BOĞAZİÇİ ÜNİVERSİTESİ

STAJ PROGRAM DEFTERİ

TRAINING PROGRAM DIARY

ÖĞRENCİNİN
STUDENT'S

SOYADI, ADI **:** UZUN Aydın
SURNAME, NAME

BÖLÜMÜ : Electrical and Electronics Engineering
DEPARTMENT

ÖĞRENİM YILI : 2016-2017
TRAINING YEAR

Staj programı
Training Program

Defter No: 1
Diary book No : 1 .

Resim
Picture

Soyadı, Adı **:** UZUN, Aydın
Surname, Name

Bölümü **:** Electrical and Electronics Engineering
Department

YAPILAN PRATİK [*]
ACCOMPLISHMENTS

Müessese ve iş yeri *Name and place of company*	Kısım *Department*	İşe başlama tarihi *Starting date*	Ayrıldığı tarih *Completion date*	Çalışmadığı Günler *Nonworking days*	Çalıştığı Günler *Working days*
TEKFEN Engineering	Electrical Engineering	07.08.2017	15.09.2017	2,5	24

[*] Bu sayfa şirket yetkilisi tarafından imzalanıp kaşelenecektir
This page must be signed and stamped by the employer

07.08.2017 Tarihinden 11.08.2017 tarihine kadar bir haftalık çalışma
From 07.08.2017 to 11.08.2017 weekly service

GÜN *DAYS*	YAPILAN İŞLER *WORK ACCOMPLISHED*	Sayfa No. *Page Nr.*	ÇALIŞILAN SAAT *WORKING HOURS*	
Pazartesi *Monday*	Meeting with the working staff Reading instructional documents about department Attendance to a presentation about pressure measurement techniques	1	8.30-12.30 13.30-17.30	8 h
Salı *Tuesday*	Reading instructional documents about department Attendance to presentations about flow measurement techniques and hook-up gauges	1	8.30-12.30 13.30-17.30	8 h
Çarşamba *Wednesday*	Download and install AutoCAD software Analysis of the AutoCAD files and developing an algorithm to detect mistakes on lightning and small power layouts	1	8.30-12.30 13.30-17.30	8 h
Perşembe *Tuesday*	Analysis of Metering Station Number 1(MS1) and Compressor Station Number 1(CS1) Introduction to TANAP	1	8.30-12.30 13.30-17.30	8 h
Cuma *Friday*	Analysis of MS2 and CS5	1	8.30-12.30 13.30-17.30	8 h
Toplam (*Total*)			40h	

Öğrencinin imzası :
Signature of trainee
Çalıştığı iş yeri ve kısmı : TEKFEN Engineering, Electrical Department
Work place
Kontrol edenin ünvanı, soyadı, adı :
Name and title of the controlling superior
İmza ve kaşe :
Signature and stamp

14.08.2017 Tarihinden 18.08.2017 tarihine kadar bir haftalık çalışma
From 14.08.2017 to 18.08.2017 weekly service

GÜN *DAYS*	YAPILAN İŞLER *WORK ACCOMPLISHED*	Yaprak No. *Page Nr.*	ÇALIŞILAN SAAT *WORKING HOURS*	
Pazartesi *Monday*	Reordering the information of distribution boards in TANAP project in a new excel file	2	8.30-12.30 13.30-17.30	8 h
Salı *Tuesday*	Studying cathodic protection layout drawings Attendance to a presentation about cathodic protection	2	8.30-12.30 13.30-17.30	8 h
Çarşamba *Wednesday*	Reordering the information of cable specifications for a telecom room in MS 3	2	8.30-12.30 13.30-17.30	8 h
Perşembe *Tuesday*	Earthing calculations in order to check suitability	2	8.30-12.30 13.30-17.30	8 h
Cuma *Friday*	Earthing calculations in order to check suitability	2	8.30-12.30 13.30-17.30	8 h
Toplam (*Total*)			40 h	

Öğrencinin imzası :
Signature of trainee
Çalıştığı iş yeri ve kısmı : TEKFEN Engineering, Electrical Department
Work place
Kontrol edenin ünvanı, soyadı, adı :
Name and title of the controlling superior
İmza ve kaşe :
Signature and stamp

From 21.08.2017 to 25.08.2017 weekly service

GÜN *DAYS*	YAPILAN İŞLER *WORK ACCOMPLISHED*	Sayfa No. *Page Nr.*	ÇALIŞILAN SAAT *WORKING HOURS*	
Pazartesi *Monday*	Voltage drop calculations for CS5 Checking cable suitability	3	8.30-12.30 13.30-17.30	8 h
Salı *Tuesday*	Voltage drop calculations for CS1 Checking cable suitability	3	8.30-12.30 13.30-17.30	8 h
Çarşamba *Wednesday*	Checking some AutoCAD documents, detecting and fixing errors Worked on panel tag list of MS1 and MS3	3	8.30-12.30 13.30-17.30	8 h
Perşembe *Tuesday*	Checking some AutoCAD documents, detecting and fixing errors Worked on panel tag list of CS1	3	8.30-12.30 13.30-17.30	8 h
Cuma *Friday*	Attendance to a presentation given by TEKFEN Construction about TANAP	3	8.30-12.30 13.30-17.30	8 h
Toplam (*Total*)			40h	

Öğrencinin imzası :
Signature of trainee
Çalıştığı iş yeri ve kısmı : TEKFEN Engineering, Electrical Department
Work place
Kontrol edenin ünvanı, soyadı, adı :
Name and title of the controlling superior
İmza ve kaşe :
Signature and stamp

28.08.2017 Tarihinden 01.09.2017 tarihine kadar bir haftalık çalışma
From 28.08.2017 to 01.09.2017 weekly service

GÜN *DAYS*	YAPILAN İŞLER *WORK ACCOMPLISHED*	Yaprak No. *Page Nr.*	ÇALIŞILAN SAAT *WORKING HOURS*	
Pazartesi *Monday*	Leave of Absence			
Salı *Tuesday*	Leave of Absence			
Çarşamba *Wednesday*	30th August Victory Day			
Perşembe *Tuesday*	Sacrifice Feast Eve ½ day leave of absence			
Cuma *Friday*	Sacrifice Feast, Day 1			
Toplam (*Total*)			0 h	

Öğrencinin imzası :
Signature of trainee
Çalıştığı iş yeri ve kısmı :. TEKFEN Engineering, Electrical Department
Work place
Kontrol edenin ünvanı, soyadı, adı :
Name and title of the controlling superior
İmza ve kaşe :
Signature and stamp

04.09.2017 Tarihinden 08.09.2017 tarihine kadar bir haftalık çalışma
From 04.09.2017 to 08.09.2017 weekly service

GÜN *DAYS*	YAPILAN İŞLER *WORK ACCOMPLISHED*	Sayfa No. *Page Nr.*	ÇALIŞILAN SAAT *WORKING HOURS*	
Pazartesi *Monday*	Sacrifice Feast Day 4			
Salı *Tuesday*	Reanalysis of the AutoCAD documents from 09.08.2017 to 11.08.2017 and detecting mistakes	4	8.30-12.30 13.30-17.30	8 h
Çarşamba *Wednesday*	Reanalysis of the AutoCAD documents from 09.08.2017 to 11.08.2017 and detecting mistakes	4	8.30-12.30 13.30-17.30	8 h
Perşembe *Tuesday*	Analysis of bill of quantities(BOQ) table of firefighting and instrument air works Saving count of the items and corresponding electrical loads as necessary information to use in next step	4	8.30-12.30 13.30-17.30	8 h
Cuma *Friday*	Preparation an excel file containing all of the necessary information in order to calculate rated current and after that decide what type of cable to be used for the corresponding item (Work done for CS1)	4	8.30-12.30 13.30-17.30	8 h
Toplam (*Total*)			32h	

Öğrencinin imzası :
Signature of trainee
Çalıştığı iş yeri ve kısmı : TEKFEN Engineering, Electrical Department
Work place
Kontrol edenin ünvanı, soyadı, adı :
Name and title of the controlling superior
İmza ve kaşe :
Signature and stamp

11.09.2017 Tarihinden 15.09.2017 tarihine kadar bir haftalık çalışma
From 11.09.2017 to 15.09.2017 weekly service

GÜN *DAYS*	YAPILAN İŞLER *WORK ACCOMPLISHED*	Yaprak No. *Page Nr.*	ÇALIŞILAN SAAT *WORKING HOURS*	
Pazartesi *Monday*	Same task as last week's Friday but worked on MS4	5	8.30-12.30 13.30-17.30	8h
Salı *Tuesday*	Same task as last week's Friday but worked on MS2	5	8.30-12.30 13.30-17.30	8h
Çarşamba *Wednesday*	Studying and understanding single line diagram of MS2 Extract the necessary information to an excel file	5	8.30-12.30 13.30-17.30	8h
Perşembe *Tuesday*	Change the dimensions of some buildings in TANAP project	5	8.30-12.30 13.30-17.30	8h
Cuma *Friday*	Preparation of a small presentation for the head of department Good-bye to colleagues	5	8.30-12.30 13.30-17.30	8h
Toplam (*Total*)			40h	

Öğrencinin imzası :
Signature of trainee
Çalıştığı iş yeri ve kısmı : TEKFEN Engineering, Electrical Department
Work place
Kontrol edenin ünvanı, soyadı, adı :
Name and title of the controlling superior
İmza ve kaşe :
Signature and stamp

Kısım *Sectıon* **Introduction and Analysis**	Yaprak No **1** *Page Nr.*
Yapılan İş *Work Done* **Analysis of some compressor and metering stations**	Tarih: **07.08.2017-11.08.2017** *Date*

(Buraya sadece bu tarihte yapılan işler "günlük" olarak yazılacaktır. Yapılan işle ilgili teknik rapor ayrıca "GENEL RAPOR" kısmında verilecektir.)
(Only the daily work will be written here, as a "diary". The technical report about the complete work done, will be given separately in the "GENERAL REPORT" section.)

