Humes

Strength. Performance. Passion.

HumeGard® GPT Technical manual

Issue 6

Contents

HumeGard® GPT

The HumeGard® system is a Gross Pollutant Trap (GPT) that is specifically designed to remove gross pollutants and coarse sediments ≥ 150 microns, from stormwater runoff. A wide range of models are available to provide solutions for normal and super-critical flow conditions.

The HumeGard® GPT incorporates a unique floating boom and bypass chamber to enable the continued capture of floating material, even during peak flows. The configuration also prevents re-suspension and release of trapped materials during subsequent storm events.

The HumeGard® GPT is designed for residential and commercial developments where litter and sediment are the target pollutants. It is particularly useful in retrofit applications or drainage systems on flat grades where low head loss requirements are critical, and in high backwater situations.

The value of the HumeGard® GPT has proven it to be one of the most successful treatment devices in Australia today:

- **The system provides high performance with negligible head loss**
  The HumeGard® GPT has a head loss 'k' factor of 0.2, important for retrofit and surcharging systems.
- **It captures and stores a large volume of pollutants**
  For pollutant export rates reported by Australia Runoff Quality (1 m^3/hectare/year), the HumeGard® GPT is sized for maintenance intervals up to annual durations.
- **It uses independently proven technology**
  The system was developed and tested by Swinburne University of Technology, Australia, in 1998, to demonstrate compliance with operational criteria from the Victorian EPA. The ability of the HumeGard® to capture and retain Total Suspended Solids (TSS), Total Phosphorous (TP), and Total Nitrogen (TN), was tested in 2015 by Sunshine Coast University.
- **It has low operational velocities**
  Flow velocity in the storage chamber is <0.2 m/s to ensure the comb self-cleans and improves settling of coarse sediment.
- **It retains floating material even in bypass**
  All GPTs bypass at high flows. The floating boom will capture and retain floating materials even when bypass occurs.
- **It provides cost effective treatment for litter and coarse sediments**
  The system's large capacity and long maintenance intervals reduces the overall lifecycle costs in comparison with other treatment measures.
- **It can reduce the footprint of the stormwater treatment train**
  Installation of a HumeGard® GPT prior to vegetated treatment measures can assist in reducing their overall footprint.
- **It maximises above ground land use**
  The HumeGard® GPT is a fully trafficable solution, so it can be installed under pavements and hardstands to maximise land use on constrained sites. Further, customised HumeGard® models can be designed to accommodate almost any design loads.
- **It is easy to maintain**
  Cleanout of the HumeGard® GPT can be performed safely and effectively from the surface using a vacuum truck. A full maintenance procedure is provided as a separate document.
- **It is made from quality componentry**
  All internal metal components are made from 304 stainless steel or fibreglass, and the system undergoes rigorous quality control prior to dispatch. The standard HumeGard® has a design life of 50 years.

System operation

The HumeGard® GPT utilises the processes of physical screening and floatation/sedimentation to separate the litter and coarse sediment from stormwater runoff. It incorporates an upper bypass chamber with a floating boom that diverts treatable flows into a lower treatment chamber for settling and capturing coarse pollutants from the flow.

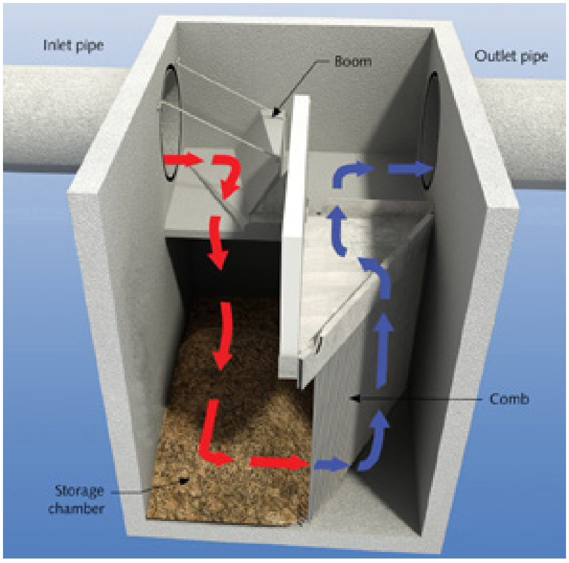
Bypass chamber

1. Stormwater flows into the inlet (boom) area of the bypass chamber (refer to Figure 1).
2. During flows up to and including the design treatment flowrate, the angled boom, acting as a weir, directs the total flow into the storage/ treatment chamber.
3. The treatment flow rate will be exceeded once the depth of flow entering the HumeGard® has reached 50% of the height of the boom. Even during these higher flow conditions, the angled boom continues to direct all floating litter from the bypass chamber into the storage/treatment chamber. The inlet area of the bypass chamber floor is angled towards the treatment chamber to ensure the bed load sediment material continues to be directed into the storage chamber even when the boom is floating.
4. At peak design flows, the boom remains semi-submerged and enables excess flow to pass underneath, regulating the flow into the storage/ treatment chamber. This ensures that higher flows, which could otherwise scour and re-suspend previously trapped materials, are not forced into the storage/treatment chamber. The floating boom bypass ensures previously trapped floating materials are retained. Each HumeGard® GPT is designed to achieve an operating velocity below 0.2 m/s through the storage chamber to ensure the settling of coarse sediment and keep the comb clean.

Treatment chamber

1. Once diverted into the treatment chamber, the flow continues underneath the internal baffle wall, passes through the stainless steel comb and flows over the flow controlling weir to the outlet.
2. Pollutants with a specific gravity less than water (S.G.<1) remain floating on the water surface in the storage/treatment chamber. Sediment and other materials heavier than water (S.G.>1) settle to the bottom of the chamber. The design and depth of the chamber minimises turbulent eddy currents and prevents re-suspension of settled material. The comb prevents any neutrally buoyant litter in the treatment chamber from escaping under the baffle wall.

Figure 1 – Operation during design flow conditions



Independent verification testing

Laboratory and field testing of the HumeGard® GPT for hydraulic performance and litter capture was conducted in Australia by Swinburne University of Technology, during 1996 and 1998.

Laboratory and field testing (Waste Management Council of Victoria 1998, Trinh 2007, Woods 2005, Swinburne University of Technology 2000) has proven the performance outlined in Table 1 below.

Further field testing was conducted by the University of the Sunshine Coast from 2013 to 2015, including a minimum of 15 qualifying storm events, to determine TSS, TP and TN removal efficiencies, which are also outlined in Table 1 below.

Table 1 – HumeGard® GPT performance summary

Pollutant	Removal efficiency	Details
Gross pollutants (litter, vegetation)	90%	Annually
TSS	49%	Annually (including bypass)
Hydrocarbons	90%	In an emergency spill event
TP	40%	Particulate-bound
TN	26%	Particulate-bound

Notes:

1. Nutrient removal is influenced by individual catchment characteristics and partitioning between dissolved and particulate nitrogen.
2. For further details on performance testing contact Humes.
3. Gross pollutant traps are not specifically designed to capture hydrocarbons, though may do so during emergency spill events. When this occurs, maintenance is required immediately.
4. The unique design of the HumeGard® floating boom allows it to be modified to treat higher flows and capture more gross pollutants and sediment on request.

System options

A wide range of sizes are available to suit catchment pollutant generation rates and Water Quality Objectives (WQO). Table 2 below presents the standard model dimensions and total storage chamber volume. We recommend that designers contact Humes Water Solutions for detailed sizing on each project and for advice with larger units.

Pollutant export rates detailed in Australian Runoff Quality (Engineers Australia 2006) suggests that a typical urban catchment will produce 1 m^3/hectare/year of gross pollutants and sediment. Humes Water Solutions advises that this be taken into account when selecting an appropriate model.

Table 2 – HumeGard® model range and dimensions

HumeGard® model	Treatment flow rate (L/s)	Storage chamber volume (m^3)	Pipe DN @ max. pipe grade %		
			0 - 1%	> 1 - 2.5%	> 2.5% - 5%
HG12	85	3	375	300	300
HG12A	100	3	450	375	375
HG15	130	3	525	450	450
HG15A	150	3	600	525	525
HG18	600	3	675	600	600
HG24	1,050	8	750	675	675
HG27	1,110	7	900	825	750
HG30	1,330	12	1050	900	825
HG30A	1,160	11	900	900	825
HG35	1,540	12	1050	1,050	900
HG35A	1,370	11	1050	900	900
HG40	1,910	16	1,200	1,200	900
HG40A	1,750	14	1,200	1,050	1,050
HG40B	1,580	12	1,200	1,050	900
HG45	1,960	19	1,500	1,350	1,200
HG45A	1,780	19	1,350	1,350	1,200
HG50 and above	Custom				

Notes:

1. The unique design of the HumeGard® floating boom allows it to be modified to treat a wide range of flowrates. Contact Humes for details on the model to suit your project.
2. HumeGard® can be modified to suit a box culvert, larger pipe or skewed outlet. Please contact your Humes Water Solutions Manager.
3. HumeGard® should be sized for either pipe diameter or treatment flow rate.
4. Units listed are standard configurations. Custom units can be provided to meet specific project requirements.
5. For confirmation of HumeGard® sizing or to discuss project specific requirements please contact your Humes Water Solutions Manager.
6. Refer to current Humes Terms and Conditions of Sale.
7. Australian Rainfall Quality recommend a pollutant export rate for a typical residential catchment is up to 1m^3/ha/yr of mixed waste and sediment.
8. HumeGard® can be modified to suit typical tail-water effects from downstream areas such as basins. Please contact Humes for design advice.
9. HumeGard® can be modified to suit high groundwater conditions. Please contact Humes for design advice.

Variants

A number of additional innovations have been made to the HumeGard® GPT to facilitate their effective operation in a wider range of applications:

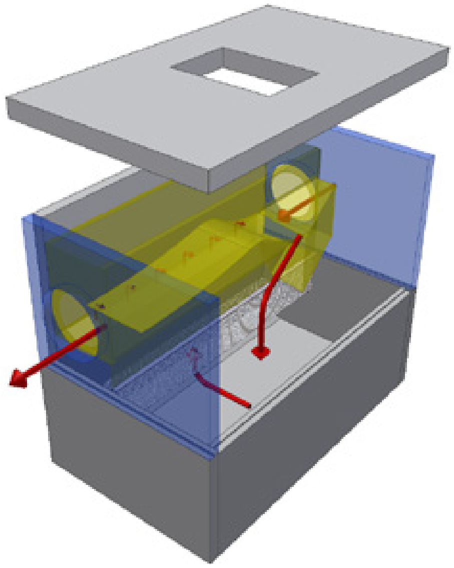
- Super-critical HumeGard® GPT – designed to operate under supercritical flow conditions in steep, high velocity drainage networks.
- Angled HumeGard® GPT – designed to replace a 45° or 90° junction in a drainage network.
- Dual outlet HumeGard® GPT – designed to divert the treatment flow to downstream natural Water Sensitive Urban Design (WSUD) elements such as wetlands and bio-retention whilst bypassing excess flows through a second outlet.

- **Super-critical HumeGard® GPT**

  The super-critical HumeGard® GPT (refer to Figure 2) was borne out of the original HumeGard® GPT, with modifications to deliver even greater performance under super-critical flow conditions. This model replaces the floating boom with a broad-crested weir that diverts the treatment flows into the treatment chamber under super-critical flow (Fr>1) conditions without creating hydraulic jumps and adversely impacting on performance.

  Flow into the treatment chamber passes through a stainless steel screen at a velocity <0.2 m/s and exits the device via a slot beneath the broad-crested weir (refer to the red arrows in Figure 2). The inserts in these models are manufactured from fibreglass for increased durability. The stainless steel screen can be shaped with a curved profile upon request. When the treatment flow rate is exceeded, the excess flow bypasses over the broad-crested weir to the outlet. This maintains the treatment flow into the chamber but protects against scour of captured material.

Figure 2 – Super-critical HumeGard® GPT



- **Angled HumeGard® GPT**
  The angled HumeGard® GPT (refer to Figure 3), was developed to facilitate the replacement of junction pits while still providing the treatment capabilities of the original HumeGard® device. These units simply alter the outlet location to allow for a change of pipe direction of 45° or 90°. The Angled HumeGard® GPT can be supplied in any of the standard unit sizes, however, the designer must allow for a minor head loss factor 'k' of 1.3 instead of 0.2 (which applies to the standard HumeGard® GPT design).

- **Dual Outlet HumeGard® GPT**
  The Dual Outlet HumeGard® GPT has been designed to operate as a diversion structure upstream of natural WSUD options such as constructed wetlands, ponds, lakes, and bio-retention systems.

  The units are designed such that one outlet conveys the treated flow into the natural WSUD measure and the standard outlet bypasses the excess flow around the downstream system (refer to Figure 4). Dual Outlet HumeGard® units are available in the same sizes as the standard HumeGard® units (refer Table 2 on page 4).

Figure 3 – Angled HumeGard® GPT

Figure 4 – Dual Outlet HumeGard® GPT

Inundation/tidal applications

The boom of the HumeGard® GPT enables the capture of floating pollutants even at peak flows, often when other fixed weir devices are in bypass mode. This unique feature also makes the HumeGard® GPT ideal for applications that are subject to both tidal and tail water effects.

In tidal applications the floating boom effectively traps the floating pollutants and prevents the loss of the gross pollutants from the system. In fixed weir devices, previously trapped floating litter may be backwashed out of the GPTs during the rising phase, to later bypass the GPT during the falling phase of the tide. As this happens twice daily, spring tides could quickly empty devices relying upon a fixed weir.

Marine grade 316 stainless steel is used for all internals in devices installed in tidal applications. In acidic/aggressive environments, these may also be epoxy-coated. Contact Humes Water Solutions for specific designs to suit these applications.

A plinth can also be added to the false floor under the boom to ensure sediment loads are captured and retained during inundation.

Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, the catchment area and the hydrology.

Configuration of the stormwater system

The configuration of the stormwater system is important since the HumeGard® GPT operates with an "in-line", 45° or 90° alignment. Inlet pipe grades between 0.5% and 5% are recommended for at least five pipe diameters upstream of the HumeGard® GPT. The pipe grade and flow velocity will determine whether a super-critical unit is required.

