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**Standard Operating Procedure (SOP) for “Super Cyclonic Storm AMPHAN”**

# Introduction

Kurichhu Hydropower Plant (KHP) is the run-off river scheme with an installed capacity of 60 MW (4 x 15 MW). The Concrete Gravity Dam has a length of 282.50m (top) and the height of dam from the deepest foundation is 55.00m. 5 Nos. of spillway radial gates (10.50m x 14.00m) are provided to regulate the excess flow through the dam. The design flood discharge is 12,200 m3/s.

# Purpose of the SOP

A Super Cyclonic Storm“AMPHAN” has made a landfall on 20.05.2020 (2:00PM) at Bay of Bengal and has progressed toward West Bengal as a very severe cyclonic storm. This is expected to result in the form of moderate to very heavy rainfall with lightning, thunderstorm and gusty wind in southern and eastern parts of the country. Thus, this SOP will help to streamline the emergency situation processes that is required to be followed in operating machines in the Power House and hydro mechanical equipment in dam so that, there is no catastrophic incidences viz. fatalities to human or damages of the equipment due to this severe storm. Heavy rain, gusty wind and flash floods upstream are the expected consequences of this storm, which the Plant is required to be prepared to act in accordance with the situation.

# Emergency Response Team

Following officials as in the Emergency Action Plan (EAP) are the Emergency Respond Team and present themselves within 15 minutes from the time of receipt of the information:

1. Zangpo, HoP, Incident Commander
2. Ugyen Tshering, Head, Operation Division (overall coordinator)
3. Toupo, Head, Maintenance Division,
4. Tshering Chhogyal, Head, DMU
5. Ugyen Tshering, Head, EMU
6. Sherab Dorji, Head, MMU
7. Leki Dendup, Head, SU

# Role of Incident Commander

Incident Commander shall be the highest reporting authority of the Plant and shall be responsible for reporting any matters or updates related to cyclonic storm AMPHAN to the higher management.

# Role of over-all coordinator

1. Over-all coordinator shall be responsible for relaying information to the Incident Command or to higher management and to the staffs for necessary operation of the machines and flood-gate regulations.
2. Over-all coordinator shall keep his phone always ON so as to be contacted and not silenced at any time.
3. It will also be his responsibility to keep contacting Shift In-charges in the Control Room to keep abreast of the situation time to time.
4. If out of station for any reason, the officiating authority shall be designated and briefed thoroughly so that, there is no mismanagement of the situation.

# Roles and responsibility of Shift In-charge, Control Room, Power House

As and when the river discharge crosses **2500 m3/s**, the inflow shall be considered flood. So following are the procedures to be followed by Shift In-charge of Control Room, Power House:

* 1. Shift-in-charge shall inform the Head, OD/overall coordinator on the inflow and the developing situation.
	2. Shift Incharges shall seek any operational advices from the overall coordinator.
	3. Warnthrough siren over the dam top to indicate that discharge passing through the gates is more than 2500 m3/s.
	4. Shall be responsible for overall safe operation of the machines in Power House and Dam in due coordination with other Divisions and Units.
	5. Any abnormal observations on machines or any part of the system including dam and powerhouse shall be reported outright to the higher authorities.
	6. Dam operational records shall be maintained at a frequency of 15 mins during the cyclone situation to monitor properly.

# Roles and responsibilities of flood warning station at Sumpa, Lhuentse

There is a manual gauging stationat Sumpa, Lhuentsewhich can give the 3-4 hours advance information of inflow so as to provide adequate time for Dam and PH control rooms to act. Thus water level shall be recorded during the cyclone and communicatedto the control room every 15 minutes. However, if the inflow increases rapidly the information should be provided immediately.

# Pre-cyclone preparations

Following are some of the preparations required to be carried out before arrival of cyclone:

1. Secure all the equipment in the reservoir properly such as boats, rafts, tuffbooms etc.
2. Secure all the equipment at the dam top so that it does not get blown or displaced due to severe wind.
3. Make all the auxiliaries and radial gates functional except gate no. 5 which is under annual maintenance main and auxiliary supplies.
4. Ensure continuous power supply to dam control panels and functionality of DG sets and its connection to the dam radial gate control panels.
5. Ensure functionalities of the Gasoline Engine and other accessories like hand pump etc.
6. Depute 2 staff to monitor water level at Sumpa, Lhuentse to keep watch over the inflow trend.
7. Keep the staff informed of the Cyclone and its probable affects to men and machineries so that, they are prepared physically and mentally and follow SOP/EAP.
8. Expect the unexpected and to deal with the situation without panic.
9. Advocate the residents, staff and families to stay put inside homes/residences and not to go out in open until cyclone recedes or passes.

# During the Cyclone

Following procedures shall be followed to cope with the Cyclone/emergency situations arising out of Cyclonic storm AMPHAN:

1. While machines shall be operated normally, consistent monitoring of load, frequency and voltage fluctuations shall be made by the shift. Machines shall not be stopped or shutdown until such advices are passed from the higher management. Any jerks in the machines if any shall be reported immediately to the Division Heads or Plant Head.
2. Tail pool level and reduction in net head shall be monitored constantly and flow regulated accordingly to avoid suction of air/pitting effect on runner.
3. While, the operation sequence of the spillway radial gates shall be done as per SOP provided by HR&DC (Attached), the gate opening shall however be done based on the inflow.
4. Shift In-charges shall monitor the river inflow continuously and update to the management. If the inflow increases beyond 1500 m3/s, the Emergency Response shall be present at the site.
5. If the power supply fails, Operators/Shift-incharge shall extend the DG supply to the dam complex for radial gate operation immediately.
6. The dam level shall be maintained as per the SOP/Operation Manual which is based on the inflow. However, if the inflow reaches 2500 m3/s or the turbidity of water is found very high, then Emergency Respond Team shall inform the management for further course of action.
7. Before stoppage of the Unit if the dam level is to be brought below MDDL or to the free flow, the tuff boom should be removed and anchored to a safe location. This information shall be relayed to the Dam Maintenance Unit.
8. During the high volume discharge, care shall be taken to avoid any damages on glacis, stilling basin and other hydraulic structures, which are prone to damages by means of uniform distribution of discharge.
9. Gate no. 3 shall not be operated unless critically required i.e. if the excess discharge is not possible with other 3 available gates. That will also be for minimum time possible to contain the damage below stop log sitting areas.

# Post Cyclone

All the structures and equipment of Dam and Power House shall be assessed by a team comprising of the ERT and a report submitted to the Incident Commander for onward submission if required.

# Manpower backup

All the staffs of DMU, EMU, MMU and Security including rescue team shall be in the dam and power house or at a safe location near it to immediately respond to any emergency situation.