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IDARA (INSTITUTING WATER DEMAND MANAGEMENT IN JORDAN)

ASSESSMENT REPORT FOR PLUMBING TRAINING AT THE
VOCATIONAL TRAINING CORPORATION

December 31, 2007

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**ASSESSMENT REPORT FOR PLUMBING TRAINING AT THE
VOCATIONAL TRAINING CORPORATION**

**IDARA
Instituting Water Demand Management in Jordan**

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The views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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I. List of Acronyms

BAU:	Balqa Applied University
EU:	European Union
GED:	General Equivalency Diploma
IAPMO:	International Association of Plumbing and Mechanical Officials
JCCA:	Jordan Construction Contractors Association
JEA:	Jordan Engineers Association
JICA:	Japan International Cooperation Agency
LPG:	Liquefied Petroleum Gas
MWI:	Ministry of Water and Irrigation
N/A:	Not available
OSHA:	Occupational Safety and Health Administration
PVC:	Polyvinyl Chloride
SABEQ:	Sustainable Achievement of Business Expansion and Quality
SME:	Small and Medium Enterprise
TAS:	Texas Accessibility Standards
UNRWA:	The United Nations Relief and Works Agency
USAID:	United States Agency for International Development
VTC:	Vocational Training Corporation
WDM:	Water Demand Management
WDMU:	Water Demand Management Unit
WEPIA:	Water Efficiency and Public Information for Action

2. Executive Summary

Jordan is considered to be one of the ten most water scarce countries in the world. A necessary and viable option for the country is to effectively manage its water demand. One key aspect of water demand management is reducing leaks and increasing efficient water use through improved water plumbing works in residential and commercial buildings. Achieving this goal needs an integrated approach that strives to improve and enable the legal and institutional environment in Jordan. This should include developing a new plumbing code and water efficient specifications and standards for plumbing materials and appliances along with improving skills and proficiency of plumbers in the country.

Capacity building of plumbers needs significant efforts that involve development of vocational education and training and linking it with the labor market. The main player in this sector is the Vocational Training Corporation (VTC) that trains plumbers, and qualifies and licenses them to work in the plumbing field.

This report assesses the VTC capacity in delivering plumbing training and proposes recommendations for the upgrade of its plumbing training facilities. The assessment was conducted for Ein Al Basha (Amman), Irbid and Aqaba Plumbing Training Facilities of the Vocational Training Corporation, with particular emphasis on Ein Al Basha Center in Amman. The report aims at assessing the training capabilities of the Ein Al Basha center in terms of current structure and infrastructure conditions, trainers' qualifications, level and nature of courses taught, in addition to the training approach applied.

The assessment is based on findings, observations, and conclusions from the analyses of information gathered from interviews, expert observations, workshops, and meetings held with the VTC and stakeholders.

The VTC plumbing facilities at the Ein Al-Basha consist of one plumbing workshop/lab that includes one classroom. The lab needs to be renovated and furnished with suitable equipment and tools to be capable of providing a suitable learning environment and delivering quality training on plumbing. Also one of the classrooms at the main building needs to be renovated and furnished with modern learning equipment (computer and data show).

Another key addition to VTC plumbing facilities would be the construction of a reduced scale three-story building to be used to train VTC trainees on all plumbing practices that are applied in buildings. This reduced scale building would also serve as testing tool for master plumbers in the future.

The total estimated cost of upgrading the plumbing training facility at Ein Al Basha center is 165,000 JD.

The issue of developing and delivering a master plumber training program by the VTC was also considered in this report. The Review of similar programs offered in the United States (particularly in the State of Texas) supports the approach of combining a certification program for professional plumbers with one to two weeks of training. This is what is really needed in Jordan. A program that combines branded certification with governmental enforcement and accreditation - by which only master plumbers would be licensed to carry and supervise major plumbing works in buildings- would insure success and create demand for the program.

The report concludes that VTC doesn't have the human resources or the capabilities required to deliver a master plumber program at present. Although the upgrade of VTC plumbing facilities is vital to provide improved training for the current training programs and would pave the way for a higher level of training, the proposed model for a master plumber

program discussed in the report should be delivered and coordinated with several institutions outside VTC. The involvement of VTC will still be important but the participation of other institutions such as the Jordan Engineers Association (JEA), Jordan Construction Contractors Association (JCCA), Balqa Applied University (BAU) and the private sector will be required to launch and sustain such a program.

3. Introduction

3.1 Overview of Technical and Vocational Education in Jordan

Jordan has experienced a remarkable growth and expansion in the education sector. The growth has taken place qualitatively in terms of the quality of offered contents, materials and teaching methods and quantitatively in terms of dramatic expansion in the number of schools, teachers, students, and streams offered in secondary education. The growth has also occurred in post-secondary education as demonstrated by the increased number of universities, community colleges and vocational training centers available all over the country.

According to the statistics of the Ministry of Education for the scholastic year 2005-2006, there are 1,550,088 students, 83,651 teachers and 5,498 schools. As for the students, 131,706 join schools every year as first graders, of which 102,689 continue to the tenth grade, 95,715 continue to the eleventh grade, and 88,616 continue to grade twelve.

Secondary education can either be academic or vocational and is further divided into the following streams: the scientific stream, which is occupied by around 29% of students enrolled in secondary education; the literary stream, taken by 39%; the Islamic Science stream, taken by 0.5%; the Information Technology Stream, taken by 13%; and, the vocational stream, taken by 18% of students. Vocational education is offered in six types of schools: commercial; industrial; agricultural; nursing; hotel services; and, home economics. Each of these categories offers different topics in the eleventh and twelfth grades, and is taught in one of the 74 secondary schools offering vocational education, which are distributed all over the Kingdom.

The Ministry of Education is the responsible body for primary and secondary education in Jordan. The Ministry realized the need for improving the sector and therefore launched reform plans that focus on the upgrade of teachers' skills, school administration, educational information systems, pre-school education, and education for children with special needs. The Ministry has also prepared a national program to enhance the vocational labor culture, directed to male and female trainees, which comes in response to the Ministry's vision in having a skilled labor force.

Vocational education is also offered to trainees enrolled in secondary education by the Vocational Training Corporation (VTC).

3.2 The Vocational Training Corporation

The Vocational Training Corporation was established in 1976 by Temporary Law No. 35. Currently the VTC operates under Law No. 11 (VTC Law) of 1985 and its revised Law No. 50 of 2001 as well as Law No. 27 of 1999 on Occupational Work Regulation.

The main roles of the VTC are to:

1. Provide workforce training (pre-service and upgrading) at different occupational levels;
2. Provide assistance for SMEs;
3. Regulate the labor force by classifying workplaces and workers.

The Corporation offers courses in various specializations such as: electricity; mechanics; carpentry; blacksmithing; hairdressing; food production; computing; sewing; vehicle maintenance; plumbing; construction works; and, maintenance.

The Corporation offers vocational programs for the following levels:

1. Semi-Skilled Level. The duration of this program is based on the requirements of each specialization, but usually does not exceed 700 hours. Applicants should not be younger than sixteen years old and have reading and writing skills.
2. Skilled Level. Depending on requirements of specializations, the duration of this program varies between two and four terms, each of 700 hours. Applicants must have completed the tenth grade and not be younger than 16 years old.
3. Craftsman Level. Depending on the requirements of specialization, the duration of this program varies between two and four terms, each of 700 hours. Applicants must have achieved a Secondary School Certificate.
4. Applied Secondary Education Program. This is a 24-month duration program that aims at preparing manpower for the Skilled Level. Applicants should not be younger than sixteen years old, and should have completed their elementary education (tenth grade).
5. Safety Supervisors Program. The output of this program is vocational safety supervisors that work according to the requirements and safety instructions issued by the Ministry of Labor. Applicants for this level must have achieved a Secondary School Certificate.

Apprentices of the above-mentioned programs are granted certificates upon completion of their requirements and passing the standard test.

6. Upgrading Programs. This includes Technical Upgrading Programs, Instructor Training Programs, Supervisory Training Programs, Occupational Safety and Health Training Programs, and Drivers Training Programs.

3.3 Purpose and objective

The purpose of this assignment is to conduct an assessment for Ein Al Basha (Amman), Irbid and Aqaba Plumbing Training Facilities of the Vocational Training Corporation, with particular emphasis on Ein Al Basha Center in Amman. The report aims at assessing the training capabilities of the Ein Al Basha center in terms of current structure and infrastructure conditions, trainers' qualifications, and level and nature of courses taught, in addition to the training approach applied.

Based on this assessment, IDARA will:

- Propose and recommend the needed upgrade for VTC's training facilities in order to deliver an advanced level of plumbing training.
- Propose and recommend an approach for establishing a master plumber program in Jordan.

3.4 Approach and methodology

- Consultation with stakeholders

A participatory approach was implemented throughout the assessment process in which formal and informal interviews, meetings, and discussions were conducted. A technical committee from the Vocational Training Corporation and IDARA project was formed for the development of a master plumber program. The objective of this committee is to facilitate and participate in the assessment of plumbing facilities, and set measures for upgrade. Building on relevant experiences in the field, IDARA reviewed the European Union's intervention in vocational education and training in Jordan¹, and contacted JICA and Sustainable Achievement of Business Expansion and Quality (SABEQ) Project to share experiences and coordinate efforts.

IDARA conducted several meetings with experienced plumbers to have a better knowledge of their training needs and the challenges that face the plumbing sector.

- Field visits

The three centers were visited to assess the current capabilities and conditions of their plumbing facilities. These visits were conducted with the cooperation and facilitation of the committee members and VTC staff.

Physical assessment was performed along with informative discussions with committee members, VTC staff and trainers.

¹ The European Training Foundation, 2006. Technical and Vocational Education and Training in Jordan - Areas for Development Cooperation. The Delegation of the European Commission in Amman. Available online at <http://www.europa.eu>

4. Current Situation at the VTC

4.1 Plumbing Training Programs

As mentioned earlier, this report will mainly focus on assessing Ein Al Basha (Amman), Irbid and Aqaba Plumbing Training Facilities of the Vocational Training Corporation, with particular emphasis on Ein Al Basha Center in Amman.

The vocational training methodology at the VTC is to deliver theoretical training accompanied by practical training (at the VTC) and on-the job training.

According to the training matrix (Appendix I), VTC has five levels of plumbing training:

1. Semi -Skilled
2. Skilled
3. Craftsman
4. Technician
5. Professional

However, the VTC has only delivered or is delivering the following two training levels:

1. First level (Semi- Skilled)

This is the first level of plumbing training. It is a 1700 hour training module.

A graduate of this level is certified as an assistant mechanic.

2. Second level (Skilled)

This is the second level of plumbing training. It is a 1373 hour of training. A graduate of this level is certified as a mechanic.

This level is currently not provided due to low demand and insufficient number of trainers.

Moreover, the VTC is planning to introduce a new level of training which is the Basic/Entry level. This level consists of 1200 hours of training (a total of 80 weeks, 32 weeks of training at the VTC and 48 weeks on the job).

4.2 Ein Al Basha Center

The VTC center at Ein Al Basha is managed under the Middle Region Directorate and was established in 1983. The total annual capacity of the center is 1500 trainees in all fields.

The VTC is currently engaged in the national training and employment program that was launched by the Jordanian Army in 2007. According to plans, the VTC will train 5,000 apprentices in 2008 in all fields. Ein Al Basha center will start training the first group in spring 2008, in which 80 Jordanians will be enrolled, in particular, in the semi-skilled plumbing course.

WEPIA's Intervention:

WEPIA project provided technical assistance to Ein Al Basha Center in 2004. WEPIA's intervention included the following:

- Training of trainers on water efficiency.
- Design and carry out of two women-oriented plumbing training courses: the first was called "Women's Home Maintenance" and the second was called "Professional Women Plumbers".
- Revision of existing plumbing curricula.

Upgrade of Ein Al Basha plumbing training facility to the minimum acceptable standards for the advanced plumbers' course.

