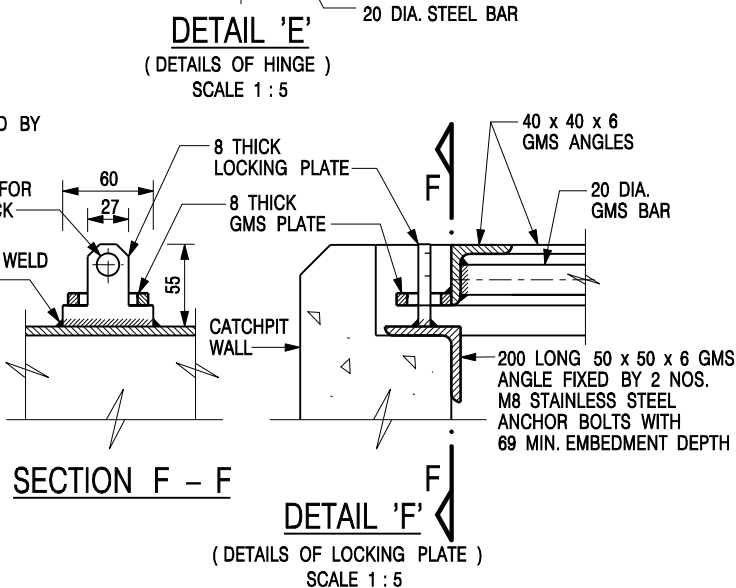
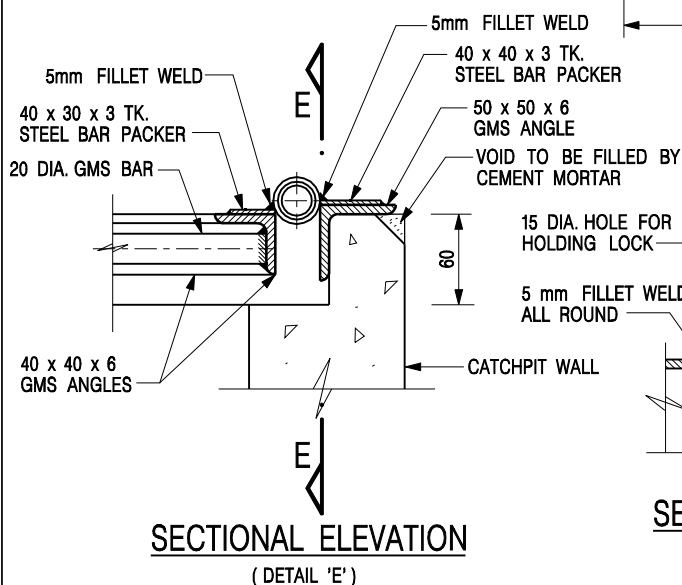
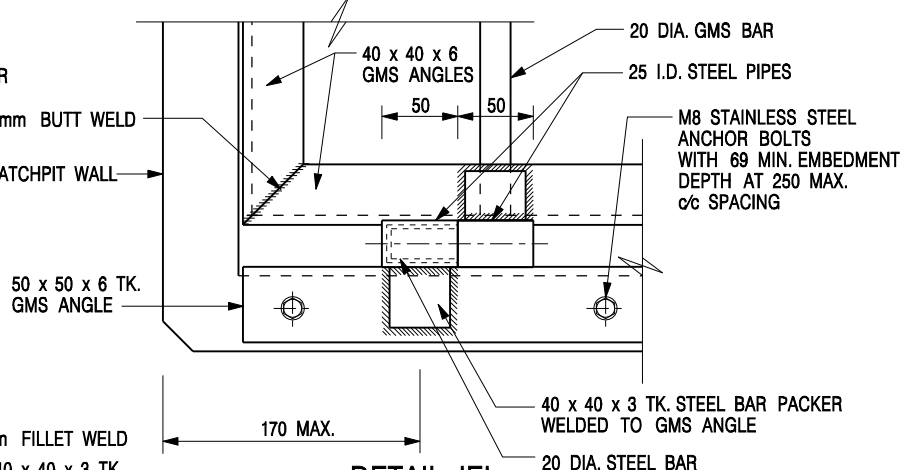
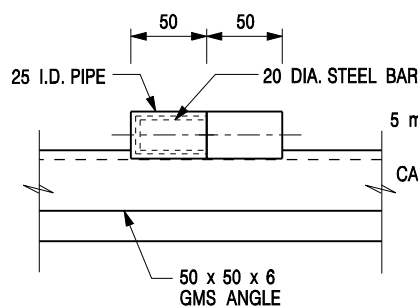
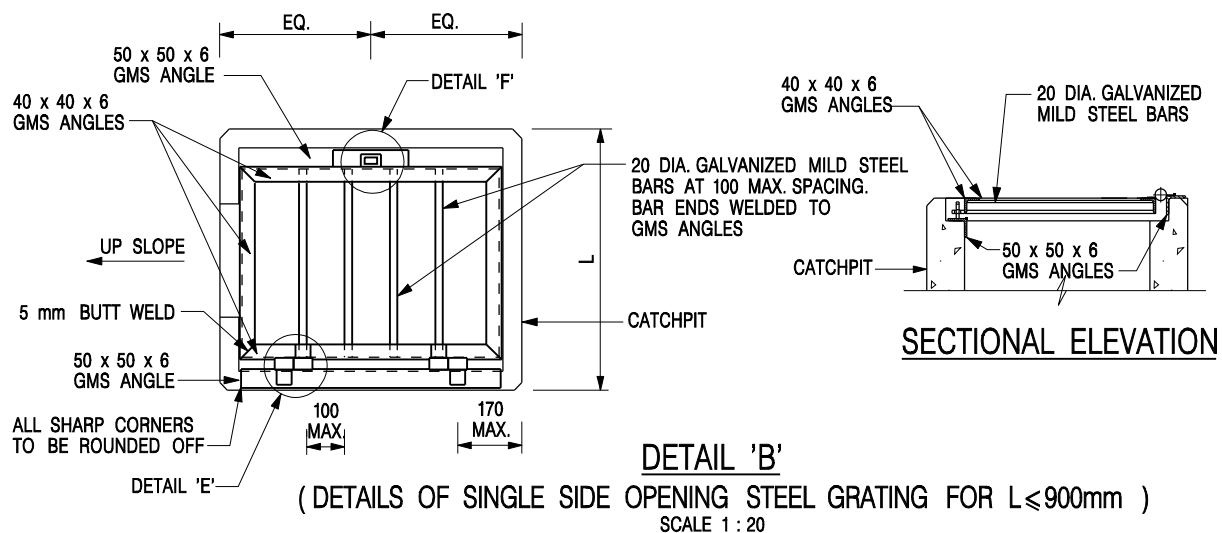
DETAIL 'D'
(DETAILS OF HOLE FOR LOCK)
SCALE 1 : 5

