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### SECTION 8. Architecture and construction.

## KNOWLEDGE AND ANALYSIS OF THE OPRC MANAGEMENT IN GEORGIA

**Abstract:** The work is considered effective management of road Infrastructure building, monitoring and analyze in Georgia. By these methods are possible deliberate and effective spending of funds attracted to road construction. By geographic information systems is possible detailed monitoring of these processes.

**Key words:** Georgia, road, economic growth, the management and conservation of road assets, geographic information system, traffic control.

**Language:** English

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### INTRODUCTION

Since 2005 Georgia has revised regulations and legislation on many aspects of transport-related infrastructure and services to facilitate rapid development of its transport sector. Increased economic activity, following these reforms, has led to more intensive use of the sector, particularly for international links, and the sector's contribution to gross domestic product has been growing about 10% annually.

The road network is about 22,000 km and the annual capital investment in all modes of transport reached \$362 million in 2011, including \$131 million of foreign direct investment. Much of this has gone into improving Georgia's international roads, following attempts to make Georgia's transport system an integral part of the Transport Corridor Europe-Caucasus-Asia and the Central Asia Regional Economic Cooperation corridors and a regional logistics hub. Improvement of the East-West Highway (EWH) remains the priority for public investment. Placing EWH improvement at the top of the investment list is justified because it is the fastest and shortest surface transport link between the east and west of the country, and is important for the cohesiveness and security of the country. It is also the only alternative to the railway.

Responsibility for road infrastructure policy and planning in Georgia lies with the RDMRDI, while management of the National/Regional roads and local roads is the responsibility of the RD and the Municipalities. While the Roads Department of MRDI builds and operates roads classified as international and secondary, since 2007 local authorities are responsible for the other roads in the network, which are classified as local roads. The Roads Department is responsible for planning, designing, constructing, and maintaining secondary and international roads. Most of its work, except some planning

and programming work, is outsourced to national and international private companies. It has evolved into a contract administrator and manager of the network. Local authorities oversee the roads in cities, towns, and villages. The Roads Department manages international and secondary roads (6,835 km), and district administrations and cities manage local roads (around 15,000 km).

Under present road construction and maintenance contracts the contractor is responsible for the execution of works which are normally defined by the Georgian Road Department (GRD), and the contractor is paid on the basis of unit prices for different work items, i.e. a contract based on "inputs" to the works. The results of this type of traditional road contracts are in many cases less-than-optimal. The problem is that the contractor has the wrong incentive, which is to carry out the maximum amount of works, in order to maximize his turnover and profits. Even if the work is carried out according to plan and considerable money is spent, the overall service quality for the road user depends on the quality of the design given to the contractor who is not accountable for it. In many cases the roads do not last as long as they should because of deficiencies in the original design, aggravated by inadequate maintenance.

Performance Based contracting or Output- and Performance-based contracting for Roads is designed to increase the efficiency and effectiveness of road asset management and maintenance. It should ensure that the physical condition of the roads under contract is adequate for the needs of road users, over the entire period of the contract which is normally several years. This type of contract significantly expands the role of the private sector, from the simple execution of works to the management and conservation of road assets.



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A countries GDP is directly correlated to the paved road kilometers as shown in the charts below. As shown in the charts below between 1997 and 2014 GDP PPP vs. Paved KM/Million Population is becoming more important

for economic growth. Efficiencies derived from maintenance/preservation performance based contracts will help to increase the Paved KM/Million Population.

