

**Socialist Republic of Viet Nam**

**Saigon Water Corporation (SAWACO)**

**Collaboration Program with the Private  
Sector for Disseminating Japanese  
Technology for Water Supply Systems  
Installation**

**Final Report**

**October, 2018**

**Japan International Cooperation Agency (JICA)**

**TABUCHI CORPORATION**

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Map

Implemented site of this project



Source: Ituki Shoji Co., Ltd. Sekai Chizu <http://www.sekaichizu.jp/>

## Abbreviation

Abbreviation	Full name	Meaning
DMA	District Metered Area	A discrete metered area of a water distribution network
JWWA	Japan Water Works Association	-
SAWACO	Saigon Water Corporation	Ho Chi Minh City Municipal Waterworks Bureau

## I . Background of the project

### 1. Challenges in society and economic development for Ho Chi Minh City

#### 1-1. Current situation of water leakage rate in Ho Chi Minh City

Table 1. Outline of water supply system in Ho Chi Minh City

Year of establishment	1880
Piped water supply coverage ratio	87.92%
Capacity of purification plant	2,000,000m <sup>3</sup> /day
Amount of water supply	1,600,000m <sup>3</sup> /day
Total conduit length	6,600km ※over 100mm
Non-revenue water rate	Approx. 30.43%

Source: Report of 2015 Water supply industry international development promotion project, March 2016 Ministry of Health、 Labour and Welfare Pharmaceutical Safety and Environmental Health Bureau Water Supply Division

Water leakage rate in Ho Chi Minh City has been improving in the past years, but it is still exceed 30% and they are losing 171 million m<sup>3</sup> (Approx. equal to 7,300 million Japanese Yen) of water per year.

Since water leakage from distribution pipe causes not only water shortage along with increasing metropolitan population, but also water contamination by negative pressure or land subsidence, effective countermeasures have to be taken immediately.

As for the location of water leakage, more than 80% are from bended or cracked water supply pipe and around Service Saddle with Corporation Stop. Therefore, we presume it will be substantially effective for water leakage reduction to replace equipment beyond Service Saddles with Corporation Stops.

#### 1-2. Current situation of countermeasures against water leakage in Ho Chi Minh City

In order to finance for water leakage countermeasures, water rates has to be increase. However, water rates is under control of People's Committee, and even under the situation that water supply equipment including Service Saddles with Corporation Stop and water supply pipes are getting old, it is quite difficult to get their approval for water rates increase.

Under such a situation, because of using cheap and inferior products to reduce near-term water leakage rate, water supply equipment and pipes laid underground deteriorate after around 10 years. Therefore, those changes cannot drastically improve water leakage rate.

Saigon Water Corporation (SAWACO) set up their target of water leakage rate to below 20% from at it was by 2020 and they has been replacing water supply equipment at high leakage rate area.



## 2. Activities of implementing organization in Ho Chi Minh City

### 2-1. Activities of Tabuchi Corporation in Ho Chi Minh City

Tabuchi Corporation has been doing business of producing and selling water supply equipment including “Service Saddles with Corporation Stop”, “fittings” and “check valves” in Japan, set up subsidiary company in Lon An Province, Vietnam in March, 2014, and began to supply our products to SAWACO.

### 2-2. Issues in Ho Chi Minh City

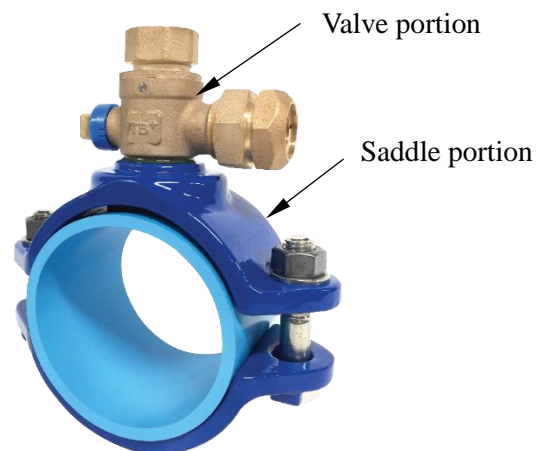
Tabuchi Vietnam has been selling high-quality and durable products to SAWACO. However, we found considerable numbers of water leakage caused by less skills for installation at construction site.

Because of that, we held technical seminar and installation seminar to water supply companies and construction companies in order to improve installation technique. Since as the area using our products were getting wider, we realized it is impossible to hold seminars for all construction companies by our staffs.

## 3. Dissemination technology

### 3-1. Installation technique of water supply equipment

The “Service Saddles with Corporation Stop” is a valve for diverging water from a water distributing pipe in the ground, and using specialized tools, which can be installed without stopping the water supply during installation.



Service Saddles with Corporation Stop

The feature of the Service Saddles with Corporation Stop is that the Saddle portion and the valve portion are firmly connected with special adhesive. It is inspected by pressure test to confirm no water leakage. So the water leakage from our Service Saddles with Corporation Stop does not happen for very long time as long as it is correctly installed.

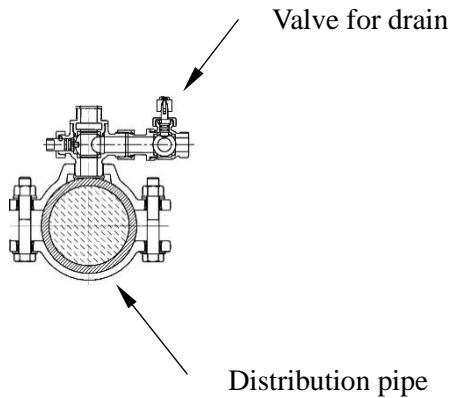
On the other hand, as for similar products which are used in Ho Chi Minh City, since saddle part and valve part are connected with screw at construction site, water leakage after installation happens frequently because of loosed screw or not enough tightened screw.