Location in the stormwater system

Depending upon the site, the GPT can be oriented to have the treatment chamber on the left or right side of the pipe to suit constraints. Humes Water Solutions can work closely with stormwater designers to select the appropriate location and orientation for their system.

Catchment area

Research presented in Australian Runoff Quality (Engineers Australia 2006) concluded that roughly 1 m^3/hectare/year of gross pollutants and sediment could be expected from a typical residential catchment. Therefore, GPTs designed for an annual maintenance interval should have a pollutant storage capacity roughly equal to the number of hectares of catchment it treats (e.g. 10 hectare catchment = 10 m^3 pollutant storage).

Sizing HumeGard® GPTs

The large storage volumes of the HumeGard® GPT enables more pollutants to be captured before maintenance is required, which greatly reduces its lifecycle costs. In accordance with accepted hydraulic principles the larger volumes in the HumeGard® GPT results in lower velocities through the device, minimising scour and re-suspension of sediment.

Humes Water Solutions has developed a design request form (see page 30) for stormwater designers to complete and return to obtain a detailed design of the appropriate device.

MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs. Considering these against the independent research results, the following conservative removal efficiencies (refer to Table 3 below) are recommended for the HumeGard® GPT on an annual basis (i.e. no bypass).

Table 3 – MUSIC inputs for HumeGard® GPTs

Pollutant	Removal efficiency
Gross pollutants (litter, vegetation)	90%
TSS	49%
TP	40%
TN	26%

System installation

Top:
Preparing the aggregate base (Step 2)

Middle:
Installing the main bypass chamber (Step 4)

Bottom:
Placing the main chamber lid (Step 7)

The installation of the HumeGard® unit should conform to the local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

The HumeGard® unit is installed as follows:

1. Prepare the excavation according to plans.
2. Prepare the compacted aggregate base.
3. Install the main treatment chamber section.
4. Install the main bypass chamber section/s (if required).
5. Fit the stainless steel comb (if required).
6. Connect the inlet and outlet pipes.
7. Place the main chamber lid.
8. Install the frame and access covers.
9. Backfill to specified requirements.

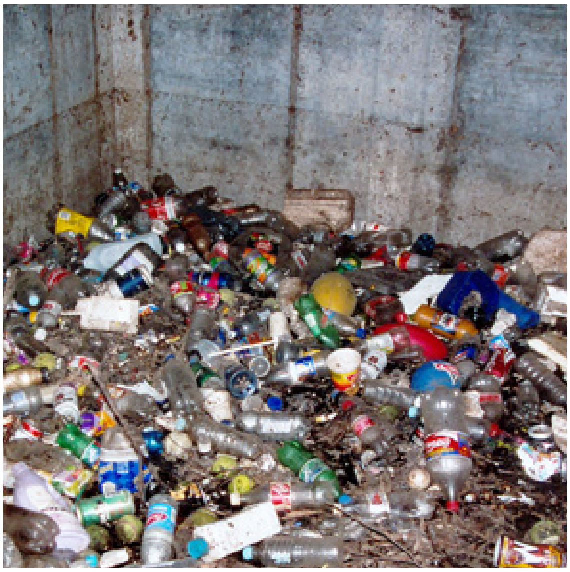
System maintenance

The design of the HumeGard® GPT means that maintenance is best performed by vacuum trucks which avoids entry into the unit.

Additional access covers can be designed upon request.

A typical maintenance procedure includes:

1. Remove access covers.
2. With a vacuum hose, remove the floating litter from the treatment chamber.
3. Determine the depth of water and sediment layers.
4. Insert sluice gate into the upstream manhole.
5. Decant water from the treatment chamber into the upstream manhole until the sediment layer is exposed.
6. Remove the sediment layer with the vacuum hose; jet with a high pressure hose if required.
7. Remove sluice gate from the upstream manhole and allow water to return to the HumeGard® GPT.
8. Replace access covers.



Left:
Floating litter captured in the treatment chamber

FAQs

- **Can the boom become stuck?**
  The boom can weight up to hundreds of kilograms depending on the model, with the smallest boom in the HG18 weighing in at 35 kg. Unless there is a large branch, car wheel, or other large item carried through the drainage network, the mass of the boom will ensure it returns to the floor.
- **Will the gross pollutants bypass when the boom floats?**
  All treatment measures are designed to treat a specific flow. Once this is exceeded, any entrained pollutants in the flow will bypass the treatment chamber. Often this is less than 5% of the annual load. A significant quantity of gross pollutants are buoyant when entering a GPT and, unlike fixed weir systems which bypass these floatable items, the HumeGard® boom provides continuous treatment of them, even in bypass.
- **Will the retention of water in the treatment chamber lead to the release of nutrients as pollutants break down?**
  Over time, captured organic materials will breakdown and release nutrients in all treatment measures whether natural or manufactured. As part of a treatment train, downstream vegetated measures can remove the small proportion of nutrients released during dry weather flows. A regular maintenance program will reduce the amount of breakdown occurring.
- **What is the design life of a HumeGard® GPT?**
  The entire product is designed to last a minimum of 50 years.
- **Why is the HumeGard® GPT larger than other GPTs?**
  The design of the HumeGard® GPT is to ensure a velocity through the treatment chamber <0.2 m/s to ensure the comb self-cleans and the coarse sediments settle in the sump. From engineering principles, a larger cross-sectional area is required to reduce the loading rate. As proven by Stokes Law, lower chamber velocities mean smaller sediment particles can be captured.
- **Why would I use a HumeGard® GPT upstream of a biofilter?**
  Using a HumeGard® GPT upstream of a biofilter acts as a sediment forebay and removes litter, containing it to a confined location for easy removal by a vacuum truck. This protects the biofilter, lengthens its lifespan and reduces the ongoing maintenance costs.

References

- Waste Management Council of Victoria (1998) “Inline Litter Separator: Installation and Monitoring Project”, EcoRecycle, Victoria.
- Trinh, N. An Investigation into the Trapping Efficiencies of Gross Pollutant Traps. Thesis. Brisbane, Queensland: Queensland University of Technology, 2007.
- Woods, S. Performance Evaluation of an In-Line Separator. Masters Thesis. Melbourne, Victoria: Swinburne University of Technology, 2005.
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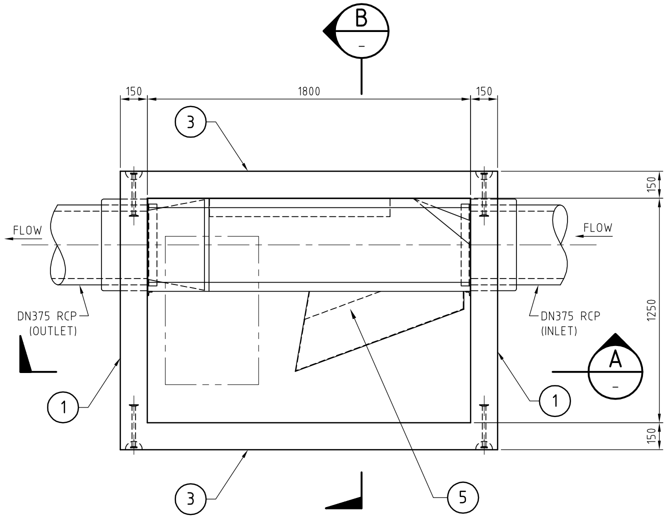
- Engineers Australia (2006) “Australian Runoff Quality”.
- Lucke, T. 2015, Characterisation of Water Quality Improvement Processes by GPTs at University of the Sunshine Coast (Humegard HG27 Monitoring Program), School of Science and Engineering, University of the Sunshine Coast, QLD, Australia.
- Nichols P., & Lucke T., 2016, Field Evaluation of the Nutrient Removal Performance of a Gross Pollutant Trap (GPT) in Australia, Sustainability, 8, 669; doi:10.3390/su8070669

Appendix

HumeGard® GPT technical drawings

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	—	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG12-20
2	BASE SLAB	HG12-21
3	SIDE WALL	HG12-22
4	PRECAST LID	HG12-07
5	GRP INSERT ASSEMBLY DETAILS	HG12A/L-08



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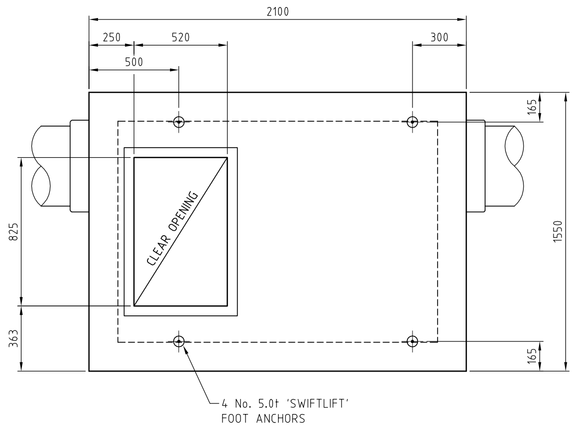

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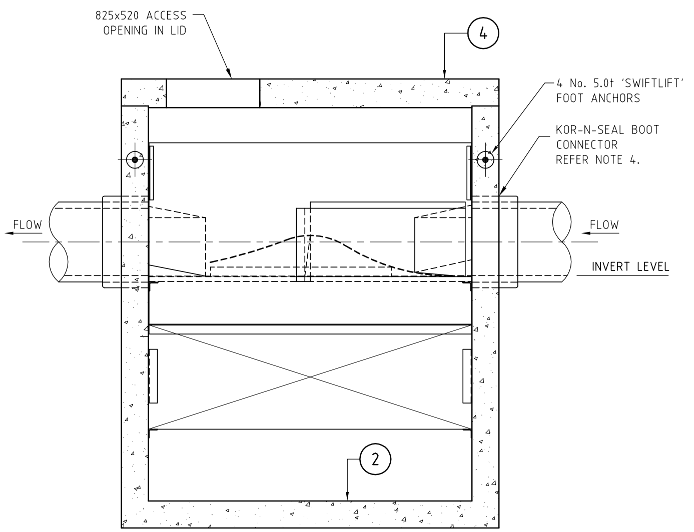

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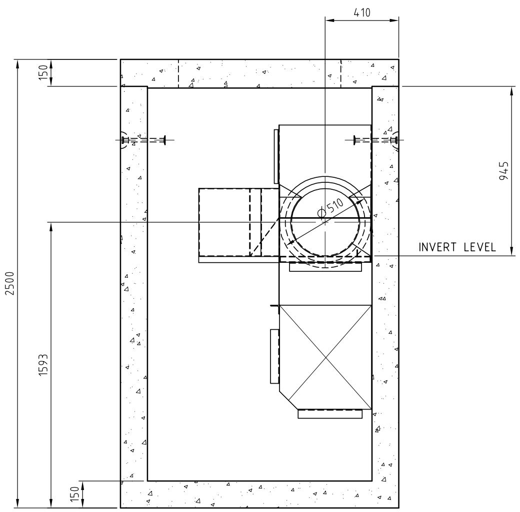

SECTION B
SCALE 1:20

NOTES

1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.0t (WITHOUT LID)
   LID = 1.2t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-20WP
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

DSN.	WST	02-09-10
DWN.	MZ	02-09-10
CKD.	RM	—
APP.	WST	—

SUPERSEDES HG12A/L-01 ISSUE 1

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG12A/L
DN375/DN375 RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG12A/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION	MZ	—	RM

ITEM No	DRAWING DESCRIPTIONS	DWG No
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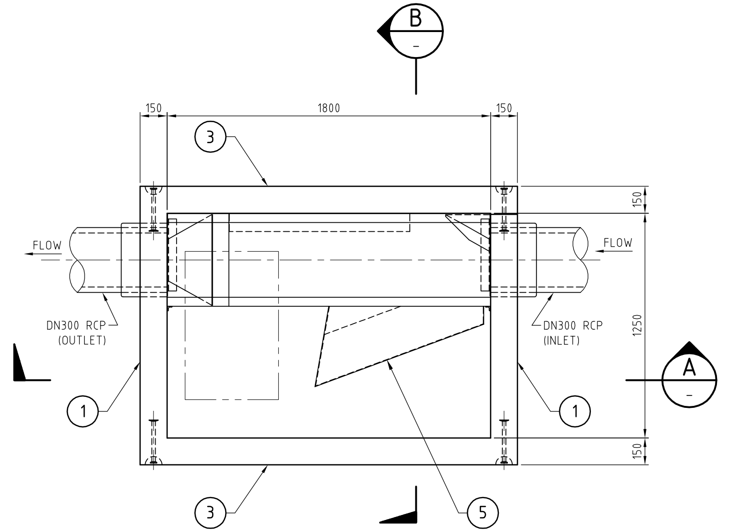
3	SIDE WALL	HG12-22
4	PRECAST LID	HG12-07
5	GRP INSERT ASSEMBLY DETAILS	HG12/L-08



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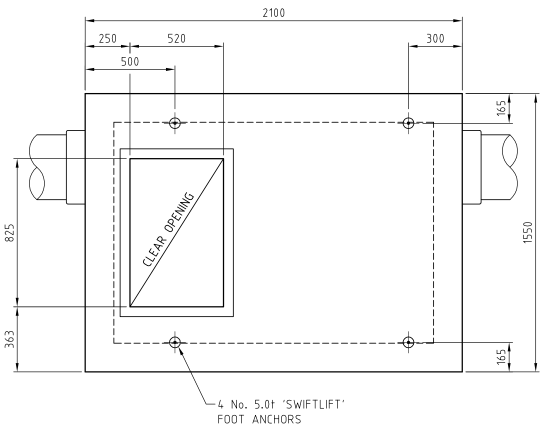

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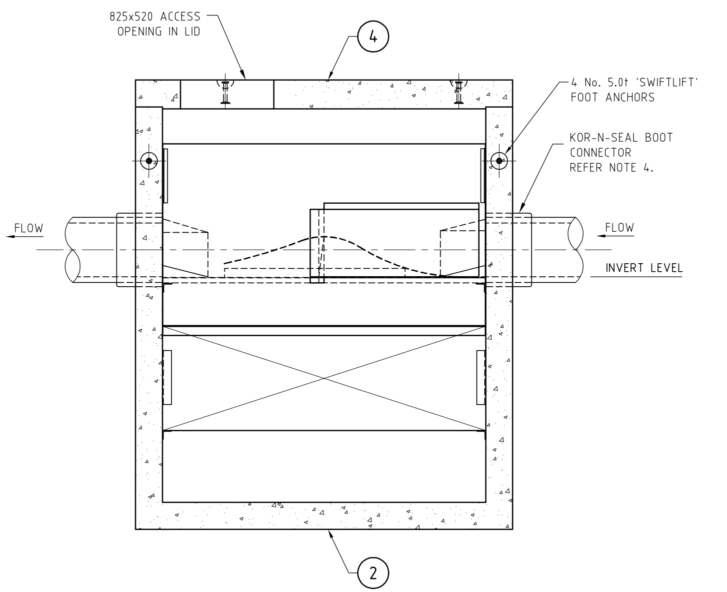

