

Construction of Apartment Buildings under Government Sector in Bangladesh

Construction of 100 units Flats for Senior Govt. Officers in Dhaka

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Summary

Bangladesh is a tropical country in the South-East Asia. The area of the country is about 147,570-square kilometres, that accommodates 125 million, people. The density of the population is about 845 person per square kilometre.

Bangladesh, like many developing countries, is a resource hungry country. It needs is enormous but resources are limited. As such judicious utilisation of resources is of prime importance. The Government of Bangladesh seeks to mobilise scarce resources for obtaining the desired rate of growth through making a national development plan. The central planning organisation of the country, namely the Planning Commission, makes economic projections, fixes priorities, and sets out target for sector activity.

Dhaka is the capital city of Bangladesh. The population of Dhaka City is about 8 million. Crisis in the Government and Public housing in Dhaka City is very acute. There are only 11,000 flats owned by the Government, which can accommodate only 10 % of total demand in the capital city.

To meet the current need of housing for senior government officers the planning commission approved the plan to construct 100 numbers flats at different parts of Dhaka City on Government land at a cost of Taka 256,90 million (=5,33 million USD). Within the proposed project each building consists of 10 numbers of flats in a six-storied frame structure building. The ground floor is a parking area and utility space. Each flat consists of 3 bedrooms, 1 living room, 3 toilets, 1 pantry, 1 kitchen, 1 dining and a guard room with a toilet. Lifts, hot and cold water facilities are also provided in the buildings. The plinth area of each unit is 175 square metres. The Department of Architecture under Ministry of Housing and Public Works prepared the architectural drawings for the proposed project.

I am a civil engineer and working in the Public Works Department as a design engineer and project manager in

the field level for 18 years. The Public Works Department is the construction agency of Bangladesh Government. It is entrusted with the design planning, construction and maintenance of all Government buildings, parks, national monuments and any work assigned by the Government.

My position in the organisation is field level project manager and my duty includes supervision, quality control, monitoring progress of the work, checking and recommending for payment the bill of quantities submitted by the contractor and administration of subordinates in my office.

In Bangladesh for any project to be under taken for implementation through annual development plan of Government approval of project concept paper and project proforma (PCP & PP) is a must authorised by the Government. The former Government introduced PCP & PP in the late 80's in order to eliminate delay in the approval process. Based on preliminary architectural drawings of the project a rough estimate is prepared, which form the basis for the preparation of the PCP. The rough estimate of the project is prepared on the basis of P.W.D schedule rates of 1998.

The PCP contains aims and objectives, description of the project, project costs, financial return, employment opportunity, production, environmental impact, and recurring expenditure and project implementation period.

Finance for the project is provided by the Bangladesh Government from tax revenues. At the beginning of the project the fund flow was regular but at the middle of the time schedule, due to devastating flood in the country, there is a fund shortage.

The knowledge and ideas I gathered from this course in *International Construction Management* leads to a vast scope to use in our future projects, like development in property management, scientific tools of implementation through computerised advance information technology.

Introduction

Aim

This article is written to give an understanding of the construction process of apartment buildings in a Govt. project, implemented by Public Works Department in Bangladesh. The project described and analysed in this article comprises construction of 100 residential flats for senior govt. official at Dhaka City. The client of the project is the Directorate of Accommodation under the Ministry of Housing and Public Works.

I am a project manager in field level serving under Public Works Department and my duties are supervision, quality control, monitoring the progress of work from field level, checking the bill of quantities submitted by the contractor and administration of sub ordinate staff of my office.

By competitive tender, nine enlisted contractors of P.W.D have been selected to construct 10 nos. of Buildings. The time schedule of completion of the work is 10 months. The project is a turnkey basis. The Department of Architecture prepared the architectural drawings and the structural drawings are prepared by P.W.D design division-II. The Planning Commission of Bangladesh Govt. approved the project. The work of the project started from October'98 and it is supposed to be finished by July'99. But due to shortage of fund disbursement and in the country the project will be delayed. The article also includes the information about the country and it's various features.

The actors and the project

Public Works Department

Public Works Department is the construction agency of Bangladesh Government. It is entrusted with the design, planning, construction and maintenance of all government buildings, parks, national monuments and any work assigned by government.

