

26.4 MW 2014 Used Caterpillar C28-16 Diesel Power Plant  
Generator Set



Harnessing Energy for Life

## Description & Additional Notes

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EXCLUSIVELY FROM USP&E!

USP&E is selling: 26.4 MW 2014 Used Caterpillar C28-16 Diesel Power Plant Generator Set  
60 Hz; 4160x Volts; 3x Phase;

4x - 2006

1x - 2014

1x - 2018

Units available: 6x - 4.4 MW Per Unit

Excludes these items: Caine Broilers; Heat Exchangers; Winder Jacket Coolers; Exhaust Stacks

\*\*Note that price is for the Entire Package!! Price is as CAD

If you are like us, you read every day about how thousands of fast growth companies struggle to find energy generation that is affordable, reliable and available for immediate shipping and installation on a turnkey basis from a company that really understands the complexities of integration of balance of plant and other site infrastructure.

At USP&E, we have been in business now for over 20 years and have offices in 9 countries. But more importantly, WE ARE OBSESSED WITH EACH CLIENTS JOURNEY TO ENERGY SUSTAINABILITY & RELIABILITY AND ARE DRIVEN TO GUIDE EACH CLIENT TO SUCCESSFUL INTEGRATION OF THE BEST IN CLASS TECHNOLOGIES.

This is important and a huge differentiating factor for our clients because USP&E isn't the hero of our story, you are. We will do everything possible to make sure you are successful, and we have over 20 years of satisfied clients and meaningful, long-term client engagements that prove this out. The potential delays related to permitting, land access, shipping, etc must be dealt with head-on and with urgency. We have helped hundreds of companies like yours for over 20 years.



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The process is really simple:

1. Quick, 30 min Engineering/Design Meeting so we Can understand Your project goals, timelines and budgets. ✓
2. Scope of work and supply to match our plants to what you need. ✓
3. Work together to finalise commercial and technical aspects into a contract and move forward with the project. ✓

Please remember, USP&E is not just an equipment broker. We are a GUIDE to energy project excellence. We offer full Engineering, Procurement, Construction and long-term O&M in over 190 countries around the world in order to make sure our client projects are a RESOUNDING success.

Some of the companies we are currently working with include the City of Neom, Barrick Gold, SPACE-X, Firefinch Gold, Kurdistan MOE, Ivanhoe Mining, Boogertman Partners, and Molo Graphite.

At USP&E, we understand how most companies struggle to find energy generation that is affordable, reliable and available for immediate shipping and installation on a turnkey basis. Your partner must be a company that really understands the complexities of integration of balance of plant and other site infrastructure, and not just be a broker. Ideally, your partner offers complete O&M and warranty support services. This is what we have been doing for over 20 years.

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### **Summary:**

6 x CAT 3616 (C280) 4.4MW, 4,160V engine generators sets, including radiators, exhaust stacks, heat recovery boilers, local/remote control panels, synchronising panel, motor control centers, start air compressor system

### **Attachments:**

- Marketing brochure for the sale of the equipment
- Equipment condition report prepared by Finning just prior to removal of the equipment this year
- General arrangement drawings of single total system (4.4MW)
- Layout drawing of all 6 units
- Fuel consumption data
- Alternator technical data sheet

### **Key points regarding this equipment:**

- 1.All the equipment was commissioned, operated, maintained, and preserved upon shutting down by Finning (OEM) personnel, a follow up preservation was completed by Finning in 2018, units are currently preserved for long term storage
- 2.Gen 1 is due for a 50k hour major overhaul
- 3.Gen 3 had a major overhaul early at 35k hours as part of a field follow agreement with Caterpillar, is due for a 25k hour top end overhaul soon
- 4.Gens 2 and 4 had 50k hour major overhauls completed in the same year the mine shut down (2015) as such are internally new
- 5.Gens 5 and 6 were installed and commissioned in 2014 and 2016 – newest units. Gen 6 was commissioned after the mine shut down (2016)
- 6.The equipment is in Leduc AB and can be viewed if desired
- 7.Finning was hired to inspect and support the removal of the equipment to ensure it was completed properly i.e. prelubed prior to rotating, sealed up appropriately
- 8.Complete drawing package available upon purchase order (pdf and CAD)

# Description & Additional Notes

## Generator Data Entry Form

10/4/2006



Spec. #

### \*\*\*\*Rating\*\*\*\*

Kw	4400
pf	0.8
Volts, L-L	4,160
Freq.	60
Speed	900
Amb. Temp.	40° C
Temp. Rise	80° C

### \*\*\*\*Specification\*\*\*\*

Pitch	66.7%
Connection	Wye
No. of Bearings	Two
No. of Leads	Six
No. of Terminals	Four
Application	Cont.
Excitation	PMG

