

United States Department of Agriculture



Natural Resources Conservation Service  
210 Walnut Street, Room 693  
Des Moines, IA 50309-2180

March 17, 2008

ENGINEERING FIELD HANDBOOK (NEH Part 650)  
IA210-ENG-AMENDMENT IA51, CHAPTER 17

PURPOSE: This notice transmits pages IA17-53(1-9) dated March 2008.

Effective Date: This Amendment is effective upon receipt.

Filing Instructions: The following pages should be filed in the Engineering Field Handbook as indicated below:

Remove Pages

IA17-54(11.1-11.12)                      dated September 1987

Insert Pages

IA17-53(1-9)                                dated March 2008

This amendment provides an updated list of pre-approved Agricultural Waste Storage Structures for use in Iowa.

/s/Al Garner  
Acting State Conservationist

Attachment

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EN2  
DSC  
SCE's Central Region



# AGRICULTURAL WASTE<sup>1</sup> STORAGE STRUCTURES

## APPROVED STANDARD PLANS

### General

“Pre-engineered” waste storage structures or components are only a portion of a waste management system construction plan. The remainder of the construction plan including the location map, site layout, soils data, pertinent elevations, manure transfer, and any other needed components, practices, or details must be assembled. The final construction plan must be approved by a person with the appropriate NRCS engineering job approval authority or signed and sealed by a Professional Engineer licensed to practice in the State of Iowa.

### Approved Pre-Engineered Agricultural Waste Storage Structures

The following pages provide information about pre-engineered agricultural waste storage structures that are approved for use in Iowa.

It is the engineer's responsibility to verify the following when using the structures on the list:

1. The site design and capacity requirements proposed by the engineer and/or supplier meets current Iowa NRCS practice standards and statements of work.
2. The specific size/drawing/condition that is being used meets the limitations shown for each product on the following pages.
3. The assumptions for the design are met at the site. For example, actual geotechnical loadings must be determined and documented for each site.
4. The construction is completed in a manner consistent with the design and installation requirements of the specific product.

**Note:** Approved standard designs/drawings originating in other states and not shown on this list may be used if a design review verifies that the design/drawings meet Iowa's NRCS practice standards. Any variation from a standard plan on this list to its design assumptions requires approval of the State Conservation Engineer.

<sup>1</sup>**Agricultural waste** is defined in the Agricultural Waste Management Field Handbook as waste normally associated with the production and processing of food and fiber on farms, feedlots, ranches, ranges, and forests which may include animal manure, crop and food processing residues, agricultural chemicals, and animal carcasses.

