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August 3, 1998



Ms. Blanca S. Bayó
Director, Records and Reporting
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: Cost of Basic Local Service -- Docket No. 980696-TP

Dear Ms. Bayó:

Enclosed for filing on behalf of MCI Telecommunications Corporation (MCI) are:

1. The original and 15 copies of the direct testimony of James W. Wells, Jr., including exhibits. 08114-98

Enclosed for joint filing on behalf of MCI and AT&T Communications of the Southern States, Inc. are:

1. The original and 15 copies of the direct testimony of Don J. Wood. 08115-98

2. The original and 15 copies of a separate bound volume containing exhibits DJW-1 to DJW-5 to the testimony of Mr. Wood.

3. One copy of Mr. Wood's Exhibit DJW-6, which is a CD-ROM containing Version 5.0a of the HAI model. At staff's request, two copies of this CD-ROM are being provided separately to Mr. Dowds.

By copy of this letter, these documents are being provided to the parties on the attached service list. If you have any questions, please call.

Very truly yours,

Richard D. Melson

RDM/mee

cc: See attached Certificate of Service
Mr. Dowds

ACK ____
AFA 2
APP ____
CAF ____
CMU Dowds
CTR ____
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SEC 1
WAS ____
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CERTIFICATE OF SERVICE

I HEREBY CERTIFY that a copy of the foregoing was furnished to the following parties by U.S. mail or Hand Delivery (*) this 3rd day of August, 1998.

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ORIGINAL

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RECORDS AND REPORTING

**BEFORE THE**

**FLORIDA PUBLIC SERVICE COMMISSION**

**DIRECT TESTIMONY OF**

**JAMES W. WELLS, JR.**

**ON BEHALF OF**

**MCI TELECOMMUNICATIONS CORPORATION**



**Docket No. 980696-TP**



**August 3, 1998**

DOCUMENT NUMBER-DATE
08114 AUG -3 98
FPSC-RECORDS/REPORTING

## I. INTRODUCTION

**Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

A. My name is James W. Wells, Jr., and my office address is 5280 Laithbank Lane, Alpharetta, GA 30022

**Q. BY WHOM AND IN WHAT CAPACITY ARE YOU EMPLOYED?**

A. I am the President of J. W. Wells, Inc. Currently, I am providing consulting expertise in Outside Plant (OSP) infrastructure planning, design and construction, including costing aspects of the local loop.

**Q. ON WHOSE BEHALF ARE YOU TESTIFYING?**

A. I am testifying on behalf of MCI Telecommunications Corporation.

## II. PURPOSE

**Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

A. The purpose of my testimony is to describe the engineering and cost aspects of telecommunications Outside Plant (OSP) and explain how they have been incorporated into the modeling methodology and input values of the local loop portion of the HAI Model, formerly known as the Hatfield Model.

My testimony is complemented by the testimony of Mr. Don Wood, which addresses the overall HAI Model. There are two attachments to Mr. Wood's testimony, which provide detailed explanations in support of my testimony:

- The HAI Model Release 5.0a Model Description (MD) and
- The HAI Model Release 5.0a Inputs Portfolio (IP).

**Q. HAVE YOU PROVIDED OTHER TESTIMONY IN THIS PROCEEDING?**

A. No.

## III. QUALIFICATIONS AND EXPERIENCE

**Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND OSP WORK EXPERIENCE.**

A. I have Bachelor of Engineering (Electrical Engineering) and Master of Business Administration degrees and certification as a Project Management Professional. I have gained OSP experience in the following assignments with:

- South Central Bell Telephone Company (now BellSouth) in Birmingham, AL: OSP Construction Foreman - 1 year, OSP Facilities Engineer - 4 years, OSP Planning Engineer - 2 years,
- Western Electric and AT&T Network Systems (now Lucent Technologies): Technical Representative for OSP Products - 5

years and District Manager - OSP Engineering and Construction - 5 years,

- AT&T Local Infrastructure and Access Management: District Manager OSP Engineering and Construction - 1 year,
- AT&T Local Services Division: District Manager Outside Plant Cost Engineering - 1 year, and
- J. W. Wells, Inc.: OSP Consultant - 1 month.

## IV. OVERVIEW OF TESTIMONY

**Q. PLEASE PROVIDE AN OVERVIEW OF YOUR TESTIMONY REGARDING THE OSP PORTION OF THE HAI MODEL.**

A. My testimony falls into two basic categories: (1) OSP modeling methodology and (2) OSP input values. In regards to the HAI Model OSP modeling methodology my testimony addresses the engineering assumptions used to ensure that the local loop network designed by the HAI Model meets OSP requirements and captures all the efficiencies available today to outside plant engineers. In particular, this testimony addresses significant enhancements incorporated into Release 5.0a of the HAI Model (HM 5.0a) and the least-cost, most-efficient loop design standards from the wire center to the customer's premise. My testimony with regard to the HAI Model OSP inputs addresses the costs of an efficient provider of telecommunications services building a network today, as well as the manner in which OSP engineers developed and validated these cost inputs.

**Q. HOW HAVE THE OSP MODEL ASSUMPTIONS AND OSP INPUT VALUES TO THE HAI MODEL BEEN DETERMINED?**

A. A team of experienced OSP Engineers utilized their collective expertise in determining the OSP assumptions and input values to the HAI Model. This HAI Model OSP Engineering Team, of which I am a member, has over 187 years of OSP experience with Incumbent Local Exchange Carriers (ILECs). A summary of our qualifications and experience is detailed in Exhibit ___ (JWW-1) attached hereto.

The OSP Engineering Team reviews the HAI Model based on information gathered, feedback from various sources and our own experiences as witnesses in support of the model. Our recommendations are passed to the HAI Model's sponsors and developers for implementation in subsequent releases. As a member of this team, I support each of the OSP modeling methodology assumptions and input values to the HAI Model.

**Q. HOW DOES AN OUTSIDE PLANT ENGINEER GAIN KNOWLEDGE AND EXPERIENCE REGARDING THE DESIGN AND COSTS OF OUTSIDE PLANT?**

A. The job of outside plant engineers is to design local loop networks and estimate their cost for approval within generally accepted outside plant engineering methods and procedures. In addition to this acquired fundamental level of OSP knowledge, the members of the HAI Model OSP Engineering Team have also developed a wealth of additional experience in areas such as planning, procurement, operations review, methods and procedures, and management of all aspects of OSP. Application of this experience is critical to determine the efficiencies available today to a local telecommunications provider, and is what separates a true least-cost, most-efficient model from an "embedded" cost proxy model that reflects outdated, inefficient ways of doing business.

## V. OSP MODELING METHODOLOGY

**Q. HOW HAS THE OSP ENGINEERING TEAM PARTICIPATED IN THE DEVELOPMENT OF THE OSP MODELING METHODOLOGY?**

A. OSP modeling entails the determination of the most appropriate methods for planning and designing the local loop and conversion of those methods into a mathematical format that can be run on a computer. In developing the OSP modeling methodology that the HAI Model uses to model the local exchange network, the OSP engineering team applied the principles set forth in paragraph 250 of the FCC's Universal Service Order along with our knowledge of and experience with local loop outside plant engineering concepts. These principles require that the OSP network design be based upon:

- the least-cost, most-efficient, reasonable technology currently available;
- existing wire center locations, wire center line counts and average loop length; and
- sound local loop transmission and design practices.

A detailed explanation of the entire HAI Model's OSP modeling methodology is included in the HAI Model Release 5.0a Model Description (MD), attached to the Direct Testimony of Mr. Wood. OSP enhancements included in the HAI Model Release 5.0a are discussed below.

**Q. WHAT ARE THE OSP IMPROVEMENTS IN RELEASE 5.0a OF THE HAI MODEL AND HOW DO THEY ENHANCE THE MODEL'S ABILITY TO CAPTURE REAL-WORLD NETWORK DESIGN EFFICIENCIES?**

A. The following significant model enhancements have been made to the OSP portion of the HAI Model in Release 5.0a:

Dynamic Aerial and Buried Structure Selection: A substantial portion of the costs of deploying outside plant facilities is the cost of placing and maintaining those facilities (as opposed to the costs of the materials themselves). Depending on terrain features, the cost, for example, of burying telephone cable (buried plant) or placing it on poles (aerial plant) may be dramatically different. OSP engineers carefully consider these differences, in light of existing technologies and demand, in designing efficient networks. For this reason, HM 5.0a automatically adjusts buried and aerial structure percentages to account for varying maintenance costs and placement costs occasioned by local Florida soil conditions and bedrock. The amount of one type of structure substituted for another depends both on differences in placement cost and on a life-cycle analysis of maintenance and capital carrying costs of the two types of structure (ref. MD 6.2.5 and IP 2.5). This enhancement (from a fixed user defined mix of plant structure by density zone) was requested by the Federal Communications Commission (FCC), and it more realistically represents the real-world decision process of an OSP Engineer.

