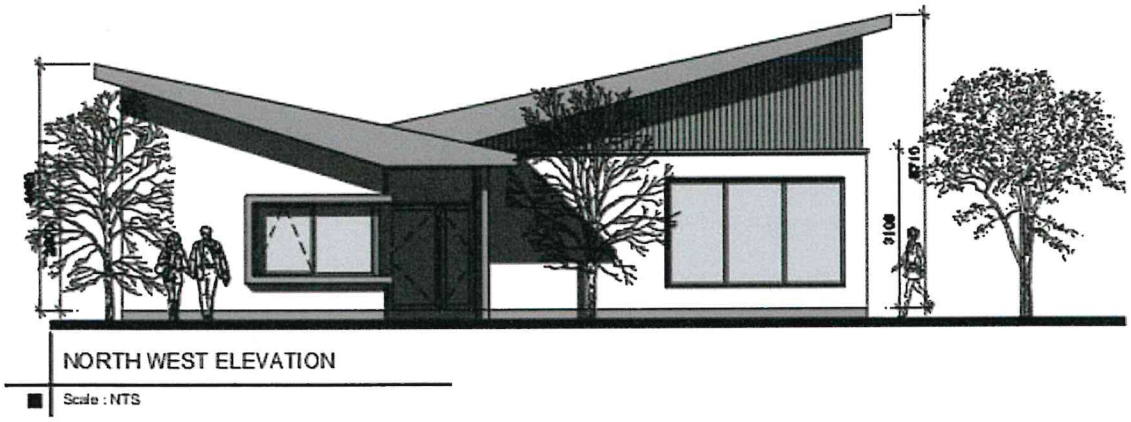
Engineering Services Report

Foul Water Drainage,
Storm Water Drainage
Attenuation of Storm Water
Watermains



Project: **Proposed Kildare County Council Welfare Facility**
Gallowshill,
Athy,
Co. Kildare.

Clarke
Highland View Terrace,
Fairgreen,
Naas,
Co. Kildare.
Tel: 045 866448

CONTENTS

1 INTRODUCTION

1.1 Introduction

Clarke & Co. have been commissioned by the applicant, Kildare County Council to design a foul and surface water drainage scheme and Watermains for a proposed Welfare Facility at Gallowshill, Athy, Naas, Co. Kildare.

The proposed development is located to the rear of the Athy Civic Amenity Site at Gallowshill, Athy, and comprises an area of 2.56 ha.

The drawing Schedule that accompanies this submission is:-

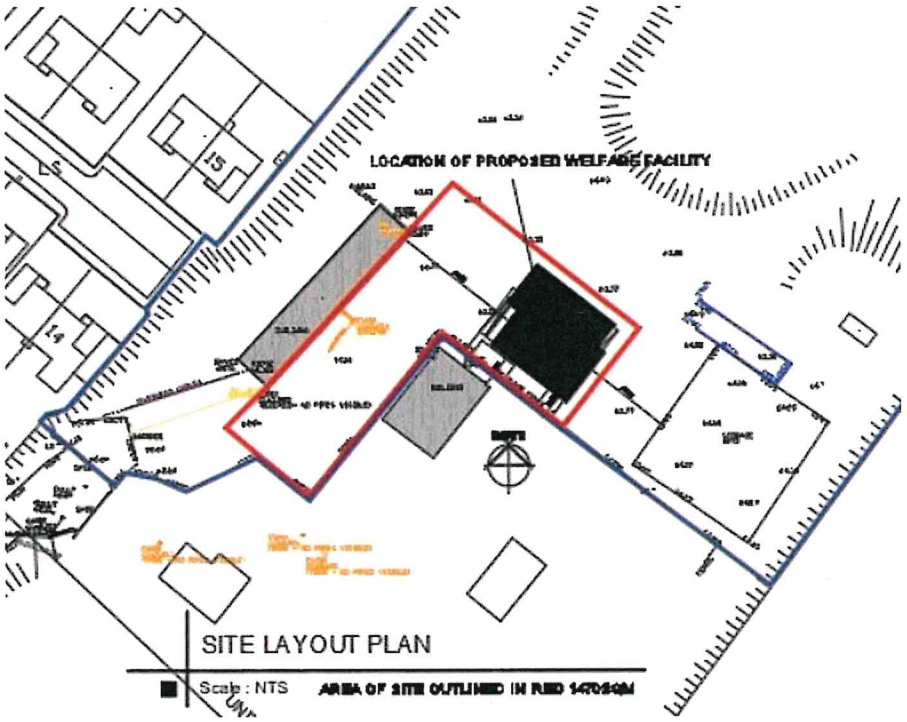
Dwg No	Title	Scale	Size	Rev
4985-13-P01	Site location map	1/1000	A3	R00
4985-13-P02	Site layout plan	1/200	A1	R00
4985-13-P03	Floor plan & Section A,A	1/50	A1	R00
4985-13-P04	Elevations	1/50	A1	R00
4985-13-P05	Site services	1/200	A1	R00

Surface water sewer are indicated in *Blue.* The development will connect to proposed 225mm diameter Surface water drainage sewers which has falls achieving a minimum self-cleansing velocity and discharge to the ground. The invert of all pipes are detailed on drawings.

Foul sewer is indicated in Red. The proposed development connects to main foul 150 mm diameter sewer which achieve a minimum self-cleansing velocity.The invert details for network are shown on drawings.

1.2 Site Locations

The proposed development is at the existing Athy Depot, Gallows Hill, Athy, which is located to located to the east of Athy Town off the Dublin Road. The development site comprise an area of 1,470 sqm approximately and proposed building accommodates Office, toilet, changing and Canteen Facilities.



1.3 References

Reference has been made to the following publications in the preparation for this report.

- Greater Dublin Regional Code of Practice for Drainage Works version 6.0
- Code of Practice for Development Works – Drainage
- Greater Dublin Strategic Drainage Study.
- Irish Water – Code of Practice for Wastewater Infrastructure
- Recommendations for Site Development works

2 SURFACE WATER DRAINAGE DESIGN

2.1 Existing Services

The existing surface water runoff generated from existing Athy Depot discharges to a 225mm surface water sewer that discharges into the ground.

2.2 Natural Flow Paths

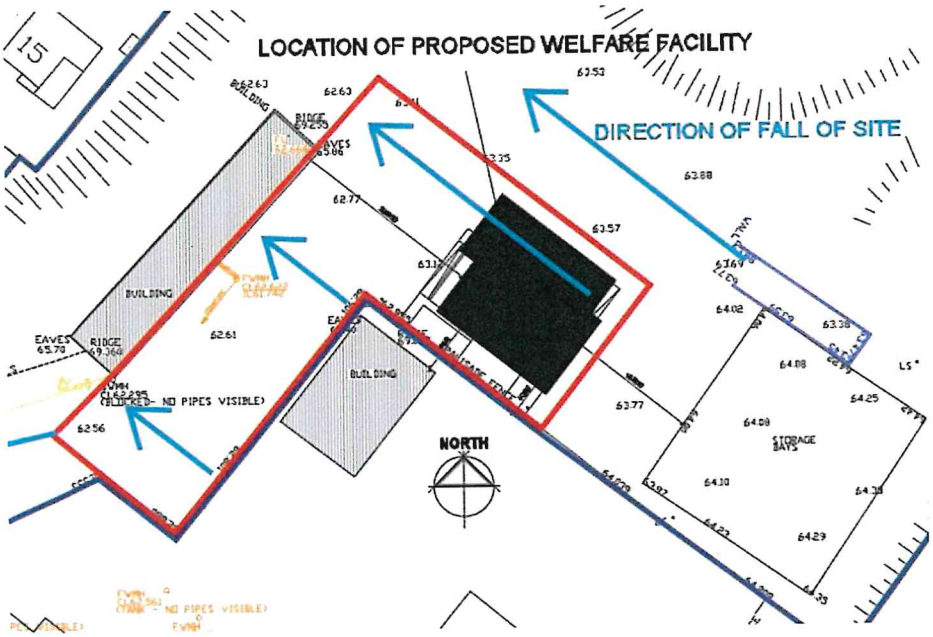


Fig: Existing Flow Path shown in Blue

Pre-existing overland pluvial and fluvial flood flow routes throughout the site is in a north westerly direction.

Because the pre-existing and post-development flood flow volumes and route are the same (the site is 100% covered in Hardstanding or roof Areas) this ensures the proposed developments will not increase the flood risk on other adjacent properties (no increase in 'hard surfaces').

