Design of Stormwater for Proposed Temporary Shop and Services for a Period of 5 Years at Lot 283 S.A RP (Part) in D.D. 109, Kam Tin Road, Kam Tin, Yuen Long, N.T.

Issue 1

Aug 2025

Design of Stormwater for Proposed Temporary Shop and Services for a Period of 5 Years at Lot 283 S.A RP (Part) in D.D. 109, Kam Tin Road, Kam Tin, Yuen Long, N.T.

Issue	Prepared by	Reviewed by	Date
1	SM	SM	12 Aug 2024

Table of Contents

List of Appendices

Appendix A - Drawings
Appendix B - Drainage Calculation of drainage system of existing 300 concrete pipe near Kam Tin Road

Drawing No.	Rev.	Drawing Title
LOT283/GL/001		Drainage Layout Plan
LOT283/DD/001		Drainage And Catchpit Details
LOT283/DD/002		Pipe Bedding Details

List of Abbreviations

CEDD	Civil Engineering and Development Department
EVA	Emergency Vehicular Access
FMO	Fish Marketing Organization
GMB	Green Minibus
HyD	Highways Department
MACL	Mannings (Asia) Consultants Ltd.
STT	Short Term Tenancy
TD	Transport Department
TPDM	Transport Planning and Design Manual

1 Introduction

1.1 Objective of this Design Submission

This submission focuses on the design of stormwater drain for the proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store). The schematic arrangement of stormwater for the proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store) are also provided for information only. Details of the objective are as follows:

a) describe the proposed stormwater drain for the proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store);
b) present the frame work of the methodologies and design philosophies adopted for the stormwater drainage design of the proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store);
c) provide design drawings with drainage layout, details and manhole schedule for the proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store);
d) describe the schematic arrangement of stormwater drain for the proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store);

1.1.2 This report includes the following sections:

Section 2	Description of Proposed Works
Section 3	Design Information
Section 4	Conclusion

2 Description of Proposed Works

2.1 Description of the Site

2.1.1 The proposed temporary shop and services (shop for selling vehicle accessories, building materials and convenient store) is located within a site at Kam Tin Road, Kam Tin. The general arrangement of the proposed site is illustrated in Drawing No. **LOT283/GL/001** of **Appendix A**.

2.2 Description of Works for Site

2.2.1 225 U-channels are proposed around the proposed site up to Kam Tin Road for stormwater collection. The stormwater will flow to the proposed Catchpit Manhole No. CP6 respectively. Stormwater in CP6 will be collected to proposed 300 Dia. stormwater pipe to the downstream (Manhole No. SMH1007610) at Kam Tin Road. The stormwater drain arrangement is illustrated in Drawing No. **LOT283/GL/001 of Appendix A.**

2.3 Existing Stormwater Drainage System

2.3.1 The existing DSD stormwater drainage system is located at the westbound of Kam Tin Road.

2.3.2 The details and catchment area of the existing drainage system at Kam Tin Road is illustrated in Appendix A**.**

2.3.3 The runoff due to the proposed site will be diverted to the downstream (Manhole No. SMH1012050) at Kam Tin Road It is found that the concerned drainage system have adequate flow capacity to accommodate the additional runoff

