

CCLDLS 96-45  
97-160

Federal Communications Commission  
Common Carrier Bureau Universal Service Support  
Preliminary Input Values

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Workshop on Material Costs  
December 11, 1998 10:00 a.m.

Draft Agenda

- I. Welcome and Introductions
- II. Fill Factors
  - A. Separate factors for distribution and feeder facilities
  - B. Variances across density zones
  - C. Applied to current demand or final demand
- III. DLC Investments
  - A. Model proponent defaults
  - B. Staff adjustments
  - C. Templates for determining DLC costs
- IV. Copper Cable Investment
  - A. Cable size adjustments
  - B. Structure variances
- V. Fiber Cable Investment
  - A. Cable size adjustments
  - B. Structure variances
- VI. SAI Investment
  - A. Model proponent defaults
  - B. Splicing costs

## II. Fill Factors

### A. Separate factors for distribution and feeder facilities

How should fiber feeder utilization be incorporated into the fill factor estimates given that HCPM currently accepts only one fill factor for feeder plant? Should the fill factor reflect the impact of cable breakage? Will distribution fill factors be greater than feeder fill factors due to the differences in plant mix?

### B. Variances across density zones

Should fill factors be lower in low density zones than in high density zones because:

1. High travel costs in low density zones
2. Higher proportion of buried plant in low density zones

### C. Applied to current demand or final demand

Current demand is the demand for lines in the year of the study. Current demand, which is used by HAI and HCPM, is approximately 1.15 to 1.2 lines per household. Final demand is the demand for lines under the expectation that customers have completed their line purchases. The BCPM default estimate of final demand is 2 lines per household.

## Density Cable Fill Factor Tables

### DISTRIBUTION FILL FACTORS

Density	M Fill Factor	HAI Default Distribution	Preliminary Low	Preliminary High
0	100.00%	50.00%	70.00%	60.00%
6	100.00%	55.00%	70.00%	60.00%
10	100.00%	55.00%	80.00%	70.00%
20	100.00%	60.00%	80.00%	70.00%
65	100.00%	65.00%	80.00%	70.00%
85	100.00%	70.00%	80.00%	70.00%
255	100.00%	75.00%	80.00%	70.00%
500	100.00%	75.00%	80.00%	70.00%
1000	100.00%	75.00%	80.00%	70.00%

### FEEDER FILL FACTORS

Density	BCPM Default Feeder	HAI Default Fiber Feeder	HAI Default Copper Feeder	Preliminary Low	Preliminary High
0-5	75.00%	100.00%	65.00%	80.00%	80.00%
5-100	80.00%	100.00%	75.00%	80.00%	80.00%
100-200	80.00%	100.00%	80.00%	92.00%	90.00%
200-650	85.00%	100.00%	80.00%	92.00%	90.00%
650-850	85.00%	100.00%	80.00%	92.00%	90.00%
850-2550	85.00%	100.00%	80.00%	92.00%	90.00%
2550-5000	85.00%	100.00%	80.00%	92.00%	90.00%
5000-10000	85.00%	100.00%	80.00%	92.00%	90.00%
10,000+	85.00%	100.00%	80.00%	92.00%	90.00%

# MATERIALS COST WORKSHOP

## DIGITAL LOOP CARRIER EQUIPMENT

December 11, 1998

### I. Discussion of Model Proponent Defaults See Attachment 1

#### A. BCPM Defaults

1. Contents
2. Adjustments

#### B. HAI Defaults

1. Contents
2. Central Office Terminal (COT) costs
3. Low Density DLCs
4. Adjustments

### II. Staff Adjustments to HAI Defaults

#### A. Fixed COT Costs See Attachment 2.

#### B. 96 / 24 Line Costs See Attachment 3.

1. 96 Line Costs
2. 24 Line Cost

#### C. Preliminary Low and High, Fixed and Variable Costs for all Five Categories See Attachment 4.

### III. Templates for Determining DLC Cost

See Attachment 5

We want fixed and variable costs for both the Remote Terminals (RT) and the Central Office Terminals (COT). If you choose to fill out a template be sure to add rows if you believe they are needed. If a row includes one or more other rows (e.g., cabinets, bays) make sure you note what rows are included. Note, for COTs, the number of remotes served by one COT.