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. REFER TO SHEET 5 FOR OTHER NOTES.

STANDARD CATCHPIT DETAILS
(SHEET 2 OF 5)

-	FORMER DRG. NO. C2405J.	Original Signed	03.2015
REF.	REVISION	SIGNATURE	DATE
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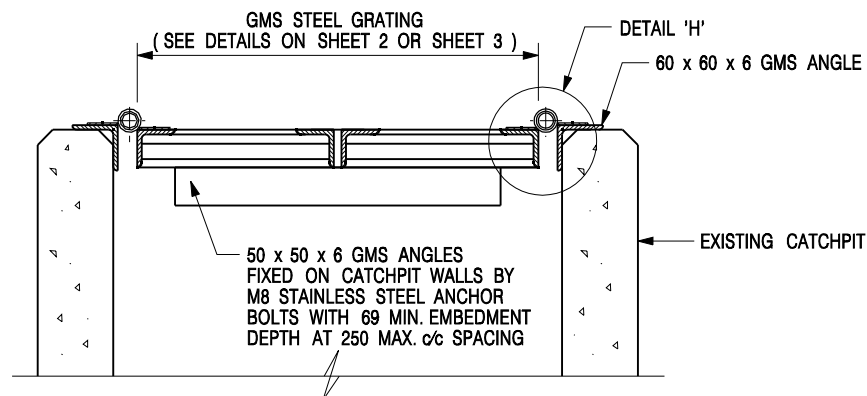


NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. REFER TO SHEET 5 FOR OTHER NOTES.

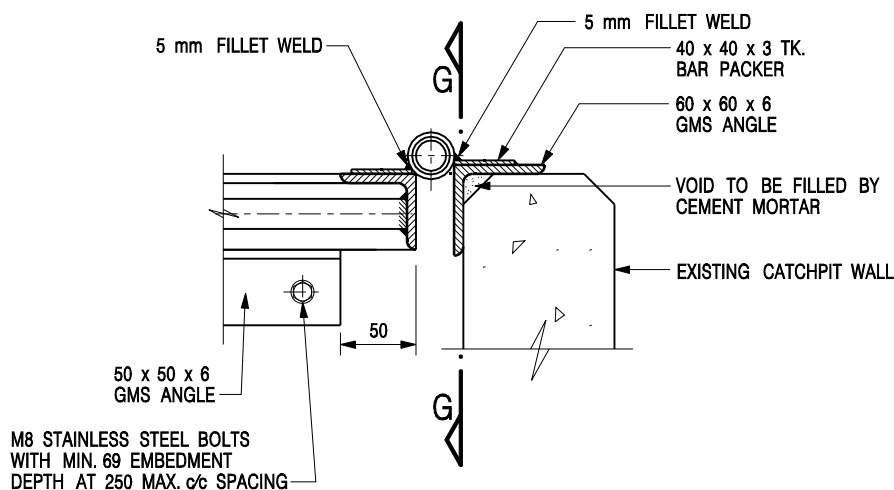
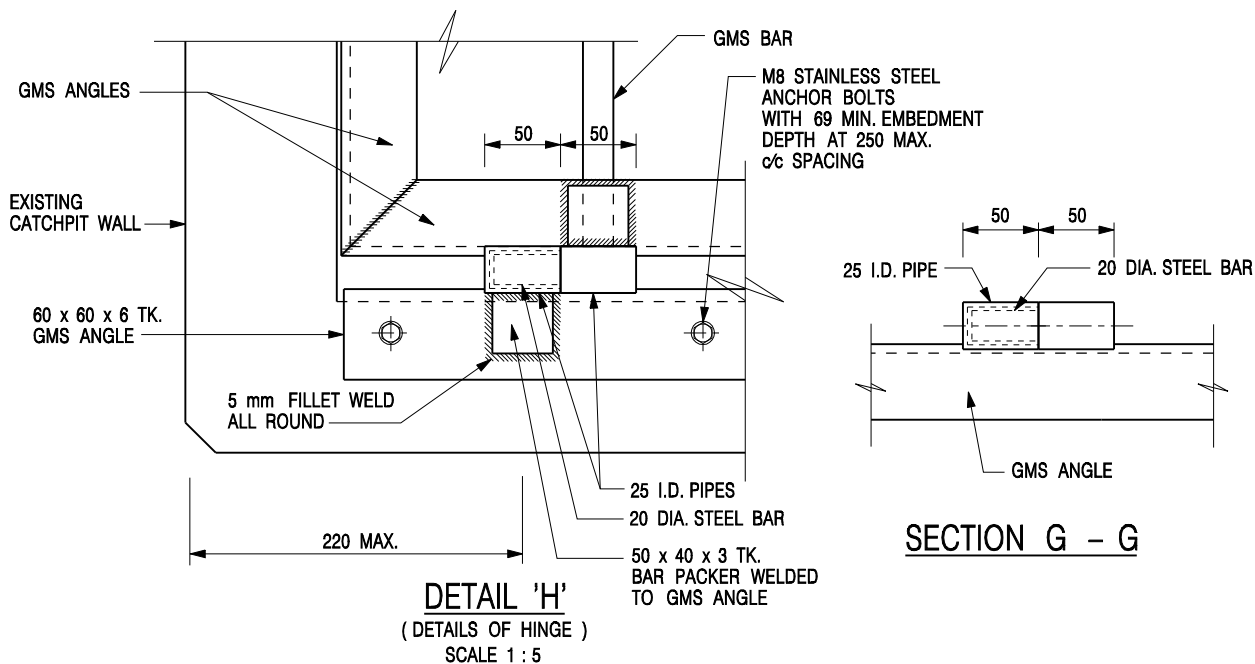
STANDARD CATCHPIT DETAILS
(SHEET 3 OF 5)