<b>AMERICAN STRUCTURES, INC.</b>																								
<b>RELOCATION OF A.O. SMITH HARVESTORE "SLURRYSTORE" STRUCTURES</b>																								
Contractor (Fabricator)	American Structures, Inc. P.O. Box 409 Menomonie, WI 54751 (715) 235-4225																							
Description	Metal above ground storage tank. Shell consists of used A.O. Smith Harvestore "Slurrystore" 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, the floor, and the footing reinforcement.																							
Designers	<u>Stainless Steel Starter Ring</u> : Steven Poethke, P.E., Cooper Engineering Co., Inc., Rice Lake, WI <u>Cathodic Protection</u> : Ralph W. Stephens, P.E., Cathodic Protection Services, Houston, TX <u>Certification to present Standard 313</u> : Timothy J. Auth, P.E., Auth Consulting Associates Menomonie, WI																							
Drawings	American Structures Inc., developed a specification titled "Relocation and Rebuilding Specification for Liquid Manure Storage Tanks", revised May 2001. A copy may be obtained from the fabricator. Drawings and details are contained within this document. This specification covers the relocation of the following A.O. Smith Harvestore products: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Series</th> <th style="text-align: center;">Diameter</th> <th style="text-align: center;">Drawing No.</th> </tr> </thead> <tbody> <tr> <td rowspan="4" style="vertical-align: top;">50A &amp; 50B</td> <td style="text-align: center;">25'</td> <td style="text-align: center;">253969</td> </tr> <tr> <td style="text-align: center;">42'</td> <td style="text-align: center;">253970</td> </tr> <tr> <td style="text-align: center;">62'</td> <td style="text-align: center;">253971</td> </tr> <tr> <td style="text-align: center;">81'</td> <td style="text-align: center;">253972</td> </tr> <tr> <td rowspan="5" style="vertical-align: top;">90</td> <td style="text-align: center;">101'</td> <td style="text-align: center;">253973</td> </tr> <tr> <td style="text-align: center;">42'</td> <td style="text-align: center;">2-261283</td> </tr> <tr> <td style="text-align: center;">62'</td> <td style="text-align: center;">2-261284</td> </tr> <tr> <td style="text-align: center;">81'</td> <td style="text-align: center;">2-261285</td> </tr> <tr> <td style="text-align: center;">101'</td> <td style="text-align: center;">2-261286</td> </tr> </tbody> </table>	Series	Diameter	Drawing No.	50A & 50B	25'	253969	42'	253970	62'	253971	81'	253972	90	101'	253973	42'	2-261283	62'	2-261284	81'	2-261285	101'	2-261286
Series	Diameter	Drawing No.																						
50A & 50B	25'	253969																						
	42'	253970																						
	62'	253971																						
	81'	253972																						
90	101'	253973																						
	42'	2-261283																						
	62'	2-261284																						
	81'	2-261285																						
	101'	2-261286																						
Assumptions	The following is a partial list of assumptions from the specifications noted above: <ul style="list-style-type: none"> <li>• The reconstructed unit is the same diameter and height as the original installation.</li> <li>• All parts previously set in concrete are replaced with new parts, equivalent to original equipment.</li> <li>• All hardware required for tank assembly will be new and equivalent in size and strength to original equipment.</li> <li>• The agitation and unloading system enters the structure through the floor slab.</li> <li>• A new cathodic protection system will be installed.</li> <li>• Concrete compressive strength will be 4,000 psi.</li> <li>• Reinforcing bars will be Grade 60.</li> <li>• The starter ring is stainless steel, Type 304 with 0% cold reduction strength values of <math>F_y = 40,000</math> psi and <math>F_u = 90,000</math> psi.</li> </ul>																							
Limitations	<ul style="list-style-type: none"> <li>• Pre-approval is subject to the structure being constructed following the approved specification booklet and the following limitations. This is to be verified by American Structures, Inc., in the form of a letter to the customer.</li> <li>• Floor slab reinforcement shall meet the requirements of Iowa Natural Resources Conservation Service (NRCS) Conservation Standard 313, Waste Storage Facility, for applications where liquid-tightness is required. Wire mesh shall not be used in the floor.</li> <li>• Hydrophilic waterstops shall be those approved for use in waste storage facilities as listed in the Hydrophilic Waterstop section of Chapter 17 of the EFH.</li> </ul>																							
Application	Iowa NRCS Practice Standard 313, Waste Storage Facility																							
Concurrence	An independent review of the structure was performed by Auth Consulting Associates. They determined the design met the structural design requirements of NRCS Standard 313.  The State Conservation Engineer in Wisconsin accepted the independent engineering review and revisions to the installation manual for compliance with Wisconsin NRCS Conservation Standard 313.  September 3, 1996. The state engineer in Wisconsin approved the specification booklet. This approval is adopted by the state engineer in Minnesota.  <b>The State Conservation Engineer in Iowa approves the use of these models.</b>																							

