

**MahaNet-I**  
**(BharatNet Phase-II)**

**IMPLEMENTATION HANDBOOK**



**MahaIT**  
IMAGINE. INVENT. INSPIRE

**Page left blank intentionally**



## **PREFACE**

### **Purpose of the Handbook**

This handbook has been prepared by Maharashtra Information Technology Corporation Limited (MahalIT) and will be used during the implementation phase of the MahaNet I (BharatNet II) project. This handbook summarizes the best practices, operating guidelines and carries the relevant templates that will be used across the implementation lifecycle.

### **Audience / who should read this Handbook**

- **Project Implementation Agency (PIA)**  
This shall include all members who are a part of project implementation team
- **State Implementation Agency (SIA)**  
This shall include all members of the central and district team (District Project Manager, Project Leader, Senior Network Engineer and Network Engineer)
- **Third Party Agency (TPA)**  
This shall include all members who are a part of acceptance/ review/ audit team of the TPA
- **Project Management Consultant (PMC)**  
This shall include all members who are a part of project implementation across central and district team

### **Significance of this document**

- PIA and TPA shall abide by the processes and guidelines specified in the handbook to ensure 100% compliance to the RFP requirements
- A three tier governance structure has been defined in the handbook to overlook and manage the implementation of the project with defined cadence schedule among relevant stakeholder for progress discussions
- This handbook shall serve as a guideline for SIA team (District and Central) to monitor and track the progress done by the PIA and TPA in the project through the implementation lifecycle
- In case of any issues or hindrance during the course of the project, timely escalation and guidelines procedure shall be followed, as specified in the handbook, by relevant stakeholders to reduce and mitigate the impact of the risk.

(S.V.R Srinivas, IAS)

Chairman & Managing Director, MahalIT  
Principal Secretary Information Technology,  
Government of Maharashtra

**Page left blank intentionally**

## Document Change History

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Modifications</b>
1.0	19-04-2018	MahalT	First Draft
2.0	01-05-2018	MahalT	Second Draft
3.0	23-08-2018	MahalT	Third Draft
4.0	11-09-2018	MahalT	Fourth Draft
5.0	19-01-2019	MahalT	- 8.2.1 Trenching - Added new points (Page no. 144)
6.0	04-02-2019	MahalT	- 8.2.1 Trenching - Added new points (Page no. 144) - 8.3.4 Installation of aerial optical fibre cable - Added new points (Page no. 152) - 9.1 Site Nomenclature and Naming Principle - GP link/ span/ route coding - Added new points in note (Page no. 164)
7.0	18-02-2019	MahalT	- 8.1.2 Guidelines for Logical ring formation and architecture - Number of fibre to be utilized for connectivity - 48F ADSS fibre (Page no. 141)
8.0	20-02-2019	MahalT	- 8.1.2 Guidelines for Logical rig formation and architecture - Design rules for deploying GP router (Page No. 138) - 8.1.2 Guidelines for Logical ring formation and architecture – Fibre connectivity at site location - Configuration of ADSS cable (Page no. 139)
9.0	14-03-2019	MahalT	- 6.5 Change Request RAM (Page No. 117) - 6.5 Change Request Template (Page No. 118) - 6.5 Guideline for defining change request form no. (Page No. 118) - 8.2.1 Trenching - Change in existing point (Page no. 144)
10.0	28-03-2019	MahalT	- 2.3 Project contact list updated ( Pg. 25 , 26 and 27 - Fig 9 , Fig 9.1 and 9.2 ) - 6.3 Optical fiber cable laying (UG and Aerial - Fig 15 / Fig 16) (Pg. 97 and 98 - flowchart updated ) - 6.3.2 Guidelines for Measurement book (Pg. 110 – Additional points ) - 9.2 Standard operation procedure for Measurement book (Pg. 165 Guidelines and flowchart created and Fig 52) - 9.4 In building cable routing diagram (Pg. 167 – Fig 53)

**Page left blank intentionally**

## Contents

1. Document Overview.....	19
1.1 Scope of the document.....	19
1.2 Key inclusions .....	19
1.3 Key Exclusions .....	19
1.4 Project Scope.....	20
2. Project Overview.....	22
2.1 Project Organization Structure and Governance mechanism.....	22
2.2 Key Responsibilities .....	23
2.3 Project Contact list .....	25
2.4 RACIS Matrix.....	28
2.5 Implementation Structure .....	45
2.6 Cadence Structure .....	46
3. Executive Summary.....	47
4. Process Overview.....	54
5. Planning .....	61
5.1 Site survey .....	61
5.2 Route survey .....	72
5.2.1 Route survey for Underground and Aerial optical fiber cable.....	72
5.2.2 Microwave Survey.....	77
5.3 Design and Engineering .....	84
5.4 Bill of Quantity (BoQ) Preparation.....	85
6. Implementation .....	87
6.1 Material Delivery and Inspection .....	88
6.2 NOC/DR-NOC Set-up.....	92
6.2.1 DCN connectivity setup .....	95
6.3 Optical fibre Cable Laying (UG and Aerial).....	97
6.3.1 Sub Normal Trenching.....	103
6.3.2 Measurement Book .....	108
6.4 Active Electronics Set-up (GP and Taluka) .....	114
6.5 Change Request.....	117
6.6 Issue/Hindrance Resolution Request.....	120
7. Payment.....	124
7.1 Invoice processing .....	124
8. Design Principles and Technical Guidelines.....	136
8.1 Design principles.....	136
8.1.1 Guideline for GP and Taluka ring creation .....	136

8.1.2	Guidelines for Logical ring formation and architecture .....	138
8.2	Technical Guidelines for Underground Optical Fiber Cable laying.....	142
8.2.1	Trenching.....	142
8.2.2	Laying OF PLB HDPE Ducts.....	144
8.2.3	Back Filling and Dressing of the Trench .....	146
8.2.4	Restoration of Road Surface.....	147
8.2.5	Cable Pulling and Joining / Splicing.....	147
8.2.6	Construction of Jointing Chamber .....	148
8.3	Technical Guidelines for Aerial Optical Fiber laying .....	150
8.3.1	Tension and Suspension poles for aerial optical fiber cable .....	150
8.3.2	Technical specifications for steel poles .....	150
8.3.3	Types of accessories and fixtures .....	151
8.3.4	Installation of aerial optical fiber cable:.....	151
8.3.5	Joint Enclosure and Splicing: .....	152
8.3.6	Splice locations .....	154
8.3.7	Entry of the optical fiber cable in the building. ....	154
8.4	Technical Guidelines for Microwave links including link budget engineering .....	155
9.	Appendix.....	156
9.1	Site Nomenclature and Naming principle .....	156
9.2	Standard Operation Procedure for Measurement Book. ....	165
9.3	Right of Way (ROW).....	166
9.4	In- building cable routing diagram for GP and Taluka .....	167

## List of Figures

Figure 1: Package A Districts, Taluka, GP .....	20
Figure 2: Package B Districts, Taluka, GP .....	20
Figure 3: Package C Districts, Taluka, GP.....	21
Figure 4: Project Organization .....	22
Figure 5: SIA Organization Structure.....	23
Figure 6: TPA Organization Structure.....	24
Figure 7: SIA HQ Contact List .....	25
Figure 8: SIA Field Contact List .....	26
Figure 9: PMC Contact List .....	26
Figure 10: Package A, RACIS Matrix .....	37
Figure 11: Package B/C, RACIS Matrix.....	44
Figure 12: Implementation Project Structure .....	45
Figure 13: Implementation Project Structure .....	46
Figure 14: Implementation Activities.....	87
Figure 15: Implementation timeline .....	87
Figure 16: Escalation Matrix for Change Request.....	118
Figure 17: Escalation Matrix for Issue Resolution .....	121
Figure 18: Payment Schedule .....	128
Figure 19: Rewards / Penalties Structure for OFC .....	131
Figure 20: Rewards / Penalties Structure for Electronics.....	133
Figure 21: GP Ring architecture example.....	136
Figure 22: Taluka Ring architecture example .....	137
Figure 23: GP router port configuration .....	138
Figure 24: Taluka router port configuration.....	139
Figure 25: Configuration of ribbon OF cable .....	139
Figure 26: Configuration of ADSS cable .....	139
Figure 27: RCC Chamber.....	148
Figure 28: Structural Diagram of Template .....	151
Figure 29: Underground buried joint (Diagram).....	153
Figure 30: Taluka Coding Principle.....	156
Figure 31: GP coding Principle.....	156
Figure 32: Taluka Router coding Principle.....	157
Figure 33: GP router coding Principle .....	157
Figure 34: NOC router coding Principle .....	158
Figure 35: DR-NOC coding Principle.....	158
Figure 36: NOC switch coding Principle .....	159
Figure 37: DR-NOC switch coding Principle.....	159
Figure 38: Taluka Firewall coding Principle .....	159
Figure 39: NOC firewall coding Principle .....	160
Figure 40: DR-NOC firewall coding Principle .....	160
Figure 416: FDMS coding Principle .....	160
Figure 427: GP FDMS coding Principle .....	161
Figure 43: Taluka RFMS coding Principle .....	161
Figure 44: Ribbon fiber coding Principle .....	161
Figure 45: Loose type fiber coding Principle .....	162
Figure 46: Near end microwave coding Principle .....	162
Figure 47: Far end microwave coding Principle.....	163
Figure 48: GP Ring coding Principle .....	163

Figure 49: Taluka Ring coding Principle .....	163
Figure 50: GP Link/Span/Route coding Principle .....	164
Figure 51: Taluka Link coding Principle .....	164

## List of Process Flowcharts

Process Flowchart 1: MahaNet-I process map (Level 1 Process) .....	47
Process Flowchart 2: Site and Route Survey (Level 2 Process).....	55
Process Flowchart 3: Design finalization & BoQ inspection and approval (Level 2 Process) .....	56
Process Flowchart 4: Material delivery and Inspection (Level 2 Process) .....	57
Process Flowchart 5: NOC/DR-NOC set-up and DCN connectivity (Level 2 Process) .....	58
Process Flowchart 6: OFC laying and access electronics set-up (Level 2 Process) .....	59
Process Flowchart 7: Invoice processing (Level 2 Process) .....	60
Process Flowchart 8: Site Survey (Level 3 Process) .....	61
Process Flowchart 9: Route Survey (Level 3 Process) .....	72
Process Flowchart 10: Microwave Survey (Level 3 Process) .....	77
Process Flowchart 11: BoQ Preparation (Level 3 Process).....	85
Process Flowchart 12: Material Delivery and Inspection (Level 3).....	88
Process Flowchart 13: NOC/DR-NOC setup (Level 3 Process) .....	92
Process Flowchart 14: DCN Connectivity setup (Level 3 Process) .....	95
Process Flowchart 15: Underground optical fibre laying (Level 3 Process) .....	97
Process Flowchart 16: Aerial optical fibre laying (Level 3 Process) .....	98
Process Flowchart 17: Sub Normal Trench (Level 3 Process).....	103
Process Flowchart 18: Measurement Book (Level 3 Process) .....	108
Process Flowchart 19: Active electronics setup (Level 3 Process).....	114
Process Flowchart 20: Change Request (Level 3 Process).....	117
Process Flowchart 21: Issue Resolution (Level 3 Process) .....	120
Process Flowchart 22: Invoice Processing (Level 3 Process) .....	125

**Page left blank intentionally**

## List of Responsibility Assignment Matrix (RAM)

RAM 1: Site Survey (Power, Civil – GP/Taluka and NOC/DR-NOC) .....	62
RAM 2: Route Survey .....	73
RAM 3: Microwave Survey .....	78
RAM 4: BoQ Preparation .....	86
RAM 5: Material Delivery and Inspection .....	89
RAM 6: NOC/DR-NOC setup .....	93
RAM 7: DCN Connectivity setup .....	95
RAM 8: Implementation of Optical fibre cable (UG and Aerial) .....	99
RAM 9: Sub Normal Trenching .....	104
RAM 10: Measurement Book .....	Error! Bookmark not defined.
RAM 11: Active electronics setup .....	115
RAM 12: Change Request.....	118
RAM 13: Issue Resolution.....	121
RAM 14: Invoice Processing .....	126

**Page left blank intentionally**

## List of Document Flowcharts

Document Flow 1: Site Survey (Power, Civil – GP/Taluka and NOC/DR-NOC) .....	63
Document Flow 2: Route Survey .....	73
Document Flow 3: Microwave Survey .....	78
Document Flow 4: BoQ Preparation .....	86
Document Flow 5: Material Delivery and Inspection .....	89
Document Flow 6: DCN Connectivity setup .....	96
Document Flow 7: Sub Normal Trenching .....	104
Document Flow 8: Measurement Book .....	109
Document Flow 9: Active electronics setup .....	115
Document Flow 10: Change Request.....	118
Document Flow 11: Issue Resolution.....	122
Document Flow 12: Invoice Processing.....	126

**Page left blank intentionally**

## List of Templates

Template 1: Site Survey – Civil Survey Form .....	66
Template 2: Site Survey - Power Survey Form .....	68
Template 3: NOC / DR-NOC Survey Form .....	71
Template 4: Route Survey Form .....	75
Template 5: Pole strengthening / Replacement / New Erection Form.....	76
Template 6: RF Survey Form.....	81
Template 7: Tower height Form .....	82
Template 8: Microwave LoS Survey Form .....	83
Template 9: Material Inspection Form .....	91
Template 10: OFC LSPM Acceptance Test Form.....	101
Template 11: OFC OTDR Acceptance Test Form .....	102
Template 12: Sub Normal Trenching Request Form.....	107
Template 13: Measurement Book .....	113
Template 14: Change Request Form.....	119
Template 15: Issue Resolution Request Form .....	123
Template 16: Invoice Enclosure.....	135

**Page left blank intentionally**

## 1. Document Overview

### 1.1 Scope of the document

This handbook has been prepared by Maharashtra Information Technology Corporation Limited (MahalIT) and will be used during the implementation phase of the MahaNet I (BharatNet II) project. This handbook summarizes the best practices, operating guidelines and carries the relevant templates that will be used across the implementation lifecycle. It will also aid key stakeholders viz. Project Implementation Agency (PIA), Third Party Agency (TPA), Project Management Consultancy (PMC) and State Implementation Agency (SIA) to identify and perform project activities and ensure smooth documentation flow

### 1.2 Key inclusions

- Project structure, key responsibilities for the TPA, PIA, PMC and MahalIT and contact list.
- Governance structure, performance reporting guidelines and cadence schedule to be followed
- Standard process flow, key activities for different stakeholders, escalation matrix, expected turnaround time of process activities, namely - change request, issue request, material inspection, measurement book etc.
- Standard operating guidelines for the project implementation lifecycle starting from site/route survey to acceptance testing.
- Templates, checklists and other documents to be used during implementation including the relevant document control procedures.
- Compliance requirement and safety norms that need to be followed during execution of the project.

### 1.3 Key Exclusions

- The scope of this handbook does not include activities that will be performed during the Operation and Maintenance (O&M) phase of the MahaNet I (BharatNet II) project.
- Until relevant modules in the Bharat Broadband Nigam Limited (BBNL) “Project Management tool” become operational, the templates defined as part of this handbook will need to be used for recording and sharing of information captured during the respective activity.

*Disclaimer: This document will need to be revised basis updated requirements and new versions of the document will be shared with the different stakeholders as and when required by MahalIT.*

## 1.4 Project Scope

The scope of implementation across the three packages (A/B/C) includes the below mentioned districts, talukas and GPs.

Package	District Name	No. of Talukas	No. of GPs	Estimated Route (km)
Package A	· KOLHAPUR	6	391	1,544
	· NASHIK	10	772	3,049
	· PALGHAR	5	237	936
	· PUNE	6	547	2,160
	· RATNAGIRI	6	467	1,844
	· SANGLI	2	172	679
	· SATARA	8	980	3,870
	· SINDHUDURG	2	69	272
	· THANE	6	456	1,801

Figure 1: Package A Districts, Taluka, GP

Package	District Name	No. of Talukas	No. of GPs	Estimated Route (km)
Package B	· AKOLA	5	395	1,560
	· AMRAVATI	7	403	1,592
	· CHANDRAPUR	9	513	2,026
	· GADCHIROLI	6	225	889
	· NANDED	11	964	3,807
	· WARDHA	6	223	881
	· WASHIM	5	346	1,366
	· YAVATMAL	13	976	3,854

Figure 2: Package B Districts, Taluka, GP

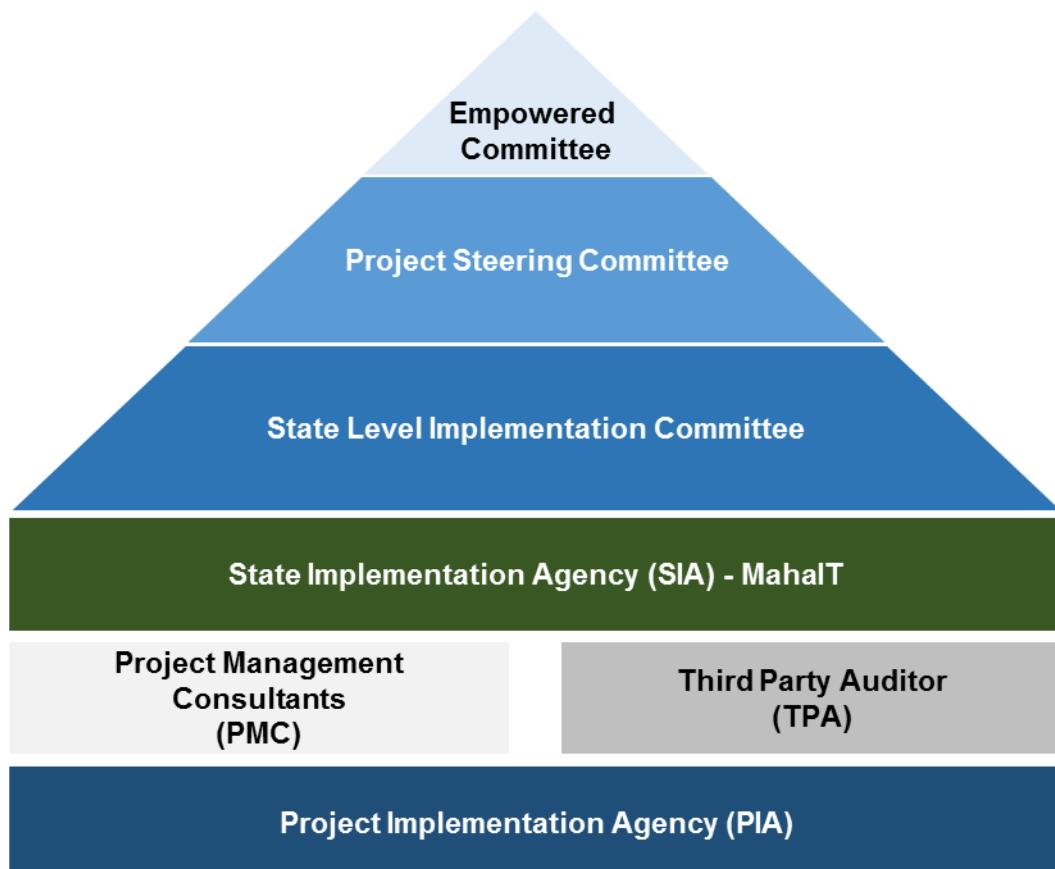
<b>Package</b>	<b>District Name</b>	<b>No. of Talukas</b>	<b>No. of GPs</b>	<b>Estimated Route (km)</b>
<b>Package C</b>	· AHMEDNAGAR	13	1,085	4,285
	· AURANGABAD	4	492	1,943
	· BEED	3	13	51
	· BULDHANA	10	588	2,322
	· HINGOLI	5	540	2,133
	· JALGAON	9	521	2,058
	· LATUR	3	268	1,058
	· PARBHANI	6	428	1,690
	· SOLAPUR	6	669	2,642

Figure 3: Package C Districts, Taluka, GP

## 2. Project Overview

### 2.1 Project Organization Structure and Governance mechanism

For the MahaNet I (BharatNet II) project, the project structure will involve multiple stakeholders viz. PIA, TPA, PMC and SIA. Apart from the stakeholders mentioned, a 3 tier governance structure has been defined



*Figure 4: Project Organization*

#### Key Stakeholders:

**State Implementation Agency (SIA):** Government of Maharashtra has undertaken implementation of MahaNet – I under the proposed State Led Implementation Model and would be responsible for execution of project.

**Third Party Agency (TPA):** Bharat Broadband Network Limited (BBNL) has empanelled TPA's for inspection, testing, verification with respect to material supply, installation, commissioning and invoicing by the PIAs. SIA will be on boarding a TPA from the 5 empanelled TPAs.

**Project Management Consultancy (PMC):** SIA has deployed a Project Management Consultancy (PMC) for assistance with planning, organizing, monitoring and reporting throughout the MahaNet-I project execution.

**Project Implementation Agency (PIA):** PIA has been selected through RFP process for implementation execution of MahaNet – I.

### 3 Tiered Governance Structure:

- Empowered Committee - Chaired by Secretary, DoT
- Project Steering Committee - Chaired by Administrator Universal Service Obligation Fund (USOF) with head of state implementation agencies as its members
- State Level Implementation Committee - Chaired by Chief Secretary of State with DoT/ USOF/ BBNL designated officials as its members

## 2.2 Key Responsibilities

### State Implementation Agency (SIA)

The organization structure of SIA comprises of HQ team in Mumbai and zonal team spread across 26 districts.

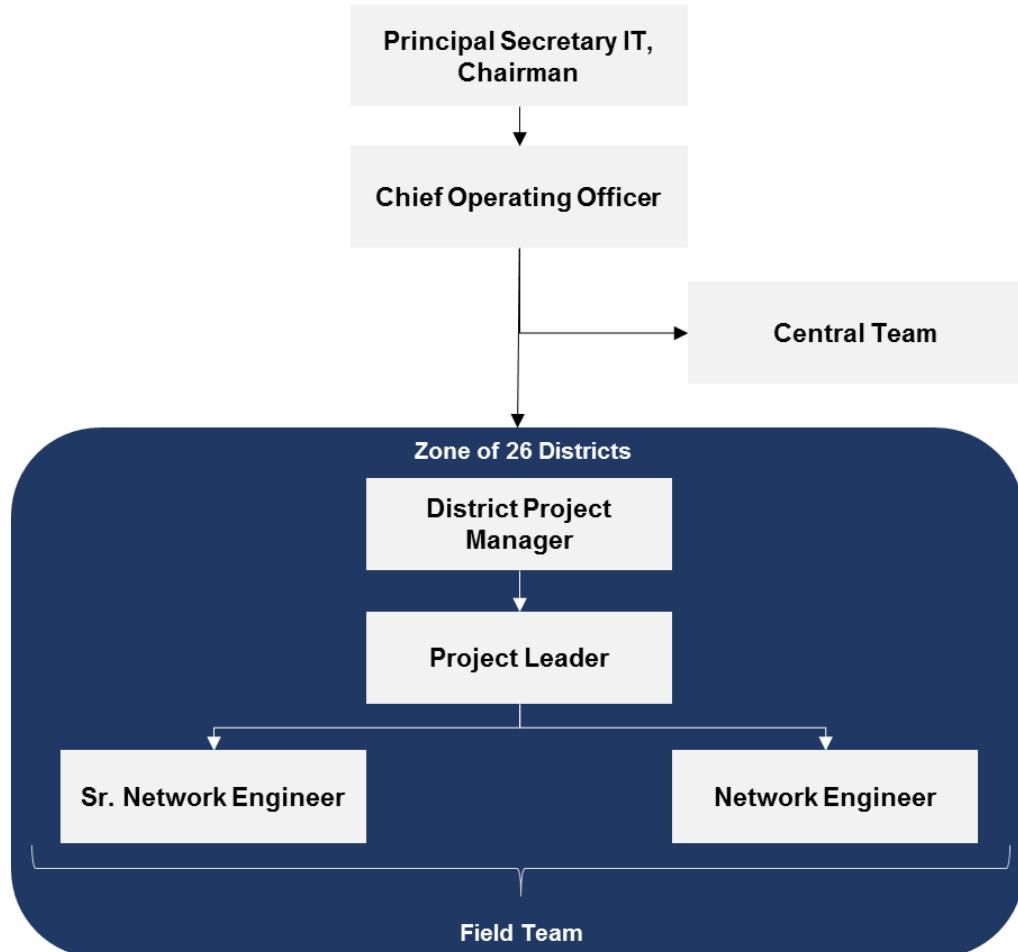


Figure 5: SIA Organization Structure

Key Responsibilities of SIA would include but not limited to:

- Sample review of Environmental, Health and Safety (EHS) compliance audit on site
- Review completeness of site survey report and resolve the locally managed gaps on site
- Support in OFC laying and tracking of RoW approvals and resolve RoW bottlenecks if any at field level
- Sample testing of trenching depth
- Monitoring overall performance of PIA / work-fronts

- Coordinate with PIA and TPA to initiate the Acceptance Testing (AT) of optical fiber cable and active electronics at GP/Taluka location and NOC/DR-NOC.

### Third Party Agency (TPA)

TPA shall be appointed district wise by MahalT across all the three packages.

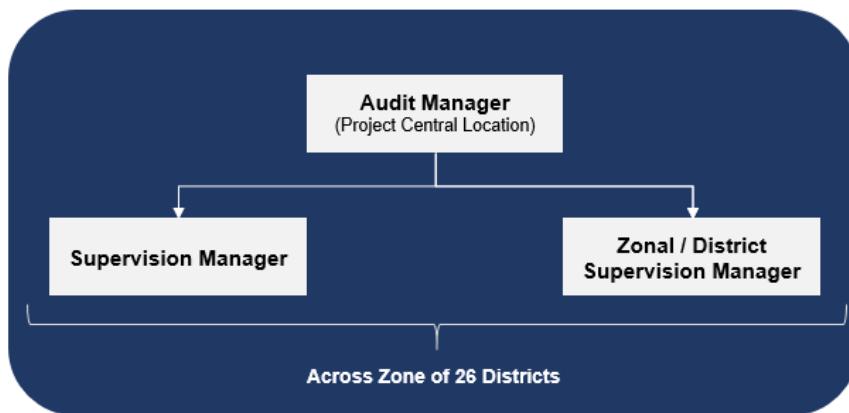


Figure 6: TPA Organization Structure

The key responsibilities of TPA would include but not limited to:

- Audit of EHS compliance
- Design acceptance of GP and Taluka rings proposed by PIA post completion site and route survey
- Approval of IP-MPLS design architecture propose by the PIA
- Approval of Bill of Quantity (BoQ) submitted by the PIA
- Validation of certificate and documentation of the material delivered by the PIA
- Approval for subnormal trenching and protection requirement
- Verification of the invoices submitted by the PIA and indicate penalties, wherever applicable

### Project Implementation Agency (PIA)

PIA Organization structure

**Note:** The organization structure shall be provided by the respective package bid winner.

The key responsibilities of PIA would include but not limited to:

- Conducting site and route survey and submission of survey report
- Design and creation of GP and Taluka ring architecture and route optimization for laying of optical fiber cable
- Trenching/ducting for underground OF cable and strengthening of existing poles and erection of new poles for stringing of aerial OF cable
- Installation and commissioning of active and passive equipment's at site location in Talukas and GPs
- Setting up of civil, electrical infrastructure and installation of active equipment's in NOC/DR-NOC
- O&M responsibility and ensuring Service Level Agreements (SLAs) after commissioning of GP and Taluka

## 2.3 Project Contact list

### State Implementation Agency (SIA)

#### Headquarter Team

S. No.	Stakeholders	Email address
1	PSIT	<a href="mailto:psec.it@maharashtra.gov.in">psec.it@maharashtra.gov.in</a>
2	Head PMU	<a href="mailto:sotech1.it@maharashtra.gov.in">sotech1.it@maharashtra.gov.in</a>
3	COO	<a href="mailto:coo.mahait@mahait.org">coo.mahait@mahait.org</a>
4	Central team	<a href="mailto:mahanet.mahait@maharashtra.gov.in">mahanet.mahait@maharashtra.gov.in</a>

Figure 7: SIA HQ Contact List

#### Field Team

S/N	Name	District	Email address	Position
1	Niraj Ashok Shekatkar	Ahmednagar	<a href="mailto:edpm.ahmednagar@maharashtra.gov.in">edpm.ahmednagar@maharashtra.gov.in</a>	DPM
2	Amit Ramesh Dhage	Akola	<a href="mailto:edpm.akola@maharashtra.gov.in">edpm.akola@maharashtra.gov.in</a>	DPM
3	Prafulla Laxmanrao Mehar	Amravati	<a href="mailto:edpm.amravati@maharashtra.gov.in">edpm.amravati@maharashtra.gov.in</a>	DPM
4	Quazi Mohammed Mujwezuddin	Aurangabad	<a href="mailto:edpm.aurangabad@maharashtra.gov.in">edpm.aurangabad@maharashtra.gov.in</a>	DPM
5	Mahesh Gole	Beed	<a href="mailto:edpm.beed@maharashtra.gov.in">edpm.beed@maharashtra.gov.in</a>	DPM
6	Sandeep D. Jirapure	Buldhana	<a href="mailto:edpm.buldhana@maharashtra.gov.in">edpm.buldhana@maharashtra.gov.in</a>	DPM
7	Sunil G. Mokde	Chandrapur	<a href="mailto:edpm.chandrapur@maharashtra.gov.in">edpm.chandrapur@maharashtra.gov.in</a>	DPM
8	Jayant Mukundwar	Gadchiroli	<a href="mailto:dpm.gadchiroli.itcell@maharashtra.gov.in">dpm.gadchiroli.itcell@maharashtra.gov.in</a>	DPM
9	Umakant Vishwanath Mokre	Hingoli	<a href="mailto:edpm.hingoli@maharashtra.gov.in">edpm.hingoli@maharashtra.gov.in</a>	DPM
10	Kiran Pargaonkar	Jalgaon	<a href="mailto:edpm.jalgaon@maharashtra.gov.in">edpm.jalgaon@maharashtra.gov.in</a>	DPM
11	Jayant Patil	Kolhapur	<a href="mailto:edpm.kolhapur@maharashtra.gov.in">edpm.kolhapur@maharashtra.gov.in</a>	DPM
12	Javed Shaikh	Latur	<a href="mailto:edpm.latur@maharashtra.gov.in">edpm.latur@maharashtra.gov.in</a>	DPM
13	Niraj Dhamangave	Nanded	<a href="mailto:edpm.nanded@maharashtra.gov.in">edpm.nanded@maharashtra.gov.in</a>	DPM
14	Chetan Sonje	Nashik	<a href="mailto:edpm.nashik@maharashtra.gov.in">edpm.nashik@maharashtra.gov.in</a>	DPM
15	Urjit Barve	Palghar	<a href="mailto:edpm.palghar@maharashtra.gov.in">edpm.palghar@maharashtra.gov.in</a>	DPM
16	Kapil Pendalwar	Parbhani	<a href="mailto:edpm.parbhani@maharashtra.gov.in">edpm.parbhani@maharashtra.gov.in</a>	DPM
17	Manoj Jadhav	Pune	<a href="mailto:edpm.pune@maharashtra.gov.in">edpm.pune@maharashtra.gov.in</a>	DPM
18	Yashwant Chougale	Ratnagiri	<a href="mailto:edpm.ratnagiri@maharashtra.gov.in">edpm.ratnagiri@maharashtra.gov.in</a>	DPM
19	Sanchit Pawar	Sangli	<a href="mailto:edpm.sangli@maharashtra.gov.in">edpm.sangli@maharashtra.gov.in</a>	DPM
20	Pankaj Mohan Veer	Satara	<a href="mailto:edpm.satara@maharashtra.gov.in">edpm.satara@maharashtra.gov.in</a>	DPM

S/N	Name	District	Email address	Position
21	Rupesh S.Mirajgaonkar	Sindhudurg	edpm.sindhudurg@maharashtra.gov.in	DPM
22	Rizvan Mulla	Solapur	edpm.solapur@maharashtra.gov.in	DPM
23	Samir Chaudhari	Thane	edpm.thane@maharashtra.gov.in	DPM
24	Shahjad Shaikh	Wardha	edpm.wardha@maharashtra.gov.in	DPM
25	Juned ashfaq sheikh	Washim	edpm.washim@maharashtra.gov.in	DPM
26	Sandeep Ramesh Warudkar	Yavatmal	edpm.yavatmal@maharashtra.gov.in	DPM

Figure 8: SIA Field Contact List

**Project Management Consultant****Headquarter Team**

S.No	Stakeholders	Email address
1	Engagement Partner	<a href="mailto:neerajarora@deloitte.com">neerajarora@deloitte.com</a>
2	Quality Assurance Partner	<a href="mailto:akhaitan@deloitte.com">akhaitan@deloitte.com</a>
3	Engagement Manager	<a href="mailto:ashishu.ext@deloitte.com">ashishu.ext@deloitte.com</a> <a href="mailto:sanmohapatra@deloitte.com">sanmohapatra@deloitte.com</a> <a href="mailto:ravikshah@deloitte.com">ravikshah@deloitte.com</a> <a href="mailto:matanwar@deloitte.com">matanwar@deloitte.com</a>

Figure 9: PMC Contact List

**Third Party Agency (TPA)**

1	Central Team	<a href="mailto:Suhasini.karkun@tcil-india.com">Suhasini.karkun@tcil-india.com</a> <a href="mailto:prashantjeph@tcil-india.com">prashantjeph@tcil-india.com</a>
---	--------------	--

Figure 9.1: TPA Contact List

**Project Implementation Agency (PIA)**

1	Package A and Package C	<a href="mailto:pmo_bgp@itiltltd.co.in">pmo_bgp@itiltltd.co.in</a> <a href="mailto:jvsellaiah_bgp@itiltltd.co.in">jvsellaiah_bgp@itiltltd.co.in</a>
2	Package B	<a href="mailto:anilkumar.mohrir@sterlite.com">anilkumar.mohrir@sterlite.com</a> <a href="mailto:abhijit.kunte@sterlite.com">abhijit.kunte@sterlite.com</a> <a href="mailto:rohit.patankar@sterlite.com">rohit.patankar@sterlite.com</a> <a href="mailto:aasim.alvi@sterlite.com">aasim.alvi@sterlite.com</a> <a href="mailto:dinesh.yadav@sterlite.com">dinesh.yadav@sterlite.com</a>

*Figure 9.2 PIA Contact list*

## 2.4 RACIS Matrix

The (indicative) responsibility matrix (RACIS) will be finalized/modified through discussion with the bidders selected through LOI (Letter of Intent) where need be.

Where RACIS stands for the following:

- R (responsibility: Those who do the work to achieve the task),
- A (accountability: The one ultimately answerable for the correct and thorough completion of the deliverable or task, and the one who delegates the work to those responsible),
- C (Consulted: Those whose opinions are sought, typically subject matter experts; and with whom there is two-way communication),
- I (Informed: Those who are kept up-to-date on progress, often only on completion of the task or deliverable; and with whom there is just one-way communication) and
- S (Support: Resources allocated to responsible)

### Responsibility Matrix - Package A (Indicative)

A	Planning	PIA	SIA	TPA	PMC
1	Closure of contracts/ sign-off with PIAs and release of purchase orders	S	A		R
2	Project governance model (processes and organization) design	S	A	I	R
3	Develop detailed project plan	S	A	I	R
4	Publishing procedures, guidelines, checklists and report formats	S	C	I	A,R
5	Resource planning	A,R	C	I	C
6	Approval of resource plan	I	A	I	R
7	Approval of detailed project plan	I	A	I	R
8	Engineering documentation	R	C	I	A
9	Approval of engineering documentation	I	A	C	R
10	EHS compliance	R	I	A	C
11	Commissioning of Project Management Tool	I	R	C	A
12	Training on usage of project management tool	S	A	I	R
13	Finalization, distribution and maintenance of: project deliverables, documentation and documentation control	S	C	I	A,R
14	Dispute resolution	S	A	I	R
15	Escalation handling	S	A	I	R
16	Risk analysis and mitigation	S	A	I	R

17	Project tracking / reporting (weekly / monthly / quarterly reports)	S	C	I	A,R
18	Process for handling Change requests and approvals	S	C	I	A,R
19	Governance process for Review meetings with PIA, MahalT, BBNL, SLIC etc.	S	C	I	A,R
<b>B</b>	<b>Site Survey</b>		<b>PIA</b>	<b>SIA</b>	<b>TPA</b>
1	Site / route survey format template		C, S	I	I
2	Conducting site survey		A,R	I	S
3	Population of site/ route survey template Inputs regarding the following to be provided as part of the site survey: -Any road expansions planned/ water pipe line/ drainage activities planned -En-route culverts and bridges, water flow of the river or stream (indicating the duration of months water is flowing) - Side of the road from where the proposed cable is to be laid -Road crossing (road and railway lines) -Existing fiber routes if any -Existing power cable routes and overhead power cables alignments -Diverse route availability w.r.t to formation of taluka and GP rings (avoidance of flat rings to avoid single point of failure) -Proposed alignment from the centre of the road/ nearest carriage way, GIS parameters (Longitude, Latitude and altitude (HASL)). -Availability of electric poles for stringing ADSS cables with headway of 12 - 15ft - Strengthening of poles		A,R	I	I
4	Entry of detailed survey data in Project management tool		A,R	I	I
5	Submission of route survey for approval		R	I	I
6	Approval of survey document		S	A	I
7	Site survey action item w.r.t to MahalT / BBNL		S	A	C
<b>C</b>	<b>Planning and Engineering</b>				
<b>C 1</b>	<b>OFC</b>		<b>PIA</b>	<b>SIA</b>	<b>TPA</b>
1	Details of planned Taluka and GP rings		I	A	R
2	Proposal for Taluka and GP rings based on survey data		A,R	I	C

3	Finalisation of distance between rings and ring formation	A,R	I	I	S
4	Avoidance of flat rings by trenching on both sides of the roads	A,R	I	I	C
5	Enhancement of scope for PIA in case of flat rings (trenching to be done on both side of road)	S	A	I	R
6	Design acceptance of GP and Taluka rings	S	I	A,R	C
7	Assessment of existing poles and strengthening where ever required	A,R	I	I	C
8	Approval for placement of additional poles	S	A	I	R
9	Planning for necessary safety arrangements while working in close range of electric lines	A,R	C	S	C
10	Guidelines for safety arrangements for stringing ADSS cable working at heightened posts and road sides	A,R	C	S	C
11	Survey of the proposed Taluka, GPs locations for civil, electric infrastructure availability	A,R	I	I	C
12	Plan for Civil and Electrical upgradation of Talukas and GPs	A,R	I	I	C
<b>C 2</b>	<b>MPLS Network</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Information request e.g. bandwidth, capacity etc. for connecting Taluka rings to district/ national rings	A,R	I	C	S
2	High level network planning design document	A,R	I	I	C
3	Area wise planning document	A,R	I	I	C
4	Final detailed design	A,R	I	I	C
5	Design approval	S	C	A,R	C
6	Low level design document	A,R	I	I	C
7	Low level design approval	S	C	A,R	C
8	Bill of Material (BoM) (electronic and installation related material)	A,R	I	I	C
9	Bill of Material (BoM) approval (electronic and installation related material)	S	C	A,R	C
<b>C 3</b>	<b>DCN</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Identification of the network elements that need to be managed	A,R	I	I	C,S
2	Leasing of bandwidth from service providers for connecting the network elements to NOC /DR	A,R	I	I	C
3	DCN design and BOM approval	S	C	A,R	C

C 4	NOC and NOC – DR	PIA	SIA	TPA	PMC
1	Specification details of Maha-NOC	A,R	I	I	C
2	Design finalisation of NOC including space/ manpower etc.	A,R	I	I	C
3	Integration requirements for BSS-OSS	A,R	I	I	C
4	Detailed BoM including video wall, servers, desktops, security and surveillance, video conferencing systems etc.	A	I	R	S
5	Design and BoM approval	S	C	A,R	C
<b>D</b>	<b>Implementation</b>				
<b>D 1</b>	<b>Civil &amp; electrical Infra (Parallel activity with OFC)</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Installation of FDMS and termination of the cable	A,R	I	I	C
2	Delivery of DG sets, ACs, UPSs, batteries, solar panels and racks at proposed Taluka locations	A,R	I	I	C
3	Installation and commissioning of DG Sets, UPs, ACs etc.	A,R	I	I	C
4	Provisioning of earth for equipment, mast and solar panel	A,R	I	I	C
5	Infrastructure acceptance of the Taluka locations/Gram panchayat	S	C	A,R	C
<b>D 2</b>	<b>UPS/ Solar (Parallel activity with OFC)</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Delivery of solar panels, on-line UPS and batteries	A,R	I	I	C
2	Installation and commissioning of solar panels, UPS and Batteries at the proposed locations	R,A	I	I	C
3	Acceptance for UPS system and solar panels	S	C	A,R	C
<b>D 3</b>	<b>Underground OFC</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	ROW requests (notification of routes planned at least 1 week prior to commence of work)	A,R	I	I	S
2	ROW approvals	S	A,R		C
3	EHS compliance audit	S	C	A,R	C
4	Procurement of material for ducting, Fiber etc.	A,R	I		C
5	Verification of the materials	S	I	A,R	C
6	Compliance testing with tender specifications for the material procured by PIA for MahaNet (GR/TEC/ etc.)	R,S	I	A	C
7	Barricading for trenching	A,R	I	I	C

