

**North Carolina Department of Environment and Natural Resources
Underground Storage Tank Section**



UST System Design Part III



UST System Design



Engineered Plans

- Scale Drawings
- UST-6C “Schedule of Materials”
- UST-20 “Alternative Fuel / Hazardous Substances Compatibility Checklist”

UST System Design

“...the design of petroleum storage tank systems, incorporating the tank, piping, ancillary equipment and containment systems, is an engineering function as defined by G.S. 89C-3 and must therefore be certified by a Professional Engineer.”

- NC Board of Examiners for Engineers and Surveyors
(December 20, 1993)

UST System Design

Scale Drawing(s):

- 11" x 17"
- Should include the scale
- Compass rose / North arrow
- Must be sealed by a North Carolina licensed Professional Engineer
- Additional sheets showing an overview of the UST facility or UST system details may be necessary

UST System Design

Scale Drawing(s):

- Must show the proposed locations of:
 - UST system features
 - Tanks
 - Product piping
 - Vent piping
 - Manifold piping
 - Detectable tape
 - Flex connectors

UST System Design

Scale Drawing(s):

- Must show the proposed locations of:
 - UST system features (cont.)
 - Leak detection equipment
 - Spill prevention equipment
 - Overfill prevention equipment
 - Vapor recovery equipment
 - Dispensers
 - Containment sumps

UST System Design

Scale Drawing(s):

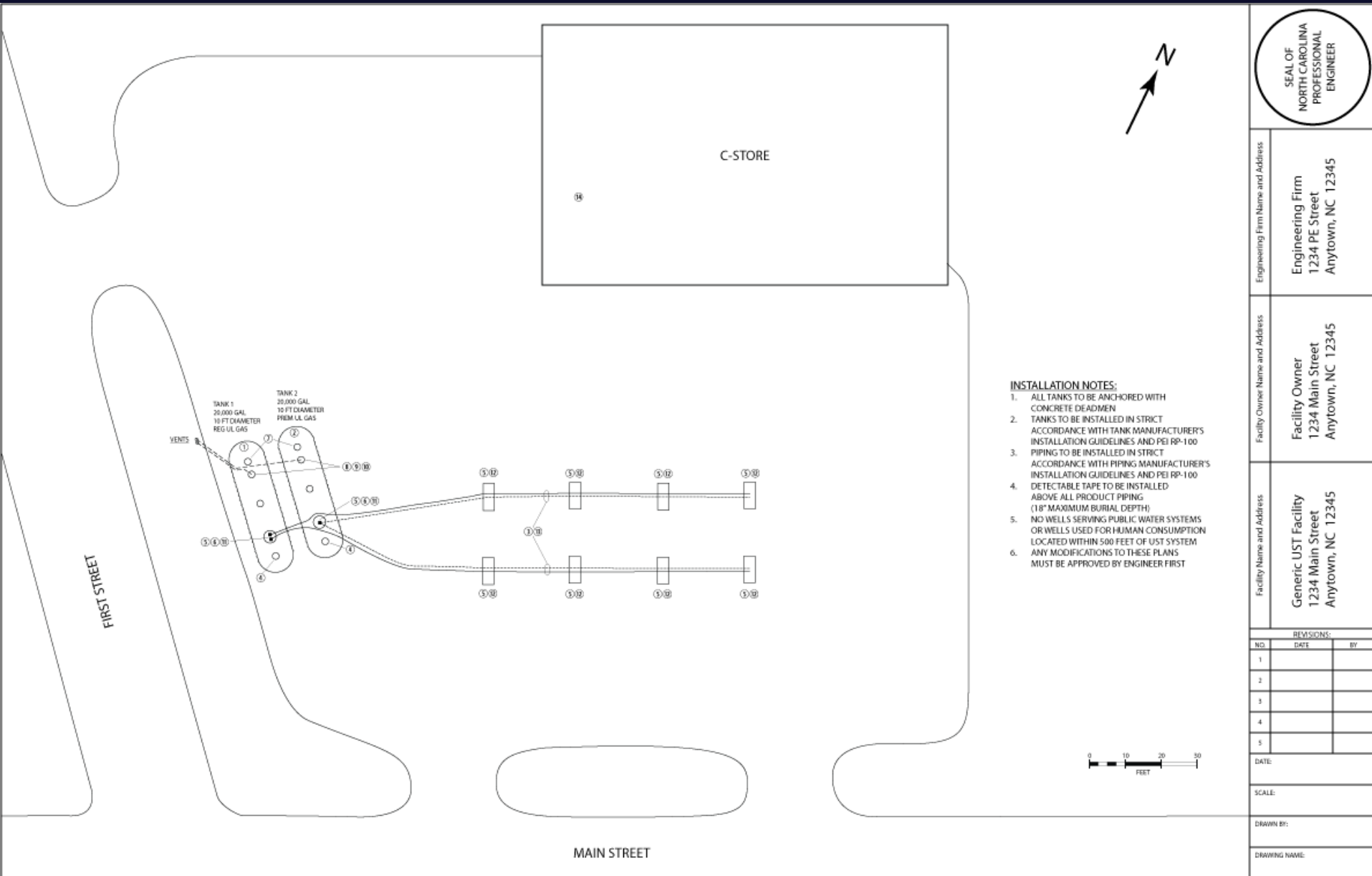
- Must show the locations of:
 - Adjacent roadways
 - Onsite structures
 - Water supply wells (within 500 feet)
 - ✓ If no wells exist that should be indicated.
- UST system components should be cross-referenced with UST-6C “Schedule of Materials”

