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LEGISLATIVE FRAMEWORK OF DAM SAFETY MANAGEMENT IN JAPAN

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INTRODUCTION

Geographic features of Japan

Japan consists of a chain of islands located at the far-east end of the Eurasian continent. The area of Japan is 378 thousand km^2, which is equivalent to 70% of France, or just 2% of Russia. Four colliding tectonic plates distinguish this area with high orogenic, and volcanic activity, as well as frequent large-scale earthquakes. Mountainous terrain, almost entirely covered with forests, occupies 2/3 of the whole country. Geological configuration is very complex, and fragile or highly permeable strata can be found everywhere.

Mountain ranges run at the backbone of the narrow islands, forming many small river basins with steep streams. The Tone River system, a major water resource for the Tokyo Metropolitan area, has the largest catchments area among the total Japanese river systems; however, its area (16,800 km^2) is small when compared to those in other continents (for example, the Volga is 1,380,000 km^2).

In view of climatic zones, Japan is located in the Asian monsoon area. The average annual precipitation is around 1,800mm, with high seasonal fluctuation. Rainy fronts in the “Tsuyu” rainy season (usually in June) and typhoons in autumn bring torrential rains, sometimes exceeding 100 mm/hour. Thus, rapid run-off causes frequent inundation and sediment disaster. The northern part of Japan has a considerable amount of winter snow, a source of spring run-off.

Much of the sediment production in mountainous areas resulted in the formation of alluvial plains downstream. Before the industrialization of Japan, rice cropping in these flood-prone areas was the primary industry. Based on these circumstances, both water utilization from river streams and flood damage mitigation have been major challenges for the Japanese. These alluvial plains occupy only 10% of the national land; however, half of the population (128 million as of 2006), as well as three fourths of the asset is concentrated in these areas.

Outline of dam construction in Japan

Over the centuries, a vast number of storage ponds (earth dams) have been constructed for

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irrigation purposes. The oldest storage pond recorded in historical document is the "Sayama-ike" dam in the Osaka Prefecture area, completed in 616. This dam has been repeatedly refurbished and raised, and still operates today as an earth dam 18.5 meter high.

After the Meiji Restoration in 1868, the government eagerly introduced Western technology to modernize Japan. The first modern dam was built in 1891 for tap water service, to prevent waterborne infectious diseases such as cholera. Construction of dams for hydropower generation followed in the 1910s. From 1930s, the central government (ex Ministry of Interior) started promoting multi-purpose dam projects for flood control, hydropower and water supply. After World War II, in order to rehabilitate society and economy devastated by war, as well as to cope with repeated flood damage, the Ministry of Construction (hereinafter referred to as MOC), which is the successor to ex Ministry of Interior in the field of public works, took the initiative in executing multi-purpose dam projects, and the Ministry of Agriculture, Forestry and Fisheries promoted dam construction for national irrigation projects.

During the post-war high economic growth period, the government made every effort to develop a legislative, organizational and financial framework to cope with the sharp rise in water use and electricity consumption, as well as to lessen flood damage. This successfully led to the accelerated construction of dams for hydropower, irrigation, and multi purposes. Examples of legislative improvement include the 1957 Act for Specific Multi-purpose Dams, which enabled the central government (ex MOC, now the Ministry of Land, Infrastructure and Transport: MLIT) to consistently execute multi-purpose dam projects in Class-A rivers from the planning stage to construction and operational stages. Another example is the founding of the Water Resources Development Public Corporation in 1962 based on the Act for Promotion of Water Resources Development and so on, whose role is to develop regional water resources such as for Tokyo, Osaka and Nagoya Metropolitan areas.

Since then, considerable changes have occurred: the major portion of efficient dam sites has been developed, water demand has been almost saturated, environmental issues must be fully considered, and financial constraints have become severe. Under these circumstances, new dam construction is slowing down. The number of dam construction under the responsibility of MLIT peaked at 405 projects in FY 1995 (including small-scale reservoirs for local demand), whereas it was 182 projects in FY 2006, less than half of the peak amount. On the other hand, the number of dams in operation under MLIT has increased to a total of 475. Thus, we can see the clear shift from the age of construction to the age of operation and maintenance, and the redevelopment of existing dams has become an important challenge.

