

Fiberglass Tank Installation Brief

You will find the following preliminary tank installation information helpful when making plans for your water storage project. A complete Installation Manual will be forwarded to you upon receipt of a tankage order. Please review this information with your installation contractor and contact Darco for additional information or specific details regarding this process.

DELIVERY OF YOUR FIBERGLASS TANK

1. Deliveries are made only on or very close to public roadways. Do not expect delivery to remote or difficult to access construction sites.
2. Owner or G.C. must inspect tank and sign shipping documents upon delivery.
3. Owner or G.C. is responsible for rigging and offloading in a safe and timely manner.
4. Always lift vessels from above rigging to all 4 designated lifting lugs.
5. Use a spreader beam to properly rig and handle large vessels.
6. Improper rigging angles may destroy the lifting lugs and cause damage or injury.
7. Always use opposing tag lines to control a tank while in the air.
8. **DO NOT** air pressure test any Darco vessel on site.

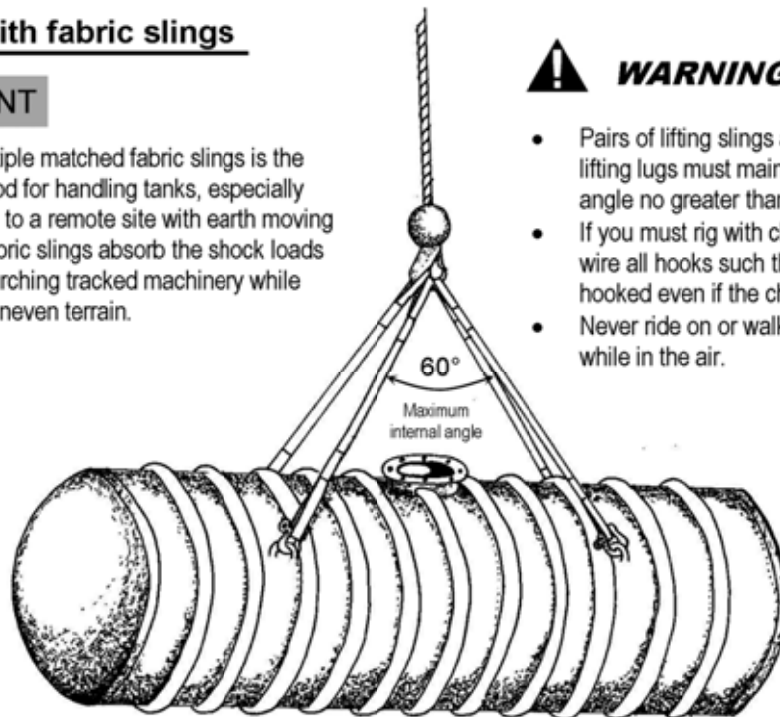


WARNING: Review OSHA 1926.650/P EXCAVATIONS

Rigging with fabric slings

IMPORTANT

Lifting with multiple matched fabric slings is the preferred method for handling tanks, especially when tramping to a remote site with earth moving equipment. Fabric slings absorb the shock loads generated by lurching tracked machinery while traveling over uneven terrain.



WARNING

- Pairs of lifting slings attached to tank lifting lugs must maintain an internal angle no greater than 60°.
- If you must rig with chain, safety wire all hooks such that they remain hooked even if the chain goes slack.
- Never ride on or walk under a tank while in the air.

