

***HAFR AL-BATIN COMMUNITY
COLLEGE***



***Radiographic Testing
Co-op Training***

FINAL REPORT

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I would like to thank the management of Hafr Al-Batin Community College for giving me the opportunity to do my co-op training in Rawabi Company.

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Summary

This report explains about the different Radiographic techniques performed during my COOP training in Rawabi Company. It covers the following topics: materials and equipments of RT, techniques, calculations for exposure time and Radiation Safety required in the field.

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Weekly schedule

Week no.	Weekly work
1	Classes of RT and safety.
2	RT and PT classes(Basics)
3	MT classes(Basics)
4	RT training in jubail.
5	RT training in jubail.
6	RT training in jubail.
7	RT training in jubail.
8	RT training in jubail.
9	RT training in jubail.
10	RT training in jubail.
11	RT training in jubail.

12	RT training in jubail.
13	RT training in jubail.
14	RT training in jubail.
15	RT training in jubail.

Aims

- 1-To learn about different radiographic testing techniques.
- 2-To complete associate degree program in NDE at HBCC by doing the co op training course.
- 3-To develop my practical skills in RT.
- 4-To learn how to work as a member of a team.
- 5-To improve my other abilities like English Language.
- 6-To practice Radiation Safety precautions.

Introduction

I have done my co op training for fifteen weeks in RAWABI Company, Jubail.

During my training I have worked in Radiographic Testing.

Company profile:

Rawabi Industrial Support Services (RISS), a fully owned subsidiary that provides Non-Destructive Testing (NDT) Services and Corrosion monitoring services in Saudi Arabia and the Middle East.

RADIOGRAPHIC TESTING (RT)

Introduction:

Radiography is used to test different products such as casting, forging and welding pipes and plates. Radiographic Testing is one of the widely used methods of the Non Destructive Testing. RT can be used to provide a permanent visual record image of the test object on the film. It has some limitations such as discontinuities which are parallel to the radiation beam are difficult to locate.

Materials and Equipments of RT:

There are variety of materials and equipments which are used in RT:

1-Radiation Sources:

There are many types of radiation sources such as X-rays, Iridium 192 and Cobalt 60.



Figure: (1) Camera.

2-Films:

There are two types of films:

Type I (slow) is used for 8" or less diameter of pipe.

Type II (fast) is used for pipes having diameters more than 8".



Figure: (2) Films.

3-Lead Screens:

They are used to improve radiation effect on films and avoid the back scatter.

Minimum thickness of front lead screen in case of Ir-192 is 0.13 and 0.25mm in case of Co-60.



Figure: (3) Lead Screens.

4-IQI (Image Quality Indicator)

It is used to check the quality of image by seeing wire numbers clearly on the film after developing it.



Figure: (4) IQI.

5- Crank Unit.

It is used for pushing the source in camera toward the joint to be shot.



Figure: (5) Crank Unit.

6- Other Equipments

Lead Number Box: It is used to keep lead numbers and letters.



Figure: (6) Lead Number Box.

Guide Tube: It is used to guide the source from camera to the tip.



Figure: (7) Guide Tube.

Stand: It is used to support guide tube.



Figure: (8) Stand.

Radiation Safety

Safety is very important in NDE (Non Destructive Evaluation) especially in radiographic testing because it is dealt with live sources which can be dangerous to technicians' lives if they were used in improper ways .To avoid exposing to unnecessary radiation, we must follow the principle of ALARA (As low As Reasonably Achievable) which means reducing radiation by hiding behind a shield or moving away from the source.

The worker must have:

A. Survey Meter.



Figure: (9) Survey Meter.

It is used for surveying the area and to make sure that the source got into the camera.

b. Pocket Dose Meter.



Figure: (10) Pocket Dose Meter.

It is used for measuring the amount of doses received during the daily work.

c. TLD (Thermo Luminescence Dosimeter).

It is used for measuring the amount of doses received during a month.



Figure: (11) TLD.

Controlled Area must have:

a. Warning Signs.

Minimum of four feet – Standing radiation warning signs must be posted at the controlled area boundary.



Figure: (12) Warning Sign.

b. Barrier Tape or Rope.

This tape must be extended for perimeter of the controlled area.

My Work during Co op

Techniques of Radiographic Testing:

There are four techniques that I practiced during my Co op:

1- Contact Technique:

In this technique, we shoot double wall exposure and single wall appears on the film. That means radiation passes through two walls, and IQI must be at film side. It is used for pipes with more than 3" diameter. It requires at least three shots up to 6" and four shots for diameter more than 6". There is a difference between contact technique and other techniques, (such that a letter "F" is on film side.)