### \*\*\*\*Resistances\*\*\*\*

Stator	0.015	Ohms
Field	2.57	Ohms
Zero Sequence	0.047	Ohms
Positive Sequence	0.020	Ohms
S.C. Ratio	0.931	

### \*\*\*\*Fault Currents\*\*\*\*

Instantaneous 3- P Symmetrical Fault Current	1119	amps
Instantaneous L- N Symmetrical Fault Current	1435	amps
Instantaneous L- L Symmetrical Fault Current	890	amps

### \*\*\*\*Losses and Efficiency \*\*\*\*

P.U. Load	kW Loss	Efficiency
0.25	71	93.9%
0.50	85	96.3%
0.75	109	96.8%
1.00	136	97.0%

### \*\*\*\*Reactances\*\*\*\*

	Saturated Per Unit	Unsaturated Per Unit
Synchronous-Direct Axis	XD-S 1.07	XD-U 1.21
Synchronous-Quadrature Axis	XQ-S 0.55	XQ-U 0.72
Transient-Direct Axis	X'D-S 0.22	X'D-U 0.25
Transient-Quadrature Axis	X'Q-S 0.55	X'Q-U 0.72
Subtransient-Direct Axis	X''D-S 0.15	X''D-U 0.17
Subtransient-Quadrature Axis	X''Q-S 0.18	X''Q-U 0.21
Negative Sequence	X2-S 0.16	X2-U 0.19
Zero Sequence	XO-S 0.02	XO-U 0.02

### \*\*\*\*Time Constants\*\*\*\*

O.C. Transient-Direct Axis	T'DO	4.333	sec
S.C. Transient-Direct Axis	T'D	1.004	sec
O.C. Subtransient-Direct Axis	T''DO	0.043	sec
S.C. Subtransient-Direct Axis	T''D	0.029	sec
O.C. Subtransient-Quadrature Axis	T''QO	0.022	sec
S.C. Subtransient-Quadrature Axis	T''Q	0.006	sec
Armature SC	TA	0.065	sec

### \*\*\*\*Exciter Output Data\*\*\*\*

I <sub>exc-FL</sub>	85
V <sub>exc-FL</sub>	298

### \*\*\*\*Rotor Data\*\*\*\*

WK <sup>2</sup>	17550	lb-ft <sup>2</sup>
D <sup>2</sup> L	55470	in <sup>3</sup>

### \*\*\*\*Saturation Data\*\*\*\*

P.U. Arm. Amps	S.C. Fld Amps
0.25	43.58
0.50	52.60
0.75	61.92
1.00	73.17
P.U. Arm. Volts	O.C. Fld Amps
0.00	0.00
0.25	8.98
0.50	18.04
0.75	27.63
1.00	40.57
1.10	49.21
1.20	63.15
1.30	87.80
1.40	134.04

### \*\*\*\*Current Decrement Curve\*\*\*\*

Elapsed Time (Cycles)	Dec. Current (Amps)
0	5228.4
5	3324.4
10	3026.9
15	2837.6
20	2668.5
25	2511.9
30	2368.5
35	2290.0
40	2290.0
45	2290.0

\*\*Efficiencies are based on a 95° C reference temperature  
 \*\*Values are subject to change without notice (values are predicted)



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**C280-16**

DIESEL ENGINE TECHNICAL DATA



<b>Genset</b>	<b>60 Hz</b>	<b>RATING:</b>	EPG/Continuous
ENGINE SPEED (rpm):	900	CERTIFICATION:	Best BSFC
COMPRESSION RATIO:	13:1	TURBOCHARGER PART #:	284-8281
AFTERCOOLER WATER (°C):	50	FUEL TYPE:	Distillate
JACKET WATER INLET (°C):	90	RATED ALTITUDE @ 25°C (m):	150
IGNITION SYSTEM:	EUI	ASSUMED GENERATOR EFFICIENCY (%):	96
EXHAUST MANIFOLD:	DRY	ASSUMED GENERATOR POWER FACTOR:	0.8
FIRING PRESSURE, MAXIMUM (kPa)	17300		

RATING	NOTES	LOAD	110%	100%	75%	50%
ENGINE POWER	(2)	bkW	5060	4600	3450	2300
GENERATOR POWER	(2)	ekW	4858	4416	3312	2208
BMEP		kPa	2283	2076	1557	1038
<b>ENGINE EFFICIENCY</b>	(ISO 3046/1)	%	<b>44.9%</b>	<b>44.9%</b>	<b>43.7%</b>	<b>40.5%</b>
ENGINE EFFICIENCY	(NOMINAL)	%	43.6%	43.6%	42.3%	39.2%