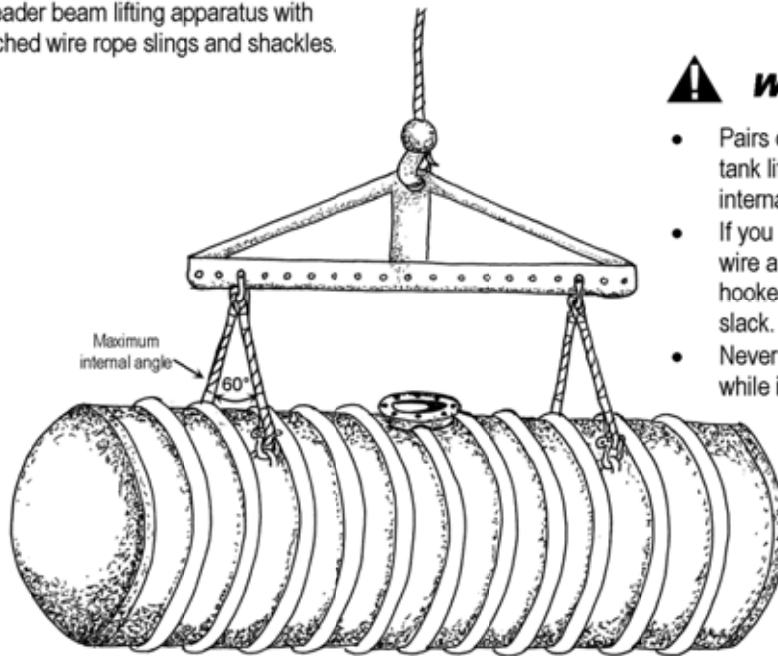
NOT TO SCALE - For illustration purposes only.

F001 Revised 02/07

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Rigging with a spreader beam

Spreader beam lifting apparatus with matched wire rope slings and shackles.



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- Never ride on or walk under a tank while in the air.

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F002 - Revised 02/07

TEMPORARY STORAGE OF VESSELS AT THE JOB SITE

1. Set FRP tanks on a temporary flat bed of soft soil or backfill material.
2. Chock in place with rubber tires and rope down if high winds are likely.
3. Never roll a tank into position over rocky or frozen ground.

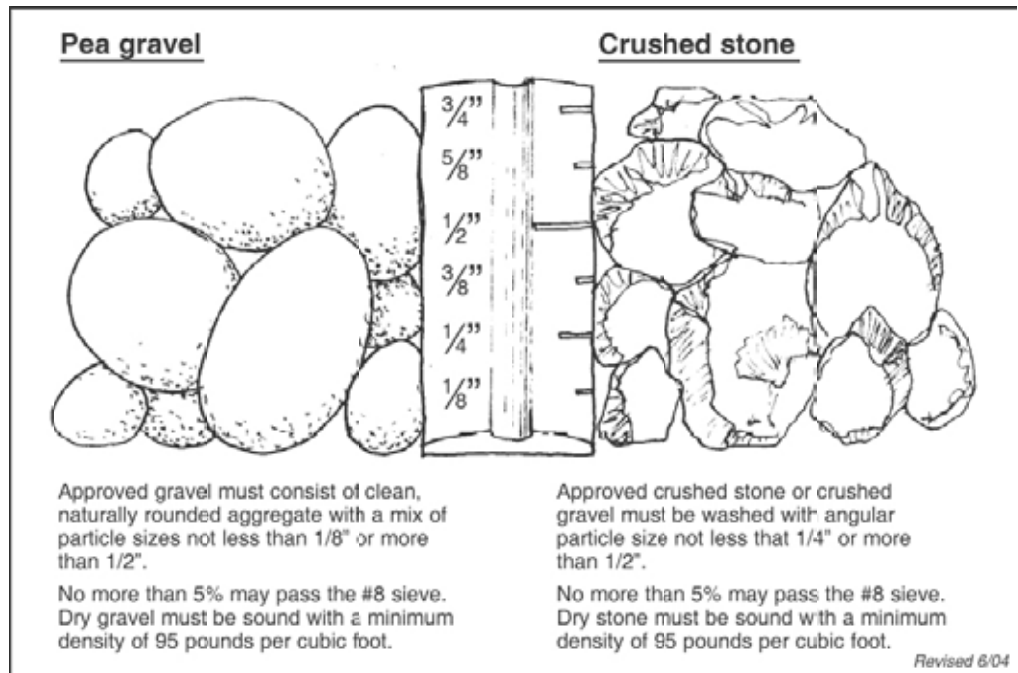
STANDARD STABLE SOIL SITE REQUIREMENTS

1. Soil bearing must be at least 2000 lbs. / sq. ft. (consult geotechnical engineer).
2. Soil cohesion must be at least 500 lbs. / sq. ft. for vertical side wall integrity.
3. Backslope or bench walls per OSHA 1926.650/P guidelines for stability and excavation safety.
4. If site may be subject to seasonal or unpredictable ground water, do consider:
 - *Using deadman anchors or a reinforced slab anchor.*
 - *Burying the tank above probable ground water with mounded soil cover.*
 - *Installing a tank bed underdrain ground water collection / discharge pipe.*

