

ABETONG Circular Precast Post Post-Tensioned Concrete,
Waste Storage Structures

Designers: Michael Malsom P.E.
No known address

Owners: Abetong America Incorporated
P.O. Box 1943
North Brunswick, NJ 09902 (201) 294-8943

Fabricator: Sollenberger Silos Corporation
P.O. Box N
Chambersburg, PA 17201 (717) 264-9588

Drawings: SK1 General Tank and Fndn Requirements 6/8/88
SK2 Tank Fndn and Fndn Curb 6/8/88
SK3 Tank Approach Slab 6/8/88
SK4 Fndn pit Details at Large Pipes
SK5 Post-Tensioning Details
SK6 Backfill and Drainage Details
SK7 Interior Pump pit Details

Sizes: The structures are multiples of nominal metric size panels. Resulting structures sizes include,
13 ft 1.5 in or 12 ft high-24.3 ft thru 74.1 ft diameters
12 ft high only -76.5 ft thru 90.8 ft diameters
8 ft high -24.3 ft thru 90.8 ft diameters

Location: Plans have been reviewed by the NNTC for compliance with the structural aspects of National Conservation Practice Standard 313-80. Design folders are on file at the NNTC. Initial reviews were completed in July 1988.

Materials: Wall panels are precast ribbed panels with Class 5000 concrete and Grade 60 steel. Floor slab is site cast, Class 3000 concrete with Grade 60 reinforcing. All wall panel joints are grouted with cement mortar before post tensioning. The post-tensioning strands are low relaxation, seven wire strands with an fpu of 270 ksi. and are covered with cement mortar after post tensioning.

Application: National Conservation Practice Standard 313-80. The Standard does not list a service life for pre-stressed concrete, but we would estimate a Long (50 year) service life since the concrete will be in compression at service loads.

Assumptions: Walls are designed for a full backfill, tank empty condition. and a tank full. no backfill condition as shown on the plans. Lateral earth pressure of 60 pcf and lateral wheel surcharge loads of 100 psf are assumed. A maximum allowable backfill height differential of 3ft is noted on the plans.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of this detail drawing.

ABETONG Circular Precast Post Post-Tensioned Concrete,
Waste Storage Structures

Designers: Michael Malsom P.E. John Jones P.E.
The consulting Engr Group Sollenberger Silos
1701 E. Lake Avenue P.O. Box N
(312) 729-0646 (717) 264-9588

Owners: Abetong Americal Incorporated
P.O. Box 1943
North Brunswick, NJ 08902 (201) 294-8943

Fabricator: Sollenberger Silos Corporation
P.O. Box N
Chambersburg, PA 17201 (717) 264-9583

Drawings: SK1 General Tank and Fndn Requirements 6/8/88
SK2A Tank Fndn and Fndn Curb rev.11/2/90
SK3 Tank Approach Slab 6/8/88
SK4 Fndn pit Details at Large Pipes
SK5 Post-Tensioning Details rev.12/13/90
SK6 Backfill and Drainage Details
SK7 Interior Pump Pit Details
Specifications rev.12/13/90

Sizes: The structures are multiples of nominal metric size
panels. Resulting structures sizes include,
13 ft 1.5 in high 24.3 ft thru 74.1 ft diameters
12 ft high 76.5 ft thru 90.8 ft diameters
8 ft high 24.3 ft thru 90.8 ft diameters

Location: Plans have been reviewed by the NNTC for compliance
with the structural aspects of National Conservation Practice
Standard 313 80. Design folders on file at the NNTC were
originally reviewed in July 1988. Revisions reviewed in
January 1991.

Materials: Wall panels are precast ribbed panels with Class 5000 concrete
and Grade 60 steel. Floor slab is site cast, Class 3000
concrete with Grade 60 reinforcing. All wall panel joints are
grouted with cement mortar before post tensioning. The post-
tensioning strands are low relaxation, seven wire strands with
an f_{PU} of 270 ksi.

Application: National Conservation Practice Standard 313-80. The
Standard does not list a service life for pre-stressed
concrete, but we would estimate a Long (50 year) service life
since the concrete will be in compression at service loads.

Assumptions: Walls are designed for a full backfill, tank empty
condition, and a tank full, no backfill condition as
shown on the plans. Lateral earth pressure of 60 pcf
and lateral wheel surcharge loads of 100 psf
are assumed. A maximum allowable backfill height differential of
3ft is noted on the plans.

Concurrence: The head of the NNTC Engineering Staff concurs in the use of
This detail drawing.

ABETONG Circular Precast Post Post-Tensioned Concrete,
Waste Storage Structures

Owners: ADL Systems, Inc
5596 Grand River Highway, P.O. Box 256
Portland, Michigan 48875 (517) 647-7543

Designers: Gary L. Foley, P.E.
Consulting Structural Engineer
3570 Carlton Center Road
Hastings, Michigan 48058(616) 367-4808

Drawings: Fifty page size drawings occur in the design folder. The drawings can be identified by description, section code, panel code, and date.

Sizes: The rectangular storage structures can be multiples of the following panels:
Height: 6.0 ft. Width: 3.0 ft. to 11.0 ft.
Height: 8.0 ft. Width 2.0 ft., 4.0ft., & 4.5 ft.
Height: 10.0 ft. Width 2.0 ft., 4.0 ft., & 4.5 ft.

Tanks are generally built in width increments of 4.0 ft. and length increments of 10.0 ft.

Location: Plans have been reviewed by the MNTC for compliance with the structural aspects of National Conservation Practice Standard 313-80. Design folder is on file at the MNTC.

Materials: Top panels, beams, columns, side wall panels, and slats are precast with Class 5000 concrete and Grade 60 steel. Floor and rectangular footings are site cast with Class 3000 concrete and Grade 60 steel. Plain concrete wall footing is site cast with Class 3000 concrete. The footings require a soil bearing capacity of 3000 psf.

Application: National conservation Standard 313-80 for short (minimum 10 year) service life.

Assumptions: Side walls are designed for a tank empty and full backfill condition. Lateral earth pressure of 60 psf and lateral wheel surcharge load of 100 psf were assumed. Solid top panels were designed for following loadings: 100 psf cattle and 30 psf snow or one 10,000 lb. axle plus 30 psf snow or two 5000 lb. wheels plus 30 psf snow. Slotted top panels were designed for 250 plf for cattle and 170 plf for swine.

Concurrence: The Head of the MNTC Engineering Staff concurs in the use of these detail drawings.

Advance Concrete Products Co., Precast Concrete Rectangular Ag Waste
Storage Structure

Owners: Advance Concrete Products Co
P.O. Box 548, 975 N. Milford Road
Highland, Michigan 48031
(313) 887-4173 or (800) 824-8351

Designers: Richard Kozlowicz P.E. (313) 348-2680
J.C.K. Associates
Novi, Michigan 48346

Drawings: Drawings dated September 3, 1991, except No. 15 dated
October 3, 1991 and No. 18 dated September 27, 1991.

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|----------------------------|--------------------------------------|
| 1. Complete Design Drawing | 11. Wall Panel Detail W 2 |
| 2. Roof Panel Detail R-1 | 12. Wall Panel Detail W-3 |
| 3. Roof Panel Detail R-2 | 13. Wall Panel Detail W-4 |
| 4. Roof Panel Detail R-3 | 14. Wall Panel Detail W-5 |
| 5. Roof Panel Detail R-4 | 15. "T" Column Detail |
| 6. Roof Panel Detail R-5 | 16. Step-Lock Panel Cons. Detail |
| 7. Roof Panel Detail R-6 | 17. Tongue-in-Groove Joint
Detail |
| 8. Roof Panel Detail R-7 | 18. Wall Footing Detail |
| 9. Roof Panel Detail R-8 | 19. T-Column Footing Detail |
| 10. Wall Panel Detail W-1 | |

Sizes: Rectangular tank with solid roof panels.
Roof Panels: Width: 8.0 ft. Length: 10.0 ft. Wall Panels:
Width 8.0 ft. 8.0 ft. 1-1/4 in
Height: 10 ft.. 2-5/8 in.
Tanks built in width increments of 8.0 ft. and
length increments of 8.0 ft. with end panel
widths of 8 ft. 1-1/4 in.

Location: Plans and design notes have been reviewed by the MNTC for
compliance with the structural aspects of Practice Standard
313-80. Design calculations are on file at the MNTC.

Materials: Roof panels, wall panels, and columns are precast with Class
5000 concrete and Grade 60 steel.

Assumptions: Wall panels are designed for a tank empty and full
backfill condition. Lateral earth pressure of 60 pcf and
lateral wheel surcharge load of 100 psf are assumed. Solid
top panels are designed for 5,000 lb. wheel loads located
4.0 ft. apart.

Application: SCS National Conservation Practice Standard 313-80.
"Waste Storage Structure" for medium (20-year) service life.

Concurrence: The Head of the MNTC Engineer Staff concurs in the use
of these detail drawings

AGRI CONCRETE Circular, Precast Concrete, Waste Storage Structures

Designers: Mid-Penn Engineering Corporation
PO. Box 51
Lewisburg, PA 17837
(717) 524-2214

Fabricators: Agri-Concrete Products, Inc
Middleburg, PA

Drawings and Sizes: D810 – thru -3 (8 ft. H by 100 ft. D)
D8140-1 thru -3 (8 ft. H by 140 ft. D)
D12080-1 thru -3 (12 ft. H by 80 ft. D)
D12120-1 thru -3 (12 ft. H by 120 ft. D)
D16070-1 thru -3 (16 ft. H by 70 ft. D)
D16110-1 thru -3 (16 ft. H by 110 ft. D)

All drawings are dated 2-85. Sheets a and 2 of each set are Revised 7-1-85. Sheet 3 of each set is revised 5-1-85.

Location: Plans have reviewed by the NNTC and the PA State Office for compliance with the structural aspects of National Conservation Practice Standard 313-80. Design folders are on file at the NNTC. Reviews were completed in July, 1985.

Materials: The circular structure consists of 8 ft. wide by 8, 12, or 16 ft. high precast waffle panels with Class 5000 concrete and Grade 40 steel is 3/4 inch. The panels are assembled with galvanized ASTM A572 Grade 60 silo hoops. The ring footing and articulated floor slab are site cast Class 3500 concrete. All wall joints contain a butyl seal. All floor joints contain a polysulfide sealant.

Application: National Conservation Practice Standard 313-80 for short (10 year) service life.

Assumptions: Design assumes a sliding base connection and considers a tank full, no backfill load condition and a tank empty, 4 ft. backfill, 100 psf surcharge condition. Backfill is assumed to be uniform height and exert an EFP of 55 pcf against the wall.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of this detailed drawing.

Advance Concrete Rectangular, Precast Concrete Storage Structure

Designers: Richard A. Mackow, P.E.
180 Golf Road
Reinholds, PA 17569
(215) 670-0834

Fabricator: Agri-Concrete Products, Inc.
R.D. 2, Box 147B
Middleburg, PA 7842

Drawings: NO. ACP-OOB. sheets 1 thru 3. dated 3-21-88. Revision 2 dated 6-39. The drawings include both tied-back and counter-forted wall alternatives. Drawings also include push-off ramp. Access ramp and timber gate options.

Sizes: The rectangular storage structures can be any multiple of 8 ft. high x 12 ft. long precast panels. Finished tank depth is actually 7 ft. 11 in.

Location: plans have been reviewed by the NNTC and the Pennsylvania State Office for compliance with the structural aspects of National Conservation Practice Standard 313-80. Design folders are on file at both reviewing locations. The reviews were completed in June, 1988.

Materials: Wall and buttress panels are precast concrete waffle panels with Class 5000 concrete and Grade 60 steel. Floor and footings are site cast, Class 3000 concrete with Grade 60 reinforcing. All metal connections are Grade 36 steel or better and epoxy Coated. The timber gate is pressure treated to ground contact standards.

Application: National Conservation Practice Standard 313-80 for short (10 year) service life.

Assumptions: Walls are designed for a full backfill, tank empty condition, and a tank full, partial backfill condition as shown on the plans. Lateral earth pressure of 45 pcf and no lateral wheel surcharge loads are assumed. The push-off ramp is proportioned to eliminate lateral surcharge loads on the walls and is designed for 2 wheels of 5 kips each. Maximum bearing pressure from the stability calculations is 1.5 ksf.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of this detail drawing.

ASTLE'S CONCRETE, INC
Circular, Site Cast Concrete Waste Storage Structure

Designer: Robert L. Tibbits, P.E (612) 864-5642
Tibbits Engineering
735 11th Street East
Glencoe, MN 55336

Owner and Astle's Concrete, Inc
Henning, Minnesota

Drawings: One drawing Sheet for each size:
90' -0" Dia. x 3' -0 Deep Manure Tank' Dated 5/5/95
105'-0" Dia. x 3'-0- Deep Manure Tank, Dated
3/11/94, Rev. 6/6/94
125'-0" Dia. x 8'-0" Deep Manure Tank, Dated 5/12/94
90'-0" Dia. x 12'-0"-Deep Manure Tank, Dated 6/6/94
105'-0" Dia. x 12'0" Deep Manure Tank. Dated 6/6/94
125'-0" Dia. x 12'-0" Deep Manure Tank, Dated 6/6/94

Location: Design notes and plans have been reviewed by MNTC for
compliance with the structural aspects of Practice
Standard 313-80. Design folders are on file at MNTC.

Materials: The reinforced concrete footings, floor and walls
contain Class 3500 concrete and Grade 60 reinforcing
steel.

Sizes: Diameters: 90, 105 and 125 feet
Wall Heights: 8 and 12 feet

Assumptions: Footings are designed for an allowable soil
capacity of 2000 psf. Walls are designed for
tank full, no backfill condition and for full
backfill, tank empty condition. The design
outside soil load is 60 pcf effective fluid
pressure plus 100 psf lateral surcharge.
Placement of the tank above the seasonal high
water table is assumed.

Application: SCS National Conservation Practice Standard
313 "Waste Storage Structure" for Medium (20
year) service life.

Concurrence: The Head of the Midwest NTC Engineering Staff
concurs in the use of these detail drawings.

Design Data Sheet for Standard Detail Drawing by:

B&K Concrete Construction, Circular, Site Cast Waste Storage Facility

Designer: Dana J. Indermuhle, PE 740-483-2501
Swiss Valley Associates, Inc.
50026 Baptist Ridge Rd., Sardis OH 43946

Fabricator: B&K Concrete Construction 330-855-6453
12340 Warwick Rd.
Marshallville, OH 44645

Drawing: Sealed by Dana J. Indermuhle, PE:
DWG No. 1, Rev. G dated 06/17/05.

