

Zone Enhancer Authorization Procedure

Acronyms in the Glossary on Page 5.

Zone enhancer devices such as a bi-directional amplifier (BDA) are used to increase in-building radio coverage. To operate a zone enhancer for in-building coverage using public safety radio frequencies, an Innovation, Science and Economic Development Canada (ISED) licence and authorization from CREST is required. This document will cover the process to apply for authorization, the required documents and the design thresholds and restrictions.

Application Process

A CREST authorized designer and installer of zone enhancers (CADI) can apply for a licence through CREST by following this process.

An initial test application form will be sent to CREST with a request for a date of testing. The application will include the site location and the applicant's contact information. The requested coverage test date must be at least 3 business days from the date of submission.

Crest will provide a tracking number CR-BDA_####, the name and location of the donor site and the testing frequency. The tracking number will be used in all correspondence moving forward.

The coverage results will be sent to CREST. If the in-building coverage is insufficient, a design for a distributed antenna system (DAS) and zone enhancer licence application will be submitted.

The DAS design will include the following:

- Site plan showing the location of the zone enhancer and donor antenna.
- Floor plan showing the location of all indoor antenna, splitters, and cable runs.
- Electrical design showing connection to backup power and alarming to the fire panel.
- DAS block diagram with calculated gains and losses, and cable lengths.
- Uplink and downlink budget reports.
- ISED antenna attestation form.
- Projected coverage provided by the DAS.

The Zone Enhancer Licence Application will include the following:

- Site and contact information.
- Contractor details.
- A contact for 24-hour building access.
- Design details.
- BDA details.
- Donor antenna details.
- Indoor antenna details.

CREST will apply for a licence with ISED after reviewing the design and application. CREST is the Frequency Licence Holder and will hold the licence for all zone enhancers using the public safety radio frequencies in the Capital Regional District.

During the waiting period, the DAS can be installed. The zone enhancer is not permitted to be connected or switched on.

Once the licence is granted from ISED, CREST will provide a notification that work may proceed and a commissioning date can be set. This is not approval to switch on the zone enhancer. The zone enhancer may be switched on during commissioning then must be switched off.

Required Documentation for Final Authorization

Final authorization will be granted after the commissioning results, final design and calculations have been submitted and approved by CREST. Once approved the zone enhancer can be switched on permanently.

As built DAS design that must reflect the final system:

- Site plan showing location of zone enhancer and donor antenna
- Floor plan showing the location of all antennas, splitters, and cable runs.
- Electrical design showing connection to backup power and alarming to fire panel.
- DAS block diagram with calculated gains, losses, and cable lengths.
- Uplink and downlink budget reports, including each antenna's output power.
- ISED Antenna attestation form.

These documents must be reviewed and sealed by a Professional Engineer.

Commissioning Form that must reflect the final system:

- Date of commissioning.
- Design details including calculated uplink noise ERP and any adjustments to gain of the zone enhancer.
- Professional Engineer's information and seal.

After Crest has reviewed these documents a notice of final authorization will be sent to the designated party. This will include the ISED license number and CREST tracking number.

Annual Inspection

An annual inspection must be performed, and the form submitted to CREST. This is a requirement for the renewal of the zone enhancer license. Failure to inspect the installed zone enhancer will result in the involvement of the respective fire department.

Every five years, an in-building coverage test must be submitted with the annual inspection form. Any required changes to the design of the zone enhancer system must be reviewed and accepted by a Professional Engineer. Once approved, design changes will be submitted to CREST.

In-Building Coverage Testing

Test Methodology

CREST will assign a test channel and turn on a V.52 test pattern. The testing agency will use this frequency and test pattern for measuring Bit Error Rate (BER) and Received Signal Strength Indicator (RSSI).

Coverage Testing Thresholds

The criteria to pass:

- Minimum RSSI of -95.0 dBm.
- BER of 2.0% or lower.

95% of all areas on each floor must pass, with no two adjacent grid failures. 99% of all critical areas must pass. Critical areas include mechanical rooms, electrical rooms, elevator lobbies, stairways and exit passageways. These strict thresholds are in place to account for degradation to the radio signal due to weather, as well as objects that will be added in the building after testing.

If the BER at a testing location is greater than 2%, the test can be repeated 1.5m in any direction within the grid tile. If the second test is above 2% BER, this will result in a failed grid tile.

When a building has insufficient coverage, a zone enhancer will be required.

Coverage Testing Grid Size

Building floor plans will be reviewed and test locations marked prior to the initial test. Grid dimensions and quantity of grid tiles will be determined by the area of the floor:

- Grid tiles will have a minimum area of 9.0m² and a maximum area of 225.0 m².
- The grid will be divided in to 20 equal areas on each floor. Additional grid tiles may be added to ensure all floor is covered. Floors greater than 4500 m² will require additional grid tiles.

The grid size may need to be reduced or increased due to obstructions or building design.

Test results must be sent to CREST whether the building passes or fails in-building coverage testing.

