! ATTENTION !

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Advanced Power Systems Technologies Incorporated

Ainsworth Engineered (USA) LLC

Grand Rapids, MN

OSB Press Main Hydraulic System Upgrade

Installation and Maintenance Manual

Layout and Hydraulic Drawings

APST Job#205400

AINSWORTH PRESS HYDRAULIC SYSTEM/ GRAND RAPIDS, MN

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FIELD INSTALLED HYDRAULIC PIPING AND FLUSHING SPECIFICATION

1.00 SCOPE

The work covered by this specification consists of supplying all of the material, labor, equipment and performing all of the necessary work to install the require hydraulic systems, as shown or implied on the project drawings and as outlined within this specification.

2.00 GENERAL

All work covered by this specification will be performed by craftsmen skilled in the trades required to execute the work.

3.00 MATERIALS

3.10 Piping

3.11 All pipe and fittings will be schedule 80 to 160 as may be appropreate.

3.12 All pipe will be pre-pickled, oiled and plugged. Pipe will be bent to reduce turbulance and pressure drops.

3.13 All pipe fittings shall be socket weld type to match the schedule of pipe.

3.14 Pipe supports and/or anchors shall be HY-CON, STAUFF, heavy duty, single unit with polypropylene or equal material (weld plate type). Electrical conduit Type U-bolts or beam clamps shall not be used on hydraulic piping.

3.15 All hydraulic pipe welding will be done by certified welders.

3.16 Hand isolation valves shall be installed at actuators for safety and troubleshooting purposes.

* 3.17 All threaded pipe connectors will be SAE "O" Ring.

3.20 Hoses

3.21 All hoses that are 3/4" or less will be SAE 100 R2AT.

3.22 All hoses that are 1" or greater will be 4 wire - cat hose or SAE 100 R12 or SAE 100 R 13 or G6R.

3.23 Hose fittings will be JIC Female Swivel type or sae split flange.

3.24 All hose lengths should be kept to minimum length possible considering the application.

3.25 All hoses on like installations will be of the same length.

4.00 INSTALLATION

4.10 All work will be performed in a workmanlike manner, with all work areas maintained in a neat and orderly manner.

4.20 The Contractor will coordinate all work with the Owner and any other contractors on the site.

4.30 The Contractor will cut all pipe with a wheel-type cutter and remove any compression ridge with the correct sized reamer.

4.40 The Contractor will take care that foreign materials are not allowed in pipe while storing, handling and/or in fabricating.

4.50 The Contractor will clean all pipes after cutting.

4.60 The pipe will be anchored and supported as shown by the drawings and typical sections, but in no case will an unsupported span exceeding 10 feet be allowed. All piping will be clamped and supported within 6" of bends and termination points. Minimum mechanical support for hydraulic pipe clamps will be angle iron appropriate to the pipe size, and must be reviewed with Owner prior to installation. Channel or box tubing is prefered.

4.70 Pipe clamp bolts will be torqued to bolt specifications using a click type torque wrench.

4.80 The Contractor will provide solid support for all HY-CON anchors and supports.

4.90 The correct welding procedure and rod (7018) will be used on all pipe-weld per A.W.S. D10. 12-79.

5.00 FLUSHING

5.10 Prior to addition of oil, contractor shall perform a leak test using 25 psi and soapy water. Reservior should be filled through a Beta 6=200 filter.

5.20 Piping shall be pressure tested to the working pressure of the system.

5.30 The Contractor will install a temporary hose loop and valve between the pressure and return lines at each actuator, prior to the pressure filter (such as a servo actuator, motor or valve), and will run the system for a minimum of eight (8) hours. Care will be taken that all parts of each system are flushed and that no line or branch is excluded. On systems with multiple actuators, the contractor shall isolate the system into individual branches so that maximizing flow is obtained in each branch line.

5.40 Oil sample will be taken and verified for oil's cleanliness.

5.50 While flushing, the contractor will monitor the status of the return filter and will change the elements as required.

5.60 After flushing has been completed to the Owner's satisfaction, the contractor will remove the temporary hose connection and connect the permanent hoses as required.

5.70 When the system has been placed in operation, the Contractor will check for any leaks or movement of the piping and will correct any differences.