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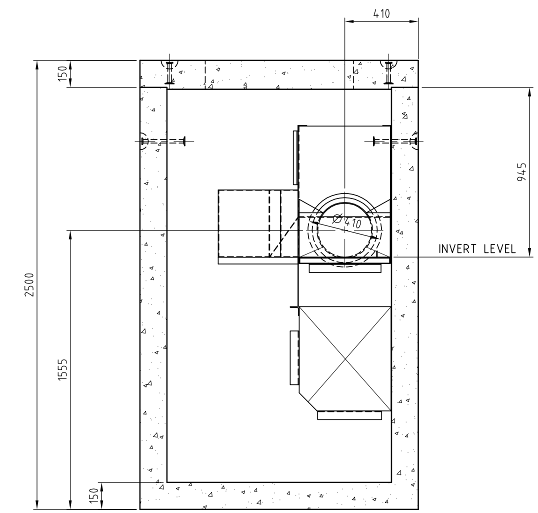

SECTION B
SCALE 1:20

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES
BRISBANE, QUEENSLAND

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DSN.	WST	14-03-07
DWN.	MZ	14-03-07
CKD.	RM	—
APP.	WST	—

SUPERSEDES HG12/L-01 REV 1

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG12/L
DN300/DN300 RCP
GENERAL ASSEMBLY

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2	GENERAL REVISION	MZ	——	RM

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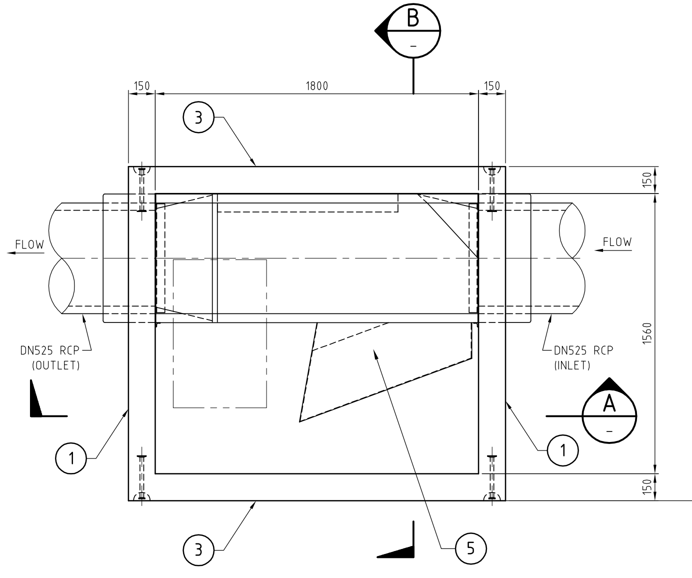

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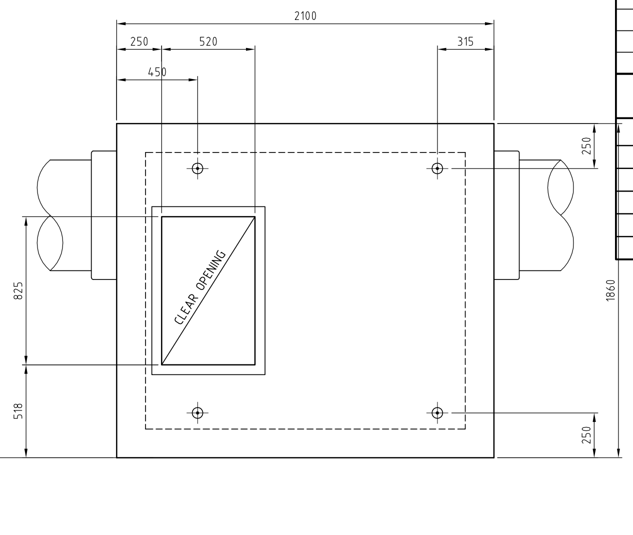

PLAN ON LID
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   LID = 1.4t
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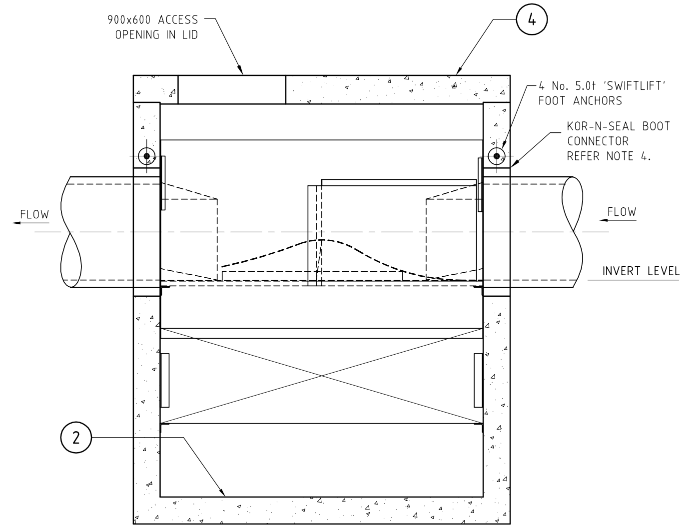
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE.



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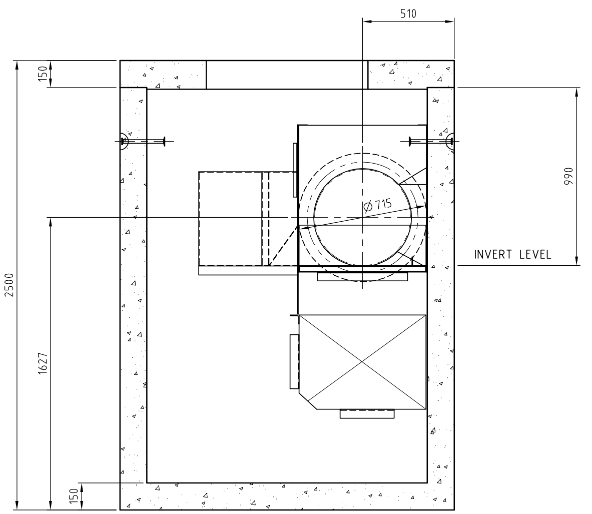

SECTION B
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Humes TECHNICAL SERVICES
BRISBANE, QUEENSLAND

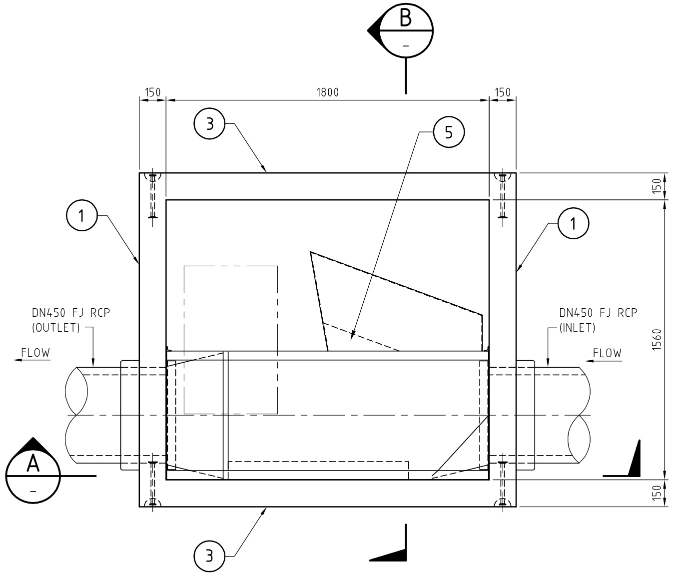
DSN.	WST	07-09-10
DWN.	MZ	07-09-10
CKD.	RM	——
APP.	WST	——
SUPERSEDES	HG15A/L-01 ISSUE 1	

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG15A/L
DN525/DN525 RCP
GENERAL ASSEMBLY

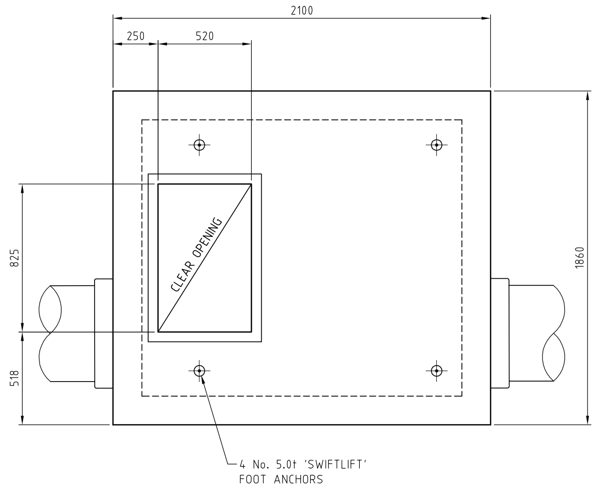
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG15A/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION	MZ	—	DFW

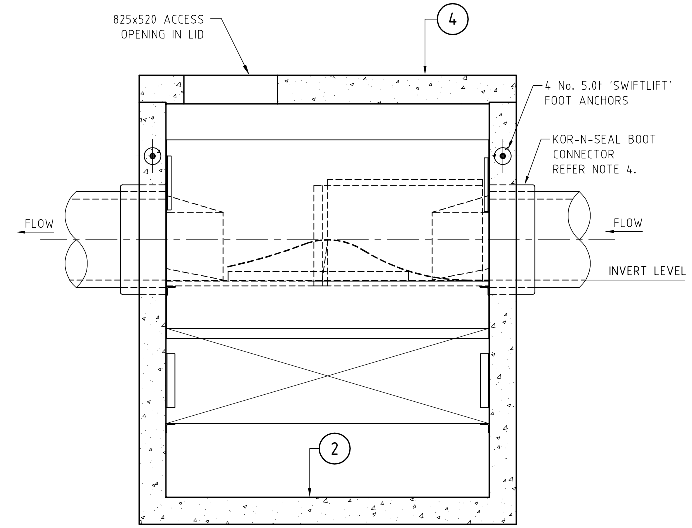
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG15-20
2	BASE SLAB	HG15-21
3	SIDE WALL	HG15-22
4	PRECAST LID	HG15-07
5	GRP INSERT ASSEMBLY DETAILS	HG15/R-08



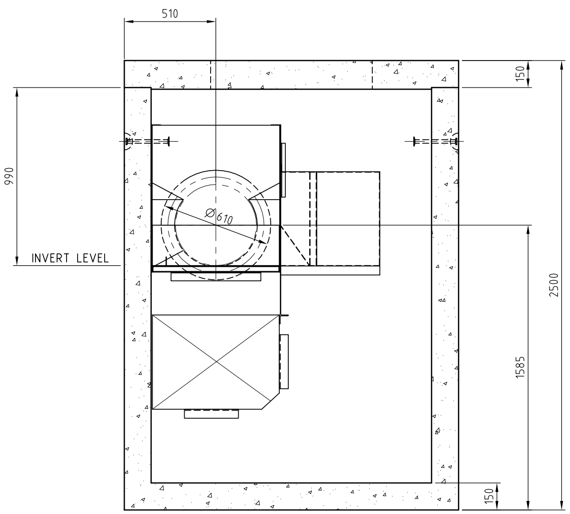
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES

1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.7t (WITHOUT LID)
   LID = 1.5t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-24WP
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

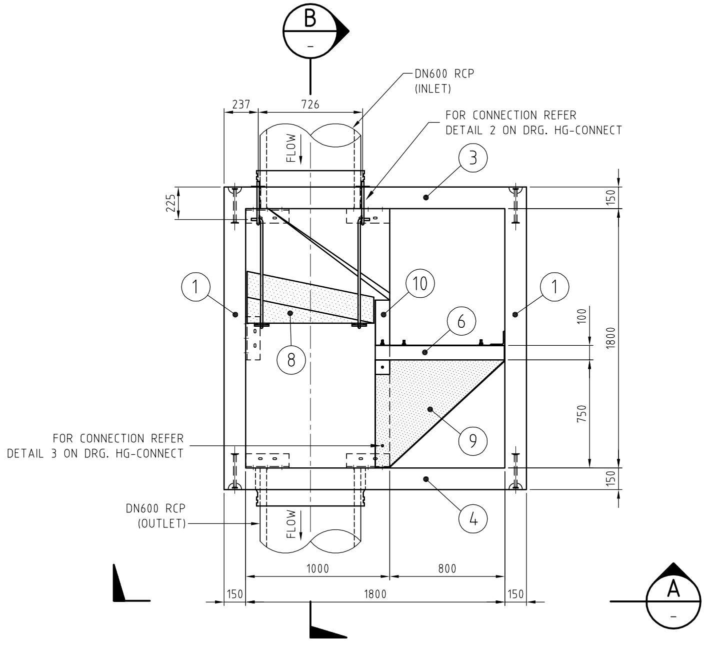
CEMEX Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	10-07-08
DWN.	MZ	10-07-08
CKD.	DFW	—
APP.	WST	—

SUPERSEDES HG15/R-01 REV 1

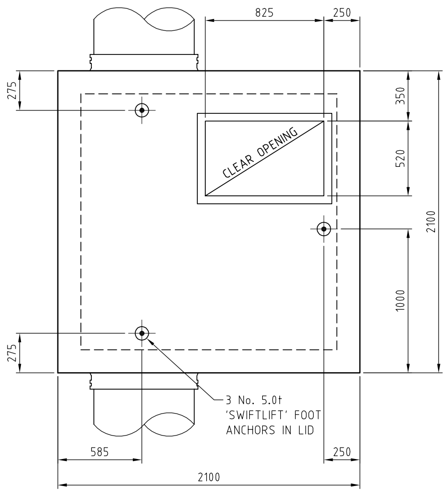
HUMES
STANDARD DRAWING
HUMEGARD HG15/R
DN450/DN450 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG15/R-01	2



