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TECHNICAL SPECIFICATIONS AND OTHER REQUIREMENTS FOR CIVIL WORKS OF SUPPLY, INSTALLATION, COMMISSIONING AND MAINTENANCE OF TRAFFIC SIGNAL AT GEORGE R DE SILVA MAWATHA / K. CYRIL C. PERERA MAWATHA JUNCTION.

1. REMOVEL OF EXISTING PAVING SLABS AND TAR MAC

Existing paved slabs or the tar mac should be removed before the excavation of foot walk for column foundation. All reusable items such as paving slabs, street furniture, guardrails, existing signal light columns, heads etc should be handed over to the Traffic Depots at Campbell Park and Thotalanga (located within 7km distance) safely without any damage as far as possible.

Pay Item	Description	Pay Unit
1.00(1)	Remove and transport of existing paving slabs and tar mac	Item
1.00(2)	Remove and transport of existing reusable paving slabs, street furniture, Guardrails, existing signal light columns, heads etc	Item

2. EXCAVATIONS FOR FOUNDATION OF SIGNAL COLUMNS

2.1 Description

This work shall consist of all trench excavation within the road formation for foundations of signal column bases. The work shall include the backfill of the foundations with aggregate base course and disposal of unsuitable or surplus material. The work shall be carried out in accordance with these Specifications and with the lines, levels, grades, dimensions and Cross-sections as shown in the Drawings or as directed by the Engineer.

2.3 Construction Requirements

2.3.1 Excavation

Foundation excavation shall be carried out using equipment and tools approved by the Engineer and to the lines, levels and Cross-sections shown in the Drawings and as directed by the Engineer. When excavating an asphalt concrete surfaced road, a suitable asphalt cutter approved by the Engineer, shall be used initially to cut the asphalt concrete layer.

The sides of the foundation shall be adequately supported at all times to ensure the stability of the rest of the road platform. Any damage done to the rest of the road platform and any over-break shall be made good by the Contractor at his own expense. Any damage done to the any type of utility services such as CEB, TELECOM, WATER BOARD etc. shall be borne by the contractor and reinstatement shall be done at the contractor's cost.

Trench excavation shall be programmed to be carried out in sections to cause the least inconvenience to the road users. The Engineer shall approve the work programme before the work commenced and contractor shall take the necessary work permits from the relevant authorities such as Sri Lanka Police, CMC, PSD, MSD and etc.

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2.3.2 Reinstatement of excavated foundation

Prior to the commencement of reinstatement of the fill above the surround, the foundation shall be cleared of any material unsuitable for incorporation in the fill. Where necessary dewatering is done, care shall be taken to ensure that the water is drained away from the roadway.

All suitable materials from the excavation shall be used for the backfill. However, any material contaminated with topsoil or other unsuitable material shall not be used. He shall make any material that becomes unsuitable by contamination due to the negligence of the Contractor good at his own expense. The placing and compaction of material from the top of the surround material up to formation level shall be done according to the drawing. The Engineer shall approve the equipment used for compaction.

The construction of the Sub-base, Base and Surfacing or shoulder affected by the excavtion shall then be carried out as per the relevant Specifications and as described in the Contract and as directed by the Engineer.

2.4.1 Other Excavation

Foot-walk should be prepared by excavating and compacting to required levels for slab paving and kerb laying work. Excavation for column bases should be according to the drawing. All unsuitable and excess excavated material should be disposed to a location within 10km distance as directed by the engineer.

2.4.2 Measurement and Payment

Foundation excavation for all required and completed work shall be measured in its original position and the volume determined in Cu m. Foundation reinstatement up to formation level in embankment fill material shall be measured as compacted in position in Cu m. Reinstatement using suitable material resulting from the excavation measured separately. All Excavation work for foundations of signal columns and transport of surplus excavated material to the dump yard are measured in cu m. and paid under removal of excavated surplus material.

