

## 600 HHP Enclosed Single Pumper – Tech Spec Sheet



### Well Service Pumping Unit — Split Configuration

**Model:** TWS600-HD / GD-600-HD

**Application:** Cementing, Acidizing, Gravel Packing, Snubbing

#### 1. Main Pump – SPM® TWS 600S HD

- **Max Brake Horsepower:** 600 BHP (447 kW)
- **Rod Load Capacity:** 106,029 lbf (47.2 metric tons)
- **Stroke Length:** 6" (152.4 mm)
- **Gear Ratio:** 4.610:1
- **Dry Weight:** 4,600 lb (2,086 kg)
- **Dimensions (L x W x H):** 50" x 53" x 24" (1,270 mm x 1,346 mm x 610 mm)
- **Max Pressure Capability:**
  - 20,000 psi with 2.5" plunger
  - 15,000 psi with 3.0" plunger
- **Displacement Range:** 0.38–1.24 gal/rev (1.4–4.7 L/rev)
- **Max Flow Rate:** Up to 565 GPM (2,137 LPM) with 4.5" plunger
- **Features:**
  - Retrofit-compatible
  - Improved lubrication and seal life
  - Reduced reciprocating mass
  - Knuckle bearing design for load distribution

## 2. Engine – Caterpillar C15 ACERT™

- **Power Rating:** 400 bkW / 536 bhp @ 1800–2000 rpm
- **Displacement:** 15.2 L (928 in<sup>3</sup>)
- **Torque:** 2,437 N·m / 1,797 lb-ft @ 1350 rpm
- **Aspiration:** Turbocharged – Aftercooled
- **Governor:** Electronic ADEM™ A4
- **Emission Standards:**
  - IMO Tier II
  - EPA Marine Tier 3
- **Cooling System Capacity:** 34 L (36 qt)
- **Lube Oil Capacity:** 75 L (79.25 qt)
- **Oil Change Interval:** 500 hours
- **Rotation (Flywheel End):** Counterclockwise
- **Dimensions (L x W x H):** 2617 x 1732 x 2095 mm (103" x 68.2" x 82.5")
- **Dry Weight:** 5,300 kg (11,650 lb)
- **Safety & Certifications:**
  - Class I Div 2 (NEC 500), Class I Zone 2 (NEC 505), ATEX Group II, Category 3G
  - Flameproof intake system
  - Electrical connectors intrinsically safe for Zone 2

## 3. Frame & Structure

- **Base Frame Drawing:** Included
- **Pad Eyes Pull Test Cert.:** Included
- **Pull Test Certificate:** Included

## 4. Electrical & Control

- **Electrical Schematic:** Included
- **Control System:**
  - ADEM A4 with J1939 CAN
  - Optional PCS2 board / Messenger display / 3GP safety system

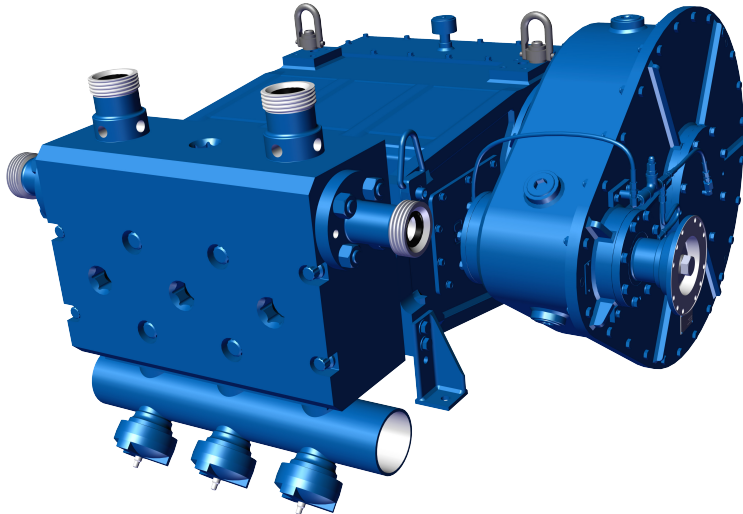
## 5. Other Equipment

- **Alternator:** 24V, 35A or 65A (Zone 2 compliant)
- **Battery Pack:** 24V 55Ah, EX d e II T4 rated
- **Cooling Package:** Offshore-rated, 45°C ambient capability

# SPM® TWS 600S HD Well Service Pump



Oil & Gas



The SPM® TWS 600S HD pump is specifically engineered to reduce downtime due to maintenance while improving rod load and high pressure capabilities. The heavy duty design is built with quick and practical maintenance in mind, while supplying 6% higher rod load at pressures of 15,000 psi utilizing a 3-inch plunger and 20,000 psi utilizing a 2.5-inch plunger. The SPM® TWS 600S HD pump is designed to eliminate contamination from pumping media into the power end, extending pump component life. Retrofit kits are available for customers currently operating SPM® TWS 600S pumps. Customers are able to update their units to the latest technology without the capital investment of a completely new unit.

## Design Features and Benefits

- Increased rod load by 6%\* to achieve 15 ksi rating with a 3-inch plunger or 20 ksi with a 2.5-inch plunger
- Eliminated fluid end proppant contamination potential in the power end greatly increasing power end seal life
- Removed 10 lbs (7%)\* of reciprocating weight per cylinder while maintaining or improving design safety factors
- Improved lubrication through the use of a ported crankshaft and ventilated shell bearings
- Reduced maintenance time by not having to remove the diaphragm seal in order to remove the packing nut
- Contamination of the power end is also reduced\* as the power end remains sealed during fluid end maintenance
- Knuckle bearing connecting rod design provides 7% more surface area for improved load transfer\*
- Technology can be retrofitted into existing pumps without modification

\* Compared to the conventional SPM® TWS 600S pump

## Applications: Cementing, acidizing, gravel packing, snubbing

Maximum Brake Horsepower Input .....	600 BHP (447 kW)
Maximum Rod Load Capacity .....	106,029lb <sub>f</sub> (472 kg)
Stroke Length.....	6" (152.4 mm)
Gear Ratio.....	4.610:1
Approximate Length.....	50" (1,270 mm)
Approximate Width.....	53" (1,346 mm)
Approximate Height .....	24" (610 mm)
Approximate Weight (Dry) .....	4,600 lb (2,086 kg)

**Note:** Pump dimensions and weights are approximate. For full detailed drawings, please contact Weir.

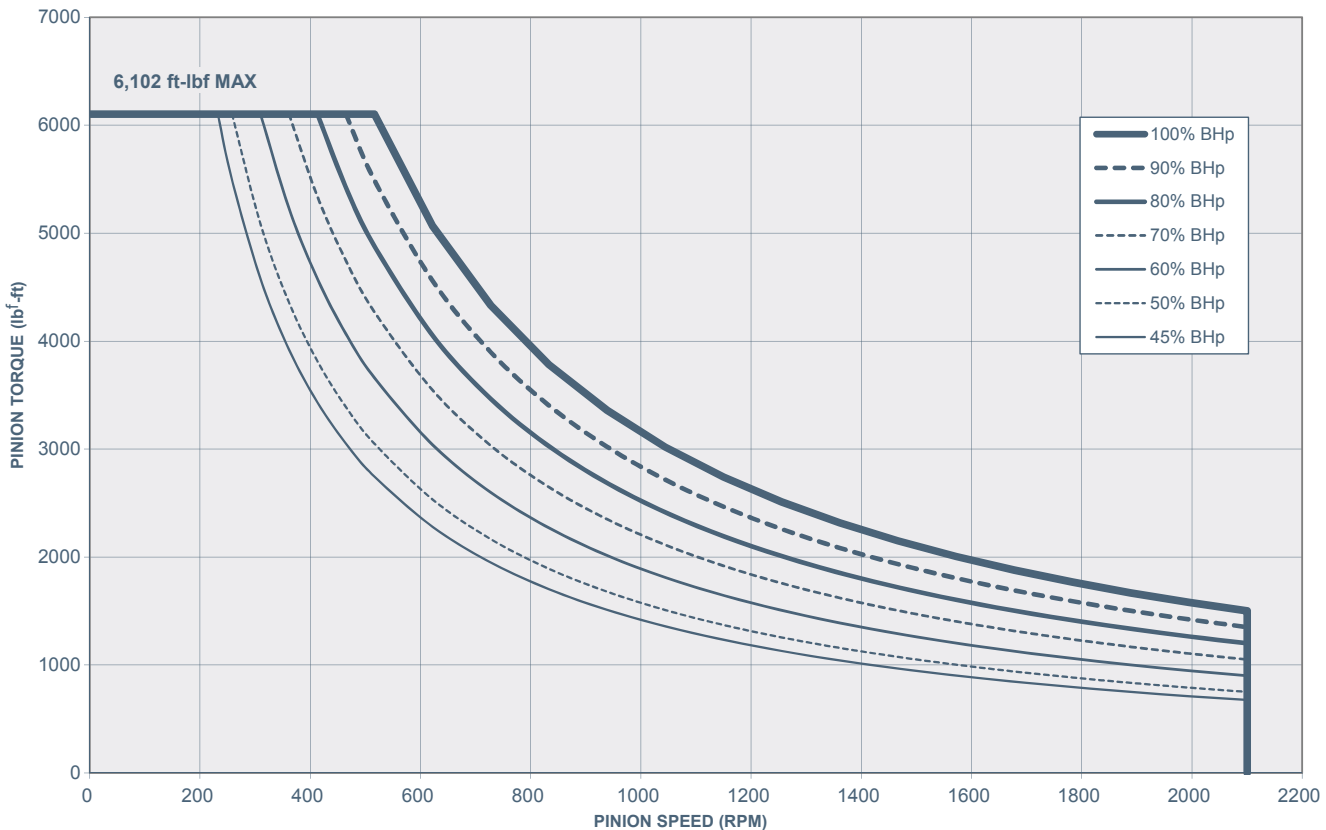
## TWS 600S & TWS 600S HD Pump—Performance Chart<sup>1,2</sup>

