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United States
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REA Form 397h,
Parts I thru IV

March 1990

REA Design Specifications for Digital Lightwave Transmission Systems

REA DESIGN SPECIFICATIONS FOR DIGITAL LIGHTWAVE TRANSMISSION SYSTEMS

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REA Form 397h
March 1990

PART I

DIGITAL LIGHTWAVE SYSTEM PERFORMANCE SPECIFICATIONS

1. SCOPE

1.1 These specifications apply to digital lightwave transmission systems which employ optical fibers as the transmission medium. They include opto-electronic terminal equipment such as transmitters and receivers and electronic terminal equipment such as digital multiplexers. Part I of Form 397h specifies the system performance of the installed equipment. Part II of Form 397h specifies requirements for installation, alignment, inspection and acceptance tests, when such service is included as part of the contract. Part III of Form 397h lists the equipment requirements and technical data necessary for application engineering. Parts I, II, and III are to be completed by the Purchaser or its Engineer. Part IV is to be completed by the Seller, including an equipment list, exceptions to the specifications, and any other clarifying information that might be useful.

1.1.1 The intent of these specifications is to define responsibilities under a variety of contractual situations. The specifications may be usefully employed in purchasing a complete, installed system, a major component of a system, or for incremental additions of equipment to already existing transmission systems.

1.2 Lightwave transmission system equipment is required for: (Company and REA Project No.)

_____

_____

This procurement involves the following checked items:

_____ Opto-Electronic terminal equipment.

_____ Electronic digital multiplexing equipment.

1.3 The Seller shall supply the equipment under one of the following (check one) conditions:

_____ REA Contract Form 397: Furnish, deliver, install, align, and test the installed equipment and materials. Parts I, II, and III of REA Form 397h comprise the specifications.

_____ REA Contract Form 398: Furnish and deliver the equipment. Parts I and III of REA Form 397h comprise the specifications.

1.4 Specific equipment quantities and detailed application information are outlined in Part III of REA Form 397h, which includes the Purchaser's Narrative, C.O. Trunking Plan, Lightwave System Layout(s), and other clarifying information as Addenda.

1.4.1 Purchaser's Narrative: The Purchaser's Narrative describes the initial and ultimate equipment, system, and route requirements along with a tentative schedule for implementing system growth. The purpose of the Narrative is to outline the Purchaser's plans so that the initial equipment furnished under this contract may later be expanded to the ultimate service requirement level with minimal impact. The intent is to configure the system so that it may be expanded by the Purchaser with additional purchases of the same type of equipment, or with other compatible equipment, at some later date.

1.4.2 Purchaser's Specifications: The Purchaser's specifications include the REA Form 397h, the attached Addenda, and any other referenced specifications; i.e., REA PE specifications, etc. All items specified in Part III of REA Form 397h and the attached Addenda are to be included in the Seller's basic proposal unless specifically stated otherwise. Where the overall system is divided into separate contracts for the component parts of the system, Seller responsibilities are identified in REA Form 397h and Addenda.

1.4.3 Seller's Proposal: Part IV of REA Form 397h and attached Addenda should contain all the information from the Seller which are considered essential for evaluating the proposal. The Seller's equipment and proposal shall meet all of the Purchaser's specifications unless specifically noted otherwise by the Seller. All items of equipment included in the Purchaser's specifications shall be included in the basic Seller's Proposal unless specifically noted otherwise. The Seller shall separate equipment and installation costs in the basic proposal and in each alternate proposal or optional equipment quotation. The equipment Seller completes Part IV of REA Form 397h and attaches Addenda as necessary.

1.4.4 Seller's Responsibility: It is the responsibility of the Seller under this contract to furnish all initial equipment requirements in a manner that facilitates system growth to ultimate requirement levels either by adding new modules to partially equipped units or by adding new equipped shelves and bays. Modification of existing or initially installed equipment or wiring, to accommodate future growth, shall not be necessary, unless specifically identified and outlined by the Seller in Part IV of REA Form 397h. (Note: Items such as digital multiplexer shelves or repeater housings, for example, shall be wired for full capacity. Additional capability, within the stated capacity of the unit, must be accommodated by inserting equipment units only, and no alteration of shelf or housing wiring should be necessary.)