Pay items shall be,

Pay Item	Description	Pay Unit
2.00(1)	Excavation for signal column foundation for column with horizontal arm	m^3
2.00(2)	Excavation for signal column foundation for column without horizontal arm	m^3
2.00(3)	Approved ABC (Aggregate Base Course) filling with compaction.	m^3
2.00(4)	Removal of excavated surplus material of column foundation	m^3

3.00 CONCRETING OF FOUNDATIONS OF SIGNAL COLUMNS

The construction of all or portions of structures of Portland cement concrete, of the required grade or grades with or without reinforcement, and with or without admixture. Constructed in accordance with the Specification and the lines, levels, grades and dimensions shown on the Drawings and as required by the Engineer.

Portland Cement concrete shall consist of a mixture of Portland cement, water and coarse and tire aggregate without admixture.

Grades of concrete –

The grade of concrete to be used in each part of the structure shall be as described in the Drawings,

03.01 Construction Methods

03.01.1 General
The Contractor shall maintain an adequate number of trained and experienced supervisors and foremen at the site to supervise and control the work. All construction, other than concrete, shall conform to the requirements prescribed in other Sections of the Specification for the several items of work entering into the complete structure.

03.01.2 Foundation
Preparation of foundations shall conform to the details as shown on the Drawings and Excavation and Backfill for Structures. The elevations of the bottoms of footings as shown on the Drawings are approximately only and the Engineer may order further excavation as necessary to obtain satisfactory foundations. Foundation for tack tile concreting base should be prepared according to the drawing.

03.02 Formwork, False work and Centering
Before concrete is placed the Engineer shall inspect all form work, false work and centering and no concrete shall be placed until the Engineer has approved such formwork, false work and centering.

03.03 Measurement and Payment
Quantity of concrete measured for payment will be in m^3 Grade of the concrete to be used is described under the pay description. Form work for Signal Column are measured in square meters and will be paid separately.

Pay Item shall be;

Pay Item	Description	Pay Unit
03.00(1)	Cement concrete 1: 1 1/2 : 3 (3/4") in signal column bases with horizontal arm.	m^3
03.00(2)	Cement concrete 1 : 1 1/2 : 3 (3/4") in signal column bases without horizontal arm	m^3
03.00(3)	Form work for signal column bases with horizontal arm	m^2
03.00(4)	Form work for signal column bases without horizontal arm	m^2

04.00 REINFORCEMENT FOR SIGNAL COLUMN BASES

04.01 Description

This work shall consist of furnishing and placing reinforcement bars of the grade, type and size shown in accordance with the Specification, and in conformity with the requirements shown on the Drawings.

04.02 Materials

Tor steel bars shall conform to the requirements of CS 26 or BS 4449

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04.02.01 Binding Wire

Reinforcement binding wire shall be best black annealed mild steel wire, approximately 1.6mm in diameter.

04.03 Construction Methods

04.03.01 Protection and Storage

Reinforcement for structures shall be handled and stored in a manner that will prevent bending out of the desired shape and the unnecessary accumulation of dirt, oil and paint. When placed in the work it shall be free from dirt, oil, grease, paint, and loose or thick rust.

04.03.02 Cutting and Bending

Bars shall be cut and bent according to the dimensions indicated and with equipment and methods approved by the Engineer. (Placing, Supporting and Fastening)

All bar reinforcement shall be placed, supported and secured before the beginning of concreting operations. The reinforcement shall be checked and approved by the Engineer before placement of concrete begins. The relationship between the minimum spacing of bars and the maximum size of aggregate shall be as follows unless otherwise stated by the Engineer. The minimum clear distance between two bars in a beam or column shall not be less than the diameter of the bars or 25mm or the largest size of aggregate or whichever is the greatest. Laying or driving bars into the concrete after placement will not be permitted. All horizontal reinforcement shall be supported on metal supports or mortar blocks of approved shape with tie wires embedded in them made out of portland cement and sand in the ratio of 1 to 3 by weight. Supports which are in contact with the external face of the concrete will all be mortar blocks. The use of small stones or wood blocks will not be permitted. The reinforcement shall be held securely in place at me exact position and at the exact spacing as indicated on the Drawings by the use of wire ties at bar intersections, supports and spacer blocks. Wire ties shall be securely tied and folded so that they do not project beyond the planes formed by the reinforcing bars.

