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# ICS COOLING TOWER OPERATIONS & MAINTENANCE MANUAL

**Project Name:** Ban Lane Power Plant

**Owner Name:** Gulf

**Project Number:** 12915 (GBL)

**ICS Model:** 3CFC-363632-22

**Type:** Counter Flow Concrete



**Gulf MP Company Limited**

**12SPP Project**

**Applicable Projects: GBL**

**Requisition No: GXEF001**

**Document No: ICS-GBL-002-M-090-238**

**Operations and Maintenance Manual**

## FOR CONSTRUCTION

<b>POYRY ENERGY LTD.</b>	
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**Industrial Cooling Solutions**

## ICS OPERATIONS AND MAINTENANCE MANUAL

PROJECT NAME	Ban Lane Power Plant
OWNER	Gulf MP
CONTRACTOR NAME	Toyo Engineering Company
P/O NUMBER	GXEF001
ICS JOB NUMBER	12915
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MODEL NUMBER	3CFC-363632-22



This Industrial Cooling Solutions, Inc. (ICS) Operations and Maintenance Manual will provide you with valuable information about your ICS cooling tower.

Included in this manual are:

- || Operating Procedures
- || Maintenance Instructions
- || Troubleshooting
- || Data Sheets
- || Spare Parts List (for 2-years operation)
- || Cooling Tower Equipment Specifications
- || General Arrangement and Installation Drawings
- || Lubrication List

ICS provides our clients with full-service cooling tower services. We hope you will see the pride we put into our towers and look to us for all of your future cooling tower needs. We specialize in new and rebuilt cooling tower engineering and construction along with repair and comprehensive maintenance of existing cooling towers. We are a preferred distributor for top name-brand cooling tower components and receive discounted OEM pricing with most vendors.

Whatever your cooling tower need, ICS is your committed partner in cooling.

Sincerely,

Timothy Bozic  
President  
Industrial Cooling Solutions, Inc. (ICS)

## NOTICE TO USER

### READ THIS ENTIRE MANUAL BEFORE OPERATING THE TOWER.

Every effort has been made to ensure that the information in this manual is complete, accurate, and up to date. Industrial Cooling Solutions (ICS) assumes no responsibility for the result of errors beyond its control.

Adequate knowledge of the operation and maintenance of the cooling tower and its components will ensure efficient and safe operation. Users should familiarize themselves with the construction, operation, and maintenance of the cooling tower and its components. **Failure to do so may cause poor performance, unnecessary equipment failure, and downtime.**

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## INTRODUCTION

### A SHORT DESCRIPTION OF A CONCRETE COUNTERFLOW COOLING TOWER



An ICS field-erected concrete evaporative cooling tower consists of:

- || A concrete superstructure.
- || A water distribution system consisting of a header to each cell with lateral piping and nozzles above the fill sections.
- || A heat exchange medium (the fill) made up of a matrix of PVC material.
- || A basin to collect the cooled water and direct it back to the circulating pumps.
- || Fans to move the air necessary for proper heat exchange.
- || Drift eliminator medium to prevent water droplets from escaping from the tower in the air flow.

Operation of the tower centers on exposing warm water to moving air, to affect an evaporative, or latent, heat transfer. This heat is dissipated into the atmosphere. Keep the tower clean and the water distribution uniform to obtain continued maximum cooling capacity. Do not allow excessive deposits of scale or algae to build up on the fill media or the drift eliminators. Keep all nozzle orifices free of debris to assure correct distribution and cooling of water.

The water to be cooled is transported to the distribution system by riser pipes external to the tower. Water flows from the risers into a horizontal distribution piping system. From there it flows into the lateral pipes and exits through nozzles. These nozzles distribute the water over the fill medium.

Before the air flow is permitted to exit through the top of the tower, it must pass through the Drift Eliminators. These are simply a block of material shaped to cause the air to change directions and thus

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# STANDARD OPERATING PROCEDURE

## WARNING!

All electrical, mechanical, and rotating machinery present a potential hazard, especially for those not familiar with their design, construction, and operation. Adequate measures should be taken with this equipment to both safeguard the public from injury and to prevent damage to the equipment and its associated systems.

The operation, maintenance, and repair of this equipment should only be performed by qualified personnel. All such personnel should be thoroughly familiar with the equipment, the associated systems, and controls, and all procedures dealing with the installation, operation, maintenance, and repair of this equipment to prevent personal injury and/or property damage.

Lock out and disconnect all electrical power before attempting to service the cooling tower.

# INTRODUCTION

provide impact surfaces which prevent water droplets from being carried out of the tower with the air flow.

The falling water is caught by the cold water basin, which then directs the flow back through pump screens to the circulation pumps. The normal water level in the tower basin is about 12" (305 mm) below top of curb. Adjust make-up water supply to maintain this water level.

The capacity of a tower to cool water to a given cold water temperature varies with the wet-bulb temperature and the heat load on the tower. As the wet-bulb temperature drops, the cold water temperature also drops. However, the cold water temperature does not drop as much as the wet-bulb temperature. A tower does not control heat load. The quantity of water circulated determines the cooling range for a given heat load. The hot and cold water temperature increases with higher heat loads.

**Wet-bulb temperature:** The temperature indicated by the wet-bulb thermometer of a sling or mechanically aspirated psychrometer. Also, an indicator of the capacity of the ambient air to receive an amount of water vapor and heat.

**Cooling range:** The temperature difference between the hot water coming into the cooling tower and the cold water leaving the tower.

## STANDARD OPERATING PROCEDURE

### INSPECTION

All operating components must be inspected before they are placed in operation. Specifically check all of the following:

1. Inspect all safety devices and interlocks to insure they are wired and functioning correctly. Safety devices such as the reduction gear oil level or flow switch (if supplied) or the vibration switch/monitoring system must never be bypassed to expedite a start-up.
2. Check drive shaft alignment. Re-align, if necessary.
3. Check tightness of bolts that attach support frame of reduction gear (fan drive) to the tower structure.
4. Check tightness of bolts at fan cylinder joints and anchorage.
5. Check tightness of the following bolted joints in the fan and drive assemblies:
  - a. Fan hub clamp bolts.
  - b. Fan hub cover bolts.
  - c. Reduction gear and motor mounting and alignment bolts.
  - d. Drive shaft coupling and guard bolts.
6. Check reduction gear oil for sludge or water by draining off and testing a sample. Check reduction gear oil level at the filling sight glass of level gauge outside of fan stack. Add oil as required.
7. Rotate fan by hand to be sure of free clockwise rotation and a tip clearance of  $\frac{3}{4}$ "-1  $\frac{1}{2}$ " (19mm-38mm) when viewed from above.
8. Lubricate the motor according to motor manufacturer's instructions.
9. **Check the fan pitch, per manufacturer's manual. Then test run each fan separately for a short time (less than five (5) seconds). Check for excessive vibration or unusual noise. If either is present, see Cooling Tower Troubleshooting on the following pages of this manual.**  
**Depending on the power demand and the ambient temperature, it may be necessary to adjust the fan pitch. Please note that more power is required to drive the fan without water flow turned on the tower than water flow with normal heat load.**
10. Check functioning of make-up water supply, blow-down, drain and outlet valves.

**NOTE:** *It is recommended that all readings be noted in a logbook. Items #1, #5 and #6 are to be made before each start-up.*

*If starting in cold weather, follow procedure outlined in Cold Weather Startup.*

## STANDARD OPERATING PROCEDURE

### PRE-STARTING PROCEDURE

Follow all operating procedures to ensure extended life of your ICS cooling tower. For any situations not covered in the manual, call Industrial Cooling Solutions Inc. (ICS) direct in Lakewood, Colorado, USA at +1 303-462-2000 or visit [www.h2ocooling.com](http://www.h2ocooling.com). Please reference the ICS tower model number and order number listed in the introduction letter regarding questions concerning this tower or upon ordering of spare parts.

### FIRST TIME WATER IS TURNED ON (FANS ARE NOT OPERATING)

Fill the cold water basin and circulating water system slightly above the operating water level to allow for drawdown. When filling the water system, make sure to close all riser valves to prevent over-pressurizing on the hot water distribution system and open bypass line valve.

1. Start-up the circulating water pumps. Under no circumstances should water from the first start-up be fed to the cells since this water is dirty, may contain debris, and is likely to block the nozzles. The water must bypass the tower and must be pumped through the circuit for a minimum of one full cycle through the circulating water system in order to clean the circuit.
2. Maintain observation on the water level in the basin to prevent overfilling if the sump screens were to clog with debris.
3. After the initial flush, the pumps are to be stopped, and the basin emptied and cleaned out.
4. Repeat this process until all significant debris has been removed.
5. Once the basin has been refilled, the tower is ready to go into operation.
6. Refer to Starting Procedure to start the cooling tower.

### SAFETY

While any portion of the tower is shut down, barricade any access openings or fan stack openings during the shutdown period. While inspecting or maintaining any section of mechanical equipment, lockout motors at fan disconnect box with proper procedures guaranteed to prevent accidental unlocking. Follow all OSHA, and/or other governing regulations and standards including use of safety harnesses where appropriate.

### CLEANING

Remove any debris or trash from the distribution system and fill. After circulating water is flowing, visually inspect the system for any clogged nozzles. Remove any sediment from the cold water basin, sump and pump screens.

## STANDARD OPERATING PROCEDURE

### RE-STARTING AFTER A STOPPAGE UNDER NORMAL CONDITIONS

1. Preliminary checks
  - a. Check gearbox oil level.
  - b. Check for freedom of rotation.
  - c. Check water level in basin.
  - d. Check that no extraneous material is present in the cells.
  - e. Check that the vibration switch/monitoring system, oil level/flow switch is energized.
2. Operation: To run the tower, proceed in the following manner:
  - a. Turn water on to cells (1) (2).
  - b. Turn fan motors on.

**NOTE:** (1) Water flow without fan operation may result in splash-out from basin.  
(2) Regulate water flow at riser valves as necessary to prevent water hammer and over pressurization of the hot water distribution system.

## STANDARD OPERATING PROCEDURE

### STARTING PROCEDURE

#### FIRST TIME WATER IS TURNED ON (AFTER THE TOWER HAS BEEN DOWN)

If the cooling tower basin has not been drained, cleaned or work performed on the cooling system, use Standard Startup Procedure. Otherwise, follow the procedure for first time filling of the basin in the First Time Water is Turned On section.

#### STARTING

**When starting the flow of water be sure to slowly open the valves ("throttle" the valves). This will ensure that the flow of water starts evenly and does not over-pressurize the system. Starting the system in Full or 100% on position of the control valves may result in damage to the tower components.**

Check the equilibrium of water distribution between the cells. By nature this system is self balancing and so all cells should receive approximately the same amount of water.

Verify that the design flow is not exceeded. This can be accomplished by monitoring of the circulating water pump KW versus the pump curve. Contact Industrial Cooling Solutions Inc. Engineering Department if greater than design water flow is necessary.

Check all mechanical equipment to insure no foreign material is obstructing movement of the fans. Start each fan separately, monitoring any excessive vibration. Excessive vibration will trip the vibration switch/monitoring system and shut down fan motors. To check operation of vibration switch, follow the instructions provided by the vibration switch/monitoring manufacturer.

- || Should the vibration detecting system be inoperative, contact ICS.
- || Should there be excessive vibration, the cell number should be noted and ICS service department notified.
- || After five minutes of operation, recheck the reduction gear oil levels.

The fan pitch should be set to approximate design brake horsepower at full heat load and design conditions. If all operating criteria including wet bulb and heat load are near design, the fan brake horsepower can be checked. After 30 minutes of operation, the gear oil will be at proper temperature to allow checking of motor wattage, or voltage and amperage; this will allow for calculation of brake horsepower.

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## STANDARD OPERATING PROCEDURE

### WINTER OPERATING PROCEDURE

#### GENERAL

The ICS counterflow cooling tower is specifically designed to reduce icing problems during cold weather operation. The only area in direct contact with entering air is the air inlet opening. All other components are within the tower and protected as long as the tower is supplied with substantial operating heat load. If no heat load is available, the circulating water should be bypassed directly to the cold water basin or if not equipped with bypass capability, shut down totally.

Water flow rates to the tower must be maintained at the highest normal operating level. This is to ensure full warm water wash of the internal components.

Any formation of substantial size icicles hanging from the bottom of the fill can result in damage to the fill material and potentially structural components in the air inlet.

#### COLD WEATHER STARTUP (TEMPERATURES BELOW 40°F (4°C))

With initial startup of the entire tower or individual cells, general procedures as outlined earlier should be followed. In addition, the procedure should include:

- || Check the hot water distribution piping system for all nozzles at full flow (see Cooling Tower Troubleshooting section if any nozzles are clogged).
- || Visually inspect the fan and drive shaft for any ice buildup. Startup with ice on the fan blades or drive shaft can cause an imbalance and lead to damage.

Start water flow prior to any other startup. Should there be any ice buildup on the mechanical equipment; the warm air vapor must be allowed to completely melt the ice prior to any other equipment startup.

#### COLD WEATHER STARTUP PROCEDURE

The cold water temperature should be maintained at 55°F (12.8°F) or greater. The temperature should be monitored every four to six hours during critical dry bulb periods.

When the water temperature fall below 55°F (12.8°F), the following steps should be taken:

1. Fans should be shut down, one at a time one at a time as needed to maintain cold water temperatures above 55°F with one fan unit off; shut off both fans.

**NOTE:** With fans off, splash-out may occur from the air inlets.

## STANDARD OPERATING PROCEDURE

### NORMAL OPERATING PROCEDURE

After the tower has been placed in full operation, all systems must be monitored on a regular basis.

Log sheets should be maintained regarding inspection of the cooling tower systems. Items to be included on the log sheets are as follows:

- || Each cell should be given a specific number and I.D.
- || Gears, motors and drive shafts should have an individual I.D.
- || Date and time of inspection.
- || Normal basin water level.

All cooling tower systems are to be checked daily. Items that must be checked include:

- || Reduction gear oil level for each cell.
- || Fan motor operation, i.e. if the fan is at half speed, full speed or off for each cell. If the fan motor is off, plant operation should be checked for any reasons as to why. If the motor should be on or at half speed, further investigation must be made.
- || Observe drive shafts for radial imbalance, unusual movement or any excessive vibration.
- || Electrical conduit on top of the tower should be visually checked for any excessive corrosion or breaks.
- || Access hatches on fan deck should be closed.
- || Any excessive noise in either motors or fans should be noted and reported.
- || Water flow observed in the air inlet area should be noted as either normal or abnormal. Areas with excessive flow or with very little flow should be noted and reported.

The tower can be operated under normal conditions with the Cold Water Temperature being above 55°F (12.8 °C) consistently throughout a 24-hour day.

**NOTE:** The cooling tower will not control heat load. The flow rate of water circulated through the tower will determine the temperature range of cooling in conjunction with a given heat load. Hot and cold water temperatures will increase with higher heat loads.

The hot water returning to the tower shall not exceed 140°F (60°C) to prevent permanent damage to the PVC cooling tower components.

## STANDARD OPERATING PROCEDURE

### SEVERE WEATHER PREPERATION

This section attempts to give instructions for minimizing cooling tower damage in the event that severe weather may affect the cooling tower. Depending on the severity of the weather and unpredictable outcomes, ICS offers this basic advice to secure a cooling tower. It is always prudent to protect human life above any property.

In the event that severe weather damages the cooling tower, ICS is prepared to assist with any and all cooling tower needs pre or post-storm. We are known first responders that successfully repair any and all makes of cooling towers.

#### BASIC PRE-STORM PROTOCOL

- Shut off electrical supply to the mechanical equipment and lock out.
- Secure fans by tying one or more blades securely to the cooling tower structure.
- High winds resulting in free-spinning blades can strike the fan-stack resulting in damage.
- Consider fan stack tie down with cables tied to the cooling tower structure.
- Remove or secure loose items on or around cooling tower.

Industrial Cooling Solutions is here for you rain or shine. The ICS Disaster Recovery Team is one of the best in the industry and available 24/7 to help you with all of your cooling tower needs. Contact the cooling tower experts directly in Lakewood, Colorado, USA at +1 303-462-2000 or visit [www.h2ocooling.com](http://www.h2ocooling.com).

## STANDARD OPERATING PROCEDURE

2. In climates where cold water temperatures fall below 55°F (12.8°F) with all fans off, the tower should be equipped with closure tarpaulins. These are to be installed at the air inlet opening on the windward side of the tower. With the tarpaulins in place, the same reduced speed and shutdown fan procedure above should be followed.
3. The same inspection method should be followed as under pre-starting procedures. In addition, visual inspection of the air inlet area should be made during the coldest hours of the day.
4. Any ice buildup on the perimeter columns or the bottom of the fill should be noted and frequently monitored. If ice buildup becomes excessive, begin shutdown procedure as noted above. Do **not** in any case try to physically remove or strip the fill or adjacent concrete structure of ice. Melting will leave components in good condition. Physical removal of ice will generally cause more damage.
5. Reverse Operation:
  - a. If the mechanical assemblies supplied with this tower are **not** capable of reverse operation, see documentation supplied by the motor starter and controls vendor for further information.
  - b. If the mechanical assemblies supplied with this tower **are** capable of reverse operation, see documentation supplied by the motor starter and controls vendor for further information. Reversing motor rotating direction will reverse fan direction and push air down through the tower components from the fan stack through the air inlet. This will push warm air to the air inlet opening for melting any ice accumulation.
  - c. Reversing procedure (if applicable) should be performed only as a last resort. The reversing mode of operation should be monitored continuously. Reverse operation should be used only on those cells with severe ice buildup and systems capable of reverse operation.
  - d. The reverse mode should be activated for a maximum of 20 minutes while monitoring for any ice build-up on fan equipment and excessive power consumption.

**NOTE:** Do not exceed maximum number of starts/hour recommended by motor manufacturer.
6. Flow water fifteen minutes with the fans shut off to prevent ice buildup in the plenum area.
7. Prior to restarting fans in either normal or reverse directions, fan blades must be visually rechecked to ensure there has been no ice buildup.
  - ♦ Please allow at least two minutes between forward and reverse operation. It is acceptable to begin reverse direction when the fan is free-spinning in the forward direction. The nearly zero-speed torque applied to the mechanical equipment is not excessive.

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## STANDARD OPERATING PROCEDURE

2. If the length of shutdown is over one month and conditions are humid, the oil in the reduction gear should be checked. If excessive water is present in the oil, the oil should be changed to avoid emulsion. Each cell, which is out of operation for periods in excess of one week, should be started and run each week for at least ten minutes to reduce the danger of rust forming on gear elements above the oil level.

For extended shutdown over one month, Shell VSI or other rust inhibitor should be added to the gear oil. See Appendix C for further information. The reduction gear vent line should be closed with a plug at the end of the vent line outside of the fanstack. This will keep a rust-inhibiting vapor inside the box to prevent rust from forming above the oil line. Ensure space heaters on motors, if supplied, are energized and operating. Refer to mechanical equipment manufacturer's manual for additional instructions.

## STANDARD OPERATING PROCEDURE

### SHUTDOWN PROCEDURE

#### FAN MOTORS AND REDUCTION GEARS

Stop all fan motors and energize space heaters, if applicable.

When the tower is shut down, operate each fan at half or full speed for a 20-minute (minimum) period monthly during any extended shutdown.

**CAUTION:** Always make sure fan is free to rotate. Schedule fan runs in winter only after visual inspection. Manually rotate motor shafts (15 revolutions) monthly if power is temporarily unavailable.

#### CIRCULATING WATER PUMPS

Stop all pumps or close all valves to the hot water distribution piping system.

In above 2°C (35°F) weather, non-fire retardant portions of the tower can be protected from fire by operation of the wet down system, if your tower has this installed, or by running one circulating water pump during no load periods. If all pumps must be stopped, auxiliary methods of continuous tower "wet down" may be utilized for improved fire protection. Alternate wetting and drying of the tower materials, wood, etc., is somewhat destructive. Caution: **DO NOT** wet down tower or circulate cold water over the tower when outside temperature is below freezing.

#### MECHANICAL EQUIPMENT

1. Prior to shutdown, all flow control valves should be left open as wide as possible. This will help reduce any excessive vacuum that would result from back siphoning effects. Back siphoning could result from improper sequencing between pump and tower supply valve closing procedures. Normal procedures would be to start closure of cooling tower supply valves first. At approximately 60-90% full closure, the discharge pumps can be shut off. The cycle and sequence depend on valve and pump design and the amount of time required for full valve closure.

During shutdown periods all external bolts, including stairway, ladder, hand rail bolts, etc., should be checked and tightened if loose. The mechanical system could vibrate if bolts are not tight between motor and gear supports and the tower concrete superstructure.

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## STANDARD OPERATING PROCEDURE

Care must be taken to avoid chemical attack on the concrete of the basin and cooling tower superstructure as well as to prevent scale build up on the tower components.

The tower materials have been selected in consideration of water analysis included in the specifications. The following commentary about water quality in cooling towers should assist the cooling tower engineer with maintaining the appropriate water quality for the tower.

Precautions must be taken in order to avoid water quality problems affecting the tower performance or operation. Specifically, attention needs to be directed to the following:

- || Scale formation and other deposits.
- || Formation of algae or excessive microbial activity.
- || Corrosion.
- || Chemical attack on the tower components.

### WATER QUALITY LIMITS

Circulating water quality should be monitored on a daily basis and maintained with the following limits:

	Minimum	Maximum
Langlier Index	-0.50	+0.50
pH	6.5	7.5
CaSO <sub>4</sub> (ppm)		1800
SiO <sub>2</sub> (ppm)		100
Total Suspended Solids (ppm) for high-efficiency low fouling fill (Brentwood OF21 or similar)		200ppm with continuous bio-control 50ppm with poor bio-control

It should be noted that suspended solids in the circulating water must be fine granular solids and that there are no oils, fats or fibrous solids present.

### CHEMICAL TREATMENT

In most cases, chemical treatment is required to prevent scale formation and corrosion. Sulfuric acid or one of the polyphosphates is generally used to control calcium carbonate scale. Various proprietary materials containing chromates, phosphates or other compounds are available for corrosion control. When water treatment chemicals are required, the services of reliable water treatment companies should be obtained.

Slime (a gelatinous organic growth), algae (a green moss), and many other microbes and fungal spores may grow in the cooling tower. A large variety of biocides, algaecides or slimicides are available for treatment of these conditions. Compounds containing copper or chloride should be used with caution to prevent damage to metal or wood compounds in the system.

## STANDARD OPERATING PROCEDURE

### WATER TREATMENT

Blow-down, or bleed-off, is the continuous removal of a portion of the water from the circulating system. Blow-down is used to prevent the dissolved solids from concentrating to the point of forming scale. The amount of blow-down required depends on the cooling range (the difference between the hot and cold temperatures) and the composition of the make-up water (water added to the system to compensate for losses by blow-down, evaporation and drift). The following calculation shows the amount of blow-down required to maintain different concentrations of the circulating water with various cooling ranges:

	A material balance on the water flow yields:
1.	Makeup (MU) = Blow Down (BD) + Evaporation (EV) + Drift Rate (DR)
	$MU = BD + EV + DR$ (equation 1)
2.	Evaporation (EV) = Range (RA) * (0.00095)
	$EV = RA * (0.00095)$ (equation 2)
3.	A material balance on the amount of dissolved solids in the system yields:
3a.	Where X% is the percentage of the flow which is dissolved solids NC is the number of cycles or "concentrations" of dissolved solids in the blow-down and drift
	$X\% * MU = X\% * NC * (BD+DR)$ (equation 3)
	This gives:
	$MU = NC * (BD+DR)$ (equation 3a)
4.	Substituting equation 2 and 3a into equation 1 and solving for the blow-down rate gives:
	$NC * (BD+DR) = DR + BD + 0.00095 * RA$ (equation 4)
5.	$BD (\%) = \frac{0.095 * RA}{(NC - 1)} - DR (\%)$ (equation 5)
6.	Thus, utilizing equation 5 above the blow down rate, as a percentage of circulating water flow, can be determined at various concentration levels. An example of which is shown below.
	Example: 20,000 GPM circulating rate, 24°F cooling range, 0.03% drift rate. To maintain three concentrations, the required blow-down is:
	$BD (\%) = \frac{0.095 * 24}{(3-1)} - 0.03\% = 1.11\%$
	or 0.0111 x 20,000 gpm = 222 gpm

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## MAINTENANCE INSTRUCTIONS

### PRE-OPERATION MAINTENANCE INSTRUCTIONS

The following instructions are a CHECK LIST for the Owner to provide proper care and maintenance of tower components after tower completion until commercial operation.

COMPONENT	INSTRUCTIONS	DOCUMENTATION
1. Motors	Manually (or by power) rotate motor shafts weekly, at least 15 revolutions, until commercial operation. Check Motor Data section for lubrication requirements to ensure warranty remains intact. (Note: Owner, immediately prior to commercial operation, to remove bearing grease, clean bearings, and re-grease if Owner determines this is necessary.)	a.) _____ *
2. Fans	Prior to commercial operation and at intervals not exceeding 6 months thereafter, check tightness of fan blade clamp hardware.	a.) _____ *
3. Drive Shafts	Check drive shaft coupling every 6 months for cracked bushings, looseness of bolts, and misalignment.	a.) _____ *
4. Gears	<p>a. Operate each fan (half speed and/or full speed) for a three (3) hour minimum period monthly or recoat all interior surfaces of reduction gear with oil. Make sure oil level is at full mark at the reduction gear and that the external sight glass full mark will correspond with the full level at the housing sight glass of the reduction gear.</p> <p><i>Note: Schedule fan runs during winter after visual inspection to avoid possible unbalance from ice or snow that may have previously accumulated on fan.</i></p> <p>b.) Maintain log sheets of daily inspection of gear oil line sight gauge to ensure proper oil level.</p>	<p>a.) _____ *</p> <p>b.) _____ *</p>

\*Owner to maintain log of this activity.

## STANDARD OPERATING PROCEDURE

### FOAMING

Foaming sometimes occurs when a new tower is put into operation. This type of foaming generally subsides after a relatively short period of operation. Persistent foaming can be caused by the concentration of certain combinations of dissolved solids or by contamination of the circulating water with foam causing compounds. Increasing the blowdown can sometimes minimize this type of foaming, but in some cases foam depressant chemicals must be added to the system. Foam depressants are available from a number of chemical companies.

### IRON

Please note that if the level of iron in the circulating water quality is high it should be controlled to <0.5ppm to prevent deposition and microbiological induced corrosion. A reputable water treatment company should be consulted to advise on suitable limits, treatment regime and controls for the system.



## MAINTENANCE INSTRUCTIONS

Do not climb on the blades or to use them as scaffolding support or a working platform. The blades must be kept clean in order to avoid unbalancing and vibration that may give rise to deterioration of the rotating parts.

For the same reason, do not keep a fan operating when one or several blades have been accidentally damaged. In case of vibration or motor shutdown due to electrical overload, check that the angle of the blades has not changed and is identical for each blade.

**Basin:** the air going through the cooling tower deposits a certain amount of dust/dirt which settles in the basin and causes the formation of a muddy deposit which must be regularly removed.

The frequency of this cleaning obviously depends on the quantity of dust contained in the air in the cooling tower. In general, cleaning once a year should be done at a minimum.

In the case where, besides the air dust, the operating conditions cause additional materials to settle, more frequent cleaning will be required. Such additional material may enter the system either from the make-up water or by the cooling process.

**Fan Stack:** the fan stack is subjected to vibratory forces inherent to the fan (they generally cannot be measured without instruments). It is necessary to check the tightness of the fan stack bolts at least every 3-6 months.

**Fill:** the fill media should be inspected on a regular schedule based on the quality of the water that is being circulated. The inspection should include the removal of a piece to determine if algae or mud is building up. If algae growth is detected, please contact your water treatment company to control the problem. If the buildup is significant, it may be necessary to remove the fill media and clean or replace it. Please contact ICS for assistance should this become necessary.

The causes of deterioration of the fill are generally of the following nature:

- || Those attributable to the quality of water.
- || Those attributable to deposits and water overloads, (i.e. ice).
- || Those attributable to high water concentrations resulting from a defect in the water distribution system (broken pipes or nozzles).

**Reduction Gear:** make daily and monthly oil checks. Inspect internal parts during seasonal oil change.

**Painting:** periodically clean and, if necessary, recoat all metal parts subject to corrosion.

**Note:** Once during every shift it is advised to make a general inspection of the tower.

## MAINTENANCE INSTRUCTIONS

### PERIODIC MAINTENANCE INSTRUCTIONS

#### UNIT MAINTENANCE

Well-maintained equipment gives the best operating results and the lowest maintenance cost. We recommend setting up a regular inspection schedule to insure effective operation of the cooling tower. ICS recommends that the Owner keeps a continuous lubrication and maintenance record for the cooling tower.

**Hot Water Distribution:** the distribution nozzles should be checked monthly for partial or total blockage. Remove any debris blocking nozzles. The nozzles must be kept in place and free of debris to assure proper water distribution. Be sure to protect the top of the fill media with plywood or other material to avoid damage from personnel walking on this surface. Damage to the fill could be detrimental to the thermal efficiency of the tower.

**Tower Superstructure:** keep any bolting to the concrete superstructure tight. Pay particular attention to bolts in the mechanical equipment supports.

**Drive Shaft:** check drive shaft alignment and condition of couplings every six months. See Drive Shaft Manual, for correcting misalignment, balancing or replacing parts.

**Electric Motor:** lubricate and maintain each electric motor in accordance with the manufacturer's instructions, Appendix E.2. If repair work is necessary, contact the nearest representative of the motor manufacturer.

**Drift Eliminators:** we recommend that the drift eliminators be kept clean by removing mosses, algae or muds that might accumulate on them. These accumulations increase the pressure loss through the drift eliminators and therefore are detrimental to tower efficiency. If the drift eliminators are accidentally damaged, it is necessary to make the repairs quickly to avoid excessive drift losses. It is not advisable to walk on the drift eliminators without planking to spread the load.

**Fan:** refer to the fan instructions that are enclosed in Appendix E.1. As a general rule, it is strongly recommended to check the torque of all bolts used for assembling the various fan elements, such as blades and hubs, during the second month after a new tower is put into operation. The torque shall be according to the value given in Appendix E.1 fan operating instructions. It is advisable to check this at least once a year.

## MAINTENANCE INSTRUCTIONS

Trouble	Cause	Remedy
Unusual motor noise	Motor running single-phase	⇒ Stop motor and attempt to start it. Motor will not start if single-phased. Check wiring, controls, and motor.
	Motor leads connected incorrectly	⇒ Check motor connections against wiring diagram on motor.
	Ball bearings	⇒ Check lubrication. Replace bad bearings.
	Electrical imbalance	⇒ Check voltages and currents of all three lines, correct if required.
	Air gap not uniform	⇒ Check and correct bracket fits or bearings.
	Rotor unbalanced	⇒ Rebalance.
Motor runs hot	Fan hitting guard	⇒ Reinstall or replace fan and/or guard.
	Motor overload, low voltage or unbalanced voltage	⇒ Check voltage and current of all three lines against nameplate values.
	Wrong Blade Pitch	⇒ See Appendix E.1 –Fan O&M and Cooling Tower Equipment Summary.
	Wrong motor rpm	⇒ Check nameplate against power supply. Check rpm of motor and gear ratio.
	Bearings over greased	⇒ Remove grease reliefs. Run motor up to speed to purge excess grease.
	Rotor rubs stator bore	⇒ If this is not due to poor machining, replace worn bearings.
	Wrong lubricant in bearings	⇒ Change to proper lubricant. See motor manufacturer's instruction and Appendix C - Lubricant List.

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## MAINTENANCE INSTRUCTIONS

It is recommended that:

- || Basin water level is checked.
- || Gear box oil level is checked.
- || Locate and check any suspect noise or vibration.
- || A detailed logbook is kept for each cell (to be supplied by purchaser).

The above checks, etc. are the minimum we consider necessary for trouble free operation.

If after installation, regular operation is delayed pending completion of plant construction or if there are long idle periods between operating cycles, it is necessary to start the motor\gearbox\fan group every week for a period of 10 minutes to bring all inner parts of gearbox and the ball bearings into contact with the lubricant. If the motor is not electrically connected, the rotation must be done manually.

### COOLING TOWER TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
Motor will not start	Power not available at motor terminals	⇒ 1. Check power at starter. Correct any connections between the control apparatus and the motor.
		2. Check starter contact and control circuits. Reset overloads, close contacts, reset tripped switches, or replace failed control switches.
	Wrong connections	⇒ Check motor and control connections against wiring diagrams.
	Low voltage	⇒ Check nameplate voltage against power supply. Check voltage at motor terminals.
	Open circuit in motor winding	⇒ Check motor windings for open circuits.
	Motor or fan drive stuck	⇒ Disconnect motor from load and check motor and reduction gear for cause of problem.
	Rotor is defective	⇒ Look for broken bars or rings.

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## MAINTENANCE INSTRUCTIONS

Trouble	Cause	Remedy
	Unbalanced drive shaft or worn couplings	⇒ Make sure motor and reduction gear shafts are in proper alignment and “match marks” properly matched. Repair or replace worn couplings. Rebalance drive shaft by adding or removing weights from balancing cap screws. See Appendix E.5 - Drive Shaft O&M.
	Fan	⇒ Be sure blades have proper pitch and track. Make certain all blades are as far from the center of the fan as safety devices permit. All blades must be pitched the same. See Fan Service manual. Clean off deposit build-up on blades.
	Worn reduction gear	⇒ Check fan and pinion shaft bearings endplay. Replace bearings as necessary.
	Unbalanced motor	⇒ Disconnect load and operate motor. If motor still vibrates, rebalance rotor.
	Bent shaft	⇒ Check fan and pinion shafts with dial indicator. Replace if necessary.
Fan noise	Loose fan hub cover	⇒ Tighten hub cover fasteners.
	Blade rubbing inside of fan cylinder	⇒ Adjust cylinder to provide blade tip clearance.
	Loose bolts in blade clamps	⇒ Check and tighten if necessary.

## MAINTENANCE INSTRUCTIONS

Trouble	Cause	Remedy
	One phase open	⇒ Stop motor and attempt to start it. Motor will not start if single-phased. Check motor wiring controls and motors.
	Poor ventilation	⇒ Clean motor and check ventilation openings. Allow ample ventilation.
	Winding fault	⇒ Check with ohmmeter.
	Bent motor shaft	⇒ Straighten or replace shaft
	Insufficient grease	⇒ Remove plugs and re-grease bearings.
	Deterioration of grease or foreign material in grease	⇒ Flush bearings and re-lubricate.
	Bearings damaged	⇒ Replace bearings.
Motor does not come up to speed	Voltage too low at motor terminals because line drop.	⇒ Check transformer and setting of taps. Use higher voltage on transformer terminals or reduce loads. Increase wire size or reduce inertia.
	Broken rotor bars	⇒ Look for cracks near the rings. A new rotor may be required. Authorized person check motor.
Wrong rotation (motor)	Wrong sequence of phases	⇒ Change any two of the three motor leads.
Reduction Gear noise	Reduction gear bearings	⇒ If new, see if noise disappears after one week of operation. Drain, flush, and refill reduction gear. See Appendix E.4 Reduction Gear O&M. If still noisy, replace bearings.
	Gears	⇒ Correct tooth engagement. Replace badly worn gears. Replace gears with imperfect tooth spacing or form.
Unusual fan drive vibration	Loose bolts and cap screws	⇒ Tighten all bolts and cap screws on all mechanical equipment and supports.