Carrier Serving Area (CSA) Size Limitations: Optimum Carrier Serving Area size and location are key characteristics of an efficiently designed universal service network. CSAs are the geographic customer areas that are served by a single remote site of Digital Loop Carrier (DLC) equipment. OSP engineers situate CSAs to serve clusters of customers efficiently. In addition, OSP engineers size CSAs to take advantage of the capabilities of currently available DLC equipment technologies. If a model fails to design to the capabilities of currently available DLC technologies, it may deploy too much expensive DLC equipment to too many remote terminal sites and place too much feeder cable to carry telephone signals to this equipment.

The HAI Model 5.0a designs the universal service network consistent with the requirements of the most-efficient CSA design given the technologies available today. The HAI 5.0a, however, places two necessary and realistic limitations on CSA design to ensure the quality service Florida consumers expect and the FCC Order requires:

- First, there is a transmission requirement that no load coils be used in the design of the universal service network because they would inhibit advanced services utilizing digital signals. Additionally, the maximum distance over which copper cable can carry a quality analog signal without adding load coils is 18,000 feet. Therefore, HM 5.0a ensures that no point in a CSA may be more than 18,000 feet from the centroid of the main cluster, which is the location of the DLC remote terminal.

- Secondly, the number of lines served by a single CSA cannot exceed 90% utilization of the capacity of the largest currently available DLC terminal units (ref. MD 5.5.1 and 6.2).

Digital Technology to Outlying Areas on Separate Cables: One important challenge faced by OSP engineers is the task of serving small pockets of isolated customers in a cost-effective manner. HM 5.0a addresses this by connecting these "outlier clusters" (i.e., fewer than five lines) to larger "main clusters" (ref. MD 6.3.2 and IP 2.8).

Dynamic Selection of Copper-to-Fiber Crossover: OSP engineers designing networks also must make decisions concerning the use of fiber or copper cable in the feeder portion of the loop (the large "pipelines" carrying telephone signals from the switch to the distribution portion of the network). Copper cable is generally more expensive than fiber, but the electronics required when using fiber cable are also rather expensive. In general, an OSP engineer finds that after a certain distance (i.e., the copper-to-fiber crossover point), the cost of several thousand feet of copper is so high that use of fiber and electronics is the clear choice. HM 5.0a makes this decision on a cluster by cluster basis, as an OSP engineer should. If the model determines that use of copper feeder is a technically acceptable option, it then performs an analysis of the relative life-cycle costs of copper versus fiber feeder to determine which feeder technology should be used to serve the given main cluster (ref. MD 6.3.5). This dynamic selection function of the model more accurately reflects the decision process of an OSP Engineer based on the economics of serving each particular cluster.

<u>Optional Cap on Distribution Investment</u>: The HM 5.0a also incorporates an optional, user-adjustable "cap" on distribution investment per customer at the request of the Federal Communications Commission. This cap is structured to reflect the potential substitution of the most cost efficient to two types of wireless distribution technologies (point - point or broadcast) for a wireline distribution network in high cost, low customer density areas (ref. MD 6.3.4 and IP 2.11).

Other local loop models also employ such "caps" on distribution investment; however, they offer only vague references as to the alternative wireless technology. In sharp contrast, HM 5.0a provides descriptions of two alternative wireless technologies and dynamically selects the most cost efficient for each particular customer geographical area.

<u>Feeder Route Steering</u>: At the user's option, the HM 5.0a "steers" feeder routes toward the preponderant location of main clusters within a given wire center quadrant. This, too, permits HAI 5.0a to model outside plant the way an OSP engineer would. Importantly, the HAI 5.0a feeder route steering algorithm exhibits two key characteristics necessary to model accurately the

efficiencies achievable through feeder steering in the real world. First, when this steering is invoked, the user may also apply an adjustable route-to-airline distance multiplier to the amounts of cable placed along these "steered" feeder routes (ref. MD 6.3.6). Use of a route-to-airline multiplier recognizes the fact that rarely can an OSP engineer deploy cable facilities directly from point to point. Generally, an OPS engineer will follow public rights-of-way or encounter obstacles requiring detours necessitating increased route distance. Second, HM 5.0a recognizes that the true efficiencies obtainable from feeder steering occur when the main feeder is steered to minimize the distance from the main feeder to the carrier serving areas associated with that feeder, thereby minimizing the costs of expensive subfeeder connections.

Increased Costs for Placing Manholes in Water: HM 5.0a increases manhole placement costs by a user-specified amount whenever the local water table depth is less than the user-specified threshold to more accurately reflect the higher costs associated with such placements.

New Indoor NID: HM 5.0a more accurately models the indoor Network Interface Device (NID) at the customer demarcation point in high rise building environments. Previous releases of the Hatfield Model provided an outdoor interface enclosure with station protection at these locations. The model now more realistically designs station protection cost at the building entrance terminal through increased cost for the indoor Serving Area Interface (SAI) (ref. IP 2.1).

Station Protection at the Entrance of Multi-Tenant Buildings: In HM 5.0a the station protection for multi-tenant buildings is more accurately and cost-effectively modeled as multi-station protection at the building entrance terminal (i.e., indoor SAI). In previous versions of the Hatfield Model, station protection had been costed individually for each customer location in a building (ref. MD 6.3.8 and IP 2.9).

Increased Riser Cable Costs: The engineered, furnished and installed (EF&I) cost for riser cable has been increased by approximately 25% because ongoing validation efforts identified previous cost to be understated. In most states riser cables are the responsibility of the ILEC as the provider of last resort. If riser cable is not the responsibility of the ILEC, then the HAI Model will overstate loop cost in urban service environments and some loop cost adjustments may need to be applied (ref. IP 2.3.3).

Defined Clusters Instead of Census Block Groups: Knowledge of customer locations is essential to an accurate, cost-efficient design of outside plant. AT&T witness Don Wood addresses in his testimony the HM 5.0a model enhancement to customer location and the modeling of distribution plant to those locations.

## VI. OSP INPUT VALUES

**Q. WHAT ARE OSP INPUT VALUES, AND HOW ARE THEY DETERMINED?**

A. Once the OSP modeling methodology has been determined and the mathematical formulas developed, the HAI Model needs input values along with demographic data to determine local loop costs for a specific area. OSP input values include such items as material costs, labor rates, quantities, fill factors, plant mix, etc. The HM 5.0a default OSP input values have been determined by the HAI Model OSP Engineering Team based on our collective knowledge and experience and subsequent validation efforts. Descriptions of and supporting information for the OSP input values are contained in the HAI Model Release 5.0a Inputs Portfolio (IP), which is attached to the Direct Testimony of Mr. Wood. As noted above, application of engineering team expertise and judgment is critical to the formation of credible universal service cost proxy model OSP inputs.

**Q. PLEASE EXPLAIN IN MORE DETAIL HOW THE OSP ENGINEERING TEAM DETERMINED APPROPRIATE INPUT VALUES.**

A. The input values to the HAI Model were derived directly from the judgment of the OSP Engineering Team. The highly experienced members of the HAI Engineering Team gave their collective expert judgment on what they perceived to be cost effective, forward-looking costs that could be reasonably achieved, and these judgments were then used to determine the default values in the model. Each of the team members then used a variety of methods to perform their own validation of the default values.

