BCPM Enhanced Loop Engineering

- Improved Engineering Based Upon Specific Grid Information
  - Feeder Plant
    - Feeder Routes Will Not Necessarily Run Straight North, East, South, and West
      - Main Feeder Will Run to Population Centers
      - Main Feeder May Split in Two to More Efficiently Serve the Grids
    - Subfeeder Will Be Shared Wherever Possible
      - Sharing is done in subfeeder segment that serves more than one grid with the same type of facility
        - Large or Small DLC on Fiber
        - Copper

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Main-Feeder Design
  - Main-Feeder will emanate from Central Office in a N, S, E, W direction for 10,000ft
  - After the 10,000 feet the Main-Feeder will
    - Split if the line count in the center 1/3 of the quadrant contains less than 30% of the lines (after the 10,000 ft distance from the main office)
    - The split will point 2 main-feeders out to the Population Centroid in each half of the quadrant (excluding the first 10,000ft)
    - Remain Single if the line count in the center 1/3 of the quadrant is greater than 30%.
      - This main-feeder will be pointed to the population centroid of the entire quadrant (excluding the first 10,000ft)
  - Main-Feeder will be limited in length to minimum to reach last subfeeder

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Sub-Feeder Design
  - For a single Main feeder,
    - Sub-feeder will run Vertical in East and West Quadrant, Horizontal in North and South Quadrant.
  - For a Split Main Feeder,
    - Sub-feeder will run vertical and horizontal off of main-feeder in a fishbone pattern emanating out.

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Sub-Feeder Design (cnt'd)
  - For the Main-feeder within 10,000ft of the CO,
    - Sub-feeder may run every 1/200 degree boundary.
    - Conceptually, it would run up or down the center of all the imaginary small (1/200) grids.
      - Those road centroids that fall within the 1/200 degree boundary will be served off of a shared sub-feeder.
      - If no road centroid exists, then no sub-feeder will be run.
  - Beyond the 10,000ft distance from the CO,
    - Sub-feeder will run once at most once in every 4/100 degree boundary.
    - Conceptually, it would run up and down (or horizontally) the center of all the imaginary large grids.
      - Ideally it should run up or down to minimize the distance to the grids in the 4/100 degree swatch.

Any Representation of data is for illustrative purposes only.