A. Physical Assessment of the Plumbing Facilities and Equipments

The VTC center at Ein Al Basha has one plumbing workshop where plumbing and central heating training takes place (Figures 1 & 2). This workshop was provided with some plumbing equipment, mainly related to water efficiency under WEPIA Project.

Training Capacity: 45 Trainees (both plumbing and central heating)

Area: 312 m² (26 m X 12 m)

Classroom: 15 m² (3 m X 5 m)

Physical condition: Medium to Poor



Figure 1: Photo of Ein Al Basha Plumbing Workshop



Figure 2: Demonstration of bathroom

The following table lists the available training stations, and major equipment and their condition at Ein Al Basha plumbing workshop/lab (as per the attached layout- Appendix 2):

Station/Equipment	Description/Status	No.	G	M	P
Grinder	Working	1	X		
Solar heating System	A small model /not to scale	1		X	
Floor drill	Working	1		X	
Plumbing training booth	Used to layout pipes horizontally/vertically				
Water Treatment Unit	Working	1		X	
Cold/Hot water installation 1	Working	1		X	
Cold/Hot water installation 2	Working	1		X	
Burners and Hot water recirculation pumps cabinet	Working	1	X		
Burner and pumping station	Working	1	X		
Burner and Pumping Station	Working	1		X	
Boiler station	Working	1		X	

Table 1: Condition of working stations and equipment available at Ein Al Basha Plumbing and Central Heating Workshop

Available Equipment and Tools

The assessed plumbing workshop/lab has the needed equipment to train trainees on the VTC curriculum for the first and the second level. However, it should be noted that the VTC curriculum needs updating and does not include sufficient training on plastic pipes and new plumbing technologies. The condition of VTC equipment and tools varies from good to poor (as per the attached list in Arabic- Appendix 3).



Figure 3: Working Tables at Ein Al Basha Plumbing Workshop



Figure 4: Demonstration of central heating system (radiators and plastic pipes)

B. Capacity of Trainers

Ein Al-Basha Center has three trainers and a training officer in the plumbing and central heating division.

The three trainers have a two-year diploma in heating and air conditioning from a community college. The Training officer has a bachelor degree in Mechanical Engineering (Table 2).

Education	Secondary	Community College	University	Other
Training officer			/	
Trainers		///		

Table 2: Academic qualifications of trainers at Ein Al Basha plumbing and central heating division

Skills	Basic	Fair	Good	Excellent
Computer Skills	///			
English Language				
Reading	///			
Writing	///			
Communication	///			

Table 3: Skills of trainers at Ein Al Basha plumbing and central heating division

Assessment Worksheet

Plumbing Workshop/Lab:

Item	No.	G	M	P
PC	1			1
TV	0			
Video	0			
Table	3		2	1
Chair	12		10	2
Cupboard	4		4	
Bench	5			5

Item	G	M	P	N/A
Paint		✓		
Floor			✓	
Door		✓		
Window		✓		
Screen			✓	
Curtains				✓
Electrical outlets		✓		
Heating system				✓
AC				✓

Classroom- within the same building

Item	No.	G	M	P
PC	0			
TV	0			
Video	0			
Cass	0			
Table	1		✓	
Chair	1			✓
Cupboard	0			

Item	G	M	P	N/A
Paint		✓		
Floor		✓		
Door			✓	
Window			✓	
Screen			✓	
Curtains				✓
Electrical outlets		✓		
Heating System				✓
AC				✓

4.3 Hakama-Irbid Center

The VTC center in Hakama-Irbid managed under the Northern Region Directorate was established in 1982. The total annual capacity of the center is 250 trainees. The center has trained more than 12000 trainees from its establishment to the year 2006.

The VTC center at Hakama-Irbid has one plumbing workshop where plumbing and central heating training takes place.

Capacity: 30 trainees

Area: 312 m² (26m X 12m)

Classroom: 15 m² (3m X 5m)

Physical condition: Good to Medium

The following table lists the available training stations and major equipment and its condition at the workshop/lab (as per the attached layout- Appendix 5):

Station/Equipment	Description/Status	No.	G	M	P
Automatic Threading Machine	Working	1	X		
Grinder	Working	1	X		
Pipe holder	Working	1	X		
Boiler	Working	1	X		
Solar heating System	A small model/not to scale	1		X	
Plumbing training booth	Used to layout pipes horizontally/vertically	1		X	

Table 4: Condition of working stations and equipment available at Hakama Plumbing and Central Heating Workshop

Available Equipment and Tools

The assessed plumbing workshops/labs have the needed equipment to train trainees on the VTC curriculum for the first and the second level. However, it is worth mentioning that the VTC curriculum needs updating and does not include sufficient training on plastic pipes and new technologies. The condition of the VTC equipment and tools varies from good to poor (Appendix 6).

B. Capacity of Trainers

The Hakama Center has three trainers and a training officer in the plumbing and central heating division.

One trainer has a two-year diploma in heating and plumbing from a community college, while the other two trainers have Tawjihi certificates-Industrial branch. The training officer has a bachelor degree in Mechanical Engineering (Tables 5 and 6).

Education	Secondary	Community college	University	Other
Training officer			/	
Trainers	//	/		

Table 5: Academic qualifications of trainers at Hakama Plumbing and Central Heating Division

Skills/Rate	Basic	Fair	Good	Excellent
Computer Skills	////			
English Language				
Reading	////			
Writing	////			
Communication	////			

Table 6: Skills of trainers at Hakama Plumbing and Central Heating Division

4.4 Aqaba Center

Established in 1988, the VTC center in Aqaba is managed under the South Region Directorate .The total annual capacity of the center is 233 trainees.

The VTC center at Aqaba has one plumbing workshop where plumbing and central heating training takes place.

Capacity: 15 trainees

Area: 214 m² (21.5 m X 9.95 m)

Physical condition: Good

No. of trainers: 1 (on sick leave)

Classroom (3.9 m X 2.68 m)

The following table lists the available training stations and their condition at the workshop/lab (as per the attached layout- Appendix 8):

Station/Equipment	No.	G	M	P
Plastic (Thermo pipe) pipe station	1	X		
Metal pipes Station	1	X		
Water Treatment Station	1	X		
Solar Heating Station- A small model /not to scale	1	X		

Table 7: Condition of working stations and equipment available at the Aqaba Plumbing and Central Heating Workshop

Available Equipment and Tools

The assessed plumbing workshops/labs have the needed equipment to train trainees on the VTC curriculum for the first and the second levels only. However, it is worth mentioning that the VTC curriculum needs updating and does not include sufficient training on plastic pipes and new technologies.

The condition of the VTC equipment and tools varies from very good to good condition (A complete list of the available plumbing equipment and tools is provided in Arabic in Appendix 9).

Skills/Rate	Basic	Fair	Good	Excellent
Computer Skills	/			
English Language				
Reading	/			
Writing	/			
Communication	/			

Table 8: Skills of the trainer at the Aqaba Plumbing and Central Heating Division

5. Findings and Analysis

As been mentioned earlier, this report assesses the current situation at Ein Al Basha Center since it is the most suitable center for introducing an advanced level of plumbing training.

This analysis will mainly cover the physical condition of the plumbing facility in addition to issues affecting its capability in providing plumbing-related training programs such as qualifications of trainers, training approach and content, accreditation and licensing and gender mainstreaming issues.

5.1 Physical condition

A. Plumbing Workshop and Classroom Finishing

Our assessment covers the finishing of the plumbing workshop and classroom in terms of condition of ceiling, flooring, restrooms, doors and windows, in addition to the availability and condition of Heating /Air Conditioning Systems.

The finishing of the plumbing workshop and classroom ranges between medium and poor. Table 9 presents the main items that have been assessed, the condition of each, and actions needed for renovation and improvement.

Item	Current Condition	Actions needed
Plumbing workshop		
Floor	Poor- eroded	Polish floor and coat it with non-slip Epoxy
Wall and ceiling	Medium	Paint with a suitable color (light gray) Fix leaks and do water proofing (Figure 5)
Windows	Medium	Maintain and fix any broken parts
Electrical sockets	Poor to medium	Install new electrical sockets
Washing sinks	poor	Install new washing sinks
Air conditioning	N/A	Install air conditioning units to be used for heating and cooling
Classroom- located in the main building		
Floor	Medium	Polish floor
Windows	Medium	Perform Maintenance
Walls and ceiling	Medium	Paint with a suitable color (such as off-white)
Door	Medium	Paint the door
Electrical sockets	Poor to medium	Install new sockets
Bathroom	Medium	Maintain the bathroom near the classroom. Install water efficient faucets and toilets.

Table 9: Finishing of the plumbing workshop and classroom at Ein Al Basha Center



Figure 5: Water leakage from windows

B. Plumbing Workshop and Classroom Furnishing

As any other plumbing facility, Ein Al Basha Center is furnished with working tables, chairs, safety equipment, first aid kits, fire extinguishers, and so forth. However, the quantity and condition of these materials vary widely depending on their importance and necessity for plumbing training.

Table 10 below lists the findings regarding the main priority items to be provided in the plumbing workshop and classroom in Ein Al Basha Center, and presents the current condition of each.

Item	Current Condition	Actions needed
Plumbing workshop		
Lockers for trainees	N/A	Provide and install 30 lockers
Fire Extinguishers	3 fire extinguishers Condition: good	Provide 2 additional fire extinguishers
First Aid kit and closet	Not adequate	Provide a first kit and closet
Working tables	3 tables Condition: medium to poor	Provide and install 4 working stations that are suitable for plumbing work
Chairs	12 chairs Condition: mainly poor	Provide 15 chairs
Safety equipment	N/A	Provide safety equipments such as safety boots, goggles, gloves, and so forth
Desktop computer	Not working	Provide one desktop computer
Printer	N/A	Provide one printer
Classroom- located in the main building (Figure 6)		
Curtains	N/A	Provide and install curtains
Chairs	School bench Condition: poor	Provide 25 lecture chairs
Air conditioning	N/A	Provide and install an air conditioning unit
White board	N/A - Only a chalk board is available	Provide and install a wide whiteboard
Data show	N/A	Provide a data show with a screen
TV and DVD player	N/A	Provide TV and DVD player
Laptop computer	N/A	Provide one laptop computer

Table 10: Condition of the plumbing workshop and classroom furnishings at Ein Al Basha Center



Figure 6: Classroom at Ein Al Basha Plumbing and Central Heating Workshop

C. Plumbing Equipment and Tools

A list of plumbing equipment and tools available at Ein Al Basha training center was provided by the VTC Technical Committee members (Appendix 3). The Committee has also provided IDARA with a list of equipment and tools needed for the upgrade of the plumbing workshop (Appendix 4).

D. Proposed Reduced Scale House for training and testing purposes (3 stories)

To simulate a workplace environment and offer a higher level of plumbing training, IDARA recommends that a reduced scale three-story building be constructed. This building would be used to train VTC trainees on all plumbing practices that are applied in houses and buildings. This reduced scale building would also serve as a testing tool for master plumbers in the future.

Main specification of this building would be

- Three stories (height of each floor not more than 230 cm)
- Each floor is 50 m² (include one kitchen, one bathroom)
- Steel Structure
- Movable floor tiles and interior wall to allow for the installation/removal of piping.

Estimated Budget for upgrading the plumbing facility at the VTC as in Table 11 below.

Item	Estimated Cost (JD)
Renovation and Furnishing of the VTC lab and classroom	45,000
Plumbing Equipment and tools	30,000
House Model (3 stories)	90,000
Total	165,000

Table 11: Estimated cost for upgrade of the plumbing facility at Ein Al Basha Center

5.2 Training capability

A. Trainers qualifications

The Plumbing and Central Heating Division at Ein Al Basha Center has three trainers and one training officer. The trainers have a two-year diploma and the training officer has a Mechanical Engineering degree. They have spent the majority of their professional lives as trainers at the Vocational Training Corporation and have not received sufficient technical training to keep them updated with modern plumbing technologies.

