Rural Water Supply & Sanitation Programme

Trainers' Guide

For

Caretaker Training

Prepared by
Public Health Engineering Unit
Health Division
Ministry of Health & Education
Bhutan

Date: June 1999

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Foreword

In 1974, the Royal Government of Bhutan with generous assistance from UNICEF launched the Rural Water Supply Programme with the aim to increase access to safe drinking water to its rural population. The programme was again made a national priority in the early nineties including a Royal Decree on water and sanitation.

While the construction of water supply schemes has progressed well, operation and maintenance which is one of the most vital factors contributing to the long life and sustainability of water supply schemes was lacking. It was of paramount importance to equip villagers with capacity to operate and maintain their Rural Water Supply schemes once construction was completed.

In 1991, a maintenance system was established that called for caretakers and Village Maintenance Committees (now renamed Village Health Development Committees) for the schemes built. Since then the DPHE staff in the Dzongkhags have been training a large number of villagers in technical and management skills. Yet many schemes are still without a proper maintenance system. Therefore, village-based training needs to be strengthened in the coming years.

In 1996, a series of workshops had been organised by PHE in collaboration with the Dzongkhag staff to review and develop a draft-training programme for caretaker training. This manual has been developed from these workshops. The training Programme and lesson plans described in this manual should be considered as general guidelines only and the trainer should accordingly carry out the training taking into account the field situation and trainees aptitude.

I sincerely hope that all the DPHE staff in the Dzongkhags will benefit immensely from this manual and carry out the training in the most effective way so that it will contribute to achieving our national goal of "Universal Access to Safe Drinking Water".

Trashi - Delek

(Dr. Sangay Thinley)
Director
Health Division.

Introduction

Part 1: Programme & Lesson plans for New Caretaker Training

Part 2 : Programme & Lesson plans for Caretaker Refresher Training

Part 3 : Programme & Lesson plans for Caretaker Training Spring Protection

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Introduction

This Trainers' Guide is a manual for the DPHE trainers who are responsible for the implementation of training courses to the beneficiaries for a better Operation and Maintenance of their drinking water schemes.

It is strongly advised that you read the lesson plans a few days in advance, rehearse the demonstrations with your helper and check if all materials are available. During the training you can have the Trainers' Guide in front of you or somewhere nearby for easy reference when you are unsure how to go on.

Part I New Caretakers

Part I is about the Caretaker Training for new, un-trained caretakers of Rural Drinking Water Schemes. Some of these persons, when selected before the construction or rehabilitation of their scheme might have assisted you in skilled work during the construction. So these persons will already have some practical experience. This is useful and makes life for you as trainer a bit easier. However there will also be caretakers who have not done any of the work till now. For them everything is new and they deserve your full attention and support during the training. Experienced caretakers can help them too during the practical sessions.

Part II Refresher course

Part II is about the refresher course which is given to the trained caretakers preferably after one year. Normally, caretakers are called only once for a refresher course and not every year. However if you feel, for example after a visit to the scheme that the caretaker is still not good in his job then you can ask him to come a second time and attend the refresher course again.

This part has no detailed lesson plans because no new skills or information have to be taught to them. However, you should go through the session briefly, as all of them are already caretakers with the experience of the previous training. The lesson plans in this part refer to the lesson plans of part I. Most lesson plans will have a few suggestions and tips on how to make the lesson plans useful for the refresher training.

Never have new, untrained caretakers attend a refresher course. They should participate in a five-day course for new caretakers.

Part III "Spring Protection Scheme" (and Small Stream Scheme) Caretakers

Spring protection schemes are a bit different from other schemes because they are much smaller and simpler. Therefore, the caretakers for these projects do not have to know as much as the caretakers for the regular schemes. If you have a number of caretakers from spring protection projects to be trained in one year then you can ask them to come as a separate batch. If you have only one or two caretakers of a spring protection project to be trained that year then it is better to have him or her to attend the full course for new caretakers.

In Part III a special programme is proposed which is relevant for the caretakers of Spring protection schemes. The lesson plans are a selection of the ones that are prepared for the regular Caretaker training. Again a few suggestions and tips are given to change the lesson plans for the Caretakers of Spring Protection Schemes where necessary.

In future PHE may formulate a program for 'Small Stream Schemes', the equivalent of Spring Protection Schemes, but then for small communities whose nearest source is a stream. The Caretaker Training Programme for Caretakers of such schemes could follow the same outline, except that the maintenance of their stream intake should also be discussed.

Tips and Hints for the Trainers

First of all a good planning and preparation before the training starts, is important. Secondly you have to pay attention to your performance as a trainer. The trainer is a very important person during the course and is often the centre of attention. If he does well the training is already half a success.

1 Preparing for a training

Time planning

The training activities should be planned at a time that suits the Caretakers as well as the Trainers. While planning consider the following:

- Farming activities and weather
- Development activities by other Sectors
- Staff and budget availability

The DHSO or the Health Assistant of the BHU preferably does the part on Health and Hygiene.

Selection of schemes and participants

The caretakers are preferably trained after the construction is completed. All new schemes under construction or rehabilitation should have priority. Second priority can be given to existing schemes not having a trained caretaker. The least priority should be given to the schemes that are not functioning because of major breakdown. For these schemes it is better to wait till the rehabilitation starts.

For new schemes or rehabilitation schemes, the caretakers are selected during the 3 day planning workshops that are organised before the actual construction work starts. Existing schemes without trained caretakers should be visited to select the caretakers during a community meeting. This meeting is important to stress the importance, agree on fair compensation and discuss the duties of caretakers.

Budget request and financial procedures

The budget must be requested through PHE according to the guidelines issued by PHE and NB&ACD. Please keep in mind that processing the request will usually take 1 - 2 months. Only thereafter, the money is available with the finance section of the Dzongkhag.

Invitation and Venue

Invitation of the caretakers should be done well in advance through the Gups. Mention the name of the scheme, village and caretaker so that the right persons will attend the training.

Organise the training if possible close to the villages from where the invited caretakers come.

Training materials

Do not forget to request in time for the caretaker tool boxes and check if you have sufficient HDP pipes for the practical. (Each participant can use two metre of small diameter [Ø 20 to 32 mm] and one metre of big diameter [Ø 50 or 63 mm] pipe.) Also bring the box with RWS fitting materials, posters and the Trainers' Guide.

2 Communication Skills

The trainer or facilitator is the key to the success of training. While explaining, discussing or demonstrating a skill, you as the trainer need to be open, friendly, positive, enthusiastic, patient and active. Make the training course enjoyable for you and your participants.

Effective communication

To be effective as a trainer check the following Do's and Don'ts.

Do's	Don'ts
✓ Use the local language	Wear sun glasses
✓ Pay attention to all participants	Be bossy
✓ Avoid complicated technical terms	Be un-prepared
✓ Listen carefully to the participants	Show off and make things complicated
✓ Speak clear and lively	Make false promises
✓ Know your subject	

Demonstration technique

A demonstration is to clearly **show** and verbally **explain** the skill that will be practised later on. During the session the participants will see the skill three times but the session is short and not all will have had a chance to practise during the demonstration.

While demonstrating a skill keep the following in mind:

- ✓ You must know the skill well and have practised it before;
- ✓ Be well prepared and organised;
- ✓ Arrange all the participants around you so that they can see what you are doing;
- ✓ Do it step wise and explain each step carefully;
- ✓ Concentrate on the essentials, do not drift away;
- ✓ Keep contact with the participants. Ask open questions to repeat important information or steps.

Remember: The KISS

Keep It Simple & Straight

New Caretaker Training Course Programme

Course Day I

Time	Activity	Who
8:30-9:00	Registration of new caretakers on the attendance sheet	DPHE staff
9:00-9:40	Opening, and issue of toolboxes to the caretakers	Chief Guest
9:40-10:00	**Tea** with Chief-guest	
10:00-10:20	Introduction game for trainers and participants (Game: Lucky shout)	S.O. DPHE
10:20-10:30	Logistics during this 5 days training course	S.O. DPHE
10:30-11:00	Introduction to the job of Caretaker	S.O. DPHE
11:00-12:30	The Rural Water Supply Scheme and its components	S.O. DPHE
12:30-13:30	**Lunch**	
13:30-13:45	Repetition: Caretaker tasks for the RWS Components	S.O. DPHE
13:45-14:15	Tools for the repair of HDP pipe.	S.O. & Plumber
14:15-14:45	Demonstration of straight HDP joining and making a HDP-strainer	S.O. & Plumber
14:45-17:00	First practical HDP pipe joining and HDP-strainer	S.O. & Plumber

End of day One

Course Day II

Time	Activity	Who
9:00- 9:30	Repetition: Caretaker tasks for RWS components	S.O. DPHE
9:30-10:15	Health and Hygiene aspects	DHSO/BHU staff
10:15-10:45	**Tea**	
10:45-11:15	Importance of Maintenance	S.O. DPHE
11.15-11.45	Roles and Responsibilities for Caretaker and RWS-Maintenance Committee	S.O. DPHE
11:45-12:00	Game	S.O. DPHE
12:00-12:30	Differentiating between Minor / Major repair. [Act on major and Do the minor repair yourself]	S.O. DPHE
12:30-13:30	**Lunch**	
13:30-13:50	Tools for the repair of GI-pipes	S.O. DPHE
13:50-14:15	Demonstration of GI fitting and Union (Socket, Elbow, Tee)	S.O. & Plumber
14:15-15:45	Practical on GI fitting and Union (Socket, Elbow, Tee]	S.O. & Plumber
15:45-16:00	**Tea**	
16:00-17:00	Source and tank cleaning procedures [Introduction to the field visit]	S.O. DPHE

End of day Two

Course Day III

Time	Activity	Who
9:00-17:00	Field visit to all the components of a RWS Scheme	S.O. & Plumber
	End of day Three	

Course Day IV

Time	Activity	Who
9:00- 10:15	Review of field visit (including repetition)	S.O. DPHE
10:15-10:45	**Tea**	
10:45-11:15	Valves [Function, Opening, Closing, Repair]	S.O. & Plumber
11:15-11:40	Demonstration of Ferro-Cement Reservoir repair	S.O. & Mason
11:40-12:30	Practical on Ferro-Cement Reservoir repair	S.O. & Mason
12:30-13:30	**Lunch**	
13:30-14:00	Demonstration on HDP-GI connections [Brass union, Plastic-adapter, Flange set and GI-union]	S.O. DPHE
14.00-15:00	Practical on HDP-GI connections [Brass union Plastic-adapter Flange set and GI-union]	S.O. & Plumber
15:00-15:15	**Tea**	
15:15-15:35	Demonstration on HDP welding [Elbow, Tee, Y, Reducer]	S.O. & Plumber
15.35-17.00	Second Practical HDP welding [Elbow, Tee, Y, and Reducer]	S.O. & Plumber
	End of day Four	

Course Day V

Time	Activity	Who
9:00- 9:10	Game	S.O. DPHE
9:10-10:30	Blockage detection	S.O. DPHE
10:30-11:00	**Tea**	
11:00-11:10	Function and use of tapstand control valve	S.O. DPHE
11:10-11:30	Bibcock repair (Demonstration)	S.O. & Plumber
11:30-12:30	Bibcock repair and washer change (Practical)	S.O. & Plumber
12:30-13:30	**Lunch**	
13:30-13:45	Game	S.O. DPHE
13:45-14:30	Problems and solutions in relation to their RWS Schemes	S.O. DPHE
14:30-15:00	Evaluation of the RWS Caretaker Training	S.O. DPHE
15:00-15:30	Payment of TA/DA for participants	S.O. DPHE
15:30-16:00	Closing and distribution of Certificates by Chief Guest	Chief Guest

End of Training course

1. Introduction to the JOBS of caretaker

Objectives: At the end of this session, the participants can:

1. Mention the 4 main categories of tasks which a caretaker should be able to perform
2. Mention 7 types of work that they are supposed to do as caretaker and will learn in this training course.

The exact details will be taught during this 5-day training course.

Time: 30 minutes

Materials:

- 4 Posters showing:
  - 1.1. Pema Dorji(PD) cleaning stream intake and Ugyen Wangmo(UW) cleaning reservoir
  - 1.2. PD repairing HDP pipe and UW repairing brass tap
  - 1.3. UW storing tools and materials and PD going to sanitary mart
  - 1.4. PD and UW discuss with the VHDC

Remember:

This is the first introduction for the caretakers. You should *not* discuss in detail the tasks that they have to do as caretaker. For that you have still 5 full days. For now, only highlight the main responsibilities and stress that they will learn this during the training course.

Activity:

1) Show and explain the nine posters one by one on the four most important tasks of a caretaker. Show the posters clearly to all participants and tell the story in a lively way.

- **(Poster1.1)** This is Pema Dorji, he is the male caretaker and is living in the village in this house. Next to him is Ugyen Wangmo, she is the female caretaker. Both have been trained in the five-day caretaker training and now they regularly look after their RWS scheme. Because of their work the RWS scheme is working well and everyone in the village can collect water from a nearby tapstand. But what is actually the work that Pema Dorji and Ugyen Wangmo are doing as Caretakers? Regular ***Inspection and cleaning*** of the RWS structures. In this training you will learn how to clean the spring or stream intake, the reservoir tank and all the BPTs.
- **(Posters 1.2)** ***Minor repair***. In this training you will learn how to repair pipes, how to replace valves, how to work with cement to repair a tank or tapstand and how to repair fencing.
- **(Poster 1.3)** Store ***tools and materials***. You will get a toolbox and the proper use of each of the tools will be demonstrated and exercised. This task also comprises getting good-quality spare parts, maybe in co-ordination with the BHU and the District RWSS Store.
- **(Poster1.4)** ***Inform/discuss with VHDC*** on the condition of the RWS Scheme. In this training you will learn about: the different responsibilities of the caretaker and the maintenance committee members; the difference between minor and major repair and internal rules that you can have or make for your scheme.

2) All these tasks are your responsibility as caretakers. To learn how to do these tasks correctly we will give you now this 5-day training course.

Evaluation:

3) Distribute the posters among the participants and give them some time, a few minutes to take a good look at them.

4) Ask them one by one to stand up, come in front, show the poster to the other caretakers and explain what is on the poster. Clarify or if necessary repeat so that all caretakers have heard the explanation. *(Remember repetition is important in the process of learning).*

2. The RWS scheme and it's Components

Purpose: Not all caretakers are already familiar with the components of the RWS scheme that they have to maintain. If the caretaker is not familiar with the components, the scheme may eventually be out of order, resulting in a water problem for the beneficiaries.

General Objectives: At the end of the session the caretaker can:
1. Identify and mention the different RWS components of a scheme;
2. Mention the regular maintenance task they have to carry out for each component.

> At this moment the air-release valve and pipeline washout valve are not mentioned. This will make it too complex for the caretakers. At a later moment you can explain the details of these valves.

Time: 1 hour 30 minutes

Materials:
- Scheme component posters 2.1-2.6
- RWS materials: HDP and GI pipe, float valve, valves, bibcock.

Activity:

1) Explain the caretakers that you will discuss the different structures in a rural water supply scheme. Each structure has its own function. And each structure needs its own maintenance. You as caretaker will learn for each structure **Five important points**, which you have to remember when checking the scheme.

> **Remember:**
>
> **The posters are a tool to help the caretakers to learn and remember the five important points. Thus the first time you show the posters, the caretakers will not yet know what is important.**

2) **(Poster2.1: Spring intake + Collection tank)** Ask what they see and understand. Explain that this is a spring protection intake. Explain its function. "In order to avoid pollution of the water or damage of the structure by animals and humans, it should be made inaccessible with shrubs or barbed wire."

3) Mention and point out on the poster the 5 Important points for spring protection intake:
   - Fencing or shrubs which make the spring inaccessible
   - No grazing of animals or cutting of trees
   - The surroundings must be clean
   - Repair of leaks
   - Maintain the surface drain above the spring

4) Let the participants repeat these five important points and count the points so that it is clear that there are five points to remember.

5) **(Poster 2.1: Spring intake and collection tank)** Ask the participants what they see and understand. Explain that this is a collection tank. Explain where it is and its function. "It is

found after an old design stream intake. If several sources join, it is also found at the point of joining, as in this poster. It collects the water and brings it in the pipe."

6) The five importance points to check for at the collection tank:
   - Is fencing maintained
   - Is the strainer in place and clean
   - Clean surroundings
   - Clean inside of the collection chamber (including strainer)
   - Repair of leaks
7) Ask the participants to recall those five points.
8) **(Poster 2.2: Stream intake)** Ask what they see and understand.
   Explain that this is a stream intake. Explain its function. "In order to avoid pollution or destruction by animals and people, it should be well fenced to make it inaccessible."
9) Mention and point out the five important points to check for at the stream intake:
   - Is fencing around intake and channel maintained and slab covered
   - No grazing/tree cutting
   - Clean surroundings
   - Clean the channel and perforated plate (or screen and gravel box, if present)
   - Keep the channel well covered with slabs
10) Let the participants repeat these five points and do not forget to count them.
11) Ask them which of the caretakers has a spring and which has a stream as source. Some also might not know it but maybe you or the plumber does.
12) **(Poster 2.3: Reservoir with valve box)** Ask the participants what they see and understand.
    Explain that this is a reservoir with valve box. A reservoir is different from a BPT in the following ways. It is always much bigger, it has a manhole at the side, not on top and it has a stone-masonry valve box with concrete slab.
    Explain its function (it fills in the night with water which is used during the next day, compare to container). It is not a bathtub for washing or bathing!
13) The five important points to check for at the reservoir:
    - Fencing maintained
    - Check valves (repair leaks)
    - Plastering intact
    - Clean inside and strainer present
    - Clean surroundings
14) Let participants repeat those five points and count the points.
15) **(Poster 2.4: Break pressure tank with valve box)** Ask the participants what they see and understand.
    Explain that this is a BPT with a valve box. A BPT is smaller than a reservoir, has a manhole in the middle and has no masonry valve box but has GI valve box.
    Explain its function (Ask the **question:** *"In a two storied house, is the wall on the first floor thick or on the second floor? Why?"* **Answer:** The down wall has to be bigger, because there is something on top. Likewise there is more pressure down in the pipe. When it becomes too much the pipe would break. The BPT reduces the pressure.