Concerning the utilization of underground water, Japan learned a bitter lesson when land subsidence due to excessive withdrawal of groundwater worsened the inundation damage in metropolitan areas. This is why the government established the policy of substituting water resource developed by dams, for the overexploited groundwater in these areas.

In the water resources development scheme, in a typical case of development by a dam reservoir, the entire amount of water demand is not directly taken from the reservoir. The intake is usually located downstream, and replenishment from the reservoir is done only when the original river discharge can not afford the water demand. This is referred to as "combined development by river flow and reservoir".

In this brief history of dam construction in Japan, what deserves special mention is the remarkable expansion in population and economic activities in the half century after World War II. The population of Japan in 1995 was 126 million, which is 1.75 times higher than that in 1945 (72 million). At the same time, the average lifetime expectancy of the Japanese has

increased from 50 years to 76 years for males and from 54 years to 83 years for females. GNP per capita was approximately 3.8 million yen (32,000 US dollars) in 1995, which is about 70 times larger than 40 years earlier (substantial value base). This is a historic achievement in social, economic fields in a very short period of time, and dam projects have successfully supported this achievement through the mitigation of flood damage and the supply of water resources and electricity.

Importance of dam safety management in Japan

The number of dam reservoirs in Japan exceeds 210,000, including storage ponds for irrigation purposes. Large dams with a height of 15 m or more numbered about 2,700 in 2000, placing Japan fourth in the world according to the WCD report (2000). As stated above, in view of the disadvantageous conditions for dam construction, such as frequent earthquakes, and complex and permeable strata, as well as the concentration of population and economic activities downstream, dam safety management is of grave importance for Japan.

There are many records of heavy rain or earthquake causing the collapse of dams (including tailing dams). For example, the “Iruka-ike” storage pond, constructed in 1633 in the Aichi Prefecture area, failed in May 1868 during a torrential rain, leaving a death toll of 941. As for modern dams, several examples of collapse are known, which include the failure of the Komoro dam in August 1928, a reinforced concrete buttress dam for hydropower generation with a height of 16 m in the Nagano Prefecture area.

To prevent this kind of tragic disaster, the River Law authorizes the River Administrator to examine water utilization plans and facility safety in an integrated way, when a dam of concern has a height of 15 m or more. This legal framework was established in the 1960s. Since then, there has been no case of heavy casualties through the collapse of a large dam designed by modern engineering. Thus, this safety management system is judged as functioning successfully. Even in the event of the Kobe earthquake in 1995 (7.3 on the Richter scale, approx. 6,400 casualties), some dams close to the epicenter underwent minor damages, without incurring any casualties downstream.

Dams can be categorized according to the enterprising body: One category includes dams planned and constructed by the River Administrator (e.g. multi-purpose dams including for flood control purposes). The other category is dams built for power generation, irrigation or other purposes (hereinafter referred to as “a water utilization dam”), which must follow necessary procedures based on the River Law. This paper deals with the latter case. As for the former case, the River Administrator makes every effort to assure safety.

FRAMEWORK OF RIVER ADMINISTARATION IN JAPAN

Outline of the River Law

The River Law, presided by the MLIT, provides the basic legal framework for river administration including approval/licensing procedures and assessment of dam safety. The existing River Law, originally enacted in 1964, was amended in 1997 when “improvement and conservation of the river environment” was added to the functions of river administration.

The ex River Law was enacted by the ex Ministry of Interior of the Meiji Government in 1896. This law focused mainly on flood damage mitigation, and ruled that the River Administrator should, in principle, be the governor of the prefecture, and that the central

government (Ministry of Interior) would bear the responsibility of administration and project implementation when needed. Concerning dams, the ex Ministry of Interior provided “the Regulations for Dams in Rivers” in 1935 in response to the aforementioned failure of the Komoro dam. River improvement projects based on this ex River Law contributed greatly to the development of national land; however, a lack of provisions for comprehensive use of river water had led to entirely new legislation for river administration, namely the new River Law in 1964. At that time, the MOC was in charge of this law. Now, the MLIT, founded in January 2001 through the merger of the MOC, Ministry of Transport, National Land Agency and Hokkaido Development Agency, is responsible for this law.

