44350

SKL GS-100

GENERAL SPECIFICATIONS

FOR A WIDE BAND TELEVISION DISTRIBUTION SYSTEM

Pages 1 through 10
and Drawings A through E

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SPENCER-KENNEDY LABORATORIES, INC.
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2/63

SKL GS-100

GENERAL SPECIFICATIONS FOR A WIDE BAND TELEVISION DISTRIBUTION SYSTEM

I. SCOPE

The intent of these specifications is to provide a set of minimum standards to be used as a guide in the planning, design and construction of a closed circuit television transmission system.

II. FUNCTIONS

1. The system shall be capable of receiving, amplifying and distributing the specified off-air or closed circuit television signals and FM channels throughout a designated area.

2. The system shall be capable of expansion to a total of twelve standard television channels within the existing VHF television spectrum, without the addition of any equipment to the distribution system.

3. The system shall be capable of receiving, amplifying and distributing color as well as monochrome broadcasts.

4. The system shall be capable of providing a signal of no less than 500 microvolts across 75 ohms to each specified receiving location.

5. The system shall be designed for 24 hour continuous operation.

III. GENERAL DESCRIPTION

1. The complete system shall include all of the following material and equipment required to perform the above-stated functions:

   (a) A complete receiving system including antennas, supporting structure and cable.

   (b) Head end equipment (preamplifiers, channel amplifiers, control amplifiers, channel converters, filters, traps, a channel combining unit and FM equipment).

   (c) Distribution equipment (line amplifiers, line extension amplifiers, bridging amplifiers, thermal and passive

equalizers, line dividing networks, thermal gain controls, automatic level control and automatic slope control equipment, connectors, terminations, attenuators, equipment housings and accessories, cable, messenger strand and pole line hardware).

2. All major system components shall be the product of one manufacturer of established reputation and experience in multichannel transmission, which manufacturer shall have designed and installed wide band systems over a minimum period of five years, and shall be able to refer to several similar installations presently rendering satisfactory service.

3. The seller shall include in his proposal all costs for providing engineering supervision and assistance during the system construction period.

4. The seller shall provide all engineering drawings, technical manuals and instructions necessary for the proper operation and maintenance of the system upon completion of the construction.

5. All system construction shall conform to existing national and local codes and shall be in accordance with accepted engineering practices. The buyer will be responsible for negotiating and obtaining all franchises, rights of way, joint use pole agreements and any other permits which are required to install the system.

IV. ANTENNA SITE SPECIFICATIONS

1. Towers

(a) All towers must be fabricated and erected in compliance with all existing federal and state aeronautical agencies' regulations, and must satisfy all requirements of EIA Specification RS-222.

2. Antennas

(a) The antennas shall be of heavy duty five-element Yagi type. Elements and booms to be fabricated of No. 6061-T6 aluminum tubing. Elements to be not less than 3/4 inch O.D. and booms to be not less than 1.25 inches O.D. The transmission line connection shall be made into a weatherproofed 75 ohm "N" type fitting built into the driven element boom bracket or the driven element casting.

(b) Individual antennas shall be combined into arrays by use of coaxial cable harnesses and combining networks, and shall be aligned so as to minimize cochannel interference. The array shall present an attenuation to a cochannel station of at least 20 db below that presented by an individual antenna in the array, with a minimum of attenuation of desired signals.

V. ELECTRONIC TRANSMISSION EQUIPMENT AND MATERIALS SPECIFICATIONS

1. Amplifiers

(a) Tower Mounted Channel Preamplifiers

All preamplifiers installed on the tower shall be of the solid state (transistorized) type, cable powered via the RF coaxial cable. They shall have an output terminal impedance of 75 ohms, with a return loss of no less than 16 db. Their band width shall be 6 mc, and they shall have a fixed gain of 16 db minimum. They shall have a noise figure of 6 db maximum on the low band channels and 8 db maximum on the high band channels. The input and output connectors shall be "N" type, and their weatherproof housing shall be an integral part of the amplifier. They shall be capable of passing both color and monochrome signals.