-- 1st WEEK –

07.08.2017, Monday

In the first day of my internship at TEKFEN Engineering, I met my internship supervisor Mr. Kuruca, my co-workers and the head of electrical department Mr. Tuncer. Then the head of electrical department Mr. Tuncer gave two documents, so that I can understand how things work in TEKFEN Engineering. Next, I attended a 1-hour presentation given by an instrumentation engineer about pressure measurement instruments produced or assembled by TEKFEN Engineering.

08.08.2017, Tuesday

I continued reading the introduction documents whose titles are "TEKFEN Engineering in brief …". I asked some questions to engineers, to understand exactly the documents, for example an engineer gave me a small presentation about the single line diagrams. Furthermore, I attended two presentations about flow measurement techniques and equipment and hook-up gauges given by instrumentation department, which is not my exact department. At the end of the day, I was totally familiar with TEKFEN engineering and ready to start working.

09.08.2017, Wednesday

I downloaded and installed AutoCAD software. My supervisor Mr. Kuruca sent the AutoCAD(.dwg) documents of MS3 of TANAP project which are lightning and small power layouts of MS3. My task was to transfer the tag information to an excel file and to check whether there is any mistake and send the excel file to an electrical draftsman to repair it.

10.08.2017, Thursday

My task was the same as yesterday, but the stations and building to examine were different. MS1 and CS1 were the new stations. Moreover, the supervisor explained in detail, what is TANAP, what do they do in office, what are these AutoCAD drawings, why are they so important, how are going all of the processes before construction etc. He also gave some documents to look at, earthing calculation and layout of a utility building in a compressor station, lightning system layout, cable tray layout, small power layout and a calculation sheet to determine the cable type to use.

11.08.2017, Friday

Today's task was analysing CS 5 and MS 2.

Kısım *Section*	**Reordering and Calculations**	Yaprak No **2** *Page Nr.*
Yapılan İş *Work Done*	**Earthing calculations and reordering documents**	Tarih: **14.08.2017-18.08.2017** *Date*

(Buraya sadece bu tarihte yapılan işler "günlük" olarak yazılacaktır. Yapılan işle ilgili teknik rapor ayrıca "GENEL RAPOR" kısmında verilecektir.)
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-- 2nd WEEK –

14.08.2017, Monday

My supervisor Mr. Kuruca sent some pdf documents containing all of the information about the distribution boards in TANAP project, like distribution board tags, incomer ratings, outgoing circuit types, outgoing feeders, incomer cable sizes coming to distribution board. My task was to put in order all the information in a new excel file and send it back to Mr. Kuruca to detect any failure present.

15.08.2017, Tuesday

Today's task was to study the cathodic protection layout drawings and design reports sent by KORTEK, the firm responsible for the cathodic protection of the metering and cathodic stations of TANAP project. A presentation was made by an engineer about cathodic protection. I had also chance to ask the details that I don't understand from the drawings and explanations.

16.08.2017, Wednesday

Electrical draftsman Mr. Ülvan sent some documents to study via mail. It contains a telecoms cable schedule prepared by ABB, a worldwide company in industrial technology, used for a communication room in MS3 of TANAP. The file contains some specifications of cables, like conductor cross sectional area,cable number, from and to equipment tags. My task was to order them in a new list, so that they can access the cable specs anytime they want.

17.08.2017, Thursday

Today I made some earthing calculations going to be used in buildings of metering stations and compressor stations of TANAP project. The necessary data is given in documents, like earthing resistance for soil(ohmxm), earthing resistance for concrete foundation(ohm x m), buried earthing conductor length(m) etc. The task was to check whether the system is suitable or not after 4 step calculations. The work is not finished today.

18.08.2017, Friday

Since there are 4 metering stations and 2 compressor stations of TANAP project under TEKFEN engineering responsibility, the work was not finished yesterday. So today I worked on the same task but different stations naturally.

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[**] *Reproduce this page as many as necessary*

Kısım **Error Detecting and Calculations** *Section*	Yaprak No **3** *Page Nr.*
Yapılan İş **Checking Panel tag list and fixing it, voltage drop calculations** *Work Done*	Tarih: **21.08.2017-25.08.2017** *Date*

(Buraya sadece bu tarihte yapılan işler "günlük" olarak yazılacaktır. Yapılan işle ilgili teknik rapor ayrıca "GENEL RAPOR" kısmında verilecektir.)
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-- 3rd WEEK –

21.08.2017, Monday

Today's task was to do some voltage drop calculations. I have worked on the buildings in CS5 of TANAP project. There were many excel files containing cable tag numbers, load, current and voltage information of the items. The task was to combine them in a new excel file and make voltage drop, cable empedance, short circuit current and cable short circuit carrying capacity calculation after that algorithm checks whether the cable is suitable or not. All of them has formulas on excel file.

22.08.2017, Tuesday

The task was the same as yesterday. But today I have worked on the buildings in CS1 of TANAP project.

23.08.2017, Wednesday

Today's task was to check some AutoCAD files and detect errors. My supervisor Mr. Kuruca has sent a panel tag list of MS1,MS3 and CS1 of TANAP project including building tag number, building names, tag description and tag numbers. First, I checked every corresponding AutoCAD layouts if the tag numbers are the same as in the tag list file. The tag list is the right list. There may be some errors in the AutoCAD layouts. If there is any error, I fixed it in the AutoCAD layout and noted it.

24.08.2017, Thursday

The task from yesterday has not finished, so I worked on it. It was a little bit challenging, because there are many buildings in every station to check like garage, portable water pump house, workshop and warehouse, administration and control building, canteen building etc.

25.08.2017, Friday

Today I attended a presentation given by an engineer from TEKFEN Construction about what they do until now. This was just for information for engineers in our department to understand how much of the total work is finished, because TANAP is a big project and my department as TEKFEN Engineering Electrical Department deals with only with the electric infrastructure in metering and compressor stations in Turkey.

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Kısım **Reanalysis and cable type analysis** *Sectıon*	Yaprak No **4** *Page Nr.*
Yapılan İş **Reanalysis of the same stations from first week and starting to cable type analysis** *Work Done*	Tarih: **05.09.2017-08.09.2017** *Date*

(Buraya sadece bu tarihte yapılan işler "günlük" olarak yazılacaktır. Yapılan işle ilgili teknik rapor ayrıca "GENEL RAPOR" kısmında verilecektir.)
(Only the daily work will be written here, as a "diary". The technical report about the complete work done, will be given separately in the "GENERAL REPORT" section.)

-- 4th WEEK –

05.09.2017, Tuesday

Electrical draftsman Mr. Ülvan has sent the AutoCAD documents of MS1,MS2,MS3,CS1 and CS5 of TANAP project to check them once them after saying that he fixed the errors that I detected before on 09-11.08.2017. Today I have finished checking the metering stations and prepared the excel file to send it back to Mr. Ülvan including the errors that was not fixed.

06.09.2017, Wednesday

The task from yesterday had not finished, so I worked on it. I have finished the compressor stations today and sent them back to Mr. Ülvan.

07.09.2017, Thursday

Today I have received a challenging task, it will continue a little long to complete it. Electrical engineer Mr. Uzun has sent the bill of quantities table of firefighting and instrument air works of TANAP project. In this list, there are items with electrical loads. I need from this list the electrical load of the item and the count of the item. After taking this information from the bill of quantities table I should prepare an excel file containing the necessary information and calculation of the rated current and find corresponding cable type from the book of AFUMEX cables.

08.09.2017, Friday

I have worked on the same task as yesterday. In a blank excel file I prepared the list of every item from bill of quantities table with corresponding electrical loads. The inputs for the list were number of phases(stable for every item 3), electrical loads(from the bill of quantity list), voltage (stable for every item at 400 V), cos(Φ) (stable for every item at 0.8) and cable correction factor(stable for every item at 0.6). The outputs were ampere and rated current. Looking at the rated current I decided which cable type of AFUMEX perfectly fits for the item. The list for CS1 has finished today.

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Kısım *Section*	**Cable type analysis and Documentation Works**	Yaprak No **5** *Page Nr.*
Yapılan İş *Work Done*	**Finishing cable type analysis and work on single line diagram and some other documentation works**	Tarih: **11.09.2017-15.09.2017** *Date*

(Buraya sadece bu tarihte yapılan işler "günlük" olarak yazılacaktır. Yapılan işle ilgili teknik rapor ayrıca "GENEL RAPOR" kısmında verilecektir.)
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-- 5th WEEK –

11.09.2017, Monday

I have worked on the same task as yesterday. Today I prepared the cable type list for the MS4

12.09.2017, Tuesday

I have worked on the same task as yesterday. Today I prepared the cable type list for the MS2.

