

Author: Darkmoon Cliffdweller, AED Consultant
Descriptive Title: Trip Report
Program: Water Efficiency and Public Information for Action Project
Strategic Objective: SO2
Sponsoring USAID office: USAID/Jordan, Operating Unit WRE; Cooperative Agreement No.: 278-A-00-00-00201-00
Contractor Name: Academy for Educational Development
Date of Publication: 2003
Key Words: NGOs, Water Conservation, Jordan, Plumbing
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September 19, 2003

To: WEPIA
From: Darkmoon Cliffdweller
Subject: Consultant's Report

Water Conservation Practices and Plumbing Practices

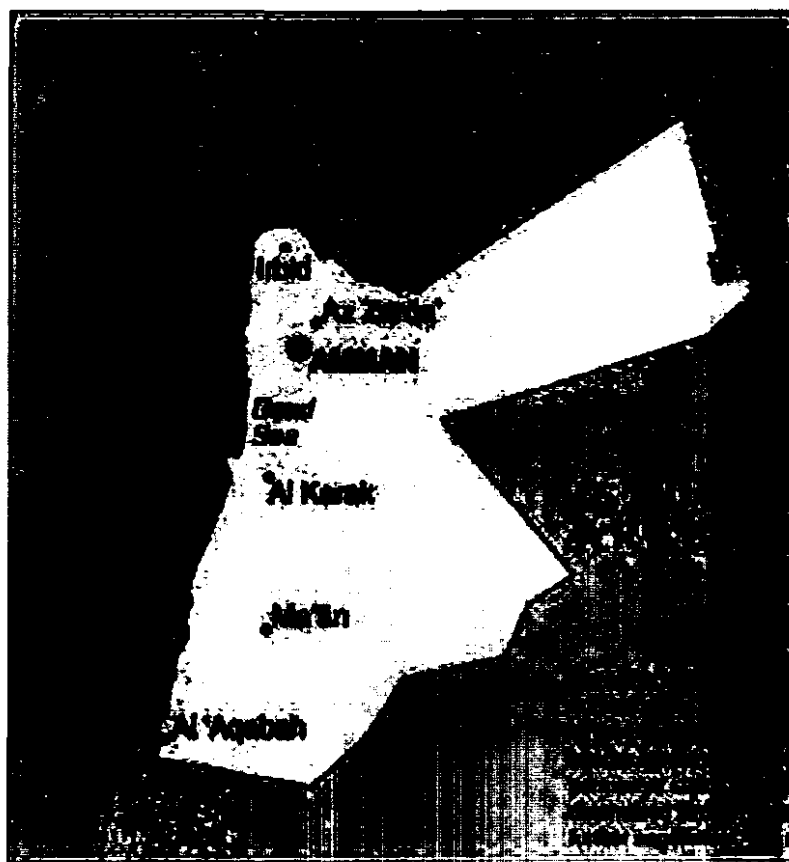


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SCOPE OF WORK

Darkmoon Cliffdweller is to perform a needs assessment to evaluate the following:

- ☐ plumber education program,
- ☐ program facility,
- ☐ plumbing code and standards,
- ☐ system for licensing plumbers.

FINDINGS

There are seven (7) Vocational Training Centers (VTC) in Jordan where students are taught various trades from auto mechanics, electrical, boilers to plumbing. The curriculum for the various trades are developed by the VTC's Instructional Resources and Curriculum department.

Exercise cards are used for training on various trade exercises. For example, installing a water closet (toilet), the *exercise card*:

- ☐ describes the exercise
- ☐ time allotted to demonstrate the work
- ☐ the objectives of the exercise
- ☐ materials & tools required
- ☐ devices (fittings) required
- ☐ and work procedures with illustrating pictures.

Water conservation- The *exercise cards* do not include water saving devices. A water leakage preventor is mentioned but with no identified provisions, so I am assuming this is the water line pressure tests. Residential water lines are tested at 6 bars and the central boiler and all other water lines are tested at 123 bars. There are no water conservation measures listed in the VTR training curriculum.

Findings of Problems-

1. The methods used for training are good but I believe the training centers lack the demonstration of materials needed to fully understand plumbing principles.
2. A more thorough plumbing theory needs to be introduced to the VTC training curriculum.
3. Changes are needed to improve plumbing safety, for example, methods to trap dangerous sewer gases, backflow preventers to prevent contamination to potable water, and to provide for safety relief valves on boilers and water heaters.
4. Changes are needed to improve plumbing efficiency, for example, venting the traps and the drainage lines.
5. Changes are needed to reduced maintenance, for example, removing grease, sand and oil from the sewer discharge.
6. There is no plumbing code in the country of Jordan. Our discussions with Dr. Jamal S. Qtaishat, Director of Codes and Standands, stated there are 34 codes in existence, and a new plumbing code is not advisable, but he would favor a *plumbing guide book* to be introduced to the VTC training centers.
7. There is no system in place for the licensing of plumbers.

Jordanian Construction Code-

WEPIA set the stage to amend the existing construction code to include water conservation efforts. Now included in the Jordanian Construction Code are rules for:

- ☐ flow rates of plumbing fittings
- ☐ water pressures permitted for various plumbing fittings
- ☐ toilet cistern flushing capacity
- ☐ roof water tanks must be so located that faulty stop cocks/ controls can be repaired
- ☐ rubber gaskets shall conform to British standards for quality assurances
- ☐ public bathrooms must be installed with self closing taps
- ☐ aerators shall be installed on faucets

Labeling-

The Jordan Institute for Standards and Meterology implemented (7-20-03) the program International Product Conformity Certification Programme. The company, Bureau Veritas will issue a conformity certificate attesting that goods & products are in accordance with required standards. The objectives of the program are to protect consumers through:

- ☐ health & environmental protection
- ☐ implementation of safety standards for products
- ☐ enhance overall product quality
- ☐ prevent unsafe products from entering the market
- ☐ detect counterfeit products

We met with vendors and merchants and emphasized that quality in materials requires product-evaluation (labeling). There are available European standards such as DIN, BS and others.

Labeling may become a requirement for certain plumbing materials. The Institute for Standards and Meterology would be a resource for available testing laboratories that do labeling. Labeling (stamped) was explained as appliances and materials being product-evaluated for safety and quality. Labeling (star) was explained as appliances are built for water conservation and energy efficient. Explanation was given on how USA companies acquired the star label.

- ☐ Water saving devices are now mandatory by the construction code. The vendors and merchants need to understand the plumbing fittings they sell must have flow control rates that comply with the construction code.
- ☐ Vendors and merchants must understand the proper fittings for drainage of water. Sell drainage fittings for drainage and vent fittings for venting.

Licensing of Plumbers-

There are 5 levels of plumbing reflected by the Vocational Training Centers (VTC).

- ☐ Limited skills...(acquired at the VTC)
- ☐ Skilled.....(acquired at the VTC)
- ☐ Craftsmen.....(acquired at the VTC)
- ☐ Technicians
- ☐ Specialists

The Ministry of Public Works and Housing could be the organization to license plumbers at the Craftsmen level. Examinations would be given on plumbing theory and requirements of the *plumbing guide book*. 75% or better is required for passing. The applicant would be required to be trained at a Vocational Training Center or demonstrate the equivalent.

Women in Plumbing-

First of all, the Arabic customs need to be understood and respected. Generally, men and women would not work jointly on a plumbing project. They could work independent of each other.

The Jordan Forum for Business and Profession Women are interested in the opportunity to have women trained and to be advanced in the plumbing disciplines. They proposed to send 20 women to learn basic plumbing for repairs and maintenance. They are receptive to be trained in:

- ☐ leaking faucets
- ☐ clogged sewer lines
- ☐ installing and cleaning aerators
- ☐ replacing non-working parts in toilet tanks
- ☐ examining the pressure-temperature relief valves on boilers and water heaters.

They stopped short of actually be trained in the installation of pressure-temperature relief valves on boilers, expressing their concern that the scope of work was advanced.

The Jordan Forum for Business and Profession Women expressed their immediate goal is to include the training for basic plumbing repairs. They have estimated 20 women would take part. After implementation of basic repairs and successful demonstration of this initial program, they would want a full plumbing program for the entire realm of plumbing training at all 5 levels. Their recipients would be selected from a portion of the original 20 women,

WATER CONSERVATION RECOMMENDATIONS

1. Install aerators on all faucets.
2. Use flow regulators on shower heads.
3. Install low water toilets with 6 liters per flush.
4. Recycle the water with graywater systems.
 - ☐ This can be used to recharge the toilet tank and for irrigation.
 - ☐ Use graywater for irrigation.
 - ☐ Use graywater for toilets.
 - ☐ Use graywater for washing cars.
5. Install automatic shutoff valves on public faucets.
6. Install leak detection devices on public buildings.
7. Replace and retrofit faucets with flow control regulators.
8. Insulate the hot water pipes.
9. Repair leaky faucets.
10. Do not water landscaping plans on windy days.
11. Water landscaping plants early in the day when evaporation is less.
12. Keep weeds in check.
13. Capture roof run off to holding tanks.
14. Take showers rather than using the bathtub.
15. Installed metered or sensing faucets in public buildings.
16. Wash only with full loads (clothes washers).
17. Set the water heater to 50 degrees celsius.
18. Wrap the water heater with an insulating blanket.

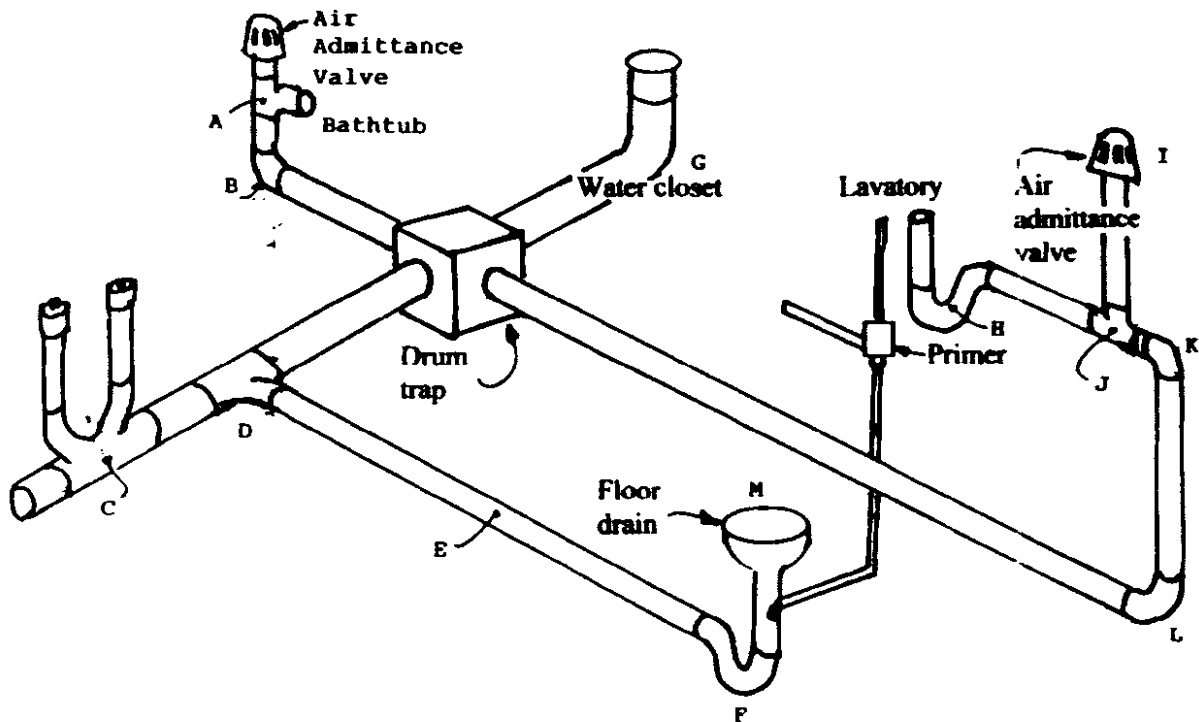
19. Use the Energy Star label.
- ☐ The Energy Star label indicates energy efficiency.
 - ☐ The Energy Star label is a way for improving the environment.
 - ☐ The Energy Star mark never implies EPA endorsement.
 - ☐ The Energy Star mark never implies DOE endorsement.
 - ☐ Energy star boilers use 10% less energy
20. Top or front loading clothes washers that are marked with the Energy Star label:
- ☐ Uses a special type of washing action with less water.
 - ☐ Uses sensors to monitor incoming water temperature.
 - ☐ Rinsing uses repeat spraying rather than soaking them with a full tub of water.
 - ☐ Energy Star clothes washers use 50% less energy than standard clothes washers.
 - ☐ Energy Star clothes washer uses 18 to 25 gallons of water.
 - ☐ A standard clothes washer uses 40 gallons.
 - ☐ Standard top loading clothes washers use 40 to 45 gallons per wash.
 - ☐ New front loading clothes washers use 20 to 30 gallons per wash.
21. Install energy saving appliances:
- ☐ Energy efficient refrigerators (largest consumer in a residential unit).
 - ☐ Energy efficient freezers.
 - ☐ Energy efficient water heaters vs. demand water heaters.
 - ☐ Energy efficient well pumps/motors vs. solar or wind powered.
 - ☐ Energy efficient toilets.
 - ☐ Energy efficient.
 - ☐ Solar ovens.
 - ☐ Food pantries (dryer and spouter).
 - ☐ Kitchen compost crock
 - ☐ Equator washer/ dryer (in the same enclosure).
 - ☐ Equator compact dishwasher.
 - ☐ Tankless water heater (booster heater).
 - ☐ Composting toilet (probably would never sell in Jordan).

