

TABLE 307-A: CONCRETE MH DETAILS

DEPTH RANGE	MAINTENANCE HOLE ID	CONCRETE MH SHAFT DETAILS		
		MIN WALL THICKNESS	CONCRETE CLASS (MIN)	REINFORCEMENT (IF REQ'D)
< 8 m	1000 / 1050	150 (170) ⁴	N32	ROLLED SL81 MESH
	1200	150 (170) ⁴	N32	ROLLED SL81 MESH
	1500	225	N32	N12
	1800	225	N32	N12
	2100	225	N32	N12
BETWEEN 8m & 15m	1000 / 1050	150 (180) ⁴	N40	N12
	1200	150 (180) ⁴	N40	N12
	1500	225	N40	N16
	1800	225	N40	N16
	2100	225	N40	N16
	2400	300	N40	N20

MH Selection and Specification

- All acceptable MH options (ie: GRP, plastic, concrete) which are suitable shall be specified for in the design template.
- Each MH shall be specified in accordance with the MH schedule (standard MRWA-S-100).
- Plan view designs shall be provided in the design in accordance with standard MRWA-S-308.
- Ref column 3 Table 307-A. Wall thickness to be 150 if concrete is not reinforced. Wall thickness to be > than the larger quoted thickness if reinforced concrete (value in brackets). This is to ensure clear cover can be achieved.
- Prefabricated MHs may be subject to depth limitations. Refer to products portal for all limitations of use.
- Situations of use of MHs are described in MRWA-S-300.
- All quoted depths are to outflow pipe invert.

Concrete Reinforcement (if required):

- MHs shall be concrete cast in situ with shaft reinforcement **only** where the Water Agency advises that the MH is subject to surcharge conditions. Otherwise, reinforcement is **not** required.
- Reinforcement shall be specified in the MH schedule of the design template (refer standard MRWA-S-100) and as per Table 307-A.
- Reinforcement shall be placed as per standard MRWA-S-309 (ie: horizontal hoops at 200 spacing, vertical bars at 300 spacing).
- Undertake specialized structural design for MHs deeper than 15m or MHs greater than 2400 in diameter to determine what reinforcement (if any) is required.

TABLE 307-B: CONCRETE MH FLOTATION CONTROL

MAINTENANCE HOLE ID	MIN WALL THICKNESS	MAX DEPTH ^a	BASE DIAMETER INCREASE ^c
1000 / 1050	150	5.5m	15 mm/ m DEPTH
1200	150	4m	25 mm/ m DEPTH
1500	225	6m	20 mm/ m DEPTH
1800	225	4.5m	35 mm/ m DEPTH
2100	225	3.5m	50 mm/ m DEPTH
2400	300	4.5m	45 mm/ m DEPTH

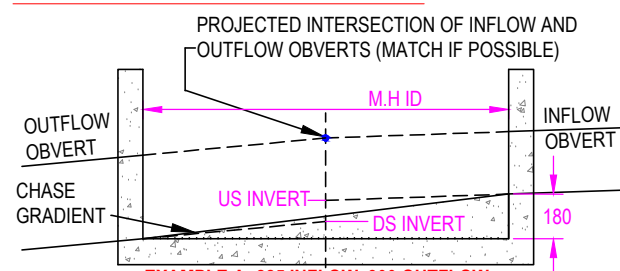
NOTES Regarding Table 307-B: Bouyancy Control

- Flotation mitigation shall be provided when the depth to invert of the outflow pipe exceeds the value specified in column 3 of Table 307-B.
- Flotation shall be mitigated by extending the MH base diameter.
- For every meter in depth below the depth limit, increase the base diameter by the value given in Table 307-B.
- MSs, MCs and prefabricated MHs do not require flotation mitigation unless the manufacturer's installation instructions or the product web portal specifies it.

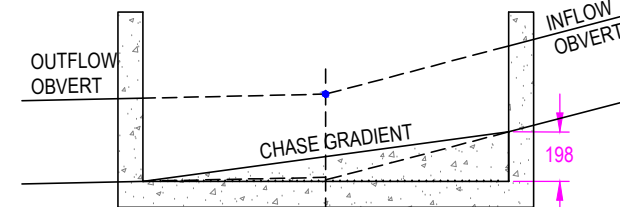
Bouyancy Control Examples

Example a: 6m deep 1500 diameter MH requires no flotation mitigation.
 Example b: 12m deep 1500 diameter MH requires a 6 x 20 = 120 addition to the base diameter.
 Example c: 3.5m deep 2100 diameter MH requires no flotation mitigation.
 Example d: 12.5m deep 2100 diameter MH requires a 9 x 50 = 450 addition to the base diameter.

