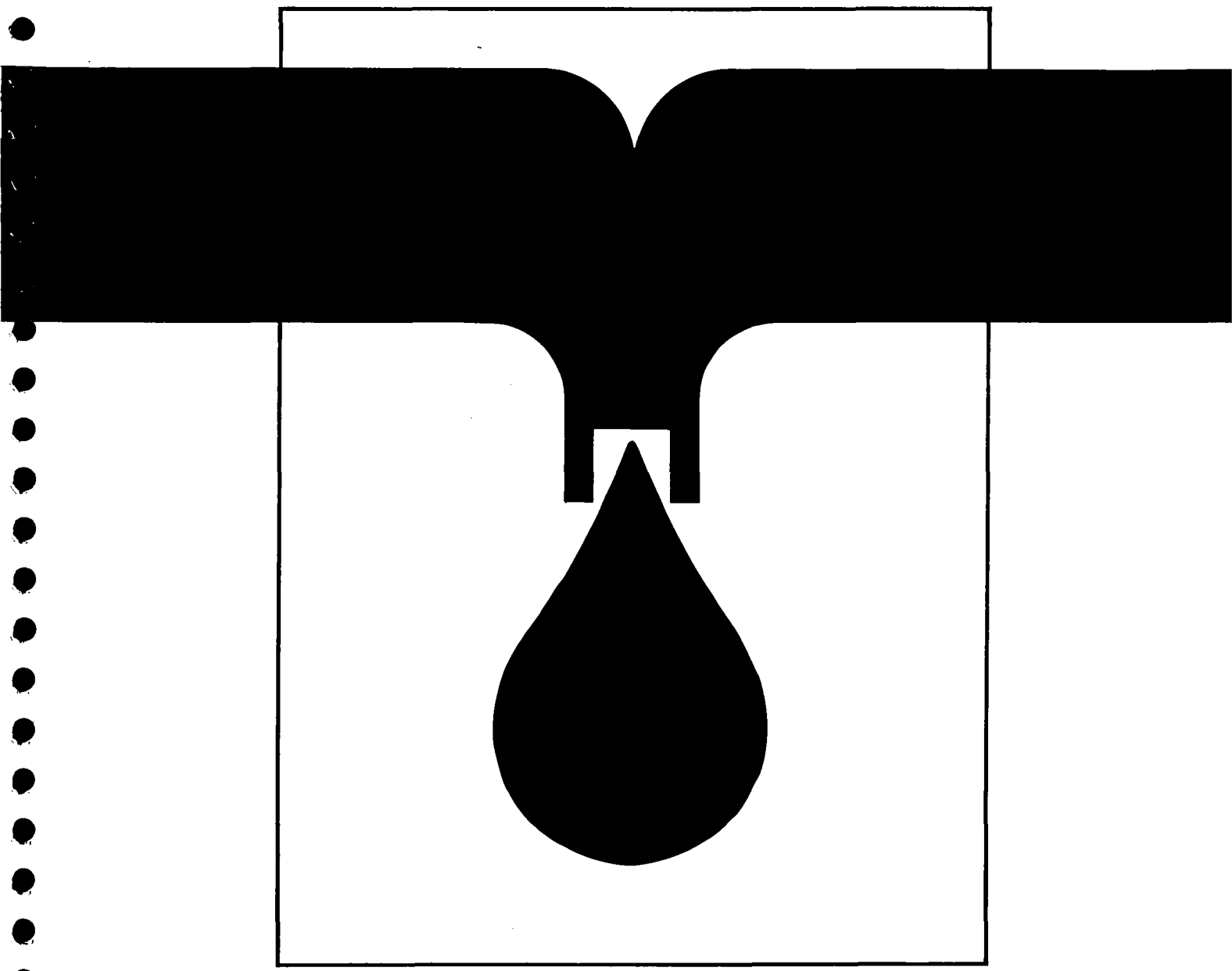
TRAINING MODULES
FOR
WATERWORKS PERSONNEL



Basic Knowledge

1.2

Organisation and administration of waterworks

Foreword

Even the greatest optimists are no longer sure that the goals of the UN "International Drinking Water Supply and Sanitation Decade", set in 1977 in Mar del Plata, can be achieved by 1990. High population growth in the Third World combined with stagnating financial and personnel resources have led to modifications to the strategies in cooperation with developing countries. A reorientation process has commenced which can be characterized by the following catchwords:

- use of appropriate, simple and – if possible – low-cost technologies,
- lowering of excessively high water-supply and disposal standards,
- priority to optimal operation and maintenance, rather than new investments,
- emphasis on institution-building and human resources development.