<b>ENGINEERED STORAGE PRODUCTS COMPANY (A.O. SMITH HARVESTOR PRODUCTS, INC.)</b>	
Designer (Fabricator)	A.O. Smith Engineered Storage Products Company 345 Harvestore Drive DeKalb, IL 60115 (815) 756-1551
Description	Metal above ground storage tank. 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 and the floor and footing reinforcement.
Drawings	The construction drawings are proprietary and not for distribution.  The installation manual titled "Slurrystore Structure Construction Manual", copyright 1999 is to be available from the fabrication crew on-site. This manual covers all the 90-Series and 96-Series Structures.
Models	Each structure is furnished with a name plate which identifies the model number, structure size (diameter and height), and a serial number.
Sizes	See following tables.
Materials	The structure shell consists of glass fused to steel sheets that are bolted together. Footing walls and floor are 3,500 psi concrete in accordance with Wisconsin Construction Specification 4, Concrete, and reinforced with Grade 60 steel bars. Cathodic protection is required and is provided by zinc anodes electrically connected to the shell sheets and the floor and footing reinforcement. Foundation sheets contain a two-part continuous seal. The upper sealant is a gray seal strip. Directly below is a bentonite seal strip. This bentonite strip may also be used for sealing pipe penetrations through the concrete floor. The seal strip materials are <u>not</u> to be applied to the sheets or pipe penetrations at temperatures below 20°F.
Assumptions	The shell design assumes above ground application only (no backfill). Footing strength design is based on a minimum 3,000 psi concrete strength. The final concrete floor slab reinforcement will be determined by the installer based on the tank diameter to be constructed. Most slabs will be reinforced to allow a monolithic pour.
Limitations	Pre-approval is subject to the structure being constructed following the approved drawings and specifications and the following limitation.
Application	Iowa NRCS Practice Standard 313, Waste Storage Facility