2.3 Catchment Parameters

Parameter	Surface Water Sewers
Minimum depth	1.2m cover under highways 0.9m elsewhere
Maximum depth	Normally 5m
Minimum Sewer Size	225mm
Runoff factors for pipe sizing	80% paved and roof surfaces 0% off pervious surfaces
Rainfall for initial pipe sizing	rainfall intensity Met Eireann Data for the Kildare area
Minimum velocity (pipe full)	1.0m/s
Roughness –ks	0.6mm

2.4 Assessment Methodology

The Storm water design is based on the Modified Rational Method and is in accordance with the Wallingford Procedure, while the main drainage method was used for the foul design.

The Surfacewater drainage method selected involves retention and infiltration at source reducing both runoff volumes and slow runoff rates.

The method in which the storage volume was calculated was conservative. The calculation assumes no benefit from the storage capacity of the pipes or a reduction in rainfall intensities as with the modified rational method for time of concentration.
The table of rainfall intensities and design of the attenuation is shown in Appendix A.

2.5 Climate Change

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	450+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1)

20% Climate change factor applicable.

2.6 Stormwater Drainage Design

Method of design for small development is Modified Rational Method for design of storm water drainage systems. It is used to derive a peak flow rate and then this is used to select a pipe size based on pipe-full flow. The modified rational method equation to determine peak flow rates is provided below:

Q=2.78 C 1.2i A

Q = design even peak rate of runoff (l/s)

1.2 = Allowance for 20% Climate Change

C = non-dimensional runoff coefficient which is dependent on the catchment characteristics $C=C_VC_R$.

C_V = volumetric runoff coefficient

A run-off coefficient of 1.0 is generally used for impermeable areas.

C_R = dimensionless routing coefficient

i = rainfall intensity for the design return period (in mm/hr) and for a duration equal to the "time of concentration" of the network

A = total catchment area being drained (ha)

2.78 is a conversion factor to address the rainfall unit being in mm/hr.

Refer to Appendix A for the drainage network design which is summarised below:

Drainage Design

Rainfall Intensities	Return Period	Peak Flow l/s
M5-60	5 years	6

Colebrook White DesignTables		
Pipe Size:	mm	225
Discharge	l/s	37.12
Velocity	m/s	0.93
Gradient	1 in	200

Refer to Drawing: 4985-13-05

Layout plan drawing shows invert levels including the discharge outfall, gradients, pipe cover and cover depths, section lengths and the intersections with other services to show they can be accommodated with the required separation.

2.8 Attentuation

Drainage design criteria satisfies requirement that no external flooding occurs up to 30 year return period and properties are protected against flooding for the 100year return period. Attenuation system (Modular Geo-Void System – void ratio>43%) design is detailed in Appendix C and is summarised below:-

- Return Period: 1-100years
- Location: Gallows Hill. Athy
- Impermeable Area: 0.147 Ha
- Soil Infiltration Rate $3.13x10^{-5}m/s$
- Climate Change 20%
- Tank Depth 1060mm
- Tank Net Volume Required 53 cu.m
- System: Stormtech SC740
- Refer to Drawing: 4985-13-05

2.9 Floor Level.

Floor level of proposed Welfare Facility is at least 500mm above the predicted maximum 100year flood level

Node point ref 14MONE00115 indicates 1% AEP Water Level: 55.28m OD (Ref Flood Risk Assessment Report)

- Minimum FFL 62.77mOD.
- Refer to Drawing: Dwg No. 4985-13-P03

3 FOUL WATER DRAINAGE DESIGN

3.1 Existing Services

The site is serviced by an existing foul network located opposite Athy Civic Amenity site which conveys the foul via a 225mm pipe to the foul sewer on Dublin Road.

3.2 Assessment Methodology

The design parameters that are outlined below set out the design flow requirements in terms of growth, infiltration, peaking factors and misconnection allowances to ensure performance is maintained over the design life of the new wastewater collection system.

Wastewater sewer capacity shall be designed with allowance for some possible surface water connection (misconnections), even where separate wastewater and surface water sewer networks exist. Allowance for the delayed flow from slow response run off due to rainfall induced infiltration shall be ignored for the purpose of design of new wastewater sewers.

Dry Weather Flow	= PG + I
Design Foul Flow	= [Pf_{Dom} x PG] + I
Design Flow	= Eqn 1 + SW
DWF	= Dry Weather Flow
P	= Population
G	= Water Consumption / Capita
I	= Infiltration
Pf_{Dom}	= Peaking factor Domestic
SW	= Surface Water Allowance +20% of water consumption

For the basis of design the per capita (ca) water consumption shall be used to equate for general wastewater flow contributions where site specific data is unavailable: Water Consumption (G) 0.15 m^3/ca/day (i.e. 150l/ca/day).

For the design of new or upgraded wastewater networks, the peaking factor applied to wastewater flows (Pf_{Dom}) is 4.5 (commercial Waste Water).

Maudlins House Hotel *Wastewater Loading*	Flow L/hd/Day	DWF L/S
Proposed Development		
25 Lockers, 2 Office, +10 Training = 37 No.	60	0.03
Dry Weather Flow ***DWF + Infiltration (+20%) 0.04 l/s*** ***Peak Flow Factor: 4.5 DWF 0.0.18 L/S***		**0.03**

Propose:-

Colebrook White Design Tables: Pipe size & Gradients selected

Pipe Size:	mm	150
Discharge	l/s	14.68
Velocity	m/s	0.83
Gradient	1 in	150

The wastewater from this proposed development discharges to the public foul sewer at Civic Amenity Facility Refer to Drawing: Refer to Drawing: 4985-13-05.

An inspection chamber should be installed within the boundary of the Premises to allow access to the private Drain and the service connection.

4 WATERMAIN DESIGN

4.1 Existing Services

A 100mm diameter trunk water main traverses the site.

4.2 Assessment Methodology

Average daily demand based on daily per-capita consumption, room occupancy, number of Lockers, etc. For design purposes the average daily domestic demand based on a per-capita consumption of 150l/person/day and an average occupancy of 37 No. The average day/peak week demand should be taken as 1.25 times the average daily domestic demand. The peak demand for sizing of the pipe network will normally be 5.0 times the average day/peak week demand for customer use only.

The watermain layout is proposed to incorporate the following requirements among others, in accordance with the Irish Water Water and Wastewater Infrastructure and DOE's "Recommendations for Site Development Works for Housing" document.

- No part of building should be more than 46m from the nearest hydrant.
- Watermains shall be looped or interconnected, to facilitate self-cleansing, rather than terminating in a duck-foot hydrant.
- Air valves are to be provided at the highest point of the main and sluice valves have been provided at branch connections and wither side of the watermeter, so that they can be isolated.
- Watermain pipes should have a minimum cover of 900m.
- Watermain crossings of roadways should be in ductile iron pipe work unless otherwise stipulated or recommended by the local authority.

The size of the watermain is 100mm diameter and proposed connection it to existing watermain located in Public Road. Refer to Drawing: Refer to Drawing: 4985-13-05

The ring main will satisfy

- The development shall have a separate Water Service Connection.
- Service Connection pipes should be a minimum of 25mm outside diameter, 20mm inside diameter, and should be provided with appropriately sized fittings.

- Materials Selection: Mains and Service Connections

Pipe Size (ID) mm	**Pipe Material**
25 to 80	HDPE and MDPE
100 to 150	HDPE, MDPE, and DI
200 to 300	HDPE, MDPE and DI
350 to 600	DPPE and DI
>600	DI

- All connections shall have individually valve controlled.
- A bulk meter and associated telemetry system shall be chosen and supplied by Irish Water to its requirements based on the range of flow anticipated and the Customer shall provide the infrastructure to accommodate the meter and the telemetry facilities.
- Metered connections shall consist of a sluice valve, a straight length of pipework at least 10 times the meter diameter upstream of the meter, approved water meter, a straight length of pipework at least 5 times the pipe diameter downstream of the meter and a sluice valve.
- Units shall have facilities for a minimum water storage capacity of 24-hour water demand.
- Where electric showers and dishwasher, washing machine, heating systems, etc. are provided in buildings, they shall not be connected directly to Irish Water's water supply system. They must be fed from the storage tank located within the building. Direct feeds from Irish Water's water supply system shall only be a potable water supply tap and the water storage tank.
- The installation of the connection pipework between the development's water supply network and the existing Irish Water supply network system shall be carried out only by Irish Water or its agents.
- The water supply pipework for developments shall not be located on private land.

