

Appendix A

CATALOG OF POTENTIAL EXPENSES AND
ESTIMATED COSTS FOR LOW POWER TELEVISION
(LPTV) STATIONS, FM STATIONS AND FM AND TV
TRANSLATORS

10085

September 2018

Catalog of Potential Expenses and Estimated Costs for LPTV Stations,

FM Stations and FM and TV Translators

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Catalog of Potential Expenses and Estimated Costs for LPTV Stations, FM Stations and Translators

I. ABOUT THIS CATALOG

This catalog of expenses (Catalog) contains descriptions of the expenses that LPTV stations, FM stations and FM and TV translators are most likely to incur as a result of broadcaster repacking. While we believe the Catalog is relatively comprehensive, it does not cover every possible expense for every situation, nor is it an exhaustive list of all expenses that may potentially qualify for reimbursement.

Widely, Inc. (Widely) developed the original Catalog for Full Power and Class A broadcasters and multichannel video programming distributors (MVPDs) in 2013 for the Federal Communications Commission (FCC) as part of the Widely Report, which was published for comment in 2014 (DA/FCC: DA-14-389). As part of the ongoing Broadcast Television Incentive Auction, periodically, the Catalog for Full Power and Class A broadcasters and MVPDs was updated to reflect the current pricing for the equipment and services that repacked broadcasters may need to purchase to facilitate the moves to their new channel assignments, and the current pricing for equipment and services that MVPDs may need to purchase to continue to carry broadcasters.

This Catalog is provided for LPTV stations, FM stations and FM and TV translators. The categories and costs contained in this Catalog build upon the work conducted by Widely; however, as certain cost components and types of equipment are not applicable to LPTV stations, FM stations and FM and TV translators and certain costs are applicable only to these types of facilities, the cost categories and price ranges vary from the Catalog for Full Power and Class A broadcasters and MVPDs. Accordingly, there are inherent differences in various cost component and cost ranges, which are clarified to for LPTV stations, FM stations and FM and TV translators.

The categories and costs contained in the Catalog are intended to serve as a reference guide, and are not intended to identify the particular expenses for which individual LPTV stations, FM stations and FM and TV translators would be eligible for reimbursement. Individual LPTV stations, FM stations and FM and TV translators may incur only some of the expenses listed in the Catalog, depending upon the LPTV stations, FM stations and FM and TV translators existing equipment and the particular transition changes that the entity must make.

Supply and demand constraints may have an impact on future costs.

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II. LPTV AND TV TRANSLATOR COSTS

A. TRANSMITTERS AND ANCILLARY COSTS

1. Minor Rechanneling Issues

Some LPTV stations or translator facilities may be able to re-use their existing transmitters or translators by replacing external receivers, transposers, or exciters to operate on the displacement channel. This replacement or reconfiguration may involve professional installation or reconfiguration. Mask filters are assumed to be required.

LPTV Reconfiguration Costs	Range of Estimated Costs (in dollars)
UHF and VHF - minor re-channel issues	2,000 - 20,000
"Simple" mask filters (includes UHF and VHF):	Range of Estimated Costs (in dollars)
10 - 100W Mask Filter	435-1,210
100 - 300W Mask Filter	695 - 2,550
"Stringent" mask filters (includes UHF and VHF):	Range of Estimated Costs (in dollars)
100W - 200W Mask Filter	525 - 3,000
200 - 300W Mask Filter	1,300 - 2,550
350W - 600W Mask Filter	1,800 - 4,100
"Full Service" mask filters (includes UHF and VHF):	Range of Estimated Costs (in dollars)
500 -750W Mask Filter	1,400 - 3,900
1 kW Mask Filter	2,200 - 4,500
1.1 - 2 kW Mask Filter	2,100 - 6,000
2.1 - 3 kW Mask Filter	4,000 - 8,400
3.1 - 5 kW Mask Filter	6,500 - 12,800

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2. New Transmitters

Solid State Transmitter prices are based on a specific channel and include the cost of a new mask filter. Costs for installation and engineering are additional and pricing for these services can be found in Section II.A.3 below. Costs vary by manufacturer and power level. Most new transmitter prices include exciters.