Concurrence	The State Conservation Engineer in Illinois has concurred in an independent review performed by a consultant that the structural design is in accordance to NRCS Standard 313.  <b>The State Conservation Engineer in Iowa approves the use of these models.</b>

**ENGINEERED STORAGE PRODUCTS COMPANY  
(A.O. SMITH HARVESTOR PRODUCTS, INC.)**

Slurrystore Model Number	Structure I.D. ft-in	Structure Height ft-in	Slurrystore Model Number	Structure I.D. ft-in	Structure Height ft-in
90A-4214	41'-11 9/16"	14'-2 11/16"	96A-5010	50'-4 13/16"	9'-7 11/16"
90A-4219	41'-11 9/16"	18'-9 11/16"	96A-5014	50'-4 13/16"	9'-7 11/16"
90A-4223	41'-11 9/16"	23'-4 11/16"	96A-5019	50'-4 13/16"	9'-7 11/16"
90A-4228	41'-11 9/16"	27'-11 5/8"			
			96A-5910	58'-9 11/16"	9'-7 11/16"
90A-6214	61'-6 1/2"	14'-2 11/16"	96A-5914	58'-9 11/16"	9'-7 11/16"
90A-6219	61'-6 1/2"	18'-9 11/16"	96A-5919	58'-9 11/16"	9'-7 11/16"
90A-6223	61'-6 1/2"	23'-4 11/16"			
90A-6228	61'-6 1/2"	27'-11 5/8"	96A-7010	70'-0"	9'-7 11/16"
			96A-7014	70'-0"	9'-7 11/16"
7009	69'-11 1/8"	9'-7 11/16"	96A-7019	70'-0"	9'-7 11/16"
7014	69'-11 1/8"	14'-2 11/16"			
7018	69'-11 1/8"	18'-9 11/16"	96A-7810	78'-4 7/8"	9'-7 11/16"
7023	69'-11 1/8"	23'-4 11/16"	96A-7814	78'-4 7/8"	9'-7 11/16"
			96A-7819	78'-4 7/8"	9'-7 11/16"
90A-8114	81'-1 1/2"	14'-2 11/16"			
90A-8119	81'-1 1/2"	18'-9 11/16"	96A-9510	95'-2 1/2"	9'-7 11/16"
90A-8123	81'-1 1/2"	23'-4 11/16"	96A-9514	95'-2 1/2"	9'-7 11/16"
90A-8128	81'-1 1/2"	27'-11 5/8"	96A-9519	95'-2 1/2"	9'-7 11/16"
90A-10114	100'-8 1/2"	14'-2 11/16"	96A-11210	112'-0 1/8"	9'-7 11/16"
90A-10119	100'-8 1/2"	18'-9 11/16"	96A-11214	112'-0 1/8"	9'-7 11/16"
90A-10123	100'-8 1/2"	23'-4 11/16"	96A-11219	112'-0 1/8"	9'-7 11/16"
90A-10128	100'-8 1/2"	27'-11 5/8"			
			96A-12310	123'-2 9/16"	9'-7 11/16"
90A-12010	120'-3 1/2"	9'-7 11/16"	96A-12314	123'-2 9/16"	9'-7 11/16"
90A-12014	120'-3 1/2"	14'-2 11/16"	96A-12319	123'-2 9/16"	9'-7 11/16"
90A-12019	120'-3 1/2"	18'-9 11/16"			
90A-12023	120'-3 1/2"	23'-4 11/16"	96A-14010	140'-0 3/16"	9'-7 11/16"
90A-12028	120'-3 1/2"	27'-11 5/8"	96A-14014	140'-0 3/16"	9'-7 11/16"
			96A-14019	140'-0 3/16"	9'-7 11/16"

