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A Comparison of Workmanship Values in Construction Manufacturing for Turkey and Suggestions

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Abstract: - Today, the need for the structure is significantly increasing in parallel to the increase of the human population. In this regard, the structure will be construct must be built at a healthy and timely manner. Some of the plan engineers compress the workers to do the job predicting a very short time for any construction entry, and this decreases the productivity. This compression also brings an important issue about the worker safety. On the other hand, some planning engineers extend this time considering the workers, and as a consequence, this leads the construction never comes an end at the intended duration. Making a proper planning when build an economic and reliable structure will minimize such these problems. In this study, twenty-five workmanship values related manufacturing from the Ministry of Environment and Urban Planning, and implementation period of the construction companies during the construction was obtained, organized and compared separately. Some suggestions were made based on the results obtained.

Keywords: - *Constraction Management, Manufacture, Workmanship, Man/Hour, Structure*

I. INTRODUCTION

The increase of people's needs such as shelter, transportation, and etc. in parallel with the rapid population growth at today's society reveals the importance of the construction sector. The most efficient and appropriate way of the fulfilling these needs are among the most important topics of civil engineering. Besides the importance of structuring associated with the growing population, it is also important the time spent during the construction. Indeed, if any project that is subjected to claim is not built in parallel to the increasing population speed, there is no point to raise the project which is not there when necessary. Manpower is needed at every stage of any project. Therefore, one of the most important production factors at every stage of urbanization is human being. People are working as a whole with the most important factors of production as labor, power, efficiency, and the time. There should be a business planning the phase of manufacturing such requires less power in a short time and where productivity is high. Also, there should be a work program that will describe the business planning. To prepare a right work program, manufacturing constituent workmanship values are required to be realistic. Less difference between workmanship values and the real practices values means the structure is efficient, and will end at the designated time. Presence of the realistic man-hour values that are used to describe the construction items and workmanship values, which one of the elements constitutes the construction items, has crucial importance to determine the structure that can be completed within the scope of the work program. In this study, assessments for the unit price of 25 man-hour rate have been made that it was published in Turkey by Ministry of Environment and Urban Planning, and also widely used by the private sector and the public. To determine the formed unit prices of man-hour values in this study, some interviews and surveys have been performed with construction companies to obtain the average man-hour value in practice. Observed man-hour values were compared to criteria announced by Ministry of Environment and Urban Development [1] and then some suggestions have been made.

II. MEHODOLOGY

All the facilities located on ground and underground that built using various construction materials to meet the needs of creatures are called structure. Basic features expected from any structures being safe, economic, aesthetic and functional. There are many parameters that affect the economics when building a construction. The total cost of a structure may be expressed as expenditures that made in whole the process that begins with the determination of the needs, continues service life of the structure and the cost of removing at the end of the structure [2]. Before starting any construction, preliminary exploration cost and approximate cost of the construction are found. Before prepare the project or in the first stage of project preparation, by doing some preliminary determination related total construction area of the building and construction quality, an approximate construction cost of the building may be estimated [3]. At the construction and other works, to

calculate the done or built amount of manufacturing is called quantity. For any manufacturing, the total monetary value of manufacturing constituent parameters states manufacturing unit price for that manufacture.
There are some uncertainties and risks related the projected cost, quality and ending time for any structure [4]. For the minimum uncertainties and risks, all the components that bring the structure together (projects, specifications, quantity calculations, work program, approximate cost, geotechnical reports, unit price analysis, etc.) must be completed and must be realistic [3]. Unit price is one of the criteria that used to calculate construction costs by the administrations and building owners. Any unit price analysis related manufacturing states the followings that the amount of materials that used in order to create that manufacturing; production style and order; application terms; amount and scope of the work; and what is included or not into the unit price and at what rate if it is included. In this study, the values of labor that generates the unit price have been taken into account. To describe the values of labor the concept of man-hour is used.
Work efficiency can be referred as the amount of work done at unit time (hour or day) or the time required to complete the unit manufacturing. At this point, man-hour concept is used to show the workers' productivity at the building manufacturing. Man-hour concept states that the time required performing a unit manufacturing. The point to be underscored that the times obtained from man-hour values are the unit work done by only a worker without using a machine [5]. Using the man-hour relationship; project planning, proposal preparation, the process of creating a work program is carried out more efficient and in a targeted manner. The small margin of error in man-hour relationship is also important for avoiding the economic losses.
Another important result that desired to reach in planning is the period of the completion of work. Man-hour data is also needed for the formation of this period. When amount of work and a worker's capacity are known, then work completion period and the number of workers needed can be calculated [5].
For the study, one to one surveys with the construction companies were conducted for the designated pose numbers. When selecting the companies, the manufacturing related chosen pose numbers are taken into account. After the company selections, an authorized technical staff who dominated with the subject was elected. The values obtained from the results of surveys arranging as unit/manufacture were compared with the values of Ministry of Environment and Urban Planning.

