

GUIDELINES FOR THEMATIC AUDIT ON ‘MAPPING OF UNDERGROUND UTILITIES IN CHENNAI CITY’

1. Introduction

Chennai City spreading over an area of 426 sq.km and has underground network for sewer lines, water pipelines, electricity lines, telecommunication cables, storm water drains, etc. A pucca mapping of these underground cables, pipelines, etc., would enable fast effective maintenance, uninterrupted services by easy location of fault, etc. But this information is now generally kept in their own format of the service providers, that too in piece meal with the field units, independent of any standards and are used for their internal purposes.

A system for complete and accurate mapping of underground facilities in a standard format by each service providers and keeping them with a centralized agency for proper coordination and regular updation would facilitate in a big way in (a) minimizing risk of the damage to the existing utilities leading to disruption of services, (b) efficient planning for laying of new cables/pipes, for using the underground for creation of new facilities (c) minimizing any delay in completion of new projects and (d) better disaster management.

An attempt was made earlier during 10th Five Year Plan by Government of India for urban mapping including underground utilities which did not fructify as follows:

The Ministry of Urban Development (MoUD), Government of India (GoI) had implemented a centrally sponsored scheme viz. National Urban Information System (NUIS) during the tenth Five Year Plan which inter-alia included Urban Spatial Information System¹ (USIS) – to meet the spatial (maps/images) data requirements of urban planning. The total project cost was Rs.58.59 crore including Rs.5.57 crore for utility mapping. The scheme was implemented in 152 cities in the country including Chennai City.

Underground utility mapping under the scheme using Ground Penetrating Radar technology was outsourced to M/s. Eaga Energy, Kolkata. This technology being new in the

¹ Spatial information - It is the data or **information** that identifies the geographic location of features and boundaries on Earth, such as natural or constructed features, oceans, and more. **Spatial** data is usually stored as coordinates and topology, and is data that can be mapped

country was chosen for implementation in 22 cities with future expansion to other cities on successful implementation. However, the job order of the outsourced agency was terminated due to incomplete execution and the NUIS came to closure in 2016 and the component of utility mapping was dropped (June 2016).

In this regard, it is also pertinent to note that the Sustainable Development Goal 11 of United Nations stipulates for an advanced policy on 'Linking Spatial Planning to Urban Infrastructure with (i) integrating land use; (ii) strategic spatial planning and infrastructure planning and (iii) linking spatial planning to infrastructure planning.

2. System of Underground Utility Mapping

The underground utilities were previously mapped as drawings on sheets of cloth or paper manually. With the advent of computers these are maintained as AutoCAD drawings. However, these drawings when prepared using Auto CAD has its limitations as they are referenced from the nearest landmark *viz.*, buildings, culverts, shops, bus stops, etc. The disadvantage in such referencing is when the landmark of the area changes, the maps become redundant. The lacunae in timely updated data, constraints in finding previous record, etc., it is difficult to secure the maps for underground utilities, hence the need of advance technology like using Geographic Information System (GIS), Global Positioning System (GPS) and Ground Penetrating Radar Technology is evident.

3. Organisational Set-up

The organisations involved in providing/utilizing underground facilities/service lines in Chennai City are as follows:-

(a) The Greater Chennai Corporation (GCC) is governed by Chennai Municipality Act 1919. GCC, the civic body for Chennai City, is providing storm water drains and sanctioning road cutting permission for any department/agency for both laying new underground service lines and for their maintenance.

(b) **The Chennai Metropolitan Development Authority (CMDA)** was constituted as an ad-hoc body in 1972 and become statutory body in 1974 vide Tamil Nadu Town and Country Planning Act, 1971. Its functions are to carry out a survey of the Chennai Metropolitan Planning area by preparing land use maps and master plan/ detailed development plan.

(c) **The Chennai Metropolitan Water Supply and Drainage Board (CMWSSB)** was constituted for exclusively attending to the growing needs of and for planned development and appropriate regulation of water supply and sewerage services in the Chennai city. CMWSSB was governed by the Chennai Metropolitan Water and Sewerage Act, 1978 and The Chennai Metropolitan Water Supply and Sewerage (Second Amendment) Act, 2012.