13.09.2017, Wednesday

Today I worked with Mrs. Ekici, an electrical engineer from the office. She gave me an overall single line diagram (hard copy) and my task was to study and understand this diagram and extract the necessary information in the diagram to an excel file.

14.09.2017, Thursday

Today I also worked with Mrs. Ekici. She gave a document containing the changes of dimensions of buildings in stations of TANAP project. My task was to change the dimension of the building in other files if it's necessary to change.

15.09.2017, Friday

Today was the last day of my internship so I prepared a small presentation to the head of department about what I did during my internship in TEKFEN Engineering. I had my papers signed and said goodbye to the colleagues.

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(The technical report about the complete work done at this department will be written here. A separate report form may be used, if necessary.)

TABLE OF CONTENTS

(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
(The technical report about the complete work done at this department will be written here. A separate report form may be used, if necessary.)

A - TEKFEN ENGINEERING IN BRIEF

A.1 - Introduction to TEKFEN Engineering

TEKFEN engineering's main goal is to provide engineering services of TEKFEN Construction which are mostly refineries, petrochemical facilities, terminal systems or power stations. It is specialized and has the experience for many years in the fields it's competing. Main areas of its expertise are industrial plants, power plants, pipelines, infrastructure, harbor, offshore structures. TEKFEN engineering has an experienced staff in all the engineering disciplines such as process engineering, mechanical and piping engineering, electrical engineering, instrumentation and control engineering, civil engineering etc.

A.2 – Ongoing projects

The ongoing projects TEKFEN Engineering is involved in:

- Azerbaijan - The new management tower of ministry of taxation of Azerbaijan
- Qatar – Design and construct service road enhancement to north road corridor
- Libya – Al Khufra – Tazerbo water conveyance system
- Turkey – Provision of pipeline repair services
- Turkey – TANAP Trans Anatolian Natural Gas Pipeline Project – Lot 3
- Turkey – TANAP Trans Anatolian Natural Gas Pipeline Project – Compressor and Metering Stations
- Azerbaijan – Shah Deniz Stage 2 (SD2) Project fabrication of offshore facilities and hook up and commissioning support
- Azerbaijan – Shah Deniz Project Stage 2 Sangachal Onshore Terminal Facility

I had the chance to work in an office inside the headquarters of TEKFEN Engineering. In the office, there are two departments: Electrical engineering and instrumentation engineering departments. First day and second day of my traineeship is the introduction part of my traineeship. I am given two large documents with the titles "Instrumentation and Control Engineering in brief" and "Electrical Engineering in brief". My department is Electrical Engineering Department, so my emphasis will be on this department.

A.3 - Instrumentation and Control Engineering in brief

The instrumentation department commonly split in 3 specialities, which are field instrumentation, systems and installation. The most important thing for instrumentation engineers is the piping and instrumentation diagram(P&ID). With the help of this diagram they can observe the instruments and simulate them. Every instrument has its own specifications and data sheet. Level sketch is also seen on the so called P&ID diagrams. These steps are called field instrumentation. Most of the instrumentation engineers in the office are working on these steps. The second important part is systems part where mostly control engineers are working. They prepare process control systems(DCS), emergency shutdown systems(ESD), fire and gas systems(F&G) etc.

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The third part is installation part concerning the field engineers. I attended some presentations given by the instrumentation engineers or draftsmen and learned somewhat what they are doing. The presentations are about pressure measurement techniques, flow measurement techniques and hook-up gauges. The devices are not produced by TEKFEN Engineering, but TEKFEN Engineering is responsible for the procurement, design, installation of the devices. The employer for these kind of big projects are mostly TÜPRAŞ. Some reference projects are TÜPRAŞ Kırıkkale refinery project, TÜPRAŞ İzmit resin upgraded project etc.

A.4 - Electrical Engineering in brief

What do electrical engineers in TEKFEN Engineering do?

A.4.1 – Basic Design

The electrical engineers are making technical specifications for electrical systems. The followings are the list of the design works done by the engineers.
• Technical specifications for electrical systems
• Determination of power systems configuration
• Grounding & lightning calculations and design
• AC & DC UPS(uninterruptible power source) design
• Lighting system basic design
• Conceptual cable routing
• Hazardous area classification

A.4.2 – Site Activities

These are the works done by the field engineers.
• Installation supervision
• Shop drawings
• Pre-commissioning

A.4.3 – Power System Design and Analysis with ETAP

ETAP is an analytical engineering software company specializing in the analysis, simulation, monitoring, control, optimization and automation of electrical power systems. The sectors this software is used are generation, transmission, distribution, industry, transportation and low voltage. In our office, this software is used by the engineers too. This software is a very useful software.

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• Single line system design
• Short circuit analysis
• Load flow analysis
• Motor acceleration analysis
• Transient stability analysis

A.4.4 – Detail Engineering

Detail engineering subjects are deeper calculation, design and analysis subjects mostly done in CAD tools. This kind of works are also done in the office by engineers.

• Single line diagrams, wiring diagrams with AVEVA Electrical
AVEVA Electrical is a software suite for electrical engineering and design. With its advanced graphical user interfaces, use of design rules and catalogues and maximum workflow flexibility it is preferred mostly. By the way it is integrated with ETAP, electrical analysis tool mentioned before.
• Cable sizing calculation & routing
• Load list, cable list
• Data sheets & calculation for electrical equipment
• Motor control center(MCC) design
• Indoor and outdoor lighting design
• Lighting calculations (ReluxPro & Dialux)
• Weak current systems; telephone & data systems, fire and gas detection, PA&GA, CCTV, security

A.4.5 – Procurement

This is the less technical part of the works done by the electrical engineers in TEKFEN.
By the way I worked with a bill of quantities table.

• Material Requisition
• Technical Bid Evaluation
• Bill of Quantities

A.4.6 – Step by step processes

First step is design in an electrical engineering process. In the beginning some design specifications are made and then electrical consumers are listed and power balance calculations are made.