Function

The main function of P.W.D is as follows

- Planning, Design Construction and maintenance of Govt. building.
- Construction and maintenance of national monuments
- Construction and maintenance of public parks
- Preparation of Book of specification containing schedule of rates and analysis of rates for construction works
- Aqisation and requisition of lands for govt. construction works
- Valuation of land and property
- Fixation of standard rent

- Procurement of material and equipment for govt. construction works

Organisational set up

A Chief engineer heads P.W.D. He is also technical advisor to the govt. 4 additional chief engineer, 10. Superintending engineer, 18 executive engineer, 18 sub divisional engineer, 26 assistant engineer and 40 sub assistant engineers assist the chief engineer for planning design and monitoring of work. In the field level there are 4 zonal additional chief engineers, 22 superintending engineers, 107 executive engineers, 255 sub divisional engineers, 142 assistant engineers and 1307 nos. sub-assistant engineers and 19,361 nos. skilled & unskilled employees for executing civil electrical and mechanical works.

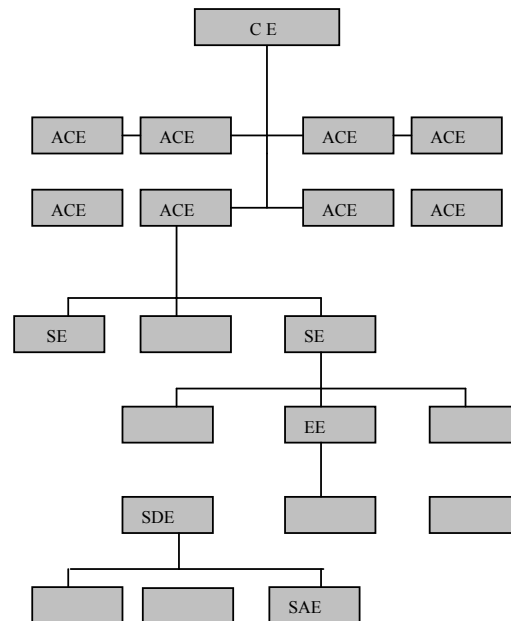


Figure: -1 Organogram of P.W.D

- CE=Chief Engineer
- ACE=Adl.Chief Engineer
- SE=Superintending Engineer
- EE=Excutive Engineer
- SDE=Sub Divisional Engineer
- SAE=Sub Assistant Engineer

The Project under study

Aim of the project

The accommodation problem of govt. officer's in Dhaka City is very acute. House rent support provided by the govt. is too inadequate to rent a private house. Also salary structure of govt. employees are lower than the private employment in the country. So it is a govt. policy to provide apartment houses to the govt. employees in subsidise rent. The govt. officers and staff in the Dhaka City are already using 11,000 Flats. More over 3000 flats construction scheme are going on to provide flats for staff and mid level officers of Bangladesh govt. But for senior govt. officials no such scheme has been done so far. For this reason Planning commission of Govt. of Bangladesh decided to construct 100 unit of flats for senior officials. It is also decided that flats shall be constructed on govt. owned land and no fresh land is required for the project

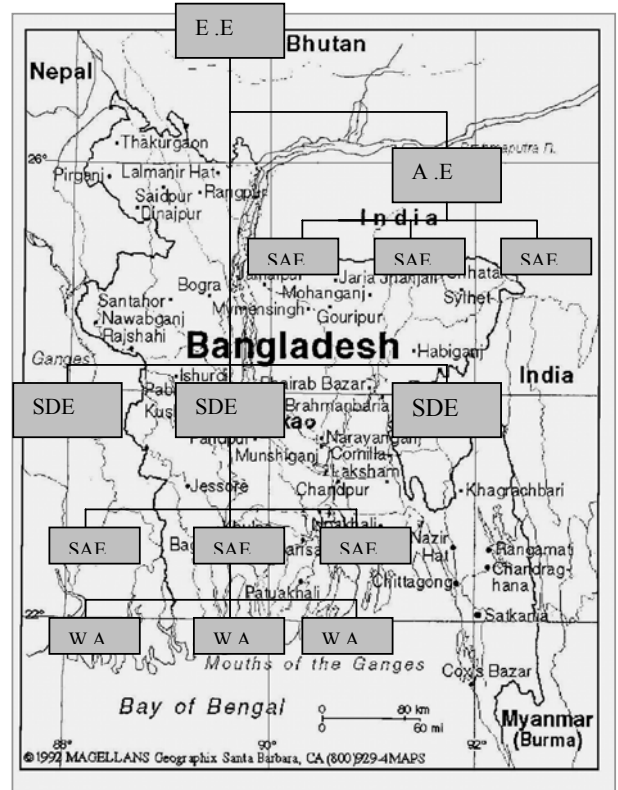
Description of the Project

The proposed project will be 100 unit flats, area of each flat will be 1800 sft and 1.5 hector land will be required to accommodate those flats in 10 nos. of building. Each building will be 6- storied with lift and car parking. The total estimated project cost would be 256.90 million Taka (50.00 million SEK) in local currency.

