An Insight into the Technical Scope, Limitations and Problems Encountered
in the Implementation of Labor-Based/ Equipment-Supported Method
of Construction and Maintenance of Infrastructure Projects of the Philippine Government

TECHNOLOGY AUDIT FOR LABOR-BASED/ EQUIPMENT SUPPORTED INFRASTRUCTURE PROJECTS IN THE PHILIPPINES

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INTRODUCTION

This report is submitted in compliance with the personal services contract requirement as external collaborator (EC) for the International Labor Organization (ILO).

The intention of this paper is to present the application and results of project implementation by the various government agencies involved in Labor-Based/ Equipment-Supported Method (LBESM) projects. It attempts to analyze the contributory factors of the labor, equipment and material components in the Labor-Based Method (LBM), Equipment-Based Method (EBM) and Labor-Base/ Equipment-Supported Method (LBESM) of constructing and maintaining infrastructure projects.

1. Background:

Since 1973, the International labor organization (ILO) through its Technology and Employment Branch has conducted programs on appropriate technology geared towards road construction and maintenance. The various research works conducted in relation to Labor-Based Method (LBM) showed that the technique is technically feasible and economically viable for a wide range of road construction works and maintenance activities. However, when the technique was applied under actual field conditions and with the participation of target rural folks, the resulting operation was never simple and is most cases not easy to implement. It was found out that the successful application of LBM depend much on organizational set-up, program/ project management, field administration and the culture and attitudes of the rural players. The technical and economic factors became only secondary.

This paper describes the experiences of the various Philippine Government agencies task to implement the LB/ESM of construction under their jurisdiction. The various findings and discussions will provide useful background and reference material to those involved in the study of LB or LB/ES method in construction and maintenance activities.

1.1 Methodology-

This report was prepared based on researches made on available records and documents and interviews with officials and staff of the following government agencies involved in the implementation of infrastructure projects. Primarily, they are composed of the Department of Public Works and Highways (DPWH); the National Irrigation Administration (NIA), the National Housing Authority (NHA) and the Department of Interior and Local Government (DILG). Although the Department of Education, Culture & Sports controls the budget for the construction and maintenance of school buildings, the implementation of building construction are delegated to the district and regional offices of the DPWH, and so coordination was established with the latter on school building projects.

2. Productivity and Employment Concepts in the Construction Industry

2.1 Introduction:

The basic consideration in the practical and economic adoption and implementation of any method or process is its consistency and predictability. Quality and time is always an essence of any construction

undertaking. All these factors taken together should translate into profitability and economy. An equipment that is designed to do compaction work will always do so when prompted and at relatively the same productivity rate; while a group of workers trained for compaction work may change their work attitude and productivity from day to day. Again, these will depend on the number of variable mindset in the group members and the supervisor or leadsman. This complex situation is brought about by the various attitudes and the physical and emotional condition of a group of workers individually and collectively. It is the main driving force which makes contractors and construction managers shift from labor-based-method to equipment-based method of construction.

2.2 Quality, Economy and Completion Time

Generally, the demand for quality, economy and completion time are major considerations for all construction projects and usually dictates the choice of technology. However, in government infrastructure projects, political consideration is not unusual since infrastructure projects are vital to the present success and political future of national and local leaders.

There are instances were road projects are implemented to serve vote rich communities only to deteriorate rapidly after election due to sub-standard construction. This could be the reason why LBM proved to be a disadvantage if employment generation is the prime objective without taking into consideration the proper skills of the worker doing the work. Under these conditions LBM becomes inversely proportional to the demand for high-quality construction works.

With the frequent occurrence of high-intensity earthquakes in the Asian region recently, and the flooding caused by tropical depressions triggering erosions and geological damages, the demand for higher-quality construction works becomes even more necessary. Manual mixing of concrete is no longer acceptable for structural components, especially for high-rise buildings and high-traffic roads and bridges. Volumetric approximation in the batching of concrete components is becoming unacceptable. Concrete batching plants are now utilizing computerized weighing scales to comply with the specifications for high-strength concrete, particularly with regards to water–cement ratio, slump, aggregate size, consistency, and uniform strength.

Economy (profitability for contractors) is always the bottom line for any business endeavor. Although political agenda may be involved in an infrastructure project, the economic viability of the undertaking for the total estimated project cost as presented in the Program of Work should at least support a reasonably-priced undertaking.

In almost all construction projects, time of completion is a major factor in the award of the contract. For government infrastructure work, especially projects with less than one-year target duration, time is crucial as funds are allotted on a fiscal year basis. This is also true for maintenance works where yearly allotments of funds are scheduled. Time is the common denominator for both privately- finance commercial projects and public works infrastructures due to the “cost of money” principle in financing and the “time cost of money” for loans and “opportunity lost” concept for commercial projects. Built-operate-transfer (BOT), Built-Operate-Own (BOO), and Turn-key arrangements in public works projects are susceptible to the foregoing principles.

Due to time constraints and set deadlines, the mechanization of construction processes is inevitable. For construction works that are exposed to severe weather conditions such as roads, bridges, piers, irrigation canals, dams, etc., the time element is very crucial. Clearing activity, roadway excavation, sub-base and base-coarse preparations and asphalt laying must take advantage of all possible dry weather conditions and works must be done immediately to avoid possible washout and erosion of prepared materials during the rainy season

Bridge foundation construction must take advantage of low water conditions and pier and abutment structures must be completed substantially to secure against high water and rampaging river flows. In the construction of seaport piers and jetties, the timing for low and high tides is critical for barge-mounted pile driving operations. Tropical depression that usually brings typhoons with high-velocity winds is dangerous for construction activities along seashores and riverbanks and of high-rise buildings. Exposure to constant wet and dry conditions under severe weather and climactic conditions, exposes manual workers to constant danger and health-risk. Under these conditions, alternative equipment can perform operations more efficiently, effectively and less life-threatening.

2.3 The Basic Economic "Law of Supply and Demand":

In the Philippines, as elsewhere where infrastructure construction delivery vary from place to place and from culture to another, the "Law of Supply and Demand" determines the sustainability of an infrastructure project. Due to geographical dispersal of island provinces or regions, the combination of LBM and EBM of construction delivery vary significantly and is dictated by the basic economic "Law of Supply and Demand". Where appropriate labor is abundant and equipment is hardly available, manual labor will always be a sensible choice of the contractor and project administrator. And where equipment is adequately available and cheaper to rent, EBM would be a logical approach. It is therefore recommended that the application of LBESM of constructing infrastructure project be done on a case to case basis taking into serious consideration the location, terrain, weather conditions, accessibility, availability of rentable equipment and skilled and trainable workers who are willing to work, among others.

2.4 The "Law of Diminishing Returns":

As human effort is exerted, physical fatigue sets in. Eventually, mental concentration is diminished followed by low productivity. In using manual labor, productivity is inconsistent and depends so much on many variable factors. This would include physical and mental health conditions, psychological stability, team spirit, and other human behavior problems. This is perhaps the reason why so many companies are switching to computers and mechanized processes to avoid unpredictable situation and unproductive conditions. The only way for workers to be acceptable to the industry is for them to become multi-skilled and flexible craftsmen. This is where training becomes necessary. As Henry Ford once said "It is not the employer that pays the workers their wages, it is the product".

3. Basic Management Components of a Construction Project; (5 M') Manpower, money (financing), material, methods & machine

3.1 Manpower

3.1.1 Sources of Construction Manpower:

Traditionally, the supply of construction manpower for Metro Manila comes from adjacent provinces and regions. During the construction boom in 1977 under the Marcos Administration, construction manpower supply came as far as the Ilocos Region in Northern Luzon and as far down south as the Bicol Region in southern part of Luzon Island. The insurgency problem in Mindanao and some islands in the Visayas started the significant migration of ethnic families to Metro Manila from war torn sitios and barrios. Many of them were mere farmhands and with low educational attainment, if ever. Unable to find jobs, the construction industry provided them the needed alternative to survive in the city and sustain their families. They settled in depressed

and blighted areas and occupied vacant government lands causing the unabated squatter problems in the metropolis.

These multi-billion infrastructure project plus the commercial developments of privately financed high-rise buildings and subdivisions provided the economic opportunities for these blighted workers and encouraged them to stay in the cities even after the construction industry glut before and after the EDSA revolution.

The multi-billion infrastructure program of the Ramos Administration sustained and provided more employment opportunities for these migrants. It encouraged relatives left behind in the provinces to seek greener pastures not only in Metro Manila but in other promising cities as well. Many who became skilled tradesmen even went into labor contracting or sub-contracting and decided to stay in the metropolis for good. Despite the government's program distributing infrastructure projects to the various regions to trigger development and encourage Metro Manila migrants to return to their original communities, many stayed and live in shanties along river banks, esteros and lands adjoining garbage dumpsites, among other sites. At this point in time when the construction and real estate industries are again on a tight squeeze, the plight of this sector of the working force is uncertain.

3.1.2 Construction Manpower Training:

Government training of construction technicians and skilled workers is basically the function of the National Manpower and Youth Council (NMYC) and the Construction Manpower Development Foundation (CMDF). The Meralco Foundation, a non-government organization also offers scholarships to qualified applicants usually in the field of electro-mechanics.

The training of LBESM supervisors and trainors are being handled by the Department of Public Works and Highways (DPWH), Central Labor-Based Unit. The trainors in turn trains local workers on the proper implementation of work activities using LBM, and LBESM. In 1986 DPWH conducted three on–site seminars for its regional offices around the country; with 74 trainees completing the training course for supervisors and 8 more completing the training course for trainors. In 1986 and 1987 the training of LBESM trainors were provided by the DPWH with assistance of the Central Labor-based Advisory and Training Team (CLATT) and supported by ILO. These trainors subsequently provided training for LBM workers and "Pakyaw" leaders.

In 1987, in a seminar conducted by the DPWH-CLB Unit, 30, 21, 20, and 1 trainees from the DPWH, NIA, DILG and DOLE/NMYC, respectively finished the course for supervisors. In the same year, 15, 10, 10 and 1 trainees, from the same agencies respectively, completed the training course for trainors on LBESM for construction and maintenance projects.

3.2 Materials

3.2.1 Procurement of Goods for Government Projects

Executive Order No. 302 dated 19 February 1996 provides for the policies, rules and regulations for the procurement of goods and supplies by the national government. It requires that goods and supplies to be procured must be of acceptable quality and at fair and reasonable price; that suppliers, manufacturers, distributors are treated fairly and equitably and that procurement is done through open, competitive bidding. Aside from competitive bidding the R&R also provides for other approved means to effect procurement of goods and supplies. Under certain circumstances, direct contracting is allowed based on recipt of quotation, repeat orders, shopping and through negotiations.

3.2.2 Indigenous Materials for LBESM Projects

Guidelines on the selection of indigenous materials for use in structures of LBESM projects is suggested by the Central Labor-base Advisory and Training Team under CLATT Guide No. 17.

It suggest that materials should, where relevant, be in conformity with the Specification for Labor-Based Construction Projects given in the Project Implementation Handbook where the constituents of concrete are covered in more detailed in the Guide on Concrete Technology. The Guide briefly advises on the following major material components used in LBESM structures:

(a) Cement - Bags of cement which have been stored for a long time, that contain lump of caked cement or are damaged should not be used for reinforced concrete or where structural strength is critical. With caution, such cement, providing it has been sieved, can be used in non-structural locations. In no case should any hardened cement be broken down for site use.

(b) Reinforcement - Should be properly stored under cover and free from any dust, scale, paint, oil, grease or other foreign substances.

(c) Coarse Aggregate (Gravel) - Should contain no more than 1 1/2 percent material passing the 0.075 mm sieve nor more than 5 per cent of soft fragments. Stockpiled materials shall be protected against contamination.

(d) Fine Aggregate (Sand) - Shall, if necessary, be washed prior to use to remove any silt or soil. If sand is obtained from a river or stream bed, turning the sand by shovel in the running water may provide the necessary washing action. Stockpiled materials shall be protected against contamination. Stockpiled sand often has a high water content which must be allowed for when mixing concrete.

(e) Water - Stream or river water can be used with caution. However, if such water is not clear, e.i. it contains suspended materials, drum storage for 24 hours may allow the water to ‘improve. But beware of mosquitoes.

(f) Concrete/mortar - Water content is critical. A rough guide to good practice is to use 20 liters of water, or 1 bucketful, per bag of cement. Without good supervision the laborer or mason may add too much water to increase workability and delay setting time making his job easier. The supervisor must be aware that excess water at mixing stage can halve the structural strength and seriously affect the durability. He must also be made aware that he is responsible for the quality control of the concrete, not the laborers. Also, the supervisor should reflect any concrete or concrete materials which contain silt, clay, roots and weeds.

(g) Stone - For masonry work or rip rap the stone should be strong and angular with no dimension less than 75mm. Rounded stone does not fit together very well and is expensive because too much mortar is needed. If possible, reject rounded stones. Cleanliness is vital for masonry work but not so for dry rip rap. Indeed, sometimes, clay can be used as a “filler” for dry stone work. For masonry wall construction, strength is dependent upon the mason’s skill. For example the largest face on a stone block should not appear on the face of the finished work. It should for maximum strength, be within the wall.

(h) Timber - Structural timber is usually used for bridge decks as bearers or timber decking. For bearers, round tree trunks are better than sawn timber beams. They are cheaper and in many cases stronger. Problems exist with the shape, seasoning and preservation. The eucalyptus is ideal for this purpose being straight, generally branch less and containing a natural oil which acts as a deterrent against

termites. Partial preservation of tree trunks can be achieved by creosoting. Other structural timber would normally be sawn or planed and treated with preservative.

(i) Gabions - Gabions are wire cages, generally 1x1x2 m of galvanized wire mesh. The mesh size is generally 80mm and wire thickness 2.5 mm. They are imported flat-pack but are very expensive. Their uses are numerous; from walling to slope and river protection. Their flexibility makes them ideal for river control works and very suitable for labor-based construction. However, for longevity, the gabion boxes should be tightly packed with rectangular or angular stones. The objective is to fit as much stone and as few voids as possible. Consider a gabion as being a stone wall inside a cage. The high cost is the greatest problem and attempts to manufacture local gabions from typhoon fencing frequently fail because of the lack of strengthening, wire at corners, as diaphragms.

(j) Hollow blocks - The most widely used blocks for walling are concrete hollow blocks (CHB) which are pre-cast building units composed of Portland cement and suitable aggregates. Hollow blocks are used for lining the walls of canals and farm ditches in irrigation projects; for construction of manholes, for drainage and for building walls of houses or in other public works projects. Standard dimensions are 8" x 16" x 6" (or 4") with 2-3 cavities and a shell thickness of ¾" –1/4"

(k) Bamboo - Bamboo is a very abundant material, available especially in the rural areas. It has a wide variety of uses, from tool handles, posts, wallings, framework of carabao carts and sledges and even as a replacement for reinforcing bars. Bamboo, If cut at the right time (i.e. seasoned), can last for many years (bamboo post used for the construction of "nipa" houses and fences in the rural areas have lasted for 20 years and even more under normal conditions). This is true for bamboo that has matured enough and has been soaked in water, i. e. usually in the river, for about 3months. Soaking has proved to increase the durability and life. Bamboo bridges for pedestrian walkways across rivers in the rural areas have also been found to last for about 20 years.

As mentioned above, bamboo is also used as a replacement for tool handles. Since bamboo is abundant in the rural areas, it is often the cheapest and the most readily available material with which the laborers can replace broken tool handles. Bamboo handles usually last for 2-3 years under normal use. These handles are quite popular because of their lightness and build- in shape. Because of the high cost of steel bars, bamboo has also been used in the reinforcing of low concrete fences and walls. It is usually not dried in order to increase its adhesion to the concrete.

3.3 Machines (Equipment &Tools)

3.3.1 Equipment Rental Rates

The standard rental rates for construction equipment and plants are based on the terms and conditions set by the Association of Construction Equipment Lessors (ACEL). The guidelines are revised periodically as the based on the equivalent purchased cost of new equipment, taking into consideration the model and condition of each machine. The equipment rental contracts are available under two types- the "Operated' Equipment Rental Contract (OERC) and the "Bare" Equipment Rental Contract (BERC).