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SPECIFICATION FOR HYDRAULIC POWER UNITS

1.00 POWER UNIT DESIGN FEATURES

1.10 General

1.101 Tanks and pumps will be arranged so that a flooded pump inlet (with valves) is the primary design. (Pumps cannot be located under the tank or on top of the tank, with the exception of the recirculation and fill pump.)

1.102 3" drip pan to encompass entire power unit, including reservoir, and the entire unit shall be mounted on 14" 3 x 3 square tube legs welded to the inside corners of the frame. The drip pan shall have a drain port with valve located to completely drain all of the pan. No interior dams will be allowed.

1.103 All power units will include a replaceable air breather, sight gauge, and three (3) temperature switches, two (2) float level switches, push to read gauge snubbers, pressure gauges, check valves, filler provision, and an oil sample provision. The sight gauge must be of sufficient length to cover the entire range of operating levels from full reservoir to below normal low operating level.

1.104 A flow meter will be included on the case drains of all hydraulic pumps where applicable.

1.105 All hydraulic valves, components, and pressures shall be permanently marked. (Decals are acceptable.)

1.106 In order to reduce hydraulic fluid leaks, all power unit components, fittings, and adapters will be SAE O-ring, flange or JIC swivel.

1.107 All pressure gauges will require push to read snubbers. They will be oil filled type gauges.

1.108 Electrical enclosures:

1.1081 All 120 volt/60hz devices located on the power unit will be pre wired to a NEMA 4 continuous hinge enclosure which is conveniently located to be accessible from the floor without climbing on the equipment for installation, adjustment and/or replacement. This enclosure will include an electrical selector switch for the fill mode of the recirculation system.

1.1082 All enclosures and/or J-boxes shall have terminal strips. All enclosures and/or J-boxes shall contain Buchanan terminal blocks.

1.1083 All Servo pumps requiring D.C. control voltage shall be pre-wired to a separate Hoffman NEMA 4 enclosure with terminal strips.

1.1084 All electrical enclosures shall be NEMA 4 continuous hinge.

1.1085 All electrical wiring of control devices shall have wire numbers at both ends, at terminal strip, and at devices.

1.109 All hydraulic cylinders shall have chrome rods, and self-aligning spherical bearings in both the rod end and blind end mounts and be of a 3000 PSI rating unless prior approval of the engineer has been obtained.

1.110 All components which are shipped loose for field mounting will be shop assembled to weld plates unless prior approval of the engineer has been obtained. When mounting remote accumulator/valve packages the bracket will be "L" shaped so that the accumulator is mounted vertically and the valve assembly is horizontal.

1.111 All low voltage direct current (D.C.) control devices shall be pre-wired to a separate NEMA 4, Hoffman style enclosure.

1.20 Reservoirs:

1.201 Reservoirs shall be baffled, customized, and with a minimum size of at least three (3) times total pumping capacity plus allowance for total system capacity between the high and low operating levels.

1.202 Reservoir inner tank surfaces will be sand blasted and painted with a special oil resistant paint.

1.203 Reservoirs 300 gallons and over will require two (2) each 1500 watt (120 VAC/single phase) tank heaters with NEMA 4

enclosures, one (1) at each end of reservoirs. Reservoirs under 300 gallons will require one (1) 1500 watt (120 VAC/single phase) unit. Heaters to be low watt density surface units (23 watts/square inch or less).

1.204 All reservoirs will have two (2) each float level switches (Square D), mounted so they are accessible and visible from floor, one (1) for warning light indication (normally closed) and one (1) for shutdown (normally open), and mounted in the side of the tank.

1.205 All reservoirs shall have three (3) each separate temperature switches (externally adjustable). 1 for heat exchanger fan control, 1 for high temperature warning indication, and 1 for high temperature shutdown condition. All contacts shall be configured as N.O. (normally open). United Electric (3 in 1) NEMA 4 switch is preferred.

1.206 All reservoirs shall have two (2) extra return drop inlets that can be utilized for future additions. (Sized to match maximum return line size.)

1.207 A locking suction line shutoff valve should be provided between reservoirs and pumps. A proximity switch shall be installed to insure that valve is open when pump is started.

1.30 Pumps:

1.301 <u>The design will not utilize stacked pumps</u>.

