International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 05 | May 2021 www.irjet.net p-ISSN: 2395-0072

Utility Management on Major Road Mumbai

A.D. Gavhane[1], Dr. A.W. Dhawale

[1]Student, ICOER, Pune, Maharashtra, India
[2]Proffesor, ICOER, Pune, Maharashtra, India

Abstract - *In Mumbai, Pipelines/Cables of almost all utilities are laid underground, generally below the road surface including the Carriage way and Footpaths. By virtue of increase in population and living standard, the demand for services has not just increased, but also citizen expect quality and prompt services from the Municipal Corporation and all other service providers. The services with pipeline or cables laid underground are basically, water supply, drainage, electric supply, telecommunication, gas line, etc. These services have caused great congestion below the road surface, thereby laying of new pipeline or cables has become difficult and occurrence of faults requiring excavation for carrying out repairs has increased. There is not a single day when roads are not excavated for either providing utilities or attending faults of services.*

Some utilities in Mumbai are very old of @ 100 years. Utilities services with their age deteriorate due to lack of information about existence of old utilities. It is difficult to trace them underground since the visual inspection of the underground utilities is not possible. It is hard to determine and to estimate when to rehabilitate or replace these utilities. There are problems concerning underground utilities due to uncertainty of the location of the utilities. This problem is leading to delays, extra work orders, change orders, construction claims, contingency bidding, loss of service, property damage, etc. This lead to understand and study of new system to be formed to sustained the growth of utilities in Mumbai city.

Key Words **: (Utilities, Services, Ducting, Trenching, etc.)**

1. INTRODUCTION

Indian urban cities are seen with high growth in population, real estate and infrastructure. Cities are expanding horizontally and vertically to cope up with the urban requirements and development projects are also increasing in urban cities. With increase in the development requirements of cities, utility services like electricity, telephone, water distribution, sewerage distribution, gas lines are also increasing. Day by day utilities providers are increasing making competition among themselves to satisfy consumer needs.

All utilities in Mumbai are running below road crust in zigzag manner. Roads are often dug for making new provisions and maintenance of existing utility services, causing damage to the road crust causing many problems related to road maintenance. There are more than 11 utilities department including government utilities in Mumbai having utility services to consumers.

There are limitations to the co-ordination of utility service providers among themselves. Therefore it is proposed that, through study of the existing systems of utility services to understand difficulties that exist in utility service providers and to come up with solutions for the service providers, so as to cause limited damage to the roads surface.

2. SHORTCOMINGS AND PROBLEMS FACED DUE TO EXISTING SYSTEM OF LAYING UTILITIES.

2.1 Open excavation of roads

Almost all the utilities lay their cables/pipes by openly excavating the road up to certain depth. Open excavation disturbs the original strata of the road, which after reinstatement do not match with the original standards. During open excavation, there is chance of damaging the already laid utilities. Damage to certain utilities like High tension cables, Gas pipelines, etc. may lead to serious accidents.

2.2 Uncertainty of locations

In Mumbai certain utility agencies have GPS/GIS system for locating their cables/pipes. But there are maximum service providers which do not have system of GPS/GIS for their networks. Hence during attending faults or repair work, unnecessary extra area of roads gets excavated due to not knowing the exact location of the concerned utility.

2.3 Non co - ordination between Utility Agencies

Very few utility agencies in Mumbai have their co-ordination during laying of their utility networks. Basically all the utility agencies are supposed to have regular meetings among themselves for their problems of networks. This is not followed properly. This causes frequent excavations of the same stretch of the roads by different utilities. This is the major cause for the failure of the crust of roads.

2.4 Delays in reinstatement of trenches

Once the work of laying of utility is completed, reinstatement of trench should start immediately. It is seen that the reinstatement of trenches works are delayed in Mumbai, this is because, procurement of material for reinstatement in advance is not possible due to lack of space available on roads. Excavating agencies and reinstatement agencies are different and sometimes reinstatement agencies are not

timely informed by the utility agencies about the completion of trenching works, which delays reinstatement work.

2.5 Environmental effects of trenching of utilities

Dumping issue : Whenever the work of trenching is carried out on the road surface there are granular materials and earth removed from the road crust. These materials gets intermixed with each other and thus cannot be utilized for back filling of the trench there by causing major problem of dumping the excavated materials form the trench in city like Mumbai, where there is lack of space for the dumping grounds.

2.6 Traffic congestions

Excavations on the roads for the trenching of the utilities takes about 15 days from the starting of the work to its completion. During this period it is seen that roads which are heavily dense of the traffic, gets more congested due to trenching activities. Vehicular as well as pedestrian traffic gets affected.

2.7 Fuel consumption

Due to congestions of the traffic there are delays in the travel time of the vehicles. This cause more fuel consumption for travelling the stretch of the roads where trenching activities are carried out.

2.8 Air Pollution

During the open excavation for the trenching work soil and granular partials are mixed with the atmosphere. New materials are brought for the back filling of the trench like sand and metals which are dumped beside the trenching activity. Thus during the excavations, removals and back filling of the trenches air pollutions are seen.

