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Traffic Volume Survey at Salem, Tamilnadu, India

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A B S T R A C T

The main scope of this study is to evaluate Traffic volume in and around Salem, which is located in Tamilnadu, India. Salem is the fifth largest city with a population of 7.54lakhs in Tamil Nadu. We select the new bus stand is center place of Salem. We select the highway bridges in four places Attur, Tharamangalam, Omalur and Namakkal based on four directions. The compressive strength is good in Panamarathupatti Bridge, Junction Bridge, Omalur Bridge and GH Bridge in Salem city. The age of the GH Bridge is old compare to the other bridge. We count the traffic volume survey in Panamarathupatti Bridge, Junction Bridge, Omalur Bridge and GH Bridge in Salem city. The previous year annual average daily traffic values are collected from NHAI in Salem. The year-by-year traffic volume is gradually increased. If the traffic volume of the bridge may be increased in further. So that the width of carriage way must be increased. So that we suggest to construct a new bridge to the adjacent side of existing bridge (i.e.) in service road to reduce the traffic volume and to increase the life period of existing bridge.

Keywords: Traffic volume, Traffic density, Average Annual Traffic, PCU, Serviceability of Bridge.

1. Introduction

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The length of the sampling period depends on the type of count being taken and the intended use of the data recorded. For example, an intersection count may be conducted during the peak flow period. If so, manual count with 15-minute intervals could be used to obtain the traffic volume data.

1.1. Types of Traffic Volume Counts

Two methods are available for conducting traffic volume counts:

(1) Manual

(2) Automatic.

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Manual counts are typically used to gather data for determination of vehicle classification, turning movements, direction of travel, pedestrian movements, or vehicle occupancy. Automatic counts are typically used together data for determination of vehicle hourly patterns, daily or seasonal variations and growth trends, or annual traffic estimates.Our objective is to study the Traffic volume survey for existing bridge like Panamarathupatti Bridge, Junction Bridge, Omalur Bridge and GH Bridge and compare the same with available Traffic volume data.

2. Literature Review

V. Thamizharasan and K. Krishnamurthy are studied and make a detailed knowledge of traffic volume is an important basic input required for planning, analysis and operation of roadway systems. Expressing traffic volume as number of vehicles passing a given section of road or traffic lane per unit time will be inappropriate when several types of vehicles with widely varying static and dynamic characteristics are comprised in the traffic. The problem of measuring volume of such heterogeneous traffic has been addressed by converting the different types of vehicles into equivalent passenger cars and expressing the volume in terms of Passenger Car Unit (PCU) per hour. The vehicles of highly heterogeneous traffic with widely varying physical and operational characteristics such as the one prevailing on Indian roads, occupy based on the availability of space, any convenient lateral position on the road without any lane discipline. The interaction between moving vehicles under such heterogeneous traffic condition is highly complex. The results of the study, provides an insight into the complexity of the vehicular interaction in heterogeneous traffic. The PCU estimates, made through microscopic simulation, for the different types of vehicles of heterogeneous traffic, for a wide range of traffic volume and roadway conditions indicate that the PCU value of a vehicle significantly changes with change in traffic volume and width of roadway.

Shahjahan kaisar alam sarkar , Traffic congestion mainly occurred by non-motorized vehicles (47 percent) such as rickshaw and pushcart, which was followed by tempo (15 percent), private car (14 percent). Illegal occupations on the roadside by hawkers, mobile shops etc. (34 percent) were among the major causes of traffic congestion in the city. Maximum pedestrian movement was found at Zindabazar to Chowhatta link running through the only busy commercial zone of the city. The Roadway Congestion Index (RCI) of 2.36 indicated the severity of traffic congestion of Sylhet City. Such a detailed scenario of the traffic paradigm of the urban conglomeration of a developing country is depicted in this paper.

A J Johnston, Test consult Limited, 11 Trinity Court, Risley, Warrington, Cheshire, WA3 6QT, UK are studied and make a detailed investigation assessing the durability of concrete has become an important function of engineer's responsibility for maintaining concrete structures. Bridge engineers have been at the forefront of emerging technology relating to their durability, as bridges are particularly susceptible to deterioration due to often-harsh environments. With the growth of non-destructive testing (NDT) over the past 25 years a be wildering array of tests has appeared. Within the industry detailed knowledge of the tests has not always kept pace with the growth, as engineers have struggled to keep abreast of increasing complexity. Because of this testing quality and interpretation of results have suffered, compounded on occasion by insufficient knowledge of such specialised techniques by those supervising the work. Appropriate advice is no treadily available being spread amongst many different specifications and references some of which outdated. In order to make the step from knowing, for example, that destructive contaminants are present in the concrete, to selecting the best methods for repair, engineers require guidance on techniques available both for condition assessment and for interpretation of the data. This paper discusses NDT techniques available to assess the condition of structures and provide the fullest information enabling effective repair strategies to be developed show casing current method sat tempting to manage the inevitable deterioration of concrete structures.

