Final Report

Rope Pump Improvement Ethiopia

Evaluation at EWTI of Rope pumps of different pump producers

Project for Rural Water Supply, Sanitation and Livelihood Improvement through Dissemination of Rope Pumps for Drinking Water (WAS-RoPSS)

Ministry of Water, Irrigation and Energy / Japan International Cooperation Agency

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Organisation : MetaMeta
Advisors : H. Holtslag, T.Tefera

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Acronyms and abbreviations

- EWTI :Ethiopian Water Technology Institute
- IDE :International Development Enterprises
- JICA :Japan International Cooperation Agency
- MoWIE :Ministry of Water Irrigation and Energy
- RP :Rope Pumps
- SNNPR :Southern Nations, Nationalities and Peoples' Region

1. Background and introduction

This report discusses the final results of the field testing of different Rope pump models in Ethiopia in order to contribute to improvements and the future promotion of Rope pump in Ethiopia.

The Rope pump is an ancient technology that, with new materials and designs, now is a very effective and low cost pump option for water supply and irrigation that is used by families and small communities. It can be produced with locally available materials in local metal workshops. Compared to other low cost hand pumps, the Rope pump has a high pump capacity and can pump from wells of 1 to 35 meter deep. It can be produced in any country and is very simple to install (no black box). If properly produced, installed and maintained, over 90% of the installed pumps may be expected to remain functional, even many years after installation. Because of the before mentioned features, the Rope pump has a high potential for Self-supply. An example is Nicaragua, where over 70,000 Rope pumps were installed primarily for Self-supply. Two reasons for its success in this country were (a) technical improvements that made the pump more effective and attractive and (b) the private sector that took interest in production and sales. The pump became a commercial product so there was a "profit based sustainability". In Nicaragua the shift from imported piston pumps to locally produced Rope pumps decreased the cost for rural water points by 60%. Close to 20% of the pumps are used for communal wells and 80% for Self-supply (domestic use, cattle watering, small scale irrigation). Due to these pumps, the total accumulated income at family level in the last twelve years was 100 Million US$. This is explained by the fact that families who have a pump on their well earn an average 220 US$ more per year than families using a rope and a bucket. Using a Rope pump saves time, results in less health related cost (water is cleaner since it is not re-contaminated by the bucket) and can provide water for income generating activities such as livestock keeping or garden irrigation.

The Rope pump was introduced in 2004 in Ethiopia by the Japan International Cooperation Agency (JICA). The model first introduced was an A frame model as used in Tanzania and Zambia, which in turn was based on the models from Nicaragua. Lateron also other organizations, including Selam and IDE, worked with Rope pumps and gave trainings to Rope pump producers. According to the results of an inventory done in 2012, there were than 5,639 Rope pumps with hand dug wells systems for drinking water supply in Ethiopia (out of a total of 92,588 drinking water systems). The majority of these Rope pumps are in Amhara (3,699),and Oromia (1,036).

Currently, the overall estimate is that over 10,000 Rope pumps are installed, including pumps primarily used for irrigation. Over the years manufacturers and organizations have made several adjustments to the original Rope model. At the same time, different models of well covers and well heads have been developed and tested by different manufacturers and organisations. Similarly, different aprons and methods to drain water away from the well have been installed.

The promotion and improvements of the Rope pump is supported by the Ministry of Water, Irrigation and Energy and JICA. There is a high interest in the Rope pump with the Regional Government of SNNPR currently procuring 10,000 Rope pumps for drinking water supply. The Ministry of Agriculture is considering an even larger number of pumps to be obtained for household use and irrigation.

However based on the assessments done by JICA and other investigations, it appears that an estimated 33% to 50% of the Rope pumps in Ethiopia are not functioning[1]. Common problems concern technical problems in the pump parts, faulty installation and low quality of

[1] JICA (2013). Report on Rope pump user's survey in three regions. Powerpoint presentation.

aprons and seals causing water to leak back in the well resulting in recontamination of the well water.

In 2013 Japan International Cooperation Agency (JICA) and Federal Democratic Republic of Ethiopia launched the technical cooperation project entitled, "The Project for Rural Water Supply, Sanitation and Livelihood Improvement through Dissemination of Rope pumps (RPs) for Drinking Water and Self-supply"[2] (hereinafter referred to as "the Project"). The Project is aiming to increase water supply coverage by disseminating RPs for Self-supply.

One output in the project is the development of specifications of RPs for drinking water and installation technologies which can lead to standardization at the national level. As experience elsewhere has shown it is crucial to have quality RP models that satisfy user's needs. JICA contracted MetaMeta to test and study improvements of details in design, materials / spare parts availability and user's affordability. Testing and field work was undertaken by Henk Holtslag and Teshome Tefera between August 2013 and June 2014. Part of the activities was executed at the EWTI (Ethiopian Water Technology Institute). All activities were done in cooperation with the project team of JICA.

Main activities were:

1. **Collection of data** at national and international level.
2. **Production and installation of improved Rope pump plus 2 lower cost models.** These were produced and installed at the EWTI.
3. **Production and installation of 12 Rope pumps in the field** and testing in the field
4. **Meetings with staff of JICA, Rope pump producers and MoWIE** to evaluate current problems and discuss proposals for improvements.
5. **Suggestions for improvement on technical and non technical aspects** of current Rope pump models.
6. **Presentation and installation of 2 lower cost Rope pump models** that are fit for Self-supply.

The general conclusions are:

1. **There is a need for improvement on technical aspects of the Rope pumps.** In particular pump details, materials, apron, well slab, soak pit and installation. In all cases water leaking back into the well needs to be avoided;
2. **There is a need for quality control and training** of producers, installers, pump operators and users.
3. **There is a need to further development of a commercial supply chain**. Market distortion needs to be avoided.
4. **There is a need for cost reduction** by modifying existing models and adding new models. With these new models, cost reduction is possible.
5. **There is a high potential for a fast scale up of rural water supply with** new low cost pump models and improved quality of pumps and well head.

The report first discusses the scope of work (chapter 2). The activities undertaken and the main results are given in chapter 3 – with details of the field test and investigation particularly elaborated in the annexes 1-4 and 8 to this report. Chapter 4 summarizes the main recommendations with the annex 5 giving the technical drawings of the final improved model. Annex 6 has the pictures of the different models and further illustrates several of the finding and recommendations.

[2] Also abbreviated as (WAS-RoPSS)

Improved Rope pump model installed in Butajera

2. Objective and scope of work

The objective of the study was to design several quality Rope pump models including well head, well cover, apron and soak pit that would be suitable and affordable to disseminate nation-wide in Ethiopia. The scope of work to achieve the objective was as follows:

1. Collection of information on international experiences of RPs and experiences of locally produced RPs by collecting models of 5 different pump producers including producers trained by JICA. Manufacturers included Selam Addis, Selam Hawassa, Amio, Betru /JICA
2. Analysis of information that was collected with a RP user survey, conducted by the Project in May 2013.
3. Based on the above, production of improved pump models at the EWTI in Addis Ababa.
4. Subsequently installation of 12 pumps for testing in the field – both improved models and earlier models – for five month field testing.
5. Monitoring of the pumps in the field on technical details, user acceptance, efficiency, durability and functionality via a frequent 2 monthly monitoring program.
6. Collection of information on additional aspects like well head, well cover, apron and soak pit on wells with installed RPs and test user acceptance, cost, hygiene, durability and functionality.

The field testing as mentioned in 4) and 5) were undertaken at village level in Meskan Woreda, Butajera. Here the suitability for different household conditions was monitored. The field tests were done by persons with no commercial interest in the promotion of any preferred Rope pump model. The improved RP models and other peripheral items were tested in selected villages on aspects such as; user friendliness, ease of installation, operation, ease of maintenance, hygiene, durability, wear, cost. During implementation, data were collected in monitoring sheets and pictures were taken. Data collection and field tests included:

- Cost of the improved and existing RP models were collected (see Annex 1)
- Torque test; measuring the strength of the pump structure of 6 different prototypes. (see further explanation of test and results in Annex 2)
- Testing rope and PVC parts by measuring the wear of both during the use in the field.
- Testing the improved parts in particular the 4 inch pipe for all maintenance, the well reducer ring, the small well slab and the pump structure with bended legs (see also section 4.2).
- Observations on compatibility, in particular on using Bushings and PVC pipes of the same dimensions (see also chapter 5.2-10 and 5.2-50).

After the tests, of the pumps, well head, well cover, apron and soak pit results were compiled and assessed. This resulted in, the final suggestions for the improved Rope pump model (see chapter 4). In addition to the main improved RP, two additional lower cost models were developed and tested. Whereas the main first improved model is suitable for use by both small communities and families, the two low cost models are more appropriate for individual household use.

The suggestions for improvement as contained in this report were discussed with the JICA project team, RP producers and government staff (MoWIE).

3. Implementation and results

3.1 Activities

The activities were implemented according to the TOR, (See Annex 7) Some additional activities were undertaken, i.e. investigating suggestions on well slab and well reducer ring as well as testing a larger number of pumps than originally was planned.

The main activities / results are :

1. **Results of field survey studied.** Before and during missions by H. Holtslag, the results of the field studies of the JICA team and reports of others like S. Sutton were studied. General conclusion is that 35 to 50% of the pumps are not functioning. See also References.
2. **Collection of Rope pumps**. From different pump producers pumps were collected and assessed. This included measurement of materials used and cost involved indicated. For details see Annex 3.
3. **Design of improved Rope pump** On the basis of the field survey and the assessment of the Rope pump models in use, a first improved Rope pump model (Model 1) were made and installed at EWTI
4. **Design of two (2) additional pump models** In addition to the above, two additional – lower cost – models were developed. These pumps are Model 2 (Economy model) and Model 3 (mounted on Poles) . These were first installed at EWTI and later – together with Model 1 - in the field.
5. **Field testing of improved Rope pump model**. Six pumps were installed at Butajera for field testing. This included:
    a. 2 improved pumps of Model 1 (Improved JICA model)
    b. 2 improved low cost pumps of Model 2 (Economy model)
    c. 2 improved low cost pump of Model 3 ('Pole' model) and 2 pumps Model 3. The Model 1 pumps included adaptations which are described and suggested in chapter 4.2. Four pumps had the pump and return pipe in the 4" hole.
6. **Production and installation of an additional 6 control pumps** These pumps were the JICA model including 2 pumps with ball bearings.
7. **Monitoring** All pumps were monitored by T. Tefera by a visit each 2 months. See monitoring sheets in Annex 8
8. **Water quality test** Of all wells water was tested at 3 stages. Before the pump installation, after pump installation and disinfection of wells, after the pumps were installed in June 2014.
9. **Review visit in May 2014.**
10. **Review discussions** In May 2013, January 2014 and May 2014 several meetings with the JICA team, Rope pump producers and staff of MoWIE with discussion on Rope pump improvements.
11. **Formulation of conclusions & suggestions** Based on all information and field experiences, recommendations were made and discussed for improvement on technical aspects, better quality, easier maintenance and improved hygiene.

3.2 Main findings / results

Main findings and results of the project were:

1 All pumps are working . Although details need to be improved, it was confirmed by the final field assessments in May 2014 as well as by the regular monitoring visits, that all pumps are working.

2 There is a need for more training. Especially regarding daily maintenance of the pumps, tension of the rope, oiling bushings etc. users need more training. See Monitoring sheets Annex 8

3 No major differences in strength of different pumps. This was also confirmed by Basic torque/ force test which was done on pump structures (see also Annex 2).

4 Improved pump model easier to maintain. Thisis because in the improved model the pump pipe and return pipe pass the slab in one hole of 4 Inch. It also reduces the risk of leakage and with this the recontamination of the well.

5 All users were satisfied. Even people with the lower cost pump models who initially were not satisfied because they wanted also the expensive model. This was reconfirmed in visits by JICA staff in June 2014.

6 Significant c improvement of water quality. The result of the installation of a pump and well cover on the wells drastically improved the water quality. Before the pumps 80% of all the wells had a very high content of harmful bacteria. After the installation of the pump almost all wells had zero harmful bacteria. This is mainly because of the **improved well head** By making a well ring the slab is not anymore directly placed on the ground. This drastically reduces the risk of collapsing of the well rim at the top and hence the danger of recontamination with pumping or during rains. With a well reducer ring, a small slab can be placed which make transport and installation easier

7 Increased productivity, like garden irrigation. It was observed that several families started irrigation on small plots. This was stimulated by having a pump since this is much less work than extracting water with a rope and bucket.

8 Opportunities for cost saving. Both on the improved model and the low cost models cost savings are possible, making the RP more attractive to disseminate. Two lower cost models were installed and tested; i.e. Model 2 (economy model with an option for a wheel cover) and model 3 (a pole model; a system that is built with a handle fixed to two poles). Both models are fit for Self-supply and irrigation, particularly at individual household level. These pump models are some 20 to 40% lower in cost than the existing JICA and other pump models. More details are given in Annex 1.

4. Conclusions and recommendations

This chapter brings together the conclusions and detailed recommendations resulting from the testing of the Rope pump, so as to come to an improved model. Conclusions are based on the survey, the field tests, the monitoring and discussion with producers and users. The following is an overview

Technical aspects
Improvements are possible in pump design, materials, apron, well slab, soak pit. Especially many problems with low quality, non standard PVC pipes and bad installation resulting in water leaking back into the well. Possible improvements are discussed in section 4.1 and 4.2

Non technical aspects
Training of producers, installers, pump operators and pump users is needed. The current approach of dissemination may distorting the market, because NGOs and government are taking the role of the Private sector regarding installation and repairs

Cost reduction improved and new Rope pump models.
By applying the suggested improvements and by adding 2 more pump models there is a cost reduction of the Pumps. The cost of the PVC parts, rope and pistons are I all models the same. Cost range of pumps "off workshop"[3] are

Existing iDE Rope pump model	2000 – 2300	Birr
Existing JICA Rope pump model	2100 – 3000	Birr
Improved Rope pump Model 1	1900 - 2200	Birr
Economy Rope pump Model 2	1500 - 1800	Birr
Pole Rope pump Model 3	1300 - 1500	Birr

More details are given in Annex 1

In summary, there is a **potential for a fast scale up of rural water supply.** With new low cost pump models and improved quality of pumps and well head, Rope pumps (and other locally produced hand pumps) have a large potential to scale up Self-supply.

		
Model 1 Ball bearings optional	Model 2 (economy model) Wheel cover Optional	Model 3 (Pole model)

[3] Without transportation and installation costs

Below general recommendations are given first (section 4.1), followed by specific technical recommendations (4.2), the promotion of three models (4.3) and the need for a number of minimum quality standards (4.4). Also a number of recommendations on non-technical aspects are given.

4.1 General recommendations on technical aspects

Based on the mentioned above general recommendations on technology are:

- **Improve current pump designs.** For instance make a narrow base which reduces material and has proven to be of the same strength as other models with a wide base. Use one size prefabricated slab. Have both pump pipe and return pipe go via the 4 inch hole which reduces the cost of the slab, reducers the danger of water leaking back and maintenance is easier. In general there is much difference in retail prices of pumps. It seems worth to investigate the reason of the differences in cost and investigate options to use good quality but lower cost materials like Gi and PVC pipes, rope and pistons. Further it is strongly suggested to start as soon as possible with the standardization of PVC pipes and after that with the standardization of the pistons.
- **Add 2 more lower cost models**, Model 2 (economy model with options for a wheel cover , and Model 3 (pole model) see pictures above. In the field test and in other countries these models have proven to work well, be accepted by users and add lower cost options that can increase the market for Household use (Self-supply) because people have more choices.
- **Use well reducer rings** eventually with prefabricated tapered blocks. This will drastically improve quality of the well head, increase hygiene and combined with standardised slabs can reduce cost of installation.

4.2 Specific recommendations on technical aspects

The recommendation resulting from the field test are made with two objectives in mind (a) to improve quality and durability of the Rope pumps and (b) reduce the cost of the Rope pumps to increase the potential uptake in the Self-supply market. The findings of the monitoring and recommendations are given below. They follow the numbers of the parts as in the technical drawings of Annex 5 for the improved model.