1.302 All pumps will be foot mounted unless approved otherwise.

1.303 The design will not utilize double shaft electric motors.

1.304 All pumps will have hose sections on all connections for vibration isolation.

1.305 All power units will include an appropriately sized (480 VAC/3-phase) motor driving a recirculation and filling pump circuit using a vane pump.

1.306 An electrical manual override switch is required for the fill mode on recirculation systems.

1.307 All pressure compensated pumps will require case drain flow meters. Provisions for a vacuum break must be supplied on each case drain line.

1.308 All major power units will have backup auxiliary pumps installed on the power unit, and piped into the system.

1.40 Cooling:

1.401 The hydraulics shall be air-cooled.

1.402 Operating temperature range:

1.4021 The operating temperature range for the hydraulic fluid shall be a minimum of 80 degrees F. (in 10 degree F. ambient conditions), and a maximum of 135 degrees F. (in 100 degrees F., 95% RH ambient conditions). All heat exchangers and tank heaters shall be designed for these conditions.

1.4022 The minimum allowance for unit heat load shall be based on 15% for cylinder and/or motor circuits plus 30% for Servo circuits of the total connected electrical horsepower. System should be designed to maintain a 20 degree window, winter and summer.

1.4023 All power unit applications with systems generating a hydraulic heat load of 15 HP or greater will require a minimum of a Thermal Transfer AOC-575 air/oil cooler with two (2) each 1 HP motors (460 VAC/3-phase), with reusable aluminum filters that can be serviced from the side, not the top. For systems with less than a 15 H.P. heat load the minimum exchanger to be allowed is a AOC-337 with a 1/4 H.P. motor (460 VAC/3-phase).

1.403 Provisions for tank line shock protection for the AOC series coolers will need to be provided.

1.50 Filters:

1.501 Air breathers shall be sized for two (2) times the maximum air flow exchange. (Filter media rating = B3 = 200.)

1.502 Power unit return line filtration requirements (6 micron absolute media B6 = 200) with electrical differential pressure indicators. Filters should be sized so as to have no more than 10 PSID at maximum surge flows.

1.503 A filter shall be used on the fill/recirculation circuit so that all oil added to the system, as well as that recirculated for cooling, is filtered through (6 micron absolute media B6 = 200).

1.504 A high pressure non-bypass filter shall be used before each 2 stage Servo valve in the system. (Examples: Atchley, Moog, Vickers.) [Exceptions: Bosch/Servo solenoid valves.]

1.505 A high pressure filter with a 50 PSID bypass shall be used on all proportional valve circuits. (Filter media requirement B6 = 200.) (Exceptions considered according to specific application.)

1.506 Transmission Filtration:

1.5061 Bi-directional systems - two (2) each pressure filters with bypass and reverse flow checks, filtering towards the pump.

1.5062 Uni-directional systems - one (1) filter with bypass and reverse flow check, filtering towards the pump.

1.5063 Suction filters:

(a) Hydrostatic pumps must have bypass style kidney loop charge pump filtration. (Suction line filtration will not be used.)

1.507 The air/oil heat exchanger shall be filtered on the air inlet side. (See section 1.4023)

1.508 All filter assemblies shall be furnished with electrical switches to indicate a differential pressure trip condition. All contacts shall be configured as N.O. (normally open).

1.60 Hoses:

1.601 All hoses should be compatible with appropreate fittings.

1.602 All hose connectors will be JIC female swivel or split flange type. Straight fittings on all hose ends are preferred.

1.603 All case drain lines, in abrasive locations, will be plumbed with four (4) wire hose assemblies (SAE 100R10 or SAE100R12). All others to be at least two (2) wire hose. (SAE 100R2)

1.604 All 1" and larger pressure lines will be plumbed with four (4) wire spiral wrap hose assemblies (SAE 100R10 or SAE 100R12). One inch (3/4") diameter and less can be two (2) wire hose. (SAE 100 R2)

1.605 All return lines must be a minimum of two (2) wire hose (SAE 100 R2). Applications with special requirments need individual review.

1.70 System Sizing Criteria:

1.701 Motor horse power will equal 1 HP per 1 GPM @ 1500 PSI.

1.702 Power unit pump sizing will be at least 25% above the maximum consumption flow requirements for all pressure compensated pump circuits.

