

Quality Control Issues for the Roads of LGED; Present State, Challenges and Scope of Improvement

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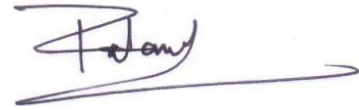
**BRAC Institute of Governance and Development,
BRAC University**

**Title: “Quality Control Issues for the Roads of LGED in NOBIDEP
Northern Bangladesh Integrated development Project;
Present State, Challenges and Scope of Improvement.”**

Declaration

It is hereby declared that this dissertation or any part of it has not been submitted elsewhere for the award of any degree or diploma

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CERTIFICATE

This is my pleasure to certify that Md. FATEMUL ISLAM, ID No. 15182011, Batch No. 08, Masters in Procurement and Supply Management, BRAC Institute of Governance and Development (BIGD), BRAC University has prepared the dissertation entitled “Quality Control Issues for the Roads of LGED in NOBIDEP-Northern Bangladesh Integrated development Project; Present State, Challenges and Scope of Improvement”. He was under my supervision to prepare this report. His efforts to the report are very much satisfactory.

Dr. M. Shamim Kaiser
Assistant Professor
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ABSTRACT

Quality control is a vital issue for all organizations and especially for construction sector. NOBIDEP- Northern Bangladesh Integrated development Project is a JICA funded project, here assuring quality is one of the main focus point. But there seem some deviations in maintaining quality and those cannot be solved over night and which is mainly for lack in sourcing of materials, Evaluation of suppliers, monitoring (pre & post), Training/staffing, and procurement, audit/reviews, Transparency& management. It is rather a total quality issue. Total Quality Management is a new concept and widely used in private sector. The concept is not familiar in public sector but it is the solution that situation demands now in public sector. So the problems can be overcome by imparting Total Quality Management .which focus on continuous improvement and value adding at all functions.

Abbreviations

ADB -Asian Development Bank

AE -Assistant Engineer

BDT- Bangladesh Taka (Currency)

CPTU- Central Procurement Technical Unit

DPD- Deputy Project Director

DPP- Development Project Proposal

GOB- Government of Bangladesh

HOPE -Head of Procuring Entity

IMED -Implementation Monitoring and Evaluation Division

LGED -Local Government Engineering Department

NOA -Notification of Award

PD -Project Director

PE -Procuring Entity

PP -Public Procurement

PPA -Public Procurement Act

PPR -Public Procurement Rules

Sr. AE- Senior assistant engineer

TEC -Tender evaluation committee

WB -World Bank

XEN -Executive Engineer

UZR-Upazila Road

UNR-Union Road

BC-Bituminous Carpeting

BOQ-Bill of Quantities

JICA-Japan International Cooperation Agency

PMO-Project Management Office

RFP-Request for Proposal

RFQ-Request for Quotation
CC-Cement-concrete
DSM- Design, Supervision and Monitoring
EA- Executing Agency
FGD- Focus Group Discussion
IFT- Invitation for Tender
JV-Joint Venture
MMT- Mobile Maintenance Team
O&M- Operation and Maintenance
OJT- on-the-job training
PME- Performance Monitoring and Evaluation
RCC- Reinforced Cement-concrete
RPM- Rehabilitation and Periodic Maintenance
RSEPS- Rate Schedule and Estimate Preparation System
UE- Upazila Engineer
e-Gp- e-Government Procurement
OTM = Open Tendering Method
LTM-Limited Tendering Method
PE -Procuring Entity
STD - Standard Tender Document
MPSM- Masters in Procurement and Supply Management
KPI- Key Performance Indicator
PPR 2008- Public Procurement Rules 2008
SSS- Single Source Selection

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1. INTRODUCTION

1.1 General

Quality is about making organizations perform for their stakeholders – from improving products, services, systems and processes, to making sure that the whole organization is fit and effective. Managing quality means constantly pursuing excellence: making sure that what your organization does is fit for purpose, and not only stays that way, but keeps improving. What quality means for your organization is ultimately a question for your stakeholders. And by stakeholders we mean anyone who has an interest in the success of what your organization does.

What unites quality professionals is their dedication to protecting and strengthening their organizations by making sure stakeholders' needs are met – and ideally, that their expectations are exceeded.

From LGED, NOBIDEP perspective quality is to construct sustainable, serviceable and safe in 69 Upazila roads-(Total 637.3 km) in 14 districts & 47 Union roads (Total 331.5 km) in 14 districts roads for the road users. Quality issues in road construction starts from the defining the need extends to design, sourcing, construction, contract management and maintenance.

1.2 Background and Rationale of the Study

Today, maintaining roads and delivering good quality by meeting target standards are an essential part of the everyday life and goals for road administrations and agencies. In order to fulfill the expectations of society and road users, road authorities need to continuously develop their operations and increase public involvement. The public sector is more actively moving on to adopting the private sector-style of “customer-focus” what has resulted in that organizations more and more use customer satisfaction ratings as an indicator on performance of services and products.

The aim for improvements in infrastructure and operations on roads is to improve the quality of the current road network and the welfare of road users and citizens. Investments and policy strategies

Or decisions regarding infrastructure and road network are often significant decisions

within the government and other organizations operating in the public sector, mostly because of the large amount of money involved and the impact that the infrastructure network and the operations on the roads can have on the different stakeholders and the environment. Most of these decisions are made by the government organizations, but in the last years the public opinion and feedback have grown in importance. The involvement of different stakeholders and integration of their needs and values in the decision-making process is nowadays seen as a key to sustainable infrastructure and transport decisions. A successful integration of these opinions and interests of the general public is greatly influenced by the quality of communication between the governmental organization and the different stakeholders.

Total Quality Management (TQM) has been widely utilized by the public sector since the end of 1980s. Through this management approach, most organizations in the public sector have sought two major purposes: first, to reconfigure administrative systems in ways that might improve public services; and second, to establish a streamlined operation in order to increase efficiency and effectiveness of their performance. So it is time for LGED-NOBIDEP to move towards TQM philosophy, imparting quality everywhere despite of its current quality assurance plan. That's why this topic was select by me.

1.3 NOBIDEP Summary

- 1. Project Title:** Northern Bangladesh Integrated development Project (NOBIDEP)

- 2. a) Sponsoring Ministry:** Ministry of Local Government, Rural Development & Cooperatives / Local Government Division
/Division

- b) Executing Agency:** Local Government Engineering Department (LGED)

3. Objectives of the Project:

The NOBIDEP is aimed to contribute to the overall goal of promoting economic growth and reducing poverty in the 14 Districts of northern region of Bangladesh. Toward this end, the Project objectives are as follows:

- Expand access to rural infrastructures and services,
- Expand access to urban infrastructures and service delivery and
- Improve urban governance in target Pourashavas

This will be achieved through improving and sustaining:

- 1) rural infrastructures,
- 2) urban infrastructures, service delivery and governance; and
- 3) Linkages between rural and urban areas.

4. Location of the Project:

Division	District	(Upazila)	
Geographical Coverage :			
The target area of the NOBIDEP is 14 Districts in total			
Rangpur	1.Rangpur(8)	2.Kurigram(9)	58
	3.Gaibanda(7)	4.Nilphamar(6)	
	5.Dinajpur(13)	6.Panchagarh(5)	
	7.Thakurgaon(5)	8.Lalmonirhat(5)	
Dhaka	1.Jamalpur(7)	2.Kishoreganj(13)	59
	3.Mymensingh(12)	4.Netrokona(10)	
	5.Sherpur(5)	6.Tangail(12)	

5. a) Estimate cost of the project (In Lakh Taka)

i)	Total	270,594	100%
ii)	GOB	57,837	21.37%

iii) P.A.

212,757 78.63%

b) Exchange rate with date

The exchange rates as on December 2012: USD 1 = BDT 81.7; USD 1 = JPY 79; BDT 1 = JPY 0.966; JPY 1=BDT 1.035

6.a) Mode of Financing with source

Mode of Financing	GOB (FE)	PA (RPA)	PA Source
1	2	3	4
Loan/Credit	-	212,757	JICA-ODA
Grant	57,837	-	GOB
Equity	-	-	-
Others (specify)		-	-
Total	57,837	212,757	-

b) source of financing GOB fund against DPP's Year wise allocation:

Whether the priority list of the project has been made according to available resources in the FY 2013-2014. If Yes give the Sl.No	Year wise GOB fund requirement		Project Aid	Source of required GOB fund	In case of re-appropriation from other projects what will be the impact of that projects
	Financial Year	Amount (in lakh taka)			
1	2	3	4	5	6
Included in the Annual procurement plan In the DPP	2013-2014	5783.65	6741.00	ADP	Not applicable
	2014-2015	11567.30	44131.00	ADP	
	2015-2016	11567.30	53059.00	ADP	
	2016-2017	11567.30	56883.00	ADP	
	2017-2018	11567.30	34817.00	ADP	
	2018-2019	5783.65	17126.00	ADP	

7. Project Implementation period:

- Date of commencement: **1st March 2013**
- Date of completion: **30th June 2019**

8.Compomets :

1)Component 1: Rural infrastructure development

The Project consists of the following eight subcomponents.

Subcomponent 1-1: Upazila roads (include bridges and culverts)

The Project will upgrade at least 69 Upazila roads (Total 637.3 km) in 14 districts. This subcomponent will provide continuous, efficient access between important rural locations, Growth Centers (GCs), Upazila headquarters, and connections to higher levels of the road network under the management of Road and Highway Department, and extend efficient connectivity between rural areas and pourashavas and other local urban centers.

Subcomponent 1-2: Union roads (include bridges and culverts)

The project will upgrade at least 47 Union roads (Total 331.5 km) in 14 districts which are, in spite of their importance, currently partly or completely brick-paved or earthen. This subcomponent will provide continuous, efficient access to connect rural areas to important locations, rural markets, Union headquarters, Growth Centers and all-weather UZR, and further extend efficient connectivity in rural areas and topourashavas and other local urban centers.

Subcomponent 1-3: Upazila roads rehabilitation

In Bangladesh, the condition of a road can change significantly during one wet season. If it would be left in the damaged condition, the need for financial resources and management will increase. SFYP emphasizes the importance of the continuing investment in development of the rural road network. A draft Rural Road Maintenance Policy (2012), prepared by LGED, also sets out clearly for giving priority to sustaining the benefit of improved rural roads through rehabilitation works. To sustain the improved level of transport service, the Project will rehabilitate Upazila roads (Total 300 km) through repairs to and replacement of sections of damaged pavement and re-sealing, together with repairs to embankments and cross-drainage structures.

Subcomponent 1-4: Growth centers and rural markets

As it is emphasized in the Rural Road Master Plan (2005), the development of rural roads that connect growth centers with Upazila headquarters and villages with growth centers is critical to poverty reduction, and the development of rural markets and other facilities in a comprehensive manner is recognized as an effective approach. The project will support improvement and development of 70 growth center markets and 74 rural markets selected by determined selection methodology.

Subcomponent 1-5: Ghats

One of the recommendations of the Rural Infrastructure Strategy (1996) was to coordinate the development of the rural road network with the use of rural waterway. LGED responded to this by taking up the improvement of riverbank and land-side facilities at rural Ghats in order to facilitate the efficient and safe transfer of people and goods between waterway and road transport. The Project will include river infrastructure such as ghats, and jetties at about 20 locations in Kishoreganj and Netrokona district.

Subcomponent 1-6: Labor contracting society (LCS) scheme

Under Component 1, the Project will put emphasis on poverty reduction through the approach that has been developed by the LGED for rural infrastructure development projects. As one of such approach, Labor Contracting Societies (LCSs) will be utilized for off-pavement routine maintenance works and tree plantation under the Project. This will benefit LCSs members that consist of destitute and disadvantaged women. For effective implementation of LCS scheme, the Project will involve local authorities and coordination mechanism at Union level in monitoring and selection of LCS scheme.

Subcomponent 1-7: Community-based road safety program

Once UZR or UNR are improved under the Project, it is expected that the number of traffic accidents will increase as drivers generally tend to increase speed on the newly improved roads. Anticipating the potential road safety risk, the Project will need to take preventive measures of road safety in both hard and soft aspects. In line with the Sixth National Road Safety Strategic Action Plan 2011-2013, the Project will formulate and implement a participatory Community-based Road Safety (CBRS) program. The objective of the participatory CBRS program will be to provide assistance to local people to mitigate any adverse effects arising from road improvement subprojects, and to improve road safety in the Project area. The Project will coordinate with the Road Maintenance and Road Safety Unit (RMRSU) to implement this Program.

Subcomponent 1-8: Training and capacity development

The project will develop capacities of (i) LGED officials; (ii) contractors and construction workers; (iii) concerned Upazila and Union Chairpersons; (iv) stakeholders of growth centers and rural markets, including women shopkeepers and physically challenged shopkeepers; (v) LCS members. The capacity development of those stakeholders will be carried out through training, workshops and meetings.

2.Component 2: Urban infrastructure and governance improvement

The Project selected target 18 (eighteen) pourashavas that fall in category B and C. Two main steps have been taken to determine target pourashavas. First step into determine which categories of pourashavas (i.e., category A, B or C) should be supported under the Project. Second, the pourashavas in the selected categories have been ranked according to the weighted averages of indicators in the selection criteria.

Subcomponent 2-1: Urban infrastructure development and service delivery

The project will develop basic infrastructure and improve service delivery including (i) roads, bridges and culverts, (ii) drains, (iii) municipal markets, (iv) slaughterhouses, (v) water distribution network and tube wells, (vi) public and community toilets, (vii) solid waste management, (viii) bus and truck terminals, (ix) streetlight, (x) parking area, and (xi) basic services for the poor; and basic services for the poor comprises a) the basic infrastructure improvement, such as footpath, drains, dustbins, tube wells, and streetlights, and b) livelihood and living standard improvement such as group saving and credit, income-generating activities such as vocational training program, primary health care including hygiene education, pre-primary school education such as satellite school program, and birth registration. The subprojects in each pourashava will be selected from the investment plan under Pourashava Development Plan (PDP) and identified through participatory planning process by using Town Level Coordination Committee (TLCC) and Ward Level Coordination Committee (WLCC). The implementation of component 2 will be divided into three phases. The Project will start 20% of infrastructure investments from phase 1 to provide stronger incentives for pourashavas to participate in governance improvement activities. This initial allocation will provide positive incentives for pourashavas to tackle governance improvement and capacity development including on-the-job-training for their engineers. The amount of investment funds for phase 2 and 3 allocated to each pourashava depends on the progress of its governance reforms. The maximum amount or ceiling of the funds to be allocated is up to BDT 150 million for category-B pourashavas, and BDT 100 million for category-C pourashavas.

The Project will also introduce special allocation of investment fund to create a new,

additional financial incentive mechanism for pourashavas to implement subprojects and thereby strengthen rural-urban linkages. The special allocation is intended to promote subprojects under subcomponent 2-1 that contribute to strengthening of linkages between pourashavas and surrounding rural areas by providing pourashavas with additional fund to such subprojects. The subproject funded by the special allocation will improve the pourashava road and build connectivity among the disconnected Upazila road/Union road and the disconnecting pourashava road.

Subcomponent 2-2: Governance improvement and capacity development

The Project will support to improve the governance and develop the capacity of pourashavas. Target pourashavas will carry out series of reform activities in six key areas defined in the Urban Governance Improvement Action Program (UGIAP): (i) citizen awareness and participation, (ii) urban planning (formulation of PDP), (iii) women's participation, (iv) integration of the urban poor, (v) financial accountability and sustainability, and (vi) administrative transparency. The UGIAP is used in ADB funded Urban Governance and Infrastructure Improvement Project (UGIIP) 1 and 2, and the Project adopts a refined version based on experiences and lessons. The activities will be supported by training and facilitation. The performance of pourashavas will be intensively monitored and assessed to determine the amount of investment funds allocated to them.

3) Component 3: Institutional development

This component will support to strengthen institutional development of the Project, by providing the manpower and procurement of vehicles and equipment. This component consists of two part; administration support and procurement support.

Subcomponent 3-1: Administration support

This subcomponent will provide incremental staffing for Project Management Office (PMO) and Urban Management Support Unit (UMSU) in LGED. For PMO and UMSU, six types of incremental staff will be hired; (i) project monitoring and reporting support

(PMRS) assistant, (ii) project accounting support (PAS) assistant, (iii) equipment procurement support (EPS) assistant, (iv) performance monitoring and evaluation (PME) assistant for UGIAP evaluation, (v) statistical analysis (SA) assistant for rating of UGIAP, and (vi) publicity campaign (PC). In addition, the cost of a chartered accountant firm for internal audit will be borne by this component.

Subcomponent 3-2: Equipment Procurement

For the smooth implementation, this subcomponent will support to procuring activities for the Project. Vehicles and goods, including heavy construction and maintenance equipment such as static roller, will be procured by central buying. The static roller (8-10 ton) will be provided to each PIO and PIU to rent out to the contractors for road construction and maintenance works in order to ensure good quality of compaction works.

4) Component 4: Consulting services

The component 4 will support overall management, implementation and reporting for component 1 and 2. This component consists of the following three consultancy services; (i) design, supervision and monitoring (DSM) for component 1, subcomponent 2-1, and component 3; and (ii) governance improvement and capacity development (GICD) for subcomponent 2-2 and component 3; (iii) benefit monitoring and evaluation (BME).

Subcomponent 4-1: Design, supervision and monitoring (DSM) consultant for component 1 and subcomponent 2-1

DSM consultants will support LGED in: (i) preparing and reviewing detailed engineering design and cost estimates for all civil works subprojects; (ii) preparing and managing project implementation plans; (iii) assisting land acquisition and environmental assessments for subprojects; (iv) preparing subproject tender documents; (v) supervising, monitoring and reporting, including cost and quality control, the implementation of all civil works subproject; (vi) preparing, implementing, monitoring and reporting on operation and maintenance action plans for rural and urban infrastructure; (vii) supporting LCS activities to ensure a fairness and transparency; and (viii) providing trainings for capacity development of LGED, engineers of pourashavas, contractors, local communities, women beneficiaries and other stakeholders related to

component 1 and subcomponent 2-1 in cooperation with LGED Training Unit and UMSU.

Subcomponent 4-2: Governance improvement and capacity development (GICD) consultant for subcomponent 2-2

In cooperation with LGED Training Unit and UMSU, GICD Consultants will conduct capacity development activities under subcomponent 2-2 on Urban Governance Improvement Action Program (UGIAP) implementation for pourashava mayors, officers, and citizens through orientations, trainings, workshops, and Training of Trainers (ToT). GICD consultants will: (i) prepare Pourashava Development Plan (PDP) of each target pourashava; (ii) prepare operational guidelines and implementation methodology of UGIAP, including the preparation of operational guidelines for TLCC and WLCC; (iii) provide training of Assistant Engineers (urban planners) and other staff on urban planning; (iv) introduce computerized modern accounting system; (v) introduce computerized tax records system; (vi) improve holding tax assessment and collection; (vii) provide training on financial management; (viii) introduce communication campaign; and (ix) introduce e-governance, such as web based information management and disclosure.

Subcomponent 4-3: Benefit monitoring and evaluation (BME) consultant

BME consultants will be engaged in monitoring and evaluating outcomes and impacts of the Project, with the exception of UGIAP evaluation for component 2-2. BME consultant will: (i) conduct the baseline survey and midterm and ex-post assessments by organizing field surveys; (ii) develop a system, methodologies, measures, processes, and tools for the BME; and (iii) conduct capacity improvement of PMO, Supervision and Monitoring Offices (SMOs), Project Implementation Offices (PIOs), and Project Implementation Units (PIUs) in conducting BME.

4 Statement of the Problem

For the analysis of the problem followings questions is asked,

- What is the present condition of quality in NOBIDEP?
- Which organization/project NOBIDEP is benchmarking?
- What is the standard of quality control?
- What is the tolerance/acceptable level in maintaining quality at road construction?
- What are the present challenges in sourcing?
- What is the monitoring/audit/review system?
- What are the steps need to take for minimize/overcome those quality related problems?
- Is it possible to apply TQM & what are the ways to implement?

1.5 Objectives of the Study

The objective of the study is to assessing current challenges & problems comes in quality issues in road construction, identify the source of the problems and identifying problems in current sourcing, management & procurement process. Finding out how to overcome those and recommended the value adding steps. Finding out KPI's can be included ,because choosing the right KPIs relies upon a good understanding of what is important to the organization.

1.6 Scope of the Study

Local Government Engineering Department (LGED) is one of the largest public sector organizations in Bangladesh & Bangladesh GOVT. spending 70% of money by LGED. LGED currently implement works by projects basis & it ongoing with huge numbers of project. This research work is able to identify the problems comes in quality control in road construction and finding solutions and better utilize of public money.

In LGED most of the road construction is typically same, so this study will help all of the projects regarding quality control.

1.7 Limitations of the Study

Although this research was carefully prepared, I am still aware of its limitations. This study will be limited within NOBIDEP a JICA funded project of LGED. The given time is too short to research in this vast area, most of the data are confidential of LGED and highly restricted to disclose outside. There is no any published source for data collection.

2. LITERATURE REVIEW

2.1 General

Glizellelangerman “the application of quality assurance in system implementation projects” Most system implementation projects fail because they do not realize their original purpose and consequently do not meet the requirements of users and organizations. Most often the reason for this is quality assurance not being implemented by the project team as well as non-adherence to quality standard guide lines.

The literature review conducted focuses on what quality is, quality standards, quality control, Total quality management and as well as how to assess quality.

2.2 Definition of Quality

In business, designing and assembling, quality has a down to earth translation as the non-mediocrity or predominance of something; it's likewise characterized as wellness for reason. Quality is a perceptual, contingent, and fairly subjective trait and might be seen diversely by various individuals. Customers may concentrate on the determination nature of an item/administration, or how it thinks about to rivals in the commercial center. Makers may gauge the conformance quality, or degree to which the item/benefit was delivered effectively.

Bolster work force may quantify quality in the degree that an item is dependable, viable, or manageable. A quality thing (a thing that has quality) can perform agreeably in benefit and is reasonable for its expected reason. There are five aspects of quality in a business context:

- Producing – providing something.
- Checking – confirming that something has been done correctly.
- Quality Control – controlling a process to ensure that the outcomes are predictable.
- Quality Management – directing an organization so that it optimizes its performance through analysis and improvement.
- Quality Assurance – obtaining confidence that a product or service will be satisfactory.