UHF – Air Cooled Solid State Transmitter/Translator	Range of Estimated Costs (in dollars)
5-50 Watts	8,000 - 12,400
50-150 Watts	10,000 - 17,500
160-300 Watts	11,000 - 37,600
320-700 Watts	12,700 - 43,500
750-1000 Watts	19,000 - 40,700
1.1 - 2.4 kW	39,000 - 97,700
2.5 - 4 kW	57,000 - 155,600
UHF – Liquid Cooled Solid State Transmitter	Range of Estimated Costs (in dollars)
1.5 - 4 kW	Variable
High VHF – Air Cooled Solid State Transmitter/Translator	Range of Estimated Costs (in dollars)
10-100 Watts	8,000 - 14,600
150-350 Watts	11,000 - 32,500
400-1000 Watts	14,000 - 46,000
1.2 - 3 kW	21,600 - 100,000
Low VHF – Air Cooled Solid State Transmitter/Translator	Range of Estimated Costs (in dollars)
50-500 Watts	8,000 - 14,600
600 W - 3 kW	Variable

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3. Other Transmitter Expenses

In limited situations, these expenses may apply in addition to those listed in Sections II.A.1 or II.A.2, above.

Other Transmitter-Related Expenses	Range of Estimated Costs (in dollars)
Frequency agile exciter	20,500
Transmitter Site Survey/Installation	8,000 - 30,000
Electrical Service - In limited situations, a station installing replacement transmitter equipment may have to change the electrical wiring to the new transmitter or perform other electrical work (prices include labor and installation).	Variable

B. ANTENNAS

Most stations moving to a new channel will require new antennas. The price of an antenna does not include installation or removal of existing antennas (for those expenses, see Section II.D, Tower Related Costs). In some cases, new transmission lines will also be required (for those expenses, see Section II.C, Transmission Lines). Additionally, antennas are rated based on input power level. Price does not include de-icing equipment. Panel antennas are priced per panel.

UHF Low-Power Antennas	Range of Estimated Costs (in dollars)
Yagi/Cross-Dipole/Log Periodic Transmit antenna	450 - 1,800
1 - 2 kW 8-bay slot antenna, horizontally-polarized side mount	4,250 - 12,000
1 - 2 kW 8-bay slot antenna, elliptically- or circularly-polarized side mount	6,750 - 12,900
2.5 - 5 kW 8-bay slot antenna, horizontally-polarized side mount	17,750 - 25,800
2.5 - 5 kW 8-bay slot antenna, elliptically or circularly-polarized side mount	19,500 - 28,500
2.5 - 5 kW slot antenna, 12-30 bays	Variable
Broadband panel antenna (per panel), horizontally-polarized	750 - 2,750

High-VHF Low Power Antennas	Range of Estimated Costs (in dollars)
Yagi/Cross dipole/Log Periodic Transmit antenna	840 - 1,400
250 - 500 W panel antenna (per panel), horizontally-polarized	850 - 1,550

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1 - 2 kW panel antenna (per panel), horizontally-polarized	13,150
2-bay 2 kW slot antenna - side mount, horizontally polarized	10,000
2-bay 2 kW slot antenna - side mount, elliptically polarized	14,000
4-bay 2 kW slot antenna - side mount, horizontally polarized	18,000 - 44,000
4-bay 2 kW slot antenna - side mount, elliptically polarized	22,000 - 56,050
8-bay 2kW slot antenna - side mount, horizontally polarized	75,950
8-bay 2 kW slot antenna - side mount, elliptically polarized	90,950
12-bay 2 kW slot antenna - side mount, horizontally polarized	117,400
12-bay 2 kW slot antenna - side mount, elliptically polarized	141,400

Low-VHF Low Power Antennas	Range of Estimated Costs (in dollars)
Yagi/Cross dipole/Log Periodic Transmit antenna	990 - 1,200
Panel antenna (per element), horizontally-polarized	19,450 - 20,600
Panel antenna (per element), circularly-polarized	33,500

Other Antenna-Related Items	Range of Estimated Costs (in dollars)
Antenna sweep (existing or new)	4,610 - 6,550
7/8" input elbow complex, single channel (if needed)	6,550
1-5/8" input elbow complex, single channel (if needed)	6,900
3-1/8" input elbow complex, single channel (if needed)	7,600
250 W VHF Combiner (per channel)	2,050 - 2,950
1 kW UHF Combiner (per channel)	4,150 - 5,250
2 kW VHF Combiner (per channel)	5,000 - 8,550
Side Mount antenna brackets	2,250 - 7,000
Power Dividers (each, for panel antenna system, if not included in antenna cost)	1,300
Cable harness (each, for panel antenna system, if not included in antenna cost)	1,000

