

5



अतुल कुमार
 बी.ई. (सिविल इन्जी.) एच.टेक. (आई.आई.टी., दिल्ली) एम.आई.ई.
 मुख्य महा प्रबंधक
ATUL KUMAR
 BE (Civil Engg.) M. Tech (IIT, Delhi), MIE
 Chief General Manager

भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
NATIONAL HIGHWAYS AUTHORITY OF INDIA
 MINISTRY OF ROAD TRANSPORT & HIGHWAYS
 GOVERNMENT OF INDIA
 G-5 & 6, SECTOR-10, DWARKA, NEW DELHI-11007
 जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-11007
 Tel. : 25074100 / 200 Ext.: 2536 & 2337
 Fax : 25093508
 E-mail : kumar_atul@nhai.org (Off)
 : kumar_atul@vsnl.com (Per.)
 Website : nhai.org
**URGENT/IMPORTANT
 BY FAX/COURIER**

M/s CMC Ltd
27/1/05
27/1

No. 11013/113/2005/IT 24.1.2005
 Sub: Implementation of the NHAI's new on-line web based toll fee collection software on the Toll plazas.

Dear Project Director

NHAI head office has got developed a new web based software for toll fee collection for implementing on all toll plazas of NHAI. To expedite installation at various tolling locations it has been decided in a review meeting Chaired by Member (Admn.) on 18.1.2005 that a team from head office will visit the tolling locations. Mandate of the team would be to review the availability of requisite infrastructure on toll plaza related to civil construction of toll plaza/booth, electrical fittings, availability of required computers of configuration etc. and identify the gaps for which the concerned Project Director would take immediate necessary actions to expedite installation of the new software. After the site is ready, M/s CMC Ltd. developer of the software will be asked to install the same. The said visit will be carried out in phases which is annexed (Annexure A).

2. Copy of guideline prescribing basic infrastructure facilities at the toll plaza related to civil construction, electrical connections, furnitures and fixtures, computers and networking etc. had been circulated and a copy of the same is enclosed (Annexure B) for ready reference. The Project Directors are requested to go through them before the team from head office visits them and quickly take action on the pending items if any. The Project Directors would also take immediate necessary actions on following:

- (a) Hiring of PCs and other equipments of required specifications etc. for a period of 4-6 months if they are not available. In next 4-6 months if required PCs, printers etc. are likely to be procured centrally from head office through a tender which is due for opening shortly.
- (b) Getting the necessary civil and electricals work done.
- (c) Project Directors along with the visiting head quarter of officers would draw a minutes of the meeting for the actions to be taken

With regards.

Yours sincerely,

 (Atul Kumar)

Encl: As above
 To

1. All concerned Project Directors: Ambala (Sh. B.S. Chauhan), Kolkata (Sh. J.K. Goyal), Himatnagar (Sh. G.D. Gupta), Udaipur (Sh. Vishal Gupta), Vadodara (Sh. G.D. Gupta), Chittorgarh (Sh. Vishal Gupta), Chennai (Sh. I.G. Reddy), Bhubaneswar (Sh. Anurag Salwan), Vijayawada (Sh. K V Rama Rao), Vishakhapatnam (Sh. K. Srinivasulu).

Copy for immediate necessary action:

1. Concerned GMs at Headquarter: Sh. R.P. Khandelwal, Sh. S.C. Jindal and Sh. M.M. Lohia.
2. Concerned team members: Sh. Deepak Saxena, Sh. P.K. Mohapatra, Sh. Suresh Kapoor, Sh. Sandeep Kumar and Sh. S. Manivasagam.
3. Team Leader CMC Ltd.

Copy also for information to: Member (Admn.)