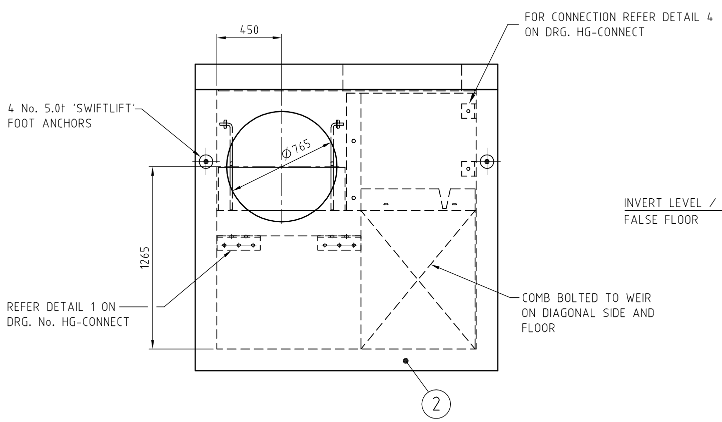
PLAN VIEW (LID REMOVED)

SCALE 1:25



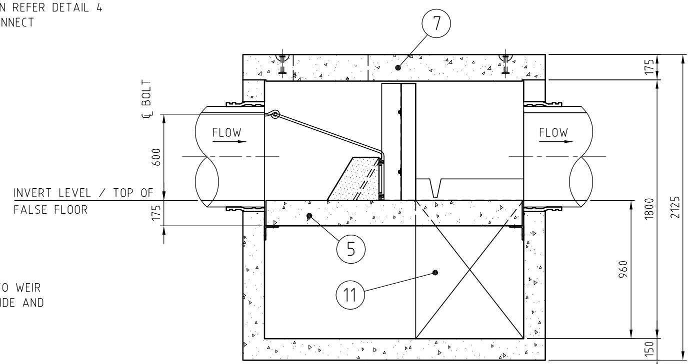
PLAN ON LID

SCALE 1:25



VIEW A

SCALE 1:25



SECTION B

SCALE 1:25

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
3	REFERENCE DWG No. REVISED - REISSUED FOR MANUFACTURE	MZ	24-11-10	RM

ITEM No	DRAWING DESCRIPTION	DWG No
1	END WALL	HG18-02
2	BASE SLAB	HG18-03
3, 4	SIDE WALL	HG18-04
5	FALSE FLOOR	HG18/L-05
6	CONCRETE BAFFLE WALL	HG18/L-05
7	PRECAST LID	HG18/L-06
8	FLOATING BOOM	HG18/L-07
9	WEIR	HG18/L-08
10	BAFFLE SIDE WALL	HG18/L-09
11	COMB	HG18/L-10

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 7.8 t (WITHOUT LID).
   MASS OF LID = 1.9 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-30L (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

DSN.	WST	24-11-10
DWN.	MZ	24-11-10
CKD.	RM	24-11-10
APP.	WST	24-11-10

SUPERSEDES HG18/L-01 REV. 2

HUMES WATER SOLUTIONS

STANDARD HUMEGARD

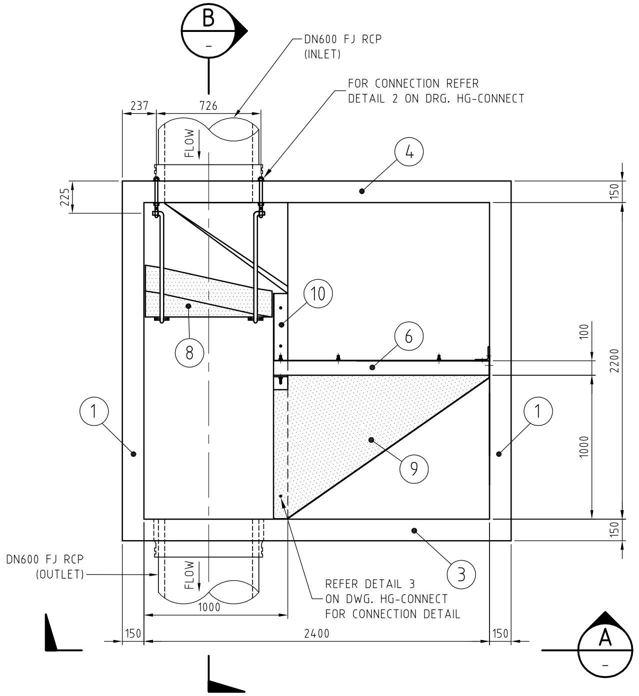
HUMEGARD HG18/L DN600/DN600 RCP

GENERAL ASSEMBLY

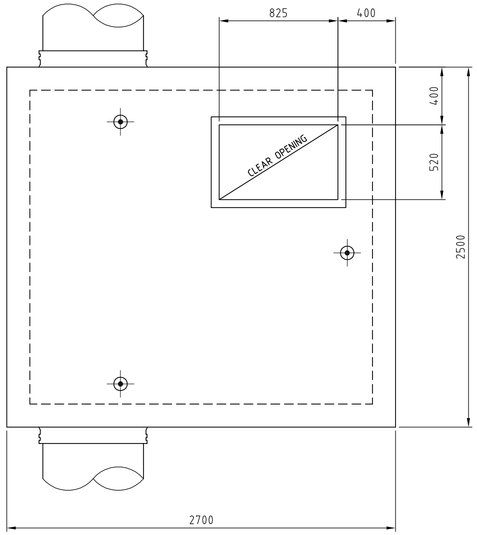
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG18/L-01	3

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

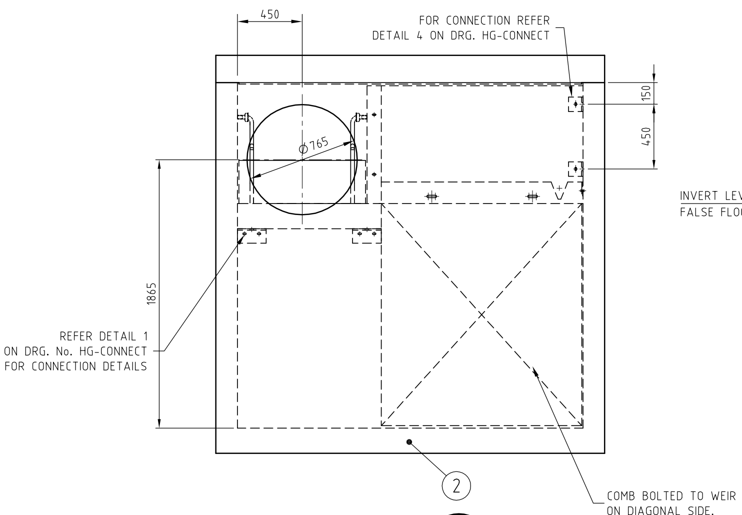
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG24/L-02
2	BASE SLAB	HG24/L-03
3, 4	SIDE WALL	HG24/L-04
5	FALSE FLOOR	HG24/L-05
6	CONCRETE BAFFLE WALL	HG24/L-05
7	PRECAST LID	HG24/L-06
8	FLOATING BOOM	HG24/L-07
9	WEIR	HG24/L-08
10	BAFFLE SIDE WALL	HG24/L-09
11	COMB	HG24/L-10
	SITE LAYOUT	HG24/L-11



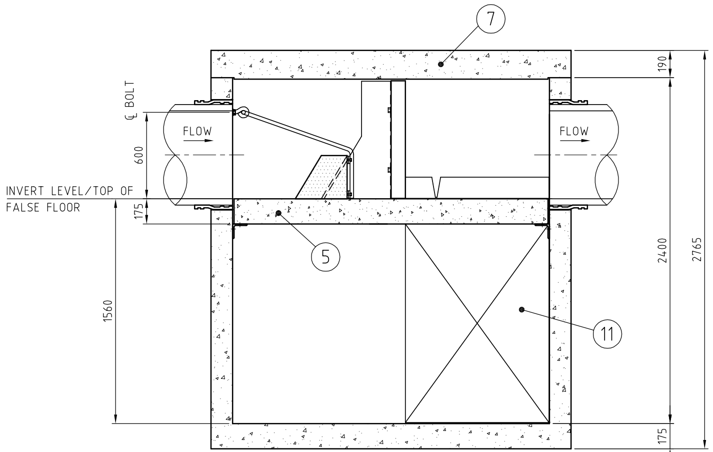
PLAN VIEW (LID REMOVED)
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 13.0 t (WITHOUT LID).
   MASS OF LID = 3.2 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-30L (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

Rinker Australia Pty Limited ABN 87 099 732 297

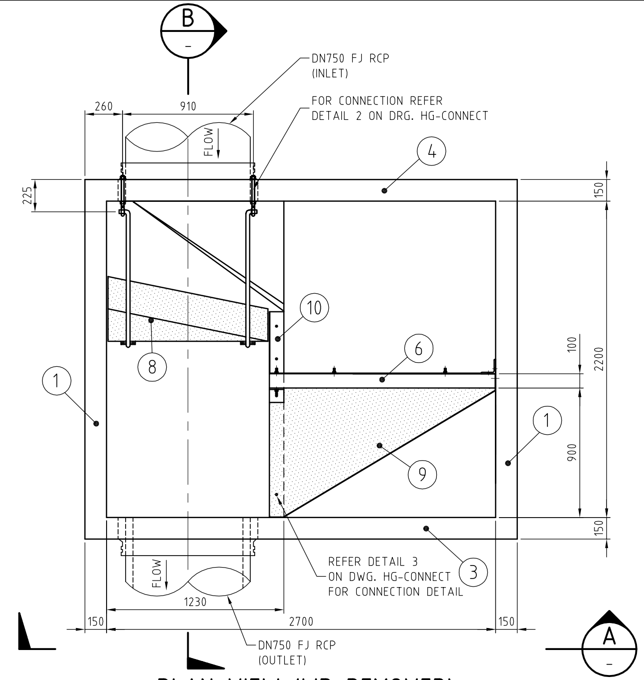
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG24/L
DN600/DN600 FJ RCP
GENERAL ASSEMBLY

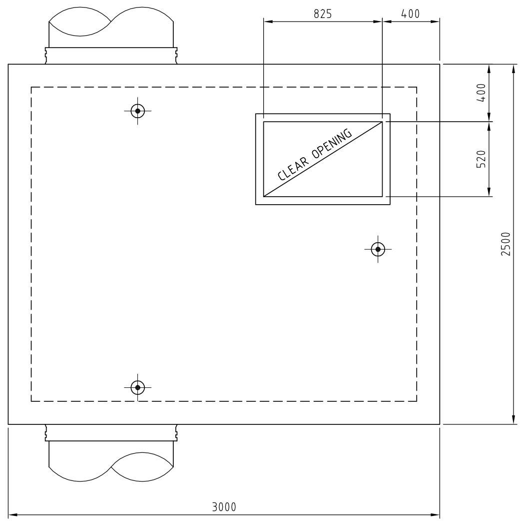
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG24/L-01 REV. 0	1:1	A2	HG24/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

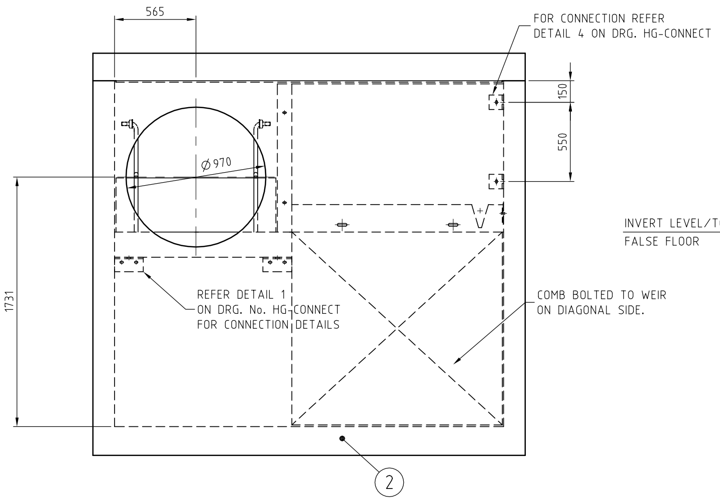
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG27/L-02
2	BASE SLAB	HG27/L-03
3, 4	SIDE WALL	HG27/L-04
5	FALSE FLOOR	HG27/L-05
6	CONCRETE BAFFLE WALL	HG27/L-05
7	PRECAST LID	HG27/L-06
8	FLOATING BOOM	HG27/L-07
9	WEIR	HG27/L-08
10	BAFFLE SIDE WALL	HG27/L-09
11	COMB	HG27/L-10
	SITE LAYOUT	HG27/L-11



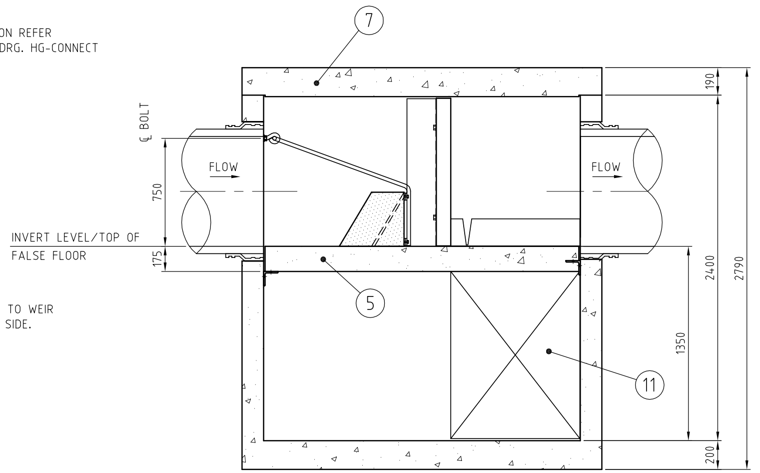
PLAN VIEW (LID REMOVED)
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 14.4 t (WITHOUT LID).
   MASS OF LID = 3.6 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-38 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