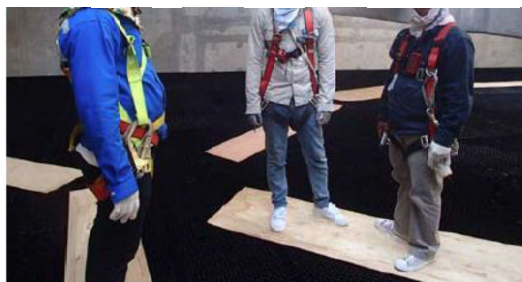
## MAINTENANCE INSTRUCTIONS

### FILL AND DE INSPECTION

#### FILL

Inspection of the fill packs in the cooling tower can be completed from the fill layer. Plywood boards should be placed in a walkway arrangement as you cross the fill layer. This temporary access layout will also provide viewing access of the distribution laterals and nozzles from underneath.

Example photos of fill layer temporary plywood walkway for inspections:



## MAINTENANCE INSTRUCTIONS

### EQUIPMENT STORAGE

#### MOTOR STORAGE

1. EQUIPMENT MUST BE KEPT CLEAN
  - || Store indoors.
  - || Keep covered to eliminate airborne dust and dirt.
  - || Cover openings for ventilation, conduit connections, etc., to prevent entry of rodents, snakes, birds, and insects, etc.
2. EQUIPMENT MUST BE KEPT DRY
  - || Store in a dry area.
  - || Temperature swings should be minimal to prevent condensation.
  - || Space heaters are recommended to prevent condensation. (Connect heaters to proper VAC under temperature swing conditions.).
  - || Treat unpainted flanges, shafts, and fittings with a rust inhibitor.
  - || Check insulation resistance before putting motor into service.
3. KEEP BEARINGS LUBRICATED
  - || Once per month, rotate shaft several turns to distribute grease in bearings.
  - || If unit has been stored more than one year, add grease before start-up.

#### GEAR BOX STORAGE

**SHORT TERM STORAGE - Note:** Dry heated indoor storage is recommended

Each unit is tested and protected before leaving the factory for any reasonable storage condition or time. Units that are to be exposed to extreme temperature variations or to high relative humidity while being stored for extended lengths of time will require special care. See the recommendations for long-term storage.

**LONG TERM STORAGE - Note:** Dry heated indoor storage is recommended

Spray internal parts with rust-prevention oil that is soluble with lubricating oil or add a vapor phase rust inhibitor to the oil as recommended by its manufacturer. Protect all outside surfaces with rust-prevention oil. Place the unit in a vapor tight bag or container or seal all vent openings. All cooling tower drives are furnished with a vent plug located on the top of the unit. Seal this vent by applying duct tape around the base of the plug. Sealed unit should be stored in a shipping crate.

#### **INACTIVE DRIVES**

Units that are operated seasonally, or used only as standby, should be protected by adding a vapor phase rust inhibitor to the oil in the amounts recommended by the manufacturer. The unit should be checked every 3-4 months, more rust inhibitor added and any water that may have formed from condensation should be drained.

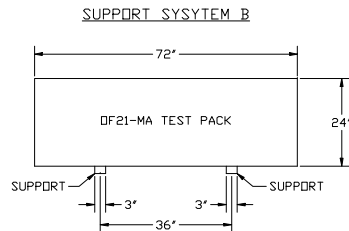
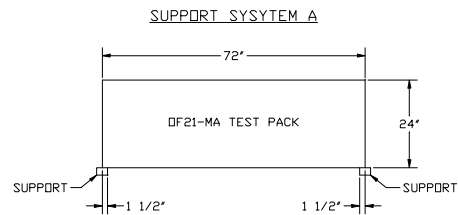
Load Test – OF-21MA  
7/29/02 Test

CRUSH DATA FOR FILL PACKS

Test Summary & Recommended Bearing Work-up

Test No.	Pack ID	Sheet Finished Gage (mils)	Support System (see dwg below)	Max. Comp. Strength (lb)	Prop. Elastic Limit (lb)	Ratio	Beam Bearing Surf. Area (sf)	Max. Comp. Strength (psf)	Prop. Elastic Limit (psf)	Recommended Bearing (psf)			
										Temp. Factor 1.2	Creep Factor 1.1	Safety Factor 1.5	Safety Factor 2
1	M1	15	A	556	480	0.863	0.375	1483	1280	1067	970	646	485
2	M2	15	A	540	484	0.896	0.375	1440	1291	1076	978	652	489
3	M3	15	A	564	468	0.830	0.375	1504	1248	1049	945	630	473
4	M4	15	A	544	500	0.919	0.375	1451	1333	1111	1010	673	505
	<b>Avg.</b>	<b>15</b>	<b>A</b>	<b>551</b>	<b>483</b>	<b>0.877</b>	<b>0.375</b>	<b>1469</b>	<b>1288</b>	<b>1073</b>	<b>976</b>	<b>651</b>	<b>488</b>
	<b>Std. Dev.</b>			<b>11</b>	<b>13</b>	<b>0.039</b>		<b>29</b>	<b>35</b>				
5	R1	10	A	244	210	0.861	0.375	651	560	467	424	283	212
6	R2	10	A	260	204	0.785	0.375	693	544	453	412	275	206
7	R3	10	A	264	237	0.898	0.375	704	632	527	479	319	239
	<b>Avg.</b>	<b>10</b>	<b>A</b>	<b>256</b>	<b>217</b>	<b>0.848</b>	<b>0.375</b>	<b>683</b>	<b>579</b>	<b>482</b>	<b>438</b>	<b>292</b>	<b>219</b>
	<b>Std. Dev.</b>			<b>11</b>	<b>18</b>	<b>0.058</b>		<b>28</b>	<b>47</b>				
8	M5	15	B	1580	1440	0.911	0.750	2107	1920	1600	1455	970	727
9	M6	15	B	1444	1320	0.914	0.750	1925	1760	1467	1333	889	667
10	M7	15	B	1552	1460	0.941	0.750	2069	1947	1622	1475	983	737
	<b>Avg.</b>	<b>15</b>	<b>B</b>	<b>1525</b>	<b>1407</b>	<b>0.922</b>	<b>0.750</b>	<b>2034</b>	<b>1876</b>	<b>1563</b>	<b>1421</b>	<b>947</b>	<b>710</b>
	<b>Std. Dev.</b>			<b>72</b>	<b>76</b>	<b>0.016</b>		<b>96</b>	<b>101</b>				
11	R4	10	B	600	566	0.943	0.750	800	755	629	572	381	286
12	R5	10	B	796	710	0.892	0.750	1061	947	789	717	478	359
13	R6	10	B	788	660	0.838	0.750	1051	880	733	667	444	333
	<b>Avg.</b>	<b>10</b>	<b>B</b>	<b>728</b>	<b>645</b>	<b>0.891</b>	<b>0.750</b>	<b>971</b>	<b>860</b>	<b>717</b>	<b>652</b>	<b>435</b>	<b>326</b>
	<b>Std. Dev.</b>			<b>111</b>	<b>73</b>	<b>0.053</b>		<b>148</b>	<b>97</b>				

Table 1



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## APPENDICIES

### APPENDIX A COOLING TOWER EQUIPMENT SUMMARY

#### DRIFT ELIMINATOR

To inspect the drift eliminator (DE) packs, the maintenance operator should open the access hatch and view if any packs are out of place. If a more in-depth cell interior inspection is required, the maintenance operator can access the cell interior by use of the cooling tower cell access ladder and temporarily place plywood to get to the closest concrete beam. From this point the maintenance operator can remove the DE across a concrete beam row and walk along the beam for additional viewing/inspection in the cell.

Example photos of DE layer concrete beam access for inspections are shown below:



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**Vibration Switch**

Manufacturer: IMI 3  
Model: 685B0001A11  
Please see Vibration Switch Drawing and Data submittal for additional specs

**Fill**

Manufacturer: Brentwood  
Model: OF21ma  
Material: PVC  
Volume: 660 m<sup>3</sup>/tower  
Mechanically Joined

**Drift Eliminator**

Manufacturer: Brentwood  
Model: CF150MAx  
Material: PVC

**Distribution Piping**

Manufacturer: Nawatech Engineering  
Lateral Lines Diameter: 6"  
Lateral Lines Material: PVC  
Nozzle Material: ABS

**Hardware**

Material: Stainless Steel, HDG

***GBL Overall Equipment List***

Equipment	Description	Quantity
<b><u>Motor</u></b>	Motor Model: 3GBP3122220-ADG Manufacturer: ABB Power: 110kW Type: M3BP 315SMB 4G Service Factor: 1.0 Speed: 1484 RPM	3
<b><u>Gear</u></b>	Gearbox Model: Amarillo 1311 Reduction Ratio: 8:1 Service Factor: 2.32	3
<b><u>Drive Shaft</u></b>	Model: LRA650.425SS Manufacturer: ADDAX Material: SS316 & Composite	3
<b><u>Fan</u></b>	Manufacturer: Hudson Model: APT-22K No. of Blades: 6 Type: Axial Fan Speed Nominal: 185.8 rpm Hub M.O.C: HDGS with SUS304 Hardware Diameter: 6705mm	3
<b><u>Fan Stack</u></b>	Manufacturer: HAC (Hoang Anh Composites) Diameter: 22 ft (6705 mm) Height: 9'-0" Materials: FRP	3

## APPENDICIES

### APPENDIX B RECOMMENDED 2-YEAR OPERATIONAL SPARE PARTS

**GBL**

VENDOR SHALL PREPARE THIS LIST INDIVIDUALLY FOR EACH PROJECT.

Spare Parts List for Mandatory (2 Years Operation)

Guif MP

TOWER

PÖYRY FORM 6.2

OWNER : Gulf MP Company Limited												Spare Parts List for Mandatory (2 Years Operation)
VENDOR NAME / EQUIPMENT/MATERIAL NAME : Industrial Cooling Solutions- Cooling Tower												
APPLIED PROJECT : GBL												
MANUFACTURERS / SUPPLIERS SPARE PARTS DATA												
REQUISITION NO. : OXEP001												
SERIAL NUMBER	NO. OF UNITS	EQUIPMENT REG. OR TAG NO.	DESCRIPTION OF PARTS (Name & QTY)	MATERIAL SPECIFICATION	DRAWING NO. INCLUDING REVISION NUMBER	NAME OF SUB-SUPPLIER OR BRAND NAME OR REMARKS	PARTS NO.		UNIT OF MEASURE	QUANTITY	Remarks	
							EQUIPMENT MANUFACTURER PARTS NO.	SUB-SUPPLIER PARTS NO.				
1	1	NA	Fill Pads Sheets, unassembled	PVC	C-200	Identical or equal	0721UA	NA	pc	1589		
2	1	NA	Dist Eliminator Pads Sheets & End Caps, unassembled	PVC	C-200	Identical or equal	CFT 50MAX	NA	pc	289		
3	1	NA	SP Nozzles, 1 1/4" orifice	Polysulfone	C-200	IE Shipped or equal	1140NTR50PPT	NA	pc	22		
4												
5												
6												
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# APPENDIX C

## LUBRICATION LIST

**ICS Thailand Office**  
9<sup>th</sup> Floor Serm-Mit Tower, 159 Sukhumvit 21, Asoke Road  
North Klongtoey, Wattana, Bangkok, 10110  
Tel. +66 (0) 2260-6598, Fax. +66 (0) 2260-6599

## 6/17/2017

III

## APPENDICIES

### APPENDIX E.1 FAN

## APPENDICIES

### APPENDIX E MECHANICAL EQUIPMENT

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#### ICS USA Office

1457 Ammons Street, Suite 206, Lakewood, CO 80214  
Tel. +1 (303) 462-2000, Fax. +1 (303) 984-2699  
[www.h2ocooling.com](http://www.h2ocooling.com)



#### ICS Thailand Office

9<sup>th</sup> Floor Serm-Mit Tower, 159 Sukhumvit 21, Asoke Road  
North Klongtoey, Wattana, Bangkok, 10110  
Tel. +66 (0) 2260-6598, Fax. +66 (0) 2260-6599

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#### ICS Thailand Office

9<sup>th</sup> Floor Serm-Mit Tower, 159 Sukhumvit 21, Asoke Road  
North Klongtoey, Wattana, Bangkok, 10110  
Tel. +66 (0) 2260-6598, Fax. +66 (0) 2260-6599

## RECOMMENDED TOOLS

- Long T-Handle Allen Wrench Set (3/16" to 3/8")
- Medium Size Flat Head Screw Driver
- Brass Ball Peen Hammer
- Flat Bastard File
- 240 Grit Sand Paper
- Anti-Seize Lubricant
- WD-40
- 12" Crescent Wrench
- Shop Towels
- Exact-A-Pitch® Digital Protractor (P/N 62375)
- 25 ft. Measuring Tape
- Pencil or Marker
- Open/Box End Wrench Set (1/2" - 1-1/2")
- Socket Set for 1/2" Drive (1/2" - 1-1/2")
- Torque Wrench(s) Rated for 0-200 ft-lb.

## INSTALLATION PROCEDURES

### ASSEMBLY WITH BUSHING

Clean all mating surfaces between hub, bushing and shaft. All grease and lubricant should be removed, leaving the mating surfaces dry.

If there is no shoulder on shaft to prevent bushing from sliding down shaft, slide spacer/sleeve (not provided) on shaft before bushing or use a thrust retainer (optional equipment) on top of hub. Slide bushing and key onto shaft until flush with end of shaft. The shaft size determines the bushing type (R2, S2, or U1). Lock bushing on shaft by tightening the set screw in flange with an Allen Wrench. Line up key and set hub on bushing. Engage the three (3) cap screws in flange of bushing into hub spool, using a torque wrench with a socket, and tighten evenly. Use the following table to determine the proper tools and torque values.

Bushing Size	Allen Wrench Size	Cap Screw Size	Socket Size	Torque (ft-lb) Dry
R2	3/16"	3/8"	9/16"	29
S2	3/16"	1/2"	3/4"	70
U1	3/16"	5/8"	15/16"	140

### ASSEMBLY WITH STRAIGHT SHAFT (NO BUSHING)

Clean all mating surfaces between the hub and the shaft. If there is no shoulder on shaft to prevent hub from sliding down shaft, slide spacer/sleeve (not provided) on shaft before hub or use a thrust retainer (optional equipment) on top of hub. Install key in shaft. Line up key and keyway and set hub on shaft. Tighten set screw(s) in hub.

### ASSEMBLY WITH TAPERED SHAFT (NO BUSHING REQUIRED)

Clean all mating surfaces between the hub and shaft.

Align keyways and install hub. Install retainer plate and cap screw(s) with lock washer(s). Shaft size determines what size cap screw is necessary. Using a torque wrench with a socket, evenly tighten cap screw to recommended standard per table below.

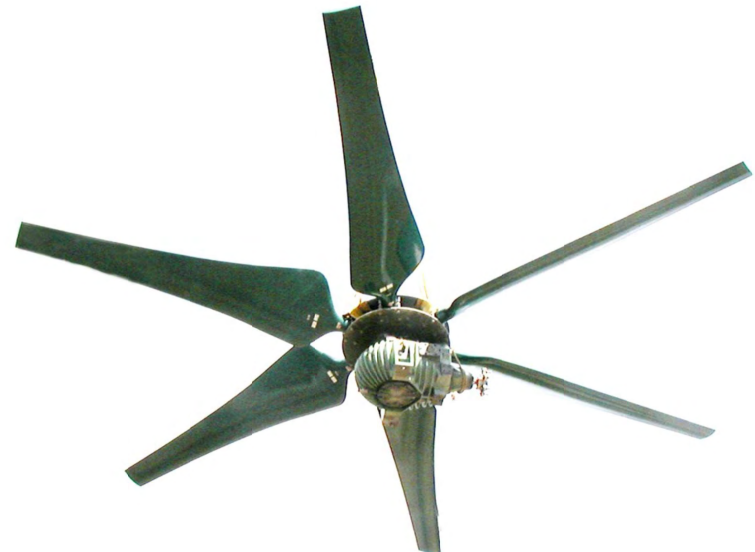
Cap Screw Size	Socket Size	Torque Value (ft-lb)	
		Lubricated	Dry
5/8" NC	15/16"	100	110
3/4" NC	1-1/8"	125	130
1" NC	1-1/2"	150	160

NOTE: Retaining arrangement varies with gear shaft design.

**HUDSON**  
Products Corporation

## Tuf-Lite III® Fans 5000K Series Hub

## INSTALLATION MANUAL



### Adjustable Pitch Fan Assembly 20' thru 30' Diameter

#### *Hudson Tuf-Lite III® fan blades*

Hudson Tuf-Lite III® fan blades are of single piece fiberglass reinforced plastic (FRP) construction optimized for performance, reliability, noise, and cost effectiveness. Tuf-Lite III® fan blades are constructed of light weight, corrosion-resistant, fiberglass reinforced vinyl-ester resin, with materials, thickness, and processes determined from finite element analysis modeling. Tuf-Edge® leading edge erosion and UV protection is a standard with this blade.

The individually balanced blades can be replaced independently - matched sets are not required.

Rotate blade in clamp until digital protractor shows specified pitch angle to within  $\pm 0.2^\circ$ . Fan pitch angle is shown on fan specification sheet for design duty. After desired pitch angle is set, raise and lower end of fan blade and find midpoint of blade travel. Hold blade at the midpoint. Pull blade outward so that the blade neck flange rests against the back of the blade clamps. Push blade to the right to remove all slack.

Use torque wrench to tighten clamp bolts to 120 ft-lb (lubricated) or 130 ft-lb (dry). Re-check pitch setting. Blade must be set within  $\pm 0.2^\circ$  of desired pitch angle. Tighten clamp bolts evenly. **DO NOT OVER-TORQUE CLAMP BOLTS.**

When bolts are tightened, hold a pencil against top end of blade and mark the level onto a fixed object, such as a pole or the fan ring.

Install remaining blades at same place as first blade, following the instructions above. After tightening bolts, mark top end of each blade in same place first blade was marked. If marks differ by 1" or more, adjust blade.

## CHECK TRACK

After fan is installed in fan stack cylinder ring, outline top side of each blade onto fan stack cylinder ring with a marker (See Figure 5). The difference between levels of highest and lowest outlines should not be more than 1". Correct blade track by loosening clamp bolts and adjusting blade to match track of other blades. Re-tighten bolts and re-check track and pitch angle setting. Re-tighten blade clamp bolts to recommended standard of 100 ft-lb (lubricated) or 125 ft-lb (dry) torque.



Figure 5

## SEAL DISC ASSEMBLY & INSTALLATION

Install self adhesive rubber gaskets on both flanges of one seal disc half. Bolt two halves of seal disc together, using 3/8" NC bolts, flat washer, lock washer, and nut. Torque to 15 ft-lb (lubricated) and 20 ft-lb (dry).

Install 3/8" NC bolts at six (6) places on top hub plate (See Figure 6). Threaded portion of bolts must be pointing up to mount seal disc. Install lock washer, nut, and flat washer on each bolt. Tighten 3/8" NC nuts to 15 ft-lb (lubricated) and 20 ft-lb (dry).

Locate the six (6) mounting holes in seal disc and install over the six (6) bolts pointing up on upper hub plate. If difficulty is encountered, loosen bolts on seal flanges until seal disc can be mounted, then re-tighten to 15 ft-lb (lubricated) or 20 ft-lb (dry).

**NOTE:** The purpose of the seal disc is to prevent hot air from recirculating back down through the hub, increasing efficiency.

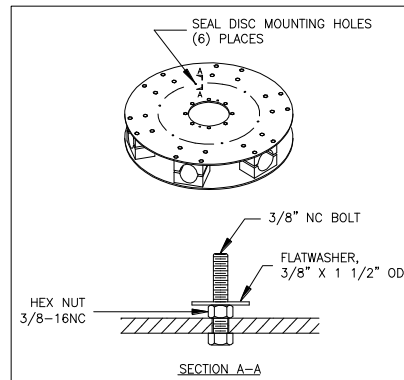


Figure 6

## THRUST RETAINER (optional equipment)

Install proper load bolt (not provided) into top of fan shaft and tighten (See Figure 1). Install thrust retainer channel on top hub plate using existing hub spool cap screws. Torque cap screws to 60-65 ft-lb. Install thrust retainer eyebolt and jam nut. Hand tighten eyebolt. Tighten jam nut securely against top of thrust retainer channel.

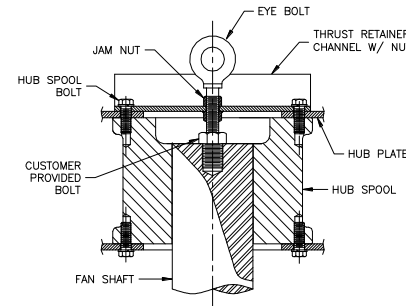


Figure 1

## BLADE INSTALLATION

Remove blade clamp bolts, nuts, lock washers, and blade clamp halves from hub. Assemble blade clamp halves over groove in blade neck, and install into hub (See Figure 2). The thick leading edge will be to your left and thin trailing edge will be to your right as you stand at end of blade.



Figure 2

Install clamp bolts through hub plates and blade clamp, putting bolt heads on top, lock washers and nuts on bottom. Tighten lightly (See Figure 3).



Figure 3

## SET PITCH AND TRACK

Use Hudson EXACT-A-PITCH® digital protractor (See Figure 4) or a bubble protractor to set blade pitch. Mount protractor on a flat bar as a base and place it approximately 1" from tip of blade. Note pitch on protractor. Rotate fan 360°, noting high and low pitch readings. Locate place where pitch reading is at mid-point between high and low readings, and set pitch at that point.



Figure 4

**PART LIST**  
**HUDSON PRODUCTS CORPORATION**  
**Adjustable Pitch Fan Assembly 20' thru 30' Diameter**  
**Series 5000K HUB**

ITEM	DESCRIPTION	TYPE	PART. NO.	NO. OF BLADES							
				6	7	8	9	10	11	12	
	Up to 3.62" Diameter Shaft	R-2	Hub Assy. No. Part. No.	5206 H5400	5207 H5410	5208 H5420	5209 H5420	5210 H5440	5211 H5450	5212 H5460	
	3.68" Diameter thru 4.19" Diameter Shaft	S-2	Hub Assy. No. Part. No.	5306 H5300	5307 H5310	5308 H5320	5309 H5330	5310 H5340	5311 H5350	5312 H5360	
	4.25" Diameter thru 5.50" Diameter Shaft	U-1	Hub Assy. No. Part. No.	5806 H5600	5807 H5610	5808 H5620	5809 H5630	5810 H5640	5811 H5650	5812 H5660	
1	Hub Plate (2 Per Hub)	R-2 & S-2 U-1	Part. No. Part. No.	C5282 C5283	61512 61521	C5282 C5283	61514 61523	61515 61524	61516 61525	C5282 C5283	
ITEM	DESCRIPTION	TYPE	PART. NO.	QUANTITY PER ASSEMBLY							
2	Hub Spool	R-2 S-2 U-1	65050 65055 65038	1	1	1	1	1	1	1	1
3	Bushing	R-2 S-2 U-1	Specify Bore	1	1	1	1	1	1	1	1
4	Blade Clamp Half, Powder Epoxy Coated Die Cast Alum. (Standard) Option 1: Powder Epoxy Coated Ductile Iron** Option 2: Coal Tar Epoxy Coated Ductile Iron**		D5131 65013 65013C	12	14	16	18	20	22	24	
5	Blade Clamp Bolt W/ Nut 3/4"-10 x 10" (Mech. Galv.)		79299	24	28	32	36	40	44	48	
6	3/4" Lock washer (Mech. Galv.)		73738	24	28	32	36	40	44	48	
7	Hub Spool Cap Screw 5/8"-11 x 1 1/2"(316 SS)		72402	16	16	16	16	16	16	16	
8	5/8" Lock washer (316 SS)		73731	16	16	16	16	16	16	16	
9	Pin, Grooved, 1/2" X 1-1/2"		74540	4	4	4	4	4	4	4	
10	76" Diameter "K" Seal Disc Kit *		D5177	1	1	1	1	1	1	1	
11	Tuf-Lite II® Blade (Teal Green)		(Varies)	6	7	8	9	10	11	12	

\* Includes all hardware (316 SS) to assembly and mount.

\*\* Recommended on concrete and round towers, or corrosive environments. Contact Hudson for pricing.

**STANDARD MATERIALS & FINISHES**

**Blades:** Fiberglass reinforced vinyl ester  
**Hub Spool:** Ductile Iron, Zinc Rich Coating  
**Plates:** Steel, Galvanized  
**Bushing:** Malleable Iron  
**Seal Disc:** Fiberglass Reinforced Polyester

**Blade Clamps:**  
 Powder Epoxy Coated Die Cast Alum (Standard)  
 Powder Epoxy Coated Ductile Iron (Option 1)  
 Coal Tar Epoxy Coated Ductile Iron (Option 2)  
**Fasteners:**  
 Steel, Mech. Galvanized & 316 SS Opt.  
 Complete Fan with 316 SS (Option 1)  
 Complete Fan with K500 Monel (Option 2)

**WHEN ORDERING, SPECIFY FAN DIAMETER, TYPE & NUMBER OF BLADES & SHAFT DIAMETER**

**EXAMPLE:**    APT                      28K                      8                      3 1/2" BORE

Fan Model                      Fan Diameter & Blade Type                      Number                      Shaft Diameter  
 Adjustable Pitch                      (Specify "K for Tuf-Lite II® Blades)

After mounting, install flat washer, lock washer, and 3/8" NC nuts. Tighten to 15 ft-lb (lubricated) or 20 ft-lb (dry). (See Figure 7)

Note: Refer to instructions included with seal disc for further details.

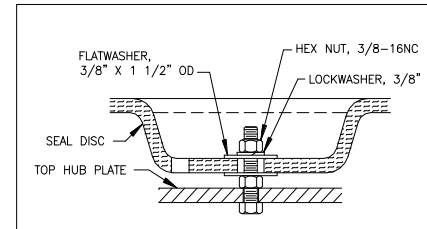


Figure 7

**CHECKING TIP CLEARANCE**

Rotate fan in position inside fan stack to check tip clearance (See Figure 8). The recommended tip clearance is between 1" and 1 1/2". Check for spots where fan blade clearance is not within the recommended tolerance. If necessary, adjust fan stack by shimming to obtain proper clearance.

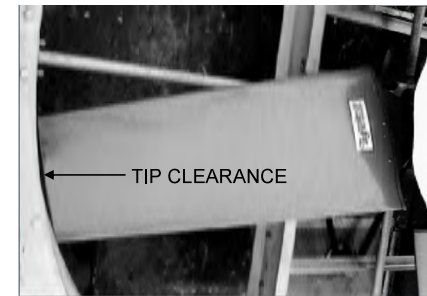


Figure 8

**OPERATING INSTRUCTIONS**

Start fan and check rotation. Viewed from top (discharge), fan blades should rotate clockwise.

Hudson recommends to re-verify the blade clamp torque after the initial 10-15 minutes of cold operation (i.e., the fan doesn't need to be exposed to the working temperature of the process). This will ensure that the blades are settled within the clamps after the centrifugal forces have acted.

Check motor power consumption to be sure fan is pulling desired load. *CAUTION: If positive pitch is set in summer to use all available motor amps (nameplate rating), motor could be overloaded in winter.* Design pitch angles usually do not use all of the available motor horsepower. This ensures that the motors will not be overloaded at low winter temperatures.

For the fans that have remained idle (such as a shut-down or turn-around), it is highly recommended to re-verify the torque on the blade clamps before putting it back into operation.

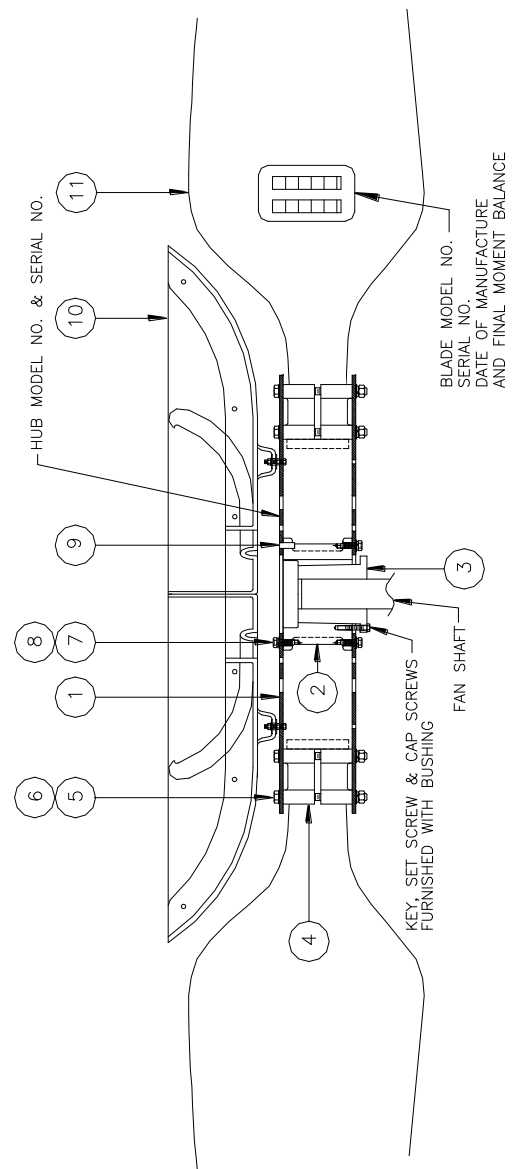
# HUDSON

Products Corporation

9660 Grunwald Rd.  
Beasley, Texas 77417-8600  
Phone: 281-396-8100  
Fax: 281-396-8388  
1-800-634-9160 (24 Hours)  
EMAIL: [HUDSONPRODUCTS@HUDSONPRODUCTS.COM](mailto:HUDSONPRODUCTS@HUDSONPRODUCTS.COM)  
<http://WWW.HUDSONPRODUCTS.COM>

Hudson, Auto-Variable, Combin-Aire, Exact-A-Pitch, Fin-Fin, Heatflo, Hy-Fin, Spill-Flo, Solo Aire, Stac-Flo, Steamflo, Thermflo, Tuf-Edge, Tuf-Lite, Tuf-Lite II, and Tuf-Lite III are registered trademarks of Hudson Products Corporation.

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ภาคผนวก ข-12

เอกสารอบรมด้านอาชีวอนามัยและความปลอดภัยในการทำงาน

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## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ขับชื่อย่างปลอดภัย	วันที่ Date : 4.12.68 เวลา Time : 09:00 ถึง to : 10:00
ส่วนงาน : GA.	รวมระยะเวลา Period : 1 ชั่วโมง : — นาที Hrs.: Sec.
สถานที่ Place : GBL	วิทยากร T. [REDACTED]

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
				เช้า (Morning)	บ่าย (Afternoon)
1	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2					
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed : [REDACTED]

- |  |                   |                 |   |
|--|-------------------|-----------------|---|
|  | ระดับ 1 (Level 1) | หมายถึง (Means) | สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)  |
|  | ระดับ 2 (Level 2) | หมายถึง (Means) | สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)           |
|  | ระดับ 3 (Level 3) | หมายถึง (Means) | สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)                     |
|  | ระดับ 4 (Level 4) | หมายถึง (Means) | มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer) |



หลักสูตร Course : ESMS-Sa-P-08 General First Aid	วันที่ Date : 16 May 2025 เวลา Time : 09.00 ถึง to : 09.30
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Team	วิทยากร Train





ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :





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|---|-------------------|-----------------|---|
|  | ระดับ 1 (Level 1) | หมายถึง (Means) | สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)  |
|  | ระดับ 2 (Level 2) | หมายถึง (Means) | สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)           |
|  | ระดับ 3 (Level 3) | หมายถึง (Means) | สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)                     |
|  | ระดับ 4 (Level 4) | หมายถึง (Means) | มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellence Working and to be trainer) |

หลักสูตร Course : ESMS-Sa-P-23_Portable Tools,Machines and Machinery Guarding	วันที่ Date : 13 June 2025 เวลา Time : 09.00 ถึง to : 09.30
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Team	วิทยากร Trainer : 

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General) <input type="checkbox"/> อบรมพนักงาน (OJT)	การประเมินผล : <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ Remark
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-  ระดับ 1 (Level 1) หมายถึง (Means) สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
-  ระดับ 2 (Level 2) หมายถึง (Means) สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
-  ระดับ 3 (Level 3) หมายถึง (Means) สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
-  ระดับ 4 (Level 4) หมายถึง (Means) มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellence Working and to be trainer)



ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : Job Safety Analysis (JSA)	วันที่ Date : 16 July 2025 เวลา Time : 14.00 ถึง to : 16.00
ส่วนงาน : All GBL	รวมระยะเวลา Period : 2 ชั่วโมง : - นาที Hrs.: Sec.
สถานที่ Place : MS-Team GBL meeting room	วิทยากร Trainer : [Redacted]

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed : [Redacted]

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellence Working and to be trainer)



ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : Job Safety Analysis (JSA)	วันที่ Date : 18 July 2025 เวลา Time : 13.00 ถึง to : 15.00
ส่วนงาน : All GBL	รวมระยะเวลา Period : 2 ชั่วโมง : ~ นาที Hrs.: Sec.
สถานที่ Place : GBL Meeting Room	วิทยากร Trainer : [Redacted]

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months")

Instructor Signed : [Redacted]

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)





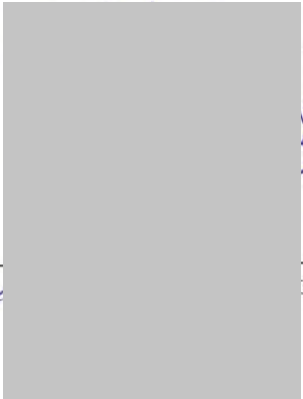
## ใบรายงานผลการฝึกอบรมภายใน (Training Report)





หลักสูตร Course : <b>อบรมดับเพลิงขั้นต้น</b>	วันที่ Date : <b>14 August 2025</b> เวลา Time : <b>08.00</b> ถึง to : <b>16.00</b>
ส่วนงาน : <b>All GBL</b>	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : <b>GBL Meeting Room</b>	วิทยากร Trainer :
ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General) Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input checked="" type="checkbox"/> ปฏิบัติจริง (Implement) Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed : 

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)

25 นายวิชาวงศ์ แก้วทอง กี่ OPT 3



## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : อบรมดับเพลิงขั้นต้น

วันที่ Date : 14 August 2025 เวลา Time : 08.00 ถึง to : 16.00

ส่วนงาน : All GBL

รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.