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-OH state office. Review of latest revision was completed in June 2005.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes:	<u>Heights</u>	<u>Wall Thickness</u>	<u>Diameters</u>
	8' & 10'	8"	30 to 120'
	12' & 14'	10"	30 to 120'
	12'	12"	121 to 170'
	14'	12"	121 to 180'
	16'	12"	45 to 180'

Applications: PA Standard 313.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than 3 feet, and the minimum backfill shall be at least 36 inches (or frost depth) above the base of the footing. Lateral earth pressure of 75 psf and 100 psf surcharge are assumed. Maximum equipment load within a distance equal to the tank depth is 100 psf unless a push off ramp is installed as shown in the drawings. Minimum required soil bearing capacity is 1500psf. Design assumes a foundation drain as shown on drawings. Structure diameters between those shown above shall be installed with the reinforcing steel for the next larger diameter increment.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

BADGER-NORTHLAND Circular, Enamel Coated Steel, Waste Storage Structure

Designers And Fabricators:	Boythrope Ltd Weaverthrope Marlton & Yorkshire, England
USA Designers:	J. J. Rouman & Associates, Inc 2400 West Leonard Street Appleton, WI 54911 (414) 739-3241
USA Distributor:	Badger-Northland 1215 Hyland Avenue Kaukauna, WI 54130 (414) 766-4603
Drawings:	#327279 B1 (Foundation) dated 1-83 #327280 B1 (Structure) dated 1-83 Installation and Owner's Manual dated 10-82
Location:	Plans were reviewed in detail during 1983 by MNTC for compliance with the structural aspects of National Conservation Practice Standard 313-80. Design folders are on file at MNTC and NNTC.
Materials:	The tanks are made with vitreous enamel coated steel panels and plastic capped bolts. All concrete is class 3000 with ASTM A615 Grade 60 reinforcing steel and ASTM A82 or A185 welded wire fabric.
Sizes:	Diameters: 30, 45, 60, 75, 90, 105 feet Heights: 15.75, 19.67, 23.5 feet
Application:	National Conservation Practice Standard 313-80 for medium (20 year) service life.
Assumptions:	Tanks are for above ground installations. The top of the footing must be at or above the ground surface. The bottom of the footing must be below frost depth. Footings are designed for an allowable soil bearing of 1500 psf. Tanks are designed for 30 psf wind pressure corresponding to an 80 mph wind velocity which is adequate for all areas of the Northeast except the coastal areas of Virginia and Massachusetts.
Concurrence:	The Head of the NNTC Engineering Staff concurs in the use of this detailed drawing.

BALMER BROS (SS), Rectangular Slotted Top, Site Cast Concrete
Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 8th Fl
Kansas City, MO (816) 421-4232

Fabricators: Balmer Bros Concrete Works, Inc
243 Miller Road Akron, PA 17501 (717) 733-0353

Drawings: Job #7525 sheets SS1 – SS3 revised 4/11/90

Location: Plans were reviewed in May 1990 at NNTC for compliance with structural aspects of National Conservation Practice Standard 313 80, Design data is on file at NNTC.

Material: The structure contains site cast Class 3508 concrete and Grade SC reinforcing steel.

Sizes: Walls are 12, 10, 8ft high and 13, 11, and 9in thick respectively. The end walls vary from 8 to 12ft long, while the sidewalls can be any length.

Application: National Conservation Practice Standard 313-80 for medium (20 year) service life.

Assumptions: Footing design analysis required an allowable soil bearing capacity of 2500psf for the 12 and 10ft high walls, and 2000psf for the 8ft. All walls are designed for a full backfill-tank empty condition with EFP=75pcf and Surcharge=100psf, and a no backfill-tank full condition with EFP=60pcf. Sidewalls are analyzed as unit length retaining walls assuming lateral support from the slotted panels for the full backfill condition. The slotted top to be supplied by others is assumed to provide a lateral reactions of 2580, 1900, 1320 lb/ft to the 12, 10, and 8ft walls respectively. End-walls are analyzed as plates according to PCA "Rectangular Concrete Tanks" assuming a hinged base. Minimum backfill heights over the footings of 3.5ft for the 12ft end-wall, and frost depth for all other walls are needed to provide the assumed base reaction. A drainage system behind the walls and under the floor with a tile outlet is provided on the drawings.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these detailed drawings.

BALMER BROS (ct) Circular, Site Cast Concrete Waste Storage Structure

Designer: Robert D. Hyland, PE
Norton & Schmidt, Consulting Engineers
1009 Baltimore, 8th Floor
Kansas City, MO 64105 (816) 421-4232

Fabricator: Balmer Brothers Concrete Work, Inc
243 Miller Road
Akron, Pennsylvania 17501

Drawings: 8CT11 thru 8CT11, 1 ft high, revised 4/27/90 and 12CT1 thru
12CT11, 12 ft. high, revised 4/27/90.

Location: Calculations and drawings have been reviewed by the NNTC and
The PA State Office for compliance with the structural aspects
Of National Conservation Practice Standard 313-80. Design
Folders are on file at both reviewing locations. The reviews
Were completed in May 1990.

Materials: Reinforced concrete footings, floor slabs, walls, and access
pads contain Class 3000 air-entrained concrete and Grade 60
steel.

Sizes (ft.): Diameter 40 to 100 feet in ten foot increments
Heights: 8 and 12 feet

Application: National Conservation Practice Standard 313-80 for Medium
year) service life.

Assumptions: Walls are designed for a full backfill, tank empty condition,
and a tank full, no backfill condition. Lateral earth
pressure of 45 pct and 100 psf surcharge are assumed. The
access pads are proportioned to eliminate lateral surcharge
loads on the walls and are designed for 2 wheels of 7.5 kips
each. Minimum required soil bearing capacities are 1.0 ksf
for the floor slabs and 2.0 ksf for the footings. Backfill
for frost protection of the footings is required for
installations. Wall steel dimensions of 4.5" and 3.5" shown
the drawings for the 12' and 8' walls respectively refer to
the horizontal steel. Structure diams. between those shown
may be used provided steel schedule for the next larger diam.
is used (see note on dwngs).

Concurrence: The Head of the NNTC Engineering Staff concurs in the use
of these detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Beaver Concrete Construction, Circular, Site Cast Waste Storage Facility

Designer: Norton & Schmidt, Consulting Engineers 816-421-4232
Suite 419, 1100 Main Street, Kansas City, MO 64105

Fabricator: Beaver Concrete Construction 717-264-9186
2685 Edenville Rd., Chambersburg, PA 17201

Drawings: Sheets BE8CT1 thru BE8CT9, BE10CT1 thru BE10CT9 and BE12CT1 thru BE12CT9 for tanks with walls 8, 10, & 12 feet high with tank diameters for each wall height ranging from 40 to 100 feet in 20 foot increments.

Location: Calculations and drawing were reviewed by the NNTC and the PA state office for compliance with SCS Practice Standard 313. Design folders are on file at both reviewing offices. The reviews were completed in September 1992.

Materials: Reinforced concrete footings, floor, walls, and access pads contain Class 4000 concrete and Grade 60 steel.

Sizes: 40 to 100 ft. diams. in 20 ft. increments. 8, 10, & 12 ft. high walls. 7 in. thick walls for 8 ft. walls, 8 in. thick walls for 10 ft. walls and 9 in. thick walls for 12 ft. walls.

Applications: SCS Practice Standard 313 for med. (20 yr.) service life.

Assumptions: Allowable soil bearing capacity for ftgs. 1500 psf. Walls designed according to PCA "Circular Concrete Tanks Without Prestressing" for hinged base connection and tank full, no backfill condition. Walls are also adequate for full backfill, tank empty condition. Height of backfill against tank walls shall not vary more than 4 ft. Minimum backfill of 4 ft. is provided to assure frost protection for footing. A drainage system under and around structure base with a pipe outlet is provided. Allowable equipment for the walls and access pad are given in the General Notes.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these Standard Detail Drawings.

Note: This sheet has been re-typed to update the company name and address. The rest of the sheet is identical to the original, issued September 11, 1992.

BRAD BEAVER CONSTRUCTION Circular, Site Cast Concrete Waste Storage Structure

Designer: Norton & Schmidt, Consulting Engineers
1100 Main Street., Suite 419
City Center Square
Kansas City, MO 64105 (816) 421-4232

Fabricator: Beaver Poured Concrete
2685 Edenville Road
Chambersburg, PA 17201 (717) 264-9186

Drawings: Sheets BE8CT9 thru BE8CT9, BE10CT1, thru BE10CT9 and BE12CT1
thru BE12CT9 for tanks with walls 8, 10 & 12 feet high with
tank diameters for each wall height ranging from 40 to 100
feet in 20 foot increments.

Location: Calculations and drawings have been reviewed by the NNTC and
The PA state office for compliance with SCS Practice Standard
313. Design folders are on file at both reviewing locations.
The reviews were completed in September 1992.

Materials: Reinforced concrete footings, floor, walls and access pads
Contain Class 4000 concrete and Grade 60 steel.

Sizes: 40 to 100 ft. diams. In 20 ft. increments. 8, 10, & 12 ft.
High walls 7in. thick walls for 1 ft. walls, 8 in. thick
Walls for 10 ft. walls and 9 in. thick walls for 12 ft. walls.

Application: SCS Practice Standard 313 for med. (20 yr.) service life.

Assumptions: Allowable soil bearing capacity for ftgs. 1500 psf. Walls
designed according to PCA "Circular Concrete. Tanks
Without Prestressing" for hinged base connection and tank full, no
backfill condition. Walls are also adequate for full
backfill, tank empty condition. Height of backfill against
tank walls shall not vary more than 4 ft. Minimum backfill of
4 ft. is provided to assure frost protection for footing. A
drainage system under and around structure base with a pipe
outlet is provided. Allowable equipment for the walls and
access pad are given in the General Notes.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of
these Standard Detailed Drawings.

Design Data Sheet for Standard Detail Drawing by:

Cover-All Building Systems, Inc., Prestressed Fabric Roof with Tubular Steel Trusses and Concrete Walls for Waste Storage Structures

- Designer:** Enrique Tabak, PE 306-657-2816
Cover-All Building Systems, Inc.
3815 Wanuskewin Road
Saskatoon, Saskatchewan Canada S7P 1A4
- Fabricator:** Elizabeth Stack 306-664-4777
Cover-All Building Systems, Inc.
3815 Wanuskewin Road
Saskatoon, Saskatchewan Canada S7P 1A4
- Drawings:** LBS 40', sheets 1 through 16 sealed by Enrique Tabak (sheets 2, 3, and 5 through 16 sealed on 07/02/2003 and sheets 1 and 4 sealed on 07/15/2003.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed July 2003.
- Materials:** Fabricated steel trusses with corrosion protection.
Reinforced fabric roof material.
Grade 60 steel.
Class 4000 (psi) concrete.
- Sizes:** 40' roof span x required length in bays of 16' or less between roof trusses.
2' to 8' high concrete walls in 2' increments. Intermediate sizes can be built using the steel reinforcement for the next 2' increment.
- Applications:** PA Standard 313.
- Assumptions:** Intended to be a permanent, stand alone, fully enclosed structure.
Wind loads: 125 mph wind speed (3 sec), exposure category C, building category "low hazard", basic wind pressure 25 psf @ 11'.
Snow loads: 60 psf ground snow load, building exposure "low hazard", "exposed" wind exposure.
Manure load on walls: 65 pcf
Soil load on walls: 120 pcf
Soil bearing capacity: 2000 psf
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

CRSI Cantilevered Walls, Site Cast Concrete Waste Storage Structure

Designer: Concrete Reinforcing Steel Institute
180 North LaSalle Street
Chicago, IL

Drawings: CRSI Handbook 1980 Edition
Cantilever Retaining walls
Structural Reinforcement

Location: Dimensions and steel cables have been reviewed by the NNTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Design data is based upon the Building Code Requirements of ACI 318-77.

Material: Class 3000 concrete with Grade 60 steel.

Size: Wall heights vary from 3 feet to 10 feet for low walls and from 10 feet to 20 feet for high walls. Wall thicknesses vary from 10 inches on low walls to 18 inches for high walls.

Application: National Conservation Practice Standard 313-80 for short (10 year) service life.

Assumptions: Walls are analyzed for four loading conditions: C: (1) level backfill, (2) sloping backfill at 33 degrees, (3) level backfill with horizontal surcharge pressure of 86 psf, and (4) level backfill with horizontal surcharge pressure of 287 psf. Backfill is assumed to have a unit weight of 100 pcf and an equivalent fluid pressure of 28.7 psf. An allowable bearing pressure of 4000 psf is assumed for walls less than 15 feet high.

Limitations: Walls are not checked for sliding safety. The BAR DETAIL typical drawings do not show T&S steel required in ACI 318 77. Walls are not analyzed for a tank full, minimum soil backfill condition. Corners require special design considerations when used as containment structures.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these standard designs for preparing construction drawings.

CREST PRECAST INC. and HENRY HUFFCUTT CO. INC.
Precast Cast Concrete Wall Panels
for Manure Storage Tanks

Designer: Gary K. Munkelt, P.E. - Wisconsin
1420 Easton Road, Warrington, PA 19876

Owners and Crest Precast Inc. (800-658-9045)
Fabricators: 1504 Ceder Drive, La Crescent, MN 55945-1531
and Henry Huffcutt Co., (715-723-7446)

Drawings: Three Drawing Sheets:
Drawing No. 92-129, Rev. D. 7/25/94, Details for 4' 6" High
wall unit
Drawing NO. 92 143, Rev. C, 7/25/94, Details for 8'-6" High
Wall Unit
Drawing No. 92-144. Rev. D. 1/30/95, Procedure Manual for
Installing Precast Manure Tanks

Precast reinforced concrete retaining wall units 4' -6" and 8'
6" high by 6 feet long. Corner units are also available.
Units are bolted together on a prepared foundation for an
open top manure tank. Plan tank dimensions are in 6 foot
increments each way when using standard length wall unit.
The corner units require a minimum plan dimension of 11 feet
each way.

Location: Design notes and plans have been reviewed by MNTC for
compliance with the structural aspects of Practice Standard
313-80. Design folders are on file at MNTC.

Materials: Retaining wall units are precast with 5000 psi concrete and
Grade 40 steel and Grade 50 welded wire fabric. Wall units
are bolted together with Stainless steel straps and bolts.
Floor slab is site cast with 3500 psi concrete and Grade 40
steel.

Assumptions: Walls are designed for limited backfill, tank empty condition,
and a tank full with one foot minimum backfill condition.
Lateral earth pressure of 65 psf and no lateral surcharge are
assumed. The allowable soil bearing pressure used for design
is 2000 psf

Application: SCS National Conservation Practice Standard 313 "Waste Storage
Structure" for Medium (20 year) service life.

Concurrence: The Head of the Midwest NTC Engineering Staff concurs in the
use of these detail drawings.