Ronan Clarke BScEng.,C.Eng.,MIEI, Dip Plan, Dip Fire Eng.
Clarke & Co. Consulting Engineers & Architects

Appendix A

SURFACE WATER DRAINAGE DESIGN

SURFACE WATER DRAINAGE DESIGN

Total Area = 0.2 ha

IMPERMEABILTY FACTOR = 0.8 Paved Area = 1470	IMPERMEABILITY FACTOR = 0.1 Green Area= 0

RETURN PERIOD 100year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
15	90.8	1.0	37.11	36.11	32
30	56.2	1.0	22.97	21.97	40
60	34.7	1.0	14.18	13.18	47
120	21.5	1.0	8.79	7.79	56
180	16.2	1.0	6.62	5.62	61
240	13.2	1.0	5.39	4.40	63
360	10	1.0	4.09	3.09	67
540	7	1.0	2.86	1.86	60
720	6.2	1.0	2.53	1.54	66

RETURN PERIOD 50year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
15	74.8	1.0	30.57	29.57	27
30	46.6	1.0	19.04	18.05	32
60	29	1.0	11.85	10.85	39
120	18	1.0	7.36	6.36	46
180	13.7	1.0	5.60	4.60	50
240	11.2	1.0	4.58	3.58	52
360	8.5	1.0	3.47	2.48	53
540	6.5	1.0	2.66	1.66	54
720	5.3	1.0	2.17	1.17	50

RETURN PERIOD 30year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
15	64.8	1.0	26.48	25.48	23
30	40.6	1.0	16.59	15.59	28
60	25.4	1.0	10.38	9.38	34
120	15.9	1.0	6.50	5.50	40
180	12.1	1.0	4.94	3.95	43
240	9.9	1.0	4.05	3.05	44
360	7.6	1.0	3.11	2.11	46
540	5.8	1.0	2.37	1.37	44
720	4.7	1.0	1.92	0.92	40

RETURN PERIOD 20year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
5	105.6	1.0	43.15	42.16	13
10	61	1.0	24.93	23.93	14
15	57.6	1.0	23.54	22.54	20
30	36.2	1.0	14.79	13.80	25
60	22.8	1.0	9.32	8.32	30
120	14.3	1.0	5.84	4.85	35
180	10.9	1.0	4.45	3.46	37
240	9	1.0	3.68	2.68	39
360	6.9	1.0	2.82	1.82	39
540	5.2	1.0	2.13	1.13	37
720	4.3	1.0	1.76	0.76	33

RETURN PERIOD 10year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
5	86.4	1.0	35.31	34.31	10
10	60	1.0	24.52	23.52	14
15	46.8	1.0	19.13	18.13	16
30	29.8	1.0	12.18	11.18	20
60	18.8	1.0	7.68	6.69	24
120	12	1.0	4.90	3.91	28
180	9.1	1.0	3.72	2.72	29
240	5	1.0	2.04	1.05	15
360	5.8	1.0	2.37	1.37	30
540	4.4	1.0	1.80	0.80	26
720	3.7	1.0	1.51	0.51	22

RETURN PERIOD 5 year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
5	68.4	1.0	27.95	26.95	8
10	48	1.0	19.62	18.62	11
15	37.6	1.0	15.37	14.37	13
30	24	1.0	9.81	8.81	16
60	15.3	1.0	6.25	5.25	19
120	9.8	1.0	4.00	3.01	22
180	7.5	1.0	3.06	2.07	22
240	6.3	1.0	2.57	1.58	23
360	4.8	1.0	1.96	0.96	21
540	3.7	1.0	1.51	0.51	17
720	3.1	1.0	1.27	0.27	12

RETURN PERIOD 2year

Duration	Intensity	Existing flow	New flow	Flow to storage	Storage
(mins)	(mm/hr)	(L/s)	(L/s)	(L/s)	(M^3)
15	25.6	1.0	10.46	9.46	9
30	16.6	1.0	6.78	5.79	10
60	10.8	1.0	4.41	3.42	12
120	7	1.0	2.86	1.86	13
180	5.4	1.0	2.21	1.21	13
240	4.5	1.0	1.84	0.84	12
360	3.5	1.0	1.43	0.43	9
540	2.7	1.0	1.10	0.11	3
720	2.2	1.0	0.90	-0.10	-4

Drainage Design

Rainfall Intensities	Return Period	Peak Flow l/s	Volume Cum
M5-60	5 years	6	22.5089928
M30-60	30 Years	10	37.3678704
M100-60	100 Years	14	51.0498072

Pipe Size:	mm	225
Discharge	l/s	37.12
Velocity	m/s	0.93
Gradient	1 in	200

Appendix B

Sizing of Petrol Interceptor

Petrol Interceptor Sizing

Area description: Contributing Proposed Welfare Facilities Site

	Calculation of Petrol Interceptor Nominal Size	
EN 858-2	$NS = (Q_r + f_x Q_s) f_d$	
4.3.1	**Where**	
	NS =	Nominal Size of Separator
	Q_r =	Max flow rate of rainwater (M5-60)
	Q_s =	Max flow rate of wastewater*
	f_d =	Density factor of light liquid
	f_x =	Impediment factor depending on nature of discharge
	No Wastewater discharge in this case, Q_s = 0	
EN 858-2	f_d =	1.5
	Q_r =	6 l/s
	NS =	45 litres/second (peak flow rate)
Klaregestor NSBD4		

Sizes & Specifications:

Nominal Size	Flow (l/s)	Peak Flow Rate (l/s)	Drainage Area (m²) PPG3 (0.0018)	Silt Storage Capacity Litres	Oil Storage Capacity Litres	Length	Dia.	Access Shaft Diameter	Base to Inlet	Base to Outlet Invert	Standard Fall Across Unit	Min. Inlet Invert	Standard Pipework Diameter
NSBD3	3	30	1670	300	45	1765	1225	750	1450	1350	100	500	160
NSBD4	4.5	45	2500	450	68	1765	1225	750	1450	1350	100	500	200
NSBD6	6	60	3335	600	90	1765	1225	750	1450	1350	100	500	200
NSBD8	8	80	4445	800	120	3065	1225	750	1450	1350	100	500	250
NSBD10	10	100	5560	1000	150	3065	1225	750	1450	1350	100	500	315
NSBD12	12	120	6670	1200	180	3915	1225	750	1450	1350	100	500	315
NSBD15	15	150	8335	1500	225	3915	1225	750	1450	1350	100	500	315
NSBD18	18	180	10000	1800	270	3200	2012	600	2110	2010	100	1000	375
NSBD24	24	240	13340	2400	360	3200	2012	600	2110	2010	100	1000	375
NSBD30	30	300	16670	3000	450	3915	2012	600	2110	2010	100	1000	450
NSBD36	36	360	20000	3600	540	3915	2012	600	2110	2010	100	1000	525
NSBD55	55	550	30560	5500	825	5085	2820	600	2310	2060	250	1000	600
NSBD72	72	720	40000	7200	1080	5820	2820	600	2310	2060	250	1000	675
NSBD84	84	840	46670	8400	1260	6200	2820	600	2310	2010	300	1000	750
NSBD96	96	960	53340	9600	1440	7375	2820	600	2310	2010	300	1000	825
NSBD110	110	1100	61110	11000	1650	7925	2820	600	2360	2010	350	1000	825
NSBD130	130	1300	72225	13000	1950	8725	2820	600	2360	2010	350	1000	825

Appendix C

Design of StormTech Storm water Management System

STORMTECH Stormwater Management System

PROJECT REF:	R20281
PROJECT:	Kildare Co Co Depot
DATE:	12-Mar-20
CREATED BY:	Lukasz

SYSTEM PARAMETERS

Required Total Storage	53	m^3
Stormtech chamber model	SC740	
Filtration Permeable Geo or Impermeable Geo	Filter geo	
Number of Isolator Rows (IR)	1	

SITE PARAMETERS

Stone Porosity	43%		
Excavation Batter Angle (degrees)	90	°	*Minimum Req*
Stone Above Chambers	0.15	m	*0.15*
Stone Below Chambers	0.15	m	*0.15*
In-between Row Spacing	0.15	m	*0.15*
Additional Storage outside Excavation. E.g manholes, Header Pipe	0	m^3	

HEADER PIPE

Is Header pipe required within excavation	No	
Orientation of Header Pipe	Parrallel to IR	
Diameter of Header Pipe	0.6	m
Length of Header Pipe	0	m

CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows		5	ea
Number of units per Row		4	ea
System Installed Storage Depth (effective storage depth)	1.060		m
Tank overall installed Width at base	7.68	8.3	m
Tank overall installed Length at Base	9.38	10	m
Total Effective System Storage	**48.3**	**53.4**	m^3

Łukasz Piorunkiewicz | Senior Design Engineer
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Stormwater Attenuation | Solar PV Systems | Rainwater Harvesting Systems & Maintenance | Cold Water Storage Tanks | Flood Defence Systems

CUBICM3 SUSTAINABLE ENGINEERING SOLUTIONS

ENGINEERS IRELAND cpd REGISTERED TRAINING PROVIDER 2019

From: Lukasz Piorunkiewicz
Sent: Thursday 12 March 2020 14:36
To: Ronan Clarke <ronanclarke@clarkeco.ie>
Cc: Ivan McFadden <Ivan.McFadden@cubicm3.com>; coolderry@gmail.com
Subject: RE: Kildare Co Co Depot R20281

Hi Ronan,

Based on information provided, please see the results from the MD and the snapshot of our proposal.