สถานที่ Place : GBL Meeting Room

วิทยากร Trainer :

ประเภทการอบรม : ☒ อบรมทั่วไป (General) ☐ อบรมพนักงาน (OJT) การประเมินผล Evaluation Method : ☒ การสอบถาม (Question) ☐ แบบทดสอบ (Test) ☒ ปฏิบัติจริง (Implement)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :



ระดับ 1 (Level 1) หมายถึง (Means) สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)








ระดับ 2 (Level 2) หมายถึง (Means) สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)



ระดับ 3 (Level 3) หมายถึง (Means) สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)



ระดับ 4 (Level 4) หมายถึง (Means) มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)

		ใบรายงานผลการฝึกอบรมภายใน (Training Report)			
หลักสูตร Course : ก๊าซรั่ว		วันที่ Date : 13 August 2025 เวลา Time : 08.30 ถึง to : 12.00			
ส่วนงาน : All GBL		รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.			
สถานที่ Place : GBL Meeting Room		วิทยากร Trainer : <div></div>			
ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)		การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Interview)		ปฏิบัติงาน (Implement)	
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)		Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)			
ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)					
Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)			Instructor Signed <div></div>		
	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)		
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)		
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)		
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)		



## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : สารเคมีรั่วไหล	วันที่ Date : 13 August 2025 เวลา Time : 08.30 ถึง to : 12.00
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.

สถานที่ Place : GBL Meeting Room	วิทยากร Trainer
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ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General) <input type="checkbox"/> อบรมพนักงาน (OJT)	การประเมินผล : <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)	Instructor Signed :
Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)	

- ระดับ 1 (Level 1) หมายถึง (Means) สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
- ระดับ 2 (Level 2) หมายถึง (Means) สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
- ระดับ 3 (Level 3) หมายถึง (Means) สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
- ระดับ 4 (Level 4) หมายถึง (Means) มีความเข้าใจดีมาก ปฏิบัติงานได้ดี คิดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)





## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ฝึกซ้อมดับเพลิง และฝึกซ้อมอพยพหนีไฟ	วันที่ Date : 14 August 2025 เวลา Time : 08.00 ถึง to : 16.00
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : GBL Meeting Room	วิทยากร Trainer :

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input checked="" type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)

๑๕ นายวรพงษ์ แก้วทาวลี OPT 3



ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ฝึกซ้อมดับเพลิง และฝึกซ้อมอพยพหนีไฟ	วันที่ Date : 14 August 2025 เวลา Time : 08.00 ถึง to : 16.00
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : GBL Meeting Room	วิทยากร Trainer :

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input checked="" type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = Level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signe

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)

## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : **ปฐมพยาบาลเบื้องต้น และการช่วยฟื้นคืนชีพ**  
(First Aids and CPR)

วันที่ Date : 08 September 2025 เวลา Time : 09.00 ถึง to : 16.00

ส่วนงาน : All GBL

รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.

สถานที่ Place : GBP Meeting Room

วิทยากร Trainer :

ประเภทการอบรม : ☒ อบรมทั่วไป (General) ☐ อบรมพนักงาน (OJT) ☐ อบรมหัวหน้างาน (OJT)  
Training Type ☐ อบรมพนักงาน (OJT) ☐ อบรมหัวหน้างาน (OJT)

การประเมินผล ☒ การสอบถาม (Question) ☒ ปฏิบัติจริง (Implement)  
Evaluation Method ☐ แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed



ระดับ 1 (Level 1) หมายถึง (Means) สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)



ระดับ 2 (Level 2) หมายถึง (Means) สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)



ระดับ 3 (Level 3) หมายถึง (Means) สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)



ระดับ 4 (Level 4) หมายถึง (Means) มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellence Working and to be trainer)



## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : **ปฐมพยาบาลเบื้องต้น และการช่วยฟื้นคืนชีพ**  
(First Aids and CPR)

วันที่ Date : 08 September 2025 เวลา Time : 09.00 ถึง to : 16.00

ส่วนงาน : All GBL

รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.

สถานที่ Place : GBP Meeting Room

วิทยากร Trainer :

ประเภทการอบรม : ☒ อบรมทั่วไป (General)

การประเมินผล

☒ การสอบถาม (Question)

ement)

Training Type ☐ อบรมหน้างาน (OJT)

Evaluation Method

☐ แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :



ระดับ 1 (Level 1) หมายถึง (Means) สามารถปฏิบัติงาน โดยมีผู้ควบคุม (Only working - helper)



ระดับ 2 (Level 2) หมายถึง (Means) สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)



ระดับ 3 (Level 3) หมายถึง (Means) สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)



ระดับ 4 (Level 4) หมายถึง (Means) มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)



หลักสูตร Course : แผนฉุกเฉินการก่อวินาศกรรม, แผนฉุกเฉินภัยพิบัติตามธรรมชาติ , แผนฉุกเฉินกรณีพนักงานหรือบุคคลได้รับอุบัติเหตุบาดเจ็บรุนแรง หรือเสียชีวิตจากการทำงาน, แผนฉุกเฉินโรคระบาด, แผนฉุกเฉินรังสีรั่วไหล

ส่วนงาน : All GBL

วันที่ Date : 13 August 2025 เวลา Time : 08.30 ถึง to : 12.00

รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.

สถานที่ Place : GBL Meeting Room

วิทยากร Trainer :

ประเภทการอบรม : ☒ อบรมทั่วไป (General)

การประเมินผล

☒ การสอบถาม (Questioning)

☐ การปฏิบัติจริง (Implement)

Training Type ☐ อบรมพนักงาน (OJT)

Evaluation Method

☐ แบบทดสอบ (Test)

ที่ No	ผู้เข้ารับการอบรม	ผลการประเมิน	หมายเหตุ	ลายเซ็น
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :



ระดับ 1 (Level 1)

หมายถึง (Means)

สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)



ระดับ 2 (Level 2)

หมายถึง (Means)

สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)



ระดับ 3 (Level 3)

หมายถึง (Means)

สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)



ระดับ 4 (Level 4)

หมายถึง (Means)

มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)



## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ESMS-Sa-P-20_Ladder and Scaffolding	วันที่ Date : 18 July 2025 เวลา Time : 09.00 ถึง to : 09.30
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Team	วิทยากร Trainer : <div></div>

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellence Working and to be trainer)



ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ESMS-Sa-P-31_Fire Pump, Sprinklers, Fixed and Detection System	วันที่ Date : 25 July 2025 เวลา Time : 09.00 ถึง to : 09.30
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Team	วิทยากร Trainer

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)



ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ความปลอดภัยในการทำงานเกี่ยวกับไฟฟ้า		วันที่ Date : 20 August 2025 เวลา Time : 09.00 ถึง to : 16.00	
ส่วนงาน : All GBL		รวมระยะเวลา Period :	ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Tems		วิทยากร Train [Redacted]	
ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบ	ปฏิบัติงานจริง (Implement)	
Training Type <input type="checkbox"/> อบรมหน้างาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)		

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed : [Redacted]

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี คิดสนใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)






ใบรายงานผลการฝึกอบรมภายใน (Training Report)





หลักสูตร Course : ESMS-Sa-P-17_Personal Protective Equipment		วันที่ Date : 01 August 2025 เวลา Time : 09.00 ถึง to : 09.30	
ส่วนงาน : All GBL		รวมระยะเวลา Period :	ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Tems		วิทยากร Trainer :	
ประเภทการอบรม :	<input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล	<input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type	<input type="checkbox"/> อบรมหน้างาน (OJT)	Evaluation Method	<input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed : 

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)



ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ESMS-Sa-P-27_General Fire Safety		วันที่ Date : 15 August 2025		เวลา Time : 09.00	ถึง to : 09.30
ส่วนงาน : All GBL		รวมระยะเวลา Period :		ชั่วโมง :	นาที Hrs.: Sec.
สถานที่ Place : MS Tems		วิทยากร Trainer			
ประเภทการอบรม :	<input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล	<input checked="" type="checkbox"/> การสอบถาม	ปฏิบัติงานจริง (Implement)	
Training Type	<input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method	<input type="checkbox"/> แบบทดสอบ (Test)		

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
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หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed :

	ระดับ 1 (Level 1)	หมายถึง (Means)	สามารถปฏิบัติงาน โดยผู้ควบคุม (Only working - helper)
	ระดับ 2 (Level 2)	หมายถึง (Means)	สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)
	ระดับ 3 (Level 3)	หมายถึง (Means)	สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)
	ระดับ 4 (Level 4)	หมายถึง (Means)	มีความเข้าใจดีมาก ปฏิบัติงานได้ดี คิดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer)



## ใบรายงานผลการฝึกอบรมภายใน (Training Report)

หลักสูตร Course : ความปลอดภัยในการทำงานกับสารเคมี	วันที่ Date : 15 October 2025 เวลา Time : 09.00 ถึง to : 15.00
ส่วนงาน : All GBL	รวมระยะเวลา Period : ชั่วโมง : นาที Hrs.: Sec.
สถานที่ Place : MS Tems	วิทยากร Trainer : [REDACTED]

ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General)	การประเมินผล <input checked="" type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> ปฏิบัติจริง (Implement)
Training Type <input type="checkbox"/> อบรมพนักงาน (OJT)	Evaluation Method <input type="checkbox"/> แบบทดสอบ (Test)

ที่ No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายมือชื่อ Signature	
				เช้า (Morning)	บ่าย(Afternoon)
1					
2					
3					
4					
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20					

หมายเหตุ : ผ่านเกณฑ์ = ระดับ 2 (ในกรณีที่ต่ำกว่าระดับ 2 ต้องทำการประเมินใหม่ภายในระยะเวลา 6 เดือน)

Remark : Passed = level 2 (In case of "under level 2 shall be re-evaluation within 6 months)

Instructor Signed : [REDACTED]

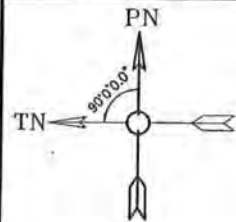
- |  |                   |                 |   |
|--|-------------------|-----------------|---|
|  | ระดับ 1 (Level 1) | หมายถึง (Means) | สามารถปฏิบัติงานโดยมีผู้ควบคุม (Only working - helper)  |
|  | ระดับ 2 (Level 2) | หมายถึง (Means) | สามารถปฏิบัติงานได้ แต่ยังไม่สามารถตัดสินใจได้ (Can be working but can't solve the problem)           |
|  | ระดับ 3 (Level 3) | หมายถึง (Means) | สามารถปฏิบัติงาน แก้ไขปัญหาหรือตัดสินใจได้ (Can be working and solve the problem)                     |
|  | ระดับ 4 (Level 4) | หมายถึง (Means) | มีความเข้าใจดีมาก ปฏิบัติงานได้ดี ตัดสินใจได้ และสอนผู้อื่นได้ (Excellance Working and to be trainer) |

ภาคผนวก ข-13

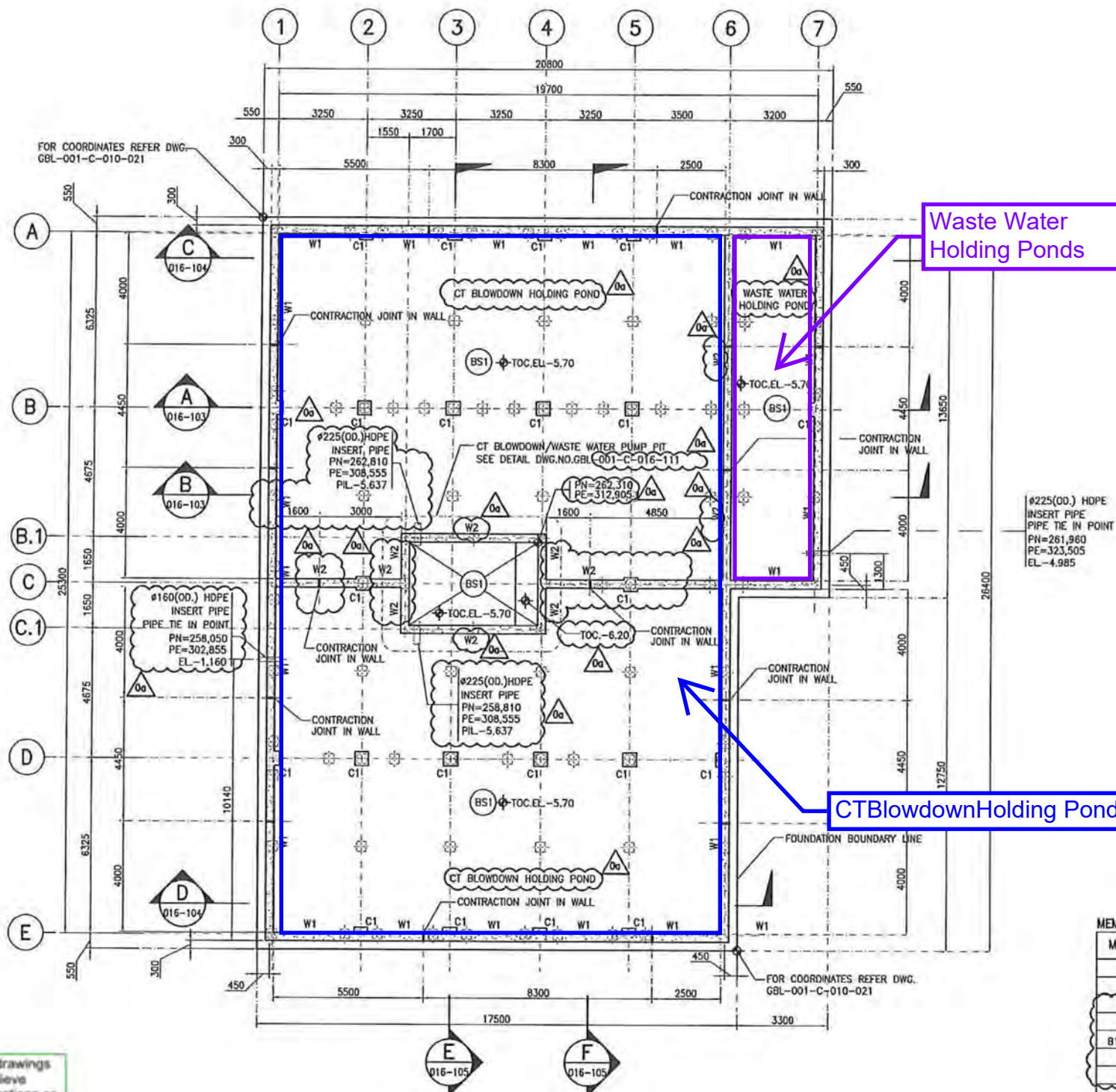
เอกสารออกแบบ Cooling Pond และ Emergency Pond

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FOR COORDINATES REFER DWG.  
GBL-001-C-010-021



Waste Water  
Holding Ponds

CT Blowdown Holding Ponds

#225(OD) HDPE  
INSERT PIPE  
PIPE TIE IN POINT  
PN=261,960  
PE=323,505  
EL=-4.985

FOR COORDINATES REFER DWG.  
GBL-001-C-010-021

FOUNDATION PLAN AT EL.-5.70  
SCALE 1:100

The approval or deemed approval of drawings  
and documents by Owner shall not relieve  
Contractor/Suppliers of any of its obligations or  
liabilities under the Construction/Supply  
Contract

**A - APPROVED**

#### MEMBER SCHEDULE

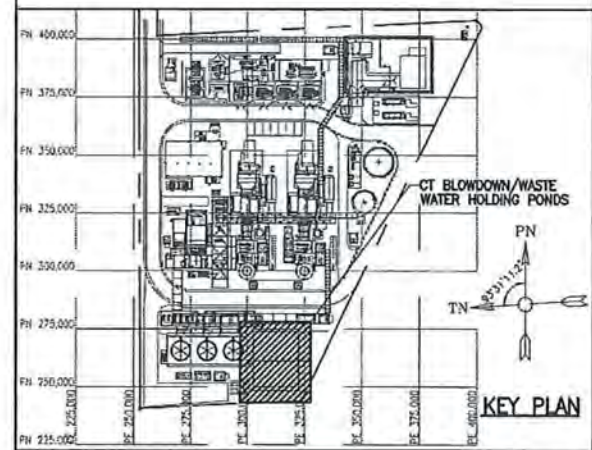
MEMBER	SIZE (mm.)
W1	300 mm. THK. RC.WALL
C1	500x500 mm. (BxD) RC.COLUMN
C2	500x500 mm. (BxD) RC.COLUMN
C3	400x400 mm. (BxD) RC.COLUMN
B1&B1A	500x500 mm. (BxD) RC.BEAM
B2	400x500 mm. (BxD) RC.BEAM
B3	300x500 mm. (BxD) RC.BEAM
BS1	800 mm. THK. RC.SLAB
S1	300 mm. THK. RC.SLAB
S2	300 mm. THK. RC.SLAB
S3	300 mm. THK. RC.SLAB
C4	250x250 mm. THK. RC.COLUMN
C4A	210x210 mm. THK. RC.COLUMN
W2	300 mm. THK. RC.WALL

#### NOTES :

- ALL DIMENSIONS AND COORDINATES ARE IN MILLIMETERS, ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
- THE SUBCONTRACTOR HAS TO CHECK ALL DIMENSIONS & ELEVATIONS. ANY DISCREPANCY, CONFLICTING OR ERRONEOUS INFORMATION SHALL BE REPORTED TO THE TOYO & CLARIFIED PRIOR TO COMMENCING WORK.
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH RELEVANT DRAWINGS & SPECIFICATIONS.
- PROJECT DATUM EL.+0.000 IS EQUAL TO +2.400 m. MSL.
- CONTROL POINT IS PROJECT BENCH MARK NO. PBM-3, LOCATED AT COORDINATES OF TRUE NORTH : TN=1,576,136.080 M., TRUE EAST : TE = 671,234.184 M., EL. = 2.170 MSL ; REFER TO TOPOGRAPHIC MAP , PREPARED BY INFRA TECH ASTM CO.,LTD.
- SUBSOIL UNDERNEATH ALL PILE FOUNDATIONS SHALL BE INSPECTED BY THE CONTRACTOR PRIOR TO LAYING OF BLINDING LAYER. RELATIVE COMPACTION OF FILLING SUBSOIL MATERIAL UNDERNEATH ALL PILE FOUNDATIONS SHALL BE AT LEAST 80% STANDARD PROCTOR DENSITY.
- STRUCTURAL REQUIREMENT
  - MINIMUM CONCRETE COMPRESSIVE STRENGTH 28 DAYS (CYLINDER)
    - FOR REINFORCED CONCRETE MEMBERS ABOVE EL.+0.00 (f'<sub>c</sub>=27.5 MPa)
    - FOR REINFORCED CONCRETE MEMBERS AT OR BELOW EL.+0.00 (f'<sub>c</sub>=31 MPa)
    - FOR ROAD, GUTTER & DUCTBANKS (f'<sub>c</sub>=31 MPa)
    - LEAN CONCRETE (f'<sub>c</sub>=13.7 MPa)
  - STEEL REINFORCEMENT
    - MINIMUM SPECIFIED YIELD STRENGTH FOR DEFORMED (f<sub>y</sub>=400 MPa)
    - MINIMUM SPECIFIED YIELD STRENGTH FOR ROUND BAR (f<sub>y</sub>=240 MPa)
  - REQUIREMENTS FOR 31MPa REINFORCED CONCRETE MEMBER
    - CEMENT SHALL CONFORM TO ASTM C150 TYPE I, OR ASTM C595 (P(HS), IS(HS), IT(HS))
    - MAXIMUM WATER-CEMENT RATIO = 0.39
    - MINIMUM COVER TO REINFORCEMENT: db<16mm, COVER = 50mm
    - db>16mm, COVER = 60mm
- CONCRETE FINISH
  - TOP OF FOUNDATION ABOVE GROUND U3 STEEL TROWELED FINISH
  - TOP OF FOUNDATION BELOW GROUND U2 WOOD FLOATED FINISH
  - TOP OF PLINTHS TO BE GROUTED ROUGH FINISH MORE THAN 6 MM. PROFILE
  - TOP OF OTHER PLINTHS, GUTTER U3 STEEL TROWELED FINISH
  - CUTTER (BASE) U2 WOOD FLOATED FINISH
  - SIDES OF PLINTHS F2 SMOOTH FINISH
  - PORTION OF FOUNDATION ABOVE GROUND F2 SMOOTH FINISH
  - PORTION OF FOUNDATION BELOW GROUND F1 ROUGH FINISH
  - INSIDE WALL SURFACE F2 SMOOTH FINISH
- THE EARTHING SYSTEM UNDER CONCRETE FOUNDATIONS SHALL BE COORDINATED AND FINISHED BEFORE CONCRETE POURING.
- WATERPROOF ADMIXTURE APPROVED BY TOYO SHALL BE ADDED TO THE CONCRETE MIX.

#### ABBREVIATIONS:

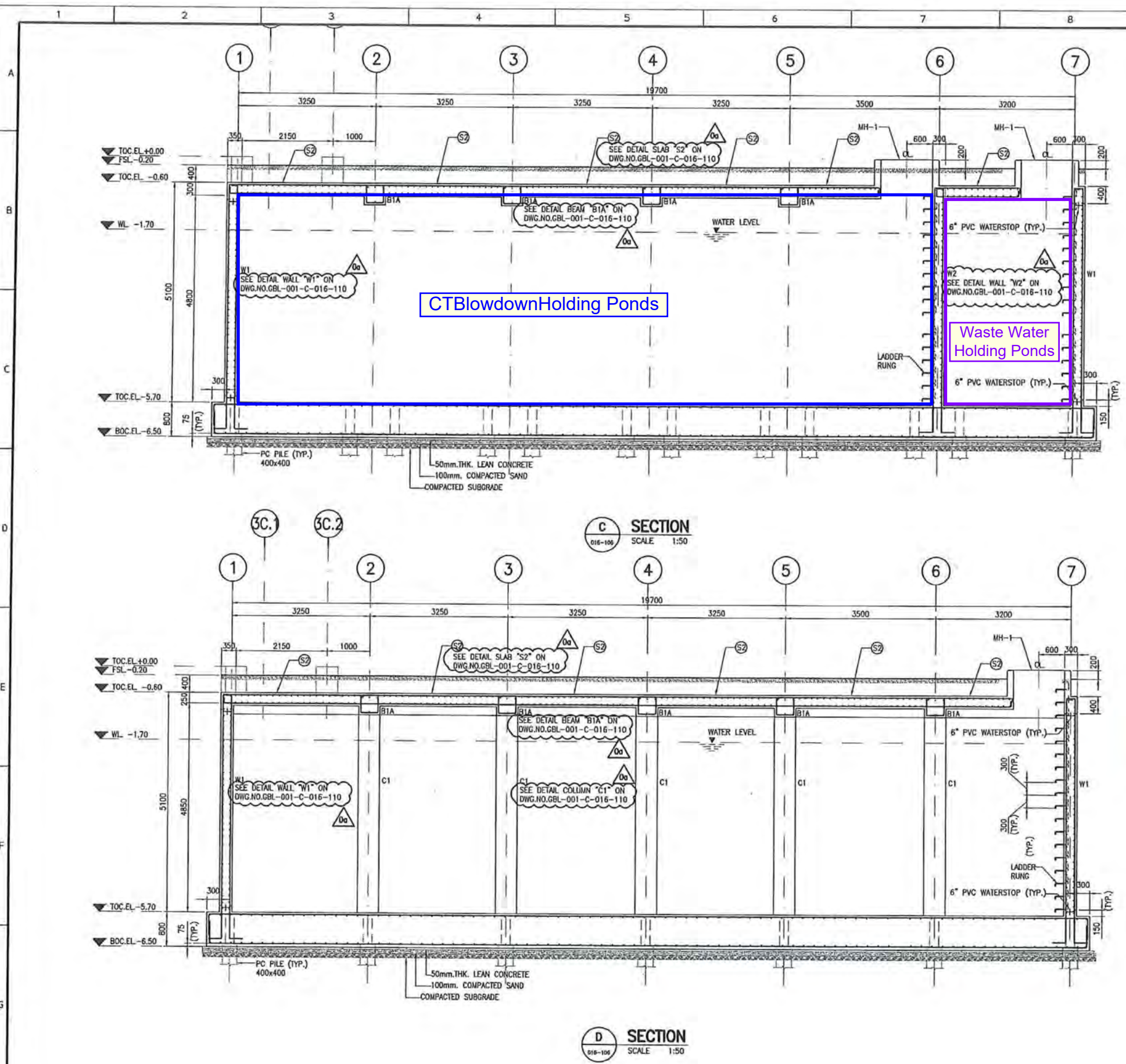
CL	CENTER LINE	TOF	TOP OF FOUNDATION
MM.	MILLIMETER	TOP.	TOP OF PLATE
M.	METER	FSL	FINISHED SURFACE LEVEL
PCO.	PILE CUT-OFF	TOC	TOP OF CONCRETE
BOF.	BOTTOM OF FOUNDATION	PIL.	PIPE INVERT LEVEL
BOC.	BOTTOM OF CONCRETE	HP.	HIGHEST POINT



**FINAL APPROVED FOR CONSTRUCTION**

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  - STRUCTURAL REQUIREMENT
    - MINIMUM CONCRETE COMPRESSIVE STRENGTH 28 DAYS (CYLINDER)
      - FOR REINFORCED CONCRETE MEMBERS ABOVE EL.±0.00  $f_c' = 27.5$  MPa
      - FOR REINFORCED CONCRETE MEMBERS AT OR BELOW EL.±0.00  $f_c' = 31$  MPa
      - FOR ROAD, GUTTER & DUCTBANKS  $f_c' = 31$  MPa
      - LEAN CONCRETE  $f_c' = 13.7$  MPa
    - STEEL REINFORCEMENT
      - MINIMUM SPECIFIED YIELD STRENGTH FOR DEFORMED  $f_y = 400$  MPa
      - MINIMUM SPECIFIED YIELD STRENGTH FOR ROUND BAR  $f_y = 240$  MPa
    - REQUIREMENTS FOR 31MPa REINFORCED CONCRETE MEMBER
      - CEMENT SHALL CONFORM TO ASTM C150 TYPE V, OR ASTM C595 IF (HS), IS (HS), IT (HS)
      - MAXIMUM WATER-CEMENT RATIO = 0.39
      - MINIMUM COVER TO REINFORCEMENT:  $d_b \leq 16$ mm, COVER = 50mm
      - $d_b > 16$ mm, COVER = 60mm
  - CONCRETE FINISH
    - TOP OF FOUNDATION ABOVE GROUND U3 STEEL TROWELED FINISH
    - TOP OF FOUNDATION BELOW GROUND U2 WOOD FLOATED FINISH
    - TOP OF PLINTHS TO BE GROUTED ROUGH FINISH MORE THAN 6 MM. PROFILE
    - TOP OF OTHER PLINTHS, GUTTER U3 STEEL TROWELED FINISH
    - GUTTER (BASE) U2 WOOD FLOATED FINISH
    - SIDES OF PLINTHS F2 SMOOTH FINISH
    - PORTION OF FOUNDATION ABOVE GROUND F2 SMOOTH FINISH
    - PORTION OF FOUNDATION BELOW GROUND F1 ROUGH FINISH
    - INSIDE WALL SURFACE F2 SMOOTH FINISH
  - THE EARTHING SYSTEM UNDER CONCRETE FOUNDATIONS SHALL BE COORDINATED AND FINISHED BEFORE CONCRETE POURING.
  - WATERPROOF ADMIXTURE APPROVED BY TOYO SHALL BE ADDED TO THE CONCRETE MIX.
- ABBREVIATIONS:**
- |     |                      |     |                        |
|-----|----------------------|-----|------------------------|
| CL  | CENTER LINE          | TOF | TOP OF FOUNDATION      |
| MM  | MILLIMETER           | TOP | TOP OF PLATE           |
| M   | METER                | FSL | FINISHED SURFACE LEVEL |
| PCO | PILE CUT-OFF         | TOC | TOP OF CONCRETE        |
| BOF | BOTTOM OF FOUNDATION | PIL | PIPE INVERT LEVEL      |
| BOC | BOTTOM OF CONCRETE   | HP  | HIGHEST POINT          |

The approval or deemed approval of drawings and documents by Owner shall not relieve Contractor/Suppliers of any of its obligations or liabilities under the Construction/Supply Contract

**A - APPROVED**

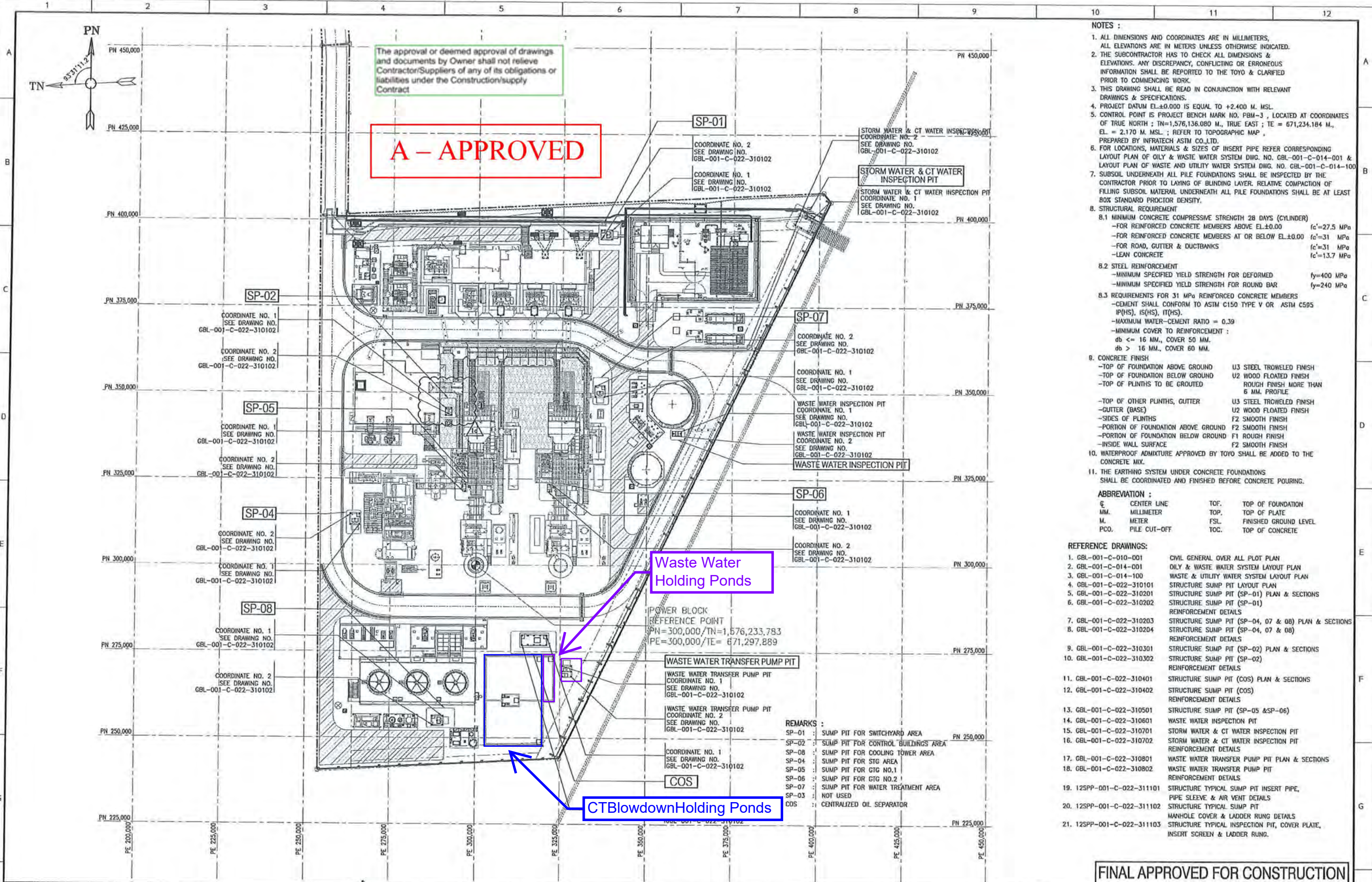
**MEMBER SCHEDULE**

MEMBER	SIZE (mm.)
W1	300 mm. THK. RC.WALL
C1	500x500 mm. (BxD) RC.COLUMN
C2	500x500 mm. (BxD) RC.COLUMN
C3	400x400 mm. (BxD) RC.COLUMN
B1&B1A	500x500 mm. (BxD) RC.BEAM
B2	400x500 mm. (BxD) RC.BEAM
B3	300x500 mm. (BxD) RC.BEAM
BS1	800 mm. THK. RC.SLAB
S1	300 mm. THK. RC.SLAB
S2	300 mm. THK. RC.SLAB
S3	300 mm. THK. RC.SLAB
C4	250x250 mm. THK. RC.COLUMN
C4A	210x210 mm. THK. RC.COLUMN
W2	300 mm. THK. RC.WALL

