Specification for Lease Automatic Custody Transfer (LACT) Equipment

API SPECIFICATION 11N
FOURTH EDITION, NOVEMBER 1, 1994

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005

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Exploration and Production Department

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CONTENTS

FOREWORD

This specification is under the jurisdiction of the API Committee on Standardization of Production Equipment.

Since the initial lease automatic custody transfers (LACT) of crude oil in December, 1955, the practice has been successfully applied in practically all U.S. producing areas and is generally accepted on a worldwide basis.

Research studies and field testing by the industry have proved that a variety of system designs will accurately measure the quantity and quality of produced crude oil and deliver it to the carrier on an automatic or unattended basis. This specification describes currently acceptable requirements for LACT. It does not endorse or advocate the preferential use of LACT as compared with other methods of effecting custody transfer. Its purpose is to describe methods and practices which are acceptable for LACT of crude oil. Further, it is not intended to restrict in any way future development of other systems or equipment.

This standard shall become effective on the date printed on the cover but may be used voluntarily from the date of distribution.

Specification for Lease Automatic Custody Transfer (LACT) Equipment

1 Scope

1.1 COVERAGE

This specification describes optimum requirements for assemblies designed for the unattended automatic custody transfer (ACT) of liquid hydrocarbons, such as crude oil and condensate, at rates below 11,000 U.S. barrels (1750m³) per 24-hour day, in field applications at less than 500 psig (3447 kPa) operating pressure.

1.2 One flow diagram illustrating acceptable locations for the charging pump, custody transfer liquid meter, monitor probe, sampling system, piping, valves and controls is presented in Fig. 1.

1.3 Although this specification depicts only one flow diagram, it is recognized that other component arrangements are possible. Any design that meets the requirements of this specification is acceptable by agreement between user and fabricator.

1.4 Appendix A contains specification data sheets for a standard API LACT Unit. Two identical data sheets are shown, one with U.S. Customary units and the other with metric units.

1.5 Required ACT system elements not described in this specification include the surge tank, electrical power and instrument gas supply, signals to start and stop the pump, connecting piping and valves.

1.6 Compliance with the provisions of this specification may result in an approach to accuracy or may establish safeguards not necessary under all conditions. By agreement between the user and fabricator, non mandatory portions of this specification may be waived.

1.7 The compulsory verb form shall has been used where a deviation from the requirements may adversely affect the satisfactory operation of a system designed for optimum operation under typical producing conditions.

1.8 This specification presents the concurrence of the industry on current system requirements for ACT. There is equipment now in the design or field-proving stage that may further improve the art of ACT. Such developments are encouraged and every effort should be made to expedite their reduction to practice and standardization.

2 References and Abbreviations

Following is a list containing the complete title of organizations, publications and terms referred to by abbreviations herein:

ACT	Automatic Custody Transfer.
ANSI	American National Standards Institute.
API	American Petroleum Institute.
ASME	American Society of Mechanical Engineers.
ASTM	American Society for Testing and Materials.
BOPD	Barrels of Oil per Day.
S&W	Sediment and Water.
LACT	Lease Automatic Custody Transfer.
NEC	National Electrical Code, copies of which are available from the National Fire Protection Association, 420 Atlantic Av., Boston, Mass. 02210. The NEC is also distributed by the American National Standards Institute and the National Board of Fire Underwriters.
NEMA	National Electrical Manufacturers Association.
NPSH	Net Positive Suction Head.
SSU	Saybolt Seconds Universal.
TEFC	Totally Enclosed Fan Cooled.

API

RP 2533	Metering Viscous Hydrocarbons, (Redesignated Chapter 6.7, API Manual of Petroleum Measurement Standards). Recommended practice for design, installation, operation and proving of meters and meter accessories for measurement of viscous hydrocarbons.
Std 1101	*Measurement of Petroleum Liquid Hydrocarbons by Positive Displacement Meter,* (ANSI Z11.170—1971, ISO DIS2714—1971). Covers installation and calibration of meters and meter provers, meter-proving procedures, and meter performance. Also includes a section on operation and maintenance of metering systems, and over 100 terms and definitions related to meter work.
Std 2502	*Lease Automatic Custody Transfer,* (ANSI Z11.249—1969), (Redesignated Chapter 6.1, API Manual of Petroleum Measurement Standards). Prepared as a general guide for the design, installation, and operation of LACT systems for liquid hydrocarbons. The generalized design requirements contained in the standard indicate minimum criteria and conditions required for acceptable measurement accuracy and fail-safe and security requirements.
Std 2534	Measurement of Liquid Hydrocarbons by Turbine Meter Systems, (ANSI Z11.299—1971) (ISO DIS 2715—1971) (Redesignated Chapter 5.3, API Manual of Petroleum Measurement Standards). Covers design, installation, operation and proving of turbine meter