No 10 Handle/ bushings

- The bushings of 40 mm as installed in some pumps were less in line with the handle than the bushings of 60 mm. It is suggested to make bushings 60 mm so as to reduce the danger of misalignment which in turn may cause wear between the bushings and handle.
- The clearance between bushing and handle was 2 mm in some pumps which may cause extra wear because of the breaking of the oil film between the bushing and handle. It is suggested to make clearance between bushing and pipe of handle 0.5 to 0.8 mm. So difference between outside diameter of handle and inside diameter bushing maximum 0.8 mm. This is important for alignment and good lubrication. If the bushing has more clearance, the diameter should be reduced by cutting out a slot.
- Oil holes in the existing pump models was on the side and was 5 mm which complicated oiling of the bushing. It is suggested to make the diameter of the oil hole 6 mm and put the oil hole on top. This makes oiling of bushings much easier for users. Eventual rain that enters in the oil hole is not a problem and even an advantage since rain will clean the bushings.
- Length of the grip in the current JICA model is long. It is suggested to make length 270 mm. This will reduce cost of material, reduce danger of bending of the handle and is long enough as experienced in the pumps installed.

No 20 Wheel

- Some wheel clamps were loose or short so difficult to close the rings. It is suggested to make the long enough to be able to close them when rope starts slipping.
- In some pumps bolts started to rust. In general it is suggested to use only galvanized bolts. In areas where corrosion is a problem spokes can be made of ½"Galvanized pipe and the clamps of ¾"galvanized pipe, wall thickness 2.5 mm.

No 30 Wheel cover

- Some of the existing pumps use sheet of 0.4 mm and sheets are cracking where it is bend. It is suggested to use galvanized sheet, thickness of minimum 0.5 mm
- In case of 0.5 or 0.6 mm thickness, bend the rims to make the cover stronger. If sheet of 1 mm is used bending is not needed.
- Drill holes in part where the sheet is bend to avoid cracking of the sheet.
- The wheel cover supports can be made of rebar round 12 mm or Angle iron 25x25x3mm.
- In areas where corrosion is a problem galvanized pipes of ½"(min. 1.4 mm wall thickness) can be used.
- For mounting the cover support to the cover use galvanized bolts M6 or 3 pop rivets of round 5 mm.

No 40 Pump structure

- The field tests indicated that there is no difference in strength between pumps with a width of 35 cm and with a width of 20 cm as was confirmed by the "torque" test. See annex 2. It is suggested to make a narrow structure, dimensions of base 200 x 400 mm. This will reduce the cost of material and is less work since bending of the wheel cover support is not needed anymore.
- It is suggested to use the system of bended legs and leave out the round bar and angle iron currently welded at the bottom of the pump structure. An advantage of the bended leg: more flexibility in the mounting of the pump in case the distance between the bolts in the well slab (well cover) are not 100% exact.
- The round bar welded between the legs of the pumps, like in the JICA model, is not essential as the torque test indicates. Also Rope pumps in other countries, never had this reinforcement and had no problems. It is recommended to leave these supports out to reduce cost in both labour and material. See drawings Annex 5;
- In the field test it appears that the handle is relatively high for the people pumping which mostly are women and children. It is suggested to have the handle at the height of the belly button of the person pumping, so the height of the handle should be 80 to 90 cm. Suggestion is to make the legs of the new models 95 cm, so the height of the handle will be around 90 cm, (the leg at the low end is bent).
- Regarding the blocking system, (the hook that prevents the handle from turning back after pumping stops). There the existing construction is OK. In case of corrosion also a galvanized hook can be used, see drawings.

No 50 Tubing / PVC pipes and parts

- It was difficult to get good quality Pump pipes with the same in and outside diameter. It is suggested to work on a supply chain of **standardized PVC pump pipes.**
- Proposed dimensions are mentioned in the table below (see also Annex 1). In general wall thickness of all pipes should be 2 mm. Pipes are produced locally by Ethiopolymer. Tees and reducers that fit on the pipes of Ethiopolymer are available at Lyca
- In the long term future, and if demand grows, or with the existing demand of 10.000 pumps, Ethiopolymer may be able to produce Tees and reducers also.
- It is suggested that pump outlet pipes are 1 ¼" so they fit in jerry cans.

- In some pumps the turning of the wheel was not smooth due to a sticking rope. It is suggested to make a smooth entrance on PVC pipes. Make so called trumpets on pipes in guide boxes and return pipe. To make this, a jig (Trumpet tool) can be used as demonstrated in the 1st and 3rd mission.

No 60 Cap / casing

- In the field survey it appeared that the cap on top of the 4 inch pipe often is of low quality or is broken so that water is leaking back there in the wells. It is suggested to make the caps and the 4 inch pipes in such a way that water cannot flow back into the wells.
- The holes in the cap for the pump pipe and return pipe should have a tight fit with the pipes.

No 70 Slab/ well cover

- In the field surveys it appeared that a major problem with the Rope pumps was low quality of well covers, pump installation and water leaking back in the wells.
- To improve this situation it is suggested to always make a well ring on which a slab can be mounted.
- It is suggested to test slabs with a diameter of 90 cm.
- It is suggested to do test with slabs of 120 cm and compare them with slabs of 90cm regarding total cost of material, production, risk of breakage, transport ease of removal by users. The logic of using a small, 90 cm slab is that it can be thin like 5 cm and still has the same strength than a slab of 120 cm which has to be 6 to 7 cm to make it strong enough. The small slab is much easier to transport les risk to break and it is also easier for families to remove in case of well cleaning.
- Test further the idea of cement well reducer ring. This reduces the diameter of the top of the well (well ring) to 80 cm so with a slab of 90cm the well can be covered.
- **Test the combination of the hole for the return pipe and pump pipe**. All repairs can be done via this 4 inch hole. If this is used a manhole is not needed anymore. In general once the well is OK there is no more need to go into the well. In case people do need to go into the well for cleaning or deepening, the slab can be removed. It is suggested that after replacement of the slab the rim is sealed again with cement.
- The use of manholes is strongly discouraged because of water leaking back in the well. This is due to the design and often poor construction of the well cover as was observed in the field visit. In general experiences is that when there is a problem with the pump, people tend to go back to the rope and bucket and remain using the bucket which is “back to zero”.
- In case the widely available cheap 4 inch pipe is used, make the part used in the slab stronger by using a double piece of pipe. This will make the 4 inch pipe more resistant to damage.
- Bolts used to mount the pumps should be welded well to the reinforcement bar structure. Use galvanized bolts M10x 25 mm.
- Place the pump a bit aside on the slab. The person who is pumping can stand on the slab. See drawings.
- Some basic investigation was done on the different well covers. The cost of the round plastic well cover is 5 times higher than that a cement well slab. Therefore plastic well covers do not seem feasible. Another disadvantage of a plastic well cover is that it has a light weight. This makes the pump less be stable.
- The slabs and well rings were tested too. Tests was done by standing with 4 persons on top of both well ring reducer and the small (90cm) slab. These did not break or crack.

No 80 Rope /Pistons

- The Rope used in all pumps was 6 mm Nylon rope and after 7 months there was no visible wear in the rope of the pumps that were used by a few families. There was visible wear on the rope of the pump that was used by many families 20-30 families. (This increased high use was due to the fact that the existing communal hand pump, Afridef pump, was broken for a few months)
- 7 of the 12 pumps installed used pistons made by Gambes (Monaco trading) and the other 5 pumps used pistons made by AMIO. The pistons of AMIO were slightly smaller and had a large (2mm) clearance in the pump pipes.
- The cost of piston made by Gambes is 1.75 Birr , the cost of the pistons of AMIO was 5.75 Birr.
- After 6 months of functioning there was no visible difference in quality (wear) between the two types of pistons in pumps used by a few families. There was some wear (0.4 mm) in pistons of the pumps that was used by many families.
- Diameters of the pistons of the two piston producers was different. The AMIO pistons were 0.2 to 0.5 mm smaller.
- A strong suggestion is to make the diameter of the pistons 0.5 - 0.8 mm smaller than the inside diameter of the pump pipe. With a greater diameter, the pump efficiency goes down. When it is smaller friction will occur especially in the smaller pumps pipes of ¾" and ½" since PVC pipes are not always exactly round and the same diameter.
- **It is strongly suggested to start as soon as possible with the standardization of PVC pipes and after that with the standardization of the pistons.**

No 90 Guide box

- With the checking of the guide boxes in the Pole model pump, some corrosion was detected.
- To avoid corrosion a suggestion is to test guide boxes made completely of galvanized tube, and adapt designs. See also drawings.
- Compared to the guide boxes as used now, new models of guide boxes will reduce 50% of material cost and is less welding.
- Another suggestion is using cement guide boxes as produced in the 1st and 3rd mission. These are currently used in many other countries and function well. The cost will be the same or lower than metal guide boxes, but will avoid corrosion in water with low PH. For deeper hand dug wells, the weight of the cement guide box will help to keep the pump pipe straight.
- The metal and cement guide boxes should be 5 mm smaller than the inside diameter of the 4 inch pipe in the slab.

Well head / Apron

Based on the field surveys and reports from others a major problem in Rope pumps is the low quality of the well heads. Pumps are to low or too high, well covers are not straight or broken. There is often no hygienic seal so with rains well rims are collapsing and water can flow into the well. So a general suggestion is to improve quality of well heads**.**
Suggestions are;

- **Install a well ring on top** of which the slab is mounted, this to avoid water leaking back in the wells. If this ring is at the same time a reducer ring, the diameter of the slab can reduce.
- It is suggested to further test the system of the tapered prefabricated blocks for the well reducer ring. This can become the activity of well diggers and local masons. If the inside diameter of the well ring is 80 cm plus / minus 5 cm it allows the diameter of the slab to be 90 cm, which is still small and easy to transport.
- It is suggested to test ring of blocks in wells of 90- 110 cm and see if it can be reduced with one ring to 80 cm.

- For wells of 110 to 130 cm diameter a suggestion is to test if 2 rings of blocks and a slab of 90 cm is cheaper than making on ring of blocks and a well cover of 120 cm diameter.
- Install the well reducer rings a bit conical and put a few wires around the ring. The conical shape will avoid water leaking back in the well and is stronger, more resistant against breaking than a flat rings.
- Put some basic reinforcement in the well blocks like 5 pieces of 40 cm black wire which will hardly increase the cost but will avoid braking of the blocks.
- Make an apron around the slab to seal the well and avoid leaking and a soak away to avoid at all times water pools near the well.
- At some pumps the soak away pit was used as a drinking place for cattle. It is strongly suggested to avoid this since the leak water form slab and apron is contaminated. In case of cattle water it is much better to make a separate pit of bucket for drinking.

Promote / train well diggers to make wells with maximum diameter of 90 cm. Calculations indicate that, compared to wells of 120 cm , a 90cm well reduces 80% in volume of material to take out so reduction of labour. Also with the small diameter only one well ring is needed.

Regarding a plastic well cover: Some basic investigation was done. However cost of round plastic tables with a similar shape was 5 times more expensive than a cement well slab. Therefore plastic well covers do not seem feasible. Another disadvantage of a plastic well cover is that it has a light weight. This makes the pump unstable.
Regarding testing of slabs and well rings:Test was done by standing with 4 persons on top of both well ring reducer and the small (90cm) slab. These did not break or crack.

4.3 Pump models

Based on the survey and tests, 3 pump models are recommended in order to give potential a range of options:

Model 1 (improved Rope pump model)

- The Model 1 is standard with bushings
- As an option it can be made with ball bearings. If ball bearings are used good quality and sealed bearings are needed. Also a grease pump should be included in the pump. Selling a pump without a grease pump will cause problems.
- An Allan key should also be provided as a requirement with the pump with ball bearing.
- In case of ball bearings, use 2 bolts to fix the handle to avoid it will get loose.
- The total additional costs for a model with ball bearings is estimated at 600 Birr.

Model 2 (economy model)

- This model is very basic without any bolts in the pump structure, no cover, a handle of ½" no return PVC pipe. It si completely made of Galvanzed pipes so no or little corrosion
- As an additional parts a well cover and a return pipe can be sold.
- The total cost (material and labour) of Model 2 is much lower than Model.

Model 3 (pole model)

- This Model is the most basic low cost Rope pump model mounted on poles and 2 pumps like this were installed in the test field.
- It consist of a handle with bushings and a wheel which is mounted with bolts on the handle. By placing the poles in an angle, the length of the handle is reduced.

- After some initial problems the users of the Model 3 were very satisfied;
  This model again can be some 30% cheaper than Model 2 with the advantage that it can be installed without a well cover. So if families do not have much money or do not want to take a loan , this can be a real first step model. Lateron when they have more money, a well cover can be installed or they can opt for a Model 2 pump.

4.4 Suggestions for minimum quality for Rope pumps

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All models fit on both hand dug wells and boreholes. The pump model no. 1 is fit for small communities and all 3 models are fit for Self-supply in households. The recommendation on the minimum quality are summarized below.

Parts	Suggestions Model 1 (improved model)	Suggestions model 2 & 3 (economy & pole model)
Wheel cover		
-sheet cover	0,5 mm Galvanized sheet Preferred 0.6 mm	Wheel cover is optional
-Sides	Bent rim if less that 1 mm	
-Mounting	Bolts M6 or pop rivets ∅ 5mm, 2 at each connection	
- Bolts cover to Support	M6 x 15 galvanized or M10	
-Cover Support	12mm rebar or 20x20x2 mm Angle iron or Gi pipe ½"	
Wheel		
- Diameter	14"	14"
-Number of spokes	6	4, with clamps in between
- Material of spokes	Rebar ∅10 mm or galv. Pipes	Rebar ∅10 mm or galv. Pipes
-Tire quality	Good quality, straight, soft rubber	Good quality, straight, soft rubber
- Bolts /Nuts	M10x25 Galvanized	Optional if uses bolts than M10x25 Galvanized
Handle		
Pipe	∅ ¾" Galvanized steel pipe. Wall thickness min. 2,2 mm	½" Galvanized steel pipe. Wall thickness min. 2 mm
Handle grip	1" PVC pipe, Wall thickness 2 mm	¾" PVC pipe, wall thickness 1.5 mm
Bushing	1", wall thickness 2,5-3mm Galvanized steel pipe	¾", wall thickness 2,2 – 2,5mm Galvanized steel pipe
Clearance	0,5- 0.8 mm	0,5-0,8 mm
Length bushing	60 mm	60 mm
Bushing strip	Strip 25x3 mm	NA
Diameter of the oil hole	∅ 6	∅6
Welding / Painting		
All welded parts	Clean weld slack, Paint with anti oxide +gloss paint	Clean weld slack, Paint with anti oxide +gloss paint
Pump structure		
-Pipes	½" Galvanized steel pipe Wall thickness 2 mm	½" Galvanized steel pipe. Wall thickness 1.6 mm
Bushing support	Angle iron 25x25x2 Angle iron	NA
Block system	Hook of Rebar or Gi pipe	NA or Gi Pipe
Outlet pipe and return pipe support	Make of ring of Gi pipe	NA or ring of Gi pipe
Name plate	Aluminium . Data incl. Producer, Tel No, Ser. No	Aluminium . Data incl. Producer, Tel No, Ser. No
Rope/ pistons	1m distance, 0,5-0.8 mm clearance	1m distance. 0,5-0.8 mm clearance
Pump PVC parts		
Pump Pipe diam	Outside diam. - Inside diam.	Outside diam - Inside diam
1 – 10m 1"	32mm- 28 mm	32mm- 28 mm
10- 20m ¾"	25mm- 21 mm	25mm- 21 mm

20- 35m ½"	20mm- 16 mm	20mm- 16 mm
Outlet pipe		
-Outlet pipe 1 1/4"	Outside diam - Inside diam 40mm- 36 mm	Outside diam - Inside diam 40mm- 36 mm
-Tee 1 1/4"	Good quality, tight fit with reducer	Good quality, tight fit with reducer
-Reducer 1 1/4" - 1"		
-Reducer 1 1/4" - ¾"		
-Reducer 1" - ½"		
- Elbow 1 1/4"		
- Return pipe	Poly Pipe or PVC pipe. 1 size bigger than pump pipe	Poly Pipe, PVC pipe. 1 size bigger than pump pipe
Well head. Cover, Apron, Soak pit		
Well cover	Diameter 90 cm Reinforced with rebar min dia 8mm distance 15 cm PVC pipe 4 Inch length 15 -20cm	Diameter 90 cm Reinforced with rebar dia 6 mm distance 15 cm PVC pipe 4 Inch length 15 -20cm
PVC Cap, cover	Round or Flat top Cap	Round top Cap
Top of casing above Ground level	20 cm	NA
Top of Casing to Apron	10cm	NA or 10 cm
Diameter apron	1 – 1.8m	1 - 1,8 m
Dist. apron to soak pit	3 -5m	3 -5m
Outlet Pump	Opposite soak pit	Opposite soak pit
Apron slope to soak pit	0-5cm	5 cm
Apron height	5-10 cm	5 – 10 cm

4.5 Specific recommendation on non technical aspects

Besides technical aspects, there are also a number of non technical aspect which are essential for a successful dissemination of Rope pumps.