Plunger Diameter in (mm)	Displace Per Rev gal/rev (liter/rev)	Displacement at Pump Strokes per Minute/Pinion RPM											
		50 gpm (lpm)	231 psi (Mpa)	112 gpm (lpm)	516 psi (Mpa)	198 gpm (lpm)	912 psi (Mpa)	284 gpm (lpm)	1308 psi (Mpa)	370 gpm (lpm)	1704 psi (Mpa)	456 gpm (lpm)	2100 psi (Mpa)
2 ½ (63.5)	0.38 (1.4)	19 (72)	21600 (149)	43 (163)	21600 (149)	76 (278)	12227 (84)	109 (411)	8527 (59)	141 (535)	6546 (45)	174 (659)	5312 (37)
2 ¾ (69.9)	0.46 (1.8)	23 (88)	17851 (123)	52 (196)	17851 (123)	92 (347)	10105 (70)	219 (829)	7047 (49)	171 (648)	5410 (37)	211 (798)	4390 (30)
3 (76.2)	0.55 (2.1)	28 (104)	15000 (103)	62 (234)	15000 (103)	109 (413)	8491 (59)	131 (497)	5921 (41)	204 (771)	4546 (31)	251 (950)	3689 (25)
3 ½ (76.2)	0.75 (2.8)	37 (142)	11020 (76)	84 (318)	11020 (76)	148 (562)	6238 (43)	156 (592)	4350 (30)	277 (1049)	3340 (23)	342 (1293)	2710 (19)
4 (101.96)	0.98 (3.7)	49 (185)	8438 (58)	110 (415)	8438 (58)	194 (733)	4776 (33)	278 (1052)	3331 (23)	362 (1370)	2557 (18)	446 (1688)	2075 (14)
4 ½ (114.3)	1.24 (4.7)	62 (235)	6667 (46)	139 (525)	6667 (46)	245 (928)	3774 (26)	352 (1331)	2632 (18)	458 (1734)	2020 (14)	565 (2137)	1639 (11)
Input Power: BHP (kW)		268 (200)		600 (447)		600 (447)		600 (447)		600 (447)		600 (447)	

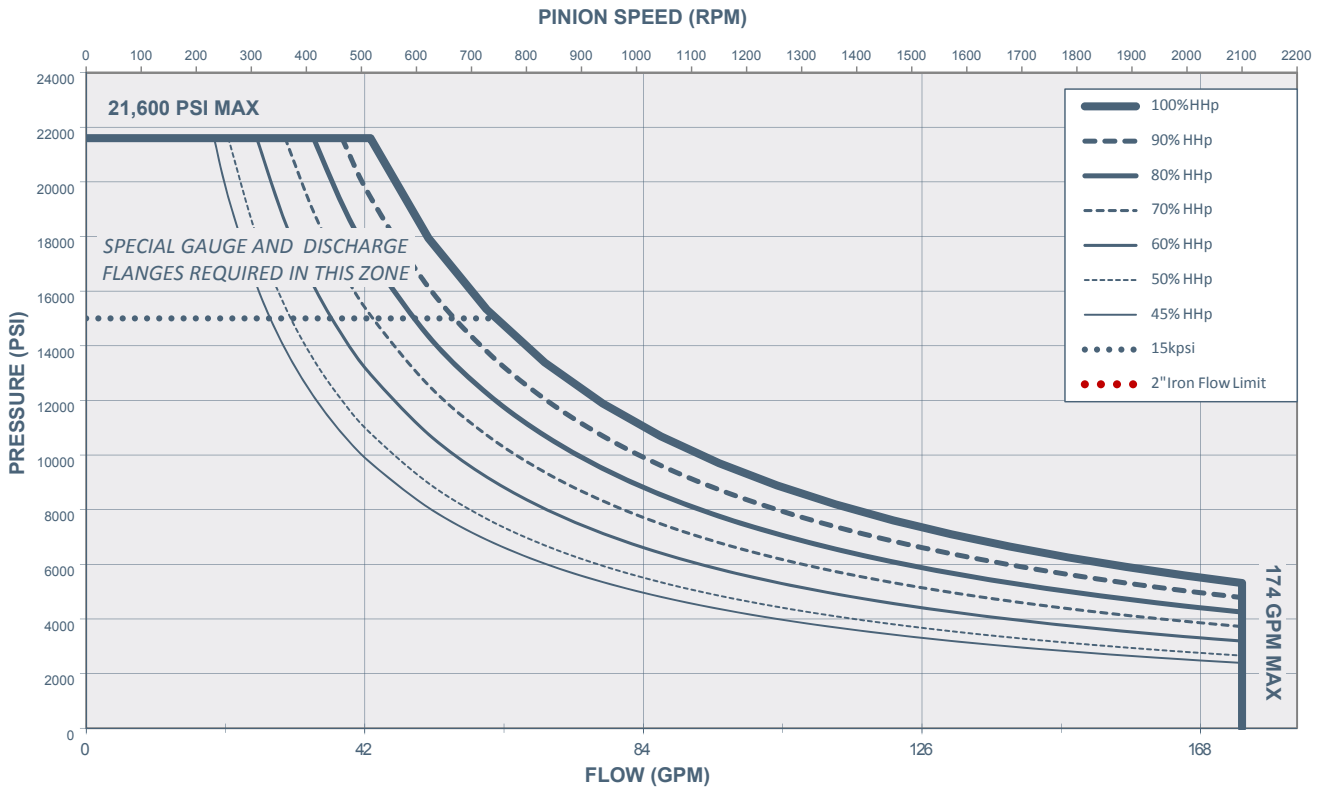
<sup>1</sup> Based on 90% ME and 100% VE—Intermittent Service Only.

<sup>2</sup> Pumps operating in excess of 15,000 psil require special gauge and discharge flanges. Contact SPM Engineering for information.

