METROLINX

Track Workers Radio Equipment and Communication Standard

MX-STC-STD-001

Revision 00
January 2025

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Metrolinx,

an Agency of the Government of Ontario

Preface

This is the first edition of the Metrolinx Track Workers Radio Equipment and Communication Standard (MX-STC-STD-001). Metrolinx requires a substantial number of track works contractors, which demand safe and reliable radio communications with the Protecting Foreman/Subforeman.

The purpose of the Metrolinx Track Workers Radio Equipment and Communication Standard is to establish a specifications platform and operating practices for radio equipment that must be followed by the Protecting Foreman/Subforeman for Radio Communications with the Track Workers, other contractors, and any other visitor to the Workblock, including Metrolinx employees.

These requirements and practices are to be followed by Metrolinx offices that hire Track Works Contractors. This standard shall be followed to supply the radios and train the track workers on these Metrolinx Radio Communications practices.

The technical content within the Metrolinx Track Workers Radio Equipment and Communication Standard (MX-STC-STD-001) was developed by the Metrolinx Signals & Communication/Radio Systems office within Asset Management and Maintenance Division, which includes specialized subject matter experts.

Suggestions for revision or improvements can be sent to Metrolinx Signals and Communication, Radio Systems, Attention: Senior Manager, Radio Systems, who will introduce the proposed changes to Metrolinx Radio Systems. The Senior Manager, Radio Systems, ultimately authorizes the changes. A description of the proposed change shall be included along with information on the background of the application and any other useful rationale or justification. Proposals for revisions or improvements shall also include your name, company affiliation (if applicable), email address, and phone number.

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1. Introduction

1.1 General

1.1.1 Portable or mobile radios can be programmed with licensed or license-exempt channels. License-exempt channels are used by the general public, potentially interfering with other radio users on the same channels, limiting the use of license-exempt channels to non-critical activities and non-professional or non-commercial radios. Besides, programming professional or commercial radios with license-exempt frequencies is considered a contravention of various federal acts. ISED considers this contravention as the "operation of radio apparatus without a radio authorization." Licensed channels are an asset and are challenging to obtain, especially when such channels shall be licensed to cover a large territory such as the Metrolinx Operating area.

1.1.2 Metrolinx, as a provincial agency, shall enforce all Contractors or employees to follow all federal regulations or acts, including the ISED Radio Communications Act and operate only Commercial/Professional Radios with licensed channels for any track works coordination.

1.1.3 Metrolinx Radio Systems owns various radio channels (UHF) licensed by ISED to be used throughout most of the Metrolinx operating area. As the channel-licensed tenant, Metrolinx shall supply radio equipment (portable radio) programmed with Metrolinx-licensed radio channels for track works communications. Track Workers shall follow the Metrolinx Track Workers Radio Equipment and Communication Standard when operating the supplied Metrolinx radios.

1.1.4 This Standard is of mandatory adoption to ensure that all track workers are equipped and use only ISED-approved and licensed radio communication equipment and channels and that track workers follow approved Metrolinx Radio Systems Communication practices. Furthermore, the standardization of radio equipment and radio communication practices guarantee that track workers will not contravene the ISED Radio Communication Act, reducing the possibility of radio interferences or mistakes that may occur when operating the radio to communicate with the Protecting Foreman or Subforeman with potentially serious consequences if proper radio equipment is not used.

2. Definitions, Interpretation, Codes, and Standards

2.1 Definitions

2.1.1 Capitalized terms used in this standard shall have the meanings prescribed in Table 1.

Table 1: List of Definitions

Term	Definition
Adjacent Channel Interference	Interference is caused by a channel which is very close in frequency to the channel being used.
Channel	In this document will be used as a short for Radio Channels.
Co-channel interference	Interference is created when two radios using the same channel transmit at the same time.
Commercial/Professional Radios	Higher-tier radios have better performance and durability than general public radios.
Digital Radio	A Radio that includes digital audio processing circuits that enhance audio quality.
Good Industry Practice	Using standards, practices, methods, and procedures to a good commercial and safety standard, conforming to applicable law, and exercising that degree of skill and care, diligence, prudence, and foresight which would reasonably and ordinarily be expected from a qualified, skilled, and experienced person engaged in a similar type of undertaking under the same or similar circumstances.
Licenced Radio Channel (Radio Frequency)	It is the legal authorization issued by ISED to allow someone to use a commercial/industrial/business or amateur frequency in the radio spectrum.
Metrolinx	Metrolinx, a non-share capital corporation, continued under the Metrolinx Act, S.O. 2006, c.16 and a Crown Agency in accordance with the Crown Agency Act, R.S.O. 1990, c.48 and includes all operating divisions.