The Country

Background

Bangladesh, dominated by Muslim population, emerged as an independent nation in 1971. A proto Australoid people as its earliest inhabitants, who were joined by the Dravidians from Western India and the Aryans from Central Asia. Through the passage of time there was an influx of people of other races-the Arabs, the Turks, the Afghans and the Persians-who made Bangladesh their home. Amongst the Europeans who came for trade, the Portuguese were the first followed by Dutch, the French, the Armenians, the Greeks and the English. As a country of communal harmony and tolerance Bangladesh acted as a melting pot of various culture and religion- Hinduism, Buddhism, Christianity and Islam.



Map of Bangladesh

Other Features

Bangladesh lies in the northeastern part of South Asia and bounded by India on the north, the west, and the northeast, and Myanmar on the southwest and the Bay of Bengal on the south. The area of the country is 147,570 sq.km, except some hilly regions the country consists mainly of low, flat and fertile land. The country has a river network of which the Padma, the Jamuna, the Meghna, the Brahmaputra and the Teesta are main rivers. The total forest area of the country is only 15% of land area.

The present population of the country is 125 million. The percentage of urban population is 25. The growth rate of population is 2.00 per year. Due to huge population the labour wages are cheaper than the developed countries. To provide jobs most of the projects are labour intensive. Bangladesh enjoys a sub-tropical monsoon climate.

Dhaka is the capital city of Bangladesh. The population of which is near about 8.00 million. To accommodate such a huge population in a comparative small area high-rise apartments are required in the city by both in the private and govt. sector. Chittagong, Rajshahi, Khulna and Sylhet are other big cities of the country. The total country is divided into six divisions then into sixty-four districts. Bangladesh has a parliamentary system of government. The Prime Minister is the chief executive of the country. During political crisis progress of development works hampers.

There are 11 govt. Universities, 1,200 colleges, 11,000 secondary schools and 66,000 primary schools for general

education and 4 Engineering, 13 Medical colleges, 1 Medical University, 18 Polytechnic institute, 51 Vocational institutes etc. for technical education in the country. Also in private sector there are many universities, colleges, and schools. The number of passing out students from the educational institution in every year is more than the job requirement of the country. So due to the unemployment or to have a better job a good nos. of technical people immigrates to the developed countries.

The country has mainly agrarian economy, about 70% population is directly and indirectly related to this sector and contributing 35% of the Gross Domestic Product. Rice, Wheat, Jute, Sugarcane, Tobacco, Oilseeds, Pulses and Potatoes are main crops of the country. Bangladesh gets its energies from natural gas & hydro electricity. The country's major exports are Jute, Tea, Ready Made Garments, Leather and Tobacco. Natural calamities hits the country almost every year causes great loss to agriculture production and export.

Design Stage

Project Organisation

The Department of Architecture under Ministry of Housing and Public Works prepared the architectural working drawings and Design div-II of P.W.D prepared the structural designs of the highlighted project. The implementation of the project is entrusted under P.W.D Maintenance Division, Dhaka.

The Division office is the main basis of project implementation in Public Works Department. The tendering, procurement, purchasing, contracts signing, payment to the contractors, issuing Govt. Cheque and continuous supervision of works is done by this unit of organisation. Executive engineer heads the division. There are either two or three Sub-divisional engineers, one Assistant engineer and three Sub assistant engineers under one Executive engineer. In the sub division office under one Sub-divisional engineer there are three sub-assistant engineers & six work assistants to assist him. The sub assistant engineers mainly do the works of quantity survey. The Sub Divisional engineer is mainly responsible for the quality and quantity of works done in the project. The S.D.E also does the works of cash purchase. For the underconsidered project a committee is formed headed by the Chief Engineer of P.W.D to monitor the projects one in every one-month. The organisation of the P. W.D Maintenance Division may be shown as Figure. -2