<b>HUFFCUTT CONCRETE</b>																	
Owner (Fabricator)	Huffcut Concrete 737 Herbert Street Chippewa Falls, WI 54729 (715) 723-7446																
Designer	Gary K. Munkelt, P.E., Gary K. Munkelt & Associates, Souderton, PA																
Description	Precast concrete T-Panels for manure storage.																
Drawings	Gary K. Munkelt and Associates prepared a design, drawings, and construction manual for precast concrete T-panels 8'-6", 10'-6", and 12'-6" in height. The design and drawing documents show a latest revision date of May 11, 2004. The construction manual is dated March 2003. The design for all three panel heights were sealed and signed by Gary K. Munkelt, P.E., and dated May 13, 2004.																
Materials	The structure is precast concrete, 5,000 psi, reinforced with Grade 40 steel and 65,000 psi welded wire fabric. The floor slab is 3,500 psi concrete. The manure panels are bolted together with two layers of 3/4" x 1" Conseal CS-231 (or equivalent), controlled expansion sealant, and placed between the units. Conseal CS-1500, elastomeric sealant (or equivalent) is applied to the inside and outside joint surface. A 12-inch wide Conseal CS-231 (or equivalent) will be installed at toe of each panel and extended 6 inches over the anchor bolt prior to pouring the concrete over the panel base.  Two 5-foot wide closure panels are used to complete the structure perimeter. A waterstop and horizontal reinforcing bars are cast into the closure panels and remain exposed to facilitate the closure concrete pour. Vertical reinforcement is added to match the adjoining precast panel reinforcement. The infill concrete is to be 4,500 psi.																
Assumptions	The weight of the soil used in the design was 110 psf. A lateral earth pressure is 85 psf/ft of depth was assumed. No concentrated loads due to machinery are allowed within 5 feet of the wall. A pumping dock design and access ramp details are included with the design submittal. The concrete strength used in this design is 4,000 psi. Pumping dock options include precast and poured in place construction details. This information is contained in the design submittal only and not in the construction manual. The maximum filling capacity assumed in the panel design was 1 foot below the panel top. In addition, the floor slab is poured over the panel base. This further reduces the available storage depth in the unit 11 inches. Therefore, the total depth available for manure storage computation is 1.9 feet less than the total panel height (see table).  Minimum and maximum soil backfill heights used in the design are shown in the table below: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Panel Height</th> <th>Minimum Backfill (ft)*</th> <th>Maximum Backfill (ft)*</th> <th>Available Manure Storage Depth (ft)</th> </tr> </thead> <tbody> <tr> <td>8'-6"</td> <td>1.5</td> <td>6.5</td> <td>6.6</td> </tr> <tr> <td>10'-6"</td> <td>1.5</td> <td>7.5</td> <td>8.6</td> </tr> <tr> <td>12'-6"</td> <td>1.5</td> <td>10.5</td> <td>10.6</td> </tr> </tbody> </table> * Measured from the bottom of the panel base.	Panel Height	Minimum Backfill (ft)*	Maximum Backfill (ft)*	Available Manure Storage Depth (ft)	8'-6"	1.5	6.5	6.6	10'-6"	1.5	7.5	8.6	12'-6"	1.5	10.5	10.6
Panel Height	Minimum Backfill (ft)*	Maximum Backfill (ft)*	Available Manure Storage Depth (ft)														
8'-6"	1.5	6.5	6.6														
10'-6"	1.5	7.5	8.6														
12'-6"	1.5	10.5	10.6														
Application	Iowa NRCS Practice Standard 313, Waste Storage Facility																
Review & Acceptance	A review of the structural design submitted by the consulting engineer was performed by NRCS staff at the National Design Center in Fort Worth, Texas. The State Conservation Engineer in Wisconsin accepts that the design submitted meets the structural requirements of NRCS Standard 313.  Conditions of Wisconsin Approval: Huffcutt Concrete's design and installation manual requires that the wall panels and floor be placed on a stone or stone and sand base material. Soils under the base material must meet Wisconsin NRCS Standard 313 Table 1 or Table 2. Soils that are imported to satisfy Table 2 must be extended 3 feet beyond the wall panel base. Soils placed against the panel sides must meet Standard 313 Table 1, Table 2, or Table 5 (Concrete Composite).  <b>The State Conservation Engineer in Iowa adopts the structural approval by the State Engineer in Wisconsin and approves the structure for use in Iowa with the above limitations.</b>																