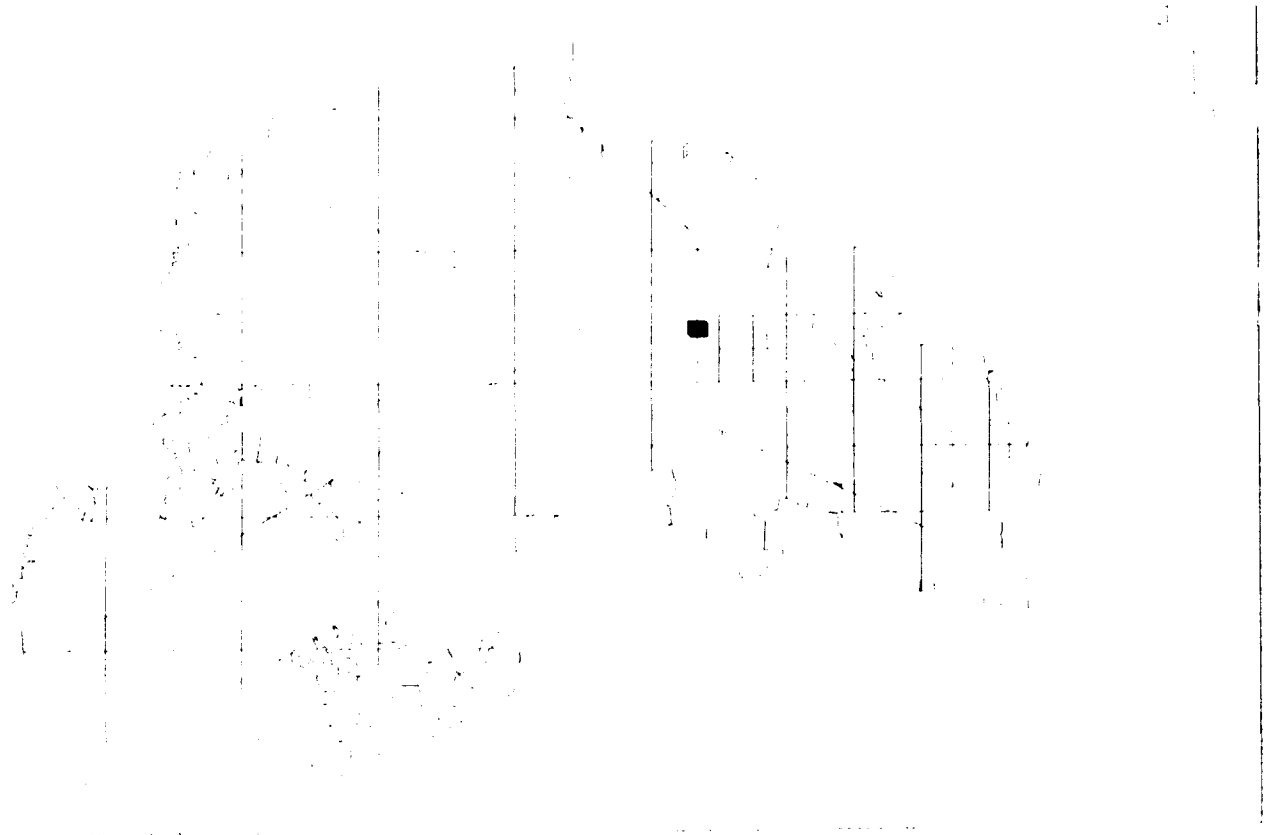
BCPM Enhanced Loop Engineering

- Sub-Feeder Design (cnt'd)
  - Part 2 Sub-feeder will run from Sub-feeder to Road Centroid of each Grid (back and forward)
  - Odds and Ends of Sub-Feeder runs
    - If the Sub-feeder run between a Grid and the previous point (adjoining grid or main-feeder) is greater than 1.5 large grid lengths, reassign the Grid to the other adjoining Grid if the distance is shorter.
    - Part or All of Connecting Cables Within a Grid Will be Feeder if FDI Moved Out From DLC Location

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Feeder Engineering Visualization



Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Feeder Plant Selection
  - Cables Are Tapered With Size Based on pairs / fibers needed for all subsidiary segments
    - Main- Feeder is Tapered at Each Main-Feeder Split or Subfeeder
    - Sub-Feeder is tapered at each Part 2 Sub-Feeder
    - Part 2 Sub-Feeder is sized for grid it serves
    - DLC to Quadrant Cables are Partly or All Feeder if FDIs are Placed Away From DLC
    - DLC to Quadrant Cables are Sized for quadrants served
      - Upper Left and Lower Left Quadrants and Upper Right and Lower Right Quadrants Will Share Left and Right Common Segments to First Divergent Point
      - Cables Beyond Split are Sized to Quadrant Requirements
      -

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Feeder Plant Selection
  - Aerial, Buried, and Underground Placement Mix Dependent on
    - Terrain
    - Density
  - Fill Factors based on Density
  - Structure Handled same was as in BCPM1.1
  - Digital Loop Carrier
    - Still using Large and Small Systems like BCPM1.1
    - Added More Cabinet Sizes to Lookup Table
    -

Any Representation of data is for illustrative purposes only.