UST System Design

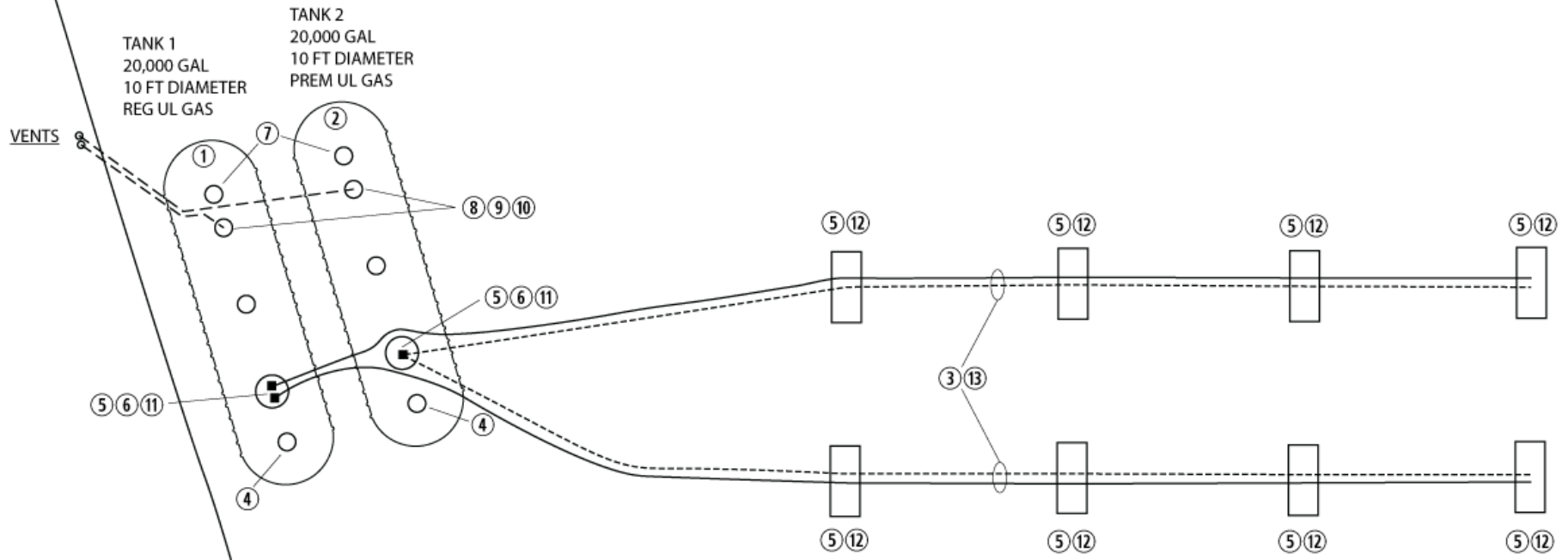
Scale Drawing(s):