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C. TRANSMISSION LINE

In most situations, existing flexible transmission line can be reused in the event of a channel change. If an LPTV station is utilizing rigid transmission line, the existing transmission line may be reusable (e.g., if the move is to a non-prohibited channel or if the transmission line is broadband capable). See Fig.3 in the Appendix A for the table of transmission line lengths and prohibited channels. New transmission lines, if needed for purchase, are generally priced per foot. The price generally includes elbows and hangers.

	Range of Estimated Costs (in dollars)
Flexible transmission line	
1/2" foam dielectric	3-5
7/8" foam dielectric	10
1-5/8" foam dielectric	24
1-5/8" air dielectric	32
3" air dielectric	57
4" air dielectric	72
Rigid Transmission Line	
7/8" rigid line	28 - 66
1-5/8" rigid line	40 - 72
3-1/8" rigid line	79 - 101
Interior RF Systems - RF plumbing for inside the transmitter building between the transmitter and the transmission line leaving the transmitter building	
Inside RF system including switching, patch panels, and dehydrators	Variable

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D. TOWER RELATED COSTS

In many cases, a broadcaster replacing or adding an antenna will incur rigging and installation costs. In addition to these expenses, it may be necessary to modify the existing tower or to construct a new tower to accommodate these new antennas and transmission line.

Existing Tower Reinforcement	Range of Estimated Costs (in dollars)
Existing Towers - Towers without sufficient documentation of tower specifications may need to be mapped prior to completion of a tower load study.	
Tower mapping and report for structural engineer	16,400 - 25,600
Structural engineering study for guyed or free-standing tower	5,100 - 12,300
Structural engineering study for a candelabra tower	15,350 - 19,450
Tower reinforcement	Variable

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New Tower Construction	Range of Estimated Costs (in dollars)
New Towers - Cost includes constructing a new tower, per foot	
New towers shorter than 500'	1,700
New towers between 500' and 1000'	2,100
New towers between 1000' and 1500'	2,560
Note: Costs may be higher for tower sites with difficult soil conditions. Footings, piers and foundations, and guy anchors may not be included in this price	

Rigging and Antenna Installation/Removal	Range of Estimated Costs (in dollars)
Tower Rigging - fees paid to tower crews to install/remove antennas and/or transmission line.	
Tower shorter than 500'	31,190 - 81,190
Towers between 500' and 1000'	102,500 - 205,000
Towers over 1000' or Complex tower (Candelabras, stacked antennas, terrain-constrained)	Variable

E. PROFESSIONAL SERVICES

Stations without sufficient internal resources, either at the station itself or at an affiliated station or company, may have to obtain professional services from an outside vendor to complete the various aspects of the station's channel relocation.

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	Range of Estimated Costs (in dollars)
RF Consulting Engineer Fees	
Engineering Study for displacement application	800 - 2,800
Prepare Engineering Section of Construction Permit	1,025 - 3,070
Prepare Engineering Section of License to Cover	510 - 1,535
Prepare Form 601	510 - 1,000
Attorney Fees	
Prepare and file Construction Permit	770 - 5,120
Prepare and file License to Cover	770 - 2,305
Lease negotiation or other legal matters	2,255 - 4,095
Other Professional Fees	
Project Management, if needed (per hour)	51 - 154
Prepare and/or review reimbursement forms	770 - 2,560
Form 399 assistance or other Program Management costs	Variable
Field Engineering	
Outside engineering assistance (per day)	1,000 - 2,750
Coverage verification of new facility	20,500 - 81,900
AM Pattern disturbance study/remediation	2,560 - 7,680
RF Exposure Measurements	3,050 - 20,500

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F. OTHER POTENTIAL COSTS

Stations may incur miscellaneous costs while constructing displaced facilities, such as: FCC form filing fees and in some isolated cases, new fixed microwave links to replace existing STL, ICR and/or general interconnect systems where frequency coordination of existing links cannot be achieved at the new location.