Rinker Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	SG	12-03-07

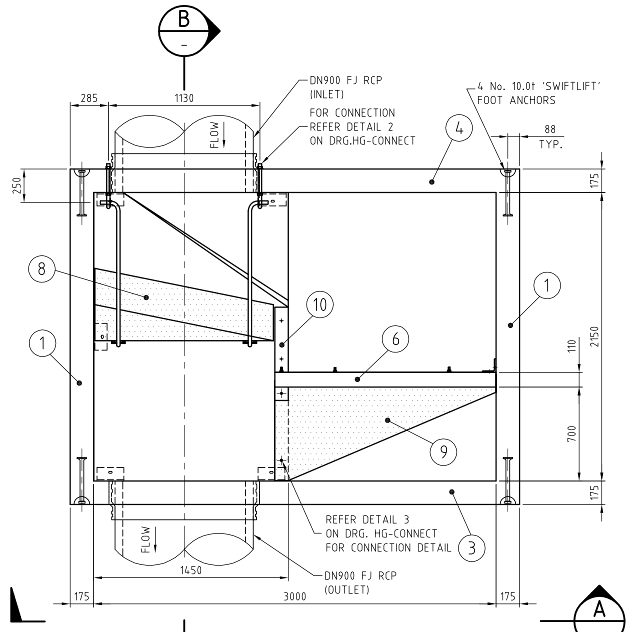
SUPERSEDES HG27/L-01 REV. 0

HUMES
STANDARD DRAWING
HUMEGARD HG27/L
DN750/DN750 FJ RCP
GENERAL ASSEMBLY

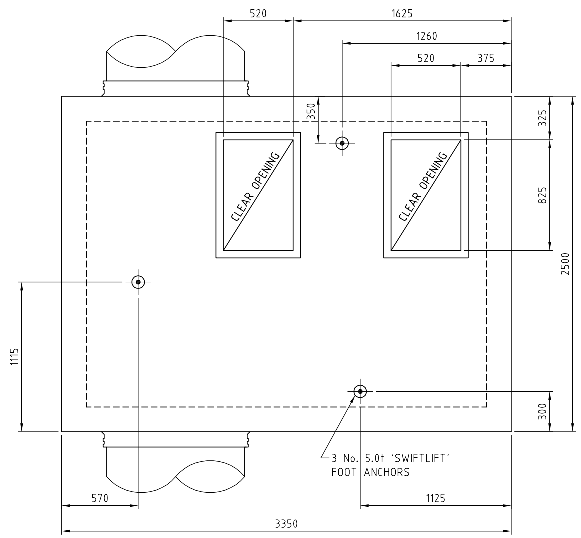
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG27/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	REFERENCE DWG No. REVISED, REISSUED FOR MANUFACTURE	MZ	—	RM

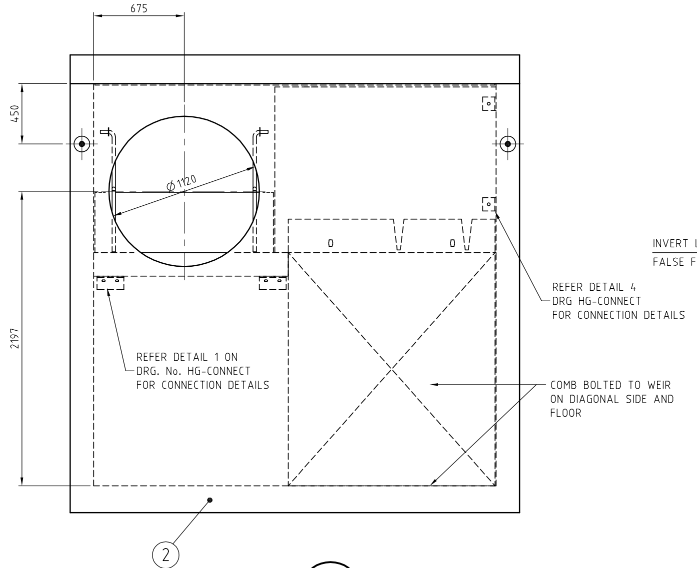
ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG30A-02
2	BASE SLAB	HG30-04
3, 4	SIDE WALL	HG30A-05
5	FALSE FLOOR	HG30A/L-07
6	CONCRETE BAFFLE WALL	HG30A/L-07
7	PRECAST LID	HG30A/L-08
8	FLOATING BOOM	HG30A/L-09
9	WEIR	HG30A/L-10
10	BAFFLE SIDE WALL	HG30A/L-11
11	COMB	HG30A/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST



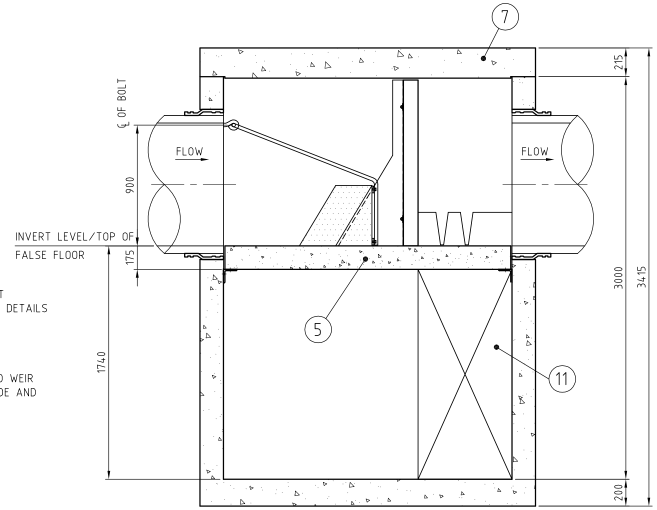
PLAN
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 20.2 t (WITHOUT LID).
   MASS OF LID = 4.3 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3)
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

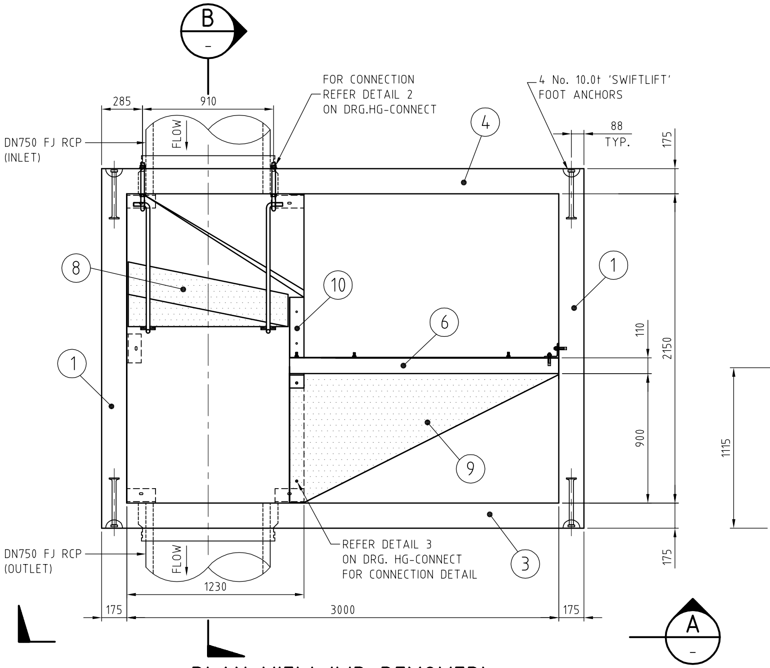
Humes
TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

CEMEX Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	06-08-08
DWN.	MZ	06-08-08
CKD.	DFW	—
APP.	WST	—
SUPERSEDES	HG30A/L-01 REV 1	

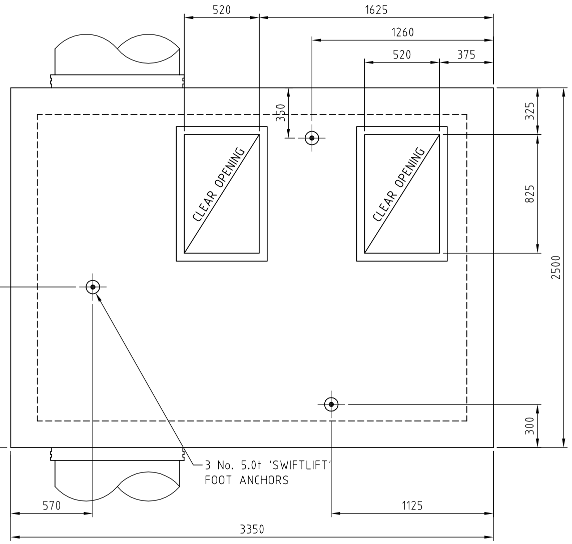
HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG30A/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG30A/L-01	2



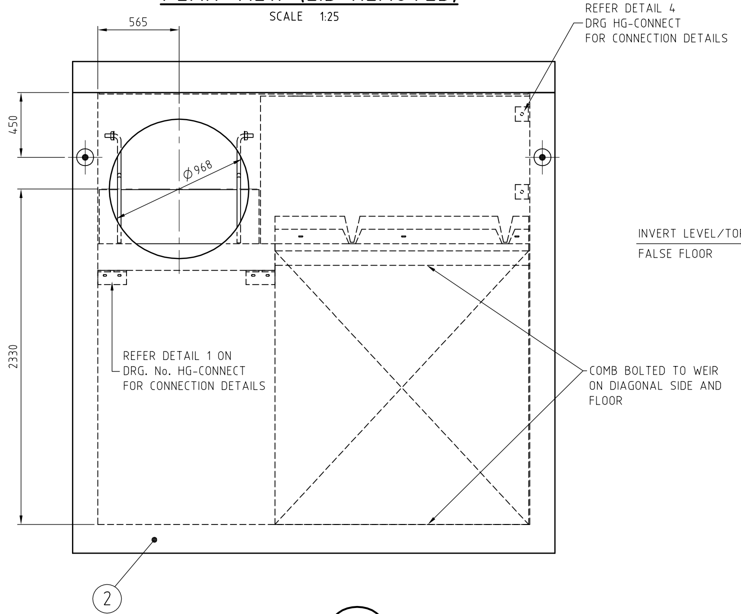
PLAN VIEW (LID REMOVED)

SCALE 1:25



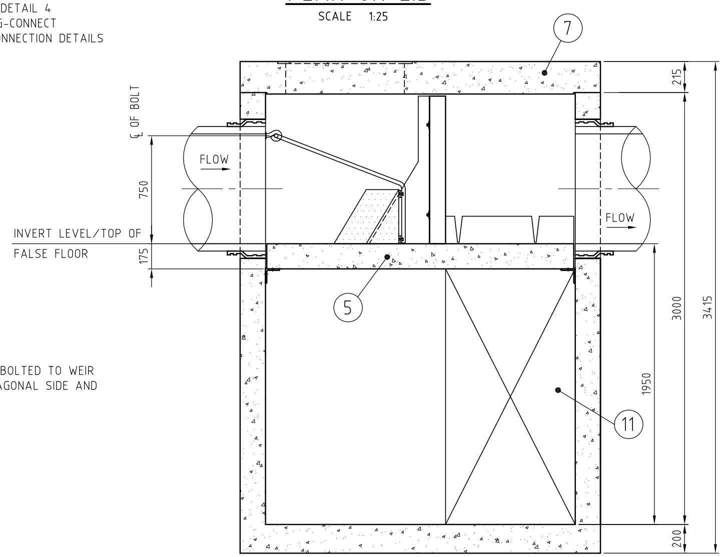
PLAN ON LID

SCALE 1:25



VIEW A

SCALE 1:25



SECTION B

SCALE 1:25

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	REFERENCE DWG No. REVISED, REISSUED FOR MANUFACTURE	MZ	—	RM

ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG30-02
2	BASE SLAB	HG30-04
3, 4	SIDE WALL	HG30-05
5	FALSE FLOOR	HG30/L-07
6	CONCRETE BAFFLE WALL	HG30/L-07
7	PRECAST LID	HG30-08
8	FLOATING BOOM	HG30/L-09
9	WEIR	HG30/L-10
10	BAFFLE SIDE WALL	HG30/L-11
11	COMB	HG30/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 20.3 t (WITHOUT LID).
   MASS OF LID = 4.3 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3)
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-38 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

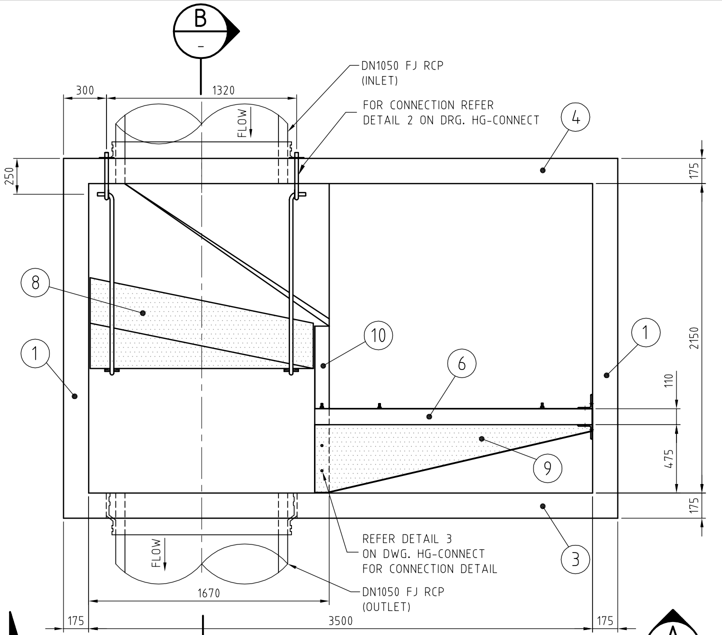
CEMEX Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

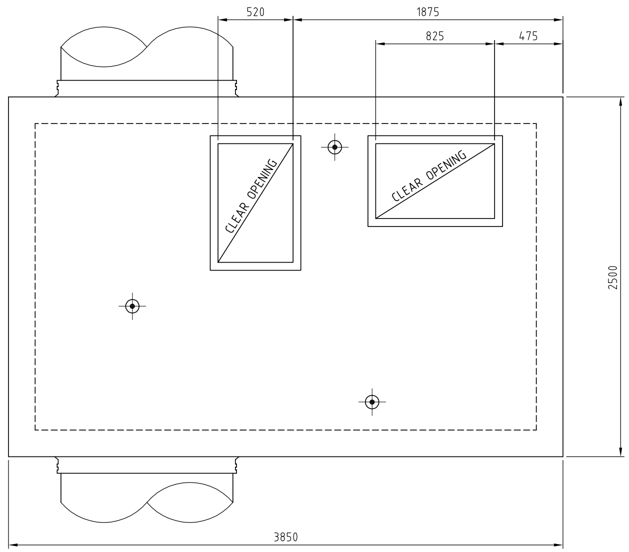
HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG30/L
DN750/DN750 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG30/L-01 REV 1	1:1	A2	HG30/L-01	2

