CALCULATION OF LABOR AND MATERIAL NEEDS IN BUILDING AND HOUSING BASED ON SNI 2008 USING MICROSOFT EXCEL MACROS

Eman Setiawan¹⁾, Julistyana Tistogondo²⁾, Tony Hartono Bagio³⁾, Rouil Afaq⁴⁾

¹⁾Fakultas Ilmu Komputer, Universitas Narotama, Surabaya, Indonesia E-mail: eman.setiawan@narotama.ac.id
²⁾Fakultas Teknik, Universitas Narotama, Surabaya, Indonesia E-mail: julistyana.tistogondo@narotama.ac.id
³⁾Fakultas Teknik, Universitas Narotama, Surabaya, Indonesia E-mail: tony@narotama.ac.id
⁴⁾Fakultas Teknik, Universitas Narotama, Surabaya, Indonesia

E-mail: rouil.afaq@narotama.ac.id

ABSTRACT

In a project in the field of civil engineering before construction activities required prior to the calculation of the basic unit price of work (HSPK), the draft budget (RAB), as well as the need for labor and materials. During this process a lot of calculations done by Microsoft Excel Program manually input the reference design is the Indonesian National Standard (SNI). Microsoft Excel very easily recognizable function (user interface), but sometimes the difficulty browse through original value or loss of cell resource, in addition to the output of Microsoft Excel do not meet all the needs. There the results of the planners only in the form HSPK and RAB do not cover the needs of labor and materials. Microsoft Excel Macro is one of the alternative programs that can calculate HSPK, RAB, as well as the need for labor and materials. The program is simple enough where the zoom is also equal to excel and do not need to see the formula of each cell. Construction of two-storey house calculated all its needs using the Microsoft Excel Macros, but at a fixed volume calculation process using Microsoft Excel Manual. The coefficient is used as an input program Microsoft Excel Macros is SNI 2008 on buildings. The result is the unit price in accordance with SNI 2008, the draft budget (RAB), need for labor in Unit One Day, and material needs in a unit adapted to SNI.

Keywords: Microsoft Excel, Microsoft Excel Macros, SNI 2008, HSPK, RAB.

I. INTRODUCTION

1.1 Background

Development planning requires a calculation before construction starts, such as the basic unit price of work (HSPK), the draft budget (RAB), as well as the need for labor and materials. Reference designs that are used as inputs in the Microsoft Program Excell is Indonesian National Standard (SNI) as needed. During this time the planners do the calculations manually or auxiliary program Microsoft Excel using formulas and links excel. In general, Microsoft Excel program is very easy to recognize its function (user interface) for the whole design. Only drawback to this program is the difficulties in tracing the origin of value or loss of cell resource. In addition at the end of the calculation process and RAB HSPK obtained only in a project has not obtained the material needs and the needs of workers.

Aboutstandard, NFPA 2008, which contains the preparatory work (RSNI T-12-2002), soil, foundation, concrete, floor coverings, wall, stucco, wood, iron and aluminum, and the ceiling.

1.2 Problems

The problem in this research are:

How to determine the amount of labor, the amount of material in the overall project as well as how to make the coding for grouping data.

1.3 Limitation of Problem

Limitation of problem in this research are:

- 1. Not counting jobs other than those contained in SNI on the unit price in 2008
- 2. Do not analyze scheduling
- 3. Do not analyze the basic unit price
- 4. Calculation RAB (Budget Plan) only covers civil works without counting the tax and cost advantages (managerial jobs).

1.4 Objectives

To get the value of RAB, material and labor needs in accordance with the results of calculations using Microsoft Excel Macros in a project.

II. LITERATURE REVIEW

2.1 Employment Unit Price

Unit price is the currency of payment of a certain type of work including taxes and analyzed based on direct costs (labor, materials and equipment) and indirect costs (general costs and profit) (BalibangPu, 2012: 5).

The unit price of work (HSP) is determined by the price of the basic unit of wages, materials and tools. Some massive index or coefficient of materials and power coefficients are arranged in a table as in the following example.