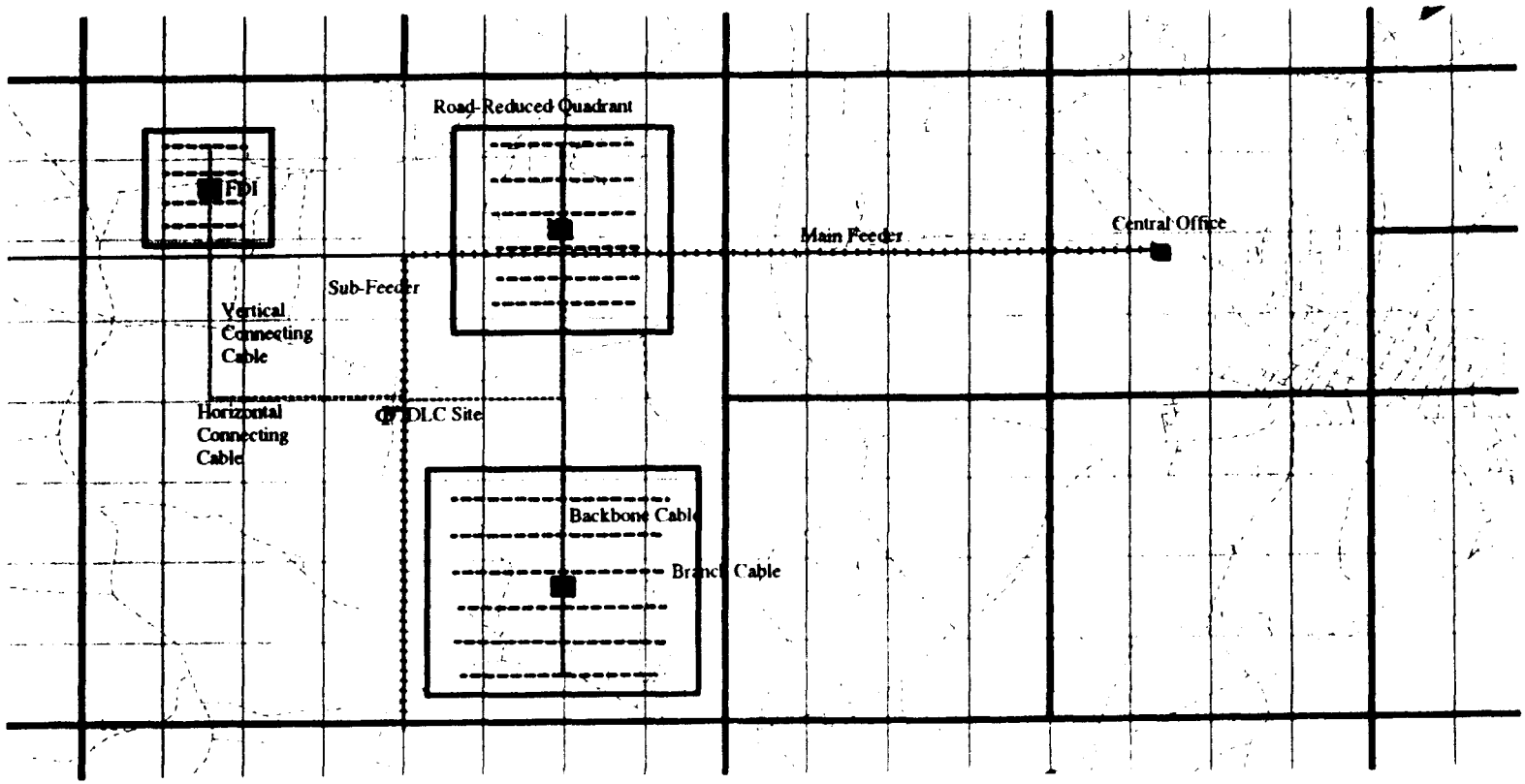
BCPM Enhanced Loop Engineering

- Feeder Plant Selection (cnt'd)
  - FDI
    - Can be at Separate Location from the DLC
    - Location Determines Whether DLC to Quadrant Cable is Feeder or Distribution
      - Plant Behind FDI is Distribution
      - Plant In Front is Feeder
    - Number of FDIs based on Grid Lines Served
      - One at DLC if <= 400 Lines in Grid
      - One at Each Left or Right Connecting Cable Split if Lines in Grid are >400 and <= 800
      - One in Each Active Quadrant if Lines in Grid are >800
      -

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Connecting Cable & Distribution Engineering Visualization



Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Improved Engineering Based Upon Specific Grid Information
  - Distribution Plant
    - Will Use Quadrant Data that Recognizes Actual
      - Dispersion / Clustering
      - Empty Areas
    - Uses a "Floating" Square in Each Quadrant
      - Size of Square Based on Road Length in Each Quadrant
      - Square is Centered on the Quadrant's Road Centroid
    - To Simplify Review and Understanding, We Have Adopted the Hatfield Naming Convention in the Distribution Area
      - Backbone and Branch Cables

BCPM Enhanced Loop Engineering

- Distribution Engineering
  - Electronics will be placed at Road Centroid of Grid
    - Should Minimize Distribution Plant
    - Sized for Total Grid Load
  - Quadrants will be created within each Grid
    - Road Reduced Clusters will be centered on Road Centroid within each quadrant
    - Backbone cable will run down center of RR Cluster
    - Branch Cables will run from Backbone to each side
    - Length of cables within each RR Cluster may be limited to a function of the Road network in the Quadrant

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Distribution Engineering (cnt'd)
  - Horizontal and Vertical Cable runs from Road Centroid of Grid to Road Centroid of RR Cluster if one FDI is Located at DLC Site
    - For Each Active Quadrant
    - Upper and Lower Right or Upper and Lower Left Shared to First Diversion Point
  - If length of Copper within Grid to Last Lot in Quadrant Exceeds 12,000 feet, 24 Gauge Cable Used in All Cables to and in Quadrant

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Distribution Plant Selection
  - Cable Sizing is Based on
    - Each Backbone Cable is Sized to Carry 1/2 of Branch Cable Pairs to FDI
    - Branches are sized to number of pairs for housing units and business locations
      - housing units times pairs per housing unit input
      - business pairs to greater of actual pairs per location or business pairs per location input
    - Number of Branches set to Every Second Lot Along Quadrant Side
  - Aerial, Buried, and Underground Placement Mix Dependent on
    - Terrain Specific to Grid
    - Density Specific to Grid

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Distribution Plant Selection (cnt'd)
  - Fill Factors based on Density
  - Structure Handled same was as in BCPM1.1
  - Terminals
    - Exterior Terminals Provided at Each Point Where Drops Connect to Branch Cables
    - Building Terminals are Placed on Each Building For Multi-Tenant Unit
    - Terminals Sized For Number of Lines Per Location to be Terminated
    - Terminal Cost Input Tables Changed to Separately Enter Cost Components Such as Material, Placing, Splicing, etc.
  -
  -

Any Representation of data is for illustrative purposes only.