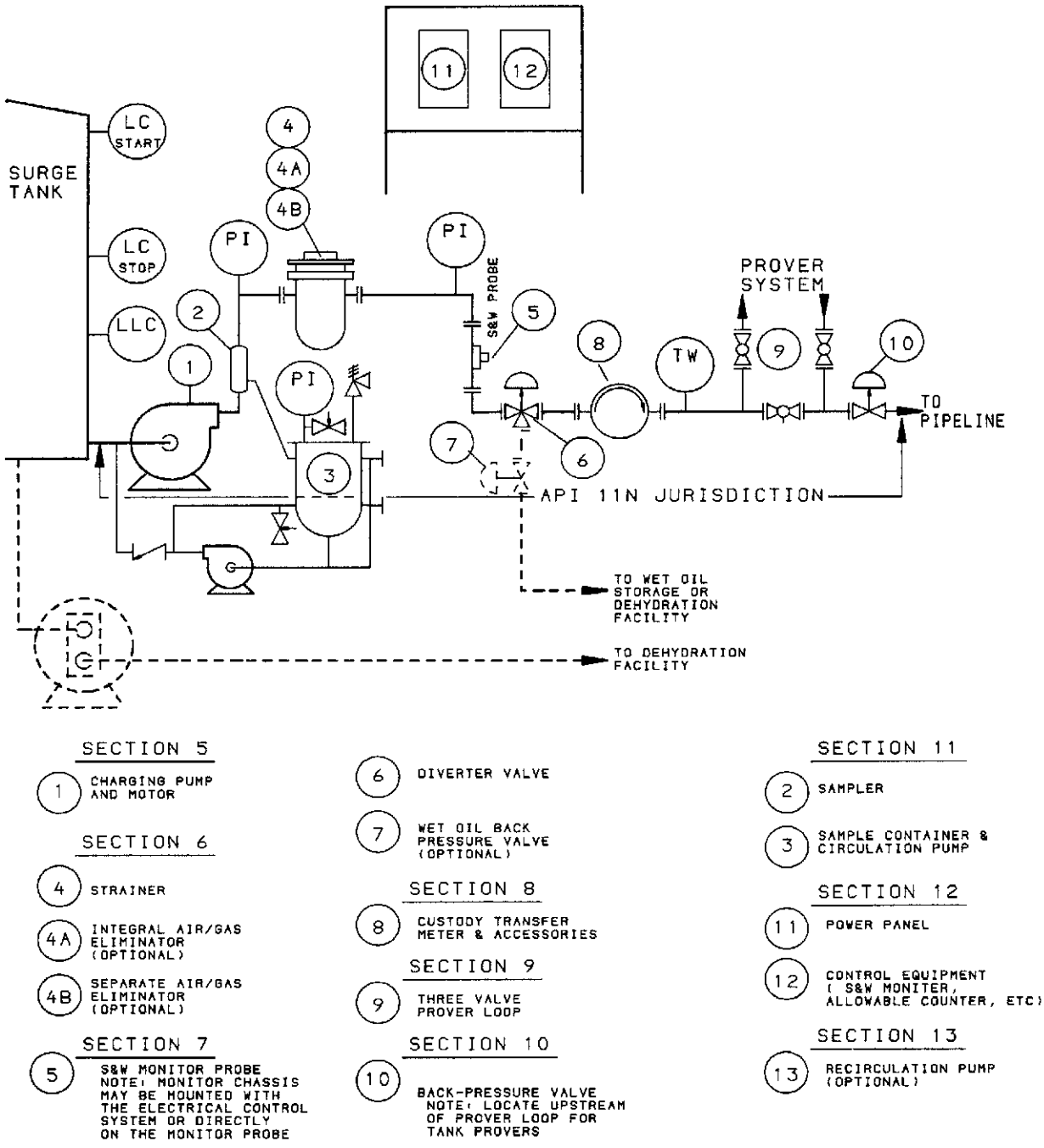

Figure 1—Typical Positive Displacement or Turbine Meter LACT Unit Flow Diagram

systems. Also presents information on the application of statistical methods to metering systems, trouble-shooting charts, explanation of electronic readout devices and glossary of terms.