Uplink Design Requirements

Donor Antenna Requirements

- The calculated noise power received at the donor radio site must be below -143dBm.
- The Effective Rated Power (ERP) of noise within the passband must not exceed -43dBm from the antenna. This maximum threshold will vary dependent on the distance to the donor site. See Table 1 and Figure 1.

Distance to Site (km)	Maximum Uplink Noise ERP (dBm)
0.1	-72.50
0.2	-66.50
0.3	-63.00
0.4	-60.50
0.5	-58.50
0.6	-57.00
0.7	-55.60
0.8	-54.50
0.9	-53.40
1.0	-52.50
1.1	-51.70
1.2	-51.00
1.3	-50.20
1.4	-49.60
1.5	-49.00
1.6	-48.50
1.7	-47.90
1.8	-47.40
1.9	-46.90
2.0	-46.50
2.1	-46.05
2.2	-45.65
2.3	-45.25
2.4	-44.90
2.5	-44.55
2.6	-44.20
2.7	-43.85
2.8	-43.55
2.9	-43.25
3.0	-43.00

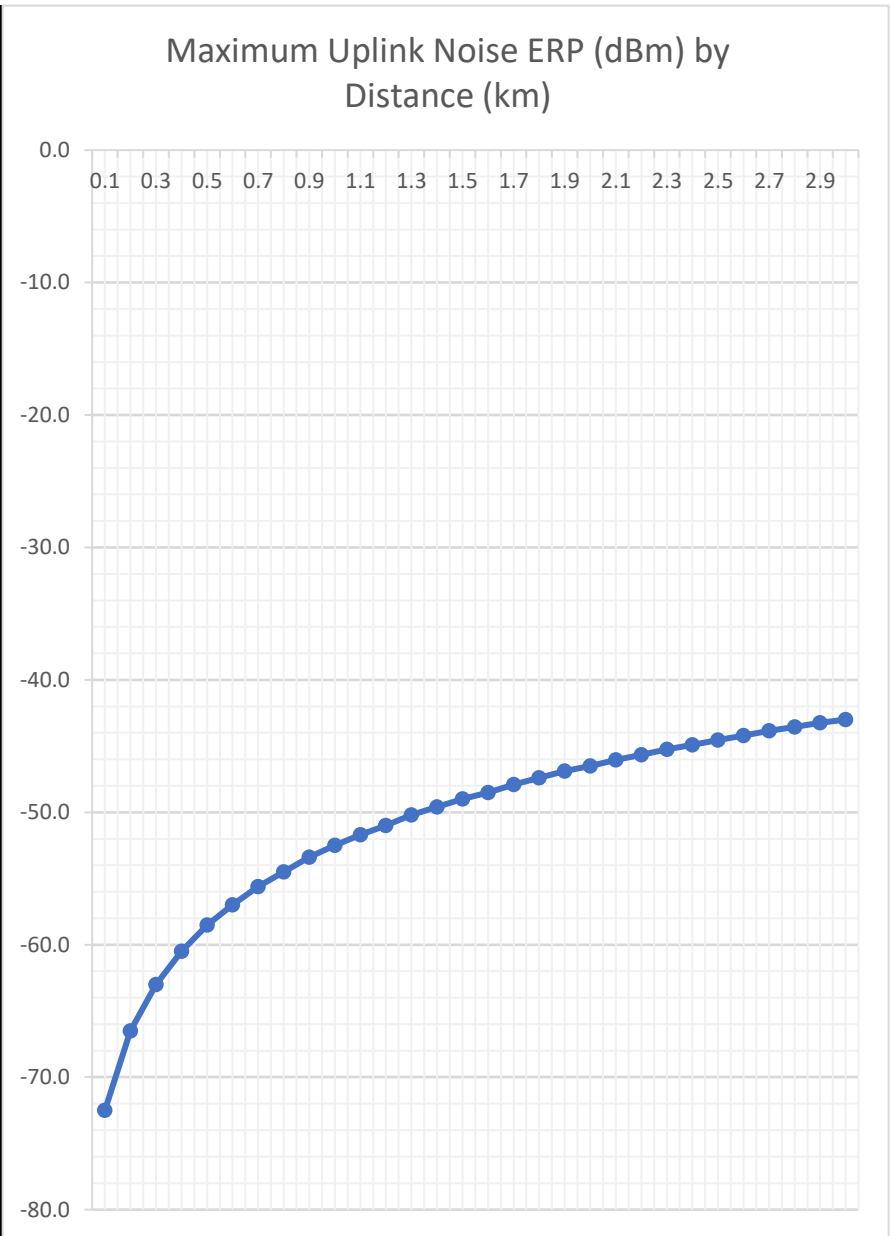


Table 1: Maximum Noise Link ERP by Distance

Figure 1: Maximum Uplink Noise ERP by Distance

Glossary

Term of Acronym	Definition or Meaning
BDA	Bi-Directional Amplifier
BER	Bit Error Rate
CADI	CREST authorized designer and installer of zone enhancers
CREST	Capital Region Emergency Service Telecommunications Inc.
DAS	Distributed Antenna System
ERP	Effective Radiated Power
ISED	Innovation, Science and Economic Development Canada
RSSI	Receive Signal Strength Indicator