04.03.03 Anchorage Bond

The anchorage bond stress can be assumed to be constant over the effective anchorage length. The anchorage bond stress taken as the force in the bar divided by the product of the effective anchorage length.

Reinforcement shall be furnished in the lengths indicated on the Drawings. splicing except where shown on the Drawings will not be permitted without written approval from the Engineer, and if additional lap splices are used the additional weight occasioned by such lap splices will not be included in the measurement of reinforcement for payment.

04.03.04: Measurements

The quantity of reinforcement to be measured under this Section shall be the computed weight in kg of material used and accepted as shown on the Drawings provided that the quantity shall not include the reinforcement in any item of work the basis of payment for which includes the reinforcement. In computing the weight to be measured, the theoretical weights of bars of the cross section shown on the Drawings or authorized, shall be used.

04.04 Payment

This work measured as provided above, shall be paid for at the Contract unit price per kg of reinforcement for the particular Bill Item listed below. The payment shall be full compensation for furnishing and placing all materials and for all labour, equipment, tools and incidentals necessary to complete the work prescribed in this section.

Pay item shall be,

Pay item	Description	pay unit
04.00(1)	10mm dia. mild steel reinforcements for Signal Column bases	kg
04.00(2)	10mm dia. Tor steel reinforcements for Signal Column bases	kg

05.00 DUCTING, CONTROLLER BASES AND MANHOLES

05.01 Description

This work shall consist of excavation for ducts, laying of ducts, back fill with aggregate base course and temporary reinstatement and construction of manholes and controller bases in accordance with this Specification and in accordance with the lines, levels grades, sizes, dimensions and types shown on the Drawings.

05.01.01 Excavation for trenches, controller bases and Manholes

The excavation work shall be carried out using equipment and tools approved by the Engineer and to the lines, levels and Cross-sections shown in the Drawings and as directed by the Engineer. When excavating an asphalt concrete surfaced road, a suitable asphalt cutter approved by the Engineer, shall be used initially to cut the asphalt concrete layer.
The sides of the trenches and foundations shall be adequately supported at all times to ensure the stability of the rest of the road platform.

The Contractor shall make good with one of the materials described above as directed by the engineer

(i) Any additional excavation at or below the bottom of trenches if the Contractor allows the trench bottom to become soft or otherwise unsuitable for the construction of the duct run.

(ii) Any excavation greater than the net volume required for the duct work below the upper level of any duct surround as described in the Contract.

Excavations requiring backfilling shall remain open only for the minimum period, necessary Excavations requiring backfilling in existing paved or other surfaces shall be carried out and reinstated in compliance with the Contract.
The Contractor shall keep excavations free of water including:

(i) Arranging for the rapid removal of water, from the site and prevent water entering the excavation,

(ii) Lowering and maintaining by appropriate measure, the water level in excavations, sufficiently to enable the Permanent Works to be constructed.

(iii) Providing where necessary temporary watercourses, drains, pumping.

(iv) Discharging accumulated water and ground water into the permanent outfalls of the drainage system where practicable;

(v) Providing adequate means for trapping silt on temporary systems discharging into permanent drainage systems.

Any damage done to the rest of the road platform and any over-break shall be made good by the Contractor at his own expense.
Any damage done to the any type of utility services such as CEB, TELECOM, WATER

BOARD etc. shall be borne by the contractor and reinstatement shall be done at the contractor's cost.

Trench excavation shall be programmed to be carried out in sections to cause the least inconvenience to the road users. The Engineer shall approve the work programme before the work commenced and contractor shall take the necessary work permits from the relevant authorities such as Sri Lanka Police, CMC, PSD, MSD and etc.