Std 2546 *(ASTM D270-65)—Method of Sampling Petroleum and Petroleum Products,* (ANSI Z11.33—1971), (Redesignated Chapter 8.1 and 8.2, API Manual of Petroleum Measurement Standards). This standard describes the standard procedures for obtaining representative samples of stocks or shipments of petroleum and petroleum products except electrical insulating oils and butane, propane, and other gases.

This specification is intended to be compatible with applicable sections of the latest editions of the following:

API MANUAL OF PETROLEUM MEASUREMENT STANDARDS

API 1101
API 2502
API 2534
API 2546
API RP 500
API 2533
National Electric Code (NEC)
ASME Code

3 Definitions

The following terms are defined as used in this specification:

3.1 fabricator: The principal agent in the design, fabrication, assembly and furnishing of an LACT Unit which conforms to this specification.

3.2 user: The purchaser and user of an LACT Unit which conforms to this specification.

4 Shop Assembly, Testing, and Warranty

4.1 ACT units shall be assembled, connected, pre-wired, and shop-tested by the fabricator before delivery to the user to assure that the unit is in good operating condition and ready for field installation.

4.2 A hydraulic test shall be made by the fabricator on the fully assembled unit as follows:

a. Test Pressure—150 percent of rated working pressure.
b. Test Duration—Thirty minutes, minimum.
c. Allowed Pressure Loss—One percent of test pressure, maximum.
d. Test Fluid—Light oil.
e. Fluid Removal—Drain after test is completed and cap all connections.

4.3 An electrical test shall be made on the wired and connected unit to verify both wiring integrity and correct functional operation for all elements of the assembly.

5 Mechanical and Hydraulic Specifications

5.1 SKID MOUNTING

The equipment components should be mounted on a sliding type, welded, oil-field style, structural steel skid designed with sufficiently sized members and bracing to provide a completely portable unit.

5.2 All equipment components should be rigidly attached to the skid and braced as necessary, using suitable connections for those items likely to require future removal for normal repairs and maintenance.

5.3 HYDRAULIC ASSEMBLY

The hydraulic assembly shall be made of Schedule 40 steel line pipe and fittings, with rigid type, grooved connections, unless other connections are specified by user.

5.4 PIPING

Piping size for all elements directly in the main flow stream shall be no less than the nominal size of the meter.

5.5 All piping and structural components should be commercially blasted, and painted with at least one coat of metal primer.

5.6 WEATHER PROTECTION

Weather protective housing, heaters, and insulation are not covered by these specifications, but may be provided when specified by user.

6 Charging Pump and Motor

6.1 PUMP

For locations where insufficient NPSH for desired flow rates will be developed by the static head, the ACT unit shall include an electrically driven pump, rated for a discharge pressure and rate that are compatible with the rating for the meter used, and sized to assure turbulent flow in the ACT main stream piping.

6.2 Centrifugal pumps are preferred, but non-reciprocating, positive displacement pumps may be specified by user; in either case, the configuration should be self-purging to avoid gas-locking.

6.3 Minimum ACT discharge pressure shall be 20 psig (138 kPa).

6.4 The pump should be directly coupled to the motor with a flexible coupling, complete with guard.

6.5 The pump should have a mechanical seal.

6.6 A drip pan and drain piping shall be provided under the pump for spill protection in event of a seal leak.

6.7 The common base plate for the pump and motor should allow vertical and horizontal adjustment for alignment relative to each other without moving the base plate on the skid.

6.8 Bronze fitted pumps should be furnished for sweet crude service, and cast iron pumps should be furnished for sour crude service, unless otherwise specified by user.

6.9 When a rotary positive displacement pump is specified, a relief valve shall be provided on the pump discharge suitably piped to return oil to storage or to the pump suction.

6.10 An inlet connection eccentrically swaged to twice the diameter of the pump suction shall be used.

6.11 MOTOR

The motor should be 460 volt AC, 1800 RPM, 3 phase, sized to prevent overloading by the pump. Alternative motor enclosures, voltage service, or motor speed may be specified by user.

