TECHNICAL SPECIFICATIONS

CODE NO.	SPECIFICATIONS
R2-RT-1	CONTROLLER
R2-RT-ATC 1.1	The controller to be supplied shall have the following features:
To R2-RT-ATC 1.4	The Controller Cabinet shall be S.S304 & as per specifications mentioned in Code No. R2-RT-ATC 1.6
	The Traffic Signal Controller equipment shall provide a microprocessor based solid state traffic signal lamp switching and a conflict monitoring facility to ensure that conflicting, dangerous or disallowed traffic signal displays are not shown. The conflict control facilities shall be independent of the microprocessor.
	The controller shall consist of a rack mounted, controller logic module, housed in Stainless Steel cabinet which provides a frame for termination to field cables.
	The traffic signal control equipment shall be capable of operating:-
	• A computer linked, coordinated system under fully adaptive control strategies;
	Linked locally to adjacent controllers with vehicle detection facilities;
	in an isolated mode;
	 in fixed time or vehicle actuated mode with detection facilities;
	 in night time mode of flashing red/amber mode.
	The traffic signal controllers specified Type wise as follows:-
	Type 1 - having four phases or signal groups
	Type 2 - having eight phases or signal groups
	Type 3 - having twelve phases or signal groups
	Type 4 - having sixteen phases or signal groups
	Type 5 - having twenty phases or signal groups
	Type 6 - having twenty four phases or signal groups
	General
	Equipment shall be designed to function correctly in a wide range of climatic conditions. In particular the equipment shall operate reliably in extremes of temperature and humidity. It shall operate in a temperature range of -10 and +60 degrees Centigrade external ambient temperature, and relative humidity to 95 percent, non-condensing and relevant standards.
	Controller Firmware
	The controller design shall be based on modern high performance microprocessor and all logical functions necessary external to the microprocessor shall be performed by solid state devices. Timing functions shall be based on digital techniques implemented by the microprocessor system. Site specific configuration data shall be stored in a single easily installed memory unit (EPROM). This data will comprise non-volatile time settings and data tables required to configure the operation for the particular

junction or intersection. The site specific configuration data shall be prepared on a PC based configuration platform. The data stored in the memory unit shall be protected by a checksum test. The site specific configuration data shall be prepared on a PC based configuration platform. The controller shall check the volatile memory for integrity at power up. All the data stored in volatile memory will be cleared if any corrupted locations are detected. In such a case the controller will use the non-volatile time settings stored in the memory unit. The data in any battery backed RAM will also be verified by a checksum test and also by range checking to ensure that the data has not been corrupted.

Controller Functionality: Basic Facilities

Phase/Signal Group Facilities:- The standard controller shall allow expansion from 4 phases/signal groups up to a maximum of at least 24 phases/signal groups. Each phase/signal group output shall be configurable to be either a vehicle phase/signal group or a pedestrian phase/signal group, within the limits of a maximum of 24 vehicle/pedestrian phases/signal groups, or combination thereof.

Each phase/signal group output shall provide 3 triac drives (or similar), which may be used for switching either vehicle or pedestrian lantern displays, Red/Amber/Green for vehicle phases/signal groups and Red/Wait/Green for pedestrian phases/signal groups. The pedestrian phases/signal groups will be configured for flashing red aspect during pedestrian clearance.

The solid state switches used shall be able to drive loads consisting of resistive and inductive elements. That is, the lamp switching outputs shall be able to drive Tungsten, Quartz Halogen, LED and Neon lamp loads, or combinations of these. All phase/signal group outputs must be rated accordingly.

Phase/signal Group Drives - Software Control

The controller software shall provide control for a maximum of 24 vehicle/pedestrian phases/signal groups or combination thereof. The numbers of vehicle and pedestrian phases/signal groups are specified by separate entries in the controller site specific data. Each lamp switching output may be configurable via the controller EPROM, to drive a vehicle phase/signal group or a pedestrian phase/signal group.

Phase/signal Group Drives – Configuration

The signal aspects shown to vehicular traffic shall be:

- red, green, amber;
- the sequence to pedestrians shall be red standing man, green walking man, flashing red standing man, red standing man;
- The green walking man shall indicate a protected pedestrian crossing movement;
- The flashing red walking man shall indicate a clearance period between the termination of the pedestrian green signal and the start of the pedestrian red signal; The flashing amber signal shall be presented to traffic in coincidence with the flashing red walking man signal and may be

co fla	ontinued for an adjus ashing red man signa	stable period (sec II.	onds) after th	e terminat	tion of	the
• Fl	ashing red (night ktinguished.	time operation) pedestrian	signals	shall	be
Each	n phase/signal group	must be configur	able to any of	the norma	al displa	ays
a. R	ed, green, Amber (3-	aspect venicle sig	nal);			
b. R	ed, Green, Flashing I	Red or Red (pede	strian signal).			
C. FI	ashing Amber (to ashing Red Man to p	main roads), Fla pedestrians.	shing Red (t	o side ro	bads) a	and
d. Fi	Iter Green Arrow for	left turning traffic;				
e. Fi	Iter Green Arrows for	r left, ahead and ri	ght traffic;			
f. Fi	Iter Green Arrow for	right turning traffic	(see above);			
g. Fl	ashing Filter Amber a	arrows for left turn	ing traffic.			
The grou cond such	displays defined are ps. Special colour so lition tables in the s as secret sign contro	the default colou equences shall be ite-specific data f ol.	rs exhibited b e capable of t or special cor	y the pha being gen htroller ap	ses/sig erated, plicatio	inal by ons,
Prot	ection of Conflicting	g Phases/signal (Groups			
It sh more coml	all be confirm if simp extensive monitor binations are possible	ble green-green co ring function co e.	onflict monitori /ering other	ng is prov dangerou	vided, c s volta	or a age
Phas	ses/signal Groups -	Appearance Crit	eria			
Any	phase/signal group s	shall be configura or only upon dema	ble in the site [.] and.	-specific c	lata, to	be
Each acco the o grou stage	n phase/signal group rding to traffic flow o controller configuration p green displays e(s)/phases in which	shall be displaye or demand, in acc on EPROM. Typic will be determ the phases/signal	ed for a fixed cordance with cally the durat ined by the groups receiv	or variabl the data ion of ph duration e right of v	e durat enterec ase/sig n of way.	tion d in Inal the
The left of asso not t is gr havir term	controller configuration or right turning traffic ciated vehicle phase erminate until right o canted. Where a filte ang 3 aspects, it sha inate from green to re	ion EPROM shall c. The filter greer /signal group and f way for the asso er green arrow p all not be possib ed without interme	provide for fi left or right a can be config pciated vehicle phase/signal g le for the pha diate amber.	lter green arrow may ured such phase/sig roup is c ase/signal	arrow y have that it gnal gro lefined group	for an will oup as to
The amb an a confi vehic	controller configuration er arrow for left turnin associated vehicle gured such that it with cle or pedestrian pha	on EPROM shall p ng traffic. The filte or pedestrian p ill not terminate u se/signal group is	provide for flas er amber left tu hase/signal g ntil right of way terminated.	hing filter urn arrow roup and y for the a	control may ha can associa	lled ave be ted
Stag	e/phase - Phase/sig	gnal Group Timin	g Intervals			
The	controller configu	Iration EPROM	shall provid	de comp	rehens	sive

stage/phase- phase/signal group timing interval facilities compatible with the system design.

Stages/Phases

The Controller shall provide facilities for a number of stages/phases or phases/signal groups, which may include all red stages/phases. The available phases/signal groups are allocated to these stages/phases or phases/signal groups in any combination subject to the method of control, with the traffic characteristics and safety considerations as necessary to meet the individual site requirement.

The controller shall provide a minimum of 7 stages/phases, within which any combination of phase/signal group displays are permitted in any stage/phase. Phases/signal groups shall be able to be specified for simultaneous appearance within a stage/phase, for appearance after a specified delay, or for early termination within a stage/phase. It shall also be possible for phase/signal group displays to overlap a number of stages/phases. Specified phases/signal groups shall also be able to provide Leaving Amber and All Red displays independent of the running stage/phase.

Each stage/phase shall be capable of conditional and alternative phase/signal group displays, as defined by condition table entries in the controller site-specific configuration data.

Complex phase/signal group or staging/phasing designs shall be possible with the appearance of phases/signal groups in multiple stages/phases being conditional on specified conditions at the junction, such as presence of particular demands or the state of special control signals.

Each stage/phase shall be configurable to appear automatically or upon demand from specified detector inputs within the controller.

In vehicle actuated mode, stages/phases shall appear as demanded. When all demands are present, stages/phases shall normally appear in cyclic order. During computer, cable linking or manual modes stages/phases shall normally appear as called. When the controller is operating in the cable-less linking mode the sequence of stages/phases shall correspond to the specified plan data stored in the traffic signal controller and must be fully configurable by operator entries from an operator terminal, (with the appropriate level of security, password or pin number).

The controller shall provide facilities for a combination of phase/signal group equipment any or all of which may be:-

- i. fully actuated by on street demands and extensions;
- ii. demand dependent (vehicle or pedestrian Phases)
- iii. fixed time phases (vehicle or pedestrian Phases);
- iv. Hurry call or other priority calls demand;
- v. Fully Adaptive Control

Each phase/signal group may provide control for one of the following:-

i. vehicular movements;
ii. pedestrian movements;
iii. vehicular movements controlled by Green Arrow signals;
iv. vehicular movements controlled by Amber Arrow signals;
v. dummy phase.
A dummy phase/signal group is used where timings or detector operation have to be associated with a particular traffic movement which is not uniquely signalled. It may be used to provide suitable time periods or to condition stage/phase changes even though no signal aspect is associated with the phase.
Timers shall be allocated to phases/signal groups. The timers shall control the following timed periods of each phase but shall not be limited to only these:-
a. minimum green time;
b. extension time;
c. maximum green time;
Timers shall control the appearance and disappearance of phases/signal groups during the interstage period. Such timers shall generate the phase/signal group to phase/signal group inter-green periods and introduce any further delays to offset phases/signal group with respect to the stage/phase end point.
The controller shall respond to vehicle detectors with associated with phases/signal groups which may be:-
a. demand a phase/signal group;
b. extend a phase/signal group;
c. demand and extend a phase/signal group;
d. introduce a hurry call facility;
e. be associated with an all red condition;
f. demand via call/cancel;
g. priority demand of stage/phase;
h. uni-directional demand for stage/phase;
i. speed measuring extensions.
All Red - The controller shall allow any stage/phase to be specified as an All Red stage/phase. Vehicle Detection
The detector equipment is a separate logic unit, which may be integrated into
the controller, or alternatively mounted in its own housing. The outputs of the detectors indicate to the controller the presence and passage of vehicles and are used to influence the operation of the controller and shall generate demands and extensions for right-of-way. Means shall be provided so that a detector may be connected to demand and / or extend a phase movement as specified.

SPECIFICATIONS FOR TRAFFIC WORKS	SP-RT
Uni-directional detection shall comprise of a combination may be connected to have this effect. The logic for this within the controller.	n of detectors, which may be incorporated
Pedestrian demands shall be registered by manual pus crossings. Means shall be provided so that pedestrian pu a demand for the appropriate phase/signal group.	sh buttons located at ush buttons can latch
The operator facility shall provide means by which demand and extensions may be applied to any phases/signal groups and a means by which the effect inhibited.	continuous artificial ase/signal group of of a detector may be
Detectors may be associated with the following deman facilities:-	nding conditions and
i. be associated with an all red condition;	
ii. demand a phase/signal group;	
iii. extend a phase/signal group;	
iv. introduce a hurry call;	
v. introduce a priority stage/phase;	
vi. call/cancel demands either latching or non latching, su and after;	bject to delay before
vii. uni-directional demand for stage/phase;	
viii. to arrange that the demand for a turning phase/signal g there is a demand for another specified stage/phase;	group is only active if
ix. to arrange that a request for right-of-way from a nom shall be ignored until a single specified stage/phase has	inated detector input s been reached;
x. speed measuring extensions	
xi. to provide for adaptive control	
Revertive demand – if a phase/signal group is terminate timer running, a demand for a return to that phase/signal be inserted. Where required the demand may alternat another specified phase/signal group.	ed with the extension group shall normally ively be inserted for
Arterial reversion which is the absence of demands to groups / phases at a traffic signal junction shall cause absence of demands, to revert to a selected stage/phase	o any and all signal the controller, in the e.
Stage/phase Selection	
The controller shall examine phase/signal group deridentify those stages/phases, which will satisfy these de changes shall normally occur to serve the next stage/p subject to the following conditions:-	mand requests and mands. Stage/phase bhase in cyclic order
i. to enable a particular stage/phase always to follow anot	ther
ii. to enable a particular stage/phase to always precede a	nother
iii. to prohibit certain stage/phase to stage/phase mo alternative moves so that the desired stage/phase ever	oves and substitute tually served.
Fixed time or Local control will follow the stage/phase pa	attern and timings set

out in the controller configuration for each specific site and shall be independent of other modes of control.

Where a demanded phase/signal group appears in more than one stage/phase, the stage/phase, which satisfies most demanded phases/signal groups shall run in preference to a stage/phase satisfying a lesser number of phase/signal groups demands, always providing that intervening stages/phases, which would normally run demanded phases/signal groups not appearing in that stage/phase.

In certain modes of operation stage/phase sequencing restrictions shall apply dependent upon the mode of operation. The effect of the vehicle detectors on the controllers may be overridden and restrictions may be applied to changes, which the controller is allowed to make.

The controller shall have the capability to prohibit certain pre-set stage/phase to stage/phase movements.

Alternative stage/phase to stage/phase movements – where a request for a change of stage/phase would violate the traffic engineering requirements of the junction the controller shall not allow the change to take place directly but shall interpret the demand as a demand for an intervening stage/phase and the desired stage/phase. The desired stage/phase shall, therefore, be served by an acceptable route.

When the controller reaches an intervening stage/phase as a result of demands in this manner it shall be free to operate as if the demand had been placed by the roadside detection equipment. The controller shall be free to service roadside demands for other stages/phases en route to the desired stage/phase.

Timing Period Ranges - Accuracy and Resolution

All timings generated within a traffic signal controller shall be digitally derived from either the mains power supply frequency or preferably from a crystal clock, and which shall be accurate to within the tolerance of the supply frequency plus or minus 100 milliseconds.

The controller shall provide a real time clock with battery backup. It shall be possible to set the real time clock locally for controllers not connected to the FATC System. When a controller is connected to the FATC System this function shall be either inhibited or synchronised from the central FATC System time source. In such a case the FATC System Computer shall update the controller clock time.

Time of day, (hour and minute), day of week activity scheduling shall be made with reference to the real-time clock.

Cable-less linking mode of operation shall use the controller real-time clock for plan scheduling and for stepping the cycle generator. That is, plans will be selected by time of day and day of week. The cycle generator step shall be set up according to the time of day.

Timing Period Ranges - A complete list of fixed and handset adjustable controller time setting ranges shall be available with clearly defined upper/lower timing limits in respect to: -

i. Fixed settings (Non Adjustable) Leaving Amber Time: 4.0 seconds;
ii. Stage Related Settings;
iii. Pedestrian time setting and enhanced Pedestrian time setting parameters;
iv. Detector, Presence or miscellaneous time setting;
v. Cable-less Linking Data Ranges
Switch On Sequence
Initial Cycle - Automatic demands for stages/phases shall be generated at start-up by entries in the controller site specific data. On change of controller mode, stage/phase demands shall automatically be inserted for all phases/signal groups for the initial cycle following change of mode.
Lamps ON - At power-up, or restart after lamps off, the controller shall maintain the lamp displays in the flash-amber flashing red state for approximately 10 seconds. The controller shall perform self-testing during the 10-second start up time and will not switch on the signal displays if any fault is found which may impair the safe operation of the signals. All faults and errors found during the start-up checks shall be recorded in the controller Fault/Error Log.
Starting Stage - Following the All Red display, the controller shall start in a stage specified in the site specific data. The appropriate mode of operation shall also be established according to the prevailing conditions.
Phases/signal groups appearing in each stage/phase shall normally be configured to appear when the stage/phase runs. The controller shall allow special logic to be used in condition tables to provide the required operation for demand dependent appearance of phases/signal groups.
If communications are present the controller shall start in the mode specified by the controller's mode priority.
Controller Inputs
General - The controller shall provide as a minimum 24 vehicle detector inputs via an integral detector rack and 16 buffered additional inputs for connection of external devices such as push buttons. All 16 inputs for external devices shall be wired to the field terminal blocks in the controller housing.
i. All 40 inputs shall be isolated either optically or by other means.
ii. Simulation of inputs shall be provided. It shall be possible to set an input to the ON (short-circuit), OFF (open-circuit) or NORMAL state. It shall also be possible to examine the status of any input.
Red Lamp Monitoring
No additional inputs shall be required for lamp monitoring. Signal lamp monitoring shall be integral with the solid state switching of the signal lamps. The status of each lamp drive circuit shall be read directly on the output drive module via an output LED or similar indicator. These indications may be in the form of software signals depending on the method by which the facility is implemented and shall comprise the following signals:-
i. Indication 1 – shows a red lamp has failed on any vehicle phase

ii. Indication 2 – shows that a second red lamp has failed on any vehicle phase where a red lamp has previously failed.
iii. Indication 3 – shows that the lamp monitor has made measurements that indicate a second red lamp failure, but that insufficient time has passed for the monitor to indicate that a second red lamp failure has definitely occurred.
iv. Indication 4 – shows any non-red vehicle lamp failure has definitely occurred.
Lamp Monitoring must be provided within the controller as a standard function without the need for any ancillary hardware. Lamp faults shall be reported to the Fully Adaptive control computer, resulting in a Lamp Fault (LF) Alarm which shall be broken down to indicate SF1, SF2 indicating first red lamp or second red lamp failure. The LF alarm (any lamp) will also be displayed at any workstation monitoring the intersection. Keyboard commands shall be provided for an operator at the workstation to obtain a complete report of the phases/signal groups at the intersection with lamp faults. Both the aspect colour and the number of failed lamps shall be reported.
The controller site specific data shall allow any number of detector or push button inputs to be assigned to a single facility such as a stage/phase demand, and any single input may be assigned to any or all facilities. The controller shall allow inputs to be individually configured as either latching or non-latching inputs such as call / cancel/ unidirectional / hurry call, priority or speed extension.
Controller Outputs - The controller shall provide for a minimum of 8 buffered outputs for miscellaneous use. These may be allocated for example to facilities such as special facility and sign control.
Special Facilities - A minimum of three of the miscellaneous outputs shall be available for allocation to the control of Special Facilities. The control of these outputs is determined by the entries in the controller site specific data. Each special facility output shall be associated with a confirmation signal which, if not received before expiry of a corresponding timer an error entry is recorded in the log.
Pedestrian Control Facilities
Appearance - The controller site specific data shall provide independent control for each of the pedestrian movements. It shall also be possible for a pedestrian phase/signal group to be configured to appear alone, in conjunction with other pedestrian phases/signal group, with non-conflicting vehicle phases/signal groups or in conjunction with a combination of pedestrian and non-conflicting vehicle phases/signal groups.
The controller shall allow pedestrian movements to be introduced automatically or by demand, whichever is required. Vehicle movements configured to run in parallel with a pedestrian phase/signal group shall continue to hold right of way until the end of the pedestrian clearance interval.

The controller shall allow the pedestrian green and/or flashing – steady red intervals (clearance) to overlap between one or more stages/phases with non-conflicting phases/signal groups.

Wait Indicators - The controller shall provide independent control of WAIT indicators for each pedestrian phase/signal group.

Pedestrian Audible Signals - The controller shall provide outputs to control audible signal equipment. The outputs shall either be conflict monitored within software or interlocked to ensure the audible signal cannot accidentally be driven when opposing phases/signal groups are present.

Audible units should be provided at all pelican type pedestrian crossings, the audible signal shall only operate when, a steady red signal is shown to the vehicle traffic in conflict with the pedestrian right of way and a steady green signal is shown to pedestrians. Where dual pelican facilities are employed whether that is staggered pedestrian crossings or otherwise, no audible signal shall be provided, this is to protect partially sighted and the blind from mishearing the signal from an adjacent crossing. When audible signals are used within a junction's pedestrian stages, the audible signal will only be allowed if an "all around pedestrian stages" is called. This is to assure that no vehicular traffic has right of way when the pedestrian stage is running. Should pedestrian stages be run separately then no audible signal shall be allowed. Audible signals can be driven directly from the green pedestrian signal or from the traffic signal controller, but in either case controller must employ red lamp monitoring of the vehicle red signals. The traffic controller can be made to extend the inter-green before the audible sounds or isolate the audible signals when the red lamp monitoring detects a failure (1st red lamp failure), but must isolate the audible signal when a second vehicle red is detected as having failed.

Tactile units can be fitted at all pedestrian crossings providing that there is red lamp monitoring within the signal controller, monitoring the vehicle red traffic signal for failures. Again, the inter-green can be extended by a configurable time, up to 5 seconds, or the tactile isolated on the first vehicle red lamp fail. If there is a second vehicle red lamp fail the tactile indicator must be isolated.

Tactile indicators are fitted into the right hand side push button unit only. Tactile paving can be used to guide the partially sighted and blind to this push button using a "L" configuration of tactile paving.

The installation of audible and tactile signals and the specification of the audible/tactile units shall be that of the following publications specifically or those which reflect comparable International Standards;

MCE 0125A Pedestrian operated traffic signal equipment (Pelican)

TR2210A Specification for traffic signal controller

TR0155B Specification for audible equipment for use at pedestrian crossings

Traffic advisory leaflet 4/91 audible and tactile signals at pelican crossings

Traffic advisory leaflet 5/91 audible and tactile signals at pelican signalled

controlled crossings.

Controller Functional Requirements Operational Facilities

Modes of Operation - The controller shall provide the following modes of operation:-

- i. Hurry Call
- ii. Manual
- iii. FATC mode
- iv. Cable-less Linking
- v. Vehicle Actuation.
- vi. Fixed Time
- vii. Night Time Flashing

The controller shall provide a configurable priority structure for the operating modes. This shall be in a hierarchy format with higher priority configured modes taking precedence over lower priority configured modes.

The controller shall enter Flash-Amber/Flash-Red mode if a fault is detected at any time which may cause unsafe operation on site. These may result from conflict monitoring, hardware failures or red lamps failing on an approach and in turn causing an entry to be made in the fault log. Any fault condition which, may cause unsafe operation on site and places a Fault entry in the controller Fault/Error Log will cause the controller to enter the Flash Amber mode. At an appropriate time of day the FATC System may isolate the local control to enter flashing amber/flashing red signal sequences. This sequence is to provide flashing amber aspects to main road approaches whilst indicating flashing red aspects to side road approaches. This facility shall be programmable via timetables in the standard system operation facilities and shall remain in operation until reset by the system timetable facilities on the following morning.

<u>Mode Priorities</u> - The controller shall normally operate in the appropriate mode of control for any particular site at any particular time of the day. The FATC system computer may direct the local controller to operate in either the FATC mode or to revert to its mode priority as appropriate.

<u>Demands</u> - The controller will accept demands for operating modes as follows:-

- i. An actuation at the designated controller input will demand the Hurry Call mode.
- ii. Connecting a manual push-button will demand the Manual mode;
- iii. The FATC system computer may command the controller to operate in either the FATC mode or by default the controller's mode priority;
- iv. The controller timetable may command the controller to operate in either the Cable-less linking mode or vehicle actuation mode;
- v. Local linking which may command the control to operate in a selected mode.

<u>Timetable - The controller shall provide control of "Time of Day" functions.</u>

Standard Timetable Control Functions shall include but not be limited to:- i. Special Facility control output switching ii. Signal plan selection <u>Timetable Scheduling</u> - The controller clock time shall be used to activate
Timetable Scheduling - The controller clock time shall be used to activate
the timetable requests by time of day and day of week. Timetable events shall be scheduled within a day by the hour, minute and second from the real-time clock so that the resolution can be to the nearest 1 second within any day.
The day of week will be specified by a day code, which shall provide economy in schedule entries. There shall be an appropriate number of such day codes, which allow selection of individual days, Sunday through Saturday and combinations thereof.
The time clock system provides the facilities necessary for the controller to be integrated into a Cable-less link system in a Fully Adaptive Contro Scheme. The time clock may additionally be used to achieve time controlled switch facilities such as alternative timings, stage structure or the control of secret signs.
<u>Manual Switch</u> - A Switch shall be provided to control lamp status and provide for manual sequencing of the signal displays. The switch shall be directly accessible from the controller requiring the opening of a panel o door.
<u>Cable-less Linking</u> - The FATC system shall be able to command the controller to operate in the Cable-less linking mode as either the normal mode of operation when the controller is no longer able to operate in the FATC mode. Demands for higher priority modes of operation shall cause the controller to operate in the higher priority mode.
<u>Operation</u> - In the Cable-less linking mode the controller shall operate in accordance with the plan data stored in the controller. For controllers no connected to the FATC system computer, the plan data shall be stored in site specific data EPROM or battery backed RAM. The battery shall be capable of supporting this data for at least 8 hours following powe disruption.
The Cable-less linking mode shall provide fixed time operation as its most basic mode. Programmable release signals shall be used to provide semi VA operation. The release signals may be associated with stages of particular phases, and may be enabled or disabled by entries in the plan data. The function of each release signal is defined by entries in the controller site specific data.
<u>Plans</u> - The controller shall provide storage of a minimum of 11 cables-less linking plans. Plan data shall be able to be in-putted / altered via a standard a communications medium (Laptop, RS 232).
Plan Selection - The active plan shall be selected by day of week, hour minute and second of the day.
Plan changes must not cause unsafe signal displays such as very shor green times or incorrect stage sequences.

