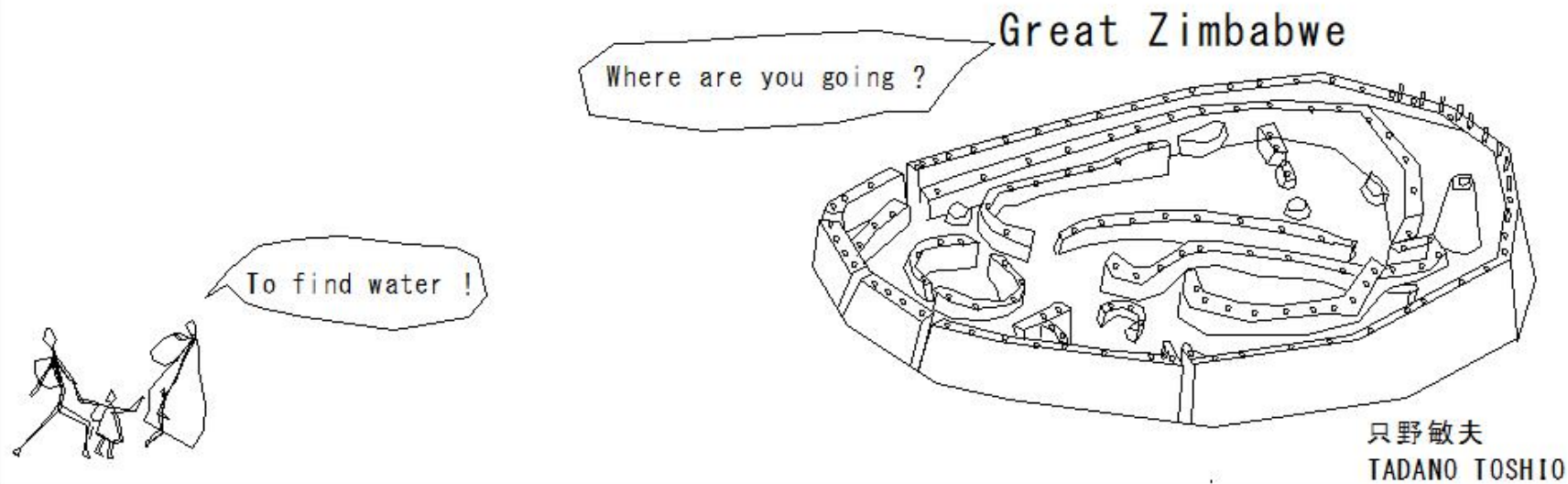


(29) Irrigation(Illustration) in Africa(984-1373)

Great Zimbabwe was a city in the south-eastern hills of the modern country of Zimbabwe,
It was settled from 1000 AD,



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- (1985) Farm road construction
- (1986) Agricultural land disaster prevention project
- (1987) Rural village drainage project
- (1988) Comprehensive rural development project
- (1989) Development of mountainous areas
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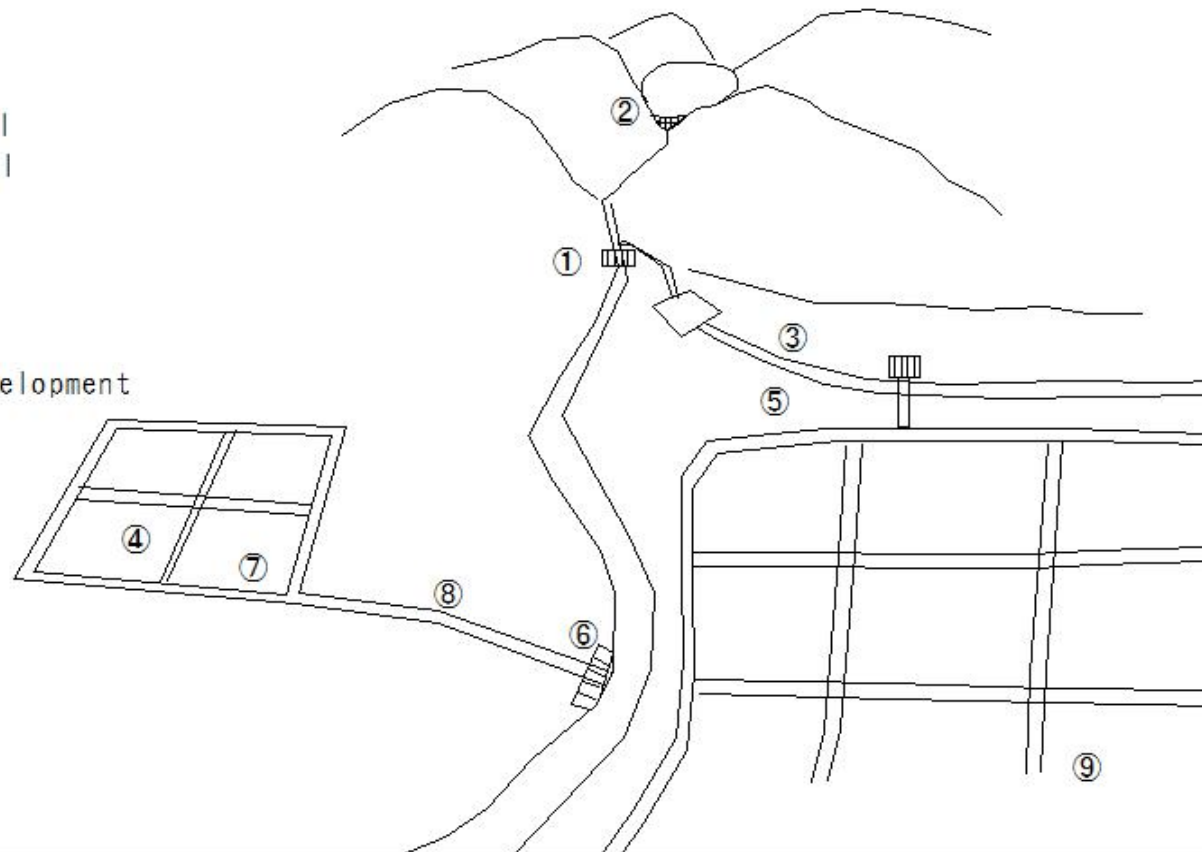
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(1984)Agricultural irrigation facilities

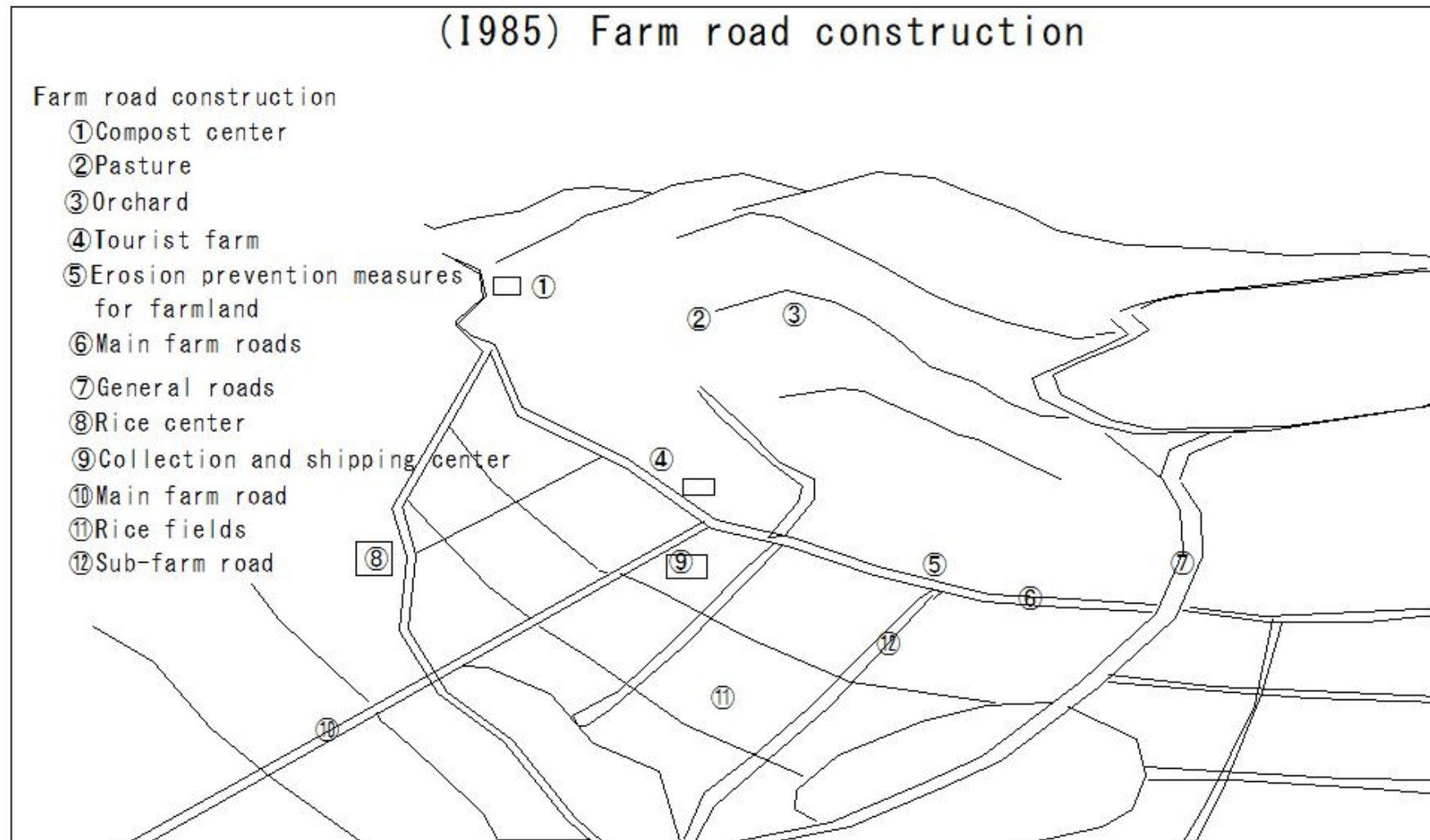
(1984)Agricultural irrigation facilities

Agricultural irrigation facilities

- ① Head works
- ② Dam
- ③ Main irrigation channel
- ④ Terminal drainage channel
- ⑤ Branch irrigation channel
- ⑥ Drainage pump station
- ⑦ Branch drainage channel
- ⑧ Main drainage channel
- ⑨ Development of terminal waterways through field development



(1985) Farm road construction



(1986) Agricultural land disaster prevention project

(1986) Agricultural land disaster prevention project

Agricultural land disaster prevention project

① Restoring the functionality of agricultural facilities

- Renovating reservoirs
- Renovating weirs

② Preventing flooding

- Raising reservoirs
- Renovating disaster prevention dams

③ Preventing soil contamination

- Switching water sources and adding soil

④ Preserving the quality of agricultural water

- Separating irrigation channels and drainage channels
- Installing water purification facilities

⑤ Resolving land subsidence

- Renovating water channels
- Switching water sources

⑥ Preventing soil erosion

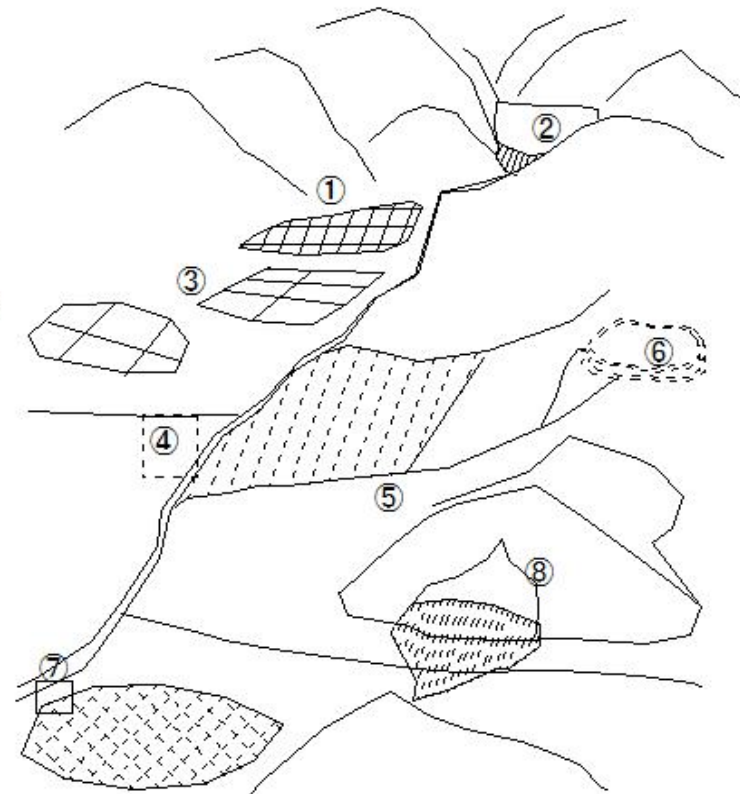
- Developing and leveling reservoirs

⑦ Removing flooding

- Installing pumping stations
- Installing drainage channels

⑧ Preventing landslides

- Installing retaining walls • Removing groundwater

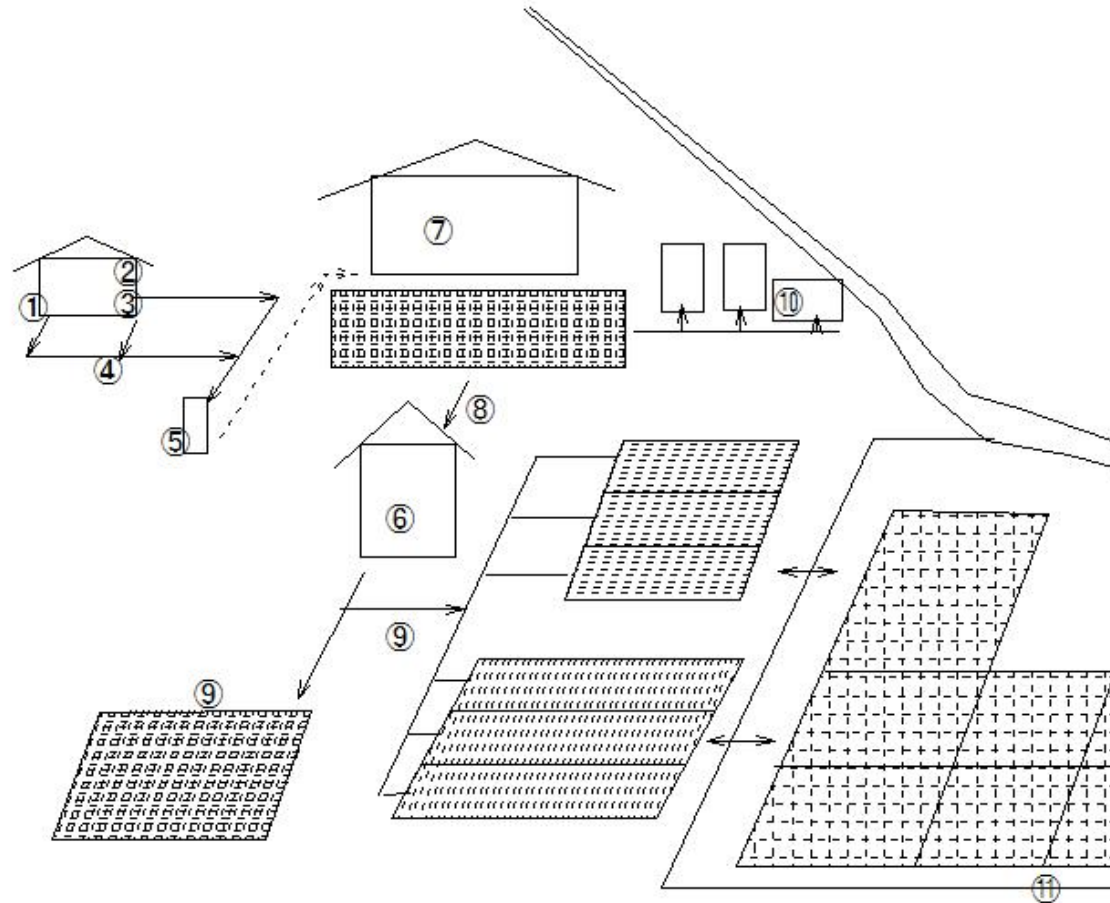


(1987) Rural village drainage project

(1987) Rural village drainage project

Rural village drainage project

- ① Kitchen
- ② Bath
- ③ Toilet
- ④ Wastewater
- ⑤ Manhole
- ⑥ Composting facility
- ⑦ Agricultural village drainage facility
- ⑧ Sludge
- ⑨ Compost
- ⑩ Treated water
- ⑪ Agricultural irrigation and drainage channel

