

FIBERGLASS WETWELL

INSTALLATION INSTRUCTIONS
& OPERATING GUIDELINES



INCLUDING LIFT STATIONS, VERTICAL PUMP VAULTS AND BASINS



CONTAINMENT
SOLUTIONS®

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1. INTRODUCTION

- 1.1. These instructions, while using the word "wetwell", will pertain to all wetwells, lift stations, vertical pump vaults and basins.
- 1.2. Fiberglass wetwells are designed for installation with concrete top pad and bottom slabs.
- 1.3. The following instructions reflect the approved methods for installing wetwells.

1.4. Safety

- 1.4.1. These instructions should not be interpreted in any way to put one's health at risk, or to harm property and/or the environment.
- 1.4.2. The following definitions will serve as a guide when reading this manual:

⚠ WARNING

Indicates a potentially hazardous situation, which if not avoided could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation, which if not avoided may result in minor or moderate injury.

NOTICE

Indicates a potentially hazardous situation, which if not avoided may result in property damage.

Field Service Dept.
Mt. Union, Pennsylvania
(800) 822-1997
(814) 542-8520

Technical Support
Conroe, Texas
(877) 274-8265
(936) 756-7731

1.5. Important Information

- 1.5.1. Proper installation of each wetwell is essential to ensure the safety of all the individuals involved in the installation; to prevent wetwell damage and/or failure, which could lead to product loss and environmental contamination; and to validate the wetwell warranty.

⚠ WARNING

Wetwells are a confined space per OSHA guidelines. Follow proper confined space safety procedures.

- 1.5.2. Containment Solutions fiberglass wetwells must be installed according to these published instructions (MAN 4004) as well as any required supplemental instructions.
- 1.5.3. Follow all OSHA, Federal, State, Local or Provincial safety and environmental codes and regulations.

1.6. Wetwell Warranty Activation

- 1.6.1. These instructions must be followed.
- 1.6.2. Any variances or deviations which are in direct conflict with these published installation instructions must be approved in writing by CSI prior to the installation.
- 1.6.3. The Wetwell Installation Checklist must be properly completed and signed by the owner's representative and the installing contractor.
- 1.6.4. The Wetwell Installation Checklist, these instructions, and any correspondence related to the wetwell installation must be retained by the owner. The checklist will be required and must be provided to CSI when making a warranty claim.
- 1.6.5. The warranty in effect at the time of delivery will apply and is available from Containment Solutions.

1.7. Before You Begin

- 1.7.1. Read, understand and follow these instructions.
- 1.7.2. Barricade the work area.
- 1.7.3. Review and prepare to complete the installation checklist as the installation progresses.
- 1.7.4. If you have questions on other wetwell installation details, call Technical Support at 800-537-4730.

2. HANDLING & PREPARATION

⚠ WARNING

Do not stand on or under wetwell while it is being lifted. This could result in injury or death.

⚠ WARNING

Do not allow driver to release straps securing the wetwell to the truck until the wetwell is safe to offload. Failure to do so could result in death or serious injury.

- 2.1. Upon wetwell delivery and when lifting wetwell, visually inspect entire exterior surface of the wetwell for shipping or handling damage.
- 2.2. If damage exists, contact CSI prior to installation.
- 2.3. Do not drop or impact the wetwell.
- 2.4. Wetwells should be stored horizontally and chocked, using only appropriate materials such as sandbags, tires, or other soft or pliable materials.
- 2.5. Do not roll or set the wetwell on any pipe stubout, accessory or appurtenance installed on the wetwell.

- 2.6. The contractor is responsible for rigging, unloading and securing the wetwell.
- 2.7. Always lift, never roll, slide or push a wetwell.
- 2.8. When lifting the wetwell in the horizontal position, use two slings with a spreader bar.
- 2.9. Only a pliable strap or rope should contact the wetwell, do not use chains, steel cables or hard metallic slings.
- 2.10. Do not wrap chain or cable around the wetwell.
- 2.11. Use a minimum of two lift lugs when pivoting the wetwell from horizontal to vertical.
- 2.12. Utilize all lift lugs provided at the wetwell top for vertical lifting.

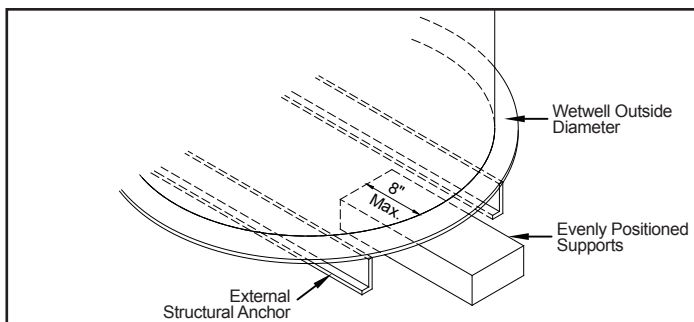
3. SITE PREPARATION

- 3.1. Dimensions of the excavation should be wide enough to provide sufficient working room around the wetwell.
- 3.2. Use minimum 3000-psi concrete for bottom slabs. Final slab depth, size, thickness and reinforcements shall meet the minimum requirements in these instructions and applicable tables, including appendix.
- 3.3. Slabs should extend at least 12" beyond the O.D. of the wetwell.
- 3.4. Minimum slab thickness and reinforcement are specified in Table 1 in the appendices of this publication. (see Appendices: Bottom Slab Design).
- 3.5. Concrete slab designs must meet American Concrete Institute Code ACI 318 Building Code Requirements for Structural Concrete with a load factor of 1.3. This is sufficient to resist bending from water head pressure and soil loading with the wetwell completely empty with water to grade and a float out Factor of Safety of at least 1.2.
- 3.6. It is the responsibility of the owner or owner's representative to install a slab of adequate design that facilitates proper product use.

