WBCK . . . 1 KW AM
Battle Creek, Mich.

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Chief Engineer

The WBCK 1-KW AM transmitter is located on high ground two miles south of the center of Battle Creek. Since the ground conductivity in this section of the country is rather poor, no attempt was made to select a swamp site, but rather a site was selected that would afford good AM coverage with a view to its future use for FM or TV. (The site overlooks downtown Battle Creek, which makes it ideal for future operations.) Results since opening of the station seven months ago prove that the location is most satisfactory for AM. Twenty-two acres give ample room for the directional antenna system.

Transmitter Building

The transmitter building was designed by the chief engineer and built by local labor. As can be seen from Fig. 2, the building contains enough room for the addition of a second transmitter to the left of, and at right angles to the present BTA-1L AM transmitter. In this event the speech racks would be moved from their present position to a new position at the left of the entry. A basement was built to provide room for the possible addition of large transformers, blowers, etc., and also to take care of future studio additions which could make the building a self-contained radio center. In that case the heating plant for the entire building could be placed in the existing basement. The heating plant consists of an oil type floor furnace, which provides ample heat for the present building. The two-car garage provides car space for the engineer on duty and also accommodates maintenance work too heavy or dirty to be handled in the shop. The use of cinder block construction covered with 'Brick-Kote" veneer gives a pleasing appearance at a reasonable cost.

Modification of BTA-1L

To get a more pleasing appearance of the combined transmitter and phasing installation, the phasing equipment was designed to match the BTA-1L cabinet and was placed *between* the exciter and the final amplifier power supply panel. How well it worked out, can be seen from the photographs (see Fig. 1). From left

FIG. 1. (below). WBCK's 1 KW transmitter room view showing how phasing equipment is located between the 250-watt exciter and 1 KW amplifier cabinets. Chief Engineer, A. J. Geranis is at transmitter control desk. At far left are test and audio input racks.

to right the units are: RCA exciter; phasing change-over controls and daytime phasing back of recessed panel; night phasing and line current meters; final power supply transformers back of recessed panels; RCA final amplifier. Placement of the phasing unit in the center and spreading the exciter away from the final has caused no technical or operational trouble whatsoever. The above design was the writer's idea and so far as can be ascertained, is the first time a BTA-1L has ever been given this same treatment. The reason for placing the phasing in the center (rather than in a right-wing cabinet of matching size) was due to the fact that a cabinet the same size as the final would not be large enough for the circuits required. Therefore an oversize cabinet in the center resulted in better physical balance and overall appearance.

An extremely short time (8 days) was required for tune-up and proof-of-performance measurements, indicating that the system of construction followed was evidently a good one.

Antenna System

The directional antenna system consists of three 250-foot Blaw-Knox type LT towers spaced 264.5 feet apart, on a line 342 degrees true. Coupling units are contained in houses made of waterproofed cinder block near the base of each tower. A series type ground system is used with 300-foot radials spaced 2 degrees. There is a 50-foot square Truscon ground screen at the base of each tower. The main innovation is in the use of solid dielectric coaxial cables as explained below.

COAXIAL CABLE INSTALLATION

Sampling Lines

Sampling lines are RG-8/U run in duplicate underground. All sampling lines were cut the same length, slightly longer than the longest run required. An r-f bridge was then used to show when they were trimmed to the same electrical length. All lines were terminated with Amphenol 83-1R receptacles for convenience in connecting the jumpers between the line used and the point of connection. Amphenol 83-1R receptacles were used on the Johnson sampling loops in place of the coaxial end seal supplied. The sampling loops were mounted on the towers at the 25-foot level and insulated from same. The sampling line was run up the towers in ½ inch conduit insulated from the tower by use of Premax #3S-20 heavy duty stand-off insulators. The section of conduit from tower to tuning house was made of copper, bent to provide a drip loop and to allow for movement of the tower in bad weather, etc. This method provides a rugged and inexpensive way of bringing the sampling line across the base insulator, and has proved trouble free in operation. All excess sampling line from the two near towers was coiled on a large drum fastened to the transmitter house basement wall near the tower conduits. (4 inch conduits from transmitters to towers.)