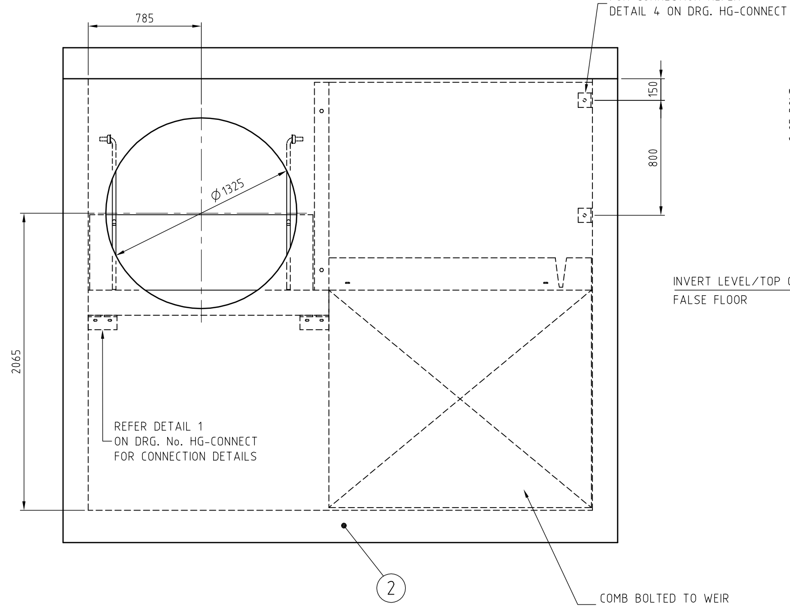
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW



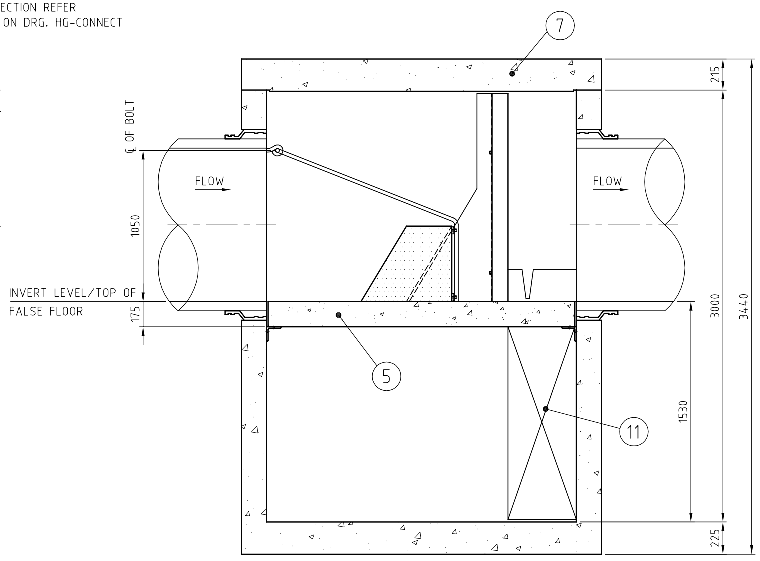
PLAN VIEW (LID REMOVED)
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG35A/L-02
2	BASE SLAB	HG35A/L-04
3, 4	SIDE WALL	HG35A/L-05
5	FALSE FLOOR	HG35A/L-07
6	CONCRETE BAFFLE WALL	HG35A/L-07
7	PRECAST LID	HG35A/L-08
8	FLOATING BOOM	HG35A/L-09
9	WEIR	HG35A/L-10
10	BAFFLE SIDE WALL	HG35A/L-11
11	COMB	HG35A/L-12
	SITE LAYOUT	HG35A/L-13

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 22.9 t (WITHOUT LID).
   MASS OF LID = 5.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-52 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

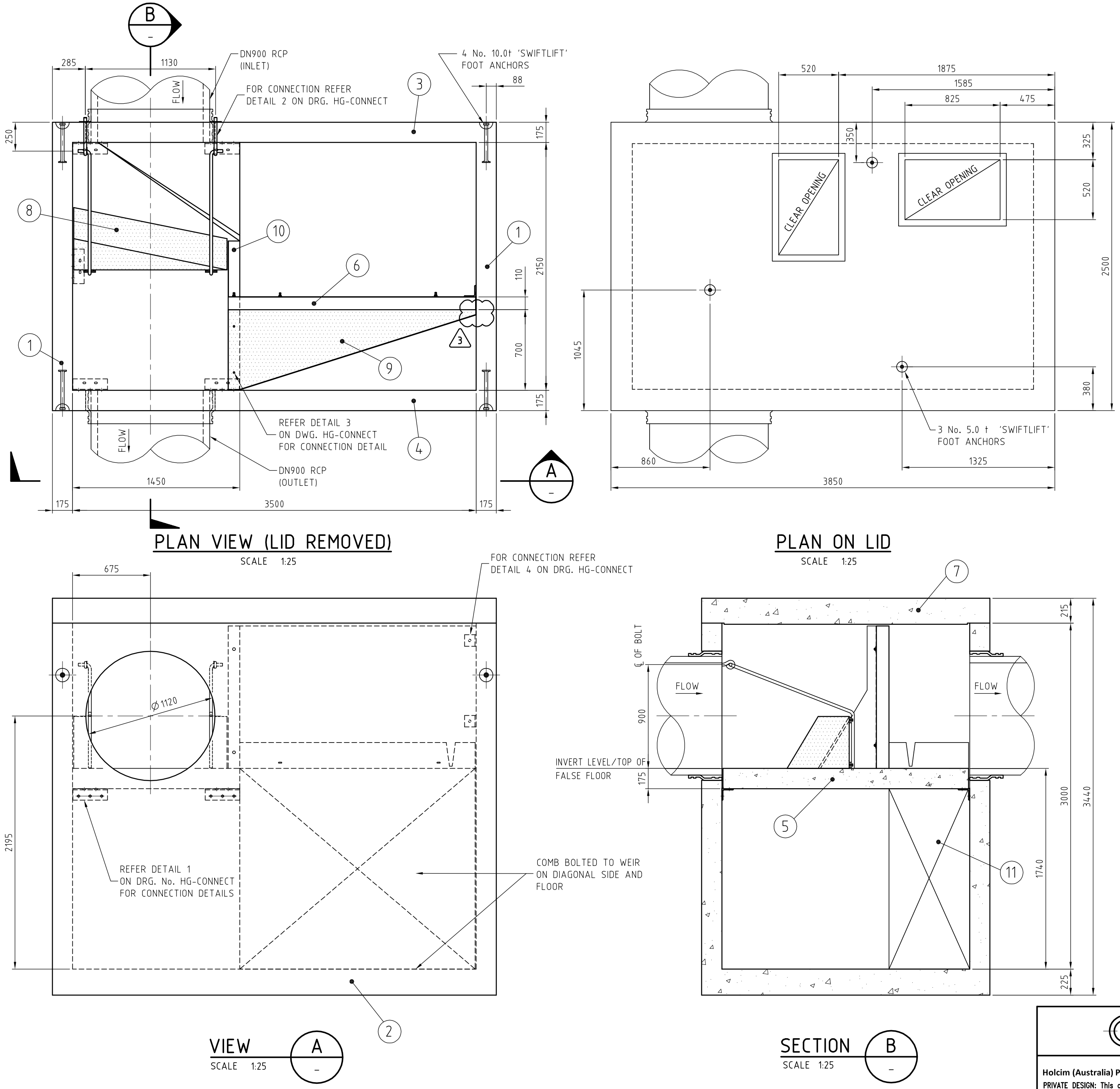
Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

Rinker Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07
SUPERSEDES	HG35A/L-01 REV 0	

HUMES
STANDARD DRAWING
HUMEGARD HG35A/L
DN1050/DN1050 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG35A/L-01	1



PLAN VIEW (LID REMOVED)
SCALE 1:25

PLAN ON LID
SCALE 1:25

VIEW A
SCALE 1:25

SECTION B
SCALE 1:25

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
3	REFERENCE DWG No. REVISED, BRACKET REMOVED, REISSUED FOR MANUFACTURE	MZ	—	RM

ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG35-02
2	BASE SLAB	HG35-04
3, 4	SIDE WALL	HG35-05
5	FALSE FLOOR	HG35/L-07
6	CONCRETE BAFFLE WALL	HG35/L-07
7	PRECAST LID	HG35-08
8	FLOATING BOOM	HG35/L-09
9	WEIR	HG35/L-10
10	BAFFLE SIDE WALL	HG35/L-11
11	COMB	HG35/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 22.8 t (WITHOUT LID).
   MASS OF LID = 5.0 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

Humes TECHNICAL SERVICES
BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

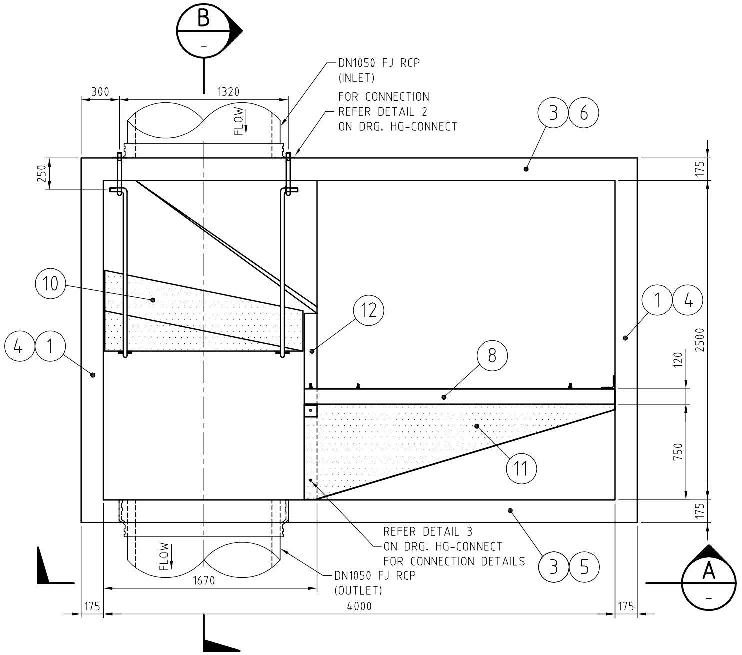
DSN.	WST	25-11-10
DWN.	MZ	25-11-10
CKD.	RM	—
APP.	WST	—

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG35/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG35/L-01 REV 2	1:1	A2	HG35/L-01	3

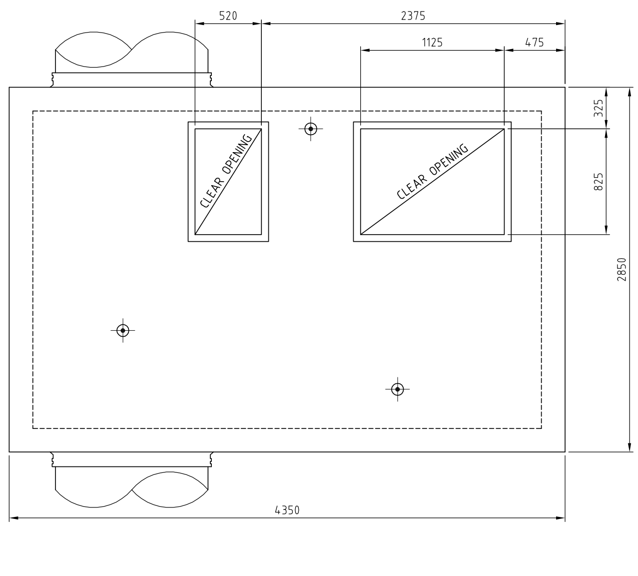
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
1	GENERAL REVISION	MZ	—	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



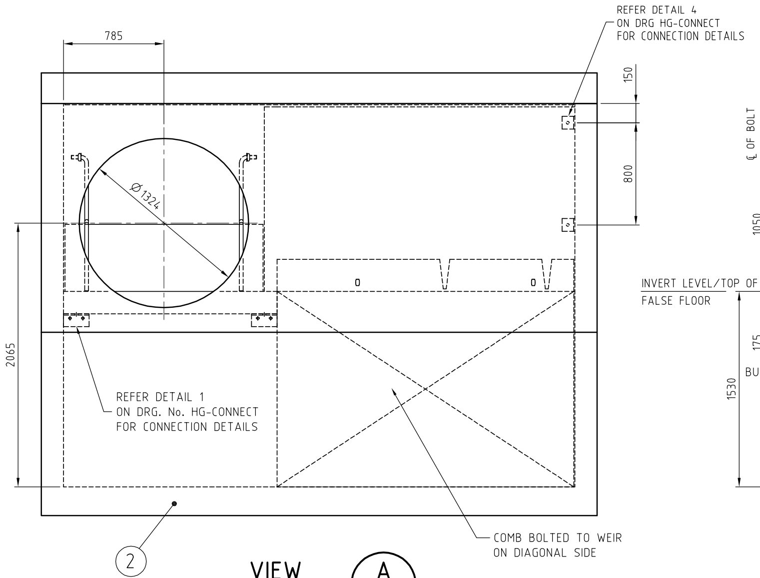
PLAN VIEW (LID REMOVED)