7 Strainer and/or (Optional) Air/Gas Eliminator

7.1 The strainer and air/gas eliminator, as separate or integral units, shall be located upstream from the meter, in a horizontal pipe with the air release head located at a piping elevation higher than the meter case.

7.2 The strainer basket should be made of non-corrosive material with 1/4 inch (6.35mm) mesh size. Smaller mesh may be specified by agreement between the user and the fabricator.

7.3 A bottom drain connection and valve plus a quick opening top cover should be provided on the strainer.

7.4 Pressure gauges with soft seat, isolation needle valves should be provided on both sides of the strainer.

7.5 When the air elimination feature is specified, the vapor relief shall be piped through a soft-seat check valve to a skid edge.

8 Sediment and Water Probe, Monitor, and Diverter Valve

8.1 If a monitor is used, an internally plastic-coated capacitance probe no smaller in diameter than the skid piping shall be mounted in a vertical pipe located upstream from the diverter valve and the meter. Piping connections shall be so located adjacent to the probe to permit draining and convenient visual internal inspection for deposits.

8.2 The monitor chassis shall be either explosion proof or mounted in a weatherproof, dust tight enclosure and shall have the following features:

a. Adjustable range: 0-3 percent water, or less, in increments of 0.1 percent water.
b. Time delay for diverter action: 0-2 minutes (adjustable when specified).
c. Automatic temperature compensation.
d. Means for field calibration.
e. Fail-safe relay for delivery shutdown in event of a monitor failure.

8.3 DIVERTER VALVE (OPTIONAL)

If a three-way, two-position control valve is used, it shall be located in the vertical pipe run below the probe to serve as a wet oil diverter, with the flow normally directed to the diverted (wet) discharge piping for a fail-safe hookup. This valve shall be activated by the BS&W monitor such that the valve moves to divert flow to the clean oil discharge only when it receives a positive signal and it fails *safe* for flow to the wet oil discharge in the absence of a positive signal.

8.4 If a diverter valve is not used, the wiring shall be configured to shut down oil delivery upon failure to receive a *clean oil* signal from the monitor.

8.5 At user request, a back-pressure flow control valve shall be located near the edge of the skid in the wet oil discharge piping.

9 Displacement Meter or Turbine Meter

9.1 The meter case and trim specifications shall be selected for the planned service conditions of working pressure and flow capacity, and be made of corrosion-resistant materials.

9.2.1 Meter Stack

The meter counter head shall register in 42 gallon U.S. barrels (cubic meters), tenths, and hundredths; and it shall be a non-reset-table design, with nine digits.

9.2.2 A low-torque pulsing switch to operate the flow monitoring and proportional sampling systems shall be attached to the barrel unit register wheel or the meter shaft.

9.2.3 A separate transmitter for remote accumulation of throughput volumes shall be furnished at user request.

9.2.4 A right-angle drive and low-torque pulse transducer shall be provided on the meter stack below the counter register for meter calibration, unless alternate proving connections are specified by the user.

9.2.5 Use of a set-stop allowable counter or a ticket printer as accessory mechanisms is optional with the user.

9.2.6 Temperature Compensation

The meter stack should include means for API gravity selection which regulates the automatic temperature compensation applied for variations in temperature of the oil being delivered.

9.2.7 The compensator shall have a resolution of one degree API gravity.

9.2.8 Volume adjustment by the compensator shall be made on the basis of ASTM D-1250, Table 6.

9.2.9 Turbine Meter Accessories

Electronic data processing and registration devices for turbine meters shall provide volume registration, flow monitoring, proportional sampling, temperature compensation, and pulse output features described previously in this section.

10 Thermowell and Three-way Prover Loop

10.1 THERMOWELL

A stainless steel thermowell socket should be provided in the piping downstream from the fluid meter.

10.2 The mercury thermometer shall be calibrated in at least one degree Fahrenheit (one-half degree Celsius) increments over a temperature range to cover expected operating conditions as specified by user.

10.3 PROVER LOOP

All three valves in the prover loop shall have a full opening design no smaller than the fluid meter size and shall be equipped with sealing devices.

10.4 The line valve shall have a double block and bleed design feature to provide for leak testing during proving operations.

10.5 The two stub valves should have quick coupling end connections with dust caps and locking devices.

11 Back-Pressure Valve

11.1 The back-pressure valve on the clean oil discharge line shall be a normally closed, spring loaded, diaphragm or electrically actuated, globe or angle style motor control valve.