STORMTECH Stormwater Management System

PROJECT REF:	R20277
PROJECT:	Railway Street, Portlaoise, Carpark
DATE:	12-Mar-20
CREATED BY:	Lukasz

SYSTEM PARAMETERS

Required Total Storage	53	m^3
Stormtech chamber model	SC740	
Filtration Permeable Geo or Impermeable Geo	Filter geo	
Number of Isolator Rows (IR)	1	

SITE PARAMETERS

Stone Porosity	43%		
Excavation Batter Angle (degrees)	90	°	Minimum Req
Stone Above Chambers	0.15	m	0.15
Stone Below Chambers	0.15	m	0.15
In-between Row Spacing	0.15	m	0.15
Additional Storage outside Excavation. E.g manholes, Header Pipe	0	m^3	

HEADER PIPE

Is Header pipe required within excavation	No	
Orientation of Header Pipe	Parrallel to IR	
Diameter of Header Pipe	0.6	m
Length of Header Pipe	0	m

CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows		5	ea
Number of units per Row		4	ea
System Installed Storage Depth (effective storage depth)	1.060		m
Tank overall installed Width at base	7.68	8.3	m
Tank overall installed Length at Base	9.38	10	m
Total Effective System Storage	**48.3**	**53.4**	m^3

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Stormwater Attenuation | Solar PV Systems | Rainwater Harvesting Systems & Maintenance | Cold Water Storage Tanks | Flood Defence Systems

From: Ronan Clarke <ronanclarke@clarkeco.ie>
Sent: Wednesday 11 March 2020 18:11
To: Lukasz Piorunkiewicz <Lukasz@cubicm3.com>
Cc: Ivan McFadden <Ivan.McFadden@cubicm3.com>; coolderry@gmail.com
Subject: Kildare Co Co Depot

Hello Lads,

I hope your keeping well.

I would appreciate the design calcs for the following;

Subject: Kildare Co Co Athy Depot ... StormTech

Location: Athy, Co. Kildare

Return Period: 100years

Climate Change: 20%

Depth of invert: 1.6m deep

Site ..... Paved Area 1,470sqm and the Green Area Nil sqm

Infiltration rate f value ....3.13 x 10-5m/s.

Thanks

Ronan

clarke | engineers architects

Appendix D

Additional Catchment Parameters

Catchment Parameters	
Soil Type	Stiff brown slightly sandy gravelly silty clay with cobbles. Soil Type 2
Ground Water table level	Not Encountered
Infiltration Rates	$3.13x10^{-5}$m/s

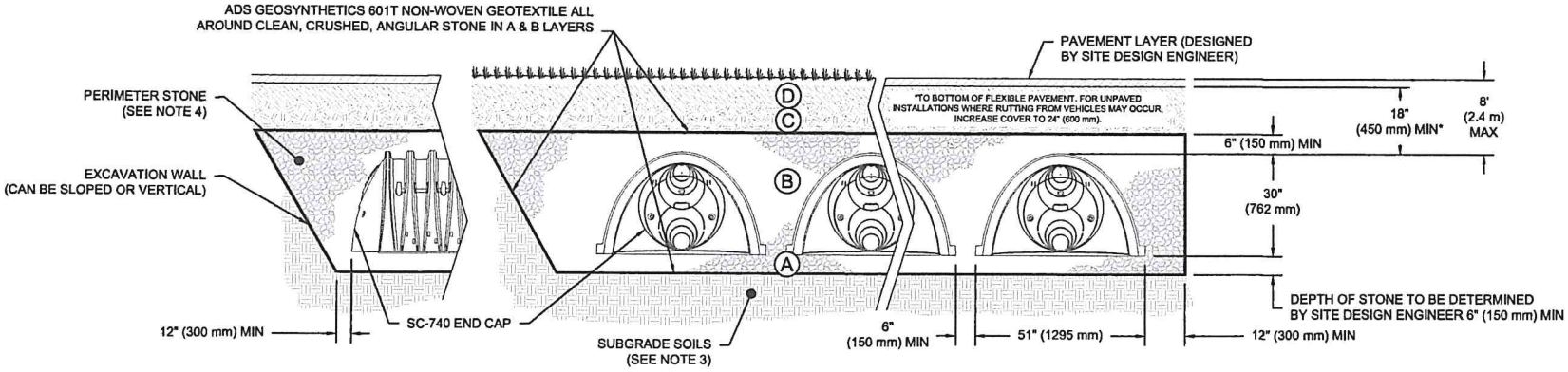
Appendix E

Details of StormTech Water Management System

ACCEPTABLE FILL MATERIALS: STORMTECH SC-740 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 18" (450 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 12" (300 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 6" (150 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS. ROLLER GROSS VEHICLE WEIGHT NOT TO EXCEED 12,000 lbs (53 kN). DYNAMIC FORCE NOT TO EXCEED 20,000 lbs (89 kN).
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 6" (150 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. SC-740 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 2".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 550 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

SC-740
STANDARD CROSS SECTION

DATE: 05-10-19 | DRAWN: KR | CHECKED: KR | PROJECT #:

DATE	DRWN	CHKD	DESCRIPTION

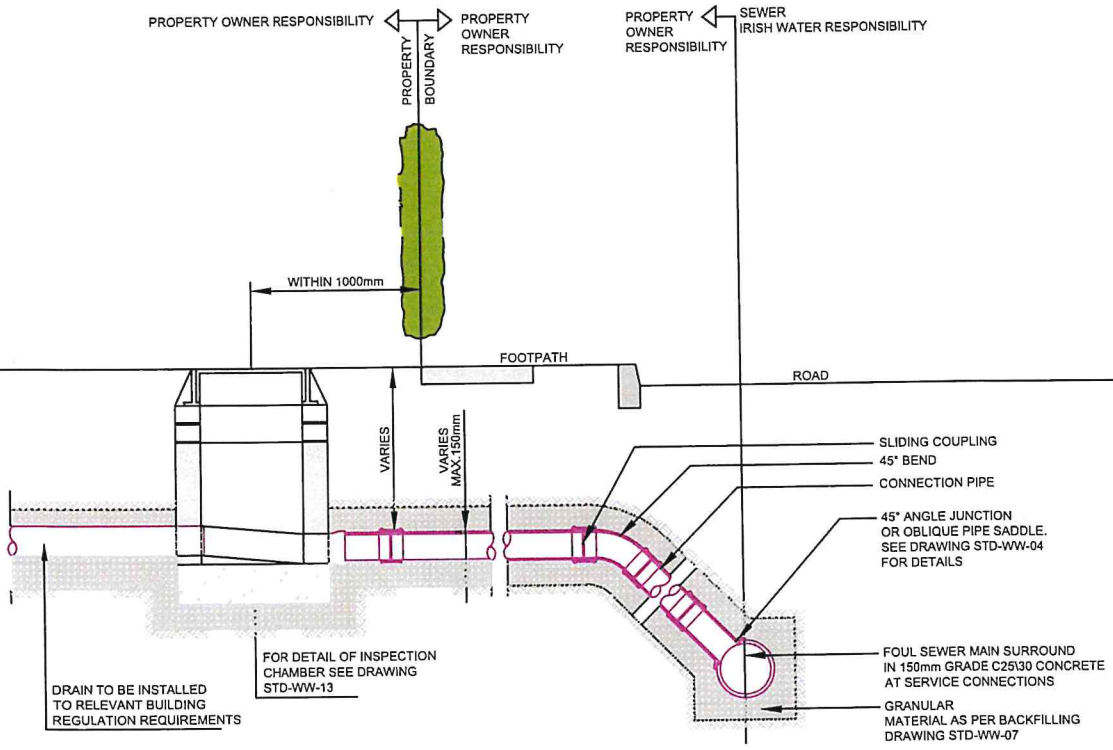
StormTech
Dominion Reservoir Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 | 888-892-2694 | WWW.STORMTECH.COM

ADS
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026

Appendix F

Irish Water Typical Details

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AN INSPECTION CHAMBER SHOULD BE LOCATED AT OR WITHIN 1m OF THE PROPERTY BOUNDARY AT THE UPSTREAM END OF EACH SERVICE CONNECTION ON THE PRIVATE SIDE OF THE CURTILAGE, IF PRACTICABLE.
3. ANY PIPE AND ASSOCIATED ACCESS UPSTREAM OF THE POINT OF CONNECTION TO A PUBLIC SEWER WITHIN THE CONFINES OF A PRIVATE BOUNDARY IS A PRIVATE DRAIN AND SHOULD BE CONSTRUCTED IN ACCORDANCE WITH BUILDING REGULATIONS.