Table	1.	Co	effic	ient	Mater	rials	and	Labour	r
1.1.1. 1.1.1.1.1		2.2	103.55		TORO COMPANY	10	ST 8240		

	Reason marged	Shint	ales
1 X2	19	ka	273,000
Marchisto	19	×2	£.4
	Gravel (and/or 27 marg)	22	1.47
	Water	· start	2215
	Wreak -	104	10.00
West -	Reinhligen	04	5,979
	Transata	071	0.028
	Diaman .	170	0,033

Source: SNI 7394 2008 Procedures Unit Price Calculation of Concrete Works

For the analysis of the unit price (HSP), steps that needs to be done is as follows:

- 1) Specify the units used to calculate fuel requirements. Labor and equipment needed to produce one unit of work.
- 2) Determine the quantity or the coefficient of the material. Labor, and equipment to produce one unit of work. For the coefficient of materials and labor construction work can be used Normative Designated (SNI-ABK Procedures Unit Price Calculation of work in line with the type of work.
- Determine HSD building materials. HSD labor and tools according to local site for building work building tools HSD not counted.
- 4) Multiply each coefficient with each HSD to produce one unit of work.

2.2 Basic Unit Price

Unit Price Basis (HSD) is the price component of the currency of payment in specific units, such as: material (m, m^2 , m^3 , kg, ton, bag, etc.), equipment (units, hours, days, and so on.), And labor (hours, days, months, and so on.) (Balitbang PU 2012: 4).

2.2.1 Unit Price Basis (HSD) Labor

Wages are the eyes of the payment on the basis of his work. In a production of the type of work using manpower either carried out by individuals or workgroups will be equipped with tools based on the method of work (shovels, hammers, saws, etc.) as well as the material is processed.

Standard labor costs may be paid in the system of the standard or standard man hours and the amount is influenced by several things, namely: labor skills, workforce, work difficulty factors, availability of equipment, the effect of the length of employment, the effect of the level of job competition.

2.2.2 Unit Price Basis (HSD) Material

The function of the base unit price of materials is as control of contractors bidding price is influenced by the quality, quantity, and baselocation of the material.

Input the price of the materials required in the process of calculating the price of materials such HSD component materials per unit of measurement. The material measurement unit e.g. m ', m2, m3, kg, ton, bag, etc.

2.3 Estimated Cost of Construction Works

Estimated cost of construction is estimated art (the art of approximation) possibility costs required for an activity that is based on the information available at the time of estimation was made. The accuracy of estimates is strongly influenced by the data and information provided both in quality and quantity, where the data is more complete, the more accurate the estimate will be.

2.4Program Microsoft Excel Macro

The Microsoft Macro is basically a line of code programming language Visual Basic in transformulated into the cells in a Microsoft Excel worksheet.

Macros can be run with a certain button on the toolbar, menu, and shapes, on the other macros or certain conditions that activate. In Visual Basic there are visual basic editor that can be used to correct mistakes or change the behavior of macros.

Macro advantage is capable of clicking the automation of even complex commands repetitive functions, including edit, move, and delete data in a spreadsheet. In addition, Macro in one workbook can also be moved to the anotherworkbook.Macro highly susceptible to the virus so that the security arrangements in excel should be arranged with high security. Macro viruses in potentially damage data or disrupt systems.

For example, visual basic transformation into Microsoft Excel Macros are described in detail in the description below.

2.5 Sample Coding Compute Volume Tubes

Steps in the writing program in Visual Basic are as follows:

- 1) Select menuDeveloper> Visual Basic> select insert module.
- 2) Write a function that we will use as a parameter when we call on the column formula.
- 3) Write "Function" and press enter. Then calculate the volume of the tube function has been successfully established.
- 4) Enter the formula calculate the volume of the tube.
- 5) Save the file with the extension .xlsm (Macro Enabled Excel File).

Step 5 is the final step in the use of visual basic program for macros. In order for steps of writing a program clearer illustration of the program is given in Figure 1 through Figure 5.