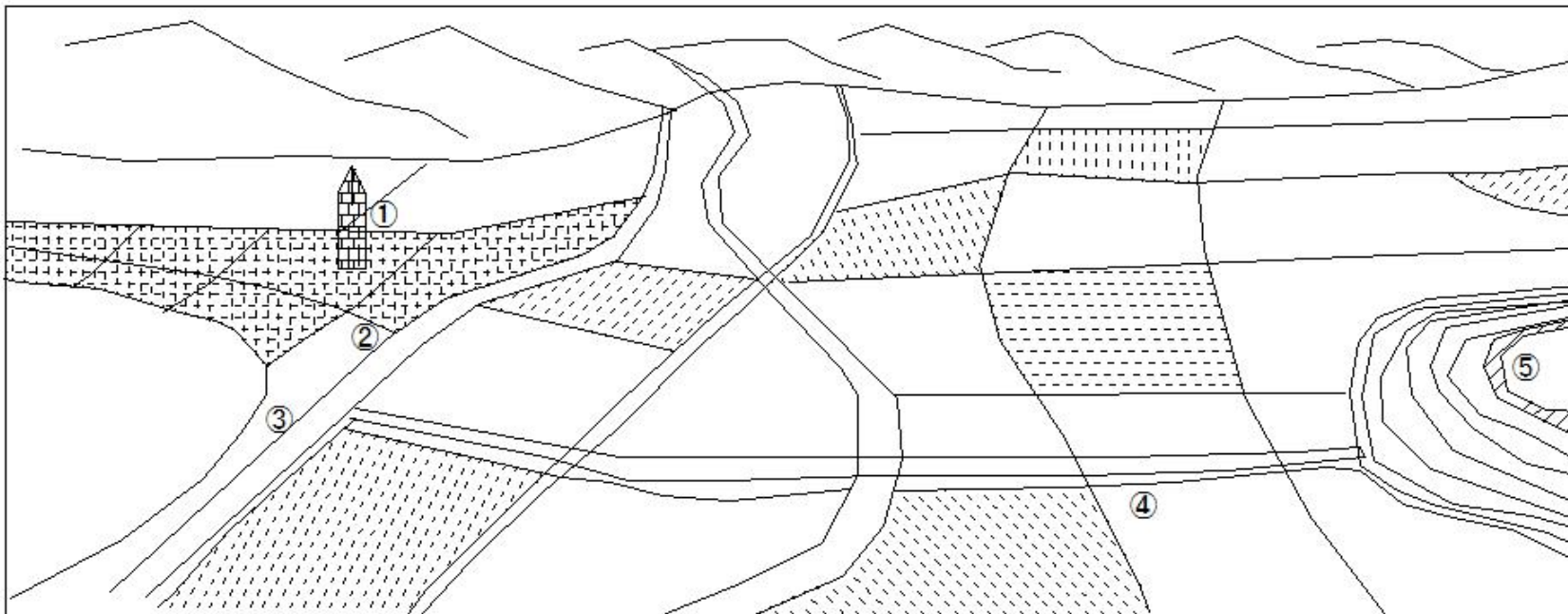


(1988) Comprehensive rural development project

(1988) Comprehensive rural development project

Comprehensive rural development project

- ① Land development for agricultural facilities, etc.
- ② Village disaster prevention and safety facilities
- ③ Agricultural village drainage channels
- ④ Agricultural irrigation channels
- ⑤ Reservoirs

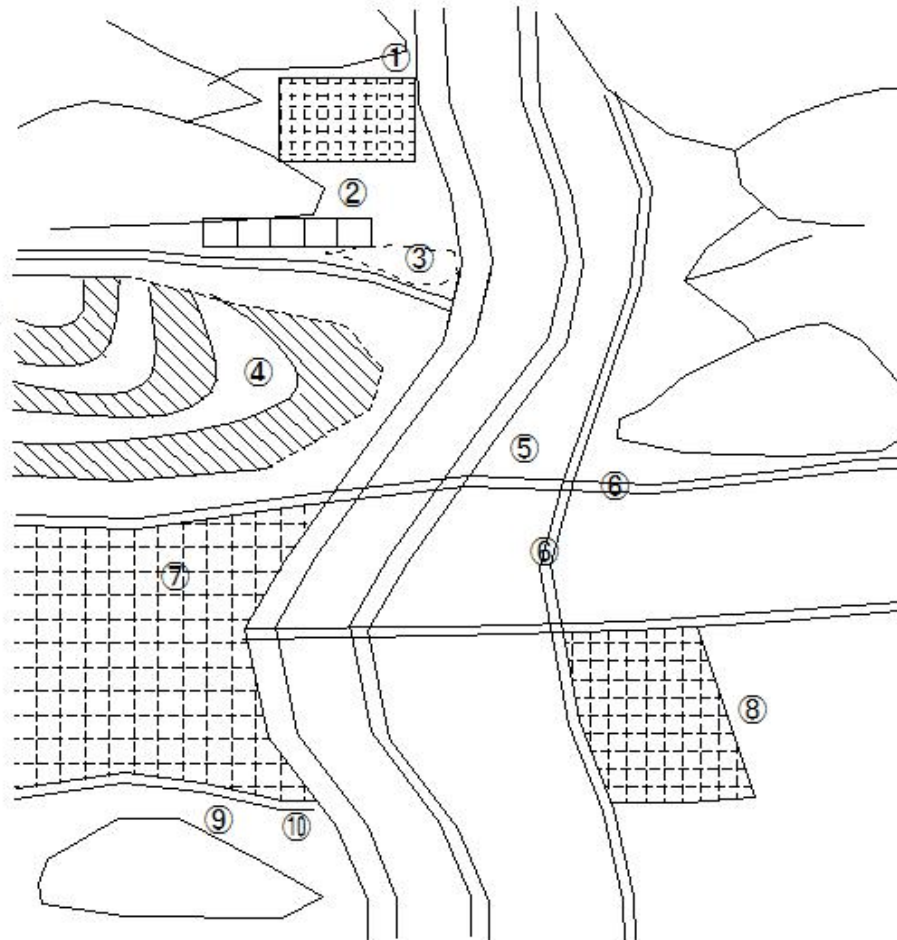


(1989) Development of mountainous areas

(1989) Development of mountainous areas

Development of mountainous areas

- ① Field development
- ② Village road development
- ③ Reservoir development
- ④ Rice terrace development
- ⑤ Agricultural drinking and
miscellaneous water facilities development
- ⑥ Farm road development
- ⑦ Agricultural drainage development
- ⑧ Land development
- ⑨ Community garden development
- ⑩ Revitalization facility development

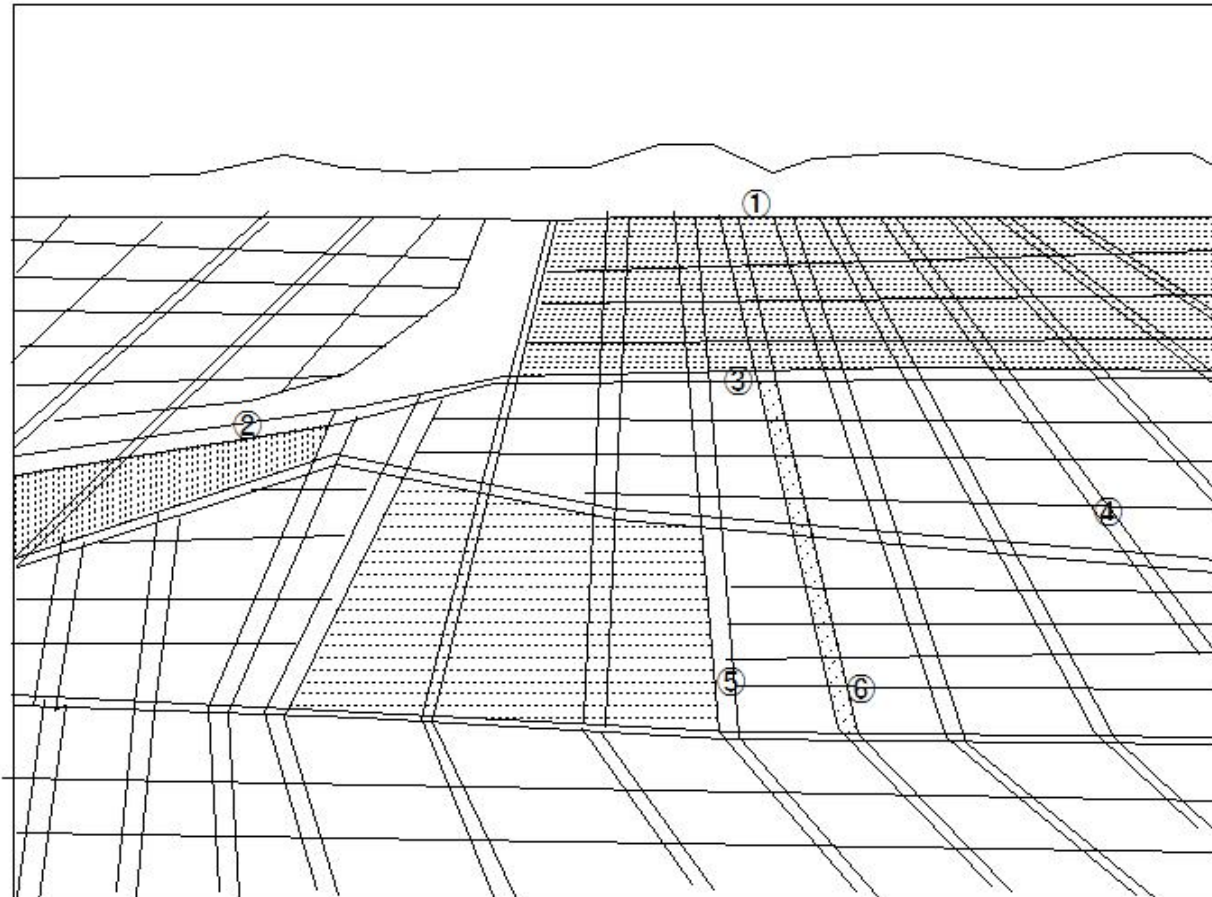


(1990) Restoration project for farmland damaged by the tsunami

(1990) Restoration project for farmland damaged by the tsunami

Before development

- ① Small plots of fields
- ② Poor drainage
- ③ Undeveloped fields
- ④ Narrow roads
- ⑤ Submerged farmland
- ⑥ Broken waterways

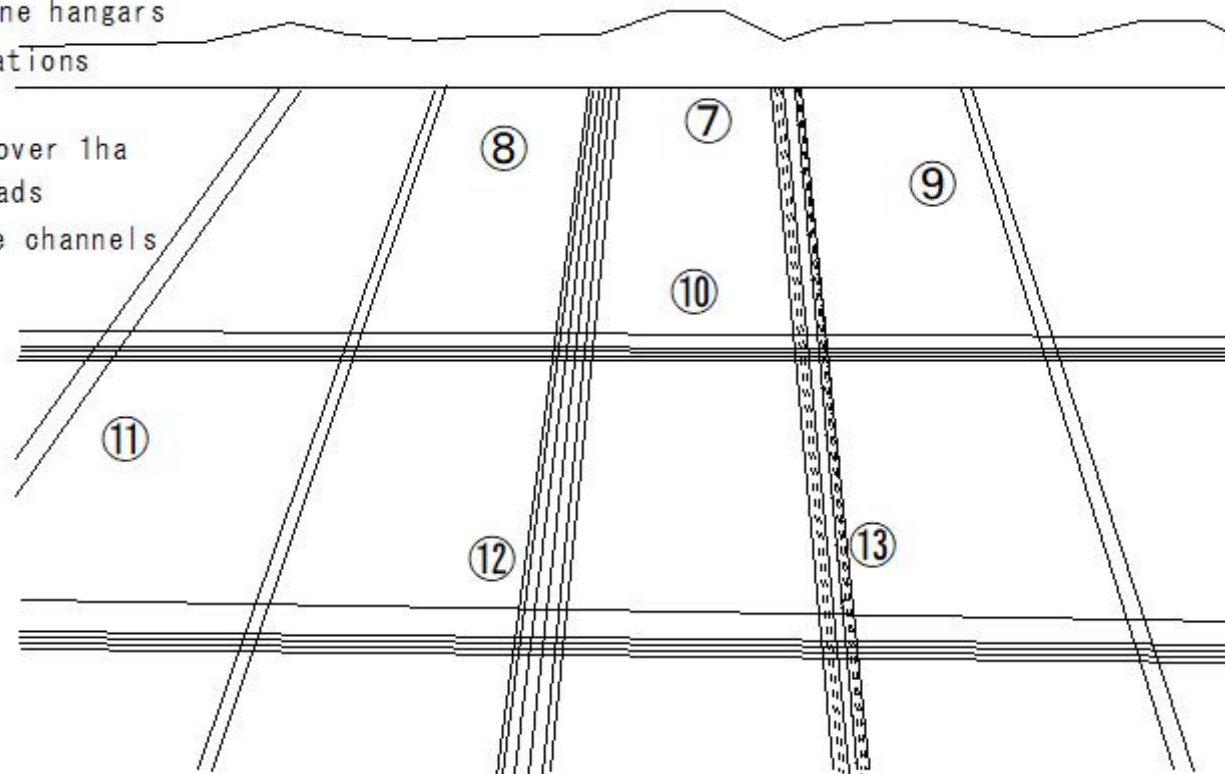


(1991) Restoration project for farmland damaged by the tsunami

(1991) Restoration project for farmland damaged by the tsunami

After development

- ⑦ Purposeful agriculture/greenhouse horticulture
- ⑧ Country elevator
Creating land for machine hangars
- ⑨ Consolidating crop rotations
- ⑩ Organizing land use
- ⑪ Large plots of fields over 1ha
- ⑫ Raising prefectural roads
- ⑬ Development of drainage channels

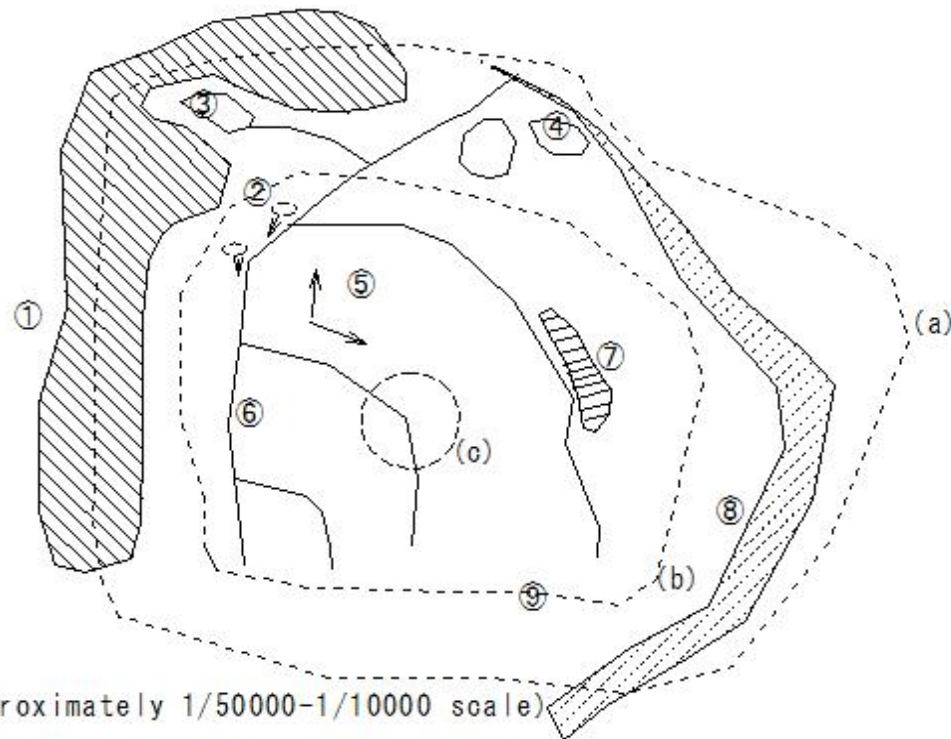


(1992) Perspectives when planning a survey

(1992) Perspectives when planning a survey

Perspectives when planning a survey

- ① Forests
- ② Springs
- ③ Reservoirs
- ④ Springs
- ⑤ Migration of living things
- ⑥ Irrigation channels
- ⑦ Scrub forests
- ⑧ Rivers
- ⑨ Drainage channels



(a) Regional level perspective (approximately 1/50000-1/10000 scale)

(b) District level perspective (approximately 1/5000-1/1000 scale)