16) Show a real sample of a float valve. Explain: "When the BPT is nearly full, this valve should stop the water from coming in. Even if there is a problem with the BPT or this float valve, it should not be bypassed, because the pipe below may burst due to high pressure."

17) Five important points to remember for the BPT:

- Fencing
- Float valve stops the flow when BPT is full
- Other valves are working (repair leaks)
- Clean inside and strainer clean and in place
- Plaster intact

18) Ask the participants to repeat the five points. Also ask why not to bypass a BPT when the float valve is broken.

19) **Show a real piece of HDP and GI pipe line (and then show Poster 2.5).** Ask what this is.
Explain that GI is used when the pipe cannot be buried but is should be well supported. HDP pipe must be buried preferably three feet deep and covered with soil or sand. Not with big and sharp stones because this will damage the HDP pipe.

20) Five important points for the Pipe line:

- HDP pipe is buried
- HDP repair by welding with heating plate
- GI pipe is well supported or buried
- GI repair by fitting with sockets and unions
- Detect blockage (session will come)

21) Let the participants repeat those five points.

22) **(Poster2.6: Tapstand with a control valve)** Ask the participants what they see and understand.
Explain the function of the control valve: "If the flow to one tap is too big, the washer spoils fast. It should be controlled by using this valve. Also if some tapstands have insufficient water and others have more, then the flow to tapstands with more water should be reduced. Regularly open the valve boxes and grease the thread. If you do not do that for a long time, it will rust and you can never open it again."

23) "Good drainage away from the tapstand is important. If there is a dirty pool of water near the tap, there will be many flies and mosquito's which can cause diseases."

24) Important points for the tap stand:

- Check drainage pipe: No stagnant water near the tap
- Bibcock is not leaking
- Control valve adjusted to have correct flow
- grease the GI cap of the valve box
- Platform well supported on all sides, no erosion

25) Let the participants repeat those five points for the tapstand.

Evaluation:

26) Go back to **poster 2.1-2.6** and show it to the participants. Ask one of the participants again what he/she remembers for this poster.

- What is it?
- What are the five important points to remember? Be happy and satisfied if they can remember 1 or 2 of the five important points.

Remember:
This is the first time that the caretakers hear about this, so they will not remember all 5 points immediately. You will repeat this several times with them so that at the end of the training all caretakers can mention the five points for all the different structures.

3. Repetition Caretaker tasks for RWS Components

Purpose: This lesson plan should be used to repeat the five most essential tasks for each structure, which the caretaker needs to remember.

Objectives: At the end of the repetition the caretakers have repeated the five important tasks that they need to remember for each component in a RWSS scheme.

Time: First repetition 45 minutes. Next repetitions shorter

Materials:
- Scheme component posters 2.1-2.6
- RWS materials: HDP and GI pipe, float valve, valves, bibcock.

Activity:

1) Show the posters with the structure and the five important tasks. In a later session you can ask participants to remember the tasks without the posters.
2) Ask what maintenance is required for each structure.
3) **Poster 2.1: Spring protection**
   - Fencing or shrubs which make the spring inaccessible
   - No grazing of animals or cutting of trees
   - The surroundings must be clean
   - Repair of leaks
   - Maintain the surface drain above the spring
4) **Poster 2.1: Collection tank**
   - Is fencing maintained
   - Is the strainer in place and clean
   - Clean surroundings
   - Clean inside of the collection chamber (including strainer)
   - Repair of leaks
5) **Poster2. 2: Stream intake**
   - Is fencing around intake and channel maintained
   - No grazing/tree cutting
   - Clean surroundings
   - Clean the channel and screen (and gravel box, if present)
   - Keep the channel well covered with slabs
6) **Poster 2.3: Reservoir**
   - Fencing maintained
   - Check valves (repair leaks)
   - Plastering intact
   - Clean inside and strainer present
   - Clean surroundings
7) **Poster 2.4: BPT (Most important Do NOT bypass)**

- Fencing
- Float valve stops the flow when BPT is full
- Other valves are working (repair leaks)
- Clean inside and clean strainer in place
- Plaster intact

8) **Poster2.5: HDP and GI pipe**

- HDP pipe is buried
- HDP repair by welding with heating plate
- GI pipe is well supported or buried
- GI repair by fitting with sockets and unions
- Detect blockage (session will come)

9) **Poster2.6: Tapstand**

- Check drainage pipe: No stagnant water near the tap
- Bibcock is not leaking
- Control valve adjusted to have correct flow
- Grease the GI cap of the valve box
- Platform well supported on all sides, no erosion

4. Tools for Repair of HDP Pipe

Objectives: At the end of the session, the participants can:

1. Mention or describe the tools for HDP joining
2. Demonstrate the correct use of the following tools: Hacksaw with blade, Heating plate and Teflon cover, Knife or Files.
3. Use the Thermochrome chalk

Time: 30 minutes

Materials:

- Drawing of hacksaw blade
- One hacksaw frame and hacksaw blade, Thermochrome chalk, Heating plate and Teflon cover, flat and half round file
- Caretakers with their own toolboxes

Preparation:

- Have all the materials for this demonstration ready
- Inform the caretakers to get their toolboxes nearby, because they will be using them

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Activity:

Introduction:

1) Most of the pipes in the scheme are made of HDP. Pipes can leak and therefore it is important to know how you can repair the pipes when they are broken or leaking.

2) The pipes from the RWS project are special pipes of very good quality and can not be bought in the normal hardware shop in the towns. Good pipes have always a green or yellow line on the side. Ask the Dzongkhag staff for advise.

3) Say that you now will show the tools needed for HDP pipe joining one by one. Then show clearly all the tools and mention their names. Do not yet explain the details of the tools because that is the next part.

   - This is a hacksaw frame and this is a hacksaw blade, they are to cut the pipes.
   - This is a heating plate and this is a Teflon bag, they are to join pipes together.
   - This is Thermochrome chalk to check the temperature of the heating plate.
   - This is a knife and this is a file, they are to remove the burrs (uneven surface) from the fresh cut pipe.

Hacksaw frame and blade (10 minutes)

4) Show a hacksaw frame again and explain that we will have a better look at this tool. Explain and carry out the following steps:

   - Ask the caretakers to get the Hacksaw Frame out of the toolbox, and unpack it from the box and plastic.
   - Explain that the hacksaw frame has two holes to justify for two different lengths of hacksaw blades. Point out these two holes.
   - Demonstrate how to adjust the frame for the correct length of the blade.
   - Then let participants do it with their own hacksaw in groups of two or three.
   - Now get the blade again and show how to feel with your fingers the direction of the teeth (same as carpenter's hacksaw).

- Teeth of the hacksaw blades should face away from your body, because it is easier to push than to pull. (**Poster 4.1:** direction of teeth)
- Explain the three main causes for breaking of hacksaw blades. They are:
  - ✓ Tightened too tight
  - ✓ Tightened too loose
  - ✓ Handled carelessly
- Explain and show that the right way to tighten it, is to turn the wing nut **two more turns after** it is tightened to the point that it does not move. Check that the bolt is properly pulled in the frame.
- Ask the caretakers to put the blade in the frame and correctly tighten it. Check for the direction of the teeth.

5) Finally ask questions like:

- In which direction should the teeth of the saw blade point?
- What are the three causes for the saw blade to break?

Heating Plate and Teflon Cover (5 minutes)

6) Show the heating plate and explain:

- This is a heating plate. It's function is to heat the HDP pipe so that the pipes can be joined together. To heat the heating plate, we have to put it in the fire.
- Do not put it in the ashes, because it would get dirty. While heating the heating plate in the fire turn it around from time to time, so that both sides become equally hot.
- The heating plate should not be **too hot** but also be not **too cold** to join pipes. To test the correct temperature we use Thermochrome chalk, show the Thermochrome chalk.
- Show the Teflon cover and explain: The function of the Teflon cover is to cover the heating plate. Then the HDP pipe can not stick to the steel plate. The Teflon cover should be placed **after heating only** else it will burn in the fire.
- The Teflon bag **must be clean**, no sand, grease or dust should be on it.
- Show the way of placing the Teflon cover over the heating plate. Hold the handle of the plate in one hand, open the Teflon bag, and carefully push it over the plate without touching the plate with your fingers. **Hot!!**
- Ask the caretakers to put the cover over the heating plate in exactly the same way. For this they may have to stand up to do it. Standing up is also good to wake them up again.

7) Finally ask question like:

- Should you heat the heating plate in the fire or in the ashes?
- When do you put the Teflon cover before or after heating?

Thermochrome Chalk (5 minutes)

8) Show Thermochrome chalk and explain:

- This is Thermochrome chalk. It's function is to test the temperature of the heating plate. Show the chalk to all.
- Explain the method of testing by counting. While counting One, . . .Two, . . .Three the blue colour should change to grey-white. Now demonstrate this with a cold heating plate.

- If the heating plate is too cold the blue colour will not change to grey-white and we have to heat it longer. If it is too hot, the blue colour changes immediately and burns. Now, we can cool it by waiting or by moving it over the grass.

9) Finally ask questions like:

- I want to test the temperature of this heating plate, what should I do?
- OK, I tested it, is this plate hot enough for joining or not?

Files and Knife (5 minutes)

10)A file or knife is used to make the cut surface of the HDP pipe smooth and clean. The two pipe ends that you want to join should fit exactly to each other, without any gaps.

- Ask the caretakers to get the half round file from the toolbox.
- Let them feel with their nails or fingers the direction of file. The file will work only in one way. In the push direction like the hacksaw.
- Explain and show that the half round file is for the inside of the pipe.

Evaluation:

11)Evaluate your explanation of all the tools for HDP repair with questions like:

- Why do we cover the heating plate with the Teflon bag?
- How many turns do you give to tighten the hacksaw blade?
- When is the temperature of the heating plate ready for joining?
- Why are there two holes in the hacksaw frame?

5 Demonstration of Straight HDP joining and making a HDP-strainer

Objectives: At the end of the demonstration the caretakers:

1. Have seen **two times** the complete procedure for making straight joints.
2. Can mention the three steps in the right order for welding 2 pieces of HDP pipe straight together.
3. Have seen how to make a strainer.

Time: 30 minutes

Materials: Hack saw and blades, Knife and File, 3 heating plates with Teflon bag, Thermochrome chalk, HDP pipe of different sizes, fire to heat the heating plates and 6mm MS rod or big nail.

Preparation:

- Have a fire burning to heat the heating plate.
- Have three heating plates ready. One too cold, one too hot, and one with the correct temperature. Arrange this with your training assistant or plumber.
- Have all other tools and materials ready for direct use.

Remember:

Arrange all the participants in such a way that they can see what you are doing during the demonstration. Move the participants from their seats if necessary.

Activity:

Introduction:

1) Explain that you will demonstrate how to join HDP pipe using the heating plate.

2) Joining has a specific order just like growing rice. First you do . . ., then you do . . . and finally you do. . . . Doing it in a different order will **not** work!

Step 1: Prepare the pipes

3) First cut the HDP pipe in two pieces. Place the pipe on a proper support while cutting it. Explain the importance of cutting straight. Show the rough sides of the pipe and explain that all loose parts on the inside and outside have to be removed with a file or knife.

4) Remove the rough parts and demonstrate how to test whether the pieces fit together or not. Put the two pieces together and hold against the light to see the spaces between the pipes. When they do not fit continue with the file or knife. **Do Not** touch the cut ends with **greasy or dirty fingers!**

Step 2: Check the temperature of the heating plate

5) Take the **too cold heating plate** and show how the Thermochrome reacts on the too cold plate. Nothing will happen.

6) Take the **heating plate with the correct temperature** and show again what happens. Count 1, 2, 3 and show the colour change from blue to grey-white. Repeat this a few times so that all participants from nearby have seen the change in colour. *(Remember that already a small amount of chalk is enough. If you put too much now they will put too much later)* place the heating plate back in the fire.

7) Lastly take the **too hot heating plate** and show again the colour change which now happens in **only one count**. Make sure that all participants have seen from nearby. It is necessary to repeat this a few times.

Step 3: Actual welding of the pipes

8) Take the heating plate with the correct temperature and again check the temperature before the Teflon cover. Place the Teflon cover with the help of your assistant over the heating plate. Do it in the same way as you showed before. **Be-*careful, the plate is hot!***

9) Squat and hold the heating plate in front while the other trainer is pressing the two pieces of pipe against the heating plate. Explain that when you see two small melted rings at both pipe ends it means that the pipe is correctly melt and ready for bringing the two pieces together. It should be melted all around, not a single place should remain unmelted. Melted HDP is also shinier.

10) Bring the two pieces **immediately** together **in ONE action** and press them firmly together. Continue pressing while counting loud and clear till ten (10). Do not twist the pipes! After counting to ten you can stop pressing and let the joint pipe slowly cool down. Cooling down takes a few minutes.

11) Place heating plate back in fire.

Repetition by two volunteers

12)Ask two volunteers to come in front and ask them to repeat the demonstration. Repeat all the steps right from the beginning. So start with **Step 1:** cutting and preparing the pipe.

13) Ask the participants **before each step** what they will do next. If they do not know the answer, ask other participants to give the answer, when the right answer does not come give it yourself. Always clearly repeat the answers of the volunteers for clear information to the other caretakers.

14) At the end compliment the caretakers with their first HDP joining. Tell every one that they soon will practice this themselves, with their own tools.

Making a strainer

15) Tell the caretakers that you will now explain how to make a strainer.

16) Ask one of the caretakers if they remember the function of a strainer and where it can be found?

17) Demonstrate how to make holes in the HDP pipe with a big hot nail or better with a hot piece of MS-Steel rod. Preferably not bigger than 6 or 8 mm.

Table: Number of holes needed in a HDP strainer

HDP Pipe Diameter	Diameter of Hole is		
	4 mm	6 mm	8 mm
25	117	**52**	29
32	192	**85**	48
40	300	**133**	75
50	469	**208**	117
63	744	**331**	186

1) Explain that enough holes should be made to get sufficient water to the reservoir. See Table for number of holes.
2) Remove all the inner and outer burrs from inside and outside of the HDPE pipe with file or knife.
3) Finally show how to close the top of the strainer with a piece of HDP and similarly make holes on this cover.

6. First practical HDP pipe joining

Objectives: At the end of this practical session all the caretakers have:

1. Made at least 5 small diameter joints, of which at least one is acceptable.
2. Made at least 2 large diameter joints of which at least one is acceptable.
3. Started making a large diameter strainer with a length of 20 cm closed at the top.

Time: 120 minutes

Materials: Mortar pans with burning fire, HDP pipes in length of 1 m and 2 m for the caretakers to practice, tool boxes of the caretakers

Preparation:

- Before the practical starts cut 2 meters of small diameter pipe (20 mm or 25 mm) and one meter of large diameter (50 mm or 63 mm) pipe preferably Class IV, sufficiently for all the caretakers. Giving pipe to the caretakers in this way can avoid excessive use of pipes by them. Store the balance pipes away from the caretakers.
- Have fire(s) ready for the heating of the heating plates. This will save time and give more practical opportunity to the caretakers.
- Ask the caretakers to bring their toolboxes.

Activity:

1) Pair up the caretakers scheme wise or make female and male pairs. Make sure that all (both men and women) do all the steps. Pipe preparation, checking of temperature and actual welding. (*Remember it is **not** a factory where one caretaker does **all cutting**, another caretaker **all filing** and a third **all welding**)*

2) First ask them all to make two pieces of small diameter of pipe ready for a straight joint. (cut with hacksaw and clean with file or knife)

Remember:
Go around and give help to all. Giving help and feedback is the most important task of a trainer. For this part of the practical also get help of the experienced plumbers.
It is not the time to relax and disappear from the site.
Give them time to experiment. Allow them to make small mistakes and then correct them in a friendly way. Do not take it over from them, they are the learners.

1) The caretakers can join the pipes only after the trainers have checked the pipes and the way it was cut. After welding check the joints by inspection and give feedback to the caretakers. Check the strength of the joint by bending.

2) Continue with the cutting and welding of the small diameter to give the caretakers enough practice.

3) After at least 5 joints of small diameter pipes, the caretakers can try the big diameter pipes, which is more difficult.

4) Use the last 15 to 20 minutes for the fabrication of a strainer. It is important to explain and repeat about the **number of holes** and **removing the burrs** on the inside and outside. The last step is to close the top after removing all burrs.

7. Health and Hygiene Aspects

Purpose: Caretakers have the responsibility to make sure that the water supply scheme is delivering safe water at the tap stand. Caretakers should know how in-sanitary situations around structures of a RWS Scheme can cause diseases when the villagers drink the water from the tap.
This is not a general talk about health and hygiene because that should reach all the villagers and not only the caretakers.