05.01.02 Reinstatement of excavated trenches and foundations

The surround for the pipe or duct or cables as appropriate shall be constructed according to the Specification of the agency to which the utility services belong or as per the drawing provided. Prior to the commencement of reinstatement of the fill above the surround, the trench shall be cleared of any material unsuitable for incorporation in the fill. Where necessary dewatering is done, care shall be taken to ensure that the water is drained away from the roadway.

All suitable materials from the excavation shall be used for the backfill. However, any material contaminated with topsoil or other unsuitable material shall not be used. He shall make any material that becomes unsuitable by contamination due to the negligence of the Contractor good at his own expense. The backfilling material should be ABC (Aggregate Base Course).

The placing and compaction of material from the top of the surround material up to formation level shall be done according to the drawing. The Engineer shall approve the equipment used for compaction.

The construction of the Sub-base, Base and Surfacing or shoulder affected by the trench shall then be carried out as per the relevant Specifications and as described in the Contract and as directed by the Engineer.

05.02 Pipes for Ducts of electrical cables

Pipes for electrical cable ducts shall have a smooth internal bore without any sharp edges. Pipes shall be selected from the permitted alternative designs described in the Contract.

Contractors shall ensure that PVC pipes are stored under cover and not subject to deterioration due to sunlight during the period between manufacture and installation in the ground.

Unless otherwise described in the Contract or agreed with the Engineer, only one type of pipe shall be used within any individual duct run between consecutive manholes.

The Contractor may provide a different pipe and bed to that which is described in the Contract, subject to the Engineer being satisfied that the design and strength of the proposed pipe together with its support and backfill are equally effective as those described in the Contract, and that the pipe will not be injuriously affected by either the adjacent ground or the cables to be carried.

05.03 Bedding, Laying and Surrounding of Ducts

Immediately following the excavation of the trench the ducts shall be laid and jointed on the approved bedding. Ducts shall be laid so that each one is in contact with the bed throughout its length. The bed shall be cut away and removed at each socket or sleeve in the case of socketed or sleeve jointed ducts to give a clearance of at least 50mm so that the socket of sleeve does not bear on the bed.

Unless otherwise described in the Contract, duct bedding material shall be according to the drawing.

Selected backfill shall be suitable material which is free from lumps of cohesive soil larger than 75mm and stones larger than 37.5mm.

The completion of bedding and the surrounding of the duct is to be carried out immediately after jointing. The bedding and surround shall be brought up equally on both sides of the ducts ensuring that it is compacted in layers not exceeding 150mm thickness. Where ducts are to be tested, the bedding or surrounding material shall only be brought up sufficiently to support the

duct and joints shall be left exposed until the mandrel test is completed and the duct run accepted by the Engineer. The mandrel test must be carried out before surfacing over the duct run.

05.04 Jointing of Ducts

Joints in UPVC pipes shall be made with plastic solvents.
Joints in pipes for ducts shall comply with the appropriate Sri Lankan Standard and be jointed so that no silt, grit, grout or concrete surround is able to enter the duct.
Pipes with push-fit joints shall have a register to ensure that the pipe is fully pushed into the joint.

05.05 Backfilling of Trenches

Backfilling shall wherever practicable be undertaken immediately the specified operations preceding it have been completed. The material as described in the Contract shall be deposited in layers and compacted as described below. Care should be taken to compact the material evenly without dislodging or damaging ducts. Material shall not be heaped in the trench before being spread. Power rammers are not to be used within 300mm of any part of the duct or joint. Material shall be compacted in layers not exceeding 150mm m depth. Each layer shall be compacted to obtain a minimum of 95% of the maximum dry density. The top surface of the backfill on which base or sub-base is to be placed shall be compacted to a minimum depth of 150mm to not less than 98% of the maximum dry density of the material.

