Tier III Solid Waste Processing Facility Permit Application

Keota AD1, LLC
21405 OK-9
Keota, Oklahoma

Prepared For:

Keota AD1, LLC

Professional Engineer Certification:
I, David A. Wright, hereby certify that I am a licensed professional engineer in the State of Oklahoma; that this document has been prepared in accordance with the Rules of Professional Conduct; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. OAS 252 to 515, Okl. Adm. Code.

David A. Wright, PE
Project Engineer
License Number: 18441

Project B2308124.00
Braun Intertec Corporation

January 10th, 2025

BRAUN INTERTEC

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September 10, 2024 Project B2308124.00

Anne Marie Smith, PE
Engineering Manager
Solid Waste Permitting Section – Land Protection Division
Oklahoma Department of Environmental Quality (ODEQ)
Post Office Box 1677
Oklahoma City, OK 73101-1677

Re: Tier III Solid Waste Processing Facility Permit Application
Keota AD1, LLC
21405 OK-9
Keota, Oklahoma

Dear Ms. Smith:

Keota AD 1, LLC herewith submits the enclosed Tier III Solid Waste Processing Facility Permit Application in accordance with Oklahoma Statute (O.S.) Part 27A and Oklahoma Administrative Code (OAC), Part 252, Section 515. The proposed Keota AD1, LLC will be a non-hazardous solid waste processing facility. The primary function of the Keota AD1, LLC is to produce alternative greener fuel for the area in the form of renewable natural gas from the anaerobic co-digestion of manure and food waste.

If you have any questions regarding the attached report, please contact Sarah Braun at 320.204.9113 or SaBraun@braunintertec.com or Jennifer Wolff at 612.360.8630 or JWolff@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Sarah A. Braun
Project Scientist

Jennifer B. Wolff, CPG, CHMM
Associate Director, Senior Scientist

Attachment:
Tier III Solid Waste Processing Facility Permit Application

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Appendices

Executive Summary

The Keota AD1, LLC facility (Keota, otherwise referred as Facility) is located within a leased area at 21405 OK-9 in Keota, Oklahoma (Site). The primary function of the Facility is to produce alternative greener fuel for the area in the form of Renewable Natural Gas (RNG) from the anaerobic co-digestion of manure and food waste.

The Facility will consist of an Anaerobic Digester (AD) vessel (two digester tanks), hydrolysis tanks, an Organics Receiving Area (ORA) building, a solid digestate storage area, a liquid digestate storage tank, a biogas upgrader system, fire water tank, process water tank, sanitary tank, vehicle parking, and ancillary equipment associated with operations such as a boiler and two natural gas emergency back-up generators. The biogas upgrader is used to create pipeline quality gas and is connected to an emergency flare. The emergency flare provides an important safety function for the digesters and gas treatment system. A Site Layout Map is provided as **Figure 1** and included in **Appendix D**. The tanks are engineered systems and are designed per American Water Works Association (AWWA) D103 and/or Natural Resources Conservation Service (NRCS) 313 Code specifications. The tanks will be hydro-tested for leaks prior to filling with material, and inspected and maintained in accordance with the manufacturer's Operation and Maintenance Manual. The tanks will be designed by a licensed professional engineer in accordance with applicable codes, as well as NRCS 313 specification.

Manure feedstock for the anaerobic digester will be provided by local dairy farms as needed. The initial manure input will help grow the bacterial colonies needed for anaerobic digestion of the food waste. Food waste materials will be sourced from local businesses and delivered to the ORA via delivery trucks. Liquid food wastes will be delivered in tanker trucks and unloaded outside the ORA via hose pumps, and then transferred into pumps within the ORA that carry liquid to the processing tanks. The packaged food wastes are delivered within the enclosed ORA building. All depackaging and sorting operations will take place within the ORA building shortly after the food wastes arrive. Waste from the depackaging and sorting operations will be disposed of as solid waste at a permitted landfill.

After depackaging, the food wastes pass along a conveyor belt, though hammermill machinery, and are macerated and processed into a slurry within the ORA before being pumped into a hydrolysis tank. After the hydrolysis tank, the slurry will move into the hydrocyclone to remove any grit or inorganic particles from the food waste before moving into a secondary hydrolysis tank. The grit and in-organics will be collected in a bin at the bottom of the hydrocyclone, and then disposed of at another permitted facility (operators will store the inorganic material in a dumpster next to the recyclable material inside ORA). In the second hydrolysis tank, the slurry is homogenized and then passed through the hydrocyclone a second time to remove any remaining grit before being fed into the anaerobic digester. The secondary hydrolysis tank can store materials for 3-5 days until it is ready to be fed to the anaerobic digester. Once the slurry is fed to the anaerobic digester, it is continuously mixed and heated for approximately 28 days. Biological processes break down the slurry into digestate and RNG. The slurry is moved through the site via pumps and pipes. The system is continuously fed.

The digestate material will be continuously extracted from the anaerobic digester to maintain optimum conditions. The digestate will be pumped to a screw press located in the solid separation building in order to dewater the digestate into a fibrous solid digestate and nutrient-rich liquid digestate. The screw press will run hourly to support the continuous feed of digestate. The liquid digestate will be pumped and stored in the onsite digestate storage tank and the solid digestate will be transported via conveyor and stored on a concrete separator pad attached to the solid separation building. Liquid digestate can be stored in the storage tank for up to 4 months and solid digestate can be stored onsite for up to 5 days. Land application of the liquid and solid digestate will be subject to the Oklahoma DEQ under its benefical reuse provision (OAC 252:515-1-7). Keota AD 1, LLC will provide DEQ with supporting documentation for DEQ to make such determination, including a third party determination of beneficial reuse in addition to other data such as a nutrient management plan. If the liquid and solid digestate does not qualify for beneficial reuse, it will be treated as waste and Keota will haul such material off site to the appropriate waste disposal facility.

The RNG produced from the anaerobic co-digestion of food waste and manure will be piped into a biogas upgrader. The upgrader removes any impurities, upgrades the gas to pipeline quality, and compresses the gas. The RNG is then injected into a gathering pipeline on site.

The daily amount of food waste received, generally from locations less than 50 miles from the facility is anticipated to be approximately 185-275 tons per day. The daily amount of food waste received from locations more than 50 miles from the Site or from out-of-state facilities shall not exceed 200 tons per day. On Site storage time for the food waste materials will be minimal due to the anaerobic digester requiring food waste materials to be fed continuously while the digester is in operation. Most of the material fed to the anaerobic digester will be comprised of food waste materials. Less than half will be comprised of manure from local dairy farms.

Keota herewith submits this Tier III Solid Waste Processing Facility Permit Application to operate the Site. The Keota is a proposed addition to the pre-existing agricultural farm. For the purposes of this application, the terminology “food waste” and “organics” may be used interchangeably and are intended to have the same meaning.

1.0 Certification

(Oklahoma Administrative Code [OAC] 252:515-3-33 and 252:4-7-13(b))

The applicant signed the permit application under oath on Form #515-010, provided by the Oklahoma Department of Environmental Quality (ODEQ). The signed and notarized forms certifying this application are attached in **Appendix A**.

1.1 Legal Right to Property

(OAC 252:515-3-34(a), (b), (c))

An affidavit certifying that the applicant has a current lease, has legal right to access and use the property in the manner for which the permit is sought, and has notified the landowner is provided in **Appendix B**. A notarized Temporary Easement for Access granting the ODEQ right of access to the permitted Site for purposes of performing closure, post-closure monitoring, or corrective action in the event of default by the Facility is also supplied in **Appendix B.**

1.2 Engineer of Record

(*OAC 252:515-3-35(a), (b))*

Maps, drawings, surveys, calculations, information, and data submitted in support of the permit application for the Keota have been prepared and or reviewed by a Professional Engineer licensed in the State of Oklahoma, as applicable. The engineer's seal has been placed on the cover page of this application.

2.0 General Information

(OAC 252:515-3-36(a))

This permit application contains all the information currently understood to be required by the Oklahoma Uniform Environmental Permitting Act for a new Tier III Solid Waste Processing Facility.

2.1 Site Information

(OAC 252:515-3-36(a)(1), (2))

Items	Information
Owner Name:	Keota AD 1, LLC
Owner Mailing Address:	21405 OK-9, Keota, OK 74941
Owner Phone Number:	To be determined
Facility Name:	Keota AD1, LLC
Facility Address:	21405 OK-9, Keota, OK 74941
Facility Phone Number:	To be determined

2.2 Disclosure Statement

(OAC 252:515-3-36(a)(3))

A disclosure statement has been signed that complies with OAC 252:515-3-36(a)(3) and 27A Oklahoma Statute (O.S.) §§ 2-10-103 and 2-10-302. The signed disclosure statement is provided in **Appendix C**.

2.3 Site Legal Description

(OAC 252:515-3-36(a)(4))

The legal description of the proposed permit boundary and processing area is identified below.

DESCRIPTION OF A 21.11 ACRE SITE, SITUATED IN SECTIONS 15 AND 16, T-9-N, R-23-E.I.M., HASKELL COUNTY, OKLAHOMA, OUT OF A TRACT OF LAND RECORDED IN BOOK 817, PAGE 537, DEED RECORDS HASKELL COUNTY, OKLAHOMA (D.R.H.C.O.), SAID SITE LIMITS BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

POINT OF BEGINNING (P.O.B., X: 2903104.81, Y: 715723.94) within said Section 16, at the Northwest corner of this site, from which a concrete nail found for the Northeast corner of said Section 16 bears North 75°26’42" East a distance of 512.55 feet;

THENCE North 88°00’42” East a distance of 1140.00 feet to the Northeast corner of this site;

THENCE South 01°59’18” East a distance of 140.00 feet to the most Northerly Southeast corner of this site;

THENCE South 88°00’42” West a distance of 140.00 feet to an interior ell corner of this site;

THENCE South 01°59’18” East a distance of 760.00 feet to the most Southerly Southeast corner of this site;

THENCE South 88°00’42” West a distance of 1000.00 feet to the Southwest corner of this site;

THENCE North 01°59’18” West a distance of 900.00 feet to the POINT OF BEGINNING, containing 21.11

acres (919,600 sq. ft.).

All bearings, distances and coordinates contained herein are grid, based upon the Oklahoma State Plane Coordinate System, South Zone, of the North American Datum 1983 (NAD83, Realization 2011, Epoch 2010.00), in U.S. Survey Feet.

See Appendix D, Exhibit B to Figure 6 for survey and description of 21-acre project area. The legal description of the property was reviewed generally, to verify completeness with the requirements of OAC, and not to evaluate or certify metes and bounds, boundaries, or adequacy of survey.

2.4 Latitude and Longitude of Permit Corners

(OAC 252:515-3-36(a)(5))

The northwest corner of the proposed Site is located at 35°15'36.39"N and 94°52'8.81"W, the northeast corner is located at 35°15'36.39"N and 94°51'56.94"W, the southeast corner is located at 35°15'27.69"N and 94°52'8.89"W, and the southwest corner is located at 35°15'27.69"N and 94°51'56.87"N. The west access off OK-9 is located at 35°15'37.25"N and 94°52'8.00"W and the east access of OK-9 is located 35°15'37.18"N and 94°51'57.64"W.

2.5 Location to Nearest Town or City

(OAC 252:515-3-36(a)(10))

The closest town is Keota, Oklahoma located approximately 3.1 miles west from the center of the Site.

2.6 Facility Processing, Storage, and Disposal Operations

(OAC 252:515-3-36(a)(7))

Food waste materials of various types are transported to the Facility from local third-party organizations and industries. When food waste is delivered, the liquid food waste materials can be unloaded by hose pump outside the ORA and then transferred to pumps in the ORA. These pumps transport the liquid to a hydrolysis tank. Within the ORA building, the packaged food waste will be received and separated from the packaging materials, processed into a slurry, and then directed to a hydrolysis tank. The hydrolysis tank will begin the digestion process before being sent through a hydrocyclone to remove any grit or inorganic material. The inorganic materials will then be captured in a bin at the bottom of the hydrocyclone, removed, baled together and stored with similar packaging materials (refer to ORA floor plan on pg 193), and sent offsite for disposal to a permitted landfill.

2.7 Accepted Waste Streams and Anticipated Amounts

(OAC 252:515-3-36(a)(8))

(OAC 252:515-19-34(a))

The anticipated food waste acceptance rate is 185-275 tons per day, generally from locations less than 50 miles from the facility. No more than 200 tons per day will be accepted from locations more than 50 miles from the local and out-of-state facility per OAC 252:515-19-34,. The anticipated daily volumes are as follows; 100-140 tons of packaged waste per day, 100-150 tons of liquid waste per day, and the occasional addition of glycerin at 5-9 tons per day. The waste streams that will be accepted at the facility are described below.

1. Source Separated Organics (SSO)

SSO are organic materials that waste generators segregate at the source for isolated collection to remove them from the waste disposal stream and direct to reuse. SSO includes organic residues generated by the handling, storage, sale, preparation, cooking, and serving of foods (including fruits, vegetables, meats, and bakery items); products that may be out of specification, past freshness date, or unsellable due to mishandling.

Sources of food waste may include commercial and institutional generators, including, but not limited to, food manufacturing and processing facilities, grocery stores, other retailers, restaurants, hotels, convention facilities, hospitals, colleges, and universities.

2. Packaged Food Material

Packaged food material is food that has been wrapped or encased to contain, protect, handle, deliver, and present it to individual, commercial, or industrial distributors or consumers generated by food production operations. The majority of this food is unspoiled, but is unsellable due to manufacturing errors, expiration dates, or mishandling.

3. Dairy Wastes

Dairy wastes include milk, milk products, buttermilk whey, ice cream, yogurt, and cheese or dairy processing wastes that may not meet applicable quality standards, or may be otherwise unsuitable for human consumption, animal feed, or other use.

4. Fats, Oils, and Greases (FOG)

Fats, Oils, and Greases (FOG) come from meat fats in cooking and food scraps, cooking oil, shortening, fryolator oil and grease, lard, butter and margarine, gravy, and food products such as mayonnaise, salad dressings, sour creams, and other foods high in fat.

5. Food Processing Wastewater

A typical type of food processing wastewater includes wastewater that has been collected from dissolved air floatation (DAF) pretreatment units at food processing plant wastewater treatment facilities. The DAF material is a thickened wastewater stream (liquid) collected from skimming wastewater containing FOG and suspended solids.

6. Glycerin

Glycerin is highly effective catalyst of organic waste to methane. It is derived from yellow grease and/or grain and corn ethanol production.

7. Brewery Wastes

Brewery wastes are waste materials produced during the brewing process including spent grains, brewery trub, and residual brewer process water.

8. Manure

Manure from nearby dairy farms will be used to commission the facility and promote biology of the system. The anticipated manure volume is roughly 1 million gallons over the first 3 weeks of commissioning. Manure will be immediately processed through the digester and not stored on site.

2.8 Municipalities, Counties, and Populations Served

(OAC 252:515-3-36(a)(9), (10))

The Site will be located within the city limits of Keota in Haskell County. Because the process facility will not serve a population, a population equivalent was calculated by using the method provided in OAC 252:515-5-36(a)(10). Based on the anticipated daily amount of waste received (185-275 tons), the population equivalent is 84,091.

Calculation Method:	Anticipated Amount of Waste per Day ÷ 4.4 Pounds per Person per Day
Calculation:	185 tons x 2,000 (convert to pounds) ÷ 4.4 = 84,091

2.9 Access Roads

(OAC 252:515-3-36(a)(11))

The access roads that will serve the facility are paved and have a grade of less than 10 percent.

2.10 Heavy Equipment Used

(OAC 252:515-3-36(a)(12))

The heavy equipment to be used on Site includes forklifts, skid steers, and delivery trucks. Forklifts will be used in unloading activities. Skid steers will be used in the moving of food waste inside the ORA. Trucks will come onto the Site to deliver food waste and to remove packaging waste.

2.11 Data, Plans, and Specifications

(OAC 252:515-3-36(a)(14))

Per OAC 252:515 Subchapter 5, the Site location is not near a scenic river, recreation, or preservation area. Approximately seven federally listed species within 5 miles of the project area and four state listed species were identified within Haskell County. With the existing landcover consisting of recently fallowed cropland and cultivated cropland, the project site does not provide suitable habitat for a majority of species identified in state and federal databases. The project area also appears to have limited floral resources or pollinators, and therefore, the candidate listed Monarch Butterfly is unlikely to be present. As a candidate species, the Monarch Butterfly has no statutory protection under the Federal Endangered Species Act but is in consideration for future listing as a threatened or endangered species. Additionally, due to the general lack of trees and other woody vegetation, most migratory birds and listed bat species are also unlikely to be present. However, depending on the project design, access from Highway 9 may require tree removal and consideration of seasonal restrictions on tree/vegetation clearing to minimize impacts to migratory birds and listed bat species. A copy of the Protected Species Evaluation can be found in **Appendix G**.

Per OAC 252:515-3 Subchapter 17, the Site is not adjacent to other facilities to allow for run-on. Run-off from the Site will be prevented by waste receival occurring within the enclosed ORA building. There will be no discharge of contaminated stormwater at the Site. Per OAC 252:515 Subchapter 19, applicable operational requirements are detailed in **Section 5.0**. Per OAC 252-515-3 Subchapter 25, the Site will abide by the regulations put in place if the facility were to close. A Closure Plan is detailed in **Section 6.0**. Per OAC 252:515 Subchapter 37, the Site will process all waste within the ORA building, reducing visual disturbance, noise, odors, and transmission of dust. Litter control is detailed in **Section 5.6**.

2.12 Financial Assurance

(OAC 252:515-3-36(a)(15))

In accordance with 252:515-27-1, this facility is subject to requirements set forth in Subchapter 27, Financial Assurance Mechanisms. The Financial assurance will be maintained continuously until released from the requirement by the DEQ. This is discussed further in Section 7.0

2.13 Aesthetic Enhancements

(OAC 252:515-3-37)

Aesthetic enhancements at the Facility will include the use of existing nearby trees and a fence with privacy features, as well as the installation of a new site perimeter fence and boundary tree line with trees capable of growings >35 ft to provide additional visual privacy. The Facility will achieve visual harmony with the surrounding area by selecting colors for all structures to achieve best blending with surrounding landscape in both summer and winter and to reduce glare/reflectivity from such structures. Lighting and light pollution will be mitigated by using down-casting lighting or other forms of lighting that mitigate light pollution. With respect to earthwork and construction, the applicant will minimize surface disturbances and minimize impacting existing vegetation. All areas of disturbance that are not needed for operation will be restored to previous conditions and the site will be maintained free of debris during operations.

3.0 Maps and Drawings

(OAC 252:515-3-51(a))

The maps and designs submitted with this permit application are for the new proposed Tier III Keota AD1, LLC and follow the requirements below:

- OAC 252:515-3-51(c) - The permit application will be considered administratively incomplete if any maps or drawings submitted are not legible.

- OAC 252:515-3-51(d) - All maps and designs shall be submitted in the permit application in the sequence identified.

- OAC 252:515-3-51(e) - Unless otherwise identified, all maps submitted as part of a permit application shall be prepared at a scale of one inch equals one hundred feet (1" = 100'). An alternative scale may be used with approval of the DEQ.

- OAC 252:515-3-51(f) - Map details: (1) All maps shall show as a minimum, legend, title, north arrow, permit boundary, buffer zone, and boundaries of waste disposal or processing areas. (2) If applicable, the locations of groundwater monitoring wells, and gas monitoring probes shall be identified.

Maps of the proposed facility meeting the requirements of OAC 252:515-3-51 have been prepared as described in the sections below and can be found in **Appendix D.**

3.1 General Location Map

(OAC 252:515-3-52)

A county highway map showing the processing facility location and any airports within 6 miles of the facility has been provided in **Appendix D** as **Figure 2**.

3.2 Floodplain Map

(OAC 252:515-3-53)

A floodplain map generated from FEMA's official online Flood Map Service Center depicting the limits and elevations of any 100-year floodplain on or within 1 mile of the permit boundary of the processing facility is provided in **Appendix D** as **Figure 3**. According to the FEMA Estimated Base Flood Elevation Flood Risk Report, the solid waste processing facility is not located within the current 100-year floodplain.

3.3 Quadrangle Topographic Map

(OAC 252:515-3-54(a), (b))

A quadrangle topographic map depicting: (1) the location of the facility permit boundaries; (2) access routes within one mile of the facility; (3) homes and buildings within one mile of the facility; (4) public water and wastewater collection, treatment, and distribution facilities within one mile of the facility; (5) receiving waters and surface variations within one mile of the facility; and (6) water wells, including private and municipal, potable, and irrigation water within one mile of the facility is provided in **Appendix D** as **Figure 4**.

3.4 Existing Contour Map

(OAC 252:515-3-55(a), (b), (c))

A contour map showing the topographic contours prior construction of the processing facility is provided in **Appendix D** as **Figure 6**. The contour interval on the map is 2 feet and 10 feet. The existing contour map shows the location of surface drainage entering and exiting the processing facility. No boreholes were completed on-site and therefore, locations of boreholes are not provided with this application.

3.5 Site Map

(OAC 252:515-3-56(a), (b))

A Site map is provided in **Appendix D** as **Figure 6** and **Appendix E**. The Site map identifies the following, as applicable to the solid waste processing facility: (1) the dimensions of the permit boundary as indicated by the legal description; (2) the receiving processing, storage, and disposal areas; (3) buffer zones; (4) the locations and surface elevations of each borehole, monitor well, test well, monitoring site, test pit, sampling site, and permanent benchmarks; (5) the surface and top casing elevations for each monitoring well or gas probe; (6) the surface drainage, including location of diversion ditches, dikes, dams, pits, ponds, lagoons, berms, terraces, and other relevant information; (7) the location of fencing and gates, utility lines, pipelines, and easements; (8) the access roads into and on the Site; (9) employee and equipment shelters; and (10) on- and off-Site soil borrow areas.

3.6 Design Drawings

(OAC 252:515-3-57)

Design drawings and specifications for receiving processing, storage, or disposal areas are supplied in **Appendix E.** Design drawings include the proposed activities within the ORA, as well as the dimensions of the processing and storage equipment:

1. Hydrolysis Tank #2 – 24 ft diameter x 50 ft. height
2. Hydrolysis Tank #3 – 14 ft. diameter x 30 ft. height
3. Digester Tank (2)– 90 ft. diameter x 32 ft. height
4. Digestate Storage Tank – 8 million gallons of storage (288 ft diameter X 18 ft. height)
5. Organics Receiving Area (ORA) – 173 ft. wide by 151 ft. long (26,123 ft2 footprint)
6. Process Water Tank (PWT): Water storage tank used for wash down of equipment
7. Fire Water Tank (FWT): Water storage tank used for safety measures

4.0 Location Restrictions

(OAC 252:515-5-31(a), (b), (c) and OAC 252:515-5-32(a), (b), (c))

The following areas are protected, dedicated, and/or managed for public recreation or natural preservation by a federal, state, or local government agencies. The solid waste processing facility permit boundaries shall not be located within the following restricted areas.

4.1 Scenic Rivers

(OAC 252:515-5-31(a))

It is acknowledged that the solid waste processing facility cannot be located within the drainage basin of any river designated under the Oklahoma Scenic Rivers Commission (OSRC) Act unless a statement is obtained from the OSRC or Oklahoma Tourism and Recreation Department. The Site will not be located within the drainage basin of a river currently designated as scenic.

4.2 Recreation and Preservation Areas

(OAC 252:515-5-31(b))

It is acknowledged that the solid waste processing facility cannot be located within 0.5 mile of an area dedicated and managed for public recreation or natural preservation by any governmental agency.
The Site is not located within 0.5 mile of an area dedicated and managed for public recreation or natural preservation by any governmental agency.

4.3 Threatened and Endangered Species

(OAC 252:515-5-31(c))

Requests for consultation concerning threatened or endangered wildlife or plant species within 5 miles of the proposed Solid Waste Processing Facility were sent to the Oklahoma Natural Heritage Inventory (ONHI), the United States Fish and Wildlife Service (USFWS), and the Oklahoma Department of Wildlife and Conservation (ODWC) on April 29, 2024. A written response from Ms. Kristin A. Comolli with ONHI on April 30, 2024, indicated eleven occurrences of two relevant species within the vicinity of the project location as described. Based on both species natural habitats being located within forested areas, impacts to threatened or endangered species are not anticipated due to the Site consisting of cleared agricultural cropland. **Appendix G** contains a copy of the request for consultation and a copy of the response.

4.4 100-Year Floodplain

(OAC 252:515-5-32(a))

It is understood that no waste management or disposal areas belonging to a solid waste disposal facility shall be located within the 100-year floodplain. According to the FEMA Estimated Base Flood Elevation Flood Risk Report, the solid waste processing facility is not located within the 100-year floodplain.

4.5 Public Water Supplies

(OAC 252:515-5-32(b))

All solid waste processing will take place inside the enclosed ORA building. No waste will be stored or placed on permeable surfaces outside of the building. Therefore, proximity to a public water supply is not applicable.

4.6 Wellhead Protection Area

(OAC 252:515-5-32(c))

After review of the Oklahoma DEQ, WaterWeb – Wellhead Protection Area Data Viewer, no Wellhead Protection Areas were noted near the Site. A wellhead protection map is included in **Appendix D** as **Figure 8.**

4.7 Wetlands

(OAC 252:515-5-32(d))

It is acknowledged that the solid waste processing facility should not be located within wetland areas and a verification letter from the Oklahoma Conservation Commission (OCC) is required.

The proposed permit boundary is not located within a current wetland area. A request for consultation was sent to the OCC on April 30, 2024. A written response from Mr. Brooks Tramell of the OCC on May 10, 2024, indicated there should be no significant impact on wetland resources in the area. A copy of the letter is included in **Appendix F.**

5.0 Operational Requirements for Solid Waste Facilities

5.1 Leachate Management and Discharges

(OAC 252:515-13-51 and OAC 252:515-17-3)

Leachate management will be maintained by receiving waste within the enclosed ORA, preventing rainfall exposure and potential leachate discharges. The facility is designed to maximize the capture of free liquids from the washing of equipment, unloading, processing, and transfer of food waste materials. The free liquids from these processes contain nutrients that are desired for digester operations. Gullies and drains covered by grating are installed on the inside of door thresholds to prevent liquid from escaping the building. The floor drain system within the ORA is designed to capture any wash water or free liquids and transfer these liquids to the hydrolysis tanks.

5.2 Utility Separation

(OAC 252:515-5-52(a))

The Site is not a land disposal facility. Therefore, utility separation is not applicable.

5.3 Prohibited Wastes

(OAC 252:515-19-31(a), (b), (c), (d), (e), (f), and (g))

All suppliers of food waste must be preapproved contractors for Keota. All feedstock is sourced from contracted partners who agree to comply with Keota's quality of standards. To maintain standard quality requirements, Keota requires the following standard sampling for all new feedstock customers in advance of receipt of the feedstock material, as well as annual testing of all incoming streams for compliance:

- Chemical Oxygen Demand (COD) [mg/L]
- Total Solids (TS) [mg/kg or %]
- Total Volatile Solids (TVS) [mg/kg or %]
- Total Organic Carbon (TOC) [mg/kg]
- Total Kjeldahl Nitrogen (TKN) [mg/kg]
- Total Sulfur [mg/kg]

All delivery vehicles are also required to be preapproved prior to delivery. All incoming delivery vehicles are weighed. The inbound truck weight, the generator name, and the time of delivery are recorded and maintained. The Facility will not accept food waste from the general public or from individuals.

Keota requires the preapproved food waste vendors to have programs in place to educate their generators on the materials that are acceptable, Keota will visually inspect received packaged loads prior to tipping into the ORA facility.

If hazardous or toxic materials are suspected by Keota in any load, the entire load will be rejected. Keota will provide signage at the entrance gate and the ORA listing acceptable and unacceptable food waste. The transporter and/or generator of food waste is required to provide to Keota a completed characterization form in advance of receipt of the food waste at the ORA. Facility employees will be given the authority to reject loads of food waste that do not meet Keota requirements.

The following wastes are prohibited and will not be accepted, handled, or disposed of at the Site:

- Hazardous, radioactive, and/or regulated Polychlorinated Biphenyl (PCB) containing waste of any kind.
- Regulated medical waste of any kind.
- Asbestos-containing waste of any kind.
- Industrial waste of any kind.

5.4 Public Access Control

(OAC 252:515-19-32)

The Site is accessible from Oklahoma State Highway 9 by a proposed access road located on the northern side of the Site. The Facility will not accept food waste directly from any individuals or the general public. The Facility will not be a drop off location for the public. The Site will control public access and prevent unauthorized traffic by using a security system with remote monitoring, electric perimeter fencing, and an access gate. The access gate will remain closed except during normal acceptance hours.

5.5 Measuring Waste Procedure

(OAC 252:515-19-33(c))

All incoming delivery vehicles will be weighed when entering the Facility. The scale shall be tested and certified annually in accordance with the requirements of the ODAFF. A delivery ticket will be created that includes the truck inbound weight, the generator name, and the time of delivery. The delivery will be classified according to its waste stream and cubic yards will be estimated based upon the size of the delivery vehicle container. The information will be recorded in the Facility operating record.

5.6 Blowing Litter

(OAC 252:515-19-35(a), (b))

Waste materials present at the facility which may be windblown include light plastic and paper packaging materials. All of these materials will be received and handled inside the ORA. The doors will remain closed at all times, except when trucks are entering or exiting the building. The air handling system will be designed to produce negative pressure for pulling fresh air into the building, trapping the windblown materials inside the building.

In addition, site employees will routinely monitor the exterior portions of the Site to ensure that windblown materials, if present, are collected and disposed of properly. These materials will also be prevented from leaving the Site by the enclosed fencing surrounding the Site.

5.7 Air Quality

(OAC 252:515-19-36(a), (b), (c))

The Site will be operated in compliance with the Oklahoma Clean Air Act, rules of the Air Quality Division of ODEQ, and any other requirements of an approved State Implementation Plan (SIP). Open burning of solid waste will be prohibited on-site. The Site will be submitting an application to ODEQ for a minor source Air Quality Construction Permit.

The Site will be operated to prevent the discharge of any visible fugitive dust emissions beyond the property boundaries to not damage or interfere with the use of adjacent properties, or to cause air quality standards to be exceeded, or interfere with the maintenance of air quality standards. The ORA is not anticipated to produce significant amounts of dust due to the moisture content of the organic materials received; however, the exhaust air from the ORA will be collected and filtered for dust. Water or other dust suppressants may be applied to the paved driveway to reduce fugitive dust from truck traffic, as needed.

5.8 Disease Vector Control

(OAC 252:515-19-37(b))

Facility operations are conducted in a manner to prevent public health hazards and nuisances, including keeping the processing facility and adjacent area clean and free from litter. The primary method of deterring vectors is the prompt depackaging and processing of all food waste deliveries within the enclosed ORA building. The solid waste is stored within the ORA building and picked up by a dedicated contracted solid waste hauler on a set schedule to eliminate any possibility of waste build-up. No food waste deliveries are stored outside of the ORA building at any time. Proper housekeeping and daily equipment cleaning are implemented, as well as daily trash pick-up and groundskeeping.

If daily investigations detect a vector issue, the issue will be investigated to determine the source of attraction for the vector. Once the source is found, it will be determined which of best management practices can alleviate the problem and implementing them immediately. If professional assistance is needed for disease vector control, a licensed professional will be contracted.

5.9 Buffer Zones

(OAC 252:515-19-38(b), (c))

The Site will be designed and maintained with a waste free buffer zone of at least 50 feet in width between all waste disposal activities and handling areas and adjacent properties.

5.10 Salvage and Recycling

(OAC 252:515-19-39(a))

Salvage and recycling operations will be conducted in accordance with a written plan approved by the ODEQ. The Recycling Plan has been provided in **Appendix H**.

5.11 Recordkeeping and Reporting

(OAC 252:515-19-40(a))

An operating record will be maintained on-Site containing all records concerning the planning, construction, operation, and closure of the facility. Such records will be maintained until the closure monitoring period is terminated and will include those records required to be maintained and/or submitted to ODEQ by Subchapter 29 of Chapter 15. The proposed facility is not a land disposal facility, therefore the recordkeeping and reporting requirements of Subchapters 7, 9, 11, 13, 15, and 31 are not currently applicable.

5.12 Putrescible Waste

(OAC 252:515-19-91(a))

All waste received at the facility will be processed within 24 hours of delivery. Incoming food wastes that are unprocessed due to being received at the end of operating hours shall remain stored within the ORA building and kept at levels to prevent spillage and/or overflow. If a processing failure occurs, waste capable of decay will be removed from the Site within 96 hours to an alternative disposal site.

5.13 Large or Bulky Items

(OAC 252:515-19-92)

Large and bulky items not suitable for facility operations will not be accepted at the Facility.

5.14 Processed Solid Waste and Characterization

(OAC 252:515-19-93)

Keota does not accept hazardous or toxic materials, septic, or rendering that may contain brain or spinal tissue from animals. If hazardous or toxic substances or any other unacceptable materials are suspected in any load, the entire load will be rejected. Keota will provide signage at the ORA listing acceptable and unacceptable materials. Facility employees will be given the authority to reject loads of waste that do not meet Keota requirements. All processed waste and residues produced at the Site will be characterized to be hazardous or non-hazardous, handled and transported accordingly, and disposed of off-Site to a properly permitted disposal or recycling facility.

6.0 Closure and Post Closure Care

(OAC 252:515-25)

The facility shall be closed in accordance with the approved closure plan and in a manner that minimizes the need for further maintenance controls which minimizes escape of waste and waste constituents into the environment.

6.1 Closure Plan

(OAC 252:515-25-2(a))

A Closure Plan describing compliance with the requirements of Part 3 of Subchapter 25 is included with this application in **Appendix I**.

6.2 Post-Closure Plan

(OAC 252:515-25-2(b))

Processing facilities are exempt from Post-Closure Plan requirements, per 252:515-25-2(b); therefore, a Post-Closure Plan was not submitted with this permit application.

6.3 Plan Amendments

(OAC 252:515-25-2(c))

An amended closure or post-closure plan will be submitted, as necessary, to ODEQ for approval when a cost estimate adjustment is required and/or with future applications for modifications of the permit if such modifications will affect closure or post-closure duties or requirements.

6.4 Records Retention

(OAC 252:515-25-3(a) & (b))

Copies of all closure documentation will be maintained on file at the proposed facility or at the owner/operator's place of business until ODEQ approves the completion of final closure.

6.5 Corrective Action

(OAC 252:515-25-4)

If at any time during closure activities, inspection of the facility and/or review of monitoring data indicates an actual release of contaminants into the environment, ODEQ may require corrective action to eliminate or mitigate such a release. Keota will adhere to corrective action recommendations established by ODEQ.

6.6 Performance Standard

(OAC 252:515-25-31)

The processing facility will be closed in accordance with the approved closure plan in a manner that controls escape of waste and waste constituents into the environment and minimizes the need for further maintenance. A Closure Plan is provided in **Appendix I**.

6.7 Notification to ODEQ

(OAC 252:515-25-33(a))

The ODEQ will be notified in writing prior to beginning final closure of the facility.

6.8 Initiation of Closure Activities

(OAC 252:515-25-33(b))

Closure activities will begin no later than 90 days after final receipt of wastes at the facility.

6.9 Completion of Closure Activities

(OAC 252:515-25-33(c))

Closure activities will be completed according to the ODEQ-approved Closure Plan within 180 days after closure activities are initiated. In the event that extensions of the closure period are deemed necessary, Keota will demonstrate to ODEQ that closure will take longer than 180 days and that all steps have been, and will be taken, to prevent threats to human health or the environment from the facility.

6.10 Certification of Final Closure

(OAC 252:515-25-34(a))

A Certification of Final Closure will be submitted to ODEQ after completion of final closure.
The certification will contain all information requested in 252:515-25-34(a).

6.11 Final Closure Approval and Extension Periods

(OAC 252:515-25-35(a), (b))

Keota will receive approval of final closure from ODEQ. ODEQ may extend the closure period and require that Keota post additional financial assurance if any testing shows the confirmed presence of elevated levels of any constituent, any evidence of contamination related to Site operations is found,
or final closure of the processing facility is found to be inadequate.

6.12 Extension of Post Closure Period

(OAC 252:515-25-52(a), (b))

Processing facilities are not subject to post-closure requirements; therefore, this regulation is not applicable to the Site or to this permit application.

6.13 Contents of Post-Closure Plan

(OAC 252:515-25-53)

Processing facilities are not subject to post-closure requirements; therefore, this regulation is not applicable to the Site or to this permit application.

6.14 Post-Closure Operational Requirements

(OAC 252:515-25-54)

Processing facilities are not subject to post-closure requirements; therefore, this regulation is not applicable to the Site or to this permit application.

6.15 Post-Closure Use of the Property

(OAC 252:515-25-55)

Processing facilities are not subject to post-closure requirements; therefore, this regulation is not applicable to the Site or to this permit application.

6.16 Certification of Post-Closure Performance

(OAC 252:515-25-56)

Processing facilities are not subject to post-closure requirements; therefore, this regulation is not applicable to the Site or to this permit application.

7.0 Financial Assurance

7.1 Applicability

(OAC 252:515-27-2)

In accordance with OAC 252:515-27-1, processing facilities are subject to requirements set forth in Subchapter 27, Financial Assurance Mechanisms. ODEQ financial assurance for closure and post-closure care will be established prior to the initial receipt of waste.

7.2 Duty to Maintain

(OAC 252:515-27-3, 4)

Financial assurance for closure, post-closure, and/or corrective action, as applicable, will be maintained continuously until released from this requirement by the ODEQ. Unit costs will be updated at least every 5 years after the initial receipt of waste.

7.3 Permit Transfer

(OAC 252:515-27-5)

The permit and financial insurance will be maintained by Keota. If the permit is to be transferred, the transferee shall either provide new financial assurance or assume the existing assurance, if adequate in amount.

7.4 Non-Renewal or Failure to Maintain

(OAC 252:515-27-6)

Keota understands that the ODEQ shall bring proceedings to suspend or revoke the permit if financial assurance is not provided, renewed, and maintained in accordance with
OAC 252:515-27.

7.5 Financial Assurance and Substitute Financial Assurance

(OAC 252:515-27)

The Financial Assurance shall be in a form approved by the ODEQ.

7.6 Cost Estimates for Financial Assurance

(OAC 252:515-27-31 thru 33)

Prior to closure, all tanks and other equipment will be emptied of organic materials and cleaned. The liquid and solid digestate will be disposed of at a permitted solid waste disposal facility unless DEQ approves land application of the liquid and solid digestate as beneficial resuse. No liquid or solid digestate will be land applied without prior approval for beneficial use. Unprocessed organic materials will be sent to an off-site landfill or another appropriate site (such as an off-site anaerobic digester or composting facility). Solid wastes from the ORA or hydrolysis tanks will be sent to a landfill.

Equipment which would require decommissioning includes, but is not limited to, digestion tanks, hydrolysis tanks, biogas processing structures, ORA processing and sorting equipment, transportation and conveying systems, heating and power systems, digestate treatment equipment, and utility connections. All equipment, structures, and operations will be emptied and cleaned of process materials prior to reusing, retrofitting, dismantling, or removal.

The Keota Facility is located on an operational farm (Two State Sod) where the decommissioned equipment could conceivably be adapted to alternative beneficial uses. All decommissioned equipment, structures, and materials which cannot be managed through reuse or sale will be disposed of at recycling centers or landfills in accordance with all state and federal requirements.

The Closure cost estimate is provided to ODEQ as part of this application. As this facility is not a land application facility, cost estimates of post-closure care and corrective action would not apply and have not been prepared.

8.0 Waste Exclusion Plan

(OAC 252:515-29)

According to OAC 252:515-29-1(b), processing facilities are not required to submit a Waste Exclusion Plan (WEP); however, all processing facilities are subject to 252:515-29-3(e), Notification of Rejected Waste.

8.1 Notification of Rejected Wastes

(OAC 252:515-29-3(e))

The Site will notify ODEQ by the end of the following working day of any prohibited waste identified and rejected prior to receipt, as required by 252:515-29-3(e)(1). The notification of rejected wastes will describe the date and reason for the rejection and include the name, address, phone number and contact person of the waste generator (if data can be obtained), and/or the name of the driver, tag number of the vehicle, carrier name, address, telephone number, and contact person (if data can be obtained), as required per 252:515-29-3(e)(2).

9.0 Public Notices

(OAC 27A O.S. 2-14-301, 302, 303 and OAC 252:4-7-13(d))

Information regarding the pending application will be made available to the public as required in O.S. 27A Sec. 2-14-301, et. Seq., OAC 252:4-7-13. Proof of the public notice submittal will be made to ODEQ within 20 days of the publication, consisting of a copy of the publication in one newspaper local to the facility Site, in addition to an affidavit from the publishers showing the date of publication.

Appendix A

Signed Certification

Type text here

BRAUN INTERTEC

APPLICATION FOR A Processing Facility PERMIT

Date: _____ County: Haskell

Send to:

Solid Waste Permitting Unit
Land Protection Division
Dept. of Environmental Quality
707 N. Robinson (PO Box 1677)
Oklahoma City, OK
73101-1677

FOR DEQ USE

DEQ Log No. _____
No. Copies _____

Date Received: _____

Keota AD 1, LLC proposes to establish, construct, operate, and maintain
(Applicant's Name)
the Keota AD 1, located at 21405 OK-9, Keota, Oklahoma, 74941
(Facility Name) *(Exact legal description:*

_____
metes & bounds, platted lot, or land survey. Append extra sheets if necessary)

in Haskell County, Oklahoma, and hereby makes application for a permit to establish, construct, operate, and maintain a Processing Facility as required by **Oklahoma Solid Waste Management Act** and Rules pursuant thereto.

Brief description of application:
Application for a Tier III Processing Facility of non-hazardous municipal solid waste in Keota, Oklahoma.

Applicant or Authorized Agent:

Victoria Lepore
Signature

Victoria Lepore
Typed Name

Address: 133 Boston Post Road, Bldg 15, 2nd Floor
City: Weston State: MA

Date signed: 8/19/2024
Phone: 781-232-7597 Extension 4

Preparing Engineer:

_____
Signature

_____
Typed Name

Address: _____
City: _____ State: _____

Date signed: _____
Phone: _____

Facility Address (if any): _____
21405 OK-9, Keota, Oklahoma, 74941

DEQ USE ONLY

APPLICATION FOR A Processing Facility PERMIT

Date: _____ County: Haskell

Send to:

Solid Waste Permitting Unit
Land Protection Division
Dept. of Environmental Quality
707 N. Robinson (PO Box 1677)
Oklahoma City, OK
73101-1677

FOR DEQ USE

DEQ Log No. _____
No. Copies _____

Date Received: _____

Keota AD 1, LLC proposes to establish, construct, operate, and maintain
(Applicant's Name)
the Keota AD1, LLC, located at 21405 OK-9, Keota, Oklahoma, 74941
(*Facility Name*) (*Exact legal description:*

metes & bounds, platted lot, or land survey. Append extra sheets if necessary)

in Haskell County, Oklahoma, and hereby makes application for a permit to establish, construct, operate, and maintain a Processing Facility as required by **Oklahoma Solid Waste Management Act** and Rules pursuant thereto.

Brief description of application:
Application for a Tier III Processing Facility of non-hazardous municipal solid waste in Arkoma, Oklahoma.

Applicant or Authorized Agent:

_____
Signature
Refer to other signature page
Typed Name
Address: 133 Boston Post Road, Bldg 15, 2nd Floor
City: Weston State: MA

Date signed: _____
Phone: 781-232-7597 Extension 4

Preparing Engineer:

Signature
David A. Wright
Typed Name
Address: 11001 Hampshire Avenue S
City: Minneapolis State: MN

Date signed: 6-21-2024
Phone: 903-245-0192

Facility Address (if any): _____
21405 OK-9, Keota, Oklahoma, 74941

DEQ USE ONLY

VERIFICATION[1]

STATE OF OKLAHOMA)
) ss
COUNTY OF Oklahoma)

Victoria A. Lepore, of lawful age, being first duly sworn, upon oath state that I have read the foregoing APPLICATION FOR A _____ PERMIT, that I am familiar with the matters set forth therein, and that the same are true to the best of my information and belief.

Victoria A. Lepore
Applicant

Subscribed and sworn to before me this 21st day of June, 2024,

by Victoria A. Lepore (Applicant or legal representative).

Laura K. Ward
Notary Public

My commission expires:

8-18-2025

LAURA K. WARD
NOTARY
#09006901
EXP. August 18, 2025
PUBLIC
STATE OF OKLAHOMA

[1] This Verification is required for a Tier III application.

Appendix B

Legal Right to Property Documentation

BRAUN INTERTEC

DEQ LANDOWNER NOTIFICATION AFFIDAVIT

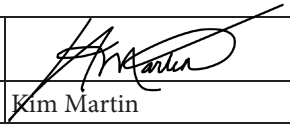
Tier I, II, or III permit applications in which the applicant does not own all the land subject to the application must notify the owner(s) of leases and/or pipeline right-of-ways. The basis for this requirement is Title 27A of the Oklahoma Statutes § 2-14-103(9), as described in OAC 252:004-7-13(b).

Please note that you MUST fill out and return this affidavit even if you don't have to give any landowner notice.

A	NOTICE TO THE LANDOWNER(S) IS NOT REQUIRED because: (check one)		
☐	My application does not involve any land.	☐	My application involves only land owned by me (or applicant business).

OR

B	NOTICE TO THE LANDOWNER(S) IS REQUIRED because the land is owned by someone other than myself or the applicant business AND I HAVE NOTIFIED the following (check one):		
☑	Landowner(s)	☐	Lessor or Administrator or Executor of the land
METHOD OF DELIVERY (check one):			
☐	Actual notice, for which I have a signed and dated receipt		
☐	Service by Sheriff or private process server, for which I have an affidavit		
☑	Service by certified mail, restricted delivery, for which I have a signed return receipt		
☐	Legal publication, for which I have an affidavit of publication from the newspaper, because the landowners could not be located through due diligence		
MY RIGHT TO USE THIS LAND is by:			
☑	Lease	☐ Easement	☐ Other, Specify

LANDOWNER AFFIDAVIT CERTIFICATION			
I, as the applicant or an authorized representative of the applicant, hereby certify that notice to the landowner(s) about the permit application for the facility described below was provided per Option A or B above.			
Company Name	Keota AD 1, LLC	Facility Name	Keota AD1 Solid Waste Processing
Facility Address or Legal Description.	21405 OK-9, Keota, Oklahoma, 74941		
Responsible Official (signature)		Date Signed	6/20/24
Responsible Official (typed)	Kim Martin	Title	VP of Development

If the landowner notice applies to your application (Option B Above) you can send the following form to them as your notice:

NOTICE TO LANDOWNER OF FILING

Dear Landowner: (Name) Don and Jan Sebo

(Applicant name) Keota AD 1, LLC has filed a permit application with the Oklahoma Department of Environmental Quality for (Name) Keota AD1 Solid Waste Processing facility.

This application involves the land owned by you located at:

Address or Legal Description: 21405 OK-9, Keota, Oklahoma, 74941

Signed: Victoria Lepore Date: 6/20/2024

TEMPORARY EASEMENT FOR ACCESS

This temporary easement is issued pursuant to the Oklahoma Environmental Quality Code (27A O.S. §2-1-101 *et seq.*, including the Solid Waste Management Act, the rules promulgated thereunder, and in accordance with the conditions and requirements of Permit No._____ , issued by the Oklahoma Department of Environmental Quality (DEQ) on _____ to Keota AD 1 , LLC.
(Date) (Name of permittee)

The facility is located on property owned by Don and Jan Sebo, hereinafter referred to as Grantor. Grantor does hereby grant unto the DEQ, including its contractors, employees, and its successors and assigns, the right of access to the below described land for purposes of performing closure, post-closure monitoring, or corrective action in the event of default by the owner or operator of the permitted facility.
The easement is granted over and across the permitted area ("Tract") on land situated in

Haskell County, State of Oklahoma.

Following is the legal description of the Tract:

Please see attached for legal description.

more particularly described as the permitted area of Keota AD1 Solid Waste Processing Facility
(Facility name)

_____, DEQ Permit Number: _____.

This Temporary Easement for Access is given subject to the following conditions:

1. The Grantor hereby grants unto the DEQ an easement and right-of-way over and across the Tract of land described above for access to said Tract for the purposes of

conducting closure and post-closure activities and/or corrective action as prescribed by the laws of the State of Oklahoma and Rules of the DEQ;

2. This Easement is temporary and shall become null and void upon certification by the DEQ that post-closure and/or corrective action has been properly completed; and

3. This Easement shall be binding upon the heirs, successors and assigns of the parties hereto.

IN WITNESS WHEREOF, the Grantor has hereunto set (his/her/its) hand this

12th Day of February, 2025.

Don Sebo - owner Jan Sebo - owner

(Name, Title)

ACKNOWLEDGMENT

STATE OF OKLAHOMA)
) SS:
COUNTY OF Haskell)

Before me, the undersigned, a Notary Public within and for said County and State, on this 12th day of February, 2025,

Don and Jan Sebo owners,

(name, title)

did personally appear before me and is known to be the identical person who executed the within and foregoing instrument and acknowledged to me that (he/she) executed the same as (his/her) free and voluntary act and deed, for the uses and purposes therein set forth.

Witness my hand and official seal the date above written.

Heather Hurst
Notary Public

My commission expires:
12-7-27

HEATHER HURST NOTARY PUBLIC IN AND FOR STATE OF OKLAHOMA EXPIRES 12-07-2027 COMMISSION #23015946

EXHIBIT "B"

HASKELL COUNTY, OKLAHOMA
SURFACE SITE DESCRIPTION
TWO STATE SOD FARM

DESCRIPTION OF A 21.11 ACRE SITE, SITUATED IN SECTIONS 15 AND 16, T-9-N, R-23-E.I.M., HASKELL COUNTY, OKLAHOMA, OUT OF A TRACT OF LAND RECORDED IN BOOK 817, PAGE 537, DEED RECORDS HASKELL COUNTY, OKLAHOMA (D.R.H.C.O.), SAID SITE LIMITS BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

POINT OF BEGINNING (P.O.B., X: 2903104.81, Y: 715723.94) within said Section 16, at the Northwest corner of this site, from which a concrete nail found for the Northeast corner of said Section 16 bears North 75°26'42" East a distance of 512.55 feet;

THENCE North 88°00'42" East a distance of 1140.00 feet to the Northeast corner of this site;

THENCE South 01°59'18" East a distance of 140.00 feet to the most Northerly Southeast corner of this site;

THENCE South 88°00'42" West a distance of 140.00 feet to an interior ell corner of this site;

THENCE South 01°59'18" East a distance of 760.00 feet to the most Southerly Southeast corner of this site;

THENCE South 88°00'42" West a distance of 1000.00 feet to the Southwest corner of this site;

THENCE North 01°59'18" West a distance of 900.00 feet to the **POINT OF BEGINNING,** containing 21.11 acres (919,600 sq. ft.).

All bearings, distances and coordinates contained herein are grid, based upon the Oklahoma State Plane Coordinate System, South Zone, of the North American Datum 1983 (NAD83, Realization 2011, Epoch 2010.00), in U.S. Survey Feet.

A survey exhibit of even date accompanies and is considered an integral part of this easement description.

_____ **Date:** _____

Codi L. Lamberson
Oklahoma P.L.S. No. 1963

Date of Survey: April 14, 2024
Revision 2: July 30, 2024

Appendix C

Disclosure Statement

BRAUN INTERTEC

DISCLOSURE STATEMENT FORM

INFORMATION AND INSTRUCTIONS: The Solid Waste Management Act requires applicants to provide the Department of Environmental Quality with information about themselves, any officer, director or partner, any person employed by the applicant as general or key manager who directs the operations of the site which is the subject of the application, and any person owning or controlling more than five percent (5%) of the applicant's debt or equity. By law, the "Disclosure Statement" must be completed by all applicants for the issuance or transfer of any solid waste permit.

If the applicant is a publicly held company, it does not need to submit a disclosure statement, but only need submit the most recent annual (SEC Form 10-K) and quarterly reports (SEC Form 10-Q) required by the Securities and Exchange Commission (SEC), which provide information regarding legal proceedings in which the applicant has been involved. However, the applicant must submit such other information as the Department may require that relates to the competency, reliability, or responsibility of the applicant, officers, directors, or other persons as set out above.

PLEASE PROVIDE THE FOLLOWING INFORMATION: (If additional space is required to answer any of the following questions, please make attachments as needed.)

(1) Name of facility:
Keota AD 1

(2) Applicant's full name and social security number:
Keota AD 1, LLC EIN:99-2891057

(3) Applicant's business address: 133 Boston Post Road, Building 15, 2nd Floor, Weston, MA 02493

(4) Applicant's business telephone number: 781-232-7597

(5) Applicant's form of business:
_____ publicly-held corporation;
___x__ privately-held corporation;
_____ partnership or sole proprietorship;
_____ municipality or public agency;
_____ other: _____

(6) Is Applicant a publicly-held company required to file annual reports with the Securities and Exchange Commission, or a wholly-owned subsidiary of such a company?
_____ yes ____x_ no

(7) If Applicant answered "yes" to question (6) above, Applicant is required to submit copies of the most recent annual and quarterly reports required by the SEC *that provide information regarding legal proceedings in which Applicant has been involved.* In addition, list below, the name and business address of any person employed by the Applicant as a general or key manager who directs the operations of the site or facility which is the subject of the application.

(**NOTE**: If Applicant is required to submit SEC reports under this section, no further reporting is required under the disclosure statement requirement, and Applicant should skip to the "Certification and Oath" section on the last page of this form. Applicant should submit copies of any SEC reports as an attachment to this form to be submitted as part of the permit application. If Applicant answered "no" to question (6) above, Applicant is required to complete all remaining sections of this Form.)

(8) Full name, business address and social security number of all affiliated persons:
(**NOTE**: "Affiliated person" means:
(a) any officer, director, or partner of the applicant;
(b) any person employed by the applicant as a general or key manager who directs the operations of the site or facility which is the subject of the application; and
(c) any person (including corporations, partnerships, etc.) owning or controlling more than five (5) percent of the Applicant's debt or equity.):

Officers of Keota AD 1

1. Marc Stewart, Chief Financial Officer
2. Victoria Lepore, General Counsel

all with a business address of 133 Boston Post Road, Building 15, 2nd Floor, Weston, MA 02493

(Social security numbers provided in separate confidential disclosure to DEQ)

Parent Entity:

3. VR Holdings 2, LLC, sole member of Keota AD 1, LLC
    a. Address: 133 Boston Post Road, Building 15, 2nd Floor, Weston, MA 02493
    b. EIN: 61-1885366

(9) Full name and address of any legal entity in which the Applicant holds a debt or equity interest of at least 5 percent, or which is a parent company or subsidiary of the Applicant, and a description of the ongoing organizational relationships as they may impact operations within the State:

VR Holdings 2, LLC, sole member of Keota AD 1, LLC
133 Boston Post Road, Building 15, 2nd Floor, Weston, MA 02493

(10) Description of the experience and credentials of the Applicant and any “affiliated person”, including any past or present permits, licenses, certifications, or operational authorizations relating to environmental facility regulation:

Through several of VR Holdings 2, LLC's subsidiaries an affiliates we have 14 years of experience in operating biodigesters in seven states: Massachusetts, Vermont, Georgia, Texas, Idaho, Nevada, and New Mexico. We employ 30 + operators and 6 biogas technicians and currently produce 1.5 million MMBTU of gas annually through currently installed sites.

(11) Listing and explanation of any administrative, civil or criminal legal actions against the Applicant or any affiliated person which resulted in a final agency order or final judgment by a court of record

including any final order or judgment on appeal in the ten (10) years immediately preceding the filing of the application relating to solid or hazardous waste. Such action shall include, without limitations, any permit denial or any sanction imposed by a state regulatory authority or the U.S. Environmental Protection Agency:

No legal actions have been taken against VR Holdings 2, LLC.

(12) Listing of any federal environmental agency and any state environmental agency that has or has had regulatory responsibility over Applicant: We have operated digesters in Massachusetts, Vermont, Georgia, Texas, Idaho, Nevada and New Mexico and worked with each state's environmental agency to comply to their guidelines.

CERTIFICATION AND OATH

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Victoria A. Lepore
(Printed or Typed) Name of Applicant or Agent

11/20/2024
Date

Victoria A. Lepore
Signature of Applicant or Agent

General Counsel
Title

ACKNOWLEDGMENT

State of Massachusetts)
)
Middlesex County) ss.

Before me, the undersigned, in and for said county and state, on this 20 day of November, 2024, personally appeared Victoria Lepore, to me known to be the identical person who executed the within and foregoing instrument, and acknowledged to me that Victoria Lepore executed the same as general counsel of VR. Holdings 2 LLC free and voluntary act and deed for the uses and purposes therein set forth.

Notary Public

My commission expires:

April 26, 2030

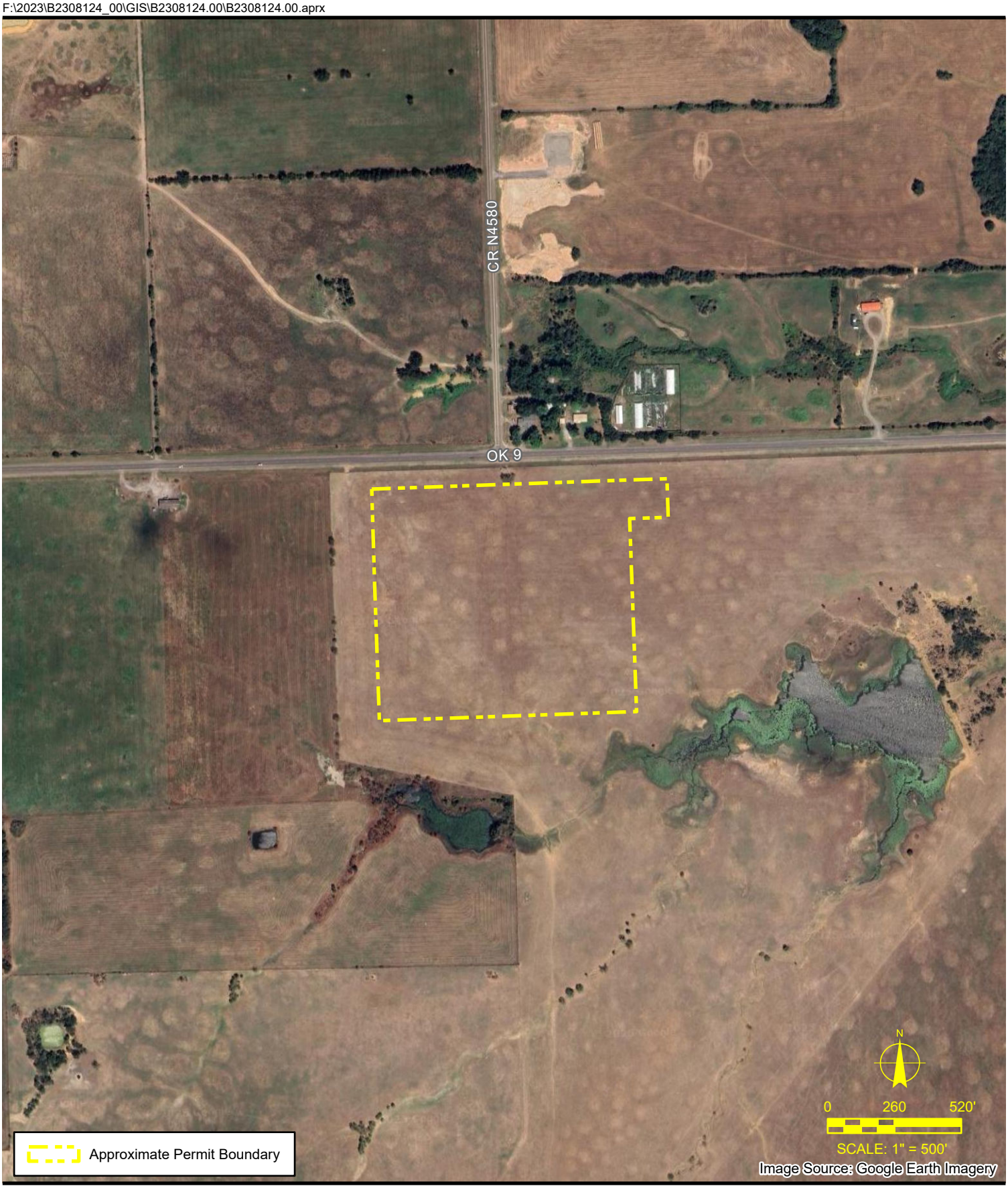
Emily Robertson
My Commission Expires April 26, 2030
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS

:\DisclStmtFORM.doc
12/00

Appendix D

Figures and Maps

F:\2023\B2308124_00\GIS\B2308124.00\B2308124.00.aprx



BRAUN INTERTEC
The Science You Build On.
11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Project No:	B2308124.00
Drawing No:	Fig1_SiteLayout
Drawn By:	ZS
Date Drawn:	2/2/2024
Checked By:	SB
Last Modified:	2/13/2025

Two State Sod Farm - Keota AD1

21404 OK-9

Keota, Oklahoma

Site Layout

Figure 1

F:\2023\B2308124_00\GIS\B2308124.00\B2308124.00.aprx

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The Science You Build On.
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Minneapolis, MN 55438
952.995.2000
braunintertec.com

Project No: B2308124.00

Drawing No: Fig2_General_Location

Drawn By:	ZS
Date Drawn:	2/2/2024
Checked By:	SB
Last Modified:	11/20/2024

Two State Sod Farm - Keota AD1

21404 OK-9

Keota, Oklahoma

General Location

Figure 2

National Flood Hazard Layer FIRMette

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

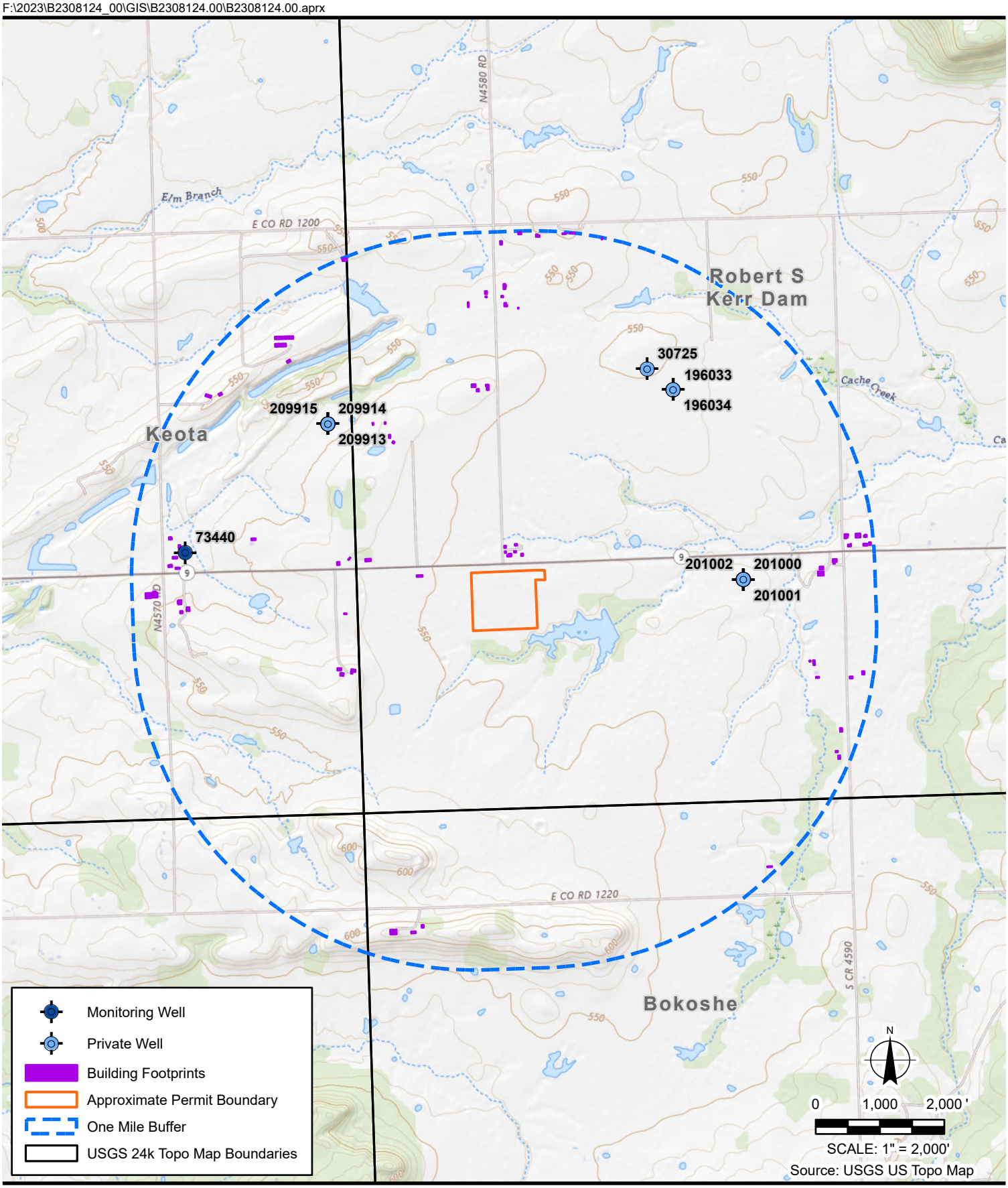
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/4/2024 at 10:04 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 3

F:\2023\B2308124_00\GIS\B2308124.00\B2308124.00.aprx



BRAUN INTERTEC
The Science You Build On.
11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Project No: B2308124.00

Drawing No: Fig4_QuadrangleTopoMap

Drawn By:	ZS
Date Drawn:	2/2/2024
Checked By:	SB
Last Modified:	2/13/2025

Two State Sod Farm - Keota AD1

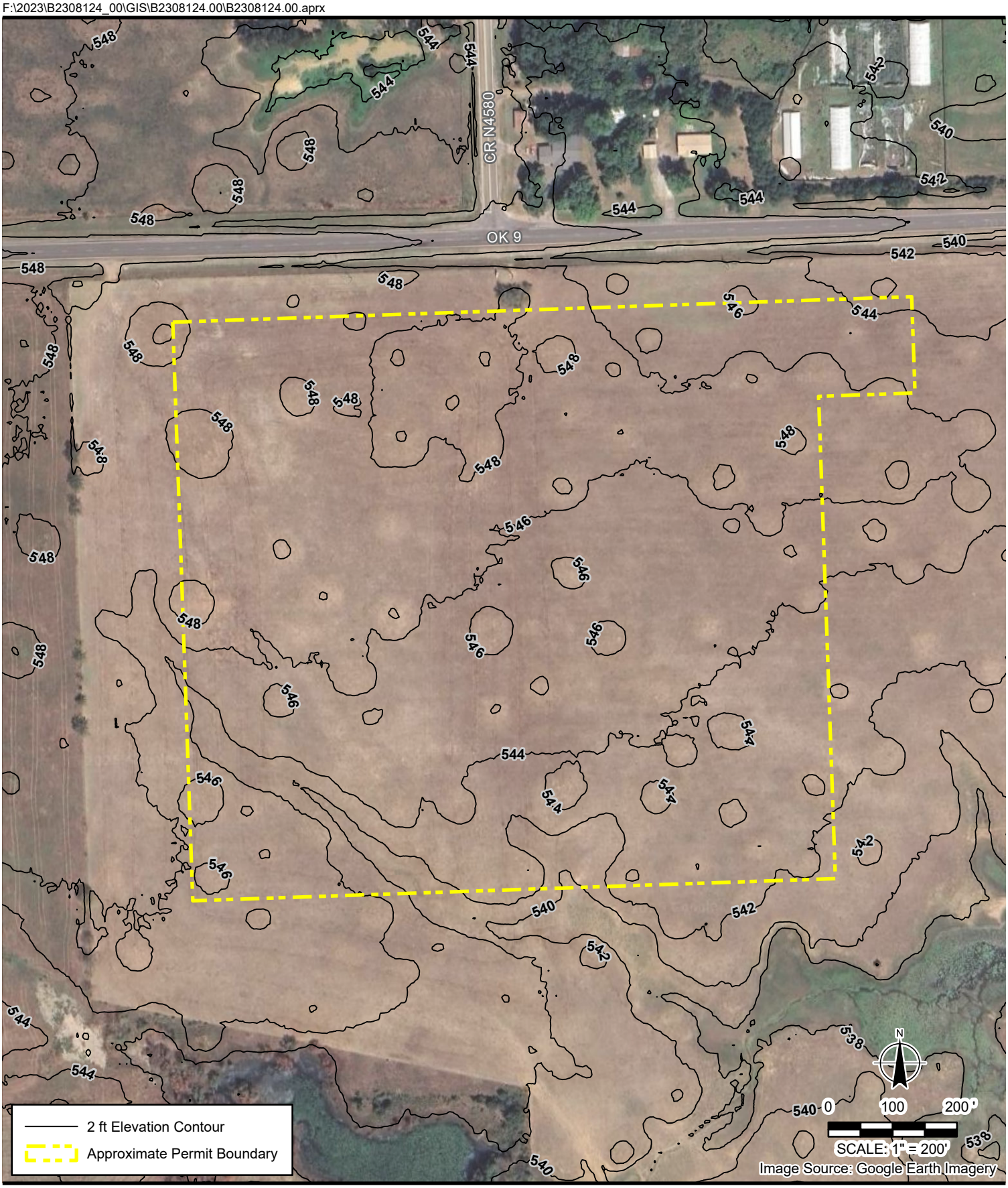
21404 OK-9

Keota, Oklahoma

Quadrangle Topographic Map

Figure 4

F:\2023\B2308124_00\GIS\B2308124.00\B2308124.00.aprx



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11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Project No: B2308124.00

Drawing No: Fig5_ExistingContours

Drawn By:	ZS
Date Drawn:	2/2/2024
Checked By:	SB
Last Modified:	2/13/2025

Two State Sod Farm - Keota AD1

21404 OK-9

Keota, Oklahoma

Existing Contours Map

Figure 5

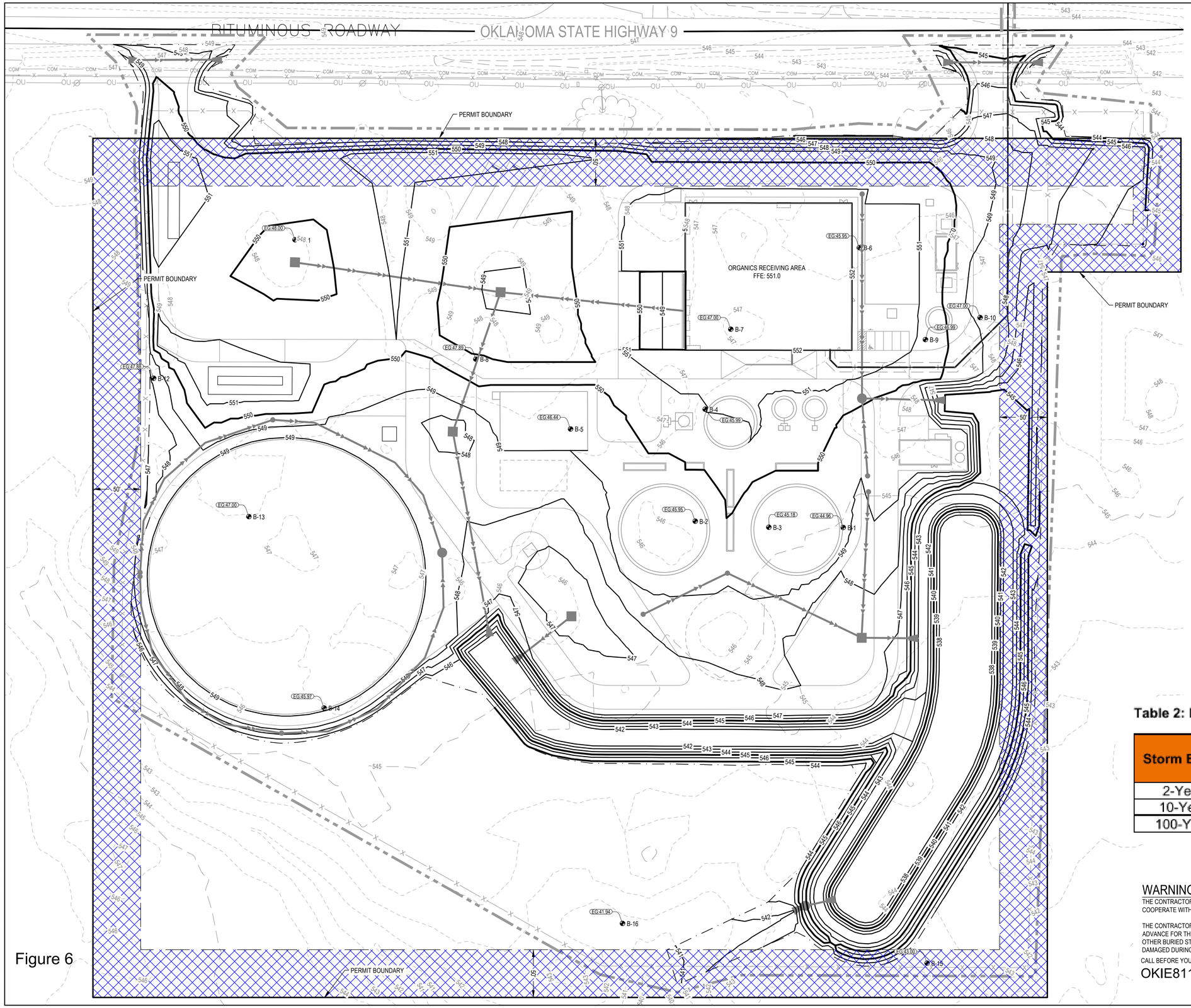
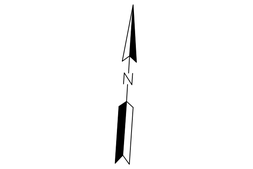


Figure 6



LEGEND

- PERMIT BOUNDARY
- 901 — EXISTING MINOR CONTOUR
- 900 — EXISTING MAJOR CONTOUR
- 901 — PROPOSED MINOR CONTOUR
- 900 — PROPOSED MAJOR CONTOUR
- GRADING LIMITS
- CONSTRUCTION LIMITS
- PERMIT BUFFER ZONE
- EG=5XX.XX — EXISTING GRADE ELEVATION

NOTES

1. SEE SHEET 0576-G-002 FOR ADDITIONAL PROJECT NOTES.
2. EXISTING SPOT ELEVATIONS AT MATCH POINTS ARE BASED ON INTERPOLATED POINT TO POINT SURVEY DATA. CONTRACTOR IS RESPONSIBLE FOR VERIFYING CONNECTION POINTS PRIOR TO INSTALLATION OF IMPROVEMENTS. CONTRACTOR SHALL NOTIFY ENGINEER IN WRITING IMMEDIATELY OF ANY FIELD DISCREPANCIES. CONTRACTOR IS RESPONSIBLE FOR MAKING NECESSARY ADJUSTMENTS IN THE FIELD FOR CONSTRUCTABILITY, REGULATORY COMPLIANCE (ADA), POSITIVE DRAINAGE, AND TO ENSURE SMOOTH TRANSITIONS TO FIELD CONDITIONS. CONTRACTOR IS RESPONSIBLE FOR REWORK OF A DISCREPANCY THAT IS NOT COMMUNICATED TO THE ENGINEER IN WRITING.
3. CONTRACTOR MUST IMMEDIATELY NOTIFY THE OWNER AND ENGINEER OF DISCREPANCIES OR CONFLICTS IN THE CONTRACT DOCUMENTS BEFORE COMMENCING WORK. NO FIELD CHANGES OR DEVIATIONS ARE TO BE MADE WITHOUT PRIOR WRITTEN APPROVAL FROM ENGINEER. FAILURE TO NOTIFY OWNER AND ENGINEER OF AN IDENTIFIABLE CONFLICT BEFORE PROCEEDING WITH INSTALLATION RELIEVES OWNER AND ENGINEER OF ANY OBLIGATION TO PAY FOR A RELATED CHANGE ORDER.
4. SEE GEOTECHNICAL REPORT FOR SUBGRADE STABILZATION AND EARTHWORK PREPARATION FOR BUILDING PAD CONSTRUCTION.

Table 2: Peak Runoff Rate Summary

Storm Event	Existing (cfs)	Proposed (cfs)
2-Year	55.62	47.15
10-Year	89.56	73.44
100-Year	157.74	125.88

WARNING:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CALLING FOR LOCATIONS OF ALL EXISTING UTILITIES. THEY SHALL COOPERATE WITH ALL UTILITY COMPANIES IN MAINTAINING THEIR SERVICE AND/OR RELOCATION OF LINES.

THE CONTRACTOR SHALL CONTACT OKIE811 DIAL 811 OR CALL AT 1-800-522-6543 AT LEAST 3 BUSINESS DAYS IN ADVANCE FOR THE LOCATIONS OF ALL UNDERGROUND WIRES, CABLES, CONDUITS, PIPES, MANHOLES, VALVES OR OTHER BURIED STRUCTURES BEFORE DIGGING. THE CONTRACTOR SHALL REPAIR OR REPLACE THE ABOVE WHEN DAMAGED DURING CONSTRUCTION AT NO COST TO THE OWNER.

CALL BEFORE YOU DIG

OKIE811

DIAL 811
TOLL FREE 1-800-522-6543

Stantec
2321 CLUB MERIDIAN DRIVE
SUITE E
OKEMOS, MI 48864
PHONE: (517)-349-9499
WWW.STANTEC.COM
CERTIFICATE OF AUTORIZATION NO. 3861, EXPIRATION 6/30/2025

CLIENT:

VANGUARD RENEWABLES

KEOTA AD1

HASKELL COUNTY, OKLAHOMA

PROJECT TITLE:

ISSUE NO:	DESCRIPTION:	DATE:
0	ISSUED FOR PERMIT	11/19/2024
1	DRIVEWAY REVISIONS	12/13/2024
2	SOLID WASTE PERMIT	01/10/2024

CERTIFICATION:

LICENSED PROFESSIONAL ENGINEER
ANDRE' M. RODRIGUE
27376
OKLAHOMA

I CERTIFY MY E-SIGNATURE FOR THE PLANS ENTITLED "KEOTA AD1"

PROJECT NO.:	193807099
DWN BY: DMC / CHK'D BY: JTP / APP'D BY: AMR	
ISSUE DATE:	01/10/2024
ISSUE NO.:	2
SHEET TITLE:	GRADING PLAN BUFFER ZONE
SHEET NO.:	EX-2

EXHIBIT "A"

TWO STATE SOD FARM SITE

LESSOR'S PROPERTY

WARRANTY DEED
Book 817, Page 537

SURFACE AND SURFACE ONLY:

The West Half (W /2), and
The Southwest Quarter of the Southeast Quarter (SW/4 SE/4), and
The South Half of the Northwest Quarter of the Southeast Quarter
(S/2 NW/4 SE/4), and
The Northwest Quarter of the Northwest Quarter of the Southeast Quarter (NW/4 NW/4 SE/4), and
The West Half of the Southwest Quarter of the Northeast Quarter
(W/2 SW/4 NE/4), of **Section Fifteen (15)**,

AND

The East Half of the Northeast Quarter of the Northeast Quarter
(E/2 NE/4 NE/4), and
The South Half of the Southeast Quarter of the Northeast Quarter
(S/2 SE/4 NE/4), and
The Southeast Quarter of the Southwest Quarter of the Northeast Quarter
(SE/4 SW/4 NE/4), and
The Southeast Quarter (SE/4), of **Section Sixteen (16)**,

AND

The Northwest Quarter (NW/4), and
The East Half (E/2), of **Section Twenty-one (21)**,

AND

The South Half (S/2), and
The Northwest Quarter (NW/4), and
The Northwest Quarter of the Southwest Quarter of the Northeast Quarter
(NW/4 SW/4 NE/4), and
The Northeast Quarter of the Northwest Quarter of the Northeast Quarter
(NE/4 NW/4 NE/4), and
The West Half of the Northwest Quarter of the Northeast Quarter
(W/2 NW/4 NE/4), of **Section Twenty-two (22)**,

All in Township Nine (9) North, Range Twenty-three (23) East of the Indian Base and Meridian.