Under the OERC day-to-day rental rates are charged on the basis of a minimum of ten (10) hours per day operating and/or standby hours during the first shift of work except in cases of equipment breakdown. On the succeeding shift, only the actual operating hours are charged to the Lessee on an hourly basis. On a month-to-month rental contract, the Lessee is charged on the basis of a minimum of two hundred (200) operating and/or standby hours. Only actual operating hours in excess of the first two hundred (200) hours is charged on a pro-rata basis.

One month is equivalent to 25 days at 8 hours or 200 hours. In cases where an equipment is utilized on a Holiday or Sunday, a minimum of 8 hours per day is charged to the Lessee. The contract commences upon departure of the equipment and accessories from the Lessor's yard and terminates upon return of the equipment and accessories to the same place. The cost of transporting the equipment and accessories and its operators to the Lessee's job-site and their return to the Lessor's yard is charged to the Lessee. Operators' wages and the cost of maintenance and repairs are born by the Lessor.

For projects outside Metro Manila, fuel and lubricants is supplied by the Lessee but for the account of the Lessor. In cases where there is a price differential between the actual fuel and lubricant cost delivered to the job-site and Metro Manila prices, the variance is borne by the Lessee. A minimum of 2% of the listed rate is charged for projects outside Metro Manila to defray additional expenses for overhead and logistical support. If the equipment is based within the job-site area the 2% additional charge does not apply. On the other hand, "Operated Dry" rental scheme can be arranged, where the Lessor provides the equipment, operators, and maintenance crew, while the Lessee supplies the fuel and lubricants at his own expense.

If the equipment is idle due to lack of Lessee-supplied fuel and lubricants but paid for by the Lessor, a minimum of ten (10) hours per day on a day-to-day rental contract, and a minimum of eight hours per day on a month-to-month contract is Applied provided the equipment is in operational. If the equipment and accessories are idle but operational, a "standby" or "waiting time" is charged the Lessee for the minimum daily or monthly rental. However, in case of unworkable conditions, the Lessee is charged P500.00/unit per day or one-hour rental rate whichever is higher.

Under the BERC monthly equipment rent is charged on the basis of a minimum of two hundred (200) hours, whether the equipment was used or not. Operation in excess 200 hours/ month is charged on a pro-rata basis. One month is computed at 8 hours a day for 25 days for a total of 200 hours. During holidays or Sundays, a minimum of 8 hours per day is applied. Charges commences as soon as the equipment leaves the Lessor's yard and after it has been checked and tested by the Lessee. The charges are terminated upon return of the equipment to the Lessor's yard.

The equipment is considered in good operating condition after the Lessee is satisfied running it for one hundred (100) hours or ten (10) days, whichever comes first. Costs associated with the equipment breakdown thereafter is for the account of the Lessee. However, any repair within the above period is borne by the Lessor except when the breakdown is due to the negligence of the Lessee, in which case the Lessee shall bear the cost. The lessor has the option to select the Lessee's operator qualified for the equipment rented. If the Lessor provides the operator, the Lessee pays for the wage, insurance, board and lodging of the operator.

The cost of fuel and lubricants, maintenance, repairs, transportation and insurance of the equipment and accessories is to the account of the Lessee. The Lessee assumes full responsibility for the loss, damage or partial loss of the equipment and accessories and for third party liability. The equipment and accessories is returned to the Lessor in the same condition as it was received by the Lessee, except for normal wear and tear.

3.3.2 Leasing of Private Equipment by the DPWH

At the DPWH, the leasing of private equipment is allowed under Department Order (DO) No. 11, Series of 1996 signed by Secretary Gregorio R. Vigilar on 16 January 1996. To improve the delivery of infrastructure services, the Department resorts to the leasing of construction equipment from private lessors whenever the need for such equipment is well beyond the internal capability of the DPWH. This approach provided the means to ensure the appropriate number and type of equipment units needed in the implementation of projects by administration.

Due to steadily increase in the costs of equipment, spare parts and supplies that triggered corresponding increase in rental rates of construction equipment available from private entities, as a guideline, DO 11-1996 authorized the use of rental rates not exceeding the 1992 ACEL Equipment Guidebook

3.3.3 LBM Tools and Equipment

The usual handtools and equipment used on LBESM of construction and maintenance programs under the DPWH (and their application) includes the following:

A Cutter Mattock is an excavation tool composed of a mattock blade for excavation in hard soils and a cutter blade for cutting tree roots and parts. It is very useful in uprooting trees.

A Bow Saw is useful for cutting felled tress into pieces or cutting thick branches on trees still standing.

Axe is used for felling trees and cutting branches off the trunk.

Brush-hook is use for bush clearing, especially for thick but flexible branches. The brush-hook is more efficient than the axe or bolo.

A Bolo is a versatile hand tool and is commonly use for general cutting purposes.

A Grass Cutting Bolo is extra light and more ergonomic than the common type of bolo. It is recommended in cases where grass cutting is very substantial.

A Stand-up Grass Cutter is operated like a golf club. It is also ergonomically designed and popular in cutting short grasses. It is useful for maintenance of road shoulders and is recommended in cases where grass is very substantial.

A Digging Chisel is used in making postholes and for excavation of soft rock and soil from the top of deep cuts. It does not replace crowbar for levering and excavation in hard rock.

A Crowbar is used mostly for excavation in hard rock and concrete, for making post holes and for levering.

A Sledgehammer is used for breaking boulders, concrete and rock, possibly in combination with a chisel. Since it has two flat striking faces, it is less appropriate for cutting rock than the stone breaking hammer which has one pointed face and a flat one.

A Pickaxe has a chisel and a point blades and is used for rock excavation. It can repalce a Pick Mattock in soft rock excavation when the chisel blade is wider than 5 cm.

A Pick Mattock consist of a point and a mattock blade. The mattock blade is used for excavation on soft rock and soil, while the pick part is used to break harder rocks.

A Forked Hoe is not commonly used in the Philippines. It is a useful tool where a common hoe cannot penetrate, i.e. on gravel soil with plenty of grass roots and garbage. It is can be efficiently use for spreading base course and gravel.

A Hoe is the excavation tool for all soils that do not contain rocks.

A Spade is used for ditching and for excavation in cohesive soils.

A Shovel is used for loading materials and for excavating loose soils.

A Wheelbarrow is used to transport materials up to 150 meters. For proper productivity the wheelbarrow should be able to carry the maximum weight that a laborer is able to take.

A Rake Spreader is used in road construction to spread materials to a proper crown.

A Hand-rammer is used for compacting where a roller cannot reach. The drop of the rammer should create a certain pressure that would result in compaction.

A Cold Chisel is used for cutting on solid rock for excavation or for drilling the pointed type is more popular than the bladed one.

A Stone Hammer is used in breaking solid rock, boulders and can be used in combination with chisels. A minimum of 4.5 kg. weight is necessary for sufficient impact.

A Carabao Drawn Scraper is used for scrapping a top layer of material and transporting it over a distance shorter than 150 meters. It is a popular and efficient tool, especially when ploughing has loosened the soil. The Carabao Scraper is very efficient under wet conditions where a wheel-borrow and a power tiller trailer are difficult to use.

A Carabao or Ox Drawn Cart is used for hauling over distances of up to 500 meters. A cart with pneumatic tires is preferred when used on sandy or gravel roads. The carabao can efficiently haul up to 600 kg. on a level road. The carabao however, needs regular rest and watering.

A Power Tiller or Walking Tractor with Trailer is often available in rice growing plains and is considered very fuel efficient. On level roads it can easily transport some 1000 kg. at a rate of about 10 km/hr. Hauling should not exceed 500 meters. It does not perform well on hilly slopes due to power shortage and insufficient traction and encounters steering problems when going downhill.

A Jeep is adaptable on level roads with a good surface and can carry loads up to 2000 kg. The Mighty Mite has a similar engine and has much more traction.

A Tractor is ideal for labor-based contraction both in hilly portions and plains. The 4-wheel drive tractor is recommended for superb traction. Their payloads vary from 10 tons on plains to less than 5 tons on hills, depending on the gradient and road condition.

A Towed Roller has a few advantages in labor-based construction compared to self-propelled roller.

3.4 Methods of Construction (EBM, LBM, LBESM)

3.4.1 Introduction

In the Philippines the choice of a construction method has many dictating factors. Cost (profitability), time, quality, social impact, political mileage, etc., these are some of the factors that affects or may affect the decision to use either equipment-based, labor-based or a combination of both methods in the construction and maintenance government infrastructure projects. The parameters for private sector sponsored/ financed projects are less complicated.

3.4.2 Relative Terms Defined:

Labor-Based Method (LBM)- is a work technique that is basically executed by manual effort using hand-tools; while Equipment-Based Method (EBM)- is a work technique that is basically executed using mechanical equipment operated by skilled labor.

Labor-Intensive Work (LIW)- is a work activity wherein LBM is predominant in its implementation with regards to **unit accomplishment** (ex… lineal meter, square meter, cubic meter, kilogram, metric ton, etc…); while Equipment-Intensive Work (EIW)- is a work activity wherein EBM is predominant in its implementation with regards to **unit accomplishment.**

Employment-Intensive Project (EIP)- is a construction undertaking wherein the cost share in the project of LBM work (% of total cost) is substantially greater than the cost share of EBM work. For example, in clearing and grubbing operations, the cutting of shrubs and felling of trees (clearing) can be done by manual labor with the use of machetes/ chain saws; while the uprooting of tree stumps (grubbing) can be done by bulldozers/ backhoes. Under usual procedures, work undertaken by manual labor is greater than the work done using equipment.

It does not necessarily follow that a Labor-Intensive Project is also an Employment-Intensive Project, since a project where the unit accomplishment is predominantly achieved by LBM may have an EBM cost share higher than the LBM of the total cost spent on a project.

Strictly speaking "employment" refers to the utilization of manpower or labor as compared to the use of mechanical equipment. Under this definition, the dominance of LBM on project cost sharing determines the employment-intensity (degree of employment) of the project. It is therefore important to strike an appropriate balance between labor utilization and equipment use to provide quality construction and maintenance of infrastructure projects to justify an "income/ job-generation" objective; otherwise the purpose will just be another exercise in social alleviation or politics.

3.4.3 Equipment-Based Method (EBM) of Construction:

For most of the Philippines' eleven major islands, construction equipment is readily available. However, this condition is wanting in remote areas and island provinces. At present, when the construction industry is experiencing a glut and inactivity, many equipment are laying idle prompting equipment lessors to lease or rent-out their equipment at relatively cheaper prices.

The basis for equipment rental rates generally guided by the Association of Construction Equipment Lessors (ACEL), an association of certified heavy equipment and construction machines lessors for the building and construction industry. Contractors doing works for the DPWH may hire or lease idle construction equipment from Department under certain conditions and depending on availability. A DPWH Equipment Holding and Average Equipment Cost Regional Summary is attached as an Exhibit.

3.4.3.1 Standard Specifications for Highways and Public Works Construction

The technical guidelines governing the Standard Specifications for Highways and Public Works Construction for regular infrastructure projects undertaken by the Philippine Government, particularly at the Department of Public Works and Highways is contained in the DPWH Standard Specification. This document provides detailed information necessary for the proper construction of roads and bridges, ports and harbors, flood control, drainage and shore protection works, buildings and water supply.

Under the Standard Specifications for highways, bridges and airports contained in Volume II, the following items of work, processes, facilities and materials are provided and describe:

Part A provides for the facilities for the Engineer which includes the field offices and laboratories, service vehicles, staff support, equipment, instrumentation, information and access to records, among others

Part B provides for general requirements of the contractors such as offices, shops, stores, and workmen's accommodation; medical room and first aid facilities.

Part C refers to pay-items under Earthwork, including Clearing and Grubbing; Removal of Structures and Obstructions; Excavation; Structure Excavation; Embankment; Sub-grade Preparation; Compaction Equipment and Control Strips; Overhaul.

Part D refers to pay-items under Sub-base and Base Course, including; Aggregate Sub-base Course; Aggregate Base Course; Crushed Aggregate Base Course; Lime Stabilized Road Mix Base Course; Portland Cement Stabilized; Road Mix Base Course; Asphalt Stabilized Road Mix Base Course; Portland Cement Treated; Plant Mix Base Course; Aggregate Stockfile.

Part E refers to pay-items under Surface Courses, including Aggregate Surface Course; Bituminous Prime Coat; Bituminous Tack Coat; Bituminous Seal Coat; Bituminous Surface Treatment; Bituminous Penetration Macadam Pavement; Bituminous Road Mix Surface Course; Bituminous Plant Mix, Surface Course (General); Bituminous Plant Mix, Surface Course (Cold-Laid); Bituminous Plant Mix (Stockpile Maintenance Mixture); Bituminous Concrete Surface (Hot-Laid); Portland Cement Concrete Pavement.

Part F refers to pay-items under Bridge Construction, including Piling; Railing; Timber Structure; Metal Structure; Reinforcing Steel; Structural Concrete; Pre-stressed Concrete Structure; Concrete Structures; Steel Bridges; Welded Structural Steel; Treated and Untreated Timber; Paint.

Part G refers to pay-items under Drainage and Slope Protection Structures, including Pipe Culverts and Storm Drains; Under-drains; Manholes, Inlets and Catch Basins; Cleaning and Reconditioning; Existing Drainage Structures; Rip-rap and Grouted Rip-rap; Stone Masonry; Hand-Laid Rock Embankment; Sheet Piles; Concrete Slope Protection; Gabions.

Part H refers to pay-items under Miscellaneous Structures, including Curb and /or Gutter; Monuments, Markers and Guide Posts; Guard-rails; Fencing; Road Sign; Pavement Markings; Reflective Pavement Studs; Topsoil; Sprigging; Sodding; Tree Planting.

Part I refers to pay-items under Materials Details including Hydraulic Cement; Construction Lime (Hydrated); Bituminous Materials; Aggregates; Masonry Units; Joint Materials; Concrete, Clay, Plastic and Fiber Pipe; Metal Pipe; Concrete Curing Materials and Admixtures; Paints; Reinforcing Steel and Wire Rope; Fence and Guardrail; Structural Metal; Treated and Untreated Timber; Water

All above items consists of the following standard presentation/ provisions:

Description of work;
General and specific requirements;
Process requirement;
Method of Measurement;
Basis of Payment.

3.4.4 Labor-based Method (LBM) of Construction:

It has been reported that most of the projects which utilized LBM were not intended to sustain the practice of the methodology. For example, after Mt. Pinatubo erupted in July 1991, LBM was applied in the calamity-stricken areas in Central Luzon in order to alleviate the economic condition of victims who were rendered homeless and unemployed by the disaster. These provided a challenge to the LBESM pilot projects that were tested under abnormal conditions.

In the DILG Upland Access Project (UAP), LBM was appropriate for the specific situation. Due to its special location and the culture of the community, the project was of short duration and limited in scope. Also the project was donor dependent and lack sustainability on a massive scale. The interest of concerned parties diminished when funding became a problem.

3.4.5 Labor-Based/ Equipment-Supported Method (LBESM) of Construction:

In the Philippine, the context of LBESM of constructing infrastructure is defined by DPWH in the "Primer on LBESM" based on Executive Order No. 336 dated 13 September 1988. It describes LBESM as a procedure on the use of labor and hand tools, rather than the used of equipment in construction or maintenance activities resulting in project completion within the specified time, cost and quality standards.

The ILO has use the term "Labor-Based" to describe a technology in which labor, supported by light equipment, is used as a cost-effective method of providing or maintaining infrastructure projects to a specified standard. It is also said that under the Philippine context, LBESM is the specific description of this ILO definition on labor-based method. ILO also uses the term "labor-intensive" to describe strategies, programs, projects, activities, and assets that will promote directly or indirectly, short term or long term employment generation at the highest possible lever compared to other more equipment-intensive alternatives. Further, ILO has defined "Equipment-Based" as the opposite of LB in that most of the work is done by labor-replacing equipment, supported by small labor force.