2.2.1 Concept of Quality – Historical Background

The idea of value as we consider it now initially risen up out of the Industrial Revolution. Already merchandise had been produced using from beginning to end by a similar individual or group of individuals, with handcrafting and tweaking the item to meet 'quality criteria'. Large scale manufacturing conveyed colossal groups of individuals together to chip away at particular phases of generation where one individual would not really total an item through and through. In the late nineteenth century pioneers, for example, Frederick Winslow Taylor and Henry Ford perceived the restrictions of the strategies being utilized as a part of large scale manufacturing at the time and the resulting differing nature of yield. Birland built up Quality Departments to direct the nature of generation and redressing of mistakes, and Ford underscored institutionalization of plan and segment models to guarantee a standard item was delivered. Administration of value was the duty of the Quality office and was actualized by Inspection of item yield to "get" surrenders.

Use of factual control came later because of World War creation techniques, which were progressed by the work done of W. Edwards Deming, an analyst, after whom the Deming Prize for quality is named. Joseph M. Juran concentrated more on overseeing for quality. The main release of Juran's Quality Control Handbook was distributed in 1951. He likewise built up the "Juran's set of three", a way to deal with cross-practical administration that is made out of three administrative procedures: quality arranging, quality control, and quality change. These capacities all assume an essential part while assessing quality.

Quality, as a calling and the administrative procedure related with the quality capacity, was presented amid the second 50% of the twentieth century and has developed from that point forward. Over this period, couple of different controls has seen the same number of changes as the quality calling.

The quality calling developed from straightforward control to designing, to frameworks building. Quality control exercises were transcendent in the 1940s, 1950s, and 1960s. The 1970s were a time of value designing and the 1990s saw quality frameworks as a developing field. Like pharmaceutical, bookkeeping, and designing, quality has accomplished status as a perceived calling

As Lee and Dale (1998) state, there are numerous associations that are endeavoring to evaluate the strategies and courses in which their general efficiency, the nature of their items and administrations and the expected operations to accomplish them are finished

2.2.2 Dimensions of Quality

Eight measurements of item quality administration can be utilized at a key level to dissect quality attributes. The idea was characterized by David Garvin. A portion of the measurements are commonly fortifying, while others are not—change in one might be to the detriment of others. Understanding the exchange offs coveted by clients among these measurements can help fabricate an upper hand. Garvin's eight measurements can be condensed as takes after:

1. **Performance:** Performance refers to a product's primary operating characteristics. This dimension of quality involves measurable attributes; brands can usually be ranked objectively on individual aspects of performance.
2. **Features:** Features are additional characteristics that enhance the appeal of the product or service to the user.
3. **Reliability:** Reliability is the likelihood that a product will not fail within a specific time period. This is a key element for users who need the product to work without fail.
4. **Conformance:** Conformance is the precision with which the product or service meets the specified standards.
5. **Durability:** Durability measures the length of a product's life. When the product can be repaired, estimating durability is more complicated. The item will be used until it is no longer economical to operate it. This happens when the repair rate and the associated costs increase significantly.
6. **Serviceability:** Serviceability is the speed with which the product can be put into service when it breaks down, as well as the competence and the behavior of the serviceperson.
7. **Aesthetics:** Aesthetics is the subjective dimension indicating the kind of response a user has to a product. It represents the individual's personal preference.

8. **Perceived Quality:** Perceived Quality is the quality attributed to a good or service based on indirect measures.

2.2.3 Quality in Procurement Process

A generic procurement cycle

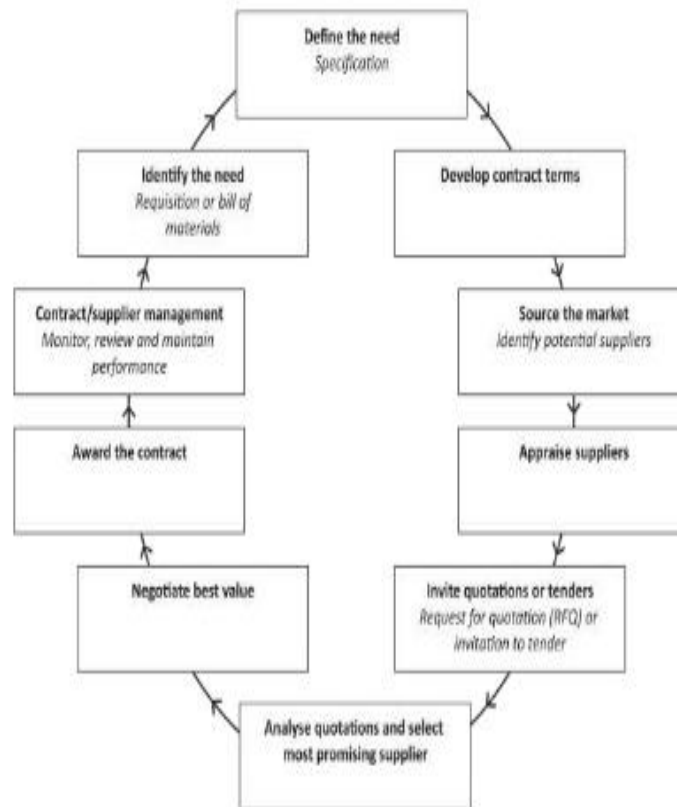


Figure A1-1-1 : Procurement Cycle

2.3 Quality Control

Quality control, or QC for short, is a procedure by which substances survey the nature of all components required underway. ISO 9000 characterizes quality control as "A piece of value administration concentrated on satisfying quality necessities".

This approach puts an accentuation on three angles:

1. Elements, for example, controls, work administration, characterized and all around oversight procedures, execution and uprightness criteria, and recognizable proof of records
2. Competence, for example, information, abilities, experience, and capabilities
3. Soft components, for example, staff, uprightness, certainty, hierarchical culture, inspiration, cooperation, and quality connections.

Controls incorporate item investigation, where each item is analyzed outwardly, and frequently utilizing a stereo magnifying instrument for fine detail before the item is sold into the outside market. Examiners will be given records and portrayals of unsuitable item deformities, for example, breaks or surface flaws for instance.

The nature of the yields is at hazard if any of these three viewpoints is lacking in any capacity.

Quality control stresses testing of items to reveal imperfections and answering to administration who settle on the choice to permit or deny item discharge, though quality confirmation endeavors to enhance and balance out creation (and related procedures) to maintain a strategic distance from, or if nothing else limit, issues which prompted the defect(s) in any case. For contract work, especially work granted by government organizations, quality control issues are among the top purposes behind not reestablishing an agreement

There is a tendency for individual consultants and organizations to name their own unique approaches to quality control—a few of these have ended up in widespread use:

Terminology	Approximate year of first use	Description
Statistical quality control (SQC)	1930s	The application of statistical methods (specifically control charts and acceptance sampling) to quality control.
Total quality control (TQC)	1956	Popularized by Armand V. Feigenbaum in a Harvard Business Review article ^[6] and book of the same name. Stresses involvement of departments in addition to production (e.g., accounting, design, finance, human resources, marketing, purchasing, sales).
Statistical process control (SPC)	1960s	The use of control charts to monitor an individual industrial process and feed back performance to the operators responsible for that process. Inspired by control systems.
Company-wide quality control (CWQC)	1968	Japanese-style total quality control
Total Quality Management (TQM)	1985	Quality movement originating in the United States Department of Defense that uses (in part) the techniques of statistical quality control to drive continuous organizational improvement.
Six Sigma (6σ)	1986	Statistical quality control applied to business strategy. Originated by Motorola.

Table A1-1-1 : Evaluation of Quality Control

2.3.1 Quality Standardization

ISO 9000 guidelines settle the standard for quality. ISO remains for International association for institutionalization. This association established in Switzerland in 1947. Comparative gauges for Indian setting are IS 14000 – 04.

ISO 9000 arrangement of standard are quality confirmation standard that guarantees customer that the association having gotten the affirmation works as indicated by determined necessity.

It remains for framework institutionalization and accreditation. Accentuation is given to characterizing and setting out the method; handle and so forth as archives.

ISO is essential since it offers a globally perceived methodical approach, combined

with regulation of the foundations, strategies, methodology, record keeping, advances and assets for overseeing quality work. Basic principles advocated by ISO are –

- 1.Focus on customer
- 2.Provide leadership
- 3.Involve your people
- 4.Use a process approach
- 5.Take a systematic approach
- 6.Encourage continual improvement
- 7.Get the facts before you decide
- 8.Work with your supplier

ISO 9000 series standards are –

- >ISO 9000
- >ISO 9001
- >ISO 9002
- >ISO 9003
- > ISO 9004

2.3.2 Quality Management System (QMS)

A quality management system (QMS) is a gathering of business forms concentrated on reliably meeting client prerequisites and improving their fulfillment. It is lined up with an association's motivation and vital heading (ISO9001:2015). It is communicated as the authoritative objectives and desires, approaches, forms, reported data and assets expected to execute and look after it. Early quality administration frameworks accentuated unsurprising results of a modern item creation line, utilizing straightforward measurements and irregular examining. By the twentieth century, work inputs were ordinarily the most exorbitant contributions to most industrialized social orders, so center moved to group collaboration and progression, particularly the early motioning of issues by means of a nonstop change cycle. In the 21st century, QMS has had a tendency to meet with manageability and straightforwardness activities, as both speculator and consumer loyalty and saw quality are progressively attached to these variables. Of QMS administrations, the ISO 9000 group of norms is likely the most broadly executed around the world – the ISO 19011audit administration applies to both, and manages quality and maintainability and their reconciliation. Other QMS, e.g. Natural Step, focus on sustainability issues and

assume that other quality problems will be reduced as result of the systematic thinking, transparency, documentation and diagnostic discipline

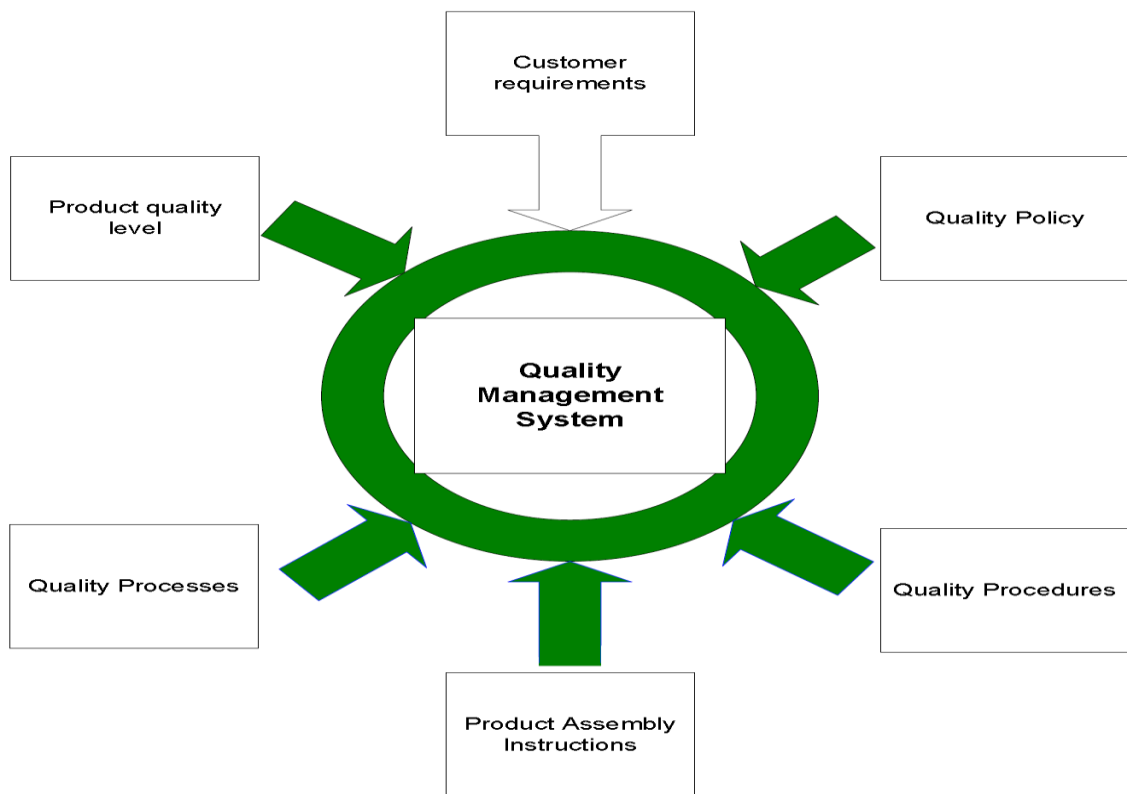


Figure A1-1-2 : Quality management system (QMS)

Elements

1. Quality policy
2. Quality objectives
3. Quality manual
4. Organizational structure and responsibilities
5. Data management
6. Processes – including purchasing
7. Product quality leading to customer satisfaction
8. Continuous improvement including corrective and preventive action
9. Quality instruments
10. Document control

2.3.3 Six Sigma

Six Sigma (in some cases adapted as 6σ) is an arrangement of strategies and devices for prepare change. It was presented by build Bill Smith while working at Motorola in 1986. Jack Welch made it fundamental to his business technique at General Electric in 1995. Today, it is utilized as a part of numerous mechanical areas.

It looks to enhance the nature of the yield of a procedure by distinguishing and evacuating the reasons for abandons and limiting inconstancy in assembling and business forms. It utilizes an arrangement of value administration techniques, mostly experimental, measurable strategies, and makes an extraordinary framework of individuals inside the association who are specialists in these techniques. Every Six Sigma extend completed inside an association takes after a characterized arrangement of steps and has particular esteem focuses, for instance: diminish handle process duration, lessen contamination, decrease costs, increment consumer loyalty, and increment benefits.

Six Sigma regulations attest:

- Continuous endeavors to accomplish steady and unsurprising procedure comes about (e.g. by lessening process variety) are of key significance to business achievement.
- Manufacturing and business forms have attributes that can be characterized, measured, examined, enhanced, and controlled.
- Achieving supported quality change requires duty from the whole association, especially from best level administration.

Components that set Six Sigma apart from past quality-change activities include:

- A clear concentrate on accomplishing quantifiable and quantifiable budgetary comes back from any Six Sigma extend.
- An expanded accentuation on solid and enthusiastic administration authority and support.
- A clear responsibility regarding settling on choices on the premise of undeniable information and measurable techniques, as opposed to presumptions and mystery.

Six Sigma - DMAIC

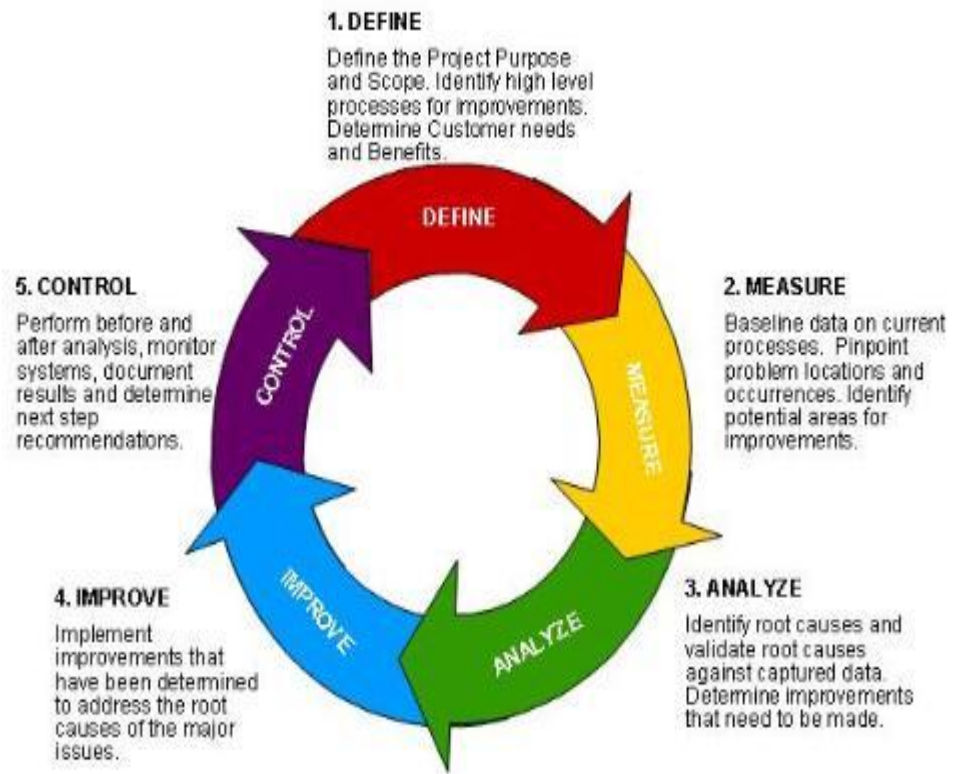


Figure A1-1-3 : Six Sigma

2.3.4 Quality Assurance

It is a term used to connote all the planned and systematic actions necessary for adequate confidence that the product or service will satisfy the given quality requirements.

QC is a part of the contractors programme to assure compliance with the quality requirements spelt out in the documents that constitute the contract between the contractor and owner. The requirement for a comprehensive QC programme should be detailed in the contract documents. To be effective, QC must be ongoing and proactive, not intermittent or reactive.

Quality assurance or acceptance is the owner responsibility and it is important investment.

Just as an effective QC programme plays for the contractor, an effective quality programme also plays an for the owner. The lack of effective QA programme can have significant long-term costs for the owner.

2.3.5 Total Quality Management

A core definition of total quality management (TQM) describes a management approach to long-term success through customer satisfaction. In a TQM effort, all members of an organization participate in improving processes, products, services, and the culture in which they work.

Total Quality Management TQM, also known as total productive maintenance, describes a management approach to long-term success through customer satisfaction. In a TQM effort, all members of an organization participate in improving processes, products, services, and the culture in which they work.

Total Quality Management Principles: The 8 Primary Elements of TQM

Total quality management can be summarized as a management system for a customer-focused organization that involves all employees in continual improvement. It uses strategy, data, and effective communications to integrate the quality discipline into the culture and activities of the organization. Many of these concepts are present in modern Quality Management Systems, the successor to TQM. Here are the 8 principles of total quality management:

1. Customer-focused

The customer ultimately determines the level of quality. No matter what an organization does to foster quality improvement—training employees, integrating quality into the design process, upgrading computers or software, or buying new measuring tools—the customer determines whether the efforts were worthwhile.

2. Total employee involvement

All employees participate in working toward common goals. Total employee commitment can only be obtained after fear has been driven from the workplace, when empowerment has occurred, and management has provided the proper

environment. High-performance work systems integrate continuous improvement efforts with normal business operations. Self-managed work teams are one form of empowerment.

3. Process-centered

A fundamental part of TQM is a focus on process thinking. A process is a series of steps that take inputs from suppliers (internal or external) and transforms them into outputs that are delivered to customers (again, either internal or external). The steps required to carry out the process are defined, and performance measures are continuously monitored in order to detect unexpected variation.

4. Integrated system

Although an organization may consist of many different functional specialties often organized into vertically structured departments, it is the horizontal processes interconnecting these functions that are the focus of TQM.

- Micro-processes add up to larger processes, and all processes aggregate into the business processes required for defining and implementing strategy. Everyone must understand the vision, mission, and guiding principles as well as the quality policies, objectives, and critical processes of the organization. Business performance must be monitored and communicated continuously.
- An integrated business system may be modeled after the Baldrige National Quality Program criteria and/or incorporate the ISO 9000 standards. Every organization has a unique work culture, and it is virtually impossible to achieve excellence in its products and services unless a good quality culture has been fostered. Thus, an integrated system connects business improvement elements in an attempt to continually improve and exceed the expectations of customers, employees, and other stakeholders.

5. Strategic and systematic approach

A critical part of the management of quality is the strategic and systematic approach to achieving an organization's vision, mission, and goals. This process, called

strategic planning or strategic management, includes the formulation of a strategic plan that integrates quality as a core component.

6. Continual improvement

A major thrust of TQM is continual process improvement. Continual improvement drives an organization to be both analytical and creative in finding ways to become more competitive and more effective at meeting stakeholder expectations.

7. Fact-based decision making

In order to know how well an organization is performing, data on performance measures are necessary. TQM requires that an organization continually collect and analyze data in order to improve decision making accuracy, achieve consensus, and allow prediction based on past history.

8. Communications

During times of organizational change, as well as part of day-to-day operation, effective communications plays a large part in maintaining morale and in motivating employees at all levels. Communications involve strategies, method, and timeliness.

2.3.6 Implementation of TQM

Generic Strategy Model for Implementing TQM Systems

1. Top administration finds out about and chooses to focus on TQM. TQM is recognized as one of the association's techniques.
2. The association evaluates current culture, consumer loyalty, and quality administration frameworks.
3. Top administration distinguishes center esteems and standards to be utilized, and conveys them.
4. A TQM all-inclusive strategy is created on the premise of steps 1, 2, and 3.
5. The association recognizes and organizes client requests and adjusts items and administrations to meet those requests.
6. Management maps the basic procedures through which the association addresses its clients' issues.

7. Management directs the arrangement of groups for handle change endeavors.
8. The energy of the TQM exertion is overseen by the controlling board of trustees.
9. Managers contribute independently to the exertion through preparing, training, or different strategies.
10. Daily process administration and institutionalization occur.
11. Progress is assessed and the arrangement is modified as required.
12. Constant representative mindfulness and input on status are given and reward/acknowledgment handle is set up.

2.3.7 Continuous Improvement

Continuous improvement, sometimes called continual improvement, is the ongoing improvement of products, services or processes through incremental and breakthrough improvements.

Continuous improvement is an ongoing effort to improve products, services or processes. These efforts can seek “incremental” improvement over time or “breakthrough” improvement all at once.

Among the most widely used tools for continuous improvement is a four-step quality model—the **plan-do-check-act (PDCA) cycle**, also known as Deming Cycle or Shewhart Cycle:

- **Plan:** Identify an opportunity and plan for change.
- **Do:** Implement the change on a small scale.
- **Check:** Use data to analyze the results of the change and determine whether it made a difference.
- **Act:** If the change was successful, implement it on a wider scale and continuously assess your results. If the change did not work, begin the cycle again.

2.4 Quality Assessment Tools

Most associations utilize quality apparatuses for different purposes identified with controlling and guaranteeing quality.