Perhaps an analogy would best illustrate how the HAI Model Outside Plant Engineering Team considers a HM 5.0a input value or modeling assumption to be "reasonable:"

> Suppose, for example, that my wife and I decide to buy a car for our teenage daughter. Based solely on our experience and knowledge of basic requirements for safe, reliable transportation and current automobile prices, we determine that $15,000 is a reasonable amount for us to budget. Our daughter, however, says that we "just don't understand," and that $15,000 is unreasonable because "everybody else's parents are spending more for their sons' and daughters' cars."
>
> First we discuss with her and come to a clear understanding of what the basic requirements are by including anti-lock brakes and airbags and eliminating the moon roof, CD player and a few other amenities. Then we say, "Let's go look around and just see what cars that meet these requirements cost these days." We find one for $12,000, two for about $14,000, several in the range of $15,000 - $18,000 and even more in the $20,000 - $25,000 range. The average cost comes out to be $20,000. "See," she says, "you have underestimated the amount;" and furthermore, she claims that we have not included some of her really desirable cars, which are over $30,000 and would raise the aven ge amount even higher.

We say no; that we have been "reasonable" because there are indeed three cars for less than $15,000 that satisfy the requirements, and if she wants a nicer car, the extra costs will have to come out of her pocket.

This illustration is intended to show how the HM 5.0a outside plant engineering assumptions and input values have been developed and validated by the HAI OSP Engineering Team. HM 5.0a input values are generally lower than average costs because the modeling criteria are to be "least-cost." However, they are certainly not the absolute lowest cost obtainable from any source.

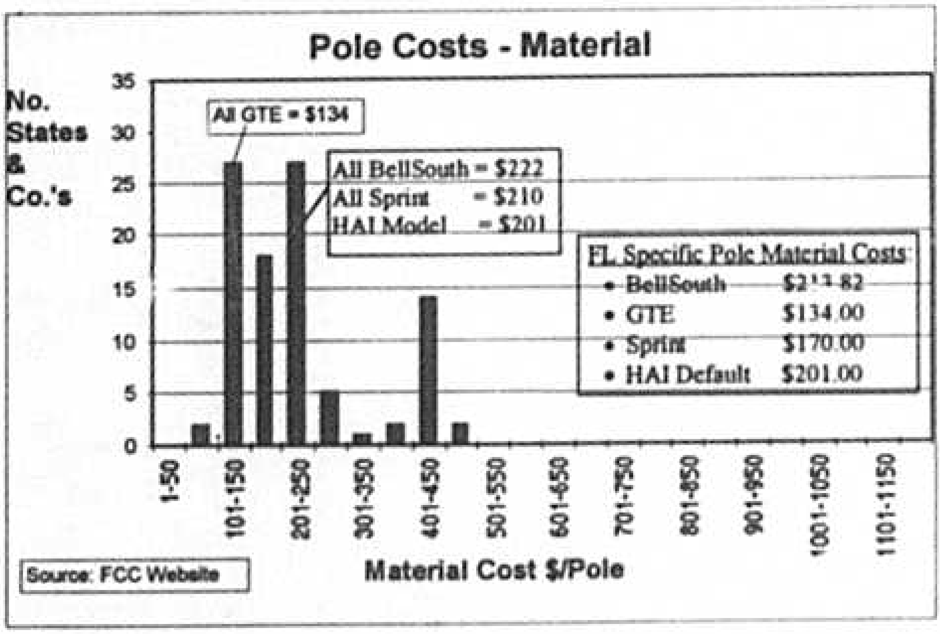
**Q. WHAT HAS BEEN DONE TO VALIDATE INPUTS AND ASSUMPTIONS PERTAINING TO THE OSP PORTION OF THE HAI MODEL?**

A. A considerable amount of validation of the OSP portion of the HAI Model has taken place, which includes the following:

- Pole costs have been validated via comparison to ILEC pole cost data gathered by the Federal Communications Commission (FCC).
- Other input values have been validated by contacting a variety of material vendors and contractors of OSP services.
- Assumptions and input values have been compared to those of the ILECs by members of the OSP Engineering Team who have been permitted to review proprietary ILEC cost data.

**Q. HOW WAS FCC DATA USED TO VALIDATE THE INPUT VALUES FOR POLE COSTS IN THE HAI MODEL?**

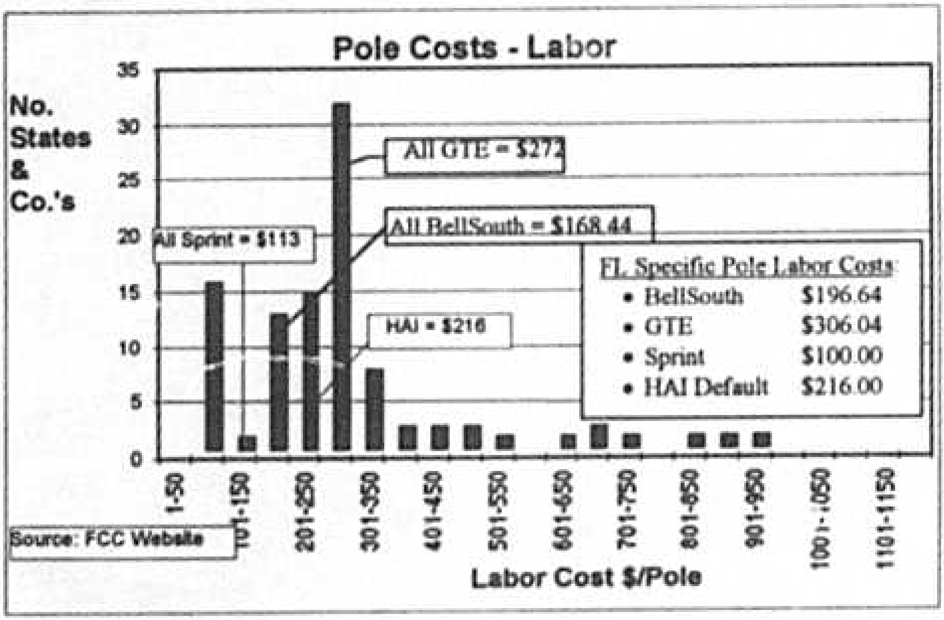
A. ILEC pole cost data was obtained from the FCC's Internet Site (http://www.fcc.gov/Bureaus/Common_Carrier/Comments/da971433_data_request/datareq.html). In August 1997, the FCC issued a data request regarding pole costs to the major telephone companies. Part of the information provided in response to that data request was the material and installation cost of a 40-foot Class 4 Pole, which is included as Exhibit ___ (JWW-2) to this testimony. A histogram appears below for pole material costs.



This information validates that the default pole material cost employed by the HAI Model is indeed reasonable for Florida because it falls within the range of the costs of the three ILECs. A more thorough review of the data reveals that the costs within an individual company can vary significantly.

**Q. WHAT DOES THE FCC DATA REVEAL ABOUT POLE LABOR COSTS?**

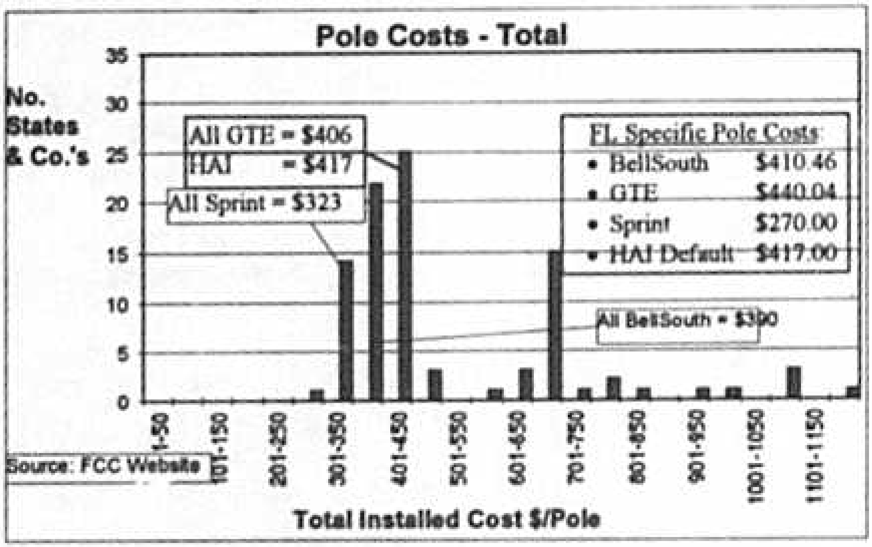
A. Compared to the results observed for pole material costs, there is an even wider range in values for pole labor costs. There is no clear productivity advantage shown by larger companies, and geographical differences do not correlate with the large variation. The following histogram illustrates labor productivity.