4. WETWELL POSITIONING

- 4.1. To aid in positioning and handling the wetwell while constructing the concrete slab, supports or shims may be utilized. (see Figure 4-1)

Figure 4-1



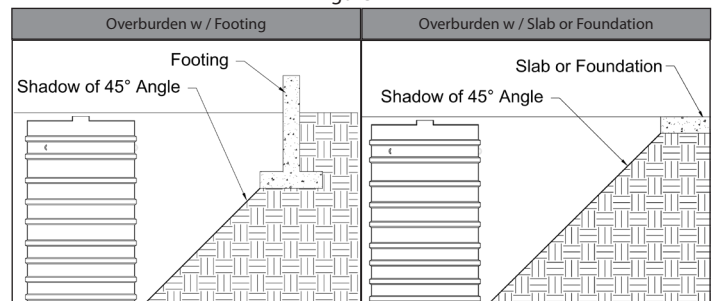
- 4.1.1. Supports should be made from a material that will not degrade or rot.
- 4.1.2. The wetwell must rest on a minimum of 3 evenly spaced supports. The supports should position the wetwell bottom above the rebar. Wetwell cannot sit on rebar reinforcement

- 4.1.3. The supports must be in contact with the flat bottom of the wetwell at the outside diameter, and must not contact the external structural anchors.
- 4.1.4. The supports must not extend more than 8" from the outside diameter of the wetwell toward the center.

4.2. Wetwell Location - Nearby Structures

- 4.2.1. CSI recommends that the wetwell owner seek the advice of a local foundation professional engineer to determine the proper placement of a wetwell excavation near any slabs or foundations.
- 4.2.2. The location of a wetwell can be affected by the location of nearby structures. When selecting a wetwell site, care must be taken to avoid undermining the foundations of new or existing structures.
- 4.2.3. Ensure that downward forces from loads carried by the foundations and supports of nearby structures (constructed before or after wetwell installation) are not transmitted to the wetwell. (Refer to NFPA 30 for additional details).
- 4.2.4. The placement of the installed underground wetwell is not designed for any of the following:
 - 4.2.4.1. Adjacent slab, footing or foundation that will place loads on the wetwell top or sides. This is typically accomplished by insuring that the wetwell is not located within the load distribution of any adjacent slabs or foundations using 45° as the angle of the projected loads (see Figure 4-2).

Figure 4-2



5. BOTTOM SLAB FOR OPEN BOTTOM WETWELLS

⚠ WARNING

Collapsing excavation walls can cause injury or death. Do not enter the wetwell excavation unless necessary and in compliance with OSHA regulations. Follow OSHA guidelines for excavations.

- 5.1. Open Bottom Wetwells with or without Anti-Flotation Flange
 - 5.1.1. Cast in place slabs (See Figure 5-1)
 - 5.1.1.1. Lower wetwell into wet concrete until it rests at correct elevation embedded 3" into concrete, then move wetwell to plumb.
 - 5.1.2. Precast slabs (See Figure 5-2)
 - 5.1.2.1. Lower wetwell until it rests on the slab. Place a minimum of 3" of concrete on top of precast slab around the circumference of the wetwell.

Figure 5-1

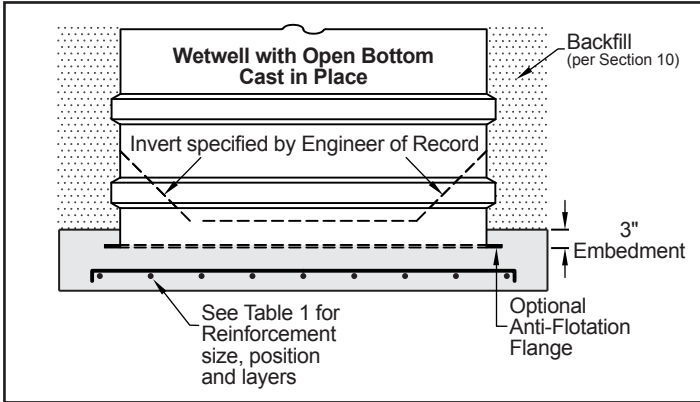
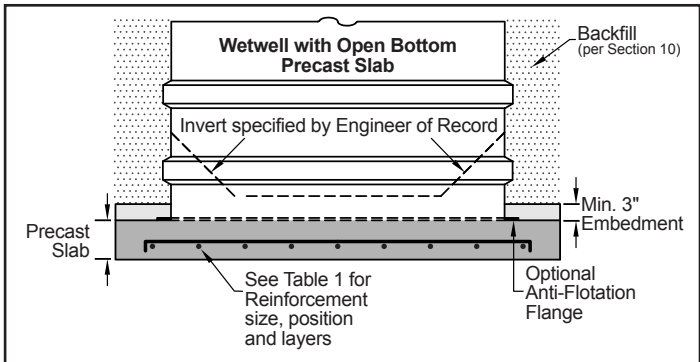


Figure 5-2



6. BOTTOM SLAB FOR CLOSED BOTTOM WETWELLS WITHOUT EXTERNAL ANCHORS

WARNING

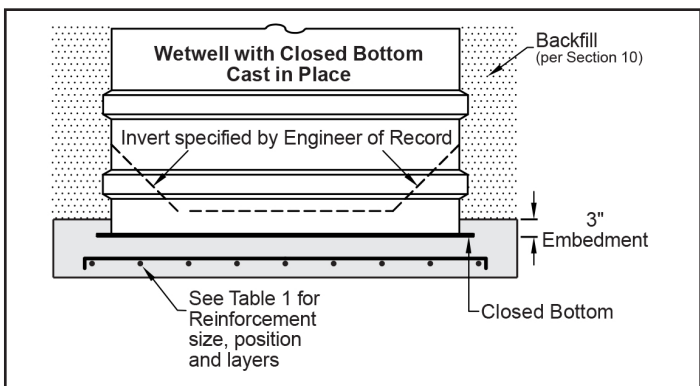
Collapsing excavation walls can cause injury or death. Do not enter the wetwell excavation unless necessary and in compliance with OSHA regulations. Follow OSHA guidelines for excavations.

6.1. Closed Bottom Wetwells without External Anchors

6.1.1. Cast in place slabs (See Figure 6-1)

- 6.1.1.1. Lower wetwell into wet concrete until it rests at correct elevation embedded 3" into concrete, the move wetwell to plumb.

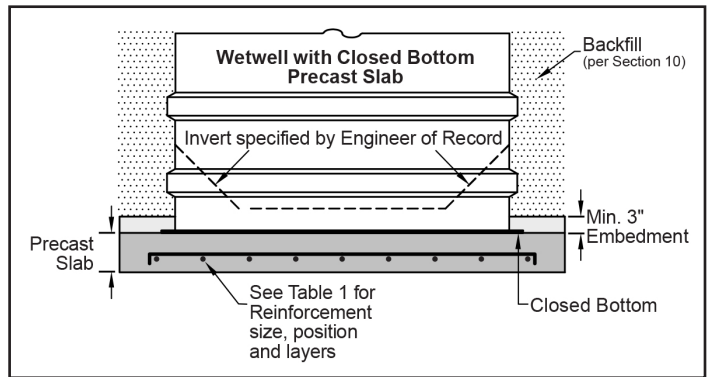
Figure 6-1



6.1.2. Precast slabs (See Figure 6-2)

- 6.1.2.1. Lower wetwell until it rests on the slab. Place a minimum of 3" of concrete on top of precast slab around the circumference of the wetwell.