1.4.5 Seller's Narrative: The Seller shall present a brief but fully descriptive narrative of the Seller's Specifications describing in quantities the proposed systems and component parts, accessories, options, and necessary test equipment. The narrative shall describe how the basic proposal meets all immediate requirements and how it provides for expansion to accommodate each phase of system growth.

2. SYSTEM PERFORMANCE

2.1 The installed lightwave transmission system equipment, including the digital multiplexing units, shall meet the the requirements as set forth in Parts I and III of REA Form 397h.

2.2 Applicable information regarding the electrical, mechanical, and optical characteristics of the optical cable to be employed in the system to be furnished under this contract, and any other information necessary for applications engineering purposes, is presented under Part III of REA Form 397h.

2.3 Where a separate metallic pair facility is used for order wire, system control, system testing, system powering, or other multipurpose uses, the lightwave system transmission, signalling, and other functions shall not be degraded by the interface equipment or accessory devices that may be required. Multipurpose use of facilities and channels is described in the Addenda to Part III of REA Form 397h.

2.4 The Seller shall include a complete set of system documentation for each terminal equipment location. In addition, one complete set of data shall be required as an office copy. (State additional requirements if any.) The system documentation shall include equipment manuals and other instructional materials, including installation and trouble-shooting practices as well as maintenance recommendations. The documentation must also include electrical protection practices for terminal equipment, repeaters, and accessory units installed in the outside plant, and the Seller shall provide installation procedures for electrical protection hardware that is to be installed by the Purchaser.

(Additional Requirements)_____

2.5 To the extent that the equipment is factory wired or cabled, the Seller shall provide rack equipment drawings and office records showing wiring options used in all terminals, jackfields, terminal blocks, and alarms.

2.6 A description of the employee training proposed must be provided by the Seller. The Purchaser requires training for:

_____Employees

2.7 If this contract includes installation, alignment, or testing by the Seller, this work may be done during normal working hours unless otherwise specified here:

(Work Hours)_____

3. TECHNICAL DATA AND REQUIREMENTS

3.1 Technical data and requirements are outlined in Part III of REA Form 397h and attached Addenda. If the complexity of the project requires it, separate Part III presentations (with or without separate addenda) may be included. If so, a brief notation and identification should be entered here. If only one Part III is presented, enter N/A in this space.

(Separate Addenda)_____

3.2 Central Office

3.2.1 A central office floor plan is attached for each central office in which lightwave transmission system terminal equipment will be located. Equipment should not be located closer than two meters from heavy power equipment such as rectifiers, DC to DC converters, inverters, voltage regulators, or rotating equipment. The floor plan includes a detailed description and location of all existing and proposed equipment relative to the Seller's responsibilities. If installation is a part of the contract, the information includes rack profiles, rack locations, and descriptions of alarm, traffic, power, ground, and other necessary connections including any structural alterations that may be required. Special considerations such as central office "ground window" bars and other grounding bars are also included in the descriptive information. Central office information is attached for each office involved and identifies the central office equipment manufacturer and the type of existing or proposed switch equipment.

3.2.2 A central office trunking plan showing trunk groups and types between central offices, and span lines between host exchanges and remote carrier terminals, concentrator terminals, or remote switching terminals (RST), is attached for information.

3.3 Electrical Protection

3.3.1 Electrical protection shall be integral to the lightwave system. The Seller shall provide necessary hardware for the protection of terminal and repeater equipment furnished under this contract.

3.3.2 The Seller shall identify all equipment subject to damage from electrostatic discharge and provide the Purchaser with handling instructions. The Seller's proposal, Part IV of REA Form 397h, shall include a statement indicating any requirement for special handling. In cases requiring the use of protective devices such as wrist straps, grounding pads, etc., the Seller shall supply same when the equipment is delivered.