<u>Reference Time</u> - The FATC system computer shall generate a synchronization signal for its associated traffic signal controllers. The manufacturer shall specify the time clock synchronization times appropriate to the controller equipment and FATC system computer, clearly stating the signals used for synchronization and confirmation of synchronization.
Vehicle Actuated Mode of Operation
Demand Conditions -
The controller shall provide for vehicle actuated operation. The Manufacturer shall describe in detail the vehicle actuated operation with particular emphasis on its effects and control over intersection timings. When communication to the FATC system is lost the controller shall revert to the Master mode of operation after a user configurable time period. That is, the highest priority mode within the controllers configuration.
Demands for higher priority modes of operation shall cause the controller to operate in the higher priority mode selected.
<u>Stage/phase Appearance</u> - When operating in vehicle actuation mode with vehicle actuated operation, stages/phase shall be serviced in cyclic order in accordance with the sequence data in the controller site specific data. Stages/phases and phases/signal groups shall only appear if a demand has been registered (i.e. latching input) or is currently active (i.e. latching and non-latching input). Stages/phases and phases/signal groups which have a demand registered will not be skipped in any cycle.
<u>Fixed Appearance</u> - Entries in the controller site specific data shall provide artificial demands for stages/phases, which have fixed duration. The controller site specific data also provides artificial extension for such stages/phases up to the Maximum Green time.
<u>Minimum Green</u> - A stage/phases shall not terminate until the Minimum Green interval has completed timing. Similarly a stage/phase shall not be terminated until the Minimum Green time for any late-introduced phase/signal group has completed timing, other than, if "late introduced phase/signal group" appears in the following stage/phase and can time its minimum/maximum off through that stage/phase. This applies for all modes of operation. Also, a stage/phase shall not terminate until all pedestrian movements, which are not required to overlap to the following stage/phase, have completed pedestrian green and flashing – steady red timing. This applies for all modes of operation.
<u>Fixed Time Operation</u> - The Fixed Time operation or the Vehicle Actuated operation shall be determined on site by the controller site specific data and mode priorities.
The Hurry Call mode will provide the means to force the controller to a defined stage, without violating safety clearances. A pre-emption input may be used to demand the Hurry Call mode to give right of way to emergency vehicles, or a queue detector input may be used to demand

the Hurry Call mode to prevent blockage of a junction. The Hurry Call mode must be the highest priority mode of operation and causes all lower modes of operation to be suspended while the Hurry Call is active.
The Hurry Call is requested by one of the inputs as configured by the controller site specific data.
<u>Operation</u> - The Hurry Call mode shall be implemented in the controller software, rather than entirely by entries in the controller Site specific data.
<u>Delay Before Period</u> - The controller shall continue to operate normally during the Hurry Call Delay period, however the status returned to the ATC System will indicate that the controller is in the Hurry Call mode. <u>Delay After Period</u> - The controller shall immediately after the running of a Hurry Call Stage commence a timer that shall prevent the recurrence of the running of the Hurry Call Stage until after the aveing of the
adjustable timer.
Fully Adaptive Control (FATC) Mode
FATC System Computer takes precedence provided that there is no demand for a higher priority mode.
In Fully Adaptive Traffic Control mode the controller is controlled by a remote computer via a data transmission system. Dependent upon the type of system provided the controller shall operate in either of the following options:-
 to respond to influences of the Central FATC system
ii. to permit a measure of vehicle actuated operation
The controller hardware must provide an integral modem or data communications equipment for communications with the FATC System computer. The communications protocol shall be capable of accepting an approved open protocol, or an alternate standard protocol, if the protocol is specific to the Bidder system alone, then the Employer shall be provided with full details of the construction and operation of the protocol shall be provided (this is to ensure that future system additions can be successfully interfaced to the existing systems).
<u>Control and Monitoring</u> - The FATC System computer shall provide control and monitoring facilities at either a quarter second or one-second resolution as appropriate. The local controller must reply with the status of the current stage/phase, the current stage/Milestone 1nterval and responses to any specific data requests received from the FATC System computer.
<u>Change of Mode</u> - The presence of a demand for a higher priority mode shall cause the controller to change to the higher priority mode, i.e. the Hurry Call mode or Manual mode.
<u>System Monitoring</u> - The FATC System computer shall monitor and control the operation of controllers at intervals of not greater than once per second dependent upon their system characteristics. The monitoring facilities and commands of the FATC System Computer shall be

independent of the local traffic signal controller operating modes. The local traffic signal controller will return normal status information at the specified intervals relevant to system operation and additional information as requested regardless of operating mode. Each local traffic signal controller shall be capable of returning indications of status at the
specified system interval to the FATC System computer for the following entities:-
Signal Lamps On/Off
Lamp Fault
Controller Fault
Controller Hurry Call
New Entry in Fault/Error Log
Current Stage/Phase
Current Stage/Phase Demands
Pedestrian Demands
Alarm Status for Special Facilities
Safety Fail Red 1
Safety Fail Red 2
Status for other entities may also be returned to the FATC System computer once per system timing interval upon request for such information from the FATC System Computer. Some of these additional status signals are:-
Detector Status
Phases/Stage Displaying Green
Miscellaneous Status (Control) Flags
Cable-less linking Plan
Controller Clock Time
The FATC System computer shall also provide a variety of other commands for transferring data to or from the local controller. These shall include but are not be limited to:-
Controller Clock Time
Controller Clock Calendar
Cable-less linking Plan Data
Cable-less linking Timing Data
Controller Fault Log Entries
Lamp Faults
Detector Faults
Push button Faults
Miscellaneous Status Signals
Send/Receive Text to/from Portable System Terminal
Detector Status Conditions

Monitor Pedestrian M	lovement Status
----------------------	-----------------

<u>Stage/phase Change Commands</u> - The controller will move to the stage/phase commanded by the FATC System, subject to safety interlocks such as pedestrian termination, upon receipt of the change stage/phase command. Each stage/phase shall be configurable to have conditional or alternative phases/signal groups. The phases/signal groups which appear in the stage/phase may also be configured to be conditional on demand status or on any control signal or other condition that can be tested by the condition tables in the site specific data.

<u>Flashing Amber/Flashing Red Mode</u> - If the controller is unable to operate in any mode, because of a fault condition, then the controller shall switch off the signal lamps and flash the amber/red displays. Any fault condition, which jeopardises the safe operation of the signals, shall place a FAULT entry in the controller Fault/Error Log. Such faults shall cause the controller to enter the Flashing Amber/Flashing Red mode. Faults which do not jeopardise the safe operation of the signals will place ERROR entries in the Fault – Log but shall not cause the controller to enter the Flashing Red mode.

While the controller is in the Flashing Amber/Flashing Red mode as a result of a major fault, the FATC System computer, by monitoring the responses of the local controller, will isolate it from its control.

The "Flashing Amber/Flashing Red" mode shall be entered if a Fault is detected, such as conflicting signal displays. The Fault Log shall provide a diagnostic which shall identify the reason for entry to the Flashing Amber/Flashing Red mode.

<u>Night-time Flashing Amber Mode</u> - It is normal practice to revert local controllers to flashing amber/flashing red signal aspect sequences at night once traffic conditions have subsided. The ATC System computer shall be capable of calling this specific requirement through appropriate timetable operation and the calling of specific Night Time Flashing facilities.

Controller User Interface

<u>Facilities within the Controller Cabinet</u> - Access to the controller housing shall be by a controller key, which fits a secure, vandal proof compression lock at the top and bottom of the traffic signal controller opening door.

<u>Facilities</u> - Facilities either external to the cabinet door or located inside the controller casing beneath a flap secured by key shall permit the local controller lamps to be switched On or Off, to select Night Time operation, to assume Normal Operation (modes priorities) and to permit the selection and control of Manual mode.

<u>Monitoring</u> - The controller front panel shall display Red, Amber and Green LEDs for each phase/signal group output to allow easy monitoring of the drive signals to the signal displays. Status LEDs shall be provided to give indication of the state of the hardware and software. The status

LEDs include:-
CPU is operating normally
Conflict detected
Communications synchronized
Power is OK
Lamp Alarm (i.e. a lamp fault exists)
System Shut down (due to an internal system fault)
Controller Safety and Reliability
<u>Fault Detection</u> - The controller must employ a number of different fault checking processes including both hardware and software checks using the processors. In general, the signal displays must be switched off within 500 milliseconds of the occurrence of a fault. There are exceptions to this as noted below.
The occurrence of a conflict in signal displays will cause the signal displays to be switched to flash amber/flashing red within 150 milliseconds by the conflict monitor. Configuration faults, which cause unsafe signal displays, must cause the signal displays to be switched off within 100 milliseconds. Examples of this class of fault are:-
 An attempt to change a signal displays from Green to Red without an intervening Leaving Amber display.
ii. Premature termination of a pedestrian signal display from either pedestrian green or flashing red to the pedestrian red.
iii. An attempt to terminate a phase Green display before expiry of the minimum green time for the phase.
iv. Invalid site specific data in a data or condition table.
It shall not be possible to alter any basic timing parameters including minimum / maximum from a handset or portable communications device/ changing such data shall only be possible by changing the controllers EPROM.
Software checks shall be performed on the battery backed RAM and also checksum checks performed on non-volatile memory.
Design Life
All components must be rated for minimum 10-year life, excluding the standby battery, which shall have a minimum life of 5 years.
A Mean Time Between Failures (MTBF), of greater than 3 years is required.
Fault Log and Diagnostic Facilities
The controller must provide a Fault Log in battery backed RAM. The Log will provide storage for Faults, which cause the signals to be blacked out. Storage is also provided for Errors, which are detected, including Hurry Call Requests and Watchdog time-out. These would not cause the signal displays to be blacked out. The control shall also provide an historical fault log, which shall be battery backed. The historical fault log

SP	ECIFICATIONS FOR TRAFFIC WORKS	0
	shall have no effect on controller operation but shall	provide an event list
	of previous faults. <u>Fault Diagnostics</u> - The controller Fault Log will store data concerning each Fault entered into the Log. Ea by a unique fault code, which will allow each fault to as to the likely cause. Diagnostics are available that	 relevant diagnostic ch Fault is identified be quickly assessed identify:
	i. Green Conflicts	
	ii. Phase Monitor Faults	
	iii. Memory Corruption/Failure	
	iv. Plan and Timetable Data Faults	
	v. Real Time Clock Failure	
	vi. Hurry Call Request	
	vii. Special Facility faults	
	<u>Detector Fault Monitor</u> - Detector fault monitoring function supported directly by the controller. The periodic messages from the ATC System to the cont the controller for current detector alarms. The control an historical detector fault log, which shall be b historical detector fault log shall have no effect on but shall provide an event list of previous detector fault	shall be a system system will provide rollers to interrogate ol shall also provide attery backed. The controller operation ults.
	The controller shall monitor detectors and push checking intervals. Tables in the site specific, dat duration of each alarm-checking interval. The table alarm checking intervals for each of four time zone tables will also allow two day, types, normal and al its own time zones and duration of time checking int zone.	 buttons in alarm a, shall specify the s will allow different s within a day. The ternative, each with ervals for each time
	The detectors, which did not change state, in an alar shall be flagged as faulty. Any push buttons continuously actuated for the entire, alarm checkin be flagged as faulty.	m-checking interval, , which remained, g interval shall also
	"Chattering" detectors (if inductive loops are the detection), with periods of oscillation less than 10 generate alarms. Such alarms will be stored in the content to the ATC System.	selected means of 0 milliseconds, will ontroller and passed
	Detector flagged as faulty shall be forced into a st controller configuration data (EPROM). E.g. force forced to state in which it failed.	ate indicated in the d active/inactive or
	Detectors flagged as faulty shall be able to result detector changes state for a pre defined adjustan normally set at 4 hours permanent detect and 18 hours	me operating if the able period of time urs non detect.
	All vehicle detection system shall be Cameras / appropriate interface cards.	Radar System with
	Phase/signal Group Drive Monitor	

	 The output switching circuits must monitor the driven state for each phase/signal group aspect to check that the output state corresponds to the drive signals from the processor. If a discrepancy is found then the controller will switch off the signal lamps and record the fault in the Fault/Error log. The controller must provide a comprehensive conflict detection mechanism for conflict monitoring. Electrical Specification Mains Power Supply - The controller shall be designed to operate with the wide variations in nominal mains supply and be tolerant to variations of +/- 15% of the nominal supply voltage and frequency. An interruption in the mains power of less than 50ms will not cause any disruption to normal controller operation. The controller shall be capable of resuming operation with interference. The controller must be protected against over-voltage on the mains power supply of 800 Volts, 50 microsecond pulses, (5 ohm source impedance) randomly phased. The controller must survive these overvoltage transients and continued to operate to equipment external to the controller shall be isolated by opto-couplers, which will provide protection from transients of +/- 75V for 1 minute. A main fuse and switch rated to a minimum of 20 Amps will be provided. The Main switch will remove power from all circuits within and fed from the traffic controller. The following schedule of fuses shall be provided:-
	• 16 Amp HRC fuse for all pedestrian control equipment:
	Lamp Circuit Isolation/Protection
	A Lamps Circuit Breaker will be provided to switch off the signal lamps and any pedestrian push button units or WAIT indicators without affecting the operation of the controller logic. The lamp circuits (red/amber/green) for each phase will be protected by separate fuses,
	Signal Lamp Switching shall be by solid state, triac load switches. The Triac load switches must be rated in excess of five million switching operations and to 40 amps during switching. The rated lamp load must be at least 4 Amperes continuous for each aspect for each phase at voltages in the range 32V to 250V.
	The battery shall protect the real time clock and RAM against loss of power. Data will not be corrupted in either the clock or the RAM due to loss of mains power, or the removal of any circuit cards from the logic module.
R2-RT-NATC 1.5	The controller cabinet shall be M.S. and as per specifications mention in code no. R2-RT-NATC 1.7. The controller shall be able to withstand

without failure a high-energy transient applied to the incoming main power supply line upto 300 volts, both positive and negative, applied three times for each polarity at a rate of once every three seconds pulse rise time not to exceed 0.1 microsecond and pulse width not to exceed 10 microseconds.

All controller timings shall be performed using digital integrated circuits. The controller shall consume not more than 15 Watts and shall function properly over the temperature range stated in the following paragraphs.

Operational Voltage and Temperature:

The cycle length and time duration of each interval shall be constant and accurate. If the voltage of the power line varies between the limit of \pm 15% of standard service voltage, and if the outside temperature changes to any value between (10°C and +70 °C), the time duration of each cycle and of each interval shall not vary by more than + 100 milliseconds. The timing of successive cycles and intervals shall be without cumulative errors that would affect the accuracy of the cycle length. Inside cabinet temperature measured at any point in the cabinet shall not exceed +74°C when outside temperature is + 50°C or less and the controller is in normal operation. Suitable cooling and heating capacity shall be furnished as required to comply with these temperature ranges. However, IC's and components used should withstand temperature 20°C to 70°C.

Operational Modes

The controller should be capable of operating in each of several modes. These modes include manual operation, flashing operation, pre-timed. It shall be capable of at least 16 distinctive signal timing plans. In addition the Controller must be able to change the timing plans on its own according to time of day. Manual operation shall require that this mode be selected locally and that timing plan control be selected by some type of hand held switch operated from the door-in-door at the front of the cabinet.

The controller shall be equipped with the capability to prevent display of conflicting green signals on any two or more opposing phases. Should this condition occur, the controller shall have the capability to enter into all red condition for the conflicting signal indications or for entering the flashing mode of entire junction

Pre-Timed Mode

The pre timed mode shall be in operating upon receipt of the proper commands from a controller. The timing plan changes shall then be controlled by an internal clock based upon time of day. There shall be pedestrian control capability.

Manual Mode

This mode shall be entered upon actuation of a switch or control at the controller. Actuation of a hand-held switch shall then provide for controlled switching from one signal phase to another. However, this

switching shall not interfere with preset minimum conditions such as minimum green, all red; minimum yellow, pedestrian clearance interval, etc. The phase sequence in this mode should be as per programmed plan at that time.

Flashing Mode

One flashing mode shall be included. It shall allow for yellow flashing on the main street and red flashing on the cross streets. The main and cross streets will be defined in the Plans.

Cycle Length Adjustment

It shall be possible to accurately set or adjust the cycle length as per site requirement, with accurate and definite settings within 1 second steps.

The controller shall transfer from one cycle length to another without causing improper timing of other intervals during changeover. From the time of electrical call for transfer, not more than two cycles, shall be required for complete transfer from one cycle length to another.

The timing controls shall on the front of the controller unit, easily identifiable, and it shall not be necessary to remove or change wires, plugs, or contacts or to use any tools in making interval adjustments. The timings and traffic data should be in decimal and not in hex, octal and binary.

The requirement for one or more separate independent groups of interval time settings for each cycle and split shall not apply to yellow vehicle intervals, red vehicle clearance intervals, or pedestrian clearance intervals. The yellow vehicle interval or red vehicle clearance interval shall be provided with one positive, accurate setting adjustable from zero to sever seconds in one-second increments. Each pedestrian clearance interval prior to beginning of the yellow interval shall be provided with one positive, accurate setting adjustable from zero to sever seconds in one-second increments. Each pedestrian clearance interval prior to beginning of the yellow interval shall be provided with one positive, accurate setting adjustable from one to 30 seconds in one-second increments. These intervals shall not change in time duration regardless of the cycle length.

Signal Load Switches and/or Relays and Conflict Monitor

Controllers shall be provided with solid-state signal load switches (TRIAC) for closing and opening of signal light circuits. These devices shall be capable of being interchanged to cause any signal light circuit to be energized or de-energised.

The number of signal load switches which are required in order to operate shall be provided according to the plans.

The closing or opening of signal load switches shall be positive without objectionable dark intervals, flickering of lights or conflicting signal indications. A signal conflict monitor shall be provided which shall prevent display of a green indication or a walk indication to two conflicting traffic phases at the same time. Each signal load switch or relay shall have a capacity adequate to make and break a lamp load current of 5 amps at 230 volts, 50 hertz AC a total of one million times

without damage when operated at 120 times per hour with 60 percent "on time", 40% 'off-time".
Signal Shutdown Switch
Each Controller shall be provided with a Signal Shutdown Switch manually operated from the front panel for turning off the signals at the intersection. This switch shall only disconnect the power to the signals; it shall not affect any other part of the controller.
Flashing of Vehicle Signal Indications
Means shall be provided for substituting flashing vehicular signal indications for the normal specified internal sequence. Flashing shall be at the rate of not less than 50 or more than 60 flashes per minute with approximately 50 percent on and 50 percent off periods. The flashing rate shall not vary with time cycle changes. The opening and closing of the flashing circuit shall be accomplished in such a manner as to avoid damage.
The controller shall be constructed so that flashing operating can be obtained by operating the flash control switch even if the controller unit malfunctions or is removed from the cabinet.
Each controller shall be equipped with adequate means to suppress or prevent radio interference from flashing or vehicular and pedestrian signal indications.
'Automatic change from flashing to stop-and-go operation shall be made at the beginning of the major street green interval, preferably at the beginning of the common major street green interval when a green indication is shown in both directions on the major street. Automatic change from stop-and-go to flashing operation shall be made at the end of the common major street red interval when a red indication is shown in both directions on the major street. The change from flashing to stop- and-go operation or from stop-and-go to flashing operation by flash control switch may be made at any time.
Manual Control
For use under special conditions, controllers shall be provided with means of substituting manual operation of interval timing shall provide the same interval sequence as when the controller is operating automatically. Manual interval timing shall be obtainable by means of a weather resisting hand operated push button switch mounted on a flexible weatherproof extension cord. The transfer from manual to automatic operation, or vice versa, shall be accomplished by an auto manual switch, it shall not be necessary, when switching from manual to automatic operation, or vice versa, to do so at any certain time or to make any time adjustments. This switching shall not cause a conflict for any signal phases.
Higher version or Special Version Controller
For big and complex functions, a larger signal groups controller should be provided. If two controllers are combined to obtain such version, then

SP	ECIFICATIONS FOR TRAFFIC WORKS	SP-RT
	 control panel must be only one. The control passwitches for following functions. Coordination / local switch Manual mode / local switch Flash Lamps off Emergency Stage Call The controller should have capability to call a sphase, when demanded. Timing Accuracy All the digital clock will be used for time generat accuracy of one second in a month. This will be clock. Battery Backup The battery back up of minimum 24 hours should the PROCESSOR cards, clock, etc. to protect volatile d interruptions and failures. Data entry to Local Controller 	anel should include specific programmed tion and it will have e quartz/radio based be provided for RAM ata in case of power
	The data entry should be made through hand- management terminal with capable interface.	held terminal, Data
R2-RT-ATC 1.6	Controller Cabinet: (Refer Drawing No RT-ATC-1.6 The traffic signal controller must be an integrat necessary control, communications, input/output facilities located within the one base mounted cal shall be housed in a cabinet fabricated from 2mm to The cabinet shall be supplied with all fixtures and internal equipment and to fix it to the base plinth. All supplied with the cabinet shall be protected against of Access to all internal equipment will be via a single binged at three positions, top, middle and bottom	b) ted system with all ut and termination binet. The controller hick S. S. 304 Steel. nd fittings to mount Il fittings and fixtures corrosion. e front opening door
	 (A4 size) shall be provided on the door to documentation. The cabinet shall be convection ventilated with channel at the base of the door, and air exit around base design shall provide frangible mountings to damage. Cabinet weatherproofing shall be to a standard or equivalent international standard. The standard cabinet shall provide field wiring phase/signal group increments to a capacity of 24 outputs, or alternatively may be available to allow phase/signal group drive capacity where appropriate The cabinet shall include a site identifier that will en 	air entry through a d the top cover. The o minimise accident a minimum of IP65 ng terminals in 4 d phase/signal group connection of larger e.

once prepared for a particular intersection can only accept a logic unit also prepared for the same intersection.
Key operated compression locks shall be provided at the top and bottom of the door.
Manual control of the controller shall be possible by either a key flap revealing a manual control panel or alternatively by a 5 position key- switch "facility key". The lock shall be flush mounted to a side panel of the controller cabinet. The lock shall be protected against water and dirt ingress. The manual panel or key-switch shall provide the following switched functions as a minimum:
i. AUTO (Normal operation)
ii. FLASH (Flash amber / red, controller continues to run)
iii. OFF (lamps off, controller continues to run)
iv. MANUAL (select manual control)
Cable clamps bars and cable trunking shall be provided for all internal cabinet wiring. Termination points shall be provided for all incoming and outgoing cables. A minimum of 40 termination points for incoming / outgoing cables are to be provided. Mains voltage lamp output terminal units shall be separate from loop terminal and auxiliary input/output terminal units. Lamp output terminal units shall be provided in each controller cabinet. Each shall have terminal positions for four 3-aspect phases, Red/Amber/Green for vehicles and Red/Wait/Green for pedestrians. Three screw terminals shall be provided at each position for incoming cables. Alternatively spring load terminations can be used. Cable clamps shall be provided. All equipment within the controller must be suitably identified, where required warnings shall be provided of hazardous voltages. Provision shall be made within the controller cabinet for the mains cable termination to the live/neutral/earth termination points.
The size of controller cabinet shall be 600X300X1200 mm (WXDXH). The cabinet shall be fabricated out of M.S. sheet of 14 guage material. The protrudes shall be chipped off & all welding surfaces shall be chamfered off. The cabinet shall be hot dip galvanised (seven tank process) & spray painting shall be done with two coats of paint approved by the Engineer. Controller unit and associated equipments shall be furnished completely housed in a cabinet. The cabinet size shall provide ample space for housing the controller unit and all associated electrical devices furnished with it, together with any other ancillary devices herein specified. Cabinet should conformed to protection standard IP-55 (14 gauge M. S. sheet, hot dip galvanized as per applicable I.S./B.S. Specification with oven baked painting having the shade of paint as instructed by the MCGM/Engineer). A hinged door shall be provided, permitting complete access to the

	interior of the cabinet. When closed, the door shall material, making, the cabinet weather resistant and shall be provided with a strong lock and key. For ea there shall be lock and two keys supplied that sha controller housings.	fit close to gasketing I dust tight. The door ch controller cabinet, all be common to all				
	A small hinged and gasketed door-in-door or other shall be included inside of the cabinet. The door-in entrance to the controller mechanism nor to expose but shall provide access to small switch panel and contains a big shutdown switch, a flash control switch required by the purchaser. A lock & a key different find door but common to the door-in-door shall be supplied	r suited arrangement a-door shall not allow d electrical terminals, l compartment which sh, and other features rom the main cabinet ed each.				
	The cabinet and all mounting attachments are to b The cabinet shall be provided with necessary openin connections.	e painted steel-grey. ngs for mounting and				
	The cabinet shall have proper mounting arrangeme The controllers are to be mounted on anti-vibration mounting plate or support. The controllers sho mechanical contact with the outer walls and cabine the damage to controller by any external impact.	nt for the controllers. mounts provided on ould not have any et, so as to minimize				
	Adequate electrical clearance shall be provided by prevent arcing or electrical short connections. The terminals and other equipment shall be so arrange that they will not obstruct the entrance and connect conductors. (Refer drawing no. RT-NATC-1.7)	between terminals to controller unit, panel, ed within the cabinet ction of the incoming				
R2-RT-ATC 1.8	The Signal controller shall be fitted on the P necessary alignment & level adjustment work. The properly tightened. The neoprene gaskets shall be p foundation & controller for proper fittings if requir proper size with spring type of washers shall be pro- earthing points shall be properly joined & shall b cable entries shall be through the cable glands & properly filled. After completion of all the fitting a wiring with proper ferruling & numbering shall be of strip shall be firmly fixed. Pre-commissioning test s applying the controller in operation. (Refer drawing r	CC foundation with nut & bolts shall be provided between the red. The washers of vided for fittings. The e tight enough. The the glands shall be activities the internal done. The connector shall be taken before no. RT-14.30)				
R2-RT-ATC 1.9	As per USOR Description					
R2-RT-ATC 1.10	Refer drawing no. RT-ATC-1.10					
R2-RT-NATC 1.11	.11 The Old Signal controller Cabinet shall be removed and the new Controller Cabinet shall be fitted on the PCC foundation with necessary alignment & level adjustment work. The utmost care should be taken while removing the Controller Cabinet so as to avoid any damage to existing PCC foundation. Alternatively the Contractor has to rebuild/repair the PCC foundation in proper manner at his own cost. The					
MUNICIP	AL CORPORATION OF GREATER MUMBAI	MUNICIPAL CORPORATION OF GREATER MUMBAI Page 25				

C	n	DT	
5	Ρ-	КΙ	
~			

	nut & bolts shall be properly tightened. The neoprene gaskets shall be provided between the foundation & controller for proper fittings. The washers of proper size with spring type of washers shall be provided for fittings. The earthing points shall be properly joined & shall be tight enough. The cable entries shall be through the cable glands & the glands shall be properly filled. After completion of all the fitting activities the internal wiring with proper ferruling & numbering shall be done. The connector strip shall be firmly fixed. Pre commissioning test shall be taken before applying the controller in operation. The Controller should be properly sealed for incress of rodents			
R2-RT-NATC 1.12	The Signal controller shall be fitted on the Pole foundation with necessary alignment & level adjustment work. The nut & bolts shall be properly tightened. The gaskets shall be provided between the pole & controller for proper fittings. The U clamps or any other fitting material having sufficient strength to withstand the load of controller shall be provided. The washers of proper size with spring type of washers shall be provided for fittings. The earthing points shall be properly joined & shall be tight enough. The cable entries shall be through the cable glands & the glands shall be properly filled. Separate G.I. pipe of proper size to carry the supply cable shall be provided from ground surface (preferably buried in the ground) to cable entry point in the controller. After completion of all the fitting activities the internal wiring with proper ferruling & numbering shall be done. The connector strip shall be firmly fixed. Pre commissioning test shall be taken before applying the controller in operation.			
R2-RT-NATC 1.13	As per USOR Description			
R2-RT-NATC 1.14	Digital Count Down Timer for non-ATC Signal Junctions (EN 12966) Graphic Type			
		1	CPU	8 bit Micro Controller
	Mechanical Specifications			
	1Structural MaterialPolycarbonate against UV ray			Polycarbonate strengthened against UV rays
	2 Body Color Black			
		3	Dimensions	360 mm x 370mm x 220 mm
	Display Specification			
		1	Lamp Diameter	300 mm
		1	Height of Man Figure	150-165 mm

	3	Display Type	Full Graphic, Dual Colored (Red & Green)			
		LED Specifications				
	1	LED Diameter	5 mm			
	2	LED Viewing Angle	30 Degree			
	3	LED Wave Length	630-640 nm (Red), 505- 520nm(Blue – Green)			
	4	LED Dice Material	AlInGap 9Red), InGaN (Blue- Green)			
	5	LED Life Time	1,00,000 hrs from the date of commissioning			
		Technic	cal Features			
	1	Power Consumption	25-30 Watt nominal per lamp			
	2	Input Power	85 to 260 Volt AC, 50 Hz			
	3	Operating Temperature	-20 Degree to +60 Degree C			
	4	Humidity	0 % to 95% Relative Humidity			
	5	Water & Dust Ingress	IP 65			
	6	Standard	As per EN12966			
	Spec Thes cond of w minu mode Wor The STP Bala Bala Bala The balan in fla	 Specifications These specifications are intended for general description of site conditions, scope of work and requirements, products, execution, quality of workmanship and finished work. They are not intended to cover minute details. The work shall be executed in accordance with best modern practices and using special techniques. Working of Countdown Timer The Vehicular countdown timer should be dual colour, Red for STOP or STP and Green Colour for GO. These should have alternate Red and Balance Phase Time for STOP or STP in flashing. Alternate Green and Balance Phase Time for GO in flashing. The Pedestrian Countdown timer should be dual color with RED MAN & balance phase time in flashing and GREEN MAN & balance phase time in flashing. 				
R2-RT-NATC 1.15	Installation of the countdown timer for vehicular & pedestrian signals at sufficient height visible to the general motorists & pedestrians or as instructed by the Engineer.					