3 Design Information

3.1 Design Codes and Reference

3.1.1 The following have been used as the basis of the stormwater drain design:

- Stormwater Drainage Manual (SDM), DSD;
- DSD Standard Drawings;
- HyD Standard Drawings;
- HyD TC 3/90 - Minimum Cover Requirement for Underground Services;
- HyD Guidance Note RD/GN/035 - Road Pavement Drainage Design;
- HyD Guidance Note RD/GN/043 - Subsoil Drainage for Road Pavements;
- DSD Technical Circulars and Practice Notes;
- Structures Design Manual for Highways and Railways (2013), HyD;
- General Specification for Civil Engineering Works (2006 Edition) and subsequent amendments and corrigendum, HKSAR Government;
- Construction Standard CS2:2012 , Steel Reinforcing Bars for the Reinforcement of Concrete by CEDD;
- BS 5911 Code of practice for precast concrete pipe design;
- BS 5911, Part 1 - Specification for Unreinforced and Reinforced Concrete Pipes (including jacking pipes) and Fittings with Flexible Joints (Complementary to BS EN 1916:2002);
- BS 5911, Part 3 - Specification for Unreinforced and Reinforced Manholes and Soakaways (Complementary to BS EN 1917:2002);
- BS EN 124:1994 - Gully tops and manhole tops for vehicular and pedestrian areas design requirements, type testing, marking, quality control;
- BS EN 1916: 2002 - Concrete pipes and fittings, unreinforced, steel fibre and reinforced;
- BS EN 1992: Eurocode 2 - Design of Concrete Structures - Part 1-1: General Rules and Rules for Buildings and its respective UK National Annex;
- BS EN 1992: Eurocode 2 - Design of Concrete Structures - Part 3: Liquid Retaining and Containment Structures and its respective UK National Annex;
- BS EN 206-1:2000 - Concrete, Specification, Performance, Production and Conformity;
- BS 8500-1 :2006 - Concrete. Complementary British Standard to BS EN206-1. Method of Specifying and Guidance for the Specifier;
- BS 8500-2:2006 - Concrete. Complementary British Standard to BS EN206-1. Specification for Constituent Materials and Concrete.

3.2 Design Considerations

3.2.1 Runoff Coefficients

Table 3-1 Runoff Coefficients

Surface Characteristic	Runoff Coefficient, C
Paved Area and Rock Slopes	1.0
Natural Catchment and Soil slope	0.35

3.2.2 Roughness Coefficient for concrete pipe flow, k_s = 3.0 mm

3.2.3 Minimum pipeline cover and manhole spacing requirements

Table 3-2 Minimum Pipeline Cover and Manhole Spacing Requirement

Minimum Pipeline Cover	
In Roads	0.9 m
In Footways and Verges	0.45 m
Manhole Spacing Requirements	
D < 675 mm	80 m
675 mm < D < 1050 mm	100 m
D > 1050 mm	120 m

3.2.4 Pipe Bedding

Table 3-3 Bedding Factors

Bedding Type	Bedding Factor
Granular bedding	1.9
120° plain concrete bedding	2.6
120° reinforced concrete bedding with min. transverse steel area equal to 0.4% of the area of concrete bedding	3.4
Concrete surround	4.5

3.2.5 Design Flow Velocity

Minimum : 1 m/s
Maximum : 6 m/s

3.2.6 Description of Analysis Method

Rational method is used for calculation of the peak runoff. The formula is extracted from Section 7.5.2 (a) of SDM which is to estimate the stormwater runoff as shown below:

$$Qp = 0.278\ CiA$$

Where Qp = peak runoff in m^3/s
C = runoff coefficient (dimensionless)
i = rainfall intensity in mm/hr
A = catchment area in km^2

10% reduction of flow area is allowed taken into account of decomposition of siltation as per DSD's Stormwater Drainage Manual (SDM) 2018.

3.2.7 Time of Concentration

Table 3-4 Time of Concentration

Type of Catchment	Time of Concentration
Natural Catchment	To be calculated according to modified Bransby William's equation with minimum 2 minutes.
Slopes	Minimum 1 minute.
Road and Urban Catchment	Time of entry (Minimum 3 minutes) plus time of flow in pipes/channels from most remote part of system.

3.2.8 Rainfall Intensity

The rainfall intensity is extracted from the Section 4.3.3 of SDM which is to estimate the Intensity-Duration –Frequency (IDF) Relationship.

$$i = a / (t_d + b)^c$$

Where i = extreme mean intensity in mm/hr
td = duration in minutes (t_d<240), and
a, b, c = storm constants given in Table 3 of SDM as below

Return Period T (years)	50
a	451.3
b	2.46
c	0.337

3.2.9 Design Return Period

1 in 50-year design return period is adopted.

