Chennai Metro Rail Limited

**2015**



Tunnel Ventilation System: Android App Development for Asset Maintenance - v1.0

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# INTRODUCTION

This report provides guidance for smart phone based App Development for asset maintenance of Tunnel Ventilation System (TVS) of Chennai Metro Rail (CMRL) Project (Phase-1).

The Chennai Metro Rail Project has been designed with a high degree of reliability in order to provide dependable service to the public. Best current practices from International Metro standards & Design have been adopted with particular emphasis on life safety systems and necessary inbuilt electrical plant redundancy to support these.

The Tunnel Ventilation System provided for the Station as well as for Tunnel comprises of Tunnel Ventilation Fans, Trackway Exhaust Fans, Trackway Supply Fan, Jet Fans Tunnel Ventilation Dampers, MCC Panels, LCP Panels, IBP Panels and Sound Attenuators.

The main aim of this report is to provide guidance to the App Developers on the requirements of the TVS assent maintenance.

# Chapter – 1: Tunnel Ventilation System

Tunnel Ventilation System consists of:

1. Tunnel Ventilation Fans (TVF)
2. Track Way Exhaust Fan (TEF)
3. Jet Fans (JEF)
4. Tunnel Ventilation Dampers (TVD)
5. Electrical Actuators and other accessories
6. Sound Attenuators
7. MCC Panels
8. LC Panels
9. IBP Panels

Corridor – 1: Washermanpet to Airport via Chennai Central and Anna Salai(Mount Road), with a total route length of apprrox.23 KM andComprising Underground stretch of apprrox.14 KM and elevatedstretch for the rest. It contains 11 nos. underground stations and 6 elevated stations.

Corridor – 2 : Chennai Central – Egmore- Shenoy Nagar – Anna Nagar –Koyambedu – CMBT – Vadapalani – Ashok Nagar – Alandur – St. Thomas Mount, with a total route length of apprrox.22 KM, of whichapprrox.10 KM will be underground and the rest, elevated. Numberof stations in the corridor comprises 9 underground and 8 elevated.

Two stations i.e. Chennai Central and Alandur are common for both corridors.

A. Underground stations for the Corridor 1: Washermanpet to Saidapet

B. Underground stations for the Corridor 2: Chennai Central to

Thirumangalam

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All UG stations of the CMRL are designed with platform screen doors (PSDs) isolating the platform area from trackway.

TVFs and Jet fans are the two main types of fan to be used for tunnel ventilation. TEF are fans to be used for track-way ventilation at station.

Jet fans are installed inside fan niches at different location tunnel portals as shown on the schematic drawing.

Track Exhaust System (TES) installed in the track-ways of each station captures both excessive tunnel airflows and the heat rejected by the train propulsion/braking/air-conditioning systems as the trains dwellin the stations. This TES is composed with Under Platform Exhaust (UPE) duct and Over Track Exhaust(OTE) duct. To increase its efficiency, the suction point shall be localized near braking systems, airconditioning units and auxiliary system which is located beneath and above the train.

Two nos. draft relief dampers are installed at each end of stations to reduce change in pressure, which results due to piston action of trains.

Sound Attenuators are installed at both intake and exhaust side of fans to achieve the acceptable noise level.

# Chapter – 2: App Development

**2. General Requirements**

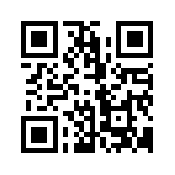
A smart phone based app needs to be developed for record and update all periodic maintenance of the TVS equipment installed at all underground stations.

In general the app should have following functionalities:

1. To scan/read the Quick Response (QR) code of every equipment.
2. To display checklist for periodic maintenance.
3. To aid fault reporting and closing out existing faults.
4. To send SMS/email alerts.
5. To store and update data from the cloud based database.
6. To upload and download data from the database.
7. Store history on the smart phone.
8. Generate short reports.

**2.1 Periodic Maintenance**

The App shall be capable of scanning the QR core of each and every equipment and upon scanning, two buttons to be displayed, 1) Periodic Maintenance and 2) Fault Reporting.



**Fault Reporting**

**Periodic Maintenance**

Once the ‘Periodic Maintenance’ is selected, based on the QR code, the App shall display equipment specific check list for the maintenance. For example, if fan is scanned all the maintenance checklist for that time period shall be displayed.

2.1.1 Fans

If a fan is scanned for Periodic Maintenance, the App shall display the following check-list for the maintenance staff at the site:

1. **Check Impeller ☑**
2. **Lubricate Motor ☑**
3. **Secure Wiring ☑**
4. **Clean Terminal Box ☑**
5. **Check Insulation ☑**
6. **Check Blade tips ☑**
7. **Tighten Flexi nuts ☑**
8. **General Cleaning ☑**

**Inspection Completed**

Send Email/SMS alerts

Update database

The time intervals for each task is as follows:

* 1. Check Impeller – 3 Months
  2. Lubricate Motor – 12 Months
  3. Secure Wiring – 6 Months
  4. Clean Terminal Box - 6 Months
  5. Check Insulation – 6 Months
  6. Check Blade tips – 3 Months
  7. Tighten Flexi nuts – 6 Months
  8. General Cleaning – 3 Months

***Note: Only those equipment with maintenance due shall be displayed, i.e. if an impeller is inspected today up to next 3 months if the equipment is scanned, it shall not show under maintenance. Only after 3 months it should be displayed.***

Once all check list is ticked off, the App shall lead to ‘Inspection Completed’ button and will update the database with time stamp.

2.1.2 Dampers

If a Damper is scanned for Periodic Maintenance, the App shall display the following check-list for the maintenance staff at the site:

1. **Clean Blades ☑**
2. **Check Linkages ☑**
3. **Manual close/open ☑**
4. **Frame tightness ☑**
5. **Actuator wiring ☑**

**Inspection Completed**

Send Email/SMS alerts

Update database

The time intervals for each task is as follows:

* 1. Clean Blades – 3 Months
  2. Check Linkages – 3 Months
  3. Manual closing/opening – 3 Months
  4. Frame Tightness - 12 Months
  5. Actuator wiring – 6 Months

2.1.3 Electrical Panels

1. **Panel Exterior ☑**
2. **Mains Isolator ☑**
3. **Bus-Bars ☑**
4. **Insulating Barriers ☑**
5. **Power contractors ☑**
6. **Thermal overload ☑**
7. **Panel wiring ☑**
8. **Fuse/MCB ☑**
9. **Instrumentation ☑**

**Inspection Completed**

Send Email/SMS alerts

Update database

The time intervals for each task is as follows:

* 1. Panel Exterior – 12 Months
  2. Mains Isolator – 12 Months
  3. Bus-Bars – 12 Months
  4. Insulating Barriers – 12 Months
  5. Power contractors – 12 Months
  6. Thermal overload – 12 Months
  7. Panel wiring – 12 Months
  8. Fuse/MCB – 12 Months
  9. Instrumentation – 12 Months