11.2 Resilient seat and corrosion resistant trim should normally be provided.

11.3 The pressure sensing line should be externally mounted and the diaphragm vent should be screened.

11.4 The spring range shall be specified by user to suit the maximum expected delivery conditions and to provide full shutoff at 20 psig (138 kPa) minimum pressure.

12 Sampling

12.1 GENERAL CONSIDERATIONS

In most instances the value of a crude oil run is determined by net volume, gravity, and water and sediment measurements. Therefore, the composite sample accumulated in a run period, which is the basis of the gravity and water and sediment measurements, must be compositionally representative of all crude oil delivered. Furthermore, where gravity and water and sediment measurements are based on a sample from the composite sample of the run, procedures used must assure this to be a compositionally representative sample of the composite sample. Means to eliminate stratification and to assure homogeneity of the flow stream at the point of sampling must be included in design criteria; and standard mixing practices must be followed in subsequent operations, to obtain accurate and repeatable results. Where gravity, water and sediment content, or physical characteristics do not affect the value of crude oil, sampling may not be required.

12.2 SAMPLE CONNECTION

The sampling connection shall be located in a vertical pipe located on the discharge side of the charging pump at a point which will prevent stratification and assure a homogenous system.

12.3 SAMPLE PROBE

The sample probe shall be located only in the horizontal plane, and it shall extend to pipe centerline where the tip opening shall face upstream at the center of the line. Acceptable sampling tip designs include:

a. Open end with a 45 degree bevel.
b. Open end 90 degree tube turn reamed to a sharp entrance edge.
c. Closed end with a round orifice entrance near the tip.

12.4 SAMPLE STREAM PIPING

The piping must be level or sloped down to the sampler connection. The sampler should be located as near to the probe connection as practical, but in no case shall this distance be greater than 10 inches (254mm), nor shall the connecting piping be larger than one-half inch (12.7mm).

12.5 SAMPLER

The sampler shall be the flow responsive (proportional) type, actuated by an impulse switch driven by the meter counter. Unless otherwise specified the impulse switch shall give one impulse per barrel (cubic meter). When volume reg-

ulation of sample size is required, the volume adjustment range shall be specified by the user. The sampler shall be capable of discharging the sample into the container against a back pressure of 10 PSIG (69 kPa) or against the true vapor pressure of the crude at 100 F (38 C), whichever is greater. This discharge pressure is to prevent the possibility of flashing in the sample system. The pressure shall also be adequate to start the stream after shutdown in case paraffin has congealed within the system.

12.6 SAMPLE CONTAINER

The sample container shall be designed and installed to prevent vaporization of the stored sample. The sample container shall be equipped with a vapor proof top closure and designed to hold the sample under a pressure sufficient to prevent the escape of vapor. Pressure required for controlling vaporization may be provided by means of a fixed-volume sample container equipped with a pressure relief valve or a sample container with an internal flexible diaphragm that is vapor-impervious and upon which a regulated gas pressure is maintained. The minimum pressure on the sample container shall slightly exceed the true vapor pressure of the crude oil at the maximum anticipated temperature of the sample container during the sampling period. When handling crude oils having significant volatility, but where vapor pressure variations with temperature data are not available, it is suggested that a minimum pressure of 10 psig (69 kPa) be maintained on the sample container. Under no condition shall gas pressure from an outside source be applied in direct contact to the sample. The sample container should be equipped with (1) a quick-opening type, top inspection hatch, (2) a sight glass or other means of determining the volume of sample it contains, (3) a relief valve, and (4) a 0-15 PSIG pressure gage. The sample container should be equipped with an electric motor-driven circulating pump, to allow a complete blending of the sample into a homogeneous mixture before and during the withdrawal of a portion of the sample for testing. The circulating pump inlet shall be attached to the bottom of the sample container. The bottom of the container shall be so constructed that there are no voids in which sample can be entrapped so that it is not subject to mixing by the circulating pump. If the inside walls are not wiped by a piston, the walls of the sample container and associated piping should be internally coated with an epoxy base paint (or equal) to minimize wax deposits and container corrosion contamination. Provision should be made for discharging into the ACT charging pump suction the unused portion of the composite sample at the end of a metering period, and any flushing hydrocarbon used to clean and empty the sample container to prepare for the next metering period.