-	FORMER DRG. NO. C2405J.	Original Signed	03.2015
REF.	REVISION	SIGNATURE	DATE
 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT		SCALE AS SHOWN DATE JAN 1991	
		DRAWING NO. C2405 /3	



DETAIL 'G' - DETAILS OF STEEL GRATING CONSTRUCTED ON EXISTING CATCHPIT

SCALE 1 : 10



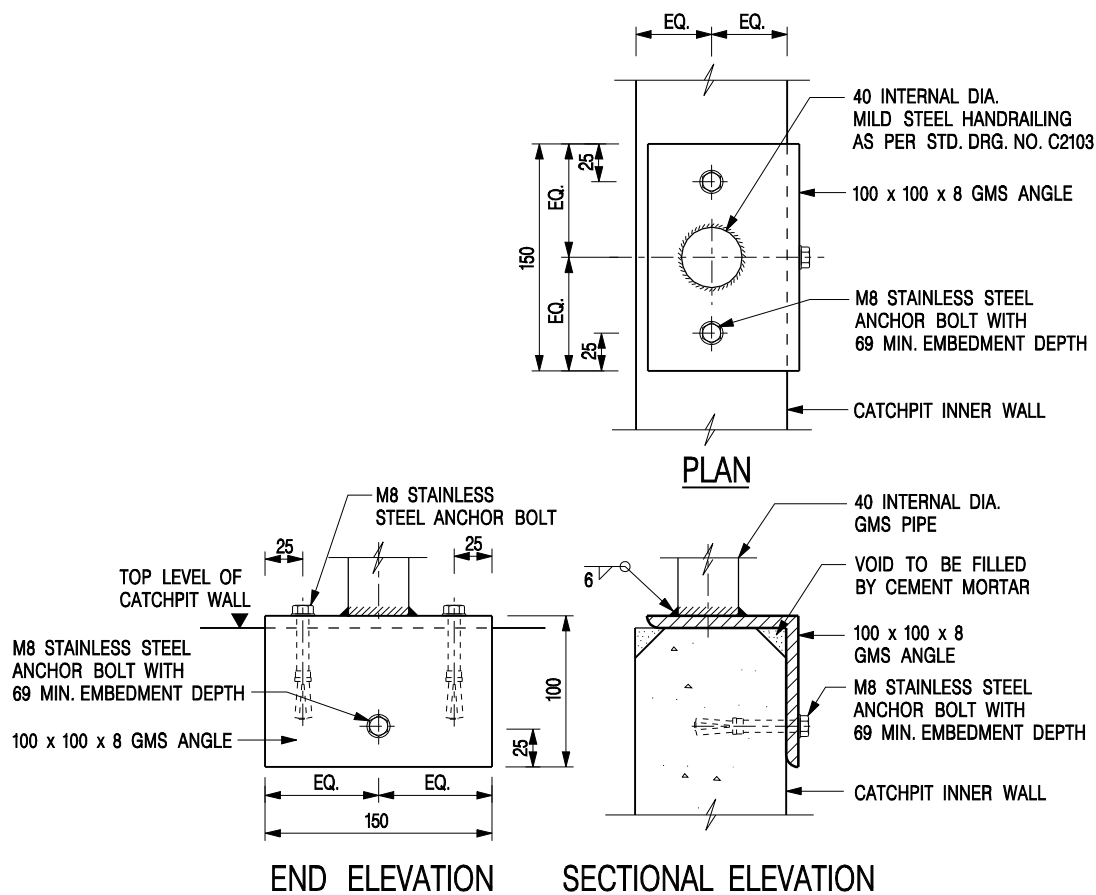
SECTIONAL ELEVATION (DETAIL 'H')

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. REFER TO SHEET 5 FOR OTHER NOTES.