In spite of the fact that a decent number of value devices particular are accessible for specific areas, fields and practices, a portion of the quality instruments can be utilized crosswise over such spaces. These quality instruments are very non specific and can be connected to any condition.

There are seven essential quality devices utilized as a part of associations. These apparatuses can give much data about issues in the association helping to infer answers for the same.

Some of these quality instruments accompanied a sticker price. A concise preparing, for the most part a self-preparing, is adequate for somebody to begin utilizing the instruments.

Give us a chance to observe the seven fundamental quality apparatuses in a nutshell.

2.4.1 Flow Charts

This is one of the fundamental quality apparatus that can be utilized for examining a succession of occasions.

The device maps out a grouping of occasions that occur successively or in parallel. The stream outline can be utilized to comprehend an unpredictable procedure keeping in mind the end goal to discover the connections and conditions between occasions.

You can likewise get a concise thought regarding the basic way of the procedure and the occasions required in the basic way.

Stream diagrams can be utilized for any field to represent complex procedures essentially. There are particular programming devices produced for drawing stream diagrams, for example, MS Visio.

You can download a portion of the open source stream graph devices created by the open source group.

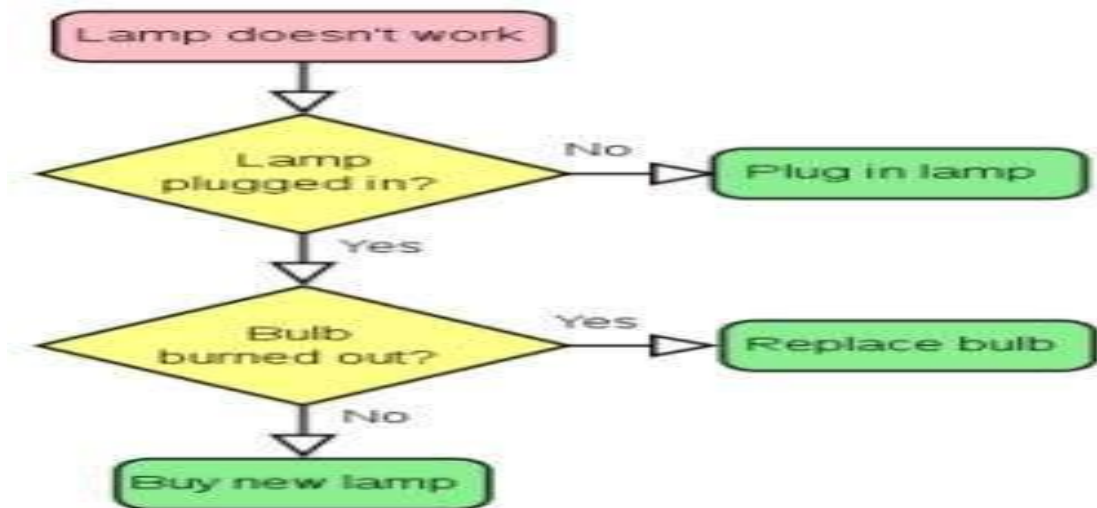


Figure A1-1-4 :Flow Charts

2.4.2 Histogram

Histogram is utilized for outlining the recurrence and the degree with regards to two factors.

Histogram is an outline with segments. This speaks to the dispersion by mean. On the off chance that the histogram is typical, the chart takes the state of a chime bend.

In the event that it is not ordinary, it might take diverse shapes in view of the state of the circulation. Histogram can be utilized to gauge something against something else. Continuously, it ought to be two factors.

Consider the accompanying case: The accompanying histogram demonstrates morning participation of a class. The X-pivot is the quantity of understudies and the Y-hub the time.

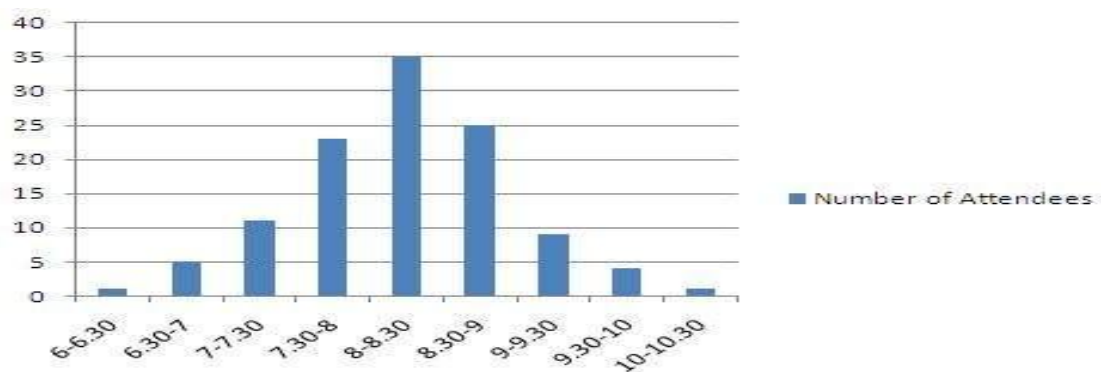


Figure A1-1-5 :Histogram

2.4.3 Cause and Effect Diagram

Cause and effect diagrams (Ishikawa Diagram) are utilized for understanding hierarchical or business issue causes.

Associations confront issues ordinary and it is required to comprehend the reasons for these issues with a specific end goal to tackle them successfully. Circumstances and end results charts practice is generally collaboration.

A meeting to generate new ideas is required keeping in mind the end goal to concoct a powerful purpose and impact graph.

All the fundamental parts of an issue region are recorded and conceivable causes from every range is recorded. At that point, in all probability reasons for the issues are distinguished to complete further examination.

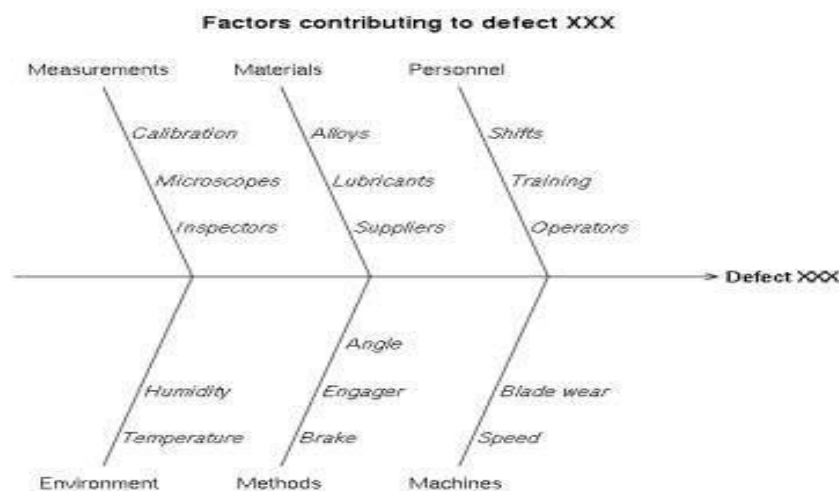


Figure A1-1-6 : Cause and Effect Diagram

2.4.4 Check Sheet

A check sheet can be presented as the most essential instrument for quality.

A check sheet is essentially utilized for social affair and sorting out information.

At the point when this is finished with the assistance of programming bundles, for example, Microsoft Excel, you can infer promote examination charts and robotize through macros accessible.

In this manner, it is dependably a smart thought to utilize a product check sheet for data assembling and sorting out necessities. One can simply utilize a paper-based check sheet when the data assembled is utilized for reinforcement or putting away purposes other than additionally preparing.

Motor Assembly Check Sheet

Name of Data Recorder: Lester B. Rapp
 Location: Rochester, New York
 Data Collection Dates: 1/17 - 1/23

Defect Type/ Event Occurrence	Dates							TOTAL
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted								20
Misaligned weld								5
Improper test procedure								0
Wrong part issued								3
Film on parts								0
Voids in casting								6
Incorrect dimensions								2
Adhesive failure								0
Mixing insufficient								1
Spray failure								4
TOTAL		10	13	10	5	4		

Figure A1-1-6 :Check Sheet

2.4.5 Scatter Diagram

With regards to the estimations of two factors, dissipate graphs are the most ideal approach to introduce. Dissipate outlines introduce the connection between two factors and delineate the outcomes on a Cartesian plane. At that point, advance investigation, for example, slant examination can be performed on the qualities. In these graphs, one variable signifies one hub and another variable indicates alternate pivot.

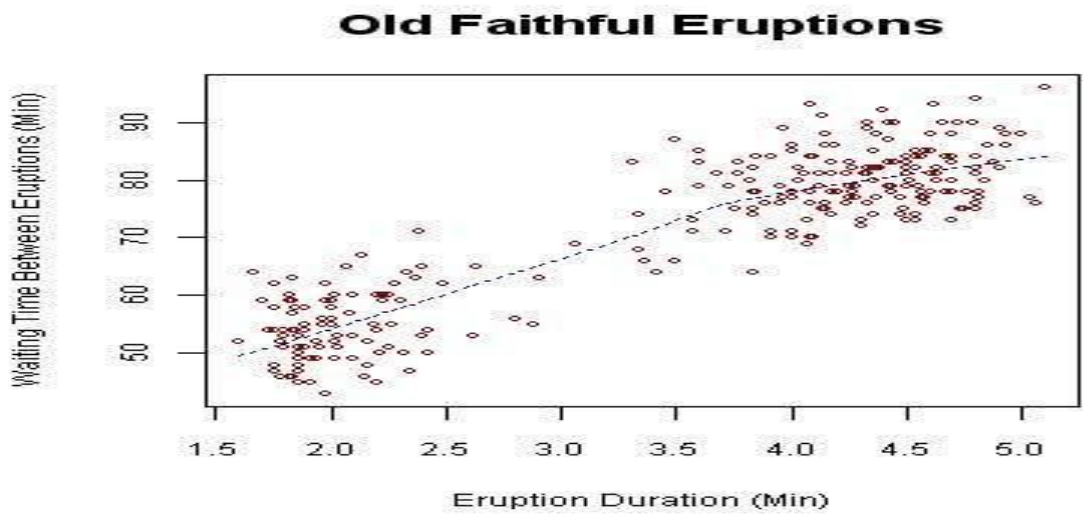


Figure A1-1-7 : Scatter Diagram

2.4.6 Control Charts

Control chart is the best instrument for observing the execution of a procedure. These sorts of graphs can be utilized for observing any procedures identified with capacity of the association.

These diagrams enable you to distinguish the accompanying conditions identified with the procedure that has been observed.

- Stability of the procedure
- Predictability of the procedure
- Identification of regular reason for variety
- Special conditions where the observing party needs to respond

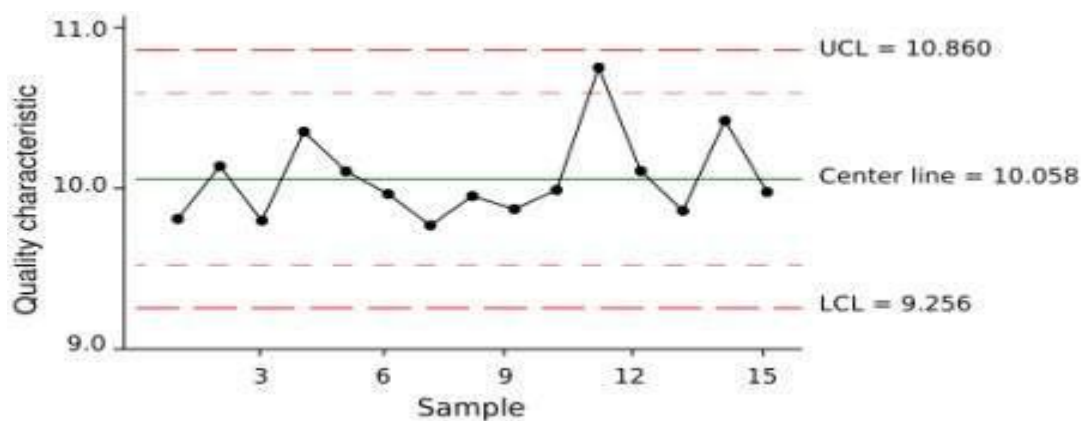


Figure A1-1-7 : Control Charts

2.4.7 Pareto Charts

Pareto graphs are utilized for distinguishing an arrangement of needs. You can diagram any number of issues/factors identified with a particular concern and record the quantity of events.

Along these lines you can make sense of the parameters that have the most noteworthy effect on the particular concern. This encourages you to deal with the respectability issues keeping in mind the end goal to get the condition under control.

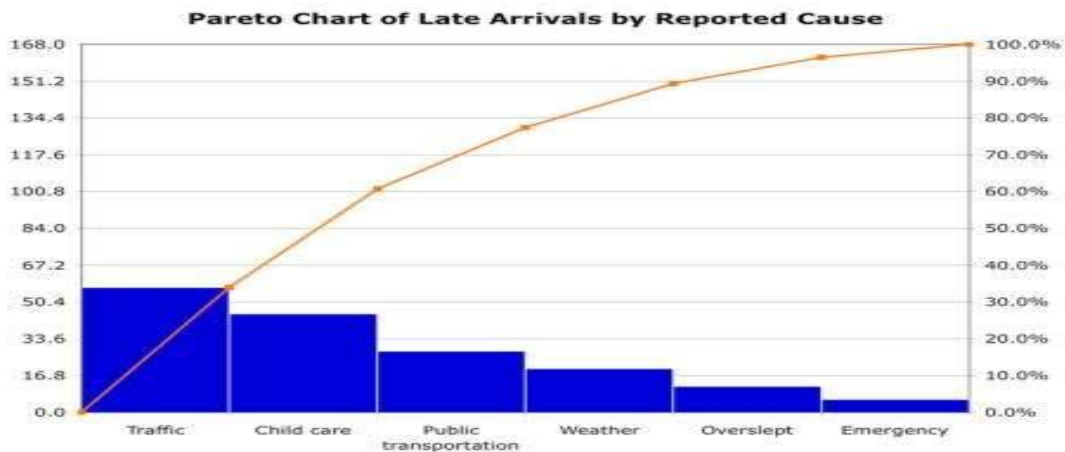


Figure A1-1-8: Pareto Charts

Over seven fundamental quality instruments help you to address diverse worries in an association.

Along these lines, utilization of such instruments ought to be a fundamental practice in the association keeping in mind the end goal to upgrade the proficiency.

Trainings on these devices ought to be incorporated into the hierarchical introduction program, so all the staff individuals get the opportunity to take in these fundamental tools.

2.5 Overview of NOBIDEP

Project Area:

The LGED proposed that the target area of the NOBIDEP would be 14 Districts in total: eight in Rangpur Division (Dinajpur, Thakurgaon, Panchagarh, Rangpur, Lalmonirhat, Nilphamari, Kurigram, Gaibandha); and six in Mymensingh area of Dhaka Division (Jamalpur, Sherpur, Tangail, Mymensingh, Netrokona, Kishoreganj).

The intervention in the proposed Project area is broadly consistent with the key national policies, and is relevant since the intervention to invest in rural infrastructure and promote economic growth and poverty reduction is highly needed in the Project area.

The proposed Project area is one of the most lagged rural areas in the country. First, the poverty rate of the 14 districts in the proposed target area is 51.1% on average, which is much higher than that of the national average of 40.0% in 2005 (measured by

upper poverty line). In addition, the Project area is predominantly rural with the rural population of 86.6%, which is also much higher than the national average of 74.5%.

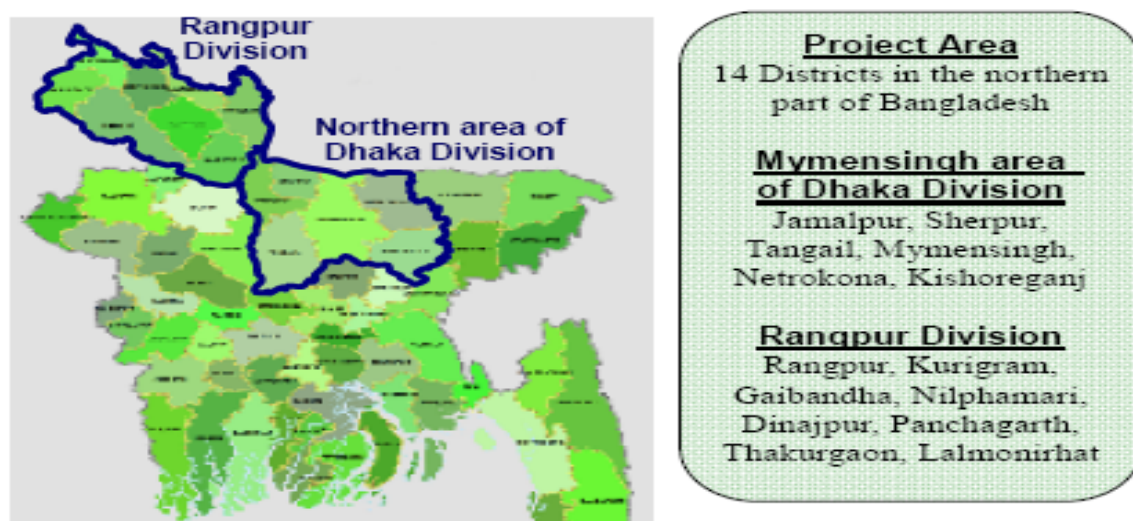


Figure A1-1-9 : Project area of NOBIDEP

Despite the high need to promote economic growth and poverty reduction, rural infrastructure such as roads and bridges in the target area is less developed than in the rest of the country. Nationwide, based on November 2011 data from the LGED Road Maintenance and Road Safety Unit (RMRSU), over 72% of Upazila Roads (UZRs) have been improved to all-weather pavement standard, compared with less than 70% in the 14 Project Districts and

only 65% in the six Mymensingh area Districts. For Union Roads (UNRs), 40% of them nationwide have been improved to all-weather standard compared with 28% in the 14 Project Districts. Additional cross-drainage structures on UZRs and UNRs are needed, particularly in the Mymensingh area – nearly 4 m span per km of road compared with the national average of 2.6 m per km. Rural transport infrastructure development therefore remains a high priority need in the target area.

2.5.1 Map of Northern Bangladesh Integrated Development Project

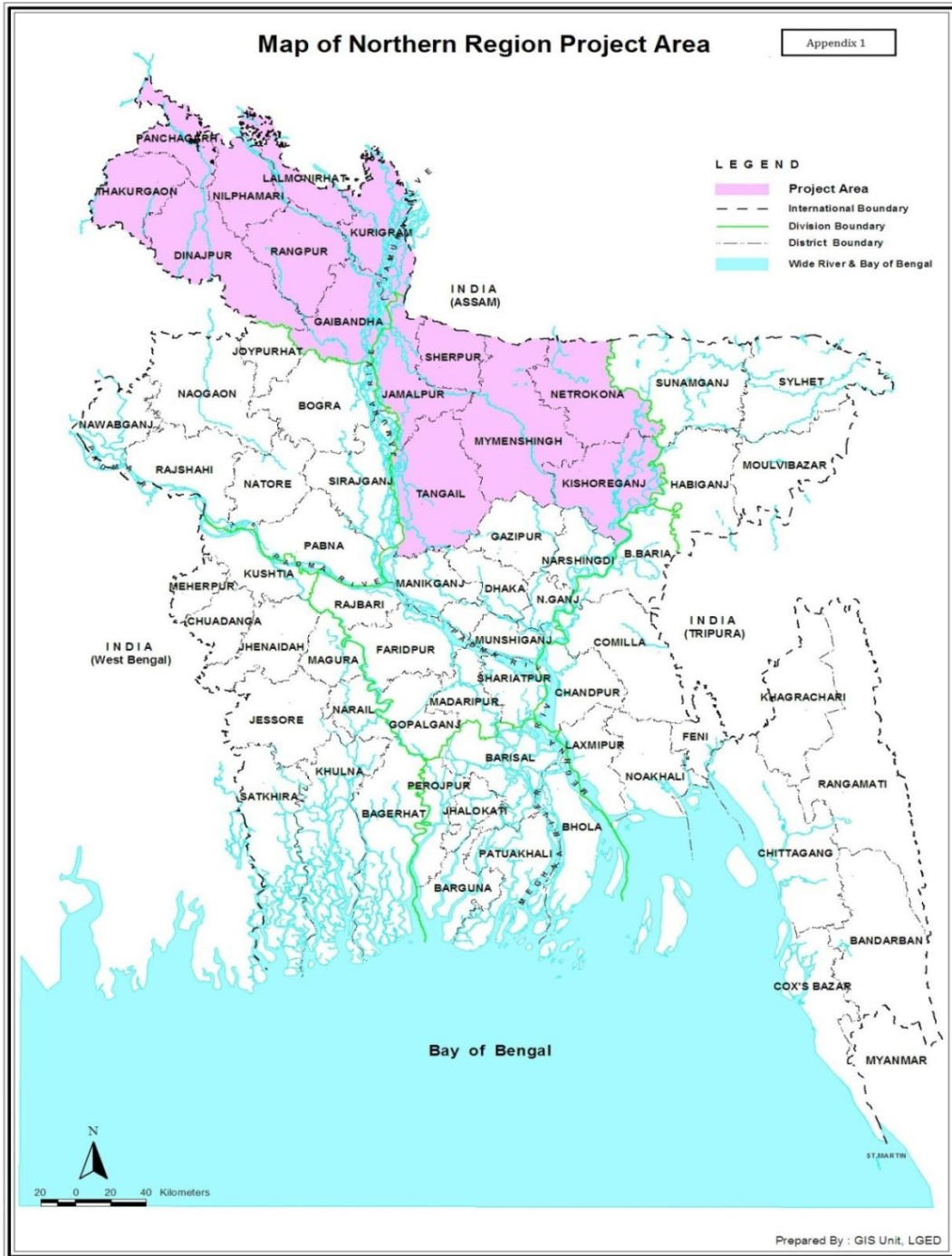
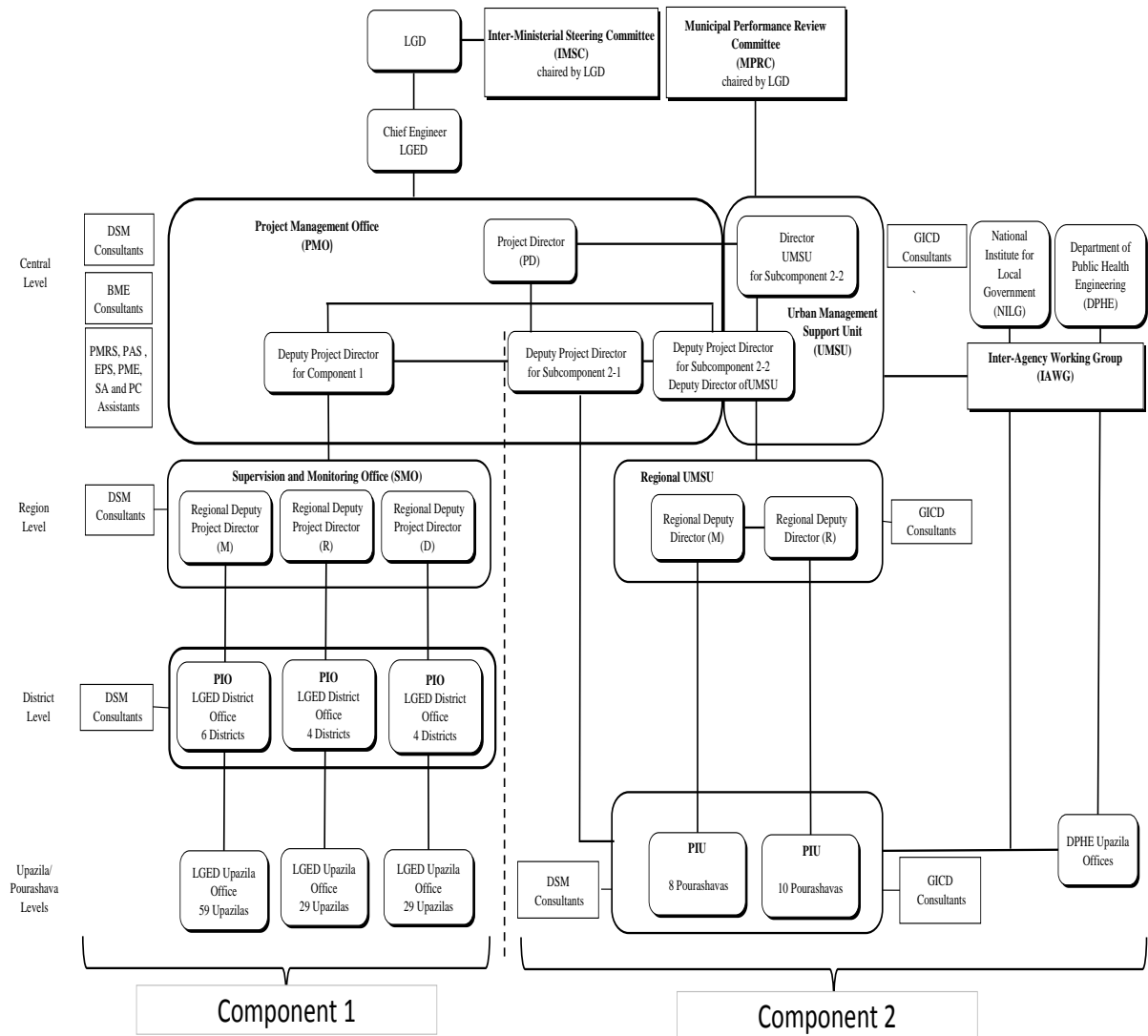