III. DATA ANALYSIS

By this research, man-hour values for twenty-five work phases have been obtained from the Ministry of Environment and Urban Planning. Man-hour values obtained from interviewed companies were organized and compared. Comparison results are given in Table 1.

Table 1. Man-Hour Values According to Pose Numbers Considered

Number	Pose Number	Work Phases	Measurement Unit	MEUP	Mean	Ratio
1	18.211/2	Roof Covering with Colored Concrete Tiles	m^2	0.30	0.133	2.25
2	18.231/2/MK	Roof Ridge with Colored Concrete Tiles	m	0.30	0.22	1.36
3	18.233/5A	Trapezoidal Aluminum Roofing Sheets (0.70 mm thick-30/50)	m^2	1.10	0.95	1.16
4	21.054	Wooden Formwork (the highest 4 m)	m^3	0.49	0.38	1.29
5	21.065	0-12.50 m Height Scaffold (for wall)	m^2	0.55	0.28	1.96
6	26.042/MK	Bilayer Terrazzo Square Plate With Normal Cement, Plane or Figured, Every Color, Any Size and Thickness	m^2	2.20	1.56	1.41
7	26.206/C1	3 cm Thickness Brocatelle Floor Covering	m^2	4.00	3.16	1.27
8	27.501/MK	250/300 Plain Plaster with Cement Slurry	m^2	1.95	1.58	1.23
9	27.511/MK	Plain Plaster with Lime Mortar	m^2	1.35	0.90	1.50
10	27.525/A1	Lime Rough-Cast and Gypsum Plaster (together)	m^2	1.35	0.90	1.50

11	Y.16.050/ 04	Produced or Purchased C20/C25 Central-Mixed Concrete and Concrete Pumping	m^3	0.45	0.18	2.50
12	Y.16.050/ 05	Produced or Purchased C25/C30 Central-Mixed Concrete and Concrete Pumping	m^3	0.45	0.18	2.50
13	Y.16.050/ 06	Produced or Purchased C30/C37 Central-Mixed Concrete and Concrete Pumping	m^3	0.45	0.18	2.50
14	Y.18.001/ C01	Building a Wall with 85 mm thick Horizontal Coring Brick (190*85*190 mm)	m^2	1.80	1.33	1.35
15	Y.18.001/ C05	Building a Wall with 190 mm thick Horizontal Coring Brick (190*190*135 mm)	m^2	1.91	1.40	1.36
16	Y.18.461/ 001	Twofold Waterproofing with Polymer Bitumen Sheeting with 3mm thick Plastomer Based (may bend at -5^o C) Fiberglass and 3 mm thick Plastomer Based (may bend at -5^o C) Polyester Felt	m^2	0.60	0.26	2.31
17	Y.21.001/ 02	Wooden Concrete Form	m^2	2.00	1.92	1.04
18	Y.21.050/ C01	Steel Tube made False Work (0.00-4.00 m)	m^3	0.36	0.24	1.50
19	Y.21.051/ C01	Steel Tube made Full Secure Façade Scaffold (0.00-51.50 m)	m^3	0.36	0.24	1.50
20	Y.21.051/ C03	Steel Tube made Full Secure Ceiling Scaffold (0.00-21.50 m)	m^3	0.30	0.24	1.25
21	Y.21.270/ 02	16 mm Oak Solid Hardwood by Gluing on Concrete Floor	m^2	4.00	3.24	1.23
22	Y.23.014	Cutting, Bending and Replacement of Φ8-Φ12 mm Deformed Concrete Reinforcing Bar	ton	50.00	29.00	1.72
23	Y.23.015	Cutting, Bending and Replacement of Φ14-Φ28 mm Deformed Concrete Reinforcing Bar	ton	42.00	24.00	1.75
24	Y.25.003/ 15	Two-Coat Water Based Matt Paint Priming Wet Plaster Surfaces (Interior Wall)	m^2	1.11	0.74	1.50
25	Y.26.005/ 302	(30*30) or (33*33) sized, all kinds of Patterns and Surface Features, first quality, Floor Covering with 3 mm Joint Gap using White Ceramic Flooring Tiles (with tile adhesive)	m^2	1.10	0.76	1.45

Description of the columns in Table 1 is given below:

The pose number describes the encoding used description of manufacturing by the Ministry of Environment and Urban Planning. Here, only pose numbers of man-hour values of the present study are taken into account. Work

phases indicate the manufacturing names that the names have been described by the Ministry of Environment and Urban Planning's pose numbers that used in the study.Measurement unit implies the unit of manufacturing described in the relevant pose. MEUP describes the man-hour relationship that anticipated for relevant manufacturing unit price found by analyzing the Ministry of Environment and Urban Planning. For instance; manufacturing pose analysis of "Cover of Roof with Colored Concrete Tiles" which a pose number of 18.211/2 has given in the Table 2.