Design Data Sheet for Standard Detail Drawing by:

DML Poured Walls, (DL_CT) Circular, Site Cast Waste Storage Facility

Designer: Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
311 East 11th Avenue, North Kansas City, MO 64116

Fabricator: DML Poured Walls 717-768-0743
155 Maple St., Gordonville, PA 17529

Drawings: Sealed 8/03/04 by Rodney Sommer, PE:
DL8CT & DL10CT – sheets 1 thru 4 dated 3/3/04, sheet 5 dated 3/8/04, sheet 6 dated 7/16/04, & sheets 7 thru 12 dated 7/19/04.
DL12CT & DL16CT- sheets 1 thru 4 dated 3/3/04, sheet 5 dated 3/8/04, & sheets 6 thru 12 dated 7/19/04.
Modifications to add extra wall steel instead of concrete access pad sealed 3/18/15 by Rodney Sommer, PE:
DL8CT, DL10CT, and DL12CT – add Note to Sheet 2

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in August 2004. Modification to allow extra steel in wall instead of concrete pad completed June 2015. Calculations and note on file at NRCS-PA state office. Copy of note for each tank sent to technical centers.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameters: 40 to 80 ft. in 10 ft. increments, 100 ft. & 115 ft..
Walls: 8 ft. high by 7 in. thick, 10 ft. high by 8 in. thick, 12 ft. high by 9 in. thick, & 16 ft. high by 10 in. thick with a single layer of steel for all heights & diameters.

Applications: PA Standard 313.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than 4 feet, and the minimum backfill shall be at least 36 inches (or frost depth) above the base of the footing. Lateral earth pressure of 45 psf and 100 psf surcharge are assumed. Maximum equipment weight within a distance equal to the tank depth is 1500 lbs. unless an equipment access pad is installed as shown in the drawings or for the 8,10, and 12' deep tanks add extra wall steel to allow equipment loads up to 15,000 lbs. Minimum required soil bearing capacities are 1.0 ksf under floor slab, and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Design assumes a foundation drain as shown on drawings. Structure diameters between those shown above shall be installed with the reinforcing steel for the next larger diameter increment.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings. (Original notification Bulletin PA 210-4-4 dated August 4, 2004)

Design Data Sheet for Standard Detail Drawing by:

DML Poured Walls, LLC (DL16CT) Circular, Site Cast Waste Storage Facility

- Designer:** Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
311 East 11th Avenue, North Kansas City, MO 64116
- Fabricator:** DML Poured Walls, LLC 717-768-0743
3199 Irishtown Road, Gordonville, PA 17529
- Drawings:** Sealed 6/18/2013 by Rodney W. Sommer, PE:
DL16CT1-DL16CT9— sheets 1 thru 9 dated 6/18/2013
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in June 2013.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** Diameters: 120 to 160 ft. in 10 ft. increments
Walls: 16 ft. high by 12 inch thick wall with two faces of steel for all heights & diameters.
- Applications:** PA Standard 313.
- Assumptions:** Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than 4 feet, and the minimum backfill shall be at least 36 inches (or frost depth) above the base of the footing. Lateral earth pressure of 45 psf and 100 psf surcharge are assumed. Maximum equipment weight within a distance equal to the tank depth is 1500 lbs. unless an equipment access pad is installed or additional steel added in the wall as shown on the drawings for a maximum equipment weight of 15,000 #. Minimum required soil bearing capacities are 1.0 ksf under floor slab and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Design assumes a foundation drain as shown on drawings. Structure diameters between those shown above shall be installed with the reinforcing steel for the next larger diameter increment.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

DML Poured Walls, LLC (DL16UN) Circular, Site Cast Waste Storage Facility

Designer: Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
311 East 11th Avenue, North Kansas City, MO 64116

Fabricator: DML Poured Walls, LLC 717-768-0743
3199 Irishtown Road, Gordonville, PA 17529

Drawings: Sealed 8/15/2014 by Rodney W. Sommer, PE:
DL16UN1-DL16UN8– sheets 1 thru 8 dated 8/15/2014

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in August 2014.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameters: 170 to 200 ft. in 10 ft. increments
Walls: 16 ft. high by 12 inch thick wall with two faces of steel for all heights & diameters.

Applications: PA Standard 313.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than 14 feet, and the minimum backfill shall be at least 36 inches (or frost depth) above the base of the footing. Lateral earth pressure of 45 psf and 100 psf surcharge are assumed. Maximum equipment weight within a distance equal to the tank depth is 1500 lbs. unless an equipment access pad is installed or additional steel added in the wall as shown on the drawings for a maximum equipment weight of 15,000 #. Minimum required soil bearing capacities are 1.0 ksf under floor slab and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Design assumes a foundation drain as shown on drawings. Structure diameters between those shown above shall be installed with the reinforcing steel for the next larger diameter increment.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Eli Fisher Construction, (EFC-NS-06U) Circular, Site Cast Waste Storage Facility

- Designer:** Everett Prewitt, PE 816-737-0128
Norton & Schmidt, Consulting Engineers
311 East 11th Avenue, Kansas City, MO 64116
- Fabricator:** Eli Fisher Construction 814-571-0976
615 Manor Road,
Centre Hall, PA 16828
- Drawings:** EFC-NS-06U sheets 1 thru 5, dated 8-29-06.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in September 2006.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** Diameter: 140 ft..
Walls: 16 ft. high by 11.5 in. thick.
- Applications:** PA Standard 313 with equivalent fluid pressure of 65 pcf.
- Assumptions:** Minimum required soil bearing capacities vary depending on the diameter. Maximum backfill differential around the tank is 12 feet. Design assumes a foundation drain as shown on drawings. Additional wall steel in lieu of access pad is designed for a vehicle surcharge of 15,000 pounds. If larger equipment loads are anticipated near the wall, the alternate equipment access pad must be used.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Eli Fisher Construction, (EFC-NS-06) Circular, Site Cast Waste Storage Facility

- Designer:** Everett Prewitt, PE 816-737-0128
Norton & Schmidt, Consulting Engineers
311 East 11th Avenue, Kansas City, MO 64116
- Fabricator:** Eli Fisher Construction 814-571-0976
615 Manor Road,
Centre Hall, PA 16828
- Drawings:** EFC-NS-06 sheets 1 thru 5, dated 2-20-06.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in August 2006.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** Diameters: 40-60 ft. or 40-100 ft.
Walls: 8 ft. high by 7.5 in. thick, and also 10 and 12 ft. high by 9.5 in. thick.
- Applications:** PA Standard 313 with equivalent fluid pressure of 65 pcf.
- Assumptions:** Minimum required soil bearing capacities vary depending on the diameter. Maximum backfill differential around the tank is 4 feet. Design assumes a foundation drain as shown on drawings. Additional wall steel in lieu of access pad is designed for a vehicle surcharge of 15,000 pounds. If larger equipment loads are anticipated near the wall, the alternate equipment access pad must be used.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

ENERGY-PAC Concrete, Site Cast, Round AgWaste Tank

Designers: Stephan B Clarke and Associates.
RD #2 Baden
Ontario, Canada
(519) 634-1453

Fabricator: Sollenberger Silos
Box N
Chambersburg, PA 17201
(717) 265-9588

Drawing: C1025-1A, 1B Revision 3 dated 2-21-86 (specs)
C1025-2 Revision 1 dated 8-10-85 (footing)
C1025-3, 4 Revision 1 dated 3-27-84
C1025-5 Revision 3 dated 3-7-84
C1025-6, 7, 8 Revised 2-82
C1025-10, 11, 12 Dated 2-10-82
C1025-13, 17, 21 Revision 1 dated 3-27-84
C1025-14, 15, 16, 18, 19, 20 Dated 2-82
C1025-22, 23, 24, 25, 26 Dated 12-84
C1025-21 Revision 1 dated 2-21-86 (ramp)
C1025-29 Dated 3-86 (sump pit)
(copy of typical title block attached)

Location: Plans have been reviewed in detail by NENTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Design data is on file at the NENTC. Reviews of revisions were completed in April 1986.

Material: The circular structure consists of site cast Class 4500 psi concrete with Grade 60 steel.

Sizes: Heights of 6, 8, 12, 11, 20, 24 ft and 30 thru 140 ft diameters.
Wall thicknesses. vary from 6 to 18 inches.

Application: National Conservation Practice Standard 313-10 for short (10 year) service life.

Assumptions: Footings are designed for an allowable soil bearing capacity of 3000 psf.

Walls are designed according to PCA "Circular concrete Tanks Without Pre-stressing for a hinged base connection and tank full no backfill condition. Walls are also adequate for full backfill tank empty condition. Backfill is assumed to be uniform depth plus or minus 2ft around the perimeter of the tank. Placement of the tank above the seasonal high water table is also assumed.

Concurrence: The Head of the NENTC Engineering Staff concurs in the use of these detailed drawings.

April 8, 1986

ENERGY – PAK Circular, Site Cast Concrete, Waste Storage Structure

Designers: Stephen B. Clarke and Associates
Rd #2 Baden
Ontario, Canada
(519) 634-8453

Fabricators: Sollenberger Silos
Box N
Chambersburg, PA 17281
(717) 265-9588

Drawings: C102S-1A,1B Revision 3 dated 2-21-86 (specs)
C1025-2 Revision 1 dated 8-10-85 (footing)
C1025-3,4 Revision 1 dated 3-27-84
C1025-6,7,8 Revised 2-82
C1825-9,10,11,12 dated 2-10-82
C1025-13,17,21 Revision 1 dated 3-27-84
C1025-14,15,16,18,19,20 dated 2-82
C1025-22,23,24,25,26 dated 12-84
C1025-28 Revision 1 dated 2-21-86 (ramp)
C1025-29 dated 3-86 (sump pit)

Location: Plans have been reviewed in detail by NNTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Design data is on file at the NNTC. Reviews of revisions were completed in April, 1986.

Material: The circular structure consists of site cast Class 4000 psi concrete with Grade 60 steel.

Sizes: Heights of 6, 8, 12, 16, 20, 24 ft. and 30 thru 140 ft. diameters. Walls thickness vary from 6 to 8 inches.

Application: National Conservation Practice Standard 313-80 for short (10 year) service life.

Assumptions: Footings are designed for an allowable soil bearing capacity of 3000 psf. Walls are designed according to PCA "Circular Concrete Tanks Without Pre-stressing" for a hinged base connection and tank full, no backfill condition. Walls are also adequate for full backfill, tank empty condition. Backfill is assumed to be uniform depth plus or minus 2 ft. around the perimeter of the tank. Placement of the tank above the seasonal high water table is also assumed.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these detailed drawings.

FARMER BOY AG – Builder (No SDD)

Designer: Timothy. Royer, PE
Timber Tech Engineering, Inc
256 West Franklin Street
P.O. Box 145
Womelsdorf, PA 19567

Fabricator: Mr. Lee Whitmer (717) 866-7565
Farmer Boy Ag. System
410 E. Lincoln Avenue
PO Box 435
Myerstown, PA 17067

Design Data Sheet for Standard Detail Drawings by:

FSRC Tanks, Inc., Circular, LIQ Fusion 7000 Interior Coated Steel Panels
Waste Storage Structure

Designer and Fabricator:	Tank Connection Affiliate Group 3609 N. 16 th Street Parsons, Kansas 67357 620-432-3010
Supplier:	FSRC Tanks, Inc. 11029 Industrial Parkway, NW Bolivar, OH 44612 Phone (234) 221-2015 or sales@fsrctanks.com
Drawings:	These are included in a site specific submittal package sealed by a PA PE licensed Tank Connection Group Engineer. This package is provided to FSRC Tanks, Inc. for their use and the client. In addition to the drawings it includes specifications, complete design calculations, installation details, product data sheets, and an Operation and Maintenance Manual.
Concurrence Review:	NRCS in Illinois completed their review in 2013 and shared all all correspondence with PA. Based on that information and some additional inquires, NRCS in PA has determined that the design meets the PA NRCS Conservation Practice Standard 313. This information is on file, both electronically and hard copy at the PA NRCS State office.
Sizes:	Each tank has its own design and therefore a limitless range can be manufactured from 9' in diameter up to nearly 300' in diameter. Most agricultural applications are in the 30' to 120' diameters. Height can be adjusted in increments of just under 5' up to 75'. The most common height is 19'.
Applications:	PA Standard 313
Assumptions:	Tank walls are designed for liquid interior fluid pressure and exterior ASC E 7-05 windloads, seismic load, and roof loads as applicable. Drawings specify minimum frost protection for footer and bearing of 2,500 psf. Foundation testing and certification by FSRC Tanks, Inc. representative with approval by Designer. No backfill allowed against tank walls. Interior coating

Fusion 7000 FBE @ 6 mils DFT minimum that can be field repaired. No cathodic protection required. Starter ring allows for expansion, if specified in original design. All concrete shall be 4,000 PSI. All Reinforcement shall be 60 KSI. Sheet steel shall meet ASTM A 1011 Grade 40. Additional details can be found in the site specific submittal package.

Description:

An above ground, bolted rolled taper steel panel tank, interior coated with LIQ Fusion 7000 FBL and painted on the exterior. Options Include access port/ manway, bottom fill or top fill, special panels for cleanout, and pumpout ports fitted with two valves plus interior suction line to sump. Owner to select unloading pump supplier with FSRC representative assistance. Tank installation and foundation certified by PA Registered Engineer working for Tank Connection Affiliate Group. FSRC Tank representative on site for all phases of construction. Pertinent tank information can be found on nameplate and in submittal package.

Concurrence:

The State Conservation Engineer concurs in the use waste storage tanks installed by FSRC Tanks, Inc. and sealed by a PA registered engineer from Tank Connection Affiliate Group.

Design Data Sheet for Standard Detail Drawing by:

Fusion Tanks & Silos (Permastore) Circular, Glass lined Steel, Waste Storage Facility

Designer: Michael Nugent, PE (812) 468-8502
Mid-States Engineering and Inspection, P.C.
255 South Garvin Street, Evansville, IN 47713

Fabricator: Marvin Zimmerman (717) 463-9731
Zimmerman Harvestore Repair
P.O. Box 26 Cell (717) 363-0570 (PA only)
Oakland Mills, PA 17076

Drawings:	<u>No.</u>	<u>Title</u>	<u>Date of P.E. Seal</u>
	566100 Rev. 1	42 Ft. Dia. Non-Extendable	3/21/01
	566101 Rev. 1	62 Ft. Dia. Non-Extendable	3/5/01
	566102 Rev. 1	81 Ft. Dia. Non-Extendable	3/5/01
	566103 Rev. 1	101 Ft. Dia. Non-Extendable	3/21/01
	566104 Rev. 1	42 Ft. Dia. Extendable	3/21/01
	566105 Rev. 1	62 Ft. Dia. Extendable	3/5/01
	566106 Rev. 1	81 Ft. Dia. Extendable	3/5/01
	566107 Rev. 1	101 Ft. Dia. Extendable	3/21/01
	558995	Cathodic Protection System	2/28/01
	BID1 Rev. 4	Foundation Section	5/9/01
	BID2 Rev. 1	6" Dia. Inlet Piping	5/9/01
	BID2 Rev. 1	8" Dia. Inlet Piping	5/9/01
	BID2 Rev. 1	12" Dia. Inlet Piping	5/9/01
	BID3 Rev. 1	Foundation Outlet Piping	5/9/01
	BID4	Foundation Outlet Piping (Section A-A)	5/9/01
	P26 Rev 2	Slurry Tank Const. Guide (32 pages)	4/28/01

Location: Calculations were reviewed and are on file in the NRCS-WI state office.
Drawings were reviewed for conformance with PA Standard 313 and on file in
NRCS-PA state office. Review of latest revision was completed in June 2001.