- All USTs must be noted with the following information:
 - Corresponding Tank ID from UST-6A
 - Tank capacity
 - Tank diameter
 - Product to be stored
 - Method of anchoring

Example Plans



Example Plans



Complex designs may require detailed figures of the UST system

UST System Design

Scale Drawing(s):

- Include installation notes on drawings to indicate maximum burial depth of detectable tape, absence of wells, etc.

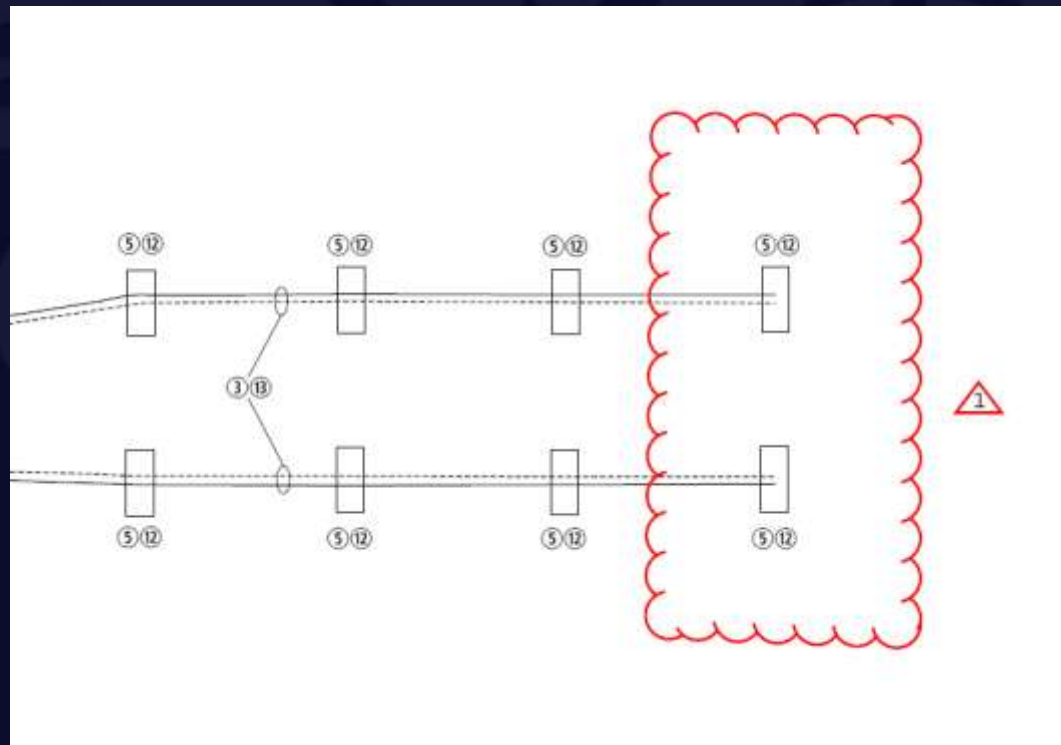
INSTALLATION NOTES:

1. ALL TANKS TO BE ANCHORED WITH CONCRETE DEADMEN
2. TANKS TO BE INSTALLED IN STRICT ACCORDANCE WITH TANK MANUFACTURER'S INSTALLATION GUIDELINES AND PEI RP-100
3. PIPING TO BE INSTALLED IN STRICT ACCORDANCE WITH PIPING MANUFACTURER'S INSTALLATION GUIDELINES AND PEI RP-100
4. UTILITY TRACER TAPE TO BE INSTALLED ABOVE ALL PRODUCT PIPING
5. ANY MODIFICATIONS TO THESE PLANS MUST BE APPROVED BY ENGINEER FIRST