Annexure A

Dates of visit	Locations to be visited	PIU	Representative of IT division	Representative of CM division
27.1.2005 to 28.1.2005	1.Panipat-Ambala 2.Ambala-Khanna 3.Khanna-Jalandhar	Ambala -do- -do-	Sh. Deepak Saxena, DGM (P&IS)	Sh. Suresh Kapoor, Manager (CM)
31.1.2005 to 3.2.2005	1.Barwa Adda-Panagarh 2.Panagarh-Palsit 3.Palsit-Dankuni 4.Kolaghat-Kharagpur 5.Kharagpur-Laxmannath	Kolkata -do- -do- -do-	Sh. Deepak Saxena, DGM (P&IS)	Sh. Sandeep Kumar, Manager (CM)
10.2.2005 to 12.2.2005	1.Ratanpur-Himatnagar 2.Udaipur-Kesaraiji 3.Chalthan-Bhagwada 4.Bhilwara-Chittorgarh 5.Udaipur-Mangalwar	Himatnagar Udaipur Vadodara Chittorgarh -do-	Sh. Deepak Saxena, DGM (P&IS)	Sh. Suresh Kapoor, Manager (CM)
Between 27.1.2005 to 31.1.2005	Tambaram-Tindivanam locations) (2)	Chennai	Sh. S. Manivasagam, Asst. Programmer	Sh. Suresh Kapoor, Manager (CM) and/or Sh. R.P. Khandelwal, GM (CM)
16.2.2005 to 18.2.2005	1.Bhubaneshwar-Cuttack-Jagatpur 2.Chillikaluripet-Vijayawada 3.Vijayawada-Goundungolanu (2 locations) 4.Ankali-Vishakapatnam	Bhubaneshwar Vijayawada -do- Vishakapatnam	Sh. P.K. Mohapatra, Manager (P&IS)	Sh. Suresh Kapoor, Manager (CM)

Standard guidelines for Computerisation of Toll Plazas

Table of Contents

Section	Particulars	Page no.
1.0	Introduction - Need for such a Manual	2
2.0	Civil Works Requirements	3
2.1	Civil works for Back Office	
	2.1.1 Server Room	
	2.1.2 Operations Room	
	2.1.3 TRC Room	
2.2	For the Toll Booths	
2.3	Drawings	
3.0	Electrical Requirements	6
3.1	For the Back Office	
3.2	For the Toll Booths	
3.3	Electrical Layouts	
3.4	Electrical Equipment required	
4.0	Furniture and Fixtures	7
4.1	Computer tables	
4.2	Computer Chair	
4.3	Network Rack	
4.4	Storage Rack in Server Room	
4.5	Storage Rack in TRC area	
4.6	Storage Rack in the Booth	
4.7	Work Tables for Booth	
4.8	Work Tables for TRC	
5.0	Hardware and Networking Requirements	8
6.0	Connectivity	10
6.1	At the Toll Collection center Level (LAN)	
6.2	To Regional office (Internet)	
7.0	Applications Software	11
7.1	Application software at the Booth Level	
7.2	Application software at the Back Office Level	
8.0	Manpower Requirement and Training	12
8.1	Manpower requirement for Data Entry Operator	
8.2	For the Back Office	
8.3	Training	

1.0 Introduction

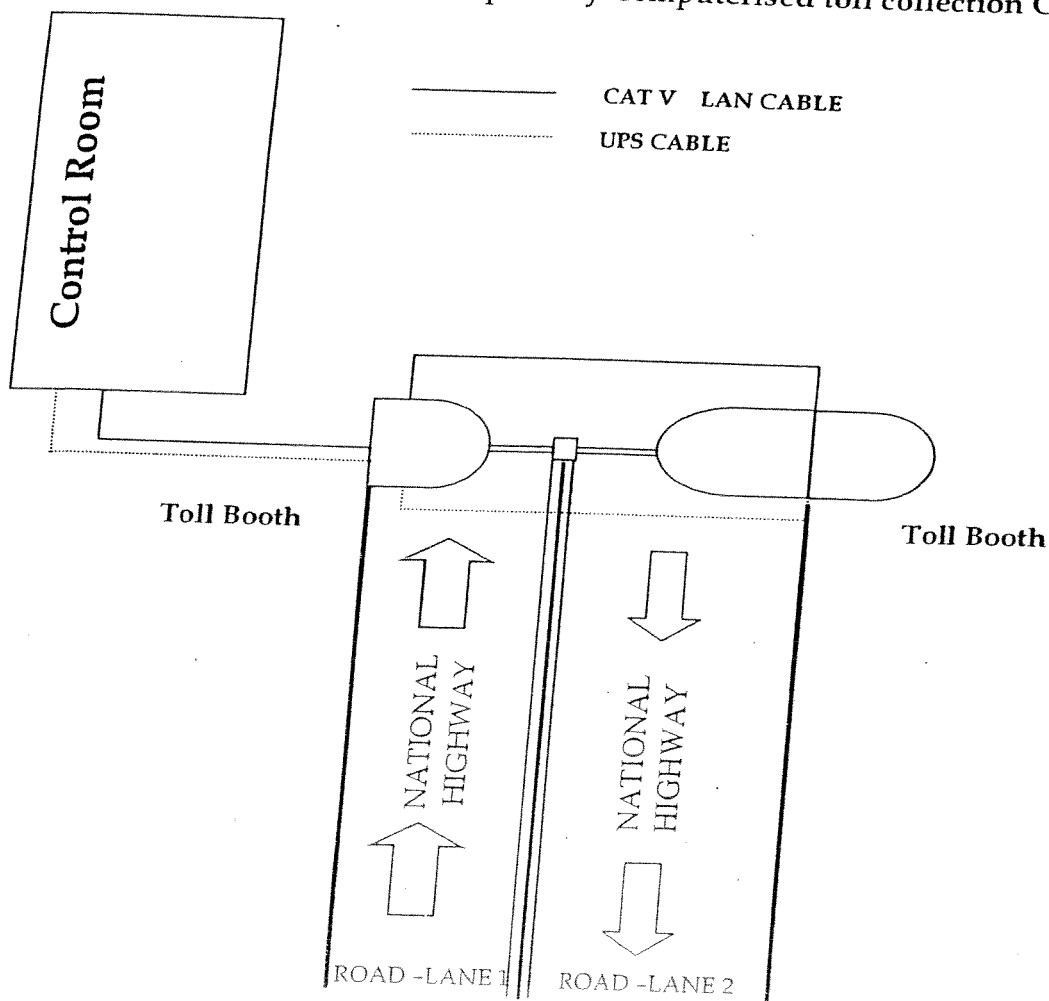
The idea of creation of a manual of this nature is really to facilitate the setting up of any Toll Booth Collection center from the preview of using contemporary technology and better management techniques.