Some problems on non- technical aspects were:

1. Poor daily maintenance. Many users do not adjust the rope or oil the bushings in time resulting in poor pump functioning and worn out bushings. (In Nicaragua Rope pumps of 20 years old still have the original bushings because they are oiled every week);
2. All Rope pumps in Ethiopia are more or less similar in model and price. There is no options for Self-supply customers to choose another model;
3. Rope pumps are simple but "Simple is not easy". For any producer it is essential to realise, **bad pumps = bad image = less sales;**
4. The dissemination of free pumps via NGOs and Woredas is distorting the development of a sustainable Supply chain;
5. In most cases there is a lack of installation and repair skills near the customers.

Some suggestions for improvement are:

- To improve the quality, it is a suggestion to make example (gold) models for each pump producer including production jigs. A number of jigs were made in the 1st and 3rd mission.
- Examples and production jigs of the new models are needed which could be copied and send out to all Rope pump producing companies.

Certification

- Improve the quality of wells and pumps by certifying or approving the producers of these technologies;
- This is in the interest of the government and should be effected by a governmental body. Until there is such a body the partners should support.

Operation/ Maintenance / repairs

- Improve maintenance by more and better training of users in daily maintenance;
- Most important maintenance is the adjustment of rope, (rope should not be too tight not be too loose) and weekly oiling of bushings with new oil!!;
- Promote the custom of maintenance by a slogan like "No oil - No pump''
- A pump installation should include a (laminated) maintenance sheet and a 0.3 l bottle with new oil (10W 40). Do not use grease or used oil!;
- General repairs like adding a piece of PVC pipe, repairing pump structure, replacing bushings etc are not done by all users.. In each Woreda there should be local technicians who can do this work on a commercial base;
- Technicians can be of pump producing companies, pump installers or metal workshops who can do repairs as one of their activities.
- **It should not be done by NGOs or local government, since this will prevent a sustainable commercial supply chain from building up!!**
- NGOs and governments should rather invest their water funds in awareness training of the local private sector, quality control, building up supply chains, evaluation, and enabling funding options for instance micro credits, monitoring etc.

Training

- In general many problems are caused by a lack of knowledge and skills of both users and caretakers. Serious investment in long term and follow up training of production quality, installation, maintenance and repairs, organisation of maintenance, (ej Circuit riders) are recommended .
- One option to guarantee knowledge and training in the long term, is a National WASH training centre where all knowledge is concentrated and which has the capacity for trainings. Then smaller training centres can start later on in the regions. Examples of such training centres are the so called SMART Centres in Tanzania and Malawi.

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Information on scaling up safe water:

www.300in6.org

Information on Rope pumps

www.ropepumps.org

Annex 1: Bills of Quantities Current and Improved Model

This table gives an indication of the cost of materials of 4 pump models based on a pump for a well of 18 meters deep. This includes 3 PVC pipes ¾", 40 m rope and 38 pistons/ washers. All models have also a well slab. The cost of materials are based on the market information collected by T.Tefera and others in Addis Ababa. Prices may differ from location to location and may also vary over time. In the report (section 4.1) hence cost ranges are proposed to reflect this variety.

Material	Unit	Price/ unit in Birr	Material, cost JICA Model *	Material , cost Impr. Pump Model 1*	Material , cost Pump Model 2*	Material , cost Pump Model 3*
Galv, sheet 0.6 mm	2 Sqr mtr.	1050	2400 cm2 131 Birr	2000 cm2 105 Birr	Optional	
Angle iron 20x20x2	6 mtr	295	1260 cm, 62 Birr	1020 cm 50 Birr		
Angle iron 30x30x3	6 mtr	405	21 cm, 20 Birr	20 cm 20 Birr		
Angle iron 40x40x2	6 mtr	630	16 cm, 17 Birr			
Flat iron 25x 3 Clamps	6 mtr	140	31 cm 7 Birr	22 cm 5 Birr		
Flat iron 30x 3	6 mtr	140	30 cm 7 Birr			
Round bar 10 mm	6 mtr	250	496 cm 206 Birr	248 cm 103 Birr	156 cm 65 Birr	
Round bar 6 mm for pump and slab	6 mtr	100	1016 cm 169 Birr	1000 cm 167 Birr	1000 cm 167 Birr	1000 cm 167 Birr
Galv, Pipe 1 ½"	6 mtr	670	15 cm 17 Birr	3 cm 4 Birr		
Galv, Pipe 1 ¼"	6 mtr	550	3 cm 3 Birr	6 cm 6 Birr	3cm 3 Birr	
Galv, Pipe 1"	6 mtr	380	32 cm 20 Birr	15 cm 10 Birr	15 cm 10 Birr	
Galv. Pipe ¾"	6 mtr	275	107 cm 49 Birr	98 cm 45 Birr	32 cm 16 Birr	24 cm 12 Birr
Galv, Pipe ½"	6 mtr	210	420 cm 147 Birr	508 cm 178 Birr	590 cm 208 Birr	264 cm 93 Birr
PVC pipe 4" Pipe in well slab	6 mtr	300	30 cm 30Birr	30cm 30Birr	30 cm 30 Birr	30cm 30 Birr
PVC pipe 1 ¼" Return pipe	6 mtr	275	100 cm 43 Birr	90 cm 40 Birr	10 cm 5 Birr	10 cm 5 Birr
PVC pipe 1" Grip	6 mtr	204	28 cm 9 Birr	23 cm 7 Birr	15 cm 5 Birr	15 cm 5 Birr
PVC pipe 3/4" Pump pipe **	6 mtr	57-250**	18 mtrs 171 Birr	18 mtrs 171 Birr	18 mtrs 171 Birr	18 mtrs 171 Birr
PVC pipe ½" Pump pipe	6 mtr	90				
Tee 1 ¼"	1	50	50 Birr	50 Birr	50 Birr	50 Birr
Elbow 1 ¼"	1	50	50 Birr	50 Birr	50 Birr	50 Birr
Red.1/1/4" -3/4"'	1	25	25 Birr	25 Birr	25 Birr	25 Birr
Rope 6 mm ***	mtr	1.3 - 4.8 ***	40 mtrs 52 Birr	40 mtrs 52 Birr	40 mtrs 52 Birr	40 mtrs 52 Birr
Pistons ¾" ****	1	1.75-5.75 ****	38 67 Birr	38 67 Birr	38 67 Birr	38 67 Birr
Bolt, Nut Galv M10x25	1	6	8 pcs 48 Birr	6 pcs 38 Birr		2 pcs 12 Birr
Bolt, Nut Galv. M 6x15	1	5	4 Pcs 20 Birr			
Pop rivet 5 mm	1	2		20		

				40 Birr		
Used car tire	1	50	50 Birr	50 Birr	50 Birr	50 Birr
Wood Poles						50 Birr
Paints			30 Birr	30 Birr	20 Birr	
Cement	Bag	120	0.3 bag	0.3 bag	0.3 bag	0.3 bag
For slab & sand	50kg		50 Birr	50 Birr	50 Birr	50 Birr
Total cost Material			**1466 Birr**	**1393 Birr**	**1044 Birr**	**889 Birr**
Labour production est.			10 hrs **300 Birr**	8 hrs **240 Birr**	5 hrs **150 Birr**	4 hrs **120 Birr**
Other cost & profit			**300 Birr**	**300 Birr**	**300 Birr**	**300 Birr**
Total cost indication			**2066 Birr**	**1933 Birr**	**1494 Birr**	**1309 Birr**

*Materials mentioned are total length or numbers per pump
** The cost of ¾" PVC pipe of 6 mtr varies from 57 Birr (Info iDE) to 250 Birr (Info AMIO T. Tefera) For the calculation the 2 lower prices were used.
*** The cost of rope per meter varies from 1.3 Birr (Info iDE) to 4.8 Birr. To calculate the cost of pumps the lower version is taken.
**** The cost of pistons varies from 1.75 Birr (Info T Tefera) to 5.7 Birr. AMIO. To calculate the cost of pumps the lower version is taken.

Information from iDE
The cost for washer at AMIO is 5.75 Birr for the 3/4" and 6.90 Birr for the 1" size. In other iDE trained pump manufacturers the price for the washers is 25% more than what AMIO sells. They purchase it from AMIO and add profit in it.

The total indicated cost of an iDE model pump for 18 meters with 3/4" pipes is 1950 Birr.
1285 Birr is the cost of material (Pump structure, slab, guide box, manufacturing cost, labor cost,
465 Birr is plastic components price (washers, rope, Tee, reducer, 40mm PVC, 3/4" PVC, Glue,cap
200 Birr is the net profit

1950 Birr for complete set of iDE Model Rope and Washer Pump

Annex 2: Torque test Rope pumps Butajera for different pumps

Well number Name Owner	Pump model	Deviation Pump structure at 5 kg	Deviation Pump structure at 10 kg	Observations
2 Shemsu Oumer	1A	6 mm	13 mm	
4 Temam Tira	1B	5 mm	15 mm	
5 Muzeyin Bergicho	6B	5 mm	14 mm	
6 Mohammed	3B	6 mm	13 mm	
11 Surur	2B	5 mm	13 mm	
12 Hussein Dawid	6A	6 mm	14 mm	

Measurement of deviation of Pump structure

Measurement with force of 5 Kg and 10 Kg with a beam of a length of 1 meter

Deviations in each pump model were noted

Different pumps

Model 1 Narrow structure, Ball bearings, Bend legs. Improved model

Model 1 Wide structure, Ball bearings, bottom reinforcement. JICA model

Model 1 Bushings, Bend legs. Pump pipe and return pipe via the 4 inch pipe.
Improved model

Model 2 Economy model, Bottom structure

Model 2 Economy model, bend legs

Model 3 Mounted on poles

Annex 3: Table of materials, pump structures and pump cost

Producer	Cover material	Mat. spokes	Cover supp. mat.	Wall thickn. handle	Wall thickn. Struct.	Use of Galv. bolts	Cost pump Incl. 3 Pipes, well cover
Aregawi (IDE)	0.4mm	8mm	Rebar 12 mm	2.1 mm	1.7 mm	50 %	2304
Selam Addis	0.6 mm	10 mm	Angle 20 x 2	2.5 mm	2 mm	100 %	3350
Selam Hawassa	0.4 mm	10 mm	Angle 20x 2mm	------	Nvt	….	3404
Amio	0.4 mm	8 mm	Angle 25x 2.5mm	1.7 mm	1.7 mm	0 %	3500
Betru	0.4 mm	10 mm	Angle 20x2	2 mm	1.5 mm	0 %	3000

Annex 4: Water quality rest Rope pumps in Yetebone Kebele

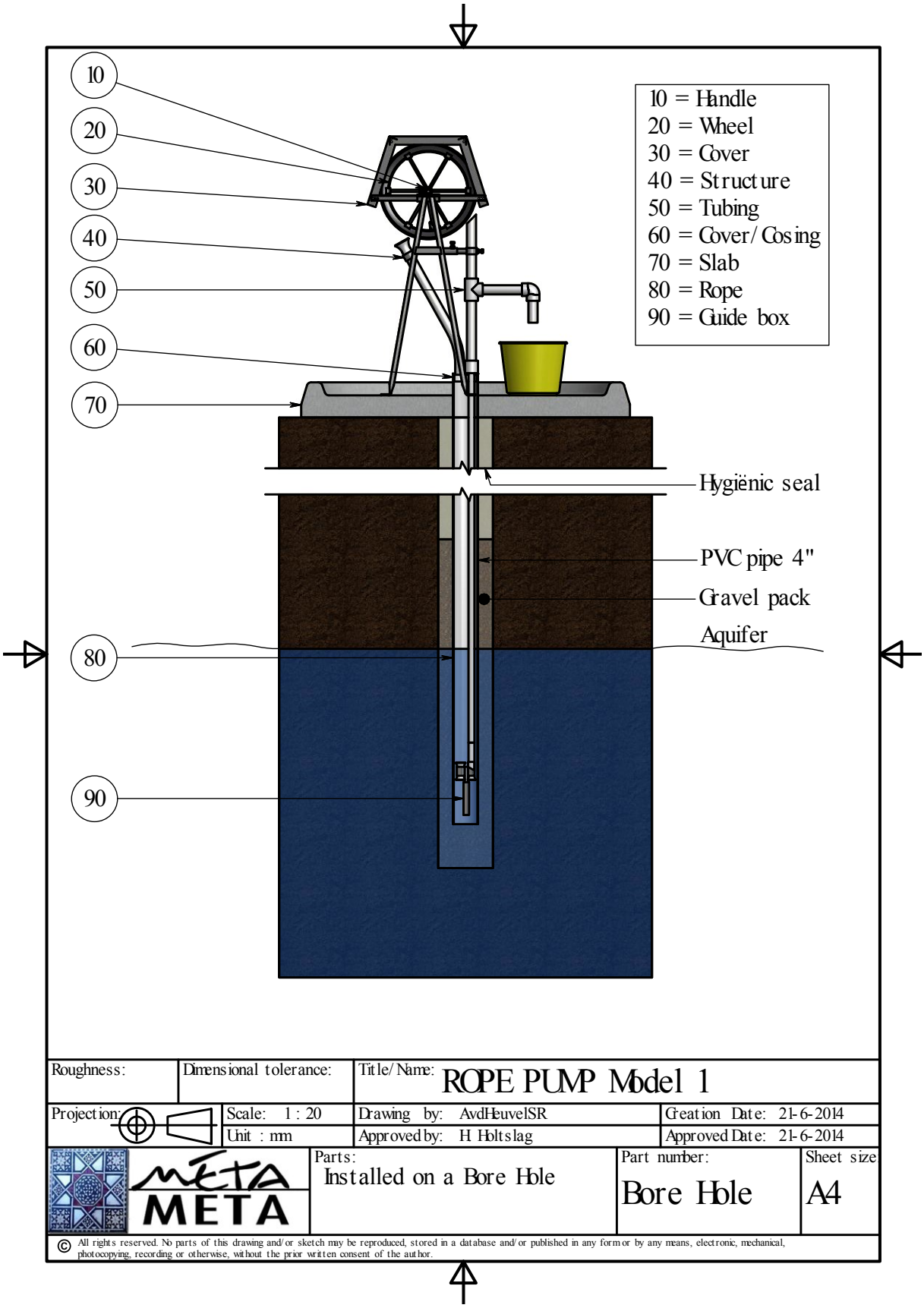
I.N	Name of well owner	First Test (Before Intervention)		Second Test (Disinfection)		Third Test (End of Test Period)		Remarks
		Total Coliform	Fecal Coliform /E.Coli)	Total Coliform	Fecal Coliform /E.Coli)	Total Coliform	Fecal Coliform /E.Coli)	
1	Mohammed Surur	TMTC	TMTC	0	0			
2	Zeleke Degaga	0/100ml	0/100ml	0	0			
3	Shemsu Oumer	8/100ml	TMTC	0	0			
4	Yasin Temam	TMTC	TMTC	0	0			
5	Muzeyin Bergicho	TMTC	TMTC	0	0			
6	Husen Dawid	6/100ml	TMTC	0	0			
7	Taju Mudesir	TMTC	TMTC	0	0			
8	Yilma Bireda	TMTC	TMTC	0	0			
9	Zeyinu Oumer	32/100 ml	TMTC	0	0			
10	Ahmed Andihu	ND	ND	0	0			
11	Temam Tira	ND	ND	0	0			
12	Surur Rijeto	ND	ND	0	0			
13	Wondimu Mitiku	0/100ml	0/100ml					
14	Mulatu Ergosha	TMTC	TMTC					
15	Mohammed Sahfo	14/100 ml	TMTC					