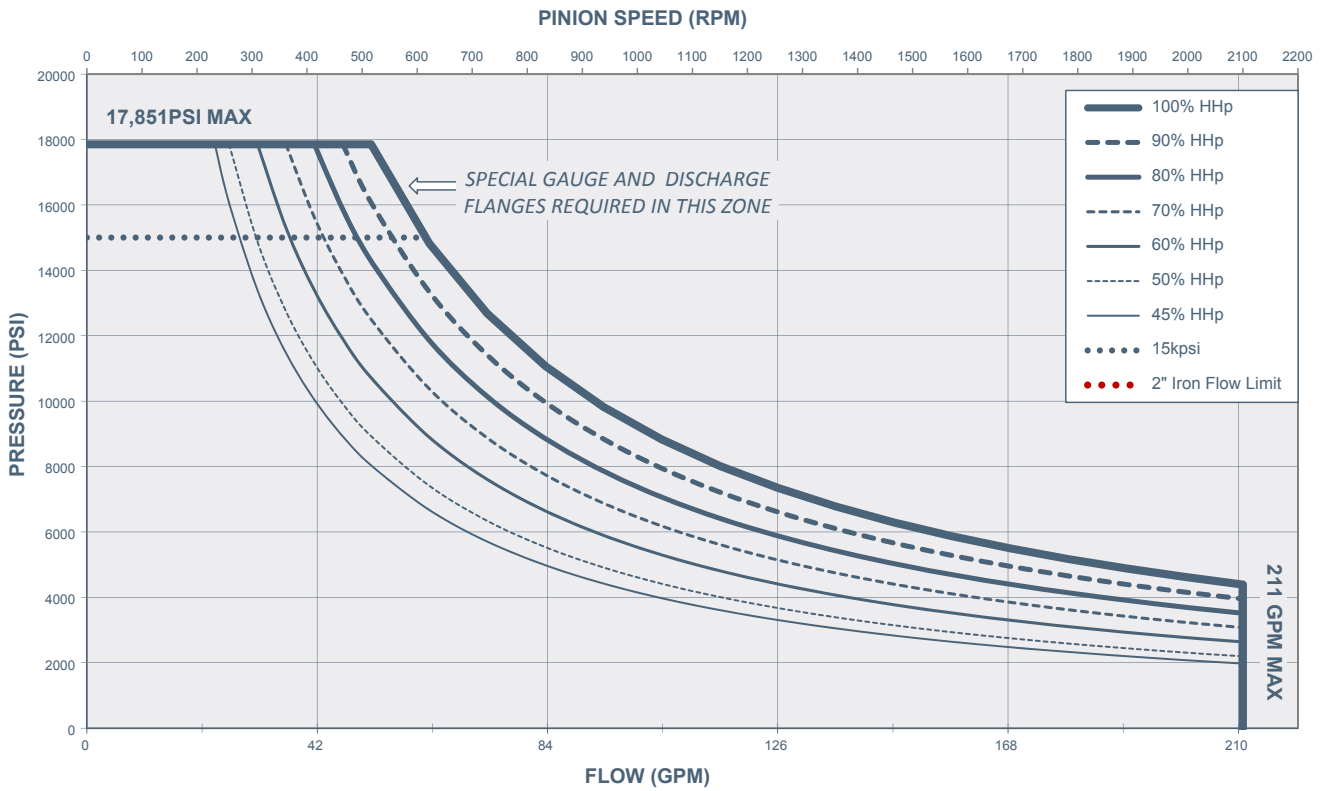
## SPM® TWS 600S Pinion Torque Curve



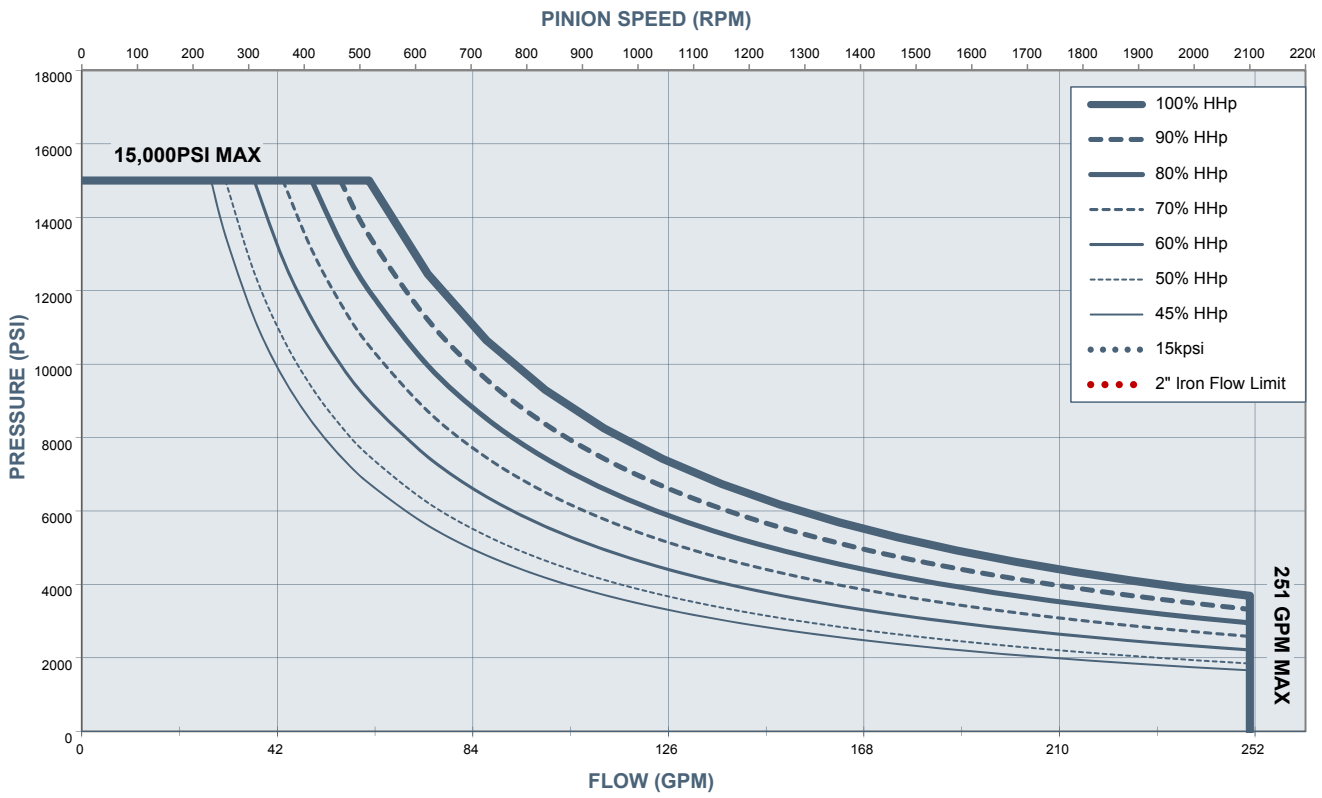
**SPM® TWS 600S & TWS 600S HD 2.50" Plunger Horsepower Curve**



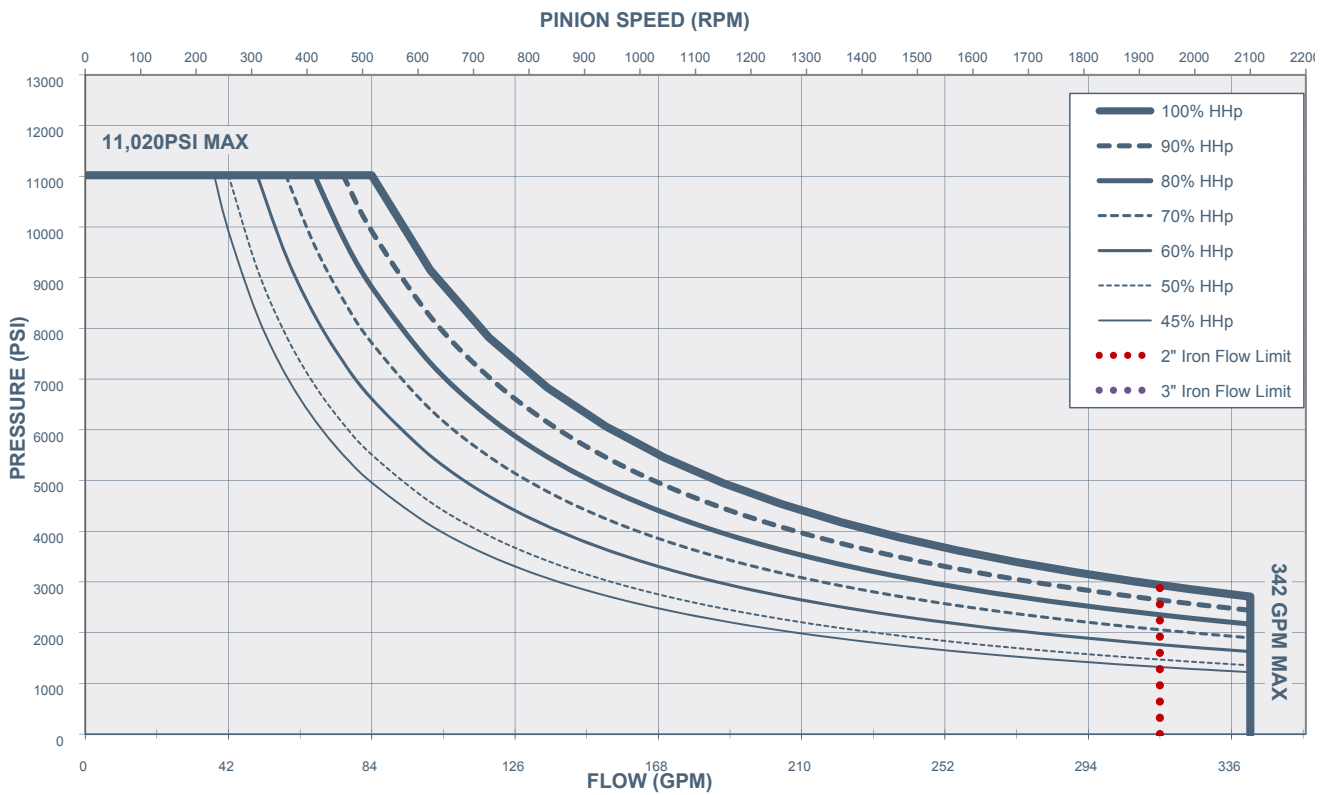
**SPM® TWS 600S & TWS 600S HD 2.75" Plunger Horsepower Curve**