Figure 6-2



7. BOTTOM SLAB FOR CLOSED BOTTOM WETWELLS WITH EXTERNAL ANCHORS

WARNING

Collapsing excavation walls can cause injury or death. Do not enter the wetwell excavation unless necessary and in compliance with OSHA regulations. Follow OSHA guidelines for excavations.

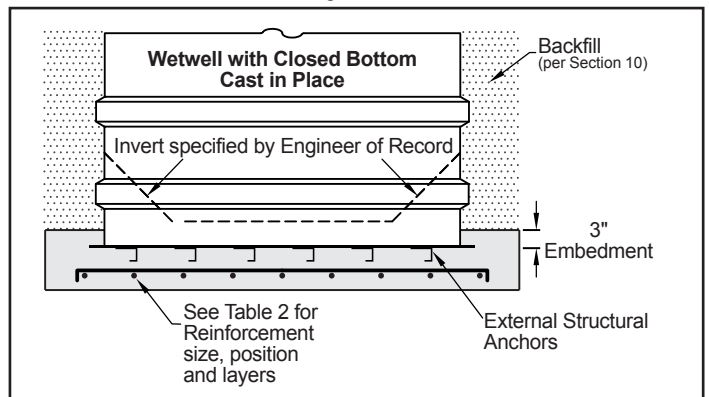
7.1. Closed Bottom Wetwells with External Anchors (See Figure 7-1)

- 7.1.1. Cold concrete joints and pre-cast slabs are not allowed. Fiberglass closed (solid) bottom wetwells with external structural anchors must be installed in a continuous and monolithic concrete pour over the anti-flotation ring cover (embedment).
- 7.1.2. Lower wetwell into the wet concrete until it rests at correct elevation embedded a minimum of 3" into concrete.
- 7.1.3. Concrete must extend at least 3" above the Wetwell bottom and around the entire circumference of the Wetwell.
- 7.1.4. It may be necessary to add ballast (water) inside the Wetwell to counteract buoyancy until the concrete is cured.
- 7.1.5. Push and/or prod the concrete to ensure all voids are filled under and around the external structural anchors.

NOTICE

Voids in the concrete pad around external anchors will result in product damage and environmental contamination.

Figure 7-1



8. CLOSED BOTTOM WETWELLS WITH FACTORY SUPPLIED BOTTOM SLAB

- 8.1. Closed bottom wetwells with factory supplied bottom slabs are only available from the manufacturer and do not require additional slab instructions.
- 8.2. Lower the complete unit into the excavation using the supplied lift lugs and backfill per Section 10. Make sure the excavation bed is level and free of rocks and debris.
- 8.3. All other instructions within this document still apply.

9. PIPING PENETRATIONS / FITTINGS

- 9.1. Pipe penetration cutouts should be round holes and should be no larger than the pipe diameter plus 1".
 - 9.1.1. Make cuts using a saw with a masonry or diamond grit blade.
 - 9.1.2. Do not use an axe or other impact type tools.
- 9.2. Accessories must be installed and used in strict accordance with the manufacturer's instructions.
- 9.3. All piping must have a flexible connector installed directly on the fitting or accessory to allow for a minimum 1/2" differential settlement between the wetwell and the pipe. If more than 1/2" differential settlement is expected, choose a flexible connector designed for the expected settlement.

10. BED AND BACKFILL

- 10.1. Proper backfill selection and compaction is required for a proper installation. The allowed backfills are shown in the Backfill & Compaction Tables (See Appendix C) along with the degree of compaction required.
 - 10.1.1. Backfill selection shall be in accordance with these instructions and based on the largest diameter of any section of the Wetwell.
- 10.2. Do not backfill around the Wetwell until the concrete slab has hardened.
- 10.3. Add backfill in maximum 12" lifts evenly around the Wetwell to avoid uneven backfill loads.
- 10.4. A flexible joint on each connecting pipe is required to relieve stresses from differential backfill movement or soil consolidation. Backfill should be added to the invert elevation of each connecting pipe, the connection made and sealed, before continuing to backfill.
- 10.5. Backfill surround requirements:
 - 10.5.1. If muck, bog, peat, or loess are present, consult with a Geotechnical Engineer for backfill and excavation requirements.
 - 10.5.2. For permafrost conditions, consult with a Geotechnical Engineer for backfill and excavation requirements.
- 10.6. Keep backfill dry and free of ice in freezing conditions.
- 10.7. Ensure that no foreign objects larger than 2" such as large stones, concrete clumps, tree roots/limbs, or debris is in the backfill surrounding the Wetwell.
- 10.8. Prevent large surges of backfill from displacing the Wetwell.

11. WETWELL INSTALLATION WITH A FIBERGLASS UNDERGROUND TANK

NOTICE

Not using approved backfill material may result in tank failure and environmental contamination.

- 11.1. If the wetwell is installed in the same excavation as an underground fiberglass tank, the backfill around the wetwell must also meet the tank backfill requirements so as to not compromise the tank installation.
- 11.2. Tank backfill requirements are more restricted and strict conformance to the tank backfill requirements in INST 6001 must be met for both the wetwell and tank.

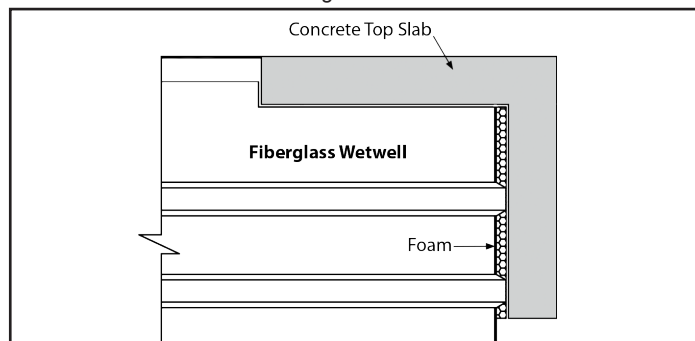
12. INVERT

- 12.1. Invert specified by Engineer Of Record. The invert may be at any angle and may project up the wetwell any distance.