3.4 Outside Plant Information

3.4.1 The outside plant facilities required for the system are described in Part III of REA Form 397h and the attached Addenda. The information supplied may include cable routing and cable system lengths, as well as details of building entries.

3.4.2 Optical cable, cable installation, cable splicing, and cable testing are not part of this contract unless specified otherwise.

3.4.3 Field mounted repeater housings shall:

_____ Not be required.

_____ Be supplied under separate procurement.

_____ Be supplied as part of this procurement.

3.4.4 Field mounted repeater housings shall:

_____ Not be required.

_____ Be installed by Purchaser.

_____ Be installed by Seller.

_____ Be installed by others (see Part III and Addenda).

3.4.5 Field mounted repeater powering shall:

_____ Not be required.

_____ Be commercial power source at repeater location.

_____ Be over metallic conductors within the optical cable.

_____ Be over metallic conductors in a separate cable.

3.5 Transmission System Requirements

3.5.1 The system transmission requirements apply to the electronic, optical, and fiber facilities between the digital multiplexer input interface at a transmitting terminal through the fiber via any intermediate repeaters to the digital multiplexer output interface at a receiving terminal. All telephony or data transmissions shall be on a full duplex basis, i.e., simultaneous transmission in both directions must be possible, unless otherwise stated. Service protection switching requirements are defined in the Purchaser's Specifications or Addenda. Specifications given here apply to intermediate repeaters and drop and insert terminals, when appropriate. The Seller shall describe how the equipment provided meets the Purchaser's requirements.

3.5.2 Digital Interface Criteria. All digital interfaces shall comply with the criteria established for DSX-1, DSX-1C, DSX-2, or DSX-3 unless specified otherwise. The detailed parameters for these interfaces shall be as specified in AT&T Technical Advisory #34 entitled, "Interconnection Specification of Digital Cross Connects."

3.5.3 Unless specified otherwise, optical terminal transmitters may employ either a laser or a light emitting diode device providing system attenuation and other transmission requirements can still be met.

3.5.4 Seller shall state, in the Seller's Specifications or Addenda, the type of light source to be employed (i.e., laser or LED), the projected service life and mean time between failure of the light sources to be supplied, and
shall describe any device cooling technique employed, i.e., convection, thermo-electric cooling, etc.

3.5.5 Seller shall state the lightwave transmitter RMS output power level and define the fiber interface point where this power level will be available.

3.5.6 If a laser light source is employed, Seller shall state the classification assigned to the source by the Bureau of Radiological Health.

3.5.7 Seller shall state the line code employed, i.e., Return-to-zero, Nonreturn-to-zero, etc.

3.5.8 Seller shall state the transmitter output wavelength and tolerance.

3.5.9 Optical terminal receivers may employ either a PIN, PIN-FET, or APD type detector.

3.5.10 Seller shall state, in the Seller's Specifications or Addenda, the type of detector to be employed and the receiver operational threshold, defined as the minimum light energy input level required to maintain the specified Bit Error Rate (BER).

3.5.11 Seller shall state the receiver overload level, defined as the maximum light energy input level at which the specified BER will be maintained.

3.6 Environmental Requirements: The optical terminal, optical repeater, and digital multiplex equipment shall meet all performance specifications under the following environmental conditions:

Ambient Temperature:	Terminal or office mounted equipment 0 to 50 degrees Celsius (32 to 122 degrees Fahrenheit)
	Field mounted equipment -40 to +60 degrees Celsius (-40 to +140 degrees Fahrenheit)
Relative Humidity:	0 to 95% (No condensation at +40 degrees C)

PART II

INSTALLATION, ALIGNMENT, INSPECTION AND ACCEPTANCE TESTS

Note: When installation is included as a part of the contract, Part II of REA Form 397h applies to the Seller. When installation is not included as a part of the contract, the Purchaser assumes responsibility for all provisions of Part II, including all measurements and data required for approval of closeout documents.

