TOWARDS TEACHING MEASUREMENT OF BUILDING WORKS IN NIGERIAN TERTIARY INSTITUTIONS.

BY
MAKINDE JOSEPH KOLAWOLE (M.Tech)
makinde.joseph@gmail.com

Abstract

This paper reviewed the various measurement techniques adopted for civil, building and heavy engineering works as it is known today. The aim is to examine and highlights the principles of measurement conventions / techniques in countries such as Australia, New Zealand, Canada and the Americas in relation to measurement convention adopted in Nigeria. A further analysis of the contractual arrangement in Europe and their standard form of contract with specific reference to France, Belgium, Italy and Denmark were carried out. It is concluded that stakeholders in education sector in Nigeria should evolve a policy that will encourage harmonization of measurement techniques for building works in tertiary institutions.

Keywords: Construction, Measurement, Standard, Tendering,

Introduction

The measurement of construction works involves the measurement of construction resources such as material, plant and labour. These are measured normally as inclusive and not separated but are referred to as the basic quantities. The measured works come alongside with work specifications, giving details of size, material, location and process. The two combined to form what is known as quantified specification. The standard method of measurement for building, civil, and heavy engineering works serves as the basis for measurement. This is a document produced by professional bodies in conjunction with client/contractors organisation and the labour union. Tenders are offer by the contractor to the client stating the price at which he is ready to execute a construction contract at a given time period. This is normally done through different Standardized process of tendering and in some cases, customized arrangement could be made. This paper seeks to understudy the various measurement Conventions/techniques of construction work being taught in Nigerian tertiary institutions.

Historical Account of the Standard Method of Measurement for Building, Civil and Heavy Engineering:

In 19th century Britain, as the Industrial Revolution was producing an ever increasing workload for the building, builders came to realize that there were duplicating of effort by measuring the same quantity of work from the architect's drawings in order to prepare bids. The obvious answer was for them to get together and employ one person to measure the work and detail it in a book known as Bill of Quantities. Then, each builder would price the work. The successful builder would pay the person who prepares the quantities (and who became known as a Quantity Surveyor) and include the fee in his bid. Since the building owner or developer ended up paying for the quantity surveyor's service anyway, it finally dawned on them that they might as well employ him directly and get some cost advice as well.

One problem that soon reared its head was that different quantity surveyors would measure work in different ways, and disputes could easily arise when a builder claimed an extra for an item of work that the quantity surveyor had deemed to be included in the measurement of a related item. What was required was an agreed standard set of rules defining what was to be measured. The surveyors' institution (which later became the Royal Institution of Chartered Surveyors or RICC) produced such a set of rules, known as the standard method of measurement (SMM) in 1922. This has been updated over the years as construction techniques and materials changed. There are also other SMMs published for specialist areas of work, such as civil engineering.

The quantity surveyors and the Bill of Quantities were not confined to Britain. As the Empire grew, a lot of building work was required. Naturally, it was British expertise that was involved in designing and procuring those buildings. As these countries started to go their own ways, so did their QSs, and now quantity surveying with attendant Bills of Quantities is not only practiced in the Commonwealth countries but also in many other parts of the world.

Aim And Objectives

The aim of this paper is examine the existing measurement conventions in some Commonwealth countries in relation with the Nigerian Standard Method of Measurement. The specific objectives are;

(i) To evaluate the existing measurement conventions as practiced in some Commonwealth countries.

(ii) To evaluate the Nigerian Standard Method of Measurement provisions for building works.

Measurement Conventions In Some Commonwealth Countries

Australia and New Zealand

In Australia, only one standard method of measurement is in use which is referred to as the Australian standard method of measurement of building works, 5th edition which was sponsored by the Australian Institute of Quantity Surveyors, Master Builders Australia Incorporated and it was adopted in 1995. However, it is rarely used in private sector projects. The bills of quantities are used in the same manner, as in the UK. The quantity surveyor (or sometimes the architect) prepares the BQ according to the rules of measurement set out in the locally produced standard method of measurement. The practice is similar in New Zealand, which has one SMM in use called New Zealand standard 4202 which is sponsored by standards council. It is always named in the contract documents. Another SMM that is no more in use is New Zealand 4204 Engineering method of measurement. (RICS, 2003).

Canada, although historically attached to Britain seems to have been influenced by its neighbour, because it does not use BQ's. In Alberta, method of measurement of construction works based on Standard unit & Imperial Version are in use. It is sponsored by the Canadian Institution of Quantity Surveyors. It is not regularly recommended by the national bodies and sometimes named in the contract documents. It is available in either English (ISBN 1-896606-28-8) or French (ISBN 1-896606-42-3).

In New Brunswick, method of measurement of construction works sponsored by the Canadian Institute of Quantity Surveyors is in use; it is recommended by the national body and sometimes named in the contract document. Furthermore, in Ontario, two SMMs are in use which are method of measurement of construction works, 7th Edition and Elemental Cost Analysis (format, method of measurement, pricing), measurement of building by Area and Volume, Pricing. The two are sponsored by Canadian Institute of Quantity Surveyors though are not recommended by the national bodies. It has never been mentioned in the contract documents.