STANDARD CATCHPIT DETAILS
(SHEET 4 OF 5)

-	FORMER DRG. NO. C2405J.	Original Signed	03.2015
REF.	REVISION	SIGNATURE	DATE
 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT			
SCALE AS SHOWN		DRAWING NO. C2405 /4	
DATE JAN 1991			



DETAIL 'J' – FIXING DETAILS FOR HANDRAILING ON TOP OF CATCHPIT WALL

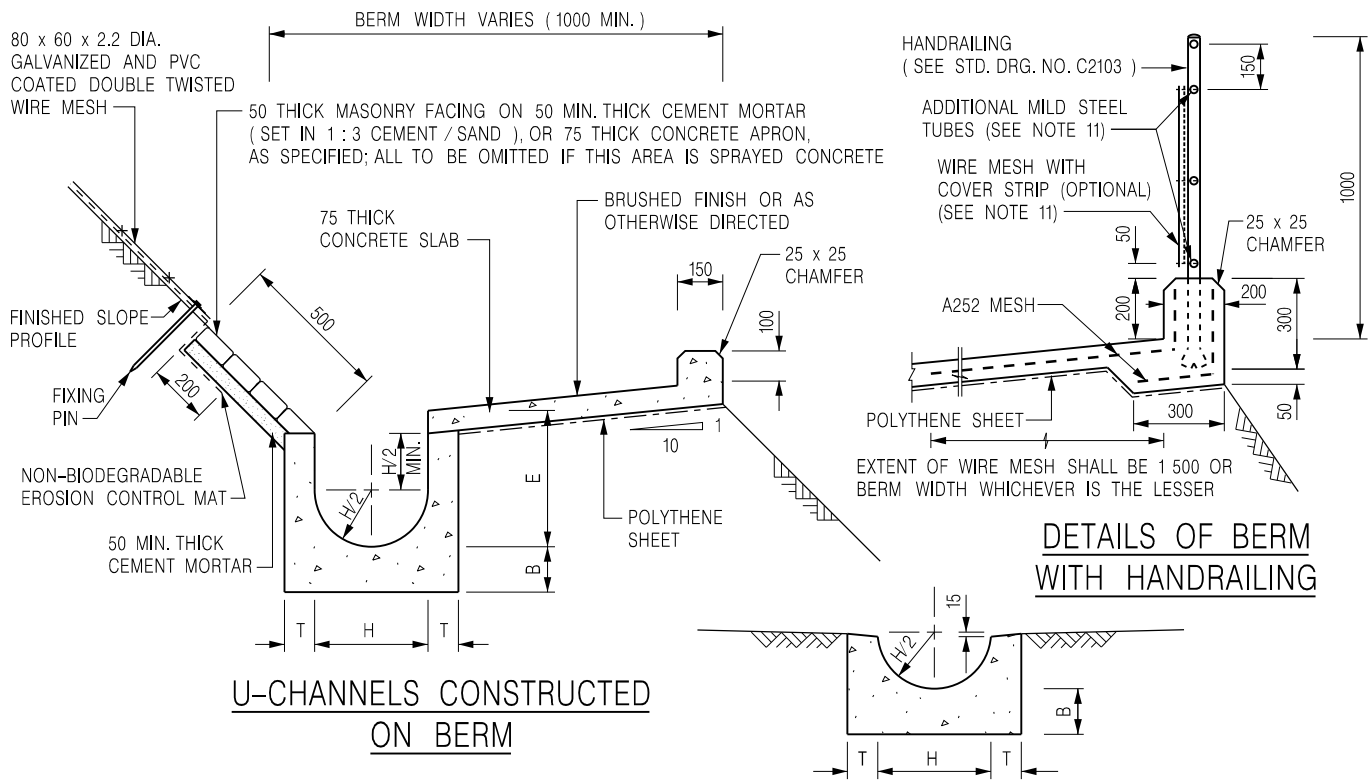
SCALE 1 : 5

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETRES.
- ALL CONCRETE SHALL BE GRADE 20 /20.
- CONCRETE SURFACE FINISH SHALL BE CLASS U2 OR F2 AS APPROPRIATE.
- FOR DETAILS OF JOINT, REFER TO STD. DRG. NO. C2413.
- CONCRETE TO BE COLOURED AS SPECIFIED.
- FOR CATCHPITS CONSTRUCTED ON OR ADJACENT TO A FOOTPATH, STEEL GRATINGS (SEE DETAILS ON SHEET 2 OR SHEET 3) OR CONCRETE COVERS (SEE STD. DRG. NO. C2407) SHALL BE PROVIDED AS DIRECTED BY THE ENGINEER.
- IF INSTRUCTED BY THE ENGINEER, HANDRAILING (SEE DETAIL 'J' ON SHEET 5; EXCEPT ON THE UPSLOPE SIDE) IN LIEU OF STEEL GRATINGS OR CONCRETE COVERS CAN BE ACCEPTED AS AN ALTERNATIVE SAFETY MEASURE FOR CATCHPITS NOT ON A FOOTPATH NOR ADJACENT TO IT. TOP OF THE HANDRAILING SHALL BE 1 000 mm MIN. MEASURED FROM THE ADJACENT GROUND LEVEL.