1. INSTALLATION

1.1 The Seller will be allowed reasonable access to all Purchaser's facilities, equipment, and materials necessary for the installation and testing of the lightwave system and equipment. It is the responsibility of the Purchaser to make certain that these facilities are in good and accessible condition for the Seller.

1.2 Implementation by the Seller shall be scheduled so as to ensure completion of the installation, and all associated alignment, inspection, and testing, within the project completion period set forth in the Seller's proposal. Installation shall not commence prior to notice in writing from the Purchaser that the facilities are completely ready for installation of the equipment. The Seller shall notify the consulting engineer and owner in writing when, for any reason, the Seller can proceed no further with the installation.

1.2.1 In the event that the facilities are not ready for installation in time for the Seller to complete the work within the specified period, upon request in writing by the Seller, a reasonable extension of completion time shall be granted in writing by the Purchaser.

1.3 Equipment and accessory plant items or devices mounted external to the central office building, or external to outside repeater housings, will be installed by the Purchaser unless stated otherwise. These may include the repeater housings themselves, externally mounted protective devices, and other such accessory items. The Seller shall provide written instructions for the Purchaser to follow when installing any such accessory or plant items.

1.3.1 The Purchaser will provide any necessary voice pairs for order wire, interrogation, repeater powering, etc., via a separate cable, when appropriate.

1.4 All leads brought out to terminal blocks on the MDF (or IDF if required in Part III of REA Form 397h), and the blocks themselves, shall be identified and permanently labeled by the Seller.

1.4.1 When shielded leads are used inside the central office, the shields shall be grounded in accordance with REA TE&CM Section 810, unless otherwise specified.

1.4.2 All cables shall be grouped to separate transmission cables from maintenance, control, or power leads.

1.4.3 The Seller shall make all necessary power and ground connections to the Purchaser's power terminals and ground bus unless stated otherwise in Part III of REA Form 397h. The location of all such connections will be shown in Part III.

1.4.4 The Seller shall provide all necessary tools to complete the installation in accordance with the schedule.

1.4.5 The Purchaser shall make all cross connections (at the MDF or IDF) between the lightwave transmission system and the carrier or central office equipment unless otherwise stated in Part III of REA Form 397h.

1.4.6 The Seller shall make the optical connections to the lightwave terminal from the optical cable, and to any paired cable facilities for order wire, test, system monitoring, powering, and alarm systems.

2. ALIGNMENT

2.1 All equipment shall be adjusted and aligned to meet the requirements and conditions set forth in Parts I, III, and IV of REA Form 397h.

3. ACCEPTANCE TESTS AND DATA REQUIRED

3.1 Data shall be supplied to the Purchaser by the Seller in writing as a part of the final documents in closing out the contract as follows:

3.1.1 A detailed cross connect drawing of connections made to alarm systems, power boards, central office battery, fuse panels, etc. Wiring options used in terminals, repeaters, etc., shall be supplied in the Purchaser's copy of the equipment manual.

3.1.2 The measured central office supply voltages applied to the equipment terminals or repeaters at the time the jack and test point readings are made and ac supply voltages where equipment is powered from commercial ac sources.

3.1.3 The test setup and a list of all instruments, including accessories, by manufacturer, model, and type number, and their calibration status, used to obtain the data.

3.1.4 The measurements at all jack or test points recommended by the manufacturer, including optical power level measurements at all terminals and repeaters where utilized. Special note should be taken to ensure a margin exists above the receiver threshold and that levels are in agreement with the system optical design budget.

3.1.5 System transmission measurements shall include Bit Error Rate (BER) on the installed digital multiplex system when it is connected through the lightwave transmission facility. BER measurements are conducted at the lowest digital data rate between system terminals. The measured BER must comply with system requirements as stated in the Purchaser's Specifications or Addenda.