SPECIFICATIONS FOR TRAFFIC WORKS			SP-RT	
Count Down Timer (2 1/2 digit 8" digit height dual colour) for non- Signal Junctions as per latest IS, BS or equivalent standards Refer Drawing No RT-NATC 1.16 Dual Colour Countdown Timer				
	Features			
	Micro Controller Based, Lamp drive input (Red Amber and Green) derived from main signal Group of a fixed time Traffic Controller, Two Cycles Sensing Time, 2 ½ Digit, 8" Digit Height			
	Sensing Sequence	:	Activated only at the start Stage Recording of Signal Stage Til Confirmation of timing in seco Start of Balance Time Display	of Green Signal ming in first cycle, and cycle, v in third cycle
	Communication Port		RS 232	
R2-RT-NATC 1.16	Output Display	:	Balance time in seconds fo	r individual Signal
			Red, Amber in Red Colour Green Stage in Green Colour	
			Steady "" during initial Change or All Red or Start Up Flash Mod	2 cycles or Plan de.
	Display Type	:	2 ¹ ⁄ ₂ Digit, 8" Digit Heig comprising of High Bright RE	ght, LED Display D & Green LEDs.
	Cabinet	:	Powder Coated MS Cabinet 375mm x 135 mm (W x H x D	of Size 490mm x))
	Input Power	:	30 VA to 100 VA	
	Storage Temp	:	0°C to 75°C	
	Operating Temp	:	0°C to 55°C	
	Humidity	:	95% at 40°C (Non-Condensir	ng)
R2-RT-NATC 1.17	Removal of countdown timer from pole			
R2-RT-NATC 1.18	Refer Drawing No RT-NATC 1.18			
R2-RT-2	PCBs			
R2-RT-ATC 2.1	Supply of M/s TELVENT make Group Card TGRY-306/5 latest version			
R2-RT-ATC 2.2	Supply of M/s TELVENT make TCE Card TCE-486/3			

Page 28

R2-RT-ATC 2.3	Supply of M/s TELVENT make Micro-1 Card TMRY-478/3 V6			
R2-RT-ATC 2.4	Supply of M/s TELVENT make Micro-2 Card TMRY-478/3 V7			
R2-RT-ATC 2.5	Supply of M/s TELVENT	make Input/Input Card EERY-274/2 V2		
R2-RT-ATC 2.6	Supply of M/s TELVENT	make Input/ Output Card ESRY-384/4V2		
R2-RT-ATC 2.7	Supply of M/s TELVENT	make SMPS Card FAY-267/12 V1.3		
R2-RT-ATC 2.8	Supply of M/s TELVENT	make REY Card REY42-544		
R2-RT-ATC 2.9	Supply of M/s TELVENT	make RESY Card RESY-42/542 V2		
R2-RT-ATC 2.10	Supply of M/s TELVENT V2	make Back Plane Mother Board Card-BPRY-311/3		
R2-RT-ATC 2.11	Supply of M/s TELVENT V2	make Back Plane Mother Board Card-BSRY-312/2		
R2-RT-ATC 2.12	Supply of M/s TELVENT detectors and guides for F	make Main Rack 6 U, depth 80 mm with division for RMY32, without bus		
	Refer Drawing no RT-I Audible Beeper Unit:	NATC 2.13		
	Voltage	: 9 – 28 Vdc		
R2-RT-NATC 2.13	Current	: 18 mA @ 24 Vdc		
	Sound Output	: 92 dB		
	Tones	: 32		
	IP Rating	: IP 65		
	Colour	: White		
R2-RT-ATC 2.14	Installation and commissioning of audible beeper unit.			
R2-RT-ATC 2.15	Removal of audible beeper unit.			
R2-RT-ATC 2.16	Refer Drawing no RT-NATC 2.16			
	display / instruction board as per drawing			
R2-RT-ATC 2.17	Removal of Push button assembly			
R2-RT-3	PIPING			
R2-RT-NATC 3.1	The high density polyethylene corrugated pipe of nominal size 120.00 mm, outside dia 120 mm and internal diameter of 103.5 mm conforming to IS 14930 (Part-2) including supply of necessary sockets, couplings etc.			

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 29

	Refer Drawing No. RT-NATC-3.2A & RT-NATC-3.2B		
R2-RT-NATC 3.2	Laying of single 120mm (OD)/ 103.5mm (ID) double walled corrugated High		
	sockets, couplings etc.		
R2-RT-NATC 3.3	The high density polyethylene corrugated pipe of nominal size 63.00 mm,		
	outside dia 63 mm and internal diameter of 47 mm conforming to IS 14930 (Part-2) including supply of necessary sockets, couplings etc.		
	Laying 63 mm (OD)/47 mm (ID) double walled corrugated High Density Poly		
R2-RT-NATC 3.4	Ethylene (HDPE) Pipes including pull wire along with necessary sockets, couplings etc. as per drawing no. RT-NATC-3.2A & RT-NATC-3.2B		
	The high density polyethylene corrugated pipe of nominal size 50.00 mm,		
R2-R1-NATC 3.5	(Part-2) including supply of necessary sockets, couplings etc.		
	Laying 50 mm (OD)/ 37mm (ID) double walled corrugated High Density Poly		
R2-RT-NATC 3.6	Ethylene (HDPE) Pipes including pull wire along with necessary sockets, couplings etc. as per drawing no. RT-NATC-3.2A & RT-NATC-3.2B		
	The G. I. conduit shall be of Class A type having inner diameter of 100 mm. The		
R2-RT-NATC 3.7	conduit shall be supplied with straight coupler to join the two separate pieces in line.		
R2-RT-NATC 3.8	Laying of 100 mm Dia. Class 'A' G.I. pipe with provision of Pull Boxes etc. as per drawing no. RT-NATC-3.2A & RT-NATC-3.2B		
	The G. I. conduit shall be of Class A type having inner diameter of 65 mm. The		
R2-RT-NATC 3.9	line.		
R2-RT-NATC 3.10	Laying of 65 mm Dia. Class 'A' G.I. pipe, with provision of Pull Boxes etc. as per drawing no. RT-NATC-3.2A & RT-NATC-3.2B		
	The G. I. conduit shall be of Class A type having inner diameter of 50 mm. The		
R2-RT-NATC 3.11	conduit shall be supplied with straight coupler to join the two separate pieces in line.		
R2-RT-NATC 3.12	Laying of 50 mm Dia. Class 'A' G.I. pipe, with provision of Pull Boxes etc.as per drawing no. RT-NATC-3.2A & RT-NATC-3.2B		
R2-RT-NATC 3.13	Removal of existing all types of Class 'A' G.I. pipe G.I. Pipe excluding excavation.		
R2-RT-NATC 3.14	Removal of existing single 120mm (OD)/ 103.5 mm (ID) double walled corrugated High Density Poly Ethylene (HDPE) Pipe excluding excavation.		
R2-RT-NATC 3.15	Removal of existing single 50 mm (OD)/ 37 mm (ID) double walled corrugated High Density Poly Ethylene (HDPE) Pipe excluding excavation.		
R2-RT-NATC 3.16	Removal of existing single 63 mm (OD)/ 47 mm (ID) double walled corrugated High Density Poly Ethylene (HDPE) Pipe excluding excavation.		

R2-RT-4	SIGNAL / CCTV / VIDEO DETECTION POLES
R2-RT-ATC 4.1	Poles (Please refer Drawing No. RT-ATC-4.1)
	All poles and posts shall comply with or exceed the requirements of BS505 or similar international approved specification as appropriate for use in India with regard to fabrication and steel content and shall be galvanized steel Class B, to BS729 or similar International standard.
	Signal poles shall have a diameter of 115mm with a height of 6m and a strength and rigidity at least equivalent to that for a seamless steel tube of 115mm outside diameter and 4.4mm thickness and a tensile strength of 375MN/m ² . Signal poles shall be of a uniform diameter.
	An exception may be made to increase the diameter of the lower part of any post at a signal installation to accommodate, for example, electrical services and/or termination assemblies.
	The use of short poles for push button units only and cranked poles for areas where pedestrian walkways are restricted may also be used.
	Poles shall be short-blasted with a crossover adhesive and dipped in a fluidized bed of PVC, to a thickness of 250/300 microns with a bitumen finish applied to the internal surfaces of the pole, alternatively a fully galvanized pole in accordance with BS729 or to a similar International standard shall be provided. All poles shall be polyethylene sleeved for protection.
	The height of the signal posts may increase by 150mm above the upper bracket fixing to permit better access to the post cap termination assembly.
	All signal poles shall include plastic coatings shall be even when scratched or torn resistant to peeling.
	The signal pole shall be designed and constructed as to provide adequate support and stability for the signal head and shall be fitted with weather - proof cap.
	Where an entry is required to permit the entry of an electric supply cable, unless otherwise specified by the purchaser the entry into the pole shall be not less than 300mm high by 500mm wide and the top of the slot shall be between 75mm and 130mm below ground level. The top and bottom of the aperture shall be radiused with radii equal to half the slot width. Where an aperture is required to permit the entry of cables which are not supply cables, it shall be capable of accommodating four cables each of 32mm diameter and any apertures above ground level shall be fitted with a suitable gland or grommet maintaining as far as possible a smooth surface of the same colour as the post.
	Unless otherwise specified posts shall be of sufficient length to allow a minimum 700mm below ground level when correctly erected.
	i. a finish complying with the requirements of BS729 or equivalent International standard; or

	ii. an anti-corrosive paint which shall be effective o range minus 25C to 70C.	ver the temperature
	The exterior portion of the steel poles below ground to at least 450mm above ground level shall be pr application of the outer plastic coating by spraying BS5269, Part 1 or equivalent International standard.	level and extending rotected prior to the with molten zinc to
	Any surface cut after galvanizing painting or the plastics finish shall be protected by appropriate mether	e application of the nods.
	All non-current carrying metal parts used to su assembly (housed at the top of the post), and th earth leads shall be non corrodible and earthed in current requirements of the IEE (or equivalent) v similar International standards as appropriate for method of terminating armoured cables shall ens connection between the frame supporting the termin metal of the signal post shall be firm and shake assembly support frame shall resist vibration fatigue full complement of cables and terminal blocks.	upport the terminal e bonding for cable accordance with the viring regulations or use in India. Any sure electrical earth al assembly and the proof. The terminal when supporting its
	The pole cap shall be constructed in such a way th loose due to vibration or adverse weather conditions be of internal captive nut / thread construction allow to fix to the assembly without a hole being required cap. This will reduce risk of moisture reaching the te	at it will not become s. The pole cap shall ring the pole cap top in the top of the pole rminal blocks.
	Fixing	
	Suitable means shall be provided to firmly fasten heads to poles, and to allow adjustment where requ fastening, hinges, brackets and other fittings shall material or suitably treated to prevent corrosion fastening signal heads to brackets / poles shall be of e.g. Nylock nuts or equivalent.	brackets and signal uired. All nuts, bolts, be of non-corrodible . All nuts used for f a anti vibration type
	Vehicle signal heads shall normally be fixed with the aspect 3.5 m above the carriage way level. Signal h shall be fitted so that the lower part of the signal l least 5.5 m above the carriage way surface, or Engineer.	e centre of the amber neads on high masts nead assembly is at as directed by the
	Pedestrian signal heads shall be fixed with the cer aspect 2.3 m above the carriage way level or Engineer.	ntre of the Red Man as directed by the
	The poles shall be such as to provide adequate s velocities up to 145 km/h. The Contractor shall be of the relevant standard details covering this point.	stability in wind gust provided with copies
	Termination of signal cables may be brought to a te within a pole-mounted box attached to the signal por above ground level. Cables connected permanently shall also be brought through the inside of the pole	rminal strip mounted ble some 1.2 metres in the signal heads into the termination
		Page 37
WONICI		Tuge JZ

	box and terminated there. Earthing between the terminal and pole shall include terminal box door and internal connection arrangements. The termination box shall be rated to IP67 or better.
	Pole cap terminations shall avoid the use of a receiving mechanism through the centre of the pole cap top.
R2-RT-ATC 4.2	Please refer Drawing no RT-ATC-4.2 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.3	Please refer Drawing no RT-ATC-4.3 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.4	Please refer Drawing no RT-ATC-4.4 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.5	Please refer Drawing no RT-ATC-4.4 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.6	Please refer Drawing no RT-ATC-4.6 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.7	Please refer Drawing no RT-ATC-4.7 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.8	Please refer Drawing no RT-ATC-4.7 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.9	Please refer Drawing no RT-ATC-4.7 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-ATC 4.10	Please refer Drawing no RT-ATC-4.7 & Construction Specifications mentioned at R2-RT-ATC 4.1
R2-RT-NATC 4.11	Supply of Traffic signal Straight pole of 6 mtr, inner dia 100 mm from resistant to peeling with base plate size of (LXWXT) 200mm X200mmX10 mm painted with redoxide and double coat with synthetic enamel paint of yellow colour assembly G.I., class B, as per technical specification
R2-RT-NATC 4.12	The cantilever pole to be supplied shall be of Class B type. Signal poles shall have an inner diameter of 100 mm or more with a height of 6m. The cantilever arm shall have outer diameter of 75mm with arm span of 4 mtr length. The complete assembly shall be dismantled for ease of transport & installation. There shall be a base plate of size 300mm X 300mm with thickness of 6 mm welded at the bottom of the pole base. The complete assembly of the pole shall be painted with red oxide one layer & two layers of yellow paint or as instructed by the Engineer with preferred make. It should be torn resistant to peeling. Please refer Drawing No RT-NATC-4.12.
R2-RT-NATC 4.13	Signal poles shall be of Class B type having inner diameter of 100 mm or more with a height of 3m. The pole shall be welded with a base plate of size 200mm X 200mm & 6 mm thick at the bottom. The pole shall be painted with red oxide one layer & two layers of yellow paint or as instructed by the Engineer with preferred make. It should be torn

-			
С	n	D '	т
2	Ρ-	к	
-		••	

	resistant to peeling.	
R2-RT-NATC 4.14	Signal poles shall be of Class B type having inner diameter of 100 mm or more with a height of 6m. The pole shall be welded with a base plate of size 200mm X 200mm X12 mm thick at the bottom. The poles shall have a facility to install the solar collector plate at the top & shall have a battery container box at sufficient height as shown in the reference drawing or as suggested by the Engineer. The pole shall be painted with red oxide one layer & two layers of yellow paint or as instructed by the Engineer with preferred make. It should be torn resistant to peeling. Please refer Drawing No RT-NATC-4.14	
R2-RT-ATC 4.18	Please refer Drawing No RT-ATC-4.18	
R2-RT-ATC 4.19	Please refer Drawing No RT-ATC-4.19	
R2-RT-ATC 4.20	Please refer Drawing No RT-ATC-4.20	
R2-RT-ATC 4.21	Supply of standard neoprene rubber gasket suitable for cantilever pole door and at cable entry portion of straight pole and cantilever pole	
R2-RT-ATC 4.22	Supply, Installation and commissioning of Pole Cap Termination Assembly for straight pole as per drawing. Please refer Drawing No RT-ATC-4.22	
R2-RT-ATC 4.23	Fixing of Traffic Signal fix type and swing type Cantilever pole extension arm	
R2-RT-ATC 4.24	Removal of Traffic signal straight pole	
R2-RT-ATC 4.25	Removal of Traffic signal cantilever pole with extension arm or camera pole assembly	
R2-RT-ATC 4.26	Removal of Traffic signal pole cantilever pole extension arm	
R2-RT-ATC 4.27	ELI Test for Poles and incoming electric Supply of Signal Junction with FLUKE Meter and submission of ELI Test Report.	
R2-RT-5	JUNCTION BOX AND POWER SUPPLY	
R2-RT-NATC 5.1	The junction box of the size 310 mm x 215 mm x 100 mm to accommodate the electrical connections of signal system shall be provided, with the details as shown in the reference drawings No RT-NATC-5.1. The junction box shall be fabricated out of M.S. material of thickness 2 mm. The door shall have internal lock to avoid any vandalism. The junction box should have IP55 protection. The junction box shall have internal electrical connecting strip with connectors for electrical connections.	
R2-RT-NATC 5.2	installation of 2 mm thick 310 mm x 215 mm x 100 mm MS junction box as described above	
R2-RT-NATC 5.3	Removal / dismantling of existing Jn. Box	
R2-RT-NATC 5.4	The power supply box shall be made from S.S.304 material of thickness 1.6mm & shall have the construction as shown in the reference drawing no RT-NATC-5.4. The power supply box shall be fabricated and shall be welded properly to obtain the protection class of IP-55. The burrs etc. shall be	

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 34

SP-RT

	chamfered off and smooth finish surface shall be main Supply Box should have door at front with internal locking door shall be provided with neoprene rubber gasket and tight. The internal arrangement shall be provided to accor- electric meter, cut outs and allied instruments. The Box shany other robust transparent material's window to note without physically opening the door. The glass/any other material shall be of good quality and shall bear the t- vibrations without breaking. The Power supply box shall press fit type of gland for the in & out entry of the cables Box shall have arrangement for mounting on foundation of	intained. The Power ng arrangement. The shall be air & water mmodate and fix the nall have the glass or e the meter reading er robust transparent emporary shocks or all be provided with s. The Power Supply r straight pole.
R2-RT-NATC 5.5	Installation & commissioning of power supply box.	
R2-RT-NATC 5.6	Removal / dismantling of existing power supply box (M.S./	/S.S.)
R2-RT-NATC 5.7	Supply & installation of new anchor fastener of S.S.material of 8 mm dia and length of 100mm with removal of existing fixed studs	
R2-RT-NATC 5.8	As per site requirement. Supply, Installation, Testing and commissioning of Police Panel Box (inclusive of Rotary Switch & Push Button) of Non-ATC Controller	
R2-RT-NATC 5.9	Supply & Installation of junction box cover for NON ATC	
R2-RT-6	SIGNAL HEADS	
R2-RT-ATC 6.1 to	The provision of LED signal heads shall be to the specifications detailed in EN12368 (European standard) and the further detailed requirements of TR2206A or other equivalent International Standards. The LED signal heads are to be compliant with Class A (-15 to + 60) for use in a class A environment, provide a luminosity of intensity of 400cd, have a medium intensity distribution, a luminous uniformity of 1:10, phantom class 5 and an impact resistance of 0.51kg dropped from 1300mm height.	
R2-RT-ATC 6.6	TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 4000 intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height	ne LED signal heads use in a class A cd, have a medium ntom class 5 and an
R2-RT-ATC 6.6	TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 4000 intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height Optical Performance	ne LED signal heads use in a class A cd, have a medium ntom class 5 and an
R2-RT-ATC 6.6	 TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 4000 intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height Optical Performance The design of the optical system shall be such that we is installed with its visor, under all normal conditional mumbai it shall give a clear and unambiguous indicational including buses, goods vehicles and pedestrians we normal viewing angles up to a distance of 80 m f shall be made from unbreakable polycarbonate. In provide a standards. 	when a signal aspect tions experienced in ation to all road users when viewed from all from the aspect and particular:
R2-RT-ATC 6.6	TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 400d intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height Optical Performance The design of the optical system shall be such that w is installed with its visor, under all normal condit Mumbai it shall give a clear and unambiguous indication including buses, goods vehicles and pedestrians w normal viewing angles up to a distance of 80 m f shall be made from unbreakable polycarbonate. In p i.When an aspect is switched off it shall give a appearance with no visible phantom or spectral reflet	when a signal aspect tions experienced in ation to all road users when viewed from all from the aspect and particular: uniform, near black ection.
R2-RT-ATC 6.6	 TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 4000 intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height Optical Performance The design of the optical system shall be such that wis installed with its visor, under all normal condit Mumbai it shall give a clear and unambiguous indication including buses, goods vehicles and pedestrians with normal viewing angles up to a distance of 80 m f shall be made from unbreakable polycarbonate. In performance with no visible phantom or spectral reflee ii. For the pedestrian and coloured arrow aspects, which contrast between the illuminated and non-illumination is or the shall be such that the intended indication is or the shall be such that t	the LED signal heads use in a class A cd, have a medium atom class 5 and an the signal aspect tions experienced in ation to all road users when viewed from all from the aspect and particular: uniform, near black ection. Then switched on, the ated portions of the completely clear.
R2-RT-ATC 6.6 R2-RT-ATC 6.7	 TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 4000 intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height Optical Performance The design of the optical system shall be such that wis installed with its visor, under all normal condit Mumbai it shall give a clear and unambiguous indicatincluding buses, goods vehicles and pedestrians with shall be made from unbreakable polycarbonate. In polycarbonate is switched off it shall give a appearance with no visible phantom or spectral reflee ii. For the pedestrian and coloured arrow aspects, which contrast between the illuminated and non-illumination aspect shall be such that the intended indication is contrast by using UV stabilized ink on face plate 	he LED signal heads to use in a class A cd, have a medium ntom class 5 and an the class 5 and an the signal aspect tions experienced in ation to all road users when viewed from all from the aspect and barticular: uniform, near black tection. Then switched on, the ated portions of the completely clear.
R2-RT-ATC 6.6 R2-RT-ATC 6.7	 TR2206A or other equivalent International Standards. The are to be compliant with Class A (-15 to + 60) for environment, provide a luminosity of intensity of 400c intensity distribution, a luminous uniformity of 1:10, phar impact resistance of 0.51kg dropped from 1300mm height Optical Performance The design of the optical system shall be such that wis installed with its visor, under all normal condite Mumbai it shall give a clear and unambiguous indication including buses, goods vehicles and pedestrians with normal viewing angles up to a distance of 80 m f shall be made from unbreakable polycarbonate. In pi. When an aspect is switched off it shall give a appearance with no visible phantom or spectral reflet ii. For the pedestrian and coloured arrow aspects, with contrast between the illuminated and non-illumination aspect shall be such that the intended indication is contrast by using UV stabilized ink on face plate 	he LED signal heads use in a class A cd, have a medium ntom class 5 and an when a signal aspect tions experienced in ation to all road users when viewed from all from the aspect and particular: uniform, near black action. hen switched on, the ated portions of the completely clear.

SP	ECIFICATIONS FOR TRAFFIC WORKS	SP-RT
R2-RT-ATC 6.8	 Signal Heads and Visors (Hoods) Refer drawing The materials used and the form of construction use ensure that the signal head (including visors, whic adequate mechanical strength and durability to with of installation, operation and maintenance. In pr capable of withstanding winds of up to 145 km/h signal body and visors shall be black UV stabilized h modified Polypropylene. The lenses shall be acrylic be polycarbonate with stainless steel or Polypropyler Materials, fixings and fastenings used shall be resistant. The signal head shall be of modular construction, pr configurations to be built from standard building d vandal resistant and easy to install and maintain. As available in 300mm sizes. It shall comply with t BS505 as amended by TRO102 and BS873, DIN6163 or other International Standard appropriate Provide a secure locking action to prevent vandali the signal head from the locked position. Fastenings used on signal heads and poles to gain not require special tools and shall be wholly captive. The signal heads shall be provided with seals betwee these may be supplemented with knife-edge type in gress of water. Visors shall be of sufficient size to adequately shad minimize phantom effects. The visors shall be mar black Where specified or made necessary by site specially designed visors shall be provided which directional view of the signal aspect. The signal head shall achieve a precise beam produces high intensities of light in the centre of the symbols shall offer some form of protection against of phantom illumination of aspects. Brackets shall be pre-drilled to suit and supplied fixing kit for standard poles and shall be treated for content atmosphere. 	RT-ATC-6.8 d shall be such as to ch are required) has stand the conditions articular it shall be to the colour of the igh impact or impact , and reflectors shall he fixings. inherently corrosion ermitting signal head esigned to be safe, spect lenses shall be the requirements of EN12368, BS1376, for use in India. sm or movement of internal access shall een all openings and seals to prevent the e the aspects and to bufactured from matt conditions, deep or give a constrained distribution, which optic. The displayed the adverse effects in kit form including or use in a high salt
R2-RT-NATC 6.9 To R2-RT-NATC 6.14	LED Retrofit: Low Power Consumption LED based on Traffic Signa power consumption 10 W ± 10% in case of RED(Blow), W ± 10% in case of Pedestrian Red, Pedestrian Green Amber Arrow. The LEDs should withstand wide van temperature -10 to +70 degree Celsius. The compact de be tight sealed and should be IP65 to resist dust, wa minimum working life of LED's should be at least 18,0 PCB should be glass epoxy sheet and the Lens should be	I Light should have Amber (Blow) and 4 n, Green Arrow and triations of ambient sign LED unit should ater, vibrations. The 00 hours. The LED e UV Stabilized Poly

Page 36
	Carbonate. The LED indications shall comply the relevant standards.
	When an aspect is switched off, it shall give uniform, near black appearance with no visible Phantom spectral reflection.
	For Pedestrian and coloured arrow aspects, when switched on, the contrast between the illuminated and non-illuminated portions of the aspect shall be such that the intended indications are completely clear.
R2-RT-ATC 6.15	Installation of Polycarbonate LED Signal aspect of 300 mm dia. on standard traffic signal straight pole
R2-RT-ATC 6.16	Installation of Polycarbonate LED Signal aspect of 300 mm dia. On standard traffic signal cantilever pole
R2-RT-ATC 6.17	Removal of Polycarbonate LED Signal aspect of 300 mm dia. on standard traffic signal straight pole
R2-RT-ATC 6.18	Removal of Polycarbonate LED Signal aspect of 300 mm dia. On standard traffic signal cantilever pole
R2-RT-7	Cables
R2-RT-ATC 7.1 to R2-RT-ATC 7.8	Supply of following 650/1100 V Grade PVC insulated PVC Sheathed Multicore copper conductor armoured cable (single strand) as per the specification and As per IS 1554 (Part I)
R2-RT-ATC 7.25 to R2-RT-ATC 7.32	Supply of Solid 1.1 KV Copper conductor cable XLPE insulated round wire armoured and PVC sheathed overall to confirming IS 7098. As per relevant IS.
R2-RT-ATC 7.9 to R2-RT-ATC 7.12	As per General Electrical Requirement Specifications
R2-RT-ATC 7.9 to R2-RT-ATC 7.12D	As per General Electrical Requirement Specifications
R2-RT-ATC 7.13	Installation of CAT-6 cable
R2-RT-ATC 7.14	Laying of signal cables (all types including communication cables with multi pairs as described above) in trenches, existing ducts / G.I. Pipes including ferruling, testing etc. but excluding any cable joint, excavation etc.
R2-RT-ATC 7.15	Relaying of signal cables (all types including communication cables with multi pairs as described above) in existing trenches, ducts / G.I. Pipes including ferruling, testing etc. but excluding any cable joint, excavation etc.
R2-RT-ATC 7.16	Removal of signal cables (all types including communication cables with multi pairs as described above) in existing trenches, ducts / G.I. Pipes including ferruling, testing etc. but excluding any cable joint, excavation etc.
R2-RT-ATC 7.17 to R2-RT-ATC 7.24	As per General Electrical Requirement Specifications

R2-RT-8	FLASHER
R2-RT-NATC 8.1	Supply of Blinker Controller with adjustable flash rate having interface to solar panel of 12 Volts D.C. supply with sufficient power rating with battery charge regulator (without battery, cabinet and Solar Panel). The flash rate for the blinker shall be 50 flashes ON and 50 OFF periods.
R2-RT-NATC 8.2	Installation, testing & commissioning of above flasher unit (solar Blinker Controller) excluding foundation, installation of cabinet, battery, panel etc.
R2-RT-NATC 8.3	Supply of Solar Panel 12V / 50 Watt. The detailed technical datasheets of OEM to be provided by the contractor after award of project/Contract.
R2-RT-NATC 8.4	Supply of Solar Panel 12V / 70 Watt. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract.
R2-RT-NATC 8.5	Supply of Solar Panel 12V / 100 Watt. The detailed technical datasheets of OEM to be provided by the contractor after award of project/Contract.
R2-RT-NATC 8.6	Supply of Solar Panel 12V / 150 Watt. The detailed technical datasheets of OEM to be provided by the contractor after award of project/Contract.
R2-RT-NATC 8.7 to R2-RT-NATC 8.10	 This specification covers requirements of stationery Vented type lead acid storage battery, complete with battery cabinet, and all other accessories. The design, manufacture and performance of equipment shall confirm to the latest applicable electrical rules, all currently applicable standards codes of practice, regulations and safety codes of the locality where the equipment are to be installed. 1. Constructional Features - The equipment offered shall be complete with all parts that are necessary or usual for the efficient operation of the equipment, whether specifically mentioned or not. PLATES Plante Positive Plates - The Plante Positive Plate shall be cast solid in pure lead in one piece and shall have adequate mechanical strength. It shall be electrochemically formed and shall be capable of operating under normal working condition without buckling or cracking. Welding together of small size lead castings or fully formed plates to form larger sizes will not be accepted. Tubular Positive Plates - The tubular positive plate shall consist of a suitable bar with spines cast of suitably alloyed lead to give adequate mechanical strength. Porous, acid resistant and oxidation resistant tubes shall be inserted one over each spine. After insertion, the tubes shall be adequately filled and packed with active material before their lower ends are closed by a common bar. The construction and material of the tubes shall be such as to reduce loss of active material and to withstand normal internal stresses developed during service Negative Plates - The negative plates shall normally be of the box