ENGINE DATA							
FUEL CONSUMPTION	(ISO 3046/1)	(1)	g/bkw-hr	189.7	187.6	188.6	201.6
FUEL CONSUMPTION	(NOMINAL)	(1)	g/bkw-hr	193.4	191.2	192.3	205.5
FUEL CONSUMPTION	(90% CONFIDENCE)	(1)	g/bkw-hr	195.6	193.5	194.9	208.4
AIR FLOW (@ 25°C, 101.3 kPa)			Nm <sup>3</sup> /min	455.0	399.0	273.0	191.5
AIR MASS FLOW			kg/hr	32132	28192	19267	12814
INLET MANIFOLD PRESSURE			kPa (abs)	393.0	344.0	241.0	182.0
INLET MANIFOLD TEMPERATURE			°C	61.0	59.0	57.0	58.0
EXHAUST STACK TEMPERATURE			°C	370.0	376.0	421.0	457.0
EXHAUST GAS FLOW (@ stack temp, 101.3 kPa)			m <sup>3</sup> /min	974.0	854.0	584.0	389.0
EXHAUST GAS MASS FLOW			kg/hr	33124	29073	19932	13287

EMISSIONS							
NOx as NO2			g/bkW-hr	14.50	15.03	14.83	12.86
CO			g/bkW-hr	0.72	0.85	1.13	1.58
THC (molecular weight of 15.84)			g/bkW-hr	0.58	0.60	0.67	0.85
Particulates			g/bkW-hr	0.23	0.25	0.30	0.56

ENERGY BALANCE DATA							
FUEL INPUT ENERGY (LHV)	(NOMINAL)	(1)	KW	11606	10551	8148	5861
HEAT REJ. TO JACKET WATER	(NOMINAL)	(3)	KW	1029	971	820	648
HEAT REJ. TO ATMOSPHERE	(NOMINAL)	(4)	KW	232	211	163	117
HEAT REJ. TO OIL COOLER	(NOMINAL)	(5)	KW	511	485	424	360
HEAT REJ. TO EXH. (LHV to 25°C)	(NOMINAL)	(3)	KW	3352	3096	2623	2051
HEAT REJ. TO EXH. (LHV to 177°C)	(NOMINAL)	(3)	KW	2640	2365	1634	1113
HEAT REJ. TO AFTERCOOLER	(NOMINAL)	(6) (7)	KW	1396	1165	650	371

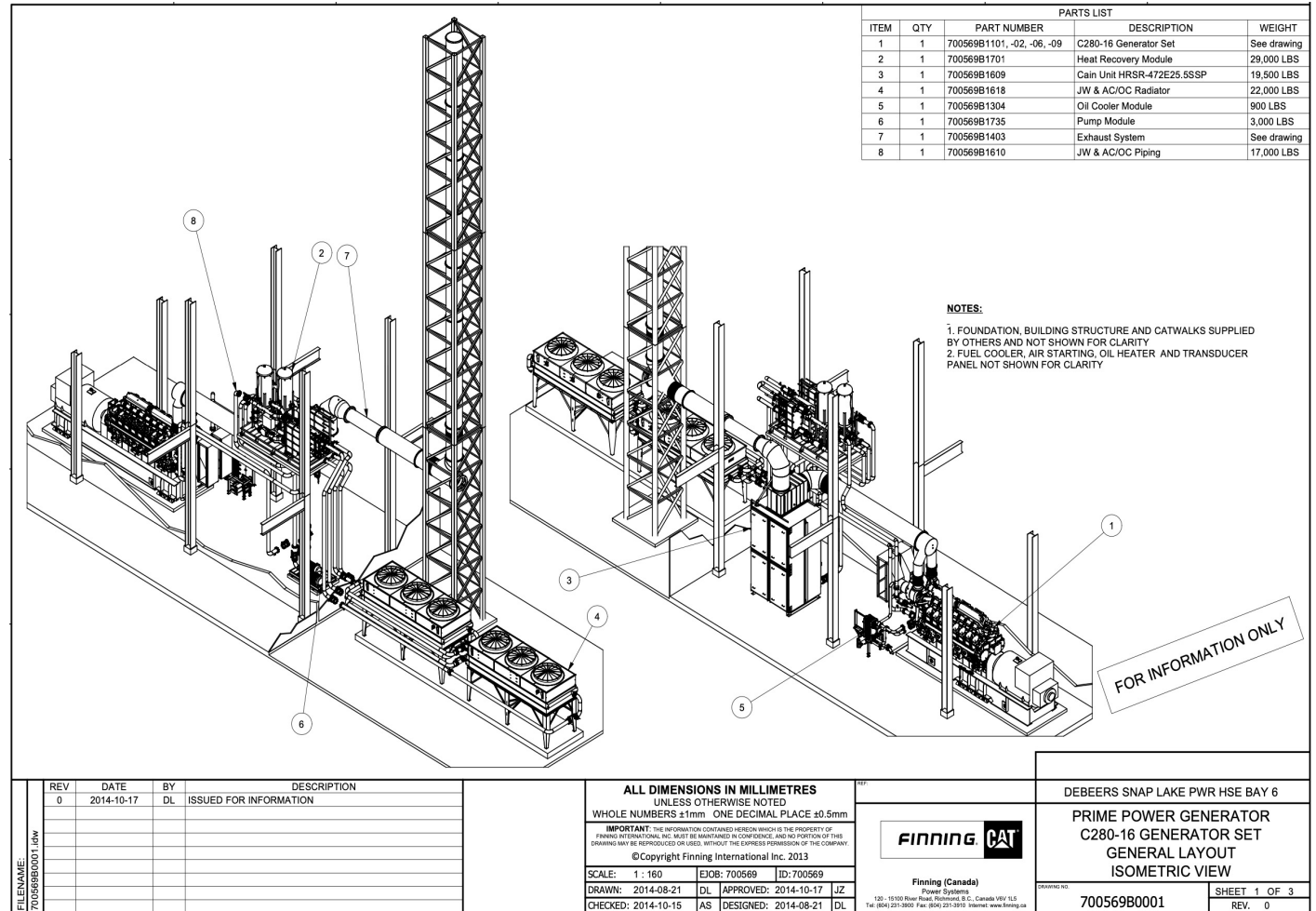
**CONDITIONS AND DEFINITIONS**  
 ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1 AND SAE J1995 JAN90 STANDARD REFERENCE CONDITIONS OF 25°C, 100 KPA, 30% RELATIVE HUMIDITY AND 150M ALTITUDE AT THE STATED AFTERCOOLER WATER TEMPERATURE. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE. PERFORMANCE AND FUEL CONSUMPTION ARE BASED ON 35 API, 16°C FUEL HAVING A LOWER HEATING VALUE OF 42,780 KJ/KG USED AT 29°C WITH A DENSITY OF 838.9 G/LITER.