Figure 1 Use of Visual Basic



Figure 2 Writing Language Program



Figure 3 The Function is Already Available in Excel



Figure 4 Applying Macro Program



Figure 5 Macro Program Results

III. METHODOLOGY

The methodology used, can be seen in Figure 6 which is a Flow Chart (flowchart). A detailed description of each stage will be given in the following sections.



Figure 6. Flowchart Material Requirements and **Procedures for Workers**

3.1 Secondary Data Collection

Secondary data include:

The coefficient of materials, wages of workers SNI 2008 Building.

Data coefficient of materials, wages, and workers differentiated by each type of work is based on SNI 2008, which covers some of the work that is: earthwork, foundation stone sides, concrete work, work walls, plastering, carpentry, iron and aluminum, ceiling, floor coverings and wall

3.2 Calculation of Volume of Work with Excel Program Manual

The volume of work is calculated based on the image Detail Engineering Design (DED) two-storey building using auxiliary program Microsoft Excel.

3.3 Input MicrosoftExcel Macro Program

In Microsoft Excel Macro program needs to input data manually as excel done manually. Input data is the coefficient of materials, wages and HSPK coefficient. Also in formula in Excel Macro included visual basic editor that can produce the expected output.

3.4Ouput Program Microsoft Excel Macro

The results of calculations based on the volume of DED input into Microsoft Excel macro program that has been equipped with coefficients and HSPK. The expected output is a draft budget (RAB), the material needs and the needs of workers in accordance with the work for the two-story house.

IV. ANALYSIS AND DISCUSSION

4.1 Calculation Step HSPK

The process of calculating the unit work in Microsoft Excel program begins by determining the types of work to be done. This type of work and the index contained in SNI attachment about units of work.

Examples of calculation used is the calculation of the construction of houses 2 floors with the following specifications:

The area of building:

- The total area of 18 m x 24 m = 432 m^2
- Building = 206.9 m^2
- Height of building
- The front side wall height t1 = 5.8 m
- The rear side wall height t2 = 7.95 m
- The back wall of the high-t3 = 5.8 m
- The foundation plate lanes and local plat

Description	P (n)	X	P total (m) (N*?
a. Francision EL-10	-	Ξ.	
1 Frenchston PT-1004	13.6	1	25.05
c. Foundation PL-100			
d Foundation PL-100A	ю	1	.6
e. Frankskim PL-10)			· ·
f Foundation PD-130A			
5 Frenchton Pl (4)	43 (8 00	1	45 (8.0)
E. Franciston PL-140A	ana dharara	anellas	
: Franciskon PL 200	1	1	I.
) Francistics PL-300			
1. Franktin PL-360	1	1	1
1 Local Part Hitel@cm2	8100	3	52.04

Table 2 Specifications Base Plat, Plat Lane & Local

Table 3Sloof

	Description	P (m)
à.	Sloof 5:30	18.01
60	Sloof \$ 10	127.03.00
S.;	Slout \$ 40A	
d.	Sloof \$ 40B	26
0.	Sloof S 50	- 1

Table 4.Image Details Beams and Columns

	Description	P (m)
a	B45	4
Ъ.	B45.1	09.03
£.	B50	06.08
d.	B50.1	
а.	B55	-
f.	B65	06.08
ą.	B40A	-
h	B40	03.03
i	1140 2	06 08
3.	B40.1	25.07.00
k.	B35	23.01
1	B35.1	29.01.00
n	B30	24.03.00
n	B30.1	\$3.85
0	1330 A	06.01
р.	B30.K	an ang a
q.	B20	
r.	B20.1	
S.	RB15	
L.	RB13	133.84

Table 5 Column

	Description	High (m)	Ν	$P \text{ total } (m) = \text{High } (m) \ge N$
a.	K25	4	15	60
b.	K20	-	-	-
c.	KP20	-	-	-
d.	KP15	-	1	-
e.	KP13	03.08	20	76
f.	KP13	01.08	13	23.04
g.	K40A	-	-	-
h.	K40	03.08	20	76
i.	K35	-	-	-
j.	K30	-	-	-
k.	K20.1	-	-	-
1.	KL30	-	-	-
m.	KL35	-	-	-
n.	K45A	-	-	-
о.	K45	03.08	2	07.06
p.	K20.35	-	-	-
q.	KL40	03.08	4	15.02
r.	KL30.40	-	-	-
s.	K40.1	03.08	4	15.02
t.	K40.2	-	-	-
u.	K50	03.08	6	22.08