Trainers have limited computer and English Language skills, and need to be given intensive courses to improve their proficiency. They also need to be acquainted with the advanced techniques in teaching, such as “Active Learning”² techniques and use of participatory approaches in teaching through “Cooperative Learning”³ methods rather than only focusing on passive listening and learning.

Most of the trainers are in their middle age (45-55 years old) and are eligible for early retirement. Therefore, in the absence of financial and recognition incentives, the trainers may not be motivated to develop their technical and training skills and may instead be motivated to apply for early retirement and join the private sector.

B. Training content

The Vocational Training Corporation currently provides training on plumbing and central heating topics as separate courses for the Semi-Skilled and Skilled levels. However, the VTC is planning to combine these topics in the proposed Basic-Level training program that will be given in the future.

Generally, plumbing and central heating courses provided at the VTC cover the following issues: installation and maintenance of central heating networks; installation of domestic water networks; assembly of sanitary water treatment networks; water tanks and solar heating tanks; isolation of plumbing pipe networks; assembly and maintenance of water saving devices; and so forth. However, these programs should also acquaint trainers and trainees with the water crisis in Jordan and focus more on the importance of implementing water-saving measures and installation of water-saving fixtures and appliances that meet water-efficiency standards such as shower heads, faucet aerators, and dual-flush toilets.

² Active Learning is anything that students do in a classroom other than merely passively listening to an instructor's lecture. This includes listening practices, short writing exercises, group exercises, and so forth.

³ Cooperative learning covers the subset of active learning activities which students do as groups of three or more, rather than alone or in pairs. Generally, cooperative learning techniques employ more formally structured groups of students assigned complex tasks, such as multiple-step exercises, research projects, or presentations.

C. Training approach and methodology

The Vocational Training Corporation provides trainees with the opportunity to get theoretical knowledge in addition to practical/hands-on training. Trainees are usually subjected to introductory theory-based classes prior to being practically trained in VTC plumbing labs and workshops. Then, after getting the required training in VTC labs and workshops, trainees are usually urged to join a private-owned plumbing workshop to get on-the-job training.

The VTC still teaches in the traditional way, which focuses on passive listening and learning. Trainers still use blackboards and chalk for teaching rather than using the more advanced techniques such as flip charts, data show, and whiteboard, not to mention group exercises and discussions.

As for the practical training, VTC plumbing labs are not equipped to demonstrate or teach the latest up-to-date technologies; hence trainees do not usually get the experience required in the labor market.

D. Accreditation and licensing

According to the Occupational Work Regulation Law No. 27 for year 1999, the Vocational Training Corporation should carry out the following:

1. Classification of workers according to a skills ladder (limited skills, skilled, craftsmen, technician, and professional levels).

This classification is maintained by testing, certifying and licensing trainees. Currently, the VTC test and certify plumbers- who apply for certification- for three levels: limited skilled, skilled and craftsmen levels. However, this certification is not enforced yet and the majority of plumbers are working and providing their services without a license or a certificate.

2. Classification of workshops (occupational places) according to size, condition and availability of equipment and tools, occupational safety measures, number and skills of workers, and technical level of the administration.

The Government and the VTC have started enforcing this provision and any plumber who decides to open a workshop has to be certified and licensed as a prerequisite for getting his workshop licensed.

E. Gender

In 2004, the USAID-funded Water Efficiency and Public Information for Action (WEPIA) project provided two plumbing training courses designed and offered only for women:

- The first was a short course called “Women’s Home Maintenance” and was offered to 23 household women.
- The second was a more advanced certification course and was called “Professional Women Plumbers”.

These courses were conducted at the facilities of the Vocational Training Corporation with assistance from the Jordan Forum for Business and Professional Women.

The courses were well received by women trainees and were proven successful. However, the Corporation did not explore the possibility of offering women-oriented plumbing courses on a continuous basis.

6. Issues/Challenges

The challenges that face the Vocational Training Corporation when conducting plumbing training programs could be divided based on their nature into internal and external. The most relevant challenges are mentioned below.

Internal (Institutional) challenges

- Minimum investment in upgrading facilities and replacing outdated plumbing equipment.
- The location of certain plumbing training facilities is remote from residential areas, which may constitute a travel barrier for trainees willing to join the profession.
- Insufficient practical skills and industry-employment experience of trainers. In addition to basic knowledge of English Language and limited computer skills.
- Insufficient number of trainers. There are difficulties in attracting local skilled trainers due to the comparatively low-wages and lack of incentives.
- Lack of capacity building programs for trainers.

External challenges

- Insufficient number of trainees. This is mainly due to the dominant perception that skilled trades and manual jobs sectors are attributed low social prestige, and are perceived by the general public as having no ongoing 'career pathway'.
- Low abilities of trainees enrolled in plumbing courses which is one of the main causes for the high drop-out rates.
- Insufficient cooperation and coordination with the private sector.
- Weak Linkages between vocational training programs and the labor market needs.

7. Master Plumber Program

As mentioned previously, the VTC plumbing training system does not include a higher level of plumbing training (craftsman or technician levels). Hence, delivering an advanced level of plumbing training/certification program is essential to regulate the plumbing occupation and insure high quality workmanship that meets local codes and standards.

In order to design an advanced, efficient and successful program, IDARA explored several existing models of advanced plumbing training and certification programs. One of these is the experience of the State of Texas in certifying plumbers. The experience of Texas demonstrated in this report because it is the only state that requires a hands-on test along with a written exam. Texas assesses apprentices for their technical and mechanical “hands-on” knowledge and experience. The three plumbing training levels that are given by the State are: tradesman plumber-limited; journeyman plumber; and, master plumber. This model is discussed in the following section.

7.1 Texas model- A Case Study⁴

Three levels of certificates are given to plumbers in Texas. The first is the **tradesman plumber-limited level**, which is issued based on the achievement of the following:

- Current Texas Plumber’s Apprentice registration.
- At least 4,000 hours of experience working at the trade under the direct supervision of a licensed plumber and general supervision of a Master Plumber or has a valid Journeyman or Master Plumber license from another state and at least 4,000 hours of experience working at the trade under the general supervision of a Master Plumber.
- Knowledge of the proper preparation and assembly of plumbing materials as well as how the entire plumbing system for a one-or-two-family dwelling should be installed.
- US citizenship, permanent residence, or legal employment permission.
- Tradesman Plumber-Limited Examination, which is based on the International Plumbing Code and International Fuel Gas Code, 2000 version, published by the International Code Council or the Uniform Plumbing Code, 2000 version, published by the International Association of Plumbing and Mechanical Officials.

The examination is divided into two parts: the written exam; and, the mechanical “hands-on” shop work. The written examination tests the applicant’s knowledge of residential waste and vent systems, natural gas systems, water systems, proper plumbing terms and definitions, cross-connections, back-siphoning, backflow, water heaters, and the Plumbing License Law and Board Rules.

The Sanitary Waste and Vent Installation portion tests the applicant’s knowledge of the proper planning, layout and installation of residential sanitary waste and vent systems. The applicant is required to design the sanitary waste and vent system for a two-story, two-family dwelling. The applicant then must develop the material “take-off” (list of materials)

⁴ Texas State Board of Plumbing Examiners, January 2005.

from the design, order the material and actually install the sanitary waste and vent system in a reduced scale two-story, two-family dwelling.

The Mechanical “Hands-On” Shop-work portion of the examination tests the applicant’s knowledge and ability to properly use plumbing tools to measure, cut, prepare, assemble, install plumbing materials and recognize proper installations of water heaters.

The second level is the **journeyman plumber level**. This type of certificate is granted based on the achievement of the following:

- Current Plumber’s Apprentice registration, current Tradesman Plumber-Limited license, or valid Journeyman or Master Plumber license from another state.
- At least 8,000 hours of experience working at the trade under the direct supervision of a licensed plumber and general supervision of a Master plumber.
- High school diploma or General Equivalency Diploma (GED).
- US citizenship, permanent residence, or legal employment permission.
- Journeyman Plumber Examination, which is based on the International Plumbing Code and International Fuel Gas Code, 2000 version, published by the International Code Council or the Uniform Plumbing Code, 2000 version, published by the IAPMO.

The examination consists of 90 written multiple choice questions, designed to test the applicant’s knowledge of waste and vent systems, natural gas systems, water systems, proper plumbing terms and definitions, cross-connections, back-siphoning, backflow, water heaters, and the Plumbing License Law and Board Rules.

The examination also includes mechanical “hands-on” shop work that includes: measuring, cutting, assembly and fitting of commonly used plumbing pipes and fittings (solvent cemented PVC, soldered copper, brazed copper, threaded steel, and compression band type cast iron); and, identifying proper and improper installation of water heaters. The examination assesses the applicant’s capability in designing a two-story sanitary drainage and vent system for eight plumbing fixtures and installing the designed system into a scaled-down model of a two-story building, using miniature pipes and fittings.

The third level is the **master plumber level**, which is granted to applicants upon the achievement of the following:

- At least one year experience as a certified journeymen plumber from Texas or other states or a holder of a master plumber license in another state.
- High school diploma or GED.
- US citizenship, permanent residence, or legal employment permission.
- Master Plumber Examination, which is based on knowledge of the OSHA regulations, Code of Federal Regulations, LPG Safety Rules, ADA TAS, in addition to knowledge of the International Plumbing Code and International Fuel Gas Code or the Uniform Plumbing Code published by IAPMO.

The applicant for a Master Plumber License is tested on his or her knowledge and understanding of the proper installation of commercial and residential plumbing systems. The examination relates to work performed and decisions made on the job

by a Master Plumber. It consists of 210 multiple choice questions designed to test the applicant's knowledge of plumbing codes, the OSHA Code Federal Regulations, the TAS as they apply to plumbing fixture installations, LPG piping installation, Plumbing Related Mathematics, and the Plumbing License Law and Board Rules. It is also composed of testing on the Fuel Pipe Sizing chart, Water Pipe Sizing chart, Gas Fueled Appliance Vent Sizing chart, Drainage System Pipe Sizing chart, and design of a three-story sanitary drainage and vent system for sixteen (16) plumbing fixtures and the installation of the designed system into a scaled-down model of a three-story building, using miniature pipe and fittings.

8. Recommendations

In order to upgrade and improve the plumbing training programs at the VTC and provide the labor market with certified and professional plumbers, the following recommendations are proposed. These recommendations should be adopted by VTC with the support of USAID, IDARA project and other governmental institutions and non governmental organizations.

Condition and upgrade of the plumbing facility at Ein Al Basha Center

- Renovate and furnish, as indicated in the report, the plumbing training facility at Ein Al Basha Center.
- Renovate and furnish, as indicated in the report, one classroom at the main building to be used as a lecturing/training room.
- Provide the VTC with new and high quality plumbing equipment and tools needed to improve the quality of offered training courses and provide an advanced level of training.

Training capability

- Revise the criteria for appointing vocational trainers and provide on-going professional development.
- Build the capacity of trainers, equip them with new technical skills in their specialties, and improve their English language and computer skills.
- Coordinate with the private sector to train trainers on the new technologies and equipment and provide training for graduates of the Vocational Training Corporation.
- Familiarize trainers with the advanced techniques in teaching, such as “Active Learning” techniques and use of participatory approach in teaching through “Cooperative Learning” methods rather than only focusing on passive listening and learning.
- Encourage linkages between the VTC and private sector companies and manufacturers to keep the VTC updated with the newly-introduced technologies. This could be done through supplying the VTC with samples of equipment, tools and plumbing materials and/or conducting promotional visits and lectures.

Master plumber program

- Develop a Master Plumber Program that combines branded certification with governmental enforcement and accreditation, by which only master plumbers would be licensed to perform and supervise major plumbing works in buildings. This would insure success and create demand for the program.

- Coordinate with the Jordan Engineers Association (JEA), Jordan Construction Contractors Association (JCCA), Balqa Applied University (BAU) and the private sector when developing and delivering the master plumber program.
- Design a two-week training course for master plumbers.

