

STANDARD OPERATING PROCEDURES
FOR NICP BOILER ROOM

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STANDARD OPERATING PROCEDURE

SAFE OPERATION OF NICP BOILERS

PROCEDURE NUMBER 500.37

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Standard Operating Procedure
Safe Operation of NICP Boilers

The following procedures are to be used as a guide and are not intended to limit the steps that can be taken to safely operate the equipment at this plant. Each operator must familiarize himself with all the equipment and procedures to the point that he is competent and confident in starting, operating, and securing all such equipment on a daily basis with little or no supervision.

It is also the operator's responsibility to utilize all the required personal protective equipment required for each procedure. If such PPE is not available, the supervisor must be informed immediately. It is the supervisors responsibility to have the required PPE available for the operators to use.

All logs are to be maintained in a neat and orderly fashion with each operator signing his name at the end of his shift. All procedures used, equipment changes, deficiencies, repairs, visitors, etc. will be logged as they occur. Any major events after hours will be reported to the supervisor immediately by telephone.

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GENERAL SHIFT OPERATIONS

1. Each Boiler Plant Operator will be responsible for the safe and proper operation of the boiler plant during their watch. The Boiler Plant Operator will direct any other personnel assigned to his shift, all repairs made during his shift and routine cleanup during his shift. He must assure himself, by frequent rounds and inspections, that all plant conditions are safe and proper.

2. The Operator, immediately upon coming on duty and taking over the watch, will make a complete tour of the boiler plant in order to familiarize himself with the condition of all equipment under his charge. If any of the equipment is in radically bad condition through negligence of the previous watch, he will accept the watch under protest, notify his supervisor, and log the condition as he found it. Once an operator accepts the watch, he accepts responsibility for the condition of all equipment in the plant. The operator will if possible, rectify irregularities observed in plant equipment during watches with assistance from anyone assigned to their watch. If defects are beyond the operators, capability he will notify the supervisor and make a full report. All information will be logged as it occurs including repairs made by other than plant personnel.

3. The operator will, during his shift, direct the oiling, greasing, and cleaning of the boilers, auxiliary equipment, and areas in and around the plant and such equipment.

4. In order that plant-operating records may be of value, it is essential that they be intelligently and accurately written. The operator is responsible for all readings entered in the log during his watch and will assure himself that they are correct. At the end of his watch the operator will see that the water level in operating boilers is at normal steaming level.

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OVERTIME

a. Planned Overtime is used when it is known in advance that the work force will be short handed and all shifts will not be covered. Then it will be used on a rotation basis, thus insuring that all overtime is distributed equally. In the supervisors absence during off hour shifts, weekends, and holidays, the operator on duty will be in charge of the plant and is responsible for the scheduling of overtime on an emergency basis only.

b. Emergency Overtime is used when an employee fails to call in to report off or calls in that he will be late, then the operator on duty will stay and cover the next shift, or stay until relieved. If an employee calls in early enough, then the operator on duty can call the next operator in line for the overtime to cover the open shift. At no time will an employee who expects to be off call another employee to take his place. The operator on duty will notify the supervisor of any emergency overtime and get his guidance for covering it when possible. Working more than two shifts will not be permitted except in extreme situations after the supervisor has been notified and all other possibilities have been exhausted.

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OIL FIRING

Oil firing requires two operators at all times.

BURNER CLEANING #1 and #2 BOILERS

- a. 1st watch will change and clean burners each night. Other watches will change burners if problems occur during their shift.
- b. Clean burners will be put at the boiler front prior to pulling burners in service.
- c. Put the boiler master in hand and lower load on the boiler.
- d. Secure one burner at the board and close the steam and oil valves to it.
- e. Pulled out the dirty burner using gloves and rags as necessary to avoid oil dripping and getting burnt. Burners will be very hot. Put dirty burner in a burner rack.
- f. Insert a clean burner and tighten connection securely.
- g. Open steam and oil valves and light the clean burner. Insure that the clean burner is burning correctly and there are no leaks.
- h. Repeat steps (d) through (g) for the second burner.
- i. After both burners have been changed bring the boiler pressure back up to operating pressure and put the boiler master back in automatic.
- j. Run steam through the dirty burners using the steam station at the oil heaters to clean any oil from the burner barrels.
- k. Dismantle the burner tips and clean them thoroughly
- l. All burner barrels, tips and plates will be thoroughly inspected when removed and replaced as necessary.
- m. Place cleaned burners at the boiler front for the next burner changing process.
- n. Clean up any oil drips, rags, etc. that were a result of the cleaning process.
- o. Inspect the burner blowdown barrel in the basement for any problems such as leaks, overflowing, or any other abnormalities.
- p. Always wear the required PPE, gloves, safety glasses, rubber apron, and face shield when performing this process.
- q.