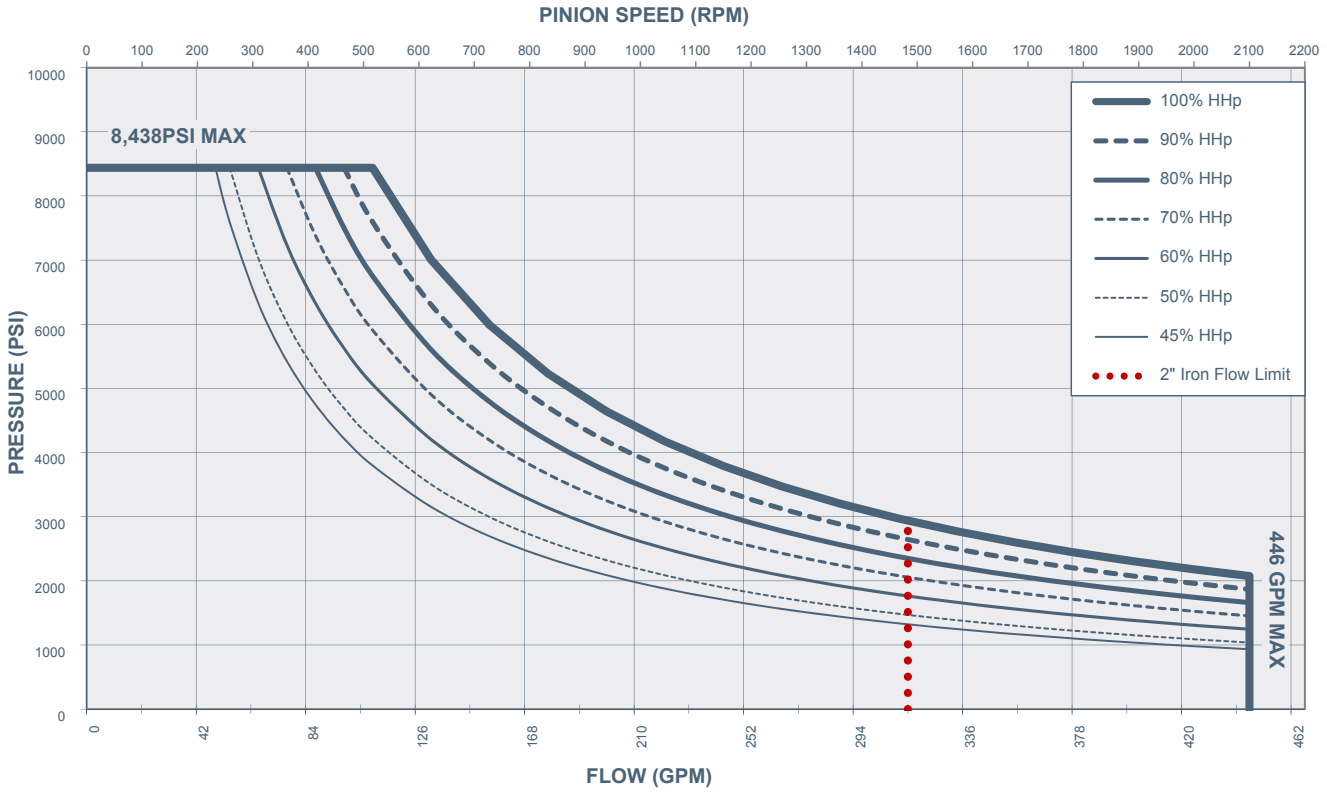
### SPM® TWS 600S & TWS 600S HD 3.00" Plunger Horsepower Curve



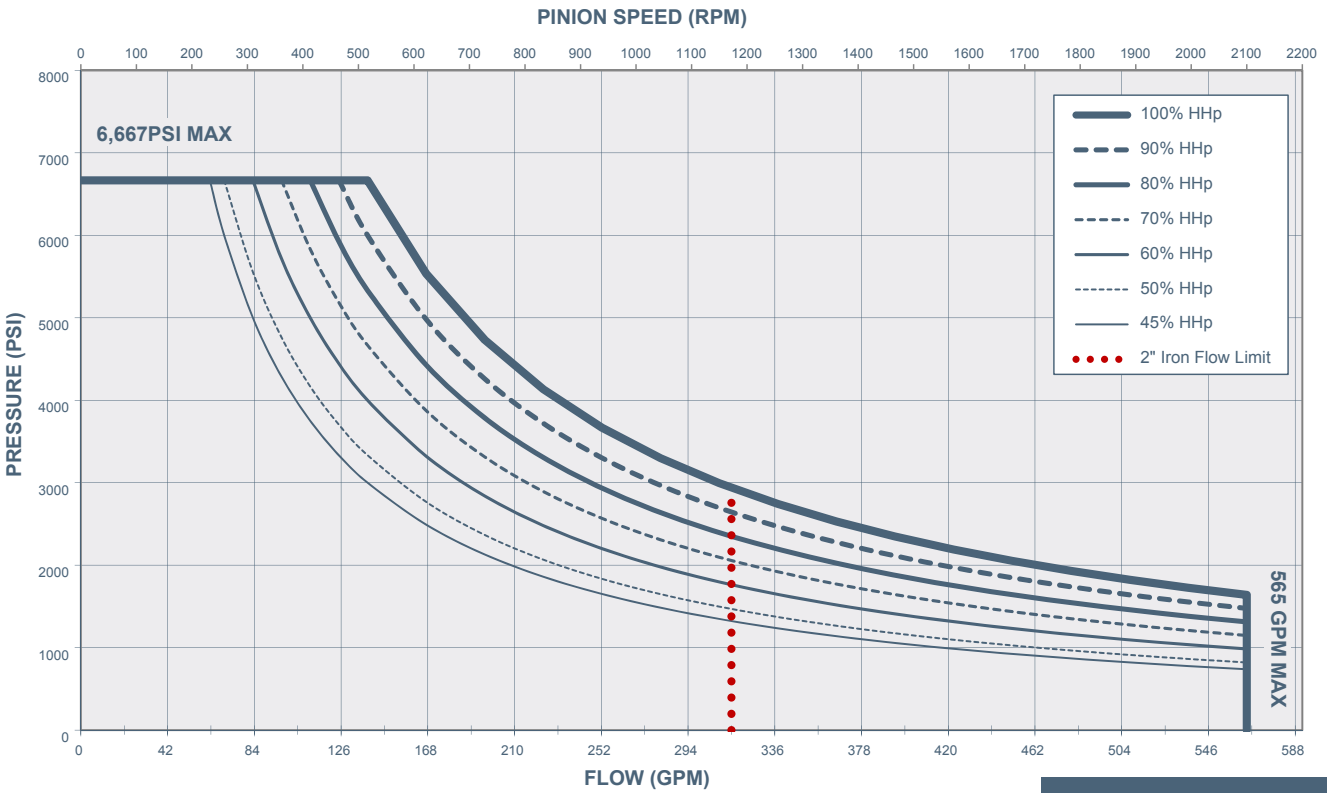
### SPM® TWS 600S & TWS 600S HD 3.50" Plunger Horsepower Curve



**SPM® TWS 600S & TWS 600S HD 4.00" Plunger Horsepower Curve**



**SPM® TWS 600S & TWS 600S HD 4.50" Plunger Horsepower Curve**



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# C15 ACERT™ Petroleum Engine

400 bkW  
(536 bhp)  
1800-2000 rpm

## HazPak Solutions

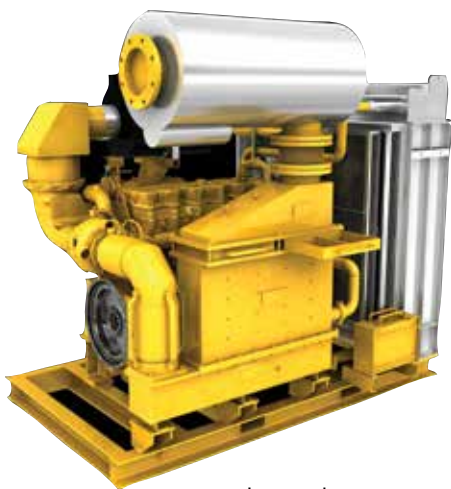


Image shown may not reflect actual engine configuration

## CAT® PACKAGE SPECIFICATIONS

### I-6, 4-Stroke-Cycle Diesel

Emissions.....	IMO Tier II certified, EPA Marine Tier 3 certified
Peak Torque at Speed.....	2428 N•m (1791 lb-ft) @ 1350 rpm
Bore.....	137 mm (5.4 in)
Stroke.....	171 mm (6.7 in)
Displacement.....	15.2 L (928 in <sup>3</sup> )
Aspiration.....	Turbocharged-Aftercooled
Governor and Protection.....	Electronic ADEM™ A4
Capacity for Liquids	
Lube System (refill).....	75 L (79.25 U.S. qts)
Cooling System.....	34 L (36 U.S. qts)
Oil Change Interval.....	500 hours
Rotation (from flywheel end).....	Counterclockwise
Flywheel and Flywheel Housing.....	SAE No. 1
Flywheel Teeth.....	113 (SAE 1)

