

**PREVENTATIVE MAINTENANCE PLAN
FOR
EMERGENCY GENERATORS AND
DUAL FUEL BOILERS**

**Royal Oak Hospital
3601 W. Thirteen Mile Road
Royal Oak, Michigan**

**Beaumont Health – Royal Oak Hospital
Generator and Boiler Preventative Maintenance Plan**

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1.0 Purpose / Scope

The purpose of this Preventative Maintenance Plan (PMP) is to document on paper the appropriate preventative maintenance practices and procedures to maintain proper operation of the emergency generators and dual fuel boilers at the Beaumont Health (Beaumont) Royal Oak Hospital. This PMP specifies the maintenance procedures that are followed to ensure that the emergency generators and dual fuel boilers are properly operated and maintained.

Conditions in the Renewable Operating Permit (ROP) require that the facility develop and implement a PMP for select emergency generators and dual fuel boilers. The facility is required to record all completed preventative maintenance events. This plan has been developed to catalog on paper the preventative maintenance that is routinely performed on all emergency generators and dual fuel boilers. The facility operates an automated computer program, 360 Maintenance System, which alerts appropriate personnel when a maintenance event is required and keeps a record of the event completion.

A copy of the most recent Preventative Maintenance Plan is maintained on file at the Beaumont Royal Oak Hospital.

Plan revisions are documented using the revision history log in Attachment A.

2.0 Supervisory Personnel

The Powerhouse Supervisor is responsible for the operation of the emergency generators and dual fuel boilers and for ensuring that this PMP is maintained, implemented and revised as necessary.

The Lead Technician is responsible for scheduling and completing the preventative maintenance tasks.

Attachment B provides a list of supervisory personnel and contact phone numbers.

3.0 General Process Description

Beaumont operates two (2) dual fuel (natural gas and No. 2 fuel oil fired) electricity and steam cogeneration engines at the Royal Oak Hospital's West Powerhouse. An additional four (4) No. 2 fuel oil fired gensets are operated at the Royal Oak Hospital's West Powerhouse. Two (2) No. 2 fuel oil fired gensets are operated at the Royal Oak Hospital's East Powerhouse. Two (2) No. 2 fuel oil fired gensets are operated at the Royal Oak Hospital's Research Building.

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The cogeneration engines, which are operated during power outages and for periodic testing, typically operate on a fuel blend of 95% natural gas / 5% No. 2 fuel oil but have the capability to operate on 100% No. 2 fuel oil in the event the natural gas supply to the hospital is disrupted. All other gensets are currently operated during power outages and for periodic testing and are fueled exclusively with No. 2 fuel oil.

Beaumont operates five (5) dual fuel (natural gas and No. 2 fuel oil fired) boilers at the Royal Oak Hospital’s West Powerhouse. The boilers typically combust natural gas but have the ability to combust No. 2 fuel oil in the event that the natural gas supply is disrupted.

Table 3.1 provides a summary of the equipment operated at the facility.

Table 3.1 Summary of Equipment Operated at Facility

Equipment Name	ROP ID	Manufacturer	Model No.	Serial No.	Rated Capacity	Initial Startup Date
Generator No. 6	EU-ELECGEN6	Caterpillar	3512	24Z08211	1,250 kW	2/1/1998
Generator No. 7	EU-ELECGEN7	Caterpillar	3512	24Z08212	1,250 kW	2/1/1998
Generator No. 8	EU-ELECGEN8	Caterpillar	3516B	1HZ01689	2,000 kW	7/31/2002
Generator No. 9	EU-ELECGEN9	Caterpillar	3516B	1HZ01686	2,000 kW	7/31/2002
Generator No. 1R	EU-ELECGEN1R	Caterpillar	3516C	DD600558	2,000 kW	6/26/2015
Generator No. 2R	EU-ELECGEN2R	Caterpillar	3516C	DD600560	2,000 kW	1/15/2016
Cogeneration Unit 1	EU-COGEN1	Fairbanks Morse	38/DD8/8	38D890007TDFS9	1,930 kW	6/1/1992
Cogeneration Unit 2	EU-COGEN2	Fairbanks Morse	38/DD8/8	38D890004TDFS9	1,930 kW	6/1/1992
Res. Em. Generator No. 1	FG-DGENGINES	Caterpillar	3508B	3LS00227	900 kW	1/1/1999
Res. Em. Generator No. 2	FG-DGENGINES	Caterpillar	3508B	3LS00226	900 kW	1/1/1999
Boiler No. 1	EU-BOILER1	Keeler	DS-30	16355	39.0 MMBtu/hr	1/1/1978
Boiler No. 2	EU-BOILER2	Cleaver-Brooks	D-60E	W6-3932	48.2 MMBtu/hr	2/1/1998
Boiler No. 3	EU-BOILER3	Cleaver-Brooks	D-60E	D-4460	48.2 MMBtu/hr	6/26/2002
Boiler No. 4	EU-BOILER4	Erie City	8A-60	98673	59.0 MMBtu/hr	1/1/1973
Boiler No. 5	EU-BOILER5	Keeler	DS-40	16013	52.1 MMBtu/hr	1/1/1973

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4.0 Emergency Generator Preventative Maintenance

As documented in Section 1.0, Beaumont Health uses the 360 Maintenance software system to manage and schedule preventative maintenance events. Facility representatives can update the information and frequency of events in the 360 Maintenance system based upon new operating experience, equipment history or manufacturer recommendation.