SCALE 1:20



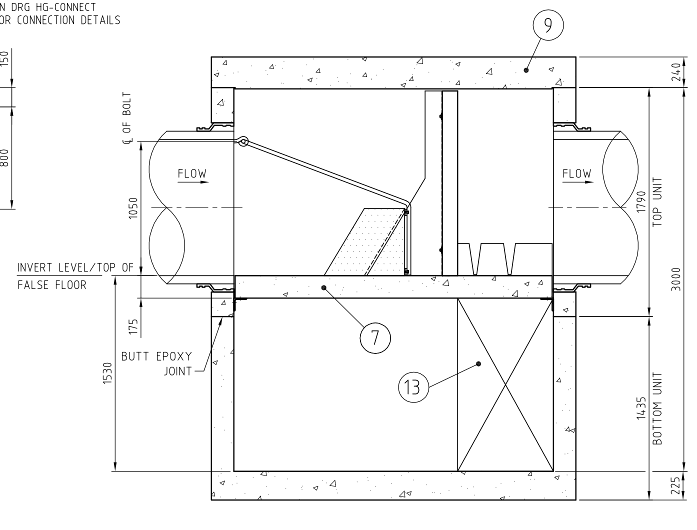
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 14.8 t
   MASS OF TOP UNIT = 12.9 t
   MASS OF LID = 7.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

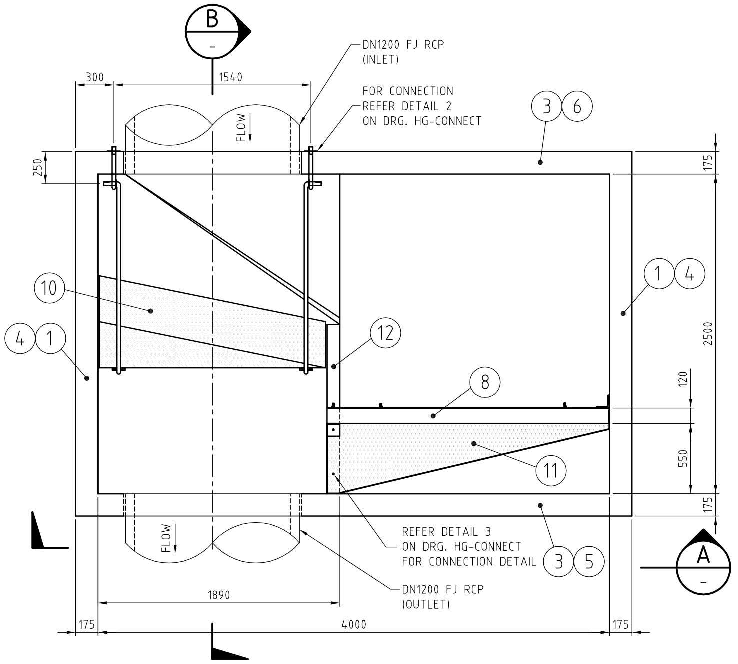
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES STANDARD DRAWING
HUMEGARD HG40A/L
DN1050/DN1050 FJ RCP
GENERAL ASSEMBLY

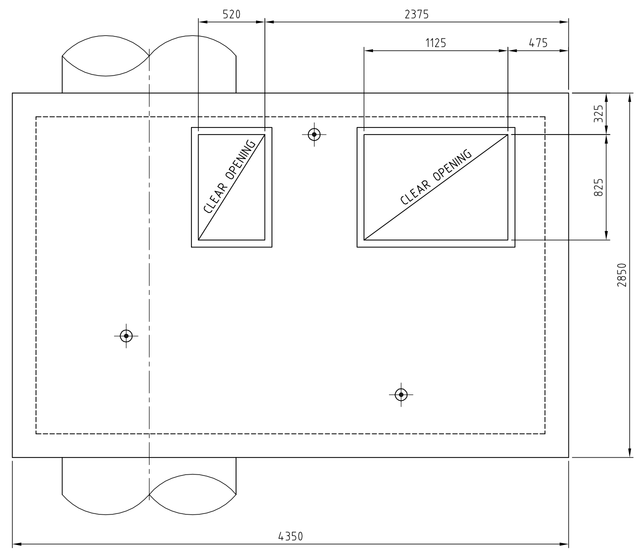
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:1	A1	HG40A/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
1	GENERAL REVISION	MZ	—	DFW

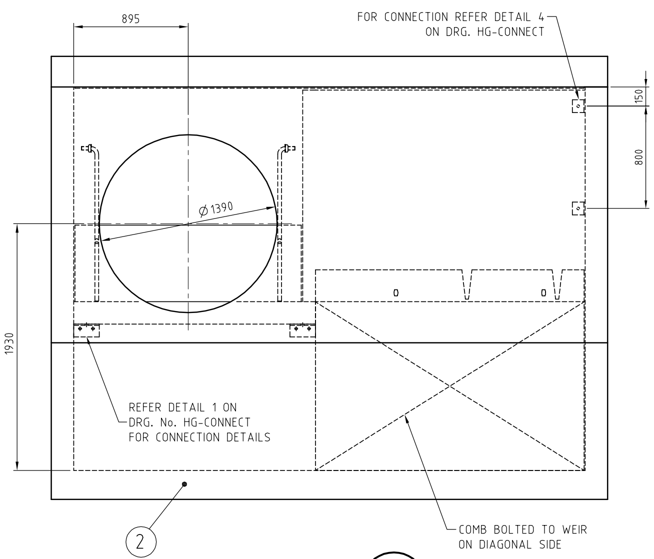
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



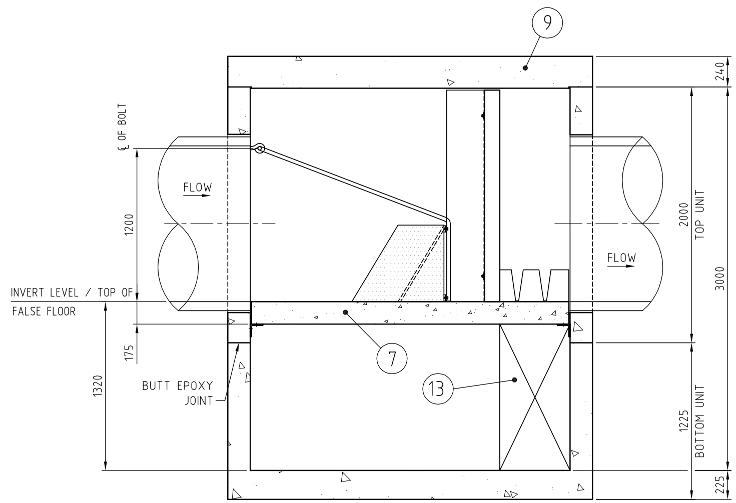
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



VIEW A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 13.4 t
   MASS OF TOP UNIT = 14.4 t
   MASS OF LID = 7.0 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

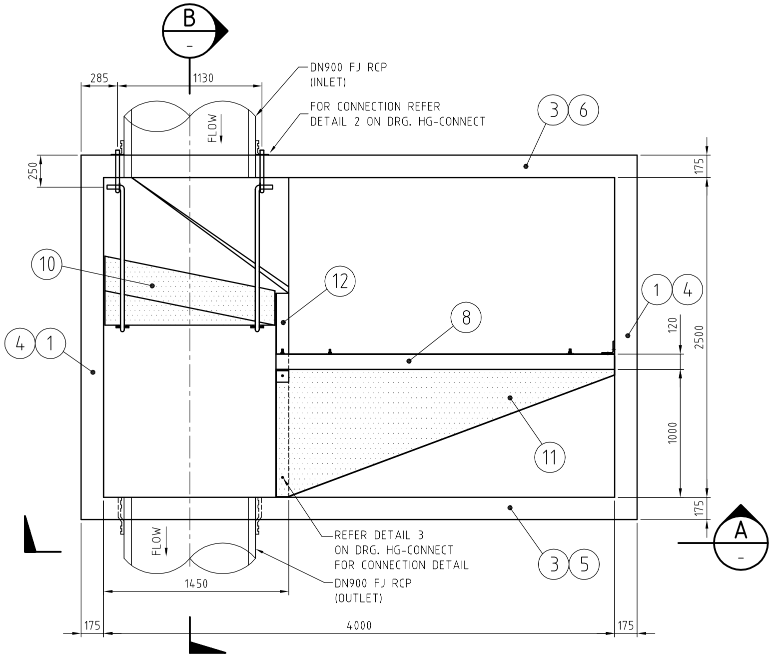
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG40B/L
DN1200/DN1200 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG40B/L-01 REV. C	1:1	A1	HG40B/L-01	1

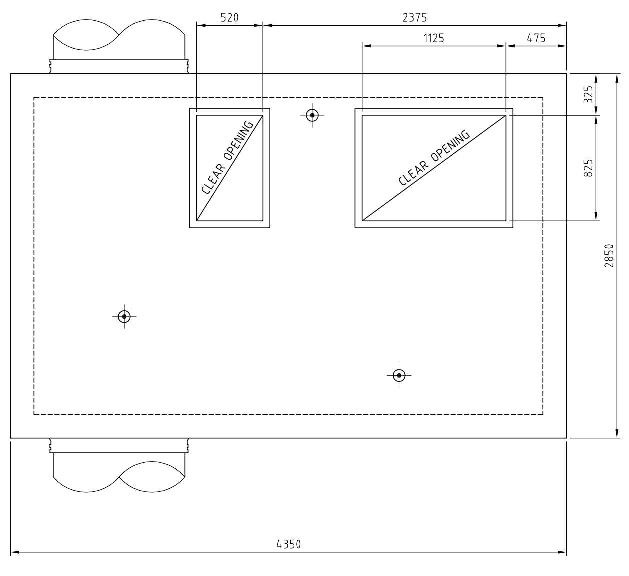
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
2	ITEM NUMBERS REVISED, REISSUED FOR MANUFACTURE	MZ	—	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



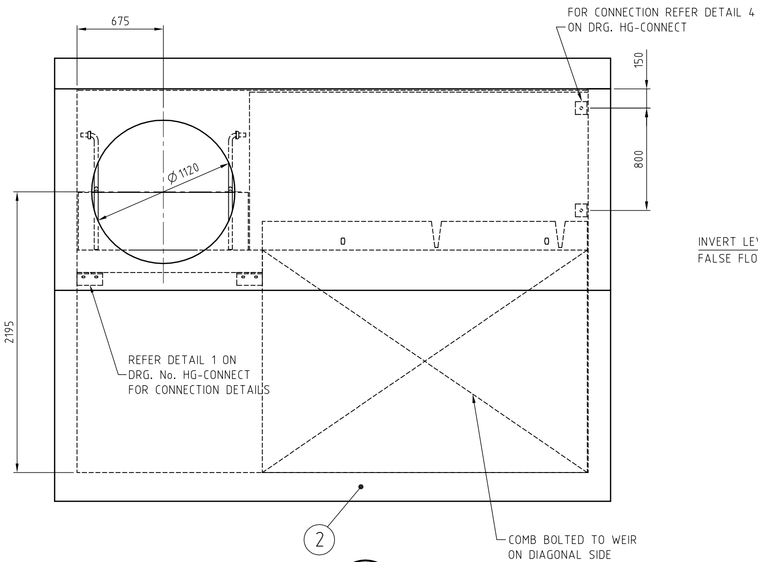
PLAN VIEW (LID REMOVED)

SCALE 1:20



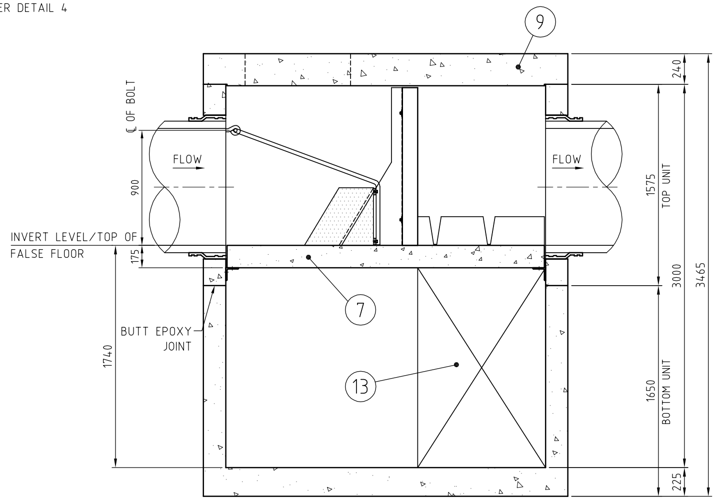
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 16.2 t
   MASS OF TOP UNIT = 11.6 t
   MASS OF LID = 7.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

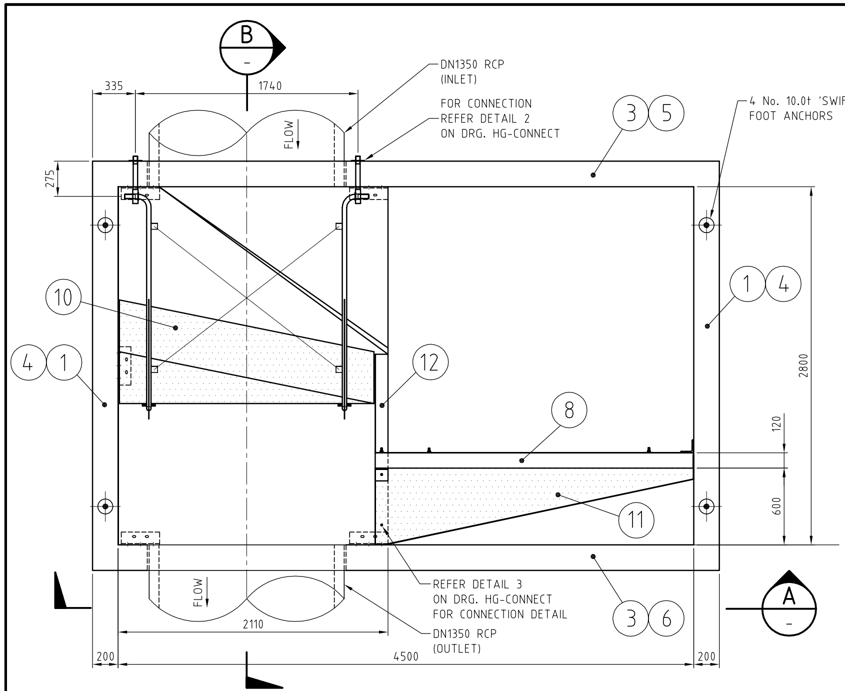
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES STANDARD DRAWING
HUMEGARD HG40/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG40/L-01 REV. 1	1:1	A1	HG40/L-01	2