Figure 7

EXHIBIT "B"

HASKELL COUNTY, OKLAHOMA

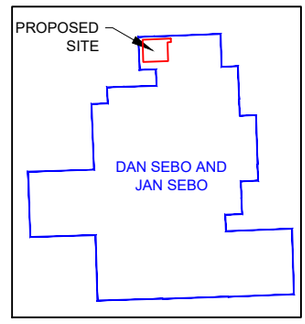
SURFACE SITE PLAT

TOTAL SURFACE SITE: 21.11 ACRES
OR 919,600 SQUARE FEET

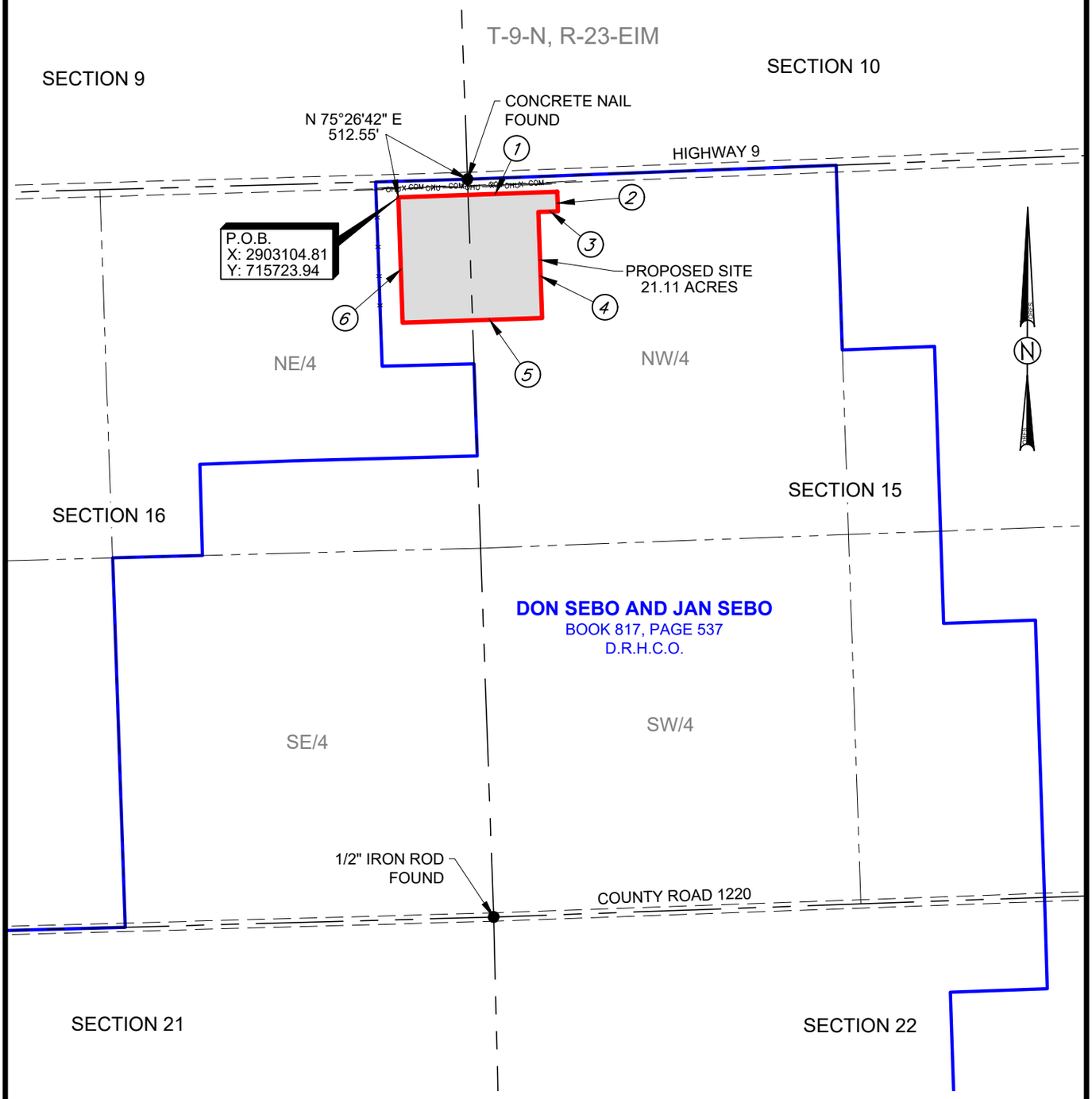
1000' 500' 0 500' 1000'
1" = 1000'

LEGEND	
	SURFACE SITE LIMIT
X X	FENCE
OHU	OVERHEAD UTILITY
COM	UNDERGROUND CABLE
	SECTION LINE
	1/4 SECTION LINE
	SUBJECT TRACT
	ROAD WAY
	MONUMENT FOUND

LINE TABLE		
LINE	BEARING	DISTANCE
1	N 88°00'42" E	1140.00'
2	S 01°59'18" E	140.00'
3	S 88°00'42" W	140.00'
4	S 01°59'18" E	760.00'
5	S 88°00'42" W	1000.00'
6	N 01°59'18" W	900.00'



VICINITY MAP
NOT TO SCALE



1. CERTIFICATION IS MADE ONLY TO THE LOCATION OF THIS EASEMENT ACCORDING TO EVIDENCE AND/OR LINES OF OCCUPATION OBSERVED UPON THE DATE OF THIS FIELD SURVEY. ONLY UTILITIES/EASEMENTS THAT WERE VISIBLE AND APPARENT ON THE DATE OF THIS SURVEY, WITHIN/ADJOINING THE DESCRIBED EASEMENT, HAVE BEEN LOCATED, SHOWN AND/OR DESCRIBED HEREON OF WHICH I HAVE KNOWLEDGE OF. THIS CERTIFICATION IS LIMITED TO THOSE PERSONS OR ENTITIES SHOWN ON THE FACE OF THIS EXHIBIT, IS NON-TRANSFERABLE AND MADE FOR THIS TRANSACTION ONLY.
2. TITLE INFORMATION HAS BEEN PROVIDED BY THE CLIENT; AS SUCH, OPEN RANGE FIELD SERVICES DOES NOT WARRANT OR GUARANTEE THAT ALL CONFLICTS, EASEMENTS OR ENCUMBRANCES ARE SHOWN. ADJOINER INFORMATION SHOWN OR DESCRIBED IS FOR INFORMATIONAL PURPOSES ONLY.
3. ALL BEARINGS, DISTANCES AND COORDINATES CONTAINED HEREIN ARE GRID, BASED UPON THE OKLAHOMA STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, OF THE NORTH AMERICAN DATUM 1983 (NAD83, REALIZATIONS 2011, EPOCH 2010.00), IN U.S. SURVEY FEET.
4. MONUMENTS SET MARKING BOUNDARY CORNERS SHALL BE 1/2 INCH DIAMETER REBAR WITH ORANGE PLASTIC CAP STAMPED "OPEN RANGE FS RPLS 6480", UNLESS NOTED OTHERWISE.
5. SURFACE SITE DESCRIPTION OF EVEN DATE ACCOMPANIES AND IS A PART OF THIS SURVEY EXHIBIT.

CODI LAMBERSON, P.L.S. 1963

REVISION				SURVEYED BY	B.C.	4-14-24
NO.	DESCRIPTION	BY	DATE	DRAWN BY	D.G.	4-17-24
1	NEW PROJECT LOCATION	DG	4-17-24	CHECKED BY	C.L.	4-18-24
2	REVISE SITE	DG	7-30-24	PROJECT MGR.	D.G.	
				PROJ. NO. ORFS-8800-117		
				DWG NAME: TWO STATE SOD FARM SITE.DWG		

Vanguard RENEWABLES

OPEN RANGE FIELD SERVICES, LLC.
1503 S. BARNES, PAMPA, TX 79065
TBPELS No.: 10193994
OFFICE: 806-665-0770
39350 IH-10 WEST, BOERNE, TX 78006
TBPELS No.: 10194069
OFFICE: 830-816-5009
(CA-7824 LS 6/30/2025)

TWO STATE SOD FARM

EXHIBIT "B"

HASKELL COUNTY, OKLAHOMA
SURFACE SITE DESCRIPTION
TWO STATE SOD FARM

DESCRIPTION OF A 21.11 ACRE SITE, SITUATED IN SECTIONS 15 AND 16, T-9-N, R-23-E.I.M., HASKELL COUNTY, OKLAHOMA, OUT OF A TRACT OF LAND RECORDED IN BOOK 817, PAGE 537, DEED RECORDS HASKELL COUNTY, OKLAHOMA (D.R.H.C.O.), SAID SITE LIMITS BEING MORE PARTICULARLY DESCRIBED BY METES AND BOUNDS AS FOLLOWS:

POINT OF BEGINNING (P.O.B., X: 2903104.81, Y: 715723.94) within said Section 16, at the Northwest corner of this site, from which a concrete nail found for the Northeast corner of said Section 16 bears North 75°26'42" East a distance of 512.55 feet;

THENCE North 88°00'42" East a distance of 1140.00 feet to the Northeast corner of this site;

THENCE South 01°59'18" East a distance of 140.00 feet to the most Northerly Southeast corner of this site;

THENCE South 88°00'42" West a distance of 140.00 feet to an interior ell corner of this site;

THENCE South 01°59'18" East a distance of 760.00 feet to the most Southerly Southeast corner of this site;

THENCE South 88°00'42" West a distance of 1000.00 feet to the Southwest corner of this site;

THENCE North 01°59'18" West a distance of 900.00 feet to the **POINT OF BEGINNING,** containing 21.11 acres (919,600 sq. ft.).

All bearings, distances and coordinates contained herein are grid, based upon the Oklahoma State Plane Coordinate System, South Zone, of the North American Datum 1983 (NAD83, Realization 2011, Epoch 2010.00), in U.S. Survey Feet.

A survey exhibit of even date accompanies and is considered an integral part of this easement description.

_____ **Date:** _____

Codi L. Lamberson
Oklahoma P.L.S. No. 1963

Date of Survey: April 14, 2024
Revision 2: July 30, 2024

WaterWeb - Wellhead Protection Areas (WHPAs) - Wellhead Protection Areas (WHPAs)

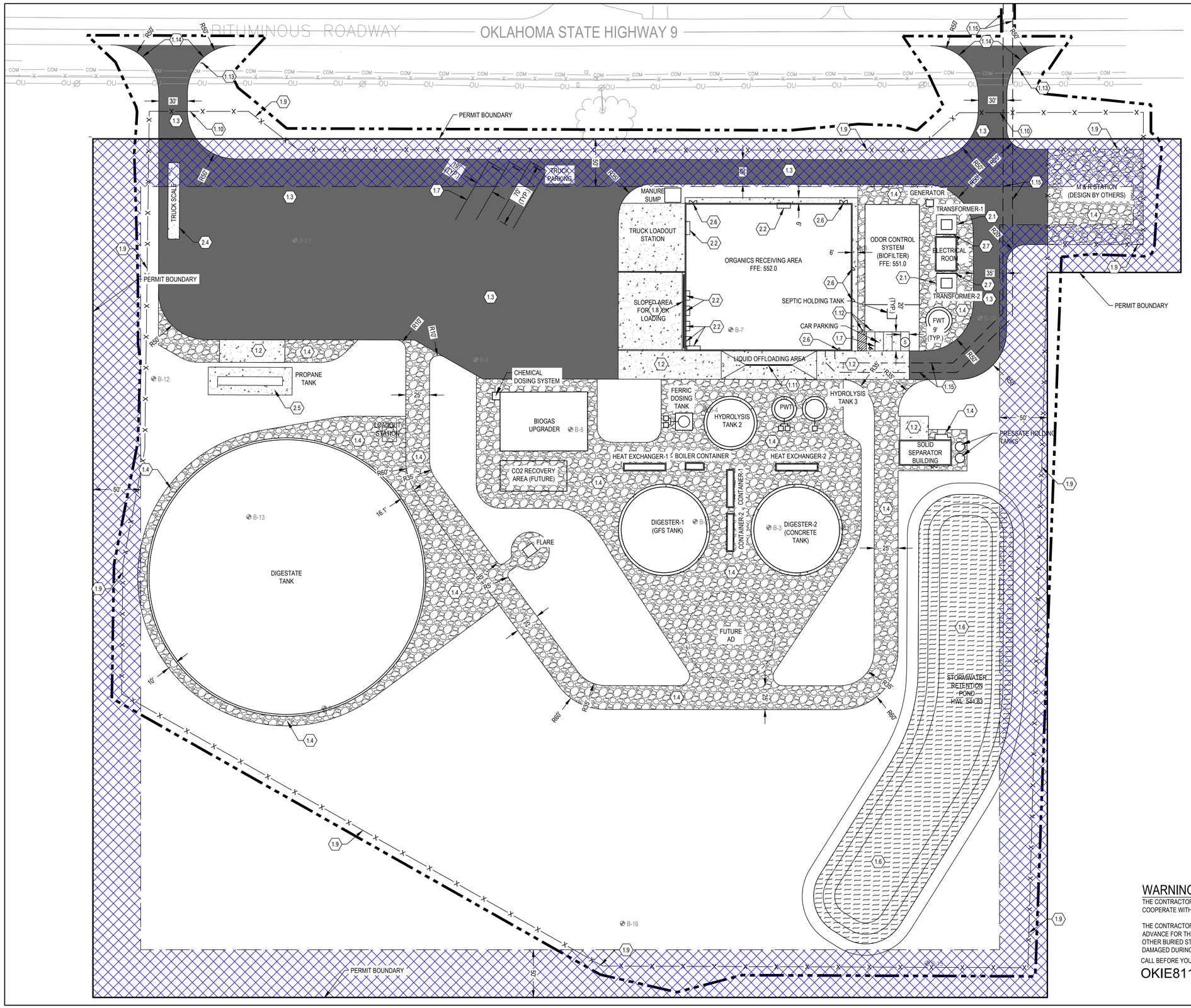
Numerical Flow/Flow-and-Transport Computer Model of wellhead protection areas in Oklahoma.

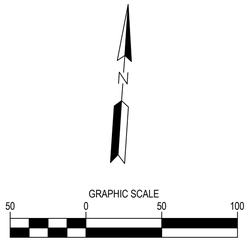
Figure 8 - Locations of Wellhead Protection Areas

Two State Sod Farm - Keota AD1
21405 OK-9
Keota, Oklahoma

Appendix E

Design Drawings





LEGEND

- PERMIT BOUNDARY
- LEASED BOUNDARY
- SETBACK LINE
- EASEMENT LINE
- HEAVY DUTY CONCRETE PAVEMENT
- HEAVY DUTY BITUMINOUS PAVEMENT
- GRAVEL SURFACING
- RETENTION POND
- FENCE
- TRENCH DRAIN
- (#) PROPOSED PARKING COUNT
- CONSTRUCTION LIMITS
- PERMIT BUFFER ZONE

NOTES

1. SEE SHEET 0576-G-002 FOR ADDITIONAL PROJECT NOTES.
2. DESIGN BY OTHERS ITEMS SHOWN FOR REFERENCE ONLY. EXACT LOCATION, DETAIL, AND DESIGN BY OTHERS. COORDINATE WITH PROJECT PARTNERS TO OBTAIN RELATED CONSTRUCTION DOCUMENTS/DRAWINGS.

KEYNOTES (#)

1. STANTEC DESIGN ITEMS
   - 1.1. MATCH EXISTING
   - 1.2. HEAVY DUTY CONCRETE PAVEMENT - SEE DETAIL 8/0576-C-801
   - 1.3. HEAVY DUTY BITUMINOUS PAVEMENT - SEE DETAIL 9/0576-C-801
   - 1.4. GRAVEL SURFACING - SEE DETAIL 7/0576-C-801
   - 1.5. BOLLARD - SEE DETAIL 1/0576-C-802
   - 1.6. STORMWATER RETENTION POND
   - 1.7. PAVEMENT MARKINGS - SEE DETAIL 4/0576-C-803
   - 1.8. TRENCH DRAIN SEE DETAIL 6/0576-C-803
   - 1.9. INSTALL CHAIN LINK FENCE - SEE DETAIL 2/0576-C-804, COORDINATE WITH OWNER PRIOR TO CONSTRUCTION
   - 1.10. SECURITY GATE (SLIDES EAST TO OPEN) - SEE DETAIL 1/0576-C-804
   - 1.11. TRENCH DRAIN LIQUID OFF LOAD AREA - SEE DETAIL 6/0576-C-803
   - 1.12. HANDICAP ACCESSIBLE PARKING STALL WITH ACCESS AISLE - SEE DETAILS 4,5,7,8,9/0576-C-803
   - 1.13. STOP SIGN - SEE DETAIL 5/0576-C-803
   - 1.14. ODOT DRIVEWAY DESIGN - SEE DETAIL RDI-3/0576-C-802
   - 1.15. PROPOSED 10' UTILITY EASEMENT
2. DESIGN BY OTHERS ITEMS - SEE NOTE 2
   - 2.1. FENCE
   - 2.2. OVERHEAD DOOR/DOCK - SEE ARCHITECTURAL PLANS
   - 2.3. EXTERIOR STAIR - SEE ARCHITECTURAL PLANS
   - 2.4. TRUCK SCALE
   - 2.5. CONCRETE PAD
   - 2.6. DOOR
   - 2.7. CONCRETE WALL

WARNING:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CALLING FOR LOCATIONS OF ALL EXISTING UTILITIES. THEY SHALL COOPERATE WITH ALL UTILITY COMPANIES IN MAINTAINING THEIR SERVICE AND/OR RELOCATION OF LINES.

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CALL BEFORE YOU DIG

OKIE811

DIAL 811
TOLL FREE 1-800-522-6543

Stantec
2321 CLUB MERIDIAN DRIVE
SUITE E
OKEMOS, MI 48864
PHONE: (517)-349-9499
WWW.STANTEC.COM
CERTIFICATE OF AUTORIZATION NO. 3861, EXPIRATION 6/30/2025

CLIENT:

VANGUARD RENEWABLES

KEOTA AD1

HASKELL COUNTY, OKLAHOMA

PROJECT TITLE:

ISSUE NO.	DESCRIPTION:	DATE:
0	ISSUED FOR PERMIT	11/19/2024
1	DRIVEWAY REVISIONS	12/13/2024
2	SOLID WASTE PERMIT	01/10/2024

CERTIFICATION:

LICENSED PROFESSIONAL ENGINEER
ANDRE' M. RODRIGUE
27376
OKLAHOMA

I CERTIFY MY E-SIGNATURE FOR THE PLANS ENTITLED "KEOTA AD1"

PROJECT NO.:	193807099
DWN BY: DMC / CHK'D BY: JTP / APP'D BY: AMR	
ISSUE DATE:	01/10/2024
ISSUE NO.:	2
SHEET TITLE:	SITE PLAN BUFFER ZONE
SHEET NO.:	EX-1

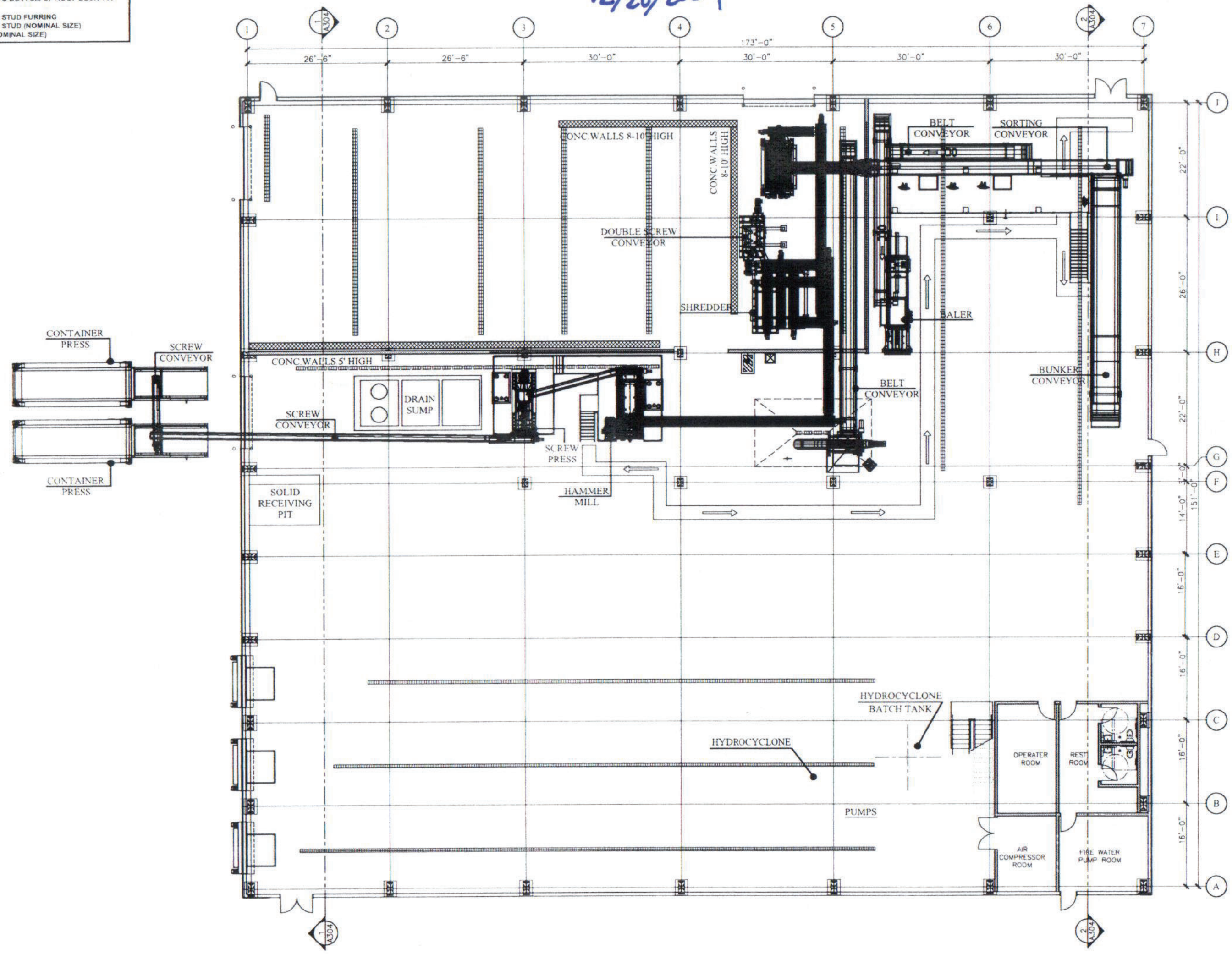
LEGEND

SYMBOL	DESCRIPTION
	NEW WALL - METAL STUD
	METAL PANEL BUILDING SYSTEM BY METAL BUILDING MANUFACTURER
	NEW 1-HOUR FIRE RATED WALL - METAL STUD - UL U419
	NEW 16" CONCRETE PUSH WALL, RE: STRUCTURAL
	LOCATION OF X-BRACING, CONTRACTOR TO COORDINATE FINAL LOCATION WITH METAL BUILDING PACKAGE
LETTER INDICATES WALL TYPE REF PLANS (A6)	NUMBER INDICATES STUD HEIGHT; NO NUMBER INDICATES STUD HEIGHT TO BOTTOM OF ROOF DECK TYP. NUMBER INDICATES STUD SIZE AS FOLLOWS: 2 - 2 1/2" METAL STUD FURRING; 4 - 3 5/8" METAL STUD (NOMINAL SIZE); 6 - 6" METAL (NOMINAL SIZE)

LICENSED PROFESSIONAL ENGINEER CORBIN HEARD 29198 OKLAHOMA 12/26/2024

FOR SOLID WASTE PERMIT APPROVAL ONLY

DRAWING IS PRELIMINARY IN NATURE AND IS NOT FOR CONSTRUCTION OR BUILDING PERMIT.



1 GENERAL EQUIPMENT ARRANGMENT PLAN

SCALE: 3/32" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
ORGANICS RECEIVING AREA (ORA)
GENERAL ARRANGEMENT
FLOOR PLAN
HASKEL COUNTY OK

REV	DATE	BY	APPD	DESCRIPTION
A	05.31.24	DP	DP	SOLD WASTE PERMIT ONLY

5/31/2024

wdesign
ARCHITECTURE & INTERIORS
608 East 3rd Street
Tulsa, OK 74120
Office: 918.794.6616
Fax: 918.794.6602
www.wdesignsite.com

DWG NUMBER 0576-A-201

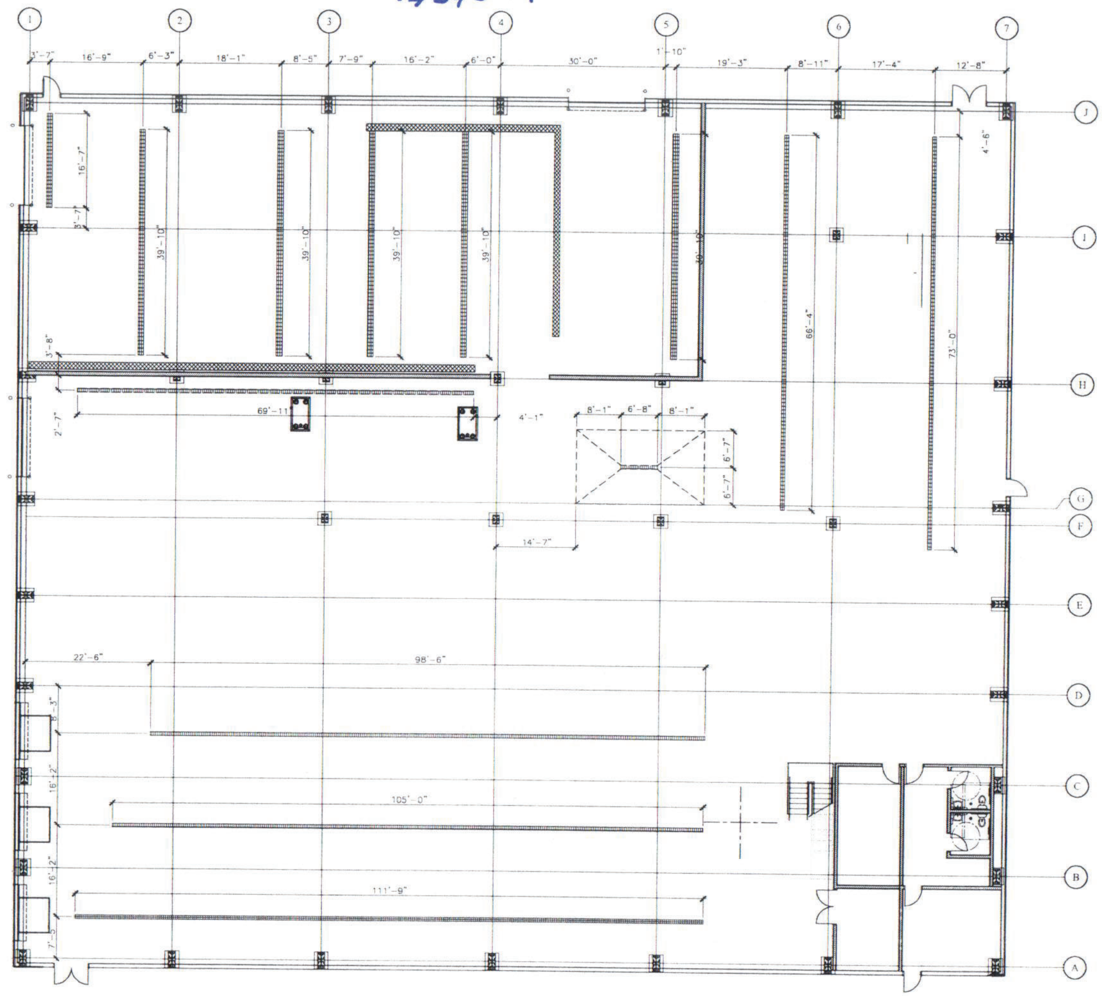
SCALE AS NOTED

REV A

FOR SOLID WASTE PERMIT APPROVAL ONLY

DRAWING IS PRELIMINARY IN NATURE AND IS NOT FOR CONSTRUCTION OR BUILDING PERMIT.

LICENSED PROFESSIONAL ENGINEER
CORBIN HEARD
29198
OKLAHOMA
12/26/2024



1 PRELIMINARY DRAIN LOCATION PLAN

SCALE: 3/32" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
ORGANICS RECEIVING AREA (ORA)
DRAIN LOCATION PLAN
HASKEL COUNTY OK

REV	DATE	BY	APPD	DESCRIPTION
A	05.31.24	DP	DP	SOLD WASTE PERMIT ONLY

LICENSED ARCHITECT, STATE OF OKLAHOMA
5/31/2024

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DWG NUMBER
0576-A-202

SCALE
AS NOTED

REV
A

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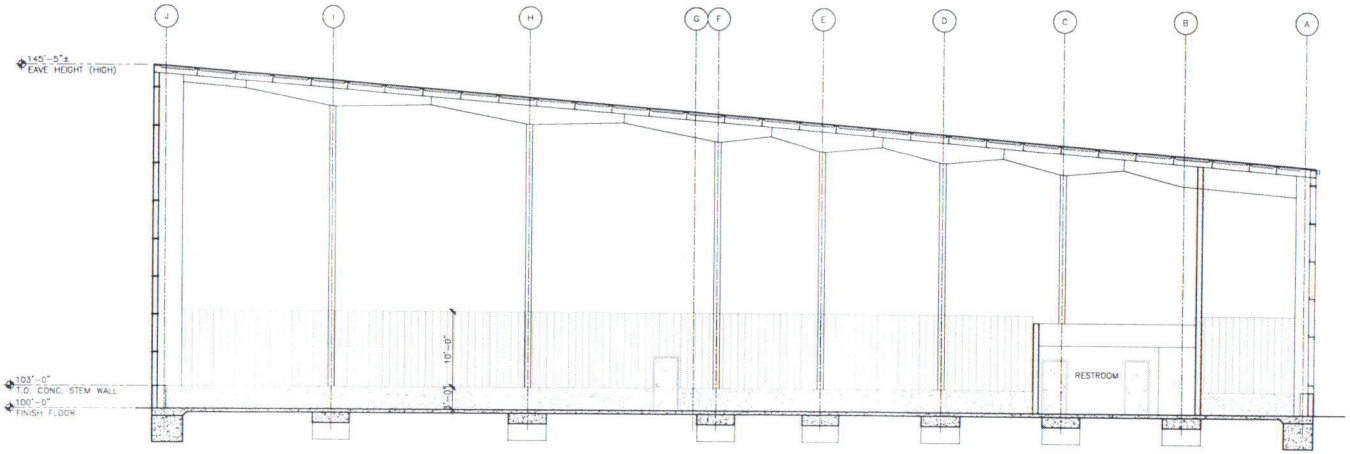
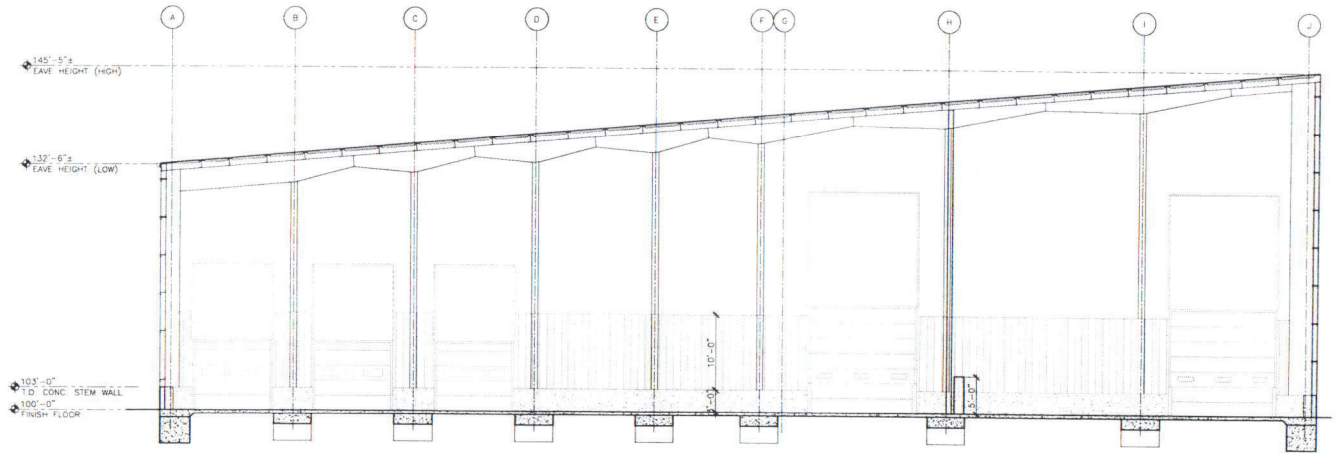
LICENSED PROFESSIONAL ENGINEER
CORBIN HEARD
29198
OKLAHOMA
12/26/2024



2 BUILDING SECTION
SCALE: 1/8" = 1'-0"



1 BUILDING SECTION
SCALE: 1/8" = 1'-0"

PRELIMINARY
NOT FOR
CONSTRUCTION

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
ORGANICS RECEIVING AREA (ORA)
BUILDING SECTIONS
HASKELL COUNTY OK

REV	DATE	BY	APPD	DESCRIPTION
A	05.31.24	DP	DP	SOLID WASTE PERMIT ONLY

STATE OF OKLAHOMA
JORDAN
OK
LICENSED ARCHITECT
5/31/2024

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GENERAL NOTES

1. ALL DIMENSIONS ARE TO CENTERLINE OF OBJECT, EXCEPT FOR THE PERIMETER STUDS WHICH ARE DIMENSIONED TO EDGE OF SLAB OR PEMB COLUMN LINE
2. ALL DOORS SHALL BE SET 4" OFF WALL, OR 6" FROM WALL WITH A DOOR CLOSER, MEASURED FROM THE HINGE SIDE OF INTERIOR DOORS, UNLESS NOTED OTHERWISE.
3. COORDINATE UNDERGROUND PLUMBING LOCATIONS WITH CONTRACTOR BEFORE POURING CONCRETE SLAB.
4. COORDINATE ELECTRICAL AND LIGHTING LOCATIONS WITH CONTRACTOR PRIOR TO INSTALLATION.
5. PROVIDE EVENLY SPACED VERTICAL CONTROL JOINTS NOT TO EXCEED 30'-0" HORIZONTAL DISTANCE BETWEEN SUCH JOINTS ON ALL GYPSUM BOARD AND STUCCO WALLS, OR AS SPECIFIED BY THE MANUFACTURER.
6. NOTIFY ARCHITECT IMMEDIATELY IF DIFFERENT CONDITIONS EXIST FROM WHAT IS DESCRIBED.
7. ALL EXIT DOORS SHALL BE OPERATIVE FROM THE INSIDE WITHOUT THE USE OF A KEY, OR ANY SPECIAL KNOWLEDGE, OR EFFORT.
   7.1. DOOR HARDWARE SHALL MEET REQUIREMENTS OF IBC 2015 SECTION 1010.1.9.1 - DOOR HANDLES, PULLS, LATCHES, LOCKS AND OTHER OPERATING DEVICES ON DOORS REQUIRED TO BE ACCESSIBLE BY CHAPTER 11 SHALL NOT REQUIRE TIGHT GRASPING, TIGHT PINCHING, OR TWISTING OF THE WRIST TO OPERATE.
8. ALL DIMENSIONS ARE TO BE TIED TO A COLUMN LINE. CONTRACTOR WILL IMMEDIATELY REPORT ANY OMISSIONS OF DIMENSIONS NOT TIED TO A COLUMN LINE TO THE ARCHITECT PRIOR TO START ON CONSTRUCTION.
9. COORDINATE ALL MEP ACCESS PANELS NOT SHOWN ON ARCHITECTURAL CONSTRUCTION DOCUMENTS WITH OWNER PRIOR TO INSTALLATION.
   PROVIDE ADEQUATE BLOCKING AS REQUIRED AT EVERY LOCATION WHERE MILLWORK, WALL LIGHT FIXTURES, TV BRACKETS, PLUMBING FIXTURES, ETC ARE TO BE MOUNTED.
10. ALL WOOD BLOCKING TO BE FIRE RETARDANT
12. SLOPE CONCRETE TO DRAIN AT ALL INTERIOR FLOOR DRAIN LOCATIONS. GENERAL CONTRACTOR TO COORDINATE FINISHED HEIGHT OF FLOOR DRAIN WITH SLOPED SLAB.
13. METAL STUD WALLS HEIGHTS TO BE MIN 6" ABOVE SCHEDULE CEILING, TYP. UNO

KEYNOTES

FLOOR PLAN

NOTE: NOT ALL KEYNOTES MAY BE USED ON THIS SHEET.

1. CONCRETE SLAB, TYP. RE: STRUCTURAL
2. 8" PERIMETER CONCRETE STEM WALL TO 1'-0" HIGH. RE: STRUCTURAL
3. CONCRETE EQUIPMENT PAD, RE: STRUCTURAL FOR HEIGHT AND LOCATION.
4. STEEL PEMB MAINFRAME AND SUPPORTING COLUMNS, FINAL LOCATION AND SIZE TO BE COORDINATED WITH PEMB MANUF.
5. STRUCTURAL X-BRACE BY PEMB. FINAL LOCATION BY METAL BUILDING SUPPLIER
6. 26 GA PBR PRE-FINISHED METAL LINER PANEL (BY PEMB PROVIDER) ABOVE STEM WALL
7. FIRE EXTINGUISHER, FINAL LOCATION BY FIRE MARSHAL
8. EQUIPMENT. FINAL LOCATION BY OWNER
9. FLOOR DRAIN, RE: PLUMBING FOR ROUTING
10. ELECTRICAL PANELS, RE: ELEC FOR FINAL LOCATION
11. KNOX BOX. FINAL LOCATION BY FIRE MARSHAL
12. 6" BOLLARDS, TYP. COORD. LOCATIONS PER OWNER AS REQUIRED.
13. 8" WIDE X 12" HIGH CONCRETE STEM WALL. RE: STRUC. 8" METAL STUD WALL ABOVE CONCRETE STEM WALL TO DECK WITH PLYWOOD SHEATHING ON INTERIOR SIDE AND METAL PANEL ON EXTERIOR SHEATHING ON EXTERIOR FACE.
14. EXTERIOR STAIRS, RE: 1/-SS-A202 & STRUCTURAL
15. TRENCH DRAIN / BOX DRAIN. RE: PLUMBING FOR ROUNTING AND SPEC. CLASS C RATED GRATES, VERIFY FINAL LOCATION WITH OWNER
16. 12" WIDE BY 6'-0" HIGH PUSH WALL. RE: STRUCTURAL.

LEGEND

SYMBOL	DESCRIPTION
(solid wall)	NEW WALL - METAL STUD
(open wall)	METAL PANEL BUILDING SYSTEM BY METAL BUILDING MANUFACTURER
(hatched wall)	12" WIDE X 6'-0" HIGH CONCRETE PUSH WALL
(dash-dot line)	LOCATION OF X-BRACING, CONTRACTOR TO COORDINATE FINAL LOCATION WITH METAL BUILDING PACKAGE
(dashed arrow)	PATH OF TRAVEL / TRAVEL DISTANCE
(exit symbols)	EMERGENCY EXIT LIGHT FIXTURE / EM EXIT WITH EMERGENCY LIGHT W/ BATTERY BACKUP
(light symbol)	EMERGENCY LIGHT W/ BATTERY BACKUP
LETTER INDICATES WALL TYPE REF PLANS A6	NUMBER INDICATES STUD HEIGHT NO NUMBER INDICATES STUD HEIGHT TO BOTTOM OF ROOF DECK TYP NUMBER INDICATES STUD SIZE AS FOLLOWS: 2 - 2 1/2" METAL STUD FURRING; 4 - 3 5/8" METAL STUD (NOMINAL SIZE); 6 - 6" METAL (NOMINAL SIZE)

WALL ASSEMBLIES

WALL TYPE	UL DESIGN #	NOTES
A		METAL STUDS AT 16" O.C. ON TOP OF STEM WALL WITH 5/8" PLYWOOD SHEATHING ON INTERIOR FACE AND PEMB PANEL ON 5/8" EXTERIOR SHEATHING ON EXTERIOR SIDE. PROVIDE BATT R19 INSULATION

LIFE SAFETY NOTES:

1. RE: A501 & ELECTRICAL DRAWINGS FOR LIGHTING PLAN FOR EMERGENCY LIGHTING LOCATIONS. ALL EXIT SIGNS AND EMERGENCY LIGHTS ARE SHOWN ON A501 DRAWINGS AND WILL BE SUBJECT TO INSPECTION FROM THE FIRE MARSHAL HAVING AUTHORITY PRIOR TO FINAL APPROVALS.
2. EXIT ACCESS TRAVEL DISTANCE = 200' (W/O SPRINKLER SYSTEM) FOR F1 FACTORY
3. FIRE EXTINGUISHERS SCHEDULED ARE FOR INTERIOR USE AS REQUIRED BY NFPA10. COORDINATE FINAL LOCATION WITH AHJ. FIRE EXTINGUISHERS TO MEET LOCAL GOVERNING CODES AND INSTALLED BY GC.

FIRE EXTINGUISHER NOTES

1. FIRE EXTINGUISHER MAXIMUM DISTANCE OF TRAVEL NOT TO EXCEED 75'-0" FEET.
2. FIRE EXTINGUISHER CABINETS AND EXTINGUISHER LOCATIONS ARE SCHEMATIC AND MAYBE ALTERED AS REQUIRED. FINAL LOCATION AND APPROVAL BY FIRE MARSHAL

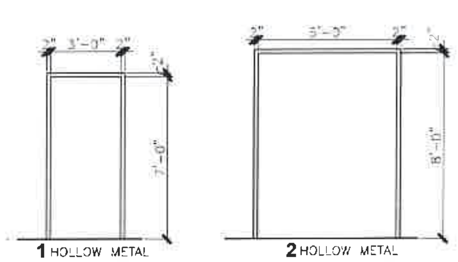
DOOR SCHEDULE

SEPARATOR BLD-DINNERBELL_EDEN AD1

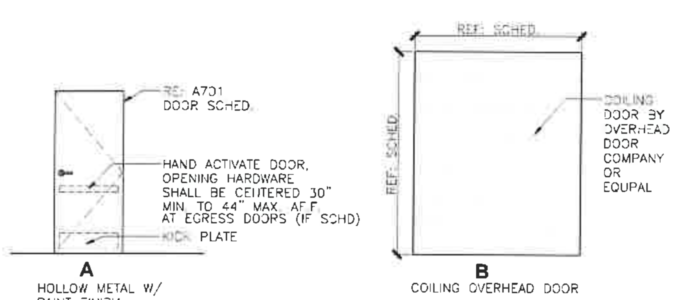
DOOR TYPE RE: 2/A201 — FRAME TYPE RE: 3/A201 — DETAIL LOCATED ON DRAWINGS AS NOTED — SIGNAGE GROUP RE: 1/A001 — TYPICAL DOOR THICKNESS 1-3/4" UNLESS NOTED OTHERWISE

OPENING NO.	ROOM NAME	DOOR TYPE	WOOD	HOLLOW METAL	STEEL	ALUMINUM	PAIR	WIDTH	HEIGHT	HARDWARE SET	PANIC HARDWARE	GLASS TYPE	DOOR AND FRAME LABEL (MIN)	FRAME TYPE	WOOD	HOLLOW METAL	ALUMINUM	HEAD	JAMB	SILL/THRESHOLD	PULL SIDE	PUSH SIDE	REMARKS
100A	SEPARATORS	A	-	●	-		●	3'-0"	8'-0"		●	-	-	2	-	●	-	-	-		-	-	CARD READER
100B	SEPARATORS	A	-	●	-		●	3'-0"	8'-0"		-	-	-	2	-	●	-	-	-		-	-	CARD READER
100C	SEPARATORS	A	-	●	-			3'-0"	7'-0"		●	-	-	1	-	●	-	-	-		-	-	CARD READER
200A	SEPARATORS	A	-	●	-			3'-0"	7'-0"		●	-	-	1	-	●	-	-	-		-	-	CARD READER
OH200A	SEPARATORS	B	-	-	●	-	-	15'-0"	10'-0"		-	-	-	-	-	-	-	-	-	-	-	-	COILING OVERHEAD DOOR

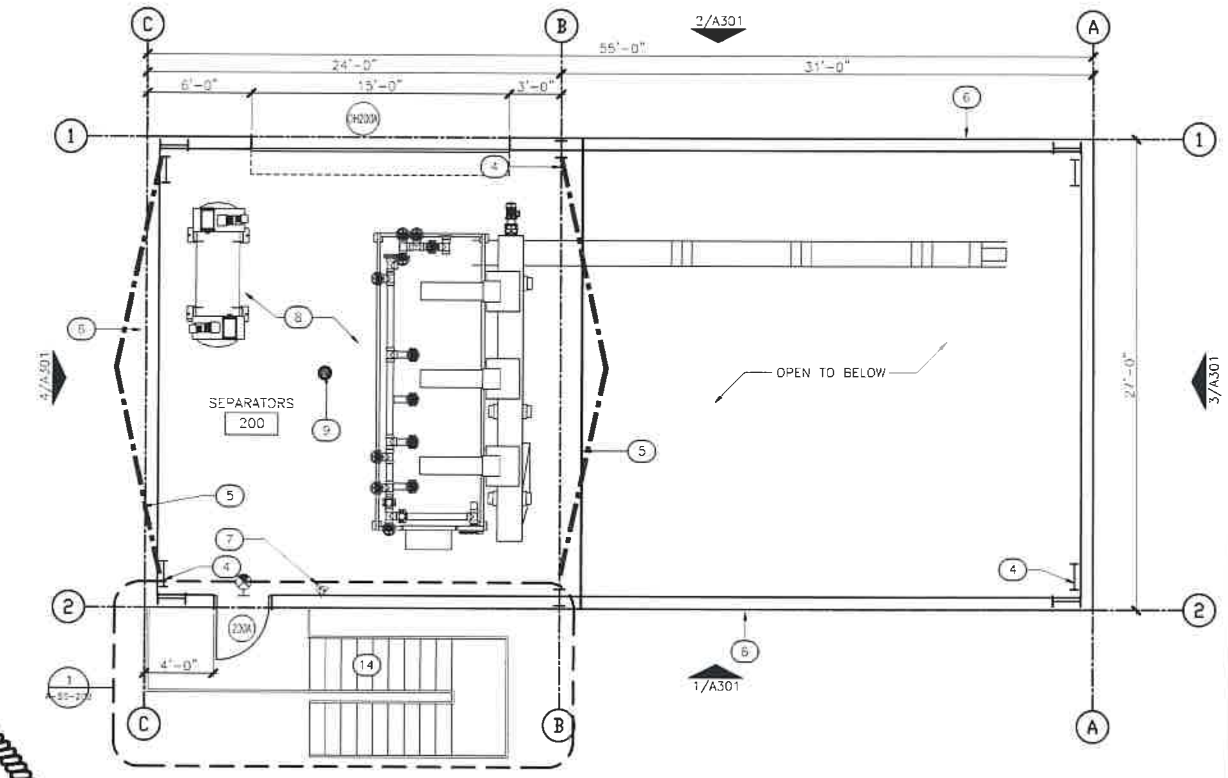
OWNER TO VERIFY REQUIREMENTS OF ALL DOORS & OVERHEAD DOOR; LOCATION, SYSTEMS, AND REQUIREMENTS PRIOR TO PURCHASE, TYP. OF ALL DOORS



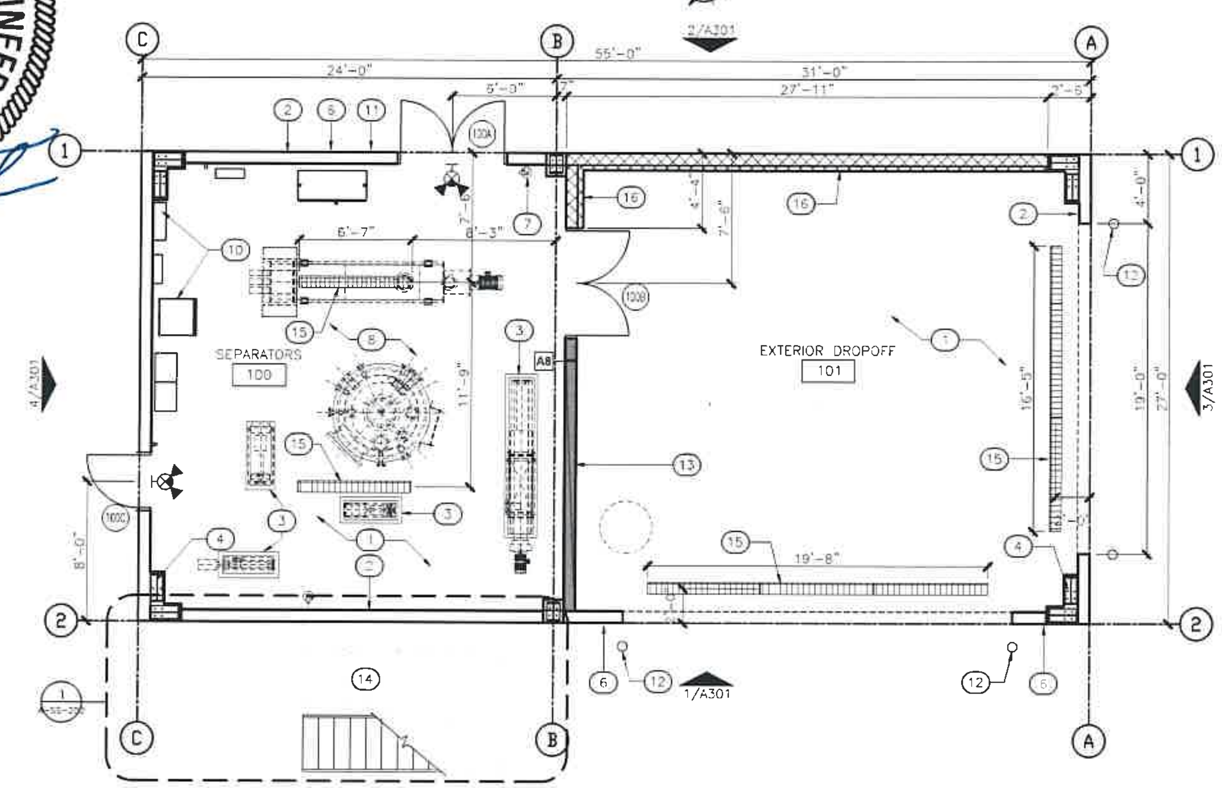
3 DOOR FRAME TYPES
SCALE: 1/4"=1'-0"



2 DOOR TYPES
SCALE: 1/4"=1'-0"



2 SECOND FLOOR PLAN
SCALE: 3/16" = 1'-0"



1 FIRST FLOOR PLAN
SCALE: 3/16" = 1'-0"

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VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
SOLID SEPERATOR BLD
FLOOR PLAN
HASKELL COUNTY OK

REV	DATE	BY	APPD	DESCRIPTION
0	01.31.25	DP	DP	SOLID WASTE PERMIT ONLY

1/31/2025

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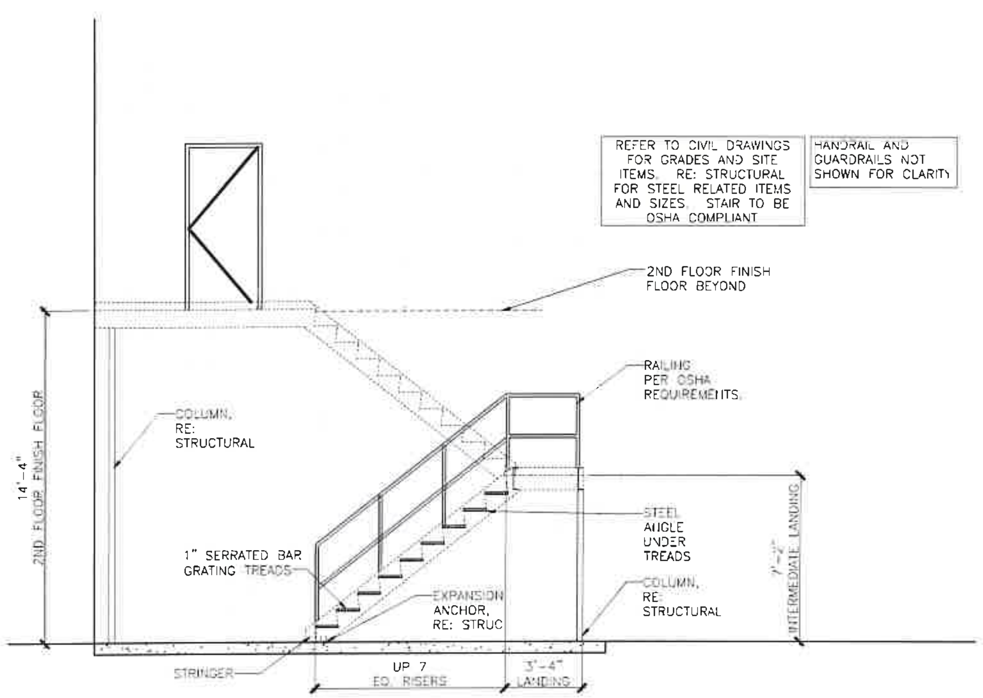
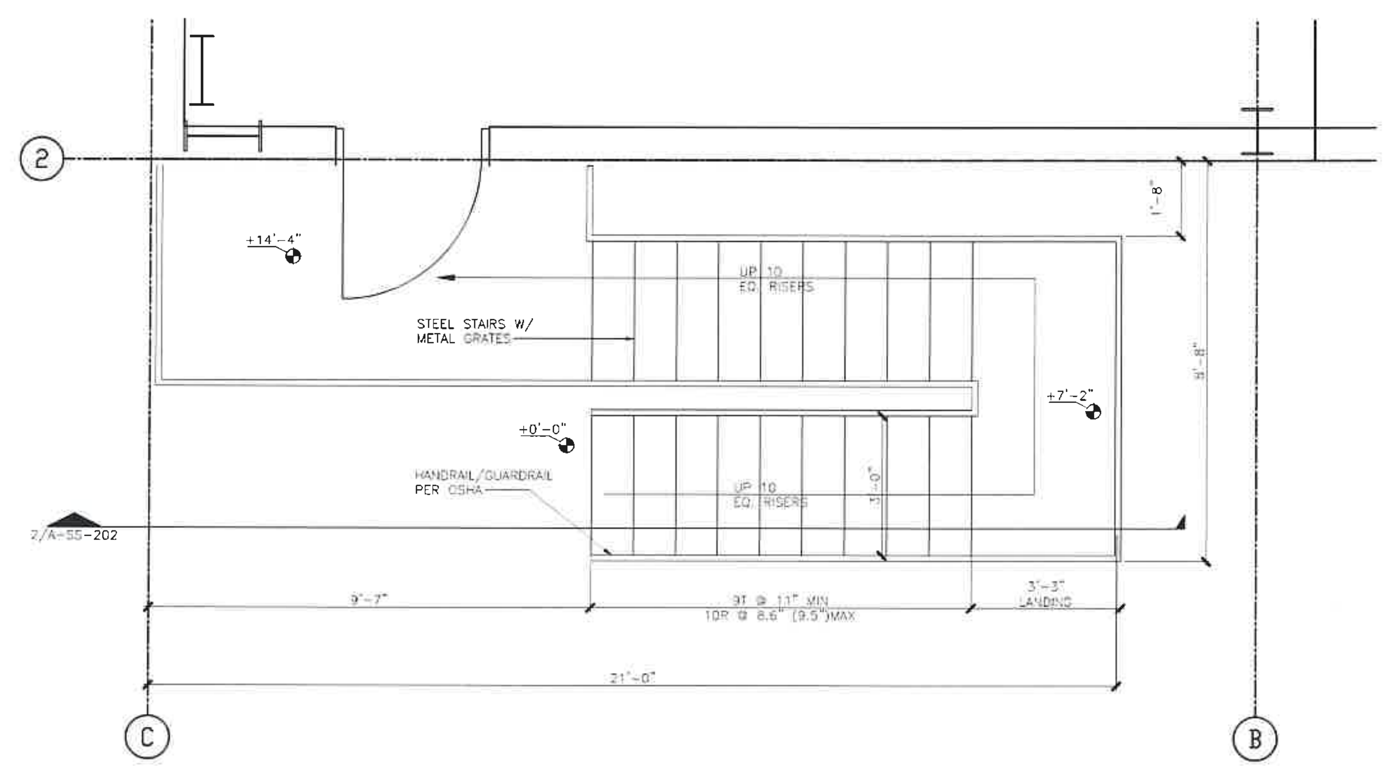


2 STAIR SECTION
SCALE: 1/4" = 1'-0"



1 ENLARGED STAIR PLAN
SCALE: 1/2" = 1'-0"

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2-12-2025
OKLAHOMA

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
SOLID SEPERATOR BLD
PLAN DETAILS
HASKEL COUNTY OK

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0	01.31.25	DP	DP	SOLD WASTE PERMIT ONLY

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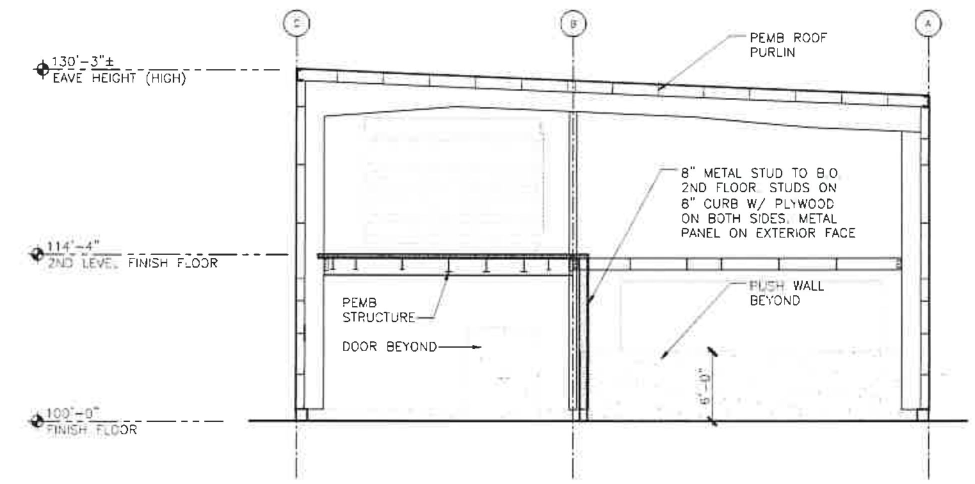
GENERAL NOTES

1. REFER TO SPECIFICATIONS FOR DETAILED PRODUCT INFORMATION SUCH AS SUBMITTAL REQUIREMENTS, SUBSTITUTION PROCEDURES, ACCEPTABLE MANUFACTURERS, SPECIFIC INSTALLATION REQUIREMENTS AND WARRANTY REQUIREMENTS.
2. ALL EXTERIOR PAINT COLORS TO BE APPROVED BY OWNER PRIOR TO COMMENCEMENT OF WORK.
3. G.C. TO PROVIDE A MOCK-UP AREA ON EXTERIOR OF BUILDING FOR OWNER'S APPROVAL OF FINISHES AT EACH FINISH LOCATION.
4. ALL EXTERIOR BUILDING MATERIALS TO MATCH MANUFACTURER, MODEL AND COLOR AS SHOWN ON THE EXTERIOR FINISH SCHEDULE. A SAMPLE OF ALL SUBSTITUTIONS TO BE SUBMITTED TO THE ARCHITECT FOR APPROVAL PRIOR TO PROCUREMENT. RE: SPECIFICATIONS.
5. ALL EXTERIOR PAINT TO HAVE. G.C. TO VERIFY WITH OWNER PRIOR TO PROCUREMENT.
6. OWNER TO APPROVE WINDOW AND DOOR STYLES PRIOR TO PROCUREMENT.
7. G.C. TO PROVIDE GUTTER AND DOWNSPOUTS AND COORDINATED WITH PEMB MANUF. MAIN BUILDING DOWNSPOUTS TO DRAIN TO DAYLIGHT OR TO CENTRAL RAIN WATER TANK, RE: CIVIL DRAWINGS. GUTTER AND DOWNSPOUT LOCATIONS TO BE APPROVED BY OWNER.
8. ALL ROOF FLASHING TO MATCH ADJACENT ROOFING FINISH.
9. PROVIDE ADEQUATE BLOCKING AS REQUIRED AT EVERY LOCATION WHERE WALL LIGHT FIXTURES, PLUMBING FIXTURES, ETC., ARE TO BE MOUNTED. ITEMS ARE REQUIRED TO RESIST 250 POUND POINT LOAD.

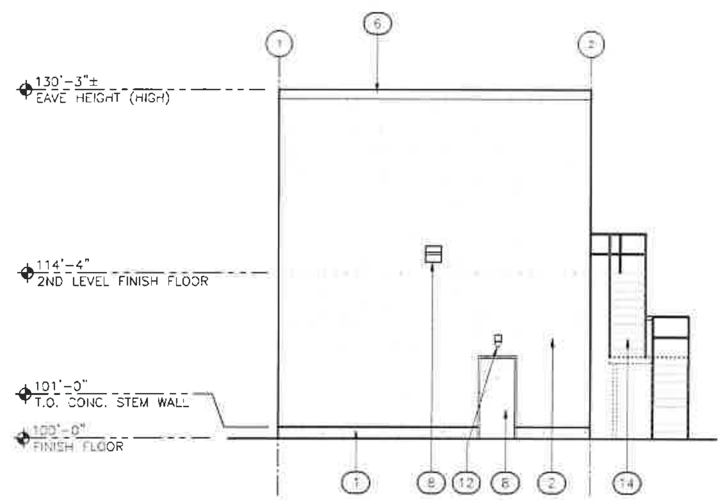
KEYNOTES ◯
ELEVATIONS

NOTE: NOT ALL KEYNOTES MAY BE USED ON THIS SHEET.

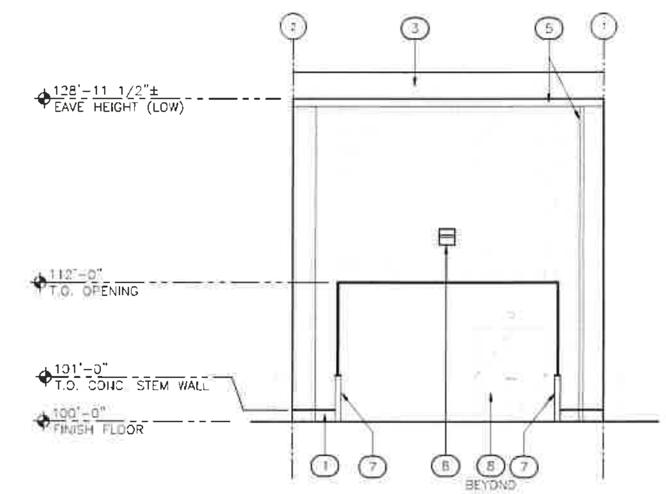
1. BUILDING PERIMETER CONCRETE STEM WALL TO 1'-0", RE: STRUCTURAL & ELEV.
2. PRE-FINISHED 26GA PPR WALL METAL PANEL SYSTEM PER APPROVED PEMB SUPPLIER. INSTALL PER MANUF. RECOMMENDATION.
3. PRE-FINISHED 24 GA MR24 ROOF PANEL PER APPROVED PEMB SUPPLIER.
4. EXPOSED PEMB COLUMNS. PAINT TO MATCH BUILDING.
5. PRE-FINISHED METAL GUTTER AND DOWNSPOUT BY PEMB SUPPLIER. RE: MEP/CIVIL
6. PRE-FINISHED RAKE TRIM BY PEMB SUPPLIER.
7. 6" STEEL PIPE BOLLARD 48" HIGH FILLED WITH CONCRETE W/ ROUNDED TOP. PAINT SAFETY YELLOW
8. SCHEDULED HOLLOW METAL MAN DOOR AND FRAME BY PEMB SUPPLIER. PAINT TO MATCH ADJACENT COLOR.
9. PRE-FINISHED ELECTRIC OPERATED COILING OVERHEAD DOOR.
10. WALL LOUVER W/ BIRD SCREEN; RE: MECHANICAL DRAWINGS FOR SIZE AND LOCATION.
11. NOT USED.
12. EXTERIOR EGRESS WALL PACK WITH BATTERY BACKUP AT EXIT DOORS, RE: ELECTRICAL
13. EXTERIOR LED WALL MOUNTED LIGHT PACK, RE: ELECTRICAL
14. EXTERIOR METAL GRATE STAIRS PER OSHA REQUIREMENTS. RE: STRUCTURAL FOR SUPPORT
15. 6'-0" HIGH CONCRETE PUSH WALL, RE: STRUCTURAL



5 BUILIDNG SECTION
SCALE: 1/8" = 1'-0"



4 EAST ELEVATION
SCALE: 1/8" = 1'-0"



3 WEST ELEVATION
SCALE: 1/8" = 1'-0"

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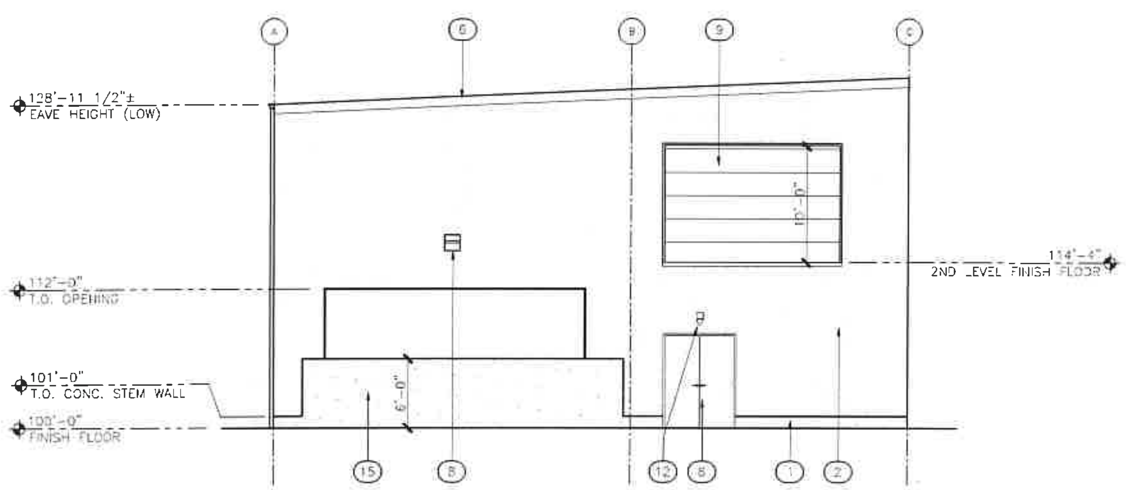
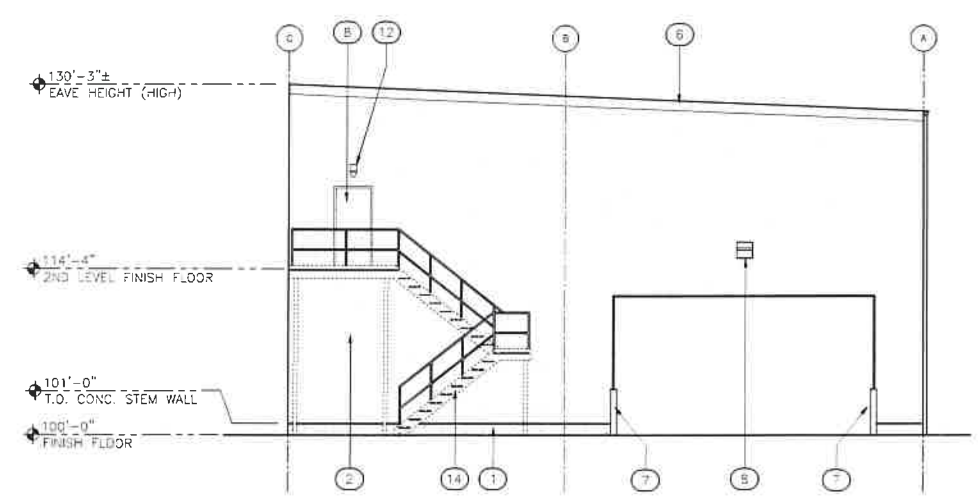
29198
2-12-2025
OKLAHOMA



2 SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



1 NORTH ELEVATION
SCALE: 1/8" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
SOLID SEPERATOR BLD
EXTERIOR ELEVATIONS
HASKEL COUNTY OK

REV	DATE	BY	APPD	DESCRIPTION
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1/31/2025

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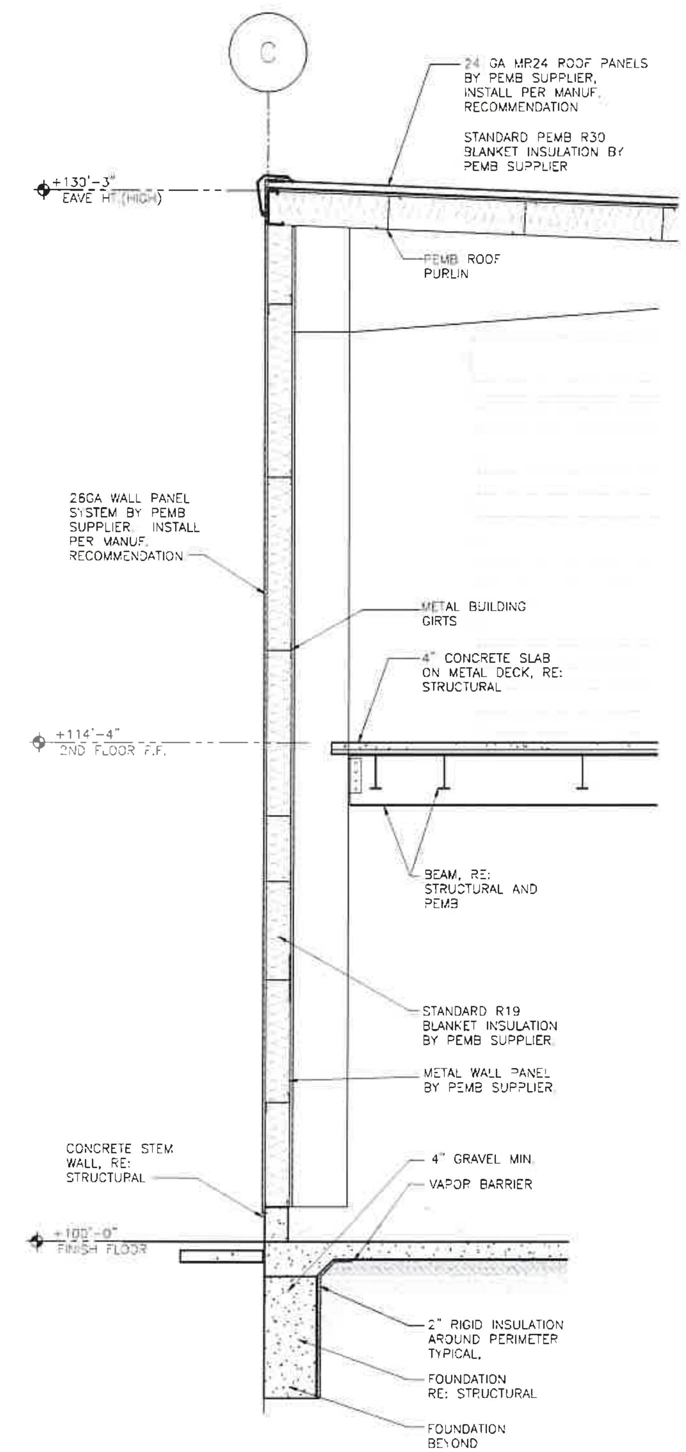

1 WALL SECTION
SCALE: 3/8" = 1'-0"

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CORBIN HEARD
29198
2-12-2025
OKLAHOMA

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
SOLID SEPERATOR BLD
WALL SECTIONS
HASKEL COUNTY OK

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SCALE: AS NOTED

REV: 0

GENERAL NOTES
ROOF PLAN

1. ALL EXTERIOR BUILDING MATERIALS TO MATCH MANUFACTURER, MODEL AND COLOR AS SHOWN PER APPROVED METAL BUILDING PACKAGE. A SAMPLE OF ALL SUBSTITUTIONS TO BE SUBMITTED TO THE ARCHITECT FOR APPROVAL PRIOR TO PROCUREMENT.
2. ROOF TO MAINTAIN 1/2" PER 1'-0" MINIMUM SLOPE IN ALL AREAS.
3. REFER TO STRUCTURAL METAL BUILDING DRAWINGS FOR ROOF FRAMING MEMBER SIZES, LAYOUT ETC.
4. CONTRACTOR SHALL CONSULT OWNER AND COORDINATE ALL DOWNSPOUT, ROOF VENTS AND PLUMBING VENT LOCATIONS.
5. GENERAL CONTRACTOR TO INSTALL AND COORDINATE ROUTING LEADERS FROM DOWNSPOUTS

KEYNOTES
ROOF PLAN

NOTE: NOT ALL KEYNOTES MAY BE USED ON THIS SHEET.

1. PRE-FINISHED 24 GA MR24 ROOF PANEL PER APPROVED PEMB SUPPLIER.
2. PRE-FINISHED METAL GUTTER AND DOWNSPOUT BY PEMB SUPPLIER. ROUTE MAIN BUILDING D.S. TO CENTRAL RAIN WATER STORAGE TANK. RE: MEP/CIVIL
3. BLOCKS AT GRADE WHERE REQUIRED.
4. DASHED LINE REPRESENTS OUTLINE BELOW

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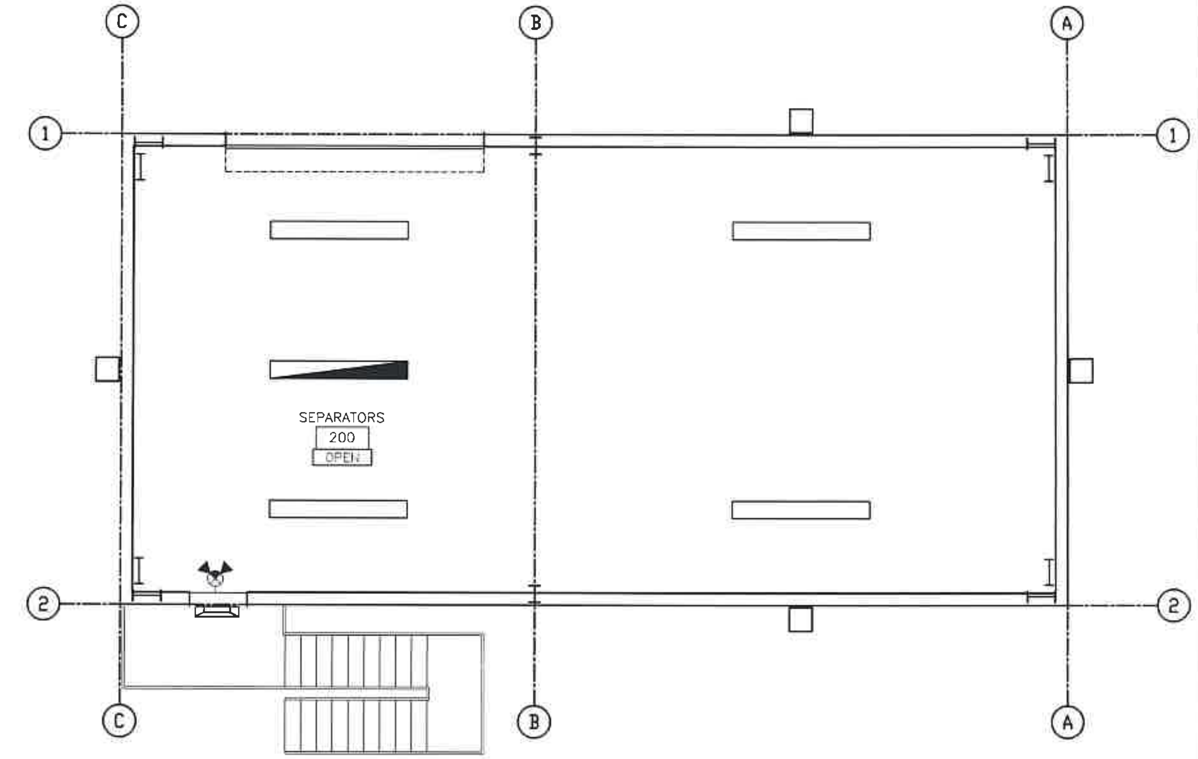
GENERAL NOTES
REFLECTED CEILING PLAN

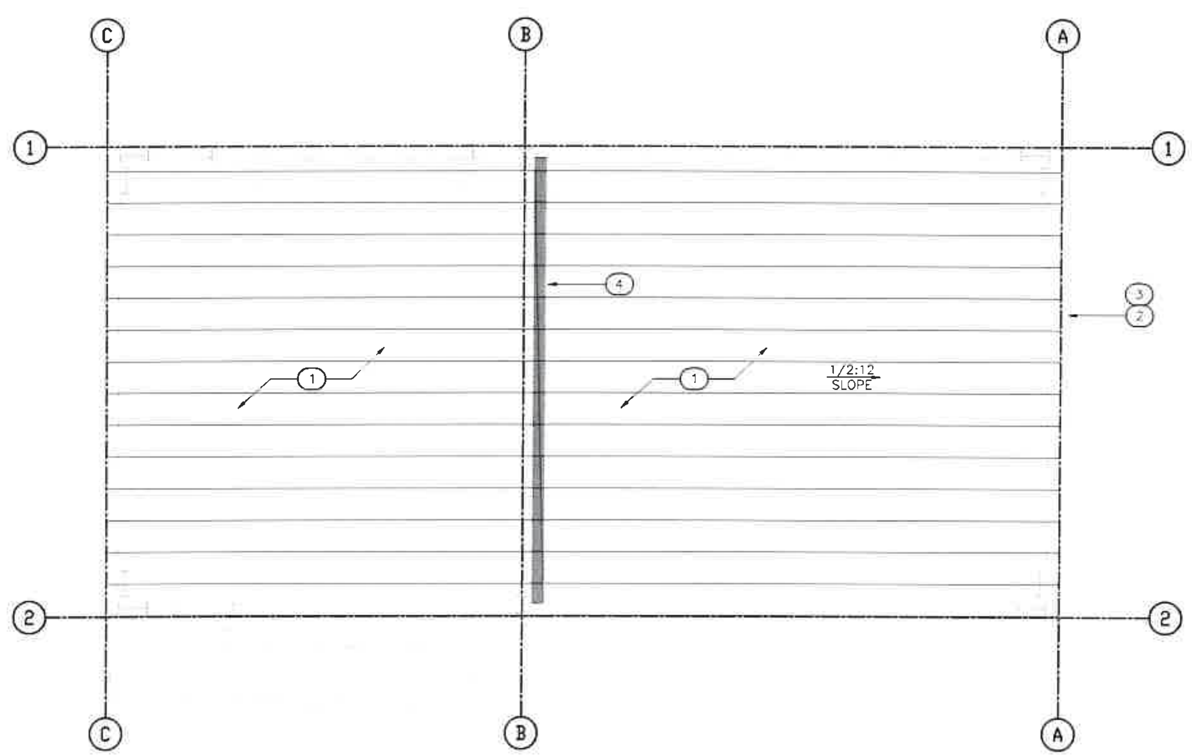
1. ALL LIGHT FIXTURES CENTERED IN ROOM UNLESS OTHERWISE NOTED.
2. GC TO SUBMIT FIXTURES AND RELOCATE AS NEEDED, ELECTRICAL DESIGNER TO REVIEW POWER SUPPLY REQUIREMENTS. RE: ELECTRICAL.
3. COORD. CEILING HEIGHT IN ELEC. W/ CABLE TRAY PLACEMENT AND ELEC. ENGINEER.

LEGEND
REFLECTED CEILING PLAN

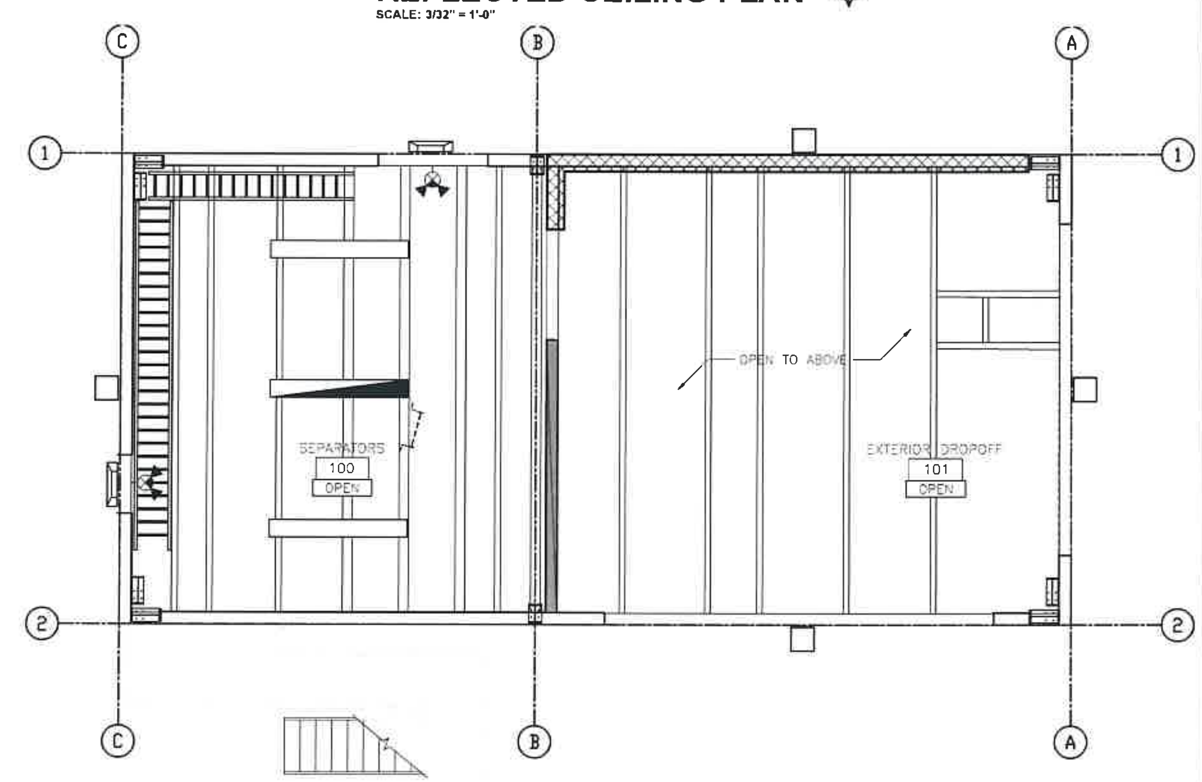
STRIP LIGHT; RE: ELEC. FOR SPECIFIC TYPE	
LED RECESSED FIXTURE; RE: ELEC. FOR SPECIFIC TYPE	
EXTERIOR EMERGENCY LED WALL PACK, RE: ELECTRICAL	
LED ROUND HIGHBAY; RE: ELEC. FOR SPECIFIC TYPE	
LED EXTERIOR WALL PACK, RE: ELECTRICAL	
CLG. MOUNTED EMERGENCY LIGHT; RE: ELEC. FOR SPECIFIC TYPE	
WALL MOUNTED EMERGENCY LIGHT; RE: ELEC. FOR SPECIFIC TYPE	
GYPSUM BOARD CEILING / SOFFIT (INTERIOR)	
CEILING HEIGHT (A.F.F.) (ACTUAL HEIGHTS SHOWN ON PLAN)	+10'-0"
1-HR RATED CEILING ASSEMBLY BUILT IN ACCORDANCE WITH UL# L503	1-HR
ROOM NAME / ROOM NUMBER	OFFICE / 201



2 SECOND FLOOR REFLECTED CEILING PLAN
SCALE: 3/32" = 1'-0"



3 ROOF PLAN
SCALE: 3/32" = 1'-0"



1 FIRST FLOOR REFLECTED CEILING PLAN
SCALE: 3/32" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
SOLID SEPERATOR BLD
REFLECTED CEILING PLAN & ROOF PLAN
HASKEL COUNTY
OK

REV	DATE	BY	APPD	DESCRIPTION
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DWG NUMBER
0576-A-PU1301

SCALE
AS NOTED

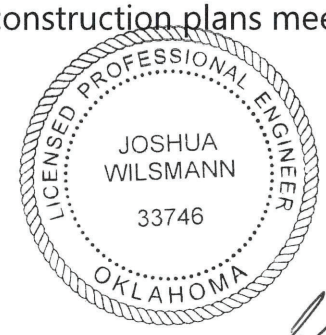
REV
0

JP TANK
AGRICULTURAL CONCRETE

DIGESTATE STORAGE TANK
TWO STATE SOD FARM

DESIGN STATEMENT

To the best of my professional knowledge, judgement, and belief, this design and these construction plans meet NRCS standards in Code 313 (Waste Storage Facility).



Joshua J. Wilsmann, P.E. 12/30/24

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 100

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REVISIONS

PROJECT: VANGUARD RENEWABLES
DIGESTATE STORAGE TANK

LOCATION: TWO STATE SOD FARM
SOUTH OF HWY. 9 & N4580
KEOTA, OK 74941

DATE: NOV. 8, 2024

DESIGN NO.: 240332100

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REVISIONS

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GENERAL SPECIFICATIONS

CIRCULAR CONCRETE TANK WITHOUT PRESTRESSING

THIS CONCRETE TANK IS DESIGNED TO THE REQUIREMENTS OF ACI 318. IT IS NOT DESIGNED AS A HYDRAULIC OR ENVIRONMENTAL STRUCTURE AS DEFINED IN NRCS CODE 313. THE DESIGN OF ANY LINER REQUIRED OR SECONDARY CONTAINMENT SYSTEM REQUIRED BY NRCS OR OKLAHOMA ADMINSITRATIVE CODE IS BY OTHERS.