Accreditation and certification

- Accreditation and issuance of certificates should be regulated and enforced as per the Occupational Work Regulation Law No. 27 of 1999.
- In terms of maintaining and improving occupational standards, testing and certification, it is recommended to establish an effective competency-based accreditation system that acknowledges trainees for their credentials, competencies, and skills in their specializations.
- A specialized committee made up of representatives from the Ministry of Higher Education, Ministry of Labor, BAU, VTC, JEA, JCCA and others should be established to participate in the certification process. Certification should be specific for each training level and specialization and should be based on completion of training-level requirements and achievement of theoretical and mechanical “hands-on” examination.

9. References

Texas State Board of Plumbing Examiners, January 2005.

The European Training Foundation, 2006. Technical and Vocational Education and Training in Jordan - Areas for Development Cooperation. The Delegation of the European Commission in Amman. Available online at <http://www.europa.eu>

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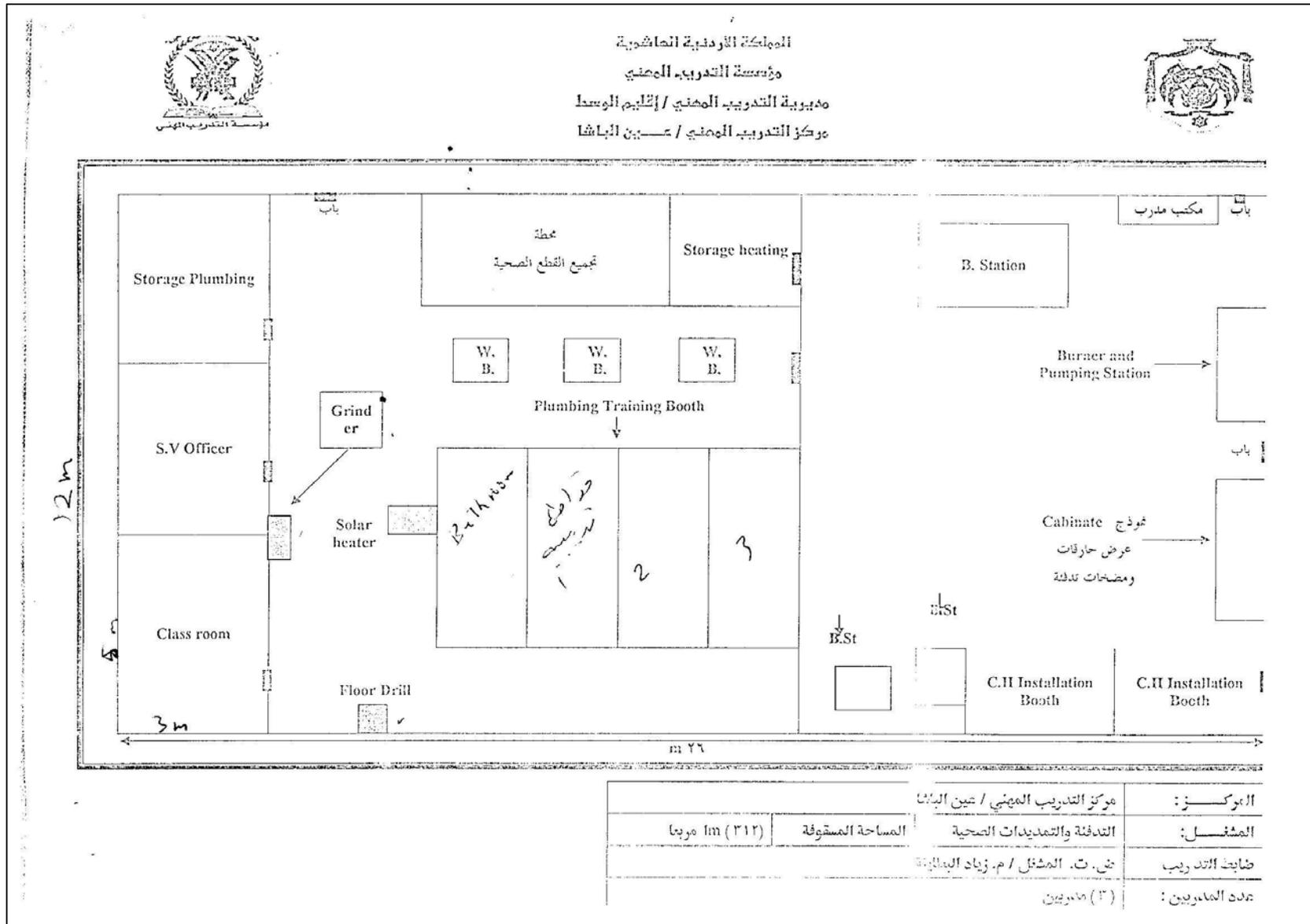
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Appendix 2- Layout of Ein Al Basha Center



Appendix 3- Plumbing and Central Heating Equipment and Tools Available at Ein Al Basha Training Center

الرقم	اسم التجهيزات والأدوات والعدد اليدوية	الوحدة	الكمية	الحالة الفنية	تاريخ الإدخال في المشغل	ملاحظات
1.	ماكينة لحام بلاستيك لقمة 22 ، 32 ملم	عدد	1	جيدة	1995/12/26	
2.	أزميل مبسط 4/3 × 12	عدد	2	متوسطة	1998/6/15	
3.	أزميل قطع 8/7 × 8	عدد	3	متوسطة	1998/6/15	
4.	أزميل قطع 8/5 × 10	عدد	1	متوسطة	1984/4/7	
5.	أزميل قطع 8/1 × 12 طول 30 سم	عدد	4	متوسطة	1998/6/15	
6.	أزميل قطع 8/5 × 6 شوكة	عدد	1	متوسطة	2000/7/27	
7.	أفوميتر فك رقمي	عدد	1	متوسطة	1998/11/25	
8.	بويلر (مرجل)	عدد	3	متوسطة	1996/11/8	نماذج تدريب
9.	بديه فخار مطلي بالصيني	عدد	1	متوسطة	2006/3/29	نموذج تدريب
10.	جهاز أوفر هيدرولوجتر	عدد	1	جيدة	1984/4/7	للتدريس (شفاقيات)
11.	همر درل	عدد	2	متوسطة	2006/3/9	واحد بقوائم الشطب وواحد متوسط
12.	زرادية كهربائية معزولة	عدد	2	جيدة	2007/5/2	
13.	زرادية كهربائية	عدد	2	متوسطة	2003/3/5	
14.	زرادية كبس	عدد	6	جيدة	2007/6/23	
15.	طاولة مدرب	عدد	2	متوسطة	1983/11/24	
16.	طاولة مفردة صغيرة	عدد	1	متوسطة	1984/6/14	
17.	طقم مفتاح رنج	طقم	1	جيدة	1987/2/16	
18.	طقم مفتاح ألت	طقم	4	جيدة	2007/6/23	اثنان حالتهم سيئة
19.	طاولة عمل أربع محطات	عدد	3	متوسطة	2000/1/12	
20.	طعاجة مواسير هيدروليكية	عدد	1	سيئة	1984/3/21	
21.	طاولة رسم	عدد	2	جيدة	2006/9/25	
22.	تورش غاز	عدد	1	جيدة	2007/9/5	
23.	طقم تختابية مواسير من 2/1 - "1 سوبر	طقم	6	متوسطة وجيدة	2007/9/5	اثنان جيدة وأربعة متوسطة
24.	طفاية حريق CO ₂	عدد	3	جيدة	1991/1/26	
25.	طقم بوكس	عدد	2	متوسطة	2003/8/5	
26.	قطاعة أسلاك معزولة	عدد	3	متوسطة	2003/10/27	
27.	طقم مفتاح شق 32/6	طقم	2	متوسطة	2003/10/27	
28.	لوحة رسم	عدد	1	متوسطة	1989/2/11	

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.29	مضخة فحص شبكات التدفئة	عدد	1	متوسطة	2005/12/29	
.30	مضخة تدفئة 2"	عدد	1	جيدة	1992/11/25	
.31	مضخة ماء إيطالي لورا	عدد	1	جيدة	2006/9/25	نموذج داخل طاولة العرض
.32	مفتاح ريجد 6"	عدد	5	متوسطة وجيدة	2006/3/23	أربعة متوسط وواحد جيد
.33	مفتاح ريجد 8"	عدد	6	متوسطة	2006/3/23	واحدة جيدة
.34	مفتاح ريجد 10"	عدد	3	متوسطة	2006/3/23	واحدة جيدة
.35	مفتاح ريجد 12"	عدد	6	متوسطة	2006/3/11	واحدة بحالة جيدة
.36	مفتاح ريجد 4"	عدد	3	جيدة	2006/3/23	
.37	مفتاح ريجد 18"	عدد	7	جيدة	2006/3/23	
.38	مفتاح ريجد 24"	عدد	5	جيدة	1983/11/20	
.39	مفتاح انجليزي أبيض 12"	عدد	1	متوسطة	1983/11/20	
.40	متر حديد	عدد	1	جيدة	2007/6/23	
.41	مقدح يدوي شاكوش	عدد	1	متوسطة	1992/11/25	
.42	مقدح قاعدة معادن	عدد	1	متوسطة	1983/11/24	
.43	ماكينة جليخ SM7	عدد	1	جيدة	1983/11/24	
.44	مطرقة قصدير	عدد	4	جيدة	1984/12/27	
.45	مطرقة بناء	عدد	3	متوسطة	1984/4/7	
.46	مقعد مزدوج	عدد	10	متوسطة	1997/12/3	
.47	منشار حديد يدوي	عدد	5	جيدة	2007/2/24	
.48	ملزمة عمل	عدد	3	متوسطة	1984/4/9	
.49	ملزمة مواسير 3 / 2 / 1"	عدد	5	متوسطة وجيدة	2006/3/23	ثلاثة جيدة + اثنان متوسطة
.50	ملزمة قصدير	عدد	6	متوسطة وجيدة	2006/3/23	ثلاثة متوسطة + ثلاثة جيدة
.51	مقص مواسير 2" / 4"	عدد	2	جيدة	1984/2/26	
.52	مقص أنابيب سكب	عدد	1	متوسطة	1985/12/19	
.53	مقص مواسير نحاسية	عدد	1	جيدة	1995/12/26	
.54	مقص مواسير 8/1 - 2"	عدد	2	متوسطة	2006/6/23	
.55	ماكينة تسليك مجاري يدوية	عدد	2	جيدة	2006/6/23	
.56	ماكينة تسليك مجاري كهربائية	عدد	2	متوسطة وسيئة	1988/1/16	واحدة متوسطة وواحدة سيئة
.57	مفتاح مغاسل	عدد	3	جيدة	2007/6/23	اثنان جيدة وواحدة سيئة
.58	مفتاح مواسير روسي	عدد	2	متوسطة	1992/5/24	