Materials: Walls are glass fused to steel sheets, bolted together. Reinforced concrete
footings and floor slabs with grade 60 steel and Class 4000 air-entrained
concrete.

Sizes: Diameters: 42'-0", 61'-7", 81'-2.5", and 100'-9.75".
Walls: 10' (two rings) to 28' (six rings) with or without starter rings
("extendable" and "non-extendable", respectively).

Applications: PA Standard 313 with equivalent fluid pressure of 60 pcf.

Assumptions: Minimum required soil bearing capacity is 2000 pst. Backfill for frost
protection is required. The design assumes above ground application only,
with no backfill against the steel sheets. Wind design considerations are
based on a wind speed of 70 mph.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail
drawings.

GERHOLD Circular, Post Tensioned, Pre Cast Concrete,
Waste Storage Structures

Designers: E. A. Olson, NE P.E. 1402
O.E. Cross, NE. P.E. 2391
925 South 52nd Street
Lincoln, NE 68510

Fabricators: Gerhold Precast Co. Calco Inc.
P.O. Box 687 St. Johnsbury, VT 05819
Columbus, NE 86501
(402) 564 7380

Drawings: Dwg H 558, pg1, 3-34, dated '82 revised 2 25-83

Design: Dated 12-30 82, revised 2-15-83

Location: Plans have been reviewed in detail by MNTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Revised design folders are on file at the NNTC and MNTC. Reviews were completed in 1983.

Material: The circular structure consists of 8 ft. wide, full height, precast waffle panels with Class 4000 concrete and Grade 60 steel. The panels are post tensioned with Grade 270, 7-wire steel rope secured with anchor heads and wedges. The ring footing and slab are site cast concrete. All joints contain a rubber seal. Minimum concrete cover on principal steel is 1 1/2 inches.

Sizes: 8, 12, 16, 20 ft. high and 30, 40, 50, 60, 70, 80, 90, 100 ft. diameters.

Application: National Conservation Practice Standard 313-80 for short (10 year) service life.

Assumptions: Footings are designed for allowable soil bearing of 2000 psf. Wall panels are designed for a sliding base connection and full internal load without backfill. Walls are also adequate for full uniform backfill of sandy silts or clays. Walls are not designed for surcharges. Backfill is assumed drained and may require footing drains if tank is placed below seasonal high water table.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of this detail drawing.

Double Wall Slurry Vat Circular, Post-tensioned,
Concrete Stave, AgW Tank

Owners: Great Lakes Silo
7200 North Highway 63
Rochester, MN 55904-9990
COMM 507-288-8850 FAX 507-288-3810

Drawings: Drawing No. ROO6307E-80-0 with original date of October 11, 1980. contains top view of footing and base; top view of completed vat; section A-A, with base, footing, and wall details; section C-C of angle mount footing tube; and vertical section of in ground vat. This drawing also contains the hooping schedule and material properties.

Sizes: Structures range in size from 20 to 100 feet in diameter in 10-foot increments, and up to 15 feet in height in 2.5-foot increments. The 120-foot diameter tank is available in the same incremental heights.

Location: Plans have been reviewed by the MNTC for compliance with the structural aspects of Waste Storage Structure Practice Standard 318-80. Design folder is on file at the MNTC.

Materials: Structure walls consist of an inner and outer ring of post-tensioned concrete stave staves with $f'_c = 4500$ psi. Hoops consist of 9/16-inch diameter rods with rolled threads and $f_y = 45,000$ psi. A 6-inch wide core area between the two rings is filled with $f'_c = 3000$ psi concrete and vertical reinforcing steel with $f_y = 40,000$ psi. Floor slab and footings are site cast concrete with $f'_c = 3000$ psi. Welded wire fabric with $f_y = 65,000$ psi is used in the floor slab.

Applications: National Conservation Practice Standard 313-80 for medium (20 year) service life.

Assumptions; Tank walls are designed for a full backfill, tank empty condition; and a tank full, no backfill condition. The minimum footing depth should be below frost depth as shown on the plan. The tanks can be backfilled to the full height. Equivalent fluid pressure of 60 pcf and a lateral wheel surcharge load of 100 psf were assumed. Tanks designed for minimum soil bearing capacity of 2,000 psf.

Concurrence: The head of the MNTC Engineering Staff concurs in the use of this detail drawing.

GROFFDALE (89UN) Circular, Site Cast Concrete, Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 8th Fl
Kansas City, MO 64105 (816) 421-4232

Fabricators: Groffdale Concrete Walls, Inc
148 Brick Church Road
Leola, PA 17540 (717) 656-2016

Drawings: GCW-NS-89UN Shts 1 – 5 dated 12-5-89 (dimensions)
GCW-NS-89UN Sht 6 dated 12-5-89 (pipe opening)
GCW-NS-89UN Sht 7 dated 12-5-89 (access pad)
GCW-NS-89UN Sht 8 dated 12-5-89 (general notes)
GCW-NS-89UN Shts 9-20 dated 12-5-89 (wall steel)

Location: Plans were reviewed in April 1990 by NNTC for
Compliance with structural aspects of National Conservation
Practice Standard 313-80. Design data is on file at the NNTC.

Material: The structure contains site cast Class 3000 concrete in the
floor slab and Class 3500 in the walls. All reinforcing steel
Grade 60.

Sizes: Heights of 8, 10, 12 ft and 50 thru 100 ft diameters, Walls
are 7in thick for the 8ft high walls and 9in thick for the other walls.

Application: National Conservation Practice Standard 313-80 for medium 20
year) service life.

Assumptions: Footings assume an allowable soil bearing capacity of 1500
psf. Walls are designed according to PCA "Circular Concrete
Tanks Without Prestressing" for a hinged base connection and
tank full, no backfill condition. Walls are also designed
with Finite Element Methods for a tank empty, backfill sloping
from full wall height uphill to 4ft minimum height downhill
condition. Walls are also adequate for all uniformly level or
sloping backfill conditions between these limits. A drainage
system behind the walls and under the floor with a tile outlet
is provided on the drawings. Walls are adequate for a wheel
load of. 15 kips adjacent to the tank when structural
modifications are made as detailed in the General Notes.
Walls are adequate for larger wheel loads when an access pad
is constructed as detailed in the Drawings.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of
these detailed drawings.

GROFFDALE (89)Circular, Site Cast Concrete, Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 9th Fl
Kansas City, MO 64105 (816) 421 4232

Fabricators: Groffdale Concrete Walls, Inc
148 Brick Church Road
Leola, PA 17540

Drawings: GCW-NS-89 shts 1-3 dated 8-31-89 (dimensions)
GCW-NS-89 shts 4-5 dated 11-30-89 (chimney)
GCW-NS-89 sht 6 dated 8-31-89 (pipe opening)
GCW-NS-89 sht 7 dated 11-30-89 (access pad)
GCW-NS-89 shts 9-20 dated 8-21-89 (wall steel)

Location: Plans were reviewed in April 1990 by NNTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Design data is on file at the NNTC.

Material: The structure contains site cast Class 3000 concrete in the floor slab and Class 3500 in the walls. All reinforcing steel is Grade 60.

Sizes: Heights of 8, 10, 12 ft and 50 thru 100 ft diameters, Walls are 7in thick for the 8ft high walls and 9in thick for the other walls.

Application: National Conservation Practice Standard 313-80 for medium 20 year) service life.

Assumptions: Footings assume an allowable soil bearing capacity of 1500 psf. Walls are designed according to PCA "Circular Concrete Tanks Without Prestressing" for a hinged base connection and tank full, no backfill condition. Walls are also adequate for full backfill, tank empty condition. Backfill is assumed to be uniform depth plus or minus 2 ft around the perimeter of the tank. Minimum backfill to assure frost protection of the footing should be provided. A drainage system behind the walls and under the floor with a tile outlet is provided on the drawings. Walls are adequate for an adjacent wheel load of 15 kips when structural modifications are made as detailed in the General Notes. Walls are adequate for larger adjacent wheel loads when an access pad is constructed as detailed in the Drawings.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these detailed drawings.

GROFFDALE (90) Circular, Site Cast Concrete, Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 8th Fl
Kansas City, MO 64105 (816) 421-4232

Fabricators: Groffdale Concrete Walls, Inc
148 Brick Church Road
Leola, PA 17540 (717) 656-2016

Drawings: GCW-NS-90 sht 1 dated 1-29-90 (plan view)
GCW-NS-90 sht 2 revised 3-19-89 (wall section)
GCW-NS-90 shts 3-4 dated 1-29-90 (chimney)
GCW-NS-90 sht 5 revised 3-19-90 (pipe opening)
GCW-NS-90 sht 6 dated 1-29-91 (access pad)
GCW-NS-90 sht. 7 revised 3-19-90 (general notes)
GCW-NS-90 shts 8-13 dated 1-29-90 (wall steel)

Location: Plans were reviewed in April 1990 by NNTC for
Compliance with structural aspects of National Conservation
Practice Standard 313-80. Design data is on file at the NNTC.

Material: The structure contains site cast Class 3000 concrete in the
floor slab and Class 3500 in the walls. All reinforcing steel
Grade 60.

Application: National Conservation Practice Standard 313-80
for medium (20 year) service life.

Assumptions: Footings assume an allowable soil bearing capacity of 2000
psf. Walls are designed according to PCA "Circular Concrete
Tanks Without Prestressing" for a hinged base connection and
tank full, no backfill condition. Walls are also adequate for
full backfill~ structure empty condition. Backfill is assumed
to be uniform depth plus or minus 2 ft around the perimeter of
the structure. Minimum backfill of 4 ft is provided to assure
frost protection of the footing. A drainage system behind the
walls and under the floor with a tile outlet is provided on
the drawings. Walls are adequate for an adjacent wheel load
of 15 kips when structural modifications are made as detailed
in the General Notes. Walls are adequate for larger adjacent
wheel loads when an access pad is provided as shown on the
Drawings.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of
these detailed drawings.

GROFFDALE (91) Circular, Site Cast Concrete, Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 8th Fl
Kansas City, MO 64105 (816) 421-4232

Fabricators: Groffdale Concrete Walls, Inc
148 Brick Church Road
Leola, PA 17540 (717) 656-2016

Drawings: GCW-NS-91 sht 1. dated 2-11-91 (tank plan view)
GCW-NS-91 sht 2 dated 2-11-91 (wall section)
GCW-NS-91 shts 3-4 dated 2-11-91 (chimney)
GCW-NS-91 sht 5 dated 2-11-91 (pipe opening)
GCW-NS-91 sht 6 dated 2-11-91 (Access pad)
GCW-NS-91 sht 7 dated 2-11-91 (general notes)
GCW-NS-91 shts 8-9 dated 2 11-91 (wall steel)

Location: Plans were reviewed in April 1990 by NNTC for
Compliance with structural aspects of National Conservation
Practice Standard 313-80. Design data is on file at the NNTC.

Material: The structure contains site cast Class 3000 concrete in the
floor slab and Class 3500 in the walls. All reinforcing steel
Grade 60.

Application: National Conservation Practice Standard 313-80 for
medium 20 year) service life.

Assumptions: Footings assume an allowable soil bearing capacity of 2000
psf. Walls are designed according to PCA "Circular Concrete
Tanks Without Prestressing" for a hinged base connection and
tank full, no backfill condition. Walls are also adequate for
full backfill, tank empty condition. Backfill is assumed to
be uniform depth plus or minus 2ft around the perimeter of the
tank. Minimum backfill of 4ft is provided to assure frost
protection of the footing. A drainage system behind the walls
and under the floor with a tile outlet is provided on the
drawings. Walls are adequate for an adjacent wheel load of 15
kips when structural modifications are made as detailed in the
General Notes. Walls are adequate for larger adjacent wheel
loads when an access pad is provided as shown on the Drawings.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of
these detailed drawings.

GROFFDALE (91 CMT) Circular, Site Cast Concrete,
Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 8th Fl
Kansas City, MO 64105 (816) 421-4232

Fabricators: Groffdale Concrete Walls, Inc
148 Brick Church Road
Leola, PA 17540 (717) 656-2016

Drawings: GCW-XS-91CMT8 sheets 1 through 12, 8 foot high walls
GCW~S-91CMT10 sheets 1 through 14, 10 ft. high walls
GCW-NS-91CMT12 sheets 1 through 17, 12 ft. high walls
All drawings revised 6/92

Location: Calculations and drawings have been reviewed by the NNTC and the PA State Office for compliance with the structural aspects of National Conservation Practice Standard 313-80. Design folders are on file at both reviewing locations. The reviews were completed in September 1992.

Materials: All site cast concrete is Class 4000. All reinforcing steel is Grade 60. All structural steel is A36.

Sizes (ft.): Diameters range from 50 to 140 feet in 10 foot increments.
Heights range from 8 to 12 feet.

Application: National Conservation Practice Standard 313-80 for medium (20 year) service life.

Assumptions: The allowable soil bearing capacity for the footings is 1500 psi. Walls are designed according to PCA "Circular Concrete Tanks Without Prestressing" for a hinged base connection and tank full, no backfill condition. Walls are also adequate for full backfill, tank empty condition. Backfill is assumed to be uniform depth plus or minus two feet around the perimeter of the tank. Minimum backfill of four feet is provided to assure frost protection of the footing. A drainage system behind the walls and under the floor with a pipe outlet is provided. Walls are adequate for an adjacent wheel load of 15 kips when structural modifications are made as explained in the General Notes. Walls are adequate for larger adjacent wheel loads when an access pad is provided.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these detail drawings.

GROFFDALE (92KW) Circular, Site Cast Concrete,
Waste Storage Structure

Designers: Norton & Schmidt Consulting Engineers, Inc
1009 Baltimore 8th Fl
Kansas City, MO 64105 (816) 421-4232

Fabricators: Groffdale Concrete Walls, Inc
148 Brick Church Road
Leola, PA 17540 (717) 656-2016

Drawings: GCW-NS-92KW (8,10 & 12) Sh.1 Tank Plan View
GCW-NS-92KW (8,10 & 12) Sh.2 Typ. Tank Wall Sec.
GCW-NS-92KW (8,10 & 12) Sh.3 Interior Chimney
GCW-NS-92KW (8,10 & 12) Sh.4 Exterior Chimney
GCW-NS-92KW (8,10 & 12) Sh.5 Pipe Opening Detail
GCW-NS-92KW (8,10 & 12) Sh.6 Equip. Access Pad & Curb
GCW-NS-92KW (8,10 & 12) Sh.7 Kicker Wall Section
GCW-NS-92KW (8,10 & 12) Sh.8 & 9 Tank plan & Elev. Views
GCW-NS-92KW (8,10 & 12) Sh.10 General Notes
GCW-NS-92KW (8, 10 & 12) Sh.11 thru 15 Reinforcing Tables
GCW-NS-92KW10 Sh.11 thru 17 Reinforcing Tables
GCW-NS-92KW12 Sh.11 thru 20 Reinforcing Tables

Location: Calculations and drawings have been reviewed by the NNTC and the PA state office for compliance with National Conservation Practice Standard 313. Design folders are on file at both reviewing locations. Reviews were completed in November 1993.