13. TOP PAD

- 13.1. The wetwell is designed to support the dead weight of an 8" thick square pad 24" larger than the diameter of the wetwell (centered on the wetwell) along with a dynamic HS-20 traffic load as long as the pad is designed to distribute the loads on the wetwell perimeter and not on the interior of the lid.
- 13.2. If the static load will exceed the 8" pad weight or the traffic load will exceed HS-20, the pad must be 48" larger than the wetwell diameter (centered on the wetwell) and all of the pad and / or traffic loads must be supported by the soil around the wetwell and not by the wetwell itself.
- 13.3. Fiberglass flat tops 36" through 96" diameter are designed to support 8" concrete pads without internal supports while the concrete cures.
- 13.4. Fiberglass flat tops greater than 96" diameter or concrete pads thicker than 8" must have internal bracing to support the top until the concrete cures. Brace internally with 2" x 10" lumber on 24" centers supporting the top from the underside to carry the load while the concrete cures. The concrete pad must be designed to be self supporting after cured. After the concrete pad is cured, remove the bracing.
- 13.5. The pad shall be specified by the Engineer Of Record.
- 13.6. If the top slab will extend down the side of the wetwell, the exterior wall and ribs must be wrapped in foam such that the concrete will not encapsulate the rib. The top slab cannot transfer load to the wetwell or rib (See Figure 13-1).

Figure 13-1



13.7. Open Top Wetwells Without Traffic Load

- 13.7.1. See Figure 13-2.
- 13.7.2. Concrete pads can be either precast or cast on site. The pad must be larger than the wetwell a minimum of 12" in all directions.
- 13.7.3. Maximum 8" concrete pad thickness.
- 13.7.4. Precast top pads must have a reasonably smooth, flat bottom to provide a seal between the pad underside and wetwell top edge when using a gasket, tar, or other sealing material.

13.8. Fiberglass Flat Tops Without Traffic Load

- 13.8.1. See Figure 13-2.
- 13.8.2. The pad must be larger than the wetwell a minimum of 12" in all directions.
- 13.8.3. Maximum 8" concrete pad thickness.

13.9. Fiberglass Flat Tops With Traffic Load

- 13.9.1. See Figure 13-3.
- 13.9.2. The pad must be larger than the wetwell a minimum of 24" in all directions.
- 13.9.3. The Engineer Of Record shall specify the pad strength and reinforcement so that the static weight of an 8" thick square pad (no more than 24" larger than the diameter of the wetwell centered on the wetwell) along with a dynamic HS-20 traffic load must be distributed on the wetwell perimeter and not on the interior of the lid.
- 13.9.4. If either the static pad load or the dynamic traffic load is exceeded, all of the pad and / or traffic loads must be supported by the soil around the wetwell and not by the wetwell itself.

Figure 13-2 Wetwell Without Traffic Load

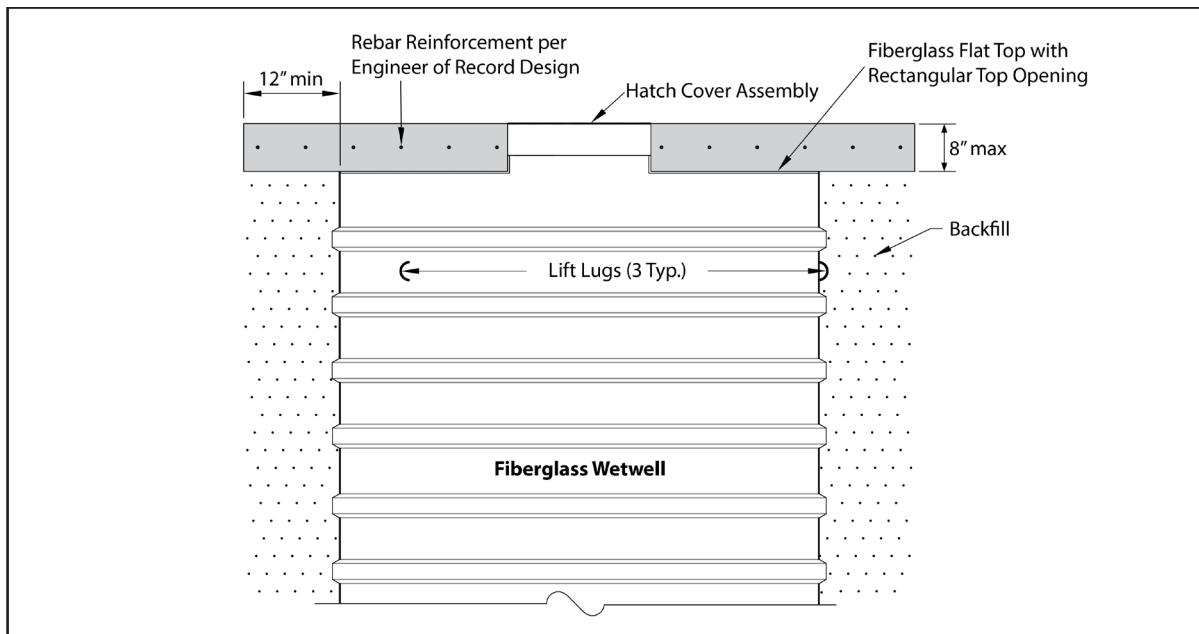
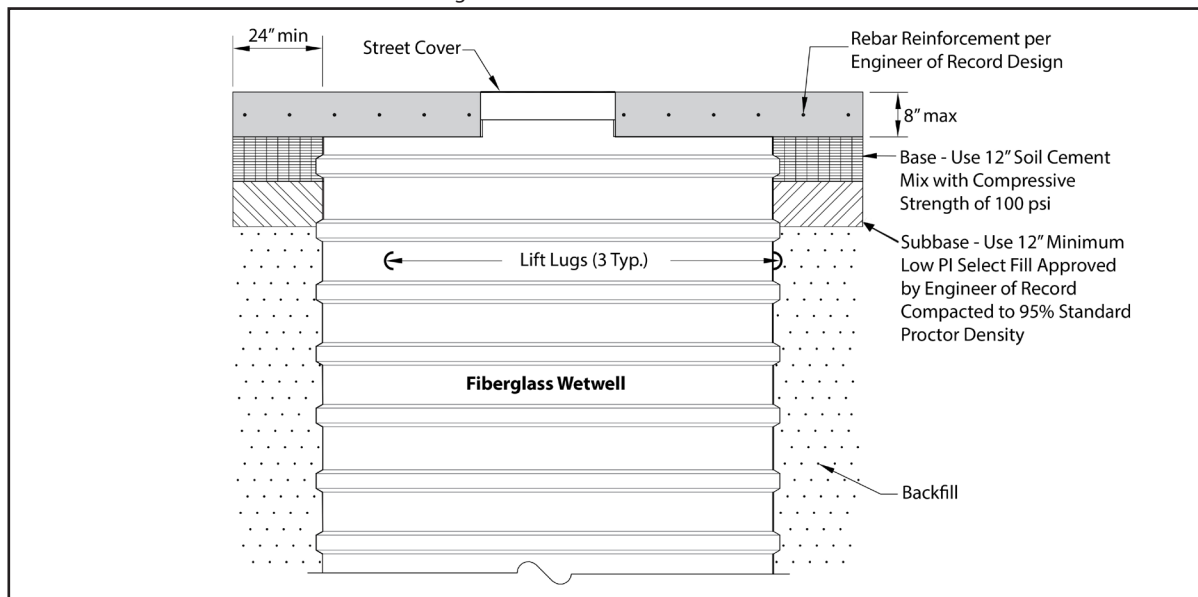