RECOMMENDATIONS FOR A DEMONSTRATION LABORATORY

There are 5 levels of plumbing reflected by the Vocational Training Centers (VTC).

- ☐ Limited skills...(acquired at the VTC)
- ☐ Skilled.....(acquired at the VTC)
- ☐ Craftsmen.....(acquired at the VTC)
- ☐ Technicians
- ☐ Specialists

The training centers need an improved demonstration of materials needed to fully understand plumbing principles.



A	1½" sanitary tee	I	air admittance valve
B	1½" medium sweep	J	2"x1½"x2" sanitary tee
C	3" two-way clean out	K	2" medium sweep
D	3"x2" combination + 1/8 bend	L	2" medium sweep
E	2" PVC piping	M	2" floor drain
F	2" p-trap		drum trap
G	water closet bend		½" trap primer
H	1½" p-trap		water lines & fittings

The Jordanian Plumbing Guide Book

September 19, 2003

100 Administrative Procedures

101 This standard shall be known as the Jordanian Plumbing Guide Book, hereinafter called the *Guide Book*.

102 The purpose of this *Guide Book* is to protect the general health and welfare of persons using plumbing systems by installing a safe and efficient plumbing system..

103 Continued maintenance of existing buildings is to ensure the plumbing systems are safe, operational and efficient. The maintenance aspects may include but not be limited to:

- ☐ replacing or repairing leaking faucets,
- ☐ unclogging sewer lines,
- ☐ installing and/ or cleaning aerators,
- ☐ installing pressure-temperature relief valves on boilers and water heaters,
- ☐ replacing and/ or repairing non-working parts in toilet tanks,
- ☐ retrofitting water conservation devices where required by codes or standards,
- ☐ implementing maintenance schedules, and other measures to conserve water or enhance safety and efficiency to plumbing systems, and
- ☐ hotels shall apply hair dissolving solvents in the bathtub drains once per 3 months.

104 Enforcement- The Ministry of Public Works and Housing shall appoint an engineer or plumbing inspector who shall be responsible for enforcing the applications of construction codes, standards and is empowered to issue citations for noncompliance.

105 Permits shall be filed with the inspector prior to engaging in any work covered by the construction codes. Permits shall be accompanied by an engineer's certification that the plumbing details and plans have been designed in accordance with engineering principles.

106 The engineer's certification shall state the skills level required to perform the work identified by the permit. Plumbers filing permits shall be certified as limited skilled, skilled, craftsman, technician, or specialist.

200 Definitions

Aerator is a device that provides for water conservation, and for the absorption and release of gases, primarily oxygen and carbon dioxide. An efficient aerator will result in near oxygen saturation and 90% reduction of the carbon dioxide content of ground water.

Air admittance valve is a device that traps sewer gases from escaping from the drainage piping and permits the entrance of air to equalized the air pressure inside the drainage pipes with the outside atmospheric pressure.

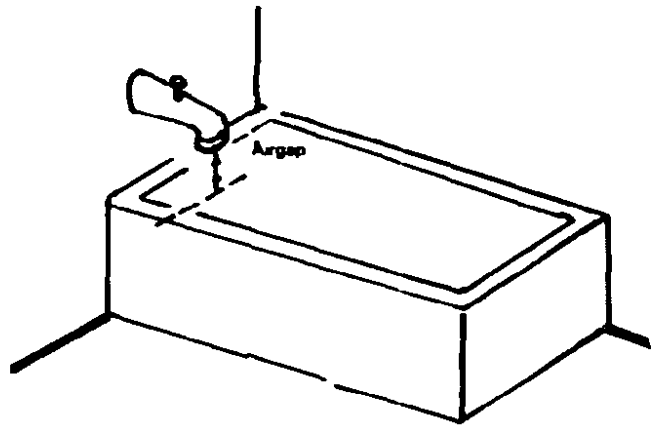


Air admittance valve

Airbreak is the physical separation between an indirect waste receptor and the appliance. Its' purpose is to break any vacuum in the drainage connection.

Air chamber is a vertical air chamber installed on the highest points of a water distribution system whose purpose is to absorb hydraulic shock. See water hammer arrestor.

Airgap is a vertical physical separation between the discharge opening of a faucet and the flood rim of the plumbing fixture.



Airgap

Backflow is the reversal of potable water flow. Backflow may result in permitting contaminated water into the water distribution lines.

Backflow preventers are devices used to prevent backflow. The most common type is the airgap.

Back pressure may contribute to backflow and is caused by increased pressure above the supply pressure.

Back siphonage may contribute to backflow and is caused by negative pressure compared to the water pressure in the pipe.

Cistern is the accompanying tank to a toilet bowl.

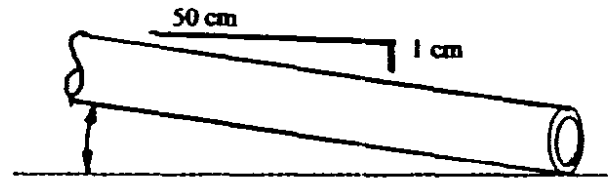
Clarifier is a device designed to separate dirt, oil or other harmful substances from sewer wastes.

CPVC is chlorinated polyvinyl chloride pipe used for hot water distribution systems.

**Grade shall be sloped downhill
not less than 2%.**

Horizontal Grade.

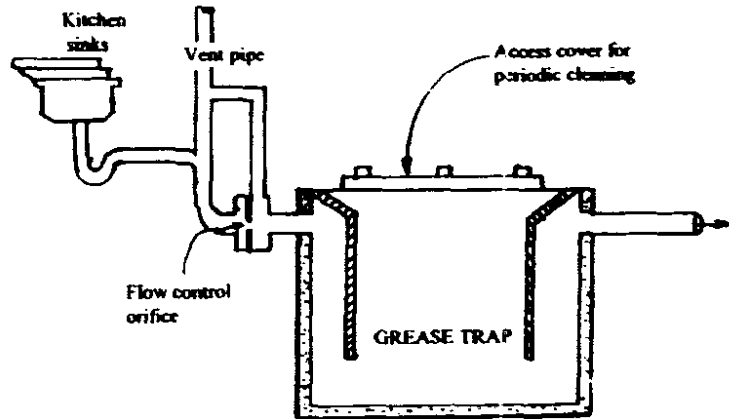
Drainage grade is the slope of a drain pipe measured from a horizontal plane.



Grade

Graywater is recovered water discharged from sinks, bathtubs, showers, lavatories, laundry tubs, and clothes washers. Graywater does not come in contact with toilet discharge.

Grease trap is a device designed to separate grease from the plumbing drainage.

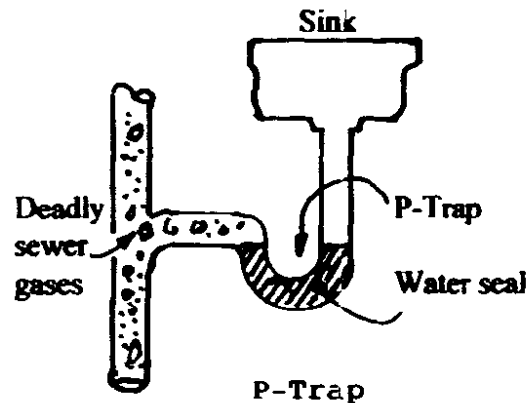


Grease trap

Interceptor. See Clarifier.

Labeling is a method used to determine that materials have been product-evaluated by an acceptable testing organization, for example, DIN which is a European standard, or BS (British Standards). Labels are stamped or applied to the materials bearing the mark of the testing organization. Testing organizations publish findings of the specific manner in which the materials were product-evaluated.

P-trap is a section of pipe that is designed to hold water for the purpose of blocking sewer gases from entering the interior portions of building through plumbing fixtures.

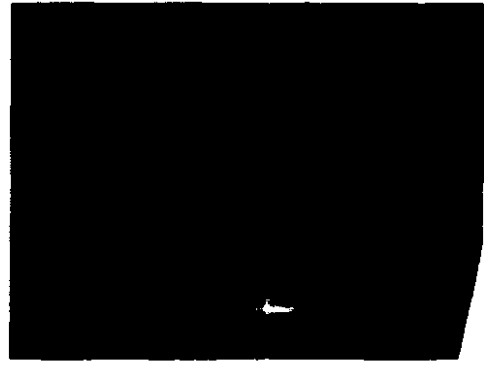


PE is polyethylene plastic piping.

Potable water is safe water for drinking, cooking, preparing foods or other personal usages.

PVC is polyvinyl chloride plastic piping.

Pressure-temperature (P-T) relief valve is a safety device designed to release the buildup of excessive stream pressures from water heaters or boilers.



Pressure-temperature relief valve

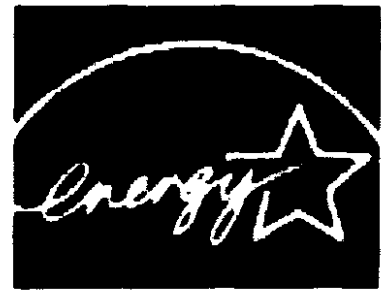
Tailpiece is a section of vertical piping that connects the plumbing fixture to the P-trap.

Trap arm is a short section of horizontal piping that connects the P-trap to the sanitary tee.

Septic tank is a waste receptor design to retain solid waste, digest organic matter, and release the liquid waste to a leach field or seepage pit.

Sewer gases are composed of hydrogen sulfide (H_2S), carbon monoxide (CO), methane (CH_4) and bacteria. Hydrogen sulfide at or above 10 parts per million or carbon monoxide at or above 35 parts per million, measured as an 8 hour time-weighted average, are considered hazardous atmospheres

Star labeling is a label applied to appliances indicating the equipment meets the USA requirements of having water conservation methods and is energy efficient.



Star labeling

Water hammer arrestor is an air chamber or mechanical device designed to absorb hydraulic shock. See air chamber.

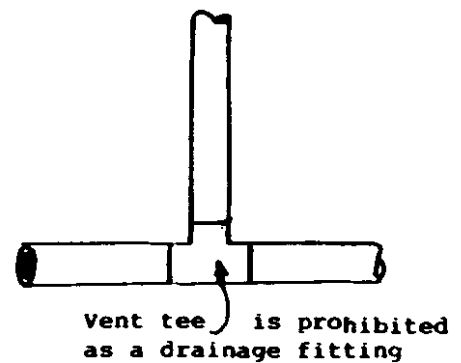
300 General Rules

301 Plumbing materials, fittings, fixtures and devices shall bear the mark of a label where required by the engineer.

302 Plumbing piping systems shall be tested for tightness in the presence of the engineer or inspector. The inspector will approve or disapprove the results of the pressure test. Pressure tests will be applied for at least 15 minutes before recording the results. See Section 608 and Section 708.

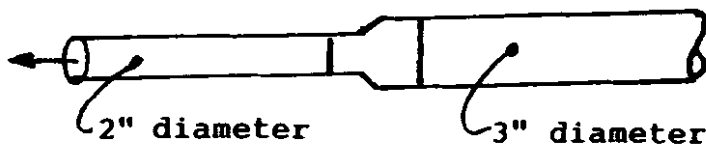
303 It is prohibited to discharge into any waste receptor or septic tank any substances that are considered harmful to the drainage system or sewer treatment plants. These substances include, but are not limited to ashes, cinders, toxics, gasoline, oil, and grease.