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TANK BEDDING AND BACKFILL MATERIAL REQUIREMENTS

1. Gravel backfill medium must totally **bed, surround, and cover** the entire vessel.
2. Backfill must be clean, dry, screened and washed aggregate.
3. Individual particles may range from 1/8 to 1/2 inch in size with minimal fines.
4. Aggregate must be structurally sound and weigh at least 95 lbs. / cu. ft.
5. Materials customarily used are natural "pea gravel" or crushed rock "chips".
6. Never use soil, sand, road base, structural fill, or crusher fines as backfill.



BURY DEPTHS FOR DARCO FRP TANK DESIGNS

1. Maximum soil cover depth is 5 feet for tanks with standard wall thickness.
2. Deeper bury depths require additional structure and tank wall thickness.
3. Minimum depth requires burial to "spring line" with mounded cover such that the **BOTTOM HALF** of the tank is fully cradled into the excavation for support.

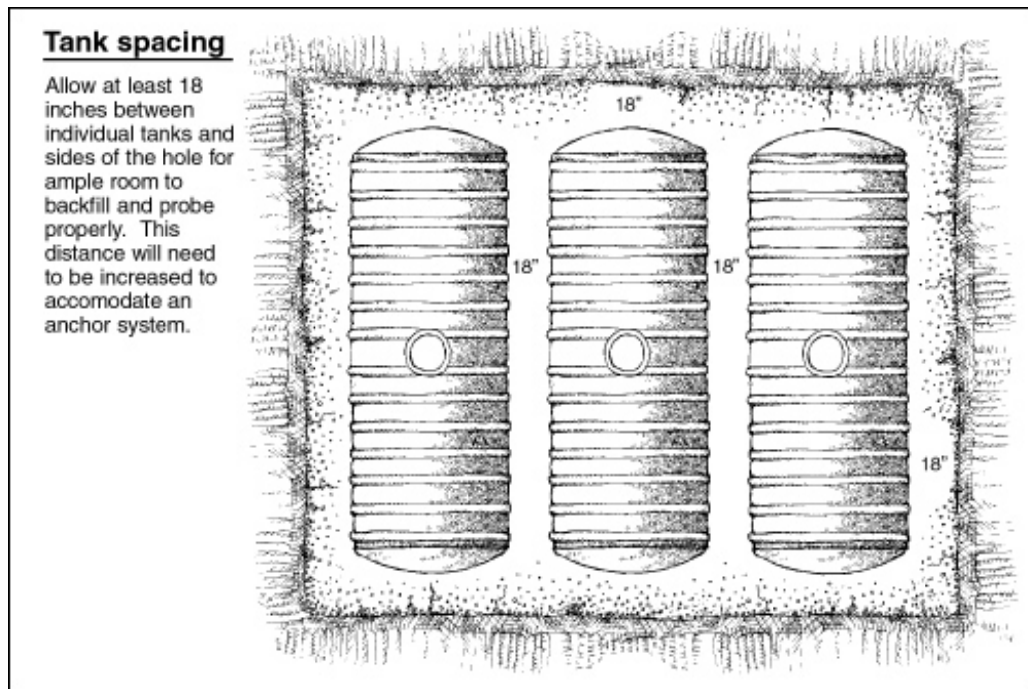
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HOLE SIZE AND WORKING CLEARANCE FOR BACKFILL



WARNING: Review OSHA 1926.650/P EXCAVATIONS

1. Allow for 12 inches of bedding material below each vessel.
2. Allow a minimum of 18 inches from the tank to the excavation walls.
3. Allow 18 inches between individual tanks set side by side or end to end.
4. Clearances will need to be increased to accommodate any anchor system.
5. Follow OSHA 1926.650/P open trench excavation safety guidelines when installing tanks.