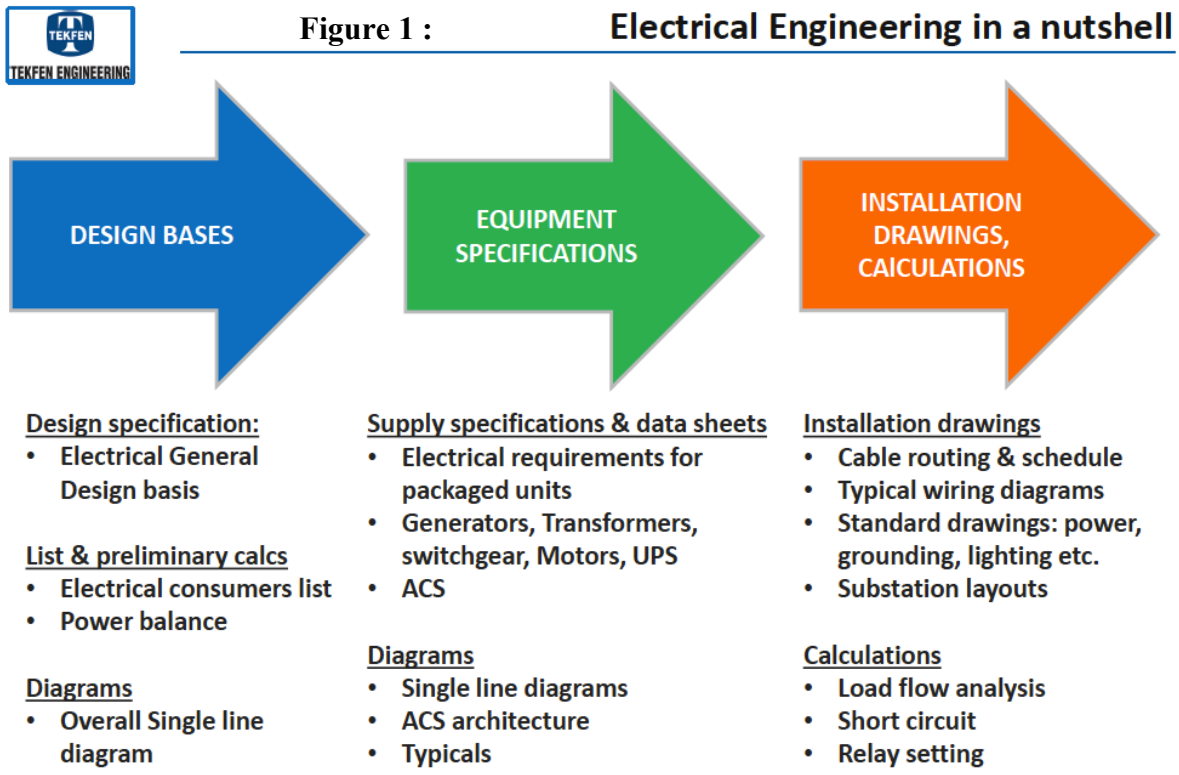
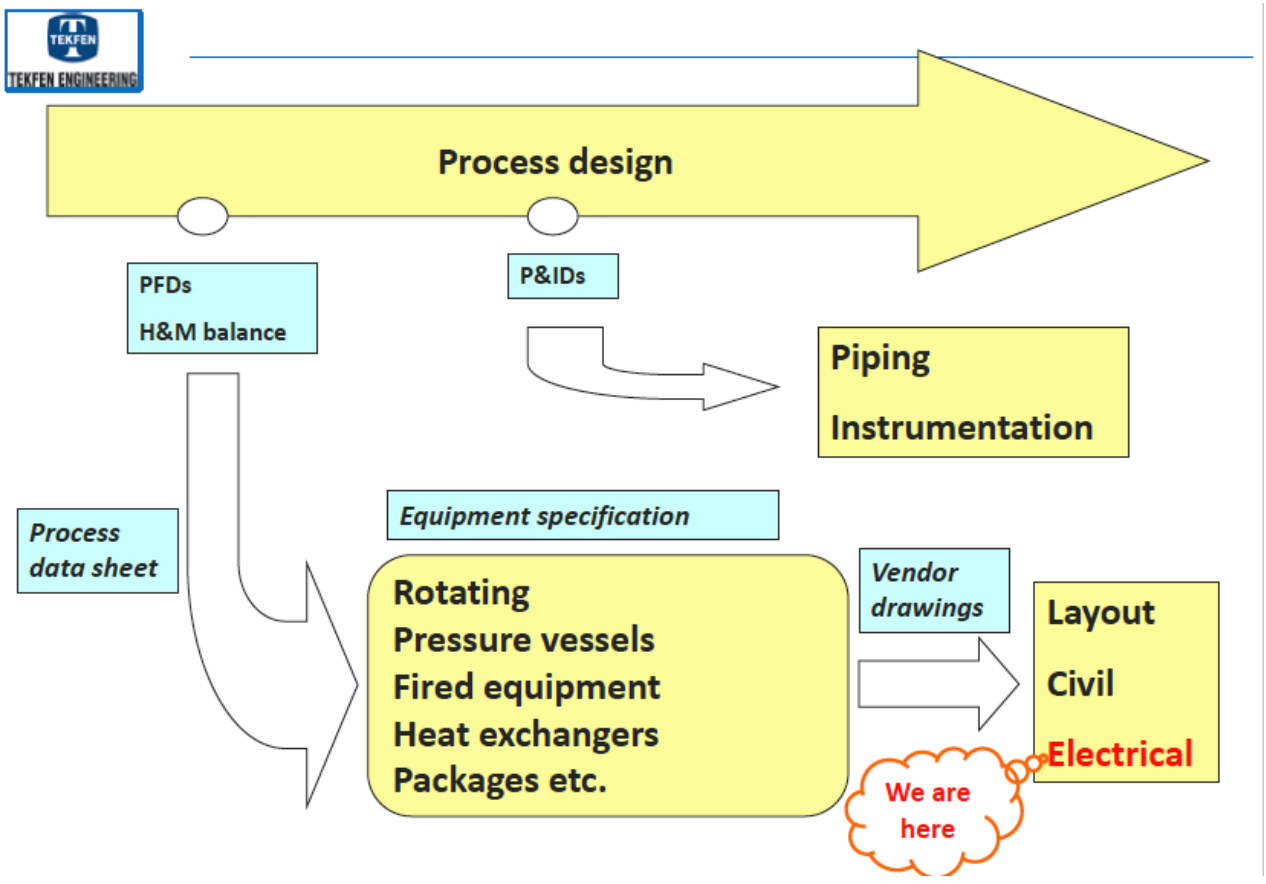


Figure 2 : TEKFEN ENGINEERING IN A NUTSHELL



(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
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In the end of the first step, overall single line diagram is formed. Then equipment specifications are made. Every equipment has a data sheet. Its data sheet is the id of this equipment. Collecting the necessary data from the data sheets some calculations are made. These calculation types are load flow analysis, short circuit analysis, voltage drop analysis, earthing calculations. There should be no mistake on a design or list and therefore there is a lot of check mechanisms. I as a trainee worked mostly in this checking mechanisms.

A.4.7 – Other Learnings from the introduction documents

A.4.7.1 FPSO systems

A floating production storage and offloading (FPSO) unit is a floating vessel used by the offshore oil and gas industry for the production and processing of hydrocarbons, and for the storage of oil. A FPSO vessel is designed to receive hydrocarbons produced by itself or from nearby platforms or subsea template, process them, and store oil until it can be offloaded onto a tanker or transported through a pipeline. FPSOs are preferred in frontier offshore regions as they are easy to install, and do not require a local pipeline infrastructure to export oil. TEKFEN has two major projects including FPSO systems: First one was in Brazil with the name “Petrobras Offshore Platform Module Fabrication”. Its deck segments were fabricated in Ceyhan Steel Factory and transported to Iskenderun Port by special vehicles and then to Brazil. The second one is in Azerbaijan.

A.4.7.2 Electrical equipment: Switchgears

In an electric power system, switchgear is the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgears are used both to de-energize equipment to allow work to be done and to clear faults downstream. This type of equipment is directly linked to the reliability of the electricity supply. One of the basic functions of switchgear is protection, which is interruption of short-circuit and overload fault currents while maintaining service to unaffected circuits. Switchgear also provides isolation of circuits from power supplies. Switchgear is also used to enhance system availability by allowing more than one source to feed a load.
A switchgear has two types of components:

- Power conducting components, such as switches, circuit breakers, fuses, and lightning arrestors, that conduct or interrupt the flow of electrical power
- Control systems such as control panels, current transformers, potential transformers, protective relays, and associated circuitry, that monitor, control, and protect the power conducting components

A.4.7.3 Motor Control center (MCC)

(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
(The technical report about the complete work done at this department will be written here. A separate report form may be used, if necessary.)

A motor control center (MCC) is an assembly of one or more enclosed sections having a common power bus and principally containing motor control units. Motor control centers are in modern practice a factory assembly of several motor starters. A motor control center can include variable frequency drives, programmable controllers, and metering and may also be the electrical service entrance for the building.

A.4.7.3 Classification of Power Consumers

- Emergency consumer: Consumer affecting personal safety whether directly or indirectly and inducing risk of major damages on installation or equipment.
    - Example: all systems: DCS(Digital Security Controls), ESD(Electronic System Design), Telecom etc.
    - Emergency power supply: UPS (Uninterrupted Power Supply)
- Essential consumer: Consumer involved in the safeguard of equipment or installation and in the restarting of the installation after a plant shutdown.
    - Example: Power generation auxiliaries, buildings HVAC(Heating, Ventilating and Air Conditioning), MOV(metal-oxide varistor)s, fire water pumps, heater to prevent chemical freezing, process consumers required to operate for some time after shutdown, e.g., for process cool down, pumps lube oil
    - Essential power fed from EDG = Emergency Diesel Generator
- Normal consumer: Consumer which has no effect either on the safety or the safeguard of installation or equipment in case of normal generation failure.
    - Example: process users etc.

A.4.7.4 Electrical Calculations

- Load Flow Analysis
  Load flow analysis is the steady state analysis of power system network. In load flow analysis, the value of current and voltage for each equipment and cable is calculated. Load flow analysis is so important for planning future expansion of power systems as well as determining the best operation of existing systems. The principal information obtained from the power-flow study is the magnitude and phase angle of the voltage at each bus, and the real and reactive power flowing in each line.

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- Short circuit analysis
  Short-Circuit Currents are currents that introduce large amounts of destructive energy in the forms of heat and magnetic force into a power system. The reliability and safety of electric power distribution systems depend on accurate and thorough knowledge of short-circuit fault currents that can be present, and on the ability of protective devices to satisfactorily interrupt these currents.

- Cable Sections
  Cable sections are calculated based on short circuit current, rated load current vs ampacity of table and voltage drop. I also made some cable section calculations.

Instrumentation department is working on the projects given by TÜPRAŞ or PETKİM. I don't know deeper details about the projects of instrumentation department because I have just a little interaction with them during my internship. Let me explain a bit about the famous TANAP project and go on with the works I did.

A.5 – TANAP

TANAP will be a central part of the Southern Gas Corridor, which will connect the giant Shah Deniz gas field in Azerbaijan to Europe through the South Caucasus Pipeline (SCP), TANAP and the Trans Adriatic Pipeline (TAP).

The pipeline will start from Sangachal terminal and in territory of Azerbaijan it will be the expansion of existing South Caucasus Pipeline (SCPx). From end point of SCPx which is in Erzurum it will be continued to Eskishehir where it will unload 6bcm of gas entitled to Turkish buyers. From Turkey-Greece border it will continue through Greece, Albania and will end in Italy. With 19 km running under the Sea of Marmara the main pipeline within Turkey reach a total of 1850 km. This project is of strategic importance for both Azerbaijan and Turkey. It will allow the first Azerbaijani gas exports to Europe, beyond Turkey. It will also strengthen the role of Turkey as a regional energy hub.

Construction of the pipeline began formally in March 2015 and is expected to be completed in 2019.
TEKFEN Construction has two different contracts at this project TANAP. One is TANAP Trans Anatolian Natural Gas Pipeline Project – Lot 3. The other one is Turkey – TANAP Trans Anatolian Natural Gas Pipeline Project – Compressor and Metering Stations. Our office was working on the second project. There will be 7 compressor stations,4 measuring stations, 11 pigging stations, 49 block valve stations and 2 off-take stations to supply Turkey's national natural gas network.