8	Trenching/ ducting for underground OFC	A,R	I	I	C
9	Update of project plan in tool for periodic monitoring	S	I	I	A,R
10	Request for sub-normal trenching and protection requirement in the portal	A,R	I	I	C
11	Approval for sub-normal trenching and protection requirement within 7 days on the portal (otherwise deemed approved)	S	I	A,R	C
12	Preparation of splice chambers with regards to cable drum lengths and coils to be placed in the chamber	A,R	I	I	C
13	Placement of OFC route Electronic indicator	A,R	I	I	C
14	Measurement and recoding of trench depth in measurement book	A,R	I	I	I
15	Auditing and acceptance of trenching depth	S	I	A,R	C
16	Back filling and dressing of the trenches	A,R	I	I	C
17	Auditing and acceptance of splice chambers, electronic indicators(Route and joints)	S	I	A,R	C
18	Notification to field electronics team for deployment of electronics for sections where fiber ducting/stringing is complete	A,R	I	I	S
19	Blowing/pulling of OF cable	A,R	I	I	C
20	Inputs/updates regarding progress on fiber blowing	C	I	I	A,R
21	Notify PIA electronics for implementation status	A,R	I	I	S
22	OFC splicing and splice-loss measurement with OTDR	A,R	I	I	C
23	Termination of OFC at FDF (Fiber Distribution Frame) and LSPM	A,R	I		S
24	Acceptance of GP rings and measurement to assess compliance for thresholds as per specifications for: Splice losses, cable loss and end-to-end ring connectivity	S	I	A,R	C
25	Acceptance of Taluka rings and measurement to assess compliance for thresholds as per specifications for: Splice losses, cable loss and end to end ring connectivity	S	I	A,R	C
26	Acceptance of interconnect rings and measurement to assess compliance for thresholds as per specifications for: Splice losses, cable loss and end to end ring connectivity	S	I	A,R	C
27	As built drawings encompassing trench, duct, splice chambers, route and joint indicators ,OF cable, route index diagrams, make and size of cable, off-set from centre of	A,R	I	I	C

	road, type of protection, depth and size of chambers amongst others and GIS data				
28	Stage wise material (pipe, OFC, accessories, etc.) reconciliation Taluka/ GP wise	S	I	S	A,R
29	Issuing notices to PIA for non-performance, if any	I	A	R	C
30	Invoice pre-verification based on the milestones and recommendation for the payments	I,S	C	A, R	C
31	Final verification of Invoice based on the milestones and recommendation for the payments	I	A	R	C
<b>D 4</b>	<b>Aerial OFC</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Request of placement of ADSS cable using existing electric poles	A,R	I	I	C
2	Joint box fixing and stringing OF cable	A,R	I	I	C
3	Notify the progress on completion of fiber Stringing of ADSS cable	C	I	I	A,R
4	Notify PIA Electronics for deployment of electronics for sections where stringing of ADSS cables are complete	A,R	I	I	S
5	OFC splicing, provisioning spare cable of Coil length and splice-loss measurement with OTDR	A,R	I	C	C
6	Termination of OFC at FDF (Fiber Distribution Frame)	A,R	I		S
7	Acceptance of GP rings and measurement to assess compliance for thresholds as per specifications for:  -Splice losses -Cable link loss -End to end ring connectivity	S	I	A,R	C
8	Acceptance of Taluka rings and measurement to assess compliance for thresholds as per specifications for:  -Splice losses -Cable link loss -End to end ring connectivity	S	I	A,R	C
9	Acceptance of interconnect rings and measurement to assess compliance for thresholds as per specifications for:  Splice losses -Cable link loss end to -End ring connectivity	S	I	A,R	C

10	As built drawings capturing ADSS alignment with offset from the road center, type of posts used, staying arrangement made, span length between poles, type of ADSS cable and count of fiber, splice closure placement, longitude and latitude of poles/alignment, distance between high tension lines and ADSS, wind load that the cable can withstand	A,R	I	I	C
11	Stage wise material (ADSS OFC, accessories, etc.) reconciliation Taluka/ GP wise, poles erected, strengthened etc.	A	I	R	S
<b>D 5</b>	<b>Electronics (MPLS Network)</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Delivery of equipment to Taluka/ GP as per the installation plan	A,R	I	I	C
2	Verification of the Active/ passive materials as per design	A	I	R	S
3	Fixing and grounding of racks	A,R	I	I	C
4	Installation of DCDB	A,R	I	I	C
5	Fixing the fiber trays for connectivity with equipment's	A,R	I	I	C
6	Fixing of patch cords and organising the ODFs at designated place	A,R	I	I	C
7	Laying the power cable from DCDB to racks	A,R	I	I	C
8	Labelling of complete equipment's, accessories, patched cords, power cables, electronic devices etc.	A,R	I	I	C
9	Installation of MPLS routers at Taluka and GP and other active equipment	A,R	I	I	C
10	Testing and Commissioning of MPLS routers at Taluka and GP Level	A,R	I	I	C
11	Nodal acceptance of Taluka and GP	S	I	A,R	C,S
12	Integration of Taluka and GP rings	A,R	I	I	C
13	DCN service readiness and node visibility at NOC (EMS/NMS)	A,R	I	I	C
14	Pre-link/ ring acceptance	S	I	A,R	C,S
15	Notification on completion of installation of Taluka and GP ring for acceptance	A	I	I	R
16	Acceptance testing of Taluka and GP Rings with NOC visibility of GP	A	I	R	C,S
17	Notification regarding completion of 25%,50% and 75% of GPs in a package and incremental of 5%	A,R	I	I	C,S
18	As-built drawings of Taluka and GP rings	A	I	R	C,S
19	Material reconciliation Taluka/ GP wise	A	I	R	C,S

20	Handover the completed GPs to O&M PIA on integration of DFMS with NOC	A,R	I	I	C
<b>D 6</b>	<b>DCN</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Delivery of the devices as per the approved design/ BOM	A,R	I	I	C
2	Verification of the DCN equipment's	A	I	R	S
3	Installation of the DCN network connecting all the elements	R,A	I	I	S
4	DCN engineering which includes assessment of bandwidth requirement of OAMP functionality.	A,R	I	C	S
5	Approval of DCN bandwidth	A	A	S	R
6	Feasibility of bandwidth requirement with service providers and testing the bandwidth before handover	A	I	R	S
7	Testing of end to end connectivity with NOC	A	I	R	S
8	DCN acceptance testing	A	I	R	S
<b>D 7</b>	<b>NOC</b>	<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Delivery of the equipment as per the approved design/ BOM	R,A	I	I	S
2	Verification of all active BOM	A	I	R	S
3	Completion of civil, electrical and other infrastructure work etc.	A	R	I	S
4	Installation of video wall, servers, desktops, security and surveillance, video conferencing systems etc.	A,R	I	I	S
5	Installation of NOC	A,R	I	I	S
6	Commissioning of NOC ( including BSS )	R,A	I	I	S
7	Testing of OSS	A	I	R	S
8	Testing of BSS	A	I	R	S
9	Formalization of all NOC processes	R,A	I	R	S
10	Approval of all NOC processes	A	I	S	R
11	Acceptance testing of OSS	A	I	R	S
12	Acceptance testing of BSS	A	I	R	S
13	Integration of MahaNet NOC	R,A	I	S	S
14	Testing of MahaNet NOC	A	I	R	S
15	Integration of MahaNet NOC with NNOC Delhi	A	I	R	S
16	Testing of MahaNet NOC with NNOC Delhi	S,R	I	R	C,S

17	Material reconciliation	A	I	R	S	
18	Acceptance of NOC (functionality, integration etc.)	A	I	R	S	
<b>D 8</b>	<b>Network integration and testing</b>		<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Leasing of bandwidth from service providers for data bearer traffic	R	A	I	S	
2	Testing of the leased bandwidth	A,R	I	S	S	
3	Integrating leased bandwidth to MTHQ and taking traffic tests	A,R	I	S	S	
4	NOC testing - creation of LSP (Label Switched Path),monitoring of alarms	A,R	I	S	S	
5	End-to-End testing and traffic trials	A,R	I	S	S	
<b>E</b>	<b>Project state: Maintenance</b>		<b>PIA</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Commissioning of NMS -Formation of FRT (Fault Repairing Team) -Route patrolling teams for OF cable routes for every 300Km -Weekly/Monthly measurement of optical power budget parameters -Sparing strategy for OF cable and jointing accessories in maintenance locations -OTDR traces after restoration of the fault -Capturing additions, deletions of OF cable in the As-Built diagrams -Provisioning of additional electronic joint indicators in new jointing locations that are introduced -Shifting of OF cable wherever found necessary - Centralized monitoring through NOC / NMS	A,R	I	I	C	
2	Preparation of Standard Operating Procedure (SOP) based on SLA criteria (e.g. network availability, GP ring- 99.5%,Spur- 95%),MTTR, Preventive maintenance)	A,R	I	I	C	
3	Approval of the SOPs	S	A	S	R	
4	Provisioning of bandwidth at GPs based on the approved requirements	A,R	I	I	C	
5	Deployment of O&M team	A,R	I	I	C	
6	Conducting Preventive Maintenance (PM) activity and submitting periodic reports	A,R	I	I	I	
7	MIS report- related to issues/ resolved/ unresolved etc.	S	I	I	A,R	

8	Escalation matrix	S	I	I	A,R
9	Root-cause analysis	S	I	I	A,R
10	Review meetings (weekly/ bi-weekly/ monthly)	S	I	I	A,R
11	Submission of performance matrix at defined periodic intervals	S	I	I	A,R
12	Governance set up and management reporting	S	I	I	A,R
13	Publishing operational reports (SLA, Availability report, Dashboards, Compliance reports)	S	A	I	R
14	Competence training/ floor mentoring	A,R	I	I	S

Figure 10: Package A, RACIS Matrix

**Responsibility Matrix - Package B/C (Indicative)**

A	Planning	PIA (A)	PIA (B/C)	SIA	TPA	PMC
1	Closure of contracts/ sign-off with PIAs and release of purchase orders	-	S	A		R
2	Project governance model (processes and organization) design	-	S	A	I	R
3	Develop detailed project plan	-	C, S	A	I	R
4	Publishing procedures, guidelines, checklists and report formats	-	S	C	I	A,R
5	Resource planning	-	A,R	C	I	C
6	Approval of resource plan	-	I	A	I	R
7	Approval of detailed project plan	-	I	A	I	R
8	Engineering documentation	-	R	C	I	A
9	Approval of engineering documentation	-	I	A	C	R
10	EHS compliance	-	R	I	A	C
11	Commissioning of Project Management Tool	-	I	R	C	A
12	Training on usage of project management tool	-	S	A	I	R
13	Finalization, distribution and maintenance of: project deliverables, documentation and documentation control	-	S	C	I	A,R
14	Dispute resolution	-	S	A	I	R

15	Escalation handling	-	S	A	I	R
16	Risk analysis and mitigation	-	S	A	I	R
17	Project tracking / reporting (weekly / monthly / quarterly reports)	-	S	C	I	A,R
18	Process for handling Change requests and approvals	-	S	C	I	A,R
19	Governance process for Review meetings with PIA, MahalIT, BBNL, SLIC etc.	-	S	C	I	A,R
<b>B</b>	<b>Site Survey</b>	<b>PIA (A)</b>	<b>PIA (B/C)</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Site / route survey format template	-	C, S	I	I	A, R
2	Conducting site survey	-	A,R	I	I	S
3	<p>Population of site/ route survey template</p> <p>Inputs regarding the following to be provided as part of the site survey:</p> <ul style="list-style-type: none"> <li>-Any road expansions planned/ water pipe line/ drainage activities planned - visual</li> <li>-En-route culverts and bridges, water flow of the river or stream (indicating the duration of months water is flowing) - Side of the road from where the proposed cable is to be laid</li> <li>-Road crossing (road and railway lines)</li> <li>-Existing fiber routes if any</li> <li>-Existing power cable routes and overhead power cables alignments</li> <li>-Diverse route availability w.r.t to formation of taluka and GP rings (avoidance of flat rings to avoid single point of failure)</li> <li>-Proposed alignment from the centre of the road/ nearest carriage way, GIS parameters (Longitude, Latitude and altitude (HASL)).</li> <li>-Availability of electric poles for stringing ADSS cables with headway of 12 - 15ft - Strengthening of poles - visual</li> </ul>	-	A,R	I	I	C
4	Entry of detailed survey data in Project management tool	-	A,R	I	I	C
5	Submission of route survey for approval	-	R	I	I	A
6	Approval of survey document	-	S	A	I	R
7	Site survey action item w.r.t to MahalIT / BBNL	-	S	A	C	R

C	Planning and Engineering					
C 1	OFC	PIA (A)	PIA (B/C)	SIA	TPA	PMC
1	Details of planned Taluka and GP rings	-	I	A		R
2	Proposal for Taluka and GP rings based on survey data	-	A,R	I		C
3	Finalisation of distance between rings and ring formation	-	A,R	I	I	S
4	Avoidance of flat rings by trenching on both sides of the roads	-	A,R	I	I	C
5	Enhancement of scope for PIA in case of flat rings (trenching to be done on both side of road)	-	S	A	I	R
6	Design acceptance of GP and Taluka rings	-	S	I	A,R	C
7	Assessment of existing poles and strengthening where ever required	-	A,R	I	I	C
8	Approval for placement of additional poles	-	A	I	R	I
9	Planning for necessary safety arrangements while working in close range of electric lines	-	A,R	C	S	C
10	Guidelines for safety arrangements for stringing ADSS cable working at heightened posts and road sides	-	A,R	C	S	C
11	Survey of the proposed Taluka, GPs locations for civil, electric infrastructure availability	-	A,R	I	I	C
12	Plan for Civil and Electrical upgradation of Talukas and GPs	-	A,R	I	I	C
D	Implementation					
D 1	Civil and electrical Infrastructure (Parallel activity with OFC)	PIA (A)	PIA (B/C)	SIA	TPA	PMC
1	Installation of FDMS and termination of the cable	-	A,R	I	I	C
2	Delivery of UPSs, batteries, solar panels and racks at proposed Taluka and GP locations	-	A,R	I	I	C
3	Installation and commissioning of UPS, Solar Panels etc.	-	A,R	I	I	C
4	Provisioning of earth for equipment, mast and solar panel	-	A,R	I	I	C
5	Infrastructure acceptance of the Taluka locations/Gram panchayat	-	S	C	A,R	C
D 2	UPS/ Solar (Parallel activity with OFC)	PIA (A)	PIA (B/C)	SIA	TPA	PMC

1	Delivery of solar panels, on-line UPS and batteries	-	A,R	I	I	C	
2	Installation and commissioning of solar panels, UPS and Batteries at the proposed locations	-	R,A	I	I	C	
3	Acceptance for UPS system and solar panels	-	S	C	A,R	C	
<b>D 3</b>	<b>Underground OFC</b>		<b>PIA (A)</b>	<b>PIA (B/C)</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	ROW requests (notification of routes planned at least 1 week prior to commence of work)	-	A,R	I	I	S	
2	ROW approvals	-	S	A,R		C	
3	EHS compliance audit	-	S	C	A,R	C	
4	Procurement of material for ducting, Fiber etc.	-	A,R	I		C	
5	Verification of the materials	-	S	I	A,R	C	
6	Compliance testing with tender specifications for the material procured by PIA for MahaNet (GR/TEC/ etc.)	-	R,S	I	A	C	
7	Barricading for trenching	-	A,R	I	I	C	
8	Trenching/ ducting for underground OFC	-	A,R	I	I	C	
9	Update of project plan in tool for periodic monitoring	-	S	I	I	A,R	
10	Request for sub-normal trenching and protection requirement in the portal	-	A,R	I	I	C	
11	Approval for sub-normal trenching and protection requirement within 7 days on the portal (otherwise deemed approved)	-	S	I	A,R	C	
12	Preparation of splice chambers with regards to cable drum lengths and coils to be placed in the chamber	-	A,R	I	I	C	
13	Placement of OFC route Electronic indicator	-	A,R	I	I	C	
14	Measurement and recoding of trench depth in measurement book	-	A,R	I	I	I	
15	Auditing and acceptance of trenching depth	-	S	I	A,R	C	
16	Back filling and dressing of the trenches	-	A,R	I	I	C	
17	Auditing and acceptance of splice chambers, electronic indicators(Route and joints)	-	S	I	A,R	C	
18	Notification to field electronics team for deployment of electronics for sections where fiber ducting/stringing is complete	-	A,R	I	I	S	
19	Blowing/pulling of OF cable	-	A,R	I	I	C	

20	Inputs/updates regarding progress on fiber blowing	-	C	I	I	A,R
21	Intimation to Package-A PIA for active electronics installation	I	A,R	I	C	I
22	Delivery of equipment to GP	R,A	I	I	S	I
23	Site Infra Readiness	I	A,R	S	S	I
24	Fiber termination at GP	I	A, R	I	S	I
25	Fiber testing (OTDR report)- upload in portal	I	A, R	I	S	R
26	Intimation to Package A-PIA for active components with (4 weeks' time window to complete MPLS)	I	A	I	R	I
27	Installation of MPLS routers at GP & Taluka and other active electronics (within 4 weeks from intimation date)	A, R	S	S	S	I
28	OFC splicing and splice-loss measurement with OTDR	-	A,R	I	I	C
29	Termination of OFC at FDF (Fiber Distribution Frame) and LSPM	-	A,R	I		S
30	Acceptance of GP rings and measurement to assess compliance for thresholds as per specifications for: Splice losses, cable loss and end-to-end ring connectivity	-	S	I	A,R	C
31	Acceptance of Taluka rings and measurement to assess compliance for thresholds as per specifications for: Splice losses, cable loss and end-to-end ring connectivity	-	S	I	A,R	C
32	Acceptance of interconnect rings and measurement to assess compliance for thresholds as per specifications for: Splice losses, cable loss and end-to-end ring connectivity	-	S	I	A,R	C
33	Package A-PIA needs to review and raise issues related to site readiness or fiber testing, within 2 weeks from intimation date of GP readiness for active installation	A, R	I	S	I	I
34	Package B/C-PIA needs to resolve such issues with respect to site readiness or fiber testing (within 2 weeks from intimation of issues)	I	A,R	S	I	I
35	Commissioning of MPLS routers at GP level with visibility at NOC (within 4 weeks from intimation date)	A, R	S	S	S	I
36	Commissioning of GP milestone (for both Package A-PIA and Package B/C-PIA)	A, R	I	I	S	I

37	If Package A-PIA team does not respond within 4 weeks from intimation date, Package B/C-PIA claims GP commissioning	I	A, R	S	S	I
38	As built drawings encompassing trench, duct, splice chambers, route and joint indicators ,OF cable, route index diagrams, size of cable, off-set from centre of road, type of protection, depth and size of chambers amongst others and GIS data	-	A,R	I	I	C
39	Stage wise material (pipe, OFC, accessories, etc.) reconciliation Taluka/ GP wise	-	S	I	S	A,R
40	Issuing notices to PIA for non-performance, if any	-	I	A	R	C
41	Invoice pre-verification based on the milestones and recommendation for the payments	-	I,S	C	A, R	C
42	Final verification of Invoice based on the milestones and recommendation for the payments	-	I	A	R	C
<b>D 4</b>	<b>Aerial OFC</b>	<b>PIA (A)</b>	<b>PIA (B/C)</b>	<b>SIA</b>	<b>TPA</b>	<b>PMC</b>
1	Request of placement of ADSS cable using existing electric poles	-	A,R	I	I	C
2	Joint box fixing and stringing OF cable	-	A,R	I	I	C
3	Notify the progress on completion of fiber Stringing of ADSS cable	-	C	I	I	A,R
4	Notify PIA Electronics for deployment of electronics for sections where stringing of ADSS cables are complete	-	A,R	I	I	S
5	OFC splicing, provisioning spare cable of Coil length and splice-loss measurement with OTDR	-	A,R	I	C	C
6	Termination of OFC at FDF (Fiber Distribution Frame)	-	A,R	I		S
7	Acceptance of GP rings and measurement to assess compliance for thresholds as per specifications for: Splice losses Cable link loss end to end ring connectivity	-	S	I	A,R	C
8	Acceptance of Taluka rings and measurement to assess compliance for thresholds as per specifications for: Splice losses Cable link loss end to end ring connectivity	-	S	I	A,R	C
9	Acceptance of interconnect rings and measurement to assess compliance for thresholds as per specifications for: Splice losses Cable link loss end to end ring connectivity	-	S	I	A,R	C

10	As built drawings capturing ADSS alignment with offset from the road center, type of posts used, staying arrangement made, span length between poles, type of ADSS cable and count of fiber, splice closure placement, longitude and latitude of poles/alignment, distance between high tension lines and ADSS, wind load that the cable can withstand	-	A,R	I	I	C
11	Stage wise material (ADSS OFC, accessories, etc.) reconciliation Taluka/ GP wise, poles erected, strengthened etc.	-	A	I	R	S
E	Project state: Maintenance	PIA (A)	PIA (B/C)	SIA	TPA	PMC
1	<ul style="list-style-type: none"> <li>-Formation of FRT (Fault Repairing Team)</li> <li>-Route patrolling teams for OF cable routes for every 300Km</li> <li>-Weekly/Monthly measurement of optical power budget parameters</li> <li>-Sparing strategy for OF cable and jointing accessories in maintenance locations</li> <li>-OTDR traces after restoration of the fault</li> <li>-Capturing additions, deletions of OF cable in the As-Built diagrams</li> <li>-Provisioning of additional electronic joint indicators in new jointing locations that are introduced</li> <li>-Shifting of OF cable wherever found necessary</li> </ul>	-	A,R	I	I	C
2	Preparation of Standard Operating Procedure (SOP) based on SLA criteria (e.g. network availability, GP ring- 99.5%, Spur- 95%), MTTR, Preventive maintenance)	-	A,R	I	I	C
3	Approval of the SOPs	-	S	A	S	R
4	Provisioning of bandwidth at Master Taluka based on the approved requirements	A,R	I	I	I	C
5	Deployment of O and M team	-	A,R	I	I	C
6	Conducting Preventive Maintenance (PM) activity and submitting periodic reports	-	A,R	I	I	I
7	MIS report- related to issues/ resolved/ unresolved etc.	-	S	I	I	A,R
8	Escalation matrix	-	S	I	I	A,R
9	Root-cause analysis	-	S	I	I	A,R
10	Review meetings (weekly/ bi-weekly/ monthly)	-	S	I	I	A,R

11	Submission of performance matrix at defined periodic intervals	-	S	I	I	A,R
12	Governance set up and management reporting	-	S	I	I	A,R
13	Publishing operational reports (SLA, Availability report, Dashboards, Compliance reports, etc.)	-	S	A	I	R

Figure 11: Package B/C, RACIS Matrix

## 2.5 Implementation Structure

A 3 tier governance structure has been defined to overlook and manage the implementation of this project.

**Executive Committee:** The committee will comprise of Chairman of MahalIT, Central Stationed TPA officer, Engagement Partner of PMC and Project Leader of PIA's (A/B/C). The executive committee's role is to provide advice, ensure delivery of the project outputs and the achievement of project outcomes. This include tasks such as:

- Providing input for the Implementation of the project
- Providing advice on the budgeting of the project
- Defining and helping to achieve the project outcomes in timely manner
- Escalations in case of missed timelines by concerned stakeholders

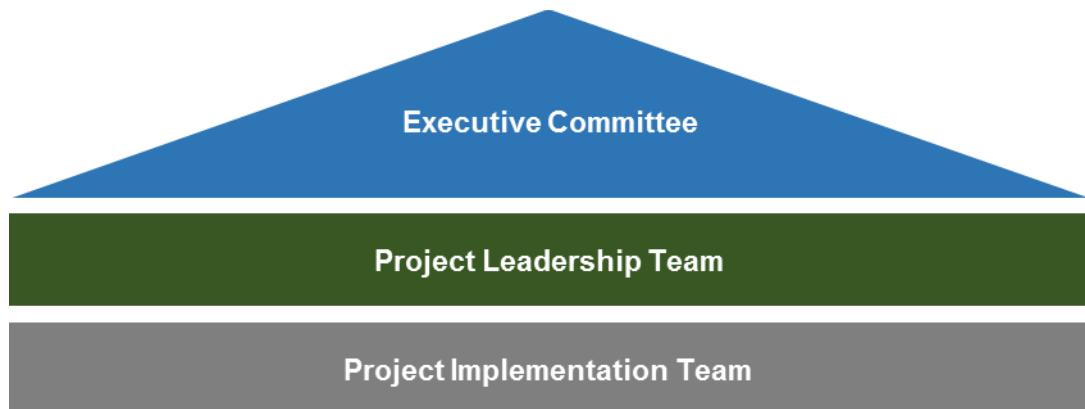


Figure 12: Implementation Project Structure

**Project Leadership Team:** This committee shall include senior-level executives/representatives across all stakeholders. The project leadership members will comprise of representatives from SIA, PMC, TPA and PIA's. The primary task of the leadership team will be as below:

- Planning and monitoring of the project implementation
- Mitigating risk by ensuring requisite controls
- Guiding project effort and delivery

**Project Implementation Team:** The team will comprise of project manager and technical experts from different stakeholder's viz. PIA, SIA, TPA, and PMC. The primary task would include:

- Day to Day project execution
- Providing technical expertise and managing closure of activities
- Develop project deliverables
- Program coordination

## 2.6 Cadence Structure

Cadence	Participants	Agenda	Frequency of Meetings
Progress update to SIA (Chairman, MahalIT) from PMC, PIA and TPA	<ul style="list-style-type: none"> <li>SIA (PSIT, Head PMU)</li> <li>PIA (Project lead, Project manager)</li> <li>PMC (Engagement Partner, Engagement Manager)</li> <li>TPA (TPA lead)</li> </ul>	<ul style="list-style-type: none"> <li>Progress update by PMC, PIA and TPA</li> <li>Number of GPs commissioned and audited</li> <li>PIA and PMC to report any performance red-flags</li> <li>PIA and PMC to report any deviations vis-à-vis project plan</li> </ul>	Once in a week
Progress update to PMC from SIA (District and Central)	<ul style="list-style-type: none"> <li>PIA (Project lead, Project manager)</li> <li>PMC (Engagement Partner, Engagement Manager)</li> <li>SIA (Project Manager)</li> </ul>	<ul style="list-style-type: none"> <li>Progress on assigned work</li> <li>Address any hindrances or performance red flags</li> <li>SIA to provide status updates to PMC</li> </ul>	Once in a week
Progress update to PMC from PIA and TPA	<ul style="list-style-type: none"> <li>PMC (Engagement Partner, Engagement Manager)</li> <li>PIA (Project lead, Project manager)</li> <li>TPA (TPA lead)</li> </ul>	<ul style="list-style-type: none"> <li>PIA and TPA to update PMC on task progress</li> <li>PIA to submit weekly report of Plan vs Actuals</li> <li>Review work completed in the week</li> <li>Seek clarifications on guidelines, checklists and report formats from PMC as and when required</li> </ul>	Once in a week
Progress update by PIA to TPA	<ul style="list-style-type: none"> <li>PIA (Project lead, Project manager)</li> <li>TPA (TPA lead)</li> </ul>	<ul style="list-style-type: none"> <li>Update on material verification</li> <li>Provide auditing and acceptance reports</li> <li>PIA to seek approval on BOQ and OFC ring routes</li> <li>TPA to inform PIA of any deviations and seek clarifications</li> </ul>	As and when required

Figure 13: Implementation Project Structure

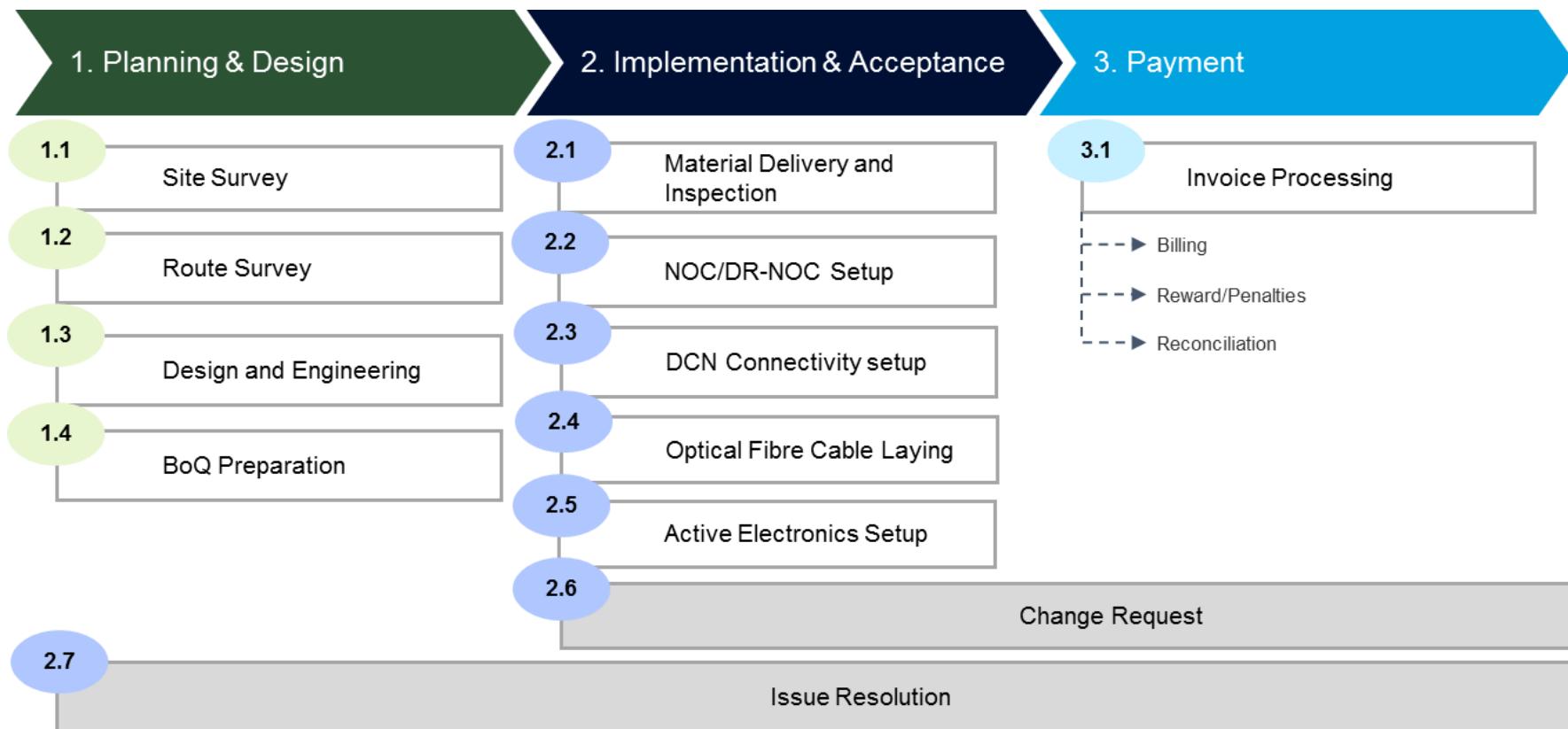
Note: Cadence structure may be changed after discussion with PIA and TPA.

### 3. Executive Summary

The executive summary provides an overview of the activities that will be carried out during the MahaNet-I project by each of the stakeholder, viz. the PIA, TPA, SIA (District team), SIA (central team) and the PMC.

The below mentioned flow-chart illustrates level 1 processes for the project. Activities to be conducted as part of these processes have been detailed further in the section to assign clear responsibilities to each stakeholder at each stage of the process.

**MahaNet-I overall process map**



Process Flowchart 1: MahaNet-I process map (Level 1 Process)

## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Summary of activity distribution of MahaNet-I process map**

Activity reference no.	PIA	SIA (District)	TPA	SIA (Central)	PMC
1.1 Site Survey	<ul style="list-style-type: none"> <li>Provide notice of work and survey schedule plan (5 days before commencement of work)</li> <li>Conduct survey and complete the civil and power site survey templates for GP / Taluka / NOC (<i>including space availability, floor type, power etc.</i>)</li> <li> Reference: Civil Survey Form; Power Survey Form; NOC Survey Form</li> <li>Forward filled up survey to TPA for approval</li> </ul>	<ul style="list-style-type: none"> <li>Coordinate with PIA and ensure notice of work is intimated 5 days before start of work</li> <li>Review completeness of the site survey data &amp; issue sign-off on the survey report filled by the PIA</li> <li> Reference: Civil Survey Form; Power Survey Form; NOC Survey Form</li> <li>Resolve locally managed issues on-site</li> <li>District level consolidation of the site survey data</li> </ul>	<ul style="list-style-type: none"> <li>Validate and approve site survey (Power, Civil, and NOC) report submitted by the PIA</li> <li> Reference: Civil Survey Form; Power Survey Form; NOC Survey Form</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that all stakeholders are informed regarding commencement of work by PIA</li> <li>State level consolidation of site survey data across all districts</li> <li>Archiving submitted and verified reports</li> </ul>	<ul style="list-style-type: none"> <li>Review and analyze challenges basis existing network infrastructure</li> <li> Reference: Civil Survey Form; Power Survey Form; NOC Survey Form</li> <li>Manage and coordinate overall progress and reporting of site survey activities</li> </ul>
1.2 Route Survey	<ul style="list-style-type: none"> <li>Provide notice of work and survey schedule plan (5 days before commencement of work)</li> <li>Conduct section wise route survey and capture details as per template</li> <li> Reference: Route Survey Form; Microwave LoS, RF and Tower height calculation Survey Form</li> <li>Forward filled up survey to TPA for approval</li> </ul>	<ul style="list-style-type: none"> <li>Coordinate with PIA and ensure notice of work is intimated 5 days before start of work</li> <li>Review completeness of the survey data and sign-off on the survey reports</li> <li> Reference: Route Survey Form; Microwave LoS, RF and Tower height calculation Survey Form</li> <li>District level consolidation of the survey data</li> </ul>	<ul style="list-style-type: none"> <li>Validate and approve route survey report submitted by PIA</li> <li> Reference: Route Survey Form; Microwave LoS, RF and Tower height calculation Survey Form</li> </ul>	<ul style="list-style-type: none"> <li>Consolidate state level route survey data across all districts</li> <li>Archive submitted and verified reports</li> </ul>	<ul style="list-style-type: none"> <li>Manage and coordinate overall progress and reporting of site survey activities</li> </ul>

## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Summary of activity distribution of MahaNet-I process map**

Activity reference no.	PIA	SIA (District)	TPA	SIA (Central)	PMC
1.3 Design and Engineering	<ul style="list-style-type: none"> <li>Develop high and low level design for Optical Fiber Cable, NOC, Access network at GP and Taluka locations</li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Validate and approve high and low level design for Optical Fiber Cable, NOC, Access network at GP and Taluka locations at District level</li> </ul>	<ul style="list-style-type: none"> <li>Archive design documents</li> </ul>	<ul style="list-style-type: none"> <li>Manage and coordinate overall progress, compliance and reporting of the activities</li> </ul>
1.4 Preparation of BoQ	<ul style="list-style-type: none"> <li>Basis the high and low level design, prepare an updated BoQ</li> <li>Intimate cost and scope changes for recording to the stakeholders (use change requests wherever applicable)</li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Validate and approve BOQ and CR (wherever applicable)</li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Review of BoQ and scope and facilitate approval from Chairman MahalIT</li> </ul>

## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Summary of activity distribution of MahaNet-I process map**

<b>Activity reference no.</b>	<b>PIA</b>	<b>SIA (District)</b>	<b>TPA</b>	<b>SIA (Central)</b>	<b>PMC</b>
<b>2.1</b> Material delivery and Inspection	<ul style="list-style-type: none"> <li>Delivery of materials at warehouse with supporting documents incl. BoQ, Delivery Challan (DC), material inspection template to TPA</li> </ul> <p> <i>Reference Material Inspection Template</i></p>	<ul style="list-style-type: none"> <li>Conduct 5% sample physical verification of the material delivered and issue sign-off on the material inspection form</li> <li>Consolidation of verified material delivery reports (verified by the TPA)</li> </ul>	<ul style="list-style-type: none"> <li>Inspect quantity of material (DC vis-à-vis BOQ)</li> <li>Check and verify QA/FAT/TSEC certification</li> <li>Validate and approve material supplied</li> </ul> <p><input checked="" type="checkbox"/> <i>Reference Material Inspection Template</i></p>	<ul style="list-style-type: none"> <li>Consolidate state level material inspection report</li> <li>Archive all verified delivery reports</li> </ul>	<ul style="list-style-type: none"> <li>Manage and coordinate progress of material delivery and inspection process</li> </ul>
<b>2.2</b> NOC/DR-NOC Setup	<ul style="list-style-type: none"> <li>Spruce-up NOC/DR-NOC civil infrastructure</li> <li>Implementation of power infrastructure, active and passive electronics, VPC, bandwidth in NOC/DR-NOC</li> <li>Integration of network with VPC</li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Acceptance testing (Soft and Physical) of active electronics (Router, Switch, etc.), civil and power infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Archive verified and accepted NOC implementation reports</li> </ul>	<ul style="list-style-type: none"> <li>Manage and coordinate progress and reporting of NOC/DR-NOC setup</li> </ul>
<b>2.3</b> DCN Connectivity setup	<ul style="list-style-type: none"> <li>Requirement gathering and preparation of DCN engineering design</li> <li>Setup, install and integrate DCN links from Master Talukas to NOC and DR-NOC</li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Validate and approve and validate the proposed DCN architecture by the PIA</li> <li>Perform acceptance testing of the DCN links</li> </ul>	<ul style="list-style-type: none"> <li>Archive verified and approved FAT reports for DCN network</li> </ul>	<ul style="list-style-type: none"> <li>Review the proposed DCN engineering architecture proposed by the PIA</li> <li>Manage and coordinate progress and reporting of DCN connectivity setup</li> </ul>

## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Summary of activity distribution of MahaNet-I process map**

Activity reference no.	PIA	SIA (District)	TPA	SIA (Central)	PMC
2.4 Optical Fiber Cable Laying	<ul style="list-style-type: none"> <li>Provide notice of work and survey schedule plan (5 days before commencement of work)</li> <li>Lay UG and aerial OFC (<i>trenching, ducting, blowing fiber, stringing, splicing etc.</i>)</li> <li>Raise subnormal trenching request via form (as and when required)  <i>Reference Sub-normal trenching request Template</i></li> </ul>	<ul style="list-style-type: none"> <li>Coordinate with PIA and ensure notice of work is intimated 5 days before start of work</li> <li>Record the depth and length measurement in the measurement book  <i>Reference Measurement Book template</i></li> <li>Consolidate sub-normal trenching request data at a district level</li> </ul>	<ul style="list-style-type: none"> <li>Conduct sample depth AT</li> <li>Physical verification and approval of protection given in case of sub-normal trenching request raised by the PIA <input checked="" type="checkbox"/> <i>Reference sub-normal Trenching request template</i></li> </ul>	<ul style="list-style-type: none"> <li>Consolidate measurement across all districts</li> <li>Archive measurement book</li> </ul>	<ul style="list-style-type: none"> <li>Manage and coordinate progress and reporting of OFC laying activities</li> </ul>
2.5 Active Electronics setup	<ul style="list-style-type: none"> <li>Install active electronics on GP and Taluka site</li> <li>Successful completion of preliminary acceptance tests (PAT) and offer site for Acceptance testing</li> </ul>	<ul style="list-style-type: none"> <li>Coordinate with TPA and PIA for acceptance testing</li> <li>Ensure document readiness (PAT, As-build diagrams, site material list etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Acceptance testing (Soft and Physical) of active &amp; passive electronics equipment's installed</li> </ul>	<ul style="list-style-type: none"> <li>Consolidate approved acceptance test report across all districts</li> <li>Forward AT report for payment as per milestone</li> </ul>	<ul style="list-style-type: none"> <li>Report and monitor progress of active network deployment</li> </ul>
2.6 Change Request	<ul style="list-style-type: none"> <li>Change request template to be filled in case of change requests  <i>Reference Change Request Template</i></li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Technical / cost impact validation of change request raised by the PIA <input checked="" type="checkbox"/> <i>Reference Change Request Template</i></li> </ul>	<ul style="list-style-type: none"> <li>Consolidate change request form and archive</li> </ul>	<ul style="list-style-type: none"> <li>Review technical and cost impact</li> <li>Facilitate approval from Chairman Mahalt</li> </ul>

1. Planning &amp; Design

2. Implementation &amp; Acceptance

3. Payment

**Summary of activity distribution of MahaNet-I process map**

Activity reference no.	PIA	SIA (District)	TPA	SIA (Central)	PMC
2.7 Issue Resolution	<ul style="list-style-type: none"> <li>Initiate issue resolution request and submit to SIA District team through template and email for review</li> </ul> <p> <a href="#">Reference Issue Request Template</a></p>	<ul style="list-style-type: none"> <li>First level review of the issue raised and escalation if required</li> </ul> <p> <a href="#">Reference Issue Request Template</a></p> <ul style="list-style-type: none"> <li>Resolve all non-critical issues (issues not impacting day to day implementation) within 48 hours</li> <li>Consolidate district level issues and status across each district</li> </ul>	No role in this activity	<ul style="list-style-type: none"> <li>Second level review of the issue to provide resolution</li> </ul> <p> <a href="#">Reference Issue Request Template</a></p> <ul style="list-style-type: none"> <li>Consolidate state level issues and status</li> <li>Archive issue request reports</li> </ul>	<ul style="list-style-type: none"> <li>Third level review of the issue to provide resolution</li> </ul> <p> <a href="#">Reference Issue Request Template</a></p> <ul style="list-style-type: none"> <li>Facilitate issue of corrective circulars through chairman MahalT in case of systemic support to PIA</li> </ul>

## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Summary of activity distribution of MahaNet-I process map**

<b>Activity reference no.</b>	<b>PIA</b>	<b>SIA (District)</b>	<b>TPA</b>	<b>SIA (Central)</b>	<b>PMC</b>
3.1 Invoice Processing	<ul style="list-style-type: none"> <li>• Complete and submit invoice processing template along with original invoice to TPA for approval</li> </ul> <p> <i>Reference Invoice processing Template</i></p>	No role in this activity	<ul style="list-style-type: none"> <li>• Validate and approve invoice value with relevant supporting documents (DC for material supply, site AT documents: As-built diagram, etc. for sites commissioned)</li> <li><input checked="" type="checkbox"/> <i>Reference Invoice processing Template</i></li> <li>• Calculate rewards and penalties</li> </ul>	<ul style="list-style-type: none"> <li>• Consolidate state level invoice report</li> <li>• Forward the invoice for processing of payment to Finance post TPA approval</li> </ul>	<ul style="list-style-type: none"> <li>• Support TPA in calculating reward and penalties</li> <li>• Report and monitor progress of invoice submitted by the PIA for processing</li> </ul>

## 4. Process Overview

Process overview provides a high level end to end view of the different activities that will be carried out during the project execution phase of MahaNet-I. The below mentioned flow-chart illustrates the interlinkages between different activities / processes, which have been detailed further as part of the planning, implementation and payment sections (sections 5,6 and 7 respectively) of this handbook.