- MINIMUM INTERNAL CATCHPIT WIDTH SHALL BE 1 000 mm FOR CATCHPITS WITH A HEIGHT EXCEEDING 1 000 mm MEASURED FROM THE INVERT LEVEL TO THE ADJACENT GROUND LEVEL. AND, STEP IRONS (SEE DSD STD. DRG. NO. DS1043) AT 300 mm c/c STAGGERED SHALL BE PROVIDED. THICKNESS OF CATCHPIT WALL FOR INSTALLATION OF STEP IRONS SHALL BE INCREASED TO 150 mm.
- FOR RETROFITTING AN EXISTING CATCHPIT WITH STEEL GRATING, SEE DETAIL 'G' ON SHEET 4.
- ALL STEEL ANGLES SHALL COMPLY WITH BS EN 10025 AND BS EN 10056.
- UNLESS OTHERWISE SPECIFIED, ALL WELDS SHALL BE 5 mm CONTINUOUS FILLET WELDS.
- ALL WELDS SHALL BE CHIPPED, GROUND SMOOTH, BRUSHED TO REMOVE SLAG PRIOR TO HOT-DIP GALVANIZATION.
- ALL STEELWORK SHALL BE HOT-DIP GALVANIZED TO BS EN ISO 1461. ALL EXPOSED STEELWORK SURFACES SHALL BE TREATED AND PAINTED IN ACCORDANCE WITH THE GENERAL SPECIFICATION.
- SUBJECT TO THE APPROVAL OF THE ENGINEER, OTHER MATERIALS CAN ALSO BE USED AS COVERS / GRATINGS.

STANDARD CATCHPIT DETAILS
(SHEET 5 OF 5)

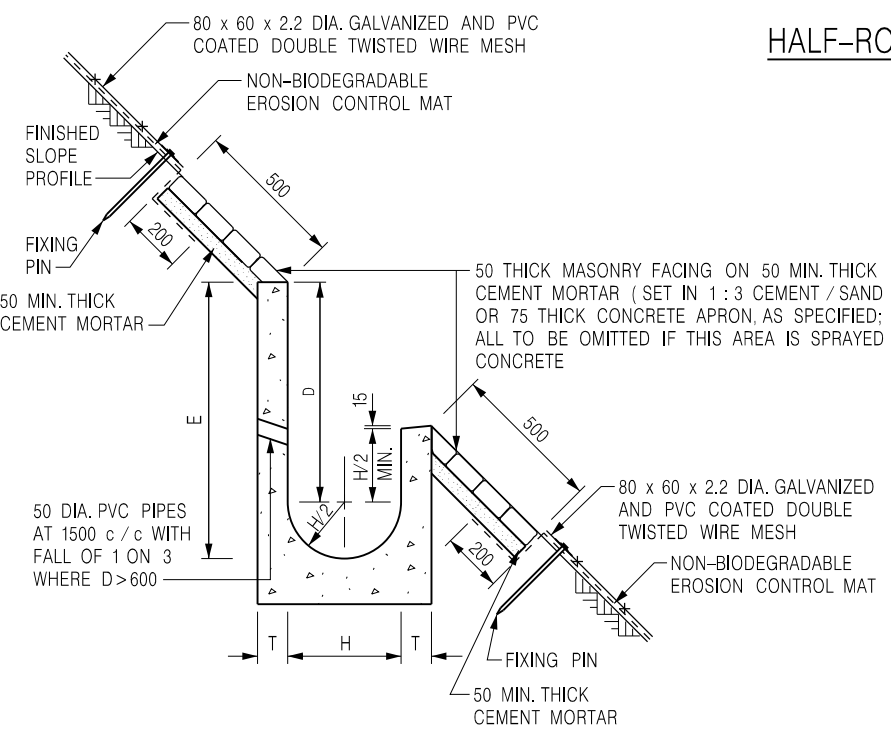
-	FORMER DRG. NO. C2405J.	Original Signed	03.2015
REF.	REVISION	SIGNATURE	DATE
 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT			
SCALE AS SHOWN		DRAWING NO. C2405 /5	
DATE JAN 1991			