- 304 Vent fittings shall not be used for drainage fittings. →

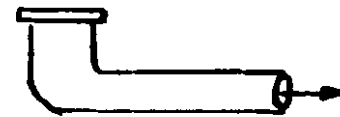


Prohibited fitting

- 305 Drainage piping shall not be reduced in diameter except for water closet bends.



PROHIBITED changing from 3" to 2"



4" x 3" water closet bend

- 306 Vent piping shall not be reduced in diameter.

- 307 Solder and solder fluxes shall be lead free.

400 Water Conservation

- 401 Water conservation methods shall be employed to the maximum extent possible for all water distribution systems.

- 402 Appliances, piping, drainage and vent fittings shall be labeled as required by the engineer during the permit review process.

- 403 Jordanian Standard (JS) 1132/1996 specifies that toilets (cistern) shall discharge not more than 7.5 liters (2 gallons) per flush. It is expected that actual volume for a cistern capacity to be not more than 6 liters per flush (1.59 gallons).

- 404 Water Conservation and Efficiency: Aerators shall be installed on all sink faucets and shower heads. Water saving devices that meet DIN 246 (1989) shall be used. Aerators shall be retrofitted on faucets in certain types of buildings where required by the engineers.

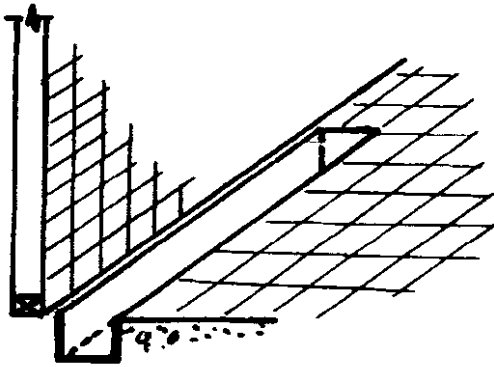
405 Devices discharging water shall be equipped with flow rates meeting the following specifications:

Fixtures	New Flow rate (L/ minute)		Water pressure available in bars
	Minimum	Maximum	
Sink	6	9	0.2 to 2 (2.9 to 29 psi)
Dishwashing basin & clothes washing basins			
½"	6	12	
¾"	12	18	0.2 to 2
1"	24	36	
Bathtub			
¾"	12	18	0.2 to 2
1"	24	36	
Showers	6	12	0.2 to 2
Hand spray	1.8	3	0.2 to 2
Bidet	6	12	0.2 to 2
Toilet tank	6	7.5	As per manufacturer's instructions
Toilet (flushometer)	—	—	Depending on type and available pressure
Urinal tank	3	6	As per manufacturer's instructions
Urinal (flushometer)	—	—	As per manufacturer's instructions
Drinking basin	1.3	3	0.2 to 2
Garden faucet (irrigation)	—	—	0.2 to 2
Washing machine	9	12	0.2 to 2
Dish washer	6	9	0.2 to 2

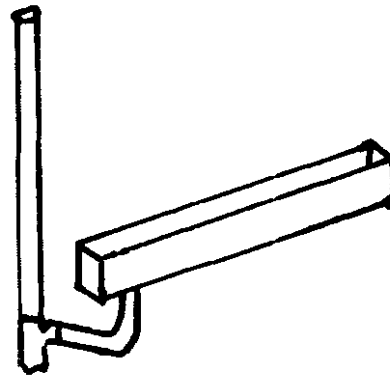
406 There shall be water saving initiatives for the following installations:

- ☐ Hotels shall develop laundry washing schedules to the engineer or inspector for review. The engineer or inspector shall approve or disapprove the laundry schedule. For example, daily washing is discouraged and when 50% of available stock are remaining, laundry washing may take place.
- ☐ Car washes shall establish time-controls and set each car wash not to exceed 4 minutes/ wash. Larger vehicles are not to exceed 6 minutes/ wash.
- ☐ Slaughterhouses shall develop schedules for washing slaughter areas and control the time period for washing. These schedules shall be submitted to the engineer or inspector for review. The engineer or inspector shall approve or disapprove these schedules. See Section 1004 regarding grease traps.
- ☐ New construction of swimming pools shall be limited in size. The maximum depth shall not exceed 244 cm (8 feet) and the area shall be approved or disapproved by the inspector during plan review.
- ☐ Submetering shall be placed on all structures and dwellings. The Ministry of Water shall set the maximum usage of water based on a time schedule and establish penalties for excessive water usage.

- 407 Metered faucets shall be installed in public buildings.
- 408 All water closets and urinals shall be thoroughly washed at flushing.
- 409 Floor type and wall-hung type troughs shall be prohibited.



☐ Floor trough-type urinals are prohibited.



☐ Wall hung trough-type urinals are prohibited.

- 410 Public buildings shall provide bathroom accommodations for the handicapped. At least 5% of all hotel rooms shall be accessible for the handicapped. Room-door dimensions and grab bars shall be installed as follows:
 - 410.1 Toilet room doors shall be at least 90 cm (3 feet) wide
 - 410.2 The toilet room shall be large enough to enclose a 150 cm (5 feet) diameter circle.
 - 410.3 Grab bars shall be firmly installed behind and to one side of the water closet.
 - 410.4 Grab bars shall be firmly installed on the walls of the bathtub.

- 411 Toilets in public buildings shall be of the elongated type with open-front seats.



Elongated toilet bowl

- 412 In public buildings, a separate toilet room shall be provided for men. A separate toilet room shall be provided for females.
 - 412.1 Unisex is permitted in residential units.
 - 412.2 Unisex is permitted for handicapped accessible rooms.

500 Boilers and Water Heaters

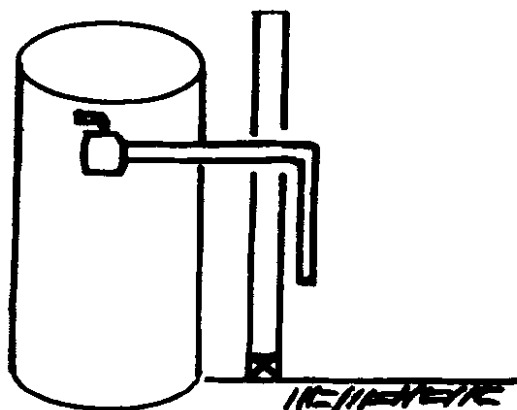
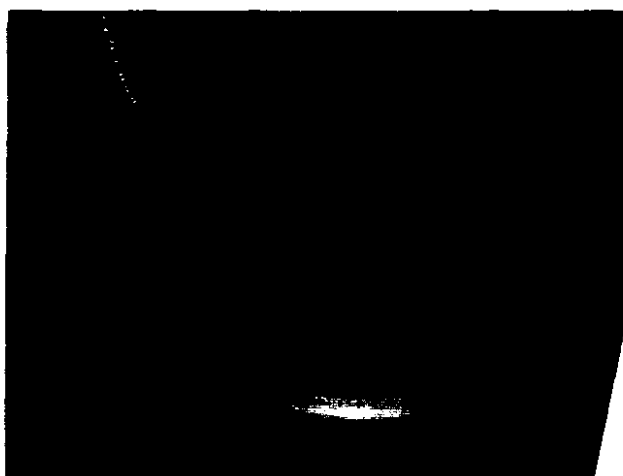
501 Boilers and water heaters shall be installed in an utility room designated for water heaters and/ or boilers.

502 In areas designated as earthquake zones by the engineer, the water heater shall be strapped to the wall by at least two straps to prevent the water heater from falling over. The top strap shall be within 20 cm (8 inches) from the top of the water heater. The lower strap shall be within 45 cm (18 inches) from the bottom of the water heater. Other means to prevent toppling shall be permitted where approved by the engineer or inspector.

503 Boilers and water heaters shall be equipped with a pressure-temperature (P-T) relief valve and the relief line shall be piped to a floor drain or other location acceptable to the inspector. The location shall be visible to occupants, thereby providing warning. The pressure-temperature (P-T) relief valve for the water heater shall not exceed 100°C (212° F) or 10 bars (147 psi). The pressure-temperature (P-T) relief valve for the boiler shall be in accordance with the manufacturer's instructions

P-T relief valve

P-T relief line



504 Diesel boilers and water heaters shall be provided with combustion air. The size of the combustion air area shall be at least 2 ½ times the exhaust vent area.

Exhaust diameter (inches)	Combustion air diameter (inches)
2	4
2.5	4
3	5
3.5	6
4	7
5	8
6	9

- 505 Exhaust venting for diesel boilers or diesel water heaters shall maintain clearances from combustible materials in accordance with their labeling.
- 506 Exhaust venting for diesel boilers or diesel water heaters shall be vented to the outside of the building.
- 507 Means shall be provided for ventilation of utility rooms where diesel is stored.
- 508 In hotels, a hot water circulating system shall be installed to provide rapid hot water to the guest hotel rooms.

600 Water Distribution System

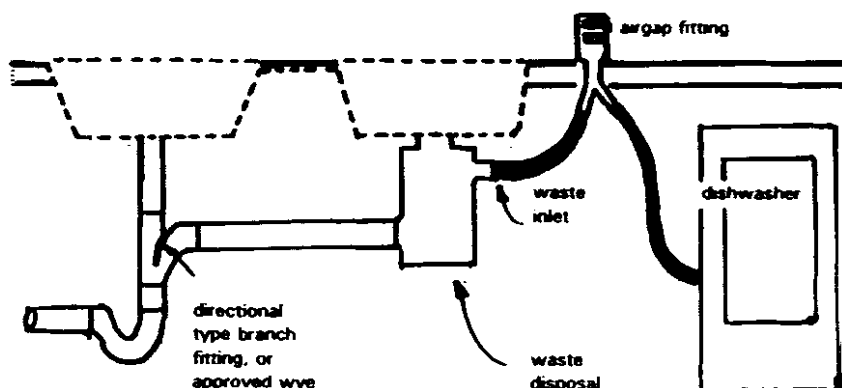
- 601 Each plumbing fixture shall be provided with potable (safe and clean) water. The flow rate of water faucets shall be in accordance with section 405.
- 602 Water systems shall be designed by an engineer and shall be installed so backflow or cross connection will not occur. Water lines shall be sized in accordance with acceptable engineering principals.
- 603 All lavatory, sinks, and bathtubs shall discharge potable water through an air gap or other means of a backflow preventer acceptable to the engineer.

Airgap distances are to be at least	
Lavatory	2.5 cm (1 inch)
Kitchen sink	5.0 cm (2 inches)
Bathtub	7.5 cm (3 inches)

- 604 Dishwashers shall discharge through an airgap fitting installed on the flange of the flood rim of the sink.

From the airgap fitting, a connection shall be made to the:

- ☐ drainage system, or
- ☐ food waste disposal.



- 605 Cross connections shall not be made between potable water and non-potable water (Graywater systems) unless a backflow preventer is installed.
- 606 Cross connections shall not be made between potable water and sewer drainage systems.
- 607 Water piping materials shall be made of PVC, CPVC, PEX, PE, copper tubing, galvanized malleable iron, galvanized steel, or other materials acceptable to the engineer.
- 608 Water lines shall be pressure tested to insure tightness in accordance with Section 302. Water distribution lines shall conform to the following testing parameters:

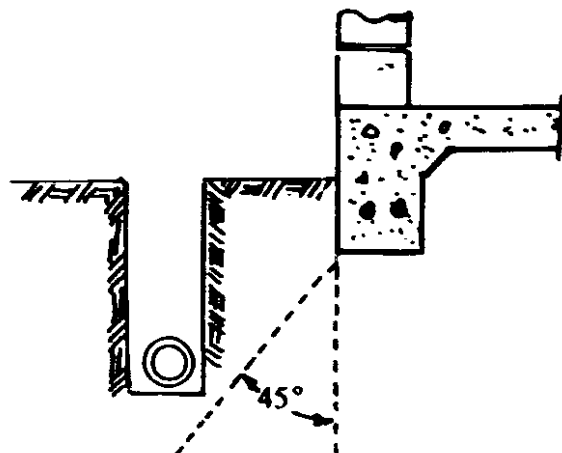
Residential, cold water	6 bars
Residential, hot water	12 bars
Boilers, central heating	12 bars
Public buildings	12 bars

The pressure tests will be held for at least 15 minutes.