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<b>Gulf MP</b> Pöyry Energy Ltd. 1126/2 Vasiit Building II 22nd Floor, Room 250-2502-2201 New poshton Road, Malakass Rajchadesi, Bangkok Thailand 10400		Project Title : <b>Gulf MP</b> Document Title : <b>STRUCTURAL CT BLOWDOWN/WASTE WATER HOLDING PONDS REINFORCEMENT DETAILS</b>	Prep'd. SKS Chkd. ACB App'd. MU Auth'd. - DATE 12/07/16	Document No.: <b>GBL-001-C-016-108</b> Project No.: SIF0102092	Page No.: 1 of 1 Scale: 1:100 File Name: GBL-001-C-016-108_0a_A01
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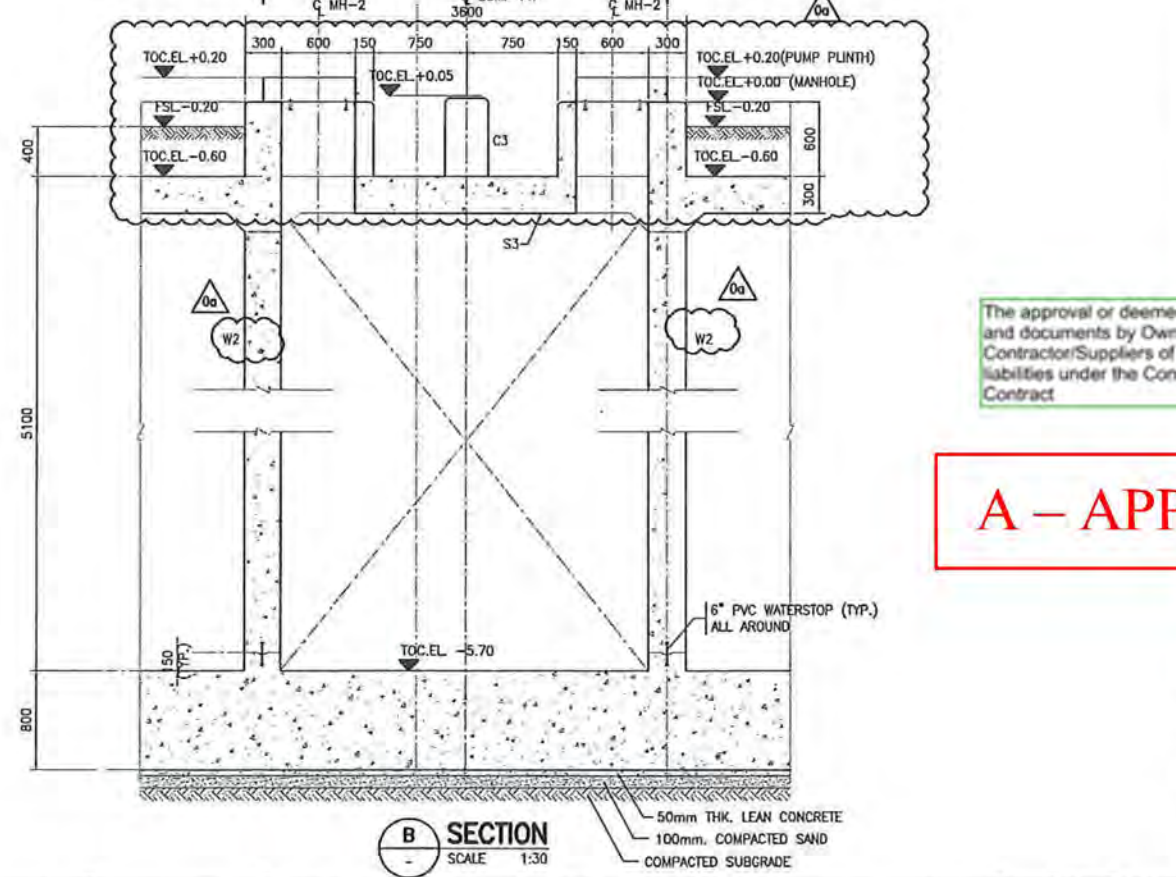
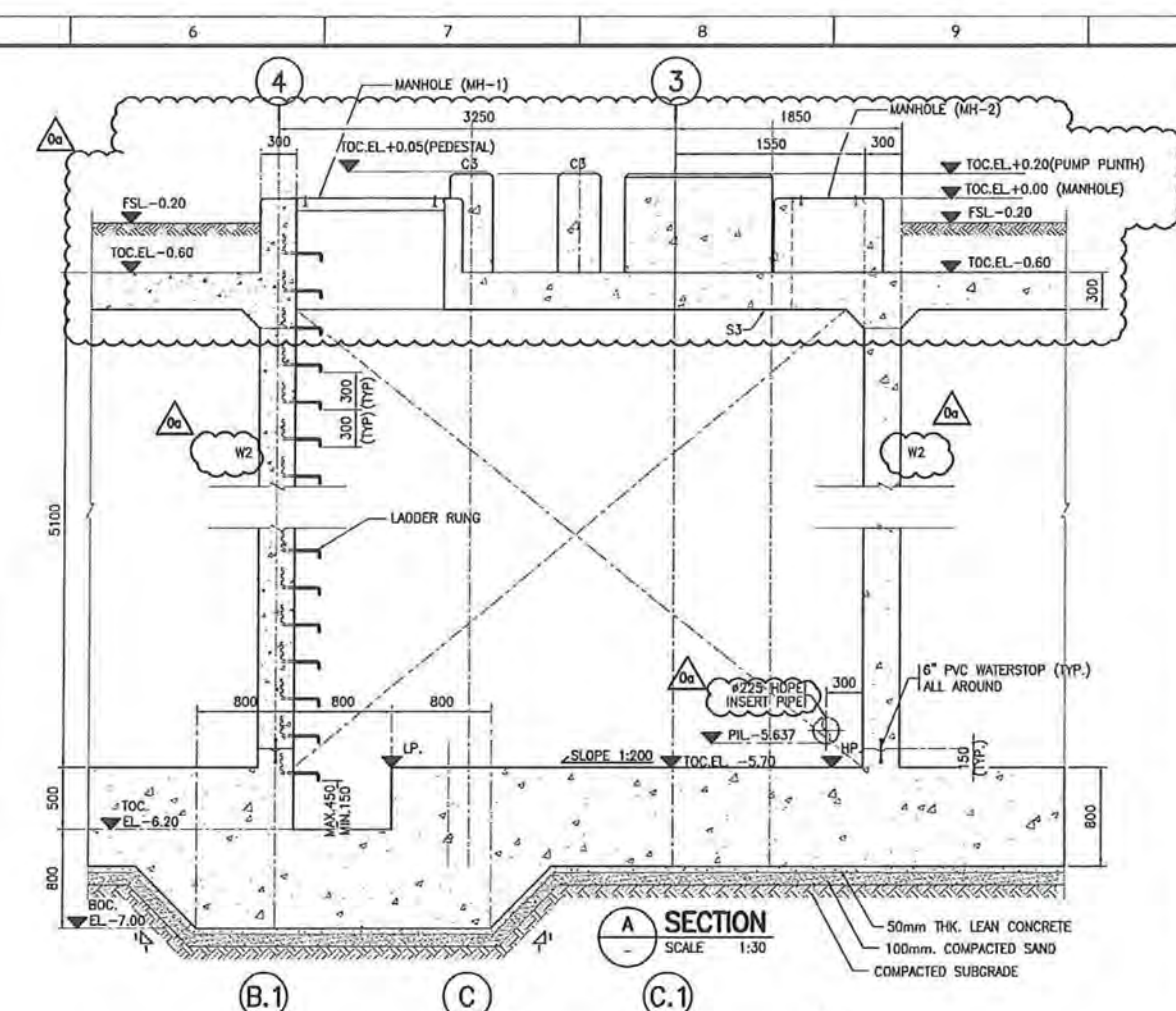
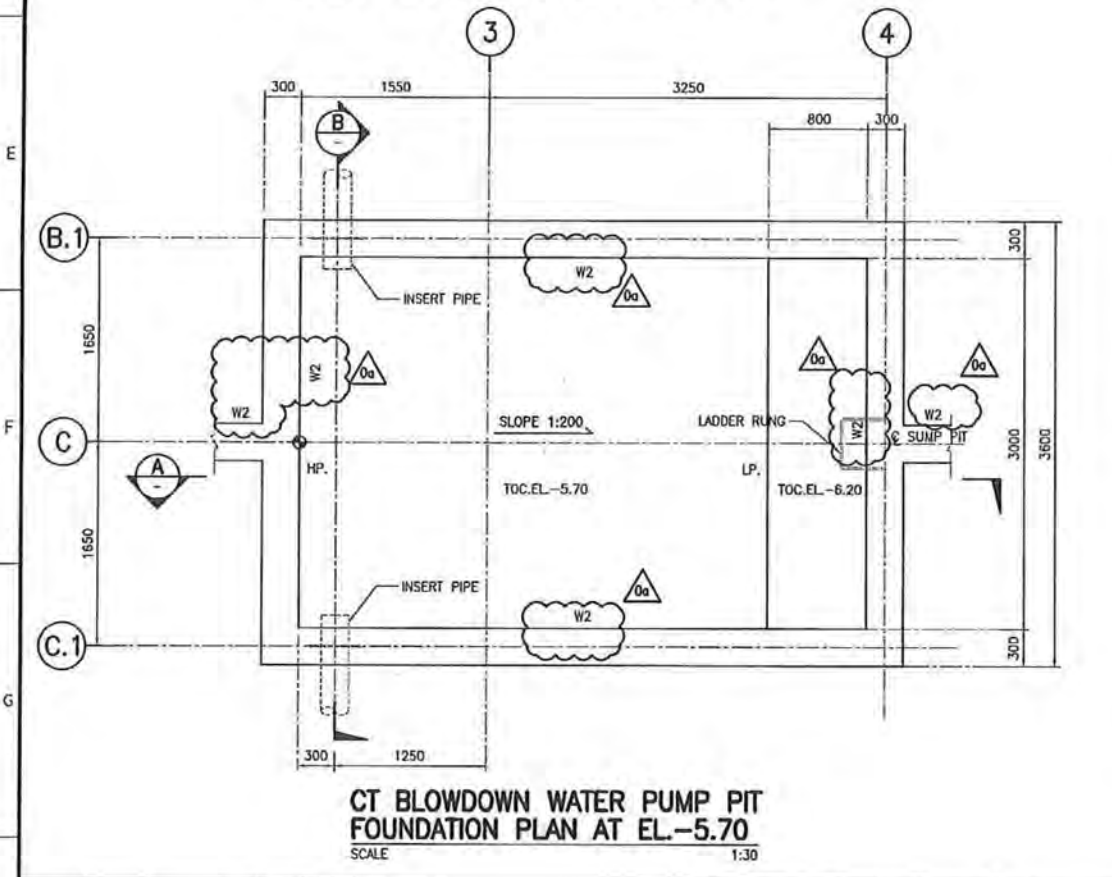
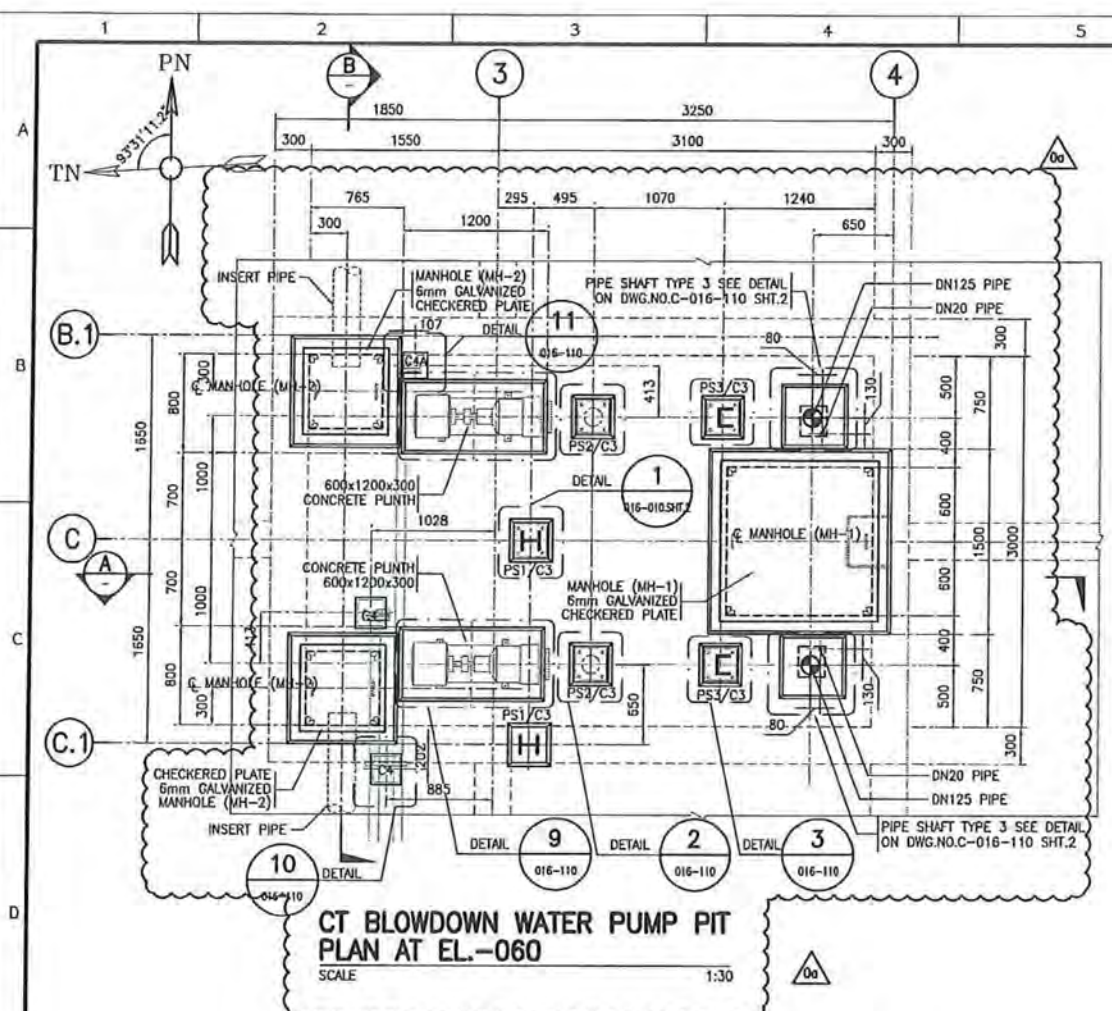


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  2. THE SUBCONTRACTOR HAS TO CHECK ALL DIMENSIONS & ELEVATIONS. ANY DISCREPANCY, CONFLICTING OR ERRONEOUS INFORMATION SHALL BE REPORTED TO THE TOYO & CLARIFIED PRIOR TO COMMENCING WORK.
  3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH RELEVANT DRAWINGS & SPECIFICATIONS.
  4. PROJECT DATUM EL.±0.000 IS EQUAL TO +2.400 M. MSL.
  5. CONTROL POINT IS PROJECT BENCH MARK NO. PBM-3, LOCATED AT COORDINATES OF TRUE NORTH : TN=1,576,136.080 M., TRUE EAST : TE = 671,234.184 M., EL. = 2.170 M. MSL ; REFER TO TOPOGRAPHIC MAP , PREPARED BY INFRA TECH ASTM CO.,LTD.
  6. FOR LOCATIONS, MATERIALS & SIZES OF INSERT PIPE REFER CORRESPONDING LAYOUT PLAN OF OILY & WASTE WATER SYSTEM DWG. NO. GBL-001-C-014-001 & LAYOUT PLAN OF WASTE AND UTILITY WATER SYSTEM DWG. NO. GBL-001-C-014-100
  7. SUBSOIL UNDERNEATH ALL PILE FOUNDATIONS SHALL BE INSPECTED BY THE CONTRACTOR PRIOR TO LAYING OF BUILDING LAYER. RELATIVE COMPACTION OF FILLING SUBSOIL MATERIAL UNDERNEATH ALL PILE FOUNDATIONS SHALL BE AT LEAST 80% STANDARD PROCTOR DENSITY.
  8. STRUCTURAL REQUIREMENT
    - 8.1 MINIMUM CONCRETE COMPRESSIVE STRENGTH 28 DAYS (CYLINDER)
      - FOR REINFORCED CONCRETE MEMBERS ABOVE EL.±0.00  $f_c=27.5$  MPa
      - FOR REINFORCED CONCRETE MEMBERS AT OR BELOW EL.±0.00  $f_c=31$  MPa
      - FOR ROAD, GUTTER & DUCTBANKS  $f_c=31$  MPa
      - LEAN CONCRETE  $f_c=13.7$  MPa
    - 8.2 STEEL REINFORCEMENT
      - MINIMUM SPECIFIED YIELD STRENGTH FOR DEFORMED  $f_y=400$  MPa
      - MINIMUM SPECIFIED YIELD STRENGTH FOR ROUND BAR  $f_y=240$  MPa
    - 8.3 REQUIREMENTS FOR 31 MPa REINFORCED CONCRETE MEMBERS
      - CEMENT SHALL CONFORM TO ASTM C150 TYPE V OR ASTM C595 IP(HS), IS(HS), IT(HS).
      - MAXIMUM WATER-CEMENT RATIO = 0.39
      - MINIMUM COVER TO REINFORCEMENT :
        - $d_b \leq 16$  MM., COVER 50 MM.
        - $d_b > 16$  MM., COVER 60 MM.
  9. CONCRETE FINISH
    - TOP OF FOUNDATION ABOVE GROUND U3 STEEL TROWELED FINISH
    - TOP OF FOUNDATION BELOW GROUND U2 WOOD FLOATED FINISH
    - TOP OF PLINTHS TO BE GROUTED ROUGH FINISH MORE THAN 6 MM. PROFILE
    - TOP OF OTHER PLINTHS, GUTTER U3 STEEL TROWELED FINISH
    - GUTTER (BASE) U2 WOOD FLOATED FINISH
    - SIDES OF PLINTHS F2 SMOOTH FINISH
    - PORTION OF FOUNDATION ABOVE GROUND F2 SMOOTH FINISH
    - PORTION OF FOUNDATION BELOW GROUND F1 ROUGH FINISH
    - INSIDE WALL SURFACE F2 SMOOTH FINISH
  10. WATERPROOF ADMIXTURE APPROVED BY TOYO SHALL BE ADDED TO THE CONCRETE MIX.
  11. THE EARTHING SYSTEM UNDER CONCRETE FOUNDATIONS SHALL BE COORDINATED AND FINISHED BEFORE CONCRETE POURING.
- ABBREVIATION :**
- |      |              |      |                       |
|------|--------------|------|-----------------------|
| CL   | CENTER LINE  | TOF. | TOP OF FOUNDATION     |
| MM.  | MILLIMETER   | TOP. | TOP OF PLATE          |
| M.   | METER        | FSL. | FINISHED GROUND LEVEL |
| PCO. | PILE CUT-OFF | TOC. | TOP OF CONCRETE       |
- REFERENCE DRAWINGS:**
- |                            |   |
|----------------------------|---|
| 1. GBL-001-C-010-001       | CIVIL GENERAL OVER ALL PLOT PLAN  |
| 2. GBL-001-C-014-001       | OILY & WASTE WATER SYSTEM LAYOUT PLAN                                       |
| 3. GBL-001-C-014-100       | WASTE & UTILITY WATER SYSTEM LAYOUT PLAN                                    |
| 4. GBL-001-C-022-310101    | STRUCTURE SUMP PIT LAYOUT PLAN  |
| 5. GBL-001-C-022-310201    | STRUCTURE SUMP PIT (SP-01) PLAN & SECTIONS                                  |
| 6. GBL-001-C-022-310202    | STRUCTURE SUMP PIT (SP-01) REINFORCEMENT DETAILS                            |
| 7. GBL-001-C-022-310203    | STRUCTURE SUMP PIT (SP-04, 07 & 08) PLAN & SECTIONS                         |
| 8. GBL-001-C-022-310204    | STRUCTURE SUMP PIT (SP-04, 07 & 08) REINFORCEMENT DETAILS                   |
| 9. GBL-001-C-022-310301    | STRUCTURE SUMP PIT (SP-02) PLAN & SECTIONS                                  |
| 10. GBL-001-C-022-310302   | STRUCTURE SUMP PIT (SP-02) REINFORCEMENT DETAILS                            |
| 11. GBL-001-C-022-310401   | STRUCTURE SUMP PIT (COS) PLAN & SECTIONS                                    |
| 12. GBL-001-C-022-310402   | STRUCTURE SUMP PIT (COS) REINFORCEMENT DETAILS                              |
| 13. GBL-001-C-022-310501   | STRUCTURE SUMP PIT (SP-05 & SP-06)  |
| 14. GBL-001-C-022-310601   | WASTE WATER INSPECTION PIT  |
| 15. GBL-001-C-022-310701   | STORM WATER & CT WATER INSPECTION PIT                                       |
| 16. GBL-001-C-022-310702   | STORM WATER & CT WATER INSPECTION PIT REINFORCEMENT DETAILS                 |
| 17. GBL-001-C-022-310801   | WASTE WATER TRANSFER PUMP PIT PLAN & SECTIONS                               |
| 18. GBL-001-C-022-310802   | WASTE WATER TRANSFER PUMP PIT REINFORCEMENT DETAILS                         |
| 19. 12SPP-001-C-022-311101 | STRUCTURE TYPICAL SUMP PIT INSERT PIPE, PIPE SLEEVE & AIR VENT DETAILS      |
| 20. 12SPP-001-C-022-311102 | STRUCTURE TYPICAL SUMP PIT MANHOLE COVER & LADDER RUNG DETAILS              |
| 21. 12SPP-001-C-022-311103 | STRUCTURE TYPICAL INSPECTION PIT, COVER PLATE, INSERT SCREEN & LADDER RUNG. |

**FINAL APPROVED FOR CONSTRUCTION**

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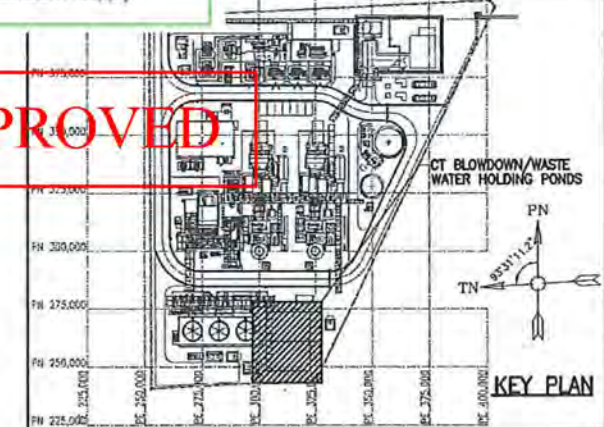




- NOTES :**
- ALL DIMENSIONS AND COORDINATES ARE IN MILLIMETERS, ALL ELEVATIONS ARE IN METERS UNLESS OTHERWISE INDICATED.
  - THE SUBCONTRACTOR HAS TO CHECK ALL DIMENSIONS & ELEVATIONS. ANY DISCREPANCY, CONFLICTING OR ERRONEOUS INFORMATION SHALL BE REPORTED TO THE TOYO & CLARIFIED PRIOR TO COMMENCING WORK.
  - THIS DRAWING SHALL BE READ IN CONJUNCTION WITH RELEVANT DRAWINGS & SPECIFICATIONS.
  - PROJECT DATUM EL.±0.00 IS EQUAL TO +2.400 m. MSL.
  - CONTROL POINT IS PROJECT BENCH MARK NO. PBW-3, LOCATED AT COORDINATES OF TRUE NORTH : TN=1,576,136.080 M., TRUE EAST : TE = 671,234.184 M., EL. = 2.170 MSL ; REFER TO TOPOGRAPHIC MAP, PREPARED BY INFRA TECH ASTM CO., LTD.
  - SUBSOIL UNDERNEATH ALL PILE FOUNDATIONS SHALL BE INSPECTED BY THE CONTRACTOR PRIOR TO LAYING OF BLINDING LAYER, RELATIVE COMPACTION OF FILLING SUBSOIL MATERIAL UNDERNEATH ALL PILE FOUNDATIONS SHALL BE AT LEAST 80% STANDARD PROCTOR DENSITY.
  - STRUCTURAL REQUIREMENT
    - MINIMUM CONCRETE COMPRESSIVE STRENGTH 28 DAYS (CYLINDER)
      - FOR REINFORCED CONCRETE MEMBERS ABOVE EL.±0.00  $f_c' = 27.5 \text{ MPa}$
      - FOR REINFORCED CONCRETE MEMBERS AT OR BELOW EL.±0.00  $f_c' = 31 \text{ MPa}$
      - FOR ROAD, GUTTER & DUCTBANKS  $f_c' = 31 \text{ MPa}$
      - LEAN CONCRETE  $f_c' = 13.7 \text{ MPa}$
    - STEEL REINFORCEMENT
      - MINIMUM SPECIFIED YIELD STRENGTH FOR DEFORMED  $f_y = 400 \text{ MPa}$
      - MINIMUM SPECIFIED YIELD STRENGTH FOR ROUND BAR  $f_y = 240 \text{ MPa}$
    - REQUIREMENTS FOR 31MPa REINFORCED CONCRETE MEMBER
      - CONCRETE SHALL CONFORM TO ASTM C150 TYPE V, OR ASTM C595 (F(HS), IS(HS), II(HS))
      - MAXIMUM WATER-CEMENT RATIO = 0.39
      - MINIMUM COVER TO REINFORCEMENT:  $d_b \leq 16\text{mm}$ , COVER = 50mm
  - CONCRETE FINISH
    - TOP OF FOUNDATION ABOVE GROUND U3 STEEL TROWELED FINISH
    - TOP OF FOUNDATION BELOW GROUND U2 WOOD FLOATED FINISH
    - TOP OF PLINTHS TO BE GROUTED ROUGH FINISH MORE THAN 6 MM. PROFILE
    - TOP OF OTHER PLINTHS, GUTTER U3 STEEL TROWELED FINISH
    - GUTTER (BASE) U2 WOOD FLOATED FINISH
    - SIDES OF PLINTHS F2 SMOOTH FINISH
    - PORTION OF FOUNDATION ABOVE GROUND F2 SMOOTH FINISH
    - PORTION OF FOUNDATION BELOW GROUND F1 ROUGH FINISH
    - INSIDE WALL SURFACE F2 SMOOTH FINISH
  - THE EARTHING SYSTEM UNDER CONCRETE FOUNDATIONS SHALL BE COORDINATED AND FINISHED BEFORE CONCRETE POURING.
  - WATERPROOF ADMIXTURE APPROVED BY TOYO SHALL BE ADDED TO THE CONCRETE MIX.
- ABBREVIATIONS:**
- |     |                      |     |                        |
|-----|----------------------|-----|------------------------|
| CL  | CENTER LINE          | TOF | TOP OF FOUNDATION      |
| MM  | MILLIMETER           | TOP | TOP OF PLATE           |
| M   | METER                | FSL | FINISHED SURFACE LEVEL |
| PCO | PILE CUT-OFF         | TOC | TOP OF CONCRETE        |
| BOF | BOTTOM OF FOUNDATION | PIL | PIPE INVERT LEVEL      |
| BOC | BOTTOM OF CONCRETE   | HP  | HIGHEST POINT          |
- REFERENCE DRAWINGS:**
- GBL-001-C-016-012 CT BLOWDOWN/WASTE WATER HOLDING PONDS FRAMING PLAN AT EL. -0.60
  - 12SP-001-C-022-311101 TYPICAL SUMP PIT INSERT PIPE, PIPE SLEEVE & AIR VENT DETAILS
  - 12SP-001-C-022-311102 TYPICAL SUMP PIT MANHOLE COVER & LADDER RUNG DETAILS
  - 12SP-001-C-022-310102 STRUCTURE SUMP PIT TYPE I, REINFORCEMENT DETAILS

The approval or deemed approval of drawings and documents by Owner shall not relieve Contractor/Suppliers of any of its obligations or liabilities under the Construction/supply Contract

**A - APPROVED**



**FINAL APPROVED FOR CONSTRUCTION**

H 0 A Gulf Pöry Rev. No. Date Description	28/04/2017 03/03/2017 FINAL APPROVED FOR CONSTRUCTION FOR APPROVAL WRP ACB MU WRP ACB MU WRP ACB MU	Gulf MP	Pöry Energy Ltd. 1136/2 Vasi Building II 22nd Floor, Room 70-2202-2204 New Petchburi Road, Makuson Rajchaburi, Bangkok Thailand 10400	Project Title : Gulf MP Document Title : STRUCTURE CT BLOWDOWN/WASTE WATER PUMP PIT PLAN & SECTIONS	Prepd. SSK Chkd. ACB Appd. MU Authd. - DATE 12/07/15 Project No. : 04X192002 Document No. : GBL-001-C-016-111 Copyright 2014 All right Reserved : Pöry Energy Ltd.	Page No. : A1 Scale : 1:30 File Name : CBL-001-C-016-111_01.dwg
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ภาคผนวก ข-14

ผลการตรวจวัดคุณภาพน้ำทิ้งจากระบบ Online Monitoring

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GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
01-Jul-25 09:00:00	5.77	7.17	1111.44	33.11
01-Jul-25 10:00:00	5.79	7.16	1099.70	33.39
04-Jul-25 22:00:00	6.08	7.22	1118.76	30.25
04-Jul-25 23:00:00	6.04	7.23	1107.69	30.11
05-Jul-25 00:00:00	6.00	7.22	1105.21	30.01
05-Jul-25 01:00:00	5.96	7.22	1102.74	29.92
05-Jul-25 02:00:00	5.92	7.21	1100.26	29.89
05-Jul-25 03:00:00	5.88	7.20	1097.79	30.06
05-Jul-25 04:00:00	5.84	7.20	1095.31	30.12
05-Jul-25 05:00:00	5.80	7.19	1092.84	30.18
05-Jul-25 06:00:00	5.77	7.18	1090.36	30.46
08-Jul-25 03:00:00	5.97	7.19	1104.13	29.23
08-Jul-25 04:00:00	5.94	7.19	1113.97	29.78
08-Jul-25 05:00:00	5.91	7.19	1131.98	29.60
08-Jul-25 06:00:00	5.88	7.19	1149.99	29.80
08-Jul-25 07:00:00	5.85	7.19	1168.00	30.30
08-Jul-25 08:00:00	5.82	7.19	1174.16	30.86
08-Jul-25 09:00:00	5.79	7.19	1179.70	31.59
15-Jul-25 21:00:00	6.19	7.10	1132.99	30.56
15-Jul-25 22:00:00	6.17	7.09	1119.35	30.59
15-Jul-25 23:00:00	6.15	7.09	1122.30	30.63
16-Jul-25 00:00:00	6.13	7.09	1125.25	30.34
16-Jul-25 01:00:00	6.11	7.09	1128.19	29.20
16-Jul-25 02:00:00	6.09	7.09	1131.14	30.21
16-Jul-25 03:00:00	6.07	7.10	1134.09	29.88
16-Jul-25 04:00:00	6.05	7.11	1137.03	29.88
16-Jul-25 05:00:00	6.03	7.11	1140.01	30.11
16-Jul-25 06:00:00	6.00	7.12	1143.25	30.33
16-Jul-25 07:00:00	5.98	7.12	1146.49	30.59
16-Jul-25 08:00:00	5.95	7.13	1149.73	30.93
16-Jul-25 09:00:00	5.93	7.13	1152.96	31.50
16-Jul-25 10:00:00	5.90	7.13	1156.20	32.18
16-Jul-25 11:00:00	5.88	7.14	1159.44	32.31
16-Jul-25 12:00:00	5.86	7.14	1162.68	32.23
16-Jul-25 13:00:00	5.83	7.14	1165.50	32.37
23-Jul-25 20:00:00	6.26	7.27	1142.46	30.09
23-Jul-25 21:00:00	6.23	7.27	1142.85	30.09
23-Jul-25 22:00:00	6.21	7.26	1143.24	30.11
23-Jul-25 23:00:00	6.18	7.25	1143.63	30.13
24-Jul-25 00:00:00	6.15	7.23	1144.02	29.54
24-Jul-25 01:00:00	6.13	7.22	1144.41	28.02
24-Jul-25 02:00:00	6.10	7.21	1144.81	29.49
24-Jul-25 03:00:00	6.08	7.20	1145.20	29.99
24-Jul-25 04:00:00	6.03	7.19	1145.77	30.20
24-Jul-25 05:00:00	5.99	7.18	1147.14	30.41
24-Jul-25 06:00:00	5.94	7.17	1148.50	30.51
24-Jul-25 07:00:00	5.90	7.16	1149.87	30.56

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
24-Jul-25 08:00:00	5.81	7.14	1151.23	30.72
24-Jul-25 09:00:00	5.79	7.14	1152.60	30.85
24-Jul-25 10:00:00	5.78	7.14	1154.11	30.94
24-Jul-25 11:00:00	5.77	7.15	1155.69	31.68
24-Jul-25 12:00:00	5.75	7.15	1157.27	32.17
24-Jul-25 13:00:00	5.74	7.15	1158.85	32.07
24-Jul-25 14:00:00	5.73	7.15	1160.43	31.79
24-Jul-25 15:00:00	5.71	7.15	1162.01	31.49
24-Jul-25 16:00:00	5.69	7.15	1163.59	31.52
26-Jul-25 23:00:00	5.70	7.16	1139.53	28.34
27-Jul-25 00:00:00	5.67	7.17	1141.27	29.21
27-Jul-25 01:00:00	5.64	7.18	1151.69	29.26
27-Jul-25 02:00:00	5.60	7.20	1162.11	28.86
02-Aug-25 20:00:00	6.07	7.28	1228.04	31.19
02-Aug-25 21:00:00	6.04	7.28	1238.56	30.46
02-Aug-25 22:00:00	6.01	7.28	1249.09	30.37
02-Aug-25 23:00:00	5.97	7.28	1259.61	30.32
03-Aug-25 00:00:00	5.94	7.28	1270.14	30.31
03-Aug-25 01:00:00	5.91	7.28	1280.66	30.24
03-Aug-25 02:00:00	5.88	7.28	1291.19	30.18
03-Aug-25 03:00:00	5.84	7.28	1296.81	30.11
03-Aug-25 04:00:00	5.81	7.27	1300.66	30.10
03-Aug-25 05:00:00	5.78	7.27	1304.52	30.23
03-Aug-25 06:00:00	5.75	7.27	1308.37	30.36
03-Aug-25 07:00:00	5.72	7.26	1312.22	30.74
06-Aug-25 15:00:00	6.13	7.23	1188.92	33.28
06-Aug-25 16:00:00	6.22	7.22	1180.54	32.68
06-Aug-25 17:00:00	6.22	7.22	1177.39	32.19
06-Aug-25 18:00:00	6.20	7.22	1174.24	31.89
06-Aug-25 19:00:00	6.17	7.22	1171.09	31.17
06-Aug-25 20:00:00	6.14	7.21	1167.94	31.02
06-Aug-25 21:00:00	6.11	7.21	1164.79	31.33
06-Aug-25 22:00:00	6.08	7.21	1161.63	31.42
06-Aug-25 23:00:00	6.05	7.20	1161.25	31.46
07-Aug-25 00:00:00	6.02	7.20	1161.75	31.49
07-Aug-25 01:00:00	5.99	7.19	1162.25	31.53
07-Aug-25 02:00:00	5.96	7.19	1162.75	31.56
07-Aug-25 03:00:00	5.92	7.18	1163.25	31.60
07-Aug-25 04:00:00	5.89	7.18	1163.75	31.63
07-Aug-25 05:00:00	5.86	7.16	1164.25	31.57
11-Aug-25 19:00:00	1.80	6.81	1304.53	30.13
11-Aug-25 20:00:00	6.12	7.19	1106.27	30.04
11-Aug-25 21:00:00	6.08	7.19	1096.15	30.17
11-Aug-25 22:00:00	6.04	7.20	1086.03	30.29
11-Aug-25 23:00:00	6.00	7.20	1075.90	30.40
12-Aug-25 00:00:00	5.96	7.21	1072.91	30.42
12-Aug-25 01:00:00	5.92	7.21	1073.02	30.27