UST System Design

Scale Drawing(s):

- Use “revision cloud” and revision dates on drawings to indicate changes, as necessary



UST System Design

UST-6C “Schedule of Materials”

- Tanks
- Piping
- Spill prevention equipment
- Overfill prevention equipment
- Containment sumps
- Vapor recovery equipment
- Detectable tape

UST System Design

UST-6C “Schedule of Materials” (cont.)

- Leak detection equipment
 - Leak detection monitoring console
 - Interstitial sensor (tank)
 - Interstitial sensor (piping)
 - Automatic Line Leak Detectors (for pressurized piping)
 - Containment sump monitoring
 - Interstitial sensor (spill bucket)

UST System Design

Enter Number of Monitoring Points	Monitoring Point / Sensor Location	Other Sensors	Monitoring Point / Sensor Location
<input type="checkbox"/>	UDC Sumps	<input type="checkbox"/>	Tank Interstitial Sensors
<input type="checkbox"/>	Piping Systems / STP Sumps		
<input type="checkbox"/>	Other Sumps		
<input type="checkbox"/>	Spill Buckets (for ones w/o built in sensors)	<input type="checkbox"/>	Spill Buckets (for ones w/ built in sensors)
<hr/> <input type="checkbox"/>	Total Number of Sump Sensors Used at Site		



It may be useful to create a checklist to account for each needed sensor

UST-6C

Application to Install or Replace Underground Storage Tank Systems (SCHEDULE OF MATERIALS)



Facility ID No.	Facility Name	Attachment to (check one): UST-6A <input type="checkbox"/> UST-6B <input type="checkbox"/>
UST System components installed (Check one): <input type="checkbox"/> Tanks and Piping <input type="checkbox"/> Tanks Only <input type="checkbox"/> Piping Only		If attached to UST-6B, have any modifications been made to approved design plan? YES <input type="checkbox"/> NO <input type="checkbox"/>

INSTRUCTIONS: List the manufacturer, model or part number and quantity for the following equipment installed at the facility: tanks; piping including flexible connectors; leak detection equipment including the monitoring console, interstitial monitoring sensors and automatic line leak detectors; spill and overflow prevention equipment; vapor recovery equipment; containment sumps and method of locating the piping once it is buried. Group like categories of equipment together in the list. The item number provided below must correspond to the location(s) of the equipment shown on the scale drawing. Attach additional pages as necessary.

ITEM NO.	ITEM/PART DESCRIPTION	MANUFACTURER	MODEL/PART NO.	QTY

<p>_____</p> <p>Print Name of North Carolina Professional Engineer</p> <p>_____</p> <p>Company Name</p> <p>_____</p> <p>Date</p>	<p>Affix PE seal here:</p>
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UST-20

“Alternative Fuel / Hazardous Substances Compatibility Checklist”

Required for:

- Greater than 10% Ethanol
- Greater than 20% Biodiesel
- Any hazardous substance

UST-20

“Alternative Fuel / Hazardous Substances
Compatibility Checklist”

*Accepted documentation to be attached to
UST-20 form:*

- Certification by manufacturer
- UL listing

UST-20

“Alternative Fuel / Hazardous Substances Compatibility Checklist”

Must be certified as compatible:

- Tank
- Spill prevention equipment
- Overfill prevention equipment
- Submersible turbine pump
- Leak detection probes
- Interstitial and sump sensors

UST-20

“Alternative Fuel / Hazardous Substances Compatibility Checklist”

Must be certified as compatible:

- Piping material
- Pipe dope / sealant / adhesive
- Gaskets / seals
- Flex connectors
- Angle check valves
- Emergency shear valves
- Line leak detectors