Materials: All site cast concrete is Class 4000. All reinforcing steel is Grade 60.

Sizes: Diameters range from 50 to 140 ft. in 10 ft. increments. Heights range from 8 to 12 ft.

Application: National Conservation Practice Standard 313 for medium (20 year) service life.

Assumptions: The allowable soil bearing capacity for the footing is 1500 psi. Walls are designed according to PCA "Circular Concrete Tanks Without Prestressing" for a hinged base connection and tank full, no backfill condition. Walls are also adequate for full backfill, tank empty condition. Backfill is assumed to be of uniform depth +/-2' around the perimeter of the tank. Min. backfill of 4' is provided to assure frost protection of the footing. A drainage system behind the walls and under the floor with a pipe outlet is provided. Walls are adequate for an adjacent wheel load of 15K when structural modifications are made as explained in the General Notes. Walls are adequate for larger adjacent wheel loads when an access pad is provided.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these standard detail drawings.

GROFFDALE Concrete Walls, (GWC-NS-97UN12) Circular,
Site Cast Agwaste Tanks

Designer: Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, consulting Engineers
1100 Main street, Suite 419, Kansas City, MO 64105

Fabricator: Groffdale Concrete Walls 717-656-2016
148 Brick Church Road, Leola, PA 17540

Drawings: GCW-NS-97UN12 sheets 1 thru 11, dated 6/20/97 and
sealed 6/23/97.

Location: Calculations and drawing were reviewed for
compliance with PA Standard 313. Design data are
on file in PA state office. Review was completed
July 1997.

Materials: Reinforced concrete footings, floor slabs, walls,
and access pads require Grade 60 steel with Class
4000 air-entrained concrete.

Sizes: Diameters: 110 to 140 ft. in 10 ft. increments.
Walls: 12 ft high by 9 in thick.

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure
empty and structure full, no backfill conditions.
Height of backfill shall vary no more than nine
feet, and the minimum backfill shall be four feet
above the base of the footing. Lateral earth
pressures of 75 pcf are assumed. Walls are adequate
for an equipment load of 15,000 pounds within 12
feet of the tank when additional reinforcing steel
is added to the wall as detailed in the General
Notes. An equipment access pad is required for
larger loads or if the additional wall steel is not
used. A soil bearing capacity of 1500 psf is
required under the wall footing and floor slab.
Design assumes a foundation drain as shown on
drawings. Structure diameters between those shown
may be used provided the reinforcing steel for the
next larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use
of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Groffdale Concrete Walls, (GCW) Circular, Site Cast Waste Storage Facility

- Designer:** Everitt H. Prewitt, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105
- Fabricator:** Groffdale Concrete Walls 717-656-2016
430 Concrete Avenue, Leola, PA 17540
- Drawings:** GCW-NS-98UN 1 thru 14, dated 9/98 and sealed 6/10/99.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed July 1999.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 (Class 5000 for diameters over 120 feet) air-entrained concrete.
- Sizes:** Diameters: 80 to 140 ft. in 10 ft. increments for 16 ft. walls.
Walls: 16 ft high by 9 in thick.
- Applications:** PA Standard 313 for Medium (20 year) service life.
- Assumptions:** Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Lateral earth pressure of 75 psf and 100psf surcharge are assumed. Walls are adequate for an equipment load up to 15,000 pounds adjacent to the tank if additional reinforcing steel is added to the wall as detailed in General Note K. An equipment access pad is required for larger loads or if the additional wall steel is not used. Minimum required soil bearing capacities are 1.8 ksf under floor slab, and 2.0 ksf for the footing. Backfill for frost protection is required. Height of backfill against the structure walls shall not vary more than 13 feet, and the minimum backfill shall be four feet above the base of the footing. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used. Design assumes a foundation drain as shown on drawings.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

KENNEDY KONSTRUCTION KOMPANY
Slant Leg Building Frame
Compost Facility

Designers: D.L. Bushman, PE
Shenandoah Engineering, Ltd.
131 S. Main Street
Woodstock, VA 22664

Fabricator: Kennedy Konstruction Kompany
P.O. Box 369
Edinburg, VA 22824

Drawings: Two frames; one set of drawings each frame:

	<u>SPAN</u>	<u>DRWG. NO.</u>	<u>NO. SHEETS</u>
a)	28-FOOT	#1228	4
b)	36 FOOT	#1236	5

Location: NNTC structural review (11/93) of design and drawings for compliance with requirements of;
SCS-NHCPS 313-80; waste Storage Struct.
ASAE EP288.4; Wind & Snow Loads
ASCE 7-88; Buildings; Load Combinations
AISC-ASD, 9th.ed; Code of Std. Practice
Computations and drawings on file at NNTC

Materials: Structural Steel, Plates & Angles. Grade A-36;
AWS Welds using E70 Electrodes;
Red Oxide Alkyd Shop Primer on Exposed Steel;
Roofing, 29 Ga. Galvanized Steel, G-90 Zinc

Size: a) 12'W X 28'span, 8'walls, 10'clear, 4:12 pitch.
b) 12'W x 36'span, 9'walls, 10'clear, 4:12 pitch.

Application: National Conservation Practice Standard 313,
for ASCE 7-88 Category IV (very low
hazard/occupancy) classification.

Assumptions: Soil bearing for footings = 2000 psf min.
Wind Loads: 90 mph, or less.
Snow Loads = 12 psf balanced & 18 psf unbalanced.

Concurrence: The Head of the NNTC Engineering Staff
concurs in the use of these standard detailed
drawings.

Design Data Sheet for Standard Detail Drawing by:

Keystone Concrete, Inc. (E056-06) 60' Litter Storage Span utilizing pre cast concrete wall panels with post frame walls and trusses above.

Designer: Timothy Royer, PE 717-335-2750
Timber Tech Engineering
22 Denver Road
Denver, Pa 17517

Fabricator: Keystone Concrete, Inc. 717-355-2361
477 E. Farmersville Road,
New Holland, PA 17557

Drawings: E056-06 cover sheet plus sheets 1 thru 5, dated 10-6-06.

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in October 2006.

Materials: Pre cast wall panels 8' high with a 4' footer with 5,000psi concrete. Post frame walls and trusses are mounted on top of the pre cast wall panels.

Sizes: Building spans are 60' and less. Interior clearance is 16' or less.

Applications: PA Standard 313 with equivalent fluid pressure of 45 pcf.

Assumptions: Minimum required soil bearing is 3,000 psf. Backfill can vary from 2.5' up to 6'. Roof designed as per IBC 2003 with 10 psf roof dead load, 30 psf roof live load, 30 psf ground snow load, and 90 mph wind speed.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Keystone Concrete Products, Precast Concrete Members with Wall Support for Waste Storage Structures

- Designer:** Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105
- Fabricator:** Keystone Concrete Products 717-355-2361
477 East Farmersville Road
New Holland, PA 17557
- Drawings:** Job No. 900013.1, sheets 1, 2, 3, 3a, 4, 5, 5a, 6, 7, & 8 of 8, sealed by Rodney W. Sommer on 3/25/97.
Job No. 900013.2, sheet 1 of 1, sealed by Rodney W. Sommer on 5/17/99.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed February 2003.
- Materials:** Precast reinforced concrete members: gang slat panels containing Class 8000 concrete; and beams, columns and lintels containing Class 5000 concrete. Steel is Grade 60 except Grade 40 for stirrups and ties. Includes coll bolts, neoprene pads, plastic shims, and grout as indicated on drawings.
- Sizes:** 4' wide panels 8', 10' and 12' long. 10" x 15-1/2" beams up to 24' long. Either of two main columns, up to 11' height, to support the ends of beams: C-1, 10" x 15-1/2", or C-3, 12" x 17". Intermediate column C-2, 6" x 6" up to 11' height to limit beam span to 12'. 8" x 10" lintels up to 13' long, up to 12' span on side walls only (no load from beam or panel ends). Components may be used for multiple spans in both directions, with grouting to accomplish full contact between abutting members as shown in the drawings.
- Applications:** PA Standard 313.
- Assumptions:** 150 psf live load for gang slat panels. 3.0 klf total load for beams. 12' max. beam span between columns. Max. 1.0 klf load for lintels. Column footings capable of supporting 39 k are required. 17.3 k max. lateral wall load on ends of beams, using beam "knuckle" per 900013.2. Max. 1440 plf lateral wall load on ends of panels. No lateral wall load on sides of panels.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

KEYSTONE CONCRETE PRODUCTS, Pre Cast Concrete,
Waste Storage Structure

Designer: Christopher T. Haffner, PE
Norton & Schmidt, Consulting Engineers
1009 Baltimore, 8th Floor
Kansas City, MO 64105 (816) 421-4232

Fabricator: Keystone Concrete Products
477 East Farmersville Road
New Holland, PA 17557

Drawings: Job #900013 (March 3, 1992).

Location: Calculations and drawings have been reviewed by the NNTC for compliance with structural aspects of Nat. Cons. Practice Standard 313-80. Design folders are on file at the NNTC. The reviews were completed in April 1992.

Materials: Precast reinf. conc. members including gang slat panels, beams, columns, and lintels. Panels contain Class 8000 concrete. Beams, columns, and lintels contain Class 5000 concrete. Steel is Grade 60 steel except Grade 40 for stirrups and ties. Includes coil bolts and neoprene pads.

Sizes: 4' wide panels 8', 10', and 12' long. 10" x 15-5/8" beams up to 24' long. 10" x 15-1/2" and 6" x 6" columns up to 11' long. 8" x 10" lintels up to 13' long.

Application: National Conservation Practice Standard 313-80 for Medium (20 year) service life except 10 year life for lintels.

Assumptions: 150 psf live load for the gang slat panels. 3 klf total load for the beams. 1 klf total load for the lintels. 23.4 k axial load for the 10" x 15-1/2" columns. 39 k axial load for the 6" x 6" columns. The design assumes self-supporting walls by others. Column footings capable of supporting 39 k are required.

In addition to the multiple spans shown by the drawings, structures may also be constructed using single span gang slats with the ends of the gang slats supported by compatible structure sidewalls. For such structures, 1) the axial load on the gang slat panels is limited to 9 klf, 2) the required restraint (if any) at the top of the sidewalls is not to exceed 9 klf, and 3) structure endwalls are designed so that restraint from the gang slat panels is not required at the endwalls.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these standard detail drawings when the components are used with multiple span structures whose drawings have NNTC concurrence and that a) have self-supporting walls as shown drawing sheet 2 of 8 and b) have footings adequate for the loading shown. Concurrence is also provided when components are used in single gang slat structures meeting the conditions outlined above.

LANCASTER POURED WALLS, Site Cast Circular,
Concrete, Waste Storage Structure

Designer: Robert D. Hyland, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419, Kansas City, MO 64105

Fabricator: Lancaster Concrete Walls 717-299-3721
2008 Horseshoe Road Lancaster, PA 17601

Drawings: All below dated 3/6/95, revised 10/10/95, and
sealed 5/14/97:
LR8CT1-LR8CT13 for 8 foot walls.
LR10CT1-LR10CT13 for 10 foot walls.
LR12CT1-LR12CT13 for 12 foot walls.
LR16CT1-LR16CT13 for 16 foot walls.

Location: Calculations and drawing have been reviewed for
compliance with PA Standard 313. Design data are
on file in PA state office. The review was
completed in May 1997.

Materials: Reinforced concrete footings, floor slabs, walls,
and access pads require Grade 60 steel with Class
4000 air-entrained concrete.

Sizes: Diameters: 50 to 120 feet in 10 foot increments.

Walls: Wall height varies from 8 feet to 16 feet.

Applications: PA Standard 313 for medium (20 year) service life.

Assumptions: Walls are designed for full backfill with a
maximum 4 foot variation in backfill height with
the structure empty and structure full, no
backfill conditions. Lateral earth pressure of 45
psf with a 100 psf surcharge are assumed. The
access pads, proportioned to eliminate lateral
surcharge loads on the walls, are designed for 2
wheel loads of 7.5 kips each. Minimum required
soil bearing capacities are 1.0 ksf for floor
slabs and 2.0 ksf plus 110 psf multiplied by the
depth below grade in feet for the footings.
Backfill for frost protection of the footings is
required. Design assumes a foundation drain as
shown on the drawings. Structure diameters
between those shown may be used provided the
reinforcing steel for the next larger diameter is
used.

Concurrence: The State Conservation Engineer concurs in the use
of these standard detail drawings.

LANCASTER Concrete Walls, Site Cast Circular,
Concrete, Waste Storage Structures

Designer: Robert D. Hyland, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419, Kansas City, MO 64105

Fabricator: Lancaster Concrete Walls
2008 Horseshoe Road
Lancaster, PA 17601
(717)-299-3721

Drawings: LR8CT1 through LR8CT11 for eight foot walls.
LR10CT1 through LR10CT11 for ten foot walls.
LR12CT1 through LR12CT11 for twelve foot walls.
LR16CT1 through LR16CT11 for sixteen foot walls.

Location: Calculations and drawing have been reviewed for
compliance with National Conservation Practice Standard
313-80 Design folders are on file in PA state
office and the NNTC. The review was completed in May
1995.

Materials: Reinforced concrete footings, floor slabs, walls, and
access pads require Grade 60 steel with Class 4000 air-
entrained concrete.

Sizes: Diameters: 50 to 100 feet in 10 foot increments.

Walls: Wall height varies from 8 feet to 16 feet.

Applications: National Conservation Practice Standard 313 for
medium (20 year) service life.

Assumptions: Walls are designed for full backfill with a maximum 4
foot variation in backfill height with the structure
empty and structure full, no backfill conditions.
Lateral earth pressure of 45 psf with a 100 psf
surcharge are assumed. The access pads, proportioned to
eliminate lateral surcharge loads on the walls, are
designed for 2 wheel loads of 7.5 kips each. Minimum
required soil bearing capacities are 1.0 ksf for floor
slabs and 2.0 ksf plus 110 psf multiplied by the depth
below grade in feet for the footings. Backfill for
frost protection of the footings is required. Design
assumes a foundation drain as shown on the drawings.
Structure diameters between those shown may be used
provided the reinforcing steel for the next larger
diameter is used.

Concurrence: The Acting Head of the NNTC Engineering Staff concurs in
the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Lancaster Poured Walls, (LR16UN 1 thru 8) Circular, Site Cast Waste Storage Facility

Designer: Rodney Sommer, PE 816-421--4232
Norton & Schmidt, Consulting Engineers
311 East 11th Avenue, Kansas City, MO 64116

Fabricator: Lancaster Poured Walls 717-299-3974
2542 Horseshoe Road
Lancaster, PA 17601

Drawings: LR16UN 1 thru 8, dated 10-06-06

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in October 2006.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameter: 130-160 ft..
Walls: 16 ft. high by 12 in. thick.