This information validates that the default pole labor cost employed by the HAI Model is reasonable for Florida because it once again falls within the range of values for the three ILECs.

**Q. WHAT DO THE INSTALLED TOTALS OF MATERIAL PLUS LABOR REVEAL?**

A. Once again, the data reveal a very wide range of ILEC costs and confirm that the default input value for installed pole cost employed by the HAI Model is valid for Florida, as illustrated below:




**Q. IN YOUR OPINION, WHAT SHOULD BE DONE WITH REGARD TO THE WIDE RANGE IN ILEC COSTS FOR THE INPUT VALUES TO LOCAL LOOP COST MODELS?**

A. The relevant criterion for these cost models is "least-cost." Therefore, cost modelers should employ a very common approach used in business -

especially large business - called "best in class" analysis, which essentially says that an organization should review performance data, and set a reasonable benchmark based on "best in class." For example, if Sprint has the lowest forward looking pole costs, then other companies should review Sprint's methods and procedures to emulate them, and even better them. The data show that the best price quoted in response to the FCC data request on pole costs was $270 for a 40 foot Class 4 pole by Sprint-Florida, while the highest was $1,161 for a 40 foot Class 4 pole by Bell Atlantic-Massachusetts. This rather astoundingly shows the potential for cost improvement and the fallacy of simply accepting ILEC cost data from their embedded network.

**Q. HOW DOES THIS RELATE TO THE DEFAULT VALUES FOR POLES IN THE HAI MODEL?**

A. Instead of using average costs, the HAI Model OSP Engineering Team has reviewed ranges of costs and recommended default values that can reasonably be expected to be realized by a cost efficient telephone company on a large project basis. The wide variance in pole values demonstrates that it is inappropriate and inaccurate to use average cost information in order to develop a least-cost, most-efficient model. The HAI Model approach produces accurate results from a least-cost, most-efficient perspective. The default values recommended in the HAI Model are not the lowest costs available, but are deemed readily achievable in practice.

**Q. HOW CAN THE USE OF HAI MODEL NATIONAL DEFAULT OSP INPUT VALUES PRODUCE RESULTS APPROPRIATE FOR FLORIDA?**

A. The way that the HAI Model utilizes the national default OSP input values produces results that are very specific to Florida at the customer geographic level for the following reasons:

- First of all, the labor content of the national default value is adjusted by a factor of .68 to reflect appropriate labor costs adjusted for Florida (ref. IP 7.0).
- Secondly, structure costs are increased as appropriate to account for the terrain characteristics of each Census Block Group in Florida.
- Next, the customer location and clustering methodologies of the HAI Model determine cable lengths and sizes specific to customers in Florida.
- Fourth, the dynamic selection algorithms of the HM 5.0a exercise sound OSP Engineering judgment in selecting copper versus fiber feeder and aerial versus buried structure.
- And finally, no one seriously could argue that material costs in today's economy are unique to a specific state, region of a state or company. All companies today buy nationally, if not internationally. Therefore, material prices clearly are national in scope.

**Q. DID THE HAI MODEL OUTSIDE PLANT ENGINEERING TEAM ALWAYS USE THE LOWEST DEFAULT INPUT VALUES?**

A. Absolutely not. Some have wrongly accused the HAI Model OSP Engineering Team of using unrealistically low default input investment costs, but that is just not the case. The proof of the reasonableness of the team's judgment is evident by looking at the validation numbers obtained by Mr. Dean Fassett, a member of the team, who contacted a number of suppliers and contractors. The information obtained by Mr. Fassett is summarized in Exhibit ___ (JWW-3) and is also displayed in the HAI Model Release 5.0a Inputs Portfolio (IP), attached to the testimony of Mr. Wood, in the form of bar charts that show the range of values obtained in Mr. Fassett's validation efforts. As the following information shows, of the 30 charted ranges of validation values in the HAI Inputs Portfolio binder, 28, or 93% of the default values recommended by the Engineering Team for the HAI Model, are not the lowest validation number obtained. In fact, the default values in the model average 81% higher than the lowest validation numbers. Any statement that the HAI Model OSP Engineering Team routinely took the lowest number is simply contrary to the evidence.

## HAI Model OSP Input Values Validation Numbers

| | Item | High | Low | Default | % High to Low | |
|---|---|---|---|---|---|---|
| 1 | Residential NID Without Protector | $11.90 | $6.85 | $10.00 | 46% | |
| 2 | NID Protector Block per Line | $4.80 | $3.05 | $4.00 | 31% | |
| 3 | Business NID (6 Pair) without Protector | $28.65 | $23.44 | $25.00 | 7% | |
| 4 | Business NID Protector Block per Line | $4.80 | $3.05 | $4.00 | 31% | |
| 5 | Rural Buried Drop Excavation/ft. | $1.75 | $0.55 | $0.60 | 9% | |
| 6 | Suburban Buried Drop Excavation/ft. | $2.10 | $0.63 | $0.75 | 19% | |
| 7 | Aerial Strand Mounted Block Terminal | $72.15 | $58.55 | $60.00 | 2% | |
| 8 | Buried Pedestal Block Terminal * | $93.00 | $39.61 | $90.00 | 127% | |
| 9 | 2 Pair Aerial Drop Wire Material/ft. | $0.113 | $0.095 | $0.095 | 0% | ← |
| 10 | 3 Pair Buried Drop Wire Material/ft. | $0.197 | $0.140 | $0.140 | 0% | ← |
| 11 | Pole Material, 40 ft. Class 4 * | $402 | $134 | $201 | 50% | |
| 12 | Pole Labor: Rural * | $902 | $150 | $216 | 44% | |
| 13 | Pole Labor: Suburban * | $902 | $170 | $216 | 27% | |
| 14 | Pole Investment: Total * | $1161 | $170 | $417 | 145% | |
| 15 | Duct Material/ft. | $0.648 | $0.515 | $0.600 | 17% | |
| 16 | Rock Saw / Trenching Ratio * | 4.6 | 1.3 | 3.5 | 169% | |
| 17 | Manhole Material * | $4,720 | $1,700 | $2,340 | 38% | |
| 18 | MH Excavation/Backfill: Rural | $4,000 | $850 | $2,800 | 229% | |
| 19 | MH Excavation/Backfill: Suburban | $4,500 | $1,250 | $3,500 | 180% | |
| 20 | MH Excavation/Backfill: Metro | $8,500 | $1,700 | $5,000 | 194% | |
| 21 | Normal Trench/ft. with Backfill: Rural: 24" depth* | $5.0a0 | $2.00 | $2.89 | 45% | |
| 22 | Normal Trench/ft. with Backfill: Rural 36" depth * | $6.00 | $1.50 | $2.89 | 45% | |
| 23 | Normal Trench/ft. with Backfill: Suburban: 24" depth * | $11.00 | $2.40 | $3.35 | 40% | |
| 24 | Normal Trench/ft. with Backfill: Suburban: 36" depth * | $15.0a0 | $2.00 | $3.35 | 75% | |
| 25 | Trench/ft. in Pavement w/ Restoral: Metro: 24" depth* | $60.00 | $7.50 | $31.22 | 316% | |
| 26 | Trench/ft. in Pavement w/ Restoral: Metro: 36" depth* | $63.00 | $7.40 | $31.22 | 322% | |
| 27 | Plow Cable/ft.: Rural: 24" depth * | $1.50 | $0.40 | $0.80 | 100% | |
| 28 | Plow Cable/ft.: Rural: 36" depth * | $2.00 | $0.50 | $0.80 | 60% | |
| 29 | Plow Cable/ft.: Suburban: 24" depth * | $3.50 | $0.85 | $1.20 | 41% | |
| 30 | Plow Cable/ft.: Suburban: 36" depth * | $4.00 | $0.90 | $1.20 | 33% | |
| | ***Average % above lowest quote (# at lowest of 30 items)*** | | | | ***81%*** | *(2)* |

**Q. WHAT IS THE PURPOSE OF VALIDATION AS USED BY THE HAI MODEL OSP ENGINEERING TEAM?**

A. The primary reasons for validation by the HAI Engineering Team are to determine that the input values are reasonable and to continually review and improve the model.