(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
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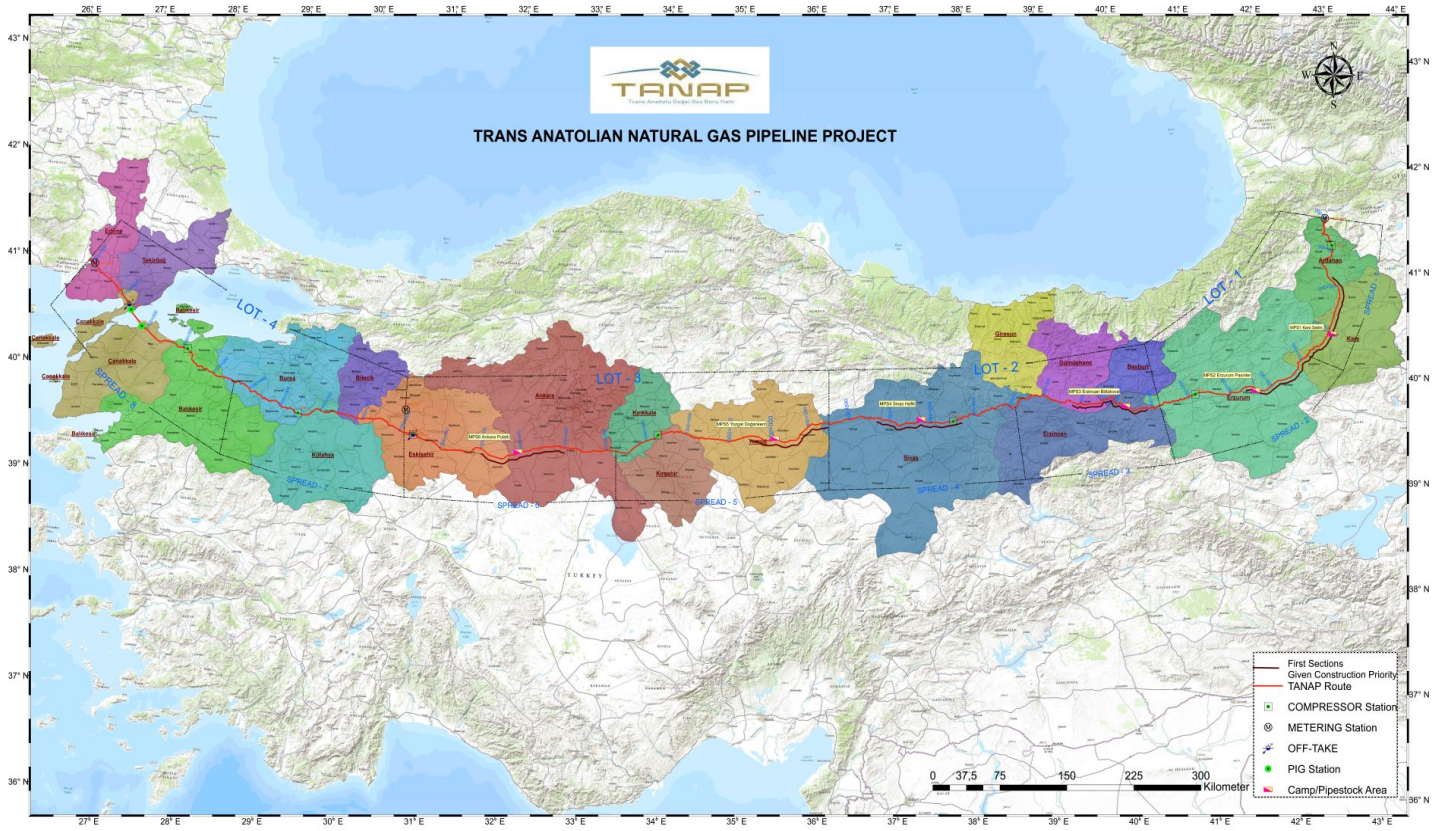
The second contract is made on 17.02.2016. The contract name is "Stations engineering procurement construction". There are 4 metering stations their name are MS1,MS2,MS3,MS4. There are 2 compressor stations, their names are CS1 and CS5. These are the ones that I worked with. The natural gas should be measured step by step through Turkey, because it should be checked that there are no leak or loss in the natural gas. The compressor stations are used to compress the natural gas. TEKFEN İnşaat ve Tesisat AŞ so called TEKFEN Construction will design and build these stations, but the electrical infrastructure of these stations are designed and tested in TEKFEN Engineering which is an another group company of TEKFEN Holding.

Electrical engineers are working on the famous TANAP project. I have already explained about the works done by Electrical Engineering Department of TEKFEN Engineering. The name of the job is "TANAP Compressor and Metering Stations", can also be seen on the ongoing works list. The contract is made on 17.02.2016 and the completion date is 31/05/2019. So, I can say that I joined the working team in the middle of the project. So, the basic design part was finished and the engineers are working on the design and analysis and detail engineering part. They mostly use CAD tools, AVEVA, ETAP, AutoCAD etc.

Figure 3 : TANAP MAP



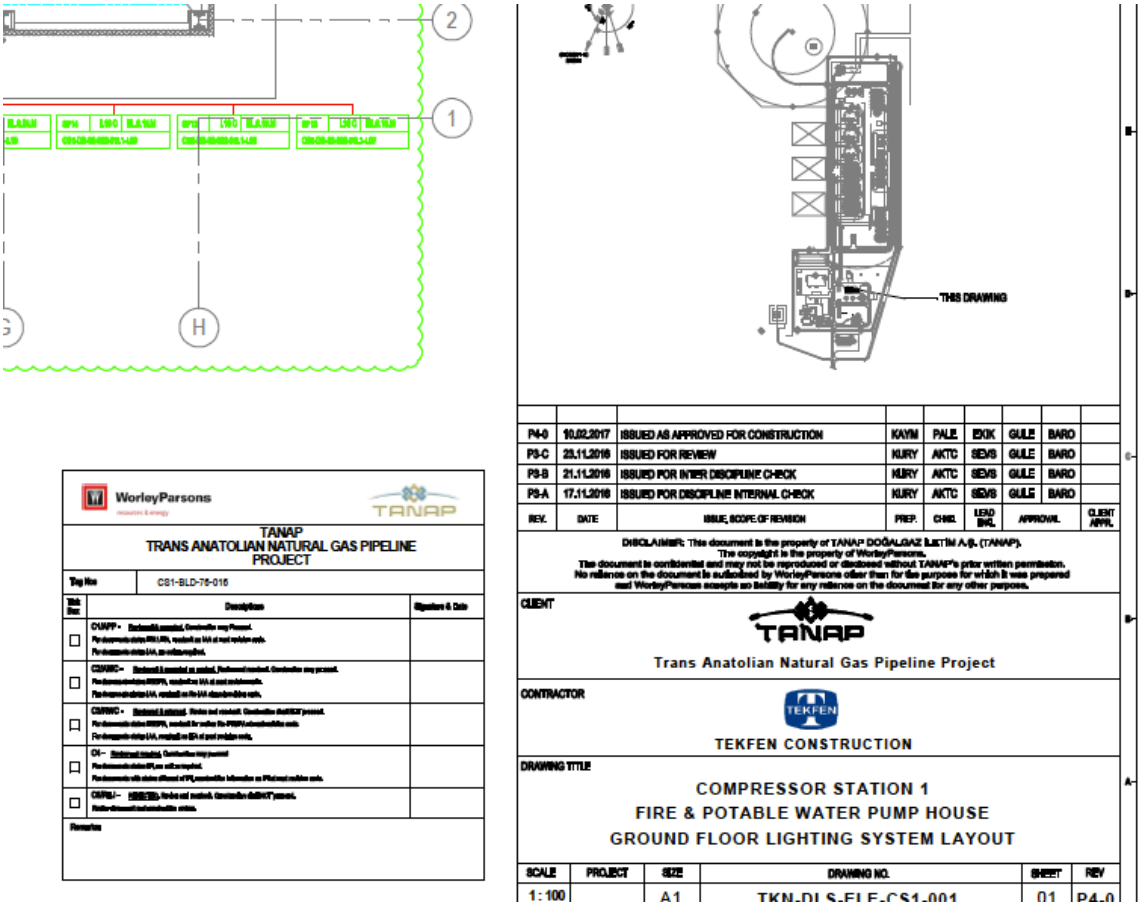
(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
(The technical report about the complete work done at this department will be written here. A separate report form may be used, if necessary.)

