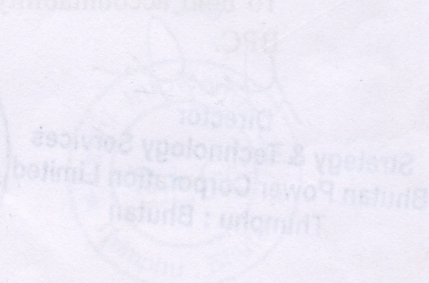


Standard Operating Procedure (SOP) for Support in restoration of the National Fiber Network during emergencies

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Background

The Department of Information Technology and Telecom (DITT), Ministry of Information and Communications (MoIC), has implemented the National Broadband Master Plan Implementation Project (NBMP) in collaboration with Bhutan Power Corporation Limited (BPC) to establish a fiber optic backbone network throughout the country. National Backbone Network connects the entire country with fiber optics cables (piggybacking on the BPC transmission and distribution network) down to the block level (all 20 districts and 201/205 blocks).

Since the current infrastructure is a linear network running from east to west lacking redundant routes, domestic rings are proposed to be connected to improve reliability of the National fiber network. As per Bhutan Telecommunication and Broadband Policy, the Government shall work with relevant players to establish a robust communication system for use during disasters. Understanding the importance of the national fiber network, the O&M services were entrusted to BPC, i.e. Fiber Network Division (FND) since the fibers, both OPGW and ADSS, are strung over BPC power infrastructure.

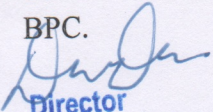
Currently, FND staff are stretched all over the country in maintaining the National fiber network. The FND team is stationed at Khaling, Gelephu, Phuentsholing, Mongar and Thimphu which cover Eastern, Central and Western region/Dzongkhags. A team from BPC conducted a study on a self-sustaining model for FND and presented it to the stakeholders at the 20th NFCC meeting. Members supported the idea of creating a self-sustaining entity but it came with a cost. Thus, to create affordable services, DITT came up with another solution of pooling manpower and equipment among the stakeholders.

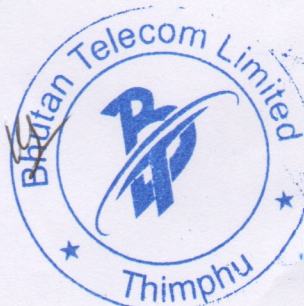
DITT had requested the meeting to look for alternatives to overcome the issues faced by FND. One of the outcomes of the stakeholder consultation was to allow ISPs staff to perform O&M services even in the absence of BPC personnel in some stretches and to clearly come up with SOPs which shall be strictly followed by them during emergency restoration of the national fiber network.

Scope: The SoP shall serve as an interim measure to restore national fiber network during emergencies which shall be followed by all the stakeholders

Key aspects for proper coordination

To hold accountability and insert safety guidelines in place during emergencies for Telcos and BPC.


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1. Emergency support for Trongsa and Samdrupjongkhar region

For the Samdrup Jongkhar and Trongsa region/Dzongkhag, BPC agreed to send one staff each to the station and coordinate the O&M of fiber networks with two Telcos and keep proper documentation of O&M works being carried out. Samdrup Jongkhar team shall cover the regions of Samdrupjongkhar and Pemagatshel whereas, Trongsa team shall cover Trongsa, Bumthang and Zhemgang regions.

The Telcos agreed to provide full support in restoring the national fiber network in the above mentioned regions.

2. Emergency Support in other Regions where there are less or No BPC staff

- a. For other regions, besides Trongsa and Samdrup Jongkhar, the Telcos agreed to extend their support to BPC in carrying out fiber restoration works wherever manpower is required. In absence of BPC team (when BPC is engaged in other works), the Telcos agreed to support in restoring the fiber link in their regions. However proper protocol and precautions shall be followed by the telcos.

3. Work permit.

Before working on BPC's power live line infrastructures, the work permit must be sought from respective Electricity Service Division (ESD) for the following;

- a. if work is to be carried on distribution infrastructures and Substation Maintenance Division (SMD) or
- b. if work is to be carried out inside the substation premises.

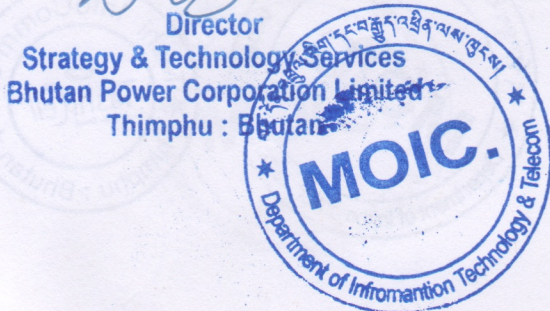
The work permit has to be surrendered to respective ESD or SMD after the completion of the work.

4. Safety protocols

Although BEA has approved the staff of the two Telcos to work on BPC's infrastructure to carry out the restoration of the Fiber network in absence of BPC's officials, there may arise unprecedented incidents/issues by the Telcos staff.

In this case, the BEA shall penalize BPC, who in turn will/shall transfer the penalties to the Telcos.