Currently there are licensing systems for “Water supply equipment construction chief engineer” or “Water

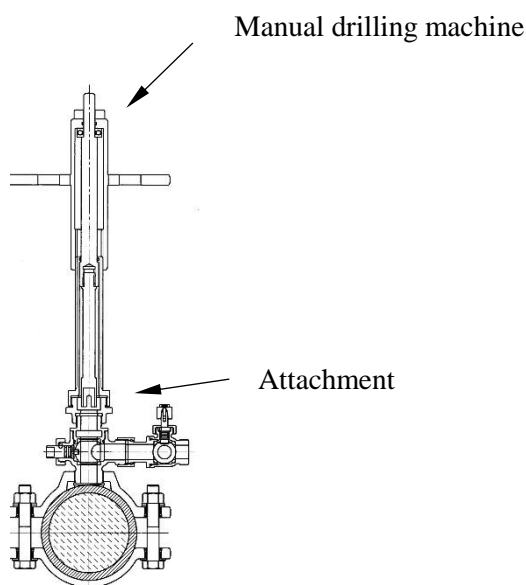
supply equipment construction piping inspection” in order to ensure the installation of water supply equipment including Service Saddles with Corporation Stop in Japan.

Also each local government in Japan has been introducing a unique installation licensing system to keep the installation quality of water supply equipment good. In Japan, the construction company without these license cannot get a contract of installation business.

### Service Saddles with Corporation Stop Constant Water Construction Method

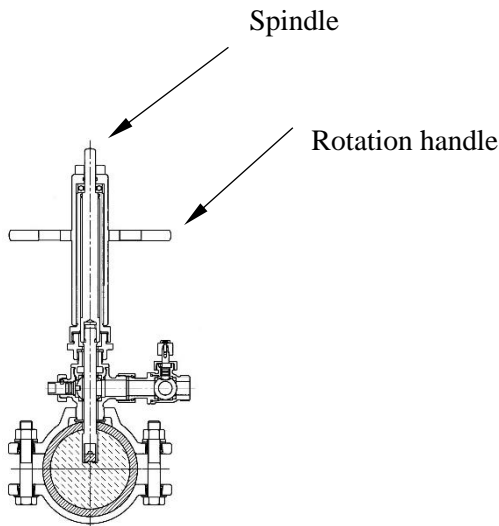


- 1) Set Service Saddles with Corporation Stop on branch point of distribution pipe, and tighten nuts at prescribed torque.  
Put valve for drain out cutting chips generated by drilling.  
Confirm valve of Service Saddles with Corporation Stop is at open position.

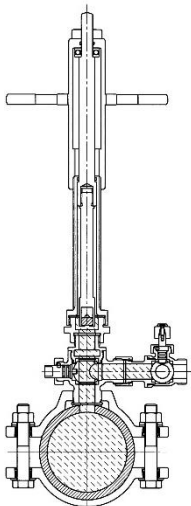


- 2) Screw the attachment to screw for drilling machine at upper part of Service Saddles with Corporation Stop,

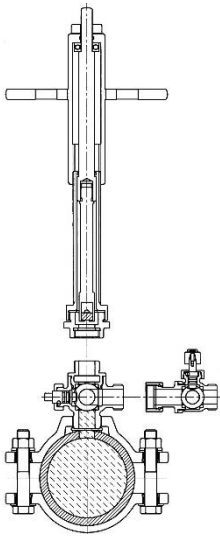
and set up manual drilling machine to the attachment. At this time, in order to pull drilling cutter up to the highest part, turn rotation handle of drill counter clockwise until it stops.  
Confirm valve for drain is at open position.



- 3) Lower drilling cutter by turning rotation handle clockwise, and when drilling cutter touches the top of distribution pipe, turn rotation handle counterclockwise only a half turn.  
Attach latchet handle onto spindle at the upper part of Service Saddles with Corporation Stop, then, turn latchet handle counterclockwise and turn rotation handle slowly clockwise at the same time to drill a hole.



- 4) After making a branch hole, pull drilling cutter up by turning rotation handle counterclockwise.  
After turning rotation handle until it stops and pull drilling cutter up to the highest part, close valve for drain, and then, close valve of Service Saddles with Corporation Stop.



- 5) Take the attachment, drilling machine and valve for drain out from Service Saddles with Corporation Stop. Put a cap on screw for drilling machine at upper part of Service Saddles with Corporation Stop, and begin branch construction using screw for branch.

### 3-2. Worldwide sales and installation results

Since Tabuchi Corporation invented and developed Service Saddles with Corporation Stop in 1965, for more than 50 years, over 10 million units have been installed in about 1,600 cities in Japan. It is one of the products contributing the low water leakage rate in Japan, less than 5%.

Tabuchi Corporation opened patents of Service Saddles with Corporation Stop to the public in order to spread the technology, and established standards of Japan Water Works Association (JWWA). Because of these background, Service Saddles with Corporation Stop is adopted by Water Bureaus nationwide in Japan.

### 3 - 3 . Assessment of technology

Tabuchi Corporation has been selling Service Saddles with Corporation Stop more than 50 years in Japan, developing products fit to distribution pipes nationwide in various materials and sizes, and has over 1,000 line-ups.

Tabuchi has technology and know-how for design and production of Service Saddles with Corporation Stop and its peripheral equipment throughout the experience for a long time, and it is possible to develop products for Vietnamese water situation.

### 3 - 4 . Specification

Conforms to Japan Water Works Association Standard JWWAB 117 Service Saddles with Corporation Stop for water supply

### 3 – 5 . Comparison to competitors

Since Service Saddles with Corporation Stop generally used in Vietnam is made of resin or brass, they induce water leakage around 10 years after installation caused by over time deterioration and so on.

And since valve portion and saddle portion are connected at construction site, there are high risk of water leakage caused by loosening and/or fastening insufficiency.

As for Service Saddles with Corporation Stop made by Tabuchi Vietnam, Saddle portion and the valve portion are firmly connected with special adhesive in our factory, and then they are inspected by pressure test to confirm no water leakage. So the water leakage from our Service Saddles with Corporation Stop does not happen for very long time after installation.

As for materials, valve portion is made of bronze and saddle portion is cast iron. Cast iron are coated by  $300 \mu$  m epoxy powder for corrosion protection in order to last long under the ground.