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.59	مبرد نصف دائري 30 سم	عدد	2	متوسطة	1992/10/26	
.60	ستران صغير	عدد	1	جيدة	1984/4/7	
.61	سلم 4 درجات ألومنيوم (سيية)	عدد	1	متوسطة	1985/2/20	
.62	صوبة كاز فوجيكا	عدد	2	متوسطة	1989/12/14	
.63	كرسي مدرب دوار	عدد	4	سيئة	2002/12/18	واحد جيد وثلاثة سيئة
.64	كرسي بلاستيك	عدد	10	متوسطة	1985/1/27	
.65	كليب قياسي	عدد	1	جيدة	1991/10/23	
.66	كشاف كهربائي	عدد	1	جيدة	1997/2/16	
.67	رايمر (مكمل قطع الأنابيب)	عدد	2	جيدة	2006/9/25	
.68	ردبتر تدفئة (مقطع)	عدد	24	جيدة	2003/1/7	
.69	شاكوش 2 ليبرة دائري	عدد	7	متوسطة	1984/1/1	
.70	شاكوش يد شام 1.5 كغم	عدد	1	متوسطة	1984/1/1	
.71	شاكوش مبسط 30 غم	عدد	5	متوسطة	1984/4/7	
.72	خزانة حديد	عدد	6	متوسطة	1987/3/7	
.73	خزانة حديد صغيرة	عدد	3	جيدة		
.74	خزانة حديدية قياس 60×130×120 سم	عدد	1	متوسطة	1995/5/3	
.75	جهاز فحص كفاءة الاحتراق	عدد	2	جيدة	1995/10/21	لم يستعمل لعدم معرفة استعماله
.76	صيدلية خشبية	عدد	1	جيدة		
.77	طقم تختاية سويد ايجو للتسنين	طقم	3	متوسطة	2003/10/27	
.78	خزانة سولار 1م3 للمراجل	عدد	1	جيدة	2002/1/16	
.79	طاولة عرض خشبية 80×80×200سم	عدد	1	جيدة	2002/9/29	
.80	ازميل مبسط 9 × 4/3"	عدد	1	متوسطة	2003/10/17	
.81	صدام أمان للمرجل	عدد	3	جيدة	2003/10/27	
.82	ملزمة مواسير فكية 2/1 - 2"	عدد	4	جيدة	2006/3/23	
.83	طقم تختاية للتثبيت 8/1 - 2"	طقم	1	متوسطة	2006/3/9	مستعمل
.84	زرادية تركيب حلقات	عدد	2	جيدة	2006/8/23	
.85	مفك 10 × 250 ملم	عدد	5	جيدة	2006/3/23	
.86	مفك 10 × 30 ملم	عدد	5	جيدة	2006/3/23	
.87	مفك مصلب كبير 3"	عدد	2	جيدة	2006/3/23	
.88	ازميل 12 × 8/5"	عدد	5	جيدة	2006/3/23	

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.89	ازميل 12 × 4/3"	عدد	5	جيدة	2006/3/23	
.90	ازميل 18 × 1"	عدد	5	جيدة	2006/3/23	
.91	ازميل 5 × 16/3"	عدد	5	جيدة	2006/3/23	
.92	ازميل 4 × 4/1"	عدد	5	جيدة	2006/3/23	
.93	كريك دائري	عدد	4	جيدة	2006/3/23	
.94	ملزمة مواسير 8/1 × 5"	عدد	2	جيدة	2006/3/23	
.95	ملزمة مواسير رأس عادي	عدد	2	جيدة	2006/3/23	
.96	ملزمة مواسير بدون قاعدة	عدد	2	جيدة	2006/3/23	
.97	ازميل يدوي لفتح مجرى	عدد	5	جيدة	2006/3/23	
.98	ازميل 7 × 6/5"	عدد	5	جيدة	2006/3/23	
.99	ازميل بناء 10 سم	عدد	5	جيدة	2006/3/23	
.100	جهاز تسرب المياه	عدد	1	جيدة	2007/6/23	
.101	مفتاح بوكس 55 ملم	عدد	1	جيدة	2007/6/23	
.102	فريزة لتصليح الخلاطات	عدد	3	جيدة	2007/6/23	
.103	جهاز تنظيم مياه	عدد	1	متوسطة	2007/6/23	مستعمل
.104	جهاز قياس التدفق	عدد	2	سيئة	2007/6/23	مستعمل
.105	نظام النضح العكسي	عدد	1	متوسطة	2007/6/23	مستعمل
.106	خزانة المنيوم للعرض 250×180سم	عدد	1	جيدة	2007/6/23	
.107	خزانة المنيوم للعرض 50 × 150سم	عدد	1	جيدة	2007/6/23	
.108	مفك "6" (6 قطع)	عدد	1	جيدة	2007/6/23	
.109	مفتاح غرفة المراض الإفرنجي	عدد	2	جيدة	2007/6/23	
.110	مفتاح مستمد الطرف	عدد	2	جيدة	2007/6/23	
.111	ابرة استخراج الجلد المطاطية	عدد	4	جيدة	2007/6/23	
.112	قلووظ سن عكسي 2/1"	عدد	1	جيدة	2007/6/23	
.113	قلووظ سن عكسي 4/3"	عدد	1	جيدة	2007/6/23	
.114	قلووظ سن عكسي 1"	عدد	1	جيدة	2007/6/23	
.115	أداة تنظيف قواعد الحنفيات	عدد	1	جيدة	2007/6/23	
.116	بريصة يدوية	عدد	1	جيدة	2007/6/23	
.117	زرادية كبس 2"	عدد	4	جيدة	2007/6/23	
.118	أداة تنظيف جلد بلاستيك يدوية	عدد	2	جيدة	2007/6/23	

الرقم	اسم التجهيزات والأدوات والعدد اليدوية	الوحدة	الكمية	الحالة الفنية	تاريخ الإدخال في المشغل	ملاحظات
.119	مفتاح بوكس للخلاطات	عدد	3	جيدة	2007/6/23	
.120	منشار حديد صغير 10سم (تخريفة)	عدد	2	جيدة	2007/6/23	
.121	ماكينة حجر جليخ	عدد	1	متوسطة	1983/11/24	
.122	مفدح كهربائي	عدد	1	متوسطة	1994/11/25	
.123	ماكينة تسنين كهربائية	عدد	1	جيدة	111994/22	

Appendix 4- Training Equipment Required in the Sanitary and Central Heating Divisions at Ein Al Basha Center

No.	Sanitary Plumbing and Central Heating Workshop
1.	Pipe Wrenches: <ul style="list-style-type: none"> • Straight Pipe Wrench (6" - 24") • End Pipe Wrench (6" - 24")
2.	Wrenches: <ul style="list-style-type: none"> • Chain Wrench • Strap Wrench
3.	Adjustable Wrenches (6" - 24")
4.	Basin Wrenches
5.	One Stop Wrench
6.	Plastic Nut Basin Wrench
7.	Pipe Vises: Portable Tristand Yoke Vise Top Screw Stand Chain Vise
8.	Pipe Vises Bench: Portable Chain and Yoke Vise
9.	Pipe Stand
10.	Pipe Cutter's (1/8" – 2")
11.	Pipe Cutting: 4-Wheel Pipe Cutter's Wide-Roll Pipe Cutter
12.	Pipe Reamer's (1/4" – 2")
13.	Copper Cutting Machine's
14.	Plastic Pipe Cutter's
15.	Manual Oilier
16.	Carrying Cases
17.	Cutting Oil
18.	Accessories: Machine stand
19.	Threading Machine
20.	Hand – Held Power Threader's with supported arm Automatic Threading Machine (1/2" – 2") Manual Ratchet Threader's: Exposed Ratchet Threader (1/2" – 1") & (1/2" – 2")
21.	Roll Grooving
22.	Drilling and Tapping (Hole cutting tool's)
23.	Hole Saw's
24.	Tapping Tool's
	General Purpose Hand Tool's Type :
25.	Bench Vises
26.	Anvil's
27.	Level's
28.	Hammer's
29.	Saws: Manual Plastic Pipe Saw
30.	Saw Blade's
31.	Tool Box
32.	Tape Measure's
33.	Folding Ruler's
34.	Screwdriver
35.	Plier's
36.	Snip's

No.	Sanitary Plumbing and Central Heating Workshop
37.	Knouckout Set's
38.	Cable Cutter
39.	Cutter Trimmer
40.	Bolt Cutter's
41.	Shovel's
42.	Screw Extractor's
43.	Replacement Drill Guide's
44.	Twist Drill's
45.	Electrical Wire Cutting
46.	Stripping Crimping
47.	Thermometer
48.	Bending and Forming (1/2" – 3") Lever bender (1/2" – 3") Hydraulic bender (1/2" – 3") Electrical bender(1/2" – 3")
49.	Ratchet Tube Wrenches
50.	Tube Repair and Joining
51.	Pipe Freezer
52.	Pipe Inspection and Locating
53.	Drain Cleaning: <ul style="list-style-type: none"> • Hand Tool's • Sink Machine's
54.	Pair Work Glove's and shoes
55.	Drain Cleaning: Sectional Machine
56.	Drain Cleaning: Electric Water Jetter's
57.	Pressure Test Pump
58.	Power Pipe Cutter
59.	L - Keys
60.	Burning Efficiency Inspection Machine
61.	Water flow measure machine
62.	Welding machine for plastic pipes (20mm – 50mm)
63.	Different size's box set
64.	Hand electrical drill
65.	Char gable electrical drill
66.	Inspection board of control box
67.	Jack hummer and it's accessories
68.	Drain Inspection
69.	Boiler cleaning brush's
70.	Chimney's cleaning brush's
71.	Special wrench for burner's
72.	Radiator assembling wrench (1" – 1 1/4")
73.	Ox Stalin welding station
74.	Electrical welding machine
75.	Efficiency Inspection machine for water saving parts
76.	Pipe stand
77.	Instrument and Control's (Level, Flow, Temperature) Pressure, Humidity and Test Instrument's
78.	Burner's
79.	Boilers and Heat exchangers
80.	Anti-scale (Scale system for water network)
81.	Magnetic fuel conditioners for diesel

No.	Sanitary Plumbing and Central Heating Workshop
82.	Cast iron boiler
83.	Steel boiler
84.	Hot water cylinder 250 (horizontal)
85.	Hot water cylinder 250 (vertical)
86.	Burner
87.	Steel chimneys
88.	As beet chimneys
89.	Steel water tank
90.	Plastic water tank
91.	Diesel filter with fire switch
92.	Hot water pumps (circulation pumps)
93.	Heating pumps (circulation pumps)
94.	Water Pumps (circulation pumps)
95.	Automatic pump
96.	R.O. machine
97.	Water treatment machine
98.	Heat exchanger (stainless Steel)
99.	Gas heater
100.	Electric heater
101.	Usual solar heater
102.	Developed solar heater
103.	Steel radiator
104.	Cast iron radiator
105.	Aluminum radiator
106.	Water saving parts
107.	Photocell water mixer
108.	Fuel tank
109.	Fuel level measure devices
110.	Temperature measure devices
111.	Room temperature controller
112.	Thermal mixer
113.	Expansion joint -(1" – 4")

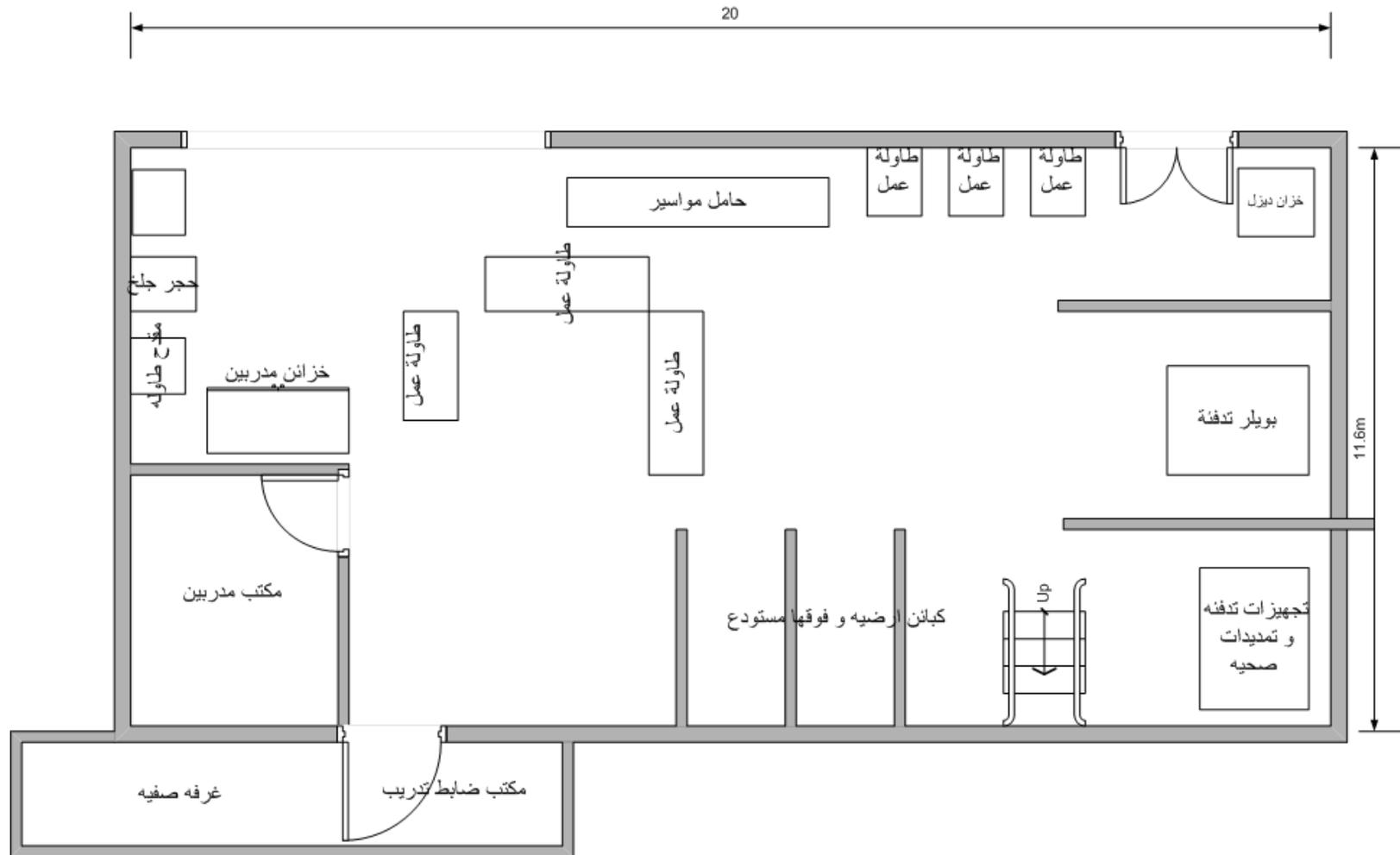
- **ALL OF THE EQUIPMENT ARE HEAVY DUTY**