Table 6 Plates Floor

	Description	p(m)	l(m)	Area $\binom{2}{m} = p x l$
		02.09	01.05	03.48
		02.09	03.09	11.31
		01.05	03.05	05.25
a.	Elevasi 3.95	08.03	05.05	45.65
		7	04.05	31.05.00
		0,149305556	2	05.09
		04.35	04.25	18.48
		03.09	02.05	8
		05.25	0,128472222	0,604861111
b.	Elevasi 3.9	0,149305556	2	05.09
		03.05	01.55	05.43
		0,09375	0,149305556	05.16
c.	Elevasi 3.77	06.45	3	19.35
1	F1 .7.	01.05	3	04.05
d.	Elevasi 7.6	08.30	2	16.06

Wall Works

Includes work on the wall with a variation of 3.2 m high, 3.8 m, 5.8 m, and 7.95 m. Detail specification extents wall shown in Table 7.

Table 7 Wall							
Description	P(m)	L(m)	Area $(m^2) = P x L$				
		3	09.09				
		04.01	13.53				
		03.09	0,560416667				
		01.04	0,209722222				
		02.03	07.59				
		0,184027778	0,548611111				
		04.08	0,683333333				
Hi-h 2.2	02.02	04.07	15.51				
High 3.3 m	03.03	1	03.03				
		05.35	0,753472222				
		03.04	11.22				
		05.55	18.315				
		03.07	12.21				
		04.05	0,642361111				
		0,149305556	9.735				
		04.02	0,601388889				
		01.04	05.32				
		2	07.06				
		01.02	04.56				
		02.01	0,359722222				
		07.08	29.64				
High 2.9 m	02.08	01.08	0,308333333				
nigii 5.8 lii	05.08	02.05	09.05				
		01.03	0,231944444				
		9	34.02.00				
		05.08	22.04				
		2	07.06				
		01.55	0,270138889				
		18.05	107.03.00				
High 5.8 m	05.08	18	104.04.00				
		0,420138889	55.97				
High 7.95 m	0,357638889	07.55	60.02.00				

Now we know the planning specifications, then compiled the types of jobs. Based on the above specifications, then the types of work that is needed includes:

- 1) Soil Excavation 1 m3 of normal soil depth of 2 meters (SNI-2835-2008Pekerjaan Tanah (6.2))
- 2) Fill land back to construction (SNI-2835-2008 (6.9))
- 3) Fill Sand (SOLID) (SNI-2835-2008 (6:11))
- Work Floor K100 (SNI-7394-2008PekerjaanBeton (6.4))
- Concrete Work K175 (SNI-7394-2008PekerjaanBeton (6.5))
- Concrete Work K255 (SNI-7394-2008PekerjaanBeton (6.7))
- Reinforcement 10 kg with a plain iron or steel screw (SNI-7394-2008PekerjaanBeton (6:17))
- Add 1 m2 of formwork for the foundation (concrete SNI-7394-2008Pekerjaan(6:20))
- 9) Add 1 m2 of formwork for sloof (SNI-7394-2008PekerjaanBeton (6:21))
- 10) Add 1 m2 of formwork for columns (SNI-7394-2008PekerjaanBeton (6:22))
- 11) Add 1 m2 of formwork for beams (SNI-7394-2008PekerjaanBeton (6:23))