For reference’s sake, in the hierarchical structure of Japanese legislation, the Constitution occupies the highest position, sequentially followed by an Act (or a Law), a Cabinet Order, and an Ordinance of the Cabinet Office or Ministry. An “Act” is enacted based on the decision of the Diet, and a “Cabinet Order” is decided by Cabinet Meeting to clarify the necessary rules and matters commissioned by the Act. An “Ordinance” is decided by the Prime Minister or the Minister in charge of the matter. Taking the river administration as an example, the “Cabinet Order of the River Law” and “Cabinet Order for Structural Standard of River Administration Facilities and Others” are under the River Law as Cabinet Order level regulations. The “Implementing Regulations of the River Law” is a Ministerial Ordinance. Furthermore, an “Instruction of the Minister” and various levels of “Notice” are provided for more detailed administrative management. An “Instruction of the Minister” is issued by the Minister to the related organizations or officials. A “Notice” is issued by an administrative body, such as the Vice Minister for Administrative Affairs, Head of the Bureau or Head of the Section, to its organizations or staffs.

Article 1 of the existing River Law stipulates the aim of the law as follows: “The purpose of this Law is to contribute to the conservation and development of the national land, and thereby maintain public security and promote public welfare, by administering rivers comprehensively, so that damages due to floods, high tides, etc. are prevented, rivers are properly utilized, the normal functions of rivers are maintained, and the river environment is improved and conserved.” In other words, it aims at comprehensive administration from the view points of disaster prevention, rivers utilization, and enhancement of river environment. Article 2 stipulates the principles of river administration to the effect that the river is a public property and the water of a river can not be a target of private right.

One of the main characteristics of the existing River Law is the idea of “consistent administration through a river system”. From the view point of conservation of national land and/or national economy, river systems are designated either as “Class-A” (very important) or “Class-B” (important). The former is administrated consistently by the central government (MLIT), whereas the latter by the prefectural government. These stipulations can be found in Article 4, Paragraph 1 (hereinafter referred to as “RL-A4P1”), RL-A5P1, A9P1 and A10P1.

The River Law clearly defines the dams handled by this law: “a dam which is constructed with approval as stipulated in RL-A26P1, in order to store or intake the flowing water of the river and which has a height from the foundation to the crest of at least 15 meters” (RL-A44P1). Generally speaking, an organization constructing a water utilization dam needs to (1) occupy the land in the river area; (2) conduct excavation and other works in the river area; (3) construct a facility (dam), and (4) use the river water. All these actions require permission from the River Administrator, respectively based on RL-A24, A27, A26 and A23.

As for administration of a water utilization dam, Subsection 3 of the River Law (Provisions

related to dams) provides a group of articles: Maintenance of the existing functions of a river (RL-A44); Monitoring of hydrological situation (A45); Report on the dam operation (A46); Regulations for dam operation (A47); Preventive measures against damage (A48); Preparation and custody of operation records (A49); Appointment of a chief superintendent for a dam (A50); and Exception for water utilization dams used as river administration facilities (A51).

In addition to the River Law, which forms the fundamental framework of river administration, there are many related laws the content of which cannot be described in this paper due to space limitation. Major laws include the "Act for Specific Multi-purpose Dams", "Act for Promotion of Water Resources Development", and "Special Measures Act for Development of Reservoir Area". Concerning sediment disasters, the "Sabo (erosion-control) Act" plays a key role.

The Role of River Administrator and its Organization

There are 109 Class-A designated rivers in Japan. The total catchment area of these rivers is 246,900 km^2, equivalent to 63% of the entire area. The average catchment area of a Class-A river is calculated as 2,200 km^2. The Tone, the Yodo and the Kiso, typical Class-A rivers, are an important source of water supply for Tokyo, Osaka and Nagoya metropolitan areas, respectively. As for Class B, there are 2,723 rivers so designated, having a total catchment area of 109,4000 km^2. (The average is about 40 km^2)

As mentioned earlier, the River Administrator for Class-A rivers is the Minister of Land, Infrastructure and Transport; for Class-B rivers, it is the governor of the prefecture. This is the basic theory; however, there is an elaborated modification in the relationship between the central government and local governments. Taking the Class-A river as an example, it is practically difficult for MLIT to administrate entire river sections ranging from the trunk river to small streams. This is why the prefecture handles the section judged as less important in the Class-A river (RL-A9P2). In addition, even in case of the Class-B rivers, the prefectural Governor should have the Minister's consent to make decisions on application for river water use when it is for power generation purposes, or when the amount exceeds the specified value (RL-A79P2). Furthermore, part of the river administration, such as river environment improvement work for small rivers can be commissioned to the city or township.