Objectives: At the end of this session the caretakers can:

1. Explain how water borne diseases like diarrhoea, worms and hepatitis are spread through water and food;
2. Mention situations which make water unsafe; and
3. Mention actions to avoid or measures to react in such situations.

Time: 1 hour

Materials: Ask DHSO or Health Assistant to bring their own posters.

Remember
This session can best be presented by the DHSO or any personal from the BHU. Show this lesson plan to him or her so that he/she can prepare for the right content and does not have to prepare much himself/herself.

Activity:

1) Explain that contaminated (dirty) water and food most often cause diarrhoea. Diarrhoea is often a symptom of water borne disease like dysentery, hepatitis, typhoid, cholera, worm infections, etc.

2) Contamination is normally caused by **faeces** from babies, children, adults and all sorts of animals. Contamination can also come from bird droppings.

3) If faeces is not properly removed or put away, then faeces can reach the water of the spring or stream. This dirty water is then coming out of your tapstand and drinking this water will make you sick. Having and **using a latrine** for the safe disposal of faeces is very important to prevent water borne diseases.

4) Explain the importance of boiling water for drinking purpose especially when the person is sick or weak. If water is boiled it should be done for 2 to 5 minutes at a rolling boil. Longer than 5 minutes is really not necessary and uses only extra firewood.

5) Personal hygiene (hand washing after visiting a latrine and before preparing or taking meals, cloth and body washing).

1) Give one by one the following messages related to the work and responsibility of a caretaker and explain in simple words why the message is important for them.

Key Messages for Caretaker on Health and Hygiene

1. All human and animal faeces should be removed within the area of at least 20 meters around the spring. When shit and cow dung are found above the stream intake, the villagers and VMC should be informed and it should be explained to them that this causes disease. Nobody should shit there or let his/her cattle graze near the intake of the water supply system.
2. The water source should be kept well fenced with barbed wire or thorny shrubs. This is to prevent pollution of the water source.
3. Dead animals near the spring or stream intake must be removed and burnt far from the intake. Also animals dead or alive in Break Pressure Tank, Reservoir or Intake chamber should be removed and burnt, if dead. Therefore the tanks must be regularly checked for animals and kept covered.
4. Wastewater from the tap should be drained away properly. No pools or ponds with stagnant water should be near the tap. Such ponds attract breeding mosquitoes and create unhealthy surrounding.
5. Leaks in the pipeline can mean loss of water. But also dirt can be sucked in the pipe and contaminate the water.
6. Hand washing includes all parts of the hands and is done with soap (or ashes) and plenty of water. Hand washing must be done after defecating or visiting a latrine, after cleaning a child who has defecated, **always** before preparing food and always before eating or feeding your child. Adults should help wash the hands of their children.

2) Ask the participants to recall these six points.

8. Importance of maintenance

Objectives: At the end of the session the caretakers can:
1. Explain the importance of maintenance.

Time: 30 Minutes

Materials:
- 8 Posters showing:
  - 8.1. Completed scheme in good condition
  - 8.2. Completed scheme in bad condition
  - 8.3. Repaired tank
  - 8.4. Broken and leaking tank
  - 8.5. HDP pipe welding + bibcock repair by caretaker
  - 8.6. Leakage in HDP pipe-line + bibcock
  - 8.7. Woman carrying water in the jungle
  - 8.8. Woman filling the container under the tap

Activity:

1) Tell the caretakers that you are going to explain the importance of maintaining their own RWS scheme.
With a story and posters you will show the difference between a properly maintained scheme and a scheme which is not maintained at all.

Well Maintained scheme	Not maintained scheme.
1. Tanks in proper condition.	1. Tank is broken and leaking.
2. Water is flowing from the tap.	2. No water is coming from the tap.
3. People taking clean water from the tap which is nearby.	3. People collecting water from a far away and dirty source.
4. No leakage in the pipe line.	4. Leakage in the pipe line.

2) **(Posters 8.1 & 8.2)** Show the two posters and discuss the differences between the two schemes.

3) **(Posters 8.3 & 8.4)** Show the posters of the damaged and repaired tank. Explain about the damaged tank and the need to repair it.

4) **(Posters 8.5 &8.6)** Show the posters of the repaired and broken pipeline and explain why it is important to repair the pipe properly with a heating plate. Explain why just fixing it with a piece of rubber from a scooter tyre is not enough.

5) **(Posters 8.5 & 8.6)** Explain why it is important that bibcocks are not leaking and what happens if water is always flowing from the tap. (Muddy pools around the tapstand and no water storage in the reservoir, thus water shortage)

6) **(Posters 8.7 & 8.8)** Show the posters of the woman collecting water. Explain that this happens because of bad or no maintenance.

7) Now ask the caretakers whether they think that maintenance is required or not. If the caretakers say ***'yes'*** then ask who should do the maintenance. Finally tell them that if they do regular maintenance there is always water from the taps and there is no need for major repairs which cost much money and take a lot of effort.

8) Ask participants to come forward and discuss about a pair of posters by each one of them.

9. Roles & Responsibilities of VHDC

Purpose: Caretakers should know what is expected from them. But they also should know what kind of support they can expect from the elected VHDC and how the community will compensate them for their work.

Objectives: At the end of this session the Caretakers can:

1. Mention the five roles and responsibilities of the VHDC,
2. Mention three possible ways of getting compensation from the community for maintaining the RWS scheme,
3. Discuss with the VHDC about framing rules and regulations for O&M of the scheme.

Time: 30 minutes

Materials: Five posters showing the responsibilities of the VHDC

Activity:

1) Explain the objective of this session and the importance of having a VHDC.

Responsibilities of the VHDC: (10 minutes)

2) Ask the caretakers what support and assistance they would expect from the VHDC. When a responsibility for which you have a poster is mentioned, then show the poster to all the caretakers and repeat the responsibility.

3) Continue to ask for other responsibilities till all five responsibilities are mentioned. If not all are mentioned by the caretakers then explain the responsibilities which were missed out and ask the caretakers if they agree that this is a responsibility too.

The five responsibilities of the VHDC are:

1. **Poster 9.1** Resolve **disputes** related to the drinking water supply
2. **Poster 9.2** Frame **rules** and regulations with the community (this implies organising beneficiary meetings as and when required), inform the beneficiaries on decisions taken by the VHDC, and see to it that people confirm to the rules (or else take action)
3. **Poster 9.3 Collect** money for the Maintenance Fund and arrange for caretaker compensation. Keep records of village labour contribution, caretaker compensation and money collection for repair work
4. **Poster 9.4 Organise** voluntary labour to assist the caretaker in major repair work and supervise the caretakers
5. Promote **health** and hygiene

Compensation possibilities for the caretakers: (10 minutes)

1) Now discuss with the caretakers the different possibilities of getting compensation. Getting a fair compensation for their work is not a friendly gesture from the other users but a part of the RWS Programme. Fair compensation for the caretakers was agreed during the Meetings before the project implementation started. The work of water supply caretakers is substantial and cannot be assumed to be a free contribution.

2) Ask the caretakers if they get compensation or not, and if they think that this is fair in relation to the workload, and whether it is swiftly and easily arranged.

3) Arranging for a fair compensation is a task for the VHDC. If the Caretaker is not yet receiving a fair compensation then he or she should discuss this after the training with the

VHDC who then should call for a meeting with all the beneficiaries to formally agree on compensation. The presence of the Gup may be essential in such a meeting.

Three compensation possibilities are:

- In cash, every household contributes yearly (or monthly) an amount in cash that is collected by the VHDC. This option is nowadays the most common and successful.
- In kind, every household contributes yearly an amount in kind. For example maize, rice, etc.
- The caretakers are exempted for a fixed number of days (12 to 20 days per year, depending on the size of the scheme) of Shapto Lemi. These many days of labour contribution should be taken over by the other beneficiaries. Currently a problem is that often the beneficiaries agree on this arrangement, but it is not practised.

Rules & Regulations for the Operation of the scheme: (5 minutes)

1) Explain the importance of having clear and fair rules known by all the users. Compare this with other rules made for example for Irrigation, or Forestry or Traditional wooden bridges.
2) Rules and regulations should be made on the following aspects:
   - Compensation of the caretakers;
   - Money collection system for the maintenance;
   - Penalties for water wastage, not paying contribution;
   - Compensation for damaging the structures of the scheme, on purpose and by accident;
   - Water use arrangements in times of scarcity (e.g. no kitchen garden irrigation before noon in times of scarcity).

10. Differentiating between Minor and Major Repair

Objectives: At the end of this session the caretakers can:
1. Mention how to react on major and on minor breakdown,
2. Mention six minor breakdowns and mention 4 major breakdowns

Time: 30 minutes

Materials: Seven Posters showing:

Minor repairs	Major repairs
1.2 Repair leaking HDP pipeline because of cutting + bibcock	**10.4** Heavily damaged reservoir or BPT
10.1 Rebury pipe line in a trench	**10.5** Stream or spring intake damaged
10.2 Repair fencing	**10.6** Pipe line washed away by landslide
10.3 Repair or adjust float valve when BPT is overflowing	

Activity:

1) Explain to the caretakers that you will now discuss with them the differences between minor and major repair. Repair is needed after scheme break down.
2) Ask the caretakers if they can mention a type of breakdown, which needs to be repaired. Take the responses one by one. When one of the caretakers mentions a breakdown for which you have a poster then show the poster.
3) Continue to ask for more response and stimulate also other caretakers to think about possible breakdown.
4) If no more responses come and you have still posters then show the posters and ask a caretaker to explain the poster.
5) Now ask the caretakers one by one to show a poster to the group and say if they as a caretaker can repair this breakdown or not. For minor breakdown the answer should be yes and for major breakdown no. Ask what should be done for major breakdown.

Evaluation:

6) Go through all posters once again. Start with the caretakers who did not talk yet. *(everyone should get a chance to talk)*
7) Ask the caretakers with the posters one by one to mention the breakdown, mention whether it is major or minor repair and what and who should do it.

11. Tools for the repair of GI pipe

Objectives: At the end of this demonstration the Caretakers:
1. Can mention when and where they have to use the sliding wrench
2. Can mention when and where to use the pipe wrench.

Time: 20 minutes

Materials: 1. Nut and bolt, Flange set, Bib cock, Brass union, piece of GI pipe, sliding wrench
2. Pieces of GI pipe of different diameter, socket and 2 pipe wrenches

Preparation:

Part 1: Sliding wrench

- Get all the materials ready,
- Make sure that the sliding wrench is working and the adjusting wheel runs easily,
- Check nuts, bolts and other threads for easy and smooth running.

Part 2: Pipe wrench

- Choose a pipe wrench, which has good teeth and really catches the pipe. Some wrenches are not that good and give you a lot of problems during demonstration of the use of a pipe wrench.
- Check if the GI fitting and the pipe nicely fit together.

Activity:

Introduction

1) Explain to the participants the objective of this demonstration. You will demonstrate the use of two important tools for the fitting of GI-pipes. How GI-pipes actually are fitted will be demonstrated somewhat later.

Part 1: Sliding wrench (10 minutes)

2) Show the sliding wrench. Explain and show that it is used to tighten nuts and bolts of the manhole covers or the flange-set, etc. Tell and show that it is used also to fit small globe-valves, gate-valves, air-release valves, brass unions and bibcocks. The sliding wrench grips as long as there are flat sides.

3) Show with wrench and GI pipe that the sliding wrench can not be used on GI pipes because the sliding wrench has no teeth to grip and the pipe has no flat sides. Thus the sliding wrench will always slip.

Demonstrate:

4) Show how the opening of the sliding wrench can be made smaller and bigger by turning the wheel in the middle. Explain that turning the wheel in one direction will open the wrench and that turning the wheel in the other direction will close the wrench. Clearly show this opening and closing.
Keep it simple: One direction is open the other direction is close!

5) Get a nut and bolt and bring the wrench over the nut and close the wrench so that it can hold the nut at the inside. Explain that there should be no free space between the nut and the wrench. Free space would easily spoil the nut.

6) Repeat saying that the wrench needs to be closed when it is placed over the nut.

7) Invite one caretaker to come forward and ask him/her to demonstrate how to open and close the sliding wrench. Then ask the same caretaker to fit the sliding wrench nicely over the globe or gate valve. ***(Remember that everything must be visible for all the other caretakers)***. Make sure that the wrench is tightened. Thank the caretaker and ask her to return to her place.

8) Ask another caretaker to come in front and do the same again.

9) Finally tell them that every one will soon practice the use of a sliding wrench in the practical session.

Part 2: Pipe Wrench (10 Minutes)

1) Show the pipe wrench, explain and show that it is used to hold the GI pipe or to hold nuts and brass valves that are too large for the sliding wrench.

Demonstrate

2) Show that this wrench can grip the pipe with the teeth.

3) Show how the opening of the pipe wrench can be made smaller or larger by turning the wheel on the side. Clearly show this opening and closing of the pipe wrench.

4) Get a piece of pipe and adjust the opening to the correct size. Then show how you have to assist the wrench in gripping the pipe. Push the wrench with your thumb over the pipe (see drawing)

5) Take a new piece of pipe with a different diameter and show that the wrench now is not fitting. First you have to adjust the opening. Do this adjustment. Then repeat the demonstration how to catch the pipe with the wrench.

6) Now explain that the pipe wrench catches the pipe only in one direction. So if the wrench is on one side of the pipe it can either tighten or loosen. To change the catching of the pipe from tightening to loosening you have to change the pipe wrench to the other side of the pipe.

7) Take a socket and hands screw it over the pipe. Now show the position of the two wrenches to tighten the socket on to the pipe. The wrenches are facing opposite.

8) Remove the socket from the pipe and change the opening of the pipe wrench. Then ask two caretakers to come in front of the group and show the use of the pipe wrench step by step. (Remember the main objective is the use of the Pipe-wrench and not fitting the pipe. This part will come next.)

- Adjust the opening
- Hand tighten the socket over the pipe
- Place the pipe wrench over the pipe using the correct hand grip to assist the wrench to catch the pipe
- Position the wrenches opposite to tighten the socket to the pipe.

9) Give feed back to the two caretakers and thank them for their help.

12. Demonstration of GI fitting

Objectives: At the end of this session the caretakers:

1. Can mention 4 types of fittings used
2. Can mention the steps in fitting GI pipe and Socket together
3. Can mention the steps to open and close a GI union

Time: 30 minutes

Materials: Hemp, Compound, GI-pipe, elbow, socket, Tee, union, toolbox with tools

Preparation:

- Check the threads of pipes and fitting for smooth running. If necessary, clean them before the demonstration.
- Select only those materials from the box that you will use in this demonstration.
- Check the compound and stir it to get the correct thickness. Dilute if necessary.

Activity:

1) Show one by one the following fittings and mention the names of Socket, Tee, Elbow and GI-Union and show with the use of GI pipe their function.

GI Pipe and Socket

2) Say that you now will demonstrate the correct fitting of GI pipe and Socket.
3) Two trainers demonstrate the following steps while clearly explaining what they are doing and why they are doing it:
   - Clean the thread of pipe and socket using brush or borra,
   - Screw the two parts together to check if they fit nicely together and then unscrew them again,
   - Take the correct amount of jute and twist it several times around,
   - Place jute and explain the correct direction of winding it in the thread,
   - Put enough compound,
   - Screw together with your hands,
   - Tie the socket with 2 pipe wrenches to the GI-pipe (Stress about the correct direction of the wrenches)
4) Ask two Participants to come forward and fit the two pieces together:
   - First ask them to unscrew the pieces
   - Ask the caretakers to do the same steps to join the pipe and socket. First they should explain the step before doing the step.
5) Finally explain that the tin with compound must be carefully closed after use. Else it will dry out and can not be used anymore.

GI Union

6) Now say that you will demonstrate the proper opening and closing of a union.

7) Show the union and two pieces of pipe. Then the trainer will demonstrate the following steps:

- Fit the complete union as one piece to the GI pipe,
- Open the union using a pipe wrench,
- Show the washer inside and explain its importance as water seal,
- Fit the other side of the union to the pipe (remember to put the collar ring first over the GI-pipe and mention this),
- Place the washer on one side,
- Close the collar ring and use pipe wrench. **Tighten only slightly and do not use hemp!**.

13. Practical GI-Pipe fitting and GI-Union

Purpose: After the two demonstrations on GI tools and GI fittings all the caretakers need to practice how to do it.

Objectives: At the end of this session the caretakers:

1. Can demonstrate the correct use of the tools used for GI fitting
2. Can show in the right order the steps in fitting GI pipe and Socket or other fittings together,
3. Can show how to open, close and fit a GI Union to GI pipe.

Time: 90 minutes

Materials: Enough toolboxes, pieces of GI pipe, sockets, unions, elbows, hemp and compound.

Activity:

1) Make groups of two or three participants with one toolbox per group.
2) Give the materials (GI-pipe and fittings) and ask them to carefully follow all the steps to fit the pipe and socket together. **USE COMPOUND AND HEMP**.
3) All trainers will help the participants to do the correct way of fitting pipe and socket together. Check for the essential points like using sufficient hemp, compound and fit tight enough.
4) Continue fitting elbows etc. on the other side of the pipe. Make sure that everyone has the chance to do all the different tasks.
5) Lastly ask the participants from all groups to connect all their parts together. This is a good moment to explain the use and function of a union because without unions it will be very difficult to fit all the parts together..
6) Now include fitting unions. Most likely participants will forget certain steps such as putting the collar ring first, but that is no problem. **Let them find out themselves!**
7) Explain to the caretakers that it is important to close the compound after use. Else it will dry and can not be used later.
8) End the practical by removing all the joints and remove the hemp and compound from the pipes and fittings. Clean the threads of the pipes and remove the compound as much as possible before drying.

