NEAR EAST UNIVERSITY

Faculty of Engineering

Department of Electrical and Electronic Engineering

INTERNAL ELECTRICAL INSTALLATION PROJECT

Graduation Project
EE-400

Student : Naci BAYAR (20002030)

Supervisor: Assist.Professor
Doğan HAKTANIR

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ABSTRACT

Starting the electrical project drawings, architectural project and measurements were examined. The places for main electrical household appliances owen, refrigerator, washine machine, dish washer machine, air condition) were designated. The illumination calculations for rooms have been done and suitable armorlures have been selected. The lights and sockets power necessary have been determined. The cross – section of conductors have been chosen as well. The suitability of cross – section of chosen conductor has been controlled with voltage decrease calculation. The equal power distribution to phases has been provided by loading tables. The value of the service has been determined by cost analysis.

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INTRODUCTION

I have exercised final thesis on electricity installations. My aim is to draw electricity projects of the subject. Before starting to draw the electricity project we need to consider the following steps in order.

Chapter 1 is devoted to area exploring,network research,determining the place of inlet cable and devoted to demands of the property owner.

Chapter 2 is devoted to convert the architectural project to electrical project, drawing preliminary project.

Chapter 3 is devoted to illumination calculations.

Chapter 4 is devoted to start the final project drawing.

Chapter 5 is devoted to form main loading tables.

Chapter 6 is devoted to calculate current-voltage, voltage decrease, illumination and draw column diagram.

Chapter 7 is devoted to draw the weak current and PTT Project, devoted to cost analysis.

Chapter 8 is devoted to add symbol list,needs report and cover page, copy project and file with cost analysis.

All the necessary knowledge has been found in order to get detailed project. The chapters above have been considered and followed carefully.

MAIN TEXT

1. CHAPTER 1

1.1 AREA EXPLORING, NETWORK RESEARCH, DETERMINING THE PLACE OF INLET CABLE AND DEMANDS OF PROPERTY OWNER;

We reached to the area where the building is located with the property owner. Our building is located in Gönyeli, 100 m north of Lefkoşa – Güzelyurt Highway. There is a three phase network voltage very near to building. Feeding will be done from this line, 10 m underground cable will be used to get in the building.

Demands of property owner about illumination force were listened. He demands flourescent armature for living room, kitchen and bedrooms, J type armature for hall, C type armature for badroom and Wc. He also demanded to purchase 12000 Btu split air-condition has got a power of 3,8 kW (1 kW = 3,148 Btu)

He also demanded an oven for every flats and at least two sockets for each room. He demanded heating system, solar energy, boiler, and pressure tank for each flat as well. He demanded 3 people capacity lift for the building too.

2 CHAPTER 2

2.1 CONVERTING ARCHITECTURAL PROJECT TO ELECTRICAL PROJECT, DRAWING PRELIMINARY PROJECT;

Architectural project was checked up through necessary arrangements. The locations of doors and windows were determined. Opening direction of the doors was drawn. Kitchen counter place and its measures were designated.

After these steps, the places of receivers in the flats were selected. Air-conditions have been installed to living room and bedrooms. Dishwasher and oven

were shown in the kitchen and washine machine in the hall. The places for demanded armatures,sockets and keys were designated.

Architectural Plans are important to energy entrance into the building and distribution and remoting regulations.The plans which are designed by architectures and civil engineers include all the construction drawings, (1 / 50 or 1 / 100).These plans are used for construction of the building and also in electrical installation.İt is clear that the buildings situation must be considered according to municipality regulations.The columns and joits are important during electrical installation in the floor plans.These parts are chosen carefully.Because reinforced concrete roof will carry all the weight of the building;so it is not liked to get any damage on the system while electrical installment has been doing. Thus electrical installment and reinforced concrete roof construction must be held together floor plans must showed separately.

Stairs going down to the basement must be considered carefully. Because of the columns and the walls situation the emty places must be used for electrical installation.

If the energy entrance through underground the first floor gets importance with the main gate or small corridor. An assembly space must be looked for in the entrance . The walls are thiner than basement's. Normal floor plans are shown with only one drawing because all the flats are the same so the electrical installments and architectural construction are followed the same construction.

If the energy enrance with air corridor, an isolator consoul equipment must be assembled on the wall side where the first floor's air corridor enters. The energy line will be connected to the stair holes with the shortest way. Column line fuse will also put in this place.

For studing floor plans, heat and ventilate holes must be considered carefully. During the installment these places must be stayed away. Opening side of the doors is important due to electrical remote switch settlement. The switch must not be behind the door. The room spaces and the other measurement must be

in cm. in floor plans. These measurements will be used for calculation of the illumination.

The architectural plans are the first studies of the electrical installation. Because the application project of electrical installment has been drawn on architectural plans first.After certification of Electrical Engineers Bureau the application is ready to start.Therefore project makers have to have a knowledge about architectural plans. For instance they have to know how to indicate the shapes and measurements of doors, windows, stairs (wooden parts) main walls columns.

Measurement in architectural plans has been done including internal and external parts of the building according to drafting rules. The number above the axis line of the door shows the widht, hte other number below the axis line shows the height. It must be avoided of height places like chimneys, in order to not give any damage to the installment during preparation of projects. Because of this it has to be known the drawings of chimney in the plan.

While the preparation of electrical installment projects the using purposes have to be known in order to designate illumination features. Additionaly, permanent house appliance and furnitures places must also be known. While the preparation of the electrical installment projects, the settlement plan of the building has to be asked. İt is going to help for the arrangement of installment.[1]

3. CHAPTER 3

3.1 ILLUMINATION CALCULATION

Illumanition calculation is performed in order to find the number of armatures necessory for rooms.

The dimensions of living room kitchen and bedroom have measured seperatally. [Lenght(a) wıth(b) height (h)]

Illumination calculation is done one by one for each part.

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[1] Necmettin TİRBEN, *Elektrik Projeleri ve Detayları*, sayfa 87-89, ANKARA, 1973

3.2 THE CALCULATION OF INTERNAL ILLUMINATION

The formulates symbols:

Φ_{dir} = the flow of the direct light

Φ_s = the flow coming to working table.

Φ_{end} = the light flow coming by reflexion

E_o = the avarage level of light of working table

S = m^2 of working table

Φ_o = the sum of light flow (lumen)

The calculation of illumination by the light flow method. The calculation of internal illumination by efficiency method. This method is mostly used in internal illumination installations. As it is known the Φ light that cames to plane has the components Φdır and Φend (Φ_{dir} shows the flow of the direct light, Φ_s shows the flow coming to working table, Φ_{end} shows the light flow coming by reflexion)

$$\Phi_s = \Phi_{dir} + \Phi_{end}$$

Φ_{dir} can be calculated easily but Φ_{end} is difficult to calculate. So that efficiency method is used in internal illumination installations. Now in order to understand this method let's think about an ideal room that it's walls and ceiling reflects the light totally, (δ=%100) and absorbs the light completely.(α = %100) and no object absorbing the light in it. The Φ_o comes out of the light sources falls on the plane S and it is absorbed their whatever the dimensions of the room, number of the lambs, settlement of the lambs, illumination system. The average illumination degree of the plane for an ideal room is

$$E_o = \frac{\Phi_o}{S}$$

E_o shows the avarage level of light of working table, Φo represents the total light flow from lambs in lumen and S represents the area of the plane in m^2. In reality some of the light flow is absorbed by walls, ceiling, and illumination devices. So that the average illumination degree of the plane is:

$$E_o = \frac{\Phi_o \eta}{S} = \frac{\Phi_o}{S}$$

η factor is called the efficiency of illumination and it is a number less then 1.

$\eta = \frac{\Phi_a}{\Phi_s}$ Φ_a represents flow of light to plane and

Φ_s represents total flow of light that is given by light sources.

Efficiency of device illumination (η) is multiplication of the efficiency of devices and efficiency of the room.