Term	Definition
Metrolinx Contract Manager	The Metrolinx employee assigned to manage contractors working at any Metrolinx-owned or leased tracks.
Mobile Radio	Two-way radio that is installed in vehicles.
Portable Radio	A handheld radio that is designed to be easily carried.
Protecting Foreman	An employee in possession of positive protection and in charge of protecting workers, visual work groups, separated work groups and track units.
Radio Channel	Individual Radio Frequencies are designated by a proper authority (ISED in Canada) for specific radio communications use.
Radio Frequency	It is the number of radio waves per second.
Radio Spectrum	All the range of radio frequencies available for radio communications.
Subforeman	When the Protecting Foreman cannot personally observe and supervise all persons engaged in the work directly related to the protecting foreman's work project, he/she shall assign a Subforeman in charge of the separated work group as per CROR Rule 855 special instructions.
Rail Platform	Any platform that is served by a track allowing passenger access to GO trains.
Rail Operations	Means the operation of an active railway, including the passage of freight, passenger, and non-passenger trains on the rail corridor.
Rail Corridors Maintenance	The division within Metrolinx is accountable for the maintenance of the Metrolinx rail corridor.
Construction Track Worker	Usually, a contractor is a person hired by Metrolinx to carry out works on Metrolinx or Metrolinx used tracks, either new construction or maintenance works.
Two-way Radio	Radio communications devices used to transmit and receive radio signals
Work Area	Any area on the Site within which Construction or maintenance Activities are taking place.

Term	Definition
Workblock	Work Area designated for track works

2.2 Abbreviations

2.2.1 The abbreviations used in this standard shall have the meaning prescribed in Table 2.

Table 2: List of Abbreviations

Abbreviation	Definition
DAQ	Delivered Audio Quality. It is the most common standard procedure adopted to test two-way radio communications audio quality.
dB	Decibel. It is a unit used to measure sound or electrical signal levels.
DRO	Designated Radio Operator. The Construction Track Worker designated as a radio operator within a VWG or any other radio operator that is under the Protecting Foreman/Subforeman protection, for example, a heavy machinery operator that holds a radio. The DRO is usually a Construction Track Worker Contractor.
EIA/TIA	EIA: Electronic Industries Alliance TIA: Telecommunications Industry Association EIA/TIA is the consortium formed by these two Standards Agencies
IEC	International Electrotechnical Commission. It creates Standards for electrical and electronic technologies.
ISED	Innovation, Science and Economic Development Canada (formerly IC—Industry Canada) is the government agency responsible for licensing the radio spectrum and resolving interference disputes over licensed frequencies.
IP	International Protection Rating, sometimes called Ingress Protection Rating, is a Standard that classifies the level of protection provided by an enclosure against the intrusion of solid objects or water.
kHz	1000 Hertz or cycles/second. A unit used to measure the frequency of an audio or electrical signal.
NRQC	Non-Rules Qualified Contractor is sometimes used synonymously for Track Works Contractors.

Abbreviation	Definition
NXDN	Next Generation Digital Narrowband is a new digital radio standard adopted by railway operators in North America to use allocated radio bandwidth more efficiently.
RCAC	Rail Corridor Access & Control.
SINAD	Short for "Signal to Noise and Distortion." It is the parameter used for measuring radio receiver sensitivity. When no radio signal is present at receiver input, the SINAD value is zero (0) db. 12 dB SINAD is a maximum accepted distortion factor of 25% at 1 kHz tone. It is the reference SINAD used to determine the minimum radio signal level a radio needs to produce an intelligible audio signal.
PTT	Push-To-Talk. It is the act of pushing the radio switch (also called PTT switch or button) to activate radio transmission.
TDMA	Time Division Multiple Access. A technology that permits more efficient use of a radio channel by splitting it into two fully functional digital channels.
UHF	UHF, which stands for Ultra-High Frequency, is the designation for radio frequencies between 300 megahertz (MHz) and 3 gigahertz (GHz).
VWG	Visual Work Group: Employees working on the list under the direct protection and within visual range of a Foreman named in the authority or the assigned Subforeman. Visual Work Group must be cleared by either radio, voice, or reliable sounding device.