No.	Equipment Required for an E-learning Station (Classroom)
1.	Classroom equipped with desk's and other's
2.	Personal Computers (PC) machine
3.	Laptop (2 laptops)
4.	Data show machine
5.	White board and accessories
6.	Show screen
7.	Digital Camera

No.	Installing System Hot and Cold Water network and Central Heating
1.	Steel pipes installing systems
2.	Plastic pipes installing systems (clamping tracks pipes)
3.	Plastic pipes installing systems (gluing pipes)
4.	Plastic pipes installing systems (welding pipes)

No.	Installing System Hot and Cold Water network and Central Heating
5.	Copper pipes installing system
6.	Aluminum pipes installing system
7.	Plastic pipes installing system (push fit)

Appendix 5- Layout of the Central Heating and Plumbing Workshop at Hakama-Irbid Center



Appendix 6- Plumbing and Central Heating Equipment and Tools Available at Hakama Training Center

التجهيزات والعدد الموجودة في مشغل التدفئة والتمديدات الصحية/مركز حكما							
الرقم	اسم المادة	الوحدة	الكمية	الرقم	اسم المادة	الوحدة	الكمية
1-1	تثاوية مواسير كهربائية	عدد	1	-35	مقح طاولة كهربائي	عدد	1
2-2	زرادية كبس	عدد	6	-36	ماكينة حجر جليخ 3 فاز	عدد	1
3-3	مفتاح جيدور	عدد	5	-37	تختاوية مواسير 2/1-4/1"1	طقم	1
4-4	ميزان ماء المنيوم	عدد	2	-38	مفتاح جيدور 19 ملم	عدد	8
5-5	جك همر	عدد	1	-39	ماكينة تسنين كهربائية مع لقم 2-2/1"	عدد	1
6-6	تختاوية مواسير 2-2/1"	طقم	7	-40	ماكينة تسليك مجاري كهربائية	عدد	5
7-7	ملزمة مواسير رأس جنزير	عدد	4	-41	مقح يدوي كهربائي 10 ملم	عدد	1
8-8	مفاتيح ألن	طقم	17	-42	مقح كهربائي للزوايا	عدد	1
9-9	مزبته	عدد	5	-43	ماكينة تسنين كهربائية 2-8/1"	عدد	1
10-10	مفتاح مواسير 10"	عدد	10	-44	ملزمة طاولة للمواسير	عدد	7
11-11	مفتاح مواسير 8"	عدد	1	-45	شاكوش 1 كغم	عدد	2
12-12	مفتاح مواسير 6"	عدد	12	-46	مفتاح مواسير 36"	عدد	1
13-13	مفتاح مواسير 12"	عدد	4	-47	منشار يدوي	عدد	11
14-14	مفتاح مواسير 14"	عدد	9				
15-15	مفتاح مواسير 18"	عدد	6				
16-16	مفتاح مواسير 24"	عدد	6				
17-17	شاكوش 1.5 كغم	عدد	9				
18-18	شاكوش 200 غم	عدد	2				
19-19	شاكوش 2 كغم	عدد	2				
20-20	ازميل حفر	عدد	6				
21-21	مقص مواسير 2"	عدد	7				
22-22	مقص مواسير 3"	عدد	1				
23-23	مقص مواسير نحاس 4/1-8/7"	عدد	3				
24-24	مقص مواسير بلاستيك	عدد	5				
25-25	مضخة فحص شبكات	عدد	2				
26-26	مسطرين	عدد	5				
27-27	رايمر مواسير 2"	عدد	10				
28-28	مفتاح جمع خلاطات	عدد	7				
29-29	مفك عادي	عدد	8				
30-30	مفك مصلب	عدد	6				
31-31	زرادية عادية	عدد	7				
32-32	فرشاة سلك	عدد	5				
33-33	تختاوية مواسير 1-2/1"	طقم	3				
34-34	ماكينة لحام أنابيب بلاستيك	عدد	3				

المواد المستهلكة في أعمال التمديدات الصحية/مركز حكما							
الرقم	اسم المادة	الوحدة	الكمية	الرقم	اسم المادة	الوحدة	الكمية
1-1	خلاط بديه 3 فتحات	عدد	4	-35	شد وصل نحاس 16 ملم 2/1"	عدد	70
2-2	خلاط مغسلة عادية	عدد	4	-36	مواسير أكوابكس 16 ملم	متر	200
3-3	عدة نيجارة مرحاض إفرنجي	عدد	3	-37	مواسير أكوابكس 25 ملم	متر	200
4-4	صندوق طرد مرحاض شرقي	عدد	4	-38	سليف 32ملم	متر	200
5-5	محبس زاوية 2/1"	عدد	15	-39	سليف 38 ملم	متر	50
6-6	صباغ بانيو	عدد	3	-40	كوع أجاصة كامل 2/1" 16 ملم	عدد	40

المواد المستهلكة في أعمال التمديدات الصحية/مركز حكما						
الرقم	اسم المادة	الوحدة	الكمية	الرقم	اسم المادة	الوحدة
7-	سيفون مجلى مجوز	عدد	3	41-	شد وصل نحاس 4/3*25"	عدد
8-	سيفون مغسلة كروم	عدد	4	42-	مواسير أكوابكس 20 ملم	متر
9-	خلاط بانينو	عدد	2	43-	شد وصل نحاس 2/1*20"	عدد
10-	صباغ شاور	عدد	3	44-	خزانة 60 سم	عدد
11-	كوع بلاستيك 2/1*2 1"	عدد	6	45-	براغي مغسلة عمود	طقم
12-	رداد 2/1"	عدد	4	46-	براغي كيزر	طقم
13-	مصفاة خط (سترينر) 2/1"	عدد	4	47-	براغي مرحاض إفرنجي	طقم
14-	مواسير مجلفنة 2/1"	متر	240	48-	كوع 32 ملم تدكيك	عدد
15-	مواسير مجلفنة 4/3"	متر	240	49-	كوع 38 ملم تدكيك	عدد
16-	كوع 4/3 90° مجلفن	عدد	50	50-	كوع ذكر انثى 2/1 90°	عدد
17-	كوع 2/1 90° مجلفن	عدد	50	51-	كوع بند مف 2/1 90°	عدد
18-	تي 4/3 مجلفن	عدد	25	52-	كوع بند ذكر انثى 2/1 90°	عدد
19-	تي 2/1 مجلفن	عدد	25	53-	كوع بند مف 4/3 90°	عدد
20-	تي 4/3*2/1*4/3 مجلفن	عدد	20	54-	كوع بند ذكر انثى 4/3 90°	عدد
21-	محبس 4/3 كروي	عدد	10	55-	كوع ذكر انثى 4/3 90°	عدد
22-	محبس 2/1 كروي	عدد	20	56-	مواسير 4 بلاستيك مضغوط	متر
23-	شد وصل 2/1 مجلفن	عدد	10	57-	مواسير 2 بلاستيك مضغوط	متر
24-	شد وصل 4/3 مجلفن	عدد	10	58-	سيفون 4 قطعنين	عدد
25-	نقاصة سن 2/1*4/3"	عدد	10	59-	فلور تراب 4 بلاستيك	عدد
26-	نبيل 4/3"	عدد	30	60-	واي بلاستيك 4"	عدد
27-	نبيل 2/1"	عدد	20	61-	كوع بلاستيك 4 90°	عدد
28-	محبس عوامة 2/1"	عدد	4	62-	كوع بلاستيك 4 45°	عدد
29-	كلكتر نحاس 1 5 فتحات	عدد	6	63-	كوع بلاستيك 2 90°	عدد
30-	محبس رئيسي مع شد وصل 1"	عدد	6	64-	كوع بلاستيك 2 45°	عدد
31-	مربط كلكتر 1"	طقم	3	65-	تي بلاستيك 4"	عدد
32-	وصلة كلكتر 1"	عدد	6	66-	نقاصة بلاستيك 3*4"	عدد
33-	هواية أتوماتيك 8/3"	عدد	6	67-	طربوش هواية 4 بلاستيك	عدد
34-	كوع نحاس مع شد وصل 25*1"	عدد	6	68-	كوع بلاستيك 4 90° مع باب	عدد