(b) Channel Amplifiers

The channel amplifiers shall incorporate a cascode input circuit and shall be of the distributed chain amplifier design. They shall have a 6 mc band width and shall be capable of passing both color and monochrome signals. The minimum gain shall be 30 db and the noise figure shall not exceed 6 db on the low channels and 9 db on the high channels. Each amplifier shall have a self-contained power supply fused in the AC input and B+ circuits. Input and output connectors shall be Type "N", and input and output RF monitoring points shall be provided as an integral part of the amplifier. The amplifiers shall be designed to mount on a standard 19 inch rack.

(c) Channel Control Amplifiers

The channel control amplifiers with automatic gain features shall incorporate a cascode input circuit and shall be of the distributed chain amplifier design. They shall have a 6 mc band width and shall be capable of passing color as well as monochrome signals. The minimum gain shall be 30 db on the low channels and 20 db on the high channels, and the noise figure shall not exceed 6 db on the low channels and 9 db on the high channels. For a 20 db change in the input signal, there shall be less than 2 db change in the output of the amplifiers. Each amplifier shall have a self-contained power supply fused in the AC input and B+ circuits. Input and output connectors shall be Type "N", and input and output RF monitoring points shall be provided as an integral part of the amplifier. The amplifiers shall be designed to mount on a standard 19 inch rack.

(d) Main Line Amplifiers

All main line amplifiers shall be of the broad band type utilizing distributed chain amplifier design principles. Distributed amplification is to be construed as meaning that the tubes in the amplifiers are placed in a parallel arrangement so that minor tube failure does not cause transmission failure, thus minimizing interruptions in operation of the system. The main line amplifiers shall have a band width of 40-216 mc with a frequency response sloped to fit the square root of frequency, and providing 6.5 db slope from 40 mc to 216 mc. Maximum deviation from the square root of frequency shall be less than $\pm$0.5 db, and with a 10 db change in gain, less than 1.0 db change in slope across the band. The amplifiers shall have a minimum gain of 28 db at 216 mc with a selectively manual (12 db) or external gain control and shall be capable of providing a 0.1 volt output (+40 db) at 216 mc with third order intermodulation distortion less than .01%. External control shall be provided either by an ALC unit (15 db) or by a thermal gain control (2 db at maximum gain and with a temperature swing from 120°F. to -20°F.). The amplifiers shall incorporate a manual two-position slope control which reduces slope from 6.5 db to 3.5 db. The input and output impedance shall be 75 ohms with a return loss of no less than 20 db over the entire frequency

spectrum of the amplifier. Each amplifier shall incorporate a self-contained power supply (voltage regulated 3% for plates and filaments for line variations between 100 and 130 volts AC, 60 cycles). The input and output connectors shall be Type "N", and input and output RF monitoring points shall be provided as an integral part of the amplifier. The amplifiers shall be capable of passing both color and monochrome signals.

(e) Line Extension Amplifiers

Line extension amplifiers shall be of the distributed amplifier design incorporating the many advantages inherent in the distributed circuit. They shall have a band width of 40 mc to 216 mc with a frequency response approximating the square root of frequency. They shall have a gain of 26 db at 216 mc and shall be matched at input and output to 75 ohms with a return loss better than 16 db over the specified band width. Input and output connectors shall be Type "N" and their power supply shall be self-contained. The amplifiers shall be capable of passing both color and monochrome signals.

(f) Line Bridging Amplifiers

Line bridging amplifiers shall be of the distributed type incorporating the many advantages inherent in the distributed circuit. They shall have a band width of 50 mc to 216 mc and a nominal gain of 12 db $\pm$1 db. They shall be capable of a +48 dbmv output at 0.1% cross-modulation. The through line loss shall be no greater than 1.25 db at 54 mc, decreasing with frequency to 1 db at 216 mc. All three terminals (input, output and bridge) shall be matched to 75 ohms with a return loss of no less than 16 db over the entire frequency range of the amplifier. Input, output and bridge connectors will be Type "N", and the amplifier's power supply shall be self-contained. The amplifiers shall be capable of passing both color and monochrome signals.

2. Automatic Level Control

System automatic level control (ALC) shall be accomplished through the use of a pilot carrier generator (fixed frequency signal source), a pilot filter (sampling device) and an automatic level control (RF to DC conversion unit). The ALC operation shall be designed so that a 20 db change in the RF input to the ALC amplifier will result in less than a 2 db change in the RF output level of the amplifier up to its maximum gain.