## FEATURES

### Improving Workforce Efficiency

- Standard factory certifications improve worksite safety
  - Class I Division 2 (NEC 500), Class I Zone 2 (NEC 505)
  - ATEX Directive (94/9/EC) Group II
  - Category 3G (Zone 2) with Mechanical Gas Group IIA, Electrical IIC and Temperature Class T3.
- Electrical harness and connectors are certified as intrinsically safe for Zone 2 and for protection against flame propagation
- Certified flameproof intake system to prevent any internal explosions from propagating to external atmosphere
- Industry-standard ADEM A4 control system improves operator interface

### Making Your Investment Work Harder

- Factory-certified engines for hazardous location applications allow simplified rig certification for OEM
- Optimized for demanding well service applications
  - Workover, pumping, cementing, blending, and acidizing
- Maintains high power over broad range of operating speeds, improving performance
- Steady torque rise provides superior load acceptance
- Optimized ambient and altitude capabilities for operating flexibility

### Committed to Sustainable Development

- Meets today's emission standards for well service applications
  - IMO Tier II
  - EPA Marine Tier 3

### Driving Down Total Cost of Ownership

- Improved serviceability versus the competition
- Industry-leading component overhaul life

### Product Support Offered Through Global Cat Dealer Network

- More than 2,200 dealer outlets
- Caterpillar factory-trained dealer technicians service every aspect of your petroleum engine
- Caterpillar parts and labor warranty

### Web Site

For all your petroleum power requirements, visit [www.catoilandgasinfo.com](http://www.catoilandgasinfo.com).



## HAZPAK SOLUTION

### Factory-supported turnkey solutions

- Factory-matched exhaust and inlet systems
- Integrated Cat control system
- Take the risk out of specification and procurement of individual parts
- All skin temperatures and exhaust gas < 200°C (T3)
- Certified to maintain T3 skin temperatures for up to 45°C ambient applications

### Class-leading safety

- ATEX 94/9/EC
- Machinery Directive 2006/42/EC

### Superior corrosion resistance

- Marine grade solder dipped core radiator
- Optional 3-coat epoxy marine paint system

### Globally supported by Cat dealer network

## STANDARD ENGINE EQUIPMENT

### Air Inlet System

Dry-type two element air filter with restriction indicator, separate circuit aftercooler with **ATEX-approved air shutoff valve**, inlet flame arrestor

### Control System

Industry-standard ADEM A4 control system, inlet air shutoff valve for integration with supervisory safety system, electronic governing, programmable ratings, automatic altitude compensation, power compensation for fuel temperature, programmable low and high idle and top engine speed limit, electronic diagnostics and fault logging, engine monitoring and protection system (speeds, temperature, pressure), J1939 broadcast (diagnostic, engine status and control), wiring suitable for Class 1 Division 2 or ATEX Zone 2 areas

### Cooling System

Cooling package designed for 45°C ambient capability; separate cooling circuit for aftercooler; offshore-capable radiators for jacket water and aftercooler circuits are manufactured using steel fabrications, galvanized solder-dipped cooling elements and all stainless steel nuts and bolts; flanged 150 lb RF connections used at cooling system interfaces; coolant pipe work in mild steel with Victaulic connections; water pumps are gear driven, centrifugal; radiator-mounted fan with ATEX-compliant fan drive and guarding; all guards designed, manufactured, and fitted in accordance with the Machinery Directive 2006/42/EC.

### Exhaust System

Exhaust gas cooler, plenum, and outlet box assembly; ATEX compliant – designed to limit the exhaust gas and exhaust duct surface temperatures to T3 (200°C); exhaust gas flametraps suitable for Gas Group IIA; designed and tested in accordance with the recommendations of EN 1834-1; wet and dry exhaust flexibles; ship-loose ATEX-compliant spark arresting muffler

### Flywheel and Flywheel Housing

SAE No. 1 cast iron housing, industrial-style flywheel for SAE-1 housing, pilot bore for 100 mm diameter bearings, provides RH starter bore location

### Fuel System

Electronic unit injector; upward-angled fuel priming pump, primary filter and water separator; engine-mounted secondary fuel filter

### General

Package ambient capability is -10°C to 45°C; mechanical systems are designed for Gas Group IIA; electrical systems are designed for Gas Group IIC; all systems meet temperature class T3 (200°C limit); includes a certificate of conformity for the entire package scope; radiator package, engine, and exhaust system fitted to sub-frame; air filter, fuel/water separator, remote oil filter installed and mounted; earth bonding per standard EN 60079-14; painted per Offshore Paint specification, standard 2-coat acrylic paint.

### Lube System

Oil cooler, LH oil gauge, remote-mounted oil filters for easy service

## OPTIONAL EQUIPMENT

### Air Compressor

Belt-driven, two-cylinder, single-stage, reciprocating with a rated displacement of 13.2 cfm at 1250 rpm compressor speed; includes two environmental drains and filtered atmospheric air connection

### Charging System

24V 35A EX d ATEX compliant alternator for Gas Group IIB, temperature class T3; heavy-duty, brushless.  
24V 65A alternator, NEC 500 Class 1 Division 2 for Gas Groups C&D, temperature Class T3; heavy-duty, brushless.  
24V 55Ah EX d e II T4 increased safety deep discharge battery pack with integral junction box and isolator switch.

### Control System

- Air, electric, or hydraulic shutdown system input options available
- **Throttle knob speed control** – shipped loose if no control panel option selected; ATEX approved 24V operation; twist knob, locking design; 2-turns, low to high speed; CCW rotation to increase engine speed, push in or turn CW to return to low idle
- **Messenger display** – shipped loose if no control panel option selected; electronic display unit for monitoring key engine operation data and diagnostic information on a full graphic LCD screen; four select buttons to scroll through the engine data and diagnostic screens and navigate through the display configuration menu to change display settings; connection to

the engine control module is via the J1939 CAN data link

- **PCS2 control board** – provides **supervisory safety system function and overspeed shutdown control**; includes shipped loose start button, run/stop switch, emergency stop button for integration in customer control panel; switches and sensors for exhaust gas temperature, coolant temperature, oil pressure, and engine speed shutdowns; user configurable alarm and shutdown relay inputs
- **3GP flametrap elimination system** – provides gas detection, supervisory safety system function, overspeed shutdown control; allows operation without exhaust flame traps to reduce maintenance; includes shipped-loose start button, run/stop switch, emergency stop button for integration with customer panel; **provides up to 20 optional inputs and outputs for customer equipment; designed to give automatic shutdown in the event of engine overspeed**, high exhaust temperature, high coolant temperature, low oil pressure, detection of hydrocarbon gas; additional I/O pressure and temperature input switches available on request.

### Fuel System

Fuel cooler, installed, maintains acceptable fuel temperature when running from day tank

### Starting System

Air, electric and hydraulic starters available

### Paint

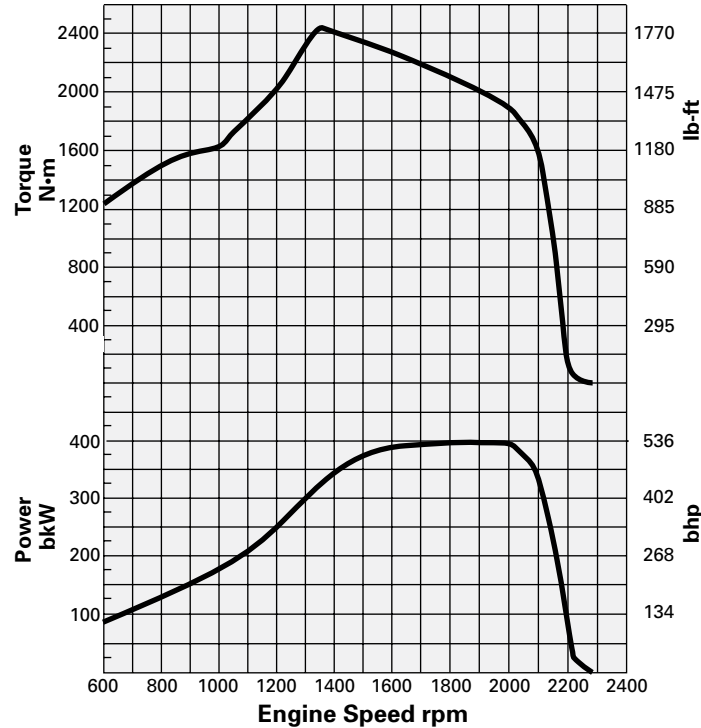
Offshore 3-coat epoxy paint system, 325 micron thickness



**PERFORMANCE DATA**

Turbocharged-Aftercooled — 1800-2000 rpm

**Rated Speed**



**Peak Power**

**Peak Torque**

Rating	Speed rpm	Peak Power bkW	Peak Power bhp	Speed rpm	Peak Torque N·m	Peak Torque lb-ft
D	2000	400	536	1350	2437	1797

**RATING DEFINITIONS AND CONDITIONS**

**D Rating** for service where maximum power is required for periodic overloads (time at full load not to exceed 10% of the duty cycle).