Figure 13-3 Wetwell With Traffic Load



14. OPERATING GUIDELINES

14.1. General

- 14.1.1. The Wetwell installation checklist, these instructions, and any correspondence related to the wetwell installation must be retained by the wetwell owner. The checklist will be required and must be provided to CSI when making a warranty claim.
- 14.1.2. For the life of the installation, all applicable Federal, State, Local or Provincial codes and regulations must be complied with.
- 14.1.3. It is the responsibility of the wetwell owner/operator to follow these instructions and operating guidelines and all limitations as stated in the limited warranties in effect at time of delivery.
- 14.1.4. The limited warranty in effect at the time of wetwell delivery will apply and is available online at www.containmentsolutions.com.

14.2. Fiberglass Wetwells Intended Use

- 14.2.1. Each wetwell is designed and manufactured to store products for the intended use as outlined in the applicable limited warranty. Storing products that were not disclosed to CSI in writing prior to the manufacture of the wetwell may damage the wetwell and could result in wetwell failure and/or damage to surrounding property.
- 14.2.2. The temperature of stored product must not exceed the temperature limits defined in the applicable limited warranty.
- 14.2.3. Product delivery temperatures must not exceed the temperature limits defined in the applicable limited warranty.

14.3. Confined Space Entry

⚠ WARNING

Do not enter wetwell unless following OSHA guidelines for confined space entry. Failure to follow OSHA guidelines could result in death or serious injury.



ASPHYXIATION



FIRE



EXPLOSION

- 14.3.1. Wetwell structures are confined spaces.
- 14.3.2. The wetwell owner should not allow anyone other than properly trained and equipped personnel to enter an underground wetwell.
 - 14.3.2.1. Proper permits and industry accepted minimum standards must be followed before anyone can enter a wetwell.
 - 14.3.2.2. Contact Containment Solutions Field Services at (800) 822-1997 if repairs or modifications are required.

- 14.3.3. Wetwell entry by unqualified personnel can lead to fire, explosion, asphyxiation and/or death. Manways and access risers are for use by qualified personnel with proper training and safety equipment.
- 14.3.4. Do not attempt to repair or modify your wetwell. Any repairs or modifications will void the wetwell limited warranty.
- 14.3.5. If wetwell entry is required for repairs, modifications or inspections, contact Containment Solutions Field Services at (800) 822-1997.

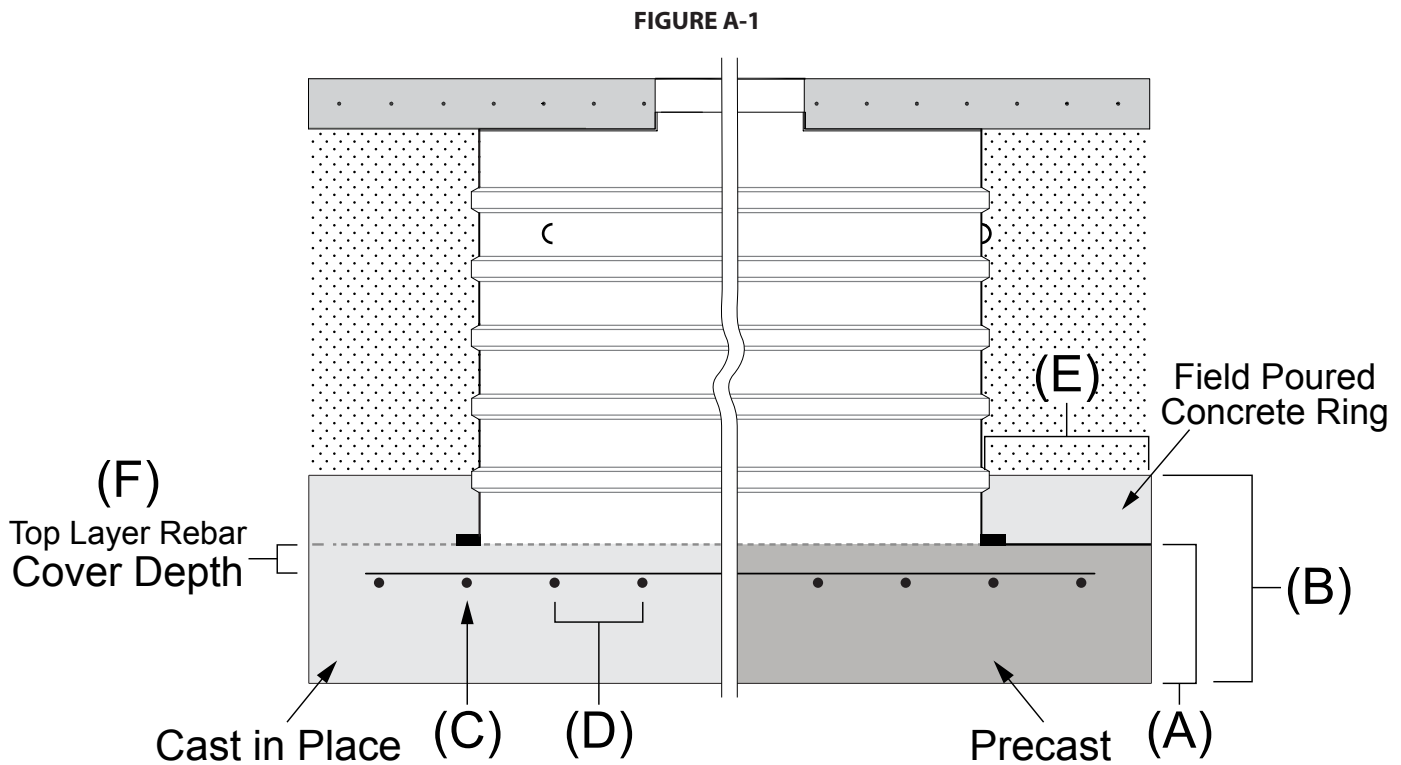
APPENDIX A - WETWELLS WITHOUT EXTERNAL ANCHORS