To help assist the setting up on any such center, it is the endeavour of the IT Dept. of NHAI to be able to define the major components that would go into it and bring in a high degree of standardisation in the specifications to be used.

Attempt has been made to include the major components as mentioned in the table of contents. These major components have then been applied to the two Functional components namely the Server room and the Toll booth room.

The pattern and model is built on the experience gained at setting-up and implementing the computerisation at the Manoharpur toll plaza/Bilaspur toll plaza/Moradabad bypass, Chennai Bypass etc.

Overview Diagram for the set-up of any Computerised toll collection Centre



2.0 Civil Works Requirements

2.1 Civil Works for Back Office

The complete Back office facility at any computerised toll booth collection centre would be typically of the size of approximately 320 sq. feet. The dimensions of the room should ideally be a 20' by 16' room. The back office should be air conditioned and provided with proper lights, ventilation etc. This should also be protected from excessive heat, humidity and dust etc. This Back office facility would be divided into three main parts. These would be as follows:-

Room I: SEVER ROOM.

Where the Physical Server is placed. With totally restricted entry.

Room II: OPERATIONS ROOM

Operations from where a Node has to be placed and all work related to ticket printing/issue happens from here.

Room III: TRC ROOM

The Storage room and Test and repair center (TRC)

2.1.1 SEVER ROOM.

Typically would be of the size 10' by 8' encompassing a total area of 80 square feet. The room would only house the Toll system computer server and all other related equipment with the server, such as switches, Hubs, back-up server, Central UPS/CVT & other devices etc.

This would be a RESTRICTED AREA for all. The movement in and out of this area maybe logged.

There would be a storage area in this server room, which would be a storage area with a locking facility. This would be used to store the more valuable things likes Spares (hard-disk etc)/ consumables / stationary or movable items such as CD - Writers, Zip drives etc.

2.1.2 OPERATIONS ROOMS

The operations room would be adjoining the Server room and in fact the entry to the server room would also be through this room. Typically it would be of the size 8' by 10' encompassing a total area of 80 square feet. The operations room would house the working node(s) and the necessary printers.

This would be the room where all the operations would take place. The entry of any kind of data, the end of shift report printing, the updation of programmes etc would

also be done through the nodes placed in this room. The provision of collection of slip by the booth operator should also be provided for.

2.3 TRC ROOM

The third room in this room would be the TRC and the STORAGE room. The location of it would necessarily have to be in the front portion of the building. The dimensions of this room would be 13' X 8' encompassing total area of 104 square feet. The room would house the complete server and support teams who would be responsible for running the computerised toll operations.

This room would comprise of, mainly two things which are as follows:-

- Testing and repair centre (TRC)
- Open Storage Areas.

There would be a workbench for the service and support team. This area would be designated for all the repair work and up gradation of all systems printers etc. There should be shelf space over head for the service engineer to be able to stock their tools. The storage bays would be open storages bay, which would allow the service and support team to store goods which are larger in size or nature such as Monitors, printers back up CPU etc. Within this there could be built up drawers for the storage of smaller items such as cables, connectors etc. Behind the Storage area we would require a 40 sq. foot room which would house the On-line UPS along with the battery bank. There would the need to provide for a room which would house a large generator. This may not necessarily be a permanent structure but could be a shed covered by asbestos sheeting.