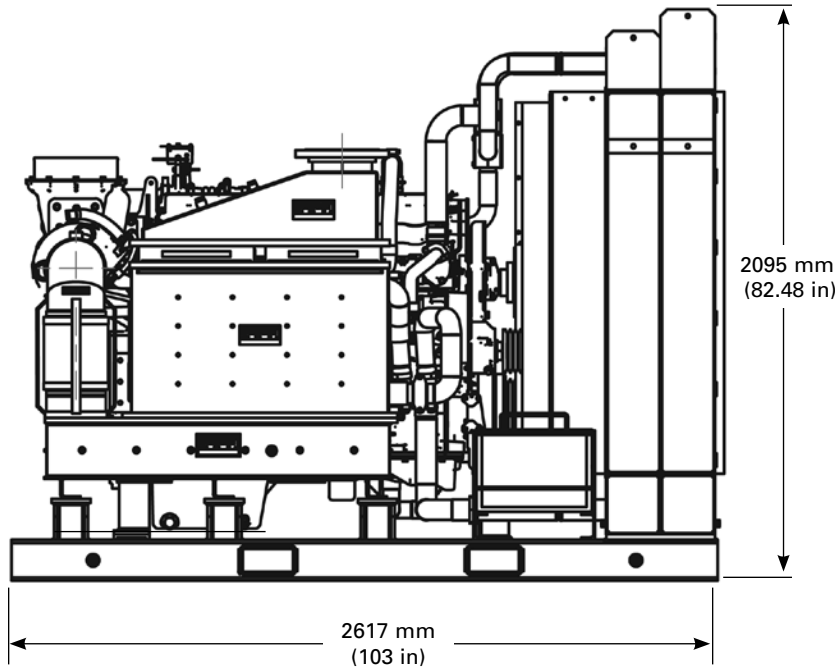
**Engine Performance Diesel Engines — 7 liter and higher** are based on SAE J1995, inlet air standard conditions of 99 kPa (29.31 in Hg) dry barometer and 25°C (77°F) temperature. Performance measured using a standard fuel with fuel gravity of 35° API having a lower heating value of 42 780 kJ/kg (18,390 btu/lb) when used at 29°C (84.2°F) with a density of 838.9 g/L.



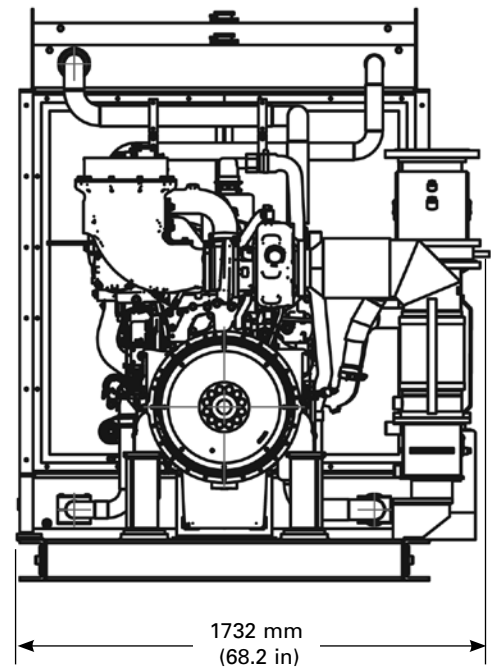
**C15 ACERT™**  
**Petroleum Engine**  
400 bkW/536 bhp @ 1800-2000 rpm

**DIMENSIONS**

**RIGHT SIDE VIEW**



**FRONT VIEW**



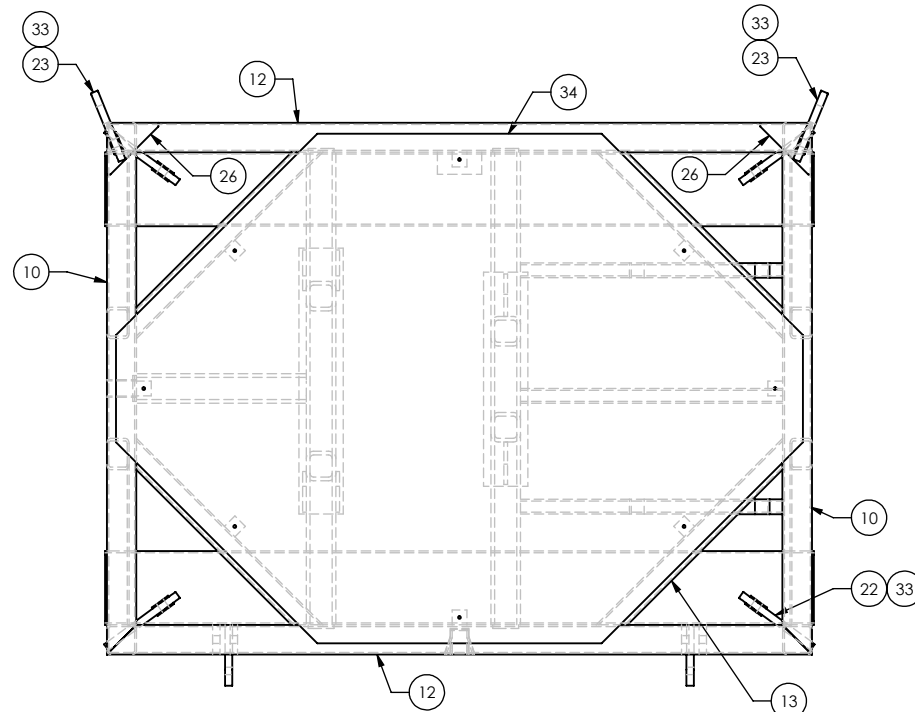
DIMENSIONS*		
Length	mm (in)	2617 (103)
Width	mm (in)	1732 (68.2)
Height	mm (in)	2095 (82.48)
Weight	kg (lb)	5300 (11,650)

\*Maximum dimensions are shown. Dimensions may be less depending on the alternator, fan adapter, and air shutoff selected.

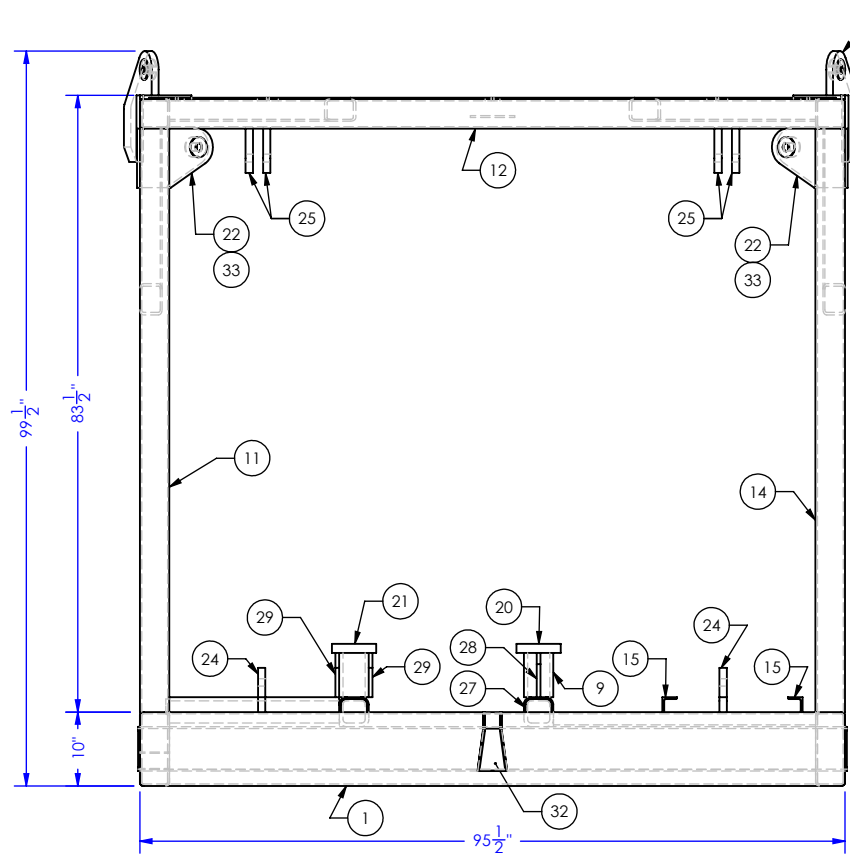
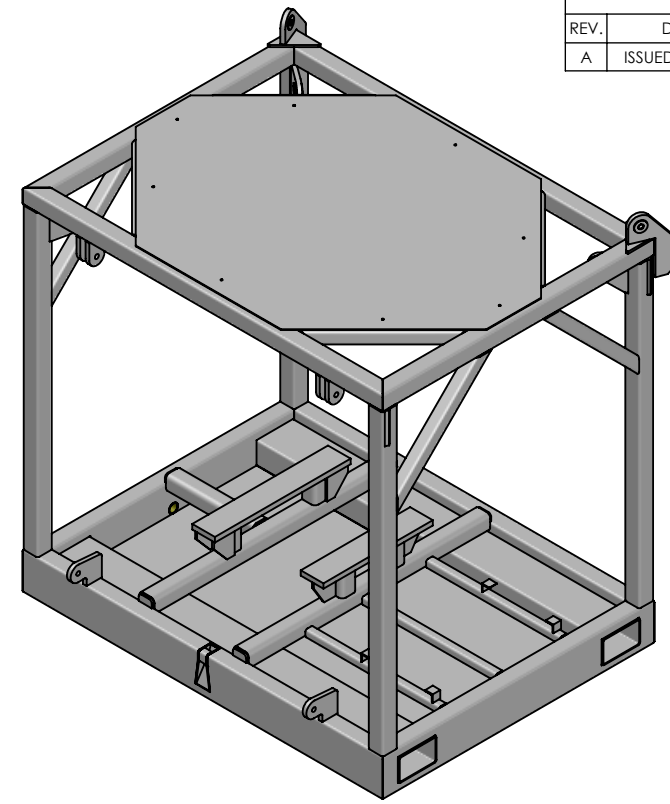
Materials and specifications are subject to change without notice. The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, their respective logos, ACERT, ADEM, "Caterpillar Yellow" and the "Power Edge" trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.

