Figure A 1: Standard Manhole Cover

- **CLASS D400**
- **MARKING**: EN 124
- **STAINLESS STEEL BOLT AND NUT 10mm Ø, 100mm LONG**
- **SECTION Y - Y**: TYPICAL HINGE STEEL BOLT
- **SECTION Y - Y**: COVER HINGE OPEN AT 90°
- **SECTION Y - Y**: COVER HINGE OPEN AT MIN. 100°
- **PRECAST R.C. MANHOLE SECTION B - B**: PLAN DETAIL '1'
- **DETAIL '2' & '3': EMBOSSED DESIGN**
- **DETAIL '4': EMBOSSED LOGO**
- **3mm ± 0.5 TO BE ROUNDED OFF**
- **B A H A Y A**
- **RUANG TERKURUNG DILARANG MASUK**
- **DANGER CONFINED SPACE DO NOT ENTER**
- **MODEL NO. AND THE SEE DETAIL '1'**
- **LOCKING AND PLACE OF MANUFACTURE**
- **MANUFACTURER'S NAME AND SERIAL NO.**
- **SEE DETAIL '2'**
- **SEE DETAIL '3'**
- **LIFTING DEVICE**
- **HINGE DEVICE**
- **16mm Ø BOLT**
- **SECTION X - X**: TYPICAL LOCKING DEVICE (TYPICAL SURFACE DETAIL)
- **SECTION Z - Z**: TYPICAL SECTION OF HEAVY DUTY D.I. MANHOLE COVER AND FRAME
- **SECTION A - A**: TYPICAL SECTION OF HEAVY DUTY D.I. MANHOLE COVER AND FRAME
- **SECTION C - C**: ANCHORING DEVICE WITH 12mm Ø THREAD AND 16mm Ø HOLE (ANCHOR DEPTH: 50mm)
- **SECTION Y - Y**: COVER HINGE OPEN AT 90°
- **SECTION Y - Y**: COVER HINGE OPEN AT MIN. 100°

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Figure A 2: Plan View of Typical Manhole
Figure A.3 Typical Shallow Precast Concrete Manhole (Ground Level to Invert of Pipe 1.2 m ≤ Depth < 2.5 m)
Figure A 4 Typical Shallow Precast Concrete Manhole with Backdrop
(Ground Level to Invert of Pipe 1.2 m ≤ Depth < 2.5 m)
Figure A5 Typical Medium Precast Concrete Manhole
(Ground Level to Invert of Pipe 2.5 m ≤ Depth < 5 m)
Figure A 6 Typical Medium Precast Concrete Manhole with backdrop (Ground Level to Invert of Pipe 2.5 m ≤ Depth < 5 m)
Figure A 7 Typical Deep Precast Concrete Manhole
(Ground Level to Invert of Pipe 5 m ≤ Depth ≤ 9 m)
Figure A8 Typical Deep Precast Concrete Manhole with Backdrop (Ground Level to Invert of Pipe 5 m ≤ Depth ≤ 9 m)
Figure A 9 : Typical Details of Large Diameter Manhole (LDM) Type
Figure A 10 : Typical Induct Vent Detail

Notes:
1. All dimensions are in millimetres.
2. Diameter of induct vent shall be approximately 1/2 of the forcemain but shall not exceed 300mm.
Figure A 11: Details of Household Connection to Main Sewer Reticulation Pipe for V.C. Pipe
Figure A 12: Typical Details of Concrete Thrust and Anchor Block
Figure A 13(a) : Typical Details of Inverted Siphons or Depressed Sewer
Figure A 13(b) : Typical Details of Inverted Siphons or Depressed Sewer
Figure A 14(a) : Typical Details for Force Main – Scour Valve and Receiving Manhole
Figure A 14(b) : Typical Details for Force Main – Air Valve
Figure A 15 : Typical Detail of Force Main Crossing
### Figure A 16(a) : Standard Pipe Beddings

#### Table A.1:

<table>
<thead>
<tr>
<th>Pipe Diameter</th>
<th>Standard Pipe Bedding Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mm</td>
<td>0.3 m</td>
</tr>
<tr>
<td>200 mm</td>
<td>0.5 m</td>
</tr>
<tr>
<td>300 mm</td>
<td>0.7 m</td>
</tr>
<tr>
<td>400 mm</td>
<td>0.9 m</td>
</tr>
<tr>
<td>500 mm</td>
<td>1.1 m</td>
</tr>
</tbody>
</table>

*Note: Measurements are approximate and subject to local variations.*
Figure A 16(b) : Standard Pipe Beddings

Notes:

1. Pipe bedding is to be used for all coating under normal site conditions, unless otherwise shown on the drawing.
2. Under circumstances where physical bedding is not feasible at site, the bedding shall be designed and applied according to the drawing.
3. For values of materials listed, the maximum material shall be 2.5% of the average density, and if not compacted by filling a 25mm minimum layer, in conjunction with the manufacturer’s recommendations.
4. For the purpose of structural design, the nominal wall thickness and design pressure shall be designed by the manufacturer.
5. For testing of water tolerance, the minimum allowance fluctuation shall be 1 foot per inch for lower areas normal diameter of pipe.
6. Place expansion joints or methods that will not distort or damage the pipe. Where the material is in contact between the bedding and the surface of the pipe, the bedding may be extended for a distance of the pipe length.
7. Where high water levels are encountered, allowance for approximate deformation and corrosion shall be made by design. For high water levels, special bedding can be used in the area of the bed and placed prior to backfilling.
8. Pipe is bedding shall be used in the area where the soft ground is encountered. Such soft ground shall generally be used to be 125% of the width of the pipe. For every 500mm, the allowable deformation shall be reduced by 125% of the width of the pipe. If the allowable deformation is 125% of the width of the pipe, the bedding shall be extended for a distance of the pipe length.
9. Pipe is bedding shall be used in the area where the soft ground is encountered. Such soft ground shall be used to be 125% of the width of the pipe. For every 500mm, the allowable deformation shall be reduced by 125% of the width of the pipe. If the allowable deformation is 125% of the width of the pipe, the bedding shall be extended for a distance of the pipe length.
10. The concrete cap for a pipe shall start and terminate at the face of the bedding to avoid breakage.
11. Detectors marker tape shall be positioned within the detectable zone and in accordance with manufacturer’s recommendation.
12. Concrete bed and bedding should not be constructed on tops or within settling tanks designed. If the effort is made, it should be designed not to create any significant risk for the structures and at any time at risk of collapse during its operating lifetime.
Appendix A

Figure A 17: Vacuum Sewage Collection System

Figure A 18: House Connection
Figure A 19 (a) : Example Of Vacuum Station With Housed Collection Vessel
Figure A 19 (b) : Example Of Vacuum Station With Housed Collection Vessel
Figure A 20 (a) : Collection Chambers With Interface Valves Vented Through Breather Pipes

Figure A. 20 (b) : Collection Chamber With Interface Valve Activated By Float
Figure A. 20 (c) : Multi-valve Collection Chamber

Plan

Section A - A
Figure A 21: Vacuum Sewer Profiles (not to scale)

Figure A. 22 : Example of Vacuum Sewer Profiles For Uphill and Downhill Transport (Not To Scale)
Figure A 23: Y-Branch for Vacuum Sewer

Figure A 24: Method of Joining Crossover Pipes and Branch Sewers to Vacuum Mains
Figure A 25: Typical Details of Dry-well Pump Station

N.B.: The discharge level for dewatering pump shall be higher than the invert level of overflow pipe to prevent sewage from back flowing into the dry well during flooding.
Figure A 26: Typical Detail of Wet-well Pump Station
Figure A 27 : Buffer Zone for Pump Station with Super Structure

Typical Section

Note :-

1. 20m buffer zone shall be provided from the external edge of the P.S super-structure fence/boundary to the nearest habitable building fence/boundary as required by building by-laws. The buffer zone shall be sufficient to allow for pump station access and working area.

2. Non-Habitable buildings may be located within buffer zone.

3. Where the pump station is located in sensitive areas, additional buffer zone may be specified for the purpose of beautification.
Figure A 28: Buffer Zone for Pump without Super Structure

Sectional Plan

Note:

1. 20m Buffer zone shall be provided from the perimeter (fence/boundary) of the pump station to the nearest habitable building fence/boundary as required by building by-laws. The buffer zone shall be sufficient to allow for pump station access and working area.

2. Non-habitable buildings may be located within the buffer zone but shall not obstruct operation, maintenance and access.

3. H is the height of the vent pipe which shall be at least higher than roof eaves level for buildings up to 2 storeys high. The vent cowl shall be at least 20m away from the nearest building window.

4. Where the pump station is located in sensitive areas, additional buffer zone may be specified for the purpose of beautification.
Figure A 29 : Standards Symbols and Abbreviations

Symbols

BUILDING (WOODEN OR
B uilding (MASONRY)
GATE
POND
FIRE
PAVED
RAIL
ROAD
CULVER
BRIDGE
PAVED CHANNEL AND FLOW
UNPAVED SIDE
SLOPES
CHAIN LINK
FENCE
UTILITY
TELEPHONE POLE
ELECTRIC STREET
PROPERTY, LOT OR RESERVE
SEPTIC TANK
BOREHOL

Abbreviations

A.C.P. ASBESTOS CEMENT
C.I. CAST
CH. CHAINAG
C.L. CONCRETE
C.R.S. DUCTILE
D.I. DIAMETER
D.M.H. DROP
D.W. DRAWN
E.G. EXISTING
F.D. GRADE
H.A. INSIDE
HORIZONTA
I.D. INVERT
J.N. JALAN
K.G. KAMPUN
L.G. LORON
L.T. LEFT
M.A. MAXIMUM
M.H. MANHOLE
MIN. MINIMUM
MOD. MODIFY
NO. NUMBER
N.T.S. NOT TO
O.D. OUTSIDE
R.C. REINFORCED
R.C.P. REINFORCED CONCRETE
RETI. RETICULATION
R.T. RIGHT
S. SLOPE
S.G. STREAM OR SHEET
S.I.T. SPECIFIC
S.T.D. STANDARD
S.C.W. STANDARD CUT-OUT
S.T. STEEL
STA. STATIO
T.Y.P. TYPICA
V.A.R. VARIOUS
V.C.P. VITRIFIED CLAY
H.D.P.E. HIGH DENSITY
W.R.T. VERTICAL