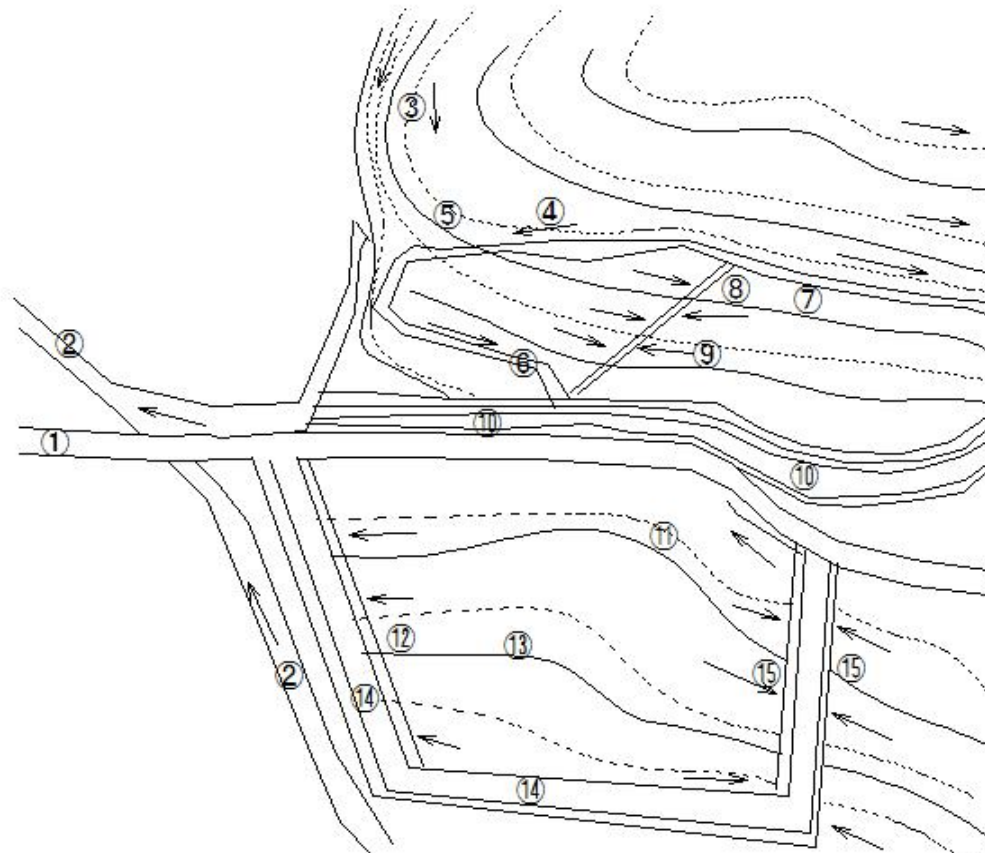
(c) Site level (approximately 1/500-1/100 scale)

(1993)Example of layout of drainage network

(1993)Example of layout of drainage network

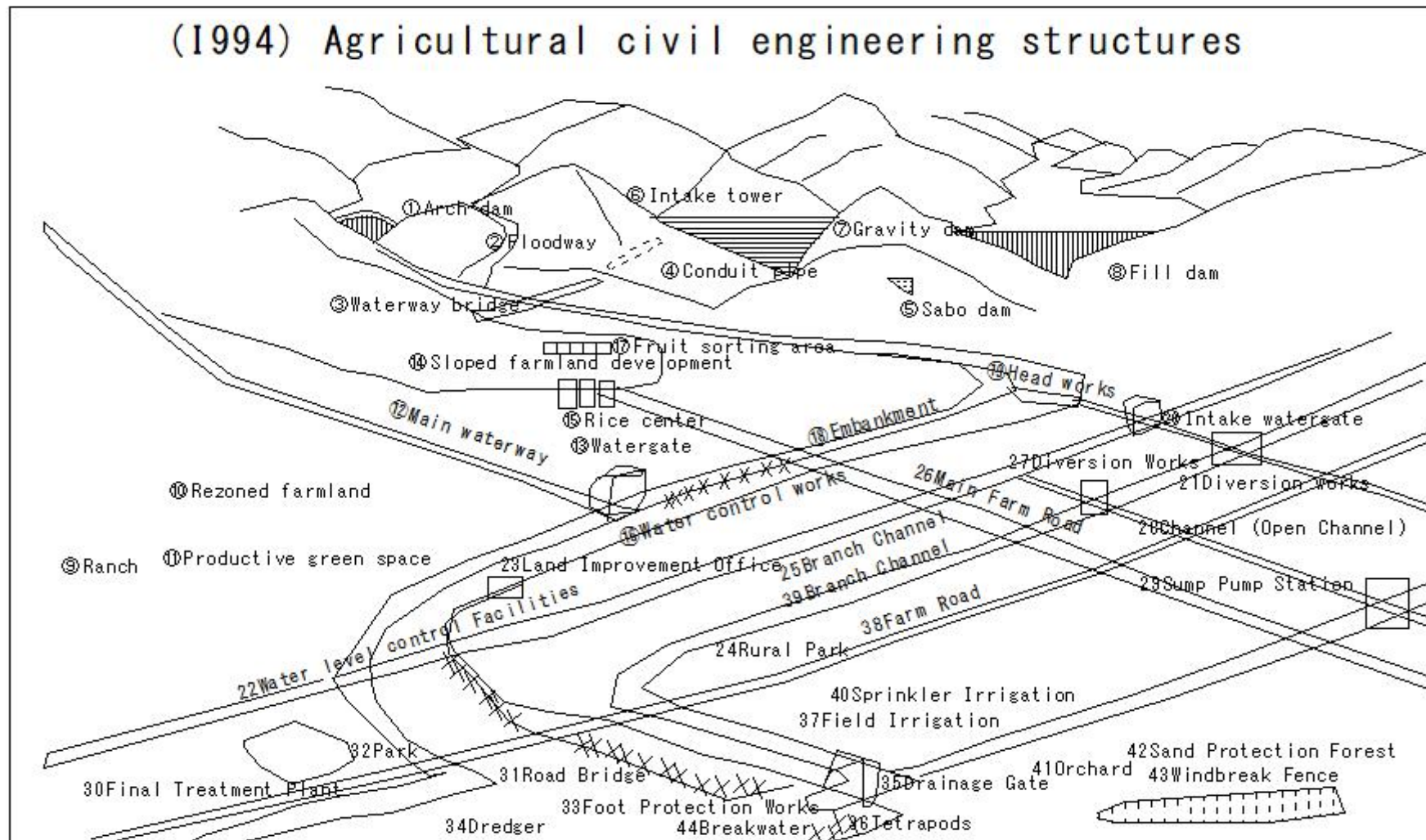
Example of layout of drainage network

- ① Road
- ② Natural drainage canal
- ③ Diversion ditch (Reception waterway)
- ④ Collection waterway
- ⑤ Contour lines
- ⑥ Collection waterway
- ⑦ Road
- ⑧ Diversion ditch (Reception waterway)
- ⑨ Collection waterway
- ⑩ Main drainage canal
- ⑪ Contour lines
- ⑫ Collection waterway
- ⑬ Contour line
- ⑭ Road
- ⑮ Collection waterway



Example of layout of drainage network

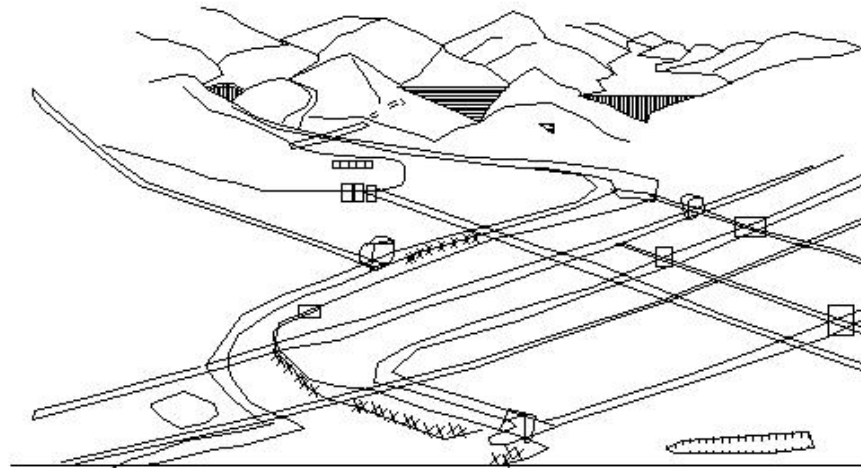
(1994) Agricultural civil engineering structures



(1995) Agriculture and Water

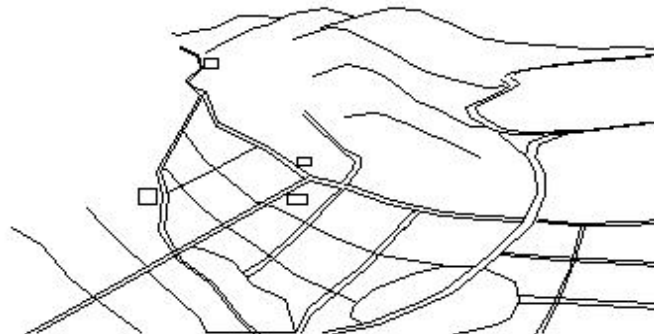
○Agricultural irrigation

- ① Water utilization activities to secure the water necessary for crop growth, supply it to cultivated land, and drain excess water
- ② Includes water storage facilities such as dams and reservoirs, waterways, drainage channels, and irrigation facilities. In addition,
- ③ Agricultural irrigation not only stabilizes food production,
- ④ it also has multiple functions such as maintaining the water cycle, disaster prevention, and creating water-friendly spaces.



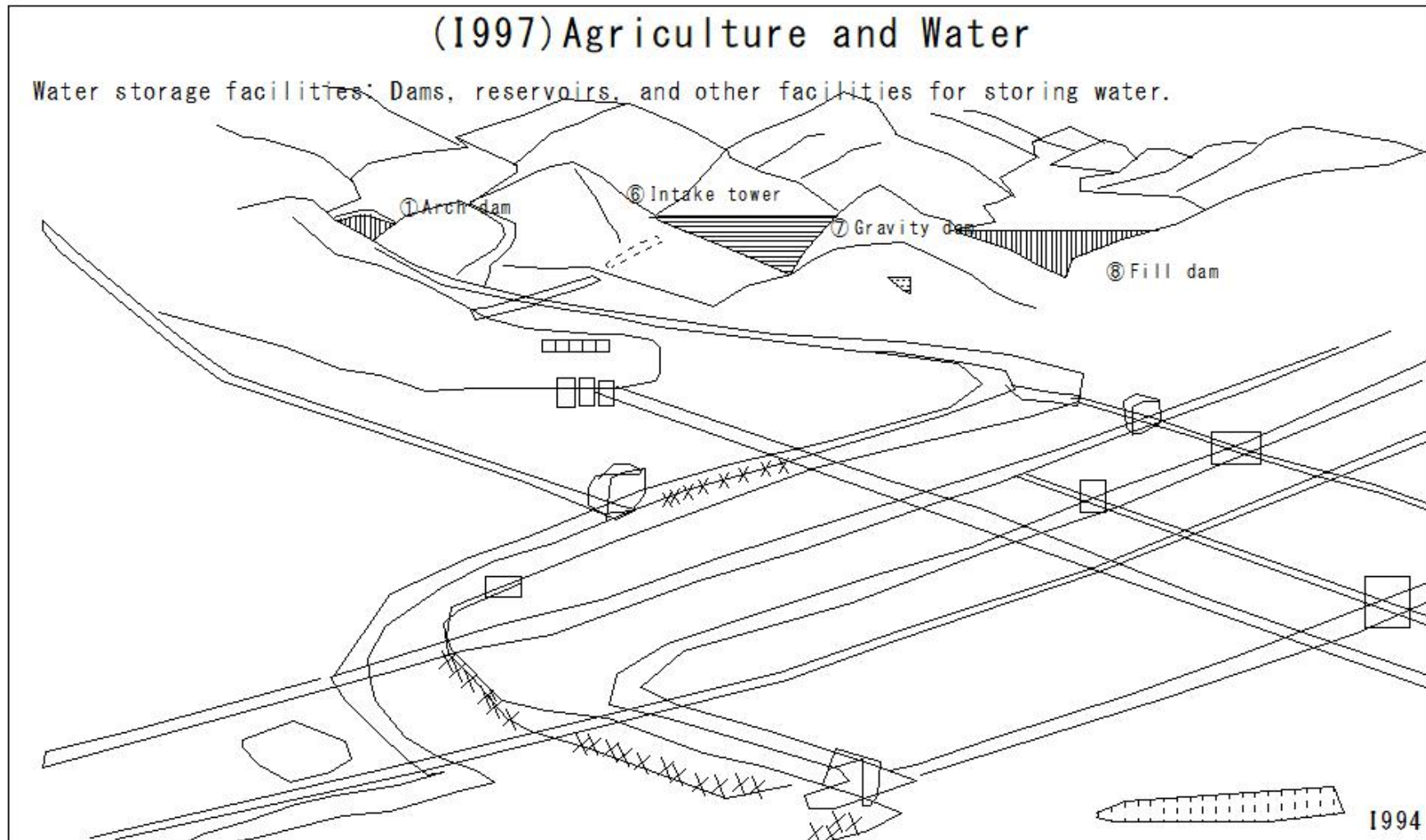
(1996)Agriculture and Water

- Main functions of agricultural irrigation:
 - ① Secures and steadily supplies the water necessary for crop growth.
- Stable supply of agricultural water:
 - ② Draining excess water dries farmland and prevents flooding that impedes crop growth.
- Drainage
 - ③ Storage of rainwater and groundwater through reservoirs and irrigation channels promotes water circulation.
- Maintaining water circulation
 - ④ Developing facilities with disaster prevention functions reduces damage from floods and water damage.
- Disaster prevention
 - ⑤ Creating water spaces
- Creating water spaces
 - ⑥ Creates water-friendly spaces using agricultural irrigation channels and reservoirs.