Our training modules are an effort to translate the last two strategies into practice. Experience has shown that a standardized training system for waterworks personnel in developing countries does not meet our partners' varying individual needs. But to prepare specific documents for each new project or compile them anew from existing materials on hand cannot be justified from the economic viewpoint. We have therefore opted for a flexible system of training modules which can be combined to suit the situation and needs of the target group in each case, and thus put existing personnel in a position to optimally maintain and operate the plant.

The modules will primarily be used as guidelines and basic training aids by GTZ staff and GTZ consultants in institution-building and operation and maintenance projects. In the medium term, however, they could be used by local instructors, trainers, plant managers and operating personnel in their daily work, as check lists and working instructions.

45 modules are presently available, each covering subject-specific knowledge and skills required in individual areas of waterworks operations, preventive maintenance and repair. Different combinations of modules will be required for classroom work, exercises, and practical application, to suit in each case the type of project, size of plant and the previous qualifications and practical experience of potential users.

Practical day-to-day use will of course generate hints on how to supplement or modify the texts. In other words: this edition is by no means a finalized version. We hope to receive your critical comments on the modules so that they can be optimized over the course of time.

Our grateful thanks are due to

Prof. Dr.-Ing. H.P. Haug
and
Ing.-Grad. H. Hack

for their committed coordination work and also to the following co-authors for preparing the modules:

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It is my sincere wish that these training modules will be put to successful use and will thus support world-wide efforts in improving water supply and raising living standards.

Dr. Ing. Klaus Erbel
Head of Division
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Eschborn, May 1987

Title: Organisation and administration of waterworks

1 Recording of operating data and compilation of water statistics

1.1 General

The regular recording of deliveries and other important operating data is essential for the monitoring of water supply facilities. These data are necessary as an aid in decisions regarding the equipment and personnel complement of existing waterworks and for the dimensioning of new or supplementary measures.

The nature and scope of the records are to be determined according to the specific features of the individual water supply facilities.

In general, the following records are kept:

Water levels of wells, or yield of other water resources used for water supply purposes.

The volumes of water extracted and supplied to the consumers.

Water losses.

Consumption of energy, lubricants and other operating materials.

Water pressure at representative measuring points.

Important bacteriological and chemical analysis values.

Performance of major maintenance and repair work.

Start-up or failure of important installations.

Pipe bursts and their cause.

Deliveries of goods.

Details of personnel deployment.

The above data are entered in logbooks and statistical records at specific intervals or plotted in the form of graphs by self-recording instruments.

1.2 Logbook

A sample logbook page is appended as Annex 1.
The logbook should be bound in book from. The original copy should remain in the book, while it should be possible to detach additional copies - as required - by means of edge perforations.

Suggested contents:

Date

Brief description of weather with minimum and maximum daily temperatures
Periods of use of large-scale machinery and process installations
Filter resistances
Water delivery
Consumption of operating materials
Performance of major maintenance and repair work
Details of unusual occurrences
e.g. power failures, pipe bursts, other incidents
Personnel deployment
Visitors
Signatures

1.3 Graphs

Fig. 1 shows the continuous recording of flow rate metering. At the top is the volume scale in m^3 per hour. The time of day is shown on the left-hand side and the date is indicated by means of a stamp.

Delivery rates can be ascertained by drawing a horizontal line from the time of day to the point of intersection with the plotted line and then adding a vertical line from this point to the volume scale.

In Fig. 1 the delivery rate is 780 m³/h at 0200 hours (point 1) and 2000 m³/h at 1800 hours (point 2).

