The Study of an Additional Liquid Waste Collection Tank Arrangement on the GA Drawings

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1. Introduction

The liquid radwaste system(WV) in the nuclear power plant processes radioactive and potentially radioactive liquid wastes. These wastes include equipment, floor and chemical drains that are transferred from Containment, Auxiliary and Compound Building sumps or equivalent tanks. Also the wastes from the steam generator blowdown system, the auxiliary steam condensate receiver tank wastes and the condensate demineralizer regeneration wastes are included, if significantly contaminated by primary to secondary leakage [1]. There are several tanks as shown on the Table 1 to accommodate these wastes in the nuclear power plant. These tanks should have the enough storage capacity to accommodate all liquid radioactive wastes.

The SKN 5&6 nuclear power plants are now being constructed with improvements resulting from operation experience of previous plants. As a result of construction permit by regulatory body, it has been decided that an additional waste tank needs to be introduced in the system in the light of increased waste volumes generated during operation abnormally which capacity attains 20,000 gallons.

This paper presents chiefly an example of an additional waste tank arrangement on the general arrangement (GA) drawings to put it on in the SKN5&6 compound building.

2. Waste Collection Tanks in the Liquid Radwaste system for SKN5&6

Various kinds of waste tanks are available to accommodate liquid radioactive wastes in the WV system. The liquid waste input sources are originated from various kinds of drains from related buildings such as leakage from equipment, equipment & floor drain, leakage from spent fuel pool, equipment decontamination, primary sampling drain, laundry drain, and human body decontamination, etc. And the quantities of liquid waste generated during operation are dependent upon several factors, including design conditions, type of equipment, equipment arrangement, and operating rate, etc. [2].

These wastes are collected in three different categories reflecting three process trains in the nuclear power plant; floor drain, equipment waste and chemical waste. Segregation of wastes is done according to the processing required in the plant [1]. Table 1 below shows various kinds of waste collection tanks and their capacities in the SKN5&6.

Table 1. Waste Collection Tanks and their Capacity

Tank Name	Capacity (gallon)	Quantity (EA)	Sum (gallon)
Floor Drain Tank	18,000	2	36,000
Equipment Waste Tank	18,000	2	36,000
Chemical Waste Tank	15,000	2	30,000
Laundry Drain Tank	6,000	2	12,000
Total			114,000

Besides of the tanks above, auxiliary waste tank named tentatively for an additional tank (20,000 gallons) will be newly added in the WV system for SKN5&6.

3. An example of an additional waste tank arrangement on the GA drawings

When a feasibility study is done from the lay-out perspective, the study has been done with some preconditions in order to minimize the effect on the current GA drawings. They are:

(a). The current other waste tanks are not changed so as not to add a pump and other process equipment in the WV system .

(b). Current civil structural columns are still maintained.

(c). A compartment for additional waste tank is prepared at CPB 63ft, 77ft and 85ft near to other waste tanks in viewpoint of efficient interconnection in the system.

From the example of arrangement, an auxiliary waste tank will be installed in the compound building along with other waste tanks; floor drain tank, equipment waste tank, and chemical waste tank. In order to reserve the space of 20,000 gallons of an additional waste tank, the civil structure needs to be revised at the 63ft, 77ft and 85ft areas. The revised portions in the GA are seen in the Fig. 1, 2 and 3 below.

As liquid waste tanks are seen in the Fig. 1 and 3, they are installed in each compartment. This is for the observation of criteria which is required in the design of radioactive waste management system from the view of mainly structural resistance and occupational radiation exposures to operating personnel.

Consequently, a compartment is prepared for an additional waste tank next to the equipment waste tank.

According to Fig. 1(IS) below, a couple of chemical waste tank, floor drain tank and equipment waste tank are seen downward from the top. And, each pump room is there by each tank. The size of each pump room is reduced to prepare a compartment for an additional waste tank next to the equipment waste tank. This makes it efficient for related pumps and piping to be interconnected in the design.

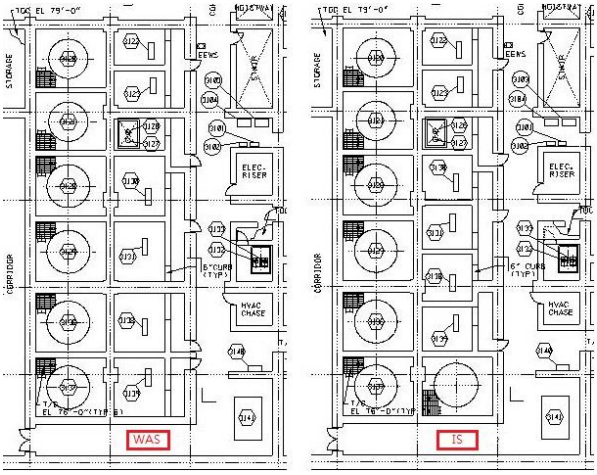

Fig. 1. Arrangement of Waste Tanks in the CPB 63ft.