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
12-Aug-25 02:00:00	5.88	7.22	1073.14	30.28
12-Aug-25 03:00:00	5.84	7.22	1073.25	30.64
12-Aug-25 04:00:00	5.81	7.21	1073.36	30.91
16-Aug-25 14:00:00	6.08	7.15	1016.16	32.39
16-Aug-25 15:00:00	6.06	7.15	1010.72	31.77
16-Aug-25 16:00:00	6.04	7.15	1005.29	31.70
16-Aug-25 17:00:00	6.02	7.16	999.85	31.28
16-Aug-25 18:00:00	6.01	7.16	1002.00	31.12
16-Aug-25 19:00:00	5.99	7.16	1004.56	30.94
16-Aug-25 20:00:00	5.97	7.17	1007.12	31.06
16-Aug-25 21:00:00	5.95	7.17	1009.68	31.05
16-Aug-25 22:00:00	5.93	7.16	1012.24	31.26
16-Aug-25 23:00:00	5.90	7.16	1014.80	31.40
21-Aug-25 20:00:00	6.38	7.15	1074.79	28.16
21-Aug-25 21:00:00	6.35	7.18	1118.21	29.32
21-Aug-25 22:00:00	6.32	7.18	1147.36	27.02
21-Aug-25 23:00:00	6.32	7.19	1189.88	27.98
22-Aug-25 00:00:00	6.35	7.19	1203.55	28.36
22-Aug-25 01:00:00	6.39	7.18	1210.56	29.60
22-Aug-25 02:00:00	6.43	7.17	1217.57	29.65
22-Aug-25 03:00:00	6.46	7.16	1224.59	30.09
22-Aug-25 04:00:00	6.43	7.15	1230.89	30.32
22-Aug-25 05:00:00	6.39	7.15	1232.23	30.46
22-Aug-25 06:00:00	6.35	7.14	1233.58	30.59
22-Aug-25 07:00:00	6.31	7.13	1234.92	30.73
22-Aug-25 08:00:00	6.27	7.12	1236.27	30.94
22-Aug-25 09:00:00	6.23	7.12	1237.61	31.60
22-Aug-25 10:00:00	6.19	7.12	1238.96	32.12
22-Aug-25 11:00:00	6.15	7.12	1240.31	32.72
22-Aug-25 12:00:00	6.11	7.12	1241.52	32.65
22-Aug-25 13:00:00	6.08	7.12	1242.42	32.48
22-Aug-25 14:00:00	6.04	7.12	1243.31	31.89
22-Aug-25 15:00:00	6.00	7.12	1244.20	31.66
22-Aug-25 16:00:00	5.96	7.12	1245.10	31.41
25-Aug-25 08:00:00	6.12	7.09	1095.29	30.59
25-Aug-25 09:00:00	6.12	7.09	1086.16	31.89
25-Aug-25 10:00:00	6.12	7.10	1076.32	32.41
25-Aug-25 12:00:00	6.06	7.11	1056.64	32.64
25-Aug-25 13:00:00	6.03	7.11	1054.23	32.65
25-Aug-25 14:00:00	6.01	7.12	1055.26	33.30
25-Aug-25 15:00:00	5.99	7.13	1056.28	32.15
25-Aug-25 16:00:00	5.97	7.12	1057.31	30.90
25-Aug-25 17:00:00	5.94	7.11	1058.34	30.74
29-Aug-25 20:00:00	6.17	7.02	1106.38	30.44
29-Aug-25 21:00:00	6.15	7.04	1116.72	30.26
29-Aug-25 22:00:00	6.14	7.04	1127.07	30.11
29-Aug-25 23:00:00	6.13	7.04	1137.42	29.96

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
30-Aug-25 00:00:00	6.11	7.05	1147.76	29.81
30-Aug-25 01:00:00	6.10	7.05	1158.11	29.82
30-Aug-25 02:00:00	6.08	7.05	1168.45	29.95
30-Aug-25 03:00:00	6.07	7.05	1174.53	30.08
30-Aug-25 04:00:00	6.03	7.05	1177.27	30.21
30-Aug-25 05:00:00	6.00	7.05	1180.00	30.29
30-Aug-25 06:00:00	5.96	7.05	1182.73	30.36
30-Aug-25 07:00:00	5.93	7.04	1185.47	30.44
30-Aug-25 08:00:00	5.90	7.04	1188.20	30.77
23-Sep-25 08:00:00	4.96	6.96	995.84	29.44
23-Sep-25 09:00:00	4.93	6.97	994.24	31.85
23-Sep-25 10:00:00	4.91	6.97	995.98	30.77
23-Sep-25 14:00:00	4.81	6.94	970.78	33.20
23-Sep-25 15:00:00	4.85	6.98	978.50	33.20
23-Sep-25 16:00:00	4.85	6.97	984.10	33.20
23-Sep-25 17:00:00	4.86	6.97	986.77	33.20
23-Sep-25 18:00:00	4.86	6.97	989.44	33.20
23-Sep-25 19:00:00	4.87	6.96	992.11	33.20
23-Sep-25 20:00:00	4.88	6.96	994.78	33.20
23-Sep-25 21:00:00	4.87	6.95	997.45	33.20
23-Sep-25 22:00:00	4.85	6.95	1000.13	33.20
23-Sep-25 23:00:00	4.82	6.94	1002.80	33.20
24-Sep-25 00:00:00	4.79	6.94	1004.51	33.20
24-Sep-25 01:00:00	4.77	6.93	1005.81	33.20
24-Sep-25 02:00:00	4.74	6.93	1007.11	33.20
24-Sep-25 03:00:00	4.71	6.92	1008.41	33.20
24-Sep-25 04:00:00	4.69	6.92	1009.71	33.20
24-Sep-25 05:00:00	4.66	6.91	1011.02	30.84
24-Sep-25 06:00:00	4.63	6.91	1012.32	30.91
24-Sep-25 07:00:00	4.60	6.91	1013.62	30.98
24-Sep-25 08:00:00	4.56	6.91	1014.50	31.34
24-Sep-25 09:00:00	4.53	6.90	1015.32	31.82
01-Oct-25 12:00:00	4.87	7.74	1329.14	31.85
01-Oct-25 13:00:00	4.99	7.70	1328.92	30.77
01-Oct-25 14:00:00	4.98	7.63	1329.44	33.20
01-Oct-25 15:00:00	4.96	7.64	1329.95	33.20
01-Oct-25 16:00:00	4.95	7.64	1330.47	33.20
02-Oct-25 12:00:00	4.89	7.63	1336.53	33.20
02-Oct-25 13:00:00	4.97	7.63	1336.43	33.20
02-Oct-25 14:00:00	4.99	7.65	1336.37	33.20
02-Oct-25 15:00:00	5.01	7.67	1336.31	33.20
02-Oct-25 16:00:00	5.02	7.63	1336.25	33.20
02-Oct-25 17:00:00	5.03	7.62	1336.19	33.20
02-Oct-25 18:00:00	5.05	7.59	1336.13	33.20
02-Oct-25 19:00:00	5.02	7.57	1336.07	32.12
02-Oct-25 20:00:00	4.98	7.53	1336.00	29.83
02-Oct-25 21:00:00	4.94	7.47	1336.49	28.53

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
02-Oct-25 22:00:00	4.90	7.53	1337.21	27.61
02-Oct-25 23:00:00	4.86	7.52	1337.92	26.95
03-Oct-25 00:00:00	4.83	7.52	1338.63	26.39
03-Oct-25 01:00:00	4.79	7.49	1339.34	25.83
03-Oct-25 02:00:00	4.77	7.47	1340.06	25.51
03-Oct-25 03:00:00	4.76	7.48	1340.77	25.28
03-Oct-25 04:00:00	4.76	7.48	1341.48	25.40
03-Oct-25 05:00:00	4.78	7.47	1342.91	25.41
03-Oct-25 06:00:00	4.84	7.46	1344.45	25.32
03-Oct-25 07:00:00	4.89	7.45	1345.98	25.27
04-Oct-25 11:00:00	5.13	7.67	1261.42	31.85
04-Oct-25 12:00:00	5.16	7.68	1259.30	30.77
04-Oct-25 13:00:00	5.17	7.67	1257.19	33.20
04-Oct-25 14:00:00	6.92	7.72	1255.07	33.20
04-Oct-25 15:00:00	6.98	7.70	1252.96	33.20
04-Oct-25 16:00:00	7.00	7.68	1250.84	33.20
04-Oct-25 17:00:00	6.99	7.73	1248.30	33.20
04-Oct-25 18:00:00	6.98	7.59	1245.58	33.20
04-Oct-25 19:00:00	6.94	7.54	1244.63	33.20
04-Oct-25 20:00:00	6.92	7.59	1246.69	33.20
04-Oct-25 21:00:00	6.90	7.62	1248.76	33.20
04-Oct-25 22:00:00	6.87	7.58	1250.83	33.20
04-Oct-25 23:00:00	6.85	7.53	1252.89	27.16
05-Oct-25 00:00:00	6.83	7.50	1254.96	26.49
05-Oct-25 01:00:00	6.80	7.50	1257.02	25.84
05-Oct-25 02:00:00	6.76	7.52	1259.09	25.54
05-Oct-25 03:00:00	6.72	7.54	1260.27	25.24
05-Oct-25 04:00:00	6.67	7.55	1260.66	25.38
05-Oct-25 05:00:00	6.62	7.55	1261.06	25.43
05-Oct-25 06:00:00	6.57	7.54	1261.45	25.32
05-Oct-25 07:00:00	6.52	7.57	1261.85	25.21
09-Oct-25 01:00:00	6.94	7.74	1211.10	24.72
09-Oct-25 02:00:00	6.92	7.72	1212.50	24.52
09-Oct-25 03:00:00	6.90	7.76	1213.35	24.58
09-Oct-25 04:00:00	6.89	7.74	1214.20	24.73
09-Oct-25 05:00:00	6.87	7.72	1215.05	24.64
09-Oct-25 06:00:00	6.86	7.73	1215.90	24.46
09-Oct-25 07:00:00	6.85	7.72	1216.75	24.62
11-Oct-25 04:00:00	7.05	7.78	969.53	24.45
11-Oct-25 05:00:00	7.03	7.75	985.61	24.13
11-Oct-25 06:00:00	7.00	7.76	1003.58	23.75
11-Oct-25 07:00:00	4.20	7.66	1017.45	23.87
11-Oct-25 08:00:00	4.15	7.72	1283.99	28.38
11-Oct-25 10:00:00	4.07	7.83	1282.14	32.99
11-Oct-25 11:00:00	5.49	7.83	1281.22	31.85
11-Oct-25 12:00:00	5.47	7.81	1280.30	30.77
11-Oct-25 13:00:00	5.45	7.82	1279.37	33.20

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
11-Oct-25 14:00:00	5.43	7.84	1278.45	33.20
11-Oct-25 15:00:00	5.40	7.85	1277.53	33.20
11-Oct-25 16:00:00	5.38	7.82	1277.28	33.20
11-Oct-25 17:00:00	5.36	7.81	1277.05	33.20
11-Oct-25 18:00:00	5.33	7.80	1276.83	33.20
11-Oct-25 19:00:00	5.31	7.75	1276.60	33.20
11-Oct-25 20:00:00	5.27	7.69	1276.38	33.20
11-Oct-25 21:00:00	5.23	7.71	1276.16	33.20
11-Oct-25 22:00:00	5.19	7.76	1275.93	33.20
11-Oct-25 23:00:00	5.16	7.72	1275.78	25.26
12-Oct-25 00:00:00	5.12	7.78	1276.17	25.08
12-Oct-25 01:00:00	5.08	7.80	1276.56	24.80
12-Oct-25 02:00:00	5.04	7.74	1276.95	24.23
12-Oct-25 03:00:00	5.00	7.72	1277.33	23.47
12-Oct-25 04:00:00	4.96	7.69	1277.72	23.04
14-Oct-25 08:00:00	5.20	7.73	1273.51	25.27
14-Oct-25 09:00:00	5.19	7.83	1272.18	31.85
14-Oct-25 10:00:00	0.01	7.89	1270.85	30.77
14-Oct-25 11:00:00	5.19	7.90	1269.52	33.20
14-Oct-25 12:00:00	5.18	7.84	1268.19	33.20
14-Oct-25 13:00:00	5.18	7.85	1266.85	33.20
14-Oct-25 14:00:00	5.17	7.83	1265.98	33.20
14-Oct-25 15:00:00	5.13	7.84	1265.75	33.20
14-Oct-25 16:00:00	5.08	7.82	1265.51	33.20
14-Oct-25 17:00:00	5.04	7.80	1265.28	33.20
14-Oct-25 18:00:00	4.99	7.80	1265.04	33.20
14-Oct-25 19:00:00	4.94	7.78	1264.81	33.20
23-Oct-25 20:00:00	6.65	7.75	1410.84	33.20
23-Oct-25 21:00:00	6.62	7.76	1421.94	29.79
23-Oct-25 22:00:00	6.60	7.75	1433.04	29.71
23-Oct-25 23:00:00	6.57	7.75	1444.14	29.64
24-Oct-25 00:00:00	6.54	7.75	1451.93	29.77
24-Oct-25 01:00:00	6.51	7.75	1445.42	29.91
24-Oct-25 02:00:00	6.49	7.75	1438.91	30.05
24-Oct-25 03:00:00	6.46	7.76	1432.40	30.14
24-Oct-25 04:00:00	6.43	7.76	1425.89	30.13
24-Oct-25 05:00:00	6.39	7.76	1419.38	30.12
24-Oct-25 06:00:00	6.36	7.76	1412.87	30.11
24-Oct-25 07:00:00	6.32	7.76	1406.36	30.10
24-Oct-25 08:00:00	6.28	7.77	1400.29	30.31
24-Oct-25 09:00:00	6.24	7.80	1395.04	30.79
24-Oct-25 10:00:00	6.21	7.82	1389.80	31.63
24-Oct-25 11:00:00	6.17	7.82	1384.55	31.36
24-Oct-25 12:00:00	6.13	7.83	1379.30	31.44
24-Oct-25 13:00:00	6.09	7.83	1374.05	31.55
24-Oct-25 14:00:00	6.05	7.84	1369.14	31.61
24-Oct-25 15:00:00	6.02	7.84	1368.74	31.65

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
24-Oct-25 16:00:00	5.98	7.84	1368.33	31.44
24-Oct-25 17:00:00	5.94	7.85	1367.93	31.06
24-Oct-25 18:00:00	5.90	7.85	1367.52	30.72
24-Oct-25 19:00:00	5.86	7.85	1367.11	30.45
01-Nov-25 00:00:00	6.27	6.97	1306.57	29.56
01-Nov-25 01:00:00	6.24	6.97	1316.01	29.80
01-Nov-25 02:00:00	6.21	6.97	1325.44	30.05
01-Nov-25 03:00:00	6.17	6.97	1334.88	30.15
01-Nov-25 04:00:00	6.12	6.98	1338.27	30.26
01-Nov-25 05:00:00	6.08	6.98	1340.70	30.37
01-Nov-25 06:00:00	6.04	6.98	1343.12	30.46
01-Nov-25 07:00:00	6.00	6.98	1345.55	30.53
01-Nov-25 08:00:00	5.96	6.98	1347.97	30.75
03-Nov-25 09:00:00	6.16	6.99	1361.37	33.43
03-Nov-25 10:00:00	6.16	7.15	1344.04	32.11
03-Nov-25 11:00:00	6.15	7.15	1338.72	31.86
03-Nov-25 12:00:00	6.14	7.16	1339.02	31.41
03-Nov-25 13:00:00	6.14	7.17	1344.86	30.82
03-Nov-25 14:00:00	6.13	7.17	1350.71	31.25
03-Nov-25 15:00:00	6.12	7.18	1355.27	31.69
03-Nov-25 16:00:00	6.10	7.18	1359.20	31.04
03-Nov-25 17:00:00	6.05	7.18	1363.14	30.62
03-Nov-25 18:00:00	6.00	7.18	1367.07	30.36
03-Nov-25 19:00:00	5.95	7.17	1371.00	30.15
07-Nov-25 20:00:00	6.53	6.94	1472.95	29.14
07-Nov-25 21:00:00	6.47	6.96	1467.46	29.35
07-Nov-25 22:00:00	6.43	6.96	1476.69	29.37
07-Nov-25 23:00:00	6.40	6.95	1485.91	28.57
08-Nov-25 00:00:00	6.36	6.94	1495.13	29.10
08-Nov-25 01:00:00	6.33	6.93	1504.35	29.28
08-Nov-25 02:00:00	6.29	6.92	1513.57	29.49
08-Nov-25 03:00:00	6.26	6.92	1522.79	29.62
08-Nov-25 04:00:00	6.23	6.91	1532.01	29.20
08-Nov-25 05:00:00	6.20	6.91	1537.01	29.65
08-Nov-25 06:00:00	6.17	6.91	1539.60	29.70
08-Nov-25 07:00:00	6.14	6.92	1542.19	29.69
08-Nov-25 08:00:00	6.11	6.92	1542.97	29.38
08-Nov-25 09:00:00	6.09	6.93	1532.86	29.52
08-Nov-25 10:00:00	6.06	6.93	1522.75	29.80
08-Nov-25 11:00:00	6.02	6.94	1512.64	30.28
08-Nov-25 12:00:00	5.96	6.94	1507.32	30.51
15-Nov-25 13:00:00	6.62	6.81	1348.10	32.60
15-Nov-25 14:00:00	6.62	6.79	1364.93	32.60
15-Nov-25 15:00:00	6.63	6.78	1358.70	32.60
15-Nov-25 16:00:00	6.64	6.76	1352.47	32.60
15-Nov-25 17:00:00	6.63	6.75	1348.23	32.60
15-Nov-25 18:00:00	6.59	6.73	1354.00	32.60

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
15-Nov-25 19:00:00	6.56	6.70	1359.76	32.60
15-Nov-25 20:00:00	6.53	6.68	1365.53	32.60
15-Nov-25 21:00:00	6.49	6.65	1371.29	32.60
15-Nov-25 22:00:00	6.46	6.63	1377.06	32.60
15-Nov-25 23:00:00	6.42	6.60	1382.82	32.60
16-Nov-25 00:00:00	6.39	6.56	1388.58	32.60
16-Nov-25 01:00:00	6.36	6.53	1392.76	32.60
16-Nov-25 09:00:00	6.17	7.14	1399.41	32.60
16-Nov-25 10:00:00	6.16	7.14	1399.01	32.60
16-Nov-25 11:00:00	6.15	7.14	1398.61	32.60
16-Nov-25 12:00:00	6.14	7.14	1398.21	32.60
16-Nov-25 13:00:00	6.13	7.14	1397.81	32.60
16-Nov-25 14:00:00	6.12	7.14	1397.41	32.60
16-Nov-25 15:00:00	3.07	7.14	730.03	32.60
16-Nov-25 16:00:00	3.09	7.14	717.15	32.60
19-Nov-25 22:00:00	3.76	7.76	733.00	28.10
19-Nov-25 23:00:00	3.75	7.76	733.00	28.08
20-Nov-25 00:00:00	3.74	7.76	733.00	28.06
20-Nov-25 01:00:00	3.73	7.76	733.00	27.95
20-Nov-25 02:00:00	3.72	7.76	733.00	27.82
20-Nov-25 03:00:00	3.72	7.76	733.00	27.68
20-Nov-25 04:00:00	3.71	7.76	733.00	27.50
20-Nov-25 05:00:00	3.70	7.76	733.00	27.36
20-Nov-25 06:00:00	3.67	7.76	733.00	27.30
20-Nov-25 07:00:00	3.63	7.76	733.00	27.50
21-Nov-25 02:00:00	3.91	6.98	1630.70	23.90
21-Nov-25 03:00:00	3.91	6.98	1567.70	27.17
21-Nov-25 04:00:00	3.90	6.98	1553.66	27.18
21-Nov-25 05:00:00	3.89	6.98	1539.62	27.19
21-Nov-25 06:00:00	3.88	6.98	1525.58	27.20
21-Nov-25 07:00:00	3.87	6.98	1511.55	27.22
21-Nov-25 08:00:00	3.87	6.98	1498.38	28.08
21-Nov-25 09:00:00	3.86	6.98	1487.76	29.24
21-Nov-25 10:00:00	3.85	6.98	1477.13	29.92
21-Nov-25 11:00:00	3.81	6.98	1464.97	28.23
21-Nov-25 12:00:00	3.78	6.98	1455.96	32.06
21-Nov-25 13:00:00	3.75	6.98	1450.36	31.38
21-Nov-25 14:00:00	3.72	6.98	1444.75	31.13
21-Nov-25 15:00:00	3.68	6.98	1439.14	30.52
21-Nov-25 16:00:00	3.65	6.98	1433.53	29.41
21-Nov-25 17:00:00	3.62	6.98	1427.92	28.96
21-Nov-25 18:00:00	3.58	6.98	1427.51	28.19
21-Nov-25 19:00:00	3.55	6.98	1427.87	28.05
21-Nov-25 20:00:00	3.52	6.98	1428.24	27.90
21-Nov-25 21:00:00	3.49	6.98	1428.60	27.82
21-Nov-25 22:00:00	3.45	6.98	1428.96	27.57
25-Nov-25 09:00:00	3.87	6.98	1454.88	29.59

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
25-Nov-25 10:00:00	3.91	6.98	1456.48	31.07
25-Nov-25 11:00:00	3.94	6.98	1466.90	30.32
25-Nov-25 12:00:00	3.93	6.98	1477.31	31.76
25-Nov-25 13:00:00	3.91	6.98	1487.73	32.65
25-Nov-25 14:00:00	3.90	6.98	1498.15	31.78
25-Nov-25 15:00:00	3.88	6.98	1508.57	30.75
25-Nov-25 16:00:00	3.87	6.98	1514.99	29.95
25-Nov-25 17:00:00	3.86	6.98	1516.56	28.92
25-Nov-25 18:00:00	3.84	6.98	1518.12	27.91
25-Nov-25 19:00:00	3.82	6.98	1519.69	27.60
25-Nov-25 20:00:00	3.78	6.98	1521.26	27.34
25-Nov-25 21:00:00	3.75	6.98	1522.83	27.16
25-Nov-25 22:00:00	3.71	6.98	1524.40	27.06
25-Nov-25 23:00:00	3.68	6.98	1522.39	26.85
26-Nov-25 00:00:00	3.65	6.98	1520.19	26.64
26-Nov-25 01:00:00	3.62	6.98	1517.99	26.58
26-Nov-25 02:00:00	3.59	6.98	1515.78	26.55
01-Dec-25 12:00:00	4.16	8.41	1592.95	31.29
01-Dec-25 13:00:00	4.20	8.41	1544.80	30.64
01-Dec-25 14:00:00	4.25	8.41	1549.67	30.39
01-Dec-25 15:00:00	4.29	8.41	1554.55	30.47
01-Dec-25 16:00:00	4.30	8.41	1559.43	29.12
01-Dec-25 17:00:00	4.27	8.41	1566.70	28.43
01-Dec-25 18:00:00	4.25	8.41	1574.32	28.13
01-Dec-25 19:00:00	4.22	8.41	1581.94	27.90
01-Dec-25 20:00:00	4.20	8.41	1589.55	27.85
01-Dec-25 21:00:00	4.17	8.41	1597.17	27.80
06-Dec-25 07:00:00	4.74	7.15	1553.67	24.40
06-Dec-25 08:00:00	4.74	7.15	1503.73	29.28
06-Dec-25 09:00:00	4.70	7.15	1462.13	31.79
06-Dec-25 10:00:00	4.67	7.15	1420.53	31.06
06-Dec-25 11:00:00	4.63	7.15	1396.78	33.13
06-Dec-25 12:00:00	4.60	7.15	1379.44	33.32
06-Dec-25 13:00:00	4.56	7.15	1362.10	33.75
06-Dec-25 14:00:00	4.53	7.15	1348.40	33.12
06-Dec-25 19:00:00	5.40	7.15	1352.22	28.36
06-Dec-25 20:00:00	5.36	7.15	1346.37	28.21
06-Dec-25 21:00:00	5.33	7.15	1340.52	28.07
06-Dec-25 22:00:00	5.29	7.15	1334.67	28.10
06-Dec-25 23:00:00	5.25	7.15	1328.82	27.98
07-Dec-25 00:00:00	5.22	7.15	1325.64	27.91
07-Dec-25 01:00:00	5.18	7.15	1325.02	27.84
07-Dec-25 02:00:00	5.14	7.15	1324.40	27.77
13-Dec-25 08:00:00	5.76	6.84	1209.58	27.34
13-Dec-25 09:00:00	5.74	6.83	1161.89	31.47
13-Dec-25 10:00:00	5.71	6.81	1166.53	32.12
13-Dec-25 11:00:00	5.69	6.80	1149.46	32.90

GBL Waste water parameter

DATE	Waste water flow (T/Hr)	pH	Conduct. (uS/CM)	Waste water temperature (Deg C)
13-Dec-25 12:00:00	5.66	6.79	1132.40	33.07
13-Dec-25 13:00:00	5.64	6.78	1115.33	33.41
13-Dec-25 14:00:00	5.61	6.77	1104.24	32.71
13-Dec-25 15:00:00	5.59	6.77	1100.20	31.68
13-Dec-25 16:00:00	5.56	6.77	1096.16	26.45
13-Dec-25 17:00:00	5.53	6.77	1092.11	27.51
13-Dec-25 18:00:00	5.50	6.77	1090.31	27.72
13-Dec-25 19:00:00	5.47	6.77	1089.25	28.12
18-Dec-25 09:00:00	6.43	6.89	1155.67	28.84
18-Dec-25 10:00:00	6.41	6.90	1155.21	32.52
18-Dec-25 11:00:00	6.39	6.92	1149.65	33.64
18-Dec-25 12:00:00	6.37	6.93	1144.09	31.92
18-Dec-25 13:00:00	6.34	6.95	1138.53	32.97
18-Dec-25 14:00:00	6.32	6.96	1132.97	31.22
18-Dec-25 15:00:00	6.30	6.97	1140.63	31.89
18-Dec-25 16:00:00	6.28	6.99	1140.21	29.65
18-Dec-25 17:00:00	6.25	7.00	1139.79	29.14
18-Dec-25 18:00:00	6.21	7.00	1139.37	28.91
18-Dec-25 20:00:00	6.23	7.02	1125.29	27.25
18-Dec-25 21:00:00	6.19	7.02	1128.19	28.11
18-Dec-25 22:00:00	6.14	7.02	1125.33	27.95
18-Dec-25 23:00:00	6.10	7.03	1122.46	27.83
19-Dec-25 00:00:00	6.05	7.03	1121.08	27.81
19-Dec-25 01:00:00	6.01	7.04	1123.39	27.68
19-Dec-25 02:00:00	5.96	7.04	1125.70	27.54
19-Dec-25 03:00:00	5.92	7.04	1128.02	27.48
19-Dec-25 04:00:00	5.87	7.05	1130.33	27.54
22-Dec-25 08:00:00	5.84	7.07	1093.30	26.64
22-Dec-25 09:00:00	5.84	7.11	1136.12	31.89
22-Dec-25 10:00:00	5.83	7.13	1135.75	33.59
22-Dec-25 11:00:00	5.82	7.14	1148.37	32.31
22-Dec-25 12:00:00	5.81	7.15	1180.31	33.29
27-Dec-25 02:00:00	6.14	7.05	559.56	24.54
27-Dec-25 03:00:00	6.10	7.13	559.99	26.91
27-Dec-25 04:00:00	6.07	7.15	560.41	27.08
27-Dec-25 05:00:00	6.04	7.15	561.52	27.21
27-Dec-25 06:00:00	6.01	7.15	564.02	27.33
27-Dec-25 07:00:00	5.97	7.15	566.52	27.37
27-Dec-25 08:00:00	5.94	7.15	568.74	28.66
27-Dec-25 09:00:00	5.91	7.14	569.65	31.50
27-Dec-25 10:00:00	5.88	7.14	570.55	32.27
27-Dec-25 11:00:00	5.85	7.14	571.46	32.42
Min	0.01	6.53	559.56	23.04
Max	7.05	8.41	1630.70	33.75

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
01-Jul-25 11:00:00	49.00	7.71	3047.22	6.73	33.02
01-Jul-25 12:00:00	48.85	7.72	3044.99	6.73	33.04
01-Jul-25 13:00:00	48.76	7.72	3042.75	6.73	33.02
01-Jul-25 14:00:00	48.67	7.72	3041.31	6.73	33.01
01-Jul-25 15:00:00	48.58	7.72	3041.54	6.73	32.99
01-Jul-25 16:00:00	48.48	7.71	3041.78	6.73	32.98
01-Jul-25 17:00:00	48.38	7.71	3042.01	6.73	32.91
01-Jul-25 18:00:00	48.27	7.71	3042.24	6.73	32.89
03-Jul-25 14:00:00	48.41	7.72	3028.63	7.75	32.00
03-Jul-25 15:00:00	49.07	7.73	3100.34	7.75	32.00
03-Jul-25 16:00:00	49.01	7.75	3106.20	7.75	32.00
03-Jul-25 17:00:00	48.94	7.76	3104.98	7.81	31.20
03-Jul-25 18:00:00	48.88	7.75	3097.55	7.82	31.20
03-Jul-25 19:00:00	48.81	7.75	3090.13	7.90	30.00
03-Jul-25 20:00:00	48.74	7.75	3082.70	7.90	30.00
03-Jul-25 21:00:00	48.68	7.74	3075.27	7.90	30.00
03-Jul-25 22:00:00	48.61	7.74	3067.84	7.90	30.00
03-Jul-25 23:00:00	48.54	7.74	3060.41	7.90	30.00
04-Jul-25 00:00:00	48.47	7.73	3052.99	7.90	30.00
04-Jul-25 01:00:00	48.40	7.73	3048.81	7.90	30.00
04-Jul-25 02:00:00	48.33	7.71	3045.17	7.90	30.00
04-Jul-25 03:00:00	48.25	7.70	3041.53	7.90	30.00
06-Jul-25 09:00:00	50.11	7.59	2942.35	6.40	31.80
06-Jul-25 10:00:00	49.94	7.58	2991.70	6.40	31.77
06-Jul-25 11:00:00	49.75	7.57	3010.22	6.40	31.73
06-Jul-25 12:00:00	49.57	7.56	3010.18	6.40	31.70
06-Jul-25 13:00:00	49.46	7.55	3010.14	6.40	31.67
06-Jul-25 14:00:00	49.39	7.54	3010.10	6.40	31.63
06-Jul-25 15:00:00	49.33	7.53	3010.06	6.40	31.60
06-Jul-25 16:00:00	49.27	7.52	3010.02	6.40	31.58
06-Jul-25 17:00:00	49.21	7.51	3009.98	6.40	31.55
06-Jul-25 18:00:00	49.16	7.51	3009.94	6.40	31.53
06-Jul-25 19:00:00	49.01	7.50	3009.89	6.40	31.51
06-Jul-25 20:00:00	48.84	7.50	3009.83	6.40	31.48
10-Jul-25 07:00:00	49.20	7.55	2893.39	5.90	31.44
10-Jul-25 08:00:00	49.13	7.55	2947.46	5.90	31.43
10-Jul-25 09:00:00	49.01	7.54	2961.86	5.90	31.43
10-Jul-25 10:00:00	48.90	7.54	2962.73	6.65	31.42
10-Jul-25 11:00:00	48.79	7.54	2963.59	6.65	31.42
10-Jul-25 12:00:00	48.67	7.53	2964.46	6.65	31.41
10-Jul-25 13:00:00	48.56	7.53	2965.32	6.65	31.41
10-Jul-25 14:00:00	48.45	7.54	2966.18	6.65	31.40
10-Jul-25 15:00:00	48.36	7.54	2967.05	7.10	31.39
10-Jul-25 16:00:00	48.27	7.55	2967.91	7.26	31.35
10-Jul-25 17:00:00	48.19	7.55	2968.57	7.26	31.31
14-Jul-25 09:00:00	50.39	7.58	2939.89	8.20	31.98
14-Jul-25 10:00:00	50.14	7.58	2964.60	8.20	32.01

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
14-Jul-25 11:00:00	49.89	7.57	2965.51	8.20	32.05
14-Jul-25 12:00:00	49.78	7.56	2966.43	8.20	32.08
14-Jul-25 13:00:00	49.66	7.56	2967.34	8.20	32.11
14-Jul-25 14:00:00	49.55	7.55	2968.25	8.20	32.14
14-Jul-25 15:00:00	49.44	7.55	2969.17	8.20	32.17
14-Jul-25 16:00:00	49.34	7.54	2970.08	8.20	32.20
14-Jul-25 17:00:00	49.27	7.54	2971.00	8.20	32.22
14-Jul-25 18:00:00	49.29	7.54	2971.84	8.20	32.24
15-Jul-25 21:00:00	49.52	7.79	2885.28	5.89	32.85
15-Jul-25 22:00:00	50.02	7.79	2971.31	5.89	32.79
15-Jul-25 23:00:00	49.85	7.80	2997.84	5.89	32.79
16-Jul-25 00:00:00	49.79	7.81	2993.72	5.89	32.78
16-Jul-25 01:00:00	49.77	7.81	2989.60	5.89	32.78
16-Jul-25 02:00:00	49.72	7.82	2985.48	5.89	32.78
16-Jul-25 03:00:00	49.63	7.82	2981.36	5.89	32.77
16-Jul-25 04:00:00	49.54	7.83	2977.24	5.89	32.77
16-Jul-25 05:00:00	49.44	7.83	2973.12	5.89	32.76
16-Jul-25 06:00:00	49.35	7.84	2969.00	5.89	32.75
18-Jul-25 21:00:00	50.24	7.77	2895.01	6.43	33.22
18-Jul-25 22:00:00	50.14	7.76	2950.77	6.43	33.18
18-Jul-25 23:00:00	50.05	7.76	2963.77	6.43	33.14
19-Jul-25 00:00:00	49.95	7.75	2968.02	6.43	33.10
19-Jul-25 01:00:00	49.83	7.74	2969.04	6.43	33.07
19-Jul-25 02:00:00	49.71	7.73	2970.05	6.43	33.02
19-Jul-25 03:00:00	49.60	7.73	2971.06	6.43	32.94
19-Jul-25 04:00:00	49.49	7.72	2972.07	6.43	32.86
19-Jul-25 05:00:00	49.38	7.71	2973.09	6.43	32.78
19-Jul-25 06:00:00	49.28	7.70	2974.10	6.43	32.70
19-Jul-25 07:00:00	49.20	7.68	2975.11	6.43	32.62
19-Jul-25 08:00:00	49.13	7.67	2975.98	6.43	32.53
20-Jul-25 21:00:00	48.83	7.67	2914.77	6.80	32.65
20-Jul-25 22:00:00	48.50	7.64	2940.62	6.80	32.64
20-Jul-25 23:00:00	48.49	7.62	2945.16	6.80	32.63
21-Jul-25 00:00:00	48.36	7.62	2945.95	6.80	32.62
21-Jul-25 01:00:00	48.24	7.61	2946.74	6.80	32.61
21-Jul-25 02:00:00	48.11	7.61	2947.54	6.80	32.60
21-Jul-25 03:00:00	48.01	7.61	2948.33	6.80	32.59
21-Jul-25 04:00:00	47.92	7.60	2949.12	6.80	32.58
23-Jul-25 04:00:00	50.29	7.78	2911.77	6.54	33.04
23-Jul-25 05:00:00	50.02	7.78	2928.36	6.54	33.03
23-Jul-25 06:00:00	49.94	7.77	2928.84	6.54	33.02
23-Jul-25 07:00:00	49.86	7.76	2925.80	6.54	33.01
23-Jul-25 08:00:00	49.79	7.76	2922.76	6.54	33.01
23-Jul-25 09:00:00	49.74	7.75	2919.72	6.54	33.00
23-Jul-25 10:00:00	49.68	7.75	2916.68	6.54	32.99
23-Jul-25 11:00:00	49.58	7.74	2913.64	6.54	32.98
23-Jul-25 12:00:00	49.40	7.74	2910.60	6.54	32.97