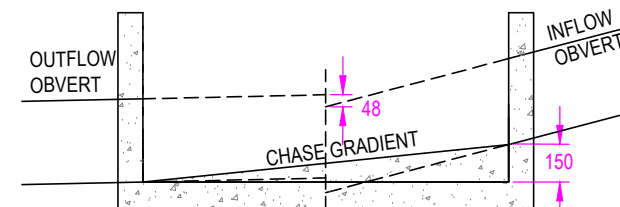
FIGURE 307-A: CONCRETE MH LEVELS



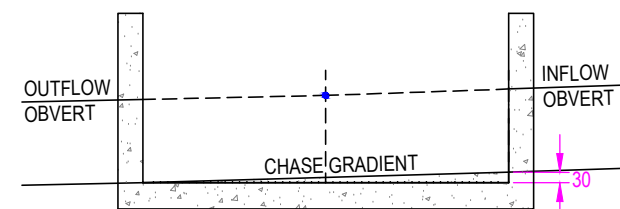
EXAMPLE A: 225 INFLOW, 300 OUTFLOW.
 FALL ADEQUATE TO COVER ANY INTERNAL BEND. FALL LIMIT (150) EXCLUDES CHANGE IN PIPE SIZE (ie: 75 (DN1 - DN2) OF ABOVE EXAMPLE SHOULD BE SUBTRACTED FROM 180)- OK



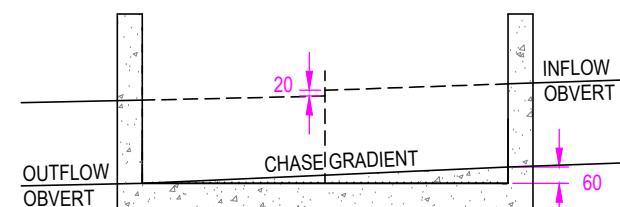
EXAMPLE B: STEEP 300 INFLOW.
 FALL EXCEEDS LIMIT (150) & IS **NOT** ACCEPTABLE



EXAMPLE C: AS EXAMPLE B, EXCEPT OUTFLOW RAISED TO REDUCE FALL
 FALL NOW WITHIN LIMIT (150)- OK
 DS PROJECTED INVERT HIGHER THAN US PROJECTED INVERT- OK



EXAMPLE D: 300 INFLOW & OUTFLOW.
 FALL ADEQUATE TO COVER INTERNAL BEND < 90°.



EXAMPLE E: AS EXAMPLE D, EXCEPT DROP INCREASED TO ACCOMMODATE A 90° BEND.
 FALL NOW ADEQUATE TO COVER INTERNAL BEND > 90°

NOTES Regarding Figure 307-A.

- Where possible, projected **obvert** levels of inflow and outflow pipes to match (to restrict flooding of upstream pipes).
- Drop through chase shall be < 150 + (outflow Ø - inflow Ø).
 Eg: (from eg 1): 180 drop. 180-(300-225) = 105. Drop OK.
- Where outflow sewers ≤DN300, provide adequate fall through the chase:
 Min 30 change in invert for bends ≤ 90° & straight through.
 Min 60 change in invert for bends > 90°.
- Where outflow sewer ≥DN375, maintain lowest connecting sewer grade through the chase.

TABLE 307-C: MAINTENANCE HOLE DROP TYPES

HIGH LEVEL SEWER	TYPICAL REQUIREMENTS	REFERENCE
≤DN375	INTERNAL DROP WITH PVC PIPEWORK	REFER MRWA-S-311
≥DN450 (SEW)	INTERNAL DROP WITH GRP PIPEWORK	REFER WATER AGENCY
≥DN450 (CWW or YVW)	ESTIMATE COST DIFFERENCE BETWEEN INTERNAL AND EXTERNAL DROP	REFER WATER AGENCY. MRWA-S-312.

NOTES Regarding Table 307-C:

- MH drops are required where the difference in invert level between the incoming and outgoing sewer mains is greater than the minimum height of a drop (refer Table 307-D).
- Where the required drop is less than the minimum, evenly grade the sewer back to the nearest upstream maintenance structure.
 If this leads to the maximum grade being exceeded or the line has already been constructed, contact the Water Agency for advice.
- Cost comparison between internal and external drop can be based on the difference in concrete volume between the two different drop types which depends largely on the depth and diameter of the two different MH types.
- The water agency will decide the optimum type based on cost and operational risk factors.