Applications: PA Standard 313 with equivalent fluid pressure of 65 pcf.

Assumptions: Minimum required soil bearing capacities vary depending on the diameter. Maximum backfill differential around the tank is 14 feet. Design assumes a foundation drain as shown on drawings. Additional wall steel in lieu of access pad is designed for a vehicle surcharge of 15,000 pounds. If larger equipment loads are anticipated near the wall, the alternate equipment access pad must be used.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

LANCASTER POURED WALLS, Circular, Site Cast Concrete,
Waste Storage Structure

Designer: Robert D. Hyland, PE
Norton & Schmidt, Consulting Engineers
1100 Main street, suite 419
Kansas city, MO 64105 (816) 421-4232

Fabricator: Lancaster Poured Walls
2008 Horseshoe Road
Lancaster, PA 17601 (717) 299-3721

Drawings: LR8UN1 thru LR8UN12 dated 11/3/95* (8 foot walls).
LR10UN1 thru LR10UN12 dated 11/3/95* (10 foot walls).
LR12UN1 thru LR12UN12 dated 11/3/95* (12 foot walls).
LR16UN1 thru LR16UN12 dated 11/3/95* (16 foot walls).
*Sheet 4 has a 4/22/96 revision date.

Location: Design loads and drawings have been reviewed for
compliance with PATG Standard 313. Design folders
are on file in the PA state office. The review was
completed in May 1996.

Materials: Reinforce concrete footings, floor slabs, walls, and
access pads require Grade 60 steel with Class 4000 air
entrained concrete.

Sizes: Diameters: 50 to 120 feet in 10 foot increments.
Walls: Height varies from 8 feet to 16 feet.

Application: PATG Standard 313 for medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure empty
and structure full, no backfill conditions. Height of
backfill shall vary no more than the wall height minus
two feet. Lateral earth pressures of 45 pcf with a 100
psf surcharge are assumed. The access pad,
proportioned to eliminate lateral surcharge loads on
the walls, is designed for 2 wheel loads of 7.5
kips each. Minimum required soil bearing capacities are 1.0
ksf for floor slabs and 2.0 ksf plus 110 psf
multiplied by the depth below grade in feet for the
footings. A minimum of three feet of cover is required
for frost protection over the footings. Design assumes
a foundation drain as shown on the drawings. Structure
diameters between those shown on the drawings may be
used provided the reinforcing steel for the next
larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use of
these detail drawings on NRCS assisted projects in PA.

Design Data Sheet for Standard Detail Drawing by:

**Lanco Concrete Walls, (LA8CT1-11, LA10CT1-11, LA12CT1-12 LA16CT1-11) Circular,
Site Cast Waste Storage Facility**

- Designer:** David Dorau/Rodney Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers LLC
311 E 11 Ave.
Kansas City, MO 64116
- Fabricator:** Lanco Concrete Walls 717-291-4585
P. O. Box 256,
Bird-in-Hand, PA 17505
- Drawings:** LA8CT1-11, LA10CT1-11, LA12CT1-12 LA16CT1-11, dated 7-20-04 and sealed on 4-20-07. **These drawings replace previous drawings dated 6/12/94.**
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in April 2007.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** 8' high x 7" thick, 50' to 100' diameter
10' high x 8" thick, 50' to 100' diameter
12' high x 9" thick, 50' to 130' diameter
16' high x 10" thick, 50' to 100' diameter
- Applications:** PA Standard 313 with equivalent fluid pressure of 65 pcf.
- Assumptions:** Minimum required soil bearing capacities are 1000 psf under floor slab and 2000+110 psf under the footing. Backfill 3 feet above the bottom of the footing is required. Maximum backfill differential around the tank is 4 feet. Design assumes a foundation drain as shown on drawings. Additional wall steel in lieu of access pad is designed for a vehicle surcharge of 15,000 pounds. If larger equipment loads are anticipated near the wall, the alternate equipment access pad must be used.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

LANCO Concrete Walls, Site Cast Circular,
Waste Storage Structure

Designer: Robert D. Hyland, PE
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419
Kansas city, MO 64105 (816) 421-4232

Fabricator: LANCO Concrete Walls
P.O. Box 256
Bird-in-Hand, PA 17505 (717) 291-4585

Drawings: LA8CT1 through LA8CT11 (Dated 6/12/94) for 8 ft. walls.
LA10CT1 through LA10CT11 (Dated 6/12/94) for 10 ft. walls
LA12CT through LA12CT12 (Dated 6/12/94) for 12 ft walls
LA16CT1 through LA16CT11 (Dated 6/12/94) for 16 ft walls

Location: Calculations and drawings have been reviewed for compliance
with National Conservation Practice Standard 313-80. Design
folders are on file at the PA state office and the NNTC.
The review was originally completed in July 1994.

Materials: Reinforced concrete footings, floor slabs, walls and access
pads require Grade 60 steel with Class 4000 air entrained
concrete.

Sizes: Diameters: 50 to 100 feet in 10 foot increments plus
the 12 ft. walls have a 130 ft . diameter.

Walls: 8 ft. high by 7 in. thick.
10 ft. high by 8 in. thick.
12 ft. high by 9 in. thick.
16 ft. high by 10 in. thick.

Application: National Conservation Practice Standard 313-80 for
medium (20 yr.) service life.

Assumptions: Walls are designed for full backfill, structure empty and
structure full, no backfill conditions. Lateral earth pres-
sure of 45 psf with a 100 psf surcharge are assumed. The ac-
cess pads, proportioned to eliminate lateral surcharge loads
on the walls, are designed for 2 wheels of 7.5 k each. The
access pads can be eliminated for certain equipment loads if
additional wall reinforcement is provided. Minimum required
soil bearing capacities are 1.0 ksf, floor slabs and 2.0 ksf
plus 110 psf multiplied by the depth below grade in feet for
the footings. Backfill for frost protection of the footings
is required. Design assumes a foundation drain as shown on
the drawings. Height of backfill against the structure
walls shall not vary more than 4 ft. Structure diameters
between those shown may be used provided the reinforcing
steel for the next larger diameter is used.

Concurrence: The head of the NNTC Engineering Staff concurs in the use of
these detail drawings.

LANCO Concrete Walls, Site Cast, Uneven Backfill Circular,
Waste Storage Structure

Designer: Robert D. Hyland, PE
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419
Kansas city, MO 64105 (816) 421-4232

Fabricator: LANCO Concrete Walls
P.O. Box 256
Bird-in-Hand, PA 17505 (717) 291-4585

Drawings: LA12UN1 through LA12UN10 (Dated 4/4/95) for 12 ft.

Location: Calculations and drawings have been reviewed for compliance with National Conservation Practice Standard 313-80. Design folders are on file at the PA state office and the NNTC. The review was originally completed in July 1995.

Materials: Reinforced concrete footings, floor slabs, walls and access pads require Grade 60 steel with Class 4000 air entrained concrete.

Sizes: Diameters: 50 to 100 feet in 10 foot increments.
Walls: 12 ft. high by 9 in. thick.

Application: National Conservation Practice Standard 313-80 for medium (20 yr.) service life.

Assumptions: Walls are designed for full backfill, structure empty and structure full, no backfill conditions. Lateral earth pressure of 45 psf with a 100 psf surcharge are assumed. The access pads, proportioned to eliminate lateral surcharge loads on the walls, are designed for 2 wheels of 7.5 k each. The access pads can be eliminated for certain equipment loads if additional wall reinforcement is provided. Minimum required soil bearing capacities are 1.0 ksf, floor slabs and 2.0 ksf plus 110 psf multiplied by the depth below grade in feet for the footings. Backfill for frost protection of the footings is required. Design assumes a foundation drain as shown on the drawings. Height of backfill against the structure walls shall not vary more than 4 ft. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.

Concurrence: The head of the NNTC Engineering Staff concurs in the use of these detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Lanco Concrete Walls, (LA12CT) Circular, Site Cast Waste Storage Facility

Designer: Robert D. Hyland, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105

Fabricator: Lanco Concrete Walls 717-291-4585
P.O. Box 256, Bird-in-Hand, PA 17505

Drawings: LA12CT sheets A thru G, dated 8/6/97(sheet E revised 9/8/97).

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed September 1997.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameter: 140 & 160 ft. Walls: 12 ft high by 9 in thick.

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than four feet, and the minimum backfill shall be three feet (or frost depth) above the base of the footing. Lateral earth pressures of 45 pcf are assumed. Walls are adequate for an equipment load of 1500 pounds within 12 feet of the tank. If additional reinforcing steel is added to the wall as detailed on sheet LA12CTB, the allowable equipment load increases to 15,000 pounds. An equipment access pad is required for larger loads or if the additional wall steel is not used. A soil bearing capacity of 2000 psf + (110 psf x depth below grade) is required under the wall footing. Soil bearing capacity under the floor slab shall be 1000 psf. Design assumes a foundation drain as shown on drawings, and select backfill. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Lanco Concrete Walls, (LA16UN) Circular, Site Cast Waste Storage Facility

Designer: Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105

Fabricator: Lanco Concrete Walls 717-291-4585
P.O. Box 256, Bird-in-Hand, PA 17505

Drawings: LA16UN sheets 1 thru 5, dated 6/9/98.

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed June 1998.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameter: 100 ft. Walls: 16 ft high by 10 in thick.

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than fourteen feet, and the minimum backfill shall be three feet (or frost depth) above the base of the footing. Lateral earth pressures of 45 pcf are assumed. Walls are adequate for an equipment load of 1500 pounds within 16 feet of the tank. An equipment access pad is required for larger loads. A soil bearing capacity of $2000 \text{ psf} + (110 \text{ psf} \times \text{depth below grade})$ is required under the wall footing. Soil bearing capacity under the floor slab shall be 1000 psf. Design assumes a foundation drain as shown on drawings, and select backfill. Structure diameters less than 100 feet may be used provided the reinforcing steel for the 100 foot diameter is used.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Len's Concrete Services, Precast Concrete Members for Waste Storage Structures

Designer: Timothy R. Royer, PE 717-335-2750
Timber Tech Engineering, Inc.
Suite B, 22 Denver Road, Denver, PA 17517

Fabricator: Len's Concrete Services 717-866-7153
247 South Race Street
Myerstown, PA 17067

Drawings: E134-05 Addendum No.1, sheets 1 through 9, dated July 6,2005 and sealed by Timothy R. Royer on 10/28/05.

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS PA state office. Review was completed November 2005.

Materials: Precast reinforced concrete members: cattle slat panels, solid slab panels, pump-out panels, and support beams and columns containing Class 5000 concrete. Steel is Grade 60. Includes grout, dowels and aluminum diamond plate lid for pump-out openings as indicated on drawings.

Sizes: Cattle slat panels 4' wide x 8',10' and 12' long, 3' wide x 12' long, and 2' wide x 12' long. Solid panels 5'-8" wide x 12' long. 8" x 10" beams are 10' long, supported by 10" x 12" columns 88" to 144" high. Components may be used for multiple spans in both directions, with grouting and dowels to accomplish full contact between abutting

Applications: PA Standard 313.

Assumptions: 250 plf and 3000 lbs/axle live load for gang slat panels. 20,000 lbs/axle live load for solid slabs. 250 plf (livestock) and no vehicle load for pump-out panels. 640 plf and 20,000 lbs/axle live loads for beams. Minimum 2" bearing surface at each end of panels and beams. "Knuckle" beam must sit in beam pocket on tank wall to be designed by others. Extra wall reinforcement at "knuckle" for 13,034 lbs load (45 pcf soil load on max. 12' wall) is shown in the drawing. Maximum 1064 plf lateral wall load on ends of panels. The drawing includes a footing design capable of supporting the 21.124 k column load on 3000 psf bearing soil.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

MAST LEPLEY Circular, Site Cast Concrete, Waste Storage Structures

Designers: Larry L. Teeling OH P.E. 30849
Teeling & Associates
1953 Englewood Avenue
Akron. OH 44312

Fabricators: Mast Lepley Company
1008 North Applecreek Road
Wooster. OH 44691
(216) 264-1338

Drawings: #2643, pages 5-1, issued 4-28-83, revised 5-16-90

Design: Dated 4-28-83

Location: Plans have been reviewed in detail by MNTC for compliance with the structural aspects of National Conservation Practice Standard 313-80. Revised design folders are on file at MNTC and NNTC. Reviews were completed in May, 1990.

Material: The circular structure consists of site cast Class 4000 concrete with Grade 60 reinforcing steel. Minimum concrete cover over the reinforcing steel is 2 inches and the wall thickness is 8 inches.

Sizes: Heights: 8, 10, 12 feet
Diameters: 30, 42, 54, 70, 100 feet

Application: National Conservation Practice 313-80 for medium (20 year) service life.

Assumptions: Footings are designed for an allowable soil bearing of 1500 psf. Walls are designed according to PCA "Circular Concrete Tanks without Pre-stressing" for a hinged base connection. Loading conditions assumed are full uniform backfill, tank empty case and tank full, no backfill case. Backfill is assumed to be a sand, silt and clay mixture with less than 50% fines. Walls for the circular tank and the loading pit are also designed for 100 psf surcharge. Placement of the tank above the seasonal high water table is also assumed.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of this detail drawing.

MIDWEST PLAN SERVICE (TR-9), Circular, Site Cast Concrete, Nov. 1983
Waste Storage Structure

Designers:	Midwest Plan Service Agricultural Engineering Department Iowa State University Ames, IA 50011
Drawings:	See PA Design Guide "PA-9"
Location:	The TR-9 Design package (Nov. 1983) was reviewed in detail by NNTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Design data is on file at the NNTC. Reviews were completed in June 1989. This does not apply to later versions of TR-9.
Material	The circular structure consists of site cast Class 4000 psi concrete with Grade 60 steel.
Sizes:	Heights of 8, 10, 12, 14 ft. and 30, 60, 90, 120 ft. diameters. Walls thicknesses vary from 6 inches on the smaller tanks to 12 inches on the larger. Minimum thickness will be 8 inches.
Application:	National Conservation Practice Standard 313-80 for medium (20 year) service life.
Assumptions	The drawings state an allowable bearing capacity of 1 ksf for footings on the 8 and 10 ft deep tanks, and 1.5 ksf for the 12 and 14 ft deep tanks. The NNTC review analyzed the designs utilizing the stiffness methods published in PCA's "Circular Concrete Tanks Without Prestressing" for a hinged base connection and tank full, no backfill condition. The tanks are structurally adequate for this assumed condition, and are also adequate for a full non-uniform backfill, tank empty condition.
Updates:	The original package did not address frost protection, high water table, kicker walls, unloading pad options, and floor steel. These have been addressed in PA Design Guide "PA-9 Design of Circular Concrete Manure Tanks using MWPS TR-9, dated November 1983". In addition, the minimum foundation bearing has been set at 2,000 PSF and the minimum wall thickness increased to 8". NRCS has received a copyright waiver and the plans do not need to be purchased from MWPS.
Concurrence	The Head of the NNTC Engineering Staff concurs in the use of the original design package and the PA State Conservation Engineer concurs with the use of the enhanced criteria found in Design Note PA-10.