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
23-Jul-25 13:00:00	49.25	7.74	2907.56	6.54	32.96
23-Jul-25 14:00:00	49.11	7.74	2904.78	6.54	32.95
23-Jul-25 15:00:00	48.98	7.74	2902.99	6.54	32.94
23-Jul-25 16:00:00	48.90	7.74	2901.20	6.54	32.93
23-Jul-25 17:00:00	48.81	7.74	2899.42	6.54	32.92
23-Jul-25 18:00:00	48.72	7.74	2897.63	6.54	32.91
23-Jul-25 19:00:00	48.63	7.73	2897.59	6.54	32.90
26-Jul-25 23:00:00	49.89	7.88	2833.84	7.65	33.10
27-Jul-25 00:00:00	50.00	7.85	2866.54	7.65	33.07
27-Jul-25 01:00:00	49.78	7.85	2872.92	7.65	33.04
27-Jul-25 02:00:00	49.56	7.85	2872.72	7.65	33.00
27-Jul-25 03:00:00	49.49	7.85	2872.51	7.65	32.97
27-Jul-25 04:00:00	49.41	7.85	2872.31	7.65	32.94
27-Jul-25 05:00:00	49.34	7.85	2872.11	7.65	32.91
27-Jul-25 06:00:00	49.23	7.85	2871.91	7.65	32.87
27-Jul-25 07:00:00	49.15	7.85	2871.70	7.65	32.83
27-Jul-25 08:00:00	49.09	7.85	2871.50	7.65	32.78
27-Jul-25 09:00:00	49.04	7.84	2870.79	7.65	32.74
27-Jul-25 10:00:00	48.79	7.83	2869.92	7.65	32.69
27-Jul-25 11:00:00	48.65	7.82	2869.04	7.65	32.65
27-Jul-25 12:00:00	48.59	7.81	2868.17	7.65	32.60
27-Jul-25 13:00:00	48.53	7.80	2867.29	7.65	32.56
27-Jul-25 14:00:00	48.47	7.79	2866.41	7.65	32.53
27-Jul-25 15:00:00	48.40	7.78	2865.54	7.65	32.50
02-Aug-25 07:00:00	49.92	7.70	2741.60	8.50	32.07
02-Aug-25 08:00:00	50.02	7.69	2791.41	8.50	32.17
02-Aug-25 09:00:00	49.92	7.69	2797.80	8.50	32.22
02-Aug-25 10:00:00	49.81	7.69	2794.54	8.72	32.26
02-Aug-25 11:00:00	49.64	7.69	2791.29	8.72	32.31
02-Aug-25 12:00:00	49.45	7.69	2788.03	8.80	32.35
02-Aug-25 13:00:00	49.35	7.69	2784.77	8.80	32.39
02-Aug-25 14:00:00	49.27	7.68	2781.52	8.80	32.44
02-Aug-25 15:00:00	49.16	7.68	2778.26	8.80	32.48
02-Aug-25 16:00:00	49.07	7.67	2775.01	8.21	32.49
02-Aug-25 17:00:00	48.98	7.66	2774.71	8.30	32.45
02-Aug-25 18:00:00	48.95	7.65	2774.95	8.30	32.41
02-Aug-25 19:00:00	48.95	7.65	2775.18	8.30	32.37
02-Aug-25 20:00:00	48.89	7.64	2775.42	8.30	32.33
02-Aug-25 21:00:00	48.76	7.63	2775.65	8.30	32.29
03-Aug-25 14:00:00	1.18	7.10	646.84	7.95	30.00
03-Aug-25 15:00:00	48.91	7.63	2722.58	8.11	30.00
06-Aug-25 16:00:00	49.61	7.68	2697.19	8.64	32.52
06-Aug-25 17:00:00	49.54	7.69	2695.31	8.64	32.47
06-Aug-25 18:00:00	49.45	7.69	2698.00	8.64	32.43
06-Aug-25 19:00:00	49.34	7.69	2700.70	8.75	32.39
06-Aug-25 20:00:00	49.23	7.70	2703.40	8.75	32.42
06-Aug-25 21:00:00	49.12	7.70	2706.10	8.75	32.44

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
06-Aug-25 22:00:00	49.01	7.71	2708.57	8.75	32.47
06-Aug-25 23:00:00	48.91	7.72	2710.79	8.75	32.49
07-Aug-25 00:00:00	48.80	7.72	2713.00	8.75	32.52
07-Aug-25 01:00:00	48.69	7.73	2715.21	8.75	32.54
07-Aug-25 02:00:00	48.59	7.74	2717.43	8.75	32.56
07-Aug-25 03:00:00	48.50	7.75	2719.64	8.75	32.56
07-Aug-25 04:00:00	48.42	7.75	2722.53	8.75	32.57
07-Aug-25 05:00:00	48.33	7.76	2725.82	8.75	32.58
07-Aug-25 06:00:00	48.24	7.76	2729.11	8.75	32.59
11-Aug-25 04:00:00	50.11	7.90	2829.23	6.23	33.22
11-Aug-25 05:00:00	49.86	7.89	2855.64	6.23	33.21
11-Aug-25 06:00:00	49.72	7.89	2854.37	6.23	33.21
11-Aug-25 07:00:00	49.57	7.88	2853.10	6.23	33.20
11-Aug-25 08:00:00	49.42	7.88	2851.83	6.35	33.19
11-Aug-25 09:00:00	49.28	7.87	2850.56	6.35	33.19
11-Aug-25 10:00:00	49.13	7.87	2849.29	6.46	33.18
11-Aug-25 11:00:00	48.98	7.86	2848.02	7.10	33.18
11-Aug-25 12:00:00	48.84	7.86	2846.75	7.10	33.19
11-Aug-25 13:00:00	48.75	7.86	2846.61	7.10	33.21
11-Aug-25 14:00:00	48.65	7.85	2847.47	7.10	33.23
11-Aug-25 15:00:00	48.55	7.85	2848.33	7.10	33.25
11-Aug-25 16:00:00	48.45	7.85	2849.19	7.10	33.27
15-Aug-25 22:00:00	49.73	8.16	2912.53	7.90	32.82
15-Aug-25 23:00:00	49.66	8.15	2969.06	7.90	32.83
16-Aug-25 00:00:00	49.59	8.15	2968.99	7.90	32.85
16-Aug-25 01:00:00	49.52	8.15	2966.49	7.90	32.87
16-Aug-25 02:00:00	49.45	8.15	2963.98	7.90	32.89
16-Aug-25 03:00:00	49.37	8.14	2961.48	7.90	32.90
16-Aug-25 04:00:00	49.30	8.14	2958.98	7.90	32.92
16-Aug-25 05:00:00	49.23	8.14	2956.47	7.90	32.94
16-Aug-25 06:00:00	49.14	8.14	2953.97	7.90	32.96
16-Aug-25 07:00:00	49.04	8.13	2951.01	7.90	32.97
16-Aug-25 08:00:00	48.93	8.12	2943.97	7.90	32.99
16-Aug-25 09:00:00	48.83	8.12	2936.93	7.90	33.00
16-Aug-25 10:00:00	48.72	8.11	2929.90	7.90	33.02
16-Aug-25 11:00:00	48.62	8.11	2922.86	7.90	33.03
16-Aug-25 12:00:00	48.55	8.10	2915.82	7.90	33.05
16-Aug-25 13:00:00	48.51	8.09	2908.78	7.90	33.07
16-Aug-25 14:00:00	48.47	8.09	2901.74	7.90	33.06
16-Aug-25 15:00:00	48.44	8.08	2894.72	7.90	33.05
16-Aug-25 16:00:00	48.33	8.07	2887.83	7.90	33.03
16-Aug-25 17:00:00	48.22	8.07	2880.94	7.90	33.02
16-Aug-25 18:00:00	48.11	8.06	2874.05	7.90	33.00
21-Aug-25 18:00:00	49.87	7.86	2766.77	7.50	32.76
21-Aug-25 19:00:00	49.78	7.87	2808.75	7.50	32.77
21-Aug-25 20:00:00	49.69	7.87	2816.04	7.50	32.77
21-Aug-25 21:00:00	49.59	7.88	2814.08	7.50	32.75



GBL CT Blowdown water parameter

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
21-Aug-25 22:00:00	49.50	7.89	2812.13	7.50	32.70
21-Aug-25 23:00:00	49.41	7.90	2810.17	7.62	32.67
22-Aug-25 20:00:00	48.16	7.93	2730.34	7.23	32.34
22-Aug-25 21:00:00	48.70	7.89	2782.59	7.23	32.53
22-Aug-25 22:00:00	48.57	7.85	2784.68	7.23	32.51
22-Aug-25 23:00:00	48.44	7.85	2786.76	7.23	32.50
23-Aug-25 00:00:00	48.30	7.85	2788.85	7.35	32.49
23-Aug-25 01:00:00	48.17	7.85	2790.12	7.35	32.48
23-Aug-25 02:00:00	48.04	7.86	2790.40	7.44	32.46
23-Aug-25 03:00:00	47.90	7.86	2790.69	7.44	32.45
23-Aug-25 04:00:00	47.77	7.86	2790.97	7.44	32.44
23-Aug-25 05:00:00	47.65	7.87	2791.26	7.44	32.40
24-Aug-25 21:00:00	47.46	7.91	2678.21	7.56	32.44
24-Aug-25 22:00:00	48.09	7.88	2752.40	7.66	32.54
24-Aug-25 23:00:00	48.00	7.86	2773.93	7.66	32.54
25-Aug-25 00:00:00	47.91	7.86	2774.34	7.66	32.54
25-Aug-25 01:00:00	47.83	7.86	2774.74	7.66	32.54
25-Aug-25 02:00:00	47.74	7.86	2775.15	7.74	32.54
25-Aug-25 03:00:00	47.65	7.86	2775.56	7.74	32.54
25-Aug-25 04:00:00	47.56	7.86	2775.96	7.74	32.54
29-Aug-25 20:00:00	48.70	7.87	2606.93	7.95	32.08
29-Aug-25 21:00:00	48.63	7.87	2642.66	7.95	32.18
29-Aug-25 22:00:00	48.57	7.88	2647.39	7.95	32.27
29-Aug-25 23:00:00	48.50	7.88	2645.25	7.95	32.32
30-Aug-25 00:00:00	48.43	7.89	2643.11	7.95	32.30
30-Aug-25 01:00:00	48.36	7.89	2640.97	7.95	32.29
30-Aug-25 02:00:00	48.29	7.90	2638.83	7.95	32.28
30-Aug-25 03:00:00	48.22	7.90	2636.69	7.95	32.23
30-Aug-25 04:00:00	48.11	7.90	2634.55	7.95	32.09
31-Aug-25 11:00:00	49.49	7.85	2560.73	8.20	32.24
31-Aug-25 12:00:00	49.50	7.85	2556.23	8.20	32.23
31-Aug-25 13:00:00	49.42	7.84	2551.74	8.20	32.21
31-Aug-25 14:00:00	49.33	7.84	2548.36	8.20	32.18
31-Aug-25 15:00:00	49.25	7.83	2546.38	8.20	32.35
31-Aug-25 16:00:00	49.17	7.82	2544.40	8.20	32.32
31-Aug-25 17:00:00	49.09	7.83	2542.42	8.20	32.28
31-Aug-25 18:00:00	49.01	7.83	2540.44	8.20	32.23
02-Sep-25 07:00:00	13.77	7.55	2500.09	6.52	25.91
02-Sep-25 08:00:00	49.73	7.84	2458.03	6.52	32.45
02-Sep-25 09:00:00	49.44	7.84	2459.02	6.52	32.52
02-Sep-25 10:00:00	49.33	7.83	2460.00	6.52	32.59
02-Sep-25 11:00:00	49.23	7.83	2460.99	6.52	32.66
02-Sep-25 12:00:00	49.13	7.82	2461.98	6.52	32.70
02-Sep-25 13:00:00	49.02	7.82	2462.96	6.52	32.74
03-Sep-25 00:00:00	48.79	7.90	2370.67	7.53	32.39
03-Sep-25 01:00:00	49.14	7.89	2432.63	7.60	32.44
03-Sep-25 02:00:00	48.96	7.88	2450.47	7.60	32.48

GBL CT Blowdown water parameter

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
03-Sep-25 03:00:00	48.80	7.87	2458.26	7.60	32.48
06-Sep-25 19:00:00	49.40	7.74	2445.38	7.60	32.98
06-Sep-25 20:00:00	49.27	7.73	2474.51	7.60	32.95
06-Sep-25 21:00:00	49.14	7.74	2480.63	7.60	32.93
06-Sep-25 22:00:00	49.01	7.75	2484.78	7.60	32.90
06-Sep-25 23:00:00	48.88	7.75	2484.94	7.60	32.88
07-Sep-25 00:00:00	48.74	7.76	2485.11	7.60	32.85
07-Sep-25 01:00:00	48.61	7.76	2485.27	7.60	32.84
09-Sep-25 20:00:00	47.95	7.79	2457.88	7.80	33.04
09-Sep-25 21:00:00	48.31	7.78	2515.68	7.80	33.03
09-Sep-25 22:00:00	48.22	7.77	2530.25	7.80	33.02
09-Sep-25 23:00:00	48.12	7.75	2530.76	7.80	33.01
10-Sep-25 00:00:00	48.03	7.74	2531.26	7.80	33.01
10-Sep-25 01:00:00	47.93	7.74	2531.76	7.80	33.00
10-Sep-25 02:00:00	47.84	7.74	2532.27	7.80	32.99
10-Sep-25 03:00:00	47.75	7.74	2532.77	7.80	32.98
12-Sep-25 23:00:00	48.52	7.77	2566.10	7.90	33.20
13-Sep-25 00:00:00	48.52	7.76	2560.84	7.90	33.12
13-Sep-25 01:00:00	49.43	7.75	2493.90	7.90	33.17
13-Sep-25 02:00:00	49.34	7.75	2546.78	7.90	33.17
13-Sep-25 03:00:00	49.22	7.75	2553.12	7.90	33.18
13-Sep-25 04:00:00	49.10	7.76	2557.96	7.90	33.18
13-Sep-25 05:00:00	48.99	7.76	2558.73	7.90	33.19
13-Sep-25 06:00:00	48.87	7.76	2557.28	7.90	33.20
13-Sep-25 07:00:00	48.75	7.77	2555.82	7.90	33.20
13-Sep-25 08:00:00	48.64	7.77	2554.37	7.90	33.21
13-Sep-25 09:00:00	48.52	7.76	2552.91	7.90	33.26
13-Sep-25 10:00:00	48.40	7.75	2551.45	7.90	33.32
13-Sep-25 11:00:00	48.27	7.74	2550.00	7.90	33.37
16-Sep-25 08:00:00	48.33	7.90	2463.72	7.45	33.19
16-Sep-25 09:00:00	48.20	7.88	2516.47	7.45	33.21
16-Sep-25 10:00:00	48.05	7.85	2535.92	7.65	33.24
16-Sep-25 11:00:00	47.90	7.85	2538.38	7.65	33.27
16-Sep-25 12:00:00	47.60	7.84	2540.85	7.72	33.30
16-Sep-25 13:00:00	47.58	7.84	2543.32	7.80	33.32
16-Sep-25 14:00:00	47.51	7.84	2545.79	7.80	33.35
16-Sep-25 15:00:00	47.44	7.84	2548.26	7.80	33.38
16-Sep-25 16:00:00	47.36	7.83	2550.22	7.80	33.35
16-Sep-25 17:00:00	47.29	7.83	2551.83	7.80	33.28
19-Sep-25 22:00:00	39.19	7.73	2514.09	7.62	32.97
19-Sep-25 23:00:00	48.35	7.72	2583.85	7.62	32.87
20-Sep-25 00:00:00	48.29	7.71	2601.35	7.77	32.86
20-Sep-25 01:00:00	48.23	7.71	2608.84	7.77	32.86
20-Sep-25 02:00:00	48.18	7.71	2605.99	7.78	32.85
20-Sep-25 03:00:00	48.12	7.70	2603.15	7.78	32.85
20-Sep-25 04:00:00	48.02	7.70	2600.31	7.79	32.77
20-Sep-25 05:00:00	47.92	7.70	2597.46	7.79	32.67

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
20-Sep-25 06:00:00	47.82	7.69	2594.62	7.80	32.57
20-Sep-25 07:00:00	47.72	7.67	2591.78	7.80	32.47
20-Sep-25 20:00:00	47.53	7.57	2467.26	7.64	32.50
20-Sep-25 21:00:00	47.70	7.57	2526.38	7.64	32.51
20-Sep-25 22:00:00	47.56	7.56	2551.32	7.70	32.53
20-Sep-25 23:00:00	47.42	7.56	2559.29	7.70	32.54
21-Sep-25 00:00:00	47.29	7.56	2559.16	7.70	32.55
21-Sep-25 01:00:00	47.15	7.55	2559.04	7.70	32.57
21-Sep-25 02:00:00	47.01	7.55	2558.92	7.70	32.58
23-Sep-25 08:00:00	47.84	7.57	2409.16	5.98	32.45
23-Sep-25 09:00:00	47.73	7.56	2460.39	5.98	32.55
23-Sep-25 10:00:00	47.58	7.55	2480.13	5.98	32.57
23-Sep-25 11:00:00	47.43	7.54	2485.11	5.98	32.61
23-Sep-25 12:00:00	47.29	7.53	2485.67	5.98	32.66
23-Sep-25 13:00:00	47.17	7.52	2486.23	5.98	32.71
27-Sep-25 00:00:00	49.26	7.73	2523.52	5.87	32.58
27-Sep-25 01:00:00	49.16	7.73	2522.76	5.87	32.62
27-Sep-25 02:00:00	49.14	7.72	2522.01	5.87	32.67
27-Sep-25 03:00:00	49.12	7.71	2521.25	5.87	32.63
27-Sep-25 04:00:00	48.01	7.71	2520.49	5.87	32.56
27-Sep-25 05:00:00	47.89	7.70	2519.74	5.87	32.49
27-Sep-25 06:00:00	47.77	7.70	2518.98	5.87	32.43
27-Sep-25 07:00:00	47.65	7.69	2518.22	5.87	32.44
27-Sep-25 08:00:00	47.53	7.69	2517.80	5.87	32.45
27-Sep-25 09:00:00	47.41	7.68	2518.00	5.87	32.46
27-Sep-25 10:00:00	47.29	7.68	2518.19	5.87	32.47
27-Sep-25 11:00:00	47.17	7.67	2518.39	5.87	32.48
30-Sep-25 00:00:00	47.68	7.67	2304.32	7.65	31.98
30-Sep-25 01:00:00	47.57	7.65	2272.54	7.75	32.15
30-Sep-25 02:00:00	47.49	7.70	2278.99	7.82	32.18
30-Sep-25 03:00:00	47.42	7.70	2285.43	7.82	32.15
30-Sep-25 04:00:00	47.34	7.70	2291.88	7.82	32.12
30-Sep-25 05:00:00	47.27	7.70	2298.32	7.82	32.09
01-Oct-25 00:00:00	46.39	7.71	2386.44	4.75	32.27
01-Oct-25 01:00:00	46.36	7.72	2385.83	4.86	32.23
01-Oct-25 02:00:00	46.30	7.72	2385.23	4.98	32.19
01-Oct-25 03:00:00	46.24	7.73	2384.63	4.11	32.16
01-Oct-25 04:00:00	46.18	7.73	2384.02	4.22	32.12
01-Oct-25 05:00:00	46.12	7.74	2383.42	4.32	32.08
01-Oct-25 06:00:00	46.06	7.74	2382.82	4.41	32.05
02-Oct-25 12:00:00	46.94	7.79	2354.47	5.79	32.30
02-Oct-25 13:00:00	47.24	7.79	2353.37	5.79	32.31
02-Oct-25 14:00:00	47.18	7.80	2352.28	5.79	32.33
04-Oct-25 13:00:00	48.44	7.83	2293.73	7.65	32.08
04-Oct-25 14:00:00	48.51	7.84	2377.55	7.65	32.41
04-Oct-25 15:00:00	48.41	7.84	2403.48	7.72	32.47
04-Oct-25 16:00:00	48.32	7.85	2415.79	7.72	32.49

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
04-Oct-25 17:00:00	48.23	7.85	2421.42	7.72	32.52
04-Oct-25 18:00:00	48.14	7.86	2422.57	7.72	32.55
06-Oct-25 21:00:00	49.22	7.57	2366.62	5.68	32.77
06-Oct-25 22:00:00	49.11	7.59	2420.83	5.68	32.76
06-Oct-25 23:00:00	48.99	7.61	2434.05	5.68	32.74
07-Oct-25 00:00:00	48.88	7.62	2435.87	5.68	32.73
07-Oct-25 01:00:00	48.76	7.63	2437.69	5.68	32.72
07-Oct-25 02:00:00	48.65	7.63	2439.51	5.68	32.71
07-Oct-25 03:00:00	48.53	7.64	2441.34	5.68	32.70
07-Oct-25 04:00:00	48.42	7.65	2443.16	5.68	32.70
07-Oct-25 05:00:00	48.29	7.66	2444.98	5.68	32.69
07-Oct-25 06:00:00	48.13	7.67	2446.80	5.68	32.68
10-Oct-25 22:00:00	49.17	7.82	2520.16	7.45	32.98
10-Oct-25 23:00:00	49.16	7.81	2516.72	7.45	33.00
11-Oct-25 00:00:00	49.15	7.81	2513.28	7.50	33.02
11-Oct-25 01:00:00	49.11	7.80	2509.83	7.50	33.04
11-Oct-25 02:00:00	49.05	7.80	2506.39	7.50	33.06
11-Oct-25 03:00:00	49.00	7.79	2502.95	7.50	33.07
11-Oct-25 04:00:00	48.95	7.78	2499.51	7.62	33.09
11-Oct-25 05:00:00	48.86	7.77	2496.06	7.63	33.09
11-Oct-25 06:00:00	48.75	7.76	2492.73	7.63	33.09
11-Oct-25 07:00:00	48.64	7.75	2489.71	7.63	33.09
11-Oct-25 08:00:00	48.53	7.74	2486.69	7.64	33.09
11-Oct-25 09:00:00	48.42	7.73	2483.66	7.64	33.09
11-Oct-25 10:00:00	48.32	7.72	2480.64	7.65	33.09
11-Oct-25 11:00:00	48.21	7.71	2477.62	7.65	33.09
11-Oct-25 12:00:00	48.10	7.70	2474.59	7.65	33.08
11-Oct-25 13:00:00	47.99	7.70	2471.57	7.65	33.07
14-Oct-25 08:00:00	47.39	7.87	2355.16	7.55	33.04
14-Oct-25 09:00:00	47.54	7.85	2441.04	7.55	33.05
14-Oct-25 10:00:00	47.45	7.83	2469.54	7.55	33.05
14-Oct-25 11:00:00	47.36	7.82	2478.22	7.55	33.06
14-Oct-25 12:00:00	47.26	7.81	2483.90	7.55	33.06
14-Oct-25 13:00:00	47.17	7.80	2484.86	7.55	33.05
17-Oct-25 00:00:00	48.80	7.80	2461.55	6.78	32.94
17-Oct-25 01:00:00	48.69	7.79	2493.34	6.78	32.91
17-Oct-25 02:00:00	48.58	7.79	2498.43	6.78	32.89
17-Oct-25 03:00:00	48.47	7.79	2499.97	6.78	32.86
17-Oct-25 04:00:00	48.36	7.79	2501.52	6.78	32.84
17-Oct-25 05:00:00	48.25	7.78	2503.07	6.78	32.81
17-Oct-25 06:00:00	48.14	7.78	2504.61	6.78	32.79
17-Oct-25 07:00:00	48.03	7.78	2506.16	6.78	32.76
17-Oct-25 08:00:00	47.88	7.76	2507.70	6.78	32.74
20-Oct-25 07:00:00	49.12	7.81	2464.64	7.65	32.44
20-Oct-25 08:00:00	48.96	7.79	2509.61	7.65	32.44
20-Oct-25 09:00:00	48.79	7.78	2523.34	7.65	32.44
20-Oct-25 10:00:00	48.66	7.77	2522.99	7.65	32.44

GBL CT Blowdown water parameter

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
20-Oct-25 11:00:00	48.53	7.75	2522.65	7.65	32.43
20-Oct-25 12:00:00	48.40	7.74	2522.30	7.65	32.44
20-Oct-25 13:00:00	48.28	7.74	2521.96	7.65	32.44
20-Oct-25 14:00:00	48.17	7.74	2521.61	7.65	32.44
20-Oct-25 15:00:00	48.06	7.74	2521.27	7.65	32.45
20-Oct-25 16:00:00	47.96	7.74	2520.92	7.65	32.33
24-Oct-25 00:00:00	47.85	8.08	2490.98	6.87	32.12
24-Oct-25 01:00:00	47.91	8.08	2521.50	6.87	32.05
24-Oct-25 02:00:00	47.80	8.08	2528.10	6.87	31.99
25-Oct-25 05:00:00	48.93	7.93	2407.65	6.87	31.56
25-Oct-25 06:00:00	49.00	7.91	2475.06	6.87	31.58
25-Oct-25 07:00:00	48.85	7.90	2498.36	6.87	31.61
25-Oct-25 08:00:00	48.72	7.88	2497.64	6.87	31.63
25-Oct-25 09:00:00	48.59	7.87	2496.93	6.87	31.65
25-Oct-25 10:00:00	48.46	7.85	2496.21	6.87	31.68
25-Oct-25 11:00:00	48.33	7.84	2495.50	6.87	31.70
25-Oct-25 12:00:00	48.20	7.83	2494.78	6.87	31.73
25-Oct-25 13:00:00	48.08	7.83	2494.07	6.87	31.75
25-Oct-25 14:00:00	47.95	7.83	2493.35	6.87	31.76
25-Oct-25 15:00:00	47.83	7.83	2493.01	6.87	31.77
25-Oct-25 16:00:00	47.77	7.84	2493.06	6.87	31.78
28-Oct-25 10:00:00	48.04	7.98	2460.42	8.95	31.32
28-Oct-25 11:00:00	48.14	7.91	2475.90	8.95	31.40
28-Oct-25 12:00:00	48.05	7.90	2485.84	8.95	31.48
28-Oct-25 13:00:00	47.97	7.90	2487.98	8.95	31.56
28-Oct-25 14:00:00	47.88	7.89	2489.10	8.95	31.65
31-Oct-25 01:00:00	47.66	7.90	2526.75	6.40	31.67
31-Oct-25 02:00:00	47.58	7.90	2523.33	6.40	31.71
31-Oct-25 03:00:00	47.51	7.90	2519.91	6.40	31.69
31-Oct-25 04:00:00	47.43	7.90	2516.49	6.40	31.66
31-Oct-25 05:00:00	47.36	7.90	2513.07	6.40	31.64
31-Oct-25 06:00:00	47.29	7.90	2509.65	6.40	31.61
31-Oct-25 07:00:00	47.21	7.90	2506.23	6.40	31.59
31-Oct-25 08:00:00	47.14	7.97	2502.80	6.70	31.56
31-Oct-25 09:00:00	47.05	7.98	2498.80	6.81	31.54
31-Oct-25 10:00:00	46.96	7.98	2493.73	6.81	31.53
31-Oct-25 11:00:00	46.86	7.99	2490.09	6.97	31.58
01-Nov-25 10:00:00	46.59	7.56	2414.01	5.48	32.03
01-Nov-25 11:00:00	47.05	7.56	2418.20	5.71	32.06
01-Nov-25 12:00:00	46.94	7.60	2418.81	5.59	32.09
01-Nov-25 13:00:00	46.83	7.75	2419.43	5.46	32.12
01-Nov-25 14:00:00	46.73	7.75	2420.05	5.35	32.14
02-Nov-25 17:00:00	46.94	7.65	2290.27	7.55	30.00
02-Nov-25 18:00:00	46.94	7.65	2356.05	7.79	32.31
05-Nov-25 05:00:00	46.46	7.24	2293.92	5.47	30.25
05-Nov-25 06:00:00	47.71	7.24	2358.09	5.47	32.24
05-Nov-25 07:00:00	47.58	7.24	2384.43	5.47	32.27

GBL CT Blowdown water parameter

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
05-Nov-25 08:00:00	47.46	7.24	2391.67	5.47	32.30
05-Nov-25 09:00:00	47.33	7.24	2397.10	5.47	32.33
05-Nov-25 10:00:00	47.21	7.24	2398.24	5.47	32.36
06-Nov-25 08:00:00	48.26	8.10	2353.47	10.30	32.22
06-Nov-25 09:00:00	48.43	8.10	2407.91	10.30	32.27
07-Nov-25 22:00:00	48.35	8.23	2407.70	9.90	32.73
07-Nov-25 23:00:00	49.03	8.23	2467.10	9.90	32.76
08-Nov-25 00:00:00	48.95	8.23	2481.51	9.90	32.79
08-Nov-25 01:00:00	48.88	8.23	2474.70	9.90	32.83
08-Nov-25 02:00:00	48.82	8.23	2467.89	9.90	32.86
08-Nov-25 03:00:00	48.76	8.23	2461.09	9.90	32.85
08-Nov-25 04:00:00	48.69	8.23	2454.28	9.90	32.84
08-Nov-25 05:00:00	48.63	8.23	2447.48	9.90	32.83
08-Nov-25 06:00:00	48.56	8.23	2440.67	9.90	32.82
08-Nov-25 07:00:00	48.49	8.23	2433.53	9.90	32.81
08-Nov-25 08:00:00	48.42	8.23	2421.07	9.90	32.80
08-Nov-25 09:00:00	48.34	8.23	2408.61	9.90	32.79
08-Nov-25 10:00:00	48.27	8.23	2396.15	9.90	32.78
08-Nov-25 11:00:00	48.20	8.23	2383.69	9.90	32.80
08-Nov-25 12:00:00	48.13	8.23	2371.23	9.90	32.83
08-Nov-25 13:00:00	48.06	8.23	2358.77	9.90	32.85
08-Nov-25 14:00:00	48.01	8.23	2346.31	9.90	32.88
08-Nov-25 15:00:00	47.96	8.23	2333.73	9.90	32.90
08-Nov-25 16:00:00	47.91	8.23	2320.64	9.90	32.92
08-Nov-25 17:00:00	47.85	8.23	2307.56	9.90	32.95
08-Nov-25 18:00:00	47.80	8.23	2317.42	9.90	32.76
08-Nov-25 19:00:00	44.89	8.23	2330.20	9.90	32.50
12-Nov-25 22:00:00	6.89	7.15	2124.00	6.81	33.20
12-Nov-25 23:00:00	47.51	7.15	2254.35	6.81	32.82
13-Nov-25 00:00:00	47.65	7.15	2293.37	6.81	32.84
13-Nov-25 01:00:00	47.59	7.15	2295.32	6.81	32.86
13-Nov-25 02:00:00	47.51	7.15	2297.28	6.81	32.88
13-Nov-25 03:00:00	47.43	7.15	2299.23	6.81	32.89
13-Nov-25 04:00:00	47.35	7.15	2301.18	6.81	32.91
13-Nov-25 05:00:00	47.27	7.15	2303.13	6.81	32.93
13-Nov-25 06:00:00	47.19	7.15	2305.09	6.81	32.95
13-Nov-25 07:00:00	47.10	7.15	2307.04	6.81	32.95
13-Nov-25 08:00:00	47.02	7.15	2308.80	6.81	32.85
15-Nov-25 09:00:00	47.79	7.15	2323.03	6.81	32.51
15-Nov-25 10:00:00	47.80	7.15	2367.92	6.81	32.51
15-Nov-25 11:00:00	47.75	7.15	2372.00	6.81	32.50
15-Nov-25 12:00:00	47.70	7.15	2369.34	6.81	32.50
15-Nov-25 13:00:00	47.48	7.15	2356.86	6.81	32.40
15-Nov-25 14:00:00	47.43	7.15	2361.51	6.81	32.36
15-Nov-25 15:00:00	47.38	7.15	2359.73	6.81	32.32
15-Nov-25 16:00:00	47.33	7.15	2357.94	6.81	32.28
15-Nov-25 17:00:00	47.29	7.15	2356.16	6.81	32.24

GBL CT Blowdown water parameter

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
15-Nov-25 18:00:00	47.18	7.15	2354.38	6.81	32.20
15-Nov-25 19:00:00	47.05	7.15	2352.59	6.81	32.16
15-Nov-25 20:00:00	46.91	7.15	2350.81	6.81	32.13
19-Nov-25 08:00:00	47.98	7.65	2322.60	7.84	31.92
19-Nov-25 09:00:00	0.79	7.65	2357.49	7.84	31.03
19-Nov-25 10:00:00	47.90	7.65	2330.14	7.84	31.93
19-Nov-25 11:00:00	47.85	7.80	2367.00	7.96	31.96
19-Nov-25 12:00:00	47.75	7.80	2368.14	7.97	31.99
19-Nov-25 13:00:00	47.66	7.80	2369.27	7.97	32.00
19-Nov-25 14:00:00	47.56	7.80	2370.41	7.98	31.99
19-Nov-25 15:00:00	47.46	7.80	2371.55	7.98	31.99
19-Nov-25 16:00:00	47.36	7.80	2372.68	7.99	31.96
19-Nov-25 17:00:00	47.25	7.80	2373.82	7.99	31.88
21-Nov-25 20:00:00	47.85	8.22	2406.41	8.65	31.08
21-Nov-25 21:00:00	47.57	8.22	2454.34	8.65	31.07
21-Nov-25 22:00:00	47.51	8.22	2461.01	8.65	31.05
21-Nov-25 23:00:00	47.45	8.22	2457.19	8.65	31.04
22-Nov-25 00:00:00	47.39	8.22	2453.38	8.65	31.02
22-Nov-25 01:00:00	47.33	8.22	2449.56	8.65	31.01
22-Nov-25 02:00:00	47.27	8.22	2445.74	8.65	30.99
22-Nov-25 03:00:00	47.21	8.22	2441.92	8.65	30.98
22-Nov-25 04:00:00	47.14	8.22	2438.10	8.65	30.91
22-Nov-25 05:00:00	47.07	8.22	2434.28	8.65	30.80
24-Nov-25 06:00:00	48.23	7.14	2319.74	6.30	30.50
24-Nov-25 07:00:00	47.99	7.14	2360.01	6.30	30.51
24-Nov-25 08:00:00	47.88	7.56	2360.22	6.36	30.53
24-Nov-25 09:00:00	47.77	7.56	2360.42	6.36	30.54
24-Nov-25 10:00:00	47.65	7.56	2360.62	6.36	30.55
24-Nov-25 11:00:00	47.54	7.56	2360.83	6.36	30.57
24-Nov-25 12:00:00	47.43	7.71	2361.03	6.36	30.58
24-Nov-25 13:00:00	47.35	7.71	2361.23	6.36	30.59
24-Nov-25 14:00:00	47.27	7.71	2361.43	6.36	30.62
24-Nov-25 15:00:00	47.19	7.71	2361.64	6.36	30.65
24-Nov-25 16:00:00	6.00	7.71	2361.84	6.36	30.68
27-Nov-25 09:00:00	47.62	7.10	2295.33	5.30	29.09
27-Nov-25 10:00:00	47.52	7.10	2339.87	5.30	29.10
27-Nov-25 11:00:00	47.50	7.10	2357.73	5.30	29.08
27-Nov-25 12:00:00	47.48	7.10	2359.76	5.30	29.11
27-Nov-25 13:00:00	47.41	7.10	2361.79	5.30	29.19
27-Nov-25 14:00:00	47.32	7.10	2363.83	5.30	29.27
27-Nov-25 15:00:00	47.23	7.10	2771.61	5.30	29.35
30-Nov-25 00:00:00	47.81	8.41	2721.45	7.23	28.03
30-Nov-25 01:00:00	47.70	8.41	2757.61	7.23	28.16
30-Nov-25 02:00:00	47.60	8.41	2760.80	7.23	28.22
30-Nov-25 03:00:00	47.50	8.41	2761.73	7.23	28.25
30-Nov-25 04:00:00	47.40	8.41	2762.66	7.23	28.28
30-Nov-25 05:00:00	47.30	8.41	2763.59	7.23	28.31