3. Automatic Slope Control (ASC)

(a) An automatic slope control unit shall be utilized in all wide band systems having more than ten line amplifiers in cascade in order to permit the ultimate in system length by equalizing the slope of the cable automatically. The ASC shall have a band width of 40 mc to 216 mc and an input and output impedance of 75 ohms with a return loss of no less than 16 db. It shall have a slope control range of 11 db.

(b) Slope control (equalization) between individual amplifier stations shall be attained by the use of thermal equalizers. They shall have a band width of 40 mc to 216 mc and shall be matched at the input and output to 75 ohms. They shall have an insertion loss at 40 mc of 10 db or 5 db and at 216 mc of 1 db at 125°F. and 2.5 db at 32°F.

4. Line Dividing Networks

All passive line dividing networks utilized in the installation of the distribution system shall be matched at all terminals to 75 ohms with a minimum return loss of 21 db and shall have an isolation between any two outputs of not less than 24 db. They shall have a band width of 40 mc to 216 mc and a nominal change in level of 3.2 db for each division of the signal.

5. Connectors

Type "N" Connectors with an impedance of 75 ohms shall be used in all equipment locations to complete connections between cable and equipment, unless the cable terminates inside the equipment and the outer braid is properly grounded as it passes through the cabinet wall. All other connectors used in the trunk, subtrunk and distribution lines should be 75 ohm connectors designed to fit the cable being used. All cable splices shall be formed with connectors or adapters designed for that purpose.

6. Cables

(a) Coaxial cables used in the system shall be of new manufacture with a smooth attenuation versus frequency characteristic and shall be preswept before installation. They shall have a nominal characteristic impedance of 75 ohms over the frequency range of 40 to 216 mc. The impedance shall vary not more than ±6% from 75 ohms.

(b) A primary transmission line is that line originating at the tower signal reception site and running to the boundary of the service area. It shall have a characteristic impedance of 75 ohms and an attenuation of not more than 1.6 db per 100 feet at 216 mc and 120°F.

(c) A secondary transmission line originates from the primary line and carries the TV signals throughout the service area. No customer service drops shall be made from a secondary line. It shall have a characteristic impedance of 75 ohms and an attenuation of not more than 1.6 db per 100 feet at 216 mc and 120°F.

(d) A distribution line is a line originating directly or indirectly from a secondary line and from which the customer service drops are made. It shall have a characteristic impedance of 75 ohms and an attenuation of not more than 2.0 db per 100 feet at 216 mc and 120°F.

7. Channel Converters

Where it becomes necessary to convert a standard television channel to another standard channel, a crystal controlled transistorized channel converter shall be used. It shall have a gain of ±3 db over a band width of 6 mc. It shall have a terminal impedance of 75 ohms and a local oscillator frequency stability (over a temperature range of -20°F. to +120°F.) of +0.005%. Spurious signals within a 12 mc band around the center frequency shall be at least 50 db down from the desired output recommended level.

8. Miscellaneous Electrical Equipment

Miscellaneous electrical apparatus, such as circuit breakers, lightning arresters and utility outlet boxes, shall conform both in manufacture and installation to the National Fire Code.

9. Equipment Housings and Mountings

(a) All electronic equipment not protected by an integral weatherproof housing shall be protected against weather by being inserted into a metal cabinet constructed of welded steel and reinforcing steel channel members. The cabinet door shall be ventilated and hinged at the top to

provide easy accessibility to the electronic equipment. The door shall be equipped with a supporting arm or arms and when raised, may be fixed at a convenient level. The catch at the bottom of the door shall have a protruding hasp to permit securing the cabinet with a padlock. Door louvers and openings in the cabinet bottom shall be provided for ventilation and shall be covered with a fine mesh screen. The cabinet shall be rust-proofed by an undercoating of zinc chromate and shall have an exterior finish of baked white enamel, in combination with a flat black interior to reduce the effect of the sun's heat to a minimal inside temperature.

(b) As various mounting methods and locations will be required by different utility companies, the cabinets shall be readily adaptable to either wall, cross arm or pole mounting (see Drawings A, B, C and D attached).

10. Accessory Power Supplies

All power supplies not provided as an integral part of a system component shall be supplied in weatherproofed housings. Protective devices shall be provided in the equipment for such circuits as required to protect the equipment from damage due to overload or short circuits.