Much have been said about Labor-Based Method (LBM) and Labor-Intensive Work (LIW) and several definitions have been offered. However, the fact is that LBM and LIW are not synonymous. While LBM is a technique, a procedure, an approach or a "means to and end"; LIW is an activity, a condition, a circumstance. To determine the intensity of the use of labor resource in an activity vis-à-vis the use of equipment, a unit of measurement must be introduced to measure the share of each resource in the overall accomplishment (see Section 2.2).

To the above ILO definition or description, I would like to offer a supplementary definition:- that "LBESM is a construction technique where the use of manual labor using hand-tools is the dominant resource in the implementation of works vis-à-vis the use of mechanical equipment operated by skilled labor".

3.4.5.1 Benefits from Using LBESM:

It is claimed that LBESM policy has generated several gains for both the national and local government. Among them are the 1) creation of employment for the less fortunate members of society; 2) additional income for under-employed workers, 3) savings in foreign exchange due to less utilization of imported equipment, 4) induces local enterprises due to increased buying capacity of local project workers, among others. It can also be added that due to increase income, the poorer sector may be able to support their children's for higher education. And technology-wise, it will provide for training of local residents on LBESM of construction and maintenance making them self–reliant in maintaining their roads and other infrastructure and providing skilled labor in future projects.

Generally, for slow-speed and low-traffic barangay and municipal roads, the adoption of LBESM is more economical. The method can also substitute for regular construction projects located in areas where heavy equipment is not available or during equipment breakdown and fuel shortage. It can also be economically employed in projects where the site is not accessible to heavy equipment as in upland areas and remote islands.

In a recent study conducted by the Development Academy of the Philippines (DAP) the category of workers who were employed on LBESM construction projects came from unemployed and underemployed members from the following trades: farm workers, construction laborers, irrigation tenders, lumberjacks, basket weavers, pasturing, shepherds, shop welders, concrete masons, carpenters, furniture makers, casual government employee, tailors, jeepney and bus drivers. The work activities that they were employed under includes; excavation for road and structure; hauling of materials; cleaning and scrubbing; installation of culverts; quarrying of stones; rip-rapping; spreading and watering of base coarse; compaction of sub-base and base coarse; spreading of asphalt.

Based on the scope of work for LBESM road construction projects prepared by the Central Labor-Based Advisory and Training Team (CLATT), the construction activities where LBESM of construction could be practically applied are the following; Bush clearing, tree and stump removal, grubbing, top soil removal, manual excavation, hauling by wheel borrow, unloading, spreading, shaping, compaction by hand rammer, compaction by manually-pulled roller; watering; planting grass (sodding); collection, loading and unloading of stones; rip-raping, grouting; culvert cleaning, installation of reinforce concrete pipe culverts, collaring of pipes, back-filling, hand mixing of concrete or one–bagger mixer operation; cutting, bending and installation of reinforcing bars, fabrication and installation of form-works, scaffoldings, concrete pouring and curing of concrete.

2.4.5.2 Scope of LBESM Application in Government Projects:

The nationwide promotion of the LB/ESM was made official in 1988 through Executive Order (EO) 336 in consonance with the Community Employment and Development Program (CEDP). Subsequent nationwide efforts for its use was directed by Memorandum Order (MO) No. 181 in 1993 by the Office of the President (OP). This created employment generation through the Countryside Development. Program (CDP) more popularly known as “Kabuhayan 2000” Program. Both documents set the organizational structure to follow and the functions of each position.

In the meantime, the incumbent Administration is in the process of formulating its own employment generation program. EO 336 of 1988 directed the DPWH, DILG, DOTC and the NIA to establish a Labor-based unit in their organization. NEDA was directed to coordinate the effort, the DBM was required to facilitate the release of the necessary funds, and the DOLE was tasked to recruit and train workers for the purpose. Together, these agencies were mandated to encourage the private sector to get involve by seeing to it that appropriate government-contractor relationship and processes become conducive for the program’s success.

The DILG and the DPWH were tasked to coordinate the implementation of the LIDP. They were to provide institution-building initiatives, including training and technical assistance, to local government units in the planning and implementation of local infrastructure projects using LB/ESM as part of the overall capability enhancement program of the government. Additionally, DILG was task to negotiate and secure funding from institutions for the construction of 1,300 km of local roads and 113 public market. The DPWH was tasked to commit 14% of its projects to said program.

2.4.5.3 Problems Encountered in the Implementation of LBESM Infrastructure Projects

At the DPWH, the problems encountered in the implementation of CARP projects using LBESM are mostly financial in nature. These included among others, the reversion of un-obligated funds to the Bureau of Treasury; project realignment; project termination; fund transfer; late payment of previous year's obligations and non-release of funds. More specifically, the DPWH CLB-CARP Program Office reported the following specific problems encountered in project implementation:

i) Delayed Project Identification/ Validation: The CARP CY 1988-89 program was substantially delayed when the Department of Agrarian Reform (DAR) only validated and confirmed the project during the second and third quarter of CY 1990. Needless to say, this affected the preparation of technical surveys and program of work (POW), the review of cost estimates, and the bidding process and award of contracts for labor, materials and hand-tools. At the initial stage, previously DAR-approved projects have to be re-evaluated due to conflicts or changes in locations. Estimates for works involving civil and bridge construction have to be re-estimated since not a few were considered to be unrealistic.

In some cases, it was more economical to construct new facilities than to rehabilitate them. Apparently, this delayed further the implementation of projects because of the necessary adjustments and re-programming. There were also instances when local government officials requested for re-alignment and re-programming of DAR-validated projects; this suspended the implementation of CARP projects until the revised program would have been approved.

ii) Delayed Release of Working Fund: Despite the issuance of the required Sub-Allotment Advises (SAA) and Special Allotment Release Orders (SARO) to the CARP field offices by the DBM, bulk of the checks were released only during the second quarter of the program year thus delaying the early start of construction. Majority of the projects implemented under CARP were done by "Administration" (force account). This required sufficient cash to support the procurement of hand tools and materials, and provide payment for mobilization and "pakyaw" contractors. For instance in 1990, the checks for said program year were issued only in September at the height of the rainy season. The funds for the 1990 Program were released towards the end of the second quarter of the following year when the rainy season is about to start. Project funds and cash were reportedly either unavailable or short during the first quarters of 1992, 1993,1994,1995,1996,1997 and 1998.

iii) Program Redirection: The specific allocation for DPWH-CARP projects were greatly affected when the Government redirected its program thrust. Affected was the CARP-supported communal water supply, inland ports and small water impounding management (SWIM) dams undertaken by the DPWH. Due to inflation, price escalation and wage-hikes, DPWH was forced to transfer CARP staff to regular operations at the various district offices. Those who could not be accommodated were laid-off. To support its operation, several DPWH-CARP units relied on subsidies.

iv) Weather Conditions and Natural Calamities: The devastating earthquake of July 1990 slowed the implementation of CARP projects in affected regions. The eruption of Mt. Pinatubo in July 1991 in halted several LBESM projects in Region III that were spared by the big earthquake the previous year. The devastation brought about by the ash deposits immobilized most on-going CARP projects in Pampanga, Zambales and Tarlac. The subsequent lahar flows triggered by perennial monsoon rains and typhoons around the Mt. Pinatubo area aggravated the already depressed situation thus considerably delaying the implementation of CARP projects. Some projects on the planning stage were abandoned. The El Nino and La Nina weather phenomena slowed down the implementation of LBESM.

v) Resistance to Change and Adjustment Problems: The adoption of LBESM to infrastructure projects in place of the traditional EB method of implementation is not an easy task to propagate. Not all of the program recipient DPWH district offices were supportive of the program. It took some time for field offices to

adjust to the perceived "backward technology" of LBESM. The proponents needed a lot of patience to convince implementing offices of the method's applicability and advantages. Only when apprehensions are removed and the Program's noble social objectives are accepted that training becomes possible.

vi) Availability of Equipment Support: As required by the combination technology, LBESM to be cost-effective and efficient is supposed to be implemented using appropriate equipment. However, especially in remote and upland areas, the availability of these machines is wanting. Many of these equipment were only available during the initial stage of construction. Maintaining their usability throughout the construction stage is a tough job. Mechanized equipment are needed for dense clearing and grubbing activities and compaction works where manual labor would produce sub-standard results and therefore expensive in the long haul. In many island provinces, such equipment are not available either from DPWH, NIA or the local government units.

vii) Peace and Order Situation: The absence of social peace and the deterioration law and order in isolated islands and some remote areas have affected substantially the progress CARP projects, resulting in the slowing down, suspension or outright abandonment of construction activities. In some instances, the assistance of the military engineering brigades were solicited for effectively implementation.

viii) Right-of-Way Problems: Right-of-Way (ROW) problem is not the monopoly of urban infrastructure projects. CARP projects were not exempted from this problem. Many landowners refused entry into their properties. Even squatters refuse to vacate their abode until they are relocated comfortably and provided transfer funds. Under this situation, no physical survey, layout of line and grade and construction activities can proceed efficiently.

ix) Creation of ARMM: The creation of the Autonomous Region for Muslim Mindanao (ARMM), transferred the management and supervision of infrastructure projects from the DPWH to ARMM jurisdiction. Consequently, the resulting reorganization has created confusion regarding policies and operating procedures, thus resulting in delayed program implementation.

4. Systems of Construction Contract Administration

4.1 Construction Technology and Implementation of Infrastructure Projects

The implementation of government construction projects in the Philippines is basically done through a rigorous process of pre-qualification, bidding and award of contracts. Presidential Decree (PD) 1594 outlines the activities involve in Contract Administration as shown below:

Activities Involved in Contract Administration:

I. Detailed Engineering Activities:
   1. Conduct survey
   2. Site investigation
   3. Foundation investigation
   4. Soils and materials investigation
   5. Preparation of design
   6. Preparation of specification
   7. Preparation of quantity and cost estimate
   8. Preparation of program of work
   9. Preparation of construction and cash flow schedule
   10. Preparation on of site or right-of-way plans including schedule of acquisition

11. Preparation of utility relocation plan
12. Preparation and submission of design report
13. Preparation of environmental impact statement

II. Pre-qualification of Contractors:
1. Secretariat prepares invitation for Pre-qualification and Bidding and Letters requesting publication to 3 newspapers with general circulation;
2. PBAC Chairman approves invitation;
3. Secretariat transmits letters requesting publication/approved invitation to publication companies;
4. Secretariat issues Pre-qualification documents to interested contractors;
5. Bidders accomplishes Pre-qualification documents and submits the same to PBAC;
6. Secretariat evaluates submitted Pre-qualification documents and submits evaluation report to PBAC;
7. PBAC deliberates and prepares resolution for pre-qualification/ pre-disqualification;
8. PBAC members sign resolution;
9. PBAC Chairman approves resolution;
10. Secretariat serves Notice of Pre qualification/ pre disqualification to bidders/ implementing office.

III. Bid Preparation and Bidding:
1. Secretariat issues bid/tender documents to pre-qualified bidders;
2. Bidder prepares bid proposal and submits the same with all the requirements to PBAC at 10:00 AM of bidding day;
3. PBAC receives sealed bids;
4. PBAC deposits submitted bids in safe;
5. PBAC advises Estimating Committee to prepare of Agency Estimate (AE);
6. Department Head approves Agency Estimate;
7. Department Head submits Approved Agency Estimate (AAE) to PBAC;
8. Opens and examine the submitted requirements of each bid, accomplishes checklist and determines whether there are at least two participating bidders;
9. PBAC Chair opens AAE and read it publicly;
10. PBAC reads bid proposals and records the same in the Abstract of Bids;
11. PBAC members sign the Abstract of Bids, the bid bond, and the amount of bid;
12. PBAC turns-over the bid documents to the Implementing Office (IO) for evaluation.

IV. Evaluation of Bids and Award of Contract:
1. IO receives all bid documents;
2. IO conducts preliminary evaluation of all bids, makes comments and recommendations;
3. IO prepares and submits evaluation report;
4. PBAC Secretariat reviews bidding documents and evaluation report;
5. PBAC Secretariat schedules regular meeting for final resolution of award;
6. PBAC drafts Resolution of Award;
7. PBAC en-banc reviews/ signs Resolution of Award;
8. PBAC Chairman approves Resolution of Award;
9. Secretariat prepares/ issues “Notice of Award” to winning bidder.

V. Contract Processing, Review and Approval:
IO prepares Draft Contract;
Issues Certificate of Availability of Funds (CAF)
Contractor signs contract and submits Performance Bond and other requirements;

Verifies CAF;
Signs contract as witness;
Review technical aspects of the contract, reviews bid documents;

7. Review contract documents/ checks and verifies letters of credit and performance Bond;
8. Initials contract;
9. Approves contract.

VI. Issuance of "Notice To Proceed" (NTP):

1. Receives approved contract;
2. Prepares notice to proceed and issues to contractor;
3. Receives notice to proceed.

4.2 Licensing and Accreditation of Construction Contractors

The accreditation, licensing and registration of construction contractors in the Philippines is being undertaken by the Philippine Contractors Accreditation Board (PCAB), a government agency under the Construction Industry Authority of the Philippines (CIAP). PCAB is mandated by law to issue, suspend and revoke licenses of contractors. On the other hand, the CIAP in coordination with other government infrastructure agencies is mandated to formulate uniform guidelines, criteria and procedures for the classification of contractors for use by all government offices and agencies, including government-owned corporations. This classification procedure replaced the former Pre-C1 (pre-qualification of contractors, stage 1) where each agency separately undertakes their own pre-qualification for bid-out projects. This procedure is now centralized under CIAP through the PCAB thus eliminating the bureaucratic and most of the time tedious process of pre-qualification for government construction contracts.

The Inter-Agency Committee (IAC) for registration and classification of contractors for government infrastructure projects categorizes contractors as Small A, Small B, Medium A, medium B, Large A and Large B. While it classifies them under General Engineering (GE), General Building (GB) and Specialty S).

Under GE, the classification is further sub-classifies based on the type of works as follows: GE-1: road, highway pavement, railway, airport, horizontal structure and bridge; GE-2: irrigation and flood control; GE-3: dam, reservoir , tunnel; GE-4: water supply; GE-5port, harbor, and offshore engineering.

Under GB, the following sub-classifications apply: GB-1: building and industrial plant; GB-2: sewerage, sewage treatment and disposal plant; GB-3: water treatment plant and system; GB-4: park, playground and recreational facilities.

The following are the various sub-classifications under specialty: SP-1; foundation work, structural steel work, concrete pre-casting and pre-stressing, plumbing and sanitary work, electrical work, mechanical work, air conditioning and refrigeration work, elevator and escalator work, fire protection work, waterproofing work, painting work, well drilling work, navigation equipment and instrument installation, communication equipment and instrument installation.

4.3 Pre-qualification, Bidding and Awards of Infrastructure Construction Project

The guidelines, rules and regulations for government infrastructure contracts is prescribe under Presidential Decree 1594 way back June 1978. Prior to its enactment the policies, rules and regulations covering government contracts for infrastructure and other construction projects were generally fragmented and

have been found to be adequate to cope with the intricate and complex process. The guidelines under PD 1594 relates to the following: detailed engineering, pre-qualification of prospective contractors, bidding, award and contract, assignment and subcontract, responsibility of the contractor, adjustment of contract price, change order and extra work order, inspection and construction contract work, government 's right to take over contract work, implementing rules and regulations. The then Minister of Public Works transportation and Communications, the Minister of Public Works and Highways, the Minister of Energy and the NEDA Director General to promulgate the rules and regulations to implement the provisions of the Decree. The first set of rules and regulations was issued in 199?, revise in 1992 and the last revision was made in 1995.