GBL CT Blowdown water parameter

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
01-Dec-25 08:00:00	47.39	8.41	2642.14	5.70	28.15
01-Dec-25 09:00:00	47.65	8.41	2697.99	5.70	28.29
01-Dec-25 10:00:00	47.46	8.41	2714.56	5.70	28.42
01-Dec-25 12:00:00	47.08	8.41	2708.26	5.70	28.65
01-Dec-25 13:00:00	47.29	8.41	2677.21	5.70	28.58
01-Dec-25 14:00:00	47.21	8.41	2715.76	5.70	28.56
01-Dec-25 15:00:00	47.12	8.41	2729.59	5.70	28.62
01-Dec-25 16:00:00	47.04	8.41	2735.72	5.70	28.67
01-Dec-25 17:00:00	46.96	8.41	2739.12	5.80	28.73
03-Dec-25 14:00:00	47.52	8.41	2764.30	5.70	33.50
03-Dec-25 15:00:00	47.30	8.41	2765.37	5.70	33.50
03-Dec-25 16:00:00	47.37	8.41	2766.11	5.70	33.50
03-Dec-25 17:00:00	47.30	8.41	2766.44	5.70	33.50
03-Dec-25 18:00:00	47.19	8.41	2766.77	5.70	33.50
03-Dec-25 19:00:00	47.09	8.41	2767.10	5.70	33.50
06-Dec-25 11:00:00	6.00	7.12	2798.40	5.70	33.50
06-Dec-25 12:00:00	48.10	7.12	2798.00	5.70	33.50
06-Dec-25 13:00:00	48.23	7.12	2797.59	5.70	33.50
06-Dec-25 14:00:00	48.14	7.12	2797.18	5.70	33.50
06-Dec-25 15:00:00	48.05	7.12	2796.78	5.70	33.50
06-Dec-25 16:00:00	47.96	7.12	2796.37	5.70	33.50
06-Dec-25 17:00:00	47.87	7.12	2796.63	5.70	33.50
06-Dec-25 18:00:00	47.78	7.12	2796.94	5.70	33.50
06-Dec-25 19:00:00	47.70	7.12	2797.25	5.70	33.50
06-Dec-25 20:00:00	47.61	7.12	2797.56	5.70	33.50
06-Dec-25 21:00:00	47.54	7.12	2797.86	5.70	33.50
06-Dec-25 22:00:00	47.46	7.12	2798.17	5.70	33.50
06-Dec-25 23:00:00	47.39	7.12	2798.48	5.70	33.50
08-Dec-25 18:00:00	47.98	6.80	2810.18	7.59	30.89
08-Dec-25 19:00:00	48.03	6.80	2810.69	7.59	30.77
08-Dec-25 20:00:00	47.88	6.80	2811.21	7.59	30.67
09-Dec-25 11:00:00	1.67	6.79	2816.72	7.60	30.00
09-Dec-25 12:00:00	47.64	6.78	2816.69	7.82	31.28
09-Dec-25 13:00:00	47.60	6.77	2816.65	7.88	32.00
09-Dec-25 14:00:00	47.62	6.77	2816.61	8.10	32.30
09-Dec-25 15:00:00	47.57	6.77	2816.58	8.24	33.00
09-Dec-25 16:00:00	47.48	6.77	2816.62	8.24	33.00
09-Dec-25 17:00:00	47.40	6.77	2817.16	8.24	33.00
09-Dec-25 18:00:00	47.31	6.77	2817.71	8.24	33.00
12-Dec-25 07:00:00	47.40	6.67	2829.55	7.56	30.29
12-Dec-25 08:00:00	48.03	6.67	2830.17	7.56	30.37
12-Dec-25 09:00:00	47.85	6.73	2830.80	7.56	30.44
12-Dec-25 10:00:00	47.67	6.76	2831.43	7.56	30.53
13-Dec-25 05:00:00	49.00	6.69	2832.51	8.00	31.01
13-Dec-25 06:00:00	49.27	6.68	2832.56	8.00	31.05
13-Dec-25 07:00:00	49.16	6.70	2832.75	8.25	31.08
13-Dec-25 08:00:00	49.05	6.72	2833.32	8.25	31.10

**GBL CT Blowdown water parameter**

Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
13-Dec-25 09:00:00	48.95	6.73	2833.88	8.25	31.13
13-Dec-25 10:00:00	48.84	6.74	2834.45	8.25	31.16
13-Dec-25 11:00:00	48.73	6.74	2835.01	8.25	31.19
13-Dec-25 12:00:00	48.63	6.74	2835.57	8.25	31.22
13-Dec-25 13:00:00	48.52	6.74	2836.14	8.25	31.25
13-Dec-25 14:00:00	48.44	6.75	2836.70	8.25	31.26
13-Dec-25 15:00:00	48.37	6.75	2836.92	8.25	31.19
13-Dec-25 16:00:00	48.30	6.74	2836.70	8.25	31.10
13-Dec-25 17:00:00	48.24	6.71	2836.49	8.25	31.11
13-Dec-25 18:00:00	48.17	6.69	2836.27	8.25	31.12
15-Dec-25 08:00:00	49.26	6.76	2841.44	5.87	31.52
15-Dec-25 09:00:00	49.09	6.76	2841.52	5.87	31.50
15-Dec-25 10:00:00	48.99	6.76	2841.60	5.87	31.47
15-Dec-25 11:00:00	48.90	6.75	2841.68	5.87	31.45
15-Dec-25 12:00:00	48.80	6.75	2841.77	5.87	31.43
15-Dec-25 13:00:00	48.71	6.75	2841.85	5.87	31.40
15-Dec-25 14:00:00	48.61	6.75	2841.87	5.87	31.38
15-Dec-25 15:00:00	48.51	6.75	2841.68	5.87	31.36
15-Dec-25 16:00:00	48.42	6.75	2841.53	5.87	31.34
15-Dec-25 17:00:00	48.33	6.75	2842.38	5.87	31.31
15-Dec-25 18:00:00	48.26	6.76	2843.23	5.87	31.27
18-Dec-25 09:00:00	48.85	6.80	2885.28	7.30	31.27
18-Dec-25 10:00:00	48.74	6.80	2886.43	7.50	31.31
18-Dec-25 11:00:00	48.63	6.79	2887.57	7.50	31.34
18-Dec-25 12:00:00	48.51	6.79	2888.72	7.55	31.33
18-Dec-25 13:00:00	48.39	6.78	2889.87	7.67	31.32
18-Dec-25 14:00:00	48.28	6.78	2891.02	7.67	31.30
18-Dec-25 15:00:00	48.16	6.77	2892.14	7.67	31.28
18-Dec-25 16:00:00	48.04	6.77	2893.21	7.67	31.26
20-Dec-25 18:00:00	49.05	6.80	2945.20	7.56	30.00
20-Dec-25 19:00:00	49.19	6.81	2945.81	7.56	30.00
20-Dec-25 20:00:00	49.09	6.82	2946.43	7.56	30.00
20-Dec-25 21:00:00	49.00	6.83	2947.05	7.56	30.00
20-Dec-25 22:00:00	48.90	6.84	2947.67	7.56	31.32
20-Dec-25 23:00:00	48.80	6.84	2948.29	7.56	31.31
21-Dec-25 00:00:00	48.70	6.85	2948.97	7.56	31.31
21-Dec-25 01:00:00	48.60	6.86	2949.93	7.56	31.31
21-Dec-25 02:00:00	48.50	6.87	2950.89	7.56	31.30
21-Dec-25 03:00:00	48.42	6.87	2951.85	7.56	31.30
21-Dec-25 04:00:00	48.33	6.88	2952.81	7.56	31.29
21-Dec-25 05:00:00	48.24	6.88	2953.77	7.56	31.22
22-Dec-25 06:00:00	0.81	6.90	3318.00	5.80	23.49
22-Dec-25 08:00:00	47.32	6.89	3156.00	10.36	31.06
22-Dec-25 09:00:00	47.89	6.89	3156.00	10.36	31.20
22-Dec-25 10:00:00	47.79	6.88	3156.00	10.36	31.23
22-Dec-25 11:00:00	47.68	6.88	3156.00	10.36	31.26
22-Dec-25 12:00:00	47.55	6.87	3156.00	10.36	31.30

**GBL CT Blowdown water parameter**

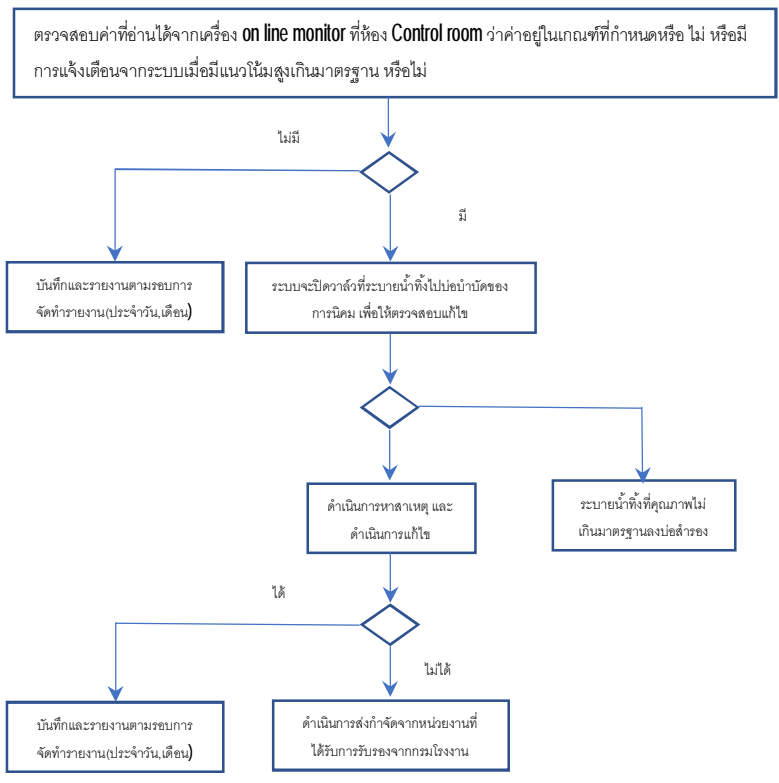
Date	CT B/D Water Flow (T/Hr)	pH	Conduct. (uS/CM)	D.O. (mg/l)	CT B/D discharge Temp. (Deg C)
22-Dec-25 13:00:00	47.37	6.86	3156.00	10.36	31.33
22-Dec-25 14:00:00	47.19	6.85	3156.00	10.36	31.36
22-Dec-25 15:00:00	47.17	7.85	3156.00	10.36	31.38
25-Dec-25 15:00:00	0.62	7.61	474.26	5.78	33.40
25-Dec-25 16:00:00	47.81	7.85	2851.48	5.78	33.40
25-Dec-25 17:00:00	47.74	7.87	2897.43	5.78	33.40
25-Dec-25 18:00:00	47.68	7.88	2905.95	5.78	33.40
25-Dec-25 19:00:00	47.61	7.89	2914.46	5.78	33.40
25-Dec-25 20:00:00	47.55	7.90	2922.97	5.78	33.40
25-Dec-25 21:00:00	47.48	7.92	2927.03	5.78	33.40
25-Dec-25 22:00:00	47.42	7.93	2929.56	5.78	33.40
25-Dec-25 23:00:00	47.35	7.94	2932.09	5.78	33.40
26-Dec-25 00:00:00	47.28	7.94	2934.63	5.78	33.40
26-Dec-25 01:00:00	47.21	7.93	2937.16	5.78	33.40
26-Dec-25 02:00:00	47.13	7.93	2939.69	5.78	33.40
27-Dec-25 02:00:00	47.51	8.06	2940.52	7.86	30.08
27-Dec-25 03:00:00	47.98	8.06	2927.56	7.86	30.11
27-Dec-25 04:00:00	48.02	8.05	2919.40	7.86	30.07
27-Dec-25 05:00:00	47.95	8.04	2911.24	7.86	30.02
27-Dec-25 06:00:00	47.85	8.03	2903.08	7.86	29.97
27-Dec-25 07:00:00	47.77	8.03	2894.93	7.86	29.92
27-Dec-25 08:00:00	47.69	8.02	2886.21	7.86	29.88
27-Dec-25 09:00:00	47.61	8.01	2876.41	7.86	29.83
27-Dec-25 10:00:00	47.53	8.00	2866.60	7.86	29.79
27-Dec-25 11:00:00	47.45	7.99	2856.80	7.86	29.74
27-Dec-25 12:00:00	47.37	7.98	2847.00	7.86	29.70
27-Dec-25 13:00:00	47.29	7.96	2837.20	7.86	29.66
27-Dec-25 14:00:00	47.19	7.95	2827.40	7.86	29.61
27-Dec-25 15:00:00	47.07	7.94	2817.59	7.86	29.62
Min	0.62	6.67	474.26	4.11	23.49
Max	50.39	8.41	3318.00	10.36	33.50

ภาคผนวก ข-15

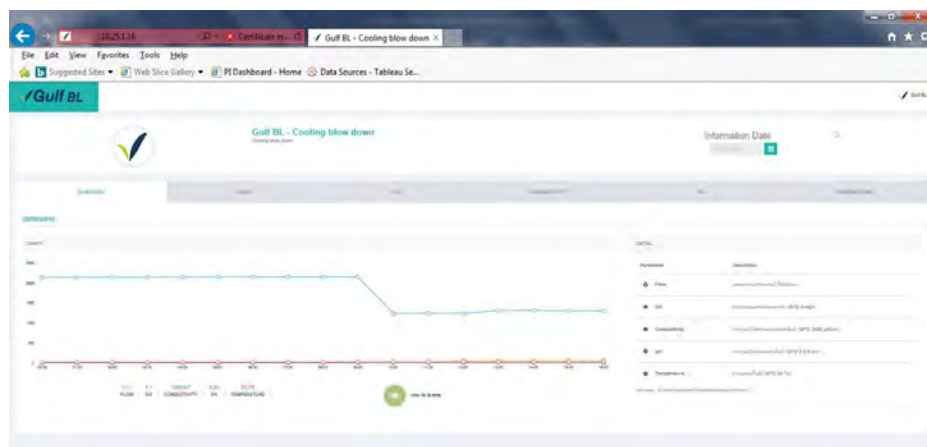
แนวทางการดำเนินการในกรณีที่คุณภาพน้ำทิ้งจากหอหล่อเย็น  
ไม่เป็นไปตามค่ามาตรฐานที่กำหนด

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แนวทางการดำเนินการในกรณีที่คุณภาพน้ำทิ้งจากหอหล่อเย็นไม่เป็นไปตามที่มาตรฐานกำหนด

ลำดับ	Flow Diagram	ผู้รับผิดชอบ	หมายเหตุ
1	 <pre> graph TD     A[ตรวจสอบค่าที่อ่านได้จากเครื่อง on line monitor ที่ห้อง Control room ว่าค่าอยู่ในเกณฑ์ที่กำหนดหรือไม่ หรือมี การแจ้งเตือนจากระบบเมื่อมีแนวโน้มสูงเกินมาตรฐาน หรือไม่] -- ไม่มี --&gt; B[บันทึกและรายงานตามรอบการ จัดทำรายงาน(ประจำวัน,เดือน)]     A -- มี --&gt; C[ระบบจะปิดวาล์วที่ระบายน้ำทิ้งไปบ่อน้ำใต้ของ การนิคม เพื่อให้ตรวจสอบแก้ไข]     C --&gt; D{ }     D --&gt; E[ดำเนินการหาสาเหตุ และ ดำเนินการแก้ไข]     D --&gt; F[ระบายน้ำทิ้งที่คุณภาพไม่ เกินมาตรฐานลงบ่อสำรอง]     E --&gt; G{ }     G -- ได้ --&gt; B     G -- ไม่ได้ --&gt; H[ดำเนินการส่งกำจัดจากหน่วยงานที่ ได้รับรองรับรองจากกรมโรงงาน]           </pre>	Shift leader	- อัตราการไหล ของน้ำทิ้งเมื่อเปิดวาล์วจะ ไม่น้ำค่าควมวัดค่าถ้าไม่มีอัตราการไหล - DO > 4 - pH 5.5 - 9 - conductivity < 3500 us/cm - Temperature < 34-degree C.
2		Shift leader	- กรณีที่มีค่าควบคุมค่าใดค่าหนึ่งเกิน มาตรฐาน ระบบจะปิด วาล์วที่จ่ายน้ำ ไปบ่อน้ำใต้เสียของการนิคม ยัดไม้มิดี เพื่อให้ทำการตรวจสอบ หรือ แก้ไข - รายงานตามรูปแบบที่บริษัท กำหนด
3		Shift leader/ Maintenance	- การแจ้งตรวจสอบ/ซ่อมในระบบ SAP - รายงานตามรูปแบบที่บริษัท กำหนด - ใช้บ่อสำรองกรณีมีน้ำทิ้งจากหอ หล่อเย็นที่คุณภาพไม่เกินค่าที่กำหนด
4		Shift leader/ Maintenance	- กรณีที่เกิดจากเครื่องมือวัดค่า error ให้ดำเนินการสอบเทียบ ใหม่ และตรวจสอบค่าจากห้อง Lab ของโรงไฟฟ้าจากนั้นถ้า เครื่องมือวัดปรกติแล้ว ค่อย ระบายน้ำออก - กรณีที่คุณภาพน้ำเกิน มาตรฐานไม่สามารถแก้ไขได้ให้ จัดจ้างส่งกำจัดจากหน่วยงานที่ ได้รับอนุญาต

ภาพแสดงหน้าจอที่ห้องควบคุมใช้สำหรับใช้ตรวจสอบ





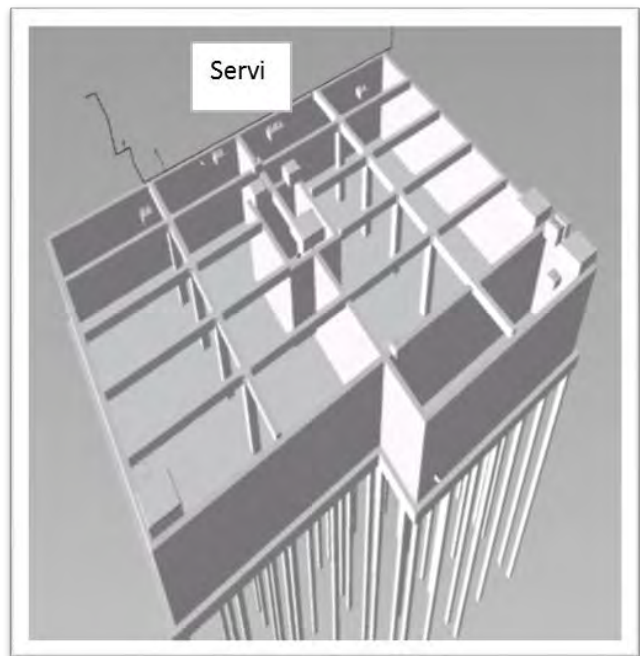
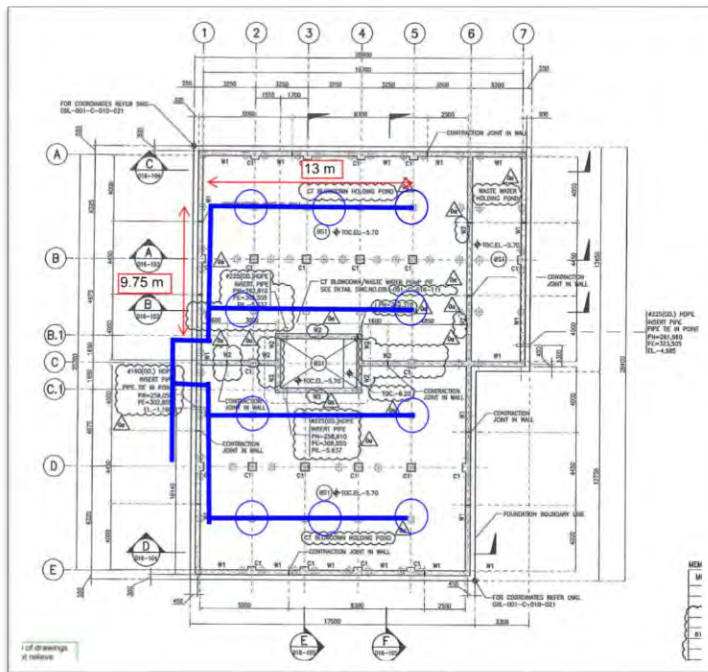
ภาคผนวก ข-16

เอกสารการออกแบบระบบเติมอากาศ

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## Air Bubble system for CT blowdown pit.

โครงการโรงไฟฟ้าบ้านเลนได้ออกแบบ ระบบเติมอากาศในบ่อซึ่งอยู่ใต้ดิน โดยติดตั้งหัวฟองอากาศ 10 หัวเพื่อเติมอากาศ ผ่านท่อ LDPE โดยมี Regulator เพื่อปรับแรงดันลมให้เหมาะสมซึ่งลมที่ใช้มาจากระบบ plant air ของโรงไฟฟ้า




## ลักษณะหัวเติมอากาศ





ภาคผนวก ข-17


เอกสารบำรุงรักษา คู่มือการทำงานของ  
เครื่องควบแน่น (Condenser)

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	บันทึกการตรวจสอบมอเตอร์ไฟฟ้าแบบเดินเครื่องปกติราย 3 เดือน		FORM NO.		
	MOTOR INSPECTION SHEET 3M (NORMAL OPERATION)		FW-MTN-ME-01-01 REV.01		
EQUIPMENT NAME : MOTOR CONDENSATE PUMP2		PLANT : GBL	PAGE 1 OF 1		
EQUIPMENT TAG (KKS CODE) : 2107-CG-10LCB20AP001-M01		DATE : 16/07/2025	WORK ORDER NO. 20320442		
2107-CG-10LCB20AP001-M01		TIME : 13:06:10	WORK PERMIT NO. 2107004827		
MOTOR DATA : <input checked="" type="checkbox"/> LV MOTOR (AC) <input type="checkbox"/> MV MOTOR (AC) <input type="checkbox"/> DC MOTOR <input type="checkbox"/> 3 Phase <input type="checkbox"/> Single Phase					
RATED POWER : 110 (kW) RATED CURRENT : 197.3 (A) RATED VOLTAGE 400 (V) MOTOR SPEED (RPM) INSULATION CLS. F					
INSPECTION AND ACTIVITY					
INTERVAL	DESCRIPTION	CRITERIA ACCEPTANCE	RESULT	REMARK	
3 MONTH	1	REGREASE DE (g) NDE (g) RANGE : 20 - 400g FOLLOW UP O&M MANUAL RECOMMEND	DE - 9 NDE - 9	*REGREASE HAVE TO INJECT UNTIL NEW GREASE COME OUT ** REGREASE HAVE TO FOLLOW OEM RECOMMEND	
	2	NOISE AND SOUND	SOUND SHOULD BE SMOOTHLY NOT FOUND METAL SCRATCH	<input type="checkbox"/> NORMAL <input type="checkbox"/> ABNORMAL	
MEASUREMENT AND RECORD DATA					
INTERVAL	DESCRIPTION	ACCEPTANCE VALUE	ACTUAL VALUE	RESULT	REMARK
3 MONTH	1	MEASUREMENT RECORD CURRENT < 1 RATED REF NAME PLATE AMP	I1 : - I2 : - I3 : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	2	MEASUREMENT RECORD VOLTAGE 220 +/- 10% 400 +/- 10% 6600 +/- 10% VOLT	Va : - Vb : - Vc : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	3	MEASUREMENT RECORD POWER SEE NAME PLATE kW	- kW	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	4	MEASUREMENT RECORD TEMPERATURE < 90 C°	DE : - NDE : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	MOTOR DE SIDE MOTOR NDE SIDE
Remark Outsource report					
REPORTED BY ELECTRICAL ENGINEER		APPROVE AND COMPLETED BY ELECTRICAL LEADER			
FULL NAME :					
DATE :					
FW-MTN-ME-01-01 REV.01					

	บันทึกการตรวจสอบมอเตอร์ไฟฟ้าแบบเดินเครื่องปกติราย 3 เดือน		FORM NO.		
	MOTOR INSPECTION SHEET 3M (NORMAL OPERATION)		FW-MTN-ME-01-01 REV.01		
EQUIPMENT NAME : MOTOR CONDENSATE PUMP1		PLANT : GBL	PAGE 1 OF 1		
EQUIPMENT TAG (KKS CODE) : 2107-CG-10LCB10AP001-M01		DATE : 25/10/2025	WORK ORDER NO. 20326714		
2107-CG-10LCB10AP001-M01		TIME : 14:42:45	WORK PERMIT NO. 2107004930		
MOTOR DATA : <input checked="" type="checkbox"/> LV MOTOR (AC) <input type="checkbox"/> MV MOTOR (AC) <input type="checkbox"/> DC MOTOR <input type="checkbox"/> 3 Phase <input type="checkbox"/> Single Phase					
RATED POWER : 110 (kW) RATED CURRENT : 197.3 (A) RATED VOLTAGE 400 (V) MOTOR SPEED (RPM) INSULATION CLS. F					
INSPECTION AND ACTIVITY					
INTERVAL	DESCRIPTION	CRITERIA ACCEPTANCE	RESULT	REMARK	
3 MONTH	1	REGREASE DE (g) NDE (g) RANGE : 20 - 400g FOLLOW UP O&M MANUAL RECOMMEND	DE - 9 NDE - 9	*REGREASE HAVE TO INJECT UNTIL NEW GREASE COME OUT ** REGREASE HAVE TO FOLLOW OEM RECOMMEND	
	2	NOISE AND SOUND	SOUND SHOULD BE SMOOTHLY NOT FOUND METAL SCRATCH	<input type="checkbox"/> NORMAL <input type="checkbox"/> ABNORMAL	
MEASUREMENT AND RECORD DATA					
INTERVAL	DESCRIPTION	ACCEPTANCE VALUE	ACTUAL VALUE	RESULT	REMARK
3 MONTH	1	MEASUREMENT RECORD CURRENT < 1 RATED REF NAME PLATE AMP	I1 : - I2 : - I3 : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	2	MEASUREMENT RECORD VOLTAGE 220 +/- 10% 400 +/- 10% 6600 +/- 10% VOLT	Va : - Vb : - Vc : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	3	MEASUREMENT RECORD POWER SEE NAME PLATE kW	- kW	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	4	MEASUREMENT RECORD TEMPERATURE < 90 C°	DE : - NDE : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	MOTOR DE SIDE MOTOR NDE SIDE
Remark Outsource report					
REPORTED BY ELECTRICAL ENGINEER		APPROVE AND COMPLETED BY ELECTRICAL LEADER			
FULL NAME :					
DATE :					
FW-MTN-ME-01-01 REV.01					

	บันทึกการตรวจสอบมอเตอร์ไฟฟ้าแบบเดินเครื่องปกติราย 3 เดือน		FORM NO.		
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2107-CG-10LCB10AP001-M01		TIME : 13:06:10	WORK PERMIT NO. 2107004827		
MOTOR DATA : <input checked="" type="checkbox"/> LV MOTOR (AC) <input type="checkbox"/> MV MOTOR (AC) <input type="checkbox"/> DC MOTOR <input type="checkbox"/> 3 Phase <input type="checkbox"/> Single Phase					
RATED POWER : 110 (kW) RATED CURRENT : 197.3 (A) RATED VOLTAGE 400 (V) MOTOR SPEED (RPM) INSULATION CLS. F					
INSPECTION AND ACTIVITY					
INTERVAL	DESCRIPTION	CRITERIA ACCEPTANCE	RESULT	REMARK	
3 MONTH	1	REGREASE DE (g) NDE (g) RANGE : 20 - 400g FOLLOW UP O&M MANUAL RECOMMEND	DE - 9 NDE - 9	*REGREASE HAVE TO INJECT UNTIL NEW GREASE COME OUT ** REGREASE HAVE TO FOLLOW OEM RECOMMEND	
	2	NOISE AND SOUND	SOUND SHOULD BE SMOOTHLY NOT FOUND METAL SCRATCH	<input type="checkbox"/> NORMAL <input type="checkbox"/> ABNORMAL	
MEASUREMENT AND RECORD DATA					
INTERVAL	DESCRIPTION	ACCEPTANCE VALUE	ACTUAL VALUE	RESULT	REMARK
3 MONTH	1	MEASUREMENT RECORD CURRENT < 1 RATED REF NAME PLATE AMP	I1 : - I2 : - I3 : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	2	MEASUREMENT RECORD VOLTAGE 220 +/- 10% 400 +/- 10% 6600 +/- 10% VOLT	Va : - Vb : - Vc : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	3	MEASUREMENT RECORD POWER SEE NAME PLATE kW	- kW	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	4	MEASUREMENT RECORD TEMPERATURE < 90 C°	DE : - NDE : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	MOTOR DE SIDE MOTOR NDE SIDE
Remark Outsorce report					
REPORTED BY ELECTRICAL ENGINEER		APPROVE AND COMPLETED BY ELECTRICAL LEADER			
FULL NAME :					
DATE :					
FW-MTN-ME-01-01 REV.01					

	บันทึกการตรวจสอบมอเตอร์ไฟฟ้าแบบเดินเครื่องปกติราย 3 เดือน		FORM NO.		
	MOTOR INSPECTION SHEET 3M (NORMAL OPERATION)		FW-MTN-ME-01-01 REV.01		
EQUIPMENT NAME : MOTOR CONDENSATE PUMP2		PLANT : GBL	PAGE 1 OF 1		
EQUIPMENT TAG (KKS CODE) : 2107-CG-10LCB20AP001-M01		DATE : 25/10/2025	WORK ORDER NO . 20326714		
2107-CG-10LCB20AP001-M01		TIME : 14:42:45	WORK PERMIT NO. 2107004930		
MOTOR DATA : <input checked="" type="checkbox"/> LV MOTOR (AC) <input type="checkbox"/> MV MOTOR (AC) <input type="checkbox"/> DC MOTOR <input type="checkbox"/> 3 Phase <input type="checkbox"/> Single Phase					
RATED POWER : 110 (kW) RATED CURRENT : 197.3 (A) RATED VOLTAGE 400 (V) MOTOR SPEED (RPM) INSULATION CLS. F					
INSPECTION AND ACTIVITY					
INTERVAL	DESCRIPTION	CRITERIA ACCEPTANCE	RESULT	REMARK	
3 MONTH	1	REGREASE DE (g) NDE (g) RANGE : 20 - 400g FOLLOW UP O&M MANUAL RECOMMEND	DE - 9 NDE - 9	*REGREASE HAVE TO INJECT UNTIL NEW GREASE COME OUT ** REGREASE HAVE TO FOLLOW OEM RECOMMEND	
	2	NOISE AND SOUND	SOUND SHOULD BE SMOOTHLY NOT FOUND METAL SCRATCH	<input type="checkbox"/> NORMAL <input type="checkbox"/> ABNORMAL	
MEASUREMENT AND RECORD DATA					
INTERVAL	DESCRIPTION	ACCEPTANCE VALUE	ACTUAL VALUE	RESULT	REMARK
3 MONTH	1	MEASUREMENT RECORD CURRENT < 1 RATED REF NAME PLATE AMP	I1 : - I2 : - I3 : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	2	MEASUREMENT RECORD VOLTAGE 220 +/- 10% 400 +/- 10% 6600 +/- 10% VOLT	Va : - Vb : - Vc : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	3	MEASUREMENT RECORD POWER SEE NAME PLATE kW	- kW	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	
	4	MEASUREMENT RECORD TEMPERATURE < 90 C°	DE : - NDE : -	<input type="checkbox"/> ACCEPT <input type="checkbox"/> NOT ACCEPT	MOTOR DE SIDE MOTOR NDE SIDE
Remark Outsorce report					
REPORTED BY ELECTRICAL ENGINEER		APPROVE AND COMPLETED BY ELECTRICAL LEADER			
FULL NAME :					
DATE :					
FW-MTN-ME-01-01 REV.01					



## WORK ORDER

### Preventive Maintenance

Work Order 20320456



Notification 10417842



#### General

Main Work Center MI1-GBL - Instrument Priority 3-Routine (30 Days)  
PM Activity Type PM1-PM-Time base Requested Date 01-Jul-2025 03:30  
Revision Status REL Status Date 31-Jul-2025 14:23

#### Reference Object

Functional Location 2107-CG-10QUA24CQ001 CONDENSATE PP SPEC. CONDUCT

#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
CONDUCTIVITY ANALYZER INSPECTION (1M)	Notif. Require	01-Jul-2025	31-Jul-2025	184.0
	Order Basic	01-Jul-2025	01-Jul-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By Maintenance Plan I207CQ11-002 CONDUCTIVITY ANALYZER  
Responded By Task List I207CQ11 CONDUCTIVITY ANALYZE

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		CONDUCTIVITY ANALYZE INSPECTION (1M)	1.4	1	1.4		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE CONDUCTIVITY SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER ZERO IN AIR	0.5	1	0.5		
0010	0060	CALIBRATION ANALYZER WITH BUFFER	0.1	1	0.1		
0010	0070	RECORD DATA ON CHECK SHEET	0.2	1	0.2		
0010	0080	REINSTALLATION CONDUCTIVITY SENSOR	0.1	1	0.1		
0010	0090	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.4		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

### Preventive Maintenance

Work Order 20320456



Notification 10417842



#### Note: (Other Comment)

	Reported By	Accepted By	Completed By
Sign			
Name			
Date	: 30 JUL 2025	Date : 29 JUL 2025	Date : 31 JUL 2025