(d) **Tamil Nadu Electricity Board (TNEB)** was formed on July 1, 1957 under Section 54 of the Electricity (Supply) Act, 1948 in the State of Tamil Nadu as a vertically integrated utility responsible for power generation, transmission and distribution. TNEB was restructured (November 2010) into **Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO)** and **Tamil Nadu Transmission Corporation Limited (TANTRANSCO)** and is governed by Tamil Nadu Electricity Act, 2010.

(e) **Bharat Sanchar Nigam Limited (BSNL)** is engaged in providing telecom facilities such as broad band, through underground Optic Fiber Cables. Other private agencies controlled by Telecom Regulatory Authority of India (TRAI) viz Reliance Geo, Vodaphone, Airtel, etc. provide telecom services through underground OFC cables.

(f) **The Tamil Nadu State Disaster Management Authority (TNSMDA)** to facilitate policy development on a variety of calamities management program and monitor all major functions related to disaster risk reduction activities and the Authority is preparing Disaster Management Plan.

(g) **Tamil Nadu e-Governance Agency (TNeGA)** is the co-ordinator for the project of Tamil Nadu Geographical Information System (TNGIS) with the objective to create generic model of GIS to integrate available data in uniform GIS platform for Tamil Nadu. TNeGA has to maintain repository of GIS maps of all departments in the State.

(h) **Chennai Metro Rail Limited (CMRL)** is providing public rail transport service through surface and underground facilities.

4. Audit Objectives

The Audit objectives are to assess:

1. Whether Acts/Rules existed to ensure that every service provider using underground space should prepare complete and accurate mapping of their underground utilities and update the maps periodically.
2. Whether system existed for proper maintenance, updation and preservation of maps on all underground utilities by a centralized agency
3. Whether any single authority exists for granting permission for using the underground space in Chennai City.
4. Whether the mapping of underground utilities results in (a) effective in minimizing the risk of damages to the existing utilities, (b) efficient planning in laying and shifting of utilities, (c) minimizing the delay in completion of projects and (d) disaster management.

5. Audit Criteria

The following are audit criteria against which the subject matter is to be measured:

1. Tamil Nadu Town and Country Planning Act, 1971
2. Chennai City Municipal Corporation Act, 1919
3. Tamil Nadu Electricity Board Act, 2010.
4. Chennai Metropolitan Development Authority Master Plan, 2008
5. Chennai Metropolitan Water Supply and Sewerage Board Act, 1978
6. Chennai Metropolitan Water Supply and Sewerage Board Master Plan, 1996
7. Indian Road Congress (IRC) guidelines on accommodating underground utility services along and across roads in urban areas (IRC: 98-1997)
8. National Disaster Management Act, 2005
9. Tamil Nadu Disaster Management Policy, 2014
10. Circulars, Orders and instructions issued from time to time

6. Scope and Coverage of Audit

This Thematic Audit will cover the offices of Storm Water Department, Road Department of GCC and selected Wards, CMWSSB, TANGEDCO, CMDA, BSNL, CMRL, PWD and High Ways Department besides Information Technology Department, Tamil Nadu e-Governance Agency(TNeGA) and Tamil Nadu State Disaster Management Authority (TNSDMA). Records related to execution of works involved shifting/re-alignment of underground service lines would be test-checked using sampling methodology for the period 2015-16 to 2017-18.

7. GIS based mapping of utilities

7.1 Greater Chennai Corporation (GCC)

Greater Chennai Corporation (GCC) is granting permission to the concerned departments and agencies for trenching the roads for laying and maintenance of underground utilities. The Government Order stipulates such permission would be granted on production of maps/drawings for the trenching by the service providers for the use of public right of way along National Highways, State Highways Department within urban areas. Annual Track Rent would be collected by GCC for the use of public right of way.

GCC is implementing “Computer Aided Utility Mapping Project” under NUIS from 2006-07 in coordination with National Informatics Center (NIC), Chennai with an objective to create large-scale digital base maps for utility network and related data on water, sewage, electricity, police, fire and gas superimposed on them with the help of the utility agencies.

The first set of ‘vector data²’ hosted in the GIS Server installed at GCC by NIC Chennai during September 2008. NIC, Chennai has uploaded the digitized Chennai Map of 192 Sq.Km. with masked areas (Since MOD masked for about 40 Sq.Km as per mapping policy) in phased manner from the year September 2008 to September 2009.

Under Tamil Nadu Sustainable Urban Development Project, GCC is now preparing Base Map, property and utility mapping for the assessment of property tax by using Geo-Spatial techniques.

