

## Retrofitting and Installation of Antenna Feed Systems: Precautions (Postprint)

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**Date:** 2023-10-08T00:00:00+00:00

### Abstract

This article presents the pre-renovation background, rationale for renovation, renovation scheme, and post-renovation performance of the transmitting antenna feed system for CCTV-1 relay, along with installation precautions for the antenna feed lines.

### Full Text

## Renovation and Installation of Antenna Feed Systems and Key Considerations

**Abstract:** This paper introduces the background, rationale, renovation plan, and post-renovation outcomes of the CCTV-1 broadcast antenna feed system upgrade, along with critical considerations for antenna feed line installation.

**Keywords:** background; antenna feed line renovation; installation considerations

**CLC Number:** TN011

**Document Code:** A

**Article ID:** 1671-0134(2017)08-087-02

**DOI:** 10.19483/j.cnki.11-4653/n.2017.08.032

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### 1. Background of Antenna Feed Line Renovation

In the context of major reforms to Anhui's broadcasting and cultural system, Bozhou Radio and Television Station underwent consolidation. The former Bozhou Television Station, Radio Station, Cable Station, and Education Television merged to form Bozhou Radio and Television Station. Existing frequencies

and channels were reorganized, power capacity was expanded, and the CCTV-1 channel 9 transmission system was relocated to the self-supporting tower of the former Bozhou Television Station. Since the linear section of this tower was already fully equipped with transmitting antennas, the antenna feed system had to be installed on the lower sloped section of the tower. To improve the field pattern of television signal coverage and ensure an effective coverage radius of approximately 30 kilometers, this antenna feed system renovation was undertaken.

## 2.1 Pre-Renovation Overview

The antenna feed line system used for relaying CCTV-1 programs employed a single-layer, four-sided, four-dipole transmitting antenna (channel 9) with a gain of 7.5 dB. The nominal power rating was 4.5 kW, with a maximum of 5.2 kW. This system was installed on a 100-meter-high guyed tower in the suburbs, featuring a single-layer, four-sided, four-dipole configuration. The field pattern is shown in [Figure 1: see original paper].

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## 3.2 Antenna Installation

When installing antennas, consult the feed system diagram to understand inter-layer spacing, offset direction, and phase relationships to avoid installation errors. During tower installation, drainage holes on VHF antenna dipoles must face downward; any errors should be corrected before hoisting. Reflector plates should be mounted near the symmetric center position with at least four fixation points, and all fastening bolts must be tightened securely. After hoisting and adjustment, dipoles should remain level, with all dipole centers on the same plane. Cable clamp spacing must comply with drawing requirements, typically one clamp every 1–2 meters, with appropriate tightness to prevent cable deformation. Each antenna panel should be pre-connected to its corresponding branch cable for that layer and face, with sufficient connection points. Whenever possible, components should be sealed before hoisting to minimize high-altitude installation and sealing work.

## 3.3 Transformer Installation

Connect components according to the feed system diagram. Before installing transformers, clean flange interfaces and contact pins with anhydrous alcohol. Clamp tightness must be appropriate—avoid deforming the transformer outer tube while preventing looseness. For feed systems with multiple transformers, ensure uniform stress distribution at each interface (flange or threaded) and maintain good electrical contact. To enhance installation quality, note that protective covers, fastening bolts (galvanized), and sealing rings (black) from the factory are single-use parts; during formal installation, use the stainless steel bolts and silicone rubber sealing rings (red) shipped with the antenna.

After transformer system installation, check insulation resistance ( $>200\text{ M}\Omega$  with a 2500V megohmmeter). For inflatable main feed cables and transformers, ensure inflation nozzles are properly aligned.

### 3.4 Branch Cable Installation

Before connecting branch cables to cable heads, verify insulation resistance ( $>200\text{ M}\Omega$  with a 2500V megohmmeter). Connect cables according to the feed system diagram and dimensional markings on cable labels. During cable laying, maintain bending radius above specified values, particularly for semi-air-insulated cables. Secure branch cables at multiple points based on site conditions to prevent wind-induced swaying, excessive suspended lengths, or excessive stress on cable joints. Tighten fastening nuts/bolts with appropriate force. Protect against moisture and rain during installation—do not remove protective covers from antenna and transformer interfaces until ready for connection. If work cannot be completed in one day, implement necessary rain protection measures. Branch cables connected to the same transformer can be attached to any output port. For semi-air-insulated branch cables, heed warning labels such as “Connect to Antenna” or “Connect to Transformer” and avoid incorrect connections. When connecting branch cables, pay special attention to phase sequence: for four-sided systems, the left-to-right sequence is A, B, C, D ( $90^\circ$  per direction); for eight-sided systems, the sequence is A, B, C, D, E, F, G, H ( $45^\circ$  per direction). Phase connections must be correct.

### 3.5 Main Cable Hoisting

Main feed cable connectors are typically factory-installed and should not be disassembled arbitrarily. Use net bags for hoisting main feed cables to ensure uniform force distribution. Personnel must protect cables when passing through holes or making turns. Pre-connect each antenna panel to its corresponding branch cable to reduce high-altitude workload.

### 3.6 Debugging

Typical tests include system standing wave ratio (SWR) and high-voltage insulation. When SWR exceeds specifications, sectional testing is commonly used to identify problems. First check for branch cable miswiring or poor contact. After verifying correct branch cable installation, observe the SWR curve—jagged curves or large bulges usually indicate poor contact. Gently tap connectors with a wooden stick while monitoring system parameters; replace the antenna and branch cable with a standard resistor to isolate the fault.

### 3.7 System Sealing

Proper sealing is critical for long-term stable system operation and demands serious attention. For threaded interfaces: apply Loctite thread sealant evenly

to the outer threads of the transformer or antenna interface, then attach the branch cable head or another transformer head and tighten with appropriate force (do not overtighten). Wrap the interface and threads completely with self-adhesive tape, preferably two layers, ensuring tight wrapping. Finally, apply heat-shrink tape or tubing (pre-installed) and heat-shrink. For flange interfaces: apply flat sealant evenly on the flange plane (outside the insulating rubber ring), avoiding electrical contact surfaces. After connecting the interface and tightening bolts evenly, apply flat sealant to gaps between the flange and outer conductor, bolt holes, and between flanges. Seal openings with butyl rubber tape, ensuring even application without gaps, then wrap with two layers of self-adhesive tape. Finally, apply heat-shrink tape or tubing (pre-installed) and heat-shrink.

#### 4. Summary

Through this renovation, we found that antenna feed system installation requires not only safety but also scientific rigor, with each step serving a specific purpose. Post-renovation field tests showed significant coverage improvement compared to pre-renovation conditions, achieving the expected coverage radius of approximately 30 kilometers.

#### References

- [1] Huang Zhili, Yan Xu. Maintenance of Television Transmitting Antenna Feed Line Systems [N]. Electronics News, 2010.
- [2] Wang Weishan. Installation, Use, and Daily Maintenance of Antenna Feed Line Systems [N]. Science and Technology Innovation Herald, 2009(27).
- [3] Shi Lei. Maintenance and Repair of Transmitter Station Antenna Feed Line Systems [N]. Electronics News, 2010.

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*Note: Figure translations are in progress. See original paper for figures.*

*Source: ChinaXiv — Machine translation. Verify with original.*