3.2.10 Rainfall Increase due to Climate Change

According to Section 6.8 and Table 28 of SDM, the rainfall increases 11.1% in Mid-21st Century (2041 – 2060). According to Table 31 of SDM – Corrigendum No. 1/2022, rainfall increase 12.1%.

3.2.11 Mean Velocity

The mean velocity of flow is calculation using the Colebrook – White Equation. The equation is extracted from Section 8.3.1 and Table 12 of SDM as shown below:

$$\overline{V} = -\sqrt{32gRS_f}\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

Where $\overline{V}$ = mean velocity (m/s)
R = hydraulic radius (m)
k_s = surface roughness (m)
v = kinematic viscosity (kg/ms)
S_f = slope of hydraulic gradient
g = gravity (m/s^2)

3.2.12 Sedimentation

Deposition of sediment in stormwater channels and pipes is inevitable, and suitable allowance should be made in the design. For the permissible degradation between desilting cycles, the following guideline is proposed to consider the effects of flow capacity due to materials deposited on the bed:

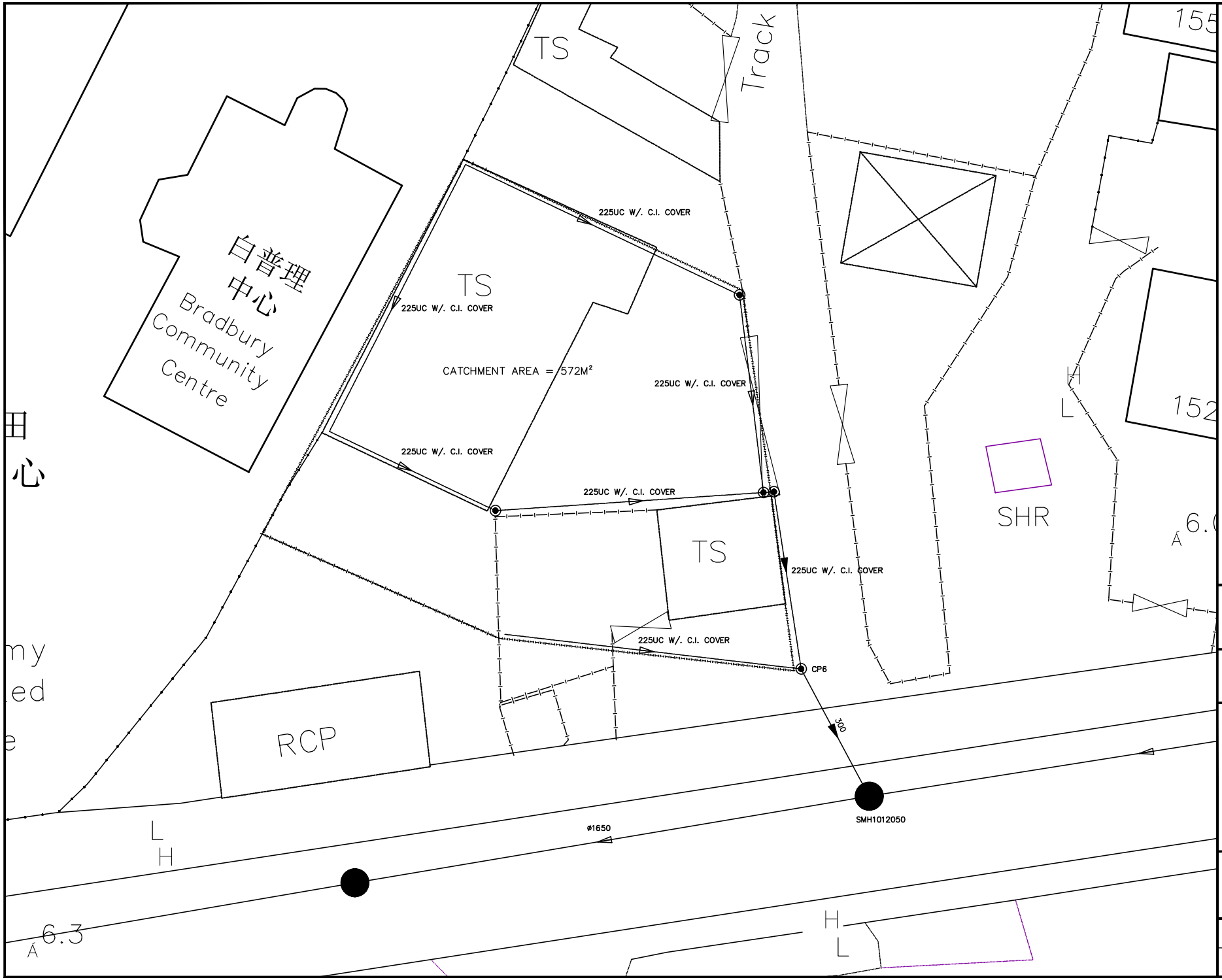
(a) 5% reduction in flow area if the gradient is greater than 1 in 25.
(b) 10% reduction in flow area in other cases.

