

APPLICATION GUIDE FOR THE PREPARATION
OF DETAILED LINE CONCENTRATOR REQUIREMENTS

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1. GENERAL

1.1 Purpose

This section provides REA borrowers, consulting engineers, bidders, and other interested parties with technical information on the application of line concentrators. It discusses the preparation of the detailed specification as the basis for an equipment contract.

1.2 This section is being issued as a guide to the completion of Part III of REA Form 397g (REA Bulletin 345-185), "Performance Specification for Line Concentrators." One Part III should be used for each line concentrator.

1.3 Item numbers shown in parentheses refer to items in Part III of REA Form 397g.

Item 1.4

1.4.1 The internal operation of line concentrator systems may vary among different bidders of systems. It would be difficult for the borrower or its engineer, for example, to determine the proper quantities of transmission facilities between the central office and the remote ends of a line concentrator system necessary to meet a specific situation for each of the systems offered by various bidders.

1.4.2 To provide for the situations outlined in paragraph 1.4.1, above, two sections are included as Parts III and IV of the "General Specifications for Line Concentrators." Part III includes all of the

information available to the borrower and its engineer in regard to the traffic and equipment requirements for a specific line concentrator. Part IV provides space for the bidder to specify the information of which only he has knowledge.

1.4.3 The borrower or its engineer will complete Part III and submit a copy of this, together with Parts I and II (if required) and a blank copy of Part IV, to each bidder invited to bid on the project. It should be noted that REA Form 397g can be added to the specifications for the purchase of digital central office equipment under REA Form 522, for example: When the line concentrator is purchased separately (see REA Bulletin 385-3), REA Form 397, "Special Equipment Contract," should be used with the REA Form 397g. It will be necessary to provide a supplemental page for REA Form 397, Article I, Section 1, Proposal Price, to permit the bidders to present their cost information on an orderly basis.

1.4.4 Each bidder will be expected to fill out and return Part IV with its bid.

2. NUMBER OF SUBSCRIBER LINES

2.1 (Item 2)

2.1.1 The number of lines of each type are shown here. A line concentrator is a useful tool for subscriber upgrading and should not be used as a means of prolonging party line service. It is recommended that systems using this device be all single-party, but never more than two-party. Beyond two-party, the type of automatic number identification for CAMA operation becomes complicated and difficult to administer.

2.1.2 It is recommended that pay stations should be served by dedicated lines rather than lines on a line concentrator. However, if the owner has determined that the only feasible way to serve pay stations is to do so by line concentrator, the number of pay stations is to be designated along with type, either prepay or postpay. The manufacturer of the line concentrator equipment intended to be used should be consulted before deciding on pay station type. Certain types of equipment may not work with prepay pay stations, for instance.

2.1.3 It is recommended that PABX and key telephone lines should be served by dedicated lines rather than lines on a line concentrator. However, if the owner has determined that the only feasible way to serve such lines is to do so by line concentrator, they should be specified under "Other." Add an explanation to cover any special applications.

3. LOOP RESISTANCE

3.1 REA transmission objectives must be met on the total loop to each subscriber; this includes the trunk portion (via physical or carrier) plus the loop beyond the concentrator.

3.2 (Item 3.1)

3.2.1 When the trunks between the two units are physical, the entire loop from the subscriber to the central office equipment must be taken into account. All REA listed central offices since about 1966 have had 1900 ohm loop limits. Older ones might have loop limits as low as 1200 ohms (see item 6.1.1 of Part III). These values include the resistance of the telephone set. The loop resistance requiring loop treatment should be shown in this item. If loops between 1200 and 1900 ohms do not require loop treatment, this should be so marked instead of number of lines in this range. Under almost all conditions the loops exceeding 1900 ohms will require loop treatment and, therefore, any quantity requirements should be shown. The bidders may determine the portion of each loop beyond his remote unit by referring to item 7.1.3.7 of Part III.