RECEIVING FUEL OIL

The operator will;

- a. Check for proper placement of the delivery truck over the spill containment area.
- b. Check on routing of fuel oil being received and determine fill capacity of the tank.
- c. Activate the pump after checking the valving and proper hook up to the tank truck.
- d. Note level in the tank prior to and after delivery along with oil temperature.
- e. After pumping off from delivery truck, secure truck valve and leave pump on for one minute to evacuate lines before securing the pump.
- f. Sign delivery slips after verifying oil received. Log all delivery information.
- g. Do not fill the tank above 250,000 gallons. (31' 1").
- e. Clean transfer strainers after each set of deliveries. (Total amount ordered)

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OIL TANK

1. The oil tank is rated for 250,000 gallons of #6 oil.
2. When checking the tank level you should turn the test knob several times and then take a reading.
3. The heat for this tank is supplied by an internal steam coil that is feed by a temperature controlled steam regulator. The temperature should be maintained at about 120 degrees. There is also a manual valve that can be used if the regulator should fail.
4. The condensate from this system runs to an oil/water separator in the basement and is then pumped into the sanitary sewage system. This system must be monitored continuously for any oil that may find its way into the system. If any oil is found in the condensate notify the supervisor immediately and do not under any circumstances pump the contaminated condensate into the sewer system.
5. All the oil lines going to and from the tank are heated by electric heat trace tape that is thermostat controlled.

OIL PUMPS AND HEATERS

1. There are two main oil pumps that are motor driven with starters at the pump station. Both pumps are identical in size. The pressure regulator is set to maintain not more than 100# after the pump and returns all excess back to the tank.
2. Prior to starting these pumps make sure the suction, discharge, and return valves are open and the oil is heated to at least 80 degrees in the tank.
3. Check the valve line up through the heaters also. Make sure relief valves are functioning
4. There are two steam oil heaters controlled by a steam pressure and an oil temperature regulator. The oil temperature should be maintained between 180 and 190 degrees. Only one heater should be needed to heat the oil under normal conditions. The unused heater can be secured by closing the steam inlet valve at the heater itself.
5. The condensate from this system also returns to the oil/water separator in the basement.

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FUEL OIL SERVICE STRAINERS

- a. Strainers will be cleaned weekly on the 2nd watch (0730 - 1530).
- b. Use equalizing line to pressurize the clean strainer.
- c. Use the handle to shift flow to the clean strainer.
- d. Secure equalizing line and check pressure on system.
- e. Open drain on the secured strainer to relieve any pressure and lower the level in the strainer housing so the top can be removed.
- f. Remove the strainer top and pull out the dirty strainer. Insert the clean strainer and put the top back in place and bolt it down.
- g. Cleaned the dirty strainer using the solvent in the cleaning bin.
- h. Always wear the required PPE, rubber gloves, rubber apron, and face shield when performing this process.
- i. All deficiencies will be reported to the Supervisor immediately for repair.
- j. All cleaning, deficiencies, and repairs will be logged as they occur.

SOOT BLOWING

- a. Soot will be blown on all boilers operating on oil daily. The 2nd watch will accomplish this at 2100 hrs.
- b. While blowing soot the forced draft and the outlet damper (or induced draft) controllers should be put in manual and draft should be increased slightly.
- c. Prior to operating soot blowers, all drains will be opened and all moisture drained from the system as it is heated up by cracking in the steam supply valve.
- d. Soot will be blown from front to back with the flow of the gasses.
- e. Soot blower valves should be operated slowly and monitored for any problems.
- f. After soot blowing is complete and steam is secured put the forced draft and outlet damper back in automatic.
- g. Check the firebox and burners for any problems after soot blowing is complete.

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BOTTOM BLOWDOWNS ON BOILERS

- a. All operating boilers will be bottom blown at least once each shift.
- b. Blow down valves should be open slowly. The valve closest to the boiler should be opened last and closed first.
- c. When more than one boiler is being blown down, there should be a delay of about 5 minutes before the next boiler is blown down to allow the system to settle.
- d. Log all blowdowns and any deficiencies that were found.