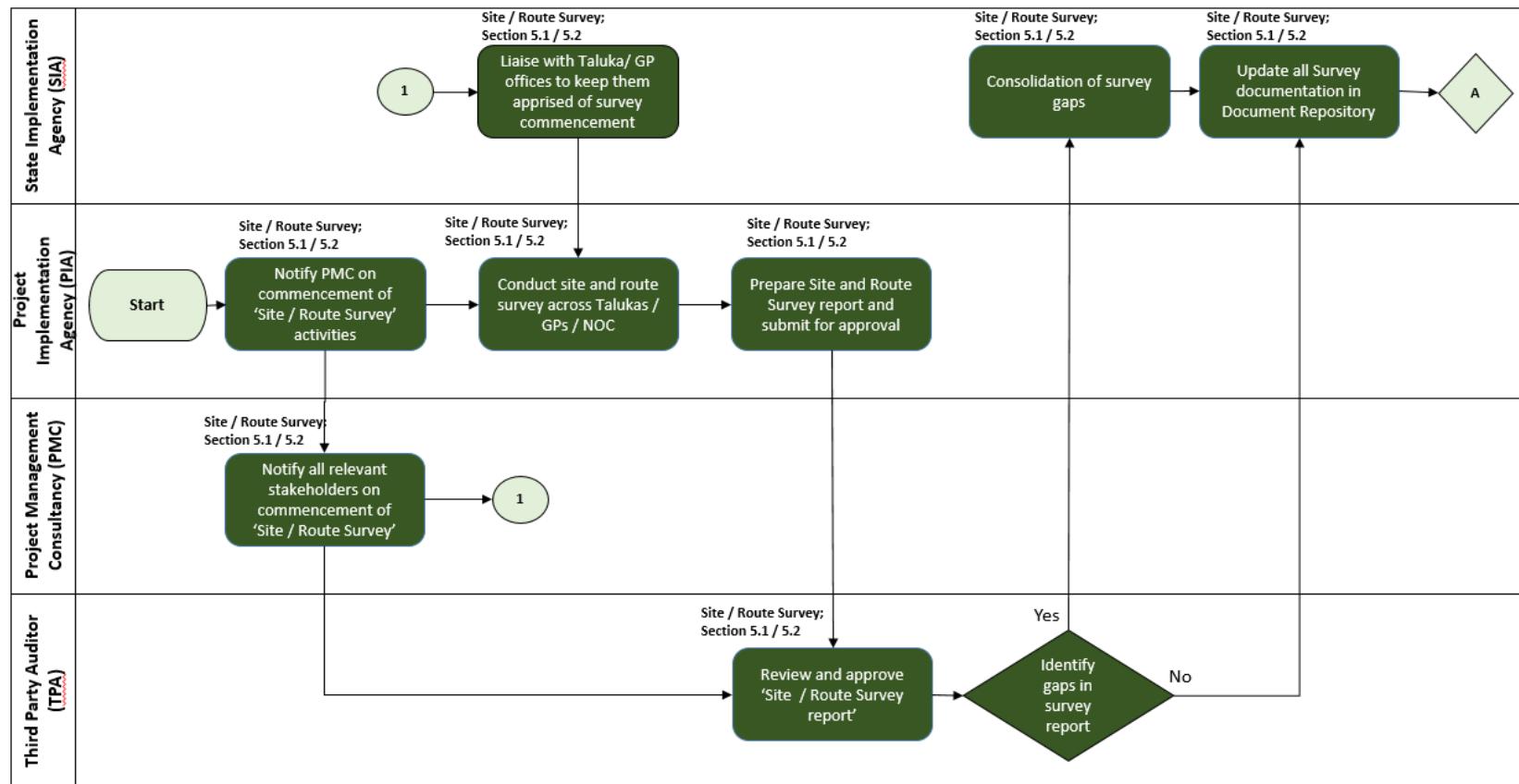
## 1. Planning & Design

## 2. Implementation & Acceptance

## 3. Payment

### Site and Route Survey

After provision of notice of work, the PIA shall conduct civil and power surveys across all site locations (GPs and Talukas) and NOC / DR-NOC sites apart from conducting a comprehensive route survey for planning the underground and aerial OFC deployment. These survey reports will be approved by the TPA and recorded and archived by the SIA team. For additional process details please refer to section 5.1 / 5.2.



Process Flowchart 2: Site and Route Survey (Level 2 Process)

## 1. Planning & Design

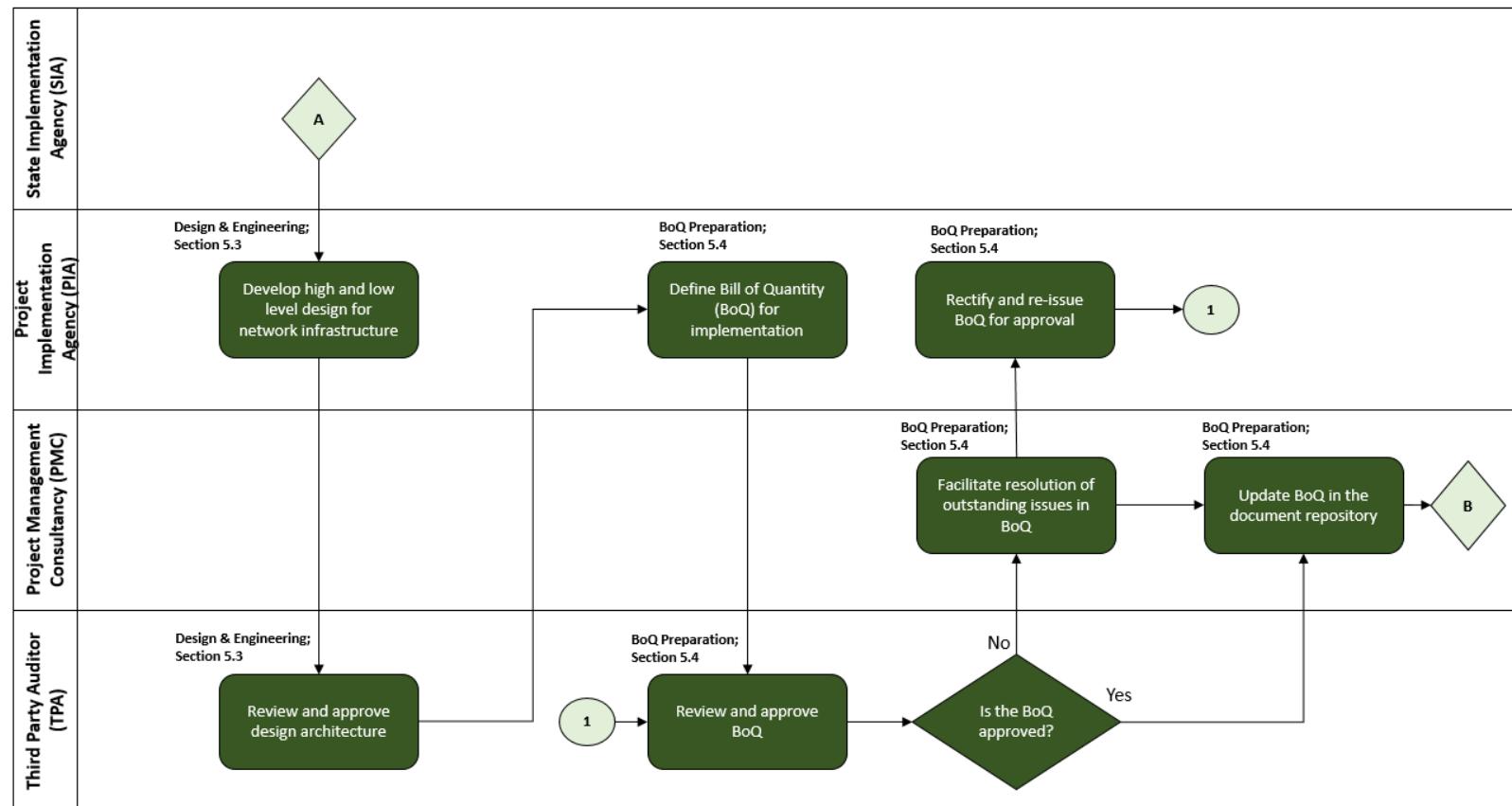
## 2. Implementation & Acceptance

## 3. Payment

### Design Finalization & BoQ inspection and Approval

After the site/route survey is successfully conducted, the PIA will develop high & low level designs for the network infrastructure, which the TPA will approve. Once the design is finalized, the BoQ will be finalized and approved by the TPA. For additional process details please refer to section 5.3.

### Design Finalization & BoQ Inspection and Approval



Process Flowchart 3: Design finalization & BoQ inspection and approval (Level 2 Process)

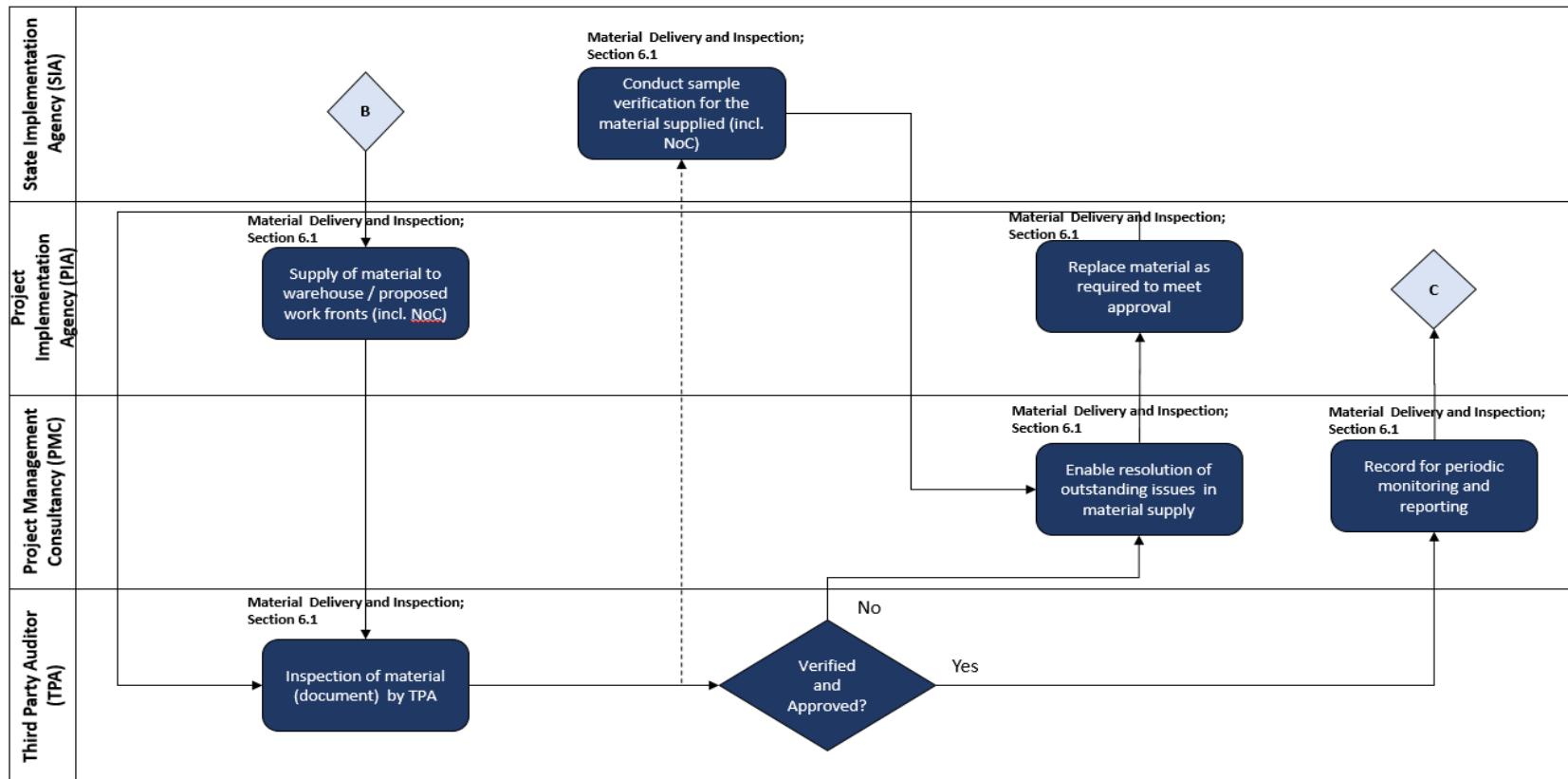
## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Material delivery and inspection**

Once the BoQ has been finalized, the PIA will deliver the material as per the delivery schedule. The documents of material delivered will be inspected by TPA and sample check will be conducted by the SIA district team. For additional process details refer to section 6.1 of this handbook.

**Preparation of Execution & Material Delivery and Inspection**

Process Flowchart 4: Material delivery and inspection (Level 2 Process)

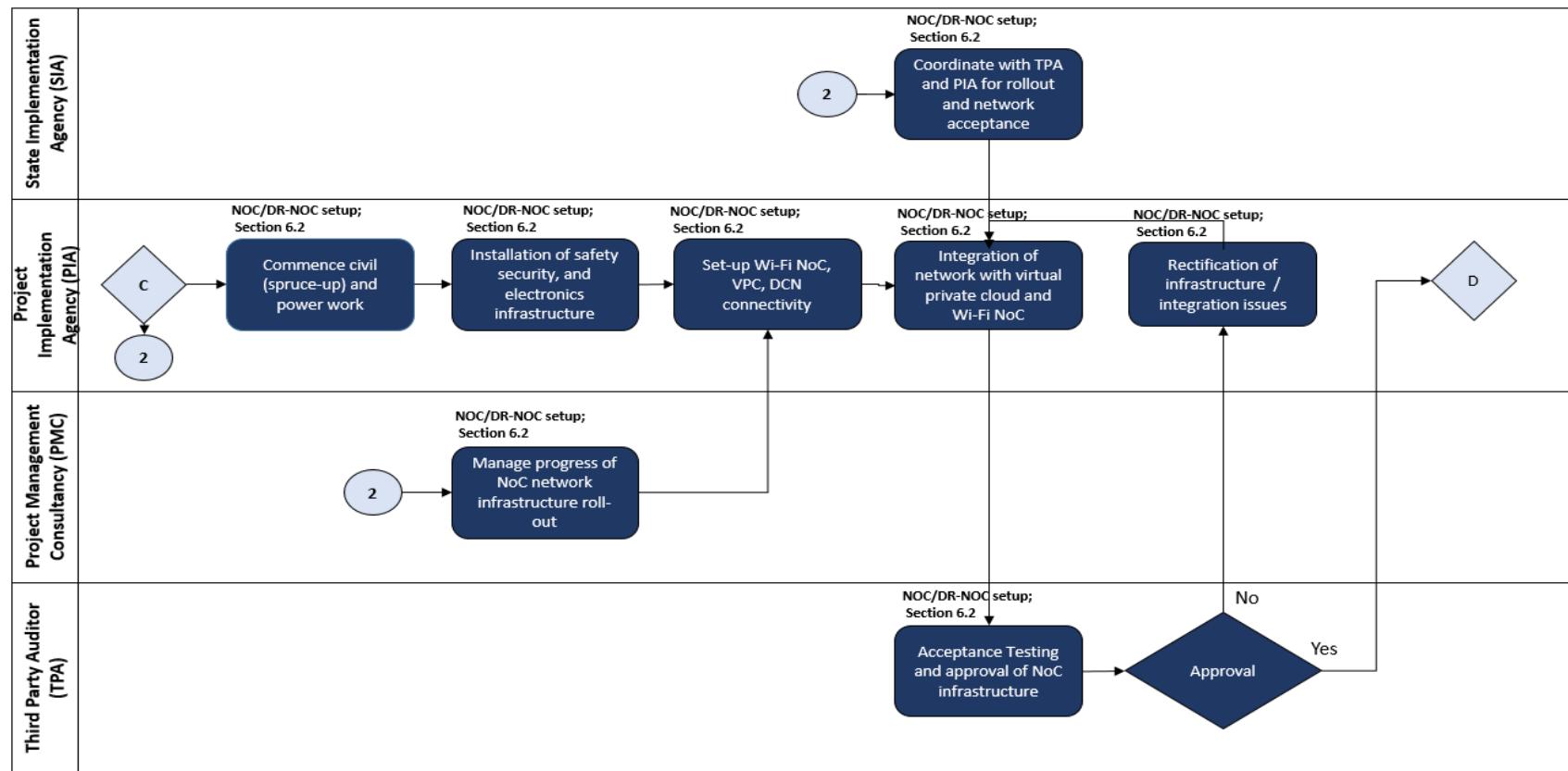
## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**NOC / DR NOC set-up and DCN connectivity**

PIA will set-up the NOC by installing the safety, security and electronic infrastructure. The PIA will also set-up, VPC and enable DCN connectivity for integration and acceptance testing. For additional process details please refer to section 6.2 of this handbook.

**NOC / DR NOC Set-up and DCN Connectivity**

Process Flowchart 5: NOC/DR-NOC set-up and DCN connectivity (Level 2 Process)

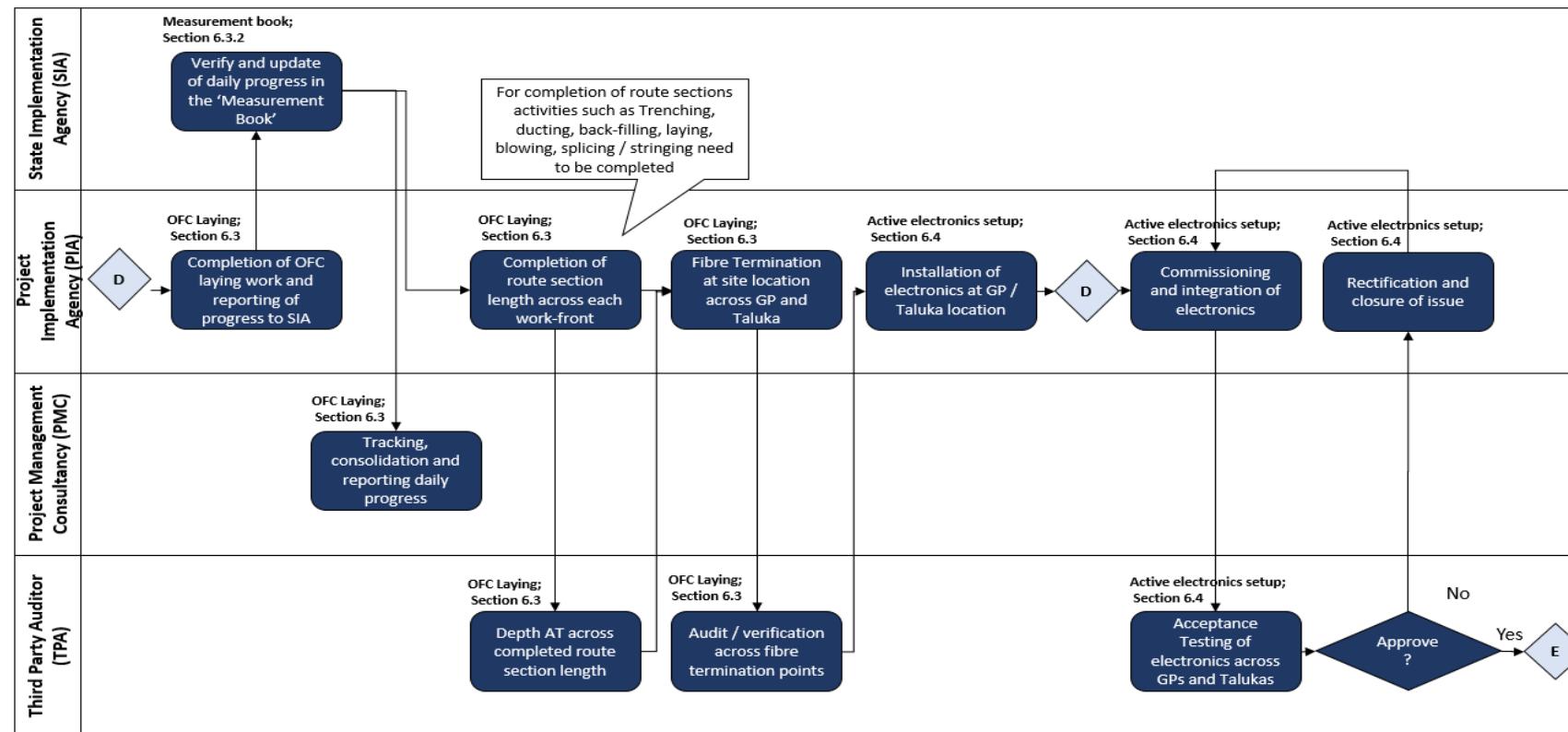
## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**OFC Laying and Access Electronics Set-up**

PIA will also simultaneously, commence the OFC layout across each route section length. Once the trenching has been completed, the SIA will fill in the measurement book. The TPA will also conduct a depth audit and ensure successful testing across fiber termination points. Post this, an end to end AT will be conducted by the TPA for the electronics across GPs / Talukas. For additional process details please refer to section 6.3.

**OFC Laying and Access Electronics Set-up**

Process Flowchart 6: OFC laying and access electronics set-up (Level 2 Process)

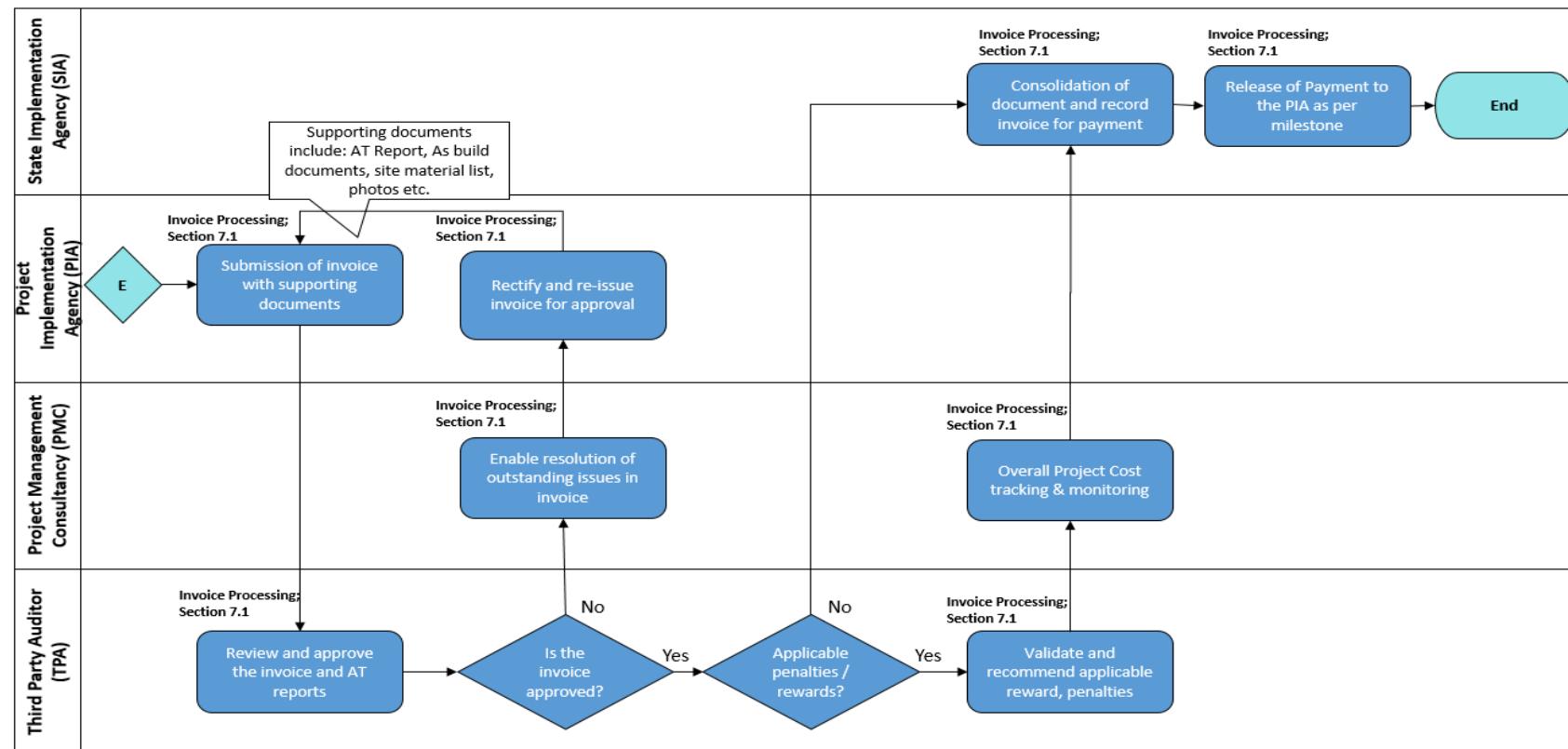
## 1. Planning &amp; Design

## 2. Implementation &amp; Acceptance

## 3. Payment

**Invoice Processing**

Basis the payment milestone, the PIA will submit relevant documents along with the invoice to the TPA for approval. The TPA will verify the invoice and confirm the penalty / reward (if any). Post finalization of the amount, the SIA will reconcile, facilitate processing of the payment and record the amount paid. For additional process details please refer to section 7.1 of this handbook.

**Invoice Processing**

Process Flowchart 7: Invoice processing (Level 2 Process)

## 5. Planning

Planning phase of the project will commence with the PIA commencing the site survey and the route survey. However, a notice of work will need to be provided by the PIA to the local government bodies / authorities (as applicable) at least 5 days before commencement of the site and route survey. The SIA district team will need to ensure and facilitate the submission of the notice of work. (Refer section 10 for the ROW single window clearance GR).

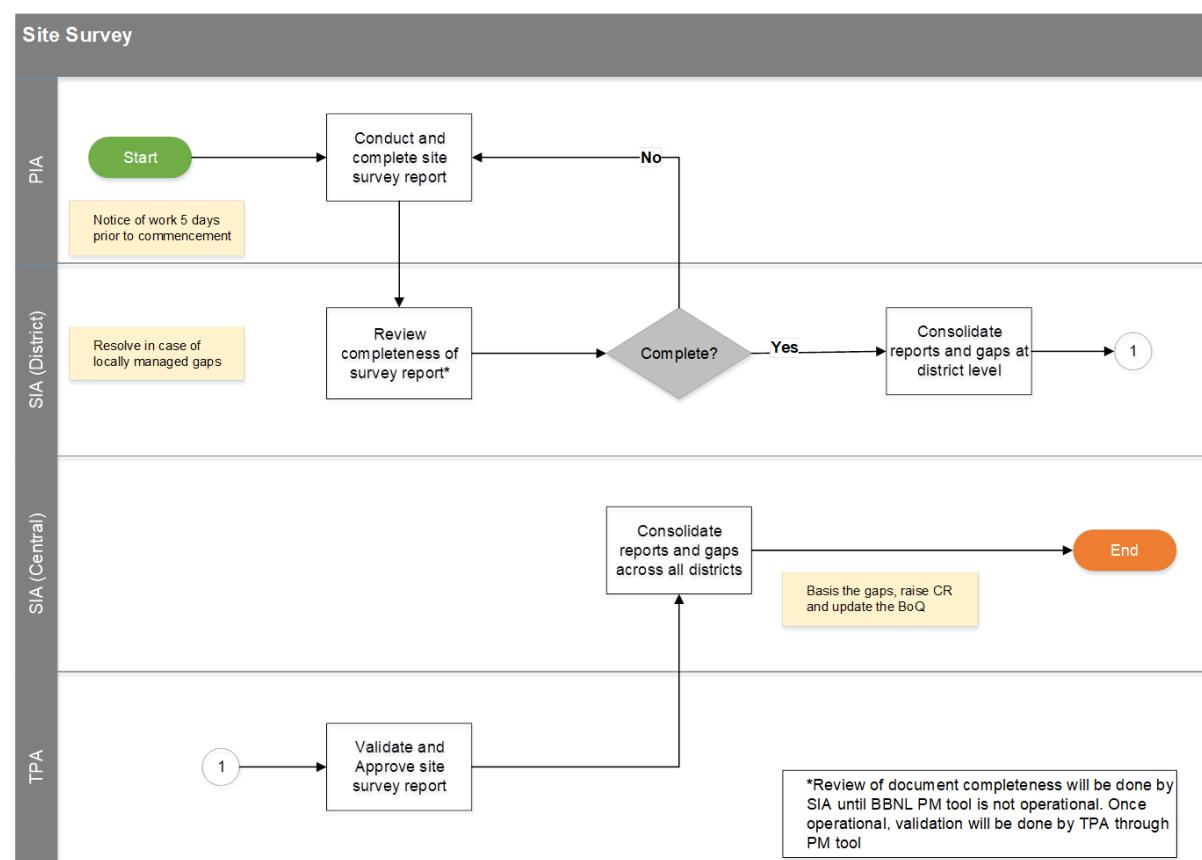
Once the site and route survey is completed the PIA will develop a high and low level design of the network architecture. Basis the design, the BoQ will be finalized by the PIA, approved by the TPA and recorded by all the other stakeholders viz. PMC and SIA. Basis of BoQ (as per the defined schedule) material shall be supplied during the implementation phase of the project.

### 5.1 Site survey

The PIA shall conduct an exhaustive physical civil and power survey across all site locations (GPs and Talukas) and the NOC / DR-NOC site, capturing relevant information as provided in the pre-defined survey checklists.

#### Process Flow-chart

The process followed for site survey (civil and power) across GPs and Talukas and the NOC/DR-NOC would be as follows.



Process Flowchart 8: Site Survey (Level 3 Process)

## Responsibility Assignment Matrix

Responsibility matrix across stakeholders for civil, power (for GP and Taluka) and NOC / DR-NOC survey.

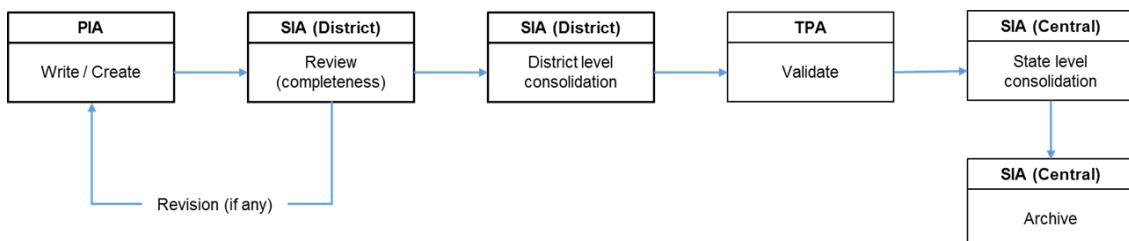
S.No	Activity	TAT	PIA	TPA	SIA (District)	PMC	SIA (Central)
1	Arrange for site accessibility across GPs, Talukas and NOC / DR-NOC by notification of commencement of work to local bodies / authorities (5 days prior to commencement of survey)	-	R	I	A	I	I
2	Conduct site location survey and complete relevant information in Civil Survey, Power Survey and NOC Survey Form for equipment space, civil, power infrastructure at GP, Taluka and NOC / DR-NOC.	-	R, A	I	I	I	I
3	Liaison with Gram Panchayat/ BDO in case of any bottlenecks for survey	-	I	I	R, A	I	S
4	Review completeness of site location survey forms across GP, Taluka and NOC	-	I	I	R, A	C	I
5	Indicate local manageable gaps and develop actionable with regards to site location survey across GP, Taluka and NOC	2 Days	R	I	A	C	I
6	Manage and facilitate closure of locally manageable gaps with regards to site location survey at GP, Taluka and NOC		I	I	R, A	C	S
7	District level consolidation of survey reports and gaps	-	I	C	R,A	I	I
8	State level consolidation of survey reports and gaps	-	I	I	I	I	R,A

RAM 1: Site Survey (Power, Civil – GP/Taluka and NOC/DR-NOC)

## Document Flow and Control

The site survey report will be created by the PIA and shared with the TPA for validation. The SIA team will be responsible for consolidation of the documents and recording the gaps digitally (excel files preferably).

The communication shall be done by email with submission of hard physical copies (as and when required).



*Document Flow 1: Site Survey (Power, Civil – GP/Taluka and NOC/DR-NOC)*

## Guidelines for Civil and Power Survey for GP/Talukas

- The PIA shall perform a civil / power infrastructure survey across all site locations as defined in the scope of MahaNet Phase – I. This includes site locations across Gram Panchayats (GPs), Taluka (Block), along with Network Operations Centre (NOC) and Disaster Recovery – Network Operations Centre (DR-NOC).
- The intent of the survey is to capture information across existing ‘as-built’ infrastructure required to support and plan network with regards to design and engineering, material procurement, site sprucing requirements and network implementation.
- The information shall be captured in the below mentioned broad categories:
  - Site Information: This category of the checklist shall capture details with regards to site name and ID, location coordinates, accessibility and site contacts related information.
  - Site Civil and Power Infrastructure: This category of the checklist shall capture details with regards to space availability and environment conditions required for installation of network infrastructure across active and passive network elements.
    - Key constituents of the civil survey: Size of the site (including height), floor and ceiling type, space for solar panels, space availability for tower outside GP/Taluka site etc.
    - Key constituents of the Power survey: Availability of electricity / EB, availability of backup power, earthing point availability and other power infrastructure details (diesel generator, SMPS, battery bank and UPS related parameters).
  - Survey Photographs: This category of the checklist shall capture photographs of the subject concern which is relevant to the survey being conducted.
  - Survey Action Register: This category of the checklist shall capture details concerning the shortcomings on the site location resulting/ causing challenges or hindrance in the deploying network infrastructure across active and passive elements.
- After the completion of the work, the PIA shall submit the site survey report to the TPA. The TPA shall validate, vet and approve the site survey report and subsequently the BoQ as prepared by the PIA.