SF	PECIFICATIONS FOR TRAFFIC WORKS	SP-RT
	 type. End negative plates, if of box type may be type. Pasted plates shall have adequate mech shall be so designed that the active material intimate contact with the grid under normal workit. Terminal posts -Terminal posts shall be designed external bolted connection conveniently and posit post shall have two bolt holes of the same diameter angles to each other. The bottom hole shall be u inter-cell connections. All the metal parts of the t lead or lead coated type. Bolts, heads and nuts, exist be hexagonal and shall be lead covered. The terminal posts and cover, and between cover a be so sealed as to prevent any seepage of elect. Containers, cell lids, vent plugs, acid level inconnectors, electrolyte, water, shall conform to standards. The cell containers and vent plug conform to the safety requirements of UL 924 or standard. In case the batteries are proposed sheet metal or polymeric enclosure, the same included in the scope of the bidder. The enclosu conform to the safety provisions of UL 1778 or eq 2. Accessories - The battery shall be complete with accessor including but not limited to the following Battery cabinet Lugs Rubber pads 	of the half pasted hanical strength and is maintained in ng conditions. ed to accommodate tively. Each terminal er, preferably at right sed to terminate the for PURCHASER'S erminals shall be of cept seal nuts, shall e junction between and container shall rolyte dicators, separators, the relevant IS/IEC s, in addition, shall or equivalent safety to be housed in a is deemed to be ure for battery shall uivalent standard.
R2-RT-NATC 8.11 to R2-RT-NATC 8.14	The Solar Battery Cabinet shall be fabricated or thickness 2mm as per Drawing No RT-NATC-8.11 . mounted on height sufficiently around at 2-3 meters battery load alongwith gravitational load. It shall construction with lock & key provision. The cabinet red oxide & two coats of paint of approved shade.	ut of M.S. sheet of The cabinet is to be s. It shall sustain the have the cage type shall be painted with
R2-RT-NATC 8.15	Installation, testing and commissioning of all types of solar above.	r Panel as described
R2-RT-NATC 8.16	Removal of already installed solar panel as described above	/e
R2-RT-NATC 8.17	Installation, testing and commissioning of batteries as desc	cribed above.
R2-RT-NATC 8.18	Removal of already installed batteries as described above.	
R2-RT-NATC 8.19	Installation, testing and commissioning of all types of sola described above.	ar battery cabinet as

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 39

R2-RT-NATC 8.20	Removal of already installe including battery.	ed solar battery cabinet a	s described above
	1		
R2-RT-9	VEHICLE DETECTION CAM	ERAS	
R2-RT-ATC 9.1 to R2-RT-ATC 9.2	 VEHICLE DETECTION CAM Traficam T1 (Ref no 10-6090 i) FUNCTIONALITIES Vehicle Detection ii) CAMERA CMOS, black & white, FPS III) COMMUNICATION RS485 service port for of IV) OUTPUTS 4 optical coupled dry co 48 VDC V) POWER SUPPLY VOLT 12-26 V AC/DC POWER CONSUMPTIC 85 mA @ 12 V DC (1,2) VI) ENVIRONMENTAL Temperature range: b humidity, non-condensin Housing: waterproof to VII) REGULATORY EMC: Electromagnetic Class ANEMA: NEMA I 	ERAS DA and 10-6091A) sensor 1/3", resolution 640> configuration ontacts; Imax = 50 mA, Pmax TAGE INPUT DN W)50 mA @ 24 V DC (1,2 W) between - 34°C and +80°C ng IP67Materials: weatherproof, Compatibility - 204/108/EG I Shock and vibration	x480, frame rate 30 = 300 mW, Umax = 0 C0 to 95% relative UV-resistant FCC: FCC part 15
		Wide Angle	Narrow Angle
	Focal distance	3.0 mm	8.0mm
	Field of view- horizontal	95°	32°
	Field of view- vertical	65°	22°
	Field of view - diagonal	103°	39°
R2-RT-ATC 0.3 to	Traficam X-stream RPL ver	sion (Ref no 10-6040 and 10	0-6041)
R2-RT-ATC 9.4	i) FUNCTIONALITIES		

	Vahiala Da	testion		
		(A 1" color resolution 64	0v190 frama rata (25 EDS comprossion
	MJPEG, M	4 Color, resolution 64 1PEG-4, H.264 (dual st	ream),	25 FPS, compression
	iii) COMM	UNICATION		
	RS485 sei	vice port for configurat	ion, IP address	
	iv) OUTPU	ITS		
	4 optical c 48 VDC	oupled dry contacts; Ir	max = 50 mA, Pmax	< = 300 mW, Umax =
	v) POWER SUPPLY VOLTAGE INPUT			
	12-26 V A	C/DC		
	POWER C	ONSUMPTION		
	24-48VAC	/DC		
	vi) ENVIR	ONMENTAL		
	Temperatu non-conde	ure range: between - 34 ensing	4°C and +80°C0 to §	95% relative humidity,
	Housing =	IP68, connectors = $IP6$	67 Materials: weathe	erproof, UV-resistant
	vii)	REGULATORY		
	EMC: Ele	ctromagnetic Compati	ibility - 204/108/EG	GFCC: FCC part 15
	Class A Al	NEMA: NEMA II Shock	and vibration	
	viii)	LENS TYPE		
		Wide Angle	Narrow Angle	
		2,1mm	6,0mm	
		0-20m	15-70m	
R2-RT-ATC 9.5 to	Traficam X-stre	eam BPL with HTTP sti	reaming (Ref no 10-	
R2-RT-ATC 9.6	Integrated cam	era and detector offeri	ng vehicle presence	detection and traffic
	data collection	with video streaming (I	MJPEG, MPEG-4 or	H.264)
R2-RT-ATC 9.7	i) Name Inte	rface 1 TrafiCam Interf	ace	
	ii) Abbreviati	on (short name) 1⊺l		
	iii) Product R	eference Number 10-6	6078	
	iv) Basic Fun	ctionality		
	- Connecting	۔ zone output(s) from T	rafiCam to controlle	r
	- Providina p	ower to TrafiCam		
	- Connecting	portable PC to TrafiCa	am for system confic	uration & viewing
	v) # TrafiCam	is to Connect 1	,	. 3
	,	* -		
MUNICIP	AL CORPORATIO	N OF GREATER MUMB		

	SPECIFICATIONS FOR TRAFFIC WORKS	SP-RT	
	vi) Power IN 12–26VAC/DC via clamps, power LED (red)	
	vii) Power OUT 12–26VAC/DC to maximum 1 TrafiCam v	/ia clamps	
	viii) Port PC – Interface USB		
	ix) # Detection Outputs		
	- 4 optical coupled dry contacts via clamps		
	- Pmax = 300mW, Imax = 50mA, Umax = 48VDC		
	- "close on event" or "open on event" (setting TrafiCam	PC Tool)	
	- 4 output LEDS (green)		
	- "detection output x" and "common detection output"		
	x) # Error Outputs		
	- 1 general optical coupled dry contact via clamps		
	- Pmax = 300mW, Imax = 50mA, Umax = 48VDC		
	- "open on event" (hardware output)		
	- RUN LED (green)		
	- "error output" and "common error output"		
	xi) Function of Error Output Error in 1TI or power supp	ly 1TI down	
	xii) Interface Firmware Yes		
	xiii) Communications		
	xiv)TrafiCam – Interface		
	xv) RS-485, Traficon protocol		
	xvi)Cable TrafiCam – Interface		
	xvii) 4 wires + shielding via clamps:		
	- Communications: RS-485A, RS-485B		
	- Power: +, -		
	- Ground (shielding)		
	xviii) Current Consumption ≤ 78mA @ 12VDC	, ≤ 42mA @ 24VDC	
	xix) Power Consumption ≤ 1W (excl. TrafiCams)		
	xx) Interface Mounting DIN-rail clickable		
	xxi)Regulatory Issues		
	- EMC: Electromagnetic Compatibility - 2004/108/EG		
	- FCC: FCC part 15 class A		
	- Shock & Vibration NEMA II specs		
R2-RT-ATC 9.8	i) Name Interface 4 TrafiCam Interface		
	ii) Abbreviation (short name) 4TI		
	iii) Product Reference Number 10-6077		
	iv) Basic Functionality		
	Connecting zone output(s) from TrafiCam(s) to controller		
	Providing power to TrafiCam(s)		
L			
NALINUC		D 40	

Connecting portable BC to TrofiCom(a) for evotom configuration 8 viewing
connecting portable PC to Trancam(s) for system conliguration & viewing
v) # Traticams to Connect 1, 2, 3 of 4
v1) Power IN 12–26VAC/DC via clamps, power LED (red)
vii) Power OUT 12–26VAC/DC to up to 4 TrafiCams via clamps
viii) Port PC – Interface USB
ix) # Detection Outputs
 16 optical coupled dry contacts via clamps
- Pmax = 300mW, Imax = 50mA, Umax = 48VDC
- "close on event" or "open on event" (setting TrafiCam PC Tool)
- 16 output LEDS (green)
- "detection output x" and "common detection output"
x) # Error Outputs
- 1 general optical coupled dry contact via clamps
- Pmax = 300mW, Imax = 50mA, Umax = 48VDC
- "open on event" (hardware output)
- RUN LED (green)
- "error output" and "common error output"
xi) Function of Error Output Error in 4TI or power supply 4TI down
xii) Interface Firmware Yes
xiii) Communications
xiv) TrafiCam – Interface RS-485, Traficon protocol
xv) Cable TrafiCam – Interface
xvi) 4 wires + shielding via clamps:
- Communications: RS-485A, RS-485B
- Power: +, -
- Ground (shielding)
xvii) Current Consumption ≤ 120mA @ 12VDC, ≤ 60mA @ 24VDC
xviii) Power Consumption ≤ 1,5W (excl. TrafiCams)
xix) Interface Mounting DIN-rail clickable
xx) Regulatory Issues
- EMC: Electromagnetic Compatibility - 2004/108/EG
- FCC: FCC part 15 class A
- Shock & Vibration NEMA II specs
Name Interface TrafiCam/ ELIR Interface v-stream
Abbreviation (short name) TI x-stream
Product Reference Number 10-10-6085
Basic Functionality
- Connecting zone output(s) from TrafiCam(s) to controller

	- Providing power to TrafiCam(s)
	- Connecting (portable) PC to TrafiCam(s) for system configuration & viewing
	# Cameras to Connect 1, 2, 3 or 4 TrafiCam x-stream BPL units
	Note: max. 4 extra TrafiCam x-stream BPL units can be connected via TI xp.*
	Power IN 24–48VAC/DC via clamps (back), power LED (front)
	Power OUT 24–48VDC to up to 4 TrafiCams via clamps
	Port PC – Interface 2 RJ45 Ethernet connectors (each 10/100Mbit/s auto
	switching)
	# Detection Outputs
	- 16 optical coupled dry contacts via clamps
	- Pmax = 300mW, Imax = 50mA, Umax = 48VDC
	- "close on event" or "open on event" (setting in TCT)
	- 16 output LEDS (green)
	- "detection output 1-16" and "common detection output" **
	Note: max. 32 extra detection outputs can be added via max. 2 TI xp. units *
	# Error Outputs
	- 4 optical isolated switch components via clamps
	- Pmax = 300mW, Imax = 50mA, Umax = 48VDC
	- "open on event" (hardware output)
	- 4 output LEDS (red)
	- "error output" and "common error output" **
	Note: max. 4 extra error outputs can be added via TI xp.*
	Function of Error Outputs
	- All error outputs active = Error in TI x-stream or power supply TI x-stream
	down
	- One error output active = Error in corresponding TrafiCam x-stream
	Interface Firmware yes
	Communications
	TrafiCam x-stream BPL –
	Interface
	BPL, Traficon protocol (XML)
	Cable
	TrafiCam x-stream BPL-
	Interface
	2 wires for BPL via clamps:
	- Power: + -
	- Communications: broadband over power line (BPL)
	Current Consumption ≤ 160mA @ 24VDC, ≤ 80mA @ 48VDC
	Power Consumption ≤ 4 W (excl. connected TrafiCam x-stream unit(s))
L	1

SP	ECIFICATIONS FOR TRAFFIC WORKS	SP-RT
R2-RT-ATC 9.11	Name Interface TrafiCam Interface expansion	
	Abbreviation (short name) TI xp.	
	Product Reference Number 10-6044	
	Basic Functionality - Connecting zone outputs from extra controller	a TrafiCams to
	- Providing power to extra TrafiCams	
	# Cameras to Connect 1, 2, 3 or 4 extra TrafiCam x-strea	am BPL units
	Power IN 24–48VAC/DC via clamps (back, loop, possible with TI x-stream), power LED (front)	
	Power OUT 20VDC to up to 4 TrafiCams via clamps (back	<)
	Port PC – TI xp. None	
	# Detection Outputs	
	- 16 extra optical coupled dry contacts via clamps (back)	
	- Pmax = 300mW, Imax = 50mA, Umax = 48VDC	
	- close on event or open on event (setting in TCT**)	
	- 16 output LEDS (green, front)	
	- detection output 1-16 and common detection output ***	
	Note: max. 16 extra detection outputs can be added via an units	n additional TI xp.
	# Error Outputs	
	- 4 extra optical isolated switch components via clamps (ba	ack)
	- Pmax = 300mW, Imax = 50mA, Umax = 48VDC	
	- open on event (hardware output)	
	- 4 output LEDS (red, front)	
	- error output 1-4 and common error output ***	
	Function of Error Outputs - All error outputs active = pow down	ver supply TI xp.
	- One error output active = error in corresponding TrafiCan	n x-stream
	Interface Firmware None	
	Communications	
	TrafiCam x-stream BPL – TI xp. BPL, Traficon protocol (2	XML)
	Cables	
	TI x-stream – TI xp.	
	RJ11 connector (back): communication of output states from xp.	om TI x-stream to TI
	3 wires via clamps (back):	
	- 2 wires for linking of TrafiCam x-streams of TI xp. with BF stream	PL network of TI x-
	- 1 wire for protective earth	
	See drawing below for visualization of system architecture	·

SP	PECIFICATIONS FOR TRAFFIC WORKS	SP-RT
	Current Consumption ≤ 25 mA @ 24VDC, $\leq 12,5$ mA @ 4 Power Consumption ≤ 600 mW	8VDC
	Resided Dimensions (Use Mar D) 40.04 error 5.05 er	40.00
	Physical Dimensions (H x W x D) · 12,84 cm x 5,05 cm	i x 18,00 cm
	Regulatory Issues	
	- EMC: Electromagnetic Compatibility - 2004/108/EG	
	- FCC: FCC Part 15 class A	
	- Shock & Vibration NEMA II specs	
R2-RT-ATC 9 12	Power Supply Unit (24V-48V/ AC/DC) of Traficon	
R2-RT-ATC 9.13	Traficon (FLIR) Management Software: FLUX 1 server lice	inse
	(Ref no 10-0076)	
R2-RT-ATC 9.14	Traficon (FLIR) Streaming Server: IMUX 1 server license (Ref no 10-0086)
R2-RT-ATC 9.15		
	Traficon Engineer's On Site Support Charges per day, exe travel expenses i.e. hotel, flights, meals and local transpor	cluding additional t at actual.
R2-RT-ATC 9.16	Preventive Corrective Maintenance of Vehicle Detection	on Cameras:
	The vehicle detectors for the ITACA system are of detectors. There are currently 698 detector cameras in Mumbai ATC system of which 500 detector cameras transmitting live video streaming alongwith vehicle detection	overhead camera stalled under the are capable of on.
	i. Traficam T-1 - Only for vehicle detection, CMOS, E Sensor 1/3", resolution 640x480, frame rate 30 specification as per Annexure B-1	Black and White, FPS. Technical
	ii. Traficam X-stream - For vehicle detection and video CMOS, sensor 1/4", resolution 640x480 pixels, fran Technical specification as per Annexure B-2.	streaming, colour ne rate 25 FPS
	The Technical specification and User manuals of both ⁻ stream shall be provided.	Fraficam T-1 & X-
	B. Detector Camera Operation & Maintenance	
	i) Review of camera view & positioning of the (virtual loops): The virtual loops or the presence deter been defined for the ITACA system. It is necessary to virtual loop location is properly defined and make necessary. The activity shall be carried out atleast of months or whenever required.	detection zones ection zones have o monitor that the changes to it if once in every six
	ii. Check for detector alarms: The ITACA system messages for malfunctioning of detectors. The alarr generated and viewed via the Graphic User Interface namely the Optimus. The Camera Maintenance Team Le	generates alarm m report can be e (GUI) of ITACA ead shall generate
		Page 16

SPECIFICATIONS FOR TRAFFIC WORKS SP-RT			
a daily report of iii) Physical ins cleaned and ch cleaned with a place once in e M/s. Traficon (Fl	the status of the detectors. spection and cleaning of camera: The necked for damages. The camera face soft cloth and mild detergent. The clean every six months. The maintenance man LIR) shall be provided	camera should be plate should be aning should take nual of the OEM	
CONTROL ROOM	CONTROL ROOM		
Supply, installation batteries providing quoted battery rac	Supply, installation, testing and commissioning of 3 kVA UPS along with batteries providing 30 minutes back up for 3 kVA UPS including MS powder quoted battery rack.		
Supply, installation batteries providing quoted battery rac	Supply, installation, testing and commissioning of 5 kVA UPS along with batteries providing 30 minutes back up for 5 kVA UPS including MS powder quoted battery rack		
Supply, installation batteries providing quoted battery rac	Supply, installation, testing and commissioning of 8 kVA UPS along with batteries providing 30 minutes back up for 8 kVA UPS including MS powder quoted battery rack		
Supply, installation batteries providing quoted battery rac	Supply, installation, testing and commissioning of 10 kVA UPS along with batteries providing 30 minutes back up for 10 kVA UPS including MS powder quoted battery rack		
Supply, installation batteries providing quoted battery race	Supply, installation, testing and commissioning of 10 kVA UPS along with batteries providing 120 minutes back up for 10 kVA UPS including MS powder guoted battery rack		
8 ports 10/100/10	8 ports 10/100/1000 Base T and 2x 1G SFP LAN Ethernet Switch		
Interface requirements	Minimum of 8 ports 10/100/1000 Base ports 1 x Out of Band IP based management Port	T and 2x 1G SFP Port , 1 Console	
Design & Performance	Each switch should have minimum 160 non blocking architecture and Forwardi Mbps Should be equipped with minimum 512 128MB flash Should have LED indicator for per port and Management Status 0°C to 45°C operating temperature and relative humidity	Gbps or more with ng rate of 10MB RAM andstatus , FAN, PSU10% to 95%	
Switching /	Support for IPv6 from day one Should have 16 K MAC Address, 255 a 802.1D spanning Tree, 802.1w, 802.1s BPDU Guard or equivalent feature on e	active Vlans , Should have edge port to auto	
	PECIFICATIONS FOR a daily report of iii) Physical ins cleaned and ch cleaned with a place once in e M/s. Traficon (Fill CONTROL ROOM Supply, installation batteries providing quoted battery rac Supply, installation batteries providing guoted battery rac Supply, installation batteries providing guoted battery rac Supply, install	PECIFICATIONS FOR TRAFFIC WORKS a daily report of the status of the detectors. iii) Physical inspection and cleaning of camera: The cleaned and checked for damages. The camera face cleaned with a soft cloth and mild detergent. The clear place once in every six months. The maintenance ma M/s. Traficon (FLIR) shall be provided CONTROL ROOM Supply, installation, testing and commissioning of 3 k' batteries providing 30 minutes back up for 3 kVA UPS in quoted battery rack. Supply, installation, testing and commissioning of 5 k' batteries providing 30 minutes back up for 5 kVA UPS in quoted battery rack. Supply, installation, testing and commissioning of 8 k' batteries providing 30 minutes back up for 8 kVA UPS in quoted battery rack. Supply, installation, testing and commissioning of 10 k batteries providing 30 minutes back up for 10 kVA UPS in quoted battery rack. Supply, installation, testing and commissioning of 10 k batteries providing 30 minutes back up for 10 kVA UPS in quoted battery rack. Supply, installation, testing and commissioning of 10 k batteries providing 120 minutes back up for 10 kVA UPS in quoted battery rack. Supply, installation, testing and commissioning of 10 k batteries providing 120 minutes back up for 10 kVA UPS in quoted battery rack. B ports 10/100/1000 Base T and 2x 1G SFP LAN Etherne Port Leach switch should have minimum 16 (non blocking architecture and Forwardi Mbps Should be equipped with minimum 512 128MB flash Should have 1ED indicator for per port	

	Should have MAC address tracking and notification for MAC address addition , delete or movement in the Network
	Should support MVR
	Local authentication database for RADIUS Authentication for 802.1x login
Security	Should have MAC security – Lockdown & Limit and MAC address tracking with syslog & snmp notification
	Should have SSH-2, SCP for secure management
	Should have dynamic arp inspection , DHCP snooping
	Should have scheduled archiving / uploading of configuration and system log to a central server
Management	Should support Trace route, Ping
	Web, Console and CLI management
	Model should have safety and standards certifications as below :
Certification	3:2010/EN6100, EU WEEE 2012/19/EU0-4-3:2006, FCC CFR 47 part 1,5 Class A, CISPR 32:2015, Class A, CISPR24:2010ClassA, Radiated Immunity 10V/m, Criteria A, UL60950-1 2ndEd, EU RoHS 2011/65/EU, EN 60825-1:2007 / IEC 60825-1:2007, EU WEEE 2012/19/EU

SF	ECIFICATIONS FOR TRAFFIC WORKS	SP-RT	
R2-RT-ATC 10.8	System Clock with GPS Specification Operating temperature: -25°C to +45°C (ambient) Weight: Electrical Connections: System supplied with a captive 25 metre length of 4-cd screened cable. For distances of up to 50 metres, the len by adding an additional length of 7/0.2 cable. For greate maximum of 200 metres, 16/0.2 (0.5mm2) cable should be 20 channel - capable of simultaneous tracking. Time to first fix - typically less than 1 minute from cold star Output of verified high accuracy time data - within 10 minut Accuracy: +/-50uS - 4860 Master Clock outputs MTBF: > 50,000 hours	ore 7/0.2 (0.22mm2) ogth can be extended er distances, up to a e used. t. ttes.	
R2-RT-ATC 10.10	Supply and Installation of HP LaserJet Printer (Black & White). The detailed technical datasheets have to be provided by the contractor after award of project/ contract.		
R2-RT-ATC 10.14.A	Supply & installation of PC upgrades additional RAM of 20	ЭВ	
R2-RT-ATC 10.14.B	Supply & installation of PC upgrades additional RAM of 40	θB	
R2-RT-ATC 10.14.C	Supply & installation of PC upgrades additional RAM of 80	ЭВ	
R2-RT-ATC 10.15	Supply of Keyboard		
R2-RT-ATC 10.16	Supply of optical Mouse		
R2-RT-ATC 10.17	Antivirus (Total Security including Internet) Renewal/ u years	pdates validity for 2	
R2-RT-ATC 10.18	Server for ITACA - Supply of HP Proliant DL580G10 Server, or any HP/ IBM higher configuration (or compatible with the said server) and capable of handling 500 signal junctions. Including 3 Years 24x7 Onsite Warranty.		
R2-RT-ATC 10.19	 HP ProLiant DL380p Gen8 (1) Intel® Xeon® E5-2643 (3.3GHz/ 4-core/10MB/8 GT-s QPI/130 W) Processor/ 10MB (1x10MB) Level 3/ 16 GB RAM PC3L-10600R (DDR3-1333) Registered DIMMS/HP Smart Array P420i/ZM (RAID 0/1/1+0)/ 8 SFF SAS/SATA HDD Bays; includes 6 SFF hard drive blanks/(1) HP 460W Common Slot Gold Hot Plug Power Supply (92% Efficient)/ 3 Years 24x7 Onsite Warranty. Refer datasheet on http://www8.hp.com 		
R2-RT-ATC 10.20	Memory for CCTV - 1 TB SATA 2.5" HDD (Hot swapp Server.	oable) - For archiver	
MUNICIF	AL CORPORATION OF GREATER MUMBAI	Page 49	

SP-RT

R2-RT-ATC 10.23 Supply, intsallation of Operator terminal Intel Processor based PC with it processor, 1TB HDD, 16GB RAM, 20.5 inch LED Monitor, 4 GB graphic carr with NVIDA facility, with the Licencse copy of operating System, Mocrosof office. R2-RT-ATC 10.24 HP Workstations Z220 SFF/Intel i7/8 GB/500 GB/Win 8 64 Bit/1 GB Graphic Card/3 Years Onsite Warranty HP Z200 SFF Workstation HP Z200 SFF Workstation HP Single Unit (SFF) Packaging HP Z220 SFF 240W 90% Efficient Chassis HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM remotely support for intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation:- The	R2-RT-ATC 10.21	Refer ME-9-2 & ME-9-2-c		
Supply, intsallation of Operator terminal Intel Processor based PC with Ti processor, 1TB HDD, 16GB RAM, 20.5 inch LED Monitor, 4 GB graphic carr with NVIDA facility, with the Licencse copy of operating System, Mocrosof office. R2-RT-ATC 10.24 HP Workstations Z220 SFF/Intel i7/8 GB/500 GB/Win 8 64 Bit/1 GB Graphic Card/3 Years Onsite Warranty HP Z200 SFF Workstation HP Z220 SFF 240W 90% Efficient Chassis HP Z220 SFF 240W 90% Efficient Chassis HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior	R2-RT-ATC 10.23			
R2-RT-ATC 10.24 HP Workstations Z220 SFF/Intel i7/8 GB/500 GB/Win 8 64 Bit/1 GB Graphic Card/3 Years Onsite Warranty HP Z220 SFF Workstation HP Z220 SFF Workstation HP Single Unit (SFF) Packaging HP Z220 SFF 240W 90% Efficient Chassis HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-OVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		Supply, intsallation of Operator terminal Intel Processor based PC with i7 processor, 1TB HDD, 16GB RAM, 20.5 inch LED Monitor, 4 GB graphic card with NVIDA facility, with the Licencse copy of operating System, Mocrosoft office.		
HP Z220 SFF Workstation HP Single Unit (SFF) Packaging HP Z220 SFF 240W 90% Efficient Chassis HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list	R2-RT-ATC 10.24	HP Workstations Z220 SFF/Intel i7/8 GB/500 GB/Win 8 64 Bit/1 GB Graph Card/3 Years Onsite Warranty		
HP Single Unit (SFF) Packaging HP Z220 SFF 240W 90% Efficient Chassis HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		HP Z220 SFF Workstation		
HP Z220 SFF 240W 90% Efficient Chassis HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		HP Single Unit (SFF) Packaging		
HP Z220 Workstation Country Kit Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		HP Z220 SFF 240W 90% Efficient Chassis		
Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU 8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		HP Z220 Workstation Country Kit		
8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM 500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room R2-RT-ATC 10.28 Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		Intel Core i7-3770 3.4 GHz (up to 3.9 GHz) 8MB 77W GT2 4C HT CPU		
500GB 7200 RPM SATA 6G 1st Hard Drive 16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		8GB DDR3-1600 nECC (2x4GB) Unbuffered RAM		
16X SuperMulti DVDRW SATA 1st ODD HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		500GB 7200 RPM SATA 6G 1st Hard Drive		
HP 3-3-3 SFF Warranty No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		16X SuperMulti DVDRW SATA 1st ODD		
No Factory OS Recovery Media Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Supervisor in the two shift from 7:00 am to 3:00 pm to 11:00 pm The indicative list of activities for the		HP 3-3-3 SFF Warranty		
Win8 Pro 64 downgrade to Win7 Pro 64 NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		No Factory OS Recovery Media		
R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		Win8 Pro 64 downgrade to Win7 Pro 64		
R2-RT-ATC 10.26 Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor afte award of project/ Contract. R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room R2-RT-ATC 10.28 Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		NVIDIA Quadro K600 1GB DL-DVI(I)+DP 1st No cables included Graphics		
R2-RT-ATC 10.27 OEM remotely support for ITACA issues OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm to 11:00 pm The indicative list of activities for the	R2-RT-ATC 10.26	Supply of A3/A4 Digital Copier /scanner with network printer with feeder. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract.		
OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer.R2-RT-ATC 10.28Operation And Maintenance For TPHQ Control RoomOperation:-The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the	R2-RT-ATC 10.27	OEM remotely support for ITACA issues		
R2-RT-ATC 10.28 Operation And Maintenance For TPHQ Control Room Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		 OEM has agreed to give support to the successful bidder selected by MCGM for their proprietary ITACA (Intelligent Traffic Adaptive Control Area) System and the Fault Management System. The support will be provided during normal working hours in country of origin. Before utilization of this item the contractor shall notify the issues to MCGM and should execute the said item with prior permission of the Engineer. 		
Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the	D2 DT ATC 10 28	Operation And Maintonance For TPHO Control Room		
Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the	NZ-RI-AIG 10.28			
		Operation:- The TPHQ control room is to be operated by the Control Room Supervisor in the two shift from 7:00 am to 3:00 pm and 3:00 pm to 11:00 pm The indicative list of activities for the		
Control Room Supervisor is as below-		Control Room Supervisor is as below-		