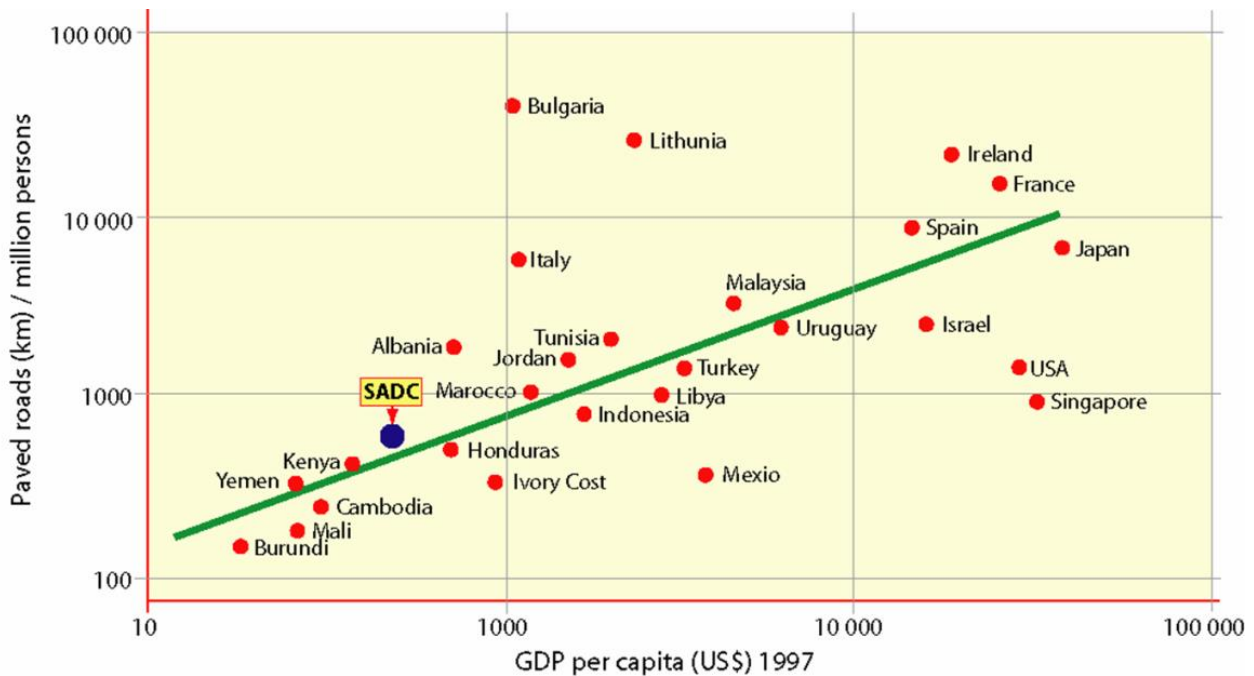
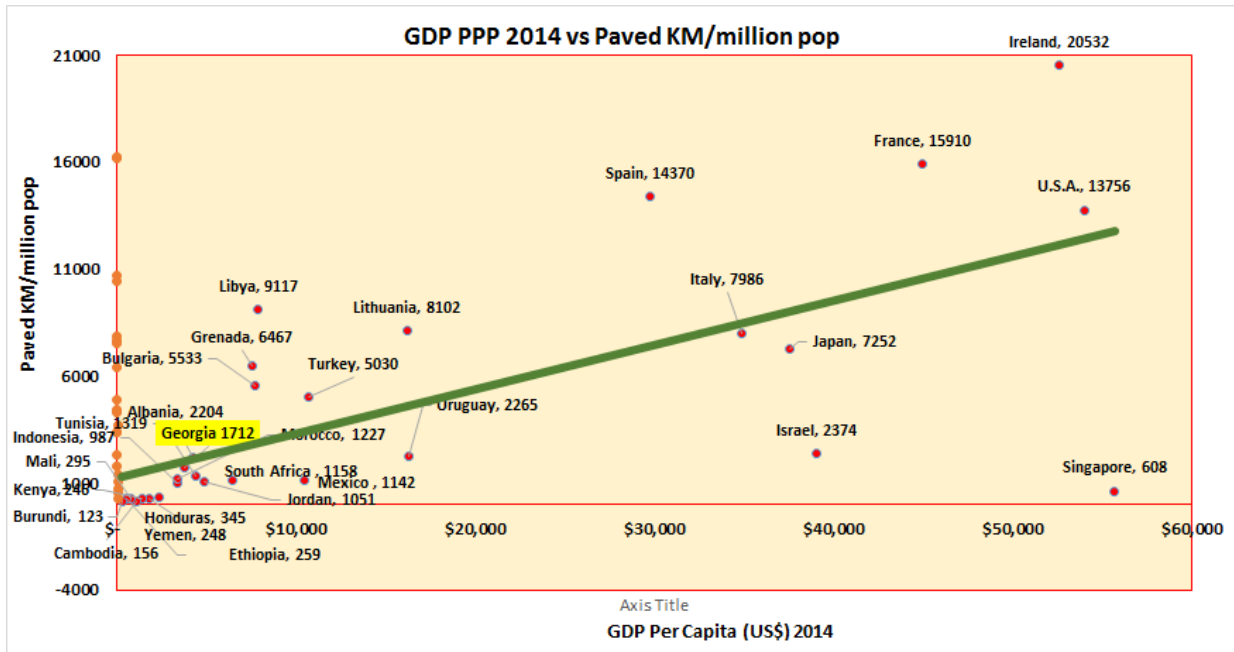


Chart 1: GDP vs. Paved RD KM /Million Populations in 1997 & 2014

Asian Development Bank, The European Bank for Reconstruction and Development, European Union, Japan International Cooperation Agency and Millennium Challenge Corporation have also assisted road network development in Georgia. WB works closely with these

development partners through frequent meetings and information exchanges.