The role of River Administrator is generally classified into two categories: (1) implementation, operation and maintenance of river administration facilities, and (2) processing of other party's application regarding rivers.

First, the River Administrator engages in flood disaster prevention, maintenance of normal river functions, and improvement of river environment. Examples include widening of river space for flood discharge, embankment, dredging, and construction of dams for flood control and river flow augmentation. The River Law stipulates that a Fundamental Management Policy and a River Improvement Plan should be drawn up for these projects (RL-A16-1, A16-2). When a prefectural government starts a project of sizable scale, it is common to request a financial subsidy from the central government. In this sense, MLIT is influential in the majority of improvement projects in Japan.

Next, the River Administrator has the authority to assess and give the necessary instructions for applications concerning activity in the river area. Examples include approval of plans for building a bridge across the river, approval of dam construction, and licensing for taking water from the river. Even in cases where the applicant is a ministerial or prefectural

organization, the approval or consent of the River Administrator is necessary.

The River Bureau is in charge of the river administration within MLIT, and consists of about 260 personnel more than half of which are in-house engineers. As for regional organizations, river departments of eight Regional Development Bureaus and the Hokkaido Development Bureau of MLIT and the Okinawa General Bureau of the Cabinet Office are in charge. Under each regional Bureau, there are about twenty to thirty work offices for project implementation, operation and maintenance of river administration facilities, and initial processing of applications etc. In addition, the Japan Water Agency (independent administrative institution), reorganized from the Water Resources Development Public Cooperation in 2003, is in charge of water resources development projects and operation of dams in specific rivers including the Tone, the Ara, the Yodo, the Kiso.

Research and development is also important for proper and efficient river administration. The NILIM (National Institute for Land and Infrastructure Management), organized within the MLIT, and the PWRI (Public Works Research Institute, independent administrative institution) are in charge of assistance in formulating technical standards, R&D, and technical guidance to regional engineers. In addition, public-interest corporations, such as the Japan Dam Engineering Center, and the Water Resources Environment Technology Center, whose nature is not governmental but of public interest, were founded under the supervision of the Ministry to support the activities of the central and local governments.

In the prefectural government, the River Section of the Public Works Department is in charge of river administration. As in MLIT, there are local work offices within the prefectural department, which are engaged in field management.

In the fiscal system of the Central Government, the budget for river administration is partitioned as a “Special Account for River Administration”, which includes project costs for dam construction and embankment, operation and maintenance costs, and personal expenses. In FY 2006, the total amount of this special account was 1,181 billion yen (about 9.8 billion dollars). The amount related dams totals 295 billion yen (about 2.5 billion dollars). The number of personnel in this account is approximately 8,160, more than half of whom are in-house engineers.

LEGAL FRAMEWORK OF DAM SAFETY MANAGEMENT

Hereinafter, the legal procedures in four stages (planning, construction, completion and operation) are described mainly from the viewpoint of dam safety management, assuming that a "water utilization dam" with a height of 15 m or more is planned in a Class-A river. The organization planning a dam is referred to as the "dam entrepreneur" in this paper. Fig.1 shows a typical procedure.

By the way, when a facility of concern has a height of less than 15 m, it is handled as a "weir". The River Administrator's approval must also be obtained for the construction of a weir, to which a different technical standard is applied.