Provision should be made separately from the sampling system of the ACT unit for the taking of hand samples during operations. These samples may be used to check the operation of the S&W monitor.

13 Electrical

13.1 All electrical equipment and wiring methods shall conform to API RP 500 and the NEC.

13.2 The unit shall be completely wired, using color coded wiring in rigid, corrosion-resistant, metallic conduit, complete with seal fittings. The conduit shall be securely attached to the skid and to the equipment items connected.

13.3 A wiring diagram shall be provided by the fabricator, including full identification of all electrical items and identification of the wire color used at each termination.

13.4 The following automatic control functions shall be provided:

a. Start and stop the charging pump on receipt of signals from the respective surge tank level control(s).
b. Divert clean oil to delivery discharge only on receipt of a positive signal from the BS&W monitor, and deliver to the wet oil discharge otherwise.
c. Restart on receipt of full power following a power outage period.
d. Stop on receipt of signal indicating either (a) low flow rate, (b) meter failure, (c) monitor failure, (d) set-stop allowable counter zero, or (e) high pressure limit exceeded, and remain locked out until a manual reset is activated.

13.5 The following manual controls shall be provided:

a. Main power *On-Off* circuit breaker with manual reset.
b. Charging pump control *Hand-Off-Automatic* selector switch.
c. Lock-out function *Reset* switch.

13.6 SAFETY FEATURES

Separate enclosures, suitable for the area classification, should be provided for power and operations controls and mounted on structural members attached to the skid.

13.7 An externally mounted lightning arrestor should be furnished on the power enclosure.

13.8 The power enclosure door handle shall be connected to a fusible disconnect switch or a circuit breaker in the power circuit so that the circuit is broken when the door is opened.

13.9 The main power circuit breaker should contain three properly sized overload relays of the bimetallic type, and shall have a reset, either internal or external to the power panel.

13.10 Plug-in type relays with contacts rated 10A, 120V AC and coils rated 40°C continuous duty, should be used between control signals and operated devices.

13.11 Barrier type terminal blocks shall be provided in each enclosure for connecting external wiring.

13.12 POWER ENCLOSURE

The power enclosure should contain the properly sized 480* volt AC three-phase circuit breakers, 1 KVA 240/120 volt AC single-phase control transformer, 120 volt holding coil in the magnetic motor contactor, fuses, and control relays needed for pump operation.

13.13 Dual, 3-wire grounded type, 120V AC convenience outlets with weatherproof covers should be externally mounted on the power enclosure.

13.14 A selector switch should be furnished in the control enclosure, wired to bypass all the automatic shutdown control features except the set-stop allowable counter (when used), and the meter monitor circuit. The enclosure should contain the indicator lamps, program timer, reset and test circuit switches, and associated control relays. The door to the control enclosure should be mounted on a piano type hinge.

13.15 ALARM BEACON

A rotating type, weather-proof, colored lens, alarm beacon light should be mounted approximately six feet (two meters) above the skid. The alarm circuit should light the beacon whenever delivery from the unit is shut down due to a malfunction.

14 Recirculating Pump

14.1 Addition of an automatic recirculating function is optional with the user.

14.2 When recirculating is added, revisions to the assembly configuration, piping, and electrical components should be compatible with previous specifications, in so far as possible.

15 Sealing

Any device or function affecting measurement accuracy or control shall be provided with a means for security sealing. Such items shall include, but not be limited to the following:

a. S&W Monitor: electrical connection to probe and to electronics enclosure.
b. Meter: meter stack and all accessories.
c. Prover Loop: stub valves and all drains.
d. Back Pressure Valve: setting adjustment.
e. Sampling System: sampler mechanism, and all valves associated with the sampling system and sample container, and all piping connections which could permit unauthorized access to the sample.
f. Electrical: control enclosure, and allowable counter if mounted separately.

*Other voltage service may be specified by agreement between the purchaser and fabricator.

16 Inspection and Rejection

16.1 INSPECTION NOTICE

When the inspector representing the purchaser desires to inspect this unit or witness testing, reasonable notice shall be given of the time at which fabrication and testing will take place.

16.2 PLANT ACCESS

The inspector representing the purchaser shall have free entry at all times while work on the contract of the purchaser is being performed, to all parts of the fabricator's works that concern the fabrication of the material ordered. The fabricator shall provide the inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All inspections and tests called for by this specification shall be made at the place of fabrication prior to shipment and at the fabricator's expense, unless otherwise specified on the purchase order. They shall be conducted so as not to interfere unnecessarily with the operation of the works.