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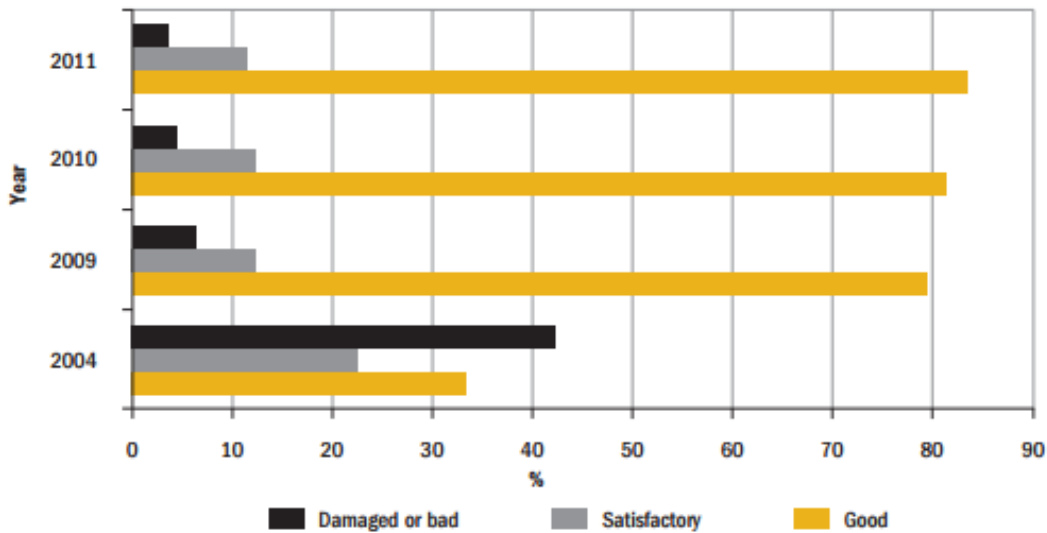


Chart2: Change in Georgia International Road Condition from 2004 to 2011

The MRDI has tendered the rehabilitation and maintenance of approximately 117 kilometers of secondary roads in Kakheti region of Georgia. The works and services will be implemented under an Output and

Performance Based Road Contract (OPRC) of 5 years' duration comprising an initial Rehabilitation phase followed by a Maintenance phase.