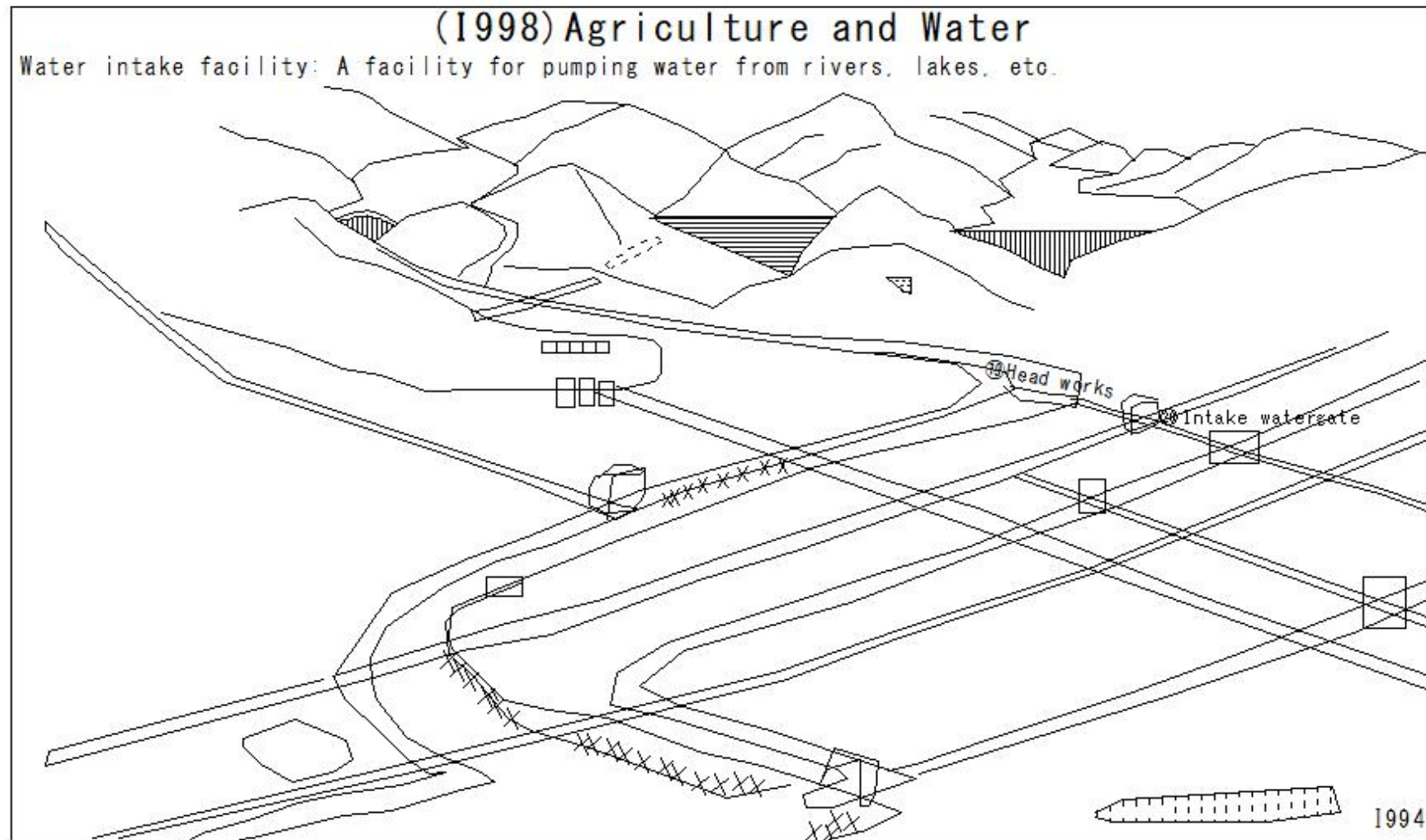


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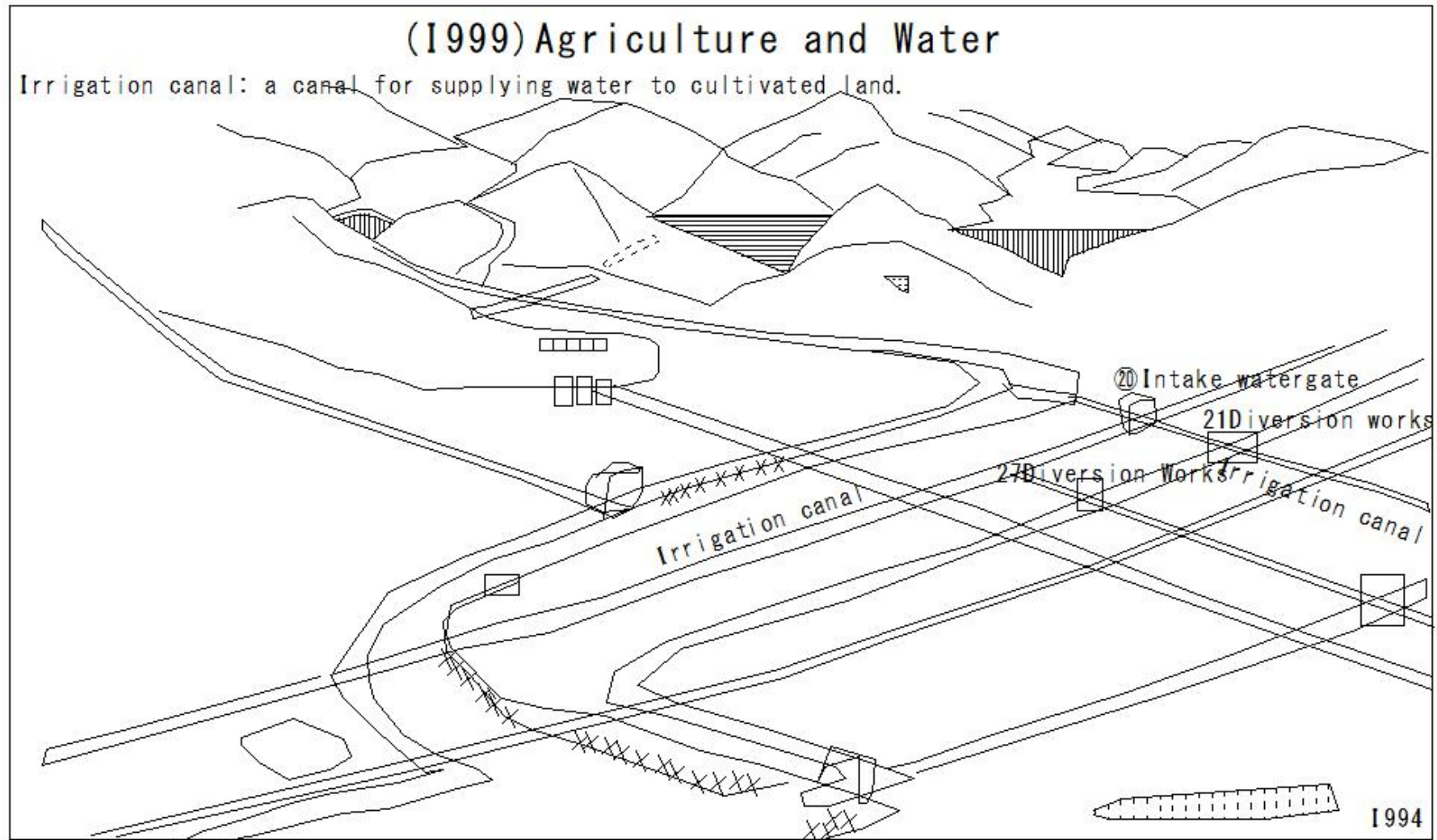
(1997)Agriculture and Water



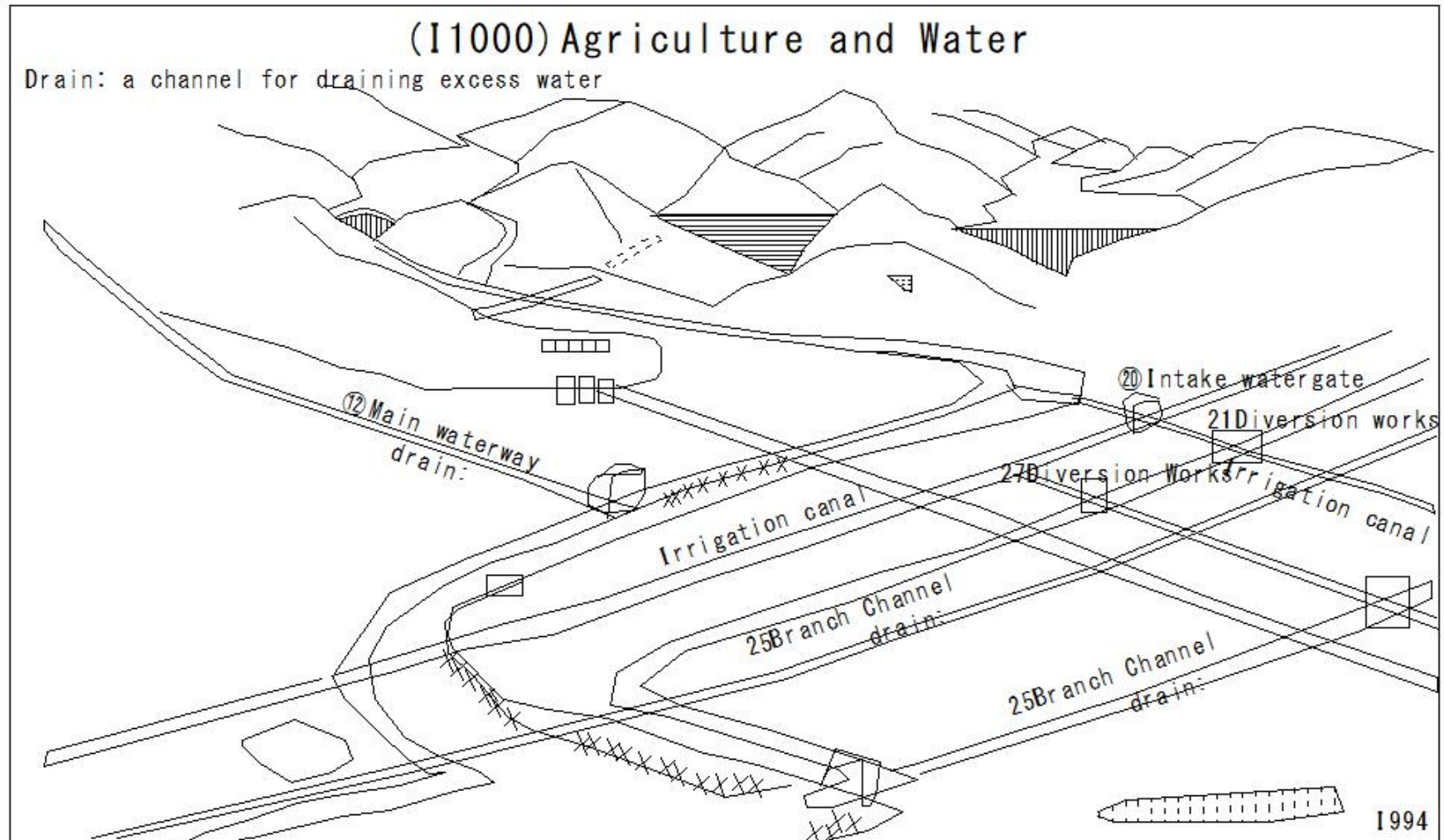
(1998) Agriculture and Water



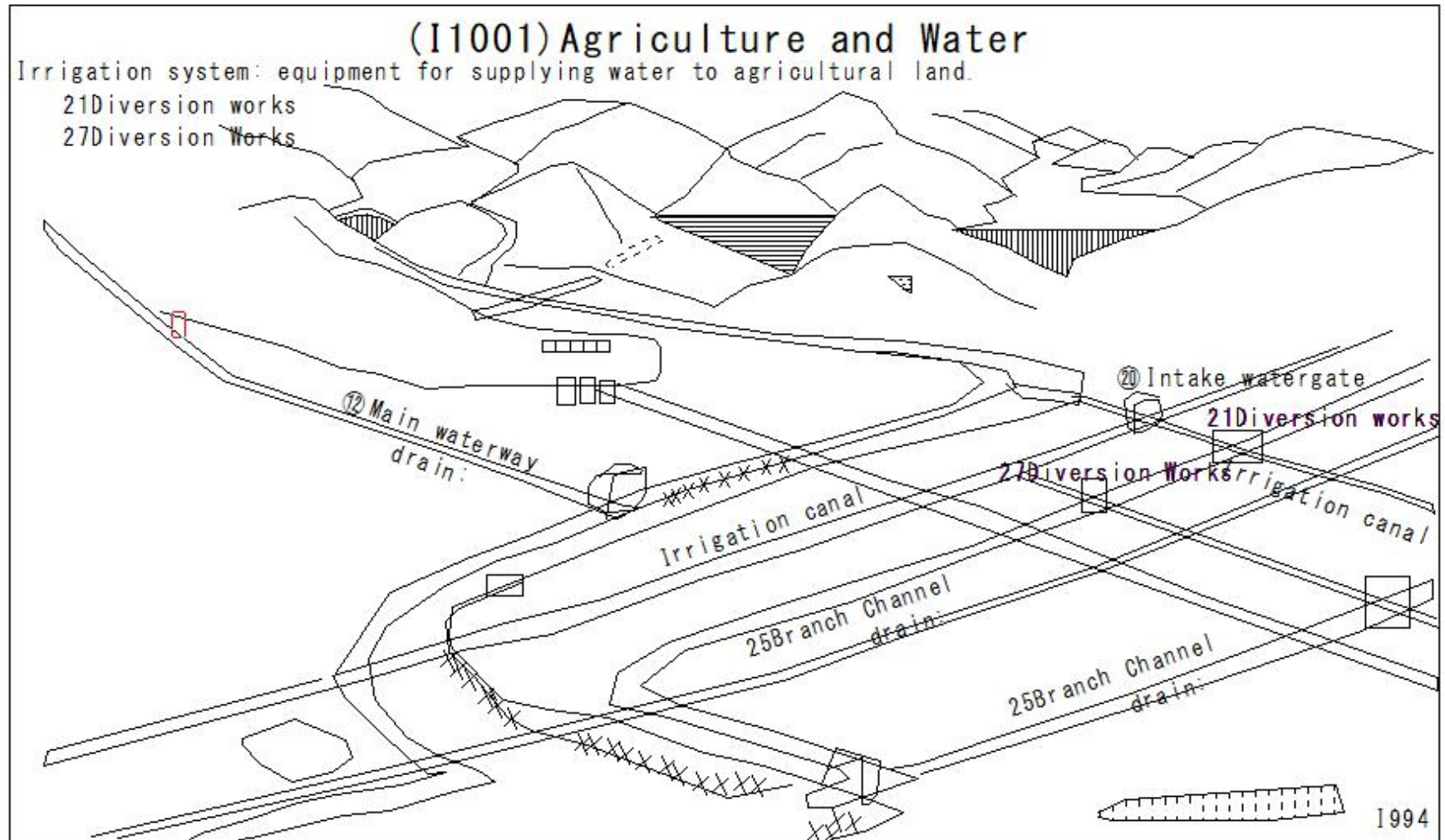
(1999) Agriculture and Water



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(I1001)Agriculture and Water

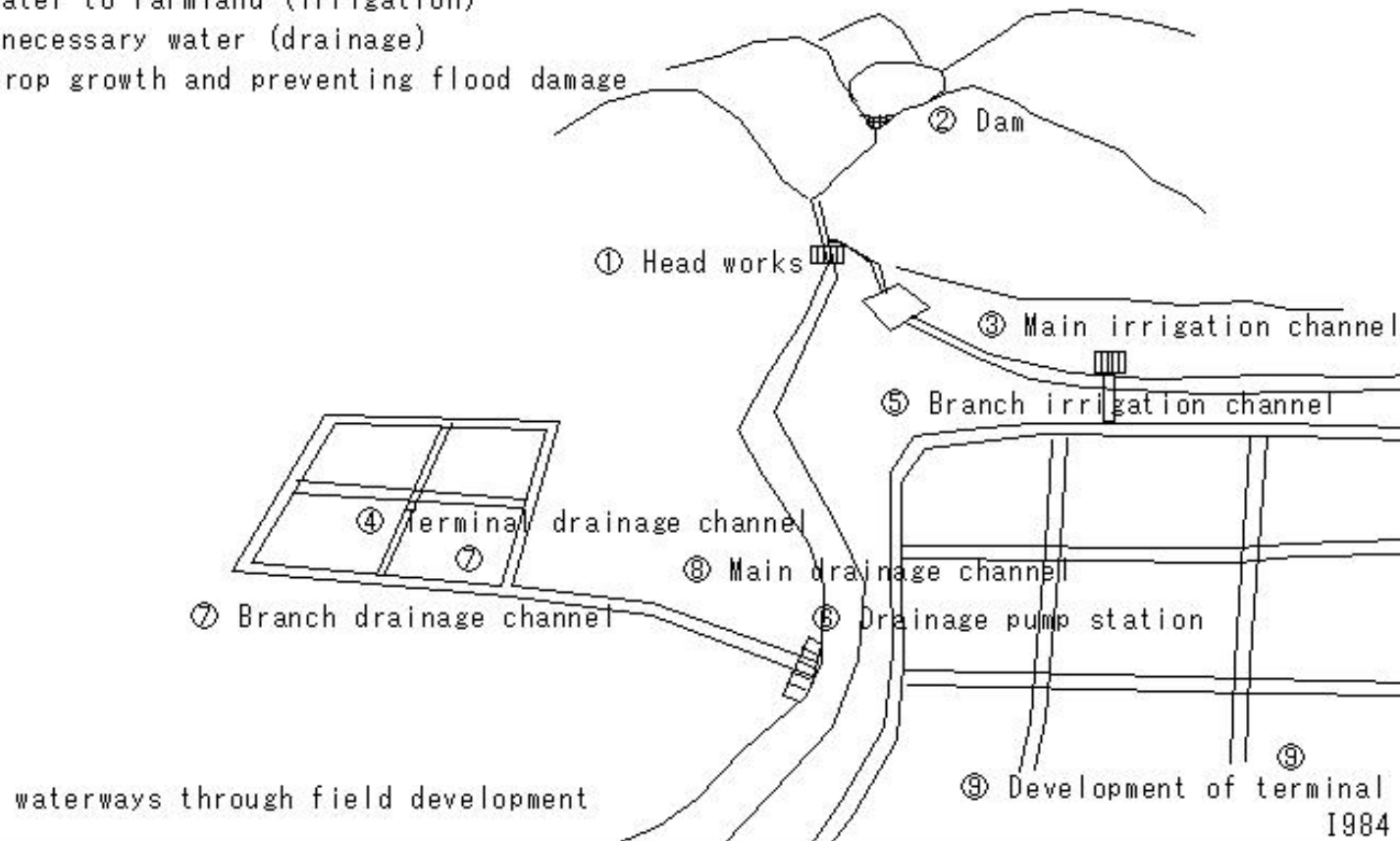


(I1002)Agriculture and Water

(I1002)Agriculture and Water

Irrigation and drainage

- ① Supplying water to farmland (irrigation)
- ② Removing unnecessary water (drainage)
- ③ Promoting crop growth and preventing flood damage