4 Conclusion

4.1 Conclusion

4.1.1 This report presents the design considerations and design requirements for stormwater drainage of proposed temporary shop and services.

APPENDIX A



GENERAL NOTES:

LEGEND:

- PROPOSED STORMWATER CATEHPIT
- EXISTING STORMWATER MANHOLE (DSD)
- 300 PROPOSED STORMWATER PIPE

DESIGNER:

CONTRACTOR

PROJECT

Design of Stormwater for Proposed Temporary Shop and Services for a Period of 5 Years at Lot 283 S.A RP (Part) in D.D. 109, Kam Tin Road, Kam Tin, Yuen Long, N.T.

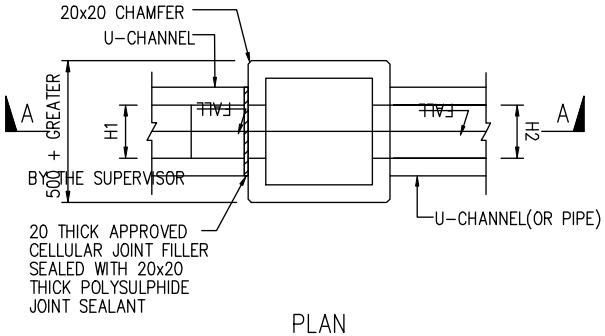
TITLE

DRAINAGE LAYOUT PLAN

SCALE: 1:200 (A3)

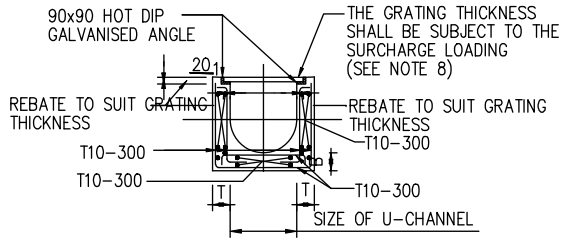
DRAWING NO. LOT283/GL/001

REV.



PLAN
TYPICAL CATCHPIT WITH TRAP

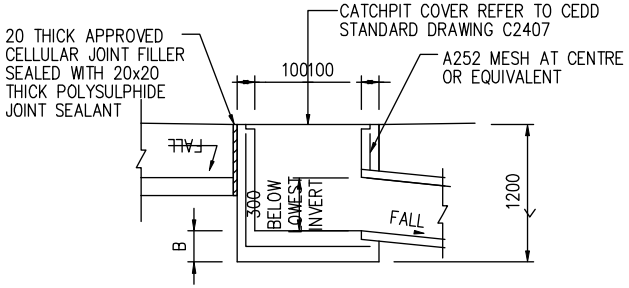
SCALE 1 : 20



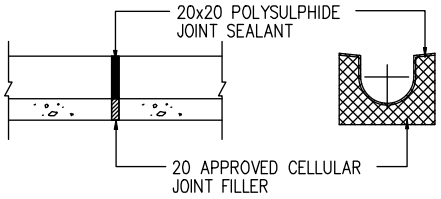
TYPICAL SECTION
SCALE 1 : 20

U-CHANNELS ON WSD ACCESS ROAD (SEE NOTE 8)