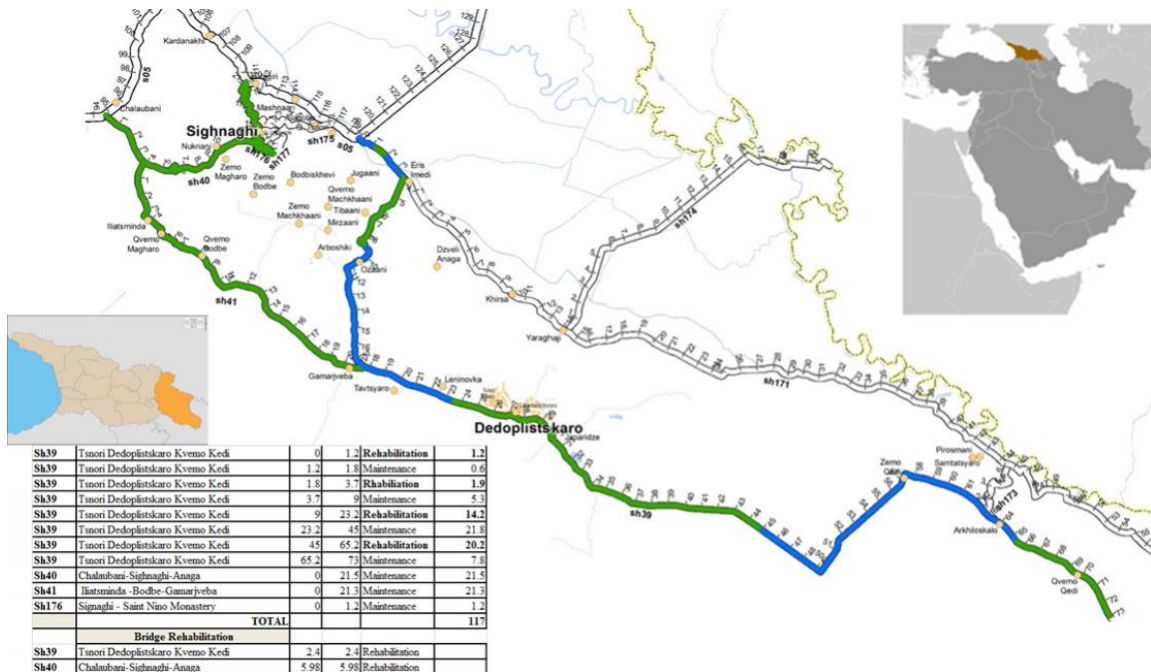


Figure 1: Main Sections of the Project Map

Therefore, the OPRC Contractor will be responsible for the overall management of the roads including design, rehabilitation, emergency and maintenance works.

As a result of it, the main objective of this project is to assist with the Monitoring of the OPRC Contract by overseeing the management of the OPRC Contract, including the continuous assessment of the OPRC Contractor's performance.

**TESTS FOR EVALUATING INDICATORS -** Asset management systems make use of data from a wide range of sources, both within and outside a road administration and supply information to various levels and parts of an administration (e.g. senior management, decision makers, etc.) where it may be combined with data from other systems. It is therefore vital that every effort is made to ensure that all data both used by and output from, an asset management system is of an appropriate quality.

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This in turn necessitates that all members of the Project Manager's Team be aware of the importance of data quality and that appropriate data checking and validation procedures are put in place. All information collected on the road sections will be studied; year program indicators and completion dates of each test; result of tests performed by the RDMRDI contrast to the award of this contract to check the values of indicators carry out by the OPRC Contractor. The Consultant is responsible for:

□ Monitoring that the OPRC Contractor maintains the roads open to traffic and substantially free of interruptions at all times.

□ Checking that the required Maintenance and Service Levels specified for each road section are being complied with in full through the system of formal and informal inspections. Set of indicators to be fulfilled by the OPRC Contractor during the maintenance period. This will applied from the end of first month after completion of rehabilitation works if any was developed or from the end of month 1 from the OPRC signature.

The inspections carried out by the Consultant will consist of formal (scheduled in advance) and informal inspections (as part of the general mandate received). They will cover entire sections of the road in both directions, also controlled branches, links, service roads and associated rest areas, adjusting the time of the inspection, when necessary, to conservation efforts or programmed by the dealer

works with ordinary or extraordinary; as well as the seasonal tasks (and other winter maintenance).

**MONITORING SERVICE AND QUALITY INDICATORS** - These inspections are primarily to monitor the implementation of those status indicators Quality and Service in accordance with the requirements must be assessed by the consultant team. A communication protocol with the OPRC Contractor shall be established along the lines of Inspection Manual, so that when the breach of an indicator has a direct impact on the safety of the track is immediately reported to the dealer so that minimum response time appropriate to correction. When the inspector considers appropriate and aligned with measurement method as provided in the contract, compliance with these indicators will be checked. Based on these results the correction factor to the rise or fall on the corresponding certification by counting the vehicles will be calculated. Furthermore, and as dictated by the annual Plan of indicators proposed by the Concessionaire and agreed with the Inspector, will proceed to track the results of tests conducted by teams of high capacity well paid by the dealer or the service. Contrast values there obtained correction factors, which are required to apply for certification according to the results of the test are determined. When actions undertaken for the improvement of an indicator, once finalized will be held in the affected measurement indicator committed.