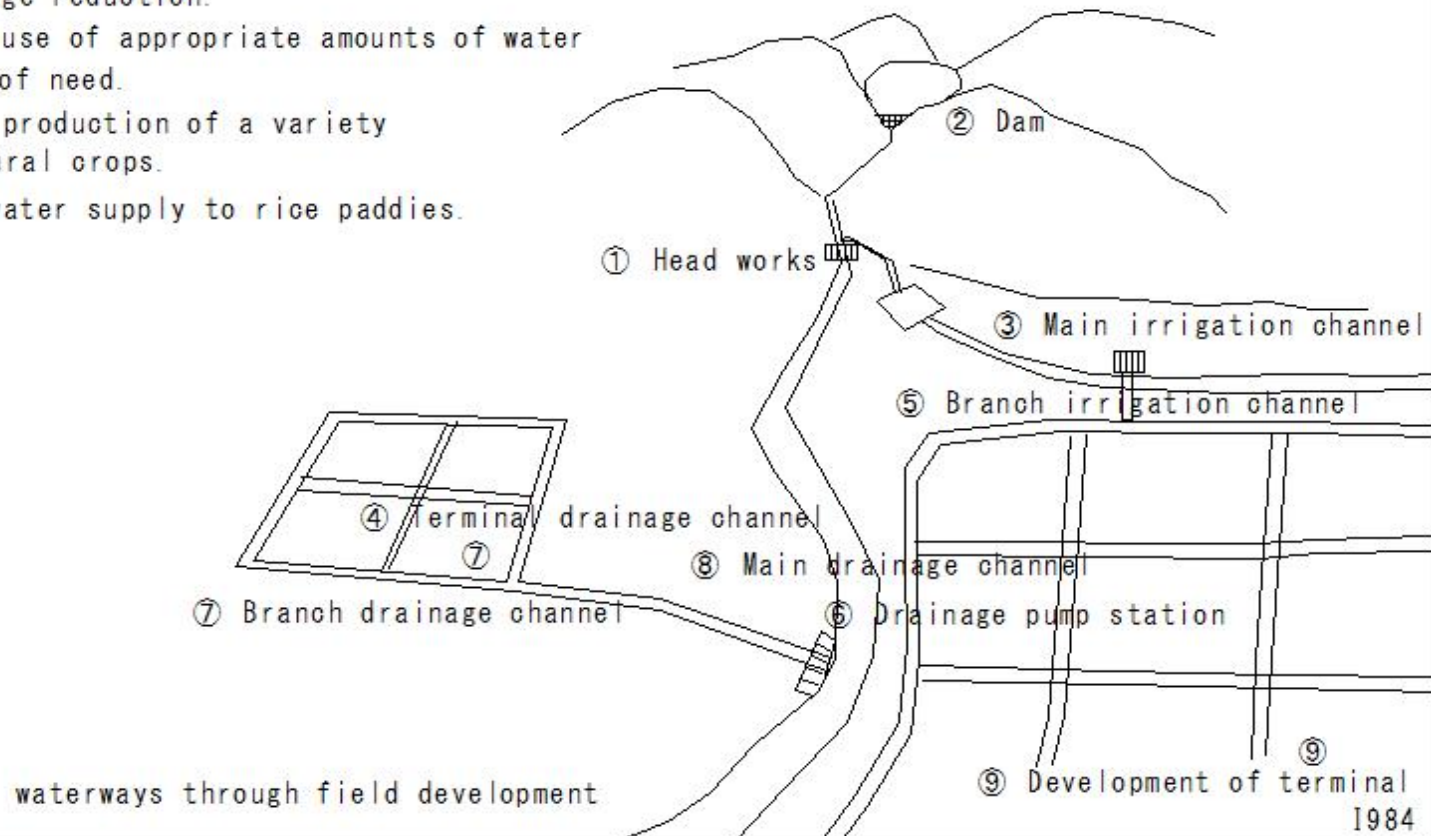


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(I1003)Agriculture and Water

Irrigation and drainage

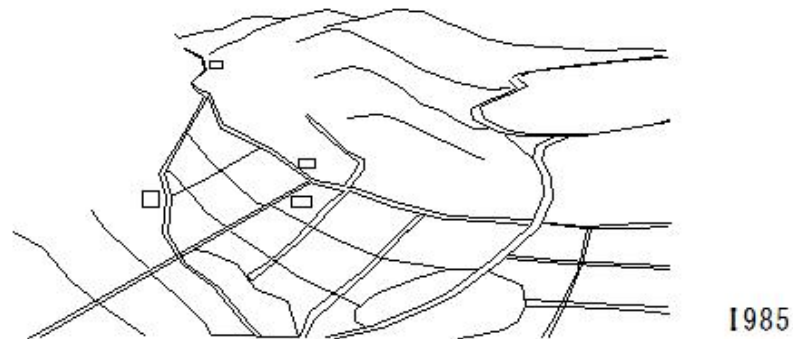
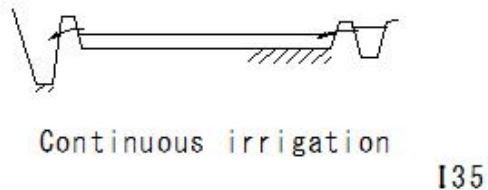
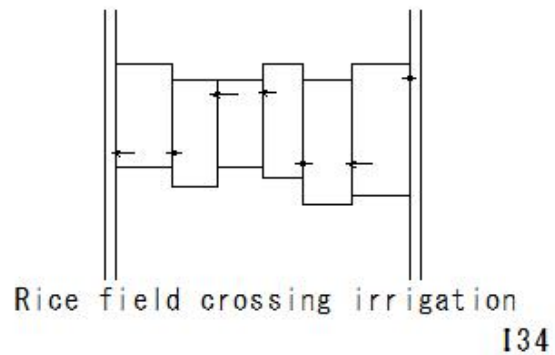
- Drought damage reduction.
- Enables the use of appropriate amounts of water at the time of need.
- Enables the production of a variety of agricultural crops.
- Stabilizes water supply to rice paddies.



(I1004)Agriculture and Water

Irrigation and drainage

- Mostly used for rice paddy irrigation
- Water is drawn from rivers and groundwater and supplied to rice paddies
- Excludes excess water from farmland
- Prevents flooding of farmland
- Improves drainage of rice paddies, making field crops possible
- Lowers groundwater levels, helping crop growth.

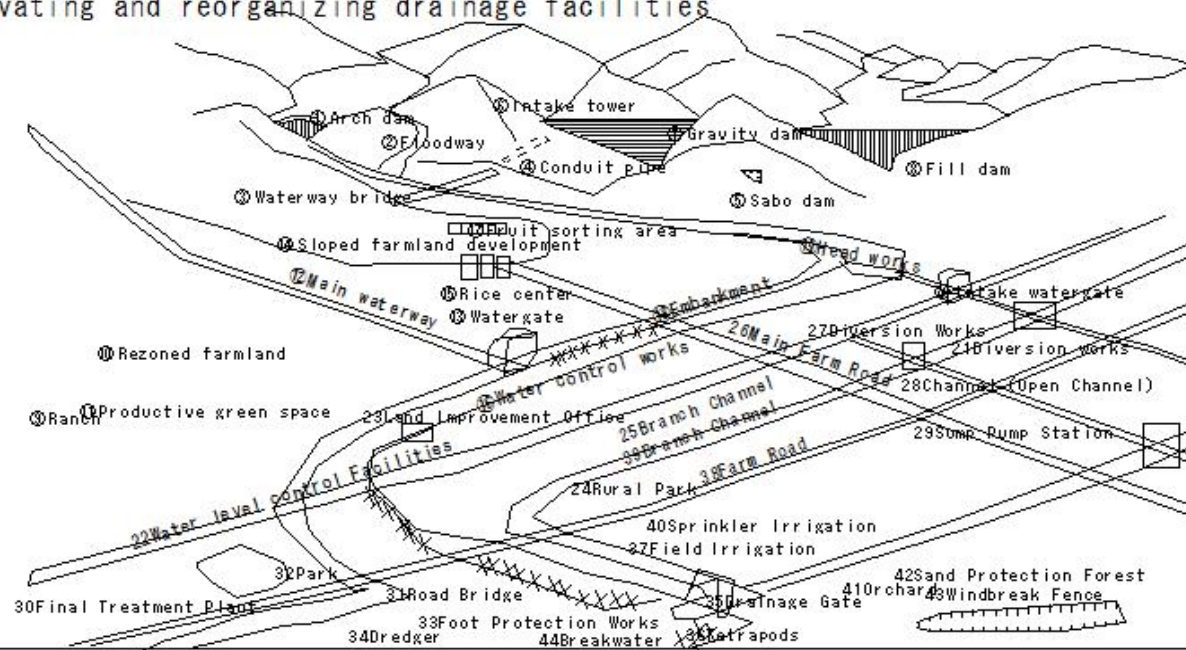


(I1005)Agriculture and Water

(I1005)Agriculture and Water

Irrigation and drainage

- Drainage channels, pumping stations, drainage culverts
- Drainage improvement
- Poor drainage in peat farmland
- Dealing with rice paddies being converted to fields
- Dealing with increased rainfall, etc.
- Renovating and reorganizing drainage facilities



1994

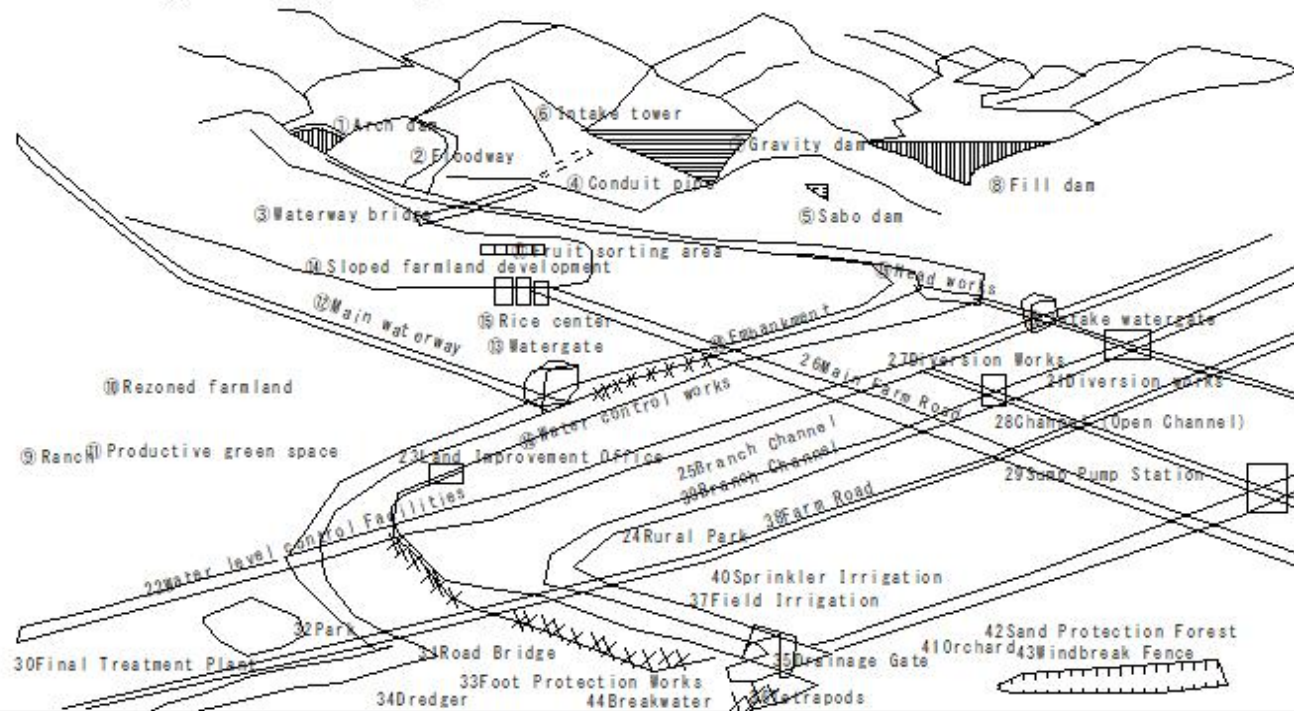
(I1006)Agriculture and Water

Irrigation and drainage

Dams, headworks, pumping stations, etc. (irrigation facilities).

Drainage pumping stations, drainage culverts, etc. (drainage facilities).

① Arch dam ⑦ Gravity dam ⑧ Fill dam ⑨ Head works ⑩ Intake watergate 29 Sump Pump Station
35 Drainage Gate ⑬ Watergate



(I1007)Agriculture and Water

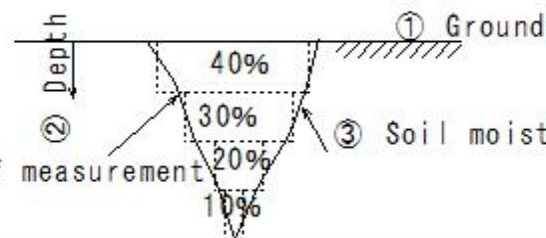
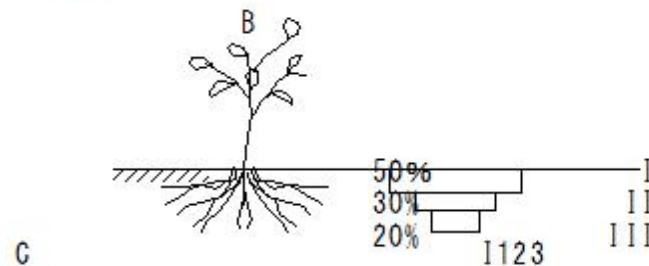
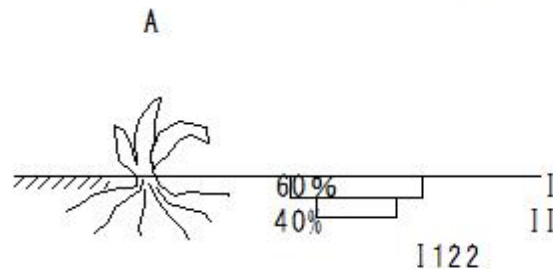
(I1007)Agriculture and Water

Soil moisture

- ① Refers to the amount of water in the soil
- ② It is an important indicator for understanding plant growth, agriculture, and soil conditions
- ③ It is expressed as water content ratio or volumetric water content
- ④ Proper management is essential for plant growth

Water consumption

- A. total of I and II layers
- B. total of I, II and III layers
- C. total of I, II, III and IV layers



④ Soil moisture at the beginning of measurement

③ Soil moisture at the end of measurement

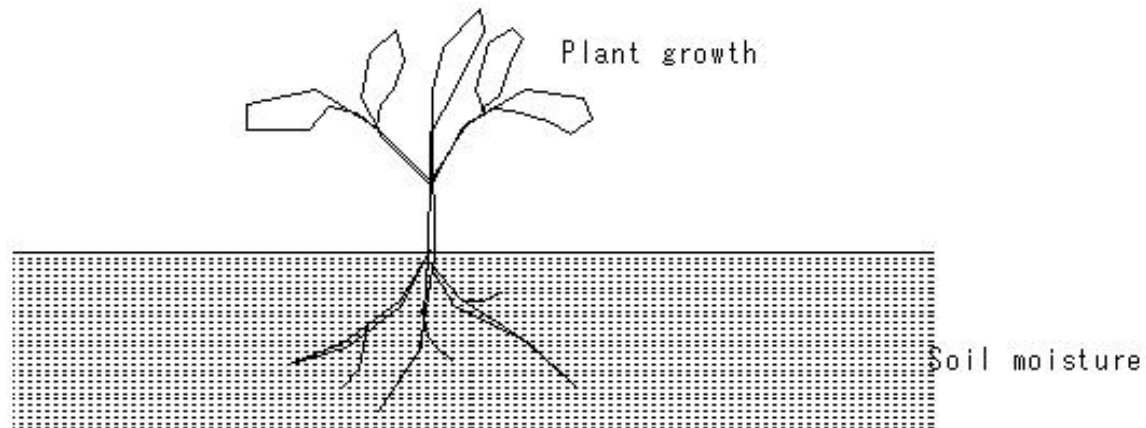
(I1008)Agriculture and Water

(I1008)Agriculture and Water

Soil moisture

Soil moisture and plant growth:

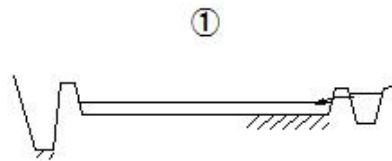
- ① Lack of soil moisture suppresses plant transpiration, inhibiting photosynthesis and fertilizer absorption.
- ② Excessive moisture can cause root rot.
- ③ It is important to manage the soil moisture without excess or deficiency.