Figure: (13) Contact Technique.

2- Superimposed Technique.

In this technique, we shoot double wall exposure and double wall viewing will appear on the film. Which means that the radiation passes through two walls and both sides of the object to be viewed. The IQI in this technique is at the source side. The direction of the collimator is (at perpendicular) angle to the weld. We use this technique for pipes whose diameters are between half inch and two inches. We don't need the number belt but we need three letters "A", "B" and "C". It requires three shots.



Figure: (14) Superimposed Technique.

3- Elliptical Technique.

(The elliptical technique is used when the diameter is small up to 3"). We don't need the number belt but it requires letters "A" and "B" at right angle. This technique requires at least two shots at 90 degrees around the pipe.



Figure: (15) Elliptical Technique.

4- Panoramic Technique.

For shooting panoramic technique, the diameter should be more than 8". In this technique the pipe must be open at least at one side to let the workers go inside the pipe easily.



Figure: (16) Panoramic Technique.

RT PROCEDURE FOLLOWED FOR DIFFERENT PIPE SIZES

Most commonly used techniques for pipe diameters less than 4 " are elliptical and superimposed. The first pipe I shot was of 2" diameter, 5.54mm thickness and the activity of the source that day was 11.9 curie for this diameter, we use elliptical technique according to RT procedure.

1-I have put letters A and B with fixing them on the pipe by masking tape at 90 degrees.

2- Then I have placed film under the pipe and the IQI above the pipe. I fixed the source by magnetic stand.

3-Then I adjusted the SFD (source film distance) on the side of letter A. The distance from tip of the source up to the film was 12".

4-We placed the source 3.5" offset from the joint because we were using elliptical technique.

5-I calculated exposure time; it was 5 min and 25 sec for one shot. After cranking the source out for radiation; we measured the time by timer clock. When time got over, I retracted the source.

6-Then I removed the film to put the other film on side B.

7-I repeated the same procedure at B.

The second pipe I shot was of 1" diameter, 4.45mm thickness and the activity of the source that day was 11.7 curie for this diameter, we use superimposed technique according to RT procedure.

1- I have marked letters A, B and C by fixing them on the pipe by masking tape at 90 degrees.

2-Then I have placed the film under the pipe and the IQI above the pipe. I fixed the source by magnetic stand.

3-Then I adjusted the SFD (source film distance) on the side of letter A, the distance from tip of the source up to the film was 12".

4-I placed the source directly above the joint because I am using superimposed technique.

5- I calculated exposure time, it was 4 min and 55 sec for one shot. After cranking the source out for radiation, we measured the time by timer clock.

6-When time got over I retracted the source .Then I removed the film to put the other film on side B and C.

7-I repeated the same procedure at B and C.

The next pipe I shot was of 6" diameter, 7.11mm thickness and the activity of the source that day was 22.5 curie for this diameter we use contact technique according to RT procedure.

1-I marked reference line on the weld joint by a marker. Then I put the number belt around the weld joint with zero on reference line.

2- I placed weld ID on weld joint. Then I placed film around the pipe.

3- I have put letter F on IQI and fixed them on the film by masking tape.

4-I placed the source directly on the joint because I was using contact technique.

5-I calculated exposure time it was 48 sec for one shot, after cranking the source out for radiation, we measured the time by timer clock.

6-When time got over I retracted the source .Then I removed the film.

7-I divided pipe weld length in three parts. The next film was placed adjacent to the first film covering one third portion of the weld and similar shot was performed. After this shot same procedure was followed to take the third shot.

Calculation of exposure time

The exposure time calculation based on pipe thickness and technique is being used. Effective wall thickness is two times wall thickness. This effective wall thickness is checked with required density from standard chart (see appendix). Then this value is multiplied by SFD two times and factor for film speed and divided by source activity.

Tricks of technicians

1-Reducing SFD for reducing exposure time and during this technique, IQI must be placed between pipe and film and not on the source side.

2-Shooting two films during one shot for fast work in contact technique.

3-Instead of using panoramic technique technicians use contact shot so that more films are shot so more money.

Conclusions

-I practiced different Radiographic Testing techniques.

-I observed radiation safety precautions.

-I learnt how to work as a member of team.

-I developed my practical skills in RT.

-I improved my other abilities like English language.

Reference

- SAEP-1143.

-Radiographic Testing book written for ASNT.