DESIGN STATEMENT

Design of structure was based on reference documents below and meets the requirements of NRCS Code 313 "Waste Storage Facility"

DESIGN REFERENCES

NRCS Code 313 "Waste Storage Facility" April, 2018 (Oklahoma)
Building Code Requirements for Structural Concrete, ACI 318
Guide to Design of Slabs-on-Ground, ACI 360R
PCA Concrete Floors on Ground (2nd Edition)

GENERAL DESIGN LOADS AND ASSUMPTIONS

Load Conditions
Tank Type Pinned Base-Free Top
Internal Pressure from Manure (per NRCS Code 313): 65 psf per foot of depth, typical
72 psf per foot of depth, sand-laden
External Pressure from Backfill — 230 psf surcharge represents heavy vehicle loading within distance equal to height of wall, (10,000 axle loads)

Condition 1a: 100 psf soil load + 230 psf surcharge — per NRCS Code 313 (height of soil to top of wall) with empty tank (assumes an unsaturated clay/silt backfill)

~~Condition 1b: 60 psf soil load + 230 psf surcharge — per NRCS Code 313 (height of soil to top of wall) with empty tank (assumes an unsaturated sand/gravel)~~

Condition 2: ~~Manure weight = 65 pcf (liquid)~~
Manure weight = 72 pcf (sand-laden)

Maximum Height of Backfill at Wall — Top of wall, typical
Minimum Height of Backfill at Wall 3'-0" above bottom of footing without insulation
See details for reduced backfill height 2'-0" above top of footing with insulation
Soil Bearing Pressure: See wall sections for required allowable soil bearing capacities
Slab-on-Grade Capacity: Standard 5" Thick Slab 16,800 lbs. Axle Load

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SITEWORK SPECIFICATION

Site Engineer to provide subbase capable of providing allowable bearing capacities specified on wall sections over entire footprint of the animal waste storage tank. Tank location is to meet all separation distances specified in current 313, 354, 522, and 634 Code.

Excavator, under the direction of the Site Engineer, is to provide a compacted granular base beneath concrete tank slab. Compacted granular base shall be 6" of clean sand or 3/4" crushed stone with fines.

BACKFILLING

Once the concrete is properly cured, backfill can be placed around the tank. Avoid backfill containing large rocks, hard or frozen soil lumps, or construction debris. Backfill no higher than 12" from the top of the wall except at the ramp apron.

Adjacent to Tank:

Within 2 feet of tank, earth fill shall be placed in 4-inch lifts (prior to compaction) in a manner adequate to prevent damage to the structure and to allow the structure or pipe to gradually and uniformly assume the backfill loads. Compaction shall be accomplished by means of manually directed power tampers or plate vibrators or hand tamping unless otherwise specified. Heavy equipment shall not be operated within 2 feet of tank. Compaction by means of drop weights operating from a crane or hoist of any type will not be permitted.

The tank site shall be graded to provide drainage according to Site Engineer's grading plan.

GEOTECHNICAL REQUIREMENTS

Excel Engineering will verify the design of the concrete tanks meets recommendations from a geotechnical report hired separately by the owner. The investigation and report may follow the guidance in NRCS EFH-Chapter 4-Exhibit A. The report will evaluate the allowable bearing capacity of the foundation and the potential for total and differential settlement.

A geotechnical report was not complete at the time of plan submission. Design criteria assumed for this project include:

- Soil bearing capacity per wall section design criteria on sheet 453.
- Swelling soils are not present on the site that would create uplift pressures.
- Total settlement of tank limited to 1 1/2" and differential settlement of tank limited to ½"

ESTABLISHING AND MAINTAINING VEGETATION

NRCS Code 342-Critical Area Planting shall be done by others under direction of Site Engineer.

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A. Scope

The work shall consist of furnishing, forming, placing, consolidating, finishing, and curing concrete with Portland and Portland-Limestone cement, and the furnishing and placing of reinforcement or other appurtenances as required on the construction drawings. All materials, test procedures, and admixtures shall meet the requirements of the latest edition of the applicable ASTM designation.

Failure to meet any requirements contained in this specification may be cause for rejection of the concrete or delay of placement.

B. Definitions

The following definitions are provided for the purpose of this specification.

1. *Batch delivery ticket* refers to the form showing the total weights of all the ingredients used to mix the contents of the rotating drum mixer (total weights of all ingredients on the load) and other job pertinent information.
2. *Consolidating* refers to the process of reducing the volume of entrapped air in a fresh cementitious mixture, usually accomplished by inputting mechanical energy.
3. *Construction joints* are those joints where two successive placements of concrete meet, through which reinforcement is continuous and bond is required between the two pours.
4. *Control joints* often called Contraction joints are joints used in unreinforced and lightly reinforced slabs-on-ground to minimize random cracking and create straight-line weakened-planes in concrete. Control joints "control" the cracking location by inducing cracks at predetermined locations. The locations can be formed or saw cut.
5. *Finishing* refers to the process of treating surfaces of fresh or recently placed concrete or mortar to produce desired appearance and service.
6. *Firm* refers to the condition of the subgrade where it is not significantly displaced or deformed by foot traffic during construction and is able to properly support reinforcement chairs.
7. *Flatwork* refers to concrete slabs poured on slopes flatter than 5:1 (Horizontal:Vertical).
8. *Form release agent* refers to commercially manufactured formwork release agents that prevent formwork absorption of moisture, prevent bond with concrete, and do not stain the concrete surfaces.
9. *Formed surfaces* are those that require a temporary structure or mold for the support of concrete while it is setting and gaining sufficient strength to be self-supporting, such as walls or poured-in- place tank lids.
10. *Hand tamping* refers to the operation of consolidating freshly placed concrete by hand-held implements.
11. *Honeycomb* refers to voids left in concrete due to failure of the mortar to effectively fill the spaces among coarse aggregate particles.
12. *Jitterbug* refers to a grate tamper for pushing coarse aggregate slightly below the surface of a slab to facilitate finishing.
13. *Liquid-containment concrete* refers to concrete applications using specific placement and finishing techniques, and design features to minimize the loss of liquids.
14. *Manufacturer* refers to the producer/supplier of the ready-mixed concrete.
15. *Mesh roller* refers to a finishing tool consisting of a rolling drum attached to a handle, of which the surface of the drum is made of mesh, sometimes used for rolling over the surface of fresh concrete to embed coarse aggregate.
16. *Rock pocket* refers to a porous, mortar-deficient portion of hardened concrete consisting primarily of coarse aggregate and open voids; caused by leakage of mortar from the form, separation

    (segregation) during placement, or insufficient consolidation.
17. *Sloped slabs* refers to concrete slabs poured on slopes of 5:1 (Horizontal:Vertical) or steeper.
18. *Technician* refers to an individual trained in specific technical processes, and may include an engineer, government agency representative, private sector technical service provider, qualified independent third-party quality assurance inspector, or a similar person that is primarily responsible for the project quality assurance.
19. *Ternary mix* is a mixture using three cementitious materials, such as Portland cement, fly ash, and ground granulated blast-furnace slag (slag).
20. *Top bars* are horizontal reinforcements placed such that more than 12 inches of fresh concrete is cast below the reinforcing bar (such as horizontal wall bars).

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21. *Vibration* refers to mechanical energetic agitation of freshly mixed concrete during placement by mechanical devices, either pneumatic or electric, that create vibratory impulses of moderately high frequency to assist in consolidating the concrete.
    a. Internal vibration employs one or more vibrating elements that can be inserted into the fresh concrete at selected locations.
    b. Surface vibration employs a portable horizontal platform on which a vibrating element is mounted.
22. *Water-cement ratio (w/c)* is the ratio of the weight of free water (excluding that absorbed by the aggregates) to the weight of Portland cement in a concrete mix expressed as a decimal.
23. *Water-cementitious material ratio (w/cm)* is the ratio of the weight of free water (excluding that absorbed by the aggregates) to the weight of cementitious material (fly ash, Portland cement, and slag) in a concrete mix expressed as a decimal.

C. Materials

The Contractor shall provide test data, independent laboratory reports, or other evidence from the concrete manufacturer showing that all materials meet the requirements of this specification. All materials proposed for use shall be approved by the Technician.

1. Type I, II, or III Portland cement shall conform to ASTM C 150.
2. Type IS Portland blast-furnace slag cement, Type IP Portland-pozzolan cement, or Type IL Portland-limestone cement shall conform with ASTM C595. Portland-limestone cement shall have a limestone content more than 5% but less than or equal to 15% by mass of blended cement as designated by Type IL(5) to Type IL(10). Moderate sulfate resistance when desired shall be specified by the suffix Type IL (MS). High sulfate resistance when desired shall be specified by the suffix Type IL(HS).
3. Fine aggregate shall conform to ASTM C 33 and be composed of clean, uncoated grains of material. Refer to the fine aggregate gradation table in Section D of this specification.
4. Coarse aggregates shall be gravel or crushed stone conforming to ASTM C 33 and be clean, hard, durable, and free from clay or coating of any character. Refer to the coarse aggregate gradation table in Section D of this specification.
5. Water shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter, or other deleterious substances.
6. Air entraining agent shall conform to ASTM C 260.
7. Pozzolan (fly ash) shall conform to ASTM C 618, Class C or F. The loss of ignition shall not exceed 3 percent for Class C and F $\pm$1 percent for lot-to-lot variations.
8. Natural pozzolan shall conform to the requirements of ASTM C618, Class N including the optional requirements of uniformity and effectiveness in controlling alkali silica reactivity.
9. Ground granulated blast furnace (GGBF) slag as a partial substitute for cement shall conform to ASTM C 989.
10. Chemical admixtures shall be used in strict compliance with the manufacturer's recommendations, conform to ASTM C 494, and may be the following types:
    a. Type A - Water-reducing admixtures.
    b. Type B - Retarding admixtures.
    c. Type C - Accelerating admixtures.
    d. Type D - Water-reducing and retarding admixtures.
    e. Type E - Water-reducing and accelerating admixtures.
    f. Type F - Water-reducing, high range admixtures (superplasticizers).
    g. Type G - Water-reducing, high range, and retarding admixtures (superplasticizers).
    h. Type S - Specific performance admixtures
        - If Type C or E is used, the manufacturer shall provide the Technician a product data sheet verifying that the product is a non-chloride accelerator.
        - If Type S is used the manufacturer shall provide the Technician a report stating the specific performance characteristic(s) of the admixture and data to substantiate the performance characteristic(s).
        - Calcium chloride or admixtures containing chloride ions other than from impurities in admixture ingredients shall not be used.
11. Deformed reinforcing bars shall be free from loose rust, oil, grease, paint, or other deleterious matter. Steel bars for concrete reinforcement shall meet the requirements of ASTM A 615. The steel shall be deformed Grade 40 or Grade 60 billet-steel bars as noted on the plans.

12. Deformed welded wire reinforcement (WWR) shall conform to the requirements of ASTM A 1064 and shall be furnished in flat sheets and shall be size D4 or larger as indicated on the plans. This material may only be used for non-structural elements such as slabs on grade. Spacing of welded intersections shall not exceed 16 inches.
13. Curing compound shall be a liquid membrane-forming compound suitable for spraying on the concrete surface. The curing compound shall meet the requirements of ASTM C 309, Type 2 (white pigmented).
14. Glass Fiber Reinforced Polymer (GFRP) bars shall be free from soil, grease, paint, or other deleterious matter. GFRP bars for concrete reinforcement shall conform to ASTM D7957.

D. Design of the Concrete Mix

No less than seven (7) days prior to the start of concrete placement the Contractor is responsible for submitting documentation of the proposed design mix to the Technician. The Contractor is responsible for providing a mix with the minimum required 28-day compressive strength in the construction plan and meet the following:

1. The water-cement (w/c) or the water-cementitious material (w/cm) ratio shall not exceed 0.45 for all concrete construction.
2. The water cement (w/c) or the water-cementitious material (w/cm) ratio shall not exceed 0.42 for all concrete being designed using ACI 350 - Code Requirements for Environmental Engineering Concrete Structures. This concrete shall also have 28-day compressive strength of 4,500 psi.
3. The cementitious material required shall be a minimum of 564 pounds per cubic yard of concrete.
   a. The cementitious material may include a maximum of 25 percent (by weight) of fly ash or a maximum of 30 percent (by weight) of ground granulated blast-furnace (GGBF) slag. The remaining cementitious materials shall be Portland cement.
   b. Mixes containing both fly ash and GGBF slag shall not exceed 30 percent in combination (ternary mix) and no more than 25 percent shall be fly ash. The remaining cementitious materials shall be Portland cement.
4. The air content (by volume) shall be 6 percent of the volume of the concrete.
5. The maximum (not to exceed) slump, with the use of water reducers, shall be 5 inches ± 0.25 inches.
6. The maximum (not to exceed) slump, with the use of superplasticizers, shall be 8 inches ± 0.25 inches.
7. The fine aggregate saturated surface dry weight shall be 30-45 percent of the total saturated surface dry weight of the combined coarse and fine aggregates. The well-graded fine aggregate shall conform to the following ASTM C 33 or Wisconsin DOT gradation requirements shown below:

Fine Aggregate Gradation

Sieve Size	Percent Passing By Weight	
	ASTM C 33	WI DOT
3/8" (9.5 mm)	100	100
No. 4 (4.75 mm)	95 — 100	90 — 100
No. 8 (2.36 mm)	80 — 100	-
No. 16 (1.18 mm)	50 — 85	45 — 85
No. 30 (600 µm)	25 — 60	-
No. 50 (300 µm)	5 — 30	5 — 30
No. 100 (150 µm)	0 — 10	0 — 10
No. 200 (75 µm)	0 — 5	0 — 3.5

8. The well graded coarse aggregate shall conform to the following ASTM C 33 gradation requirements for size number 67 aggregate shown below:

Coarse Aggregate Gradation

Sieve Size	Percent Passing By Weight
1" (25.0 mm)	100

3/4" (19.0 mm)	90 — 100
3/8" (9.5 mm)	20 — 55
No. 4 (4.75 mm)	0 — 10
No. 8 (2.36 mm)	0 — 5
No. 200 (75 µm)	0— 1.5

E. Mixing

1. Ready-mixed concrete shall be in accordance with ASTM C 94 for ordering (OPTION C, Minimum Cement Content), batching, mixing, and transporting.
2. Batching Tolerances (maximum w/c or w/cm ratio shall not exceed 0.45):
   a. Cementitious Material: The weight of the cementitious material shall be within plus or minus 1 percent (± 1%) of the required weight of the cementitious material.
   b. Admixtures: The admixtures shall be within plus or minus 3 percent (± 3%) of the required weight or volume for each specific admixture.
   c. Mixing Water: The water added to the batch, including free water on the aggregates, shall be measured by weight or volume to an accuracy of 1 percent of the required total mixing water. Added ice shall be measured by weight.
   d. Aggregate: The weight of the fine and coarse aggregate shall be within plus or minus 2 percent (± 2%) of the required weight.
   e. Air: The air content (by volume) shall be 6 ± 1.5 percent of the volume of the concrete at the location and time of placement.
3. Concrete shall be uniform and thoroughly mixed when delivered to the forms.
4. The water-cement (w/c) ratio or water-cementitious material (w/cm) shall not exceed 0.45 at any time, including the addition of water at the site.
5. The concrete shall be batched and mixed such that the temperature of the concrete at time of placement shall not be less than 55 degrees Fahrenheit or, at no time during its production or transportation more than 90 degrees Fahrenheit.

F. Batch Delivery Ticket Information

1. The Contractor shall obtain from the manufacturer a batch delivery ticket for each load of concrete before unloading at the site. Any concrete load delivered without a batch delivery ticket containing all the following information shall not be allowed to be discharged in any part of the construction project covered under this specification.
2. The following minimum information shall be included on the batch delivery ticket.
   a. Job-pertinent information
      i. Name of concrete manufacturer and batch plant
      ii. Name of purchaser and job location
      iii. Date of delivery
      iv. Truck number
      v. Amount of concrete delivered
      vi. Time loaded or time of first mixing of cement and aggregates
   b. Ingredients used to mix the batch
      i. Mixing water added as free water
      ii. Percent moisture, or weight of water contained on the aggregates
      iii. Percent absorption, or weight of water absorbed by the aggregates
      iv. Type and amount of cementitious materials
      v. Type and amount of admixtures
      vi. Weights of fine and coarse aggregates
   c. The Contractor is responsible for adding the following information:
      i. Volume of water added by the receiver of the concrete

ii. Time the concrete arrived at the site

iii. Time the concrete was completely unloaded

3. Upon completion of the concrete placement, copies of all batch delivery tickets shall be provided to the Technician.

G. Placement of Subgrade, Forms, and Reinforcing Steel

1. Subgrade

a. The site shall be graded to the dimensions and elevations as specified in the construction plans.

- All surfaces shall be firm and damp prior to placing concrete.
- Concrete shall not be placed on mud, dried earth, uncompacted fill, frozen subgrade, or in standing water.
- The use of plastic sheeting beneath the concrete is not permitted except for a designed vapor barrier in an enclosed building.

2. Forms

a. The forms, associated bracing, and stakes shall be substantial, unyielding, and constructed so that the finished concrete will conform to the specified dimensions and contours.

- Forms shall be mortar tight.
- Forms shall be coated with a form release agent before being set into place.
- Form release agent shall not come in contact with the steel reinforcement, waterstop, or with hardened concrete against which fresh concrete is to be placed.
- For structures which are to be store liquids, form ties shall be used that permit their removal to a depth of at least ½ inch.
- Concrete joints shall be placed at locations and be of the type shown on the construction drawings.

3. Reinforcing Steel and GFRP Bars

Reinforcement shall be accurately placed as shown on the drawings and secured in position in a manner that will prevent its displacement during the placement of concrete.

a. Tolerances - The following tolerances will be allowed in the placement of reinforcement:

- Where 1½ inches clear distance is shown between reinforcing steel and forms, or embedded objects, allowable clear distance is 1⅛ to 1½ inches.
- Where 2 inches clear distance is shown between reinforcing steel and forms, allowable clear distance is 1⅝ to 2 inches.
- Where 3 inches clear distance is shown between reinforcing steel and earth or forms, allowable clear distance is 2½ to 3 inches. Over-excavation backfilled with concrete shall not be considered as clear distance.
- The maximum variation from the reinforcing steel spacing shown, shall be 1/12 of the spacing, without a reduction in the amount of reinforcing steel specified.
- The ends of all reinforcing steel shall be covered with at least 1½ inches of concrete, with an allowable minimum distance of 1⅛ inches.

b. Reinforcement Support - Holding steel reinforcement in position with temporary supports is not permitted. Tack welding of bars is not permitted.

- Steel chairs, hangers, spacers; coated steel chairs, hangers, spacers; or plastic chairs, hangers, spacers may be used as supports. Short sections of GFRP bars inserted into the ground may be used as supports if they demonstrate an ability to stay rigid and upright, and hold the grid in a fixed position, under foot traffic and concrete placement.
- Precast concrete chairs may be used as supports providing the chairs are manufactured from concrete equal in compressive strength to the concrete being placed.
- Reinforcement shall be supported at a minimum as follows:
  - Deformed reinforcing bars for flatwork and sloped slabs shall be supported by a minimum of 1 support chair every 4 feet in each direction. Reinforcement shall not deflect or sag between supports. Deformed reinforcing bars shall be tied at every other rebar intersection or as approved by the Technician.
  - Deformed welded wire reinforcement (WWR) shall be supported no further than as indicated in the table below.

- When two layers of deformed reinforcing bars or deformed welded wire reinforcement are used for wall footings, flatwork and sloped slabs, the bottom layer may be supported by precast concrete chairs. The upper layer must be supported by metal chairs, metal spacers, plastic spacers, or rebar with legs tied to the lower mat and supporting the upper layer of reinforcing bars.

WWR Support

Welded Wire Reinforcement Size[1]	Welded Wire Spacing	Maximum Support Spacing in Each Direction[2], feet
D9 or larger	12 inches or more	4 to 6 feet
D5 to D8	12 inches or more	3 to 4 feet
D9 or larger	Less than 12 inches	3 to 4 feet
D4 to D8	Less than 12 inches	2 to 3 feet

Notes:
[1] "D" is the standard designation for deformed wire
[2] Support spacing shall be adequate to support all loads, including construction personnel and equipment. If excessive deflections occur, closer support spacing is required.

c. When GFRP bars are used, they require adequate stiffness (diameter) or chair support to prevent deflection into the base material under the weight of poured concrete. Bars need to maintain a specified vertical location within + ½ inch.

d. Flatwork reinforcement may be driven on prior to placement of supports if both of the following conditions are met:
   - The subgrade is firm so that minimal displacement is made by equipment. If significant displacement occurs, the steel shall be removed, the subgrade regraded and compacted before steel and concrete placement.
   - The reinforcing steel is not deformed by the equipment. If the steel is deformed, it shall be replaced before concrete placement.

e. Steel tying to protruding steel from a previous pour or form construction for new concrete that will be in contact with previously poured concrete shall not be started until the previously poured concrete has cured a minimum of 12 hours.

f. Reinforcement Splice Lengths and Bend diameters:
   - Deformed reinforcing bars
     - Bend diameter: 6 bar diameters for #3 through #8 bar sizes and 8 bar diameters for larger bars. Reinforcing bars shall not be heated to facilitate bending.
     - Splice Length for Steel Bars: The minimum splice lengths in the table below are for concrete designed with a 28-day compressive strength of 3,500 psi. (NRCS standard wall designs) Other higher concrete design strengths and reinforcement grades require different splice lengths (typically shorter) in accordance with ACI 318.
     - Splice Lengths for GFRP Bars: The minimum splice length shall be specified by manufacturer.
     - Deformed reinforcing bars shall not be spliced by welding. All lap splices shall be adequately tied together to firmly hold the reinforcement in position to maintain the proper splice length.

Minimum Splice Lengths [Note 1]

	Grade 40	Grade 60
#3 through #6 bars		
Top bars	27 bar diameters	41 bar diameters
All other bars	21 bar diameters	32 bar diameters
#7 and larger bars		
Top bars	34 bar diameters	51 bar diameters
All other bars	26 bar diameters	40 bar diameters

Note 1: Splice lengths shall be the greater of that indicated in Table 1 or 12 inches

REVISIONS

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DIGESTATE STORAGE TANK

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DESIGN NO.: 240332100

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- Deformed welded wire reinforcement (WWR) - Splice length shall be in accordance with the requirements of ACI 318-08 or ACI 318-11 Part 12.18. Deformed welded wire reinforcement shall not be spliced by welding. All lap splices shall be tied to firmly hold the reinforcement in position to maintain the proper splice length.

H. Delivering, Placing, Consolidating, and Finishing Concrete

1. The Contractor shall notify the Technician of the proposed method of placement, consolidation, and finishing of the concrete at least seven (7) days prior to the start of concrete placement. The Contractor shall furnish the Technician a record of daily data including:
   a. Ambient temperature
   b. Relative humidity
   c. Wind velocity
2. General
   a. Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Concrete shall not be placed until the subgrade, forms, waterstop, and steel reinforcement have been inspected and accepted by the Technician. Any deficiencies shall be corrected before the concrete is delivered for placement. Forms, reinforcing steel, and subgrade shall be moistened prior to placing concrete. All reinforcement bars stored at the worksite shall be stored according to manufacturer recommendations. The bars shall also be stored above the ground surface on skids or other supports, kept clean and dry. GFRB shall be stored out of direct sunlight and away from temperatures high enough to soften the polymer.
3. Delivery
   a. Concrete shall be delivered to the site and discharged into the forms within 1½ hours after the introduction of the mixing water to the cement and aggregates, or when a superplasticizer is used, the manufacturer's recommended time limit for discharge after addition shall apply. The 1½ hour time may be extended if the concrete is of a slump that it can be placed, consolidated, and finished without the addition of water to the batch. Upon arrival at the job site, addition of water will be allowed to adjust the slump, provided such addition does not exceed the water- cement (w/c) ratio or water-cementitious material ratio (w/cm). Final placement of the batch shall begin immediately after mixing of the added water is completed.
   b. Additional superplasticizer shall not be added to the concrete mix after discharge of the concrete at the job site has commenced.
4. Placement
   a. The slump of the placed concrete shall not exceed the maximum slump of 5 inches ± 0.25 inches with the use of water reducers.
   b. The slump of the placed concrete shall not exceed the maximum slump of 8 inches ± 0.25 inches with the use of superplacticizers.
   c. Concrete shall be deposited as closely as possible to its final position. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates. All placement shall be done in a manner that prevents incorporation of subgrade material into the concrete.
   d. Methods for placing concrete on sloped slabs shall only include chutes, pumps, conveyors, wheelbarrows, or similar means of directly depositing concrete as near as possible to its final position. Placement of concrete by other methods where concrete is deposited upslope and flows to its final position downslope (commonly called "lava flow", "glacial pours", etc.) shall not be permitted.
   e. Concrete shall not be dropped more than 6 feet vertically unless suitable equipment is used to prevent segregation. Concrete containing superplasticizer shall not be dropped more than 12 feet vertically and shall not be placed in lifts exceeding 6 feet in depth. Non-superplasticized concrete shall be placed in forms in horizontal layers not more than 24 inches deep. Each layer shall be thoroughly consolidated before the next is placed, at a rate such that previously placed concrete has not yet set when the next layer of concrete is placed upon it.
5. Consolidation
   a. All concrete required to be consolidated with internal type mechanical vibrator shall be capable of transmitting vibration to the concrete at frequencies not less than 8,000 impulses per minute, unless otherwise specified or approved before placement.

- Vibration shall compact the concrete and bring it into intimate contact with the forms, reinforcing steel, and other embedded items while removing voids and pockets of entrapped air. The location, insertion, duration, and removal of the vibrators shall be such that maximum consolidation of the concrete is achieved without causing segregation of the mortar and coarse aggregate or causing water or cement paste to flush to the surface.
- Vibration shall be supplemented by spading, rodding, and hand tamping as necessary to ensure smooth and dense concrete along the form surface, in corners, and around embedded items. The contractor shall provide a sufficient number of vibrators to properly consolidate the concrete immediately after it is placed. Placement rate will be restricted if an inadequate number of vibrators are available.
- The use of vibrators to transport concrete in the forms, slabs or conveying equipment will not be permitted.

b. Formed Surfaces
   - All concrete walls shall be vibrated.
   - Immediately after the concrete is placed in the forms, it shall be consolidated by internal vibration or hand tamping as necessary to insure dense concrete. Vibration shall be applied to the freshly deposited concrete by rapidly inserting the vibrator and slowly, in an up and down motion, removing the vibrator at points uniformly spaced at not more than 1.5 times the radius of the area visibly effected by vibration. Generally, this is at 5 to 10 seconds per foot on 14-inch spacings or less. The area visibly effected by the vibrator shall overlap the adjacent, just vibrated area. The vibrator shall extend vertically into the previously placed layer of fresh concrete by at least 6 inches at all points. Concrete supplied with superplasticizer shall be placed with a minimum amount of vibrating and finishing effort. Vibration shall not be applied directly to the reinforcement steel or the forms, nor to concrete which has hardened to the degree that it does not become plastic when vibrated. Each pour shall be consolidated to insure a monolithic bond with the preceding pour.

c. Slabs and footings
   - Immediately after the concrete is placed, it shall be consolidated by hand or mechanical methods as necessary to insure dense concrete.
     - Surface vibrators may be used to consolidate slabs 8 inches and less in thickness. In thin slabs the internal vibrator(s) should be sloped toward the horizontal to allow operations in a fully embedded position, but shall not contact the subgrade.
     - Slabs and footings more than 8 inches thick shall be consolidated with internal vibration and may be augmented through use of a surface vibrator.
   - Surface vibrators include vibrating screeds, plate or grid vibratory tampers, or vibratory roller screeds. (Mesh rollers, jitterbugs, and grate tampers are finishing tools and not consolidation tools.) When the concrete slab is to be consolidated using surface vibration methods, the contractor shall detail how this work is to be performed in writing to the technician for review and approval. This report must be submitted no less than 7 calendar days before placing concrete by this method. It includes equipment selection and specifications.

6. Finishing
   a. All screed support devices shall be removed from the concrete or driven down flush with the subgrade prior to finishing.
   b. All formed concrete surfaces shall be true and even, and shall be free of depressions, holes, projections, bulges, or other defects in the specified surface finish or alignment. All surface defects shall be repaired as stated in the "Form Removal" section of this specification.
   c. All flatwork and sloped slabs shall be worked to a uniform grade, maintaining the specified thickness. Concrete shall be worked to minimize segregation and in a manner that does not adversely affect the structural integrity, durability, or function of the structure. Surfaces shall be free from rock pockets, or honeycomb areas or other harmful irregularities or defects.
   d. Water shall not be sprinkled or added to the surface of the concrete to facilitate finishing. An additional finish shall be applied if specified in the construction plans.
   e. The proposed finished texture (broom, float, mesh roller, trowel, non-slip, etc.) of the concrete surface shall be approved by the Technician.
   f. Evaporation reducer may be used during the finishing operation if approved by the Technician. Curing of the concrete is still required as per Section K, Curing.
   g. If a protective concrete coating is specified on the drawings, the coating manufacturer's recommendations for curing and surface preparation shall be followed.

7. Contraction (Control) Joints
    a. Control joints shall be the type and locations shown on the drawings.
    b. Saw-cutting should be performed before concrete starts to cool, as soon as the concrete surface is firm enough not to be torn or damaged by the blade, and before random drying- shrinkage cracks can form in the concrete slab.
    c. A 5 ft long cut should be attempted and evaluated for spalling or raveling before the contractor cuts the entire section of the slab. The saw-cutting can be done shortly after final set, but timing of the sawing is critical so not to pull up coarse aggregate. If aggregate is pulled up, delay the saw-cutting.
    d. Saw-cut joints shall be one-third the slab thickness and spacing specified on the drawings.
    e. New, clean saws fitted with an abrasive or diamond blades are recommended, using one of the following three types of saws: conventional wet-cut, conventional dry-cut, or early-entry dry-cut.
    f. Care should be taken to make sure the early-entry saw does not ride up over hard or large coarse aggregate and the joints shall be free of mortar and concrete.

I. Construction Joints

1. If the concrete sets during placement to the degree that it will not flow and merge with the succeeding pour when tamped or vibrated, the Contractor shall discontinue placing concrete and install a formed construction joint. The Contractor shall be prepared to install unplanned construction joints in the event that there is an interruption of the pour, equipment breakdown, or

   other problem which makes it necessary to stop placement of concrete at locations other than those previously planned. The reinforcement shall pass through the joint, unless otherwise indicated on the construction plan. Prior to the succeeding pour, the joint surface shall be cleaned to remove all unsatisfactory concrete, laitance, coatings, stains, or debris by one of the following methods:
    a. The joint surface shall be cleaned to expose the fine aggregate and sound surface mortar, but not so deep as to undercut the edges of coarse aggregate. Cleaning shall be by wire brush, sandblasting, or high pressure air-water cutting after the concrete has gained sufficient strength to prevent displacement of the coarse aggregate. The joint surface shall be washed to remove all loose material after cutting.
    b. According to methods specified by the person approving the construction plans.
2. The surfaces of all construction joints shall be wetted and standing water removed immediately prior to placement of the new concrete. The new concrete shall be placed directly on the cleaned and washed surface. New concrete shall not be placed until the hardened concrete has cured at least 12 hours. The newly placed concrete shall be consolidated to achieve a good bond with the previously hardened concrete.

J. Form Removal and Concrete Repair

1. Form Removal
    a. Forms shall be removed without damage to the concrete. Supports shall be removed in a manner that permits the concrete to take the stresses due to its own weight uniformly and gradually. The minimum period from completion of the concrete placement to the removal of the forms shall be based on either strength tests or cumulative times.
        - The strength of the in-place concrete is determined by testing concrete cylinders specifically cast for this purpose and cured adjacent to the member in accordance with the ASTM C 31 methods for determining removal time.
        - Unless otherwise specified, forms supporting the weight of the concrete member may be removed after the concrete strength is 70 percent of that specified for the 28-day compressive strength.
        - Form removal for concrete tank walls between 10 and 20 feet high is allowed after a curing period of at least 16 hours if approved by the design engineer. Form removal time must be supported by a site-specific, compression cylinder that is cast, field cured, and tested to verify strength attainment of at least 600 psi.
        - The total accumulated time, not necessarily continuous, that the air adjacent to the concrete is above 50 degrees Fahrenheit will be determined by the Contractor and accepted by the Technician. The forms may be removed after the total accumulated time shown in the following table:

          Form Removal

Forms	Time
Sides of slabs or beams without waterstop	12 hours

Sides of slabs or beams with waterstop		24 hours
Undersides of slabs or beams	Clear Span <10 feet	4 days
	10 — 20 feet	7 days
	>20 feet	14 days
Sides of walls or columns	Height of Forms <20 feet	24 hours*
	>20 feet	72 hours

*** Form strikes as low as 16 hours are permissible if (3) concrete cylinders are cast on the first pour, cured under field conditions, delivered to the lab, and tested the next day for a minimum compressive strength of 600 psi. The lab shall break cylinders at 2-hour intervals starting at 16-hour cure time until required strength is met. This test will establish the strike pace for the remainder of the job, assuming similar curing conditions are maintained.**

b. For structures which are not required to store liquid, form ties shall be removed flush with or below the concrete surface. For structures which are to be store liquid, form ties shall be

removed to a minimum depth of ½ inch. All cavities or depressions resulting from form tie removal shall be patched in accordance with J.(2)(d).

c. Forms shall be removed and the concrete inspected by the Technician before walls are backfilled. Concrete loading shall be in accordance with Section N, Loading New Reinforced

Concrete Structures.

2. Repair of Surface Defects (other than tie holes)

a. Immediately after removal of the forms, concrete which is honeycombed, damaged or otherwise defective as identified by the Technician shall be repaired or replaced by the Contractor. All repairs of surface defects shall be completed prior to the application of curing compound. Repair of surface defects such as honeycombed or otherwise defective concrete shall be made using bonding grout and site mixed Portland cement mortar or other products specifically intended to repair surface defects that are applied in accordance with the manufacturer's recommendations.

b. Bonding grout and site mixed Portland cement mortar:

- Outline the honeycombed or otherwise defective concrete with a ½ to ¾ inch deep saw cut and remove such concrete down to sound concrete. When chipping is necessary, leave chipped edges perpendicular to the surface or slightly undercut. Do not feather edges.
- Dampen the area to be patched plus another 6 inches around the patch area perimeter.
- Prepare bonding grout by mixing approximately one part Portland cement and one part fine sand with water to the consistency of thick cream.
- Thoroughly brush the bonding grout into the surface. When the bond coat begins to lose water sheen, apply repair mortar. Repair mortar is made by mixing 1 part Portland cement to 2½ parts fine sand (approximately finer than the No. 16 sieve size) by damp loose volume. The mortar shall be at a stiff consistency with no more mixing water than is necessary for handling and placing. Mix the repair mortar and manipulate the mortar frequently with a trowel without adding water.
- Thoroughly consolidate the mortar into place and strike off, leaving the patch slightly higher than the surrounding surface to compensate for shrinkage. Leave the patch undisturbed for 1 hour before finishing. The repair shall be cured as specified Section K, Curing.

c. Repair materials other than site mixed Portland cement:

- Portland cement mortar modified with a latex bonding agent conforming to ASTM C 1059, Type II.
- Epoxy mortars and epoxy compounds that are moisture-insensitive during application and after curing and that embody an epoxy binder conforming to ASTM C 881. The type, grade, and class shall be appropriate for the application as specified in ASTM C 881.
- Nonshrink Portland cement grout conforming to ASTM C 1107.
- Packaged dry concrete repair materials conforming to ASTM C 928.
- Other products specifically intended to repair surface defects that are applied and cured in accordance with the manufacturer's recommendations.

d. Repair of Form Tie Holes

- Liquid Containment Concrete Structures — Repair tie holes immediately after formwork removal and prior to the application of curing compound. All cavities or depressions resulting from form tie removal shall be patched with commercially available patching products or site mixed Portland cement repair mortar.
  - Site-mixed Portland cement repair mortar
    - Repair mortar is made by mixing 1-part cement to 2.5-parts fine sand (approximately finer than the No. 16 sieve size) by damp loose volume. Mortar shall be at a stiff consistency with no more mixing water than is necessary for handling and placing. Mix the repair mortar and manipulate the mortar frequently with a trowel without adding water. Clean and dampen tie holes before applying the mortar. Cure in accordance with Section K, Curing.
  - Repair materials other than site mixed Portland cement:
    - All those materials listed in J.2.(c).
    - Other products specifically intended to fill form tie holes for liquid containment applications that are applied and cured in accordance with the manufacturer's recommendations.

K. Curing

1. Concrete shall be cured for a period of at least 7 consecutive days (curing period) after it is placed, except as stated in Section M. Exposed concrete surfaces shall be kept continually wet during the entire curing period or until curing compound is applied.
2. Curing compound shall be applied at the rate and with the proper equipment recommended by the manufacturer. It shall form a uniform, continuous, adherent film that shall not check, crack, or peel and shall be free from pinholes or other imperfections.
3. Curing compound shall not be used at construction joints or other areas that are to be bonded to additional concrete. Surfaces subjected to heavy rainfall or running water within 3 hours after the application of curing compound, or surfaces damaged by subsequent construction operations during the curing period, shall be recoated in the same manner as the original application.
4. Concrete in feed storage areas shall be allowed to cure or be protected from contact with stored feed for a minimum of 28 days.

L. Concrete Placement in Hot Weather

1. Hot weather conditions exist at the time of proposed placement when:
   a. The rate of evaporation greater than 0.10 lb. /sq. ft. /hr. OR
   b. Two or more of the following factors are exceeded:
      - Ambient temperature is greater than 80 degrees Fahrenheit
      - Relative humidity is less than 60 percent
      - Wind velocity (average) is greater than 10 mph
2. Concrete surfaces shall not be allowed to dry after placement and during the curing period.
3. Measures to reduce surface moisture loss and rate of cement hydration must be taken to immediately protect and cure the concrete due to rapid drying conditions.
   a. Plan placement to early morning, late afternoon or evening.
   b. Use a set-retarding admixture meeting the requirements in Section C when the time between the introduction of the mixing water to the cement and aggregates and discharge exceeds 45 minutes. The 45 minute time may be extended if the concrete is of a slump that it can be placed, consolidated, and finished without the addition of water to the batch.
   c. Use a fog spray to raise the relative humidity of the ambient air.
   d. Moist cure the concrete surface as soon as the surfaces are finished and continue for at least 24 hours.
   e. Use a monomolecular film, or evaporation retarder in accordance with the manufacturers printed instructions.
4. Concrete placement shall be suspended when:
   a. The rate of evaporation is greater than 0.25 lb./sq. ft./hr. OR
   b. When all of the following factors, as measured at the time of concrete placement are exceeded:
      - The ambient temperature is greater than 80 degrees Fahrenheit,
      - Relative humidity is less than 40 percent, and
      - Wind velocity (average) is greater than 15 mph E = (Tc2.5 - R * Ta2.5) (1+0.4V) x 10-6

where: E = evaporation rate, lb. /sq. ft. /hr.

Tc = concrete temperature, °F Ta = air temperature, °F
R = percent relative humidity /100 (decimal form 20% = 0.20) V = wind velocity, mph

5. Wind speeds at reporting station are taken above the ground surface, so V = average reported wind speeds x 0.66).

M. Concreting in Cold Weather

1. The following provisions shall apply when the minimum air temperature at the local job site is less than 35 degrees Fahrenheit (the forecasted temperature, which shall be verified with a maximum/minimum thermometer at the start of the morning job shift).
   a. No concrete shall be placed without the required thermometers at the job site.
   b. The Contractor shall furnish the Technician a record of daily temperature data including:
      - Outside air maximum and minimum temperatures at the local job site, and
      - Temperatures, of the air adjacent to the surface of the concrete, at several points along the concrete surface for all concrete curing periods.
   c. When the cement is initially added to the mix, the temperature of the mixing water shall not exceed 100 degrees Fahrenheit nor shall the temperature of the aggregate exceed 100 degrees Fahrenheit.
   d. The temperature of the concrete at the time of placement shall be not less than 55 degrees Fahrenheit or at no time during its production or transport more than 90 degrees Fahrenheit.
   e. Placed concrete may be protected by covering, housing, insulating or heating concrete structures.
   f. The minimum air temperature adjacent to the surface of the concrete shall be maintained above 40 degrees Fahrenheit for a period of at least 7 accumulated days. These 7 days must occur during the first 10 days after the concrete is placed. At no time, during the first 10 days after concrete is placed, shall the minimum air temperature adjacent to the surface of the concrete be less than 32 degrees Fahrenheit unless Type III cement or an approved accelerating admixture is used (see Item (g) below).
   g. The curing period may be reduced from 7 cumulative days to 3 consecutive days when Type III cement or an approved accelerating admixture is used. The accelerating admixture shall be used at the proportions recommended by the manufacturer. The minimum air temperature adjacent to the surface of the concrete shall be maintained above 40 degrees Fahrenheit for the 3 day curing period.
   h. Combustion heaters shall have exhaust flue gases vented out of the concrete protection enclosure. The heat from heaters and ducts shall be directed in such a manner as to not overheat or dry the concrete in localized areas or to dry the exposed concrete surface.
   i. At the end of the curing period, the concrete shall be allowed to cool gradually. The maximum temperature decrease at the concrete surface in a 24-hour period shall not exceed 40 degrees.

N. Loading New Reinforced Concrete Structures

1. Backfill material shall be the type indicated on the drawings and shall be free of large stones or debris.
2. Compaction within 3 feet of the new structure wall will be by means of small manually directed tamping or vibrating equipment.
3. Days before backfilling:
   a. The age of concrete shall be at least 14 days prior to backfilling for vertical or near-vertical walls with earth loading on one side only and prior to backfilling for conduits and spillway risers with inside forms removed.
   b. The age of concrete shall be at least 7 days before any load (including backfill) is applied for walls backfilled on both sides simultaneously and prior to backfilling conduits and spillway risers with inside forms and bracing in-place.
   c. Loads may be applied to new concrete less than the specified days (7 or 14) after placement when the design strength has been attained and verified through compressive strength testing on cylinders that have been cured on-site under field conditions.

O. Inspection and Testing

1. The inspection and testing details of this section shall apply when specific concrete tests are required in the construction drawings or quality assurance plan. This testing does not relieve the Contractor of the responsibility to perform the work according to this specification. The Technician shall have free access to the work site and batching to obtain samples.
2. When testing is conducted, the following methods shall be used:

   Testing

TYPE OF TEST	TEST METHOD (ASTM DESIGNATION)

Sampling	C172
Slump	C143
Air Content	C231 or C173
Making and Curing Specimens in the Field	C31
Obtaining and Testing Drilled Cores	C42
Compressive Strength	C39
Density (Unit Weight)	C138
Temperature	C1064

3. The contractor is responsible for determining who is responsible for testing, and providing results to all parties.
4. Compressive strength of the concrete shall be considered satisfactory if test results equal or exceed the 28-day design strength. For each ASTM C 39 strength test, three test specimens shall be made and cured onsite for 24 hours. The test result shall be the average of the compressive strength tests of any two of the three test specimens. If one test specimen shows evidence of improper sampling, molding, or testing, it shall be discarded and the remaining specimens tested. The strengths of the remaining two specimens shall be averaged, and the result shall then be considered the compressive strength of the concrete. If more than one specimen shows such defects, the test is not valid and the remaining specimen shall be discarded.
5. If test results are invalid due to specimen defects, or the in-place concrete that is in question was not sampled, the in-place concrete may be sampled by coring in accordance with ASTM C 42. For

   core tests, at least three representative cores shall be taken from each area of the concrete in question. If one or more of the cores shows signs of being damaged before testing, it shall be replaced by a new one.

Specific Site Requirements

REVISIONS

PROJECT: VANGUARD RENEWABLES
DIGESTATE STORAGE TANK

LOCATION: TWO STATE SOD FARM
SOUTH OF HWY. 9 & N4580
KEOTA, OK 74941

DATE: NOV. 8, 2024

DESIGN NO.: 240332100

JP TANK
AGRICULTURAL CONCRETE

100 CAMELOT DRIVE
FOND DU LAC, WI 54935
PHONE: (920) 926-9800
FAX: (920) 926-9801
EXCEL ENGINEERING inc.

SHEET

WATERSTOP

1. Scope

   The work shall consist of furnishing, welding, placing and installation of embedded waterstop base seal waterstop, or expansive waterstop as required on the construction drawings. All material shall meet the requirements of the latest edition of the applicable ASTM designation.

2. Quality Control and Quality Assurance During Concrete Placement

   The contractor shall provide the technician a construction quality control plan at the pre- construction conference.

   The plan shall detail the requirements for waterstop installation, including as a minimum:

- Waterstop placement and welding methods that will be utilized during construction,
- Name, contact information and responsibilities of a quality control (QC) individual providing continuous quality control during concrete placement around the embedded waterstop to ensure proper placement and consolidation.
- The quality control person may be an employee of the contractor or the owner of the project, without other duties during concrete placement.
- Name, contact information and responsibilities of an individual performing continuous quality assurance (QA) during concrete placement around the embedded waterstop to ensure proper placement and consolidation.
- The quality assurance individual shall be a person under the direction and control of the individual responsible for approving the as-built construction plan.

  OR

- A qualified consultant hired by the owner to assure and document the installation complies with the manufacturer's recommendations and procedures and this specification. The third party consultant shall provide documentation to the owner and the Technician.

3. Materials

   The Contractor shall provide evidence from the manufacturer showing that the waterstop materials meet the requirements of this specification. All materials proposed for use shall be approved by the Technician.

   Preformed expansion joint filler shall be commercially available products made of sponge rubber, closed cell foam, or boards containing bituminous materials. The joint filler shall have a minimum thickness of ½ inch and a width equal to the full cross sectional width of the concrete at the joint.

   Embedded waterstops shall be made of polyvinyl chloride (PVC), thermoplastic elastomeric rubber (TPE- R), or polyethylene (PE or VLDPE). The minimum width of waterstop shall be 6 inches, or the width and material shown on an NRCS approved Wisconsin Standard Drawing. The waterstop web thickness shall be a minimum of 3/8 inches throughout the entire cross section of the waterstop. The maximum bulb size shall not exceed 1 inch. Waterstops shall be the type intended for placement entirely within the concrete cross section, or as shown on an NRCS approved Wisconsin Standard Drawing or other drawings as approved by the NRCS State Conservation Engineer. Waterstops shall have ribbed or "dumb-bell" type anchor flanges and a hollow tubular center bulb. Split flange waterstops are prohibited.

   Base seal waterstops shall be made of polyvinyl chloride (PVC), thermoplastic elastomeric rubber (TPE- R), or polyethylene (PE or VLDPE). The minimum width of waterstop shall be 9 inches. This waterstop shape is limited to NRCS approved Wisconsin Standard drawings for feed storage facilities and pre- engineered waste storage structures approved by the Wisconsin State Conservation Engineer (SCE).

   Expansive waterstops shall consist of preformed strips or mastic (caulk) made of hydrophilic materials that expand when subjected to moisture and shall not contain bentonite. Use shall be limited to non- movement joints (fixed joints).

4. Welding of Waterstop

   Manufacturer's fabricated waterstop intersections shall be provided.

   Only straight butt joint splices are allowed for field fabrication. Splices in waterstops shall be welded as recommended by the manufacturer. The specific splicing iron and the temperature of the iron shall be in accordance with the manufacturer's instructions for the type of waterstop being spliced.

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK	DATE: NOV. 8, 2024
	LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE	100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801 EXCEL ENGINEERING inc.
		SHEET 121

Manufacturer-certified contractors may fabricate waterstop intersections in a controlled environment with the proper manufacturer's equipment. Prior to the time of delivery of the fabricated intersections, documentation of certification must be presented to the Technician.

5. Placement and Installation of Waterstop

Embedded Waterstop

Joints with embedded waterstops shall not be placed horizontally across sloped slabs.

Embedded waterstops shall be located as shown on the drawings and secured in position so that displacement does not occur during concrete placement.

Vertical applications (footing to wall joints and wall to wall joints) shall be secured to reinforcement using wire or "hog ring" type fasteners or factory installed grommets at the outermost rib at the spacing as recommended by the waterstop manufacturer (usually 12 inches on center). Hog rings shall be factory installed, if the manufacturer has that option available. Each waterstop shall be placed and secured with the hollow bulb aligned in the center of the planned joint.

Split forms should firmly hold the waterstop in place to prevent misalignment of the waterstop during concrete placement. A tight fit between the waterstop and the form is also necessary to prevent excessive leakage of concrete paste, which could lead to honeycombing of the concrete.

Waterstop clearance shall be a minimum of 1½ inches from reinforcement and one half the waterstop's width to the face of the concrete (3 inches for 6 inch wide waterstop).

Internal vibration is required along the entire length of all joints that contain embedded waterstops for both formed surfaces and slabs and shall be performed in the presence of the QC and QA individuals.

Continuous placement of concrete through a waterstop joint is not allowed, except for control joints in formed walls where preformed joint control formers are used in conjunction with the waterstops, or in control joints as shown on an NRCS approved Wisconsin Standard Drawings or other drawings as approved by the NRCS SCE.

Expansive Waterstop

Expansive waterstop shall be placed at the locations shown on the drawings in accordance with the manufacturer's instructions.

Preformed strips may require adhesive or other forms of mechanical fastening to existing concrete based on the manufacturer's instructions. The adhesive for preformed expansive waterstop and the mastic for caulk type expansive waterstop shall be allowed to cure for the duration as indicated by the manufacturer prior to placing concrete over the waterstop.

Mastic (caulk) type expansive waterstops shall be placed to the bead size as recommended by the manufacturer based on the amount of concrete cover provided.

Colder temperatures will require longer curing periods prior to concrete placement. Do not allow the expansive waterstop to become wet prior to placing concrete over the waterstop.

6. Repair Protocol

Waterstop which does not comply with this specification, damaged or otherwise defective shall be repaired or replaced by the Contractor in accordance with the manufacturer's recommendations or a repair plan developed by the contractor and approved by the Technician. All repairs shall be completed prior to additional work on the waterstop joint.

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 122

CONSTRUCTION QUALITY INSURANCE PLAN

Prior to any sitework, a preconstruction meeting shall be conducted between the owner, excavation contractor, tank contractor, Construction Inspector/Engineer of Record, Site Engineer, and the NRCS/County Land Conservation Department.

Concrete Supplier to provide Excel Engineering, Inc. wall and floor mix designs for approval, consistent with the specifications, prior to pouring slab.

Construction Inspector to locate actual wall and floor joint locations on "As-Built" plan relative to north arrow. Provide final copy of "As-Built" plan to the Engineer of Record for approval.

Construction Inspector must be competent in interpreting construction documents, familiar with type of construction, independent, and not a direct employee of Contractor.

Construction Inspector will be responsible for as-built documentation, construction inspection log, and photographs.

Construction Inspector to inspect rebar size, location, spacing, and waterstop locations in footing and slab prior to concrete pour. Slab is to be poured as indicated on plan to complete the tank.

Inspected items shall be as follows:

- Provide continuous inspection of concrete placement around the waterstop to ensure consolidation.
- Number and spacing of footing reinforcing
- Spacing of typical floor slab reinforcing
- Spacing of wall dowels
- Footing waterstop joint
- Slab waterstops, if required

Construction Inspector to inspect rebar size, location, spacing, and waterstop location in each wall section prior to concrete pour. Wall is to be poured in 200-foot-long maximum sections to compete the tank.

Inspected items shall be as follows:

- Concrete placement adjacent to all waterstop
- Spacing of wall vertical and horizontal reinforcing
- Wall waterstop at joint after welding to footing waterstop
- Form tie hole plugs at inside face of wall
- Grouted form tie holes at outside face of wall

TESTING FOR CONCRETE GREATER THAN 4,000 PSI

All concrete with required compressive strength above 4,000 psi must be tested. Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Cast and laboratory cure one set of four standard cylinders for each composite sample for each day's pour of each concrete mix. Provide four cylinders for each 200 cu. yd. or fraction thereof. Perform tests according to Concrete Section 7 - Inspection and Testing. Test one specimens at 7 days and two specimens at 28 days.

To avoid testing of 4,000 psi concrete provide a concrete mix with minimum of 6 bags of portland cement per cubic yard. Additional cementitious materials, (i.e. fly ash and / or slag) may be used to satisfy water cement ratio and or strength requirements.

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 123

CONFINED SPACE ENTRY INTO MANURE TRANSFER SYSTEM

- Confined spaces where human entry may occur shall be designed and operated in compliance with the provisions contained in ASABE EP470, Manure Storage Safety.
- Post warning signs on or next to all confined spaces. The signs should be sturdy, weatherproof, and display such wording as, "DANGER! CONFINED SPACE, DO NOT ENTER". Regularly inspect all warning signs to make sure they are clean, readable, and have not been tampered with.
- Be sure that all openings to confined spaces are appropriately covered or blocked off. Openings should be covered with substantial metal grill covers. These provide natural ventilation, and help prevent accidental falls or unauthorized entry.
- If employees are not required to enter a confined space, lock the opening to prevent entry.
- Obey all warning signs on and around confined spaces.
- Avoid going near confined spaces while smoking or using electrical equipment.
- Notify someone who has been trained in confined rescue operations if they spot anyone in trouble in a confined space.
- Confined spaces can be deadly. If the air in the space is not tested before entry, you could be overcome by fumes and pass out or die due to lack of oxygen, toxic gases, or an inability to escape quickly enough. Multiple deaths often occur when one person enters the space, is overcome, and others try unsuccessfully to save the first person.
- The following are the basic guidelines for confined space entry:
    - Test the atmosphere for oxygen, and for levels of toxic and explosive gases.
    - If a dangerous atmosphere exists, you must wear a self-contained breathing apparatus. Ventilate the area as thoroughly as possible.
    - All mechanical and electrical equipment must be locked out.
    - Use the 'buddy' system and wear a lifeline. Sufficient equipment and manpower must be available. A third person should be on hand to summon assistance if needed.
    - Establish how you will be communicating before entering the confined space. The meaning of verbal signals, hang gestures, or tugging line signals must be understood by the people on the outside.
    - Never re-enter a confined space without re-testing and venting the area.

EMERGENCY SLAB CRACK REPAIR PLAN

IN THE EVENT UN-INTENTIONAL FLOOR CRACKING OR CRACK MIGRATIONS OCCUR REPAIR THE CRACKS WITH A SIMPSON ETI-LV EPOXY ADHESIVE. THE REPAIR INVOLVES INJECTING LOW-VISCOSITY EPOXY INTO THE CRACKS TO MAKE THEM WATERPROOF. USE "GRAVITY-FEED APPLICATION" WHICH MEANS DISPENSING THE OIL-LIKE VISCOSITY EPOXY ALONG THE CRACK TO FILL IT WITHOUT PRESSURE. IN THE EVENT OF NARROW CRACKS, SIMPSON RECOMMENDS USING TWO BEADS OF CAULK ALONG EACH SIDE OF THE CRACK APPROXIMATELY 1/8" FROM THE EDGE OF THE CRACK TO WORK AS A RESERVOIR FOR THE EPOXY. ALTERNATIVELY, THE INSTALLER MAY ROUT THE CRACK TO FORM A V-GROOVE. WITH ROUTING, IT IS REQUIRED TO CLEAN THE CRACK WITH COMPRESSED AIR AFTERWARDS AS ROUTING CAN IMPACT DUST AND DEBRIS INTO THE CRACK AND PREVENT PROPER FLOW OF THE EPOXY.

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 124

OPERATION AND MAINTENANCE PLAN

Maximum height of manure in tank shall be maintained below the maximum operating level mark cast into the inside wall of the manure pit. If the maximum operating level is exceeded, implement contingency plan immediately.

Tank wall designed for a maximum height of backfill adjacent to tank level with the top of wall.

Tank design allows a **32,000 lbs.** vehicle surcharge at face of wall at any spot around the tank.

Slab design allows for a **16,800 lbs.** maximum vehicle axle load for 5" slab.

Slab design allows for a **20,000 lbs.** maximum vehicle axle load for 5-1/2" slab.

Fencing, guardrails, and other safety features shown on construction documents shall be inspected and maintained to ensure safe operation of waste storage facility and prevent access by humans or livestock.

Other Suggestions:

- Following emptying of the facility, inspect the concrete walls for and slab for separation or cracking and repair them as needed.
- Inspect pumps, pipes, and valves twice yearly to ensure they are functional and not a safety hazard.
- Post universal warning signs to prevent children and others from entering liquid waste facility.

CONTINGENCY PLAN

Begin planned contingency utilization of manure by applying to fields at rates according to 590 Nutrient Management Plan

Be certain to avoid areas of steep slopes or saturation.

EMERGENCY RESPONSE PLAN

Have name and phone number of a licensed septic waste hauler readily available to farm personnel.

Call licensed septic tank waste hauler to vacuum up spilled manure into vacuum tank and deposit back into waste storage tank or apply to land according to 590 Nutrient Management Plan.

Assess the extent of the spill and notify the DNR.

Provide temporary earthen barriers to contain liquid, if required, to stop liquid from entering nearby waterways or stormwater system. Return spilled manure to waste storage tank or apply to land according to 590 Nutrient Management Plan.

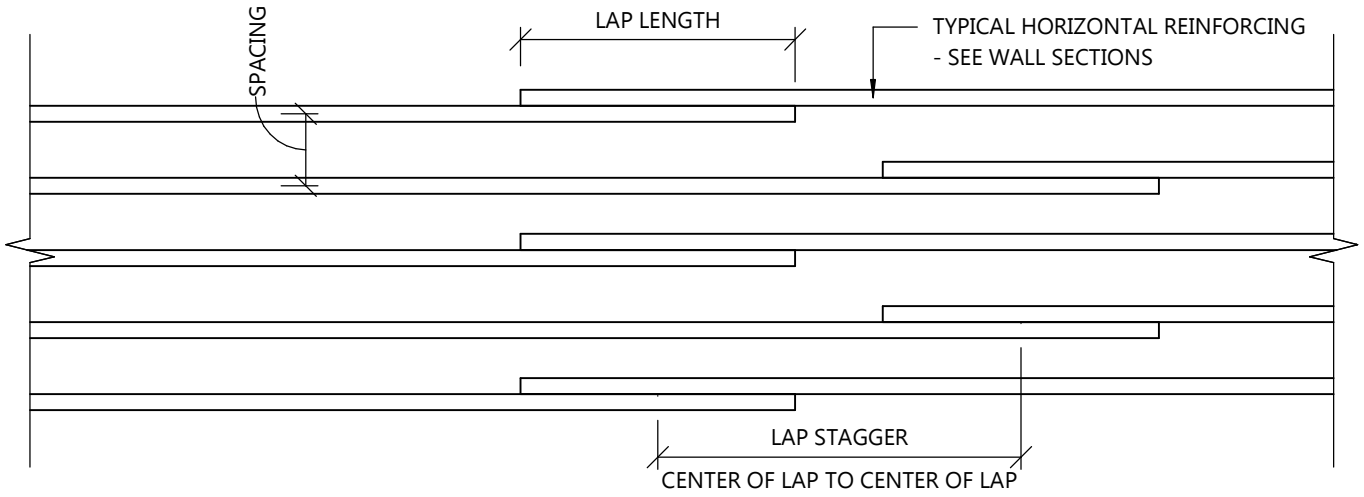
Do regular inspections of pipes, pumps, and valves to ensure proper operation at potential spill areas.

OWNER AGGREEMENT TO O/M PLAN

Signed:_____

Date:_____

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 125



* LAP STAGGER TO BE THE GREATER OF 36" & SPLICE LENGTH - SEE SCHEDULE BELOW

3/300

WALL BAR SPLICE LAP

HORIZONTAL WALL R/F
LAP PATTERN TO REPEAT EVERY OTHER BAR

BAR SPLICE SCHEDULE		
BAR SIZE	SPLICE LENGTH (in.) SLABS AND FOOTINGS (f'c = 4,000 PSI)	SPLICE LENGTH (in.) WALLS (CONCRETE STRENGTH AS NOTED)
#4Ø	15"	
#5Ø	20"	26" (f'c = 4,000 PSI OR GREATER)
#6Ø		30" (f'c = 4,000 PSI OR GREATER)
#7Ø		40" f'c = 5,500 PSI OR GREATER)
#8Ø		

2/300

BAR SPLICE SCHEDULE

APPROVED SEALANT
• LEAKMASTER LV-1 BY SIKA - GREENSTREAK GROUP, INC.

1/300

APPROVED SEALANTS

REVISIONS

PROJECT: VANGUARD RENEWABLES
DIGESTATE STORAGE TANK

LOCATION: TWO STATE SOD FARM
SOUTH OF HWY. 9 & N4580
KEOTA, OK 74941

DATE: NOV. 8, 2024

DESIGN NO.: 240332100

JP TANK AGRICULTURAL CONCRETE

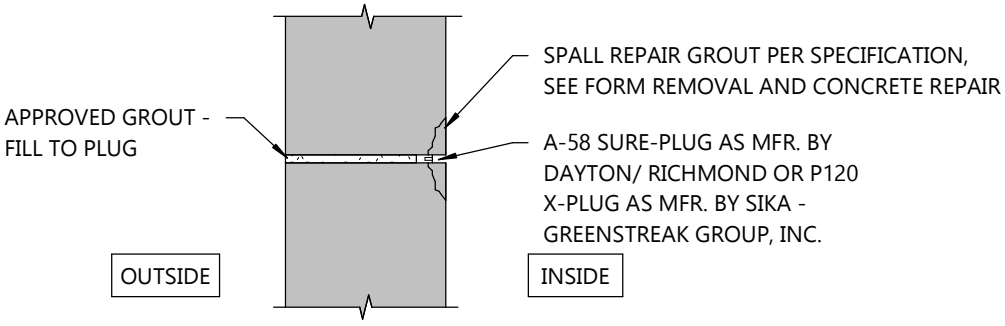
100 CAMELOT DRIVE
FOND DU LAC, WI 54935
PHONE: (920) 926-9800
FAX: (920) 926-9801
EXCEL ENGINEERING inc.

SHEET 300

NOTE: CONTR. HAS OPTION TO APPLY TAMMS THIN PATCH OVER GROUT IF A COLOR MATCH TO WALL IS REQ'D

APPROVED GROUTS

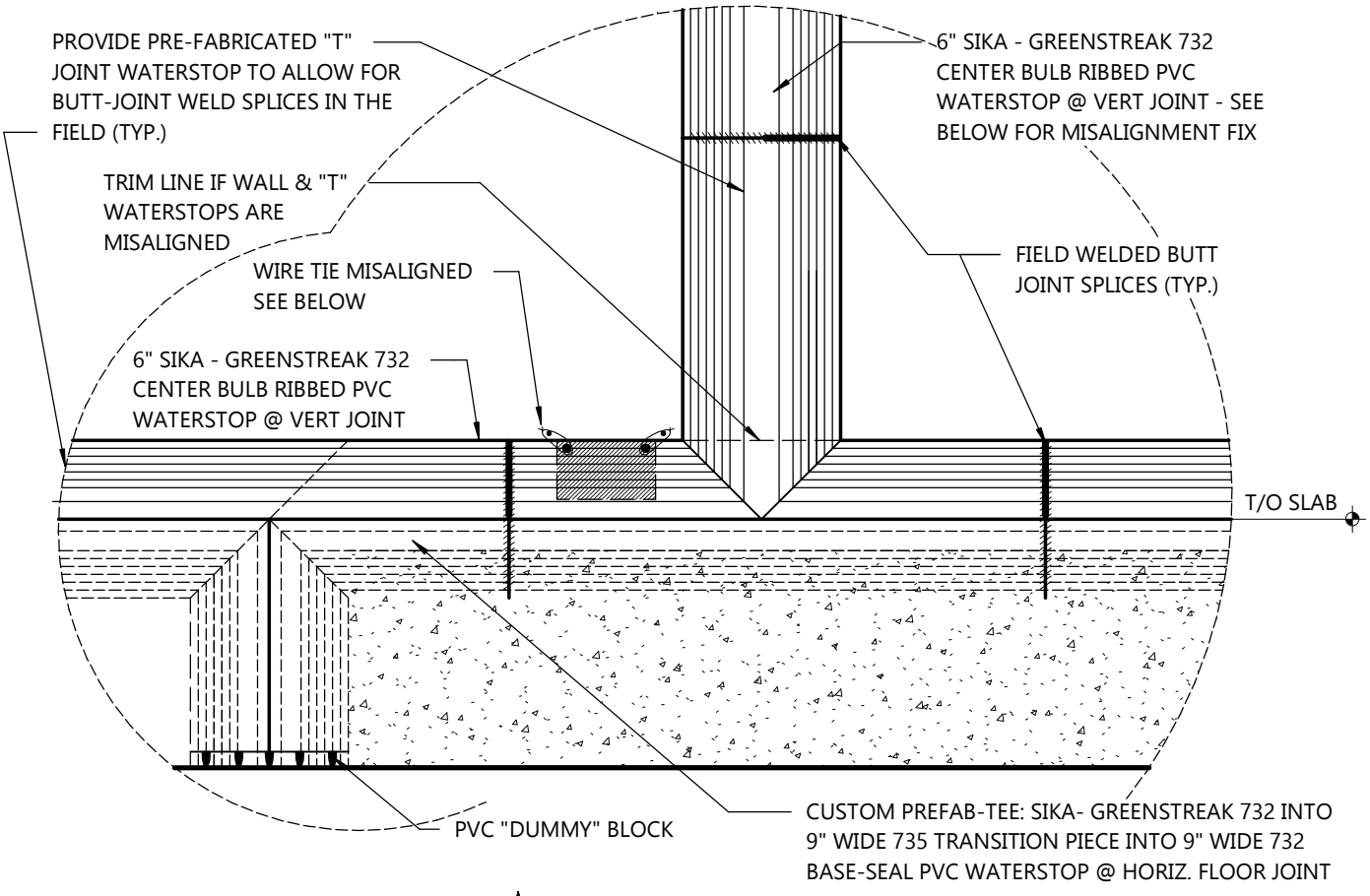
- DURAGROUT BY L&M CHEMICAL
- SIKAGROUT 212 BY SIKA
- HORN GROUT BY TAMMS
- 1107 DAYTON/SUPERIOR ADVANTAGE GROUT

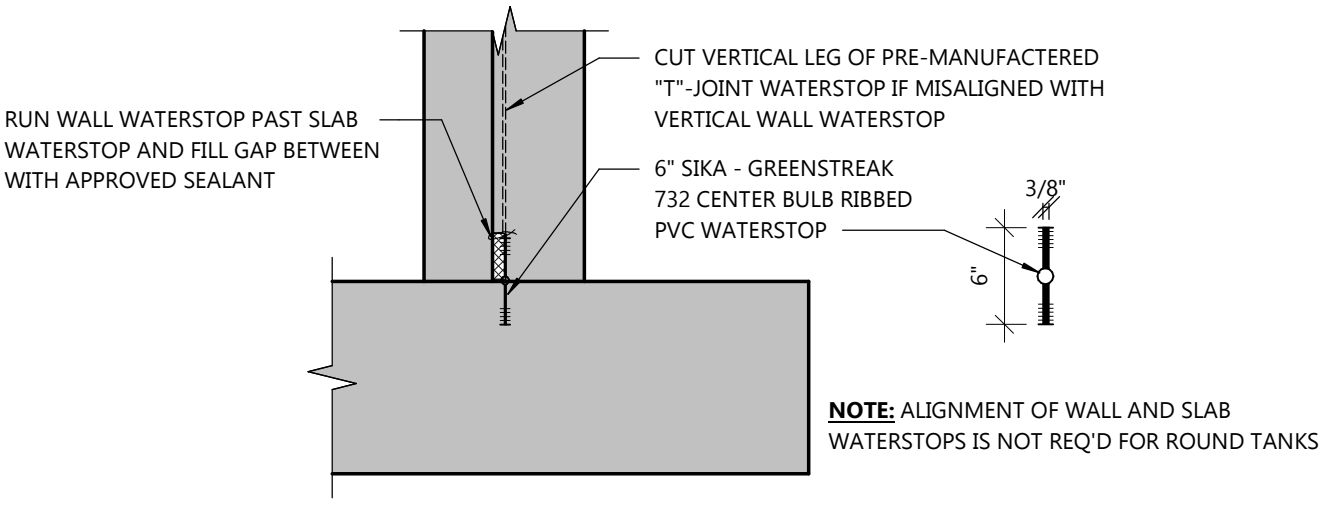


1/301 TIE HOLE DETAIL

SCALE: 1" = 1'-0"

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 301





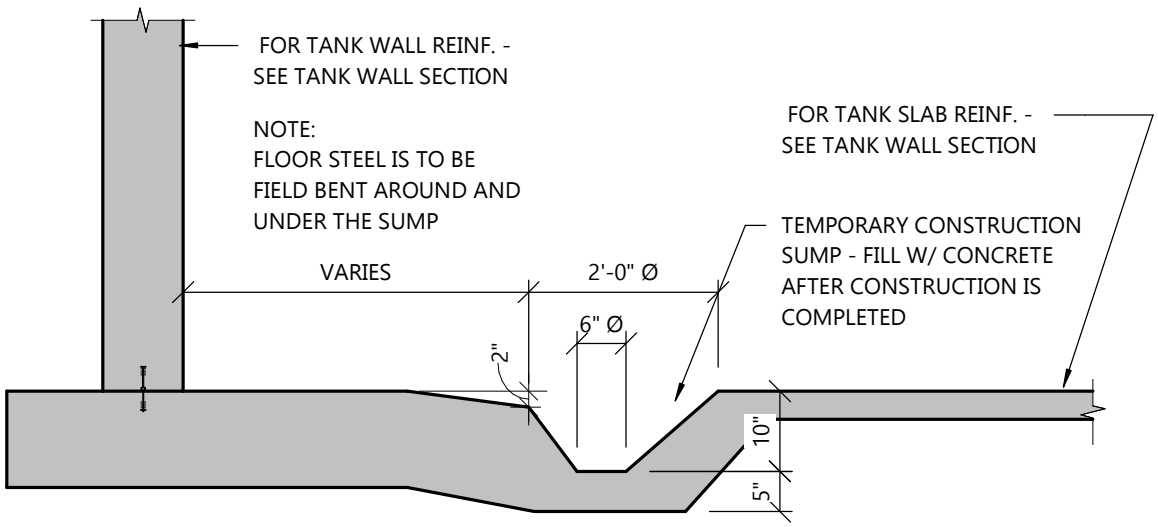
NOTE: ALIGNMENT OF WALL AND SLAB WATERSTOPS IS NOT REQ'D FOR ROUND TANKS

1
303

PREFABRICATED T-JOINT WATERSTOP

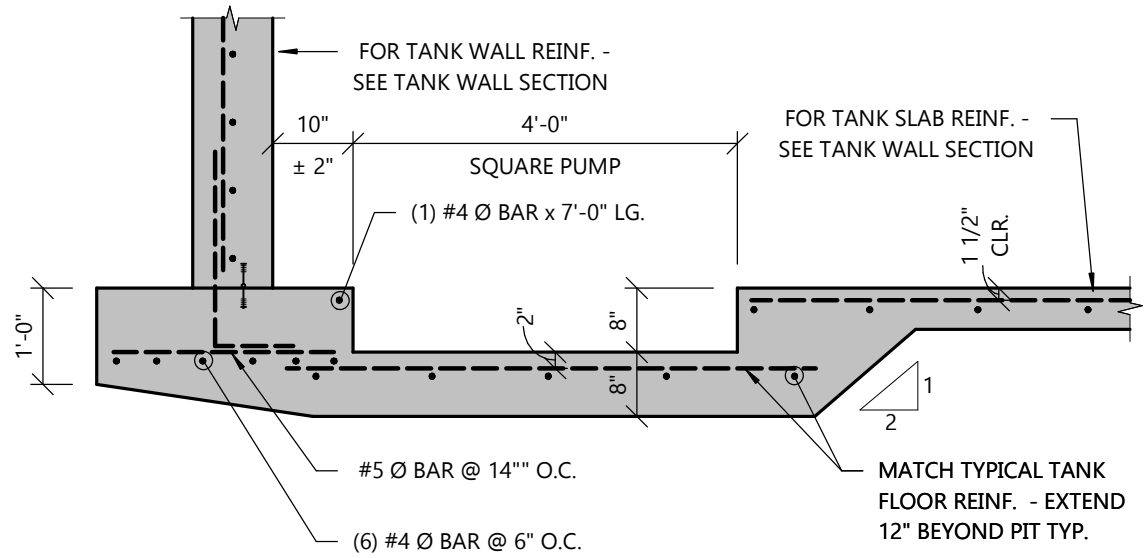
NOT TO SCALE

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK	DATE: NOV. 8, 2024
	LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE	EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801
		SHEET 303



2 / 309 TEMP. CONSTRUCTION SUMP PIT

SCALE: 1/2" = 1'-0"

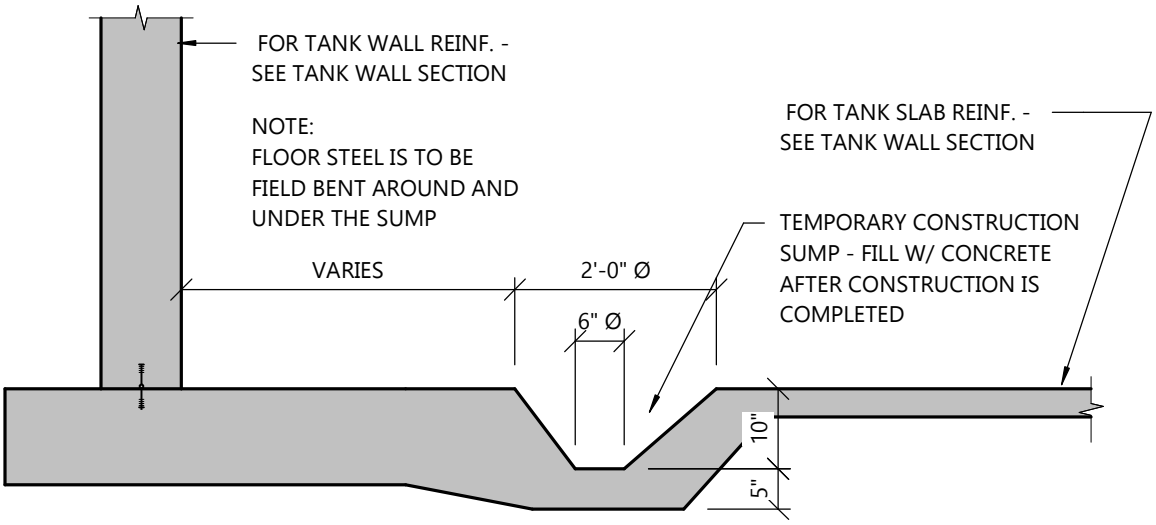


1 / 309 TYPICAL SUMP PIT

SCALE: 1/2" = 1'-0"

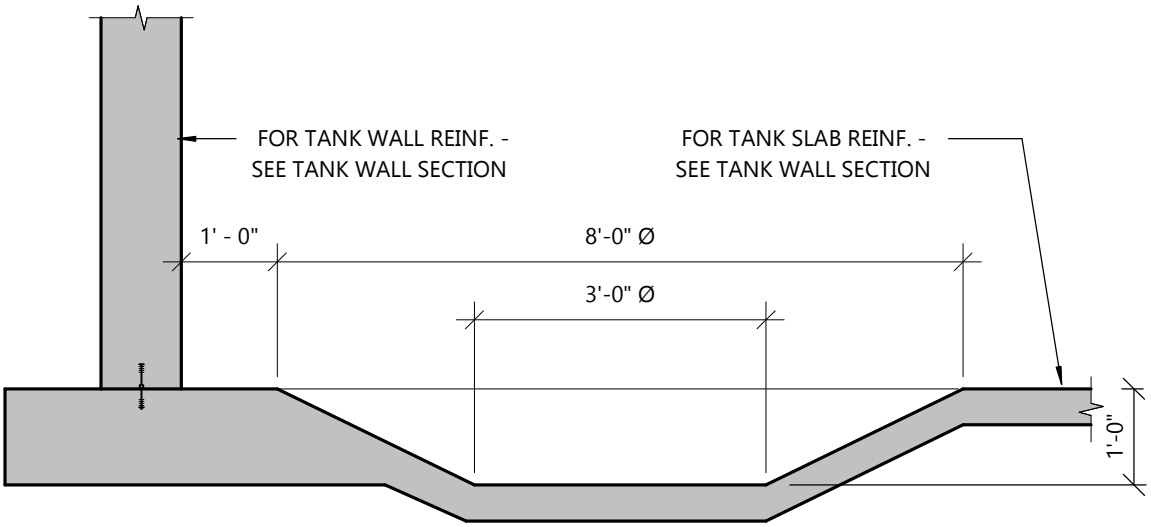
(TAPERED BOTTOM OPTION #1)

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET **309**



2 / 310 TEMP. CONSTRUCTION SUMP PIT

SCALE: 1/2" = 1'-0"



1 / 310 TYPICAL SUMP PIT

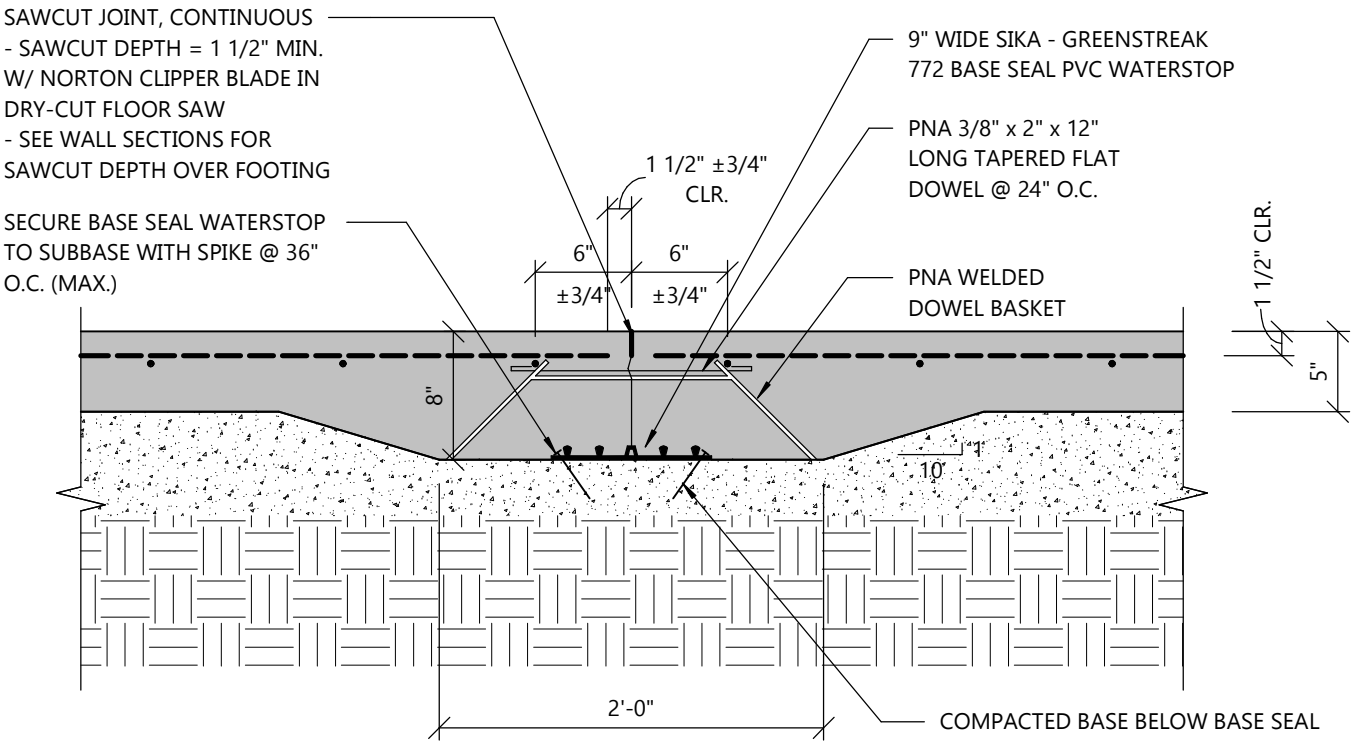
SCALE: 1/2" = 1'-0"

(TAPERED BOTTOM OPTION #2)

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET **310**

SIKA - GREENSTREAK 772 INSTALLATION NOTES:

- PAINTED NAILS WILL BE PLACED ON THE FOOTING FORM BOARDS ALONG THE INTENDED FLOOR JOINT LINE.
- A STRING LINE IS THEN ATTACHED TO THE NAILS IN ADDITION TO THE CENTER ALIGNMENT FIXTURE WHEN REQUIRED TO PREVENT EXCESSIVE SAG IN THE LINE.
- THE 772 WATERSTOP WILL BE LOCATED BELOW THIS LINE AND SECURED TO THE COMPACTED GRADE AS INDICATED IN THE DETAIL.
- THE PAINTED NAILS WILL REMAIN WHILE THE STRING LINE WILL BE REMOVED TO FACILITATE SLAB POUR.
- AFTER PLACING OF CONCRETE IN BASE SEAL JOINT AREA, ENSURE CONSOLIDATION OF CONCRETE AROUND PLATE DOWELS AND DOWEL BASKET WITH THE USE OF IMMERSION VIBRATOR.
- WITHIN 12 HOURS OF THE POUR BEING COMPLETED, A SNAP CHALK LINE UTILIZING THE PAINTED NAILS WILL BE ESTABLISHED TO GUIDE CONTRACTOR DURING SAWCUTTING OVER WATERSTOP.



NOTE:
PROVIDE SAWCUT AS SOON AS POSSIBLE AND NOT GREATER THAN 12 HRS. AFTER POUR
PLATE DOWEL IS FACTORY COATED TO ELIMINATE THE NEED TO GREASE DOWEL

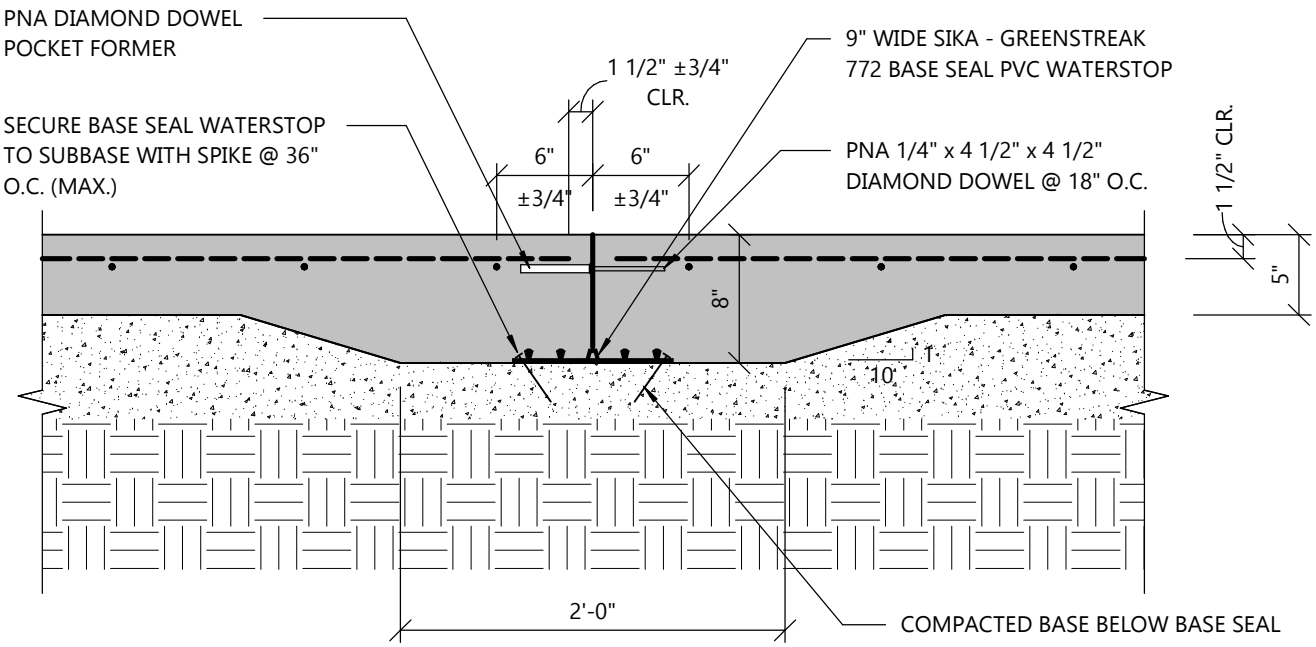
1/400 SAWCUT CONTROL JOINT

SCALE: 1" = 1'-0"

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK	DATE: NOV. 8, 2024
	LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE	100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801 EXCEL ENGINEERING inc.
		SHEET 400

SIKA - GREENSTREAK 772 INSTALLATION NOTES:

- THE 772 WATERSTOP WILL BE SECURED TO THE COMPACTED BASE AS INDICATED IN THE DETAIL.
- AFTER PLACING OF CONCRETE IN BASE SEAL JOINT AREA, ENSURE CONSOLIDATION OF CONCRETE AROUND SPEED PLATE POCKET FORMER WITH THE USE OF IMMERSION VIBRATOR.