Except in carriageways and other paved areas, backfill of trenches for all ducts shall be brought up to ground level. Where the ground surface on the line of the trench consists of top soil, the upper section of the backfill shall be top soil of the thickness described, or of the same thickness and quality of soil as the surrounding ground. For trenches in carriageways or other paved areas the backfill shall be brought up to formation level, or such lower level as described in the Contract and capped with carriageway construction or paving is described in the contract and to be similar to the adjacent surfacing.

05.06 Connecting to Existing Services

Before entering or breaking into any existing services the Contractor shall give notice of his intention to do so to the Authority responsible for the utility to which the connection is to be made.

05.07 Man Holes and controller bases

All man holes and controller bases shall be constructed as described in the Contract drawing. Excavation around man holes and controller bases shall be backfilled with aggregate base course and compacted, where mechanical compaction is impracticable, the excavation shall be backfilled with concrete.

05.08 Cleaning

Each duct shall be fitted with a stranded polypropylene draw rope off 5.3KN breaking load, the ends of which shall be made fast as described in the Contract. Immediately after laying, the position of ducts shall be marked and the ends sealed by removable stoppers.

05.09 Measurement

The quantities measured for payment for,

- Duct laying shall be lengths in meters including excavation as specified, laying of 110 mm dia, pipes, jointing, and backfilling as specified and temporary

reinstatement.

- Man holes construction shall be in numbers including excavation as specified in the drawings

05.10 Payment

The quantities, measured as provided above,

shall be paid for at the Contract price per unit of measurement, respectively, for each of the items listed below that is shown in the Bill of Quantities. The prices and payment shall be full compensation for furnishing and excavation, supply and placing pipes, reinforcing, concreting, formwork, labour, equipment, backfilling, reinstatement, testing, cleaning, removal of surplus material and transported 10km away from site, base, sub base preparation and all incidentals necessary to complete the work.

Pay Item shall be;

Pay item	Description	Pay unit
05.00(1)	Supply and Lay 110mm PVC duct (type 600)	Lm
05.00(2)	Construction of manholes	No
05.00(3)	Construction of controller bases	No
05.00(4)	Supply and Lay 38mm (1.5") dia 3.25 mm thickness GI pipe	Lm

6.00 ARRANGEMENTS FOR TRAFFIC WITH SAFETY PRECAUTIONS DURING REHABILITATION OR CROSSING OF EXISTING ROADS

06.01 General

The Contractor shall provide and maintain for the period of construction, traffic control and safety devices including Traffic Signs, Barricade Boards, Traffic Cones, Lighting Devices at all locations where work is in progress in accordance with Part II of the "Manual Of Traffic Control Devices, Road Development Authority, Ministry of Transport and Highways-March 2001" or their latest editions.

Materials and equipment temporarily stored on, or adjacent to, the existing roadway shall be so placed, and the work at all times, shall be so conducted as to cause minimum disruption to the road user.

Warning signs, painted barrels and warning tape strung across barrels shall be provided to separate the Contractor's material and equipment and the Contractor's working area from the roadway. Red lanterns or warning lights shall be mounted on barricades at sunset and shall be kept lit until sunrise. Reflective tapes and stickers of minimum size of 50x50 mm shall be pasted on each barrel and directed at oncoming traffic.

At the points where traffic is to deviate from its normal path whether on part of the carriageway or temporary diversion clear directions to the traffic shall be conspicuously exhibited at both ends with the aid of appropriate road signs. The portion of road closed for traffic shall be barricaded and at night these markings shall be adequately lit so as to be clearly visible, as stated in the aforesaid paragraphs of this section. One way traffic arrangements shall be resorted to, in case the traffic is heavy, in consultation with and with the assistance of the Police Authorities. Signs warning the traffic of the obstructions or diversions ahead shall also be installed well forward of the points of diversion. The Contractor shall arrange for the Traffic Police to be in attendance for traffic management. Necessary flag men with stop / go boards and or traffic lights shall be stationed at both ends to guide the traffic.