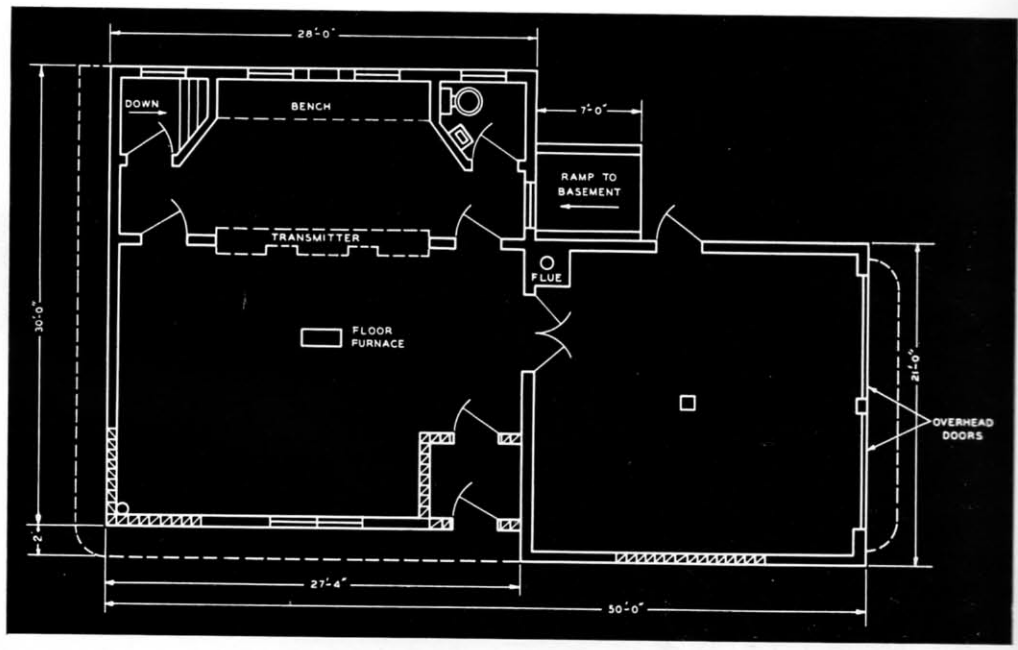

FIG. 2 (above). The floor plan illustrates how the BTA-1L is flush-mounted in one wall, with access doors provided at each side of transmitter.

R.F. Transmission Lines

R.F. transmission lines were made of Amphenol 21-125 coaxial cable also run in duplicate underground. They were cut to the exact length needed for each run and terminated at the phase unit and also at the tower coupling unit with Amphenol #152-101 end seals. Choice of either line for separate towers is made by changing a short copper strap jumper at each end. Silicone compound was used in making up all connections.

Method of Installation

The entire cable bundle to each tower was run in 4-inch fibre (Orangeburg) conduit buried below the frost line. Each conduit run was broken approximately every 125 feet by a manhole constructed of concrete block with a poured concrete top. A cast concrete tapered block was used to close the access opening. Since the soil in this area is sandy, no floor was used in the manholes so that drainage was obtained. The conduits are laid so as to be higher

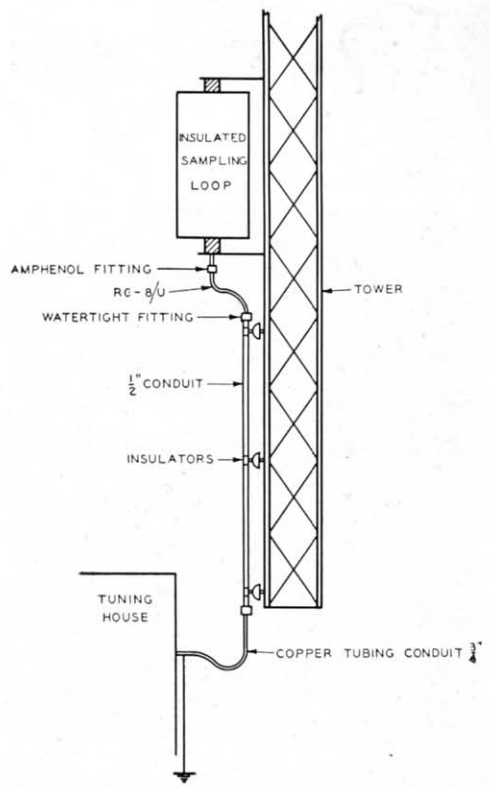

FIG. 3 (above). A line drawing which illustrates sampling loop detail.