16.3 COMPLIANCE

The fabricator is responsible for complying with all of the provisions of this specification. The purchaser may make any investigation necessary to satisfy himself of compliance by the fabricator and may reject any material that does not comply with this specification.

17 Marking

17.1 LACT units fabricated in conformance with this specification shall be marked by the fabricator as specified hereinafter.

17.2 LACT units fabricated according to this specification shall be identified by a name plate containing the following information. Marking shall be either raised or stamped. Markings shall be at least 1/8 inch (3mm) high. The name plate shall be securely attached to the power control panel in a conspicuous place.

a. Fabricator's name.
b. API specification under which the unit was fabricated (11N).
c. Design flow rate in GPM or B/D.
d. Working pressure at design flow rate.
e. Date of fabrication.

*Users of this specification should note that there is no longer a requirement for marking a product with the API monogram. The American Petroleum Institute continues to license use of the monogram on products covered by this specification but it is administered by the staff of the Institute separately from the specification. The policy describing licensing and use of the monogram is contained in Appendix C, herein. No other use of the monogram is permitted.

APPENDIX A—DATA SHEETS —API LACT UNIT SPECIFICATION DATA SHEET—(U.S. Customary Units)

COMPANY:_____ FIELD:_____

ADDRESS:_____ COUNTY:_____

_____ STATE:_____

SIZE: (Circle applicable column)

Max. Delivery, BOPD	1000	2000	3500	6000	7500	11,500
Min. Motor HP	1	1	1½	3	5	7½
Piping & Valves, in.	1½	2	2	3	3	4
Monitor Probe, in.	2	2	2	3	4	4
Diverter Valve, in.	2	2	2	3	3	4
Air Eliminator, in.	2	2	2	3	4	4
Strainer, in.	2	2	2	3	4	4
Meter, in.	2	2	2	3	3	3
Sample Container, min. gal	5	10	15	15	20	20

DESIGN SERVICE CONDITIONS:

_____ psig discharge pressure at _____ gpm for (sweet) (sour) (crude) (condensate) of _____ API gravity having _____ SSU viscosity at _____ F and _____ SSU at _____ F. (Paraffin) (Wax) (Asphalt) problem is (none) (light) (severe)

HOUSING REQUIREMENTS:

(Meter) (Sampler + container) (Total skid) (none) (weather proof) (insulated) for _____ F min. air temp. Internal Heater: (Yes) (No) Light: (Yes) (No)

PUMPS: Charging (Yes) (No) GPM: _____at _____psig
Circulating (Yes) (No) _____at _____psig

WET OIL DISCHARGE LINE: (Yes) (No) w/check valve (Yes) (No)
Line Size_____in. w/back pressure valve (Yes) (No)

DIVERTER VALVE: (Hydromotor) (Piston) (Diaphragm) actuator Model _____

PNEUMATIC POWER AT SITE:_____ psig (gas) (air) (available)
Compressor Required (Yes) (No)

METER STACK TO INCLUDE: Pulse Switch _____ Large Numeral Counter _____
Transmitter _____ Non-Reset Totalizer _____
Ticket Printer _____ Temp. Compensator _____
Right Angle Drive_____ Other _____

ELECTRICAL: (120) (240) (480) VAC (1) (3) Phase
Power Enclosure (Separate) (On) (Off) Skid
Control Enclosure (Separate) (On (Off) Skid
Monitor (On Probe) (On) (Off) Skid Range _____%W
Lightning Arrestor (Yes) (No) Allowable Counter (Yes) (No)
Alarm Beacon Color_____
Indicator Lamps (Specify Function) _____

_____

_____

AREA CLASSIFICATION OF LOCATION _____
REMARKS: _____

_____

PREPARED BY: _____
DATE: _____

API LACT SPECIFICATION DATA SHEET—(Metric Units)

COMPANY:_____ FIELD:_____

ADDRESS: _____ COUNTY: _____

_____ STATE:_____

SIZE: (Circle applicable column)

Max. Delivery, m³/d	158.99	317.97	556.46	953.92	1192.40	1828.35
Min. Motor kw	.746	.746	1.12	2.24	3.73	5.60
Piping & Valves, mm	38	51	51	76	76	102
Monitor Probe, mm	51	51	51	76	102	102
Diverter Valve, mm	51	51	51	76	76	102
Air Eliminator, mm	51	51	51	76	102	102
Strainer, mm	51	51	51	76	102	102
Meter, mm	51	51	51	76	76	76
Sample Container, min. m³*	0.02	0.04	0.06	0.06	0.08	0.08

*Rounded to nearest 0.01 m³.