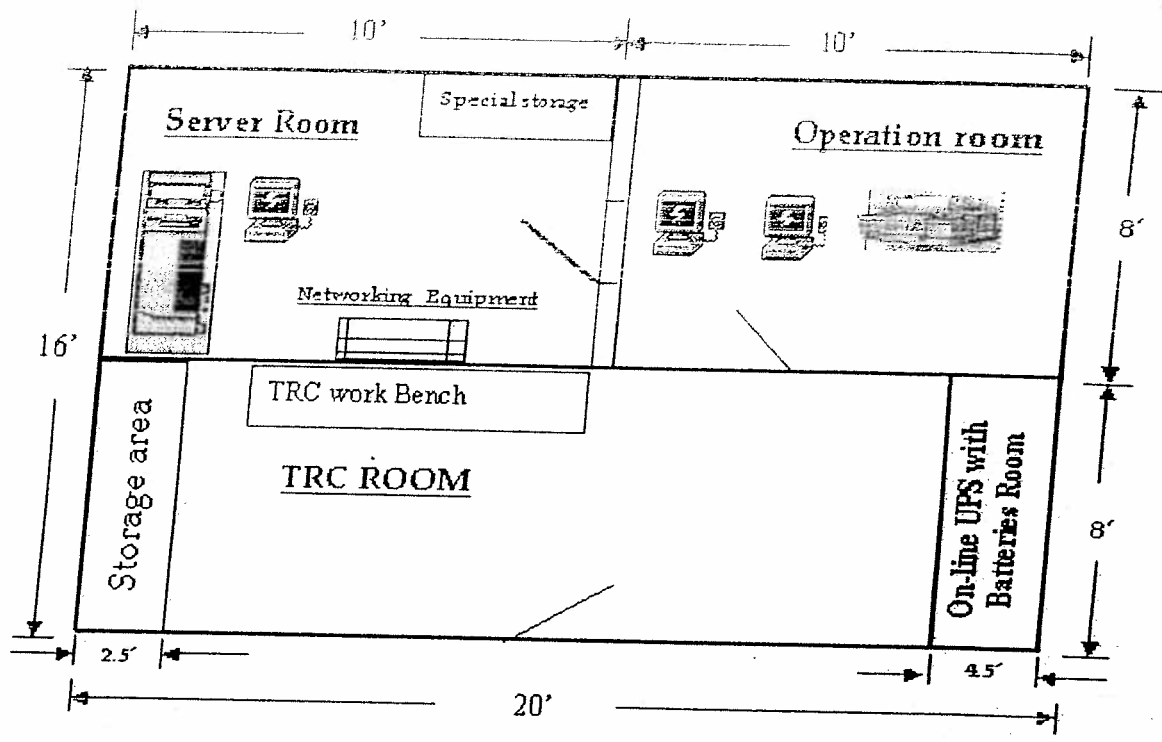
2.2 Toll Booths

The Toll Booth would be dimensionally of the size 8' by 8' covering at total area or 64 square feet. The shape of the booth can be a square box (like the booths at Manhoapur toll plaza) or it could be curved from the front (as in DND). The height of these booths should not be more than 8 feet. The front portion should be glass cover from all sides to enable the operator to get a good view of the flow or traffic. Also the windows should allow easy of handling of tickets. The toll booths should also be protected from excessive atmospheric heat, dust, humidity and smoke of passing vehicles. It should be provided with proper lights and fan etc. These booths should preferably be air conditioned so as to protect the equipments which need to run 24 hours without stopping.