14. Source and tank cleaning procedures

Objectives: At the end of this session the caretakers:

1. Can explain that not cleaning of intake and tanks may cause blockage of the pipe and explain the health danger.
2. Can explain how to clean spring and stream sources.
3. Can explain how to clean tanks in their system.

Time: 60 minutes

Materials: • Posters on source cleaning Lesson plan 2), piece of pipe with HDP adapter

Importance of cleaning

Frequency of cleaning

Explain the importance of frequent cleaning. Clean not only when there are problems but clean at least **every month**! If you do not clean the scheme regularly, you may get dirty water and get sick or the pipe blocks. How often you have to clean depends on your source. For schemes with a good spring intake, cleaning once a month is enough. In schemes with a stream intake, especially in the rainy season, you may have to clean the source and tanks at least twice a month.

If possible It is good to inform the other villagers **before** you go for cleaning, so that they can store some water!!!.

Remember:
The next part is an introduction for tomorrow's field visit. What you explain now should be repeated and demonstrated tomorrow when visiting the actual structures.

How to clean the source

Activity:

Spring intake

1) Show **Poster 2.1** of spring source **(lesson plan 2)**. Point out the drain and explain the function of the drain above a spring. It needs to be clean and free from grass.
2) Point out the fencing with thorny shrubs around the source and explain that this needs to be maintained.
3) Point out the source area and explain that regular cleaning is required.
4) How to clean a spring protection itself:
   - If there is a union or adapter below the spring open this (Use sample to show how to open),
   - Then stop the flow of water by covering the pipe with your hand. After some time the overflow pipe.will give water. Now let the water flow again by removing your hand. If some small dirt particles are in the spring protection they will come out. Again close with your hand.
   - Do this two times and connect the pipe again.

Collection tank

1) The collection tank (in the case of any new intake this is part of the structure, in the case of different sources joining together this is a separate structure) must be cleaned every month, or when necessary more often during the rainy season. Explain the steps to clean a collection tank.

   - Clean the top of intake structure with a broom (remove leaves and sand);
   - Remove the two cement-masonry covers of valve chamber and collection chamber;
   - Close outlet valve of outlet pipe (This is the pipe with air-vent);
   - Open washout-valve of washout pipe (this is the pipe without air-vent);
   - Clean inside walls of collection chamber with brush or borra. Remove all mud, sand and leaves from the bottom;
   - Clean the strainer and open the holes in the strainer;
   - Close the washout-valve and **WAIT TILL THE COLLECTION CHAMBER IS OVERFLOWING** (this reduces the chance of air-blocks lower in the pipe line);
   - Only now you can open the outlet-valve;
   - Place both the covers back and fix them with nuts and bolts (if manhole cover is absent cover with planks and stones);
   - Close the gate and lock.

2) Show the drawings again and ask the participants what needs to be done. Remember that tomorrow they will practise it during the field visit.

Stream Intake

3) Show **Poster 2.2 (lesson plan 2)** of a stream intake with fencing (or thorny shrubs). Explain that this needs to be maintained or repaired so that nobody or any animals can enter.

4) Explain that regular cleaning of the area is required.

   - Dirt in the collection channel should be removed and the box under the plate (if perforated steel plate is used) should be drained out and cleaned like a normal collection tank.

Cleaning of tanks

Activity:

Show **poster 2.3 of lesson plan 2**. Explain that all the tanks need regular cleaning. If the tanks are not regularly cleaned dirt will accumulate. The dirt can block the pipe or make the users sick.

Reservoir

1) Explain the steps to clean the reservoir.

   - Remove all leaves and other dirt from the roof and the valvebox;
   - Remove manhole covers of reservoir and valvebox (by opening nuts and bolts);
   - **First close** the outlet valve in the pipe with the airvent (gently);
   - **Then open** the wash-out valve;
   - Stir water inside the tank with a stick so that water carries the silt away;
   - Then use borra to rub the walls;

- Continue until the tank is clean;
- Clean the strainer
- When the tank is clean, close the wash-out valve (gently);
- **WAIT TILL THERE IS A GOOD WATER LAYER**, **Only then** open the outlet valve;
- Put manhole covers back and put the nuts and bolts back. Tighten with wrenches.

2) Ask questions like:
   - "Why do you have to clean the tank regularly?"
   - "Which valves do you use to clean a tank?"

BPT

1) Show **poster 2.4 from lesson plan 2**. Explain the steps to clean the break pressure tank.
   - Remove manhole cover from the top of the BPT (by opening nuts and bolts)
   - Open the wash-out valve with the valvebox key
   - You may close the inlet valve
   - **WAIT TILL THE WATER LEVEL IS BELOW THE OUTLET LEVEL**. **Only then** stir the water inside the tank with a stick, then borra
   - Continue stirring until the tank is clean;
   - Clean the strainer
   - When everything is clean, close the wash-out valve (gently)
   - If you have closed it, fully open the inlet again
   - Put manhole cover back (nuts and bolts)
2) Ask questions like:
   - Why do you have to clean the BPT regularly?
   - Which valves do you use to clean a BPT?

Cleaning of Tapstands

Activity:

1) Show **poster 2.6 of lesson plan 2**. The beneficiaries of one tapstand have to take care of that tapstand, but the caretaker can remind them on the following points:
   - Flat stones around the platform
   - No dirt and other waste, like potato peals or cloth at the platform
   - No stagnant water and mud around the tapstand
   - No cattle grazing around the tapstand
2) The following reasons can be given to convince :
   - Doesn't look good
   - Mosquito's, flies and flees are more around mud pools
   - Flies spread diarrhoea
   - Cattle can damage the tap or spread disease

15. Field visit

Objectives: The objectives of the field visit are to:

1. Re-enforce the theoretical talks about all sorts of RWS structures of the first two days.
2. Show how all the RWS structures really look like,
3. Carry-out the procedures for cleaning all the structures step by step as discussed.

Time: One full day

Materials: A working scheme with all or most of the RWS components present. Transport for the caretakers to the site, two sets of tools for small repairs and cleaning. Valve box key and grease.

Preparation:

- Inform the Caretaker of the scheme you plan to visit. Ask him/her to assist you in the field visit.
- Make sure that you have the keys of the locks on the structures so that you can open them.
- More information regarding the lesson plan for field visit can be found in **the lesson plan 14 "Source and Tank cleaning procedures"**

Remember:

Remember that the procedures are more important than the cleaning itself. Therefore it is suggested to split the group of caretakers in smaller sub-groups of 5-10 persons so that you are heard and understood by all caretakers in your sub-group.

Activity:

1) All structures have been discussed during the first few days of the Caretaker training. So you can give the caretakers the chance to show how much they have learnt in the first few days. Start with asking questions before explaining all again. Wait till all the caretakers have arrived at the site, before you start with questions and explaining what to do.

2) Ask questions like:

   - What is this structure? Answer will be a name.
   - What is the function of this structure? A simple answer on the purpose should come. Remember a caretaker is not a section officer who studied for three years in Deothang.
   - What should we do here regularly to maintain the scheme. Answers are all the activities mentioned below. Remember the five key points which are stressed and repeated for all the different structures.
   - What is the condition of this structure? Is it in good condition? Is it clean? What should the caretaker do to bring it in good condition?

3) Explain clearly how to do the following activities for the different structures and tell the caretakers what the consequences are if they are not doing it properly. The following structures should be visited:

Intake

4) Activities to do with the caretakers. Always ask the caretakers what to do. Don't let them start before you have discussed with all the caretakers.

- Checking and cleaning of the surroundings of the spring or stream intake,
- Checking and repair (if necessary) the fencing and the door,
- Cleaning the intake channel to the intake chamber, removing and cleaning the screen. Place it back.
- Cleaning and checking the intake chamber, removing mud, sand and leaves.
- Checking the washout and outlet valve.
- Procedure of cleaning intake with closing and opening of valves

Pipe-line

1) Activities to do with the caretakers:

- Follow the pipe line as much as possible to check for leakage,
- Check for blockage in the pipe line,
- Check for exposed parts,

Pipe-line washout Valve

1) Activities to do with the caretakers:

- Open the gate-valve and flush out the water till Crystal clear water comes out.
- Close valve and place cover back.

Air-release Valve

1) Activities to do with the caretakers:

- Remove the cap and press the ball. Water should come out.
- Check if the valve is leaking.
- Check for proper functioning.
- Check for proper valve box with cover.

Ferro-Cement Reservoir

1) Activities to do with the caretakers:

- Checking the fencing and the door, and repair if necessary.
- Drain out all the water through opening the washout valve.
- Check if there is lot of dirt (sand, mud and leaves) in the reservoir, if so then go inside and remove the entire dirt.
- Before leaving the reservoir site, place the cover back with nuts and bolts on the manhole and close the gate.

Break Pressure Tanks

1) Activities to do with the caretakers:

- Checking the fencing and the door, and repair if necessary.
- Drain out all the water through opening the washout valve
- Check if there is lot of dirt (sand, mud and leaves) in the reservoir, if so then go inside and remove the entire dirt.

- Check if the arm of the float valve can move up and down and if the valve closes when the arm is lifted up.
- Show how to adjust the flow of water through the control valve
- Before leaving the break pressure tank site, place the cover back with nuts and bolts on the manhole and close the gate.

Tapstands

1) Activities to do with the caretakers:
   - Show the control valve at the backside of the tapstand and demonstrate how to control the flow when the bibcock is fully open.
   - Apply grease and recap the GI-valve box cover.
   - Check if the bibcock is not leaking when it is closed.
   - Ask one caretaker to demonstrate in front of the others how to remove and replace a bibcock.
   - Ask another caretaker to open up the bibcock and point out the washer. Explain that the washer is the actual seal of the bibcock.
   - Check the drainpipe, and explain how the drain can be cleaned with a long stick.

16. Review of field visit

Purpose: The caretakers have seen many new structures and have practically learned how to clean the structures. This review session is to repeat whatever they have learnt the day before.

Objectives: At the end of this session the participants can:
1. Identify the different RWS structures in the field
2. Explain the proper method of cleaning of the structures,

Time: 60 minutes

Materials: Posters 2.1-2.6 The RWS scheme and it's Components

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Activity:

1) Discuss with the participants the activities of yesterday's field visit.

2) Relate the answers to what has been taught in the session on components. Make sure that the five points per structure/component are repeated.

3) Ask the participants what they saw and what they did at the source, reservoir, break pressure tank, air-release valve and tapstand etc.
Some possible responses are:

- Cleaning of surroundings in and around the structures,
- Drainage around the intake tank,
- Operation of valves while cleaning the tank,
- Plantation or tree cutting around the source,
- Checking of fencing around the structures,
- Proper closing and locking of structures and fencing.

4) Ask one participant to come forward and explain what he has done and what has to be done at the tapstand.

Possible responses are:

- See and check the conditions of the tapstand, bibcock, platform and drainage
- Replace the bibcock if the thread inside the bibcock is spoiled.
- Check the cleanliness of the surroundings and talk to the users on the importance of a clean tapstand,
- Proper drainage arrangements for waste water, no pools of stagnant water
- Latrine should not be built near tapstand
- Adjustment of tap flow, and see, which tools are used for the adjustment of the tap flow.

1) Ask what they have seen / found in or around the pipeline and explain the solution.
Possible responses are:

- Exposed pipe which then was properly buried
- Leaks at joints and just some where in the exposed HDP pipe
- Illegal connection (connections which are not approved by the rest of the community)

2) Place the seven posters upside down on the floor. Ask six caretakers to come forward and take one poster from the floor.

3) Ask the caretakers to form a line away from you. The line with the posters that they show in front of them should make a scheme. This means that the first caretaker has a poster of a source and the last caretaker in the line has a poster of the tapstand.

4) Ask the caretakers to once again repeat the 5 points for each structure.

17. Valves (All types)

Objectives: At the end of this session the new caretakers will be able to:

1. Mention and identify the 4 different main types of valves, their function and where they are placed
2. Demonstrate the required maintenance of air release valves and float valves

Time: 30 minutes

Materials:

- Gate-valve, Globe-valve, Float valve complete with inlet fittings (2 types of valves local and imported), Air-release valve (All types available), Wrenches and pliers,
- Posters showing:
  17.1 Gate and Globe valve open and closed
  17.2 Old brass, chromium and new brass air-release valve
  17.3 Float valve open and closed

Activity:

Gate-valve: (5 minutes)

1) Show a sample of a gate-valve and demonstrate how it opens and closes. Show the **poster 17.1** of the gate valve and explain.
2) Explain that a gate valve is used only to stop the flow of water in the pipe. A gate-valve is **fully opened or fully closed**. Two gate-valves are placed in the intake (outlet pipe and washout). Two in the reservoir (outlet and washout). Two in BPT (inlet before float-valve and washout).

Globe-valve: (5 minutes)

1) Show a sample of a globe-valve and demonstrate how it opens and closes. Show the **poster 17.1** of the globe valve and explain.
2) Explain that through a globe valve water can only pass in one direction, which is in the direction of the arrow. Clearly show the arrow on the side of the valve.
3) A globe valve is located at the back or beside a tapstand, or in a valve box where a branch-line starts. The function of the globe-valve is to reduce the flow of water so that more water can flow to other parts of the scheme or to other tapstands.

Air-release valve: (Time: 5 minutes)

4) Show a new model air-release valve (and if available also the old model). Show the **poster 17.2** of the different models of air-release valves used in the past.
5) Explain the following about place and function of air-release valves:
   - An air release valve is found always on peaks but not on all peaks or high points (From high point where the pipe is going down in both directions). Its function is to remove trapped air (do not explain in detail) from the pipe. Trapped air can create air-blocks, which prevent the water to flow.
   - Open an air-release valve and show the small plastic part or ball inside. This part is down when there is air and now the valve is open. When this part is up there is only water and the valve is closed.

6) Explain the following about required maintenance:
   - Sometimes the caretaker should clean the surrounding of the valve and the valve box.
   - Test once a month the correct function of the air release valves.
7) Testing of an air release valve is done in the following way:
   - Remove the cap by hand.
   - Press the ball down with a stick (NOT with the point of a knife; this will damage the ball and can cause leaks). If there is water pressure, you have to press with some force and water will come out. Regularly pressing is good, because otherwise the ball may stick to the top.
   - When pressed down water will come out.
   - Place the cap back on the valve and close the valve box.

Pipeline Wash-out valve: (Time: 5 minutes)

1) Show a gate valve and say that this is sometimes installed at low points in the pipeline. In a low point the pipeline goes up on both sides.
2) At such low points sand and dirt may collect there in the pipeline and block it. Through the pipeline washout valve the sand and dirt can be flushed out.
3) Once a month this valve should be opened. Continue with water flowing out until only clean water comes out of the pipe.

Float-valve: (Time: 15 minutes)

4) **Poster 17.3** Demonstrate and explain the following on the function of a float valve.
   - Draws with chalk a real size plan view of the BPT on the ground.
   - Get all the participants around you to see the plan view.
   - Show an imported float valve that is connected to BPT inlet pipes and demonstrate how the float valve opens and closes. Blow air with your mouth through the valve to show opening and closing.
   - Explain that float valves are located in the break-pressure tank. Their function is to stop the flow of water when the BPT is full.
5) Show a local float valve and explain about the weak points such as float-arm connection, leaking float. In future PHE will only install the improved models.
6) If a float valve is not working the reservoir higher up will empty thus no water is stored. All this water is overflowing from the BPT. The result is less tap flow or no water at all.
7) Explain and demonstrate the following on how to adjust the float valve for proper operation (refer to the poster if you wish).
   - The valve closes because the float (ball) and arm will move up and close the valve or in other words stop the water.
   - If the float valve is not closed when the water is at the overflow level it needs to be adjusted.
   - The adjustment can be done using an adjustable wrench and pliers.
     - ✓ First close the inlet Gate-valve.
     - ✓ The float (ball) should be at the far end of the arm. Loosen both small bolts at the rotating point on the valve itself.
     - ✓ Adjust the arm at the rotating point of the valve such that the flow of water stops before the water level is same as the overflow level.

- ✓ Tighten both bolts properly using pliers and adjustable wrench.
- ✓ Check if the valve closes before the overflow level is reached.

8) Unscrew float valve again and ask two participants to adjust in the right manner and reinstall the float valve. Give positive remarks and support them with the task.

9) Sometimes the float or ball is leaking, it is important to immediately repair it somehow.

   - If you as caretaker cannot do it, you can take it to the Dzongkhag office and ask them for help.
   - In the mean time if there is no working float valve in your BPT, you may use the gate valve on the inlet pipe as a control valve. The gate valve is not really made for this , so it is only a temporary solution. You can make the flow smaller such that all the tapstands have sufficient water and the water is not overflowing too much from the BPT.

Evaluation of all types valves

1) Display all the valves on the floor or table.

2) Ask some one to come forward. You mention a valve and ask the participants to select that valve from the table/floor. Ask the participant to open and close the valve. Repeat this for all the valves with different participants.

3) Ask questions like:

   - What is the difference between a gate-valve and a globe valve?
   - Where do you find an air release valve?
   - When do I have to adjust a float valve?
   - What happens if the float of the float valve is missing? Yes it is not working but what else?