	Range of Estimated Costs (in dollars)
FCC Filing Fees	
FCC Form 2100 Major Change Construction Permit	4,960
FCC Form 2100 Minor Change Construction Permit	1,110
FCC Form 2100 License to Cover	335
FCC Form 601 STL	305
Equipment Disposal Cost	
Equipment Storage	Variable
Equipment Delivery and Handling Charges	Variable
Point to Point Microwave (STL/ICR)	
Frequency Coordination (per license - 2 needed for bi-directional link)	350 - 750
Unlicensed systems (includes antennas attached to the radios. Larger antennas are additional)	500 - 4,000
6/11 GHz Licensed Part 101 Systems (price includes 6-foot antennas. Single link and redundant systems are included in this price range).	18,000 - 39,000
7/13 GHz Licensed Part 74 Systems (price includes 6-foot antennas. Single link and redundant systems are included in this price range).	27,700 - 74,900

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III. FM AND FM TRANSLATOR COSTS

A. TRANSMITTERS AND ANCILLARY COSTS

1. New Facility or Auxiliary and Interim Transmitters

There may be circumstances in which an FM station may need to construct an interim or auxiliary facility (in rare cases, a new main facility) in order to remain on the air during the TV repack, including stations on the same tower or nearby tower. Prices listed include notch and channel filtering as needed, but do not include installation, which can be found in Section III.A.2 below. Costs vary by manufacturer and power level, with additional pricing for hybrid models.

Air Cooled Solid State FM Transmitter (not including installation)	Range of Estimated Costs (in dollars)
10-100 Watts Analog	1,500 - 8,000
101-250 Watts Analog	3,215 - 8,850
300 - 500 Watts Analog	3,800 - 12,500
600-1000 Watts Analog	4,550 - 15,000
1.5 - 3 kW Analog	8,500 - 32,000
3.5 - 6 kW Analog	12,000 - 52,500
7 - 10kW Analog	41,000 - 75,350
15 - 20 kW Analog	68,900 - 120,500
30 kW Analog	118,000 - 169,500
40 kW Analog	132,500 - 231,300
10-100 Watts Hybrid	7,000 - 17,000
101-250 Watts Hybrid	5,800 - 17,850
300 - 500 Watts Hybrid	3,850 - 21,500
600-1000 Watts Hybrid	7,000 - 24,000
1.5 - 3 kW Hybrid	9,200 - 40,990
3.5 - 6 kW Hybrid	19,200 - 61,500
7 - 10 kW Hybrid	52,900 - 83,500
15 - 20 kW Hybrid	78,900 - 129,500
30 kW Hybrid	128,000 - 178,500

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40 kW Hybrid	142,500 - 240,400
More than 40 kW Analog or Hybrid	Variable (requires a quote)
Liquid Cooled Solid State FM Transmitter (not including installation)	
10 kW Analog	66,850 - 139,850
20 kW Analog	102,500 - 195,850
30 kW Analog	141,700 - 264,450
40 kW Analog	181,550 - 351,050
10 kW Hybrid	128,650 - 149,850
20 kW Hybrid	221,000 - 234,600
30 kW Hybrid	289,600 - 351,800
40 kW Hybrid	354,800
More than 40 kW Analog or Hybrid	Variable

HD Importers/Exporters	
HD Importer	1,600 - 3,500
HD Exporter	1,600 - 3,500

2. Other Transmitter Expenses

In limited situations, these expenses may apply in addition to those listed in Section III.A.1, above.

Other Transmitter-Related Expenses	
Additional Exciter (if required; most transmitters are shipped with one exciter)	7,000 - 17,000
Installation Services	
Transmitter Installation (includes daily rate and expenses)	11,000 - 130,000

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Transmitter Building Site Survey (includes daily rate and expenses)	5,000 - 15,000
Electrical Service - A station installing replacement transmitter equipment may have to increase the power supply to the transmitter or perform other electrical work (<i>prices include labor and installation</i>).	
Service entrance 3 phase/800 amp/208 volt	14,050
Switchgear – industrial 800 amp	37,150
Transformer 3 phase/480V – 150 KVA	24,900
Transformer 3 phase/480V – 300 KVA	35,850
Transformer 3 phase/480V – 500 KVA	47,100
2" Rigid Conduit and Wiring (cost per foot)	26
3" Rigid Conduit and Wiring (cost per foot)	50
4" Rigid Conduit and Wiring (cost per foot)	98
HVAC Service - Cooling Only - A station installing replacement transmitter equipment may need additional cooling capability (<i>prices include labor and installation</i>).	
5 Ton System	19,700
10 Ton System	37,900
15 Ton System	54,300
25 Ton system	89,100
50 Ton system	168,000
HVAC Service - Heating and Cooling - A station installing replacement transmitter equipment may need additional air-handling capacity that includes both heating and cooling (<i>prices include labor and installation</i>).	
10 Ton System	37,900
15 Ton System	54,300
25 Ton system	89,100
50 Ton system	168,000
Transmitter Building Modifications - In limited situations, expansions of the transmitter building may be required to accommodate new equipment (costs vary with location, site access and construction type).	100 - 250 per ft ²