NOTE:
DIAMOND DOWEL ELIMINATES THE NEED TO GREASE DOWEL

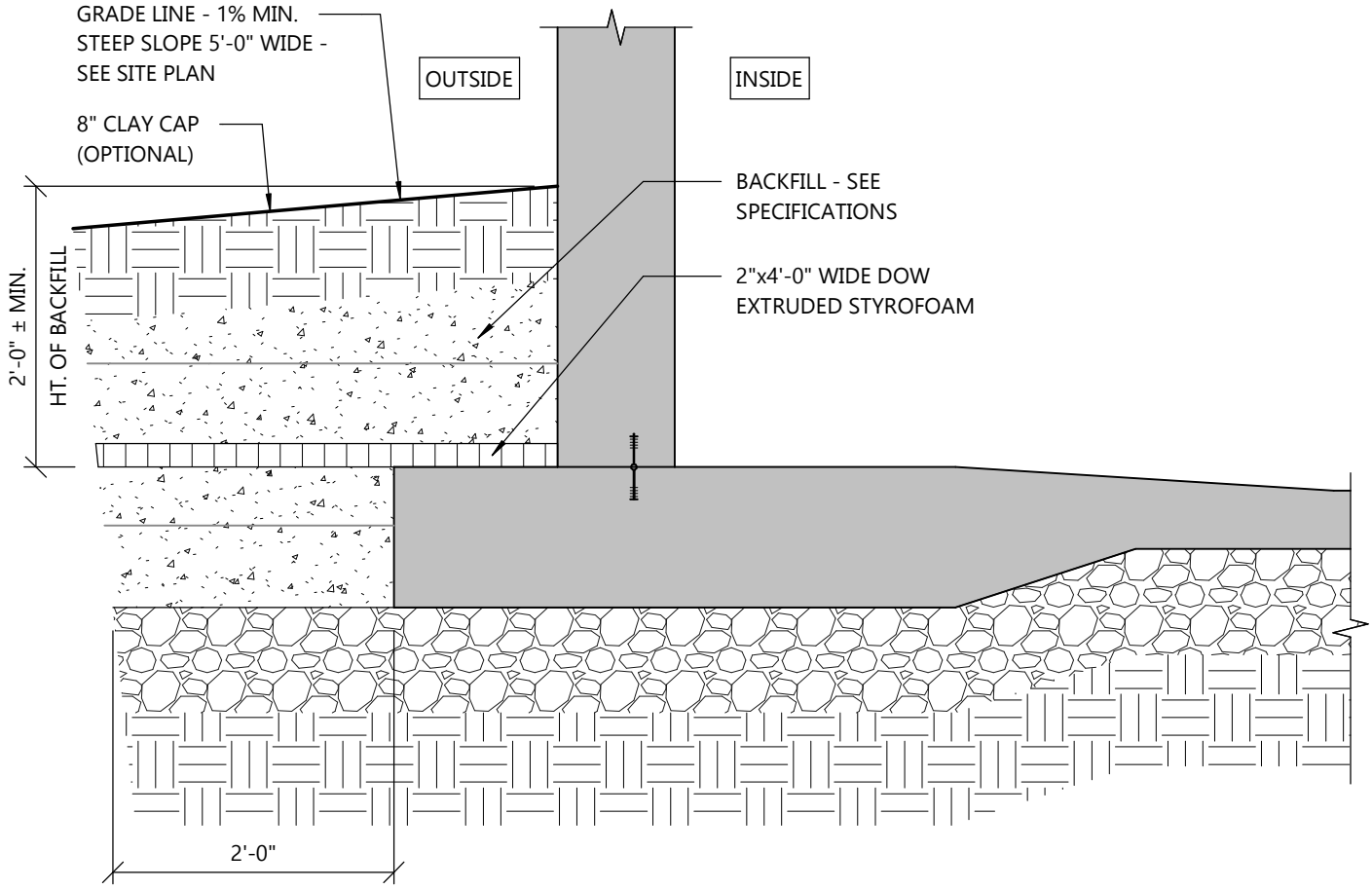
1 / 401

CONSTRUCTION CONTROL JOINT

SCALE: 1" = 1'-0"

REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 401

NOTE:
FOR TANK WALL & FOOTING
REINF. REQUIREMENTS - SEE
TANK WALL SECTION



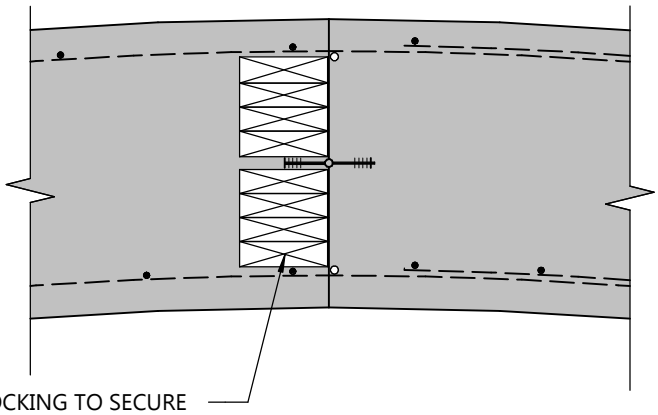
1
402

SHALLOW BASE FROST PROTECTION SECTION

SCALE: 3/4" = 1'-0"

PROJECT SPECIFIC - USED WHERE FINISH GRADE
IS LESS THAN 4'-0" ABOVE TOP OF FOOTING

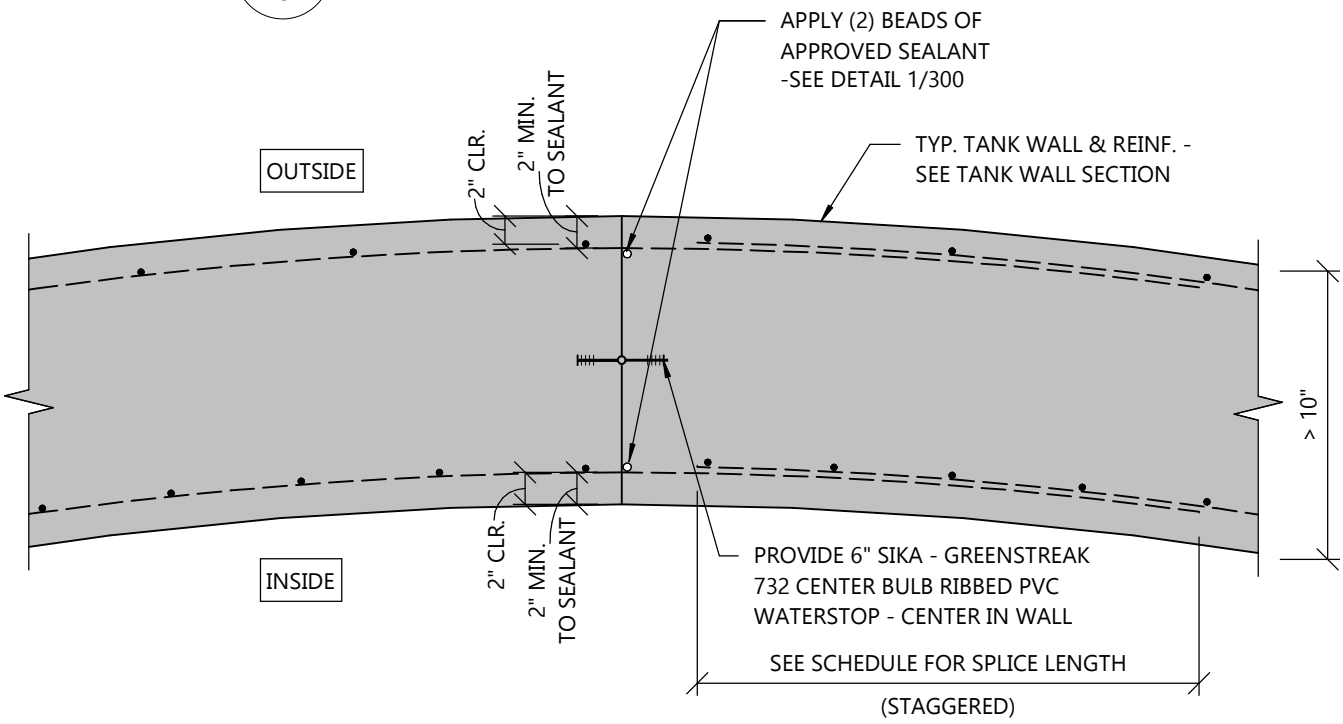
REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET **402**



2x BLOCKING TO SECURE PVC WATERSTOP IN PLACE DURING CONCRETE POUR. CENTER WATERSTOP IN WALL WIDTH.

2 / 404 WALL CONSTRUCTION JOINT

SCALE: 1" = 1'-0"

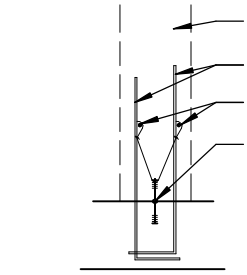


1 / 404 WALL CONSTRUCTION JOINT

SCALE: 1" = 1'-0"

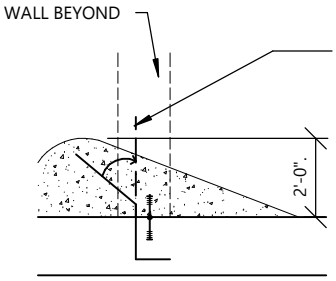
REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 404

IN THE EVENT THAT THE WATERSTOP NEEDS TO BE ADJUSTED BY HAND AFTER INITIAL PLACEMENT, THE CONCERETE ADJACENT TO THE WATERSTOP MUST BE RECONSOLIDATED WITH AN IMMERSION VIBRATOR



3 / 405 WATERSTOP INSTALLATION

SCALE: 1/2" = 1'-0"



-BEND WALL DOWELS AT CONSTRUCTION ENTRANCE TO 45 DEG. MAX.
-COVER BAR & WATERSTOP WITH PLASTIC.
-COVER WITH GRAVEL RAMP DURING CONSTRUCTION.
-AFTER REMOVAL OF GRAVEL RE-STRAIGHTEN DOWELS TO VERTICAL POSITION.

2 / 405 WALL CONSTR. OPENING

SCALE: 1/2" = 1'-0"

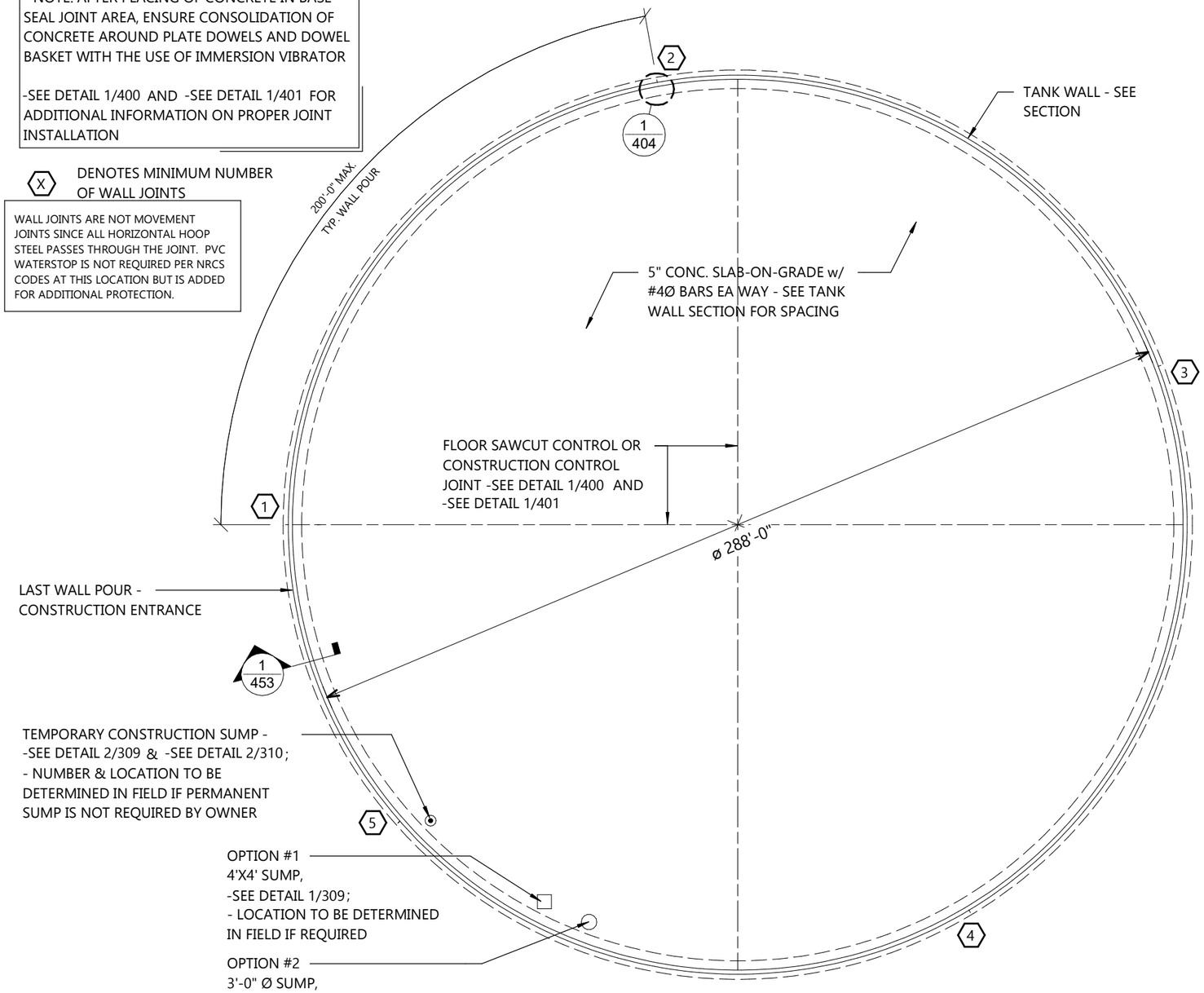
REVISIONS	PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941	DATE: NOV. 8, 2024 DESIGN NO.: 240332100
	JP TANK AGRICULTURAL CONCRETE EXCEL ENGINEERING inc. 100 CAMELOT DRIVE FOND DU LAC, WI 54935 PHONE: (920) 926-9800 FAX: (920) 926-9801	SHEET 405

- NOTE: AFTER PLACING OF CONCRETE IN BASE SEAL JOINT AREA, ENSURE CONSOLIDATION OF CONCRETE AROUND PLATE DOWELS AND DOWEL BASKET WITH THE USE OF IMMERSION VIBRATOR

-SEE DETAIL 1/400 AND -SEE DETAIL 1/401 FOR ADDITIONAL INFORMATION ON PROPER JOINT INSTALLATION

(X) DENOTES MINIMUM NUMBER OF WALL JOINTS

WALL JOINTS ARE NOT MOVEMENT JOINTS SINCE ALL HORIZONTAL HOOP STEEL PASSES THROUGH THE JOINT. PVC WATERSTOP IS NOT REQUIRED PER NRCS CODES AT THIS LOCATION BUT IS ADDED FOR ADDITIONAL PROTECTION.



NORTH

288' Ø TANK W/ 18 FT WALLS - FOUNDATION PLAN

SCALE: 1" = 40'-0"

REVISIONS

PROJECT: VANGUARD RENEWABLES
DIGESTATE STORAGE TANK

LOCATION: TWO STATE SOD FARM
SOUTH OF HWY. 9 & N4580
KEOTA, OK 74941

DATE: NOV. 8, 2024

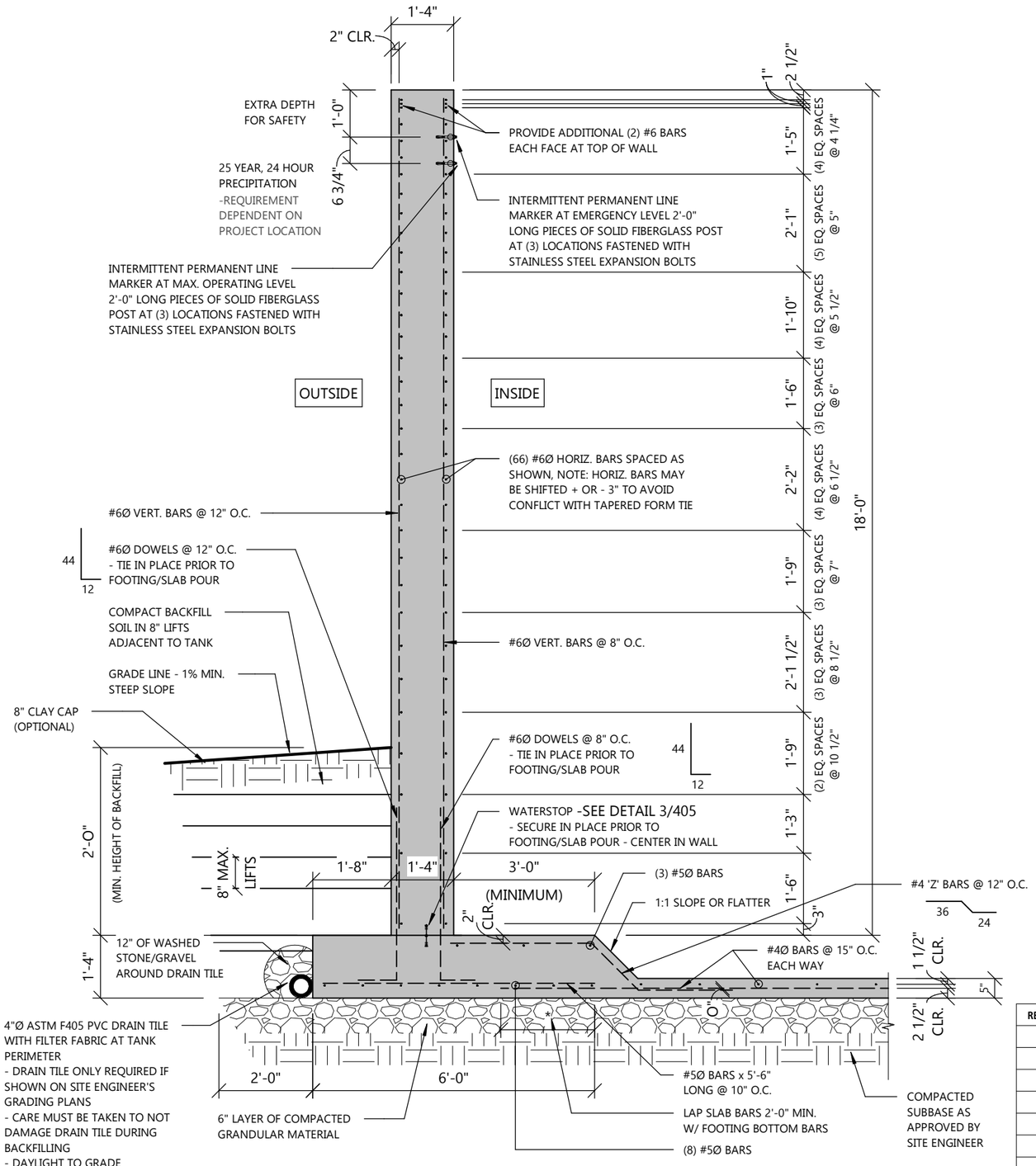
DESIGN NO.: 240332100

JP TANK AGRICULTURAL CONCRETE

100 CAMELOT DRIVE
FOND DU LAC, WI 54935
PHONE: (920) 926-9800

EXCEL ENGINEERING inc.

SHEET 452



CONSTRUCTION NOTES:

1. FOR SCREEDING THE FLOOR USE A SOMERO S-240 LASER SCREED. THIS EQUIPMENT USES A HYDRAULIC POWERED LASER CONTROLLED SCREEDING HEAD MOUNTED ON A TELESCOPIC BOOM. SELF-LEVELING SCREED HEAD CONSISTS OF A PLOW THAT REMOVES EXCESS CONCRETE, AN AUGER THAT CUTS CONCRETE TO GRADE, AND A VIBRATOR THAT CONSOLIDATES MATERIAL AT 3000 VPM. THE SCREED WILL BE RUN UP TO THE WALL DOWELS, WITHIN INCHES OF THE WATERSTOP TO ACHIEVE CONSOLIDATION.
2. IN ADDITION, A GAS-POWERED, HAND-HELD LINDLEY RATTLER SHALL BE USED ON THE EXTERIOR SIDE OF THE WATERSTOP. THIS IS HIGH EFFICIENCY, 1 5/8" DIAMETER HEAD, VIBRATING AT A FREQUENCY PROPORTIONAL TO THE THROTTLE SPEED, WHICH HAS A 7,000 RPM MAXIMUM. PROBE WITH THE WAND ALONG THE WATERSTOP WITH APPROXIMATE SPACING OF 24" O.C. WITH A DURATION OF VIBRATION OF 2 SECONDS PER PROBE.
3. THE SAWCUTTING DEPTH OVER FOOTING TO BE COMPLETED WITHIN 12 HOURS OF POUR AS FOLLOWS:

- IN THE AREA OF A 16" THICK FOOTING ON A 18 FOOT TALL WALL, A 48" LONG X 4" DEEP CUT WILL BE MADE. THIS CUT WILL BEGIN IN THE TRANSITION AREA OF THE SLAB BETWEEN THE TYPICAL 5" SLAB AND THE 16" FOOTING. THE 4" DEEP SAWCUT EQUALS THE MINIMUM 1/4 SLAB THICKNESS RECOMMENDATION, (I.E. 1/4 X 16" = 4").

CONCRETE 28 DAY STRENGTH

WALLS	f'c	5,000 PSI
FLOOR	f'c	4,000 PSI
ALLOWABLE SOIL BEARING PRESSURE		
2,000 PSF		

1 / 453 SCALE: 3/8" = 1'-0"

18 FT TANK WALL SECTION

(FLAT BOTTOM OPTION)

REVISIONS

PROJECT: VANGUARD RENEWABLES DIGESTATE STORAGE TANK

LOCATION: TWO STATE SOD FARM SOUTH OF HWY. 9 & N4580 KEOTA, OK 74941

DATE: NOV. 8, 2024

DESIGN NO.: 240332100

SHEET 453

JP TANK AGRICULTURAL CONCRETE

EXCEL ENGINEERING inc.

100 CAMELOT DRIVE
FOND DU LAC, WI 54935
PHONE: (920) 926-9800

STRUCTURAL CALCULATIONS

EXCEL
ARCHITECTS • ENGINEERS • SURVEYORS

Project:

DIGESTATE STORAGE
KEOTA, OK
288 FT DIAMETER TANK

Prepared For:

JP TANK

Date:

11/8/2024

Calculation Index:

Authorization:

EXCEL PROJECT NUMBER:	240332100	SUPERVISED BY:	
PREPARED BY:	JOSH WILSMANN, PE	FIRM COA NUMBER:	OK: CA 5092 PE

Stamps: **For Review Only**

12/30/24

100 Camelot Drive
Fond du Lac, WI 54935

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Circular Concrete Tank Design:

(Pinned Base - Free Top w/ Triangular Load)

Project Name: Keota digestate Storage
Project No.: 240332100
Description: 280' dia. x 18' ht. Tank

Design References

"Circular Concrete Tanks Without Prestressing" by PCA, 1993
"TR-9: Circular Concrete Manure Tanks" by MWPS, 1998 w/ 1999 rev.
"Waste Storage Facility Code 313" by NRCS, October 2017
"Wisconsin Construction Specification #4 - Concrete" by NRCS,
"Pond Sealing or Lining - Concrete Code 522" by NRCS, October 2017
Building Code Requirements for Structural Concrete - ACI 318-11
Design of Slabs On Grade - ACI 360 by ACI

Design Assumptions

Wall - minimum 28-Day, F'c per design, with max. w/cm ratio of 0.45 =	**5000 psi**
Floor - minimum, 28-day F'c per design, with max. w/cm ratio of 0.45 =	**4000 psi**
Condition 1 (Full Manure - No Backfill): Manure weight =	**72 psf, Sand-Laden**
Condition 2a (Empty Manure - Full-height Backfill): 100 psf soil load + 230 surcharge w/ clay present in backfill	**Used**
Condition 2b (Empty Manure - Full-height Backfill): 60 psf soil load + 230 psf vertical surcharge, backfill to be only Sand or Gravel, (no clay or silts)	**Not Used**

Conditions 2a and 2b are assumed to be unsaturated soil to the top of the tank wall.
Completely saturated soil is unlikely to occur, especially for walls of heights over 8 ft.
Tanks tend to be set just below top soil and have berms; they are not completely buried below grade.
Also, CPS 522 Table 2 requires 2.5 ft of separation from regional high water level & the bottom of the tank.

Ring steel in a single row is located at center of wall.
Ring steel in a double row:
Outside bar is located to inside of vert. steel.
Inside bar is located 2" clear from face of wall.

Vertical bars in a single layer are located to the outside of the ring steel.
Vertical bars in a double layer:
Outside layer is located 2" clear from the face of the wall (2"+vert bar/2).
Inside layer is located to the inside of horizontal steel (2"+horiz bar+vert. bar/2).

Note ACI318-11, Section 14.1.2 states that cantilevered retaining walls are to be designed according to flexural design provisions of Chapter 10 with minimum horizontal reinforcement according to Section 14.3.3.
Min As for flexural **vertical** bar = 0.0018 x wall t x spacing per ACI 318-11, Sections 10.5.4 and 7.12.2.1.
Min temperature and shrinkage **horiz** bar area = 0.0020 x wall t x spacing, (no movement joints provided) per ACI 318-11, Sections 14.3.3. for #5 or smaller bars.
Max spacing of vertical and horizontal reinforcement shall not exceed 3 x thickness, nor 18 in.

Liquid pressure is resisted by outside face steel.
Soil & surcharge pressures are resisted by inside face steel.

Max vertical bar spacing based on ACI318-95 Z-number method, 10.6.4, Equation (10-5) which MWPS used.
Bar spacing for empty tank based on strength with new 100/230 loading.
Max vertical bar spacing based on ACI318-11, 10.6.4, Equation (10-4) is far less conservative.

Dowel size to match wall vert. bar size, per MWPS TR-9 spec.
Dowel spacing to match wall vert. bar spacing, per MWPS TR-9 spec.

Concrete slab reinforcing per Table 1 in "Pond Sealing or Lining - Concrete Code 522" by NRCS, October 2017
Maximum floor steel spacing = 18 in., see sheet 3 for actual bar spacing used.
Maximum floor joint spacing = 175 ft., see sheet 3 for actual joint spacing used.

Radial bar size to be #5 maximum.
Radial bar size to match wall vert. bar size, up to 9" spacing
Radial bar size to be #5, for spacings greater that 9"
Radial bar spacing as required by calculation.
Radial footing steel is placed on top of ring steel. Use area of steel = 0.0027 x gross concrete area per original MWPS design guide.

Ring footing steel is placed 3" clear from bottom.

Allowable net soil bearing pressure is 1500 psf for walls less than or equal to 16 ft tall.
Allowable net soil bearing pressure of 2000 psf for walls > 16 ft tall needs to be verified by a geotechnical engineer.

Circular Concrete Tank Design (cont.): Condition 1 & Condition #2a Clay Static Loading

(Pinned Base - Free Top w/ Triangular Load)

Sand- laden Manure

: Wall height = Soil assumed		18	ft	(H)
: Inside tank diameter =		288	ft	(D)
: Wall thickness =		16	in	(t)
	Vertical	Lateral		
: Weight of liquid (internal) =	72	72	pcf	(wl)
: Weight of soil (external) =	115	100	pcf	(ws)
: Horizontal pressure from surcharge (external) =		200	psf	(S)
: Vertical surface pressure creating horizontal surcharge (external) =		230	psf	(W)
: Factored horizontal pressure from surcharge = Sd(1.6)(S) =		320	psf	(p)
: Concrete compressive strength (wall) =		5000	psi	(f'c)
: Concrete compressive strength (footing) =		4000	psi	(f'c foot)
: Reinforcement yield strength =		60	ksi	(fy)
: Modulus of elasticity (concrete wall) = (57)(f'c)$^{.5}$ =		4031	ksi	(Ec)
: Modulus of elasticity (steel) =		29000	ksi	(Es)
: Ratio of moduli of elasticity = (Es/Ec) =		7.2		(n)
: $H^2/Dt = (H)^2/(D)(t)$ =		0.84		(H^2/Dt)
: w_S (soil pressure) = (1.6)(ws) =		160.00	pcf	(w_S)
: w_L (liquid pressure) = (1.4)(wl) =		100.80	pcf	(w_L)
: w_LHR = (w_L)(H)(D/2) =		261273.60	pcf	(w_LHR)

Horizontal Reinforcing (ring steel) Bar size = #6 # Bars per row = 2 Splice length = 29 inches

Point	Elev. (ft)	Tension coeff. Table A-5	Ring Tension (plf)	As per row (in^2/ft)	Max. spacing (in o.c.)	Act. spacing (in o.c.)	As provided (in^2/ft)	Check Strength & T+S
0.0H	18.00	0.423	110519	1.02	5.16	5.00	1.06	O.K.
0.1H	16.20	0.402	105032	0.97	5.43	5.00	1.06	O.K.
0.2H	14.40	0.381	99545	0.92	5.73	5.50	0.96	O.K.
0.3H	12.60	0.358	93536	0.87	6.10	6.00	0.88	O.K.
0.4H	10.80	0.330	86220	0.80	6.61	6.50	0.81	O.K.
0.5H	9.00	0.297	77598	0.72	7.35	7.00	0.75	O.K.
0.6H	7.20	0.249	65057	0.60	8.77	8.50	0.62	O.K.
0.7H	5.40	0.202	52777	0.49	10.80	10.50	0.50	O.K.
0.8H	3.60	0.145	37885	0.35	15.05	15.00	0.35	O.K.
0.9H	1.80	0.076	19857	0.24	18.00	18.00	0.29	O.K.
1.0H	0.00	0.000	0					

Wall Thickness

: Allowable concrete tensile stress = (.1)(f'c) = ...Per Section 4, of "Circular Concrete Tanks Without Prestressing" by PCA, 1993		500.00	psi	(Ta)
: Actual concrete tensile stress = ((.0003)(Es)(As provided)+(Tmax))/(Ac+(n)(As provided)) =	O.K.	469.68	psi	(Tu)

Vertical Reinforcing (moment steel) Bar size = #6 # of layers = 2

Outside face bar spacing = 12.00 in o.c. | Outside face As = 0.4400 in^2/ft | d outside = 13.625 in

a outside = 0.518 in | a inside = 0.776 in | Inside face bar spacing = 8.00 in o.c. | Inside face As = 0.6600 in^2/ft | d inside = 12.875 in

Point	Elev. (ft)	Moment coeff. Table A-7	Mu outside (ft-lb)	ϕMn outside (ft-lb)		Mu inside (ft-lb)	ϕMn inside (ft-lb)	
0.0H	18.00	0.0000	0	26465	O.K.	0	37086	O.K.
0.1H	16.20	0.0019	1117	26465	O.K.	1970	37086	O.K.
0.2H	14.40	0.0064	3762	26465	O.K.	6636	37086	O.K.
0.3H	12.60	0.0133	7819	26465	O.K.	13789	37086	O.K.
0.4H	10.80	0.0207	12169	26465	O.K.	21462	37086	O.K.
0.5H	9.00	0.0271	15931	26465	O.K.	28097	37086	O.K.
0.6H	7.20	0.0319	18753	26465	O.K.	33074	37086	O.K.
0.7H	5.40	0.0329	19341	26465	O.K.	34111	37086	O.K.
0.8H	3.60	0.0292	17166	26465	O.K.	30275	37086	O.K.
0.9H	1.80	0.0187	10993	26465	O.K.	19388	37086	O.K.
1.0H	0.00	0.0000	0	26465	O.K.	0	37086	O.K.

z factor is for reference to historical code and designs only. Bar spacing is set by ACI 318 spacing equations.

Circular Concrete Tank Design (cont.): Condition #1 Clay Static Loading

(Pinned Base - Free Top w/ Triangular Load)

: Shrink & Temp Vertical r/f = As/(12)(h) =	0.0057	**O.K. > 0.0018**				
Crack Control (vertical steel spacing)	outside face		inside face			
: c = kd =	2.430		2.821			
: ρ = As/(12)(d) =	0.0027		0.0043			(ρ)
: k = ((2(ρn)+(ρn)^2)$^{.5}$)-(ρn) =	0.178		0.219			(k)
: j = 1-(k/3) =	0.941		0.927			(j)
: fs = M/(As)(j)(d) =	29.401	**OK < fs max**	32.479	**OK < fs max**	ksi	(fs)
: z =	**136**		**201**	**OK**	k/in	(z)
: dc =	2.375		3.125		in	(dc)
: Pre ACI 318-99 max spacing = (z)^3/((2(dc)^2(fs)^3) =	8.77	**check**	12.14	**empty tank**	in	(s)
: Cc =	2.000		2.750		in	(Cc)
: ACI 318-11 max spacing = (15)x(40,000/fs) - 2.5Cc <= (12)x(40,000/fs) <= 18..	15.41	**O.K.**	11.60	**O.K.**	in	(s)

Wall Shear

: Shear coefficient (Table A-12) =				0.2340		(C_{shear})
: Actual outside face shear = (C_{shear})(w_{ui})(H^2) =				7642.25	lb	(Vui)
: Actual inside face shear = (C_{shear})(((w_{ue})(H^2))+((p)(H))) =				13478.40	lb	(Vue)
: Allowable outside face shear = (.75)(2)(f'c)$^{.5}$(12)(d outside) =			**O.K.**	17341.79	lb	(ϕVc)
: Allowable inside face shear = (.75)(2)(f'c)$^{.5}$(12)(d inside) =		**Required increased F'c**	**O.K.**	16387.20	lb	(ϕVc)
Dowel size =	#6	Footing develop. length =	10.5 in			
Outside face dowel spacing =	12.00	Min. projection =	29 in	Total vertical =	42	in
Inside face dowel spacing =	8.00	Hook length =	12 in			
: Allowable dowel shear (shear friction) = (.75)(Asv)(fy)(.6)(1.0) =				**O.K.**	29700.00	lb (Vn)

max of Vert Bar Lap or 24"

Floor Slab Design Slab thickness = **5.00** in

slab sections reqd. = **4** Slab length = 147 ft

: Required area of steel = (1.5)(L)(w)/(2(.7)(fy)) =	**O.K. per CPS 522, Table 1**		0.164	in^2	(Asf)
Bar size =	**#4**				
Bar spacing =	**15.00** in o.c.				
: Area of steel provided =		**Redesign**	0.160	in^2	0.27%

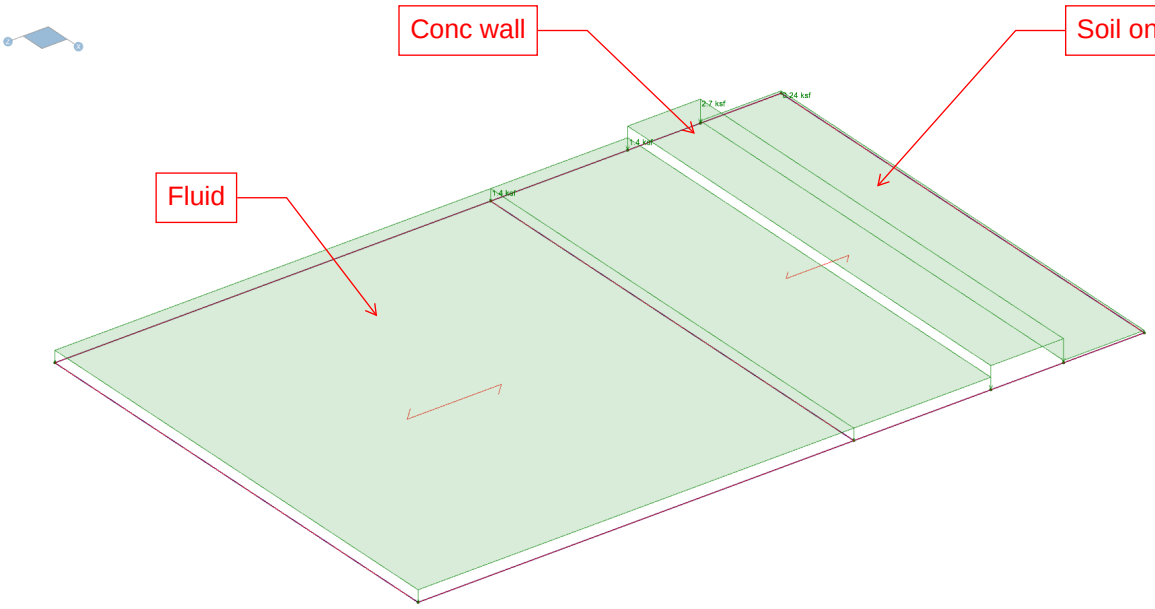
Table A
Reinforcing Steel for Temperature and Shrinkage Control

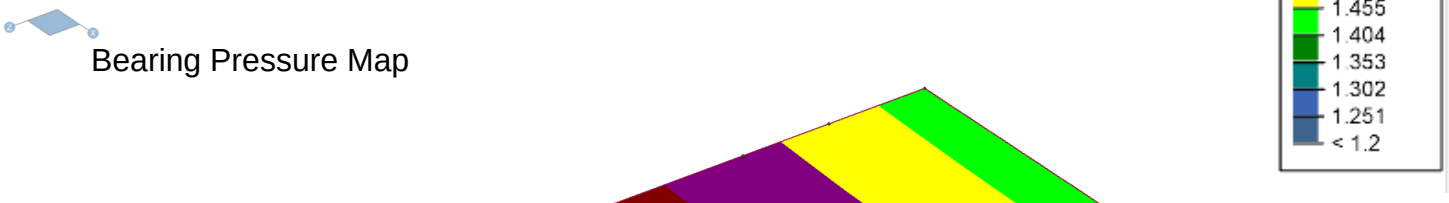
Control Joint Spacing			
Concrete Thickness	Rebar Size (grade 60) and Spacing		
	≤ 100 ft.	≤ 150 ft.	≤ 175 ft.
≤ 5 "	#4 @ 18"	#4 @ 15"	#5 @ 18"
≤ 6 "	#4 @ 18"	#5 @ 18"	#5 @ 15"
≤ 7 "	#4 @ 15"	#5 @ 15"	#5 @ 12"
≤ 8 "	#5 @ 18"	#5 @ 15"	#5 @ 12"

slab sub grade drag formula is no longer included in ACI 360 references. Calculation is included for historical comparison only. Design is OK per WI NRCS design standards.

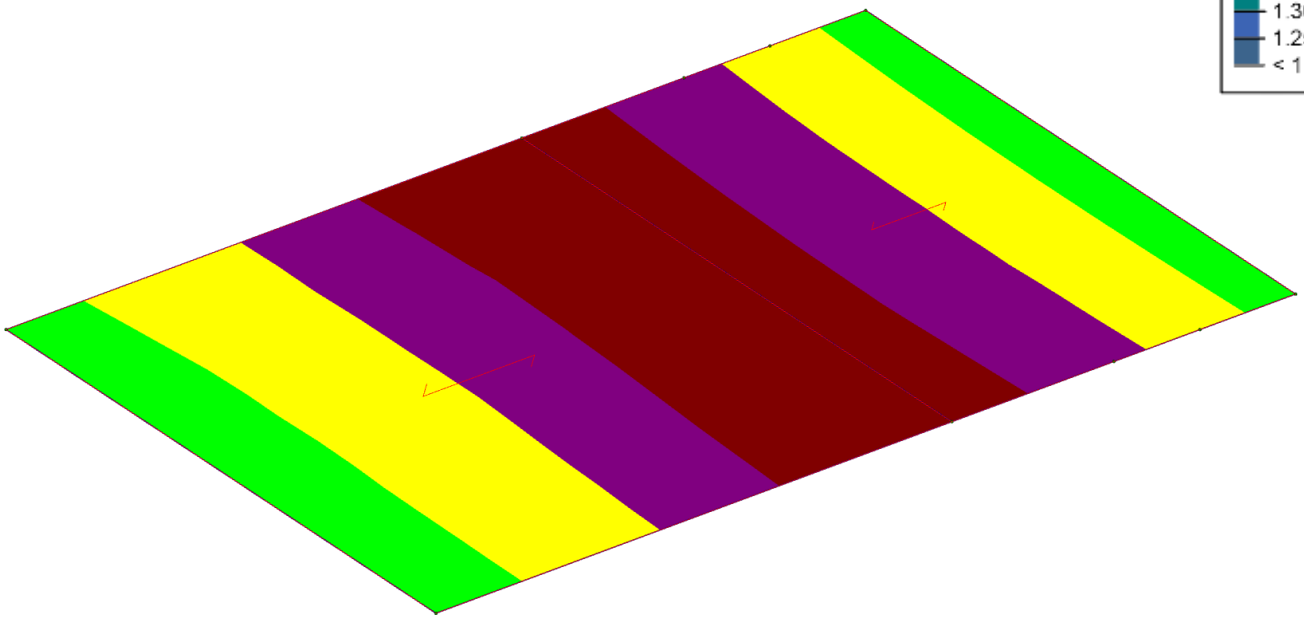
Envelope Slab Soil Pressures

	Label	Max UC	Max LC	Soil Pressure[ksf]	Allowable Bearing[ksf]	Node
1	S1	0.794	1	1.589	2	N2
2	S2	0.796	1	1.592	2	N61





Bearing Pressure Map



Detail Report : DS2-X1

Input Data

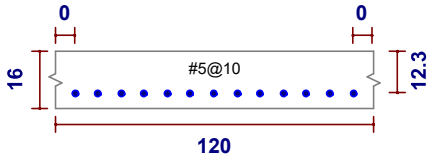
Cut:	DS2-X1	**Max Top bar Spac. (in):**	18	**Stress Block:**	Rectangular
Material:	Conc3000NW	**Min Top bar Spac. (in):**	3	**Slab Design Option:**	Construction
Start (ft):	(0.08 , 0)	**Max Bot bar Spac.:**	NA	**Rebar Spacing Inc (in):**	2
End (ft):	(0.08 , 10)	**Min Bot bar Spac.:**	NA	**Design Rule:**	Footing
Tension Bar Fy (ksi):	60	**Concrete Weight (k/ft^3):**	0.145	**Top Cover (in):**	12 in
Shear Bar Fy (ksi):	60	**λ:**	1	**Bottom Cover (in):**	3.375
F'c (ksi):	3	**$E_{Concrete}$ (ksi):**	3156	**Side Cover (in):**	0
Flex. Rebar Set:	ASTM A615				

ACI 318-19 (22) Code Check

Top Bending Check:	0.000	**Bot Bending Check:**	0.003	**1 Way Shear Check:**	0.101
Gov Mu Top (k-ft):	0	**Gov Mu Bot (k-ft):**	-0.569	**Gov Vu (k):**	6.823
phi*Mn Plain (k-ft):	41.517	**phi*Mn Bot (k-ft):**	213.962	**phi*Vn (k):**	67.607
Governing LC:	N/A	**Governing LC:**	2	**Governing LC:**	2
				ρ_w:	0.0027
				λ_s:	1

As Reqd(Flex.) (in^2):	0.01	**Rho Reqd(T/S) (in^2):**	0.00180
As Prvd (in^2):	3.988	**Rho Prvd(Gross) (in^2):**	0.00208
	(13 #5)		

Cross Section Detailing(All Bars Equally Spaced, Units: in)



Detail Report : DS1-X1

Input Data

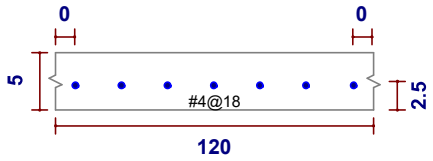
Cut:	DS1-X1	**Max Top bar Spac. (in):**	18	**Stress Block:**	Rectangular
Material:	Conc3000NW	**Min Top bar Spac. (in):**	3	**Slab Design Option:**	Construction
Start (ft):	(6.08 , 0)	**Max Bot bar Spac. (in):**	18	**Rebar Spacing Inc (in):**	2
End (ft):	(6.08 , 10)	**Min Bot bar Spac. (in):**	12	**Design Rule:**	Slab
Tension Bar Fy (ksi):	60	**Concrete Weight (k/ft^3):**	0.145		
Shear Bar Fy (ksi):	60	**λ:**	1		
F'c (ksi):	3	**$E_{Concrete}$ (ksi):**	3156		
Flex. Rebar Set:	ASTM A615				

ACI 318-19 (22) Code Check

Top Bending Check:	0.000	**Bot Bending Check:**	0.804	**1 Way Shear Check:**	0.293
Gov Mu Top (k-ft):	0	**Gov Mu Bot (k-ft):**	-11.757	**Gov Vu (k):**	4.796
phi*Mn Top (k-ft):	14.629	**phi*Mn Bot (k-ft):**	14.629	**phi*Vn (k):**	16.375
Governing LC:	N/A	**Governing LC:**	2	**Governing LC:**	2
				ρ_w:	0.0046
				λ_s:	1

Mid As Reqd(Flex.) (in^2):	1.092	**Rho Reqd(T/S):**	0.00180
		Rho Prvd(Gross):	0.00229
Mid As Prvd (in^2):	1.374		
	(7 #4)		

Cross Section Detailing(All Bars Equally Spaced, Units: in)



Reinforced Concrete Slab Design

EQUIPMENT INPUTS

Equipment Weight =	16800	lbs
Maximum Net Load Weight =	0	lbs
Total Weight of Loaded Equipment =	16800	lbs
Type of Equipment =	Front-End Loader	
# of Axles on Equipment being Analyzed =	2	
Weight per Axle =	16800	lbs
Axle Type =	Single Tired	
Weight per Tire =	8400	lbs
Outside Tire Spacing =	72	
Tire Width =	10	in
Wheel Spacing, on-center =	62	in
Tire Pressure =	100	psi
Tire Contact Area = Tire Load/Tire Pressure =	84	in2

Assumes Total Load on front Axle

SUBGRADE INPUTS:

Subgrade Material =	Sand	
k =	200	pci

SLAB THICKNESS DESIGN

Contact Area =	84	in^2
Design Concrete Strength (f'c) =	4000	psi
MR = 9*root(f'c) =	569.21	psi
Factor of Safety (FS) =	1.6	
Joint Factor (JF) =	1	1 = Joint has designed "dowels" for load tranfer
Allowable Working Stress - MR/(FS*JF) =	355.76	psi
Working Stress per 1 kip Axle =	21.18	psi

Design Summary to be Used in Sheet 2:			
Working Stress per 1 kip (1,000 lbs) Axle Load =	21.18	psi	
Effective Tire Contact Area Contact =	84	in2	
Wheel Spacing, on-center =	62	in2	
Subgrade k-value	200	pci	

Click here to go to Design Graph to determine Slab Thickness based on Summary Values!

CALCULATED SLAB THICKNESS =	5	inches

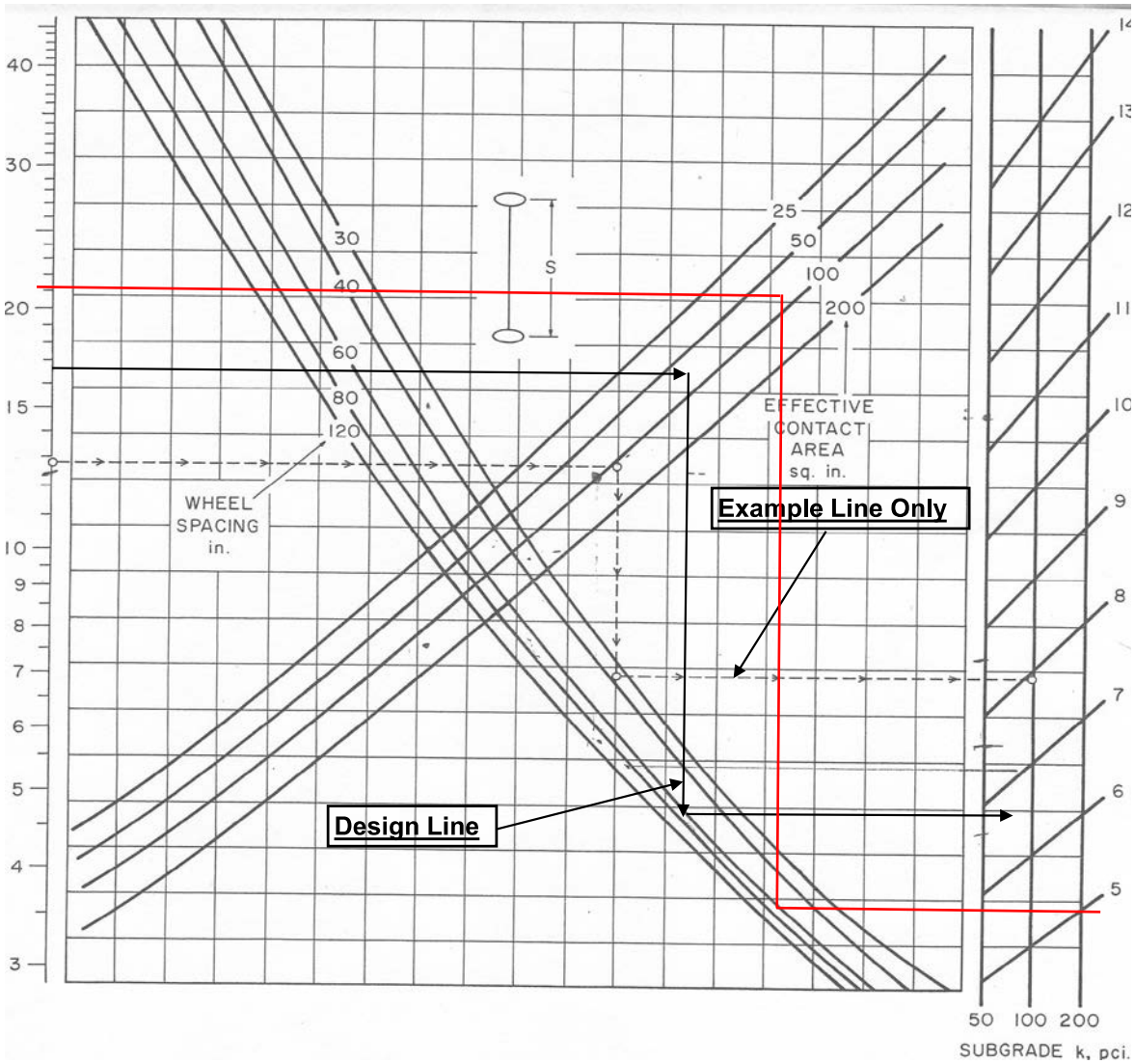


Fig. 5-4 Design chart for axles with single wheels. From PCA - Concrete Floors on Ground

Design Summary to be Used in This Chart		
Working Stress per 1 kip (1,000 lbs) Axle Load =	21.18	psi
Effective Tire Contact Area Contact =	84	in2
Wheel Spacing, on-center =	62	in2
Subgrade k-value	200	pci

Back to Slab Thickness Design Sheet!

Joshua Wilsmann

From: Jason Buenker <Jason.Buenker@shanwil.com>
Sent: Tuesday, November 5, 2024 8:02 PM
To: Joshua Wilsmann

Subject: RE: JP Tanks / Shannon & Wilson

{EXTERNAL EMAIL}

Josh,

Answers in red below.

Jason Buenker
SHANNON & WILSON
Mobile: **(217) 821-4807**
jason.buenker@shanwil.com

From: Joshua Wilsmann <josh.wilsmann@excelengineer.com>
Sent: Tuesday, November 5, 2024 7:06 PM
To: Jason Buenker <Jason.Buenker@shanwil.com>

Subject: RE: JP Tanks / Shannon & Wilson

Jason,

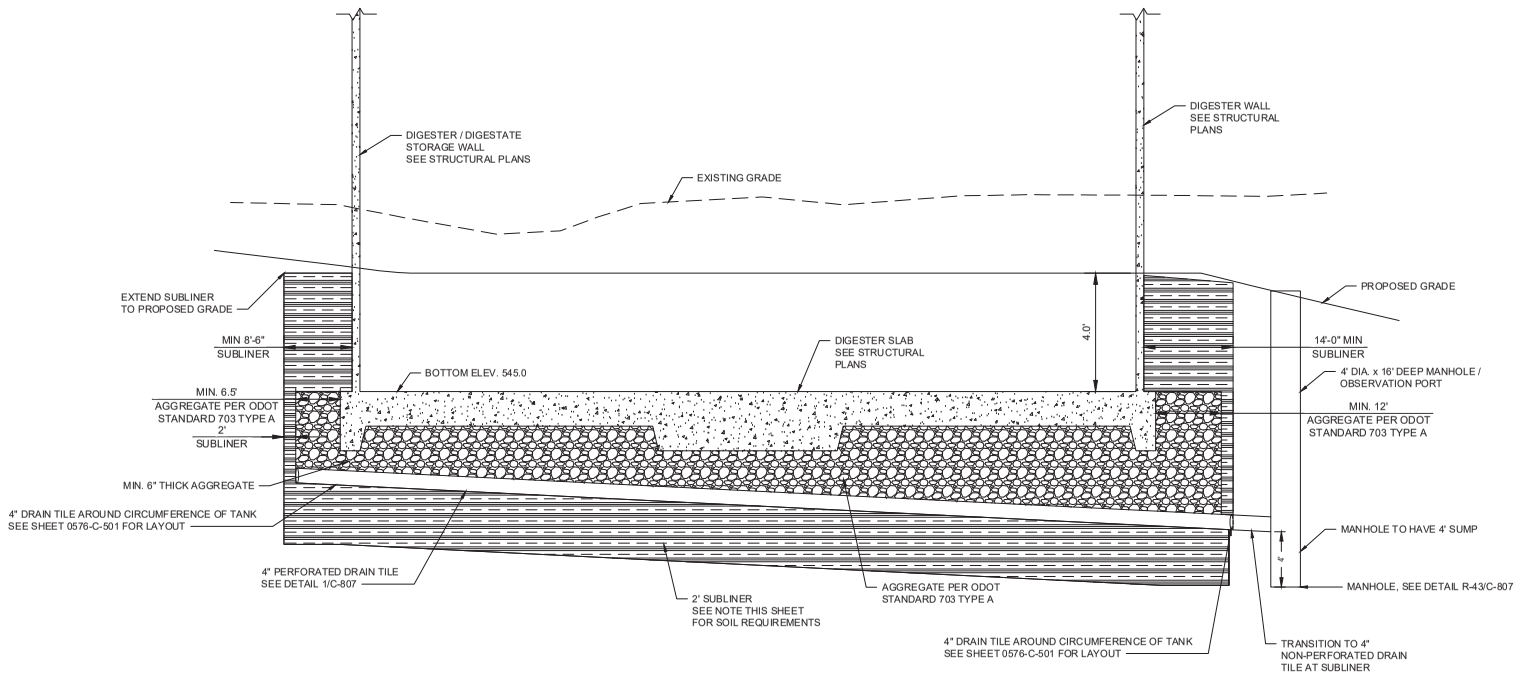
Following up on our call today, I am looking for preliminary confirmation on a few design items for the project in Keota, OK. I understand these are based on preliminary analysis and will need to be verified with your final report.

The design is for a 288' diameter digestate storage tank with 18' tall walls. The footing under the walls is poured integral with the footing. Let me know if your preliminary geotechnical review agrees with the following design assumptions

1. The soil under the tank can support an imposed load of 2,000 PSF Correct, provided the tank can be embedded some amount and the tank is able to tolerate 1 – 1.5 inches of settlement. We would need to run the calcs to get a more precise number.
2. The slab will not need to resist uplift forces from swelling of the soil Correct, but this conclusion is based on mapping that shows no expansive soils in the area and our borings, which did not disclose expansive soils. We still need to run lab testing to back this up.
3. There is not differential settlement concerns between the slab and wall foundation Not sure this is the case. Some differential is inevitable. It's overall a pretty stiff soil profile, but we should discuss how much differential the tank system can tolerate. A typically amount is half the total settlement, so ½ inch or more.

Thanks!

Josh Wilsmann SE, PE
Senior Structural Engineer



1 / C-806 DIGESTATE STORAGE TANK LINER AND SAMPLE COLLECTION SYSTEM
NOT TO SCALE

SUBLINER REQUIREMENTS:

1. SOILS USED FOR THE SUBLINER MUST MEET THE FOLLOWING REQUIREMENTS:
   - •• PI EQUAL TO OR GREATER THAN 10
   - •• LL EQUAL TO OR GREATER THAN 24, P200 EQUAL TO OR GREATER THAN 30%
   - •• DRY WEIGHT PERCENTAGE RETAINED ON THE NO. 4 SIEVE SHALL BE EQUAL OR LESS THAN 20%
   - •• 100% OF THE LINER SOIL SHALL PASS THE 1" SIEVE
2. WATER CONTENT AFTER SOIL IS COMPACTED SHALL BE EQUAL TO OR GREATER THAN OPTIMUM.
3. SOIL COMPACTION SHALL BE 95% OF THE STANDARD PROCTOR OR 90% OF THE MODIFIED PROCTOR DENSITY.
4. THE IN-PLACE HYDRAULIC CONDUCTIVITY SHALL BE NO GREATER THAN 1.0X10-7 CM/SEC.

Stantec
2321 CLUB MERIDIAN DRIVE
SUITE E
OKEMOS, MI 48864
PHONE: (517)349-9499
WWW.STANTEC.COM
CERTIFICATE OF AUTORIZATION NO. 3861, EXPIRATION 6/30/2025

CLIENT: VANGUARD RENEWABLES

PROJECT TITLE: KEOTA AD1
HASKELL COUNTY, OKLAHOMA

ISSUE NO.	DATE	DESCRIPTION
0	11/15/2024	ISSUED FOR PERMIT
1	12/17/2024	ODEQ RAI RESPONSES
2	01/10/2024	SOLID WASTE PERMIT

CERTIFICATION:
LICENSED PROFESSIONAL ENGINEER
ANDRE' M. RODRIGUE
27376
I CERTIFY MY E-SIGNATURE FOR THE PLANS ENTITLED "KEOTA AD1"

PROJECT NO: 193807099
DWN BY: DMC | CHK'D BY: JTP | APP'D BY: AMR
ISSUE DATE: 01/10/2024
ISSUE NO.: 2
SHEET TITLE: DETAILS
SHEET NO.: 0576-C-806

TWO STATE SOD FARM DIGESTER TANK

PROJECT CONTACTS

PROJECT MANAGER:
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Phone: (920)322-1719
E-mail: kurt.konkol@excelengineer.com

STRUCTURAL:
JOSH WILSMANN
Phone: (920)322-1710
E-mail: josh.wilsmann@excelengineer.com

DESIGN CRITERIA

CIRCULAR CONCRETE TANK WITHOUT PRESTRESSING

THIS CONCRETE TANK IS DESIGNED TO THE REQUIREMENTS OF ACI 318. IT IS NOT DESIGNED AS A HYDRAULIC OR ENVIRONMENTAL STRUCTURE AS DEFINED IN NRCS CODE 313. THE DESIGN OF ANY LINER REQUIRED OR SECONDARY CONTAINMENT SYSTEM REQUIRED BY NRCS OR OKLAHOMA ADMINSITRATIVE CODE IS BY OTHERS.

DESIGN STATEMENT

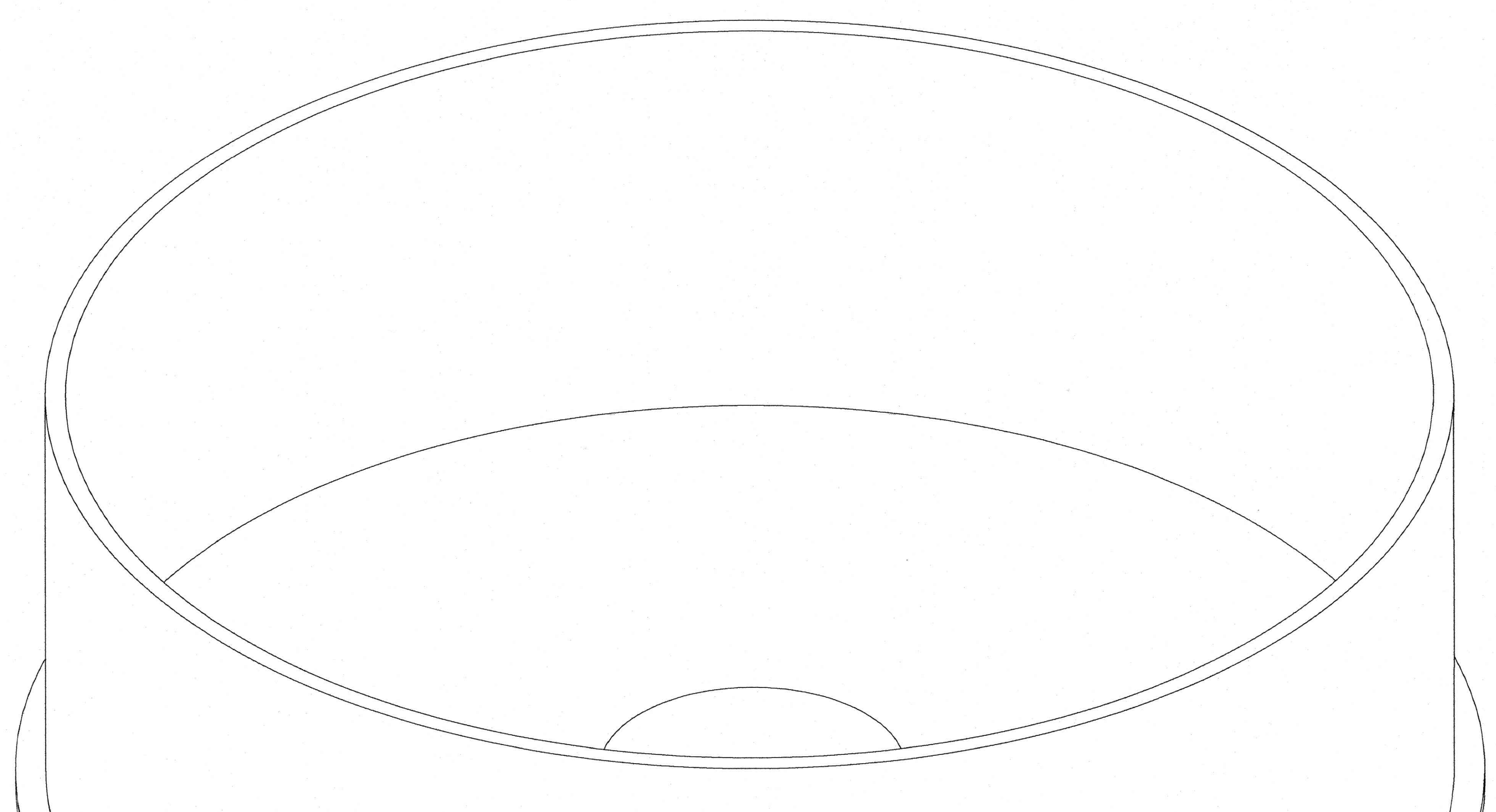
Design of structure was based on reference documents below and meets the requirements of NRCS Code 313 "Waste Storage Facility"

DESIGN REFERENCES

NRCS Code 313 "Waste Storage Facility" April, 2018 (Oklahoma)
Building Code Requirements for Structural Concrete, ACI 318
Guide to Design of Slabs-on-Ground, ACI 360R
PCA Concrete Floors on Ground (2nd Edition)

GENERAL DESIGN LOADS AND ASSUMPTIONS

Load Conditions
Tank Type: Pinned Base-Free Top
Internal Pressure from Manure (per NRCS Code 313): 65 psf per foot of depth, typical
~~72 psf per foot of depth, sand-laden~~
External Pressure from Backfill — 230 psf surcharge represents heavy vehicle loading within distance equal to height of wall, (10,000 axle loads)
Condition 1a: 100 psf soil load + 230 psf surcharge — per NRCS Code 313
(height of soil to top of wall) with empty tank
(assumes an unsaturated clay/silt backfill)
~~Condition 1b: 60 psf soil load + 230 psf surcharge — per NRCS Code 313~~
~~(height of soil to top of wall) with empty tank~~
~~(assumes an unsaturated sand/gravel)~~
Condition 2: Manure weight = 65 pcf (liquid)
~~Manure weight = 72 pcf (sand-laden)~~
Maximum Height of Backfill at Wall — Top of wall, typical
Minimum Height of Backfill at Wall: 3'-0" above bottom of footing without insulation
See details for reduced backfill height: 2'-0" above top of footing with insulation
Soil Bearing Pressure: See wall sections for required allowable soil bearing capacities



ISOMETRIC VIEW

STRUCTURAL NOTES

GENERAL NOTES:

1. STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH PROJECT SPECIFICATIONS. REFER TO DRAWINGS BY OTHER DISCIPLINES FOR ADDITIONAL ITEMS NOT SHOWN ON STRUCTURAL PLANS.
2. IN THE EVENT THAT THE STRUCTURAL DRAWINGS AND PROJECT SPECIFICATION CONFLICT ON INFORMATION, STRUCTURAL DRAWINGS SHALL SUPERSEDE THE SPECIFICATIONS.
3. STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER CONSTRUCTION. THE CONTRACTOR SHALL DETERMINE ERECTIONS PROCEDURES AND SEQUENCE TO ENSURE THE SAFETY OF THE STRUCTURE DURING CONSTRUCTION.
4. ANCHORAGE OF ALL EQUIPMENT TO CONCRETE STRUCTURE IS DESIGNED BY OTHERS.
5. DO NOT OPERATE HEAVY EQUIPMENT WITHIN A ZONE FROM THE TANK WALL OUT TO A 1 TO 1 SLOPE FROM THE TOP OF THE FOUNDATION. BASED ON PROJECT ELEVATIONS THE ZONE FOR THIS PROJECT WOULD EXTEND APPROXIMATELY 11'-0" FROM OUTSIDE OF TANK.
6. WATERSTOPS SHALL BE AS SPECIFIED IN THE DRAWINGS.
7. RIGID INSULATION BELOW FOUNDATIONS SHALL HAVE A MINMUM COMPRESSIVE STRENGTH OF 60 PSI @ 5% DEFORMATION BELOW THE TANK SLAB.
8. FOUNDATION DESIGN IS BASED ON THE GEOTECHNICAL REPORT COMPLETED BY STANDARD ENGINEERING + FIELD SERVICES (PROJECT #2430-0268) DATED JUNE 28,2024.
9. TANK DESIGN IS BASED ON PRELIMINARY COVER INFORMATION PROVIDED BY THE OWNER. THE CENTER COLUMN LOAD FOR ANY COVER SYSTEM SHALL NOT EXCEED 100 KIPS.

CONCRETE NOTES:

1. ALL CONCRETE WORK ON TANKS SHALL CONFORM TO ACI STANDARDS, IN ADDITION TO NRCS CODE 313.
2. TESTING OF CONCRETE IS REQUIRED AS STATED IN NRCS CONSTRUCTION SPECIFICATION #4.
3. IN ADDTION TO NRCS CONSTRUCTION SPECIFICATION #4, PROVIDE INTEGRAL WATERPROOFING ADMIXTURE TO CONCRETE, HYDOPHILIC, CRYSTALLINE ADMIXTURE. ADMIX C-500 BY XYPEX, PENETRON BY W.R. GRACE, OR MASTERLIFE 300D BY BASF, OR EQUAL.
4. SEE TANK WALL SECTION FOR REQUIRED CONCRETE STRENGTHS.
5. REINFORCING SHALL BE ASTM A615, 60 KSI.
6. CLEARANCE OF ALL REINFORCING BARS SHALL BE AS SPECIFIED IN SECTIONS AND DETAILS.
7. ALL REINFORCEMENT DETAILS SHALL COMFORM TO THE METHODS AND STANDARDS OF ACI 318.
8. ALL INSIDE DIAMETER OF BENDS, UNLESS OTHERWISE SHOWN, SHALL BE AS DEFINED IN ACI 7.2.
9. ROUGH SURFACE- WHEN CONCRETE IS PLACED AGAINST PREVIOUSLY HARDENED CONCRETE, THE INTERFACE SURFACE OF THE HARDENED CONCRETE SHALL BE CLEAN AND FREE OF LAITANCE AND SHALL BE ROUGHENED TO A FULL AMPLITUDE OF 1/4 INCH. THIS CAN BE ACCOMPLISHED BY USING A FORM LINER OR RACKING THE PLASTIC CONCRETE OF THE FIRST POUR OR BY BUSHHAMMERING OR CHISELING HARDENED CONCRETE SURFACES OR ANY OTHER METHORD APPROVED BY THE ENIGNEER.
10. CRACKS IN CONCRETE MAY BE SEALED WITH EPOXY INJECTION OR GRAVITY FEED EPOXY SYSTEMS FRIM SIKA, SIMPSON, OR APPROVED MANUFACTURER.
11. ANY MEASURES REQUIRED TO PREVENT CORROSION OF THE CONCRETE TANK SHALL BE SPECIFIED BY THE DIGESTER PROCESS DESIGNER.

THIS TANK IS DESIGNED SOLEY FOR INSTALLATION AT TWO STATE SOD FARM IN KEOTA, OK TO BE CONSTRUCTED BY JP TANK. ANY USE BY ANOTHER CONTRACTOR OR IN OTHER LOCATIONS IS NOT IN ACCORDANCE WITH THE ENGINEERED DESIGN. THE DESIGN IS COMPLETED ACCORDING TO CODES LISTED IN EFFECT AT THE TIME DRAWINGS WERE ISSUED. DESIGN SHALL NOT BE USED MORE THAN 1 YEAER AFTER DRAWINGS ARE ISSUED WITHOUT CONTACTING EXCEL ENINGEERING TO REVIEW AND VERIFY DESIGN IS STILL COMPLIANT WITH CURRENT CODES.

TITLE SHEET

EXCEL
Always a Better Plan
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Fond du Lac, WI 54935
920-926-9800
excelengineer.com

COLLABORATION
JP TANK CONCRETE

PROJECT INFORMATION
TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL
LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
33746
OKLAHOMA
12/30/24

PRELIMINARY DATES
DEC. 30, 2024

NOT FOR CONSTRUCTION

JOB NUMBER
240380000

SHEET NUMBER
10

SITEWORK SPECIFICATION

Site Engineer to provide subbase capable of providing allowable bearing capacities specified on wall sections over entire footprint of the animal waste storage tank. Tank location is to meet all separation distances specified in current 313, 354, 522, and 634 Code.

Excavator, under the direction of the Site Engineer, is to provide a compacted granular base beneath concrete tank slab. Compacted granular base shall be 6" of clean sand or 3/4" crushed stone with fines.

BACKFILLING

Once the concrete is properly cured, backfill can be placed around the tank. Avoid backfill containing large rocks, hard or frozen soil lumps, or construction debris. Backfill no higher than 12" from the top of the wall except at the ramp apron.

Adjacent to Tank:

Within 2 feet of tank, earth fill shall be placed in 4-inch lifts (prior to compaction) in a manner adequate to prevent damage to the structure and to allow the structure or pipe to gradually and uniformly assume the backfill loads. Compaction shall be accomplished by means of manually directed power tampers or plate vibrators or hand tamping unless otherwise specified. Heavy equipment shall not be operated within 2 feet of tank. Compaction by means of drop weights operating from a crane or hoist of any type will not be permitted.

The tank site shall be graded to provide drainage according to Site Engineer's grading plan.

GEOTECHNICAL REQUIREMENTS

Excel Engineering will verify the design of the concrete tanks meets recommendations from a geotechnical report hired separately by the owner. The investigation and report may follow the guidance in NRCS EFH-Chapter 4-Exhibit A. The report will evaluate the allowable bearing capacity of the foundation and the potential for total and differential settlement.

A geotechnical report was not complete at the time of plan submission. Design criteria assumed for this project include:

- Soil bearing capacity per wall section design criteria on sheet 453.
- Swelling soils are not present on the site that would create uplift pressures.
- Total settlement of tank limited to 1 1/2" and differential settlement of tank limited to ½"

ESTABLISHING AND MAINTAINING VEGETATION

NRCS Code 342-Critical Area Planting shall be done by others under direction of Site Engineer.

Concrete

(Consistent with NRCS Wisconsin Construction Specification #4 "Concrete", August 2023

A. Scope

The work shall consist of furnishing, forming, placing, consolidating, finishing, and curing concrete with Portland and Portland-Limestone cement, and the furnishing and placing of reinforcement or other appurtenances as required on the construction drawings. All materials, test procedures, and admixtures shall meet the requirements of the latest edition of the applicable ASTM designation.

Failure to meet any requirements contained in this specification may be cause for rejection of the concrete or delay of placement.

B. Definitions

The following definitions are provided for the purpose of this specification.

1. *Batch delivery ticket* refers to the form showing the total weights of all the ingredients used to mix the contents of the rotating drum mixer (total weights of all ingredients on the load) and other job pertinent information.
2. *Consolidating* refers to the process of reducing the volume of entrapped air in a fresh cementitious mixture, usually accomplished by inputting mechanical energy.
3. *Construction joints* are those joints where two successive placements of concrete meet, through which reinforcement is continuous and bond is required between the two pours.
4. *Control joints* often called Contraction joints are joints used in unreinforced and lightly reinforced slabs-on-ground to minimize random cracking and create straight-line weakened-planes in concrete. Control joints "control" the cracking location by inducing cracks at predetermined locations. The locations can be formed or saw cut.
5. *Finishing* refers to the process of treating surfaces of fresh or recently placed concrete or mortar to produce desired appearance and service.
6. *Firm* refers to the condition of the subgrade where it is not significantly displaced or deformed by foot traffic during construction and is able to properly support reinforcement chairs.
7. *Flatwork* refers to concrete slabs poured on slopes flatter than 5:1 (Horizontal:Vertical).
8. *Form release agent* refers to commercially manufactured formwork release agents that prevent formwork absorption of moisture, prevent bond with concrete, and do not stain the concrete surfaces.
9. *Formed surfaces* are those that require a temporary structure or mold for the support of concrete while it is setting and gaining sufficient strength to be self-supporting, such as walls or poured-in- place tank lids.
10. *Hand tamping* refers to the operation of consolidating freshly placed concrete by hand-held implements.
11. *Honeycomb* refers to voids left in concrete due to failure of the mortar to effectively fill the spaces among coarse aggregate particles.
12. *Jitterbug* refers to a grate tamper for pushing coarse aggregate slightly below the surface of a slab to facilitate finishing.
13. *Liquid-containment concrete* refers to concrete applications using specific placement and finishing techniques, and design features to minimize the loss of liquids.
14. *Manufacturer* refers to the producer/supplier of the ready-mixed concrete.
15. *Mesh roller* refers to a finishing tool consisting of a rolling drum attached to a handle, of which the surface of the drum is made of mesh, sometimes used for rolling over the surface of fresh concrete to embed coarse aggregate.
16. *Rock pocket* refers to a porous, mortar-deficient portion of hardened concrete consisting primarily of coarse aggregate and open voids; caused by leakage of mortar from the form, separation (segregation) during placement, or insufficient consolidation.
17. *Sloped slabs* refers to concrete slabs poured on slopes of 5:1 (Horizontal:Vertical) or steeper.
18. *Technician* refers to an individual trained in specific technical processes, and may include an engineer, government agency representative, private sector technical service provider, qualified independent third-party quality assurance inspector, or a similar person that is primarily responsible for the project quality assurance.
19. *Ternary mix* is a mixture using three cementitious materials, such as Portland cement, fly ash, and ground granulated blast-furnace slag (slag).
20. *Top bars* are horizontal reinforcements placed such that more than 12 inches of fresh concrete is cast below the reinforcing bar (such as horizontal wall bars).
21. *Vibration* refers to mechanical energetic agitation of freshly mixed concrete during placement by mechanical devices, either pneumatic or electric, that create vibratory impulses of moderately high frequency to assist in consolidating the concrete.
    a. Internal vibration employs one or more vibrating elements that can be inserted into the fresh concrete at selected locations.
    b. Surface vibration employs a portable horizontal platform on which a vibrating element is mounted.
22. *Water-cement ratio (w/c)* is the ratio of the weight of free water (excluding that absorbed by the aggregates) to the weight of Portland cement in a concrete mix expressed as a decimal.
23. *Water-cementitious material ratio (w/cm)* is the ratio of the weight of free water (excluding that absorbed by the aggregates) to the weight of cementitious material (fly ash, Portland cement, and slag) in a concrete mix expressed as a decimal.

C. Materials

The Contractor shall provide test data, independent laboratory reports, or other evidence from the concrete manufacturer showing that all materials meet the requirements of this specification. All materials proposed for use shall be approved by the Technician.

1. Type I, II, or III Portland cement shall conform to ASTM C 150.
2. Type IS Portland blast-furnace slag cement, Type IP Portland-pozzolan cement, or Type IL Portland-limestone cement shall conform with ASTM C595. Portland-limestone cement shall have a limestone content more than 5% but less than or equal to 15% by mass of blended cement as designated by Type IL(5) to Type IL(10). Moderate sulfate resistance when desired shall be specified by the suffix Type IL (MS). High sulfate resistance when desired shall be specified by the suffix Type IL(HS).
3. Fine aggregate shall conform to ASTM C 33 and be composed of clean, uncoated grains of material. Refer to the fine aggregate gradation table in Section D of this specification.
4. Coarse aggregates shall be gravel or crushed stone conforming to ASTM C 33 and be clean, hard, durable, and free from clay or coating of any character. Refer to the coarse aggregate gradation table in Section D of this specification.
5. Water shall be clean and free from injurious amounts of oil, salt, acid, alkali, organic matter, or other deleterious substances.
6. Air entraining agent shall conform to ASTM C 260.
7. Pozzolan (fly ash) shall conform to ASTM C 618, Class C or F. The loss of ignition shall not exceed 3 percent for Class C and F ±1 percent for lot-to-lot variations.
8. Natural pozzolan shall conform to the requirements of ASTM C618, Class N including the optional requirements of uniformity and effectiveness in controlling alkali silica reactivity.
9. Ground granulated blast furnace (GGBF) slag as a partial substitute for cement shall conform to ASTM C 989.
10. Chemical admixtures shall be used in strict compliance with the manufacturer's recommendations, conform to ASTM C 494, and may be the following types:
    a. Type A - Water-reducing admixtures.
    b. Type B - Retarding admixtures.
    c. Type C - Accelerating admixtures.
    d. Type D - Water-reducing and retarding admixtures.
    e. Type E - Water-reducing and accelerating admixtures.
    f. Type F - Water-reducing, high range admixtures (superplasticizers).
    g. Type G - Water-reducing, high range, and retarding admixtures (superplasticizers).
    h. Type S - Specific performance admixtures
       - If Type C or E is used, the manufacturer shall provide the Technician a product data sheet verifying that the product is a non-chloride accelerator.
       - If Type S is used the manufacturer shall provide the Technician a report stating the specific performance characteristic(s) of the admixture and data to substantiate the performance characteristic(s).
       - Calcium chloride or admixtures containing chloride ions other than from impurities in admixture ingredients shall not be used.
11. Deformed reinforcing bars shall be free from loose rust, oil, grease, paint, or other deleterious matter. Steel bars for concrete reinforcement shall meet the requirements of ASTM A 615. The steel shall be deformed Grade 40 or Grade 60 billet-steel bars as noted on the plans.
12. Deformed welded wire reinforcement (WWR) shall conform to the requirements of ASTM A 1064 and shall be furnished in flat sheets and shall be size D4 or larger as indicated on the plans. This material may only be used for non-structural elements such as slabs on grade. Spacing of welded intersections shall not exceed 16 inches.
13. Curing compound shall be a liquid membrane-forming compound suitable for spraying on the concrete surface. The curing compound shall meet the requirements of ASTM C 309, Type 2 (white pigmented).
14. Glass Fiber Reinforced Polymer (GFRP) bars shall be free from soil, grease, paint, or other deleterious matter. GFRP bars for concrete reinforcement shall conform to ASTM D7957.

D. Design of the Concrete Mix

No less than seven (7) days prior to the start of concrete placement the Contractor is responsible for submitting documentation of the proposed design mix to the Technician. The Contractor is responsible for providing a mix with the minimum required 28-day compressive strength in the construction plan and meet the following:

1. The water-cement (w/c) or the water-cementitious material (w/cm) ratio shall not exceed 0.45 for all concrete construction.
2. The water cement (w/c) or the water-cementitious material (w/cm) ratio shall not exceed 0.42 for all concrete being designed using ACI 350 - Code Requirements for Environmental Engineering Concrete Structures. This concrete shall also have 28-day compressive strength of 4,500 psi.
3. The cementitious material required shall be a minimum of 564 pounds per cubic yard of concrete.
    a. The cementitious material may include a maximum of 25 percent (by weight) of fly ash or a maximum of 30 percent (by weight) of ground granulated blast-furnace (GGBF) slag. The remaining cementitious materials shall be Portland cement.
    b. Mixes containing both fly ash and GGBF slag shall not exceed 30 percent in combination (ternary mix) and no more than 25 percent shall be fly ash. The remaining cementitious materials shall be Portland cement.
4. The air content (by volume) shall be 6 percent of the volume of the concrete.
5. The maximum (not to exceed) slump, with the use of water reducers, shall be 5 inches ± 0.25 inches.
6. The maximum (not to exceed) slump, with the use of superplasticizers, shall be 8 inches ± 0.25 inches.
7. The fine aggregate saturated surface dry weight shall be 30-45 percent of the total saturated surface dry weight of the combined coarse and fine aggregates. The well-graded fine aggregate shall conform to the following ASTM C 33 or Wisconsin DOT gradation requirements shown below:

Fine Aggregate Gradation

Sieve Size	Percent Passing By Weight	
	ASTM C 33	WI DOT
3/8" (9.5 mm)	100	100
No. 4 (4.75 mm)	95 — 100	90 — 100
No. 8 (2.36 mm)	80 — 100	-
No. 16 (1.18 mm)	50 — 85	45 — 85
No. 30 (600 μm)	25 — 60	-
No. 50 (300 μm)	5 — 30	5 — 30
No. 100 (150 μm)	0 — 10	0 — 10
No. 200 (75 μm)	0 — 5	0 — 3.5

8. The well graded coarse aggregate shall conform to the following ASTM C 33 gradation requirements for size number 67 aggregate shown below:

Coarse Aggregate Gradation

Sieve Size	Percent Passing By Weight
1" (25.0 mm)	100
3/4" (19.0 mm)	90 — 100
3/8" (9.5 mm)	20 — 55
No. 4 (4.75 mm)	0 — 10
No. 8 (2.36 mm)	0 — 5
No. 200 (75 μm)	0— 1.5

E. Mixing

1. Ready-mixed concrete shall be in accordance with ASTM C 94 for ordering (OPTION C, Minimum Cement Content), batching, mixing, and transporting.
2. Batching Tolerances (maximum w/c or w/cm ratio shall not exceed 0.45):
    a. Cementitious Material: The weight of the cementitious material shall be within plus or minus 1 percent (± 1%) of the required weight of the cementitious material.
    b. Admixtures: The admixtures shall be within plus or minus 3 percent (± 3%) of the required weight or volume for each specific admixture.
    c. Mixing Water: The water added to the batch, including free water on the aggregates, shall be measured by weight or volume to an accuracy of 1 percent of the required total mixing water. Added ice shall be measured by weight.
    d. Aggregate: The weight of the fine and coarse aggregate shall be within plus or minus 2 percent (± 2%) of the required weight.
    e. Air: The air content (by volume) shall be 6 ± 1.5 percent of the volume of the concrete at the location and time of placement.
3. Concrete shall be uniform and thoroughly mixed when delivered to the forms.
4. The water-cement (w/c) ratio or water-cementitious material (w/cm) shall not exceed 0.45 at any time, including the addition of water at the site.
5. The concrete shall be batched and mixed such that the temperature of the concrete at time of placement shall not be less than 55 degrees Fahrenheit or, at no time during its production or transportation more than 90 degrees Fahrenheit.