U-CHANNELS CONSTRUCTED ON BERM

HALF-ROUND CHANNEL

- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. ALL CONCRETE TO BE GRADE 20 / 20.
 3. CONCRETE SURFACE FINISH SHALL BE CLASS U2, F2 OR BRUSHED FINISH AS DIRECTED.
 4. SPACING OF EXPANSION JOINT IN CHANNELS, BERM SLABS AND APRONS TO BE 10 METRES MAXIMUM, SEE STD. DRG. NO. C2413 FOR DETAILS.
 5. JOINTS FOR CHANNELS, BERM SLABS, APRONS AND WALLS, ETC. TO BE ON THE SAME ALIGNMENT.
 6. FOR DIMENSIONS T, H, & B, SEE TABLE BELOW.
 7. BIODEGRADABLE EROSION CONTROL MAT IF REQUIRED, SEE STD. DRG. NO. C2511/E.
 8. CONCRETE TO BE COLOURED AS SPECIFIED.
 9. CONCRETE U-CHANNEL CAN BE CAST IN-SITU OR PRECAST CONCRETE SUBJECT TO THE ENGINEER'S AGREEMENT ON THE DETAILS.
 10. DETAILS OF EROSION CONTROL MAT AND WESH MESH ON BERM. (SEE STD. DRG. NO. C2511/E)
 11. THE WIRE MESH ON HANDRAILING IS OPTIONAL. THE COVER STRIP AND ADDITIONAL MILD STEEL TUBES ARE NEEDED ONLY IF WIRE MESH IS PROVIDED. (SEE STD. DRG. NO. C2103)



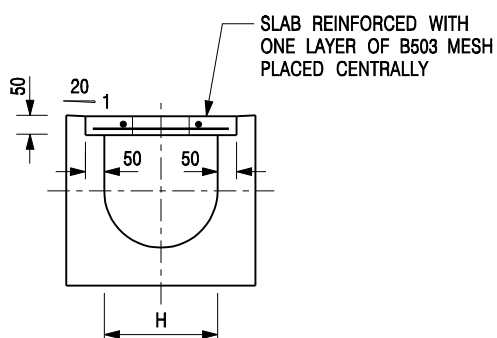
U-CHANNELS NOT CONSTRUCTED ON BERM

NOMINAL SIZE H	T	B	REINFORCEMENT
300	80	100	A252 MESH PLACED CENTRALLY AND T=100 WHEN E>650
375 - 600	100	150	
675 - 900	125	175	A252 MESH PLACED CENTRALLY

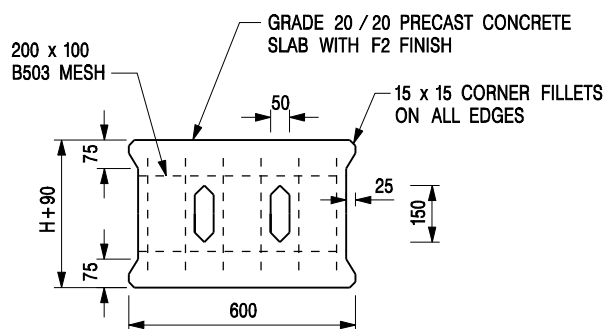
DETAILS OF HALF-ROUND AND U-CHANNELS (TYPE A – WITH MASONRY APRON)

J	DETAILS OF HANDRAILING AMENDED.	Original Signed	08.2024
I	MINOR AMENDMENT.	Original Signed	07.2018
H	THICKNESS OF MASONRY FACING AMENDED.	Original Signed	01.2005
G	MINOR AMENDMENT.	Original Signed	01.2004
F	GENERAL REVISION.	Original Signed	12.2002
REF.	REVISION	SIGNATURE	DATE

 CIVIL ENGINEERING AND DEVELOPMENT DEPARTMENT	
SCALE 1 : 25 DATE JAN 1991	DRAWING NO. C2409J



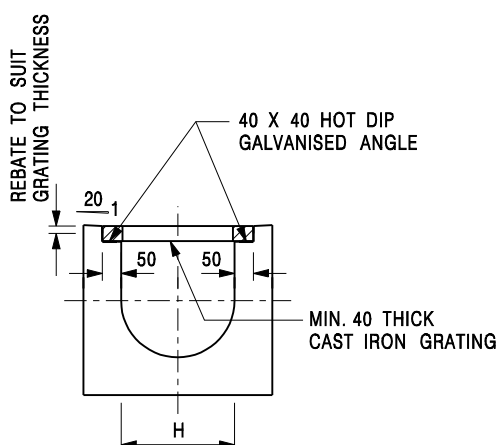
TYPICAL SECTION



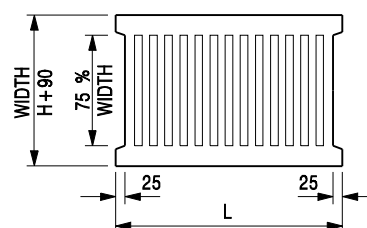
PLAN OF SLAB

U-CHANNELS WITH PRECAST CONCRETE SLABS

(UP TO H OF 525)



TYPICAL SECTION



L = 600mm FOR H ≤ 375mm
L = 400mm FOR H > 375mm

CAST IRON GRATING

(DIMENSIONS ARE FOR GUIDANCE ONLY, CONTRACTOR MAY SUBMIT EQUIVALENT TYPE)

U-CHANNEL WITH CAST IRON GRATING

(UP TO H OF 525)

NOTES:

- ALL DIMENSIONS ARE IN MILLIMETRES.
- H=NOMINAL CHANNEL SIZE.
- ALL CAST IRON FOR GRATINGS SHALL BE GRADE EN-GJL-150 COMPLYING WITH BS EN 1561.
- FOR COVERED CHANNELS TO BE HANDED OVER TO HIGHWAYS DEPARTMENT FOR MAINTENANCE, THE GRATING DETAILS SHALL FOLLOW THOSE AS SHOWN ON HyD STD. DRG. NO. H3156.