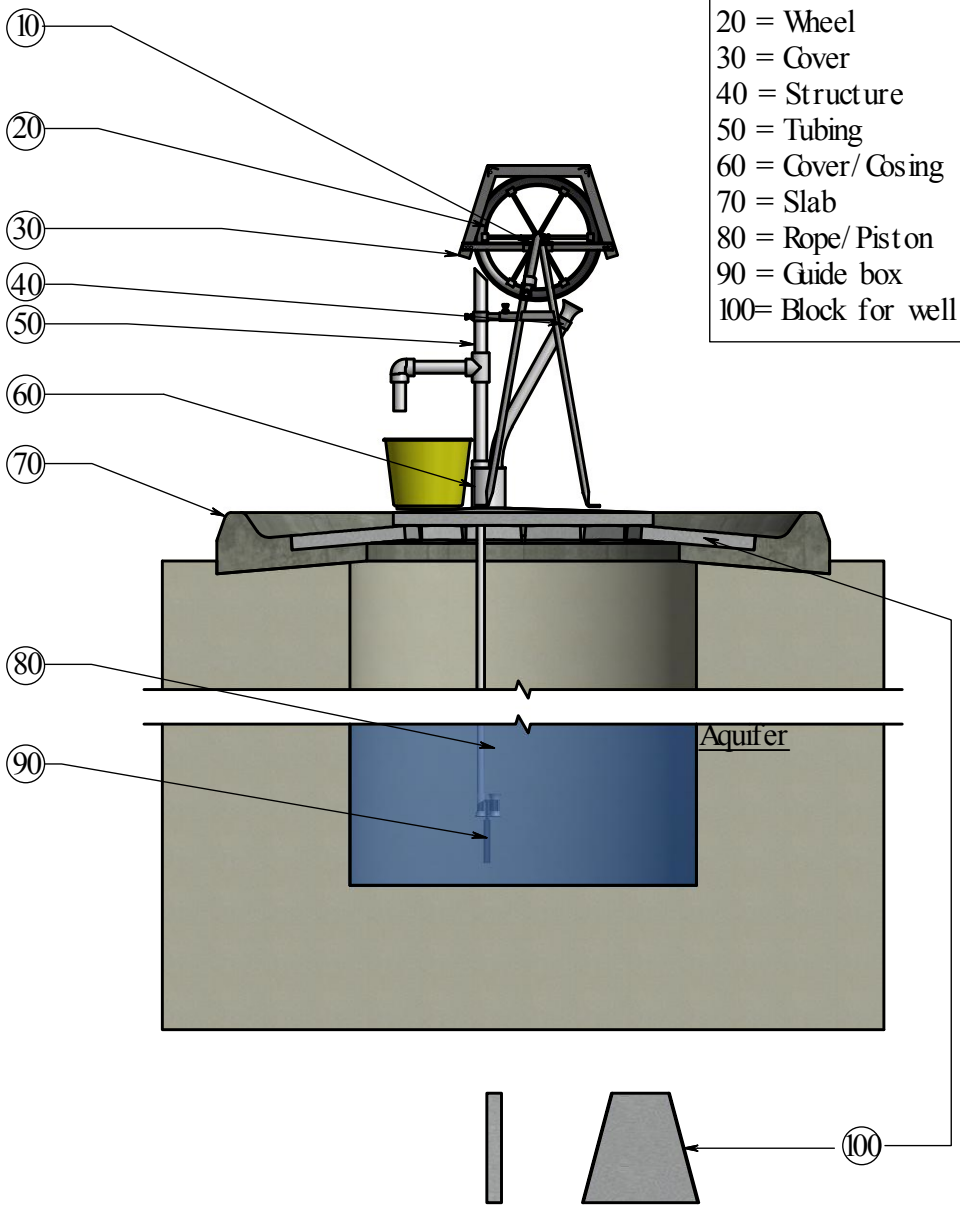
N.B: 1. During the second test, as the wells were disinfected, no bacteriological tests was carried out (as disinfection kills all the bacteria). Disinfection, physico- chemical and chlorine residual were measured at this time byto the water quality expert.

2. **ND** means **Not Done**

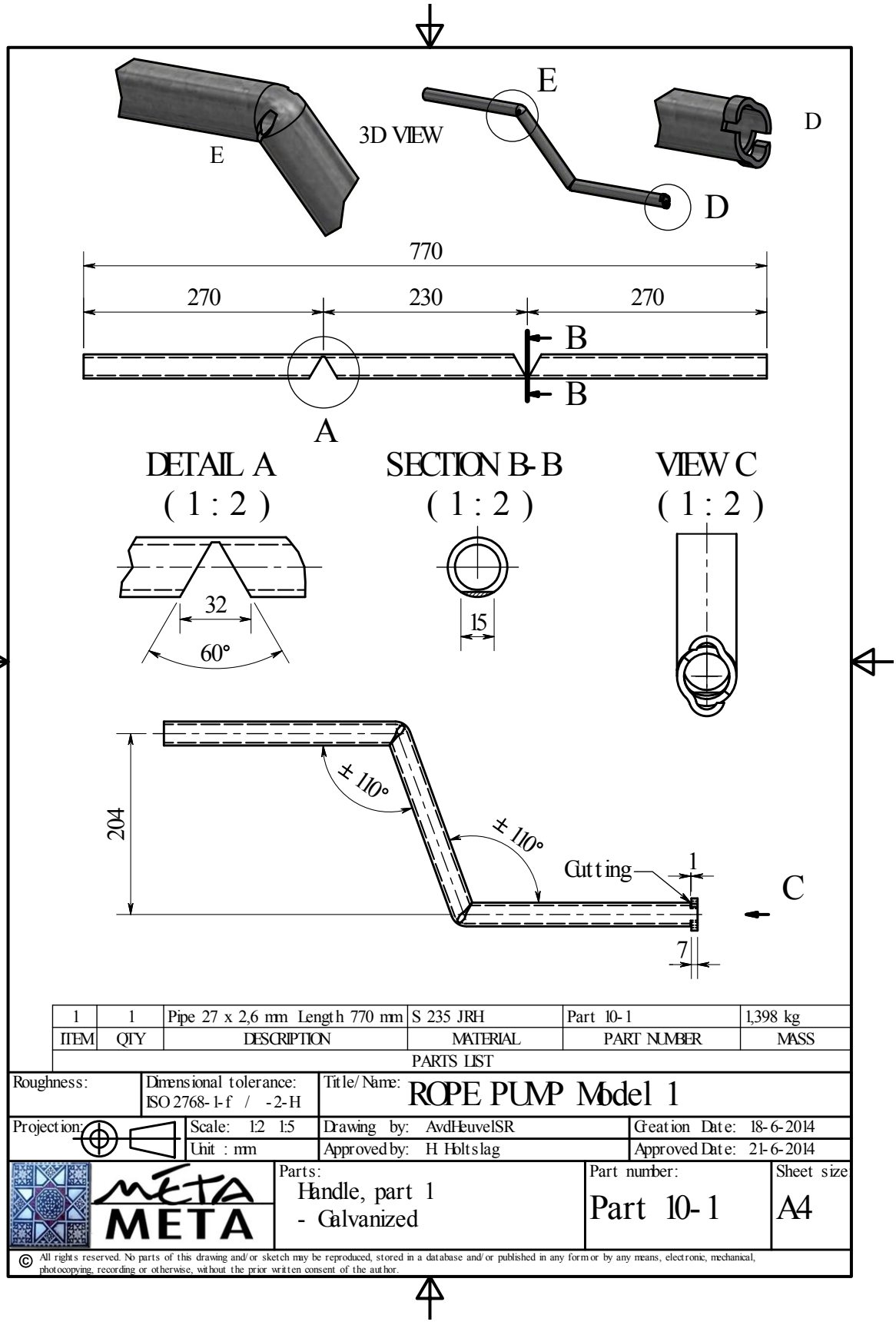
13, 14 , 15 . No RP installed due to unreliable well yield during dry season as confirmed after well cleaning and deepening.

Annex 5: Technical drawings improved Rope Pump Model





Roughness:	Dimensional tolerance:	Title/Name: ROPE PUMP Model 1		
Projection:	Scale: 1 : 20	Drawing by: AvdHeuvelSR	Creation Date: 21-6-2014	
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014	
META	Parts: Installed on a Duc Well	Part number: Duc well	Sheet size A4	



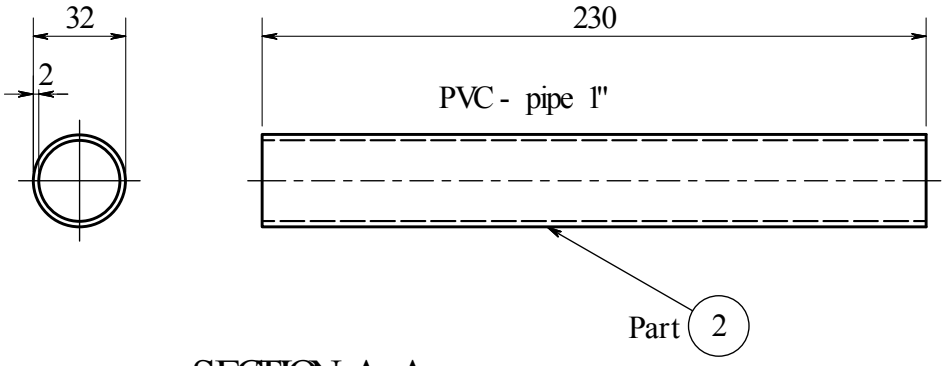
ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER	MASS
1	1	Pipe 27 x 2,6 mm Length 770 mm	S 235 JRH	Part 10-1	1,398 kg

PARTS LIST

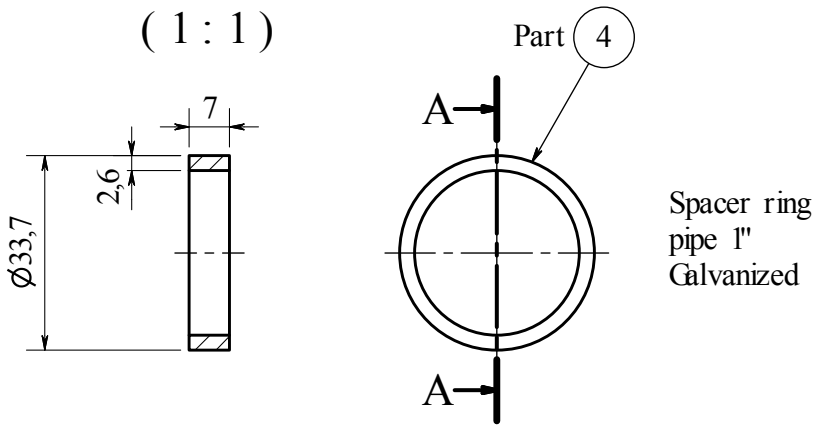
Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1:2 1:5	Drawing by: AvdHeuvelSR	Creation Date: 18-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014

Parts: Handle, part 1 - Galvanized	Part number: Part 10-1	Sheet size A4

3D VIEW



SECTION A-A
(1 : 1)



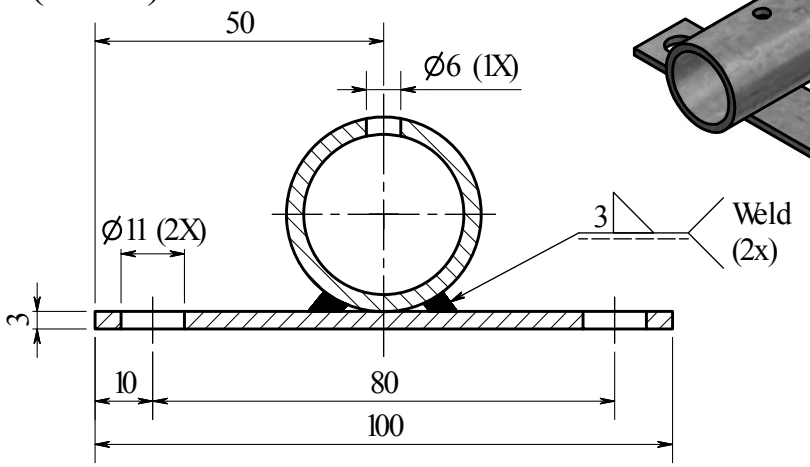
Spacer ring
pipe 1"
Galvanized

ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER	MASS
2	4	Pipe 33,7 x 2,6 mm Length 7 mm	S 235 JRH	Part 4	
2	1	Pipe 32 x 2 mm Length 230 mm	PVC	Part 2	0,061 kg

PARTS LIST

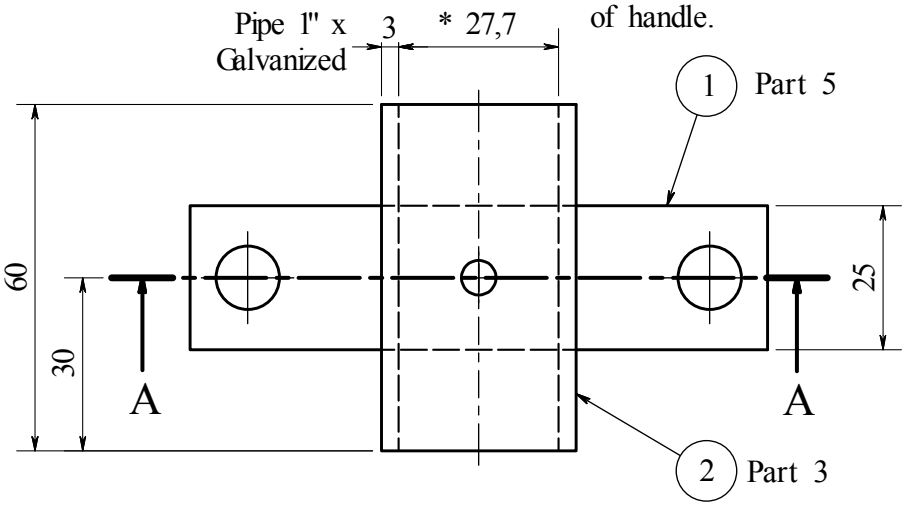
Roughness:	Dimensional tolerance:	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1:1 1:2	Drawing by: AvdHeuvelSR	Creation Date: 19-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014
META	Parts: Handle, PVC pipe and part 4	Part number: 10-2 and 4	Sheet size A4

SECTION A-A
(1 : 1)



3D VIEW

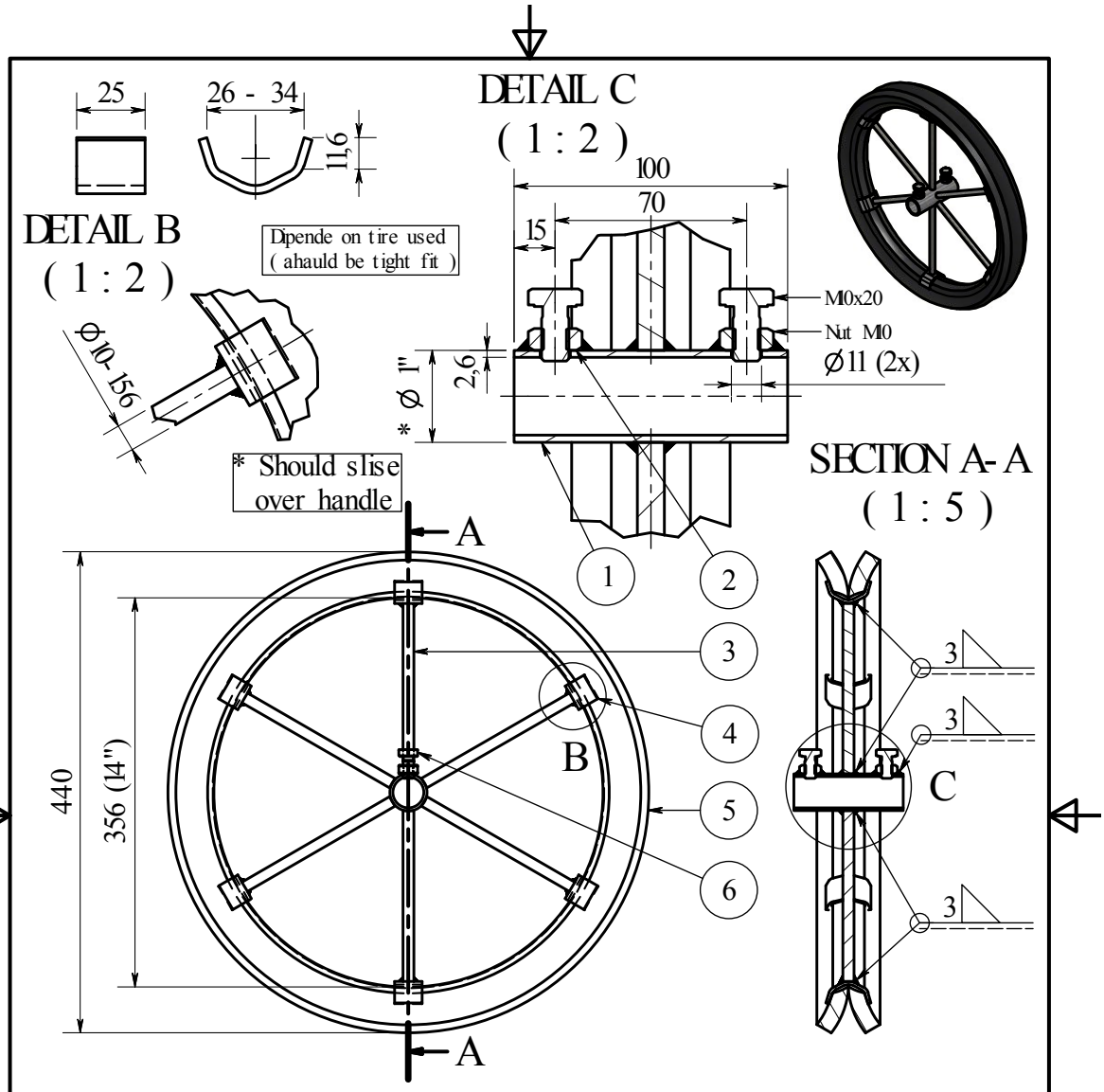
* Inside diametre 0,5-0,8 mm more than outside diametre of handle.



ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER	MASS
2	2	Pipe 1" x 2,6 mm Length 60 mm	S 235 JRH Galv.	Part 3	0,136 kg
1	2	Flat bar 25 x 3 mm Length 100 mm	S 235 JR	Part 5	0,054 kg

PARTS LIST

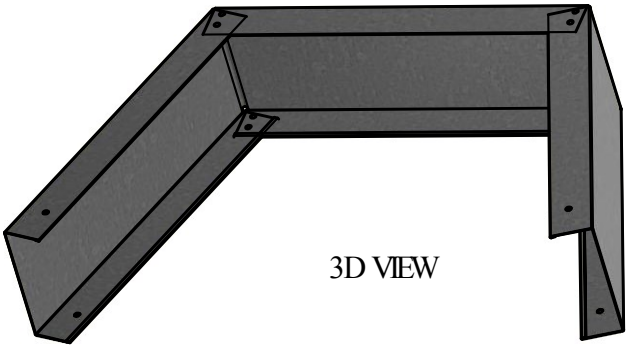
Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1 : 1	Drawing by: AvdHeuvelSR	Creation Date: 19-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014
META	Parts: Assembly of handle, part 3 and 5	Part number: 10-3+5	Sheet size A4



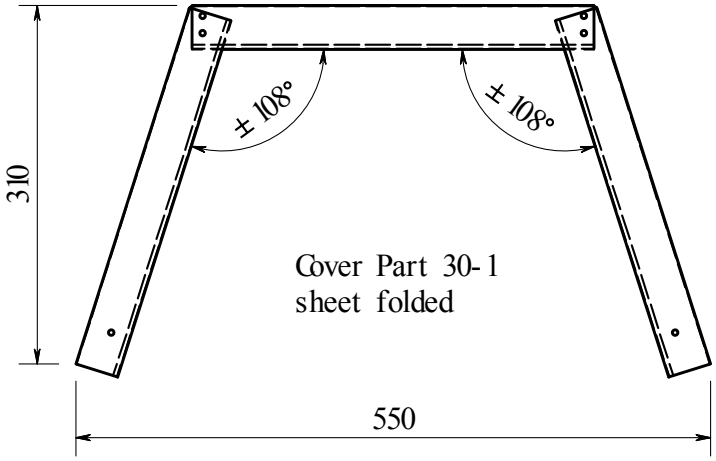
ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER	MASS
6	2	Bolt M10 x 20 mm	Steel 8.8 Galvanized	Part 5	0,024 kg
5	1	Wheel rim 14"	Car tire 14"	Part 6	1,320 kg
4	6	Flat bar 25x3mm Length 55/64mm	S 235 JR	Part 3	0,035 kg
3	6	Round 10 mm Length 156 mm	S 235 JR	Part 2	0,096 kg
2	2	Nut M10	Steel 8.8 Galvanized	Part 4	0,012 kg
1	1	Pipe 1" x 2,6 mm Length 100 mm	S 235 JRH Galv.	Part 1	0,195 kg

PARTS LIST

Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1:2 1:5	Drawing by: AvdHeuvelSR	Creation Date: 19-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014
META	Parts: Wheel 20 - Assembly	Part number: 20	Sheet size A4



3D VIEW

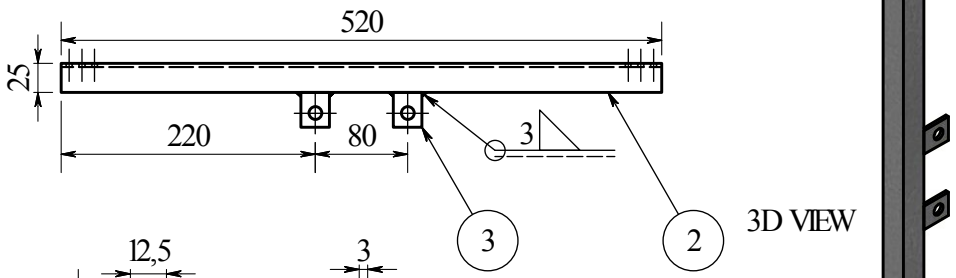


Cover Part 30-1
sheet folded

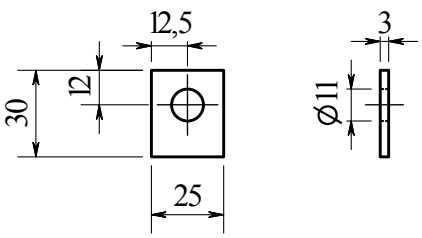
ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER	MASS
1	1	Galvanized sheet 1000x200x0,6mm	Steel	Part 30-1	0,922 kg

PARTS LIST

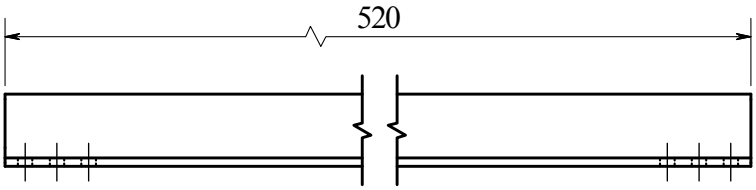
Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1 : 5	Drawing by: AvdHeuvelSR	Creation Date: 19-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014
META	Parts: Cover, part 30-1 Galvanized	Part number: 30-1	Sheet size A4

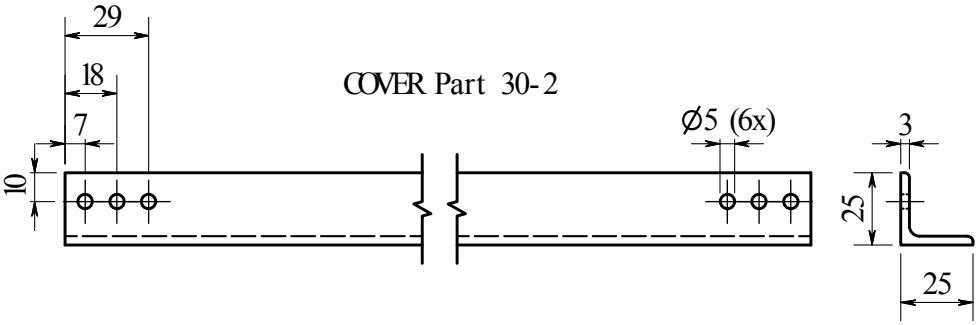


3D VIEW



COVER Part 30-3



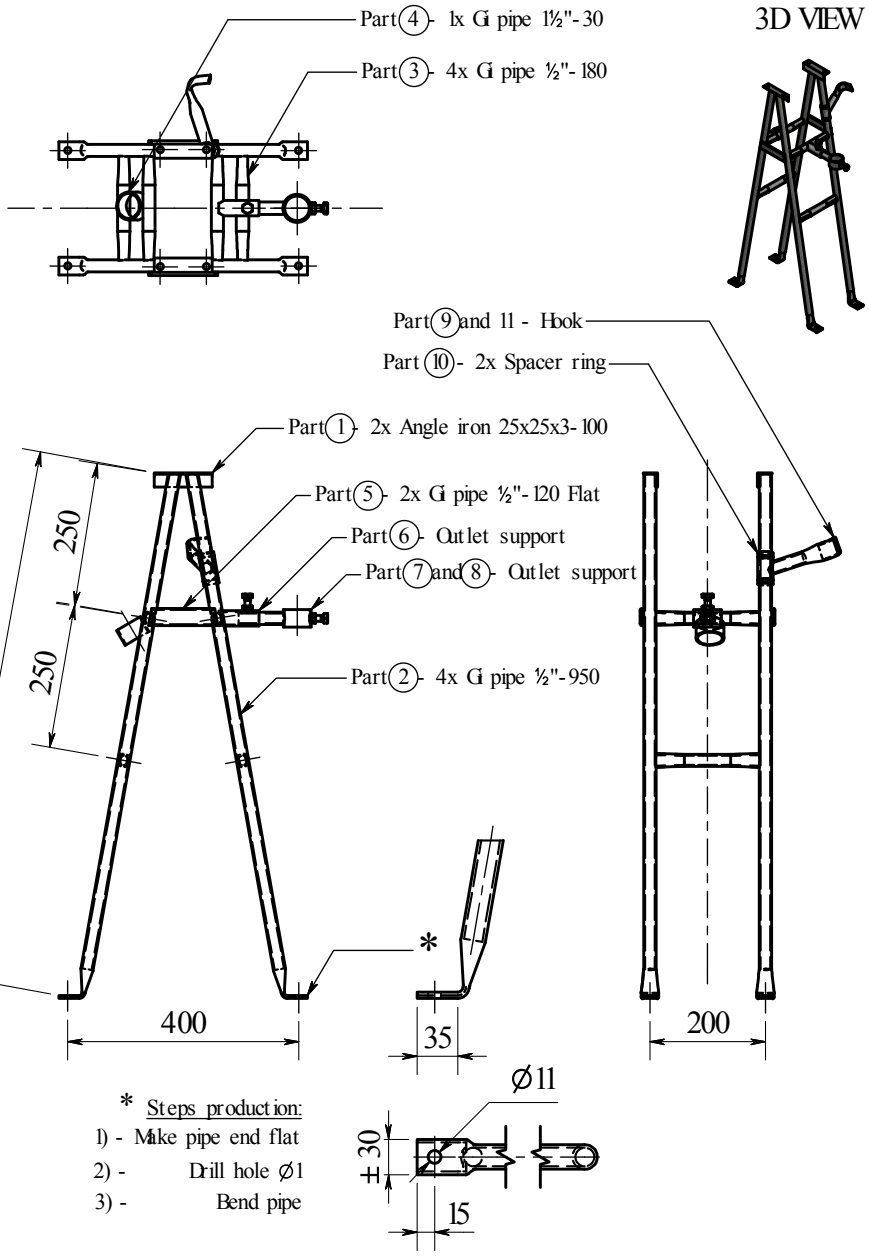


COVER Part 30-2

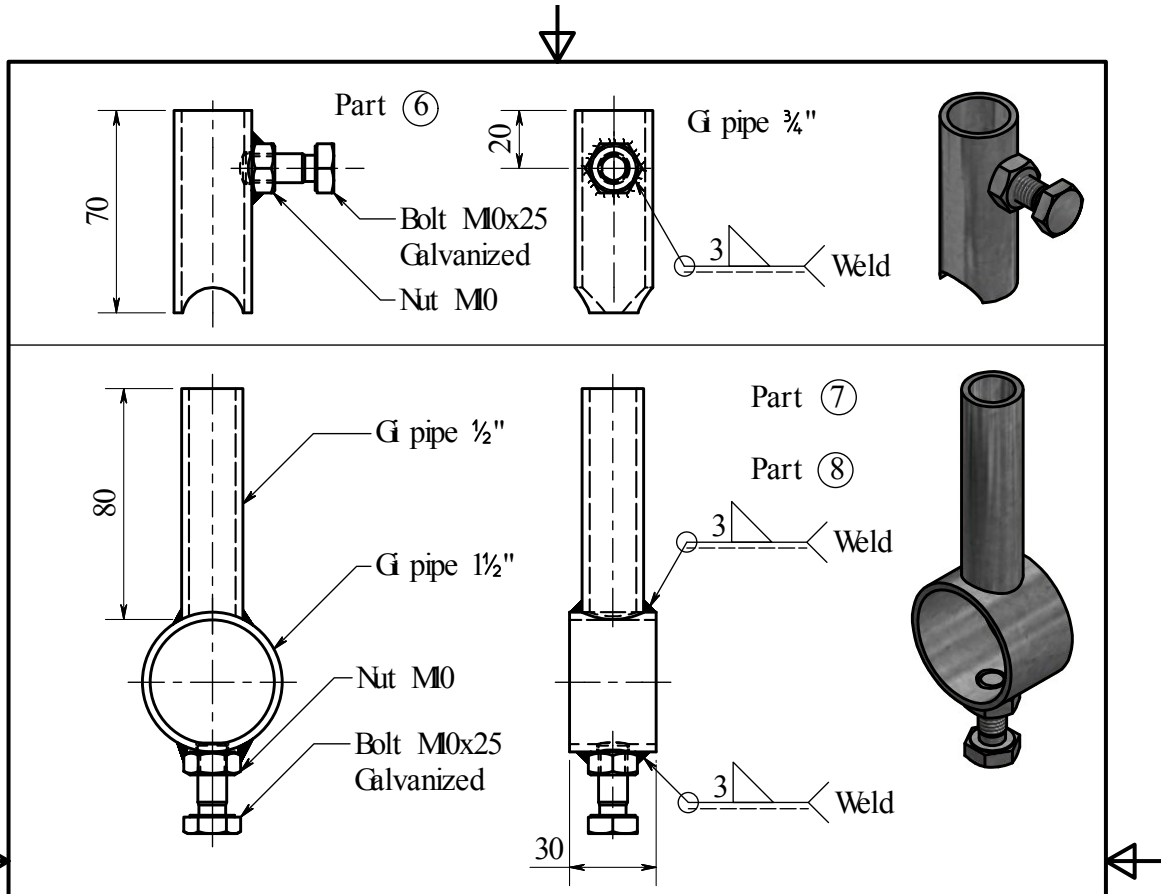
ITEM	QTY	DESCRIPTION	MATERIAL	PART NUMBER	MASS
3	4	Flat bar 25 x 3 mm length 30 mm	S 235 JR	Part 30-3	0,015 kg
2	2	Angle profile 25 x 25 x 3 Length 520 mm	S 235 JRG 2	Part 30-2	0,579 kg

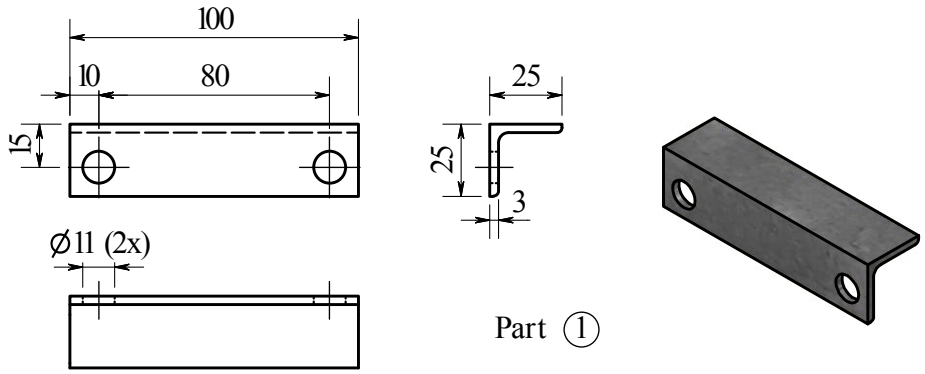
PARTS LIST

Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1:2 1:5	Drawing by: AvdHeuvelSR	Creation Date: 19-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014
META	Parts: Assembly of cover support part 30-2 to 30-3	Part number: 30-2+3	Sheet size A4