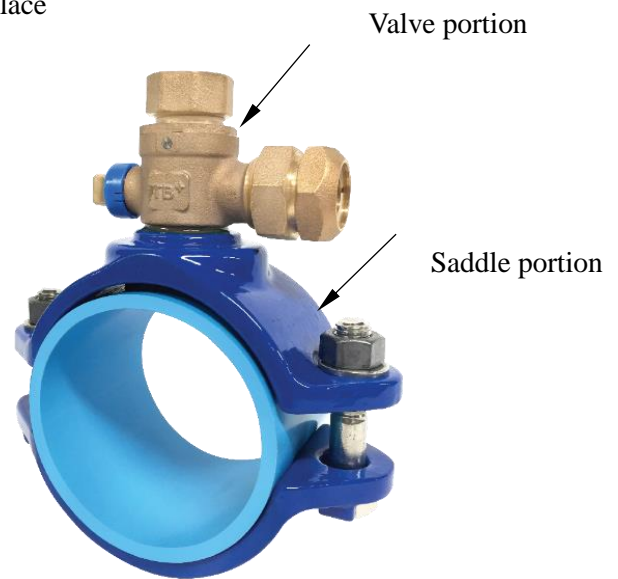
As for price, compared to Koi Viet or Minh Hoa branded products widely used by SAWACO at now, our Service Saddles with Corporation Stop are about 1.7 times high. However, it is quite reasonable price taking into Japanese standard pressure resistance quality and more than 4 times of product age.

And Tabuchi Vietnam employee often visit construction site to instruct installation procedure and how to use tools to workers in order to reduce installation error.



A product of competitor

Connecting place



Tabuchi Service Saddles with Corporation Stop

#### 4 . Outline of the project

##### 4 – 1 . Necessity of the project

At this moment, water leakage rate is quite high as 30%, and their water distribution and supply are inefficient. Since the population in Vietnam including Ho Chi Minh City is getting bigger, it is obvious water shortage will be a serious problem in future.

And in Ho Chi Minh City, number of high-rise buildings and condominiums are increasing. Since those buildings spend huge amount of water, underground water and organic substances are suck into distribution pipes by negative pressure which cause water contaminations.

Because SAWACO regards high water leakage rate as an immediate problem to be solved, they impose the target of water leakage reduction to their 8 subsidiary water supply companies. (The target of water leakage rate is less than 20% in 2020.)

##### 4 – 2 . Outline of business

To construct a facility for installation training course and certificate examination at the training center owned by SAWACO in District 9, Ho Chi Minh City, educate SAWACO employee as trainer and introduce water supply equipment installation license certificate system in Ho Chi Minh City.

##### 4 – 3 . Goal of this project

To make a system to reduce water leakage rate in Ho Chi Minh City by introducing water supply equipment installation license certificate system and properly installing water supply equipment including Service Saddles with Corporation Stop.

At this moment, about 20,000 units of Service Saddles with Corporation Stop produced by Tabuchi Vietnam is used in installed in Ho Chi Minh. We expect this project led to further understanding to Japanese technology and quality as well as increasing local governments adopting it and sales volume.

##### 4 – 4 . Planned schedule of this project

August, 2017 – December, 2018

4 – 5 . Local activities

Table 2. Local Activities

	Schedule	Purpose	Counterpart
1 <sup>st</sup> Local Activity	Aug. 2017	On sight observation and exchange of opinion	SAWACO
2 <sup>nd</sup> Local Activity	Dec. 2017	Institutional design / Mutual confirmation of textbook	SAWACO
3 <sup>rd</sup> Local Activity	March. 2018	Hold a simulated training course	SAWACO
4 <sup>th</sup> Local Activity	Aug. 2018	Hold the 1 <sup>st</sup> training course	SAWACO

4 – 6 . Transportation plan for materials and equipment

Materials and equipment for this project are all locally procured.

4 – 7 . Implementing organization

Tabuchi Corporation and its local subsidiary, Tabuchi Vietnam Co., Ltd. took charge of coordination and negotiation with SAWACO as counterpart as well as procurement of materials and total schedule management including personnel training for trainers.

Osaka Municipal Waterworks Bureau who take part in the project as an advisor took charge of supervising textbooks for training course and institutional design of licensing system.

4 – 8 . Activities in Japan

Table3. Activities in Japan

	Schedule	Purpose	Counterpart
1 <sup>st</sup> Activity in Japan	Aug. 2017	Confirmation of operation of licensing system in Japan, Service Saddles with Corporation Stop factory visit	SAWACO

## II. Activity report of the project

### 1. Outline of implemented local activities

Table 4. Outline of implemented local activities

1 <sup>st</sup> local activity	
Purpose	On site observation, providing details of project, mutual confirmation of schedule and exchange of opinions
Schedule of activity	Aug.2, 2017 – Aug. 4, 2017
Target place	Ho Chi Minh City, Vietnam
Main implementation	<ul style="list-style-type: none"> <li>• Final confirmation of details of the project and schedule</li> <li>• Providing outline of equipment introduced in training center</li> <li>• Dissemination of Service Saddles with Corporation Stop Constant Water Construction Method</li> <li>• Visit factory of Service Saddles with Corporation Stop</li> </ul>
Main target organization	Saigon Water Corporation (SAWACO)
2 <sup>nd</sup> local activity	
Purpose	Discussion about design and details of licensing system
Schedule of activity	Dec. 4, 2017
Target place	Ho Chi Minh City, Vietnam
Main implementation	<ul style="list-style-type: none"> <li>• Discussion about details of practical skill certificate examination</li> <li>• Discussion about schedule to begin operation of installation licensing system and operating policy.</li> <li>• Exchange of opinion about progress</li> </ul>
Main target organization	Saigon Water Corporation (SAWACO)
3 <sup>rd</sup> local activity	
Purpose	Hold simulated training course
Schedule of activity	Mar. 21, 2018 – Mar 23, 2018
Target place	Ho Chi Minh City, Vietnam
Main implementation	<ul style="list-style-type: none"> <li>• Hold simulated training course</li> <li>• Exchange of opinion about contents of training course</li> </ul>
Main target organization	Saigon Water Corporation (SAWACO)