2.3 Codes, Standards and Reference Documents

2.3.1 All systems, equipment and materials required for work relating to this standard shall be provided by Metrolinx in accordance with the most current edition of applicable federal, provincial, Municipal, and industry codes, standards, and guidelines (collectively, "Standards and Guidelines") including the following:

a) ISED's Radio Communications Act;

b) Environmental Engineering Considerations and Laboratory Tests; Portable Military Standards MIL-STD 810 C, D, E, F and G;

c) EIA/TIA 603;

d) Canadian Centre for Occupational Health and Safety;

e) Digital Mobile Radio (DMR) Standard;

f) Canadian Standards Association (CSA);

g) French Language Services Act; and

h) IP rating IP54 or IP55.

3. Track Workers Radio Standards

3.1 Radio Equipment Standard

3.1.1 Track Workers shall use only the radios supplied by Metrolinx Radio Systems whenever they communicate with the Protecting Foreman/Subforeman and coordinate activities along the tracks.

3.1.2 Metrolinx-supplied radios shall comply with the ISED Radio Communications Act, and any other code, act and regulation described in 2.3.1. That includes the radio channels included with the radios.

3.2 Radio Specifications

3.2.1 The following are the minimum specifications of the Track Workers radios supplied by Metrolinx:

a) All radio equipment and accessories supplied by Metrolinx adhere to ISED and Metrolinx Standards and regulations;

b) Only two-way Commercial Grade Radios or better are permitted within the Workblock;

c) Only Digital Radios will be supplied by Metrolinx;

d) The Portable Radio shall have a power of 4-5 watts measured at the antenna port;

e) Radios shall be programmed with valid ISED-licensed frequencies owned by Metrolinx;

f) Radio Receiver sensitivity of 0.3 μV for a 12 dB SINAD or better;

g) Heavy Duty, high-capacity batteries will be supplied;

h) Average Battery Life @ 5/5/90 duty cycle or, in other words, 5% of the time on reception, 5% on transmission and 90% on standby mode;

i) Li-Ion Batteries;

j) Operating Temperature: -30° to +50° C, or better;

k) Water and Dust Intrusion: IEC60529 - IP54 or better; and

l) Military Specs 810.

4. Track Worker's Radio Communications Practices

4.1.1 The DRO and Protecting Foreman/Subforeman shall test all the functions of the supplied portable radios before commencing the works.

4.1.2 The Contractors/Track Workers shall be supplied with at least 20% spare radios. Note: When 20% is less than one radio, the Metrolinx Contract Manager will supply at least one spare radio.

4.1.3 When the DRO or Protecting Foreman/Subforeman reports a radio malfunction to the Contractor, the Contractor shall replace the radio as soon as possible with one from the 20% spare pool supplied as per 4.1.2.

4.1.4 The Contractors shall be supplied and keep within the Workblock a healthy and fully charged spare battery pool of at least 20% and a minimum of one (when 20% is less than one) (supplied by Metrolinx).

4.1.5 The batteries shall be fully charged at the beginning of the shift. Verify that the charger LED indicates the battery is charged before removing radio from charger. Turn ON the radio and verify full battery charge (check-radio battery indicator). If the battery does not show full charge or it is not performing properly at any moment, it shall be replaced immediately, and the radio re-tested.

4.1.6 Using the Metrolinx training material provided by Radio Systems, train all radio operators in the setup and use of the radio at the beginning of the work and later when new employees are added. Training for radio communication procedures will be provided by the Metrolinx Safety Standards and Practices Rail Training Team.

4.1.7 The DRO and Protecting Foreman/Subforeman shall inspect the radio conditions daily for any visible problem. An inspection checklist is included in the training material to be supplied with new radios.

4.1.8 The DRO and Protecting Foreman/Subforeman shall test radios before the shift starts and replace them if any operational issue is found. They shall also test the radios again at the end of the work shift and before leaving the workplace.

4.1.9 Confirm all radios under the same Protecting Foreman/Subforeman are on the same channel.

4.1.10 Once all the radios are inspected, perform an audio quality test from the position of work (daily): The Protecting Foreman and/or Subforeman shall call each DRO on their clearing list equipped with a radio and vice versa. Both parties shall verify that the received audio is at least 3.5/5 based on the DAQ Table 3. Next, the Subforeman shall verify audio quality with the Protecting Foreman following the same procedure.