## WORK ORDER

### Preventive Maintenance

Work Order 20320456



Notification 10417842



#### Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10QUA24CQ002	CONDENSATE PP SPEC. CONDUCT			



## WORK ORDER

### Preventive Maintenance

Work Order 20320486



Notification 10417872



#### General

Main Work Center	M11-GBL - Instrument	Priority	3-Routine (30 Days)
PM Activity Type	PM1-PM-Time base	Requested Date	01-Jul-2025 03:30
Revision		Status	REL
		Status Date	31-Jul-2025 14:23

#### Reference Object

Functional Location	2107-CG-10QUA27CQ001	PH AFTER CONDENSER
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#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
PH ANALYZER INSPECTION (1M)	Notif. Require	01-Jul-2025	31-Jul-2025	184.0
	Order Basic	01-Jul-2025	01-Jul-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By	Maintenance Plan	I207CQ12-002	PH ANALYZER INSPECTION
Responded By	Task List	I207CQ12	PH ANALYZER INSPECTION

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		PH ANALYZER INSPECTION (1M)	1.2	1	1.2		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE PH SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER WITH BUFFER	0.5	1	0.5		
0010	0060	RECORD DATA ON CHECK SHEET	0.1	1	0.1		
0010	0070	REINSTALLATION PH SENSOR	0.1	1	0.1		
0010	0080	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.2		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

Preventive Maintenance

Work Order 20320486



Notification 10417872



Note: (Other Comment)

Reported By		Accepted By		Completed By	
Sign					
Name					
Date	30 JUL 2025	Date	29 JUL 2025	Date	31 JUL 2025



## WORK ORDER

Preventive Maintenance

Work Order 20320486



Notification 10417872



Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10PAB35CQ001	MCW SUPPLY PH			





## WORK ORDER

### Preventive Maintenance

Work Order 20322906



Notification 10420496



#### General

Main Work Center MI1-GBL - Instrument Priority 3-Routine (30 Days)  
PM Activity Type PM1-PM-Time base Requested Date 01-Aug-2025 03:30  
Revision Status REL Status Date 29-Aug-2025 11:23

#### Reference Object

Functional Location 2107-CG-10QUA24CQ001 CONDENSATE PP SPEC. CONDUCT

#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
CONDUCTIVITY ANALYZER INSPECTION (1M)	Notif. Require	01-Aug-2025	31-Aug-2025	168.0
	Order Basic	01-Aug-2025	01-Aug-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By Maintenance Plan I207CQ11-002 CONDUCTIVITY ANALYZER  
Responded By Task List I207CQ11 CONDUCTIVITY ANALYZE

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		CONDUCTIVITY ANALYZE INSPECTION (1M)	1.4	1	1.4		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE CONDUCTIVITY SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER ZERO IN AIR	0.5	1	0.5		
0010	0060	CALIBRATION ANALYZER WITH BUFFER	0.1	1	0.1		
0010	0070	RECORD DATA ON CHECK SHEET	0.2	1	0.2		
0010	0080	REINSTALLATION CONDUCTIVITY SENSOR	0.1	1	0.1		
0010	0090	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.4		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

### Preventive Maintenance

Work Order 20322906



Notification 10420496



#### Note: (Other Comment)

Reported By		Accepted By		Completed By	
Sign					
Name					
Date	: 29 AUG 2025	Date	: 28 AUG 2025	Date	: 29 AUG 2025



## WORK ORDER

### Preventive Maintenance

Work Order 20322906



Notification 10420496



#### Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10QUA24CQ002	CONDENSATE PP SPEC. CONDUCT			



## WORK ORDER

### Preventive Maintenance

Work Order 20322920



Notification 10420510



#### General

Main Work Center	M11-GBL - Instrument	Priority	3-Routine (30 Days)
PM Activity Type	PM1-PM-Time base	Requested Date	01-Aug-2025 03:30
Revision		Status	REL
		Status Date	29-Aug-2025 11:23

#### Reference Object

Functional Location	2107-CG-10QUA27CQ001	PH AFTER CONDENSER
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#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
PH ANALYZER INSPECTION (1M)	Notif. Require	01-Aug-2025	31-Aug-2025	168.0
	Order Basic	01-Aug-2025	01-Aug-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By	Maintenance Plan	I207CQ12-002	PH ANALYZER INSPECTION
Responded By	Task List	I207CQ12	PH ANALYZER INSPECTION

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		PH ANALYZER INSPECTION (1M)	1.2	1	1.2		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE PH SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER WITH BUFFER	0.5	1	0.5		
0010	0060	RECORD DATA ON CHECK SHEET	0.1	1	0.1		
0010	0070	REINSTALLATION PH SENSOR	0.1	1	0.1		
0010	0080	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.2		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

Preventive Maintenance

Work Order 20322920



Notification 10420510



Note: (Other Comment)

Reported By	Accepted By	Completed By
Sign		
Name		
Date : 29 AUG 2025	Date : 28 AUG 2025	Date : 29 AUG 2025



## WORK ORDER

Preventive Maintenance

Work Order 20322920



Notification 10420510



Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10PAB35CQ001	MCW SUPPLY PH			



## WORK ORDER

### Preventive Maintenance

Work Order 20324841



Notification 10422549



#### General

Main Work Center MI1-GBL - Instrument Priority 3-Routine (30 Days)  
PM Activity Type PM1-PM-Time base Requested Date 01-Sep-2025 03:30  
Revision Status TECO Status Date 30-Sep-2025 17:23

#### Reference Object

Functional Location 2107-CG-10QUA24CQ001 CONDENSATE PP SPEC. CONDUCT

#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
CONDUCTIVITY ANALYZER INSPECTION (IM)	Notif. Require	01-Sep-2025	01-Oct-2025	184.0
	Order Basic	01-Sep-2025	01-Sep-2025	8.0
	Order Actual	30-Sep-2025	30-Sep-2025	8.0

#### Responsibilities

#### Work Instruction

Requested By Maintenance Plan I207CQ11-002 CONDUCTIVITY ANALYZER  
Responded By Task List I207CQ11 CONDUCTIVITY ANALYZE

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		CONDUCTIVITY ANALYZE INSPECTION (IM)	1.4	1	1.4		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE CONDUCTIVITY SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER ZERO IN AIR	0.5	1	0.5		
0010	0060	CALIBRATION ANALYZER WITH BUFFER	0.1	1	0.1		
0010	0070	RECORD DATA ON CHECK SHEET	0.2	1	0.2		
0010	0080	REINSTALLATION CONDUCTIVITY SENSOR	0.1	1	0.1		
0010	0090	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.4		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

### Preventive Maintenance

Work Order 20324841



Notification 10422549



#### Note: (Other Comment)

Reported By	Accepted By	Completed By
Sign		
Name		
Date : 30 SEP 2025	Date : 29 SEP 2025	Date : 30 SEP 2025





## WORK ORDER

Preventive Maintenance

Work Order 20324841



Notification 10422549



### Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10QUA24CQ002	CONDENSATE PP SPEC. CONDUCT			



## WORK ORDER

Preventive Maintenance

Work Order 20324895



Notification 10422603



### General

Main Work Center	M11-GBL - Instrument	Priority	3-Routine (30 Days)
PM Activity Type	PM1-PM-Time base	Requested Date	01-Sep-2025 03:30
Revision		Status	TECO
		Status Date	30-Sep-2025 17:23

### Reference Object

Functional Location 2107-CG-10QUA27CQ001 PH AFTER CONDENSER

### Equipment

### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
PH ANALYZER INSPECTION (IM)	Notif. Require	01-Sep-2025	01-Oct-2025	184.0
	Order Basic	01-Sep-2025	01-Sep-2025	8.0
	Order Actual	30-Sep-2025	30-Sep-2025	8.0

### Responsibilities

### Work Instruction

Requested By	Maintenance Plan	I207CQ12-002	PH ANALYZER INSPECTION
Responded By	Task List	I207CQ12	PH ANALYZER INSPECTION

### Lead Engineer

### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		PH ANALYZER INSPECTION (IM)	1.2	1	1.2		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE PH SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER WITH BUFFER	0.5	1	0.5		
0010	0060	RECORD DATA ON CHECK SHEET	0.1	1	0.1		
0010	0070	REINSTALLATION PH SENSOR	0.1	1	0.1		
0010	0080	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.2		

### Damage / Problem

### Cause

### Activity



## WORK ORDER

Preventive Maintenance

Work Order 20324895



Notification 10422603



Note: (Other Comment)

Reported By	Accepted By	Completed By
Sign		
Name		
Date : 30 SEP 2025	Date : 29 SEP 2025	Date : 30 SEP 2025



## WORK ORDER

Preventive Maintenance

Work Order 20324895



Notification 10422603



Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10PAB35CQ001	MCW SUPPLY PH			



## WORK ORDER

### Preventive Maintenance

Work Order 20326746



Notification 10424645



#### General

Main Work Center MI1-GBL - Instrument Priority 3-Routine (30 Days)  
PM Activity Type PM1-PM-Time base Requested Date 01-Oct-2025 03:30  
Revision Status REL Status Date 30-Oct-2025 17:23

#### Reference Object

Functional Location 2107-CG-10QUA24CQ001 CONDENSATE PP SPEC. CONDUCT

#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
CONDUCTIVITY ANALYZER INSPECTION (1M)	Notif. Require	01-Oct-2025	31-Oct-2025	176.0
	Order Basic	01-Oct-2025	01-Oct-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By Maintenance Plan I207CQ11-002 CONDUCTIVITY ANALYZER  
Responded By Task List I207CQ11 CONDUCTIVITY ANALYZE

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		CONDUCTIVITY ANALYZE INSPECTION (1M)	1.4	1	1.4		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE CONDUCTIVITY SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER ZERO IN AIR	0.5	1	0.5		
0010	0060	CALIBRATION ANALYZER WITH BUFFER	0.1	1	0.1		
0010	0070	RECORD DATA ON CHECK SHEET	0.2	1	0.2		
0010	0080	REINSTALLATION CONDUCTIVITY SENSOR	0.1	1	0.1		
0010	0090	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.4		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

### Preventive Maintenance

Work Order 20326746



Notification 10424645



#### Note: (Other Comment)

	Reported By	Accepted By	Completed By
Sign			
Name			
Date	: 30 OCT 2025	Date : 28 OCT 2025	Date : 30 OCT 2025





## WORK ORDER

### Preventive Maintenance

Work Order 20326746



Notification 10424645



#### Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10QUA24CQ002	CONDENSATE PP SPEC. CONDUCT			



## WORK ORDER

### Preventive Maintenance

Work Order 20326812



Notification 10424711



#### General

Main Work Center	M11-GBL - Instrument	Priority	3-Routine (30 Days)
PM Activity Type	PM1-PM-Time base	Requested Date	01-Oct-2025 03:30
Revision		Status	REL
		Status Date	30-Oct-2025 17:23

#### Reference Object

Functional Location	2107-CG-10QUA27CQ001	PH AFTER CONDENSER
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#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
PH ANALYZER INSPECTION (1M)	Notif. Require	01-Oct-2025	31-Oct-2025	176.0
	Order Basic	01-Oct-2025	01-Oct-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By	Maintenance Plan	I207CQ12-002	PH ANALYZER INSPECTION
Responded By	Task List	I207CQ12	PH ANALYZER INSPECTION

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		PH ANALYZER INSPECTION (1M)	1.2	1	1.2		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE PH SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER WITH BUFFER	0.5	1	0.5		
0010	0060	RECORD DATA ON CHECK SHEET	0.1	1	0.1		
0010	0070	REINSTALLATION PH SENSOR	0.1	1	0.1		
0010	0080	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.2		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

Preventive Maintenance

Work Order 20326812



Notification 10424711



Note: (Other Comment)

Reported By	Accepted By	Completed By
Sign		
Name		
Date : 30 OCT 2025	Date : 28 OCT 2025	Date : 30 OCT 2025



## WORK ORDER

Preventive Maintenance

Work Order 20326812



Notification 10424711



Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10PAB35CQ001	MCW SUPPLY PH			



## WORK ORDER

### Preventive Maintenance

Work Order 20329036



Notification 10427089



#### General

Main Work Center MI1-GBL - Instrument Priority 3-Routine (30 Days)  
PM Activity Type PM1-PM-Time base Requested Date 01-Nov-2025 03:30  
Revision Status REL Status Date 29-Nov-2025 15:23

#### Reference Object

Functional Location 2107-CG-10QUA24CQ001 CONDENSATE PP SPEC. CONDUCT

#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
CONDUCTIVITY ANALYZER INSPECTION (IM)	Notif. Require	01-Nov-2025	01-Dec-2025	176.0
	Order Basic	03-Nov-2025	03-Nov-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By Maintenance Plan I207CQ11-002 CONDUCTIVITY ANALYZER  
Responded By Task List I207CQ11 CONDUCTIVITY ANALYZE

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		CONDUCTIVITY ANALYZE INSPECTION (IM)	1.4	1	1.4		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE CONDUCTIVITY SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER ZERO IN AIR	0.5	1	0.5		
0010	0060	CALIBRATION ANALYZER WITH BUFFER	0.1	1	0.1		
0010	0070	RECORD DATA ON CHECK SHEET	0.2	1	0.2		
0010	0080	REINSTALLATION CONDUCTIVITY SENSOR	0.1	1	0.1		
0010	0090	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.4		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

### Preventive Maintenance

Work Order 20329036



Notification 10427089



#### Note: (Other Comment)

Reported By		Accepted By		Completed By	
Sign					
Name					
Date	: 28 NOV 2025	Date	: 27 NOV 2025	Date	: 29 NOV 2025



## WORK ORDER

Preventive Maintenance

Work Order 20329036



Notification 10427089



### Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10QUA24CQ002	CONDENSATE PP SPEC. CONDUCT			



## WORK ORDER

Preventive Maintenance

Work Order 20329059



Notification 10427112



### General

Main Work Center	M11-GBL - Instrument	Priority	3-Routine (30 Days)
PM Activity Type	PM1-PM-Time base	Requested Date	01-Nov-2025 03:30
Revision		Status	REL
		Status Date	29-Nov-2025 15:23

### Reference Object

Functional Location	2107-CG-10QUA27CQ001	PH AFTER CONDENSER
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### Equipment

### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
PH ANALYZER INSPECTION (IM)	Notif. Require	01-Nov-2025	01-Dec-2025	176.0
	Order Basic	03-Nov-2025	03-Nov-2025	8.0
	Order Actual			0.0

### Responsibilities

Requested By	Maintenance Plan	I207CQ12-002	PH ANALYZER INSPECTION
Responded By	Task List	I207CQ12	PH ANALYZER INSPECTION

### Lead Engineer

### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		PH ANALYZER INSPECTION (IM)	1.2	1	1.2		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE PH SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER WITH BUFFER	0.5	1	0.5		
0010	0060	RECORD DATA ON CHECK SHEET	0.1	1	0.1		
0010	0070	REINSTALLATION PH SENSOR	0.1	1	0.1		
0010	0080	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.2		

### Damage / Problem

### Cause

### Activity





## WORK ORDER

Preventive Maintenance

Work Order 20329059



Notification 10427112



Note: (Other Comment)

Reported By	Accepted By	Completed By
Sign		
Name		
Date : 28 NOV 2025		



## WORK ORDER

Preventive Maintenance

Work Order 20329059



Notification 10427112



Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10PAB35CQ001	MCW SUPPLY PH			



## WORK ORDER

### Preventive Maintenance

Work Order 20330845



Notification 10428981



#### General

Main Work Center MI1-GBL - Instrument Priority 3-Routine (30 Days)  
PM Activity Type PM1-PM-Time base Requested Date 01-Dec-2025 03:30  
Revision Status REL Status Date 02-Jan-2026 07:03

#### Reference Object

Functional Location 2107-CG-10QUA24CQ001 CONDENSATE PP SPEC. CONDUCT

#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
CONDUCTIVITY ANALYZER INSPECTION (1M)	Notif. Require	01-Dec-2025	31-Dec-2025	168.0
	Order Basic	01-Dec-2025	01-Dec-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By Maintenance Plan I207CQ11-002 CONDUCTIVITY ANALYZER  
Responded By Task List I207CQ11 CONDUCTIVITY ANALYZE

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		CONDUCTIVITY ANALYZE INSPECTION (1M)	1.4	1	1.4		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE CONDUCTIVITY SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER ZERO IN AIR	0.5	1	0.5		
0010	0060	CALIBRATION ANALYZER WITH BUFFER	0.1	1	0.1		
0010	0070	RECORD DATA ON CHECK SHEET	0.2	1	0.2		
0010	0080	REINSTALLATION CONDUCTIVITY SENSOR	0.1	1	0.1		
0010	0090	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.4		

#### Damage / Problem

#### Cause

#### Activity



## WORK ORDER

### Preventive Maintenance

Work Order 20330845



Notification 10428981



#### Note: (Other Comment)

	Reported By	Accepted By	Completed By
Sign			
Name			
Date	: 22 DEC 2025	Date : 22 DEC 2025	Date : 02 JAN 2026



## WORK ORDER

### Preventive Maintenance

Work Order 20330845



Notification 10428981



#### Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10QUA24CQ002	CONDENSATE PP SPEC. CONDUCT			



## WORK ORDER

### Preventive Maintenance

Work Order 20330869



Notification 10429005



#### General

Main Work Center	M11-GBL - Instrument	Priority	3-Routine (30 Days)
PM Activity Type	PM1-PM-Time base	Requested Date	01-Dec-2025 03:30
Revision		Status	REL
		Status Date	02-Jan-2026 07:03

#### Reference Object

Functional Location	2107-CG-10QUA27CQ001	PH AFTER CONDENSER
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#### Equipment

#### Warranty Expire Date

Requested For	Date	Start	End	Duration (Hrs)
PH ANALYZER INSPECTION (1M)	Notif. Require	01-Dec-2025	31-Dec-2025	168.0
	Order Basic	01-Dec-2025	01-Dec-2025	8.0
	Order Actual			0.0

#### Responsibilities

#### Work Instruction

Requested By	Maintenance Plan	I207CQ12-002	PH ANALYZER INSPECTION
Responded By	Task List	I207CQ12	PH ANALYZER INSPECTION

#### Lead Engineer

#### Planned Labor

Op#	SOp#	Description	Work (Hrs)	No.	Duration (Hrs)	PR No.	Remark (if abnormal)
0010		PH ANALYZER INSPECTION (1M)	1.2	1	1.2		
0010	0010	RECORD DATA BEFORE CALIBRATION	0.1	1	0.1		
0010	0020	HOLD LAST VALUE OF ANALYZER	0.1	1	0.1		
0010	0030	REMOVE PH SENSOR FOR CLEAN	0.1	1	0.1		
0010	0040	CALIBRATION TEMP. SENSOR OF ANALYZER	0.1	1	0.1		
0010	0050	CALIBRATION ANALYZER WITH BUFFER	0.5	1	0.5		
0010	0060	RECORD DATA ON CHECK SHEET	0.1	1	0.1		
0010	0070	REINSTALLATION PH SENSOR	0.1	1	0.1		
0010	0080	CHECK CONDITION OF CABLE AFTER INSTALL	0.1	1	0.1		
Total Operation Duration					1.2		

#### Damage / Problem

#### Cause

#### Activity





## WORK ORDER

Preventive Maintenance

Work Order 20330869



Notification 10429005



Note: (Other Comment)

Reported By	Accepted By	Completed By
Sign		
Name		
Date : 23 DEC 2025	Date : 22 DEC 2025	Date : 02 JAN 2026



## WORK ORDER

Preventive Maintenance

Work Order 20330869



Notification 10429005



Object List

No	Functional Location	Func. Loc. Description	Equipment	Manufacturer Serial Number	Notification
1	2107-CG-10PAB35CQ001	MCW SUPPLY PH			

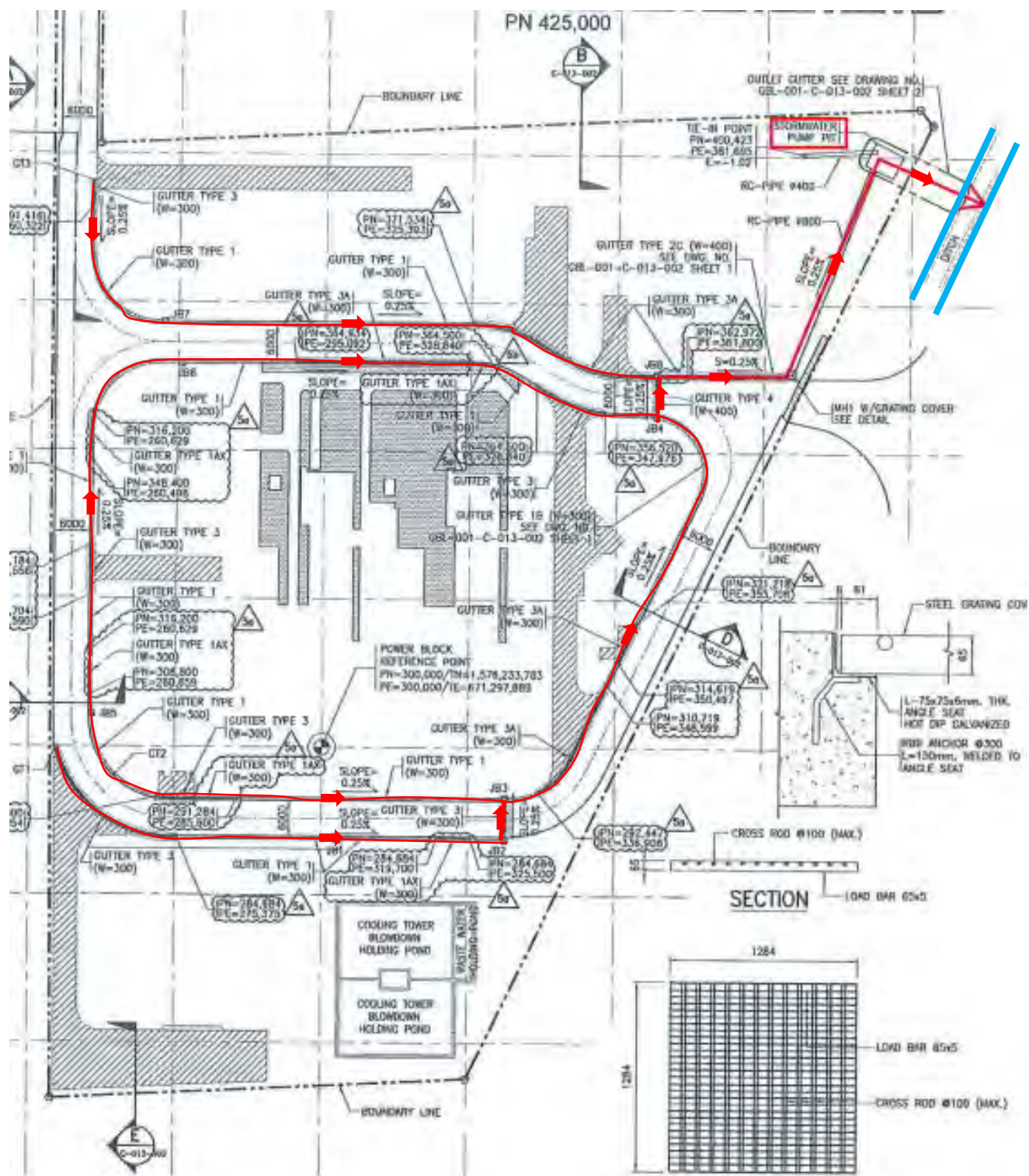
ภาคผนวก ข-18

แผนผังแสดงเส้นทางการระบายน้ำของโครงการฯ

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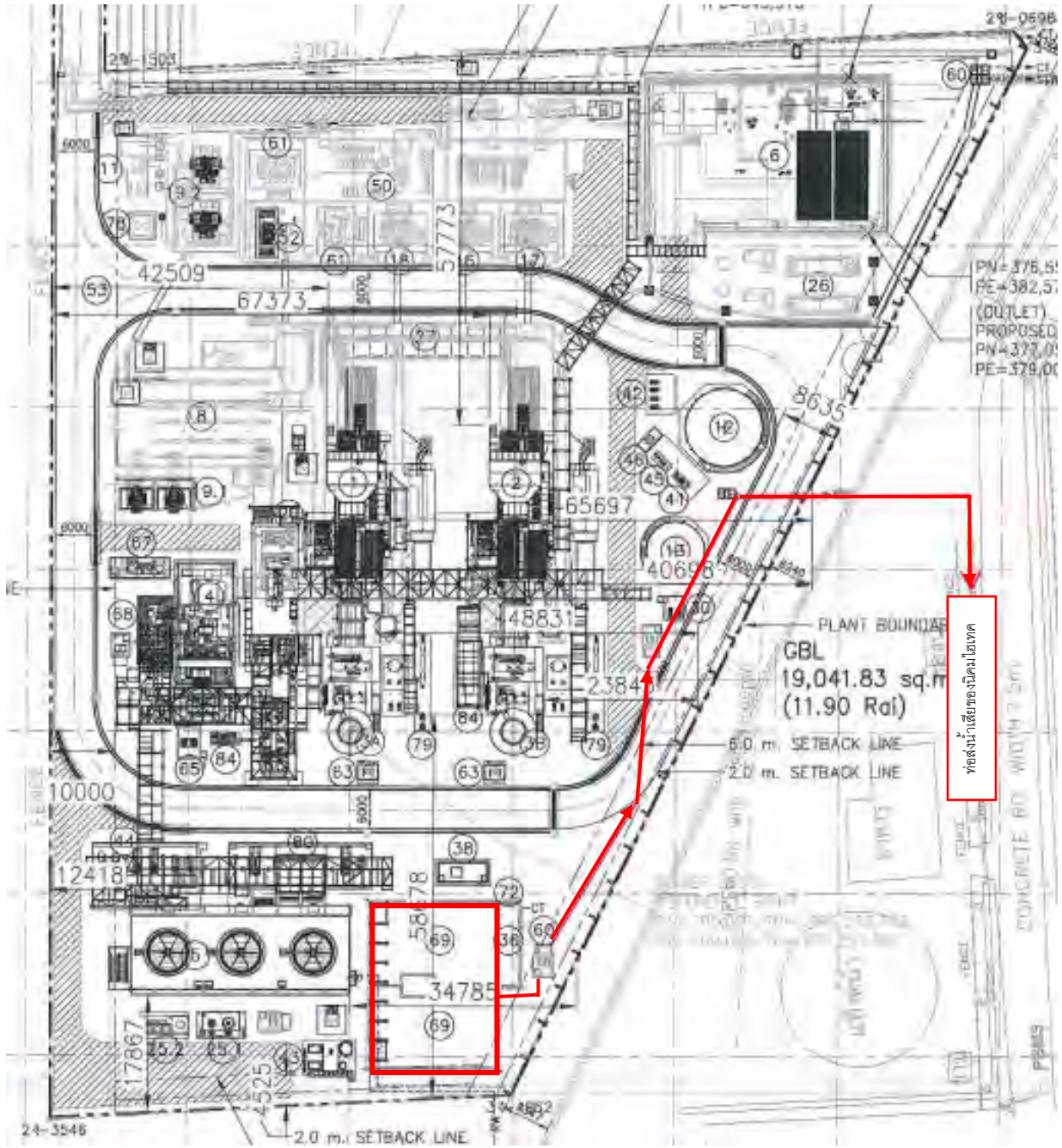
นำฝนจากทรงระบายนํ้าฝนของโรงไฟฟ้า ไหลออกนอกโรงไฟฟ้าลงสู่รางระบายน้ำฝนของนิคมบ้านห้วย(ไฮเทค)





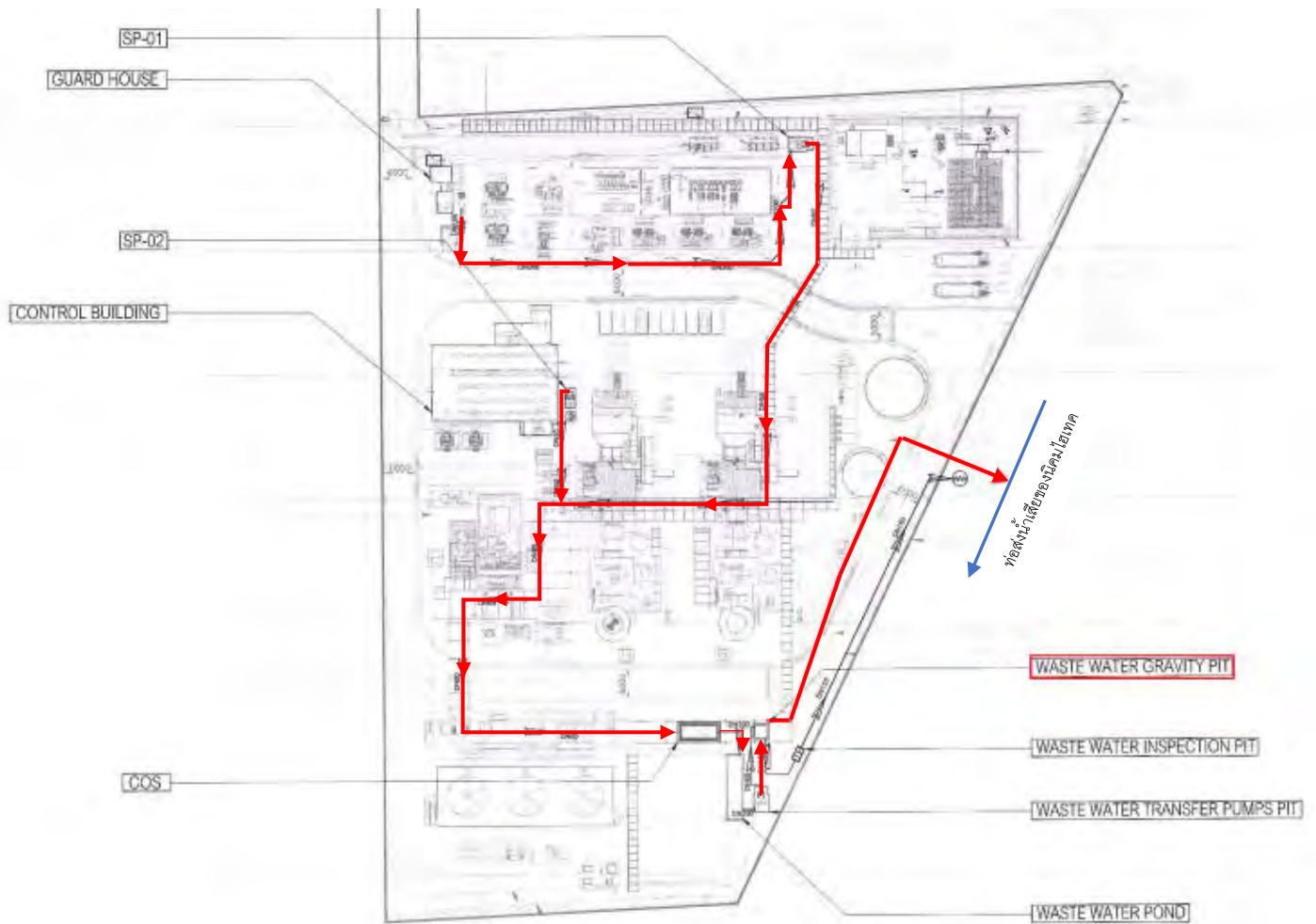
เส้นทางระบายน้ำทิ้งของโรงไฟฟ้า

น้ำทิ้งของโรงไฟฟ้า จากบ่อกักน้ำใต้ดิน ทั้ง 2 บ่อ จะระบายออกสู่ระบบบำบัดน้ำเสียของนิคมบ้านห้วยไทร(เขต)



## เส้นทางระบายน้ำฝน ปนเปื้อน

น้ำฝนปนเปื้อน จากบ่อดักน้ำฝนตามอุปกรณ์ต่างๆของโรงไฟฟ้า ไหลรวมที่บ่อแยกน้ำมัน ก่อนระบายออกสู่ระบบบำบัดน้ำเสียของนิคมบ้านห้วย (ไฮเทค)

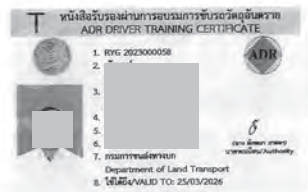


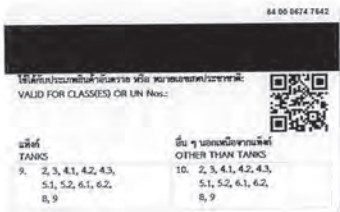
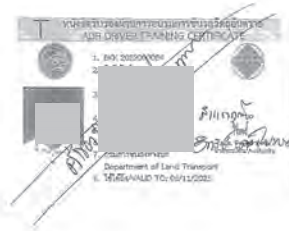


ภาคผนวก ข-19

เอกสารการอบรมพนักงานขับรถ

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VGULF					ใบรายงานผลการฝึกอบรมภายใน (Training Report)	
หลักสูตร Course : ขับรถแข่งรถถนน			วันที่ Date : 4/10/68 เวลา Time : 07:00 ถึง 10:00			
ส่วนงาน : GA			ระยะเวลา Training Period : 1 ชั่วโมง : - นาที Min : Sec :			
สถานที่ Place : GBL			วิทยากร Trainer :			
ประเภทการอบรม : <input checked="" type="checkbox"/> อบรมทั่วไป (General) <input type="checkbox"/> อบรมเฉพาะ (Special)			<input type="checkbox"/> การประเมินผล (Evaluation) <input type="checkbox"/> การปฏิบัติจริง (Implementation)			
Training Type : <input type="checkbox"/> อบรมเชิงปฏิบัติการ (OJT) <input type="checkbox"/> การประเมินผล (Evaluation)			<input type="checkbox"/> การสอบถาม (Question) <input type="checkbox"/> การปฏิบัติจริง (Implementation)			
No.	ชื่อ - สกุล Name - Surname	งาน / ส่วนงาน Department / Division	ผลการประเมิน Result	ลายเซ็นชื่อ Signatures		
				เช้า (Morning)	เย็น (Afternoon)	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
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23						
หมายเหตุ : ระดับ 2 (ในกรณีที่ผู้เข้ารับการอบรมได้คะแนนรวมไม่ถึง 6 คะแนน)						
Remark : Passed = level 2 (in case of "study level 2 shall be re-examination within 6 months)			Instructor Signed :			
	ระดับ 1 (Level 1)	หมายความว่า (Mean)	สามารถปฏิบัติงานได้โดยไม่ต้องช่วยเหลือ (Only working - help)			
	ระดับ 2 (Level 2)	หมายความว่า (Mean)	สามารถปฏิบัติงานได้แต่ยังไม่สามารถแก้ไขปัญหาได้ (Can be working but can't solve the problem)			
	ระดับ 3 (Level 3)	หมายความว่า (Mean)	สามารถปฏิบัติงานได้และสามารถแก้ไขปัญหาได้ (Can be working and solve the problem)			
	ระดับ 4 (Level 4)	หมายความว่า (Mean)	มีความสามารถปฏิบัติงานได้เป็นอย่างดี (Excellent Working and to be notice)			