Example of Corrosion Due to E-85

**Standard, non-E85 fuel
STP**



E85 STP



Photos courtesy Iowa DNR

UST-20

“Alternative Fuel / Hazardous Substances Compatibility Checklist”

UST-20		Alternative Fuel/Hazardous Substances Compatibility Checklist			
Is this an existing facility? Yes <input type="checkbox"/> No <input type="checkbox"/>		STATE USE ONLY			
Is this a revised checklist? Yes <input type="checkbox"/> No <input type="checkbox"/>		Revised name: _____			
If known, enter Facility ID Number: _____		Approved: Yes <input type="checkbox"/> No <input type="checkbox"/>			
		Date Approved/Disapproved: _____			
<p>Instructions: This form is to be used to notify NC DENR that the proposed UST systems are compatible with ethanol blends greater than 10%, biodiesel blends greater than 20% or hazardous substances. This form must also be submitted <u>prior</u> to conversion from a conventional motor fuel to an ethanol blend greater than 10% ethanol content, a biodiesel blend greater than 20% biodiesel content or hazardous substances. Forms shall be submitted to the following address:</p> <p style="text-align: center;"> NC DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES DIVISION OF WASTE MANAGEMENT / UST SECTION 1637 MAIL SERVICE CENTER, RALEIGH, NC 27609-1637 PHONE (919) 797-8171 FAX (919) 718-1117 http://portal.ncdenr.gov/webform </p> <p>Sections I, II, and VI are to be completed by the UST owner/operator. Sections III through V of the form are to be completed by a UST Equipment Contractor. Complete one form for each UST system that will be storing the ethanol, biodiesel blend fuel or hazardous substances. Keep a copy of this form and all supporting documentation for your records to be made available for inspection.</p> <p>For equipment items below that have manufacturer approved checked, you must provide copies of the applicable documents from the manufacturer stating the approval for use with the ethanol, biodiesel or hazardous substance concentration to be stored. If the manufacturer provides a warranty for the item, then you must provide a copy of the manufacturer's warranty that states the component is warranted for use with that concentration of alternative fuel blend/hazardous substance.</p> <p>If any component is not Underwriters Laboratory (UL) listed or manufacturer approved for use with ethanol blend fuels greater than 10%, biodiesel blends greater than 20% or hazardous substances, then it cannot be stored and/or dispensed from the UST system. For "Tank Material" in Section II, if the tank is a steel tank that has not been internally lined and will not contain hazardous substances, write "steel" in the "manufacturer" box. UL or Manufacturer approval is not required.</p> <p>For "Pipe Material" in Section IV, if the piping is steel and will not contain hazardous substances, write "steel" in the "manufacturer" box. UL or Manufacturer approval is not required.</p> <p>Write "NA" in the manufacturer box if the UST system does not have a particular component on the list.</p> <p>Please note that the Fire Marshal must be notified prior to dispensing ethanol blend fuels.</p>					
I. Ownership of Tanks Owner's Name (Corporation, Individual, Public Agency or Other Entity): _____ Contact Person for UST Location: _____ Phone Number: _____ E-mail Address: _____			II. Location of Tanks Facility Name: _____ Address: _____ City (nearest): _____ County: _____		
III. Tank Information Tank ID No. _____ Tank Size: _____ Install Date: _____ Product formerly stored: _____ New product stored: _____ % Ethanol or Biodiesel: _____ Is tank listed: <input type="checkbox"/> Yes <input type="checkbox"/> No Note: Tanks that have an interior lining are not approved for storage of ethanol or biodiesel blend fuels. This exception is FRP tanks that were listed under certification by the tank manufacturer to provide the compatibility. UST Leak Detector: <input type="checkbox"/> Automatic Tank Gauge (ATG) <input type="checkbox"/> Inventory control & tank tightness testing <input type="checkbox"/> Manual monitoring <input type="checkbox"/> Statistical Inventory Reconciliation (SIR)					