- In case, there is inadequate space for deployment of active and passive infrastructure in the GP office or alternative space options needs to be identified for deployment of the same. It should be noted that the designated space for deployment of infrastructure should not have public access and should be Government owned premises only. The following options should be preferred as per the order mentioned below.
  - School office premises
  - Health centre office premises
  - Any other government office premises

**Civil Survey Form template**

 <b>MahaNet I</b> <b>Civil Survey Form (CSF)</b>		
<b>PIA use only</b>		
GP/Taluka Name		
Taluka ID (as per nomenclature)		
GP ID (as per nomenclature)		
Site Address		
Latitude		
Longitude		
Official Working hours		
Site Contact person Name		
Contact Number		
Impact Analysis		
<b>Site Survey</b>		
Size	Sq. ft.	
Height	Ft	
Floor & ceiling Type	Cemented / Mud	
Air Conditioning availability	Yes/No	
Air Conditioning tonnage (if available)	Tons	
Store Room Space availability	Yes/No	
Store Room Space	Sq. ft.	
Security of Store Room	Yes/No	
Uncluttered Space for Solar Panel	Yes/No	
Space for solar panels	Sq. ft.	
Assessment of site earthing	Yes/No	
Site Accessibility (Access Road)	Yes/No	
Distance to access road	Metres	
Is space available for Tower outside GP/Taluka	Yes/No	
Size of space for Tower	Sq. ft.	
Identification of OFC Cable Entry & Exit Point	Yes/No	
Proposed Chamber Location Out-side Taluka Building with Landmark	Yes/No	
<u>Note: Site photographs to be attached as part of this survey</u>		
<b>Site Survey Action Register</b>		
Remarks (If any)		
Survey Engineer Name		
Contact Number		
Signature		

Survey Date	
Survey Forward Date for SIA assessment	
<b>SIA use only</b>	
SIA Name   Designation	
Contact Number	
Signature	
Date	
Remarks (If any)	
<b>TPA use only</b>	
TPA Name	
Contact Number	
Signature	
Date	
Remarks (If any)	

*Template 1: Site Survey – Civil Survey Form*

**Power Survey Form template**

 <b>MahaNet I</b> <b>Power Survey Form (PSF)</b>	
<b>PIA use only</b>	
GP/Taluka Name	
Taluka ID (as per nomenclature)	
GP ID (as per nomenclature)	
Site Address	
Latitude	
Longitude	
Site Contact person Name	
<b>Power Infrastructure</b>	<b>Details</b>
Electricity / EB availability (Single or Three phase)	
Availability of EB in hours	
Switch board type/Power sockets	
Power interruption frequency in a month	
Availability of Backup Power and Capacity	
Availability of Earthing point (Yes/No)	
If Earthing point No, Requirement of Earthing accessories (Yes/No)	
Space availability for cable tray	
Distance from New Earthing point to 42 U Rack Location (In meter)	
Distance from New UPS Location to 42 U Rack Location (In meter)	
Distance from New UPS location to EB Supply point (In meter)	
<b>Other Power Infrastructure (If available then fill details, otherwise write NA)</b>	
<b>Diesel Generator</b>	<b>Details</b>
Name and Model	
Capacity in KVA	
DG runtime (meter reading)	
DG consumption / hour	
DG automatic start or manual start	
<b>SMPS</b>	<b>Details</b>
Name and Model	
Power capacity in Watts	
Total no. of rectifiers	
Low Voltage Directive available (Yes/No)	
<b>Battery Bank</b>	<b>Details</b>
Name and Model	
Capacity of battery in AH	
No. of Batteries	
Dimension of battery	
<b>UPS</b>	<b>Details</b>
Name and Model	
Capacity of battery in AH	

Backup in hours	
<u>Note:</u> Site photographs to be attached as part of this survey	
<b>Site Survey Action Register</b>	
Remarks (If any)	
Survey Engineer Name	
Signature	
Survey Date	
Survey Forward Date for TPA and SIA assessment	
<b>SIA use only</b>	
SIA Name	
Signature	
Date	
Remarks (If any)	
<b>TPA use only</b>	
TPA Name	
Signature	
Date	
Remarks (If any)	

*Template 2: Site Survey - Power Survey Form*

**Guidelines for NOC / DR-NOC survey**

- The PIA shall be responsible to perform the NOC site survey based on the MahaNet-1 Project scope. The NOC survey report will be submitted to the SIA district / central team for resolution of identified gaps.
- As part of the electrical survey performed at the NOC site, the PIA will capture the below mentioned parameters as part of the technical inspection.
  - Power supply availability on site
  - Range of voltage
  - Availability of MCB/MCCB and Earthing space
  - Size of transformer near site
- Additionally, as part of the civil infrastructure NOC survey conducted by the PIA, the below mentioned parameters will be captured.
  - Availability of false flooring and ceiling
  - Water seepage issue on site
  - Availability of freight elevators
  - No. of exit point in case of emergency
  - Space availability for conference room, electronics equipment, reception area, Diesel Generator, for Installation of Video Wall, etc.
- After the completion of the work, the PIA shall submit the NOC site survey report and the same shall be verified in terms of quality and completeness
- The site survey report should also be submitted with detailed BoQ covering additional requirement (if any)
- MahalIT/TPA shall validate, vet and approve the NOC survey report and BoQ as prepared by the PIA. Based on approved NOC survey report work order shall be issued to PIA

**NOC Survey Form template**

 <b>MahaNet I</b> <b>NOC / DR-NOC Survey Form</b>			
<b>PMC use only</b>			
Site Address			
Latitude			
Longitude			
Official Working hours			
Site Contact person Name			
Contact Number			
<b>S.No</b>	<b>Description</b>	<b>Remarks</b>	
<b>1</b>	<b><u>Space Availability</u></b>		
1.1	Size	Sq. Ft	
1.2	Height	Ft	
1.3	Is the site layout diagram provided?	Yes/No	
<b>2</b>	<b><u>Landscape Details</u></b>		
2.1	False ceiling availability	Yes/No	
2.2	False flooring availability	Yes/No	
2.3	Presence of Pillar/Partition obstructing the video wall view	Yes/No	
2.4	Presence of Power Down Old equipment to be removed	Yes/No	
2.5	Is site dust free?	Yes/No	
2.6	Is there any water seepage issues present?	Yes/No	
2.7	Prone to natural disasters?	Yes/No	
2.8	Availability of freight elevators/Staircase/Hallway	Yes/No	
<b>3</b>	<b><u>Power Availability Details</u></b>		
3.1	Type of Power Supply	AC/DC	
3.2	Available Voltage range	Volt	
3.3	Available MCB/MCCB	Amp	
3.4	Availability of Earthing space	Yes/No	
3.5	Size of the transformer	KVA	
<b>4</b>	<b><u>Space Requirement Assessment</u></b>		
4.1	NOC Room Space	3500 sq. ft.	
4.2	Video Wall Space	Wall dimensions - 15 feet x 35 feet (H x B)	
4.3	NOC Equipment space (Rack, Switches etc.)	1500 sq., ft.	
4.4	Helpdesk and Reception Area space		
4.5	Meeting room space		
4.6	Manager cabin space		
4.7	Electrical room space		
4.8	Conference room space		

4.9	UPS, Battery and accessories space													
4.10	Adequate space for placing DG	6ft x 12ft x 7ft (l x h x b)												
<u>Note:</u> Site photographs to be attached as part of this survey														
<b>Site Survey Action Register</b>														
Remarks (If any)														
<table border="1"> <tr><td>Survey Engineer Name</td><td></td></tr> <tr><td>Contact Number</td><td></td></tr> <tr><td>Signature</td><td></td></tr> <tr><td>Survey Date</td><td></td></tr> <tr><td>Survey Forward Date for SIA assessment</td><td></td></tr> </table>					Survey Engineer Name		Contact Number		Signature		Survey Date		Survey Forward Date for SIA assessment	
Survey Engineer Name														
Contact Number														
Signature														
Survey Date														
Survey Forward Date for SIA assessment														
<b>SIA use only</b>														
<table border="1"> <tr><td>SIA Name</td><td></td></tr> <tr><td>Contact Number</td><td></td></tr> <tr><td>Signature</td><td></td></tr> <tr><td>Date</td><td></td></tr> <tr><td>Remarks (If any)</td><td></td></tr> </table>					SIA Name		Contact Number		Signature		Date		Remarks (If any)	
SIA Name														
Contact Number														
Signature														
Date														
Remarks (If any)														
<b>TPA use only</b>														
<table border="1"> <tr><td>TPA Name</td><td></td></tr> <tr><td>Contact Number</td><td></td></tr> <tr><td>Signature</td><td></td></tr> <tr><td>Date</td><td></td></tr> <tr><td>Remarks (If any)</td><td></td></tr> </table>					TPA Name		Contact Number		Signature		Date		Remarks (If any)	
TPA Name														
Contact Number														
Signature														
Date														
Remarks (If any)														

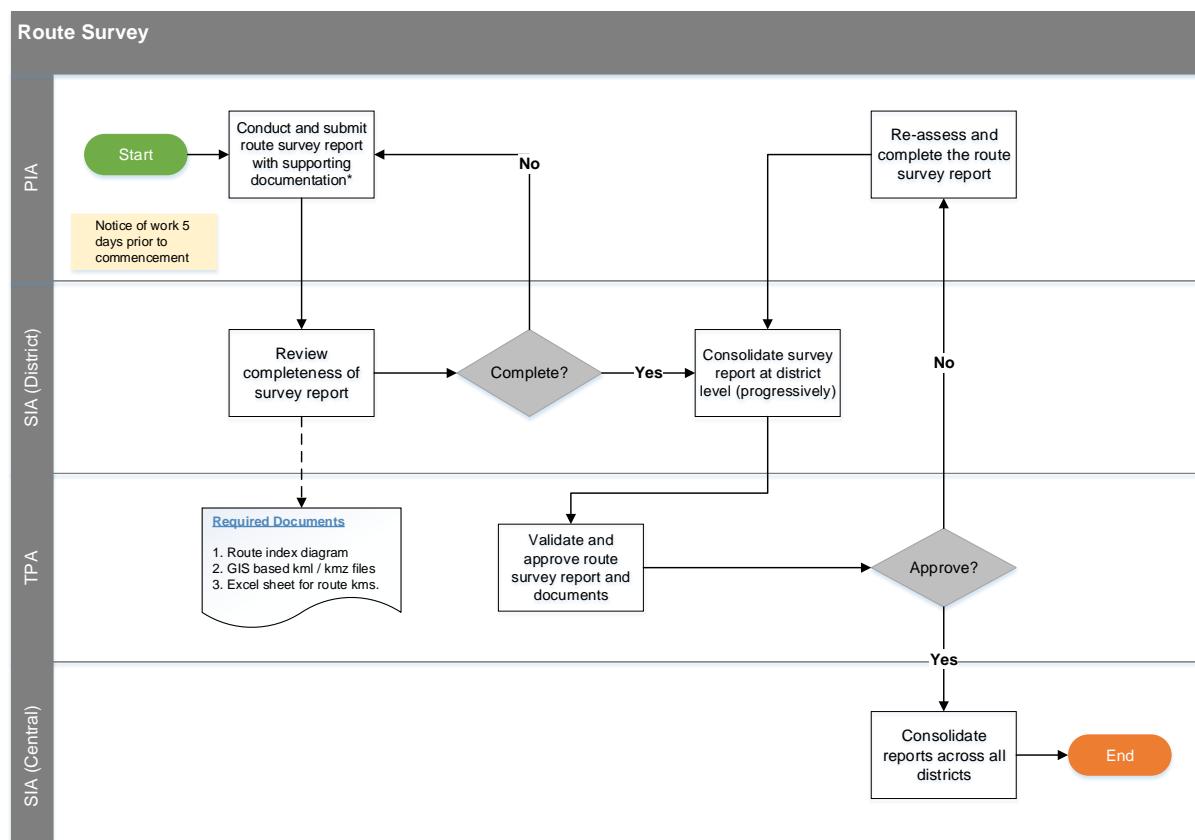
Template 3: NOC / DR-NOC Survey Form

## 5.2 Route survey

### 5.2.1 Route survey for Underground and Aerial optical fiber cable

In parallel to the site survey, a route survey will be conducted by the PIA. The route survey will be validated by the SIA and TPA as follows.

#### Process Flowchart



Process Flowchart 9: Route Survey (Level 3 Process)

#### Responsibility Assignment Matrix

Responsibility matrix across stakeholders for route survey.

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC	SIA (Central)
1	Arrange for site accessibility across GPs, Talukas and NOC / DR-NOC by notification of commencement of work to local bodies / authorities (5 days prior to commencement of survey)	-	R	A	I	I	I
2	Conduct route survey and complete relevant information in Route Survey Form and submit the same along with other supporting documents (route index diagram and KML/KMZ files)	-	R, A	I	I	I	I

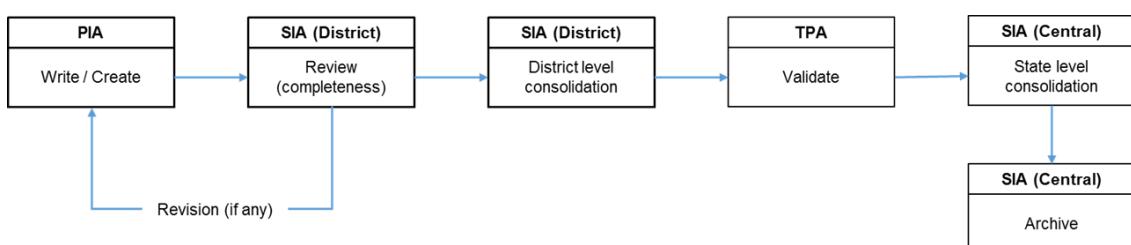
S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC	SIA (Central)
3	Liaison with Gram Panchayat/ BDO in case of any bottlenecks for survey	1 Day	I	R, A	I	I	S
4	Review completeness of route survey forms and perform district level consolidation of route survey report	-	I	R, A	I	C	I
5	Validate and approve of route survey report (including whether the most optimized routes are considered) and other documents	2 Days	I	I	R, A	I	I
6	State level consolidation of route survey report	-	I	I	I	I	R, A

RAM 2: Route Survey

### Document Flow and Control

The route survey report along with the other supporting documents (KMZ files, route index diagrams, etc.) will be created by the PIA and shared with the SIA district team. The SIA district team will review the completeness of the documents and perform a district level consolidation. District wise documentation will be shared with the TPA progressively for validation. After TPA sign-off, the SIA central team will consolidate and record state wide findings. The TPA shall intimate the acceptance of the survey report and BoQ to the PIA & SIA (district) while forwarding to SIA (central) for consolidation.

The communication shall be done by email with submission of hard physical copies (as and when required).



Document Flow 2: Route Survey

## Route Survey Guidelines

- The PIA shall conduct exhaustive route survey based on optimal path for preparing the Bill of Quantity (BoQ) for each site.
- The PIA shall carry out the route survey by capturing the site coordinates at every 100 metres through a GIS application capturing the ROW Authorities (Primary as well as secondary), offset, side of road, road crossing, culvert bridges, road crossing /railway crossing etc.
- PIA shall need to keep a distance of 1 meter (based on available route markers of existing utilities) from the existing underground fiber laid by other telecom service provider / tower-co.
- During the survey, the PIA shall take into account connectivity to GP based on optimal and shortest path for fiber layout covering maximum population and road connectivity en-route.
- While performing the route survey for aerial optical fiber, poles will need to be replaced, strengthened or added. In such instances, the PIA shall take TPA approval by filling the “Pole strengthening / replacement / new erection template”. During such cases, PIA will raise request with Maharashtra State Electricity Board (MSEB) and SIA district team to facilitate.
- The PIA shall prepare KMZ/KML file as per the data recorded during site survey from Taluka to GP and GP to GP using optimized routes.
- Mode of execution (aerial / underground) to be specified by PIA post completion of route survey for accurate BoQ calculation
- A comprehensive documentation folder (including Route Index Diagrams (RID)/ Single Line Diagram (SLD), KMZ / KML ring architecture files, route survey template etc.) to be submitted to SIA District and TPA on the completion of the survey. The SIA district team will review the completeness of the documents and perform a district level consolidation. District wise documentation will be shared with the TPA progressively for validation. After TPA sign-off, the SIA central team will consolidate and record state wide findings.

## Route Survey Template

 <b>MahaNet I</b> <b>Route Survey Form (RSF)</b>																		For SIA use only				For TPA use only					
Route Details										Chainage Details						Additional Route Details						PIA Sign off		SIA Sign off		TPA Sign off	
Sl. No.	Date	Route Length	Side of Road (while facing B)	Road bend	Offset from centre of the road	RoW Authority	Start Point		End Point		Terrain - Chainage Details				Crossings - Chainage Details				Existing Service Provider Cable	Existing activities enroute				PIA Sign off	SIA Sign off	TPA Sign off	
							Latitude (A)	Longitude (A)	Latitude (B)	Longitude (B)	Hilly Area	Ghat Area	Forest Area	Plain Area	River Crossing	Culvert	Level Crossing	Road Cross		Built up Area	Sewage	Road Expansion	Water Pipe Laging				Drainage
		Km	Left / Right	Yes / No	Metre	Dimension						Metre						Yes / No				Name	Signature	Name	Signature	Name	Signature
1																											
2																											
3																											
4																											
5																											
6																											
7																											
8																											
9																											
10																											
11																											
12																											
13																											
14																											
15																											
16																											
17																											
18																											
19																											
20																											
21																											
22																											
23																											
24																											
25																											
26																											
27																											
28																											
29																											
30																											
31																											
32																											

Template 4: Route Survey Form

**Pole Strengthening / Replacement / New Erection Template**

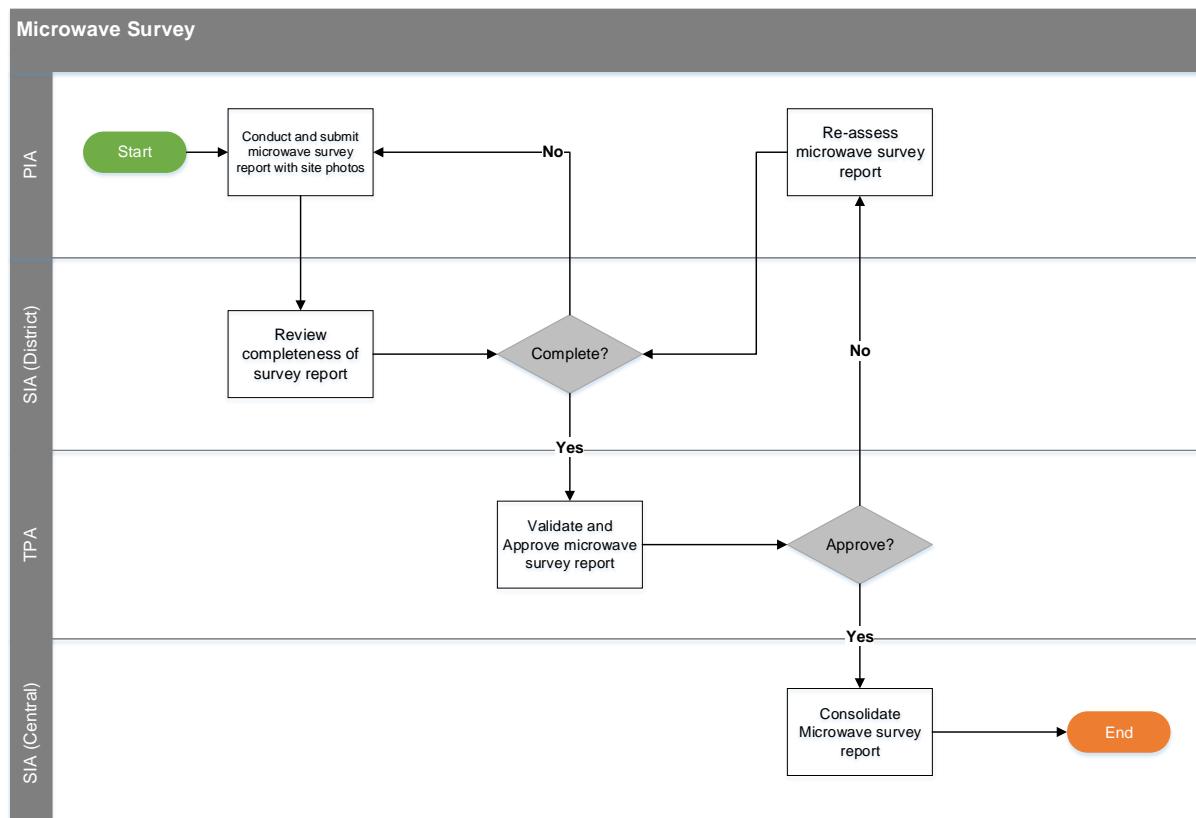
 <b>MahaNet I</b> <i>Pole Strengthening / Replacement / New Erection Form</i>															
<b>Site Information</b>															
Package (A/B/C)															
District															
Taluka															
Name of Requestor															
Contact Number															
Request Date															
<b>PIA</b>										<b>TPA</b>					
					<b>Strengthening / Replacement</b>				<b>New Erection</b>			<b>Strengthening/Replacement/Erection</b>			
S.No	GP1	GP2	Distance between GP1 and GP2 (km)	Number of Poles per km (in between GPS)	Pole position		Pole Number	Length of Pole (m)	Rationale for pole Strengthening / Replacement	Number of Poles Required		Rationale for new pole erection	Recommendation (Replacement / Strengthening / New Erection / No Action)	Remarks (if any)	Signature
					Latitude	Longitude				7 Metre Poles	8 Metre Poles				
1															
2															
3															
4															
5															
6															

*Template 5: Pole strengthening / Replacement / New Erection Form*

### 5.2.2 Microwave Survey

Microwave survey shall be conducted only when UG/ Aerial OFC network is not feasible. The non-feasibility status shall be intimated by PIA to the SIA-District & TPA. The TPA on validation shall approve MW installation for the site. Survey for Microwave will be conducted by the PIA within 3 weeks and maximum of 4 weeks.

#### Process Flow



Process Flowchart 10: Microwave Survey (Level 3 Process)

**Responsibility Assignment Matrix** Responsibility matrix across stakeholders for Microwave survey.

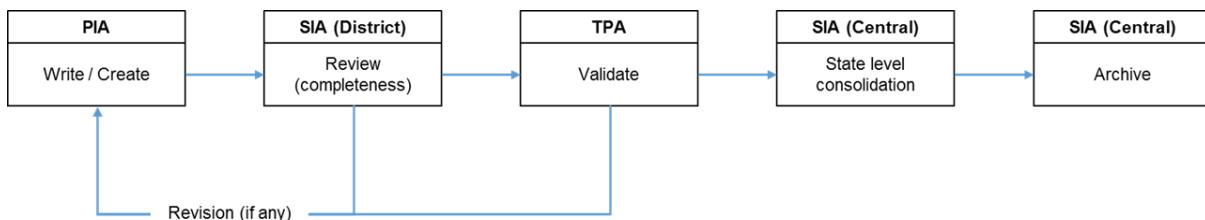
S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC	SIA (Central)
1	Conduct Microwave survey and provide relevant information as per the template/form	-	R, A	I	I	I	I
2	Liaison with Gram Panchayat/ BDO in case of any bottlenecks for survey	1 Day	I	R, A	I	I	S
3	Review completeness of the Microwave survey forms	-	I	R, A	I	C	I

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC	SIA (Central)
4	Validate and approve of Microwave survey report	2 Days	I	I	R, A	I	I
5	State level Consolidation of Microwave survey report	-	I	I	A	I	R

RAM 3: Microwave Survey

### Document Flow and Control

The LoS survey, RF survey and the tower height calculation form will be filled up by the PIA and forwarded to the SIA district team along with the supporting documents to review the completeness of the documents and perform a district level consolidation. District wise documentation will be shared with the TPA for validation. After TPA sign-off, the SIA central team will consolidate and record state wide findings.



Document Flow 3: Microwave Survey

### Guidelines for Microwave Survey

- Microwave links should be planned after detailed survey of the links which can be engineered in single hop or multiple hops for preparing the Bill of Quantity for each radio connected site.
- Once the locations are finalized between which connectivity is required, both the locations should be inspected so as to check whether they have sufficient land space of 50 meters x 50 meters.
- The intervening landscape should be thoroughly examined for construction of suitable height tower at location A and Location B (in case there are no existing towers). In case the tower is existing at one end, the path profile capturing the critical points should be examined so that the link can be established by construction of suitable tower at the other end where there is no tower. If towers exist at both the ends, the path profile should be examined on whether enough clearance is present for establishment of LoS (Line of Sight).
- Tower location Photos are mandatory (Both far end as well as near end)
- Cable route (Both far end as well as near end)
- When the locations are known, they should either be mapped on google maps or on the Survey of India maps of 15 minutes by 15 minutes for providing requisite resolution. The line joining the two locations may intersect contours. The critical points at the intersection of contours should be considered as the basic reference point for arriving at the clearance requirement. At these points the corresponding earth bulge and Fresnel zone clearance should be considered for various K factors.(K=1,K=2/3)

- At the critical points intervening between the end points, there should be a requirement to consider overhead clearance of 10 meters. However at end points the height above main sea level should be taken with a conservative estimate deliberately 5 meters less than the altitude indicated. With a suitable high low technique, the connectivity between location A and B should be examined for feasibility with minimal tower height requirements.
- Parameters to be considered for floating modified path profile “K” factor is critical. K is known as equivalent earth radius factor and for a standard atmosphere  $K = 4/3$ . However this can vary from  $K = 2/3$  to  $4/3$  depending upon the refractive index of the atmosphere. Hence K factor would affect earth bulge. Cumulative impact of earth bulge, first Fresnel zone clearance, obstruction at each critical point of the path profile for all critical points should be computed so that all critical points can be cleared to establish the LoS with suitable antenna height.
- The survey report should indicate the antenna diameter for zeroing in on the antenna with the requisite gain.
- Requirement radome for the antennas should be identified as to whether it should be flat or convex keeping in view the wind load exerted on the mouth diameter.
- Reflection points falling on the path should be examined as to whether there are large tracks of standing crops or water bodies aiding reflection so that the secondary wave arriving at the antenna would significantly reduce the receive level that is fading.
- For wide-band systems frequency selective fading (in band as well as out of band) and flat fading should be considered.
- Terrain roughness factor should also be considered for reflection of the ground reflected waves.
- Angle diversity, frequency diversity and space diversity should also be considered to combat fading.
- To increase the system capacity, CCDP (co-channel co-polar dual polarized) systems with XPIC (cross polarization interference cancellation) should be considered.

## RF survey Template

 <b>MahaNet I</b> <i>RF Survey Form</i>			
<b>Site Information</b>			
Site Name			
Taluka Name			
GP ID ( <i>Near end</i> )			
Site Address			
Official Working hours			
Site Contact person Name			
Contact Number			
<b>For PIA use only</b>			
<b>Far end / Near end</b>	<b>Parameters</b>		<b>Details</b>
Near end	Latitude	degrees	
	Longitude	degrees	
	AMSL	meter	
	Proposed Tower Height	meter	
	Proposed Tower	(GBT / RTT)	
	If RTT, height of building structure	meter	
	Antenna height	meter	
	Space Availability for equipment	yes/no	
	Power Availability for equipment	yes/no	
Far end	Latitude	degrees	
	Longitude	degrees	
	AMSL	meter	
	Proposed Tower Height	meter	
	Proposed Tower	(GBT / RTT)	

If RTT, height of building structure	meter	
Antenna height	meter	
Space Availability for equipment	yes/no	
Power Availability for equipment	yes/no	
PIA Name		
Contact Number		
Signature		
Date		
Remarks (if any)		
For SIA use only		
SIA Name		
Contact Number		
Signature		
Date		
Remarks (if any)		
For TPA use only		
TPA Name		
Contact Number		
Signature		
Date		
Remarks (if any)		

Template 6: RF Survey Form

## Tower height calculation Template

<b>MahaNet I</b>				
<b>Tower Height Form</b>				
<b>PIA use only</b>				
<b>Description</b>	<b>Details</b>	<b>Critical point 1</b>	<b>Critical point 2</b>	<b>Critical point 3</b>
d1 (KM)	Distance of Critical point from A			
d2 (KM)	Distance of Critical point from B			
D (KM)	d1+d2			
Ea (Mts)	Height of antenna at A			
Eb (Mts)	Height of antenna at B			
Ep (Mts)	Height of the Obstruction			
B 2/3 (Mts)	Earth Bulge K=2/3			
B1 (Mts)	Earth Bulge for K=1			
F 7 GHZ	$F_o = \text{Fresnel zone at operating zone}$			
0.3 F	0.3 F			
C1 (Mts)	Max of (B2/3 + 0.3f) or (B1+F)			
CH (Mts)	Clutter height			
$\frac{(Ea - Eb) d1}{D}$	Slope calculation (ft)			
Total height	Tower height			

Template 7: Tower height Form

## Microwave LoS Survey Template



## MahaNet I

*Microwave LoS Survey Form**To be filled by PIA*

<b>Site Information</b>	
Site Name	
Taluka ID	
GP ID	
Site Address	
Latitude	
Longitude	
Official Working hours	
Site Contact person Name	
Contact Number	

**For PIA use only**

Sr. No	Hop Distance From Site1 (km)	Critical points of the path profile (distance from near end)	Parameters for all Critical Points			Sum of overall for all critical points	Angle of Slope	Total Clearance Required	Elevation at Location A (m)	Elevation at Location B (m)	Distance From Other End (km)	Obstruction Type	For SIA use	For TPA use
			Earth Bulge (K Factor)	Fresnel Zone Clearance	Obstruction Height (m)									
1														
2														
3														
4														

Template 8: Microwave LoS Survey Form

### **5.3 Design and Engineering**

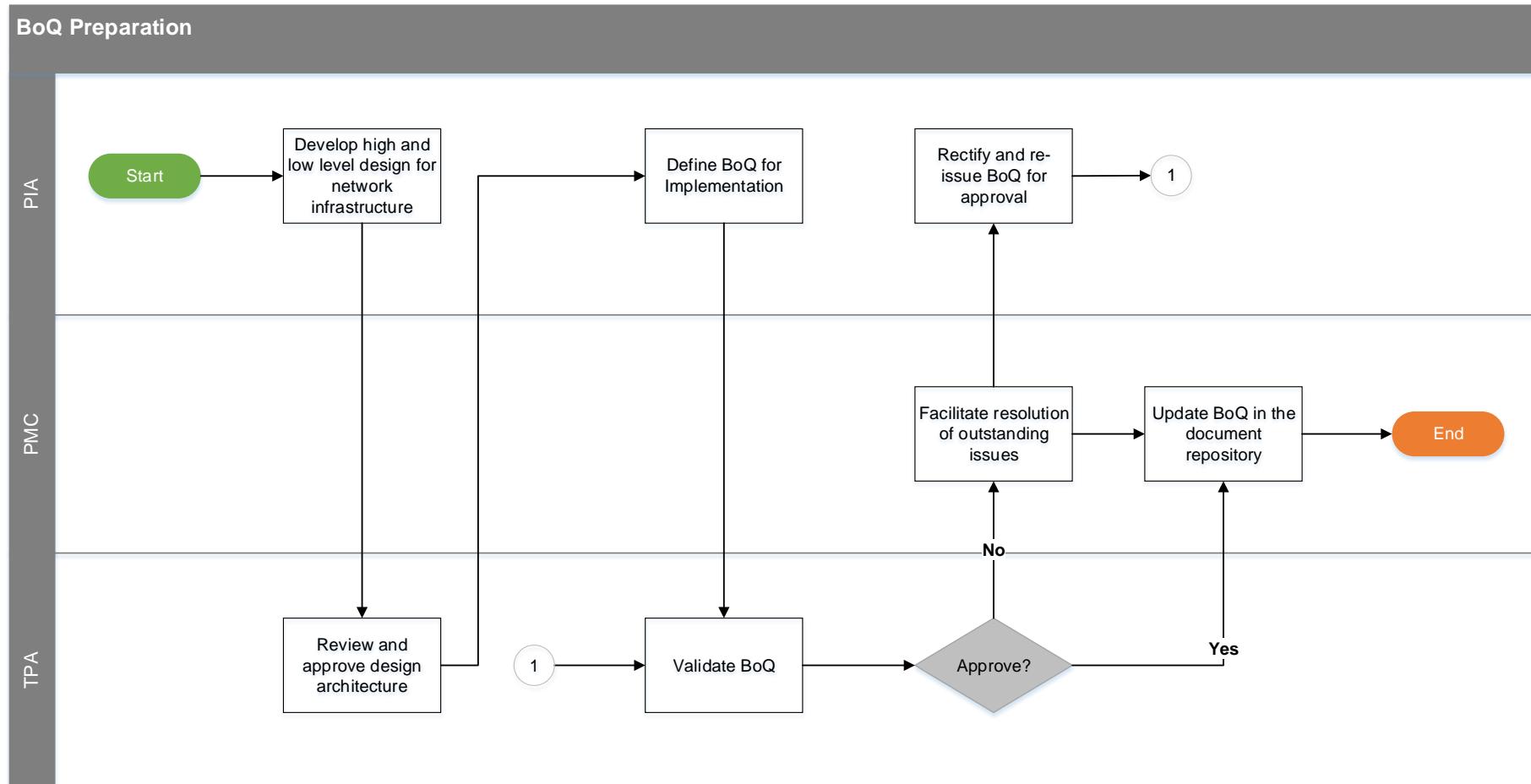
After the completion of survey activities, PIA shall develop high and low level design of the network (as one time activity) across optical fiber implementation, NOC implementation and electronics implementation at GP and Taluka. In case of change in design, CR needs to be raised and subsequent approvals need to be taken. These design documents shall be verified and approved by the TPA and shall form the basis for changes in the BoQ.

Refer section 8.1 and 9.1 for technical design principle and guidelines for site nomenclature and naming principle.

## 5.4 Bill of Quantity (BoQ) Preparation

Basis the defined network architecture, the BoQ will be updated in a progressive manner. Upon finalization, the TPA will review and approve the BoQ prepared by the PIA.

### Process Flow chart



Process Flowchart 11: BoQ Preparation (Level 3 Process)

## Responsibility Assignment Matrix

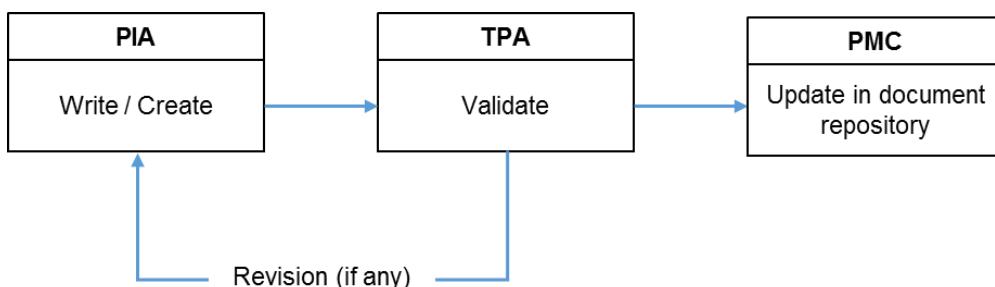
Responsibility for each stakeholder has been defined for BoQ finalization.

S/N	Activity	TAT	PIA	TPA	PMC	SIA (Central)
1	Prepare Bill of Quantity (BoQ) for network implementation	-	R, A	I	I	I
2	Review and approve the defined BoQ	2 days	I	R, A	I	I
3	Perform resolution of issue in defined BoQ, if any	-	I	I	R, A	I
4	Archive and update the approved BoQ in the document repository	-	I	I	R, A	I

RAM 4: BoQ Preparation

## Document Flow and Control

The PIA shall prepare the BoQ basis the HLD and LLD documents post the site/route survey. The TPA will verify and approve the BoQ and the PMC will review and upload the document in the document repository.



Document Flow 4: BoQ Preparation

## Guideline for BoQ preparation

- Post successful completion of the site / route survey and identification of requisite gaps, the PIA will finalize the network architecture design, basis which the BoQ will be updated progressively.
- The proposed BoQ will need to be audited and approved by the TPA. In addition, a delivery schedule will also be decided for delivery of material at warehouse / sites.
- The BoQ will be referred to by the different stakeholders e.g., Delivery challan for the material supplied will be verified by the TPA basis the updated BoQ at the time of material supply, subsequently, leading to material invoice payment.
- Any further changes to the BoQ during the project lifecycle will be raised via a change request e.g., any changes in network architecture, network interfaces vis-à-vis planned network topology/architecture the BoQ.

## 6. Implementation

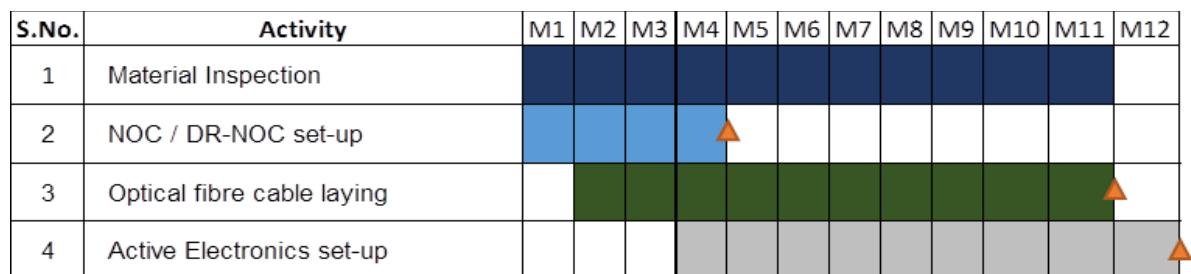
After completion of site & route survey across GPs, Talukas and the NOC / DR-NOC locations, the BoQ shall be prepared. Once approved by the TPA, the material shall be supplied by the PIA for network implementation.

The network infrastructure shall be implemented across the following broad categories.

S. No	Activity Categories
1	<b>Material Inspection</b> ( <i>Material documentation review, QA certification / factory acceptance testing / TSEC checks by TPA, Physical check by SIA</i> )
2	<b>NOC/DR-NOC setup</b> ( <i>Implementation of NOC / DR-NOC setup, NOC / DR-NOC electronic acceptance testing (AT) and DCN connectivity</i> )
3	<b>Optical Fiber Cable Laying</b> ( <i>Optical fiber cable laying, Cable depth AT and OFC AT - OTDR and LSPM</i> )
4	<b>Active Electronics Setup</b> ( <i>Active electronics installation, configuration and physical / software AT</i> )

Figure 14: Implementation Activities

The timeline for the implementation of above activities is shown in below Gantt chart.



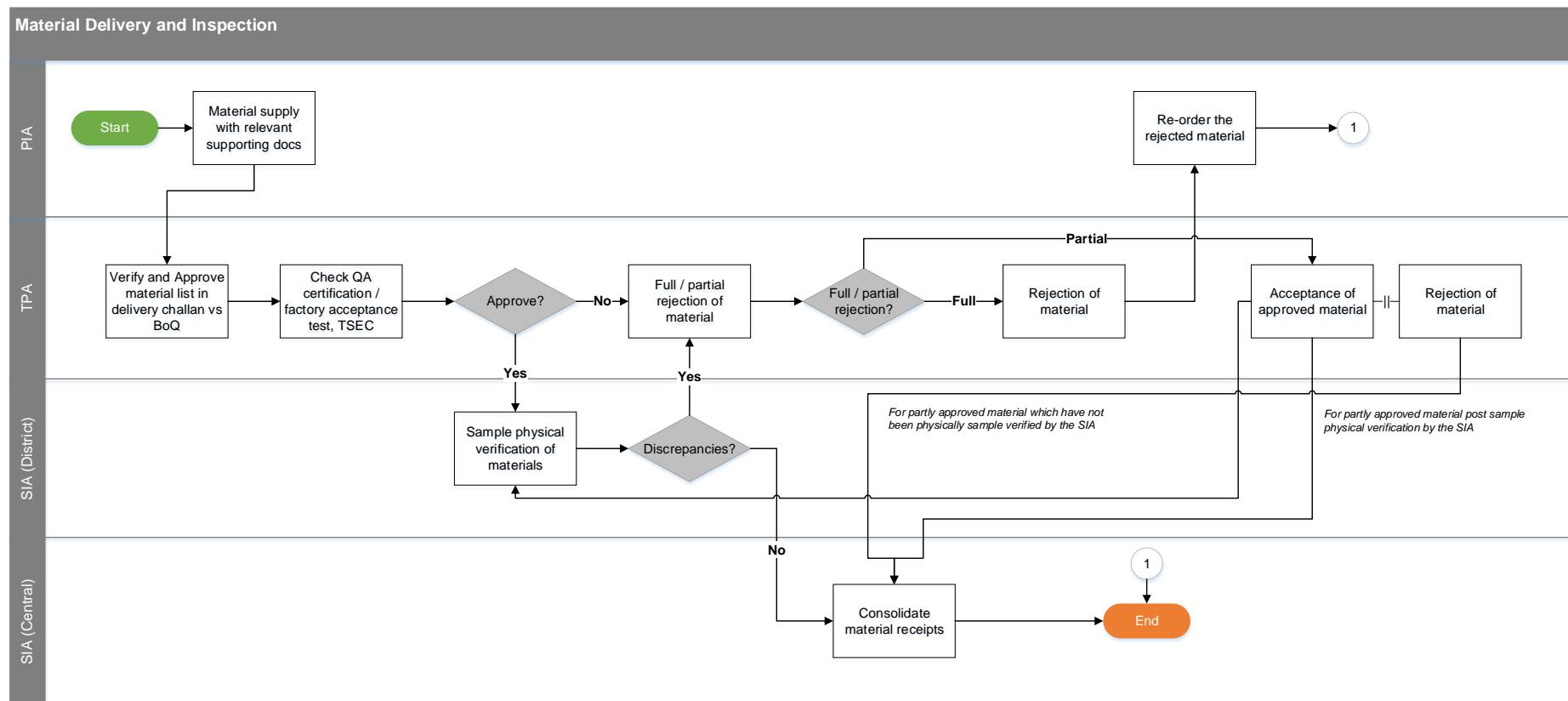
▲ Completion milestone for respective activities

Figure 15: Implementation timeline

## 6.1 Material Delivery and Inspection

TPA shall conduct inspection and verification of the material delivered by PIA and ensure correct quantity of the material is delivered as per the approved design and quality standards.

### Process Flow Chart



Process Flowchart 12: Material Delivery and Inspection (Level 3)

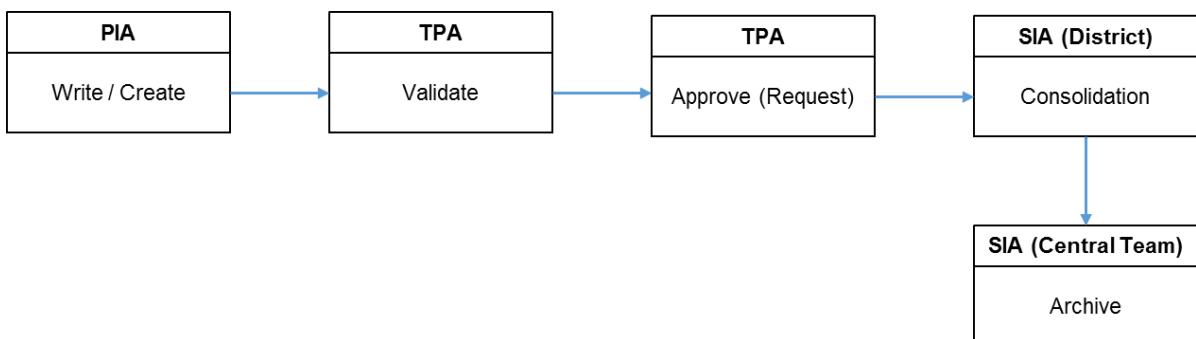
### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC	SIA (Central)
1	Delivery of materials along with relevant supporting documents	-	R, A	I	I	I	I
2	Verification of material in delivery challan vis-à-vis BoQ and review of QA certification / factory acceptance testing / TSEC	1 day	I	I	R, A	I	I
3	Full/Partial approval of materials supplied		I	I	R, A	I	I
4	Perform 5% sample physical verification of material supplied	1 day	I	R, A	I	I	I
5	District Level consolidation of material supplied and supporting documentation	-	I	R, A	I	I	C
6	State level consolidation of material supplied and supporting documentation	-	I	I	I	I	R,A

RAM 5: Material Delivery and Inspection

### Document Flow and Control

TPA will inspect and approve the material by filling up the material inspection form and signing off on the relevant documents provided by the PIA. A sign-off from the SIA District will also be required for the sample check conducted. Once both signoffs have been received consolidation of the material receipt will be conducted.



Document Flow 5: Material Delivery and Inspection

**Guidelines for Material delivery and inspection**

- The delivery schedule plan shall be shared with relevant stakeholders viz. TPA, SIA, PMC to support and plan inspection activities.
- Basis the work order raised by MahalT, the PIA shall supply and deliver the requisite material as per the delivery schedule.
- In a scenario where the PIA has central warehouses with the package district to cater to multiple districts, the SIA located in the local district shall do the material inspection with sign & stamp on behalf of other districts. Material delivery shall be treated as complete for invoice submission and these signed documents shall be adequate for invoicing for materials.
- The TPA shall perform the following activates during material inspection; (but not limited to)
  - TPA shall verify the quantity of materials in delivery challan vis-à-vis quantity mentioned in material inspection template.
  - The TPA will need to review and verify the following documents which will be received from the PIA along with the material supplied.
    - Material inspection template summarizing the details of the material supplied
    - Delivery challan for the material received.
    - Copy of the purchase order raised by PIA for the material to be supplied
    - Copy of the BoQ for the material supplied.
    - Relevant product certificates including TSEC certifications (one time for each product type) for active and passive infrastructure, radio etc. QA FAT certificates for electronics.
  - The TPA shall counter-sign on the reviewed documents and approve for quality and quantity.

Post verification by the TPA, the SIA district officer shall perform a physical sample checks (5% sampling) across all types of material, e.g. 10 drums of fiber will be checked by the SIA district officer on a delivery of 200 drum of optical fiber cable.

- In case the material delivered by the PIA is found to not have the necessary certifications and / or quantity, the TPA shall notify all stakeholders including the SIA District regarding the rejection of the partial/complete order.
- TPA shall verify the material receipt within 24 hours of delivery of material at the warehouse.