The latest issue of the rules and regulations governing PD 1594 includes the following subject matters:

I. Detailed Engineering

II. Instruction to Bidders:

Who May Be Allowed to Bid, Organization of the PBAC, Invitation to Pre-qualify and to Bid, Issuance of Qualification Statements/Forms, Classification and Registration of Contracts, Pre-qualification of Contractors for Specific Contracts, Issuance of Plans, Specifications, Proposal Book, Forms(s) and Draft Contract, Interpretation of Bid/Tender Documents and, Other Supplemental Notices, Prospective Bidder's Responsibility, Bid/Tender and Award, Preparation of Bids, Bid Bonds and Pre-qualification Statement, Submission, Opening and Abstracting of Bids/Tenders, Evaluation of Bids, , Awarding of Contract, By Bid Contract, By Negotiated Contract or Simplified Public Bidding, Disclaimer, Administrative Sanctions, Approval of Awards and Contracts, Documents Comprising the Contract, Supporting Documents, Approval of Contract, Issuance of Notice to Proceed, Monitoring of Contract Awards Process

III. Contract Implementation:

Variation Orders-Change Order/Extra Work, Order/ Supplemental Agreement, Extra Work Costing, Condition Under Which Contractor is to Start Work, Under variation Orders and Receive Payments, Advance Payment, Progress Payment, Retention Money, Contract Completion, Liquidated Damages, Incentive Bonus, Suspension of Work, Extension of Contract Time, Contract Price Escalation, Guides on Contract Price Escalation, Fluctuation Factor, Accreditation of Testing Laboratories.

IV. Evaluation of Contractors Performance:

Subject and Scope, Evaluation Guidelines, Submission of Evaluation Result, Utilization of Evaluation Results

4.4 Preparation of Agency Estimates

At the Department of Public Works and Highways (DPWH), the preparation of Agency Estimates (AE), Pre-qualification of Contractors, Evaluation of Bids and Submission of Contracts is governed by Department Order No. 24, Series of 1989. The rationale offered by DO 24-1989 is to ensure expeditious delivery of DPWH frontline services, improve the managerial capabilities of its staff and pinpoint responsibilities in various decision/ action areas.

The DO directs all "Implementing Offices" (IO) and makes them responsible for preparing Agency Estimates, initial review of pre-qualification statements of contractors and submission of recommendation on the results of the pre-qualification process and the preliminary evaluation of bids submitted and submission of recommendation for an award of contract.

The DO also includes the guidelines on the limitations and composition of the AE to be prepared by the IOs. It includes the direct costs of the project, plus applicable taxes, taking into consideration the current market prices of construction materials and supplies, local and "imported" labor, rental of equipment, and the most cost-effective construction methods and procedures and right choice of equipment.

The PBAC Chairman, its regular technical member, and the IO's representative to the committee is empowered to jointly to determine the percentage mark-ups for Indirect Costs (overhead, contingencies, miscellaneous) and profit, taking into account the project location, site conditions and the market situation during the call for bids. The mark-ups is added to the estimates of Direct Costs and applicable taxes to generate the AE. The IO secures the approval of the Authority concerned for the Agency Estimate to make it official. The DO also sets the mark-ups that can be applied for overhead, contingency, miscellaneous and profit.

The DO requires the inclusion in the contract a provision for payment and the allowable percentage cost for mobilization and demobilization. This is tied-up with the mobilization payment to the degree of actual mobilization of the required minimum equipment. The IO determines each prospective bidder's technical and financial capability to prosecute the Project. Special attention is called to the verification and inspection of the contractor's appropriate equipment pool pledge to the project and its managerial and technical personnel to be assigned.

The IO also looks into the performance of all prospective bidders regarding their past and on-going projects. These include records of rescission and termination of past contracts. The results of the evaluation is taken into consideration in determining the eligibility of the contractor to participate in the bidding. Other documentary requirements such as licenses, joint-venture agreements if appropriate, shall also be checked by the IO. The PBAC concerned reviews the IO's recommendations and approves the necessary resolution indicating who among the contractors are pre-qualified and pre-disqualified and the reasons for disqualification.

The DO places the responsibility for the preliminary evaluation of bids, including the careful examination of all bidding documents on the IO. The IO checks arithmetically all bids and their compliance with bidding requirements. The bids of the three lowest bidders are evaluated in more detail by cross-comparing unit bid prices against the unit Approved Agency Estimates (AAE) rates.

Finally, after completing the evaluation and recommending an award of the project to a particular bidder adjudge to have submitted the most advantageous bid, the IO submits to the PBAC a draft resolution of award. After the award, the IO prepares the contract and submits the same to the authorities concerned.

To ensure compliance with the DO and to institutionalized the process, the Bureau of Construction and the Internal Audit Service is authorized to post-review approved contracts and to report their findings to the Department Secretary.

5. Construction Projects Undertaken by Various Government Infrastructure Agencies

According to the DAP study, the magnitude of budgetary releases for labor-intensive infrastructure projects for 1998, represents the government's commitment to the program. Based on the General Appropriations Act, it appears that most projects are being implemented by the DPWH, DOTC, DECS, NIA, and NHA using labor intensive methods. Some releases even exceeded the agencies corresponding budgets for the year, the study added. The rate of application or utilization of the Labor-intensive Method ranges from 1.10 % to145.75 % of the budgets is shown on Table 5A.

1.	Seaports and lighthouses	145.75%
2.	Airports and navigational facilities	126.59%
3.	School building	100.65%
4.	Water supply	100.00%
5.	Land transportation	85.38%
6.	Medium –rise public and private housing	75.00%
7.	Telecommunication	69.83%
8.	Irrigation	68.64%
9.	Roads and bridges	55.26%
10.	Flood control and drainage	48.77%
11.	Other infrastructure project	15.22%
12.	Resettlement	4.52%
13.	Local housing	1.10%

According to the DAP study, these levels of Labor-intensive utilization appear to suggest that the understanding of Labor-intensive Method more so of LBESM among the respondents is vague or perhaps they did not have sufficient time to discern the more appropriate data. Considering these data, the major users of the Labor-intensive method would be DPWH, NIA, DOTC, NHA and DECS, in this order. On the other hand, based on the fund releases for Labor-intensive projects, the order is as shown in Table 5B.

	PROJECT CATEGORY		FUNDS (in Million)	% WEIGHT
1.	Roads and bridges	Pesos	14,659,100,000	43.77
2.	Other infrastructure project		4,570,000,000	13.64
3.	Irrigation		3,641,400,000	10.87
4.	Flood control and drainage		2,497,600,000	7.46
5.	School building		2,341,600,000	6.99
6.	Telecommunication		1,700,500,000	5.07
7.	Airports and navigational facilities		1,352,600,000	4.04
8.	Land transportation		1,337,200,000	3.99
9.	Seaports and lighthouses		809,600,000	2.44
10.	Medium –rise public and private housing		277,500,000	0.83
11.	Resettlement		271,300,000	0.81
12.	Water supply		33,100,000	0.81
13.	Local housing		2,200,000	-
			---	---
		Total:	P33,485,000,000	100.00%

Comparing Table 5A & 5B it is interesting to note that project categories which got the biggest slice of the budget for Labor-intensive Project did not necessarily used Labor-based method as shown in Table 5C below.

	Uitilization rate of LB Method	% Weight of Fund for LI Proj
1. Seaports and lighthouses (PPA)	145.75%	2.44
2. Airports and navigational facilities (DOTC/DPWH)	126.59%	4.04
3. School building (DECS/DPWH)	100.65%	6.99

4. Water supply MWSS/LWUA/DILG)	100.00%	0.81
5. Land transportation, LRT, MRT (DOTC/BOT)	85.38%	3.99
6. Medium–rise public (NHA) and private housing (NHMFC)	75.00%	0.83
7. Telecommunication (DOTC)	69.83%	5.07
8. Irrigation (NIA)	68.64%	10.87
9. Roads and bridges (DPWH)	55.26%	43.77
10. Flood control and drainage (DPWH)	48.77%	7.46
11. Other infrastructure project (DILG)	15.22%	13.64
12. Resettlement (NHA/DILG)	4.52%	0.81
13. Local housing (NHA/ Government Corp.)	1.10%	none

5.1 Infrastructure Projects Implemented by the DPWH under the CARP

Basic infrastructure projects which the Department of Public Works and Highways (DPWH) implemented under the CARP from 1988 to 1999 (10-year program) included the following:

Construction of new roads	3,000 km
Construction of barangay roads	470 km
Construction of indigenous roads	2,600km
Rehabilitation/ improvement of existing roads	4,400 km
Construction of multi-purpose pavement	800km
Improvement/ rehabilitation of ports	150km
Construction of small water impounding management projects	330 units
Construction of. Water supply facilities (level I)	27,690 units
Construction of shallow well	10,552
Spring development projects	2,200 units

5.2 Infrastructure Projects under the Local Government Units (LGU)

The basic infrastructure facilities/ projects which Local Government Units (LGU) are responsible for constructing under the new Local Government Code include the following:

For a Barangay: Farm produce collection and buying stations; health and day-care center; maintenance of barangay roads and bridges and water supply system; multi-purpose hall, multi-purpose pavement, plaza, sports center, public market.

For a Municipality: Inter-barangay irrigation systems, water and soil resource utilization and conservation projects, communal forest, tree parks, greenbelts, public library, municipal building, cultural center, public parks, playground, sports facilities, infra facilities intended primarily to service the needs of the residents of the municipality. municipal roads, and bridges, school buildings, clinics, health centers, communal irrigation, small water impounding projects, fishing ports, artesian wells, spring development, rainwater collectors and water supply systems, seawalls, dikes, drainage and sewerage systems, flood control structures, traffic signals, and road signs, public markets, slaughter houses, public cemetery, tourism facilities, police and fire stations, municipal jail.

For a Province: Dairy farms, livestock markets, animal breeding stations, artificial insemination centers, hospitals and tertiary health centers, provincial buildings, provincial jails, freedom parks, public assembly areas, provincial roads and bridges, inter-municipal water works, drainage and sewerage systems, flood control, irrigation systems, reclamation projects, inter-municipal telecommunication facilities, tourism development facilities.

For a City: All the facilities of the municipality and province and in addition thereto, the following: communication and transportation facilities, education, police and fire facilities, public works and infrastructure projects and other facilities, funded by the national government under the annual general appropriations act (GAA), other special laws, pertinent executive orders, and those wholly or partially funded from foreign sources in cases where the LGU concerned is duly designated as the implementing agency for such projects.

5.3 Infrastructure Projects under the National Irrigation Administration (NIA)

Infrastructure Projects undertaken by the NIA includes, irrigation canals, small impounding dams, weirs, irrigation-related access roads, communal irrigation systems, and other related structures.

5.4 Infrastructure Projects under the Department of Education Culture & Sports (DECS)

The school building project of the DECS is being implemented by the DPWH district and regional offices concerned.

5.5 Infrastructure Projects under the National Housing Authority (NHA)

Infrastructure Projects undertaken by the NHA includes, row houses, single detached and duplex bungalows for mass housing and high-rise tenement buildings including site development, power supply and water and sewerage system and other support facilities.

6. Experiences of various Government Agencies in the Implementation of EBM. LBM and LBESM of Construction and Maintenance on Labor and Equipment Cost Share:

6.1 Labor and Equipment Cost Share in DPWH Projects Using LBESM

6.1.1 LBESM Barangay Road Construction by “Administration”:

The Construction of the Tumbaga I Barangay Access Road I located in Sariaya, Quezon Province was implemented by “Administration” using LBESM with 40unskilled and 10 skilled worker under four “pakyaw” groups. Based on the Detailed Breakdown of Project Account submitted by the DPWH Implementing District Office of the Lucena Sub-district based in Quezon , the Actual Total Project Cost amounted to P3,094,290.00 against the Program of Work (POW) Estimate of P 3,430,000.00 or a difference of P 335,710.00. and the resulting cost per LM of the gravel road is P4,125.72 and P4,573.33 respectively.

The Scope of Work included the construction of a 4.00-meter wide gravel carriage way with 1.00 meter shoulders; back-filling and rip-raping of both slopes; construction of a single-barrel reinforced concrete box culvert (RCBC); installation of reinforced concrete culvert pipes (RCCP) at intermediate sections and construction of masonry retaining walls for RCBC approaches.

The Items of Work consisted of the following activities: removal of trees, excavation of unsuitable materials, structure excavation, embankment, aggregate sub-base coarse, aggregate base-coarse, reinforcing steel bar, structural concrete; laying of 900-mm and 300mm pipe culverts; stone masonry and bunkhouse.

In this LBESM construction project, based on the total Material+ Equipment+ (Labor+ tools) MEL Cost, the Labor Component consisting of skilled and unskilled workers plus tools has a labor employment intensity of 18.93 %; an equipment utilization intensity of 5.34 %; and materials % weight of 75.73 %.

II. LBESM Barangay Road Construction by "Administration":

In the construction of the Bado-Dangwa barangay road project which was implemented by "administration" also using LBESM, the use of 40 unskilled and 10 skilled workers resulted in the following cost sharing of the Project's major components:

Labor (skilled and unskilled)	24.31 %
Materials	38.20 %
Equipment (POL)	21.86 %
Tools	4.30 %

The work consisted of site clearing, bulk earthwork, ditching and sloping, slotting, mitre drains, gravelling, concrete carriage-way, erosion protection, pipe culverts, spillways, and rip-rap. The Project traversed several rice paddies and runs parallel to the existing National Irrigation Administration (NIA) irrigation ditch and concrete lining was needed on the 100-meter approach to prevent erosion. The Project was funded under the ARISP and undertaken by the Kalinga-Apayao Engineering District of the Cordillera Autonomous Region (CAR) based in Tabuk.

III. LBESM Barangay Road Construction by :"Administration":

Another project implemented using LBESM by "Administration" is the construction of the farm to market road in Region IX under the 3rd Engineering District located in Dapitan City in Zamboanga del Norte. The Project utilized 11 unskilled and 13 skilled workers. The scope of work consisted of 180 linear meter x 4.00 meter wide gravel road, a 10 linear meter x 4.00 meter wide concrete pavement with 1.00 meter wide shoulders on both sides and grouted rip-rap lined ditch. The labor component was 16.37 %; for materials-53.26 %, while equipment including cost of petrol, oil and lubricants was 11.56 %.

IV. LBESM Barangay Road Construction by "Pakyaw" Contract:

In the rehabilitation of the Biangan-Talus Road Section located in Malungon, Sarangani Province in Region XI, the Sarangani Engineering District used LBESM and implemented the work by "pakyaw" contract. This required the employment of 30 unskilled and 7 skilled workers under three "pakyaw" leaders. The resulting percentage weight for Labor (skilled and unskilled) was 16.28 %; 5.30 % for Equipment, including provisions for petroleum, oil and lubricants(POL); 58.53 % for Materials and 5.00 % for Hand-tools.

The scope of work consisted of excavation, clearing, gravelling of 6.00-meter wide roadway, ditching and sloping of both sides of the road, installation of 42" reinforced concrete pipes, construction of double-barrel box culvert, slope protection (grouted rip-rap), embankment, and construction of a multi-purpose pavement.

6.2 Labor and Equipment Cost Share in DPWH Projects Using EBM

V. EBM Bridge and Approaches Construction by Contract:

Under the DPWH regular infrastructure project, the construction of the Poblacion Bridge and Approaches, located in Maramag, Bukidnon was awarded by contract. The project involved the construction of 21.00-linear meter reinforced concrete deck girder (RCDG) bridge, including approaches and slope protection. The Items of Work consisted of the following: Structure excavation, embankment, common borrow, aggregate sub-base coarse, aggregate base coarse, pre-cast concrete piles (PCCP), reinforced concrete (RC) test pile (furnished), RC test pile (driven), RC regular pile (driven), RC regular pile (furnished), neoprene pad, metal structure, reinforcing steel, structural concrete and grouted rip-rap.

The minimum equipment requirement of the project included, 1-bulldozer, 1-road grader, 2-concrete mixer, 2-concrete vibrator, 1-bar bender, 1-bar cutter, 1-crane, 1-diesel hammer, and 1-drop hammer. The project also required the employment of the following technical personnel: 1-engineer I, 1-foreman, 20-laborer, 2-mason, 6-carpenters, 6-steelman, 2-rigger.

The Estimated Project Cost amounted to P 5,302,202.39 which consisted of 0.82 % labor component; 10.78 % for equipment rental and fuel and 62.82 % for the supply, delivery and testing of materials.