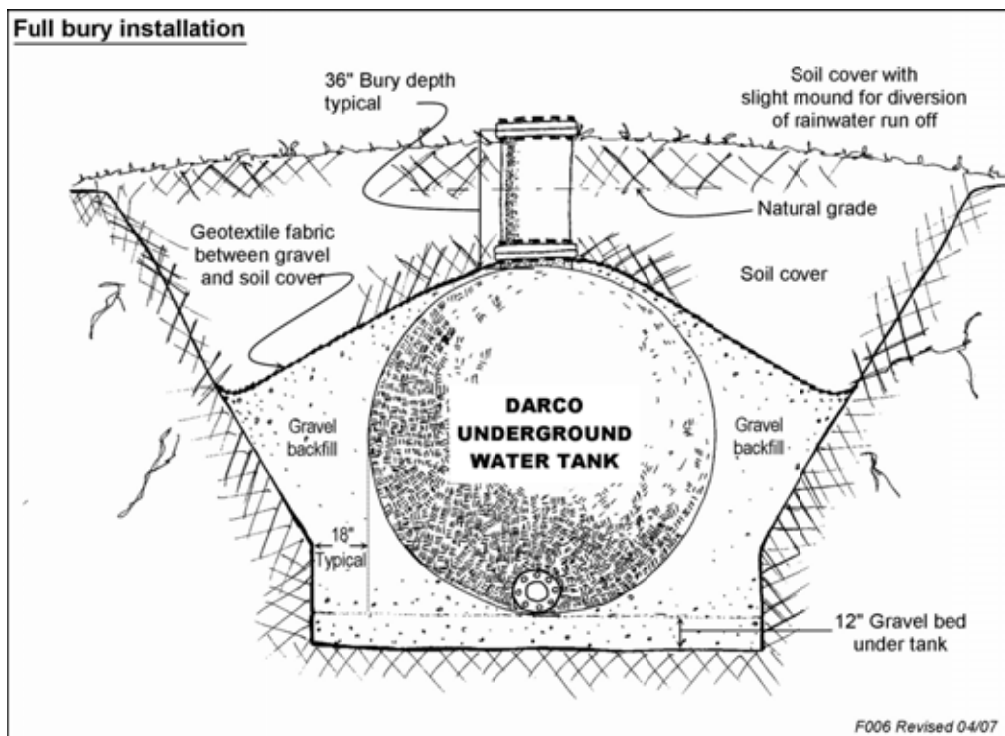


Revised 7/02

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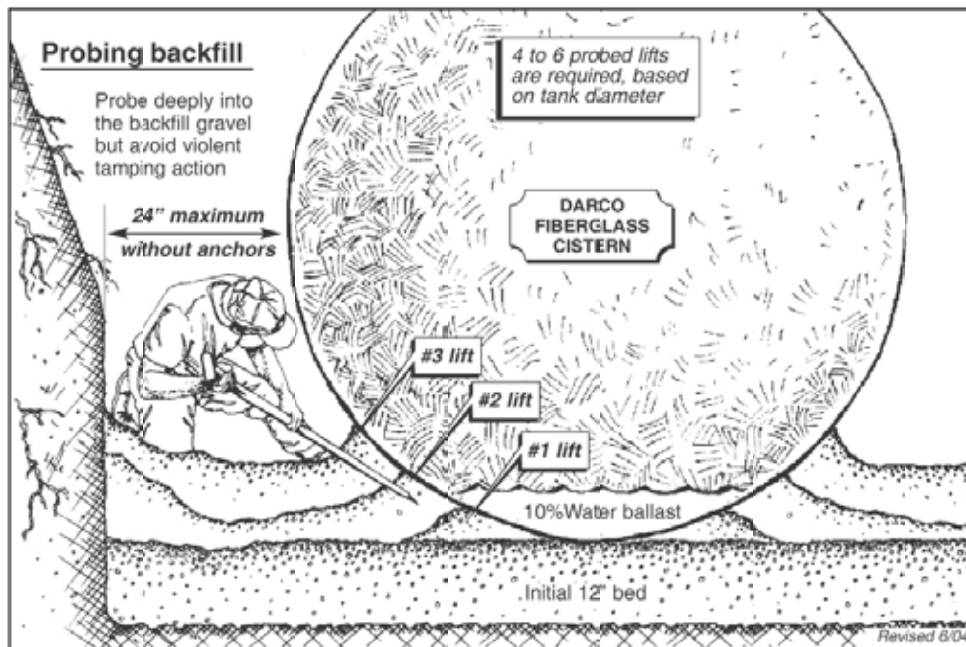
FULL BURY INSTALLATION PROCEDURE