GAGE GLASSES AND WATER COLUMNS

- a. Gage glasses and water columns on all operating boilers will be blown down once each shift to check for proper operation using the bypass button to prevent the boiler from tripping.
- b. Log all blowdowns and any deficiencies that were found.

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FEED PUMPS

- a. All pumps should be greased weekly.
- b. Prior to starting pumps check for proper valve setups, vent air from casing, and flow water through casing to heat it up.
- c. If applicable open cooling water valves for the bearings.
- d. NEVER START A FEED PUMP WITH THE DISCHARGE VALVE OR THE RECIRCULATING VALVE CLOSED.
- e. Conditions permitting, pumps should be rotated weekly to evenly distribute the operating hours.
- f. All start and stop times, discrepancies, and repairs should be logged as they occur.

DEAERATING TANK

- a. The DA tank should be checked every hour by the operator on duty for proper level, temperature, and any leaks or malfunctions.
- b. The purpose of the DA tank is to preheat and remove oxygen from the water being sent to the boilers.
- c. Temperature should be maintained at 220 degrees using the steam pressure supply to the tank.
- d. This steam pressure should be maintained at about 5 psi. And this should keep the temperature within the proper range.
- e. The float controlled electronic level control valve automatically controls the level. In the case of power loss or malfunction of this device it fails open. The chain valve before this control valve must then be used to throttle the water to the tank.
- f. Water to this tank is supplied from the condensate pit via the main condensate pumps. The water in this pit is a combination of condensate returns from the compound and makeup water from the zeolites.
- g. Water can also be supplied to this tank directly from the zeolites or in extreme emergencies direct city water can be used. Under normal circumstances you should never put untreated city water directly into this tank.
- h. Any adjustments or discrepancies to this tank should be logged immediately as they occur.

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CONDENSATE PIT AND PUMPS

The condensate pit is a receiver for all the returns coming back from the complex. These returns are controlled only by the pumps in the field for the various buildings. Under normal conditions this condensate equals about 75% of our required feedwater. The other 25% is makeup water from the zeolites.

A float valve located inside the condensate pit controls the makeup water. When the level in the pit drops due to a reduction in return water this float valve opens and allows zeolite water to flow into the tank and mix with the condensate to maintain a normal operating level. Using this makeup process also allows the makeup water to be preheated by the condensate prior to going to the dearating tank.

The water from the condensate pit is pumped from the pit using either of two 7.5 HP pumps which send the water directly to the dearating tank. Normal pressure for this system is from 20 to 25psi. If this pressure should drop to 0 psi check the level in the condensate pit. It may be empty. Also check the pumps for air in the casings.

WATER TESTING AND TREATMENT

- a. All water testing will be performed by the 2nd watch operator (0730 - 1530) except in extreme circumstances where monitoring is necessary through the other shifts.
- b. The 2nd watch operator will perform these tests according to the procedures outlined by the water treatment company. These procedures are written and on station for the operators to follow.
- c. The 2nd watch operator will use the test results to adjust chemical feeds to the boilers and feedwater, and blowdown requirements. The other watch operators will monitor these systems by performing routine checks of these systems during their shifts and maintaining the settings established by the 2nd watch operators test results.
- d. If it becomes necessary to use the mixing tank for adding chemicals to the boiler, all the proper personnel protection equipment will be used. This includes but is not limited to a rubber apron, safety glasses, face shield, rubber gloves, and respirator if chemicals used require it.
- e. All emergency showers and eyewashes will be flushed and tested once a week. All operators will be familiar with the location of these units and how to use them.
- d. The MSDS=s for all chemicals used are readily available to all operators at the water testing area. These books are not to be removed from this site for any reason.
- e. All test results, adjustments, deliveries, and discrepancies will be logged as they occur.

ZEOLITES

- a. Zeolites will be tested at least every two hours on each shift and more if they are close to exhausting.
- b. A zeolite should be removed immediately from service when it starts turning hard. Except in an extreme emergency hard water should never be allowed to get to the boilers.
- c. An exhausted zeolite will be regenerated immediately after being removed from service.
- d. Upon completion of the regeneration cycle the brine tank will be replenished by the operator on watch with the required amount of salt.
- e. All regeneration's, tests, and discrepancies will be logged as they occur.