Figure A1-1-10 : Map of NOBIDEP

2.5.2 LGED-NOBIDEP Organogram



Source: Survey team

Legend: BME = Benefit Monitoring and Evaluation, D = Dinajpur Region, DPHE = Department of Public Health Engineering, DSM = Design, Supervision and Monitoring, EPS = Equipment Procurement Support, GICD = Governance Improvement and Capacity Development, M = Mymensingh Region, PAS = Project Accounting Support, PC = Publicity Campaign, PIO = Project Implementation Office, PIU = Project Implementation Unit, PME = Performance Monitoring and Evaluation, SA = Statistical Analysis, R = Rangpur Region, UMSU = Urban Management Support Unit

Figure A1-1-11 : LGED-NOBIDEP Organogram

2.5.3 Manpower of NOBIDEP

Table A1-1.2 : Composition of members of PMO Post

S.L No	Designation	Manpower Required	PM	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
1	Project Director	1	72	25750-1000x 8-33750	Grade-4	Deputation
2	Deputy Project Director	2	144	22250-900x 10-31250	Grade-5	Deputation
3	Executive Engineer	2	144	22250-900x 10-31250	Grade-5	Deputation
4	Senior Assistant Engineer	2	144	18500-800x 14-29700	Grade-6	Deputation
5	Socio-economist	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
6	Environment Engineer	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
7	Procurement Officer	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
8	MIS Officer	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
9	Sub-Assistant Engineer	4	288	8000-450x 7-11150-EB-490x11-16540	Grade-10	Deputation
10	Accounts & Audit Officer	1	72	8000-450x 7-11150-EB-490x11-16540	Grade-10	Deputation
11	CAD Operator	2	144	8000-450x 7-11150-EB-490x11-16540	Grade-10	Direct
12	Office Assistant Cum-Computer Operator	3	216	6400-415x 7-9305-EB-450x 11-14255	Grade-14	Direct
13	Accountant	2	144	5200-320x 7-7440-EB-345x 11-11235	Grade-14	Deputation
14	Accounts Assistant	2	144	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Deputation
15	Driver	5	360	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Outsourcing
16	Messenger/MLSS	4	288	4100-190x 7-5430-EB-210x 11-7740	Grade-20	Deputation/ Outsourcing
17	Cleaner	1	72	4100-190x 7-5430-EB-210x 11-7740	Grade-20	Outsourcing
	Total=	35	2520			

Table A1-1-3 : Composition of UMSU Post

S.L No	Designation	Manpower Required	PM	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
1	Assistant Engineer	3	216	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
2	Community Development Officer	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
3	Social & Gender Development Officer	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Direct
4	Training Officer	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Direct
5	Urban Planner	1	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Direct
6	Office Assistant Cum-Computer Operator	1	72	5200-415x 7-9305-EB-450x 11-14255	Grade-14	Direct
7	Accountant	1	72	5200-320x 7-7440-EB-345x 11-11235	Grade-14	Deputation
8	MLSS	2	144	4100-190x 7-5430-EB-210x 11-7740	Grade-20	Outsourcing
	Total=	11	792			

Table A1-1-4 : Composition of RUMSU Post

S.L No	Designation	Manpower Required	PM	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
1	Deputy Director RUMSU	2	72	22250-900x 10-31250	Grade-5	Deputation
2	Assistant Director	2	72	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
3	Office Assistant Cum computer operator	2	72	6400-415x 7-9305-EB-450x 11-14255	Grade-14	Direct
4	Accountant	2	72	5200-320x 7-7440-EB-345x 11-11235	Grade-14	Deputation / Direct
5	Driver	2	72	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Outsourcing
6	MLSS	2	72	4100-190x 7-5430-EB-210x 11-7740	Grade-20	Outsourcing
	Total=	12	432			

Table A1-1-5 : Composition of SMO members Post

S.L No	Designation	Manpower Required	PM	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
1	Regional Deputy Project Director (RDPD)	1x3	216	22250-900x 10-31250	Grade-5	Deputation
2	Assistant Engineer	1x3	216	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
3	Sociologist	1x3	216	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
4	Sub-Assistant Engineer	1x3	216	8000-450x 7-11150-EB-490x11-16540	Grade-10	Deputation
5	Office Assistant Cum-Computer Operator	1x3	216	6400-415x 7-9305-EB-450x 11-14255	Grade-14	Direct
6	Accounts Assistant	1x3	216	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Deputation / Direct
7	Driver	1x3	216	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Outsourcing
8	Messenger/MLSS	1x3	216	4100-190x 7-5430-EB-210x 11-7740	Grade-20	Deputation / Outsourcing
	Total=	24	1728			

Table A1-1-6 : Composition of PIO officials Title

S.L No	Designation	Manpower Required	PM	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
1	Assistant Engineer (Quality Assurance)	1 x 14	1,008	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
2	Office Assistant Cum-Computer Operator (Quality Assurance)	1 x 14	1,008	6400-415x 7-9305-EB-450x 11-14255	Grade-11	Direct (Consulted pay)
3	Lab Technician (Quality Assurance)	1 x 14	1,008	6400-415x 7-9305-EB-450x 11-14255	Grade-11	Deputation/ Additional Charge
4	Accountant Assistant (Quality Assurance)	1 x 14	1,008	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Deputation/ Direct (Consulted pay)
5	Operator/Driver (Quality Assurance)	1 x 14	1,008	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Outsourcing
	Total=	70	5,040			

Table A-1-7 :Upazila Office :

S.L No	Designation	Manpower Required	Person Month	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
1	Sub-Assistant Engineer	117	8424	8000-450x 7-11150-EB-490x11-16540	Grade-10	Deputation/ Additional Charge
	Total=	117	8424			

Table A1-1-8 : Composition of PIU members Post

S.L No	Designation	Manpower Required	PM	Pay Scale	Salary Grade	Remarks
1	2	3	4	5	6	7
Infrastructure Improvement Section (IIS)						
1	Assistant Engineer/Urban Planner	18x1	648	11000-490x 7-14430-EB-540x11-20370	Grade-9	Additional Charge
2	Sub Assistant Engineer (Civil)	18x1	648	8000-450x 7-11150-EB-490x11-16540	Grade-10	Additional Charge
3	Surveyor	18x1	648	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Additional Charge
4	Account Assistant	18x1	648	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Additional Charge
5	Work Assistant-1,2	18x2	1296	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Additional Charge
6	Slum Development Officer	18x1	648	8000-450x 7-11150-EB-490x11-16540	Grade-10	Additional Charge
7	Computer Operator	18x1	1296	6400-415x 7-9305-EB-450x 11-14255	Grade-11	Additional Charge
8	Community field worker	18x3	3888	4700-265x 7-6555-EB-290x 11-9745	Grade-16	Additional Charge
Urban Governance Improvement Section(UGIS)						
1	Secretary	18x1	648	11000-490x 7-14430-EB-540x11-20370	Grade-9	Additional Charge
2	Accountant	18x1	648	5200-320x 7-7440-EB-345x 11-11235	Grade-14	Additional Charge
Environmental, Sanitation and Slum Improvement Section(ESSIS)						
1	Health Officer	18x1	648	11000-490x 7-14430-EB-540x11-20370	Grade-9	Deputation
2	Sanitary Inspector	18x1	648	5200-320x 7-7440-EB-345x 11-11235	Grade-14	Deputation
3	Conservancy Inspector	18x1	648	4900-290x 7-6930-EB-320x 11-10450	Grade-15	Deputation
Total=		288	12960			

2.5.4 Major Components of NOBIDEP

Sl. No.	Name of the Project	Date of Completion	Name of major items	Unit cost (In lakh Taka)
1.	Proposed Project			
	Northern Bangladesh Integrated development Project (NOBIDEP)	June/19	Improvement of Upazila Road	98.9/km
			Improvement of Union Road	72.7/km
			Rehabilitation & maintenance of Upazila& Union Road	35.0/km
			Improvement of Growth Center	75.0/no
			Development of Ghat	40.0/no

Table A1-1-9 : Major Components of NOBIDEP

3. Present State of Quality Control In NOBIDEP

3.1 General

Present state of QC in NOBIDEP-LGED will be discuss here which includes approach, Strategies for QC, quality in sourcing, quality in construction ,audit & review.

The aim of institutionalizing of the quality control actives are:

- To establish accountability as well as to justify the feasibly of investment.
- To have technically sound and durable structure
- To reduce maintenances cost
- To have economic and safe structure design

3.2 Pre-requisite for QC

The prerequisite for effective quality control of infrastructure development projects are as follows:

- >Standard contraction specification for all items of works should be provided for effective quality control. The specification should be clearly stated and methods of contraction should also be written as the contractors may have little qualified technical and skilled personnel
- >Well-equipped laboratory for quality control activities should be set up with adequately trained staff.
- >Periodic appraisal of the quality control data should be prepared, reviewed not only for implementation during constriction but also for effective possible improvements in QC and constriction techniques in future.
- >To impart training to the site supervision staff and contractors staff continuously before the start of each individual section of the project.
- >Provision for the cost of QC should be duly incorporated in the estimate and specifications.

3.3 Approach

Component 1 of this Project will further develop basic rural infrastructure in the Project area, which is consistent with Rural Development Policy, Sixth Five Year Plan, and Rural Road Master Plan. This component has been designed to build on the achievements of, and lessons from, four projects of the LGED with yen-loan support of JICA, including ongoing South West Bangladesh Rural Development Project (SWBRDP). The Survey team also studied the achievements and lessons from Rural Transport Improvement Project (RTIP-1 and 2) supported by the World Bank, and Second Rural Infrastructure Improvement Project (RIIP-2) supported by Asian Development Bank. Component 1 has been designed to ensure complementarily with ongoing and forthcoming projects in the Project area including RTIP-2, SRIIP, and HAILIP.

3.4 Project Implementation Strategy

It covers the upgrading selective upazila & union roads including bridges and culverts, upazila roads rehabilitation, improvement of Growth Centers and Rural Markets, Ghats, off-pavement routine maintenance through Labor Contracting Society (LCS), community based road safety program, training and capacity development. The physical work sub-projects including engineering design, estimate preparation will be done by the DSM consultants performing necessary surveys, consultation with the stakeholders. The sub-projects so prepared will be procured by PIOs and implemented with the direct supervision of Upazila Engineer offices and DSM consultants. SMOs will play the role of supervision and monitoring of the rural infrastructure development activities on behalf of the PMO. The trainings of Labor Contracting Societies, Tree Caretakers, Community Based Road Safety programs, Women Shopkeepers, Various Stakeholders will be conducted by the NGOs in co-ordination with the Design Supervision and Monitoring Consultants.

3.5 Maintenance Policy

Since the previous JICA's missions in June and October 2012, JICA always emphasized that the sustainable maintenance is the key concern, especially the shortage of the maintenance budget. Road maintenance budget for LGED has increased year-by-year to BDT 7,300 million in 2012/13, but it remains far from sufficient to meet the increasing requirement. The rural road maintenance policy addresses this deficiency, and it proposes that increasing funding for maintenance through a 20% annual rise in the revenue allocation until it meets 75% of the need, combined with greater support from donors. The JICA mission and LGED agreed that LGED will make the best efforts to receive the approval of the Rural Road Maintenance Policy by January 31, 2013. The JICA mission explained to LGED that the approval of the Rural Road Maintenance Policy may be the precondition for L/A signing.

3.6 Standards and Specifications for Road

3.6.1 Upazila road pavement design

LGED defines five Upazila road pavement and embankment cross-section standards.

Design Type 4A: This pavement has a double lane carriageway to support 301 to 600 commercial vehicles per day. It has a 5.50 m wide pavement with 2.15 m earthen shoulders on each side totaling 9.80 m crest width. Brick-on-end edging (125 mm) is specified to safeguard the pavement.

The shoulder soil should have a PI value ranging from 8 to 20 compacted to minimum 95% STD.

Design Type 4B: This pavement differs from Type 4A only in that the sub-base and base courses are 150mm thick rather than 200mm.

Design Type 5A: This pavement is to support 201 to 300 commercial vehicles per day.

Design Type 5B: This pavement differs from Type 5A only in that the hard shoulder is herringbone bond brick rather than bitumen sealed.

Design Type 6: This pavement is to support 101 to 200 commercial vehicles per day. It has a 3.70 m wide pavement with 1.80 m earthen shoulder on each side totaling 7.30 m crest width.

Brick-on-end edging (125mm) is specified to safeguard the pavement.

The shoulder soil should have a PI value ranging from 8 to 20 compacted to minimum 95% STD.

The five Upazila road pavement Types are illustrated in

Figure A2-1-1 to Figure A2-1-5, followed by detailed specifications in Table A2-1-1to A2-1-3

