HFC FIBER NETWORK DESIGN – 500 MILES RF DESIGNED DATA

A Case Study

PROJECT OVERVIEW:

The project involved the design of approximately 100 miles of fiber backbone network to support a 500-mile HFC RF network. After the RF design was completed and all optical node locations were finalized, the fiber network was designed to connect the Headend/Hub to each RF node. The objective was to develop an optimized, cost-effective, and scalable fiber backbone that minimized construction costs while providing sufficient capacity for future network expansion and node segmentation.

SCOPE OF WORK:

- Review the completed RF design and approved node locations.
- Design fiber routes from the Headend/Hub to all RF nodes.
- Select appropriate fiber cable sizes and fiber counts.
- Assign fiber strands and develop splice plans.
- Design splice closures, cabinets, and optical equipment connectivity.
- Generate construction drawings, splice documentation, and Bill of Materials (BOM).
- Perform Quality Control (QC) and Quality Assurance (QA).

DESIGN PROCESS

RF Design Review

The completed RF design was reviewed to identify all optical node locations, node IDs, service areas, and network connectivity requirements. The fiber design was developed based on the finalized RF network.

Fiber Route Planning

Fiber routes were designed from the Headend/Hub to each RF node by selecting the shortest practical route while utilizing the existing HFC infrastructure wherever possible. The routing was optimized to reduce construction costs, minimize cable lengths, and improve network reliability.

Network Optimization

The fiber backbone was engineered to provide efficient connectivity to all RF nodes while considering future node segmentation, capacity growth, and network expansion. Adequate spare fibers were reserved to accommodate future customer requirements without major network modifications.

Head Office:

Layer Informatics Pvt.Ltd.
#147/10, Sri Krishna Mansion, 4th Floor, 9th Cross, Sarakki Village, J.P Nagar, 1st Phase, Bangalore-560078.

Layer Informatics Pvt. Ltd.
Vision Through Mapping

HFC FIBER NETWORK DESIGN – 500 MILES RF DESIGNED DATA

Fiber Cable and Equipment Design

Fiber cable sizes, splice closures, cabinets, terminals, and other optical components were selected based on customer standards and network capacity requirements. Equipment locations were optimized for ease of construction, maintenance, and future scalability.

Fiber Assignment and Splice Planning

Fiber strands were assigned according to customer standards, ensuring efficient fiber utilization and sufficient spare capacity. Detailed splice plans and fiber assignments were prepared to maintain continuous connectivity from the Headend to every RF node.

Quality Control

Each completed fiber design underwent a comprehensive Quality Control review to verify:

- Fiber route optimization
- Fiber continuity from the Headend to all RF nodes
- Fiber cable sizes and fiber counts
- Fiber assignments and splice plans
- Optical loss calculations
- Equipment placement and labelling
- Compliance with customer engineering specifications
- Accuracy of construction documentation and BOM

Any identified issues were corrected before proceeding to Quality Assurance.

Quality Assurance

A final engineering review ensured the fiber design met all customer standards, network performance requirements, and project specifications. The complete design package was validated before final delivery.

HFC FIBER NETWORK DESIGN – 500 MILES RF DESIGNED DATA

DELIVERABLES:

The completed project included:

- Fiber Route Maps
- Fiber Assignment Sheets
- Splice Schematics
- Optical Loss Reports
- Construction Drawings
- Bill of Materials (BOM)
- QC and QA Reports
- Final Fiber Design Package

KEY DESIGN CONSIDERATIONS:

- Connected every RF node to the Headend through the shortest practical fiber route.
- Minimized construction costs by optimizing fiber routing and infrastructure utilization.
- Maintained optical loss within customer-specified limits.
- Optimized fiber strand utilization while reserving spare fibers for future expansion.
- Designed a scalable fiber backbone to support future node segmentation and network growth.
- Ensured compliance with customer engineering standards and construction specifications.
- Produced accurate construction documentation and engineering deliverables.

OUTCOME:

The 500-mile HFC Fiber Design project was successfully completed by designing an optimized fiber backbone connecting the Headend to all RF nodes established during the RF design phase. The final design minimized construction costs, maximized fiber utilization, and provided sufficient capacity for future network expansion. Comprehensive construction drawings, splice documentation, optical loss validation, and Bill of Materials enabled efficient construction, simplified maintenance, and ensured long-term reliability of the HFC fiber network.