Table 4.1 presents the description of preventative maintenance tasks and their associated frequency for the emergency generators.

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Table 4.1 Emergency Generator Preventative Maintenance Summary

<i>Description of PM</i>	<i>Frequency of PM</i>	<i>NFPA 110-2005</i>	<i>JCAHO</i>	<i>Mfg. Recommended</i>	<i>Generator Log Reading</i>
Visual Inspection	Weekly	8.4.1			X
No Load Test	Weekly			X	X
Load Test	Monthly	8.4.1			
Load bank	Annually	8.4.2.3			
Load bank auto shutoff	Annually	8.4.2.4.2			
4 hr. load test at 30%	36 Month	8.4.9/8.4.9.1	X		
Replace starting battery	24-36 Month	A 5.6.4.5.1			
Inspect starting battery	Weekly	8.3.7			
Engine hours	Weekly			X	X
Lube oil pressure	Weekly			X	X
Jacket water temperature	Weekly			X	X
Battery Voltage	Weekly			X	X
Generator output voltage	Weekly			X	X
Generator output amperage	Weekly			X	X
Power factor tag	Weekly			X	X
Frequency	Weekly			X	X
Kilowatts	Weekly			X	X
Kilowatt hours	Weekly			X	X
Air filter	Annually			X	X
Lube oil level	Weekly			X	X
Radiator water level	Weekly			X	X
Day tank level	Weekly			X	X
Main tank level	Monthly			X	X
Belts	Weekly			X	X
Hoses	Weekly			X	X
Block heater temperature	Weekly			X	X
Battery water level	Weekly	8.3.7		X	X
Battery cable check	Weekly			X	X
Battery charger voltage	Weekly			X	X
Battery charger amperage	Weekly			X	X
Battery electrolyte specific gravity	Monthly	8.3.7.1			F-360
Fuel sample quality test	Annually	8.3.8/7/9/1/2		X	
10 second start time	Monthly	4.5.4.1.1.1.1			
Simulated cold test	Monthly	8.4.3/8.4.4			F-360
EM breaker exercise	Annually	8.4.7			F-360

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5.0 Dual Fuel Boiler Preventative Maintenance

As documented in Section 1.0, Beaumont Health uses the 360 Maintenance software system to manage and schedule preventative maintenance events. Facility representatives can update the information and frequency of events in the 360 Maintenance system based upon new operating experience, equipment history or manufacturer recommendation.

Table 5.1 presents the description of preventative maintenance tasks and their associated frequency for the dual fuel boilers.

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Table 5.1 Dual Fuel Boiler Preventative Maintenance Summary

<i>Description of PM</i>	<i>Frequency of PM</i>
Test boiler condensate, softener and feedwater once each shift and record results.	Daily
Make necessary water treatment adjustments to feed equipment and record changes.	Daily
Blow down water column and gauge glass once each shift.	Daily
Blow down boiler mud drum once each shift.	Daily
Inspect gauge glass, tighten or replace as needed.	Daily
Perform boiler operational rounds every two hours and record results	Daily
Deaerator water column blow down for float bowl, sight glass and level alarm.	Monthly
Check for proper operation of the blow down tank. Water to trench around 130 °F.	Monthly
Test fire on fuel oil.	Quarterly
CSD-1 boiler inspection.	Semi-Annually
Test low-water cutoff on boiler (evaporation test method).	Semi-Annually
Test boiler water column try cocks and chain operated gauge glass valves.	Semi-Annually
Test boiler high water level alarm.	Semi-Annually
Test boiler high steam pressure alarm.	Semi-Annually
Test flame safeguard scanner on boiler.	Semi-Annually
Test boiler excess steam pressure cutout.	Semi-Annually
Inspect burner fuel valves and damper linkages.	Semi-Annually
Inspect and/or replace boiler water level gauge glass.	Semi-Annually
Pop test boiler safety relief valves and make sure that they reseated.	Annually
Isolate and drain boiler for annual inspection.	Annually
Disassemble boiler for annual inspection.	Annually
Assist boiler inspector with annual inspection.	Annually
Perform burner combustion analysis.	Annually
Contractor to perform CSD-1 testing.	Annually
Clean boiler VFDs.	Annually

6.0 Attachments

The following documents and materials are included as part of this Preventative Maintenance Plan:

Attachment A: Plan Revision History

Attachment B: Supervisory Personnel

ATTACHMENT A
PLAN REVISION HISTORY

Attachment A

**Preventative Maintenance Plan
Revision History**

Date of Revision	Actions / Reason for Revision
4/8/2016	Initial draft of Preventative Maintenance Plan.

ATTACHMENT B
SUPERVISORY PERSONNEL

Attachment B

Preventative Maintenance Plan Supervisory Personnel

Title	Name	Contact Numbers	
Powerhouse Supervisor	Gerald Meek	Phone email	248-551-6351 gerald.meek2@beaumont.org
Powerhouse Lead Technician	Howard Bosch	Phone email	248-551-2541 howard.bosch@beaumont.org