A.6 - DETAILED DESCRIPTION OF WORKS DONE

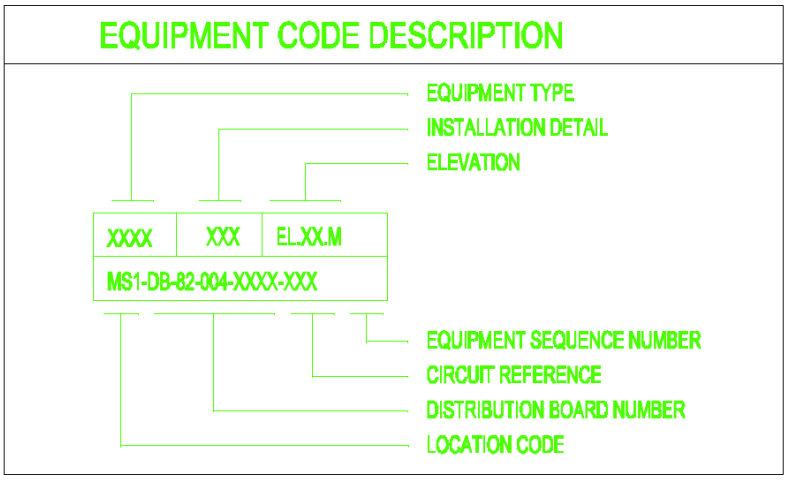
I did generally documentation works. I worked on MS Office Excel, AutoCAD software. There were also a lot engineers doing documentation works. There are also a lot of draftsmen professionalized for technical drawing on AutoCAD. Some of engineers professionalized for 3D drawings worked on SolidWorks. Some of them are just working on Excel. Let me explain the documentation works I did.

In the figure 4, you can see a typical AutoCAD layout of one of buildings in one of the stations of TANAP project. On the right, it has all the necessary information about the drawing. For example, this drawing's title is compressor station(CS) 1 fire & potable water pump house ground floor lightning system layout. I have already explained about the stations in TANAP project and their functions. Fire & potable water pump house is the building name. There can also be a canteen, a guesthouse, a garage etc. in the building. The other specification is the layout type. I worked on lightning system layouts and small power layouts only. The client is TANAP. The contractor is TEKFEN Construction. Every building has a key plan, legend and reference drawing. By the way all of these files associated with TANAP project is online coded. They are accessible only via the authorized users. The revision history of the file can also be seen on the right. For example, this document is issued as approved for construction on 10.02.2017. The information of who prepared or checked this document, who approved this document, who is the leading engineer can be seen too.

Figure 4 : Information of layout



(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
(The technical report about the complete work done at this department will be written here. A separate report form may be used, if necessary.)



Let's come to point what I was interested in: The equipment code description. You can see in the figure 5 the details. These are the tag numbers set by the electrical draftsmen.

Figure 5 : Equipment Code Description

Because they set them manually, it could possibly be some errors. Every tag number should be unique. For example, if there's a duplication it is definitely an error. The line numbers should be consecutive. If they are not it's an error too. To detect these kind of errors the first step is to extract all of the tag numbers in a building and sort them. It was the first time that I used the AutoCAD Software, so I have some difficulties in the beginning. After some internet research and work I find the short way to extract them in a new excel file. After sorting the tags, I write some small algorithms to detect failure between tag number sequences. I was also new to MS Office Excel, but now I can say that I am good at it. After detecting the failure location, I wrote the failure type and some description of it manually. For every building in MS1,MS2,CS5, CS1 and MS3 I repeated these sequences and created two excel files containing the errors and sent them back to electrical draftsman. After 3 weeks, the same AutoCAD layouts are sent to me again and it is said that the errors are fixed, but I am requested to check them once more. So, all of these processes are made two times for CS1,MS2,CS5 MS1 and MS3 by me.

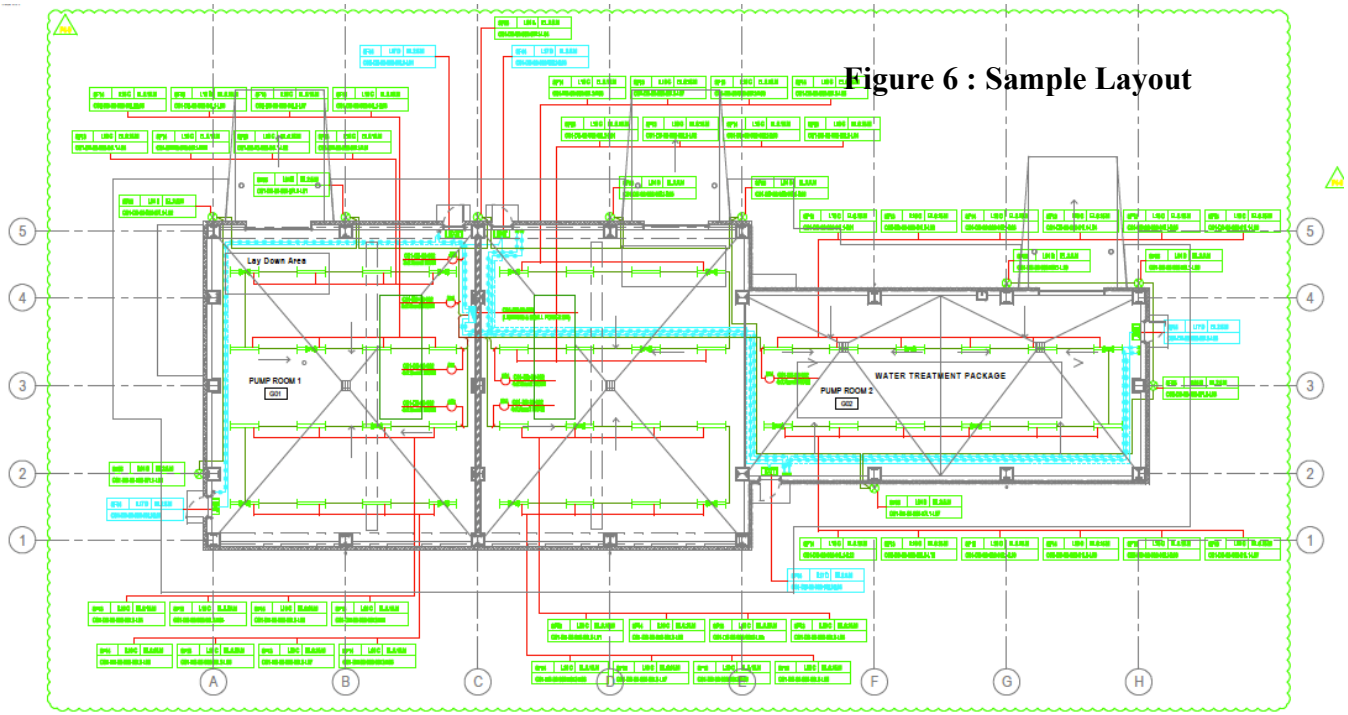


Figure 6 : Sample Layout

(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
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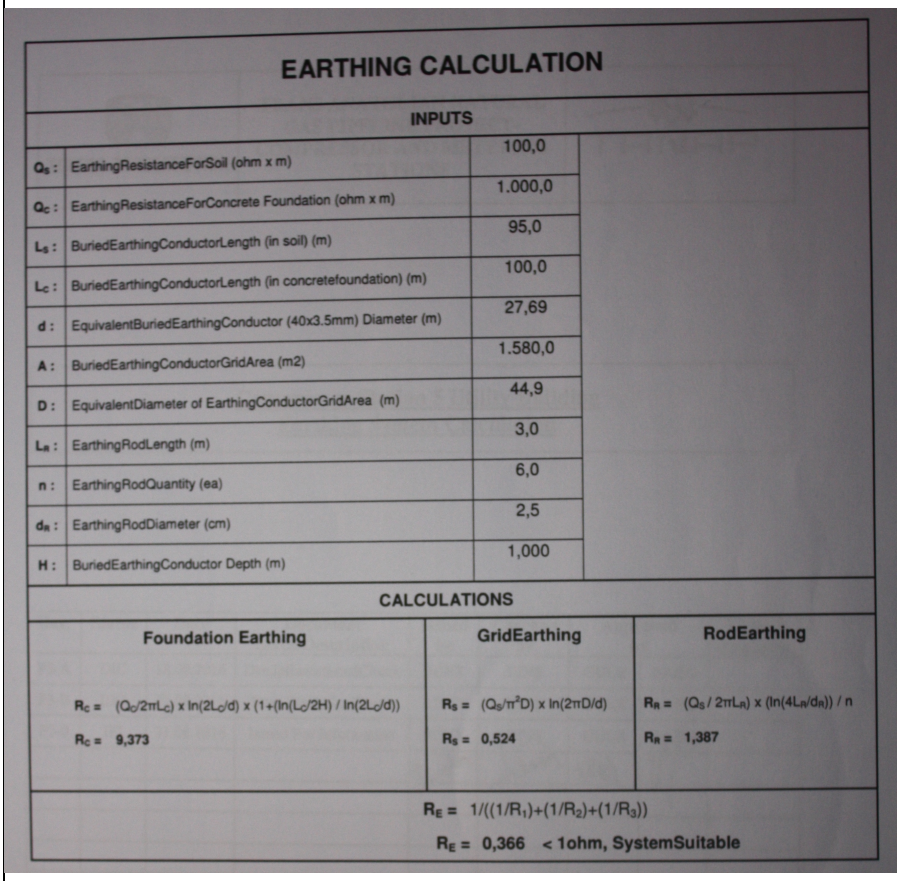
I did also some reordering jobs, for example: distribution board lists. Distribution board documents are sent by WorleyParsons, one of the contractors of TANAP project. These lists are located in different pdf files, but my supervisor wants all of the necessary information in an excel file, so I did some copy-paste works and ordered and extracted the necessary information.