PIPE SIZE (mm)	GRADIENT
100	1 : 60
150 TO 225	1 : 150 MINIMUM

REFER TO INDEX SHEET FOR NOTES REGARDING DESIGN RESPONSIBILITY & RISK ASSESSMENT

UISCE ÉIREANN : IRISH WATER

No	Date	Drn	Chk	Description	App
0	09/'15	JMC	TOC	Initial Issue	SL

STANDARD DETAILS - WASTEWATER

SCALE: NOT TO SCALE

DATE: SEPT. 2015

TITLE: DRAIN AND SERVICE CONNECTION PIPEWORK

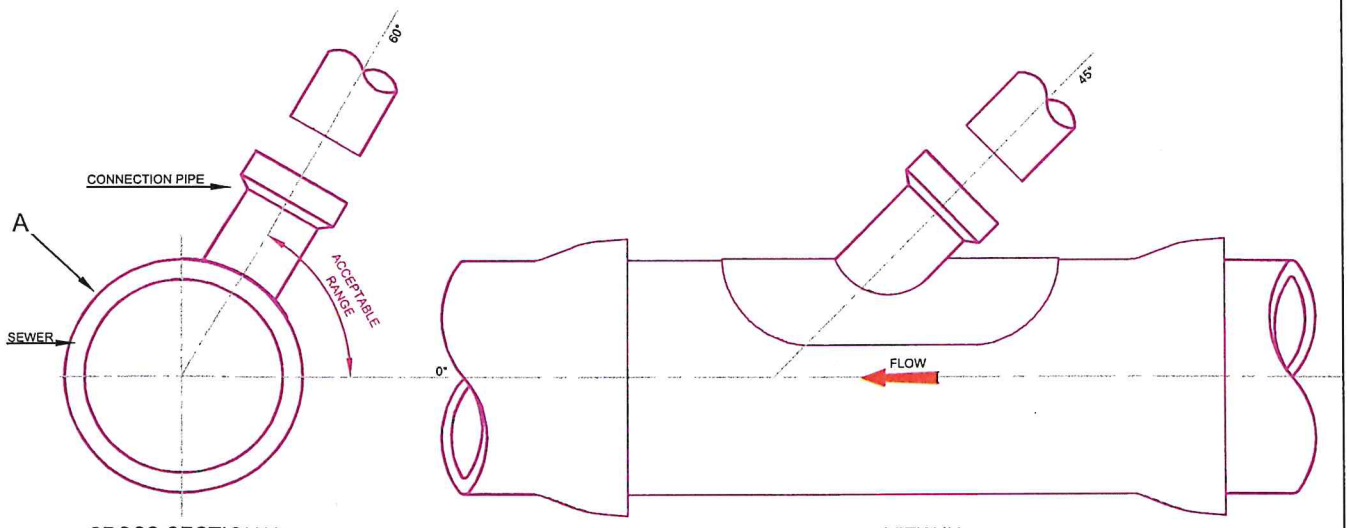
DRAWING No.: STD-WW-03

REV: 0

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. AS FAR AS PRACTICABLE, JUNCTIONS AND SERVICE CONNECTIONS SHALL BE BUILT IN FOR ALL PLANNED USERS WHEN THE SEWER IS BEING CONSTRUCTED. WHERE IT IS NECESSARY TO MAKE A POST-CONSTRUCTION CONNECTION THE DEVELOPER SHALL BRING THE SEWER TO THE INSPECTION CHAMBER, INSTALL THE INSPECTION CHAMBER AND SEAL THE UPSTREAM END UNTIL THE CONNECTION IS REQUIRED.
3. THE VERTICAL ANGLE BETWEEN THE SERVICE CONNECTING PIPE AND THE HORIZONTAL SHALL BE GREATER THAN 0° AND NOT MORE THAN 60°.
4. WHERE THE CONNECTION IS BEING MADE TO A SEWER WITH A NOMINAL INTERNAL DIAMETER OF 300mm DIAMETER OR LESS, CONNECTIONS SHALL BE MADE USING 45° ANGLE JUNCTIONS.
5. WHERE THE CONNECTION IS BEING MADE TO A SEWER WITH A NOMINAL INTERNAL DIAMETER GREATER THAN 300mm :

A) IF THE DIAMETER OF THE CONNECTING PIPE IS GREATER THAN HALF THE DIAMETER OF THE SEWER, AN ACCESS MANHOLE SHALL BE CONSTRUCTED TO FORM THE CONNECTION POINT; OR,
B) IF THE DIAMETER OF THE CONNECTING PIPE IS LESS THAN OR EQUAL TO HALF THE DIAMETER OF THE SEWER, THEN THE CONNECTION SHALL BE MADE USING A PREFORMED SADDLE FITTING WITH A SLOW BEND BETWEEN THE SADDLE AND THE CONNECTING SEWER/DRAIN .

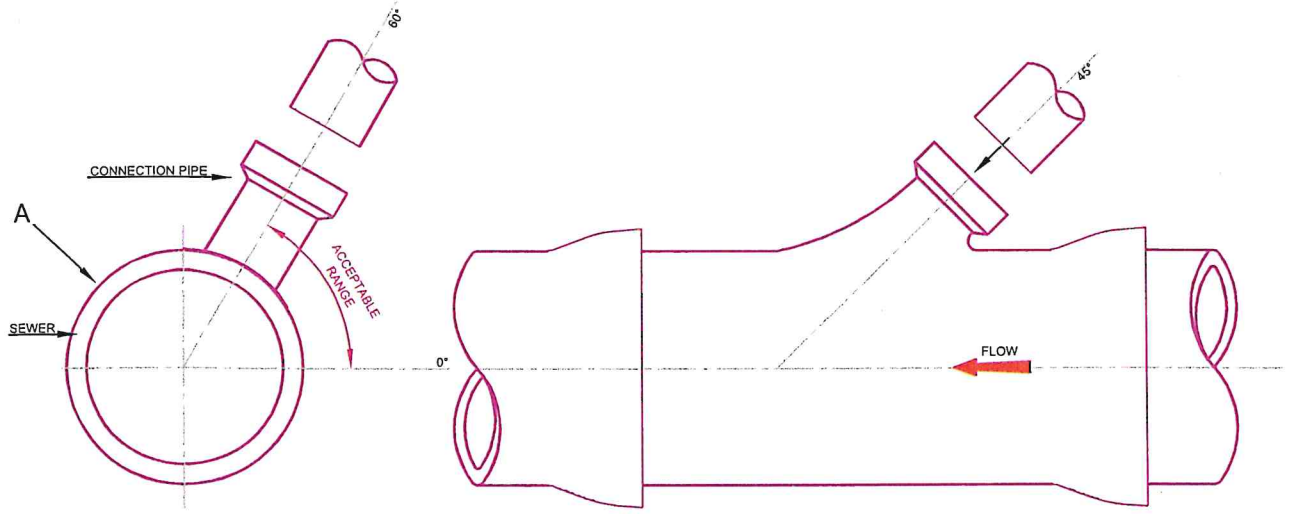
6. CONNECTIONS MADE WITH SADDLE FITTINGS SHALL BE MADE BY CUTTING AND SAFELY REMOVING A CORE FROM THE PIPE AND JOINTING THE SADDLE FITTING TO THE PIPE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS TO ENSURE A WATERTIGHT JOINT. THE CONNECTING PIPE SHALL NOT PROTRUDE INTO THE SEWERS.