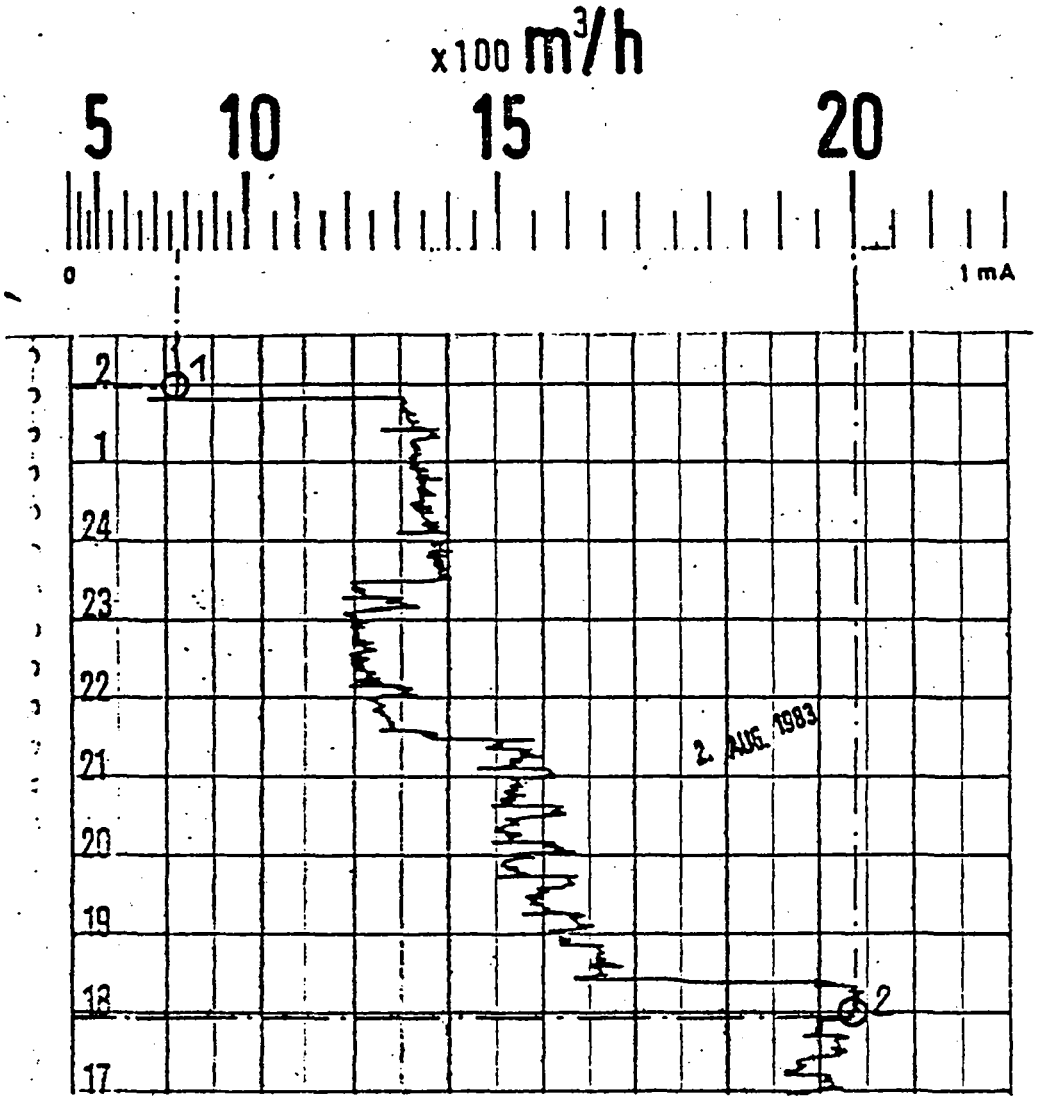


Fig. 1 Graph showing flow rate measurement

1.4 Water statistics

1.4.1 General

The compilation of water statistics is necessary for the following information and monitoring purposes:

Demonstration of compliance with limitations as regards extraction from wells or other water resources, resulting from statutory provisions or the particular local situation

Demonstration of water losses
Indication of water demand trends
Provision of basic data for hydraulic calculations for pipe networks as well as for the designing of pumps and other installations
Charging of water rates
Drawing-up of budgets and calculation of the water price

1.4.2 Practical example

By way of example Annex 2 contains the monthly statistics of a group waterworks, the central waterworks of which supplies water to several towns. The water, which is supplied via a large-scale transportation pipe network, is routed through one or more delivery points and metered before it reaches the municipal distribution networks.