1. Follow the Darco "Fiberglass Tank Installation Manual" provided with your order.
2. Provide 12 inch minimum bedding over soil or anchor slab below tanks.
3. Allow room around and between tanks for hand probing - 18 to 24 inches.
4. Rig and place tank into the prepared excavation using 4 lift lugs.
5. When practical, add 10% water ballast to stabilize the tank during backfill. **Burial may be done dry (without water).**
6. Apply backfill in uniform layers or lifts no more than 12 inches deep.
7. Hand probe under and around the vessel after each lift as illustrated.
8. Backfill with approved gravel until tank is **totally covered** and no longer visible.
9. Rake surface smooth and apply approved foam insulation board as required in extreme cold climate areas.
10. When insulation is not necessary, overlay the entire exposed gravel surface with geotextile fabric prior to soil cover.
11. Replace soil only as top fill and mound final cover - 5 foot maximum bury depth.
12. Fill tank with water immediately after backfill is complete to reduce uplift.
13. Secure the manway cover at all times to discourage children and vandals.



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14. Review the illustration below depicting the probing process.
- Probe tool is a 3/4 inch metal pipe about 4 to 5 feet long with tee handle and flattened tip to more easily penetrate deep into the gravel backfill.
 - No voids or air pockets may exist under tank belly for proper support.
 - Probe thoroughly from 4 o'clock to 8 o'clock positions from both sides.
 - Probe deeply, but avoid violent tamping, which may disturb the tank.
 - **IMPORTANT Select backfill gravel must completely cover and encapsulate the tank - below, on all sides, and above - such that the tank is no longer visible.**



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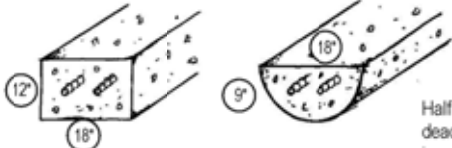
OPTIONAL ANTI-FLOATATION ANCHOR DETAILS

When FRP tanks are subject to known high ground water conditions created by riparian locations, heavy seasonal run off, natural springs, tidal effects, etc.:

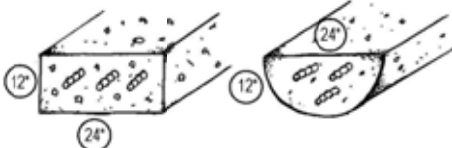
1. Follow our installation manual carefully / call Darco for advice if necessary.
2. Form and install **deadmen** or a reinforced **slab anchor** below the vessel.
3. Use designated strap locations, anchor hardware, and installation procedure.

Deadman anchor details

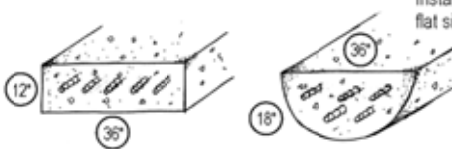
For use with 8' diameter tanks 2 - #5 rebars



For use with 10' diameter tanks 3 - #5 rebars

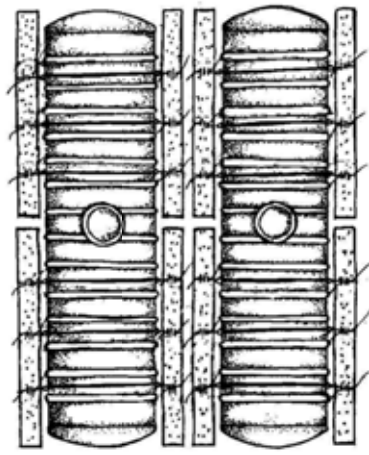


For use with 12' diameter tanks 5 - #5 rebars



IMPORTANT See your tank drawing for individual deadman lengths

Nominal tank diameter	Minimum bury depth below grade	Half round concrete deadman size
8 feet	24 inches	9"H X 18"W
10 feet	24 inches	12"H X 24"W
12 feet	24 inches	18"H X 36"W
13 feet	24 inches	24"H X 48"W



F 013—Revised 01/07

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ANCHOR LUG DETAIL
MATERIAL: MILD STEEL
16" DIAMETER HOLE
3/4" 1 1/2" 1 1/2"