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



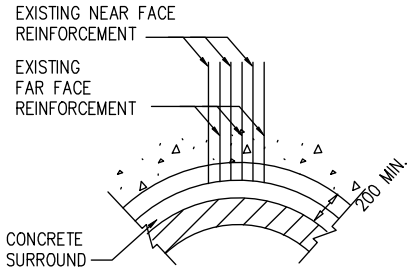
SECTION B – B
SCALE 1 : 20



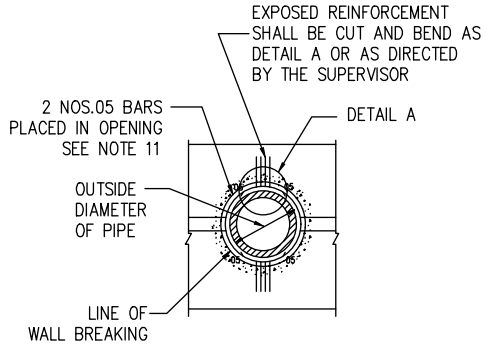
DETAIL OF U-CHANNEL EXPANSION JOINT
N.T.S.

NOTES:

1. ALL CONCRETE TO GRADE 20/20 UNLESS OTHERWISE SPECIFIED.
2. CONCRETE SURFACE FINISH SHALL BE CLASS U2, OR F2 AS APPROPRIATE.
3. EXPANSION JOINT FOR U-CHANNELS SHALL BE PROVIDED AT A MAXIMUM SPACING OF 10m..
4. U-CHANNEL REBATE TO SUIT GRATING THICKNESS NOT TAKEN INTO ACCOUNT FOR LEVELS. THEREFORE IF REBATE IS 20 THEN ALL INVERT LEVELS TO BE LOWERED BY 20.
5. H = NOMINAL CHANNEL SIZE.
6. MINIMUM INTERNAL CATCHPIT WIDTH SHALL BE 1000mm FOR CATCHPITS WITH A HEIGHT EXCEEDING 1000mm MEASURED FROM THE INVERT LEVEL TO THE ADJACENT GROUND LEVEL. AND STEP IRONS (SEE DSD STD. DRAWING NO. DS1043) AT 300 c/c STAGGERED SHALL BE PROVIDED. THICKNESS OF CATCHPIT WALL FOR TO 150mm.
7. UNLESS OTHERWISE STATED, ALL CATCHPITS SHALL BE WITHOUT TRAP, EXCEPT FOR THOSE CATCHPITS CONNECTED TO MANHOLE SHALL BE PROVIDED WITH TRAP
8. FOR GRATINGS SUBJECT TO VEHICLE LOAD SHALL BE BS EN 124 CLASS E600. FOR GRATINGS NOT SUBJECT TO VEHICLE LOAD SHALL BE BS EN 124 CLASS C250.
9. B REFER TO CEDD STANDARD DRAWING NO. C2405,
   T REFER TO CEDD STANDARD DRAWING NO. C2409.
10. UNLESS OTHERWISE STATED. ALL U-CHANNEL DETAILS REFER TO CEDD STANDARD DRAWING NO. C2412.
11. DIAMETER OF 05 BAR
    2T12 FOR PIPES LESS THAN 450 DIA.
    2T16 FOR PIPES 450 TO 750 DIA.
    3T16 FOR PIPES 900 TO 1200 DIA.
    3T25 FOR PIPES 1200 TO 1800 DIA.



DETAIL A
N.T.S.