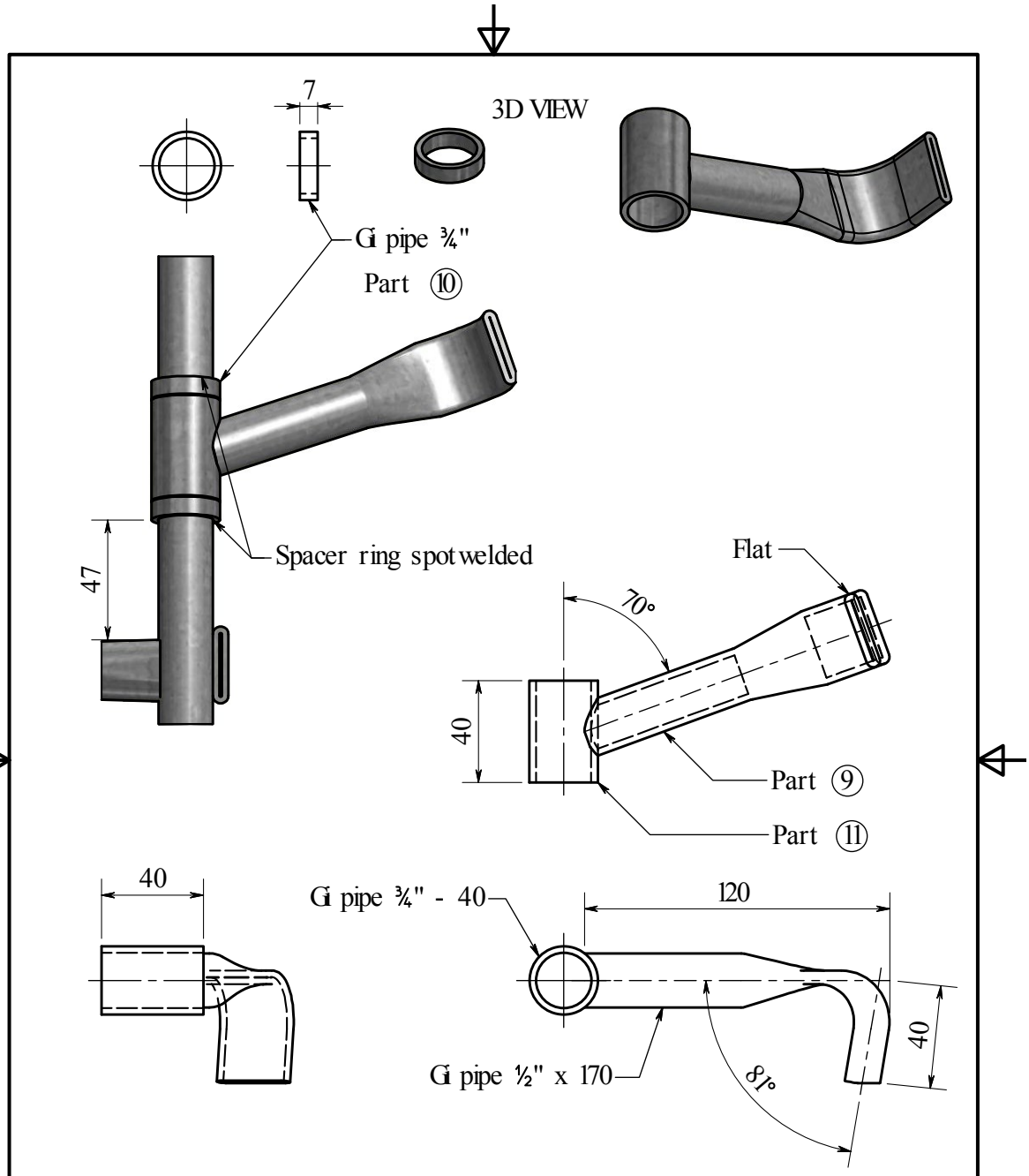


Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/ Name: ROPE PUMP Model 1		
Projection:	Scale: 1:5 1:10	Drawing by: AvdHeuvelSR	Creation Date: 20-6-2014	
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014	
META	Parts: Structure: 40 Assembly		Part number: 40	Sheet size A4

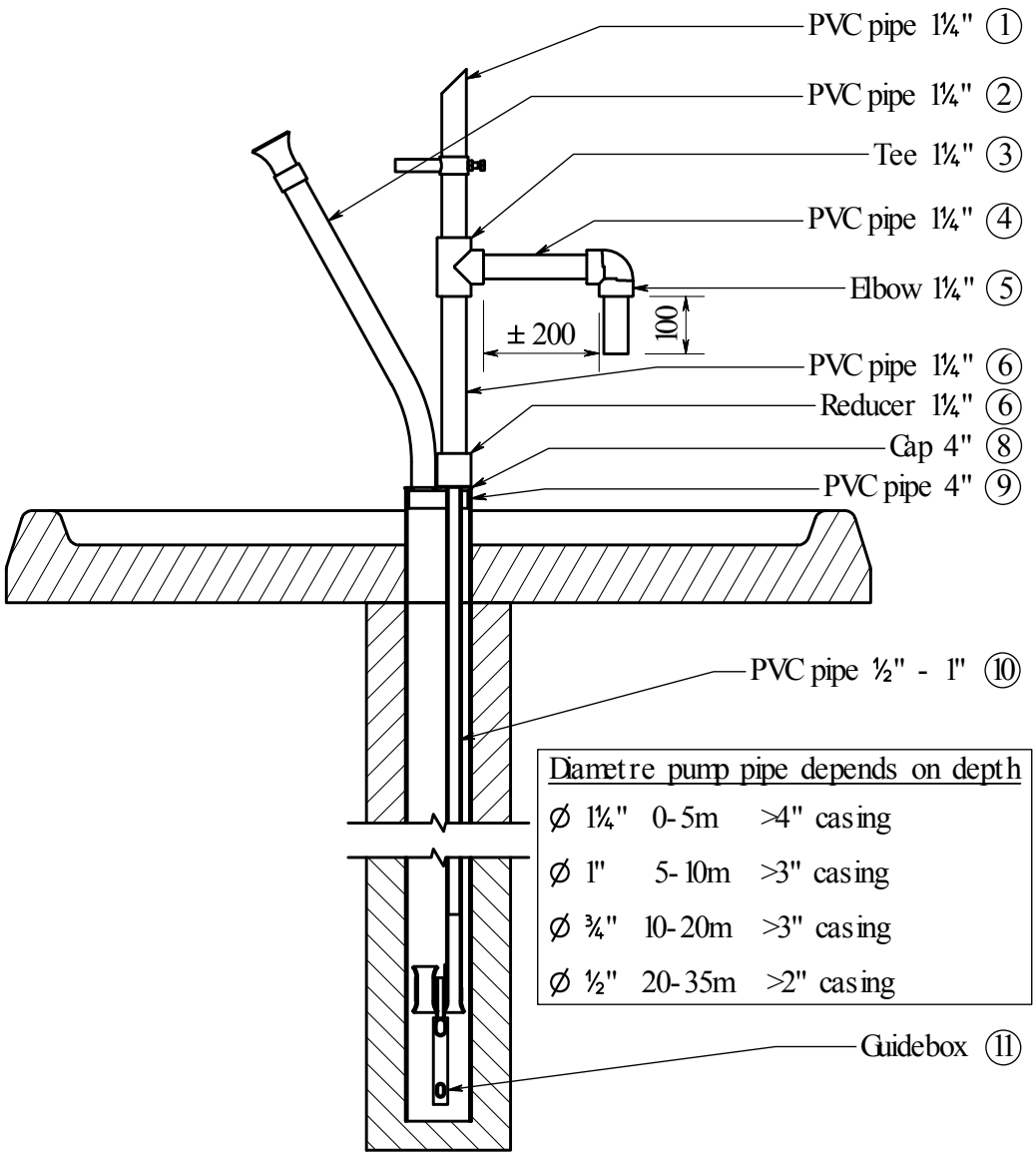




Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1		
Projection:	Scale: 1 : 2	Drawing by: AvdHeuvelSR	Creation Date: 20-6-2014	
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014	
META	Parts: Structure: 40-part 1 - part 6 - part 7 - part 8		Part number: Part 40	Sheet size A4

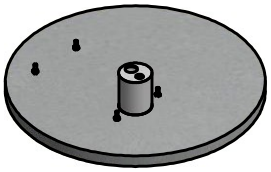


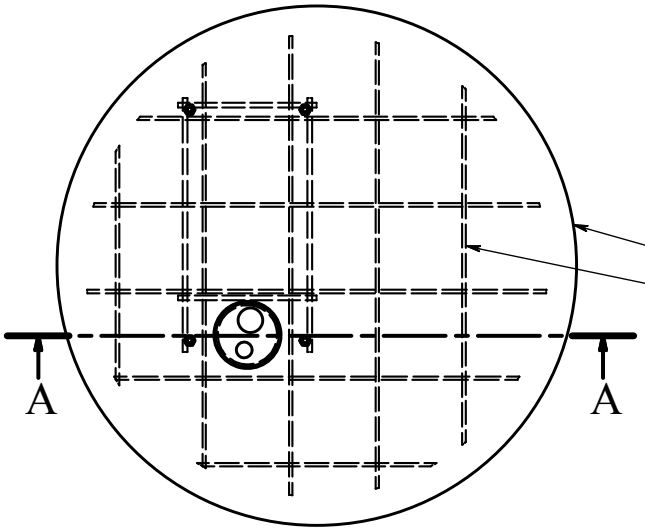
Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1		
Projection:	Scale: 1 : 2	Drawing by: AvdHeuvelSR	Creation Date: 20-6-2014	
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014	
META	Parts: Structure: 40 -part 9-part 10 -part 11 Blocking System		Part number: 40 -9-10-11	Sheet size A4



Roughness:	Dimensional tolerance:	Title/ Name: ROPE PUMP Model 1	
Projection:	Scale: 1 : 10	Drawing by: AvdHeuvelSR	Creation Date: 21-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014
META	Parts: Tubing: Assembly 50	Part number: 50	Sheet size A4

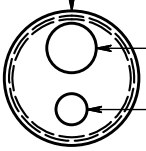
3D VIEW





Part① - Cement slab

Part② - Rebar Ø6 - 800



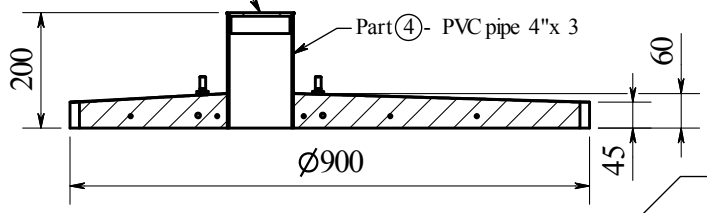
Part③ - PVC cap 4"

Hole Ø1¼"

Hole Ø½"

- ¾"
- 1"

SECTION A-A
(1 : 10)



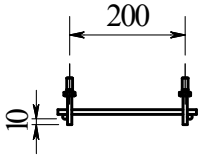
Part⑧ - 2x Round bar 8mm-440

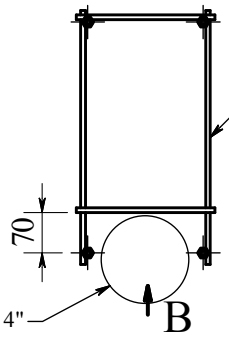
Part⑤ - 4x Bolt M10x25 Galvanized

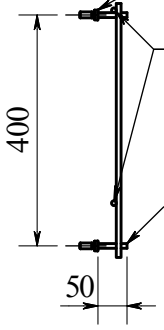
Part⑥ - 2x Round bar 8mm-240

Part⑦ - 4x Round bar 8mm-55

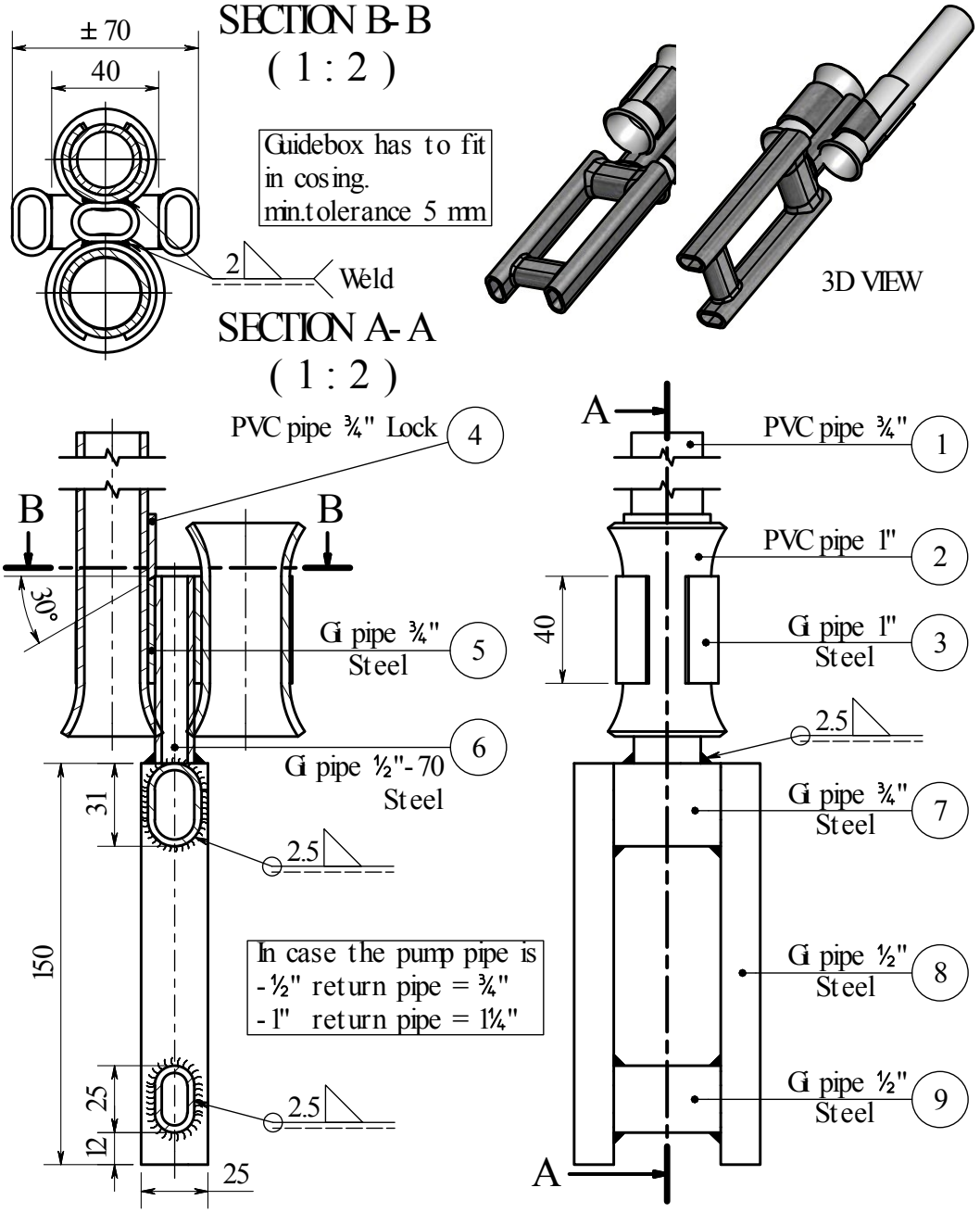
VIEW B
(1 : 10)