Explanatory notes to accompany statistics sheet, Annex 2

Column no.:	Explanatory notes:
1	Delivery point
2	Last meter reading
3	New meter reading
4	Volume supplied at delivery point in period between last reading and new reading
5	Town's water consumption in period between last reading and new reading
6	Population of town
7	Average consumption per inhabitant per day, calculated on the basis of columns 5 and 6 for the individual towns.

1.4.3 Evaluation of statistics

The calculated average consumption per inhabitant per day - column 7 - can be used in particular for monitoring water losses. It can be assumed that the average consumption per inhabitant per day of towns with the same structure will be the same and that it will for the most part be modified only by seasonal climatic differences. If the most up-to-date values are now compared with those determined over a lengthy period of time, or if the values for different towns are compared with one another, major changes will suggest an increase or reduction in water losses in the pipe network.
If the total volume of water delivered to the local networks - the total of column 5 - is compared with the total volume delivered by all waterworks over the same period, the magnitude of the water loss in the transportation pipe network can be ascertained.

The water losses in a local network are established by comparing the quantities of water supplied - the total of column 5 - with the total registered by the supply meters (domestic water meters).

2 Planning of inspection and maintenance work

2.1 General

Regular inspection and maintencance of installations is the best way of ensuring a reliable and efficient water supply.
In order to make sure that inspection and maintenance work is performed regularly and in the correct manner, it is necessary to have an inspection and maintenance plan, which must take into account the following points, among others:

- Gearing of the work to operational requirements. For example, containers/tanks should be cleaned at a time when consumption is low (winter or rainy season).

Apart from specifying when the work is to be performed, the inspection and maintenance plan must also contain a description of the correct way to carry out the work, as well as detailing requirements in terms of special tools, spare parts, expendable materials and lubricants.

2.2 Suggested procedure: Inspection and maintenance plan

Annex 3 contains an inspection and maintenance plan which, as described below, is divided up as follows:

1. Schedule
2. Instruction sheets
3. Equipment code cards

Brief descriptions

Schedule

The schedule lists all inspection and maintenance work to be performed regularly over the course of a year, showing the times at which it is to be carried out.
It also indicates the scope and nature of the maintenance measures, as well as relevant instruction sheets and maintenance specifications.
- See Annex. 3.1 for sample -

Instruction sheets

The instruction sheets contain individual descriptions of the maintenance operations and specify the intervals at which they are to be performed. They also contain references to special maintenance specifications and equipment code cards.
- See Annex 3.2 for sample-

Equipment code cards

Equipment code cards are to be made out for all important components of the water supply facility, e.g. wells pumps, generators, high-volume water meters and feeding devices.
The cards must contain all important information on a machine or structure, e.g. performance data, maintenance specifications and notes regarding the storage of spare parts an tools.
- See Annexes 3.3 and 3.4 respectively for samples relating to a pump and a well -.

3 Stockkeeping

3.1 General

Every waterworks must maintain a minimum stock of operating material, spare parts, tools and pipe materials. The quantities to be kept available or in stock are to be geared to the specific facilities and size of the individual waterworks.
If regional or central stores are set up, the individual stores can be kept small; pumps, spare parts and special tools which can be used by several waterworks can be stored together.

Material and spare-parts stores are to be kept as small as possible for reasons of cost. Endeavours should be made to standardize the pipes, pumps or other equipment used and thereby ensure that the articles kept in stock can be used in a number of different places.

3.2 Suggested procedure for stockkeeping

Stock list

A list of the articles in stock must be kept for every waterworks installation. The individual articles are to be classified according to their use, material type, size, nominal pressure and characteristic data. The maximum and minimum stock levels for an article are to be determined according to the frequency with which it is used and the necessary replacement time. In the case of special spare part or pump storage it is advisable to give the number of the equipment code card as referred to in Section 2.2
- See Annex 4.1 for a sample stock list -

Filing card

A filing card must be made out for every item kept in stock. On this card stock movements, such as issuing within the waterworks, reordering and the receipt of materials, must be confirmed by way of signature.
- See Annex 4.2 for a sample filing card -

4 Standing instructions

The aim and purpose of standing instructions is to allocate the responsibility for precisely defined work areas and duties to a particular member of personnel, e.g. supervisor. The member of personnel himself must be able to act independently within the scope of the work areas and duties assigned to him. His employer must provide the equipment and personnel necessary for enabling him to perform his tasks.
Standing instructions should cover the following details, taking into account local conditions.

Terms of employment

Area of competence

Wells, treatment plant, pipe network, storage facilities

Powers

Authorization to issue instructions to personnel below him, defined authority to sign

Authority within the waterworks

Exercising of authority with regard to specific works areas, holding of keys

Working hours

Regular working hours, work outside regular working hours in emergencies

Deputy

Training of a deputy, handing-over of official duties to the deputy

Duty to provide information

Vis-à-vis superiors on unusual occurrences

Duties

Keeping of logbooks, inspection and maintenance of specific installations in accordance with inspection and maintenance plan, monitoring of water quality, making of provisions and stockkeeping as regards equipment, tools, spare parts and expendable materials, safety and accident prevention measures.

LOGBOOK	WATERWORKS	TEMPERATURE °C	DATE: 19	Annex 1

TIME	PUMP NO: ON	PUMP NO: OUT	GENERATOR ON	GENERATOR OUT	FILTER PLANT ON	FILTER PLANT OUT	ON	OUT	ON	OUT	ON	OUT	ON	OUT	ON	OUT
6 – 7																
7 – 8																
8 – 9																
9 – 10																
10 – 11																
11 – 12																
12 – 13																
13 – 14																
14 – 15																
15 – 16																
16 – 17																
17 – 18																
18 – 19																
19 – 20																
20 – 21																
21 – 22																
22 – 23																
23 – 24																
24 – 1																
1 – 2																
2 – 3																
3 – 4																
4 – 5																
5 – 6																

PUMPING AND CONSUMPTION DATA

	METER READING TODAY	READING YESTERDAY	RAISED CONSUMED
WATER RAISED WELL NO. 1			m^3/d
WATER RAISED WELL NO. 2			m^3/d
WATER RAISED WATERWORKS			m^3/d
WATER SOLD			m^3/d
ELECTRICITY CONSUMPTION			kw/d
CHLORINE CONSUMPTION			g/d
DIESEL CONSUMPTION			e/d

FILTER RESISTANCE BACK-FLUSH YES/NO

DATA ON WORK COMPLETED, HOURS WORKED

ALL MEASUREMENTS TO BE CARRIED OUT AT:

DATA ON ANNUAL INSPECTION AND MAINTENANCE PLAN

CARRIED OUT TO SCHEDULE YES ☐ NO ☐

IF NOT, GIVE REASONS

SPECIAL FINDINGS:

PUMP BEARING TOO HOT OR DELIVERY RATE TOO LOW ETC.

OTHER UNUSUAL OCCURRENCES

FOR EXAMPLE: BURST PIPE, POWER FAILURE, PUMP FAILURE

VISITORS:

ENTERED BY: VERIFIED:

SUPERVISOR

Annex 2

NAME				Date of reading: Read by:		
1	2	3	4	5	6	7
Name of delivery point	Meter reading Old:	New:	Volume supplied at delivery point (m³)	Volume consumed by town (m³)	Population of town	Spec. consumption l/inhab/d
ALTHEIM	644595	649945	5 350			
	85 212	86 883	1 671	7 021	2150	117
DIEBURG I ALTHEIMER STR.	[illegible]	[illegible]	61 400			
DIEBURG II L 3114	287210	287210	—			
				61 400	13 852	158
EPPERTSHAUSEN ORTSMITTE	454 710	[illegible]69719	15 009			
EPPERTSHAUSEN KREUZBRUCH	240 193	241728	1 535			
	30 455	30 533	78	16 622	5399	110
GR.-ZIMMERN SCHILLER STR.	111 157	116432	5 275			
	3 587	3726	139			*
GR.-ZIMMERN L 3114	346 860	[illegible]7 560	29 880			
				35 294	8 783	144
HERGERSHAUSEN SICKENHOFEN	325 142	335182	10 040			
	9 305	9573	268	10 308	2 881	128
KL.-ZIMMERN	325782	330220	4 438			
				4 438	1 500	106
MÜNSTER GERSPRENZ		368120	18 986			
MÜNSTER OST	119 457	126703	7 246			
	16 896	18 375	1 479	[illegible]	9306	106
ND.-RODEN AM WALD	155720	214930	59 210			
ND.-RODEN RINGSTRASSE	165 151	165155	4			
	5 703	5715	12	59 226	11958	177
ND.-RODEN ROLLWALD	53536	58237	4701			
	3689	4153	464	5165	1600	115
OB.-RODEN BREIDERT	35020	55873	20 853			
	2833	4722	1 889			
OB.-RODEN TRIFTBRÜCKE	133 330	158340	25 060			
OB.-RODEN L 3097	22 300	[illegible]				
				47 8[illegible]	10 383	164
OB.-RODEN WALDACKER	157 123	165579	[illegible] 456			
				8456	2 405	126
OB.-RODEN MESSENHAUSEN	85 930	87 462	1 532			
	21134	21 614	490	2 022	610	118
URBERACH AM HOCHBEHÄLT.	456 596	466165	9 569			
	23 297	24 241	944			
URBERACH LIEBIGSTRASSE	51 153	63268	12 115			
	5 152	6383	1 231			
Urberach Messeler Str.	34 297	56108	21 811			
	1 328	1919	591	45 161	10 300	157
URBERACH BULAU	17 746	17884	138			
	21 798	22258	460	[illegible]	73	293
GUNDERNHAUSEN AM HOCHBEHÄLT.	[illegible]	[illegible]	[illegible]			
	[illegible]	40654	[illegible]			
GUNDERNHAUSEN CHEMIE GES.	72211	[illegible]	[illegible]			[illegible]
				12 774	2 734	168

Total volume supplied B = m³

Water loss in transportation pipe network:

= Total A - Total B = m³

$\frac{(A-B)\ 100\ \%}{A}$ = %

Feed-in from waterworks:

From W.W. 1 .... m³

From W.W. 2 .... m³

From W.W. 3 .... m³

Total Feed-in (A) .... m³

—— OPTICAL INSPECTION — — — SUPERVISION — . — MAINTENANCE "A" — . . — MAINTENANCE "B"

ANNUAL INSPECTION AND MAINTENANCE PLAN | WATERWORKS | 1st 6 MONTHS Annex 3.1

	INSTR. SHEET NO.		JANUARY 5 10 15 20 25 31	FEBRUARY 5 10 15 20 25 28	MARCH 5 10 15 20 25 31	APRIL 5 10 15 20 25 30	MAY 5 10 15 20 25 31	JUNE 5 10 15 20 25 30
EXAMPLE WELLS + SUBMERSIBLE PUMPS	3.2-1 to 3.2-3							

INSPECTION AND MAINTENANCE INSTRUCTION SHEET — Annex 3.2.-1

WELLS AND SUBMERSIBLE PUMPS

TO BE PERFORMED:

Important safety note:

Before inspecting the shaft, always obtain permission to enter. Check whether there is enough oxygen and take safety precautions as detailed in special instructions.

OPTICAL INSPECTION

Check whether the well shafts are clean; clean if necessary. Read measuring instruments showing pressure, rate of delivery, current consumption, voltage.
Check pumps for unusual noise.
Turn slide valve hand-wheel and check opening.
Inspect electrical and control equipment optically.

Once a week

SUPERVISORY WORK

Once a month

Measure water level if possible in both filter pipe and gauge pipe, at:

a) Static water level (when pump has been at a standstill for a least 4 hours), and
b) Dynamic water level (after pump has been in operation for at least 4 hours).

Record the measured values on the pump card. Pay particular attention to the differences between static and dynamic water level and between water levels in the filter pipe and in the gauge pipe.

Annex 3.2-2

INSPECTION AND MAINTENANCE INSTRUCTION SHEET
WELLS AND SUBMERSIBLE PUMPS

	TO BE PERFORMED:
Note:	
A considerable drop in the water level leads in the case of centrifugal pumps to an increased delivery head and thus to a lowering of the rate of delivery. Differences between the water level in the filter pipe and in the gauge pipe point to encrustation or ochering of the filter pipe or filter gravel.	Every 6 months
Determine the working point of the submersible pump - delivery head and delivery rate - in operation and record it in the space provided for the characteristic curve on the pump's Code Card.	Once a year
Check entry against the characteristic curve specified by the works for agreement; check efficiency.	Once a year
Take water sample for analysis.	
MAINTENANCE WORK	
Clean well chambers, including external equipment. Clean and paint pipes and fittings wherever necessary.	
Inspect strainers at ventilation or other shaft openings - replace if necessary.	
Pull out dry-operation protecting electrodes, clean and replace.	Once a year or more often if necessary

Annex 3.2.-3

INSPECTION AND MAINTENANCE INSTRUCTION SHEET

WELLS AND SUBMERSIBLE PUMPS

	TO BE PERFORMED
Measure control cable with direct-current measuring instrument 500 V. Enter the loop resistance and insulation resistance in the correct space on the record sheet.	Once a year
Take out submersible pumps and clean. Inspect pump, motor and back-pressure valve for corrosion damage, cracks or fractures. Examine rotor runner for wear, ensure freedom of movement. Replace worn parts.	After 3 years at the latest, or sooner depending on local conditons
Check functioning of back-pressure valve.	
Examine pump on pump test stand, determine efficiency. If result satisfactory, re-install pump.	
If required by water-level difference between filter and gauge pipe, re-generate well.	Depends on local conditions

PUMP	INVENTORY NO.	Annex 3.3

MAKE _____
YEAR OF CONSTRUCTION _____
WORKS NO. _____
MODEL _____
NO. OF STAGES _____
ENGINE MODEL _____
OPERATING VOLTAGE _____ V
FREQUENCY _____ HZ
RATED OUTPUT _____ KW
RATED CURRENT _____ A
R.P.M. _____

TYPE OF SWITCHING
- ☐ DIRECT
- ☐ STAR-DELTA
- ☐ TRANSFORMER

ALTERATIONS	DATE	ENTERED BY

DELIVERY RATE _____ l/s
DELIVERY HEAD _____ m

LOCATION	FROM	TO

DELIVERY FROM LOCATION

DELIVERY RATE

l/s		

REPAIRS

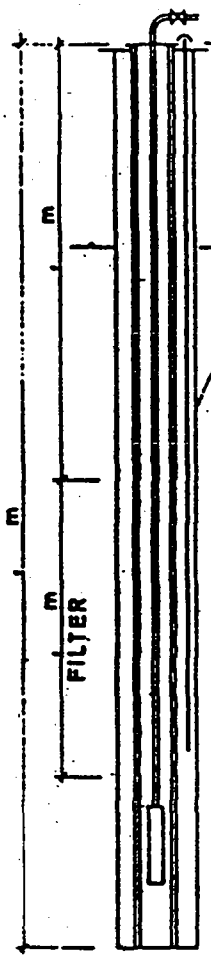
DISMANTLED	RE-INSTALLED	CAUSE + DESCRIPTION OF REPAIR	SIGNATURE

SPARE PARTS

ITEM	NUMBER	LOCATION IN STORE

NOTICE OF PUMPS OF THE SAME SIZE

DEEP WELLS	LOCATION:	Annex 3.4
	NO.	



TECHNICAL DATA

YEAR OF CONSTR. : 19.....
DIAMETER OF BORE : .....mm
FILTER PIPES Ø : .....mm
PUMP INSTAL. DEPTH : .....m

IMPORTANT CHEMICAL DATA

	INITIAL	ALTERATIONS
SPECIFIED DELIVERY RATE l/s		
SPECIFIED DELIVERY HEAD m		

* in "M" = ABOVE SEA LEVEL

WATER LEVEL IN "M" FROM MEASURING POINT

		19....	19....	19....	19....	19....	19....	19....	19....	19....	19....
JAN.	STAT.										
	DYN.										
FEBR.	STAT.										
	DYN.										
MARCH	STAT.										
	DYN.										
APRIL	STAT.										
	DYN.										
MAY	STAT.										
	DYN.										
JUNE	STAT.										
	DYN.										
JULY	STAT.										
	DYN.										
AUG.	STAT.										
	DYN.										
SEPT.	STAT.										
	DYN.										
OCT.	STAT.										
	DYN.										
NOV.	STAT.										
	DYN.										
DEC.	STAT.										