Sh No	From	To	Work Type	Cum Length KM	ROAD USABILITY		AV TRAFFIC SPEED & RIDE		ROAD USER COMFORT & SAFETY		ROAD DURABILITY		ROAD DEFORMATION		ROAD & SHOULDER CLEANLINESS		ROAD & SHOULDER VEGETATION		ROAD SKID RESISTANCE		TOTAL
					12	11	12	11	12	11	14	13	12	11							
Sh39	1.20	1.45	Maintenance	1.45	5	60	5	55	5	60	5	75	5	70	5	65	5	60	5	55	500
Sh39	1.45	1.70	Maintenance	1.7	5	60	5	55	5	60	5	75	5	70	5	65	5	60	5	55	500
Sh39	1.70	1.80	Maintenance	1.8	5	60	5	55	5	60	5	75	5	70	5	65	5	60	5	55	500
Sh39	1.80	2.05	Rhabilitation	2.05	5	60	1	11	1	12	1	15	1	14	5	65	5	60	5	55	292
Sh39	2.05	2.30	Rhabilitation	2.3	5	60	1	11	1	12	1	15	1	14	5	65	5	60	5	55	292
Sh39	2.30	2.55	Rhabilitation	2.55	5	60	1	11	1	12	1	15	1	14	5	65	5	60	5	55	292
Sh39	2.55	2.80	Rhabilitation	2.8	5	60	1	11	1	12	1	15	1	14	5	65	5	60	5	55	292
Sh39	2.80	3.05	Rhabilitation	3.05	5	60	1	11	1	12	1	15	1	14	5	65	5	60	5	55	292

Table 1: EXCEL spreadsheet sample for Road TOTAL PERFORMNCE CONDITION INDEX ANALYSIS

**TRACKING PERFORMANCE MANAGEMENT PLAN FOR THE OPRC** - The Project Manager will monitor compliance by OPRC Contractor of all sections proposed Management Plan, which includes the following:

**SURFACE MANAGEMENT:** The Project Manager will collect information regarding surface auscultations, evolution calculation models and the assessment and prioritization of improvement actions. Preventive actions for maintenance will be developed, as well as correction measures will be recommended for values below the permissible thresholds.

**REGULAR MAINTENANCE ROAD MANAGEMENT:** The Project Manager will review the original proposal according to the needs assessment and taking into account implementation deadlines, estimated measurement, and average yields in the operations to

perform. A revision of the annual and monthly work plans will be develop to check staff resources, available equipment and materials, management of roads in relation to the care of accidents and incidents and signaling.

**MANAGEMENT OF WINTER MAINTENANCE:** In the Inception Phase, the last Winter Road Plan available will be reviewed, including a re-examination of the facilities and resources available. After each season, the proposed Plan will be analyzed and will be submitted to the OPRC Contractor. It will be extremely important the location of singular points in the sector that will require special attention due to their status at this time of year (high levels, winter maintenance associated parking, access status). It is also important to note that winter breaks could happen during the winter months, when it is snowing, or when snow accumulates at junctions, preventing visibility.



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**STRUCTURES MANAGEMENT:** An Action Plan will be prepared, which will include the estimated investment for rehabilitation in the year of concession (i.e. seals changes).

**SLOPES AND LAND WORKS MANAGEMENT:** The Project Manager will monitor slope ranking by slide and by potential damage in case of failure. That will be used to establish a visual inspection program to be agreed with the OPRC Contractor. A complementary action plan for land works, meshes, drains, sea walls and other structures will be prepared. An auscultation monitoring program will be established for those items with previous topographic monitoring protocols or that are being monitored at the moment.

**SIGNALLING AND MARKING MANAGEMENT:** The Project Manager will carry out daytime and night time inspections to ensure the full recognition of all of the signals and marks.

**TRAFFIC MANAGEMENT:** The Consultant will verify that the calculation of counting stations will comply with the OPRC. The Monthly Traffic Calculations as well as the Annual Report will be validated.

**ROAD SAFETY MANAGEMENT:** In a monthly basis, a contrast test will be carried out in order to check out the number of accidents published by the OPRC Contractor, and they will be crossed with other sources and databases. The Project Manager will collect as many information as possible in order to draft a monthly report

of the accidents. The correction factor will be recalculated each year.

**COMMUNICATIONS AND INFORMATION MANAGEMENT:** A 24/7 Communication Management System will be established as well as an Information Management System. The last one will be used for the OPRC Contractor in a daily basis in order to analysis road conditions and external communications protocols, and it will inform about traffic conditions on the road.

**QUALITY MANAGEMENT:** All existing checkpoints will be collected according to the OPRC Contractor's QAP. The Project Manager will supervise the proper implementation and enforcement of the actions to be taken in the field of conservation and operation of the road.

**ENVIRONMENTAL MANAGEMENT:** The OPRC Contractor will apply its own environmental management system for all its activities undertaken.

**USE OF GEOGRAPHIC INFORMATION SYSTEM** - Among other measures to improve the knowledge about the real status of assets and services the Project Manager will prepare and use network mapping and a geographic information system (GIS) so all information and knowledge can be further used in adjusting the contract and in monitoring the performance of the OPRC Contractor.