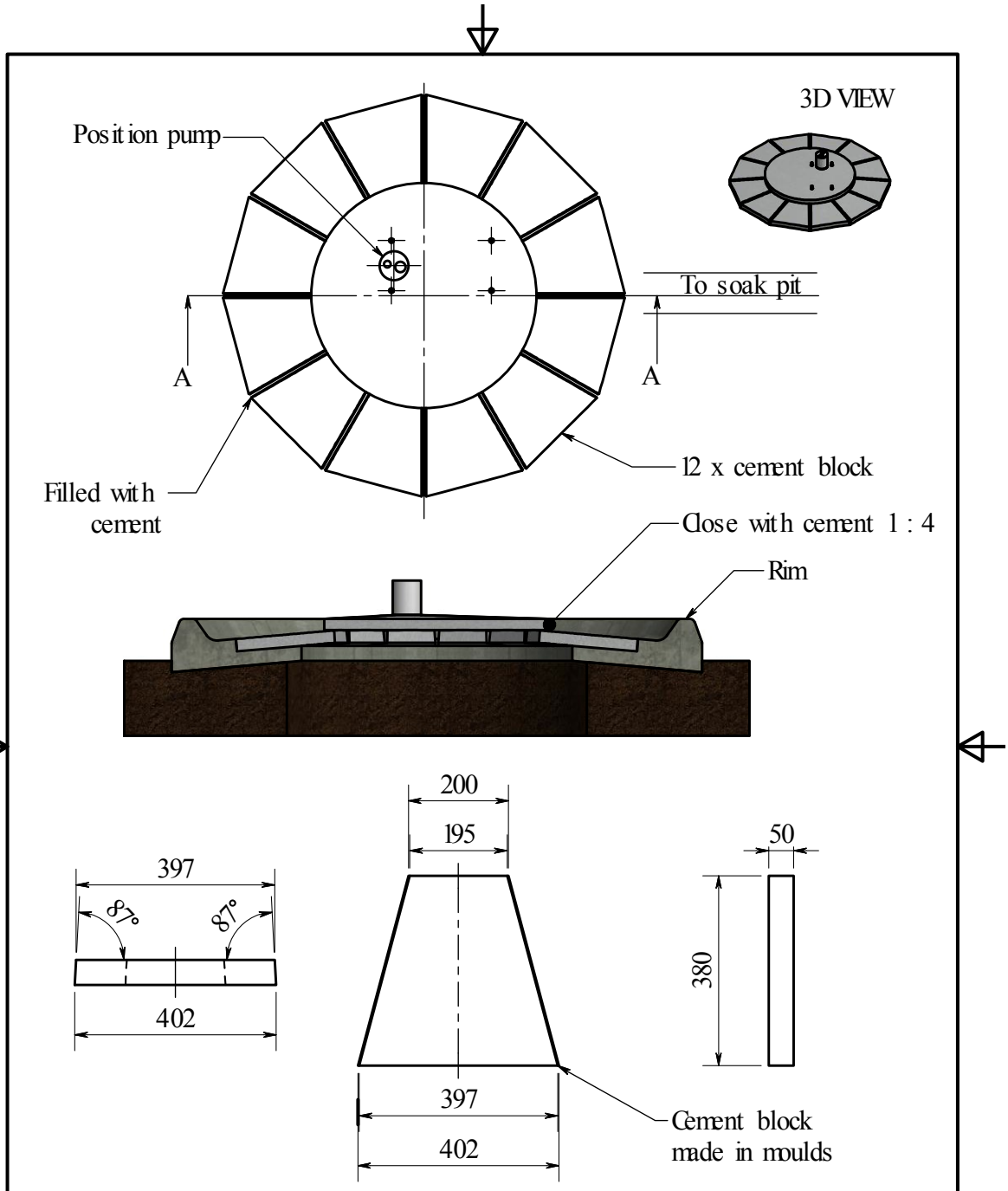


Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/ Name: ROPE PUMP Model 1+2		
Projection:	Scale: 1 : 10	Drawing by: AvdHeuvelSR	Creation Date: 21-6-2014	
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014	
META	Parts: Slab / Wellcover	Part number: Part 70	Sheet size A4	



Roughness:	Dimensional tolerance: ISO 2768-1-f / -2-H	Title/Name: ROPE PUMP Model 1	
Projection:	Scale: 1 : 2	Drawing by: AvdHeuvelSR	Creation Date: 17-6-2014
	Unit : mm	Approved by: H Holtslag	Approved Date: 21-6-2014

	Parts:	Part number:	Sheet size
META	GUIDEBOX: part 90 part 90-1 to part 90-9	90 - 1 to 9	A4



Roughness:	Dimensional tolerance:	Title/ Name: ROPE PUMP Model 1		
Projection:	Scale: 1:10 1:20 Unit : mm	Drawing by: AvdHeuvelSR Approved by: H Holtslag	Creation Date: 20-6-2014 Approved Date: 21-6-2014	
META META	Parts: Well reducer ring	Part number: 100	Sheet size A4	

Annex 6: Picture report

Page 1

Collection of pumps of 5 producers at EWTEC

Model Aregawi (IDE)

Model Amio

Model Selam Hawassa

Use of black bolts instead of galvanised bolts

Problems with mounting of wheel cover

Page 2

	
Problems with cover of sealed model	Corrosion of bolts, trumpet on return pipe poor quality
	
Heavy Guidebox. New models use 60% less metal and are galvanised materials	Lack of oiling resulting in broken handles
	
To much clearance in bushing resulting in extra wear	Use of ball bearing but low quality. If ball bearing are used than sealed models with grease nipple

Page 3

	
Problems in Pump installation	Return pipe not sealed, PVC parts broken, Pipe end cap is cut and has large holes so water leaks back in well.
	
Lack of apron so water leaking back in well	Lack of soak pit so water around the well
	
Large diameter outlet pipe so pipe does not fit into the jerrycans. Suggestion to reduce diameter outlet pipe to 1 ¼”	Pump high since it is mounted an a parapet. In this case short base model should have been used or a platform should be installed.

	
First meeting at EWTEC	Producing adapted models at EWTEC
	
Producing a tapered well ring block	Producing well cover with M10 Galvanized bolts
	
Mounting of Rope pump Model 2. A frame, economy model. Instead of welding angle iron and rebar, legs are bend and have a hole so less material and less welding	Jigs and tools produced during mission Incl. socket and trumpet tools, end caps, cement guide block.

Making cement guideblock

Making demonstration wells at EWTEC

Installing pole model pump

Use of soil punch to make a demonstration tube well

Demonstration of new low cost household water filters (15-18US$)_

2e meeting at EWTI discussing results
Of investigation and ideas

Rope pump model 2. Cost 100-150 US$. The model 1 is similar but has ball bearings

Rope pump model 2. Cost 60-100 US$
No bolts , cover optional

Rope pump model 4, Cost 35 – 50US$
Using poles , wheel cover and well cover are optional

Meeting in Hawassa ate TVETC.
The ladder is used to explain the idea of the “water ladder”

page 7

	
Monitoring pumps in the field	Special tapered blocks to make a well ring
	
Families/masons in Butajera trained in making blocs with moulds	Well reducer ring made of tapered blocks
	
Well cover with Manhole. Water can leak back in well since there is no rim around the hole.	The manhole makes the well cover weak. Like in this case there is a crack cracked in the corner so another source for leaking water in the well.

Page 8

	
The inlet of the return pipe is not good. It requires a nice smooth entrance, a so called trumpet which can be made with a trumpet tool.	Here the well slab is not sealed well on the well rim.
	
The outlet pipe of 1 ¼ " it fits in jerrycans	Several pumps were used for productive use. Here the pumps is used for irrigation of a garden of 300 m2
	
Here a hose is connected to the outlet to traport water to the garden on the other side of the house	Here water is pumped for cattle. The cattle drink from a separate drinking bucket away from the pump.

Page 9

	
Pump with ball bearings	Pumping with the pump model 3 In this case a platform is needed
	
Wheel with 4 Spokes of GI pipe. Clamps in between are missing	Here clamps are installed but length is not good
	
Bad example of Soakpit, The pit with stones was blocked and a new hole for cattle was made. This results in contaminated water.	Good example of Soakpit, all water goes to the pit The pit is filled with stones so no water is visible so not drinking of cows, no mosquitos etc.

Page 10

Rope pump protected from Cows

Lubrication of bushings. To make it easier oil hole should be on top

Slab of 90cm with one Hole of 4 inch

Guide boxes of JICA model

Pump connected with a hose for garden irrigation

3 pump models installed at the EWTI

Annex 7: Terms of Reference and Scope of Services

1. BACKGROUND

Japan International Cooperation Agency (JICA) and Federal Democratic Republic of Ethiopia have officially launched a new technical cooperation project entitled, “The Project for Rural Water Supply, Sanitation and Livelihood Improvement through Dissemination of Rope Pumps (RPs) for Drinking Water (hereinafter referred to as “the Project”). The Project is aiming at increment of water supply coverage by disseminating RPs through Self-supply. And one of the outputs is “Specifications of RPs for drinking water and installation technologies are standardized at the national level”. It is crucial to have quality RP models which satisfy user’s needs; the RP which provides drinkable safe water for a long period-with easy maintenance.

Over the years manufacturers and organizations have made small adjustments to the original RP model. At the same time, different models of concrete and improved well covers and well heads have been developed and tested by different manufacturers and organisations. Also different aprons and methods to drain water away from the well have been installed.

To design quality RPs, it is necessary to study the existing RPs and improve its functionality with consideration to materials / spare parts availability and user’s affordability. The Project Team decided to contract out this activity to local consultants or engineers who have better RP experiences to reach effective and efficient result.

Please note that the Project Team has started survey on current users for RP improvement. The consultant/engineer shall utilize this survey result when conducting this activity.

2. OBJECTIVE

The objective is to design several quality Rope Pump models with well head, well cover, apron and soak pit which are suitable and affordable to disseminate nation-wide.

3. SCOPE OF WORK AND PROCESS

To achieve this goal, it is necessary to;

1) Collect information on RPs, national and international, and test the durability / functionality of the existing RPs.
2) Analyze information collected at the RP active user survey, which was conducted by the Project in May 2013.
3) Together with the 1) test result and 2) survey result, design several models, produce the test model samples and test the durability / functionality.
4) Collect information on well head, well cover, apron and soak pit fitted with the RP wells and test the durability / functionality.
5) Test 3) and 4) at the village level to find out if it is suitable to different household condition.
6) Provide the details of at least three improved RP models; 2 or more household RP models and 1 or more community RP model.

The tentative work process is outlined below;

First of all, to envisage the functionality, cost, hygiene and quality of the different RP models with well head, well cover, apron and soak pit, an inventory of existing models shall be made and improvements/adjustments done by manufacturers shall be collected. Furthermore, new

ideas (making a well cover from moulded plastic) and options used in other countries shall be investigated.

The sample RP models (e.g. JICA, Selam, IDE, etc. models) shall be procured by the consultant/engineer. Before starting the test, the consultant/engineer should present to the Project Team the list of the collected RP samples and all the devices to be used for the test. Further, the methodology of the test should be preliminarily well-discussed and approve by the Project Team.

Examples of test shall be:

1) A torque test. This test will test the strength of the pump structure.
2) A durability test for rope and PVC parts.
3) Based on the selected improvements a 3rd test may be needed to test some of the improved parts.
4) Compatibility test. During this test the compatibility of spare parts will be tested.
5) The exact cost price of each model/improvement will be calculated.

A set of the test shall be basically implemented for several days and be repeated in the same way after changing the specific pieces. During the implementation of the test, the data shall be collected in the data sheet. The pictures should be taken occasionally in observing the changes.

Based on the test result, consultant/engineer shall design several improved pumps and present to the Project Team.

Upon approval on the improved pumps from the Project Team, consultant/engineer shall produce and test the improved models. The testing shall take place in an independent facility. (by persons with no commercial interest for a preferred rope pump model).

Along with the test and improvement of RP models, several models of well head, well cover, apron and soak pit shall be designed to suit different household conditions.

The improved RP models and other peripheral items shall be tested in selected villages on different aspects such as; user friendliness, ease of installation, operation, ease of maintenance, hygiene, durability, wear, cost, etc.

After the tests, the details of the improved rope pumps well head, well cover, apron and soak pit shall be compiled as the final recommendation. The dimensions of these carefully constructed models will serve as a base for the items for standardisation of the technology.

The consultant/engineer shall fulfil the tasks described above with its own innovative ideas efforts, in respecting the technical instructions from the Project.

4. TIME SCHEDULE

The activity shall be satisfactorily completed within eleven month after the contract.

5. COMPETENCY AND EXPERTISE REQUIREMENTS

The consultant/engineers shall fulfil the following qualifications;

- Work experiences in RP and/or water supply related field for at least 8 years.
- Basic knowledge on testing functions of RP/well
- Access to an independent facility/workshop and machineries for testing
- Skills on producing RPs
- Good command of English

6. NOTE

- The consultant/engineer shall pay due attention and consideration of the following:
  - Locally available materials
  - Simple and easy manufacturing techniques
  - Durability of the products
  - Affordable sale prices for the customers
- Technical advises shall be given from the experts of the Project.

Annex 8: Sheets of 3 sessions of Rope pump Monitoring

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 B / 4 / 5 / 6
Owner (full name):	Muzeyin Bergicho	Mobile nr. owner:	0928971104
Static water level:	3.45 M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 21 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.8M Depth of the well: 9.95M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no Because the raise men clamp has no adjustment so it is difficult to centered in pvc pipe so it is important the adjustment system
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no In economy type there is no bolt and nut
- Do you observe any broken welds? yes / the back pipe clam was broke when we tried to clamp pvc pipe so we re weld it
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------

- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock doesn't lock properly

Well cover, apron, drainage and soak pit

- Is pump still tightly connected to well cover? yes / no
- What is the condition of bolts in well cover? It is good
- What is the condition of the well cover? cracks / Placement , Good
- What is the condition of the apron? cracks / other, Good
- Can water leak back into the well? yes / no
- What is the condition of the drainage? cracks / other, Good
- Any other observations:

MAINTENANCE CHECKS yes / no if not correct, please explain !

- Who does the maintenance on the pump? No one
- Is this the same person that was trained? yes / no if not, why The broken of clamp is beyond their capacity so we weld by our self
- Are the bushings well lubricated (oiled)? yes / no frequency
- How often has the rope been re-tightened? frequency Once I Adjusted up to now it is ok
- Was there any problem since installation? yes / no what? The problem is The broken of clamps
- If yes, did the owner solve the problem? yes / no how? It is beyond their capacity

Please carefully check!
Was the maintenance training (provided during installation) fully understood?
If all maintenance has been done correctly, the answer is yes.
But if maintenance has not been done, or not correctly, please try to find out why!

For example:
Imagine you observe that the rope tension is too tight, you have to try to find out why

- Do you think the O&M training has been fully understood? yes / no
- If not, why do you think so? Since it is beyond their capacity I couldn't test them

- Any other observations:

OTHER INFO

- How many households are using the pump? there are 4 house
- Accidentally more (from other villages)? The owner told me 5 hour per day
- How many hours / day is the pump used?
- Who operates the pump? woman / man / children,
- For what purpose is the pump used? drinking / irrigation / both,/cooking ,washing, cattle feed,

- Any other relevant comments about use:

OTHER QUESTIONS TO THE USER

- Is it easy or heavy to operate the pump? easy / heavy / other
- Have you tested other rope pump models? yes / no, which ones:
- Which model do you prefer? The user told me I prefer the one which I have now
- Why? Because it is enough for us
- Do you have any suggestions or remarks?