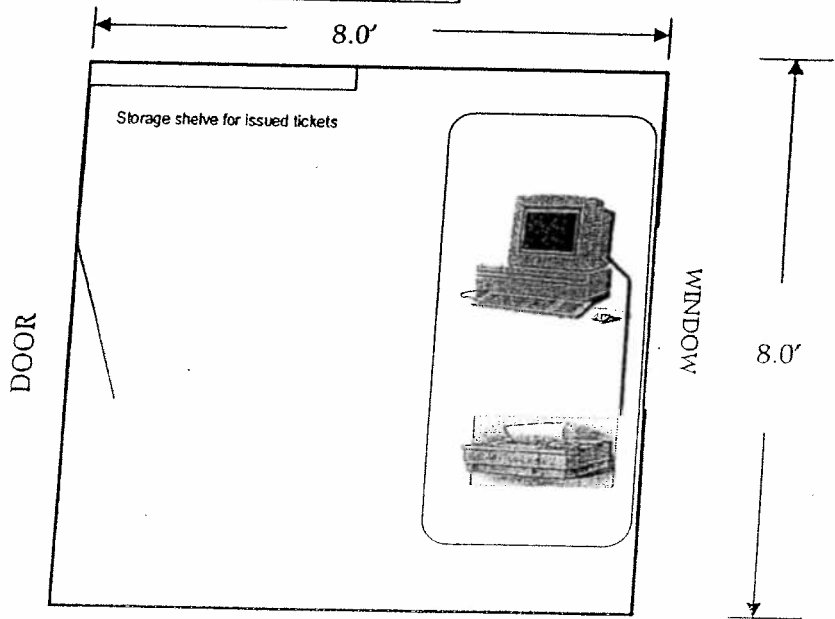
It should be able to accommodate NOT more than two people at any point of time. It would house a computer and a printer for which adequate furniture should also be provided for.

2.3

DRAWING FOR BACK OFFICE



DRAWING FOR TOLL BOOTH



3.0 ELECTRICAL REQUIREMENTS

The electrical requirement on 8 booths of a typical four lane highway would be close to 35 KVA the break up of this is as follows:-

3.1 For the Back office

Computer Systems	
Server	1.60 KVA
Nodes (Two nos.) with Monitors	0.50 KVA
DM Printer (One nos.)	0.15 KVA
Air conditioning (2 Tons)	4.00 KVA
Lights, Fans and other power points	1.00 KVA
Sub total	7.25 KVA

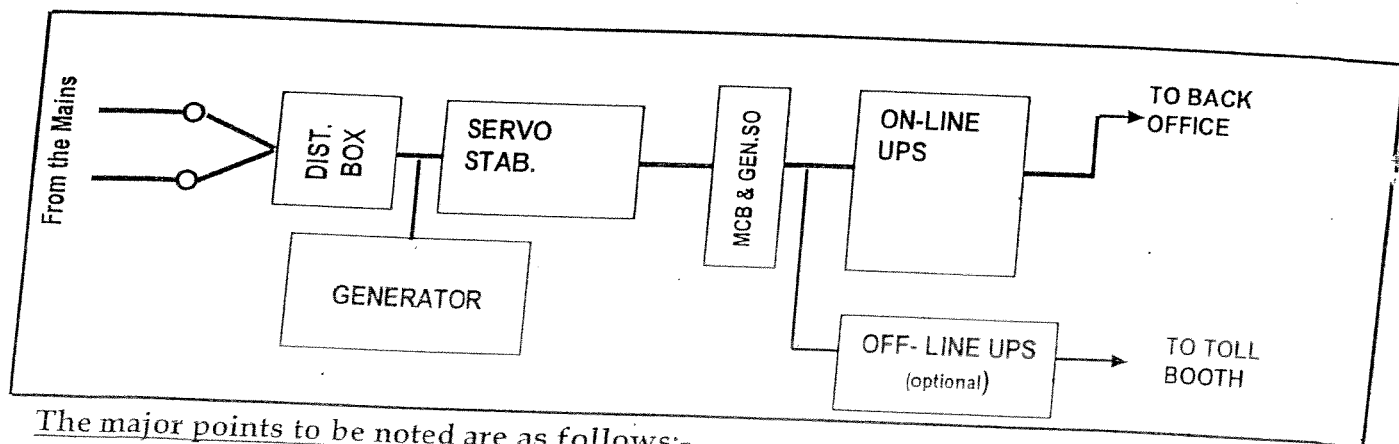
3.2 For the Toll Booth

Computer Systems	
Nodes (One nos.)	0.200 KVA
DM Printer (One nos.)	0.150 KVA
Air conditioning (.75 Tons)	3.00 KVA
Lights, Fans and other power points	0.150 KVA
Sub total	3.5 KVA

Assume that there are at least 8 Booths for a FOUR LANE HIGHWAY

Total booth requirement would be	28.00 KVA
Total Power requirement would be	35.25 KVA

3.3 Electrical layouts (Block Diagram)



The major points to be noted are as follows:-

1. There has to be a separate (physical) power line for the Air conditioning and the computer systems.

2. For the server room and all other Electrical points for computer it would be imperative to have EARTHING DONE. Permissible limits for earthing between Phase and Neutral is not less than ZERO and Not more than 3 Volts.