3.2 Data shall be supplied showing the results of the operational tests. The operational test shall include the following:

3.2.1 Performance tests to demonstrate compliance with the specifications shall be performed by the Seller.

3.2.2 Performance tests shall be made on previously existing equipment of a type similar to that supplied under this contract to determine that the lightwave system does not cause interference with other systems.

3.2.3 Local and remote alarm indications shall be checked, including fuse failure and other alarm conditions.

3.2.4 System service protection features shall be demonstrated and protection switching functions shall be exercised and monitored while traffic, or simulated traffic, is transmitted through the system.

4. JOINT INSPECTION REQUIREMENTS

4.1 The Seller shall notify the Purchaser in writing at least one week before the date that equipment will be ready for inspection and testing. A joint inspection shall be made by the Seller and the Purchaser (or Purchaser's Engineer) to determine that the equipment installation is acceptable. The inspection shall include a physical examination, a review of acceptance test data, operational tests, and sample measurements.

4.2 The Purchaser shall review the acceptance test data and compare it to the requirements of this specification.

4.3 Sample Measurements shall be made on all systems installed under this contract.

4.4 Deficiencies: In the event that the measured data or operational tests indicate that the equipment or system fails to meet the requirements of this specification, the deficiencies are to be resolved as set forth in Article II of the contract. The reports of the Seller and Purchaser should be detailed as to deficiencies, causes, corrective action necessary, correction action to be taken, completion time, etc.

PART III

PURCHASER'S LIGHTWAVE TRANSMISSION SYSTEM REQUIREMENTS

1. GENERAL

1.1 This section of REA Form 397h is to be completed by the Purchaser or its Engineer, and presents detailed equipment requirements and applications engineering data for a lightwave transmission system required for (Telephone Company, REA Project No.):

_____

1.2 Part III may be completed by itemizing quantities in blanks provided or checking appropriate blocks. All line items in Part III are preceded by a block which must be filled in when no information entry is made in that particular line item. This block can be notated N/A when a response would be not applicable, or, if the requested response data is not known, the notation N/K must be entered. For example, if an operating wavelength has not been finalized at the time Part III is filled out, the N/K notation would be appropriate in the ___ space ahead of item 2.2.4 Operating Wavelength.

1.3 Every individual line item in Part III requires a response. If no notation is made in the block preceding the numerical identification (neither N/A or N/K applies), then itemized information must be entered in the body of the line item.

1.4 When necessary or desirable, detailed explanations are included in the Purchaser's Addenda.

2. PURCHASER'S EQUIPMENT REQUIREMENTS

2.1 The lightwave system includes the following links:

Link 1 from Term 1A_____

to Term 1B_____

Link 2 from Term 2A_____

to Term 2B_____

Link 3 from Term 3A_____

to Term 3B_____

Link 4 from Term 4A_____

to Term 4B_____

		LINK 1	2	3	4
2.2	Optical Cable				
____	2.2.1 Cable Route Length (km) Total	____	____	____	____
____	2.2.2 Optical Fiber Type				
	Single Mode	____	____	____	____
	Multimode	____	____	____	____
____	2.2.3 Optical Data Rate (Mb/s)	____	____	____	____
____	2.2.4 Operating Wavelength (nom.)	____	____	____	____
____	2.2.5 Optical Fiber Loss (dB/km)	____	____	____	____
____	2.2.6 Optical Fiber Splicing				
	Fusion	____	____	____	____
	Mechanical	____	____	____	____
____	2.2.7 No. Splices Req'd. (Est.)	____	____	____	____
____	2.2.8 Optical Fiber Assignments				
	Primary Service	____	____	____	____
	Service Protection	____	____	____	____
	Unassigned (future)	____	____	____	____
	Total Fiber Count	____	____	____	____
2.3	Intermediate Repeaters				
____	2.3.1 No. of New Equipments Req'd	____	____	____	____
____	2.3.2 No. of New Locations Req'd	____	____	____	____
____	2.3.3 Repeater Housings Req'd.				
	Pole Mounted	____	____	____	____
	Hut Mounted	____	____	____	____
	Manhole Mounted	____	____	____	____
	Central Office Mounted	____	____	____	____
	Pedestal Cabinet Mounted	____	____	____	____