CROSS-SECTIONAL VIEW OF SEWER

VIEW IN DIRECTION OF ARROW A

APPROVED 45° SADDLE CONNECTION



CROSS-SECTIONAL VIEW OF SEWER

45° JUNCTION

VIEW IN DIRECTION OF ARROW A

REFER TO INDEX SHEET FOR NOTES REGARDING DESIGN RESPONSIBILITY & RISK ASSESSMENT

UISCE ÉIREANN : IRISH WATER

No	Date	Dm	Chk	Description	App
0	09/15	JMC	TOC	Initial Issue	SL

STANDARD DETAILS - WASTEWATER

SCALE: NOT TO SCALE

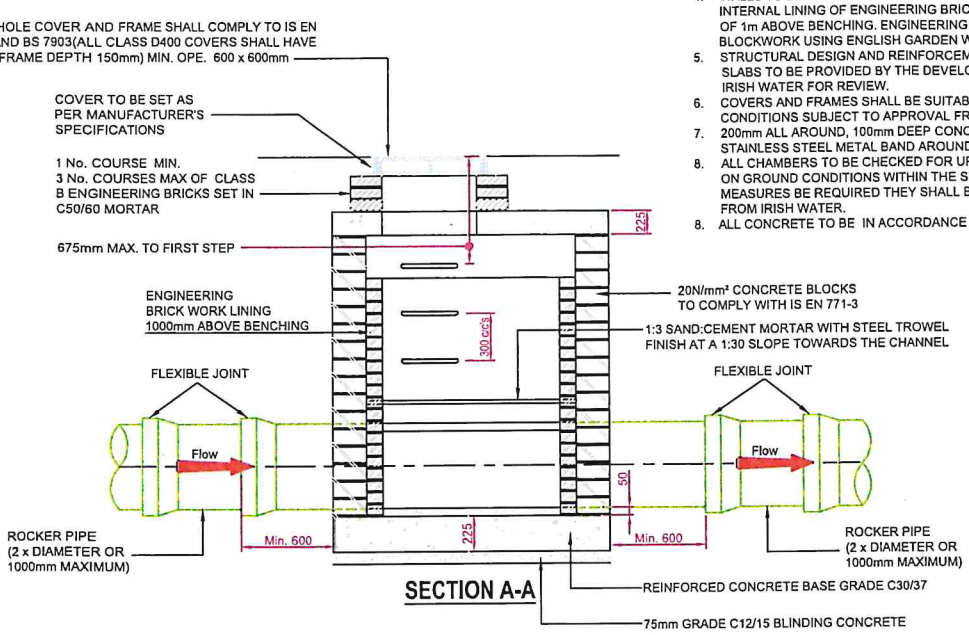
DATE: SEPT. 2015

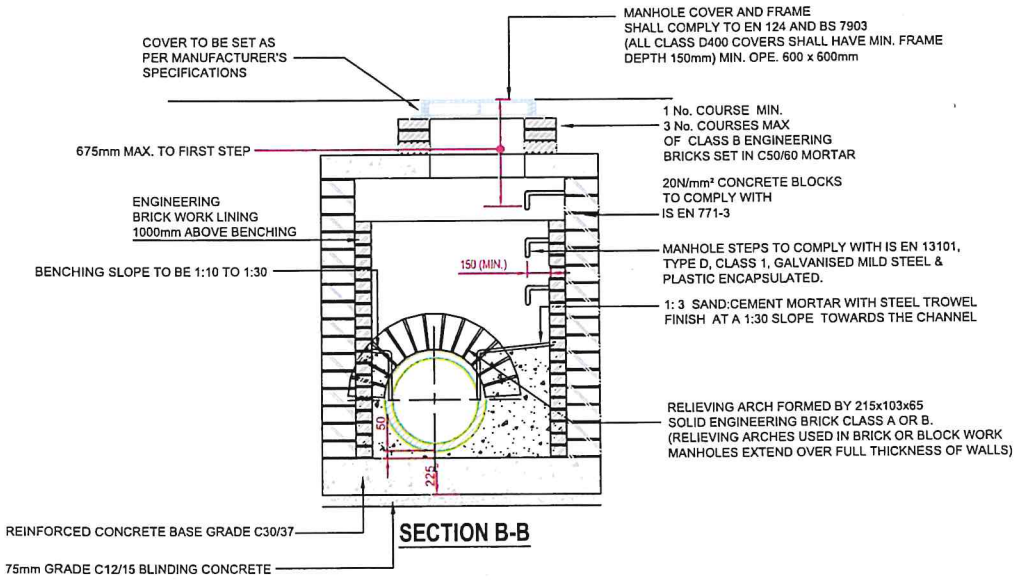
TITLE: TYPICAL SEWER / SERVICE PIPE CONNECTION

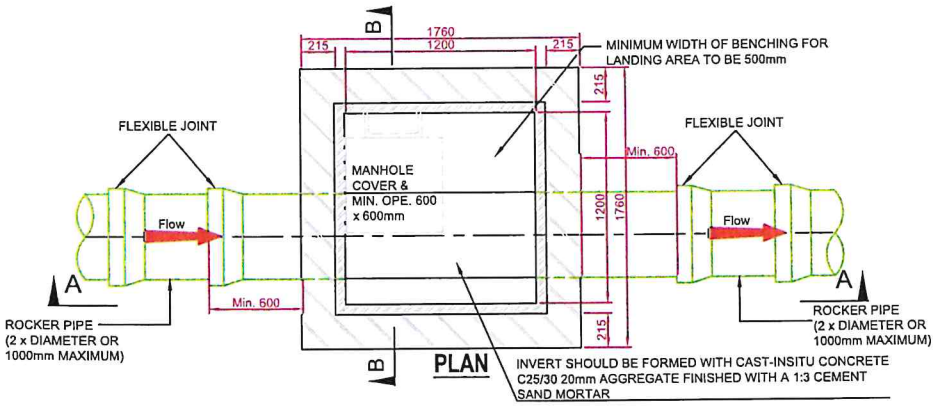
DRAWING No.: STD-WW-04

REV: 0

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. SOLID BLOCKWORK TO BE OF HIGH STRENGTH (20N/mm²) TO IS EN 771.
3. MAXIMUM DEPTH OF BLOCK WORK MANHOLE IS 1.20m (THE USE OF BLOCK WORK IN DEEPER MANHOLES WILL BE CONSIDERED BUT SUCH USE WILL REQUIRE DETAILED STRUCTURAL DESIGN AND WRITTEN APPROVAL FROM IRISH WATER).
4. WALLS TO BE FLUSH POINTED AND NOT PLASTERED INTERNALLY, INTERNAL LINING OF ENGINEERING BRICK TO IS EN 771-1 TO A HEIGHT OF 1m ABOVE BENCHING. ENGINEERING BRICK TO BE BONDED TO BLOCKWORK USING ENGLISH GARDEN WALL BOND.
5. STRUCTURAL DESIGN AND REINFORCEMENT DETAILS FOR ROOF AND BASE SLABS TO BE PROVIDED BY THE DEVELOPER AND SUBMITTED TO IRISH WATER FOR REVIEW.
6. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
7. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
8. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO APPROVAL FROM IRISH WATER.
8. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206 : 2013.







REFER TO INDEX SHEET FOR NOTES REGARDING DESIGN RESPONSIBILITY & RISK ASSESSMENT

No	Date	Drn	Chk	Description	App
1	08/16	JMC	TOC	Added steps & revised access ope & cover notes	MOD
0	09/15	JMC	TOC	Initial Issue	SL