Design Data Sheet for Standard Detail Drawing by:

NRCS – Iowa, Circular, Site Cast Waste Storage Facility

Designer: Morris Lobrecht, Design Team Leader 515-284-4364
Natural Resources Conservation Service
Suite 693, Federal Building, 210 Walnut St., Des Moines, IA 50309

Fabricator: Locally available contractors.

Drawings: IA-900 sheets 1 and 2, revised 5/99.

Location: Drawings were reviewed for conformance with PA Standard 313.
Design data are on file in NRCS-Iowa state office. Review was completed July 1999.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameters: 30 to 120 ft. in 15 ft. increments.
Walls: 8 ft and 10 ft high by 8 inches thick.
12 ft and 14 ft high by 10 inches thick.

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Lateral earth pressure of 60 psf with 120 psf surcharge, or 85 psf lateral earth pressure with no surcharge are assumed. Design assumes a foundation drain as shown on drawings. Backfill material must have less than 38% clay, and drain fill must be placed along the wall from the footing to 1/3 of the backfill height. Height of backfill against the structure walls shall not vary more than 3 feet. Minimum required soil bearing capacities are 2000 psf for tanks 10 feet and deeper, and 1500 psf for tanks less than 10 feet deep. An unloading access pad underlain with drain fill is required for heavy equipment loads adjacent to the tank wall. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

PAN-L-VAT CIRCULAR POST-TENSIONED, PRECAST
AgW Storage Structure

Owners: C & L Manufacturing & Distributing
Highway 3 East, Box 306
Edgewood, IA 52042 (319) 928-6987

Drawings: Sheet 1 of 2 has standard panel, jacking panel, strand placement, below ground tank, maximum backfill height, design stresses, and design loads (date 3/13/81).
Sheet 2 of 2 contains above ground tank and footing, and map of United States showing average annual frost penetration (no date).

Sizes: Structures range in size from 30 ft to 150 ft in diameter in 10 ft increments, and from 10 ft to 20 ft in height depending on the diameter. Wall panels are 4 ft wide and full structure height.

Materials: Wall panels are precast ribbed panels with Class 4000 psi concrete and Grade 60 ksi reinforcing bars plus welded wire fabric. The floor and footings are cast-in-place Class 4000 psi concrete with Grade 60 ksi reinforcing bars or welded wire fabric. The post-tensioning strands are plastic coated, stress-relieved 1/2 inch diameter strands with an ultimate strength of 270 ksi. Material reference specifications and required strengths are shown on the drawings or in the technical standards and specification booklets.

Location: Plans have been reviewed by the Midwest NTC for compliance with the structural aspects of Waste Storage Structure Practice Standard 313-80. Design folder is on file at the Midwest NTC. Review was completed in August 1981.

Application: Walls are designed for a tank full, no backfill condition, and a tank empty with backfill heights for different equivalent fluid pressures shown on the plans. Lateral earth pressures from 50 pcf to 115 pcf and a lateral wheel surcharge loads of 100 psf were assumed. Pressure uplift values are required if drainage of the water table below the floor slab can not be guaranteed.

Concurrence: The Head, of the Midwest NTC Engineering Staff concurs in the use of these detail drawings and they are to be used in accordance with NEM 536.02, paragraphs (a) and (b).

Patz Sales, Inc., Reinforced Concrete, Ag Waste Storage Structure

Owners: Patz Sales, Inc.
P.O. Box 7
Pound, WI 54161-0007
Telephone: (414) 897-2251

Designer: Milton A. Nero, P.E.
DePere, WI

Drawings: Patz Solid Manure Storage Plans and Specifications for Construction of Concrete Holding Areas for Above-Ground Storage and Manure dated (as revised) May, 1983 (document PA-2052 1.5M Rev. 5/83) consisting of 15 numbered sheets plus cover sheet

1. Facilities for Storage and Handling of Manure
2. Planning Considerations
3. Manure Storage Area for Patz Model 400 44' Manure Stacker
4. Plan View
5. Wall Footing and Reinforcing Detail
6. Specifications
7. Manure Storage Area for Patz Model 400 54' Manure Stacker
8. Plan View
9. Wall Footing and Reinforcing Detail
10. Specifications
11. Manure Storage Area for Patz Model 400 60' Manure Stacker
12. Plan View
13. Wall Footing and Reinforcing Detail
14. Specifications
15. Alternate Wall Footing and Reinforcing Detail

Sizes: Torus section or "arc" shaped (in plan) above ground reinforced concrete storage facilities (for use with pivoting manure stacker) varying from 90' centerline length and 42' in width (44' Manure Stacker). Walls are 8" and 12" thick (12" where manure stacker shuttles on wall top) and vary in height from 3' to 8', and typically are backfilled to half-height.

Location: Design notes and plans have been reviewed by the MNTC for compliance with the structural aspects of Conservation Practice Standard 313-80. Design folders are on file at the MNTC.

Materials: Walls, footings and floors are site cast with Class 3000 concrete and Grade 60 steel.

Data Sheet for Standard Detail Drawing by:

Precise Concrete Walls, (PCCT) Circular, Site Cast Waste Storage Facility

Designer: Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105

Fabricator: Precise Concrete Walls 717-354-2780
601 Overly Grove Rd., New Holland, PA 17557

Drawings: PC8CT1 thru 11 (dated 4/19/91), revised 9/25/91, 1/8/92, and 3/10/97 for 8 foot walls.
PC10CT1 (sealed 6/25/99) thru PC10CT4 and PC10CT11 revised 6/25/99;
PC10CT5 thru 10 dated 4/19/91; and PC10CT12 thru 17 dated 6/25/99 for 10 foot walls.
PC12CT1 (sealed 4/30/99), PC12CT3 and PC12CT4 revised 9/2/98
PC12CT2 and PC12CT11 revised 4/30/99; PC12CT5 thru 10 revised 2/11/91;
PC12CT12 and 13 dated 3/11/97; PC12CT14 dated 8/19/98; and PC12CT15 thru 17 dated 4/30/99 for 12 foot walls.
PC16CT1 thru 11 (dated 12/28/92), and PC16CT20 thru 30 (dated 2/15/00 and sealed 2/18/00) for 16 foot walls.

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in May 2000.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameters: 50 to 100ft. in 10ft. increments for 8 ft. walls.
50 to 160 ft. in 10ft. increments for 10, 12, & 16 ft. walls.
Walls: 8 ft. high by 7 in. thick. 10ft. high by 8 in. thick, 12 ft. high by 9 in. thick, 16 ft high by 10 in thick (50 thru 100' dia). & 16 ft high by 12 in thick (110 thru 160' dia)

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Lateral earth pressure of 45 psf and 100psf surcharge are assumed. The access pads, proportioned to eliminate lateral surcharge loads on the wall, are designed for 2 wheels of 7.5 k each. The alternate wall steel in lieu of access pad is designed for 2 wheels of 10k each. Minimum required soil bearing capacities are 1.0 ksf under floor slab, and 2.0 ksf + (110 pst multiplied by the depth below finished grade) for the footing. Backfill for frost protection is required. Design assumes a foundation drain as shown on drawings. Height of backfill against the structure walls shall not vary more than 4 feet. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Precise Concrete Walls, (PCCT) Circular, Site Cast Waste Storage Facility

- Designer:** Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105
- Fabricator:** Precise Concrete Walls 717-354-2780
601 Overly Grove Rd., New Holland, PA 17557
- Drawings:** PC8CT1 thru 11 (dated 4/19/91), revised 9/25/91, 1/8/92, and 3/10/97 for 8 foot walls.
PC10CT1 (sealed 6/25/99) thru PC10CT4 and PC10CT11 revised 6/25/99; PC10CT5 thru 10 dated 4/19/91; and PC10CT12 thru 17 dated 6/25/99 for 10 foot walls.
PC12CT1 (sealed 4/30/99), PC12CT3 and PC12CT4 revised 9/2/98; PC12CT2 and PC12CT11 revised 4/30/99; PC12CT5 thru 10 revised 2/11/91; PC12CT12 and 13 dated 3/11/97; PC12CT14 dated 8/19/98; and PC12CT15 thru 17 dated 4/30/99 for 12 foot walls.
PC16CT1 thru 11 (dated 12/28/92) for 16 foot walls.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed October 1998.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** Diameters: 50 to 100 ft. in 10 ft. increments for 8 and 16 ft. walls.
50 to 160 ft. in 10 ft. increments for 10 and 12 ft. walls.
Walls: 8 ft. high by 7 in. thick, 10 ft. high by 8 in. thick, 12 ft. high by 9 in. thick, and 16 ft high by 10 in thick.
- Applications:** PA Standard 313 for Medium (20 year) service life.
- Assumptions:** Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Lateral earth pressure of 45 psf and 100psf surcharge are assumed. The access pads, proportioned to eliminate lateral surcharge loads on the wall, are designed for 2 wheels of 7.5 k each. The alternate wall steel in lieu of access pad is designed for 2 wheels of 10 k each. Minimum required soil bearing capacities are 1.0 ksf under floor slab, and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Backfill for frost protection is required. Design assumes a foundation drain as shown on drawings. Height of backfill against the structure walls shall not vary more than 4 feet. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Precise Concrete Walls, (PCCT) Circular, Site Cast Waste Storage Facility

- Designer:** Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105
- Fabricator:** Precise Concrete Walls 717-354-2780
601 Overly Grove Rd., New Holland, PA 17557
- Drawings:** PC8CT1 thru PC8CT11 (dated 4/19/91), revised 9/25/91, 1/8/92, and 3/10/97) for 8 foot walls.
PC10CT1 thru PC10CT11 (dated 4/19/91, revised 9/25/91, 1/8/92, and 3/10/97) for 10 foot walls.
PC12CT1 thru PC12CT4 and PC12CT11 (dated 10/24/90 and revised 9/2/98), PC12CT5 thru PC12CT10 (revised 2/11/91), PC12CT12 and 13 (dated 3/11/97), and PC12CT14 (dated 8/19/98) for 12 foot walls.
PC16CT1 thru PC16CT11 (dated 12/28/92) for 16 foot walls.
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed October 1998.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** Diameters: 50 to 100 ft. in 10 ft. increments for 8, 10 and 16 ft. walls.
50 to 130 ft. in 10 ft. increments for 12 ft. walls.
Walls: 8 ft. high by 7 in. thick.
10 ft. high by 8 in. thick.
12 ft. high by 9 in. thick.
16 ft high by 10 in thick.
- Applications:** PA Standard 313 for Medium (20 year) service life.
- Assumptions:** Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Lateral earth pressure of 45 psf and 100psf surcharge are assumed. The access pads, proportioned to eliminate lateral surcharge loads on the wall, are designed for 2 wheels of 7.5 k each. The alternate wall steel in lieu of access pad is designed for 2 wheels of 10 k each. Minimum required soil bearing capacities are 1.0 ksf under floor slab, and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Backfill for frost protection is required. Design assumes a foundation drain as shown on drawings. Height of backfill against the structure walls shall not vary more than 4 feet. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

Precise Concrete Walls, (PCCT) Circular, Site Cast Agwaste Tanks

Designer: Robert D. Hyland, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419, Kansas City, MO 64105

Fabricator: Precise Concrete Walls 717-354-2780
601 Overly Grove Rd., New Holland, PA 17557 *Mr. Elmer King*

Drawings: PC8CT1 thru PC8CT11 (dated 4/19/91, revised
9/25/91, 1/8/92, and 3/10/97) for 8 foot wall.
PC10CT1 thru PC10CT11 (dated 4/19/91, revised
9/25/91, 1/8/92, and 3/10/97) for 10 foot wall.
PC12CT1 thru PC12CT13 (dated 10/24/90, revised
2/11/91, 1/8/92, and 3/11/97) for 12 foot wall.
PC16CT1 thru PC16CT11 (dated 12/28/92) for 16 foot
wall.

Location: Calculations and drawing were reviewed for
compliance with PA Standard 313. Design data are
on file in PA state office. Most recent review was
completed April 1997.

Materials: Reinforced concrete footings, floor slabs, walls,
and access pads require Grade 60 steel with Class
4000 air-entrained concrete.

Sizes: Diameters: 50 to 100 ft. in 10 ft. increments for
8, 10, and 16 ft. walls.
50 to 120 ft. in 10 ft. increments for
12 ft. walls.
Walls: 8 ft high by 7 in thick.
10 ft high by 8 in thick.
12 ft high by 9 in thick.
16 ft high by 10 in thick.

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full backfill, structure
empty and structure full, no backfill conditions.
Lateral earth pressure of 45 psf and 100 psf
surcharge are assumed. The access pads,
proportioned to eliminate lateral surcharge loads
on the walls, are designed for 2 wheels of 7.5 k
each. The alternate wall steel in lieu of access
pad is designed for 2 wheels of 10 k each. Minimum
required soil bearing capacities are 1.0 ksf,
floor slabs and 2.0 ksf plus 110 psf multiplied by
the depth below grade in feet for the footings.
Backfill for frost protection of the footings is
required. Design assumes a foundation drain as
shown on drawings. Height of backfill against the
structure walls shall not vary more than 4 feet.
Structure diameters between those shown may be
used provided the reinforcing steel for the next
larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use
of these standard detail drawings.

PRECISE CONCRETE WALLS (PCCT) Circular, Site Cast Concrete,
Waste Storage Structure

Designer: Robert D. Hyland, PE
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419
Kansas City, MO 64105 (816) 412-4232

Fabricator: Precise Concrete Walls
601 Overly Grove Road
New Holland, PA 17557 (717) 354-2780

Drawings: PCC3CT1 through PC8CT11 (Dated 4/19/91, revised 9/25/91 and
1/8/92) for 8 ft wall.
PC10CT1 through PC10CT11 (Dated 4/19/91, revised 9/25/91 and
1/3/92) for 10 ft wall. PC12CT1 through PC12CT11 (Dated 10/24/90, revised 2/11/91
and 1/8/92) for 12 ft wall.
PC12CT1 through PC12CT11 (Dated 12/24/90, Revised 2/11/91 and
1/8/92) for 12 ft wall.
PC16CT through PC16CT11 (Dated 12/28/92) for 16 ft wall.

Location: Calculations and drawings have been reviewed for compliance
with National Conservation Practice Standard 313.80. Design
folders are on file at PA state office and NNTC. The most
recent review was completed March 1993.

Materials: Reinforced concrete footings, floor slabs, walls, and access
pads require Grade 60 steel with Class 3000 air-entrained
concrete (12 ft walls), Class 3500 air-entrained concrete (8 &
10 ft walls), and Class 4000 air-entrained concrete (16 ft
walls).

Sizes: Diameters: 50 to 100 ft. diameters in 10 foot increments.
Walls: 8 ft high by 7 in thick;
10 ft high by 8 in thick;
12 ft high by 9 in thick;
16 ft high by 10 in thick.