4 <sup>th</sup> local activity	
Purpose	Hold the 1 <sup>st</sup> training course for installation of Service Saddles with Corporation Stop
Schedule of activity	Aug. 29, 2018 – Aug. 30, 2018
Target place	Ho Chi Minh City, Vietnam
Main implementation	<ul style="list-style-type: none"> <li>• Hold training course for installation of Service Saddles with Corporation Stop</li> <li>• Exchange of opinion about contents of training course</li> </ul>
Main target organization	Saigon Water Corporation (SAWACO)

	Task: Items to be implemented in the project for business development.	Activity Plan					Implementation ○ : Finished/Confirmed/In progress smoothly ▲ : With problems/Not in progress smoothly N/Y : Not finished/Not confirmed yet (Scheduled to be finished/to be confirmed)	Goal (Status at the end of project)
		1st '17.08 (Vietnam)	1st '17.10 (Japan)	2nd '17.11 (Vietnam)	3rd '18.03 (Vietnam)	The 4th '18.08 (Vietnam)		
1	Study of market and local needs	■■■					○ -Current water leakage rate and activities of Ho Chi Minh City to reduce water leakage rate, Discussion about licensing system of this project, Re-confirmation of schedule	-Be able to forecast reduction degree of water leakage rate by utilizing training center
2	Promote understanding of SAWACO for Service Saddles with Corporation Stop		■■■■				○ -Visit the experience type training center of Osaka Municipal Waterworks Bureau and training at Tabuchi head office	-Deepen trainee's understanding about "Japanese high quality installation standard" and "Technology and know-how about Service Saddles with Corporation stop"
3	Institutional design for introducing licensing system			■■■■■■■■■■			○ -Check licensing system operation at Osaka Municipal Waterworks Bureau and implement training about system design -Check procedures for introducing licensing system	-Decided system design including schedule of training course, frequency, fee, operation management etc. -Became clear procedures for introducing licensing system

4	Training the trainer of SAWACO staff					○	-Make materials for training course and check important point of course -Tabuchi implement training to staffs of SAWACO -Check contents of textbook	-SAWACO staffs can manage operation of lecture and practical skill examination continuously only by themselves
5	Hold training course for the installation technology of water supply equipment					○	-Check equipment at training center -Check after sales maintenance operation -Check materials for training course -Check operation procedures	-SAWACO staffs can hold training course

## 2. Report of the 1st local activity

Main purposes of the 1st local activity are as follows regarding contents of the project which we mutually agreed upon at the pre-meeting with our counterpart, SAWACO.

- 1) Construct a facility which can hold installation training course and certificate examination at SAWACO training center (District 9, Ho Chi Minh City).
- 2) Educate SAWACO employee and develop trainers for training course and certificate examination.
- 3) Implement the 1st activity in Japan in Oct., 2017.
- 4) Hold the 1st training course for installation of Service Saddles with Corporation Stop
- 5) Further dissemination of Service Saddles with Corporation Stop Constant Water Construction Method

Table 5. Main Place to visit and agenda (The 1<sup>st</sup> local activity)

Schedule	Place to visit	Agenda
Aug. 3, 2017	SAWACO Head office	Hold Kick-off meeting
	SAWACO training center	Observation of site for certificate examination ,meeting
Aug. 4, 2017	Tabuchi Vietnam Co., Ltd.	Training of Service Saddles with Corporation Stop Constant Water Construction Method
	Construction site at District 10, Ho Chi Minh City	Observation of construction site

### 2 – 1 . Certificate examination

Certificate examination is to branch from 100mm PVC pipe to polyethylene two layer pipe using Service Saddles with Corporation Stop and fittings.

Time limit for certificate examination shall be 30 minutes. Examinee pass the exam, if water does not leak for

1 minute under 0.6Mpa water pressure after installation.

After examination, license (or Completion certificate) will be issued. It will be studied to regulate only companies hiring license holders are able to take part in tenders of constructions in SAWACO's territory of charge.



Planned examination venue

#### 2 – 2 . Certificate examination venue

At the certificate examination venue, 4 lines of 100mm distribution pipe will be set up at 20cm higher than ground on the designated area (about 200 m<sup>2</sup>) at training center, and up to 50 people can take examination at the same time.

To prevent pressure drop inside the distribution pipe after drilling followed by air bleeding, a pressure tank shall be set up at the secondary side of a booster pump,

In order to perform training course during rainy season by putting a roof above examination venue.

#### 2 – 3 . About textbooks for training course

Tabuchi Corporation and Osaka Municipal Water Bureau will prepare textbooks for training course.

As for contents of textbook, cover not only installation procedure of Service Saddles with Corporation Stop, but also cover safety management at construction site and construction process control.

Tabuchi Vietnam translate textbooks prepared in Japanese into Vietnamese, then, after SAWACO's check, bind a book.

2 – 4 . Pictures of activities

1 ) Kick-off meeting



2 ) Training center visit



3 ) Tabuchi Vietnam visit





#### 4) Construction site observation



#### 3. Report of the 2nd local activity

Main purpose of the 2nd local activity is to mutually confirm progress of the project, and to agree details of licensing system design, way of operation and schedule of simulated training course.

Table 6. Main Place to visit and outline (2<sup>nd</sup> local activity)

Schedule	Place to visit	Outline
Dec. 4, 2017	SAWACO Head Office	Mainly discussed following subjects <ul style="list-style-type: none"> <li>• Details of technical certificate examination</li> <li>• Schedule to begin operation of installation licensing system</li> <li>• Way to operate installation licensing system</li> </ul>

#### 3 – 1. Schedule of installation training course

Confirmed installation training course shall be carried out on a following schedule.

【Classroom lectures】 (50 minutes per lecture, 10minute breaks)

- I. History of Service Saddles with Corporation Stop
- II. Installation method of Service Saddles with Corporation Stop
- III. Corrosion and protection against corrosion of Service Saddles with Corporation Stop

#### IV. Quality and safety control of water supply constructions

##### 【Technical certificate examination】

- I. Explanation for contents of examination, using materials and acceptance and rejection criterion
- II. Technical certificate examination (25 people / 60 minutes)
- III. Technical certificate examination (25 people / 60 minutes)
- IV. Announcement of examination results and present license to people passed (60 minutes)

#### 3 – 2 . Implementation of simulated training course

Before holding installation training course, held a simulated training course to SAWACO employees of engineering dept. and facility dept., find problems, improve things to reflect on, and mutually confirm holding the 1st installation training course in September, 2018.