18. Demonstration of Ferro Cement Reservoir repair

Objectives: At the end of the demonstration the caretakers can:

1. Mention the steps needed to repair the ferro-cement structure;
2. Select good quality sand;
3. Mention the cement-sand-water ratio for Ferro-cement;
4. Prepare the right mix for repair;
5. Explain the preparation of the spot to be repaired;
6. Explain the need for curing.

Time: 10 minutes introduction and 15 minutes demonstration.

Materials:
- Cement, good and poor quality sand, water, empty tin or ladle, something to mix, mortar pan or cooking pot, trowel
- Vertical wall for practical plastering

Activity:

Introduction: (10 minutes)

1) Explain that cracks, holes or leaking spots in a ferro-cement reservoir can easily be repaired with a cement-sand mix. This is called mortar (masala).
2) Ask who has prepared cement mortar before. Do they remember what mixing ratio for Cement : Sand was used? Ask for what purpose it was used.
3) Explain that the mix used for Ferro-cement repair is different from a normal mix. The cement content must be higher. For normal masonry work like repair of tapstands and retaining walls, a mix of 1:4 or 1:6 Cement: Sand is used, but for Ferro-cement reservoir repair a mix of 1:2½ Cement: Sand is used.
4) Materials needed for repairs are (show the materials and explain why it needs to be clean).
   - Cement
   - Clean sand, not mud or earth
   - Clean water
   - Some tools
5) Explain the 10 steps for repair of reservoir. The repair can not be done in one day but will take several days to make the different layers of plaster.

First day:

- Get the materials ready
- Mark the places for repair
- Empty the tank
- Remove all loose cement parts
- Prepare the Cement : Sand mix for repairing the reservoir
- Today: apply with trowel or borra one thin layer on outside and wait till tomorrow

Second Day:

- Make new mix and apply second thin layer on outside and one layer on the inside
- Make the repaired spot wet every day for 7 days
- Use the tank **only after** 7 days

Demonstrate the preparation of Cement mortar: (15 minutes)

1) Demonstrate how to make the mix for reservoir repair:
   - Show a bag of cement and the cement powder, fill one ladle or tin with cement and put it in a pot or mortar pan,
   - Show good sand and fill two and a half times the ladle or tin and add this to the pot or mortar pan with cement.
   - Mix well, it is easier when it is dry.
   - Add one ladle or tin of clean water and again mix well,
   - Add little by little more water till the mix is of the right consistency.
2) Let the caretakers feel with their own hands how wet/dry the right mix should be.
3) Make a second mix but now use only half of the water. This mix will be too dry. Again let them feel the dry mix and compare between the two mixes.
4) Now add extra water to the dry mix and make it too wet. Again let them feel the wet mix and compare between the right mix and the wet mix
5) Demonstrate how to apply the mix using borra or trowel.

19. Practical on Ferro cement Reservoir repair

Objectives: At the end of this session the caretakers can:

1. Prepare a cement mortar with the correct mixing
2. Prepare the crack before applying mortar
3. Apply mortar with a trowel or borra back on the wall where the reservoir was cracked

Time: 50 minutes

Materials: Cement, Clean water, good quality sand

Activity:

1) Divide the participants in small groups and take them outside for the practical.
2) Let the groups prepare the spot that needs to be repaired and make it wet with water. (chisel and remove dust and lose parts)
3) Each group makes its own cement mortar, exactly in the way you described it in the demonstration. Check frequently for the right mix. Correct when necessary.
4) Let the participants apply the mortar on the cleaned and wet wall or cracks. Whatever was chosen for the practical.
5) Ask each group what they should do for the next few days

20. Demonstration of HDP - GI Fittings

Objectives: At the end of this session the caretakers:

1. Can explain how to join HDP and GI with a brass union, Plastic Adapter, or Flange-set
2. Can explain how to use a GI-union
3. Are ready for a short practical using union and adapter

Time: 30 Minutes

Materials:

- Brass unions and adapters of different types,
- Flange-set and GI-unions
- Correct diameter HDP pipes with straight end, correct diameter GI pipe with thread, for all types of fittings
- Hacksaw, pipe wrench, sliding wrench, knife or file,
- Compound and hemp, borra

Activity:

1) Tell that this session is about joining of HDP and GI pipe with brass unions, or Plastic adapter or with flange set)

Brass union: (8-10 minutes)

2) Show the different brass unions and say that these different types are in use.
3) "Break" one brass union into its parts and show all these parts clearly one by one. Put them in order on the table or chodrum.
4) Take the GI pipe and the part of the union that should be fitted to it. (Remember that the caretakers have already practised GI pipe fitting so you can do this quite quickly)
   - Check the GI thread and clean it with borra
   - Apply hemp and compound on the GI pipe thread
   - Connect the two parts and tie with sliding wrench and pipe wrench
5) Now go to the HDP pipe
   - Discuss what is the proper length at which the HDP pipe should be cut: Show all participants clearly how many centimetres the pipe should be pushed in the union. Less depth will result in a leak.
   - Show that your HDP pipe is cut straight and remove burrs with the knife
   - Tell them that they should not reduce the outer pipe diameter by filing or cutting with a knife or damage the pipe in any way.
6) Put the parts in the right order over the pipe and tell that this is the right order
7) Close the union by hand, then close further by wrenches, telling that some force needs to be applied. They should continue tightening till it stops leaking.
8) Take the union apart and take all parts from the HDP pipe. (**Note:** To remove the brass ring inside the HDP pipe, first move the outer ring up, then cut the HDP pipe diagonally where the brass ring is inside. Bend it open to remove the brass part. Finally cut the damaged part of HDP pipe. Now you have all parts again)
9) Show all parts and let the caretakers one by one take a part from different sides of the union: the first person should take the part which should be put over the pipe first.

10) Let the first person put the first part over the pipe and then the second and so on till all parts are finished; take care for right direction of the parts.

11) Ask two participants to close the union with two wrenches.

Plastic Adapter (8-10 minutes)

1) Explain: "The function of the Plastic Adapter is to join HDP and GI of small diameter. Actually there are many different types of Adapters to join HDP and GI. But all Adapters are almost the same."

2) Unscrew the adapter in all its parts. Explain the function of all the parts. Also point out the rubber ring inside. (**Note**: *In some types the ring is loose in other types the ring is fixed in* the adapter.)

3) Explain that you fix the Adapter to the GI pipe first because you have to screw the adapter on the fixed GI pipe. This you can not do when the adapter is already connected to the HDP pipe in the ground. Think of the location behind the tapstand.

4) Join the GI pipe **only** with compound, **not** with hemp. Tell that hemp should only be used when fitting GI to GI. *Using hemp will destroy the plastic thread of the Adapter. Do not* use the pipe wrench on the plastic with too much force. Best is to tighten with bare hands first. Finally give it one final turn with a pipe wrench.

5) Now we will fix the HDP side. Cut the end of the HDP straight and only remove the burrs, inside and outside with a knife or file. Tell that the adapter will leak if they make the pipe thinner with the knife: **(Note: Making the pipe thinner should not be done.)**

6) The HDP pipe must be inserted deep in the adapter and has to pass the rubber ring. To pass the rubber ring you sometimes have to press hard. Show this before cutting the HDP pipe to its correct length.

7) Put one part of the adapter over the HDP pipe followed by the white gripping ring. Stress that both parts must be put in the right direction and explain how to see what is the right direction. **(Note: On the HDP side you must not use any hemp or compound!!)**

8) Insert the HDP pipe in the Adapter and check if the HDP pipe passes the rubber ring. To pass the ring might take some force. (**Tip:** *Make the pipe and rubber ring wet to insert it easier.*)

9) Ask two participants to dismantle the adapter. Ask two other participants to re-join GI and HDP pipes back to the adapter. **(Note: Position the participants in such way that all others can see what they are doing.)**

Flange-Set (5-8 minutes)

1) Show a flange-set and the pieces of HDP and GI pipe. Explain to the participants that a flange-set can be used instead of an adapter or brass union. Flange sets are normally used only for large pipe sizes.

2) Dismantle the flange-set and give special attention to the rubber ring and the orientation of the flanges.

3) Like in an adapter you first have to fit the flange on the GI-pipe.

4) Show how to fit the flange to the GI-pipe

- Show how to clean the GI thread with brush, borra or small stick.
- Check if the Flange fits to the GI pipe.

- Place hemp and put compound on the GI thread and show how much you have to put.
- Fit the flange and tighten with your hands first.
- Show/explain that for tightening of the flange you use two bolts & nuts placed opposite each other in the flange. The handle/arm of a pipe-wrench is used as lever to tighten.

5) Check the length of the HDP-pipe and cut to the correct length. Make the HDP-pipe end ready for welding with heating plate.

6) Before joining HDP, bring the second flange over the HDP pipe. **(Note: This can NOT be done after joining.)**

7) Bring the two flanges together and place the rubber washer between the flanges.

8) Fit the bolts and nuts and hand tighten. Check the position of the rubber washer. Then tighten the nuts and bolts with sliding wrench.

9) Dismantle the flange-set and ask two participants to come forward and assemble the flange-set again.

10) Ask the caretakers before each step what they will do next. Give feedbacks to the caretakers on how they are doing, at the same time explain to the others what the two participants are doing.

GI-union (5 minutes repetition)

1) Now say that you will demonstrate the proper opening and closing of a union again.

2) Show the union and two pieces of pipe. Then the trainer will demonstrate the following steps:

- Fit the complete union as one piece to the GI pipe;
- Open the union using a pipe wrench. Place one wrench on union body connected to GI-pipe the other wrench on collar ring,
- Show the washer inside and explain its importance as water seal;
- Fit the other side of the union to the pipe **(Remember to put the collar ring first over the GI-pipe and mention this)**;
- Place the washer on one side;
- Close the collar ring & use pipe wrench. **(Note: Tighten only slightly and do not use hemp!)**

21. Practical on HDP-GI connections Brass Union, Plastic Adapter, Flange-set

Purpose: So far you have only demonstrated the use and way of connecting HDP and GI pipes together with Brass union, plastic adapter and flange set. It is now time to let all participants experiment with the different fittings. Only through this practice the caretakers will really learn how to use these fittings.

Objectives: At the end of this session all the caretakers:

1. Have individually opened, fitted and closed a Brass Union and can demonstrate the right order of fitting to other caretakers;
2. Have individually opened, fitted and closed a Plastic-Adapter and can demonstrate the right order of fitting to the others;
3. Have fitted a flange set to the GI pipe and closed the flange. Welding the HDP pipe is not necessary.

Time: 60 minutes

Materials: Brass Unions, Plastic Adapters, flange-sets, Caretaker toolboxes, Hemp, Compound

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Activity:

1) Make pairs or groups of three and distribute to each group either a brass-union, or a plastic adapter or a Flange set. (Make as many groups as you have materials for them to practise on.) Also distribute the other materials such as HDP and GI pipes, Hemp, compound, etc.

2) Ask the caretakers to get their own toolboxes to work with during this practical

3) Get the attention of all the caretakers and explain the objective. They should fit the union, adapter or flange which is now with them as was demonstrated before.

Remember:
You as trainer have again the important task to go around and assist the caretakers in the practical. Of course they do the fitting but you and the other trainers should explain and demonstrate again if necessary.

4) Make sure that every one in the group has a chance to try fitting the union or adapter.

5) After some time circulate the different items to other groups so that finally all groups have worked with the Brass-Unions, Plastic Adapters and the Flange set.

6) Collect all materials at the end of the practical and count whether all items are returned.

7) During the practical, watch for the following common mistakes and correct and explain to all the groups individually.

Brass Union mistakes:

- Forget to push the brass ring and the (white) plastic ring over the HDP pipe before placing the inserter in the HDP pipe.
- Fit the HDP pipe before the GI pipe.
- Use Hemp and compound on the HDP side were it should not be.
- Make the pipe thinner with a knife or file. Only the burrs should be removed.

- Insert the HDP pipe not far enough in the brass union.

Plastic Adapter mistakes:

- Forget to push the closing ring over the HDP pipe before the gripping ring.
- Use of hemp on the GI side of the Plastic-Adapter.
- Use hemp and Compound on the HDP side of the Plastic-Adapter.
- Push the HDP pipe not deep enough in the adapter. The pipe does not go through the ring but only touches it.

Flange set mistakes:

- The steel ring with bolt holes is not placed over the HDP pipe before joining the HDP flange and HDP pipe together
- The rubber ring or gasket is not placed between the two flanges.

1) Ask the caretakers question on the above mentioned mistakes to evaluate their knowledge on this topic.

22. Demonstration to make HDP TEE's and Y-joints

Objectives: At the end of this demonstration the caretakers:

1. Have seen how to make HDP bend, Tee, Y, and reducer
2. Can mention the steps in the correct order to make HDP bend, Tee, Y, and reducer.

Time: 20 minutes

Materials: Hacksaw, File / knife, Heating plate, Teflon cover, Thermochrome chalk, Fire to heat the heating plate, HDP pipes small and large diameter,

Preparation:

- Have a fire burning heating up a heating plate

Activity:

Introduction

1) Explain the objective of this demonstration session. Arrange the participants in such a way that all can see clearly what you will demonstrate.

2) Explain: Only in rare cases you need an HDP bend. But a bend is also the beginning for making a Y or a Tee. The function of a Y or TEE is to supply water in two directions.

Making a Bend (5 minutes)

3) Cut with helper the 40mm pipe at 45° angle. Show how the 90° corner of the toolbox can be used to make a good 45° angle.

4) Ask participants if they remember what to do next before welding can be done. Answer: *Remove the burrs with the use of knife or file and clean the pipe.* This is the same for a straight joint. Remove the burrs clearly in front of the caretakers.

5) Check the temperature of the heating plate, count till 3 and show that the colour of the Thermochrome changes. Put the Teflon cover over the plate. Do actual welding together with your helper. **(Remember to count loud and clear to ten before releasing the pressure.)** How long should we wait before the joint is cooled down? Yes, at least five minutes.

Making a TEE (5 minutes)

6) Explain the cutting required to make a Tee. Again show how to get a nice 90° angle by using the corner of a toolbox. Do the cutting and remove the burrs inside and outside with a knife or file. Explain that the outside of the welded pipe should not be cut flat.

7) Ask the participants what to do next. Correct!, We check the temperature of the heating plate before putting the Teflon cover and making the welding. Do not forget to count again.

Making a Y joint (5 minutes)

8) Explain the cutting required to make a Y-joint. Do the cutting and remove the burrs inside and outside with a knife or file.

9) Check if the two parts fit together by holding it against the light.

10) Repeat all the steps and make a Y joint. Explain that the outside of the welded pipe should not be cut flat.

Making a Reducer (5 minutes)

11) Show a reducer and ask. *Do you remember what is this called?* Then: *What is the function of it?*

12) Explain the use of a reducer and how to make a reducer. Demonstrate it without really heating the pipe (nothing really happens).

13) Explain that it is important to constantly rotate the HDP pipe in the fire or flame for equal heating. After cooling the end should be cut off to make it fit to the larger size pipe.

23. Second practical HDP pipe joining

Objectives: At the end of this practical all the caretakers have:

1. Made at least 3 small diameter 90° Bends of which at least one is acceptable,
2. Made at least 3 small diameter TEEs, of which at least one is acceptable,
3. Made at least 2 small diameter Y joints, of which at least one is acceptable,
4. Made at least 2 large diameter TEEs of which at least one is acceptable,
5. Made at least 2 reducers of which at least one is acceptable

Time: 85 minutes

Materials: Mortar pans with burning fire,
Smaller and larger diameter HDP pipes, tool boxes of the caretakers

Preparation:

- Remind the caretakers to bring the pieces of pipe given on the first day.
- Have fire(s) ready for the heating of the heating plates. This will save time and give more opportunity for real practice by the caretakers.
- Ask the caretakers to bring their toolboxes.

Activity:

1) Pair the caretakers scheme wise or make female pairs and male pairs. Make sure that all (men and women) both do all the steps. Pipe preparation, checking of temperature and actual welding. *(**Remember** it is still not a factory where one caretaker does **all cutting**, another caretaker **all filing** and a third **all welding**)*
2) First ask them all to make two pieces of small diameter of pipe ready for a 90° bend (cut the pipe under 45° with hacksaw and clean with file or knife). Use the corner of a toolbox to get the right angle.
3) Go around and give help to all the caretakers. Giving help and feedback is the most important task of a trainer. Also get the help of the experienced plumbers.
4) The caretakers can join the pipes only after the trainers have checked the pipes and the way it was cut. After welding check the joints by inspection and give feedback to the caretakers. Check the strength of the joint by bending but do this only after the pipe is completely cooled.
5) Continue with cutting and welding to make the small diameter bends followed by TEEs and Y-joints to get enough practice.
6) After at least 5 TEEs or Y-joints of small diameter the caretakers can try for the big diameter, which is more difficult.

24. Blockage Detection

Purpose: Blockage of a pipe is a common problem. Caretakers should have an idea how to find the blockage without digging up the complete scheme. Some analytical thinking before getting to work can save a lot of time and effort.