		LINK			
		1	2	3	4
2.4	Lightwave Terminal Equipment				
____	2.4.1 Light Source Type				
	Laser Diode	____	____	____	____
	Light Emitting Diode	____	____	____	____
____	2.4.2 Light Detector Type				
	PIN Detector	____	____	____	____
	PIN/FET Detector	____	____	____	____
	APD Detector	____	____	____	____

2.5 Digital Multiplex Equipment

____ 2.5.1 Number of Digital Interconnects Required

Digital	TERMINALS							
Interface	1A	1B	2A	2B	3A	3B	4A	4B
DSX 1								
DSX 1C								
DSX 3								

____ 2.5.2 Number of Jackfield Accesses

Digital	TERMINALS							
Interface	1A	1B	2A	2B	3A	3B	4A	4B
DSX 1								
DSX 1C								
DSX 2								
DSX 3								

3. PURCHASER'S ADDENDA TO THIS SPECIFICATION

3.1 This section of the specification presents a check list as a guide for the Purchaser in preparing Addenda which will be attached to and become a part of this specification. All items on this check list should be marked. Those that do not apply should be marked N/A (not applicable), and a check mark should be placed to indicate those items that have been addressed specifically in the Addenda.

3.2 The Purchaser may include items in the Addenda that are not listed here, and since the Addenda become a part of this specification in its entirety, such items also become a part of the specification.

____ 3.3 Narrative: Describes proposed trunk service, specific system requirements, and a tentative timetable for future system expansion.

____ 3.4 Trunking Plan: Shows trunk groups and quantities for both immediate and future requirements.

____ 3.5 Transmission System Layout: Shows cable routes and capacities.

____ 3.6 Seller Responsibilities: Identifies any separate contracts or purchases that are the Seller's obligation.

____ 3.7 Office Equipment: Details office power availability for each location involved, office protectors required, hardware, special features, etc.

____ 3.8 Special Considerations: Covers Purchaser furnished equipment, hardware, cable, etc.

____ 3.9 Alternate Proposals: Describes alternate proposals or options that the Purchaser would like to consider.

____ 3.10 Hardware: Identifies rack heights, sizes, and methods of support for each terminal location.

____ 3.11 Floor Plans: Provides a floor plan for each location showing the proposed location for all equipment to be provided.

____ 3.12 Test Equipment: A request for a list of recommended test equipment and accessories.

____ 3.13 Spare Parts: A request for a list of recommended spare parts.

____ 3.14 Transmission System Description: To be provided when the procurement is for additions to existing facilities or systems.

____ 3.15 Project Schedule: Includes site and building availability for Seller, schedule for completion of related facilities, Purchaser's project schedule, and Purchaser's commitments to others.

____ 3.16 Service Protection: Details the levels of service protection that are required for each system link and terminal.

____ 3.17 Alarms and Order Wire: Details the alarm features required and the interconnection of such alarms to local or remote displays, and identifies order wire requirements.

____ 3.18 Remote Maintenance Systems: Details any remote testing or maintenance features required including any required interfaces with existing test or maintenance capabilities.

____ 3.19 Equipment Powering: Details power availability for all locations where equipment is to be supplied, including any intermediate repeater installations.

____ 3.20 Transmission Link Loss Budget: Details the fiber, splice, connector, and other transmission losses.

PART IV

SELLER'S PROPOSAL FOR LIGHTWAVE TRANSMISSION SYSTEM

1. GENERAL

1.1 This section of REA Form 397h is to be completed by the Seller. The lightwave transmission system equipment is required for: (Company and REA Project No.)