## Material Inspection Form Template



## MahaNet I

## Material Inspection Form (MIF)

## Warehouse Information

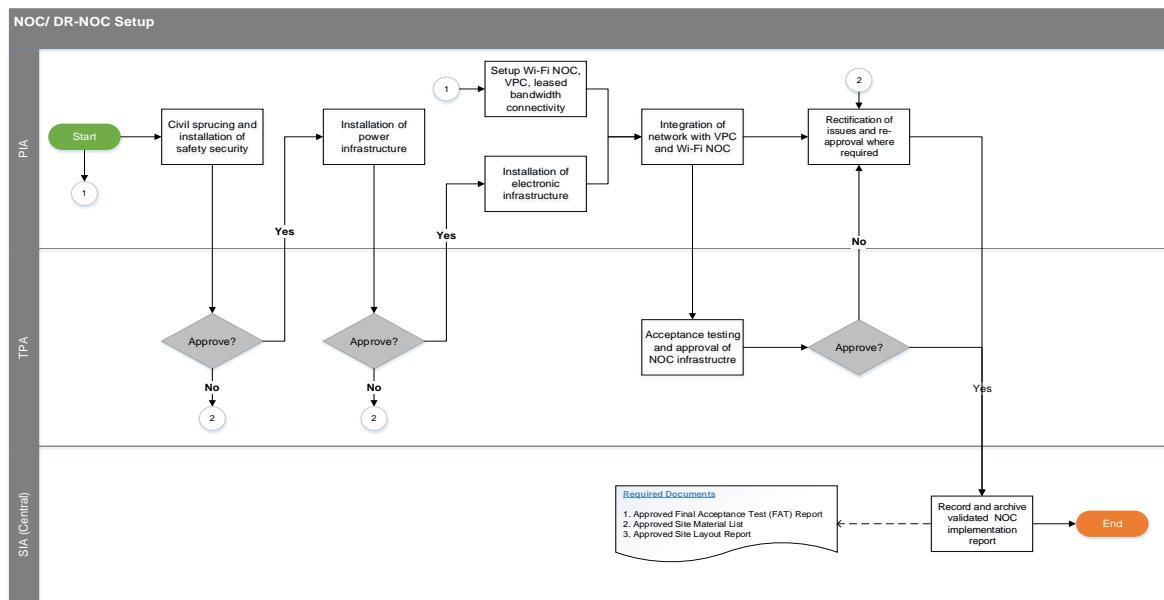
Warehouse Name								For PMC use only					
Warehouse Address								Validation of documentation completeness		Yes / No			
For PIA use only						For TPA use only			For SIA use only				
S.No	Type of Material (Active / Passive)	Name of Material	Item code	Quantity of material	Delivery Challan (DC) Number	Signature	Verification of quantity in DC (Yes / No)	Verification of QAC / FAT / TSEC (Yes / No)	Remarks (If any)	Signature	Sample verification of material	Remarks (If any)	Signature
											Count		

Template 9: Material Inspection Form

## 6.2 NOC/DR-NOC Set-up

Implementation of NOC/DR-NOC shall include sprucing of civil infrastructure along with installation and acceptance of active and passive electronics in NOC/DR-NOC and acceptance testing of all the active and passive infrastructure.

### Process Flow chart



Process Flowchart 13: NOC/DR-NOC setup (Level 3 Process)

### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC
1	Commence Civil and Power work in NOC/DR-NOC	-	R,A	I	I	I
2	Perform installation of safety security and electronics infrastructure	-	R,A	I	I	I
3	Initiate setup NOC, VPC, leased bandwidth connectivity	-	R,A	I	I	I
4	Perform Integration of NOC with VPC	-	R,A	I	I	I
5	Coordinate with TPA and PIA for network rollout and acceptance testing	-	I	R,A	I	I
6	Execute rectifications of infrastructure/integration related issues	-	R,A	I	I	I
7	Perform acceptance testing (across civil works, safety solution, power infrastructure, electronic installation and integration of services)	5 days	I	I	R,A	I
8	Monitor and manage the progress of NOC network infrastructure rollout	-	I	I	I	R, A

RAM 6: NOC/DR-NOC setup

### Guidelines for Implementation of NOC/DR-NOC

Network Operations Centre (NOC) will be the central location from where network administrators supervises, monitors, controls and maintains the telecommunication/data network, which in our case is MahaNet Optical Fiber Network.

It will be the focal point for all network management activities across GP, Taluka site location along with Virtual Private Cloud (VPC) services. This shall include activities such as

- Alarm Management
- Fault Management
- Configuration Management
- Integration Management
- Trouble Ticketing Management
- Performance Management
- Security Management
- Asset Management

With regards to the above mentioned activities, the NOC shall support deployment, integration, acceptance and operations to all active and passive network elements including services rendered through Virtual Private Cloud (VPC). Furthermore, the establishment of DR NOC shall provide an end-to-end disaster recovery solution that will ensure the recovery of failed business processes to support restoration of networks services.

Setup of NOC/DR-NOC shall be broadly done across the following:

- Civil Infrastructure (Sprucing)
- Power Infrastructure
- Electronics Infrastructure
- Other Supporting Infrastructure

After the completion of NOC site survey, the PIA for Package A shall be responsible for installation and conduct of civil works, along with network elements as per the above mentioned categories. They shall also ensure end to end integration of network elements and services as per the approved engineering designs.

Once the NOC/DR-NOC is offered for acceptance, the TPA shall be responsible to verify, validate and approve the electronic infrastructure.

The TPA shall conduct acceptance of equipment basis testing report/checklist as agreed with the PMC and shall be responsible for verification and validation of the following document to issue a Final Acceptance Test (FAT) report on the electronics as implemented in the network

- Preliminary Acceptance Test (PAT)
- As-built Diagram
- Site Material List

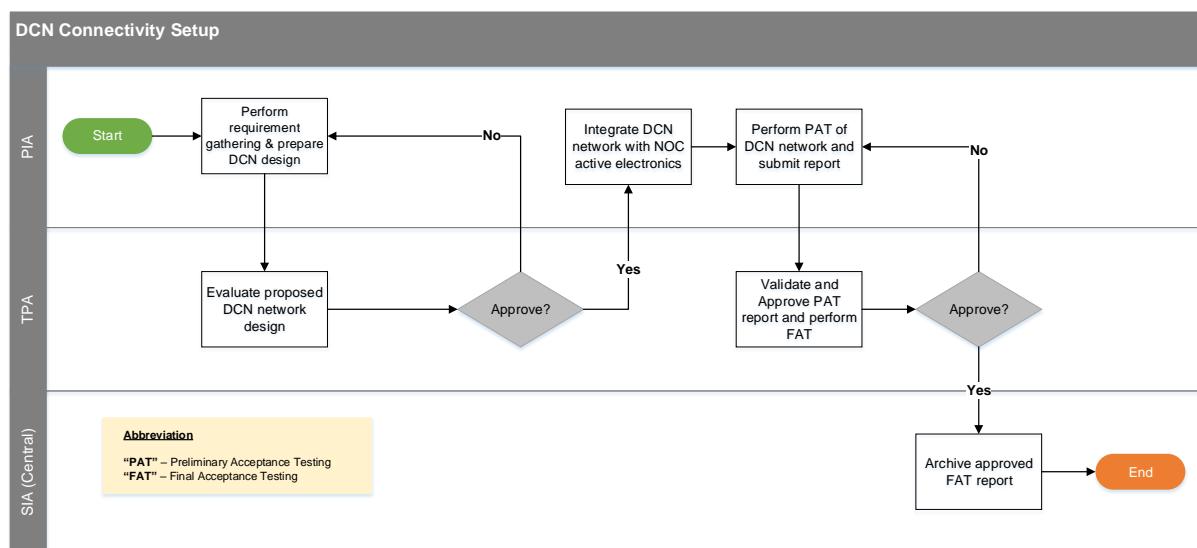
During the course of the NOC/DR-NOC setup, the SIA shall coordinate and support PIA, TPA and PMC for installation and acceptance of the NOC/DR-NOC electronic equipment's along with rectification of service/non-service affecting issues ensuring progress of the project as per the plan.

**Note:** *Acceptance test checklist/template for NOC/DR-NOC electronic equipment shall be provided by the PIA.*

### 6.2.1 DCN connectivity setup

DCN shall be implemented between all Network Elements (NE) and NOC/DR-NOC via Virtual Private Cloud. This connectivity shall provide visibility and network management functionality for all active elements deployed across the network.

#### Process Flow chart



Process Flowchart 14: DCN Connectivity setup (Level 3 Process)

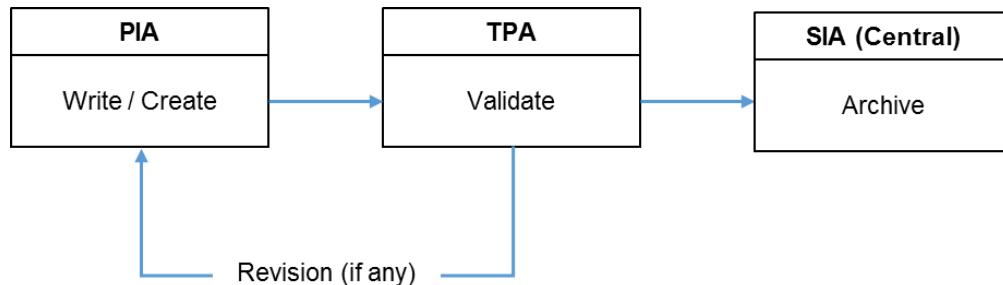
#### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	TPA	PMC	SIA (Central)
1	Perform requirement gathering and prepare DCN design	-	R, A	I	I	I
2	Evaluate proposed DCN network design	-	I	R, A	I	I
3	To integrate DCN network with NOC active electronics and perform PAT testing	-	R, A	I	I	I
4	Validate PAT report and perform FAT	5 days	I	R, A	I	I
5	Archive approved FAT report	-	I	I	I	R, A

RAM 7: DCN Connectivity setup

## Document Flow for DCN connectivity

PIA will play a critical role of engineering of DCN links, get it approved by the TPA, provision and configure the links and offer the links for AT. TPA shall share the AT documents with SIA central team post successful completion of AT of all DCN links.



## *Document Flow 6: DCN Connectivity setup*

## **Guidelines for DCN connectivity**

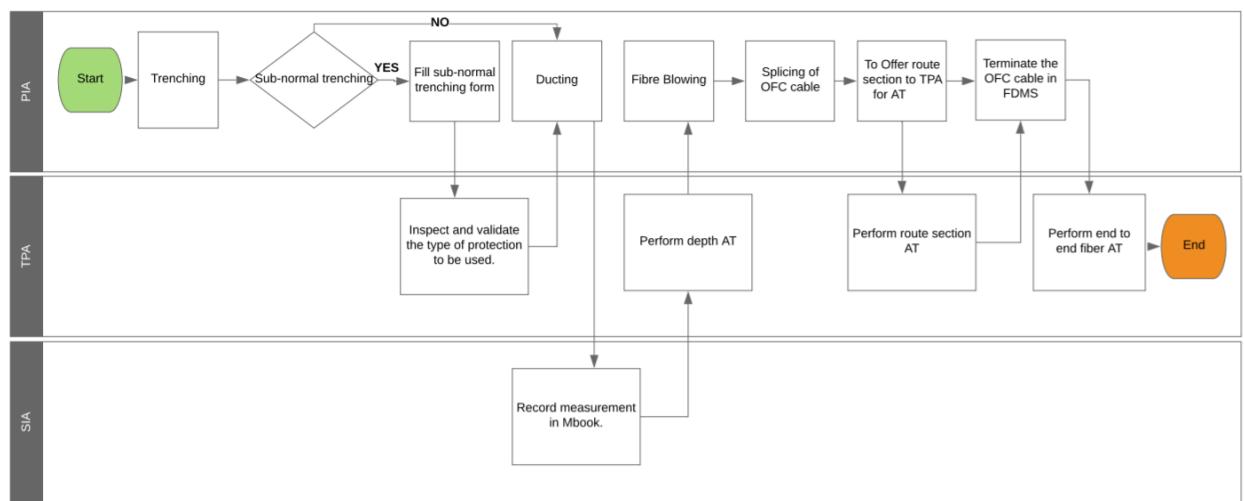
- PIA shall conduct requirement analysis and prepare options for providing DCN links.
  - PIA shall perform DCN engineering design to calculate the bandwidth requirement between Master Taluka and NOC/DR-NOC for remote visibility of NEs. Connectivity between NOC/DR-NOC and VPC DC/DR will also be connected by DCN links.
  - PIA will be responsible to get the DCN solution approved by the TPA.
  - Post TPA approval, PIA will provision, configure and perform pre-test of the DCN links.
  - Once configured, PIA will share the Acceptance Testing (AT) results for TPA verification.

### 6.3 Optical fibre Cable Laying (UG and Aerial)

Implementation of optical fibre cable shall be done for underground and aerial and shall include activities: trenching, ducting, fiber blowing and splicing for underground cable and erection of new poles or strengthening of existing poles, stringing of optical fiber cable and splicing for aerial OF cable.

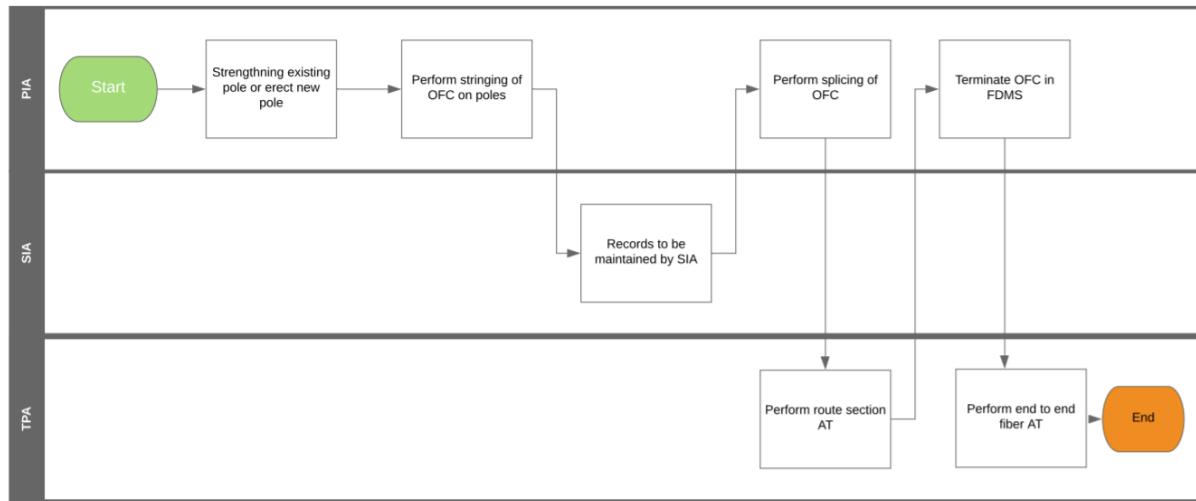
A notice of work will need to be provided by the PIA to the local government bodies / authorities (as applicable) at least 5 days earlier to commencement of trenching for OFC laying. The SIA district team will need to ensure and facilitate the submission of this notice of work to the concern authorities falling under its jurisdiction. (Refer section 10 for the ROW single window clearance GR).**Process Flowchart**

#### Underground optical fibre cable



Process Flowchart 15: Underground optical fibre laying (Level 3 Process)

### Aerial optical fibre cable



Process Flowchart 16: Aerial optical fibre laying (Level 3 Process)

### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC
1	Commence trenching work	-	R,A			
2	Perform strengthening of existing poles and erection of new poles	-	R,A			
3	Fill the sub-normal trenching request form, as and when required	-	R,A			
4	Inspect and validate type of protection in case of sub-normal trenching	-			R, A	
5	Perform installation of duct	-	R,A			
6	Perform recording of measurement in M-book	-		R, A		
7	Perform depth AT across route section	2 days			R, A	
8	Commence blowing of fiber	-	R,A			

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC
9	Perform stringing of optical fiber cable on poles	-	R,A	I	I	I
10	Initiate splicing of fiber cables	-	R,A	I	I	I
11	Perform route section AT	2 days	I	I	R, A	I
12	Termination of optical fiber cable in FDMS	-	R,A	I	I	I
13	Perform end-to-end AT	2 days	I	I	R, A	I

*RAM 8: Implementation of Optical fibre cable (UG and Aerial)*

### **Guidelines for Implementation of Optical Fiber Cable Implementation**

Based on the route survey report and planned route implementation report, the PIA of Package A, B and C shall be required to initiate optical fiber deployment connecting GP and Taluka locations. The fiber shall be implemented in a ring topology and the medium of connectivity shall be as per the design of the network. This includes:

- Laying of fresh underground fiber from GP to GP , Taluka to GP and Taluka to Taluka with type:
  - 96 core fiber (ribbon type)
  - 48 core fiber (ribbon type)
  - 24 core fiber (loose tube type)
- Laying of fresh underground fiber from GP to GP, Taluka to GP and Taluka to Taluka with type (applicable only where underground connectivity is not feasible depending upon site survey):
  - 48 core fiber (ADSS type)
  - 24 core fiber (ADSS type)

The PIA of Package A, B, and C shall initiate deployment of optical fiber cable across GP and Taluka location as per the route design approved by the TPA. Furthermore, the PIA shall be responsible for the following

- Supply, delivery to site, unloading, storing, warehousing and handling of Optical Fiber cable equipment along with fittings and associated items as required, including the HDPE PLB duct, Splice Chamber, Manhole and FDMS
- RoW approval intimation to concerned local authority for each route section for deployment of optical fiber 7 days before commencement of work
- Activities to be conducted in case of underground optical fiber cable – Trenching, ducting/laying, backfilling, fiber blowing, splicing, fiber termination at FDMS
- 15 meter OFC loop to be created at every chamber, for future use
- Activities to be conducted in case of aerial optical fiber cable – Pole erection and strengthening, stringing, splicing, fiber termination at FDMS
- Link loss measurement across splices and terminations to ensure seamless connectivity

Aerial assigned district shall have underground fiber in the section where there are bridges, national or state highway crossing and railway crossing.

The SIA are the custodian of the measurement book and shall record the measurement with regards to the details of the route section along with depth of the trench across various length of sections.

Once the route section is offered for acceptance, the TPA shall be responsible to verify, validate length and depth of trench across the chainage details vis-à-vis the measurement book and approve the optical infrastructure as deployed by the PIA.

#### **Acceptance testing of optical fiber cable:**

TPA shall perform below test to perform section wise and end-to-end AT for underground optical fiber cable.

- Cable depth Acceptance Test
  - Post completion of trenching, pipe laying, back filling, and sub-normal protection, if any, TPA shall perform depth AT.
  - TPA would indicate the location at which the samples are required to be taken to access the trench for depth AT i.e. the depth (and length) for which the HDPE pipes are laid with protection in case pipes are laid in subnormal trenches.
  - Height of the trench above the pipe should be measured
  - Type of protection in sub-normal trench should be checked vis-à-vis the protection mentioned in measurement book. Wherever protection is provided by precast RCC pipes due diligence must be done to examine the joint of the RCC pipes are properly closed with cement mortar without leaving any gaps.
- Optical fiber cable Acceptance Test
  - For optical fiber AT following checks must be performed:
    - End-to-end optical loss measurements from both directions based on self-certified OTDR & LSPM report by PIA and validation and approval by TPA.
    - Light sources and power meters should be used to facilitate bidirectional measurement of attenuation.
  - The attenuation measured for the link should be within the nominal value. The nominal value of attenuation per km should be less than 0.3 dB in 1550 nm and 0.5 dB in 1310 nm and the value of the splice loss should be less than 0.1 dB.
  - Pair of talk set and clip on device should be available to carry out the above mention test on site.
  - Route Index diagram to be provided for the section showing the location of fiber laid.

## Acceptance Testing Template for OFC: LSPM

 <p><b>MahaNet I</b></p> <p><b>OFC LSPM Acceptance Test Form</b></p>												
Package						<b>PIA Site Representative Details</b>						
District						Name						
Taluka						Contact Number						
Between GP-1 and GP-2						Date						
						Signature						
Name of Area												
Light Source and Power Meter Reading - Link Loss for Optical Fiber Links												
<b>PIA use only</b>												
Sl. No.	Fiber No.	Distance (km)	Reference Power of Light source (dBm)		Measurement Received in Power Meter (dBm)		Link loss (db)		Average Link Loss (db)	Loss per KM (db)	<b>TPA use only</b>	
			A	B	B	A	A-B	B-A			Approval/ Rejection	Signature
1												
2												
3												
4												
5												
6												
7												
8												

Template 10: OFC LSPM Acceptance Test Form

## Acceptance Testing Template for OFC: OTDR



MahaNet I

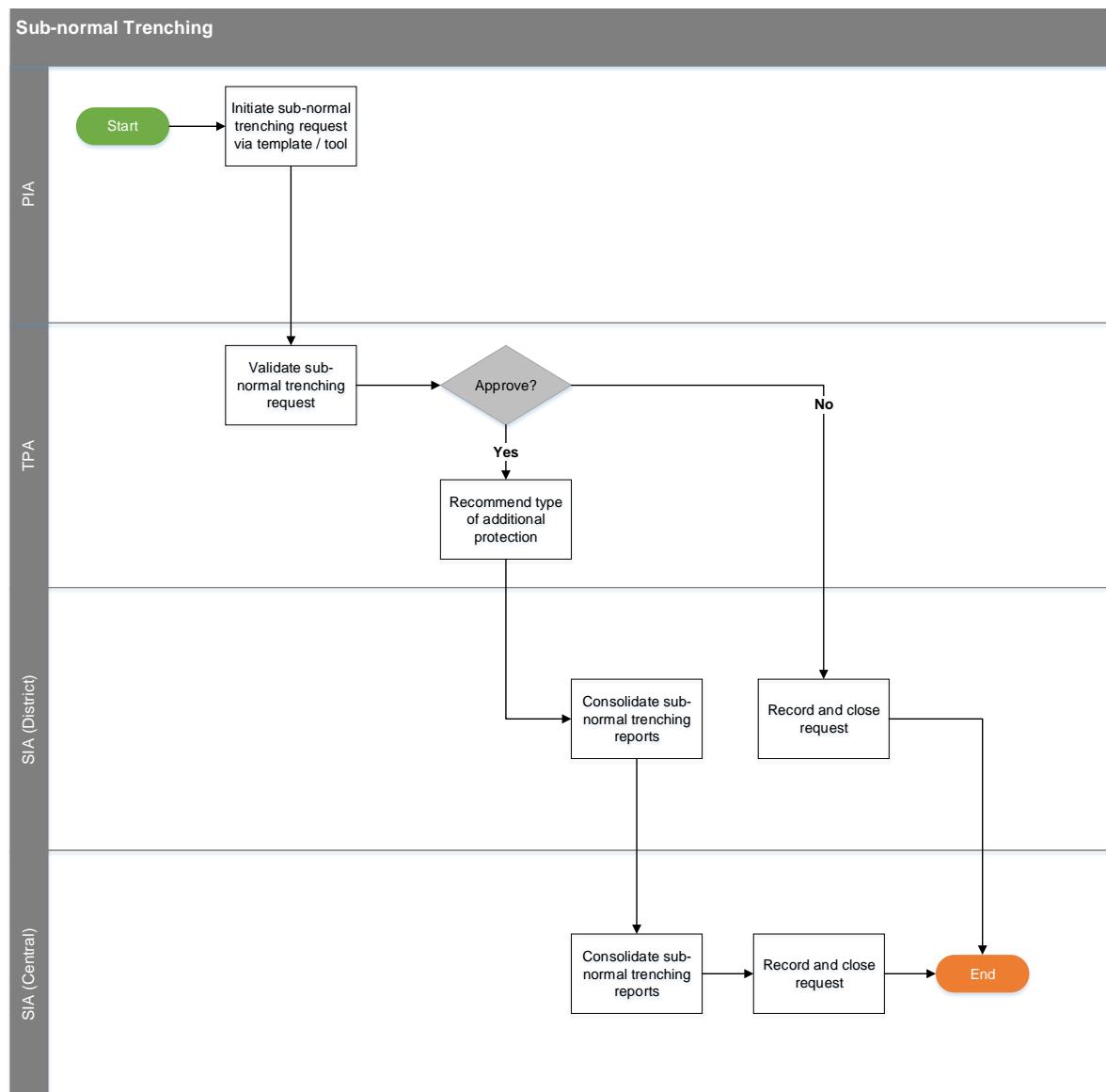
## **OFC OTDR Acceptance Test Form**

*Template 11: OFC OTDR Acceptance Test Form*

### 6.3.1 Sub Normal Trenching

In certain cases when trenching is done on hard terrain, it may not be possible to lay the cable at the full depth of 140 cm. In such cases, cable can be laid at subnormal depth of 120 cm without protection and without any penalty. However, in Normal / Rocky terrain where 140 cm/ 120 cm depth respectively cannot be achieved due to soil conditions the PIA shall take approval from the TPA prior to start of work. In all such cases, necessary physical protection to be provided. For the different types of sub-normal depths, the TPA will evaluate and recommend different type of protection (RCC/ DWC) to be used.

#### Process Flowchart



Process Flowchart 17: Sub Normal Trench (Level 3 Process)

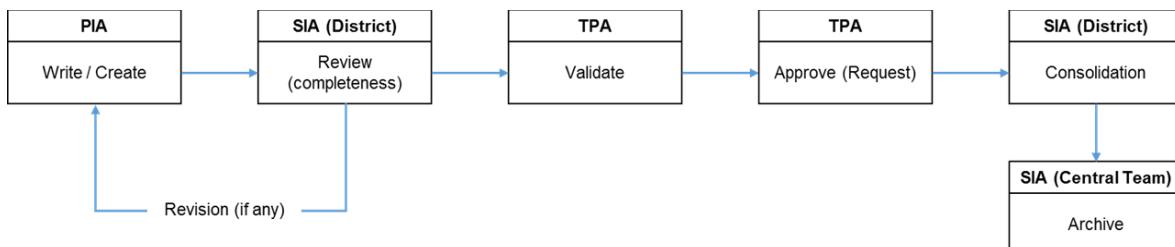
### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	SIA (District)	TPA	SIA (Central)	PMC
1	Raise request for sub-normal trenching via Sub-normal Trenching Request Form with all relevant details	-	R	I	I	I	I
2	Validate and approve request for sub-normal trenching basis the chainage details and additional protection requirement	2 days	I	I	R, A	I	I
3	Consolidate and share validated and approved sub-normal trenching report with SIA (Central Team)	-	I	R	I	A	I
4	Consolidate validated and approved sub-normal trenching report (District-wise)	-	I	I	I	A, R	I
5	Perform compliance of sub-normal trenching basis the chainage details and additional protection implemented	-	I	I	R, A	I	I

RAM 9: Sub Normal Trenching

### Document Flow and Control

PIA will fill the sub-normal trenching request form which will be reviewed by the SIA District officer. The request will be validated by the TPA and consolidated by the SIA District and achieved by the SIA central team.



Document Flow 7: Sub Normal Trenching

### **Guidelines for Sub-normal Trenching**

- The TPA shall record the depth measurement in centimeters (cm).
- If depth is less than 1.2 meters but better than 0.9 meters, protection by using precast 100 mm NP-3 RCC/ DWC pipe shall be provided.
- If depth is less than 0.9 meters but better than 0.6 meters, protection by using pre-cast RCC pipes is recommended.
  - The choice between RCC/DWC would basis the soil and operating conditions. In urban and rodent infested areas, use of RCC might be mandated by the site in-charge based on site survey results.
  - If more than one PLB HDPE pipe is to be laid and protected, RCC/ DWC pipe of suitable size to accommodate the required number of PLB HDPE pipes shall be used.
  - Wherever RCC pipes are used for protection, the gaps between the RCC collars and the RCC pipes shall be sealed using cement mortar 1:3 (1:53 grade cement of reputed brand, 3:fine sand without impurities) to bar entry of rodents.
- If depth is less than 0.6 meters but better than 0.5 meters, concrete surrounding the pipes with a cover of 11 cm on all the sides with weld mesh shall be provided. Cement Concrete Mixture used shall be of 1:2:4 composition, i.e. 1: 53 Grade Cement, 2: Coarse Sand, 4: Graded Coarse Stone aggregate of 20 mm nominal size, reinforced with mild steel weld mesh.
- Laying OF cables at trench depth less than 0.5 m will not be permitted.

### **Additional Guidelines for providing additional protection**

- RCC Full Round Pipes: Reinforced cement concrete pipes (spun type) coupled with RCC collars sealed with cement mortar used to provide additional protection to PLB HDPE Ducts/coils at lesser depths should be of full round, NP-2 class and size 100 mm (internal diameter), conforming to IS standard 458-1988 with latest amendments. The pipes should have a nominal length of 2 meters.
- The RCC collars should be properly sealed using cement mortar 1:3 (1:53 grade cement of reputed brand, 3: fine sand without Impurities). In case of long spans, every third joint will be embedded in a concrete block of size 60 cm (L) x 40cm (W) x 25 cm (H) of 1:2:4 cement concrete mix (1: cement, 2: coarse sand, 4: stone aggregate of 20 mm nominal size) so that the alignment of RCC pipes remain firm and intact. Also, both ends of RCC pipes spans will be sealed by providing concrete block of size 40 cm (L) x 40 cm (W) x 25 cm (H) of 1:2:4 cement concrete mix to avoid entry of rodents.
- RCC Split Pipes: The split reinforced cement concrete pipes (spun type) with in-built collars used to provide additional protection to PLB HDPE Ducts/coils should be of 100mm internal dia.(Spotted), Class--NP-3, Thickness: 25mm, Length: 2 Meters with inbuilt collar at one end, Conforming to ISI Specification IS: 458, 1988 with latest amendment
- G.I. Pipes: G.I. pipes should be of medium duty class having inner diameter of 50mm and should conform to specifications as per IS 554/1985 (revised up to date) IS 1989 (Part-I), 1900 Sockets (revised up to date) & IS 1239 (Part-II) 1992 (revised up to date).
- DWC Pipes: Use of normal duty DWC (Double walled corrugated) HDPE pipe – confirming to TEC GR no.GR/DWC-34/01 Sep.2007 with latest amendments shall be preferably utilized as first choice for protection of Optical Fiber Cable instead of GI pipes. The DWC pipes used shall be of size 75/61mm as per table 2 of the said TEC GR.
- M.S. Weld Mesh: The PLB HDPE Ducts can also be protected by embedding it in concrete of size of 25 cm x25 cm reinforced with MS weld mesh. The MS weld mesh used should be of 50 mm x 100mm size, 12 SWG, 120 cm in width in rolls of 50m each. One meter of MS weld mesh caters to approx. 3 meters of concreting. The strength of RCC/CC is dependent on proper curing, therefore, it is imperative that water content of CC/RCC mix does not drain out into the surrounding soil. In order to ensure this, the RCC/CC work should be carried out by covering

all the sides with yellow PVC sheets of weight not less than 1 kg per 8 sq. meter to avoid seepage of water into the soil.

- Joint Chamber: The Joint chamber shall be provided at every joint location to keep the OF cable joint well protected and also to house extra length of cable which may be required in the event of faults at a later date. The Joint chamber shall be of pre-cast RCC type as per construction specification. Brick chamber can also be made with prior permission of MahalT.
- Rubber Bush: To prevent entry of rodents into PLB HDPE DUCTS, the ends of PLB HDPE DUCTS are sealed at every manhole and joint using rodent resistant hard rubber bush (cap) after optical Fiber cable is pulled. The rubber bush should be manufactured from hard rubber with grooves and holes to fit into 40 mm PLB HDPE DUCTS pipe, so that it should be able to prevent the entry of insects, rodents, mud, and rainwater into the PLB HDPE DUCTS pipe. It should conform to TEC GR with latest amendments.
- Route/Joint Indicator: The Route/Joint indicators are co-located with each manhole/joint chamber. In addition Route indicators are also to be placed where route changes direction like road crossings etc. Either RCC/Pre-cast or Stone based route indicators can be used. The detailed specification and design of the same shall be as per construction specification. Generally, Stone Route indicators shall be used for the MahaNet-I (BharatNet-II) project.

### **Sub-Normal trenching form coding guideline**

A unique form number will be generated for each sub-normal request.

The SIA district team will generate the form number basis the below mentioned principle.

#### **Code structure**

District	SNT	Unique code (3 digit)
3 digit from left	SNT	3

#### **Example:**

Ahmednagar: AHM-SNT-001

Yavatmal: YAV-SNT-001

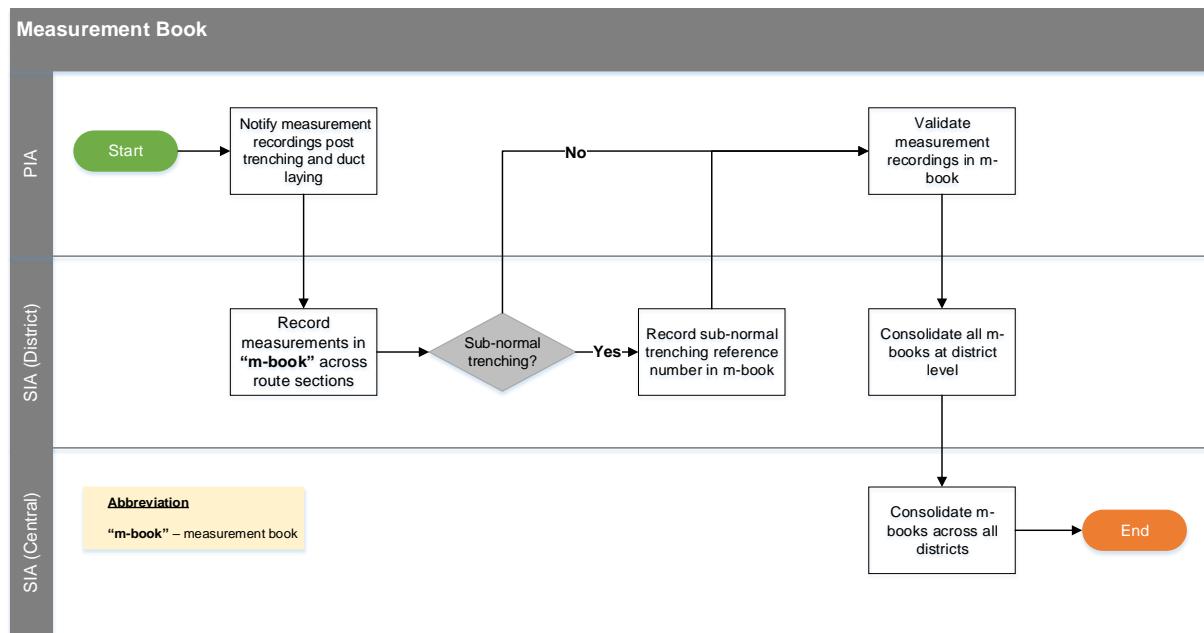
## **Sub Normal Trenching Request Form Template**

### *Template 12: Sub Normal Trenching Request Form*

### 6.3.2 Measurement Book

Depth and length measurements are to be recorded for each route section trenched and ducted in the measurement book by a designated SIA District officer. The measurement book will help indicate the number of kilometres trenched and the quantity of duct laid.

#### Process Flowchart



\* The standard operating procedure for the above flowchart has been covered under Appendix 9.2.

*Process Flowchart 18: Measurement Book (Level 3 Process)*

#### Responsibility Assignment Matrix

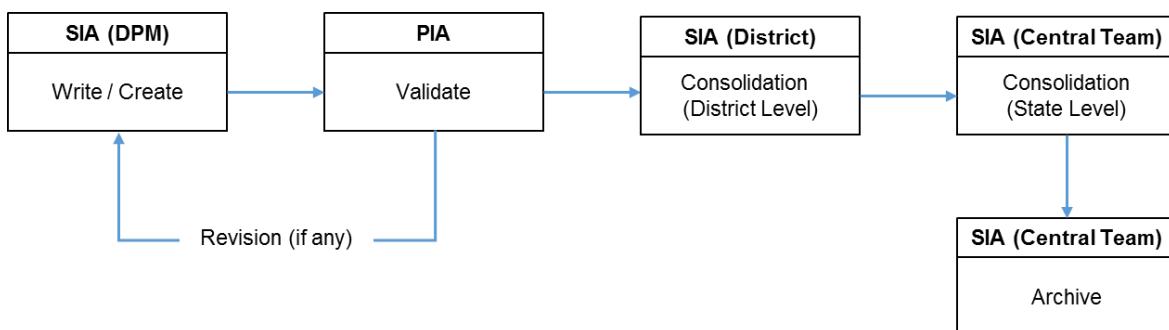
S/N	Activity	TAT	PIA	SIA (District)	TPA	SIA (Central)	PMC
1	Notify the SIA District after trenching and duct laying to record measurement in M-book	1 day	R	A	I	I	I
2	Fill-up M-book for route section length	2 days	I	R,A	I	I	I
3	In case of sub-normal trenching add the sub normal trenching request reference number		I	R,A	I	I	I
4	Validate the measurement recorded in M-Book	1 day	R	A	I	I	I
5	District level consolidation of M-Book	-	I	R,A	I	I	I
6	State level consolidation of M-Book	-	I	I	I	R,A	I

*RAM 10: Measurement Book*

### Document Flow and Control

The SIA District team will play the critical role of filling and consolidating the M-book for the SIA (central) team along with the PMC to consolidate and report performance of completion of work

The communication shall be done by email and by submitting physical copy of the document with evidence, whenever required.



*Document Flow 8: Measurement Book*

### Guidelines for recording the measurement book

Brief description of item of work as captured in the tender document should be used for measurement of the items. Below are item of work which shall be recorded in measurement book.

- The cable routes shall be divided into segments of maximum 200 meters length bounded by identifiable landmarks at both the ends of the route. If landmarks are not available, length of segment will be maintained at 200 meters maximum.
- The measurement of depth shall be recorded at each point where the depth of trench is changing, even if the same is falling within the 200 meter segment.
- Latitude and Longitude of each Point of Measurement (PoM) shall be recorded in the measurement book.
- Measurement of the trenching and pipe laying shall be recorded as running meter.
- The type of protection in a segment shall be recorded in the measurement book in the template provided for this purpose.
- The length of cables laid through pipes and through ducts shall be measured by use of RODO meter/measurement tape and the depth of the trench should be measured by the measurement tape.
- The PIA shall sign all the measurements recorded in the measurement book. This will be considered as an acceptance by the PIA contractor of measurements recorded in the book. In case PIA contractor fails to countersign or to record difference with in a week, then in such events the measurements taken by SIA district team shall be taken as final binding on the PIA and the PIA shall have no right to dispute.

### Additional Points

- A single Mbook is to be used for one ring only. In case, the single Mbook pages get exhausted while filling for one ring, a new Mbook can be taken for the same ring
- Each page in the Mbook will have recordings for one SPAN only (all the chainages of a single SPAN). If the SPAN is longer (more chainages), then the recordings can get recorded in subsequent pages. Also, as a good practice leave a blank page between two SPANS recording
- These blank pages can be used for any SNT (Subnormal trenching) in that SPAN
- The SPAN ID and Location need to be clearly mentioned in the Mbook
- Have 200 m Chainage recordings in for open trenching normal soil condition.
- HDD shots to be recorded as per the length of the shot.
- In case of SNT, the SNT number should be clearly mentioned and it should be a unique number as guided in the mbook
- Overwriting is not allowed permitted in measurement book, so the figures need to be recorded carefully
- Date and signatures should be proper and legible
- DPA (District PMC) should check the completeness of the data in the Mbook, before it is submitted to TPA for further process (TPA Audit/observations)
- In case of HDD, the chainage recording should mention HDD in remarks column
- The HDD depth graph is to be attached with the Mbook
- The Average depth given in the graph, will be the depth that would be recorded in the Mbook in depth column
- The Lat-Long recording should have minimum of 5 digits post decimal point.
- In case of common SPAN between two rings, common SPAN recordings need to be incorporated in the Ring 1 and in Ring 2 it should be mentioned that the distance is already covered in Ring 1, care should be taken to avoid double entries which could result in additional payment in double entry. PIA has to ensure that while entering data in PMTool, the same is specified so that double entry of Trench is avoided in PMTool.

**Note:** Measurement shall be recorded in digital platform with Geo-tagged and time stamp images post implementation of PM tool.

**Guidelines for maintaining the Measurement book**

- A register shall be maintained factoring the serial number of each of the books and pages contained therein.
- The pages of the measurement book shall be serially numbered and entries shall be recorded continuously leaving no blank pages or gaps. If any pages left blank inadvertently, it shall be cancelled by the diagonal lines in red ink. The cancellation should be attested and dated.
- No entry shall be erased or overwritten. If the mistake is made, it should be corrected by crossing out the incorrect words or figures and inserting the corrections, the corrections thus made shall be signed by the concerned MahALT officer with date.
- When the SIA district officer holding the measurement book is transferred, he/she shall handover the measurement book issued to his/her successor and the same should be shown as received from the relieved officer. The transfer shall also be recorded in the measurement book.
- Separate measurement book shall be maintained for each of the items of work.