Objectives: At the end of this session the caretakers will be able to:

1. Mention two different types of pipe blockage (air / dirt)
2. Mention 6 most common places where blockage can occur
3. Judge whether water is flowing in the pipe or not
4. Locate the blockage in a systematic way
5. Remove the blocks without damaging the scheme

Time: 80 minutes

Materials:

- Two pieces of HDP pipe, a bucket of water and a stone
- Posters 17.3 with different types of air-release valves (lesson plan 17)
- Two posters of schemes
  24.1 Easy scheme 24.2 Complicated scheme

Activity:

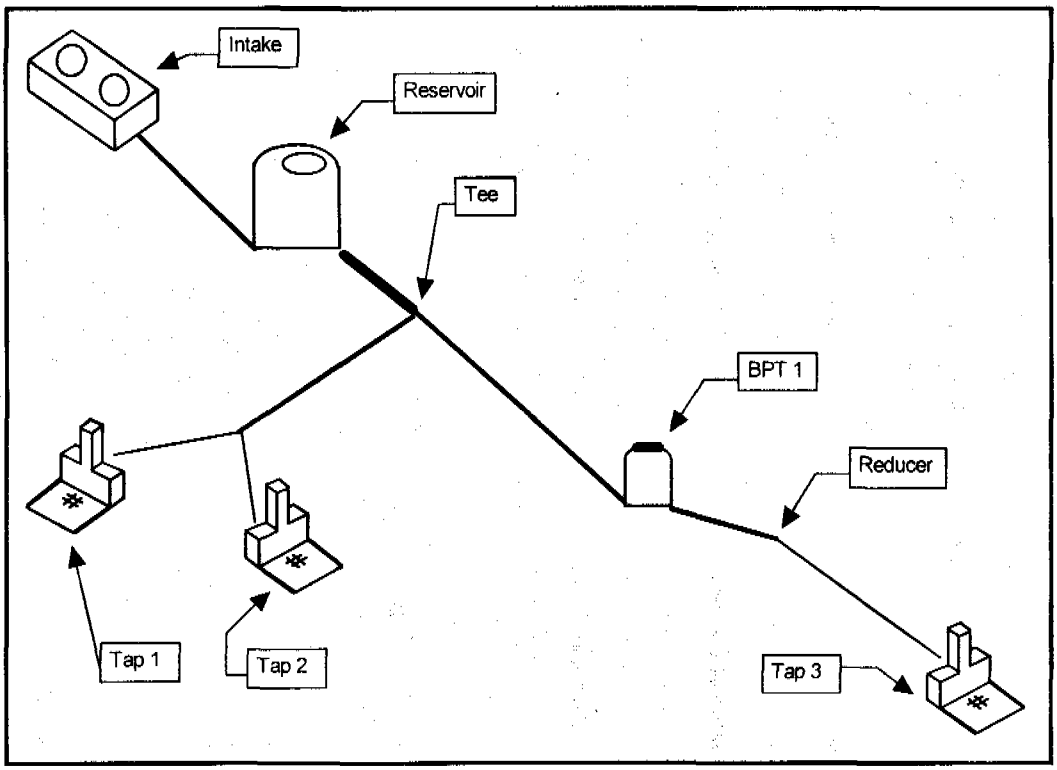
1) Explain the objective of this session, which is on blockage detection. Tell the caretakers that this is a difficult subject because blockage can occur at many different places , each with their own solution. It is important to think carefully about the blockage problem before you as caretaker start digging up pipeline.

2) Explain the following:

- Many blockages can be prevented if regular cleaning of source and reservoirs are done. It is better to prevent blockage because this saves much time.
- Basically there are two types of blockage. One is because **air** is trapped in a high point of the pipeline. The other type is because **dirt** has entered the pipe and got stuck somewhere on the way to the reservoir or tap stand.
- Air blocks can only occur at places where the pipeline has gone up again. Air blocks sometimes happen when you have cleaned the intake and open the outlet valves again. Sometimes, at such high points air-release valves are installed to release air automatically from the pipe.
  Show samples or drawings of the three different types of air release valves.
  Operation and maintenance of air release valves was discussed earlier. Air blocks are most likely at:
  - ✓ High points in the pipe line
  - ✓ High points especially when the pipe layout is horizontal
  - ✓ Occurs mostly at the outlet pipes right after the intake or reservoir
- Because of a missing strainer or a dirty source or reservoir, dirt and larger particles can enter the pipe. This dirt most likely gets stuck at the following places:
  - ✓ Just after a tank (reservoir, BPT)
  - ✓ Control valves before the tapstand
  - ✓ Bibcock of the tapstand
  - ✓ TEEs and Reducers in the pipe line
  - ✓ Low points in the pipe line (U profile)
  - ✓ Float valves in the BPT

3) **Ask:** *How do you know that the pipeline is blocked?* **Answer:** *When there is no water running from an open tap!* This is correct, but is there water in the reservoir and is the

Poster 24.1 Blockage detection Example 1



7) Explain the following steps to locate the blockage. This is the first example thus you might have to tell and explain more than that they can answer your questions.

pipeline not broken? See, there are many reasons why there is no water coming from the tap. And if it is a blockage then where can this blockage be found? How to find the blockage we will see and learn next.

Blockage from dirt

4) Explain that if there is no water from a tap the caretaker first has to find out the whole situation of the scheme. This means that the caretaker should ask himself the following questions.
   - Which taps have no water?
   - Is there water flowing in the nearest BPT above the tap?
   - Is there water in the reservoir and is there water flowing into the reservoir?
   - What is the condition of the source?
5) By knowing the answers to all these questions it is easier to find the blockage if there is any. Show poster 24.1, an example of an easy scheme.
6) Now explain the following situation for the example scheme. Water is in the BPT above the tapstand and is also flowing out of the float valve, but is not flowing out of **tap 3** and the pipe is not broken. Thus most likely there is a blockage some where in the pipe but where?
   - First check strainer of the BPT
   - Check if the bibcock is open and working? OK, but no water ➔

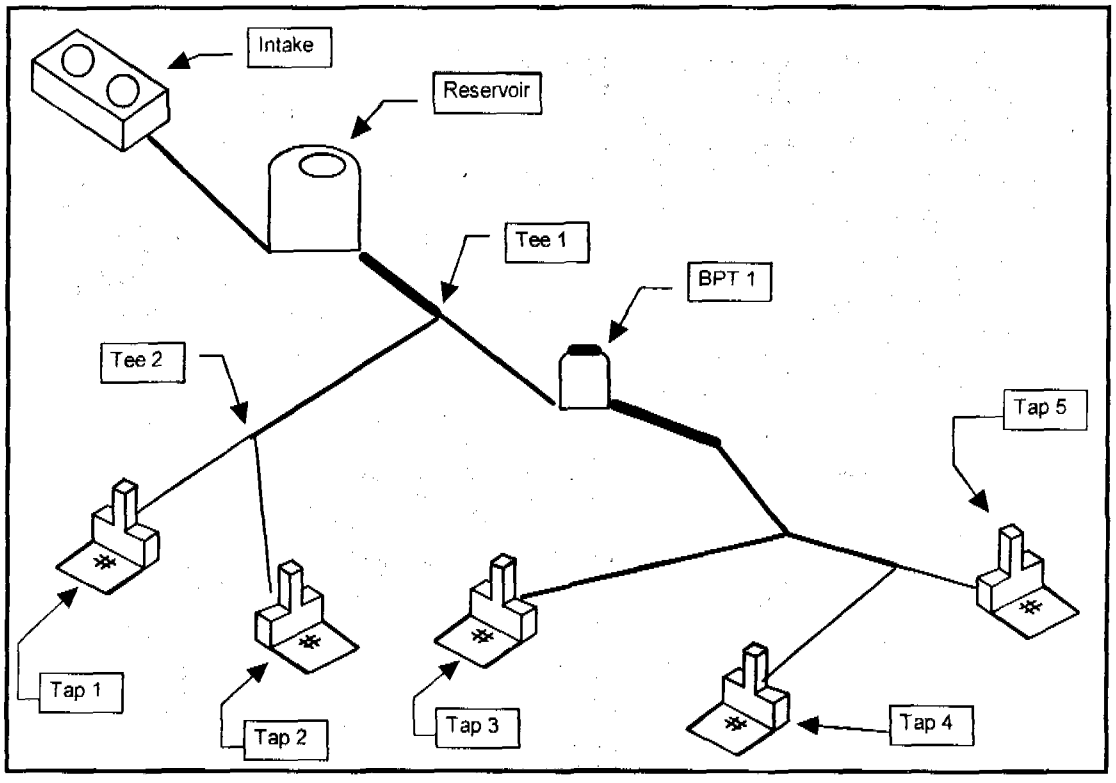
- Check if control valve near the tapstand is open? OK, but no water➔
- Remove bibcock from tapstand with pipe wrench. Done, but no water➔
- Dig up the control valve and open the plastic adapter between HDP and GI. Done but no water➔
- Check if the pipe above the reducer is filled with water. You can check this by banging gently on the pipe. Hollow sound means empty, and "solid" sound means full. If the pipe above the reducers is full then the blockage is probably at the reducer. Dig up some more pipes and bang the pipe. If this does not help to remove the block then only cut the pipe 20 cm above the reducer, and remove the block.
- If the pipe above the reducer is empty then the blockage is somewhere between the BPT and the reducer. When there are no other reducers then the blockage can be at any joint in the pipe line. If the caretaker still remembers where these joints are then he/she should check there first.

8) Now, you have finished the first example of blockage detection.

9) Show the second example poster 24.2 of a more difficult situation. The way of analysing the problem is the same.

10) Now explain the following situation for the scheme of example 2. Water is **not** in taps 1

Poster 24.2 Blockage detection Example 2



and 2 and the pipes are not broken. There is water in taps 3, 4 and 5. Where is the blockage?

11) Explain the following steps to locate the blockage. This is the second example thus you can ask more questions to the caretakers to check whether they understand.

- Ask the caretakers where they think that the blockage is. Answer: *At Tee 1, Tee 2 or somewhere in between.* It can happen that the control valves of both taps 1 and 2 are

blocked at the same time but it is not very likely. Thus it is not necessary to look there first.

- Bang the pipe between Tee 1 and Tee 2 gently to check if the pipe is filled with water. If the pipe is empty then the blockage is in Tee 1, if the pipe is full then it is more likely that the blockage is in Tee 2.
- Dig up the chosen Tee and bang the pipe near the Tee. If this does not help then cut the pipe above the Tee to remove the blockage. Join the pipe nicely after removing the blockage.

Air-blocks

1) Explain the following about air blocks.
   - Air-blocks are always located at high points and at places where the pipeline runs almost horizontally. Air-blocks will often occur at the same place. Thus remember the place and go there first to check.
   - If water is not entering the pipe in the inlet chamber, reservoir or BPT **and** the pipe is not closed at the end then there might be an air-block.
   - Air-blocks can be found by banging the pipe gently at a high point. If the banging sound is "hollow" then the pipe is empty, if the banging sound is "solid" the pipe is filled.
   - Take a piece of HDP pipe and bang it so that all can hear. Fill it with water and bang it again. Ask: *Do you hear the difference?*
   - Ask caretakers one by one to come forward and let them bang the pipes with and without water. Repeat so that all have noticed the difference.
   - The air must be released from the pipe, and this is normally done with an air release valve. Sometimes an air release valve is not placed during construction and then an air-block can happen. When you have air-blocks in you scheme ask the Dzongkhag staff to come and place an Air-release valve. This solves the problem permanently.
   - For the time being you must remove the air from the pipe through a small hole which you can make with a nail. Puncture the pipe with a nail and pull the nail out. Now air should escape from the hole in the pipe. Wait till all the air has gone and only water comes out. Now put the nail back in the hole to close the pipe. Next time when there is an air-block you can simply remove the nail and let the air escape.
2) Air-release valves must be placed even if the procedure with the nail works.
3) If time still permits you can discuss a third example with the caretakers. Go back to the scheme of Poster 24.2 Blockage detection Example 2. Question: *Where is the blockage, if no water comes into the BPT 1?*
4) Possible places for the block are:
   - Tee 1
   - Joints in the pipe between Tee 1 and the BPT
   - Control valve or float valve in the BPT.

25. (Tapstand) control valve

Objectives: At the end of this lesson the participants can:
1. Mention the function of a control valve;
2. Explain how to adjust or stop the flow of water with it;
3. Demonstrate how to replace the globe valve.

Time: 10 Minutes

Materials: Control valve (globe valve ½"), fitted between two pieces of GI pipe,2" Valve box with end cap and short piece of MS-rod at the bottom of the valve box, valve box key, sliding wrench, 18" pipe wrench and grease

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Activity:

Function of control valve:

1) Show a control valve (globe valve).
2) Explain that control valves are found at two places. At the back of almost every tapstand, and in some branch lines.
3) Show how a control valve fits in its valve box and where the iron rod is placed.
4) Explain the two functions of a control valve.
   - To stop the water (e.g. while replacing / repairing a bibcock).
   - To regulate (= reduce) the flow. This is needed if one branch line or one tapstand gets more water than others, as result there may be no water at other tapstands. The bibcock in the tapstand with too much water will spoil fast.

Operating the control valve:

1) To operate the control valve open the valve box with the sliding wrench (if it has a nut welded on top) or the pipe wrench,
2) Use the valve box key. Turning the wheel in the **same** direction as you would go around the Chorten means less flow, in the **wrong** direction around the Chorten means more flow.
3) Check at the tapstand if the flow is now sufficient but not too much.
4) If you want to stop the flow entirely (e.g. because you want to do repair of the bib-cock), turn as much with the direction around the Chorten as you can. The flow will stop. However, **DO NOT APPLY MUCH FORCE**, because that would spoil the control valve.
5) When the tap has the correct flow, you can close the valve box again with the cap. (Remember to grease regularly).
6) However, before we close it, we should apply some grease or oil. Regularly you should apply grease or oil on the thread of the valve box, otherwise you can not open the box after some time.
7) Then close it, and use the wrench only for one final turn more than hand-tight.

Replacement of the control valve:

8) If the control valve needs to be replaced, or if you want to put a new one somewhere, you have to pay attention to the flow direction.

9) Show the participants from nearby the arrow on the valve. The water should flow in the direction of the arrow.

10) Fitting the control valve is done with hemp and compound

Evaluation:

11) Ask the participants the following questions:

- Why should the flow to one branch line or tap not be too much *(Answer: Bibcock will spoil and other taps may have no water)*
- If I turn the wheel of the control valve the way you turn your prayer wheel, will there be more or less flow to the bibcock? *(Answer: Less)*
- Why should you put grease on the valve box thread? *(Answer: The thread will not rust)*
- What is important when you want to stop the flow entirely? *(Answer: That you do not apply much force)*
- Let two participants open the control valve using the correct tools
- Let two other participants close it again and put the valve box over it as well
- Let one participant come forward and ask:
  "If this is the pipe line and the tapstand is on that side, how should you put the valve in?

26. Demonstration on repair of bib cock

Objectives: At the end of the session the caretakers can:

1. Mention 4 places where the bibcock can leak;
2. Mention the steps to repair the 4 different possible leakage;
3. Mention 3 alternative materials for making washers.

Time: 30 Minutes for explanation and demonstration

Materials: 5 Bibcocks with GI sockets and 5 PCs of GI pipe 50 cm long, 14" pipe wrench, sliding wrench, pliers, hemp and compound, tyre tube, vaccine bottle cap

- Poster 28 of bibcock leaking at four places

Activity:

1) Divide the participants into groups of 3-5 caretakers. If necessary arrange strong and weak learners over the different groups.

2) Get everybody's attention and explain the objective of this session. Then distribute the materials (bibcock, socket and pipe) to each group.

3) Show the bibcock with pipe and explain that it can leak at different places. Allow some time for the participants to observe their own taps. Point out the following four places of leakage, referring to the poster if you like:

   - **The socket between pipe and bibcock;**
   - **Between the top and the handle;**
   - **In the middle of the bibcock;**
   - **From the mouth and the bibcock can not be closed.**

4) Now we will look at the four different places of leakage one by one. First we will talk about what to do when the leak is at the socket between pipe and bibcock.

Leaking socket

5) **Explain** how to repair the leakage from the socket. The solution is to fit the bibcock and socket nicely again with hemp and pipe joining compound. Or replace the socket when it is cracked.

(**NOTE:** do not explain pipe fitting in detail again because that was done in a previous session of the training programme.)

Leaking top part

6) The next leakage problem is when water is coming from the top part. **Explain and demonstrate** how to repair the leakage between top part and handle. The solutions are first check with sliding wrench or pliers if the top nut is properly tied. Try to tie it a little more and see if the leakage stops. If this is not the case then the rubber ring inside is spoilt and needs to be replaced.

7) **Explain and demonstrate** at the same time the following steps to replace this rubber ring.

   - Close the control valve at the back of the tapstand and count the number of turns to close it. After repair you have to open it the same number of turns to get the same flow back.
   - Open the top nut with sliding wrench or pliers and remove the broken ring..

- Take some hemp and twist it. Put sufficient hemp but also not too much with some compound BELOW the top nut. It should not be in the thread. Hemp and compound will function as replacement for the rubber ring.
- Fix the top nut back and tie. Don't over tie it because then the tap handle can not be turned.
- Open the control valve the same number of turns as it was closed.

Leaking middle part

1) The third leakage problem is when water is coming from the middle of the bibcock. **Explain and demonstrate** how to repair the leakage in the middle of the bibcock. The solutions are first check with sliding wrench if the middle part is properly tied. Try to tie it a little more and see if the leakage stops. If this is not the case then the big washer between middle part and bottom part is spoilt and needs to be replaced.

2) **Explain and demonstrate** the following steps to replace this big washer.

   - Close the control valve at the back of the tapstand and count the number of turns to close it.
   - Remove the top of the tap with a sliding wrench. Be careful because there is a smaller washer inside.
   - Put a new washer or a little hemp and compound in the thread and fix the top of the tap back. Make sure that the smaller washer is still in place.
   - Open the control valve the same number of turns as it was closed.