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 B / 4 / 5 / 6
Owner (full name):	Muzeyin Bergicho	Mobile nr. owner:	0928971104
Static water level:	3.45 M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 21 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	9.95M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no Because the raise men clamp has no adjustment so it is difficult to centered in pvc pipe so it is important the adjustment system
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no In economy type there is no bolt and nut
- Do you observe any broken welds? yes / the back pipe clam was broke w hen we tried clamp pvc pipe so we re weld it
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Tale	Pump model nr:	1 / 2 / 3 / 4 / 5 / 6 A
Owner (full name):	Husen Dawid	Mobile nr. owner:	0919667559
Static water level:	7.5M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 1 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.95M	Depth of the well:	15.15M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no during the first monitoring I adjust it
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations:

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Tale 01	Pump model nr:	1A / 2 / 3 / 4 / 5 / 6
Owner (full name):	Shemsu Omer	Mobile nr. owner:	0910190317
Static water level:	8.52M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 2 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.7M	Depth of the well:	12.94M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Grease nipples are taken by Kids but for the moment I replaced it
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5B / 6
Owner (full name):	Surur rejato	Mobile nr. owner:	0936488302
Static water level:	2.4M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 25 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	6.9M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no — too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	6B / 2 / 3 / 4 / 5 / 6
Owner (full name):	Temam Tira	Mobile nr. owner:	0932680251
Static water level:	4.3M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 27 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.94M	Depth of the well:	8.6M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Grease nipples are taken by Kids
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1B / 2 / 3 / 4 / 5 / 6
Owner (full name):	Yasin Temam	Mobile nr. owner:	0925747448
Static water level:	4.8M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 29 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.98M	Depth of the well:	10.8M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken (I adjusted it)
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Grease nipples are taken by Kids
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5A / 6
Owner (full name):	Yilma Bireda	Mobile nr. owner:	0920997100
Static water level:	4.1M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 23 / `12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	8.45M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 19 / 1/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamijat	Pump model nr:	1 / 2B / 3 / 4 / 5 / 6
Owner (full name):	Mehamed surur	Mobile nr. owner:	
Static water level:	6.5M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 3 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.65M	Depth of the well:	13.3M

TECHNICAL CHECKS yes / no if not correct, please explain !

stons and PVC

e rope tension still correct?	yes / no	too loose / too tight / brok
e rope connection still correct?	yes / no	
e rope still centered in the PVC pipe?	yes / no	
ou observe any wear on the rope?	yes / no	
ou observe any wear on the pistons?	yes / no	
ou observe any wear on PVC parts?	yes / no	
other observations:		

Pump structure

- Are all bolts and nuts still present and tight? yes / no----------
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations:

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date 19 / 1/ 2014

LOCATION

ıame: Meskan Kebele : Yetebon

me: Mamija Pump model nr: 1 / 2 / 3 / 4 / 5 / 6

ame): Taju Mundese(Sofiay Ariga) Mobile nr. owner: O920 456224

evel: 2.7M Measuring time:

GENERAL INFO (only once during installation)

Installation date: 18 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.75M Depth of the well: 7.25M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Since the model is windless there is no bolt an nut on it
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: There is no Handle lock

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Jorga Gashe	Pump model nr:	1 / 2A / 3 / 4 / 5 / 6
Owner (full name):	Ahimed Andhun	Mobile nr. owner:	0925655994
Static water level:	2.54M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 30 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.79M Depth of the well: 5.5M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / brok
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations: Because the rope is too tight rope and piston started wear during monitoring (I try to adjust it) one of the reason to wear for piston and rope now more than 20 household are using the rope pump

Pump structure

- Are all bolts and nuts still present and tight? yes / no----------
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------

- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock doesn't lock properly so I prefer the previou Model

Well cover, apron, drainage and soak pit

- Is pump still tightly connected to well cover? yes / no
- What is the condition of bolts in well cover? It is good
- What is the condition of the well cover? cracks / Placement , Good
- What is the condition of the apron? cracks / other, Good
- Can water leak back into the well? yes / no
- What is the condition of the drainage? cracks / other, Good
- Any other observations:

MAINTENANCE CHECKS yes / no if not correct, please explain !

- Who does the maintenance on the pump? The owner
- Is this the same person that was trained? yes / no if not, why the trained person was his son but now he move to the town to Butajera so the owner try to maintain by him self
- Are the bushings well lubricated (oiled)? yes / no frequency
- How often has the rope been re-tightened? frequency
- Was there any problem since installation? yes / no what? No other problem
- If yes, did the owner solve the problem? yes / no how? But I solved the problem during monitoring

Please carefully check!
Was the maintenance training (provided during installation) fully understood?
If all maintenance has been done correctly, the answer is yes.
But if maintenance has not been done, or not correctly, please try to find out why!

- Do you think the O&M training has been fully understood? yes / no
- If not, why do you think so? because the trained person was his son but now he move to the town so the owner try to maintain by him self
- Any other observations:

OTHER INFO

- How many households are using the pump? Previously there are 4 house holds but now because the Afredev pump is not working the user become 20
- Accidentally more (from other villages)? The owner told me 8hour per day
- How many hours / day is the pump used?
- Who operates the pump? woman / man / children,
- For what purpose is the pump used? drinking / irrigation / both,/cooking ,washing, cattle feed, seedling
- Any other relevant comments about use:

OTHER QUESTIONS TO THE USER

- Is it easy or heavy to operate the pump? easy / heavy / other
- Have you tested other rope pump models? yes / no, which ones:
- Which model do you prefer? The user told me I prefer the one which I have now
- Why? Because I don't see any problem and I adapt it
- Do you have any suggestions or remarks? Due to the advice of our side he started fence the area of rope pump

The user compiling for the digger Because they were only Dewater but they didn't Dug my well

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 B / 4 / 5 / 6
Owner (full name):	Muzeyin Bergicho	Mobile nr. owner:	0928971104
Static water level:	3.45 M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 21 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	9.95M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no Because the raise men clamp has no adjustment so it is difficult to centered in pvc pipe so it is important the adjustment system
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations: because of disconnect of raisin men we reconnect the pipe because during installation we didn 't get enough U.S.A pvc glue we used for some of the pump we USE pvc glue But now a day it is available in the market

Pump structure

- Are all bolts and nuts still present and tight? yes / no In economy type there is no bolt and nut
- Do you observe any broken welds? yes / no

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 A / 4 / 5 / 6
Owner (full name):	Zeleke Degaga	Mobile nr. owner:	0924719863
Static water level:	3.76M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 22 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.7M	Depth of the well:	6.83M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no Because the raise men clamp has no adjustment so it is difficult to centered in pvc pipe so it is important the adjustment system
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no In economy type there is no bolt and nut
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock doesn't lock properly so I prefer the previous

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Tale	Pump model nr:	1 / 2 / 3 / 4 / 5 / 6 A
Owner (full name):	Husen Dawid	Mobile nr. owner:	0919667559
Static water level:	7.5M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 1 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.95M	Depth of the well:	15.15M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations:

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Tale 01	Pump model nr:	1A / 2 / 3 / 4 / 5 / 6
Owner (full name):	Shemsu Omer	Mobile nr. owner:	0910190317
Static water level:	8.52M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 2 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.7M	Depth of the well:	12.94M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Grease nipples are taken by Kids but for the moment I replaced it
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock doesn't lock it

r, apron, drainage and soak pit

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5B / 6
Owner (full name):	Surur rejato	Mobile nr. owner:	0936488302
Static water level:	2.4M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 25 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	6.9M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly so I prefer the previous model

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	6B / 2 / 3 / 4 / 5 / 6
Owner (full name):	Temam Tira	Mobile nr. owner:	0932680251
Static water level:	4.3M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 27 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.94M	Depth of the well:	8.6M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Grease nipples are taken by Kids but for the moment I replaced
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1B / 2 / 3 / 4 / 5 / 6
Owner (full name):	Yasin Temam	Mobile nr. owner:	0925747448
Static water level:	4.8M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 29 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.98M	Depth of the well:	10.8M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no since Greece nipple is taken by kids I replace it
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly so I prefer the previous model

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5A / 6
Owner (full name):	Yilma Bireda	Mobile nr. owner:	0920997100
Static water level:	4.1M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 23 / `12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	8.45M

TECHNICAL CHECKS yes / no if not correct, please explain !

ons and PVC

rope tension still correct?	yes / no	too loose / too tight / broken
rope connection still ct?	yes / no	
rope still centered in the pipe?	yes / no	
u observe any wear on the	yes / no	
u observe any wear on the s?	yes / no	
u observe any wear on PVC ?	yes / no	

because of disconnect of raisin men we reconnect the pipe because during installation we didn't get enough U.S.A pvc glue we used for some of the pump we USE pvc glue But now a day it is available in the market

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamijat	Pump model nr:	1 / 2B / 3 / 4 / 5 / 6
Owner (full name):	Mehamed surur	Mobile nr. owner:	
Static water level:	6.5M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 3 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.65M	Depth of the well:	13.3M

TECHNICAL CHECKS yes / no if not correct, please explain !

stons and PVC

e rope tension still correct?	yes / no	too loose / too tight / brok
e rope connection still correct?	yes / no	
e rope still centered in the PVC pipe?	yes / no	
ou observe any wear on the rope?	yes / no	
ou observe any wear on the pistons?	yes / no	
ou observe any wear on PVC parts?	yes / no	
other observations:	He dismantle the pump as the owner told me that because the digger didn't dag my well so that to deepen the well I dismantle from the well	

Pump structure

- Are all bolts and nuts still present and tight? yes / no----------
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

e:	Meskan	Kebele :	Yetebon
:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5 / 6
ame):	Taju Mundese(Sofiay Ariga)	Mobile nr. owner:	O920 456224
evel:	2.7M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 18 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.75M Depth of the well: 7.25M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Since the model is windless there is no bolt an nut on it
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock was no designed so with the discussion of Henk we make hand by rope

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 25 / 3 / 2014

LOCATION

la name:	Meskan	Kebele :	Yetebon
name:	Kwachim(Tale 02)	Pump model nr:	1 / 2 / 3 / 4 / 5 / 6
ll name):	Zeyinu Omer	Mobile nr. owner:	O920 456224
er level:	9.8M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 20 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.7M Depth of the well: 18.85M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Since the model is windless there is no bolt an nut on it
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock was no designed so with the discussion of Henk we make hand by rope

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Jorga Gashe	Pump model nr:	1 / 2A / 3 / 4 / 5 / 6
Owner (full name):	Ahimed Andhun	Mobile nr. owner:	0925655994
Static water level:	2.54M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 30 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.79M Depth of the well: 5.5M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / brok
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations: Because there are a lot of user like 20 user the owner told them to not come and take water from his RP but I told him it is one of the agreement to use neighbor's for 3-4 month

Pump structure

- Are all bolts and nuts still present and tight? yes / no----------
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------

- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: Handle lock doesn't lock properly so I prefer the previou Model

Well cover, apron, drainage and soak pit

- Is pump still tightly connected to well cover? yes / no
- What is the condition of bolts in well cover? It is good
- What is the condition of the well cover? cracks / Placement , Good
- What is the condition of the apron? cracks / other, Good
- Can water leak back into the well? yes / no
- What is the condition of the drainage? cracks / other, Good
- Any other observations: He start to fence partially

MAINTENANCE CHECKS yes / no if not correct, please explain !

- Who does the maintenance on the pump?
- Is this the same person that was trained? yes / no if not, why the trained person was his son but now he move to the town to Butajera
- Are the bushings well lubricated (oiled)? yes / no frequency
- How often has the rope been re-tightened? frequency
- Was there any problem since installation? yes / no what?
- If yes, did the owner solve the problem? yes / no how?

Please carefully check!
Was the maintenance training (provided during installation) fully understood?
If all maintenance has been done correctly, the answer is yes.
But if maintenance has not been done, or not correctly, please try to find out why!

For example:

- Do you think the O&M training has been fully understood? yes / no
- If not, why do you think so? because the trained person was his son but now he move to the town s the owner Doesn't now about maintain
- Any other observations:

OTHER INFO

- How many households are using the pump? Previously there are 4 house holed but now because the Afredev pump is not working the user become 20
- Accidentally more (from other villages)? The owner told me 8hour per day
- How many hours / day is the pump used?
- Who operates the pump? woman / man / children,
- For what purpose is the pump used? drinking / irrigation / both,/cooking ,washing, cattle feed, seedling
- Any other relevant comments about use:

OTHER QUESTIONS TO THE USER

- Is it easy or heavy to operate the pump? easy / heavy / other
- Have you tested other rope pump models? yes / no, which ones:
- Which model do you prefer? The user told me I prefer the one which I have now
- Why? Because I don't see any problem and I adapt it
- Do you have any suggestions or remarks? Due to the advice of our side he started fence partially the area of rope pump
  The user compiling for the digger Because they were only Dewater but they didn't Dug my well

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 B / 4 / 5 / 6
Owner (full name):	Muzeyin Bergicho	Mobile nr. owner:	0928971104
Static water level:	3.45 M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 21 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.8M Depth of the well: 9.95M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no *Because the raise men clamp has no adjustment so it is difficult to centered in pvc pipe so it is important the adjustment system but for this pump I tried to adjust it by welding*
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no In economy type there is no bolt and nut
- Do you observe any broken welds? yes /no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 A / 4 / 5 / 6
Owner (full name):	Zeleke Degaga	Mobile nr. owner:	0924719863
Static water level:	3.76M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 22 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.7M	Depth of the well:	6.83M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no *Because Kids have broken the raiser men clamp so the rope is not centered so that I re weld it by keeping the center*
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no In economy type there is no bolt and nut
- Do you observe any broken welds? yes / raisin men holder clamp is broken according of t user told me kids wear playing on it during their absence and broken
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Tale	Pump model nr:	1 / 2 / 3 / 4 / 5 / 6 A
Owner (full name):	Husen Dawid	Mobile nr. owner:	0919667559
Static water level:	7.5M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 1 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.95M	Depth of the well:	15.15M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no during the first monitoring I adjust it
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations:

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Tale 01	Pump model nr:	1A / 2 / 3 / 4 / 5 / 6
Owner (full name):	Shemsu Omer	Mobile nr. owner:	0910190317
Static water level:	8.52M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 2 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.7M	Depth of the well:	12.94M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Grease nipples are taken by Kids but for the moment I replaced it
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5B / 6
Owner (full name):	Surur rejato	Mobile nr. owner:	0936488302
Static water level:	2.4M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 25 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	6.9M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly so I prefer the previous model

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	6B / 2 / 3 / 4 / 5 / 6
Owner (full name):	Temam Tira	Mobile nr. owner:	0932680251
Static water level:	4.3M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 27 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.94M	Depth of the well:	8.6M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properlyt

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1B / 2 / 3 / 4 / 5 / 6
Owner (full name):	Yasin Temam	Mobile nr. owner:	0925747448
Static water level:	4.8M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 29 / 12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.98M	Depth of the well:	10.8M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly so I prefer the previous model

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamija	Pump model nr:	1 / 2 / 3 / 4 / 5A / 6
Owner (full name):	Yilma Bireda	Mobile nr. owner:	0920997100
Static water level:	4.1M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 23 / `12 / 2013

GPS (North):		GPS (East):	
Diameter of the well:	0.8M	Depth of the well:	8.45M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no
- Do you observe any broken welds? yes / no
- Is there any corrosion on pump parts? yes / no
- Do you observe any wear on the bushings? yes / no
- Do you observe any wear on the axle? yes / no
- Is there any play between axle and busing? yes / no
- Any other observations: Handle lock doesn't lock properly so I prefer the previous model

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

Woreda name:	Meskan	Kebele :	Yetebon
Village name:	Mamijat	Pump model nr:	1 / 2B / 3 / 4 / 5 / 6
Owner (full name):	Mehamed surur	Mobile nr. owner:	
Static water level:	6.5M	Measuring time:	

GENERAL INFO (only once during installation)

Installation date: 3 / 1 / 2014

GPS (North):		GPS (East):	
Diameter of the well:	0.65M	Depth of the well:	13.3M

TECHNICAL CHECKS yes / no if not correct, please explain !

stons and PVC

e rope tension still correct?	yes / no	too loose / too tight / brok
e rope connection still correct?	yes / no	
e rope still centered in the PVC pipe?	yes / no	
ou observe any wear on the rope?	yes / no	
ou observe any wear on the pistons?	yes / no	
ou observe any wear on PVC parts?	yes / no	
other observations:	After I re install on 26/03/14 everything is good	

Pump structure

- Are all bolts and nuts still present and tight? yes / no----------
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations:

TECHNICAL MONITORING SHEET FOR VILLAGE TEST RPS

for monitoring by a technical (project) person

Name of technician: Teshome Tefera

Monitoring date: 10 / 4/ 2014

LOCATION

e: Meskan Kebele :Yetebon

: Mamija Pump model nr: 1 / 2 / 3 / 4 / 5 / 6

ame): Taju Mundese(Sofiay Ariga) Mobile nr. owner: O920 456224

evel: 2.7M Measuring time:

GENERAL INFO (only once during installation)

Installation date: 18 / 12 / 2013

GPS (North): GPS (East):

Diameter of the well: 0.75M Depth of the well: 7.25M

TECHNICAL CHECKS yes / no if not correct, please explain !

Rope, pistons and PVC

- Is the rope tension still correct? yes / no too loose / too tight / broken
- Is the rope connection still correct? yes / no
- Is the rope still centered in the PVC pipe? yes / no
- Do you observe any wear on the rope? yes / no
- Do you observe any wear on the pistons? yes / no
- Do you observe any wear on PVC parts? yes / no
- Any other observations:

Pump structure

- Are all bolts and nuts still present and tight? yes / no Since the model is windless there is no bolt an nut on it
- Do you observe any broken welds? yes / no----------
- Is there any corrosion on pump parts? yes / no----------
- Do you observe any wear on the bushings? yes / no----------
- Do you observe any wear on the axle? yes / no----------
- Is there any play between axle and busing? yes / no----------
- Any other observations: