

NORWEGIAN SOCIETY OF CHARTERED ENGINEERS

**NORTH SEA FLOW METERING  
WORKSHOP**

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**BUYING AND INSTALLING A METERING STATION**

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- BUYING AND INSTALLING A METERING STATION.

- FISCAL AUTHORITIES ROLE IN THIS PROCESS.

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### INTRODUCTION

A Guideline for the application of approval of the design, testing and installation of a metering station according to the Norwegian Petroleum Directorate`s (NPD`s) regulation is given in fig. 1.

The first contact between the licensee and the NPD metering department will be when the plan for development and operation of Petroleum deposits is sent to NPD. Paragraph 15 in the Regulations supplementing the act pertaining to Petroleum activities is stating that a general description to be given of installations and equipment which are planned to be installed, among other things metering facilities.

Paragraph 19 in the same regulation is giving another broad statement concerning the metering of petroleum products. (Fig. 2)

The more detailed description of the NPD requirements is given in our own regulation for fiscal measurement of oil and gas.

The documentation NPD requires is given in (Fig. 3.) This paragraph is laying the responsibility of submitting correct documentation on the licensee. This could look like a simple way for NPD to put everything on the shoulder`s of the licensee. From a theoretical point of view that is perfectly correct. In the real world however NPD has experienced that to obtain a satisfactory results it is necessary to have close cooperation between NPD and the project team to obtain an optimum result. (For NPD that means a technical excellent solution, for the project team

it means a smooth project progress and to avoid extra work  
(cost) due to late implementation of NPD requirements.)

## 2. DESIGN APPROVAL OF THE METERING SYSTEM

Chapter V in the NPD regulations is dedicated directly to this subject. Paragraph 31 (41) (Fig. 4).

I will draw the essence out of the five relevant paragraphs 32, 37 (43 - 47) to focus on the documentation NPD regard as vital at this stage Fig. 5 and 6 are visualizing this.

It has been occasions over the past years where the licencees have not received the necessary approval from NPD at an early stage of the project. Due to this, major changes had to be implemented to the metering packages. This has caused unnecessary negative vibrations between the licencee and NPD in addition to the extra cost and inconvenience to the project.

## 3. TESTING, CALIBRATION AND CONTROL OF THE METERING SYSTEM BEFORE START UP

Chapter VI in the NPD regulation is dealing with this aspect. Fig. 7 is giving paragraph 39 (49).

The tests NPD normally witness on a gas metering system are given in fig. 8, and for an oil metering system is fig. 9 giving the same.

#### 4. RECOMMENDATION

The NPD advice to the licencees is that they should stick to the flow sheet shown in viewgraph 1 when they are in the process of buying and installing a fiscal metering station for Norwegian waters.

A vital item which we sometimes have experienced as a bottleneck is the communication.

From our point of view the licencee should rather inform the fiscal authorities too much than the opposite.

#### 5. REFERENCES

1. Regulations supplementing the act pertaining to petroleum activities. (1985)
2. Regulation for fiscal measurement of gas produced in interval waters, in Norwegian terretorial waters and in the Norwegian Continental shelf which is subject to Norwegian sovereignty. (1984)
3. Regulation for fiscal measurement of oil produced in internal waters, in Norwegian terretorial waters and in the Norwegian Continental shelf which is subject to Norwegian sovereignty. (1984)

Fig. 1

FLOW SHEET SHOWING THE VARIOUS STAGES IN NPD'S ACCEPTANCE/APPROVAL ROUTINE FOR A METERING STATION

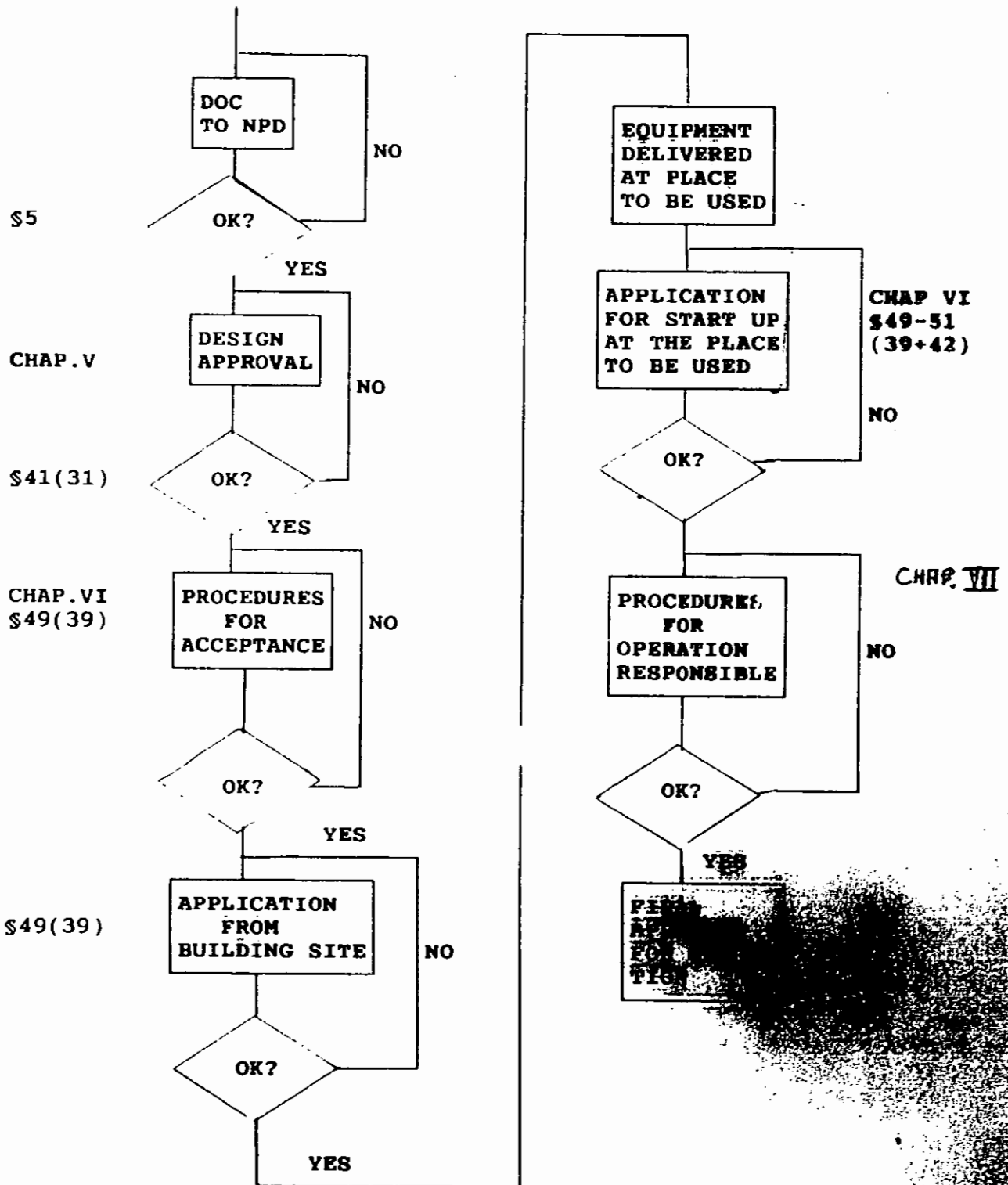


Fig. 2

Section 19

METERING ETC. OF PETROLEUM PRODUCED

THE LICENCEE SHALL METER AND ANALYZE PETROLEUM  
PRODUCED IN ACCORDANCE WITH GENERALLY ACCEPTED PROCEDURES.  
THE EQUIPMENT AND PROCEDURES MUST BE APPROVED BY NORWEGIAN  
PETROLEUM DIRECTORATE.



FIG. 3

SECTION 5

CONTROL AND DOCUMENTATION

BEFORE THE LICENCEE OBTAINS AN APPROVAL IN ACCORDANCE WITH CHAPTERS V, VI & VII, THE FORMER SHOULD SEE TO THAT THE DOCUMENTATION REQUIRED BY THE NORWEGIAN PETROLEUM DIRECTORATE IS IN ACCORDANCE WITH THE REQUIREMENTS STIPULATED IN THIS REGULATION.

FIG. 4

SECTION 31 (41)

DESIGN APPROVAL OF THE METERING SYSTEM

THE DESIGN OF THE METERING SYSTEM SHALL BE APPROVED BY THE NORWEGIAN PETROLEUM DIRECTORATE.

APPLICATION FOR APPROVAL OF THE DESIGN OF THE METERING SYSTEM SHALL BE SUBMITTED IN A SET OF DOCUMENTS CONTAINING A COMPLETE TECHNICAL DESCRIPTION OF THE SYSTEM. THESE DOCUMENTS SHALL CONTAIN THE DOCUMENTS SPECIFIED IN THIS CHAPTER.

FIG. 5

NPd REQUIRE THE LICENCEE TO CONFIRM THAT THE  
METERING STATION WILL BE BUILT ACCORDING TO THE NPd  
REGULATION.

FIG. 6

1. P & ID (TYPICAL)
2. LOOP DIAGRAM (TYPICAL) ONE FOR EACH SIGNAL TYPE.
3. GENERAL ARRANGEMENT DRAWING. ISOMETRIC SHOWING MAJOR DIMENSIONS, INSTRUMENT LOCATIONS ETC.
4. SIZING CALCULATIONS.
  1. SET TO BE SUPPLIED FOR VERIFICATION OF METHOD.
5. BLOCK DIAGRAM FOR SIGNAL FLOW BETWEEN INSTRUMENTATION AND COMPUTER.

FIG. 7

SECTION 39

ARRANGEMENTS AND PROCEDURES

UNLESS SPECIFIED IN EACH PARAGRAPH, THE CONTROLS AS DESCRIBED IN THIS CHAPTER SHALL BE CARRIED OUT IN THE FOLLOWING ORDER.

- A) BEFORE THE METERING SYSTEM LEAVES THE BUILDING SITE.
- B) AFTER INSTALLATION AT THE PLACE TO BE USED IMMEDIATELY BEFORE START UP.

THE LICENCEE SHALL WORK OUT AND FORWARD TO NPD DETAILED CONTROL PROCEDURES ACCORDING TO THE REQUIREMENTS GIVEN IN THIS CHAPTER. THE NPD SHALL HAVE THE OPPORTUNITY TO BE PRESENT AND WITNESS THE CONTROLS EITHER COMPLETELY OR PARTLY NOTICE ABOUT THE POINT OF TIME FOR THE CONTROLS SHALL BE GIVEN NPD AT LEAST 3 WEEKS IN ADVANCE.

THE METERING SYSTEM SHALL BE APPROVED BY THE NPD BEFORE IT LEAVES THE BUILDING SITE AND BEFORE IT IS PUT IN OPERATION IN THE AREA OF APPLICATION.

FIG. 8

TESTS FOR A GAS METERING STATION WHICH NPD NORMALLY  
PARTICIPATE IN

1. MEASUREMENT OF GAS METERING PIPES
2. CHECK OF MECHANICAL/INSTRUMENTPART
3. CHECK OF COMPUTERPART
4. F.A.T. FULL FUNCTIONAL CHECK

TESTS TO BE DONE BOTH ON BUILDING SITE AND OFFSHORE,  
BEFORE START UP.

FIG. 9

TESTS FOR AN OIL METERING STATION WHICH NPD NORMALLY  
PARTICIPATE IN

1. CHECK OF TURBINE METERS
2. CHECK OF MECHANICAL/INSTRUMENT PART
3. CHECK OF COMPUTER PART
4. CALIBRATION OF PROVER
5. F.A.T. FULL FUNCTIONAL CHECK

TESTS TO BE DONE BOTH ON BUILDING SITE AND BEFORE START  
UP.

## PITFALLS

- 1 - Project Engineer's knowledge in fiscal metering is insufficient
- 2 - Project interest in preservation of packages is not high enough
- 3 - Operating personnel is involved at a too late stage
- 4 - Progress is important. Short cuts are therefore done, this leads to failing tests.  
Internal tests are not done.