700 Sewer Drainage Systems

- 701 Sewer drainage materials installed within buildings shall be made of PVC, cast iron, galvanized steel, galvanized wrought iron, or brass.
- 702 PVC materials shall be primed before applying cement solvent.
- 703 Sewer drainage materials installed outside buildings shall be made of materials permitted for indoor installation and may also include clay and concrete pipe. Asbestos piping is prohibited.

- 704 All trenches that are deeper than the footing of any building or structure, and also parallel to the same building or structure shall be kept above a 45 degree angle projected from the bottom corner of the footing so the building's weight is not transmitted onto any piping in the trench →



- 705 All buildings shall be equipped with a floor drain in the bathrooms.

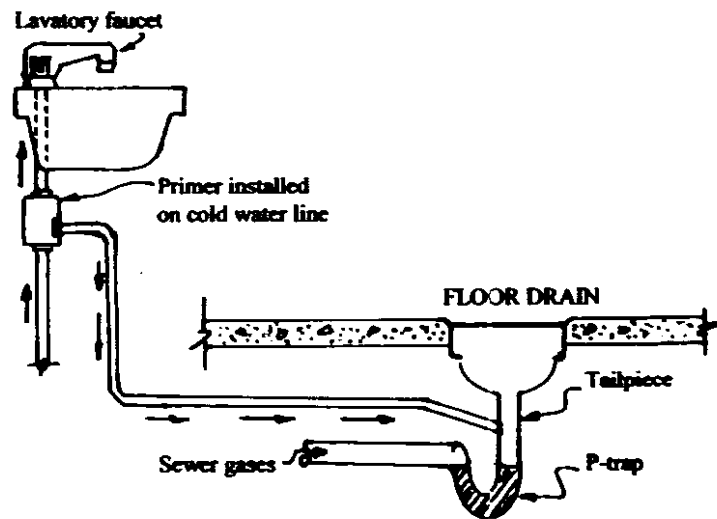
706 Food establishments shall be equipped with a floor drain in the kitchens.

707 Floor drains:

707.1 The minimum diameter of a horizontal drain pipe connected to a floor drain shall be 2 inches.

707.2 Floors drains shall be installed with P-traps.

707.3 A trap seal primer shall be installed on the cold water supply line to the nearest plumbing fixture and routed to the tailpiece of the P-trap serving the floor drain.



Floor drain with trap primer

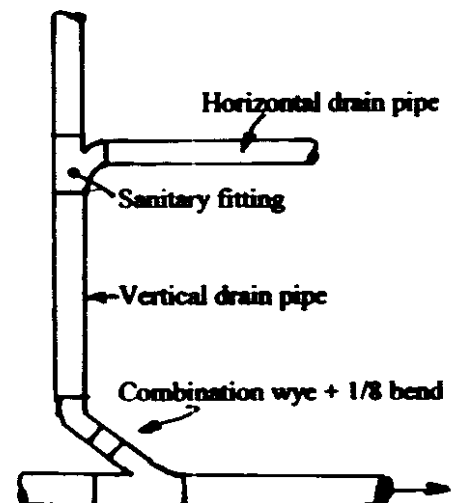
708 Sewer lines shall be pressure tested to insure tightness in accordance with Section 302. Sewer lines shall be tested with an air pressure test of at least 0.35 bars (5 psi) for 15 minutes or subjected to a 365 cm (12 feet) head of water test may be used.

709 Sewer drainage shall be done with the proper fittings. Vent fittings shall not be used for drainage fittings.

709.1 Horizontal drain pipes shall be connected to vertical drain pipes with sanitary fittings.

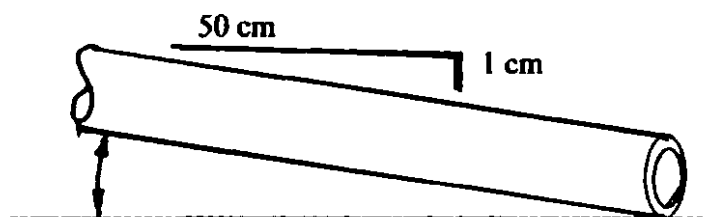
709.2 Horizontal drain pipes shall be connected to other horizontal pipes with a 1/8 bends, wye fittings, or combination of these fittings.

709.3 Vertical drain pipes shall connect to horizontal pipes with long sweeps or combination wye + 1/8 bends.



710 Drum traps shall be accessible.

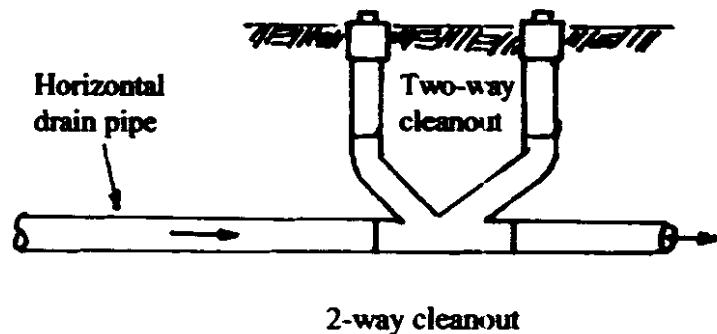
711 All drainage piping shall be vented in accordance with Section 900.



712 Horizontal drain pipes shall have a grade of at least 1 to 50 (2%) or steeper. Any less of a grade shall require the approval of the engineer.

- 713 A 2-way clean out shall be installed outside the building as soon as the horizontal drain pipe exits the building area.

- 714 Horizontal drain pipes shall be connected to the municipality sewer or a septic tank.

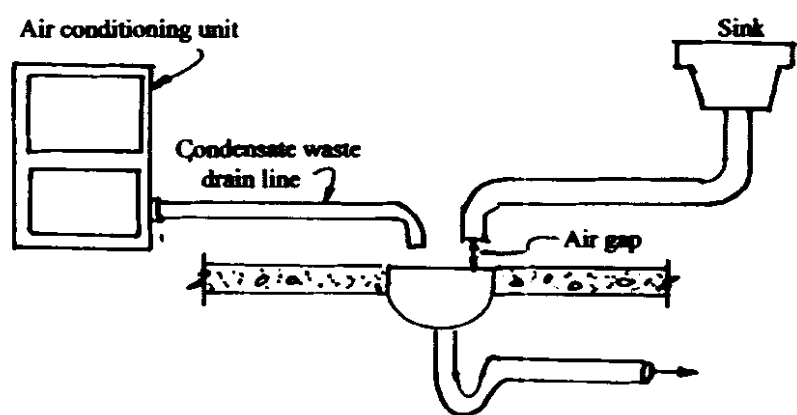


800 Indirect Waste Methods

- 801 Refrigerators, food storage compartments and coolers shall drain by an indirect waste method and an air gap of at least 5 cm (2 inches).
- 802 Sinks draining into a floor drain shall maintain an air gap in accordance with Section 603.

- 803 Condensate waste drain lines from air conditioning shall drain into floor drains with a minimum air gap of 2.5 cm (1 inch). Other discharge locations acceptable to the engineer may be used.

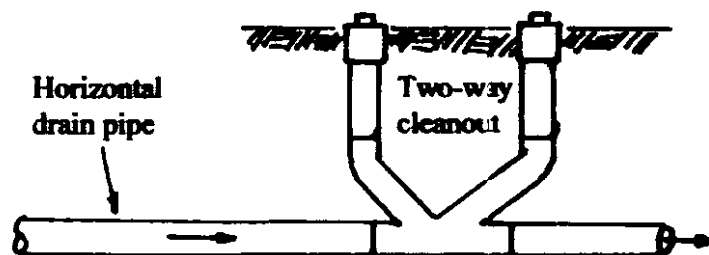
- 804 The size of the condensate waste drain line shall not be smaller than the outlet installed on the air conditioning unit.



900 Venting of Plumbing Fixtures.

- 901 Each water seal trap shall be protected against siphonage by venting the P-trap.
- 902 The air pressure within a sewer drainage pipe shall be equalized with the outside atmospheric air pressure by venting.
- 903 Venting of sewer drainage systems shall be either of the following:
- 903.1 Venting the vent piping through the wall to the outside,
 - 903.2 Venting the vent piping through the roof, or
 - 903.2 Venting by an air admittance valve.

- 709 Sewer drainage shall be done with the proper fittings. Vent fittings shall not be used for drainage fittings.



- 709.1 Horizontal drain pipes shall be connected to vertical drain pipes with sanitary fittings.
 709.2 Horizontal drain pipes shall be connected to other horizontal pipes with a 1/8 bends, wye fittings, or combination of these fittings.
 709.3 Vertical drain pipes shall connect to horizontal pipes with long sweeps or combination wye + 1/8 bends.

- 710 Drum traps shall be accessible.

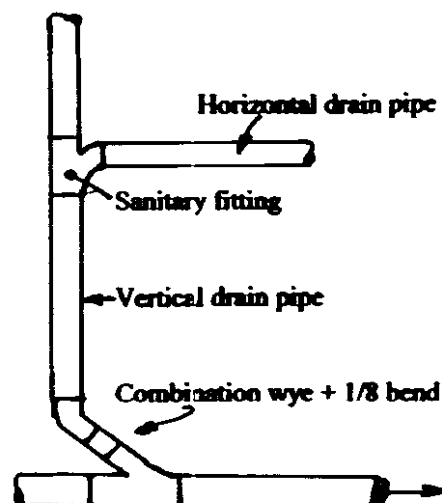
- 711 All drainage piping shall be vented in accordance with Section 900.

- 712 Horizontal drain pipes shall have a grade of at least 1 to 50 (2%) or steeper. Any less of a grade shall require the approval of the engineer.

- 713 A 2-way clean out shall be installed outside the building as soon as the horizontal drain pipe exits the building area.

- 714 Horizontal drain pipes shall be connected to the municipality sewer or a septic tank. way cleanout

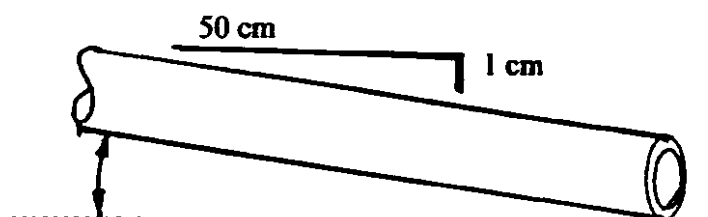
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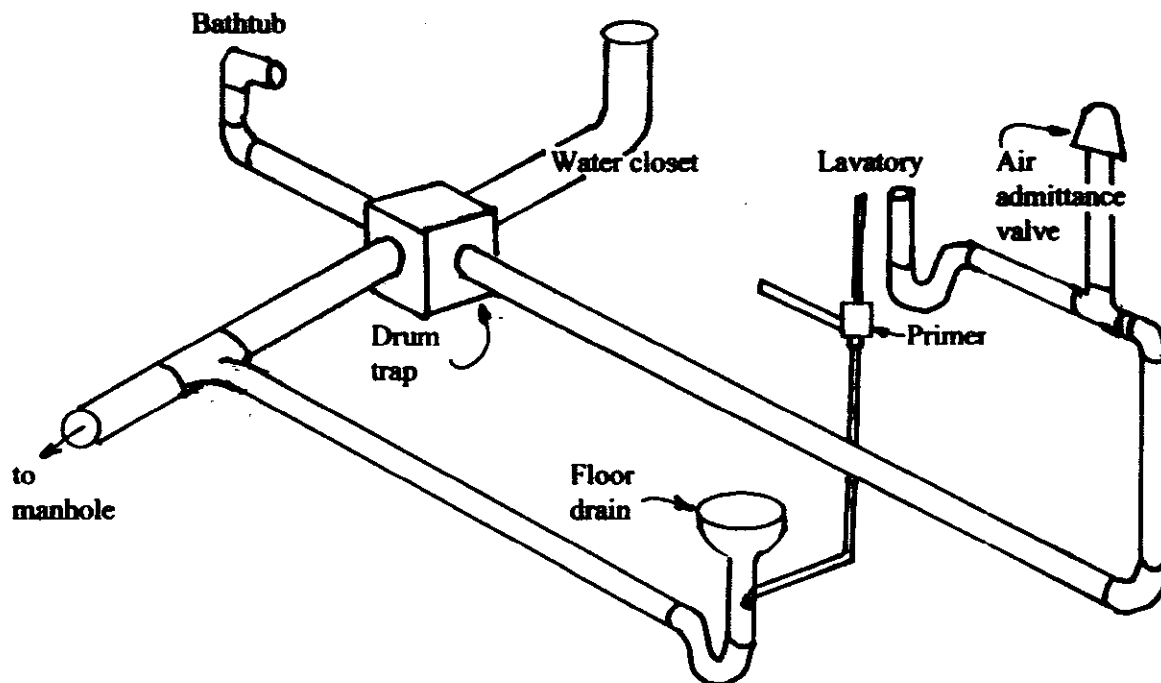


800 Indirect Waste Methods

- 801 Refrigerators, food storage compartments and coolers shall drain by an indirect waste method and an air gap of at least 5 cm (2 inches).