11. System Accessories

System accessories, such as filters, traps, attenuators and line terminating units, shall have an impedance of 75 ohms and shall be of the same manufacture as the major electronic system components to assure complete equipment compatibility throughout the system.

VI. POLE LINE MATERIALS

1. Supporting Messenger Strand

(a) For cable spans up to 200 feet, a 1/4 inch high-strength seven-wire strand with a galvanized zinc coating shall be used. It shall have a minimum breaking strength of 4750 lbs.

(b) For cable spans exceeding 200 feet, a 1/4 inch extra high-strength seven-wire strand with a galvanized zinc coating shall be used. It shall have a minimum breaking strength of 6650 lbs.

2. Lashing Wire

All coaxial cables shall be lashed to the messenger strand with a .045 inch diameter stainless steel lashing wire.

3. Hardware

All hardware shall meet the requirements of accepted system construction practice and of state and local codes where applicable.

VII. CONSTRUCTION PRACTICES

1. All construction shall be in accordance with standard utilities practices as detailed in the EEI Handbook E3 governing joint use agreements and in the Bureau of Standards Handbook H30 (National Electrical Safety Code). In addition, construction practices shall satisfy all state and local codes where applicable.

2. The system messenger strand, when installed on joint use poles, shall always be attached on the side of the pole to which the telephone cables have been attached, unless otherwise requested by the owner of the pole plant.

3. Equipment housings shall be mounted on the poles in accordance with Drawings A, B or C. Wherever possible, Drawing A should be followed, since this method of mounting eliminates the possibility of damage to the telephone plant or pole.

4. Grounding

   (a) The television messenger strand shall be grounded at the first, the last and at every tenth pole throughout the system with No. 6 solid, soft-drawn copper wire (covered with wood molding) and bonded to a 3/4" x 8' copper ground rod, driven its full length and 6 inches under the ground surface.

   (b) All pole mounted equipment housings shall also be grounded as described in subsection (a) of this paragraph above.

   (c) Where requested, the television messenger strand may be bonded to the telephone strand and then grounded as described in subsection (a) of this paragraph above.

(d) All anchor guys shall be effectively grounded and electrically continuous to earth through the anchor. A guy bond clamp shall be inserted in all bolt and nut thimble eyes, except at pole-to-pole guys, where ground continuity is not dependent upon the guy.