UISCE ÉIREANN : IRISH WATER

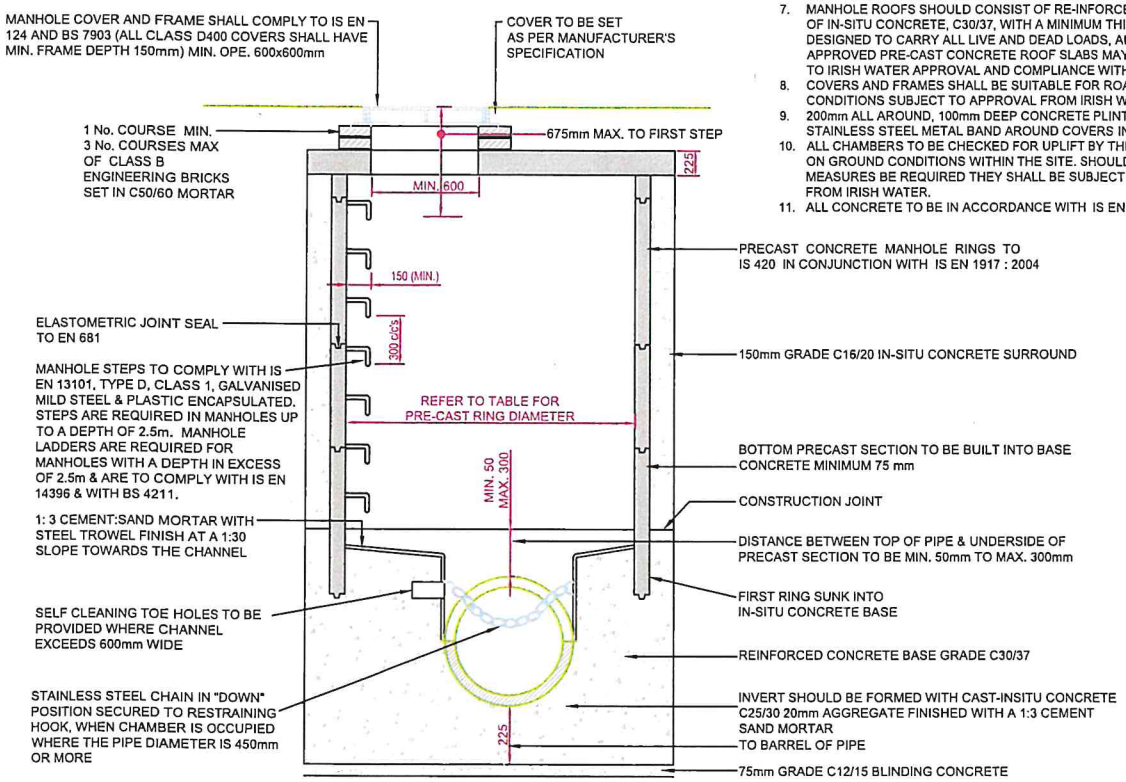
STANDARD DETAILS - WASTEWATER

SCALE: NOT TO SCALE | DATE: SEPT. 2015

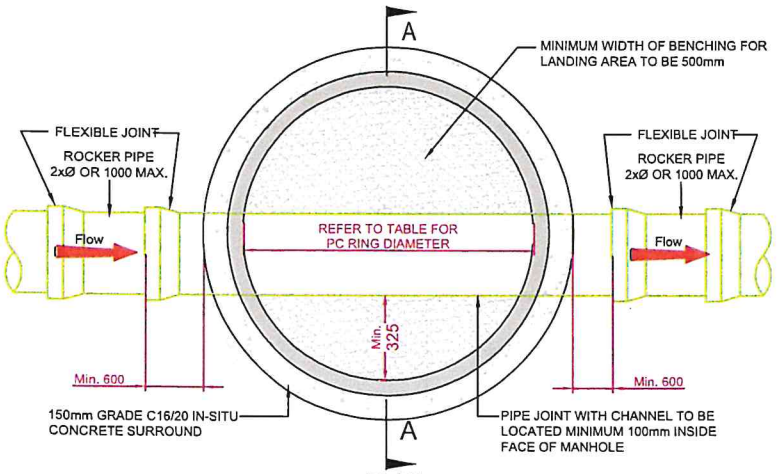
TITLE: BLOCKWORK MANHOLE (< 450mm DIA.)

DRAWING No.: STD-WW-09 | REV: 1

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. PRE-CAST MANHOLES UNITS: COMPLYING WITH REQUIREMENTS OF IS EN 1917 AND BS 5911-PART 3.
3. THICKER MANHOLE BASES REQUIRED FOR SEWERS IN EXCESS OF 3m DEEP WHERE THE SIZE IS GREATER THAN THE STANDARD MINIMUM SIZE
4. APPROVED PRE-CAST CONCRETE BASES MAY BE USED INCORPORATING CHANNELS, BENCHING ETC. SUBJECT TO IRISH WATER APPROVAL AND COMPLYING WITH BS 5911-PART 4 2002.
5. STRUCTURAL DESIGN AND REINFORCEMENT DETAILS TO BE PROVIDED BY THE DEVELOPER AND SUBMITTED TO IRISH WATER FOR REVIEW.
6. MANHOLES GREATER THAN 3m IN DEPTH WILL REQUIRE A DETAILED STRUCTURAL DESIGN AND BE SUBJECT TO IRISH WATER APPROVAL.
7. MANHOLE ROOFS SHOULD CONSIST OF RE-INFORCED CONCRETE SLAB OF IN-SITU CONCRETE, C30/37, WITH A MINIMUM THICKNESS OF 225mm DESIGNED TO CARRY ALL LIVE AND DEAD LOADS, ALTERNATIVELY, APPROVED PRE-CAST CONCRETE ROOF SLABS MAY BE USED SUBJECT TO IRISH WATER APPROVAL AND COMPLIANCE WITH BS 5911 PART 4: 2002.
8. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
9. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
10. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO APPROVAL FROM IRISH WATER.
11. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206 : 2013.



SECTION A-A



PLAN

MINIMUM MANHOLE DIAMETERS	
DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	**INTERNAL DIAMETER OF MANHOLE (mm)**
LESS THAN 375	1200
375 TO 450	1350
500 TO 750	1500

REFER TO INDEX SHEET FOR NOTES REGARDING DESIGN RESPONSIBILITY & RISK ASSESSMENT

UISCE ÉIREANN : IRISH WATER

No	Date	Drn	Chk	Description	App
1	08/16	JMC	TOC	Added steps & revised access ope & cover notes	MOD
0	09/15	JMC	TOC	Initial Issue	SL