Leaking from the mouth

1) Now finally we look at the problem when even closing the tap with full force cannot stop the flow from the tap.

2) **Explain and demonstrate** how to repair the leakage from the mouth of the bibcock. The solution is to replace the small washer inside because this one is spoilt.

3) **Explain and demonstrate** the following steps to replace this small washer inside.

   - Close the control valve at the back of the tapstand and count the number of turns to close it.
   - Remove the top part of the tap with sliding wrench and take out the brass saddle where the washer is fixed. Be careful because there is this small part inside.
   - Take the small washer out by loosening the small nut with a plier and replace the rubber washer with a new one. **OR**
   - Turn the old washer upside down, which gives a flat rubber surface again. This can only be done once. **OR**
   - Cut a new washer from old ***tyre tube*** to exactly the same size and make a small hole in the middle. **OR**
   - *Use a **vaccine bottle cap*** from BHU and cut this flat. This is of nice rubber quality and almost the same size. **OR**
   - Cut a new washer from an old "***chappel***" like from a tyre tube. Do not make the washer too thick.
   - Place the (new or local) washer and washer saddle back in the tap. Check for the right direction. Rubber washer must be at the bottom.
   - Fix middle part back and do not forget the big washer. When the big washer is spoilt use a little hemp and compound to replace it.
   - Open the control valve the same number of turns as it was closed.

4) Explain that when the thread of the handle inside the tap is spoilt nothing can be done to repair the bibcock. Only a new bibcock can solve the leakage.

5) Ask if they know of a problem with the bib-cock which has not been mentioned. When they point out other problems briefly discuss possible solutions on how to repair it.

Evaluation:

Remember:
The evaluation should not take too much time, it is better to spend more time on the following practical.

1) Ask one of the participants to come in front to mention and point out on a tap the different places of leakage.

2) Then ask another participant to come forward and ask him to explain how to repair a leaking socket.

3) Repeat the explanation of repair for all the other types of leakage by different caretakers.

4) Ask also what alternative materials can be used for the replacement of washers.

27. Practical on repair of Bib-cock

Objectives: At the end of the practical session **all** the participants **themselves** have:

1. Loosened the top nut and replaced the rubber ring with twisted hemp.
2. Removed the top part of the tap, turned the inner washer upside down and placed the top part back again.
3. Made at least one good washer from an old tyre tube.

Time: 60 minutes

Materials: 5 Bibcocks with GI sockets and 5 pieces of GI pipe 50 cm long, Hemp and compound, tyre tubes, vaccine bottle cap, Caretaker toolboxes.

Activity:

1) Explain to the caretakers the objective of this practical session, which is the repair of a brass tap. Ask, *"At which four places can the brass tap leak?* Answer: *leakage from the socket, the top, and the middle and from the mouth.* First we repair the tap as if it was leaking from the top.

Tap leaking from the top: (15 minutes)

Note: Make sure that all of them individually carry out the work and have their share of the learning experience. During the practical go around and give help and assistance when necessary.

2) Divide the participants in small groups of 3 to 5 participants and give each group a bibcock with socket and pipe. Tools are already with them in their own toolbox (or give each group a set of necessary tools).

- First they have to loosen the top nut and see the washer ring hidden inside. All of them should see the washer ring.
- Now try to remove the small washer ring, but this is not always possible.
- The washer can be replaced with hemp, let them make a washer for this.
- Place the self-made washer in the top part of the tap and close the nut.

3) Get the attention of all the caretakers after 15 minutes and explain that now the tap is leaking from the middle part.

Tap leaking from the middle: (15 minutes)

4) Let the caretakers continue working with the tap to do the following:

- open the tap and check the large washer ring.
- Replace the washer ring with hemp and some compound and close the taps.

5) After again 15 minutes ask the caretakers to repair the tap when it is leaking from the mouth.

Tap leaking from the mouth: (15 minutes)

6) Leaking from the mouth happens because the small washer inside is worn out and needs to be replaced.

7) Ask them to remove the existing washer and to place it back upside down. Put the top part of the bibcock back and close it.

8) Give each participant a piece of tyre tube and ask him or her to make a spare washer for the bibcock.

9) Ask them to remove the existing washer and replace it with the newly made washer of tyre tube. Put the top part of the bibcock back in its place.

Make sure that every one has opportunity to practice

Conclude the practical session by taking all the taps and tools.

28. Problems and Solutions

Objective: At the end of this session the participants:

1. Have expressed their specific problems in maintaining their own scheme.
2. Have received an answer to solve the problem or have made an appointment with the Dzongkhag staff to further discuss the specific problem.

Time: 45 minutes

Materials: Notebook to take note of the problems and offered solutions

Activities:

Remember:

This session is preferably done by the DPHE-in-charge himself, supported by the other DPHE staff. The word of an in-charge has much more influence on the villagers and his promises have more values.

1) Explain that the training programme is now almost over but there might be problems which they face as caretaker and which were not discussed or solved in this training.
2) Ask representatives from each scheme, one by one to briefly describe the condition of their scheme. Explain that they should focus on the following:
   - Source;
   - Water flowing from the taps or not;
   - Maintenance committee active or not;
   - Their compensation as caretakers of the scheme;
   - What is the biggest problem that you as caretaker have with the maintenance of the scheme.
3) If necessary ask questions to the caretakers to get a good picture of the condition of the scheme.
4) Note down essential information and promises made for follow up after the training is over. **Report to DPHE if any problems need national follow-up**.

Do not make any promises that you can not keep, because next time they will not believe you anymore!

29. Evaluation of the Caretaker training

Objectives: At the end of the evaluation the participants will:

1. Have expressed their views and ideas about the course for the last five days.

At the end of the evaluation **you as trainers** can mention:

1. What the caretakers liked best about the programme
2. What they did not like about the programme

Time: 30 minutes

Activities:

Remember:

This evaluation is not to repeat the total five day course in half an hour. If the caretakers did not understand the subjects of the last 5 days you can not explain it to them in the remaining 30 minutes.

This evaluation can help you learn how to improve the course and do an even better job next time.

1) Ask the participants what they liked or disliked, and what they found easy and what they found difficult. Did this training prepare them for their job or do they still feel incompetent in certain areas?

2) Draw lessons from their feedback for your next training. Share issues of national interest with PHE/HD.

30. Introduction game *"Lucky Shout"*

Objective: At the end of the game the participants will:
1. Know each others name and village,
2. Are more relaxed and at home in a comfortable atmosphere

Place: Inside the hall or other place for the training
Time: 30 minutes
Materials: Enough small pictures with drawings of different animals. With many participants a number of the same pictures can be put in the bag.

Activities:

1) Get the attention of all the participants and explain what we are going to do.
2) Tell the participants that:
3) We will play a nice game together, which is called **"Lucky Shout"**.
4) They have to pick one by one exactly one small piece of paper from inside the bag. The pieces of paper are rolled.
5) On the paper they will find a drawn picture of an animal.
6) You as the game leader can ask the participants to come forward one at a time with the picture taken from the bag.
7) Once he or she is in front of the other participants he has to do the following:
8) Mention clearly their own name , the name of the village and their function (if necessary you as game leader may have to repeat the information so that it is clearly heard by every one)
9) Show the picture to the participants.
10) Then say: "I am . . . . ." (name of the animal on the picture, for example a cow) and they have to shout three times like a cow
11) Ask all the participants to shout the same together.
12) Repeat the game till all participants have mentioned their name, also you and the other trainers from Dzongkhag can come forward for their introduction.

31. Energiser exercise: *"HDP Pipe connection"*

Purpose: After a long lecture or discussion the participants will feel tired and sleepy. They find it difficult to pay full attention to trainer. This is the right moment to play a short game or exercise.

Objectives: 1. After this exercise the participants will be with new energy ready for the next lesson.
2. The caretakers will more easily remember the names of the different HDP pipe connections.

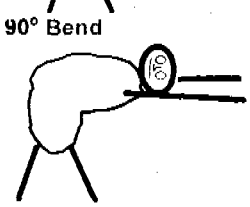
Time: 5 to 10 Minutes

Activity:

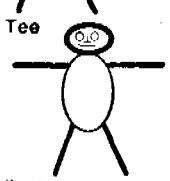
1) Ask the participants to stand up and spread over the classroom.
2) Explain that this is a HDP pipe exercise and that they have to do exactly what you are doing.
3) Demonstrate the following joints and ask the participants to do the same together with you.
4) The following joints or connections can be made:

Straight joint: is arms above your head and hands together

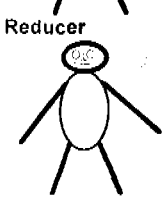
Y-joint: is arms above your head spreading like a Y



90° degree bend: is bend the body forward and stretch the arms horizontally out.



Tee joint: is stretch arms horizontally to both sides



Reducer: Is arms pointing downwards under a small angle with the body.

1) Continue for some time making the different types of joints while you are speeding up in changing the joints.
2) Finally say a different joint from the one you have shown to them. Stop and wait. Many will have made a mistake.

32. Exercise: "Message game"

Purpose: Information gets normally less clear or lost when passed on from one to another and then again to another. Go and see for yourself is the best way to get information. This game shows what happens when the information is passed on to many different people before reaching the Dzongkhag Administration.

Objectives: At the end of the game the participants will:

1. Have had a good time and a laugh,
2. Have experienced that when a message is passed on, information is lost and changed.

Materials White lagays, red kabney

Time: 30 Minutes

Activity:

1) Send two people out of the hall or classroom. Appoint one of them to act as Section Officer and the second one will act as DPHE In-charge. Give them white sleeves to dress and behave like Dzongkhag SO and DPHE-in-charge.

2) Ask one participant to come forward and tell her/him that she/he is one of the VHDC members for this game. You (the Dzongkhag trainer) act in the game as the male Caretaker and are now going to tell the VHDC member what has happened to your RWS scheme, and the VHDC will have to inform the Dzongkhag after you have given the VHDC member the message

3) Read out the following message twice for the VHDC member:

"One and a half year ago, in our village Takor under Joktang Gewog, we all together completed the construction of our new RWS scheme. All the villagers were very happy.

But now already the scheme is completely out of condition. The intake is full of leaves and crabs and the pipe is blocked near the intake. In the hope to get water, three people cut the pipeline at the back of their tapstand. Mimi Pakpa is storing potatoes in the empty BPT near his house.

We, the caretakers Ap Longchung and Morab Wangmo, do not want to repair the scheme anymore. The people are angry with us, but we say that we do not work, because the other beneficiaries do not pay or give us anything in return. The others just cut the pipes. We ask you as VHDC member to inform the DPHE In-charge and ask help from Dzongkhag."

4) Ask the one of the participants to act as Section Officer. Remind him that he is the Dzongkhag SO, and that the VHDC member will inform him what has happened to their RWS scheme and that he will have to inform the DPHE-in-charge afterwards. Therefore he should listen very carefully to the VHDC member.

5) Let the VHDC member tell the story to the Section Officer.

6) Now ask the DPHE(I) to come in and let the SO explain the story.

7) One of the other Dzongkhag trainers acts as Dasho Dzongda wearing a white lagay and red kabney and the DPHE-in-charge has to explain it to the Dzongda.

8) Ask the participants if there is difference in the final message (when Dasho Dzongda gets the message) to the original message.

9) Ask the theme of the game? Answer: information gets normally less clear or lost when passed on to many people. So the best way to convey message is in writing or by bringing the message directly.

Objectives for a Two-day RWS Caretaker Refresher Training Course

Approximately one year after the Caretaker training all participants are called once again to attend a two day course for the operation and maintenance of their water supply schemes. This time the course duration can be shorter because the caretakers were trained before and should have been doing some maintenance work and maybe even have repaired a pipeline or a brass tap. Because of this experience the programme and the way of training can be different. You as the trainer should keep in mind that they have knowledge and skills on which you can build during the training sessions. Stimulate the caretakers to show what they know and what they can do. This makes it also easier for you to see in which subjects the caretakers still need more training. You should try to focus in the programme on these subjects and not on the subjects which they already know.

The refresher course is not meant to be training with new subjects or more details. It is just **to repeat** the important skills and knowledge, which is essential to the caretaker to do his job well.

The Programme outlined on the next two page deals with the most important subjects. It is recommended to repeat the subjects with the caretakers following the lesson plans that were used during the caretaker training for new caretakers. However you can ask more questions to stimulate their thinking.

Refresher Caretaker Training Course Programme

Course Day I

Time	Activity	Who
8:30- 9:00	Registration of Caretakers and checking of the toolboxes issued previously	S.O.
9:00- 9:30	Opening session	DPHE-in-charge
9:30-10:00	**Tea**	
10:00-10:20	Introduction Game	S.O.
10:20-10:30	Logistics during the training	S.O.
10:30-10:45	Caretaker Tasks	S.O.
10:45-11:00	Importance of maintenance of RWS Schemes	S.O.
11:00-11:15	Game	S.O.
11:15-12:30	RWS components and cleaning procedures for all structures [Stress the five tasks]	S.O.
12:15-13:30	**Lunch**	
13:30-13:40	Use of GI tools and identification of fittings	S.O.& Plumber
13:40-14:00	GI fitting demonstration including GI-union and Brass union	S.O.& Plumber
14:00-15:15	GI fitting practical, pipes and unions	S.O.& Plumber
15:15-15:30	**Tea**	
15:30-15:45	Adjustment of tapstand control valve	S.O.
15:45-16:15	Bibcock repair (demonstration by the trainers)	S.O.& Plumber
16:15-17:00	Bibcock repair (practical by the participants)	S.O.& Plumber

End of Day One

Course Day II

Time	Activity	Who
9:00- 9:45	Repetition of the 5 tasks per component and how to clean them	S.O.
9:45-10:15	Roles and Responsibilities of Maintenance Committee, fund raising and compensation	S.O.
10:15-10:30	**Tea**	
10:30-11:00	Use of HDP tools and HDP welding demonstration for Straight, Bend, and TEE	S.O.& Plumber
11:00-12:30	HDP welding (practical for straight, Bend and TEE)	S.O.& Plumber
12:30-13:30	**Lunch**	
13:30-13:45	Ferro cement repair (demonstration)	S.O. & Mason
13:45-14:30	Ferro cement repair (practical)	S.O. & Mason
14:30-15:00	Blockage Detection	S.O.
15:00-15:15	**Tea**	
15:15-16:15	Discussion on Problems of caretakers	DPHE-in-charge
16:15-16:30	Payment of TA/DA for participants	S.O.
16:30-17:00	Closing with Chief Guest	

1. Caretaker Tasks

Use Lesson Plan 0 "1. Introduction to the JOBS of caretaker" on page 11 to explain the 4 main categories of tasks for the caretakers.

2. Importance of maintenance of RWS Schemes

Use Lesson Plan 0: "8. Importance of maintenance" on page 28. Since this is a refresher course you can ask more open questions instead of explaining all the posters.

3. RWS components & cleaning procedures for all structures

Use lesson plan 0: "2. The RWS scheme and it's Components" on page 13.

Ask for each poster what they see and understand from it. Then ask what the 5 important points are.

Remember: Only the caretakers who were trained using these materials will have seen these posters.

4. Use of GI tools and identification of fittings

Use Lesson Plan 0: "11. Tools for the repair of GI pipe" on page 32 to explain and demonstrate the proper use of sliding wrench and pipe wrench.

Use the first part of Lesson Plan 0: "12. Demonstration of GI fitting on page 34 to repeat the different types of GI fitting.

5. GI fitting demonstration including GI-union and Brass union

Use the second part of Lesson Plan 0: "12. Demonstration of GI fitting" on page 34 to demonstrate the steps for correctly fitting the GI pipes and fittings together.

Use Lesson Plan 0: "20. Demonstration of HDP - GI Fittings" on page 51 to demonstrate the use and fitting of brass unions.

6. GI fitting practical, pipes and unions

Use Lesson Plan 0: "13. Practical GI-Pipe fitting and GI-Union" on page 36 to practise the fittings of GI union to GI pipe.

Use Lesson Plan 0: "21. Practical on HDP-GI connections Brass Union, Plastic Adapter, Flange-set" on page 54 to practise the use of brass-union and plastic adapter.

Maybe not all participants have brought their toolboxes. Group the participants for the practical in such way that each group has tools to work with. If you have toolboxes in store you can also consider using these tools during the training.

7. Adjustment of tapstand Control valve

Use Lesson Plan 0: "25. (Tapstand) control valve" on page 63.

8. Bib-cock repair (Demonstration)

Use Lesson Plan 0: "26. Demonstration on repair of bib cock" on page 65.

9. Bib-cock repair (Practical)

Use Lesson Plan 0: "27. Practical on repair of Bib-cock" on page 68.

10. Repetition of the 5 tasks per component

Use lesson plan 0: "3. Repetition Caretaker tasks for RWS Components" on page 17.

11. Roles of the VHDC

Use Lesson Plan 0: "9. Roles & Responsibilities of VHDC" on page 29.

Roles and responsibilities of the Maintenance Committee (20 minutes)

Use Lesson Plan 0 9. Roles & Responsibilities of VHDC on page 29 to explain the 8 roles and responsibilities of the Maintenance Committee.

12. Use of HDP tools and welding demonstration

Use Lesson Plan 0: "4. Tools for Repair of HDP Pipe" on page 19, and Lesson Plan 0 "5. Demonstration of Straight HDP joining and making a HDP-strainer" on page 22 and Lesson Plan 0: "22. Demonstration to make HDP TEE's and Y-joints" on page 56

13. HDP welding practical

Use Lesson Plans 0: "6. First practical HDP pipe joining" on page 25 to practise the straight joint and the strainer. Then continue with Lesson Plan 0: 23. Second practical HDP pipe joining on page 58 for the Tee and Y-joint.