VI. EBM Secondary Road Construction by Contract:

In the construction of a 3,710-meters x 10-meters National Secondary Road in Libuan, Parang, Maguindanao which was implemented by "Contract" using Equipment-Based Method, the respective percentage weights resulting based on the Total Project Cost were;

Labor (including fringe benefits)	8.24 %
Materials	34.65 %:
Equipment	34.03 %
Fuel & Oil of Equipment	9.57 %

The Items of Work consisted of common excavation, embankment, aggregate sub-base coarse, excavation for pipe culvert, foundation fill, pipe culvert and stone masonry headwall.

The minimum equipment requirement were: 1-bulldozer, 1-road grader,1-payloader, 2-dump-truck, 1-road roller, 1-water-truck, 1-backhoe, 1-water-truck & 1-chain-block. The technical Personnel requirement included 1-engineer I, 1-foreman, 17-laborer, 2-mason and 3-carpenters.

VII. EBM Barangay Road Construction by Contract:

When the DPWH Regional Office, based in Baguio city undertook the Improvement of the Taloy Norte ARC Barangay Road Component located in Tuba, Benguet, the Equipment-Based Method of construction was adopted and contracted-out the work. The Project was 4,607.6-meters long with pavement width of 10.0-meters. The contract duration was 120 calendar days.

The scope of work included the removal of slides, structural excavation on solid rock, structural excavation on common soil, embankment, sub-grade preparation, gravel blanketing, PCCP, RSB, structural concrete, catch basin, grouted rip-rap, and curb & gutter.

The minimum equipment requirement for the contractor included 3-payloaders, 10-dump trucks, 1-road-roller, 1-water truck, 3-transit mixers, 1-concrete cutter, 3-one-bagger concrete mixers, 4-concrete vibrators & 3-plate compactors. The technical personnel required for assignment to the Project were1-civil engineer I, 1-construction foreman, 1-materials engineers, 2-masons, 2-carpenters, 2 steel-men, 24-laborers.

The Total Project Cost amounting to P14,395,203.00 generated a Labor (including fringe benefits) share of 4.67 %; a materials share of 48.22 %; and an Equipment share of 17.98 %.

6.3 Labor and Equipment Cost Share in NHA Projects Using LBM

I. LBM House Construction by "Contract":

The Construction of the NHA single-detached houses (SD-48) at the Nesoricom Village in Magdaup, Ipil, Zamboanga del Sur was implemented by contract using LBM. The Items of Work included the concrete masonry works, carpentry works, tinsmithry and hardware, doors and windows, plumbing works, electrical works and painting works. Below is the estimate for the project.

Total Direct Cost =	P 181,968.40
Total Material Cost =	P 145,574.72
Total Labor Cost =	P 36,393.68
Material Cost Share =	80.00%
Labor Cost Share =	20.00%

In this LBM construction project only hand tools were used and no equipment. Based on the total project cost of P181,968.40, Total Material Cost of P 145,574.72 and Total Labor Cost of P 36,393.68 the labor component which consisted of skilled and unskilled workers has a labor employment intensity of 20.00 % vis-à-vis material share of 80.00 %.

II. LBM Land Development by "Contract":

In the land development of the Nesoricom Village located in Magdaup, Ipil, Zamboanga del Sur the various construction activities were also implemented using LBM and contracted out to a local contractor. The Scope of Work included survey-works, earth-works, road-works, drainage-works, water-works, power supply system and off-site development

While the Items of Work consisted of Roadway excavation, Sub-grade preparation, Aggregate Base coarse, Concrete pavement, Trench excavation, Covered canal, Open canal, RCP (600mm), RCP (900mm), Headwall, Water distribution system, Single water service connection, Duplex water service connection, Elevated concrete water tank, Spoon drain, Trapezoidal canal, Catch basin, RC Pipe (1,200mm), Wing-wall, out-fall structures

ESTIMATED PROJECT COST:

Item:	Description	Material Cost	Labor Cost	Equipment Cost	Item Cost
1.	Survey-Works	319,177	189,600	108,000	616,777
2.	Earth-Works	7,000,720	55,800	6,019,200	13,075,720
3.	Road-Works:	9,725,261	831,180	1,039,580	11,596,021
4.	Drainage-Works:	4,759,500	1,693,510	none	6,453,010
5.	Water-Works:	1,885,403	384,517	36,000	2,305,920
6.	Power Dist. System	1,372,372	247,026	none	1,619,398
7.	Off-site Development:	1,296,424	272,800	34,560	1,603,784

1.	Survey-Works	Material Cost Share =	51.75%
		Labor Cost Share =	30.74%
		Equipment Cost Share =	17.51%
2.	Earth-Works	Material Cost Share =	53.54% (imported fill)
		Labor Cost Share =	0.43%
		Equipment Cost Share =	46.03%
3.	Road-Works	Material Cost Share =	83.86%
		Labor Cost Share =	7.17%
		Equipment Cost Share =	8.97%
4.	Drainage-Works	Material Cost Share =	73.75 %
		Labor Cost Share =	26.25 %
		Equipment Cost Share =	00.00 %
5.	Water-Works	Material Cost Share =	81.76 %
		Labor Cost Share =	16.68 %
		Equipment Cost Share =	1.56 %
Power Distribution System		Material Cost Share =	84.75 %
		Labor Cost Share =	15.25 %
		Equipment Cost Share =	00.00 %
Off-site Development		Material Cost Share =	80.83 %
		Labor Cost Share =	17.01 %
		Equipment Cost Share =	2.16 %

The labor share varies from one items of work to another, but the average labor share (excluding survey-work) was 13.80 %, while the equipment share was 9.79 %.

6.4 Labor and Equipment Cost Share in NIA Projects Using LBESM

I. LBESM Canal Irrigation Works Construction by “Administration”:

Under the NIA communal irrigation projects program, the construction of the San Agustin-Del Rosario Canal Irrigation Structures, located in Libon, Pulangui, Albay was implemented using LBESM by "Administration". The project was completed in 120 calendar days and the scope of work consisted of diversion works, canal structures, canalization, terminal facilities. While the Items of Work included the following; Grouted rip-rap, Boulder Rip-rap, Common excavation, Borrow & Haul + Compaction, Common borrow, Rubble Masonry, Cofferdam & De-watering, Main Turn-Out, Main Farm Ditch, 460 mm RC Pipes. The minimum required equipment were 1-Stake Truck, 1-Backhoe Loader, 1-Dozer, 2-Dump trucks, 1-Concrete Mixer & 2-Water Pumps. The Total Project Cost (TPC) was P 1,999,989.70

Cost Shares of Labor and Equipment:	Cost	% Weight
Labor (including fringe benefits)	1,209,451.80	60.48 %
Materials	347,332.25	17.36 %:
Equipment Rental	79,396.79	3.97 %
Petrol, Oil &Lubricants	31,455.50	1.57 %

The Total Project Cost amounted to P 1,999,989.70. This consisted of 60.48 % labor component; 3.97 equipment rental and 1.57 % for petrol, oil and lubricants. Equipment was provided by NIA

6.5 Labor and Equipment Cost Share in DECS School Building Projects Using LBM

I. LBM Multi-Purpose Building Construction by "Contract":

In the Construction of a Multi-Purpose Building located in Sara, Iloilo with a floor area of @ 40 square meters completed in 75 calendar days, the method of construction used was LBM contracted out to a local contractor.

The Items of Work consisted of column footings, wall footings, flooring, reinforced concrete columns, concrete hollow block zocalo walls, concrete hollow block wall partitions, finishing, concrete bench, doors and windows, roofing and roof framing, sidings and post. The project was supervised by one project engineer and one construction foreman.

A. Direct Cost Percentage Weights-

1. Materials (supply, delivery and material testing)	65.99 %
2. Manual Labor	18.68 %
3. Equipment	none
4. Contingency	2.54 %

B. Indirect Cost Percentage Weights-

1. Profit	8.03 %
2. Tax	4.76 %
	==========
Total Contract Percentage =	100.00 %

The Total Labor share was 18.68 % while material expenditures accounted for 65.99 %. No equipment was used in the construction.

II. LBM Renovation Works by "Contract":

In the replacement of Two (2) School Buildings at the same location in Sara, Iloilo with a floor area of 35 square meters constructed in 75 calendar days, the contract was undertaken using Labor-Based Method.

The Items of Work included the Replacement of two (2) – BLT School Buildings consisting of column footings, wall footings, beams, slabs, concrete hollow block zocalo walls, concrete hollow block wall partitions, finishing, doors and windows, roofing and roof framing. One project engineer and a construction foreman supervised the activities.

A. Direct Cost Percentage Weights-

1. Materials (supply, delivery and material testing)	67.02 %
2. Manual Labor	17.63 %
3. Equipment	none
4. Contingency	2.56 %

B. Indirect Cost Percentage Weights-

1. Profit	8.03 %
2. Tax	4.76 %
	==========
Total Contract Percentage =	100.00 %

Without using equipment, the labor cost share registered at 17.63 % and a material cost share of 67.02 % (including material testing).

It would be noticed that in school building construction, the use of construction equipment is negligible if not nil, especially in remote areas where a one-bagger concrete mixer may not even be available or the fuel to drive it may have to be source from a great distance. In most cases mixing is done by hand using hand shovels and mixing pan. The cost share of manual labor usually averages 20% of the total project cost while material cost is 65% at the average.

7. Conclusions and Recommendation

7.1 In the choice of recipient projects for LBESM, serious consideration should be given to the location, weather, terrain, management orientation, culture, and work attitude of the recipient community and the target workers. The degree of unemployment must also be defined and determined as many people who do not work does not necessarily mean that they are willing to work and in this particular case, as manual laborers.

7.2 In determining the viability of a project, priorities must be set to determine whether the purpose is to introduce appropriate technology or to alleviate poverty. A unit of measurement must be introduced to determine the labor-intensity of the work to strike a reasonable balance between labor and equipment utilization.

7.3 Where appropriate labor is abundant and equipment is hardly available, manual labor will always be a sensible choice of the contractor and project administrator. And where equipment is adequately available and cheaper to rent, EBM would be a logical approach. It is therefore recommended that the application of LBESM of constructing infrastructure projects be done on a case-to-case basis taking into serious consideration the location, terrain, weather conditions, accessibility, availability of rentable equipment and skilled and trainable workers who are willing to work, among others.

7.4 The application of LBM and LBESM in construction projects should not be hinged on the primary objective of alleviating poverty alone since this will only be a palliative solution to the problem of unemployment. It must be pursued as a long term, practical method of providing the construction industry (especially where equipment is scare or very impractical if not expensive to use) the availability of trained and skilled labor-based workers in both the government and private financed projects. It is therefore strongly recommended that continuously training of rural workers on the proper use of tools and equipment be institutionalized for a more productive, less strenuous use of specialized tools.

7.5 Coupled with the workers training, the training and development of promising “pakyaw” leaders who have the entrepreneurial spirit and progressive attitude must be undertaken on a periodic basis.

7.6 Lastly, while the implementation of the ILO proposed concept of LBESM in the construction of infrastructure projects may be successful in other countries particularly in the African Continent its total application in the Philippines needs further study and experimentation. Although the method is recognized as transferable and value-neutral, its total application may not. Labor-based method and Labor-based/equipment supported method are indigenous and culture-conditioned. It is time therefore to focus on indigenous Filipino actual needs and expectations in the application of LBM and/or LBESM in the alleviation of poverty.

7.7 Finally, it is highly recommended that a more extensive study be conducted on the actual application of the LBESM in the various agencies concerned. A project specific monitoring system to determine compliance by recipient projects must also be established

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APPENDIX A: DPWH Department Order 24, Series of 1989

APPENDIX B: Sample Advertisement for Bids

APPENDIX C: DPWH Program of Work for infrastructure Projects Undertaken Using Labor-Based/ Equipment-Supported Method by "Pakyaw" Contracts and by "Administration"

I. Labor-Based/ Equipment-Supported Method by "Administration":

TITLE OF PROJECT:	Construction of Tumbaga I Barangay Access Road I
LOCATION:	Barangay Tumbaga I, Sariaya, Quezon Province
CLASSIFICATION:	Barangay gravel road with one singlr-barrel RCBC
LENGTH:	750 linear meters
PAVEMENT WIDTH:	4.00 meters
DURATION:	86 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 50unskilled and 10 skilled workers under 4 "pakyaw" groups

SCOPE OF WORK: Construction of 4.00-meter wide gravel road carriage-way with 1.00 meter-shoulder , back-filling and rip-raping of both side slopes; construction of 3.00 meter x 3.00 meter x 7.50 meter single barrel reinforced concrete box culvert (RCBC); installation of reinforced concrete culvert pipe (RCCP) at intermediate sections; construction of masonry retaining walls for RCBC approaches.

ITEMS OF WORK:

Removal of trees	Unsuitable excavation
Structure excavation	Embankment
Aggregate. sub-base coarse	Aggregate. base coarse
Reinforcing steel	Structural concrete
1.20 m pipe culverts	0.60 m pipe culverts
0.30 m pipe culverts	Grouted rip-rap
Stone masonry	Rubble concrete
Temporary field office & bodega.	

ESTIMATED PROJECT COST:

A. Direct Cost-

Pre-Construction Engineering	40,694.91	0.75 %
Labor (skilled and unskilled)	1,026,956.90	18.93 %
Materials	3,159,325.83	58.22 %
Equipment (POL)	225,190.00	4.15 %
Tools	69,900.00	1.29 %
Project Superintendence	238,003.56	4.39 %

Total Direct Cost (TDC)	4,760,071.20	87.73 %

B. Indirect Cost-

Engineering and Administrative Overhead	162,779.64	3.00 %
Material Testing:	27,129.94	0.50 %
C. Land Acquisition + compensation for ROW	none	---
D. Contingencies (physical & economic)	476,007.12	8.77 %
Total Estimated Project Cost (TEPC)=	P 5,425,987.90	100.00 %

II. Labor-Based/ Equipment-Supported Method by "Administration":

TITLE OF PROJECT:	Construction of Bado Dangwa Road under ARISP
LOCATION:	Tabuk, Kalinga-Apayao
CLASSIFICATION:	Barangay Road
LENGTH:	800.00 linear meters
DURATION:	68 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By Administration utilizing 40- unskilled and 10 skilled workers.

ITEMS OF WORK:

Site clearing	Bulk earthwork
Ditching and sloping	Slotting
Mitre drains	Gravelling
Concrete carriage way	Erosion protection
Pipe culverts	Spillways
Rip-rap	

ESTIMATED PROJECT COST:

A. Direct Cost-

Pre-Construction Engineering	6,780.00	00.32 %
Labor (skilled and unskilled)	517,179.70	24.58 %
Materials	801,631.00	38.20 %
Equipment (POL)	459,068.35	21.86 %
Tools	90,000.00	4.30 %
Project superintendence	90,000.00	4.30 %
Total Direct Cost (TDC)	1,964,659.10	93.56 %

B. Indirect Cost-

Engineering and Administrative Overhead	63,000.00	3.0 %
Material Testing:	15,750.00	0.75 %

C. Land Acquisition + compensation for ROW	none	--------
D. Contingencies (physical & economic)	56,590.95	2.69 %
	==========	
Total Estimated Project Cost =	P 2,100,000.00	100.00 %

III. Labor-Based/ Equipment-Supported Method by Administration:

TITLE OF PROJECT:	Construction of Farm-to- Market Road
LOCATION:	Bulagok, Lap, Baja, Polanco, Zamboanga del Norte
CLASSIFICATION:	Barangay Road
LENGTH:	300.00 linear meters
PAVEMENT WIDTH:	4.00 meters
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By Administration, utilizing 11 unskilled and 13 skilled workers

SCOPE OF WORK: Construction of 180.00 linear meter x 4.00 meter wide gravel road and 120.00 linear meter x 4.00 meter wide concrete pavement with 1.00 meter shoulders on both sides and a grouted rip-rap line ditch.