Equally, a revision of civil structure at CPB 77ft and 85ft is envisaged as shown on Fig. 2 &3. The Fig. 2 shows a necessity of revision of the hot pipe way while Fig. 3 valve room and access way to the tanks. The hot pipe way is revised to prepare a space for an additional waste tank which measures 12ft (Dismeter) x 29ft (Height) supposedly as shown on Fig. 2.

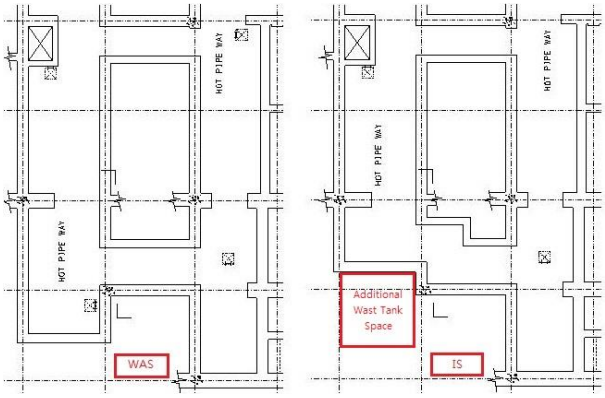

Fig. 2. Hot Pipe Chase Arrangement in the CPB 77ft.

The Fig. 4 below shows a flow diagramt of liquid radwaste system (WV). It shows many major components of WV system such as various tanks, pumps, Reverse Osmosis (R/O) packages, associated piping which contribute to waste collection, waste processing through R/O package and LRS monitor tank, etc. It also shows that it is designed to do necessary process to produce effluent of quality suitable for discharge or recycle. That is, the waste gone through the process is collected in the monitor tanks, and sampling is carried out. The contents inside monitor tank is decided either to go for recycle or for discharge to environment.

The effluent shall meet the requirement of NSSC Notice No.2014-34, Standards on Radiation Protection [4]. In the flow diagram, an additional extended waste tank in red is seen. It is designed to accommodate all kinds of wastes without differentiation of equipment, floor or chemical drain. And it shows its role of buffer storage in case of a temporarily increase of liquid waste in the process. And there are links with other related tanks and a couple of equipment waste pumps for interconnection network.

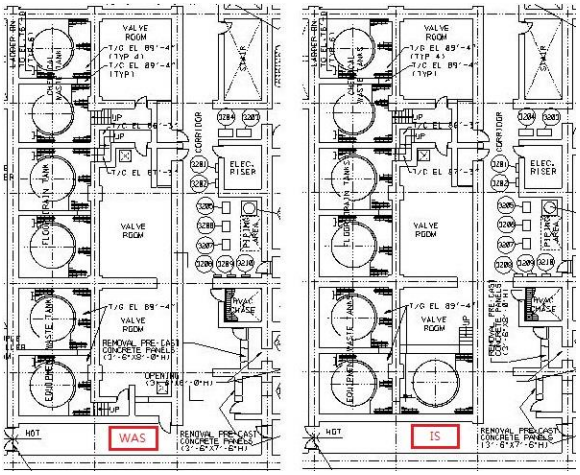

Fig. 3. Arrangement of Waste Tanks in the CPB 85ft.

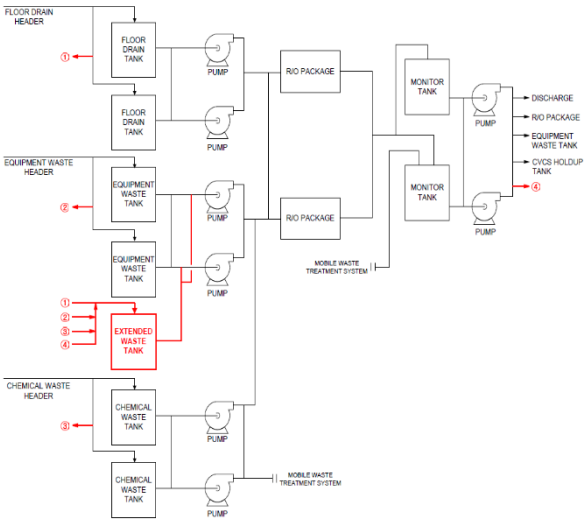

Fig.4. A flow diagram of Liquid Radwaste System (WV).

4. Conclusions

The liquid radwaste system (WV) should be designed to control and manage of liquid radwaste generated as a byproduct of nuclear power plant. It should be designed to accommodate total volumes generated from routine operation including abnormal operation which result in a great quantity of liquid wastes.

This paper has reviewed its possible location on the GA drawings according to the introduction of 20,000 gallons of an additional waste tank.

By introducing a new tank in the system, many advantages are expected with enhanced system reliability, operability and availability.

REFERENCES

[1] Liquid Radwaste System(WV) System Functional Description, 0-472-N403-001, KEPCO-E&C, 2016.
[2] ANSI/ANS-55.6-1993, Liquid radioactive waste processing system for light water reactor plants.
[3] Plant Manual, Liquid Radwaste System(WV), 0-472-N442-001, KEPCO-E&C, 2015.
[4] NSSC Notice No.2014-34, Standards on Radiation Protection.