**Q. DID THE HAI MODEL OSP ENGINEERING TEAM FIND ANY SIGNIFICANT FLAWS AS A RESULT OF ITS VALIDATION EFFORTS?**

A. No. In several cases we found that some of our assumptions used in the past were too conservative. For example, in the past, we used the common planning assumption that the installed cost of copper cable is a linear "a + bx" type of straight line. After examining a variety of validation values and listening to concerns that the model produced high costs for larger cables, the OSP Engineering team members came to realize that it did not take 42 times as long to engineer a 4200 pair cable than to engineer a 100 pair cable. Therefore, appropriate changes were made.

**Q. DID EACH MEMBER OF THE HAI MODEL OSP ENGINEERING TEAM PARTICIPATE IN THE VALIDATION PROCESS, AND DID THEY EACH DO IT THE SAME WAY?**

A. Yes, each member participated, but not in the same way. It is significant to note the depth and breadth of experience and knowledge of the members of this team as detailed in Exhibit ___ (JWW-1). Each member of the team used different approaches to validate the HAI Model OSP methodology, assumptions and input values.

Mr. Fassett took the lead since he had a large number of successful contacts with vendors and contractors. The information he obtained is extensive, and is reproduced in Exhibit ___ (JWW-3).

Among his many areas of OSP expertise, Mr. Riolo is eminently qualified to address the pricing of poles and cable. For eight years he was responsible for purchasing all poles and all outside plant cable for the New York Telephone Company.

Mr. Donovan has attended trade shows, questioned exhibitors, and called vendors for detailed price and technical information. In addition, Mr. Donovan has a wide range of experience that includes negotiating contracts for millions of dollars worth of contract labor, including excavation, pole placing, electronic equipment installation, cable placing, and splicing. He is eminently qualified to address electronic costs. In his last ILEC employment, he was responsible for purchasing over one million dollars per day in electronic equipment for the entire NYNEX Company. Other work included the design of construction job pricing methods and procedures.

Besides an extensive outside plant career in Bell Canada, after retiring as a General Manager, Mr. Carter did detailed engineering design of Digital Loop Carrier Systems for a major RBOC. He has exceptional depth of knowledge in detailed engineering aspects of IDLC as used in the HAI Model. He has validated prices in the HAI Model based on his recent experience, and has contacted a number of vendors to obtain detailed technical and costing information that confirms the default values in the model.

I have had a variety of OSP experiences with BellSouth and AT&T and have extensively reviewed ILEC modeling methodology, assumptions and input values in fourteen USF and UNE dockets as detailed in Exhibit ___ (JWW-4). My contribution to the validation effort involved the detailed design of ten Census Block Groups in Georgia to validate the accuracy of the distribution plant design for Hatfield Model Releases 3.1 and 4.0.

Perhaps the most credible form of validation has been the numerous comparisons of HAI OSP input values to those of the ILECs. The members of the HAI OSP Engineering Team have been witnesses in approximately fifty USF and UNE hearings in the past two years. We have seen (under non-disclosure agreements) literally thousands of ILEC OSP input values, often from two or more ILECs in the same docket. Comparisons have consistently shown the HAI Model input values to be "reasonable."

The discussion above is intended to highlight the fact that there are many ways to validate expert opinion. The HAI Model OSP Engineering Team has done a more thorough job than any other model proponent in documenting assumptions and validating input values against least-cost benchmarks based on currently available technology.

## VII. CONCLUSION

**Q. HOW WOULD YOU SUMMARIZE YOUR TESTIMONY CONCERNING HAI's COST MODELING OF OUTSIDE PLANT FOR THE LOCAL LOOP?**

A. The HAI Model Release 5.0a correctly employs outside plant design methodology, assumptions and input values that reflect how an outside plant engineer should design a local loop network employing the following FCC criteria:

- a network based upon least-cost, most-efficient, reasonable technology that is currently being deployed,
- existing wire center locations, wire center line counts and average loop length, and
- local loop network transmission standards and design practices.

Therefore, I recommend the Florida Public Service Commission adopt the HAI Model Release 5.0a as the appropriate local loop cost basis for determining Universal Service Funding.

**Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes.

HAI MODEL OUTSIDE PLANT ENGINEERING TEAM

**MEMBERS:**

Carter, Ernest M., Protocol Telecommunications Services, 104 Westwick Court, No. 4, Sterling, VA 20165

Donovan, John C., President of Telecom Visions, Inc., 11 Osborne Road, Garden City, NY 11530

Fassett, Dean R., Owner of Adirondack Telecom Associates, 141 Juniper Drive, Ballston Spa, NY 12020

Madden, Thomas C., Manager-OSP Cost Engineering, AT&T Local Services Division, 131 Morristown Rd, Basking Ridge, NJ, 07920

Riolo, Joseph P., Telecommunications Consultant, 102 Roosevelt Drive, East Norwich, New York 11732

Wells, James W., Jr., President of J. W. Wells, Inc., 5280 Laithbank Lane, Alpharetta, GA 30022

**QUALIFICATIONS AND EXPERIENCES:**

| HAI Team Member | EMC | JCD | DRF | TCM | JPR | JWW | Total |
|---|---|---|---|---|---|---|---|
| Telecom Experience (Yr) | 34 | 30 | 26 | 42 | 30 | 25 | 187 |
| OSP Experience (Yr) | 24 | 25 | 26 | 40 | 30 | 18 | 163 |
| Local Exchange Carrier Background | Bell Canada | Nynex | Nynex & ICO | Bell-Atlantic | Nynex | Bell-South | 5 |
| Entry Level | OSP Engr. | OSP Fld Mgr | OSP Craft | OSP Craft | OSP Craft | OSP Supvr. | OSP Craft |
| Retirement Level | Gen. Mgr. | Gen. Mgr. | Oper. Mgr. | Design Ctr Mgr | Director | | Gen. Mgr. |
| Post Secondary Education Degrees | BSEE | BSEM MBA | | | BSEE | BEEE MBA | 6 |
| Member of Team Since | 1/97 | 5/96 | 10/96 | 10/97 | 10/96 | 2/97 | 5/96 |

**AREAS OF OUTSIDE PLANT SUBJECT MATTER EXPERTISE INCLUDE:**

| | | | |
|---|---|---|---|
| Long Range Planning | Methods and Procedures | Repair Strategy | Capital Budgets |
| Current Planning | OSP Product Specification | OSP Construction | Expense Budget |
| Network Design | Installation and Repair | Digital Loop Carrier | Project Management |
| OSP Engineering | Fiber Optic Electronics | Procurement | Operational Reviews |
| Transmission | Facilities Assignment | Material Logistics | Fiber Optic Cable |
| Electrical Protection | Cable Entrance Facilities | OSP Records | OSP Maintenance |
| Conduit | Premise Distribution | Records Digitization | OSP Engr Economics |
| Pole Lines | Copper Cable and Wire | OSP Cost Modeling | Right-of-Way |
| Aerial Plant | Interoffice Trunking | Urban Outside Plant | International OSP |
| Buried Plant | Main Distributing Frame | Suburban OSP | |
| Underground Plant | Building Industry Consult | Rural Outside Plant | |