The United States, despite its size and enormous construction programs, stubbornly refuse to consider the use of Bills of Quantities. However, Guyana, and in most Islands in the Caribbean, BQ's prepared by Quantity Surveyors are the recognized method of obtaining bids and maintaining cost control during the contract. (RICS 2003)

Contractual Arrangement in Europe and Standard Form of Contract

In France, contractors normally prepare their tenders on the basis of specifications and drawings but Bills of Quantities are sometimes used in Lile and Lyon regions. The contract documents which are prepared under the direction of the Architect or Engineer include drawings, wither detailed or outline

control drawings only, depending on the type of contract, specification, comprising a general specification and a detailed specification for the particular scheme, national codes of practice, contract conditions, contract agreement, form of tender and an agreed programme of work submitted by the contractor at the time of tender, together with a schedule of rates or similar analysis of the tender for variation purpose.(RICS,2003)

There are three principal types of tender in France which are used in both public and private works. These are the negotiated tender which is very popular with private clients, the 'adjudication' tender which is a competitive tender often used for public works and the 'appeld 'offres' tender which is used equally by both the public and private sectors. It is usual for contracts to be on a lump sum basis permitting variations and fluctuations, the latter being adjusted using a formula and monthly published indices.

In Belgium, the tender and contract documents are prepared either by the architect or Engineer and normally include; Drawings, Form of Contract, General specification for material and workmanship and a particular specification, any quantities which are necessary for compiling the tender almost always being prepared by the contractor. Although standard specifications are published, a standard form of contract does not exist apart from those issued by Government Departments for public works and government subsidized housing schemes. Methods of tendering include selective tendering (preferred for private work), negotiated and public tendering which is used for Government contract. Contractors tendering for public work must hold a license issued by the Government stating the type and size of work which they may undertake and they are only permitted to tender for work covered by their license.

Contractors usually receive payments on account during the course of the contract. These are subject to retention, the method of payment being specified in the contract conditions. The payment are normally made on completion of various stages of work but when the re-measurement contract is used, the work is normally measured and valued monthly using the schedule of rates.

Seeley (1997) explained that the building industry in Italy seems to be less well organized than most others in Europe, with building regulations – of which there are many practices, fees etc. varying from local authority area to another. Apart from the principal professions of Architecture and Engineering, there is also a type of 'general surveyor' known as 'geometra' who is permitted to design and supervise work of a small nature. Architects and Engineers do not always supervise construction or lead the building team as it is common for a client to employ a 'Director of Works' or 'Project

Coordinator' who will be directly responsible to him for the whole project including design, construction programme, progress on site etc.

The principal types of tender and contract in Italy include negotiation, package deal and contracts based on open and selective tendering, the former two methods similar to those used elsewhere. Selective and open tendering methods are mainly used by government and public works authorities; contractors are given in addition to the documents an estimate of cost of the project and they are required to tender a percentage addition or deduction to this. Very often, limits are set by the client as to the amount of percentage variations, which are permitted in an attempt to insure that tenders are reliable.

In the same vein, the Danish building industry is highly organized and very sell served with legislation, building regulation, code of practice, research and standard institutions etc. There is a standard form of contract and this has very strict clauses concerning contract programme and price. Generally speaking, extensions of time and fluctuations are not permitted but in certain circumstances beyond the control of the contractor adjustments are allowed.

The tender and contract documents in addition to the standard form of contract usually consist of the progress chart or programme, detailed specification, drawings and form of tender, Bills of Quantities are sometimes given to tendering contractors, although this is not usual practice, most tenderers preferring to prepare their own schedule of quantities. (RICS, 2003).

In Germany, the practice is similar to France. Standard contract and tender documents are published by the Federal Government in the form of the VOB verding ungsording fiir Bauleisturgen – which in turn is covered by a series of DIN. The VOB contains standard specification clauses for labour and materials, contract clauses and technical requirements and forms the basis of all government contracts and usually used for private schemes as well. When supplemented by drawings, approximate bills of quantities and special contract clauses, the VOB forms the tender and contract documents.

Contracts are usually placed as lump sums being remeasured on completion and permit both variations, the costs of which are often agreed before work is put in hand, and fluctuations, unless the contract period is very short. A list of tenderers is compiled either by public advertisement, the most common method for public work, or by selection from a short list; occasionally tenders are negotiated with individual contractors for private schemes. (RICS, 2003).

International Contract System

According to RICS 2003, It is usual for all except the smaller jobs to adopt one of the standard forms of contract. The main advantage of using a standard form is that the persons using it are familiar with its contents and in particular the contractor is aware of his obligations at the time of tendering without having to make a detailed study of an unknown form. The contract documents are: Tender, Agreement, General Conditions, Drawings, Bill of Quantities and Specifications.