Figure 2: Time Stamped, GPS Tagged Video, Photo and Map Record

**SPECIAL CONSIDERATION TO TRAFFIC SIGNALLING AND ROAD SAFETY** - The economic and social rewards for achieving a sustained improvement in Road Safety are substantial and should far exceed the effort and costs incurred in achieving these improvements. However, implementing sustained and lasting advancement to Road Safety is notoriously difficult and takes a long time to achieve results. They require long-term and consistent political and financial support to succeed. Improving Road Safety traditionally requires strengthening the three "E"s: Engineering, Enforcement and Education:

Engineering measures involve improving the standards, design, implementation and maintenance of the physical infrastructure (roads, bridges/structures and other street furniture) and the vehicles using these facilities;

Enforcement, which is required to ensure that the regulations and standards stipulated are properly implemented and complied with, by all those involved; and

Education, which is necessary to ensure that all road user groups and other stakeholders (e.g. those involved in the various areas of road management), are fully aware of the importance of

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Road Safety, and integrate it automatically in their interaction with the roads.

The Project Manager will monitor that OPRC Contractor achieve performance indicators related to road safety (response time, road signs, traffic signals, guard rail, traffic markings, visibility...) and keep track of incidents to elaborate statistics and improvement measures in order to achieve the first of the elements required for an effective long term road safety strategy. Among elements of road safety, traffic signs are an essential element of the road system, and a road with poor signing or by poorly maintained signs is an insufficient road. Road users depend on traffic signing for information and guidance, and route authorities depend on signing for the economical operation of the route network, the group action of traffic rules, traffic control and facilitate to road safety. Three distinct types of traffic signal maintenance that will be frequently referenced:

□ Preventative maintenance. This type of maintenance is the periodic scheduled maintenance to minimize future problems. It includes inspection, calibration, cleaning, testing, sealing, painting, etc., in accordance with a predefined schedule to minimize the probability of unexpected failure and to maximize the life of the equipment. And the goal is to make the traffic signal fully functional as soon as possible. Since response maintenance is frequently necessary at the most inopportune time, the objective is to minimize this type of maintenance.

□ Operational maintenance. This type of maintenance is the periodic scheduled operational

maintenance to minimize existing and future congestion problems. This maintenance includes the analysis of traffic signal timings and other operational activities that can potentially improve safety and mobility at the traffic signal. The Project Manager will supervise the following:

□ Staff from OPRC Contractor. If the OPRC Contractor staff is enough to maintain the traffic signals to the established guidelines. It is recommended at least one qualified technician for every 40 signalized intersections.

□ The equipment disposed by the OPRC Contractor. It should have include as minimum vehicles, test equipment for retro reflective measures, digital multi meter, Controller and conflict monitor test equipment, Detector sensor test equipment, Small tools, Vacuum cleaner, Small generator for backup power for signals at major intersections during power outages, a field laptop with appropriate traffic signal controller and detection software, a small video monitor when using video detection systems, Replacement parts and Work zone traffic control devices

□ Maintenance activities. Various components all work together to provide a fully functional traffic signal. Neglecting any one of these components can be detrimental to the safe and efficient operation of the entire traffic signal; therefore, it is important to maintain each and every one of these components. The following traffic signal components are detailed in the following sections:

ELEMENT	OPERATION
SUPPORTS	Inspections of the welded and bolted connections
TRAFFIC SIGNALS SIGNING	On field inspections to confirm they are not missing signs
PAVEMENT MARKINGS	On field inspections of retro reflective

**EVALUATION REPORTS** - The purpose of the formal inspections is to enable the Consultant to verify the information presented in the Contractor's monthly statement and to issue the Interim Payment Certificate. Therefore, based on the outcome of the formal inspection, the Consultant will immediately correct any possible errors or misrepresentations in the Contractor's statement, countersign it and present it to the Client for payment, and to the Contractor for information. On the other hand, the Consultant shall notify the OPRC Contract within 24 hours

of its lack of compliance after an informal inspection to take remedial action as soon as possible and will subsequently check to see whether they have been rectified during the specified time. However, it is the duty of the Contractor's Self Control Unit, not of the Project Manager, to identify and ensure the rectification of defects in a timely manner. In any case the Consultant shall officially notify the OPRC Contractor in a case of any deviation and penalties will be deducted from the relevant monthly payment calculation.

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