EARTHING CALCULATION

INPUTS

Q_s :	EarthingResistanceForSoil (ohm x m)	100,0
Q_c :	EarthingResistanceForConcrete Foundation (ohm x m)	1.000,0
L_s :	BuriedEarthingConductorLength (in soil) (m)	95,0
L_c :	BuriedEarthingConductorLength (in concretefoundation) (m)	100,0
d :	EquivalentBuriedEarthingConductor (40x3.5mm) Diameter (m)	27,69
A :	BuriedEarthingConductorGridArea (m2)	1.580,0
D :	EquivalentDiameter of EarthingConductorGridArea (m)	44,9
L_R :	EarthingRodLength (m)	3,0
n :	EarthingRodQuantity (ea)	6,0
d_R :	EarthingRodDiameter (cm)	2,5
H :	BuriedEarthingConductor Depth (m)	1,000

CALCULATIONS

Foundation Earthing	GridEarthing	RodEarthing
$R_C = (Q_C/2\pi L_C) \times \ln(2L_C/d) \times (1+(\ln(L_C/2H) / \ln(2L_C/d))$	$R_S = (Q_S/\pi^2 D) \times \ln(2\pi D/d)$	$R_R = (Q_S / 2\pi L_R) \times (\ln(4L_R/d_R)) / n$
$R_C = 9,373$	$R_S = 0,524$	$R_R = 1,387$

$R_E = 1/((1/R_1)+(1/R_2)+(1/R_3))$

$R_E = 0,366$ < 1ohm, SystemSuitable

Figure 7 : Earthing Calculation

During my traineeship, I also made some calculation works. In the figure, you can see all the necessary information to complete an earthing calculation. After this calculation, it is detected that if the system is suitable or not. In the beginning, it is calculated 3 different resistance values: foundation earthing, grid earthing, rod earthing. Then if the parallel combination of these 3 resistances smaller than 1 ohm the system is suitable.

In addition to earthing, calculation I also made voltage drop calculations. It was not so difficult as one can expect. Because the formulas are set in the excel file and everybody uses it. The specifications of items may vary, but the formulas remain same. So, to calculate voltage drop first I need the documentation. The documentation is given to me in a pdf file. I extract the necessary columns of the documentation and fill the voltage drop calculation document. It was so easy for me, but there are so much buildings and stations to calculate.

Another type of documentation work I made is panel tag list check. In the document sent to me the unique tag numbers of every panel are set, so these tag numbers must be on the AutoCAD layouts too. My work is to check whether the unique panel tag exists in AutoCAD layout or not. If it does not exist, I noted that there's no such a panel. If the panel tag exists in AutoCAD layout I noted the document name it exists on so that they can detect easily in which building the unique panel tag exists. If there are any unique panel tag numbers different on the AutoCAD layout and on the panel tag list, the right one is the one on the panel tag list.

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Therefore, the panel tag number on the AutoCAD layout must be changed. I noted on the excel file also when I make a change. This was another kind of documentation work for me. I repeated the same steps both for CS1 and CS5.

After that I am given a more challenging documentation work and it takes 4 days. There is a fire fighting and instrument air works bill of quantities(BOQ) table. Every item will be used in fire-fighting and air works structure can be seen on the list. For example: heating, ventilating and air conditioning system items like expansion tanks, supply air handling units, exhaust fans etc. The total quantity of a unique item in all stations and the unique quantity of an item in a unique building of a station can also be seen in the table. Some of them requires electrical load. If an item requires electrical load, it is written in the table, how much electrical load it requires. What I need to do is to specify the items in every building requiring electrical load. Let's say that I need the items and its quantities which require electrical load in guest house of MS4. With some simple codes, I first detect which item and how many items present in the guest house of MS4. Then I check if the item has electrical load or not. If it has electrical load, its name, its electrical load and its count are my necessary information to complete an excel file containing the items and their corresponding cable information. After collecting the necessary information, I paste them and order them in a new excel file.

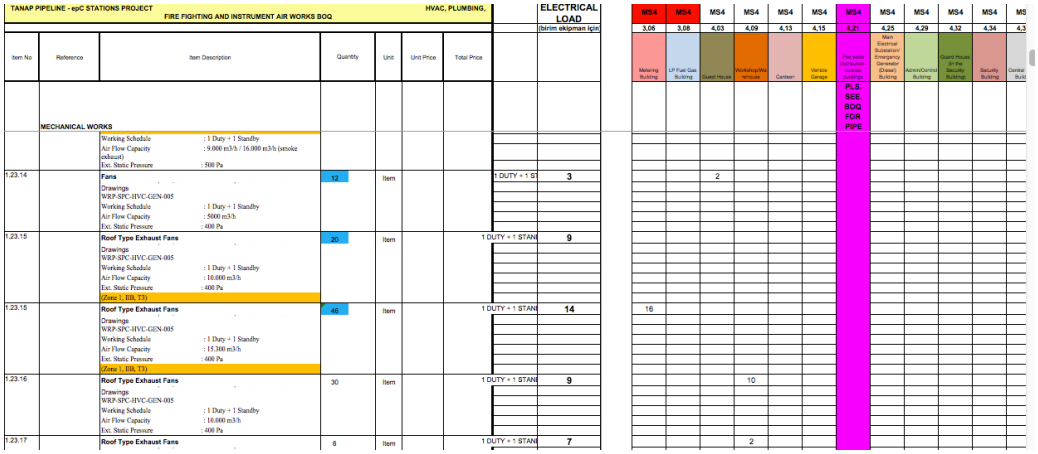


Figure 8 : BOQ table

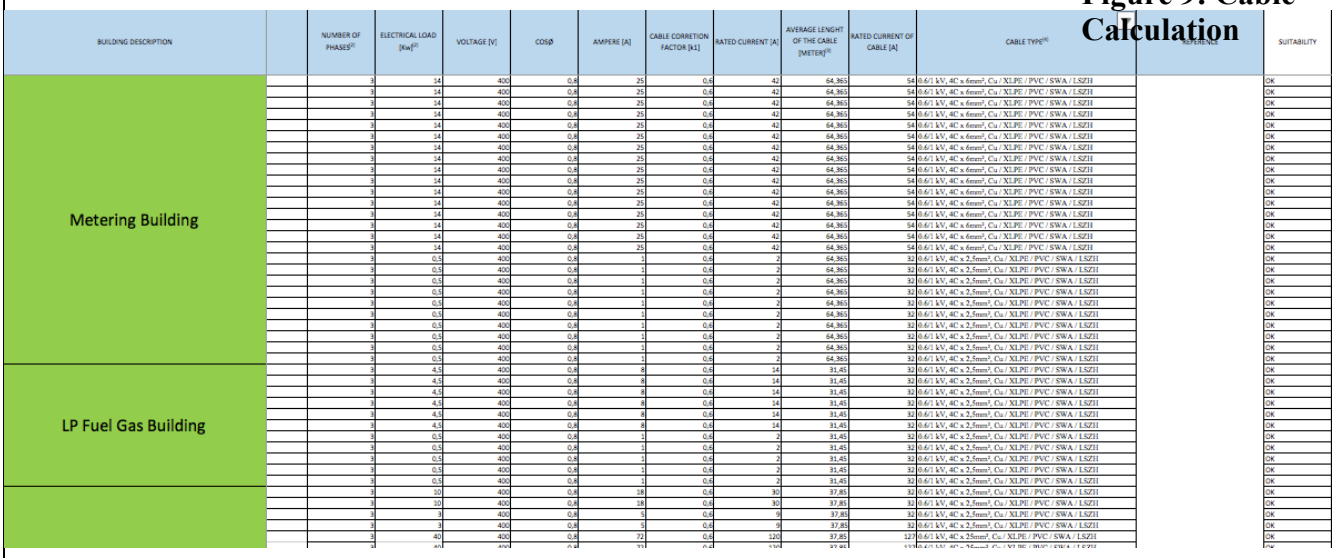
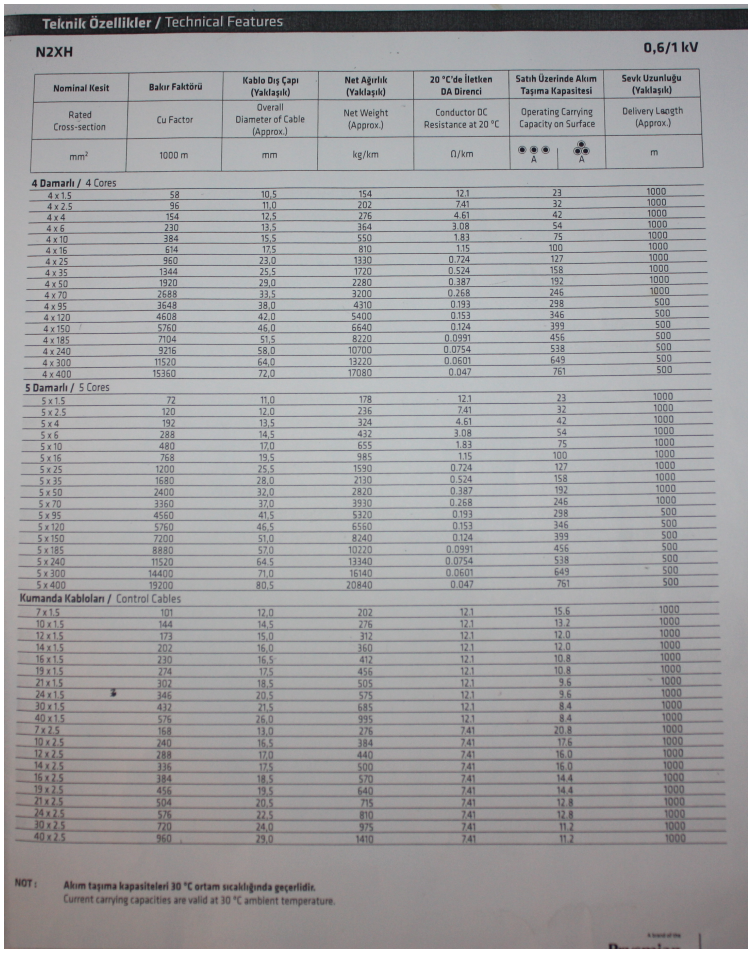


Figure 9: Cable Calculation

(Buraya işyerinin bu bölümünde yapılan işle ilgili teknik rapor yazılacaktır. İstenirse bu rapor ayrı bir doküman olarak da verilebilir.)
(The technical report about the complete work done at this department will be written here. A separate report form may be used, if necessary.)