ESTIMATED PROJECT COST:

B. Direct Cost-

Pre-Construction Engineering	9,915.00	1.50 %
Labor (skilled and unskilled)	108,213…58	16.37 %
Materials	352,040.00	53.26 %
Equipment (POL)	76,418.00	11.56 %
Tools	no provision	0.00 %
Project Superintendence	33,050.00	5.00 %

Total Direct Cost (TDC)	P 579,636.58	87.69 %

B. Indirect Cost-

Engineering and Administrative Overhead	19,830.00	3.00 %
Material Testing:	5,783.75	0.88 %
C. Land Acquisition + compensation for ROW	15,000.00	2.27 %
D. Contingencies (physical & economic)	40,749.67	6.16 %
	==========	
Total Estimated Project Cost =	P 661,000.00	100.00 %

IV. Labor-Based/ Equipment-Supported Method by "Pakyaw" Contract:

TITLE OF PROJECT:	Rehabilitation of Biangan-Talus Road Section
LOCATION:	Malungon, Sarangani Province
CLASSIFICATION:	Barangay Road
LENGTH:	5,340 linear meters
DURATION:	239 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Pakyaw" Contract, utilizing 30-unskilled and 7 skilled workers and three (3) "pakyaw" groups.

ITEMS OF WORK:

Excavation	Clearing
Gravelling of 6.00 meter roadway	Ditching and sloping of both sides
Installation of 42" reinforced concrete pies	Construction of double-barrel box culvert
Slope protection (grouted rip-rap)	Embankment
Construction of multi-purpose pavement	

ESTIMATED PROJECT COST:

A. Direct Cost-

Labor (skilled and unskilled)	594,324.36	16.28 %
Equipment (POL)	193,475.10	5.30 %
Materials	2,136,498.92	58.53 %
Tools	182,500.00	5.00 %
Supervision Cost	182,500.00	5.00 %
Pre-Construction Engineering	9,125.00	0.25 %
Total Direct Cost (TDC)	P 3,298,423.38	90.36 %

B. Indirect Cost-

Engineering and Administrative Overhead	109,500.00	3.00 %
Material Testing/ Quality Control	22,812.50	0.63 %
C. Land Acquisition + compensation for ROW	3,500.00	0.10 %
D. Contingencies (physical & economic)	215,764.12	5.91 %
Total Estimated Project Cost =	P 3,650,000.00	100.00 %

APPENDIX D: DPWH Program of Work for infrastructure Projects Undertaken Using Equipment-Based Method Contracted Out to Regular Contractors

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V. Equipment-Based Method by "Contract":

TITLE OF PROJECT:	Construction of North Poblacion Bridge and Approaches
LOCATION:	Purok 9-A, North Poblacio, Maramag, Bukidnon
CLASSIFICATION:	National Road and Bridges
METHOD OF CONSTRUCTION:	Equipment-Based
MODE OF IMPLEMENTATION:	By Contract

SCOPE OF WORK: Construction of 21.00 linear meters reinforced concrete deck-girder (RCDG) bridge, including approaches and slope protection.

ITEMS OF WORK:

Structure excavation	Embankment
Common borrow	Aggregate sub-base coarse
Aggregate. Base coarse	PCCP
Reinforced concrete test pile (furnished)	Reinforced concrete test pile (driven)
Reinforced concrete regular pile (furnished)	Reinforced concrete regular pile (driven)
Neoprene pad	Metal structure
Reinforcing steel	Structural concrete
Grouted rip-rap	

MINIMUM EQUIPMENT REQUIRED:

1-Bulldozer	1-Grader
2-Concrete mixers	2-Concrete vibrators
1-Bar bender	1-Bar cutter
1-Crane	1-Diesel hammer
1-Drop hammer	

TECHNICAL PERSONNEL REQUIRED:

1-Engineer I	1-Foreman
20-Laborers	2-Masons
6-Carpenters	6-Steelmen
2-Riggers	

ESTIMATED PROJECT COST:

A. Direct Cost-	[3,991,304]	[81.42 %]
Materials (Supply & delivery)	3,330,954	67.95 %
Labor (including fringe benefits)	67,742	1.38 %
Equipment (rental & fuel)	571,301	11.65 %
Project Superintendence	21,739	00.44 %

B. Indirect Cost-	[910,382]	[18.58 %]
Overhead, Contingency, Miscellaneous	271,641	5.54 %
Mobilization/Demo, Profit, Tax	453,164	9.24 %
Engineering and Administrative Overhead	185,577	3.79 %
Total Estimated Project Cost =	P 4,902,118	100.00 %

VI. Equipment-Based Method by "Contract":

TITLE OF PROJECT:	Rehabilitation of the Old National Road
LOCATION:	Libuan, Parang, Maguindanao
CLASSIFICATION:	National Secondary Road
LENGTH:	3,710.00 meters
PAVEMENT WIDTH:	10.0 meters
DURATION:	120 CD
METHOD OF CONSTRUCTION:	Equipment-Based
MODE OF IMPLEMENTATION:	By Contract

ITEMS OF WORK:

Surplus common excavation	Embankment
Aggregate sub-base coarse	Excavation for pipe culvert
Foundation fill	Pipe culvert
Stone masonry headwall	

MINIMUM EQUIPMENT REQUIREMENT:

1-Bulldozer	1-Grader
1-Payloader	2-Dump-trucks
1-Roller	1-Water-ruck
1-Backhoe	1-Chain-block

TECHNICAL PERSONNEL REQUIREMENT:

1-Engineer I	1-Foreman
17-Laborers	2-Masons
3-Carpenters	

ESTIMATED PROJECT COST:

Labor (including fringe benefits)	346,045	8.33 %
Materials	1,455,295	35.03 %:
Equipment	1,423,094	34.26 %
Fuel & Oil of Equipment	418,625	10.08 %
Construction Contingencies	167,751	4.04 %

Price Contingencies	54,755	1.32 %
Overhead	126,000	3.03 %
Budget Reserved	162,452	3.91 %
Total Estimated Project Cost (TEPC)=	P 4,154,017	100.00 %

VII. Equipment-Based Method by "Contract":

TITLE OF PROJECT:		Improvement of Taloy Norte ARC Road Component
LOCATION:		Tuba, Benguet Province, CAR
CLASSIFICATION:		Barangay Road
LENGTH:		4,607.6 meters
PAVEMENT WIDTH	:	3.00 meters (4.50 meters w/ shoulders)
DURATION:		120 CD
METHOD OF CONSTRUCTION:		Equipment-Based
MODE OF IMPLEMENTATION:		By Contract

ITEMS OF WORK:

Removal of slides	Structural excavation (solid rock)
Structural excavation (common soil)	Embankment
Sub-grade preparation	Gravel blanketing
PCCP	RSB
Structural concrete	Catch basin
Grouted rip-rap	Curb & gutter

MINIMUM EQUIPMENT REQUIREMENT:

3-Payloader	10-Dump trucks
1-Road-roller	1-Water truck
3-Transit mixers	1-Concrete cutter
3-One-bagger concrete mixers	4-Concrete vibrators
3-Plate compactors	

TECHNICAL PERSONNEL REQUIRED:

1-Civil engineer I	1-Construction foreman
1-Materials engineer	2-Masons
2-Carpenters	2-Steelmen
24-Laborers	

ESTIMATED PROJECT COST:

Labor (including fringe benefits)	715,258	4.97 %
Materials	6,941,589	48.22 %:
Equipment	2,588,514	17.98 %
Indirect Cost (DCM, Profit, Tax)	2,681,805	18.63 %
Quality Control (const contigency)	64,635	0.45 %
Engineering & Administrative Overhead	110,684	0.77 %
Contingency	1,292,716	8.98 %

Total Project Cost (TPC)	P 14,395,201	100.00 %

Cost Share of Various Elements in the Construction of DPWH Infrastructure Projects

I. Labor-Based/ Equipment Supported Method (LBESM):

	(I) LBESM Admin	(II) LBESM Admin	(III) LBESM Admin	(IV) LBESM "Pakyaw"	Percent (%) Average
A. Direct Cost:	[87.73 %]	[93.56 %]	[87.69 %]	[90.36 %]	[89.835 %]
Pre-Cons Engg	0.75 %	0.32 %	1.50 %	0.25 %	0.705 %
Labor	18.93 %	24.58 %	16.37 %	16.28 %	19.040 %
Materials	58.22 %	38.20 %	53.26 %	58.53 %	52.052 %
Equipment	4.15 %	21.86 %	11.56 %	5.30 %	10.717 %
Tools	1.29 %	4.30 %	0.00 %	5.00 %	2.648 %
Project Superintendence	4.39 %	4.30 %	5.00 %	5.00 %	4.673 %
B. Indirect Cost	[12.27 %]	[6.44 %]	[12.31 %]	[9.64 %]	[10.165 %]
Engg & Admin Overhead	3.00 %	3.00 %	3.00 %	3.00 %	3.000 %
Material Testing	0.50 %	0.75 %	0.88 %	0.63 %	0.690 %
C. Land Acqui +ROW	---	--	2.27 %	0.10 %	0.592 %
D. Contingency	8.77 %	2.69 %	6.16 %	5.91 %	5.883 %
Percent Total:	100.00%	100.00%	100.00%	100.00%	100.00 %
Total Est. Project Cost	P5,425,987	P2,100,100	P661,000	P3,650,000	P2,959,272

II. Equipment-Based Method (EBM):

	(V) EBM Contract	(VI) EBM Contract	(VII) EBM Contract	Percent (%) Averages
A. Direct Cost-	[81.42 %]	[91.74 %]	[71.62 %]	[81.59 %]
Labor	1.38 %	8.33 %	4.97 %	4.89 %
Materials	67.95 %	35.03 %	48.22 %:	50.40 %
Equipment	11.65 %	44.34 %	17.98 %	24.66 %
Project Superintendence	0.44 %	NA	NA	0.14 %
Const Contingency	NA	4.04 %	0.45 %	1.50 %

B. Indirect Cost-	[18.58 %]	[8.26 %]	[28.38 %]	[18.41 %]
OH, Cont, Misc	5.54 %	8.26 %	8.98 %	7.59 %
Mobili/Demo, Profit, Taxes	9.24 % --	NA --	18.63 %	9.30 %
Eng'g & Admin OH	3.79 %	NA	0.77 %	1.52 %
Percent Total:	100.00%	100.00%	100.00%	100.00 %
Total Estimated: Project Cost	P4,902,118	P4,154,017	P14,395,200	7,817,111

NOTES:

1. NA – "not applied"
2. In Project V- mobilization & demobilization, profit, VAT, are lumped into DCM, profit , taxes row.

FINDINGS AND CONCLUSIONS ON DPWH PROJECTS:

1. The labor cost share of the four (4) DPWH projects undertaken by administration using force account and one by "pakyaw" award averaged 19.04 % of the total project cost; while those undertaken by contract, three (3) in this instance, only averaged 4.89 % or a difference of 14.15 %.

2. The equipment cost share of the three (3) DPWH projects undertaken by contract averaged 24.66 % ; while those undertaken by administration recorded an average of 10.72 % still. The effective equipment intensity over labor in this case is 13.94 %.

3. However under the LBESM, the project superintendence by labor-based engineers needed to supervised intensely the workers averaged 4.67 % while the supervision needed to oversee contract work done using EBM is a negligible 0.14 % or a difference of 4.53 %. As a matter of fact, the two EBM projects did not register project superintendence cost as an expense account.

4. It was also observed that the cost share of equipment was smaller on road construction projects where installation of RC pipes is a project component, suggesting that such activity does not require much equipment assistance and that muscle power would be sufficient to accomplish the job.

5. Although the bases of the findings are quite few and far between due to the limited extent of the study, the indication is clear that LBESM has a practical effective usage on road construction projects. It is also clear that labor cost share is inversely proportional to the size, magnitude and project cost. The LBESM tends to be uneconomical for large road projects with very short duration. Likewise for long term and long haul projects, close and attentive supervision of skilled and unskilled workers become, unmanageable. But properly applied and utilized on work activities where equipment is second only to man's craftsmanship abilities, then LBESM could be not only an economical method of constructing infrastructure projects but also an effective means of making the lives of marginal rural workers better and more community oriented.

APPENDIX E: NHA Program of Work for infrastructure Projects Undertaken Using Labor-Based Method by Contract

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I. Labor-Based Method House Construction by Contract:

TITLE OF PROJECT: Construction of Housing Project
LOCATION: Nesoricom Village, Magdaup, Ipil, Zamboanga del Sur
CLASSIFICATION: Single Detached House, SD-48
AREA: 48 square meters
METHOD OF CONSTRUCTION: Labor-Based Method
MODE OF IMPLEMENTATION: By Contract

ITEMS OF WORK: Concrete masonry works, carpentry works, tinsmithry and hardware, doors and windows, plumbing works, electrical works, painting works

ESTIMATED PROJECT COST:

Item:	Description	Mat'l Cost	Labor Cost	Item Cost
1.	concrete masonry works	56,192.00	14,048.00	70,240.00
2.	carpentry works	22,976.22	5,744.06	28,720.28
3.	tinsmithry and hardware	19,769.50	4,942.38	24,711.88
4.	doors and windows	25,630.00	6,407.50	32,037.50
5.	plumbing works	6,278.50	1,569.62	7,848.12
6.	electrical works	3,964.50	991.12	4,955.62
7.	painting works	10,764.00	2,691.00	13,455.00
	Total Project Cost =	P 145,574.72	P 36,393.68	P 181,968.40

Total Direct Cost = P 181,968.40
Unit Direct Cost = P 3,791.01/ sm
Material Cost Share = 80.00%
Labor Cost Share = 20.00%

No Equipment was used; only Hand Tools.

II. Labor-Based Method Land Development by Contract:

TITLE OF PROJECT: Land Development for a Housing Project
LOCATION: Nesoricom Village, Magdaup, Ipil, Zamboanga del Sur
CLASSIFICATION: Land Development, Water and Power Supply
METHOD OF CONSTRUCTION: Labor-Based Method
MODE OF IMPLEMENTATION: By Contract

SCOPE OF WORK: Survey-works, earth-works, road-works, drainage-works, Water-works, power supply system, off-site development

ESTIMATED PROJECT COST:

Item:	Description	Material Cost	Labor Cost	Equipment Cost	Item Cost
1.	Survey work	319,177	189,600	108,000	616,777
Material Cost Share =		51.75%			
Labor Cost Share =		30.74%			
Equipment Cost Share =		17.51%			
2.	Earthwork	7,000,720	55,800	6,019,200	13,075,720
Material Cost Share =		53.54% (imported fill)			
Labor Cost Share =		0.43%			
Equipment Cost Share =		46.03%			
3.	Road work:	9,725,261	831,180	1,039,580	11,596,021
	Roadway excavation	none	5,100	384,200	389,300
	Sub-grade preparation	none	2,040	129,200	131,240
	Aggregate Base coarse	2,357,250	9,360	197,680	2,564,290
	Concrete pavement	7,368,011	814,680	328,500	8,511,191
Material Cost Share =		83.86%			
Labor Cost Share =		7.17%			
Equipment Cost Share =		8.97%			
4.	Drainage work:	4,759,500	1,693,510	none	6,453,010
	Trench excavation	none	317,340	none	317,340
	Covered canal (A)	582,434	102,870	none	685,304
	Open canal (A)	255,445	108,600	none	364,045
	Open canal (B)	3,185,861	1,064,280	none	4,250,141
	RCP (600mm)	393,010	32,500	none	425,510
	RCP (900mm)	270,520	18,200	none	288,720
	Headwall	72,230	49,720	none	121,950
Material Cost Share =		73.75 %			
Labor Cost Share =		26.25 %			
Equipment Cost Share =		00.00 %			
5.	Water works:	1,885,403	384,517	36,000	2,305,920
	Water distribution system	928,601	163,877	none	1,092,478
	Single water service conn.	33,008	3,080	none	36,088
	Duplex water service conn.	293,722	29,400	none	323,122
	Elev. conc. water tank	630,072	188,160	36,000	854,232

5A.	Water-Well Drilling	M	L	E	1,162,375
Material Cost Share =		81.76 %			
Labor Cost Share =		16.68 %			
Equipment Cost Share =		1.56 %			
6.	Power Dist. System	1,372,372	247,026	none	1,619,398
Material Cost Share =		84.75 %			
Labor Cost Share =		15.25 %			
Equipment Cost Share =		00.00 %			
7.	Off-site Development:	1,296,424	272,800	34,560	1,603,784
	Spoon drain	17,250	8,000	none	25,250
	Trapezoidal canal	856,310	203,320	none	1,059,630
	Catch basin	9,906	2,600	none	12,506
	RCP (1,200mm)	382,310	44,800	none	427,110
	Wing-wall	30,648	14,080	none	44,728
	Water-way Dev.(outfall)	none	none	34,560	34,560
Material Cost Share =		80.83 %			
Labor Cost Share =		17.01 %			
Equipment Cost Share =		2.16 %			

FINDINGS AND CONCLUSIONS:

1. For mass housing, specially for single detached and row houses, the dominance of labor over equipment use is apparent and expected.