J.C. Agunwambaa, T. Adagbabare studied and makes a detailed investigation on the comparison between some non-destructive testing techniques (Rebound Hammer and Ultrasonic Pulse Velocity). Tests were performed to compare the accuracy between the rebound hammer and the ultrasonic pulse velocity method in estimating the strength of concrete. Eighty samples (cubes of 150 * 150 * 150) were prepared using two mix designs of 1:2:4 and 1:3:6 with a constant w=c ratio of 0.45 and were tested at 7, 14, 21 and 28 days. The slump test was between 62 -78mm. The results obtained from the non-destructive testing methods were correlated with the compressive strength results which showed that a higher correlation existed between the Rebound Hammer and the compressive strength than the Ultrasonic Pulse Velocity. The rebound hammer readings had a correlation coecient of 0.794 while the ultrasonic pulse velocity had a correlation coecient of 0.790 for the 1:2:4 mix and the rebound hammer readings for1:3:6 was 0.783 and that for the ultrasonic pulse velocity was 0.777. Statistical analysis of the results obtained showed that there was no significant difference between the means of the two methods for both mix at a 0.05 level of significance.

3. Traffic Survey Area

Salem is the fifth largest city with a population of 7.54lakhs in Tamil Nadu. We select the new bus stand is center place of Salem. We select the highway bridges in four places Attur, Tharamangalam, Omalur and Namakkal based on four directions.

Figure 1: Salem City Map

3.1 Panamarathupatti Bridge

The bridge is between Salem to Namakkal in NH 7. The distance is 15km from Salem new bus stand. The Panamarathupatti Bridge project started in the year of 2002 and it was completed in the year of 2007.

Figure 2: Panamarathupatti Bridge

3.1.1 Dimension of Panamarathupatti bridge

Length of bridge with retaining wall	= 1.5km
Length of bridge without retaining wall	= 30m
Diameter of abutment	= 2m
Abutment cap (Length x breath x depth)	= 11.2 x 3.4 x 1.0 m
Girder (I Section)	
Overall length of girder	= 28.7m
I. Top Flange	= 1.3 m
II. Bottom Flange	= 0.63m
III. Web	= 0.8m
Overall depth of the girder	= 1.570m
Slab (Length x Breath x Depth)	= 11.2 x 6.0 x 0.15m
Carriage way	= 22.4m

3.2. Junction Bridge

The bridge is between Salem to Tharamangalam in SH 159. The distance is 12m from Salem new bus stand. The Junction Bridge project started in the year of 1973 and it was completed in the year of 1979.

3.2.1. Dimension of Junction bridge

Length of bridge with retaining wall	= 1.0km
Length of bridge without retaining wall	= 60m
Diameter of Pier	= 1.5m
Pier cap (Length x breath x depth)	= 10.5 x 4.5 x 1.0 m
Girder (I Section)	
Overall length of girder	= 57.6m
I. Top Flange	= 1.4 m
II. Bottom Flange	= 0.80m
III. Web	= 1.0m
Overall depth of the girder	= 2.0m
Slab (Length x Breath x Depth)	= 10.2 x 5.0 x 0.15m

Carriage way = 20.4m

3.3. Omalur Bridge

The bridge is between Salem to Omalur in NH 7. The distance is 20km from Salem new bus stand. The Omalur Bridge project started in the year of 2005 and it was completed in the year of 2010.

Figure 3: Omalur Bridge

3.3.1Dimension of Omalur bridge

Length of bridge with retaining wall	= 2.0km
Length of bridge without retaining wall	= 90m
Diameter of abutment	= 2m
Abutment cap (Length x breath x depth)	= 11.5 x 4.0 x 1.0 m
Girder (I Section)	
Overall length of girder	= 87.6m
I. Top Flange	= 1.5 m
II. Bottom Flange	= 0.7m
III. Web	= 0.9m
Overall depth of the girder	= 1.75m
Slab (Length x Breath x Depth)	= 11.5 x 6.0 x 0.15m
Carriage way	= 11.0m

3.4. GH Bridge

The bridge is between Salem to Attur in NH 79. The distance is 3km from Salem new bus stand. The Attur Bridge project started in the year of 1982 and it was completed in the year of 1987.