### IV. Some Alternatives

#### A. Refile Contracts under the Protective Order

#### B. File Completed Templates for each Line Size with Contract Support

#### C. Use one or the other of the Defaults shown in Attachments 1 and 2, supplemented by state commission numbers.



COT ADJUSTMENT FOR HAI						Attachment 2	
						HAI	
	RT	COT Fix. as%	COT #	Total	Cost per	Total	
SIZE	Fixed	of RT Fix.	Fixed	Fixed	Line	Cost	
24	n.a.	0.589333672	n.a.	19,258.68	100	21,658.68	
96	15100	0.534329701	8,068.38	23,168.38	100	32,768.38	
672	70000	0.324319581	22,702.37	92,702.37	77.5	144,782.37	
1344	88500	0.228951362	20,262.20	108,762.20	77.5	212,922.20	
2016	107000	0.162682466	17,407.02	124,407.02	77.5	280,647.02	

<b>HAI 96 and 24 Line Costs</b>		<b>Attachment 3</b>	
<b>96 Line Costs:</b>			
HAI Low Density: (No. of Lines)	120		96
Site & Power	1,300		1,300
Basic Common Equipment	16,000	0.8	12,800
Optical Patch Panel	1,000		1,000
Total Fixed-RT	18,300		15,100
COT		0.53433	8,068.38
Total Fixed			23,168.38
Rounded			23,200
	High	Low -to-High	
	36,500	Ratio =	0.6356164
<b>24 Line Cost</b>			
	High		
	30,300	0.6356	19,258.68
Rounded			19,300

	<b>PRELIMINARY STAFF PROPOSAL</b>			<b>Attachment 4</b>	
	Low and High, Fixed and Variable Costs for all Five Categories				
	<b>Number</b>	<b>LOW</b>		<b>HIGH</b>	
	<b>of Lines</b>	<b>Fixed</b>	<b>Variable</b>	<b>Fixed</b>	<b>Variable</b>
	2016	124400	77.5	192100	89.11
	1344	108700	77.5	119000	89.11
	672	90500	77.5	92700	89.11
	96	23200	94	36500	100
	24	19300	94	30300	100



Common Control Shelf Assembly				
Full Electrical Cabling				
Fiber Jumpers				
Fiber Patch Panel				
DSX-1 Panel				
Line Interface Unit				
Line Suppressor Unit				
Terminal Block				
Fiber Optics Multiplexer:				
Optical Transmitter Unit				
Optical Receiver Unit				
SONET Ring Formatter Unit				
Timing Control Unit				
Terminal Control Processor				
System Backup Memory				
Datalink Controller and Tone Generator				
Common Cards w/ Optics				
Time Slot Interchanger				
Common Power Supply				
Alarm Control Unit				
Maintenance and Test Interface				
System Communications Unit				
Channel Bank Assembly:				
Bank Control Unit				
Bank Power Supply				
DS-1 Switch Interface Unit				
Number DS-1's per Card				
<b>Note number of RTs served by one COT.</b>				

#### IV. Copper Cable Investment

Staff used HAI default and ex parte filings to determine preliminary estimates of the cost of the smallest cable. These estimates were adjusted for larger cables using estimates published in the NRRI report, *Estimating the Cost of Switching and Cables based on Publicly Available Data*, to determine preliminary cable costs by pair size and structure type.

##### NRRI estimates

Type of Plant	Coefficient Per 1000 ft	Table Number	Page Number
Buried	11.8932	2-7	41
Aerial	9.67289	2-15	57
Underground	10.14025	2-19	60

Copper Cable Cost - preliminary estimates from web page

Feeder	Low	High
Copper Investment per foot, buried - 4200	43.08	43.34
Copper Investment per foot, buried - 3600	37.01	37.27
Copper Investment per foot, buried - 3000	30.95	32.21
Copper Investment per foot, buried - 2400	24.88	25.14
Copper Investment per foot, buried - 2100	21.85	22.11
Copper Investment per foot, buried - 1800	18.82	19.08
Copper Investment per foot, buried - 1200	12.75	13.01
Copper Investment per foot, buried - 900	9.72	9.98
Copper Investment per foot, buried - 600	6.69	6.95
Copper Investment per foot, buried - 400	4.66	4.92
Copper Investment per foot, buried - 300	3.65	3.91
Copper Investment per foot, buried - 200	2.64	2.90
Copper Investment per foot, buried - 100	1.63	1.89
Copper Investment per foot, buried - 50	1.13	1.39
Copper Investment per foot, buried - 25	.87	1.13

Preliminary Results-for Discussion Purposes Only

Feeder	Low	High
Copper Investment per foot, buried - 18	.80	1.06
Copper Investment per foot, buried - 12	.74	1.0
Copper Investment per foot, buried - 6	.68	.94
Copper Investment per foot, buried - 1	.63	.89
Copper Investment per foot, aerial - 4200	35.86	36.12
Copper Investment per foot, aerial - 3600	30.15	30.41
Copper Investment per foot, aerial - 3000	25.23	25.49
Copper Investment per foot, aerial - 2400	20.31	20.57
Copper Investment per foot, aerial - 2100	17.85	18.11
Copper Investment per foot, aerial - 1800	15.39	15.65
Copper Investment per foot, aerial - 1200	10.46	10.72
Copper Investment per foot, aerial - 900	8.00	8.26
Copper Investment per foot, aerial - 600	5.54	5.80
Copper Investment per foot, aerial - 400	3.90	4.16
Copper Investment per foot, aerial - 300	3.08	3.34
Copper Investment per foot, aerial - 200	2.26	2.52
Copper Investment per foot, aerial - 100	1.44	1.70