- 802 Sinks draining into a floor drain shall maintain an air gap in accordance with Section 603.





1002 S-traps and $\frac{3}{4}$ S-traps are prohibited from being installed.

1003 Greases from cooking shall be not discharged into the sewer drainage system. Greases shall be separated by a grease trap installed directly outside the building.

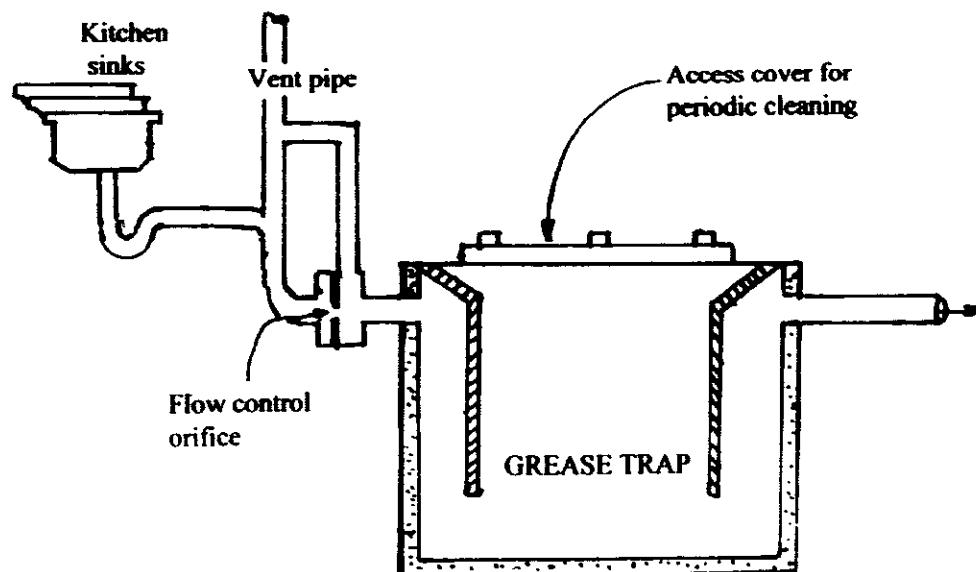
1004 Grease traps:

1004.1 The type of buildings requiring grease traps are commercial restaurants or similar cooking establishments, hotel and school kitchens. Grease traps are not required for residential type units.

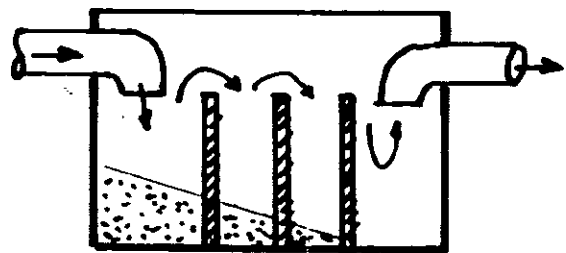
1004.2 Slaughter houses for fish, fowl or animal, meat packing, curing shops, soap factories, and fat processing shall be equipped with a grease trap.

1004.2 Grease traps shall have periodic cleaning.

1004.3 A flow control shall be installed in accordance with the manufacturer's instructions.

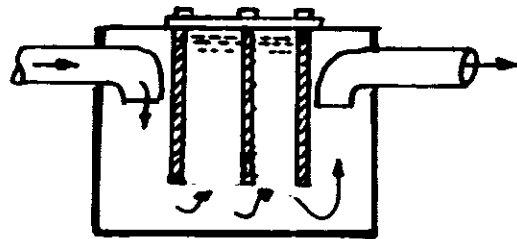


- 1005 Car washes shall be installed with sand interceptor (clarifiers). Sand interceptors (clarifiers) shall be periodically cleaned out. Sand interceptors (clarifiers) shall be installed in accordance with the manufacturer's instructions.



Sand clarifier

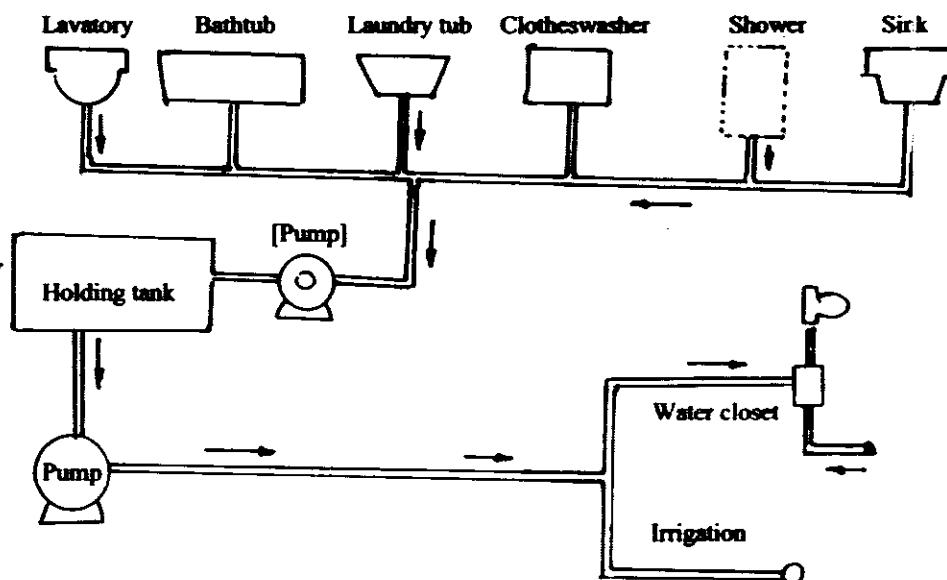
- 1006 Garages and similar shops shall be installed with an oil interceptor (clarifier). Oil interceptors (clarifiers) shall be periodically cleaned out. Floors shall be swept of sand before washing the floors down. Oil interceptors (clarifiers) shall be installed in accordance with the manufacturer's instructions. Solvents shall not be discharged into the sewer drainage system.



Oil clarifier

1100 Graywater Systems

- 1101 Graywater systems shall not be connected to any potable water piping except by a backflow preventor.
- 1102 Graywater is recovered water discharged from sinks, bathtubs, showers, lavatories, laundry tubs and clothes washers. Graywater shall not come in contact with toilet discharge.
- 1103 Graywater shall be diverted to a holding tank by a motor pump or gravity. It shall be used to supplement the filling of toilet tanks by an independent water line from the potable water line, or be used for irrigation purposes.
- 1104 Drawings for the holding tank shall be submitted to the engineer for approval.

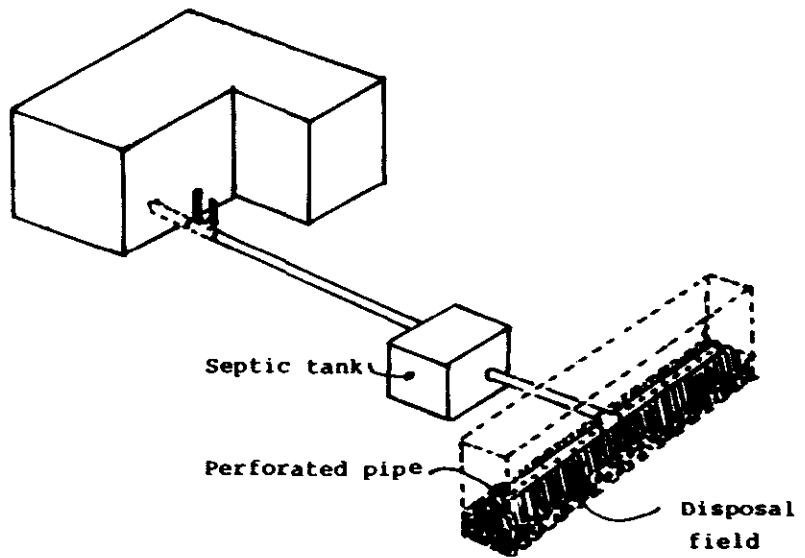


1200 Septic tanks

1201 Septic tanks shall require sufficient land area and proper soils conditions.

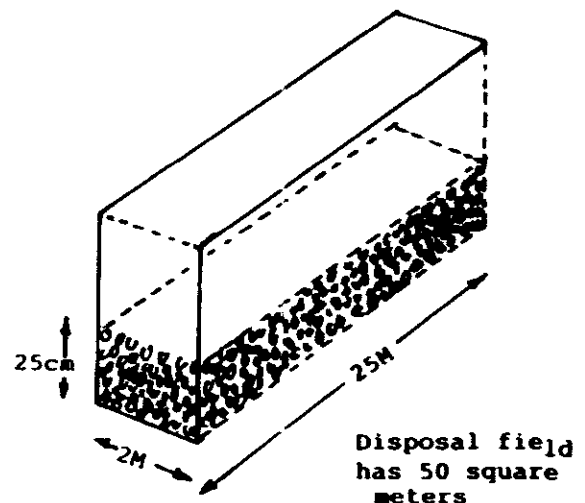
1202 Septic tanks shall have minimum capacities as follows for residential units:

1 bedroom	2800 liters
2 bedroom	2800 liters
3 bedroom	3800 liters
4 bedroom	4500 liters
5 bedroom	5500 liters
6 bedroom	6000 liters



1203 The disposal fields may be of any configuration that has the minimum square meters as follows:

Coarse sand	5 m ² / 1000 L tank
Gravel	5 m ² / 1000 L tank
Fine sand	6 m ² / 1000 L tank
Sandy loam	10 m ² / 1000 L tank
Sandy clay	10 m ² / 1000 L tank
Clay with lots of sand	22 m ² / 1000 L tank
Clay with little sand	30 m ² / 1000 L tank



1204 The bottom of the disposal field trenches shall be filled with at least 25 cm (10 inches) of small to medium size gravel.

1205 The perforated pipe shall be laid on a horizontal plane and covered with felt paper before filling in the trenches.

1300 Safety Requirements for the Plumber

1301 Manholes are deadly. It is impossible to completely isolate the manhole space to be entered and therefore the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the plumber.

1302 The contractor shall designate only plumbers who are trained to enter manholes.

1303 Atmospheric monitoring. Designated plumbers shall be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions is encountered:

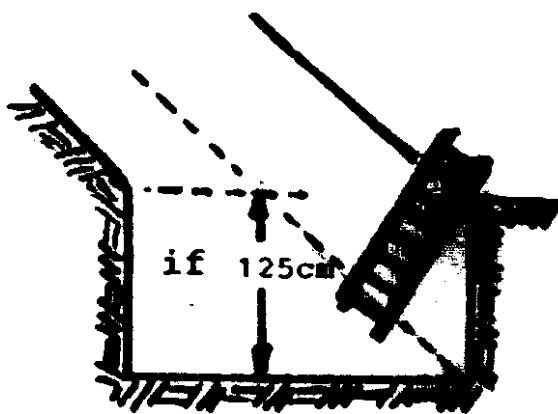
- ☐ Oxygen concentration becomes less than 19.5 percent,
- ☐ Methane gas or vapor reaches 10 percent or more of the lower flammable limit (LFL),
- ☐ Hydrogen sulfide reaches 10 ppm, measured as an 8 hour time-weighted average,
- ☐ Carbon monoxide reaches 35 ppm, measured as an 8 hour time-weighted average

Atmospheric monitoring equipment shall be calibrated in accordance with the manufacturer's instructions.

1304 Excavations: The contractor shall provide for the safety and protection of plumbers involved in excavation. Before entering trenches, the plumbers shall:

- ☐ Locate, remove or support all surface encumbrances that may create a hazard.
- ☐ Structural ramps used by plumbers for access to and egress from the excavation shall be designed by an engineer.