Application: National Conservation Practice Standard 313-80 for Medium (20
year) service life.

Assumptions: Walls are designed for a full backfill, structure empty and
structure full, no backfill condition. Lateral earth pressure
of 45 psf and 100 psf surcharge are assumed. The access pads,
proportioned to eliminate lateral surcharge loads on the
walls, are designed for 2 wheels of 7.5 k each. Minimum
required soil bearing capacities are 1.0 ksf, floor slabs and
2.0 ksf plus 110 psf multiplied by the depth below grade in
feet for the footings. Backfill for frost protection of the
footings is required. Design assumes a foundation drain as
shown on drawings. Height of backfill against the structure
walls shall not vary more than 4 feet. Structure diameters
between those shown may be used provided the reinforcing steel
for the next larger diameter is used.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of
these detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Precise Concrete Walls, (PCUE) Circular, Site Cast Waste Storage Facility

Designer: Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105

Fabricator: Precise Concrete Walls 717-354-2780
601 Overly Grove Rd., New Holland, PA 17557

Drawings: PC12UE1 thru PC4UE3 (dated 3/24/94 & revised 9/10/98).
PC12UE4 (revised 10/29/98).
PC12UE5 thru PC12UE10 (dated 3/24/94 & revised 8/25/94).
PC12UE11 thru PC12UE13 (dated 9/10/98 & revised 10/29/98).

Location: Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review was completed November 1998.

Materials: Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameters: 50 to 130 ft. in 10 ft. increments for 12 ft. walls.
Walls: 12 ft. high by 9 in. thick.

Applications: PA Standard 313 for Medium (20 year) service life.

Assumptions: Walls are designed for full and uneven backfill with a maximum 10 foot variation in backfill height with the structure empty and the structure full, and for no backfill conditions. Lateral earth pressure of 45 psf and 100 psf surcharge are assumed. The access pad, proportioned to eliminate lateral surcharge loads on the wall, is designed for 2 wheel loads of 7.5 k each. The alternate wall steel in lieu of access pad is designed for 2 wheel loads of 7.5 k each. Minimum required soil bearing capacities are 1.0 ksf under floor slab, and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Backfill for frost protection of footings is required. Design assumes a foundation drain as shown on drawings. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.

Concurrence: The State Conservation Engineer concurs in the use of these standard detail drawings.

PRECISE Concrete Walls, Site Cast, Circular,
Waste Storage Structures

Designer: Robert D. Hyland, PE
Norton & Schmidt, Consulting Engineers
1100 Main Street, Suite 419
Kansas City, MO 64105 (816) 421-4232

Fabricator: PRECISE Concrete Walls
601 Overly Road
New Holland, PA 17557 (717) 354-2780

Drawings: PC12UE1 (Dated 3/24/94) Typical Wall Section & Plan View
PC12UE2 (Rev. 8/25/94) Exterior Chimney and Access Pad
PC12UE3 (Rev. 8/25/94) Reinforcement at Pipe Openings
PC12UE4 (Rev. 8/25/94) General Notes
PC12UE5 through PC12UE10 (Rev. 8/25/94) Reinforcing Tables

Location: Calculations and drawings have been reviewed for compliance with National Conservation Practice Standard 313-80. Design folders are on file at the PA state office and the NNTC. The review was completed in August 1994.

Materials: Reinforced concrete footings, floor slabs, walls and access pads require Grade 60 steel with Class 4000 air-entrained concrete.

Sizes: Diameters: 50 to 100 feet in 10 foot increments.
Walls: Wall height for all diameters is 12 feet.

Application: National Conservation Practice Standard 313-80 for medium (20 year.) service life.

Assumptions: Walls are designed for full and uneven backfill with a maximum 10 foot variation in backfill height with the structure empty and structure full and for no backfill conditions. Lateral earth pressure of 45 psf with a 100 psf surcharge are assumed. The access pads, proportioned to eliminate lateral surcharge loads on the walls, are designed for 2 wheel loads of 7.5 kips each. Minimum required soil bearing capacities are 1.0 ksf for floor slabs and 2.0 ksf plus 110 psf multiplied by the depth below grade in feet for the footings. Backfill for frost protection of the footings is required. Design assumes a foundation drain as shown on the drawings. Structure diameters between those shown may be used provided the reinforcing steel for the next larger diameter is used.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these detail drawings.

Design Data Sheet for Standard Detail Drawing by:

Precise Concrete Walls, (PC16UE) Circular, Site Cast Waste Storage Facility

- Designer:** Rodney W. Sommer, PE 816-421-4232
Norton & Schmidt, Consulting Engineers
Suite 419, 1100 Main Street, Kansas City, MO 64105
- Fabricator:** Precise Concrete Walls 717-354-2780
601 Overly Grove Rd., New Holland, PA 17557
- Drawings:** PC16UE1 thru 6 (dated 7/18/00).
PC16UE7 revised 7/27/00.
PC16UE8 thru 19 (dated 7/17/00).
- Location:** Calculations and drawing were reviewed for conformance with PA Standard 313. Design data are on file in NRCS-PA state office. Review of latest revision was completed in May 2004.
- Materials:** Reinforced concrete footings, floor slabs, walls, and access pads require Grade 60 steel with Class 4000 air-entrained concrete.
- Sizes:** Diameters: 50 to 160 ft. in 10 ft. increments.
Walls: 16 ft. high by 10 in. thick with a single layer of steel for 50 to 100 ft. diameter tanks.
16 ft. high by 12 in. thick with 2 layers of steel for 110 to 160 ft. diameter tanks.
- Applications:** PA Standard 313.
- Assumptions:** Walls are designed for full backfill, structure empty and structure full, minimum backfill conditions. Height of backfill shall vary no more than 14 feet, and the minimum backfill shall be three feet (or frost depth) above the base of the footing. Lateral earth pressure of 45 psf and 100 psf surcharge are assumed. Maximum equipment weight within 16 feet of tank is 1500 lbs. unless an equipment access pad or additional wall steel (for loads up to 15,000 lbs) is installed as shown in the drawings. Minimum required soil bearing capacities are 1.0 ksf under floor slab, and 2.0 ksf + (110 psf multiplied by the depth below finished grade) for the footing. Design assumes a foundation drain as shown on drawings. Structure diameters between those shown shall be installed with the reinforcing steel for the next larger 10 foot diameter increment.
- Concurrence:** The State Conservation Engineer concurs in the use of these standard detail drawings.

RIBCAST Circular, Precast Concrete, Waste Storage Structures

Designer: Gerald L. Kilheffer, PA P.E. 31602-E
P.O. Box 152
Brownstown, PA 17508

Fabricators: Ribcast Systems Co.
49 Wolf Road
Akron, PA 17501
(717) 359-3324

Drawings: B-1000, B-2000, B-3000 dated 12-15-83

Location: Plans have been reviewed in detail by NNTC for compliance with structural aspects of National Conservation Practice Standard 313-80. Design folders are on file at the NNTC. Reviews were completed in February, 1984.

Material: The circular structure consists of 8 ft. wide, 12 ft. high precast waffle panels with Class 5000 concrete and Grade 40 steel. Minimum concrete cover on principal steel is 3/4 inch. The panels are held together with galvanized Grade 60 silo hoops. The ring footing and articulated slab are site cast Class 3500 concrete. All joints contain a butyl seal.

Sizes: 12 ft. high and 60 ft. diameter.

Application: National Conservation Practice Standard 313-80 for Medium (20 year) service life.

Assumptions: Design assumes a sliding base connection and considers a tank full, no backfill condition and a tank empty, 4 ft. high backfill condition. Backfill assumed is sandy silts and clays with 70 pcf EFP. A perimeter footing drain is also assumed. No wall surcharge loading is considered.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of this detail drawing.

SLURRYSTORE SYSTEM – 90 SERIES

Designer & Fabricator: Engineered Storage Products, Inc.
345 Harvestore Drive
DeKalb, IL 60115 (815) 756-1551

Drawings & Sizes: Drawing numbers and nominal structure sizes are as follows:

Shell Assembly		
Drawing No.	Diameter (ft)	Height (ft)
261283	42	14, 19, 23 & 28
261284	62	14, 19, 23 & 28
261285	81	14, 19, 23 & 28
261286	101	14, 19, 23 & 28
262358	120	10, 14, 19, 23 & 28
261282	Foundation Assembly, all sizes	
261289	Foundation Construction Details, all sizes	
257014	Cathodic Protection System, all sizes	

Note: The minimum height shown for 42 thru 101 ft diameter structures is 14 ft. It is permissible to eliminate the bottom row of shell sheets from the 14 ft height models to produce a 19 ft nominal structure height if desired. All other requirements remain the same as for the 14 ft height model.

Each structure is furnished with a nameplate which identifies the Model No., structure size (diameter and height), and a Serial No..

Materials: The structure shell consists of glass fused to steel sheets that are bolted together. Footing walls and floor are reinforced concrete. Cathodic protection is provided by zinc anodes electrically connected to the shell sheets and the floor and footing reinforcement.

Assumptions: The shell design assumes above ground application only. Footing sizes are designed for a maximum allowable bearing capacity of 2000 psf. Footing strength design is based on a minimum 3000 psi concrete strength. Wind design considerations are based on a wind speed of 80 mph.

Applications: National Conservation Practice Standard 313 "Waste Storage Structure" for Medium (20 year) service life.

Concurrence: December 8, 1993. The Head, Midwest NTC Engineering Staff concurs in the use of these detail drawings.

Note: This sheet was re-typed to update the company name. The rest of the sheet is identical to the original.

SLURRYSTORE SYSTEM – 90 SERIES

Designer: Mr. David Frederick, P.E.
Product Manager
Engineered Storage
345 Harvestore Drive
De Kalb, IL 60115 (815) 756-1551

Fabricator: Mr. Frank Possessky
Penn Jersey Products, Inc
PO Box 7
New Holland, PA 17557 (717) 354-4051

Drawing & Sizes: Drawing numbers and nominal structure sizes are as follows:

Shell Assembly

Drawing No.	Diameter (ft)	Height (ft)
261283	42	14, 19, 23, & 28
261284	62	14, 19, 23, & 28
261285	81	14, 19, 23, & 28
261286	101	14, 19, 23, & 28
262358	120	10, 14, 19, 21 & 28

261182 Foundation Assembly. all sizes

261289 Foundation. Construction Details all sizes

257014 Cathodic Protection System, all sizes

Note: The minimum height shown for 42 thru 101 ft diameter structures is 14 ft. It is permissible to eliminate the bottom row of shell sheets from the 14 ft height models to produce a 10 ft nominal structure height if desired. All other requirements remain the same as for the 14 ft height model.

Each structure is furnished with a nameplate which identifies the Model No., structure size (diameter and height), and a Serial No.

Materials: The structure shell consists of glass fused to steel sheets that are bolted together. Footing walls and floor are reinforced concrete. Cathodic protection is provided by zinc anodes electrically connected to the shell sheets and the float and footing reinforcement.

Assumptions: The shell design assumes above ground application only. Footing sizes are designed for a maximum allowable bearing capacity of 2000 psf. Footing strength design is based on a minimum 3000 psi concrete strength. Wind design considerations are based a wind speed of 80 mph.

Application: National Conservation Practice Standard 313. "Waste Storage Structure for Medium (20 year) service life.

Concurrence: December 8, 1993. The Head. Midwest NTC Engineering Staff concurs in the use of these detail drawings.

SLURRYSTORE (90 Series) Circular, Glass-Fused Steel,
Waste Storage Structure

Designer: Mr. David Frederick, P.E.
Product Manager
Engineered Storage
345 Harvestore Drive
De Kalb, IL 60115 (815) 756-1551

Fabricator: Mr. Frank Possessky
Penn Jersey Products, Inc
PO Box 7
New Holland, PA 17557 (717) 354-4051

Drawing & Sizes: Drawing numbers and nominal structure sizes are as follows:

Shell Assembly		
Drawing No.	Diameter (ft)	Height (ft)
2-261283	42	14, 19, 23, & 28
2-261284	62	14, 19, 23, & 28
2-261285	81	14, 19, 23, & 28
2-261286	101	14, 19, 23, & 28
2-261182	Foundation Assembly. all sizes	
2-261289	Foundation. Construction Details all sizes	
2-257014	Cathodic Protection System, all sizes	

Structures can be identified by the Model No. shown on their nameplate. The first two numbers indicate the series (90 Series). The second set of 2 or 3 numbers indicate the nominal diameter. The last two numbers indicate the nominal height. The 90 Series replaced the 50A and SOB Series that were originally concurred in by the NNTC in 1979.

Materials: The structure shell consists of glass fused to steel sheets that are bolted together. Footing walls and floor are reinforced concrete. Cathodic protection is provided by zinc anodes electrically connected to the shell sheets and the floor and footing reinforcement

Application: SCS Practice Standard 313 for med. (20 yr.) service life.

Assumptions: The shell design assumes above ground application only. Footing sizes are designed for a maximum allowable bearing capacity of 2000 psf. Footing strength design is based on a minimum 3000 psi concrete strength. Wind design considerations are based a wind speed of 70 mph.

Concurrence: The Head of the NNTC Engineering Staff concurs in the use of these Standard Detailed Drawings.

SLURRYSTORE SYSTEM, Circular, Site assembled, Exopy Coated Steel Panels
Waste Storage Facility

Designer & Farbricator:	CST STORAGE 345 Harvestore Drive De Kalb, IL 60115 (815) 756-1551
Drawings:	CST Storage now supplies a site specific, 26+ page engineering submittal of drawings and specifications with each Slurrystore.
Location:	The original submittal was reviewed by Wisconsin NRCS and sent to the Midwest NTC Engineering Staff for final approval. At that time, shop drawing were reviewed and approved. The exact information is now supplied as part of the 26+ page engineering submittal for each slurrystore that is designed for a specific location.
Materials:	The structure shell consists of glass fused to steel sheets that are bolted together. Footing walls and floor are reinforced concrete. Cathodic protection is provided by zinc anodes electrically connected to the shell sheets and the float and footing reinforcement.
Size:	Typical heights are 10, 14, 19, 23, and 28 feet. Typical diameters are 42, 50, 59, 62, 70, 78, 81, 95, 101, 112, 120, 123, 131, and 140 feet. This information is now in a four or five digit model number. The last two digits representing the height and the others the diameter. Dealers can request intermediate and larger diameters.
Assumptions:	The shell design assumes above ground application only. Footing sizes are designed for a maximum allowable bearing capacity of 2,500 psf. Footing strength design is based on a minimum 3,000 psi concrete strength. Wind design considerations are based a wind speed of 80 mph. The selected starter ring sets the maximum tank height.
Updates:	A unique design package is provided for each site. Higher tanks may include an access portal. The "90A" part of the structure model number has been dropped. The structure size is used to designate a model number.
Application:	National Conservation Practice Standard 313. Waste Storage Structure for Medium (20 year) service life.
Concurrence:	December 8, 1993, The Head of the Midwest NTC Engineering Staff concurred in the use of these detail drawings.