2.9 Noise Pollutions

All the activities of the trenching from excavations, removals, and back fillings and reinstatements mechanical machineries are used. This machinery cause heavy noise pollutions in the surrounding area. Secondly due to traffic congestions created by the trenching activities noise pollutions are seen by vehicular traffic. The work of the trenching is also carried out during the night time, making it difficult to avoid the noise pollution for the local residents.

2.10 Consumption of Naturals resources

Trenching activities consumes natural resources like Sand, Metals, Cement, Bitumen etc. There is scarcity of these materials in the country. All the time of the year trenching activities are carried out by different utility service providers of the electricity, gas, communication, etc in the city of Mumbai. It is also seen that these utility service providers attend their faults in the cables/pipes by open excavations. This also consumes natural materials.

3. PROPOSED DUCTING SYSTEM TO MINIMIZE ABOVE MENTIONED PROBLEMS

3.1 Provision of Compartments

It is seen that many of the utility service providers have problems with each other during laying of the cables/pipe networks. Gas network is dangerous with the electricity network and vice versa. Any break down of the network can create fire in the ducting system. Hence it is proposed to have compartments in the ducting system as shown in figure no.1

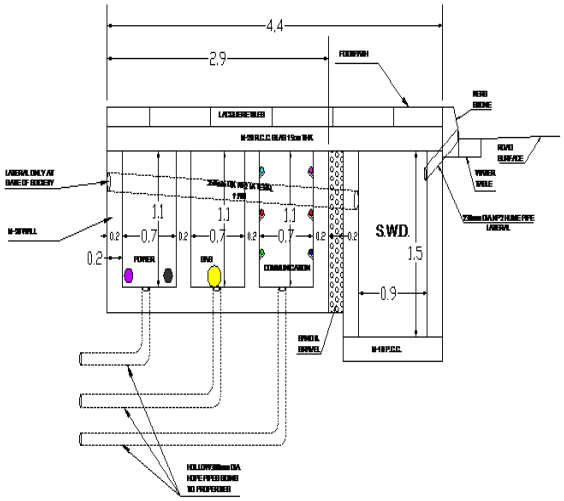

Figure No. 1

3.2 Separation from Storm Water Drains

In Mumbai in Western and Eastern Suburbs Storm water drains are running parallel to the Road networks. In case of ducting system to be provided on major roads in Mumbai it is necessary to keep ducting away from the network of SWD so as to avoid accumulation of Rain water in the ducting. For this purpose a gap is to be kept between the walls of the ducting and SWD network as shown in the above figure no. 1. This gap is filled up with the sand metal layers as drainage layers.

3.3 Maintenance provisions

For maintaining the lines in ducting system it is necessary to have regular maintenance provisions. This can be done by the providing chambers in the slabs of ducting which will have such a size that entering and exit of the cables/pipes can be easily done.

3.4 Drainage Arrangement

During the heavy Rainfalls there are chances of having duct submerged in water. To overcome this difficulty pumping arrangements can be provided in ducting compartments. The accumulated water can be pumped in the adjacent Storm Water Drains.

3.5 Natural Ventilation Provision

Utility like electricity and gas gives generation of heat due to energy. This may cause heating of ducting system which may cause danger of fire of the utility cables/pipes. To overcome this natural ventilation can be provided by perforated R.C.C. covers made for the openings. This perforated covers will allow heat generated in ducting system to exhaust since the covers provided are exposed to atmosphere.

3.6 Interconnection of compartments and Junctions

In case of major roads, utility service providers have to cross the roads by laying the cables/pipes. For this reason, ducting system entirely has to cross the roads. This crossing may affect the existing Storm Water Drains. To overcome this difficulty entire ducting system has to go below the S.W.D. networks. The ducting compartments will be provided with heavy duty frame and covers, as on this compartments vehicular traffic will be plying due to crossing of the ducting system.

3.7 Safety Measures

Fire alarm system should be provided at 100m intervals. This will save the time in finding exact location of the fire. This will enable to attend the fire in less time.

Auto pumps should be installed at specific locations so as to pump the water in side drains after the specific depth of water is reached in ducting compartments.

Locking arrangement should be provided by each utility service providers for access of authorized persons only in compartments.

3.8 G.P.S./ G.I.S

G.P.S./ G.I.S arrangements should be made to identify the exact location of faults, so as to detect and attend the faults in time.

4. ADVANTAGES OF PROPOSED DUCTING SYSTEM

- Road surfaces and pavements are not disturbed to get at utility networks.
- Huge reductions in the number of road works where ducts are installed.
- Traffic delays from road works for maintenance of networks are greatly reduced there by reduction in fuel consumption.
- Air and noise pollutions are reduced.
- Huge reductions in non-renewable materials usage there by reductions in consumption of the natural materials like sand, metals, bitumen etc.
- Huge reductions in the cost of maintaining networks and hence less charges to consumers. The usage of ducts would be covered by annual rentals which would be far less than today's costs.
- New and evolving networks can usually be accommodated in existing ducts.
- The locations of the ducts and thus of the networks are much easier to monitor. Utility networks occupy less space.
- Access to networks is via access points. Where ducts are installed, excavations are a thing of the past.
- Since there will not be any excavations to get at utility network, quality of the road surfaces and pavements can be improved.