3.2.2 Where carrier is used to derive the trunks between the remote and central office units, there are two possible cases. One is that the carrier will face the subscriber loop directly and the loop beyond the remote end will be that of the subscriber carrier. Another possibility is that the carrier will stop at the remote unit and the remote unit will have its own loop limit. In either case, the loop resistance from the remote terminal to the subscriber is the one to be used for completion of this portion. Do not forget that the loop resistances include 200 ohms for the telephone; in other words, 400 to 600 ohms represents 200 to 400 ohms of outside plant plus 200 ohms of telephone since subscriber carrier specifications have always dealt with only the portion of loop resistance included in the cable part of the loop.

3.2.3 (Item 3.1.2)

These blanks are self-explanatory. The number of pay station lines with outside plant loop limits, excluding the pay station, greater than 1200 ohms for prepay or 1000 ohms for semi-postpay operation, should be indicated. The same rules concerning physical trunks versus carrier derived connecting trunks apply to these loops.

3.3 (Item 3.1.3)

If the owner is to supply the range extension equipment, he should closely coordinate his quantities with the bidder as the loop limit capabilities of remote units vary widely. Also, if the loop extension devices are to use common mode operation in connecting physical trunks, the bidder will be able to give advice about any range extension devices that are not compatible with his equipment. Describe in item 11.

4. TRAFFIC DATA

4.1 (Item 4.1)

This requirement should be determined by measurement as the nature of the area being covered may vary widely from the average CCS per line of the central office to which the line concentrator is attached.

An example would be using a line concentrator to serve a small industrial park versus one serving a rural residential area. As a last resort, use the measured average CCS per line of the central office.

4.2 (Item 4.2)

This item should be very carefully thought out. The use of intra-links in a concentrator can lead a bidder to furnish a lesser number of trunks than are needed. This percentage should be carefully determined and if the number is in doubt, use zero. This item is useful in special situations where there is a large quantity of intracalling and intralinks can be used to reduce the amount of traffic to be carried between the central office and remote terminals. Intracalling is not expected to represent a significant amount of traffic in line concentrators serving less than 100 lines.

Certain operations such as busy verification and some custom calling features on intracalls are not possible in all systems.

4.3 (Item 4.3)

Line concentrators are designed to provide the specified traffic carrying capacity as defined by the number of calls to be made during the busy hour. If the number of busy hour calls (BHC) is not known, an estimate may be made by the following:

$$\text{BHC} = \frac{\text{Total No. Lines Equipped (item 2)} \times \text{CCS/Line (item 4.1)}}{\text{Estimated Holding Time Per Call in Sec.}} \times 100$$

5. TYPE OF RINGING

5.1 (Items 5.1 and 5.2)

These items do not apply where a line concentrator uses physical trunks. With carrier derived transmission facilities, the ringing power must be generated at the remote terminal. Fill in the maximum number of phones for each frequency used. For item 5.2, use the ultimate number of lines for each frequency to ensure capacity for growth.

6. CENTRAL OFFICE TELEPHONE SWITCHBOARD INTERFACE

6.1 (Item 6.1)

The type of central office equipment to which the line concentrator will be connected is described in this paragraph. This information is used by the bidder to determine if special adapters or options are required on the line concentrator to be supplied.

6.2 Interface Description (Item 6.2)

A line concentrator system can work with almost any central office by using the line circuits of the central office as the interface. If the line concentrator will be furnished by the same manufacturer as

the digital central office switching system, it may be possible to use a direct digital interface at the central office, which eliminates the need for any other line concentrator equipment at the central office end.

6.3 (Item 6.3)

The mounting rack(s) for the line concentrator equipment is normally supplied by the bidder, but if the owner has an available rack which can be used it should be described here.

7. TRANSMISSION FACILITIES

7.1 Details of the transmission facilities between the central office and the remote terminal should be provided in this section.

7.1.1 Type (Item 7.1.1)

Check the type of transmission facilities which will be provided. Be sure to attach a layout showing appropriate parameters.