Table 3: Delivered Audio Quality (DAQ)

DAQ	Description
1	Unreadable. Speech present but not understandable.
2	Barely readable. Requires frequent repetition due to noise or distortion.
3	Speech understandable with some effort. Requires occasional repetition due to noise or distortion.
3.5	Speech understandable without repetition. Some noise or distortion present.
4	Speech easily understandable. Little noise or distortion.
4.5	Speech easily understandable. Rare noise or distortion.
5	Perfect. No distortion or noise discernible

4.1.11 Verify that radios are free of interference at the beginning of the shift, especially when adjacent Workblocks are present. If necessary, switch channels to avoid interference.

4.1.12 All crews protected by the same Protecting Foreman/Subforeman shall have their radios programmed with the same frequency.

4.1.13 Radios are supplied with multiple channels. If multiple simultaneous radio conversations are required within the same area, each conversation shall be carried out on a different channel to avoid co-channel interference. This applies when multiple simultaneous conversations are required within the same, adjacent, or overlapping Workblocks.

4.1.14 Each radio shall undergo a Preventative Maintenance procedure once a year, which shall be carried out only by the Metrolinx Radio Systems group. Radios shall be made available to carry out the Preventative Maintenance. The appropriate Metrolinx Contract Manager for track works shall be contacted at least two weeks in advance of every fiscal year to coordinate the preventative radio maintenance.

A Radio Services Request Procedures

A.1 Requesting New Radios

A.1.1. The Metrolinx Contract Manager shall forward the new radio request to the following email account:

RadioServiceRequests@metrolinx.com

A.1.2. The Metrolinx Contract Manager, include as much information as you can in the e-mail. The e-mail shall consist of at least the following:

a) The reasons for requesting the new radio gear (new supervisor, service expansion, etc.);

b) The information of the new user (name, etc.); and

c) The e-mails requesting new subscriber gear shall be issued or approved by the respective Office Manager, for example, the Manager of Corridor Track Protection.

A.1.3. The Radio Request shall be approved by the Assistant Manager, Subscriber Gear or in his/her absence by the Manager, Radio Maintenance.

A.1.4. Radio Systems doesn't normally keep radio stock for new users; Radio Systems only keeps a minimum inventory to replace damaged, lost, stolen, or broken radios. Upon receiving the request for a new radio, Radio Systems will purchase, tag, and inventory the new asset(s). It usually takes between four and eight weeks to have new radios delivered to the final user. Radio Systems encourages radio users to plan for new radios in advance.

A.1.5. Once the radio arrives, a Radio Systems representative will deliver it to the Metrolinx Contract Manager office and answer any questions related to its usage.

A.2 Requesting Radio Accessories

A.2.1. Radio Accessories include:

a) Batteries;

b) Portable Antenna;

c) Chargers; and

d) Any other type of accessory required for daily radio operations.

A.2.2. The Metrolinx Contract Manager shall forward the request to the following email account:

RadioServiceRequests@metrolinx.com

A.2.3. The e-mails requesting radio accessories can be sent directly by the Metrolinx Contract Manager and will not require a Metrolinx manager's approval.

A.2.4. The Radio Accessories will be mailed or delivered to the Metrolinx Contract Manager.

A.3 Requesting Radio Maintenance

A.3.5. The Portable Radios shall be maintained according to the time schedule described below:

a) Subscriber gear service calls will be attended to only during the normal day shift hours, which are from 6:30 AM to 4:00 PM; and

b) Service calls for subscriber gear after 4:00 PM will be attended the next day.

A.3.6. The Metrolinx Contract Manager shall issue an email requesting service to the following email account:

RadioServiceRequests@metrolinx.com

A.3.7. The Metrolinx Contract Manager shall include as much information as possible in the email, for example:

a) Description of the radio problem and radio ID (radio ID# assigned located at XX St, powers up but does not PTT, etc.);

b) Description of the Radio Location (vehicle ID, Supervisor's name, etc.);

c) Date and time of radio failure;

d) Location of the portable radio when the radio failed (mile, corridor, etc.); and

e) Immediate action/taken, if any, to mitigate the problem.

A.3.8. The above information shall be included in FORM RE-1 Rev 01 attached to the email.

A.3.9. The maintenance service can be requested by the Metrolinx Contract Manager for track works, regardless of their Metrolinx Position.

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