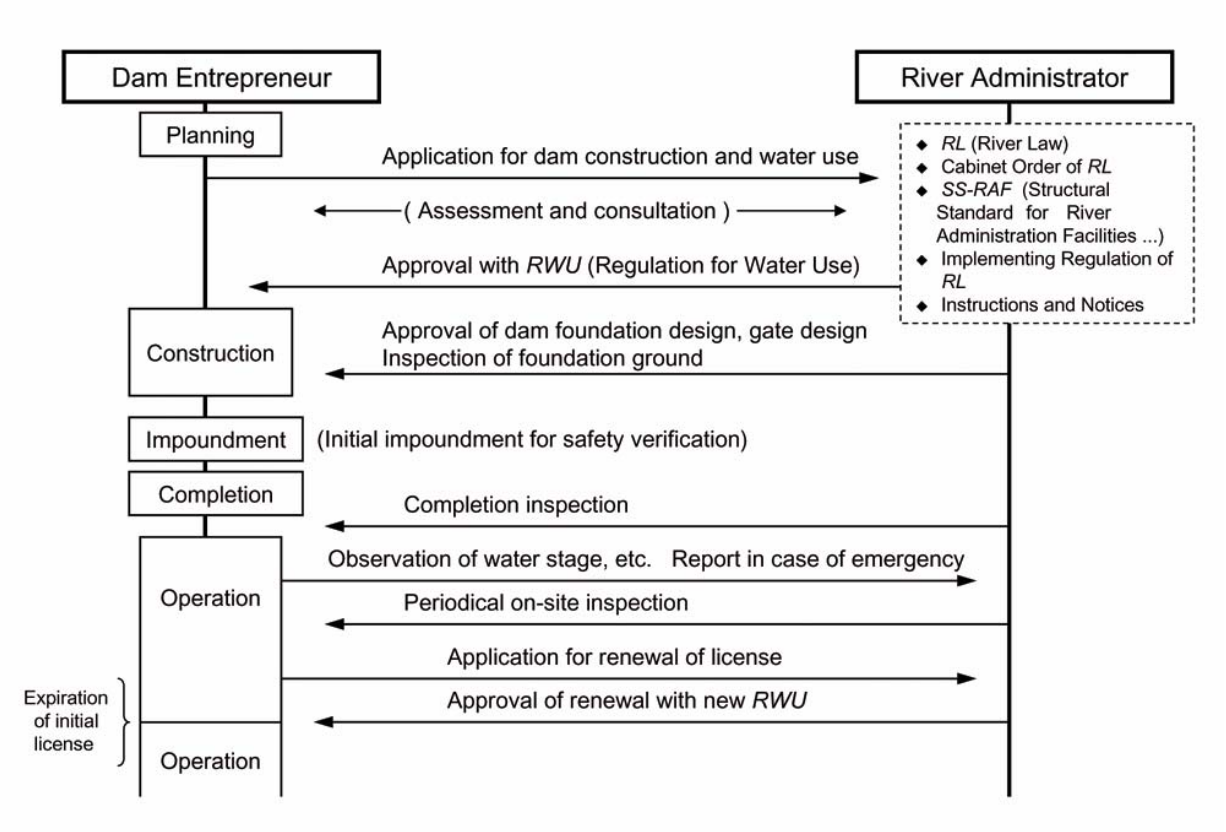

Fig.1 A Typical example of legal procedures for a water utilization dam

Procedures at the Planning Stage

In general, prior to construction work, the dam entrepreneur should have the approval to occupy the land in river area (RL-A24), as well as to conduct excavation and other works (A27), to construct the dam (A26) and to use the river water (A23). The Implementing Regulations of the River Law (hereinafter referred to as "IR-RL") stipulates that these applications should be submitted as one package (IR-RL-A39).

IR-RL-A11 stipulates the application documents, which are briefly summarized below.

(1) Contents of the water utilization project, its influence and countermeasures

a. Outline of the project
b. Necessity and calculation of the required water utilization

c. Amount of required withdrawal and its relationship to river discharge and existing river users.
d. Influence of the required water utilization and its countermeasures with respect to flood damage mitigation, existing use of river, fisheries, natural monuments, etc.
e. Present status of the impound area and compensation to those suffering losses from impoundment

(2) Details of the construction plan

This includes detail of dam structure design, topographic map, and data concerning water stage and discharge. The items related to dam safety are as follows:

a. Calculation of design flood discharge
b. Calculation of dam stability
c. Hydraulic calculation of facilities
d. Calculation of back water
e. Geologic map
f. Design documents of dam (including treatment of dam foundation)

As for structural safety, RL-A13P1 stipulates the basic design policy to the effect that the facility should be structurally safe in consideration of water level, flow, topographical, geological and other river conditions, as well as the dead load, water pressure and other anticipated loads. RL-A13P2 stipulates the establishment of technical standards at Cabinet Order level.