$\eta = \frac{\Phi \text{ ayg}}{\Phi_o}$ η **ayg** represents the efficiency of device

$\eta = \frac{\Phi_s}{\Phi_{ayg}}$ η **oda** represents the efficiency of room

$$\eta = \eta \text{ ayg} - \eta \text{ oda}$$

Efficiency of device is related with the illumination device. Efficiency of the room is related with geometric dimensions of room, reflection factors and colours of walls and ceiling, light distribution curves of illumination devices, height of them to plane and their places. Table 10.1 shows belowed in same situations that are used mostly;

Illuminiation system	direct illiminiation (nayg=%70)		semi-direct illiminiation (nayg=%80)		Mixed illiminiation (nayg=%80)		semi indirect illiminiation (nayg=%80)		İndirect illiminiation (nayg=%70)	
	n(%)		n(%)		n(%)		n(%)		n(%)	
Room index (a/h)	A	B	A	B	A	B	A	B	A	B
0,5	13	9	9	5	12	7	11	6	9	5
0,7	19	13	13	7	16	10	15	8	12	6
1,0	25	19	17	10	21	13	19	12	15	8
1,5	35	30	24	15	27	17	25	16	20	11
2,0	40	36	29	19	32	21	29	19	23	14
2,5	44	40	33	23	35	24	32	22	26	16
3,0	47	43	36	26	38	26	35	24	28	18
4,0	51	47	41	30	43	30	39	28	32	20
5,0	54	50	45	34	46	33	42	30	34	22
7,0	57	53	51	39	51	37	46	34	36	24
10,0	59	55	57	40	55	40	51	37	38	26

In this Table;

a: lenght of one side of a square room

h: height of light sources to the plane in direct and semi-direct illumination system.

Height of ceiling to the plane in direct; mixed and semi-direct illumination system.

A: Situation where is ceiling is white (ρ_T= %75) and walls are quite white (ρ_D = %50)

B: Situation where is ceiling is quite white (ρ_T = %50) and wall are dark (ρ_D = %30)

If the room is a rectangle (a,b) , efficiency is ;

$$\eta = \eta a + 1/3 (\eta a - \eta b)$$

While preparing the table 10.1 , only two efficiency about illumination devices (η ayg = %70 and η ayg = %80) is taken.

If another illumination device that has the efficiency η^1 **ayg** is used(η^1 is an aygıt different from %70, %80 efficensy level) , the efficiency that is found from table is multiplied with a factor of η^1 **ayg** / η **ayg**

After finding the efficiency η , light flow that goes to plane (Φ_o) is found with the help of flow of light by illumination sources (Φ_s). Then the average illumination level is:

$$E_O = \frac{\Phi_s}{S} = \eta \frac{\Phi_o}{S}$$

If the average illumination level of plane is given and total light flow that light sources give (Φ_o) is looked for ;

$$\Phi_o = \frac{E_o \, S}{\eta}$$

In below the dimensions of living room are given and number of armatures are found by performing necessory calculation.

ILLIMINIATION UNITS

NAME	SYMBOL	UNIT	EXPLANATION
Light flow		Lümen (lm)	İt is the amount of the total light source gives in all directions. İn other words it is the port of the electrical energy converted into the light energy. That isgiven to light source.
Light intensity	I	kandela (cd)	İt is the amount of light flow in any direction. (the light flow may be constant but the light indensity may be different in various directions)
Illumination intensity	E	lux (lux)	İt is the total light flow that comes to 1 m^2 area
flashing	L	cd/cm2	İt is th elight indensity that comes from light sources or unit surfaces that the light sources lighten.

This table was taken from report 1 page 18, showed in references page.

IILUMINATION EQUATION

EQVATION	SYMBOL	EXPLANATION
$n = \Phi_T / \Phi_L$	n	Number of light bulbs
	Φ_T	Total light flow necessary (lm)
	Φ_L	Light flow given by a light bulb.
k= a.b/ h(a+b)	k	Room index (according to dimensions)
	a	Length (m)
	b	width (m)
	h	Height of the light source to the working sueface (m)
	H	Height of the light source to the floor(m)
	h1	Height of the working surfaces to the flor (m)
Φ_T = E.A.d / η	E	Necessary illiminiations level (lux) chosen from the table
	A	Surface area that will be lighted (m2)
	d	Pallution installmentfactors 1,25 - 1,75
	η	Efficensy factors of the installment it is chosen from the table according to wall, ceiling, flor reflexion factors, tipe of armature chosen, room index

This table was taken from report 1 page 19, showed in references page.

a=5,8 m H=2,8 m P_t (Ceiling) =%80 (white) d= 1,25

b= 4,9 m E=50 lux P_d (Wall) = %50 (white)

h= H-h1 h= 2,8 – 1 h= 1,8 m

These symbols have been explained in tables above.

The table in Appendix F is correct if a=b

If a doesn't equal b the indexes of a and b have been calculated separately, It is showed below.

a/h=5,8/1,8=3,2 ηa= 0,36 $\eta = \eta a + 1/3(\eta b - \eta a)$

b/h = 4,9/1,8=2,7 ηb=0,33 η= 0,35

$$n = \frac{E_o \cdot S \cdot d}{\eta} = \frac{50.5,8.4,9.1,25}{0,35} = 5075 \text{ lumen}$$

The armature tipe = fluorescant lamb tipe = 65/80 W have been choosen.

The light flow for this tipe of lamb has been showed as 5600 lumen in table below.

TYPICAL FLOWS OF SOME LAMPS

TYPE OF LAMP	POWER OF LAMP (W)	AVERAGE FLOWS (lm)
(GENERAL USİNG –WİRED)	60	610
	100	1230
RESCANT	18/20	1100
	36/40	2850
	65/80	5600
	9	400
	11	600
	15	900
mic)	20	1200
	23	1500
MPACT FLOURESAN	16	1050
	28	2050
	38	3050
	50	1800
	125	6300
CURY (MBF)	400	12250
	1000	38000
CURY (MBIF)	250	17000
	1000	81000
SSURİZED SODİUM (SON PLUS)	100	10000
	400	54000
SSURİZED SODİUM (SON DELUXE)	150	12250
	400	38000
	300	5950
	500	11000
	750	16500
NGTEN HALOJEN	1000	22000
	1500	33000

This table was taken from report 1 page 18, showed in references page.

$= \frac{\Phi T}{\Phi L} = \frac{5075}{5600} = 0{,}90$ one piece of 65/80 W lamb is enough for the illuminiation of the room.

Illumınatıon of kıtchen and bedrooms have been done ın the same way. Finally the number place and power of the armatures have been calculated for each flat.[2]

[2] Prof.Dr.Muzaffer KAYA, *Aydınlatma Tekniği*, Page No Between 208-214, Birsen Publishing, 2000,İstanbul

4. CHAPTER 4

4.1 STARTING THE FINAL PROJECT DRAWING

Situation plan has been drawn considering the location of the area where the building is standing. The inlet cable to building was designated. Force projects of first floor and other floors were drawn. Conductor cross-sections were chosen as; 1,5 mm^2 for light outlet, 2,5 mm^2 for socket outlets,2,5 mm^2-4 mm^2 for the linye outlets, at least 16 mm^2 for column lines.Fuse currents that will be used in these lines were determined according to receiver currents. A linye has been shown for each air-conditioner. Dishwasher and oven in the kitchen have been fed with the same linye. Light, socket and ground 0.4 mm thick, column lines 0.5 thick, writing and walls 0.2 mm thick were selected in the plan. Total 14 light outlets have been fed by two linye and 23 socket outlet have been fed by ten linye. The sockets in the kitchen were planned to put at least two meters away from sink and tap. The main table were planned to first floor entrance, distribution tables were planned to a suitable place in front of the inlet door. All the counters were installed into the main table.The grounding line has been done with 16 mm^2 copper conductor and grounding has been done with 0,5 m^2 copper board as stated in laws.