Preliminary Results-for Discussion Purposes Only

Feeder	Low	High
Copper Investment per foot, aerial - 50	1.03	1.29
Copper Investment per foot, aerial - 25	.83	1.09
Copper Investment per foot, aerial - 18	.77	1.03
Copper Investment per foot, aerial - 12	.72	.98
Copper Investment per foot, aerial - 6	.67	.93
Copper Investment per foot, aerial - 1	.63	.89
Copper Investment per foot, ug - 4200	36.27	36.53
Copper Investment per foot, ug - 3600	31.18	31.44
Copper Investment per foot, ug - 3000	26.08	26.34
Copper Investment per foot, ug - 2400	20.99	21.25
Copper Investment per foot, ug - 2100	18.45	18.71
Copper Investment per foot, ug - 1800	15.90	16.16
Copper Investment per foot, ug - 1200	10.81	11.07
Copper Investment per foot, ug - 900	8.26	8.52
Copper Investment per foot, ug - 600	5.71	5.97
Copper Investment per foot, ug - 400	4.02	4.28
Copper Investment per foot, ug - 300	3.17	3.43

Preliminary Results-for Discussion Purposes Only

Feeder	Low	High
Copper Investment per foot, ug - 200	2.32	2.58
Copper Investment per foot, ug - 100	1.47	1.73
Copper Investment per foot, ug - 50	1.05	1.31
Copper Investment per foot, ug - 25	.83	1.09
Copper Investment per foot, ug - 18	.77	1.03
Copper Investment per foot, ug - 12	.72	.98
Copper Investment per foot, ug - 6	.67	.93
Copper Investment per foot, ug - 1	.63	.89

Preliminary Results-for Discussion Purposes Only

Feeder	Low	High
Fiber Investment per foot, aerial - 48	1.64	4.18
Fiber Investment per foot, aerial - 36	1.13	3.38
Fiber Investment per foot, aerial - 24	.82	2.65
Fiber Investment per foot, aerial - 18	.82	2.29
Fiber Investment per foot, aerial - 12	.82	1.93
Fiber Investment per foot, ug - 288	7.66	11.69
Fiber Investment per foot, ug - 144	4.05	9.50
Fiber Investment per foot, ug - 96	2.84	7.10
Fiber Investment per foot, ug - 72	2.24	5.55
Fiber Investment per foot, ug - 60	1.82	4.93
Fiber Investment per foot, ug - 48	1.52	4.18
Fiber Investment per foot, ug - 36	1.22	3.38
Fiber Investment per foot, ug - 24	.92	2.65
Fiber Investment per foot, ug - 18	.77	2.29
Fiber Investment per foot, ug - 12	.62	1.93

Preliminary Results-for Discussion Purposes Only

## V. Fiber Cable Investment

Staff used estimates published in the NRRI report, *Estimating the Cost of Switching and Cables based on Publicly Available Data*, to determine preliminary low cable costs by pair size and structure type. The preliminary high cable costs reflect state commission staff estimates.

### NRRI estimates

Type of Plant	Coefficient Per 1000 ft	Table Number	Page Number
Buried	36.58157	2-10	49
Aerial	39.04649	2-17	59
Underground	34.73169	2-20	61

Fiber Cable Costs - preliminary estimates from web page

Feeder	Low	High
Fiber Investment per foot, buried - 288	7.98	11.69
Fiber Investment per foot, buried - 144	4.30	9.50
Fiber Investment per foot, buried - 96	3.07	7.10
Fiber Investment per foot, buried - 72	2.46	5.55
Fiber Investment per foot, buried - 60	2.15	4.93
Fiber Investment per foot, buried - 48	1.84	4.18
Fiber Investment per foot, buried - 36	1.53	3.38
Fiber Investment per foot, buried - 24	1.23	2.65
Fiber Investment per foot, buried - 18	1.07	2.29
Fiber Investment per foot, buried - 12	.92	1.93
Fiber Investment per foot, aerial - 288	7.82	11.69
Fiber Investment per foot, aerial - 144	4.10	9.50
Fiber Investment per foot, aerial - 96	2.86	7.10
Fiber Investment per foot, aerial - 72	2.24	5.55
Fiber Investment per foot, aerial - 60	1.95	4.93