- ☐ Excavations at least 125 cm (49 inches) in depth shall have a stairway, ladder, ramp or other safe means of escape for plumbers. →



- ☐ Plumbers shall be protected from vehicular traffic when so exposed. Plumbers shall be provided with warning vests which shall be made of reflectorized or highly visible materials.
- ☐ Plumbers are prohibited from standing underneath loads handled by lifting or digging equipment.
- ☐ Plumbers shall not work in excavations in which there is accumulated water, unless adequate precautions are taken to protect the plumbers from drowning or engulfment.
- ☐ Plumbers shall be protected against loose rocks or falling soils. This includes operating equipment adjacent to excavations.
- ☐ Daily inspections of excavations, the adjacent areas, and protective systems shall be made by an engineer.

- ☐ Trenches cut in unstable or loose soil shall be sloped. The slope shall not be less than 1 to 2. →

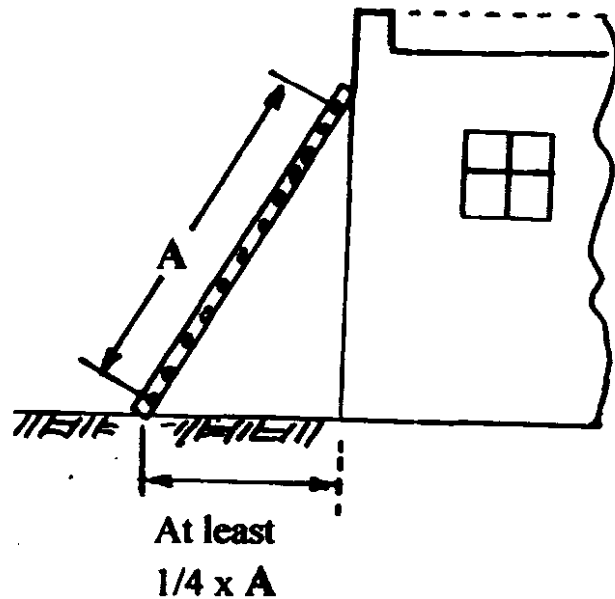


1305 Personal Protective Equipment: The contractor shall provide plumbers with and the plumber shall wear:

- ☐ hard hats where subject to impact from falling objects.
- ☐ safety glasses with side shields.
- ☐ respirators in areas of dusts.
- ☐ leather or heavy gloves.
- ☐ self-forming ear plugs.
- ☐ safety shoes providing protection against compression or impact.

1306 Ladders:

- ☐ Plumbers shall not stand on the top rung or step of a ladder
- ☐ Ladders shall be secured before ascending them.
- ☐ The base of the ladder shall be placed from the building at least $\frac{1}{4}$ the length of the distance between the top and bottom rungs. →



1307 Cutting Asbestos Piping:

- ☐ Plumbers shall be trained in the hazardous of asbestos materials.
- ☐ Plumbers shall be equipped with appropriate respirators while cutting asbestos materials.
- ☐ If trained plumbers are not available for working with asbestos, asbestos pipe shall be prohibited. See section 703.

Explanation for the Jordanian Plumbing Guide Book

100 Administrative Procedures

Administrative procedures are required to define the purpose of the *Plumbing Guide Book* and to identify the systems used to protect the general health and welfare of persons using plumbing systems.

200 Definitions

Definitions of plumbing terms, fittings and materials are necessary for consistency and understanding plumbing terminology.

300 General Rules

- 301 Labeling of plumbing materials, fittings, fixtures and devices insure the plumbing item has been product-evaluated for consumer safety and/or energy efficient appliances.
- 302 Water and sewer drainage lines shall be tested for tightness to insure non-leakage.
- 303 This rule controls and prohibits the discharge of any substances that are considered harmful to the drainage system or sewer treatment plants.
- 304 An efficient plumbing system uses drainage fittings for drainage and vent fitting for venting. The use of a vent fitting for drainage is consider an obstruction.
- 305 Once the diameter of drainage piping is established, it shall not be reduced in diameter except for water closet bends. A change to a smaller diameter is considered an obstruction.
- 306 Once the diameter of vent piping is established, it shall not be reduced in diameter. A change to a smaller diameter is considered an obstruction.
- 307 Solder and solder fluxes shall be lead free. Lead is a dangerous metal and causes:
 - ☐ vomiting,
 - ☐ headaches,
 - ☐ appetite loss,
 - ☐ slowed growth,
 - ☐ nerve disorders,
 - ☐ hearing problems,
 - ☐ behavior problems,
 - ☐ learning problems,
 - ☐ sleeping problems,
 - ☐ digestive disorders,
 - ☐ muscle and joint pains,
 - ☐ increased blood pressure,
 - ☐ mood changes in personality, and
 - ☐ memory and concentration problems.

400 Water Conservation

- 401 Water conservation methods shall be employed to the maximum extent possible for all water distribution systems. This is the theme of WEPIA in conjunction with the Ministry of Water and Irrigation.
- 402 Appliances, piping, drainage and vent fittings shall be labeled as required by the engineer. Labeling insures product-evaluation for safety and/or energy efficient appliances.
- 403 This rule enforces the Jordanian Standard (JS) 1132/1996 specifying that toilets (cistern) shall not discharge more than 7.5 liters (2 gallons) per flush.
- 404 For water conservation measures, aerators shall be installed on all sink faucets and shower heads.
- 405 Devices discharging water shall be equipped with flow rates meeting the specifications as specified in the Jordan Construction Code.
- 406 There shall be water saving initiatives developed for the following:
- ☐ hotels
 - ☐ car washes
 - ☐ Slaughterhouses
 - ☐ swimming pools
 - ☐ sub-metering
- 407 Metered faucets shall be installed in public buildings because the public sometimes do not shut off the water faucets. Metered faucets will have automatic shutoff features.
- 408 All water closets and urinals shall be thoroughly washed at flushing for sanitary purposes.
- 409 Floor type and wall-hung type troughs shall be prohibited because bacteria is not removed causing a serious unsanitary condition.
- 410 Public buildings shall provide bathroom accommodations for the handicapped. Bathroom accommodations and adequate dimensions must be provided for persons with disabilities.
- 411 Toilets in public buildings shall be of the elongated type with open-front seats. The purpose of this rule is to prevent venereal disease from being communicated. Infected genitals cannot rub on the front of open toilet seats.
- 412 In public buildings, separate toilet rooms are required for both sexes. There are provisions for unisex bathrooms.

500 Boilers and Water Heaters

- 501 Boilers and water heaters should not share rooms with other utilities.
- 502 In the event of an earthquake, a water heater with hot water will not toppled over spilling hot water and burning people if it is strapped to the wall.
- 503 Boilers and water heaters produce steam. Steam pressure is a powerful force and an exploding boiler is equivalent to a large bomb exploding. Pressure-temperature relief valves reduce this hazard.
- 504 Diesel boilers and water heaters shall be provided with sources of combustion air. Without adequate combustion air, dangerous carbon monoxide gases becomes a by-product of combustion.
- 505 Hot exhaust venting for diesel burning boilers and water heaters shall maintain clearances from combustible materials to prevent fires.

- 506 Exhaust venting for diesel boilers and water heaters shall be vented to the outside of the building to expel dangerous gases to the atmosphere.
- 507 Means shall be provided for ventilation of utility rooms where diesel is stored to reduce dangerous accumulated vapors.
- 508 In hotels, a hot water circulating system shall be installed to provide rapid hot water to the guest hotel rooms. This reduces running water to achieve a desired temperature.

600 Water Distribution System

- 601 Each plumbing fixture shall be provided with potable (safe and clean) water for washing or cooking purposes.
- 602 Water systems shall be safe from sources of contamination. Assurances must be made to prevent contamination.
- 603 The air gap is simplest and most economic means of preventing contamination to water.
- 604 The interior of the dishwasher is a sterile environment and the only means to maintain this sterile environment is to drain the dishwasher through an airgap fitting.
- 605 Cross connections between potable water and non-potable water places potable water at risk to contamination. A labeled backflow preventer would prevent this and would be required at toilet tanks where graywater systems are used.
- 606 Cross connections between potable water and sewer drainage systems shall never be made. The trap primer required in section 707.3 prevents backflow.
- 607 Water piping materials shall be of a good quality. The identified materials are proven.
- 608 Water lines shall be pressure tested to insure tightness. This guards against future leakage.

700 Sewer Drainage Systems

- 701 Sewer drainage materials installed within buildings shall be so constructed that it will never leak. These identified materials have been proven to be reliable.
- 702 PVC materials shall be primed before applying cement solvent. PVC requires a chemical fusion produced by primer.
- 703 Sewer drainage materials installed outside buildings permit clay and concrete piping which is known for leaking. It is acceptable as long as it is kept outside of buildings. Asbestos piping is prohibited because of its hazards.
- 704 Outside sewer drainage piping permits clay and concrete piping. By keeping the drainage piping above the 45 degree angle, weight loading is avoided and leakage is reduced.
- 705 Bathroom floors are frequently mopped and washed down. A floor drain is necessary.
- 706 Food establishments often mopped and wash down kitchen floors, therefore a floor drain is necessary.
- 707 Floor drains and piping are established with dimensions for efficiency.
- 708 Sewer drainage lines shall be pressure tested to insure tightness. This guards against future leakage.

- 709 Sewer drainage shall be installed with the proper fittings for efficiency and the avoidance of obstructions.
- 710 Drum traps shall be accessible as it is a source of clogging.
- 711 All drainage piping shall be vented to protect water seals and efficient drainage.
- 712 The desired drainage grade of 2% will insure water will flow slow enough to carry waste and scour the drainage pipes.
- 713 A 2-way clean out shall be installed outside the building as soon as the horizontal drain pipe exits the building area. This permits access to clogged sewer lines and a way to free them.
- 714 Horizontal drain pipes shall be connected to the municipality sewer or a septic tank. This rule prevents sewer drainage to unprotected means.

800 Indirect Waste Methods

- 801 By avoiding a direct drainage connection, refrigerators, food storage compartments and coolers cannot be contaminated due to an clogged sewer drain.
- 802 Air gaps insure backflow prevention.
- 803 Condensate waste drain lines from air conditioning are considered contaminated. Air gaps insure protection against backflow.
- 804 Diameters are matched for consistency.

900 Venting of Plumbing Fixtures.

- 901 Each water seal trap shall be protected against siphonage by venting and maintaining the water seal in the p-trap.
- 902 For efficient drainage, the air pressure within a sewer drainage pipe shall be equalized with the outside atmospheric air pressure by venting.
- 903 The rules lists effective venting methods.
- 904 Vent sizes are listed for consistency.
- 905 Air admittance valves are installed to vent the water seals and for efficient drainage.
- 906 Air admittance valves are permitted terminate under the kitchen sink countertop for ease.
- 907 Vent piping terminating above the roof shall terminate at least 30.5 cm (12 inches) above the roof surface so effective diffusion of sewer gases are made into the atmosphere..

1000 Trapping with Water Seals

- 1001 Each plumbing fixture drain shall be trapped to guard against sewer gases.
- 1002 S-traps and $\frac{1}{4}$ S-traps are prohibited from being installed because they cause siphonage of the water seals with negative pressure.
- 1003 Greases from cooking clogs the sewer drainage system. Greases shall be separated by a grease trap installed directly outside the building.

- 1004 Grease traps are specified for certain establishments because they are heavy producers of grease.
- 1005 Sand interceptor (clarifiers) are specified for car washes. Sand clogs the sewer drainage system.
- 1006 Oil interceptor (clarifiers) are specified for car garages. Oil clogs the sewer drainage system.

1100 Graywater Systems

- 1101 Graywater systems shall not be connected to any potable water piping except by a backflow preventor. This prevents the risk of contamination.
- 1102 Graywater is defined as recovered water discharged from sinks, bathtubs, showers, lavatories, laundry tubs and clothes washers.
- 1103 Graywater systems are defined as well as its purposes for water conservation.
- 1104 Drawings are required for installing the gray water system.

1200 Septic tanks

- 1201 Septic tanks require sufficient land area for the disposal fields and proper soils conditions for percolation.
- 1202 Septic tanks shall have minimum capacities based on the size of the residential units.
- 1203 The disposal fields require so many square meters of trench bottom depending on the soil conditions.
- 1204 The bottom of the disposal field trenches shall be filled with at least 25 cm (10 inches) of small to medium size gravel.
- 1205 The perforated pipe shall be laid on a horizontal plane and covered with felt paper before filling in the trenches. This prevents clogging the disposal field.