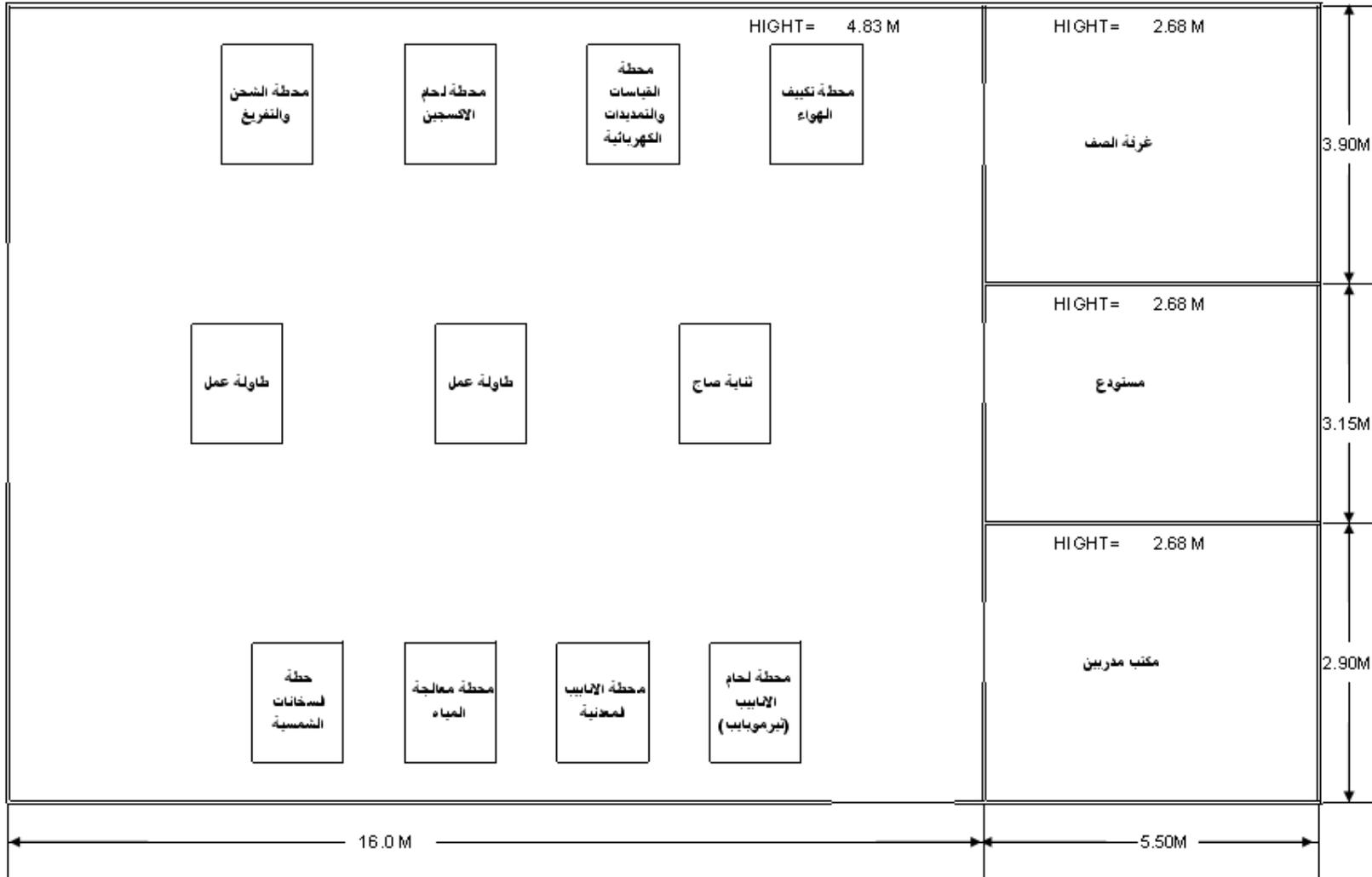
التجهيزات والعدد الموجودة في مشغل التدفئة والتمديدات الصحية/مركز حكما						
الرقم	اسم المادة	الوحدة	الكمية	الرقم	اسم المادة	الوحدة
69-	تفلون	لفة	50			
70-	كنكت	كغم	5			
71-	زيت تبريد للتسنين رجد	جالون	8			
72-	مواسير ثير موبايب 25 ملم	متر	50			
73-	مواسير ثير موبايب 20 ملم	متر	50			
74-	تي بلاستيك 25 ملم	عدد	15			
75-	كوع 25 ملم 90°	عدد	15			
76-	تي 25*20*25 ملم	عدد	15			
77-	نقاصة 20*25 ملم	عدد	15			
78-	تي 20 ملم	عدد	15			
79-	كوع 20 ملم 90°	عدد	15			
80-	كوع نهاية خط 2/1*20"	عدد	15			
81-	مفة 20 ملم	عدد	10			
82-	مفة 25 ملم	عدد	10			
83-	مواسير نحاس مستقيمة 12	متر	30			

التجهيزات والعدد الموجودة في مشغل التدفئة والتمديدات الصحية/مركز حكما							
الرقم	اسم المادة	الوحدة	الكمية	الرقم	اسم المادة	الوحدة	الكمية
	ملم						
-84	مواسير نحاس مستقيمة 16 ملم	متر	30				
-85	تي نحاس 12 ملم	عدد	15				
-86	كوع نحاس 12 ملم 90°	عدد	25				
-87	كوع نحاس 16 ملم 90°	عدد	25				
-88	تي نحاس 16 ملم	عدد	15				
-89	لفة قصدير 3 ملم	عدد	10				
-90	فلكس معجون 250 غم	عدد	8				
-91	عزل أرم فلكس جاهز 2/1"	عدد	30				
-92	عزل أرم فلكس جاهز 4/3"	عدد	30				
-93	تتيب عزل عريض	لفة	15				

Appendix 7- Layout of Aqaba Training Center

مؤسسة التدريب المهني
مخبرية التدريب المهني/التعليم الجنوب
مركز لتدريب المهني/العقبة

مخطط مشغل لتكثيف والتدريب والتمديدات الصحية



Appendix 8- Plumbing and Central Heating Equipment and Tools Available at Aqaba Training Center

قائمة التجهيزات والادوات والعدد المتوفرة والمطلوب في مشغل التدفئة والتمديدات الصحية					
التاريخ : 2007/12/4			مركز تدريب مهني : العقبة ذكور		
الحالة الفنية جديدة / جيدة/ بحاجة لصيانة	العدد المطلوب توفيره	العدد المتوفر	الوحدة	اسم المادة / تجهيزة / عدد / أدوات	الرقم
جيدة جداً	0	2	طقم	طقم تسنينين مواسير من 1/2 " - 2"	1
جيدة جداً	2	4	عدد	مقص مواسير 8/1 " - 2"	2
جيدة جداً	0	1	عدد	ملزمة مواسير راسي عادية مع القاعدة	3
جيدة جداً	3	2	عدد	مفتاح مواسير 6"	4
جيدة جداً	2	1	عدد	مفتاح مغاسل متحرك 8/3 " - 4/1 1"	5
جيدة جداً	0	4	عدد	ملزمة مواسير طاولة بدون قاعدة	6
جيدة جداً	0	2	عدد	مضخة فحص شبكات التدفئة	7
جيدة جداً	5	3	عدد	مزيتة يدوية	8
جيد	1	1	عدد	فرد سيلكون	9
جيدة جداً	0	1	عدد	ماكينة تسنينين كهربائية	10
جيدة جداً	0	2	عدد	قاعدة ملزمة مواسير	11
جيدة جداً	0	4	عدد	ازاميل	12
جيدة جداً	0	1	عدد	ماكينة تسليك مجاري كهربائية	13
جيدة جداً	0	1	عدد	ماكينة تسليك مجارية يدوية	14
جيدة جداً	0	2	طقم	تختاية تسنينين 1/2 " - 1"	15
جيدة جداً	0	1	عدد	سلم حبل 30 متر	16
جيدة جداً	0	50	عدد	حبل ليف سماكة 25 ملم	17
جيدة جداً	10	6	عدد	شفرات مقص 1/2 " - 2"	18
جيدة جداً	0	1	عدد	جهاز افوميتر رقمي TD-22-23	19
ممتاز	0	1	جهاز	جهاز افوميتر MA TH	20
جيدة جداً	0	1	عدد	درل همر حفر مع تكسير W1100	21
جيدة جداً	0	1	طقم	طقم ريش حفر + تكسير 6x1	22
جيدة جداً	0	1	عدد	وصلة كهربائية 50 م على بكرة معدنية	23
جيدة جداً	0	1	عدد	ماكينة لحام 1 فاز ايطالي	24
جيدة جداً	3	1	عدد	مقص انابيب بلاستيك 8/1 - 2 8/3	25
جيدة جداً	0	1	عدد	مقص انابيب سكب 6-2-1"	26
جيدة جداً	0	1	طقم	طقم بوكس من 36-80ملم موديل D21	27
جيدة جداً	0	1	عدد	درل همر هلتي (38ملم) هيتاشي	28
جيدة جداً	0	1	طقم	اطقم بوكس كروم EIORA	29
جيدة جداً	2	1	عدد	مفتاح جي دور 8"	30

قائمة التجهيزات والادوات والعدد المتوفرة والمطلوب في مشغل التدفئة والتمديدات الصحية					
التاريخ : 2007/12/4			مركز تدريب مهني : العقبة ذكور		
الرقم	اسم المادة / تجهيزة / عدد / ادوات	الوحدة	العدد المتوفر	العدد المطلوب	الحالة الفنية جديدة / جيدة / بحاجة لصيانة
31	شاكوش حديد سمكري من طرف واحد	عدد	2	0	جيدة جداً
32	جهاز سوفتر 30000 جرين كامل	جهاز	1	0	جيدة جداً
33	جهاز water wate RO	جهاز	1	0	جيدة جداً
34	منشار لحم قابل للتطويل	عدد	2	0	جيدة جداً
35	كفوف لحم ازرق	زوج	6	0	جيدة جداً
36	مفتاح شق رنق كروم من 6-22 (13 قطعة)	طقم	1	0	جيدة جداً
37	ساعة توقيت	عدد	1	0	جيدة جداً
38	تختاية تسنين مع الذراع 1/2 - 4/1 مع حقيبة	عدد	1	0	جيدة جداً
39	ملزمة مواسير 1/2 - 3	عدد	3	0	جيدة جداً
40	ماكنة تسنين كهربائية مع ستة لقم (1/2 - 2)	طقم	1	0	جيدة جداً
41	طقم تسنين فولاذي من 1/2 - 2 في صندوق	طقم	1	0	جيدة جداً
42	مفك كهرباء عازل	عدد	3	0	جيدة جداً
43	زرادية كيس 7	عدد	2	0	جيدة جداً
44	مفك عادي	عدد	2	0	جيدة جداً
45	مفك مصلب	عدد	1	0	جيدة جداً
46	طقم بوكس 24 قطعة داخل صندوق	طقم	1	0	جيدة جداً
47	مفك نو مقبض خشب	عدد	2	0	جيدة جداً
48	ازميل حفر 25 سم	عدد	2	0	جيدة جداً
49	مفتاح مواسير 1/2 - 7 مع الذراع جنزير	عدد	1	0	جيدة جداً
50	خراط شطافة بيديه	عدد	2	3	جيدة
51	صندوق طرد بلاستيك نياجرا	عدد	3	2	جيدة
52	سيفون مجلي بلاستيك	عدد	3	10	جيدة
53	مغسلة عامود كاملة	عدد	1	1	جيدة
54	كولتر نحاس 3/4 " 4 فتحات	عدد	1	3	جيدة جداً
55	ماكنة لحم انابيب بلاستيك	عدد	2	2	جيدة جداً
56	سيفون مغسلة حلزوني	عدد	2	10	جيدة جداً
57	سيفون قطعتين 4	عدد	5	5	جيدة جداً
58	بطارية مغسلة عادية	عدد	1	3	جيدة جداً
59	غطاء مصفاة بلاستيك 20x20	عدد	2	3	جيدة جداً
60	ريشة باطون 14 ملم	عدد	1	0	جيدة جداً
61	فلتر ماء مزدوج	عدد	2	0	جيدة جداً
62	فتر ماء مفرد	عدد	2	0	جيدة جداً

قائمة التجهيزات والادوات والعدد المتوفرة والمطلوب في مشغل التدفئة والتمديدات الصحية					
التاريخ : 2007/12/4			مركز تدريب مهني : العقبة ذكور		
الرقم	اسم المادة / تجهيزة / عدد / ادوات	الوحدة	العدد المتوفر	العدد المطلوب	الحالة الفنية جديدة / جيدة / بحاجة لصيانة
63	ريشة باطون 16 ملم	عدد	10	0	جيدة جداً
64	كولكترات 1 ¼" 6 فتحات	عدد	6	0	جيدة جداً
65	خزانة كولكترات 60×60	عدد	3	0	جيدة جداً
66	هواية اتوماتيك 8/3"	عدد	6	0	جيدة جداً
67	محبس كولكترات 1 ¼"	عدد	5	0	جيدة جداً
68	قيزر كهرباء 50 لتر	عدد	1	0	جيدة جداً
69	قيزر غاز 15 لتر	عدد	1	0	جيدة جداً
70	خلاط مغسلة عامود	عدد	1	4	جيدة جداً
71	أنابيب اكوابكس حراري	لفة	1	2	جيدة جداً
72	زيت تزييت 350	لتر	25	0	جيدة جداً
73	ريشة حديد 12 ملم	عدد	1	0	جيدة جداً
74	فرد دش ماء حمام	عدد	1	2	جيدة جداً