Activity List
1 Monitor and generate daily status of Operating mode of junctions (Master/Computer/ ITACA/ Flashing). Ensure all junctions (except 33 junctions on LBS) are operating in Real time adaptive mode (ITACA) 2 Check all MTNL link communications, generate a tracksheet on daily basis &follow up with MTNL in case there is a communication failure.
2. Escalate the issues to MCGM if not resolved within 24 hrs
3 Check availability of detection cameras & generate a tracksheet on daily basis. Follow up with MTNL in case there is a communication failure. Escalate the issues to MCGM if not resolved within 24 hrs
4 Make temporary changes to timing parameters (force orders) 5 Action Scheduling
6 Compose timing structure or make permanent changes to existing one
(.tbl files). In coordination with maintenance agency.
7 Configure Optimized offsets (In consultation with Traffic Engineer)
8 Update and improve Plan Library including Import data from TRANSYT and Adpative (In consultation with Traffic Engineer)
9 Configure Expert Traffic Rules Editor (In consultation with Traffic Engineer)
10 Link Calibration/ Validation (In consultation with Traffic Engineer)
11 Implement Temporary green wave if required (In consultation with Traffic Police)
12 Configure or modify ITACA systems components subarea/ countsite/ link/ junction/ route
The Control Room Supervisor shall be certified ITACA/ Optimus operator by OEM. The User Manual of the Graphic User Interface of ITACA namely the Optimus shall be made available.
Internet facility must be provided.
Leased Line Network- The contractor will booked the docket and follow up with MTNL in case there is a communication failure at any of the junctions, or the Control Rooms. The Contractor has to generate on daily basis the statement non-availability of MTNL network supported with track-sheet verifying link connectivity.
•
• Cleaning of server and related equipment (switches, modems) by vacuum cleaners with suitable attachments so as to achieve a total dust free environment.
•

R2-RT-ATC 10.29	 Server Maintenance:- The currently installed FATC control room is capable of handling 500 signal junctions. T provide Server Management Services with Comprehensive Support from the OEM (M/s. HP) or equivalent having min 3 years in similar works for the Fully Adaptive Traffic Cont Server and shall include the following along-with all other a necessary for optimum server operation- Periodic backups – Quarterly. 	Server at the TPHQ The Contractor shall e Maintenance imum experience of rol System/ ITACA actions, which are
	• Monitor Physical / Logical Disk Free Space. Disk a cleanups and maintenance. Activity to be carried out mont	nd file system hly.
	Monitor memory- monthly	
	• Re-installation, Updation of OS when necessary ar the same	nd maintaining log of
	Remote management tools- Operative remote constant rescue mode tools for remote server management. Cli Remote management tools monthly.	sole, remote reboot neck usability of
	• Check for hardware errors- Overheating notices, dinetwork failures should be logged, monitored and rectified Service Level Agreement.	isk read errors, as per the Minimum
	Check server utilization. Review server's disk, CPL utilization. Review to be done monthly	J, RAM and network
	• Check system security. Check server's security us tool such as Nessus. Activity to be done quarterly.	ing a remote auditing
R2-RT-ATC 10.31	Monthly Preventive & Corrective Comprehensive N Conditioner Spilt per unit	Maintenance of Air
R2-RT-ATC-10.33	Monthly Comprehensive Maintenance of Barco Video Wa	II per Cube
R2-RT-ATC-10.34	The MCGM Fault Management centre is to be operate Room Supervisor in morning working shift from 09:00AM indicative list of activities for the Control Room Supervisor Sr Activity List	ed by the Control to 05:00 PM The is as below-
	 Generate the Fault Management System logs and issu the street equipment maintenance team 	ie the same to
	2 Update the faults attended in the Fault Management S	ystem
	3 Maintain the Availability Calculation details as per Prof shall be made available	orma-I which
	The FMS Manual shall be made available	
	The Contractor shall also provide one housekeeping	personnel. Also
MUNICIP	AL CORPORATION OF GREATER MUMBAI	Page 52

	Internet facility must be provided		
R2-RT-ATC 10.35 to R2-RT-ATC 10.43	Preventive and Corrective Comprehensive Maintenance of FMS Server/ Operator terminals/Personal Computer per unit / UPS per unit/ HP Laserjet Printers per unit/ A3 Digital copier and Network Printer		
R2-RT-ATC 10.44	MCGM has set up a storage and repair depot at address mentioned in tender -		
	The following activities are to be carried out at the Storage depot.		
	Inventory Maintenance by the Store Keeper		
	Housekeeping, pest control, security &electricity charges of Storage space, Store Keeper's office and Store compound.		
	Responsibilities Of Store Keeper		
	The contractor under this contract has to provide a person responsible for inventory of all the equipments under the maintenance contracts of -		
	 Control room equipment if any 		
	•Street Equipment Maintenance of Mumbai Area Traffic Control System Island City, Eastern Suburbs and Western Suburbs		
	Video Detection camera maintenance		
	•CCTV maintenance contract.		
	•Material already procured by MCGM under previous contracts to be maintained as MCGM stock.		
	The store keeper is responsible for taking the inventory of all the procured equipments by the respective maintenance contractors and the existing MCGM stock. He will be also responsible for day to day issue of the equipments to the maintenance contractors. He should maintain records as directed by the respective in-charge of the contract, who will either procure or issue the material to the respective contractor		
	MCGM has appointed Asst. Engineer/ Sub-engineer/ Jr. Engineer for each region (City/ WS/ ES) and the Store Keeper has to work in co- ordination with the respective MCGM Engineer. The material will be issued/ or inwarded on the instruction of respective MCGM Engineer in- charge for that work who will also sign the Gate pass/ Delivery Challan while taking out/ inwarding the material.		
	The contractor shall provide security personnel 24X7.		
	Pest control should be done for rodents &Other pests from Godrej/ PCI. Housekeeping with 1 person on daily basis between 07:00 AM to 09:30AM. Also one computer with printer &Internet facility must be provided to the store keeper.		

R2-RT-ATC 10.47, R2-RT-ATC 10.52 & R2-RT-ATC 10.61	As per USOR description		
R2-RT-ATC 10.64	Review of ITACA System:		
	The brief scope of services that shall be provided are as below:		
	1. System Performance of ITACA		
	a. Fault analysis		
	b. System availability review		
	c. Detector performance review		
	2. Corridor management issues		
	a. Table synchronisation review		
	b. Sub area setup review		
	c. Optimisation of stand alone tables		
	3. Operational Issues		
	a. Identification of issues in any particular junction (either manual handling or parking etc.)		
	b. Review of response time of the Maintenance Contractors		
	c. Issues in the maintenance of the system		
	d. Actions to be taken to improve the system		
	 System Performance of ITACA a) Fault analysis – Area wise fault analysis (Island City, Western Suburb Eastern Suburb) for all junctions shall be done on the basis of daily generated faults in FMS system & manually. b) System availability review – The review of Server, MTNL & Power Supply down time shall be done. c) Detector performance review – The performance review of Vehicle Detection camera shall be done on the basis of daily generated faults in FMS system. 2. Corridor management issues a) Synchronisation review – The review of synchronization (flow v/s cycle) of each sub area shall be taken on the basis of historical data. Before review, junction plan & offset of all the junctions corresponding to that sub area shall be verified physically on site. b) Sub area setup review -The review on sub area set up shall be verified physically on site. c) Optimisation of stand alone tables – The junction parameters shall be physically verified at site location and same shall be conformed in ITACA system as mentioned below: I. Status of junction in Optimus II. Phase configuration in ITACA – Phases shall be verified as per site condition 		
	suggestion shall be addressed for the same to improve better optimization o		

ourrent signal approxim
Current signal operation.
iv. video Detector Loops – Loop configuration shall be verified physically on
Site.
V. Countsite – Countsite configuration shall be carried out and the detailed
report in this regard shall be submitted alongwith audit report.
VI. Link – The configuration of "In link" & "Outlink" shall be verified physically
on site. The link calibration shall be carry out and the parameters like
Discharge measure, Max Queue, Access time & congestion factor shall be
reviewed physically on site. The calibration procedure is detailed out under the
point "Link Calibration".
3. Operational Issues
a) Identification of issues in any particular junction (either manual handling or
parking etc.
b) Scheduler of the System shall be verified
c) Review of response time of the Maintenance Contractors
d) Issues of maintenance of the system - The monthly roviow shall be taken
with maintenance agongy in presence of MCCM Engineer
e) Suggestions to be taken to improve the system
Note: The reports of link calibration, Discharge measure, Max. Queue, Access
time & congestion factor shall be submit in each quarter.
The Audit & Calibration activities shall be carried out (excluding monsoon
period) as per following schedule:
Report Parameters Period Review
Quarterly report
System Performance Review For all ATC signal junction
Operational Review- For all ATC signal junction
Corridor Management (40 junctions approx)
First 15 days of quarter - Review of corridor Before calibration
2 months Link calibration
Last 15 days of quarter - Review of corridor after calibration
Note: The corridor shall be selected for the review in consultation with
Engineer.
Link Calibration
The calibration of approaches for the ITACA system is the basic task apart
from the configuration of controllers and the defining the logical sub areas for
the start-up of the adaptive control mode in real time
During the calibration period, the parameters that the traffic model needs to
individualise each approach are adjusted
These parameters are
1 Journoy Timo
measuring of Journey Time
1. Depending upon whether the approach is of the UPSREAM type (detectors
before the stop lne) of DOWNSTREAM (detectors after the stop line)"
UPSTREAM – The average length of time taken by a vehicle to move from the
detector line to the stop line.

DOWNSTREAM – The average length of time taken by a vehicle to move from
the stop line to the detector line.
2. To calculate this measurement, it is necessary that:
- The approach exit is not blocked.
- The Vehicles which are selected to be measured move the detector line past
the stop line in free flowing traffic.
3. The number of samples which must be taken has to be representative. Ten
is the suitable number.
4. The measurement is taken by an individual when the detector line and the
stop line are clearly visible by one observer. If this is not possible, two people
equipped with mobile phones or short wave radios would be required
2 Maximum Queue
Measuring the Maximum Queue
1 The maximum queue for an approach is the number of vehicles which fit
hetween the step line and the detector line. This parameter is abviously
coloulated for the LIDDTREAM type approaches
2. The best manufacturement which can initially be attained for this necessator is if
2. The best measurement which can initially be attained for this parameter is, in
the queue reaches up to the detector line, by counting directly along the lane
now many venicies are in the queue.
3. For those approaches where this never or rarely happens, it can be
estimated whether at least the queue formed takes up 40% of the total space.
3. Saturation Flow
Measuring the Saturation Flow
For measuring the saturation flow, a utility is provided within the system which
tremendously eases the task. Thus, the following will be required for taking this
measurement:
 One(or several) people on the street.
 One person in the control room.
– The Control system operating at the Computer Time System level.
- Communication between control room and the street via radio transmitter,
mobile telephone,etc.
 The journey time and maximum queue values must have been
previously calibrated.
- An initial value must additionally be provided for the approach Saturation
flow. For this purpose, the following values will be used.
- 1600 veh/h per lane, increased by up to 15% under very good conditions or
reduced by 15% under poor conditions.
- This can also be calculated using the following formula:
525 x width of the approach on the stop line
- Both the intersections for which approaches are going to be calibrated as
well as those to which the detectors defined for them must be put into ITACA
operating mode. This operating mode (which can be operated from the
software menu) only implies that the intersections will exerct on fixed time
bases (on the pertinent bourly plan) and they will transmit detector date to the
phases (on the pertinent houry plan) and they will transmit detector data to the
The approach to be collibrated must have its suit free unblacked or have
- The approach to be calibrated must have its exit free, unblocked of have
such a queue that a slower than expected dispersal takes place.
- The detector line can not be invaded by the queue, and the queue must

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 56

 disperse with sufficient time while the light is on green at the approach. An overly congested approach cannot be properly calibrated. A queue of at least 5 vehicles per lane must have formed by the time when the light at the approach switches to green. Once the intersections involved are in the ITACA operating mode, the observer on the street can tell the
control room to start the calibration. The names of the approaches to be calibrated must be provided first. If the intersection is not operating on ICF or the detectors are faulty, the calibration unit warns of the problem. Once the calibration has begun, the communications can be cut off. As of the time at which the command to commence the calibration s given, there is a single- cycle lapse for collecting data from the system. Subsequently, data is picked up every cycle for the following values:
 Length in vehicles in the queue precisely when the intersection switches to green.
– Length of time the queue takes to disperse. This is measured from the time at which the light turns green until the last vehicle (which, not as yet being exactly in the queue, slow down due to there being a queue ahead) across the stop line.
 These measurements are taken for approx. 10 cycles or somewhat fewer (6), if the sum of the dispersal times exceeds 100 seconds. (1st measurement+2nd measurement+_)
Once all the information is obtained, the observer on the street informs the control centre, and the calibration is commanded to halt. This utility progressively requests the number of samples taken and the data gathered (it is possible for some of the samples not to be taken into account, and this can be stipulated). When all the data have been entered, the program responds with a Saturation flow values for the approach calibrated and a new Maximum
queue value. Both are automatically recorded in the databse (configuration) of the system.
To calibrate the approaches for ITACA, the following material and human resources are required.
– One person in the control room who is responsible for starting the calibration utility, putting junctions in ITACA function mode and receiving the data that has been collected by the team in the street.
 It is normal to have work groups in the street consisting of three or four people (the average number of approaches per junction is usualy 3) equipped with a single mobile phone or radio transceiver, chronometer, master plans and a measuring wheel in case it is necessry measure the maximum queue length.
- Taking into account that the average junction has 3 approaches; considering the displacements and measurements that they have to take (time, queue length and rate) a team of three people could take an hour to calibrate a junction.
Note: It is important that the measurements are taken in a discreet manner so as not to distract the drivers and so cause changes in their normal driving habits. It is advisable for the team to carry documents that authorise them to undertake the work.

SPECIFICATIONS FOR TRAFFIC WORKS				SP-RT
	Commissioning & Testing Once the calibration completed, the system is then set into operation for the purpose of observing its working order. A check can be made regarding the extent to which the calibration is correct by focusing special attention on: – Correct calculation of queues – Correct calculation of field unit times (cycle, distributions and phase shifts). Based on the observations made and the data collected, an adjustment in the weights and the corrections of those measurements which are deemed advisable will be made.			
	 The following data / assistance shall be provided by MCGM/ maintaining agency appointed by MCGM- 1. Access to and copies of the maintenance software data 2. Access to and copies of the ITACA data 3. Permission to access the control rooms for reviewing system parameters and data collection 4. Permission to access local level controllers to evaluate hardwar performance 			
R2-RT-ATC 10.65	5. Any maintenance data provided by the Maintenance contractors. Providing 12 Mtr Maclifton on hire for CCTV and Video Detection Cameras per Shift of 8 hrs			
R2-RT-11	CCTV Cameras			
R2-RT-ATC 11.1	Type Of Camera	:	Outdoor PTZ dom High Definition came	e type infrared IP era
	Image Sensor	:	1/2.8" Progressive S	Scan CMOS
	Video Resolution	:	High Definition, 192	0x1080
	Lens	:	30X optical zoom better)	(4.3-129 mm or
	Day/Night Operation	:	Required/ Automation	2
	Iris Exposure Control	:	Auto mode/ manual	mode
	Horizontal Angle Of View/ Vertical Angle of View	:	90° - 30°/ 65° - 22°	
	Min. Illumination / Light Sensitivity (Lux)	:	Color: 0.3 lux at 30 B/W: 0.01 lux at 30 Color: 0.4 lux at 50 B/W: 0.02 lux at 50	IRE F1.6 IRE F1.6 IRE F1.6 IRE F1.6

Video Compression	:	H.264
White Balance	:	Automatic
Electronic Shutter	:	Automatic
Dual Streaming	:	Required. Both the streams shall be of H.264. the resolution for each stream shall be same as the resolution of the camera (i.e. 1080p for HD dome IP cameras)
Frames Per Second	:	25 fps for viewing
Signal to Noise Ratio	:	>50 dB
Motion Detection	:	Built-in Required
Back Light Compensation	:	Required, On/Off
Tampering Alarm	:	Required (tampering such as de-focus/ move viewing direction/ masking)
IEEE 802.1x Compatible	:	Required
Network	:	IP v4/ v6
Network Protocols	:	TCP, IP, HTTP, HTTPS, IGMP V2/ V3, SMTP, SNTP, SNMP
Power	:	PoE IEEE 802.3af / 230V AC/ 24V/12V AC/DC
Network Connectivity	:	10/ 100 Base-T, auto-sensing, full duplex, RJ 45
AGC	:	Required
Housing	:	Vandal Proof, IP 66, Rugged, Durable, Dome shall be clear with UV blocking & anti-scratch coating
ONVIF Compatible	:	Required
PAN/TILT/ZOOM Camera (PTZ)	0.4.5	Deswined
PAN: 360° TILT: Minimum 180°	2.1.5	ĸequirea

			1
	optical & 12x digital		
	Operating Temperature	:	0-50deg.
	Mounting accessories	:	Vendor/ Contractor shall provide the appropriate mounting arrangement stanchions, brackets & all mounting accessories like mounting brackets, nut bolts shall be of die-cast aluminium/ corrosion resistant material for indoor & outdoor cameras.
	IR filter	:	Required
	Wide dynamic range	:	>80dB, required
	Embedded comprehensive (multi-segment polygons an minimum filters like Object: Auto tracker, Dwell, Speed Filter, Object Classification, VCA follow;	Intellig d lines) Enter, d, Una Logica	ent Video Analytic with Up to 40 zones 60 VCA filter rules in total should include Exit, Appear, Disappear, Stop, Direction, uthorized Access, Counting Line, Color I Rules; PTZ Object Auto tracking, fit with
	VCA Features: Up to 20 accuracy people and vehic service, VCA calibration via definable object class to incl	Onscre de cou 3D too ude inte	en Counter Displays, Counting-Line for nting with local database and reporting ols for right object size detection, Several o the detection rules for the VCA alarm.
R2-RT-ATC 11.2	As per USOR description		
R2-RT-ATC 11.3	As per USOR description	As per USOR description	
R2-RT-ATC 11.4	As per USOR description, Refer drawing no RT-ATC 11.4		
R2-RT-ATC 11.5	As per USOR description, Refer drawing no RT-ATC 11.5		
R2-RT-ATC 11.6A	SN VIDEO MANAGEMEN	T SOF	TWARE
	1 Video Management S level software solution solution that shall be s of third party security i be capable of worki platforms.	oftware . It sha calable nfrastru ng on	a shall be a highly scalable, enterprise all offer a complete Video Surveillance e. It shall allow for seamless integration acture where possible. The system shall Windows OS and Windows Server
	2 The software shall con loadable units. If it con servers, they shall be cost shall be included i	ne prei nes as as per n the q	ferably as one unit and not as multiple multiple loaded units requiring multiple NVR specification of this tender and the uoted price of each software unit.
	3 The software shall not user seats/installations scalability at no manage	have se on the jement	eat-licensing, allowing for any number of IP video network to be added for future software cost. If seat licensed software

	is to be quoted then it shall have 32 such recording licenses per site.
	Recording license not applicable.
4	The manufacturer supplied management software pack shall have a
	separate file player to authenticate and play exported files.
5	The SOFTWARE shall allow for video to be streamed on a video
	mosaic wall. The price of the same shall be included in software cost.
	In case VGA output from one client, video wall with processor is not in
	bidders scope & in that case mosaic wall not required.
6	The Software shall provide user licenses for at least 7 users (to
	be included in software cost itself).
7	The system shall allow operation with/without a PC keyboard, Joy
	stick or mouse. Once system is configured, virtual matrix functions
	can be carried out using CCTV keyboards
8	The SOFTWARE shall provide the following:
	Automatic search and registration of components of proposed system
	on the network. They can be Cameras, Monitors, Alarm panels,
	NVRs.
	The system shall allow for live view, playback and system
	configuration of the IP video system.
	The system shall allow for creation of multiple users and user groups
	and assign tasks to each.
	Drag & Drop functions for most functions on the system and also for
	set up of connection between cameras and monitors
	Several simultaneous live picture connections of camera in network. It
	shall be capable of showing video pane layouts including 2x2, 3x3,
	4x4, various Hot Spots (1+5, 1+7, 1+9, 1+12, 1+16) and custom
	layouts.
	It shall be possible to display video and audio bit rates; frame rate and
	resolutions on each video pane as overlays.
	The live view SHALL be capable of highlighting motion as green
	rectangle overlays and displaying real time alarm information over
	layed on the live video feed.
	n shall be possible to listen to audio from individual encodel/ cameras
	Audio shall be simultaneously transmitted from the Operator to allow
	a two-way conversation
	It shall be possible to establish hi-directional audio connection on
	alarm. The user shall also be able to disable listen when speaking to
	prevent feedback through the microphone
	System setup for pre-defined surveillance tasks to be invoked at pre-
	defined times in the day.
	Programming of automatic recording events on NVR, maybe based
	on events such as alarms and video analysis Remote maintenance
	of IP Video components
	It shall be possible to show text on screen display (OSD) when video
	is displayed on a Receiver. The OSD shall detail the camera name,
	number, date and time (in the time zone of the VIDEO Encoder)
	It shall be possible to establish bi-directional audio connection on alarm. The user shall also be able to disable listen when speaking to prevent feedback through the microphone. System setup for pre-defined surveillance tasks to be invoked at pre- defined times in the day. Programming of automatic recording events on NVR, maybe based on events such as alarms and video analysis Remote maintenance of IP Video components It shall be possible to show text on screen display (OSD) when video is displayed on a Receiver. The OSD shall detail the camera name, number, date and time (in the time zone of the VIDEO Encoder)

9	The Software shall allow the following:
	Live display of cameras
	Live display of camera sequences & salvos.
	Control of PTZ cameras
	Playback of archived Video at speeds of x1/4 – x16
	Retrieval of archived Video using normal playback, thumbnails (event
	or time based)
	Instant Replay of Live Video
	Use of site maps
	Configuration of system settings
	Execution of Salvos, Guard Tour & sequences using tasks or
	manually
10	For each camera set up hit rate, frame rate, and resolution shall be
10	For each camera set up bit rate, frame rate, and resolution shall be
	set independent of other cameras in the system. Altering the setting
	of one shall not affect the settings of other cameras.
11	PTZ Operations:
	Each Camera and SOFTWARE shall be able to operate with PTZ
	protocols of the offered cameras.
	Named presets (up to 64) and custom commands (up to 64) shall be
	supported per camera, invoked from SOFTWARE.
	User priority between 1 and 5 shall be allocated for PTZ enabled
	transmitters.
12	The software shall allow for using .BMP format area maps.
13	The software system shall be capable of handling camera and alarm
	icons on area maps. The area map shall be configurable to pop up
	upon the receipt of an alarm received from a VIDEO Encoder on the
	map. This can be on the same or other monitors on the PC
14	The Software system shall allow direct connection of control keyboard
14	to the DC workstation running the SOFTWARE for virtual matrix
	Uperations.
15	The software shall be capable of monitoring the status of camera in
	the network and shall indicate when a device goes offline by suitable
	red cross across the camera.
16	The system shall be able to carry out a motion search on recorded
	video and highlight motion in the playback bar and also as motion
	event based thumbnails to navigate straight to that event in recording.
17	The alarm and map window shall have docking facility on the main
	screen.
18	The SOFTWARE shall have the following facilities:
	Retrieve data with "alarm on" with key on live video screen
	Search of recorded images based on motion congestions counter
	flow time date alarmete
	Shall support 22 Video streams consurrantly on a work station
	Shall support 52 video streams concurrently on a work station
	Shall allow 5 levels of user and Alarm prioritization
	Shall allow 32 cameras to be replayed simultaneously from one NVR
	Auto-protecting of video recording on post and pre "alarm" images.
	The hashing function and a bit key shall describe a digital signature of

		the video images and be watermarked into files of	exported images.
		Shall have facilities for play, forward, rewind, paus	e along with fast
		forward and rewind for reviewing the recorded vide	eos.
		Shall be capable of 4 X 4(max) viewing panes at 1	6 frames.
	19	Video Management Software must be ONVIF/S- F	rofile available on
		www.onvif .com	
	20	The Software shall provide Electronic Map or Goo	gle 2D support, in
		which user shall be able to View Video by Double	Click mouse on the
		camera with Bidirectional Intercom Facility on Map).
	21	The VMS should have Double stream support so c	one Stream can be
		used for Viewing and other for Recording.	
	22	The VMS shall support hashing Function and bit k	ey which describes
		a digital signature the video images and be watern	narked into files of
		exported images to prove Video is not tampered.	
	23	The VMS should compatible with H.264, MJPEG a	and G7.11 and
		above compression technology.	
	24	VMS shall provide manual recording, auto recordir	ng, alarm recording
		and motion recording	
	25	Remote maintenance of IP Video components: It s	hall be possible to
		show text on screen display (OSD) when video is	displayed on a
		Receiver. The OSD must detail the camera name,	number, date and
		time (in the time zone of the VIDEO Encoder).	
	26	Unicast and Multicast Support	
R2-RT-ATC 11.6B	Supp	ly of VMS software camera License for ENTERF	RISE Master server
	syste	m	
R2-RT-ATC 11.6C	Supp	ly of Review/ Smart client License	
R2-RT-ATC 11.6D			
	VMS	Maintenance and support services per year	
R2-RT-ATC 11.7	Instal	lation, testing and commissioning of Master recorde	er VMS software with
	per ca	amera review license and per camera license.	
R2-RT-ATC 11.8	Clear	ning of CCTV Cameras: - It is expected from the cont	tractor to clean the
	CCT\	/ as per user manual of M/s. Verint so as to ensure of	lear visibility in the
	Traffi	c Police HQ/ Disaster control room.	
R2-RT-ATC 11.9	Preve	entive and Corrective Maintenance of CCTV Cam	era:
	i) Res	sponse time: The response time is the time taken by	Contractor to attend
	a par	ticular fault from the time of registration of fault. The	response time for all
	faults	is maximum of 3 hours.	,
	ji) Ro	solution Time: Resolution time is the total time tak	en by the Contractor
	betwe	een registering the complaint by Traffic Police and	completely rectifying
	the fa	ult. All the calls are to be closed within the Resolution	n time as per SLA.
R2-RT-ATC 11.10			
	CCT\	/ Server Comprehensive Maintenance Yearly	
MUNICI		PORATION OF GREATER MUMBAI	Page 63
			1 460 00

SP-RT

R2-RT-ATC 11.11	Refer Drawing No. RT-ATC-11.11
R2-RT-ATC 11.12	Encoder
	 VIDEO Input : 1 composite, 1 Vpp into 75 ohms NTSC/PAL, BNC female Quadruple Streams : 3 x H.264, 1 x MJPEG streams Performance : D1/30fps on all streams simultaneously for up to 10Mbps Compression : H.264 (MPEG-4 Part 10/AVC) Main Profile and MJPEG Resolution : Scalable from CIF (352x240 pixels for NTSC; 352x288 pixels for PAL) to D1 (720x480 pixels for NTSC; 720x576 pixels for PAL) Frame Rate : 1-30fps NTSC, 1-25fps PAL programmable (full motion) Bandwidth : Each stream configurable from 30Kbps to 6Mbps
	 NETWORK Interface 1 : RJ-45, Ethernet 10/100 Base-T Protocols : Transport: RTP/IP, UDP/IP, TCP/IP, RTSP, or multicast IP; Others: DNS, NTP, SNMP v1/v2c/v3 (MIB-II), HTTP, HTTPS, DHCP client and 802.1x Security SSL-based authentication, password protected, HTTPS
	 SERIAL AND USB PORTS Electrical Levels : Port 1: RS-232 (max. 230 kbps) pluggable clip-terminal strip or RS-422/485 2/4 wires (max. 230 kbps) pluggable clip-terminal strip Operating Mode : Transparent serial port supporting any asynchronous serial protocol Storage : SDHC MicroSD Card, up to 32 GB (SD card not included)
	ALARM • Input : 2 dry contacts • Output : 1 relay contact (48V AC/DC at 100 mA max.)
	AUDIO • Bi-Directional : Input: -46 to -3 dBV into 30 Kohms (line or microphone input) Output: -46 to -3 dBV into 16 ohms min. • Connectors : 1/8 in. (3.5 mm) stereo jacks
	 POWER Supply Voltage : 12V DC +/- 10% Power Supply : 12V DC included with non-PoE models Power Consumption : Max. 5W Max. Output Power : 5W (with PoE models only)