Table 2. Analysis of 18.211/2 Numbered Pose (Data from www.birimfiyat.com) [6]

Administrative Code	Fair Number	Definition	Unit	Amount
BAY	04.038	Concrete Tile (colored)	Number	10
BAY	04.271	Galvanized Nail (TS 155)	Kilogram	0.05
BAY	01.016	Tile Setter	Hour	0.1
BAY	01.501	Construction Worker	Hour	0.2

Man-hour values of referred pose number are found in the Table 3 below:

Table 3. Man-hour values of 18.211/2 numbered pose

Definition	Unit	Amount
Tile setter	Hour	0.1
Construction worker	Hour	0.2
	Total	0.3

Mean states that the average of different man-hour values which obtained from survey performed for every work phase of construction companies.Ratio describes the rate of average man-hour values of present work to man-hour values of Ministry of Environment and Urban Planning. The value of 1 state that the compared results are same. If the ratio goes farther than 1, which means, there is a discrepancy between the compared results. When these results were investigated for the 25 production, distribution of the calculated production number is shown in Figure 1.

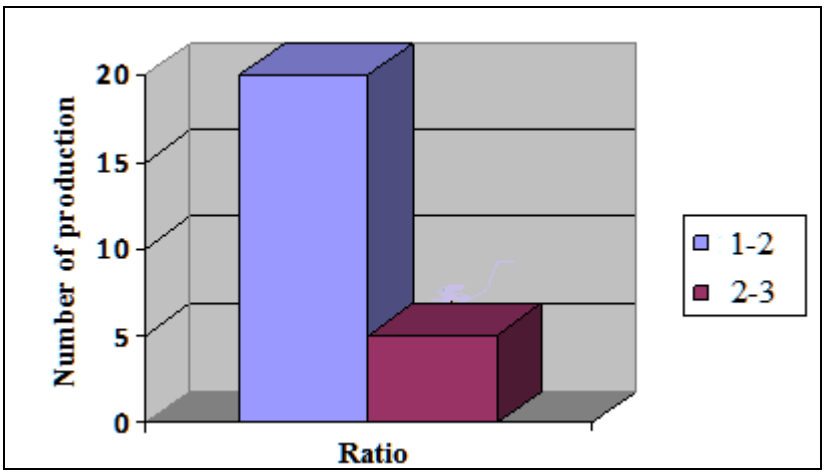

Figure 1. Production distribution of man-hour rate

The results showed that all of the 25 production man-hour values used in practice by the construction companies found less than the value indicated by the Ministry of Environment and Urban Planning. In the study, the average ratio is calculated for the 25 production found 1.62. When the ratio is investigated, the heavy works such as concrete and etc., Ministry of Environment and Urban Planning anticipates approximately 2 times much workmanship. Furthermore, the size and finishing values were found quite similar.

IV. CONCLUSION

Construction sector, which one of the leading sectors of the economy, consumes the majority of resources of the public sector, private sector and foreign sources that imported. Efficient use of the resources is the basis of the development movements. Therefore, construction management that targets the principle of efficiency in the construction industry has further increased its importance today. The manpower and time concepts constitute the most important part of planning the construction works. A unity that will be created with

these two concepts will make work progress and time management much easier. In the construction sector, in order to reach a better future targets this unity is needed. Failure of proper time management causes indirect economic losses as well as direct economic losses. Any work that cannot complete on time may cause huge economic losses. If the number of vehicles will pass daily on a construction of highway is considered 20.000 and the highway fee is considered to be 4 TL for each vehicle; a delay of one-day will bring about 20.000*4 = 80.000 TL indirect economic losses. Therefore, in a work program to be carried out for a construction work must be prepared considering the direct economic losses. Prescribed man-hour rates by the Ministry of Environment and Urban Planning is not certain to be greater than the values in the practice. The values obtained from the study are average values. There are many factors that affect these values. Some of those factors are the technology used, the qualifications of the workforce, local conditions, climate conditions, and etc.

Creating a sense of integrity between the work program and construction manufacturing; upper-level studies about the worker and worker productivity should be made and implemented.

The development of technology is closely followed and widely used by the construction sector. Man-hour relationship will be a variable parameter with the use of technology. Therefore, it is important to update these values.

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