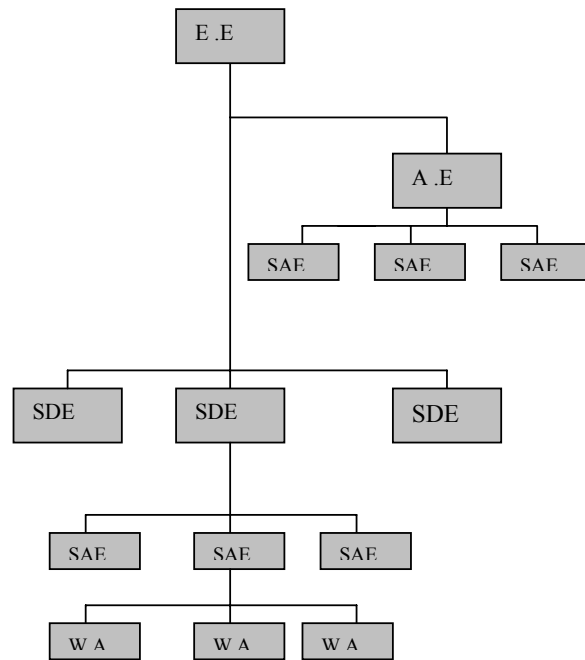


Figure.-2 Organogram of PWD Maintenance Division

*E.E=Executive Engineer, S.D.E=Sub Divisional Engineer
S.A.E=Sub Assistant Engineer, W.A=Work Assistant*

Purchasing, Procurement and Contacting Forms

As per tender clause of the project supply of all materials requires for the works will be taken from the concern contractor.

The contract agreement with the contractor is done under Form-2911 basis. It is a prefixed govt. form, used in every govt. construction work.

The main feature of the contract documents is as below: -

1. The document contains bill of quantities, items of works, rates and quantities.
2. Quoting of rates is on percentage above or less of total cost.
3. Time schedule of completion of project work.
4. Specification of works.
5. Condition of payment of bill.
6. Condition for acceptance of tender.
7. Condition for payment of S.T. items and NT. Items that evolved during execution of work.
8. Amount of taxes and security for the warranty period. Condition & specification for site management.

The figure: -3 shows the contract procedure followed in the project.

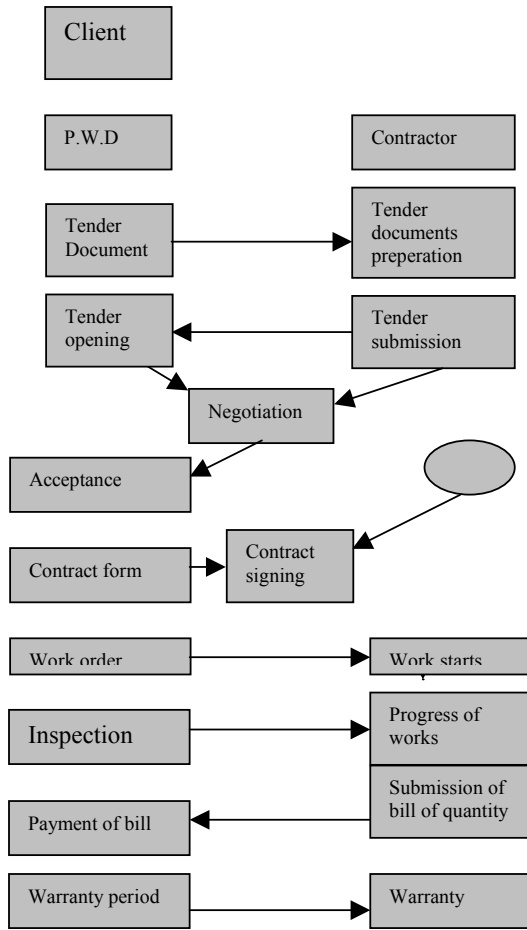


Figure: -3.Contract procedure

Project Planning

To solve the housing problem of senior govt. officials in the Dhaka city the Ministry of Housing and Public Works on it's meeting on 30-10-94 decided to constructs 100 nos. flats at different places of Dhaka City It is also decided that the flats will be in the vacant places within the govt. houses so that the price of land can be excluded from the project cost. The buildings will be 4 –storied, load bearing brick structure. Initially the cost of the project estimated around 200.3 million Taka. But considering the high cost of land, and to provide parking facilities in the ground floor the decision has been changed by the concern ministry to built 6-storied frame structure buildings with lift and parking facilities.