SP	ECIFICATIONS FOR TRAFFI	IC WORKS	SP-RT
	PHYSICAL • Enclosure : Metal cas • Dimensions : 4.2L x 3 • Weight : 9.2 oz. (260 g • Operating Temperatur 32°F to 131°F (0°C to 5 • Humidity : 95% non-c • Firmware Embedded	se with flange mount (black) 3.5W x 1.7H in. (106L x 90W x 42F g) re : 32°F to 140°F (0°C to 60°C) [6 5°C)] condensing at 140°F (60°C) Linux-based operating system	H mm) except PoE model:
	MANAGEMENT • Configuration and Firr Center (single device a Web browser interface	nware Upgrade : Supported throu nd batch mode firmware upgrade) (single device firmware upgrade)	igh Verint Control , SConfigurator, and
	CERTIFICATION AND • USA RoHS compliant • Canada ICES03 class • Europe CE marking (E	<u>REGULATION</u> UL, FCC Part 15 (Subpart B, Clas A EN55022, EN55024)	ss A)
	 OPTIONAL ACCESSO 19-inch rack mount pa Power over Ethernet i 	RIES anel for 8 units of the Verint S1800 njector	e series
R2-RT-ATC 11.13	Supply of 48 ports 10/100/1000 Base T and 4 x 10G SFP+ ports Ethernet Switch for CCTV		
	Interface requirements	Minimum of 48 ports 10/100/10 10G SFP+ ports 1 x Out of Band IP based ma Console Port, USB Port / Extern Support stacking for upto 8 swit 40 Gbps stacking.	000 Base T and 4 x nagement Port,1 al Flash ches with minimum
		variable speed fan to adjust to variable in campus	arying weather
	Design &	Each switch should have minin more with non blocking Forwarding rate of 130 Mpps Should be equipped with minimu	mum 176 Gbps or architecture and um 1GB RAM and
	Performance	Should have LED indicator for p FAN, PSU and Management St	er port status , atus
		0°C to 50°C operating temperate 95% relative humidity	ure and 10% to

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 65

	Hardware and software configuration have for IPv6 from day one
	Should have 16 K MAC Address, 4K active Vlans
	Should support 10 K ARP entries
	802.1D spanning Tree and PVST+, 802.1w, 802.1s , Should have BPDU Guard or equivalent feature on edge port to auto disable port for a configurable time period to if an accidental loop occurs in the network
	Should support aggregating and load balancing of traffic to two or more peer switches within same VLAN
	Should support G.8032 standard based protocol for ring backbone
	Should have Port based VLAN, MAC based VLAN, private vlan and 802.1 AK for dynamic VLAN propagation
	Should have Local ,Remote and multisession port mirroring (minimum 4 session)
Switching / Routing	Support Standard based protocols for lossless transport of real time data with dynamic QOS reservation.
	Should have 8 Hardware QOS Queues per port
	Should have traffic rate limiting with Configurable bandwidth granularity of 8 Kbps
	Should have Link Layer Discovery Protocol (802.1ab) to allow recognition of third party network devices and LLDP MED for auto configuration
	Should have MAC address tracking and notification for mac address addition , delete or movement in the Network
	Should support policy based routing and switching
	Should have basic dynamic routing protocols like RIP from day 1 and be upgradeable to OSPF , PIM , VRRP
	Should have Configurable multicast session limit per port
Security	Local authentication database for RADIUS Authentication for 802.1x login

		Should have MAC security – Lockdown & Limit and MAC address tracking with syslog & snmp notification
		Should have SSH-2, SCP, SFTP for secure management
		Should have dynamic arp inspection , DHCP snooping, Private VLAN, SYN attack protection, GARP protection
		Should have ASIC based traffic flow analysis based on Netflow/ sFlow/ lpfix
		Should have minimum 1 K ACL entry support and Time Based ACL
		Should have scheduled archiving / uploading of configuration and system log to a central server
		Should support inbuilt DHCP server and Client for quick configuration of endpoints and switch
		Telnet server , ssh server, Ping and trace route over Ipv6
	Management	Should have L2 Trace route, L2 Ping and Multicast Traceroute
		Web, Console and CLI management
		Dual firmware and configuration rollback
		Should be SDN capable with Open stack support and OpenFlow API support, Should support IEEE P802.1Qaz
		Inbuilt browser based bandwidth monitoring
		Should support Energy Efficient Ethernet 802.3az
		Model should have safety and standards certifications as below :
	Certification	IEC61000-4-6:2008/EN61000-4-6:2009, IEC61000-4-8:2009/EN61000-4-8:2010, EN 55022:2010 Class A, CISPR 22:2008 Class A, CISPR24:2010ClassA, Radiated Immunity 10V/m, CriteriaA, UL60950-1 2ndEd, CE 2.0 Compliant
RT-ATC-11.14.A	20 Mtrs. VGA Cable with	connectors
RT-ATC-11.15	As per USOR Descriptio	n
R2-RT-ATC 11.16	It is expected that the c	contractor should provide one technical support staff

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 67

	who has minimum of two years of experience in operation of CCTV and the operator is responsible for daily availability reports & weekly recording status reports on system availability to MCGM/traffic police. The technical support staff will be placed in the Traffic Police HQ and MCGM Disaster Control Room as per the instructions of the Engineer. The technical support staff should be capable of imparting basic operator's training as and when required as per instruction of Engineer.
R2-RT-ATC 11.14	VGA Cable with connectors 20 Mtrs. VGA Cable with connectors
R2-RT-ATC 11.15	As per USOR description
R2-RT-ATC 11.16	It is expected that the contractor should provide one technical support staff who has minimum of two years of experience in operation of CCTV and the operator is responsible for daily reports on system availability to MCGM/traffic police. The technical support staff will be placed in the Traffic Police HQ and MCGM Disaster Control Room as per the instructions of the Engineer. The technical support staff should be capable of imparting basic operator's training as and when required as per instruction of Engineer.
	bullet camera with VCA as overview camera Image Sensor SONY STARVIS 1/2.8" 1080p CMOS Effective Pixels 1920 x 1080 Scanning System Progressive scanning AGC Control Auto, adjustable amplification level Auto IRIS (DC) Iris control via camera unit Minimum Illumination Color: 0.2Lux / 0.01Lux (DSS On) B/W : 0 Lux (IR LED On) Lens 2.8(w) – 12.0mm(t), F1.4(w) – F2.6(t), Motorized Focus & Zoom Control – One Click Focus Function Angle of View Horizontal: Approx. 99°(Wide) to 35°(Tele) Vertical: Approx. 54°(Wide) to 20°(Tele) Day & Night Switching Auto/Manual (both switching level adjustable 1 ~ 64) removable IR Cut Filter Image Settings Configurable brightness, contrast, saturation, sharpness, vertical flip & horizontal mirror function, Corridor Mode (-90° / +90° image flip) Wide Dynamic Range Up to >80dB Dynamic Range with activated WDR
	Backlight Compensation BLC On/Off (possible to designate zone) IR ILLUMINATOR

IR LED High Power IR LED x 16 (850nm)
IR Working Distance up to 35m (115ft)
Video Compression
H.264 Baseline, Main, High profile (MPEG-4 Part
10/ AVC), MJPEG (Motion JPEG)
Resolutions 16:9 mode
1920x1080, 1280x720, 1120x630, 960x540,
800x450, 640x360, 480x270, 320x180
4:3 mode
SXGA(1280x960), XGA(1024x768), SVGA
(800x600), PAL(720x576), NTSC(720x480)
VGA(620x480), QVGA(320x240)
Frame Rate
H.264: Configurable up to max 30fps in all resolution
MJPEG: Configurable up to max 30fps in all resolution
Motion Detection
Max. 8 zones with independent configuration of detection sensitivity and target
object size
Privacy Mask Zones
4 flexible configurable regions
Analogue Video NTSC/PAL Video Signal (1.0Vp-p. 750)
Ethernet Standard/IP 10 / 100 Base-T / IPv4. IPv6
Protocol
QoS Laver 3 DiffServ. TCP/IP. UDP/IP. HTTP.
HTTPS, FTP, RTSP, RTCP, RTP/UDP, RTP/TCP.
mDNS, UPnP™, SMTP.DHCP, DNS, DvnDNS,
NTP. SNMPv1/v2c/v3(MIB-II), IGMP.ICMP.
SSI v2/v3. TI Sv1. SRTP. RTMP
Users Connection Live viewing for up to 10 clients
Security
HTTPS(SSL), IP Filtering, Multi-level access with password protection NERAL
I/O Terminal
1x Alarm In - max 50mA@5VDC. TTL
1x Alarm Out - max 50mA@24VDC. TTL
Edge Storage
Via micro SD/SDHC (up to 32GB) card for continuous or event recording.
Search interface for event files, playback and download (card not included).
Application Programming Interface
Software Development Kit (SDK) available
Event Metadata
Streaming RTSP/RTP
Video Motion Detection(MD), Video Content
Analytics(VCA)
ONVIF Version: 2.41 (Support Profile S and G)
Event Sources
Sensor(DI), Video Motion Detection, Tamper
Detection, Video Content Analytics(VCA),
Detection Zones and Rules

SP-RT

SPECIFICATIONS FOR TRAFFIC WORKS

	Up to 40 zones (multi-segment polygons and lines) 60 VCA filter rules in total Tamper Detection
	Recognize camera tampering via VCA detection
	(defocusing, lens covering, camera moving)
	Available License
	VCAdetectIP VCAcountIP VCAadvancedIP VCAprofessionalIP
	VCA Detection Filters
	Object: Enter Evit Annear Disannear Ston
	Direction Dwell Speed Unauthorized Access
	Counting Line, Color Filter, Object Classification
	Un to 20 Observed Counter Displays
	Counting Line for ecouracy people and vehicle
	Counting-Line for accuracy people and vehicle
	Service \Box VCA collibration via 2D tools for right chiest size
	Celection
	detection rules for the VCA slorm
	\Box 10 colors in total to distinguish chiests by color
	Decolors in total to distinguish objects by color Decolor tracking mode to tracks individuals
	Beatman Banart above relative around density of
	the 24 hour period (eriterion) midnight)
	Logical Pulos
	Evention of clorm rules using logical operators
	(AND, OD) for the VCA detection filters of
	(AND, OR.) for the VCA detection filters of
	created zones / lines
R2-RT-ATC 11.18.A	Supply of Speed and vehicle classification radar sensor:
	The specification should be equal or HIGHER/ BETTER than the requirement indicated below
	1. Frequency : K Band: 24,125 GHz
	2 Range of detected speed: From 5 to 250 km/b
	3. Protection level: IP65
	4. Power supply: 10-30 V AC, 10-42 V DC
	5 Power consumption: $< 1 VA$
	6 Transmitted power: $< 5 \text{ mW}$
	7 Operating temperature range: From -40° C to $\pm 75^{\circ}$ C
	8 Dimensions: $200 \times 120 \times 100 \text{ mm}$
	9 Precision: - Speed 98%
	- Counting : 98%
	- Length · + 1m
	10. Protection lovel: IP65 or higher
	11. Interface: RS232, RS422, RS485, TCP/IP, Wifi, Bluetooth

	minute, sec, 100th sec), speed, length and direction
S w o 3	Standards: CE (electromagnetic compatibility and electrical safety) : Complies with the essentials requirements of Article 3 and the other relevant provisions f the R&TTE Directive 1999/5/CE, when used for its intended purpose (Article .1.a : EN 60950 ; Article 3.1.b : EN50082-2 ; Article 3.2 : EN 300 440-2)
R2-RT-ATC 11.18.B	
Ir	nstallation & Commissioning of Speed and vehicle classification radar sensor
R2-RT-ATC 11.19.A S	Supply of Additional illuminator for ANPR
H	lardware specification should be equal or HIGHER/ BETTER than the equirement indicated below-
i.	Type: IR illuminator 780 nm/ 850 nm/930 nm
ii.	Illumination Range: 15 to 20 feet
E	Invironment Protection: IP67
R2-RT-ATC 11.19.B	estallation & Commissioning, of Additional illuminator for ANDD
	istaliation & Commissioning of Additional liluminator for ANPR
R2-RT-ATC 11.20.A S	Supply of ANPR license with Processing Unit with Central Control Software
Т ir	he specification should be equal or HIGHER/ BETTER than the requirement ndicated below-
T si tr p b sy	The ANPR System shall enable monitoring of vehicle flow at entry/exit and at trategic locations. The system shall support real-time detection of vehicles at ne deployed locations, recording each four wheeler, reading its number late, database lookup from central server and triggering of alarms/alerts ased on the vehicle status and category as specified by the database. The ystem usage shall be privilege driven using password authentication.
Т	he ANPR System shall have the following in built features:
1	. Vehicle Detection and Video Capture Module
	The System should automatically detect a vehicle in the camera view using motion detection technology and activate license plate recognition.
2	. License Plate Detection
	a. The System shall automatically detect the license plate in the captured image frame in real-time.
	 The system shall perform OCR (optical character recognition) of the license plate characters (English alpha-numeric characters in standard fonts).
	c. The System shall store HD resolution image in JPEG format of vehicle and license plate and enter the license plate number into database (MS SQL/MySQI/ PostgreSQL) along with date timestamp and site location details.
1	d System should be able to detect and recognize the English alpha

a. b.	The system shall enable easy and quick retrieval of snapshots and other data for post incident analysis and investigations. The system should provide advanced and smart searching
b.	and other data for post incident analysis and investigations. The system should provide advanced and smart searching facility of License Plates from the database. There should be
a.	The system shall enable easy and quick retrieval of snapshots and other data for post incident analysis and investigations. The system should provide advanced and smart searching
5. Vehi	detection of any vehicle falling in the Hotlisted categories.
b.	 according to the hotlisted categories like "Wanted", "Suspicious' "Stolen", etc by authorized personnel. The system should be able to generate automatic alarms to aler the control room personnel for further action in the event of the control room personnel for further action.
4. Alert a.	Generation The system should have option to input certain license plates
D.	post event analysis by the vehicle color or the vehicle color with license plate and date time combinations.
Ŀ	view during daytime and label them as per the predefined list c configured system colors. The system will store the colo information of each vehicle along with the license plate information for each transaction in the database.
3. Color E a.	accuracy. Detection The system shall detect the color of all vehicles in the camera
f.	vehicles with speed even up to 120 km/hr. The system shall be robust to variation in License Plates in terms of font, size, contrast and color and should work with good
e.	wheelers including cars, HCV, and LCV. The system should be able to process and read number plates of
SP-RT

	Central Control Software		
R2-RT-ATC 11.21A	Supply of Road side processing unit with Processor, storage, communication modem, battery charger, watch dog module within IP66 casing including power & data cabling, mounting brackets and fixtures: Road side processing unit compatible with the ANPR system as detailed in R2-		
	Installation & Commissioning of Road side processing unit with Processor, storage, communication modem, battery charger, watch dog module and IP66 casing, cabling, mounting brackets and fixtures		
R2-RT-12	VARIABLE MESSAGING S	IGNBOARDS	
R2-RT-ATC 12.1	VMS Technical Specificati EN 12966 Equivalent	ons:	
	Display type	: Fully programmable Red Amber Dual Colour- Full Matrix LED Display	
	Display Pitch	: 25mm	
	Size	: 2.88 Mtrs X 1.44 Mtrs Display	
		Outer cabinet 3.18 X 1.74	
	Display Resolution	: 150(Columns) X 72(Rows) Pixels	
	Lighting Element :5mm High-bright through hole LEDs reputed manufacturers such as CREE, NH AVAGO with polycarbonate lens and concurrent drive technology for higher light of and better visibility. Pixel Configuration :3LEDs(minimum) per pixel, 1 each of GREEN & BLUE colour		
	Lighting Colour	: As per EN12966, Class C1/2	
	Luminous Intensity	: As per EN 12966, Class L3	
	Contrast Ratio	: As per EN12966, Class R2	
	Beam Width	: As per EN12966, Class B3	
	Display Capacity:Fully programmable Pictograms & Elingual(English & Indian language) Texts with pre-loaded Fonts to display minimum 3Lines over 20 characters per line, Facility to creat configurable Text height through Application softwareDisplay Styles:Steady, Flash, Partial Flash, Right Entry, Le Entry, Top Entry, Bottom Entry, Center spreat Blank, Dimming (255 levels 0% to 100%)		
	VMS Storage Capacity	: Over 100 Images/Messages	
	VMS Message creation	:Through Central Control Room Application or via local portable computer loaded with relevant	

	ooftworo
	Soliwale.
	GSM/GPRS Modem
VMS Diagnostics	: Pixel wise diagnostics in with remote preview with automatic Health/Error/Event alert
Communication	: On wireless (GSM DATA/GPRS/3G) channel with NTCIP compliant protocol to work with third- party Central Control Room Integrated HTMS software in Server-Multiple Client architecture. <u>Optional</u> – on Wired (TCP/IP) channel.
Operating Voltage	: 230VAC <u>+</u> 15%, 50Hz, Single Phase
Input Power	:2000VA (max) in WHITE mode with all pixels ON at maximum intensity.
EMI/EMC	: Electromagnetic interference immunity levels as defined in EN 50293:2000:
	EN 61000-3-3: limitation and voltage fluctuations and flicker low voltage supply system
	EN 61000-4-4: immunity to fast transients (burst), failure criteria: B
	EN 61000-4-5: immunity to surges, failure criteria: B
	EN 61000-4-11: immunity to voltage drops, short interruptions and voltage variations.
Operating Temperature	e : As per EN 12966, T1(-15°c to +60°C)
VMS Enclosure : 0	Outer shell of 3mm thick corrosion resistant Aluminum alloy.
	Lifting eyes of Galvanised Steel material
	Other hardware of stainless steel material
	Exterior finish – UV resistant Black wet paint, all other surfaces
	in Natural aluminum
	Weather Rating – As per EN12966
	Welding Rating – As per ANSI/AWS D1.1(Steel) & D1.2(Aluminum)
	Access – From rear side
	Ventilation – Through thermostatically controlled forced air Fans.
	Ingress Protection – As per EN12966, P3(IP66)
2.1	1.7
R2-RT-ATC 12.2 VMS Technical Specific	cations:
EN 12966 Equivalent	

Display type	: Fully programmable Full Colour-Full Matrix LED Display
Display Pitch	: 25mm
Size	· 2 88 Mtrs X 1.44 Mtrs Display
	Outer cabinet 3.18 X 1.74
Display Resolution	: 150(Columns) X 72(Rows) Pixels
Lighting Element	:5mm High-bright through hole LEDs from reputed manufacturers such as CREE, NICHIA, AVAGO with polycarbonate lens and constant current drive technology for higher light output and better visibility.
Pixel Configuration	:3LEDs(minimum) per pixel, 1 each of RED, GREEN & BLUE colour
Lighting Colour	: As per EN12966, Class C1/2
Luminous Intensity	: As per EN 12966, Class L3
Contrast Ratio	: As per EN12966, Class R2
Beam Width	: As per EN12966, Class B3
Display Capacity	:Fully programmable Pictograms & Bi- lingual(English & Indian language) Texts with pre-loaded Fonts to display minimum 3Lines of over 20 characters per line, Facility to create configurable Text height through Application software
Display Styles	:Steady, Flash, Partial Flash, Right Entry, Left Entry, Top Entry, Bottom Entry, Center spread, Blank, Dimming (255 levels 0% to 100%)
VMS Storage Capacity	: Over 100 Images/Messages
VMS Message creation	:Through Central Control Room Application or via local portable computer loaded with relevant software.
VMS Input ports/interface	: Serial ports for local portable computer, GSM/GPRS Modem
VMS Diagnostics	: Pixel wise diagnostics in with remote preview with automatic Health/Error/Event alert
Communication	: On wireless (GSM DATA/GPRS/3G) channel with NTCIP compliant protocol to work with third- party Central Control Room Integrated HTMS software in Server-Multiple Client architecture. <u>Optional</u> – on Wired (TCP/IP) channel.
Operating Voltage	: 230VAC <u>+</u> 15%, 50Hz, Single Phase
Input Power	:2000VA (max) in WHITE mode with all pixels ON at maximum intensity.
EMI/EMC	: Electromagnetic interference immunity levels

SF	PECIFICATIONS FOR TRAFFIC WORKS	SP-RT
	as defined in EN 50293:200	0:
	EN 61000-3-3: limitation and and flicker low voltage supplementation	d voltage fluctuations ly system
	EN 61000-4-4: immunity to f failure criteria: B	ast transients (burst),
	EN 61000-4-5: immunity criteria: B	to surges, failure
	EN 61000-4-11: immunity to interruptions and voltage val	o voltage drops, short riations.
	Operating Temperature : As per EN 12966, T1(-15°c	c to +60°C)
	VMS Enclosure : Outer shell of 3mm thick corrosio alloy.	n resistant Aluminum
	Lifting eyes of Galvanised S	teel material
	Other hardware of stainless	steel material
	Exterior finish – UV resistar other surfaces	nt Black wet paint, all
	in Natural aluminum	
	Weather Rating – As per EN	12966
	Welding Rating – As per Al & D1.2(Aluminum)	NSI/AWS D1.1(Steel)
	Access – From rear side	
	Ventilation – Through them forced air Fans.	nostatically controlled
	Ingress Protection – As per	EN12966, P3(IP66)
R2-RT-ATC 12.5	Refer Drawing no RT-ATC-12.5	
R2-RT-ATC 12.6	Refer Drawing no RT-ATC-12.6	
R2-RT-ATC 12.7	As per USOR description	
R2-RT-ATC 12.8	As per USOR description	
R2-RT-ATC 12.9	Integration of travel time information system with ATC	CITACA software
	The integration of travel time information system with Opti	mus system for
	processing information collected by traffic sensors of signa	aling system on
R2-RT- ATC 12 10	different road segments. Preventive & Corrective Maintenance of VMS and its travel time	
	accessories per VMS	
	- Cleaning of VMS	
	- Minimum Service Level Agreement and System Available	ility calculation
	I) Response time: The response time is the time taken by	/ Contractor to attend
	faults is maximum of 3 hours. Response time of 03 hr	s is stipulated in the
MUNICI	PAL CORPORATION OF GREATER MUMBAI	Page 76

SP-RT

SPECIFICATIONS FOR TRAFFIC WORKS

	between registering the complaint by Traffic Police/MCGM at the control room and completely rectifying the fault. All the calls are to be closed within the Resolution time is of 03 working days (excluding ONLX Sundays) which
	includes all hardware/ damage replacements.
R2-RT- ATC 12.11	 SITC of Blue traffic Sensor with IP 67 casing, mounting brackets, power cable and accessories and battery charger module The specification should be equal or HIGHER/ BETTER than the requirement indicated below i. Bluetooth class: 1, 2 ii. Communication: GPRS/Bluetooth iii. Positioning & Time Sync: GPS based iv. Configuration updates: Local (via Bluetooth enabled smart phone/laptop) Remotely (Over the Air) v. Capacity: 200 vehicles/minute / unit vi. Aggregation: Vehicle by vehicles to configurable from 10 sec. to unlimited time period (5min common). vii. Filters: Outliers, BT brands and speed distribution viii. Watchdog: Hardware and software ix. Max distance: source 100 m x. Max detected: speed 200 kmh xi. Accuracy: travel times 99% at distances > 1km xii. Operational Temp20 ° C - +60 °C xiii. IP Class IP67 xiv. Antennas: 1 or 2, directional and Omni-directional, inbuilt xv. Antenna gain: 8dBi xvi. Antenna frequency 2400-2500 MHz
R2-RT- ATC 12.12	SITC of Traffic data warehouse system with VMS interface and system
	support- The data warehouse system must ensure that the huge volumes of real time traffic data from a variety of data sources and locations are recorded and maintained for traffic management, traffic information and traffic analysis and decision support. From this dataset high quality traffic information and forecast applicable to traffic information/traffic management/traffic engineering is broadcasted.
R2-RT- ATC 12.13	SITC of Server hardware, Operating system and network setup for up to 15 Blue traffic sensor & travel time information application. The detailed technical datasheets of OEM to be provided by the contractor after award of project/ Contract.
R2-RT-13	Preventive & Corrective Maintenance, SITC of Junctions
	& MISCEllaneous Items
to R2-RT-NATC 13.1	Preventive & Corrective Maintenance of Isolated Signal Junctions:

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 77

1	3.	3
---	----	---

Specifications

These specifications are intended for general description of site conditions, scope of work and requirements, products, execution, quality of workmanship and finished work. They are not intended to cover minute details. The work shall be executed in accordance with best modern practices and using special techniques.

Services to be offered under preventive and corrective maintenance schedule are:

A. Preventive Maintenance

Regular preventive maintenance of RTS involving external and internal cleaning of the controllers with hot / cold blowers & cleaning of other electrical / electronic components with antirust solution once in a month, cleaning of the signal aspects, cleaning of poles, cleaning of Junction Box, Tightening of all screws on the controllers, poles, alignment of aspects, checking of junction box covers, greasing to controller etc. once in a fortnight.

All cable terminals shall be checked & if necessary loose lugs shall be replaced immediately.

The Connector strip & Connector shall be cleaned with antirust solution / gel fortnightly.

In addition to above, for solar flasher, the Solar Panel should be cleaned to ensure proper working of Flasher. In case of Distilled Water filled Battery, distilled water (Battery Water) should be replaced after every six months.

B. Operative & Corrective Maintenance

- a. Taking corrective action for all electrical / electronic failures inside the controllers / poles / Aspects etc.
- b. Replacement of defective LEDs / SMPS, repairing of LED PCBs etc.
- c. Controller Programming / reprogramming
- d. Making necessary software changes.
- e. Repairing / replacement of faulty / defective spare parts of the controller including repairs of various cards etc.
- f. Repairing of faulty PCBs / cards of LED Signal Aspects and replacement of fused / faulty LEDs mounted on the Aspects.
- g. Replacement of doors of aspect/junction box/controllers/Power supply box.
- h. Replacement of damaged/missing hoods.
- i. Maintaining & Updating History Sheets / Maintenance Log sheets junction wise.

All the details of Preventive & Corrective maintenance shall be logged in History Sheet. The updated History Sheet / log Sheets record shall be kept properly and every six months record shall be submitted to M.C.G.M.