Therefore to avoid such circumstances, BPC agreed to provide basic training on critical electrical safety standards and set protocols in place which would be followed by the nominated staff of Telcos responsible for carrying out the maintenance works.



5. Equipment sharing & materials usage for Trongsa and SamdrupJongkhar and other Regions

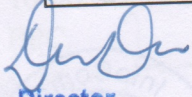
The fiber test equipment and splicing machines available with Dzongkhag ICTOs shall be used during the fiber O&M and emergency works if there is a shortage of equipment with the Telcos and BPC.

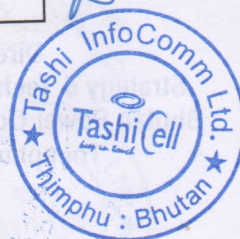
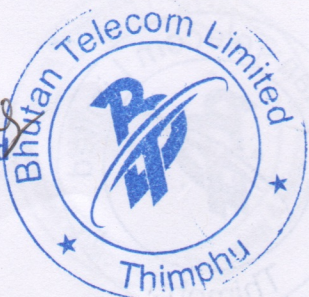
Following guidelines shall be followed while using the fiber test equipment & splicing machines:

- a. All authorized nominated fiber network technical staff of BPC, BTL, and TICL shall inform the requirement of test equipment & splicing machines to ICTOs for O&M of fiber networks.
- b. All the nominated technical personnel list has to be submitted to ICTOs prior to using the equipment.
- c. The ICTOs shall require keeping proper record of equipment usage in log books, such as purpose of use (O&M fiber route or link name to be mentioned), name of personnel taking the equipment, date of issue and equipment return date, etc
- d. The authorized staff (BPC & 2 Telcos) shall check the status of equipment & all its accessories available in the tool box/bag before taking to the site in the presence of ICTOs. During returning of the equipment, the ICTOs shall ensure to check the condition of equipment & availability of all the accessories.
- e. The personnel taking the equipment shall be accountable for loss or damage of equipment.
- f. Materials usage during O&M works (ADSS cable & its fitting accessories & Joint enclosures)
- g. The materials such as ADSS cables, Joint closures, ADSS cable pole fittings which are required during emergency restoration of fiber networks in the regions where there is no BPC's store, Telcos can use their own materials on returnable basis with BPC. However, prior information must be provided to BPC before materials are used at sites.

Summarized Responsibility in case of failure or damages during normal and ad-hoc emergencies.

Agency/Organisation	Roles and Responsibilities
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Department of Information Technology and Telecom (DITT)	<ul style="list-style-type: none"> - Intimate with Dzongkhag ICTOs in case the O&M team requires fiber splicing machines and OTDR. - Concern ICTO's should act as DITT's representative in that particular Dzongkhag. - Approve the Network Outage requests submitted by stakeholder for O&M works
Bhutan Power Corporation	<ul style="list-style-type: none"> - Coordinate the Overall O&M works - Take lead role for O&M of fiber across country - Provide trainings and certify the telcos staff on critical electrical safety standard - Take Stock entry of all fiber assets and equipment - BPC shall dispatch one staff each to Trongsa and Samdrup Jongkhar region to coordinate the O&M works with other stakeholders and maintain proper documentation. Samdrup Jongkhar team shall cover the regions of Samdrupjongkhar and Pemagatshel whereas, Trongsa team shall cover Trongsa, Bumthang and Zhemgang regions.
Telcos (Tashi cell and Bhutan Telecom)	<ul style="list-style-type: none"> - Follow the safety standards as per BPC while carrying out O&M works. - Telcos shall and will provide full support for the restoration of the national fiber network during emergencies.

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Annexure 1:Electrical Safety Guidelines for Live line ADSS Maintenance

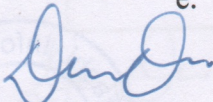
Following general guidelines for electrical and optical safety needs to be followed for all maintenance works.

1. General guidelines

- a. The work near power lines and other electricity infrastructure can be extremely dangerous. As ADSS live line installation is on distribution poles, one should follow the following safety guidelines while working with live line ADSS fiber optic cable.
- b. Always assume that the power lines are live. If you see a snapped power line do not go near it, instead call the nearest BPC O&M office immediately and proceed for the maintenance work only after proper restoration of the snapped Power lines.
- c. Do not touch any part of the ADSS cable and its accessories if it is wet or if it is touching power lines.
- d. Locate and keep clear of ground-based infrastructure such as poles, transformers, cables, pillars and kiosks.
- e. Always contact BPC O&M Office if you come across any unsafe live equipment or other unsafe conditions.
- f. The ADSS maintenance team should not enter the 'danger zone' around the power structure at any time without obtaining a work permit from the concerned O&M office or substation.
- g. Use a ladder with proper safety gadget while climbing the poles.
- h. Never access the live line installed ADSS fiber alone. Always go with a companion or helper for any support or help.
- i. Never touch ADSS installed poles while raining or snow fall, it can be dangerous.