Accordingly the preliminary architectural drawing is prepared by Department of Architecture.Based on the preliminary drawings a rough estimates is prepared by P.W.D Maintenance Div., which form the basis of project concept paper, the rough estimate is prepared on the basis of P.W.D schedule of rates effective in 1998.The Project concept paper contains aim, objective, and description

of the project,project cost,financing,effect of the project ,financial return ,employment opportunity ,production ,enviromental impact,recuring expenditure,project impemention period etc.

The Ministry of Planning Approved the P.C.P of the project. The final estimated cost for 100 flats standd to 256.9 million Taka.Accordingly the Department of Architecture prepared the working architectural drawing and P.W.D Design Div.-11 done structural design.

Project Financing

The project is financed from annual development programme of Bangladesh Government.The enter amount is in local currency.

Budget and Budget control

The estimated cost for the project considered 256.9 million Taka.No price escalation is included in the project cost considering P.W.D's schedule of rates will be unchanged during the implementation of the project.

But the budget flow and disbursement was curtailed in the middle of project completion due to great loss of govt. Revenue by the devastating flood.

Information Technology

Most of the information technology using in this project is in form of office letters. Use of modern information technology like computer and fax machines are used in compilation of data and monitoring progress of works to Ministry only. The flow of information within different offices and the contractor may be shown by following flow chart.

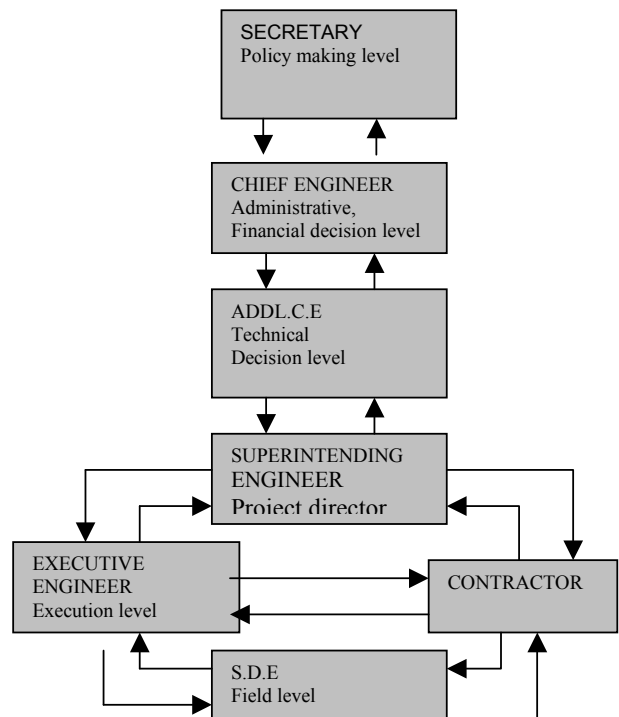


Figure.-4. Informatiom flow chart.

Experiences to use in future projects

P.W.D standard specification and Turnkey system is applied in this project which helps a lot to maintain the time schedule of project Generally the project works of P.W.D is done by three types of contractor for three categories of works such as 1) Civil work 2) Sanitary and water supply & 3) electrical works. But it becomes very difficult to maintain the sequence of works by three different contractors on time. In this project, three different categories of works are offered to one contractor and it is termed as turnkey basis contract. Initially the project progressed well but due to shortage of fund disbursement the contractors are unwilling to maintain the time schedule.

So for the future projects it should be planned to have availability of actual fund disbursement and turnkey system.

Conclusion

The work is carried out in a traditional method of P.W.D. The advance machines tools like concrete batch plant, material lift and cranes are not used in this project. The programme schedule of work is done by a bar chart. Bar chart is rescheduled due to non-availability of required fund. That means the project extended beyond 10 month. The progress report is not much specific, which could not reflect the field conditions.

In future the above considerations should be reflected for better implementation of any project.

Production Stage

Tendering and Contract Document

P.W.D Maintenance Div. Prepared the model estimate of the project on the basis of P.W.D schedule of rates' 1998. The model estimate contains the civil construction work, Sanitary and water supply work and electrical work. The project director of the project invites the tender. The special class contractors (Prequalified for turnkey contract) were illegible to participate in the tender and the time schedule of completion of work was 10 months. For construction of 10 nos. of building 9 nos of construction firms came out successful in the tender bidding. The work order is issued by the Executive Engineer Maintenance on the following contract document basis.