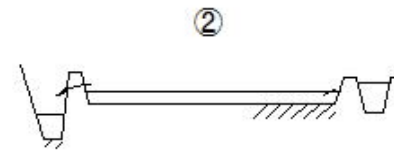
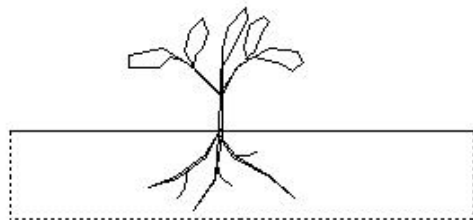
(I1009)Agriculture and Water

Soil moisture

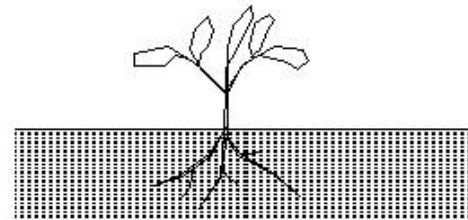
- ① In case of the soil moisture is insufficient, appropriate irrigation is required.
- ② In case of there is excess moisture, drainage should be considered.



Irrigation



Drainage

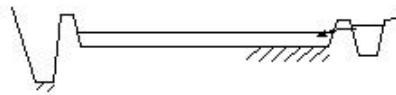


(I1010)Agriculture and Water

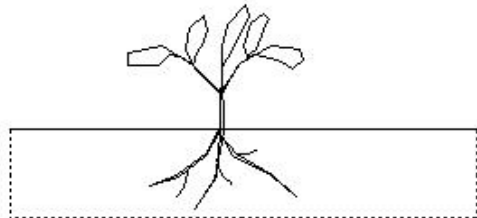
(I1010)Agriculture and Water

Soil moisture

Soil type and condition:



Irrigation

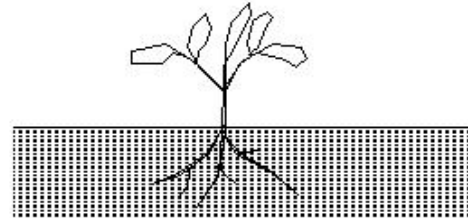


① Sandy soil tends to dry out easily.



Drainage

135



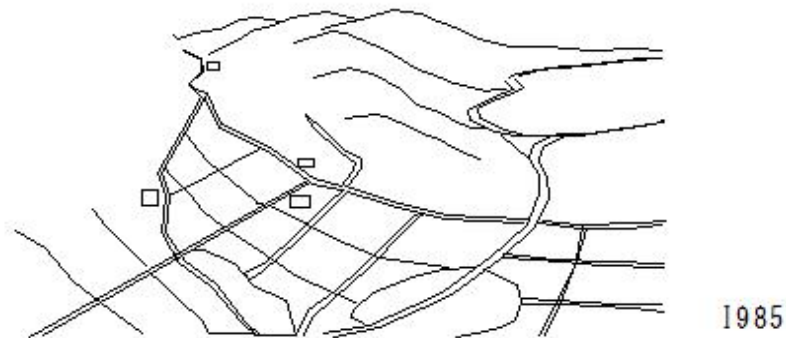
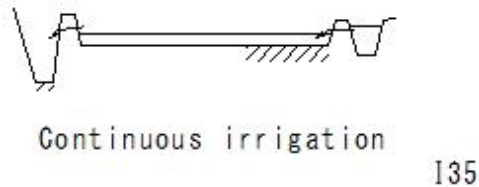
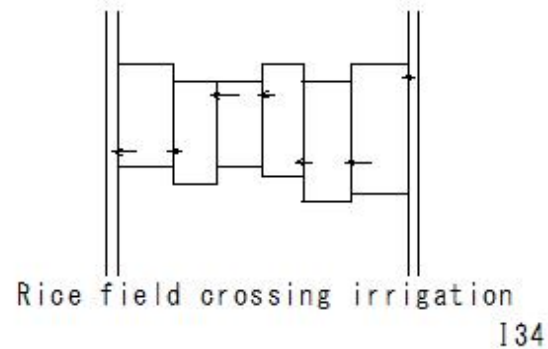
② Clay soil tends to retain moisture easily.

(I1011)Agriculture and Water

(I1011)Agriculture and Water

Paddy field irrigation water

- ① This is agricultural water that artificially supplies the water needed for rice cultivation
- ② By supplying water to paddy fields without relying on natural rainfall
- ③ It stabilizes crop growth and increases yields
- ④ Water is taken from dams and rivers and supplied to paddy fields through irrigation channels



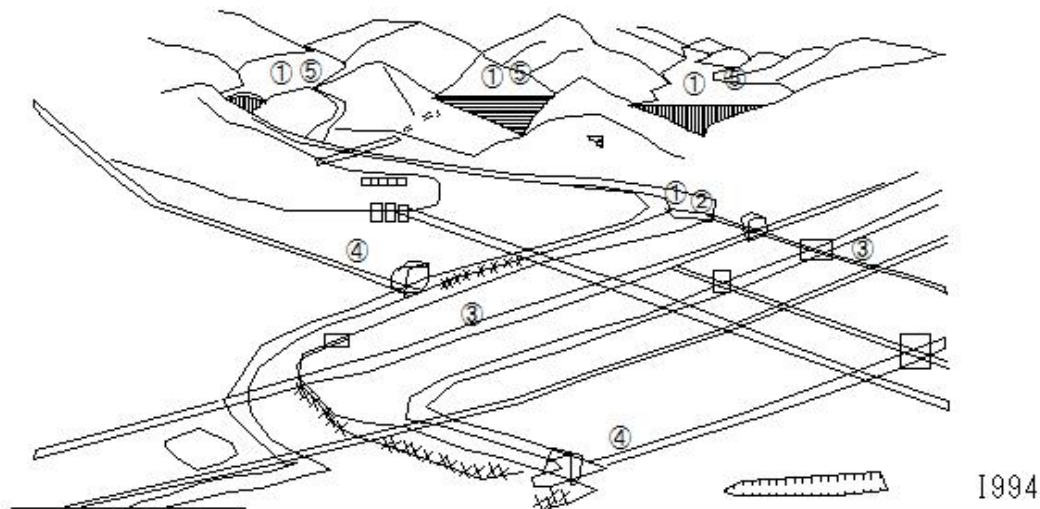
(I1012)Agriculture and Water

(I1012)Agriculture and Water

Paddy field irrigation water

How water is used for rice paddy irrigation

- ① Securing water sources: Drawing water from rivers and dams.
- ② Water intake: Using facilities such as dams and headworks, water is drawn from rivers into waterways.
- ③ Supply through irrigation channels: The secured water is transported to the rice paddies using channels and culverts.
- ④ Drainage: Drainage channels are installed to drain excess water from the rice paddies.
- ⑤ Water storage: In preparation for drought, water is stored using reservoirs and dams.

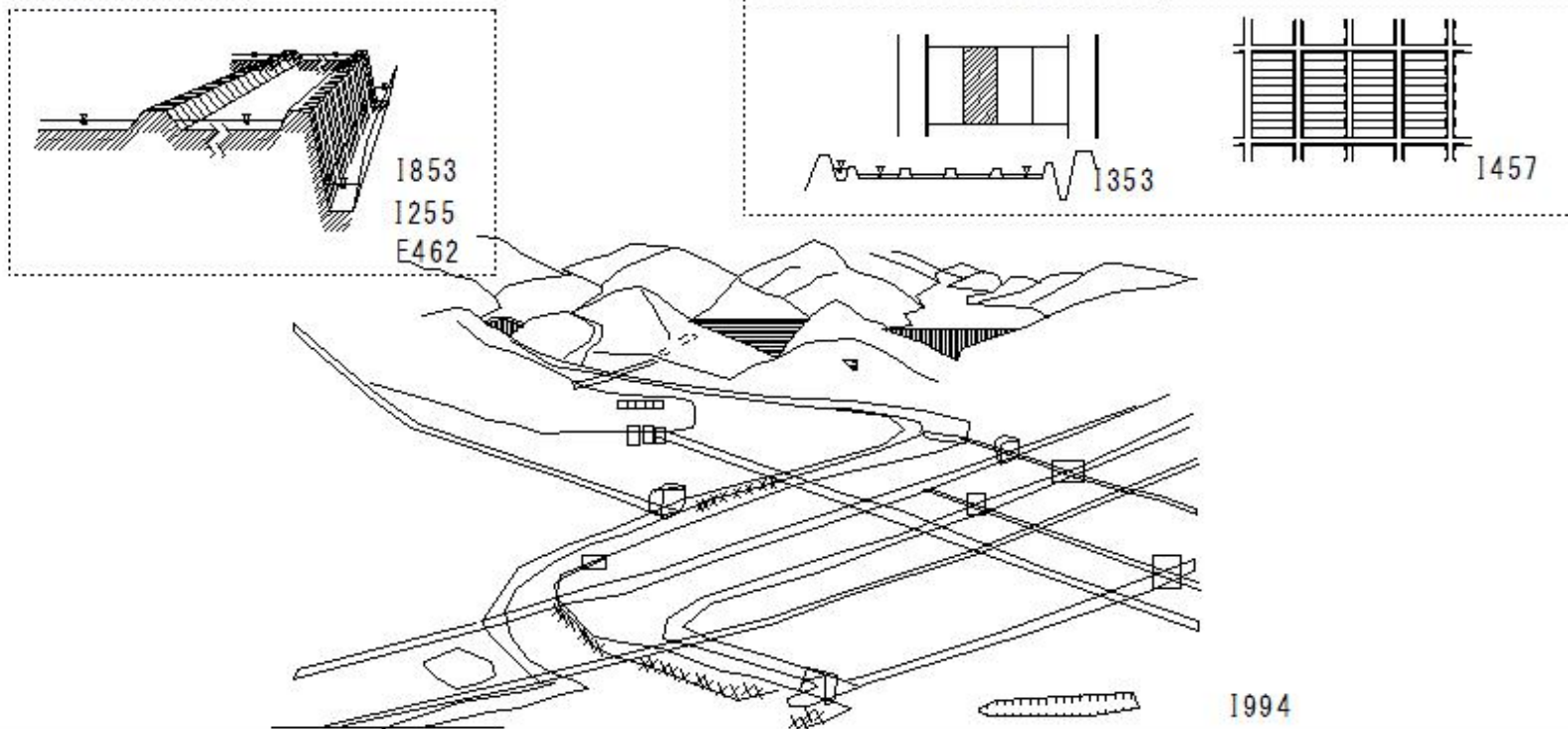


(I1013)Agriculture and Water

(I1013)Agriculture and Water

Paddy field irrigation water

Benefits of paddy field irrigation: 1. Crop growth is stabilized. 2. Yields increase.
3. Agriculture is possible in arid regions. 5. It contributes to revitalizing the local economy.
4. Agriculture is possible in areas where natural rainfall alone is not possible.

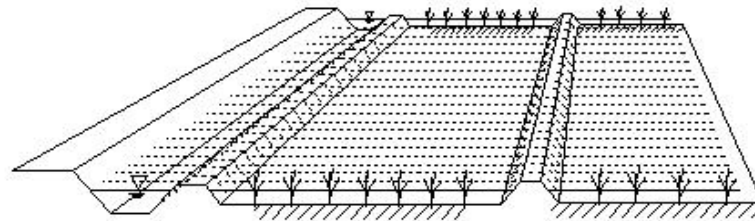


(I1014)Agriculture and Water

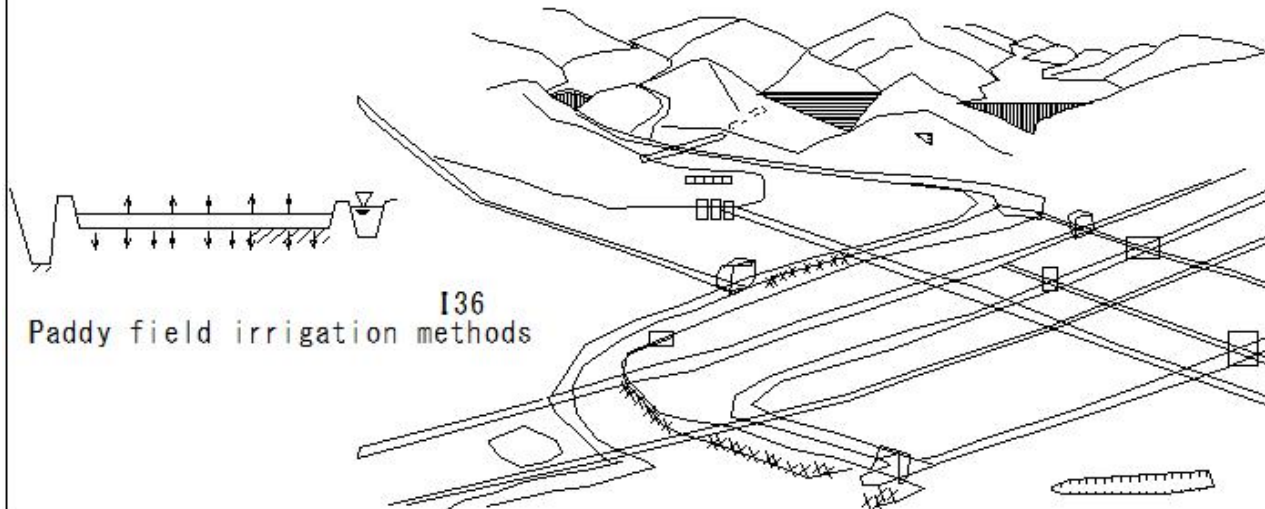
Paddy field irrigation water

Purposes of paddy field irrigation:

1. Stable rice production.
2. Increased yields.
3. Diverse utilization
(fertilization, pesticide spraying, etc.).

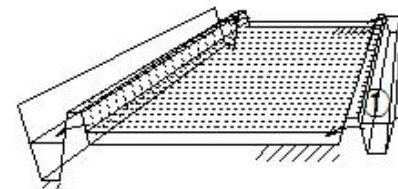


1465



Paddy field irrigation methods

136



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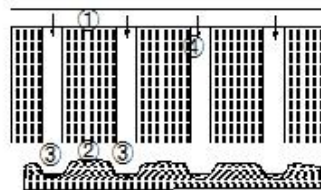
(I1015)Agriculture and Water

Field irrigation water

System that supplies water to fields for the growth of field crops.

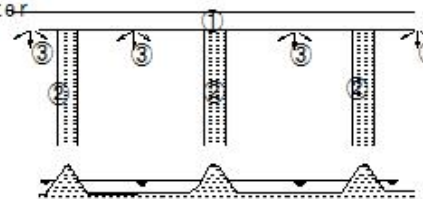
- ① Cultivation management becomes easier, making planned cultivation and shipping possible.
- ② Quality improves, making it possible to cultivate better crops.
- ③ Labor savings are achieved, shortening work time.
- ④ No longer affected by drought.
- ⑤ Multipurpose use allows for reduced use of pesticides and more diverse farming.