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FIG. 4 (above). Partial view showing a portion of the work bench in WBCK's shop.

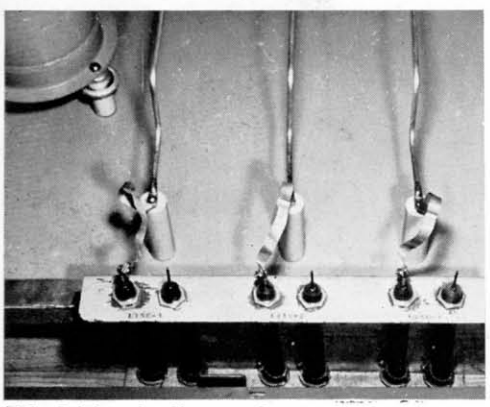

FIG. 5 (above). Closeup showing the output connections at phasing unit. Note lines run in duplicate and method of selection.

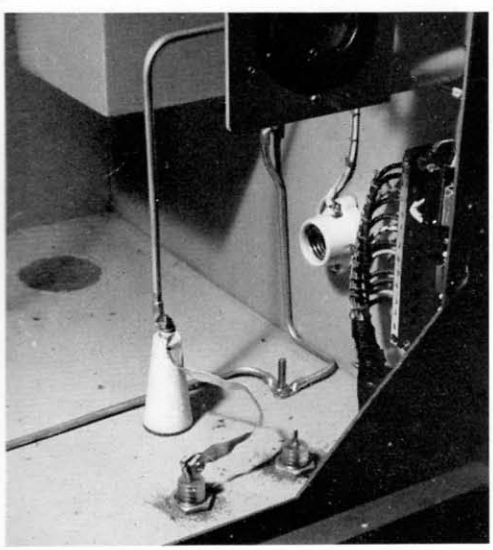

FIG. 6 (above). A coupling unit termination of transmission lines showing method of selecting the line desired.

in the center of the runs than at the ends, thus they drain into the manholes. The trenching in our instance was done with a power grader with a tilt blade, however, a regular trenching machine is to be recommended if obtainable. The grader cost us .30/foot to open and backfill our trenches to a depth of three feet. The four manholes were built with common labor and ran about $25 each. The cable bundle consisted of the following: two 21-125 transmission lines; two RG-8/U sampling lines; three #6 "TW" lighting cables; one MHFA-14 control cable (Navy surplus 14 conductor armoured).

The cable bundle was pulled as a unit after first fishing a ½-inch rope through the conduit as a pull cable. The manholes made it possible to pull the long lengths required (two 250-foot runs and one 520-foot run).

Advantages of System

1. Easy installation. Entire cable laying operation required approximately four days. R-f cables can be handled like large a-c cables, therefore no skilled labor needed.

2. Low maintenance. No dry-air pump required. No splices, leaks, or special fittings to worry about. Water—no problem.

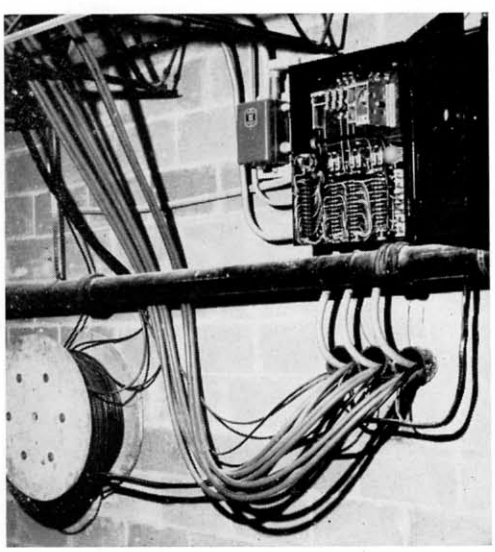

FIG. 7 (above). View of conduit entrance to building, junction box with tower light flasher, photo-electric motor starter, and (at left) reel of surplus sampling line from #2 and #3 towers.