Preliminary Results-for Discussion Purposes Only

**PRELIMINARY SAI DEFAULT INPUTS AND RANGES**

11-Dec-98

Row #	INDOOR/OUTDOOR SAI	HAI	BCPM	LOW	HIGH	BCPM/HAI
	SAI Cable Size 1			1	1	
	SAI Cable Size 2			50	50	
	SAI Cable Size 3			100	100	
	SAI Cable Size 4			200	200	
	SAI Cable Size 5			400	400	
	SAI Cable Size 6			600	600	
	SAI Cable Size 7			900	900	
	SAI Cable Size 8			1,200	1,200	
	SAI Cable Size 9			1,800	1,800	
	SAI Cable Size 10			2,400	2,400	
	SAI Cable Size 11			3,600	3,600	
1	SAI Indoor Investment 1 - 1			509	1,004	
2	SAI Indoor Investment 25	N/A	340			
3	SAI Indoor Investment 2 -50	98	509	509	1,004	5.2
4	SAI Indoor Investment 3 -100	148	812	812	1,473	5.5
5	SAI Indoor Investment 4 -200	296	1,293	1,293	2,282	4.4
6	SAI Indoor Investment 300	N/A	1,966			
7	SAI Indoor Investment 5 -400	592	2,324	2,324	3,899	3.9
8	SAI Indoor Investment 6 -600	888	3,757	3,757	5,697	4.2
9	SAI Indoor Investment 7 -900	1,232	4,901	4,091	7,577	4.0
10	SAI Indoor Investment 8 -1200	1,776	6,867	6,867	9,457	3.9
11	SAI Indoor Investment 9 -1800	2,464	8,658	8,658	14,309	3.5
12	SAI Indoor Investment 2100	N/A	11,096			
13	SAI Indoor Investment 10 -2400	3,352	13,560	13,560	18,070	4.0
14	SAI Indoor Investment 3000	N/A	16,670			
15	SAI Indoor Investment 11 -3600	4,928	19,605	19,605	26,682	4.0
16	SAI Indoor Investment 4200	N/A	23,362			
17	SAI Indoor Investment 5400	7,392	N/A			
18	SAI Indoor Investment 7200	9,656	N/A			
19	SAI Outdoor Investment 1 - 1			250	407	
20	SAI Outdoor Investment 25		407			
21	SAI Outdoor Investment 2 -50	250	407	250	407	1.6
22	SAI Outdoor Investment 3 -100	350	1,885	1,885	2,769	5.4
23	SAI Outdoor Investment 4 -200	600	2,120	2,120	2,769	3.5
24	SAI Outdoor Investment 300	N/A	2,355			
25	SAI Outdoor Investment 5 -400	1,000	2,590	2,590	3,896	2.6
26	SAI Outdoor Investment 6 -600	1,400	5,509	5,509	5,393	3.9
27	SAI Outdoor Investment 7 -900	1,900	6,848	6,848	7,159	3.6
28	SAI Outdoor Investment 8 -1200	2,400	7,586	7,586	9,082	3.2
29	SAI Outdoor Investment 9 -1800	3,400	8,717	8,717	12,040	2.6
30	SAI Outdoor Investment 2100	N/A	11,490			
31	SAI Outdoor Investment 10 -2400	4,300	11,490	11,490	16,208	2.7
32	SAI Outdoor Investment 3000	N/A	11,713			
33	SAI Outdoor Investment 11 -3600	6,000	14,056	14,056	23,918	2.3
34	SAI Outdoor Investment 4200	N/A	16,398			
35	SAI Outdoor Investment 5400	8,200	N/A			
36	SAI Outdoor Investment 7200	10,000	N/A			

### FCC Staff Comments on Preliminary SAI Ranges

- 1- The low end of the ranges for both **Indoor & Outdoor SAIs** represent BCPM default inputs.  
Note: On row # 15, the original number was 23,362 for the low end , but 19,605 is the corrected number
- 2- The high end of the range for the **Indoor SAIs** represent Sprint's numbers presented to us on July 30, 1998 in an ex-parte.
- 3- The high end of the range for the **Outdoor SAIs** represent our internal analysis of state-approved parameters.
- 4- Sprint breakdown the SAI into 10 different segments and claims that HAI's defaults only represent the cost of **2 components**: Jumpers and Protection.
- 5- Also, Sprint and HAI seem to disagree on the number of hours required to splice an SAI.
- 6- **BCPM SAI size** = {Feeder cable number of pairs + Distribution cable number of pairs}  
**HAI SAI size** = {1.5\*(# Households+# Business+#specail Access+# public lines) + 2\*(# Households+# Business+#specail Access+# public lines)}  
which = {Feeder cable number of pairs + Distribution cable number of pairs}