1300 Safety Requirements for the Plumber

- 1301 The hazards of manholes is defined.
- 1302 This rule requires only qualified plumbers to enter manholes.
- 1303 The atmosphere of a manhole is required to be constantly monitored and provide warning to plumbers when the atmosphere becomes dangerous.
- 1304 The contractor shall provide for the safety and protection of plumbers involved in excavations since many plumbers die from trenches collapsing.
- 1305 The contractor shall provide plumbers with personal protective equipment.
- 1306 This rule defines ladder safety.
- 1307 Plumbers shall be trained in the hazards of working with asbestos materials.

Activity Log for Darkmoon Cliffdweller

Sunday, August 31, 2003

1. WEPIA staff meeting
 - Introduced by Mona Grieser
 - Staff introduced themselves and their job functions



Mona Grieser



Abdus.salam Kamal (Alburajai)

- Meeting with Abdus.salam Kamal (Alburajai) and Andrawes Snobar. Abdus.salam Kamal emphasized the importance of water saving devices. Future code direction must be based on water saving devices.
2. Meeting with Vocational Training Corporation (VTC)
 - Adbel-Rahim Abdel-Jaber, Assistant Director General for Technical Affairs
 - Hassan Abu Rayyan, Engineer, Vocational Training Coordinator



Adbel-Rahim Abdel-Jaber



Hassan Abu Rayyan



Basem Abdullah



Andrawes Snobar

WEPIA was represented by:

- Abus.salam Kamal (Alburajai)
- Basem Abdullah
- Andrawes Snobar
- Darkmoon Cliffdweller

Adbel-Rahim Abdel-Jaber wants us to visit centers under construction: assess the "Specialized Training Institute for Chemical Treatment"; lecture to the VTC "trainers" rather than the "trainees"; & assess safe work practices; and address code enforcement.

3. Returned to WEIPA headquarters

Motaseem Haddadin discussed with Darkmoon the existing Jordanian codes. There is a "Specification and Standards for the Jordanian Construction Codes" and a "Draft Background Paper- Sanitary Code". There is no existing "plumbing code".

4. Basem Abdullah arranged for a viewing of a plumbing supply shop and the plumbing products commonly sold.

- Water supply lines are an unknown plastic. We were told the plastic pipes are constructed to withstand 230 psi. The shop owner said the materials were PVC, CPVC and PE plastic materials.
- Where installed under foundations, the plastic water supply lines are installed inside of electrical nonmetallic tubing. This electrical nonmetallic tubing [Basem Abdullah called it "conduit"] is used for protection of the water supply line where buried in the earth.
- The toilets for sale are 12 liters per flush. This is an excessive water usage of water. Toilets are available that average approximately 6 liters per flush.
- There were no identifiable "water saving devices", that is, information did not exist on water flow rates for sink faucets or shower heads.
- The plumbing shop sells vent tees for drainage fixtures. This is an incorrect usage. Suppliers needed to be included in an educational platform addressing the proper fixtures

- for changing of direction for drainage and proper usage of other fittings.
- There were no backflow preventors available in variation. A spring loaded backflow preventor was shown us. Basem Abdullah explained backflow cannot occur providing a gravity tank is used on a roof top and equipped with a float shutoff system. Most of, but not all residences have gravity tanks.

Basem Abdullah and I discussed the lack of grease traps and clarifiers (Interceptors) which are non-existent in Jordan. There are commercial business in Amman that produced large amounts of grease during cooking activities. These greases are being washed down the sewer drains which will lead to clogging all the way to the sewer treatment plants. Grease substances need to be separated by a grease trap before being washed into the sewer drainage system.

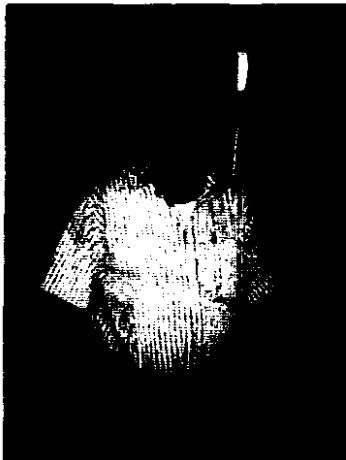
Car washes create a lot of dirt contaminants and they are washed down the sewer drains which will lead to clogging all the way to the sewer treatment plants. Dirt contaminants need to be separated by clarifiers (or sand interceptors) before being washed into the sewer drainage system.

Oil-change businesses and garages washed oil down the sewer drains which will lead to clogging all the way to the sewer treatment plants. Oil contaminants need to be separated by a clarifiers (or oil interceptors) before being washed into the sewer drainage system.

Monday, September 1, 2003

We met with officials at the VTC Curriculum Center/ Training and Development Center.

We met with officials at the VTC Curriculum Center/ Training and Development Center.



Nasser Elian

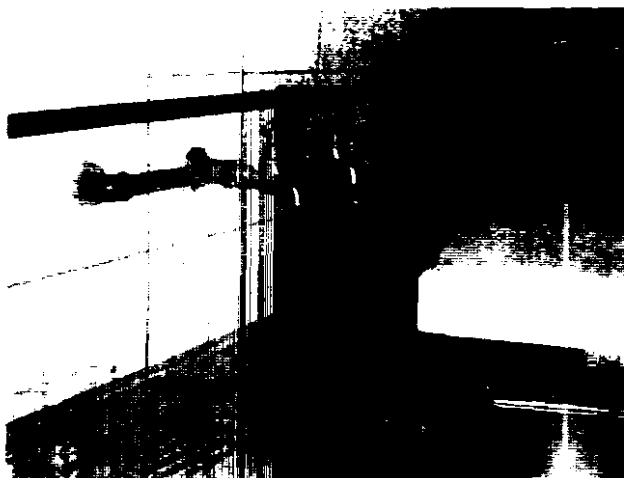


Nour Al-deen J. Nazer

We met with the VTC Assistant Director Nasser Elian. Abdus.salam Kamal and I explained our mission and the interest to incorporate water saving devices and other water conservation methods into the school's curriculum. In the interest of water conservation, Nasser Elian stated

that flow control devices have been installed on the majority of hotels and public buildings in Amman. It is estimated that these flow control devices have resulted in 60% savings in water consumption. There is no data to support these observations.

- Nasser Elian showed us the kitchen facilities where sink faucets are incorporated with a pin selector. Push the pin in one direction and water flow is retarded. Push the pin in the opposite direction and water flow is increased. These push-pull pin faucet devices could be effective if the authorities would set days when water flow retarding is in effect. This means the public must be educated on the seriousness of water shortages.



- Nasser Elian introduced us to Nour Al-deen J. Nazer, who is in charge of the Institutional Resource & Curriculum Development Center. Nour Al-deen J. Nazer explained the methods used to develop the trades curriculum for the various trades.

The trades levels of accomplished skills are categorized as follows:

1. Limited skills
2. Skilled
3. Craftsmen
4. Technicians
5. Specialists

- The last official we met was Saleh M. Harb. Mr. Harb re-emphasized the trade levels of accomplishment as categorized above. If WEPIA would provide the materials based on the Jordan Construction Codes for water saving devices, he would cooperate in having them become a part of the trade curriculum.

2. We visited another VTC training center. Mr. Khalaileh Bassem is the school's director. Mr. Bassem is willing to cooperate with WEPIA regarding materials on water conservation to be placed in the school's curriculum.

- We visited the electrical laboratory.
- We visited the plumbing laboratory. There are limited training materials available for understanding the plumbing trade. What was available for review were:
 - 2 threading machines, one manual and one electric.
 - 1 water line pressure test equipment. We were told that the plastic water lines are tested for leaks by using 12 bars (176.4 psi). I explained that in my opinion this was excessive pressure to use for a pressure test and that 3.5 bars (51.4 psi) would be sufficient. The school officials did not know why they used 12 bars or where the testing value came from.
 - There was a model solar collector for heating water in water heaters.
 - There was 2 boilers connected with piping.
 - There was an assortment of pipe fittings made of galvanized materials.
 - There 1 small coil of ½" plastic water tubing.
 - There was a demonstration room equipped with a bathtub, lavatory, toilet and the cold and hot water lines.



Saleh M. Harb



Khalaileh Bassem

- An ideal plumbing laboratory might have the following items for students:
 - ☐ Tools. The old saying goes, "Always the right tool for the given job". They need to demonstrate saws with explanation of cutting teeth, reamers, lead heating and pouring kits, oakum, and packing hammers.
 - ☐ mapp gas or the equivalent, solder, fluxes, signs warning of the danger of lead in solder and fluxes, manometer testers.
 - ☐ various draining fittings and various venting fittings.
 - ☐ traps and how they work, grease traps, sand clarifiers, and oil clarifiers.
 - ☐ water hammer arrestors,
 - ☐ aerators
 - ☐ charts depicting septic tank construction and leach field construction.

Tuesday, September 2, 2003

1. I was introduced to Hala Dahlan.
2. I met with Mona Grieser, Setta Tutanjian (USAID) and Rania Abdel Khaleq (WDMU). We discussed the efforts of assessing the plumbing practices, training curriculum for plumber trainees, the type of materials used, and the need for a plumbing code. The plumbing code is being written and will be a concerted effort by staff of WEPIA to channel it through the proper authorities for adoption into law. I will develop the basic skeleton for the code.
3. Andrawes Snobar, Hassan Abu Rayyan and I went to Sahab to visit the VTC center. Mr. Marwan Abu Sa's is the director for the VTC center.



Marwan Abu Sa's

- Mr. Sa's said the water storage tanks on residential roofs were approximately 1 cubic meter and the water tanks are filled once per week.
- The plumbing graduates of his VTC center usually start their own plumbing businesses.
- Mr. Sa's opinion of existing water piping being installed under the streets is a major problem because of the continuing deterioration of the piping material. There are constant major leaks and a great loss of water caused by these leaks.
- We visited his electrical and plumbing laboratory. His plumbing laboratory is better equipped than the 2nd VTC we visited yesterday.

Wednesday, September 3, 2003

1. We visited the VTC center at Aein Al Bashar. Today, representing WEPIA was:
 - Abdus.salam Kamal
 - Basem Abdullah
 - Andrawes Snobar
 - Hassan Abu Rayyan, Engineer, Vocational Training Coordinator
 - Darkmoon Cliffdweller
2. Mr. Ishraem Ali, Director, greeted us. Mr. Ishraem Ali explained his VTC centered had 16 trades including plumbing. The curriculums for the trades are all standard with the other VTR centers.



Ishraem Ali



Electrical nonmetallic tubing in red & blue protects the 1/2" plastic water lines. Concrete will be poured over the ENT.

We explained the efforts of WEPIA were to develop a format for water conservation and safe plumbing installations which would require a plumbing code and a cooperative effort among the Ministry for Public Works & Housing, WEPIA, curriculum developers, engineers, VTC's, trainers, and trainees.

We were taken to the plumbing laboratory and shown the facilities. There is an effective display of plumbing fittings and a safety chart. Cubicles are set up to install the drainage system and water piping. Variations of pipe holders and cutting dies are available.

The plumbing instructors took us to actual job sites where plumbing is being installed. The drainage systems all drain into a drum trap and the fixture receptacles are not vented. Venting is required to maintain equilibrium in the drainage system. The water closets were of the 6 liter per flush. The drainage system terminates in a manhole outside the building. The water supply lines were 1/2" and installed in electrical nonmetallic tubing which will be embedded in concrete.

Thursday, September 4, 2003

1. We visited the VTC center at Al Hashmiyyeh. Today, representing WEIPA was:
 - ☐ Abdus.salam Kamal
 - ☐ Darkmoon Cliffdweller
 - ☐ Hassan Abu Rayyan, Engineer, Vocational Training Coordinator

Mr. Haddadin Zaed Abed greeted us. Adbus.salm Kamal explained the objectives of WEPIA regarding water conservation. Darkmoon Cliffdweller explained the proposed plumbing code

and its provisions will not only address water conservation, but also requirements for a sanitary system and safety for plumbers. This will process through channels of authority, and if it is adopted into law, then the WTC curriculum will incorporate the plumbing code provisions.



Haddadin Zaed Abed



2nd year trainees

We visited a near completed building in Zarka and a half completed structure at the Zarka Private University. At the Zarka Private University, the boiler and associated piping had been completed by VTC 2nd year trainees. The 3 trainees shown above also complete the plumbing system and water distribution system. They are 2nd year trainees under WTC and have performed excellent work.