5. CONCLUSIONS

All existing system of laying of utility has been studied in the area of Mumbai. Shortcoming and problems of existing system of trenching works for utility networks are studied. It is been concluded that utilities in Mumbai city have become integral part of the road. With increase in population and service providers in urban cities like Mumbai finding more underground space has become difficult.

To overcome current problems faced due to utilities in Mumbai, It has become need to apply ducting system on large scale.

Ducting of utilities as suggested in this paper if implemented properly during course of construction of new roads or improvement of the existing roads shall provide space to the utilities agencies in separate area of the road.

Efficient use of planning of utilities in advance can be made in ducting system.

Open excavations which are one of the major problems for the quality of road will be reduced, which is turn will reduce the dumping of excess excavated material.

Mapping and coding of the utilities can be made in a systematic manner which will ease crew member of utility service provider to attend the faults.

6. REFERENCES

[1] Leonhard E. Bernold" Economic Model to Optimize Underground Utility Protection" ASCE JOURNAL OF CONSTRUCTION ENGINEERING AND MANAGEMENT © ASCE / NOVEMBER/DECEMBER 2003 / 645

[2] M. Sohail, M.ASCE1; S. Cavill2; and A.P.Cotton3 "Sustainable Operation and Maintenance of Urban Infrastructure: Myth or Reality?" JOURNAL OF URBAN PLANNING AND DEVELOPEMNT© ASCE / MARCH 2005/39

[3] Yeun J. Jung1 and Sunil K. Sinha2 "Evaluation of Trench less Technology Methods for Municipal Infrastructure System" 144 JOURNAL OF INFRASTRUCTURE SYSTEMS © ASCE / JUNE 2007

[4] S. H. Pau, K. W. Chau, and W. G. Wong "Prospects For No-Dig Technology In Hong Kong Construction Industry"

[5] Hassan Al-Barqawi1 and Tarek Zayed2 "Condition Rating Model For Underground Infrastructure Sustainable Water Mains" 126 JOURNAL OF PERFORMANCE OF CONSTRCUTED FACILITIES © ASCE / MAY 2006

[6] Thomas A. bettersworth1 "Aesthetics Design Of Electric Distribution Lines" Journal of the urban planning and development division proceedings of the American Society of Civil Engineers July 1965.

[7] M. C. Ircha1 and D. Sundarajan2 "Municipal Service Distribution: Equity Concerns. Journal of the urban planning and development Dec 1983

[8] F.C. Chow (Geotechnical Consulting Group, London, UK), T. Paul (John Barnet & Associated Ltd (CSA Group), Dublin , Ireland) I. T. Vahaaho (City of Helsinki Geotechnical Division, Helsink , Finland .) , B. Sellberg (The Swedish Council for Environmental , Agricultural Science & Spatial Planning, Stockholm, Sweden) , L. J, L Lemos (University of, Coimbra Portugal "HIDDEN ASPECTS of Urban Planning : Utilizations of Underground Space" Proc 2nd int. Conference on Soil Structure interaction in Urban Civil Engineering .

[9] R. B. Gutam* "AN APPROACH FOR SUSTAINBALE DEVELOPMENT OF TOWNS AS NEW GROWTH CENTERS." Journal of Indian Buildings Congress. Volume xiv. No. 1. 2007.

[10] Marukau City's District " LAY POSITION OF SEVICES – GUIDELINES"

[11] M.C.G.M NO MBD/4259 Dated 14 march 2005 "POLICY GUIDELINES FOR GRANTING OF PERMISSION TO UTILITY AND MUNICIPAL AGENCES FOR EXCAVTION AND REINSTATEMENT THEREAFTER"

[12] OIL INDUSTRY SAFETY DIRECTORATE Functional Committee" DISTRIBUTION OF PIPED NATURAL GAS" Nov 2006

[13] Lawern Salvin "Buried Duct Network" Roakaway, NJ

[14] National Transportation Planning and Research Centre, Thiruvanthapuram "Impact of digging by public utility department or urban roads". ROAD RESERCH INDIA 2005-06

[15] Mark Tollock "A proposed Solution for Mapping Underground Utilities for buried Assets Management" National Resource Journal Nov 2005.

[16] Scottish Executive in Scotland "Improvement in the Road Construction Central process in Scotland." 2004.

[17] Smile "Underground Services Detection and Data Issues Paper" 060217 Issue Paper Underground Services detection and data final Feb 2006.

[18] Subdivision and development code of practice "Network Utilities" Oct 2006.

[19] Traffic Management Division of " OPTION FOR MANAGING URBAN CONGESTION"

[20] "The Road Management Act"

[21] IRC 98 2000 GUIDELINES ON ACCOMODATION OF UTILITY SERVICES ON ROADS IN URBAN AREA.