3. Future alterations made easy. Use of large conduit allows cables to be pulled at will. Use of 21-125 cable good for powers up to 10,000 watts with ample safety factor.

4. 100% safety factor due to FCC requirements for duplicate r-f cables in underground installations.

5. Overall efficiency measured slightly higher than normally used air-type cable. (No absolute tests made, however, above was noticed by consulting engineer, A. F. Englis.)

6. Absence of cable runs above ground leaves area clear for producing a money crop such as alfalfa.

Studio Set-up

A floor plan diagram of the studio is shown in Fig. 9. We were limited as to room, having approximately 2000 square feet to work with. However approximately 1500 square feet additional room can be obtained in the future. It was therefore decided to design the studios and control rooms in their final form so that future expansion would consist only of providing additional office space. The theory back of this being that it is less expensive in the long run to outfit the space as studios and use some of it temporarily for offices than to have to convert offices to studios at some future date. Accordingly we are at the present time using studio "C" and Control Room #2 as offices. The music library is also in "C". The overall size of studio "A" is limited by the ceiling height and other structural factors present in the building.

The WBCK studios are located on the 4th floor of the 18-floor Security National Bank Building, the best constructed and most imposing building in Battle Creek. Sound treatment of the studios consists of Johns-Manville studio element covered with perforated Transite on the walls, and Johns-Manville "Fibertone" on ceilings. "Riverbank" doors are used on all studios and studio "B" is provided with sound locks. Studio "B" is also designed so that it may be converted into two announce booths by the addition of one wall. Recessed fluorescent lighting is used and studios are air conditioned by connection to the bank's system.

At present one RCA 76-B5 Consolette is used in the control room along with two RCA 70-D Turntables and a speech rack holding associated equipment such as cueing and recording amplifiers, etc. An eight-bay patch panel is used and is wired for the addition of a second 76-B5 Consolette in Control Room #2. All microphones, remote lines, auxiliary amplifiers, etc., are brought up to jacks for maximum flexibility.

Recording is done at present with two RCA 72-DX cutter attachments. When the second control room is installed, it will be equipped to handle all recording.

WBCK Mobile Unit

A simple but very effective mobile unit is used for all emergency and special events remotes. This unit consists of a station wagon equipped with a tape recorder, reels for extension microphone, a-c and telephone cable, and with an operating desk mounted in the rear for use of any other remote equipment desired. The heart of the unit is a simple 150 watt power supply providing 115 volts 60 cycle a-c for the recorder or remote amplifiers as desired. A vibrator inverter is run from a 12 volt d-c supply. The d-c is obtained by using a second six-volt battery in series with the car battery. A double-pole, double-throw switch allows this second battery to be paralleled across the car battery for charging. Use of the vibrator type inverter keeps the output frequency constant regardless of input voltage and is the reason the system works so well. We cut tapes in the mobile unit and play back on the studio machine with excellent results. The above system has been in operation for six months with no trouble of any kind. It permits us to cover emergency remotes "on the run". Two-way radio is to be added at a later date.

Staff

The engineers who helped materially in the above installations are: William McLellan, Wendell Crum, Robert Wilbur and James Tinsler. All design, supervision and organization during the construction period was handled by the chief engineer.

The president and general manager of WBCK is Mr. Robert H. Holmes, local Buick dealer.

FIG. 8 (at right). Studio engineer, Leo Jylha, shown at control of RCA 76-B5 consolette located in control room #1. Note KB-2C bantam microphone mounted on special arm.

FIG. 9 (below). Floor plan of WBCK studios A, B and C which are served by control rooms #1 and #2.