1. 2911 form is used in every contract.
2. Rates are in percent above or less on the estimated cost
3. Time of completion of the project is 10 month from the date issue of work order.
4. Work specification, Design procedure and quality control rules are in the contract.
5. Payment of bill of quantities are-Measure-and-Value contract method.

Production Planning

The successful construction firms are asked to submit a Bar chart to the field office and as well as Project director office before starting the work. This is the only tool for implementing and monitoring the project. C.P.M or no other modern technique is applied in this project.

Secretary Ministry of Housing and Public Works heads the monitoring committee. P.W.D and Department of Architecture monitor the project by getting the progress report from the field level and through a series of meetings, discussions and site visits from various level.

The consolidate progress report is done in a computer by the project director for the actual and expected progress of work and incurred and expected expenditure. Which is then examined and compared by the monitoring committee and instructions are circulated for further actions to be taken by field office for successful completion of the work.

A finishing schedule of work is prepared jointly by Public Works Department and Department of Architecture to attain uniformity of finishing works at different sites.

It is very many commons in Bangladesh that the projects always experience cost over run due to failing in time schedule. The fate of the said project may be same if the total disbursement is not available within this financial year.



A view of one of the newly constructed apartment building. Only the structural part is completed

Quality Assurance

The project's Quality Assurance is maintained by two phases. First the Quality of material supplied to the site and Second during the execution of work. In the first phase, when the concerned contractors arranged the construction materials to the site, the Sub Divisional Engineer checks first and if required approval from Executive Engineer or Superintending Engineer should be taken. In the case of stone, cement and reinforcing steel the samples are taken from work site and tested in the laboratory of Bangladesh University of Engineering Technology. The physical properties of bricks and sands are tested at the site by S.D.E concern and for Checking the chemical properties it is sent to the laboratory.

In the second face during execution of works, the items of works are checked and verified. All the concrete works are done in presence of Sub assistant engineer and the random samples are collected by S.D.E concern. These random samples are regularly sent to testing laboratory. Any items failed to attain the desired strength are removed from the structure. Moreover Executive Engineer, Project Director i.e. Superintending Engineer and often Additional Chief Engineer Inspected the site to co-ordinate the quality and progress of the works

Economic Control, Budget Review and Reconciliation

During the contact period the rates of bill of quantity would be remain same. So if the required fund is available within this year, there is little chance to change the project cost. But if the fund disbursement dalyed the contractors may not interested to continue the work. Then fresh tender is required for further construction, which may require more time and money. Under the project 10nos.of buildings are constructed in 10 different place of Dhaka City.Due to change of soil condition the volume work of foundation varies to 4% of total cost of the project. But the tenders are excepted 5% less than the estimated costs this variation does not affect the project cost. Since the project is on going one, we cannot to the budget review.

If the entire required fund available in time the project would be finished in schedule time also within the budget.

Experiences to use in Future Projects

Project should be design with clear picture of fund disbursement in a single fiscal year. Advance method of construction like concrete batch plant is very much required for better quality control of concrete. Procurement of material should be bulk quantity for uniformity in construction. By standardising some parts of construction components like doors and window, ventilators etc and prefabricate it in industries the onsite production can be reduced and quality control can be simplified.

Conclusions

By gathering the experience in production stage we got the idea that project should have following criteria to improve the implementation process.

- Fair idea about fund.
- Turnkey system of tender.i.e's civil construction, sanitary and water supply and electrical work should be done by a single contractor in one project.
- Quality control should be entrusted on contractors with ISO 9002 certificates.
- Monitoring the project work by computer from the field level.
- Design and planning by CAD.Inrtoducing CPM and other modern method both in the design and site.

- Prefabrication of standardise large quantity units.Like doors, windows,partitions e.t.c

Property Management

Life-cycle Economy

P.W.D has it's own "standard specification" of construction work and "schedule of rates" for construction. These are used as the benchmark of national construction, and respectively standard and competitive in price considering the present market condition of country. All the buildings that P.W.D used to construct are belongs to govt. And financed from state revenue budget. Since the buildings of said project will be used by the govt.officers in subsidise rate of rent it is difficult to calculate the life cycle economy in the formulated way. But for economic and efficient use of state money the life cycle economy should be measured in advance before implementing the project.

Maintenance Planning

P.W.D maintains most of the govt. Buildings in a standardise way. The "division" unit of P.W.D of a particular area under the disposal of "executive engineer" is mainly responsible for maintenance work of all the govt. structure of that area. The maintenance works are divided into three parts.