B. Tank Information (Continued)					
Component	Manufacturer	Model/Brand	UL		Manufacturer Approved*
			Listed	Number	
Tank material			<input type="checkbox"/>		<input type="checkbox"/>
Soil bucket			<input type="checkbox"/>		<input type="checkbox"/>
Control: Auto shut-off			<input type="checkbox"/>		<input type="checkbox"/>
Ball float: KROHNE			<input type="checkbox"/>		<input type="checkbox"/>
Submersible pump			<input type="checkbox"/>		<input type="checkbox"/>
Leak detection probe			<input type="checkbox"/>		<input type="checkbox"/>
Material & tank varnish			<input type="checkbox"/>		<input type="checkbox"/>
* Attach documents from the manufacturer stating the approval and warranty (if one is provided) for use with specific alternative fuel/hazardous substance.					
IV. Pipe Information					
Component	Manufacturer	Model/Brand	UL		Manufacturer Approved*
			Listed	Number	
Configuration: <input type="checkbox"/> Single wall <input type="checkbox"/> Double wall	Type: <input type="checkbox"/> Steel <input type="checkbox"/> Fiberglass <input type="checkbox"/> Flexible <input type="checkbox"/> Other (specify): _____				
Pipe material			<input type="checkbox"/>		<input type="checkbox"/>
Pipe appurtenance / additive			<input type="checkbox"/>		<input type="checkbox"/>
Gaskets / Gaskets			<input type="checkbox"/>		<input type="checkbox"/>
Flex connector			<input type="checkbox"/>		<input type="checkbox"/>
Angle check valve (outside pipe system)			<input type="checkbox"/>		<input type="checkbox"/>
Emergency shear valve			<input type="checkbox"/>		<input type="checkbox"/>
Line leak detector			<input type="checkbox"/>		<input type="checkbox"/>
* Attach documents from the manufacturer stating the approval and warranty (if one is provided) for use with specific alternative fuel/hazardous substance.					
V. Petroleum Equipment Contractor Signature					
I certify by signing below that the components checked in the "UL" and/or "Manufacturer Approved" columns of sections III through IV are UL listed and/or manufacturer approved for use with the specified ethanol blend, specified biodiesel blend or specific listed hazardous substances.					
Signature of petroleum equipment contractor: _____			Date: _____		
Print petroleum equipment contractor name: _____					
Certificate Company Name: _____		Address: _____		Phone: _____	
City: _____		State: _____		Zip: _____	
VI. Owner / Operator Signature					
By signing below you are acknowledging that all of the items in sections I through V have been completed.					
Tank owner / operator signature: _____			Date: _____		
Print tank owner / operator name: _____			Company: _____		
Failure to submit this form with all sections completed and any appropriate attachments could result in an enforcement action and/or non-renewal of your operating permit.					

UST-20

Alternative Fuel/Hazardous Substances Compatibility Checklist



Is this an existing facility? Yes No

Is this a revised checklist? Yes No

If known, enter Facility ID Number:

STATE USE ONLY

Reviewer name: _____

Approved: Yes No

Date Approved/Disapproved: _____

Instructions: This form is to be used to notify NC DENR that the proposed UST systems are compatible with ethanol blends greater than 10%, biodiesel blends greater than 20% or hazardous substances. This form must also be submitted **prior** to conversion from a conventional motor fuel to an ethanol blend greater than 10% ethanol content, a biodiesel blend greater than 20% biodiesel content or hazardous substances. Forms shall be submitted to the following address:

**NC DEPARTMENT OF ENVIRONMENT & NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT / UST SECTION
1637 MAIL SERVICE CENTER, RALEIGH, NC 27699-1637
PHONE (919) 707-8171 FAX (919) 715-1117
<http://portal.ncdenr.org/web/wm>**

Sections I, II, and VI are to be completed by the UST owner/operator. Sections III through V of this form are to be completed by a UST Equipment Contractor. Complete one form for each UST system that will be storing the ethanol, biodiesel blend fuel or hazardous substances. Keep a copy of this form and all supporting documentation for your records to be made available for inspection.