<b>MIDWEST PLAN SERVICE CIRCULAR-SITE CAST CONCRETE WASTE STORAGE STRUCTURES</b>	
Designer	Midwest Plan Service Agricultural Engineering Department Iowa State University Ames, IA 50011 (515) 294-4337
Drawings	TR-9 'Circular Concrete Manure Tanks' dated November 1983, Revised 1999.
Sizes	Heights of 8, 10, 12, 14 ft. and 30, 60, 90, 120 ft. diameters. Wall thicknesses vary from 6 inches on the smaller tanks to 12 inches on the larger.
Materials	The circular structure consists of site cast Class 4000 psi concrete with Grade 60 steel.
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 Pre-stressing" 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.
Limitations	The drawings do not show any minimum backfill which would be necessary in cold areas to provide adequate frost depth to the bottom of the footings. The drawings do not show any drainage which would be necessary in areas below the seasonal groundwater table to relieve uplift pressures under the nonstructural floor slab.
Application	Iowa NRCS Practice Standard 313, Waste Storage Facility
Review & Acceptance	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 were completed in June 1989.  The Head of the NNTC Engineering Staff concurs in the use of these detailed drawings.  <b>The State Conservation Engineer in Iowa approves the use of this tank.</b>

<b>WIESER PAN-L BILT MANURE STORAGE FACILITY</b>	
Owner (Manufacturer)	Wieser Concrete Products, Inc. W3716 U.S. Highway 10 Maiden Rock, WI 54750 (715) 647-2311 (800) 325-8456
Designers	<u>Original Designer:</u> Bernard J. Jahn, P.E., Corcoran, MN <u>Additional Features Designer:</u> Michael J. Malson, P.E., Mount Prospect, IL <u>Latest Standard 313, Criteria Designer:</u> Greg A. Jewell, P.E., Spring Green, WI
Description	Rectangular, covered, in-ground, reinforced concrete tank comprised of precast wall panels keyed into a cast in-place floor slab. Precast cover panels and columns. Water tightness provided by compressed mastic strips between wall panels and grouting wall panels into floor slab key.
Drawings	The construction drawings (43 pages) are in the document titled INSTALLATION MANUAL, PAN-L-BILT MANURE STORAGE FACILITY, April 9, 2001. The installation manual is signed and sealed by Joseph H. Marter, P.E. <b>Page 4 of the installation manual has a revised date of January 24, 2005.</b> <ul style="list-style-type: none"> <li>• Wall panels are 8 or 12 feet high precast ribbed panels with 5,000 psi concrete and Grade 60 steel.</li> <li>• The cover slats and supporting beams and columns are precast with 5,000 psi concrete and Grade 60 steel.</li> <li>• Wall panels are bolted together with 5/8 inch bolts and sealed with Con-Seal Butyl Resin Concrete Sealant.</li> <li>• Floor slab and footings are site cast with a minimum 3,500 psi concrete and Grade 60 steel.</li> <li>• Site soils and backfill requirements and options are listed in the Installation Manual.</li> </ul>
Assumptions	The wall panels are designed for a full backfill, tank empty condition, and a tank full condition with backfill one foot below the top of the wall panel. Equivalent fluid pressures are 65 psf for the manure and 60 psf and 80 psf for the soil backfill. An equipment surcharge loading equal to two feet of backfill soil (120 or 170 psf) is provided. A complete listing of loadings is contained on page 2 of the Installation Manual Drawings.  The cover slats, free stall panels, drive through panels, or pump out covers are required to support the wall panels. Slats or cover panels and cover opening options are contained in the manual. See "Review and Acceptance" section for additional site soil requirements.
Limitations	Pre-approval is subject to the structure being constructed following the approved drawings and specifications and following limitation. This is to be verified by Wieser Concrete in the form of a letter to the customer. Type 1 and Type 2 floors are not approved. The Type 3 floor is approved.
Application	Iowa NRCS Practice Standard 313, Waste Storage Facility
Review & Acceptance	The State Conservation Engineer in Wisconsin accepted the independent engineering review and revisions to the installation manual for compliance with Wisconsin NRCS Standard 313.  Condition of Wisconsin Approval: To meet the requirements of NRCS Standard 313 the structure must be installed on sites with soils that meet the criteria in Table 1 of Standard 313, or placed on and backfilled with soils that meet the criteria in Table 2 or Table 5 (Concrete Composite) of Standard 313.  April 6, 2000, the State Engineer in Minnesota adopts the structural approval by the State Engineer in Wisconsin (March 20, 2000) and approves the structure for use in Minnesota with the above limitations.  <b>The State Conservation Engineer in Iowa adopts the structural approval by the State Engineer in Wisconsin and approves the structure for use in Iowa with the above limitations.</b>