# **Measurement Book Template**



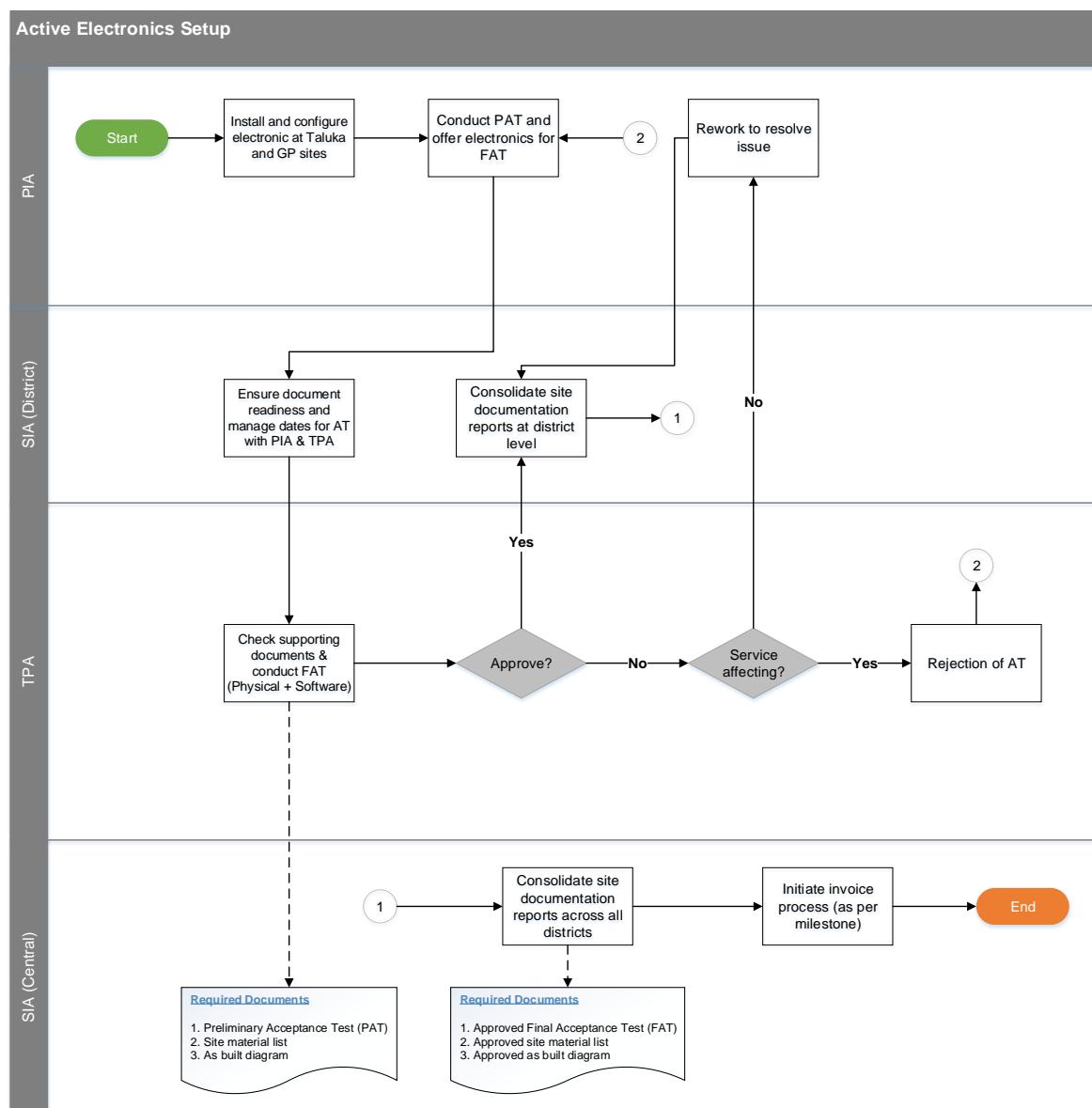
**MahaNet I**  
**Measurement Book (M-Book) - Aerial**

*Template 13: Measurement Book*

## 6.4 Active Electronics Set-up (GP and Taluka)

Implementation of active electronic equipment (*includes GP, Taluka router, Microwave radio equipment, Route reflector, Remote fiber management system, security / next generation solution etc.*) will include installation and configuration of active access electronics at GP and Taluka. Post pre-test completion, acceptance testing (software and physical) shall be performed before hand over the equipment to operations.

### Process Flowchart



Process Flowchart 19: Active electronics setup (Level 3 Process)

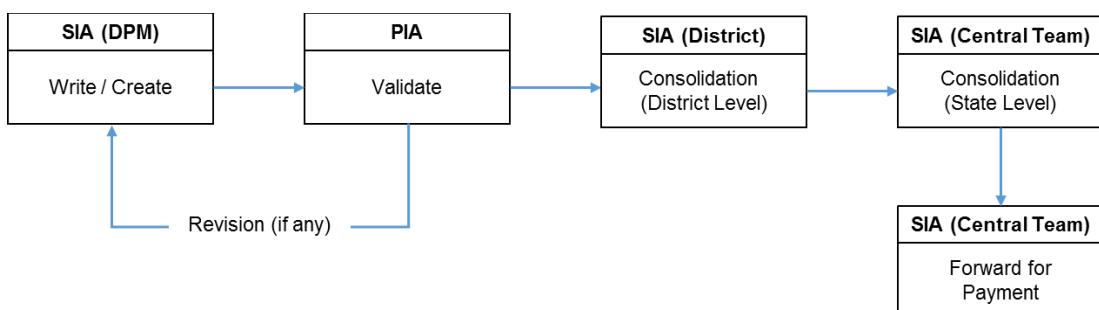
### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	SIA (District)	TPA	PMC	SIA (Central)
1	Perform installation and configuration of electronics equipment's on site	-	R, A	I	I	I	I
2	Successfully conduct pre-test and offer site for AT	-	R,A	I	I	I	I
3	Ensure document readiness and manage and coordinate dates for AT with PIA and TPA	2 days	I	R, A	I	I	I
4	To check relevant support documents and conduct AT		I	I	R, A	I	I
5	District level consolidation of site documentation reports	-	I	R, A	I	I	I
6	State level consolidation of site documentation report and forward for payment as per milestone	-	I	I	I	I	R, A

RAM 11: Active electronics setup

### Document Flow for acceptance testing of all the implementation activities (NOC/DR-NOC, Optical fiber cable and Active electronics)

TPA will play critical role of validating and approving AT report. SIA District and Central will perform district and state level consolidation respectively. Post consolidation by SIA central team, the report shall be forwarded for payment.



Document Flow 9: Active electronics setup

### **Guidelines for Implementation of Active electronic**

Electronics implementation shall be done across all GP and Taluka sites locations comprising of the following network elements

- IP – MPLS based routers
- Next Generation Security Solutions
- Microwave Radio Solution
- Remote Fiber Management System (RFMS)
- Route Reflectors

The network at GP and Taluka location shall be implemented in a distributed ring based architecture to create a transport based network using IP-MPLS routers across three layers-

- Pre – Aggregation Layer (Gram Panchayat)

This layer of the network shall be used to connect users at GPs. Based on current Bandwidth estimation the access network at GP is planned to carry average 150 Mbps traffic from each Gram Panchayat

Electronics deployed – IP MPLS routers, Microwave Radio Solution

- Aggregation Layer (Taluka)

This layer of the network shall connect all Talukas in a District together in ring topology and aggregate the traffic at Master Talukas connected in a ring topology

Electronics deployed – IP MPLS routers, Remote Fiber Management System (RFMS)

- Master Aggregation Layer (Master Taluka)

This layer of the network is the major aggregation point of the traffic and shall act as gateway for signaling and bearer traffic for DCN and VPC based connectivity respectively.

Electronics deployed – IP MPLS routers, Next Generation Security Solutions, Remote Fiber Management Solution (RFMS), Route Reflectors

After the completion of site survey and fiber termination on FDMS at site locations for various route sections, PIA of Package A shall be responsible for installation, configuration and integration of the electronics equipment. The plan schedule for deployment of electronics shall depend on the near completion of the fiber implementation activity as executed by PIA of Package A, B and C and further shall be implemented in accordance with the aggregation layers as mentioned above.

Once the site is offered for acceptance, the TPA shall be responsible to verify, validate and approve the network infrastructure and service setup as installed, configured and integrated by the PIA within an agreed service timelines.

The TPA shall conduct acceptance of equipment basis testing report/checklist as agreed with the PIA and shall be responsible for verification and validation of the following document to issue a Final Acceptance Test (FAT) report on the electronics as implemented in the network

- Preliminary Acceptance Test (PAT)
- As-built Diagram
- Site Material List

During the course of the electronics implementation at GP and Taluka locations, the SIA shall coordinate and support PIA, TPA and PMC for rollout and acceptance of the network along with rectification of service/non-service affecting issues ensuring progress of the project as per plan.

**Note:** Acceptance test checklist/template for GP/Taluka electronic equipment shall be provided by the PIA.

## 6.5 Change Request

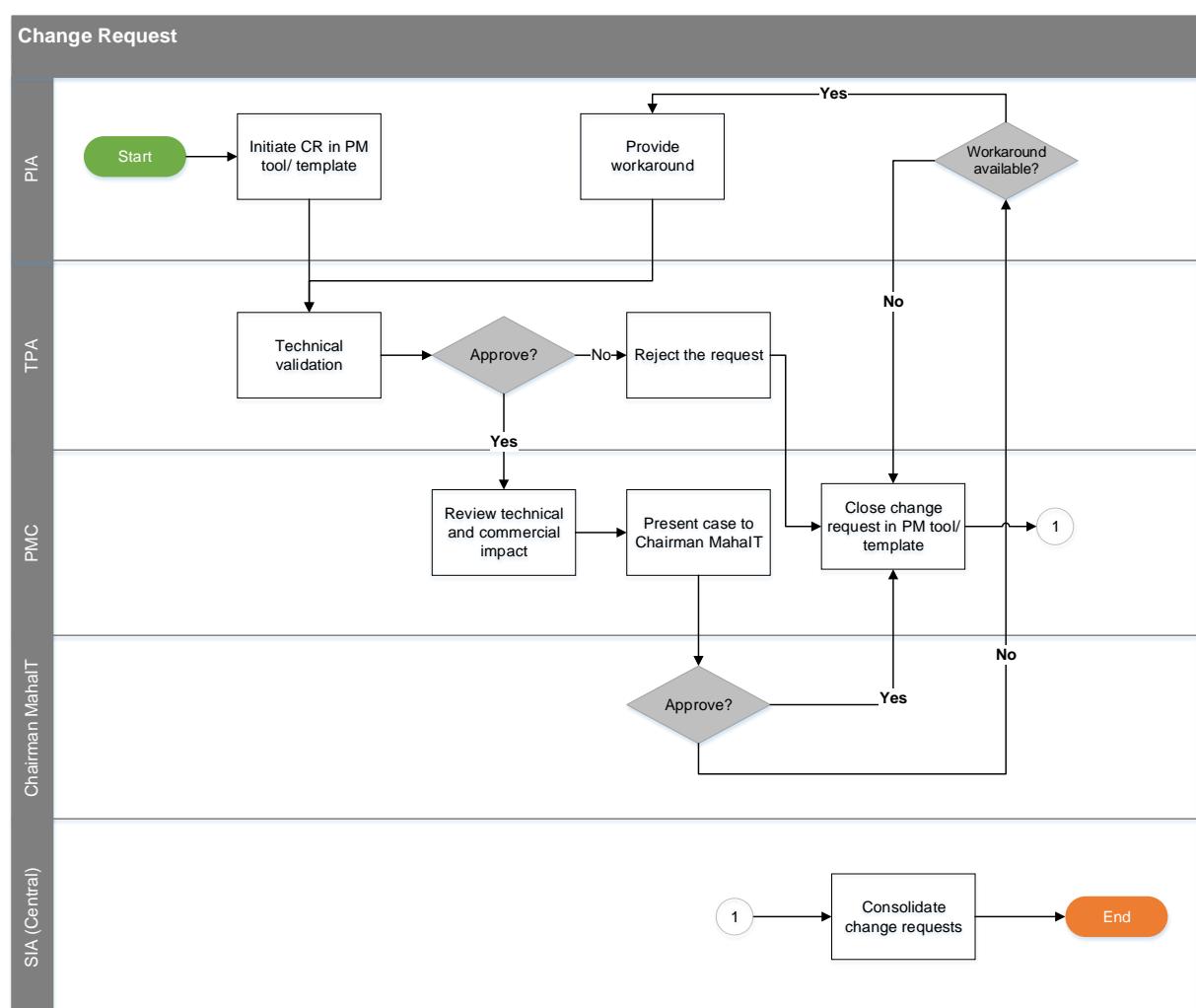
The change request process establishes an orderly and effective procedure for tracking the change request submissions, review & evaluation and approval for release of all changes to the project's baseline.

The change request shall be initiated in case of the below mentioned activities but not limited to:

- Post TPA audit, change in work proposed by PIA impacting the BoQ e.g. Change in network architecture, network interfaces vis-à-vis planned network topology/architecture, execution methodology (UG/Aerial) etc.
- Addition to the scope of PIA work due to co-build requirements of TSPs and Tower companies.
- Changes in scope of work as directed by MahalIT, e.g. Increase in number of GPs.

### Process Flowchart

Below process shall be followed by the PIA to initiate the change request in the PM tool / template.



Process Flowchart 20: Change Request (Level 3 Process)

## Change Request Escalation

The escalation structure and mechanism to be followed in case of a change request will be as follows.

Escalation Levels	1 <sup>st</sup> Level	2 <sup>nd</sup> Level	3 <sup>rd</sup> Level
Evaluator	TPA	PMC	Chairman, MahalT
Turnaround Timeline	3 Working Days	3 Working Days	3 Working Days

Figure 16: Escalation Matrix for Change Request

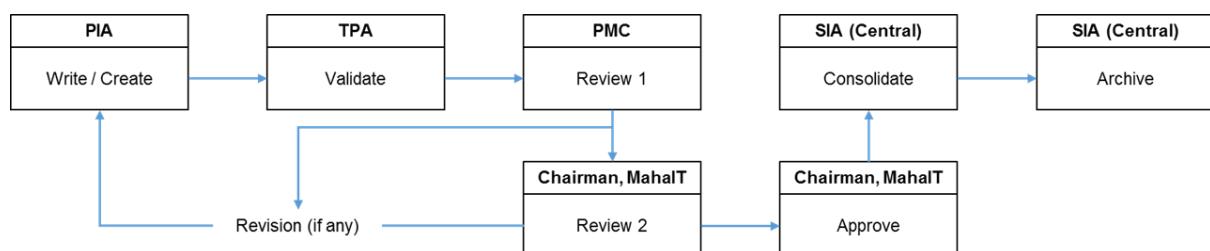
## Responsibility Assignment Matrix

S/N	Activity	PIA	TPA	SIA (Chairman, MahalT)	PMC	SIA (Central)
1	Raise change request via <b>Change Request Form</b> with all relevant details and supporting documents (site pictures, documentary evidence, authority letters, valid proof, etc.) justifying the change	R	I	I	I	I
2	Technical and cost validation for change request raised along with assessment summary	I	R, A	I	C	I
3	Review technical and commercial impact of the change request	I	C	A	R	I
4	Provide workaround for change requirements with regards to solution proposed	R	A, C	C	I, C	I
5	Closure of Change Request	I	I	C	R, A	I
6	Consolidation of Change Requests	I	I	-	I	R, A

RAM 12: Change Request

## Document Flow and Control

The communication shall be done by email and by submitting physical copy of the document with evidence, whenever required.



Document Flow 10: Change Request

## Change Request Template

A Change request template will need to be filled as and when required by the PIA as and when cases for variations arise.

 <b>Project: MahaNet I</b> <b>Change Request (CR) Form</b>			
Change Request (CR) ID			
<b>PIA use only</b>			
Name of Requestor	Date of Raising CR		
Summary of Request			
Reason for Request			
Impact (if change is not made)	Cost Impact (in INR)		
Signature			
<b>TPA use only</b>			
Date of receipt of CR	Forwarding Date	Analysis Due	
Assessment of change requested			
Signature			
<b>PMC use Only</b>			
Date of receipt of CR		Analysis Due	
Change Analysis			
<b>MahaIT use Only</b>			
Recommended Action		Signature	
Final Decision		Decision Date	

Template 14: Change Request Form

**Note:**

Below guidelines should be followed for naming CR form:

CRXXXX-<SPANID>

- XXXX stands for form no.
- Span ID of the span for which CR is raised

For Example:

CR form no. for span in Chandur Bazar taluka in Amravati district:

CR01- AMCHR0105

## 6.6 Issue/Hindrance Resolution Request

Issues could exist between multiple stakeholders, hence need to be managed effectively for timely and smooth progression / execution of the MahaNet I project.

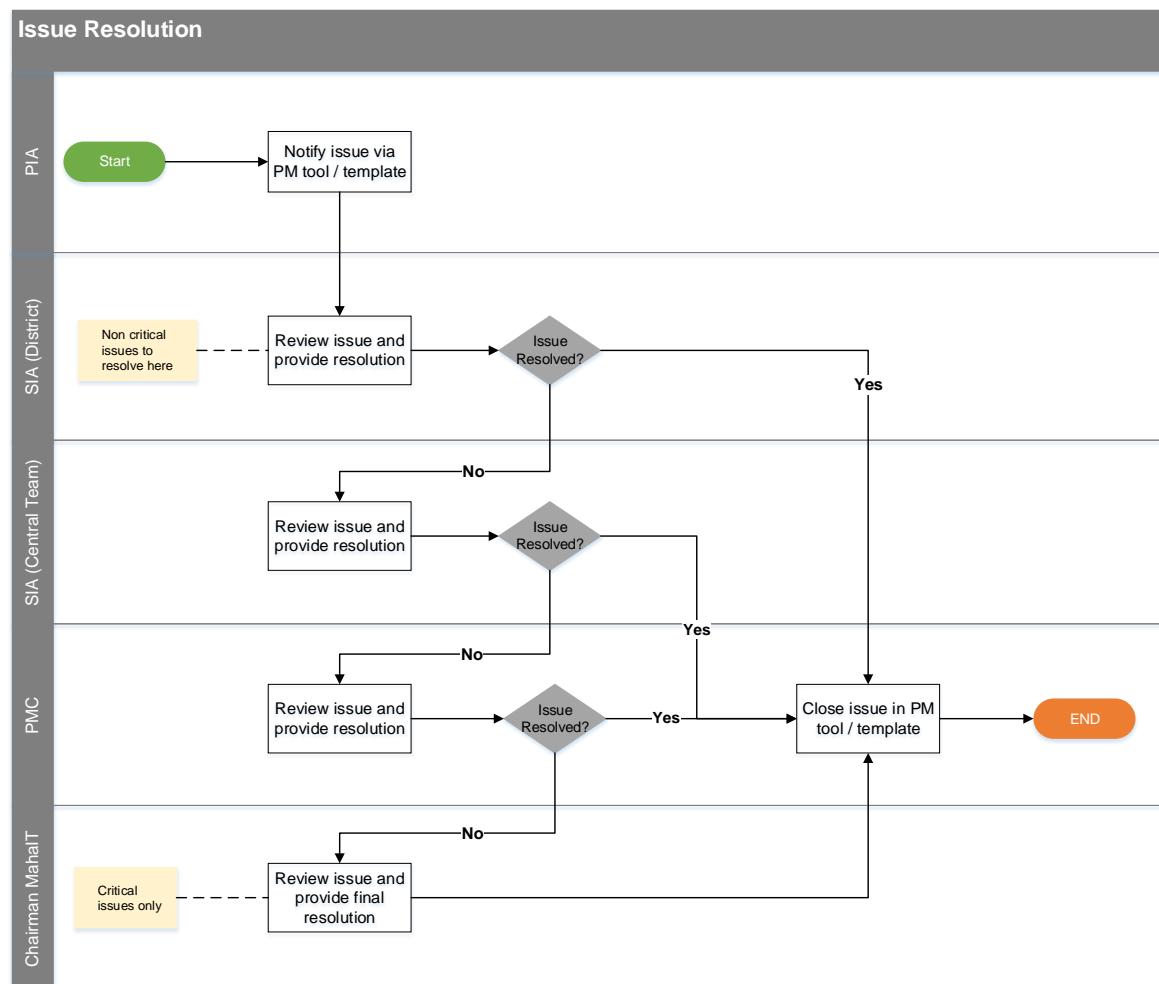
An issue resolution request shall be initiated in case of the below mentioned conditions:

- Critical Issues: Issues which result in stoppage of work e.g. Disagreement between TPA and PIA on various execution parameters such as trench depth relaxation, quality of protection, issues with local bodies / authorities etc.
- Non-critical Issues: Issues which do not result in stoppage of work, e.g. Complaints with respect to digging, trenching in front of houses, animal falling in the pit etc.

All the relevant stakeholders shall fill the Issue/Hindrance register template to record the event impacting project execution. The hindrance register shall be signed off by the PIA & SIA District on monthly basis and circulated by email to all the stakeholders. The register shall be referred by TPA for calculating Rewards/Penalty.

### Process Flow-chart

The issue resolution process consists of multiple steps including issue identification, validation and analysis of the issue leading to issue resolution.



Process Flowchart 21: Issue Resolution (Level 3 Process)

### Issue/Hindrance Resolution Escalation Matrix

The escalation structure and mechanism to be followed in case of an issue will be as follows.

<b>Escalation Levels</b>	<b>1<sup>st</sup> Level</b>	<b>2<sup>nd</sup> Level</b>	<b>3<sup>rd</sup> Level</b>	<b>4<sup>th</sup> Level</b>
<b>Evaluator</b>	SIA	SIA	PMC	Chairman, MahALT
	District Project Manager	Central Team		
<b>Turnaround Timeline</b>	2 Working Days	2 Working Days	2 Working Days	2 Working Days

*Figure 17: Escalation Matrix for Issue Resolution*

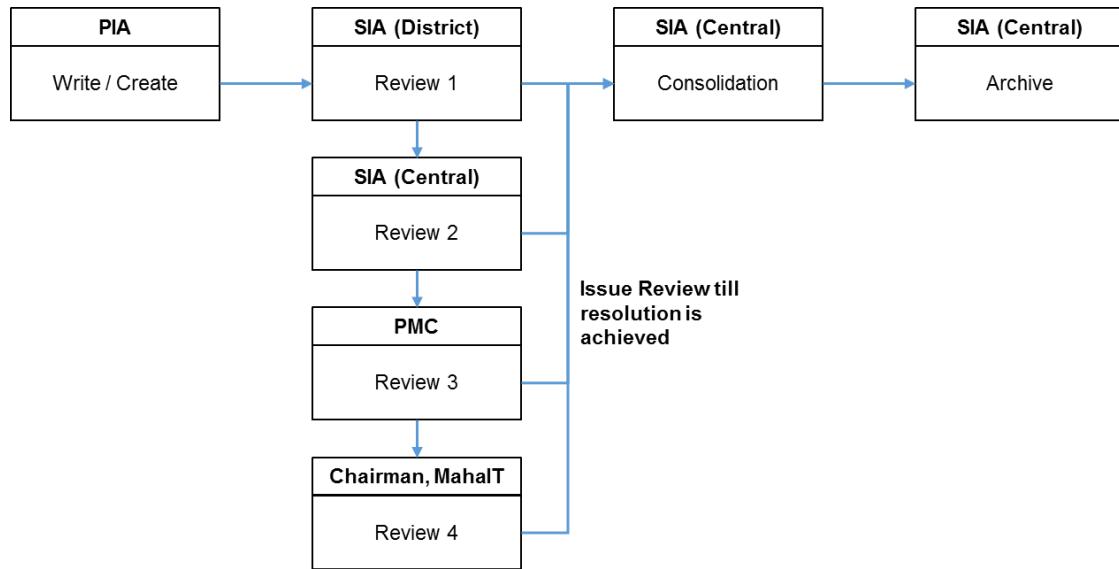
### Responsibility Assignment Matrix

<b>S/N</b>	<b>Activity</b>	<b>PIA</b>	<b>SIA (District)</b>	<b>SIA (Central)</b>	<b>PMC</b>	<b>SIA (Chairman)</b>
1	Raise issue via Issue Resolution Request Form with all relevant details	R	I	I	I	I
2	First Level review of issue and resolution, else, escalate to next level for review	I	R, A	I	C	I
3	Second Level review of issue and resolution, else, escalate to next level for review	I	S	R, A	C	I
4	Third Level review of issue and resolution, else, escalate to next level for review	I	I	S	R,A	I
5	Fourth Level review of issue and resolution	I	I	I	C, S	R, A
6	Closure of Issue raised along with resolution	I	I	I	R, A	C

*RAM 13: Issue Resolution*

## Document Flow and Control

The communication shall be done by email and by submitting physical copy of the document with evidence, whenever required.



Document Flow 11: Issue Resolution

## Issue request/Hindrance Register template

All relevant stakeholders will need to fill the below mentioned template to record an issue for resolution.

 <b>MahaNet I</b> <i>Issue Resolution Request (IRR) Form</i>			
<b>PIA use only</b>			
Package Type	Name of Requestor	Issue Occurrence Date	Issue Raised on
District	Nearest GP		
Issue Description	Severity ( <i>Critical/Non Critical</i> )		
Dependency (if any)			
Impact Analysis			
<b>SIA (District) use only</b>			
Suggested Action			
Issue request forward date			
Signature			
<b>SIA (Central Team) use only</b>			
Suggested Action			
Issue request forward date			
Signature			
<b>PMC use only</b>			
Date of receipt of Issue Request		Analysis due date	
Analysis Summary			
Forward to MahalIT for resolution (Yes / No)			
Date of forwarding to MahalIT			
MahalIT Decision Date			
MahalIT Decision Details			
Date of issue closure			
Signature			

Template 15: Issue Resolution Request Form

## 7. Payment

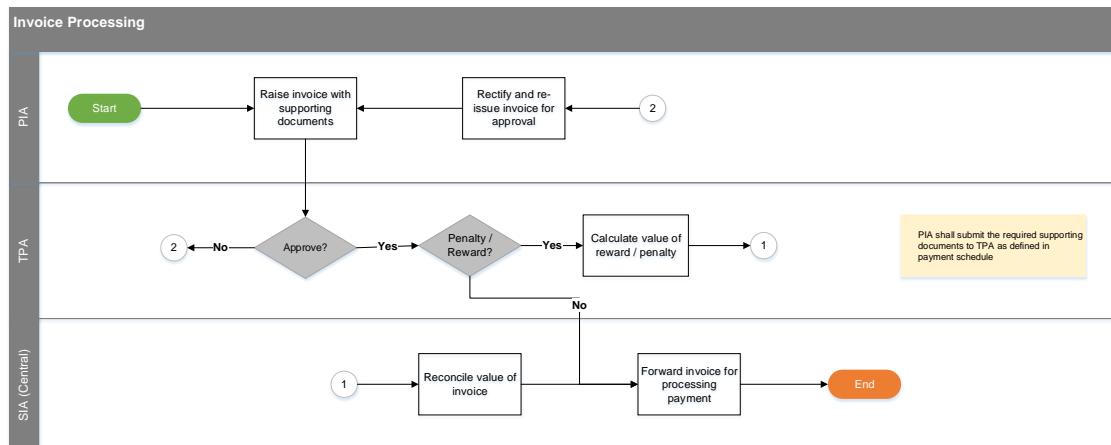
Payment shall be released only on acceptance of the deliverables for each milestones as per following schedule

- First Milestone: Supply of materials
- Second Milestone: Commissioning of GPs
- Third Milestone: Balance payment after start of O&M

### 7.1 Invoice processing

Invoice processing guideline needs to be considered in conjunction with the MahaIT policies and procedures. The below mentioned invoice process applies to invoices raised across different milestones e.g. supply of material, GP commissioning, etc.

## Process Flow Chart



Process Flowchart 22: Invoice Processing (Level 3 Process)

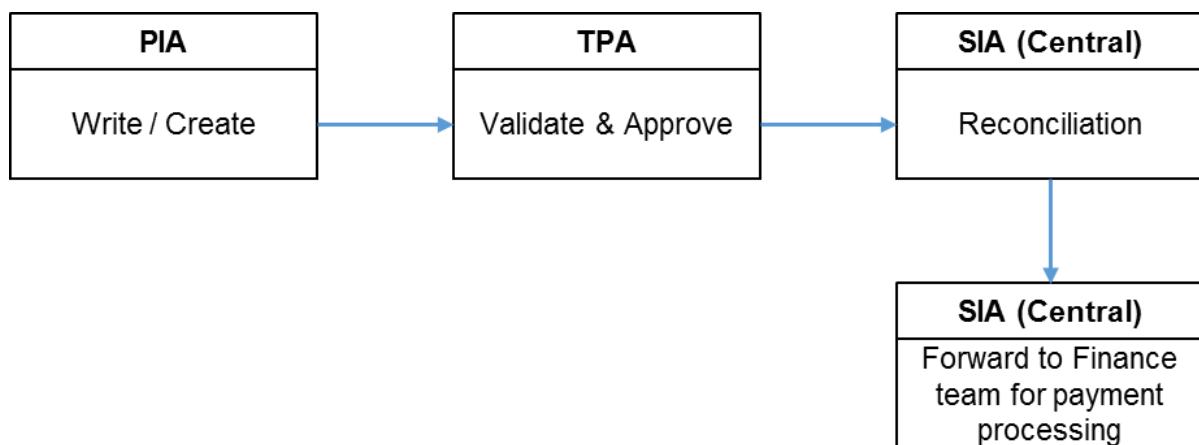
### Responsibility Assignment Matrix

S/N	Activity	TAT	PIA	SIA (District)	TPA	SIA (Central )	PMC
1	Raise request for invoice processing along with Invoice Processing Request Form and supporting documents	-	R, A	I	I	I	I
2	Validate and approve invoice value and supporting documents	10 Days	I	I	R, A	I	I
3	Calculate and validate applicable penalty / reward basis PIA performance		I	I	R, A	I	S
4	Reconciliation value of invoice	2 Days	I	I	I	R,A	I
5	Forward invoice to MahalT finance department for payment	2 Days	I	I	I	R,A	I

RAM 14: Invoice Processing

### Document Flow and Control

At the start of project (till online portal is implemented) PIA will submit invoices and related documents manually and through emails to TPA. Date of email will be considered a date of submission of invoice. After online portal implementation, PIA will submit the invoices and related documents manually to SIA and upload the same in online portal. Date of uploading the documents in portal will be considered as date of invoice submission.



Document Flow 12: Invoice Processing

### Guidelines for Invoice processing

The below mentioned payment schedule applies to all invoices submitted to MahalT by the PIA. The payment guidelines need to be considered in conjunction with the penalty clauses defined in the RFP.

- Invoice and supporting documents must be submitted to MahalT based on the milestones completed as mentioned in the payment schedule below.
- The defined documentary evidence (as mentioned in the figure: payment schedule below) should be attached along with the invoice for the TPA to validate the same.
- TPA will be calculating the penalty / incentive value after considering the project hindrance recorded in the Issue/Hindrance register and SIA central shall reconcile the value of invoice and forward the finance department.
- The penalty / incentive will be calculated as per the rewards / penalties structure for OFC and electronics (mentioned in figure: Reward and Penalty Schedule for Fiber Optics; Rewards and Penalty Schedule for electronics below).
- If the relevant documents have been provided by the PIA in a timely and complete manner, the payment shall be released by MahalT to the PIA within 7 days of submission.

For Package A, B and C (as relevant)

S. No.	Milestone	Payment against material	Payment against services	Documentary evidence
1	Mobilization advance	10% of PO value against supplies	10% of PO value against services	Submission of BG of 110% of mobilization advance
2	Supply of all the material required to commission the GPs in a particular month	60% payment of supply made during previous month	N.A.	Copy of duly signed and stamped delivery challan for material supplied
3 (a)	Commissioning of GPs in a month	25% payment of supplied material consumed in commissioning in previous month	85% payment of service, i.e. GPs commissioned during previous month	<b>Material:</b> Copy of duly signed and stamped delivery challan <b>Services:</b> OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report.
3 (b)	Commissioning of central electronic infrastructure, e.g. NOC, DR-NOC, NMS, OSS/ BSS, etc.	25% payment of supplied material consumed in commissioning	85% payment of service for commissioning of central infrastructure	<b>Material:</b> Copy of duly signed and stamped delivery challan <b>Services:</b> As-Built Diagram (ABD report).

S. No.	Milestone	Payment against material	Payment against services	Documentary evidence
4	After start of Operations and Maintenance (O&M) on submission of O&M Performance Bank Guarantee (PBG)	5% payment of supplied material consumed in commissioning of GPs.	5% payment of services, i.e. GPs commissioned in the block	<b>Material:</b> Copy of duly signed and stamped delivery challan <b>Services:</b> OTDR link test reports and As-Built Diagram (ABD report).
5	Operation and Maintenance (inclusive of services levels agreement)	Payment shall be made GP wise after completion of every quarter arrears (based on SLA parameters)		SLA report duly certified by state

Figure 18: Payment Schedule

#### Reward and Penalty Schedule for Fiber Optics

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
1	Issuance of APO/ Work Order	T0	NA	NA	NA	On selection of PIA, award of contract and Work Order is issued
2	Site Survey and OFC laying where survey is completed	3 months from the date of issuance of Award of Work	2%	If the bidder fails to complete 2% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of Duly Signed and Stamped Installation, Commissioning and testing report approved by MahalT, OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
3	GPs to be RFI (Ready For Installation) for active network elements	4 months from the date of issuance of Award of Work	10%	If the bidder fails to complete 10% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of Duly Signed and Stamped Installation, Commissioning and testing report approved by MahalT, OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report
4	GPs to be RFI (Ready For Installation) for active network elements	8 months from the date of issuance of Award of Work	30%	If the bidder fails to complete 30% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	1) If the bidder completes additional no. of GPs as given in milestone within the stipulated time schedule, then an incentive of 2% of total cost of Project (excluding O&M cost) of additional completed GPs shall be given to the  2) Additional 1% Incentive shall be provided subject to all the GPs completing RFI in 8th month achieve GP commissioning in the 9th month.	Copy of Duly Signed and Stamped Installation, Commissioning and testing report approved by MahalT, OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
5	GPs to be RFI (Ready For Installation) for active network elements	9 months from the date of issuance of Award of Work	50%	If the bidder fails to complete 50% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of Duly Signed and Stamped Installation, Commissioning and testing report approved by MahalT, OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report
6	GPs to be RFI (Ready For Installation) for active network elements	10 months from the date of issuance of Award of Work	75%	If the bidder fails to complete 75% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	1) If the bidder completes additional no. of GPs as given in milestone within the stipulated time schedule, then an incentive of 2% of total cost of Project (excluding O&M cost) of additional completed GPs shall be given to the bidder 2) Additional 1% Incentive shall be provided subject to all the GPs completing RFI in 10th month achieve GP commissioning in the 11th month.	Copy of Duly Signed and Stamped Installation, Commissioning and testing report approved by MahalT, OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
7	GPs to be RFI (Ready For Installation) for active network elements	11 months from the date of issuance of Award of Work	100%	If the bidder fails to complete 100% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of Duly Signed and Stamped Installation, Commissioning and testing report approved by MahalT, OTDR link test reports, As-Built Diagram (ABD report) and Monthly Progress Report

Figure 19: Rewards / Penalties Structure for OFC

**Reward and Penalty Schedule for Electronics**

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
1	Issuance of APO/ Work Order	T0	NA	NA	NA	On selection of PIA, award of contract and Work Order is issued
2	Site Survey and OFC laying where survey is completed	4 months from the date of issuance of Award of Work	2%	If the bidder fails to complete 2% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of GP Commissioning report approved by MahalT, As-Built Diagram (ABD report) and Monthly Progress Report

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
3	Commissioning of GP for active network elements	5 months from the date of issuance of Award of Work	10%	If the bidder fails to complete 10% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of GP Commissioning report approved by MahalT, As-Built Diagram (ABD report) and Monthly Progress Report
4	Commissioning of GP for active network elements	9 months from the date of issuance of Award of Work	30%	If the bidder fails to complete 30% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of GP Commissioning report approved by MahalT, As-Built Diagram (ABD report) and Monthly Progress Report
5	Commissioning of GP for active network elements	10 months from the date of issuance of Award of Work	50%	If the bidder fails to complete 50% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of GP Commissioning report approved by MahalT, As-Built Diagram (ABD report) and Monthly Progress Report

S.No.	Deliverable	Timeline for completion	% of total GPs to be completed (Milestone)	Penalties	Incentives	Remarks
6	Commissioning of GP for active network elements	11 months from the date of issuance of Award of Work	75%	If the bidder fails to complete 75% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of GP Commissioning report approved by MahalT, As-Built Diagram (ABD report) and Monthly Progress Report
7	Commissioning of GP for active network elements	12 months from the date of issuance of Award of Work	100%	If the bidder fails to complete 100% of total GPs within stipulated time schedule, then a penalty as computed below shall be deducted	NA	Copy of GP Commissioning report approved by MahalT, As-Built Diagram (ABD report) and Monthly Progress Report

Figure 20: Rewards / Penalties Structure for Electronics

\*\* The milestone is for material planning of active electronics, however, the actual benchmark will be the cumulative GPs RFI provided by all 3 packages in the previous month

Method of computation of LD at the end of execution period (T0+11 Months):

- MahalT will compute the bills payable against milestones, rewards and penalties at the end of each intermediate milestone / period ('Timeline for Completion', as outlined in the Annexure K Corrigendum 2 Rewards and Penalties. Penalties would be computed as % of total cost of project implementation (excluding O&M cost) of incomplete GPs, as below for respective milestone:
  - 0.25%/ week - Achievement is  $\geq 90\%$  and  $< 100\%$  of the milestone defined
  - 0.5 %/ week - Achievement is  $\geq 75\%$  and  $< 90\%$  of the milestone defined
  - 1.0 %/ week - Achievement is  $\geq 50\%$  and  $< 75\%$  of the milestone defined
  - 2.5 %/ week - Achievement is  $< 50\%$  of the milestone defined
- On a quarterly basis, MahalT would compute, recover and adjust the consolidated rewards and penalties from the bills payable at the end of every quarter based on the progress achieved on the

milestones outlined in Annexure K, Rewards and Penalties. If the PIA is able to re-align progress to meet or exceed the milestone defined in the subsequent quarter/s, MahalT will release the sum equivalent to the penalty charged in the previous quarters.

- At the end of the project, SIA shall assess liquidated damages for breach of contract. Final reconciliation, settlement and recovery would be done at the end of the project execution phase as per the milestones outlined in Payment Schedule.
- LD shall be capped to maximum of 12% of total cost of Project (excluding O&M cost and Taxes)
- In extraneous circumstances, if the work is not completed due to reasons beyond control of PIA, or any other unforeseen reasons, MahalT may extend the timelines (without LD) till such time as deemed fit for completion of project
- During execution period if MahalT has withheld more amount than the actual LD calculated at the end of project, MahalT will release the balance amount after recovering the LD amount from withhold payments on account of LD.

**Invoice Processing Form Template**

 <b>MahaNet I</b> <b>Invoice Enclosure</b> <b>PIA use only</b>	
PIA Name	
PAN No	
GSTIN	
Invoice Date	
Invoice Number	
Package(A/B/C)	
Invoice Type (Material/Services)	
<b>Invoice value raised by PIA</b>	<b>TPA use only</b>
Delivery Challan/Acceptance Testing Validation (Y/N)	
Penalty (If any)	
Invoice Verification (Y/N)	
<b>Signature &amp; Date</b>	<b>PMC use only</b>
Check TPA Verification (Y/N)	
Check Amount Verification (Y/N)	
Forward to SIA for Payment processing (Y/N)	
<b>Signature &amp; Date</b>	<b>SIA (Central) use only</b>
Verified by SIA (Central) (Y/N)	
<b>Signature &amp; Date</b>	

*Template 16: Invoice Enclosure*

## 8. Design Principles and Technical Guidelines

### 8.1 Design principles

#### 8.1.1 Guideline for GP and Taluka ring creation

MahalIT envisage to connect maximum GPs and all Talukas in ring architecture for resilient network architecture. Below are the guidelines for creation of GP and Taluka ring.

##### Gram Panchayat Ring

- The quantum of GPs connected in spur should be limited to extent possible.
- Not more than 2 GPs should be connected in contiguous architecture in spur
- Options should be explored to connect the spur GP in subtended ring, if the additional fiber route distance is equal to or marginally higher than the spur distance
- For radio connected GP, receive signal level (RSL) should be within the threshold level for uninterrupted connectivity
- A radio link connected GP in spur should not be further connected to another GP
- GP with high population should not be connected in spur
- Flat ring should be avoided to the extent possible
- If a Taluka has less than or equal to 2 GP, then the GP shall be connected in linear architecture.