Open or Closed Bottom Wetwells Without External Anchors:

The diagram below defines the measurements utilized in Table 1 for designing concrete slabs suitable for use with Containment Solutions products. Slabs are designed to ACI code to resist buckling from external water pressure in the installed condition with the perimeter of the wetwell (including the anti-flotation flange if included) embedded in concrete. Use a minimum 3000 psi concrete and 60 ksi yield strength rebar. Each Wetwell must rest on, or being embedded in, a concrete bottom slab.

Definitions:

- (A) Concrete Thickness Under Wetwell - measured from the bottom of the slab to the bottom of the Wetwell.
- (B) Total Slab Thickness - the total concrete height including the 3" of concrete embedment around the anti-flotation flange.
- (C) Rebar Size - the rebar number based on the diameter of the rod in $\frac{1}{8}$ " increments.
- (D) Rebar Spacing - the center-to-center distance within a rebar layer.
- (E) Slab Extension - the minimum required concrete beyond the Wetwell outer diameter (O.D.)
- (F) Top Layer Rebar Cover Depth -



Additional Instructions:

1. The layer of rebar includes rebar placed with the bottom rows laying perpendicular to the top rows, with specified rebar cover depth (F) between top of rebar and wetwell bottom.
2. All rebar to extend to within 2" of the slab perimeter.
3. The rebar cover depth may not be changed, but the rebar size and spacing within a layer may be adjusted as long as the amount of steel specified in Table A-1 is matched or exceeded.
4. Each Wetwell slab must be independent of any other slab or structure.
5. Cast in place or precast slabs are acceptable for closed bottom wetwells without external anchors.

APPENDIX A - WETWELLS WITHOUT EXTERNAL ANCHORS

Open or Closed Bottom Wetwells WITHOUT External Anchors:

The measurements identified in the table below are referenced in Figure A-1.

TABLE A-1

Wetwell Diameter	Depth (feet)	Concrete Thickness Under Manhole (inches)	Total Slab Thickness (including 3" Embedment) (inches)	Rebar Size (number)	Rebar Spacing (inches)	Slab Extension (inches)	Top Rebar Cover Depth (inches)
		A	B	C	D	E	F
36"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	28	12	1.5
	21-30	6	9	5	28	12	1.5
	31-40	6	9	5	28	12	1.5
	41-50	6	9	5	26	12	1.5
42"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	28	12	1.5
	21-30	6	9	5	28	12	1.5
	31-40	6	9	5	26	12	1.5
	41-50	6	9	5	23	12	1.5
48"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	28	12	1.5
	21-30	6	9	5	26	12	1.5
	31-40	6	9	5	21	12	1.5
	41-50	7	10	5	20	12	1.5
54"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	26	12	1.5
	21-30	6	9	5	23	12	1.5
	31-40	6	9	5	17	12	1.5
	41-50	7	10	5	17	12	1.5
60"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	26	12	1.5
	21-30	6	9	5	18	12	1.5
	31-40	7	10	5	17	12	1.5
	41-50	7	10	5	14	12	1.5
66"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	23	12	1.5
	21-30	6	9	5	15	12	1.5
	31-40	7	10	5	14	12	1.5
	41-50	8	11	5	14	12	1.5
72"	1-10	6	9	5	28	12	1.5
	11-20	6	9	5	19	12	1.5
	21-30	6	9	5	12	12	1.5
	31-40	7	10	5	12	12	1.5
	41-50	8	11	5	16	12	1.5

Notes:

- 36" through 42" diameter – flat unreinforced bottoms in this size range are restricted to a maximum 25' burial depth in CSI specifications.
- 48" through 72" diameter – large deflection unreinforced bottoms in this size range are restricted to a maximum 40' burial depth in CSI specifications.
- >72" diameter or burial depths deeper than those shown in the table require bottoms that have external anchors.

APPENDIX B - WETWELLS WITH EXTERNAL ANCHORS

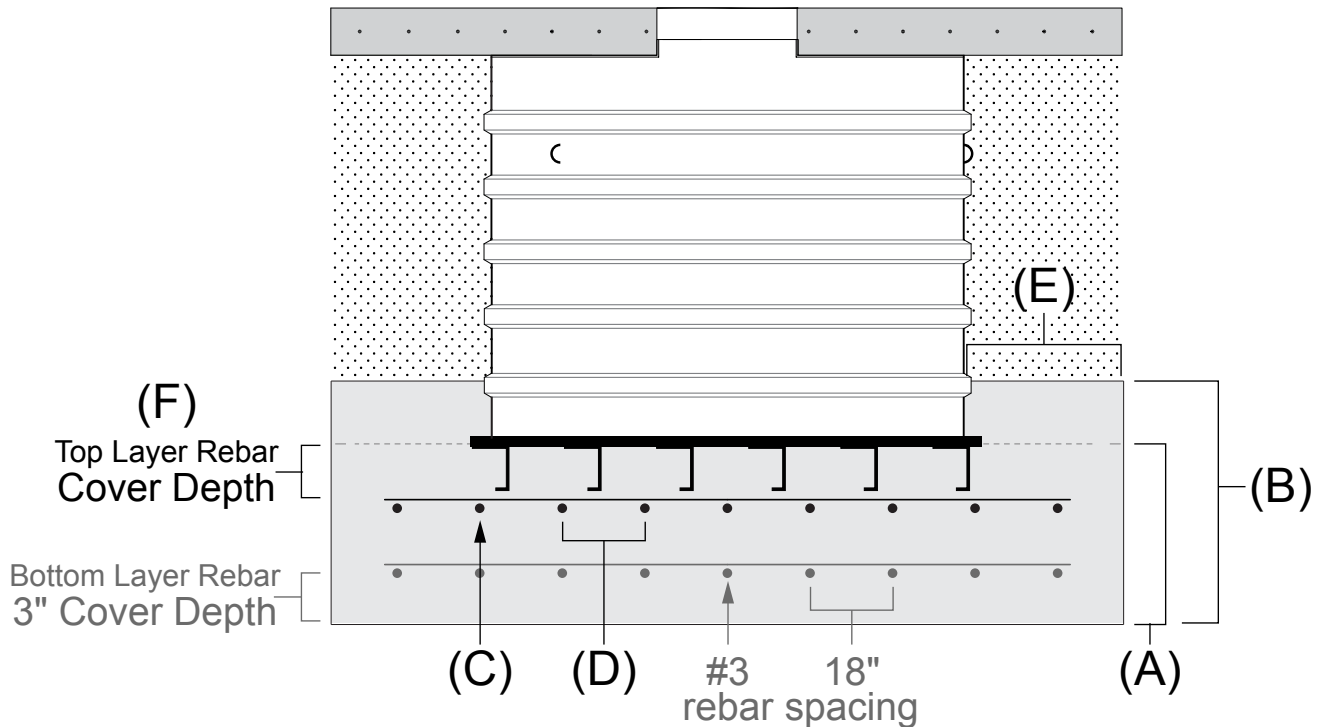
Closed Bottom Wetwells WITH External Anchors:

The diagram below defines the measurements utilized within Table B-1 for designing concrete slabs suitable for use with Containment Solutions products. Slabs are designed to ACI code to resist buckling from external water pressure in the installed condition with the perimeter of the wetwell (including the anti-flotation flange if included) embedded in concrete. Use a minimum 3000 psi concrete and 60 ksi yield strength rebar. Use a minimum 3000 psi concrete and 60 ksi yield strength rebar. Each Wetwell must be embedded in a concrete bottom slab.

Definitions:

- (A) Concrete Thickness Under Wetwell - measured from the bottom of the slab to the bottom of the wetwell.
- (B) Total Slab Thickness - measured from the bottom of the slab to the top of the concrete embedment.
- (C) Rebar Size - the rebar number based on the diameter of the rod in $\frac{1}{8}$ " increments.
- (D) Rebar Spacing - the center-to-center distance within a layer.
- (E) Slab Extension - the minimum required concrete beyond the wetwell outer diameter (O.D.)
- (F) Top Layer Rebar Cover Depth -

FIGURE B-1



Additional Instructions:

1. The Top Layer Rebar, (C) & (D), is required on all slabs, reference Table B-1 for size and spacing. Place bottom rows of rebar perpendicular to top rows of rebar with specified cover depth (F) between top rebar and Wetwell bottom.
2. A Bottom Layer of Rebar is only required when indicated on Table B-1. For a bottom rebar layer, place bottom rows of rebar perpendicular to top rows of rebar with 3" of cover depth (between the bottom of slab and bottom rebar). When bottom layer rebar is required, use #3 rebar and 18" spacing.
3. All rebar to extend to within 2" of the slab perimeter.
4. Each Wetwell slab must be independent of any other slab or structure.
5. For a layer of rebar, the rebar cover depth may not be changed, but the rebar size and spacing within a layer may be adjusted as long as the amount of steel specified in Table B-1 is matched or exceeded.

APPENDIX B - WETWELLS WITH EXTERNAL ANCHORS

Closed Bottom Wetwells WITH External Anchors:

The measurements identified in the table below are referenced in Figure B-1.

TABLE B-1

Concrete pad with 1 layer of rebar each way at top with 5" of cover (distance between top of rebar and flat of wetwell bottom). Rebar to extend to within 2" of the pad perimeter and have hooks at each end extending toward the pad bottom to within 2" of the bottom.							
Wetwell Diameter	Depth (feet)	Concrete Thickness Under Wetwell (inches)	Total Slab Thickness (including 3" Embedment) (inches)	Rebar Size (number)	Rebar Spacing (inches)	Slab Extension (inches)	Top Rebar Cover Depth (inches)
		A	B	C	D	E	F
36"	1-10	7	10	5	24	12	5
	11-20	8	11	5	21	12	5
	21-30	8	11	5	21	12	5
	31-40	9	12	5	18	12	5
	41-50	9	12	5	18	12	5
42"	1-10	8	11	5	21	12	5
	11-20	8	11	5	21	12	5
	21-30	8	11	5	21	12	5
	31-40	9	12	5	18	12	5
	41-50	10	13	5	17	12	5
48"	1-10	8	11	5	21	12	5
	11-20	8	11	5	21	12	5
	21-30	9	12	5	18	12	5
	31-40	9	12	5	18	12	5
	41-50	10	13	5	17	12	5
54"	1-10	8	11	5	21	12	5
	11-20	8	11	5	19	12	5
	21-30	9	12	5	18	12	5
	31-40	10	13	5	17	12	5
	41-50	11	14	5	15	12	5
60"	1-10	8	11	5	21	12	5
	11-20	8	11	5	14	12	5
	21-30	9	12	5	15	12	5
	31-40	10	13	5	15	12	5
	41-50	11	14	5	15	12	5
66"	1-10	8	11	5	21	12	5
	11-20	9	12	5	18	12	5
	21-30	9	12	5	12	12	5
	31-40	10	13	5	12	12	5
	41-50	11	14	5	12	12	5
72"	1-10	8	11	5	21	12	5
	11-20	9	12	5	16	12	5
	21-30	10	13	5	14	12	5
	31-40	11	14	5	13	12	5
	41-50	12	15	5	13	12	5

APPENDIX B - WETWELLS WITH EXTERNAL ANCHORS

Closed Bottom Wetwells WITH External Anchors:

The measurements identified in the table below are referenced in Figure B-1.

TABLE B-1 (CONT'D)

Concrete pad with 1 layer of rebar each way at top with 5" of cover (distance between top of rebar and flat of wetwell bottom). Rebar to extend to within 2" of the pad perimeter and have hooks at each end extending toward the pad bottom to within 2" of the bottom.