STANDARD LIST	STORE LOCATION	Annex 4.1

ITEM	ITEM NO.	STOCK LEVEL MIN.	STOCK LEVEL MAX.	UNIT	CODE CARD No.	SIGNATURE
Operating materials						
Fuels						
Diesel						
Petrol						
Super-grade petrol						
Mixture						
Mixture ratio 1:3						
Chemicals						
Chlorine gas						
Hypochloride						
Aluminium sulphate						
Lime						
Lubricants						
Pipe materials						
Cast-iron pipes with Tyton joints						
Cast-iron pipe adapting pieces						
U pieces						
EU pieces						
.....						
PVC pipes						
AZ pipes						
Slide valves, fittings						
House connection materials						
Electrical spare parts						
Pump spare parts						

FILING CARD	LOCATION	Annex 4.2

	STOCK LEVEL ... MIN = ORDER " " MAX = DEPENDING ON DELIVERY TIM
ITEM IDENT.NO.	AMOUNT TO ORDER = MAX.-MIN. LEVEL

DATE	RECEIVED FROM FORWARDED TO	AMOUNTS IN	AMOUNTS OUT	AMOUNTS LEVEL	SIGNATURE	ORDER DATE	ORDER ITEM	ORDER

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The government-owned GTZ operates in the field of Technical Cooperation. Some 4,500 German experts are working together with partners from some 100 countries in Africa, Asia and Latin America in projects covering practically every sector of agriculture, forestry, economic development, social services and institutional and physical infrastructure. – The GTZ is commissioned to do this work by the Government of the Federal Republic of Germany and by other national and international organizations.

GTZ activities encompass:

- appraisal, technical planning, control and supervision of technical cooperation projects commissioned by the Government of the Federal Republic of Germany or by other authorities
- advisory services to other agencies implementing development projects
- the recruitment, selection, briefing and assignment of expert personnel and assuring their welfare and technical backstopping during their period of assignment
- provision of materials and equipment for projects, planning work, selection, purchasing and shipment to the developing countries
- management of all financial obligations to the partnercountry.

The series **"Sonderpublikationen der GTZ"** includes more than 190 publications. A list detailing the subjects covered can be obtained from the GTZ-Unit 02: Press and Public Relations, or from the TZ-Verlagsgesellschaft mbH, Postfach 36, D 6101 Roßdorf 1, Federal Republic of Germany.

TRAINING MODULES FOR WATERWORKS PERSONNEL

List of training modules:

Basic Knowledge

0.1 Basic and applied arithmetic
0.2 Basic concepts of physics
0.3 Basic concepts of water chemistry
0.4 Basic principles of water transport
1.1 The function and technical composition of a watersupply system
1.2 Organisation and administration of waterworks

Special Knowledge

2.1 Engineering, building and auxiliary materials
2.2 Hygienic standards of drinking water
2.3a Maintenance and repair of diesel engines and petrol engines
2.3b Maintenance and repair of electric motors
2.3c Maintenance and repair of simple driven systems
2.3d Design, functioning, operation, maintenance and repair of power transmission mechanisms
2.3e Maintenance and repair of pumps
2.3f Maintenance and repair of blowers and compressors
2.3g Design, functioning, operation, maintenance and repair of pipe fittings
2.3h Design, functioning, operation, maintenance and repair of hoisting gear
2.3i Maintenance and repair of electrical motor controls and protective equipment
2.4 Process control and instrumentation
2.5 Principal components of water-treatment systems (definition and description)
2.6 Pipe laying procedures and testing of water mains
2.7 General operation of water main systems
2.8 Construction of water supply units
2.9 Maintenance of water supply units Principles and general procedures
2.10 Industrial safety and accident prevention
2.11 Simple surveying and technical drawing

Special Skills

3.1 Basic skills in workshop technology
3.2 Performance of simple water analysis
3.3a Design and working principles of diesel engines and petrol engines
3.3b Design and working principles of electric motors
3.3c –
3.3d Design and working principle of power transmission mechanisms
3.3e Installation, operation, maintenance and repair of pumps
3.3f Handling, maintenance and repair of blowers and compressors
3.3g Handling, maintenance and repair of pipe fittings
3.3h Handling, maintenance and repair of hoisting gear
3.3i Servicing and maintaining electrical equipment
3.4 Servicing and maintaining process controls and instrumentation
3.5 Water-treatment systems: construction and operation of principal components: Part I - Part II
3.6 Pipe-laying procedures and testing of water mains
3.7 Inspection, maintenance and repair of water mains
3.8a Construction in concrete and masonry
3.8b Installation of appurtenances
3.9 Maintenance of water supply units Inspection and action guide
3.10 –
3.11 Simple surveying and drawing work

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