² A representation of the world using points, lines, and polygons. **Vector** models are useful for storing **data** that has discrete boundaries, such as country borders, land parcels, and street

7.2 Chennai Metropolitan Development Authority

According to the Guidelines of Atal Mission for Rejuvenation and Urban Transformation (AMRUT), one of the reforms stipulated for urban planning and city level plans was preparation of master plans using GIS mapping. CMDA has developed a Land Use information System (LUIS) which is a Web-enabled application software serviced to the public under Second Master Plan. This facility provides information on and use for the specific survey number, street alignment, Coastal Regulation Zone, Red Hills Catchment Area, Archeological Sensitive Areas etc.

7.3 Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)

The laying of sewer lines and water pipe lines are executed by CMWSSB in Chennai City. Repairs and maintenance of the underground service lines are done by open cut method.

The manually prepared and AutoCAD 'as constructed maps' for underground utilities (sewerage lines and water pipelines) were already available with CMWSSB as it was one of the tender conditions in the contract that the contractor who lays the underground utilities should, on completion on the work, provide 'as constructed maps'. In certain cases CMWSSB felt that these maps were not updated in case of modifications to these utilities during operations and maintenance. A proposal for centralized GIS map in CMWSSB was considered and the Terms of Reference (ToR) for GIS mapping is under progress.

GIS was implemented in CMWSSB under the Twinning Arrangement Consultancy Programme during the year 2002. One of the components of the consultancy programme was implementation of Global Information System (GIS) which consisted of verification and mapping of underground assets, customization and implementation of GIS software for a pilot area of about 10 sq.m. in Area-V. A base map of 1:2000 was purchased for the entire Chennai City from National Remote Sensing Agency, Hyderabad. Later for the Computer Aided Utility Mapping Project launched by the Planning Commission during 2006 the GIS, work was again taken up.

7.4 Tamil Nadu General and Distribution Corporation Limited (TANGEDCO)

Distribution of electricity involves the transfer of electrical energy from one electric substation to another electrical substation through sub-transmission and distribution lines. TANGEDCO claimed that underground cables have been laid for the entire city of Chennai.

The Tamil Nadu General and Distribution Corporation Limited had commenced the GIS mapping assets under the Computer Aided Utility Mapping Project in 2008 (under NUIS) But in the meanwhile, GOI scheme of the Re-structured Accelerated Power Development and Reforms Programme (RAPDRP) was introduced and the GIS mapping was continued as part of RAPDRP scheme. As of February 2019, the GIS mapping was completed for 11 KV and 33 KV lines. The mapping for 66 KV, 110 KV and 230 KV has not yet commenced. The GIS mapping was completed only for 11 KV and was put in to use. However, the GIS mapping for 33 KV was not yet put to use and has not been updated.

8 Points noticed so far

As part of the preliminary study the offices of the GCC, CMDA, CMWSSB and TNEB were covered and the following points were noticed:

- (a) The Acts/Rules governing all these entities do not stipulate mapping of underground utilities for the services provided by them.
- (b) The CMDA has GIS mapping for the land use and does not cover the underground utilities
- (c) The GCC has prepared GIS mapping for 2 out of 15 zones and the purpose of the map was for proper assessment of property tax.
- (d) The CMWSSB had prepared GIS mapping as part of various schemes in 2002 and 2015 but did not have any data. The GIS cell was being renewed and is in the process of preparing the Term of Reference for mapping the underground utilities *viz.*, water and sewer lines
- (e) The TNEB has prepared GIS mapping for 11 kilo volts (KV) and 33 KV lines. The GIS mapping for 11 KV lines was only being updated. The GIS mapping for 66 KV, 110 KV and 230 KV was not taken up till date (March 2019).

9 Emerging issues

The following issues are likely to emerge.

- (a) Absence of legal mandate and policy for obtaining GIS maps by other utility providers

- (b) Underground utilities are neither mapped nor updated by certain utility providers
- (c) Absence of integrated mapping of underground utilities with a single authority
- (d) GIS mapping done as part of various schemes were not carried over to its logical end and were replaced by new schemes
- (f) Absence of Inter departmental coordination in exchange of underground utility maps for timely action on shifting of utilities results in cost and time over run.

10 Audit Design Matrix

Audit Design Matrix for scrutiny of records prepared on the basis of objectives is annexed separately.

(Approved by PAG on 27.03.2019)