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<i>Other Transmitter-Related Expenses (For stations that have to rebuild permanent facilities only)</i>	<i>Range of Estimated Costs (in dollars)</i>
Remote Control	1,500 - 3,300
RDS Encoder	1,000 - 2,500
Audio Processing	
Audio Processing - Analog basic	2,000 - 5,000
Audio Processing - Analog/HD basic	2,500 - 7,000
Audio Processing - Analog/HD upgraded	7,000 - 15,000

B. ANTENNAS

Most FM stations building a separate facility will require a new antenna. The price of an antenna does not include installation or removal of existing antennas (for those expenses, see Section III.D, Tower Related Costs). Additionally, new transmission line may also be required (for those expenses, see Section III.C, Transmission Line). All antennas are rated based on input power and priced per bay. Antenna prices do not include radomes or de-icing equipment.

<i>FM Low-Power Antennas (price includes fine matcher(s))</i>	<i>Range of Estimated Costs (in dollars, per bay)</i>
200 Watt to 1 kW Log-periodic antennas	1,200 - 1,750
200 Watt to 1 kW Yagi antennas	850 - 2,400
200 Watt - 1 kW Vertically or horizontally-polarized	620 - 2,050
200 Watt - 1 kW Circularly-polarized	1,250 - 1,350
1 kW - 2.5 kW Vertically or Horizontally-polarized	1,100
1 kW - 2.5 kW Circularly-polarized	1,000 - 1,800
2.5 kW - 5 kW Circularly-polarized	3,805 - 6,070

<i>FM High-Power Antennas (price includes fine matcher(s))</i>	<i>Range of Estimated Costs (in dollars, per bay)</i>
6 kW - 10 kW Circularly-polarized	4,200 - 7,570
11 kW - 25 kW Circularly-polarized	5,300 - 10,500
26 kW - 50 kW Circularly-polarized	3,500 - 6,700
26 kW - 50 kW Panel (3 panels per bay)	16,500 - 44,650
51 - 100 kW Circularly-polarized	7,200 - 12,000

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51 - 100 kW Panel (3 panels per bay)	19,500 - 47,200
More than 100kW	Variable
Directional antenna fabrication and testing	Variable
Dual polarization antennas, H-only or V-only antennas more than 2 kW	Variable
Broadband (community or combined) antennas	Variable

Other Antenna-Related Items	Range of Estimated Costs (in dollars)
Antenna sweep	4,610 - 6,550
New FM combiner, cost per channel (depends on power input and min. frequency separation)	6,865 - 36,700
FM Band pass filter (depends on power input and number of sections)	5,325 - 26,190
Notch Filter (depends on power input and number of sections)	5,020 - 16,260
Mounting Brackets	Variable
De-Icers (per bay)	1,000 - 2,000
Radomes (per bay)	900 - 1,800

C. TRANSMISSION LINE

New transmission line, if needed for purchase, is priced per foot, based on a length of 1,000 feet. The price generally includes elbows and hangers.

	Range of Estimated Costs (in dollars per foot)
Flexible transmission line	
1/2" foam dielectric	3
7/8" foam dielectric	10
1-5/8" foam dielectric	24
1-5/8" air dielectric	32
3" air dielectric	57
4" air dielectric	72
Rigid Transmission Line	
7/8" rigid line	28 - 66
1-5/8" rigid line	39 - 61

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3-1/8" rigid line	79 - 101
4-1/16" rigid line	101 - 138
3-1/8" broadband line	91 - 117
4-1/6" broadband line	117 - 159
Interior RF Systems - RF plumbing for inside the transmitter building between the transmitter and the transmission line leaving the transmitter building	
Elbows, fitting, hangers, etc.	Variable
Inside RF system including switching, patch panels and dehydrators	Variable

D. TOWER RELATED COSTS

FM broadcasters replacing or adding an antenna may incur rigging, installation, and removal costs. In addition to these expenses, it may be necessary to modify the existing tower or to construct a new tower to accommodate the additional antenna(s).