7.1.2 If physical plant is to be used, show the number of pairs available. If not included in item 7.1.1 or 7.1.3.7, show resistance, gauge, length, and loading scheme.

7.1.3 Terminal Equipment (Item 7.1.3)

Check whether owner or bidder is to provide terminal equipment for transmission facility. If bidder is to provide terminal equipment we recommend that REA Form 397c, "Design Specifications for Subscriber Systems," be used.

7.1.3.1 If the line concentrator will interface the central office equipment thru line circuits (not a direct digital interface), often the circuits will be derived by subscriber carrier. Specify the manufacturer and type. Show how many voice terminations (channels) are equipped and how many are wired only.

7.1.3.2 Check whether the span lines are to be supplied by the owner or the bidder. If by the owner, show manufacturer and type. If by the bidder, use REA Form 397c.

7.1.3.3 Show the number of repeaters to be used in each span line.

7.1.3.4 By using at least two different routes for span lines it is possible to provide more reliable service, although traffic carrying capacity may be reduced when both routes are not in operation. Check whether this will be done in this item. The bidder must make provisions so that the signaling channels will use the remaining cable route when the other is not working.

- 7.1.3.5 Check whether the bidder is to furnish the span line terminations.
- 7.1.3.6 Check whether the bidder is to furnish power for the span lines.
- 7.1.3.7 If a physical facility is to be used, provide information on loop resistance and length.

8. POWER EQUIPMENT REQUIREMENTS (Item 8)

8.1 Central Office Terminal (Item 8.1)

- 8.1.1 If the central office terminal must operate on the regular 48-volt central office battery, check "yes."
- 8.1.2 If the answer to 8.1.1 is "no," describe the power source available.
- 8.1.3 Indicate whether standby power is available by checking "yes" or "no."

8.2 Remote Terminal (Item 8.2)

- 8.2.1 Check "yes" if the owner will furnish a nominal 48-volt power supply at the remote terminal. Describe in item 11, including any limitation on capacity available for the bidder's use.
- 8.2.2 If the bidder is to furnish the power supply at the remote terminal, check "yes."
- 8.2.3 Check if 110 volt a.c., 60 Hz single-phase power is available at the remote site. In the case that some other voltage, etc., is available, check "other" and describe voltage, frequency, and number of phases in item 11.
- 8.2.4 If the bidder is to provide batteries, indicate the number of busy hours of reserve which are required. A minimum of 3 hours is recommended when standby emergency power is available.
- 8.2.5 Check which type of battery is preferred. REA currently suggests, in order of preference, lead calcium, stabilized electrolyte, and sealed lead acid.
- 8.2.6 Check whether standby emergency power is available.

9. REMOTE TERMINAL

9.1 Mounting (Item 9.1)

If no building is available at the remote end, the unit must be mounted in some sort of housing or enclosure. Check which type of arrangement is required.

9.2 Existing Building (Item 9.2)

If the equipment is to be installed in an existing building, information must be given to the bidder concerning the space available, environmental conditions (heat, humidity, cooling, etc.), or other pertinent information concerning the existing building.

9.3 Describe any equipment location requirement which does not fit with requirements in items 9.1 or 9.2.

10. ALTERNATE REQUESTS (ITEM 10)

When a request for additional prices on equipment not specified in the main section of Part III is necessary, it must be done under this item. This covers equipment which may or may not be included in the contract depending on price. The number of alternates should be kept to a minimum.

11. EXPLANATORY NOTES (ITEM 11)

If there are other items not covered in Part III that could possibly affect the installation, these should be covered in a separate note and added to Part III. These could include such items as a special application of the unit or the fact that the unit may be only temporarily installed at its present location. Describe any equipment or labor to be supplied by the owner; include: manufacturer, catalog number, condition, location, scheduled availability and the assignment of responsibility for its relocation and installation. Be certain to give a detailed explanation of any unusual circumstances.