Based on this, the “Structural Standard for River Administration Facilities and Others” (hereinafter referred to as “SS-RAF”) was established in 1976. Chapter 2 (Article 4 to 16) describes technical standards for dam: Principle of structure (SS-RAF-A4); Height of non-overflow section of dam (A5); Category of loads to dam (A-6); and Installation of a spillway (A-7). The “Implementing Regulations of the Structural Standard”, a Ministerial Ordinance, details the technical requirements.

The River Administrator carefully assesses the application contents, and gives permission if judged appropriate. This may be done with required conditions (RL-A90). As for licensing of water rights, the “Regulations for Water Use” attached to the approval document (hereinafter referred to as “RWU”) provides detailed permission conditions such as the purpose of water use, location of intake, amount of withdrawal, other conditions (restriction of withdrawal and storage, priority of water use etc.). The standard RWU was formalized by Notice No.245 of June 29, 1965 issued by the Director General of the River Bureau. This includes inspection of foundation ground, necessity of approval of foundation treatment and others.

Concerning the inspection during construction and at completion, and periodical inspection during the operation stage by the River Administrator, the “Rule for Dam Inspection”, Instruction No.2 of the Minister of Construction of February 17, 1968, provides detailed procedures for related organizations of the Ministry

By the way, it is more than likely that a newly developed technology would contribute to more effective implementation of the project, although it does not comply with existing SS-RAF. To cope with this kind of problem, SS-RAF-A73P4 stipulates to the effect that a new technology can be adopted under the condition that its performance is certified by the Minister as being equivalent or superior to the conventional technology.

When a dam reservoir comes into existence, it may increase the possibility of disaster through

changes in flood conditions downstream, or changes in river bed and water level conditions upstream. In such a case, RL-A44P1, stipulating the maintenance of the existing river functions, urges the dam entrepreneur to take necessary steps according to the instructions of the River Administrator.

Procedures at the Construction Stage

The dam entrepreneur starts construction work after obtaining the required approval from the River Administrator. In addition, it is assumed that all the necessary legal procedures have been completed, such as requirements related to environmental conservation.

At the construction stage, the dam entrepreneur must have received approvals and inspection from the River Administrator or his agent, based on the RWU. Major items in the standard RWU are listed below. Technical judgment is usually done by the head of the work office of MLIT who has jurisdiction over the dam project area. When necessary, experts of PWRI and/or NILIM provide supports.

a. Safety verification through a model test, in the case of an arch dam, or non-standard type of spillway
b. Approval of dam foundation design
c. Inspection of foundation ground prior to the concrete placement (in the case of a concrete dam), or filling (in the case of a fill-type dam), based on the agreed inspection schedule
d. Approval of designed concrete composition, or standard of filling work
e. Approval of dam gates design

Procedures at the Completion Stage (Initial Impoundment for Safety Verification and Completion Inspection)

RL-A30P1 stipulates that the dam can be operated only after passing completion inspection by the River Administrator. There is a similar provision in the RWU.

Prior to the completion inspection, the first impoundment for safety verification is executed as an important test to confirm the structural safety of the dam and water proof performance, as well as the safety against possible landslides along the reservoir. In this special test, the water level is raised gradually up to the surcharge level, in principle, and then maintained for a certain period, and finally lowered, while carefully monitoring the behavior of the dam, water leakage etc. The test usually takes half a year to a full year to complete. If unusual values are observed, necessary measures are taken (e.g., additional grouting against excessive leakage).

It is common practice throughout the world to carefully monitor the behavior of a dam and its related facilities at the first impoundment after completion; however, such a thorough impoundment test as described above characterizes the safety management system of Japan. This kind of impoundment test, originally conceived through repeated experiences of reservoir slope landslides, started in the latter half of 1970s mainly to confirm the effectiveness of countermeasure against landslides in MOC dam projects. This was regularized in the1980s for dam projects under the responsibility of MOC.

As for water utilization dams, this type of test was introduced after its generalization in MOC projects. The initial impoundment for safety verification is not a legal obligation, but is now executed without exception based on the guidance of the River Administrator.

After confirming the safety of the dam through the impoundment test, completion inspection

is performed by the River Administrator. When the inspection finishes successfully, the dam can be put into operation. In the case of a dam for hydropower generation, the dam entrepreneur must go through another completion inspection based on the Act for Electricity Enterprises.