Existing Tower Reinforcement	Range of Estimated Costs (in dollars)
Existing Towers - Towers without sufficient documentation of tower specifications may need to be mapped prior to completion of a tower load study.	
Tower mapping and report for structural engineer	16,400 - 25,600
Structural engineering study for guyed or free-standing tower	5,100 - 12,300
Structural engineering study for a candelabra tower	15,350 - 19,450
Tower reinforcement	Variable
New Tower Construction	Range of Estimated Costs (in dollars per foot)
New Towers - Cost includes constructing a new tower, per foot	
New towers shorter than 500'	1,700
New towers between 500' and 1000'	2,100
New towers over 1000' and 1500'	2,560
Note: Costs may be higher for tower sites with difficult soil conditions. Footings, piers and foundations, and guy anchors may not be included in this price.	

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Rigging and Antenna Installation/Removal	Range of Estimated Costs (in dollars)
Tower Rigging - fees paid to tower crews to install/remove antennas and/or transmission line.	
Tower shorter than 500'	61,400 - 81,900
Towers between 500' and 1000'	102,500 - 205,000
Towers over 1000' or Complex tower (Candelabras, stacked antennas, terrain-constrained)	102,500 - 409,500
Helicopter installation/removal (for antennas on top of high-rise buildings, a complex tower, or tower that is terrain-constrained so that antennas can't be lifted using a gin pole or winches)	Variable
Other Tower Expenses	
Temporary Tower Rent	Variable

E. PROFESSIONAL SERVICES

Stations without sufficient internal resources, either at the station itself or at an affiliated station or company, may have to obtain professional services from an outside vendor to complete the various aspects of the station's channel relocation.

	Range of Estimated Costs (in dollars)
RF Consulting Engineer Fees	
Prepare Engineering Section of Construction Permit	1,025 - 3,070
Prepare Engineering Section of License to Cover	510 - 1,535
Prepare Engineering STA	510 - 2,050
Prepare Form 601	510 - 1,000
Attorney Fees	
Prepare and file Construction Permit	770 - 5,120
Prepare and file License to Cover	770 - 2,305
Prepare and file STA	770 - 3,585
Lease negotiation or other legal matters	510 - 2,050
Other Professional Fees	
Project Management, if needed (per hour)	51 - 154

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Prepare and/or review reimbursement forms	770 - 2,560
Form 399 assistance or other Program Management costs	Variable
Field Engineering	
Outside engineering assistance (per day)	1,000 - 2,750
Coverage verification of new primary facility	20,500 - 81,900
AM Pattern disturbance study/remediation	2,560 - 7,680
RF Exposure Measurements	3,050 - 20,500

F. OTHER POTENTIAL COSTS

This section contains a number of miscellaneous costs that LPTV stations may encounter while constructing displaced facilities, which includes FCC form filing fees, equipment handling and disposal costs, and in some isolated cases, new fixed microwave links to replace existing STL, TSL and ICR systems where frequency coordination of existing links cannot be achieved at the new location.

	Range of Estimated Costs (in dollars)
FCC Filing Fees (from the 2018 Filing Fee Guide)	
FCC Form 2100 Major Change Construction Permit	1,110
FCC Form 2100 Minor Change Construction Permit	200
FCC Form 2100 License to Cover	335
FCC Form 601 STL	305
Equipment Disposal Cost	Variable
Equipment Storage	Variable
Equipment Delivery and Handling Charges	Variable
Point to Point Microwave (STL/ICR)	
Frequency Coordination (per license - 2 needed for bi-directional link)	350 - 750
Unlicensed systems (includes antennas attached to the radios. Larger antennas are additional)	2,000 - 4,000
6/11 GHz Licensed Part 101 Systems (price includes 6-foot antennas. Single link and redundant systems are included in this price range).	18,000 - 39,000
950 MHz Licensed Part 74 Systems (price includes 6-foot antennas. Single link and redundant)	12,000 - 25,000

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systems are included in this price range).	
1 pair IP-only Codecs for fiber, internet or IP microwave systems	4,000 - 7,700