14. Ferro Cement repair demonstration

Use Lesson Plan 0: "18. Demonstration of Ferro Cement Reservoir repair" on page 48.

Note: The time for this demonstration is less compared to the New caretakers training. Spend more time on the actual demonstration than on the introduction part.

15. Ferro cement repair practical

Use Lesson Plan 0: "19. Practical on Ferro cement Reservoir repair" on page 50.

16. Blockage Detection

Use Lesson Plan 0: "24. Blockage Detection" on page 59.

17. Discussion on problems of the Caretakers

Use Lesson Plan 0: "28. Problems and Solutions" on page 70.

Objectives for a Three-day RWS Caretaker Training Course, Spring Protection Schemes

The Training course programme for a caretaker of spring protection schemes is specially designed to meet their specific needs. Spring protection schemes are by definition smaller and do not have a number of structures normally found in other rural water supply schemes. To train caretakers on subjects, such as reservoir cleaning and adjustment of float valves is useless if they do not have such structures in their schemes. Therefore a number of subjects is deleted from the 5-day training programme for new Caretakers.

This training programme should not be used for a mixed group, with caretakers from spring protection schemes and normal rural water supply schemes. Only when the number of participants is small, the trainer can decide to organise one batch for both types of caretakers and use the 5- day programme.

The objective for this training course is the same as for the other caretaker-training course. In this course the caretakers should learn and certainly practice how to maintain their Spring Protection Scheme. Most of the tasks of a caretaker are based on skills that need to be demonstrated by the trainers and then practised by the caretakers. Well-organised practical sessions are essential for the success of the course.

The specific objective for this course is the sum of the objectives of each lesson plan. When you conduct the training according to the programme and you keep the lesson plan objectives in mind, you will not forget to explain or demonstrate any essential subject.

In future PHE may formulate a program for 'Small Stream Schemes', the equivalent of Spring Protection Schemes, but then for small communities whose nearest source is a stream. The Caretaker Training Programme for Caretakers of such schemes could follow the same outline, except that the maintenance of their stream intake should also be discussed.

Caretaker Training Course Programme for Spring Protection Schemes

Course Day I

Time	Activity	Who
8:30-9:00	Registration of new caretakers on the attendance sheet	DPHE staff
9:00-9:40	Opening session	Dzongda & DPHE-in-charge
9:40-10:00	**Tea** with Chief-guest	
10:00-10:20	Introduction game for trainers and participants (Game: Lucky shout)	S.O.
10:20-10:30	Logistics during this 3 days training course	S.O.
10:30-11:00	Introduction to the job of Caretaker	S.O.
11:00-12:30	The Spring Protection Scheme and its components	S.O.
12:30-13:30	**Lunch**	
13:30-13:45	Repetition: Caretaker tasks for the Spring Protection Components	S.O.
13:45-14:15	Tools for the repair of HDP pipe.	S.O. & Plumber
14:15-14:45	Demonstration of straight HDP joining and making a HDP-strainer	S.O. & Plumber
14:45-17:00	First practical HDP pipe joining and making a HDP-strainer	S.O. & Plumber

End of day One

Course Day II

Time	Activity	Who
9:00- 9:30	Repetition: Caretaker tasks for RWS components	S.O.
9:30-10:15	Health and Hygiene aspects	DHSO
10:15-10:45	**Tea**	
10:45-11:15	Importance of Maintenance and role for the Caretaker	S.O.
11.15-11.35	Tools for the repair of GI-pipes	S.O.
11:45-12:00	Demonstration of GI fitting (Socket, Elbow, Tee)	S.O. & Plumber
12:00-13:00	Practical on GI fitting (Socket, Elbow, Tee]	S.O. & Plumber
13:00-14:00	**Lunch**	
14:00-14:10	Function and use of tapstand control valve	S.O.
14:10-14:40	Bibcock repair (Demonstration)	S.O. & Plumber
14:40-15:30	Bibcock repair and washer change (Practical)	S.O. & Plumber
15:30-15:45	**Tea**	
15.45-16:00	Demonstration on HDP-GI connections Brass union, Plastic-adapter and GI-union	S.O.
16:00-17:00	Practical on HDP-GI connections Brass union Plastic-adapter and GI-union	S.O. & Plumber

End of day Two

Course Day III

Time	Activity	Who
9:00-12:30	Field visit to all the components of a Spring Protection Scheme	S.O. & Plumber
12:30-13:30	**Lunch**	
13:30-14:30	Blockage detection	S.O.
14:30-15:00	Problems and solutions in relation to their Spring Protection Schemes	DPHE-in-charge
15:00-15:30	Evaluation of the Caretaker Training	DPHE-in-charge
15:30-16:00	Payment of TA/DA for participants	S.O.
16:00-17:00	Closing and distribution of Certificates by Chief Guest	DPHE-in-charge & Dzongda

End of Training course

1. Introduction to the job of Caretaker

Remember:

This is the first introduction for the caretakers. You should not discuss in detail the tasks, which they have to do as caretaker. For that you have still 3 full days. For now, only highlight the main responsibilities and stress that they will learn this during the training course.

Use Lesson Plan 0: "1. Introduction to the JOBS of caretaker" on page 11. Do not mention Stream intakes, Break pressure tanks or ferro cement reservoirs because they are not found in a spring protection scheme.

2. The Spring Protection Scheme and its components

Use Lesson Plan 0: "2. The RWS scheme and it's Components" on page 13. Do not mention and discuss Stream intakes, Break pressure tanks or ferro cement reservoirs because they are not found in a spring protection scheme. (Thus, posters 2,4 and 5 are not needed)

3. Repetition: Caretaker tasks for the Spring Protection Components

Use Lesson Plan 0: "3. Repetition Caretaker tasks for RWS Components" on page 17. Do not mention and repeat Stream intakes, Break pressure tanks or ferro cement reservoirs because they are not found in a spring protection scheme. (posters 2,4 and 5)

4. Tools for the repair of HDP pipe.

Use Lesson Plan 0: "4. Tools for Repair of HDP Pipe" on page 19.

5. Demonstration of straight HDP joining and making a HDP-strainer

Use Lesson Plan 0: "5. Demonstration of Straight HDP joining and making a HDP-strainer" on page 22.

6. First practical HDP pipe joining and making a HDP-strainer

Use Lesson Plan 0: "6. First practical HDP pipe joining" on page 25.

15. Demonstration of HDP - GI Fittings

Use Lesson Plan 0: "20. Demonstration of HDP - GI Fittings" on page 51. Do not discuss flange-sets because they are not used for the small spring protection schemes.

The demonstration on the use of a GI-union is part of Lesson Plan 0: "12. Demonstration of GI fitting" on page 34.

16. Practical on HDP-GI connections Brass-union, Plastic Adapter and GI-union

Use Lesson Plan 0: "21. Practical on HDP-GI connections Brass Union, Plastic Adapter, Flange-set" on page 54. There is no need to practise flange-sets because they are not used in the spring protection schemes.

The instructions for the practical on the use of a GI-union are in Lesson Plan 0: "13. Practical GI-Pipe fitting and GI-Union" on page 36.

17. Field visit

For the general ideas of a field visit see Lesson Plan 0: "15. Field visit" on page 40. Spring protection schemes are small, thus a half day field visit should be enough.

- Visit the Spring source;
- Check the collection tank, if there is one;
- Check and open the brass union or HDP coupling;
- Check and review the tapstands.

18. Blockage Detection

Purpose: Blockage of a pipe is a common problem. Caretakers should have an idea how to find the blockage without digging up the complete scheme. Some analytical thinking before getting to work can save a lot of time and effort.

Objectives: At the end of this session the caretakers will be able to:

1. Mention two different types of pipe blockage (air / dirt)
2. Mention 6 most common places where blockage can occur
3. Judge whether water is flowing in the pipe or not
4. Locate the blockage in a systematic way
5. Remove the blocks without damaging the scheme

Time: 60 minutes

Materials:
- Two pieces of HDP pipe, a bucket of water and a stone
- Posters belonging to this lesson plan

Activity:

7. Health and Hygiene Aspects

Use Lesson Plan 0: "7. Health and Hygiene Aspects" on page 26.

8. Importance of maintenance

Use Lesson Plan 0: "8. Importance of maintenance" on page 28.

9. Tools for the repair of GI pipe

Use Lesson Plan 0: "11. Tools for the repair of GI pipe" on page 32.

10. Demonstration of GI fitting

Use Lesson Plan 0: "12. Demonstration of GI fitting" on page 3432. Do not discuss or demonstrate the use of a GI-union now. This will come in the afternoon.

11. Practical GI-Pipe fitting

Use Lesson Plan 0: "13. Practical GI-Pipe fitting and GI-Union" on page 36. Do not practise the use of a GI-union. This is not jet demonstrated and will be practised after the demonstration later this afternoon.

12. (Tapstand) control valve

Use Lesson Plan 0: "25. (Tapstand) control valve" on page 63.

13. Demonstration on repair of bib cock

Use Lesson Plan 0: "26. Demonstration on repair of bib cock" on page 65.

14. Practical on repair of Bib-cock

Use Lesson Plan 0: "27. Practical on repair of Bib-cock" on page 68.

1) Explain the objective of this session, which is on blockage detection. Because spring protection schemes are small the detection of a blockage is much easier then in other RWS schemes.

2) It is important to think carefully about the blockage problem before you as caretaker start digging up the pipeline.

3) For a spring protection scheme blockage can occur at three different places:
   - Inside the spring capping itself,
   - In the pipe line, or
   - Near the tapstand.

4) How do you know that there is a blockage in pipeline or near the tapstand(s)?
   - No water is flowing from the open taps but water is still flowing from the overflow of the spring. This means that the source is not dried up and thus water should reach the tapstand(s).

5) How to find the place of the blockage?
   - First check if there is water at the connector or brass-union near the spring. If water flows out of the pipe then the blockage is below the connector in the direction of the tapstands.
   - In No water flows from the plastic connector then check the brass-union directly in front of the spring. If there is no water then the blockage is in the spring protection and this is a serious problem.
     Do not dig up the spring yourself but ask help from the Dzongkhag.

6) How to find the blockage between the plastic connector and the tap? First explain for one tapstand. See Figure 2 Blockage detection: One tapstand.
   - Check if the bibcock is open and working? OK, but no water ➔
   - Check if control valve near the tapstand is open? OK, but no water➔
   - Remove bibcock from tapstand with pipe wrench. Done, but no water➔

Figure 2 Blockage detection: One tapstand.

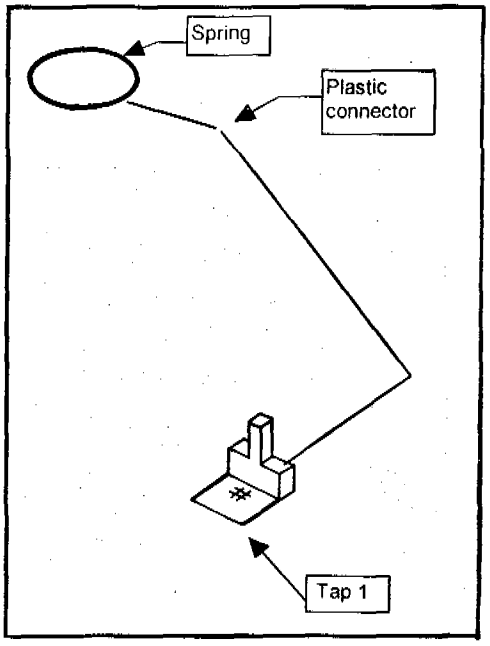
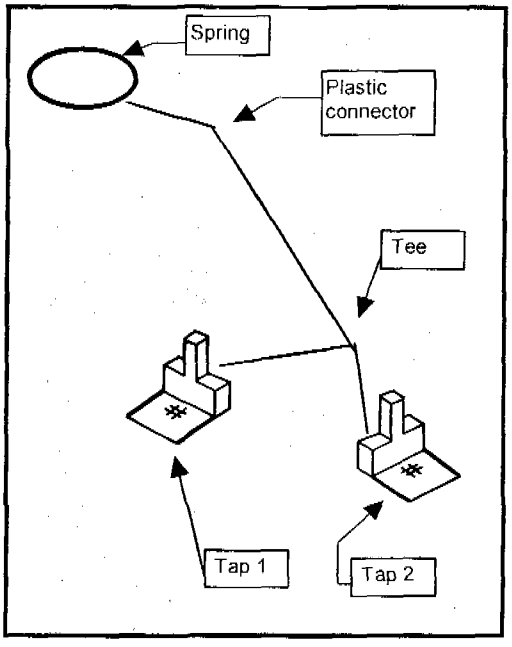


Figure 1 Blockage detection: Two tapstands.



- Dig up the control valve and open the plastic adapter between HDP and GI. Done but no water➔
- The blockage is somewhere else in the pipe. Check first at butt welding where the pipe is most likely to get blocked

7) How to find the blockage when there are two taps? See Figure 1 Blockage detection: Two tapstands.
   - No water in both the taps? If this is so the blockage is at or above the Tee.
   - Carefully bang the pipe above the Tee to check if it is filled with water. A hollow sound means that the pipe is empty. Thus the blockage is not at the Tee but higher up.
   - If one of the two taps has water then follow the procedure of point 6.

19. Problems and Solutions

Use Lesson Plan 0: "28. Problems and Solutions" on page 70.

20. Evaluation of the Caretaker training

Remember:

This evaluation is not to repeat the total three day course in half an hour. If the caretakers did not understand the subjects of the last 3 days you can not explain it to them in the remaining 30 minutes.

This evaluation can help you learn how to improve the course and do an even better job next time.

Annex: Tasks and responsibilities of an RWS caretaker

Whenever you feel that the tasks of a Caretaker are not understood well enough, you can use lesson plan 1. Introduction to the JOBS of caretaker at page 11 or explain the four main tasks with the posters belonging to the mentioned lesson plan.

The responsibilities of the RWS Caretakers are mainly Preventive Maintenance and Small or Minor Repair Works. It is the caretaker's responsibility to ensure that the Rural Water Supply scheme in his or her community functions in a proper manner and that supply of water is guaranteed to all legally installed stand posts (that is: water points approved by the community). Most important is that the caretaker lives permanently in the village it serves and is a beneficiary of the project. The caretaker should be compensated for the work rendered to the community satisfactory to the caretaker and the community.

1 Regular Preventive Maintenance

Preventive maintenance is a set of inspections and tasks that are done regularly by the caretakers to **prevent** breakdown. This work needs to be done at least once a month but during the monsoon more frequent inspections and cleaning will be needed. All the following works are part of preventive maintenance.

- ✓ Regular cleaning of the source-intake, especially when the source is a stream,
- ✓ Avoid in-sanitary conditions near the source such as animal dung or dead (wild) animals,
- ✓ Cleaning of intake chambers and division boxes (removing silt and sediments),
- ✓ Checking of the pipe lines and pipe connections for any leakage or blockage,
- ✓ Cleaning of Reservoirs and Break Pressure Tanks (BPT) through flushing the water and sediment out through the washout pipe,
- ✓ Checking the correct functioning of automatic air-release valves,
- ✓ Regular flushing of the supply line through the pipe-line washout valve,
- ✓ Checking the proper functioning and at the correct level closing of float-valves in break pressure tanks,
- ✓ Checking the cleanliness of tap stands and surroundings and advising the tap users on tap stand maintenance.
- ✓ Regulating and adjusting the tap-flow with the control valve placed near the tap-stand.

2 Minor Repair Works

Repair becomes necessary when one or more parts of the scheme fail to work properly. Even when the scheme works and water is flowing out of the taps, still small repairs might be needed. It is important to carry out these repair works because this will avoid larger damage in the near future. Furthermore, because of small damage for example a broken tap, water is unequally distributed even causing some taps to give NO water. This can lead to disputes in the village.

Minor repairs that are the responsibility of the Caretaker are:

- ✓ Repair the fencing around system components,
- ✓ Repair leaking pipes and joints and replace leaking fittings,
- ✓ Repair and /or change bib-cock washers and valve seals,
- ✓ Repair cracks in the ferro-cement wall through which water is leaking out of reservoirs and break pressure tanks.

3 Storage and maintenance of tools

Before or during the caretaker-training course the caretaker is given a simple toolbox with the essential tools to do the required repair work. The toolbox remains the property of the VHDC but is kept and maintained by the caretaker. Furthermore upon completion for the project the technical staff of the Dzongkhag has to hand over to the caretaker or the VHDC the minor balance amount of pipes and fittings for future repair work.

It is the responsibility of the caretaker to store tools and materials properly as to have it ready when it is required for repair work.

4 Inform and discuss with VHDC on repairs needed and work done

The VHDC is the users committee selected by the beneficiaries to support the two caretakers in their maintenance tasks. The VHDC collects the maintenance fund from the beneficiaries for purchase of spare-parts and compensation of the caretaker and provides the caretaker with money when purchases have to be made in town for repair. The VHDC keeps record on the money collected and paid for spare parts and compensation to the caretaker.

The caretakers inform the VHDC on all the work done. The caretakers also inform the VHDC regularly on the condition of the scheme and explain any problems in the operation.

When spare parts are required the caretaker will go to the Dzongkhag or nearest town (Sanitary Mart) to purchase the parts with