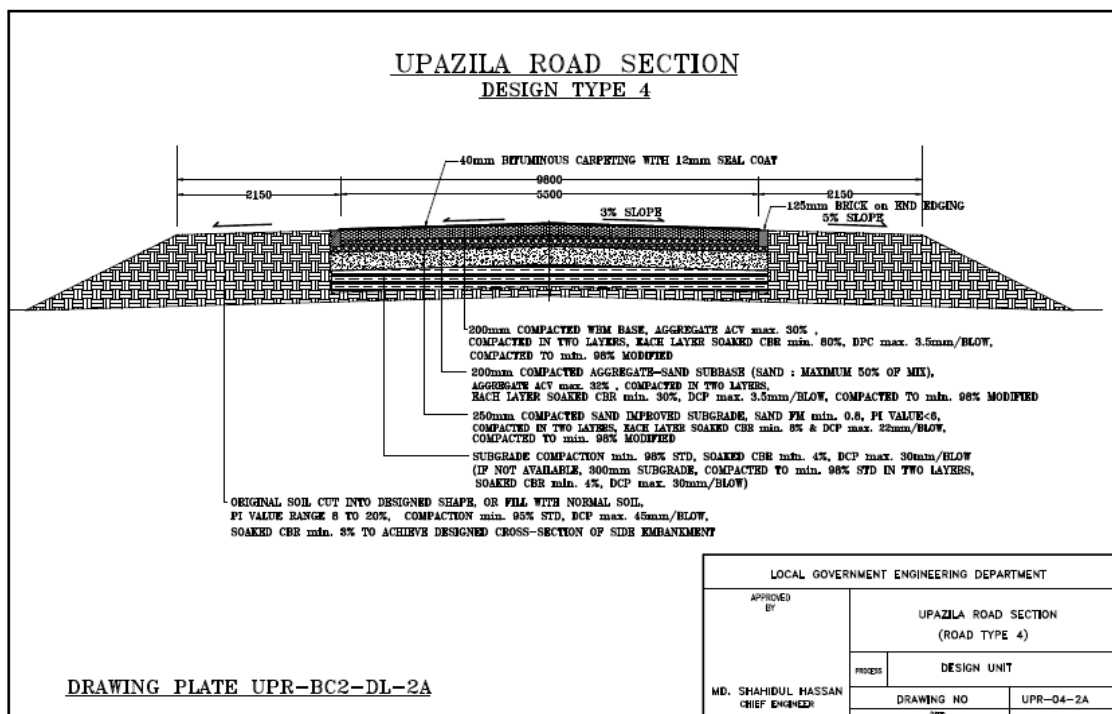


Figure A2-1-1: Type 4A UZR

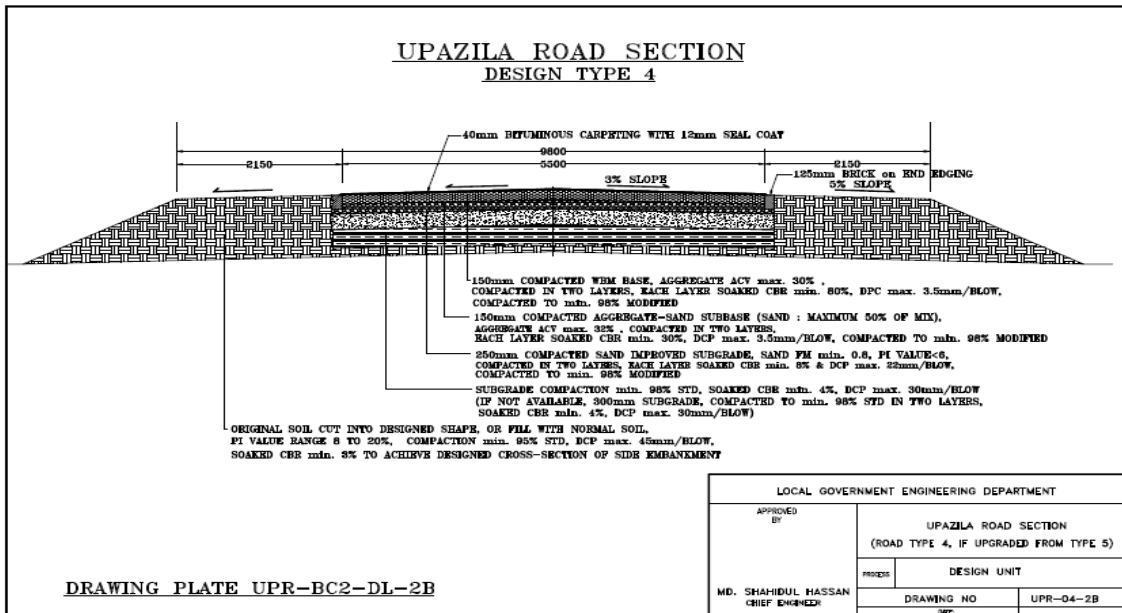


Figure A2-1-2: Type 4B UZR

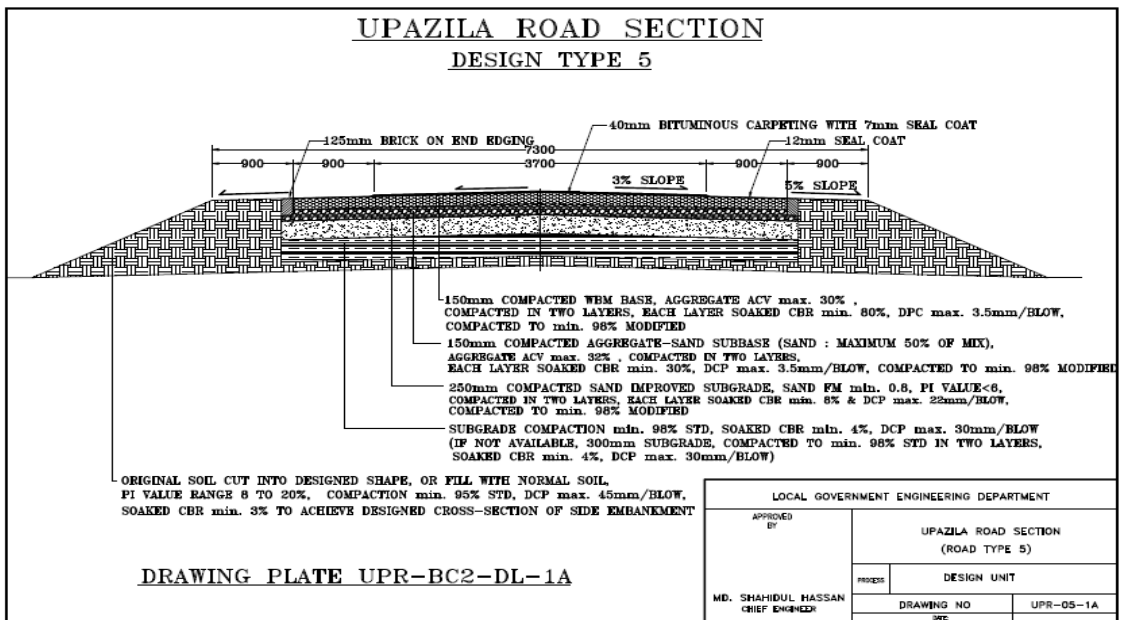


Figure A2-1-3: Type 5A UZR

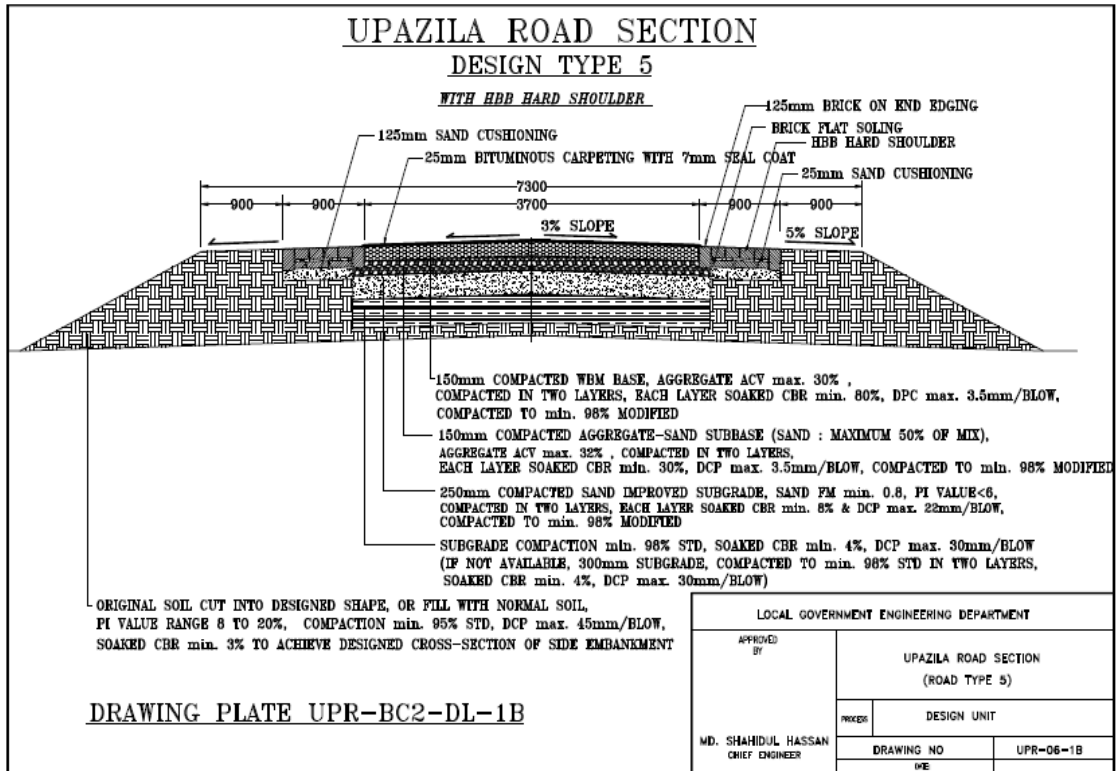


Figure A2-1-4 : Type 5B UZR

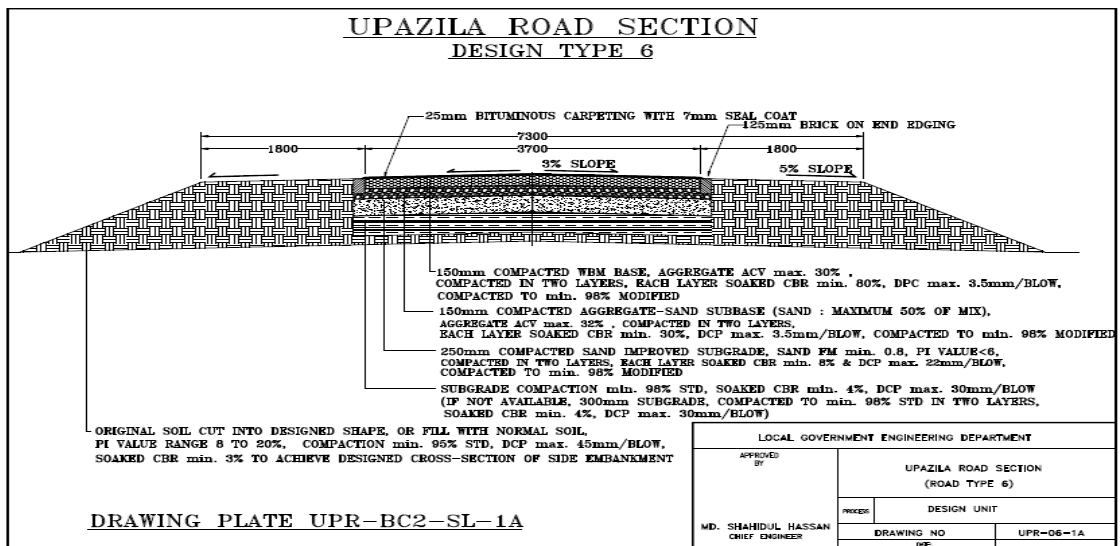


Figure A2-1-5: Type 6 UZR

Table A2-1-1 : Technical specifications for Type 4 Upazila road

DESIGN TYPE 4

1.	Equivalent Axle Loading	:	8.2 Ton
2.	Traffic	:	301 - 600 CV/Day
3.	Growth rate	:	5%
4.	Design life	:	10 Years
5.	Embankment fill	:	Min. 95% STD Compaction DCP Max 45mm per blow to ensure Min. 3% SOAKED CBR (Ref. Article 1.1)
6.	Sub-Grade, Min 300mm Thick	:	Min. 98% STD Compaction DCP Max 30mm per blow to ensure Min 4% SOAKED CBR (Ref. Article 1.2)
7.	Improved Sub-Grade Sand FM 0.80 min, PL Value<6	:	Min. 98% (Modified) Compaction DCP Max 22mm per blow to ensure Min. 8% SOAKED CBR (Ref. Article 1.3)
8.	Aggregate-Sand Sub-Base Course (Sand : Max. 50% of mix) Brick or Stone Aggregates, 38mm downgraded according to the prescribed grading envelop, ACV <32%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 9mm per blow to ensure Min. 30% SOAKED CBR (Ref. Article 5.0)
9.	Base-Course, Water Bound Macadam with Brick or Stone Aggregate, 38mm downgraded according to the prescribed grading envelop, ACV <30%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 3.5mm per blow to ensure Min. 80% SOAKED CBR (Ref. Article 6.0)
10.	Bituminous carpeting	:	40mm BC (Ref. Article 10.0) plus 12mm Seal coat (Ref. Article 12.0)
11.	Double Lane Carriageway width	:	5.5m.
12.	Earthen Shoulder	:	95% STD Compaction DCP Max 45mm per blow to ensure Min 3% SOAKED CBR (Ref. Article 1.1)
13.	Crest width	:	9.80m.
14.	Side Slope	:	1: 1.5 for clayey soil Road Embankment : 1:2 for Clayey Sand Road Embankment : 1:3 for Sand or silty Sand Road Embankment

Note: In absence of ACV testing equipment, LAA test of coarse aggregates shall be carried out provided LAA value of coarse aggregates should be less than 40 percent.

Table A2-1-2: Technical specifications for Type 5 Upazila road

DESIGN TYPE 5

1.	Equivalent Axle Loading	:	8.2 Ton
2.	Traffic	:	201 - 300 CV/Day
3.	Growth rate	:	5%
4.	Design life	:	10 Years
5.	Embankment fill	:	Min. 95% STD Compaction DCP Max 45mm per blow to ensure Min. 3% SOAKED CBR (Ref. Article 1.1)
6.	Sub-Grade, Min 300mm Thick	:	Min. 98% STD Compaction DCP Max 30mm per blow to ensure Min 4% SOAKED CBR (Ref. Article 1.2)
7.	Improved Sub-Grade Sand FM 0.80 min, PL Value<6	:	Min. 98% (Modified) Compaction DCP Max 22mm per blow to ensure Min. 8% SOAKED CBR (Ref. Article 1.3)
8.	Aggregate-Sand Sub-Base Course (Sand : Max. 50% of mix) Brick or Stone Aggregates, 38mm downgraded according to the prescribed grading envelop, ACV <32%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 9mm per blow to ensure Min. 30% SOAKED CBR (Ref. Article 5.0)
9.	Base-Course, Water Bound Macadam with Brick or Stone Aggregate, 38mm downgraded according to the prescribed grading envelop, ACV <30%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 3.5mm per blow to ensure Min. 80% SOAKED CBR (Ref. Article 6.0)
10.	Bituminous carpeting	:	40mm BC (Ref. Article 10.0) plus 7mm Seal coat (Ref. Article 11.0)
11.	Single Lane Carriageway width	:	3.7m.
12.	Hard Shoulder	:	0.90 Wide Pavement Simile with 12 mm Seal Coat (Ref. Article 12.0)
12.	Earthen Shoulder	:	95% STD Compaction DCP Max 45mm per blow to ensure Min 3% SOAKED CBR (Ref. Article 1.1)
14.	Crest width	:	7.30m.
15.	Side Slope	:	1: 1.5 for clayey soil Road Embankment 1:2 for Clayey Sand Road Embankment 1:3 for Sand or silty Sand Road Embankment

Note: In absence of ACV testing equipment, LAA test of coarse aggregates shall be carried out provided LAA value of coarse aggregates should be less than 40 percent.

Table A2-1-3: Technical specifications for Type 6 Upazila road

DESIGN TYPE 6

1.	Equivalent Axle Loading	:	8.2 Ton
2.	Traffic	:	101 to 200 CV/Day
3.	Growth rate	:	5%
4.	Design life	:	10 Years
5.	Embankment fill		Min. 95% STD Compaction DCP Max 45mm per blow to ensure Min. 3% SOAKED CBR (Ref. Article 1.1)
6.	Sub-Grade, Min 300mm Thick	:	Min. 98% STD Compaction DCP Max 30mm per blow to ensure Min. 4% SOAKED CBR (Ref. Article 1.2)
7.	Improved Sub-Grade Sand FM 0.80 min, PL Value<6	:	Min. 98% (Modified) Compaction DCP Max 22mm per blow to ensure Min. 8% SOAKED CBR (Ref. Article 1.3)
8.	Aggregate-Sand Sub-Base Course (Sand : Max. 50% of mix) Brick or Stone Aggregates, 38mm downgraded according to the prescribed grading envelop, ACV <32%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 9mm per blow to ensure Min. 30% SOAKED CBR (Ref. Article 5.0)
9.	Base-Course, Water Bound Macadam with Brick or Stone Aggregate, 38mm downgraded according to the prescribed grading envelop, ACV <30%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 3.5mm per blow to ensure Min. 80% SOAKED CBR (Ref. Article 6.0)
10.	Bituminous carpeting	:	25mm BC (Ref. Article 10.0) plus 7mm Seal coat (Ref. Article 11.0)
11.	Single Lane Carriageway width	:	3.7m.
12.	Earthen Shoulder		95% STD Compaction DCP Max 45mm per blow to ensure Min 3% SOAKED CBR (Ref. Article 1.1)
13.	Crest width	:	7.30m.
14.	Side Slope	:	1: 1.5 for clayey soil Road Embankment 1:2 for Clayey Sand Road Embankment 1:3 for Sand or silty Sand Road Embankment

Note: In absence of ACV testing equipment, LAA test of coarse aggregates shall be carried out provided LAA value of coarse aggregates should be less than 40 percent.

3.6.2 Union road Pavement Design

LGED defines two Union road pavement and embankment cross-section standards.

Design Type 7: This pavement has a single carriageway to support 51 to 100 commercial vehicles per day. It has a 3.70 m wide pavement with 0.90 m earthen shoulders on each side totalling 5.50 m crest width. Brick-on-end edging (125 mm) is specified to safeguard the pavement.

The shoulder soil should have a PI value ranging from 8 to 20 compacted to minimum 95% STD.

Design Type 8: This pavement has a single carriageway to support up to 50 commercial vehicles per day. It has a 3.00 m wide pavement with 1.25 m earthen shoulder on each side totaling 5.50 m crest width.

Brick-on-end edging (125mm) is specified to safeguard the pavement.

The shoulder soil should have a PI value ranging from 8 to 20 compacted to minimum 95% STD.

The two Upazila road pavement Types are illustrated in Figure A2-1-6 and Figure A2-1-7, followed by detailed specifications in Table A2-1-4 and Table A2-1-5

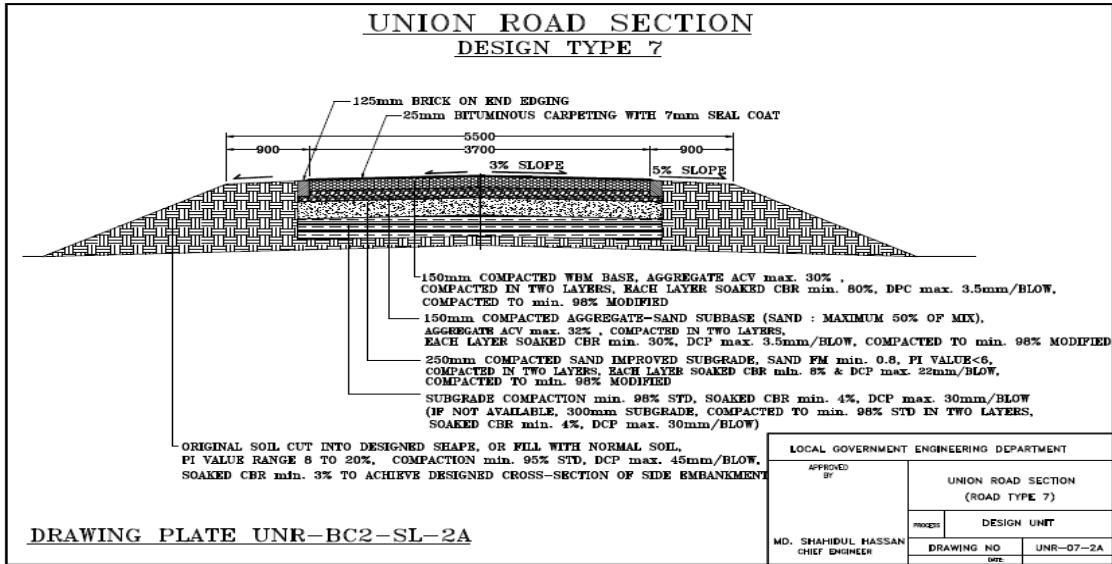


Figure A2-1-6 : Type 7 UNR

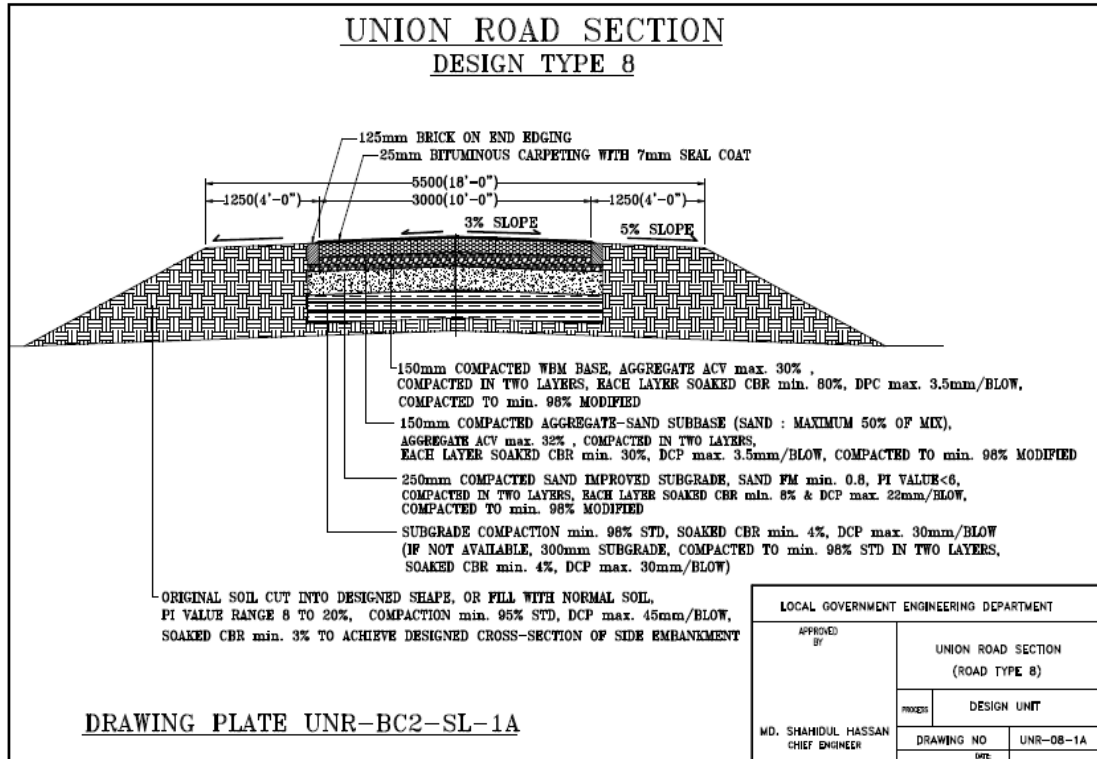


Figure A2-1-7 : Type 8 UNR

Table A2-1-4: Technical specifications for Type 7 Union road

DESIGN TYPE 7

1.	Equivalent Axle Loading	:	8.2 Ton
2.	Traffic	:	51 - 100 CV/Day
3.	Growth rate	:	5%
4.	Design life	:	10 Years
5.	Embankment fill	:	Min. 95% STD Compaction DCP Max 45mm per blow to ensure Min. 3% SOAKED CBR (Ref. Article 1.1)
6.	Sub-Grade, Min 300mm Thick	:	Min. 98% STD Compaction DCP Max 30mm per blow to ensure Min 4% SOAKED CBR (Ref. Article 1.2)
7.	Improved Sub-Grade Sand FM 0.80 min, PL Value<6	:	Min. 98% (Modified) Compaction DCP Max 22mm per blow to ensure Min. 8% SOAKED CBR (Ref. Article 1.3)
8.	Aggregate-Sand Sub-Base Course (Sand : Max. 50% of mix) Brick or Stone Aggregates, 38mm down graded according to the prescribed grading envelop, ACV <32%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 9mm per blow to ensure Min. 30% SOAKED CBR (Ref. Article 5.0)
9.	Base-Course, Water Bound Macadam with Brick or Stone Aggregate, 38mm down graded according to the prescribed grading envelop, ACV <30%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 3.5mm per blow to ensure Min. 80% SOAKED CBR (Ref. Article 6.0)
10.	Bituminous carpeting	:	25mm BC (Ref. Article 10.0) plus 7mm Seal coat (Ref. Article 11.0)
11.	Single Lane Carriageway width	:	3.7m.
12.	Earthen Shoulder	:	95% STD Compaction DCP Max 45mm per blow to ensure Min 3% SOAKED CBR (Ref. Article 1.1)
13.	Crest width	:	5.50m
14.	Side Slope	:	1: 1.5 for clayey soil Road Embankment 1:2 for Clayey Sand Road Embankment 1:3 for Sand or silty Sand Road Embankment

Table A2-1-5: Technical specifications for Type 8 Union road

DESIGN TYPE 8

1.	Equivalent Axle Loading	:	8.2 Ton
2.	Traffic	:	01 - 50 CV/Day
3.	Growth rate	:	5%
4.	Design life	:	10 Years
5.	Embankment fill	:	Min. 95% STD Compaction DCP Max 45mm per blow to ensure Min. 3% SOAKED CBR (Ref. Article 1.1)
6.	Sub-Grade, Min 300mm Thick	:	Min. 98% STD Compaction DCP Max 30mm per blow to ensure Min 4% SOAKED CBR (Ref. Article 1.2)
7.	Improved Sub-Grade Sand FM 0.80 min, PL Value<6	:	Min. 98% (Modified) Compaction DCP Max 22mm per blow to ensure Min. 8% SOAKED CBR (Ref. Article 1.3)
8.	Aggregate-Sand Sub-Base Course (Sand : Max. 50% of mix) Brick or Stone Aggregates, 38mm down graded according to the prescribed grading envelop, ACV <32%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 9mm per blow to ensure Min. 30% SOAKED CBR (Ref. Article 5.0)
9.	Base-Course, Water Bound Macadam with Brick or Stone Aggregate, 38mm downgraded according to the prescribed grading envelop, ACV <30%; Sand FM 0.80 min, PI Value<6)	:	Min. 98% (Modified) Compaction DCP Max 3.5mm per blow to ensure Min. 80% SOAKED CBR (Ref. Article 6.0)
10.	Bituminous carpeting	:	25mm BC (Ref. Article 10.0) plus 7mm Seal coat (Ref. Article 11.0)
11.	Double Lane Carriageway width	:	3.0m.
12.	Earthen Shoulder	:	95% STD Compaction DCP Max 45mm per blow to ensure Min 3% SOAKED CBR (Ref. Article 1.1)
13.	Crest width	:	3.0m
14.	Side Slope	:	1: 1.5 for clayey soil Road Embankment : 1:2 for Clayey Sand Road Embankment : 1:3 for Sand or silty Sand Road Embankment

3.6.3 Possible Modifications to the Rural Road Pavement Design

Under the existing design standards, the road pavement is constructed by box-cutting the completed embankment, and then ‘inserting’ the successive pavement layers, each of which is the same width. This method could be improved by:

Constructing the pavement and the adjacent compacted embankment layer-by-layer, with each pavement layer extended 250 mm on either side beyond the layer above. Inserting sub-grade sand drains at 7.5 m intervals along each side of the embankment to take away water that would otherwise penetrate into the pavement. Sub-grade drains were used in the past, but were abandoned because it was difficult to prevent them becoming blocked. However, this problem can now be overcome by covering the drains with geotextile material.