Schedule to hold simulated training course in March, 2018. Osaka Municipal Water Bureau will join and make comments.

#### 3 – 3 . Problems

We have persisted license, to be presented to person attended training course and passed certificate examination should be one of the conditions to take part in tender of water works constructions. However, SAWACO said the license should not have such legal force, because it will be a heavy burden for constructors and it will be too much difficult to be authorized (ex. Approval by People’s Committee)

In Japan, since 1996, there are licensing systems for “Water supply equipment construction chief engineer” or “Water supply equipment construction piping inspection” in order to ensure the installation of water supply equipment, and have kept World No.1 lowest water leakage rate. For that reason, we will continue to discuss about the legal force of the license.

#### 4 . Report of the 3rd local activity

Purpose of the 3rd local activity is to find the issues of training course and to improve them for the 1st training course through simulated installation training course of Service Saddles with Corporation Stop.

Table 7. Main Place to visit and outline (3<sup>rd</sup> local activity)

Schedule	Place to visit	Outline
Mar. 22, 2018	SAWACO training center	Hold simulated training course
Mar. 23, 2018	SAWACO Head Office	Discussion about issues of training course

#### 4 – 1 . Point of this activity

Reconcile the differences of opinions about contents of whole project, and confirm progress.

Implement simulated training course, confirm contents of training, textbook, practical skill test and agenda of training course, and exchange opinions about the 1st training course scheduled in September, 2018.

#### 4 – 2 . About simulated training course

Hold a simulated training course to candidates of future trainer selected from engineering dept. and construction dept. of SAWACO, and exchange opinion about contents and agenda of training course and contents and results of certificate examination.

Mr. Khan, former GM of engineering dept. of SAWACO performed as trainer this time.

At beginning, Mr. Su, head for training center of SAWACO, explained that purpose of this project is to realize lowering water leakage rate by improving installation technology of water supply system in Ho Chi Minh City through the JICA project.

At classroom lecture, after explanation about technical superiority of Japanese Service Saddles with Corporation Stop, materials and durability of products, history of Japanese water supply system standards and Tabuchi's activity in Ho Chi Minh City, demonstrate installation of Service Saddles with Corporation Stop and fittings, explained points to be noted and answered questions.

After that, moved to examination venue which was constructed under this project, practiced installation by all attendees, and implemented certificate examination.

Examination method is to install Service Saddles with Corporation Stop on distribution pipe (100 mm PVC pipe) with water pressure and connect fittings and water supply pipe (20mm polyethylene pipe) to Service Saddles with Corporation Stop in 30 minutes, then, perform pressure proof test at 0.6MPa for 1 minutes. All 15 examinee were passed the examination.

#### 4 – 3 . About details of discussion after simulated training course

Based on the result of simulated training course, extract problems in terms of contents, agenda, way of certificate examination and time allocation, and exchange opinions for the 1st training course.

Main discussions are as follows:

##### **【Request from Tabuchi Corporation and Osaka Municipal Waterworks Bureau】**

1 ) Since today's trainees are managers who don't work at construction site, took longer time for study of installation method, for actual training course, want to take more time for explanations regarding the reason why water leakage rate is going down with using Service Saddles with Corporation Stop and how it has been spreading nationwide in Japan and how Japanese licensing system contributed to improve quality of installation. (Need to correct textbook as well.)

2 ) During demonstration of installation, there is a happening that trainer made a mistake in installation procedure. Trainers and employees of training center are requested to practice demonstration of installation in advance.

3 ) Though materials of examination venue was used for practice before certificate examination, since it is wasteful to change distribution pipe every time, it is better to use standalone pipe for practice.

4 ) Though Service Saddles with Corporation Stop for certificate examination can be used repeatedly, stainless bolt will be useless after 15-20 times usage because of seizure. For that reason, it is necessary to record how

many time each Service Saddles with Corporation Stop was used.

5) Need to prepare one level to check Service Saddles with Corporation Stop are horizontally installed or not after installation. (Trainer check level of installed Service Saddles with Corporation Stop.)

6) Since the process of installation is different from Japanese one, time of certificate examination is shorten to 20 minutes. (Only this time, done by 30 minutes, same as Japan)

**【Request from trainees】**

- 1) Need textbook in color. Monochrome is difficult to see.
- 2) Want to take more time for practice
- 3) Want to borrow equipment for practice

**4 – 4 . Follow-ups**

- 1) Correct textbooks and develop trainers for the 1st training course
- 2) Taking the issue of legal force of license carried over from the last time in consideration, implement training only to SAWACO employees in 2018, and will spread it to employees of private construction company in 2019. (It is necessary to get approval from People’s Committee and it takes long time to enforce to private sector.)
- 3) SAWACO will discuss with People’s Committee as for mandatory of attending training course for tender participation after 2019.

**4 – 5 . Pictures of activities**

- 1) Simulated training course (Classroom lecture)





2) Practical skill / certificate examination



3) Meeting



## 5. Report of the forth activity at local site

The main objective of this activity is to discuss issues about the operation of future training course and continuous utilization of training center facilities, after the first session of Service Saddles with Corporation Stop installation training.

Table 8. Main place to visit and overviews (Activities of the forth local activity)

Date	Place to visit	Overview
30 <sup>th</sup> of August, 2018	SAWACO Training Center	Carry out installation training course of water supply equipment.
		Discussion about issues of training course.

### 5-1. Purpose of this activity

The installation training course of water supply equipment for 40 people selected from engineering and construction department of SAWACO is carried out, and then discuss about the contents of the session, procedure and the contents and result of the examination.

### 5-2. Installation training course of water supply equipment

First of all, Mr. Su, director of SAWACO training center, explained the background of this project and the purpose of this project, which is to eliminate the mistake of installation and to realize the water leakage ratio reduction.

After that, Mr. Viet Anh, manager of the training center, served as a lecturer, and Mr. Phuong, senior stuff of Thu Duc Water Company, served as assistant.