1.703 Hydrostatic transmission circuits will be designed to each specific application's flow requirements. (Should additional surplus flow be required from a transmission circuit beyond the maximum stated feed speed required, then a design and cost review will be required.)

1.704 The design will allow for the combining of multiple uses on a single pump circuit, but the users must be compatible in pressure, flow characteristics and hydraulic features so that a balance circuit results.

1.705 Power unit overall physical size requirements will be outlined with a power unit layout drawing illustrating length, width and height. If maximum limits need to be set for any of these parameters, project engineers will return the marked up approval print with the requested changes clearly marked.

1.706 The air/oil heat exchanger will be designed to limit the maximum oil temperature to 135 degrees F. using the full thermal heat load of the system with a ambient air of 100 degrees F., a humidity of 95%, and a dirty cooler factor of 75%.

1.707 Line sizes should be standardized (with exceptions for transmission circuits and case drains).

1.708 All pump applications will be designed for low pressure operation (1500 PSI or less) and continuous running operation. Exceptions must be noted.

1.80 Accumulator Usage:

1.801 When an accumulator is used in a system, the following items are required:

1.8011 Remote accumulators will require 3-way locking ball valves to vent any stored energy when closed.

1.8012 Pressure gauge on the system side of the accumulation. A

visual indicator with a fill valve shall be present on the top of each accumulator.

1.8013 Accumulation system check valves installed at the power unit.

1.8014 A system to discharge the stored energy of the accumulator to comply with all O.S.H.A. and/or other regulations.

1.802 Accumulators shall be of the bladder type. Top repairable above 5 gallons is required.

2.00 POWER UNIT CONSTRUCTION REQUIREMENTS

2.10 Power Unit Frame Specifications:

2.101 Reservoir base frames shall consist of welded channels with cross pieces dividing the frame to support the inside edge of the pump/motor and reservoir feet. With additional cross pieces under each pump/motor station and under reservoir center if reservoir exceeds six feet (6') in length.

2.102 Pads will be welded to the frame to accommodate the Reservior

2.103 Holes drilled in each corner of the frame for anchoring purposes.

2.104 Drip trays will consist of a 1/2" plate welded to the exterior frame and the cross pieces to serve as the pump/motor bases.

2.105 Fork truck access holes and lifting eyes to be furnished. Lifting eyes shall also be welded to all L-shaped and overhead frames.

2.106 Legs of appropriately sized square tubing are welded to the inside corners of the frame.

2.107 Drip trays for pump/motor stations and the reservoir will consist of 1/2" plates with four (4) sides broken to 45 degrees. All drip trays must have drain ports located to completely drain the tray.

2.20 Power Unit Reservoir Specifications:

2.201 For reservoirs 25-100 gallons there will be two (2) 3/16" end covers and an eleven (11) gauge belly pan, for reservoirs over 100 gallons there will be two (2) 3/16" end covers and a ten (10) gauge belly pan.

2.202 Reservoirs over six feet (6') in length will have appropriately sized channel or tubing legs supporting the middle.

2.203 A 3 x 3 x 3/16 angle divides the reservoir and supports the baffle and lid. The baffle shall run the length of the tank so as to separate pump inlets from returns.

2.204 Tank top units will have a minimum of a 3/8" lid to support the pump/motor base.

2.205 Reservoir clean-out windows are plasma burned from 1/2" steel plate and drilled and tapped for 1/4" bolts, then welded to end covers. They shall expose the bottom of tank for ease of cleaning (zero lip construction). For reservoirs of 300 gallons or larger, the clean out cover shall be large enough for entry of maintenance personnel.

2.206 Clean-out covers are 3/16" steel plate drilled for 5/16" holes to mate up with the windows. Clean-out covers with drain ports, heaters, temperature probes, or sample ports welded on them will have guards. The guards are bolted to feet, which are welded to the clean out covers.

2.207 Reservoirs are to be sandblasted inside and out before baffles and lids are welded on.

2.208 Reservoirs shall be thoroughly cleaned and painted after all fabrication is completed. On units with large return flows, the tank ends should be rounded to minimize impact of fluid on welds.