3.4.1Dimension of GH bridge

Length of bridge with retaining wall	= 2.5km
Length of bridge without retaining wall	= 1.0km
Diameter of Pier	= 1.2m
Pier cap (Length x breath x depth)	= 12 x 3.0 x 1.0 m
Girder (I Section)	
Overall length of girder	= 900m
I. Top Flange	= 1.3 m
II. Bottom Flange	= 0.65m
III. Web	= 0.7m
Overall depth of the girder	= 1.80m
Slab (Length x Breath x Depth)	= 12 x 5.0 x 0.15m
Carriage way	= 11.0m

4. Traffic Survey results

4.1 GENERAL

This survey is designed to measure the trips trade made by commercial vehicles within the internal areas.Transportation contributes to the economic, industrial, social and cultural development of any country. It is well recognized that transport performs a key role in achieving fast economic growth of developing countries. Export and import, industry agriculture defense, social services (health, education), general administration, maintenance of law and order, exploitation of untapped resources, mobility of persons etc., are some of the many areas of activity which are very closely linked to the availability of adequate transportation.

4.2 Traffic Volume Counts

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The length of the sampling period depends on the type of count being taken and the intended use of the data recorded. For example, an intersection count may be conducted during the peak flow period. If so, manual count with 15-minute intervals could be used to obtain the traffic volume data.

4.2.1Manual Method

Manual counts are typically used to gather data for determination of vehicle classification, turning movements, direction of travel, pedestrian movements, or vehicle occupancy. Most applications of manual counts require small samples of data at any given location. Manual counts are sometimes used when the effort and expense of automated equipment are not justified. Manual counts are necessary when automatic equipment is not available.

Manual counts are typically used for periods of less than a day. Normal intervals for a manual count are 5, 10, or 15 minutes. Traffic counts during a Monday morning rush hour and a Friday evening rush hour may show exceptionally high volumes and are not normally used in analysis; therefore, counts are usually conducted on a Tuesday, Wednesday, or Thursday.

4.2.2 Key Steps to a Manual Count Study

A manual count study includes three key steps:

1. Perform necessary office preparations.
2. Select proper observer location.
3. Label data sheets and record observations.

4.2.3Perform Necessary Office Preparations

Office preparations start with a review of the purpose of the manual count. This type of information will help determine the type of equipment to use, the field procedures to follow, and the number of observers required. For example, an intersection with multiple approach lanes may require electronic counting boards and multiple observers.

4.2.4 Select Proper Observer Location

Observers must be positioned where they have a clear view of the traffic. Observers should be positioned away from the edge of the roadway. If observers are positioned above ground level and clear of obstructions they usually have the best vantage point.

4.2.5 Label Data Forms and Record Observations

Manual counts may produce a large number of data forms; therefore, the data forms should be carefully labeled and organized. On each tally sheet, the observer should record the location, time and date of observation, and weather conditions. Follow the data recording methods discussed earlier.

S.No	Place	Day	Two wheelers	Cars	Vans	Light lorries	Heavy lorries	Buses	Multi axle vehicles	Total
1	Salem to Namakkal	Mon	8208	6124	385	1706	1028	1131	65	18647
2		Tue	7823	5975	427	1727	1232	1394	52	18630
3		Wed	8152	6219	362	1690	1152	1267	73	18915
4		Thu	7659	6342	420	1592	1253	1360	80	18706
5		Fri	8392	5560	365	1580	1324	1186	67	18474
6		Sat	6643	4560	370	1232	993	1045	59	14843
7		Sun	6259	4932	352	1168	958	980	62	14711

Table 1:Traffic Volume Survey at Panamarathupatty Area

4.3 ANNUAL AVERAGE DAILY TRAFFIC (AADT)

4.3.1 Annual Average Daily Traffic at Namakkal:

7-day 12 hour traffic flow = (5x18675)+(2x14777)

= 122929 vehicles

Using a 95% confidence limit for the 24 hr traffic flow with 5% tolerance.

Then, 12 hr traffic flow is 95%of 24 hr traffic flow, therefore:

7 days, 24hr traffic flow = 122929/0.95

= 129399 vehicles

Average daily traffic =129399/7

= 18486 vehicles

Annual average daily traffic = 18486xconversion factor

= 18486x1

= 18486 vehicles

Year	Annual Average Daily Traffic
2007	12453
2008	13789
2009	14563
2010	15568
2013	18486

Table 2: Year Vs Annual Average Daily Traffic at Namakkal

S.No	Place	Day	Two wheelers	Cars	Vans	Light lorries	Heavy lorries	Buses	Multi axle vehicles	Total
1	Salem to Tharamangalam	Mon	2663	1865	132	513	358	333	19	5883
2		Tue	3542	2102	120	450	268	257	17	6756
3		Wed	2504	1936	143	563	404	361	22	5933
4		Thu	2781	2013	178	481	362	287	26	6128
5		Fri	2368	1653	192	537	383	269	15	5417
6		Sat	2258	1282	173	493	319	301	14	4840
7		Sun	2109	1328	158	504	248	328	18	4693

Table 3: Traffic Volume Survey at Junction Area

4.3.2Annual Average Daily Traffic at Tharamangalam:

7-day 12 hour traffic flow = (5x6024)+(2x4767)

= 39654 vehicles

Using a 95% confidence limit for the 24 hr traffic flow with 5%tolerance.