Regarding the content of the lecture, explained installation procedure and attentional demand for Service Saddles with Corporation Stop and then carried out the demonstration of installation, after explain the technological superiority of the Service Saddles with Corporation Stop and historical background of spread usage in Japan using textbook.

Then, after participants was training the practical installation work at examination site, examination was implemented for divided 4 groups.

The contents of the examination is that installation service saddle on distribution pipe (100mm diameter pipe of vinyl chloride) with water pressure, connecting the fittings and water supply pipe should be done within 20 minutes. After that, pressure test of 1 minute at 0.6 MPa water pressure is carried out to confirm water leakage. The judgement of acceptance was done based on the table below, and all participants has finished the work within specified time and passed the examination.

Table 9. Table of examination criteria

Criteria	Evaluation item	Results (point)
Cleaning of pipe where install	Was the pipe cleaned by using waste cloth?	

Installation of Service Saddles with Corporation Stop	Was the material of Service Saddles with Corporation Stop checked?	
	Has checked whether there is any damage at the drilling position of the pipe?	
	Was the closing direction of Service Saddles with Corporation Stop checked?	
	Was it set vertically by using leveling tool?	
	Was the open and close motion of ball valve confirmed?	
Set up drilling tool	Was the Service Saddles with Corporation Stop set in the direction of water supply pipe?	
	Was stainless steel bolt and nut tightened evenly?	
	Was the upper cap mounted to the outlet of water supply pipe?	
	Was the closed position reconfirmed when set the drilling tool?	
Drilling	Was the load of the drilling tool not too much?	
	Was the handle turn up to the top after drilling?	
	Was the closed position confirmed before removing the drilling tool?	
	Was the cutting chips confirmed not exist after remove the drilling tool?	
Re-attend item. Disapprove if you have even one item.	Damage an equipment	disapproval
	After install Service Saddles with Corporation Stop, water not come through	disapproval
	Water leakage after passing water	disapproval
	The series of work time is over 30 minutes	disapproval
Total point		

### 5-3. Contents of the meeting after training course

After the first training course, exchange opinions about the review of the session of this time and the issues for continuous management toward next and succeeding session has been carried out. The contents mainly discussed were as follows.

#### 【Impressions and comments from Tabuchi Corporation and Osaka Municipal Waterworks Bureau】

- 1) Compared with the simulated training course, it was very good that the teaching approach of the instructor has improved to explain installation method and the key point of installation repeatedly.
- 2) The participants also very enthusiastic and concentrate on the lecture, and it was good that there were no private conversations each other.
- 3) Content of the lecture was also creative by using video of installation effectively.
- 4) When the skill practice carrying out in the classroom, it is better to come closer to see than seated.
- 5) Because Service Saddles with Corporation Stop for the examination can be used repeatedly but the stainless

steel bolt caused seizure in screw part when using it 15 to 20 times, it is necessary to record how many times each Service Saddles with Corporation Stop has been used.

6) For the textbook, it is better to describe not only the installation method but also safety management, process control of the installation site and recording method after installation.

7) Because the water distribution pipe need to be drilled under the ground at the actual installation site, it is assumed that water leakage will be occurred when the rubber packing is scratched by the earth and sand etc. adhered to the pipe. It is better to explain to participants the importance of pipe cleaning to reduce the risk.

8) The examination was conducted by ten people at a time, five participants were assigned to one instructor, and detailed instruction has been given to each participant.

#### **【Impressions and comments from SAWACO】**

1) To reduce water leakage ratio to less than 20% by 2020 is the target of both Vietnam and Ho Chi Minh City People's Committee. Water leakage due to installation error will disappear by continuing this training course, and we hope it will help to reduce future water leakage ratio.

2) In the area where using the Service Saddles with Corporation Stop of Tabuchi Corp., the water leakage ratio is remarkably reduced. In particular, TAN HOA Water Supply Company, where use Tabuchi's Service Saddles with Corporation Stop thoroughly, has achieved the highest record in terms of reducing water leakage ratio among eight SAWACO's subsidiaries companies last year.

3) Through this training course, I think it will trigger to use Japan quality water supply equipment.

4) Thanks to educating SAWACO's staff as an instructor, the awareness of reducing water leakage ratio increased in SAWACO such as the importance of installation technology and selection of water supply equipment.

(So far, we were thinking only to replace the old equipment.)

5) From now on, the seminar will plan to hold twice by end this year and 4 to 5 times next year, and would like to expand this activities of this project by working with outside constructors and waterworks department of other provinces.

6) Regarding the issue of license, we are in negotiations with the People's Committee and Labor Sick and Wounded Soldiers Ministry of Social Affairs, and I would like to make it valid as an official license in the future.

7) SAWACO, Tabuchi Corp. and Osaka Municipal Waterworks Bureau have been promoting this project with maintaining a very good relationship. I would ask you to propose to reduce water leakage ratio by utilizing the JICA project in the future.

#### **【Request from participants】**

1) I was able to acquire assured knowledge by participating in this training course.

2) I can understand the products and technologies of leading country and also improved my installation technique.

3) Japan products are made functionally, and they are products which can be surely installed if we learn its procedures only.

4) I would like to use of what I learned in this training course for my future work.



#### 5-4. Challenges

- 1) Establish the follow-up system in order to continue the training course.
- 2) Coordinate with related government ministries and agencies about the validity of the license awarded.
- 3) Modify of contents of lectures and skill practice aware of actual installation field site.
- 4) Amend the text to include safety management and process control of installation.
- 5) Measures to make it into activities involving outside constructors and other provinces

#### 5-5. Pictures of activities

- 1) Training course of Service Saddles with Corporation Stop installation (lecture in classroom)





## 2) Practical skill and certification examination



## 3) Meeting



## 6 . Activity report of Japan visit

The main purpose of Japan visit is to deepening the technical knowledge of the water supply equipment including Service Saddles with Corporation Stop through the visit to the manufacturing site of the Service Saddles with Corporation Stop, technical seminar and observe various trials, and also learn about the licensing system operation by observing the experimental training center of the Osaka Municipal Waterworks Bureau.