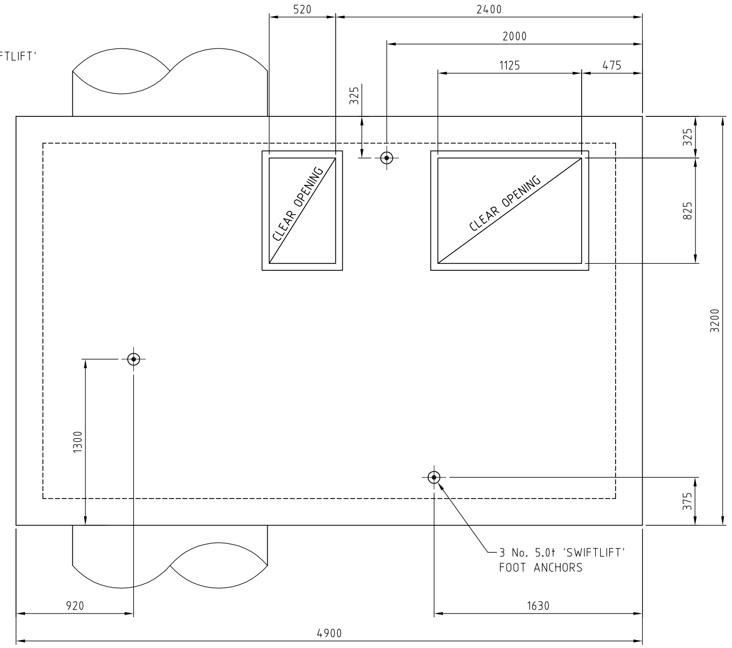
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	15-12-10	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG45A-02
2	BASE SLAB	HG45A-04
3	SIDE WALL - BOTTOM UNIT	HG45A-05
4	END WALL - TOP UNIT	HG45A-03
5,6	SIDE WALL - TOP UNIT	HG45A-06
7	FALSE FLOOR	HG45A/L-07
8	CONCRETE BAFFLE WALL	HG45A/L-07
9	PRECAST LID	HG45A/L-08
10	FLOATING BOOM	HG45A/L-09
11	WEIR	HG45A/L-10
12	BAFFLE SIDE WALL	HG45A/L-11
13	COMB	HG45A/L-12



PLAN VIEW (LID REMOVED)

SCALE 1:20



PLAN ON LID

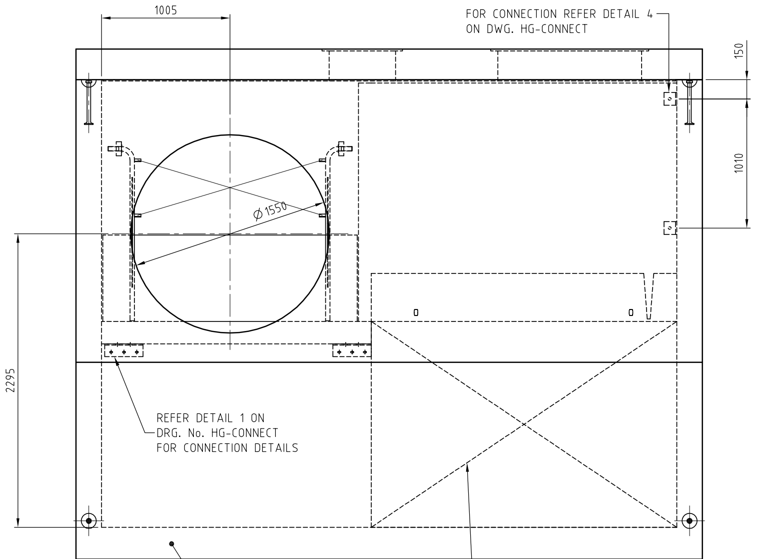
SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 20.7 t
   MASS OF TOP UNIT = 19.7 t
   MASS OF LID = 9.1 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

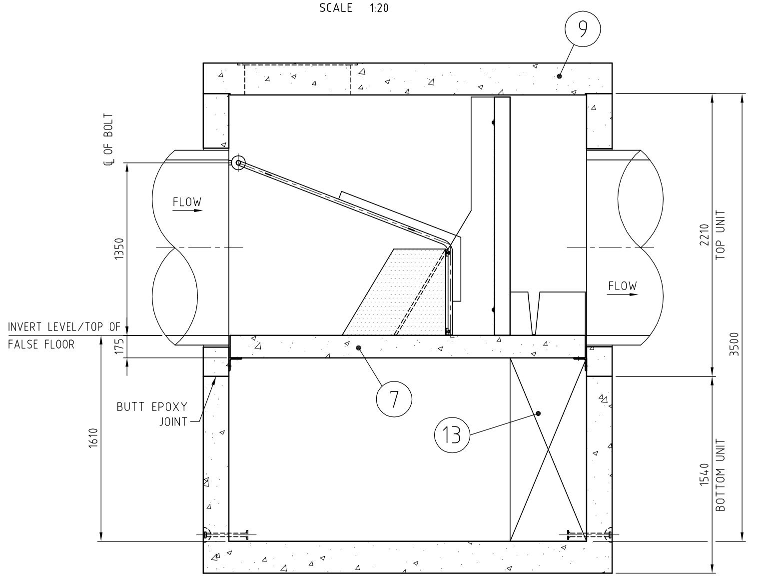
DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

Humes

TECHNICAL SERVICES
BRISBANE, QUEENSLAND

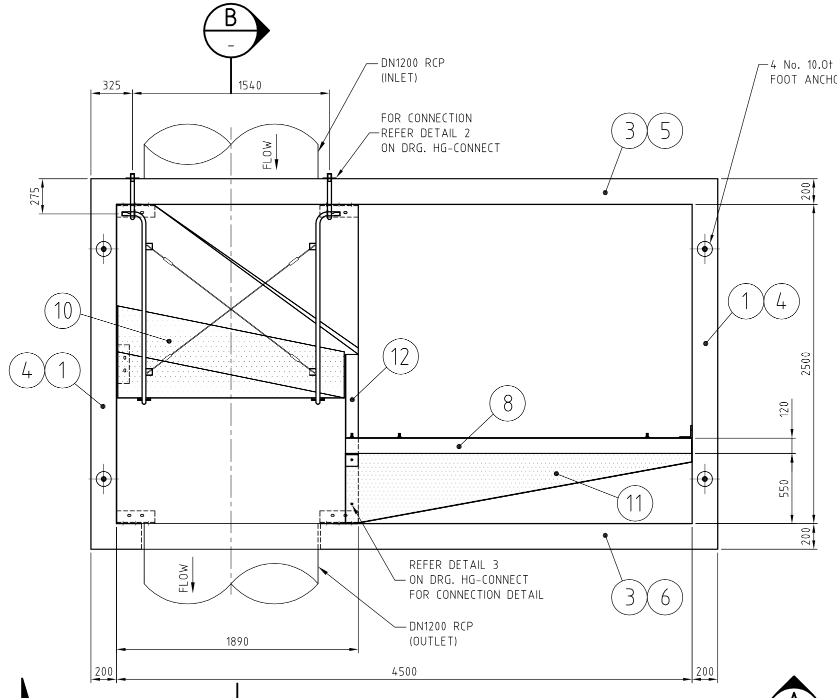
DSN.	WST	07-12-10
DWN.	MZ	07-12-10
CKD.	RM	15-12-10
APP.	WST	15-12-10

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG45A/L
DN1350/DN1350 RCP
GENERAL ASSEMBLY

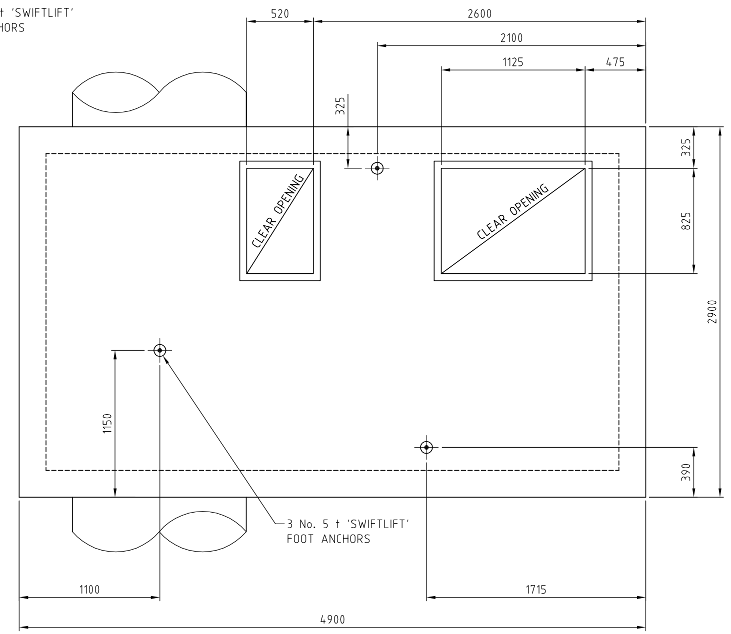
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG45A/L-01 REV. 0	1:1	A1	HG45A/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	15-12-10	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG45-02
2	BASE SLAB	HG45-04
3	SIDE WALL - BOTTOM UNIT	HG45-05
4	END WALL - TOP UNIT	HG45-03
5,6	SIDE WALL - TOP UNIT	HG45-06
7	FALSE FLOOR	HG45/L-07
8	CONCRETE BAFFLE WALL	HG45/L-07
9	PRECAST LID	HG45/L-08
10	FLOATING BOOM	HG45/L-09
11	WEIR	HG45/L-10
12	BAFFLE SIDE WALL	HG45/L-11
13	COMB	HG45/L-12



PLAN VIEW (LID REMOVED)
SCALE 1:20



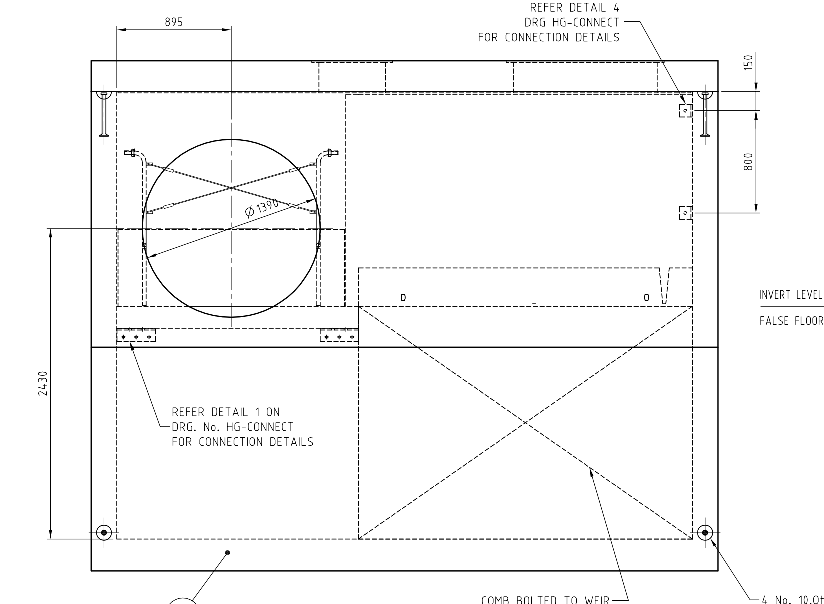
PLAN ON LID
SCALE 1:20

NOTES:

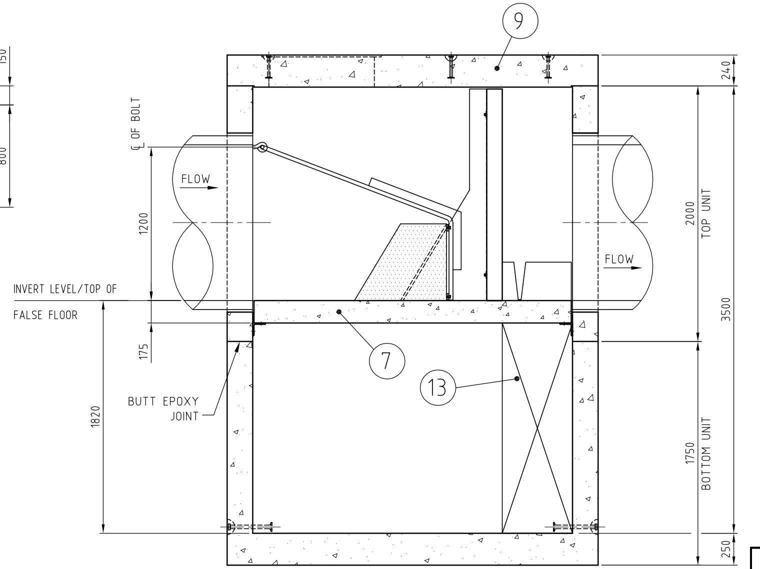
1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 20.8 t
   MASS OF TOP UNIT = 17.3 t
   MASS OF LID = 8.1 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.



VIEW A
SCALE 1:20



SECTION B
SCALE 1:20

Humes

TECHNICAL SERVICES
BRISBANE, QUEENSLAND

DSN.	WST	01-12-10	HUMES WATER SOLUTIONS
DWN.	MZ	01-12-10	STANDARD HUMEGARD
CKD.	RM	15-12-10	HUMEGARD HG45/L
APP.	WST	15-12-10	DN1200/DN1200 FJ RCP GENERAL ASSEMBLY

Holcim (Australia) Pty Ltd ABN 87 099 732 297

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG45/L-01 REV 0	1:1	A1	HG45/L-01	1

Precast solutions

Top:
StormTrap® system

Middle:
RainVault® system

Bottom:
Segmental shaft

Stormwater

Stormwater treatment

Primary treatment

HumeGard® Gross Pollutant Trap

Secondary treatment

HumeCeptor® hydrodynamic separator

Detention and infiltration

StormTrap® system

Soakwells

Harvesting and reuse

RainVault® system

ReserVault® system

RainVault® Mini system

Precast concrete cubes

Segmental shafts

Stormwater drainage

Steel reinforced concrete pipes – trench

Steel reinforced concrete pipes – salt water cover

Steel reinforced concrete pipes – jacking

Box culverts

Uniculvert® modules

Headwalls

Stormwater pits

Access chambers/Manholes

Kerb inlet systems

Floodgates

Geosynthetics

Sewage transfer and storage

Bridge and platform

Tunnel and shaft

Walling

Potable water supply

Irrigation and rural

Traffic management

Cable and power management

Rail

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