These possible changes to the pavement specification are illustrated for Type 4A, 5A and 6 Upazila roads in

Figure A2-1-8 to

Figure **A2-1-10**, and for Type 7 and 8 Union roads

Figure **A2-1-11** and

Figure A2-1-12. These modifications would result in some increase in the pavement cost. A detailed comparison of the pavement costs for the existing and modified Type 5A pavements, for the four cost regions in the Project area, is in of Pavement

Table **A2-1-6** and Table A2-1-7.

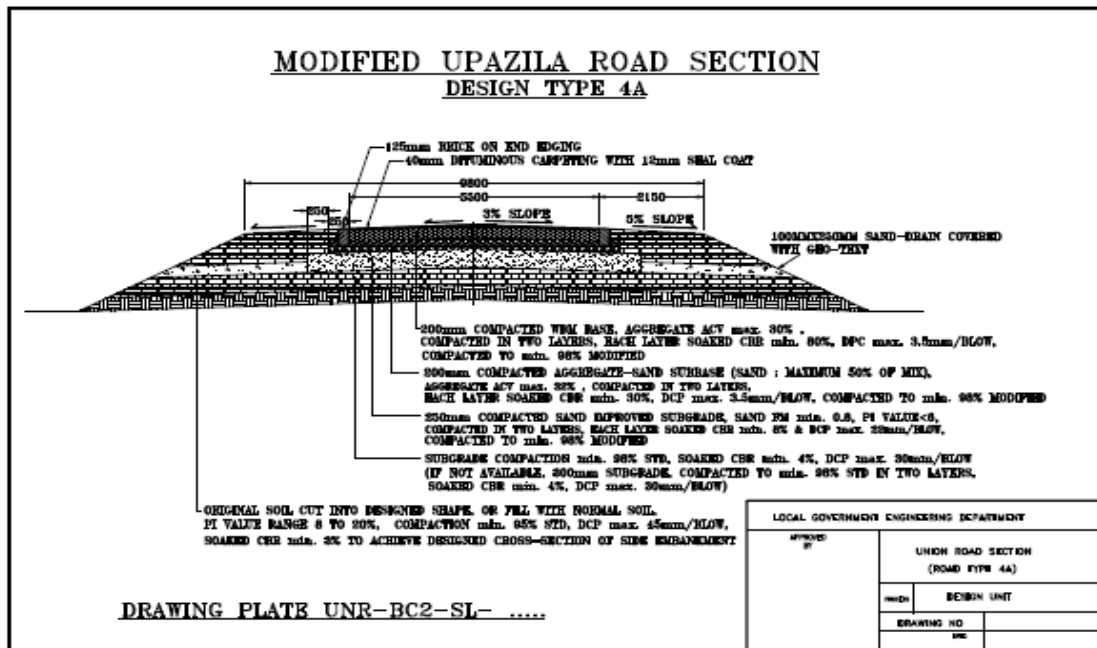


Figure A2-1-8: Possible modified pavement design, Type 4A

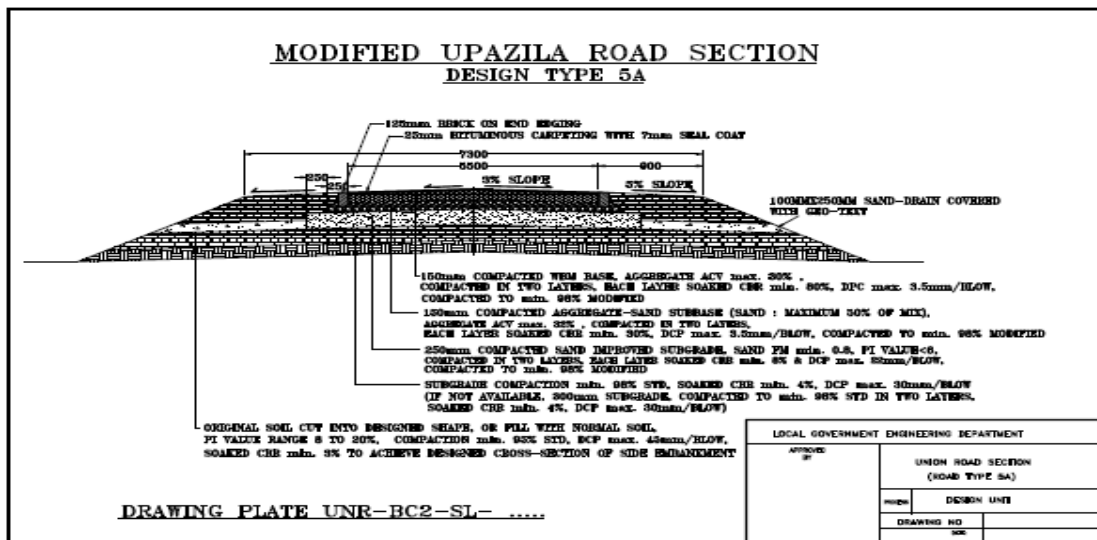


Figure A2-1-9: Possible modified pavement design, Type 5A

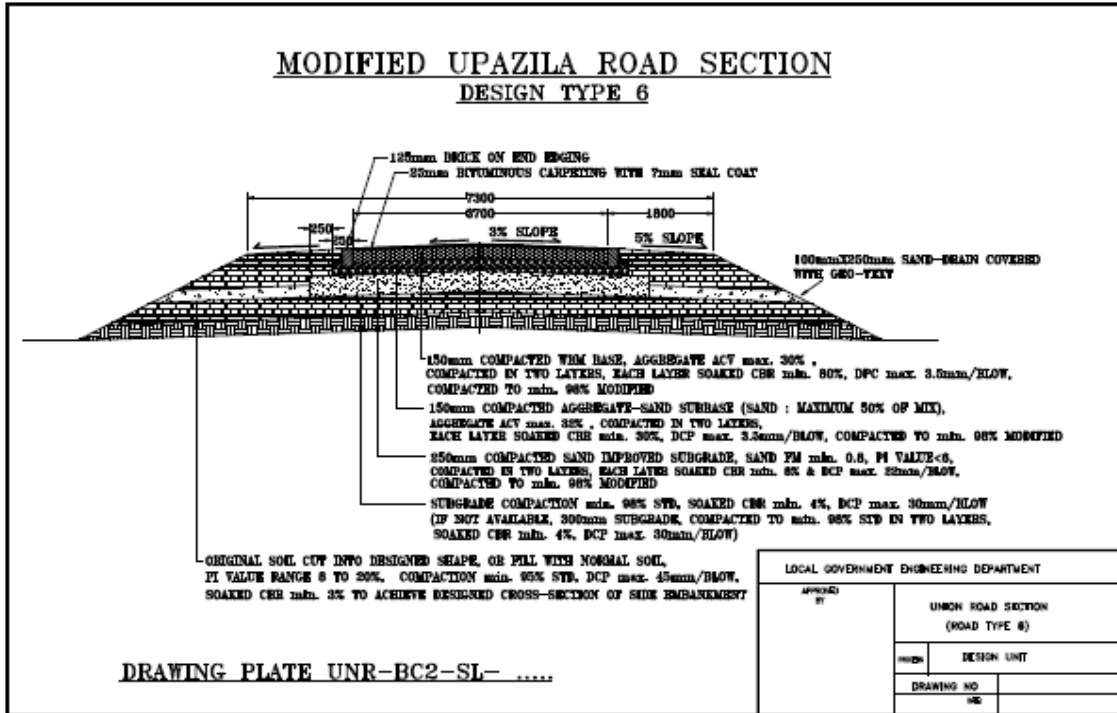


Figure A2-1-10 : Possible modified pavement design, Type 6

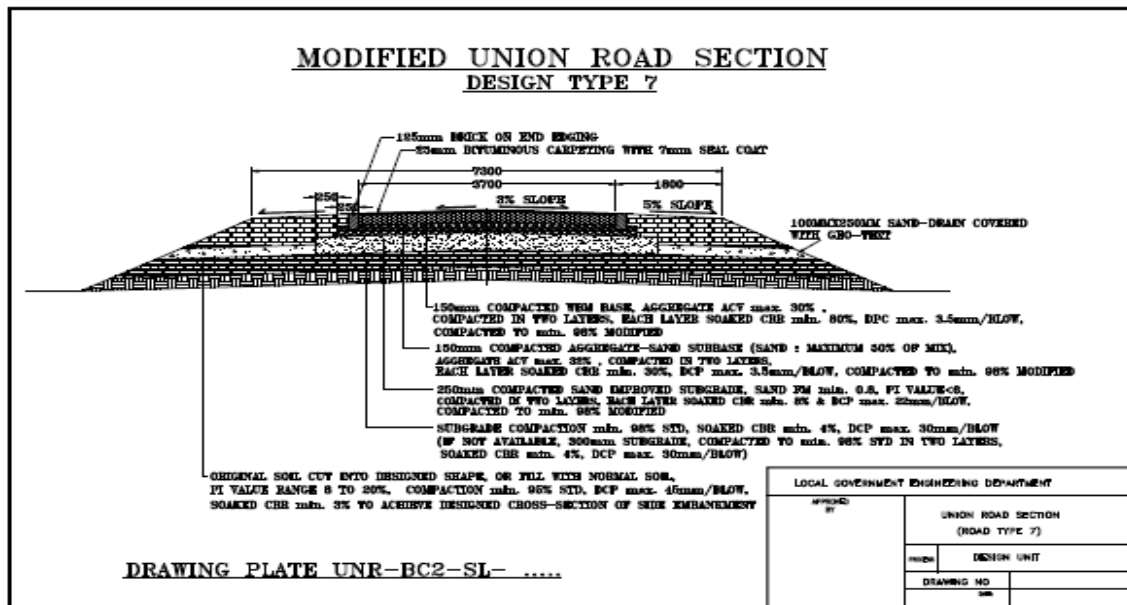


Figure A2-1-11 : Possible modified pavement design, Type 7

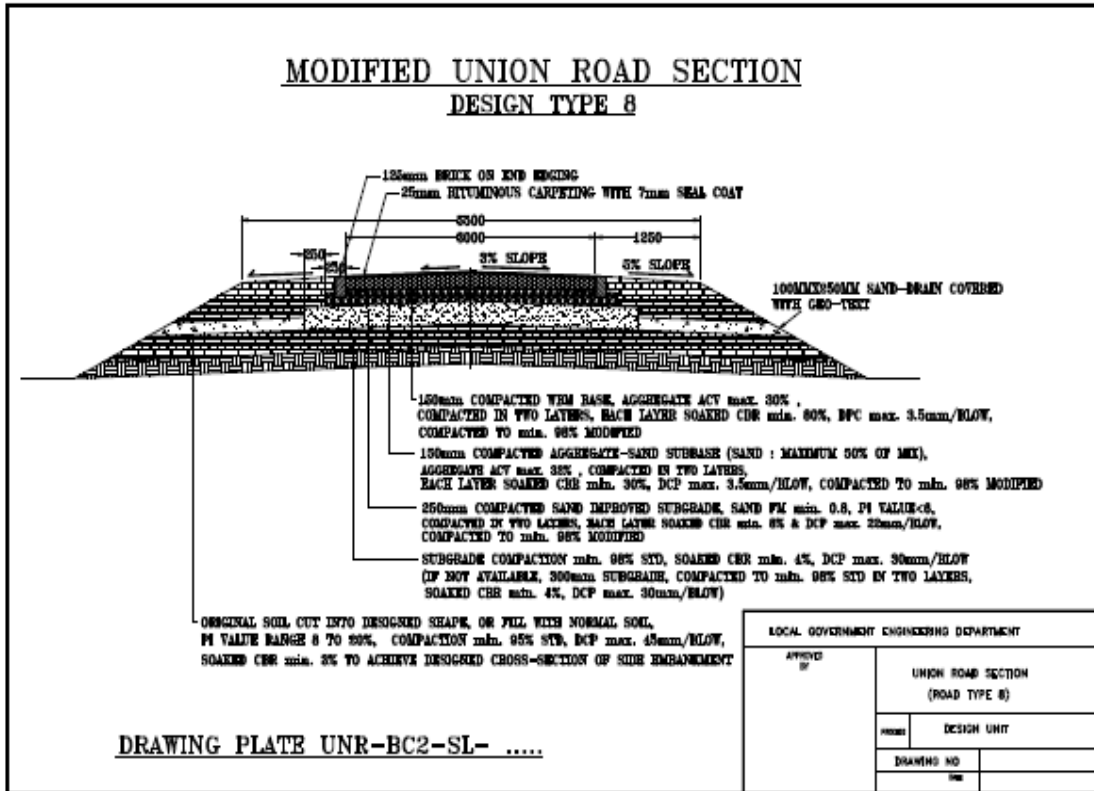


Figure A2-1-12: Possible modified pavement design, Type 8

3.6.4 Estimated Cost of Pavement

Table A2-1-6 : Estimated cost of existing Type 5A pavement in four regions

Sl. no	Item code.	Description	Unit	Quantity	Schedule of Rate 2011/12 (BDT)							
					Mymensingh Region		Tangail Region		Rangpur Region		Dinajpur Region	
					Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount
1	3.1.04	Earth work in box cutting on road crest up to 450 mm depth	Sqm	5500	50.15	275,825.00	50.15	275,825.00	49.06	269,830.00	47.37	260,535.00
2	3.2.15.02	Brick on end edging (125 mm across)	m	2000	119.92	239,840.00	114.71	229,420.00	114.82	229,640.00	104.32	208,640.00
3	3.1.06.02	Sand (F.M. 0.80) filling on the road bed in the improved sub-grade with sand free from dust	Cum	1450	487.55	706,947.50	487.55	706,947.50	422.15	612,117.50	334.13	484,488.50
4	3.2.02.02	Providing compacted aggregate sand sub-base course with 38 mm downgraded 1 st class bricks (ricked chips)	Cum	1160	2,334.90	2,708,484.00	2,260.69	2,622,400.40	2,215.83	2,570,362.80	2,013.41	2,335,555.60
5	3.2.03.06	Providing, laying, spreading and compacted 38 mm downgraded aggregate as specified in the relevant item of LGED road design	Cum	825	3,742.06	3,087,199.50	3,597.01	2,967,533.25	3,578.67	2,952,402.75	3,289.68	2,713,986.00
6	3.2.24.01	Providing tack coat with 60/70 or 80/100 penetration grade	Sqm	3700	69.51	257,187.00	69.51	257,187.00	69.02	255,374.00	68.40	253,080.00
7	3.2.25	Prime coat with cut back bitumen to be prepared by cutting back 60/70 or 80/100 penetration grade	Sqm	5500	88.35	485,925.00	88.35	485,925.00	88.14	484,770.00	87.89	483,395.00
8	3.2.30.1	40 mm thick (compacted) pre-mixed bituminous carpeting to be prepared using 20 mm down graded aggregate	Sqm	3700	520.94	1,927,478.00	509.78	1,886,186.00	481.97	1,783,289.00	478.63	1,770,931.00
9	3.2.39	12 mm thick (compacted) pre-mixed bituminous seal coat	Sqm	1800	218.56	393,408.00	218.56	393,408.00	208.84	375,912.00	207.44	373,392.00
10	3.2.34	7 mm thick (compacted) pre-mixed bituminous seal coat	Sqm	3700	115.48	427,276.00	115.48	427,276.00	111.47	412,439.00	110.67	409,479.00
					Total	10,509,570.00	Total	10,252,108.15	Total	9,946,137.05	Total	9,293,482.10

Table A2-1-7 : Estimated cost of modified Type 5A pavement in four regions

Sl. no	Item code.	Description	Unit	Quantity	Schedule of Rate 2011/12 (BDT)							
					Mymensingh Region		Tangail Region		Rangpur Region		Dinajpur Region	
					Rate	Amount	Rate	Amount	Rate	Amount	Rate	Amount
1	3.1.04	Earth work in box cutting on road crest up to 450 mm depth	Sqm	5500	50.15	275,825.00	50.15	275,825.00	49.06	269,830.00	47.37	260,535.00
2	3.2.15.0 2	Brick on end edging (125 mm across)	m	2000	119.92	239,840.00	114.71	229,420.00	114.82	229,640.00	104.32	208,640.00
3	3.1.06.0 2	Sand (F.M. 0.80)filling on the road bed in the improved sub-grade with sand free from dust	Cum	1638	487.55	798,363.13	487.55	798,363.13	422.15	691,270.63	334.13	547,137.88
4	3.2.02.0 2	Providing compacted aggregate sand sub-base course with 38 mm downgraded 1 st class bricks /nicked chips	Cum	1210	2,334.90	2,825,229.00	2,260.69	2,735,434.90	2,215.83	2,681,154.30	2,013.41	2,436,226.10
5	3.2.03.0 6	Providing, laying, spreading and compacted 38 mm downgraded aggregate as specified in the relevant item of LGED road design standard or wet mix macadam	Cum	825	3,742.06	3,087,199.50	3,597.01	2,967,533.25	3,578.67	2,952,402.75	3,289.68	2,713,986.00
6	3.2.24.0 1	Providing tack coat with 60/70 or 80/100 penetration grade	Sqm	3700	69.51	257,187.00	69.51	257,187.00	69.02	255,374.00	68.40	253,080.00
7	3.2.25	Prime coat with cut back bitumen to be prepared by cutting back 60/70 or 80/100 penetration grade	Sqm	5500	88.35	485,925.00	88.35	485,925.00	88.14	484,770.00	87.89	483,395.00
8	3.2.30.1 40	mm thick (compacted) pre-mixed bituminous carpeting to be prepared using 20 mm down stone chips	Sqm	3700	520.94	1,927,478.00	509.78	1,886,186.00	481.97	1,783,289.00	478.63	1,770,931.00
9	3.2.39	12 mm thick (compacted)pre-mixed bituminous seal coat	Sqm	1800	218.56	393,408.00	218.56	393,408.00	208.84	375,912.00	207.44	373,392.00
10	3.2.34	7 mm thick (compacted)pre-mixed bituminous seal coat	Sqm	3700	115.48	427,276.00	115.48	427,276.00	111.47	412,439.00	110.67	409,479.00
11		Sand Drain	LS	133	500.00	66,500.00	500.00	66,500.00	500.00	66,500.00	500.00	66,500.00
					Total	10,784,230.63	Total	10,523,058.28	Total	10,202,581.68	Total	9,523,301.98

Price of geo-text =120 and Sand FM 2.5 =380

Quantity of items 3 & 4 have increased, all other items will remain same

3.7 Quality in Sourcing

In every step of sourcing process quality must be ensured like in standard and specifications (discussed earlier), Supplier evaluation, BOQ, procurement ,consultant recruitment etc. If quality can be ensure in sourcing process then it is much easier to maintaining quality during implementation phase. Before going into sourcing ‘‘user requirements’’ must be analyzed & identified.

3.7.1 Bills of Quantities

The objectives of the Bill of Quantities (BOQ) are;

- (a) to provide sufficient information on the quantities of Works to be performed to enable Tenders to be prepared efficiently and accurately; and
- (b) when a Contract has been entered into, to provide a priced BOQ for use in the periodic valuation of Works executed.

In order to attain these objectives, the items in the BOQ should be grouped into sections to distinguish between those parts of the Works that by nature, location, access, timing, or any other special characteristics may give rise to different methods of construction, phasing of the Works, or considerations of cost. General items common to all parts of the Works may be grouped as a separate section in the BOQ. Consistent with these requirements, the layout and content of the BOQ should be as simple and brief as possible. Quantities should be computed net from the Drawings, unless directed otherwise in the Contract, and no allowance should be made for bulking, shrinkage, or waste. Quantities should be rounded up or down where appropriate and spurious accuracy should be avoided.

The quantities given in the BOQ are estimated and provisional, and are given to provide a common basis for Tendering. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Project Manager and valued at the rates or prices quoted in the priced BOQ,

where applicable, and otherwise at such rates or prices as the Project Manager may fix within the terms and conditions of the Contract.

The method of measurements of completed works for payment shall be based on metric system unless otherwise unavoidable.

3.7.1.1 Unit Rates and Price

All unit rates and prices quoted by the Tenderers against each basic item or activity shall include the Tenderer's profit, overheads, VAT and all other charges including corresponding incidental service charges and premiums for banking and insurances, as applicable and, thus forth the total Tender Price quoted by the Tenderers

3.7.1.2 Day work Schedule

A Day work Schedule is commonly used in contracts where the likely incidence of unforeseen work cannot be covered by definitive descriptions and approximate quantities in the BOQ. A Day work Schedule should therefore be included only if the probability of unforeseen work, outside the items included in the BOQ, is high. To facilitate checking by the Procuring Entity of the realism of rates quoted by the Tenderers, the Daywork Schedule should normally comprise the following:

- (a) a list of the various classes of labour, materials, and construction plant for which basic Day work unit rates or prices are to be quoted by the Tenderer, together with a statement of the conditions under which the Contractor will be paid for work executed on a Day work basis.
- (b) quantities for each item of Day work, to be priced or quoted by each Tenderer at Day work rates as Tender.

If a Day work Schedule is to be included **at all** in the Tender Document, it shall include nominal quantities against the items most likely to be used and the unit rates or prices quoted by the Tenderer shall remain invariable whatever the quantities ordered .

3.7.1.3 Provisional Sums

A general provision for physical contingencies (quantity overruns) or for meeting other essential expenditures may be made by including a provisional sum in the Summary BOQ. Similarly, a contingency allowance for possible price increases

should be provided as a provisional sum in the Summary BOQ. The inclusion of such provisional sums often facilitates budgetary approval by avoiding the need to request periodic supplementary approvals as the future need arise.

3.7.1.4 Correction of Errors

If in preparing BOQ of its Tender, the Tenderer has made errors in the unit rates or prices or the total price, and wishes to correct such errors prior to submission of its Tender, it may do so, but shall ensure that each correction of error is properly initialled by the authorised person of the Tenderer and that a statement shall be made as to the total number of such corrections made, at the end of the priced BOQ.

The Procuring Entity shall ensure that the following note is added at the end of each page of the BOQ.

3.7.2 General Specifications

A set of precise and clear specifications is a prerequisite for Tenderers to respond realistically and competitively to the requirements of the Procuring Entity without introducing deviations or conditionality's in their Tenders. In the context of national competitive Tendering, the specifications must be drafted to permit the widest possible competition and, at the same time, present a clear statement of the required standards of workmanship, materials, and performance of the works to be procured. Only if this is done will the objectives of economy, efficiency, and fairness in procurement be realized, responsiveness of Tenders be ensured, and the subsequent task of Tender evaluation facilitated. The specifications should require that all goods and materials to be incorporated in the Works be new, unused, of the most recent or current models, and incorporate all recent improvements in design and materials, unless provided otherwise in the Contract.