2. For land development, sites and related services, THE use of LBM is practical on concrete works, drainage works, water supply system and water well-drilling, electrical power systems, and other site structures; while EBM is more applicable to bulk excavation, roadway excavation, sub-base preparation and base course preparation.

3. Site development and mass housing are closely tied-up with each other. Many work activities under this sector can offer several opportunities for LB workers who can provide the right skills. Training workers to acquire several skills is the first step to make these opportunities available to those who can respond to project needs.

APPENDIX F: NIA Program of Work for infrastructure Projects Undertaken Using Labor-Based Method by "Pakyaw" and Labor-Based/ Equipment-Supported Method by "Administration" and "Pakyaw"

I. Labor-Based/ Equipment-Supported Method by "Administration":

TITLE OF PROJECT: San Agustin- Del Rosario Canal Irrigation Structures
LOCATION: Libon, Polangui, Albay
DURATION: 120 CD
METHOD OF CONSTRUCTION: Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION: By Administration

SCOPE OF WORK: Diversion works, canal structures, canalization, terminal facilities.

ITEMS OF WORK:

Grouted Rip-rap	Grouted rip-rap
Boulder Rip-rap	Common excavation
Borrow & Haul + Compaction	Common borrow
Rubble Masonry	Cofferdam & De-watering
Main Turn-Out	Main Farm Ditch
460 mm RC Pipes	

MINIMUM EQUIPMENT REQUIREMENT:

1-Stake Truck	1-Backhoe Loader
1-Dozer	2-Dump trucks
1-Concrete Mixer	2-Water Pump

ESTIMATED PROJECT COST:

	Cost	% Weight
Labor (including fringe benefits)	1,209,451.80	60.48 %
Materials	347,332.25	17.36 %
Equipment Rental	79,396.79	3.97 %
Petrol, Oil & Lubricants	31,455.50	1.57 %
General Overhead	149,628.07	7.48 %
Management Fee	100,000.00	5.00 %
IDF Fund	82,735.59	4.14 %
Total Project Cost (TPC) =	P 1,999,989.70	100.00 %

II. Labor-Based Method by "Pakyaw" (Local Minor Contract):

TITLE OF PROJECT: Marozo- Culbreng CIP
LOCATION: Narvacan, Ilocos Sur
DURATION: 30 CD

METHOD OF CONSTRUCTION: Labor-Based Method
MODE OF IMPLEMENTATION: By Administration using "Pakyaw" Local Minor Contract (LMC)

SCOPE OF WORK: Diversion works, canal structures & canalization

ITEMS OF WORK:

Concreting	Rubble Masonry
24" RC Pipes	Common structure excavation
Back-filling + compaction	Back-filling + compaction
Rubble masonry	Structure excavation
Concreting	Common structure excavation
Flash-boards	

MINIMUM EQUIPMENT REQUIREMENT: 1-Stake Truck

ESTIMATED PROJECT COST:

	Cost	% Weight
Labor (thru "Pakyaw")	350,550.00	82.00 %
Materials (provide by NIA)	---	---
Equipment Rental (provided by NIA)	---	---
IDP Fund	12,825.00	3.00 %
Pre-Engineering	21,375.00	5.00 %
PIO	32,062.50	7.50 %
RIO	10,687.50	2.50 %
Total Project Cost (TPC) =	P 427,500.00	100.00 %

III. Labor-Based/ Equipment-Supported Method by "Pakyaw":

TITLE OF PROJECT: Don Benito Canal Irrigation Structures
LOCATION: Pozurrobio, Pangasinan
DURATION: 7 months
METHOD OF CONSTRUCTION: Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION: By "Pakyaw", Local Minor Contract (LMC)

SCOPE OF WORK: Diversion works, canal structures, canalization, terminal facilities.

ITEMS OF WORK:

Reinforced Concrete (3000 psi)	Common Structure excavation
Structure Backfill	Care of water
Cofferdam	Steel Gate
36" RC Pipes	Grouted Rip-rap
Filter Drain	Concrete Demolition + disposal of 24" RC Pipes
2" PVC Pipes	Steel Gate & Wasteway
4" PVC Pipes	Common excavation

MINIMUM EQUIPMENT REQUIREMENT:

1-Stake Truck
3-Dump Trucks
1-Water Pump

ESTIMATED PROJECT COST:

	Cost	% Weight
Labor (including fringe benefits)	89,871.79	2.55 %
Materials	66,500.00	1.88 %:
Civil contracts	2,807,927.07	79.56 %
General Overhead	307,422.00	8.71 %
Management Fee	165,549.00	4.69 %
IDF Fund	92,223.14	2.61 %
Total Project Cost (TPC) =	P 3,529,299.00	100.00 %

APPENDIX G: NIA Equipment-Based Method Unit Cost for Various Embankment Construction Activities

Description	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Item Unit Cost
Quarrying	1.50/cm	1.86/cm	18.73/cm	20.59/cm
Loading	none	1.86/cm	11.40/cm	13.26/cm
Hauling	none	40.57/cm	179.50/cm	220.07/cm
Spreading	none	1.66/cm	12.43/cm	14.09/cm
Watering	none	0.72/cm	6.70/cm	7.42/cm
Compaction	none	1.46/cm	10.23/cm	11.69/cm
Total Item Cost =	1.50/cm	48.20/cm	238.98/cm	302.18/cm

Cost Summary for Embankment:

Material Unit Cost =	15.00/cm
Labor Unit Share =	48.20/cm
Equipment Unit Share =	238.98/cm
Material Cost Share =	4.96 %
Labor Cost Share =	15.95 %
Equipment Cost Share =	79.09%

APPENDIX H: NIA Equipment Use for Various Construction Activities

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Item	Activity	Preferred Equipment Use
1.	Clearing & grubbing for dense vegetation and uprooting of trees	dozer
2.	Excavation of common material for canals, structures and creeks	crane with clamshell (wet) dozer (dry)
3.	bank excavation of canals, and creeks	backhoe
4.	for quarrying of common material, aggregates, cobble stones , boulders	dozer
5.	for loading of common soil, aggregates, cobble stones, boulders	pay-loader
6.	for spreading of common soil, borrow materials aggregates for sub-base and base coarse preparation	road grader
7.	for back-filling with compaction	bulldozer
8.	for embankment compaction	vibratory or static roller
9.	for loading, and unloading common soil, asphalt, cobblestones, boulders	pay-loader
10.	for hauling and dumping of common soil, aggregates, asphalt, cobblestones , boulders	dump truck
11.	for demolition of light concrete structures and thin pavements	jack hammer powered by air compressors
12.	for demolition of heavy concrete structures and thick pavements	concrete pavement breakers (wheel or crawler mounted)
13.	for driving of steel piles	25-ton crane w/ 2-tons drop hammer
14.	for drilling of concrete piles	25-ton crane with diesel-powered pile hammer

FINDINGS and CONCLUSION:

For NIA projects, LBM is predominant over EBM since most of the works involve canalization and canal structures and diversion works. These items would include the following: concreting, rubble masonry, RC pipes, common structure excavation. On the other hand EBM is suitable for bulk excavation, back-filling and compaction.

APPENDIX I: DECS Program of Work for School Building Projects Undertaken Using Labor-Based Method by Contract

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I. Labor-Based Method by Contract:

TITLE OF PROJECT:	Construction of Multi-Purpose Building
LOCATION:	Sara, Iloilo
CLASSIFICATION:	Multi-Purpose Building
FLOOR AREA:	@ 40 square meters
DURATION:	75 CD
METHOD OF CONSTRUCTION:	Labor-Based Method
MODE OF IMPLEMENTATION:	By Contract

ITEMS OF WORK: Column footings, wall footings, flooring, reinforced concrete columns, concrete hollow block zocalo walls, concrete hollow block wall partitions, finishing, concrete bench, doors and windows, roofing and roof framing, sidings and post.

TECHNICAL PERSONNEL REQUIRED: 1-project engineer
1-construction foreman

PERCENTAGE WEIGHTS:

C. Direct Cost Percentage Weights-

1. Materials (supply, delivery and material testing)	65.99 %
2. Manual Labor	18.68 %
3. Equipment	none
4. Contingency	2.54 %

B. Indirect Cost Percentage Weights-

1. Profit	8.03 %
2. Tax	4.76 %
	==========
Total Contract Percentage =	100.00 %

II. Labor-Based Method by Contract:

TITLE OF PROJECT:	Replacement of Two (2) School Buildings
LOCATION:	Sara, Iloilo
CLASSIFICATION:	Multi-Purpose Building
FLOOR AREA:	@ 35 square meters
DURATION:	75 CD
METHOD OF CONSTRUCTION:	Labor-Based Method
MODE OF IMPLEMENTATION:	By Contract

ITEMS OF WORK: Replacement of two (2) – BLT School Buildings consisting of column footings, wall footings, beams, slabs, concrete hollow block zocalo walls, concrete hollow block wall partitions, finishing, doors and windows, roofing and roof framing.

TECHNICAL PERSONNEL REQUIRED: 1-project engineer
1-construction foreman

PERCENTAGE WEIGHTS:

D. Direct Cost Percentage Weights-

1. Materials (supply, delivery and material testing)	65.99 %
2. Manual Labor	18.68 %
3. Equipment	none
4. Contingency	2.54 %

B. Indirect Cost Percentage Weights-

1. Profit	8.03 %
2. Tax	4.76 %
	==========
Total Contract Percentage =	100.00 %

FINDINGS & CONCLUSIONS:

In the construction of one-storey light material and two-storey reinforced concrete school buildings for the DECS, it is very apparent that EMB is not a practical substitute for LBM particularly in the provinces and rural municipalities. As such local workers must be trained periodically on the particular technology that the building design and specifications require of the contractors and the workers to muster.

APPENDIX J DPWH Individual Project Completion Report

I. Labor-Based/ Equipment-Supported Method by "Administration":

TITLE OF PROJECT:	Construction of Tumbaga I Barangay Access Road I
LOCATION:	Barangay Tumbaga I, Sariaya, Quezon Province
CLASSIFICATION:	Barangay gravel road with one singlr-barrel RCBC
LENGTH:	750 linear meters
PAVEMENT WIDTH:	4.00 meters
DURATION:	86 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 40unskilled and 10 skilled workers under 4 "pakyaw" groups

SCOPE OF WORK: Construction of 4.00-meter wide gravel road carriage-way with 1.00 meter-shoulder , back-filling and rip-raping of both side slopes; construction of 3.00 meter x 3.00 meter x 7.50 meter single barrel reinforced concrete box culvert (RCBC); installation of reinforced concrete culvert pipe (RCCP) at intermediate sections; construction of masonry retaining walls for RCBC approaches.

PROJECT SUPERINTENDENCE:

1-Engineer II
1-Engineering Assistant
1-Materials Laboratory Technician

Foreman	119 MD
Carpenter	58 MD
Steelman	48 MD
Mason	180 MD
Laborer	2,262 MD

EQUIPMENT USED:

Bulldozer	28 Hr.
Pay Loader	28 Hr.
Road Roller	152 Hr.
Water Truck	152 Hr
Concrete Mixer	208 Hr.
Concrete Vibrator	40 Hr.

DETAILED BREAKDOWN OF PROJECT ACCOUNT:

I.	DIRECT COST:		2,969,952.00
(1)	Construction Cost		2,747,952.00
100 (4)	Removal of trees	1,800.00	
102 (1)	Unsuitable excavation	32,900.00	
103	Structure excavation	45,279.00	
104	Embankment	1,490,632.00	
200	Aggregate Sub-base Course	105,151.00	
201	Aggregate Base Course	196,952.50	
404	Reinforcing Steel Bar	92,926.25	
405	Structural Concrete, Class A	134,613.98	
500 (A)	Pipe Culvert 900mm	71,640.20	
500 (B)	Pipe Culvert 300mm	15,676.90	
505	Stone masonry	475,373.90	
1713	Rubble concrete	35,536.70	
SPL-1	Bunkhouse	49,469.60	
(2)	Pre-Construction Engineering		17,150.00
(3)	Tools		101,950.00
(4)	Project Superintendence		102,900.00
(5)	Mobilization/ Demobilization		none

II.	INDIRECT COST		124,338.00
(1)	Engineering/ Administrative	102,900.00	
(2)	Materials Testing	21,438.00	
III.	CONTINGENCIES		none
		TOTAL PROJECT COST	P 3,094,290.00

Unit Cost (per LM) = P 4,125.72 per LM

BREAKDOWN OF EXPENDITURES:

Labor	437,696.00	14.15%
Materials	2,158,145.00	69.75
Equipment	152,110.00	4.92
Hand Tools	101,950.00	3.30
Project Superintendence	102,900.00	3.32
Engineering/ Administrative Overheads	102,900.00	3.32
Quality Control	21,438.00	0.69
Pre-Construction Engineering	17,150.00	0.55
Total Expenditures	**3,094,289.00**	**100.00%**

II. Labor-Based/ Equipment-Supported Method by "Administration"/ "Pakyaw":

TITLE OF PROJECT:	Construction of San Jose Pentor Road
LOCATION:	Dinalupihan, Bataan
CLASSIFICATION:	Gravel road
LENGTH:	396 linear meters
DURATION:	24 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 60 unskilled and 20 skilled workers under "pakyaw" groups

ITEMS OF WORK:

105	Sub-Grade Preparation
200	Aggregate Sub-base Course
201	Aggregate Base Course
311	PCC Pavement (t=150mm)
600	RC Pipe Culvert, 600mm

BREAKDOWN OF EXPENDITURES:

Labor	543,287.00	39.20%
Materials	556,930.00	40.19
Equipment	243,912.00	17.60
Hand Tools	none	
Project Superintendence	none	
Engineering/ Administrative Overheads	41,571.00	3.01

Quality Control	none	
Pre-Construction Engineering	none	
Total Expenditures	**1,385,700.00**	**100.00%**

III. Labor-Based/ Equipment-Supported Method by "Administration"/ "Pakyaw":

TITLE OF PROJECT:	Construction of Sapang Putol Bridge
LOCATION:	New San Jose, Dinalupihan, Bataan
CLASSIFICATION:	Concrete Bridge
LENGTH:	15 linear meters
DURATION:	25 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 45 unskilled and 15 skilled workers under "pakyaw" groups

ITEMS OF WORK:

1. Demolition of Existing Structure
2. Excavation for Structure
3. Embankment
4. Foundation Fill
5. Reinforcing Steel Bars
6. Structural Concrete Class "A"
7. Boulder Fill & Filler in Place
8. Grouted Rip-rap with Plastering
9. Cofferdam

BREAKDOWN OF EXPENDITURES:

Labor	310,270.00	31.03%
Materials	420,002.00	42.00
Equipment	239,728.00	23.97
Hand Tools	none	
Project Superintendence	none	
Engineering/ Administrative Overheads	30,000.00	3.00
Quality Control	none	
Pre-Construction Engineering	none	
Total Expenditures	**1,000,000.00**	**100.00%**

V. Labor-Based/ Equipment-Supported Method by "Administration"/ "pakyaw":

TITLE OF PROJECT:	Construction of Multi-Purpose Pavement
LOCATION:	Malamig ARC-FMR, Bustos, Bulacan
CLASSIFICATION:	Multi-Purpose Concrete Pavement
LENGTH:	920 linear meters
DURATION:	42 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method

MODE OF IMPLEMENTATION: By “Administration” utilizing 18 unskilled and 2 skilled workers under “pakyaw” groups.