BOM Table				
ITEM NO.	DESCRIPTION	LENGTH	MATERIAL	QTY.
1	TR10x4x0.25	95 1/2"	ASTM A500 Gr. B	1
2	TR10x4x0.25	95 1/2"	ASTM A500 Gr. B	1
3	TR10x4x0.25	72"	ASTM A500 Gr. B	1
4	TR10x4x0.25	72"	ASTM A500 Gr. B	1
5	TR10x6x0.25	96"	MATERIAL	2
6	TS4x4x0.50	64"	ASTM A500 Gr. B	2
7	TS4x4x0.50	23"	ASTM A500 Gr. B	1
8	TS2x2x0.25	35 1/2"	ASTM A500 Gr. B	3
9	TS4x4x0.50	6"	ASTM A500 Gr. B	4
10	TS4x4x0.25	72"	ASTM A500 Gr. B	2
11	TS4x4x0.25	79"	ASTM A500 Gr. B	2
12	TS4x4x0.25	95 1/2"	ASTM A500 Gr. B	2
13	TS3x3x0.25	35 11/16"	ASTM A500 Gr. B	8
14	TS4x4x0.25	79"	ASTM A500 Gr. B	2
15	L2x2x.25	2"	ASTM A36	4
16	FB3x0.25	6"	ASTM A36	1
17	FB2x0.25	2"	ASTM A36	8
18	SB1.5x1.5	2 1/4"	ASTM A36	1
19	1-1/2" Coupling Full	4"	ASTM A106 Gr. B	1
20	1 1/4" Plate (Pump Plate 1)	6" x 29"	ASTM A36	1
21	1 1/4" Plate (Pump Plate 2)	6" x 36"	ASTM A36	1
22	1" Plate (Lift Lug 2)	12" x 8"	API 2H Gr. 50	4
23	1" Plate (Lift Lug 2)	10" x 15"	API 2H Gr. 50	2
24	1" Plate (Lock Padeye 1)	8 1/4" x 6"	API 2H Gr. 50	2
25	1" Plate (Lock Padeye 2)	6" x 4"	API 2H Gr. 50	4
26	1/2" Plate (Base Plate)	7" x 7"	API 2H Gr. 50	2
27	1/2" Plate	3-1/2" x 1-3/4"	ASTM A36	5
28	1/2" Plate	6" x 5 3/4"	ASTM A36	2
29	1/2" Plate	6" x 5 1/2"	ASTM A36	4
30	1/4" Plate	See Dwg.	ASTM A36	1
31	1/4" Plate	See Dwg.	ASTM A36	1
32	3/16" Plate	See Dwg.	ASTM A36	1
33	3/16" Plate (Cheek Plate)	2 3/4" O.D.	ASTM A36	12
34	3/16" Plate (Roof)	93" x 69"	ASTM A36	1
35	3/16" Plate (Floor)	87 1/2" x 44"	ASTM A36	1

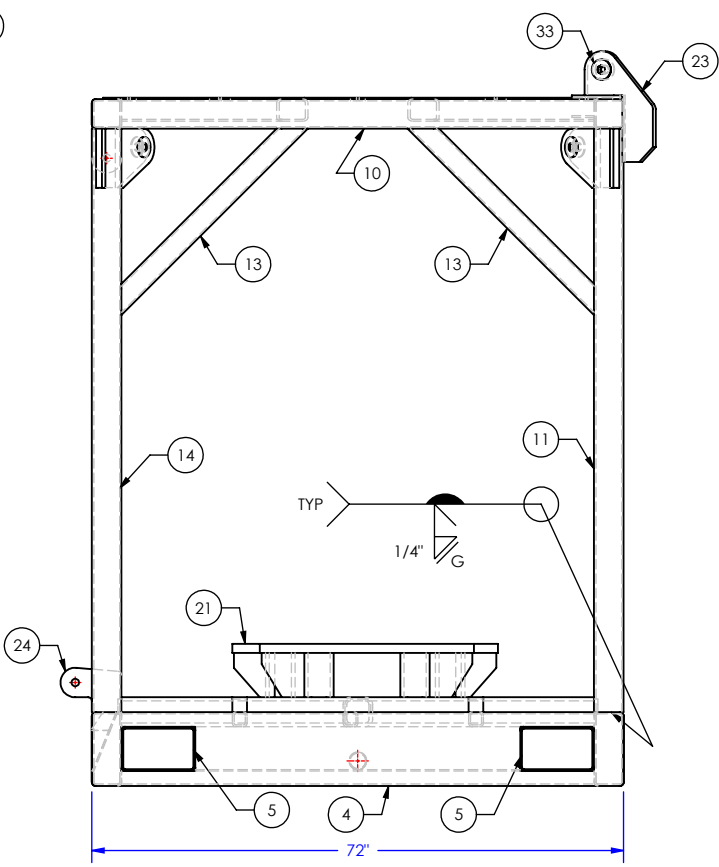
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	ISSUED FOR APPROVAL	10/29/2018	TS



PLAN VIEW



SIDE ELEVATION



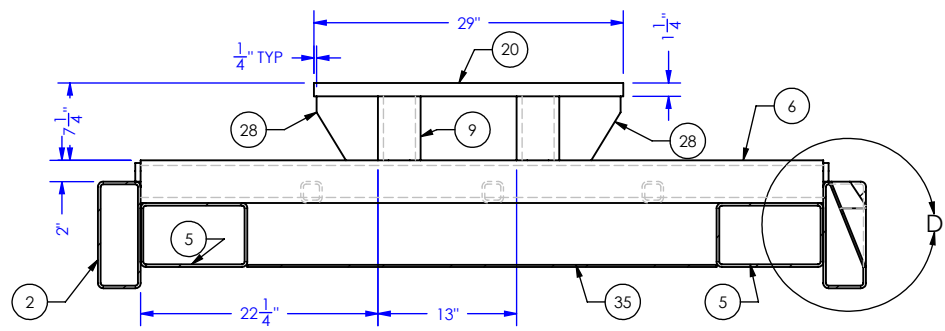
END ELEVATION

- GENERAL NOTES:**
1. ALL WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 & 1.2.
  2. ALL WELDS SHALL BE FULL PENETRATION WELDS UNLESS NOTED OTHERWISE.
  3. ALL LIFT LUG HOLES SHALL BE DRILLED OR REAMED.