<b>WIESER L-PANEL MANURE STORAGE FACILITY</b>	
Owner (Manufacturer)	Wieser Concrete Products, Inc. W3716 U.S. Highway 10 Maiden Rock, WI 54750 (715) 647-2311 (800) 325-8456
Designers	<u>Original designer:</u> (8'-6"), Reigstad & Associates, St. Paul, MN <u>Latest Standard 313 criteria designer:</u> (8'-6" and 12"), Greg A. Jewell, P.E., Spring Green, WI
Drawings	The construction drawings (26 pages) are in the document titled INSTALLATION MANUAL, L-PANEL MANURE STORAGE FACILITY, January 21, 2003, revised August 24, 2004. The installation manual is signed and sealed by Mark A. Wieser, P.E.
Materials	<ul style="list-style-type: none"> <li>• Wall panels are 8'-6" or 12' high precast ribbed panels with 5,000 psi concrete and Grade 60 steel.</li> <li>• Wall panels are bolted together with 5/8 inch bolts and sealed with Con-Seal Butyl Resin Sealant (CS 102 or 202).</li> <li>• Floor slab and footings are site cast with a minimum 3,500 psi concrete and reinforced per Floor Type utilized.</li> <li>• Wall panels are secured to the floor slab with anchor bolts of various diameters.</li> <li>• Site soils and backfill requirements and options are listed in the Installation Manual.</li> </ul>
Assumptions	<p>The wall panels are designed for a full backfill, tank empty condition, and a tank full condition with backfill 4 feet below the top of the wall for both the 8'6" and 12' panels. Equivalent fluid pressures are 65 psf for the manure and 65 psf for the soil backfill. An equipment surcharge loading equal to two feet of backfill soil (130 psf) is provided. A complete listing of loadings is contained on page 2 of the Installation Manual drawings.</p> <p>See "Review and Acceptance" for additional site soil requirements.</p>
Application	Iowa NRCS Practice Standard 313, Waste Storage Facility
Review & Acceptance	<p>An independent review of the 8'-6" structure design was performed by Jewell &amp; Associates of Spring Green, WI. They determined the design required only minor revisions to meet the structural design requirements of NRCS Standard 313.</p> <p>The State Conservation Engineer in Wisconsin accepted the independent engineering review of the 8'-6" panel design and revisions to the installation manual for compliance with Wisconsin NRCS Standard 313.</p> <p>NRCS engineering staff performed a review of the 12' structure design performed by Jewell &amp; Associates and have determined it to be in compliance with Standard 313.</p> <p>Condition of Wisconsin Approval: To meet the requirement of Wisconsin NRCS Standard 313, the structure must be installed on sites with soils that meet the criteria in Table 1 of Standard 313, or placed on and backfilled with soils that meet the criteria in Table 2 or Table 5 (Concrete Composite) of Standard 313.</p> <p><b>The State Conservation Engineer in Iowa adopts the structural approval by the State Engineer in Wisconsin and approves the structure for use in Iowa with the above limitations.</b></p>

**NATURAL RESOURCES CONSERVATION SERVICE  
CURRENT PLANS**

**TR-9 Circular Concrete Manure Tank**

Description	Cast in-place, open top, circular, reinforced concrete tank. Design reviewed and plans completed by NRCS, Des Moines, Iowa, design team based on Midwest Plan Service publication TR-9, "Circular Concrete Manure Tanks Using a Hinged-Base, Free-Top Design."
Drawings	Iowa NRCS standard drawing dated 5/99. CAD drawings available on Iowa NRCS home page <a href="http://www.ia.nrcs.usda.gov">www.ia.nrcs.usda.gov</a> under Technical Resources, Iowa Engineering, and then CADD Drawings.
Sizes	Diameters of 30 ft to 120 ft in 15 ft increments. Heights of 8, 10, 12, and 14 ft.
Assumptions	Soil backfill loads: 85 psf/ft. EFP with no surcharge or 60 psf/ft. EFP with 120 psf lateral surcharge. No minimum backfill. Maximum backfill is 6" from top of tank. Backfill shall be brought up uniformly around the tank. The maximum difference in the finished backfill elevations around the tank shall be 3 ft.  Hydrophilic or nonmetallic waterstops or sand-blasted surfaces used to provide water tightness in all joints.

**Minnesota 8 ft. Deep Concrete Tank**

Description	Cast in-place, rectangular, reinforced concrete tank with beams and columns. Tank can be open top or covered. Design based on Midwest Plan Service Publication 36, "Concrete Manure Storages Handbook."
Drawings	Two sheets, dated 05/02. CAD drawings available on Minnesota NRCS home page <a href="http://www.mn.nrcs.usda.gov">www.mn.nrcs.usda.gov</a> under Technical Resources Information, Engineering, and then CADD Drawings.
Sizes	Infinite length and width. Depth of 8 ft.
Assumptions	Assumptions are listed on the drawings. Wall soil loadings is 85 psf/ft based on backfill with low to medium plasticity silts and clays lacking in sand and gravel, CL or ML. Wall loading also assumes a 100 psf vertical surcharge on the backfill.