Table 10. Outline of activities implementation in Japan

Activities of the first Japan visit	
Objective	See the licensing system put into practice in Japan and visit the production site of Service Saddle with Corporation Stop.
Schedule	From 24th October 2017 to 27th October 2017
Target Place	Osaka city
Main implementation content	<ul style="list-style-type: none"> <li>• Visit assembly site of Service Saddle with Corporation Stop at Tabuchi Corporation.</li> <li>• Visit the experience type training center of Osaka Municipal Waterworks Bureau and participate in a training course.</li> <li>• Understand the Constant Water Construction Method of Service Saddle with Corporation Stop.</li> </ul>
Main target organization	Saigon Water Corporation (SAWACO)

### 6-1. Purpose of this activity

Through the visit of the production site of Service Saddles with Corporation Stop and the training course at the training center of Osaka Municipal Waterworks Bureau, promote understanding of high quality water supply equipment and installation technology, and proceed with the preparations of licensing system operation in Ho Chi Minh City.

### 6-2. Outline of this activity

Table 11. Main place to visit and overviews (Activities of the first Japan visit)

Date	Place to visit	Overview
From 24 <sup>th</sup> to 27 <sup>th</sup> of October 2017	Tabuchi Corp.	Visit production site of water supply equipment
	Nichiden Iron Works Co., Ltd.	Attend the technical seminar
		Observe experimental trials
		Visit coating and assembly process of Service Saddles with Corporation Stop
		Experience type Training Center of Osaka Municipal Waterworks Bureau
		Visit training center
		Attend the seminar on safety management at installation site
	Seminar on the operation of licensing system	
Meeting about the licensing system design		

### 6-3. Results of the implementation

#### 1) Factory tour of Tabuchi Corporation

Through the factory tour, got a better understanding about the approach for the quality of Japanese products such as in-line inspection system and automatic assembly line, and confirm the achievement of kaizen activity and cost reduction activity. Also understand about the production process to produce high quality water supply equipment.

In particular, SAWACO member have a lot of questions about the mechanism of automatic inspection equipment and operation method of kaizen activities, and detailed explanation was given from the person in charge.

#### 2) Attend the technical seminar and observe the experimental trials

Seminar was held not only for the installation method of Service Saddles with Corporation Stop but also on the adjunctive water supply equipment, the mechanism of corrosion when buried for a long time and the anticorrosion technology, and as a result deeply understood the technical knowledge for Japan water supply equipment.

Also they have observed the pressure test, creep test, the lateral deviation test for the service saddle and tensile test of the fitting with pipe, and then confirmed its performance.

#### 3) Visit the factory of Nichiden Iron Works Co., Ltd.

Visited each process of coating, machining and assembly line of service saddle, and understood the several activities for the quality improvement.

#### 4) Visit experience type training center of Osaka Municipal Waterworks Bureau and attend the seminars.

Attend the following seminars at experience type training center of Osaka Municipal Waterworks Bureau.

- ① Outline of Osaka Municipal Waterworks Bureau and experience type training center.
- ② Outline of water supply equipment
- ③ Construction control of water supply work and water distribution work

Also promoted a better understanding of operating situation of actual construction technology's licensing system and its effect, by visiting water purification plant and conducting a simulated examination of construction training course.

#### 5) Wrap-up meeting

Exchange of opinions about the issues for license management in Ho Chi Minh City based on the experience of two-day training course was done.

Particularly, many questions were raised how much tuition fee should be collected appropriately. Osaka Municipal Waterworks Bureau has explained that the tuition fee for water supply constructors in other cities will be charged about 5,000 yen per person, including personnel expenses, equipment costs and place charge.

(It is depend on the number of the participants)

In case of implementation in Ho Chi Minh City, SAWACO will estimate the cost, and set the tuition fee in order to raise the profit as a training project. SAWACO raised an opinion that they would like to expand



this licensing system for the constructors of surrounding area such as Dong Nai and Binh Duong Provinces.

#### 6-4. Pictures of activities

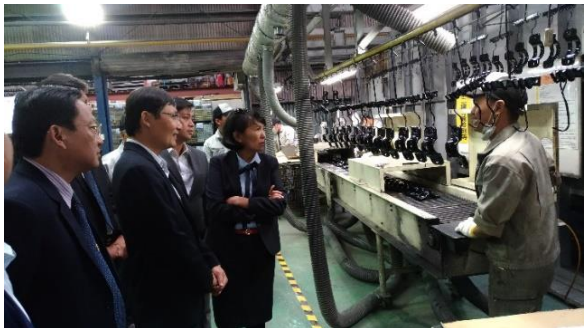
##### 1) Factory tour at Tabuchi Corporation.



##### 2) Attend the technical seminar and observe experimental trials



##### 3) Factory tour at Nichiden Iron Works Co., Ltd.





4) Visit the experience type training center of Osaka Municipal Waterworks Bureau and attend seminar



5) Wrap-up meeting



### III. Scope of business development after this project.

#### 1. The direction of business development after this project

##### 1-1. Business Model

Tabuchi Corp. has been already selling water supply equipment such as Service Saddles with Corporation Stop to SAWACO, which is the counterpart of this project, and its subsidiaries through Tabuchi Vietnam Co., Ltd. which is subsidiary company of Tabuchi Corp. From now, disseminate the Constant Water Construction Method of Service Saddles with Corporation Stop more and expand business to other areas of Ho Chi Minh City.

##### 1-2. Target market of the business

First of all, Tabuchi Corp. will concentrate on increasing market share of Service Saddles with Corporation Stop in Ho Chi Minh City and after that, aim to expand to other large cities which also have the high water leakage ratio such as Hanoi, Hai-Phong, Da-Nang and Can-Tho.

##### 1-3. Implementation structure of the business

Tabuchi Vietnam Co., Ltd. manufactures the Service Saddles with Corporation Stop and will sell them through local agents. In addition, Tabuchi Corporation, which is parent company of Tabuchi Vietnam Co., Ltd., will fully give technical support for the local factories and dispatch advisors to training course at SAWACO.

##### 1-4. Challenges for business development

The challenges found through the business experiences and this project are listed below.