The andication of the linye tables and characterdistic features of the motors for first and the ordinary floors have been showed in the tables at the end of tis chapter.[3]

This is divided into various types according to materials we use in internal electricity installation:

1) Installation made with conveyers with pipes
2) Installation with Bergman pipe
3) Installation with Peşel pipe
4) Installation with Şalpanzer and sempleks pipe
5) Installation with antigron (material for damp places) material

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[3] Tahir ÜRGÜPLÜ, *Elektrobank,Elektroteknik Bilgi BankasıPage No 350-351-352,*, Bizim Büro Publishing,1997,Ankara

6) Installation on the isolators

7) Installation with underground cable

During construction of these installations the work order to be followed is for over-plaster installation and for conveyers with pipes is as follows:

1) **Drawing the way of the conveyer:** The conveyer, should be placed in a way that will not spoil the appearance of the wall or the ceiling. We should place the keys to places that could easily be reached when the door is opened.

2) ***Opening transit holes:*** They should be opened by hole pens and by drills.

3) ***Placing the pipe collars:*** We should place the pipe collars with 30-50 cm intervals throughout the planned conveyer ways.

4) ***Placing the junction boxes:*** We should determine the junction boxes on the wall by pipe collar nails, steel nails or by wooden screws on the plugs, formerly placed.

5) ***Placing conveyers with pipes***

6) ***Placing sockets and keys***

7) ***Making the connections***

8) ***Hanging and connecting the lamps and chandeliers***

For sub-plaster installation with Bergmen and Peşel pipes, the order is as follows:

First of all, we draw the way for conveyers. Then we mark places of junction boxs, keys and sockets. Then we open channels on the walls and on the ceiling for pipes. After that, we place the cases of junction boxes, keys and sockets taking the plaster thickness into consideration. We attach the pipes with screws to the channels formerly opened. We take and connect the conveyers from the pipes by the help of guidance only after plaster is made and dried.

Before the underground cables spread the conductor way must be designated.The cable cannel is opened at least 80 cm depth and 40-50 cm width.Sand must be put at least 10 cm deep of the canal cable is installed. After

putting the sand on the cables bricks must be put. After that the system is buried by soil.[4]

5. CHAPTER 5

5.1 FORMING MAIN LOADING TABLES

Loading table consists of TZ1, TZ2 tables for first floor, TN1, TN2, TN3, TN4, TN5, TN6, TN7,TN8, TN9, TN10, TN11, TN12, TN13, TN14, TN15, TN16, TN17, TN18 tables for other floors and TO tables for common used areas (lift, fair automatic, cable tv, telephone, door automatic). 14 light outlets and 23 socket outlets are fed by first floor and other floors tables. Power of light outlet is 700 W, Power of socket outlet is 26900 W and sum of power of a table is 27600 W. The demanded power has been calculated as 12080 W that can be used from a table simultaneously.

The sum of the power of the tables shown above is 557570 W. If we calculate the demanded power as %40 of sum of the power of the tables, then it decreases to 223028 W.

The loading table has been the same like the table showed at the end of this chapter.

An application plans are important to give the details to the workers. After installation completed it is necessary to be connected into city network. Shortly the Electrical Company has to know the features and measurements of the building. Because of this during preparation energy distribution features and installation loading tables must be prepared.

The summary of energy distribution exsplains the summary of electrical installation; the loading table explains the loading measurements of the phases. Thus company executives will be able to do energy distribution more regular and balanced in the area. Voltage degrees measurements also help them in this subject stable network voltage protects the system carefully.

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[4] Prof.Dr.Muzaffer KAYA, *Aydınlatma Tekniği*,Page No 338-339-340, Birsen Publishing, 2000,İstanbul

The summary of energy distribution is written starting from energy inlet and it includes column line, fuse, counter main switch and all of the linyes that are fed from distribution table as linye fuse, sort of linye and charge of the linye and shown separately. Therefore sort of linyes are distinguished.

Electrical values that belong to each part are shown explicitly and separately in summary of energy distribution drawings. The loading tables are prepared for distribution tables separately. Linye numbers, sort of linyes, linye fuse current, linye lenght, number of outlets, sum of powers are explained separately in distribution table. If the feeding is with three phase it must be clarified that which phase it takes the current from.

The sum of the powers in loading tables shown the building's power. If the feeding is with three phase it shows the distribution of the charges of the phases separately. Electrician is responsible for the balanced internal distribution of the charge distribution as much as possible. The network executives should take care of this energy distribution.

The main loading table has been attached to the project.[5]

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[5] Necmettin TİRBEN, *Elektrik Projeleri ve Detayları*, Page no 112-115, ANKARA, 1973

AT
HOUSE TYPE UNDER PLASTER COUNTER BOX
IKP 4 mm & 200X100

	TZ1	14 700W	23 26900W	2X16+16 NYA	35 P/28 m	L 63 A	27600W					
	TZ2	14 700W	23 26900W	2X16+16 NYA	35 P/6 m	L 63 A	27600W			27600W		GROUND FLOOR NO:2
	TN1	14 700W	23 26900W	2X16+16 NYA	35 P/5 m	L 63 A	27600W				27600W	FIRST FLOOR NO:3
	TN2	14 700W	23 26900W	2X16+16 NYA	35 P/9 m	L 63 A	27600W		27600W			FIRST FLOOR NO:4
	TN3	14 700W	23 26900W	2X16+16 NYA	35 P/8 m	L 63 A	27600W			27600W		SECOND FLOOR NO:5
	TN4	14 700W	23 26900W	2X16+16 NYA	35 P/12 m	L 63 A	27600W				27600W	SECOND FLOOR NO:6
	TN5	14 700W	23 26900W	2X16+16 NYA	35 P/11 m	L 63 A	27600W		27600W			THIRT FLOOR NO:7
	TN6	14 700W	23 26900W	2X16+16 NYA	35 P/15m	L 63 A	27600W			27600W		THIRT FLOOR NO:8
	TN7	14 700W	23 26900W	2X16+16 NYA	35 P/14 m	L 63 A	27600W				27600W	FOURTH FLOOR NO:9
	TN8	14 700W	23 26900W	2X16+16 NYA	35 P/18 m	L 63 A	27600W	557570W	223028 W	27600W		FOURTH FLOOR NO:10
	TN9	14 700W	23 26900W	2X16+16 NYA	35 P/17 m	L 63 A	27600W				27600W	FIVETH FLOOR NO:11
	TN10	14 700W	23 26900W	2X16+16 NYA	35 P/21 m	L 63 A	27600W				27600W	SIXTH FLOOR NO:12
	TN11	14 700W	23 26900W	2X16+16 NYA	35 P/20 m	L 63 A	27600W			27600W		SIXTH FLOOR NO:13
	TN12	14 700W	23 26900W	2X16+16 NYA	35 P/24 m	L 63 A	27600W				27600W	SEVENTH FLOOR NO:14
	TN13	14 700W	23 26900W	2X16+16 NYA	35 P/23 m	L 63 A	27600W				27600W	SEVENTH FLOOR NO:15
	TN14	14 700W	23 26900W	2X16+16 NYA	35 P/27 m	L 63 A	27600W			27600W		EIGHT FLOOR NO:16
	TN15	14 700W	23 26900W	2X16+16 NYA	35 P/26 m	L 63 A	27600W				27600W	EIGHT FLOOR NO:17
	TN16	14 700W	23 26900W	2X16+16 NYA	35 P/30 m	L 63 A	27600W				27600W	NINEHT FLOOR NO:17
	TN17	14 700W	23 26900W	2X16+16 NYA	35 P/29 m	L 63 A	27600W			27600W		NINEHT FLOOR NO:19
	TN18	14 700W	23 26900W	2X16+16 NYA	35 P/33 m	L 63 A	27600W				27600W	TENHT FLOOR NO:20
	TD	12 970W	2 4600W	2X6+6 NYA	0.5 m	L 35 A	5570W			970W	300W	300W	4000W	SHARE USING
TOTAL	LIGHT	292	14970W							194170W	193500W	166200W	4000W	
	SOCK.	462	542600W											