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OPERATING #7 BOILER

1. Make sure all fuel valves are open to the boiler.
2. Make sure feedwater is lined up to the boiler feedwater stop valve and that boiler level is at proper steaming level. Reset low water cutout.
3. Make sure air is on to the water level controller.
4. Make sure all power breakers are on and all resets have been checked.
5. **Gas firing:**
 - a. Make sure firing rates is at 10% and the boiler is in manual control.
 - b. Turn boiler switch to the on position check for fan and purge cycle to start.
 - c. The boiler will ignite on low fire after purge cycle is complete.
 - d. Boiler water will expand as it is heated. Bottom blow as needed to maintain proper level.
 - e. Close boiler vent valve at 25#.
 - f. Leave the boiler at 10% firing rate until pressure is above 50#.
 - g. When boiler pressure matches the header pressure, shift the control to automatic. The boiler will now modulate with the load.
 - h. Monitor the water level and open boiler water stop valves when needed. The feedwater regulator will now maintain the proper level.
6. **Oil firing:**
 - a. Turn fuel selection switch to oil.
 - b. Turn on the oil heater switch.
 - c. Check oil temperature. Should be at 175 degrees or better.
 - d. Make sure firing rate is at 10% and the boiler is in manual control.
 - e. Turn boiler switch to the ON position check for fan and purge cycle to start.
 - f. Make sure air compressor for atomizing air starts running. Check oil level in the compressor.
 - g. The boiler will ignite on low fire after purge cycle is complete. Check for any smoking from the stack.
 - h. Boiler water will expand as it is heated. Bottom blow as needed to maintain proper level.
 - i. Close the boiler vent valve at 25#.
 - j. Leave the boiler at 10% firing rate until pressure is above 50#.
 - k. When boiler pressure matches the header pressure, shift the control to automatic. The boiler will now modulate with the load.
 - l. Monitor the water level and open boiler water stop valves when needed. The feedwater regulator will now maintain the proper level.
7. Monitor all boiler systems and piping for any leaks or abnormalities. Log all startup information and any problems that occurred. Continue to take hourly readings as indicated on the log sheet.

LITE OFF PROCEDURES #1 AND #2 BOILERS

A. GAS FIRING

1. Check water level in sight glass.
2. Insure gas valves are lined up to the boiler.
3. Turn on cooling water to the ID fan. (IF APPLICABLE)
4. Open air registers two notches.
5. Turn on the boiler control panel.
6. Put the fuel selector switch in the gas position.
7. Turn on FD and ID fans (if equipped).
8. Make sure limits light is on.
9. Run fan and damper controllers up to 100%.
10. Push the purge start button. Insure that the purge light is on.
11. When the purge complete light comes on run the fan and damper controls down to 0%. Also make sure the fuel controller is at 0%. Put the ID fan or outlet damper controller in automatic.
12. The ready to light indicator should be on.
13. Turn on both burner toggle switches and push the ignition button. Hold this button until the relay clicks in and then release it.
14. Increase the fuel and air controllers some and repeat step 13 for the second burner.
15. Crack in the boiler header to put a slight flow on the boiler
16. Use the copes bypass valve to supply water to the boiler as needed while heating it up. At 60# the copes should be blown down and upon cooling put in service when the boiler calls for water.
17. Slowly bring the boiler up to operating pressure and then put the boiler master and the FD fan controller in automatic.
18. Continue opening the boiler header valve slowly until system is fully charge and valve is open 100%.
19. Boiler is now ready to fluctuate with the demand.

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B. OIL FIRING #1 and #2 BOILERS

1. Check water level in sight glass.
2. Insure oil valves are lined up to the boiler including recirculating valves.
3. Circulate oil until temperature is above 160 degrees at the boiler front. Oil pressure should be 100# at the pump station.
3. Turn on cooling water to the ID fan. (IF APPLICABLE)
4. Open air registers two notches.
5. Turn on the boiler control panel.
6. Put the fuel selector switch in the oil position.
7. Open the drains on atomizing steam system and crack in the atomizing steam valve. Let drains run free until system is dry and then close drains and open steam valve 100%.
7. Turn on FD and ID fans (if equipped).
8. Make sure limits light is on.
9. Run fan and damper controllers up to 100%.
10. Push the purge start button. Insure that the purge light is on.
11. When the purge complete light comes on run the fan and damper controls down to 0%. Also make sure the fuel controller is at 0%. Put the ID fan or outlet damper controller in automatic.
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14. The ready to light indicator should be on.
15. Turn on both burner toggle switches and push the ignition button. Hold this button until the relay clicks in and then release it.
16. Increase the fuel and air controllers some and repeat step 13 for the second burner.
17. Crack in the boiler header to put a slight flow on the boiler
18. Use the copes bypass valve to supply any needed water to the boiler while heating it up. At 60# the copes should be blown down and upon cooling put in service when the boiler calls for water.
19. Slowly bring the boiler up to operating pressure and then put the boiler master and the FD fan controller in automatic.
21. Continue opening the boiler header valve slowly until system is fully charge and valve is open 100%.
22. Boiler is now ready to fluctuate with the demand.