ANCHOR LUG DETAIL WITH ANCHOR LUG
GRAVEL BEDDING
STEEL ANCHOR LUGS
CONCRETE SLAB ANCHOR
1/2" GALVANIZED CABLE (WIRE ROPE)
3 CABLE CLAMPS
5 REBAR TYPICAL

SLAB ANCHOR DETAIL WITH ANCHOR LUG
NOT TO SCALE, FOR ILLUSTRATION ONLY

TRADITIONAL DESIGN DEADMAN ANCHOR DETAILS STANDARD CONDITIONS

TANK INSIDE DIAMETER	MINIMUM BURY DEPTH	HALF ROUND DEADMAN	ALTERNATE RECTANGULAR DEADMAN	MIN. SPACE BETWEEN INCL. TANKS	ALL ANCHORS SLAB SIDE PROJECTION	FRP STRAP LENGTH	CABLE LENGTH (PER SIDE)	APPROX. GRAVEL REQD. PER LINEAR FOOT OF TANK LENGTH
8'	24"	9"x18"	12"x18"	3'	18"	181"	12'	2 CUBIC YARDS
10'	24"	12"x24"	12"x24"	4'	24"	225"	14'	3 CUBIC YARDS
11'	24"	18"x36"	12"x36"	6'	36"	271"	16'	5 CUBIC YARDS
12'	24"	18"x36"	12"x36"	6'	36"	271"	18'	5 CUBIC YARDS
13'	24"	24"x48"	12"x48"	8'	48"	271"	20'	6 CUBIC YARDS

OPTIONAL DESIGN SLAB ANCHOR DETAILS EXTREME CONDITIONS

DEADMAN EXAMPLE
ANTICIPATED MAXIMUM GROUND WATER LEVEL FOR DEADMAN ANCHOR SYSTEM
DEADMAN ANCHOR SIDE PROJECTION

SLAB EXAMPLE
SLAB ANCHOR SIDE PROJECTION

SPRING LINE

DEADMAN ANCHOR DETAIL
FIBERGLASS STRAP OR HOOK
ANCHOR STRAP DETAIL
8" THRU 13" DIA. ANCHOR SIZES
W H
FIBERGLASS OR CARDBOARD DEADMAN FORM (USE HALF A CASSON TUBE)

SLAB ANCHOR DETAIL
CABLE TENSION TOOL (SUPPLIED BY DARCO)

TRADITIONAL DESIGN DEADMAN ANCHOR DETAILS STANDARD CONDITIONS

OPTIONAL DESIGN SLAB ANCHOR DETAILS EXTREME CONDITIONS

WHEN TANKS ARE EMPTY AND GROUND WATER IS EXPECTED NO HIGHER THAN SPRING LINE (STANDARD CONDITIONS).

HALF ROUND FIBERGLASS DEADMAN ANCHOR FORMS ARE AVAILABLE WITH YOUR TANK ORDER.

USE FULL SLAB ANCHOR IF GROUND WATER IS ANTICIPATED ABOVE SPRING LINE (EXTREME CONDITIONS).