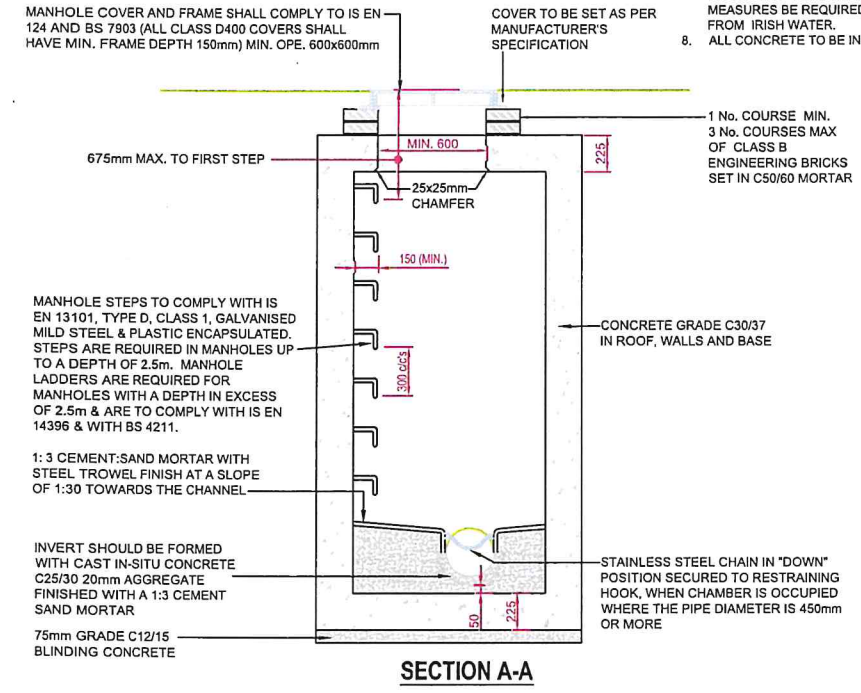
STANDARD DETAILS - WASTEWATER

SCALE: NOT TO SCALE | DATE: SEPT. 2015

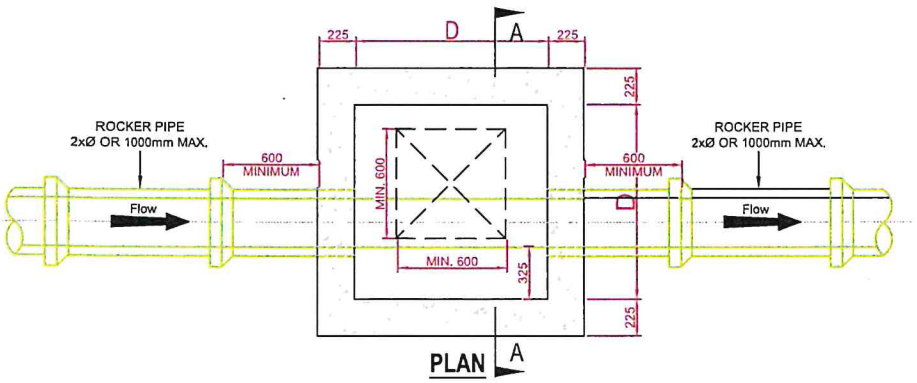
TITLE: PRE-CAST CONCRETE MANHOLE

DRAWING No.: STD-WW-10 | REV: 1

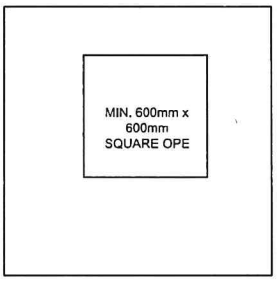
1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. IN-SITU MANHOLES TO HAVE A MINIMUM WALL AND FLOOR THICKNESS OF 225mm FOR MANHOLE DEPTHS UP TO 3.0m AND 300mm OR MORE WHEN THE MANHOLE DEPTH EXCEEDS 3.0m.
3. STRUCTURAL DESIGN & REINFORCEMENT DETAILS TO BE PROVIDED BY THE DEVELOPER AND SUBMITTED TO IRISH WATER FOR REVIEW.
4. MANHOLES GREATER THAN 3m IN DEPTH WILL REQUIRE A DETAILED STRUCTURAL DESIGN AND BE SUBJECT TO IRISH WATER APPROVAL.
5. COVERS AND FRAMES SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS SUBJECT TO APPROVAL FROM IRISH WATER.
6. 200mm ALL AROUND, 100mm DEEP CONCRETE PLINTH WITH PROTECTIVE STAINLESS STEEL METAL BAND AROUND COVERS IN GREEN AREAS.
7. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO APPROVAL FROM IRISH WATER.
8. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206 : 2013.



SECTION A-A



PLAN



ROOF PLAN

MINIMUM MANHOLE DIMENSION "D"	
DIAMETER OF LARGEST PIPE IN MANHOLE (mm)	INTERNAL DIMENSION OF MANHOLE (mm)
LESS THAN 375	1200
375 TO 450	1350
500 TO 750	1500

REFER TO INDEX SHEET FOR NOTES REGARDING DESIGN RESPONSIBILITY & RISK ASSESSMENT

UISCE ÉIREANN : IRISH WATER

No	Date	Dm	Chk	Description	App
1	08/16	JMC	TOC	Added steps & revised access ope & cover notes	MOD
0	09/15	JMC	TOC	Initial Issue	SL

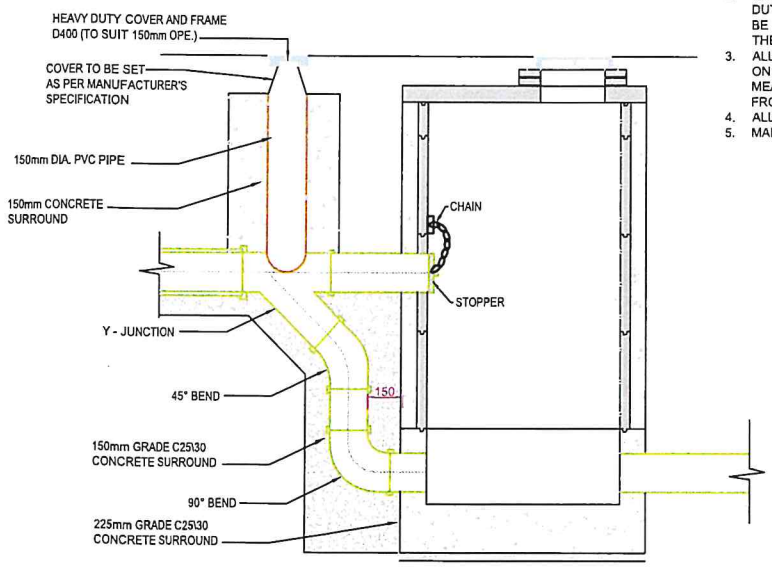
STANDARD DETAILS - WASTEWATER

SCALE: NOT TO SCALE | DATE: SEPT. 2015

TITLE: IN-SITU CONCRETE MANHOLE

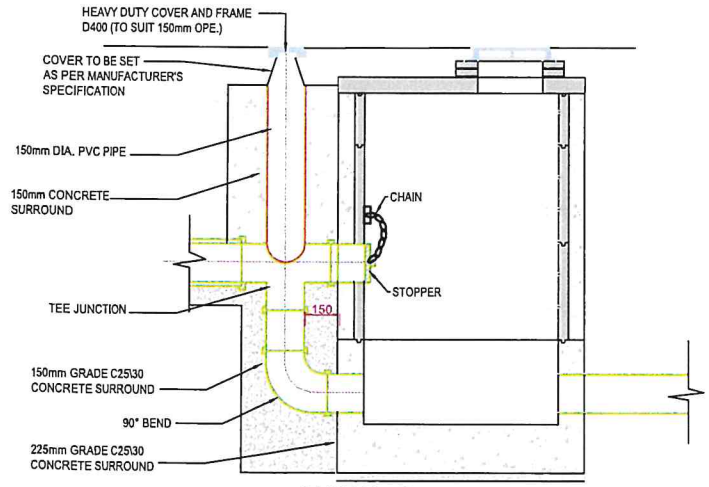
DRAWING No.: STD-WW-11 | REV: 1

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm) UNLESS NOTED OTHERWISE.
2. RODDING EYE CHAMBER SHALL BE COVERED WITH APPROVED HEAVY DUTY METAL COVERS TO IS 261 AND BS 5834. COVER AND FRAME SHALL BE SUITABLE FOR ROAD AND TRAFFIC CONDITIONS AND IS SUBJECT TO THE APPROVAL OF IRISH WATER.
3. ALL CHAMBERS TO BE CHECKED FOR UPLIFT BY THE DEVELOPER BASED ON GROUND CONDITIONS WITHIN THE SITE. SHOULD ANTI FLOATATION MEASURES BE REQUIRED THEY SHALL BE SUBJECT TO APPROVAL FROM IRISH WATER.
4. ALL CONCRETE TO BE IN ACCORDANCE WITH IS EN 206.
5. MANHOLE DETAILS TO BE IN ACCORDANCE WITH STD-WW-09, 10 AND 11



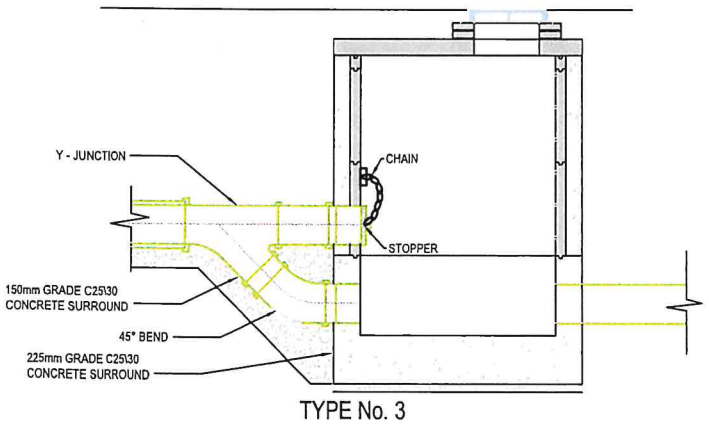
TYPE No. 1

150mm - 450mm DIA. (INCL.) DROP GREATER THAN 1700mm
500mm - 900mm DIA. (INCL.) DROP GREATER THAN 2300mm



TYPE No. 2

150mm - 450mm DIA. (INCL.) DROP GREATER THAN 900 AND LESS THAN 1700mm
500mm - 900mm DIA. (INCL.) DROP GREATER THAN 1300mm AND LESS THAN 2300mm



TYPE No. 3

150mm - 450mm DIA. (INCL.) DROP GREATER THAN 600mm AND LESS THAN 900m
500mm - 900mm DIA. (INCL.) DROP GREATER THAN 600mm AND LESS THAN 1300mm

REFER TO INDEX SHEET FOR NOTES REGARDING DESIGN RESPONSIBILITY & RISK ASSESSMENT

UISCE ÉIREANN : IRISH WATER

No	Date	Drn	Chk	Description	App
1	08/16	JMC	TOC	Added steps	MOD
0	09/15	JMC	TOC	Initial Issue	SL

STANDARD DETAILS - WASTEWATER

SCALE	DATE
NOT TO SCALE	SEPT. 2015

TITLE: BACKDROP MANHOLES

DRAWING No.	REV
STD-WW-12	1