3.4 Electrical Equipment required

The list of electrical equipment required would be as follows for any toll booth: -

- Servo Stabilizer for 2KVA
- On-Line UPS for 2 KVA (one) with off-line UPS for 500VA as many as the nos. of toll booths. Alternatively on-line central UPS of 5 KVA (one).
- Battery Pack for One hour for above UPS
- Generator of capacity 35 KVA with Change over switch
- MCB at the change over stage and at the UPS points (rating of these can vary and should be installed in consultation with the respective electrical vendors of UPS and Generators)

Electrical points requirement

Room	Server	Operations	TRC	Booth
15 Amps	3	2	2	1
5 Amps	6	6	6	3

4.0 Furniture and Fixtures

In the endeavour to standardised on all the Furniture and Fixtures so as to enable the smooth implementation of the operation of setting up we have built the list of required Furniture and Fixtures which is as follows:-

- Computer tables
- Computer Chair
- Network Rack
- Storage Rack in Server Room
- Storage Rack in TRC area
- Storage Rack in the Booth
- Work Tables for Booth
- Work Tables for TRC

4.1 Computer tables

Standard computer tables would be used. The dimensions of these tables would be 3'X 5'. They must provide for a slot so as to allow all the wire to be passed below. They have to have a sliding keyboard drawer.

4.2 Computer Chair

Standard computer chairs would be used, considering the long hours that have to be spend they must be ergonomically correct.

4.3 Network Rack

The network rack would be a simple rectangular shaped rack opened from both end with shelves. The physical dimensions would be 4' X 2' X 4' with shelves at a distance of a foot each.

4.4 Storage Rack in Server Room

The Storage rack in the server room would be 6' X 3' X 3' dimensional rack with shelves and locking facility. One could also use a standard Godrej storewell cupboard for this purpose, as sensitive materials is to be placed here.

4.5 Storage Rack in TRC area

This Storage Rack would be very different from what we have in the server room. This would really be a wall to wall storage cabinet. This cabinet would take the following dimensions 8' X 2.5' X 10". This must have 12" to 18" cubes built in to allow the storage of defective parts such as CPU, Printers, Monitors etc. Also the housing of back-up CPU's etc could be done. In one section it should have drawers with locks to allow storage of cables connectors etc.

4.6 Storage Rack in the Booth

This Storage Rack for the booths would a simple rack which would be wall mounted or could be under the work bench of the operator. The wall mounted cabinet would be of the following dimensions 24" X 18" X 12". There need not be shelves.

4.7 Work Tables for Booth

The working table for the relatively long table of size 8 X 2'. This is where all the repairing etc would be carried out. The length being critical so as to enable the repair of two CPUs at the same time. This table necessarily call for overhead lighting and at least 5-6 nos. 5 amp power points and 2 Nos. 15 amps points.

4.8 Work Tables for TRC

The working table for the operators at the booth level would be simple and straight forward. As it's an operations work bench it should be able to accommodate the operators PC and his printer. The dimensions of these are 4' by 2'.

5.0 Hardware Requirement

Annexure B

The automated Toll collection system would require the following hardware at the Back Office Level.