TABLE 307-D: MH DROP OPTIONS, LIMITS & DIMENSIONS

SEWER SIZE (DN)	DROP SIZE (DN)	MIN DROP (m)	DROP HEIGHT (m) IF OPEN SYSTEM			IF CLOSED SYSTEM		P= PLUNGE POOL DEPTH ^E
			FREE DROP + BEND ^F	FREE DROP + PLUNGE POOL	VORTEX DROP + PLUNGE POOL	FREE DROP + BEND ^F	VORTEX DROP + PLUNGE POOL	
100	100	0.5	MIN to 10	10 to 20	>20	MIN to 10	>10	300 + 20mm / m
150	100	0.6	MIN to 8.5	8.5 to 17.5	>17.5	MIN to 8	>8	300 + 20mm / m
225	150	0.9	MIN to 7	7 to 15	>15	MIN to 6	>6	350 + 20mm / m
300	225	1.1	MIN to 5.5	5.5 to 12.5	>12.5	MIN to 4	>4	450 + 30mm / m
375	300	1.2	MIN to 4	4 to 10	>10	MIN to 2	>2	600 + 30mm / m
450	300	1.3	MIN to 2.5	2.5 to 8	>8	NOT MENDED	> MIN	650 + 30mm / m
525	375	1.4	NOT	MIN to 6	>6	RECOM- MENDED	> MIN	750 + 30mm / m
600	375	1.5	RECOM- MENDED	MIN to 5	>5		> MIN	800 + 30mm / m
675	450	1.6		MIN to 4	>4		> MIN	CONTACT
750	450	1.7		MIN to 3	>3		> MIN	WATER AGENCY
>750	CONSULT WATER AGENCY FOR ADVICE							

NOTES Regarding Table 307-D

- Whether a system is open or closed shall be determined in accordance with MRWA-S-401.
 - For an example of a plain drop with bottom bend, refer MRWA-S-311 & Figure 312-D.
 - For an example of a plunge pool, refer Figure 312-A & C. Plunge pools may also be designed with internal drops. Contact the Water Agency for advice on any such structure.
 - Contact the Water Agency for requirements of vortex drops.
 - Plunge pool depth = min + (drop height - min drop required for plunge pool) x rate of depth increase.
- For drops to bends (rather than to plunge pools), care must be taken to avoid high velocity sewage jumping out of the chase and over the table. This risk is diminished where:
 - Bends direct sewage to the MH outlet.
 - The drop flow has a minor change in direction within the MH.
 - The drop flow intersects a relatively large flow.
 - Plunge pool depth shall be from the ADWF HGL of the outflow sewer.
- eg: 7m drop of an open incoming DN450 sewer = 650 + ((7-2.5) x 30) = 785

TABLE 307-E: CONCRETE CORROSION RISK CONTROLS

LOW RISK (<3 POINTS)	MEDIUM RISK (3 TO 6 POINTS)	HIGH RISK (> 6 POINTS)
NO CONTROL REQUIRED	POLYUREA (MORE FLEXIBLE & EASIER TO APPLY), or EPOXY NOVALAC OR VINYL ESTER (HIGHER CHEMICAL RESISTANCE). CONSULT WATER AGENCY ON WHICH IS MORE APPROPRIATE UNDER THE CIRCUMSTANCES.	CAST IN SITU THERMOPLASTIC SHEET LINER OR PLASTIC / GRP SHAFT

NOTES Regarding Table 307-E:

- The Water Agency will indicate the risk level to be applied to concrete MHs. Hydrogen sulphide risk assessments may be calculated in accordance with MRWA-S-401.
- Natural ventilation shall be implemented as per drawings MRWA-S-401 & 402.
- Coatings and linings shall be prepared, applied and tested as per the WSA 201- Selection and Application of Protective Coatings Manual.
- Calcium Aluminate cement mortar, whilst an effective rehabilitation system, is not suitable on new concrete surfaces (which are too smooth).

ALL DIMENSIONS IN mm UNLESS STATED OTHERWISE

DESIGNED: R. JAGGER DATE: 1 JULY 2015
 DRAWN: R. JAGGER DATE: 1 JULY 2015

CHECKED:	NAME	DATE	APPROVED:	NAME	DATE
<input checked="" type="checkbox"/>	CWW	D. MOORE	01/09/15	<input checked="" type="checkbox"/>	CWW
<input checked="" type="checkbox"/>	SEW	C. PAXMAN	01/09/15	<input checked="" type="checkbox"/>	SEW
<input checked="" type="checkbox"/>	YVW	K. DAWSON	01/09/15	<input checked="" type="checkbox"/>	YVW

ISSUED 2015 VERSION 1

MELBOURNE RETAIL WATER AGENCIES

MRWA SEWERAGE STANDARDS
 MAINTENANCE HOLES
 GENERAL DESIGN REQUIREMENTS

NOT TO SCALE

MRWA-S-307

Planning	Design	Construction
	✓✓✓	✓