The maintenance team should comprise of Technician-1 No., Wireman-1 No. And Labourers-2 Nos. The Contractor should estimate the no. of maintenance

	team, transport, tools and tackles etc. required for preventive & corrective / damage maintenance of traffic signals and observe that the signal maintenance work is not hampered in any circumstances. The Contractor should provide separate transport to signal maintenance staff and also to Supervisory Staff of MCGM for monitoring day to day activities. The Damage/Repair Maintenance transport should be a Utility vehicle.	
R2-RT-NATC 13.4 to R2-RT-NATC 13.6	All Signal Hardware should be ATC compatible (Signal Poles, Housing, Retrofits, Brackets, Cables, Earthing, Power supply Box, chambers with FRP chamber frame & covers, HDPE/ G.I. Pipes, including all vehicular & Pedestrian Digital Countdown Timers with EN specification etc.) excluding ATC signal controller. The signal controller shall be Non ATC type. I.e. RT-NATC 1.5 and as directed by the Engineer.	
R2-RT-NATC 13.7 to R2-RT-NATC 13.8	The installation should include Blinker Controller, Solar panel, Battery with cabinet, Signal source LED Retrofit with housing (Non ATC type), Straight Pole with foundation and as directed by the Engineer.	
R2-RT-NATC 13.9	Painting of Signal Junction Hardware The existing paint of Signal hardware should be scrapped out properly. The surfaces to be paint shall be made smooth by using emery paper. Then poles & junction boxes shall be painted with red oxide one layer & two layers of yellow paint with preferred make or as instructed by the Engineer. The Controller Cabinet & M. S. power supply box shall be painted with red oxide one layer and two layer of grey colour with preferred make or as instructed by the Engineer.	
R2-RT-NATC 13.10	Cleaning of Signal Junction	
	The Signal junction hardware should be cleaned once in a year or as per instruction of MCGM Engineer.	
	The cleaning procedure for Aspect, Signal Pole, Controller, Power Supply Box shall	
	be done as follows :	
	 First clean the aspect, signal pole, power supply box & controller with dry cotton waste. 	
	ii) Remove the glasses, if necessary.	
	iii) Cleaning of removed glasses in soap water, if necessary.	
	iv) Dry the glass with dry cloth.	
	v) Clean the aspects with soap solution.	
	 vi) Clean the Signal Poles including Cantilever Poles by soap water with sponge or soft cloth. 	
	vii) Clean the exterior surface of Controller Cabinet and Power Supply Box by soap water with sponge or soft cloth.	
R2-RT-NATC 13.11	Preventive & Corrective Maintenance of ATC Signal Junctions	
	Specifications	
	These specifications are intended for general description of site conditions, scope of work and requirements, products, execution, quality of	

wor det pra Ser sch	rkmanship and finished work. They are not intended to cover minute ails. The work shall be executed in accordance with best modern actices and using special techniques. rvices to be offered under preventive and corrective maintenance medule are:
1.	Controller:- The Preventive & Corrective maintenance should be carried out as recommended by M/s Telvent Traffico y Transporte S.A. The Contractor has to carry out the maintenance of Road traffic ATC Signal Controllers as per procedure & schedule prescribed in their manual.
2.	LED Retrofits & Housings:- As far as preventive & corrective maintenance of LED Retrofits and Housing is concerned, the maintenance to be carried out as per the procedure prescribed by M/s Leotek, Taiwan. The aspect should be cleaned and alignment of aspect to be done.
3.	Signal Poles:- The Contractor has to keep all signal poles cleaned. The grommets on pole shall be properly fitted.
4.	Chambers:- The chambers should be checked for through n through connectivity between Controller to Pole and Pole to Pole.
5.	Pest Control:- It is the responsibility of Contractor to get pest control done once in a year for all Signal Controllers for Rat and Rodent.
6.	The Contractor should apply Antirust solution to every nut bolts, hinges of Controller and Signal Poles.
7.	Summary records of the quarterly test, inspection and cleaning of all equipment within the FATC Area which must be broken down by individual junction within FATC Region or grouping of traffic signal junctions providing details of all Equipment, FATC Traffic Signals providing the following:
	a) Number and types of equipment.
	b) Faults identified and subsequent actions to clear these faults.
	c) Any equipment unable to be repaired
8.	The original hand written logs or copies thereof, shall be held for the duration of the Contract and be available for inspection to the Traffic Police.
Su Re det	mmary records of all Routine Maintenance Activities undertaken during the port Period, the summary information shall be broken down by Region ail the following:
	a) Numbers and types of equipment tested and inspected.
	b) Faults identified and subsequent actions taken.
9.	Summary records of routine maintenance undertaken outside normal working hours due to access constraints to provide:
	a) The activities performed.
	b) The sites visited.

SPECIFICATIONS FOR TRAFFIC WORKS SP-RT		SP-RT
	 c) The date, time and duration of the work. d) The names and grades of staff involved. A concluding summary shall highlight any particular maintenance problems reasons for not achieving programmed targets, and proposals to recover any shortfall. The maintenance team should comprise of Technician-1 No., Wireman-1 No. And Labourers-2 Nos The Contractor should estimate the no of the start of the	
	maintenance team, transport, tools and tackles etc. required for preventive & corrective / damage maintenance of traffic signals and observe that the signal maintenance work is not be hampered in any circumstances. The Contractor should provide separate transport to signal maintenance staff & material transportation and also to Supervisory Staff of MCGM for monitoring day to day activities. The Damage/Repair Maintenance transport should be a Utility vehicle.	
	The Contractor has to operate the maintenance from ATC Project Office Bandra Reclamation, Krishna Chander Road, Bandra (West), Mumba 400050. The Contractor will be provided with the Office space for Contractu Staff. In lieu of this, MCGM will deduct Rs. 35000/- per month from the running bill. However the charges towards electricity, waters, etc. shall to borne by the Contractor.	
R2-RT-NATC 13.12	As per USOR Description	
R2-RT-ATC 13.13	2-RT-ATC 13.13 The Contractor shall be responsible for the validation / calibration of the I Adaptive traffic control system. The Validation / Calibration shall be carried to the satisfaction of the Engineer. The Contractor shall provide to Engineer full written records of all Validation / calibration activities. Contra will be required to undertake a network assessment in order to ensure f time plans are developed according to time of the day. This should feature use of TRANSYT network modelling or other proprietary tool once approp traffic count surveys have been completed. The Contractor will be require submit the resultant models for approval by the Engineer before loading implementing any plans.	
R2-RT-14	CIVIL WORKS	
R2-RT-14.1toR2-RT-14.12Painting Junction Number, Meter Number etc with Black Paint to Road Traffic Signal Controller Power supply box of S.S 304 . R drawing R2-RT-14.2, R2-RT- 14.3, R2-RT- 14.5, R2-RT- 14.6To distinguish the signal controller of Area Traffic Department from the c utilities the Cement Concrete base of the Controller (i.e. foundation) sha be painted by the Traffic Signing colors. The entire surface to be painted shall be cleaned thoroughly by the wet cloth. There shall be applied one coat of the primer of the reputed make on the cement concrete portion o the Controller to be painted before application of the paint. Upon comple dried surface an alternate Strips of 100 mm width of purple & yellow color at the inclination of approximately 30-60 degrees, preferably at 45 degree		Black Paint to the of S.S 304 . Refer I- 14.6
		rtment from the other . foundation) shall ace to be painted II be applied one oncrete portion of int. Upon completely rple & yellow colours rably at 45 degrees
MUNICIP	AL CORPORATION OF GREATER MUMBAI	Page 81

SPECIFICATIONS FOR TRAFFIC WORKS	SP-RT
shall be painted as shown in the drawing. There shall lapse to allow the coat of paint to be dried before appli coat. The paint to be used shall be of the make specifi Wild Purple: Asian paints Apcolite Premium Glass En	De sufficient time cation of the second ed as follows: amel, Gr-2,
Golden Yellow: Asian paints Apcolite Premium Glass	Enamel, Gr-3,
Black: Asian paints Apcolite Premium Glass Enamel,	Gr-4,
The controllers and meter box made up of SS-304 ma with green colour lettering carved out of Retroreflective approved make as per MORTH specifications and sha with pressure sensitive adhesive.	terial shall be named e sheeting of Il be sticked on panel
LETTERING AND LETTER SIZE:	
Painting to the Controller and Power Supply Box	
A) On Controller front portion:	
There shall be written the following letters	
'PLEASE STICK NO BILLS'	
BY ORDER	
The height of letters for the first line shall be 80 mm & appropriate to the height. The letters of second line i.e have the height of 40 mm & the breadth shall be appro The colour for lettering to be used shall be black only, drawing.	the breadth shall be . BY ORDER shall opriate to the height. as shown in the
B) Below which on front panel and RHS or LHS w There shall be written the following information-	vhichever is visible:
AREA TRAFFIC CONTROLLER – RTSS or RTSS CO	ONTROLLER
JUNCTION NO:-	
JUNCTION NAME:	
The vellow coloured Square of approximate size 290m	nm (wide) X 300 mm

The yellow coloured Square of approximate size 290mm (wide) X 300 mm (height) shall be painted by yellow paint on which the above information shall be written as shown in the drawing. The shade of the paint to be used for the lettering shall be black. The height of the letters shall be 40 mm & the breadth shall be appropriate to the height.

	C) On Power Supply Box front portion:
	SERVICE NO:
	METER NO:
	JUNCTION NO:
	The Rectangle of appropriate size shall be painted by yellow paint on which the above information shall be written with black paint as shown in the drawing. The shade of the paint to be used for the lettering shall be black. The height of the letters shall be 40 mm & the breadth shall be appropriate to the height.
	For Signal Poles
	The 120 mm diameter Circle of yellow paint shall be painted at a appropriate height of around 1.5 to 1.8 m from the ground level. The yellow painted circle shall be allowed to be dried completely & then on this junction number & below which pole number shall be painted with black colour. The height of the letters shall be 50 mm & the breadth shall be appropriate to the height. There shall be a demarcation line between the junction number & pole number diagonally horizontal as shown in the drawing.
R2-RT-14.13 to R2-	EXCAVATION AND BACK FILLING
K1-14.15	All excavations and backfilling required for installations of cable, conduit, pull boxes and foundations shall comply with the inter-utility Organisation and Code of Conduit for Road Excavation specification. The work shall be performed in such a manner as to cause the least possible disturbance to streets, sidewalks, driveways and other structures. At the end of each workdays and at all other times when construction operations are suspended all equipment and other obstructions shall be removed from that portion of the roadways and walkway open for use to vehicular and pedestrian traffic.
R2-RT-14.16	AS PER USOR DESCRIPTION
R2-RT-14.17 to R2- RT-14.24	CONSTRUCTION OF CHAMBER AND FRAME & COVER, REFER DRAWING RT-14.17, RT-14.19,
	RT-14.21, RT-14.23,
	Construction of brick masonary chambers with FRP covers and MS frame

SP	ECIFICATIONS FOR TRAFFIC WORKS	SP-RT
	The chambers shall be constructed to accommodat cables. The size of the chambers shall be as spe- chambers shall be surface finished and there shall surface. The chamber shall be constructed as such it s movement. FRP chamber covers shall be heavy of withstand the normal force without breaking. The size of such that it shall accommodate the covers properly. The as such between the frame and chamber covers. The n maintained which is otherwise required for easy operat have facility to lift the same for opening and closing operation.	te the conduits and ecified in SOR. The not be any uneven shall not obstruct any duty type and shall of MS frame shall be here shall be no gap ninimum gap shall be ion. The covers shall eration.
R2-RT-14.25 to R2-	Controller cabinet with power supply box, signal strai	ght pole, cantilever
RT-14.30	pole, camera pole and VMS straight and cantilever of Refer drawing RT-NATC-14.30, RT-14.25, RT-14.26, 12.5, RT-ATC-12.6	gantry foundations. RT-14.29, RT-ATC-
	Controller cabinet, signal straight pole, cantilever pole, or VMS straight and cantilever gantry foundations shall be locations as directions by the Engineer. Where subsurface encountered, the ENGINEER may instruct the CONTRAC the obstructions or to replace the excavated material and foundation. If caving of the foundation occurs, the CONT excavate to the specified depth, maintaining the sidewar as possible. No extra payment shall be made for an exc reinforcing steel used in excess of the planned quantitie	camera pole and constructed at the ace obstructions are ACTOR to remove ad relocate the TRACTOR shall Ils as nearly vertical cavation, concrete or es.
	For the foundation, the CONTRACTOR shall provide an cement concrete of grade M-20 in foundations of signal pedestrian poles as directed by the ENGINEER. All exp foundation blocks above ground level will be form finish all underground surfaces will be unfinished. The work w accordance with the relevant IS	nd place plain poles and osed surface of the ed to F-2 finish and ill be carried out in
	Specifications for cement concrete works (IS-456 of 197 concrete shall be placed against undisturbed soil or con embankment.	78 in particular.) The npacted
	Forms shall be used for the upper portion of all foundati shall be permitted from the bottom to within 6 inches be Foundation concrete shall be vibrated and spaded.Conc ground rods shall be installed as per requirement. Anch shall be held in position with a template when concrete	ons and backfilling low ground level. duit, drains and or bolts and conduits is poured.
	Installation of Poles (all types)	
	The Cantilever as well as the Straight poles shall be ins location. The poles shall be fixed as shown in the drawin foundation are given in the drawing. atmost care shall be Cantilever poles. The poles shall be suitably fixed as no other utilities in the vicinity. All the poles shall be fixed i the standard procedure. The curing time shall be allower foundation shall be made above the ground for the addi pole as directed by the Engineer.	talled at the given ng. The details of the e taken to fix the of to damage the n the RCC as per ed. The pole tional support of the

SP-RT

SPECIFICATIONS FOR TRAFFIC WORKS

R2-RT-14.31	Providing steel barricading as shown in drawing no. RT-14.31 and details of material used for fabricating are:
	-GI pipe round/square 1- 1/2 " B grade
	-GI pipe round/square 1 " B grade
	-MS rod square & others
	-1.6 mm GI sheet (1400 mm x 700 mm)
	-3" dia wheel assembly 4 nos.
	-Powder coating with lettering.
R2-RT-15	FAIR Items
	Supply of 25 Watt Speaker, here type construction weather proof. Voice
R2-RT-ATC 15.1	Range - 0.6 Km, Rated 25 W Max with approved colour coats.
R2-RT-ATC 15.2	Range - 0.6 Km, Rated 25 W Max with approved colour coats.
R2-RT-ATC 15.3	Supply of 60 Watt Amplifier:
	Power Output: 75W Max.
	50W RMS at 10% THD,
	45W RMS at 5% THD, Signal to Noise Patio: 55dP
	4 microphone inputs 1 Aux input
	with high quality reputed make having facility to accept USB drives.
R2-RT-ATC 15 4	Supply 120 Watt Amplifier:
	Power Output: 120W Max.
	5 Mic & 2 Aux Inputs,
	Outputs: Preamp 200mV/600,
	Frequency Response: 50-15,000Hz 3dB
	4 microphone inputs, 1 Aux input,
	with high quality reputed make having facility to accept USB drives.
R2-RT-ATC 15.5	Supply Audio IP Controller
	Wired Wireless Network Compatibility USB Dengle Slot HDML VGA USB
	SATA Port with suitable operating system.
	Supply Server
NZ-NT-ATC 15.0	INTEL processor of Quard cored type having minimum RAM of 16 GB with
	minimum hard disk of 4TB extendable 32 TB of reputed make accommodate
	and process the data for about 300 locations (25 locations for the current
	contract).
R2-RT-ATC 15.7	Supply RCA Cable
	2 Core Multistrand Shielded Cable of reputed make with RCA Connectors on
	Both ends
R2-RT-ATC 15.8	Supply Wireless Mic
	vvireiess nandneid microphone alone with receiver
R2-RT-ATC 15.9	Besolution 480Y272 Colour TET LCD, Duck Switch outo consider 10/100/1000
	Tresolution 400/272 Colour TFT LCD, Dual Switch auto sensing, 10/100/1000

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 85

	Gigabit network ports, POE, Bluetooth, USB Integrated Real time applications		
R2-RT-ATC 15.10	Supply junction Box ;		
R2-RT-ATC 15.11	Supply Central Management Software Location License: Central Management Software for the above system shall be supplied with all the protocol and right to use the protocol for further expansion / modification / alteration etc. The software shall allow pre-recording of messages and remote selection of locations.		
R2-RT-ATC 15.12	Installation, Commissioning & Maintenance during defect liablity period of one year including technical support etc.		
R2-RT-ATC 15.13	Supply of Gantry for 2 Lane;		
R2-RT-ATC 15.14	Supply of Gantry for 3 Lane;		
R2-RT-ATC 15.15	Installation of Gantry		
R2-RT-ATC 15.16	Supply of SS-304 JB ;		
R2-RT-ATC 15.17	Providing Power supply 1 KW Single phase with wooden plank, MCCB etc. from power supply company		
R2-RT-ATC 15.18	Supply of Charge Regulator 24 V/ 10 Amps		
R2-RT-16	Other Items		
R2-RT-ATC 16.1 to R2-RT-ATC 16.4	As per USOR description.		
R2-RT-ATC 16.5	As per USOR description.		
R2-RT-ATC 16.6	As per USOR description.		
R2-RT-ATC 16.7	As per USOR description.		
R2-RT-ATC 16.8	Supply of Fix base of conventional signal cantilever pole (R2-RT-NATC 4.12) and painted with traffic yellow colour including transportation		
R2-RT-ATC 16.9	Supply of extended arm of conventional signal cantilever pole (R2-RT- NATC 4.12) and painted with traffic yellow colour including transportation etc.		
R2-RT-ATC 16.10	Supply & installation of FRP junction box of size 300 X 200 X 125 mm as per relevant IS standard with IP 56 protection including providing cover with provision to adjust overall height, knock outs on four sides to accept cables of specified sizes and including elmex connector, gland, cable terminations etc.		
R2-RT-ATC 16.11	Supply, installation & Testing Chemical earthing which includes Chemo MF Earthing electrodes field with SSC compound, seal from both the end having dia 80 mm length 1000mm, terminal 50 * 6 mm, MOC-SDGI with soil resistivity improvement powder with moister booster compound by manually digging process fixing of FRP earthing chamber cover, connection of earthing Pit to		

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 86

	grip with each other & accessories i.e. cables, lux, nuts, bolts, GI strips (25X3) 1 mtr etc. as directed by engineer.					
R2-RT-ATC 16.12	Supply & installation of FRP Chamber Cover Frame of size 620 (L) X 620(B) X72 (W) mm suitable of FRP cover size 510 X 510 X35 mm as per EN 124:2004 for 12.5 MT load capacity					
R2-RT-ATC 16.13	Supply & installation of EN 124:2004 for 25 M	f FRP Chamber Cover size 510 X 510 X35 mm as p T load capacity	ber			
R2-RT-ATC 16.14	Supply & installation of X72 (W) mm suitable of 124:2004 for 25 MT los	f FRP Chamber Cover Frame of size 620 (L) X 620 of FRP cover size 510 X 510 X45 mm as per EN ad capacity	(B)			
R2-RT-17	New Items					
R2-RT-ATC 17.1	Painting of straight po surface of pole shall shall be painted with r prefereed make or as i	Painting of straight pole by Silver Aluminium. The existing paint of the exterior surface of pole shall be made smooth by using emery paper. Then surface shall be painted with red oxide one layer & two layer of silver aluminium with prefereed make or as instructed by Engineer.				
R2-RT-ATC 17.2	Painting of cantilever pole by Silver Aluminium. The existing paint of the exterior surface of pole shall be made smooth by using emery paper. Then surface shall be painted with red oxide one layer & two layer of silver aluminium with preferred make or as instructed by Engineer.					
	Up gradation of Barc	o Video wall				
R2-RT-ATC 17.3 and R2-RT-ATC 17. 6	Supply of Upgrade Kit from Lamp to LED for existing 3x2 and 2x2 Barco Video Wall with controller at TPHQ Control Room with two years warranty.					
	System/Solution Requirements					
	· ·	The upgrades must use solid-state LED illumina	ation			
		The upgrade technology must not be lamped ba	ased.			
		The upgrade technology must be fully CE appro	ved.			
		All component upgrades must provide a full two vears Standard manufacturer's warranty.				
		The upgrade must provide a higher brightness level				
	During the physical upgrade no operational down time of the overall display wall time is allowed, each display module will be installed independently.					
	The upgrade solution must use the existing display wall mechanical structure.					
	No infrastructure changes within the room are desired.					
	Long term financial and maintenance plans, which					

	provide a lower total cost of ownership, are
Core Technology	The display modules uprade shall be rear projection based and will make use of DLP as the projection technology. The technology should guarantee against defects on account of burn-ins, image retention with inherent capability of test pattern generation. No mechanical parts for imparting color to images should be used
Callibration & Control	The system must have an auto-calibration system that constantly measures and analyses brightness, individual grey scales levels, hue and colour saturation through the use of industry accepted spectrometers and carry out measurements of the complete spectrum of each non-secondary colours for achieving brightness and does not have a loss of more than 10% of peak possible values.
	An industry accepted spectrometer must be integrated/built-in within each individual display module.
Duty Cycle	The display module system should be designed to operate for 24/7 operations.
Scalability	The system has to be fully scalable in size, inputs and performance. The system should be non-limiting in terms of input signal processing.
Constructed	The overall system should be completely modular and configurable and should allow for the easy access and removal of major components or modules for illumination, cooling and connectivity for repair and maintenance, without opening adjacent modules.
Display Module	The upgrade module shall be DLP-based Display
Requirements	Modules with solid-state (LED) illumination. The upgrade module should have a native aspect of 4:3 or Better .
	Each upgrade module shall support 4HD @ 30Hz inputs and the image shall be displayed on up to four display modules by using loop-through. Arbitrary cropping and scaling should be allowed by defining specific co-ordinates.
	The overall system should have a continuous duty cycle of 24/7 for colour calibration and brightness uniformity through the use of automated software and should also support manual override function and feature on demand.

The power modules should be tolerant to voltage spikes to about 20% of specified values in brochure. Each individual display module must have the ability to be connected to the network for remote monitoring and maintenance. The System Should be Scalable to 6 Rows High The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data en- route. Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from		
spikes to about 20% of specified values in brochure. Each individual display module must have the ability to be connected to the network for remote monitoring and maintenance. The System Should be Scalable to 6 Rows High The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data en- route. Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The hardware should be compatible with windows, Linux & Unix. The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a		The power modules should be tolerant to voltage
Each individual display module must have the ability to be connected to the network for remote monitoring and maintenance. The System Should be Scalable to 6 Rows High The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data en- route. Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be compatible with windows, Linux & Unix. The system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keyto directy under the LCD touchs		spikes to about 20% of specified values in brochure.
to be connected to the network for remote monitoring and maintenance. The System Should be Scalable to 6 Rows High The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data en- route. Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include in- built redundancy. It should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, wit		Each individual display module must have the ability
and maintenance. The System Should be Scalable to 6 Rows High The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data enroute. Display module The system should comprise of industrial class control & monitoring control & monitoring The system should be capable of handling minimum 10 displays from single unit The hardware should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be compatible with windows, Linux & Unix. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable kyes directly under the LCD touchscreen. The buttons of the keys bl		to be connected to the network for remote monitoring
The System Should be Scalable to 6 Rows High The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data enroute. Display module control & monitoring The system should comprise of industrial class control & monitoring The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should be independent of an OS being used and should be compatible with windows, Linux & Unix. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable kyster directly under the LCD touchscreen. The buttons of the keys blocks can have various		and maintenance.
The display should have provision for supporting data privacy and should make use of strong encryption techniques to avoid copying of data enroute. Display module control & monitoring The system should comprise of industrial class control & monitoring control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from write robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from write robustness with a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right		The System Should be Scalable to 6 Rows High
data privacy and should make use of strong encryption techniques to avoid copying of data en- route. Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable buttons can be integrated directly to		The display should have provision for supporting
Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard h		data privacy and should make use of strong
Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed latency-free to all workstations The master controller unit also manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed latency-free to all workstations The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, ke		analyzed and should make use of strong
Display module control & monitoring The system should comprise of industrial class control hardware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should nesure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttors of the keys blocks can		routo
control & monitoring The system should comprise of industrial class control & monitoring The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttors of the keys blo	Display modulo	The system should comprise of industrial class
Control raindware The hardware should be capable of handling minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. The buttors of the keys blocks can have various		appression should comprise of industrial class
The hardware should be capable of handing minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. The buttons of the keys blocks can have various	control & monitoring	
minimum 10 displays from single unit The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. The buttons of the keys blocks can have various		I ne hardware should be capable of handling
The master controller should be IP-based, keyboard, mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. The buttons of the keys blocks can have various		minimum 10 displays from single unit
mouse, image signal, USB and audio-matrix solution is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs		The master controller should be IP-based, keyboard,
is a solution with which all source servers can be optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The coperating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. The buttons of the keys blocks can have various		mouse, image signal, USB and audio-matrix solution
optionally distributed latency-free to all workstations The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. The buttons of the keys blocks can have various		is a solution with which all source servers can be
The master controller unit manages all encoders, transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		optionally distributed latency-free to all workstations
transcoders, decoders, video streams from cameras of a system for distributed large screens and assigns the required tasks to the decoders and transcodersThe master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.).The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The control and monitoring system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		The master controller unit manages all encoders,
of a system for distributed large screens and assigns the required tasks to the decoders and transcoders The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.). The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include in- built redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		transcoders, decoders, video streams from cameras
the required tasks to the decoders and transcodersThe master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.).The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		of a system for distributed large screens and assigns
The master unit also manages all sources and source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.).The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		the required tasks to the decoders and transcoders
source names, as well as individual network and video wall settings (such as input, de-interlace mode, quality, etc.).The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		The master unit also manages all sources and
video wall settings (such as input, de-interlace mode, quality, etc.).The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		source names, as well as individual network and
quality, etc.).The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		video wall settings (such as input, de-interlace mode,
The hardware should be independent of an OS being used and should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		quality, etc.).
used and should be compatible with windows, Linux & Unix.The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		The hardware should be independent of an OS being
& Unix. The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage. The operating system should be non-proprietary and should not suffer from limitation due to upgrades. The control and monitoring system shall include inbuilt redundancy. It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file. Operator Interface for video wall & PCs The multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		used and should be compatible with windows, Linux
The system should ensure robustness through the use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		& Unix.
use of non-moving mechanical parts either for cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		The system should ensure robustness through the
cooling or for storage.The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		use of non-moving mechanical parts either for
The operating system should be non-proprietary and should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		cooling or for storage.
should not suffer from limitation due to upgrades.The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		The operating system should be non-proprietary and
The control and monitoring system shall include in- built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		should not suffer from limitation due to upgrades.
built redundancy.It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		The control and monitoring system shall include in-
It should be possible to carry out firmware upgrades from more one than one application or system environment, with all details of operation being maintained within a log file.Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		built redundancy.
Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various	<u> </u>	It should be possible to carry out firmware upgrades
Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		from more one than one application or system
Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		environment, with all details of operation being
Operator Interface for video wall & PCsThe multifunctional keyboard has a total of eight programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		maintained within a log file.
for video wall & PCs programmable keys directly under the LCD touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various	Operator Interface	The multifunctional keyboard has a total of eight
touchscreen. Optionally, key blocks with a maximum of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various	for video wall & PCs	programmable keys directly under the LCD
of 32 programmable buttons can be integrated directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		touchscreen Ontionally key blocks with a maximum
directly to the left or right of the LCD touchscreen. The buttons of the keys blocks can have various		of 32 programmable buttons can be integrated
The buttons of the keys blocks can have various		directly to the left or right of the LCD touchercon
		The buttons of the keys blocks can have various
		The bullons of the keys blocks can have valious

	sizes, colours and individual labels
	The eight integrated, freely-programmable buttons
	and the optional, up to 32 freely-programmable
	buttons on the key blocks enable instantaneous
	the working environment
	Integrated brightness and motion sensors increase
	data security, energy efficiency, and ergonomics
	The motion sensors can be activated or deactivated
	in the system settings of the multifunctional keyboard
	which can be accessed via the LCD touchscreen
	interface.
	quick ejection mechanism, the multifunctional
	keyboard keys can be removed from the keyboard
	housing unit at any time. This means that multiple
	operators can sit at the same workplace but still
	exclusively use their own individual keyboards. This
	naces
	Integrated brightness and motion sensors increase
	data security, energy efficiency, and ergonomics.
	The motion sensors can be activated or deactivated
	in the system settings of the multifunctional keyboard
	which can be accessed via the LCD touchscreen
	interface.
	It must always be possible for users to store and
	recall multiple scenarios/presets using the keyboard,
	I.e. which sources are assigned to which screens.
	I ne users must be able to name and delete
	so that it is automatically displayed after every login
	Every user must be able to access display and
	control any connected system from any
	workplace/desk, in accordance with his user rights.
	The user must be able to quickly and easily assign
	sources to screens using the keyboard
R2-RT-ATC 17 4	Installation & Commissioning charges with half day onsite training (for 3x2)
	Comprehensive Maintenance Charges for 3x2 Video wall for 3rd 4th and 5th
R2-R1-ALC 17.5	Comprehensive maintenance charges for 5x2 video wall for 5rd , 4th and 5th

SP-RT

SPECIFICATIONS FOR TRAFFIC WORKS

	vear				
R2-RT-ATC 17. 7	Installation & Commissioning charges with half day onsite training (for 2x2)				
R2-RT-ATC 17. 8	Comprehensive Maintenance Charges for 2x2 Video wall for 3rd , 4th and 5th year				
R2-RT-ATC 17. 9	48 Port 10G switch Layer 3 Core Switch (Control Room)				
	Sr. CORE SWITCH (L3 LAYER CORE MANAGEABLE SWITCH)				
	I	General			
	1	The Switch should have 32*10G BaseT Ports & 16 Nos. of SFP + ports from Day one.			
	2	The switch should have additional expansion slots to accommodate upto additional 48 nos. of 10G ports or 12 nos. of 40G QSFP+ Ports as and when required.			
	The switch supports 10 Gigabit Ethernet (fiber and copper), Fibre Channel, and FCoE. The 10G BASE-T ports support FCoE up to 30m distance with Category 6/6A and Category 7 cables				
	4	The switch should support hot-swappable power supplies and a hot- swappable fan tray with redundant fans			
	5	Support for both front-to-back and back-to-front airflow configurations.			
	П	Layer 2 Features			
	1	4096 VLANs			
	2	Non-blocking - Layer 2 hardware forwarding at 1920 Gbps or 1428 mpps; Layer 3 performance of up to 160 Gbps or 240 mpps			
	3	3 Should support 32,000 MAC addresses			
	4 Spanning Tree Protocol				
	5	5 IEEE 802.1w Rapid Spanning Tree (Rapid PVST+)			
	6	6 IEEE 802.1s Multiple Spanning Tree (MST)			
	7	IEEE 802.3x Flow Control			
		Layer 3 Features (any additional licenses required shall be included)			
	1	Support for upto 16000 IPv4 and 8000 IPv6 host entries			
	2	2 Support for static routes and 8000 Multicast routes and 8000 IGM groups			
	3	BGP, OSPFv2, HSRP, VRRP, IGMPv2 and v3, PIMv2, VRF-lite(IP- VPN), MSDP			
	4	Dynamic Host Configuration Protocol (DHCP) relay			
	IV	V Availability Features support			
	1	ISSU for layer 2			