TOTAL DEMANDIN POVER=SAME TAME COFFICIENTXTOTAL POWER=(557570-5570)X0.4=223028 W
SAME TAME COFFICIENT CHOUSES IS 0.6

TZ1=TZ2
HOUSE TYPE UNDER PLASTER
BOX OF FUSE W 60 A

Lin No	OUTLET		LINYE CROOS S.	LENGHT OF LINE	FUSE CURRENT	PIPE CROOS S.	POWER LINE	POWER BOX	DEMAND POVER	THINGS
	LIGHT	SOCKET								
1		1	3X4 NYA	6.4 m	L 20 A	18 P	3800W	27600W	12080W	CLIMATE
2		1	3X4 NYA	11 m	L 20A	18 P	3800W			CLIMATE
3		1	3X4 NYA	12 m	L 20A	18 P	3800W			CLIMATE
4		5	3X2.5 NYA	11.6 m	L 16A	14 P	1500W			SOCKET LINE
5		5	3X2.5 NYA	13.4 m	L 16A	14 P	1500W			SOCKET LINE
6		1	3X2.5 NYA	9.5m	L 16A	14 P	2500W			DISHWASHER
7		1	3X2.5 NYA	2 m	L 16A	14 P	2000W			OWEN
8		5	3X2.5 NYA	11.2 m	L 16A	14 P	1500W			LOUNDRY MACH.
9		1	3X2.5 NYA	9.5m	L 16A	14 P	2500W			SOCKET LINE
10	8		2X2.5 NYA	13.5 m	L 10A	14 P	455W			LIGHT LINE
11	6		2X2.5 NYA	8.1 m	L 10A	14 P	295 W			LIGHT LINE
12		1	3X6 NYA	32 m	L 16A	18 P	2200W			WATHER PAMP
13		1	3X6 NYA	32 m	L 16A	18 P	1800W			WATHER HEAT
TOTAL	14						700W			
		23					26900W			

DEMAND POWER=(TOTAL POWER-3800-3800-3800-2500-2500-2000-2200-1800)X40%+(3800+3800+3800+2500+2500+2000+2200+1800)X60%=12080W

TZ1&TZ2 BOX DETAIL

TN1.2.3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.18
HOUSE TYPE UNDER PLASTER
BOX OF FUSE W 60 A

Lin No	OUTLET LIGHT	OUTLET SOCKET	LINYE CROOS S.	LENGHT OF LINE	FUSE CURRENT	PIPE CROOS S.	POWER LINE	POWER BOX	DEMAND POVER	
1		1	3X4 NYA	6.4 m	L 20 A	18 P	3800W	27600W	12080W	CLIMATE
2		1	3X4 NYA	11 m	L 20A	18 P	3800W			CLIMATE
3		1	3X4 NYA	12 m	L 20A	18 P	3800W			CLIMATE
4		5	3X2.5 NYA	11.6 m	L 16A	14 P	1500W			SOCKET LINE
5		5	3X2.5 NYA	13.4 m	L 16A	14 P	1500W			SOCKET LINE
6		1	3X2.5 NYA	9.5m	L 16A	14 P	2500W			DISHWASHER
7		1	3X2.5 NYA	2 m	L 16A	14 P	2000W			OWEN
8		5	3X2.5 NYA	11.2 m	L 16A	14 P	1500W			LOUNDRY MACH.
9		1	3X2.5 NYA	9.5m	L 16A	14 P	2500W			SOCKET LINE
10	8		2X2.5 NYA	13.5 m	L 10A	14 P	455W			LIGHT LINE
11	6		2X2.5 NYA	8.1 m	L 10A	14 P	295 W			LIGHT LINE
12		1	3X6 NYA	32 m	L 16A	18 P	2200W			WATHER PAMP
13		1	3X6 NYA	32 m	L 16A	18 P	1800W			WATHER HEAT
TOTAL	14						700W			
		23					26900W			

DEMAND POWER=(TOTAL POWER-3800-3800-3800-2500-2500-2000-2200-1800)X40%+(3800+3800+3800+2500+2500+2000+2200+1800)X60%=12080W

TN1.2..3.4.5.6.7.8.9.10.11.12.13.14.15.16.17.18 BOX DETAIL

Num. No	KW	HP	COSQ	YIELD	220/380 VOLT	FUSE 220/380	LINE CUR. SEC	THINGS
1	4	5.4	0.84	% 82	14.7/8.5A	L 25/16A	4X6 NYA	LIFT MOT
2	2.2	3	0.34	% 81	8.7/5 A	L 20/16A	4X6 NYA	WATER POMP

MOTOR LABEL VALUES

TO BOX OF FUSE W 60 A

Lin No	OUTLET		LINYE CROOS S.	LENGHT OF LINE	FUSE CURRENT	PIPE CROOS S.	POWER LINE	POWER BOX	DEMAND POVER	THINGS
	LIGHT	SOCKET								
1	6		3X2.5 NYA	16 m	L 10 A	18 P	360W	5570W	5570W	STAIR ILLUMINATION
2	6		3X2.5 NYA	32 m	L 10A	18 P	360W			STAIR ILLUMINATION
3		2	3X2.5 NYA	32 m	L 16A	18 P	600W			FOR TV NEED
4			0.75 NYA	32 m	L 6A	18 P	350W			DOOR BELL&DOOR OT.
5		1	4X6 NYA	32 m	L 16A	14 P	4000W			LIFT MOT.
TOTAL	12						970W			
		3					4600W			

TO BOX DETAIL

CHAPTER 6
CALCULATION OF WIRE CROSS SECTION

While the calculation of wire cross section, mechanical strenght, heating voltage degrees and power loss controls are done in electrical installation. The wire cross section regarding mechanical strenght except weak current installation must be less than 1 mm in electrical internal installation.

The wire cross sections regarding to mechanical strenght must be less than 6 mm^2 for 20 – 35 meters pole distance and at least 10 mm^2 for larger pole distances in external electrical installation.

If the currents exceeds the heat limitation the wire heats up and insulation part burns. Therefore table 12.1 shows belowed in the limitation of the currents that pass through the conductors in the pipes and the fuse currents that will protect these conductors .

The voltage decrease must not be more than %5 for light installation, %3 for machine installation, %2.5 for low voltage networks, %5-6 for low voltage feeding lines, %10 for midium and high voltage lines.

Table 12.1: table of flows of excessive current and anma fuse of three group of isolated conductors

Cross-section of wire S (mm2)	group 1		group 2		group 3	
	Imax(A)	Fuse flow In(A)	Imax (A)	Fuse Flow In(A)	Imax (A)	Fuse Flow In(A)
1	12	10	16	16	20	20
1,5	16	16	20	20	25	25
2,5	21	20	27	25	34	35
4	27	25	36	36	45	50
6	35	35	47	50	57	63
10	48	50	65	63	78	80
16	65	63	87	80	104	100
25	88	80	115	100	137	125
35	110	100	143	125	168	160
50	140	125	178	160	210	200
70	-	-	220	225	260	260

Group 1: Till three line in the pipe (T,AT, and CT type conductors)

Group 2: moist floor lines,lines connected to mobile receivers, circular wired mutiway lines laid down in outdoor (CTNH, ATT and TTR type conductors)

Group 3: One way line laid down outdoor(TNH, TT type conductors)

CALCULATION OF WIRE SECTION REGARDING VOLTAGE DECREASE IN ONE PHASE CIRCUIT

It is necessary to consider the effect of inductance and capacity apart from the resistance of line in alternating current. Meanwhile only the effect of inductance and resistance will be considered. The inductance of line can be ignored because it's smallness in internal electrical installation.