The Contractor shall be responsible for the provision and maintenance of adequate standard signing for the duration of any diversion.

If in the opinion of the Engineer, the above Road Safety and Traffic Control measures have not been provided at the start or at any stage of rehabilitation, the Contractor shall not be permitted to start or continue to work at such sections of the road.

06.02 Using a part of carriageway

A part of carriageway shall be kept open to traffic while improvement works such as widening of the road or strengthening of the existing Pavement is being carried out in the other part. The above procedure shall be carried out provided the part kept open to traffic is adequate for the purpose, if necessary, by widening the shoulders. In such cases the shoulders shall be dressed and brought in level with the existing carriageway and shall be continuously maintained in a good condition for the entire duration of the work. Where improvement work is in progress in long stretches along important roads, suitable passing bays shall, where possible, be provided with the approval of the Engineer and in consultation with the traffic police. On less important roads, the method of keeping part of the carriageway open to traffic shall, as far as practicable, be adopted even in respect of repairs to or reconstruction of culverts and minor bridges.

The Contractor shall not be permitted to have excavations open on both sides of the road at a particular chainage such that there are steep drops adjacent to traffic, which may create a danger to traffic. That is the excavation and backfilling with Sub-base or Base shall be flush with the existing road level on one side, before excavation can proceed on the other side of the road.

The working length may be further reduced depending on the traffic flow and if visibility is reduced at bends or increased where appropriate at the Engineer's discretion. For one way working the Contractor shall not commence work until the Engineer approves the proposal submitted by the Contractor for this purpose.

During construction for operations which require one-way traffic the Contractor shall be responsible for the removal of broken down vehicles, including vehicles damaged in accidents and shall maintain one way uninterrupted traffic flow at all times.

06.03 Temporary Diversion

If, in the opinion of the Engineer, it is not possible to pass the traffic on a part width of the carriageway, or by any other route, a temporary diversion close to the road shall be constructed as directed by the Engineer.

06.04 Measurement and Payment

Measurement

(a) Specifications approved by the Engineer by using locally available materials, as far as practicable. Temporary surface and cross drainage arrangements shall also be provided as directed wherever necessary. The diversion shall be maintained in good condition till the original or new road is opened to traffic.

(i) All costs related to the implementation and execution of the traffic safety and management work shall be measured monthly.

(b) Payment

Traffic management and safety

(i) Payment shall include all costs necessary and required for the implementation of this work in accordance with these specification, including updating.

(ii) Payment shall be made monthly.

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(iii) The Engineer may any time withhold payments if in his opinion this work is not being provided, in due compliance with the requirements and procedures of this specification.

06.05 The Pay Items and Pay Units shall be as follows;

Pay Item	Description	Pay Unit
6.00 (a)	Traffic management and safety	Month

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SPECIAL, TECHNICAL AND OTHER REQUIREMENTS FOR SUPPLY, INSTALLATION, COMMISSIONING AND MAINTENANCE OF TRAFFIC SIGNALS IN GEORGE R. DE SILVA MAWATHA/ K.CYRIL. C. PERERA MAWATHA JUNCTION.

Selected Contractor should be responsible to do the above scope of work within the Bill of Quantities attached herewith.

This specification describes the requirements for the supply, installation, commissioning and maintenance of traffic signals at the above mentioned junction.

1.0 Proposed Location

- George R.De Silva Mawatha / K.Cyril C. Perera Mawatha junction.

2.0 Proposed facilities & Specifications

Colombo Municipal Council propose to install the Traffic signals at the above location with the several facilities including Audible Siren Unit, Count down Digital Indicator and Pedestrian Detection camera according to the following conditions.

2.1 Signal Heads

All signal lights shall be low power consuming Light-Emitting Diodes (LEDs) of the high intensity type possessing high resistance to shock and vibration. Equipment shall comply with BS 505 (or equivalent international standard) and shall be vermin proof. All lanterns shall be of 300 mm in diameter.