5. Service Entrance (Power Drop)

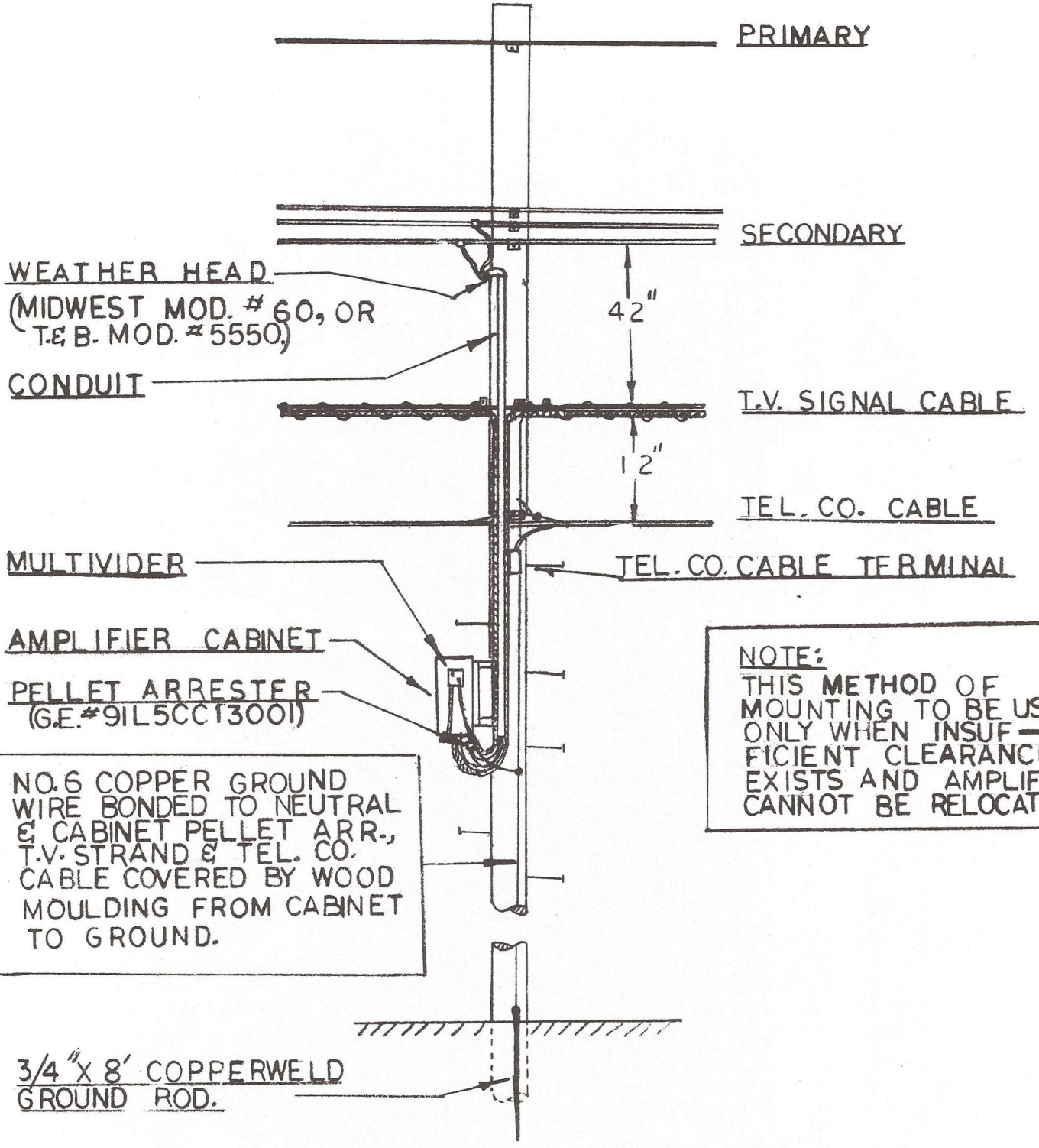
(a) A two-wire No. 12 weatherproof service entrance cable, located in 1/2 inch conduit, shall be used from the weather head to the circuit breaker mounted inside of the equipment housing.

(b) The neutral side of the service entrance shall be continuous and shall be bonded to the equipment housing, which, in turn, shall be grounded as described in Section VII., Paragraph 4. (a) above.

(c) All service entrance circuits shall incorporate a pellet type lightning arrester to protect the electronic equipment.

REVISIONS						
NO.	DATE	ECO	SYM	DESCRIPTION	BY	APPROVAL

A



NOTE:
THIS METHOD OF MOUNTING TO BE USED ONLY WHEN INSUFFICIENT CLEARANCE EXISTS AND AMPLIFIER CANNOT BE RELOCATED.

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

SKL
TYPICAL CABINET POLE MOUNT

SPENCER-KENNEDY LABORATORIES INC.
BOSTON 35, MASSACHUSETTS

MATERIAL:	DRAWN: EMR	SCALE: NONE	DRAWING — B	REV.
FINISH:	CHECKED: RAB	DATE: 2-18-63		
	APPROVED:			