Then, 12 hr traffic flow is 95%of 24 hr traffic flow, therefore:

7 days, 24hr traffic flow = 39654/0.95

= 41741 vehicles

Average daily traffic = 41741/7

= 5963 vehicles

Annual average daily traffic = 5963xconversion factor

= 5963x1.00

= 5963 vehicles

Year	**Annual Average Daily Traffic**
1979	1486
1980	2895
1981	3568
1982	4896
2013	5963

Table 4: Year Vs Annual Average Daily Traffic at Junction

S. No	Place	Day	Two wheelers	Cars	Vans	Light lorries	Heavy lorries	Buses	Multi axle vehicles	Total
1	Salem to Omalur	Mon	10769	8019	575	1976	1233	1358	90	23750
2		Tue	9856	8034	547	1876	1345	1090	81	22829
3		Wed	10345	8756	679	1967	1456	1190	87	24480
4		Thu	9978	8756	458	1006	1245	1078	90	22611
5		Fri	10894	7893	567	1098	987	1098	81	22618
6		Sat	9876	6859	456	1034	685	997	56	19963
7		Sun	8878	7689	435	989	657	987	67	19698

Table 5: Traffic volume survey at Omalur area

4.3.3 Annual Average Daily Traffic at Omalur:

7-day 12 hour traffic flow = (5x23258) + (2x19831)

= 155952 vehicles

Using a 95% confidence limit for the 24 hr traffic flow with 5%tolerance.

Then, 12 hr traffic flow is 95%of 24 hr traffic flow, therefore:

Average daily traffic = 164160/7

= 23451 vehicles

Annual average daily traffic = 23451xconversion factor

= 23451x1=23451 vehicles

Year	Annual Average Daily Traffic
2010	18564
2011	19645
2012	20642
2013	23451

Table 6: Year Vs Annual Average Daily Traffic at Omalur

S.No	Place	Day	Two wheelers	Cars	Vans	Light lorries	Heavy lorries	Buses	Multi axle vehicles	Total
1	Salem to Attur	Mon	13092	9090	942	2252	1777	1973	110	29236
2		Tue	12667	9067	987	2345	1456	1987	100	28609
3		Wed	12456	8675	876	2365	1378	1876	109	27735
4		Thu	13456	8976	854	1987	1245	1754	112	28384
5		Fri	12567	7896	934	2189	1679	1765	87	27117
6		Sat	11450	6796	776	2089	1200	1554	56	23921
7		Sun	10389	6876	802	2023	1034	1765	78	22967

Table 7: Traffic volume survey at Attur area

4.3.4 Annual Average Daily Traffic at Attur:

7-day 12 hour traffic flow = (5x28217) + (2x23444)

= 187973 vehicles

Using a 95% confidence limit for the 24 hr traffic flow with 5%tolerance.

Then, 12 hr traffic flow is 95%of 24 hr traffic flow, therefore:

7 days, 24hr traffic flow = 187973/0.95

= 197867vehicles

Average daily traffic = 197867/7

= 28267 vehicles

Annual average daily traffic = 28267 x conversion factor

= 28267x1

= 28267vehicles

Year	Annual Average Daily Traffic
1987	14584
1988	15844
1989	16469
1990	17844
2013	28267

Table 8: Year Vs Annual Average Daily Traffic at Attur

5. Conclusion

- In this project we conclude that the compressive strength is good in Panamarathupatti Bridge, Junction Bridge, Omalur Bridge and GH Bridge in Salem city. The age of the GH Bridge is old compare to the other bridge.

- We calculate that traffic volume survey in Panamarathupatti Bridge, Junction Bridge, Omalur Bridge and GH Bridge in Salem city. The maximum traffic volume is obtained in GH Bridge compare to other bridges.

- The previous year annual average daily traffic values are collected from NHAI in Salem. The year by year traffic volume is gradually increased. If the traffic volume of the bridge may be increased in further. So that the width of carriage way must be increased.

- So that we suggest to construct a new bridge to the adjacent side of existing bridge (i.e.) in service road to reduce the traffic volume and to increase the life period of existing bridge.

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