E	NOTES 3 & 4 AMENDED.	Original Signed	12.2014
D	NOTE 4 ADDED.	Original Signed	06.2008
C	MINOR AMENDMENT. NOTE 3 ADDED.	Original Signed	12.2005
B	NAME OF DEPARTMENT AMENDED.	Original Signed	01.2005
A	CAST IRON GRATING AMENDED.	Original Signed	12.2002
REF.	REVISION	SIGNATURE	DATE

COVER SLAB AND CAST IRON
GRATING FOR CHANNELS



**CIVIL ENGINEERING AND
DEVELOPMENT DEPARTMENT**

SCALE 1 : 20

DATE JAN 1991

DRAWING NO.
C2412E

Assessment of Hydraulic Capacities of the Proposed Drainage System for 1 in 50 year design return period

Using Rational Method
Design Flow = 0.278CIA m³/s for grassland (heavy soil) - steep, C 0.35
for concrete surface, C = 0.95

Using Manning Equation
Design Mean Velocity = $R^{1/6}/n(RS_0)^{1/2}$ where n = 0.016 for concrete-lined open channel with fair surface
(ref. 0.045 for natural stream channels, winding some pools and shoals with some weeds and stones with fair surface Table13 in SDM)

Using Gumbel Solution in frequency analysis
Rainfall intensity = $a / (t_r+b)^c$ where a = 505.5, b = 3.29 and c = 0.355 in 50 year design return period
referenced from Table 3a in SDM - Storm Constants for Different Return Periods of HKO Headquarters

Using Bransby William's Equation (for channel flow)
Inlet time t_0 = $0.14465L / (H^{0.2}A^{0.1})$ or 2 when the distance is too short

Using Colebrook's White Equation (for pipe flow)
 $V = - \text{Sqrt} (8gDs) \times \log [(k_s / 3.7D) + (2.51v / D \times \text{Sqrt} (2gDs))]$
For precast concrete pipes with 'O' ring joints with poor condition,
 k_s (mm) = 0.6, k_s (m) = 0.0006
 v (m²/s) = 1.00E-06
 g (m²/s) = 9.81

* - conservative, as the subject proposed development is for temporary use for 3 years only