REVISIONS						
NO.	DATE	ECO	SYM	DESCRIPTION	BY	APPROVAL

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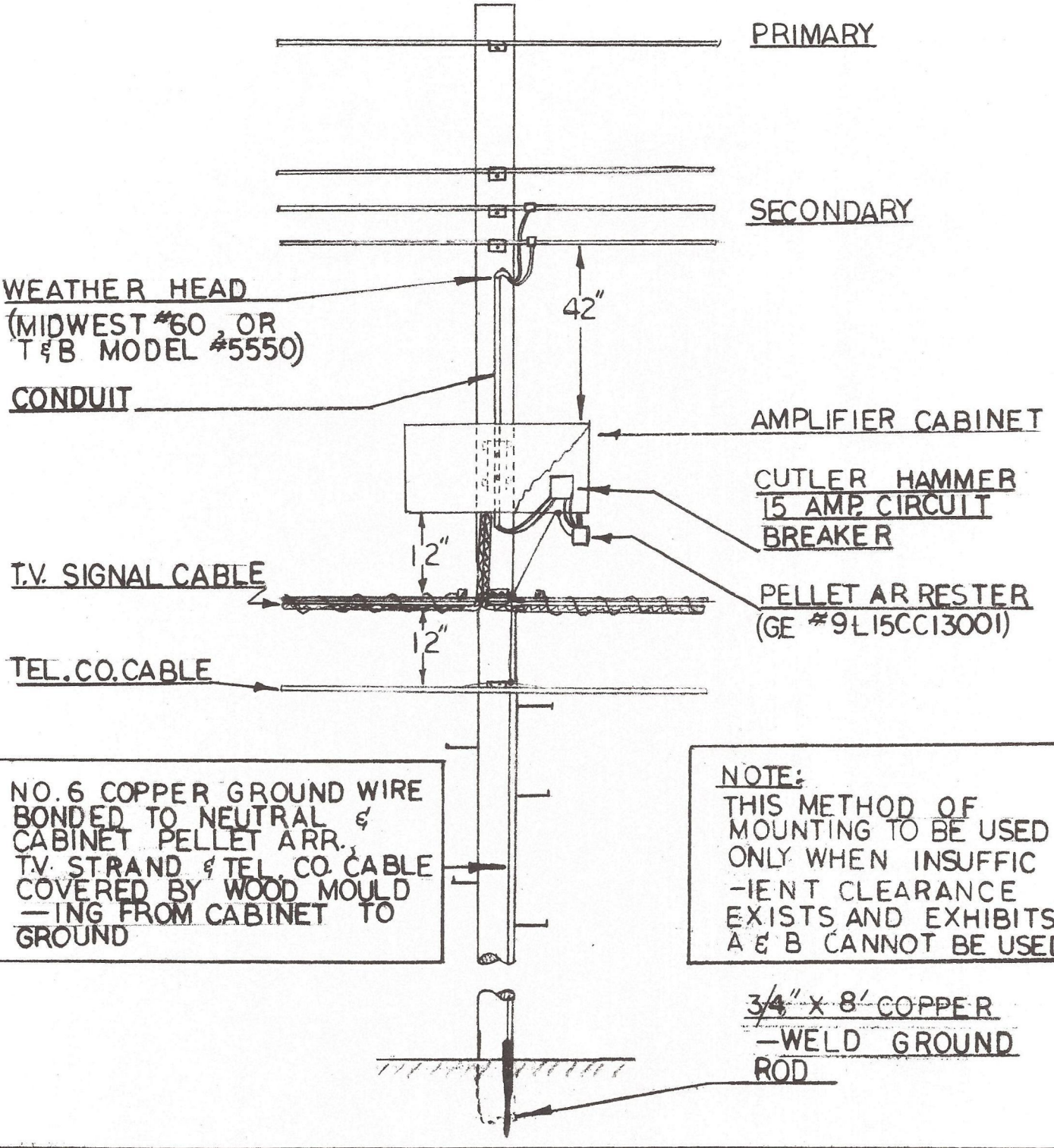

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

SKL
TYPICAL CABINET POLE MOUNT

SPENCER-KENNEDY LABORATORIES INC.
BOSTON 35, MASSACHUSETTS

MATERIAL:	DRAWN: EMR	SCALE: NONE	DRAWING - C	REV.
FINISH:	CHECKED: RAB	DATE: 2-18-63		
	APPROVED:			

REVISIONS						
NO.	DATE	ECO	SYM	DESCRIPTION	BY	APPROVAL

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MODEL NO.	USE	LENGTH	DEPTH	HEIGHT
850	MAINLINE AMP. WITH OR WITHOUT 208 AMP.	20"	7"	$20\frac{1}{8}$"
851	ALC STATION OR, ALC & 208 AMP. STATION, OR ALC & ASC STATION	31"	7"	$20\frac{1}{8}$"
853-B	208 OR 209B AMP STATION	20"	6"	10"

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

AMPLIFIER CABINET DIMENSIONS

SPENCER - KENNEDY LABORATORIES INC.
BOSTON 35, MASSACHUSETTS

MATERIAL:
FINISH:
DRAWN: EmR
CHECKED:
APPROVED: RaB
SCALE: NONE
DATE: 2-15-63
DRAWING — D
REV.