قائمة بالمواد التي يستهلكها 20 متدرب لدورة كاملة في تخصص التمديدات الصحية ماهر			
الرقم	اسم المادة	الوحدة	الكمية لمجموعة
1	مفتاح أنابيب 14"	عدد	5
2	مفتاح أنابيب 12"	عدد	5
3	مفتاح أنابيب 10"	عدد	5
4	مفتاح أنابيب 8"	عدد	5
5	مفتاح جيدور 10"	عدد	5
6	مفتاح 6"	عدد	5
7	شاكوش حديد 200 غم	عدد	5
8	زرادية عادية	عدد	5
9	أطقم مفاتيح شق	عدد	5
10	أطقم مفاتيح رنج	عدد	5
11	أطقم مفكات عادية	عدد	5
12	أطقم مفكات مصلبة	عدد	5
13	منشار يدوي حديد	عدد	10
14	نسلة منشار	عدد	100
15	ملزمة جنزير مع القاعدة	عدد	5
16	ميزان ماء تسوية	عدد	5
17	مسطرين صغير	عدد	5
18	متر قياس طول 3م	عدد	20
19	رايمر انابيب من 8/1" - 2"	عدد	5
20	رايمر حلزوني 1/2" - 2"	عدد	5

قائمة بالمواد التي يستهلكها 20 متدرب لدورة كاملة في تخصص التمديدات الصحية ماهر			
الرقم	اسم المادة	الوحدة	الكمية لمجموعة
21	مقص أنابيب 8/1 " - 2"	عدد	5
22	تختاية تسنين يدوية	طقم	6
23	ملزمة مواسير راس عادية مع القاعدة	عدد	5
24	مفتاح مغاسل متحرك 8/3 " - 11 1/4" (مفتاح جمع مغاسل)	عدد	5
25	ملزمة مواسير طاولة بدون قاعدة	عدد	5
26	مضخة فخص الشبكات	عدد	2
27	مقص أنابيب بلاستيكية 42 ملم	عدد	6
28	مزيتة يدوية	عدد	10
29	فرد سلكون بارد	عدد	6
30	ماكنة تسنين كهربائية	عدد	2
31	ازاميل حديد حفر	عدد	5
32	ماكنة تسلك مجاري كهربائية	عدد	2
33	ماكنة تسليك مجاري يدوية	عدد	2
34	انابيب تدكيك 20 ملم	متر	200
35	كوع بند 32 ملم		25
36	شد وصل 16 × 1/2" ملم	عدد	50
37	عازل 32 ملم	متر	100
38	شفرات مقص انابيب حديدية	عدد	15
39	درل يدوي	عدد	2
40	وصلة كهربائية 50م على بكرة	عدد	2
41	مقص انابيب سكب 2-6"	عدد	2
42	طقم بوكس من 36-80ملم	عدد	1
43	زرادية كبس	عدد	6
44	بربيش كروم 30 سم	عدد	15
45	بربيش كروم 50 سم	عدد	15
46	بربيش كروم 100 سم	عدد	15
47	شظافة يدوية	عدد	10
48	حنفية كروم ساق طويل 1/2"	عدد	25
49	حنفية كروم ساق قصير 1/2"	عدد	25
50	كوع حديد 3/4 "	عدد	50
51	تي حديد 3/4 "	عدد	50
52	مفة حديد 3/4 "	عدد	50
53	شد وصل 3/4 "	عدد	50
54	نبل حديد 3/4 "	عدد	50
55	نقاصة 3/4 " - 1/2"	عدد	50
56	محبس ستيم 3/4 "	عدد	25
57	كوع حديد 1/2"	عدد	100
58	تي حديد 1/2"	عدد	50
59	مفة حديد 1/2"	عدد	50
60	شد وصل 1/2"	عدد	50

قائمة بالمواد التي يستهلكها 20 متدرب لدورة كاملة في تخصص التمديدات الصحية ماهر			
الرقم	اسم المادة	الوحدة	الكمية لمجموعة
61	نبل 1/2"	عدد	50
62	محبس ستيم 1/2"	عدد	25
63	عوامة تنك كاملة 1/2"	عدد	15
64	أنابيب حديد مجلفن 3/4 " 6×1	عدد	15
65	أنابيب حديد مجلفن 1/2 " 6×1	عدد	20
66	سدادة 1/2"	عدد	25
67	سدادة 3/4 "	عدد	25
68	كوع فاتح 1/2"	عدد	25
69	خلاط مغسلة	عدد	6
70	خلاط شطافة يدوية	عدد	6
71	دوش تلفون	عدد	5
72	خلاط دوش	عدد	5
73	خلاط مجلى	عدد	5
74	مرحاض إفرنجي مع الصندوق	عدد	5
75	مرحاض دعسة (شرقي)	عدد	5
76	شطافة بديية كاملة	عدد	5
77	صندوق طرد بلاستيك نياجرا	عدد	5
78	سيفون مغسلة بلاستيك	عدد	15
79	سيفون مجلى بلاستيك مفرد	عدد	15
80	سيفون حلزوني مغسلة 1 1/4"	عدد	15
81	سيفون حلزوني مجلى 1 1/2 "	عدد	15
82	شور (حوض حمام عمق 19سم)	عدد	2
83	صباغ بانيو	عدد	10
84	بانيو مع الصباغ والخلاط	عدد	2
85	سيفون مجلى مزدوج بلاستيك	عدد	15
86	تي منقص 3/4 x 1/2 " 3/4 x "	عدد	25
87	راداد خط 1/2 "	عدد	20
88	ردار خط 3/4"	عدد	20
89	مرابط 1/2 "	عدد	50
90	مرابط 3/4 "	عدد	50
91	محبس زاوية 1/2"	عدد	25
92	كوع ستريت منقص 3/4 " - 1/2"	عدد	25
93	واي بلاستيك 4"	عدد	20
94	مفة بلاستيك 4 Ø"	عدد	15
95	كوع بلاستيك 2 Ø"	عدد	50
96	كوع بلاستيك 4 Ø"	عدد	20
97	مفة فاتح بلاستيك 4 Ø"	عدد	15
98	كوع نحاس مع انجاصه	عدد	50
99	مفة بلاستيك 2 Ø"	عدد	30
100	كوع بلاستيك 3 Ø"	عدد	20

قائمة بالمواد التي يستهلكها 20 متدرب لدورة كاملة في تخصص التمديدات الصحية ماهر			
الرقم	اسم المادة	الوحدة	الكمية لمجموعة
101	مواسير بلاستيك Ø 4"	متر	50
102	مواسير بلاستيك Ø 2"	متر	100
103	مجلى سنيل 120×60 (حوض واحد)	عدد	2
104	مغسلة عامود كاملة	عدد	2
105	هواية اتوماتيك 1/2"	عدد	15
106	هواية اتوماتيك 3/4"	عدد	15
107	انابيب بلاستيك حرارية 16×13 ملم	عدد	100
108	قطع وصل نحاسية 1/2" × 16 ملم	عدد	50
109	شد وصل نحاس 1/2" × 16 ملم	عدد	50
110	كوع نحاس 1/2" × 16 ملم	عدد	50
111	شد وصل نحاس 3/4" × 20 ملم	عدد	50
112	كوع نحاس 3/4" × 20 ملم	عدد	50
113	كولكتر نحاس 3/4" (4 فتحات)	عدد	10
114	هواية كولكتر 8/3 نحاس	عدد	10
115	تفلون تب	لفة	100
116	كتكت	كغم	30
117	كوع منقص 3/4" × 1/2"	عدد	50
118	جسر تقاطع 1/2" وحديد	عدد	25
119	جسر تقاطع 3/4" وحديد	عدد	25
120	كوع ستريت فاتح 1/2"	عدد	20
121	نبيل كروم 2سم	عدد	20
122	نبيل كروم 3سم	عدد	20
123	نبيل كروم 2ر5سم	عدد	20
124	زيت تسنين عيار 10	عدد	50
125	أنابيب بلاستيكية ثير موبانيب 20ملم	متر	100
126	لحام 20ملم T	عدد	100
127	منقص 25×20×25 ملم T	عدد	50
128	مفة بسن 20 × 1/2" (ادبتر) ذكر	عدد	50
129	وصلة بسن 20 × 1/2" انثى (ادبتر)	عدد	50
130	كوع نهاية خط 20 × 1/2"	عدد	100
131	مفة لحام 20ملم	عدد	100
132	مفة لحام 25ملم	عدد	100
133	كوع لحام 25ملم	عدد	100
134	لحام 25ملم T	عدد	100
135	نقاصة 20×25 ملم	متر	50
136	جسر 20 ملم	عدد	50
137	جسر 25 ملم	عدد	50
138	شد وصل 20 × 1/2" نحاس	عدد	50
139	شد وصل ذكر نحاسي 25 × 3/4"	عدد	25
140	شد وصل انثى نحاسي 25 × 3/4"	عدد	25

قائمة بالمواد التي يستهلكها 20 متدرب لدورة كاملة في تخصص التمديدات الصحية ماهر			
الرقم	اسم المادة	الوحدة	الكمية لمجموعة
141	عازل 38 ملم	متر	50
142	مرابط 20 ملم	عدد	50
143	كوع بسن 25 × ¼ "	عدد	50
144	ماكنة لحام أنابيب بلاستيك	عدد	5
145	أنابيب أنابيب بلاستيك 20 ملم	متر	100
146	أنابيب أنابيب بلاستيك 25 ملم	متر	100
147	كوع لحام 20 ملم	متر	100
148	مرابط 25 ملم	عدد	100
149	مرابط مغسلة عامود	عدد	50
150	مرابط كيزر	عدد	15
151	كيزر كهرباء 50 لتر	عدد	2
152	كيزر غاز 15 لتر	عدد	2
153	مرابط مرحاض افرنجي	عدد	15
154	رداد كيزر	عدد	5
155	مقاومة كيزر 1500 واط	عدد	5
156	نبل كروم سداسي ½ "	عدد	50
157	سلندر سخان شمسي	عدد	2
158	جلدة مانجيت 2×4/1 1	عدد	50
159	اغو (لاصق انابيب)	علبة	10
160	بطارية مغسلة عامود ثقب واحد	عدد	5
161	بطارية مغسلة عامود ثلاثة ثقب	عدد	5
162	صباغ مغسلة ¼ 1"	عدد	5
163	سيفون قطعتين 4"	عدد	50
164	قصبه خلاط	عدد	5
165	فلتر اب بلاستيك 4"	عدد	10
166	نقاصة بلاستيك 3×2"	عدد	25
167	"بلاستيك ضغط 2 T	عدد	50
168	ماسورة بلاستيك 3" ضغط	متر	30
169	مفة بلاستيك 3" ظغط	عدد	25
170	كوع فاتح ضغط 3"	عدد	25
171	كوع بلاستيك فاتح ضغط 2"	عدد	50
172	ضغط بلاستيك 4" T	متر	50
173	محبس فرعي ½ "	عدد	25
174	كولكتر ½ 1" 6 فتحات	عدد	5
175	خزانة كولكترات 60×60	عدد	5
176	هواية اتوماتيك 8/3 "	عدد	15
177	محبس كولكترات ¼ 1"	عدد	15
178	تي كروم ½ "	عدد	25
179	كولكتر ¼ كروم 5 فتحات	عدد	10
180	سدادة كولكتر ¼ 3"	عدد	15

قائمة بالمواد التي يستهلكها 20 متدرب لدورة كاملة في تخصص التمديدات الصحية ماهر			
الرقم	اسم المادة	الوحدة	الكمية لمجموعة
181	سدادة كلكتنر 1/2 "	عدد	15
182	مرابط كلوكتنر	عدد	15
183	مغسلة عادية	عدد	2
184	كوع بلاستيك 2" بسن	عدد	25
185	قطعة توفير المياه للمغسلة والمجلى	عدد	10
186	قطعة توفير المياه للحنفية	عدد	10
187	قطعة توفير المياه للدوش	عدد	10
188	نقاصة كروم 1/2" x 3/4"	عدد	25
189	أنابيب اكوابكس حراري 25ملم	لفة 50م	2
190	شد وصل 25 x 3/4" ثير موبكس نحاس	عدد	25
191	مصفاة ارضية بلاستيك	عدد	10
192	سيفون مجلى S	عدد	10

ملاحظة يمكن اضافة مواد حديثة التطبيق لتطبيقها مستقبلاً في البرنامج التدريبي