_____

1.2 The Seller proposes to supply the following type or model number of equipment:

_____

_____

_____

1.3 The Seller proposes to supply sufficient quantities of equipment to satisfy all requirements as given in Parts I, II (when included), and III of REA Form 397h unless specifically stated otherwise in the Seller's Addenda attached hereto.

1.4 All equipment proposed meets all requirements and specifications as given in Parts I; II (when included); and III of REA Form 397h, unless specifically stated otherwise in section 3, "Seller's Exceptions to Specifications," of Part IV of REA Form 397h.

1.5 All exceptions to the quantities (see 1.3) and specifications (see 1.4) as given in Parts I, II (when included), and III of REA Form 397h must be clearly identified and individually referenced to the related line item identification used throughout REA Form 397h.

2. SELLER'S ADDENDA TO THIS SPECIFICATION

2.1 The Seller may include items in the Addenda that are not listed elsewhere in REA Form 397h, and since the Addenda become a part of this specification in its entirety, such items also become a part of the specifications. Any additions do not alter the obligation to comply with Items 1.3, 1.4, and 1.5 of Part IV of REA Form 397h.

2.2 The following section of the specification presents a check list as a guide for the Seller in preparing Addenda which will be attached to and become a part of this specification. All items on this check list should be marked. Those that do no apply should be marked N/A (not applicable), and a check mark should be placed to indicate those items that have been specifically addressed in the Addenda.

____ 2.3 Narrative: Describes proposed system and its component parts and accessories. Describes the transmission facilities to be provided and the level of transmission performance the system will produce.

____ 2.4 Equipment Descriptions: Presents published descriptions of the proposed equipments and materials including specifications. Proposed equipment must meet Seller's specifications as well as Purchaser's specifications.

____ 2.5 System Expansion: Discusses the capability for orderly expansion of the purchased system to ultimate requirements as stated by the Purchaser.

____ 2.6 List of Equipment and Material: List and cost of materials and equipment comprising the basic proposal.

____ 2.7 List of Spare Parts: List and cost of recommended spare parts offered as an option for the Purchaser.

____ 2.8 List of Test Equipment: List and cost of recommended test equipment offered as an option for the Purchaser.

____ 2.9 List of Special Maintenance Items: List and cost of recommended special test or maintenance equipment offered as an option for the Purchaser.

____ 2.10 Alternate Proposals: Describes optional alternative proposals and costs.

____ 2.11 Power Requirements: Calculated maximum current drain from central office batteries for each terminal location and power requirements at each repeater installation. Seller shall note power require- ments for partially equipped and fully equipped installations for both cases. Where access to -50 Volts DC is involved, Seller must specify capacity, type, and quantity of fuses required.

____ 2.12 Personnel Training: Seller to describe training available and cost as an option for the Purchaser.

____ 2.13 Hardware: A description of racks to be supplied by the Seller including rack height, width, support system, etc.

____ 2.14 Transmission System Description: System layout including repeater spacings, optical transmission data rates, drop and insert terminal
configurations, signal format, etc.

____ 2.15 Optical Cable: Description of optical cables to be supplied including type, fiber count, attenuation, etc.

____ 2.16 Project Schedule: Proposed schedule of delivery, installation, testing, cutover and training.

____ 2.17 Light Sources: Type, power output, etc.

____ 2.18 Light Detectors: Type, threshold, dynamic range, etc.

____ 2.19 Service Protection: Describe details of service protection for each link including alarm reporting, interface with remote testing systems, etc.

____ 2.20 Alarms and Order Wire: Describe features, interconnections, etc.

____ 2.21 Transmission Link Loss Budget: Present fiber, splicing connector and other transmission losses along with transmitter output and receiver input power levels for each link.

3. SELLER'S EXCEPTIONS TO SPECIFICATIONS.

3.1 Seller must individually state all exceptions taken to these specifications as outlined in sections 1.3, 1.4, and 1.5 of Part IV of REA Form 397h. If the Seller takes no exceptions to these specifications, the Seller must include a specific statement to that effect.

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