2	Embedded Packet analyzer
3	SPAN, ERSPAN
V	Security Features
1	Ingress and egress ACLs
2	Extended ACLs, MAC addresses, ipv6 port ACL (PACL), ipv6 VLAN ACL (VACL), and ipv6 routed ACL (RACL)
3	Broadcast, multicast, and unicast storm control
4	User-configurable Control-Plane Policing (CoPP) – ipv4 and ipv6
5	Authentication, authorization, and accounting (AAA), TACACS+
6	Challenge Handshake Authentication Protocol (CHAP), Password Authentication Protocol (PAP), Microsoft MS-CHAP
7	Capability to disable role-based access control (RBAC) and use AAA server authentication
8	Layer 2 switch port and VLAN trunks
9	Layer 3 interfaces: Routed ports, switch virtual interface (SVI), port channels, sub interfaces, and port channel sub interfaces for a total of 4096 entries
VI	QoS Features
1	Up to 8 queues per port
2	Modular QoS command-line interface (CLI; MQC)
3	ACL-based classification
4	Queuing, Marking and classification
VII	Device Management Features
1	Configuration rollback
2	Network Time Protocol (NTP), RMON, SNMP v1, v2 and v3, syslog, Virtual Terminal (vty), XML (Netconf), Secure shell (ssh)v2, Telnet
VIII	Standards Compliance
1	IEEE 802.1D Bridging and Spanning Tree
2	IEEE 802.1p QoS/CoS
3	IEEE 802.1Q VLAN Tagging
4	IEEE 802.1w Rapid Spanning Tree
5	IEEE 802.1s Multiple Spanning Tree Protocol
6	IEEE 802.3ad Link Aggregation with LACP
7	IEEE 802.3x Flow Control

	8	Approved Makes – CISCO / HP / ALLIED TELESIS / SIXNET / GARRETCOM / BRACADE		
R2-RT-ATC 17. 10	24 Port Switch (Control Room & DR)			
		Technical Specification		
	1	24x10G SFP+ Switch		
	2	12X10G SFP+ Switch		
	II	Backplane		
	1	240Gbps/480Gbps		
	2	Forwarding		
	3	180Mpps/360Mpps		
	4	MAC 64K		
	5	1* console port		
		Ports		
	1	12*1GE/10GE SFP slots / 24*1GE/10GE SFP slots		
	2	8 10M/100M/1000M TX ports		
	3	Size		
	4	442.5×315×44		
	5	Power		
	6	AC 100V-240V 50Hz±10%		
	7	Source		
	8	DC ₀ -36V~-72V		
	IV	Environment		
		Working temperature and humidity: 0□-50□, 10%-90% non-condensir Storage temperature and humidity: -20□-70□, 5%-95% non-condensi		
	2	Static configuration and dynamic MAC learning		
	3	MAC browsing and removal		
	4	Configurable aging time of the MAC address		
	5	Limited number of learnable MAC addresses		
	6	MAC filtration		
	7	Black-hole MAC list		
	8	MAC exchange		
	V	VLAN		
	1	4K VLAN		
	2	GVRP 1:1 VLAN		
	3	mapping and N:1VLAN mapping		
	4	QinQ and flexible ,QinQ ,PVLAN		
	VI	STP		
	1	802.1D . (STP) .802.1W .(RSTP)		
	2	And 802.1S (MSTP) ,BPDU ,protection, root		
	3	protection, and loopback protection		
	4	IGMP v1/v2/v3 .IGMP snooping .Multicast		

	5	IGMP Fast Leave ,Multicast group strategy and quantity limitation			
	6	Multicast flow copying over VLANs ,ICMPv6, DHCPv6, ACLv6 and			
	7	IPv6 Telnet ,IPv6 neighbour discovery ,IPv6 Path MTU discovery ,ML			
	8	V1/V2 ,IGMP snooping ,Flow ,classification Based on L2~4 ,protocols			
	9	CAR ,flow limit ,802.1P/DSCP ,priority ,re-labeling			
	VII	QoS			
	1	SP, WRR, and "SP+WRR", Congestion avoidance ,mechanisms like ,Tail-Drop			
	2	and WRED Flow monitoring and flow shaping L2/L3/L4 ,ACL ,flow identification and filtration ,DDoS attack prevention, TCP's SYN flood			
		attack prevention, UDP Flood attack prevention, etc ,			
		Broadcast/multicast/unknown unicast storm-control			
	1	Dert isolation, Dart acquirity, and "IDLMACL part hinding features			
	1	Point isolation, Point security, and IP+MAC+point binding reatures			
	3	LEEE 802 1x Authentication			
	4 Notu	IEEE 802.1X Authentication			
RZ-RT-AIC 17. II	Specifi	cations			
	Must be able to support minimum 10000 Switches and should be scalable to support minimum 20000 switches on the same or additional hardware appliance if required.				
	Must be able to create correlated topology based on LLDP , SNMP , STP connectivity hierarchy				
	Must provide centralized management that should be able to manage wired , wireless & security components of 3rd party OEMS's				
	Must allow system-level operations such as device discovery, event management, logging and application maintenance to be performed centrally.				
	Must provide the capabilities to modify, filter, and create your own flexible views of the network.				
	Must allow for graphing or viewing in table format and multiple OIDs that are user selectable.				
	Must allow scheduled events or tasks that the user can perform behind the scenes or schedule an event for another time in the future.				
	Must provide a utility to view and select MIB objects from a tree-based representation and include a compiler for new or third-party MIBs.				
	Must provide a system wide deployment of VLAN configuration and monitoring capabilities.				
	Must provide comprehensive remote management support for all proposed network devices as well as any SNMP MIB-I or MIB-II manageable devices.				
	Must support RADIUS and LDAP Authentication for users of the application.				
	Must have SNMP MIB compile capability to integrate any snmp compliant device				

Must be able to define policies to rate-limit bandwidth, throttle the rate of new network connections, prioritize based on Layer 2 or Layer 3 QoS mechanisms, apply packet tags, isolate/quarantine a particular port or VLAN, and/or trigger pre-defined actions.
Must provide a tool to find the physical location of systems and end users, and where they are connected, quickly and easily.
Must provide automated functionality to ensure that appropriate services are available to each user, no matter where they log on.
Must support features to interact with 3rd party network security devices to provide automated response to security events and thus remediating real time threats
Must provide an audit trail (event log).
Must be able to integrate with NAC and Wireless devices
Must allow IT administrators to easily define a number of pre-configured network policies, and designate select personnel to activate/deactivate these policies as appropriate
When integrated with compatible WLAN it must be able to provide granular management functionalities like system location and tracking , wi-Fi dashboards , client search, event logs etc via mobile devices as well such as tablet and smart phone
Must provide a detailed inventory of products organized by device type.
Must provide the ability to track device attributes such as serial number, asset tag, firmware version, CPU type, and memory.
Must support the ability to present detailed configuration information including date and time of configuration saves, firmware version, and file size.
Must record a history of device attributes, and reports any changes made to the device.
Must be able to provide a history of firmware and configuration changes made to a device.
Must provide a centralized history of inventory management operations.
Must be able to generate valuable, in-depth reports for network inventory for planning purposes.
Must support the ability to download firmware to single or multiple devices simultaneously.
Must be able to schedule routine device configuration back-ups.
Must be able to download text-based (ASCII format) configuration templates to one or more devices.
Must instantly identify the physical location and user profile where an attack was sourced.
Must be able to take action based on a predefined security policy, including the ability to notify the intrusion detection system of the actions taken via a SNMPv3 trap (inform).
When integrated with security devices such as NAC or IDS it must be able to isolate and quarantine the attacker without disruption to other users, applications and business critical systems

SP	ECIFICAT	IONS FOR TR	AFFIC WORKS	SP-RT
	When integrated with security devices such as NAC or IDS it must be able to dynamically deny, limit or change the characteristics of the user's access to the network			
	Must provide a web interface that contains reporting, dashboards,			shboards,
	Must provide web-based flexible view, device views, and event logs for the			event logs for the
	entire intrastructure. Must enable diagnosis of network issues and performance through real-			ce through real-
	time N Must p	etFlow analys provide port le	sis. evel analysis capability	
	Must p	rovide custor	mizable reports	
R2-RT-ATC 17. 12	SAN St	orage		
	Sr. No.	Item	Minimum Specification	
	1	Controller	Dual Controller in High Availability (one controller failure, the takeover must	Active-Active). In case be seamless and insta
			without any additional reconfiguration	on.
	2	The system should have 6 GB trans Metadata and System OS memory / should be a Battery-free cache back	portable read/write & cache per controller. In cup with super capacito	
	3	Storage Operating	grated with web brows and RAID manageme	
		System	setup, configuration, and troublesho	oting.
	4	Support iSCSI and/or I		
	5	Storage to Host Connectiv ity	SAS: 4 x 12 Gb mini-SAS HD using SAS 3.0 SFF-86 connect interface (per controller) & option to add SAS (SFF8088) 4x lane 6 Gb SAS in future	
	6 Storage At Control Room : 30 days 1080P@25FPS (Min 350TE Capacity Usable)		@25FPS (Min 350TB 100 TB Usable)	
	7	Redunda ncy	 Ia There should not be any single point of failure have following Redundant and hot swappable disk drive, power supply, fans 	
	8 RAID The solution to be configured with RAID Support hot spare			
	9	Storage Feature	Storage system (disk shelves) should support SSD/ SAT NL-SAS/ SAS disks simultaneously with different rpm. Storage ba	
	end connectivity should be at least 6Gbps SAS Ports 4 No			

C	n		D	Т	
2	Р	-	к		
~	•		•••		

	10	Disk	The Storage Should be configured with Large Form Factor			
		Connective (LEF) SAS MDL DP drives				
		itv				
	11	Licobio	Storage shall be provided with SATA or NIL SAS disks (7.2)			
		Storago	DIM			
		Consoity	1/2/2/4 / 6 /8 TP) on PAID 5 hoving Single parity. The			
		Capacity	1/2/3/4 / 0 /0 TB) OIT RAID 5 having Single party. The			
			the Bill of Quantity (BQQ) to most the minimum retention			
			the Bill of Quantity (BOQ) to meet the minimum retention			
			(C) shall also confirm the sufficiency of the standard indicate			
			(SI) shall also confirm the sufficiency of the storage indicated			
	10		In the BOQ to meet the General			
	12	Host /	Linux, MS Windows etc.			
		Server				
		OS				
		Support				
	13	Installatio	It should support Single DISK Failure Installation Should be			
		n	done by SI Partner / OEM			
R2-RT-ATC 17. 13	Rac	ks:				
	420	Rack				
	SI.	Descriptio	Description			
	No	Description				
		TECHNICA	AL SPECIFICATION FOR Floor Mount RACK			
	1	Racks mar	Racks manufactured out of steel sheet punched, formed, welded and			
		Powder coated Rack should be from ISO 9001:2008 & ISO14001:2004 Certified				
	2					
		Company & UL Listed				
	3	Rack Shou	Rack Should carry 3 years warranty			
	4	MAF certifi	cate should be required from OEM			
		Rack shou	d have 100% assured compatibility with all equipment's			
	5	conforming	to DIN 41494 (General Industrial Standard for equipment's)			
		Equivalent	EIA /ISO / EN Standard			
		I ne Rack	snould nave 4 No Adjustable, 19" verticals with Punched 10r			
	6	Square Ho	ie and Universal 12./mm-15.8/5mm-15.8/5mm alternating			
		pattern offe	ering greater mounting flexibility, with numbered U positions			
	7	Rack Shou	Id able to take load of 750 KG, Document proof need to sub			
		at time of b	idding.			
	8	Size : 42U	800X1000			
		Front Glass Door & Perforated Back Door				
R2-RT-ATC 17. 14	55" LE	D Display				
	SIN	Parameter	Minimum Required Specifications			
	1	ConfigurationFull HD IPS LED, Direct LED BacklightScreen Size55" or higher				
	2					
	3	Resolution Full High definition (1920 X 1080) 16:9				
		Widescreen				
	1	Contrast Ratio 1200:1 or better				
	1 1 - 1	Contrast i va				

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 97

	5	Brightness	300 Cd/m2 or better			
	6	Refresh Rate	60 Hz or better			
	7	Response Time	8 to 12 ms			
	8	Viewing Angle	160 degrees or better			
	9	Speakers	Built in 2 x 10W (RMS)			
	Inter	face				
	10 Standard Inputs 1		1x Digital DVI I; 1x Digital DVI D/HDMI Port or Higher			
	11	Standard Outputs	1x Digital DVI D / 1x DP 1.2			
	12	Control	RS 232/RS 422/IR			
	Pow	er				
	13	Consumption	Not more than 300 Watt			
	14	Power Supply	AC 100 240 V- (+/ 10 %), 50/60 Hz			
	Gen	eral				
	15	Operating	0°C 40°C			
		Temperature				
	16	Humidity	20% 90%, Non-condensing			
	17	Certification	ANSI/ETL/UL, FCC, CE, BIS certified at the			
			time of bidding			
	Acce	essories				
	18	Accessories	Dual Link DVI D /DP/HDMI cable, AC power			
			cable, Remote Control, Batteries, Wall mount			
R2-RT-ATC 17. 15	Supply, Installation, Testing & Commissioning of Video Management and incident management software per camera with Redundancy (1:1) & basic Video analytics and Marathi/Hindi language capability and Capability of third Party Integration with ANPR, RLVD, Speed and Sound detection AND RTO/VAHAN Data for e-challan					
R2-RT-ATC 17. 16	Supply, Testing & Commissioning of Red Light Violation Detection System with ANPR Solution (For Per Lane) (With Single Processor Unit support up to 3 ANPR Cameras) (Module : Including Camera + Local Processing Unit + IR Illuminator)					
R2-RT-ATC 17. 17	Supply, Testing & Commissioning of Single Channel Encoder for Analog Camera Connection					
R2-RT-ATC 17. 18	Supply Room	Supply, Testing & Commissioning of Indoor 2 MP IR Dome Camera for Control Room AND DR				
R2-RT-ATC 17. 19	TrafiOne 195 (Ref No 10-7070):Thermal Camera based Vehicle, Bicycle & Pedestrians detection sensor. Focal Plane Array (FPA) uncooled VOx microbolometer LWIR sensor, 8 to 14 µm wavelength. 9fps 160X120 reolution RTSP thermal black&white streaming video (H.264, MPEG-4, MJPEG) . Wi-Fi monitoring capabilities (optional) & Visual HD stream (optional)					
R2-RT-ATC 17. 20	FLUX	embedded clustering library license				
R2-RT-ATC 17. 21	FLUX	embedded database li	cense			

MUNICIPAL CORPORATION OF GREATER MUMBAI

Page 98

R2-RT-ATC 17. 22	TrafiSense 390 BPL Version Wide Angle 7.5mm lens: integrated thermal camera and detector for vehicle and bike detection or Data Collection. Thermal
	Streaming video 30fps. Long wave Infrared (7 – 14 μ m) Compression H.264, MPEG-4, MJPEG (dual stream)
R2-RT-ATC 17. 23	TrafiSense 325 BPL Version Medium Narrow Angle 13mm lens: integrated thermal camera and detector for vehicle and bike detection only. Thermal Streaming video 30fps. Long wave Infrared (7 – 14 μm) Compression H.264, MPEG-4, MJPEG (dual stream)
R2-RT-ATC 17. 24	TI Xstream BPL Version, 2nd Generation.(NEW HARDWARE), supports TrafiOne
R2-RT-ATC 17. 25	TrafiRadar BPL version Vehicle Presence Sensor: Combination of a video sensor and radar for:Stop bar and advance detection, Traffic adaptive systems & Dilemma zone protection.
R2-RT-ATC 17. 26	Supply of EcoTrafiX controller 32 D1 E5, standard metal enclosure, supplied with 24 phases and capability of extension up to 32 phases which supports ITACA Traffic management system in Mumbai. EcoTrafiX controller proposal includes: Op.P1-KIT Rack detectors EcoTrafiX (detectors not included) Op.G1- KIT 48 Digital Entry EcoTrafiX Op.I1-KIT 8 Digital Exit EcoTrafiX
R2-RT-ATC 17. 27	OEM site support for ITACA issues, one technician 2 weeks, including travelling and boarding expenses
R2-RT-ATC 17. 28	Upgrade of FMS server system on Widows 8 or higher version. (The existing FMS server is installed on Windows XP). Only remote works: installation, testing and commissioning. Works on site excluded
R2-RT-ATC 17. 29	Upgrade of Optimus 7.0. Only remote works: installation, testing and commissioning. Works on site excluded.
R2-RT-ATC 17. 30	Supply of FRP Chamber Cover size 513 X 513 X30 mm as per BS EN 124 :1994 for 12.5 MT load capacity
R2-RT-ATC 17. 31	Supply of FRP Chamber Frame Size 606 X 606 X52 mm for the cover 513 X 513 as per BS EN 124 :1994 for 12.5 MT load capacity
R2-RT-ATC 17. 32	Supply of FRP Chamber Cover size 536 X 536 X45 mm as per BS EN 124 :1994 for 25 MT load capacity
R2-RT-ATC 17. 33	Supply of FRP Chamber Frame Size 665 X 665 X78 mm for the cover536 X536 as per BS EN 124 :1994 for 25 MT load capacity
R2-RT-ATC 17. 34	Supply of FRP Chamber Cover size 513 X 663 X30 mm as per BS EN 124 :1994 for 12.5 MT load capacity
R2-RT-ATC 17. 35	Supply of FRP Chamber Frame Size 606 X 756 X52 mm for the cover 513 X 663 as per BS EN 124 :1994 for 12.5 MT load capacity
R2-RT-ATC 17. 36	Supply of FRP Chamber Cover size 537 X 687 X45 mm as per BS EN 124 :1994 for 25 MT load capacity
R2-RT-ATC 17. 37	Supply of FRP Chamber Frame Size 654 X 804 X74 mm for the cover 537 X 687 as per BS EN 124 :1994 for 25 MT load capacity
R2-RT-ATC 17. 38	Installation of FRP Chamber Frame & Cover of all sizes.

List of Preferred makes						
Sr. No.	Item description	Preferred Makes				
1	NON ATC controller	CMS	Keltron	Trafitronics		
2	ATC Controller	Telvent	Swarco	PEEK	Kapsch	
3	ATC Cards	Telvent			Kapsch	
4	Controller cabinet (SS 304)	Pyrotech	Machwel			
5	Pipes (HDPE)	Duraline	Rex	Balaji		
6	Pipes (GI)	Zenith	Tata	Surya	Bhushan Steel	
7	Junction Boxes MS (Non ATC)	Machwel	Pyrotech	Ramesh Steel.		
8	Power supply box Boxes SS 304 (Non ATC)	Pyrotech	Machwel	Rajan Tubes	Ramesh Steel	
9	Power supply box Boxes MS (Non ATC)	Pyrotech	Machwel	Rajan Tubes	Ramesh Steel	
10	Poles (ATC) & CCTV poles	Pyrotech	Rajan Tubes	Ramesh Steel		
11	Straight pole 6 m (non ATC)	Rajan tube	Pyrotech	Ramesh Steel		
12	Canteliver pole 9 m (non ATC)	Rajan tube	Pyrotech	Ramesh Steel		
13	Brackets	Pyrotech	LEDON	Sarvodaya		
14	Pole cap and pole cap termination	Pyrotech	Rajan Tubes	Ramesh Steel		
15	Signal heads retrofit (ATC)	Leotek	Swarco	Siemens	GE	
16	Signal heads retrofit (non ATC)	CMS	Trafitronics	Keltron		
17	Signal housing (ATC)	LEDON	Sarvodaya	Pyrotech		
18	Signal housing (non ATC)	LEDON	Sarvodaya	Pyrotech		
19	Cables	KEI	Polycab	Universal	Avocab	
20	Cable jointing kit	Raychem	ЗМ	UCIL		
21	Solar Flasher retrofit(ATC)	Swarco	Siemens	Leotek	GE	
22	Solar Flasher retrofit(non	Pyrotech	CMS	Trafitronics	Keltron	

List of Preferred makes							
Sr. No.	Item description	Preferred Makes					
	ATC)						
23	Blinker controller	CMS	Keltron	Trafitronics			
24	Audible beeper unit	Askari					
25	Solar panel	Tata BP	BEL	Siemens	Titan		
26	Batteries	Exide	Amaraja	Amco			
27	Battery cabinet	Pyrotech	Machwel				
28	ССТV	Axis	Verint	PELCO	Panasoni c	Infinova / Bosch	
29	Vehicle detection Camera	Traficam (FLIR)					
30	UPS	APC	Socomec	ABB - New wave	Emerson		
31	LAN Ethernet switch	Cisco	HP	Extreme Networks	Allied Telesis	Junipe r	
32	Paints (other than ATC poles)	Asian paints	Nerolac				
33	Paints (ATC poles)	Asian paints	Jotun	Kansai - Nerolac			
34	FRP chamber and Frame	Rex	Thermodrai n	Everlast	HP internatio nal	Rawji	
35	Retro reflective Film	3M					
36	VMS (Variable messaging Sign board)	Ortana	Swarco	Pyrotech	ARS T&T	CMS	
37	VMS Pole & Gantry Structure	Pyrotech	Rajan Tubes				
38	Video Wall	Barco	Delta	Planar	LG	WEY TEC	
39	System Clock with GPS	Wharton Electronics					
40	Server	HP					
41	Push button centre	Pyrotech					

List of Preferred makes							
Sr. No.	Item description	Preferred Makes					
42	Split AC	Voltas	Bluestar	Daikin	LG	Videoc on	
43	Casset AC Unit	Daikin	Voltas	Panasonic	-	-	
44	OFC Cable	Finolex	HFCL	Sterlite	Commsc ope		
45	Digital Countdown timer	Ortana	CMS	Intetra			
46	Dual Colour Countdown timer	Ortana	CMS	Intetra			
47	Junction Box for CCTV	Pyrotech	Rittal				
48	Junction Box for Non ATC Signals	Rajan tube	Pyrotech	Machwel	Ramesh Steel		
49	Cement	Ambuja	L&T	ACC	Ultratech		
50	RMC	ACC	RMC india	Ultra tech	Godrej		
51	Structural Steel	TISCON	SAIL	RINL	Jindal		
52	Reinforcement steel	TISCON	SAIL	TMT	Jindal		
53	Vitrified Ceramic Tiles	Marbo Granit,	NITCO	Euro,	Kajaria		
54	False ceiling	Armstrong	Gyp. Steel				

Special directions to Contractors

The Contractor, prior to the start of any civil engineering works associated with either Junction Improvements, Traffic Signal Installation and Ducting shall produce engineering drawings. The Engineer shall agree these drawings prior to the commencement of any works.

The Contractor shall be responsible for all civil engineering work included in roads and footways for those elements described above. Works for the implementation of traffic signals system shall be carried out to minimize disruption to traffic and pedestrians. Work in sections shall be completed and the road shall be backfilled and opened to traffic before work commences in the next section. Work in any section, including loading and unloading, shall be carried out in such a manner that traffic and utilities in the adjacent footway will be adequately maintained. Unless otherwise defined in the Contract, excavations shall be formed with a clean edge in such a manner that the adjacent road or

footways, including edges are not damaged to ensure reinstatement to match and be continuous with the adjacent area.

Excavated material shall not be stored adjacent to excavations in roads or footways unless permitted by the Engineer. The excess of excavated material shall be disposed off by the contractor at his own within time period specified in the guidelines of MCGM for trenches, otherwise strict action as stated in the trenching policy will be applicable to the contractor.

Vehicular access across excavations in roads shall be provided by steel covers. The covers shall be designed to appropriate Indian standards and shall be capable of withstanding the full traffic load permitted to use the road. Sufficient steel covers shall be kept on the Site adjacent to excavations in roads to permit vehicular access across the excavations in case of emergency.

The Contractor shall ensure that excavations are fully supported at all times to ensure the safety of his own employees and the public. Temporary traffic diversion, pedestrian access and lighting, signages, guarding and traffic control equipment shall be removed immediately if they are no longer required. Roads, footways and other items affected by temporary traffic arrangements and control shall be reinstated to the same condition as existing before the work started or to such other condition as may be agreed or instructed by the Engineer or otherwise defined in the Contract.

Measures shall be taken to prevent excavated material, silt or debris from entering drainage systems in roads and footways. Entry of water to any gullies shall not be obstructed.





1 1 pesei . ____ ----6 1300 SECTION Y-Y . -680-. \overline{c} INSIDE CANOPY FRONT DOOR GASKET 20X3mm TOP CANOPY WIRE DETAIL "B" DETAIL "C" M5 HARDWARE GASKET 20X3mm TOP CAHOPY GASKET 20X3mm BOTTOM PLATE SIDE SHEET DOOR GASKET DETAIL "A" NS HARDWARE OL.141.0. 1 D SS HARDWARE CS PLATE SIDE BOX DOOR FRAME



O U 4 S NOTES: -ALL SHEET SHALL BE OF 1.6mm TH. SS304 SHEET. DOOR SHALL BE MADE OF 2mm TH. SS304 SHEET. SUPPOTR ANGLE SHALL BE MADE OF 2mm TH. SS304 SHEET. PANEL SHALL BE MADE OF WELDED CONSTRUCTION SYSTEM PROTECTION CLASS: IP65 FINISH: -(A) BOX AND SS COMPONENT - BUFF FINISH












+) Specification

Votage	9 - 28Vdc
Current	18mA @ 24Vdc
Temperature	- 25°C to + 70°C
Sound Output	92dB(A) at 24Vd;
Tonas	32
IP Rating	IP65
Weight	0.95%
Colour	Red or White

A compact sounder, purpose designed to fit through the fascias of control panels or equipment housings. The single nut fixing ensures simple installation and maximum audibitity, while the high IP rating allows installation in most process and industrial environments.

. THROUGH PANEL FIXING

· LOW CURRENT CONSUMPTION

32:TONES AUTOMATIC STNCI ROMISATION SECOND TONE FOR TWO STAGE ALARMS

AUDIBLE BEEPER UNIT TITLE :-DRGNO : RT-NATC -2.13



रस्ता ओलॉडण्याकरीता पादचाऱ्यांसाठी सूचना INSTRUCTIONS TO PEDESTRIANS FOR CROSSING THE ROAD.



लाल बटण दाबा आणि हिरवा पादचारी सिग्नल येण्याची प्रतिक्षा करा PRESS RED BUTTON & WAIT FOR PEDESTRIAN SIGNAL TO TURN GREEN



हिरवा पादचारी सिग्नल आल्यानंतर रस्ता ओलांडा CROSS THE ROAD AFTER PEDESTRIAN SIGNAL TURNS GREEN

: विशेष सूचना : बटन न दाबल्यास हिरवा पादचारी सिग्नल दर्शविला जाणार नाही PEDESTRIAN SIGNAL WILL NOT TURN GREEN UNLESS RED PUSH BUTTON IS PRESSED

- SIZE: - 380× 200 mm THK: - 28 Gauge . M.S. Sheet, vinyal coating with lawingtion

TITLE: DISPLAY BOARD (INSTRUCTION DRG ND : RT-ATC-2.16 BOARD)





















*











Г

L

٦

٦






























٦

L

















ţ

_



ţ









14400 - F-100--5285















St Ci			the second se	Ba Hold	E Ø10
FOR COVER SIZE 510×510×35	A 510	B 510	C 520	D 520	E SS
620×510×35	620	510	520	630	35
MUNICIPAL CORPORATION OF GREATER MUIVIBAI Title: Chamber cover frame Scale: NTS All dimensions are in mm Drg. No.RT-14:23					





\$



.

^а ю



.



RT-14.31



DRAWING NO: -E.E.Tr.PL/ Type Drg/1/Taxi Stand Dt.23.4.2013