In this condition ;

$$\frac{100\ PR}{U^2} = \frac{200\ PR}{\chi S U^2}$$

There $2L/\chi S$ was put instead of R. P,L, χ,W and E is known, so the wire cross section can be calculated

$$S = \frac{200\ PL}{\chi\ \varepsilon\ U^2}$$

this formulate. If there are receiving device more than one this formulate is

$$\varepsilon = \frac{200}{\chi U^2} \sum_{k=1}^{n} \frac{Pk\ lk}{Sk}$$

= voltage decrease
= network voltage (v)
= sum of power (w)
= cross- section (mm^2)
= öz direnç for cupper $56^m/\Omega mm^2$ $Al=35^m/\Omega mm^2$

Here represents the power passes through k. lk represents Pk represents the length of line and Sk represents the cross section.

Example 1.

A one phase alternating current engine 220 V , 5 kw, and cos Φ= 98 will be fed by 1000 m air line. % 5 voltage decrease is allowed so how many mm^2. The cross section must be ?

Solution

In this formula $S = 200\ Pl / \chi\varepsilon\ U^2$ $P = 5\ 10^3\ W\ l = 1000\ m$

χ= 56 m / Ω mm^2

If $\varepsilon = 5$ and $U = 220$ V is put

$$S = \frac{200 \cdot 5 \cdot 10^3 \cdot 1.10^3}{56 \cdot 5 \cdot 220^2} = 74 \text{ mm}^2$$

70 mm² wire can be used with slight mistake because of the standart wire cross section is 70 mm².

6.3 THE WIRE CROSS SECTION CALCULATION REGARDING VOLTAGE DECREASE IN THREE PHASE CIRCUIT.

There symmetrical height must be considered of three phase circuit.Therefore it is considered that three phase circuit composed of three equal parts. Thus every part carry the power 1 / 3 p between one phase wire and neutral wire

$\varepsilon = 100\ P\ L/\chi S U^2$ If the unit of P is taken as (W), L as (m) , χ as (m / Ω mm²) S as (mm²), U as (V)
Then the ε becames as a percentage value. U represents the voltage of the line.

$$S = \frac{100\ PL}{X \varepsilon U^2}$$

If the voltage decrease is known as a percentage then this formula is used to obtain the wire cross section. Lastly the conductors' medium and high voltage lines must be chosen not exceeding for thermic power station % 6 or % 8, and for water power station % 10 – 12 regarding voltage decrease.

6.4 THE CALCULATION OF WIRE CROSS SECTION REGARDING POWER LOSS IN ONE PHASE CIRCUIT.

The power loss in a line where the resistance is R is ;

$\Delta P = R\ I^2$

As a percentage ; $p = \frac{100\ \Delta P}{P} = \frac{100\ R\ I^2}{P}$

If it is put $\frac{P}{U\ Cos\ \Phi}$ instead of I and $2L / \chi S$

instead of R $p = \frac{200PL}{X\ S\ U^2\ Cos^2\ \Phi}$ $Cos\ \Phi = \frac{\text{real power}}{\text{zahiri power}} = \frac{W}{VA}$

Then the wire cross – section becomes ; $S = \frac{200\ P\ L}{\chi\ p\ U^2\ Cos^2\ \Phi}$

6.5 CALCULATION OF CROSS SECTION REGARDING POWER LOSS IN THREE PHASE CIRCUITS

As three phase system is loaded symmetrically the the power loss in the line becomes ;

$\Delta P = 3\ R\ I^2$

as a percentage ; $p = \frac{100\ \Delta P}{p} = \frac{300\ R\ I^2}{P}$

If it is put $\frac{P}{1{,}73.U\ Cos\ \Phi}$ instead of I and $L / \chi\ S$ instead of R then the power loss in percentage becomes ;

$$p = \frac{200\ P\ L}{\chi\ S\ U^2\ Cos^2\ \Phi}$$

So that the wire cross – section becomes ;

$$S = \frac{100\ P\ L}{\chi\ p\ U^2\ Cos^2\ \Phi}$$

6.6 CALCULATION OF CURRENT IN THREE PHASE CIRCUITS

Three phase current calculations is done in order to find the maximum current that inter mediate coloumn line carries and also the cross section of the

cable. The current vave found must be smaller than the current capacity of the cable. The current calculation for coloumn line in our bulding is made in example:

$$I = \frac{p}{1{,}73 \times U \times COSQ} = \frac{223028}{1{,}73 \times 380 \times 0{,}3} = 427{,}28A > 2X310\ A$$

Currying carring capacity of 2x120 mm2 NYY cable is designated as 2x310 A utilizing this way.

The same calculation is performed for coloumn line as well;

$$I = \frac{P}{U} = \frac{12080\ W}{220\ V} = 54{,}9\ A < 65\ A$$

Its appropriantenes has been found from table 12.1 Appendix D

The curring carring capacity of 16 mm2 NYA cable is given as 65 Ain the table

TABLE 2M

CONDUCTOR)
mm2
in the table is when the protection was done with perfect protection.These value must be used for.
korunması için aşağıda verilmiş değer katsayılan uygulanacaktır.

as a bunch in installion pipe or in tranking							on a cable carrier as a bunch or attachaed to directly the graund								conductor
one phase two cable a.c veya d.c		three phase 3 or 4 cable a.c		one phase two cable o a.c or d.c			three phase 3 or 4 cable a.c		identified conditions						
									horizontal (one phase a.c.or d.c. Two cable theree phase or two cable				clover leaf shaped theree phases three cable		
anma current	the voltage for each amper and meter		anma current	the voltage for each amper and meter	anma current	the voltage for each amper and meter		anma current	the voltage for each amper and meter	anma current	the voltage for each amper and meter			anma current	the voltage for each amper and meter	
	a.c	d.c				a.c	d.c				one phase	d.c	theree phase			
A	mV		A	mV	A	mV		a	mV	A	mV	mV	mV	A	mV	mm2
146	0,97	0,91	125	0,84	175	0,93	0,91	160	0,82	195	0,95	0,91	0,85	170	0,8	50
195	0,71	0,63	160	0,62	220	0,65	0,63	200	0,59	240	0,68	0,63	0,62	210	0,59	70
238	0,56	0,45	1958	0,48	270	0,48	0,46	240	0,46	300	0,52	0,46	0,49	260	0,42	95
269	0,48	0,36	220	0,42	310	0,4	0,63	280	0,38	350	0,44	0,36	0,43	300	0,34	120
-	-	-	-	-	355	0,94	0,29	320	0,34	410	0,39	0,29	0,39	350	0,29	150
-	-	-	-	-	405	0,29	0,24	365	0,3	470	0,35	0,24	0,38	400	0,25	185
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,22	-
-	-	-	-	-	480	0,24	0,18	430	0,27	5660	0,36	0,18	0,38	480	0,22	240
-	-	-	-	-	560	0,22	0,14	500	0,25	660	0,33	0,14	0,35	570	0,19	300
-	-	-	-	-	680	0,2	0,12	610	0,24	800	0,3	0,12	0,33	680	0,17	400
-	-	-	-	-	800	0,18	0,086	710	0,23	910	0,28	0,086	0,31	770	0,16	500
-	-	-	-	-	910	0,17	0,068		0,22	1040	0,26	0,068	0,3	880	0,15	630

This table was taken from report 4 showed in references page.