- NOTES**
- FUEL CONSUMPTION TOLERANCE, ISO 3046/1 IS 0, +5% OF FULL LOAD DATA. NOMINAL IS ± 3% OF FULL LOAD DATA.
  - ENGINE POWER TOLERANCE IS ± 3% OF FULL LOAD DATA.
  - HEAT REJECTION TO JACKET AND EXHAUST TOLERANCE IS ± 10% OF FULL LOAD DATA. (heat rate based on treated water)
  - HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ±50% OF FULL LOAD DATA. (heat rate based on treated water)
  - HEAT REJECTION TO LUBE OIL TOLERANCE IS ± 20% OF FULL LOAD DATA. (heat rate based on treated water)
  - HEAT REJECTION TO AFTERCOOLER TOLERANCE IS ± 5% OF FULL LOAD DATA. (heat rate based on treated water)
  - TOTAL AFTERCOOLER HEAT = AFTERCOOLER HEAT x ACHRF (heat rate based on treated water)

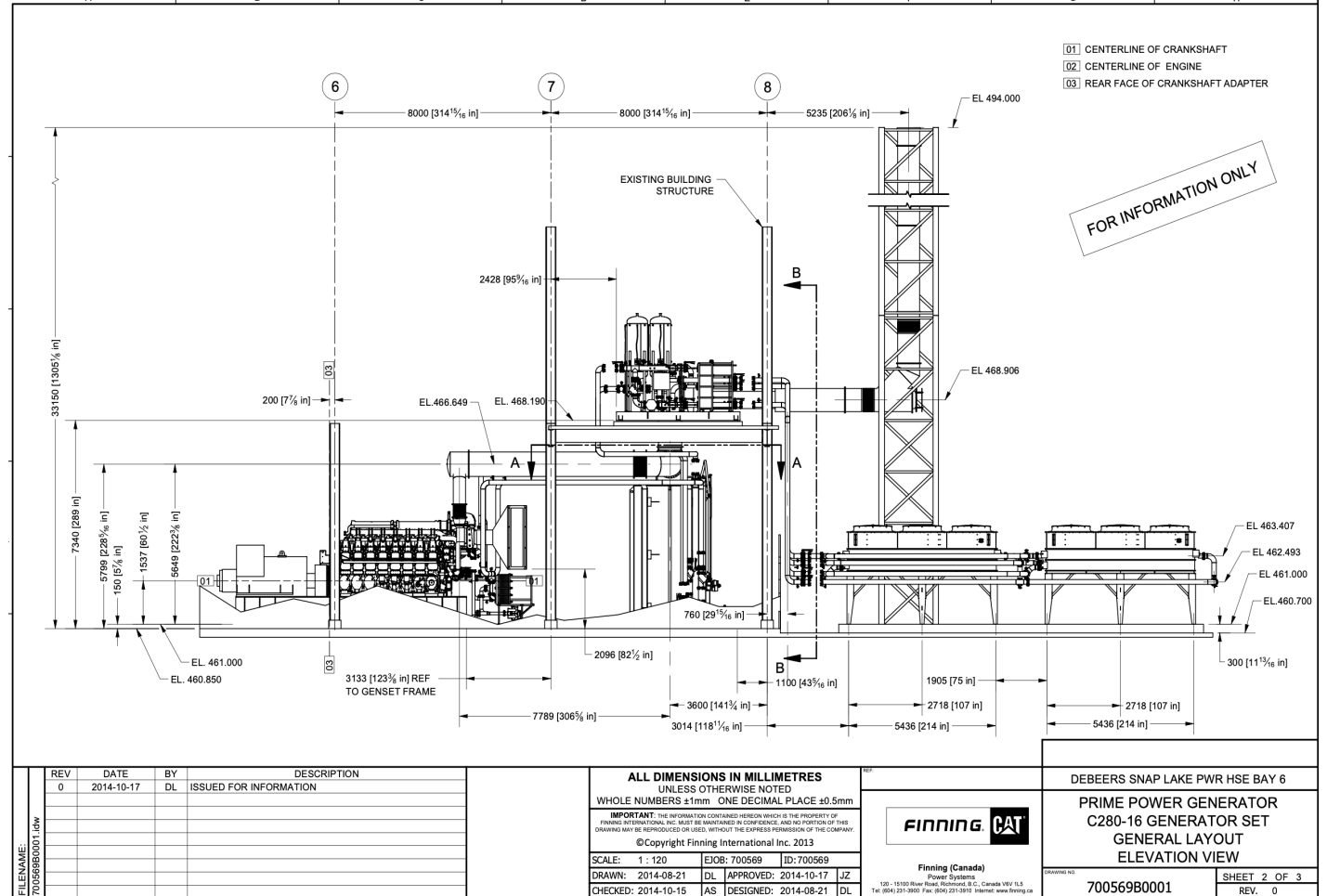
C280 Best BSFC



# Description & Additional Notes

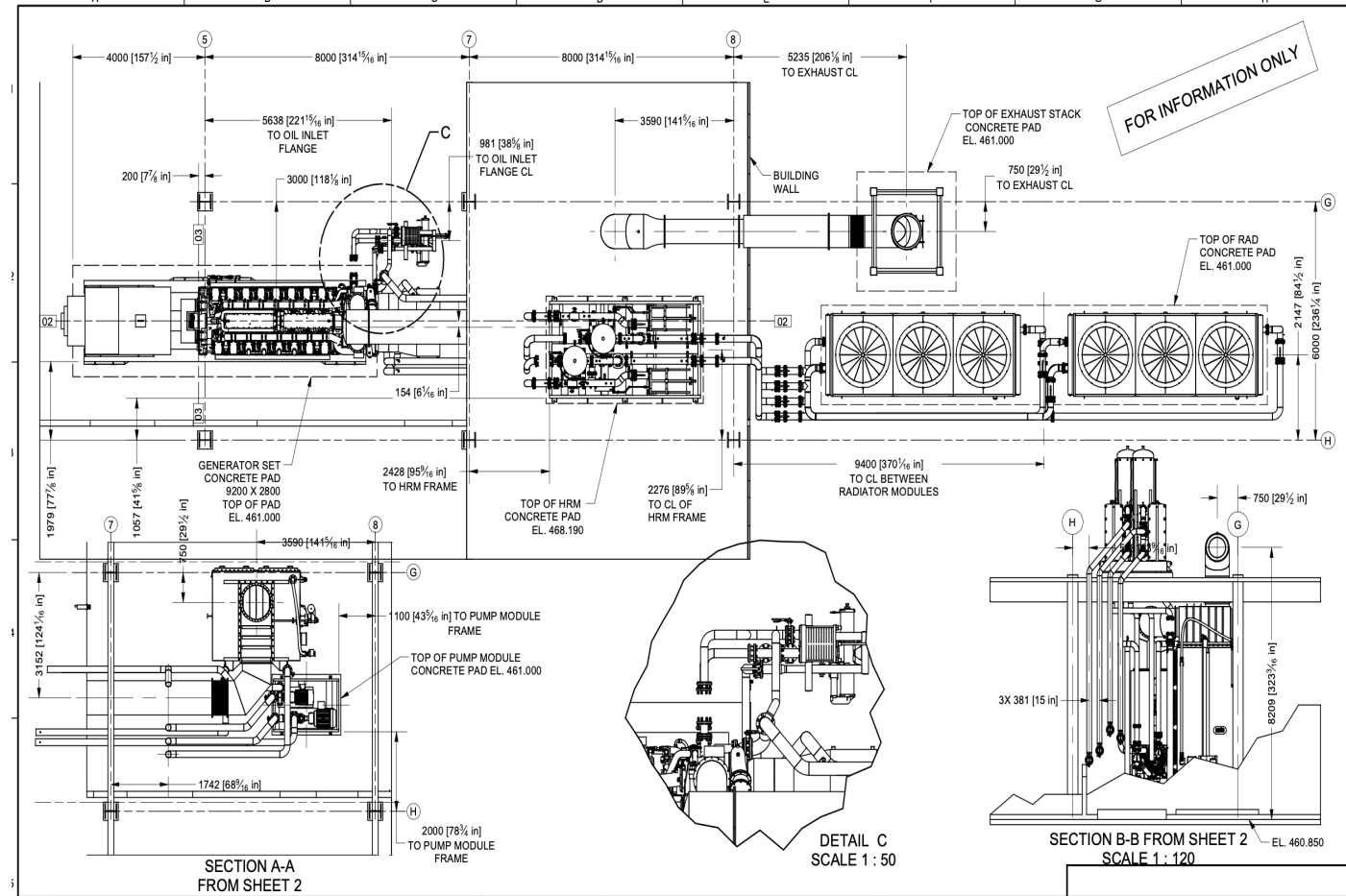


# Description & Additional Notes





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REV	DATE	BY	DESCRIPTION