PROPOSED DRAINAGE PIPE
CONNECTION TO EXISTING
MANHOLE

GENERAL NOTES:

DESIGNER:

CONTRACTOR

PROJECT

Design of Stormwater for Proposed Temporary Shop and Services for a Period of 5 Years at Lot 283 S.A RP (Part) in D.D. 109, Kam Tin Road, Kam Tin, Yuen Long, N.T.

TITLE

DRAINAGE AND CATCHPIT DETAILS

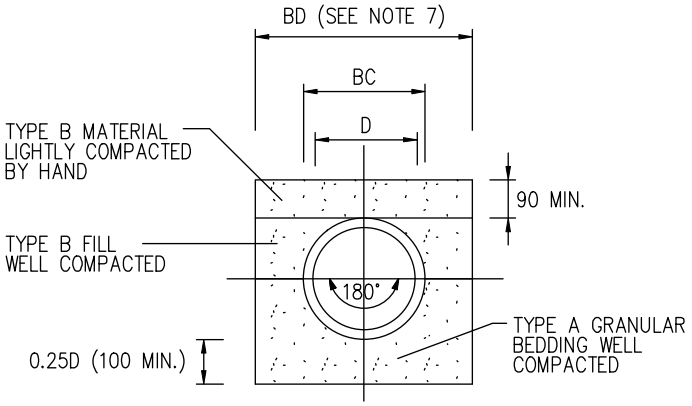
SCALE:
AS SHOWN

DRAWING NO.
LOT283/DD/001

REV.

NOTES FOR PRECAST CONCRETE PIPE BEDDING:

1. DIMENSIONS ARE IN MILLIMETRES .
2. PIPE BEDDING MATERIAL: –
   TYPE B – SPECIAL FILL IN ACCORDANCE WITH 2006 CEDD GS CLAUSE 5.22.
3. ABBREVIATIONS: –
   Bc = EXTERNAL DIA. OF PIPE OR WIDTH OF CONCRETE SURROUND (AS USED IN MARSTON EQUATIONS).
   BD = TRENCH WIDTH AS MEASURED AT THE PIPE CROWN.
   D = NOMINAL INTERNAL DIAMETER OF PIPE.
   T = THICKNESS OF PIPE WALL.
4. CONSTRUCTION TRENCH WIDTHS SHALL NOT EXCEED THE MAXIMUM TRENCH WIDTHS GIVEN IN TABLE 1.
5. THE DETAILS FOR THE PIPE JOINT SHALL REFER TO DSD STANDARD DRG NO. DS1050.



CLASS B BEDDING
(FOR CONCRETE PIPE)
BEDDING FACTOR 1.9
N.T.S.

DETAILS FOR PRECAST CONCRETE PIPE BEDDING

TABLE 1

D	CLASS AR TRANSVERSE REINFORCEMENT	CLASS AR LONGITUDINAL REINFORCEMENT	MAX. TRENCH WIDTH BD
150	R16–250	2xR16	600 "
225	R16–250	2xR16	700
300	R16–250	2xR16	750
375	R16–250	2xR16	1050
450	R16–250	2xR16	1150
525	R16–250	2xR16	1250
600	R16–250	2xR16	1350
675	R16–250	2xR16	1450
750	R16–250	2xR16	1500
825	R16–250	2xR16	1600
900	R20–250	2xR20	1900
1050	R20–250	2xR20	2050
1200	R20–250	2xR20	2300
1350	R20–250	2xR20	2450
1500	R20–250	2xR20	2600
1650	R20–250	2xR20	2800
1800	R20–250	2xR20	2950
1950	R20–250	2xR20	3150
2100	R20–250	2xR20	3500
2250	R20–250	2xR20	3400
2400	R20–250	2xR20	3500
2550	R20–250	2xR20	3650
2700	R20–250	2xR20	3800
2850	R20–250	2xR20	3950
3000	R20–250	2xR20	4150
3200	R20–250	2xR20	4400
3300	R20–250	2xR20	4500
3450	R20–250	2xR20	4700
3600	R20–250	2xR20	4850