For equipment items below that have manufacturer approved checked, you must provide copies of the applicable documents from the manufacturer stating the approval for use with the ethanol, biodiesel or hazardous substance concentration to be stored. If the manufacturer provides a warranty for the item, then you must provide a copy of the manufacturer's warranty that states the component is warranted for use with that concentration of alternative fuel blend/hazardous substance.

If any component is not Underwriters Laboratory (UL) listed or manufacturer approved for use with ethanol blend fuels greater than 10%, biodiesel blends greater than 20% or hazardous substances, then it cannot be stored and/or dispensed from the UST system. For "Tank Material" in Section III, if the tank is a steel tank that has not been internally lined and will not contain



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"Alternative Fuel / Hazardous Substances Compatibility Checklist"

Sections I, II, and VI are to be completed by the UST owner/operator. Sections III through V of this form are to be completed by a UST Equipment Contractor. Complete one form for each UST system that will be storing the ethanol, biodiesel blend fuel or hazardous substances. Keep a copy of this form and all supporting documentation for your records to be made available for inspection.

For equipment items below that have manufacturer approved checked, you must provide copies of the applicable documents from the manufacturer stating the approval for use with the ethanol, biodiesel or hazardous substance concentration to be stored. If the manufacturer provides a warranty for the item, then you must provide a copy of the manufacturer's warranty that states the component is warranted for use with that concentration of alternative fuel blend/hazardous substance.

If any component is not Underwriters Laboratory (UL) listed or manufacturer approved for use with ethanol blend fuels greater than 10%, biodiesel blends greater than 20% or hazardous substances, then it cannot be stored and/or dispensed from the UST system. For "Tank Material" in Section III, if the tank is a steel tank that has not been internally lined and will not contain hazardous substances, write "steel" in the "manufacturer" box. UL or Manufacturer approval is not required.

For "Pipe Material" in Section IV, if the piping is steel and will not contain hazardous substances, write "steel" in the "manufacturer" box. UL or Manufacturer approval is not required.

Write "NA" in the manufacturer box if the UST system does not have a particular component on the list.

Please note that the Fire Marshal must be notified prior to dispensing ethanol blend fuels.

I. Ownership of Tanks		II. Location of Tanks	
Owner's Name (Corporation, Individual, Public Agency or Other Entity):		Facility Name:	
Contact Person for UST Location:	Phone Number:	Address:	
E-mail Address		City (nearest):	County:

III. Tank Information			
Tank ID No. _____	Tank Size: _____	Install Date: _____	
Product formerly stored: _____	New product stored: _____	% Ethanol or Biodiesel: _____	
Is tank lined: <input type="checkbox"/> Yes <input type="checkbox"/> No	Note: Tanks that have an interior lining are not approved for storage of ethanol or biodiesel blend fuels. The exception is FRP tanks that were lined under certification by the tank manufacturer to provide the compatibility.		

Leak Detection: Automatic Tank Gauge (ATG) Inventory control & tank tightness testing



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"Alternative Fuel / Hazardous Substances Compatibility Checklist"

III. Tank Information (Continued)					
Component	Manufacturer	Model/Brand	UL		Manufacturer Approved *
			Listed	Number	
Tank material			<input type="checkbox"/>		<input type="checkbox"/>
Spill bucket			<input type="checkbox"/>		<input type="checkbox"/>
Overfill / Auto shut-off / Ball float (circle)			<input type="checkbox"/>		<input type="checkbox"/>
Submersible pump			<input type="checkbox"/>		<input type="checkbox"/>
Leak detection probes			<input type="checkbox"/>		<input type="checkbox"/>
Interstitial & sump sensors			<input type="checkbox"/>		<input type="checkbox"/>

* **Attach** documents from the manufacturer stating the approval and warranty (if one is provided) for use with specific alternative fuel/hazardous substance.