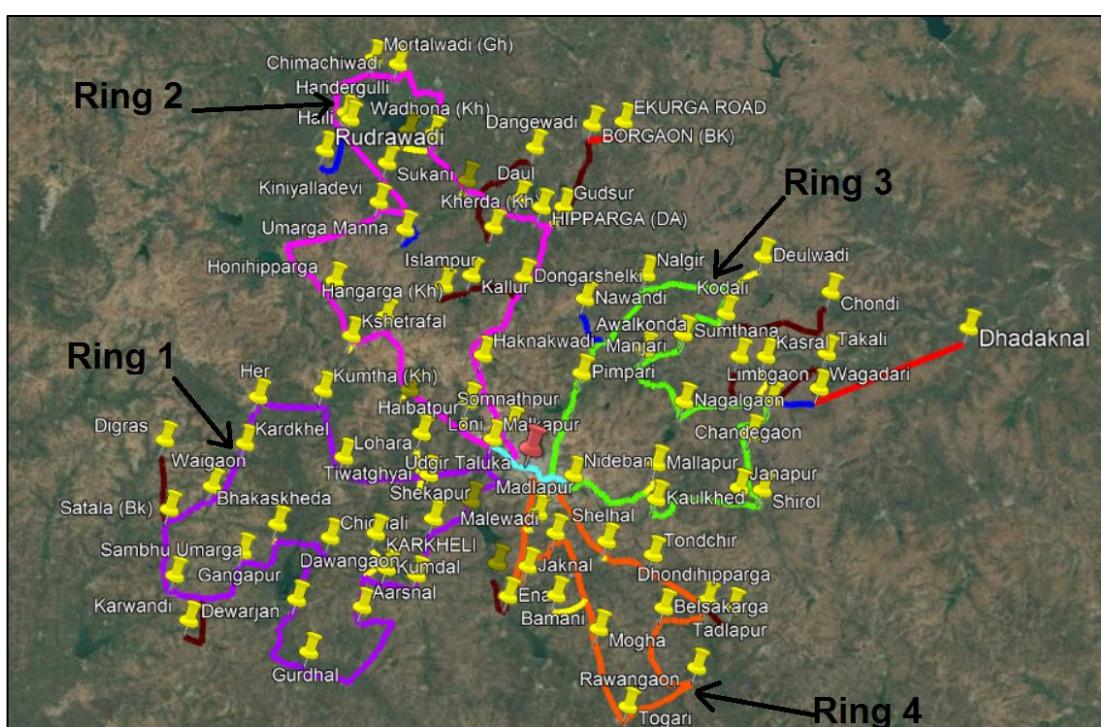


Figure 21: GP Ring architecture example

### Taluka Ring

- Taluka rings shall be designed with the optimum number of talukas
- GP ring fiber pair should be utilized for creation of Taluka ring

Example: In below figure, Taluka 1 is connected to Taluka 2 by connecting the outermost GPs of both the talukas

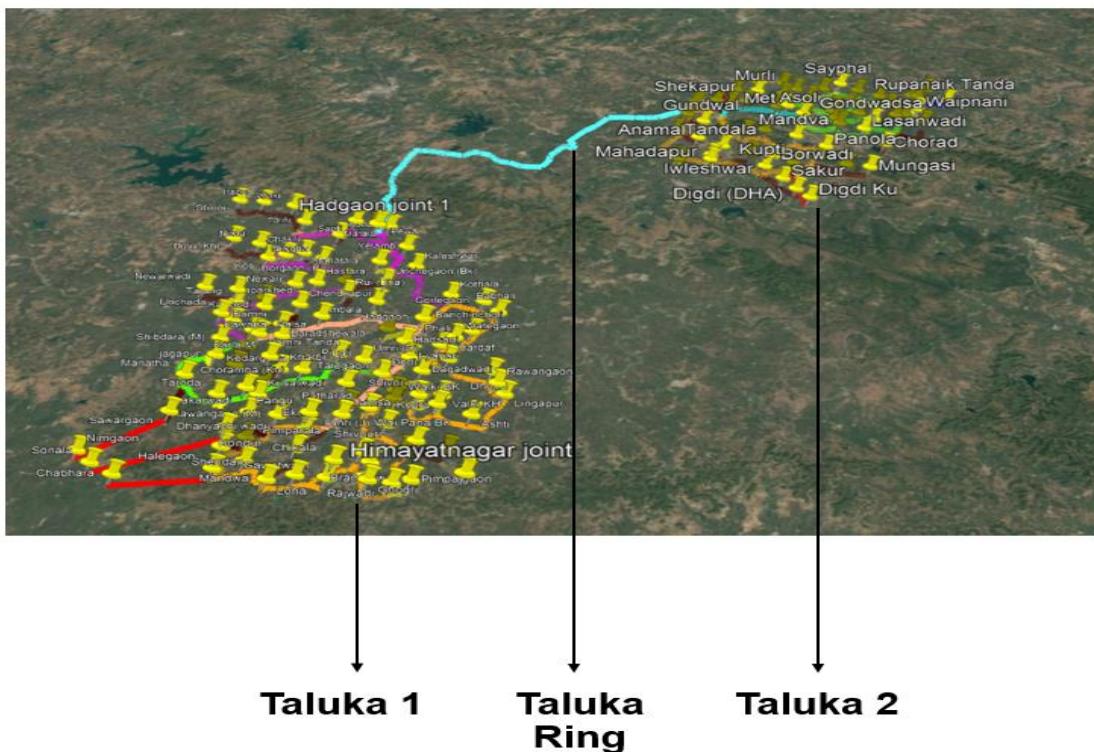


Figure 22: Taluka Ring architecture example

### 8.1.2 Guidelines for Logical ring formation and architecture

Logical Ring Formation and Architecture for connecting GP routers

- Physical ring architecture shall be deployed for connectivity optimized across all GP in a given taluka with a view to providing high availability of network.
- Since, deploying all the routers on a physical fiber pair of ring architecture can exceed the switching capacity of the router itself, logical rings are required to be carved out for network implementation to connect the routers
- For UG deployment, the GPs to be covered in ring architecture should be planned at minimum 90%. However, for aerial deployment the GPs to be covered in ring architecture should be planned at minimum 70%. Only in exceptional cases, with prior approval from MahalT, it can be reduced.
- The number of routers to be placed in a logical ring shall depend on the following:
  - Traffic in network port of the GP Type routers in a ring topology and,
  - No. of GPs connected as spurs from the same logical ring architecture as mentioned above
  - Distance between neighbouring routers to be placed in a logical ring (to be equally distributed largely across the physical network architecture)
  - Optimal category of SFP for connectivity between the routers (keeping in view the optimal sparing strategy)

GP Router	Network port	Access port	Switching capacity
Type 1	2 x 1 Gbps	10 x 1 Gbps	12 Gbps
Type 2	2 x 10 Gbps	10 x 1 Gbps	30 Gbps
Type 3	2 (upgradable to 4) x 10 Gbps	10 x 1 Gbps	30 Gbps - 50 Gbps
Type 4	4 x 10 Gbps	10 x 1 Gbps	50 Gbps

Figure 23: GP router port configuration

#### A. Design Rules for deploying GP Type 1 Router

- There will be router locations in a ring architecture which may be further connected to an additional router in spur (at the far end) either by UG and aerial fiber or by a radio network connectivity. All such spur location end points shall be catered to by Type 1 GP router
- For any fiber branch out as a spur from a given GP site location, two 1G ports of the tributary cards (access ports) shall be utilized in a 1+1 configuration to address single point of failure. The same shall get terminated at the spur end location on the network port of Type 1 router.

#### B. Design Rules for deploying GP Type 2

- Type 2 routers shall be deployed in all GP locations in a ring network architecture with a network backhaul capacity of 10 Gbps and a router switching capacity of 30 Gbps.

#### C. Design Rules for deploying GP Type 4 Router

- Type 4 routers with a 40 Gbps (4 X10G) network backhaul capacity shall be deployed in case there is a subtended ring architecture.

### Logical Ring Formation and Architecture for connectivity Taluka routers

Taluka Router	Network port	Access port	Switching capacity
Type 1 and 2	2 x 100 Gbps	12 x 10 Gbps, 20 X 1Gbps	400 Gbps - 600 Gbps
Type 3 and 4	4 x 100 Gbps	12 x 10 Gbps, 20 X 1Gbps	600 Gbps - 800 Gbps

Figure 24: Taluka router port configuration

- Taluka routers are to be deployed in a ring architecture with SFPs having sufficient link gain to cater to the loss between the Transmitter & Receiver (typically 80Km). However, span exceeding 80 kms are to be dealt by placing of optical amplifier at locations with good power infrastructure so that the availability of the network is not getting compromised.
- In some of the GP locations falling in the intervening distance between talukas (span length in exceedance of 80Km), a high end router will be placed in the GP locations to terminate Taluka connectivity at Network ports & also for terminating GP connectivity on the client ports

#### A. Design Rules for deploying Taluka Type 1/ 2 Router

- Type 1 and 2 routers shall be deployed in taluka which is a constituent member of the ring with no further requirement to support any other ring or spur connectivity

#### B. Design Rules for deploying Taluka Type 3/ 4 Router

- This type of routers shall be deployed at master taluka locations where two rings would get terminated.

### Fiber Connectivity at Site Location

- As per the network architecture, logical ring network shall be carved out by largely having uniform distance among GP in the formation of ring architecture. While deploying optical fiber for connectivity among GPs and Taluka, glassing through of fiber is required at designated site locations as per engineering design
- The glassing through methodology will depend on the number of GPs in a physical and logical ring.

Cable type	Tubes (in each cable)	Ribbons (in each tube)	Fiber (in each ribbon)	Total fiber count
96F Ribbon cable	4	4	6	$4 \times 6 \times 6 = 96$
48F Ribbon cable	4	2	6	$4 \times 2 \times 6 = 48$

Figure 25: Configuration of ribbon OF cable

Cable type	Tubes (in each cable)	Fiber (in each tube)	Total fiber count
48 ADSS	4	12	$4 \times 12 = 48$
24 ADSS	6	4	$6 \times 4 = 24$
24F Loose cable	6	4	$6 \times 4 = 24$

Figure 26: Configuration of ADSS cable

#### Example:

- Multiple logical rings can be created in a physical ring, considering total number of client ports at the Taluka router. Also, 2 fiber from different ribbon shall be reserved for monitoring purposes.

- The GP to be connected on the fiber as a logical ring should hop from taluka to 1st designated router, then to subsequent router by the count of number of logical rings (x, n+x, 2n+x, 3n+x.....). All the logical ring planned should be planned in a round robin fashion (x = 1<sup>st</sup> designated router of the logical ring, n = no. of logical ring considered)

**Note:** The logical ring should be such formed that the total consumption of fiber should leave 6 fiber pairs as spare (i.e. 12 fiber - 2 ribbons). This will lead to formation of max. 12 logical rings accommodating 5 routers each.

### Points for considerations for deploying logical ring per site

- In the 48F ribbon type cable, there are 4 buffers/tubes each having 2 ribbon of 6 fiber each.
- Since 2 fiber (1 pair) is either reserved or identified for network monitoring, the actual usable fiber per ribbon are 4 only (i.e. 2 pairs). So, this computes to a total of 16 pairs in 48F ribbon type optical fiber. (2 pairs X 2 ribbons X 4 tubes)
- For a formation of ring architecture, 1 buffer/tube consisting of 2 ribbons (12 fiber) from both east and west end route of optical fiber shall be brought in at the site location.
  - 1st and 2nd fiber of the first ribbon from east and west end of the optical fiber shall be connected to the router on network ports (i.e. two ports of the network will be utilized)
  - 5th (spare) and 6th fiber of both the ribbons from east and west end of the optical fiber shall be identified/earmarked for dark fiber monitoring of the ribbon and can be patched with each other through an indoor FDMS solution (glassing or hard patching through FDMS)
  - The leftover 6 fiber including – 3rd, 4th in ribbon 1 and 1st, 2nd, 3rd and 4th in ribbon 2 shall also be patched with each other through an indoor FDMS solution (glassing or hard patching through FDMS)
  - The remaining 3 buffers/tubes of both east and west end route of the optical fiber lying outside the site location along with the fiber patched through the indoor FDMS solution shall be fusion spliced (glass through) with each other to further progress towards the next site location.
- All the above techniques shall ensure deployment of optical fiber through all planned GP locations in a ring and dropping of relevant fiber pair from east and west end routes of the fiber would enable formation of a logical ring.
- Above all points shall also be accordingly applicable for 96F ribbon type fiber for deploying logical rings.

### Classification of types of fibre to be deployed

- For Underground
  - 96F ribbon fibre - GP Ring and Subtended Ring
  - 48F ribbon fibre - Taluka Ring
  - 24F loose type - Spur Connectivity
- For Aerial
  - 48F ADSS fibre - GP Ring, Subtended Ring and Taluka Ring
  - 24 ADSS fibre – Spur Connectivity

**Number of ribbon to be utilized for connectivity**

- 96F Ribbon type fibre

S. No.	Ring type	Tube No.	Ribbon No.
1	Taluka link	T1	R1 &R2
2	Future Use	T1	R3 & R4
3	Ring-1	T2	R5 & R6
4	Ring-2 (if any)	T2	R7 & R8
5	Ring-3 (if any)	T3	R9 & R10
6	Ring-4 (if any)	T3	R11 & R12
7	Subtended ring / O&M	T4	R13 & R14
8	Spur / O&M	T4	R15 & R16

- 48F Ribbon type fibre:

S. No.	Ring Type	Tube No.	Ribbon No.
1	Taluka ring	T1	R1 & R2
2	Spur connectivity	T2	R3 & R4
3	Future use	T3	R5 & R6
4	Future use	T4	R7 & R8

- 48F ADSS type fibre:

S. No.	Ring type	Tube No.	Fibre
1	Taluka link	T1	1F-12F
2	GP Ring	T2 and T3	13F-36F
3	Subtended/ Spur	T4	37F-42F
4	Subtended/ Spur	T4	43F-48F

## 8.2 Technical Guidelines for Underground Optical Fiber Cable laying

### 8.2.1 Trenching

- Location and Alignment of the Trench: In built up areas, the trench will normally follow the footpath of the road except where it may have to come to the edge of the carriage way cutting across road with specific permissions from the concerned authorities maintaining the road. Outside the built up limits the trench will normally follow the boundary of the roadside land. However, where the road side land is full of burrow pits or afforestation or when the cable has to cross culverts/ bridges or streams, the trench may come closer to the road edge or in some cases, over the embankment or shoulder of the Road (permissions for such deviations for cutting the embankment as well as shoulder of the road shall be obtained). The alignment of the trench will be decided by a responsible official of the MahALT (SIA).
- Once the alignment is marked, no deviation from the alignment is permissible except with the approval of MahALT (SIA). While marking the alignment only the centre line will be marked and the PIA shall set out all other work to ensure that, the excavated trench is as straight as possible. The PIA shall provide all necessary assistance and labour, at their own cost for marking the alignment. PIA shall remove all bushes, undergrowth, stumps, rocks and other obstacles to facilitate marking the centre line without any extra charges. It is to be ensured that minimum amount of bushes and shrubs shall be removed to clear the way and the PIA shall give all, consideration to the preservation of the trees.
- The line-up of the trench must be such that PLB pipe(s) shall be laid in a straight line, both laterally as well as vertically except at locations where it has to necessarily take a bend because of change in the alignment or gradient of the trench.
- The line-up of the trench must be such that PLB HDPE Ducts shall be laid in a straight line except at locations where it has to necessarily take a bend because of change in the alignment or gradient of the trench.
- In built up areas, the PIA shall resort to use of manual labour / HDD only to ensure no damage is caused to any underground or surface installations belonging to other public utility services and/or private parties. However, along the Highways and cross country there shall be no objection to the PIA resorting to mechanical means of excavation, provided that no underground installations existing the path of excavation, if any, are damaged.
- There shall be no objection to resort to horizontal boring to bore a hole of required size and to push through G.I. Pipe (50 mm ID) through horizontal bore at road crossing or rail crossing or small hillocks etc.
- All excavation operations shall include excavation and ‘getting out’. ‘Getting out’ shall include throwing the excavated materials at a distance of at least one meter or half the depth of excavation, whichever is more, clear off the edge of excavation. In all other cases ‘getting out’ shall include depositing the excavated materials.
- In Rocky strata excavation shall be carried out by use of electro mechanical means like breakers/ jack hammers or by blasting wherever permissible with express permission from the competent authority. If blasting operations are prohibited or not practicable, excavation in hard rock shall be done by chiselling/ jack hammers.
- Trenching shall as far as possible be kept ahead of the laying of pipes. PIA shall exercise due care that the soil from trenching intended to be loose for back filling is not mixed with loose debris. While trenching, the PIA should not cause damage to any underground installations belonging to other agencies and any damage caused should be made good at their own cost and expense.
- Necessary barricades, night lamps, warning board and required watchman shall be provided by the PIA to prevent any accident to pedestrians or vehicles. While carrying out the blasting operations, the PIA shall ensure adequate safety by cautioning the vehicular and other traffic. The PIA shall employ sufficient man-power for this with caution boards, flags, sign writings etc.
- The PIA should provide sufficient width at the trench at all such places, where it is likely to cave in due to soil conditions without any extra payment. A minimum free clearance of 15 cm should be maintained above or below any existing underground installation. No extra payment will be

made towards this. In order to prevent damage to PLB HDPE DUCTS over a period of time, due to the growth of trees, roots, bushes, etc., the PIA shall cut them when encountered in the path of alignment of trench without any additional charges.

- In large burrow pits, excavation may be required to be carried out for more than 140 cm in-depth to keep gradient of bed less than 15 degrees with horizontal. If not possible, alignment of trench shall be changed to avoid burrow pit completely.
- Depth and Size of the Trench: Normal trench shall be 140cm and relaxation up to 120cm wherever 140cm is not possible (which shall be validated by SIA District). However deviations due to field conditions will be required to have necessary protections in case of depth less than 120cms.
- In rocky terrain, less depth shall be allowed only in exceptional circumstances with additional protection where it is not possible to achieve the normal depth due to harsh terrain/ adverse site conditions encountered. This shall be done only with the approval of the MahalT. This shall be properly documented. In all cases, the slope of the trench shall not be less than 15 degrees with the horizontal surface. The width of the trench shall normally be 45 cm at the top & 30 cm at the bottom. However, the trench width can be optimized as per site conditions.
- In case, additional pipes (HDPE/GI/RCC Pipes) are to be laid in some stretches, the same shall be accommodated in this normal size trench.
- When trenches are excavated in slopes, uneven ground and inclined portion, the lower edge shall be treated as top surface of land and depth of trench will be measured accordingly. In certain locations, such as uneven ground, hilly areas and all other Places, due to any reason whatsoever it can be ordered to excavate beyond standard depth of 140 cm to keep the bed of the trench as smooth as possible. Near the culverts, both ends of the culverts shall be excavated more than 140 cm to keep the gradient less than 15 degree with horizontal. For additional depth in excess of 140 cm, no additional payment shall be applicable.
- If excavation is not possible to the minimum depth of 140 cm, full facts shall be brought to the notice of the MahalT in writing giving details of location and reason for not being able to excavate that particular portion to the minimum depth.
- Approval shall be granted by the MahalT in writing under genuine circumstances. The decision of the MahalT shall be final and binding on the PIA. All the relaxations granted shall be dealt with as per the laid down norms and procedure of MahalT.
- Dewatering: The PIA shall be responsible for all necessary arrangements to remove or pump out water from trench. The PIA should survey the soil conditions encountered in the section and make their own assessment about dewatering arrangement that may be necessary. No extra payment shall be admissible for this.
- Wetting: Wherever the soil is hard due to dry weather conditions, if watering is to be done for wetting the soil to make it loose, the same shall be done by the PIA. No extra payment shall be admissible for this.
- Blasting: For excavation in hard rock, where blasting operations are considered necessary, the PIA shall obtain approval of the MahalT in writing for resorting to blasting operation. The PIA shall obtain license from the MahalT for undertaking blasting work as well as for obtaining and storing the explosive as per the Explosive Act, 1884 as amended up to date and the explosive Rules, 1983. The PIA shall purchase the explosives fuses, detonators, etc. only from a licensed dealer. Transportation and storage of explosive at site shall conform to the aforesaid Explosive Act and Explosive Rules. The PIA shall be responsible for the safe custody and proper accounting of the explosive materials. Fuses and detonators shall be stored separately and away from the explosives. The MahalT or its authorized representative shall have the right to check the PIA's store and account of explosives. The PIA shall provide necessary facilities for this. The PIA shall be responsible for any damage arising out of accident to workmen, public or property due to storage, transportation and use of explosive during blasting operation. Blasting operations shall be carried out under the supervision of a responsible authorized agent of the PIA, during specified hours as approved in writing by the MahalT. The agent shall be conversant with the rules of blasting. All procedures and safety precautions for the use of explosives drilling

and loading of explosives before and after shot firing and disposal of explosives shall be taken by the PIA as detailed in IS: 4081 safety code for blasting and related drilling operation.

- Trenching Near Culverts/ Bridges: The PLB HDPE Ducts shall be laid in the bed of culvert at the depth not less than 140 cm protected by RCC pipes as decided by MahalT. Both ends of culverts shall be excavated more than 140 cm in depth to keep the gradient of not less than 15 degree with horizontal. The bed of trench should be as smooth as possible.
- While carrying out the work on bridges and culverts, adequate arrangement for cautioning the traffic by way of caution boards during day time and danger lights at night shall be provided .In case of small bridges and culverts, where there is a likelihood of their subsequent expansion and remodelling, the cable should be laid with some curve on both sides of the culvert or the bridge to make some extra length available for readjustment of the cable at the time of reconstruction of culvert or the bridge.
- In case the initiating and culminating path of a ring at taluka is same, then trenching should be done on different side of the road. In any other scenario, trenching on different side of the road should not be performed. Additionally, in case whenever there are two ducts in a trench, then those ducts have to be placed diagonally in the trench, with horizontal separation of 0.03 meters.
- If trenching is performed on either side of the road, single trench to accommodate the ducts in case of railway and national highway crossing.

### **8.2.2 Laying OF PLB HDPE Ducts**

- After the trench is excavated to the specified depth, the bottom of the trench has to be cleared of all stones or pieces of rock and levelled up properly. A layer of soft soil/or sand (in case the excavated material contains sharp pieces of rock/stones) of not less than 5 cm is required for levelling the trench to ensure that the cable when laid will follow a straight alignment. Adequate care shall be exercised while laying so that the OF cables are not put to undue tension/pressure after being laid as this may adversely affect the optical characteristics of cables with passage of time.
- The PIA shall ensure that trenching and pipe laying activities are continuous, without leaving patches or portions incomplete in between. In case intermediate patches are left, measurement of the completed portions will be taken only after work in such left over patches are also completed in all respects.
- Preparatory to aligning the pipe for jointing, each length of the PLB HDPE Ducts shall be thoroughly cleaned to remove all sand, dust or any other debris that may clog, disturb or damage the optical Fiber cable when it is pulled at a later stage. The ends of each pipe and inside of each Socket shall be thoroughly cleaned of any dirt or other foreign materials.
- After the trench is cleaned the PLB HDPE Ducts/Coil shall be laid in the cleaned trench, jointed with Sockets. Drawing up of PP rope is optional. In case of use of PP Rope, at every manhole approximately at every 200m or at bends or turns the PP rope will be tied to the HDPE end caps used for sealing the PLB HDPE Ducts, to avoid entry of rodents/mud etc.
- At the end of each day work, the open ends of the pipes sections shall be tightly closed with endcaps to prevent the entry of dirt/mud, water or any foreign matter into PLB HDPE Ducts until the work is resumed. In built up area falling within Municipal/Corporation limits, the PLB HDPE Ducts shall be laid with protection using RCC Pipes/ Concreting reinforced with weld mesh (only in exceptional cases).
- For lesser depths requiring additional protection in built up areas, towns and cities falling within the municipal limits, suitable protection shall be provided to PLB HDPE pipes/coils using RCC/DWC full round/split pipes or GI pipes or cement concreting reinforced with MS weld mesh or a combination of any of these as per the site requirement. This shall be done only with the prior instructions/approval of the MahalT.

- Moreover, in cross country routes, if depth is less than 1.2 meters, protection by using RCC/DWC Pipe shall be provided. MahalT shall decide about such stretches and type of protection to be provided in view of the site requirements. Normally 100 mm RCC /DWC Pipes shall be used for protecting PLB HDPE Ducts but if more than one PLB pipe is to be laid and protected, RCC/DWC Pipe of suitable size to accommodate the required number of PLB Pipes shall be used.
- The PLB HDPE Ducts shall be laid in RCC Full Round spun Pipes/GI Pipes as required at Road crossings. The RCC pipes/GI pipes/DWC Pipes shall extend at least 3 meters on either side of the road at Road crossings. At Road crossings, extra GI/PLB HDPE Ducts may be laid as per the direction of the MahalT. On Rail bridges and crossings, the PLB HDPE Ducts shall be encased in suitable cast iron as prescribed by the Railway Authorities.
- Wherever RCC pipes are used for protection, the gaps between the RCC collars and the RCC pipes shall be sealed using cement mortar 1:3 (1:53 grade cement of reputed brand, 3: fine sand without impurities) to bar entry of rodents. Every third collar of RCC pipes (normally of 2 meters length) and also both ends of RCC Pipes will be embedded in a concrete block of size 40 cm (L)x 40 cm(W) x 25 cm (H) of 1:2:4 cement concrete mix (1:53 grade cement of reputed brand, 2: coarse sand, 3: stone aggregate of nominal size of 20 mm ) so that the alignment of RCC pipes remain firm and intact and to avoid entry of rodents.
- Wherever GI pipes are used, special care should be taken to ensure that G.I. Pipes are coupled properly with the sockets so as to avoid damage to PLB pipe and eventually the OF Cable in the event of pressure coming on the joint and G.I. Pipe joint giving its way. Rubber bushes shall be used at either ends of the GI pipes to protect PLB pipe. Both the ends of G.I. Pipe will be embedded in a concrete block of size 40 cm (L) x 40 cm (W) x 25 cm (H) of 1:2:4 cement concrete mix (1:53 grade cement of reputed brand, 2: coarse sand, 3: stone aggregate of nominal size of 20 mm) so that the alignment of G.I. Pipes remain firm and intact and to avoid entry of rodents.
- In case of protection by concreting at site, the nominal dimension of concreting shall be 250 mm x250 mm section. Cement Concrete Mixture used shall be of 1:2:4 composition i.e. 1:53 grade Cement of a reputed company, 2: Coarse Sand, 4: Graded Coarse Stone aggregate of 20 mm nominal size, reinforced with MS weld mesh. As the RCC is cast at site, it is imperative to ensure that special care is taken to see that proper curing arrangements are made with adequate supply of water. The PIA shall invariably use mechanical mixer at site for providing RCC protection, to ensure consistency of the mix.
- For carrying out concreting work in trenches, yellow PVC sheets of width not less than 1.0 M and of weight not less than 1 kg. Per 8 sq. meters shall be spread and nailed on sides of the trench to form trapezoidal section for concreting in the cleaned trench, to avoid seepage of water into the soil.
- A bed of cement concrete mixture of appropriate width and 75 mm thickness shall be laid on the PVC sheet, before laying PLB HDPE ducts. The PLB HDPE Ducts shall then be laid above this bed of concrete. After laying the PLB HDPE Ducts, MS weld mesh is wrapped around and tied and concrete mix is poured to form the cross sectional dimensions as instructed by the MahalT.
- The strength of RCC is dependent on proper curing therefore, it is imperative that water content of RCC mix does not drain out into the surrounding soil. Portions where cement concreting has been carried out shall be cured with sufficient amount of water for reasonable time to harden the surface. After curing, refilling of the balance depth of the trench has to be carried out with excavated soil.
- The PLB HDPE Ducts/RCC/GI Pipes shall be laid only in trenches accepted by MahalT or its representative. The PIA shall exercise due care to ensure that the PLB HDPE Ducts are not subjected to any damage or strain.
- Water present in the trench at the time of laying the PLB HDPE Ducts shall be pumped out by the PIA before laying the pipes in the trench to ensure that no mud or water gets into the pipes, thus choking it.

- In case of nallahs, which are dry for nine months in a year, the PLB HDPE Ducts shall be laid inside the RCC Pipes laid at a minimum depth of 140 cm, as instructed by the MahALT. The mechanical protection shall extend at least 5 meters beyond the bed of nallah on either side.
- The MahALT may order, based on special site requirements, that the PLB HDPE Ducts may be encased in reinforced cement concrete. While laying the pipes, a gap of 2 M is kept at convenient locations approx. 200 m apart and at the bends and turns, which will be used as manholes during OF cable pulling. Ends of the PLB HDPE Ducts at the manholes shall be sealed using end caps after tying the PP rope to the end caps to avoid choking of the pipes. In a similar manner, manholes shall be kept while approaching bridges, road crossings etc., as instructed by the MahALT. The location of the manholes will be decided by the MahALT.
- Laying Protection Pipes on Bridges and Culverts: In case trenching and pipe laying is not possible on the culverts, the pipes shall be laid on the surface of the culverts/bridges after due permission from the MahALT. Of late the bridge construction authorities are providing channel ducts on the footpaths on the bridges for various services. The RCC/DWC/ G.I. Pipes can be laid in these ducts for pulling cables. However, for laying cables on existing bridges, where duct arrangement does not exist, one of the following methods may be adopted.
- In case of the Bridges/Culverts, where there are no ducts and where the cushion on the top of the Arch is 50 cm to 100 cm or more, G.I. Pipe (Carrying PLB HDPE pipe and cable) may be buried on the top of the Arch adjoining the parapet wall, by digging close to the wheel guards. Every precaution shall be taken to see that no damage occurs to the arch of the culvert. After burying the GI pipe, the excavated surface on the arch shall be restored.
- Where the thickness of the Arch is less than 50 cm, the pipe must be buried under the wheel guard masonry and the wheel guard rebuilt.
- If neither of the two methods is possible, the G.I. Pipes/GI Troughs must be clamped on the parapet wall with the clamps. If necessary, the pipes may be taken through the parapet wall at the ends where the wall diverges away from the road. Methods cited in above clauses should be carried out under close supervision of Road authorities.
- The surface to be concreted should be thoroughly cleaned and levelled before concreting. At both ends of the Bridges/Culverts, where the GI Pipes /GI Troughs slope down and get buried, the concreting should be extended sufficiently to ensure that no portion of the GI Pipes/GI Troughs is exposed as approved by the MahALT to protect the pipe/trough from any possible externally caused damage. Where white wash/colour wash is existing on the Bridges/ Culverts, the same should also be carried out on the concreted portion to ensure uniformity.
- The color of the duct should be as below:
  - Primary duct - Blue
  - Secondary duct - Orange
  - Co-build duct - Green

### **8.2.3 Back Filling and Dressing of the Trench**

- Provided that the PLB HDPE pipes have been properly laid in the trench at the specified depth, the back filling operation shall follow as early as practicable. The earth used for filling shall be free from all roots, Grass, shrubs, vegetation, trees, saplings and any other kind of garbage or pebbles. The back filling operation shall be performed in such a manner so as to provide firm support under and above the pipes and to avoid bend or deformation of the PLB HDPE pipes when the pipes get loaded with the back filled earth.
- At locations where the back filled materials contains stones/sharp objects which may cause injury to the PLB HDPE pipes and where the excavated or rock fragments are intended to refill the trench in whole or in part, the trench should be initially filled, with a layer of ordinary soil or loose earth (free from any stones/pebbles) not less than 10 cm thick over the pipes.
- Back filling on public roads, railway crossings, footpaths in city areas shall be performed immediately after laying the HDPE pipes. Back filling at such locations shall be thoroughly rammed, so as to ensure original condition so that it is safe for the road traffic. All excess soil/

material left on road/ footpath/railway crossing shall be removed by PIA. However, along the highways and in country side, the excess dug up material left over after refilling should be kept in a heap above over the trench. In city limits, at any given time not more than 50 Meters length of trench should be kept open and in all places where excavation has been done, no part of the trench should be kept open over night to avoid occurrence of any mishap or accident in darkness.

#### **8.2.4 Restoration of Road Surface**

- Road restoration work to be made with bituminous macadam for semi grouting 50 mm thick and premix carpet surfacing 25 mm thick over the grouted surface (total up to 75 mm thick) including supply of asphalt etc. to evenly match the road, including consolidation and rolling as per standard specification of DSR 1997
- Road restoration work with cement concrete 1:4:8 mix for thickness varying from 150 mm to 225 mm, including supply of concrete to be made to evenly match the road.

#### **8.2.5 Cable Pulling and Joining / Splicing**

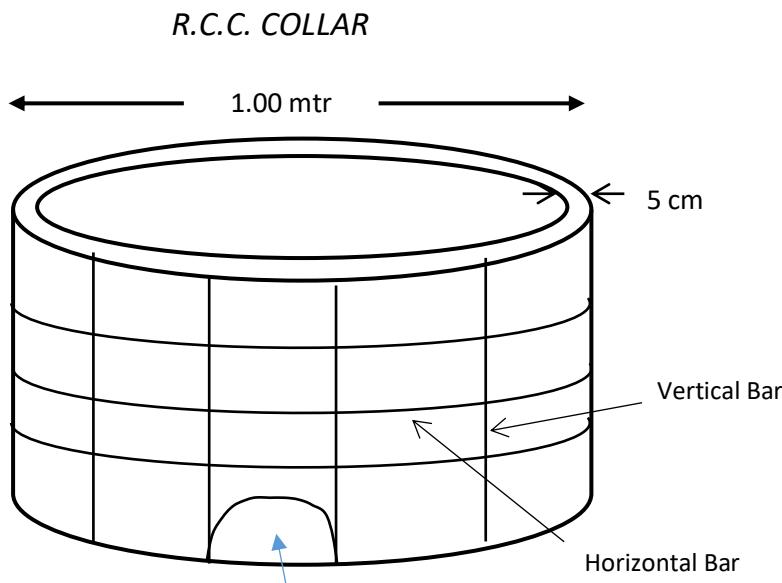
- Cable Pulling: Manholes marked during PLB HDPE Ducts pipe laying of approx. size of 2.0 m length x 1.0 m width x 1.4 m depth shall be excavated for pulling the cables. There may be situations where additional manholes are required to be excavated, for some reasons, to facilitate smooth pulling of cable. Excavation of addition manholes will be carried out, without any extra cost. De-watering of the manhole, if required, will be carried out without any extra costs. Dewatering/ Degasification of the Ducts, if required, will be carried out without any extra costs.
- The Optical Fiber cables are available in drums in lengths of approx. 2 km. The cables shall be blown / manually pulled (in exceptional cases) through already laid PLB HDPE DUCTS. This work is to be carried out under the strict supervision of site in-charge. It shall be ensured that during the blowing / pulling of Cable the tension is minimum and there is no damage to the Cable/Optical Fiber.
- After pulling of the drum is completed, both ends of the PLB HDPE DUCTS pipe in each Manhole should be sealed by hard rodent resistant rubber bush, to avoid entry of rodents/mud into PLBHDPE Ducts.
- The Manholes are prepared by providing 40 mm split PLB HDPE DUCTS pipe of 2.5 to 3m length and closing the split PLB HDPE Ducts by providing necessary clamps/ adhesive tape as per the directions of MahalT. Afterwards, the split/cut PLB HDPE DUCTS pipe are covered with 100 mm split RCC pipe of 2m length and sealing the ends of RCC pipe with lean cement solution for protecting bare cable in the manhole . After fixing of RCC Split Pipes necessary back filling/reinstatement and dressing of manholes should be carried out. The location of the pulling manhole should be recorded for preparation of documentation.
- Jointing/ Splicing: Optical Fiber Cable Joints will be at varying distances depending upon the incremental Fiber to be laid for connecting Panchayats. The 48 Fiber are to be spliced at every Joint & at both ends (Terminations) in the equipment room as directed by the MahalT. The Infrastructure required for cable splicing i.e.
  - Splicing machine
  - OTDR
  - Optical talk set
  - Toolkit etc.
- Will be arranged by the PIA and also any additional accessories. e. g. Engine etc. required at site for splicing will also be arranged by the PIA.
- The Optical Fiber Cable thus jointed end-to-end will be tested by the MahalT/TPA officer of Acceptance Testing unit of the concerned MahalT for splice losses and transmission

parameters as specified by MahalIT and prevalent at that time. The through Optical Fiber should meet all the technical parameters, specified and no relaxation will be granted.

### 8.2.6 Construction of Jointing Chamber

- The joint chambers are provided at every joint to keep the OFC joint well protected and also to keep extra length of cable, which may be, required to attend the faults at a later date. Jointing chambers are to be prepared at the Fiber Point of Interconnect (FPIO) or normally at distance of every 2 km. Actual location of jointing chamber depends on length of cable drum and appropriateness of location for carrying out jointing work. The location is finalized by MahalIT. The jointing chambers are constructed by way of fixing pre-cast RCC chambers/Brick Chambers and covers as per the instructions from MahalIT.
- Pre cast RCC chamber: For fixing pre cast RCC chamber, first a pit of size 2 m x 2 m x depth of the trench shall be required to be dug. Pre cast RCC chamber shall consist of three parts
  - round base plate of 120 cm diameter and 5 cm thickness in two halves
  - full round RCC joint chamber with diameter of 110 cm (outer), 100 cm (inner) and height of 50 cm and thickness of 5 cm
  - round top cover will be in two halves with diameter of 120 cm and thickness of 5 cm having one handle for each half in center and word 'MahalIT OFC' engraved on it. After, fixing the pre cast RCC joint chamber, the joint chamber is filled with clean sand before closing. Back filling of joint chamber pit with excavated soil shall be carried out in the end.

### R.C.C. COLLAR



#### Specifications

1. Diameter: 1 Mtr (Inner)
2. Thickness: 5 Cm
3. Height: 50 Cm
4. 6 mm Horizontal Iron Round rings 4 Nos.
5. 6 mm Vertical bar iron 12 nos.
6. 12-gauge wire to be wrapped before reinforcing the concrete.

Figure 27: RCC Chamber

- Brick Chamber: For constructing brick chamber, first a pit of size 2m x 2 m x depth of the trench depth shall be required to be dug, then, base of the chamber shall be made using concrete mix of 1:5:10 (1 cement, 5 coarse sand, 10 graded stone aggregate of 40mm nominal size) of size of 1.7m x 1.7 m and 0.15 m thickness. Wall of brick chamber should be constructed on this base having wall thickness of 9" using cement mortar mix of 1:5 (1: cement, 5: fine sand). The chamber should have internal dimensions of 1.2 m x 1.2 m and 1 m height. The bricks to be used for this purpose should be of size 9" x 4.5" x 3", best quality available and should have

smooth rectangular shape with sharp corners and shall be uniform in colour and emit clear ringing sound when struck.

- The joint chamber should be so constructed that PLB pipe ends remain protruding minimum 5 cm inside the chamber on completion of plastering. The PLB pipes should be embedded in wall in such a way that, the bottom brick should support the pipe and upper brick should be provided in a manner that PLB HDPE pipe remains free from the weight of the construction. The joint chamber should be plastered on all internal surfaces and top edges with cement mortar of 1:3 (1: cement, 3: coarse sand), 12 mm thick finished with a floating coat of complete cement as per standard. Pre-cast RCC slab with two handles to facilitate easy lifting, of size 0.7 m x 1.4 m and of thickness of 5 cm having one handle for each half in centre and word "MahalT OFC" engraved on it are to be used to cover the joint chamber. Two numbers of such slabs are required for one joint chamber. This pre-cast slab should be made of cement concrete mix of 1:2:4 (1: cement, 2: coarse sand, 4: stone aggregate 6 mm nominal size) reinforced with steel wire fabric 75 x 25 mm mesh of weight not less than 7.75 Kg per sq. Meter. The joint chamber is filled with clean sand before closing. Back filling of joint chamber pit with excavated soil shall be carried out in the end
- Fixing of Route Indicators / Joint Indicators  
Pits shall be dug 50 cm to 100 cm towards jungle side at every Manhole and Jointing chamber for fixing of Route/Joint Indicator. In addition, Route Indicators are also required to be placed where OF Cable changes directions like road crossing etc.  
The pits for fixing the indicator shall be dug for a size of 60 cm x 60 cm and 75 cm (depth). The depth at which the route/ joint indicators to be place may vary depending on the depth of the trench. The minimum depth at which indicators shall be placed should be 30 cm.
- Electronic route markers shall be places at the bottom of the trench at specified intervals.

## 8.3 Technical Guidelines for Aerial Optical Fiber laying

### 8.3.1 Tension and Suspension poles for aerial optical fiber cable

#### • Tension poles

Tension poles are dead end or termination poles. The tension poles shall have dead end fittings. The Dead end fittings offer a continuous run of the aerial optical Fiber cable. These fittings relieve the optical Fiber cable of its compressive, bending & clamping stresses. The performed dead end fittings are suitably gritted for excellent tensile holding strength. Selection of tension poles depends upon the actual site location of the route. Every fifth pole should be a tension pole in straight alignment. Splicing location poles should be tension poles or wherever alignment takes a sharp turn (more than 15 degrees) should also be a tension pole.