***WHEN A SECOND LAYER OF REBAR IS REQUIRED PER THE TABLE BELOW:
1 layer of rebar each way at the bottom of the pad with #3 rebar each way w/ min 6" hooks and 3" of cover.**

Wetwell Diameter	Depth (feet)	Concrete Thickness Under Wetwell (inches)	Total Slab Thickness (including 3" Embedment) (inches)	Rebar Size (number)	Rebar Spacing (inches)	Slab Extension (inches)	Top Rebar Cover Depth (inches)	Second Rebar Layer Required
		A	B	C	D	E	F	
96"	1-10	9	12	5	18	12	5	NO
	11-20	10	13	5	12	12	5	NO
	21-30	12	15	5	12	12	5	NO
	31-40	12	15	6	12	12	5	NO
	41-50*	14	17	6	13	12	5	YES
10'	1-10	10	13	5	15	12	5	NO
	11-20	11	14	6	13	12	5	NO
	21-30	12	15	6	10	12	5	NO
	31-40*	14	17	6	10	12	5	YES
	41-50*	16	19	6	11	12	5	YES
12'	1-10	10	13	6	14	24	5	NO
	11-20	11	14	6	8	24	5	NO
	21-30	13	16	6	8	24	5	NO
	31-40*	15	18	6	8	24	5	YES
	41-50*	18	21	6	9	24	5	YES
14'	1-10	10	13	6	10	24	5	NO
	11-20	12	15	6	7	24	5	NO
	21-30*	14	17	6	7	24	5	YES
	31-40*	17	20	6	7	24	5	YES
	41-50*	19	22	6	7	24	5	YES
16'	1-10	10	13	6	7	24	5	NO
	11-20	12	15	6	5	24	5	NO
	21-30*	15	18	6	6	24	5	YES
	31-40*	18	21	6	6	24	5	YES
	41-50*	21	24	6	6	24	5	YES
18'	1-10	10	13	6	5	24	5	NO
	11-20	13	16	6	5	24	5	NO
	21-30*	16	19	6	5	24	5	YES
	31-40*	20	23	6	5	24	5	YES
	41-50*	24	27	6	6	24	5	YES
20'	1-10	11	14	6	5	24	5	NO
	11-20*	14	17	6	5	24	5	YES
	21-30*	18	21	6	5	24	5	YES
	31-40*	21	24	6	5	24	5	YES
	41-50*	25	28	6	5	24	5	YES

APPENDIX C - BACKFILL & COMPACTION TABLES

TABLE C-1

Diameter	Smooth Wall Cylinder			Ribbed Cylinder Manhole		
	<= 72" diameter*			> 72" diameter*		
Depth	0' - 20'		21' - 50'	0' - 20'		21' - 50'
Soil Type	Stable Soils AND Water Table more than 5' below grade	Unstable Soils OR water table less than 5' below grade	All Soils	Stable Soils AND Water Table more than 5' below grade	Unstable Soils OR water table less than 5' below grade	All Soils
	Bearing capacity greater than 2000 lbs. per sq. ft.	Bearing capacity less than 2000 lbs. per sq. ft. (Ex: include expansive clay, quick sand or marsh)		Bearing capacity greater than 2000 lbs. per sq. ft.	Bearing capacity less than 2000 lbs. per sq. ft. (Ex: include expansive clay, quick sand or marsh)	
Backfill Type Allowed	Native Soil	Backfill per Table G-2		Backfill per Table G-2		
Compaction	Dumped	Compaction per Table G-2		Compaction per Table G-2		
Backfill Around Cylinder	12"	24"	24"	24"	½ Diameter	½ Diameter
Max Lifts	12"	12"	12"	12"	12"	12"

* 72" diameter manhole cylinders less than 20' deep will be smooth wall, 72" diameter manholes equal to or greater than 20' deep will be ribbed.

TABLE C-2

Bed and Backfill Compaction	
Soil type-pipe bedding material (Unified Soil Classification System) (See Table G-3_	Minimum Degree of Compaction Required*
Fine - grained soils (Liquid Limit < 50) with medium to no plasticity with less than 25% coarse grained particles. CL, ML, ML - CL,	High
Fine grained soils (Liquid Limit < 50) with medium to no plasticity with more than 25% coarse grained particles. CL, ML, ML - CL	Moderate
Coarse grained soils containing more than 12% fines. GM, GC, SM, SC	Moderate
Coarse grained soils with less than 12% fines. GW, GP, SW, SP	Moderate
Crushed Rock or Pea Gravel (¾" maximum size with less than 50% passing No. 4 sieve)	Dumped
* Degree of compaction: <ul style="list-style-type: none"> • Dumped - No compaction effort. • Moderate - Intermediate level of compactive effort, In-place density >=85% and < 95% standard Proctor Density, or >=40% and <70% Relative Density. • High - Considerable compactive effort. In-place density >= 95% standard Proctor Density, or >= 70% Relative Density. 	

TABLE C-3

First Letter		Second Letter	
Letter	Definition	Letter	Definition
G	Gravel	P	Poorly Graded (uniform particle sizes)
S	Sand	W	Well Graded (diversified particle sizes)
M	Silt	H	High Plasticity
C	Clay	L	Low Plasticity
O	Organic		

The Unified Soil Classification System can be applied to most unconsolidated materials, and is represented by a two-letter symbol.



Wetwell Installation Checklist

including Lift Stations, Vertical Pump Vaults, and Basins

Complete this checklist and keep it with copies of any written authorizations for variations and/or deviations received from CSI.

Site Owner _____ Installation Date _____ Wetwell Unit Serial Number _____

Site Address _____
Street City State Zip

Installing Contractor _____
Company Street City State Zip

Fiberglass Wetwell	Completed	N/A
1. Wetwell inspected for damage prior to installation as described in Section 2.	_____	_____
2. Installation method used for Bottom Slab: (select only one)	_____	_____
Open Bottom (Section 5):		
<input type="checkbox"/> Cast in place slab		
<input type="checkbox"/> Precast slab		
Closed Fiberglass Bottom <u>without</u> external anchors (Section 6):		
<input type="checkbox"/> Cast in place slab		
<input type="checkbox"/> Precast slab		
Closed Fiberglass Bottom <u>with</u> external anchors (Section 7):		
<input type="checkbox"/> Cast in place slab		
3. Bottom Slab design according to: (select only one)	_____	_____
<input type="checkbox"/> Table 1		
<input type="checkbox"/> Engineer of Record for the specific jobsite		
4. Backfill around exterior of the Wetwell meets requirements in Section 10.	_____	_____
5. Wetwell top pad meets minimum design requirements of Section 13 <u>or</u> is designed specifically for this installation by the Engineer of Record.	_____	_____
6. Top pad is designed for:	_____	_____
<input type="checkbox"/> Non-traffic load		
<input type="checkbox"/> Traffic Load		

Installation was in accordance with Wetwell Installation Instructions (Pub No. MAN 4004).

Owner Representative (Print Name)

Contractor Representative (Print Name)

Owner Representative (Signature) Date

Contractor Representative (Signature) Date



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