3.00 PIPING

3.10 Hydraulic Piping:

3.101 All piping shall be pickled, oiled and plugged.

3.102 All connection points shall be plugged and protected to prevent contamination during shipment and installation.

3.103 Only Schedule 80 or 160 P.O.P. will be used for field piping on pressure lines.

3.20 Hydraulic Power Unit Piping:

3.201 Hydraulic tubing can be used on the power unit. All tubing will only utilize JIC 37 degree connections.

3.202 When an installed spare system is utilized, the piping system shall be designed so that the switch over to the spare system is simple with minimal downtime.

3.203 When a hydraulic unit is designed to furnish power to multiple production centers, the power unit piping system shall be designed to maximize system efficiency.

3.204 Pump discharge to be plumbed with hoses. (See Section 1.304.)

3.30 Hydraulic Piping on Production Machines:

3.301 All vendor installed hydraulic piping will be socket weld type.

3.302 No hydraulic tubing shall be allowed on production machinery.

3.303 All piping shall be supported with Hycon type mounting brackets with maximum spans of ten feet (10'), and within 12" of bend and points of termination.

3.304 All ball valves will be of the locking type (OSHA required) Hycon or equal.

4.00 HYDRAULIC SYSTEM COMPONENT SELECTIONS

4.10 Power units as specified in Section 3.20.

4.20 Electric motors - General Electric type XSD high efficiency motors (460 volt/3 phase, 60 hertz).

4.30 Hydraulic pumps (vendor will identify pump model and pressure range for each unit):

4.301 Open loop - Piston Pump - Bosch VPV or Denison Premium series.

4.302 Closed loop hydrostatic - Sunstrand, Denison.

4.40 Pump couplings - Magnaloy

4.50 Valves:

4.501 Directional - Bosch.

4.502 Servo - Bosch .

4.503 Proportional - Bosch.

4.60 Accumulators - (bladder type) - Bosch

4.70 Filtration - PALL

4.80 Heat exchangers - Thermal Transfer

4.90 Cylinders - Vickers

4.100 Linear positioners - Vickers Temposonic II Series

4.110 Hydraulic motors - Char-Lynn/Danfoss/Volvo

4.120 See the standard components list, that is included elsewhere in these specifications, for additional items.

5.00 DOCUMENTATION: HYDRAULICS

5.10 Electrical Schematics:

5.101 Provide electrical schematics of all equipment contained on the hydraulic power unit, as well as any remote mounted hydraulic control panels.

5.102 Provide electrical component interconnection diagrams for all electrical/electronic devices contained within the hydraulic control system.

5.103 Provide specifications for all special purpose instrumentation control cables required to complete field wiring connections to all hydraulic control devices.

5.20 Hydraulic Schematics:

5.201 Showing all pump flow capacities, motor horsepowers, accumulator size, pre-charge setting, operating pressures, relief valve settings, pressure control settings, individual device operating specifications, and line size information.

5.202 Showing all interconnects and case drains from field assembly to tank.

5.203 Listing all field devices by name and model that are part of the system whether supplied by power unit vendor or by others.

5.30 Tank Layout Mechanical Drawings:

5.301 Show plan and elevation views that locate and dimension all pumps, electric motors, ports, accumulators, heat exchangers and junction box locations.

5.302 All control and/or junction boxes must be shown with a listing of what each contains.

5.303 Drip pan detail drawings.

5.40 For Approval Drawings - drawings must be submitted to the Martco Project Manager prior to start of any fabrication.

5.401 The Project Manager will require four (4) copies.

5.50 For Construction Drawings:

5.501 The Project Manager will require two (2) bluelines and one (1) reproducible vellum D size or better.

5.502 All drawings to be furnished in Autocad format Version 12.0.

6.00 EXCEPTIONS

All exceptions to the specifications above must be approved in writing by the Martco Project Manager.