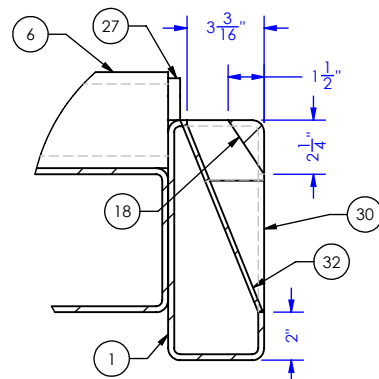
DRAWING DESCRIPTION:

## Mud Pump Skid

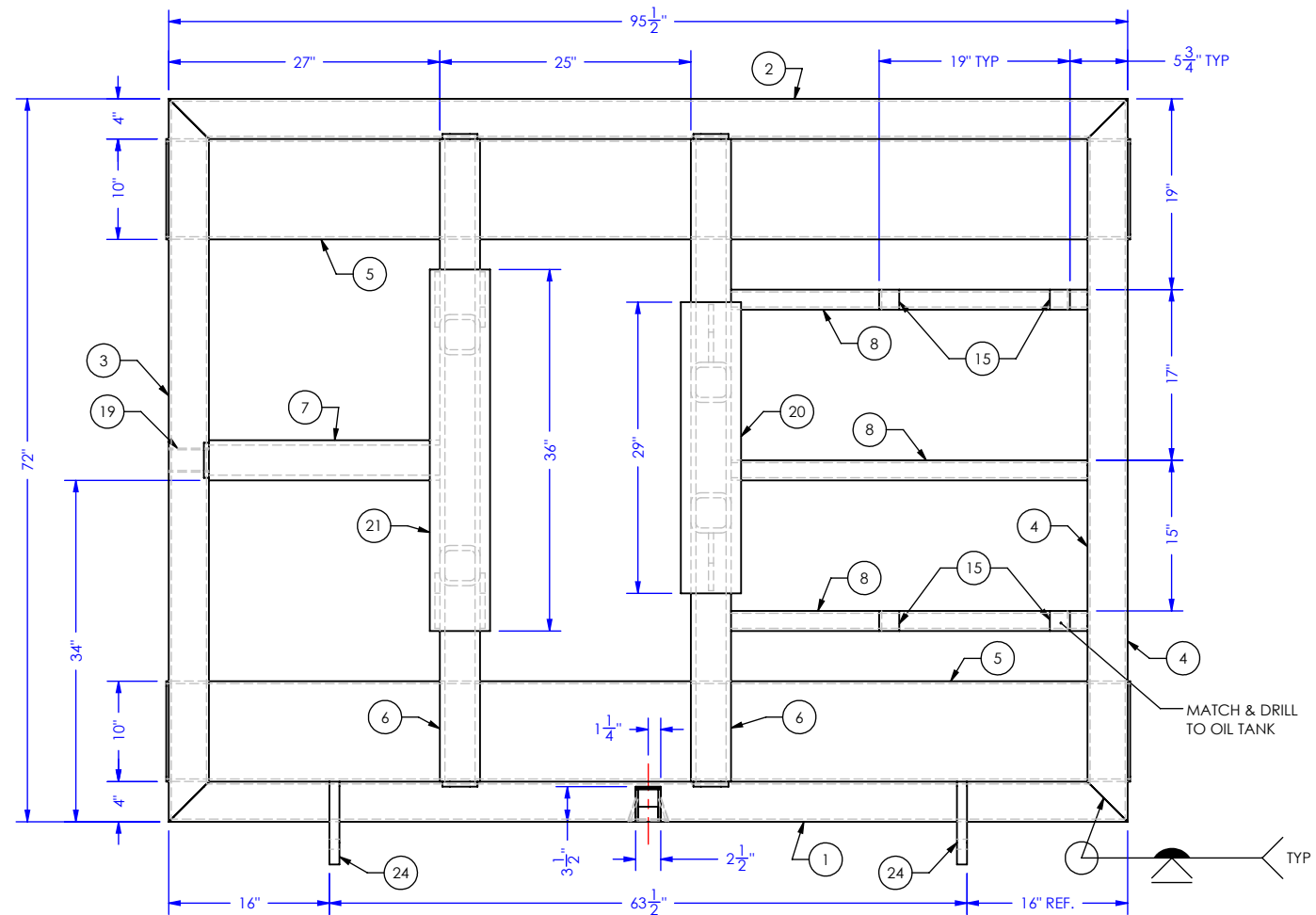
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SCALE: NTS	SHEET: 1 OF 4	REV: A



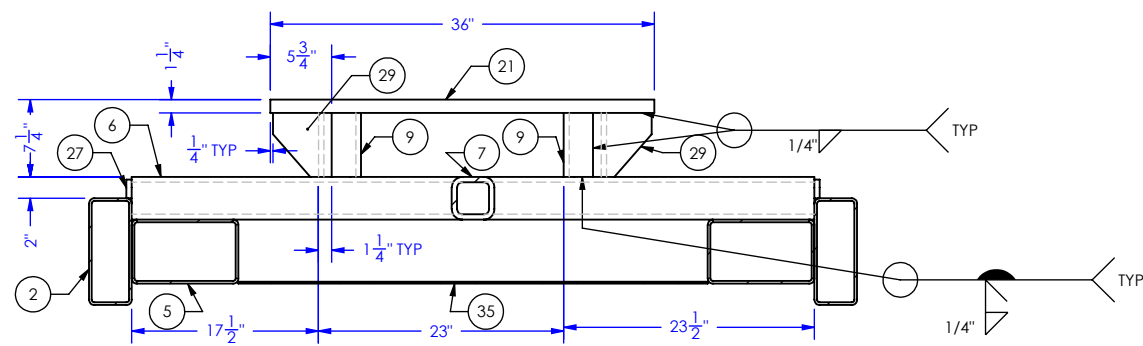
SECTION B-B



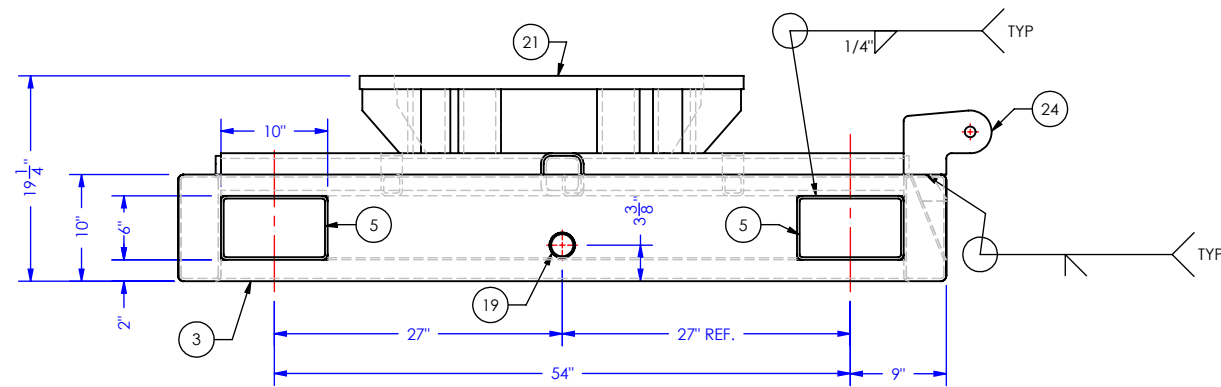
DETAIL D  
SKID HOOK UP DETAIL



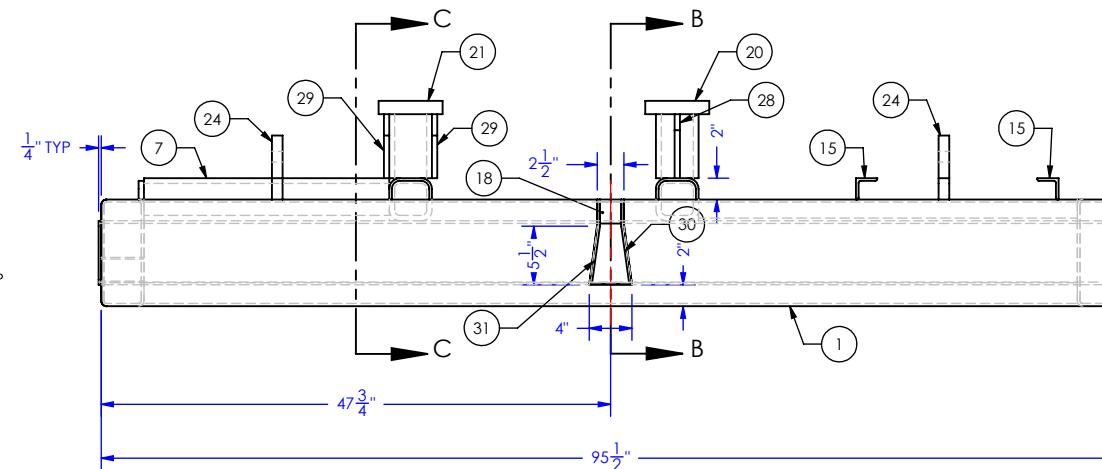
PLAN VIEW



SECTION C-C



END ELEVATION



SIDE ELEVATION

- GENERAL NOTES:**
1. ALL WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 & 1.2.
  2. ALL WELDS SHALL BE FULL PENETRATION WELDS UNLESS NOTED OTHERWISE.
  3. ALL LIFT LUG HOLES SHALL BE DRILLED OR REAMED.

DRAWING DESCRIPTION:

**Mud Pump Skid**

DRAWING #:

DRAWN BY: TS	APPROVED BY: TS	DATE: 10/24/2018
SCALE: NTS	SHEET: 2 OF 4	REV: A