- ① Water supply channel
- ② Furrow
- ③ Furrow
- ④ Water



(Furrow irrigation)

- ① Water supply channel
- ② Bank
- ③ Water

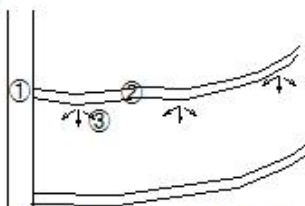


(Border method)

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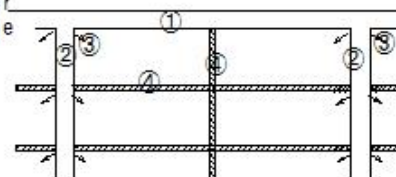
- ① Water supply channel
- ② Contour ditch
- ③ Water



(Contour ditch method)

1177

- ① Main channel
- ② Branch channel
- ③ Water
- ④ Ridge



(Division method/Basin method)

1178

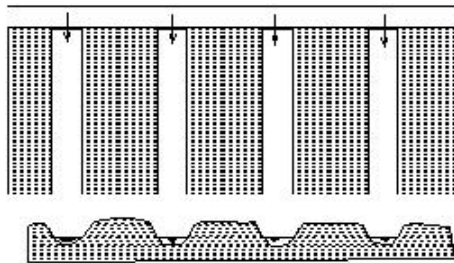
1833

(I1016)Agriculture and Water

Field irrigation water

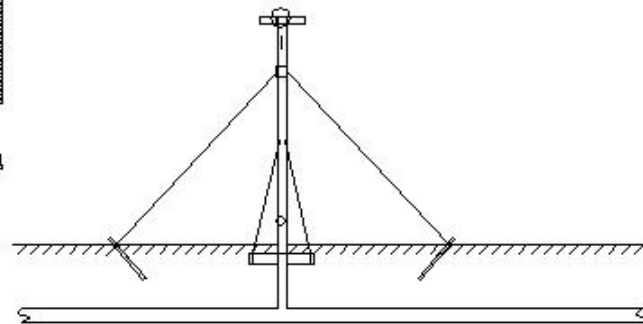
Watering methods:

- ① Sprinkler: Uses water pressure to spray water in the form of rainfall
- ② Reel machine: Consists of a large reel for winding up the hose and a cart with a sprinkler attached
- ③ Fully automatic watering facility: It is attracting attention as a labor-saving machine because it can be operated unmanned



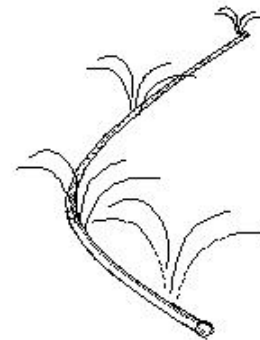
Furrow irrigation

I175



Sprinkler

I160



Perforated pipe:

I832

I479

(I1017) Field irrigation

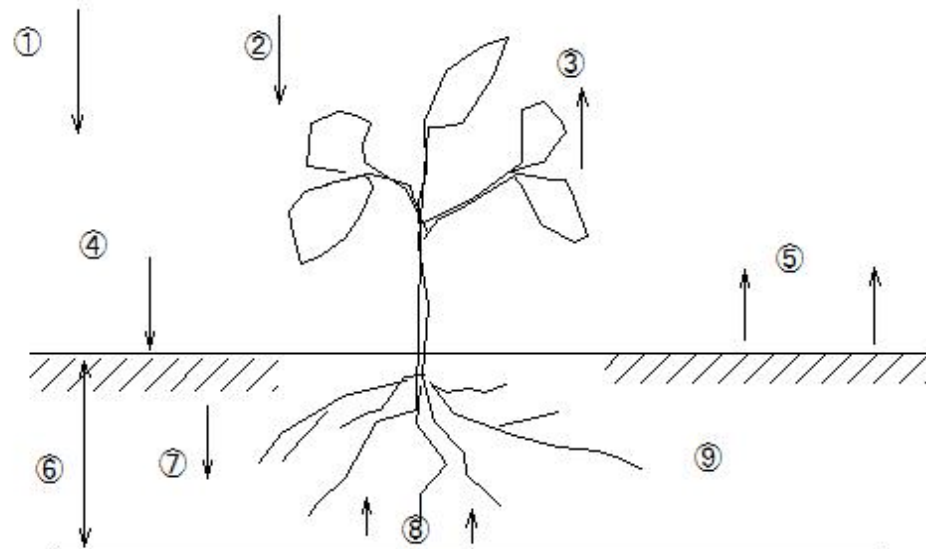
(I1017) Field irrigation

Water consumption in fields

- the sum of the amount of transpiration from plants and the amount of evaporation from the soil
- the amount of water required for crops to grow

Water consumption in fields

- ① Irrigation
- ② Rainfall
- ③ Transpiration
- ④ Soil surface
- ⑤ Evaporation
- ⑥ Effective soil layer
- ⑦ Infiltration
- ⑧ Capillary water
- ⑨ Root zone



Water consumption in fields

1828

(I1018) Field irrigation

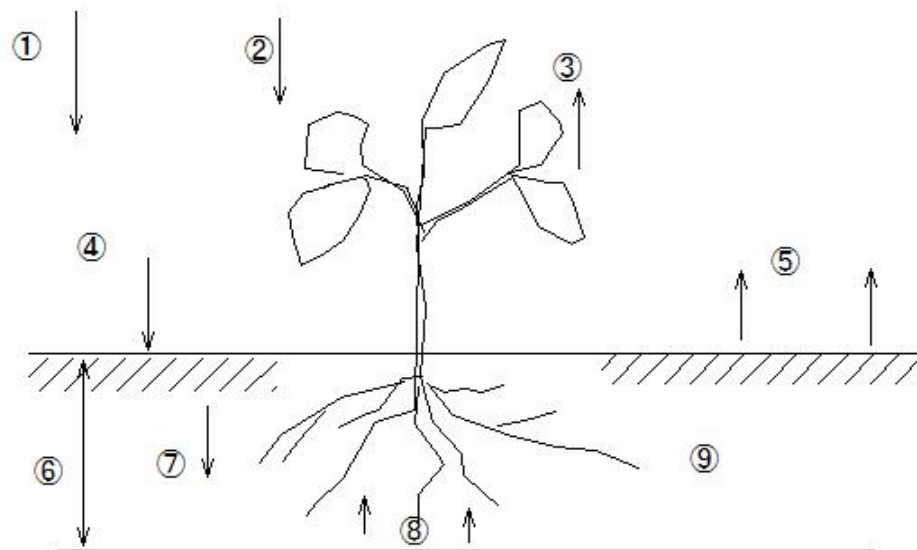
(I1018) Field irrigation

○ Components of water consumption in fields:

- ③ Transpiration: The amount of water vapor emitted from plant leaves.
- ⑤ Evaporation: The amount of water that evaporates from the soil surface.
- ⑥ Water consumption in the effective soil layer: The amount of water that plants can absorb from the soil.

Water consumption in fields

- ① Irrigation
- ② Rainfall
- ③ Transpiration
- ④ Soil surface
- ⑤ Evaporation
- ⑥ Effective soil layer
- ⑦ Infiltration
- ⑧ Capillary water
- ⑨ Root zone



Water consumption in fields

(I1019) Field Irrigation

Field water consumption and related terms:

⑤ Evapotranspiration: The sum of transpiration and evaporation.

• Soil moisture consumption pattern (SMEP): Represents the situation in which soil moisture changes.

⑥ Effective soil layer: The layer of soil in which plant roots can absorb moisture.

• pF value: An index of soil moisture that affects crop water absorption.

• 24-hour field water capacity: The amount of moisture retained in the soil after sufficient irrigation.

• Daily water consumption: The amount of moisture consumed by plants in a day.

Water consumption in fields

① Irrigation

② Rainfall

③ Transpiration

④ Soil surface

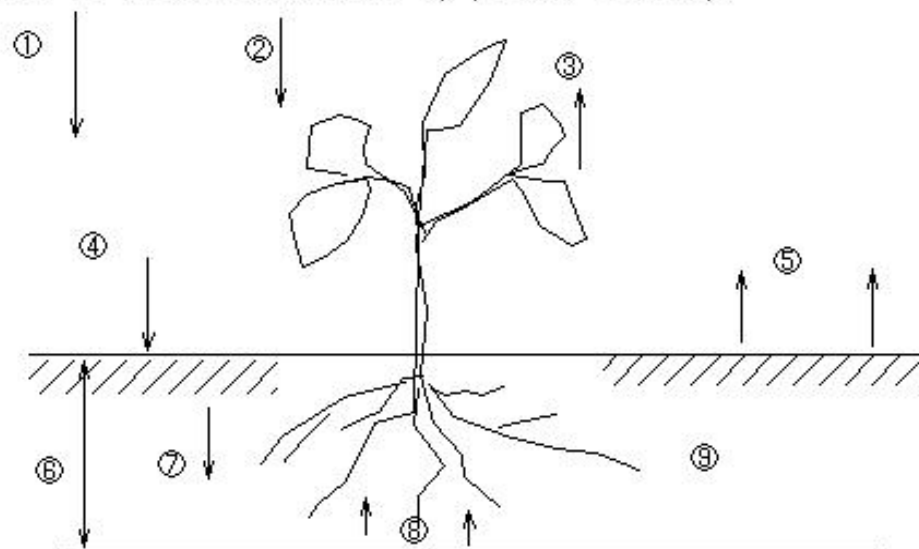
⑤ Evaporation

⑥ Effective soil layer

⑦ Infiltration

⑧ Capillary water

⑨ Root zone



Water consumption in fields

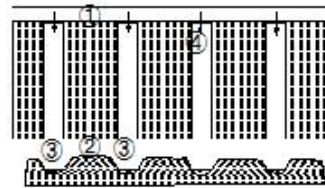
(I1020) Field irrigation

(I1020) Field irrigation

○ Methods for measuring water consumption in fields:

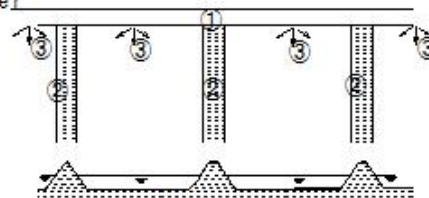
- ① Soil moisture loss method: Measure the amount of moisture loss in the soil and estimate evapotranspiration.
- ② Stem heat balance method: Measure the heat balance of the plant stem and estimate transpiration.
- ③ Bulk heat balance method: Measure the heat balance of the soil surface and estimate evapotranspiration.

- ① Water supply channel
- ② Furrow
- ③ Furrow
- ④ Water



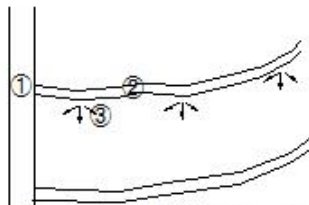
(Furrow irrigation)

- ① Water supply channel
- ② Bank
- ③ Water



(Border method)

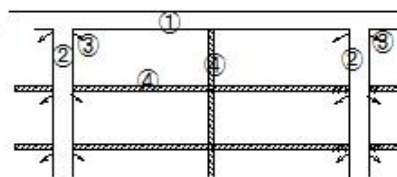
- ① Water supply channel
- ② Contour ditch
- ③ Water



(Contour ditch method)

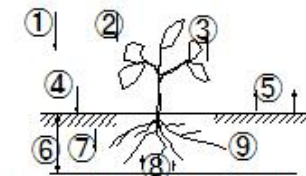
1175

- ① Main channel
- ② Branch channel
- ③ Water
- ④ Ridge



(Division method/Basin method)

1177



Water consumption in fields

- ① Irrigation
- ② Rainfall
- ③ Transpiration
- ④ Soil surface
- ⑤ Evaporation
- ⑥ Effective soil layer
- ⑦ Infiltration
- ⑧ Capillary water
- ⑨ Root zone

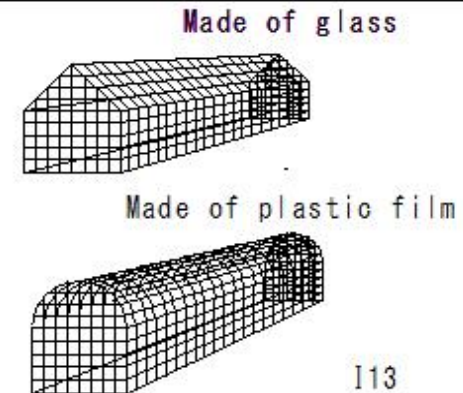
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(I1021) Field irrigation

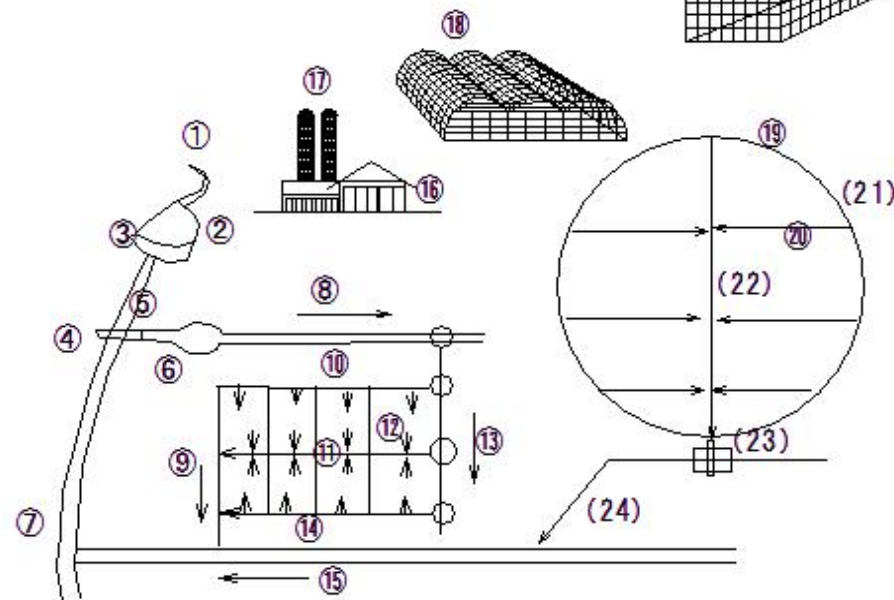
Water for greenhouses

- ① Water used for growing crops in greenhouses and vinyl greenhouses
- ② Water supply necessary for irrigation and crop growth
- ③ Adjusting temperature and humidity inside the greenhouse



I13

- ① Upstream of river
- ② Reservoir
- ③ Dam
- ④ Weir
- ⑤ Intake
- ⑥ Sand trap
- ⑦ River
- ⑧ Main irrigation channel
- ⑨ Branch drainage channel
- ⑩ Small irrigation channel
- ⑪ Small drainage channel
- ⑫ Rice field
- ⑬ Branch irrigation channel
- ⑭ Small irrigation channel
- ⑮ Main drainage channel
- ⑯ Animal barn
- ⑰ Silo
- ⑱ House
- ⑲ Surface drainage of fields
- ⑳ Conveyor channel
- (21) Field
- (22) Collecting channel
- (23) Sand dam
- (24) Branch drainage channel



Layout of farmland and various facilities

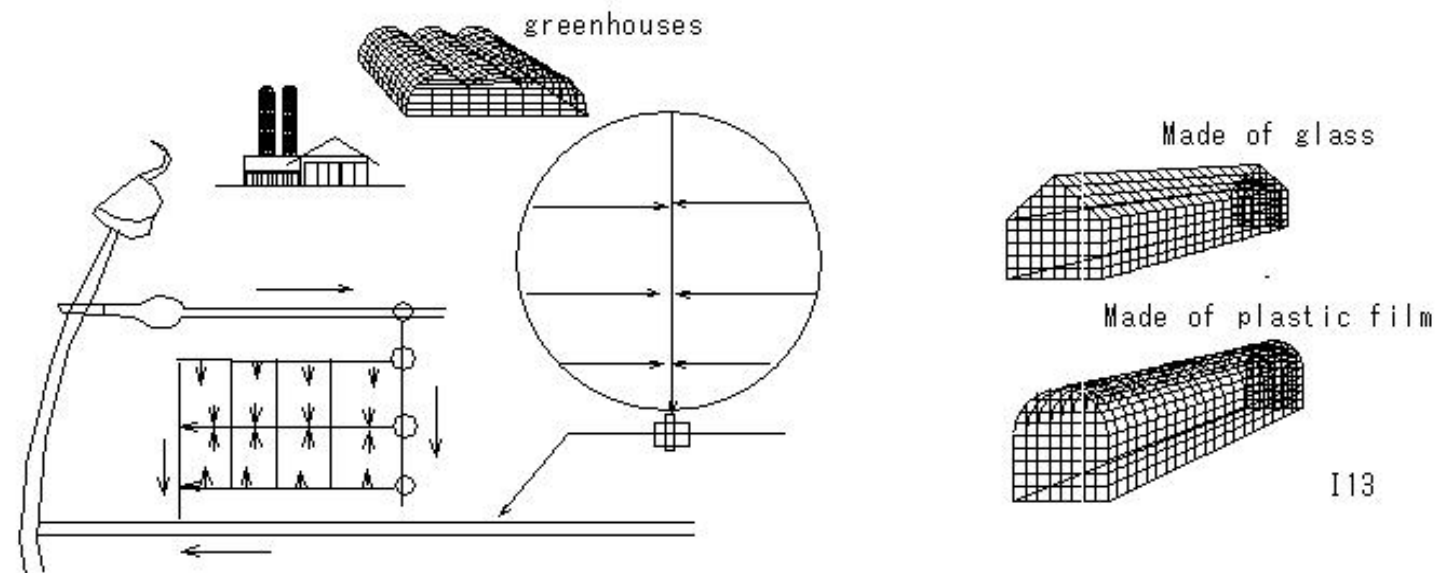
1413

(I1022) Field irrigation

(I1022) Field irrigation

Water for greenhouses

- ① It is used to supply moisture to crop roots and promote growth.
- ② Water is used to lower the temperature and control humidity inside the greenhouse.
- ③ Water is used to wash the crops and facilities to keep them clean.
- ④ Greenhouse water is treated as a type of agricultural water,
and it is important to manage its utilization efficiency and water quality.