| Company | State | Matl | Labor | Total |
|---|---|---|---|---|
| Ameritec | IL | $193.91 | $372.36 | $566.27 |
| Ameritec | IN | $189.47 | $456.12 | $645.59 |
| Ameritec | MI | $191.48 | $447.21 | $638.69 |
| Ameritec | OH | $180.16 | $633.59 | $813.75 |
| Ameritec | WI | $191.93 | $485.02 | $676.95 |
| Bell Atlantic | DC | $190.00 | $250.00 | $440.00 |
| Bell Atlantic | DE | $190.00 | $250.00 | $440.00 |
| Bell Atlantic | MA | $259.00 | $902.00 | $1,161.00 |
| Bell Atlantic | MD | $190.00 | $250.00 | $440.00 |
| Bell Atlantic | ME | $259.00 | $692.00 | $951.00 |
| Bell Atlantic | NH | $209.00 | $860.00 | $1,069.00 |
| Bell Atlantic | NJ | $190.00 | $250.00 | $440.00 |
| Bell Atlantic | NY | $269.00 | $658.00 | $927.00 |
| Bell Atlantic | PA | $190.00 | $250.00 | $440.00 |
| Bell Atlantic | RI | $228.00 | $544.00 | $772.00 |
| Bell Atlantic | VA | $190.00 | $250.00 | $440.00 |
| Bell Atlantic | VT | $238.00 | $837.00 | $1,075.00 |
| Bell Atlantic | WV | $190.00 | $250.00 | $440.00 |
| BellSouth | AL | $254.75 | $160.61 | $415.36 |
| BellSouth | FL | $213.82 | $196.64 | $410.46 |
| BellSouth | GA | $210.05 | $176.92 | $386.97 |
| BellSouth | KY | $247.82 | $172.31 | $420.13 |
| BellSouth | LA | $204.35 | $154.18 | $358.53 |
| BellSouth | MS | $209.56 | $146.05 | $355.61 |
| BellSouth | NC | $211.10 | $165.36 | $376.46 |
| BellSouth | SC | $233.68 | $151.76 | $385.44 |
| BellSouth | TN | $212.73 | $192.10 | $404.83 |
| GTE | AL | $134.00 | $251.21 | $385.21 |
| GTE | AR | $134.00 | $259.66 | $393.66 |
| GTE | AZ | $134.00 | $312.73 | $446.73 |
| GTE | CA | $134.00 | $312.73 | $446.73 |
| GTE | FL | $134.00 | $306.04 | $440.04 |
| GTE | HI | $134.00 | $290.14 | $424.14 |
| GTE | IA | $134.00 | $257.00 | $391.00 |
| GTE | ID | $134.00 | $266.99 | $400.99 |
| GTE | IL | $134.00 | $270.33 | $404.33 |
| GTE | IN | $134.00 | $271.26 | $405.26 |
| GTE | KY | $134.00 | $242.16 | $376.16 |
| GTE | MI | $134.00 | $249.70 | $383.70 |

| Company | State | Matl | Labor | Total |
|---|---|---|---|---|
| GTE | MN | $134.00 | $220.13 | $354.13 |
| GTE | MO | $134.00 | $262.14 | $396.14 |
| GTE | NB | $134.00 | $259.74 | $393.74 |
| GTE | NC | $134.00 | $241.08 | $375.08 |
| GTE | NM | $134.00 | $302.26 | $436.26 |
| GTE | NV | $134.00 | $312.73 | $446.73 |
| GTE | OH | $134.00 | $254.30 | $388.30 |
| GTE | OK | $134.00 | $268.96 | $402.96 |
| GTE | OR | $134.00 | $266.99 | $400.99 |
| GTE | PA | $134.00 | $249.67 | $383.67 |
| GTE | SC | $134.00 | $260.38 | $394.38 |
| GTE | TX | $134.00 | $293.74 | $427.74 |
| GTE | VA | $134.00 | $317.04 | $451.04 |
| GTE | WA | $134.00 | $266.99 | $400.99 |
| GTE | WI | $134.00 | $264.59 | $398.59 |
| **Sprint** | **FL** | **$170.00** | **$100.00** | **$270.00** |
| Sprint | IL | $217.00 | $100.00 | $317.00 |
| Sprint | IN | $217.00 | $100.00 | $317.00 |
| Sprint | KS | $217.00 | $100.00 | $317.00 |
| Sprint | MN | $217.00 | $100.00 | $317.00 |
| Sprint | MO | $217.00 | $100.00 | $317.00 |
| Sprint | NC | $195.00 | $163.00 | $358.00 |
| Sprint | NE | $217.00 | $100.00 | $317.00 |
| Sprint | NJ | $217.00 | $100.00 | $317.00 |
| Sprint | NV | $217.00 | $100.00 | $317.00 |
| Sprint | OH | $217.00 | $100.00 | $317.00 |
| Sprint | OR | $217.00 | $100.00 | $317.00 |
| Sprint | PA | $217.00 | $100.00 | $317.00 |
| Sprint | SC | $195.00 | $163.00 | $358.00 |
| Sprint | TN | $195.00 | $163.00 | $358.00 |
| Sprint | TX | $217.00 | $100.00 | $317.00 |
| Sprint | VA | $195.00 | $163.00 | $358.00 |
| Sprint | WA | $217.00 | $100.00 | $317.00 |
| Sprint | WY | $217.00 | $100.00 | $317.00 |
| SWBT | AR | $356.00 | $383.40 | $739.40 |
| SWBT | CA | $277.00 | $350.00 | $627.00 |
| SWBT | KS | $219.91 | $244.82 | $464.73 |
| SWBT | MO | $327.95 | $442.79 | $770.74 |
| SWBT | NV | $378.33 | $716.33 | $1,094.66 |

| Company | State | Matl | Labor | Total |
|---|---|---|---|---|
| SWBT | OK | $198.52 | $259.78 | $458.30 |
| SWBT | TX | $202.20 | $228.71 | $430.91 |
| US West | AZ | $402.00 | $277.00 | $679.00 |
| US West | CO | $402.00 | $277.00 | $679.00 |
| US West | IA | $402.00 | $277.00 | $679.00 |
| US West | ID | $402.00 | $277.00 | $679.00 |
| US West | MN | $402.00 | $277.00 | $679.00 |
| US West | MT | $402.00 | $277.00 | $679.00 |
| US West | ND | $402.00 | $277.00 | $679.00 |
| US West | NE | $402.00 | $277.00 | $679.00 |
| US West | NM | $402.00 | $277.00 | $679.00 |
| US West | OR | $402.00 | $277.00 | $679.00 |
| US West | SD | $402.00 | $277.00 | $679.00 |
| US West | UT | $402.00 | $277.00 | $679.00 |
| US West | WA | $402.00 | $277.00 | $679.00 |
| US West | WY | $402.00 | $277.00 | $679.00 |

| Residential NID w/o Protector ($10) | | Residential NID Protector Block/Line ($4) | | Business NID (6 Pair) w/o Protector ($25) | | Business NID Protector Block/Line ($4) | | Bury Service Wire (Drop)/ft. Rural ($ .60) | | Bury Service Wire (Drop)/ft. Suburban ($ .75) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $6.85 | *v* | $3.05 | *y* | $23.44 | *v* | $3.05 | *y* | $0.55 | *n* | $0.63 | *n* |
| $9.38 | *y* | $3.06 | *x* | $28.65 | *w* | $3.06 | *x* | $0.60 | *c* | $0.70 | *l* |
| $9.80 | *w* | $3.07 | *v* | | | $3.07 | *v* | $0.60 | *d* | $0.72 | *f* |
| $11.90 | *x* | $4.80 | *w* | | | $4.80 | *w* | $0.60 | *e* | $0.75 | *c* |
| | | | | | | | | $0.60 | *m* | $0.75 | *d* |
| | | | | | | | | $0.70 | *l* | $0.75 | *e* |
| | | | | | | | | $0.74 | *f* | $0.75 | *k* |
| | | | | | | | | $0.75 | *k* | $0.90 | *j* |
| | | | | | | | | $0.75 | *p* | $1.00 | *m* |
| | | | | | | | | $0.75 | *q* | $1.15 | *p* |
| | | | | | | | | $0.90 | *i* | $1.15 | *q* |
| | | | | | | | | $0.90 | *j* | $1.25 | *b* |
| | | | | | | | | $0.95 | *b* | $1.50 | *o* |
| | | | | | | | | $1.00 | *o* | $1.50 | *i* |
| | | | | | | | | $1.30 | *a* | $1.90 | *g* |
| | | | | | | | | $1.75 | *g* | $2.10 | *a* |

| w/1 protector | |
|---|---|
| $9.92 | *v* |
| $12.43 | *y* |
| $14.96 | *x* |
| w/3 protectors | |
| $24.20 | *w* |

Note: Price used is Quote for SNI-2100 w/protector(s) minus "Add a Line" kit(s).

| w/o protectors | |
|---|---|
| $23.44 | *v* |
| w/6 protectors | |
| $57.45 | *w* |

Note: Price used is Quote for SNI-4600



Notes: 1) HAI default value in ( )
2) letters represent vendor code

| Block Terminal Material Cost (Aerial Strand Mounted) ($60) | | Block Terminal Material Cost Buried Pedestal ($90) | | Drop Wire Material Cost/ft. Aerial 2-Pair ($0.095) | | Drop Wire Material Cost/ft. Buried 3-Pair Filled ($0.140) | | Pole Investment Material 40' Class 4 ($201) | | Pole Investment Labor Rural 40' Class 4 ($216) | | Pole Investment Labor Suburban 40' Class 4 $216) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $58.55 | y | $39.61 | ww | $0.0947 | y | $0.140 | tt | $150.00 | tt | $150.00 | o | $205.00 | n |
| $72.15 | z | $54.20 | ww | $0.1130 | v | $0.197 | ww | $189.68 | yy | $155.00 | n | $216.00 | h |
| | | $87.00 | x | | | | | $201.27 | yy | $216.00 | h | $350.00 | o |
| | | $90.00 | y | | | | | $201.17 | xx | $294.00 | f | $392.00 | f |
| | | $93.00 | x | | | | | $217.49 | yy | $300.00 | p | $350.00 | p |
| | | | | | | | | $219.81 | yy | $300.00 | q | $350.00 | q |
| | | | | | | | | $248.04 | yy | | | | |
| | | | | | | | | $240.00 | ss | | | | |
| | | | | | | | | $262.68 | yy | | | | |
| | | | | | | | | $392.00 | x | | | | |

Pole Investment Material: Also see FCC* data containing 94 entries of values from $134 to $402.