Samples of specifications from previous similar projects are useful in this respect. Most specifications are normally written specially by the Procuring Entity or Project Manager to suit the Contract Works in hand. There is no standard set of Specifications for universal application in all sectors, but there are established principles and practices, which are reflected in these documents.

There are considerable advantages in standardizing General Specifications for repetitive Works in recognized public sectors, such as highways, ports, railways,

urban housing, flood control, drainage and irrigation, and water supply, where similar conditions prevail. The General Specifications should cover all classes of workmanship, materials, and equipment commonly used in construction, although not necessarily to be used in a particular Works Contract. Deletions or addenda should then adapt the General Specifications to the particular Works. Such General Specifications are those issued by the specialised ministries/professional bodies in Bangladesh and/or those of the International Standards Organisation (ISO)

Care must be taken in drafting specifications to ensure that they are not restrictive. In the specification of standards for goods, materials, and workmanship, recognized national standards should be used as much as possible. Where other particular standards are used the specifications should state that goods, materials, and workmanship that meet other authoritative standards, and which ensure substantially equal or higher quality than the standards mentioned, will also be acceptable.

Provision as such be kept that wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract.

3.7.3 Particular Specifications

If an item of the Works is not covered in the General Specifications or if any specification clause requires that further details as to precise requirements for the particular Works are to be given or needs to be modified or clarified then these should be reflected in the Particular Specifications. Where the Particular Specification clause replaces or clarifies an existing clause of the General Specification then the same clause numbering system need to be followed.

3.7.4 Tender Documents

Local Government Engineering Department (LGED) uses the standard tender documents prepared by the CPTU. It assist LGED in the preparation, using this Standard Tender Document (STD), for the procurement of Works and Physical services having estimated cost up to Tk 500 million. LGED refer to the Public Procurement Act 2006 (Act No 24 of 2006) and the Public Procurement Rules, 2008 ,

which is also available on CPTU's website: <http://www.cptu.gov.bd/>.

3.7.5 Tendering Process of LGED-NOBIDEP :eGP

LGED will carry out procurement in accordance with “Guidelines for Procurement under Japanese ODA Loans” dated April 2012. Under the Project, all the civil works will follow Local Competitive Bidding (LCB) method and only consulting services and some vehicle and equipment will follow International Competitive Bidding (ICB) method.

- (a) JICA's review and concurrence is required in the bidding process in accordance with the relevant loan agreement.
- (b) If the provision of the guidelines comes into conflict with the relevant domestic regulations, such as the Public Procurement Regulations 2008 (hereinafter “PPR 2008”) and Public Procurement Act 2006 (hereinafter “PPA 2006”) which may be amended from time to time, the provisions of the guidelines shall prevail over them.
- (c) In accordance with the guidelines, the following procedures will be applicable to the International Competitive Bidding (ICB).
 - (i) Prequalification (PQ) Process:
 - i) Prequalification (PQ) is in principle required in advance of bidding to ensure that invitations to bid are extended only to those who are technically and financially capable.
 - ii) The criteria for prequalification (PQ) shall be the major technical and financial parameters of the Project and the bidders shall have sufficient and proven experiences, personnel and equipment capabilities and financial position in this regard.
 - iii) LGED will use the latest “Standard Prequalification Document under Japanese ODA Loans” published in 2012.

(ii) Single-Stage Two-Envelope Bidding:

A two-envelope bidding procedure (Section XX) shall be adopted for all the procurement packages. With this process, GOB shall open the price envelopes of only those bidders whose technical proposals have confirmed to the technical specification, so that sufficient capacity and technical conformity are ensured.

(iii) Bidding Documents:

LGED will use the latest “Standard Bidding Documents” at the time of finalization of bidding documents.

- (d) In addition, considering the recent price fluctuation of the work, LGED will accommodate appropriate price adjustment clause in the bidding document. Even in case of fixed price contracts, an appropriate clause should be included in bidding documents such as the following;

In the case of fixed price contracts (not subject to priced adjustment), if the bid validity period is extended beyond SIXTY (60) days, the amounts payable in both local and foreign currencies to the bidder selected for the award shall be increased by applying the factors specified in the request for extension to both the local and the foreign currency component of the payments, respectively, for the period of delay beyond SIXTY (60) days after the expiry of the initial bid validity up to the time of notification of the award. Bid evaluation will be based on bid prices without taking into consideration the above correction.

The factors to be applied and mentioned in the request for extension should be as follows:

- (i) The value of the foreign currency factor should be based on, or be comparable with, the expected pro rata annual increases in international prices.
- (ii) The value of the local currency factor should be based on the projected inflation in the Employer’s country for the period in question.

3.7.6 Procedures for Consultant Selection

LGED will select the consultants in accordance with “Guidelines for the Employment of Consultant under Japanese ODA Loans” dated April 2012.

- (b) Consultants will be employed for smooth project implementation through a short-list method to avoid lowering of quality. LGED will employ the international-level experienced consulting firms in order to ensure smooth implementation of the Project.
- (c) JICA’s review and concurrence is required in the selection process in accordance with the relevant loan agreement.
- (d) The Request of Proposal (RFP) should be in principle sent after the Prior Notification for the Project from GOJ to GOB. On the other hand, for expeditious implementation of the Project, the Short List, the Request for Proposal (RFP) including the Terms of Reference (TOR) for the consulting services can be prepared even before the Prior Notification.
- (e) LGED will prepare the Request for Proposal (RFP) document in accordance with the latest “Standard Request for Proposals under Japanese ODA Loan” at the time of finalization of bidding documents.
- (f) Quality- and Cost-Based Selection (QCBS) method is applied to the selection of consultants under the Project. As to the evaluation of proposal in QCBS method, the total score shall be obtained by weighting and adding the technical and financial scores in accordance with the Section 3.10 of “Guidelines for the Employment of Consultants under Japanese ODA Loans” dated April 2012. LGED will adopt the weight of 20% for the “cost” in the Project. The agreed M/M should be provided as “Minimum M/M” in RFP.

3.8 Quality in Construction

Construction is an art, and as with arts the goal is quality. Quality is usually defined as the ability of a product or service to satisfy a given need and hence “fitness for use”. Adequate quality control during construction constitutes a very essential activity for ensuring technically sound civil engineering structures . It also results in economical use of materials through the efficiency of organization. It does not only ensures safe

and sound structures , but also significantly reduces the maintenances cost and increases the durability of the structures .

Failures and inadequacies in many structures are due to inadequate attention to quality control during and construction. Lack of proper knowledge in respect of materials testing and QC is also one of the factors that has been responsible for failure of structures. Therefore, it is of paramount importance to master and practice techniques to testing and QC in all construction projects .

3.8.1 Inspection

There are layers of inspection will be performed during construction of works. After signing the Contract the Project Manager will deploy one Sub-Assistant Engineer and Work Assistant for regular supervision of works. They will supervise the works regularly and will give necessary instruction on environmental mitigation plan, quality of works or any other activities related to works. The PM will issue an Inspection Book for each Contract. Any comment or instruction during supervision or Inspection will be written into the inspection book. The PM shall present in each casting and keep record of measurement. All inspections will be documented and records maintained.

The PM will supervise/inspection the works at least once a week but more frequently as needed. He will check each layer of works such as improve sub-grade, sub-base, base coarse and surfacing works and identify the defects if any. He will provide necessary instruction for removal or rectification if any problem regarding materials quality, thickness of layers. He is entitled to suspend the works temporarily for non-compliance. The PE will take action immediately and will instruct Contractor for necessary action.

The PE will inspect the site at least two times in a month. However, the PE will inspect after completion of each layer of a milestone and will provide necessary direction for proceeding next layer of works if completed works meets specification supported by test results.

The Project Director will undertake periodic interim visits to project sites in order to provide necessary direction for smooth implementation of the project. The Project

Director will report to Chief Engineer and JICA and other government agencies if needed. The record of all inspection report will be maintained at the PE and PM offices.

Progress review meetings are held in each month at LGED headquarters and at the Local Government Division under chairmanship of Chief Engineer and Secretary respectively. In that meeting the project progress will be reported. The Chief Engineer, LGED will also monitor the implementation of the projects works through the Additional Chief Engineer (Implementation). Moreover, a high level inter-ministerial Steering Committee headed by the Secretary, Local Government Division will review progress and solving problems at least once a year. The Project Director will present all project activities before the meeting.

Design Engineers will also undertake interim visit to check and verify the design of the works. He will make modification if necessary for site condition.

3.8.2 Testing

Quality of any construction works will be controlled by performing necessary tests. Testing includes initial materials testing and follow-on field testing conducted during implementation.

3.8.2.1 Testing Lab Requirements

LGED has a well-equipped laboratory in each district with sufficient instruments. One Assistant Engineer is in charge of the laboratory supported by Laboratory Technician (LT) and one Laboratory Assistant (LA). All material and field tests shall be performed by LGED's laboratory in charge. Test reports will be signed by the Lab Technician, Assistant Engineer and District Executive Engineer. In cases where the testing facilities are not available in the LGED laboratory; the tests shall be performed elsewhere as directed by the District Executive Engineer.

3.8.2.2 Materials and Field Testing

All requisite tests for materials shall be performed by LGED before using in any works. The SAE shall oversee material sampling. The SAE will verify that the contractor has conducted material testing and that materials meet the requirements of the NOBIDEP standard Design for Roads, the design drawings and the contract

specifications. Copies of all sample test reports will be maintained at the Upazila Office. The approval authority for all material testing is the District Executive Engineer. The PM will be responsible for submitting material testing to the District Executive Engineer. Signed approval shall be received and will be maintained at the Upazila Office. In the event that materials fail testing, a written notice will be issued by the PM and all materials will be removed from the site immediately. The PM will ensure all unspecified materials are removed from site. If timely removal is not possible, the PM will direct the contractor to mark the materials as rejected until removed. Field testing will be conducted by LGED during project implementation.

Table A2-1-8 : Rates of Laboratory and Field Test

Sl No.	Item Code	Item of Work	Type/ Name of test	Test	
				Unit	Rate (Tk)
1	2.02.1.4	Embankment	i) Plasticity Index (PI)	One	600.00
			ii) 4 day soaked CBR	Each	7000.00
			iii) MDD (Standard)	Each	1500.00
			iv) FDD	Each	400.00
			v) DCP	Each	200.00
2	3.01.4.2	Sub grade	i) Plasticity Index (PI)	One	600.00
			ii) 4 day soaked CBR	Each	7000.00
			iii) MDD (Standard)	Each	1500.00
			iv) FDD	Each	400.00
			v) DCP	Each	200.00
3	3.02.1.2	Improved sub grade	i) FM / Gradation	Each	400.00
			ii) 4 day soaked CBR	Each	7000.00
			iii) MDD	Each	1800.00
			iv) FDD	Each	800.00
			v) DCP	Each	200.00
4	3.03.3.4	Sub-base	i) Gradation	Each	400.00
			ii) 4 day soaked CBR	Each	8000.00
			iii) LAA	Each	1000.00
			iv) MDD	Each	1800.00
			v) FDD	Each	800.00
			vi) W/A (Stone/Brick)	Set	1000.00
			vii) DCP	Each	200.00

5	3.05.7.2	Base Course	i) Gradation	Each	400.00
			ii) 4 day soaked CBR	Each	8000.00
			iv) MDD	Each	1800.00
			iv) FDD	Each	800.00
			v) LAA	Each	1000.00
			vi) W/A (Stone/Brick)	Set	1000.00
			vii) DCP	Each	200.00
6		Brick on End Edging	i) Compressive Strength	Set	1400.00
			ii) Water Absorption	Set	1000.00
7		HBB	i) Compressive Strength	Set	1400.00
			ii) Water Absorption	Set	1000.00
8		Bituminous Materials	i) Softening point	Each	1000.00
			ii) Flash Point	Each	1000.00
			iii) Penetration	Each	1000.00
			iv) Gradation of FA	Each	400.00
			v) Gradation of CA	Each	400.00
			vi) WA of CA	Each	300.00
			vii) LAA	Each	1000.00
			viii) Flakiness Index	Each	200.00
	4.06.03,4.07.03 4.09.03.01		i) FM	Each	400.00
			ii) W/A (Coarse Aggregate)	Each	300.00
9	4.09.03.02.01 4.09.03.02.02 4.09.03.05.02 4.09.03.03.02 4.09.03.06.02	Concrete	iii) LAA/ACV	Each	1000.00
			iv) Gradation of CA	Each	400.00
			v) Setting Time of Cement	Each	700.00
			vi) CS of Cement (3,7,28 days)	Set	1200.00
			vii) CS of concrete	Set	600.00
10		Brick Work	i) Compressive Strength of bricks	Set	1400.00
			ii) Water Absorption of bricks	Set	1000.00
			iii) Efflorescence of bricks	Set	300.00
			iv) Setting Time of cement	Set	700.00
			v) CS of Cement	Set	1200.00
			vi) FM of Sand	One	400.00
11	4.11.01.02	Reinforcement	Unit wt., Elongation & Tensile Strength	1 Set/ Dia	1000.00

3.8.3 Maintaining Temperature

For road dense bituminous carpeting work LGED have specific standard of temperature chart. There is form for temperature check list & E-I-C have to check

temperature two times in a hour periodically & documented down with signature. Temperature is strictly maintained here cause if bitumen is overheated it will lose its bonding capacity & if less heated boding between WBM and WC will not be strength. LGED prefer 60/70 or 80/100 penetration grade bitumen.

Table A2-1-9 : Temperature chart for Bituminous Carpeting (BC)-

Items	Temperature
Prime coat	100°C – 120°C
tack coat	175°C – 185°C
Only bitumen	140°C – 155°C
Only aggregate	150°C – 170°C
Bitumen & aggregate mixing	140°C – 160°C
Rolling	90°C – 130°C

3.8.4 Maintaining Thickness

For comply with LGED’s design, speciation & standard head office (lab) provides equipments to district lab & they delivers to the upazila or field level .LGED have thickness chart form on field & after checking thickness he/she will document it down , if any deviation found he/she will write it to ‘site order book’. For accurate thickness of road layers LGED maintain it by two ways,

- i) Loose thickness
- ii) After compaction thickness

Before paying bill to the contractor LGED do an joint measurement to the field by presence of district office, upazila office and contractor and check thickness & quantity of work done. If any deviation found contractor have to rectify before having payments

3.8.5 Rejection of Works & Correction of Defects

If, as a result of an examination, inspection, measurement or testing, of Works it is found to be defective or otherwise not in accordance with the Contract, the Project Manager may reject the Works by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected Works subsequently complies with the Contract

The Project Manager shall give notice to the Contractor, with a copy to the Procuring Entity and others concerned, of any Defects before the end of the Defects Liability Period, which begins at Completion Date. The Defects Liability Period shall be extended for as long as Defects remain to be corrected

3.8.6 Storage and Usage

LGED-NOBIDEP also has the standard & requirement for storage & usage. All the materials should be kept and sized in the selected stake yard. Rebar should be clean by wet sack before using & storing should be done using bamboo & geo-textile that moisture could not attack. All the forecasting will be done by E-I-C of LGED-NOBIDEP & engineer of contractor.

3.8.7 Record and As-built Drawings

LGED is responsible for producing necessary drawings and designs. Contractor will follow this design and drawing. During construction some aspects of the road/structure may need to be built differently than designed. In that event, the Design Engineer will visit site and if necessary modification would be made and contractor will do accordingly. At the conclusion of the project the design drawings will be updated to produce the as-built drawings. All construction drawings will be maintained at field by Contractor. One set of drawing will be available in the Upazila office and SAE will be responsible. The Contractor will be responsible for recording field changes and maintaining record drawings. The SAE will notify the PM if changes occur that affect the design.

3.8.8 Construction Machinery and Equipment

(1) Contractor should use machine according to LGED's specification & submitted by contractor in bidding. i.e. 8 ton roller for carpeting work (25mm).

(2) Before any major work of construction should check the availability & condition .i.e. Don't give casting permission if there is no "vibrator machine" & adequate "mixture machine"

(3) Contractor should repair construction machinery & equipment regularly, that don't hamper time during construction.

3.9 Quality Management system at Regional, District, Upazila level of LGED-NOBIDEP

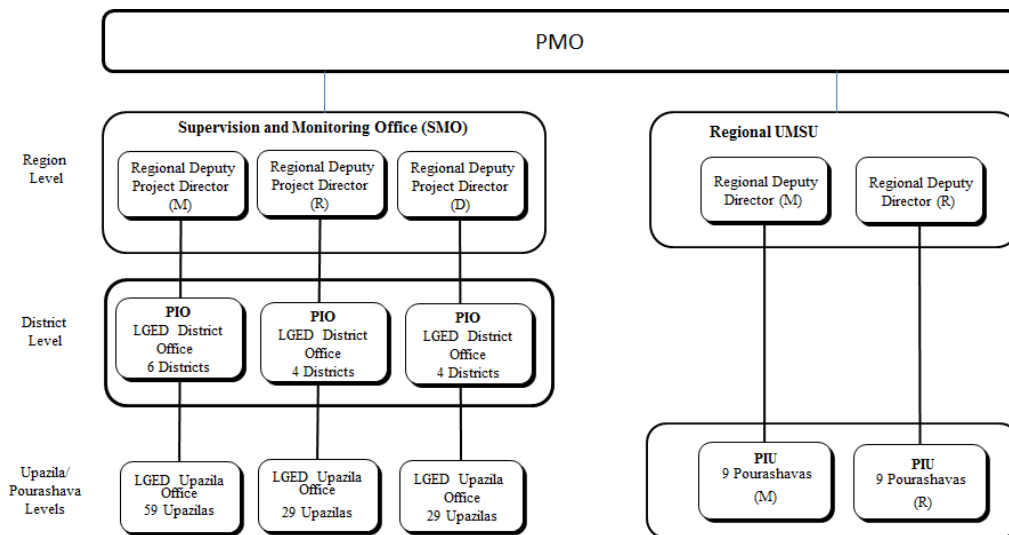


Figure A2-1-13: Quality Management system at Regional, District, Upazila level of LGED-NOBIDEP

3.9.1 Supervision and Monitoring Offices (SMO) :

The SMO will be under management of PMO and will be located within LGED Regional offices in Mymensingh, Rangpur, and Dinajpur regions. The SMO, headed by one full-time Regional Deputy Project Director (RDPD), will assist Project Implementation Office (PIO) at LGED District office and LGED Upazila offices with matters related to implementation of the Project, preparation of subproject implementation plans and designs with stakeholders, check and examination to the expenditure, and monitoring of subproject construction works. The SMO will provide their comments on the progress reports and other relevant documents prepared by PIOs for the PMO. In case those PIOs face any difficulties such as delay in

implementation of physical works, the SMO will also provide proper advices including actions to be taken to resolve problems for PIOs and Upazila offices. The officials and staff of the SMO will visit PIOs and sites to identify the progress of implementation and problems to be addressed regularly and whenever necessary. The SMO consists of one RDPD, one Senior Assistant Engineer, one Sub-Assistant Engineer, one Sociologist, one Computer Operator, one Account Assistant, and two Surveyor/work assistants as a full-time project staff.

3.9.2 Project Implementation Offices (PIO) :

The PIO will be located in 14 LGED District Offices, headed by Executive Engineer, in the Project area. On the implementation of Component 1, the PIO will be responsible for preparing individual subproject implementation plans in consultation with stakeholders, coordinating with NGOs, carrying out investigations and surveys, and creating designs with support from the PMO and SMO. The PIO will manage tendering process including preparing bid documents. For tender evaluation, PIO will evaluate tenders up to BDT 40 million and for approval of tender, PIO will gain approval from PMO. The PIO will also supervise construction activities and expenditures, ensure safeguard compliance and quality of construction works, and conduct monitoring activities with staff in charge of quality control in the PIO. It will provide information at the field level to the PMO on the detailed design of each subproject in close coordination with the SMO, Upazila offices, and stakeholders, and get PMO's approval. The PIO will also submit the monthly progress reports and other relevant documents to the PMO with copy to the SMO for their comments and observation. The PIO consist of one Assistant Engineer, one Sub-Assistant Engineer, one sociologist, one Lab Technician, one Lab Assistant, one Computer Operator, one Account, one Account Assistant, and other office assistants as a full-time project staff. One Field Engineer and one Site Engineer from DSM consultant will support PIO.

3.9.3 LGED Upazila Offices :

LGED Upazila offices will be responsible for the implementation of subprojects in component 1 in consultation with local stakeholders. Upazila Engineer of each Upazila office will report to PIO and the Executive Engineer at the LGED District office with regard to subproject implementation. S/he will act as LGED

representative to local stakeholders in all matters related to the implementation of subprojects, management of construction process, and supervision of construction works. In LGED Upazila office, the Project will be managed by one Sub-Assistant Engineer and one Work Assistant as a full-time project staff. Community Organizers (CO), revenue staff of each LGED Upazila office, will supervise the LCS scheme in corporation with DSM consultants

3.10 Audit and Review

All records of project related activities will be kept in Upzila Engineer's office and Executive Engineers Office. Contractor will notify PM (Upazila Engineer) for testing of materials as well as works. A log of material testing will be maintained at the LGED district laboratory.

The PE will maintain all records and documents in his/her custody at least 5 years for any audit, post review. This will include:

- Tender documents, invitation of tender, copy of advertisement
- Tender Opening Sheet, Tender Evaluation Report, copy of approved estimate, approval of evaluation
- All submitted tenders
- All correspondences with Contractor, JICA
- Inspection Books, Daily, Weekly and Monthly Reports
- Measurement book, Bills, copy of all test reports, payment voucher etc.

4. Challenges and Scope of Improvement

4.1 General

In this chapter I will discuss how LGED-NOBIDEP can implement TQM, Contractors engagement & workforce development, my findings of the research paper, SWOT analysis of LGED-NOBIDEP for knowing it's current position & sustainability of the project. LGED is a well established public sector organization hence; there are few sectors it needs to improve which are discussed here.