TABLE 2

D	T
150	150
225	150
300	150
375	150
450	150
525	150
600	150
675	200
750	200
825	200
900	200
1050	200
1200	250
1350	250
1500	250

GENERAL NOTES:

LEGEND:
- PROPOSED STORMWATER CATEHPIT
- EXISTING STORMWATER MANHOLE (DSD)
- 300 PROPOSED STORMWATER PIPE

DESIGNER:

CONTRACTOR

PROJECT
Design of Stormwater for Proposed Temporary Shop and Services for a Period of 5 Years at Lot 283 S.A RP (Part) in D.D. 109, Kam Tin Road, Kam Tin, Yuen Long, N.T.

TITLE
PIPE BEDDING DETAILS

SCALE:
1:200 (A3)

DRAWING NO.
LOT283/DD/002

REV.

APPENDIX B

Stormwater Drainage Design

Manhole		Catchment Area [5]		Length (m)	Nominal Diameter (mm)	Gradient, S_f		Velocity [7] (m/s)	Time of Flow (min)	Time of Conc. [2] (min)	Rainfall Duration (min)	50 year Intensity [4] (mm/hr)	Runoff [6] Coeff.	50 year Runoff [1] (m^3/s)	1.111 x 1.121 x 50 year Runoff [1] (m^3/s)	Inflow (m^3/s)	Total flow (m^3/s)	Adjusted Capacity *0.9 (m^3/s)	Adjusted Capacity > Runoff ?	Cover Level [9]		Invert Level [9]		soil cover		Utilization
From	To	Increment (m^2)	Accu. (m^2)			(%)	1 in													From (mPD)	To (mPD)	From (mPD)	To (mPD)	From (mPD)	To (mPD)	
CP6	SMH1012050	572	572	8	300	3.3	30.0	2.16	0.06	0.06	0.06	330.61	1.0	0.053	0.058	0.000	0.058	0.137	Yes	6.47	6.30	5.72	5.47	0.42	0.50	0.42

Mean Velocity is calculated by Colebrook- White equation

Where:
V =Mean Velocity (m/s)
R =Hydraulic Diameter (m)
Ks =Surface Roughness (m)
V =Kinematic viscosity (kg/ms)
S =Slope of Hydraulic Gradient
g =Gravity (m/s2)

$$\overline{V} = -\sqrt{32gRS_f}\log\left[\frac{k_s}{14.8R} + \frac{1.255\nu}{R\sqrt{32gRS_f}}\right]$$

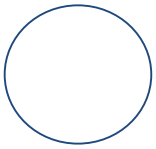
The Roughness Coefficient Ks is assumed to be 3.
Peak Runoff is estimated using rational method according to SDM.

Calculation Sheet	Job No.	Sheet No.	Rev.
	Member / Location		
Job Tilte: STORMWATER FOR PROPOSED TEMPORARY SHOP AND SERVICES FOR A PERIOD OF 5 YEARS	Drg. Ref. LOT283/GL/001		
	Made By	Date	Chd.

Checking of Capacity (SMH1007610)

Input Data

Diameter of Pipe = 0.3 m
Design flow = 0.058 m^3/s



Flow capacity, Q

$$Q = \frac{A \times r^{2/3} \times s^{1/2}}{n}$$

where A = cross sectional area of flow (m^2) = 0.0672 m^2
r = hydraulic radius (m)
s = slope of the water surface or the linear hydraulic head loss (m/m)
n = Manning coefficient of roughness