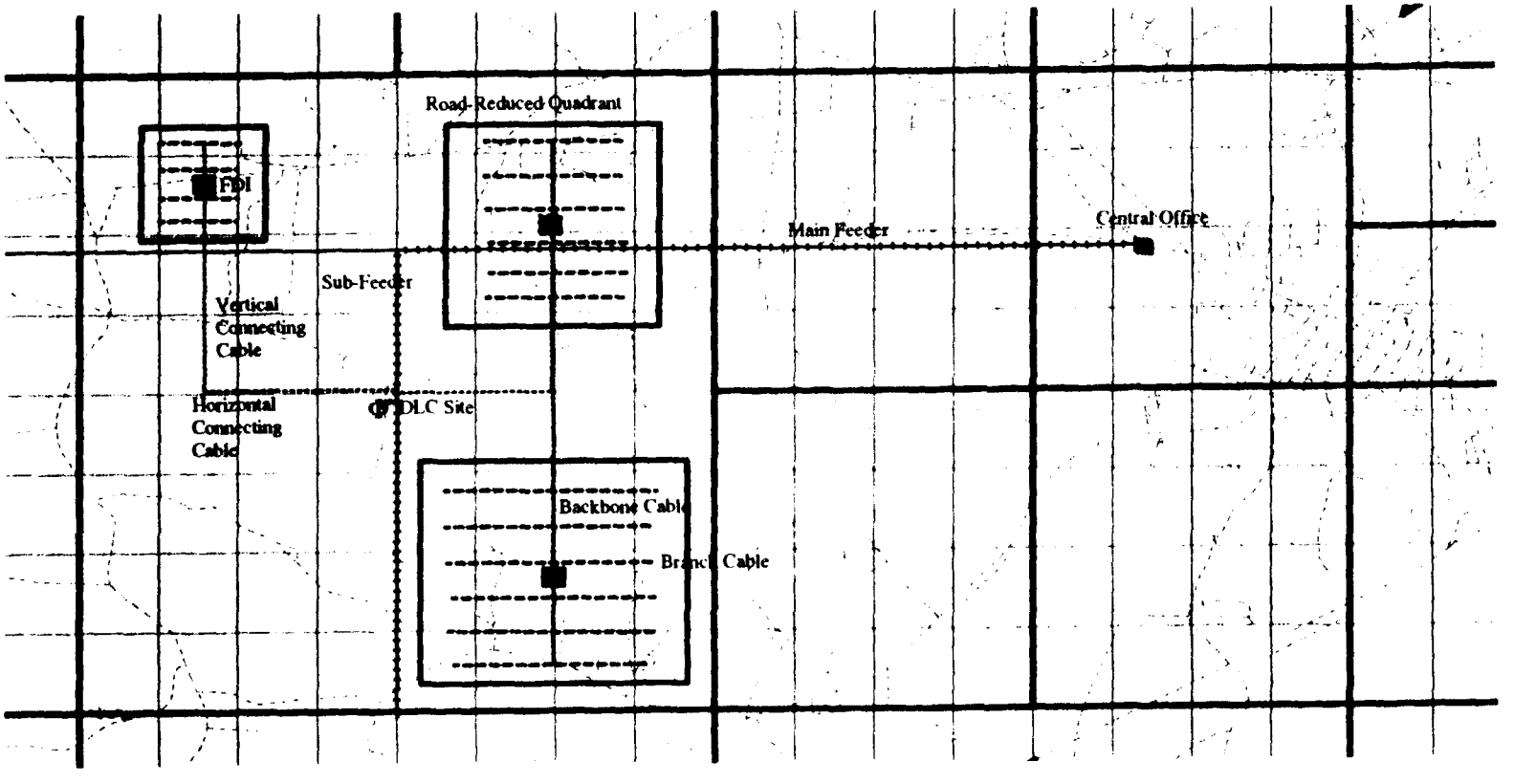
BCPM Enhanced Loop Engineering

- Distribution Plant Selection (cnt'd)
  - Drop
    - Percent Aerial and Buried Based on Distribution Mix
    - Cable Provided Where 3 or More Dwellings per Lot
    - Drop Cable Size Based on Pairs Per Housing Unit Input
    - Length from Lot Corner to Center of Lot, Capped at 500FT
  - NID
    - Separate Business and Residence Sizing and Costing
    - One Housing per Drop Terminated plus One Protector and One Interface Per Drop Pair Terminated

Any Representation of data is for illustrative purposes only.

BCPM Enhanced Loop Engineering

- Distribution Engineering Visualization



Any Representation of data is for illustrative purposes only.