ITEMS OF WORK:

1. Site Clearance
2. Aggregate Base Course
3. Concrete;
   3.1 Aggregates
   3.2 Cement

BREAKDOWN OF EXPENDITURES:

Labor	264,810.00	28.70%
Materials	549,927.00	59.61
Equipment	17,820.00	1.93
Hand Tools	15,000.00	1.63
Project Superintendence	25,000.00	2.71
Engineering/ Administrative Overheads	30,000.00	3.25
Quality Control	20,000.00	2.17
Pre-Construction Engineering	none	
Total Expenditures	**922,557.00**	**100.00%**

VI. Labor-Based/ Equipment-Supported Method by “Administration”/ “Pakyaw”:

TITLE OF PROJECT: Construction of Feeder Road
LOCATION: New Albay, Maragusan, Compostela Valley
CLASSIFICATION: Feeder Road
LENGTH: 300 linear meters
DURATION: 159 CD
METHOD OF CONSTRUCTION: Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION: By “Administration” utilizing 27 unskilled and 7 skilled workers under “pakyaw” groups

ITEMS OF WORK:

1. Excavation for Structure
2. Embankment
3. Foundation Fill
4. Aggregate Sub-base Course
5. Aggregate Base Course
6. RCCP, 24”
7. Grouted Rip-rap

BREAKDOWN OF EXPENDITURES:

Labor	12,622.00	2.65%
Materials	310,043.00	65.16
Equipment	100,000.00	21.02

Hand Tools	none	
Project Superintendence	27,000.00	5.68
Engineering/ Administrative Overheads	16,000.00	3.36
Quality Control	4,725.00	0.99
Pre-Construction Engineering	5,400.00	1.14
Total Expenditures	**475,790.00**	**100.00%**

VII. Labor-Based/ Equipment-Supported Method by "Administration"/ "Pakyaw":

TITLE OF PROJECT:	Gravelling of Parulong PS Dam
LOCATION:	Conception, Tarlac
CLASSIFICATION:	Gravelling
LENGTH:	1,247 linear meters
DURATION:	40 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 18 unskilled and 2 skilled workers under "pakyaw" groups

ITEMS OF WORK:

1. Aggregate Sub-base Course
2. Aggregate Base Course

BREAKDOWN OF EXPENDITURES:

Labor	37,446.00	5.90%
Materials	461,232.00	72.72
Equipment	40,872.00	6.45
Hand Tools	32,206.00	5.08
Project Superintendence	33,360.00	5.26
Engineering/ Administrative Overheads	20,010.00	3.14
Quality Control	5,836.00	0.92
Pre-Construction Engineering	3,336.00	0.53
Total Expenditures	**634,296.00**	**100.00%**

VIII. Labor-Based/ Equipment-Supported Method by "Administration"/ "Pakyaw":

TITLE OF PROJECT:	Rehabilitation of Sampaguita Road
LOCATION:	Malaya, Banga, South Cotabato
CLASSIFICATION:	Rural Road
LENGTH:	2,486 linear meters
DURATION:	209 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 646 unskilled and 102 skilled workers under "pakyaw" groups

ITEMS OF WORK:

1. Excavation for Structure
2. Embankment
3. Aggregate Sub-base Course
4. Aggregate Base Course
5. RCCP, 900mm
6. Granular Fill
7. Headwall
8. Lined Ditch
9. Bunkhouse
10. Backfill
11. Embankment Protection
12. Billboard

BREAKDOWN OF EXPENDITURES:

Labor	128,512.00	4.47
Materials	2,366,221.00	82.31
Equipment	164,142.00	5.71
Hand Tools	none	
Project Superintendence	164,274.00	5.72
Engineering/ Administrative Overheads	31,700.00	1.10
Quality Control	19,813.00	0.69
Pre-Construction Engineering	none	
Total Expenditures	**2,874,662.00**	**100.00%**

IX. Labor-Based/ Equipment-Supported Method by "Administration"/ "Pakyaw":

TITLE OF PROJECT:	Construction of Basak-Pangutusan Road
LOCATION:	Nabunturan
CLASSIFICATION:	Rural Road
LENGTH:	710 linear meters
DURATION:	193 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By "Administration" utilizing 10 unskilled and 3 skilled workers under "pakyaw" groups

ITEMS OF WORK:

1. Excavation for Structure
2. Foundation Fill
3. Drainage Excavation
4. Embankment
5. Aggregate Sub-base Course
6. Aggregate Base Course
7. RCCP, 24"
8. RCCP, 36"
9. RCCP, 48"

10. Grouted Rip-rap
11. Structural Metal
12. lumber
13. Concrete Class “A”
14. Camp House

BREAKDOWN OF EXPENDITURES:

Labor	202,404.00	9.67
Materials	1,574,532.00	75.22
Equipment	100,000.00	4.78
Hand Tools	none	
Project Superintendence	118,500.00	5.66
Engineering/ Administrative Overheads	71,100.00	3.40
Quality Control	14,813.00	0.71
Pre-Construction Engineering	11,850.00	0.56
Total Expenditures	**2,093,199.00**	**100.00%**

X. Labor-Based/ Equipment-Supported Method by “Administration”/ “Pakyaw”:

TITLE OF PROJECT:	Construction of Sto. Rosario PHF Access Road
LOCATION:	Conception, Tarlac
CLASSIFICATION:	Rural Road
LENGTH:	50 linear meters
DURATION:	15 CD
METHOD OF CONSTRUCTION:	Labor-Based/ Equipment-Supported Method
MODE OF IMPLEMENTATION:	By “Administration” utilizing 5 unskilled and 1 skilled workers under “pakyaw” groups

ITEMS OF WORK:

1. Aggregate Sub-base Course
2. Aggregate Base Course
3. RCCP, 45mm”
4. Site Clearance

BREAKDOWN OF EXPENDITURES:

Labor	9,584.00	29.82
Materials	18,791.00	58.47
Equipment	none	
Hand Tools	none	
Project Superintendence	1,835.00	5.71
Engineering/ Administrative Overheads	1,101.00	3.43
Quality Control	459.00	1.43
Pre-Construction Engineering	367.00	1.14
Total Expenditures	**32,137.00**	**100.00%**

APPENDIX K: DPWH Equipment Holding & Average Equipment Cost per Region

APPENDIX L

COST SHARE OF MATERIAL, LABOR AND EQUIPMENT COMPONENT IN LBESM
OF CONSTRUCTION AND MAINTENANCE OF INFRASTRUCTURE PROJECTS AT DPWH

Construction Work Type	Technology Specifications	Field Conditions Environment	Material Unit Cost % of MEL	Labor Unit Cost % of MEL	Equipment Unit Cost % of MEL	Total Unit Cost % of TPC
1. Gravel Road (750 LM)	LBESM	Road Right of Way Problem	2,877.53/ LM 75.73%	719.53/ LM 18.93 %	202.81/ LM 5.34 %	4,125.72/ LM 100.00 %
Removal of Trees						
Unsuitable Excavation						
Structure Excavation						
Embankment						
Aggregate Sub-base Course						
Aggregate Base Course						
Reinforcing Steel Bar						
Structural Concrete, Class A						
Pipe Culvert 900mm						
Pipe Culvert 300mm						
Stone Masonry						
Rubble Concrete						
Bunkhouse						
2. Portland Cement: Concrete Pavement (396 LM)	LBESM	none	1,406.39/ LM 41.43 %	1,371.94/ LM 40.42 %	615.94/ LM 18.15 %	3,499.24 100.00 %
Sub-Grade Preparation						
Aggregate Sub-base Course						
Aggregate Base Course						
PCC Pavement (t=150mm)						
600RC Pipe Culvert, 600mm						

3. Concrete Bridge (15 LM) Demolition of Existing Structure Excavation for Structure Embankment Foundation Fill Reinforcing Steel Bars Structural Concrete Class “A” Boulder Fill & Filler in Place Grouted Rip-rap with Plastering Cofferdam	LBESM	none	28,000.00/ LM 43.30 %	20,684.66/ LM 31.99 %	15,981.86/ LM 24.71 %	66,666.66/ LM 100.00 %
4. Concrete Road (550 LM) Clearing & Grubbing Excavation for Structure Embankment (t=10mm) Aggregate Sub-base Aggregate Base Course Grouted Rip-rap Concrete Class “A”	LBESM	none	1,140.57/ LM 32.80 %	1,381.69/ LM 39.73 %	955.43/ LM 27.47 %	3,579.63/ LM 100.00 %
5. Multi-Purpose Concrete Pavement (920 LM) Site Clearance Aggregate Base Course Concrete Aggregates & Cement	LBESM	none	597.74/ LM 64.88 %	304.14/ LM 33.02 %	19.37/ LM 2.10 %	1,002.78/ LM 100.00 %

6. Gravel Feeder Road (300 LM)	LBESM	bad weather	1,033.47/ LM 73.35 %	42.07/ LM 2.99 %	333.33/ LM 23.66 %	1,586.63/ LM 100.00 %
Excavation for Structure Embankment Foundation Fill Aggregate Sub-base Course Aggregate Base Course RCCP, 24” Grouted Rip-rap						
7. Gravelling of PS Dam (1,247 LM)	LBESM	none	369.87/ LM 80.67 %	55.86/ LM 12.18 %	32.78/ LM 7.15 %	508.65/ LM 100.00 %
Aggregate Sub-base Course Aggregate Base Course						
8. Road Rehabilitation (2,486 LM)	LBESM	bad weather	951.82/ LM 88.99 %	51.69/ LM 4.84 %	66.03/ LM 6.17 %	1,156.34/ LM 100.00 %
Excavation for Structure Embankment Aggregate Sub-base Course Aggregate Base Course RCCP, 900mm Granular Fill Headwall Lined Ditch Bunkhouse Backfill Embankment Protection Billboard						

9. Road Construction (710 LM)	LBESM	heavy rain	2,217.65/ LM 83.89 %	285.08/ LM 10.78 %	140.84/ LM 5.33 %	2,948.17/ LM 100.00 %
Excavation for Structure						
Foundation Fill						
Drainage Excavation						
Embankment						
Aggregate Sub-base Course						
Aggregate Base Course						
RCCP, 24”						
RCCP, 36”						
RCCP, 48”						
Grouted Rip-rap						
Structural Metal						
Lumber						
Concrete Class “A”						
Camp House						
10. Gravel Road (50 LM)	LBESM	none	375.82/ LM 66.22 %	191.68/ LM 33.78 %	none none	642.74/ LM 100.00 %
Aggregate Sub-base Course						
Aggregate Base Course						
RCCP, 45mm”						
Site Clearance						

An Insight into the Technical Scope, Limitations and Problems Encountered
in the Implementation of Labor-Based/ Equipment-Supported Method
of Construction and Maintenance of Infrastructure Projects of the Philippine Government

TECHNOLOGY AUDIT FOR LABOR-BASED/ EQUIPMENT SUPPORTED INFRASTRUCTURE PROJECTS IN THE PHILIPPINES

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5. Construction Projects Undertaken by Various Government Infrastructure Agencies

According to the DAP study, the magnitude of budgetary releases for LaborIntensive Infrastructure projects for 1998, represents the government's commitment to the program. The study observed that based on the General Appropriations Act, most projects are being implemented by the DPWH, DOTC, DECS, NIA, and NHA using "labor intensive methods". They also infered that some releases even exceeded the agencies corresponding budgets for the year. Based on the Table they provided below, the rate of application or utilization of the "Labor-intensive Method" ranges from 1.10 % to 145.75 % of the budgets.

Further, according to the DAP study, these levels of Labor-intensive utilization appear to suggest that the understanding of Labor-Intensive Method more so of LBESM among the respondents is vague or perhaps they did not have sufficient time to discern the more appropriate data. They observed further, that the major users of the Labor-intensive Method are the DPWH, NIA, DOTC, NHA and DECS, in that order. Based on the 1998 fund releases for Labor-intensive projects, the types of infrastructure projects that got substantial fundings are shown below in the follwing order.

	PROJECT TYPE	Fund Releases For LI Projects	% WEIGHT (in Million)	Rate of Applucation Of LB Method
1.	Roads and bridges	Php 14,659,100,000	43.77	55.26%
2.	Other infrastructure projects	4,570,000,000	13.64	15.22%
3.	Irrigation	3,641,400,000	10.87	68.64%
4.	Flood control and drainage	2,497,600,000	7.46	48.77%
5.	School building	2,341,600,000	6.99	100.65% ?? (46.93%)
6.	Telecommunication	1,700,500,000	5.07	69.83%
7.	Airports and navigational facilities	1,352,600,000	4.04	126.59%
8.	Land transportation	1,337,200,000	3.99	85.38%
9.	Seaports and lighthouses	809,600,000	2.44	145.75%
10.	Medium –rise public and private housing	277,500,000	0.83	75.00%
11.	Resettlement	271,300,000	0.81	4.52%
12.	Water supply	33,100,000	0.81	100.00%
13.	Local housing	2,200,000		1.10%
		Total: P33,485,000,000	100.00%	

Note: Correction- the percentage (%) of fund release to total budget (rate of application per DAP) for school buildings should be 46.93 % instead of 100.65 %

A. General Observations:

A1. The total budget for all types of government infrastructure projects of Php 84,162,384,277 seems to be unrealistically too large if earmarked only for Labor-intensive projects. However, if it covers budgets for regular infrastructure projects, then the % total of each project type seems to be too big as a component of the total annual budget.

A2. The smaller the project budget the bigger the percentage of fund released.

A3. The "rate of application or utilization" of the project funds as mentioned by the DAP Report has no direct relation to the actuall labor cost-share in each type of infrastructure projects.

A4. The report that some fund releases (for seaports & lighthouses and airports % navigational facilities) seems vague and unprecise since government agencies are limited by funds appropriated for each specific project.

B. Conclusion:

B1. The real measure of whether labor-based method (LBM) is effectively and efficiently utilized in a particular infrastructure project to alliviate poverty, is the cost-share component of labor in the total project cost and not the quantity of manpower or number of manhours involved in the various construction activities.

B2. The judicious use of labor-based method (LBM) vis-a-vis the use of equipment-based method (EBM) or their optimum combined utilization is incumbent on the type of construction activity or project under consideration. For example in road construction, where construction equipment have been established to be more efficient than manual labor, if not more effective, the cost-share of work activities using equipment-based method would naturally tend to be higher. While on the other hand in the construction of school buildings, manual labor (using ordinary or power tools) practically monopolizes all work items.

C. Recommendations:

C1. The application of LBM be "work item oriented" rather than "project type oriented", meaning that in each project type, construction activities or work items must be studied further to identify which among the work activities can be implemented efficiently using labor-based method.

C2. It connection with item C1 above, it is highly recommended that continous training of prospective "pakyaw" contractors and tradesmen be conducted, since in the pursuit of government to provide employment and thus alleviate poverty, the acquisition of additional or new skill is one of the best tools that a "pakyaw" contractor or worker could possess to be competitive in the construction industry. Being a skilled or multi-skilled worker will make them qualified for both labor-based or equipment-based construction, thereby expanding their marketability in the whole construction industry.

C3. Picking from the DAP comment suggesting that the understanding of Labor-Intensive Method more so of LBESM among the respondents is vague or time was not sufficient for them to discern the more appropriate data, it is also recomended that a standard definition or description of Labor-Based Method vis-a-vis Labor-Intensive Work and consequently Equipment-Based Method vis-avis Equipment-Intensive Work be agreed upon among the parties involved as suggested in PA Leoncio's Report (Item 3.4.2) of December 1999.

C4. It is further recommended that in order to guide the proponents of "employment-intensive projects", a minimun cost-share in the project of LBM work (% of total cost) be set.

5. Finally, it is also important to strike an appropriate balance between labor utilization and equipment useto provide quality construction and maintenance of infrastructure projects to justify an "income/ job-generation" objective.