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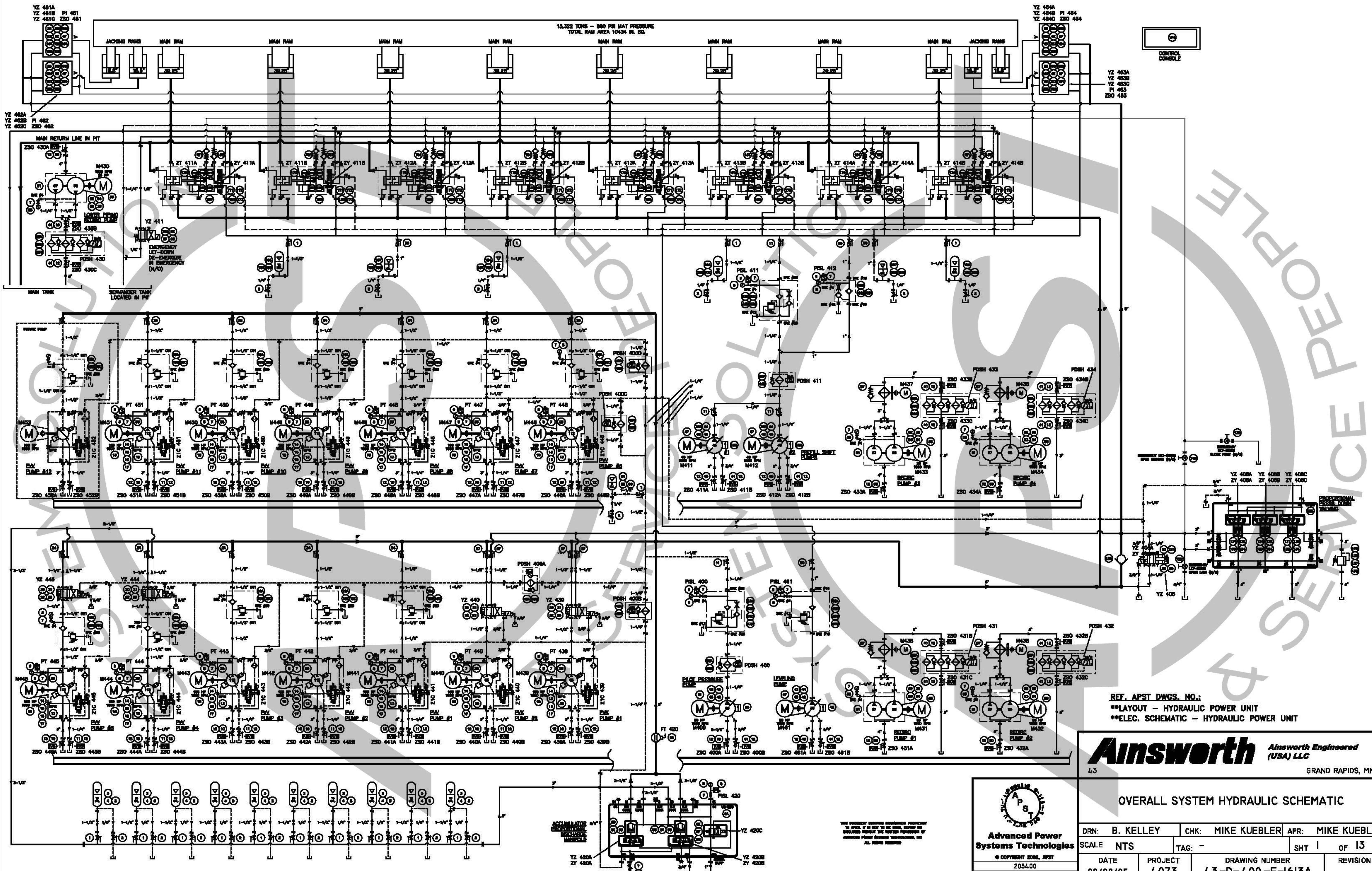

REF. APST DWGS. NO.:
**LAYOUT – HYDRAULIC POWER UNIT
**ELEC. SCHEMATIC – HYDRAULIC POWER UNIT

Ainsworth Ainsworth Engineered (USA) LLC

GRAND RAPIDS, MN

43

Advanced Power Systems Technologies

205400

A.P.S.T.

OVERALL SYSTEM HYDRAULIC SCHEMATIC

DRN: B. KELLEY	CHK: MIKE KUEBLER	APR: MIKE KUEBLER	
SCALE NTS	TAG: -	SHT 1	OF 13
DATE 08/08/05	PROJECT 4073	DRAWING NUMBER 43-D-400-E-1613A	REVISION -