F. Batch Delivery Ticket Information

1. The Contractor shall obtain from the manufacturer a batch delivery ticket for each load of concrete before unloading at the site. Any concrete load delivered without a batch delivery ticket containing all the following information shall not be allowed to be discharged in any part of the construction project covered under this specification.
2. The following minimum information shall be included on the batch delivery ticket.
    a. Job-pertinent information
       i. Name of concrete manufacturer and batch plant
       ii. Name of purchaser and job location
       iii. Date of delivery
       iv. Truck number
       v. Amount of concrete delivered
       vi. Time loaded or time of first mixing of cement and aggregates
    b. Ingredients used to mix the batch
       i. Mixing water added as free water
       ii. Percent moisture, or weight of water contained on the aggregates
       iii. Percent absorption, or weight of water absorbed by the aggregates
       iv. Type and amount of cementitious materials
       v. Type and amount of admixtures
       vi. Weights of fine and coarse aggregates
    c. The Contractor is responsible for adding the following information:
       i. Volume of water added by the receiver of the concrete
       ii. Time the concrete arrived at the site
       iii. Time the concrete was completely unloaded
3. Upon completion of the concrete placement, copies of all batch delivery tickets shall be provided to the Technician.

G. Placement of Subgrade, Forms, and Reinforcing Steel

1. Subgrade
    a. The site shall be graded to the dimensions and elevations as specified in the construction plans.
       - All surfaces shall be firm and damp prior to placing concrete.
       - Concrete shall not be placed on mud, dried earth, uncompacted fill, frozen subgrade, or in standing water.
       - The use of plastic sheeting beneath the concrete is not permitted except for a designed vapor barrier in an enclosed building.
2. Forms
    a. The forms, associated bracing, and stakes shall be substantial, unyielding, and constructed so that the finished concrete will conform to the specified dimensions and contours.
       - Forms shall be mortar tight.
       - Forms shall be coated with a form release agent before being set into place.
       - Form release agent shall not come in contact with the steel reinforcement, waterstop, or with hardened concrete against which fresh concrete is to be placed.
       - For structures which are to be store liquids, form ties shall be used that permit their removal to a depth of at least ½ inch.
       - Concrete joints shall be placed at locations and be of the type shown on the construction drawings.
3. Reinforcing Steel and GFRP Bars
   Reinforcement shall be accurately placed as shown on the drawings and secured in position in a manner that will prevent its displacement during the placement of concrete.
    a. Tolerances - The following tolerances will be allowed in the placement of reinforcement:
       - Where 1½ inches clear distance is shown between reinforcing steel and forms, or embedded objects, allowable clear distance is 1⅛ to 1½ inches.
       - Where 2 inches clear distance is shown between reinforcing steel and forms, allowable clear distance is 1⅝ to 2 inches.
       - Where 3 inches clear distance is shown between reinforcing steel and earth or forms, allowable clear distance is 2½ to 3 inches. Over-excavation backfilled with concrete shall not be considered as clear distance.
       - The maximum variation from the reinforcing steel spacing shown, shall be 1/12 of the spacing, without a reduction in the amount of reinforcing steel specified.
       - The ends of all reinforcing steel shall be covered with at least 1½ inches of concrete, with an allowable minimum distance of 1⅛ inches.
    b. Reinforcement Support - Holding steel reinforcement in position with temporary supports is not permitted. Tack welding of bars is not permitted.
       - Steel chairs, hangers, spacers; coated steel chairs, hangers, spacers; or plastic chairs, hangers, spacers may be used as supports. Short sections of GFRP bars inserted into the ground may be used as supports if they demonstrate an ability to stay rigid and upright, and hold the grid in a fixed position, under foot traffic and concrete placement.
       - Precast concrete chairs may be used as supports providing the chairs are manufactured from concrete equal in compressive strength to the concrete being placed.
       - Reinforcement shall be supported at a minimum as follows:
         - Deformed reinforcing bars for flatwork and sloped slabs shall be supported by a minimum of 1 support chair every 4 feet in each direction. Reinforcement shall not deflect or sag between supports. Deformed reinforcing bars shall be tied at every other rebar intersection or as approved by the Technician.
         - Deformed welded wire reinforcement (WWR) shall be supported no further than as indicated in the table below.
         - When two layers of deformed reinforcing bars or deformed welded wire reinforcement are used for wall footings, flatwork and sloped slabs, the bottom layer may be supported by precast concrete chairs. The upper layer must be supported by metal chairs, metal spacers, plastic spacers, or rebar with legs tied to the lower mat and supporting the upper layer of reinforcing bars.

WWR Support

Welded Wire Reinforcement Size(1)	Welded Wire Spacing	Maximum Support Spacing in Each Direction(2), feet
D9 or larger	12 inches or more	4 to 6 feet
D5 to D8	12 inches or more	3 to 4 feet
D9 or larger	Less than 12 inches	3 to 4 feet
D4 to D8	Less than 12 inches	2 to 3 feet

Notes:
(1) "D" is the standard designation for deformed wire
(2) Support spacing shall be adequate to support all loads, including construction personnel and equipment. If excessive deflections occur, closer support spacing is required.

    c. When GFRP bars are used, they require adequate stiffness (diameter) or chair support to prevent deflection into the base material under the weight of poured concrete. Bars need to maintain a specified vertical location within + ½ inch.
    d. Flatwork reinforcement may be driven on prior to placement of supports if both of the following conditions are met:
       - The subgrade is firm so that minimal displacement is made by equipment. If significant displacement occurs, the steel shall be removed, the subgrade regraded and compacted before steel and concrete placement.
       - The reinforcing steel is not deformed by the equipment. If the steel is deformed, it shall be replaced before concrete placement.
    e. Steel tying to protruding steel from a previous pour or form construction for new concrete that will be in contact with previously poured concrete shall not be started until the previously poured concrete has cured a minimum of 12 hours.
    f. Reinforcement Splice Lengths and Bend diameters:
       - Deformed reinforcing bars
         - Bend diameter: 6 bar diameters for #3 through #8 bar sizes and 8 bar diameters for larger bars. Reinforcing bars shall not be heated to facilitate bending.
         - Splice Length for Steel Bars: The minimum splice lengths in the table below are for concrete designed with a 28-day compressive strength of 3,500 psi. (NRCS standard wall designs) Other higher concrete design strengths and reinforcement grades require different splice lengths (typically shorter) in accordance with ACI 318.
         - Splice Lengths for GFRP Bars: The minimum splice length shall be specified by manufacturer.
         - Deformed reinforcing bars shall not be spliced by welding. All lap splices shall be adequately tied together to firmly hold the reinforcement in position to maintain the proper splice length.

Minimum Splice Lengths Note 1

	Grade 40	Grade 60
#3 through #6 bars		
Top bars	27 bar diameters	41 bar diameters
All other bars	21 bar diameters	32 bar diameters
#7 and larger bars		
Top bars	34 bar diameters	51 bar diameters
All other bars	26 bar diameters	40 bar diameters

Note 1: Splice lengths shall be the greater of that indicated in Table 1 or 12 inches

       - Deformed welded wire reinforcement (WWR) - Splice length shall be in accordance with the requirements of ACI 318-08 or ACI 318-11 Part 12.18. Deformed welded wire reinforcement shall not be spliced by welding. All lap splices shall be tied to firmly hold the reinforcement in position to maintain the proper splice length.

H. Delivering, Placing, Consolidating, and Finishing Concrete

1. The Contractor shall notify the Technician of the proposed method of placement, consolidation, and finishing of the concrete at least seven (7) days prior to the start of concrete placement. The Contractor shall furnish the Technician a record of daily data including:
    a. Ambient temperature
    b. Relative humidity
    c. Wind velocity
2. General
    a. Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Concrete shall not be placed until the subgrade, forms, waterstop, and steel reinforcement have been inspected and accepted by the Technician. Any deficiencies shall be corrected before the concrete is delivered for placement. Forms, reinforcing steel, and subgrade shall be moistened prior to placing concrete. All reinforcement bars stored at the worksite shall be stored according to manufacturer recommendations. The bars shall also be stored above the ground surface on skids or other supports, kept clean and dry. GFRB shall be stored out of direct sunlight and away from temperatures high enough to soften the polymer.
3. Delivery
    a. Concrete shall be delivered to the site and discharged into the forms within 1½ hours after the introduction of the mixing water to the cement and aggregates, or when a superplasticizer is used, the manufacturer's recommended time limit for discharge after addition shall apply. The 1½ hour time may be extended if the concrete is of a slump that it can be placed, consolidated, and finished without the addition of water to the batch. Upon arrival at the job site, addition of water will be allowed to adjust the slump, provided such addition does not exceed the water- cement (w/c) ratio or water-cementitious material ratio (w/cm). Final placement of the batch shall begin immediately after mixing of the added water is completed.
    b. Additional superplasticizer shall not be added to the concrete mix after discharge of the concrete at the job site has commenced.
4. Placement
    a. The slump of the placed concrete shall not exceed the maximum slump of 5 inches ± 0.25 inches with the use of water reducers.
    b. The slump of the placed concrete shall not exceed the maximum slump of 8 inches ± 0.25 inches with the use of superplacticizers.
    c. Concrete shall be deposited as closely as possible to its final position. Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates. All placement shall be done in a manner that prevents incorporation of subgrade material into the concrete.
    d. Methods for placing concrete on sloped slabs shall only include chutes, pumps, conveyors, wheelbarrows, or similar means of directly depositing concrete as near as possible to its final position. Placement of concrete by other methods where concrete is deposited upslope and flows to its final position downslope (commonly called "lava flow", "glacial pours", etc.) shall not be permitted.
    e. Concrete shall not be dropped more than 6 feet vertically unless suitable equipment is used to prevent segregation. Concrete containing superplasticizer shall not be dropped more than 12 feet vertically and shall not be placed in lifts exceeding 6 feet in depth. Non-superplasticized concrete shall be placed in forms in horizontal layers not more than 24 inches deep. Each layer shall be thoroughly consolidated before the next is placed, at a rate such that previously placed concrete has not yet set when the next layer of concrete is placed upon it.
5. Consolidation
    a. All concrete required to be consolidated with internal type mechanical vibrator shall be capable of transmitting vibration to the concrete at frequencies not less than 8,000 impulses per minute, unless otherwise specified or approved before placement.
       - Vibration shall compact the concrete and bring it into intimate contact with the forms, reinforcing steel, and other embedded items while removing voids and pockets of entrapped air. The location, insertion, duration, and removal of the vibrators shall be such that maximum consolidation of the concrete is achieved without causing segregation of the mortar and coarse aggregate or causing water or cement paste to flush to the surface.
       - Vibration shall be supplemented by spading, rodding, and hand tamping as necessary to ensure smooth and dense concrete along the form surface, in corners, and around embedded items. The contractor shall provide a sufficient number of vibrators to properly consolidate the concrete immediately after it is placed. Placement rate will be restricted if an inadequate number of vibrators are available.
       - The use of vibrators to transport concrete in the forms, slabs or conveying equipment will not be permitted.
    b. Formed Surfaces
       - All concrete walls shall be vibrated.
       - Immediately after the concrete is placed in the forms, it shall be consolidated by internal vibration or hand tamping as necessary to insure dense concrete. Vibration shall be applied to the freshly deposited concrete by rapidly inserting the vibrator and slowly, in an up and down motion, removing the vibrator at points uniformly spaced at not more than 1.5 times the radius of the area visibly effected by vibration. Generally, this is at 5 to 10 seconds per foot on 14-inch spacings or less. The area visibly effected by the vibrator shall overlap the adjacent, just vibrated area. The vibrator shall extend vertically into the previously placed layer of fresh concrete by at least 6 inches at all points. Concrete supplied with superplasticizer shall be placed with a minimum amount of vibrating and finishing effort. Vibration shall not be applied directly to the reinforcement steel or the forms, nor to concrete which has hardened to the degree that it does not become plastic when vibrated. Each pour shall be consolidated to insure a monolithic bond with the preceding pour.
    c. Slabs and footings
       - Immediately after the concrete is placed, it shall be consolidated by hand or mechanical methods as necessary to insure dense concrete.
         - Surface vibrators may be used to consolidate slabs 8 inches and less in thickness. In thin slabs the internal vibrator(s) should be sloped toward the horizontal to allow operations in a fully embedded position, but shall not contact the subgrade.
         - Slabs and footings more than 8 inches thick shall be consolidated with internal vibration and may be augmented through use of a surface vibrator.
       - Surface vibrators include vibrating screeds, plate or grid vibratory tampers, or vibratory roller screeds. (Mesh rollers, jitterbugs, and grate tampers are finishing tools and not consolidation tools.) When the concrete slab is to be consolidated using surface vibration methods, the contractor shall detail how this work is to be performed in writing to the technician for review and approval. This report must be submitted no less than 7 calendar days before placing concrete by this method. It includes equipment selection and specifications.
6. Finishing
    a. All screed support devices shall be removed from the concrete or driven down flush with the subgrade prior to finishing.
    b. All formed concrete surfaces shall be true and even, and shall be free of depressions, holes, projections, bulges, or other defects in the specified surface finish or alignment. All surface defects shall be repaired as stated in the "Form Removal" section of this specification.
    c. All flatwork and sloped slabs shall be worked to a uniform grade, maintaining the specified thickness. Concrete shall be worked to minimize segregation and in a manner that does not adversely affect the structural integrity, durability, or function of the structure. Surfaces shall be free from rock pockets, or honeycomb areas or other harmful irregularities or defects.
    d. Water shall not be sprinkled or added to the surface of the concrete to facilitate finishing. An additional finish shall be applied if specified in the construction plans.
    e. The proposed finished texture (broom, float, mesh roller, trowel, non-slip, etc.) of the concrete surface shall be approved by the Technician.
    f. Evaporation reducer may be used during the finishing operation if approved by the Technician. Curing of the concrete is still required as per Section K, Curing.
    g. If a protective concrete coating is specified on the drawings, the coating manufacturer's recommendations for curing and surface preparation shall be followed.
7. Contraction (Control) Joints
    a. Control joints shall be the type and locations shown on the drawings.
    b. Saw-cutting should be performed before concrete starts to cool, as soon as the concrete surface is firm enough not to be torn or damaged by the blade, and before random drying- shrinkage cracks can form in the concrete slab.
    c. A 5 ft long cut should be attempted and evaluated for spalling or raveling before the contractor cuts the entire section of the slab. The saw-cutting can be done shortly after final set, but timing of the sawing is critical so not to pull up coarse aggregate. If aggregate is pulled up, delay the saw-cutting.
    d. Saw-cut joints shall be one-third the slab thickness and spacing specified on the drawings.
    e. New, clean saws fitted with an abrasive or diamond blades are recommended, using one of the following three types of saws: conventional wet-cut, conventional dry-cut, or early-entry dry-cut.
    f. Care should be taken to make sure the early-entry saw does not ride up over hard or large coarse aggregate and the joints shall be free of mortar and concrete.

I. Construction Joints

1. If the concrete sets during placement to the degree that it will not flow and merge with the succeeding pour when tamped or vibrated, the Contractor shall discontinue placing concrete and install a formed construction joint. The Contractor shall be prepared to install unplanned construction joints in the event that there is an interruption of the pour, equipment breakdown, or

SPECIFICATIONS

EXCEL
Always a Better Plan
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Fond du Lac, WI 54935
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COLLABORATION

JP TANK CONCRETE

PROJECT INFORMATION

TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
33746
OKLAHOMA
12/30/24

PRELIMINARY DATES
DEC. 30, 2024

NOT FOR CONSTRUCTION

JOB NUMBER
240380000

SHEET NUMBER
11

other problem which makes it necessary to stop placement of concrete at locations other than those previously planned. The reinforcement shall pass through the joint, unless otherwise indicated on the construction plan. Prior to the succeeding pour, the joint surface shall be cleaned to remove all unsatisfactory concrete, laitance, coatings, stains, or debris by one of the following methods:

a. The joint surface shall be cleaned to expose the fine aggregate and sound surface mortar, but not so deep as to undercut the edges of coarse aggregate. Cleaning shall be by wire brush, sandblasting, or high pressure air-water cutting after the concrete has gained sufficient strength to prevent displacement of the coarse aggregate. The joint surface shall be washed to remove all loose material after cutting.
b. According to methods specified by the person approving the construction plans.

2. The surfaces of all construction joints shall be wetted and standing water removed immediately prior to placement of the new concrete. The new concrete shall be placed directly on the cleaned and washed surface. New concrete shall not be placed until the hardened concrete has cured at least 12 hours. The newly placed concrete shall be consolidated to achieve a good bond with the previously hardened concrete.

J. Form Removal and Concrete Repair

1. Form Removal
   a. Forms shall be removed without damage to the concrete. Supports shall be removed in a manner that permits the concrete to take the stresses due to its own weight uniformly and gradually. The minimum period from completion of the concrete placement to the removal of the forms shall be based on either strength tests or cumulative times.
      - The strength of the in-place concrete is determined by testing concrete cylinders specifically cast for this purpose and cured adjacent to the member in accordance with the ASTM C 31 methods for determining removal time.
      - Unless otherwise specified, forms supporting the weight of the concrete member may be removed after the concrete strength is 70 percent of that specified for the 28-day compressive strength.
      - Form removal for concrete tank walls between 10 and 20 feet high is allowed after a curing period of at least 16 hours if approved by the design engineer. Form removal time must be supported by a site-specific, compression cylinder that is cast, field cured, and tested to verify strength attainment of at least 600 psi.
      - The total accumulated time, not necessarily continuous, that the air adjacent to the concrete is above 50 degrees Fahrenheit will be determined by the Contractor and accepted by the Technician. The forms may be removed after the total accumulated time shown in the following table:

Form Removal

Forms		Time
Sides of slabs or beams without waterstop		12 hours
Sides of slabs or beams with waterstop		24 hours
Undersides of slabs or beams	Clear Span <10 feet	4 days
	10 — 20 feet	7 days
	>20 feet	14 days
Sides of walls or columns	Height of Forms <20 feet	24 hours*
	>20 feet	72 hours

*** Form strikes as low as 16 hours are permissible if (3) concrete cylinders are cast on the first pour, cured under field conditions, delivered to the lab, and tested the next day for a minimum compressive strength of 600 psi. The lab shall break cylinders at 2-hour intervals starting at 16-hour cure time until required strength is met. This test will establish the strike pace for the remainder of the job, assuming similar curing *conditions are maintained.***

   b. For structures which are not required to store liquid, form ties shall be removed flush with or below the concrete surface. For structures which are to be store liquid, form ties shall be

   removed to a minimum depth of ½ inch. All cavities or depressions resulting from form tie removal shall be patched in accordance with J.(2)(d).

   c. Forms shall be removed and the concrete inspected by the Technician before walls are backfilled. Concrete loading shall be in accordance with Section N, Loading New Reinforced

   Concrete Structures.

2. Repair of Surface Defects (other than tie holes)
   a. Immediately after removal of the forms, concrete which is honeycombed, damaged or otherwise defective as identified by the Technician shall be repaired or replaced by the Contractor. All repairs of surface defects shall be completed prior to the application of curing compound. Repair of surface defects such as honeycombed or otherwise defective concrete shall be made using bonding grout and site mixed Portland cement mortar or other products specifically intended to repair surface defects that are applied in accordance with the manufacturer's recommendations.
   b. Bonding grout and site mixed Portland cement mortar:
      - Outline the honeycombed or otherwise defective concrete with a ½ to ¾ inch deep saw cut and remove such concrete down to sound concrete. When chipping is necessary, leave chipped edges perpendicular to the surface or slightly undercut. Do not feather edges.
      - Dampen the area to be patched plus another 6 inches around the patch area perimeter.
      - Prepare bonding grout by mixing approximately one part Portland cement and one part fine sand with water to the consistency of thick cream.
      - Thoroughly brush the bonding grout into the surface. When the bond coat begins to lose water sheen, apply repair mortar. Repair mortar is made by mixing 1 part Portland cement to 2½ parts fine sand (approximately finer than the No. 16 sieve size) by damp loose volume. The mortar shall be at a stiff consistency with no more mixing water than is necessary for handling and placing. Mix the repair mortar and manipulate the mortar frequently with a trowel without adding water.
      - Thoroughly consolidate the mortar into place and strike off, leaving the patch slightly higher than the surrounding surface to compensate for shrinkage. Leave the patch undisturbed for 1 hour before finishing. The repair shall be cured as specified Section K, Curing.
   c. Repair materials other than site mixed Portland cement:
      - Portland cement mortar modified with a latex bonding agent conforming to ASTM C 1059, Type II.
      - Epoxy mortars and epoxy compounds that are moisture-insensitive during application and after curing and that embody an epoxy binder conforming to ASTM C 881. The type, grade, and class shall be appropriate for the application as specified in ASTM C 881.
      - Nonshrink Portland cement grout conforming to ASTM C 1107.
      - Packaged dry concrete repair materials conforming to ASTM C 928.
      - Other products specifically intended to repair surface defects that are applied and cured in accordance with the manufacturer's recommendations.
   d. Repair of Form Tie Holes
      - Liquid Containment Concrete Structures — Repair tie holes immediately after formwork removal and prior to the application of curing compound. All cavities or depressions resulting from form tie removal shall be patched with commercially available patching products or site mixed Portland cement repair mortar.
        - Site-mixed Portland cement repair mortar
          - Repair mortar is made by mixing 1-part cement to 2.5-parts fine sand (approximately finer than the No. 16 sieve size) by damp loose volume. Mortar shall be at a stiff consistency with no more mixing water than is necessary for handling and placing. Mix the repair mortar and manipulate the mortar frequently with a *trowel without adding water.* Clean and dampen tie holes before applying the mortar. Cure in accordance with Section K, Curing.
        - Repair materials other than site mixed Portland cement:
          - All those materials listed in J.2.(c).
          - Other products specifically intended to fill form tie holes for liquid containment applications that are applied and cured in accordance with the manufacturer's recommendations.

K. Curing

1. Concrete shall be cured for a period of at least 7 consecutive days (curing period) after it is placed, except as stated in Section M. Exposed concrete surfaces shall be kept continually wet during the entire curing period or until curing compound is applied.
2. Curing compound shall be applied at the rate and with the proper equipment recommended by the manufacturer. It shall form a uniform, continuous, adherent film that shall not check, crack, or peel and shall be free from pinholes or other imperfections.
3. Curing compound shall not be used at construction joints or other areas that are to be bonded to additional concrete. Surfaces subjected to heavy rainfall or running water within 3 hours after the application of curing compound, or surfaces damaged by subsequent construction operations during the curing period, shall be recoated in the same manner as the original application.
4. Concrete in feed storage areas shall be allowed to cure or be protected from contact with stored feed for a minimum of 28 days.

L. Concrete Placement in Hot Weather

1. Hot weather conditions exist at the time of proposed placement when:
   a. The rate of evaporation greater than 0.10 lb. /sq. ft. /hr. OR
   b. Two or more of the following factors are exceeded:
      - Ambient temperature is greater than 80 degrees Fahrenheit
      - Relative humidity is less than 60 percent
      - Wind velocity (average) is greater than 10 mph
2. Concrete surfaces shall not be allowed to dry after placement and during the curing period.
3. Measures to reduce surface moisture loss and rate of cement hydration must be taken to immediately protect and cure the concrete due to rapid drying conditions.
   a. Plan placement to early morning, late afternoon or evening.
   b. Use a set-retarding admixture meeting the requirements in Section C when the time between the introduction of the mixing water to the cement and aggregates and discharge exceeds 45 minutes. The 45 minute time may be extended if the concrete is of a slump that it can be placed, consolidated, and finished without the addition of water to the batch.
   c. Use a fog spray to raise the relative humidity of the ambient air.
   d. Moist cure the concrete surface as soon as the surfaces are finished and continue for at least 24 hours.
   e. Use a monomolecular film, or evaporation retarder in accordance with the manufacturers printed instructions.
4. Concrete placement shall be suspended when:
   a. The rate of evaporation is greater than 0.25 lb./sq. ft./hr. OR
   b. When all of the following factors, as measured at the time of concrete placement are exceeded:
      - The ambient temperature is greater than 80 degrees Fahrenheit,
      - Relative humidity is less than 40 percent, and
      - Wind velocity (average) is greater than 15 mph E = (Tc2.5 - R * Ta2.5) (1+0.4V) x 10-6

        where: E = evaporation rate, lb. /sq. ft. /hr.

        Tc = concrete temperature, °F Ta = air temperature, °F
        R = percent relative humidity /100 (decimal form 20% = 0.20) V = wind velocity, mph
5. Wind speeds at reporting station are taken above the ground surface, so V = average reported wind speeds x 0.66).

M. Concreting in Cold Weather

1. The following provisions shall apply when the minimum air temperature at the local job site is less than 35 degrees Fahrenheit (the forecasted temperature, which shall be verified with a maximum/minimum thermometer at the start of the morning job shift).
   a. No concrete shall be placed without the required thermometers at the job site.
   b. The Contractor shall furnish the Technician a record of daily temperature data including:
      - Outside air maximum and minimum temperatures at the local job site, and
      - Temperatures, of the air adjacent to the surface of the concrete, at several points along the concrete surface for all concrete curing periods.
   c. When the cement is initially added to the mix, the temperature of the mixing water shall not exceed 100 degrees Fahrenheit nor shall the temperature of the aggregate exceed 100 degrees Fahrenheit.
   d. The temperature of the concrete at the time of placement shall be not less than 55 degrees Fahrenheit or at no time during its production or transport more than 90 degrees Fahrenheit.
   e. Placed concrete may be protected by covering, housing, insulating or heating concrete structures.
   f. The minimum air temperature adjacent to the surface of the concrete shall be maintained above 40 degrees Fahrenheit for a period of at least 7 accumulated days. These 7 days must occur during the first 10 days after the concrete is placed. At no time, during the first 10 days after concrete is placed, shall the minimum air temperature adjacent to the surface of the concrete be less than 32 degrees Fahrenheit unless Type III cement or an approved accelerating admixture is used (see Item (g) below).
   g. The curing period may be reduced from 7 cumulative days to 3 consecutive days when Type III cement or an approved accelerating admixture is used. The accelerating admixture shall be used at the proportions recommended by the manufacturer. The minimum air temperature adjacent to the surface of the concrete shall be maintained above 40 degrees Fahrenheit for the 3 day curing period.
   h. Combustion heaters shall have exhaust flue gases vented out of the concrete protection enclosure. The heat from heaters and ducts shall be directed in such a manner as to not overheat or dry the concrete in localized areas or to dry the exposed concrete surface.
   i. At the end of the curing period, the concrete shall be allowed to cool gradually. The maximum temperature decrease at the concrete surface in a 24-hour period shall not exceed 40 degrees.

N. Loading New Reinforced Concrete Structures

1. Backfill material shall be the type indicated on the drawings and shall be free of large stones or debris.
2. Compaction within 3 feet of the new structure wall will be by means of small manually directed tamping or vibrating equipment.
3. Days before backfilling:
   a. The age of concrete shall be at least 14 days prior to backfilling for vertical or near-vertical walls with earth loading on one side only and prior to backfilling for conduits and spillway risers with inside forms removed.
   b. The age of concrete shall be at least 7 days before any load (including backfill) is applied for walls backfilled on both sides simultaneously and prior to backfilling conduits and spillway risers with inside forms and bracing in-place.
   c. Loads may be applied to new concrete less than the specified days (7 or 14) after placement when the design strength has been attained and verified through compressive strength testing on cylinders that have been cured on-site under field conditions.

O. Inspection and Testing

1. The inspection and testing details of this section shall apply when specific concrete tests are required in the construction drawings or quality assurance plan. This testing does not relieve the Contractor of the responsibility to perform the work according to this specification. The Technician shall have free access to the work site and batching to obtain samples.
2. When testing is conducted, the following methods shall be used:

   Testing

TYPE OF TEST	TEST METHOD (ASTM DESIGNATION)
Sampling	C172
Slump	C143
Air Content	C231 or C173
Making and Curing Specimens in the Field	C31
Obtaining and Testing Drilled Cores	C42
Compressive Strength	C39
Density (Unit Weight)	C138
Temperature	C1064

3. The contractor is responsible for determining who is responsible for testing, and providing results to all parties.
4. Compressive strength of the concrete shall be considered satisfactory if test results equal or exceed the 28-day design strength. For each ASTM C 39 strength test, three test specimens shall be made and cured onsite for 24 hours. The test result shall be the average of the compressive strength tests of any two of the three test specimens. If one test specimen shows evidence of improper sampling, molding, or testing, it shall be discarded and the remaining specimens tested. The strengths of the remaining two specimens shall be averaged, and the result shall then be considered the compressive strength of the concrete. If more than one specimen shows such defects, the test is not valid and the remaining specimen shall be discarded.
5. If test results are invalid due to specimen defects, or the in-place concrete that is in question was not sampled, the in-place concrete may be sampled by coring in accordance with ASTM C 42. For

   core tests, at least three representative cores shall be taken from each area of the concrete in question. If one or more of the cores shows signs of being damaged before testing, it shall be replaced by a new one.

Specific Site Requirements

WATERSTOP
(Consistent with NRCS Wisconsin Construction Specification #4 "Embedded or Expansive Waterstop", October 2017 and WSCS 004 — WS Embedded or Expansive Waterstop, November, 2022.)

SCOPE

The work shall consist of furnishing, welding, placing and installation of embedded waterstop base seal waterstop, or expansive waterstop as required on the construction drawings. All material shall meet the requirements of the latest edition of the applicable ASTM designation.

QUALITY CONTROL AND QUALITY ASSURANCE DURING CONCRETE PLACEMENT

The contractor shall provide the technician a construction quality control plan at the pre- construction conference.

The plan shall detail the requirements for waterstop installation, including as a minimum:

- Waterstop placement and welding methods that will be utilized during construction,
- Name, contact information and responsibilities of a quality control (QC) individual providing continuous quality control during concrete placement around the embedded waterstop to ensure proper placement and consolidation.
  - The quality control person may be an employee of the contractor or the owner of the project, without other duties during concrete placement.
- Name, contact information and responsibilities of an individual performing continuous quality assurance (QA) during concrete placement around the embedded waterstop to ensure proper placement and consolidation.
  - The quality assurance individual shall be a person under the direction and control of the individual responsible for approving the as-built construction plan.
    OR
  - A qualified consultant hired by the owner to assure and document the installation complies with the manufacturer's recommendations and procedures and this specification. The third party consultant shall provide documentation to the owner and the Technician.

MATERIALS

The Contractor shall provide evidence from the manufacturer showing that the waterstop materials meet the requirements of this specification. All materials proposed for use shall be approved by the Technician.

Preformed expansion joint filler shall be commercially available products made of sponge rubber, closed cell foam, or boards containing bituminous materials. The joint filler shall have a minimum thickness of ½ inch and a width equal to the full cross sectional width of the concrete at the joint.

Embedded waterstops shall be made of polyvinyl chloride (PVC), thermoplastic elastomeric rubber (TPE- R), or polyethylene (PE or VLDPE). The minimum width of waterstop shall be 6 inches, or the width and material shown on an NRCS approved Wisconsin Standard Drawing. The waterstop web thickness shall be a minimum of 3/8 inches throughout the entire cross section of the waterstop. The maximum bulb size shall not exceed 1 inch. Waterstops shall be the type intended for placement entirely within the concrete cross section, or as shown on an NRCS approved Wisconsin Standard Drawing or other drawings as approved by the NRCS State Conservation Engineer. Waterstops shall have ribbed or "dumb-bell" type anchor flanges and a hollow tubular center bulb. Split flange waterstops are prohibited.

Base seal waterstops shall be made of polyvinyl chloride (PVC), thermoplastic elastomeric rubber (TPE- R), or polyethylene (PE or VLDPE). The minimum width of waterstop shall be 9 inches. This waterstop shape is limited to NRCS approved Wisconsin Standard drawings for feed storage facilities and pre- engineered waste storage structures approved by the Wisconsin State Conservation Engineer (SCE).

Expansive waterstops shall consist of preformed strips or mastic (caulk) made of hydrophilic materials that expand when subjected to moisture and shall not contain bentonite. Use shall be limited to non- movement joints (fixed joints).

WELDING OF WATERSTOP

Manufacturer's fabricated waterstop intersections shall be provided.

Only straight butt joint splices are allowed for field fabrication. Splices in waterstops shall be welded as recommended by the manufacturer. The specific splicing iron and the temperature of the iron shall be in accordance with the manufacturer's instructions for the type of waterstop being spliced.

Manufacturer-certified contractors may fabricate waterstop intersections in a controlled environment with the proper manufacturer's equipment. Prior to the time of delivery of the fabricated intersections, documentation of certification must be presented to the Technician.

PLACEMENT AND INSTALLATION OF WATERSTOP

Embedded Waterstop

Joints with embedded waterstops shall not be placed horizontally across sloped slabs.

Embedded waterstops shall be located as shown on the drawings and secured in position so that displacement does not occur during concrete placement.

Vertical applications (footing to wall joints and wall to wall joints) shall be secured to reinforcement using wire or "hog ring" type fasteners or factory installed grommets at the outermost rib at the spacing as recommended by the waterstop manufacturer (usually 12 inches on center). Hog rings shall be factory installed, if the manufacturer has that option available. Each waterstop shall be placed and secured with the hollow bulb aligned in the center of the planned joint.

Split forms should firmly hold the waterstop in place to prevent misalignment of the waterstop during concrete placement. A tight fit between the waterstop and the form is also necessary to prevent excessive leakage of concrete paste, which could lead to honeycombing of the concrete.

Waterstop clearance shall be a minimum of 1½ inches from reinforcement and one half the waterstop's width to the face of the concrete (3 inches for 6 inch wide waterstop).

Internal vibration is required along the entire length of all joints that contain embedded waterstops for both formed surfaces and slabs and shall be performed in the presence of the QC and QA individuals.

Continuous placement of concrete through a waterstop joint is not allowed, except for control joints in formed walls where preformed joint control formers are used in conjunction with the waterstops, or in control joints as shown on an NRCS approved Wisconsin Standard Drawings or other drawings as approved by the NRCS SCE.

Expansive Waterstop

Expansive waterstop shall be placed at the locations shown on the drawings in accordance with the manufacturer's instructions.

Preformed strips may require adhesive or other forms of mechanical fastening to existing concrete based on the manufacturer's instructions. The adhesive for preformed expansive waterstop and the mastic for caulk type expansive waterstop shall be allowed to cure for the duration as indicated by the manufacturer prior to placing concrete over the waterstop.

Mastic (caulk) type expansive waterstops shall be placed to the bead size as recommended by the manufacturer based on the amount of concrete cover provided.

Colder temperatures will require longer curing periods prior to concrete placement. Do not allow the expansive waterstop to become wet prior to placing concrete over the waterstop.

REPAIR PROTOCOL

Waterstop which does not comply with this specification, damaged or otherwise defective shall be repaired or replaced by the Contractor in accordance with the manufacturer's recommendations or a repair plan developed by the contractor and approved by the Technician. All repairs shall be completed prior to additional work on the waterstop joint.
Specific Site Requirements

CONSTRUCTION QUALITY INSURANCE PLAN

Prior to any sitework, a preconstruction meeting shall be conducted between the owner, excavation contractor, tank contractor, Construction Inspector/Engineer of Record, Site Engineer, and the NRCS/County Land Conservation Department.

Concrete Supplier to provide Excel Engineering, Inc. wall and floor mix designs for approval, consistent with the specifications, prior to pouring slab.

Construction Inspector to locate actual wall and floor joint locations on "As-Built" plan relative to north arrow. Provide final copy of "As-Built" plan to the Engineer of Record for approval.

Construction Inspector must be competent in interpreting construction documents, familiar with type of construction, independent, and not a direct employee of Contractor.

Construction Inspector will be responsible for as-built documentation, construction inspection log, and photographs.

Construction Inspector to inspect rebar size, location, spacing, and waterstop locations in footing and slab prior to concrete pour. Slab is to be poured as indicated on plan to complete the tank.

Inspected items shall be as follows:

- Provide continuous inspection of concrete placement around the waterstop to ensure consolidation.
- Number and spacing of footing reinforcing
- Spacing of typical floor slab reinforcing
- Spacing of wall dowels
- Footing waterstop joint
- Slab waterstops, if required

Construction Inspector to inspect rebar size, location, spacing, and waterstop location in each wall section prior to concrete pour. Wall is to be poured in 200-foot-long maximum sections to compete the tank.

Inspected items shall be as follows:

- Concrete placement adjacent to all waterstop
- Spacing of wall vertical and horizontal reinforcing
- Wall waterstop at joint after welding to footing waterstop
- Form tie hole plugs at inside face of wall
- Grouted form tie holes at outside face of wall

TESTING FOR CONCRETE GREATER THAN 4,000 PSI

All concrete with required compressive strength above 4,000 psi must be tested. Contractor shall engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Cast and laboratory cure one set of four standard cylinders for each composite sample for each day's pour of each concrete mix. Provide four cylinders for each 200 cu. yd. or fraction thereof. Perform tests according to Concrete Section 7 - Inspection and Testing. Test one specimens at 7 days and two specimens at 28 days.

To avoid testing of 4,000 psi concrete provide a concrete mix with minimum of 6 bags of portland cement per cubic yard. Additional cementitious materials, (i.e. fly ash and / or slag) may be used to satisfy water cement ratio and or strength requirements.

CONFINED SPACE ENTRY INTO MANURE TRANSFER SYSTEM

- Confined spaces where human entry may occur shall be designed and operated in compliance with the provisions contained in ASABE EP470, Manure Storage Safety.
- Post warning signs on or next to all confined spaces. The signs should be sturdy, weatherproof, and display such wording as, "DANGER! CONFINED SPACE, DO NOT ENTER". Regularly inspect all warning signs to make sure they are clean, readable, and have not been tampered with.
- Be sure that all openings to confined spaces are appropriately covered or blocked off. Openings should be covered with substantial metal grill covers. These provide natural ventilation, and help prevent accidental falls or unauthorized entry.
- If employees are not required to enter a confined space, lock the opening to prevent entry.
- Obey all warning signs on and around confined spaces.
- Avoid going near confined spaces while smoking or using electrical equipment.
- Notify someone who has been trained in confined rescue operations if they spot anyone in trouble in a confined space.
- Confined spaces can be deadly. If the air in the space is not tested before entry, you could be overcome by fumes and pass out or die due to lack of oxygen, toxic gases, or an inability to escape quickly enough. Multiple deaths often occur when one person enters the space, is overcome, and others try unsuccessfully to save the first person.
- The following are the basic guidelines for confined space entry:
  - Test the atmosphere for oxygen, and for levels of toxic and explosive gases.
  - If a dangerous atmosphere exists, you must wear a self-contained breathing apparatus. Ventilate the area as thoroughly as possible.
  - All mechanical and electrical equipment must be locked out.
  - Use the 'buddy' system and wear a lifeline. Sufficient equipment and manpower must be available. A third person should be on hand to summon assistance if needed.
  - Establish how you will be communicating before entering the confined space. The meaning of verbal signals, hang gestures, or tugging line signals must be understood by the people on the outside.
  - Never re-enter a confined space without re-testing and venting the area.

EMERGENCY SLAB CRACK REPAIR PLAN

IN THE EVENT UN-INTENTIONAL FLOOR CRACKING OR CRACK MIGRATIONS OCCUR REPAIR THE CRACKS WITH A SIMPSON ETI-LV EPOXY ADHESIVE. THE REPAIR INVOLVES INJECTING LOW-VISCOSITY EPOXY INTO THE CRACKS TO MAKE THEM WATERPROOF. USE "GRAVITY-FEED APPLICATION" WHICH MEANS DISPENSING THE OIL-LIKE VISCOSITY EPOXY ALONG THE CRACK TO FILL IT WITHOUT PRESSURE. IN THE EVENT OF NARROW CRACKS, SIMPSON RECOMMENDS USING TWO BEADS OF CAULK ALONG EACH SIDE OF THE CRACK APPROXIMATELY 1/8" FROM THE EDGE OF THE CRACK TO WORK AS A RESERVOIR FOR THE EPOXY. ALTERNATIVELY, THE INSTALLER MAY ROUT THE CRACK TO FORM A V-GROOVE. WITH ROUTING, IT IS REQUIRED TO CLEAN THE CRACK WITH COMPRESSED AIR AFTERWARDS AS ROUTING CAN IMPACT DUST AND DEBRIS INTO THE CRACK AND PREVENT PROPER FLOW OF THE EPOXY.

OPERATION AND MAINTENANCE PLAN

Maximum height of manure in tank shall be maintained below the maximum operating level mark cast into the inside wall of the manure pit. If the maximum operating level is exceeded, implement contingency plan immediately.

Tank wall designed for a maximum height of backfill adjacent to tank level with the top of wall.

Tank design allows a **32,000 lbs.** vehicle surcharge at face of wall at any spot around the tank.

Slab design allows for a **16,800 lbs.** maximum vehicle axle load for 5" slab.

Slab design allows for a **20,000 lbs.** maximum vehicle axle load for 5-1/2" slab.

Fencing, guardrails, and other safety features shown on construction documents shall be inspected and maintained to ensure safe operation of waste storage facility and prevent access by humans or livestock.

Other Suggestions:

- Following emptying of the facility, inspect the concrete walls for and slab for separation or cracking and repair them as needed.
- Inspect pumps, pipes, and valves twice yearly to ensure they are functional and not a safety hazard.
- Post universal warning signs to prevent children and others from entering liquid waste facility.

CONTINGENCY PLAN

Begin planned contingency utilization of manure by applying to fields at rates according to 590 Nutrient Management Plan

Be certain to avoid areas of steep slopes or saturation.

EMERGENCY RESPONSE PLAN

Have name and phone number of a licensed septic waste hauler readily available to farm personnel.

Call licensed septic tank waste hauler to vacuum up spilled manure into vacuum tank and deposit back into waste storage tank or apply to land according to 590 Nutrient Management Plan.

Assess the extent of the spill and notify the DNR.

Provide temporary earthen barriers to contain liquid, if required, to stop liquid from entering nearby waterways or stormwater system. Return spilled manure to waste storage tank or apply to land according to 590 Nutrient Management Plan.

Do regular inspections of pipes, pumps, and valves to ensure proper operation at potential spill areas.

OWNER AGGREEMENT TO O/M PLAN

Signed: ______________________

Date: ______________________

SPECIFICATIONS

EXCEL
Always a Better Plan
100 Camelot Drive
Fond du Lac, WI 54935
920-926-9800
excelengineer.com

COLLABORATION
JP TANK CONCRETE

PROJECT INFORMATION
TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL
LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
33746
OKLAHOMA
12/30/24

PRELIMINARY DATES
DEC. 30, 2024

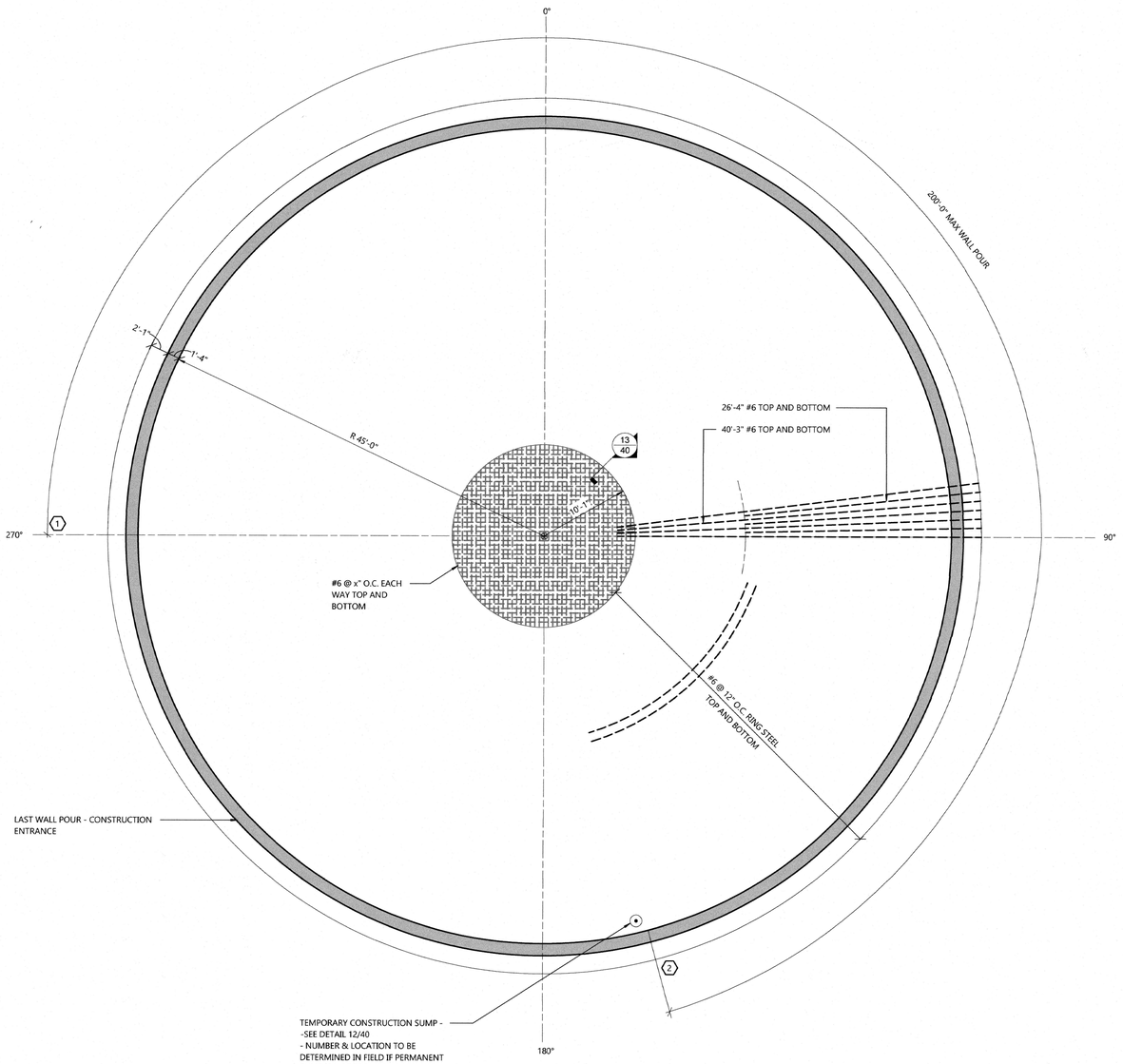
NOT FOR CONSTRUCTION

JOB NUMBER
240380000

SHEET NUMBER
12

(X) DENOTES MINIMUM NUMBER OF WALL JOINTS

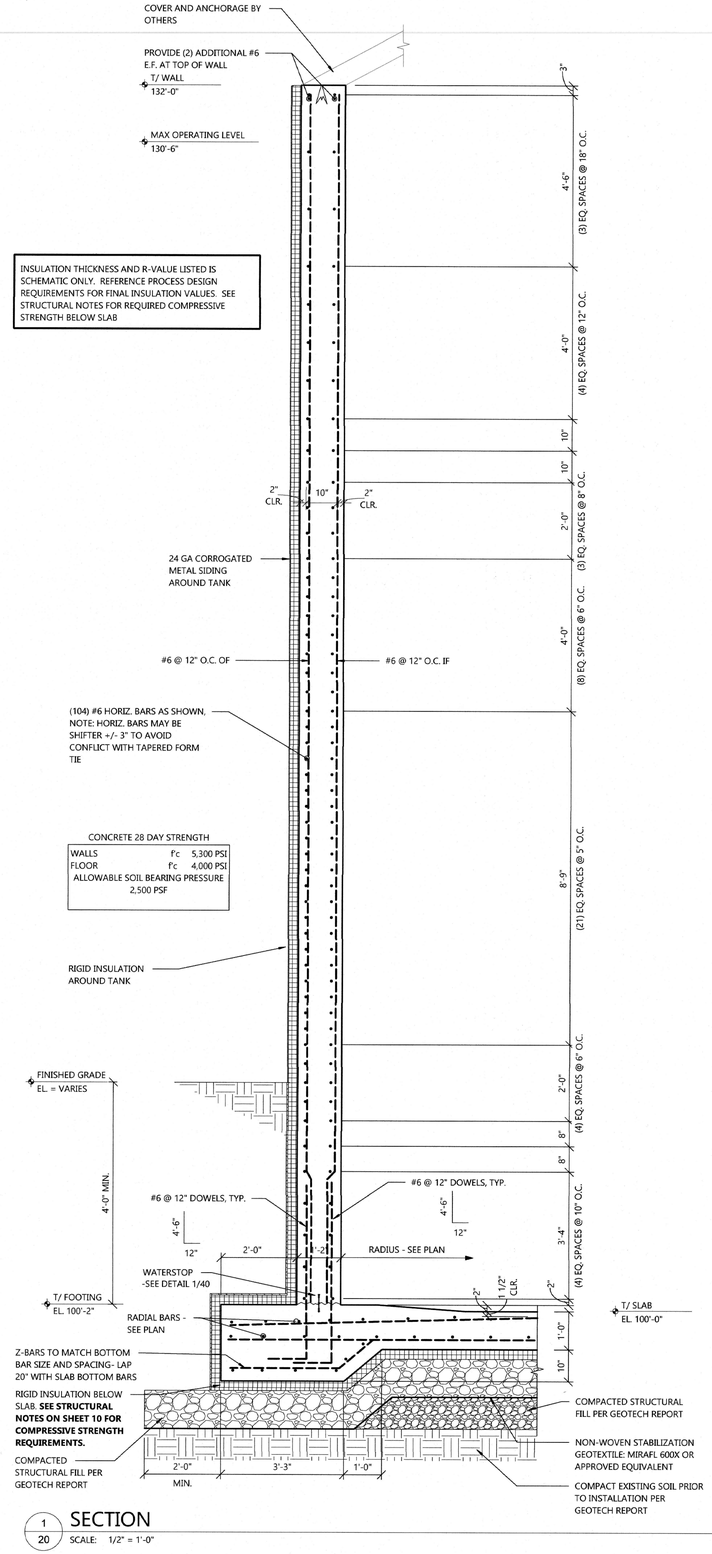
WALL JOINTS ARE NOT MOVEMENT JOINTS SINCE ALL HORIZONTAL HOOP STEEL PASSES THROUGH THE JOINT. PVC WATERSTOP IS NOT REQUIRED PER NRCS CODES AT THIS LOCATION BUT IS ADDED FOR ADDITIONAL PROTECTION.



NORTH

DIGESTER FOUNDATION PLAN

SCALE: 1/8" = 1'-0"



1/20 SECTION

SCALE: 1/2" = 1'-0"

90' DIA 32' TALL DIGESTER TANK FOUNDATION PLAN

EXCEL

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100 Camelot Drive
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COLLABORATION

JP TANK CONCRETE

PROJECT INFORMATION

TWO STATE SOD FARM

DIGESTER & HT TANK

SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

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JOSHUA WILSMANN
33746
OKLAHOMA
12/30/24

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DEC. 30, 2024

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JOB NUMBER

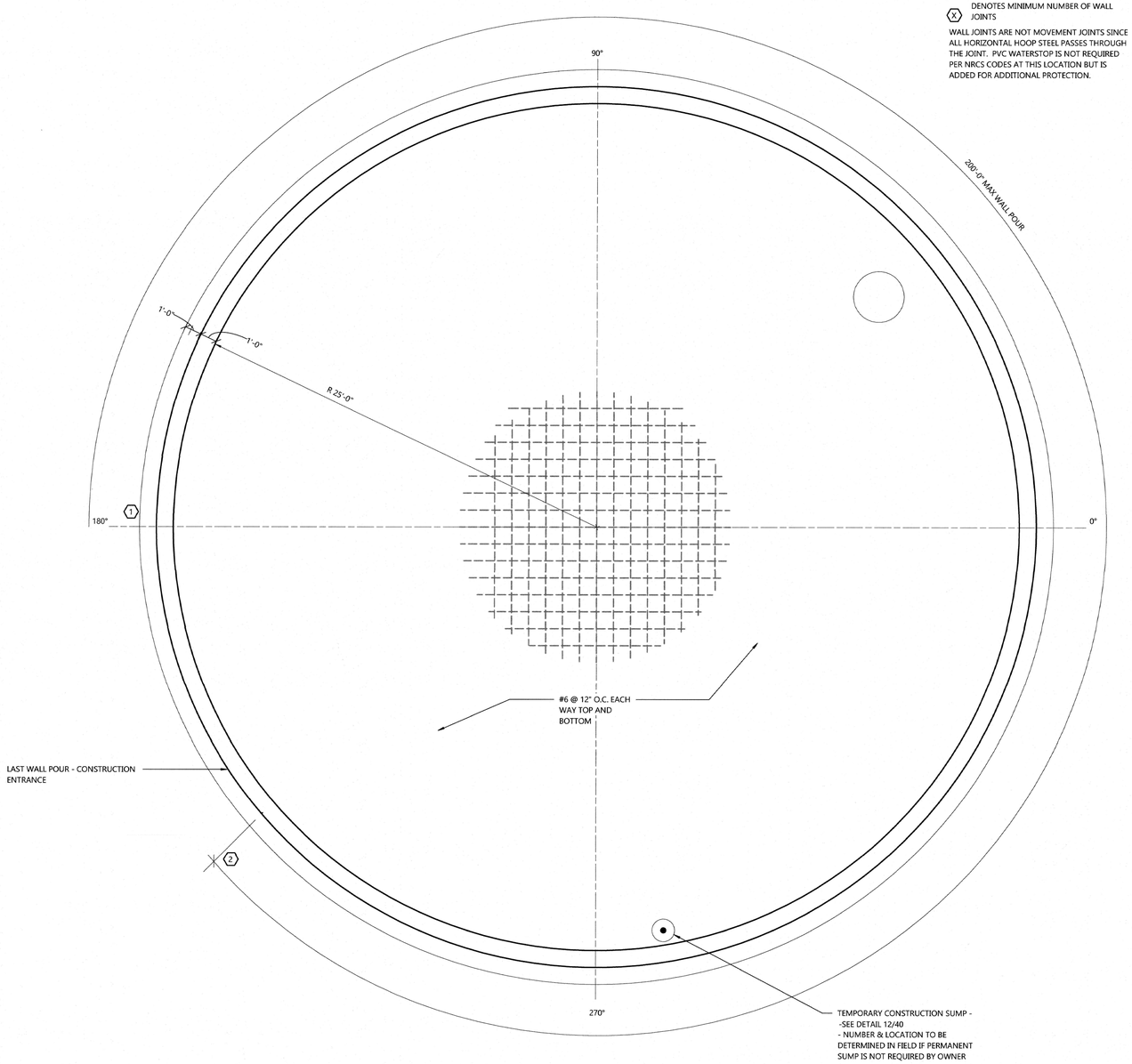
240380000

SHEET NUMBER

20

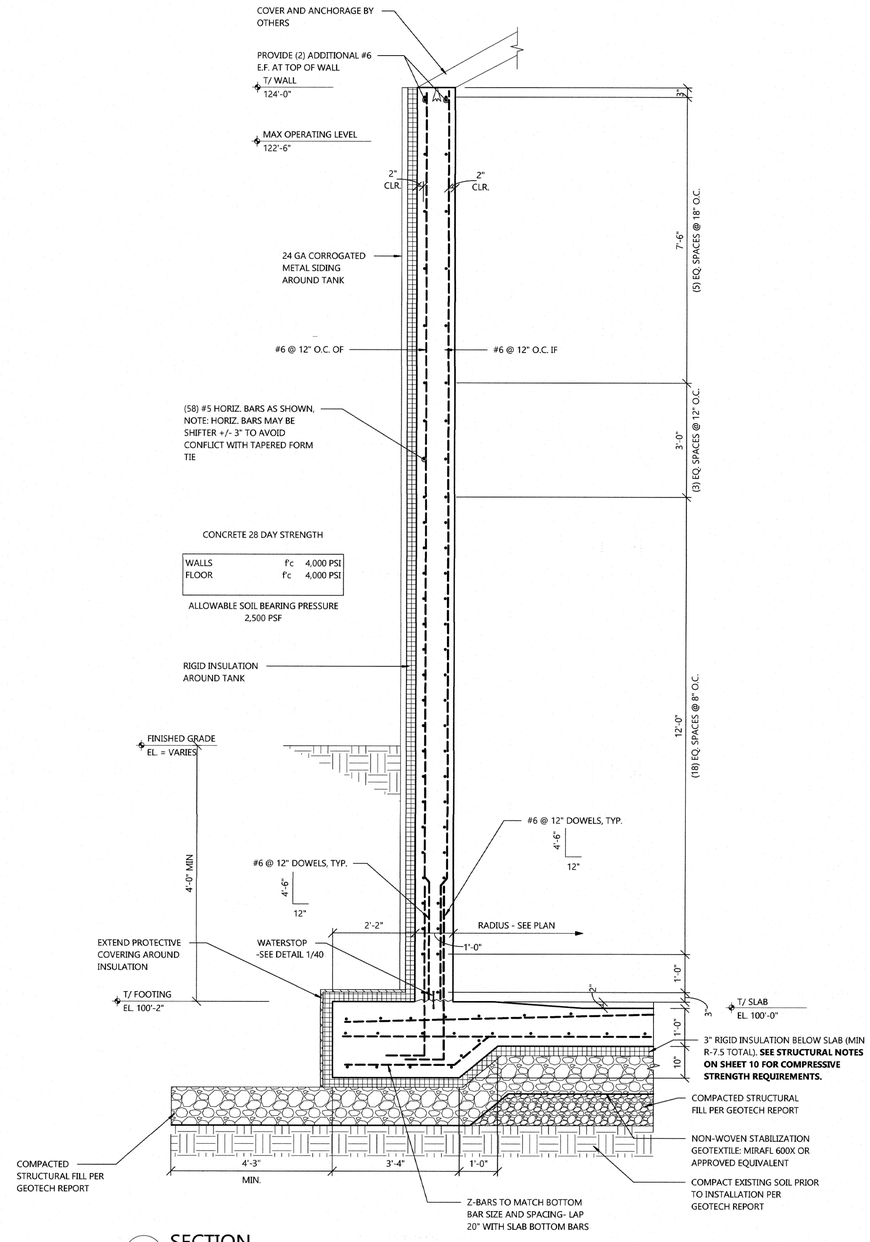
(X) DENOTES MINIMUM NUMBER OF WALL JOINTS

WALL JOINTS ARE NOT MOVEMENT JOINTS SINCE ALL HORIZONTAL HOOP STEEL PASSES THROUGH THE JOINT. PVC WATERSTOP IS NOT REQUIRED PER NRCS CODES AT THIS LOCATION BUT IS ADDED FOR ADDITIONAL PROTECTION.



1/21 HYDROLYSIS TANK FOUNDATION PLAN
SCALE: 1/4" = 1'-0"

INSULATION THICKNESS AND R-VALUE LISTED IS SCHEMATIC ONLY. REFERENCE PROCESS DESIGN REQUIREMENTS FOR FINAL INSULATION VALUES. SEE STRUCTURAL NOTES FOR REQUIRED COMPRESSIVE STRENGTH BELOW SLAB



2/21 SECTION
SCALE: 1/2" = 1'-0"

50' DIA 24' TALL HYDROLYSIS TANK FOUNDATION PLAN

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100 Camelot Drive
Fond du Lac, WI 54935
920-926-9800
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COLLABORATION

JP TANK CONCRETE

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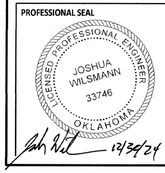
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL



PRELIMINARY DATES
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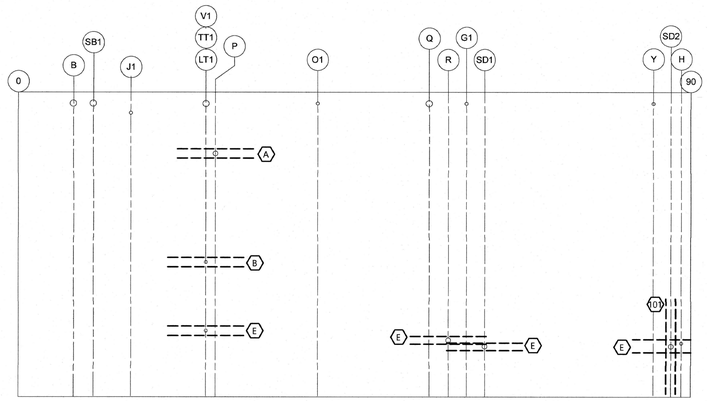
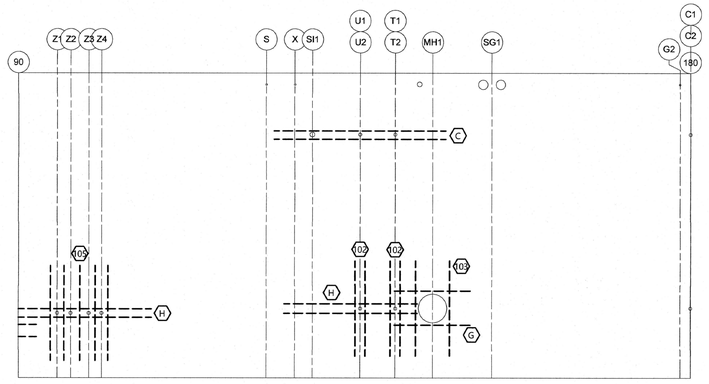
240380000

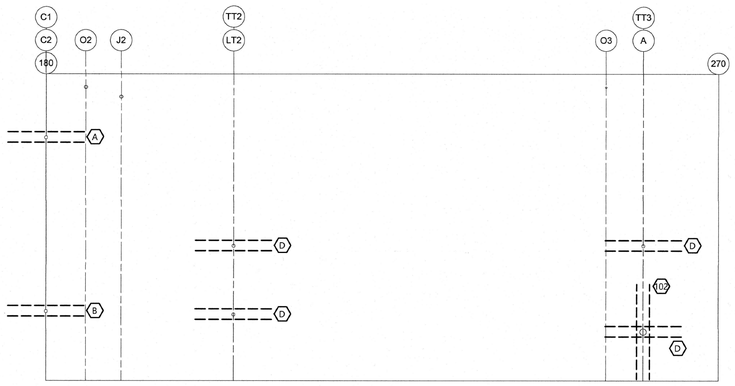
SHEET NUMBER
21



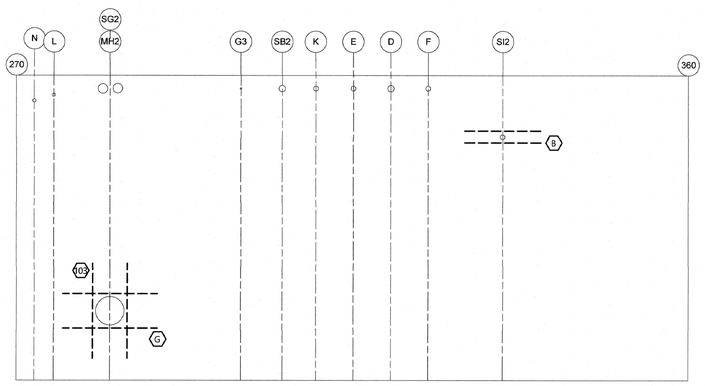
1/30 DIGESTER 2 TANK ELEVATION 0° - 90°
SCALE: 1/8" = 1'-0"



2/30 DIGESTER 2 TANK ELEVATION 90° - 180°
SCALE: 1/8" = 1'-0"



3/30 DIGESTER 2 TANK ELEVATION 180° - 270°
SCALE: 1/8" = 1'-0"

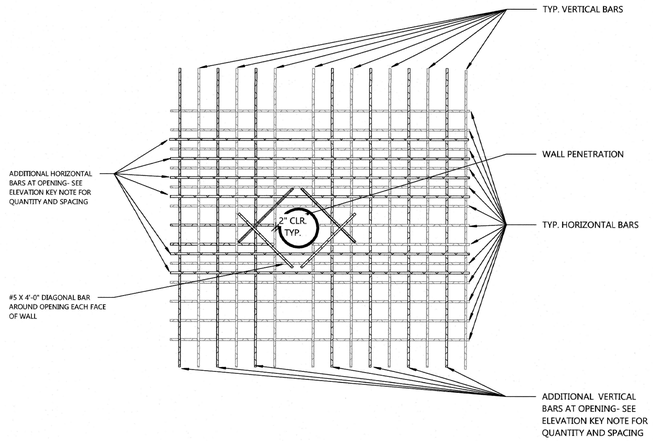


4/30 DIGESTER 2 TANK ELEVATION 270° - 360°
SCALE: 1/8" = 1'-0"

OPENING LAYOUT SHOWN IS SCHEMATIC ONLY. FINAL OPENING DRAWING TO BE UPDATED ONCE FINAL PROCESS DRAWINGS ARE PROVIDED.

PLACEMENT OF REBAR AROUND OPENINGS:

1. PROVIDE ADDITIONAL BARS @ SPACING INDICATED. INSTALL ADDITIONAL BARS CENTERED BETWEEN TYPICAL BARS
2. DO NOT PLACE BARS CLOSER THAN 2" O.C.



rr/30 WALL PENETRATION REINFORCING
SCALE: 1/2" = 1'-0"

OPENING REINFORCING LEGEND

OPENING REINFORCING

101 PROVIDE (1) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING

102 PROVIDE (2) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING

103 PROVIDE (3) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING

105 PROVIDE (2) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS EACH FACE BETWEEN EACH PENETRATION

OPENING REINFORCING

12 PROVIDE (12) ADDITIONAL #6 X 12'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING

A PROVIDE (1) ADDITIONAL #6 X 8'-0" LONG BAR EACH FACE AT TOP AND BOTTOM OF OPENING

OPENING REINFORCING

B PROVIDE (2) ADDITIONAL #6 X 8' LONG BARS EACH FACE AT TOP AND BOTTOM OF OPENING

OPENING REINFORCING

C PROVIDE (2) ADDITIONAL #6 X 18' LONG BARS EACH FACE TOP AND BOTTOM OF OPENING

OPENING REINFORCING

D PROVIDE (3) ADDITIONAL #6 X 15' LONG BARS EACH FACE TOP AND BOTTOM OF OPENING - (1) PER SPACING OF TYP. BARS

OPENING REINFORCING

E PROVIDE (3) ADDITIONAL #6 X 8' LONG BARS EACH FACE AT TOP AND BOTTOM OF OPENING - (1) PER SPACING OF TYP BARS

OPENING REINFORCING

F PROVIDE (1) ADDITIONAL #6 X 11' LONG BAR EACH FACE AT BOTTOM OF OPENING

OPENING REINFORCING

G PROVIDE (9) ADDITIONAL #6 X 12' LONG BARS EACH FACE AT TOP AND (3) #6 X 12' LONG BARS EACH FACE AT BOTTOM

OPENING REINFORCING

H PROVIDE (3) ADDITIONAL #6 X 14' LONG BARS EACH FACE AT TOP AND BOTTOM OF OPENING - (1) PER SPACING OF TYP. BARS

OPENING REINFORCING

J PROVIDE (1) ADDITIONAL #6 X 14' LONG BAR EACH FACE T&B

OPENING REINFORCING

K PROVIDE (2) ADDITIONAL #6 X 21' LONG BARS @ 6" O.C. SPACING EACH FACE AT TOP AND BOTTOM OF OPENINGS

DIGESTER TANK 1 ELEVATIONS

EXCEL
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100 Camelot Drive
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COLLABORATION

JP TANK CONCRETE

PROJECT INFORMATION

TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
33746
OKLAHOMA
12/30/24

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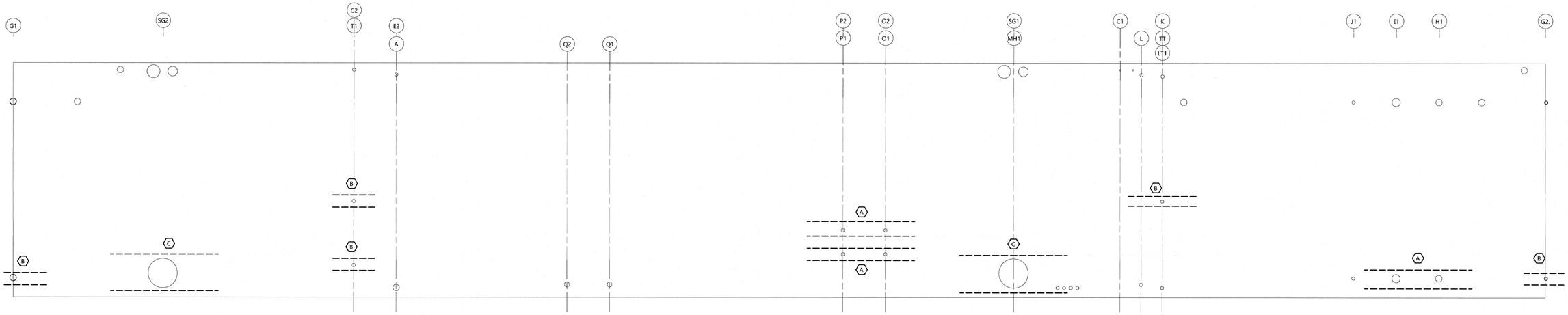
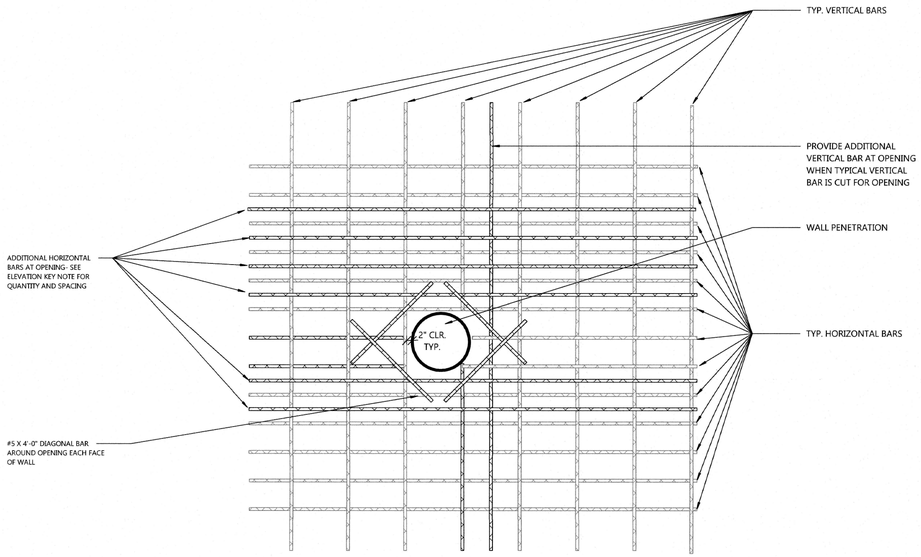
SHEET NUMBER
30



1/32 HT TANK ELEVATION
SCALE: 3/16" = 1'-0"

OPENING LAYOUT SHOWN IS SCHEMATIC ONLY. FINAL OPENING DRAWING TO BE UPDATED ONCE FINAL PROCESS DRAWINGS ARE PROVIDED.



2/32 WALL PENETRATION REINFORCING
SCALE: 3/4" = 1'-0"

PLACEMENT OF REBAR AROUND OPENINGS:

1. PROVIDE ADDITIONAL BARS @ SPACING INDICATED. INSTALL ADDITIONAL BARS CENTERED BETWEEN TYPICAL BARS
2. DO NOT PLACE BARS CLOSER THAN 2" O.C.

HT TANK OPENING REINFORCING LEGEND

OPENING REINFORCING

(A) PROVIDE (1) ADDITIONAL #5 X 11'-0" LONG BAR EACH FACE TOP AND BOTTOM OF OPENING

OPENING REINFORCING

(B) PROVIDE (1) ADDITIONAL #5 X 7' LONG BAR EACH FACE AT TOP AND BOTTOM OF OPENING

OPENING REINFORCING

(C) PROVIDE (4) ADDITIONAL #5 X 11' LONG BARS @ 8" O.C. SPACING EACH FACE AT TOP OF OPENING AND (1) ADDITIONAL #5 x 11' LONG EACH FACE AT BOTTOM OF OPENING

OPENING REINFORCING

(D) PROVIDE (1) ADDITIONAL #5 X 11' LONG BARS EACH FACE AT TOP OF OPENING

OPENING REINFORCING

(E) PROVIDE (2) ADDITIONAL #5 X 7' LONG BARS @ 8" O.C. SPACING EACH FACE ABOVE OPENING

HYDROLYSIS TANK ELEVATIONS

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100 Camelot Drive
Fond du Lac, WI 54935
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COLLABORATION

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DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
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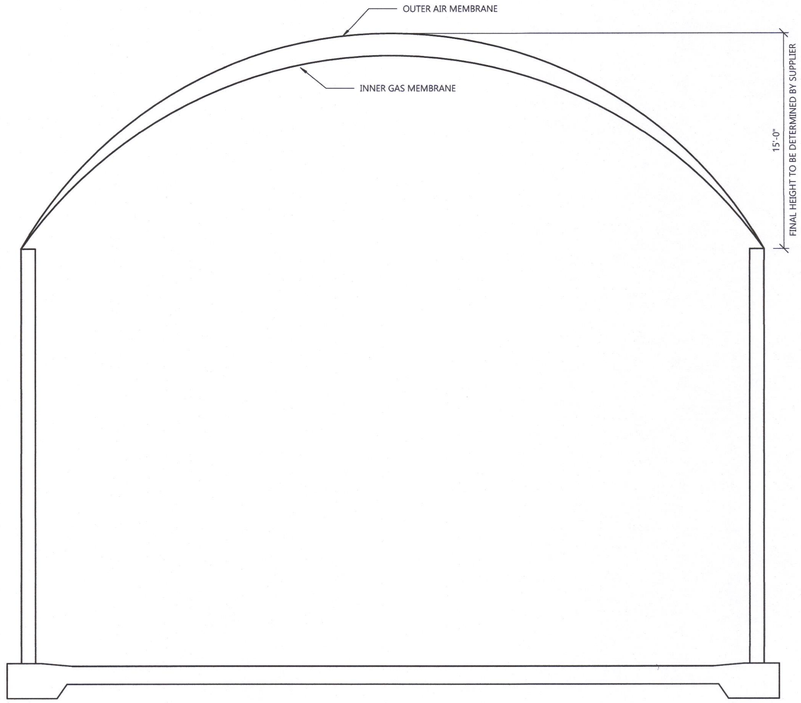
OKLAHOMA
12/30/24

PRELIMINARY DATES
DEC. 30, 2024

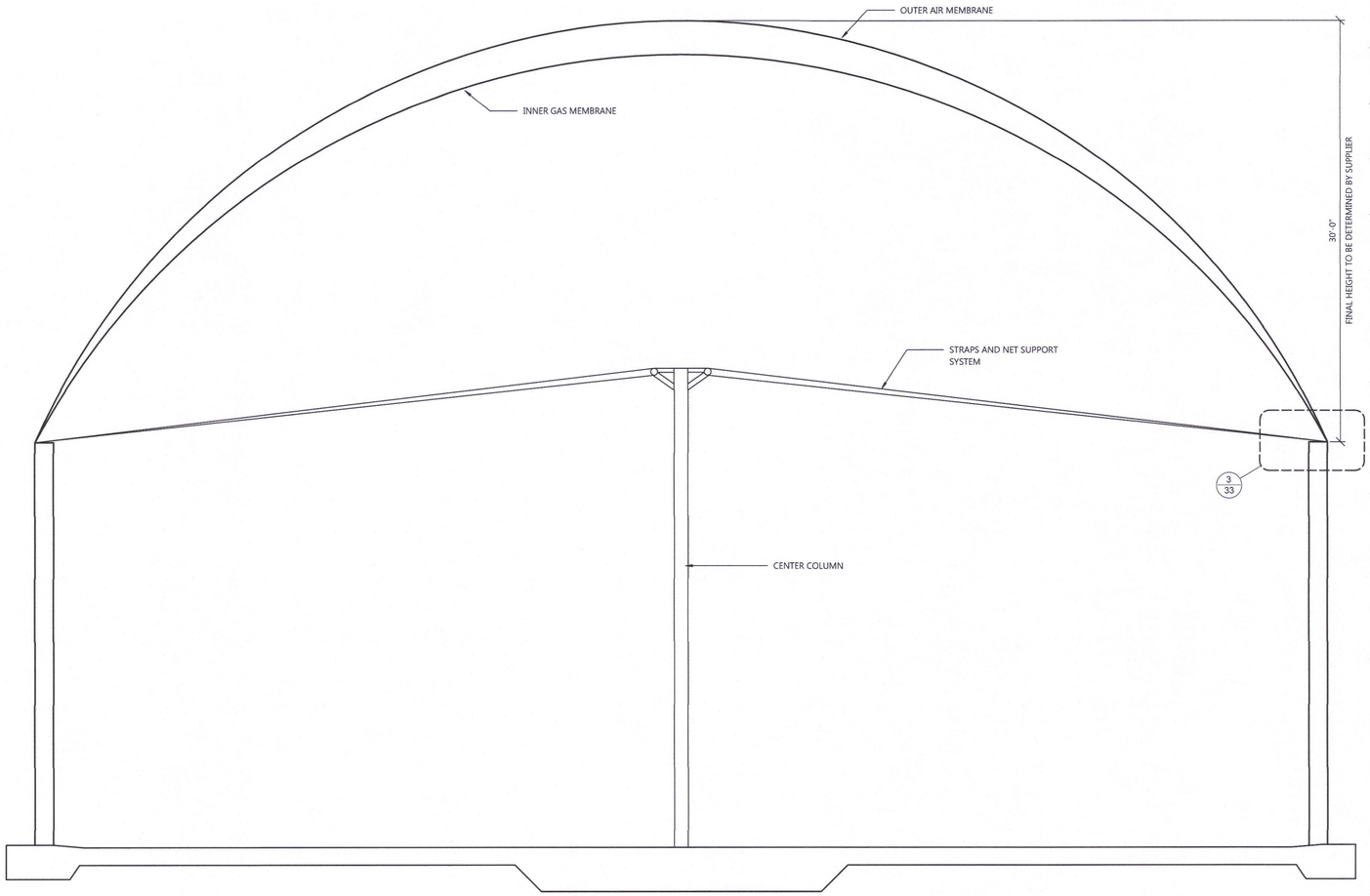
NOT FOR CONSTRUCTION

JOB NUMBER
240380000

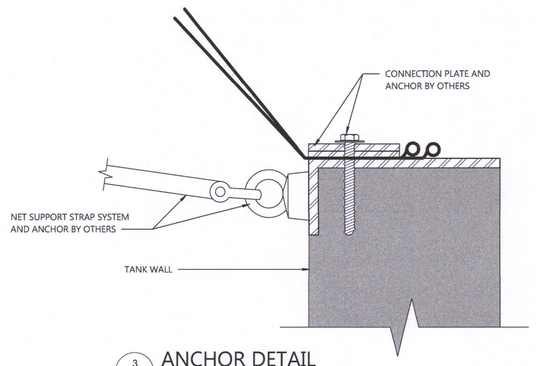
SHEET NUMBER
32



2/33 HYDROLYSIS TANK SECTION
SCALE: 3/16" = 1'-0"



1/33 DIGESTER TANK SECTION
SCALE: 3/16" = 1'-0"



3/33 ANCHOR DETAIL
SCALE: 3" = 1'-0"

ALL ROOF INFORMATION IS SCHEMATIC ONLY. ROOF DESIGN AND SPECIFICATION IS THE RESPONSIBILITY OF THE PROCESS DESIGN TEAM.

DIGESTER & HYDROLYSIS TANK SECTIONS

EXCEL
Always a Better Plan
100 Camelot Drive
Fond du Lac, WI 54935
920-926-9800
excelengineer.com

COLLABORATION
JP TANK CONCRETE

PROJECT INFORMATION

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DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL
LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
33746
OKLAHOMA
1/27/25

PRELIMINARY DATES
JAN. 27, 2025
~~PERM- AD1~~ 01/27/25

NOT FOR CONSTRUCTION

JOB NUMBER
240380000

SHEET NUMBER
33

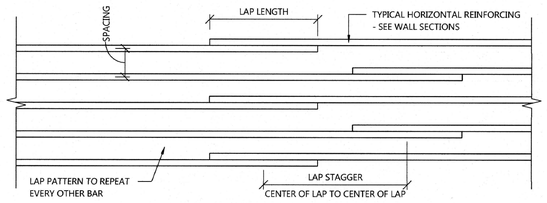
C:\Users\owens\Documents\240332100_JP Tank Digester HT Tank_V23_owens.sh24cl.rvt
1/27/2025 11:16:36 AM

APPROVED SEALANT
• LEAKMASTER LV-1 BY SIKA - GREENSTREAK GROUP, INC.