IV. Pipe Information		Install Date: _____	Pipe: Pressurized <input type="checkbox"/> Suction <input type="checkbox"/>		
Component	Manufacturer	Model/Brand	UL		Manufacturer Approved *
			Listed	Number	
Configuration: <input type="checkbox"/> Single wall <input type="checkbox"/> Double wall Type: <input type="checkbox"/> Steel <input type="checkbox"/> Fiberglass <input type="checkbox"/> Flexible <input type="checkbox"/> Other (specify): _____					
Pipe material			<input type="checkbox"/>		<input type="checkbox"/>
Pipe dope/sealant / adhesive			<input type="checkbox"/>		<input type="checkbox"/>
Gaskets / Seals			<input type="checkbox"/>		<input type="checkbox"/>
Flex connector			<input type="checkbox"/>		<input type="checkbox"/>
Angle check valve (suction pipe systems)			<input type="checkbox"/>		<input type="checkbox"/>
Emergency shear valve			<input type="checkbox"/>		<input type="checkbox"/>
Line leak detector			<input type="checkbox"/>		<input type="checkbox"/>

* **Attach** documents from the manufacturer stating the approval and warranty (if one is provided) for use with specific alternative fuel/hazardous substance.



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"Alternative Fuel / Hazardous Substances Compatibility Checklist"

(suction pipe systems)			<input type="checkbox"/>	<input type="checkbox"/>
Emergency shear valve			<input type="checkbox"/>	<input type="checkbox"/>
Line leak detector			<input type="checkbox"/>	<input type="checkbox"/>

* **Attach** documents from the manufacturer stating the approval and warranty (if one is provided) for use with specific alternative fuel/hazardous substance.

V. Petroleum Equipment Contractor Signature

I certify by signing below that the components checked in the "UL" and/or "Manufacturer Approved" columns of sections III through IV are UL listed and/or manufacturer approved for use with the specified ethanol blend, specified biodiesel blend or specific listed hazardous substances.

Signature of petroleum equipment contractor

Date

Print petroleum equipment contractor name

Contractor Company Name:		Phone:	
Address	City:	State:	Zip:

VI. Owner / Operator Signature

By signing below you are acknowledging that all of the items in sections I through V have been completed.

Tank owner / operator signature

Date

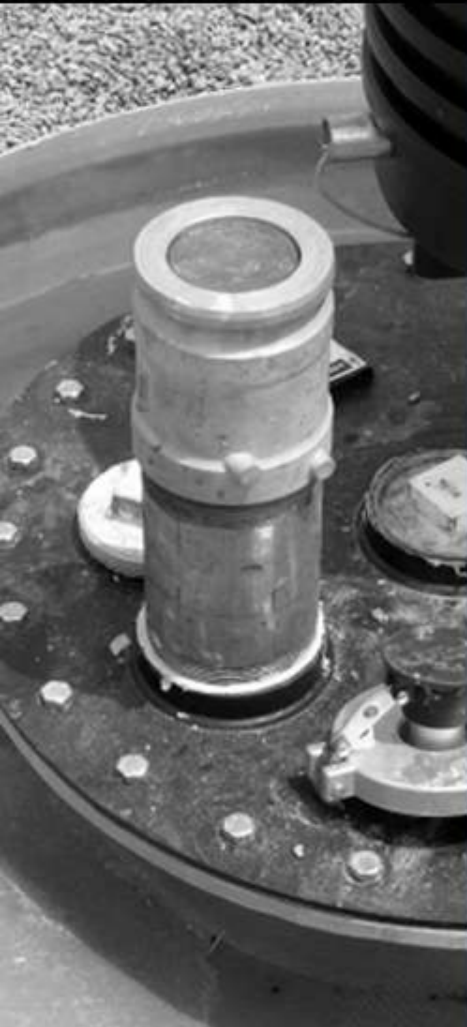
Print tank owner / operator name

Company

Failure to submit this form with all sections completed and any appropriate attachments could result in an enforcement action and/or non-issuance of your operating permit.



North Carolina Department of Environment and Natural Resources
Underground Storage Tank Section



Questions?