Sunday, September 7, 2003

1. WEPIA had a staff meeting and addressed administrative and technical issues. I presented an update on the progress of the assessment, the development of a plumbing code, and the direction we are going. The plumbing code will be completed by Tuesday and ready for presentation. The plumbing code is a working document required to enforce water conservation issues and plumbing safety.
2. A meeting was held with the USAID. In attendance were:
 - ☐ Mona Grieser
 - ☐ Abdus.salam Kahal
 - ☐ Bassem Abdullah
 - ☐ Darkmoon Cliffdweller

Our guests were:

- ☐ Jim Frankovich
- ☐ Setta T. Abu-Jamra.

We discussed the primary platform for water conservation and implementation of several efforts through aerators, water flow rates now mandated in the Jordanian Construction Code, and other proposed techniques.



Jim Frankovich



Setta T. Abu-Jamra.

3. We visited the Jordan Forum for Business and Profession Women. Represent ng WEPIA were:

- ☐ Abdus.salam Kamal
- ☐ Bassem Abdullah
- ☐ Darkmoon Cliffdweller

The Jordan Forum for Business and Profession Women were represented by:

- ☐ Bashar Al Ali
- ☐ Hayat Bakir
- ☐ Entesar AL-Dweak
- ☐ Eman Qasem
- ☐ Sawsan Gith
- ☐ Hala Ibbins



Jordan Forum for Business and Professional Women



Hayat Bakir
WSF Program

Bashar Al Ali
Project Manager



Entesar AL-Dweak
Waethat Liaising Officer

Eman Qasem
Waethat Program
Coordinator



Hala Ibbibi

Sawsan Gith

The Jordan Forum for Business and Profession Women are interested in the opportunity to have women trained and to be advanced in the plumbing disciplines. They proposed to send 20 women to learn basic plumbing for repairs and maintenance.

They are receptive to be trained in:

- ☐ leaking faucets
- ☐ clogged sewer lines
- ☐ installing and cleaning aerators
- ☐ examining the pressure-temperature relief valves on boilers and water heaters.

They stopped short of actually installing pressure-temperature relief valves on boilers , expressing their concern that the scope of work was advanced.

- ☐ replacing non-working parts in toilet tanks

The Jordan Forum for Business and Profession Women expressed their immediate goal is to include the training for basic plumbing repairs. They have estimated 20 women would take part. After implementation of basic repairs and successful demonstration of this initial program, they would want a full plumbing program for the entire realm of plumbing training at all 5 levels. Their recipients would be selected from a portion of the original 20 women.

Monday, September 8, 2003

1. Bassem Abdullah and Darkmoon Cliffdweller met to discuss Tuesday's presentation to VTC trainers. Bassem Abdullah will translate the presentation into Arabic. In general the presentation will address the proposed Plumbing Code which will address:
 - ☐ Why sewer gases are deadly & toxic.
 - ☐ A proposed Plumbing Code.

Codes enhance safety, consistency and adherence to national standards water conservation.

- ☐ aerators shall be installed on all sinks and shower heads.
- ☐ water closets not to exceed 7.5 liters per flush.
- ☐ water flow rates on selected fixtures
- ☐ new criteria for hotels
- ☐ new criteria for car washes
- ☐ new criteria for slaughterhouse
- ☐ new criteria for swimming pools
- ☐ boilers and water heaters.
 - Pressure temperature relief valves
 - ventilation requirements
 - combustion air for diesel boilers
- ☐ water distribution system.
 - air gaps
 - pressure tested at 6 and 12 bars
- ☐ sewer drainage system.
 - P-traps on floor drains
 - pressure tested at 0.35 bars
 - drainage fittings
- ☐ Indirect waste methods.
- ☐ Venting of plumbing fixtures.
- ☐ Trapping with water seals.
- ☐ Graywater systems.
- ☐ Recovery water systems.
- ☐ Septic tanks.
- ☐ Safety requirements for the plumber.
 - Manholes
 - Excavation
 - Personal Protective Equipment
 - Ladders

2. WEPIA staff had a meeting with the National Center for Human Resources Development. WEPIA was represented by:
- ☐ Mona Grieser
 - ☐ Abdus.salam.Kamal
 - ☐ Bassem Abdullah
 - ☐ Darkmoon Cliffdweller

The National Center for Human Resources Development was represented by:

- ☐ Munther S. Kayyali, Project Director, SETVET
- ☐ Brenda Cooke, Canadian Team Leader

Mona Grieser explained the mission of WEPIA to facilitate directions for water conservation, parties WEPIA has been coordinating with, and progress made to date.

Munther S. Kayyali explained the purposes of SET-VET (Sustaining and Extending Technical Vocational Education and Training) which is to develop human resources and employment among Jordanian people.

I received the impression that Munther S. Kayyali and Brenda Cooke did not share the same philosophy on a cooperative effort between the National Center for Human Resources Development and WEPLA. Brenda Cooke express her willingness that SETVET could assist in the readdress of the VTC curriculum based on a plumbing code.

Tuesday, September 9, 2003

1. Abdus.salam Kamal, Bassem Abdullah and Darkmoon Cliffdweller collaborated on the strategy for the presentation to the VTC trainers. Bassem Abdullah will translated the presentation into Arabic. There were revisions made by Mona Grieser. Mortasem Haddadin will present the water shortage and demographic data.
2. Moh'd Kh. Al Masri, Manager of the Vocational Training Center at Ein EL-Basha welcomed us. He opened his facilities for our presentation. He invited 20 of the VTC trainers to share in our general conclusions.
3. A presentation of general conclusions was presented by Darkmoon Cliffdweller and Bassem Abdullah to the VTC trainers. The general presentation addressed:
 - ☐ Why sewer gases are deadly & toxic.
 - ☐ A proposed Plumbing Code.
 - codes enhance safety, consistency and adherence to national standards
 - ☐ water conservation.
 - aerators shall be installed on all sinks and shower heads.
 - water closets not to exceed 7.5 liters per flush.
 - water flow rates on selected fixtures
 - new criteria for hotels, cash waters, slaughterhouses, swimming pools
 - ☐ boilers and water heaters.
 - pressure temperature relief valves
 - ventilation requirements
 - combustion air for diesel boilers
 - ☐ water distribution system.
 - air gaps
 - pressure tests
 - ☐ sewer drainage system.
 - P-traps on floor drains
 - drainage fittings
 - ☐ Trapping with water seals.
 - ☐ Graywater systems.

- Safety requirements for the plumber for manholes, excavation, personal protective equipment and ladders.

□

Wednesday, September 10, 2003

1. A meeting was held with the Director for Codes at the Ministry of Public Works and Housing.

Representing WEPIA were:

- Adbus.salam Kamal
- Motasem Haddadin
- Andrawes Snobar
- Bassem Abdullah
- Darkmoon Cliffdweller

Representing the VTC was:

- Hassan Abu Rayyan, Engineer
Vocational Training Coordinator



Dr. Jamal S. Qtaishat

Representing the Ministry of Public Works & Housing was:

- Dr. Jamal S. Qtaishat
Director for Codes & Standards

Darkmoon Cliffdweller presented his scope of work, findings and the need for enhanced controls on water conservation and safer plumbing with a plumbing code. Darkmoon explained the plumbing code would benefit engineers, the VTC, trainers, plumbers and vendors.

Dr. Jamal S. Qtaishat added the Jordanian government as benefactor.

Jamal S. Qtaishat stated 34 codes have been developed with 33 in effect. The efforts of water conservation have already been written into existing codes. The address of safer plumbing with P-traps, air gaps, pressure-temperature relief valves, etc., would be better written as a *guide book* rather than code. Any sound concepts could be possibly written into existing codes. He suggested WEPIA provide accompanying letters of supports from the Ministry of Water and the VTC when the *guide book* is submitted. Dr. Qtaishat also mentioned the need for training the VTC with the new *guide book*.

2. Bassem Abdullah and Darkmoon Cliffdweller strategized the presentation to the Chamber of Commerce and vendors scheduled for September 11, 2003.

Proposed Agenda

- The Chamber of Commerce will make introductions.
- WEPIA will present its objectives and mission for water conservation.
- Motasem Haddadin will present the situation of water shortages and other demographic data.

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- Darkmoon Cliffdweller will present the following:
 - the assessment of existing training and practices of plumbers.
 - finding of the assessment:
 - lack of sound practices
 - lack of safe plumbing (sewer gases)
 - lack of a plumbing code
 - lack of water saving devices
 - lack of quality in materials
 These findings are to be corrected.

You vendors are being given advanced knowledge of what is coming and a head-start to meet the future.

- Quality in materials requires product evaluation. There are available European standards such as DIN and others. Labeling may be a requirement for certain plumbing materials. The Institute for Standards and Meterology would be a resource for available testing laboratories that do labeling.
- Water saving devices are now mandatory. The following chart will be given:

Fixtures	New Flow rate (L/ minute)		Water pressure available in bars
	Maximum	Maximum	
Sink	6	9	0.2 to 2 (2.9 to 29 psi)
Dishwashing basin & clothes washing basins			
½"	6	12	
¾"	12	18	0.2 to 2
1"	24	36	
Bathtub			
¾"	12	18	0.2 to 2
1"	24	36	
Showers	6	12	0.2 to 2
Hand spray	1.8	3	0.2 to 2
Bidet	6	12	0.2 to 2
Toilet tank	6	7.5	As manufacturer's instructions
Toilet (flushometer)	---	---	Depending on type and available pressure
Urinal tank	3	6	As per manufacturer's instructions
Urinal (flushometer)	---	---	As per manufacturer's instructions
Drinking basin	1.3	3	0.2 to 2
Garden faucet (irrigation)	---	---	0.2 to 2

Washing machine	9	12	0.2 to 2
Dish washer	6	9	0.2 to 2

Toilets with cisterns are now mandated not exceed 7 liters per flush. A common toilet manufactured today does not exceed 6 liters per flush.

You need to stay updated on plumbing materials required.

Washing machines

Abdul.sadam Kamal demanded I discuss clothes washing machines! The electric motor is to be discussed which includes the split phase motor (1/4 and 1/3 horsepower) that operates the washing machine. Labeling of electrical motors is to be addressed and who the laboratories are. Some of these United States laboratories that product-evaluate electric motors are:

- Underwriters Laboratories, Inc.
- Inchscape Testing Services, NA Inc.
- Canadian Standards Association
- MET Laboratories
- Factory Mutual Research Corporation
- Wyle Laboratories
- Entela, Inc.
- Applied Research Laboratories, Inc.

Motors require a disconnect, short-circuit and ground-fault protection unless the motor is smaller than 2 horsepower, a controller, a branch circuit and overload protection.

The front-end loading washing machines use less water than the top loading washing machines.

Thursday, September 11, 2003

1. We met with vendors and merchants at the Chamber of Commerce. Adbus.salam Kamal made the introductions. Darkmoon Cliffdweller did the presentation and Basem Abdullah did the interpretations.

Vendors are important because they provide the materials used in plumbing. We in the plumbing industry depend on vendors and merchants to provide quality materials and energy efficient appliances.

Vendors are being given advanced knowledge of what is coming and the understanding and head start to meet the future.

□ Quality in materials requires product evaluation. There are available European standards such as DIN, BS and others. Labeling may be a requirement for certain plumbing materials. The Institute for Standards and Meterology would be a resource for available testing laboratories that

do labeling.

Labeling (stamped) was explained as appliances and materials being product-evaluated for safety and quality.

Labeling (star) was explained as appliances being built for water saving and energy efficient. Explanation was given on how USA companies acquired the star label.

□ Water saving devices are now mandatory by the construction code. The vendors and merchants need to understand the plumbing fittings they sell must have flow control rates that comply with the construction code.

□ Vendors and merchants must understand the proper fittings for drainage of water. Sell drainage fittings for drainage and vent fittings for venting.

□ I praised the vendors and merchants for their important efforts and contributions to the plumbing industry.

2. We met with Abdel-Rahim Abdel-Jaber, Assistant Director General for Technical Affairs, and provided a findings briefing. I explained all countries periodically revised their codes and standards to improve them. The Jordan plumbing industry has plumbing practices in place, and like the USA, these need to be improved from time to time. I praised the efforts of the VTC and the techniques used with limited funding. I will make recommendations to enhance the water conservation and safer plumbing practices. Finally I explained the efforts to address safety in the plumber's environment.

A final report will be written by September 26th.