1. Daily maintenance and house keeping work. Which includes repair to small defects, maintaining the utility lines and attending the complains of users.
2. Annual Maintenance, done once in a year. Which includes all type painting, small structural repair e.t.a.
3. Quarterly Maintenance, done once in every 4 year. Which includes small-scale renovation, changing old service lines, major repair to doors windows and toilets.

When major renovation required for a building a special repair estimate is required for approval of concerned authority for that and after getting fund the renovation work is taken up.

Following procedures are required to maintain a building

Under P.W.D maintenance programme. After completion of building, P.W.D sent a completion report to the Director of Accommodation through the Secretary of the Minitry.Secretary plays an important role as the chairman of the Board of Accommodation and Chief Account Officer of the Ministry.as a Chairman he is responsible for the allotment of flats/residence and as a Chief Account Officer he takes the responsibilities of all expenditure of the Ministry.

The Govt. Employees are getting additional 40 to 50% of their salary as house rent allowance. The person, who gets a govt. accommodation, cannot receive this house rent allowance, moreover he has to pay 5 to 7.5% of his salary as ahouse rent to govt. In this way govt. collects the revenue and compensates maintenance cost.

First year is the warranty period of newly constructed building. During this warranty period the concerned contractor is responsible for any maintenance of the building. The first three years there is no maintenance fund except house keeping and daily maintenance only. From the 4th year the Ministry of Finance starts to place the maintenance fund in every fiscal year. Normally 1% of the present cost of the building is calculated annual maintenance fund requirement. In addition to that in every 4 years another 2% of building cost are calculated as quarterly maintenance fund. In some special cases it may rises to 4%.

The executive engineer is empowered to give sanction to daily maintenance work. The superintending engineer has got the power of annual repair and quarterly repair upto 100000.00 Taka for a single structure. Approval for special repair and any amount are given by Additional Chief Engineer subjected to availability of fund.

The Running cost of building i.e. payment for utilisation of electricity and cooking gas is made by residing person. The municipal taxes, water and sewerage service

Charges are paid by govt, a small amount for these facilities are deducted from the monthly salary.

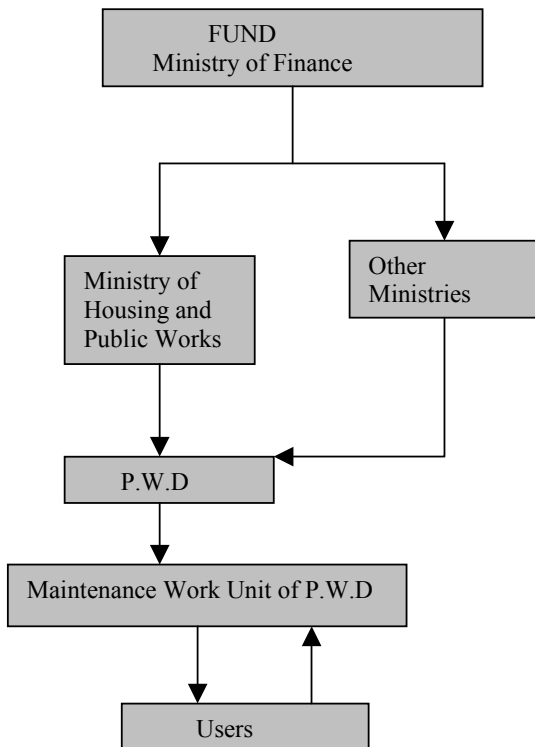


Figure.-5 Shows maintenance flow chart.

Connection to the Design Stage— Feedback

During execution of work as a project manager I have suggested some new product like concrete hollow blocks to be used as a partition wall instead of normal bricks to minimise the cost of building as well as lowering the building load

Experience to use in Future Project

New building materials that has been introduced in the market should be included in the next P.W.D Schedule of Rates so that the cost of building and as well as time of construction can be reduced.

Conclusion

Life cycle economy is very much important issue to construct a building. Though in P.W.D scope of calculating the life cycle economy in a formulated way is difficult, means to be introduced to calculate the life cycle economy of building before construction.

References

- a. Model estimate of the Project.
- b. P.W.D Standard Manuel
- c. PCP of the Project
- d. Govt.Contract Form no. 2911
- e. Different lecture scripts of ICM, LCHS.
- f. Statistical yearbook of Bangladesh.
- g. Contemporary Architecture Bangladesh