Hydraulic radius

$$r = \frac{A}{P}$$

p = wetted perimeter (m) = 0.94 m

r = 0.07 *m*

Slope

s = 3.333 m/m

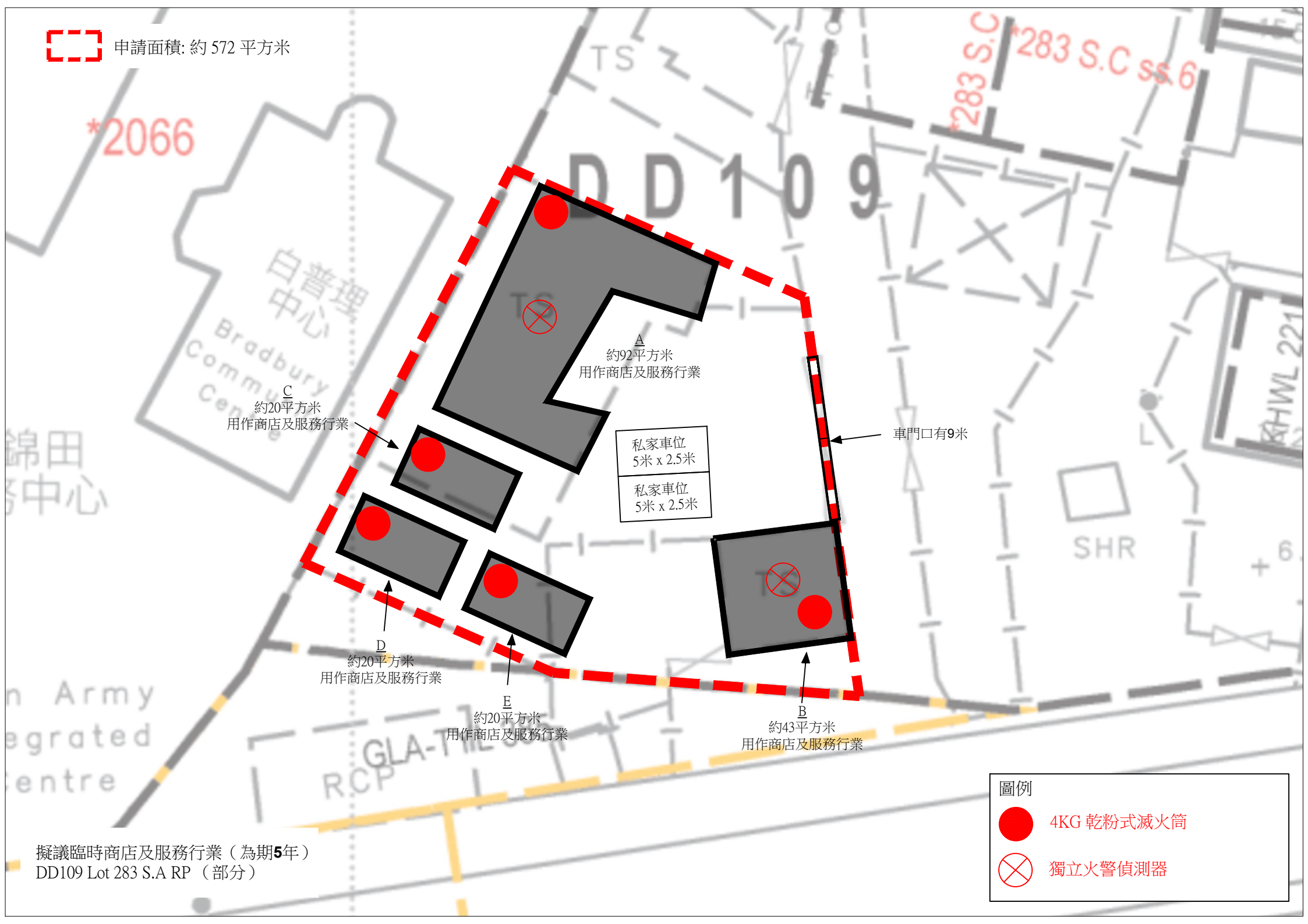
Manning coefficient of roughness

n = 0.016

Therefore,

Q = 1.317 m^3/s > Design flow, OK!

V = Q/A = 19.61 m/s



擬議臨時商店及服務行業（為期**5**年）
DD109 Lot 283 S.A RP （部分）