Sr. No.	Description	Units	Qty
I Hardware:			
1	Computer Systems for tolling booths: Suggested make IBM, HP or equivalent. Minimum Configuration: Intel Pentium IV 2.8 GHz, 256 MB RAM, 40 GB HDD, 15" colour monitors, 32 MB (or above) VRAM, 10x100 Mbps Ethernet, Keyboard & Mouse with Windows XP professional and anti virus pre loaded.	No	Vary as per location and equals to the number of booths
2	Database/Application Server: Suggested make HP/IBM or equivalent. Rack mountable server - Minimum Configuration: Pentium-IV, 2.0 GHz or higher, 2 GB RAM, 6 x 36 GB (10K rpm) HDD Hot Pluggable (10K rpm) with RAID 5 support, 1.44 MB Floppy drive, 52 X CD ROM, 10/100 Mbps Ethernet, Redundant 10/100 Mbps Ethernet card, 52X CD Writer, Redundant power supply. Anti virus preloaded, Windows 2003 certified.	No	1
3	Server (Primary Domain Controller): Suggested make HP/IBM or equivalent. Minimum Configuration: Rack mountable server - Pentium-IV, 2.0 GHz or higher, 1 GB RAM, 2 x 36 GB (10K rpm) HDD hot plug, 1.44 MB Floppy drive, 52 X CD ROM, 10/100 Mbps Ethernet card, Redundant 10/100 Mbps Ethernet, Redundant power supply, 52X CD Writer. Anti virus preloaded. Window 2003 certified.	No	1
4	Server (for back-up domain server and for report printing): Same as at Sl.No. 1 with 256 additional RAM	No	1
5	External DAT Drive 24/48 GB with installation media and connectivity cable & Disks. Suggested make HP/IBM or equivalent.	No	1
6	HP 1010 or HP 1015 Laser Printer	No	2
7	Centralized UPS 5 KVA (with minimum ½ hour back-up) in redundant mode (including wiring and set-up). APC/TATA Libert	No	1
8	Centralized CVT 10 KVA	No	1
9	56 Kbps External modem US Robotics/GVC	No	1
10	Thermal printer Epson TM T88III Part No. C420084	Nos	Vary as per location and equals to the number of booths
11	Bar code Scanner Symbol make Model LS2208 along with table top set	Nos	Vary as per location and equals to the number of booths
II Networking:			
1	CISCO Catalyst 2950 12 port Switch with power cord.	No	1
2	CISCO Access Point AP 1100 series – AIR – AP 112 1G - A - K9 and power cord for access point AP 1100 -AIR - PWR - Cord UK. The bidder will be required to avail the required approval from Ministry of Communications/ DoT for Outdoor Wireless LAN set-up for NHAI.	No	2
3	Primary Controller Interface card for PC's – CISCO AIR-P 121 AG-A-K9	No	Vary as per location and equals to the number of booths
4	Access Controlled Server for wireless security CISCO CSACS-3.2	No	1
5	Structure Cabling conduit and fixing servers, routers and switches etc.		

Sr. No.	Description	Units	Qty
6	(a) CAT5 cable (AT&T/ AVAYA or equivalent) including PVC conduit of minimum 1" & thickness 2 mm of good quality (ISI standard).	Meter	500
7	(b) I/O Wall socket (AT&T/ AVAYA or equivalent).	No	10
8	(c) 7 feet patch cord (AT&T/AVAYA or equivalent).	No	20
9	Rack 42U for mounting active network components and servers with standard accessories and sufficient no. of power points. Suggested make: Vero President/HCL.	No	1
10	Patch Panel 12 ports (AVAYA)	No	1
11	15" colour monitor, keyboard & mouse for console along with tray for placing inside the rack. Suggested make: HP/IBM or equivalent.	No	1
12	8 port KVM switch with cables and accessories. (HP/IBM)	No	1

III Manpower deployment: 1 Network/Server Administrator and 1 Desktop Engineer on booths per shift of 8 hours duration.
Note: There will be requirement of 6 persons per day for three shifts of 8 hours duration each.

As per details Estimated consumption for 24 months

IV Supply of Consumables

1	Original toner cartridge for HP 1010 or HP 1015 Laser printer	No	16
2	Perforated computer stationary A4 size (70 gsm) (suggested make Century)	Pkt	24
3	Computer stationary A4 size (70 gsm) (suggested make Century)	Pkt	24
4	CDRW (HP/Samsung/Moserbear)	No	50
5	HP DAT Media (24/48 GB)	No	50

6.0 Connectivity

There would be two levels of connectivity at any Toll collections centre. These would be to connect all the machines within the centre namely the server and the clients in the Booths. The second level would be to connect the toll to the closest regional office or Project office.