- a) Although each entity recognized the issues of water leakage ratio, securing the financial resources to use high quality water supply equipment is a challenge.
- b) In order to secure financial resources required for leakage reduction, revision of water charge is essential. However, the People's Committee is in charge to decide water charge. As having approval from the People's Committee is extremely difficult, each entity has difficulty to secure the necessary financial resources.
- c) Each entity carries out renewal work by using lower price and lower quality water supply equipment for short-term water leakage ratio reduction. However, it is not a fundamental countermeasure.
- d) Countermeasures against water leakage due to installation mistake have not been taken enough. Although SAWACO staffs station at the construction site and work on the process control, the installation quality isn't necessarily checked properly. However, by continue the installation training course, the importance of installation quality will be understood and it contributes solving the issue.

##### 1-5. Tentative schedule of business development

- a) From January 2019 to December 2019.

To expand the adoption area of Service Saddles with Corporation Stop. Through the installation training course of Service Saddles with Corporation Stop four times a year with initiative of

SAWACO, deepening the understanding of high quality water supply equipment, and aim at expanding business in Nha Be, Ben Thanh and Thu Duc water company, where Service Saddles with Corporation Stop is not currently used.

b) January 2020

To establish a SAWACO standard for Service Saddles with Corporation Stop. Establish a SAWACO standard based on Japan's standard for Service Saddles with Corporation Stop (JWWA B 117), and promote further reduction of leakage ratio of Ho Chi Minh City. The SAWACO standard obliges all entity to use high quality water supply equipment.

c) From January 2020 to December 2020

To expand adoption of Service Saddles with Corporation Stop to neighboring province such as Dong-Nai, Baria-Vungtau and Binh-Duong Province by inviting the Waterworks Bureau of other provinces to training course,

#### IV. Summary of this project

To reduce water leakage ratio by introducing the installation skills, venue of the construction training course has been set up, textbook for the training course is prepared and also training of the lecturers has been done. Through continuing the construction training course, the installation skills of water supply constructor's engineers will be improved and their awareness for the installation quality will be raised. As installation mistakes reduces, water leakage ratio in Ho Chi Minh City is expected to be improved.

During this project, we specially kept in our mind to share the issues which SAWACO has faced, to exchange opinions and to promote this project jointly. In this project, SAWACO is expected to continue the training course on their own initiative by developing the lecturers among SAWACO staff.

In addition, to maintain the motivation for the lecturers and staffs who take course, we suggest SAWACO to give a good appraisal score at yearly pay raise to the staffs who contribute to reduce water leakage ratio without installation mistake. For the students from outside companies, SAWACO has already requested Ministry of Labour – Invalids and Social Affairs instructions to verify the license as the official one by FY 2019 when a training course for the outside company's construction workers will start. The contents of the textbook will be revised if needed while exchanging opinions with SAWACO.

#	Task: Items to be implemented in the project for business development .	Activity plan and results					Achievement status and assessment Fin : finish/completed No : issues remain	Remaining issue and solution	Action plan and schedule for the solution
		1st (Vietnam)	1st (Japan)	3rd (Vietnam)	4th (Vietnam)	5th (Vietnam)			
1	Survey of market and local needs						<p>1) License has certain validity as a precondition for a bid.</p> <p>2) Though seminar, SAWACO staff learned how to measure water leakage ratio.</p>	1) Consider whether the license can be essential requirement for bid.	1) Regarding the validity of license to outside companies, approval by PC and MOLISA is required. SAWACO will discuss with related ministries before training course starts in 2019.
2	Promote understanding of SAWACO for the Service Saddles with Corporation Stop						<p>1) Through a visit of OMWB Training Center, SAWACO learned license system in Japan.</p> <p>2) Through the training at Tabuchi Corp., high quality water supply equipment and installation technology was understood.</p>		

3	Institutional design for introducing licensing system					<p>1) Prepared the contents of seminar, text, schedule, examination content, and criteria etc.</p> <p>F i n</p>	<p>1) Whether to include safety management and technical content such as corrosion proof has to be discussed</p>	<p>1) Regarding the content of text, by end of December 2018 SAWACO will confirm to People's Committee about procedure and if inspection of Ministry of Culture</p>
4	Training the lecturer of SAWACO staff					<p>Tabuchi Corp. trained SAWACO staff and appointed two lecturers.</p> <p>F i n</p>		
5	Hold training course for the installation technology of water supply equipment					<p>The training course about installation technology of Service Saddles with Corporation Stop, which SAWACO acts as a main body, has been held on 30th August, 2018.</p> <p>N o</p>	<p>To continue training course, Tabuchi Vietnam Co. Ltd., will support to implement four seminars each year after this project.</p>	<p>Hold a monthly meeting with SAWACO.</p>

OMWB: Osaka Municipal Waterworks Bureau

PC: People's Committee

MOLISA: Ministry of Labour – Invalids and Social Affairs

1. Achievement of this project (Contribution to target country, area and city)

By training the SAWACO staffs as lecturers for seminar and set the environment to hold seminar with SAWACO's own initiative, the training courses will be held continuously in the future.

Through installation training course of Service Saddles with Corporation Stop, the importance of both installation skills and the selection of water supply equipment are recognized mainly among students. We suppose it will contribute to reduce the water leakage ratio.

From FY2020, When expanding the project to the waterworks bureau of other provinces starting from FY2020, reduction of water leakage ratio will be achieved not only in Ho Chi Minh City, but in surrounding area as well. As for the training course after the this project, Tabuchi Vietnam Co., Ltd will continue to support on site.

2. Achievement of this project (business side), remaining issues and its solution proposal.

Through this project, understanding about high quality and high durability of Service Saddles with Corporation Stop was deepen for SAWACO's engineers.

Also as one of the solution for reduction of water leakage ratio, we were able to present that it is effective to replace current low price Service Saddles with Corporation Stop with high quality ones. We expect that network with executives of SAWACO through the project will contribute future business development. Challenge is that the price difference with competitor are about 1.7 times while waterworks bureau is not able to secure the necessary financial resources. It is necessary to present that our product is cost-effective by explaining that product lifetime of the competitor's corporate is about 10 years while our Service Saddles with Corporation Stop can be used for 50 years. Through training course, we will present that our Service Saddles with Corporation Stop is very effective to reduce water leakage ratio and has better cost-performance.