Measures at the Operation Stage

Concerning dam operation, the dam entrepreneur must prepare the operation rule in advance, and must have the approval of the River Administrator (RL-A47). To assure appropriate operation from the viewpoint of river administration, RL-A45 stipulates that water level, river discharge, and rainfall/snowfall must be monitored. RL-46 obliges the dam entrepreneur to report the result of monitoring to the River Administrator and the prefectural governor in the case of occurring or imminent flood. The installation plan for observation facilities must be approved based on the RWU.

With a view to appropriate dam operation, RL-A50 stipulates that a chief superintendent engineer must be appointed for the dam. As for the records of dam operation, RL-49 stipulates that the dam entrepreneur must make and keep the record of dam operation during a flood. In addition, the RMU requires that the reservoir water level and discharge, dam deformation, uplift pressure etc. be monitored and reported to the River Administrator.

The River Administrator periodically inspects a water utilization dam in operation. This is based on the stipulation of RL-A78: the River Administrator may request the submission of a report from the dam entrepreneur, or make an on-site inspection. The Rule for Dam Inspection provides details of the procedures. Usually, once in three years (once in five or more years for a dam posing no risk in view of river administration), on-site inspection is conducted to review dam operation, maintenance of facilities, sedimentation upstream and so on. The River Administrator may give necessary instructions afterwards.

In principle, the period of permission for water use, which is specified in the RWU, is approximately thirty years for power generation, and approximately ten years for other purposes. The dam entrepreneur usually applies for renewal of permission when the expiration date is drawing near. The River Administrator makes a judgment on this application. In recent examples, renewals were made with additional conditions, such as an increase in obligatory discharge downstream with a view to enhancing the river environment. In addition, the permission period is sometimes shortened to assure more appropriate river administration.

Moreover, RL-A75 stipulates supervisory measures and orders. Based on this, the River Administrator may annul or alter the existing approval, order the discontinuation of construction work, order the reconstruction or removal of the facility, or order to restoration of the status quo of the river, in the case of conducts as stated in this article. This is a very powerful tool; however, many disputes are solved through negotiations among the parties concerned, before invocation of this article. As far as the permission for dam water use is concerned, this provision has not been exerted so far.

ENHANCEMENT OF THE ADMINISTRATION SYSTEM AND RECENT TOPICS

As stated so far, the River Law of 1964 established the legal framework for dam safety management, and subsequently SS-RAF of 1976 consolidated the technical framework. Along with these fundamental enactments, various technical standards and guidelines, although they

were not legal imperatives, have been developed to date. Taking the aforementioned impoundment test as an example, a draft guideline for planning the initial impoundment for safety verification was compiled in1985, and this was later revised in 1999.

SS-RAF has been updated according to the amendment of the River Law and enhancement of river administration policy, however, the core part related to dam design has not changed. The seismic dam design stipulated in SS-RAF is the so-called “earthquake intensity method”, a traditional pseudo-static methodology. Following the development of technology and the Kobe earthquake in 1995, a new evaluation method is now in trial implementation. This is “Seismic performance evaluation of dams against level 2 earthquake motions”, based on the guideline of March 30, 2005 issued by the Director of the River Improvement and Management Division, River Bureau, MLIT. “Level 2 earthquake motions” are defined as the largest-class earthquake motion that could conceivably occur at each dam site now and in the future. Using a dynamic methodology, the evaluation is to identify whether the dam’s function to store water is maintained and any damage incurred is limited to the repairable extent, in the event of these strong earthquake motions.

Recently, in 2007, inappropriate cases of the management of hydropower generation dams were revealed, in which some of the observation values had been altered prior to the official report to the River Administrator. MLIT is now investigating these cases, as well as considering preventive measures.

ACRONYMS AND ABBREVIATIONS

IR-RL	Implementing Regulations of the River Law
MLIT	Ministry of Land, Infrastructure, and Transport
MOC	Ministry of Construction
NILIM	National Institute for Land and Infrastructure Management
PWRI	Public Works Research Institute
RL	River Law cf. “RL-A4P2” represents “Article 4 Paragraph 2 of the River Law”
RWU	Regulations for Water Use, attached to the approval document
SS-RAF	Structural Standards for River Administration Facilities and Others

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