5/40 APPROVED SEALANTS

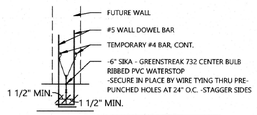
BAR SPLICE SCHEDULE		
BAR SIZE	SPLICE LENGTH (in.) SLABS AND FOOTINGS (f'c = 4,000 PSI)	SPLICE LENGTH (in.) WALLS (CONCRETE STRENGTH AS NOTED)
#4Ø	15"	
#5Ø	20"	26" (f'c = 4,000 PSI OR GREATER)
#6Ø		30" (f'c = 4,000 PSI OR GREATER)
#6Ø		27" (f'c = 5,000 PSI OR GREATER)
#7Ø		40" f'c = 5,500 PSI OR GREATER)
#8Ø		

4/40 BAR SPLICE SCHEDULE



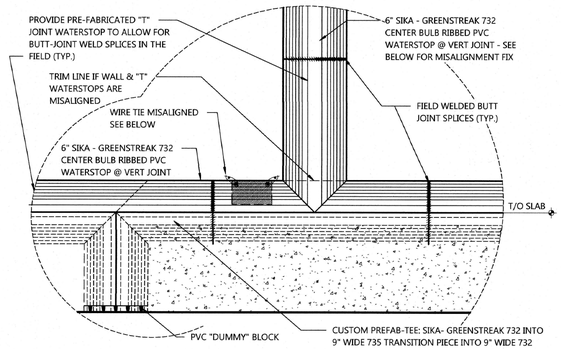
* LAP STAGGER TO BE THE GREATER OF 36" & SPLICE LENGTH -SEE DETAIL -/---

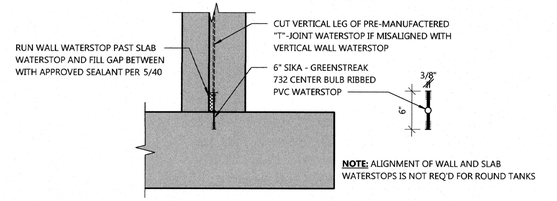
3/40 CIRCUMFERENTIAL REINFORCING SPLICE DETAILS
NOT TO SCALE



IN THE EVENT THAT THE WATERSTOP NEEDS TO BE ADJUSTED BY HAND AFTER INITIAL PLACEMENT, THE CONCERETE ADJACENT TO THE WATERSTOP MUST BE RECONSOLIDATED WITH AN IMMERSION VIBRATOR.

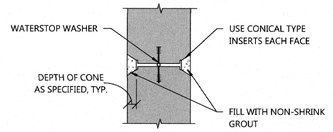
2/40 WATERSTOP INSTALLATION
SCALE: 1/2" = 1'-0"





NOTE: ALIGNMENT OF WALL AND SLAB WATERSTOPS IS NOT REQ'D FOR ROUND TANKS

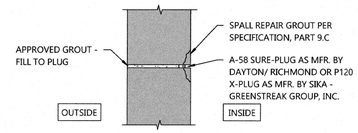
1/40 PREFABRICATED T-JOINT WATERSTOP
NOT TO SCALE



8/40 FORM SNAP-TIE HOLE
SCALE: 1" = 1'-0"

NOTE: CONTR. HAS OPTION TO APPLY TAMMS THIN PATCH OVER GROUT IF A COLOR MATCH TO WALL IS REQ'D

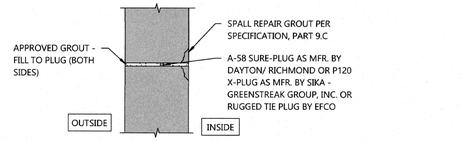
APPROVED GROUTS
- DURAGROUT BY L&M CHEMICAL
- SIKAGROUT 212 BY SIKA
- HORN GROUT BY TAMMS
- 1107 DAYTON/SUPERIOR ADVANTAGE GROUT



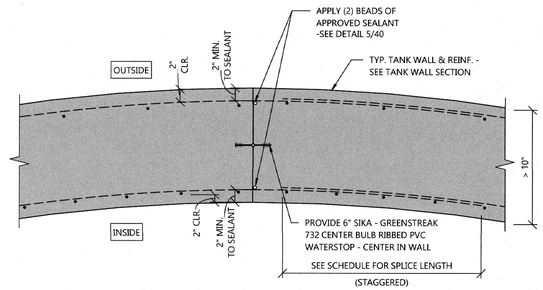
7/40 ALTERNATE FORM TIE-THROUGH BOLT
SCALE: 1" = 1'-0"

NOTE: CONTR. HAS OPTION TO APPLY TAMMS THIN PATCH OVER GROUT IF A COLOR MATCH TO WALL IS REQ'D

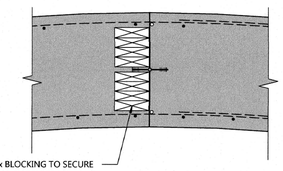
APPROVED GROUTS
- DURAGROUT BY L&M CHEMICAL
- SIKAGROUT 212 BY SIKA
- HORN GROUT BY TAMMS
- 1107 DAYTON/SUPERIOR ADVANTAGE GROUT



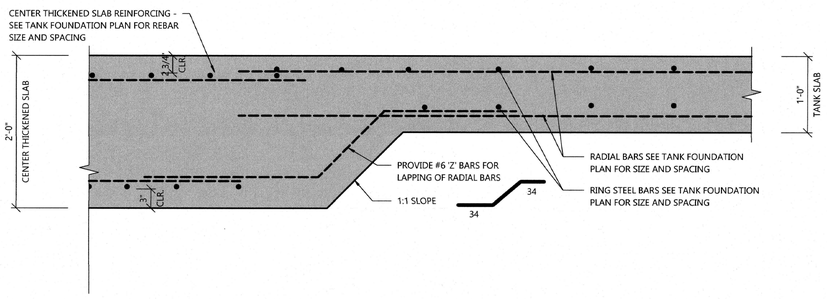
6/40 TIE HOLE DETAIL
SCALE: 1" = 1'-0"



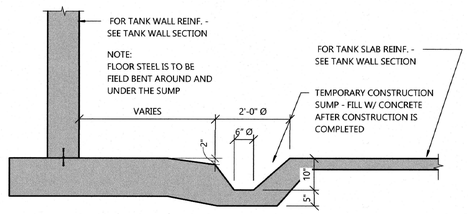
11/40 WALL CONSTRUCTION JOINT
SCALE: 1" = 1'-0"



10/40 WALL CONSTRUCTION JOINT
SCALE: 1" = 1'-0"



13/40 CENTER SLAB TRANSITION DETAIL
SCALE: 1" = 1'-0"



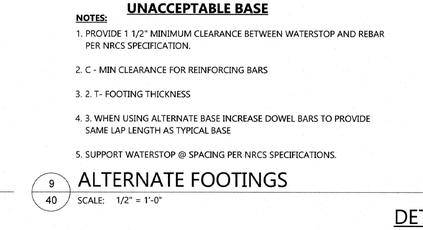
NOTES:

TO FILL TEMPORARY SUMP PIT:

1. ROUGHEN EXISTING CONCRETE
2. CLEAN & PREPARE SURFACE
3. APPLY BONDING AGENT TO EXIST. CONCRETE
4. FILL SUMP WITH CONCRETE.

ALL WORK TO BE COMPLETED ACCORDING TO MANUFACTURER INSTALLATION PROCEDURES. APPROVED BONDING AGENT: SIKADUR 32 OR EQUAL.

12/40 TEMP. CONSTRUCTION SUMP PIT
SCALE: 1/2" = 1'-0"



NOTES:

1. PROVIDE 1 1/2" MINIMUM CLEARANCE BETWEEN WATERSTOP AND REBAR PER NRCS SPECIFICATION.
2. C - MIN CLEARANCE FOR REINFORCING BARS
3. 2. T- FOOTING THICKNESS
4. 3. WHEN USING ALTERNATE BASE INCREASE DOWEL BARS TO PROVIDE SAME LAP LENGTH AS TYPICAL BASE
5. SUPPORT WATERSTOP @ SPACING PER NRCS SPECIFICATIONS.

9/40 ALTERNATE FOOTINGS
SCALE: 1/2" = 1'-0"

DETAILS

EXCEL
Always a Better Plan
100 Camelot Drive
Fond du Lac, WI 54935
920-926-9800
excelengineer.com

COLLABORATION

JP TANK CONCRETE

PROJECT INFORMATION

TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

LICENSED PROFESSIONAL ENGINEER
JOSHUA WILSMANN
33746
OKLAHOMA
12/30/24

PRELIMINARY DATES
DEC. 30, 2024

NOT FOR CONSTRUCTION

JOB NUMBER
240380000

SHEET NUMBER
40

STRUCTURAL CALCULATIONS

EXCEL
ARCHITECTS • ENGINEERS • SURVEYORS

Project:

TWO STATE SOD FARM DIGERSTER & HT TANKS

KEOTA, OK

90 FT AND 50 FT DIAMETER TANKS

Prepared For:

JP TANK

Date:

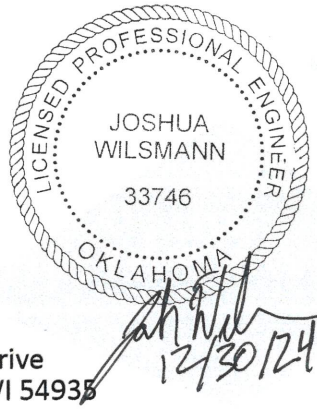
12/30/2024

Calculation Index:

Authorization:

EXCEL PROJECT NUMBER:	240380000	SUPERVISED BY:	
PREPARED BY:	JOSH WILSMANN, PE	FIRM COA NUMBER:	OK: CA 5092 PE

Stamps: **For Review Only**



100 Camelot Drive
Fond du Lac, WI 54935

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Circular Concrete Tank Design (cont.): Condition 1 & Condition #2a Clay Static Loading

(Pinned Base - Free Top w/ Triangular Load)

Sand- laden Manure

	Vertical	Lateral		
: Wall height = Soil assumed		32	ft	(H)
: Inside tank diameter =		90	ft	(D)
: Wall thickness =		14	in	(t)
: Weight of liquid (internal) =	72	72	pcf	(wl)
: Weight of soil (external) =	115	100	pcf	(ws)
: Horizontal pressure from surcharge (external) =		200	psf	(S)
: Vertical surface pressure creating horizontal surcharge (external) =		230	psf	(W)
: Factored horizontal pressure from surcharge = Sd(1.6)(S) =		320	psf	(p)
: Concrete compressive strength (wall) =		5300	psi	(f'c)
: Concrete compressive strength (footing) =		4000	psi	(f'c foot)
: Reinforcement yield strength =		60	ksi	(fy)
: Modulus of elasticity (concrete wall) = (57)(f'c)$^{.5}$ =		4150	ksi	(Ec)
: Modulus of elasticity (steel) =		29000	ksi	(Es)
: Ratio of moduli of elasticity = (Es/Ec) =		7.0		(n)
: $H^2/Dt = (H)^2/(D)(t)$ =		9.75		(H^2/Dt)
: w_S (soil pressure) = (1.6)(ws) =		160.00	pcf	(w_S)
: w_L (liquid pressure) = (1.4)(wl) =		100.80	pcf	(w_L)
: w_LHR = (w_L)(H)(D/2) =		145152.00	pcf	(w_LHR)

Horizontal Reinforcing (ring steel) Bar size = #6 # Bars per row = 2 Splice length = 29 inches

Point	Elev. (ft)	Tension coeff. Table A-5	Ring Tension (plf)	As per row (in^2/ft)	Max. spacing (in o.c.)	Act. spacing (in o.c.)	As provided (in^2/ft)	Check Strength & T+S
0.0H	32.00	-0.009	-1263	0.21	18.00	18.00	0.29	O.K.
0.1H	28.80	0.095	13804	0.21	18.00	18.00	0.29	O.K.
0.2H	25.60	0.201	29147	0.27	18.00	18.00	0.29	O.K.
0.3H	22.40	0.312	45331	0.42	12.58	12.00	0.44	O.K.
0.4H	19.20	0.430	62343	0.58	9.15	8.00	0.66	O.K.
0.5H	16.00	0.553	80298	0.74	7.10	7.00	0.75	O.K.
0.6H	12.80	0.666	96599	0.89	5.90	5.00	1.06	O.K.
0.7H	9.60	0.727	105482	0.98	5.41	5.00	1.06	O.K.
0.8H	6.40	0.672	97586	0.90	5.84	5.00	1.06	O.K.
0.9H	3.20	0.428	62169	0.58	9.17	9.00	0.59	O.K.
1.0H	0.00	0.000	0					

Wall Thickness

: Allowable concrete tensile stress = (.1)(f'c) = ...Per Section 4, of "Circular Concrete Tanks Without Prestressing" by PCA, 1993		530.00	psi	(Ta)
: Actual concrete tensile stress = ((.0003)(Es)(As provided)+(Tmax))/(Ac+(n)(As provided)) =	O.K.	512.80	psi	(Tu)

Vertical Reinforcing (moment steel) Bar size = #6 # of layers = 2

Outside face bar spacing = 12.00 in o.c. | Outside face As = 0.4400 in^2/ft | d outside = 11 in

a outside = 0.488 in | a inside = 0.488 in | Inside face bar spacing = 12.00 in o.c. | Inside face As = 0.4400 in^2/ft | d inside = 11 in

Point	Elev. (ft)	Moment coeff. Table A-7	Mu outside (ft-lb)	ϕMn outside (ft-lb)		ϕMn inside (ft-lb)	
0.0H	32.00	0.0000	0	21297	O.K.	21297	
0.1H	28.80	0.0000	0	21297	O.K.	21297	
0.2H	25.60	0.0000	0	21297	O.K.	21297	
0.3H	22.40	-0.0002	-661	21297	O.K.	21297	
0.4H	19.20	-0.0001	-297	21297	O.K.	21297	
0.5H	16.00	0.0003	826	21297	O.K.	21297	
0.6H	12.80	0.0012	3931	21297	O.K.	21297	
0.7H	9.60	0.0026	8687	21297	O.K.	21297	
0.8H	6.40	0.0044	14665	21297	O.K.	21297	
0.9H	3.20	0.0046	15161	21297	O.K.	21297	
1.0H	0.00	0.0000	0	21297	O.K.	21297	

Circular Concrete Tank Design (cont.): Condition #1 Clay Static Loading

(Pinned Base - Free Top w/ Triangular Load)

: Shrink & Temp Vertical r/f = As/(12)(h) =	0.0052	**O.K. > 0.0018**				
Crack Control (vertical steel spacing)	outside face		inside face			
Mmax=	15,161		17,500		fr-lb	
: c = kd =	2.132		2.132			
: ρ = As/(12)(d) =	0.0033		0.0033			(ρ)
: k = ((2(ρn)+(ρn)^2)$^{.5}$)-(ρn) =	0.194		0.194			(k)
: j = 1-(k/3) =	0.935		0.935			(j)
: fs = M/(As)(j)(d) =	28.703	**OK < fs max**	28.991	**OK < fs max**	ksi	(fs)
: z =	**136**		**175**	**OK**	k/in	(z)
: dc =	3		3		in	(dc)
: Pre ACI 318-99 max spacing = (z)^3/((2(dc)^2(fs)^3) =	5.91	**check**	12.22	**empty tank**	in	(s)
: Cc =	2.625		2.625		in	(Cc)
: ACI 318-11 max spacing = (15)x(40,000/fs) - 2.5Cc <= (12)x(40,000/fs) <= 18..	14.34	**O.K.**	14.13	**O.K.**	in	(s)

Wall Shear

: Shear coefficient (Table A-12) =				0.0879		(C_{shear})
: Actual outside face shear = (C_{shear})(w_{ui})(H^2) =				10,000	lb	(Vui)
: Actual inside face shear = (C_{shear})(((w_{ue})(H^2))+((p)(H))) =				10,000	lb	(Vue)
: Allowable outside face shear = (.75)(2)(f'c)$^{.5}$(12)(d outside) =			**O.K.**	14414.62	lb	(ϕVc)
: Allowable inside face shear = (.75)(2)(f'c)$^{.5}$(12)(d inside) =		**Required increased F'c**	**O.K.**	14414.62	lb	(ϕVc)
Dowel size =	#6	Footing develop. length =	10.5 in			
Outside face dowel spacing =	12.00	Min. projection =	29 in	Total vertical =	41	in
Inside face dowel spacing =	12.00	Hook length =	12 in			
: Allowable dowel shear (shear friction) = (.75)(Asv)(fy)(.6)(1.0) =			**O.K.**	23760.00	lb	(Vn)

max of Vert Bar Lap or 24"

Floor Slab Design Slab thickness = **12.00** in

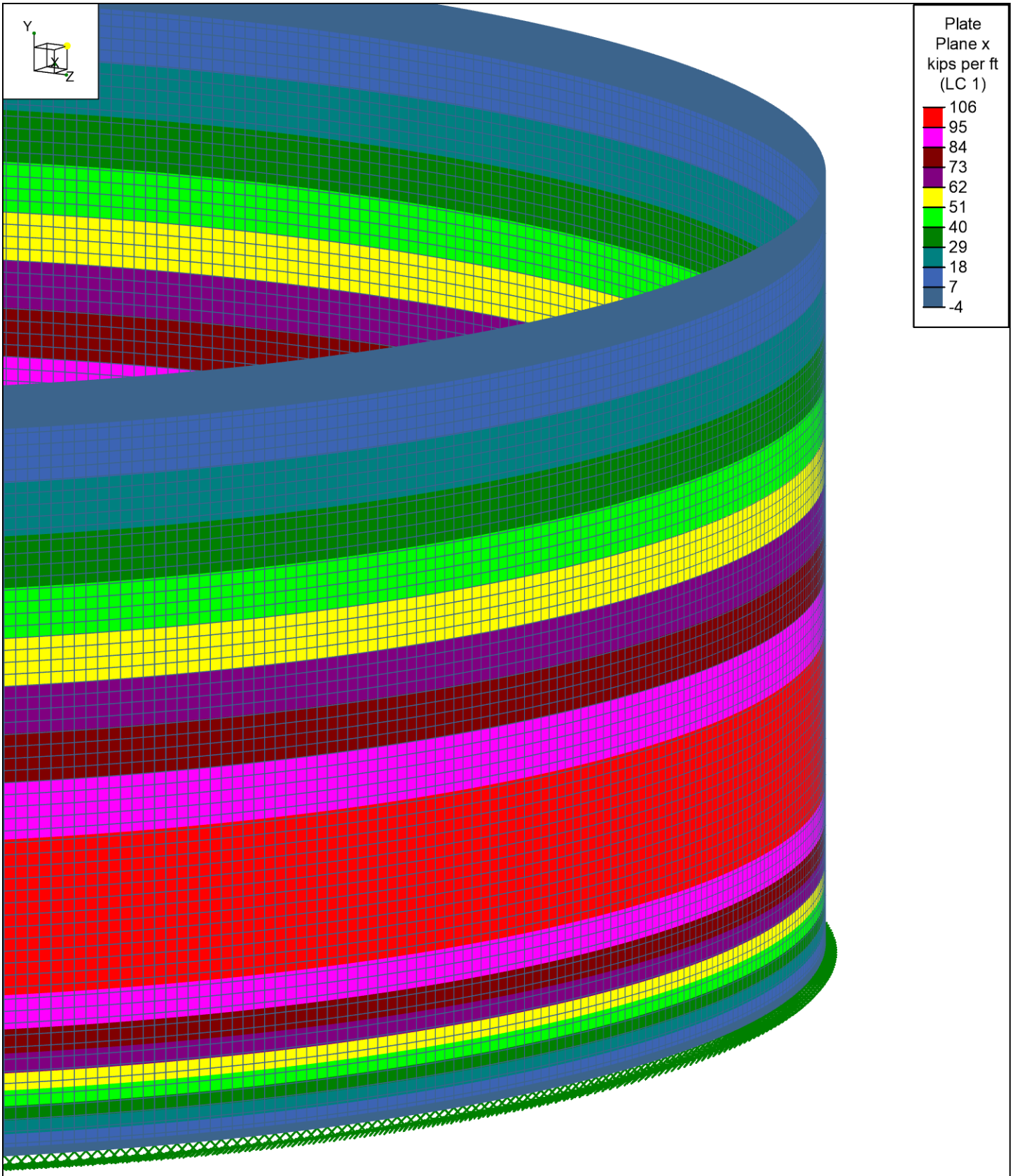
slab sections reqd. = **1** Slab length = 95.33333333 ft

: Required area of steel = (1.5)(L)(w)/(2(.7)(fy)) = **O.K. per CPS 522, Table 1** 0.255 in^2 (Asf)

Bar size = **#6**

Bar spacing = **12.00** in o.c.

: Area of steel provided = **O.K.** 0.440 in^2



Results for LC 1, 1.4 FL

IRISA A NEMETSCHEK COMPANY	<Licensed Company>		SK-2
	joshw		Dec 30, 2024 at 01:51 PM
			240380000 90x32 Digester.r3d

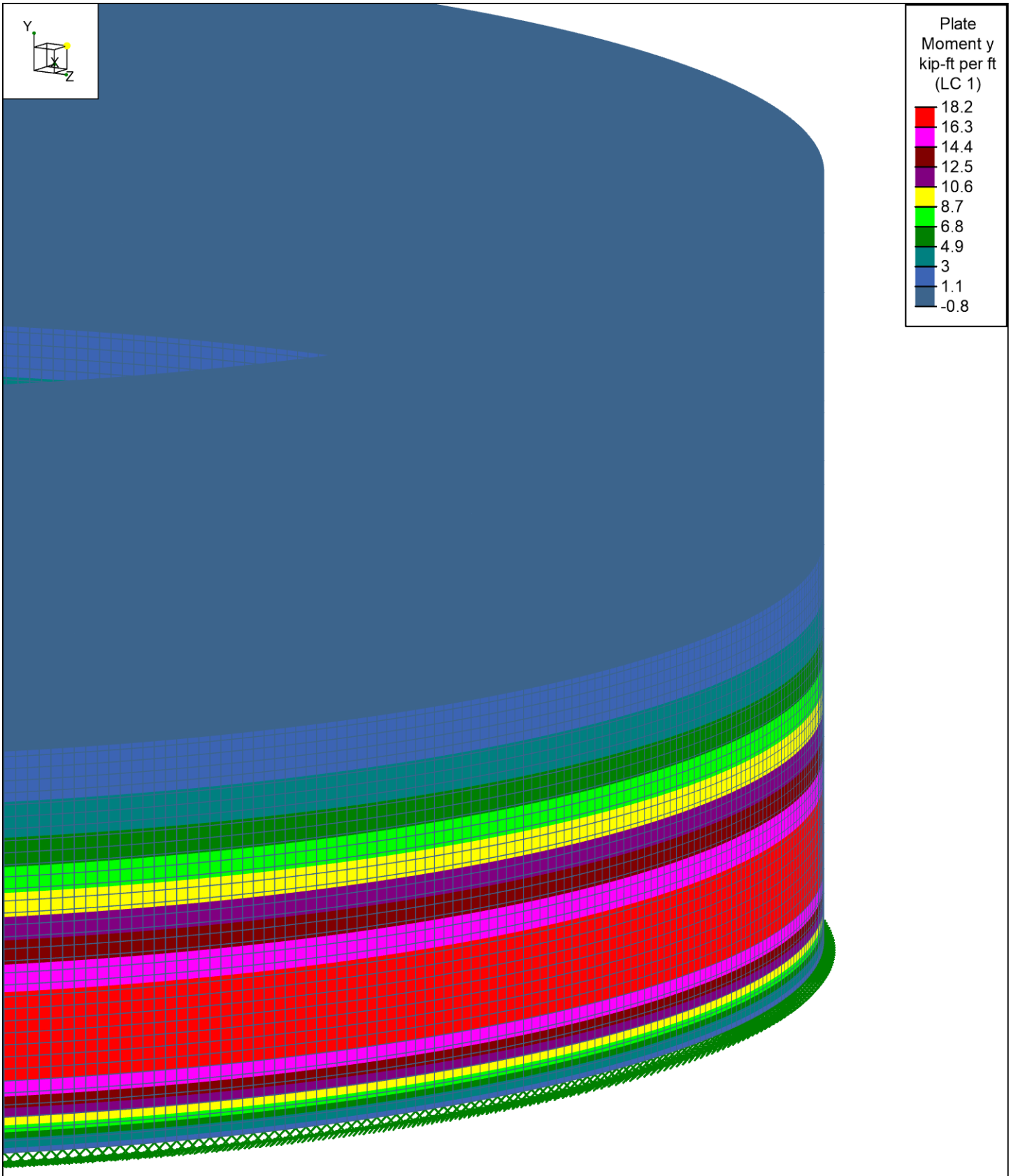
Fluid Pressure on tank

Load Combo	Height	Plate Label	Qy	My	Fx	Reinf	Spacing	Label	Ast (in2/Ft)	ΦT (kips)	Design Check
1	32	P36222	0.012	-0.003	-0.523	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	31.5	P35656	0.03	-0.014	1.91	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	31	P35090	0.046	-0.033	4.343	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	30.5	P34524	0.059	-0.059	6.776	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	30	P33958	0.071	-0.092	9.212	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	29.5	P33392	0.082	-0.13	11.65	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	29	P32826	0.09	-0.173	14.093	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	28.5	P32260	0.096	-0.219	16.542	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	28	P31694	0.1	-0.268	18.999	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	27.5	P31128	0.102	-0.319	21.466	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	27	P30562	0.102	-0.37	23.944	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	26.5	P29996	0.099	-0.42	26.436	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	26	P29430	0.094	-0.468	28.944	(2) #6 @	18	" O.C.	0.587	31.68	OK
1	25.5	P28864	0.086	-0.513	31.468	(2) #6 @	12	" O.C.	0.880	47.52	OK
1	25	P28298	0.075	-0.553	34.012	(2) #6 @	12	" O.C.	0.880	47.52	OK
1	24.5	P27732	0.061	-0.587	36.577	(2) #6 @	12	" O.C.	0.880	47.52	OK
1	24	P27166	0.043	-0.613	39.163	(2) #6 @	12	" O.C.	0.880	47.52	OK
1	23.5	P26600	0.022	-0.63	41.773	(2) #6 @	12	" O.C.	0.880	47.52	OK
1	23	P26034	-0.003	-0.635	44.406	(2) #6 @	12	" O.C.	0.880	47.52	OK
1	22.5	P25468	-0.032	-0.626	47.063	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	22	P24902	-0.066	-0.601	49.744	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	21.5	P24336	-0.105	-0.558	52.448	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	21	P23770	-0.148	-0.495	55.174	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	20.5	P23204	-0.197	-0.409	57.919	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	20	P22638	-0.251	-0.297	60.681	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	19.5	P22072	-0.311	-0.156	63.455	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	19	P21506	-0.376	0.015	66.236	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	18.5	P20940	-0.447	0.221	69.018	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	18	P20374	-0.524	0.464	71.795	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	17.5	P19808	-0.606	0.746	74.557	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	17	P19242	-0.694	1.071	77.294	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	16.5	P18676	-0.786	1.441	79.993	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	16	P18110	-0.884	1.858	82.643	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	15.5	P17544	-0.985	2.325	85.228	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	15	P16978	-1.089	2.844	87.729	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	14.5	P16412	-1.195	3.415	90.13	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	14	P15846	-1.302	4.039	92.408	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	13.5	P15280	-1.409	4.717	94.541	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	13	P14714	-1.513	5.447	96.504	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	12.5	P14148	-1.612	6.229	98.271	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	12	P13582	-1.705	7.058	99.811	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	11.5	P13016	-1.788	7.931	101.095	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	11	P12450	-1.859	8.843	102.091	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	10.5	P11884	-1.914	9.787	102.764	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	10	P11318	-1.95	10.753	103.079	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	9.5	P10752	-1.961	11.73	103.002	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	9	P10186	-1.944	12.706	102.494	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	8.5	P9620	-1.894	13.666	101.519	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	8	P9054	-1.805	14.59	100.041	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	7.5	P8488	-1.671	15.459	98.026	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	7	P7922	-1.487	16.249	95.44	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	6.5	P7356	-1.245	16.932	92.252	(2) #6 @	5	" O.C.	2.112	114.048	OK
1	6	P6790	-0.939	17.478	88.436	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	5.5	P6224	-0.562	17.853	83.969	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	5	P5658	-0.107	18.02	78.838	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	4.5	P5092	0.434	17.939	73.031	(2) #6 @	6	" O.C.	1.760	95.04	OK
1	4	P4526	1.069	17.563	66.552	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	3.5	P3960	1.805	16.844	59.409	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	3	P3394	2.649	15.731	51.628	(2) #6 @	8	" O.C.	1.320	71.28	OK
1	2.5	P2828	3.608	14.167	43.245	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	2	P2262	4.688	12.093	34.315	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	1.5	P1696	5.896	9.447	24.911	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	1	P1130	7.235	6.164	15.125	(2) #6 @	10	" O.C.	1.056	57.024	OK
1	0.5	P564	8.71	2.178	5.075	(2) #6 @	10	" O.C.	1.056	57.024	OK

My- bending due to fluid pressure. Reference tank design spreadsheet for capacity- consistent full height

Fx- hoop stress in tank varies over height. See capacities

Qy- shear force. Reference tank design spreadsheet



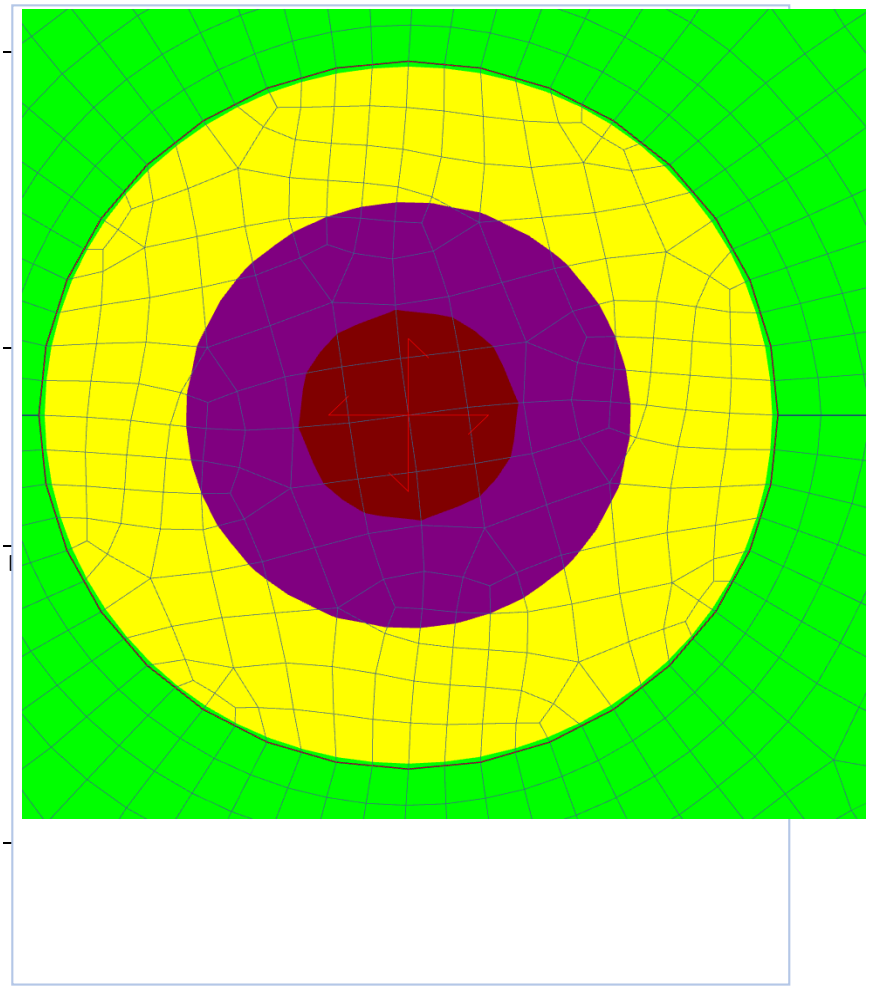
Results for LC 1, 1.4 FL

RISA A NEMETSCHEK COMPANY	<Licensed Company>		SK-1
	joshw		Dec 30, 2024 at 01:50 PM
			240380000 90x32 Digester.r3d

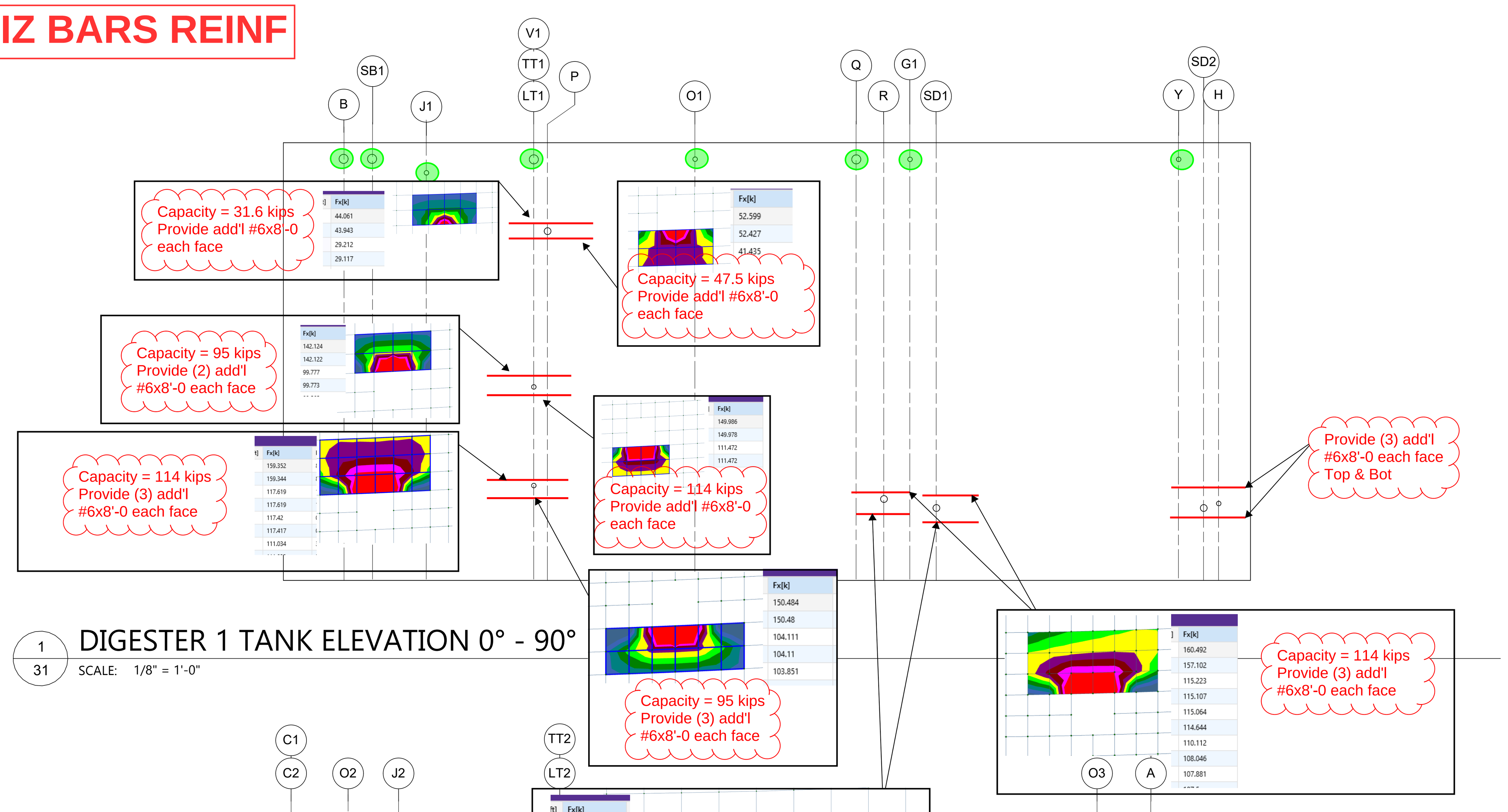
100 kip col load

Diameter (FT)	Area (FT^2)	Pressure (PSF)	Load (LBS)	
9.056	64.4	2,398	154,459	maroon
18.2	195.7	2,342	458,432	purple
30	446.7	2,286	1,021,163	yellow
	0.0	2,230	0	bright green
	0.0		0	dark green
	0.0		0	teal
	0.0		0	bright blue
	0.0		0	dark blue
	0.0		0	
	707		1,634,054	

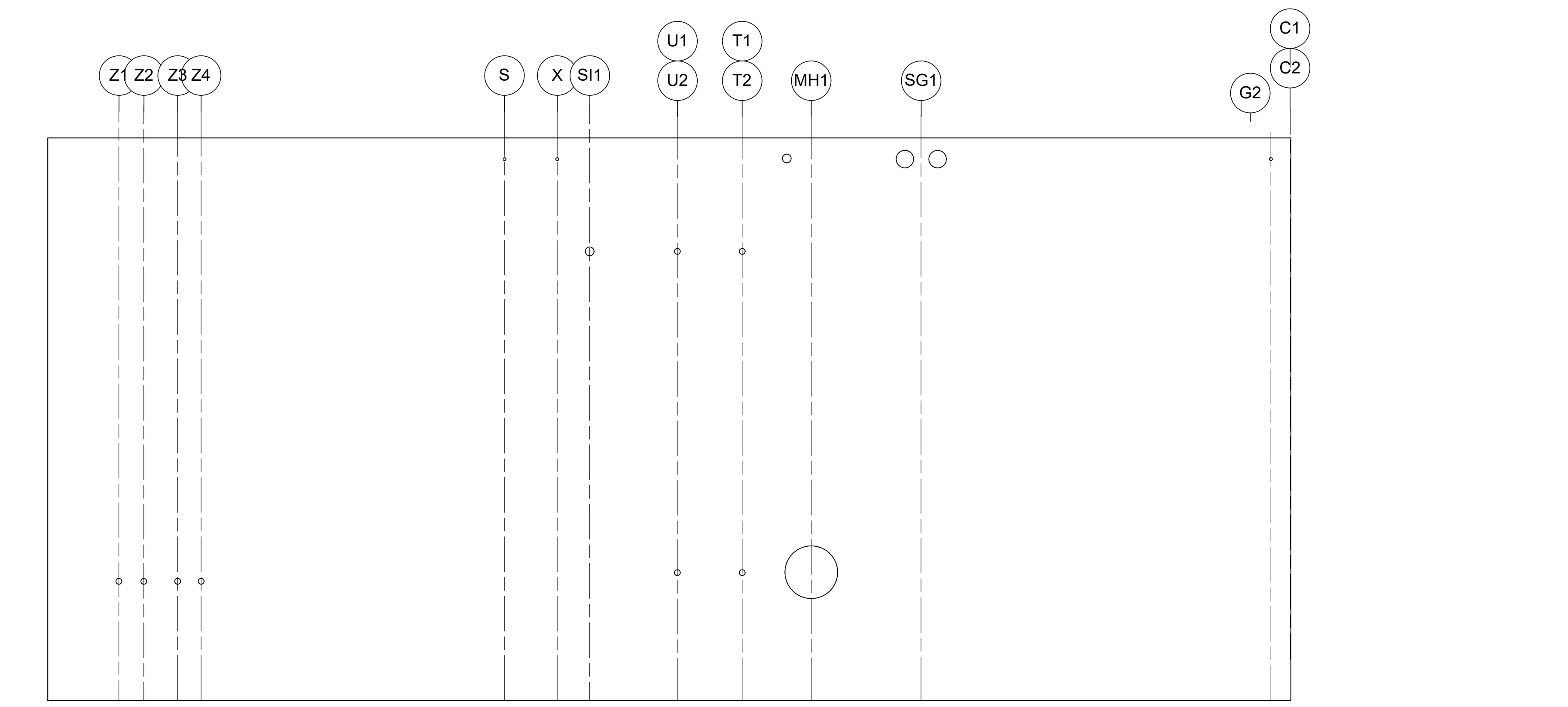
Average bearing pressure **2,312 PSF**



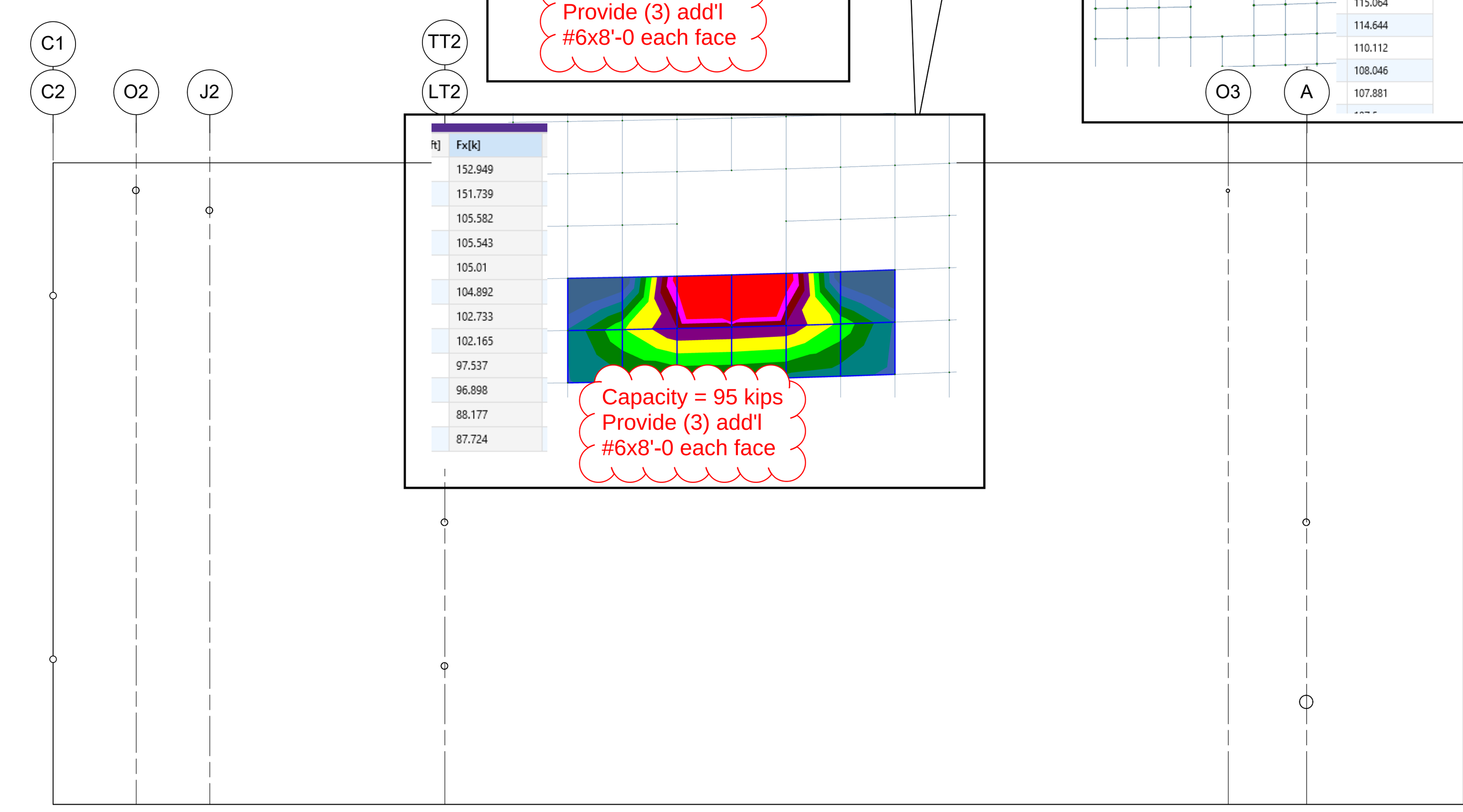
HORIZ BARS REINF



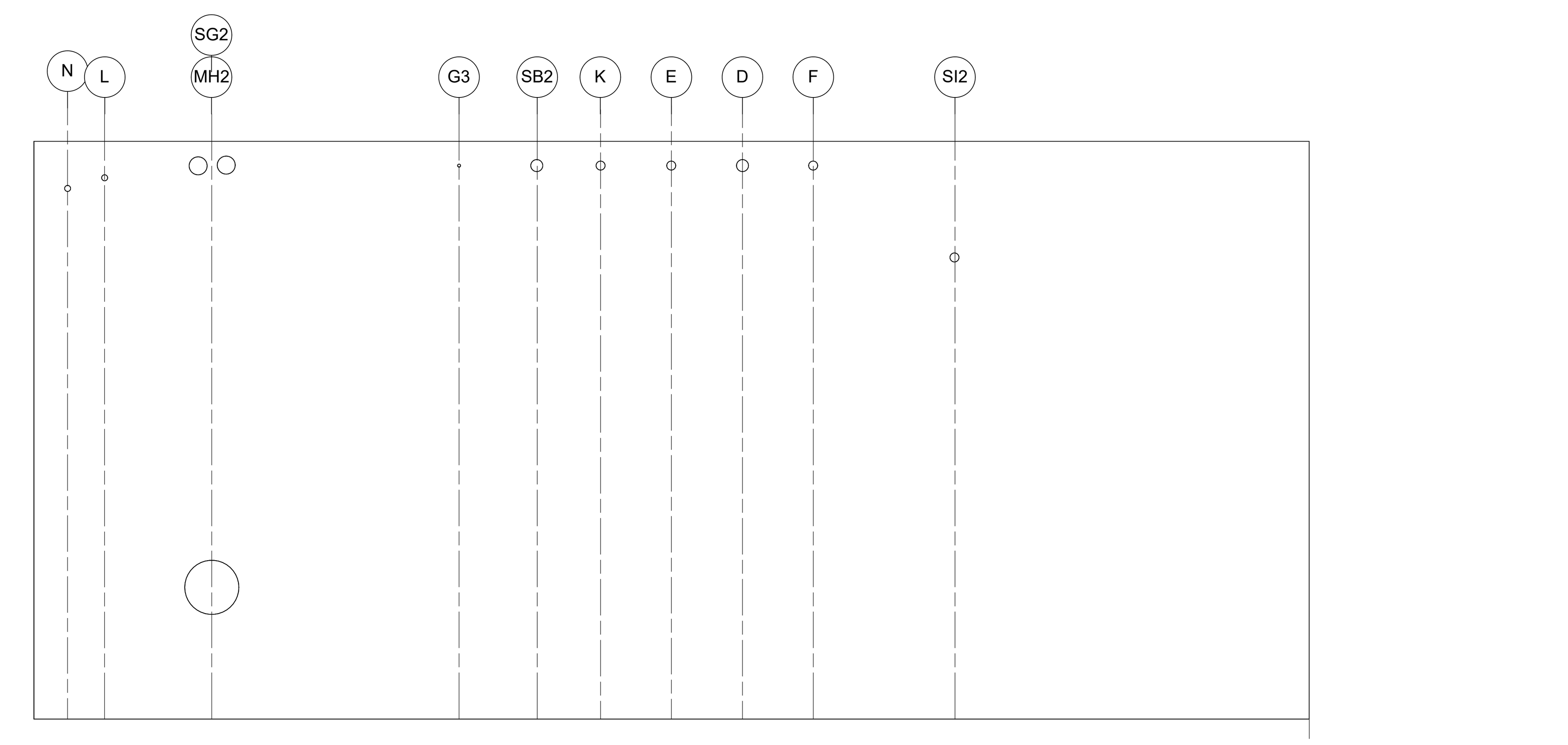
1/31 DIGESTER 1 TANK ELEVATION 0° - 90°
SCALE: 1/8" = 1'-0"



2/31 DIGESTER 1 TANK ELEVATION 90° - 180°
SCALE: 1/8" = 1'-0"



3/31 DIGESTER 1 TANK ELEVATION 180° - 270°
SCALE: 1/8" = 1'-0"

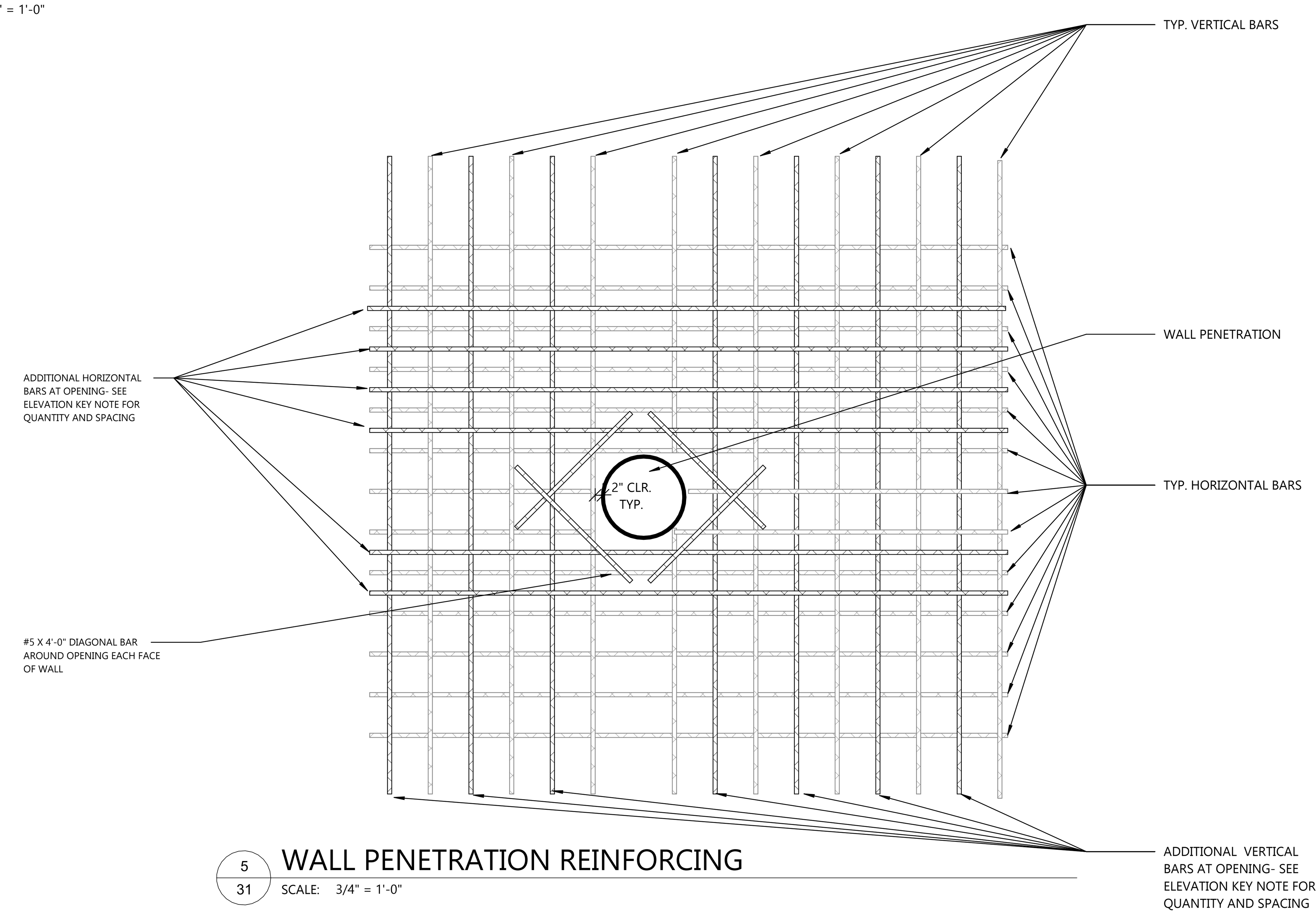


4/31 DIGESTER 1 TANK ELEVATION 270° - 360°
SCALE: 1/8" = 1'-0"

OPENING LAYOUT SHOWN IS SCHEMATIC ONLY. FINAL OPENING DRAWING TO BE UPDATED ONCE FINAL PROCESS DRAWINGS ARE PROVIDED.

PLACEMENT OF REBAR AROUND OPENINGS:

1. PROVIDE ADDITIONAL BARS @ SPACING INDICATED. INSTALL ADDITIONAL BARS CENTERED BETWEEN TYPICAL BARS
2. DO NOT PLACE BARS CLOSER THAN 2" O.C.



5/31 WALL PENETRATION REINFORCING
SCALE: 3/4" = 1'-0"

EXCEL
Always a Better Plan
100 Camelot Drive
Fond du Lac, WI 54935
920-926-9800
excelengineer.com

COLLABORATION

JP TANK CONCRETE

PROJECT INFORMATION

TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

PRELIMINARY DATES

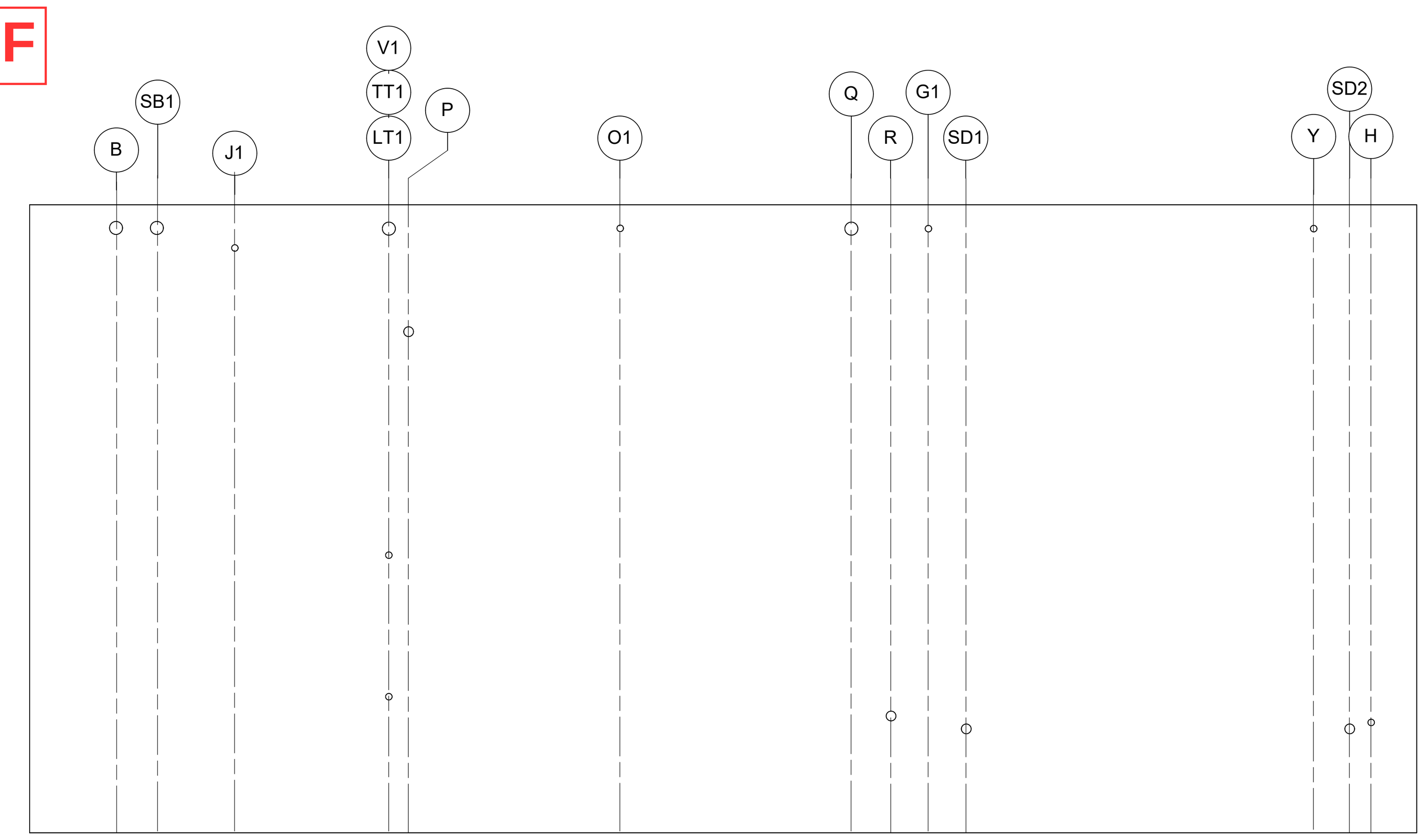
NOT FOR CONSTRUCTION

JOB NUMBER
240089700

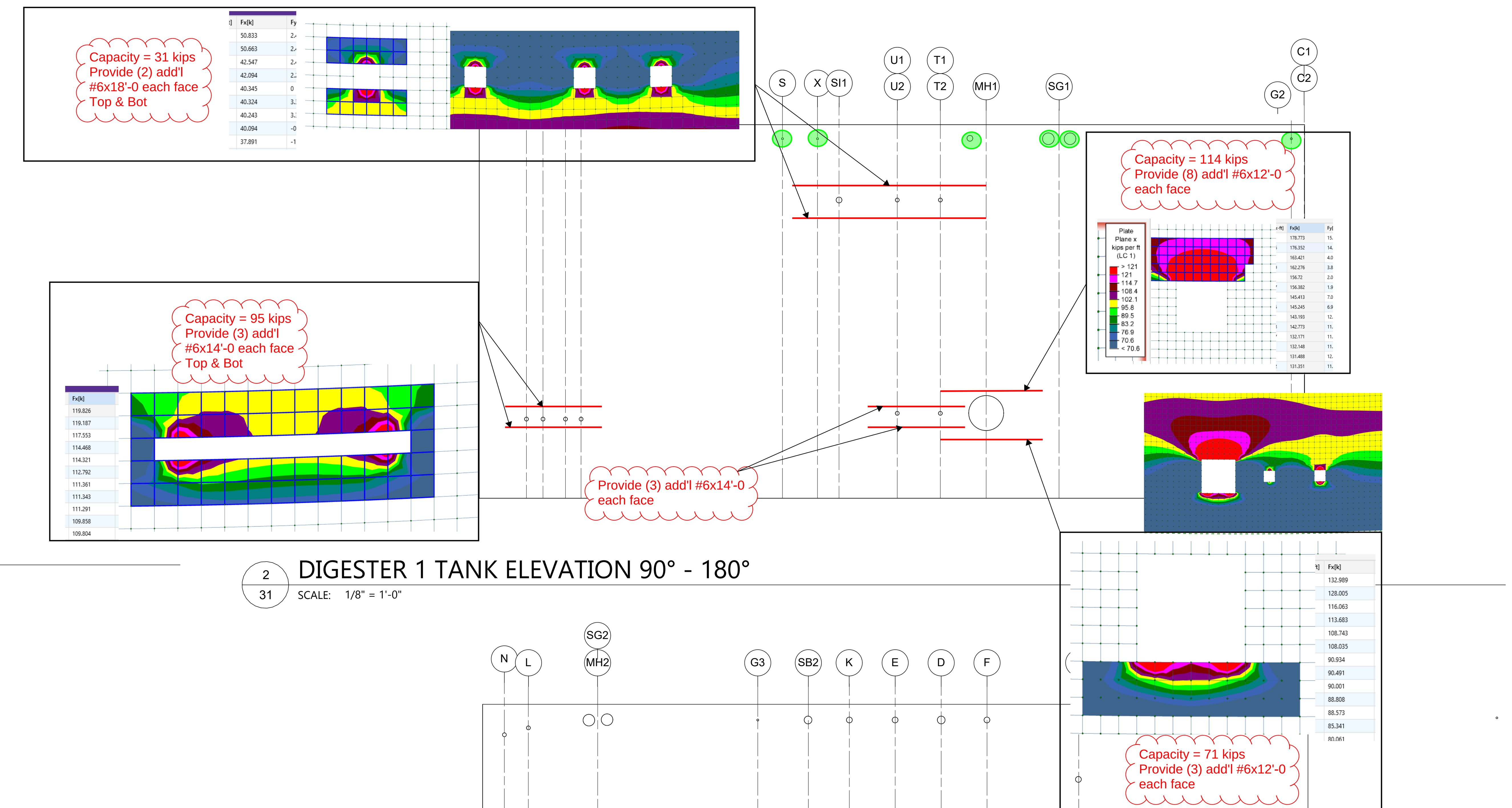
SHEET NUMBER
31

DIGESTER TANK 2 ELEVATIONS

HORIZ BARS REINF

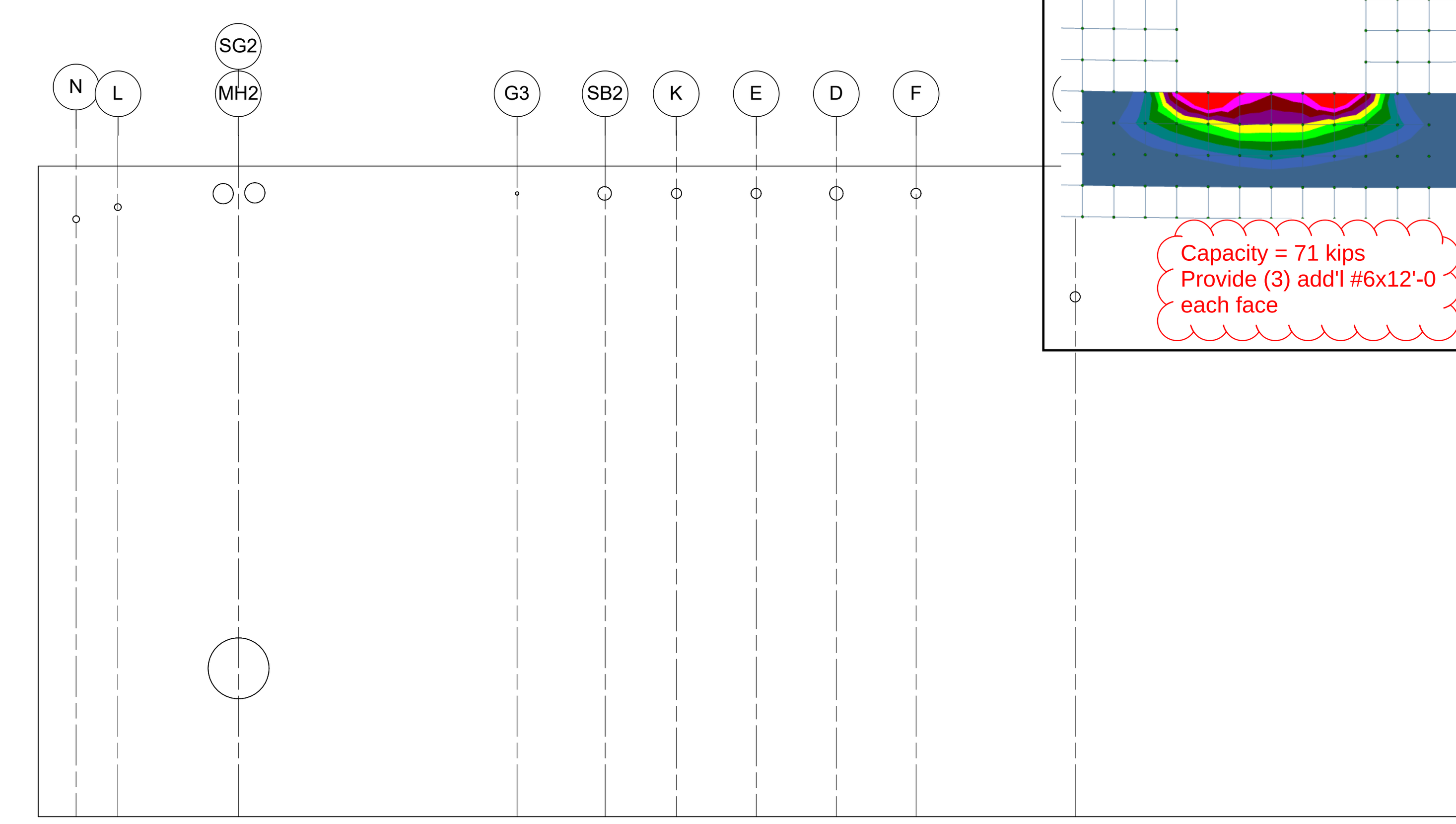


1 / 31 DIGESTER 1 TANK ELEVATION 0° - 90°
SCALE: 1/8" = 1'-0"



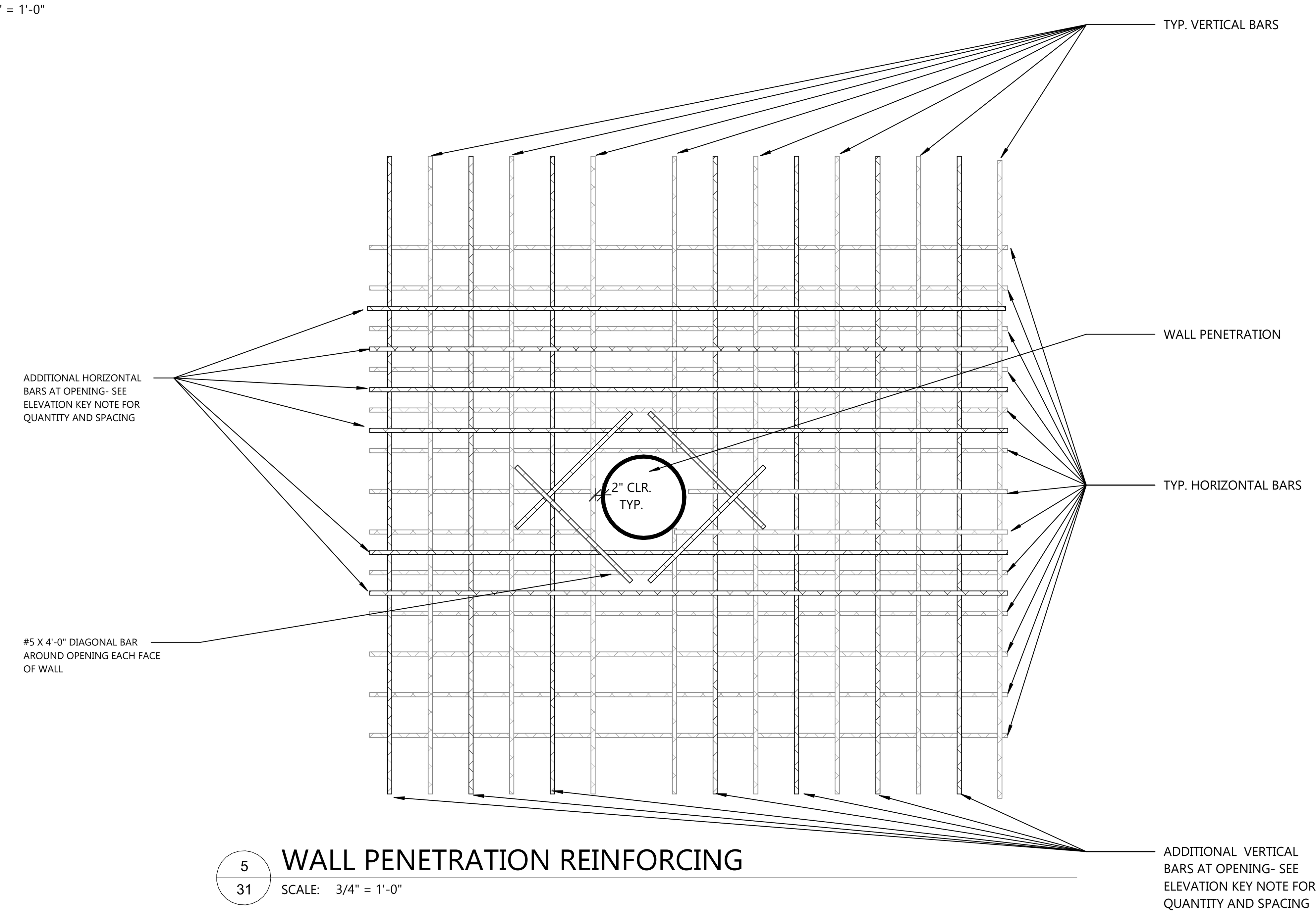
2 / 31 DIGESTER 1 TANK ELEVATION 90° - 180°
SCALE: 1/8" = 1'-0"

3 / 31 DIGESTER 1 TANK ELEVATION 180° - 270°
SCALE: 1/8" = 1'-0"



4 / 31 DIGESTER 1 TANK ELEVATION 270° - 360°
SCALE: 1/8" = 1'-0"

OPENING LAYOUT SHOWN IS SCHEMATIC ONLY. FINAL OPENING DRAWING TO BE UPDATED ONCE FINAL PROCESS DRAWINGS ARE PROVIDED.



5 / 31 WALL PENETRATION REINFORCING
SCALE: 3/4" = 1'-0"

PLACEMENT OF REBAR AROUND OPENINGS:

1. PROVIDE ADDITIONAL BARS @ SPACING INDICATED. INSTALL ADDITIONAL BARS CENTERED BETWEEN TYPICAL BARS
2. DO NOT PLACE BARS CLOSER THAN 2" O.C.

EXCEL
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100 Camelot Drive
Fond du Lac, WI 54935
920-926-9800
excelengineer.com

COLLABORATION
JP TANK CONCRETE

PROJECT INFORMATION

TWO STATE SOD FARM
DIGESTER & HT TANK
SOUTH OF HWY. 9 & N4580 • KEOTA, OK 74941

PROFESSIONAL SEAL

PRELIMINARY DATES

NOT FOR CONSTRUCTION

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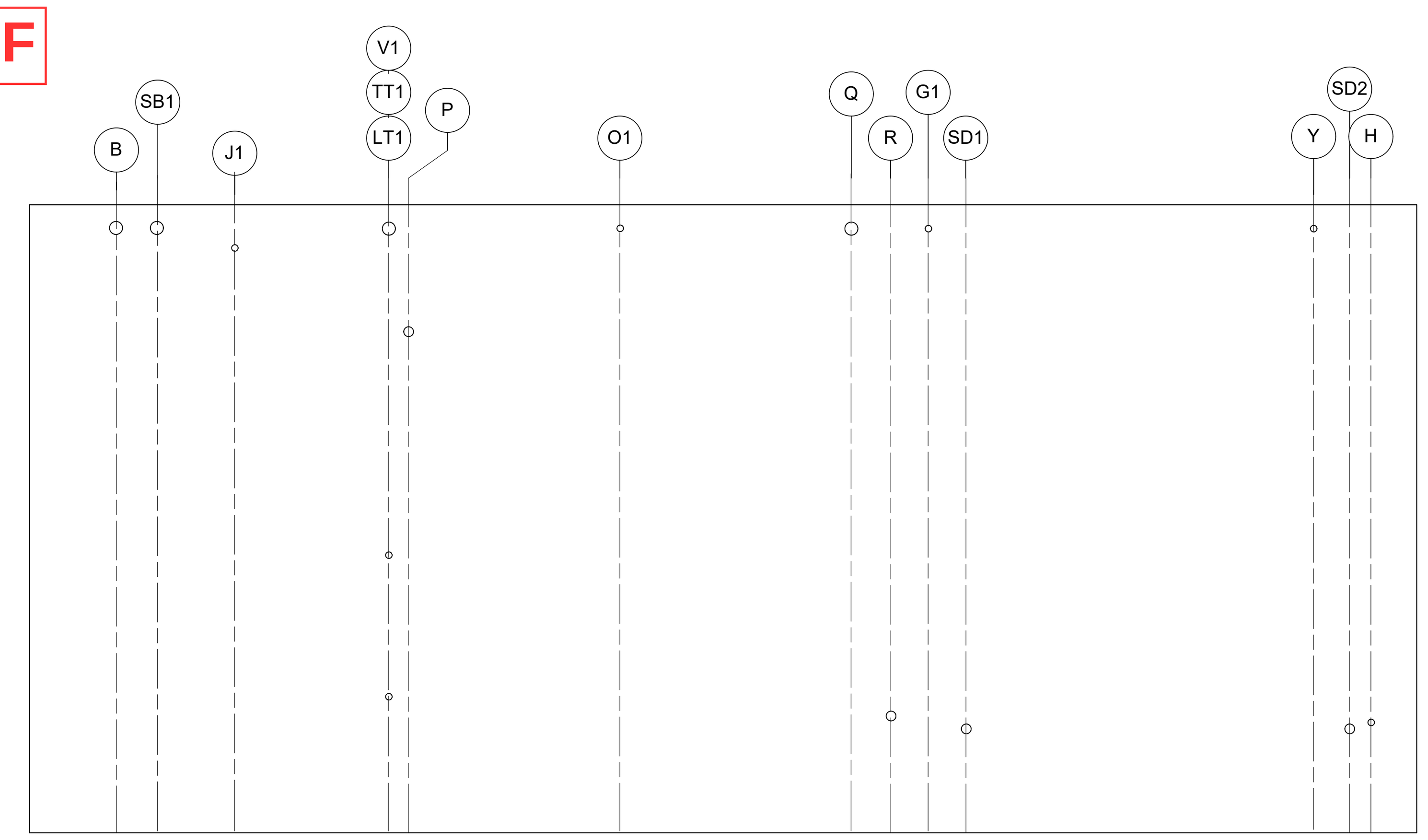
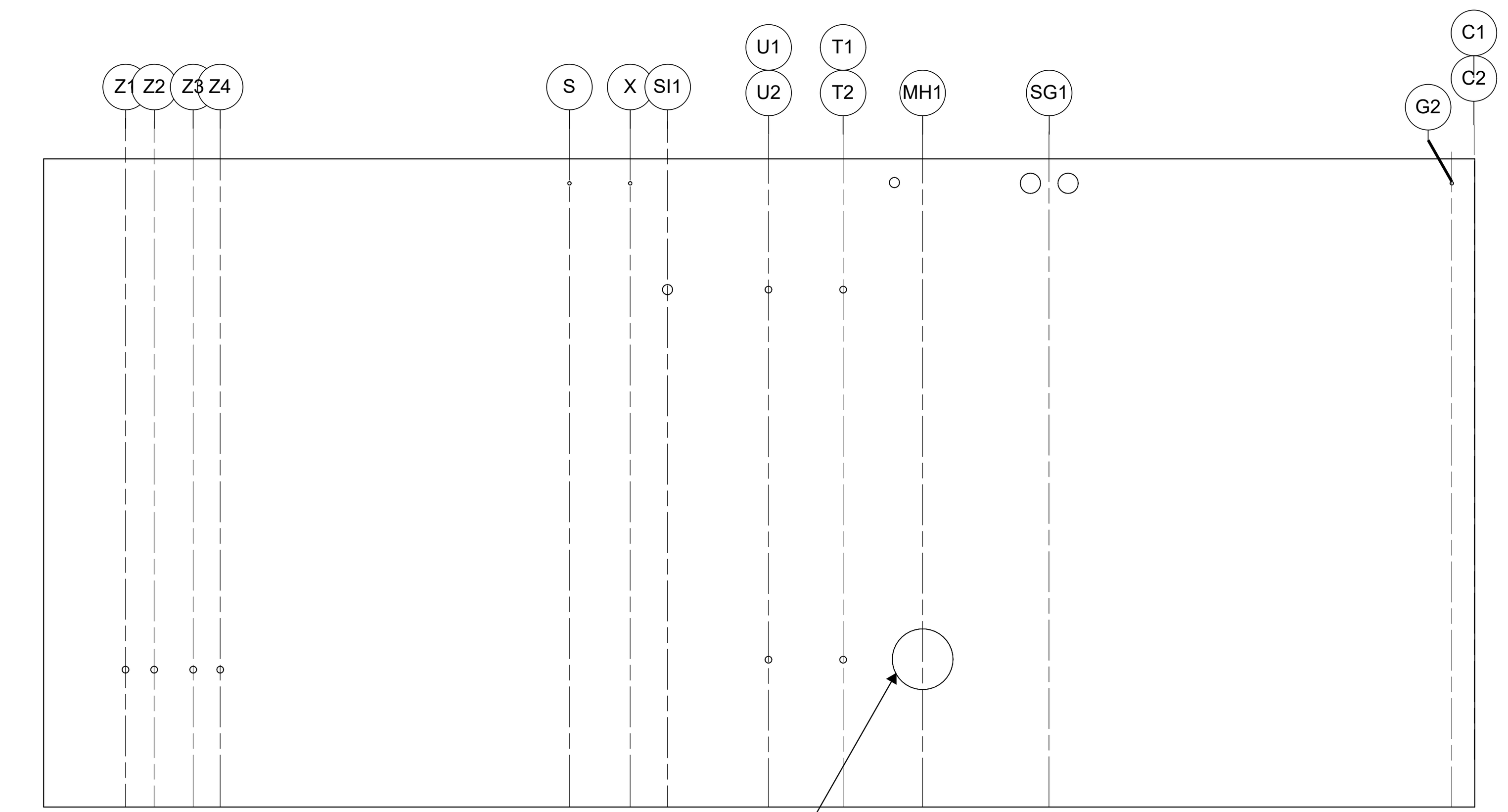
DIGESTER TANK 2 ELEVATIONS

HORIZ BARS REINF



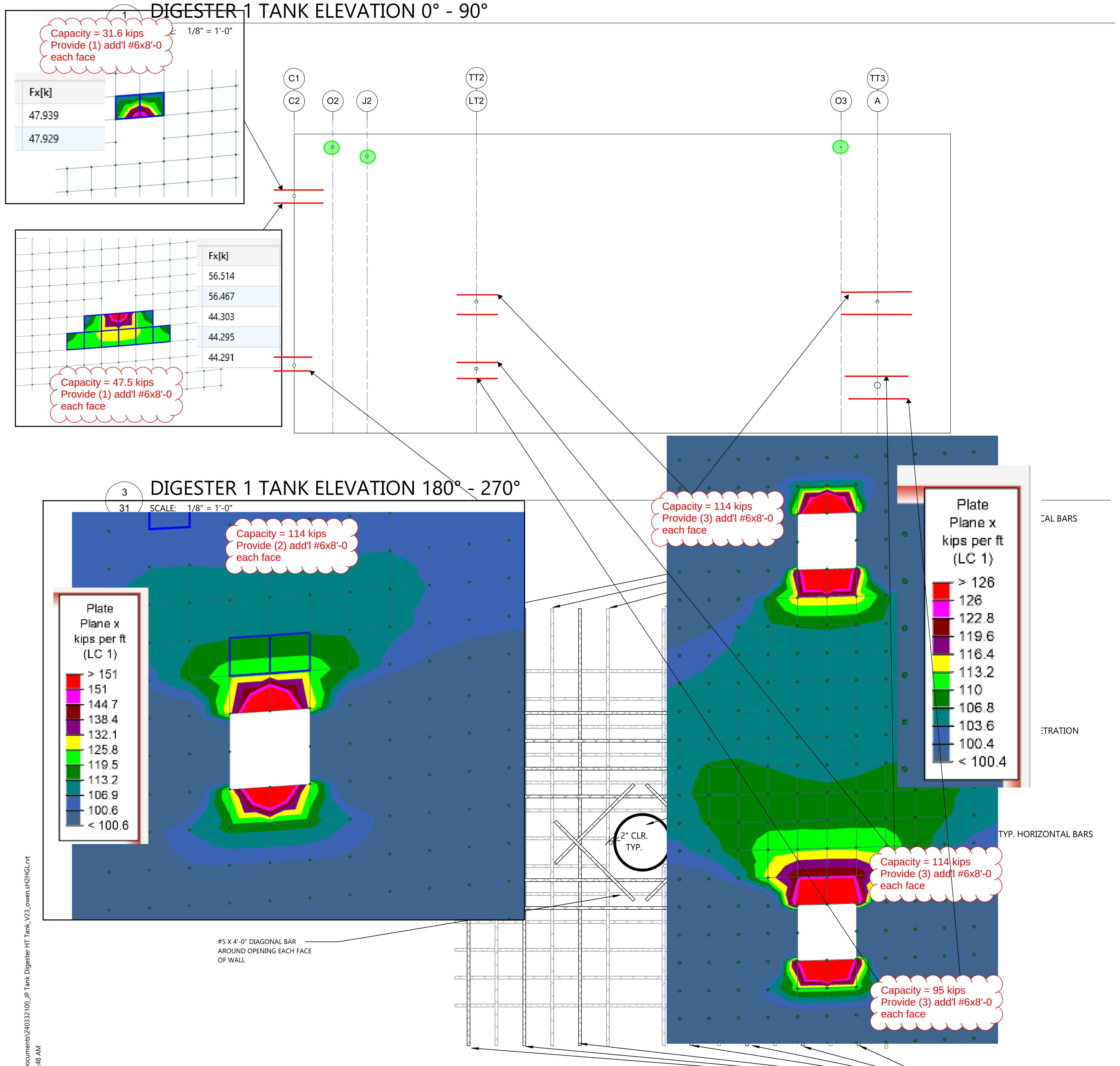
1 DIGESTER 1 TANK ELEVATION 0° - 90°

SCALE: 1/8" = 1'-0"



2 / 31 DIGESTER 1 TANK ELEVATION 90° - 180°

SCALE: 1/8" = 1'-0"

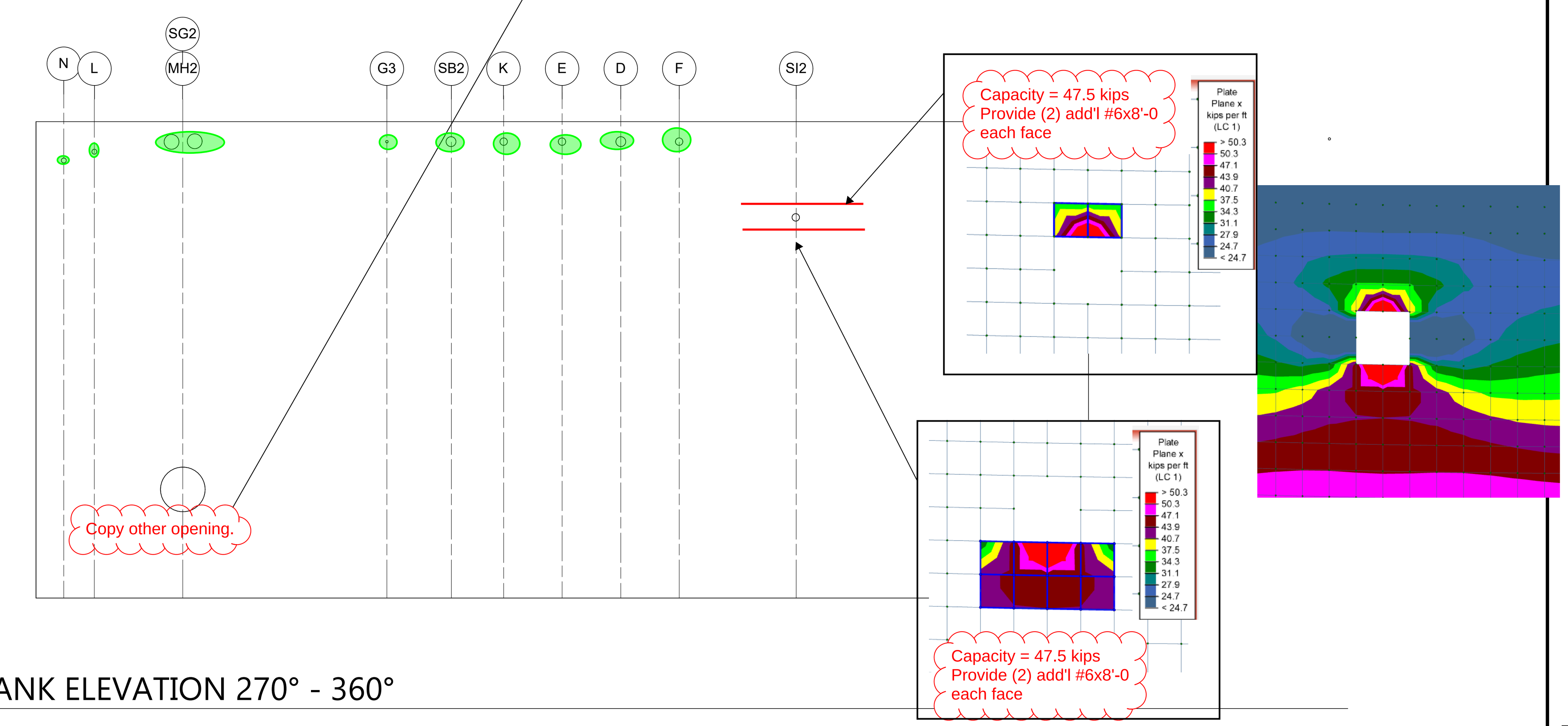


3 / 31 DIGESTER 1 TANK ELEVATION 180° - 270°

SCALE: 1/8" = 1'-0"

5 / 31 WALL PENETRATION REINFORCING

SCALE: 3/4" = 1'-0"



4 / 31 DIGESTER 1 TANK ELEVATION 270° - 360°

SCALE: 1/8" = 1'-0"

OPENING LAYOUT SHOWN IS SCHEMATIC ONLY. FINAL OPENING DRAWING TO BE UPDATED ONCE FINAL PROCESS DRAWINGS ARE PROVIDED.