For example: For MS4's compressor building number 1 I create a section and write its dimension which are given to me. Then the tag of the electrical board of the building. After that I order the items taken from the previous file with corresponding electrical load. Then I should do ampere calculation. For ampere calculation one needs three input data, first one is voltage fixed at 400V, second one is electrical load taken from the previous file, third one is power factor ($\cos(\phi)$). Then calculate the ampere value for the item, but the ampere value should be corrected by cable correction factor. After correction, I had the rated current. According to this rated current I can decide which cable type to use. 4 cores cable are used in TANAP project. These cables are called AFUMEX cables which are halogen free, flame redundant and non-corrosive. A documentation is given to me about these cable types. What I consider is its operating carrying capacity on surface. The carrying capacity of a 4 cores cable with 2.5 mm^2 rated cross section is 32 A. With increasing rated cross section the carrying capacity on surface increases too. I looked at the calculated rated current value and it's 60 A. What kind of cable to use? I looked at the carrying capacities of 4 core cables. The capacity of the cable with 10 mm^2 rated cross section is 75 A. So, it is suitable, because every time it should be used a cable type with a larger capacity than calculation. I note this cable type in excel file. The job is done. The purpose of all work done is to decide the cable type going to be used for the item. In addition to that a calculation for the average length of the cable is done too, because the dimensions of the building are also given. All the processes are repeated for every building of MS2, MS4 and CS1.



Teknik Özellikler / Technical Features

N2XH **0,6/1 kV**

Nominal Kesit Rated Cross-section mm^2	Bakır Faktörü Cu Factor 1000 m	Kablo Dış Çapı (Yaklaşık) Overall Diameter of Cable (Approx.) mm	Net Ağırlık (Yaklaşık) Net Weight (Approx.) kg/km	20 °C'de İletken DA Direnci Conductor DC Resistance at 20 °C Ω/km	Satıh Üzerinde Akım Taşıma Kapasitesi Operating Carrying Capacity on Surface A	Sevk Uzunluğu (Yaklaşık) Delivery Length (Approx.) m
4 Damarlı / 4 Cores						
4 x 1.5	58	10,5	154	12.1	23	1000
4 x 2.5	96	11,0	202	7.41	32	1000
4 x 4	154	12,5	276	4.61	42	1000
4 x 6	230	13,5	364	3.08	54	1000
4 x 10	384	15,5	550	1.83	75	1000
4 x 16	614	17,5	810	1.15	100	1000
4 x 25	960	23,0	1330	0.724	127	1000
4 x 35	1344	25,5	1720	0.524	158	1000
4 x 50	1920	29,0	2280	0.387	192	1000
4 x 70	2688	33,5	3200	0.268	246	1000
4 x 95	3648	38,0	4310	0.193	298	500
4 x 120	4608	42,0	5400	0.153	346	500
4 x 150	5760	46,0	6640	0.124	399	500
4 x 185	7104	51,5	8220	0.0991	456	500
4 x 240	9216	58,0	10700	0.0754	538	500
4 x 300	11520	64,0	13220	0.0601	649	500
4 x 400	15360	72,0	17080	0.047	761	500
5 Damarlı / 5 Cores						
5 x 1.5	72	11,0	178	12.1	23	1000
5 x 2.5	120	12,0	236	7.41	32	1000
5 x 4	192	13,5	324	4.61	42	1000
5 x 6	288	14,5	432	3.08	54	1000
5 x 10	480	17,0	655	1.83	75	1000
5 x 16	768	19,5	985	1.15	100	1000
5 x 25	1200	25,5	1590	0.724	127	1000
5 x 35	1680	28,0	2130	0.524	158	1000
5 x 50	2400	32,0	2820	0.387	192	1000
5 x 70	3360	37,0	3930	0.268	246	1000
5 x 95	4560	41,5	5320	0.193	298	500
5 x 120	5760	46,5	6560	0.153	346	500
5 x 150	7200	51,0	8240	0.124	399	500
5 x 185	8880	57,0	10220	0.0991	456	500
5 x 240	11520	64,5	13340	0.0754	538	500
5 x 300	14400	71,0	16140	0.0601	649	500
5 x 400	19200	80,5	20840	0.047	761	500
Kumanda Kabloları / Control Cables						
7 x 1.5	101	12,0	202	12.1	15.6	1000
10 x 1.5	144	14,5	276	12.1	13.2	1000
12 x 1.5	173	15,0	312	12.1	12.0	1000
14 x 1.5	202	16,0	360	12.1	12.0	1000
16 x 1.5	230	16,5	412	12.1	10.8	1000
19 x 1.5	274	17,5	456	12.1	10.8	1000
21 x 1.5	302	18,5	505	12.1	9.6	1000
24 x 1.5	346	20,5	575	12.1	9.6	1000
30 x 1.5	432	21,5	685	12.1	8.4	1000
40 x 1.5	576	26,0	995	12.1	8.4	1000
7 x 2.5	168	13,0	276	7.41	20.8	1000
10 x 2.5	240	16,5	384	7.41	17.6	1000
12 x 2.5	288	17,0	440	7.41	16.0	1000
14 x 2.5	336	17,5	500	7.41	16.0	1000
16 x 2.5	384	18,5	570	7.41	14.4	1000
19 x 2.5	456	19,5	640	7.41	14.4	1000
21 x 2.5	504	20,5	715	7.41	12.8	1000
24 x 2.5	576	22,5	810	7.41	12.8	1000
30 x 2.5	720	24,0	975	7.41	11.2	1000
40 x 2.5	960	29,0	1410	7.41	11.2	1000

NOT : Akım taşıma kapasiteleri 30 °C ortam sıcaklığında geçerlidir.
Current carrying capacities are valid at 30 °C ambient temperature.

Figure 10 : Cable Manual

In addition to documentation works I researched also at new areas to me, like single line diagrams. It is a useful tool for power engineers with its largest application in power flow studies. It is a simple notation for presenting a 3-phase system, because instead of representing each of three phases with a separate line only line conductor is presented. There are some universally accepted electrical symbols to represent the different electrical components. Most frequently used ones are transformer, fuse, disconnect switch, ground, battery, motor. Elements on the diagram do not represent the physical size or location of the component but it is a common convention to organize the diagram with the same sequence-mostly top to bottom, therefore one working technique with single line diagram is to start at the top where the highest voltage is and down to lowest voltage. One example single line system can be seen on the figure.

Şirket Değerlendirme Yazısı
Letter of Evaluation

Name of the company: **TEKFEN Engineering**
Address of the company: Kültür Mahallesi TEKFEN Sitesi Budak Sokak C Blok No:1 34340 Beşiktaş / İSTANBUL

Company Profile:
TEKFEN Holding Contracting Group
Group Companies:
- TEKFEN Construction
- TEKFEN Manufacturing & Engineering
- TEKFEN Engineering
- HMB

Founding Date : 1956

Partnerships
-Azfen JV (Azerbaijan)
-Cenub Tikinti Services (Azerbaijan)
-GATE Contracting (Turkey)

- Nr. of Employees: 12691
- Nr. of Electrical Engineers: Because TEKFEN is a big company, the data is not defined exactly.

2016 Turnover (31.12.2016)
2.823 million TL

Company evaluation:
(Buraya işyeri ile ilgili sizin değerlendirmeleriniz yazılacaktır.)
(At this section your evaluation of the company will be given)

I worked in the Electrical Department of Tekfen Engineering as a trainee. The head of department is Hasan Cavit Tuncer. My supervisor is Mehmet Alpsagun Kuruca.

My internship at TEKFEN Engineering lasted 24 days. During this time, my main duty was to make documentation works and observe the company and help the engineers. I had the opportunity to observe how things work in such a big company like TEKFEN Engineering. By the way, to work on the well-known project TANAP was motivating and wonderful. I know the electrical infrastructure of stations in TANAP project very well. The traineeship helped me understand the working mechanism and methods of electrical engineers in an office.

During this internship period, I developed my calculation skills, my social communication skills, my computer software skills and my analytical skills. I gained the experience of working life in a such a big company. I think that this experience is going to help me a lot to make my future decision after graduation.

I am very pleased completing an internship in TEKFEN Engineering and I will suggest everyone.

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DOCUMENTATION