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)
USCP/USMH	DSCP/DSMH	Collected Runoff from Catchment (refer to Figure 3 and 4)	USGL (mPD)	DSGL (mPD)	USIL (mPD)	DSL (mPD)	INVERT DIFF. (m)	LENGTH OF CHANNEL / DRAIN l (m)	SLOPES	SLOPE 1 IN	LENGTH FOR CALCULATION OF INLET TIME L (m)	AVERAGE SLOPE OF GROUND FOR CALCULATION OF INLET TIME H (m per 100m)	INLET TIME t_0 (min) = $0.14465 \times [L / (H^{0.2} \times A^{0.1})]$	TIME OF FLOW INSIDE CHANNEL/ DRAIN t_1 (min) = L/V (I.e. Column (9) + Column (26) + 60)	TIME OF CONCENTRATION t_c (min) = $t_0 + t_1$	RAINFALL INTENSITY i (mm/hr)	RAINFALL INTENSITY INCLUDING EFFECT OF CLIMATE CHANGE (+16.0%*) (mm/hr) [refer to Item (e) and (k) in SDM Corrigendum No. 1/2022]	ADOPTED RAINFALL INTENSITY INCLUDING EFFECT OF CLIMATE CHANGE (+16.0%) & DESIGN ALLOWANCE (12.1%*) (mm/hr) [refer to Item (e), (k) and (n) in SDM Corrigendum No. 1/2022]	RUNOFF COEFF. C	SUB-CATCHMENT AREA A (m ²)	EFF. AREA (m ²)	CUM. EFF. AREA (m ²)	DESIGN FLOW (m ³ /s)	SIZE (mm)	CHANNEL TYPE	VELOCITY (m/s)	FLOW CAPACITY (m ³ /s)	90% FLOW CAPACITY (m ³ /s) (to cater for potential deposition of sediment)	SPARE CAPACITY (m ³ /s)	Occupancy of the Proposed Pipe / Channel
Top of Area A1	Starting Point	A1			31.58	30.00		17.00			17.00	0.35	1.57						0.35	722	253	253								
Starting Point	CP10	A1 + 1/3 Site Area (conservative)	30.00	30.10	29.53	29.47	0.06	13.00	0.005	220	-	-	1.57	0.18	1.75	284.63	330.17	370.12	0.95	617	586	839	0.086	375	UC	1.19	0.27	0.24	0.152	36.2%
CP10	CP11	ditto	30.10	30.20	29.47	29.45	0.01	3.00	0.005	220	-	-	1.75	0.04	1.79	283.81	329.22	369.05	0.95	0	0	839	0.086	375	UC	1.22	0.32	0.29	0.204	29.6%
CP11	CP12	ditto	30.20	29.83	29.45	29.41	0.04	9.00	0.005	220	-	-	1.79	0.14	1.93	281.17	326.16	365.63	0.95	0	0	839	0.085	375	UC	1.11	0.16	0.14	0.056	60.2%
CP12	CP13	ditto	29.83	29.75	29.41	29.38	0.03	5.50	0.005	220	-	-	1.93	0.08	2.01	279.57	324.30	363.55	0.95	0	0	839	0.085	375	UC	1.08	0.14	0.12	0.037	69.3%
CP13	CP14	ditto	29.75	29.60	29.38	29.23	0.03	7.00	0.005	220	-	-	2.01	0.11	2.12	277.58	322.00	360.96	0.95	0	0	839	0.084	375	UC	1.08	0.14	0.12	0.038	68.8%
CP14	CP15	ditto	29.60	29.60	29.23	29.19	0.03	7.00	0.005	220	-	-	2.12	0.11	2.23	275.68	319.79	358.48	0.95	0	0	839	0.084	375	UC	1.10	0.15	0.14	0.053	61.3%
CP15	CP16	ditto	29.60	29.50	29.19	29.11	0.08	18.00	0.005	220	-	-	2.23	0.27	2.50	270.96	314.32	352.35	0.95	0	0	839	0.082	375	UC	1.09	0.14	0.13	0.046	64.1%
CP16	TM	ditto	29.50	29.50	29.11	29.08	0.03	7.00	0.005	220	-	-	2.50	0.11	2.61	269.24	312.32	350.11	0.95	0	0	839	0.082	375	UC	1.11	0.16	0.14	0.061	57.4%
Top of Area A1	Starting Point	A2			40.00	30.00		88.00			88.00	0.35	6.56						0.35	6,203	2,171	2,171								
Starting Point	CP1	A2 + 2/3 Site Area (conservative)	30.45	30.20	30.00	29.75	0.09	7.00	0.013	80	-	-	6.56	0.06	6.61	223.97	259.81	291.24	0.95	1,235	1,173	3,344	0.271	450	UC	2.03	0.37	0.33	0.059	82.1%
CP1	CP2	ditto	30.20	30.15	29.75	29.57	0.18	18.00	0.010	100	-	-	6.61	0.16	6.77	222.72	258.36	289.62	0.95	0	0	3,344	0.269	450	UC	1.91	0.46	0.41	0.142	65.5%
CP2	CP3	ditto	30.15	29.60	29.57	29.15	0.26	21.00	0.013	80	-	-	6.77	0.17	6.94	221.38	256.80	287.88	0.95	0	0	3,344	0.268	450	UC	2.03	0.37	0.33	0.062	81.1%
CP3	CP4	ditto	29.60	29.60	29.15	29.08	0.07	7.00	0.010	100	-	-	6.94	0.06	7.01	220.91	256.25	287.26	0.95	0	0	3,344	0.267	450	UC	1.87	0.40	0.36	0.090	74.7%
CP4	CP5	ditto	29.60	29.50	29.08	28.99	0.09	9.00	0.010	100	-	-	7.01	0.08	7.09	220.30	255.54	286.46	0.95	0	0	3,344	0.266	450	UC	1.86	0.39	0.35	0.082	76.4%
CP5	CP6	ditto	29.50	29.50	28.99	28.91	0.08	8.00	0.010	100	-	-	7.09	0.07	7.16	219.77	254.94	285.79	0.95	0	0	3,344	0.266	450	UC	1.92	0.47	0.42	0.155	63.2%
CP6	CP7	ditto	29.50	29.30	28.91	28.69	0.22	22.00	0.010	100	-	-	7.16	0.19	7.35	218.37	253.31	283.96	0.95	0	0	3,344	0.264	450	UC	1.93	0.49	0.44	0.174	60.2%
CP7	CP8	ditto	29.30	29.50	28.69	28.62	0.07	15.00	0.005	220	-	-	7.35	0.18	7.53	217.06	251.79	282.25	0.95	0	0	3,344	0.262	450	UC	1.37	0.51	0.46	0.198	57.0%
CP8	CP9	ditto	29.50	29.50	28.62	28.52	0.10	22.00	0.005	220	-	-	7.53	0.26	7.79	215.21	249.64	279.84	0.95	0	0	3,344	0.260	450	UC	1.39	0.58	0.52	0.263	49.8%
CP9	TM	ditto	29.50	29.50	28.52	28.50	0.02	5.00	0.005	220	-	-	7.79	0.06	7.85	214.79	249.16	279.31	0.95	0	0	3,344	0.260	450	UC	1.39	0.60	0.54	0.277	48.4%
Discharge Point																														
TM	Proposed outfall	A1 + A2 + Site Area	29.50	30.00	28.35	28.33	0.02	1.00	0.017	60			7.85	0.01	7.86	214.75	249.11	279.25	0.95	0	0	4,183	0.290	450	pipe	2.63	0.42	0.38	0.087	77.0%
Existing Streamcourse at Downstream of the Subject Site																														
Proposed outfall	Section X-X at the immediate downstream of the Proposed outfall	A1 + A2 + Site Area + A3		30.00	494.00	28.41		995.00			100		20.25	10.46	30.70	144.57	167.70	187.99	0.35	150,515	52,680	56,863	2,651	3000	V-shaped earth channel	1.59	3.78	3.40	0.753	77.9%
U-channel at the Proposed External Access																														
Proposed 300 UC	Existing 375 UC	A4	30.47	28.69	30.12	28.39	1.44	72.00	0.020	50			2.00	0.61	2.61	269.14	312.21	349.98	0.35	3,908	1,368	1,368	0.119	300	UC	1.96	0.16	0.14	0.023	83.9%

subcatchment
Site Area 1,852
A1 722
A2 6,203
A3 150,515
total = 159,292

1,852