PLACEMENT OF REBAR AROUND OPENINGS:

1. PROVIDE ADDITIONAL BARS @ SPACING INDICATED. INSTALL ADDITIONAL BARS CENTERED BETWEEN TYPICAL BARS
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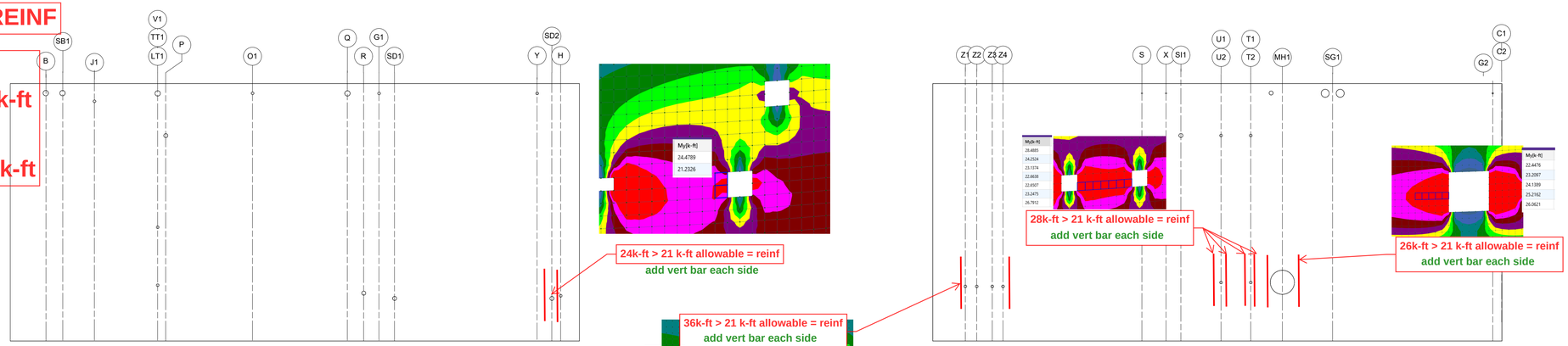
DIGESTER TANK 2 ELEVATIONS

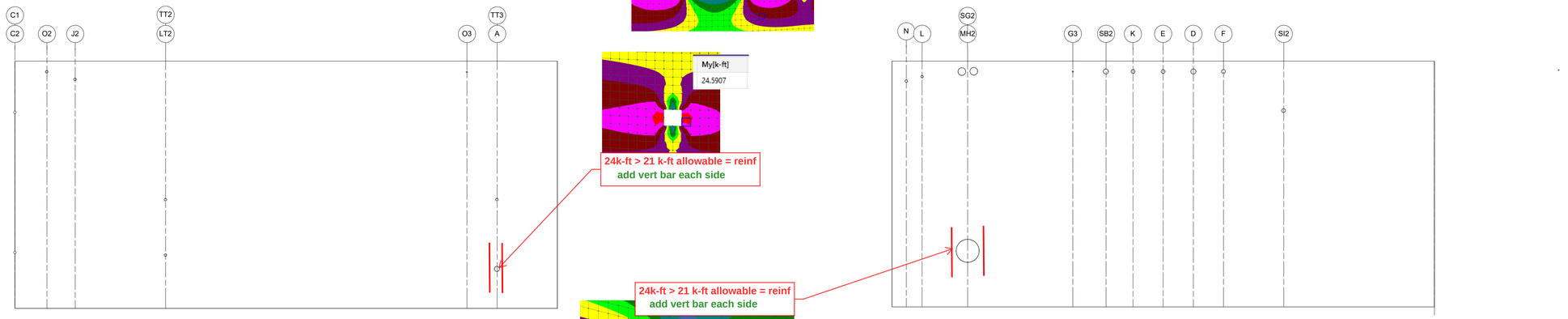
VERTICAL BARS REINF

12' o.c. spacing
allowable Mn = 21 k-ft
6" o.c. spacing
Allowable Mn = 41 k-ft



1/31 DIGESTER 1 TANK ELEVATION 0° - 90°
SCALE: 1/8" = 1'-0"

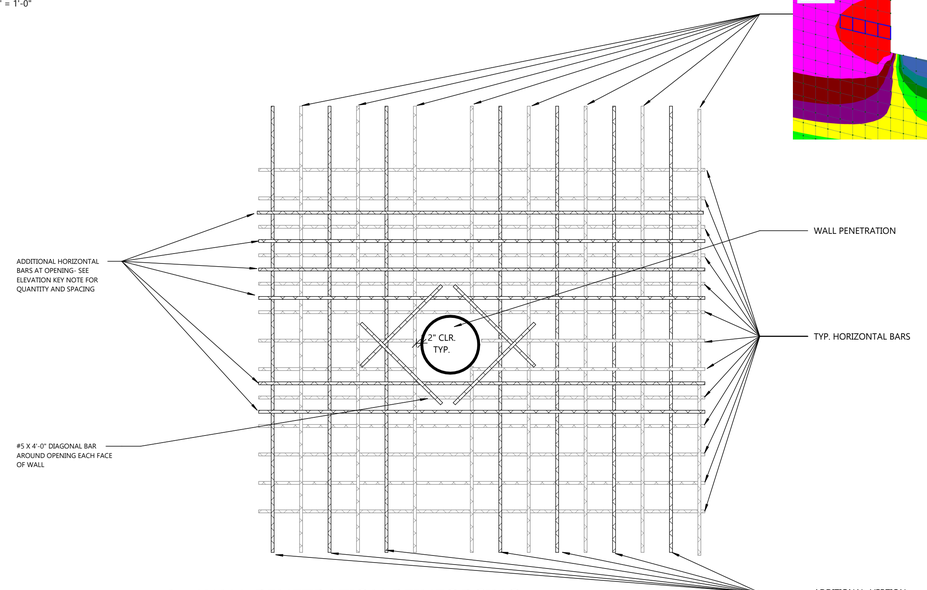
TER 1 TANK ELEVATION 90° - 180°
= 1'-0"



3/31 DIGESTER 1 TANK ELEVATION 180° - 270°
SCALE: 1/8" = 1'-0"

GESTER 1 TANK ELEVATION 270° - 360°
1/8" = 1'-0"

PENING LAYOUT SHOWN IS SCHEMATIC ONLY. FINAL OPENING DRAWING
O BE UPDATED ONCE FINAL PROCESS DRAWINGS ARE PROVIDED.



5/31 WALL PENETRATION REINFORCING
SCALE: 3/4" = 1'-0"

PLACEMENT OF REBAR AROUND OPENINGS:

1. PROVIDE ADDITIONAL BARS @ SPACING INDICATED. INSTALL ADDITIONAL BARS CENTERED BETWEEN TYPICAL BARS
2. DO NOT PLACE BARS CLOSER THAN 2" O.C.

OPENING REINFORCING LEGEND

OPENING REINFORCING
10 PROVIDE (1) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING
10 PROVIDE (2) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING
10 PROVIDE (3) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING
10 PROVIDE (2) ADDITIONAL #6 X 10'-0" LONG VERTICAL BARS EACH FACE BETWEEN EACH PENETRATION

OPENING REINFORCING
12 PROVIDE (12) ADDITIONAL #6 X 12'-0" LONG VERTICAL BARS @ 12" SPACING EACH FACE EACH SIDE OF OPENINGS

OPENING REINFORCING
A PROVIDE (1) ADDITIONAL #6 X 8'-0" LONG BAR EACH FACE AT BOTTOM OF OPENING

OPENING REINFORCING
B PROVIDE (2) ADDITIONAL #6 X 8' LONG BARS @ 5" O.C. EACH FACE AT TOP AND BOTTOM OF OPENING

OPENING REINFORCING
C PROVIDE (2) ADDITIONAL #6 X 8' LONG BARS @ 4" O.C. SPACING EACH FACE T&B OF OPENING

OPENING REINFORCING
D PROVIDE (3) ADDITIONAL #6 X 15' LONG BARS EACH FACE TOP AND BOTTOM OF OPENING - (1) PER SPACING OF TYP. BARS

OPENING REINFORCING
E PROVIDE (3) ADDITIONAL #6 X 8' LONG BARS EACH FACE AT TOP AND BOTTOM OF OPENING - (1) PER SPACING OF TYP BARS

OPENING REINFORCING
F PROVIDE (1) ADDITIONAL #6 X 11' LONG BAR EACH FACE AT BOTTOM OF OPENING

OPENING REINFORCING
G PROVIDE (9) ADDITIONAL #6 X 14' LONG BARS @ 4" O.C. SPACING EACH FACE AT TOP AND (4) #6 X 14' LONG BARS @ 6" O.C. SPACING EACH FACE BELOW

OPENING REINFORCING
H PROVIDE (3) ADDITIONAL #6 X 8' LONG BARS EACH FACE AT TOP AND BOTTOM OF OPENING - (1) PER SPACING OF TYP. BARS

OPENING REINFORCING
J PROVIDE (1) ADDITIONAL #6 X 14' LONG BAR EACH FACE T&B

OPENING REINFORCING
K PROVIDE (2) ADDITIONAL #6 X 21' LONG BARS @ 6" O.C. SPACING EACH FACE AT TOP AND BOTTOM OF OPENINGS

DIGESTER TANK 2 ELEVATIONS

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CONCRETE SLAB ON GRADE THICKNESS ANALYSIS

For Slab Subjected to Single Wheel Loading from Vehicles with Pneumatic Tires
Per PCA "Slab Thickness Design for Industrial Concrete Floors on Grade" - Figure 3, page 5

Job Name:	Dinnerbell Dairy Digester	Subject:	Digester Slab Check		
Job Number:	230376700	Originator:	JJW	Checker:	

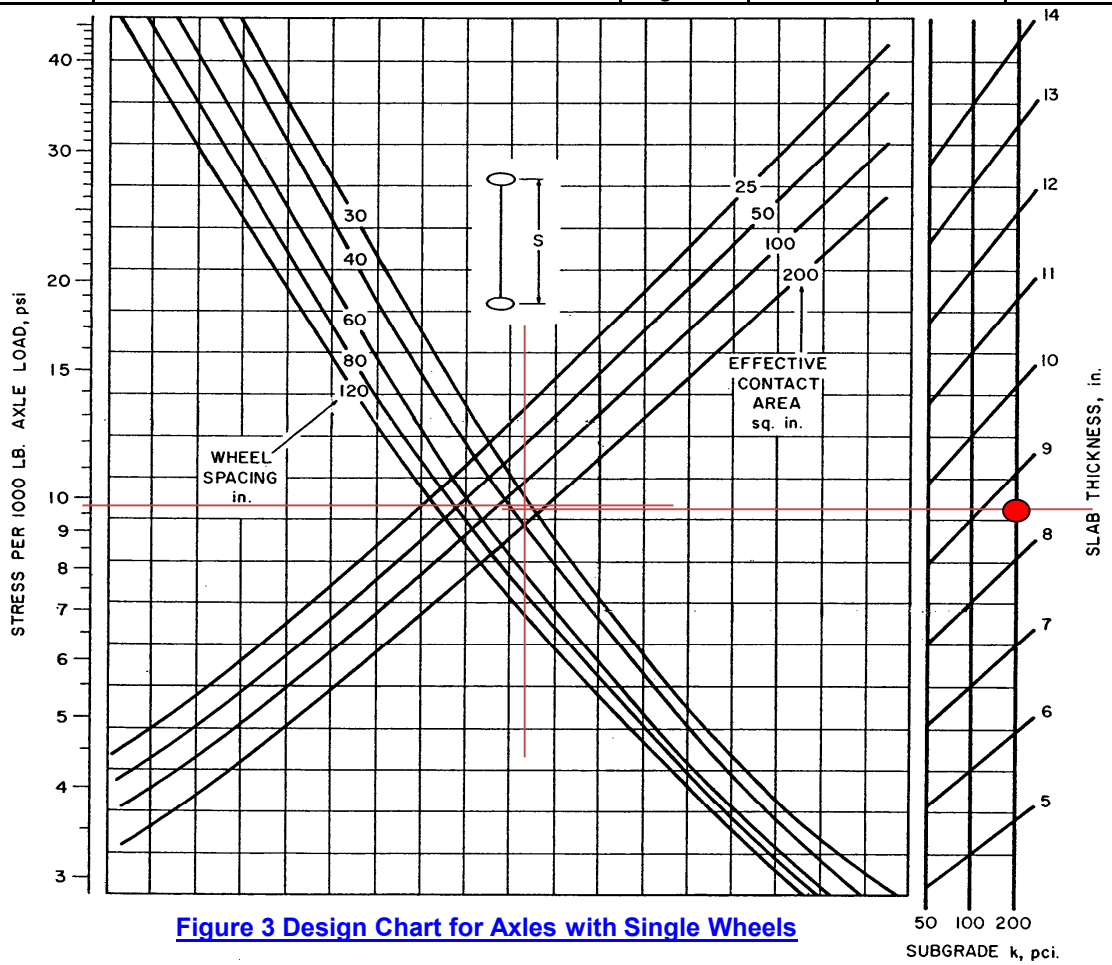


Figure 3 Design Chart for Axles with Single Wheels

Input Data:

Concrete Strength, f 'c =	4000	psi
Subgrade Modulus, k =	100.00	pci
(Unfactored) Axle Load, Pa =	30000.00	lbs.
Wheel Spacing, S =	34.00	in.
Tire Inflation Pressure, Ip =	100.00	psi
Factor of Safety, FS =	2.00	

Instructions for Use of Figure 3:

1. *Enter Design Chart with Slab Stress = 9.49*
2. *Move to right to Eff. Contact Area = 150*
3. *Move up/down to Wheel Spacing = 34*
4. *Move to right to Subgrade Modulus = 100*
5. *Read required Slab Thk., t (Must input below)*

Results:

Wheel Load, Pw =	15000.00	lbs.	Pw = Pa/2 (1/2 of axle load for 2 wheels/axle)
Tire Contact Area, Ac =	150.00	in.^2	Ac = Pw/Ip
Effective Contact Area, Ac(eff) =	150.00	in.^2	Ac(eff) = determined from Figure 5, page 6
Concrete Flexual Strength, MR =	569.21	psi	MR = 9*SQRT(f 'c) (Modulus of Rupture)
Concrete Working Stress, WS =	284.60	psi	WS = MR/FS
Slab Stress/1000 lb. Axle Load =	9.49	psi	Ss = WS/(Pa/1000)
Slab Thickness, t =	12.000	in.	t = determined and input from Figure 3 above

12" slab adequate to support wheel loads

Circular Concrete Tank Design (cont.): Condition 1 & Condition #2a Clay Static Loading

(Pinned Base - Free Top w/ Triangular Load)

Sand- laden Manure

	Vertical	Lateral		
: Wall height = Soil assumed		24	ft	(H)
: Inside tank diameter =		50	ft	(D)
: Wall thickness =		12	in	(t)
: Weight of liquid (internal) =	72	72	pcf	(wl)
: Weight of soil (external) =	115	100	pcf	(ws)
: Horizontal pressure from surcharge (external) =		200	psf	(S)
: Vertical surface pressure creating horizontal surcharge (external) =		230	psf	(W)
: Factored horizontal pressure from surcharge = Sd(1.6)(S) =		320	psf	(p)
: Concrete compressive strength (wall) =		4000	psi	(f'c)
: Concrete compressive strength (footing) =		4000	psi	(f'c foot)
: Reinforcement yield strength =		60	ksi	(fy)
: Modulus of elasticity (concrete wall) = $(57)(f'c)^{.5}$ =		3605	ksi	(Ec)
: Modulus of elasticity (steel) =		29000	ksi	(Es)
: Ratio of moduli of elasticity = (Es/Ec) =		8.0		(n)
: $H^2/Dt = (H)^2/(D)(t)$ =		11.52		(H^2/Dt)
: w_S (soil pressure) = (1.6)(ws) =		160.00	pcf	(w_S)
: w_L (liquid pressure) = (1.4)(wl) =		100.80	pcf	(w_L)
: $w_L HR = (w_L)(H)(D/2)$ =		60480.00	pcf	$(w_L HR)$

Horizontal Reinforcing (ring steel) Bar size = #5 # Bars per row = 2 Splice length = 24 inches

Point	Elev. (ft)	Tension coeff. Table A-5	Ring Tension (plf)	As per row (in^2/ft)	Max. spacing (in o.c.)	Act. spacing (in o.c.)	As provided (in^2/ft)	Check Strength & T+S
0.0H	24.00	-0.004	-212	0.14	18.00	18.00	0.21	O.K.
0.1H	21.60	0.097	5836	0.14	18.00	18.00	0.21	O.K.
0.2H	19.20	0.198	11960	0.14	18.00	18.00	0.21	O.K.
0.3H	16.80	0.304	18401	0.17	18.00	18.00	0.21	O.K.
0.4H	14.40	0.420	25386	0.24	15.83	12.00	0.31	O.K.
0.5H	12.00	0.544	32886	0.30	12.22	12.00	0.31	O.K.
0.6H	9.60	0.665	40189	0.37	10.00	8.00	0.47	O.K.
0.7H	7.20	0.745	45058	0.42	8.92	8.00	0.47	O.K.
0.8H	4.80	0.710	42911	0.40	9.36	8.00	0.47	O.K.
0.9H	2.40	0.466	28184	0.26	14.26	12.00	0.31	O.K.
1.0H	0.00	0.000	0					

Wall Thickness

: Allowable concrete tensile stress = (.1)(f'c) = ...Per Section 4, of "Circular Concrete Tanks Without Prestressing" by PCA, 1993		400.00	psi	(Ta)
: Actual concrete tensile stress = ((.0003)(Es)(As provided)+(Tmax))/(Ac+(n)(As provided)) =	O.K.	265.87	psi	(Tu)

Vertical Reinforcing (moment steel) Bar size = #6 # of layers = 2

Outside face bar spacing = 18.00 in o.c. Outside face As = 0.2933 in^2/ft d outside = 9.625 in

a outside = 0.431 in a inside = 0.431 in

Inside face bar spacing = 18.00 in o.c. Inside face As = 0.2933 in^2/ft d inside = 9 in

Point	Elev. (ft)	Moment coeff. Table A-7	Mu outside (ft-lb)	ϕMn outside (ft-lb)		Mu inside (ft-lb)	ϕMn inside (ft-lb)	
0.0H	24.00	0.0000	0	12420	O.K.	0	11595	O.K.
0.1H	21.60	0.0000	0	12420	O.K.	0	11595	O.K.
0.2H	19.20	0.0000	0	12420	O.K.	0	11595	O.K.
0.3H	16.80	-0.0001	-174	12420	O.K.	-100	11595	O.K.
0.4H	14.40	-0.0002	-244	12420	O.K.	-400	11595	O.K.
0.5H	12.00	0.0001	70	12420	O.K.	-900	11595	O.K.
0.6H	9.60	0.0007	906	12420	O.K.	-700	11595	O.K.
0.7H	7.20	0.0019	2648	12420	O.K.	1400	11595	O.K.
0.8H	4.80	0.0035	4842	12420	O.K.	3600	11595	O.K.
0.9H	2.40	0.0041	5644	12420	O.K.	2900	11595	O.K.
1.0H	0.00	0.0000	0	12420	O.K.	0	11595	O.K.

Circular Concrete Tank Design (cont.): Condition #1 Clay Static Loading

(Pinned Base - Free Top w/ Triangular Load)

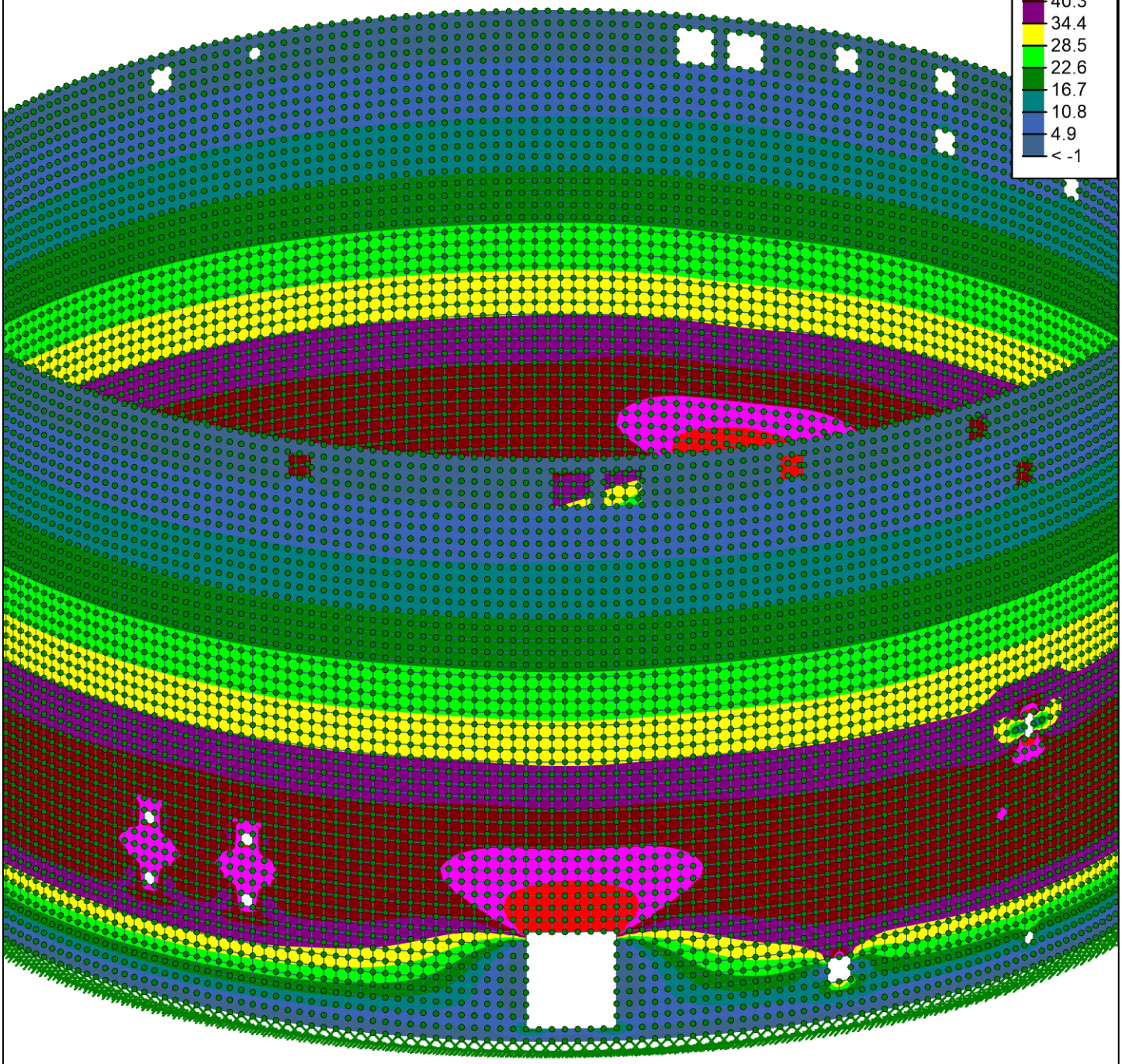
: Shrink & Temp Vertical r/f = As/(12)(h) =	0.0041	**O.K. > 0.0018**				
Crack Control (vertical steel spacing)	outside face		inside face			
: c = kd =	1.759		1.695			
: ρ = As/(12)(d) =	0.0025		0.0027			(ρ)
: k = ((2(ρn)+(ρn)^2)$^{.5}$)-(ρn) =	0.183		0.188			(k)
: j = 1-(k/3) =	0.939		0.937			(j)
: fs = M/(As)(j)(d) =	18.245	**OK < fs max**	10.912	**OK < fs max**	ksi	(fs)
: z =	**136**		**201**	**OK**	k/in	(z)
: dc =	2.375		3		in	(dc)
: Pre ACI 318-99 max spacing = (z)^3/((2(dc)^2(fs)^3) =	36.72	**check**	347.19	**empty tank**	in	(s)
: Cc =	2.000		2.625		in	(Cc)
: ACI 318-11 max spacing = (15)x(40,000/fs) - 2.5Cc <= (12)x(40,000/fs) <= 18..	18.00	**O.K.**	18.00	**O.K.**	in	(s)

Wall Shear

: Shear coefficient (Table A-12) =				0.0810		(C_{shear})
: Actual outside face shear = (C_{shear})(w_{ui})(H^2) =				4702.92	lb	(Vui)
: Actual inside face shear = (C_{shear})(((w_{ue})(H^2))+((p)(H))) =				8087.04	lb	(Vue)
: Allowable outside face shear = (.75)(2)(f'c)$^{.5}$(12)(d outside) =			**O.K.**	10957.29	lb	(ϕVc)
: Allowable inside face shear = (.75)(2)(f'c)$^{.5}$(12)(d inside) =		**Required increased F'c**	**O.K.**	10245.78	lb	(ϕVc)
Dowel size =	#6	Footing develop. length =	10.5 in			
Outside face dowel spacing =	18.00	Min. projection =	29 in	Total vertical =	56	in
Inside face dowel spacing =	18.00	Hook length =	12 in			
: Allowable dowel shear (shear friction) = (.75)(Asv)(fy)(.6)(1.0) =				**O.K.**	15840.00	lb (Vn)

max of Vert Bar Lap or 24"

Sample HT Tank Analysis with openings- final opening layout needed for final design of this project.



Results for LC 1, 1.4 FL

RISA A NEMETSCHEK COMPANY	<Licensed Company>		SK-1
	joshw		Jun 17, 2024 at 09:21 PM
			230376700 50x24.r3d

Typical horizontal bar analysis

Fluid Pressure on tank

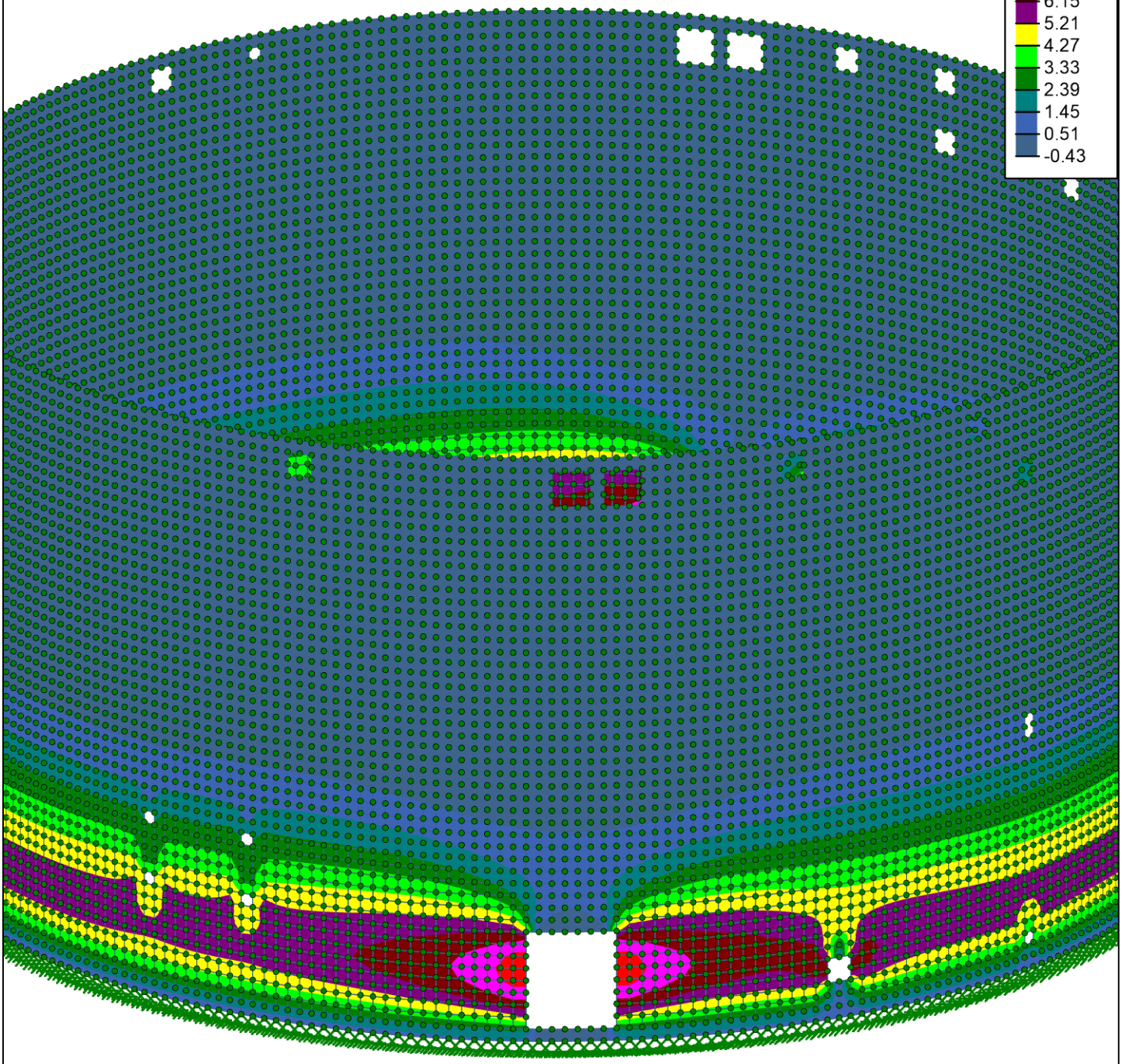
Load Combo	Height	Plate Label	Qy	My	Fx	Reinf	Spacing	Label	Ast (in2/Ft)	ΦT (kips)	Design Check
P14790	1	24 P14790	0.003	-0.001	0.476	(2) #5 @	18	" O.C.	0.413	22.32	OK
P14476	1	23.5 P14476	0.006	-0.003	1.71	(2) #5 @	18	" O.C.	0.413	22.32	OK
P14162	1	23 P14162	0.009	-0.006	2.941	(2) #5 @	18	" O.C.	0.413	22.32	OK
P13848	1	22.5 P13848	0.012	-0.011	4.172	(2) #5 @	18	" O.C.	0.413	22.32	OK
P13534	1	22 P13534	0.016	-0.018	5.404	(2) #5 @	18	" O.C.	0.413	22.32	OK
P13220	1	21.5 P13220	0.021	-0.027	6.641	(2) #5 @	18	" O.C.	0.413	22.32	OK
P12906	1	21 P12906	0.026	-0.039	7.889	(2) #5 @	18	" O.C.	0.413	22.32	OK
P12592	1	20.5 P12592	0.032	-0.054	9.153	(2) #5 @	18	" O.C.	0.413	22.32	OK
P12278	1	20 P12278	0.037	-0.071	10.436	(2) #5 @	18	" O.C.	0.413	22.32	OK
P11964	1	19.5 P11964	0.041	-0.091	11.738	(2) #5 @	18	" O.C.	0.413	22.32	OK
P11650	1	19 P11650	0.044	-0.112	13.057	(2) #5 @	18	" O.C.	0.413	22.32	OK
P11336	1	18.5 P11336	0.046	-0.135	14.391	(2) #5 @	18	" O.C.	0.413	22.32	OK
P11022	1	18 P11022	0.046	-0.158	15.738	(2) #5 @	18	" O.C.	0.413	22.32	OK
P10708	1	17.5 P10708	0.043	-0.18	17.101	(2) #5 @	18	" O.C.	0.413	22.32	OK
P10394	1	17 P10394	0.039	-0.2	18.481	(2) #5 @	18	" O.C.	0.413	22.32	OK
P10080	1	16.5 P10080	0.032	-0.218	19.88	(2) #5 @	18	" O.C.	0.413	22.32	OK
P9766	1	16 P9766	0.021	-0.231	21.302	(2) #5 @	18	" O.C.	0.413	22.32	OK
P9452	1	15.5 P9452	0.008	-0.239	22.749	(2) #5 @	12	" O.C.	0.620	33.48	OK
P9138	1	15 P9138	-0.01	-0.238	24.221	(2) #5 @	12	" O.C.	0.620	33.48	OK
P8824	1	14.5 P8824	-0.032	-0.228	25.72	(2) #5 @	12	" O.C.	0.620	33.48	OK
P8510	1	14 P8510	-0.059	-0.205	27.245	(2) #5 @	12	" O.C.	0.620	33.48	OK
P8196	1	13.5 P8196	-0.092	-0.167	28.793	(2) #5 @	12	" O.C.	0.620	33.48	OK
P7882	1	13 P7882	-0.13	-0.112	30.361	(2) #5 @	8	" O.C.	0.930	50.22	OK
P7568	1	12.5 P7568	-0.175	-0.035	31.944	(2) #5 @	8	" O.C.	0.930	50.22	OK
P7254	1	12 P7254	-0.227	0.065	33.532	(2) #5 @	8	" O.C.	0.930	50.22	OK
P6940	1	11.5 P6940	-0.285	0.193	35.115	(2) #5 @	8	" O.C.	0.930	50.22	OK
P6626	1	11 P6626	-0.349	0.352	36.678	(2) #5 @	8	" O.C.	0.930	50.22	OK
P6312	1	10.5 P6312	-0.42	0.544	38.204	(2) #5 @	8	" O.C.	0.930	50.22	OK
P5998	1	10 P5998	-0.495	0.772	39.67	(2) #5 @	8	" O.C.	0.930	50.22	OK
P5684	1	9.5 P5684	-0.573	1.039	41.049	(2) #5 @	8	" O.C.	0.930	50.22	OK
P5370	1	9 P5370	-0.653	1.346	42.311	(2) #5 @	8	" O.C.	0.930	50.22	OK
P5056	1	8.5 P5056	-0.732	1.692	43.418	(2) #5 @	8	" O.C.	0.930	50.22	OK
P4742	1	8 P4742	-0.806	2.076	44.331	(2) #5 @	8	" O.C.	0.930	50.22	OK
P4428	1	7.5 P4428	-0.871	2.496	45.002	(2) #5 @	8	" O.C.	0.930	50.22	OK
P4114	1	7 P4114	-0.922	2.944	45.381	(2) #5 @	8	" O.C.	0.930	50.22	OK
P3800	1	6.5 P3800	-0.953	3.414	45.415	(2) #5 @	8	" O.C.	0.930	50.22	OK
P3486	1	6 P3486	-0.955	3.892	45.045	(2) #5 @	8	" O.C.	0.930	50.22	OK
P3172	1	5.5 P3172	-0.919	4.362	44.214	(2) #5 @	8	" O.C.	0.930	50.22	OK
P2858	1	5 P2858	-0.836	4.803	42.863	(2) #5 @	8	" O.C.	0.930	50.22	OK
P2544	1	4.5 P2544	-0.692	5.187	40.938	(2) #5 @	8	" O.C.	0.930	50.22	OK
P2230	1	4 P2230	-0.478	5.483	38.397	(2) #5 @	8	" O.C.	0.930	50.22	OK
P1916	1	3.5 P1916	-0.181	5.65	35.208	(2) #5 @	8	" O.C.	0.930	50.22	OK
P1602	1	3 P1602	0.211	5.645	31.361	(2) #5 @	8	" O.C.	0.930	50.22	OK
P1288	1	2.5 P1288	0.711	5.416	26.862	(2) #5 @	8	" O.C.	0.930	50.22	OK
P974	1	2 P974	1.333	4.905	21.735	(2) #5 @	8	" O.C.	0.930	50.22	OK
P660	1	1.5 P660	2.091	4.048	16.03	(2) #5 @	12	" O.C.	0.620	33.48	OK
P346	1	1 P346	2.993	2.774	9.834	(2) #5 @	12	" O.C.	0.620	33.48	OK
P32	1	0.5 P32	4.044	1.012	3.281	(2) #5 @	12	" O.C.	0.620	33.48	OK

My- bending due to fluid pressure. Reference tank design spreadsheet for capacity- consistent full height

Fx- hoop stress in tank varies over height. See capacities

Qy- shear force. Reference tank design spreadsheet

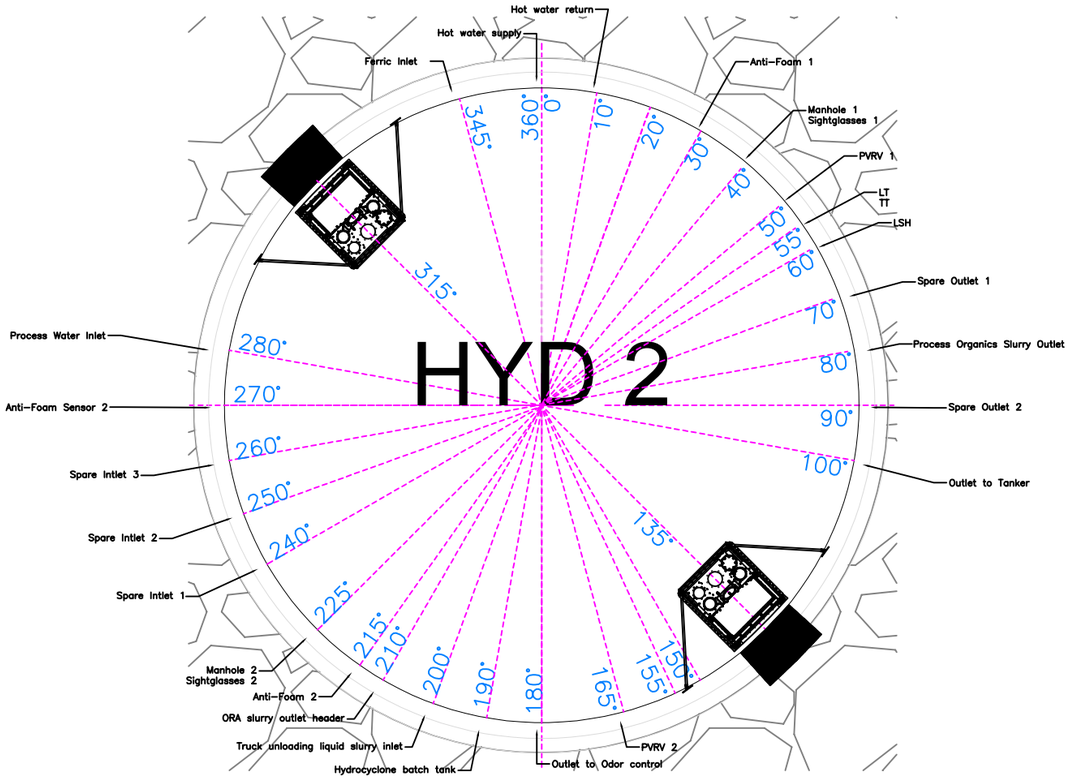
Vertical bending moments in HT tank wall.



Results for LC 1, 1.4 FL

RISA A NEMETSCHEK COMPANY	<Licensed Company>		SK-2
	joshw		Jun 17, 2024 at 09:22 PM
			230376700 50x24.r3d

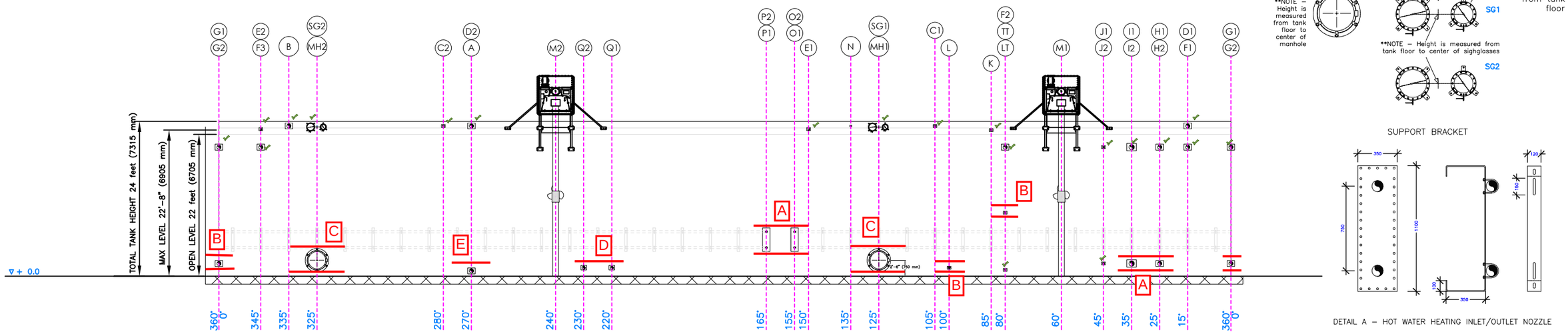
Sample additional reinforcing added for openings.

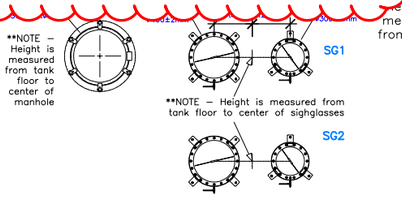


Flange rating similar ASME 16.5

Q1 Q2	DN150	6"	400	1'–4"	220° 230°	1 SIDE	o=1'/i=1.5"	SS316		Spare (Outlet)	
P1 P2	DN100	4"	1350 2100	4'–5" 6'–11"	165°	2 SIDE	o=1'/i=1'	SS316		Hot water return	*Detail A
O1 O2	DN100	4"	1350 2100	4'–5" 6'–11"	155°	2 SIDE	o=1'/i=1'	SS316		Hot water supply	*Detail A
N	DN50	2"	7100	23'–3"	135°	2 SIDE	o=1'/i=1'	SS316		Ferric Chloride dosing inlet	
MH1 MH2	DN800	36"	750	2'–6"	125° 325°					Manhole	
M1 M2					60° 240°					Top Mixer	
L	DN100	4"	400	1'–4"	100°	1 SIDE	o=1'/i=1.5"	SS316		Process organics slurry outlet	
TT	DN100	4"	3000	9'–10"	80°	1 SIDE	o=1'/i=1.5"	SS316		Temperature transmitter	
LT	DN100	4"	300	1'	80°	1 SIDE	o=1'/i=1.5"	SS316		Level transmitter	
K	DN100	4"	6905	22'–8"	85°	1 SIDE	o=1'/i=1.5"	SS316		LSH	
J1 J2	DN100	4"	6100 600	20' 2'	45°	2 SIDE	o=1'/i=1'	SS316		Process water inlet	
I1 I2	DN250	10"	6100 600	20' 2'	35°	2 SIDE	o=1'/i=1'	SS316		Truck unloading liquid slurry inlet	
H1 H2	DN200	8"	6100 600	20' 2'	25°	2 SIDE	o=1'/i=1'	SS316		Hydrocyclone batch tank	
G1 G2	DN200	8"	6100 600	20' 2'	360°	2 SIDE	o=1'/i=1'	SS316		ORA slurry outlet header	
F1 F2 F3	DN200	8"	6100	20'	15° 80° 345°	2 SIDE	o=1'/i=1'	SS316			
E1 E2	DN100	4"	6950	22'–9"	150° 345°	1 SIDE	o=1'/i=1.5"	SS316			
SG1 SG2	DN400 DN300	16" 12"	7050	23'–1"	125° 325°	1 SIDE	o=1'/i=1.5"	SS316			
D1 D2	DN200	8"	7100	23'–3"	15° 240°	1 SIDE	o=1'/i=1.5"	SS316			
C1 C2	DN100	4"	7100	23'–3"	105° 280°	2 SIDE	o=1'/i=1'	SS316			
B	DN200	8"	7100	23'–3"	335°	1 SIDE	o=1'/i=1.5"	SS316			
A	DN200	8"	300	1'	270°	2 SIDE	o=1'/i=1.7'	SS316			
Position	**DN**	**Inch**	**Height (mm)***	**Height (feet)***	**Angle (°)**	**Type**	**Length (inch)**	**Material**			

A: (1) add'l #5 x 11'-0" each face top & bot
B: (1) add'l #5 x 7'-0" each face top & bot
C: (4) add'l #5 x 11'-0" long @ 8" OC each face above opening and (1) #5 x 11'-0" long each face below the opening
D: (1) add'l #5 x 11'-0" long each face above opening
E: (2) add'l #5 x 7'-0" @ 8" OC long each above opening





SUPPORT BRACKET

DETAIL A – HOT WATER HEATING INLET/OUTLET NOZZLE

REV.	DESCRIPTION	PROCESS DESIGN	CIVIL ENGINEER	MECHANICAL ENGINEER	ELECTRICAL ENGINEER	SITE ENGINEER
01/02/2024	FIRST DRAFT					

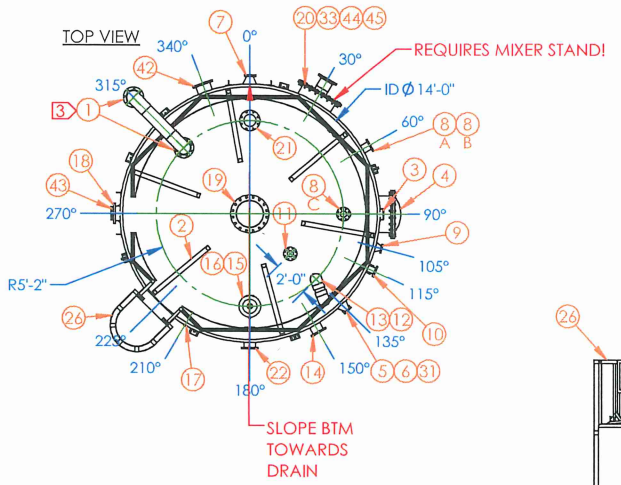
biotrix
Biotrix Asia Co., Ltd.
52 3rdFloor, Soi Phattanawet, Sukhumvit 71, Klongton-Nua Wattana, Bangkok 10110, Thailand
Tel:(662)-003-8162
Website : www.biotrix.asia

PROJECT	SCALE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
AUBURN AD1	1:XXX	CHATNARIN	THANATHONG	CHATNARIN	STEPHEN E.
OWNER: VANGUARD RENEWABLE					

TITLE: HYDROLYSIS TANK 2 DATASHEET

JOB NO. J1324 | REV. A | SHEET 1

DWG. NO. J1324-G-BI0008



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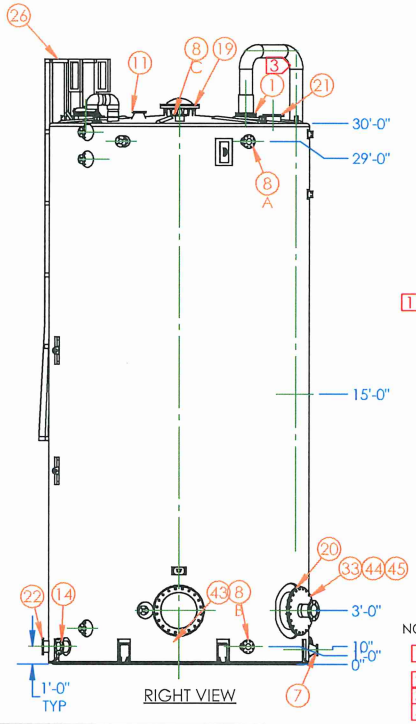
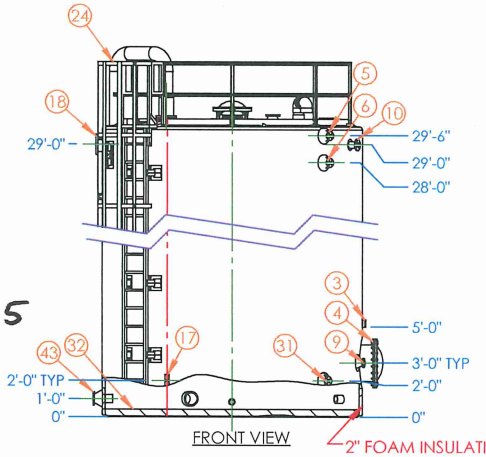
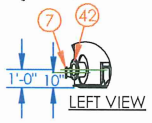






LICENSED PROFESSIONAL ENGINEER
BRENT WILSON
29219
OKLAHOMA
1/31/2025

IN PROCESS	FINAL QC	ITEM NO.	BOM NAME	SIZE	DESCRIPTION	MATERIAL	QTY.	PART NUMBER
3		1	INLET	8"	FF FRP FLANGE	FRP	3	26SF0800
		2	RIBS	4'	FOAM SUPPORT	FRP	6	25FR6003
		3	NAMEPLATE	5" x 7"	FRP KBK NAMEPLATE	FRP	1	21NPASBLYK
		4	MANWAY	24"	HIGH MW W/ NEOPR. GSKT & 304SS BOLTS	FRP	1	90MWHNESS
		5	LSHH	2"	FF FRP FLANGE	FRP	1	26SF0200
		6	LEVEL SWITCH	2"	FF FLANGE FRP	FRP	1	26SF0200
		7	DRAIN	6"	FF FLANGE FRP	FRP	1	26SF0300
		8	SPARE	4"	FF FLANGE FRP	FRP	3	26SF0400
		9	SPARE	4"	FF FLANGE FRP	FRP	1	26SF0200
		10	SPARE	4"	FF FLANGE FRP	FRP	1	26SF0300
		11	LEVEL TRANSMITTER	4"	FF FRP FLANGE	FRP	1	26SF0400
		12	VENT	6"	FRP HALF COUPLING	FRP	1	26HF0600
		13	J-VENT	6"	J-VENT ASSY W/ BIRD SCREEN	PVC	1	30JV0600
		14	SPARE	6"	FF FLANGE FRP	FRP	1	26SF0600
		15	THIEF HATCH		JAYCO JT-8, 12oz PSI/0.4 VAC, VITON GSKT	ALUM	1	31JYRD012V
		16	THIEF HATCH FLANGE	8"	FF FLANGE FRP	FRP	1	26SF0800
		17	GROUNDING LUG		PART #1 STEEL	A36	2	32PT01LUGGDSS
		18	SPARE	8"	FF FLANGE FRP	FRP	1	26SF0800
		19	MANWAY	18"	LOW MW w NEO GSKT & 304SS BOLTS	FRP	1	27MWLD18
		20	MIXER	24"	HIGH MW FLANGE	FRP	1	27MWFLSD24
		21	ODOR EXTRACTION	8"	FF FLANGE FRP	FRP	1	26SF0800
		22	OUTLET	4"	FF FRP FLANGE	FRP	1	26SF0600
1		23	INSULATION	2"	4' x 8' x 2" SCORED FOAM INSULATION	FOAM	1	25FIS040802
		24	TOPHANDRAIL	Ø 14'	TOP HANDRAIL - GALV	A36	1	TOPHANDRAIL
		26	CAGED LADDER	30'	LADDER w/ FALL ARREST		1	CAGED LADDER30
		29	HEAVY LIFT-LUG		PART #23 - A36 STEEL GALV	A36	4	32PT23LUGLIFTH
		30	H.D. SINGLE ANCHOR		PART #25 - H.D. SINGLE PIECE ANCHOR	GALV	8	32PT25HSPAN
		31	TEMPERATURE	2"	FF FRP FLANGE	FRP	1	-
		32	SLOPE BTM		FOAM SLOPE BOTTOM	FOAM	1	25SB1405P400
		33	MIXER LID	Ø 24"	24" x 1/4" SS MW LID - (1) 8" SS SHOP FLANGE	SS	1	
		42	TANK LOADOUT	8"	FF FLANGE FRP	FRP	1	26SF0800
		43	IMMERSION HEATER	4"	FF FRP FLANGE		1	26SF0400
		44	MW GASKET	3/16"	24" MW Gasket - Neoprene	NEOP	1	34GS3160N
		45	BOLT KIT		24" LOW MW BOLT KIT	304SS	1	18MW24L300S

NOTES:
1. TANK IS INSULATED WITH 2" POLYFOAM INSULATION AND GP JACKET.
2. TANK IS ENGINEERED PER 0307333-01_DESIGN_REV0_STAMPED.
3. SEE SHEET 2 FOR DOWNCOMER DETAIL.
4. CONTENTS - UP TO 17% TS FOR FOG AND UP TO 40% TS FOR GLYCERIN.

DESIGN PARAMETERS		FABRICATION MATERIALS		FABRICATION MATERIALS	
PRESSURE:	16oz PSI / 1.0 VAC	LINER RESIN:	VE w/ SILICON CARBIDE	GEL COAT:	WHITE
MAX TEMP:	100°F MAX	LINER GLASS TYPE:	DOUBLE C-VEIL	PIGMENT:	NONE
MIN TEMP:	-20°F MIN	STRUCTURE RESIN:	ISO	GROUNDING STRIP:	YES-FULL LENGTH
CONTENTS: 4	SEE NOTES	STRUCTURE GLASS:	E-GLASS	WATER TEST:	YES-1HR
SPECIFIC GRAVITY:	1.3 MAX	WOVEN ROVING:	24oz (.033")	POST CURE	NO
EMPTY WEIGHT:	17,996 LBS	CHOP HOOP:	27% E-GLASS (.046")	THIEF HATCH GSKT:	VITON
CAPACITY:	30,000 GAL	CHOP GLASS:	E-GLASS (.043")	MANWAY GASKET:	NEOPRENE
REFERENCE SPEC:	PE ENGINEERED 2	CHOPPED MAT:	1 1/2 oz E-GLASS	BOLT TYPE:	304 SS

REVISIONS

REV.	DATE	DESCRIPTION	DRN	CHD
A	09/27/24	UPDATED AS PER CUSTOMER REQUEST	HTS	
B	10/29/24	ADDD IMMERSION HEATER AND TANK LOAD OUT	KAH	BJ

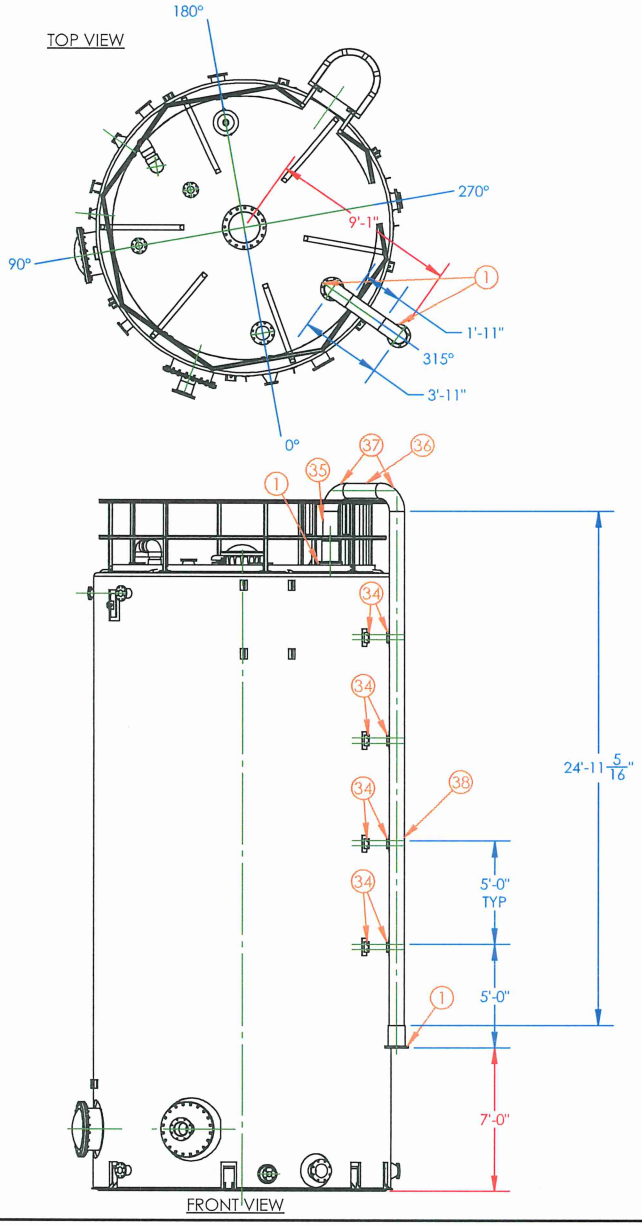
KBK

CUSTOMER
VANGUARD RENEWABLES

DRAWING NAME
Ø 14' x 30' INDUSTRIAL

DRAWING NUMBER
IN-2024-0533

DRAWN BY	K.HYLTON	08-19-2024
CHECKED BY	K. BENTON	08-19-2024
SERIAL NUMBER	0307333-002	
SCALE 1:80	RUSH CENTER, KANSAS LIBERAL, KANSAS	SHEET 1 of 6



IN PROCESS	FINAL QC	ITEM NO.	BOM NAME	SIZE	DESCRIPTION	MATERIAL	QTY.	PART NUMBER
		1	INLET	8"	FF FRP FLANGE	FRP	3	26SF0800
		34	PIPE SUPPORT BRACKET		SS PIPE SUPPORT BRACKET	304SS	8	32PT10BKTWALKW
		35	INLET RISER	8"	FRP PIPE	FRP	1	28080000
		36	INLET RUNNER	8"	FRP PIPE	FRP	1	28080000
		37	LONG RADIUS ELBOW	8"	90° LONG RADIUS ELBOW	FRP	2	26EL9008
		38	INLET DOWNCOMER	8"	FRP PIPE	FRP	1	28080000

Keota AD1
Two State Sod

LICENSED PROFESSIONAL ENGINEER
BRENT WILSON
29219
OKLAHOMA
1/31/2025

NOTES:
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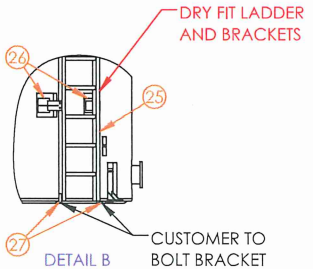
2. TANK IS ENGINEERED PER 0307333-01_DESIGN_REV0_STAMPED.
3. SEE SHEET 2 FOR DOWNCOMER DETAIL.

REVISIONS				
REV.	DATE	DESCRIPTION	DRN	CHD
-	-	See Sheet1	-	-

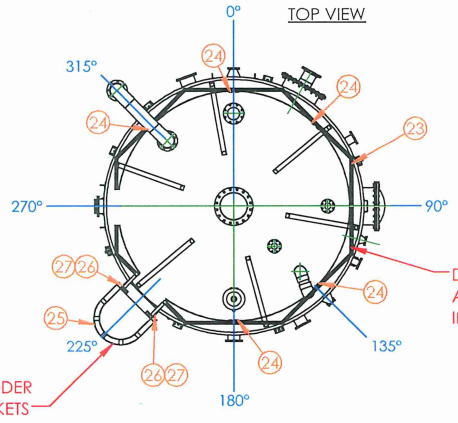
KBK

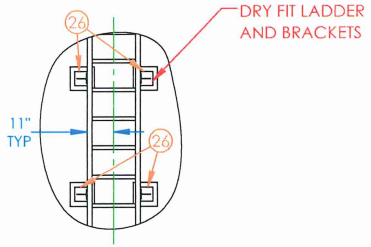
CUSTOMER	VANGUARD RENEWABLES
DRAWING NAME	∅ 14' x 30' INDUSTRIAL
DRAWING NUMBER	IN-2024-0533
DRAWN BY	K.HYLTON 08-19-2024
CHECKED BY	K. BENTON 08-19-2024
SERIAL NUMBER	0307333-002
SCALE 1:70	RUSH CENTER, KANSAS LIBERAL, KANSAS SHEET 2 of 6

IN PROCESS	FINAL QC	ITEM NO.	BOM NAME	SIZE	DESCRIPTION	MATERIAL	QTY.	PART NUMBER
		23	TOPHANDRAIL	Ø14'	TOP HANDRAIL - GALV	A36	1	TOPHANDRAIL
		24	CROWS NEST BRKT SET		CROWS NEST BRKT SET		5	26CNBRKT
		25	CAGED LADDER	30'	LADDER w/ FALL ARREST		1	CAGED LADDER30
		26	FALL ARREST BRKT SS		FALL ARREST BRKT STAINLES STEEL	304SS	14	32PT28FALLARSTBRKT SS
		27	LADDER ANCHOR CLIP		1/4" FRP BRACKET COMES WITH LADDER	FRP	2	

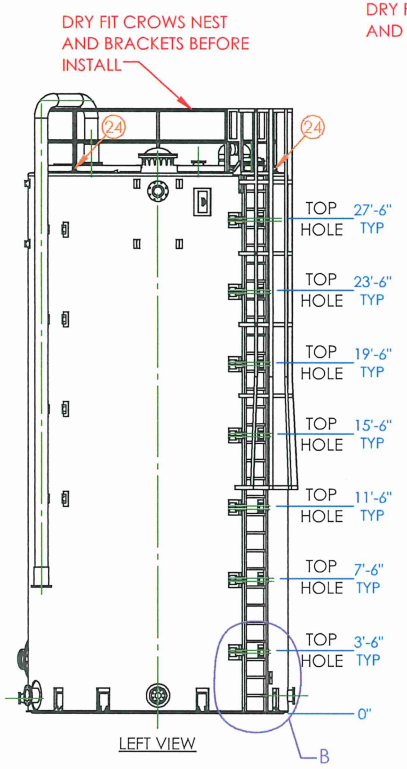


DETAIL B
SCALE 1 : 50

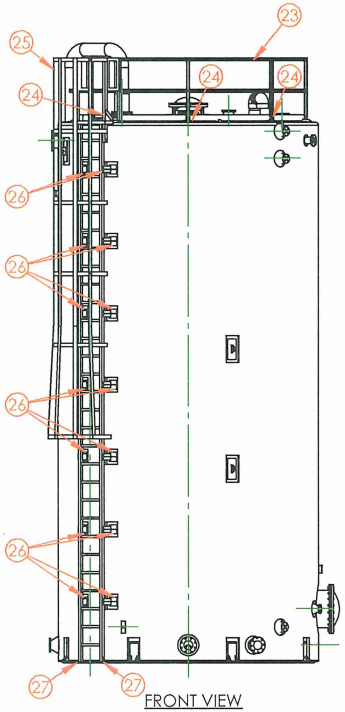




LADDER BRACKET DETAIL
SCALE 1:50



LEFT VIEW



FRONT VIEW

Keota AD1
Two State Sod

NOTES:
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2. TANK IS ENGINEERED PER 0307333-01_DESIGN_REV0_STAMPED.
3. SEE SHEET 2 FOR DOWNCOMER DETAIL.

LICENSED PROFESSIONAL ENGINEER
BRENT WILSON
29219
OKLAHOMA
1/31/2025

REVISIONS				
REV.	DATE	DESCRIPTION	DRN	CHD
-	-	See Sheet1	-	-

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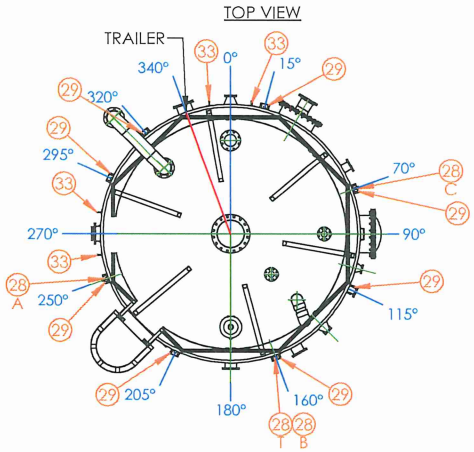
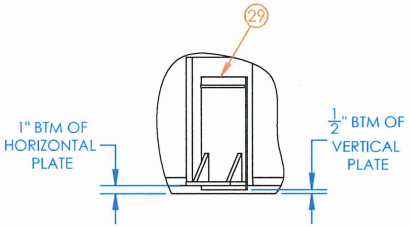
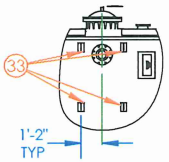
KBK

CUSTOMER	VANGUARD RENEWABLES
DRAWING NAME	Ø 14' x 30' INDUSTRIAL
DRAWING NUMBER	IN-2024-0533
DRAWN BY	K.HYLTON 08-19-2024
CHECKED BY	K. BENTON 08-19-2024
SERIAL NUMBER	0307333-002
SCALE 1:80	RUSH CENTER, KANSAS LIBERAL, KANSAS SHEET 3 of 6



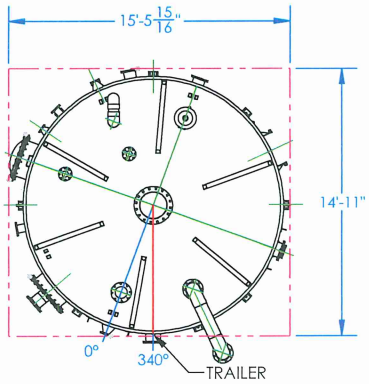


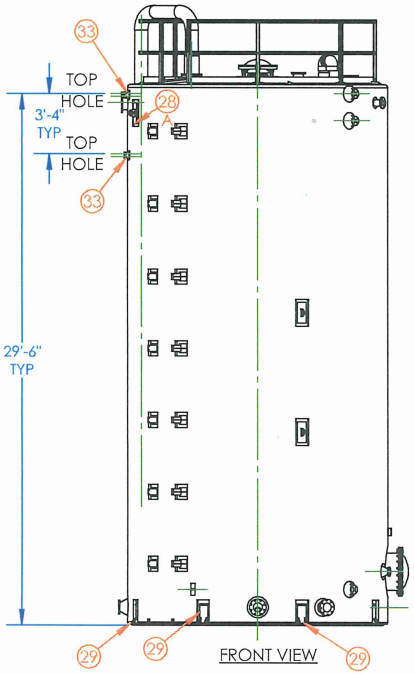
DETAIL C
SCALE 1 : 15

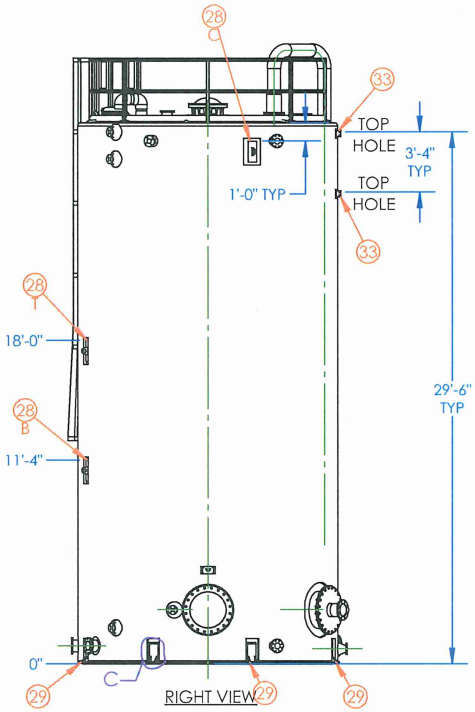


LEFT VIEW

SHIPPING ENVELOPE DETAIL







Keota AD1
Two State Sod

IN PROCESS	FINAL QC	ITEM NO.	BOM NAME	SIZE	DESCRIPTION	MATERIAL	QTY.	PART NUMBER
		28	HEAVY LIFT-LUG		PART #23 - A36 STEEL GALV	A36	4	32PT23LUGLIFTH
		29	H.D. SINGLE ANCHOR		PART #25 - H.D. SINGLE PIECE ANCHOR	GALV	8	32PT25HSPAN
		33	WALKWAY BRACKET		PART #10 BRACKET	304 SS	8	32PT10BKTWALKWS

NOTES:
1. TANK IS INSULATED WITH 2" POLYFOAM INSULATION AND GP JACKET.
2. TANK IS ENGINEERED PER 0307333-01_DESIGN_REV0_STAMPED.
3. SEE SHEET 2 FOR DOWNCOMER DETAIL.

LICENSED PROFESSIONAL ENGINEER
BRENT WILSON
29219
OKLAHOMA
1/31/2025

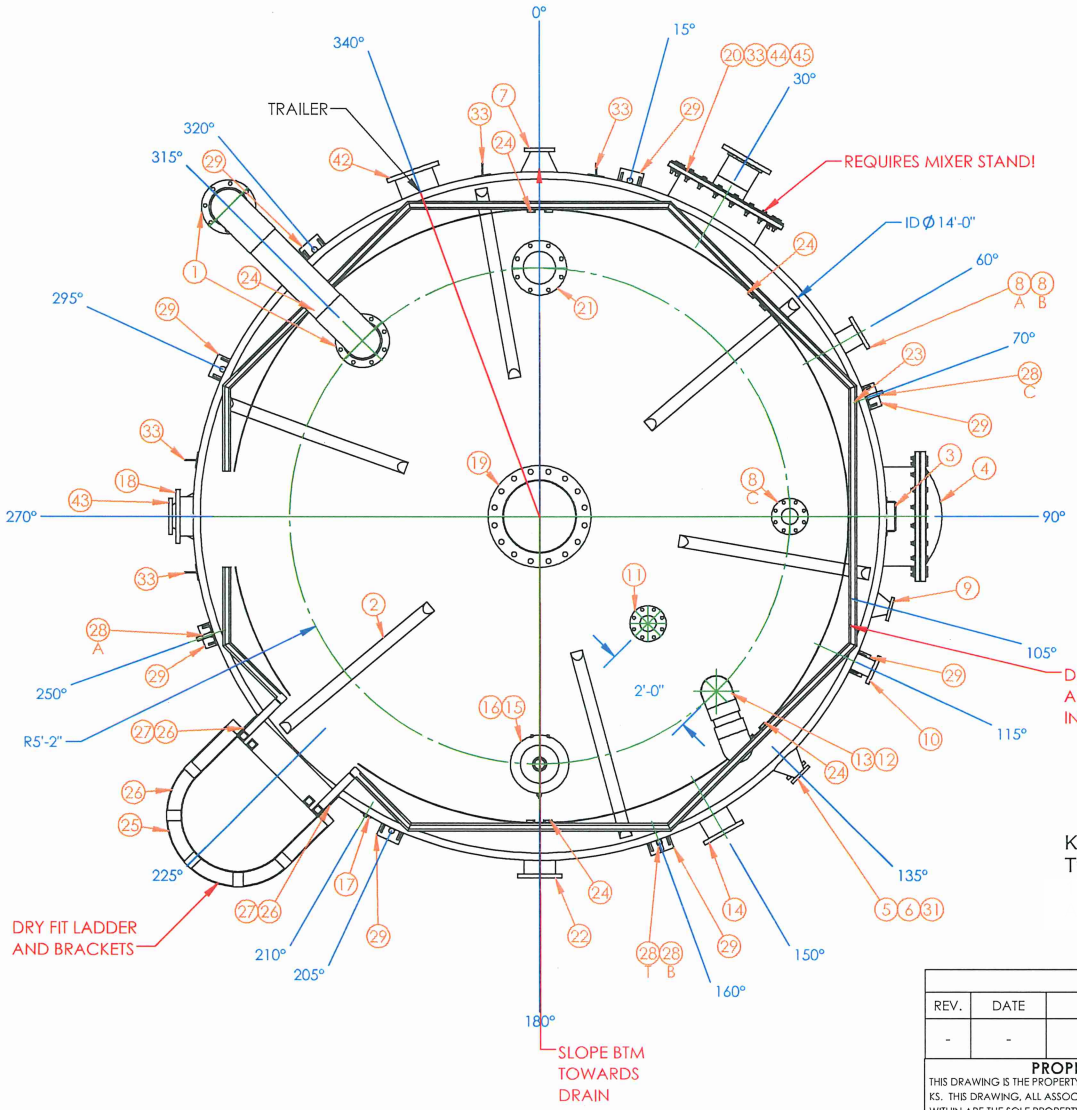
SHIPPED LOOSE ITEMS

IN PROCESS	FINAL QC	ITEM NO.	BOM NAME	SIZE	DESCRIPTION	MATERIAL	QTY.	PART NUMBER
		1	TOPHANDRAIL	Ø14'	TOP HANDRAIL - GALV	A36	1	TOPHANDRAIL
		2	CAGED LADDER	42'	LADDER w/ FALL ARREST		1	CAGED LADDER30
		3	UTILITY WATER DOWNCOMER	8"	UTILITY WATER ASSY	FRP	1	
		4	MIXER STAND		2"x 2" -1/8" ANGLE STEEL	A36	1	

REVISIONS				
REV.	DATE	DESCRIPTION	DRN	CHD
-	-	See Sheet1	-	-

KBK
RUSH CENTER, KANSAS
LIBERAL, KANSAS

CUSTOMER	VANGUARD RENEWABLES
DRAWING NAME	Ø 14' x 30' INDUSTRIAL
DRAWING NUMBER	IN-2024-0533
DRAWN BY	K.HYLTON 08-19-2024
CHECKED BY	K. BENTON 08-19-2024
SERIAL NUMBER	0307333-002
SCALE 1:80	SHEET 4 of 6



Keota AD1
Two State Sod

NOTES:

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2. TANK IS ENGINEERED PER 0307333-01_DESIGN_REV0_STAMPED.
3. SEE SHEET 2 FOR DOWNCOMER DETAIL.

LICENSED PROFESSIONAL ENGINEER
BRENT WILSON
29219
OKLAHOMA

1/31/2025

REVISIONS				
REV.	DATE	DESCRIPTION	DRN	CHD
-	-	See Sheet1	-	-

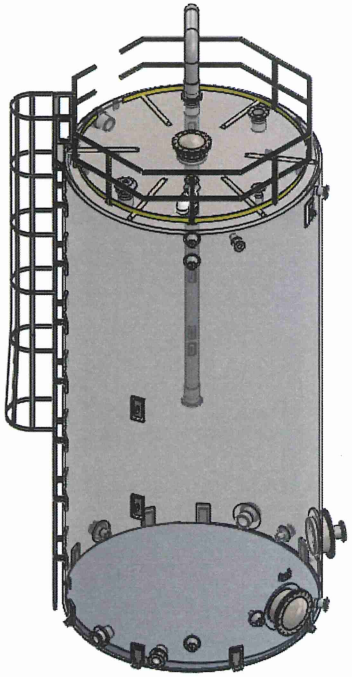
PROPRIETARY NOTICE

THIS DRAWING IS THE PROPERTY OF KBK INDUSTRIES, PO BOX 216, RUSH CENTER, KS. THIS DRAWING, ALL ASSOCIATED CALCULATIONS, AND CONTENTS HERE WITHIN ARE THE SOLE PROPERTY OF KBK INDUSTRIES & ANY USE OF THIS DRAWING FOR ANY PURPOSE OTHER THAN END-CLIENT APPROVAL OR KBK FABRICATION IS STRICTLY PROHIBITED. AT ANY TIME, KBK MAY REQUEST THIS DRAWING AND ALL ASSOCIATED MATERIAL BE RETURNED TO KBK INDUSTRIES.

KBK

CUSTOMER	VANGUARD RENEWABLES
DRAWING NAME	Ø 14' x 30' INDUSTRIAL
DRAWING NUMBER	IN-2024-0533

DRAWN BY	K.HYLTON	08-19-2024
CHECKED BY	K. BENTON	08-19-2024
SERIAL NUMBER	0307333-002	
SCALE 1:30	RUSH CENTER, KANSAS LIBERAL, KANSAS	SHEET 5 of 6



Keota AD1
Two State Sod

IN PROCESS	FINAL QC	ITEM NO.	BOM NAME	SIZE	DESCRIPTION	MATERIAL	QTY.	PART NUMBER
3		1	INLET	8"	FF FRP FLANGE	FRP	3	26SF0800
		2	RIBS	4'	FOAM SUPPORT	FRP	6	25FR6003
		3	NAMEPLATE	5" x 7"	FRP KBK NAMEPLATE	FRP	1	21NPASBLYK
		4	MANWAY	24"	HIGH MW W/ NEOPR. GSKT & 304SS BOLTS	FRP	1	90MWHNESS
		5	LSHH	2"	FF FRP FLANGE	FRP	1	26SF0200
		6	LEVEL SWITCH	2"	FF FLANGE FRP	FRP	1	26SF0200
		7	DRAIN	6"	FF FLANGE FRP	FRP	1	26SF0300
		8	SPARE	4"	FF FLANGE FRP	FRP	3	26SF0400
		9	SPARE	4"	FF FLANGE FRP	FRP	1	26SF0200
		10	SPARE	4"	FF FLANGE FRP	FRP	1	26SF0300
		11	LEVEL TRANSMITTER	4"	FF FRP FLANGE	FRP	1	26SF0400
		12	VENT	6"	FRP HALF COUPLING	FRP	1	26HF0600
		13	J-VENT	6"	J-VENT ASSY W/ BIRD SCREEN	PVC	1	30JV0600
		14	SPARE	6"	FF FLANGE FRP	FRP	1	26SF0600
		15	THIEF HATCH		JAYCO JT-8, 12oz PSI/0.4 VAC, VITON GSKT	ALUM	1	31JYRD012V
		16	THIEF HATCH FLANGE	8"	FF FLANGE FRP	FRP	1	26SF0800
		17	GROUNDING LUG		PART #1 STEEL	A36	2	32PT01LUGGDSS
		18	SPARE	8"	FF FLANGE FRP	FRP	1	26SF0800
		19	MANWAY	18"	LOW MW w NEO GSKT & 304SS BOLTS	FRP	1	27MWLD18
		20	MIXER	24"	HIGH MW FLANGE	FRP	1	27MWFLSD24
		21	ODOR EXTRACTION	8"	FF FLANGE FRP	FRP	1	26SF0800
		22	OUTLET	4"	FF FRP FLANGE	FRP	1	26SF0600
1		23	INSULATION	2"	4' x 8' x 2" SCORED FOAM INSULATION	FOAM	1	25FIS040802
		24	TOPHANDRAIL	Ø14'	TOP HANDRAIL - GALV	A36	1	TOPHANDRAIL
		26	CAGED LADDER	30'	LADDER w/ FALL ARREST		1	CAGED LADDER30
		29	HEAVY LIFT-LUG		PART #23 - A36 STEEL GALV	A36	4	32PT23LUGLIFTH
		30	H.D. SINGLE ANCHOR		PART #25 - H.D. SINGLE PIECE ANCHOR	GALV	8	32PT25HSPAN
		31	TEMPERATURE	2"	FF FRP FLANGE	FRP	1	-
		32	SLOPE BTM		FOAM SLOPE BOTTOM	FOAM	1	25SB1405P400
		33	MIXER LID	Ø24"	24" x 1/4" SS MW LID - (1) 8" SS SHOP FLANGE	SS	1	
		42	TANK LOADOUT	8"	FF FLANGE FRP	FRP	1	26SF0800
		43	IMMERSION HEATER	4"	FF FRP FLANGE		1	26SF0400
		44	MW GASKET	3/16"	24" MW Gasket - Neoprene	NEOP	1	34GS3160N
		45	BOLT KIT		24" LOW MW BOLT KIT	304SS	1	18MW24L300S

LICENSED PROFESSIONAL ENGINEER
BRENT WILSON
29219
OKLAHOMA
1/31/2025

NOTES:
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2. TANK IS ENGINEERED PER 0307333-01_DESIGN_REV0_STAMPED.
3. SEE SHEET 2 FOR DOWNCOMER DETAIL.
4. CONTENTS - UP TO 17% TS FOR FOG AND UP TO 40% TS FOR GLYCERIN.

DESIGN PARAMETERS		FABRICATION MATERIALS		FABRICATION MATERIALS	
PRESSURE:	16oz PSI / 1.0 VAC	LINER RESIN:	VE w/ SILICON CARBIDE	GEL COAT:	WHITE
MAX TEMP:	100°F MAX	LINER GLASS TYPE:	DOUBLE C-VEIL	PIGMENT:	NONE
MIN TEMP:	-20°F MIN	STRUCTURE RESIN:	ISO	GROUNDING STRIP:	YES-FULL LENGTH
CONTENTS: 4	SEE NOTES	STRUCTURE GLASS:	E-GLASS	WATER TEST:	YES-1HR
SPECIFIC GRAVITY:	1.3 MAX	WOVEN ROVING:	24oz (.033")	POST CURE	NO
EMPTY WEIGHT:	17,996 LBS	CHOP HOOP:	27% E-GLASS (.046")	THIEF HATCH GSKT:	VITON
CAPACITY:	30,000 GAL	CHOP GLASS:	E-GLASS (.043")	MANWAY GASKET:	NEOPRENE
REFERENCE SPEC:	PE ENGINEERED 2	CHOPPED MAT:	1 1/2 oz E-GLASS	BOLT TYPE:	304 SS

REVISIONS

REV.	DATE	DESCRIPTION	DRN	CHD
A	09/27/24	UPDATED AS PER CUSTOMER REQUEST	HTS	
B	10/29/24	ADDD IMMERSION HEATER AND TANK LOAD OUT	KAH	BJ

KBK

CUSTOMER
VANGUARD RENEWABLES

DRAWING NAME
Ø 14' x 30' INDUSTRIAL

DRAWING NUMBER
IN-2024-0533

DRAWN BY	K.HYLTON	08-19-2024
CHECKED BY	K. BENTON	08-19-2024
SERIAL NUMBER	0307333-002	
SCALE 1:80	RUSH CENTER, KANSAS LIBERAL, KANSAS	SHEET 6 of 6

Appendix F

Letter from Oklahoma Conservation Commission

OKLAHOMA CONSERVATION COMMISSION

Our Land • Our Heritage • Our Future

November 6, 2024

Timothy Sowecke
Shareholder
GableGotwals
499 W. Sheridan Avenue, Suite 2200
Oklahoma City, OK 73102

RE: ***Request for determination of wetlands for Project in Haskell County, Oklahoma at Lat/Long: 35.26035, -94.86739; 21405 OK-9, Keota, OK.***

Dear Mr. Sowecke:

Your request for a wetland determination for the referenced project, as described in your email of November 6, 2024, has been reviewed using the U.S. Fish and Wildlife Service National Wetlands Inventory and U.S. Department of Agriculture Natural Resources Conservation Service Soil Survey of Haskell County. Neither hydric soils nor wetlands are indicated within the proposed project area. If you believe this determination to be inaccurate, an on-site investigation may be needed. The investigation should be coordinated with the U.S. Army Corps of Engineers, Regulatory Branch, in Tulsa. Their address and phone number is:

U.S. Army Corps of Engineers
Mr. Andy Commer
Chief of Regulatory Branch
2488 E 81st St.
Tulsa, OK 74137
918/669-7400

If you have any further questions or concerns, please contact me at 405/534-6997.

Sincerely,

Brooks R Tramell

Brooks Tramell
Director of Monitoring, Assessment, and Wetlands Programs
Water Quality Division

cc: Wetlands File

From:	Timothy Sowecke
To:	Brooks Tramell
Cc:	Janet Stewart
Subject:	RE: Request for determination: no OCC wetland confirmation for Project in Haskell County, OK
Date:	Wednesday, November 6, 2024 2:50:00 PM
Attachments:	image005.png image006.png image007.png image008.png image009.png Two State site plan 10-25-24.kmz Two State Sod Farm Site REV1 preliminary 4-18-24.pdf

---

Thanks, Brooks. I appreciate your quick response! I'm attaching a kmz (will work with google earth) and also survey showing the footprint (see p. 2/Exhibit B delineating footprint).
Thanks!
Tim

Timothy Sowecke | 405-568-3308 | **GableGotwals**

From: Brooks Tramell <Brooks.Tramell@Conservation.ok.gov>
Sent: Wednesday, November 6, 2024 1:13 PM
To: Timothy Sowecke <tsowecke@gablelaw.com>
Cc: Janet Stewart <Janet.Stewart@Conservation.ok.gov>
Subject: Re: Request for determination: no OCC wetland confirmation for Project in Haskell County, OK

Mr. Sowecke,

Janet asked me to respond to your request for a determination. All of my screening tools use latitude/longitude and PLSS (section/township/range) as you've provided. However, full legal descriptions are difficult to relate back to these resource maps. Can you supply a basic property boundary map to ensure I review the appropriate area?