All signal heads and the optical systems shall be a combination of the high intensity LED type with high rate of durability. Equipment shall be to the IP 55 to BSEN 60529 / IEC 60509.

- Light intensity: - ≥ 255cd for Red, ≥291cd for Yellow, ≥510cd for Green
- Outside material - Fiber or Poly Carbonate
- Operating Temperature: - -10 ~80°C
- Warranty - 5 years comprehensive

The unit shall show red, green and amber. Additional optical units may be added as required for special facilities. Suitable visors shall be fitted to all optical units. Louvers and sighting screens shall be supplied if required to give the most efficient operation under all conditions. Each signal head shall conform to a sample submitted to and approved by the Engineer.

Pedestrian displays shall be a single section, LED red man/ green man displays with a separate countdown timer for both red man (red colour) and green man (Green colour). Pedestrian pushbuttons shall be accessible type.

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Vehicle Count Down – vehicle count down shall be displaced wherever necessary. It is capable of showing real time information.

Pedestrian Count Down - Green man time countdown units should be installed at either side of the Pedestrian signal heads. The two digit countdown units should have a height of at least 16 cm. LED, seven segment display system or any other method of long distance visibility (about 20m) may be used for this application. The signal heads should not contain any mechanical parts but should be with LED lights.

2.2 Audible Siren Unit

Specially designed distinctive and audible range has been restricted by monitoring the ambient level of traffic noise the unit should be adjusted the level of the audible tone with relatively short period. This should be generated with the green man indication.

- Multi operation periods with built-in high precision clock chip, It should free from interuption of power down mode and less than 2 years operation error.
- CE power supply with AC220V~AC230V wide range working voltage shall use.
- The highly efficient class D power supply shall adopt.
- It should available to adjust the volume atleast 50 grades by control box and when the volume is 0 power amplifier it should work in silence without any noice.
- It should be connected to control box by USB interface and it should easy for setup.
- Maximum Peak Work Power - < 18W
- Maximum Average Work Power - < 8W
- Work Temperature - -10°C to 80°C
- Setting Mode - By control Box
- IP Grade - IP 65
- Warranty - 5 years comprehensive

2.3 Pedestrian Detection Cameras

The purpose of installation of the camera is to confirm, that pedestrian has not departed the crossing zone before the "walk signal" appears. If the pedestrian departs the crossing zone prior to

the appearance of the "walk signal" the call from the such pedestrian by pressing the push button should be cancelled.

The basic feature of the camera should be able to detect the human presence in the vicinity of the push button unit of the Pedestrian Controller System. The detection distance should be at least 5m and the area of detection should be adjusted with the tilting of the camera at site. Under normal circumstances it would be 2m * 4m.

Microwave Radar or Video motion detector cameras or any other practically viable detector systems should be used.

The camera should be operated with 230V power supply 24 months warranty should be offered for the detector system.

The contractor should verify the logic in the already installed controller units for the compatibility of the offered camera.

2.5 Luminous Directional Signs

Specially designed Directional Sign shall be made of Retro Reflective Sheeting pasted on 40cmx40cm composite Aluminum frame. However, the width of the frame has to be matched with the width of the relevant signal head. This shall be fixed to signal head using nuts and bolts as instructed by the Engineer.

The sign face shall be fully reflector zed.

Reflective sheeting shall be of High Intensity Prismatic Grade confirming to ASTM D 4956 Type IV with green background and letters symbols shall be in white. The surface of the sheeting shall be smooth and flexible and have high durability under all weather conditions, heat and moisture and be strongly fungus-resistant.

The colour of the sheeting shall be even and free from any spots or loss of colour. The colour shall not fade appreciably under local weather conditions during its expected service life.

The co-efficient of retro reflection shall not be less than the minimum values specified in the Table below.