6.7 CALCULATION OF VOLTAGE DECREASE

As everbody kaows there is a loss of voltage and power because of the resistance of the conductor it self the laws permit to voltage decrease as %1,5 of maximum network voltage. As it is shawn below voltage decrease is loss than %1,5 of network voltage. Voltage decrease methad is applied to longest and most loaded linye. The most loaded and longest linye is number 3air conditioner linye in the example.

$$\%\ e = \frac{100 \times P \times L}{K \times S \times U^2} \qquad \frac{200 \times P \times L}{K \times S \times U^2} \qquad \frac{200 \times P \times L}{K \times S \times U^2}$$

$$\%\ e = \frac{100 \times 223028 \times 10}{56 \times 240 \times 380^2} \qquad \frac{200 \times 12080 \times 27}{56 \times 35 \times 220^2} \qquad \frac{200 \times 3800 \times 12}{56 \times 6 \times 220^2}$$

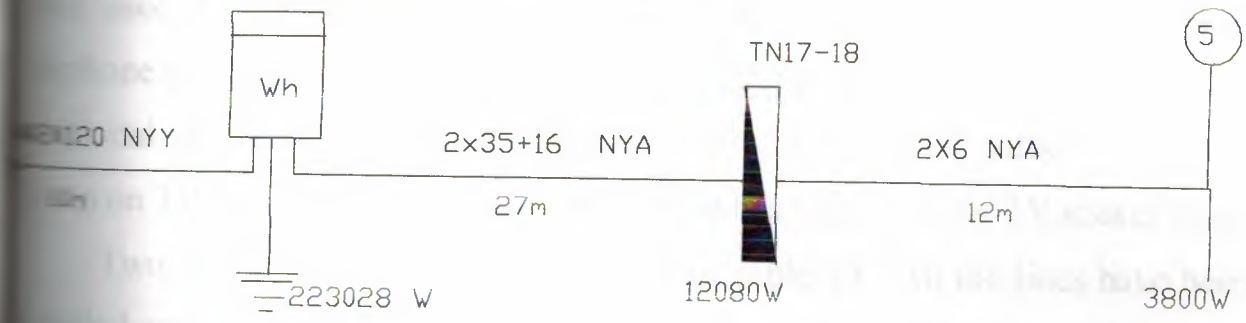
$\%\ e = 1,39 < 1,5$

So that; the chosen cable cross-sections is found according to current and voltage decrease calculations if the result is not suitable then the upper cross-sections valve is chosen.[6]

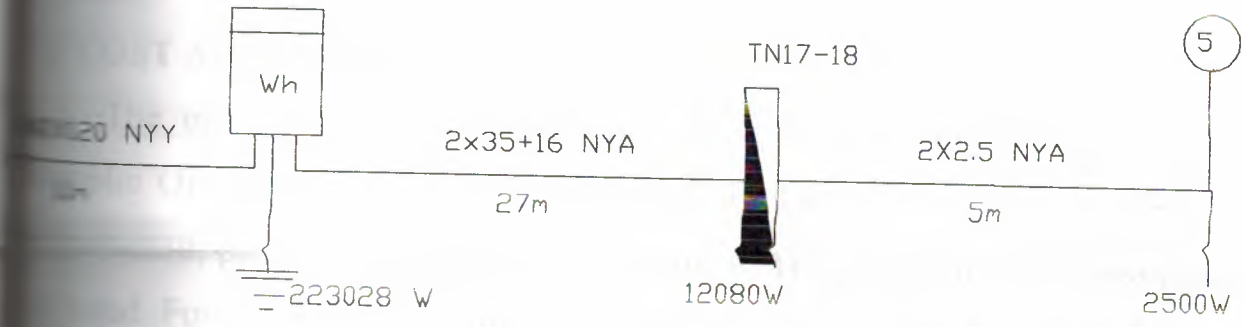
[6] Prof.Dr.Muzaffer KAYA, ***Aydınlatma Tekniği***,Page No 340-348,Birsen Publishing, 2000,İstanbul

$= \frac{223028}{1.73X380X0.9} = 427.28 < 2X310A \quad I = \frac{P}{U} = \frac{12080}{220} = 54.9 < 65A$

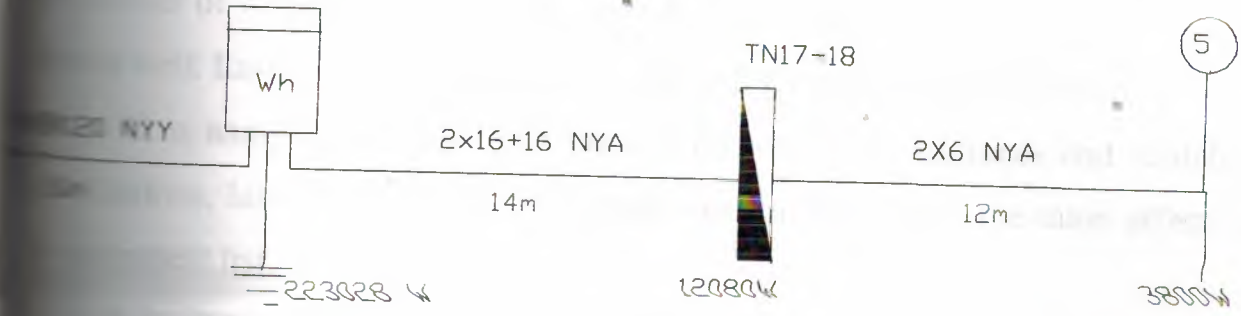
CURRENT CONGLUSION ch-7



$\frac{200XPXL}{KXSXU^2} + \frac{200XPXL}{KXSXU^2} = \frac{100X223028X10}{56X240X380^2} + \frac{200X12080X27}{56X35X220^2} + \frac{200X3800X12}{56X6X220^2} = 1.39 < 1.5$



$\frac{200XPXL}{KXSXU^2} + \frac{200XPXL}{KXSXU^2} = \frac{100X223028X10}{56X240X380^2} + \frac{200X12080X27}{56X23X220^2} + \frac{200X2500X5}{56X2.5X220^2} = 1.37 < 1.5$



$\frac{200XPXL}{KXSXU^2} + \frac{200XPXL}{KXSXU^2} = \frac{100X336770X10}{56X240X380^2} + \frac{200X12080X14}{56X16X220^2} + \frac{200X3800X12}{56X6X220^2} = 1.46 < 1.5$

IM DECREAS OF VOLTAGE CONGLISION

7. CHAPTER 7

7.1 DRAWING WEAK-CURRENT AND PTT PROJECT AND

Next bell switches for each flat have been installed to the main door. Bell transformers for all flats have been fed by the distribution table for each flat. All the bells and door automatic have been put next to flat door. 0.75NYA cable has been used for bell installation and door automatic installation. Independent telephone socket line has been installed to each room for ordinary TV antenna. Any additional cable is avoided because any additional cable can affect the perfect vision on TV negatively. 75 ohm coaxical cable has been used for TV socket linye.

Two socket lines have been installed for cable TV. All the lines have been installed separately for each flat. TV sockets have been put to living room and bedroom. Additional Box Inlet has been installed for ordinary telephone line for each flat. Telephone sockets and its lines have been installed to living room and bedroom.

7.2 COST ANALYSIS

The electrical installion minimum unit price list was taken from The Republic Of Nourthen Cyrus Turkish Republic, Munistriy of public works and transportation, planing and costruction deparmant. The things that have been done are listed. For example avcontation instalion water pump instalitation 1x13 socket installation ptc. The unit price numbersin this list were marked from the mimimum price list. Total work cost has been plotained by multiplicition of the unit prices and number of works. The same procedure has been sustanied for the for the other steps as well. Lastly total cost has been found and given to property owner.

Cost analysis is the sum all the equipments used, machines and vehicles amortizations, laboring and inevitable expences. In these parts the main affect is the equipment list.

It is important to obtain the equipment list while calculating the cost of installation. It is also important for new engineers in their early career.

Equipment list is done by counting and writing the equipments in order and separately.İt should not be forgotten the degree of damage possibility.After completting these processes, multiplication and addition will give the total cost of equipment list. The cost analysis has been showed in appendix B.[7]

Estimated expences is to calculate the cost of the project. The work is divided into work units that done by executive institutions.The unit list is called meeting of the unit numbers in the work analyzed.

These list have importance in order to identify the units and their features.The estimated expenses are the assesment regarding unit prices.

It is used the list of electrical installation estimated expences price list by the Ministary of Public Works.