Thanks,

Brooks

Brooks Tramell

Director of Monitoring, Assessment, and Wetlands Programs

Oklahoma Conservation Commission

Phone: 405.534.6997

Email: brooks.tramell@conservation.ok.gov

OKLAHOMA CONSERVATION COMMISSION

From: Janet Stewart <Janet.Stewart@Conservation.ok.gov>
Sent: Wednesday, November 6, 2024 11:46 AM
To: Brooks Tramell <Brooks.Tramell@Conservation.ok.gov>
Subject: FW: Request for determination: no OCC wetland confirmation for Project in Haskell County, OK

Can you respond to this? Thanks, Janet

From: Timothy Sowecke <tsowecke@gablelaw.com>
Sent: Wednesday, November 6, 2024 11:30 AM
To: Janet Stewart <Janet.Stewart@Conservation.ok.gov>
Subject: [EXTERNAL] Request for determination: no OCC wetland confirmation for Project in Haskell County, OK
Importance: High

Good morning, Janet,

Was great to hear updates from OCC at the recent ELS CLE, thank you!

I'm writing to run a certain property description by OCC to confirm that the proposed location is not located within a wetland as designated by the OCC. We need confirmation from OCC as part of permitting the project with DEQ. See OAC 252:515-5-32(d)). The property is a 20-acre MOL parcel on the south side of Hwy 9 about two miles east of Keota, Haskell County, OK. Physical location is 21405 OK-9, Keota, OK. **Lat/Long is: 35.26035, -94.86739** Legal description is:

> A 20.66 acre site, situated in Section 15 and 16, T9N, R23EIM, Haskell County, Oklahoma, out of tract of land recorded in Book 817, Page 537, Deed Records of Haskell County, Oklahoma, said site limits being more particularly described by metes and bounds as follows:
>
> Point of Beginning (POB, X: 2903104.81, Y: 715723.94) within said Section 16, at the Northwest corner of this site, from which a concrete nail found for the Northeast corner of said Section 16 bears North 75°26'42" East a distance of 512.55 feet;
>
> Thence North 88°00'42" East a distance of 1000.00 feet to the Northeast corner of this site;
>
> Thence South 01°59'18" East a distance of 900.00 feet to the Southeast corner of this site;
>
> Thence South 88°00'42" West a distance of 1000.00 feet to the Southwest corner of this site;
>
> Thence North 01°59'18" West a distance of 900.00 feet to the POINT OF BEGINNING, containing 20.66 acres (900,000 sq. ft.).

Please review this location and confirm that there are no wetlands within the proposed 20-acre tract. Please let me know if you need any more information to make this determination.

Thanks,

Tim

Timothy Sowecke | Shareholder | **GableGotwals**
(W) 405-568-3308 | (F) 918-595-4990 | tsowecke@gablelaw.com
BOK Park Plaza | 499 W. Sheridan Avenue, Suite 2200
Oklahoma City, OK 73102 | USA | Bio | Download vcard | www.gablelaw.com |

Appendix G

ONHI, ODWC, OBS Request

and Response

BRAUN INTERTEC

BRAUN INTERTEC

Protected Species Evaluation

Project Name: Keota, AD 1, LLC
Site Address: Hwy 9, Keota, OK 74941
Client: Keota AD 1, LLC
County: Haskell
Lat/Long: 35.258941, -94.867650

Date: May 14, 2024
Project No.: B2308124.00
Evaluator: B. Ruhme
TRS: Sec. 15 &16, T9N R23E

Resource	Description	Evaluation
Aerial Photo	Historical Aerial Photographs (1995-2023)	Historically, and through at least 2023, the project area has consisted of cultivated cropland (1995-2023 aerial photos). A stream channel is intermittently apparent in the southwest portion of the project area in the historical aerial photos.
Site Photos	Google Earth Street View (June 2023)	The project area consists of open fields consistent with fallow cropland or an early old field environment. Vegetation present includes grasses, forbs and sparse early stage shrubs. A small cluster of trees is located just north of the project area boundary along Hwy 9.
Federal (IPaC)	Query of IPaC Database	Seven federally listed species were identified for the project area in the IPaC database.
State	Oklahoma Natural Heritage Inventory (ONHI)	Four state listed species were identified for Haskell County in the ONHI database.

Field Survey Conducted No

Conclusion: Not likely to adversely affect protected species.

With existing landcover consisting of recently fallowed cropland, the project area does not provide suitable habitat for the majority of species identified in state and federal databases. The project area also appears to have limited floral resources for pollinators, and therefore, the candidate listed Monarch Butterfly is unlikely to be present. As a candidate species, the Monarch Butterfly has no statutory protection under the Federal Endangered Species Act but is in consideration for future listing as a threatened or endangered species. Additionally, due to the general lack of trees and other woody vegetation, most migratory birds and listed bat species are also unlikely to be present. However, depending on the project design, access from Highway 9 may require tree removal and consideration of seasonal restrictions on tree/vegetation clearing to minimize impacts to migratory birds and listed bat species.

Further Action Recommended: Yes

If required for the proposed project, it is recommended to conduct tree/vegetation clearing from November 16-February 28 to avoid impacts to listed bat species and nesting migratory birds (nesting season is typically from March 1 to August 31). Additionally, voluntary conservation measures for the Monarch Butterfly are encouraged for development projects that occur within its range. Conservation measures would include planting native flowering vegetation species that bloom spring through fall in landscaping and removal/control of invasive plant species present.

Signed: 

Attachments: Yes IPaC output, Species Determination Keys and table of listed species attached.

Common Name	Scientific Name	Federal Status[1]	State Status[1]	Habitat	Impact	Comment
Alligator Snapping Turtle	*Macrochelys temminckii*	Proposed T	none	Lakes, rivers, streams and sloughs.	No effect.	Suitable habitat is not present within the project area.
American Burying Beetle	*Nicrophorus americanus*	T	T	Tall grass prairie, open oak-hickory woodlands and forests.	No effect.	Suitable habitat is not present within the project area.
Arkansas River Shiner	*Notropis girardi*	T	T	Shallow sandy areas and backwaters of sand bars in large rivers.	No effect.	Suitable habitat is not present within the project area.
Blackside Darter	*Percina maculata*	none	T	Streams and rivers in the Mountain Fork, Poteau, Kiamichi and Litter River watersheds.	No effect.	Suitable habitat is not present within the project area.
Monarch Butterfly	*Danaus plexippus*	C	none	Meadows, open fields and clearings with plants that provide floral resources, particularly milkweed.	May affect; not likely to adversely affect.	Limited floral resources appear to be at the Site, which provides poor habitat for the species and it is unlikely to be present.
Northern Long-eared Bat	*Myotis septentrionalis*	E	E	Caves, mesic-hardwood and floodplain forests	May affect; not likely to adversely affect.	This project may affect the northern long-eared bat due to the presence of trees on Site. While the bat is unlikely to be present, the trees on site may provide potential summer roosting habitat. To avoid impacts to the bat, it is recommended to complete tree clearing activities outside the active roosting season (Nov 16- March 31).
Piping Plover	*Charadrius melodus*	T	E	Coastlines, sandy beaches and tidal flats, mudflats, spoil islands, shorelines of lakes, reservoirs & rivers, alkali wetlands	No effect.	Suitable habitat is not present within the project area.
Red Knot	*Calidris canutus rufa*	T	T	Tundra slopes, sedge meadows, lakeshores, estuaries, sandy beaches, tidal mudflats and salt marshes	No effect.	Suitable habitat is not present within the project area.
Tricolored Bat	*Perimyotis subflavus*	Proposed E	none	Caves, mesic-hardwood and fire dependent forests	May affect; not likely to adversely affect.	This project may affect the tricolored bat due to the presence of trees on Site. While the bat is unlikely to be present, the trees on site may provide potential summer roosting habitat. To avoid impacts to the bat, it is recommended to complete tree clearing activities outside the active roosting season (Nov 16- March 31).
Migratory birds		MBTA		Various	May affect; not likely to adversely affect.	Various migratory birds may nest in shrubs and trees on the property. Avoidance should be considered by clearing vegetation outside the migratory bird breeding season (May-August for most species).

[1] T = Threatened, E = Endangered, C = Candidate, SPC = Special Concern, NEP = Non-Essential Population (experimental); MBTA = protected under Migratory Bird Treaty Act

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467

In Reply Refer To: 05/14/2024 19:19:53 UTC
Project Code: 2024-0090467
Project Name: Sebo Parcel- Two State Sod Farm

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological

evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts, see https://www.fws.gov/program/migratory-bird-permit/what-we-do.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures, see https://www.fws.gov/library/collections/threats-birds.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
(918) 581-7458

PROJECT SUMMARY

Project Code: 2024-0090467
Project Name: Sebo Parcel- Two State Sod Farm
Project Type: Power Gen - Other
Project Description: Location of farm where installation of an anaerobic digester is proposed. Construction is anticipated to begin in late 2024 or 2025.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.259172899999996,-94.86749290731552,14z

Counties: Haskell County, Oklahoma

ENDANGERED SPECIES ACT SPECIES

There is a total of 7 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 1 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ This species only needs to be considered if the project includes wind turbine operations. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened

REPTILES

NAME	STATUS
Alligator Snapping Turtle *Macrochelys temminckii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4658	Proposed Threatened

INSECTS

NAME	STATUS
American Burying Beetle *Nicrophorus americanus* Population: Wherever found, except where listed as an experimental population No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/66	Threatened
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

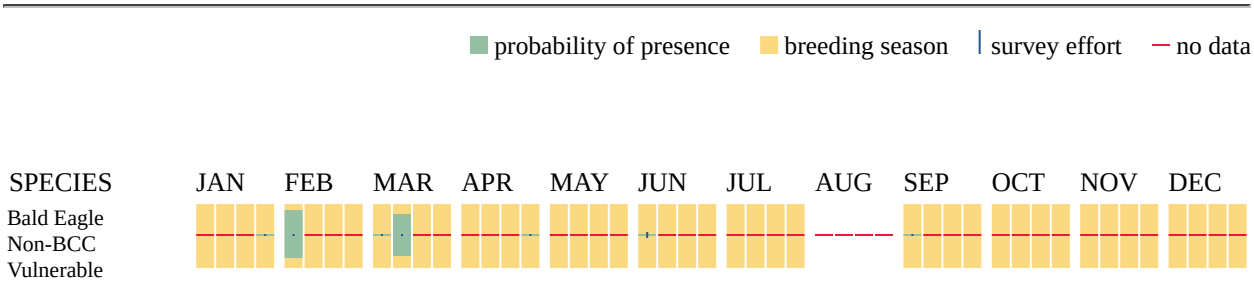
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Least Tern *Sternula antillarum antillarum* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/11919	Breeds Apr 25 to Sep 5
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Southeastern American Kestrel *Falco sparverius paulus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/4076	Breeds Apr 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

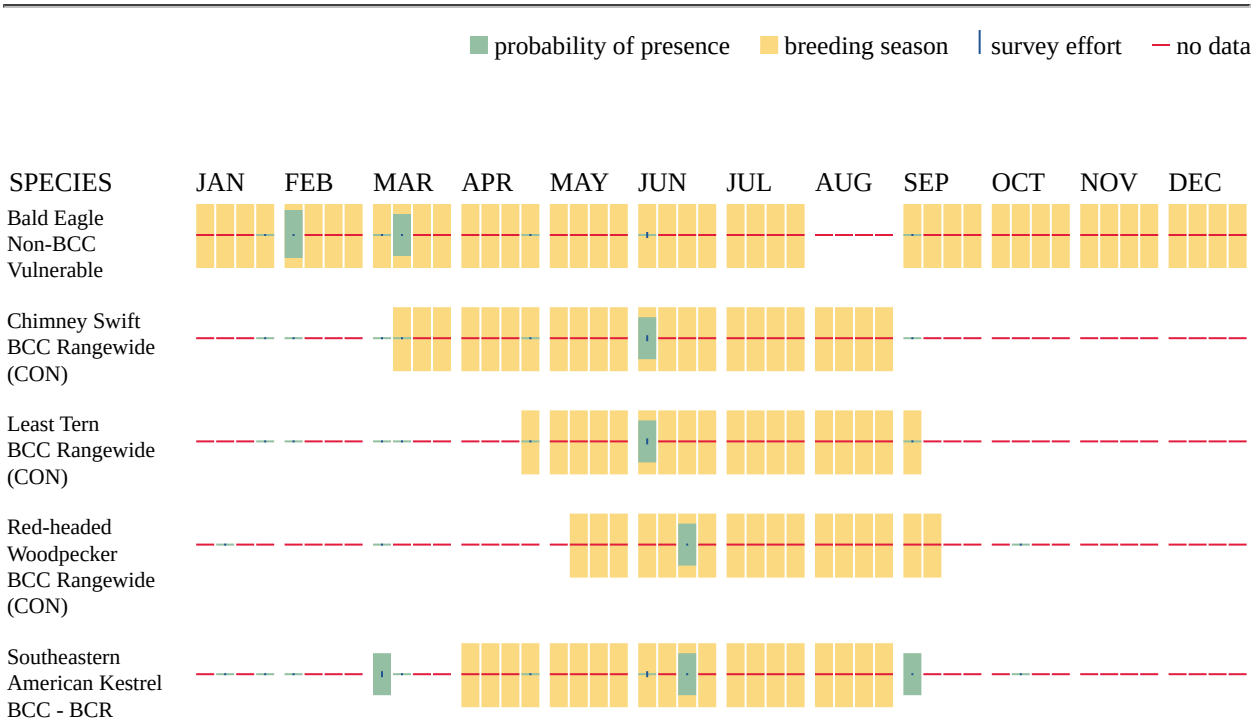
Probability of Presence (▪)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management

- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

THERE ARE NO WETLANDS WITHIN YOUR PROJECT AREA.

IPAC USER CONTACT INFORMATION

Agency: Braun Intertec
Name: Ben Ruhme
Address: 11001 Hampshire Ave South
City: Minneapolis
State: MN
Zip: 55438
Email bruhme@braunintertec.com
Phone: 6125082770

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467

In Reply Refer To: 05/14/2024 19:55:00 UTC
Project code: 2024-0090467
Project Name: Sebo Parcel- Two State Sod Farm

Subject: Consistency letter for 'Sebo Parcel- Two State Sod Farm' project for a No Effect determination for the American burying beetle

Dear Ben Ruhme:

The U.S. Fish and Wildlife Service (Service) received on **May 14, 2024** your effect determination(s) for the 'Sebo Parcel- Two State Sod Farm' (the Action) using the American burying beetle (*Nicrophorus americanus*) determination key within the Information for Planning and Consultation (IPaC) system.

The Service developed this system in accordance with the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.)
Based on your consideration of the Action and the assistance in the Service's American burying beetle determination key, you have determined that your proposed action will have No Effect on the American burying beetle.

Your agency has met consultation requirements for these species by informing the Service of your "no effect" determination. No further consultation for this project is required for the American burying beetle. This consistency letter confirms you may rely on effect determinations you reached by considering the American burying beetle DKey to satisfy agency consultation requirements under Section 7(a) (2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended 16 U.S.C. 1531 et seq.; ESA).

Coordination with your local Ecological Services Office is complete for the American burying beetle. If your project may affect additional listed species, please contact your local Ecological Services Field Office for assistance with those species. Thank you for considering Federally-listed species during your project planning.

This letter covers only the American burying beetle. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Alligator Snapping Turtle *Macrochelys temminckii* Proposed Threatened
- Monarch Butterfly *Danaus plexippus* Candidate

- Northern Long-eared Bat *Myotis septentrionalis* Endangered
- Piping Plover *Charadrius melodus* Threatened
- Rufa Red Knot *Calidris canutus rufa* Threatened
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

If your project may affect additional listed species, you must evaluate additional DKeys for other species, or submit a request for consultation for the additional species to your local Ecological Services Field Office.

The Service recommends that your agency contact the Service or re-evaluate the project in IPaC if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occurs, additional consultation should take place before project changes are final or resources committed.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Sebo Parcel- Two State Sod Farm

2. Description

The following description was provided for the project 'Sebo Parcel- Two State Sod Farm':

> Location of farm where installation of an anaerobic digester is proposed.
> Construction is anticipated to begin in late 2024 or 2025.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.259172899999996,-94.86749290731552,14z

QUALIFICATION INTERVIEW

1. Is the action authorized, funded, or being carried out by a Federal agency?

   No

2. Have you determined that the proposed action will have “no effect” on the American burying beetle? (If you are unsure select "No")

   No

3. Will your activity **purposefully take** American burying beetles?

   No

4. Is your project wholly inside the 4d rule Analysis Area? For areas of your project occurring inside the Analysis Area (New England, Northern Plains, Southern Plains), your project may qualify for exemptions. For areas of your project occurring outside the Analysis Area, all incidental take is exempted according to the ABB 4d Rule.

   Automatically answered
   Yes

5. Is American burying beetle suitable habitat present within the action area?

   No

PROJECT QUESTIONNAIRE

Please select the activity that best matches your proposed action.

1. Soil disturbance related to urban expansion or construction of structures

If you chose 13 above, please describe below. If you did not choose 13 above, please type "0".

0

IPAC USER CONTACT INFORMATION

Agency: Braun Intertec
Name: Ben Ruhme
Address: 11001 Hampshire Ave South
City: Minneapolis
State: MN
Zip: 55438
Email bruhme@braunintertec.com
Phone: 6125082770

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oklahoma Ecological Services Field Office
9014 East 21st Street
Tulsa, OK 74129-1428
Phone: (918) 581-7458 Fax: (918) 581-7467

In Reply Refer To: 05/14/2024 19:58:45 UTC
Project code: 2024-0090467
Project Name: Sebo Parcel- Two State Sod Farm

Federal Nexus: no
Federal Action Agency (if applicable):

Subject: Technical assistance for 'Sebo Parcel- Two State Sod Farm'

Dear Ben Ruhme:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on May 14, 2024, for 'Sebo Parcel- Two State Sod Farm' (here forward, Project). This project has been assigned Project Code 2024-0090467 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (Dkey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid.***

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis, your project is not reasonably certain to cause incidental take of the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the Action is not likely to result in unauthorized take of the northern long-eared bat.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Alligator Snapping Turtle *Macrochelys temminckii* Proposed Threatened
- American Burying Beetle *Nicrophorus americanus* Threatened
- Monarch Butterfly *Danaus plexippus* Candidate
- Piping Plover *Charadrius melodus* Threatened
- Rufa Red Knot *Calidris canutus rufa* Threatened
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species and/or critical habitat listed above. Note that if a new species is listed that may be affected by the identified action before it is complete, additional review is recommended to ensure compliance with the Endangered Species Act.

Next Steps

Coordination with the Service is complete. This letter serves as technical assistance. All conservation measures should be implemented as proposed. Thank you for considering federally listed species during your project planning.

We are uncertain where the northern long-eared bat occurs on the landscape outside of known locations. Because of the steep declines in the species and vast amount of available and suitable forest habitat, the presence of suitable forest habitat alone is a far less reliable predictor of their presence. Based on the best available information, most suitable habitat is now expected to be unoccupied. During the interim period, while we are working on potential methods to address this uncertainty, we conclude take is not reasonably certain to occur in areas of suitable habitat where presence has not been documented.

If no changes occur with the Project or there are no updates on listed species, no further consultation/coordination for this project is required for the northern long-eared bat. However, the Service recommends that project proponents re-evaluate the Project in IPaC if: 1) the scope, timing, duration, or location of the Project changes (includes any project changes or amendments); 2) new information reveals the Project may impact (positively or negatively) federally listed species or designated critical habitat; or 3) a new species is listed, or critical habitat designated. If any of the above conditions occurs, additional coordination with the Service should take place before project implements any changes which are final or commits additional resources.

If you have any questions regarding this letter or need further assistance, please contact the Oklahoma Ecological Services Field Office and reference Project Code 2024-0090467 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Sebo Parcel- Two State Sod Farm

2. Description

The following description was provided for the project 'Sebo Parcel- Two State Sod Farm':

> Location of farm where installation of an anaerobic digester is proposed.
> Construction is anticipated to begin in late 2024 or 2025.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@35.259172899999996,-94.86749290731552,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect, but not likely to adversely affect" for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. The action area does not overlap with an area for which U.S. Fish and Wildlife Service currently has data to support the presumption that the northern long-eared bat is present. Are you aware of other data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

   Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed NLEB acoustic detections. Data on captures, roost tree use, and acoustic detections should post-date the year when white-nose syndrome was detected in the relevant state. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

   No

3. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer 'yes' if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

4. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   No

PROJECT QUESTIONNAIRE

IPAC USER CONTACT INFORMATION

Agency: Braun Intertec
Name: Ben Ruhme
Address: 11001 Hampshire Ave South
City: Minneapolis
State: MN
Zip: 55438
Email bruhme@braunintertec.com
Phone: 6125082770

From: Comolli, Kristin A.
To: Braun, Sarah
Subject: Re: ONHI Data Request
Date: Monday, April 29, 2024 5:10:31 PM
Attachments: 2024-260-BUS-BIC.pdf

See attached results of your information request.

Please note, in accordance with our standard protocol (to ensure appropriate representation given the manner in which our data are formatted), I searched for occurrences of federal and state regulatory species within a 5-mile radius of your project area.

Kristin Comolli (she/her)
Database Analyst
Oklahoma Natural Heritage Inventory
University of Oklahoma
111 East Chesapeake Street
Norman, OK 73019
https://ou.edu/oknaturalheritage

Check out our database: https://obis.ou.edu

From: ONHI Data Request <noreply@qemailserver.com>
Sent: Monday, April 29, 2024 12:25 PM
To: Comolli, Kristin A. <kcomolli@ou.edu>
Subject: ONHI Data Request

Recipient Data:
Time Finished: 2024-04-29 12:25:12 CDT
ResponseID: R_3EXoTCIyTjdiaJu
Link to View Results: Click Here
URL to View Results: https://ousurvey.yul1.qualtrics.com/apps/single-response-reports/reports/pB2mMJpn7Ven%2EPjxrhTUNjegY62iC3dqHrTtbdPJ5wpBfNXUxS8Y2kzKHqaXBFqdP2qdBwc2lQFnE9QMkbXq0boT8JKXppAt5d%2EcngXT5cOzDS%2EIFuvSEd8t8NzWYSvtg6f0ked1QcltGq6s69usmsQi3JEt0tYo6m-4lAz4G5pQDYtvyEgocitO-HC0lV2Ita5lp7g19eMetgqbqz4HHzVJuDQ4hYp%2EIn9xNYZTeQybQTlWAiRU7INmvWzu8-y82HLLfOs8hoy9prugkxlDGLkMbIXv4GsZG99DHK6tgMfg9OXyO69zDcMZq6USKULL1fso-iKAqvVa10PcFDETg

Response Summary:

Requestor Information Organization or Company Name
Braun Intertec Corporation

Requestor Name
Sarah Braun

Email (a copy of this request will be sent to this email)
SaBraun@braunintertec.com

Secondary Email (this will send a copy of the request to a second email)
sabraun@braunintertec.com

Phone
3202049113

Project Information Project Name
Tier III Solid Waste Processing Facility Permit Application

Project Description
Construct a Solid Waste Processing Facility using an anaerobic digester to create renewable natural gas. Per OAC 252:515-5-31(c), statement concerning endangered or threatened wildlife or plant species within 1 mile of proposed site from ODWC, OBS, &ONHI

Location Information Please note: Shapefiles or KMZs/KMLs are the preferred method to specify loc...
Haskell County

Description of Project Location
35.258877, -94.867395

Please upload location information (shapefile, KMZ, KML, or PDF). Only one file can be attached,...
https://ousurvey.qualtrics.com/WRQualtricsControlPanel/File.php?F=F_2tbtAb4Of0U3mP2

OBS Ref. 2024-260-BUS-BIC

Dear Sarah Braun, April 29, 2024

We have reviewed occurrence information on federal and state threatened, endangered, or candidate species currently in the Oklahoma Natural Heritage Inventory database for the following location you provided:

Sec. 15, 16, 21, and 22-T9N-R23E, Haskell County

We found 11 occurrences of relevant species within the vicinity of the project location as described.

Species Name	Common Name	Federal Status
Nicrophorus americanus	**American Burying Beetle**	**Threatened**
County	***TRS***	***Count***
Haskell	Sec. 18-T9N-R23E	1
Haskell	Sec. 25-T9N-R23E	1
Haskell	Sec. 26-T9N-R23E	1
Haskell	Sec. 28-T9N-R23E	4
Le Flore	Sec. 8-T9N-R24E	1
Le Flore	Sec. 30-T9N-R24E	1
Le Flore	Sec. 31-T9N-R24E	1
Haliaeetus leucocephalus	**Bald Eagle**	**Protected**
County	***TRS***	***Count***
Haskell	Sec. 21-T10N-R23E	1

Additionally, absence from our database does not preclude such species from occurring in the area.

If you have any questions about this response, please send me an email.

Kristin Comolli
Oklahoma Natural Heritage Inventory
(405) 325-4700
kcomolli@ou.edu

DATE: 11 November 2024 ONHI REF: 2024-601-BUS-BIC

TO: Ben Ruhme
raun Intertec Corporation
bruhme@braunintertec.com

RE: Project Name: Two State Sod Farm
County: Haskell

Regarding your request for information on the presence of endangered species or other elements of biological significance at the project referenced above, we have reviewed information currently in the Oklahoma Natural Heritage Inventory database.

We found NO occurrences of relevant species within the vicinity of the project location.

Because the ONHI database is only as complete as the information that has been collected, we cannot say with certainty whether or not a given site harbors rare species or ecological communities.

Additionally, the USFWS IPaC (https://ipac.ecosphere.fws.gov/) lists the following species as potentially being affected by activities in this location:

Tricolored Bat *Perimyotis subflavus* Proposed Endangered
Piping Plover *Charadrius melodus* Threatened
Rufa Red Knot *Calidris canutus rufa* Threatened
Alligator Snapping Turtle *Macrochelys temminckii* Proposed Threatened
American Burying Beetle *Nicrophorus americanus* Threatened
Monarch Butterfly *Danaus plexippus* Candidate

If you have further questions regarding biological information within your project area, please contact us.

Priscilla Crawford, PhD
Oklahoma Natural Heritage Inventory, Coordinator
prill@ou.edu
405-889-7188

November 8, 2024

Braun Intertec
11001 Hampshire Avenue S
Minneapolis, MN 55438

RE: Two State Sod Digester- Biological Assessment Concurrence

Mr. Ben Ruhme:

This letter is written in response to your request for threatened and endangered species information in reference to the Two State Sod Farm - Anaerobic Digester in Haskell County, Oklahoma. Based upon the site description provided, there are no species listed as species of STATE concern which may be at or within one mile of the proposed permit boundary.

Please understand that due to time and a personnel constraint, the Oklahoma Department of Wildlife Conservation has not performed an actual field survey of this specific project area; therefore, we can provide only limited site-specific information. The information sent to this office regarding the proposed project has been reviewed and compared against our current records for endangered and threatened species, and our response is based on this review. I will make note that there is a difference between STATE and FEDERALLY listed species. The Oklahoma Department of Wildlife Conservation only oversees STATE listed species, whereas the U.S. Fish and Wildlife Service reserves authority FEDERALLY listed species. For this reason, if you are concerned about species of federal interest, we urge you to consult with the Tulsa Ecological Service Office of the U.S. Fish and Wildlife Service (918-581-7458), as they may have additional information of which we are unaware.

We appreciate the opportunity to review this project and submit comments. If you have any questions, or if I can be of any assistance, please contact me at either (918)680-2687 or chris.whisenhunt@odwc.ok.gov.

Sincerely,

Chris Whisenhunt, Senior Fisheries Biologist
Environmental Review and Compliance Coordinator
Oklahoma Department of Wildlife Conservation

From: Wolff, Jennifer
To: Michelle Durand
Cc: Patrick Crowley; Braun, Sarah
Subject: FW: Two State Sod Digester- Biological Assessment Concurrence
Date: Friday, November 8, 2024 4:13:17 PM
Attachments: image001.png
image002.png
Outlook-ntuwyp3k.png
Braun Intertec 2024.11.08_107_response.pdf

In case this wasn't forwarded earlier.

Jenn

From: Chris Whisenhunt <chris.whisenhunt@odwc.ok.gov>
Sent: Friday, November 8, 2024 2:30 PM
To: Ruhme, Benjamin <BRuhme@braunintertec.com>
Cc: Curtis Tackett <curtis.tackett@odwc.ok.gov>; Braun, Sarah <SaBraun@braunintertec.com>; Wolff, Jennifer <jwolff@braunintertec.com>; Kurt Kuklinski <kurt.kuklinski@odwc.ok.gov>
Subject: Re: Two State Sod Digester- Biological Assessment Concurrence

Mr. Ben Ruhme

Attached is the ODWC response regarding your project for the Two State Sod Digester in Haskell County, OK. Please understand that this response related only to STATE listed species and not federally listed species. Please feel free to contact me if you have any additional questions about this project and our response. Thanks.

Regards,

Chris Whisenhunt

Senior Fisheries Biologist

Porter Office

9097 N. 34th St. W
Porter, OK 74454-2743

O: (918) 683-1031

C: (918) 680-2687

wildlifedepartment.com

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

From: Ruhme, Benjamin <BRuhme@braunintertec.com>
Sent: Wednesday, November 6, 2024 1:19 PM
To: Kurt Kuklinski <kurt.kuklinski@odwc.ok.gov>
Cc: Curtis Tackett <curtis.tackett@odwc.ok.gov>; Chris Whisenhunt <chris.whisenhunt@odwc.ok.gov>; Braun, Sarah <SaBraun@braunintertec.com>; Wolff, Jennifer <jwolff@braunintertec.com>
Subject: [EXTERNAL] RE: Two State Sod Digester- Biological Assessment Concurrence

Good Afternoon Kurt,

This project has moved locations and as a result, we have completed another evaluation for protected species on the new project area. Attached is our evaluation and a KMZ file with the project area outlined in green.

As part of the project's solid waste permitting process, a statement regarding current information about endangered or threatened wildlife/plant species (state and federally listed) within 1-mile of the project location per OAC 252:515-5-31 (c) is again needed.

Could you please review our evaluation and provide a written statement to satisfy this requirement?

Please contact me with any questions.

Best Regards,

Ben Ruhme

Project Scientist

BRAUN INTERTEC
The Science You Build On.

11001 Hampshire Avenue S | Minneapolis, MN 55438

952.995.2491 direct | 612.508.2770 mobile

braunintertec.com

From: Kurt Kuklinski <kurt.kuklinski@odwc.ok.gov>
Sent: Friday, February 2, 2024 7:56 AM
To: Ruhme, Benjamin <BRuhme@braunintertec.com>
Cc: Curtis Tackett <curtis.tackett@odwc.ok.gov>; Chris Whisenhunt <chris.whisenhunt@odwc.ok.gov>
Subject: Re: Concurrence on Biological Assessment

Hello Ben,

Several staff of the ODWC Wildlife Diversity Program and experts from our Fisheries Division have reviewed your proposed anaerobic digester project in Le Flore County. Based on the project scope and description you provided, we find that the project should have no negative impact on two state-listed fishes which occur in Le Flore County: blackside darter and longnose darter. All other state-listed threatened or endangered species are also federally listed and should be addressed directly with the US Fish & Wildlife Service Oklahoma field office in Tulsa.

Oklahoma Ecological Services Field Office | U.S. Fish & Wildlife Service (fws.gov) (918) 581-7458

The site location is adjacent to a creek or oxbow remnant now disconnected (or almost disconnected) from the Arkansas River to the west. The Poteau River sits about a mile east of the site. Because of the proximity to these two streams and their tributaries, we strongly advise the implementation and use of proper silt and erosion barriers during construction to prevent runoff into local streams. Any construction runoff has the potential to introduce excess solid

materials (soils), nutrient loading, and turbidity to local streams which are known to have detrimental effects on aquatic resources.

We appreciate the opportunity to review your project and provide our input. Please do not hesitate to contact me if you have any questions.

Respectfully,

Kurt Kuklinski

Wildlife Diversity and Research Supervisor

Wildlife Division Office

1801 N. Lincoln Ave.

Oklahoma City, Oklahoma 73105

C: (405) 496-3311

wildlifedepartment.com

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

From: Ruhme, Benjamin <BRuhme@braunintertec.com>
Sent: Friday, January 26, 2024 1:01 PM
To: Kurt Kuklinski <kurt.kuklinski@odwc.ok.gov>
Cc: Curtis Tackett <curtis.tackett@odwc.ok.gov>
Subject: [EXTERNAL] RE: Concurrence on Biological Assessment

Hi Kurt,

Thanks for getting back to me. Attached is our evaluation and a location map of the project site

(outlined in red).

Please let me know if you have any questions or need additional information.

Thanks,

Ben Ruhme

Project Scientist
11001 Hampshire Avenue S | Minneapolis, MN 55438

~~952.995.2491 direct~~ | 612.508.2770 mobile

braunintertec.com

From: Kurt Kuklinski <kurt.kuklinski@odwc.ok.gov>
Sent: Friday, January 26, 2024 12:03 PM
To: Ruhme, Benjamin <BRuhme@braunintertec.com>
Cc: Curtis Tackett <curtis.tackett@odwc.ok.gov>
Subject: Re: Concurrence on Biological Assessment

Hello Ben,

I will be able to review the biological assessment for your project and provide a response regarding Oklahoma's state-listed species. Please send your project information to this email.

Regarding federally-listed species, you will need to coordinate that with the US Fish & Wildlife

Service Oklahoma field office in Tulsa.

Oklahoma Ecological Services Field Office | U.S. Fish & Wildlife Service (fws.gov) (918) 581-7458

Thank you,

Kurt Kuklinski

Wildlife Diversity and Research Supervisor

Wildlife Division Office

1801 N. Lincoln Ave.

Oklahoma City, Oklahoma 73105

C: (405) 496-3311

wildlifedepartment.com

OKLAHOMA DEPARTMENT OF WILDLIFE CONSERVATION

From: ODWC No Reply <no.reply2@odwc.ok.gov>
Sent: Friday, January 26, 2024 10:39 AM
To: Marni Loftis <marni.loftis@odwc.ok.gov>; Nathan Erdman <nathan.erdman@odwc.ok.gov>; Wade Farrar <wade.farrar@odwc.ok.gov>
Subject: Concurrence on Biological Assessment

Submitted on Fri, 01/26/2024 - 10:39

Submitted by: Your Name, Your Email

Submitted values are:

Category
Regulations

Your Name
Ben Ruhme

Your Email
bruhme@braunintertec.com

Subject
Concurrence on Biological Assessment

Message
Good Morning ODWC Staff,

We have completed a desktop habitat assessment for threatened & endangered species on a farm property in Le Flore County where construction of an anaerobic digester is proposed. As part of the project's solid waste permitting process, a statement regarding current information about endangered or threatened wildlife/plant species (state and federally listed) within 1-mile of the project location per OAC 252:515-5-31 (c) is required.

Could you please connect me with an appropriate staff member to review our assessment and provide a statement to satisfy the above regulation?

Thank you.

From: Ruhme, Benjamin
To: prill@ou.edu
Cc: Braun, Sarah; Wolff, Jennifer
Subject: OBS Statement: Proposed Anerobic Digester Haskell County
Date: Wednesday, November 6, 2024 2:28:41 PM
Attachments: image001.png
Sebo Parcel Two State Sod Farm_Protected Species Evaluation_20241106.pdf
Two State Sod Farm proposed site 4-18-24.kmz

Good Afternoon Priscilla,

We have a client proposing to construct an anaerobic digester facility (would convert organic wastes into renewable natural gas) in Haskell County and as part of the project's solid waste permitting process, a statement regarding current information about endangered or threatened wildlife/plant species (state and federally listed) within 1-mile of the project location per OAC 252:515-5-31 (c) from the Oklahoma Biological Survey is required.

We have completed an evaluation of the project area for threatened & endangered species utilizing data from the OK Natural Heritage Inventory and U.S. Fish & Wildlife Service IPaC databases and determined suitable habitat is absent for the species identified in state and federal databases. The evaluation is attached along with a KMZ showing the project area in green.

Could you please review our evaluation and provide a written statement to satisfy the OAC requirement?

Please contact me with any questions.

Best Regards,

Ben Ruhme
Project Scientist
11001 Hampshire Avenue S | Minneapolis, MN 55438
952.995.2491 direct | 612.508.2770 mobile
braunintertec.com

Appendix H

Salvage and Recycling Plan

BRAUN INTERTEC

Operational Plan for Conducting Salvage and Recycling Activities at a Permitted Solid Waste Disposal Facility

Regulatory Reference: OAC 252:515-19-39(a)

Applicability: All solid waste disposal facilities.

Technical Discussion. Owner/operators of solid waste disposal facilities who wish to conduct salvage/recycling activities at the facility should complete this form and submit it to the DEQ. Once approved, salvage/recycling activities may begin.

Name of site: **Keota AD1, LLC Solid Waste Processing Facility**
County: **Haskell County, Oklahoma**
Permit number: **To Be Determined**

1. MATERIALS AND STORAGE

What materials will be ***reused at the facility*** (Include the type and source of the material, an estimate of the largest quantity that will be on-site on a given day and how long and how the material will be stored. Generally, such material should be processed within 90 days of receipt.)

No items are anticipated to be reused at the facility.

If any of these materials are to be reused at the facility, how will they be reused:

No items are anticipated to be reused at the facility.

What materials will be salvaged/recycled at the facility (Include the type and source of the material, an estimate of the largest quantity that will be on-site on a given day, how long and how the material will be stored)?

Roughly 150 tons per day of packaged waste will be received on site. The 150 tons will be de-packaged and separated into salvaged/recyclable materials and processable food waste. On-Site storage time for waste materials will be less than 5 days. The maximum quantity of packaged waste that will be on site on a given day will be 520 tons - of which, up to 20 tons will be salvaged/recyclable material. The salvagable/recyclable waste streams that will be accepted at the facility are described below

- **Packaged Food Material (PFM)**

Packaged food material (PFM) is food that has been wrapped or encased to contain, protect, handle, deliver, and present it to individual, commercial, or industrial distributors or consumers generated food production operations. The majority of this food is unspoiled but is unsellable due to manufacturing errors, expiration dates, or mishandling.

Removed packaging will be stored within the enclosed Organics Receiving Area (ORA) between pillars E and D of the ORA building (near the operators office) and picked up by a dedicated contracted solid waste hauler/recycling facility on a set schedule to eliminate any possibility of waste build-up. No food waste deliveries are stored outside of the ORA building at any time.

What will be done with any stored materials at the end of the approved storage period?

On-Site storage time for the food waste materials will be minimal because all packaging and inert grit from the solid waste will be picked up on a schedule by a dedicated and contracted solid waste handler.

How will the materials be transported to and from the facility?

Food waste materials will be transported to the facility from local third-party organizations and industries via delivery trucks. Food packaging will be picked up by a contracted solid waste hauler on a regular basis.

How will the salvaged/recycled materials be weighed and reported?

All incoming delivery vehicles will be weighed at the entrance of the facility. The scale shall be tested and certified annually in accordance with the requirements of ODAFF. A delivery ticket will be created that includes the truck inbound weight, the generator name, and the time of delivery. The delivery will be classified according to its waste stream and cubic yards will be estimated based upon the size of the delivery vehicle container. The information will be recorded in the facility operating record.

Will the materials to be reused/salvaged/recycled be source separated? **YES X NO**

If no, how will the materials be separated?

N/A

2. HOURS OF OPERATION

What will be the hours the salvage/recycling area will be open to receive and/or handle material?

5:00 am - 10:00 pm, Monday through Saturday

3. OPERATIONAL AREA

Briefly describe where the location salvage/recycling activities will take place and show the area on a site map.

The Keota AD1, LLC Solid Waste Processing Facility will be constructed at 21405 OK-9 in Keota, Haskell County, Oklahoma. Appendix D of the Application contains a Site Map (Figure 6).

How will stormwater run-on/run-off be controlled?

Stormwater run-on/run-off will be controlled by the construction of a stormwater pond. All solid food wastes will be unloaded indoors within the Organic Receiving Area (ORA) building. Drains within the ORA building will collect any liquid wastes and direct the stream into a processing tank. Unloading liquid food waste outdoors will take place on an impervious unloading pad using sealed pumping equipment, reducing the potential for a release of materials to the ground surface. All unloading activities will be monitored to ensure any accidental release is promptly cleaned up. Spill kits will be present in areas where food waste will be unloaded, and employees will be trained to properly use the spill kits.

How will blowing litter be controlled?

Waste materials will be received and handled inside the enclosed ORA. Except when trucks are entering or exiting the ORA, the building doors will remain closed at all times. In addition, as discussed above, the air handling system will be designed to produce negative pressure for pulling fresh air into the building, trapping the windblown materials inside the building.

Site employees will routinely monitor the exterior portions of the Site to ensure that windblown materials, if present, are collected and disposed of properly. These materials will also be prevented from leaving the Site by the fencing that will enclose the Site.

How will disease vectors (rodents, birds, insects, etc.) be controlled?

The Site will promptly de-package and process all of the food waste deliveries within the enclosed ORA building. The solid waste will be stored within the ORA building and picked up by a dedicated contracted solid waste hauler on a set schedule to eliminate any possibility of waste build-up. No food waste deliveries will be stored outside of the ORA building at any time. Proper housekeeping and daily equipment cleaning will be implemented, as well as daily trash pick-up and groundskeeping.

How will fires be controlled?

Open burning at the facility is prohibited. The processing facility is equipped with appropriately rated fire extinguishers throughout. Personnel will be trained on the proper operation of these fire suppression systems.

4. PROCESSING EQUIPMENT

What equipment will be used for the collection, transportation, and processing of the material?

Traffic cones, barricades, spill control kits, forklifts, skid steer loader, packer truck, dump truck, roll-off truck, carts, and other equipment as needed.

What will be done with stored materials to be salvaged/recycled in the event of an equipment failure?

The ORA will be designed to provide full containment of materials received. The ORA is designed with extra storage for salvaged/recyclables if there is a need.

Location and elevation of equipment will be considered in the design of the facility to prevent damage to equipment if there is a catastrophic loss of containment. The facility will have an on-site operator and overflows will be prevented through facility inspections, operator observations, and remote data monitoring.

Also, the Site is equipped with redundant equipment that can be used while one part of the system is down. This is the case for the de-packaging systems in the ORA as well as the hydrolysis tanks.

5. SAFETY

List any training that employees who will conduct salvage/recycling operations have received or will receive.

- **Waste Characterization, Identification, and Segregation**
- **OSHA Training**
- **General Safety Rules**
- **PPE Programs**
- **Fire Extinguishers**
- **First Aid**
- **Chemical Safety**
- **Hazardous Emergency Response**

6. COST ESTIMATES AND FINANCIAL ASSURANCE

If the facility is required to maintain financial assurance, closure cost estimates must be adjusted to reflect the cost for landfill disposal of the maximum amount of recyclable material that is authorized to be stored by this plan, or the maximum amount actually on site, whichever is greater. Documentation that the additional financial assurance has been established must be submitted before DEQ will approve the plan.

Current DEQ-approved closure cost estimate:	**$ 3,190,975.90**
Current DEQ-approved post-closure cost estimate:	**$ N/A**
Cost estimate for landfill disposal of recyclables:	**$ N/A**
Grand Total:	**$ 3,190,975.90**

NOTE: Receipts for pick up or delivery of the recyclable material must be kept as part of the operating record of the facility.

Please attach additional sheets to the back of this form if necessary.

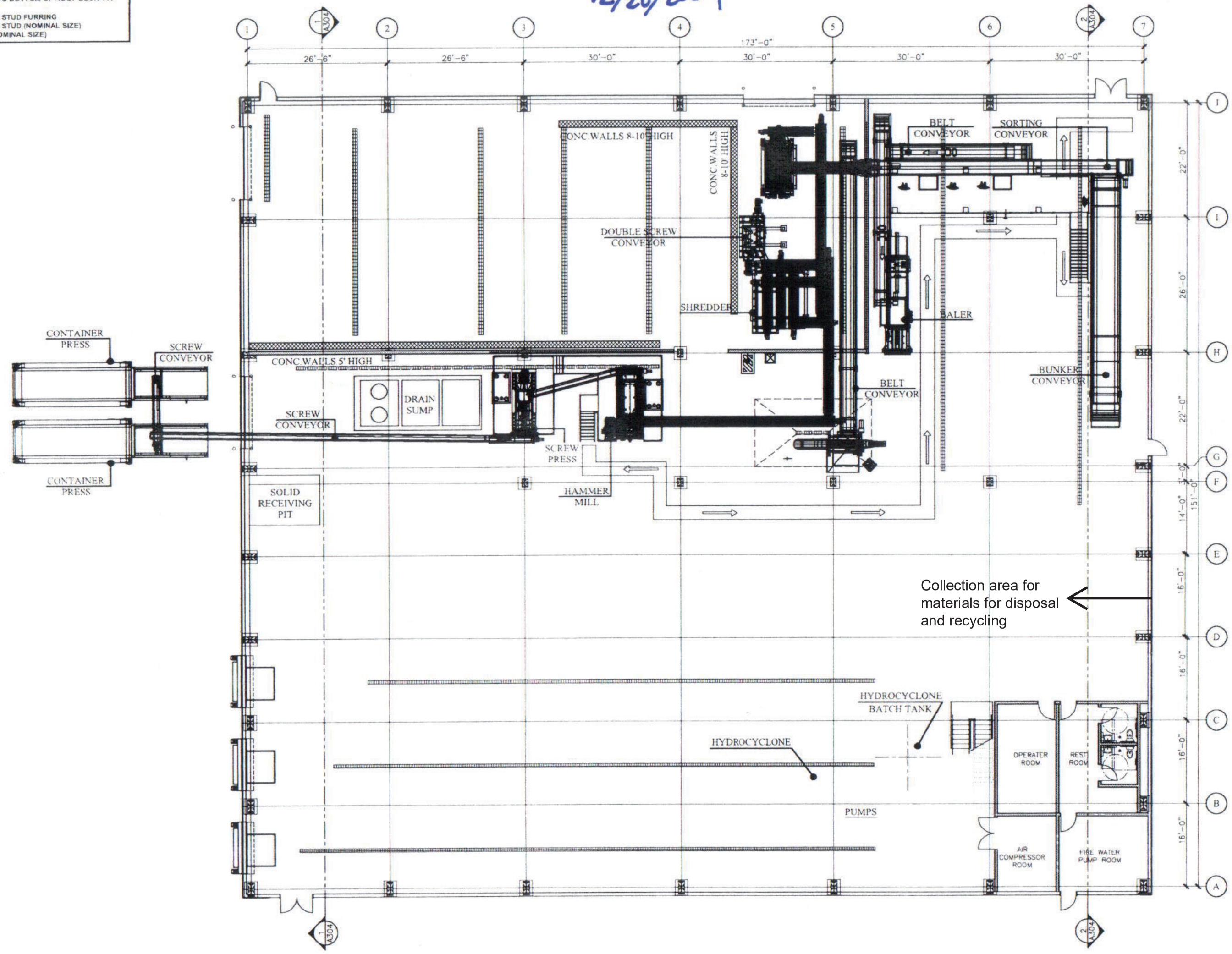
LEGEND

SYMBOL	DESCRIPTION
	NEW WALL - METAL STUD
	METAL PANEL BUILDING SYSTEM BY METAL BUILDING MANUFACTURER
	NEW 1-HOUR FIRE RATED WALL - METAL STUD - UL U419
	NEW 16" CONCRETE PUSH WALL, RE: STRUCTURAL
	LOCATION OF X-BRACING, CONTRACTOR TO COORDINATE FINAL LOCATION WITH METAL BUILDING PACKAGE
LETTER INDICATES WALL TYPE REF PLANS (A6)	NUMBER INDICATES STUD HEIGHT NO NUMBER INDICATES STUD HEIGHT TO BOTTOM OF ROOF DECK TYP NUMBER INDICATES STUD SIZE AS FOLLOWS: 2 - 2 1/2" METAL STUD FURRING; 4 - 3 5/8" METAL STUD (NOMINAL SIZE); 6 - 6" METAL (NOMINAL SIZE)

LICENSED PROFESSIONAL ENGINEER CORBIN HEARD 29198 OKLAHOMA
12/26/2024

FOR SOLID WASTE PERMIT APPROVAL ONLY

DRAWING IS PRELIMINARY IN NATURE AND IS NOT FOR CONSTRUCTION OR BUILDING PERMIT.



1 GENERAL EQUIPMENT ARRANGMENT PLAN
SCALE: 3/32" = 1'-0"

PRELIMINARY NOT FOR CONSTRUCTION

VANGUARD RENEWABLES

VANGUARD RENEWABLES
KEOTA AD1
ORGANICS RECEIVING AREA (ORA)
GENERAL ARRANGEMENT
FLOOR PLAN
HASKEL COUNTY OK

REV	DATE	BY	APPD	DESCRIPTION
A	05.31.24	DP	DP	SOLD WASTE PERMIT ONLY

5/31/2024

wdesign
ARCHITECTURE & INTERIORS
608 East 3rd Street
Tulsa, OK 74120
Office: 918.794.6616
Fax: 918.794.6602
www.wdesignsite.com

DWG NUMBER 0576-A-201

SCALE AS NOTED

REV A

Appendix I

Closure Plan

BRAUN INTERTEC

Solid Waste Processing Facility Closure Plan

Keota AD1, LLC Solid Waste Processing Facility
21405 OK-9
Keota, Oklahoma

Prepared For

Keota AD 1, LLC

Prepared By

Braun Intertec Corporation

September 10, 2024
Project B2308124.00

BRAUN INTERTEC
The Science You Build On.

Table of Contents

Description **Page**

BRAUN INTERTEC

1.0 Introduction

The Keota AD1, LLC Solid Waste Processing Facility (Keota AD 1 otherwise referred as Facility) is a proposed addition to the pre-existing Two State Sod Farm. The Facility will produce renewable natural gas from the anaerobic co-digestion of food waste and manure.

Manure feedstock for the anaerobic digester will be provided by local dairy farms as needed. The initial manure input will help grow the bacterial colonies needed for anaerobic digestion of the food waste. Food waste materials will be sourced from local businesses and delivered to the Organics Receiving Area (ORA) building via delivery trucks. Liquid food wastes will be unloaded directly through hose pumps outside the ORA and then transported through the ORA via pumps into the hydrolysis tank. The packaged food wastes are delivered within the enclosed ORA building. All depackaging and sorting operations will take place within the ORA building shortly after the food wastes arrives.

After delivery and depackaging, the food waste will travel along a conveyor belt, through a hammermill and be macerated and processed into a slurry within the ORA before being directed into a hydrolysis tank. After the hydrolysis tank, the slurry will be sent through a hydrocyclone to screen for indigestible inorganic material prior to being fed into the anaerobic digester. The inorganic material will be collected in a bin at the bottom of the hydrocyclone, compacted with similar materials, and sent off-site for waste disposal.

The daily amount of food waste received from the local area, generally from locations less than 50 miles from the facility, is anticipated to be approximately 185-275 tons per day. The daily amount of food waste received from locations which are more than 50 miles from the site or from out-of-state facilities shall not exceed 200 tons per day.

On-Site storage time for the food waste materials will be minimal because the anaerobic digester will require food waste materials to be fed continuously while the digester is in operation. Majority of the material fed to the anaerobic digester will be comprised of food waste materials, besides the initial seeding of the site which will require manure or digestate.

For the purposes of this solid waste management facility closure plan, the terminology “food waste” and “organics” may be used interchangeably and are intended to have the same meaning.

2.0 Closure Plan

Keota will implement the following Closure Plan in accordance with Oklahoma Administrative Code (OAC) Title 252, Chapter 515, Subchapter 25(2)(a) (252:515-25-2(a)).

2.1 Schedule (252:515-25-32(a)(1))

The Oklahoma Department of Environmental Quality (ODEQ) will be notified in writing at least 6 months prior to beginning final closure of the facility. Closure activities will begin no later than 90 days after final receipt of wastes at the facility. Closure activities will be completed according to this approved closure plan within 180 days after closure activities are initiated. Extensions of the closure period may be granted by ODEQ if the facility can demonstrate that closure will, of necessity, take longer than 180 days. All steps will be taken to prevent threats to human health or the environment from the unclosed facility. The approximate Site-specific closure schedule is provided in **Table 2-1**.

Table 2-1. Approximate Closure Schedule

Month	Closure Task/Milestone
Month 1	Planning for disposals and relocations
Month 2	Trucking out liquid material from tanks (~20 days)
	Trucking out ORA unsorted material to other Anaerobic Digester (AD) facilities (~10 days)
Month 3	Solid (bedding and nutrient) (~7 days)
	ORA stored materials (~9 days)
Month 4	Dismantling and removing tanks and equipment (work can be started in previous months as equipment is emptied and cleaned. Month 4 is the last month when this is occurring)
Months 5 and 6	Return Site to original working condition (mostly civil work and ground movement)
Month 6	Environmental professional assessment and final report (10 days)

2.2 Calculation of Closure Cost Estimates (252:515-25-32(a)(2))

(OAC 252:515-27-31 thru 33)

Prior to closure, all tanks and other equipment will be emptied of organic materials and cleaned. The liquid and solid digestate will be disposed of at a permitted solid waste disposal facility unless DEQ approves the land application of liquid and solid digestate as beneficial resuse. No liquid or solid digestate will be land applied without prior approval for beneficial reuse. Unprocessed organic materials will be sent to an off-site landfill or another appropriate site (such as an off-site anaerobic digester or composting facility). Solid wastes from the ORA or hydrolysis tanks will be sent to a landfill.

Equipment which would require decommissioning includes, but is not limited to, digestion tanks, hydrolysis tanks, biogas processing structures, ORA processing and sorting equipment, transportation and conveying systems, heating and power systems, digestate treatment equipment, and utility connections. All equipment, structures, and operations will be emptied and cleaned of process materials prior to reusing, retrofitting, dismantling, or removal.

The Keota AD1, LLC Facility is located on an operational farm (Two State Sod) where the decommissioned equipment could conceivably be adapted to alternative beneficial uses. All decommissioned equipment, structures, and materials which cannot be managed through reuse or sale will be disposed of at recycling centers or landfills in accordance with all state and federal requirements.

The Closure cost estimate is provided to DEQ as part of this application. As this facility is not a land application facility, cost estimates of post-closure care and corrective action would not apply and have not been prepared.

2.3 Estimate of Maximum Waste Inventory (252:515-25-32(a)(3))

Based on the operating hours of 5:00 am to 10:00 pm from Monday to Saturday, the expected food waste acceptance rate is approximately 85,800 tons per year at 275 tons per day. With a maximum acceptance rate of 156,000 tons per year at 500 tons per day. The facility shall not accept more than 200 tons per day of food waste from locations more than 50 miles from the facility and/or which are located out of State per OAC 252:515-19-34. An estimation of the maximum inventory of waste on-site will be provided to ODEQ upon closure. The maximum waste inventory on site will be 520 tons of packaged waste, 150 tons of solid digestate, and 10,410,000 gallons of slurry and liquid digestate.

2.4 Site-Specific Closure Activities (252:515-25-32(a)(4))

2.4.1 Equipment and Temporary Buildings Removal

All tanks, equipment, and temporary buildings will be emptied of organic materials and cleaned prior to removal, dismantling, retrofitting, or reusing. Equipment requiring decommissioning includes, but is not limited to the anaerobic digestion tank, hydrolysis tanks, biogas processing structures, ORA processing and sorting equipment, transportation and conveying systems, heating and power systems, digestate treatment equipment, and utility connections.

The Site will be located within a leased area on an operational farm (Two State Sod Farm) where the decommissioned equipment could potentially be adapted to alternative beneficial uses. In alignment with Keota's mission, it would be a priority to repurpose or retrofit decommissioned equipment to serve the Two State Sod Farm's agricultural operations. Equipment and systems which cannot be effectively

repurposed by the Two State Sod Farm will be sold on the market for reuse or scrap. All decommissioned equipment, structures, and materials which cannot be managed through reuse or sale will be disposed of at recycling centers or authorized landfills in accordance with all state and federal requirements.

2.4.2 Defective Groundwater Monitoring Wells

Groundwater monitoring wells are not required at the Site. Therefore, the requirements of this section are not applicable.

2.4.3 Monitoring Ground and Surface Water (if required)

The Site is not required to conduct ground or surface water monitoring; however, to prevent contamination the waste receiving areas and processing areas will be located indoors. Any outdoor loading activities such as pumping liquid food wastes directly from a tanker truck to a hydrolysis tank will occur on a paved unloading area with a spill kit. Therefore, the Site does not anticipate contamination of soil or groundwater from the Site's activities.

2.4.4 Collecting and Analyzing Soil and Water Samples

The Site will conduct waste processing activities indoors. Any outdoor loading activities will be conducted on a paved surface. The Site does not anticipate contamination of soil, groundwater, or surface water; therefore, soil and water sampling of the process area is not planned.

2.4.5 Disposal of Final Wastes and Affected Soils

All final waste will be collected by authorized transporters and disposed of at authorized disposal facilities. Final wastes include residual waste from tanks, residuals from decontamination activities (if applicable), and non-recyclable equipment. Unprocessed organic materials will be sent to an off-site landfill or another appropriate site (such as an off-site anaerobic digester or composting facility). Solid wastes from the ORA or hydrolysis tanks will be sent to a landfill. The processed organic materials from the digester will be returned to Two State Sod Farm to be land applied in accordance with all applicable permits as long as the liquid and solid digestate are approved by OK DEQ for beneficial reuse. If not, it will be considered a waste and be disposed of at a permitted solid waste disposal facility.
Keota does not anticipate the contamination of soils; however, if soil removal is necessary, the affected soils will be disposed of by a properly permitted contractor at an authorized disposal facility.

2.4.6 Decontamination of Facility Structures (if necessary)

Facility structures that may require decontamination include paved surfaces in the processing areas. If the paved surfaces are in good condition and unstained, decontamination will not be necessary. If the paved surfaces are stained, decontamination will be conducted by an experienced and properly permitted contractor. Decontamination may include the removal of the top layer of the paved surface via abrasive blasting until a clean debris-free surface is obtained. The anaerobic digester and associated

tanks will be purged of all methane and hydrogen sulfide based on safety precautions prior to decontamination. The tanks will then be deconstructed and the materials will be sent to the appropriate disposal facility. All waste generated by the decontamination activity will be disposed of at an authorized disposal facility.

2.4.7 Post-Closure Monitoring Site Security and Access Control

The Site is not required to conduct post-closure monitoring; therefore, Site security and access control requirements are not applicable. In the instance that post-closure monitoring is required by ODEQ due to soil or surface or groundwater contamination from Site activities, Keota will maintain the lease agreement with the landowner for the period specified by ODEQ. Keota will provide limits of no access until no longer necessary.

2.4.8 Redesigning Final Closure (if necessary)

If during the closure process the ODEQ determines that contamination of the Site occurred or any additional closure activities are necessary, Keota will amend the Closure Plan to ensure a clean closure.

2.4.9 Final Closure Certification

A Certification of Final Closure will be submitted to ODEQ after final closure is completed. The certification will meet requirements set by OAC 252:515-25-34 which include the signature of the owner/operator, a statement indicating that the Site was closed according to the approved closure plan, the permit, and applicable rules. The certification will also include a closure report with related drawings, plans describing how closure was performed, and if evidence of contamination was found. Corrective measure taken will be included in the certification if contamination was discovered.

2.4.10 Other Tasks as Necessary

The Site will perform any other tasks deemed necessary by ODEQ to achieve final closure and to protect human health and the environment.

3.0 Final Closure

The ODEQ must approve the final closure of the Site. ODEQ may extend the closure period if any evidence of contamination related to Site operations is found or if final closure is determined to be inadequate. Records of closure documentation will be maintained on file until ODEQ approved completion of final closure.

4.0 Post-Closure

Post-closure activities are not applicable to the Site, per 252:515-25-51(a), unless soil or surface or groundwater contamination from activities performed at the Site are discovered. If ODEQ deems post-closure monitoring necessary, Keota will conduct such monitoring activities for the period specified by ODEQ.

2025 Worksheet for Calculating Closure and Post-closure Cost Estimates

All site data necessary to calculate estimates of closure and post-closure costs can be gathered by completing Table H.1. Data from Table H.1 should be inserted into Tables H.2 and I.1 to complete calculations.

Table H.1: Site Data

Facility Name:

Permit Number:

Description	Quantity	Units
Total Permitted Area	21.11	acres
Active Portion		
Composite Lined		acres
Soil Lined		acres
Area of Largest Cell/Phase Requiring Final Cap		
Composite Lined		acres
Soil Lined		acres
Perimeter Fencing		linear feet
Groundwater Monitoring Wells	0	VLF
Methane Gas Probes		VLF
Terraces		linear feet
Letdown channels		linear feet
Perimeter drainage ditches		linear feet
Average Daily Flow	275	tons/day
Landfill Disposal Cost	$169	$/ton

VLF = Vertical linear feet. The sum of the depths of all monitoring wells.

Table H.2: Closure Cost Estimate

Facility Name:

Permit Number:

	Task/Service	Quantity	Units	Multiplier[a]	Unit Cost[b]	Subtotal
1	**Preliminary Site Work**					
1.1	Conduct Site Evaluation	1	Lump sum	1	$4,481.54	$4,481.54
1.2	Dispose Final Wastes					
	Average Daily Flow[c]	275	tons/day			
	Landfill Material – Unprocessed waste (packaged)	520	Tons (max inventory)	1	$169/ ton (MSG Quote)	$87,880
	Wasterwater Plant – Unprocessed Liquids	410,000	Gallons (Max inv.)	1	$.22/gal (Renew Gas	$90,200

					Quote)	
	Wastewater Plant – Processed Liquids	10,000,000	Gallons (Max Inv.)	1	$.22/gallon (Renew Gas Quote)	$2,200,000
	Landfill – Processed Solids	150	Tons (Max Inv.)	1	$169 (MSG Quote)	$25,350
1.3	Remove Temporary Building(s)	1	lump sum	1	$4,109.60	$4,109.60
1.4	Remove Equipment	1	lump sum	1	$3,354.63	$3,354.63
1.5	Repair/Replace Perimeter Fencing		linear feet	0.25 (25% of fencing)	$4.39	
1.6	Clean Leachate Line(s)	1	lump sum	1	$2,029.82	$2,029.82
2	**Monitoring Equipment**					
2.1	Rework/Replace Monitoring Well(s)		VLF	0.25 (25% of wells)	$94.23	
2.2	Plug Abandoned Monitoring Well(s)		VLF	0.25 (25% of wells)	$37.72	
2.3	Rework/Replace Methane Probe(s)		VLF	0.25 (25% of probes)	$81.39	
2.4	Plug Abandoned Methane Probe(s)		VLF	0.25 (25% of probes)	$29.74	
2.5	Rework/Replace Remediation and/or Gas Control Equipment [f]	1	lump sum	0.05 (5% of equipment capital cost)	[f]	
3	**Construction**					
3.1	Complete Site Grading to include on- and off-site borrow areas		acres	1	$1,776.82	
3.2	Construct Final Cap					
	Compacted On-site Clay Cap or		cubic yards	1	$6.38	
	Compacted Off-site Clay Cap or		cubic yards	1	$10.37	
	Install Geosynthetic Clay Liner Cap		square feet	1	$0.67	
3.3	Construct Landfill Gas Venting Layer					
	Place Sand or		acres	1	$47,510.30	
	Install Net and Geotextile		square feet	1	$0.47	
3.4	Install Passive Landfill Gas Vents		acres	1	$1,138.17	

3.5	Install Flexible Membrane Liner		square feet	1	$0.52	
3.6	Drainage Layer					
	Place Sand or		acres	1	$47,510.30	
	Install Net and Geonet		square feet	1	$0.47	
3.7	Place On-site Topsoil		cubic yards	1	$2.74	
	Place Off-site Topsoil		cubic yards	1	$21.96	
3.8	Establish Vegetative Cover, including on- and off-site borrow areas		acres	1	$1,266.29	
4	**Drainage/Erosion Control**					
4.1	Construct Terraces		linear feet	1	$11.50	
4.2	Construct Letdown Channels		linear feet	1	$125.78	
4.3	Clean Perimeter Drainage Ditches		linear feet	0.5 (50% of ditches)	$8.77	
5	**Tasks Not Identified**					
6	**Subtotal**					$2,417,406
7	**Administrative Services** [g]	1	lump sum	0.1 (10%)	g	$241,740.60
8	**Technical and Professional Services** [g]	1	lump sum	0.12 (12%)	g	$290,088.70
9	**Closure Contingency** [g]	1	lump sum	0.1 (10%)	g	$241,740.60
10	**Total Final Closure** [h]					**$3,190,975.90**

a Multipliers are determined from the *Solid Waste Financial Assurance Program Report* , December 22, 2000.
b Unit costs include a 2.41% inflationary adjustment for 2025.
c New facilities: Insert the value for "W" in OAC 252:515-27-8(a)(2). Existing facilities: Insert reported annual tonnage for the previous year, divided by 312 operating days per year (52 weeks per year x 6 operating days per week).
d Insert number of tons/day from above.
e Insert landfill disposal cost per ton of waste ($/ton).
f Input capital cost for gas control/remediation equipment, if installed at the site.
g Input subtotal from line 6.
h Add rows 6 through 9.

Table I.1: Post-closure Cost Estimate

Facility Name:

Permit Number:

	Task/Service	Quantity	Units	Multiplier[a]	Unit Cost[b]	Subtotal
1	**Site Maintenance**					
1.1	Site Inspections	4	per year	30 yrs	$815.25	$97,830.00
				8 yrs	$815.25	$26,088.00
1.2	General Maintenance	1	per year	30 yrs	$2,444.15	$73,324.50
				8 yrs	$2,444.15	$19,553.20
1.3	Remediation and/or Gas Control Equipment [c, d]	1	lump sum	0.3 [c]	[d]	
2	**Monitoring Equipment**					
2.1	Rework/Replace Monitoring Well(s)		VLF	0.25 (25% of wells)	$94.23	
2.2	Plug Abandoned Monitoring Well(s)		VLF	0.25 (25% of wells)	$37.72	
2.3	Final Plugging of Monitoring Wells		VLF	1	$37.72	
2.4	Rework/Replace Methane Probe(s)		VLF	0.25 (25% of probes)	$81.39	
2.5	Plug Abandoned Methane Probe(s)		VLF	0.25 (25% of probes)	$29.74	
2.6	Final Plugging of Methane Probes		VLF	1	$29.74	
2.7	Final Plugging of Piezometer(s)		VLF	1	$29.74	
3	**Sampling and Analysis**					
3.1	Groundwater Monitoring Wells [e]		wells	60 (2/yrX30yrs)	$879.07	
	C&D [e]		wells	16 (2/yrX8yrs)	$216.99	
3.2	Methane Gas Probes		probes	60 (2/yrX30yrs)	$57.05	
3.3	Surface Water Monitoring Points		points	60 (2/yrX30yrs)	$105.93	
3.4	Leachate		samples	60 (2/yrX30yrs)	$170.71	
4	**Final Cover Maintenance**					
4.1	Mow and Fertilize Vegetative Cover (MSWLF)		acres	30 yrs	$269.70	
	C&D LF		acres	8 yrs	$269.70	

4.2	Repair Erosion, Settlement, and Subsidence for On-site Soils (MSWLF)		acres	60 (2CY/acX30yrs)	$3.91	
	C&D LF		acres	16 (2CY/acX8yrs)	$3.91	
	Repair Erosion, Settlement, and Subsidence for Off-site Soils (MSWLF)		acres	30 yrs	$23.39	
	C&D LF		acres	8 yrs	$23.39	
4.3	Reseed Vegetative Cover		acres	0.2 (20% reseeded over post-closure period)	$1,266.29	
5	**Leachate Management**					
5.1	Clean Leachate Line(s)	1	per year	30 yrs	$2,090.51	$62,715.30
5.2	Maintain Leachate Collection System and Equipment	1	per year	30 yrs	$3,247.69	$97,430.70
5.3	Collect, Treat, Transport, and Dispose of Leachate		gal/yr	30 yrs	$0.41	
6	**Tasks Not Identified**					
7	**Subtotal**					
8	**Administrative Services** [f]	1	lump sum	0.06 (6%)	[f]	
9	**Technical and Professional Services** [f]	1	lump sum	0.07 (7%)	[f]	
10	**Post-closure Contingency** [f]	1	lump sum	0.1 (10%)	[f]	
11	**Total Post-closure** [g]					[g]

a Multipliers are determined from the *Solid Waste Financial Assurance Program Report* , December 22, 2000.
b Unit costs include a 2.41% inflationary adjustment for 2025.
c 5% of equipment capital cost, maintenance performed once per 5 yrs for 30 years (6 x 0.05 = 0.30).
d Input capital cost for gas control/remediation equipment, if installed at the site.
e If the approved groundwater monitoring plan requires monitoring for alternative constituents, unit costs shall be calculated in accordance with OAC 252:515-27-51(b) or (c).
f Input subtotal from line 7.
g Add lines 7 through 10.

Identified Tasks of Contractors for Site Closure:

Liquid Waste Identified Tasks:

1. Collection of liquid waste from process tanks and digestate storage tank
2. Hauling of liquid waste via tanker
3. Disposal of liquid waste at wastewater treatment plant

Solid Waste Identified Tasks:

1. Procure storage vessel for solid waste
2. Haul solid waste to local landfill
3. Dispose of solid waste at local landfill

All final waste will be collected by authorized transporters and disposed of at authorized disposal facilities. Final wastes include residual waste from tanks and non-recyclable equipment. Unprocessed solid organic materials will be sent to an off-site landfill or another appropriate site (such as an off-site anaerobic digester or composting facility). Liquid digestate from the process tanks and digestate storage tank will be sent to a wastewater treatment plant (or another appropriate site such as an off-site anaerobic digester).

Renew Gas
TRANSPORTATION

Digestate Transport Proposal for

VANGUARD RENEWABLES

Oklahoma Anerobic Digester

Emergency Disposal

For: 21405 OK-9, Keota, Oklahoma

December 19, 2024

Thank you for the opportunity to offer our emergency response digestate disposal services for your RNG project.

Ours disposal solutions include all equipment, drivers, and daily logistics.

1. **Digestate Tankers**
2. **Daily Logistics**
3. **Delivery Charges**
4. **Service Cost for Emergency Cleanout**

We can provide safety documentation, policies, and procedures with a signed letter of intent.

We also offer Emergency Response support for every customer site, and we provide design review and code compliance for loading and unloading stations, as well as support for permit applications.

We are available to answer any questions you have, and I look forward to your input so we can tailor our solution to best satisfy your emergency response disposal plan.

Sincerely,

Matt Smith
President
RNG Transportation LLC

Phone: 617-513-3192
Email: matt@rngtransportation.com

1. Digestate Tankers

We use 7000-gallon tankers at 85-90% full to ensure each delivery meets over-the-road weight restrictions.

We will provide twelve (12) digestate tankers for this project for $16,500 per tractor-trailer per month for an estimated four (4) month period.

Our tanker (shown below) is a gravity-discharge tanker using our custom-design that ensures offload in under 5 minutes without hydraulics, and most importantly meets all USDOT regulations relating to the equipment extension from the ICC bumper on the rear of the trailer. **The vast majority of digestate transport does not meet DOT over-the-road specifications – our tankers do.**

2. Daily Logistics

Based on the 10-million-gallon requirement, we will need to run 16 loads a day for 100 days to complete the project.

Deliveries are assumed to be run 167 miles each way to an approved waste-water treatment plant where we will dump the digestate into outdoor offload tanks. As a result, each driver will make one (1) run per day per trailer.

Every driver is responsible under US DOT for a pre- and post-trip inspection (DVIR). RenewGas will coordinate all routine maintenance and minimize down-time for repairs.

Each RenewGas trailer is equipped with an on- board real-time telematics solution with GPS tracking and diagnostics integrated into our driver management and compliance platform for US DOT reporting.

- REAL-TIME GPS TRACKING: Live vehicle location tracking, trip histories, geofence alerts
- TRAILER TRACKING: Theft detection, utilization reporting
- ROUTING: Real-time route tracking, historical trending
- DOCUMENTS: Centralized trip record- keeping and proof of delivery
- FLEET MAINTENANCE: Fault code monitoring, paperless DVIRs, use-based maintenance
- ELECTRONIC LOG COMPLIANCE: FMCSA-listed ELD with driver mobile cell logs.

RenewGas will work with your operations team to develop a service metric dashboard around the three key focus areas for reliability: safety incidents, driver performance (on-time and accuracy), and in-service performance (up-time and equipment availability).

Driving offenses are cause for immediate termination.

3. Delivery Charges

Delivery charges are $1000 per roundtrip delivery.

Per trip fees are subject to a diesel fuel surcharge. We add a 50% holiday premium for deliveries on New Year's Day, Easter or Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas. Should any rate adjustment be required, the request will be substantiated by direct demonstration of additional costs due to the operational and/or regulatory requirements.

Safety is our number one priority. We are committed to ensuring the safety of our employees, your employees, and the public.

- **Driver Training:** Every driver that will be operating on a designated route must complete driver training. All drivers will be expected to complete mandatory driver safety and operations training prior to employment. An experienced RenewGas driver manager will serve as a driver-trainer for all new hires and will accompany all drivers to each site prior to any driver making deliveries unaided.

- **Regulatory Compliance:** All driver records are maintained on-line for US DOT hours-of-service compliance. All drivers must have class A licenses, Tanker endorsements, and pass all state and federal health and safety requirements with a clean driving record.

4. Service Cost for Emergency Cleanout

Pricing and logistics are based on the AD providing a pump for top-fill of the slurry trailers.

Estimate assumes transport of a waste slurry (<10% solids) of 10M total gallons transported 167 miles to a waste-water treatment plant with capacity and offload facilities for a side-chute discharge to pond or tank.

All rates as of December 2024.

Service assumes loading/unloading sites can accommodate two trailers with road base and foundations to support 80,000 lb GVW tractor-trailers. We assume access to all sites between 6am and 12pm for deliveries.

Emergency Closure - Deliveries to WWTP		100	days to empty
Slurry Volumes - per day		100,000	gallons
Total Volume to Dispose		10,000,000	gallons
Tanker Capacity		7,000	gallons
@ GVW = 80k (OTR max)		92%	
Utilization Capacity		6,440	gallons
Trips per day		16	trips
ROUNDTRIP AD to WWTP disposal		335	miles
Equipment Rental			
Tractor-Trailer rentals		12	
Monthly Lease	$	16,500	per month
Subtotal	$	198,000	
Transportation Services			
Drivers w PTO non-hazmat			
Charge per Delivery	$	1,000	per delivery
Diesel Surcharge	$	250	per delivery
Deliveries to Complete		1,600	trips
Subtotal	$	2,000,000	
TOTAL Estimated Cost	**$**	**2,198,000**	
Cost per Gallon	**$**	**0.220**	

NOTE: We make assumptions that impact pricing, including contract term and slurry volumes. All performance requirements, equipment, scheduling, transportation routes, and operating responsibilities will be confirmed prior to contract.

MSG Waste Services, LLC
PO Box 180181
Fort Smith, AR 72918
(479) 4799966899
msgwaste@gmail.com

Estimate

ADDRESS
VanGuard Renewables
133 Boston Post Road
Building 15, 2nd Floor
Weston, MA 02493 USA

SHIP TO
VanGuard Renewables
21405 OK-9
Keota, OK

ESTIMATE # 2467
DATE 12/23/2024
EXPIRATION DATE 12/31/2025

TRACKING NO.
Roll Off Dumpster

PMT METHOD
Credit Card

DATE	ACTIVITY	QTY	RATE	AMOUNT
	30yrd 30 Yard open top container: Delivery Per Roll Off Dumpster	1	185.00	185.00
	Fuel Surcharge National Fuel Surcharge Per Delivery	1	35.00	35.00
	30yrd 30 Yard open top container: Swap out	1	345.00	345.00
	Fuel Surcharge National Fuel Surcharge: Per Swap out	1	35.00	35.00
	Disposal Disposal Price Per Ton	1	49.00	49.00

TOTAL **$649.00**

Accepted By

Accepted Date

MSG Waste Services, LLC
PO Box 180181
Fort Smith, AR 72918
(479) 4799966899
msgwaste@gmail.com

Estimate

ADDRESS
VanGuard Renewables
133 Boston Post Road
Building 15, 2nd Floor
Weston, MA 02493 USA

SHIP TO
VanGuard Renewables
21405 OK-9
Keota, OK

ESTIMATE # 2466
DATE 12/23/2024
EXPIRATION DATE 12/31/2025

TRACKING NO.
Liquid Digestate Removal

PMT METHOD
Credit Card

DATE	ACTIVITY	QTY	RATE	AMOUNT
	Services 6,000 Gallon Vacuum Tanker: Liquid Digestate Transportation	1	876.00	876.00
	Fuel Surcharge National Fuel Surcharge	1	75.00	75.00
	Disposal Liquid Digestate Disposal Per Load	1	2,677.00	2,677.00

TOTAL **$3,628.00**

Accepted By

Accepted Date

From: Kristin Brown
To: Michelle Durand
Subject: Re: Quote for Large Dumpster and Hauling
Date: Thursday, January 2, 2025 10:50:30 AM

Good Morning,

This is Kristin with Sue's Recycling. We appreciate you reaching out with your request.

Our largest dumpster is a 30 yard and it has a weight limit of 5 tons. I placed the quote below.

30yd (22x8x6)
DeliveryFee: $230
Haul Fee: $610.00 (includes 5 tons of disposal)
Disposal: $85.00 per ton after 5 tons

Delivery date is determined once service agreement is created.

Please let me know if there is anything else I can do for you today. Thank you for contacting Sue's Recycling and I hope you have a great day.

Sincerely,
Kristin
Customer Account Manager
Sue's Recycling & Sanitation
(918) 773-4007
support@suesrecycling.com

> On Thu, Jan 2 at 9:00 AM , Michelle Durand <mdurand@vanguardrenewables.com> wrote:
> Good Morning –
>
> Could you please provide me a quote for handling and hauling 520 tons of solid waste? We are developing a digester facility in Keota, OK that will process local food waste. For our solid waste permit, we need to have a closure plan for if the site were to close with its maximum inventory. If you quote could please include your largest sized dumpster and your hauling rate the would be greatly appreciated.
>
> Thank you!
>
> Michelle
>
> **Michelle Durand**
> Director of Development
>
> mdurand@vanguardrenewables.com
> 508-951-6081

133 Boston Post Rd
Weston, MA 02493
vanguardrenewables.com

From: Scoute Warren
To: Michelle Durand
Subject: Re: Quote for Hauling Liquid and Solid "Waste"
Date: Thursday, January 2, 2025 4:52:13 PM
Attachments: image001.png
image002.png
image003.png
image004.png
image005.png

Michelle the price of removal for the liquids would be around $10,100,000.00 and the price for the solids would be around $90,000.00

On Mon, Dec 30, 2024 at 10:15 AM Michelle Durand <mdurand@vanguardrenewables.com> wrote:

> Hi Chad –
>
> Following up on my below request. Any chance you could have a quote by Friday?
>
> Thank you!
>
> Michelle Durand
>
> Director of Development
>
> Vanguard Renewables
>
> C: 508-951-6081
>
> ---
>
> **From:** Michelle Durand
> **Sent:** Monday, December 23, 2024 3:08 PM
> **To:** estimating@robinsonconstruction.org
> **Subject:** Quote for Hauling Liquid and Solid "Waste"
>
> Hi Chad –
>
> As discussed, we need to present the state with quotes for a site closure plan to support our solid waste permit. The max inventory on site at one time is the following:

10.5 mil gallons of liquid digestate (from two digester tanks and an 8 million gallon digestate storage tank)

- To be hauled to a waste water treatment plant (Do you know any nearby facilities that would accept liquid digestate? – we have a place in mind but it is 167 miles away in Missouri)

520 tons of pallets and solid waste to likely be brought to a landfill.

- Local landfill looks to be 30 miles away

Could you please put together a one-page PDF quote per tanker and per truck to haul this material off the Keota site?

Thank you!

Michelle Durand
Director of Development

VANGUARD RENEWABLES

mdurand@vanguardrenewables.com
508-951-6081
133 Boston Post Rd
Weston, MA 02493
vanguardrenewables.com

--

Estimating Department
Scoute Warren 918-839-6931
Chad Robinson 918-839-6938
Office 918-649-0023
Fax 918-649-0013

When recorded return to:
Tim Sowecke
GableGotwals
499 W. Sheridan Ave., Suite 2200
Oklahoma City, OK 73102

NOTICE OF CLOSURE – SOLID WASTE PROCESSING FACILITY

STATE OF OKLAHOMA §
§ **KNOW ALL MEN BY THESE PRESENTS**
COUNTY OF HASKELL §

Vanguard Renewables, LLC d/b/a Keota AD 1, LLC, does hereby provide notice pursuant to OAC 252:515-25-36 of closure of the Keota AD 1 solid waste processing facility located upon the real property described as follows:

A 20.66 acre site, situated in sections 15 and 16, T-9-N, R-23-E.I.M., Haskell County, Oklahoma, out of a tract of land recorded in book 817, page 537, deed records Haskell County, Oklahoma, said site limits being more particularly described by metes and bounds as follows:
POINT OF BEGINNING (P.O.B., X: 2903104.81, Y: 715723.94) within said Section 16, at the Northwest corner of this site, from which a concrete nail found for the Northeast corner of said Section 16 bears North 75°26'42" East a distance of 512.55 feet;
THENCE North 88°00'42" East a distance of 1000.00 feet to the Northeast corner of this site;
THENCE South 01°59'18" East a distance of 900.00 feet to the Southeast corner of this site;
THENCE South 88°00'42" West a distance of 1000.00 feet to the Southwest corner of this site;
THENCE North 01°59'18" West a distance of 900.00 feet to the POINT OF BEGINNING, containing 20.66 acres (900,000 sq. ft.).

Types of non-hazardous solid waste processed at this facility include: source separated organics; packaged food material; dairy wastes; fats, oils, and greases; food processing wastewater; glycerin; brewery wastes; and dairy farm manure, at a quantity of approximately ____ tons daily.

This facility has been closed. Closure of this solid waste processing facility has been authorized by the ODEQ consistent with its solid waste provisions at OAC 252:515-1-1 *et seq*.

DATED this ____ day of _____, 20___.

Vanguard Renewables, LLC d/b/a Keota AD 1, LLC

_____

Printed Name: _____

ACKNOWLEDGMENT

STATE OF OKLAHOMA)
) ss.
COUNTY OF _____)

BEFORE ME, the undersigned Notary Public, in and for said County and State, on the ____ day of _____, 20___, appeared _____, to me known to be the person who executed the foregoing instrument, and acknowledged to me that he/she executed the same as his/her free and voluntary act and deed, for the uses and purposes therein set forth.

_____
Notary Public in and for the State of Oklahoma

[AFFIX NOTARY SEAL HERE]