Table - Minimum co-efficient of Retro-reflection (RA)

Candelas per Lux per Square metre

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Minimum co-efficient of Retro reflection is given in below

Observation Angle	Entrance Angle	White	Green
0.1	-4	400	56
0.1	30	120	13
0.2	-4	250	35
0.2	30	80	9
0.5	-4	135	17
0.5	30	55	6.5

2.6 Aluminum Target Board

Target boards shall be fitted to each signal head supplied. The target boards shall be constructed using type 5005 aluminium alloy with a minimum thickness of 1.6 mm.

3.0 General Requirements

3.1 All equipments shall be supplied in new condition except in so far as it has to be tested in the course of manufacture.

3.2 Vertical & horizontal poles should be as per the drawings provided.

3.3 For all equipments an acceptance test shall be carriedout prior to installation.

3.4 These tests which shall be conducted at the site shall be in accordance with accepted good practice and all to the satisfaction of the Engineer.

3.5 Installation and commissioning will be carried out at the site as specified in accordance with accepted good practice and all to the satisfaction of the Engineer.

3.6 All Equipments shall be suitable for the climatic conditions and use of public roads in Sri Lanka.

3.7 Technical Specifications of the all items should be submitted by the bidder with tender document.

3.8 All vertical and horizontal mounting traffic signal heads should supply and install by the contractor. Drawing and specifications attached.

3.9 All the brackets for installation of traffic signals should be supplied by the contractor.

3.10 Selected contractor should maintain the newly installed signal light units free of charge for one year period from the date of commissioning and especially pedestrian detection

camera system should maintain free of charge for two year period as mentioned in **section 2.3.**

3.11 The system should be state of the art with microprocessor controlled architecture along with solid state switching techniques. The Controller should have industry standard techniques with compatible software to operate/maintain the system. Amature Controllers using devices such as Programmable Integrated Circuits (PICs) are not acceptable since they could not be maintained by a third party. The Controller should be either Internationally Standard Branded Controllers or designed with Programmable Logic Controllers (PLCs) with manufactures software.

The construction of the controller housing shall be in accordance with the requirements of BS 505:1971. The control panel box shall be securely fixed to a concrete foundation such that the cabinet is aligned true to the vertical and cannot be rocked from side to side. The panel shall be weatherproof with steel housing and shall be locked with a Warning sign displayed on the door. Control Panel Cabinet shall give access to control equipment unit, main power supply unit, solid state relay units (SSR) etc.

3.12 The signal sequence should comply with the current pattern operating in Colombo and the basic features of the system including heads should comply with international standards.

3.13 The cantilevered 3 aspect signal heads should have a diameter of 300mm. (Red/Amber/Green)
The pedestrian Red Man / Green Man heads should also be 300mm.
All the heads should be with low power and high bright LEDs.

3.14 All the system parameters in the system should be able to control via a Lap Top Computer or by Hand held terminal.

3.15 Rugged push button units should be installed.

3.16 Staging/ Phasing patter changes -
The proposed controller should have the facility to alter/amend the staging/phasing pattern upon installation at site. It is preferable that this to be done at site on low traffic hours while the controller is running on standby mode. The necessary software for this purpose should be handled over to CMC free of charge.

3.17 The hardware and software should be able to facilitate flashing Amber facility with the signals.

3.18 Count down heads should be fixed with secondary heads on cantilever poles on each arm. Count down timing should be displayed during the red time and the green time.

3.19 Cables – The underground multi core cables should be armored type with 1.5 – 2mm2 copper conductors. There should be an electrical termination top cap on top of each pole

ORIGINAL

for the case of maintenance of Traffic Signal heads.

3.20 Electrical Installation shall comply to BS 7671:2018 requirements for Electrical Installations IET wiring Regulations.

3.21 Tenderer should submit his past experience in the similar types of projects. Following information should be submitted with the tender.

Name of project

Place of the project

Letter of acceptance

Total value of the project

Letter of recommendation

3.22 As Built drawings, all related software, programmes shall be submitted, after completion of the project.