REVISIONS						
NO.	DATE	ECO	SYM	DESCRIPTION	BY	APPROVAL

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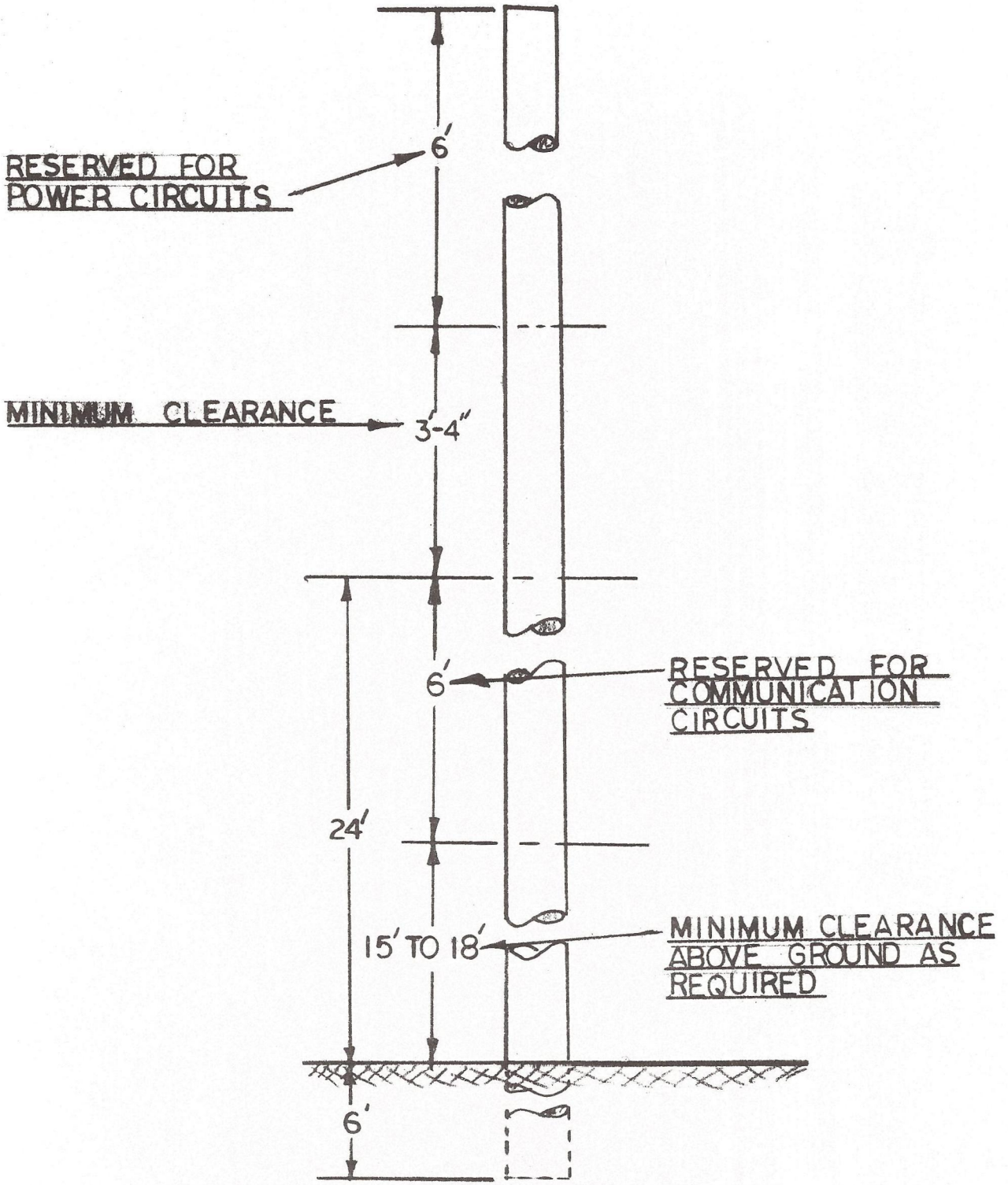

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
TOLERANCES ON:
FRACTIONS DECIMALS ANGLES

40 FT. JOINT USE POLE SHOWING SPACE ALLOCATION

SPENCER - KENNEDY LABORATORIES INC.
BOSTON 35, MASSACHUSETTS

MATERIAL:	DRAWN: EMR	SCALE: NONE	DRAWING - E	REV.
FINISH:	CHECKED: RAB	DATE: 2-18-63		
	APPROVED:			