2. Work at pole height

- a. All the personnel who undertake the ADSS maintenance should be familiar with Occupational Safety and hazard, safety manual of the Bhutan power Corporation Ltd., and the safety code 2008 of the Bhutan Electricity Authority.
- b. The personnel who work at Pole heights must have undergone safety training by BPC before being allowed to take part in the work at Pole heights.
- c. During work at Pole heights, the personnel must use safety gadgets such as safety belts, Helmet, safety shoes etc.
- d. Delivering things up and down the poles should be done using insulated ropes. It is strictly prohibited to throw or drop things.
- e. During bad weather conditions such as strong winds, rain-storms, thunderstorms, thick fog and rain, work at Pole heights should be stopped immediately.


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3. Minimum Approach Distance

In order to safeguard against electric shock from the live conductor, the minimum safe distance from the live conductor must be maintained in accordance with the Minimum Approach Distance specified by the Bhutan Electricity Authority as given in the table below.

Nominal Design Voltage (kV)	Minimum Approach Distance (Meter)
400	8.3
220	5.5
132	4.2
66	2.8
33	2.1
11	1.5
04	0.5

4. Dry Weather Conditions

When the cable is suspended by insulators or on poles, a voltage potential may be induced in the metal suspension grips and support hardware. To avoid dangerous



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electrical shock, GROUND THE METAL GRIPS BEFORE TOUCHING. The cable can be touched anywhere when it is dry, because there is little charge induced on the small area that is touched.

5. Wet Weather Conditions

When the cable is wet, the resistance to ground is low near the tower or grounded structure, so there is little voltage potential on the metal grips for cable at these points. However, at distances of 10 to 15 feet or further from the metal grips, a voltage potential may exist. To avoid dangerous electrical hazards, GROUND THE CABLE WITHIN 3 TO 5 FEET ON BOTH SIDES OF THE AREA TO BE TOUCHED.

Adequate electrical protection must be established at all work sites. The method required and the equipment used, will be determined by the degree of exposure to electrical hazards and the soil conditions at the site. All metallic equipment, hardware, anchors and structures within such work sites must be commonly bonded together, and then grounded to assure worker safety.

Annexure 2. Contact details from Telcos and BPC during emergencies

Whenever manpower is required from two Telcos during O&M of a fiber network, BPC shall contact the personnel given in this contact details via phone call or emails. The focal person will take up necessary approval for his/her manager for sending the personnel (the number of persons described in O&M support).

Table below is the contact details of the focal person.

SL. no	Contact details of focal person (Name, contact No, email, place)		
	BPC	Bhutan Telecom Ltd	Tashi InfoComm
1			
2			
3			
4			

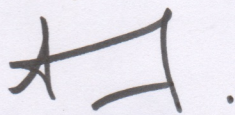

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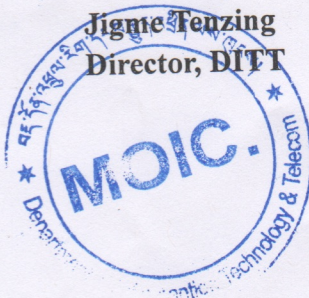
Annexure 3 : Optical Safety Guidelines for ADSS Fiber Maintenance

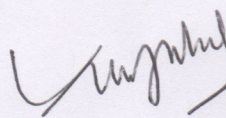
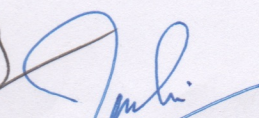
1. Keep all food and beverages out of the work area. If fiber particles are ingested they can cause internal hemorrhaging.
2. Always wear safety glasses with side shields to protect your eyes from fiber shards or splinters. Treat fiber optic splinters the same as you would treat glass splinters.
3. Keep track of all fiber and cable scraps and dispose of them properly. If available, work on black work mats and wear disposable lab aprons to minimize fiber particles on your clothing. Fiber particles on your clothing can later get into food, drinks, and/or be ingested by other means.
4. Never look directly into the end of fiber cables - especially with a microscope - until you are positive that there is no light source at the other end having tested it with a power meter. Use a fiber optic power meter to make certain the fiber is dark. When using an optical tracer or continuity checker, look at the fiber from an angle at least 6 inches away from your eye to determine if the visible light is present.
5. Contact lens wearers must not handle their lenses until they have thoroughly washed their hands.
6. Do not touch your eyes while working with fiber optic systems until your hands have been thoroughly washed.
7. Only work in well-ventilated areas.
8. Keep all combustible materials safely away from the curing ovens and fusion splicers.
9. When finished with the lab, dispose of all scraps properly. Put all fiber scraps in a properly marked container for disposal.
10. Thoroughly clean your work area when you are done.

Endorsed by:



Jigme Tenzing
Director, DITT

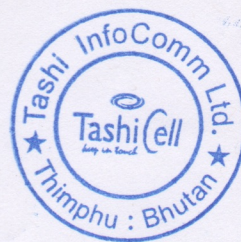


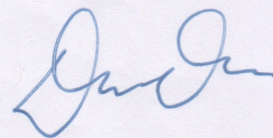
 

Karma Jurme
CEO, BTL



Tashi Tshering
MD, TICL





Dechen Dema
Director, STS, BPC

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