DARCO
INC
UNDERGROUND TANKAGE

ANTI-FLOTATION ANCHORS
CARBON STEEL HARDWARE

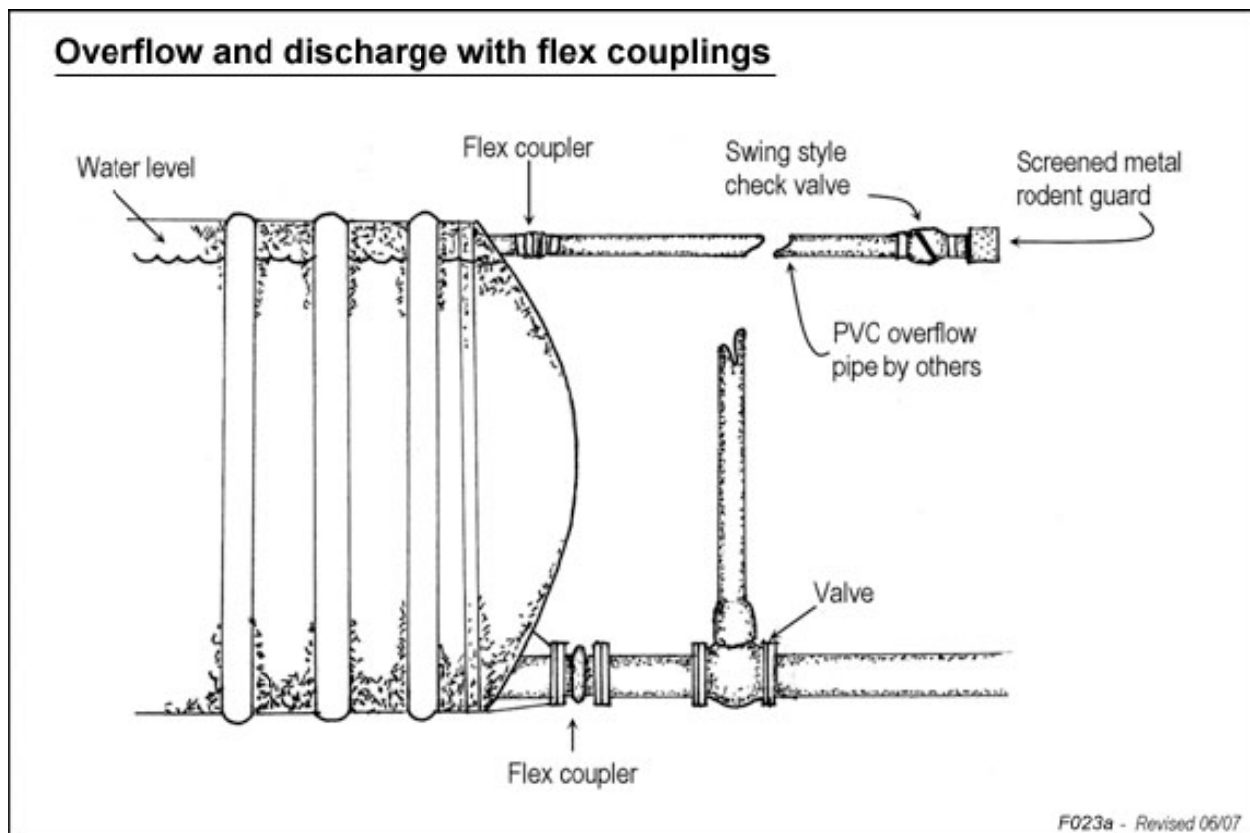
Rev. No. T
Drawing No. 11/10/09
980 Darco Drive, Bennett, Colorado 80102
800-232-8660 (phone) 303-644-5001 (fax)
www.darcoinc.com

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OPTIONAL FLEXIBLE TANK-TO-PIPE CONNECTIONS

It is always a good idea to use some type of flexible coupling between any tank and connecting horizontal pipelines, additional manifolded tanks, or a wet well.

1. Limited tank movement is often caused by minor settling after installation.
2. Pipeline alignment with tank fittings is less critical.
3. Tank shell and fitting strain is kept to a minimum.
4. A full range of axial and radial movement is designed into each elastomeric or stainless steel flexible coupling manufactured or supplied by Darco. Order these optional accessory flex-couplers with your tank if you wish.