0	2014-10-17	DL	ISSUED FOR INFORMATION

**ALL DIMENSIONS IN MILLIMETRES**  
UNLESS OTHERWISE NOTED  
WHOLE NUMBERS ±1mm ONE DECIMAL PLACE ±0.5mm

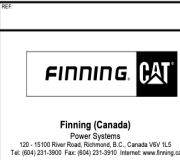
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DRAWN: 2014-08-21    DL    APPROVED: 2014-10-17    JZ

CHECKED: 2014-10-15    AS    DESIGNED: 2014-08-21    DL

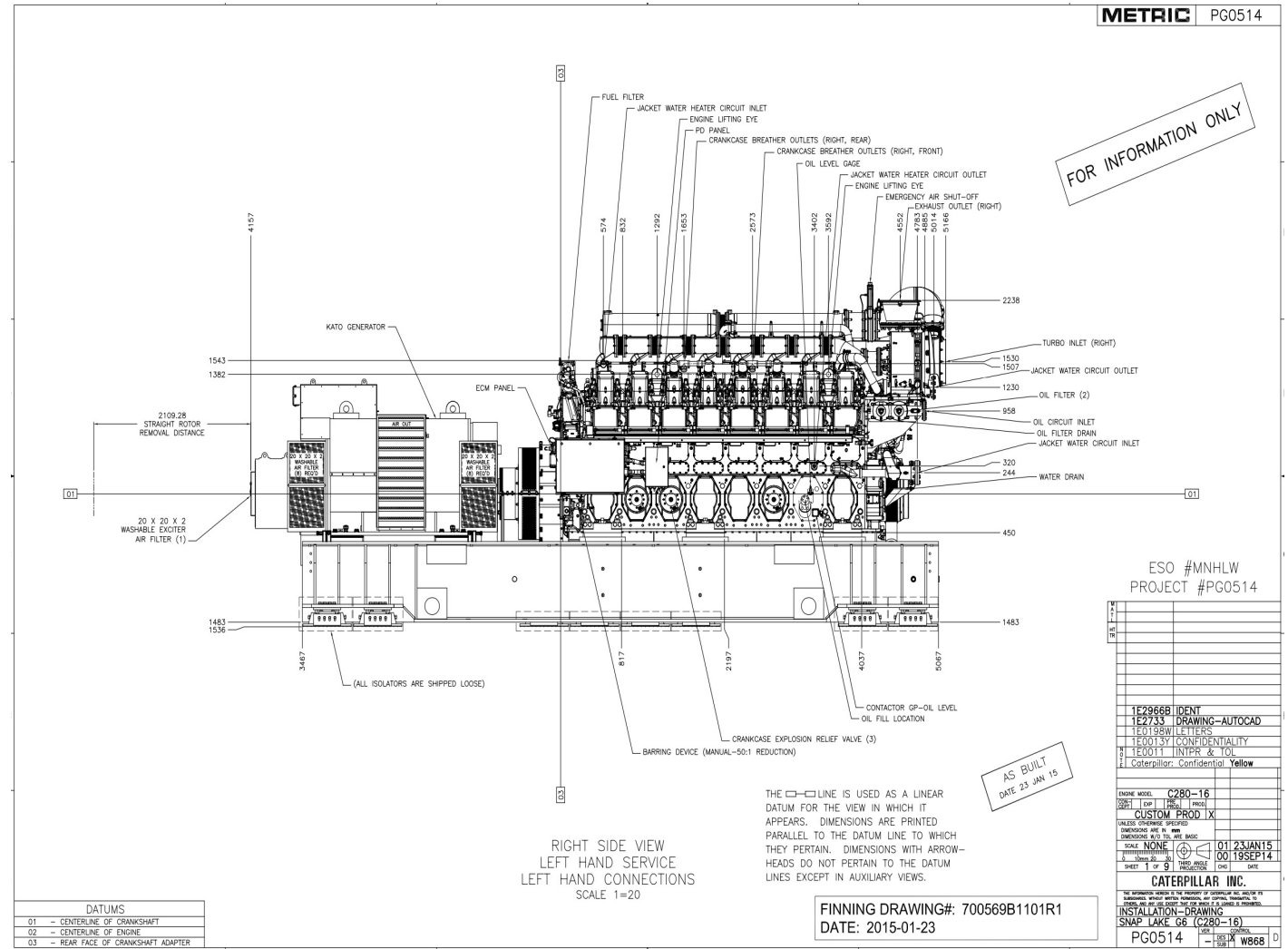
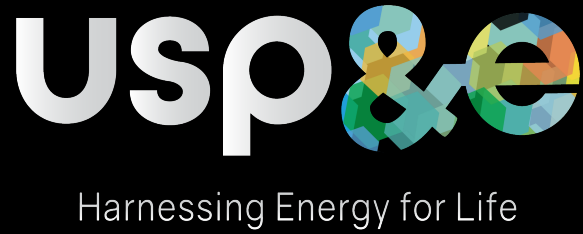