- 12) Add 1 m2 of formwork for stairs (SNI-7394-2008PekerjaanBeton (6:29))
- 13) Installation of Red Stone Wall 1pc: 1 brick thick 3PP
- 14) (SNI-6897-2008PekerjaanDinding (6.2))
- 15) Plastering Fine 1pc: 4Ps 1.5 cm thick (SNI-2837-2008Plesteran (6.4))
- 16) Flooring Marble (100x100) (SNI-7395-2008PenutupLantaidanDinding (6:43))
- 17) Installation of Ceramic Wall Tegel 20x20cm
- 18) (SNI-7395-2008PenutupLantaidanDinding (6:54))
- 19) Installation of Ceramic WaffelTegel 30x30 cm
- 20) (SNI-7395-2008PenutupLantaidanDinding (6:35))
- 21) Installation of porcelain tiles 11 x 11 cm (Wall) (SNI-7395-2008PenutupLantaidanDinding (6:48))
- 22) Doors teakwood (SNI-3434-2008PekerjaanKayu (6:11))
- 23) The door frame / window camphor wood (SNI-3434-2008PekerjaanKayu (6.2))
- 24) Creating and installing gypsum ceiling profiles list (SNI-2839-2008- Works ceilings (6.8))
- 25) Install jurai zinc (ISO-7393-2008-job-and-ironaluminum (6:18))

• Then, from the list of work above obtained coefficients of materials and workers in each job. The coefisien shown at attachment 4.6

- Data is displayed in the attachment material prices
- Data wages of workers in the table 8 inputted as follows: Table 8 List of Wage Workers

	Table o List of wa	ge mon	ACT 5
No.	Description	Usit	Price
1	Forenan	OH	60.000
2	Foreman	OII	55.000
3	Bricklayer	OH	50.000
4	Blacksmith	OII	50.000
5	Blacksmith Construction	OH	50.000
¢.	Painter	OH	50.000
1	Digger	OH	50 000
8	Carpenter	OH	50,000
9	Weble	OH	10 000
10	Worker	OH	40.000
85		5 2 <u>5 5</u> 5 3	5 Q 6 7

Table 9 Volume of Work

Work	Volume
l më Mas ordnary escassion depti 2 m	23
Linzi Sod compaction Linzi Sano fil	
64 Maior 1 nó lean connect fé = 1,4 May, (K. 100), shina (S-6) en, wie = 6,8 6,5 Maior 1 ní, concrete K' = 11,5 May, (K. 175), shina (12,7 A) en, wie = 0,56 6,7 Maior 1 ní, saneras fé = 10 May, (K. 237)	
6.17 Kehilocenen (0 &g vih pääritor on son sueva dang (12 m / 2) m, with 0.59 6.20 Iostil 1m2 Formition forework 6.21 Iostil 1m2 Shoff forework	
6.22 hasid 1m2 Columnitionweak 6 23 hasid 1m2 Ream Sermant	
6.24 Instal 1 m2 Floor plat Joursonk	12
6.26 Lostal 1 n/2 Starformwork Loci Reichtrad IPC (3 PS) feide	
64 Mater I na Restering, LPC 14 19 Mater I Samu 643 Januil Lm2 Mathie Manusine (1904-10) an	08 11
6.54 Install 1 m2 Wall Tele size (20x20) em	34
6.55 Instal 1 m2 Fiors The size (70.30) cm 6 11 Instal 1 m2 Double Teakwood, expose wood grade I	
6.2 Make and moral 1 m5 Deer Frank and Deer Witches	3
6.8 Maior 1 nº Gypran list platonà 6 18 Iontal 1 nº Flet Cottre bje 28 storik 50 en	

The next step is to calculate the need for labor and materials for each job. This step can be done with Microsoft Excel Manually After all the data is entered, calculated using Microsoft Excel Macros,

No.	Code	Description	Unit	Volume	Price	Total
1	E001x	Foremen	OH	30.827	50.000	1.849.500,00
1	1002	Foremen	OH	¥2.795	\$5.000	24(8.725,00
3	E003x	Bricklayer	ŌH	113.400	\$0.000	5.570.000,00
4	L004x	Elacksmith	- OH	1.610	90.000	\$0,500,00
5	LCOBa	Carpester	- OH	325.750	\$0.000	16.287.500,00
6	LOIOx	Worker	- OH	674,630	40.000	26,985,200,00
				.hr	rlai	\$1281 \$45,00