6.1 At the Toll collections centre (LAN)

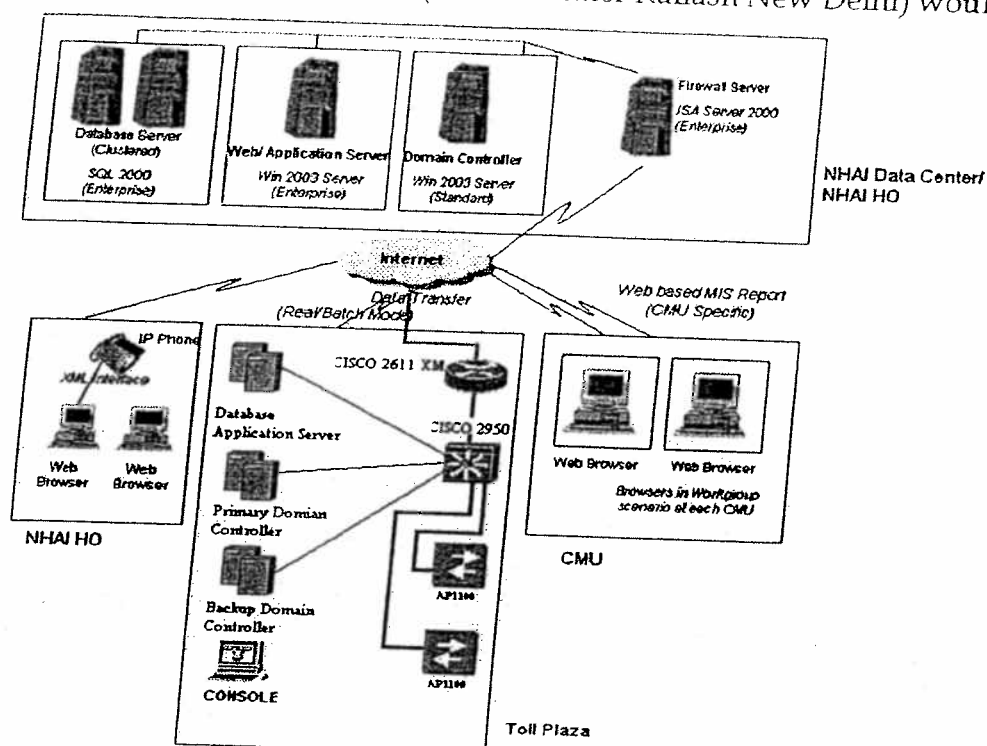
This could be achieved either through wireless LAN or wired LAN. The BOQ given above is for wireless LAN which is less time consuming to implement and cost effective in long run. Alternatively wired LAN though Ethernet cards in the PC can also be implemented through a HUB/ Switch placed in the server room. The physical cabling to be used for this purpose would be CAT-5 from AT & T, AVAYA or Nortel or any other internationally reputed vendor. In case the distance is very large (more than 80 meters) between the Booths and the sever room a thick Ethernet/Optical fibre would have to be used.

6.2 To Regional Office/PIU/CMU etc. (Internet)

The second level of connectivity would be between the toll Center to the closest regional office or Project office. This would be done based on the usage of the

internet. This would call for deploying a standard modem and a phone line at the site. Once this connectivity is established then the flow of information would become very smooth right up to the Head office. One telephone/ internet ISDN connection for data transfer from toll plaza to Internet data center (IDC) would be necessary.

6.3 Typical architecture to connect all the toll booths and its server with the data centre of NHAI head office (VSNL Greater Kailash New Delhi) would be as under.



7.0 Application Software for toll fee collection

The application software is a very crucial component in this entire automation process. The Applications Software would also be working at the two operational levels which are as follows:-

- The Booth Level
- The Back Office Level

7.1 Application Software at the Booth Level

As regards the Booth level the software should be such that it should be able to print out the toll ticket. Considering the most skewed traffic patterns the key factors here should be that each ticket should be printed out within 3-4 sec. The other key factor would be, that the software should be so simple to use that no prior training is required to do so. It should be highly graphic oriented in nature thus displaying pictures rather than text.

7.2 Application Software at the Back Office Level

This is where all the operations and MIS reports would be generated. It is here that the software would inform the user about the complete operations of the day at the toll collections centre.

The software should be capable of generating at the details of collections (booth wise / shiftwise/ daywise/ period wise) It should also be able to inform about any discrepancies if they do occur.

On the MIS front the software should be able to inform the management on issues such as: -

- Shiftwise deployment of manpower
- Shiftwise Collections
- Vehicular Movements

8.0 Manpower Requirement and Training

The manpower required from the IT perception for running an automated toll centre would be as follows:-

8.1 For the Booth Level Operations

Data entry Level Operator Nos. 24 approximately. The operators who would be involved in the issuance of Tickets at the booth level would be required to be at least tenth standard pass with or without any past working experience. It has been felt that ex-service men are good for such jobs.

8.2 Manpower Requirement for the network/server administration and desktop engineer. There should ideally be one network/server administration and one desktop engineer available in every shift.

Educational Qualification

1. Network / Server Administrator	Graduate with Diploma in Hardware and Networking, Cisco Certification on Networks and MCSE, Experience: 4 years
2. Desktop Engineer	Graduate with Diploma in Hardware and Networking, Cisco Certification on Networks and MCSE, Experience: 2 years

8.3 Training

At each level NHAI would be ready to impart basic training in a simulated environment on the application package at the NHAI head office. This is more for the operators training. This could also include a small orientation on how to use the computers for those operator who have not used computers before.