Pole Investment Labor Rural: Also see FCC* data containing 94 entries of values from $170 to $902.

Pole Investment Labor Suburban: Also see FCC* data containing 94 entries of values from $170 to $1,161.

*http://www.fcc.gov/Bureaus/Common_Carrier/Comments/da971433_data_request/datareq.html



Notes: 1) HAI default value in ( )
2) letters represent vendor code

| Duct Material Cost/ft. ($0.60) | Rock Saw/ Trenching Ratio (3.5) | Manhole Material ($2,340) | Manhole Excavation & Backfill Rural ($2,800) | Manhole Excavation & Backfill Suburban ($3,200-$3,500) | Manhole Excavation & Backfill Metro ($3,500-$5,000) |
|---|---|---|---|---|---|
| $0.515 f | 1.3 g | $1,700 o | $850 o | $1,250 o | $1,700 o |
| $0.585 u | 1.8 n | $2,340 uu | $1,500 n | $1,630 f | $2,650 g |
| $0.648 s | 1.9 l | $3,100 n | $1,600 p | $2,050 g | $3,140 f |
| | 2.1 o | $3,389 v v | $1,600 q | $2,100 n | $3,200 l |
| | 2.5 q | $3,500 k | $1,614 f | $2,400 p | $3,500 n |
| | 2.8 p | $4,720 p | $1,750 g | $2,400 q | $4,000 p |
| | 3.6 l | $4,720 q | $2,800 l | $2,800 l | $4,000 q |
| | 4.6 k | | $3,500 l | $4,200 l | $5,000 k |
| | | | $4,000 k | $4,500 k | $8,500 l |

| Normal Trenching 24" |
|---|
| $2.40 l |
| $3.00 p |
| $3.18 n |
| $3.25 q |
| $3.50 k |
| $4.38 g |
| $5.00 l |
| $7.00 o |

| Frost Wheel or Rock Saw Rural & Suburban 24" |
|---|
| $4.50 l |
| $5.75 g |
| $5.75 n |
| $8.00 q |
| $8.50 p |
| $15.00 o |
| $16.00 k |
| $18.00 l |

| Manhole Material notes |
|---|
| 1 Quote @ $1865 less frame & cover +$125 delivery (uu) |
| Frame+Cover from "Nat'l Constr Estimator" @ $350.00 |
| Total=$2,340 |
| 1 Bid @ $3150 plus $239 delivery (v v) |
| Total=$3,389 |



Notes: 1) HAI default value in ( )
2) letters represent vendor code

| Normal Trenching in Dirt with Backfill Rural/ft. 24" depth ($2.81-$2.97) | Normal Trenching in Dirt with Backfill Rural/ft. 36" depth ($2.81-$2.97)** | Normal Trenching in Dirt with Backfill Suburban/ft. 24" depth ($2.81-$3.88)** | Normal Trenching in Dirt with Backfill Suburban/ft. 36" depth ($2.81-$3.88)** | Trenching in Pavement with Restoral Metro/ft. 24" depth ($13.58 & $48.85) | Trenching in Pavement with Restoral Metro/ft. 36" depth ($13.58 & $48.85) |
|---|---|---|---|---|---|
| $2.00 o | $1.50 b | $2.40 l | $2.00 b | $7.50 k | $7.40 f |
| $2.00 p | $1.87 f | $3.00 p | $2.46 f | $8.85 g | $8.50 k |
| $2.15 n | $2.10 e | $3.25 n | $2.50 l | $9.60 g* | $8.60 c |
| $2.25 q | $2.50 l | $3.25 q | $3.10 j | $12.00 p | $8.60 d |
| $2.40 l | $2.75 n | $3.45 g | $3.50 e | $13.00 q | $8.80 e |
| $2.50 p* | $2.75 j | $3.50 k | $3.60 n | $13.10 j | $9.10 g |
| $2.60 n* | $3.00 o | $3.50 p* | $3.60 g | $13.50 n | $9.80 g* |
| $2.75 q* | $3.00 p | $3.75 n* | $3.90 h | $14.00 p* | $9.87 h |
| $3.00 o* | $3.15 n* | $3.75 q* | $4.00 p | $15.00 o | $10.00 b |
| $3.30 g | $3.20 c | $4.85 g* | $4.10 n* | $15.00 q* | $10.50 e |
| $3.50 k | $3.25 q | $5.00 l | $4.25 c | $16.20 n* | $14.00 p |
| $3.90 g* | $3.30 d | $9.00 o | $4.25 q | $19.00 o* | $14.25 n |
| $5.00 l | $3.30 e | $11.00 o* | $4.50 d | $42.00 l | $15.00 q |
| | $3.40 g | | $4.50 e | $60.00 l | $16.00 p* |
| | $3.50 o* | | $4.50 k | | $17.00 o |
| | $3.50 p* | | $4.50 p* | | $17.00 q* |
| | $3.75 q* | | $4.75 q* | | $17.50 n* |
| | $4.00 g* | | $4.90 g* | | $22.00 o* |
| | $4.50 k | | $6.00 l | | $42.00 l |
| | $4.93 h | | $11.00 o | | $63.00 l |
| | $6.00 l | | $15.00 o* | | |

*12" wide trench price as well as 6" trench price was submitted*

***Equivalent Default Values Excluding Plowing, Boring, and Pushing Pipe*



Notes: 1) HAI default value in ( )
2) letters represent vendor code

| Plow Cable Rural/ft. 24" depth ($ .80) | | Plow Cable Rural/ft. 36" depth ($ .80) | | Plow Cable Suburban/ft. 24" depth ($1.20) | | Plow Cable Suburban/ft. 36" depth ($1.20) | |
|---|---|---|---|---|---|---|---|
| Normal | | Normal | | Normal | | Normal | |
| $0.40 | *p* | $0.50 | *p* | $0.85 | *k* | $0.90 | *j* |
| $0.50 | *q* | $0.60 | *q* | $1.15 | *g* | $0.95 | *k* |
| $0.75 | *l* | $0.80 | *l* | $1.15 | *n* | $1.05 | *b* |
| $0.80 | *k* | $0.90 | *a* | $1.20 | *l* | $1.20 | *g* |
| $0.85 | *n* | $0.90 | *j* | $1.50 | *p* | $1.25 | *c* |
| $1.10 | *g* | $0.90 | *k* | $1.60 | *q* | $1.30 | *a* |
| $1.50 | *i* | $0.92 | *f* | $2.00 | *o* | $1.30 | *l* |
| $1.50 | *o* | $0.95 | *b* | $3.50 | *i* | $1.35 | *d* |
| | | $0.95 | *n* | | | $1.35 | *e* |
| | | $1.15 | *g* | | | $1.57 | *f* |
| | | $1.25 | *c* | | | $1.65 | *n* |
| | | $1.35 | *d* | | | $1.90 | *p* |
| | | $1.35 | *e* | | | $2.00 | *q* |
| | | $1.75 | *i* | | | $2.95 | *o* |
| | | $2.00 | *o* | | | $4.00 | *i* |