DEBEERS SNAP LAKE PWR HSE BAY 6	
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DRAWING NO. 700569B0001	SHEET 3 OF 3 REV. 0

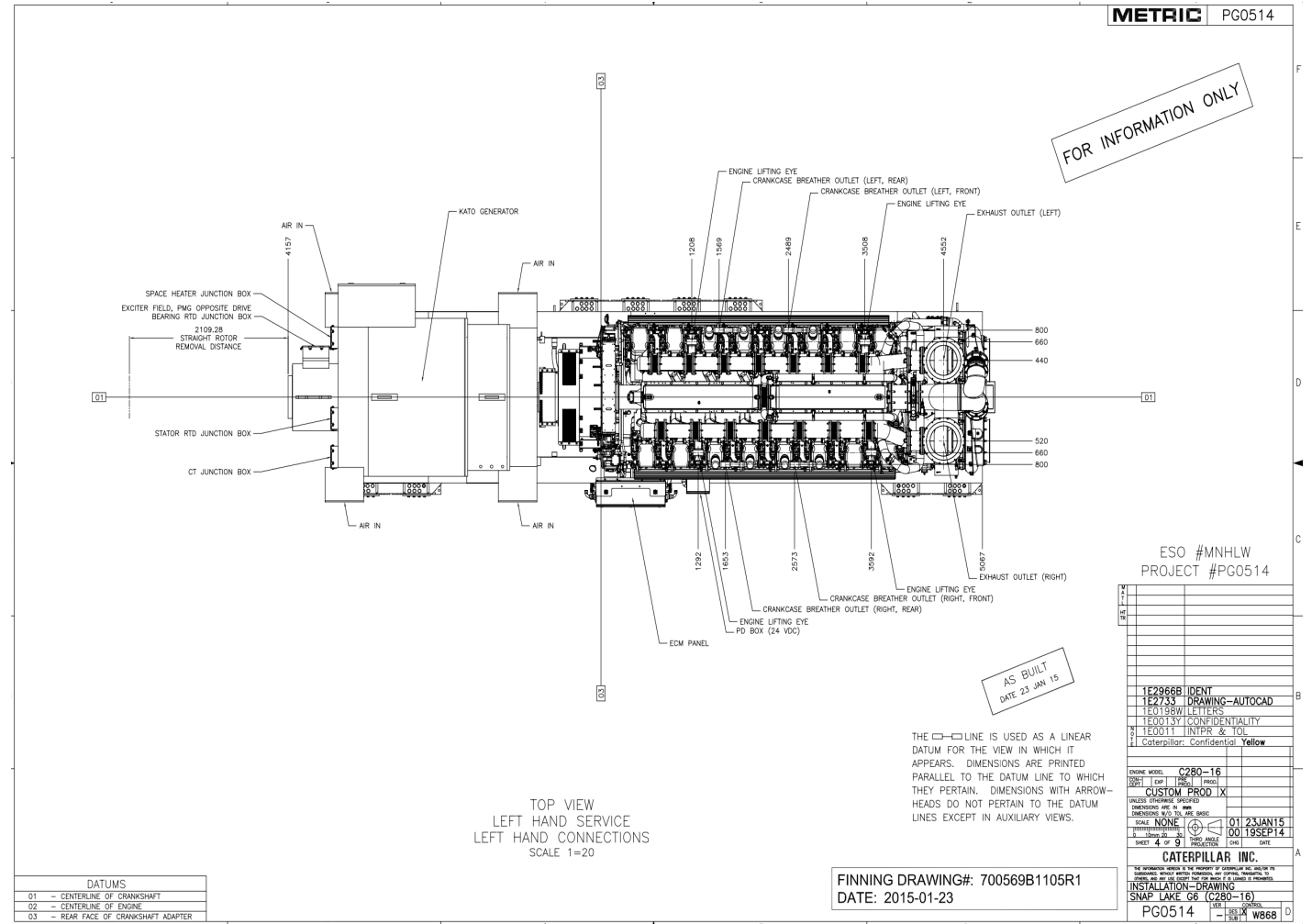
# Description & Additional Notes

METRIC PG0514

FOR INFORMATION ONLY



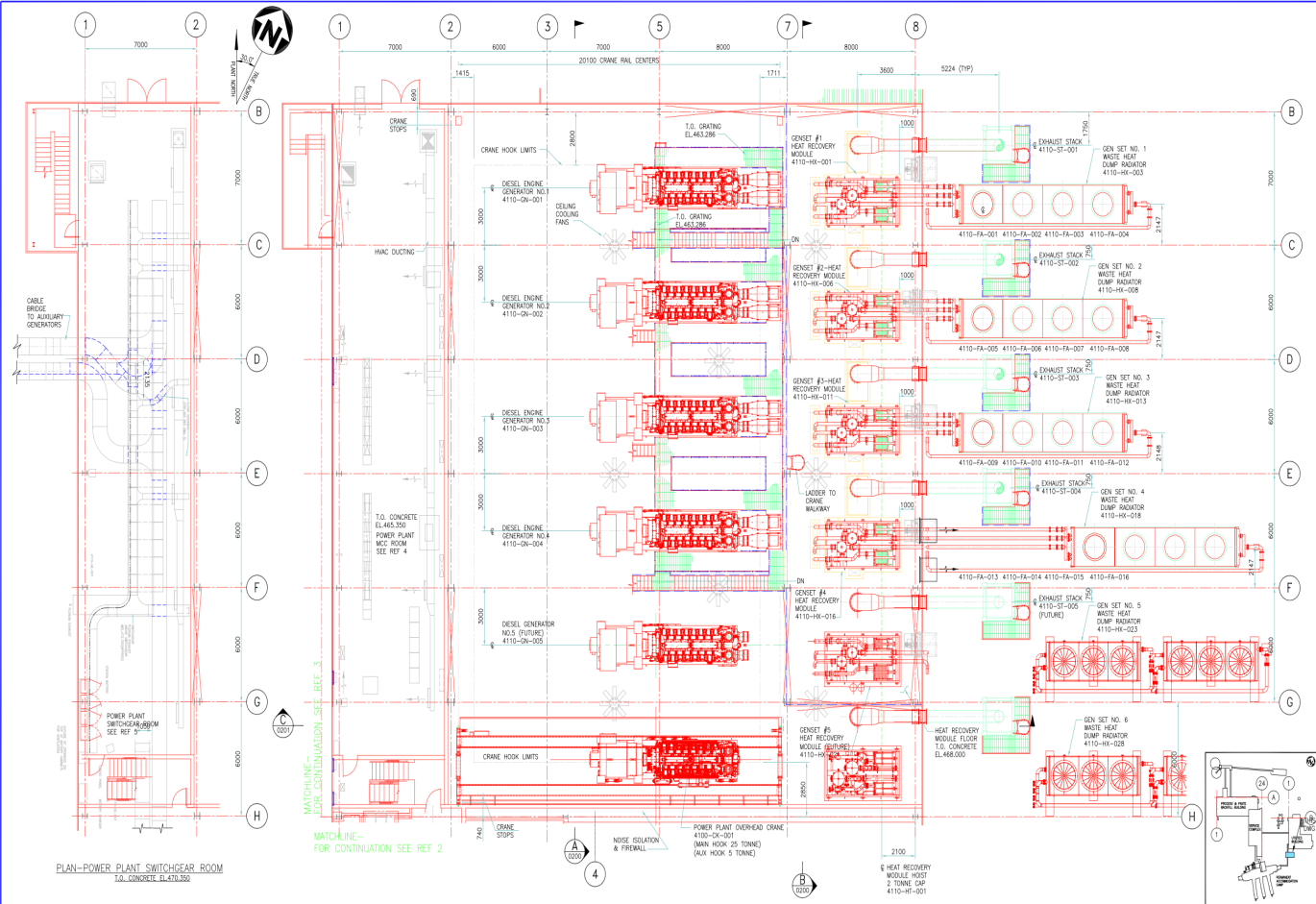
# Description & Additional Notes



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# Specifications



<b>Manufacturer</b>	Caterpillar
Model	C28-16
Year	2014
Condition	used
Location	Europe
Price	\$11,988,750.00
Category	Diesel Generators
Subcategories	<ul style="list-style-type: none"><li>• 10 - 99 MW</li></ul>
Stock Number	USP010136
Wattage	26.4 MW
Hours	50 000x
Frequency	60 Hz
Fuel type	Diesel
Voltage	4160x
Balance of Plant Available? (BOP)	-

# Asset Images



- Images may be representative, and actuals can be supplied upon request.



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