Three standard forms of contract cover the bulk of construction work carried out in the United Kingdom. These are the Standard Form of Building Contract intended primarily for building works; the ICE Conditions of contract used primarily for civil engineering works; and General Conditions for work produced by Central government for both building and civil engineering works. Under the Standard Form, the contractor is required to complete the works in accordance with the contract documents and to use materials and workmanship of the specified quality and standard and they shall be to the reasonable satisfaction of the Architect. The table below shows the similarities and differences in the measurement techniques used by some commonwealth countries

Table 1- Identified Similarities and Differences among some commonwealth countries

classification country	Comparison analysis
Australia	Purpose of standard method of measurement (SMM) is to provide a uniform basis of measurement.
Canada	Work measured as net in position.
Ireland	Allows for the provision of Location Drawing and Bill Diagrams to aid the descriptions of time.
United Kingdom	Location to be provided in descriptions unless evident from drawings or other information required to be provided by these rules.
Singapore	Purpose of SMM is to provide a uniform basis of measurement Enabling the exchange of date between SMM, National Productivity and Quality Specifications CAD drawings

Source-Jae Hoo Cho etal (2008)

Measurement Convention Practiced In Nigeria.

The Building industry in Nigeria has come to a long way. All along the World wars, up to 1960, it had been British oriented both in design and operational modus. Thereafter, various incursions were made from other areas of Europe and America. All these innovations and our inborn concept metamorphosed into a new complexity which can rightly be regarded as a Nigerian Building industry culture. This obviously necessitates a new approach to measurement of building works.

Right from the period of independence, Nigeria has been following the British System of measuring building works. Hence, the Nigerian standard method of measurement for building works had been of British model and at any time the British changes their Standard method of measurement of building works due to technological changes in their building industry, the Nigerian Institute of Quantity Surveyors will only follow suit without due regard to our own traditional system of building.

It is obvious that the basic need for a uniform method of measurement is to accord all tenderers a common basis for computing their prices. This in effect creates a congenial platform for comparison of quotations and makes easier, the settlement of claims and variations. (SMM, 2006)

Following the decision to adopt the use of the metric system in the construction industry, Users have now had considerable experience of the fifth edition of SMM and are not expected to assimilate changes in principle at a time when they need to accustom themselves to metric measurements and decimal money. For a period both imperial and metric editions will be in use, so the principles, with a few minor exceptions, are the same and the substitutions natural, but not literal. In Nigeria for instance, the use of metric quantities does not preclude imperial units in the description of individual items. Virtually, the majority of building artisans in Nigeria are trained in the imperial units system of measurement.

Nigeria, like most parts of the commonwealth, inherited the use of the Standard Method of Measurement for Building Works and still uses it without any modification whatsoever. The performances of existing SMMs in Nigeria were unsatisfactory. This was attributed to excessive-unnecessary details in measurements, inadequate communication effectiveness and inadequate consideration for local practice and stakeholders. Majority of the building operatives in Nigeria are not in tune with the existing Standard method of Measurement which was British- tailored. Not only that, do the contractors in Nigeria of the same knowledge in pricing with their counterpart in UK?

Based on the above observations, there is a need to propose a new curriculum for building works measurement to be taught in Nigerians higher institutions which will include some building trades tabulated below;

Table 1.00

TRADES	As measured in SMM	Proposed measurement	Remark
1. Blockworks	Measured in Square meters	Measured as number of blocks laid per day/week	
2. Reinforcement	Measured in Kilograms	Measured as market length	
3. Formwork	Measured in linear and square meters	Measured in plank length	
4. Earthworks and Excavation	Measured in meters, square meters and cubic meters	Measured in feet, square feet and cubic feet	
5. Painting	Measured in linear meters, square meters	Measured in gallons (4 litres /20 litres	
6.Hardwood for roofing trusses	Measured in linear meters	Measured in plank length	

Source: Researcher's field works (2012)

According to Mogbo 1977, there is a need to relate measurement and Standard methods of measurement to extant developments in building industry in Nigeria.. It is therefore imperative that the curriculum and synopsis on measurement courses being taught in Nigerian tertiary institution should cover both the imperial unit and metric unit of measurement in order to afford graduates in this field more versatility.

Conclusion

The standard method of measurement for building, civil, and heavy engineering works serves as the basis for measurement. This is a document produced by professional bodies in conjunction with client/contractors organisation and the labour union. One problem that soon reared its head was that different quantity surveyors would measure work in different ways, and disputes could easily arise when a builder claimed an extra for an item of work that the quantity surveyor had deemed to be included in the measurement of a related item. What was required was an agreed standard set of rules defining what was to be measured.

Recommendation

In the light of the above, there is a need to harmonize the measurement techniques being taught in tertiary institution in such away that the practitioners can have uniform basis for measurement of building works. In addition, building industry should as a matter of urgency convene a stakeholder conference on the need to prepare a new set of guidelines, condition of contracts, and overhauling existing regulations operated within the building industry. The Nigerian Institute of Quantity Surveyors and Builders federation should develop a framework for a new Standard Method of Measurement for building works which when published will gradually phased out the inherited standard method of measurement from United Kingdom.

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