CHAPTER 8

ADDING SYMBOL LIST NEEDS REPORT AND COVER PAGE COPYING PROJECT AND FILING WITH COST ANALYSIS

The names and symbol of the materials used (weak current, strong current, armatures, fuses, cables, sockets, panels etc,) have been shawn in the list. This list is attacked as an appendix.

Necessity report is abort the technical rules for internal electrical installation that the company or person who makes the installation must obey. This report is attached as an appendix.

The cover page is composed of the place of the buiding and informations about the company.

After all these processes the project is copied in 1/50 scale. One copy is given to property owner. One copy to the company that did the business, one copy is filed with the cost analysis and one copy to the related company. After completing the busines if any problem occurs the files are compared with each other.

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[7] Necmettin TİRBEN, *Elektrik Projeleri ve Detayları*, sayfa 74-75, ANKARA, 1973

Regulation is a unit that manages the projects implication it determines the conditions in order to implement the project that it should be fulfilled. The regulations about electrical internal installation leads the electricians work. Every country has this kind of regulations peculiar to its own.

Contracts are the compulsary written notices that releates the conditions.These conditions are looked for in deliverance of the work. Contracts are divided into two.Special and technical.Special contracts include mutual requests of employer and employee.İt also includes the financial conditions. An other meaning of this is written agreements.

Technical contracts is a document that shows, the conditions of the building. Especialy it has got technical subjects. It has got duty of restriction and leading the occupations technically.

It is a matter that goverment and enterprises keen on it. It is also main effect on development of work security, arrangement and industry life.

Symbol list, necessities report wnd cover page have been attached at the and of this chapter.

SİGN TABLE

Up nourshing		Three phase normal socket
From up nourshing		Three phase grounded socket
Down nourshing		There phase etanj socket
From down nourshing		B-C-J type armature
From down up nourshing		N type chandelier
From up down nourshing		Wall light
Up and down nourshing		Etanj armature
Buvat / square Buvat		Etanj wall light
Main table		Flourescent armature
Secondary table		Etanj flourescent armature
Power table		Circular flourescent armature
Secondary power table		Stairs automatic switch
Reserve main table		Stair automatic
Control table		Door automatic line
One Phase fuse		Bell transformer
One Phase fuse		Door bell
One Phase automatic fuse		Kapi zili dügmesi
3 Phase automatic fuse		Bell transformer switch
3 Phase fuse		Bell line
3 Phase knife fuse		Bell
One Phase active counter		Door automatic
3 Phase active counter		Door automatick switch
3 Phase reactive counter		Amplificator
Ampermeter		Tv. Antenna
Voltmeter and commutatur		Tv. socket
Power transformer		Grounding line
Current transformer		Oven
Machine		
Generator		
One phase key switch		
Three phase key switch		
High current key		
Contactor		
One line		
Simple key		
Commutator key		
Vaviey key		
Internal vaviey key		
Electrical switch key		
One phase normal socket		
One phase grounded socket		

NECESSİTİES REPORT

he sheet iron boards, 1 mm DKP sheet iron up to 0.5 m2 and at least 2 mm
iron up to 0.5 m2 and at least 2 mm DKP sheet iron above 0.5 m2 will be used.
oards that take 60A are in barali tape.
body and all the parts that are not affected by the voltage have to be
n boards.
ght of botton side of the counter must be at most 1.8
he equipments used must be certified by TSE.
eys amma currentmust not be small than 10 A that will be used in electrical
o to 250 V amma voltage.
eys and sockets can not be used as distribution box.
fuses must be put at the begining of the line that will be used .
socket circuits must be seporated from iluminiation circuits.
onductors cross sectionss must be Cu =6 mm Al=10 mm
umination outlets must be at least 1.5 mm, socket outlet must be at least

hase socket should be calculated as 300 W, three phase socket should be
t will be connected to a socket circuit.
cession from a bulb to another one if it is not compulsory.
eak current installation is NYA.
nderground cables must be buried at least 80 cm depth. This measurement
duced If it is necessary by security steps taken.
onuctor colours will be chooser as brown for phase conductor, blue for
nductor, black for rotation conductor in ilumination installation circuts,
brown or black for phase conductor, blue for neutral conductor, yellow or
protective grounding conductor while considering the socket circuits.
ree phase column line system black represents R, red represents S, brown
s T, light blue represents neutral and green represents protective

TELEPHONE INSTALLATIONS

s to be done the connection between telecom in let central and telecom network.
of pipes which are 50 mm in diameter will be installed starting from building main
box up to out of the building where the number of telephone sockets less
he pipes will be buried 40 cm deep suitably.
distance between building cable inlet and front side parcel border is less
ters 60*80 cm additional room will be buiet to the building outlet. Two pieces
hice are 50 mm in diameter will be installed from this additional room to the

st two telephon outlets must be used in residence but for the workshops
three outlets.
ght of the bilding main inlet central box must be approximately 2 m
meter of the pipe that will be used in installation must be twice that
diameter of the wires.
stanresistance for the cable used in installation must not be less than
ephonical weakness that measured in central must not be more than 70 dB.

BELEDİYE ONAY

mari projesine uygundur.

MEDAŞ ONAY ÜCRETİ

UMU BILGI FORMUNU ONAYLAYAN KURUM DOLDURACAKTIR.

URUM ADI	
ROJE KAYIT NO	
ROJE ONAY T	
LGİLİ DÖNEM	

MEDAŞ AÇIKLAMA

ROJE ODA ONAYI

TUS ODA ONAYI

ROJE MÜELLİFİ

FENNİ MESUL (TUS)

ÖLÇÜLERI KONTROL EDINIZ
YETKILILERE BILDIRINIZ

LAN PRO RES VE HESAPI YAP		B	PLAN PR RESIM VE HES YAPTIRANIN		
ERGI DAIRESI		11	VERGI DAIRESI		
CIL NO	20002030	12	SICIL NO		
OYADI	BAYAR	13	SOYADI		
	NACI	14	ADI		
BA ADI	IBRAHIM	ADRES	15	MAH.SEMT	
CUM TARIHI	1974		16	CAD.SOK.	
CUM IL	AYDIN		17	KAPI NO	
RI ILÇE	SÖKE		18	DAIRE	
G OLD ODA	NEU		19	KAPI NO	
A SICIL NO			20	IL/ILÇE	
ROJEYI YAPANIN ADI SOYADI			YAP ISIN ÇE	PROJE ÇIZIMI	
NACI BAYAR			PAFTA NO	PARSEL NO	ADA NO

N E U FACULITI OF ENGINEERING
ELECTRIC&ELECTRONIC DEPARTMEND
TEL: CEP:0.533.866 1253
LEFKOŞA

CONCLUSION

According to agreement with the property owner the illumination installment as been delivered on time.

During our work time a painstaking and careful labouring has been mplemented.All conditions and owner's benefits have been fulfilled.

Inspite some contradictions with the property owner, his demands have been ways considered and tried to implement.

The inlet cable for the building was taken two cross-sections more than it is pposed to be,considering the technical rapid developments in our world.

Separate ordinary TV cable was taken through the roof for each socket. This reased the cost of the installation and no enough benefit as expected.

Three 12 BTU airconditioners has been demanded for each flat by the perty owner.this kind of airconditioner will not be completely useful during mer time. A heater will be definately needed when the winter season es.Beside these, the electricity that will be used is going to increase.All these sons are going to cost a lot and put the owner in financal trouble. In order to ent this problem *a central heating and cooling system could have been* led.

Despite the contradictions mentioned above I believe that a proper on installation project has been implemented.