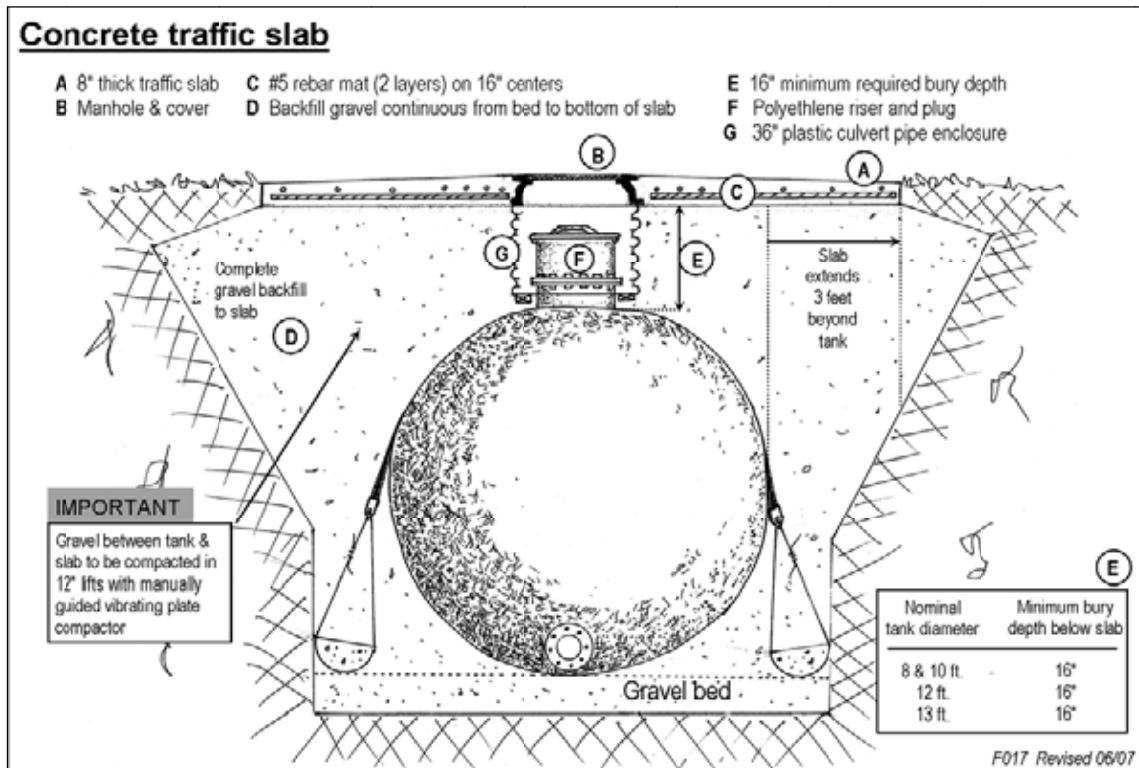


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TRAFFIC SLABS FOR HEAVY VEHICLES

We recommend that you install tanks under a driveway **only as a last resort** when no other suitable alternate location is available.

1. Follow our installation manual carefully and call Darco if you have questions or concerns.
2. Observe the proper 16-inch minimum backfill depth from tank to slab underside.
3. Select backfill must be used exclusively - **no soil may be replaced between the tank and the bottom of the concrete slab on grade.**
4. Manually probe each 12 inch lift to spring line followed by mechanical compaction with a hand-guided vibrating plate machine.
5. Traffic slabs must be properly reinforced, cured, and of correct thickness and strength.



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STANDARD DARCO FIBERGLASS CISTERNS

8 foot diameter x 28 feet long ⁺	10,000 gallons @ 3,500 lbs. ship weight
8 foot diameter x 33 feet long ⁺	12,000 gallons / 4,000 lbs.
8 foot diameter x 41 feet long	15,000 gallons / 5,000 lbs.
8 foot diameter x 49 feet long	18,000 gallons / 6,000 lbs.
10 foot diameter x 27 feet long	15,000 gallons / 4,500 lbs.
10 foot diameter x 35 feet long	20,000 gallons / 5,500 lbs.
10 foot diameter x 44 feet long	25,000 gallons / 7,000 lbs.
10 foot diameter x 52 feet long	30,000 gallons / 8,000 lbs.
10 foot diameter x 61 feet long	35,000 gallons / 10,000 lbs.
12 foot diameter x 37 feet long	30,000 gallons / 8,500 lbs.
12 foot diameter x 43 feet long	35,000 gallons / 10,000 lbs.
12 foot diameter x 49 feet long	40,000 gallons / 11,000 lbs.
12 foot diameter x 60 feet long ^{**}	50,000 gallons / 13,500 lbs.
13 foot diameter x 52 feet long ^{**}	50,000 gallons / 14,000 lbs.

⁺ These sizes also available in our lower cost polyethylene OcTank series.

^{**} The 50,000 gallon tanks and larger vessels may not be shippable through some states due to wide and tall load restrictions.

NOTE: All the above lengths and weights are nominal and may vary.

AREA MFG. AND SHIPPING POINTS FOR DARCO TANKS

Fiberglass Underground Tanks
San Antonio, Texas

Polyethylene Uderground OcTanks
Denver, Colorado