| More Difficult | | More Difficult | | More Difficult | | More Difficult | |
|---|---|---|---|---|---|---|---|
| $0.75 | *l* | $0.80 | *l* | $0.85 | *k* | $0.95 | *k* |
| $0.80 | *k* | $0.90 | *k* | $1.20 | *g* | $1.25 | *b* |
| $0.80 | *p* | $1.00 | *p* | $1.20 | *l* | $1.30 | *l* |
| $0.90 | *q* | $1.10 | *q* | $1.95 | *n* | $1.40 | *g* |
| $1.15 | *n* | $1.15 | *b* | $2.75 | *p* | $1.40 | *j* |
| $1.20 | *g* | $1.20 | *f* | $2.85 | *q* | $1.87 | *f* |
| $1.50 | *i* | $1.25 | *g* | $3.50 | *i* | $2.35 | *n* |
| $2.00 | *o* | $1.40 | *j* | $4.00 | *o* | $2.50 | *c* |
| | | $1.40 | *n* | | | $2.70 | *d* |
| | | $1.75 | *i* | | | $2.70 | *e* |
| | | $2.00 | *a* | | | $2.90 | *a* |
| | | $2.25 | *c* | | | $3.75 | *p* |
| | | $2.50 | *d* | | | $3.85 | *q* |
| | | $2.50 | *e* | | | $4.00 | *i* |
| | | $2.95 | *o* | | | $6.00 | *o* |

| Ratio | | Ratio | | Ratio | | Ratio | |
|---|---|---|---|---|---|---|---|
| 1.00 | *i* | 1.00 | *i* | 1.00 | *i* | 1.00 | *i* |
| 1.00 | *k* | 1.00 | *k* | 1.00 | *k* | 1.00 | *k* |
| 1.00 | *l* | 1.00 | *l* | 1.00 | *l* | 1.00 | *l* |
| 1.09 | *g* | 1.09 | *g* | 1.04 | *g* | 1.17 | *g* |
| 1.33 | *o* | 1.21 | *b* | 1.70 | *n* | 1.19 | *b* |
| 1.35 | *n* | 1.30 | *f* | 1.78 | *q* | 1.19 | *f* |
| 1.80 | *q* | 1.47 | *n* | 1.83 | *p* | 1.42 | *n* |
| 2.00 | *p* | 1.48 | *o* | 2.00 | *o* | 1.56 | *j* |
| | | 1.56 | *j* | | | 1.93 | *q* |
| | | 1.80 | *c* | | | 1.97 | *p* |
| | | 1.83 | *q* | | | 2.00 | *c* |
| | | 1.85 | *d* | | | 2.00 | *d* |
| | | 1.85 | *e* | | | 2.00 | *e* |
| | | 2.00 | *p* | | | 2.03 | *o* |
| | | 2.22 | *a* | | | 2.23 | *a* |



Notes: 1) HAI default value in ( )
2) letters represent vendor code

1. Louisiana, Louisiana Public Service Commission, Docket No. U-22022/U-22093 regarding Unbundled Network Elements. Analysis of the outside plant local loop portions of BellSouth Cost Study on behalf of AT&T filed on August 25, 1997. Deposed on September 5, 1997. Appeared at hearing on September 12, 1997.

2. Georgia, Georgia Public Service Commission, Docket No. 7061-U regarding Unbundled Network Elements. Analysis of the outside plant local loop portions of BellSouth Cost Study on behalf of AT&T filed on August 29, 1997. Appeared at hearing on September 19, 1997.

3. Alabama, Alabama Public Service Commission, Docket No. 26029 regarding Unbundled Network Elements. Analysis of the outside plant local loop portions of BellSouth Cost Study on behalf of AT&T filed on September 12, 1997. Appeared at hearing on September 25, 1997.

4. Maine, Maine Public Utilities Commission, Docket No. 97-505. Description of the outside plant inputs to the local loop portion of the Hatfield Model on behalf of AT&T filed on October 3, 1997. (Testimony adopted by John Donovan, and no hearing appearance was made.)

5. Tennessee, Tennessee Regulatory Authority, Docket No. 97-01262 regarding Unbundled Network Elements. Description of the outside plant inputs to the local loop portion of the Hatfield Model on behalf of AT&T filed on October 10, 1997. Analysis of the outside plant local loop portions of BellSouth Cost Study on behalf of AT&T filed on October 17, 1997 and February 12, 1998. Appeared at hearing on February 27, 1998.

6. Kentucky, Kentucky Public Service Commission, Administrative Case No. 360 regarding Universal Service Funding. Description of the outside plant inputs to the local loop portion of the Hatfield Model on behalf of AT&T filed on October 10, 1997 and February 18, 1998. Analyses of the outside plant local loop portions of the Benchmark Cost Proxy Model (proposed by BellSouth and GTE) on behalf of AT&T filed on November 4, 1997, December 2, 1997 and February 26, 1998. Appeared at hearing on November 13 and 14, 1997 and March 3 and 5, 1998.

7. South Carolina, Public Service Commission of South Carolina, Docket No. 97-239-C regarding Universal Service Funding. Description of the outside plant inputs to the local loop portion of the Hatfield Model and analysis of the outside plant local loop portions of the Benchmark Cost Proxy Model (proposed by BellSouth and GTE) on behalf of AT&T filed on November 10, 1997 and February 17, 1998. Appeared at hearing on March 10, 1998.

8. South Carolina, Public Service Commission of South Carolina, Docket No. 97-374-C regarding Unbundled Network Elements. Description of the outside plant inputs

to the local loop portion of the Hatfield Model and analysis of the outside plant local loop portions of the BellSouth Cost Study on behalf of AT&T filed on November 17, 1997. Appeared at hearing on December 17, 1997.

9. North Carolina, North Carolina Utilities Commission, Docket No. P-100, SUB 133d regarding Unbundled Network Elements. Description of the outside plant inputs to the local loop portion of the Hatfield Model on behalf of AT&T filed on December 15, 1997 and February 16, 1998. Analysis of the outside plant local loop portions of BellSouth Cost Study on behalf of AT&T filed on March 2, 1998. Appeared at hearing on March 26, 1998.

10. North Carolina, North Carolina Utilities Commission, Docket No. P-100, SUB 133b regarding Universal Service Funding. Descriptions of the outside plant inputs to the local loop portion of the Hatfield Model on behalf of AT&T filed on December 15, 1997 and January 16, 1998. Deposed on January 28, 1998, by GTE. Analyses of the outside plant local loop portions of the Benchmark Cost Proxy Model (proposed by BellSouth, Sprint and GTE) on behalf of AT&T filed on filed on January 30, 1998. Appeared at hearing on February 4, 1998.

11. Florida, Florida Public Service Commission, Docket Nos. 960757-TP, 960833-TP, 960916-TP and 971140-TP regarding Unbundled Network Elements. Analysis of the outside plant local loop portions of the BellSouth Cost Study on behalf of AT&T filed on December 12, 1997. Deposed on January 7, 1998. Appeared at hearing on January 27, 1998.

12. Mississippi, Mississippi Public Service Commission, Docket No. 97-AD-544 regarding Unbundled Network Elements. Descriptions of the outside plant inputs to the local loop portion of the Hatfield Model on behalf of AT&T filed on January 28, 1998. Analysis of the outside plant local loop portions of BellSouth Cost Study on behalf of AT&T filed on March 13, 1998. Appeared at hearing on April 2, 1998.

13. Texas, Public Utility Commission of Texas, Docket No. 18515 regarding Universal Service Funding. Descriptions of the outside plant inputs to the local loop portion of the HAI Model Release 5.0a on behalf of AT&T filed on February 17, 1998. Analyses of the outside plant local loop portions of the Benchmark Cost Proxy Model (proposed by Southwestern Bell, Sprint and GTE) on behalf of AT&T filed on filed on February 27, 1998. Deposed on March 13, 1998, by SWB. Appeared at hearing on March 19 - 20, 1998.

14. Tennessee, Tennessee Regulatory Authority, Docket No. 97-00888 regarding Universal Service Funding. Descriptions of the outside plant inputs to the local loop portion of the HAI Model Release 5.0a on behalf of AT&T filed on April 3, 1998. Analysis of the outside plant local loop portions of the Benchmark Cost Proxy

Model (proposed by BellSouth and Sprint) on behalf of AT&T filed on April 9, 1998. Appeared at hearing on April 21, 1998.