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B SITES

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PORTS

TMMOB Elektrik Mühendisleri Odası, Yayın No:5, **Proje Düzenleme asları ve Yardımcı Bilgiler Kitabı**, 2002 Lefkoşa

ktrik iç Tesisat Yönetmeliği,EMO Yayınları, 2002 Ankara

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naların Elektrik Tesisatları İçin Yönetmelik, EMO,1993,Lefkoşa

APPENDIX A

rnal Electricity Installation Equipment:

s:

inal voltage of the keys are 250, 500, 750 V and nominal currents are 6, 10, 50A.

ple Key: Switches on and off one lamp or a group of lamps.

utator Key: Switches on and off two groups of lamps one by one or at the e time.

ap Key: Switches on and off two groups of lamps one by one.

iven Key: Switches on and off one lamp or a group of lamps from two rent points.

iator Key: Switches on and off one lamp or a group of lamps from more than different points.

kets:

of mobile receivers, connected to the network such as flashlight, vacuum er, electricity stove etc, is called socket. Sockets, in damp places, must have a ctive contact.

es:

es are apparatuses that keep the current within allowed borders for conveyers in installation. Fuses prevent that the conveyers, they protect, are heated up in a erous way. They are divided into two as automatic and manual.

matic Fuse: Automatic fuses are small switches with thermic and magnetic ers. In automatic fuses, also, thermic and magnetic circuits operate separately. e event of short circuit, an electro magnet pulls a core, engines are switched on the magnetic circuit is activated. In case of excessive current, on the other , thermic opener is activated. These are divided into two types:

utomatic fuse with body

fa type automatic fuse

ere are switch off buttons in addition to switch on buttons in these type of fuses. tomatic fuses are also divided into types as regards to time-current aracteristics. Line type (L), house type (H) and apparatus type (G).

nuel Fuses: These fuses consist of three parts. Body, Cover and Cover head or d. Body consists of 2 parts in wall type fuses and of 1 part in table type fuses. dy's task is to supply connection to the line to be protected. Line, through the work, is always connected to the vice-contact of the body and line, to the eiver, is connected to the screwed ring of the body. Vice-contact is the conveyer to which metal-headed edge touches, when cover is duly placed. Vice contact is the non-conductive part, which prevents cover with greater current, to be into the fuse.

ers are like empty cylinders made of porcelain. Covers are of 6, 10, 15, 20, 25, 50, 60, 80, 100 A. There are different indication signs for each current. For nce, 6A green, 10A red, 15A gray etc

bles:

es are formed by placing the fuses on a proper surface. In one table, apart from fuses, there may be keys, sockets, measuring apparatuses and watches. They are ded into two as main table and secondary table with respect to distribution. regards to place of use, they are divided as tables used in dry places and es used in damp places. Tables, attracting current up to 60A must be without Tables, attracting current more than 60A must be with bar.

TERNAL ELECTRICITY INSTALATION EQUIPMENT

nveyers:

y are divided two as isolated and bare conveyers. Generally, copper conveyers sed in internal electricity installation.

es:

st of the conveyers in internal electricty installation are protected in the pipes. y differ with respect to place of use.

gman Pipe (B): These are made of thin cover with lead. Inner parts of these es are isolated with a paper on which a hard-to-burn paint is absorbed. These es are generally used in dry places and for over-plaster installations.

el Pipe (P): These are splitted pipes made of steel cover. Internal and external es of these pipes are painted with black varnish. They are mostly used in dry ces and for sub-plaster installations.

hlpanzer Pipe (st): These are unsplitted steel pipes. Inner parts of these pipes solated with a paper on which a hard-to-burn paint is absorbed. These kinds of es are used in damp places for sub-plaster and over-plaster installations.

pleks Pipe (Steel Pipe): These are absent steel pipes, internal parts of which solated. They are used in the same places as Stahlpanzer pipes are used.

t Parts:

e are various joint parts to the pipes and different parts are used for each kind pe. These are respectfully, Sub-connector (MUF), Angle (Corner), T-joint, hpiece, connection box and fixing material.

connector (Rakort): It is a flat joint part that connects one pipe to another pipe e to the part.

(Corner): These are curved joint parts that are used in the places where the change direction.

t Part: This is a joint part that makes the pipes divide into two different ons from one point.

piece: This is an edge part, used to prevent bruising of conveyer isolations s of pipes.

ction Box (Junction box): Conveyer connections are made in this box. are connectors (klemens) in the junction boxes to joint the conveyers. n boxes are named as bergman, Peşel and stalpanzer etc. according to the pipe, used in the installation. Bergman junction box is made of iron cover d or porcelain; Peşel junction box is made of cover or cast iron and er junction box is made of cast iron. Junction boxs may have 1 to 8

uths.

ing Material: These are materials such as hook, cramp iron and hook with one two lugs, to fix the pipes or parts to the places where they will be used.

lve:

s an internal installation material, which is used to connect internal electricity allation to the part of an electricity installation, made of a cordon and by the help of nectors.

ht Sockets:

ht sockets are used to connect the lights to the installation. These are divided two as Swan light sockets and Edison light sockets.

EPERATION OF INTERNAL ELECTRICITY INSTALLATION OJECTS AND CONSTRUCTION OF THE INSTALLATION:

e definitions about internal electricity installation:

in column line: It is the feeding line from the main junction box of the building e watch.

umn line: These are feeding lines from the watch to the main table or to sub-es.

e lines: These are lines from a fuse in distribution table to the junction boxs e outlet lines are separated.

let line: These are lines, which are separated from the junction boxs on fuse and stretch to receiver apparatus.

APPENDIX B

PRICE ANALYSİS

TYPE OF PRODUCTİON	QUANTITY	UNİT QUAN.	UNIT PRİCE	TOTAL
CED TYPE LAMP INSTALLATION	AD	280	34.200.000	9.576.000.000 TL
R TYPE LAMP INSTALLION	AD	60	36.800.000	2.208.000.000 TL
G INSTALLATION	AD	140	44.000.000	6.160.000.000 TL
G WALL LİGHT	AD	60	85.700.000	5.142.000.000 TL
INSTALLATION	AD	120	67.700.000	8.124.000.000 TL
OCKET INSTALLATION	AD	360	45.000.000	16.200.000.000 TL
INSTALLATION	AD	20	110.000.000	2.200.000.000 TL
PUMP INSTALLATION	AD	20	135.000.000	2.700.000.000 TL
R CONTROL INSTALLATION	AD	20	98.000.000	1.960.000.000 TL
G MACHİNE INSTALLATION	AD	20	73.500.000	1.470.000.000 TL
ASHER MACHİNE INSTALLATION	AD	20	73.500.000	1.470.000.000 TL
DİTİON INSTALLATION (SPLİT UNIT)	AD	20	79.300.000	1.586.000.000 TL
ELL WİTH TRASFORMER INSTALLATION	AD	20	93.200.000	1.864.000.000 TL
UTOMATIC INSTALLATION	AD	1	124.000.000	124.000.000 TL
SOCKET INSTALLATION	AD	60	49.100.000	2.946.000.000 TL
ONNECTION BOX	AD	8	169.700.000	1.357.600.000 TL
İLL 30 PEYAR	MT	48	13.300.000	638.400.000 TL
ILL 50 PEYAR	AD	20	21.900.000	438.000.000 TL
AL SOCKET INSTALLATION	AD	60	60.300.000	3.618.000.000 TL
E AUTOMATIC	AD	20	128.000.000	2.560.000.000 TL
MM2 CV PVC COLUMN LINE	MT	140	99.000.000	13.860.000.000 TL
MM2 CV PVC COLUMN LINE	MT	290	12.000.000	3.480.000.000 TL
MM2 CV PVC CABLE BED	AD	40	120.000.000	4.800.000.000 TL
SOİLİNG	AD	1	1.800.000.000	1.800.000.000 TL
-3X100 AMP BUS-BUR'LI DİSTRIBUTION	AD	1	590.000.000	590.000.000 TL
DISTRIBUTION TABLE	AD	2	476.000	952.000 TL
OGARI	AD	1	300.000.000	300.000.000 TL
OIL CABLE BED	MT	20	12.100.000	242.000.000 TL