4.2 LGED-NOBIDEP Towards TQM

Constriction sector is far behind then other sector in implementing TQM. Here for implementing of TQM, it can easily follow manufacturing industry. The success of other sector by TQM forcing construction industries to implement TQM. As LGED's one of the main vision is " Developing, maintaining and managing transport, trading and small scale water resources infrastructure at the local level." Where components of TQM is must needed to fulfill it's vision. So, time has come for LGED-NOBIDEP to implement TQM . Here, i will discuss how TQM can be implemented here.

4.2.1 Top Management Commitment

According to research on TQM it is noticed that many organization implemented TQM successfully but it didn't sustain because of lack in top management commitment and most of failure scenario are same. So, senior management commitment is most essential for it. If they are not motivated no need to proceed further.

4.2.2 Quality Culture

For quality culture there are few factors which helps to ensure a quality culture, which must have Gender diversity, equity, resource sharing, knowledge sharing, teamwork, collaboration, employee engagement/involvement, stakeholders need and satisfaction. LGED-NOBIDEP can make a change management on basis of culture for implementing quality culture. Failure of the TQM is lack of developing and sustaining a quality oriented culture. Here, top management should play a major role.

4.2.3 Strategic Quality Management

Strategic quality management concepts should be put by comprehensive description of quality objectives in the strategic planning process and through strategic planning frameworks, for example, like quality function deployment (QFD). It gives particular directions on developing of any strategic concepts.

4.2.4 Quality in Design

Design should be in that way that it ensures less time consuming, flexibility, environmental friendly, low maintenance cost, recyclable materials which also minimize harmful impact on society and environment and resources. Clarity of specifications and avoidance of frequent redesigns should be ensured. Detail design, schedule and cost estimate, design evaluations, constructability in design, control of design activity are part of quality in design. Design unit should focus on ‘need base design’ & ‘economic design’.

4.2.5 Process Management

On construction sector process management is one the major component. It focuses on how the construction process will be ongoing smoothly without any kind of barrier. It focuses on proactive rather than reactive. It minimizes time, rework, waste, shortage, misuse, breakdown of work during implementation phase. In construction activities like independent & dependent work, forecasting, quantity of materials needed, site facilities, safety, equipment & tools, transportation is performed here.

4.2.6 Contractor Quality Management

Contractor quality management mainly focuses on Contractors process control, purchasing policy, quality control, quality assurance, quality rather than price. Here, contractor materials source will be identified and a clear ‘supplier mapping’ can be established for more knowledge of tiers supplier. LGED-NOBODEP already have this function but separately, just need to align with TQM theory.

4.2.7 Education and Training

“Education” and “on job” training” makes the employees more knowledgeable , skillful & confidence to perform the job . Organization core activities & issues related TQM may be discussed here. Failure for TQM one of the main reason is lack of training & inadequate knowledge. This will helps to motivate employees towards quality related activities and more engagement of employees will be ensured and employees swill started to thinking that this their organization.

4.2.8 Empowerment and Involvement

Empowerment and involvement makes employee self dependent and confident on taking strategic decision. Those employee helps organization to achieve its desire outcome. Problems related with group decision, team work, focus group, knowledge sharing, conflict can be eliminated by employee empowerment and involvement& they participate in quality improvement activities.

4.2.9 Information and Analysis

Organization policies, decision making, audit & review, strategies, cost of quality, both employee & supplier performance measurement is analyzed here. LGED already have this unit which collects information on market rates, labor prices, market availability, market obsolesce , actual quality/time needed to perform and updates the “rate schedule” for different regions and also make changes on “RSEPS” software which is used to estimate LGED’s work. Now LGED just need to think this unit in TQM theory.

4.3 Contractor Engagement & Workforce Development

As total construction work of LGED-NOBIDEP is carried out by contractor , it is very important to establish a contractor engagement and workforce development plan.

Following indicates how NGED-NOBIDEP implement it

- Contractor recruitment strategy
- Contractor participation procedures
- Procedures for ensuring the quality from the contractor
- Actions to ensure and encourage contractor participation
- Training for contractor skill development.

Step-by-Step

4.3.1 Plan for program process

At the pre-stage and early phase of the project it is very tough for contractor to understand the requirement, procedure, reporting, documentation of the project . LGED-NOBIDEP could organize the following program to support

- Help to understand how to enrolment in supplier listing .
- Help to understand how to implement successfully the project.
- Training on e-GP procedures
- Training on verbal communication and other online tools

4.3.2 Outline contractor's incentives, training & financial support

For more contractor engagement LGED-NOBIDEP should documented contractor training, incentives, and financial support in project implementation plan and there need to create schedules, procedures, measurement tools.

4.3.2.1 Technical Skills training

LGED-NOBIDEP can train their enlisted contractor for new project and new types of work and procedures. For that first need to identify the ongoing technical problems then need to decide what kind of training need at what format. It will also help to increase the understanding between contractors and LGED-NOBIDEP. And after completing training LGED-NOBIDEP should provide a certificate which help the contractor to show experience of any similar kind of work.

4.3.2.2 Incentives and Financial Support

Financial and non financial incentives and support helps to ensure more quality from the contractor. If LGED-NOBIDEP can ensure frequent running bill and a big amount in first running bill then contractor don't have to tense about startup cost, equipment cost, labour and materials cost, cash flow for that they don't have to compromise with quality and sustainability. Following are the procedures

- Recognition and reward
- Financial incentives for quality ,time, performance

- Tuition or training reimbursement, including for business skills training
- Skill training programme for contractors staff
- Training and staffing for new procedures
- Loans for equipment and tools
- Renting construction equipment to the contractor
- Helps contractor in lowering the cost

4.3.3 Define the Quality Assurance Program for the Project

LGED-NOBIDEP already have QA & QC but contractors need to understand what is current QA & QC for this project. LGED-NODIEP

Need to define this plan to the contractors top to bottom manager that they can easily understand..

QA/QC is the combination of quality assurance, the process or set of processes used to measure and assure the quality of a product, and quality control, the process of ensuring products and services meet consumer expectations.

Quality assurance is process oriented and focuses on defect prevention, while quality control is product oriented and focuses on defect identification.

The key stages of a QA process,

1. Mentoring program
2. Helps to understand reporting system, submitting progress report & work plan
3. Periodic inspection & follow up
4. Helps to understand the quality standard and specifications to the contractor.
5. Proactive plan and decision rather than reactive .

4.3.4 Create a Workforce Development Plan

If both LGED-NOBIDEP & employee of the contractor receive development training then unskilled employee will be skilful and they will help to gain mission, vision, objective of the project. For workforce development plan, scheduling is a vital factor & it must have to be ensured that training is on the proper time. And after finishing proper training proper training they could participate in quality management process. Workforce development plan must have a topic, structure, schedule, output, scope.

Work with your workforce development partners to establish plans for the following

- Curriculum of specific classes that technicians will be required to complete, including:
 - Training content (e.g., technical training, including training to acquire professional certifications, as well as business development and management skills)
 - Formats for training (e.g., practicum and in-field mentoring opportunities, short-term training, and career pathways for technicians to advance as home performance professionals)
- Schedule time for training classes and that should be held on discussion with the contractors, that they can participate.

4.3.5 Plan for Coordination & Feedback

For establish a contractor engagement . LGED-NOBIDEP needs to take account contractors needs and satisfaction .Listening to contractor what they & do they have any alternative plan for related quality and progress issues.

- For organizing coordination and feedback LGED-NONIDEP needs to organize quarter meeting, monthly conference, verbal communication.
- LGED-NOBIDEP need to monitor regularly, identify ongoing problems, discuss with contractor, take necessary action to remove the problems & conflicts.

4.4 My findings

4.4.1 Irregularities in Audit:

It is very common that external audit didn't perform accordingly because of corruption between LGED officials and audit firm. In LGED there is going huge numbers of projects, it is not possible to perform all the audits because of lack in HR and technical personnel for audit of engineering works. Most of the time it is seen that audit firm are not technically smart enough to understand the LGED,s work.

4.4.2 Corruption in Project Implementation:

Following are the irregularities found during project implementation :

4.4.2.1 Political Influence in Giving Work Order

Suppose in the supplier evaluation a firm got contract award. But that firm could not start the work if political party is not wanted. Here, work given according to MPs choice.MP most of the time give the work order to their political members. They forced the LGED,s officials to give work order to their to their choice. And that's why problems comes in quality related issues.

4.4.2.2 Controlling Tender

Controlling tender is very common factor in LGED , this is mainly by giving estimated cost and drawing before tendering process, controlling tender notice, unethical practice in bidding , influencing local office for changes by mutual understanding etc.

4.4.2.3 Irregularities in License Use

It is very common that LGED,s contractor using others license for bidding. Some of the contractor use others license who don't have the experience that mentioned in the tender documents for getting contract award. This causes conflict and problems related quality issues during implementation phase. LGED need to take some action to stop this unethical practice.

4.4.2.4 Selling Work Order

There are many contractor's who have this unethical practice. After getting contract award they sell the work to other individual/firm by some percentage of total contract.

This is an regular practice & this also hampers quality of the construction. Because the given firm/individual may not have the manpower, equipment, expertise related to LGED's work.

4.4.3 Corruption Through Mutual Understanding :

At the local level, the following irregularities take place through mutual understanding between contractors and engineers.

4.4.3.1 Changing Information After Getting the Work Order:

To get the work order contractors submit a competitive price quote. But during the assessment of tenders or after getting the work order, documents are changed on the basis of negotiation and mutual understanding between engineer and contractors. The changed tender documents usually increase the quoted price 5% and the money is divided between the engineer and contractors.

4.4.3.2 Irregularities Related to Performance Security Money:

Sometimes it is also seen that contractor got their performance security money very soon after getting work order this is mainly because corruption by the LGED,s staff because they got some amount of money for that from the contractor.

4.4.4 Inadequate Skilled and Technical Staff:

LGED-NOBIDEP is facing problems to ongoing its current monitoring, procurement, supplier appraisal, turn over because of Inadequate skilled and technical staff. Which is mainly for corruption in recruitment of project staff. It causes the narrowing down the scope of maintaining quality work.

4.4.5 Unrealistic Rate with Market Price:

LGED's rate schedule sometimes does not compatible with market price. To deliver the project contractors have to compromise with quality. As materials price increasing day by day and the time between estimate and contract award is high. By that time field condition poorer and requires more allocation

4.4.6 Unsustainable Work:

To comply with LGED,s BOQ rate contractors have to source low price materials which causes low of quality .Which also hampers damage in contraction within one year and need to maintenance again such waste of money & time. It's because huge difference between

Tenders BOQ rate and ongoing market rate and contractor have to pay illegal money in many stages for getting work order & continuing of work & also getting bill. In some cases it is getting very difficult to deliver the project.

4.4.7 Lack of Motivation:

Here the employees are not motivated well to work as it is there organization because of corruption and exploiting .And HRM contribution is not up to the mark.

4.4.8 Irregularities in Lab Test Report:

It is found that lab reports are not generated accordingly to materials test. Corruption and mutual benefit between lab technicians and contractors, LT manipulate the report. So, there is every chance to used of low quality materials into construction.

4.4.9 Lengthy Procedures:

If any drawing or design need to be change for current situation of the field condition , for decision making it need a longer period of time. For any changes or correction firstly contractor report to the upazilla level, then upazilla office report to the executive office then they report to PD&DSM consultants ,then they jointly make the decision and there informing design unit is also required. For adopt any any non-tender item for field situation it needs ministry permission if it exceed estimated cost which needs huge amount of time to approval.

4.4.10 Inadequate Equipments/Manpower of Contractor:

In submission of tender, contractor documented that he/she has construction equipment's , manpower including engineer (with quantity) for getting qualified in the "supplier evaluation". But the problem is that they are performing many works at a time where those are not sufficient. It hampers the time & sometime they perform construction work manually but that suppose to do by plant machine. i.e Dense bituminous carpeting.

4.4.11 Irregularities in Subcontractors

Subcontracting the whole of the Works by the Contractor shall not be permissible. The Contractor shall be responsible for the acts or defaults of any Subcontractor, his or her agents or employees, as if they were the acts or defaults of the Contractor. Nominated Subcontractor named in the Contract shall be entitled to execute the specific components of the Works. But the situation is that contractor assign subcontractor by their sweet will ,which causes ambiguity & problems in quality for poor supplier.

4.4.12 Irregularities in Estimation:

Irregularities found in estimate of road packages. Its because of deviation in the field condition, survey & technical report. It causes high allocation of fund & waste of govt. money .Information proposal send from the local level most of the time inaccurate & not in need base. That's why money is wasting than can be uses in other important works.

4.4.13 Irregularities in Materials testing by Contractor:

In NOBIDEP for any construction work before starting materials(cement, reinforcement bar, stone/brick chips, sand, soil, picked bricks, Bitumen, add-mixture etc.) should be tested and after testing of sample the brand cannot be changed but if needed to change brand it requires test again. But in reality contractors changes brand at their wish.

4.4.14 Irregularities in the Process of Consultant Recruitment

As per DPP of the project, consultant recruitment process should be on open competition. But LGED's current practice is assigning consultancy firm by corruption from the top management . There is no notice for recruitment of consultant.

4.4.15 Sourcing Unspecified Stone by Contractor:

Carpeting work for road construction stones chips must be crushed and sizes are 6mm,12mm,16mm with stone dust (NOBIDEP-LGED standard) but contractor have

the tendency to use uncrushed/pregravel stones (which don't have bonding capacity) & also have the tendency to use over size stone chips for more thickness but that causes void in the base and also causes standing water in those void portions, finally going towards cracks.

4.4.16 Irregularities in Dust Suppression:

After finishing base course and before carpeting there needs to be done Prime coat (mixture of bitumen & kerosene @ 0.75 kg per sqm-ratio 2:1). But contractor has the practice not to do dust suppression accurately, for this the carpeting cannot be bonded with base course which causes serious damage to the road.

4.4.17 Irregularities in Maintaining Temperature :

Bitumen & stone chips should be heated separately for carpeting work & mixing should be in a false stove (manual work). Cause if bitumen is over heated loses its bonding capacity. But workers have the tendency to mix in a burning stove for saving time.

4.4.18 Inappropriate Monitoring Formats:

The inspection formats are designed on a quantitative basis. There is no space for qualitative information. Hence, it is not giving appropriate information of the construction work regarding quality. Sometimes those formats are filled by assumption without visiting the site.

4.5 SWOT Analysis of LGED-NOBIDEP

SWOT Analysis is a useful technique for understanding your Strengths and Weaknesses, and for identifying both the Opportunities open to you and the Threats you face.

Strengths and weaknesses are often internal to your organization, while opportunities and threats generally relate to external factors. For this reason, SWOT is sometimes called Internal-External Analysis.

-Strengths of LGED-NOBODEP

- # Employee has Project Management skill
- #Strong Organizational structure
- #Procurement activities carried out by e-GP
- #integrity/transparency/value adding/efficiency
- #NBIDEP is receiving consultant service which means more control & mentoring on roads
- #Organization has just in time mobile maintenance system
- #Motivated& loyal employee
- #On job training system
- #Have experience of implementing similar kind of works
- #Very strong chain of command
- #Own laboratory for QC tests

-Weakness of LGED-NOBODEP

- #Excessive work load on employee ; sometimes causes less monitoring
- #High hierarchy
- #Less training in lower/root level
- #inadequate/shortage of employee
- #Low budget
- #Shortage of construction equipment's

-Opportunity of LGED-NOBODEP

- #Constructing RCC roads in the excessive traffic volume areas
- #Adequate fund for Periodic maintenance of roads
- #Availability of materials
- #Availability & low cost labor
- #Satisfied donors are satisfied & motivated for further donation
- #Rural infrastructure development
- #Engage village women into work
- #Using durable ingredients for longer life cycle of roads

#implementing sustainable project

-Thread of LGED-NOBODEP

Using CPTU's standard tender document

#Lack of skilled/professional contractor

#Geographic condition of the country

#Political constrains

#Gifted representative turnover

#Similar kind of organizations

4.6 Sustainability of LGED-NOBIDEP :

The purpose of the proposed Project is to “extend access to rural and urban infrastructures and services, and improve urban governance in the project area” and this will be achieved through improving and sustaining: 1) rural infrastructure, 2) urban infrastructure, service delivery and governance; and 3) linkage between rural and urban areas. Aiming toward that a “credible” Maintenance Action Plan is developed for the project.

The project design includes a number of measures to enhance sustainability:

- Under Component 1 (rural infrastructure development), JICA will finance the off-pavement routine maintenance by LCS of all Project roads during the Project period, and the rehabilitation of priority UZR which were previously improved but which have deteriorated through the lack of adequate maintenance. The selection procedure for the Growth Center market improvement subprojects includes the requirement that they should generate sufficient lease revenue to cover their routine maintenance costs. This Rural Road Maintenance Action Plan provides the mechanism not just to sustain the Project investments in upgrading UZR and UNR, but also to increase the sustainability of the wider core rural road network in the Project area.
- Under Subcomponent 2-1 (urban infrastructure and service delivery), sustainable operation and maintenance (O&M) of the subproject investments will be addressed at the planning stage. It is a requirement that all subproject proposals, selected from the Pourashava Development Plans (PDP), should include an O&M

plan that defines the budget, the sources of finance and the institutional responsibilities. In addition, the NOBIDEP will adopt a strategy of partial loan financing for some revenue-generating subprojects, e.g. bus and truck terminals and municipal markets.

LGED is already taking a number of actions to address the issue of sustainability:

- It has prepared a Rural Road Maintenance Policy which is currently being processed for formal adoption by the GOB. This policy proposes: 1) increased funding for maintenance through a 20% annual rise in the revenue allocation until it meets 75% of the need, combined with greater support from donors; and 2) measures to increase the efficiency with which resources are applied to sustain the level of service of the rural road network.
- Increased emphasis, in both GOB and foreign financed rural infrastructure projects, on rehabilitation and periodic maintenance of UZR and UNR.
- Progressive adoption of the use of long-term, Performance-based Maintenance Contracting which potentially will result in maintenance funds being applied more effectively to sustain levels of service.

5. RECOMMENDATIONS & CONCLUSION

5.1 Recommendations

Followings are the recommendations of the study,

- i)** There should be adequate maintenance fund for road and with more than three years tenure. Mobile maintenance can be enabled for more agility.
- ii)** Electronic procurement should be ensure at every level of the procurement process
- iii)** Tender's BOQ rate should comply market price that contractor can bear the "cost of quality"
- iv)** E-I-C should have a close focus on bitumen temperature during DC work
- v)** Before prime coat dust suppression should be done accordingly
- vi)** Consultant recruitment process should be transparent & open competition
- vii)** Materials testing should be done before construction work & which are fail in lab test should be carry out from the site, E-I-C need to ensure/responsible for those.
- viii)** Subcontractor should be appointed by the concern of LGED-NIBIDEP's responsible persons
- ix)** On "pre-contract award" supplier's equipment/information/manpower should be inspect by procuring entity.
- x)** Supplier should source materials as per LGED-NOBIDEP's specifications
- xi)** Design/drawing/estimation should be done prior to field condition
- xii)** Audit should be transparent and acceptable by all the stakeholders of NOBIDEP
- xiii)** Reinforcement bar should not be store/kept to direct soil or nature & use geo-textile or bamboo under it .
- xiv)** Ensuring proper training for the root/bottom level.
- xv)** Not just "volume of traffic" rather "axel load" should be analyzed before designing the pavement.
- xvi)** Whole life cycle, operating & maintenance cost should be considered on planning phase rather focus on up front cost .

- xvii)** All the staff of NOBIDEP should have the project management knowledge and skill
- xviii)** Contract award should be on the basis of most “realistic bid” instead of “low bid”
- xix)** A responsibility assignment **matrix** (RAM), also known as **RACI matrix** /'reisi:/ or linear responsibility chart (LRC) can be adopted for more participation/co-operation/collaboration/involvement from the employee of the project.
- xx)** Come up with “flat organizational structure theory” which ensures involvement of employees into decision making ,less time taken to decision making, less complicated communication channel & Lessing down managerial level
- xxi)** In works procurement there should points for eco-friendly experience of supplier & in goods procurement using eco-friendly clauses for sustaining the project
- xxii)** Focus not only the percentage of total “turn over” rather focus on quality & sustainability of the project.
- xxiii)** Post monitoring program should be held on regular basis
- xxiv)** Coming up with PPP theory for avoid the barriers of financial problems.
- xxv)** “Supplier award” based on their performance can be organize which will motivate them & they will start understanding that organization is thinking about their hopes & expectations.
- xxvi)** Contractor should have the “work plan” & they need to submit it periodically basis to the responsible person of LGED-NOBIDEP, which will also help to identify the independent & dependent/linkage of work.
- xxvii)** LGED-NOBIFEP can train their supplier for complying with their requirements.
- xxviii)** Geo-textile used in construction should not be poly-synthetic , it should be environmental friendly.

5.2 Conclusion

Basically Govt. work implemented by lowest bid system, here this system it is very tough to maintain high level of quality. The “Contract award” should not be given for lowest bid rather it should be on most realistic price. Because in current e-GP system, software takes just lowest price given by contractor. If Supplier selection can change in this way & measures can take discussed in the recommended section then highest level of quality can be ensure from here.

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ANNEX 1 : Pictures of Pavement works



1. Sample collecting for proportion checking of Bitumen & stones.



2. Mixing & watering of base course.



4. Compaction work of base course.



5. RCC wall for protection of road.



6. Thickness checking of BC work



7. Prime coat work ongoing.



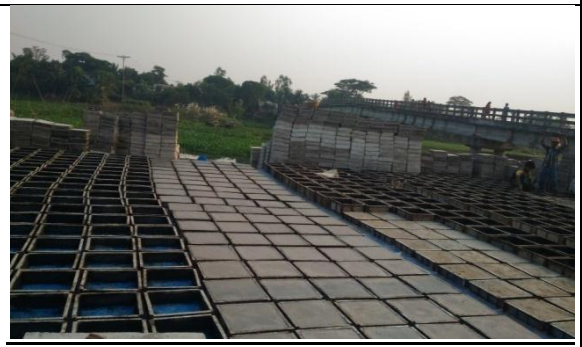
8.Rolling temperature checking



9.Compaction work ongoing of BC.



10.12mm Seal coat work ongoing.



11.CC block casting for slope protection of road.



12.Using PVC pipe for proper thickness



13.Post thickness checking of all layers of road.



14.Using Distance wheel for measuring length of road.



15.Laser thermometer for maintaining temperature.