DESIGN SERVICE CONDITIONS:

_____ kPa discharge pressure at _____ m³/d for (sweet) (sour) (crude) (condensate)
of _____ API gravity having _____ SSU viscosity at _____ C and _____ SSU
at _____ C. (Paraffin) (Wax) (Asphalt) problem is (none) (light) (severe)

HOUSING REQUIREMENTS:

(Meter) (Sampler + container) (Total skid) (none) (weather proof) (insulated) for _____ C
min. air temp. Internal Heater: (Yes) (No) Light: (Yes) (No)

PUMPS: Charging (Yes) (No) m³/d: _____at _____kPa
Circulating (Yes) (No) _____at _____kPa

WET OIL DISCHARGE LINE: (Yes) (No) w/check valve (Yes) (No)
Line size _____mm w/back pressure valve (Yes) (No)

DIVERTER VALVE: (Hydromotor) (Piston) (Diaphragm) actuator Model _____

PNEUMATIC POWER AT SITE:_____ kPa (gas) (air) (available)
Compressor Required (Yes) (No)

METER STACK TO INCLUDE: Pulse Switch _____ Large Numeral Counter _____
Transmitter _____ Non-Reset Totalizer _____
Ticket Printer _____ Temp. Compensator _____
Right Angle Drive _____ Other _____

ELECTRICAL: (120) (240) (480) VAC (1) (3) Phase
Power Enclosure (Separate) (On) (Off) Skid
Control Enclosure (Separate) (On (Off) Skid
Monitor (On Probe) (On) (Off) Skid Range _____%W
Lightning Arrestor (Yes) (No) Allowable Counter (Yes) (No)
Alarm Beacon Color_____
Indicator Lamps (Specify Function) _____

AREA CLASSIFICATION OF LOCATION _____
REMARKS: _____

PREPARED BY: _____ DATE: _____

APPENDIX B—METRIC CONVERSIONS

Metric conversions of U.S. customary units* are provided throughout this specification as parenthesized numbers, e.g., 5.5 ft/sec (1.7 m/s). The values stated in U.S. cutomary units are to be regarded as standard. The metric equivalents of U.S. customary units may be approximate.

The following factors are used in this text for conversion from U.S. customary to metric units:

To convert from	to	Multiply by
inch (in.)	millimeter (mm)	25.4
foot (ft.)	meter (m)	0.3048
foot/second (ft/s)	meter/second (m/s)	0.3048
gallon, U.S. (gal.)	cubic metr (m^3)	0.003785412
barrel, U.S. (bbl.)	cubic meter (m^3)	0.1589873
pound-force/$inch^2$(psi)	kilopascal(kPa)	6.894757
barrel/day	cubic meter/day (m^3/d)	0.1589873
horsepower, electric (hp)	kilowatt (kw)	0.7456999
degree Fahrenheit difference (F)	degree Celsius difference (C)	5/9
degree Fahrenheit temperature (F)	degree Celsius temperature (C)	$tc = (t_F-32)/1.8$

*U.S. customary units are units based on theyard and the pound commonly used in the united States of America and defined by the National Bureau of Standards.

APPENDIX C—USE OF API MONOGRAM

C.1 Marking

The following marking requirements apply to licensed manufacturers using the API monogram on products covered by this specification.

C.2

LACT units fabricated in conformance with this specification shall be marked by the fabricator as specified hereinafter.

C.3

LACT units fabricated according to this specification shall be identified by a name plate containing the following information. Marking shall be either raised or stamped. The API monogram shall be at least ½ inch (13mm) high; other markings shall be at least ⅛ inch (3mm) high. The name plate shall be securely attached to the power control panel in a conspicuous place.

a. Fabricator's name.

b. API monogram.

The API monogram shall be applied to products complying with the requirements of the specification and only by authorized fabricators.

c. API specification under which the unit was fabricated (11N).

d. Design flow rate in GPM or B/D.

e. Working pressure at design flow rate.

f. Date of fabrication.

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