#### • Suspension poles

The suspension pole assembly is designed to offer cushion to aerial optical Fiber cable against the dynamic stress of Aeolian vibration at the suspension point. They also reduce static stresses at the Support point. Selection of suspension poles depends upon actual site location of route. All the intermediate poles between two tension poles will be suspension poles

### 8.3.2 Technical specifications for steel poles

- The standard poles for aerial cable installations are galvanized steel poles of the sizes 7 and 8 meters. The Steel poles shall be tubular in design and swaged and shall be as per IS 2713 / 1986 (Part- I- II). The designation of Steel Poles is 410 SP-3 (for 7 meter length) and 410 SP-13 (for 8 meter length)
- All poles supplied by the manufacturer shall be hot dipped galvanized as per IS specification (The top of the pole shall not remain open, it is to be sealed with cap)
- RCC MUFF of 300mm (ID) and 360 mm (OD) shall be provided for mounting the poles
- A lightning spike of 30 cm. shall be welded at the top of each pole
- Coil earthing shall be provided for every pole
- All other parameters shall be as per IS 2713 / 1986
- Marking on each pole shall be done as – “MahalT OFC” <year of manufacture>
- Stay arrangements are to be supplied as per requirement
- Template to be used to hold the pole vertically to avoid inclination of the pole. Below is the structural diagram of the template:

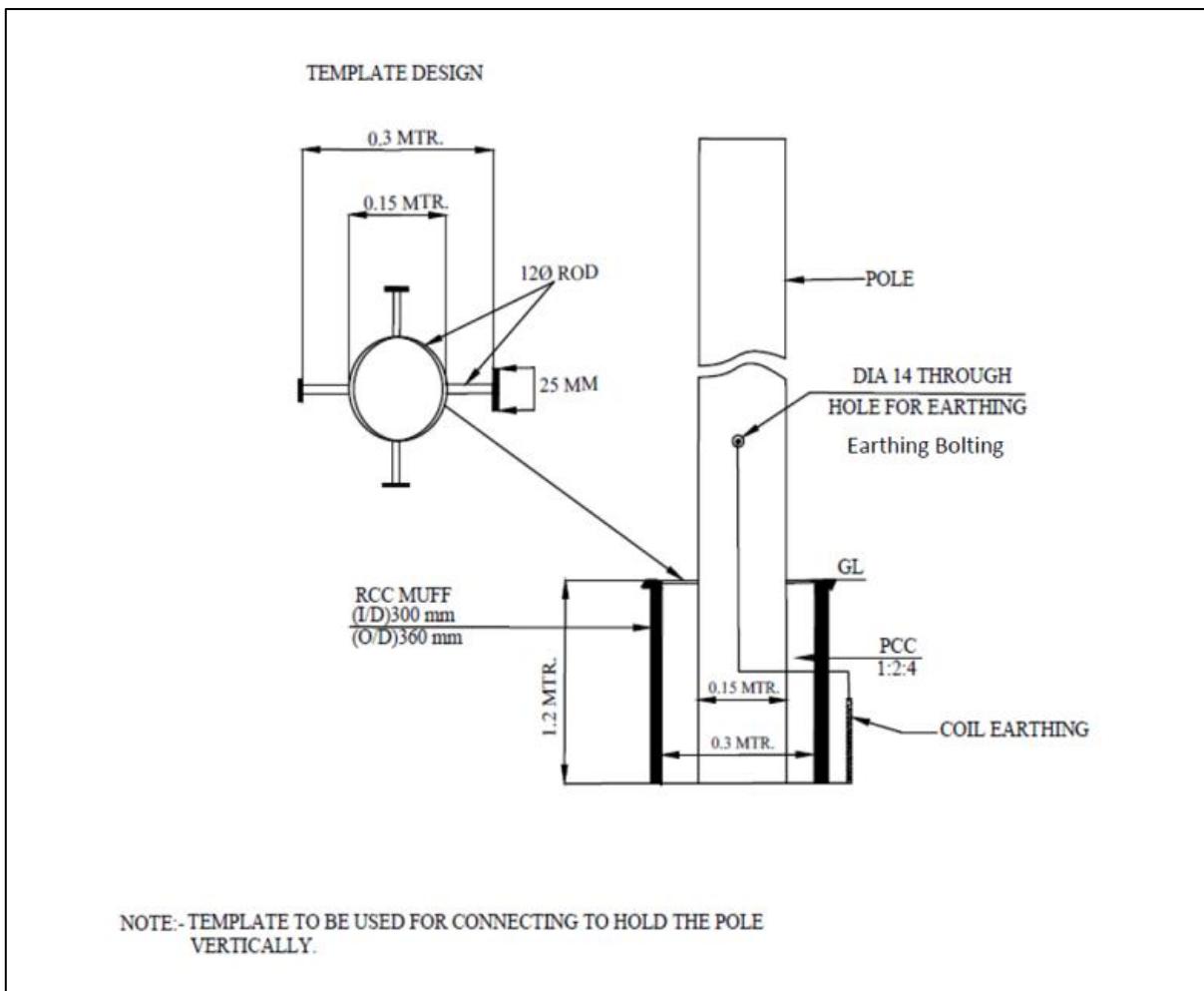


Figure 28: Structural Diagram of Template

### 8.3.3 Types of accessories and fixtures

Accessories and fixtures should be as per specifications based on TEC GR No. TEC/GR/TX/OAF/001/03 Mar 2017 Type –II.

### 8.3.4 Installation of aerial optical fiber cable:

Following are the recommended steps for installation of aerial optical fiber cable

- Install the accessories and fixtures as per the requirement of the individual poles tension and suspension fittings.
- Install the demountable pulley on all the poles in the section before pulling the cable.
- Keep the cable drum over the jack near the 1st pole at the beginning of the section.
- Attach anti-twist device and the shackle hook along with the rope to the front end of the cable on pulling eye or on the cable grip. Carry the attached rope over the demountable pulleys for pulling the cable.
- Depute one person at each pole to monitor and in case it is required to guide the cable over the demountable pulley during pulling operation.
- The cable should be pulled till the cable reaches the last pole of the section.
- Wherever in the pulling section; through pulling is difficult; half section or one fourth, action pulling method may be adopted by using figure of techniques.

- The feeding and pulling of the cable should be synchronized by using communication link. Care is required to be taken so that the cable is not accumulated at any one point during pulling operation and sharp bends are avoided.
- Once the cable reaches the other end actual tensioning of the cable and fixing the installation of the accessories and fixtures shall be taken up with the help of cable pulling winch. The pulling tension must be monitored during tensioning.
- Install the tension fittings and accessories at the 1st pole.
- Fix a flat twin open type cable grip on the cable after tension pole for tensioning the cable in the preceding tension section.
- The cable shall be tensioned to a tension of 1-3 to 1-6 times of the cable weight. The Sag shall be Monitored and kept between 0.25 to 0.5% of the span length.
- The cable should be lifted between two poles by using cable pole fork during tensioning and fixing of the cable.
- During the fixing operation the cable shall remain under required tension for minimizing the sag in the splice section.
- Now install tension fitting and accessories at the all tensioned pole at the end of the tension section.
- Install the suspension fitting and accessories on the intermediate poles in the tensioned section.
- Similarly installation should be carried out in each tension pole in the entire section and the tension and suspension fittings are installed.
- At the through tension poles the cable shall be kept loose and shall be supported by cable jumper clamp.
- At the end pole where the cable reel is kept; the cable is to be taken through GI pipe (fixed to the pole) to the splice location in case of underground splicing. Extra care for the aerial OF Cable may be taken at the bends and at entry and at the exit of the pipe. About 10 meters of cable shall be kept at the splice location for coiling (spare cable) and jointing requirement.
- The GPs to be covered in ring architecture should be planned at minimum 70% in a district. Only in exceptional cases, with prior approval from MahalIT, it can be reduced.
- The span length between 2 consecutive poles to be kept at a maximum of 80meter. The PIA has to ensure that the sag and losses are as per the specifications mentioned in TSEC, while finalizing the span length between two poles.
- Test the installed OF Cable.
- Coil the OF Cable and keep it safe in the splice location for splicing.

### **8.3.5 Joint Enclosure and Splicing:**

The ADSS cables would be required to be spliced at every joint, normally at a distance of every 2 kilometre. Splicing can be placed overhead or underground. The choice of placement of joint as overhead or underground buried would depend upon the field conditions & the decision of the executing agency based on the suitability as indicated below.

- **Overhead placement of joint:**

- The placement of joint overhead on the poles may be preferred choice of splicing in cases where power utilities are carrying out the work as most Power distribution companies may be more comfortable with aerial joint placement as compared to underground.
- The overhead joints shall be placed with proper mounting arrangements on the poles.
- Proper tool/arrangement should be made available during maintenance for overhead joints.

- **Underground buried joint:**

- Underground-buried joint is an established and field proven practice.
- This would be safer and better-suited methodology in cases where the workmanship of overhead joints may not be of desired quality and that chance of damage due to this may be higher.
- During maintenance, the handling of underground joints would be easier as compared to Aerial placement of joints.

**Features include:**

- Standard Fiber count 24 F
- Universal type i.e. suitable for all type of cable (ADSS OFC, Armored and metal free cable)
- Provide scope for straight / branch joints
- Resistant to chemicals and corrosive atmosphere.
- Easy re-entry and closing with mechanical plastic clamp.
- Shall be water and air proof.
- Ribs on the body for extra strength
- 6 Cable entry port & 1 oval port
- Suitable for cable size upto-30mm
- Mounting Bracket for erecting on pole vertically straight.
- Dome type

*Figure 29: Underground buried joint (Diagram)***Dimensions**

- Length-395mm ±5%
- Outer diameter-273mm ±5%

### **8.3.6 Splice locations**

For the cases, where field splices are to be buried underground, the cable should be brought down through a 40mm diameter GI pipe clamped on the pole. Proper bends (120-135 degree) are recommended for negotiating the bend. Wooden/hard rubber bushes shall be used at the entry and exit points of the GI pipe to avoid damage to the cable. A splice chamber as per the standard practice shall be made.

The selection of the splice point shall depend upon the availability of space and the cable length.

### **8.3.7 Entry of the optical fiber cable in the building.**

Normal methods for leading in and precautions recommended for leading-in of the optical fiber cable should be followed. A conduit pipe should be laid for leading-in the OF cable.

Inside the building, the cable may also be taken directly from the nearby overhead pole to inside of the building for termination.

## 8.4 Technical Guidelines for Microwave links including link budget engineering

### Key Principles

- In order to devise a link budget equation it is necessary to investigate all the areas where gain and losses may occur between the transmitter and the receiver
- Each link has to be analyzed with available parameters.
- It is necessary to consider antennae gain for transmit as well as receive.
- Antennae with directivity are essential to enable interference from other directions to be reduced at the receiver, and at the transmitter to focus the available transmitter power in required direction.
- A typical link budget equation for a radio communications system may look like the following:

$$P_{RX} = P_{TX} + G_{TX} + G_{RX} - L_{TX} - L_{FS} - L_P - L_{RX}$$

Where

$P_{RX}$  = Received power (dBm)

$P_{TX}$  =Transmitter output power (dBm)

$G_{TX}$  =Transmitter antenna gain (dBi)

$G_{RX}$ =Receiver antenna gain (dBi)

$L_{TX}$ =Transmit feeder and associated loss (feeder, connectors, etc.) (dB)

$L_P$  = Miscellaneous signal propagation losses (Flat fade, Frequency selective fade, Rain fade)

$L_{RX}$  =Receiver feeder and associated loss (feeder, connectors, etc.) (dB)

- **Earth bulge**

$$h = \frac{d_1 d_2}{12.75K}$$

$h$  = earth curvature (in Mts)

$d_1$  &  $d_2$  = Distance of the critical point (in KM)

- **Free space loss (Attenuation in dB)**

$$A_{dB} = 92.4 + 20 \log_{10} F_{GHz} + 20 \log_{10} D_{Kms}$$

$F$  = frequency in Ghz

$D$  = distance at which loss is measured

- **Fresnel zone**

$$F_1 = 17.3 \sqrt{\frac{d_1 d_2}{f_{GHz} D}}$$

## 9. Appendix

### 9.1 Site Nomenclature and Naming principle

- Taluka Coding Guidelines**

The Talukas have been assigned a 4-character alphabetical code. The naming convention has been mentioned in the table below

Details	District	Taluka	Taluka Site Code
Character position	1-2	3-4	-
Character Length	2	2	4
Notation	2 Alphabets	2 Alphabets	-
Example	Ahmednagar	AKOLE	-
	AH	AHAK	<b>AHAK</b>

Figure 30: Taluka Coding Principle

Note: First two alphabets are to be taken for every district, taluka and GP. However, if in a district, two or more talukas have the same first two alphabets then the second alphabet is to be chosen in a way that there are no duplicates.

- GP Coding Guidelines**

The GPs have been assigned a 10-character alphanumeric code. The naming convention has been mentioned in the table below

Details	Taluka Site Code	GP	GP Sequence No.	GP Site Code
Character position	1-4	5-6	7-10	-
Character Length	4	2	4	10
Notation	4 Alphabets	2 Alphabets	Number sequence for an entire district in 4 digit format	-
Example	Ahmednagar	AKOLE	PIMPALGAON KHAND	<b>AHAKPI0208</b>
	AHAK	PI	0208	

Figure 31: GP coding Principle

- **Taluka Router Coding Guidelines**

The Taluka Routers will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	Taluka Site Code	Router No.	Taluka Router Code
Character position	1-4	5-7	-
Character Length	4	3	7
Notation	2 Alphabets	RO + Number Sequence in 1 digit format	-
Example	AHAK	RO1	<b>AHAKRO1</b>

*Figure 32: Taluka Router coding Principle*

- **GP Router Coding Guidelines**

The GP Routers will be assigned a 13-character alphanumeric code. The naming convention has been mentioned in below table:

Details	GP Site Code	Router No.	GP Router Code
Character position	1-10	11-13	-
Character Length	10	3	13
Notation	10 Alphanumeric	RO + Number Sequence in 1 digit format	-
Example	AHAKPI0208	RO1	<b>AHAKPI0208R O1</b>

*Figure 33: GP router coding Principle*

- NOC Router Coding Guidelines**

The NOC Routers will be assigned an 8-character alphanumeric code. The naming convention has been mentioned in below table:

Details	District	NOC	Router No.	NOC Router Code
Character position	1-2	3-5	6-8	-
Character Length	2	3	3	8
Notation	2 Alphabets	3 Alphabets	RO + Number Sequence in 1 digit format	-
Example	Navi Mumbai	NOC	1	<b>NMNOCRO1</b>
	NM	NOC	RO1	

Figure 34: NOC router coding Principle

- DR NOC Router Coding Guidelines**

The DR NOC Routers will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	District	DR NOC	Router No.	DR NOC Router Code
Character position	1-2	3-4	5-7	-
Character Length	2	2	3	7
Notation	2 Alphabets	3 Alphabets	RO + Number Sequence in 1 digit format	-
Example	Nagpur	DR NOC	1	<b>NGDRRO1</b>
	NG	NGDR	RO1	

Figure 35: DR-NOC coding Principle

- SWITCH Coding Guidelines**

- NOC Switch Coding Guidelines**

The NOC Switches will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	District	NOC	Switch No.	NOC Switch Code
Character position	1-2	3-5	6-8	-
Character Length	2	3	3	8
Notation	2 Alphabets	3 Alphabets	SW + Number Sequence in 1 digit format	-
Example	Navi Mumbai	NOC	1	<b>NMNOCSW1</b>

	NM	NOC	SW1	
--	----	-----	-----	--

Figure 36: NOC switch coding Principle

- **DR NOC Switch Coding Guidelines**

The DR NOC Switches will be assigned a 6-character alphanumeric code. The naming convention has been mentioned in below table:

Details	District	DR NOC	Switch No.	DR NOC Switch Code
Character position	1-2	3-4	5-7	-
Character Length	2	2	3	7
Notation	2 Alphabets	3 Alphabets	SW + Number Sequence in 1 digit format	-
Example	Nagpur	DR NOC	1	<b>NGDRSW1</b>
	NG	NGDR	SW1	

Figure 37: DR-NOC switch coding Principle

- **Firewall Coding Guidelines**

- **Taluka Firewall Coding Guidelines**

The Taluka Firewall will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	Taluka Site Code	Firewall No.	Taluka Firewall Code
Character position	1-4	5-7	-
Character Length	4	3	7
Notation	2 Alphabets	FW + Number Sequence in 1 digit format	-
Example	AHAK	FW1	<b>AHAKFW1</b>

Figure 38: Taluka Firewall coding Principle

- **NOC Firewall Coding Guidelines**

The NOC Firewall will be assigned an 8-character alphanumeric code. The naming convention has been mentioned in below table:

Details	District	NOC	Firewall No.	NOC Firewall Code
Character position	1-2	3-5	6-8	-
Character Length	2	3	3	8

Notation	2 Alphabets	3 Alphabets	FW + Number Sequence in 1 digit format	-
Example	Navi Mumbai	NOC	1	NMNOCFW1
	NM	NOC	FW1	

Figure 39: NOC firewall coding Principle

- **DR NOC Firewall Coding Guidelines**

The DR NOC Firewall will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	District	DR NOC	Firewall No.	DR NOC Firewall Code
Character position	1-2	3-4	5-7	-
Character Length	2	2	3	7
Notation	2 Alphabets	3 Alphabets	FW + Number Sequence in 1 digit format	-
Example	Nagpur	DR NOC	1	NGDRFW1
	NG	NGDR	FW1	

Figure 40: DR-NOC firewall coding Principle

- **FDMS Coding Guidelines**

- **Taluka FDMS Coding Guidelines**

The Taluka FDMS will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	Taluka Site Code	FDMS No.	Taluka FDMS Code
Character position	1-4	5-7	-
Character Length	4	3	7
Notation	2 Alphabets	FD + Number Sequence in 1 digit format	-
Example	AHAK	FD1	AHAKFD1

Figure 416: FDMS coding Principle

- **GP FDMS Coding Guidelines**

The GP FDMS will be assigned a 13-character alphanumeric code. The naming convention has been mentioned in below table:

Details	GP Site Code	FDMS No.	GP FDMS Code
Character position	1-10	11-13	-

Character Length	10	3	13
Notation	10 Alphanumeric	FD + Number Sequence in 1 digit format	-
Example	AHAKPI0208	FD1	<b>AHAKPI0208FD1</b>

Figure 427: GP FDMS coding Principle

- **RFMS Coding Guidelines**

  - **Taluka RFMS Coding Guidelines**

The Taluka RFMS will be assigned a 7-character alphanumeric code. The naming convention has been mentioned in below table:

Details	Taluka Site Code	RFMS No.	Taluka RFMS Code
Character position	1-4	5-7	-
Character Length	4	3	7
Notation	2 Alphabets	FM + Number Sequence in 1 digit format	-
Example	AHAK	FM1	<b>AHAKFM1</b>

Figure 43: Taluka RFMS coding Principle

- **OFC Coding Guidelines**

  - **Ribbon Type Cable**

Each fiber in the ribbon will be assigned a 24-character alphanumeric code. The naming convention has been mentioned in below table:

Details	GP Site Code (Fiber originating GP)	GP code (Fiber terminating GP)	Ribbon Number	Fiber Number	Fiber Code
Character position	1-10	11-16	17-21	22-24	-
Character Length	10	6	5	3	24
Notation	10 Alphanumeric	2 Alphabets + Number Sequence in 4 digit format	48/ 96 + R + Number sequence in 2 digit	F + 12/ 34	-
Example	AHAKPI0208	RA0211	48R02	F34	<b>AHAKPI0208RA021148R02F34</b>

Figure 44: Ribbon fiber coding Principle

- **Loose Type Cable**

Each fiber in the ribbon will be assigned a 24-character alphanumeric code. The naming convention has been mentioned in below table:

Details	GP Site Code (Fiber originating GP)	GP code (Fiber terminating GP)	Ribbon Number	Fiber Number	Fiber Code
Character position	1-10	11-16	17-21	22-24	-
Character Length	10	6	5	3	24
Notation	10 Alphanumeric	2 Alphabets + Number Sequence in 4 digit format	24 + L + Number sequence in 2 digit	F + 12/34	-
Example	AHAKPI0208	RA0211	48L02	F34	<b>AHAKPI0208RA021148L02F34</b>

Figure 45: Loose type fiber coding Principle

- **Radio/ Microwave Coding Guidelines**

- **Near End Equipment**

The Radio/ Microwave equipment have been assigned a 14-character alphabetical code. The naming convention has been mentioned in the table below:

Details	GP Site Code (Radio/ Microwave originating GP)	Near End	Radio/Microwave Link Code
Character position	1-10	11-14	-
Character Length	10	4	14
Notation	10 Alphanumeric	MW + NE	-
Example	AHAKPI0208	MWNE	<b>AHAKPI0208MWNE</b>

Figure 46: Near end microwave coding Principle

- **Far End Equipment**

The Radio/ Microwave equipment have been assigned a 14-character alphabetical code. The naming convention has been mentioned in the table below:

Details	GP Site Code (Radio/ Microwave originating GP)	Far End	Radio/Microwave Link Code
Character position	1-10	11-14	-
Character Length	10	4	14
Notation	10 Alphanumeric	MW + FE	-
Example	AHAKSA0216	MWFE	<b>AHAKSA0216MWFE</b>

Figure 47: Far end microwave coding Principle

- **Taluka and GP ring coding guidelines**

The Taluka and GP ring have been assigned a 7-character alphabetical code. The naming convention has been mentioned in the table below:

- **GP ring coding**

Details	Taluka site code	Ring No.	Taluka ring code
Character position	1-4	5-7	-
Character Length	4	3	7
Notation	4 Alphanumeric	1 Alphabets + Number Sequence in 2 digit format	-
Example	AHAK	R01	AHAKR01

Figure 48: GP Ring coding Principle

- **Taluka ring coding**

Details	District site code	Ring No.	District ring code
Character position	1-4	5-7	-
Character Length	4	4	8
Notation	4 Alphanumeric	1 Alphabets + Number Sequence in 2 digit format	-
Example	AHME	TR01	AHMER01

Figure 49: Taluka Ring coding Principle

- **Link/Span coding guidelines**

The Taluka and GP Link/Span/Route have been assigned a 9-character alphabetical code. The naming convention has been mentioned in the table below:

- **GP Link/Span/Route coding**

Details	Taluka Ring code	Link No.	GP Link code
Character position	1-7	7-9	-
Character Length	7	2	9
Notation	7 Alphanumeric	Number Sequence in 2 digit format	-
Example	AHAKR01	01	Link id between Taluka and first GP will be <b>AHAKR0101</b> , between first GP and second GP will be <b>AHAKR0102</b> .

Figure 50: GP Link/Span/Route coding Principle

**Note:**

1. First two alphabets are to be taken for every district and taluka. However, if in a district, two or more talukas have the same first two alphabets then the second alphabet is to be chosen in a way that there are no duplicates.

2. Span ID for GP should be given in below priority:

- GPs in Ring
- GPs in Subtended Ring
- GPs in Spur

3. The span ID of culminating ring path connecting last GP with the Taluka should be Span ID of penultimate span + “-EX”.

Example: Span ID of penultimate span: **AHAKR0115**, in this case span ID of last span of the ring should be **AHAKR0115-EX**.

4. In case of subtended ring, span ID of the span connecting the ring with the primary ring should be span ID of previous span + “-EX”.

Example: Span ID of previous span: **AHAKR0124**, in this case span ID of span connecting subtended ring with primary ring should be: **AHAKR0124-EX**.

- **Taluka Link coding**

Details	District Ring code	Link No.	GP Link code
Character position	1-7	7-9	-
Character Length	7	2	9
Notation	7 Alphanumeric	Number Sequence in 2 digit format	-
Example	AHMER01	01	Link id between first and second Taluka will be <b>AHMER0101</b> , between second and third Taluka will be <b>AHMER0102</b> .

Figure 51: Taluka Link coding Principle

## 9.2 Standard Operation Procedure for Measurement Book.

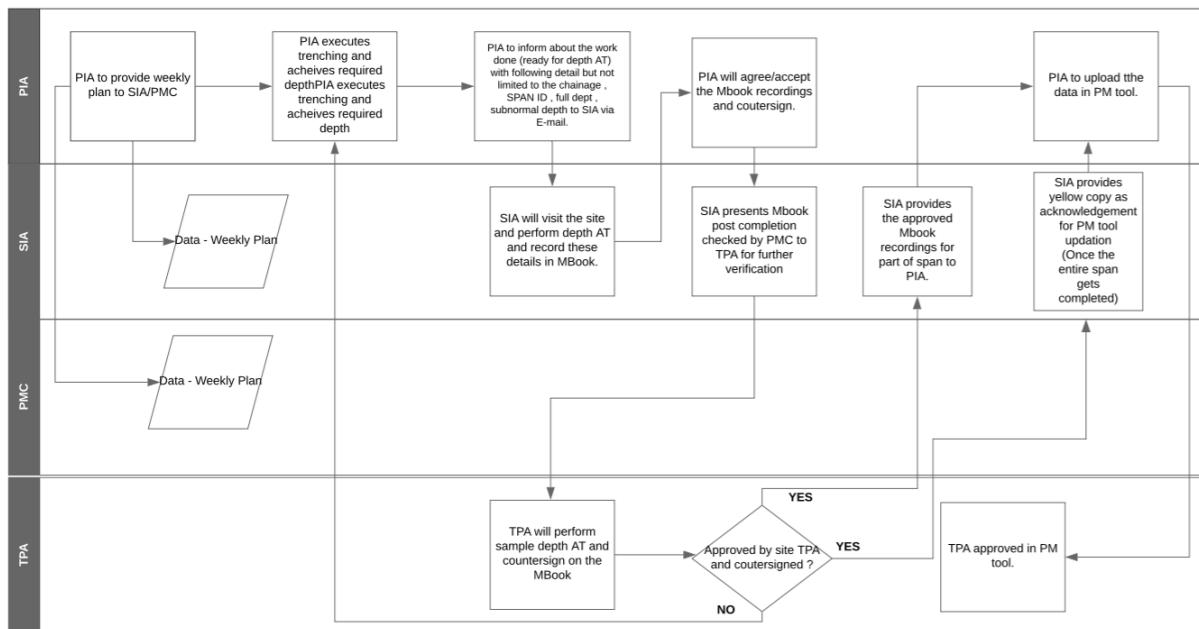


Fig 52: SOP Measurement Book

- Measurement Book coding guidelines :**

1. PIA to provide weekly plan to SIA / PMC.
2. PIA executes trenching and achieves required depth.
3. PIA to inform about the work done (ready for depth AT) with following detail but not limited to chain age , SPAN ID , full / subnormal depth to SIA via mail.
4. SIA will visit the site and perform depth AT simultaneously record these detail in Mbook.
5. PIA will agree / accept to the Mbook recordings and countersign.
6. SIA presents Mbook post completion checked by PMC to TPA for further verification.
7. TPA will perform sample depth AT and countersign on Mbook.
8. If approved by site TPA and countersigned, then SIA to provide approved Mbook recordings for part of SPAN to PIA and SIA provides yellow copy as acknowledgement for PM tool recondition.
9. Finally PIA will upload the data to PM tool and take approval from TPA.
10. Else PIA will execute trenching and achieve the required depth.

### 9.3 Right of Way (ROW)

A single window permission for Right of Way (ROW) for installation of OFC infrastructure has been provided by MahalIT for this prestigious project. (Document reference: GR GAD मातस 082/3/2018-DIR-DIT (MH) - page number 179 of this handbook).

- The ROW clearance applies to all departments and all local bodies (except forest, NHAI & Gas, where a prior approval as per the provision of law will be required) under the jurisdiction of the State Government of Maharashtra. All charges for ROW including administrative charges, administrative and other fees has been waived off.
- A 5 day prior intimation would need to be provided to the concerned local bodies / authorities before commencement of trenching work by the PIA.
- Cost for restoration of work after trenching and layout of OFC will be borne by the PIA.

Additionally, a ROW clarification has been provided by the Ministry of Railways, GOI (Document reference: 2017/LML-I/24/13 - page number 182 of this handbook).

- The ROW charges including registration charges, P&E charges, and other deposits have been exempt for the PIA in case of railway track crossings.
- The PIA will need to provide adequate prior intimation time to the relevant local railway department for seamless initiation of trenching work.
- Post route survey completion the PIA shall fill and submit the RoW application to concerned central government authority with fiber route diagram and Letter of Intent (LOI) provided by MahalIT as attachment. SIA district team will facilitate PIA in the process.

#### 9.4 In- building cable routing diagram for GP and Taluka

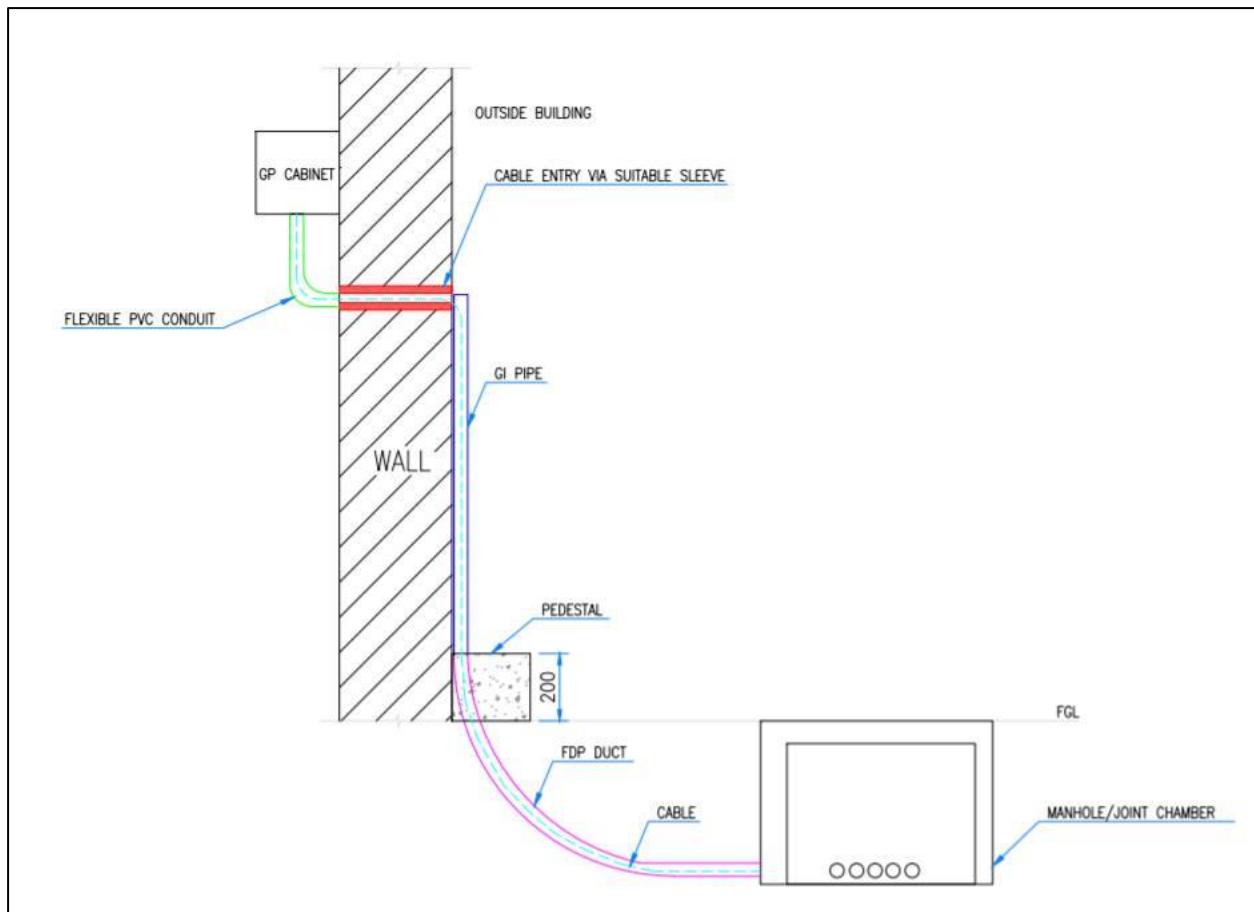


Fig 53: In-building cable routing diagram

- **In-building cable routing guidelines**

1. Underground optical fiber cable looped in manhole / joint chamber emerging from the duct reaches the ground surface level of Gram Panchayat / Taluka.
2. A cement concrete pedestal is built 200mm above the ground surface to protect the duct. Optical fiber cable is routed from duct to cabinet mounted inside GP / Taluka via GI pipe mounted on the outer wall of the GP & suitable sleeve (for building entry). Refer Fig. 53.
3. The optical fiber shall be routed at every bend with a minimum bending diameter of 20D (where D is the Cable diameter).
4. The sleeve shall be concealed with suitable substance post cable routing.
5. Optical fiber cable inside building shall be routed via flexible conduit up to the cabinet.

**Single Window clearance  
to the Right Of Way for  
BharatNet project.**

**Government of Maharashtra  
General Administrative Department**

**Government Resolution No. GAD-मात्रा 082/3/2018-DIR-DIT(MH)**

Mantralaya, Mumbai 400 032

Dated: 17/02/2018

**Read: Government Resolution no. DIT/File-03/336 dated 01/04/2006**

**Introduction:-**

The prestigious Mahanet (Bharat Net- phase 2) project is being implemented for providing high speed internet connectivity to around 13000 Gram Panchayats in the State through the State led implementation model. The project is being executed by the 100% Government owned company, Maharashtra Information Technology Corporation (MahalIT), which is the Special Purpose Vehicle (SPV) & the State Implementation Agency (SIA) for the project. MahalIT will process the tender and execute the project. The project will comprise of underground optic fibre cable (for around 70% of the Gram Panchayats) and use of the aerial route using the electricity transmission and distribution network for the remaining Gram Panchayats. Government of India has approved the Mahanet project in September 2017 at a project cost of around Rs. 2180 crore for 50,313 km of optic fibre cable. Maharashtra IT Corporation (MahalIT) has entered into a Memorandum of Understanding (MoU) with the Government of India on 9<sup>th</sup> December 2017. According to the project deadlines set by the Government of India, the project has to be completed by March 2019. MahalIT has published the RFP on 31<sup>st</sup> January, 2018 for selection of system integrators. To complete the project in given timelines, it was considered to give single window clearance to the Right of Way (ROW) approvals to the project.

**Government Resolution:-**

- (a) Mahanet project is hereby declared as a “Vital Public Purpose Project”.
- (b) Right of way permissions across the state (including underground and aerial) is being waived off for the Mahanet project. Prior intimation will be given to concern authorities five days before trenching/laying of Cable for the Mahanet Projects. This will apply for all areas under the jurisdiction of the State Government Departments (except Forest areas where prior approval under various provisions of law is necessary), urban and rural local bodies of the State & all Public Sector Undertakings of the State Government & any institution set up by an Act of the State Government.
- (c) According to the Memorandum of Understanding (MoU) signed between Department of Telecom, Govt of Maharashtra & BBNL for phase-1 of the Bharat Net project, no RoW charges were levied by the State Government as the assets created are primarily for the benefit of the local communities. Mahanet, which is phase-2 of the Bharat Net project, Right of Way (RoW) charges, administrative and other kinds of fees and charges is being waived

Government Resolution No.: GAD-मात्रा 082/3/2018-DIR-DIT(MH)

off. This will apply for all areas under the jurisdiction of the State Government Departments (except Forest areas where prior approval under various provisions of law is necessary), urban and rural local bodies of the State & all Public Sector Undertakings of the State Government & any institution set up by an Act of the State Government.

- (d) Necessary funds required for the Mahanet project will be made available by the state Government also.
- (e) MahalT or its agencies will ensure that restoration work is carried out as per extant rules after completion of trenching and laying of OFC. MahalT or its agencies will have the option of carrying out the restoration work on its own or depositing the amount for the same (as per schedule of rates of PWD or rates discovered through tendering whichever is lower) with the respective authority, which will then carry out the restoration work.
- (f) For aerial route, access to electric poles and related infrastructure of MSEDCCL, ULBs and Grampanchayats etc. is hereby allowed and can be utilized by MahalT/authorized agencies. Also, charges thereof are hereby waived. No further permissions from concerned bodies will be required to be taken.
- (g) Network termination devices and electronics equipments and other structures for the Mahanet project will be installed at Gram Panchayats, Tehsil offices and other offices/locations where DIT decides to set up Points of Presence (PoP). Further, approval be granted to access to personnel duly authorized by MahalT to the fibre termination points, equipment and structures of the Mahanet project.
- (h) Gram Panchayats, Tehsil offices and other PoP locations decided by MahalT will provide necessary space (around 400 sq. ft in Tehsil offices & 200 sq.ft in Gram Panchayat offices) free of cost for the Mahanet project within the respective office/building premises owned by them. MahalT will not be required to seek any separate permissions for the same.
- (i) Gram Panchayats, Tehsil offices and other PoP locations decided by MahalT will provide access to existing electricity connections, free of cost for the Mahanet project without insisting on separate metering. After project commissioning, MahalT should endeavor to provide separate electrical power connections to Mahanet assets. Cabinet is requested to grant approval to waive off all permissions & no-objection certificates if any that may be required for this purpose.
- (j) For State Network operating Centre (NOC) minimum 2500 Sr ft area at Navi Mumbai and for Disaster recovery minimum 1200 Sr ft area at Aurangabad/ Nagpur (Preferably in Divisional Commissioner office premises)
- (k) Administrative Departments will issue instructions to their field units in the form of a circular to strictly adhere to the above decisions of the Cabinet so that Right of Way for laying of optic

Government Resolution No.: GAD-मार्तसं082/3/2018-DIR-DIT(MH)

This Government resolution is being issued based on the approval given in the cabinet meeting dated 31.01.2018.

This Government resolution of Maharashtra Government is available at the website [www.maharashtra.gov.in](http://www.maharashtra.gov.in). Reference no. for this is 201802172020141111. This order has been signed digitally.

By order and in the name of the Governor of Maharashtra.

S V R  
Srinivas

Digitally signed by S V R Srinivas  
DN: c=IN, postalCode=400000, st=Maharashtra,  
2.5.4.30-31cd3fda97ca06a6c5a2ca7125d8ba7f  
7201a47f0e71dbf230047862bd061,  
serialNumber=914d8a9c1092ca4b44280033c7156  
0ea75920256dcdb433c181eb6d5c5fb6e63, cn=S V  
R Srinivas  
Date: 2018.02.20 15:24:28 +05'30'

( S.V.R. Srinivas )

Principal Secretary IT,  
Government of Maharashtra.

**Copy forwarded to:**

1. Secretary to the Hon'ble Governor of Maharashtra,
2. Principal Secretary to Hon'ble Chief Minister,
3. Personal Secretary to All Ministers/All Ministers of State,
4. All Hon'ble Members of Legislative Assembly/ Legislative council,
5. Additional Chief Secretary/Principal Secretary/Secretary of All Departments,
6. Personal Assistant to Chief Secretary,
7. Managing Director, MahalIT,
8. Managing Director, Mahadist,
9. Managing Director, MahaGenco,
10. All divisional Commissioner,
11. All Collectors,
12. All Chief Executive Officer, Zilla Parishad/ All Chief Officers,
13. Commissioners of All Municipal Corporations,
14. Chief Officers of all Nagar Parishad
15. Auditor, Accountant General (A & E), Maharashtra Mumbai,
16. Auditor, Accountant General (Audit), Maharashtra Mumbai,
17. Auditor, Accountant General (Audit), Maharashtra Nagpur,
18. Pay and Accounts Officer, Mumbai,
19. Select File, DIT, General Administration Department, Mantralaya.

भारत सरकार GOVERNMENT OF INDIA  
रेल मंत्रालय MINISTRY OF RAILWAYS  
(रेलवे बोर्ड RAILWAY BOARD)

\*\*\*\*

No. 2017/LML-I/24/13

New Delhi, Dt.: 28/02/2018

The General Managers  
All Zonal Railways & PUs.

The Director  
IRICEN/Pune.

The Director Generals  
RDSO/Lucknow  
NAIR/Vadodara

**Sub:** Granting of way leave facilities/easement rights/Right of Way –  
recovery of way leave charges / Right of Way Charges in  
connection with Bharat Net Project of Department of  
Telecommunication (DoT).

**Ref :** Board's policy circulars No. 97/LML-1/24/3 dated 27.11.2001  
30.07.2002 and 16.02.2008.

For the track crossing cases of Bharat Net Project of Department of Telecommunication (DoT), Government of India, there is no need to take any money for the registration as in most of the cases the same will be much more than the actual charges. When the hard copy of the application is received, the registration is shown completed. Similarly, entries against P&E charges, advice and deposition may also be shown completed. After feasibility study, the detailed estimate as per the charges mentioned in the Board's letter of even number dated 05.01.2018 & 15.02.2018 may be prepared and the BBNL may be asked to deposit the same and thereafter approval be given. As such, the present web based system for track crossing cases can be used for Bharat Net Project of Department of Telecommunications, Government of India.

  
28.02.2018  
(Shekhar Kashyap)  
Deputy Director/LML-I  
Railway Board

1. The PFAs, All Indian Railways, Production Units.
2. The Deputy controller & Auditor General of India, R. No. 224 Rail Bhawan, New Delhi.
3. Secretary, Dept. of Telecommunications, Sanchar Bhawan, 20 Ashoka Road, New Delhi-110001.
4. EDCE(P), EDCE(G), EDCE(B&S), OSD/RCIL, DIR.(TELE), TELE &F(X)-I Branches, Railway Board.
5. CP&DE, S.E.Rly (Ref: L/Genl/Way leave/674 dt. 27.02.2018)

**Page left blank intentionally**

**Issued by: -**

**MAHARASHTRA INFORMATION TECHNOLOGY CORPORATION LIMITED**

**Room No 514, 5th Floor, Annexe Building,**

**Hutatma Rajaguru Chowk, Mantralaya,**

**Mumbai City, Maharashtra, India, 400032**

**TEL: +91 22 22026534 Fax: +91 22 2815087**

**Website: www.mahait.org**

**E-mail: mahanet.mahait@maharashtra.gov.in**