1 AND # 2 BOILERS ARE IDENTICAL IN THESE PROCEDURES EXCEPT FOR THE FACT THAT #1 BOILER HAS AN ID FAN AND #2 BOILER DOES NOT.

ALL BOILER LIGHT OFFS SHOULD BE LOGGED AS THEY OCCUR ALONG WITH ANY PROBLEMS OR DISCREPANCIES.

FIRE PROTECTION

1. There are two sets of fire pumps in the plant (bldg. 12).
 - A. **Main fire pumps (2)**
 1. Diesel engine driven fire pump.
 - a. This pump is left in the manual position. If needed, this pump is started by an operator.
 - b. Prior to starting this pump make sure the suction is open and the discharge valve is throttled.
 - c. Open cooling water valves to the engine and insure water is flowing.
 - d. Notify the maintenance shop and the fire inspectors before you start the pump.
 - e. Check for the proper oil level in the engine. Add oil if needed.
 - f. To start the pump either the (Manual Crank 1) or the (Manual Crank 2) button inside the control panel.
 - g. Slowly open the discharge valve and pressurize the system.
 - h. When the system is satisfied turn the control switch from manual to off and engine will stop. Secure the discharge valve and close the cooling water valve after the engine has cooled down.
 - i. Put control switch in the manual position and pump back in standby.
 2. Electric motor driven fire pump.
 - a. This pump is left in the manual position from 0600 until 1700 hrs. From Monday till Friday except on holidays. All other times it is to be left in automatic for compound main fire protection. This pump is set to come on if the firemain pressure drops below 40#.
 - b. To start this pump manually put the controller in the manual position and push the start button.
 - c. The suction and discharge valves on this pump are left fully open at all times to allow the pump to come on in the automatic mode and fill the system.
 - d. To stop this pump you can push the stop button at the control panel or turn the switch to the off position. There also is a stop button on the outside wall of the bldg. near the diesel fuel tank. If this button is used, the pump will come back on after 3 minutes if the pressure is still not satisfied. The inside switch must be put in the off or manual position to avoid this.

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B. Jockey pumps.

1. These pumps are used on a continuous basis to maintain pressure above 50# on the sprinkler system.
 2. These pumps are kept in automatic unless instructed otherwise by the fire inspectors and/or the maintenance group.
 3. Only one of these pumps can be operated at a time. The main breaker switch can be set to either pump #1 or pump #2. The secondary switch can be set to off, manual, or automatic.
 4. Check for the suction and discharge valves to be open on these pumps prior to putting them in service.
2. All operations of these pumps are to be logged as they occur along with any discrepancies, repairs, or maintenance items.

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AIR COMPRESSORS

1. There are two air compressors at this plant that are set to maintain 100# of pressure on a continuous basis for instrumentation, fire protection, and tool use. Either air compressor can handle the full load of the plant under normal circumstances.
2. To start these air compressors you just close the breaker for the unit you want in service and it will automatically come on and operate until the pressure setting is satisfied.
3. Prior to starting these air compressors the operator will:
 - a. Check the oil level.
 - b. Check the belts for any obstructions or breaks.
 - c. Drain any water from the receiver.
 - d. Insure that the discharge valve is open.
4. After starting the unit check for any leaks, overheating, or other abnormalities. Monitor the first couple of cycles to be sure that the pressure controller is working properly.
5. To secure either of these units turn off the breaker and make sure the opposite unit is lined up and ready for service. Close the discharge valve and relieve any pressure on the tank if this unit is to be serviced.
6. All air receivers in the plant will be drained several times daily to remove any condensate from the system.
7. The relief valve on both the compressors and the tanks will be manually tested once a week to insure their proper operation.
8. All changes, discrepancies, repairs, or testing will be logged as it occurs.