Table 10 Power Requirements

Table 11 Material Requirements

Na	Geals	Description	37mit-	Not ruc	Pite .	Tiol
1	M00 s	Meranti 2020	n3	2.125	3,400,000,000	7 437 509 60
12	MUUGE	Nau	15	(d), (d)	11.500.02	1.051.302.59
37	M001a	Perfasi Cenat	Bus	1.591.550	(1.520.02)	70.212.859,00
1ê.	MOUSS	Connet: Ford	ki.	140.541.000	89 28 (0)	12 556 425 48
1	MOOT	Sand Fill	fm	14 400	111300.02	1 656 005 60
~	MOOST	Declarations 22x1 #45 cm	No	7 990 001	445-000,05	1 389 000-00
88	MULTER	Fordate Cenent	45	28.0/0	1.130.02	01,215, (02, 00
8	MOILE	East late	u)	11,103	120.2000	1,375,560,00
9	M00.2e	Colour Conten	46.	157,060	4 (0.0.)	1.256 480,00
3	Malts	Modules Floor Tile	112	95,041	111 000 014	10 9 9 895 00
1	MOLSe	Finer tile 206/02	n2	90 001	1710005	13 127 105 50
	M324s.	Gave	345	187,255.90.	1.5.0.02	5.117.155,90
35	MCCE	Wood Glar	44	28,505	25.20.02	712,300,00
*4	MONTS	Trakwood siz: 110-210-4 mm	le .	170 000	\$3 (20.05)	9 Self (00)00
5	M0544	Kongar %.7	in)	3 601	5 100 000 00	12 (00 000 00 .
5	Millie.	Water	10.0	72 135 601	13.00	195 565 00
-7	Milon	Maudouceseel	14	212.50,	25.500.02	5.281.150.00
18	MO The	Concrete wire	44	3.450	15.200.02	\$1,759,00
19	MUMIN	Wood Chas III	mj .	6.330	1.103.0003	7.620.000,00
23	M0425	Fermiscik Ci	. It	90 50	\$ 500.00	150 000 00
21	MD-3e	Woodes Rear class T	nG	2.417	1875 00000	1 151 371 50
22	MD 1s	Physical Thick 9 mm	h:	57,053	105.00002	6.017.309.90
35	MD Sa	Dolley (die 8-10 day) ingli 1 au	Les.	371.000	72.2003	20,528,000,00
24	Mikes.	Floor de 30650	bh.	\$46,020	50,0000	27.301.000,00
25	M0475	Cryptom Lise	n	24 95	\$ 500.00	205 275 00.
25	M0481	Gypron Bowder	łę:	\$ 450	12 500.05	43 129 60
27	MD St.	Flat ink	14	21.50	5.00002	1,086,750,00
28	MOSTE	Wooden board class II dan III	EL/	9,300,4723,22	2.312.500.00	1.010.562,50
					Antala	321,631,634,48
						2008/07/2017/06

IV. CONCLUSION

- Input data manually to Microsoft Excel Macro quite easy. The first step is to enter the data in column 02 of material price. Material with this type of material is placed in column C under Item column. Units under the Unit field, and nominally under the Price column. For the code can be assigned a code by the user, the origin is not the same one with the other is placed in column 2 / B under the Code column.
- 2) Then enter data Daily Wage Workers in sheet 03 Labour. Workers in under coloumn Type Description, Unit (OH) under the Unit field, and nominally under the Price column. Regulation coding applies equally to the material code which must be different from one another.
- 3) On 04 Koef sheet, work items along with material data and the worker is filled with codes that have been entered in the previous sheet. For example in one line contains an item with a value bricklayer koef 0,045, the data entered under the item column is the code of the masons of sheet 03 Labour and 0,045 in the adjacent column. Also do not forget to put the code under the work item code field. Once the data is entered correctly, click on the sheet 05 An Unit Price Analysis button then the macro will start the calculation process and stops when all is finished and generate output tables HSPK value each - each job.

4) Output of Microsoft Excel Macro form HSPK values and needs of materials and workers. RAB value is the sum of material and labor needs

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