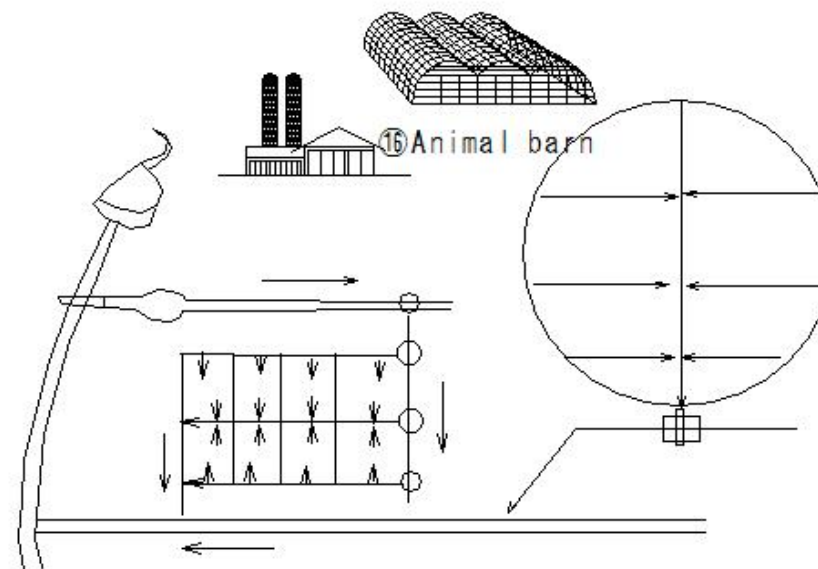
Layout of farmland and various facilities

(I1023) Field irrigation

(I1023) Field irrigation

Livestock water

1. Water necessary for raising livestock such as cows, pigs, and chickens
2. Drinking water for livestock, cleaning the breeding environment, and treating waste
3. Classified as "agricultural water" together with water for irrigating rice paddies and farmland



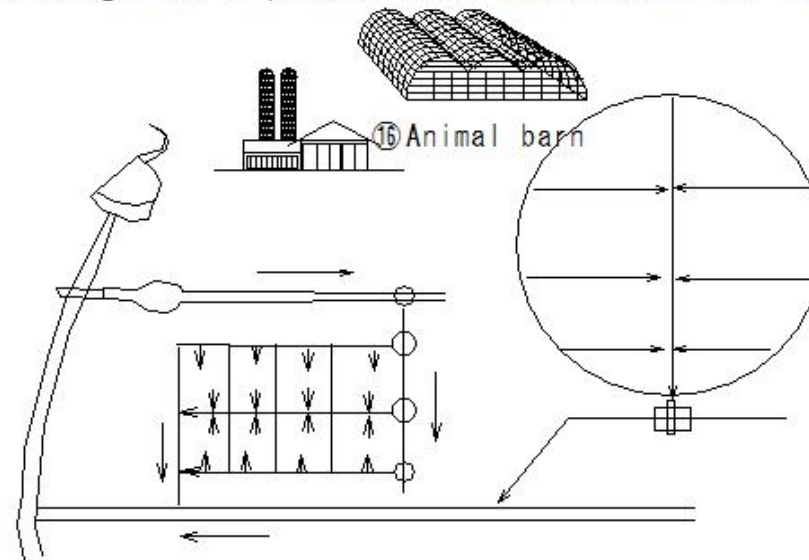
Layout of farmland and various facilities

(I1024) Field irrigation

(I1024) Field irrigation

Livestock water

- ④ Drinking water for livestock, cleaning the breeding environment, treating waste, washing animals, etc.
- ⑤ Treated as a type of agricultural water.
- ⑥ About 29% of the world's freshwater is consumed by livestock
- ⑦ Livestock consumes a lot of water, so it has a large impact on the environment
- ⑧ Various efforts are being made to promote water conservation for livestock water



Layout of farmland and various facilities

(I1025) Field irrigation

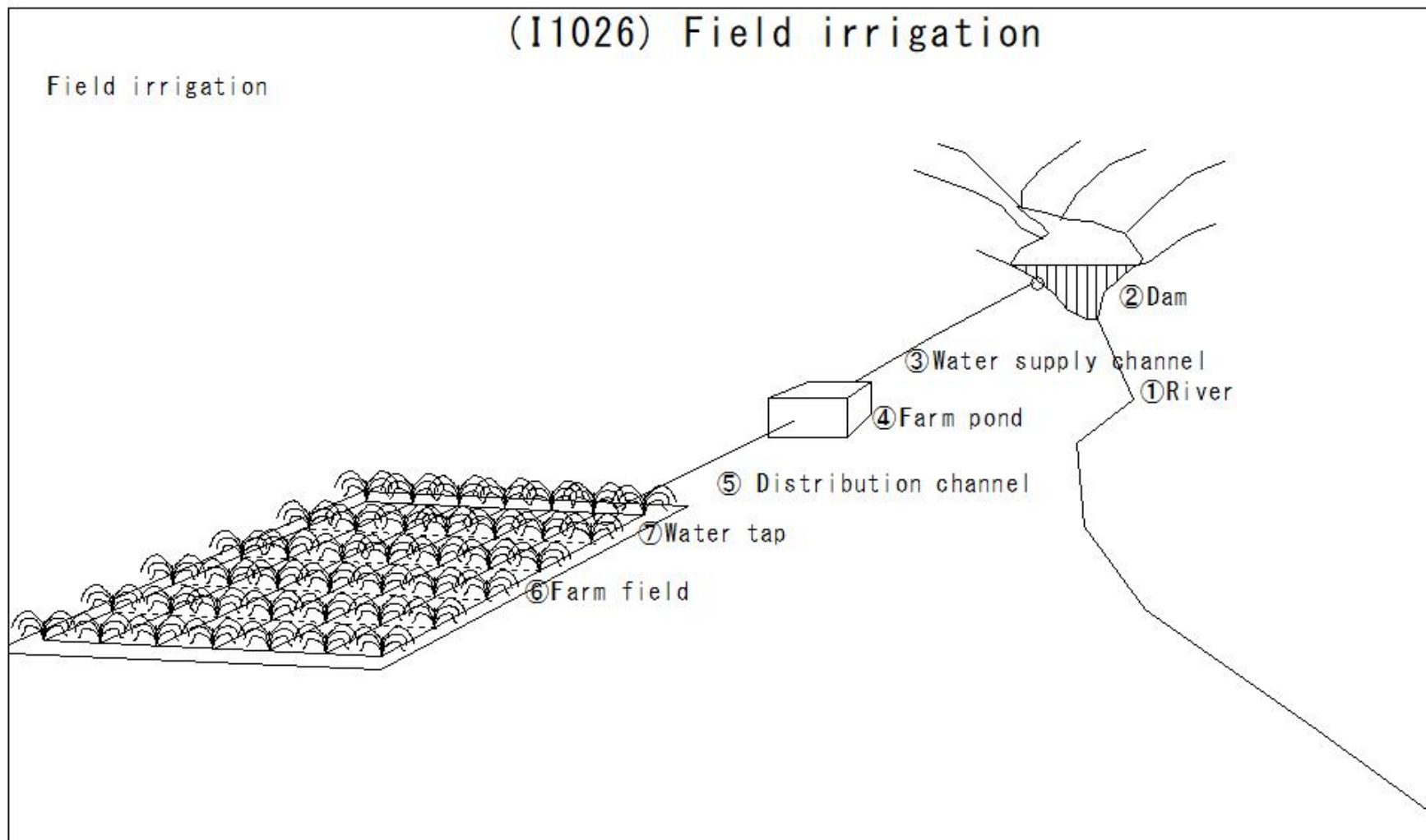
(I1025) Field irrigation

1 atmosphere = 1000 cm equivalent $\log_{10} 3 = 3$ (pF)

⑮ TAM: Total Available Moisture ⑯ TRAM: Total Readily Available Moisture	① Soil moisture form	② Appearance	③ pF value	④ Soil moisture constant
	⑤ Hygroscopic water	⑧ Dry		
			4.2	⑪ Permanent wilting point
			3.8	⑫ Initial wilting point
	⑥ Capillary water	⑨ Wet	3.0	⑬ Growth inhibition moisture point
			1.5	⑭ Field water capacity
	⑦ Gravitational water	⑩ Moisture		

③ pF value: An index for measuring soil moisture, which affects crop moisture absorption
Relationship between soil moisture and pF

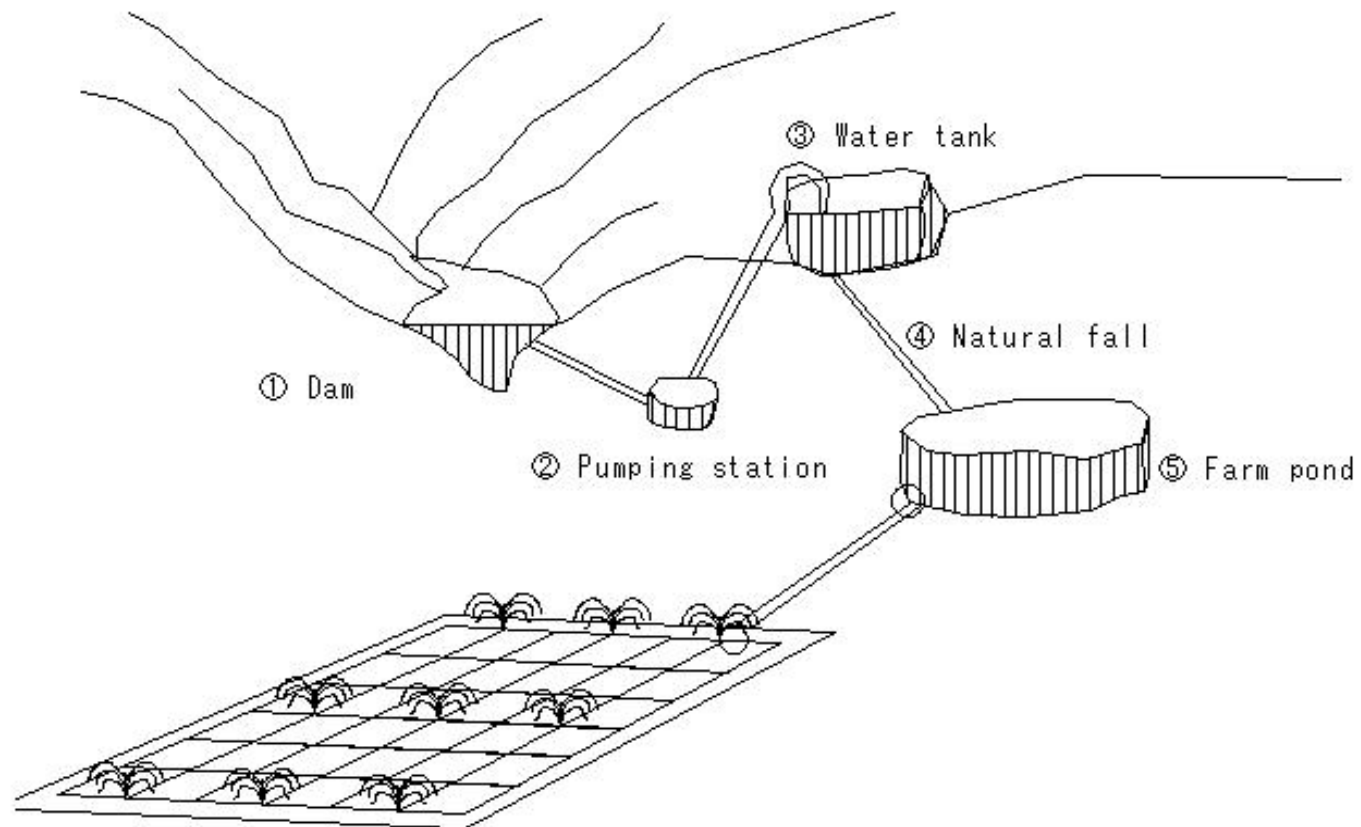
(I1026) Field irrigation



(I1027) Field irrigation

(I1027) Field irrigation

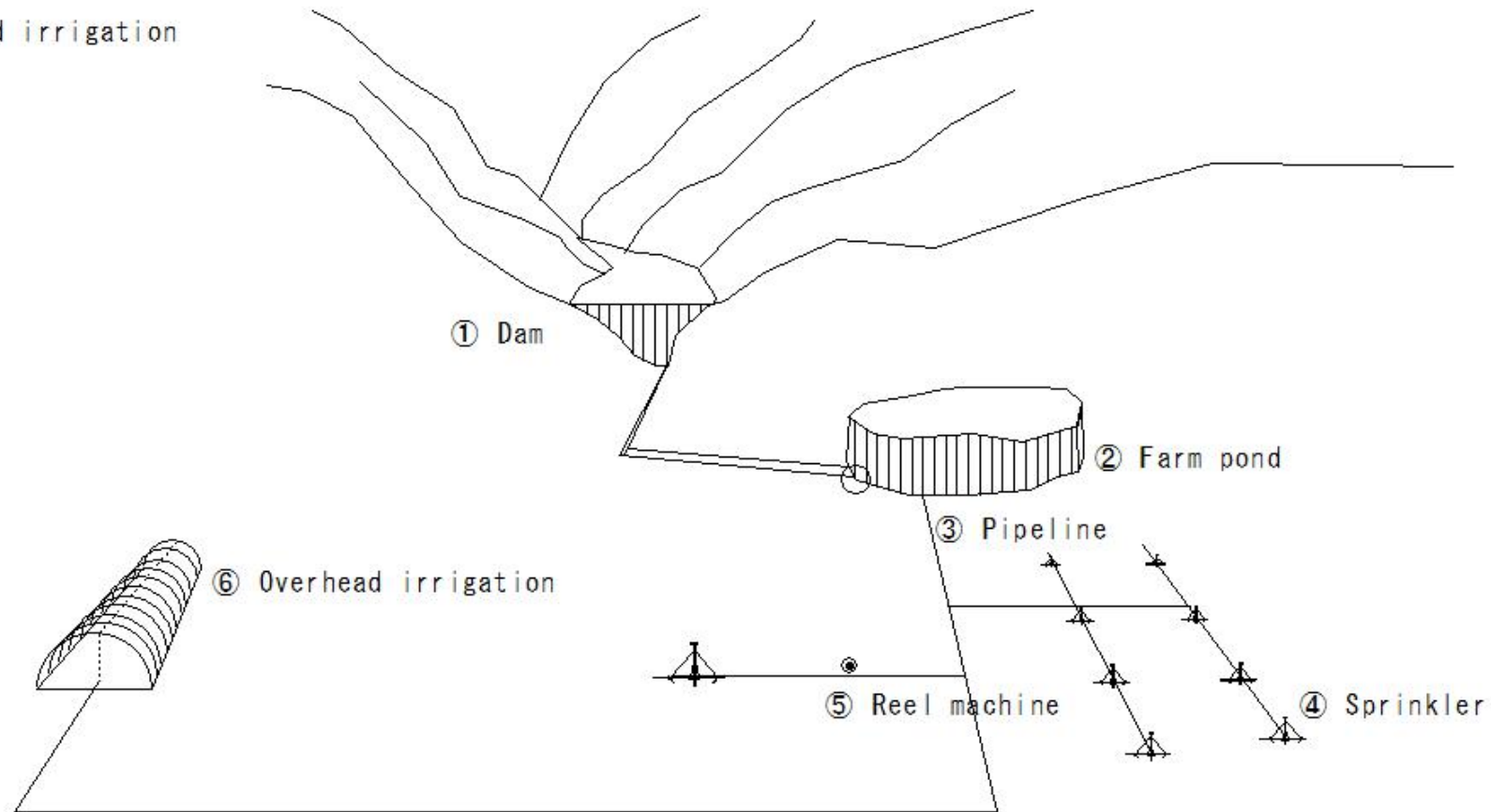
Field irrigation



(I1028) Field irrigation

(I1028) Field irrigation

Field irrigation



(I1029) Field irrigation

(I1029) Field irrigation

Field irrigation

- ② Small hydroelectric power generation
- ③ Field irrigation facilities
- ④ Pumping station
- ⑤ Head works
- ⑥ Irrigation canals
- ⑦ Culvert drainage
- ⑧ Drainage gate
- ⑨ Drainage pumping station
- ⑩ Drainage canals

○ Field irrigation facilities

Drought damage prevention

Quality improvement

Reduction in farm labor

○ Water supply improvement

Water supply stabilization

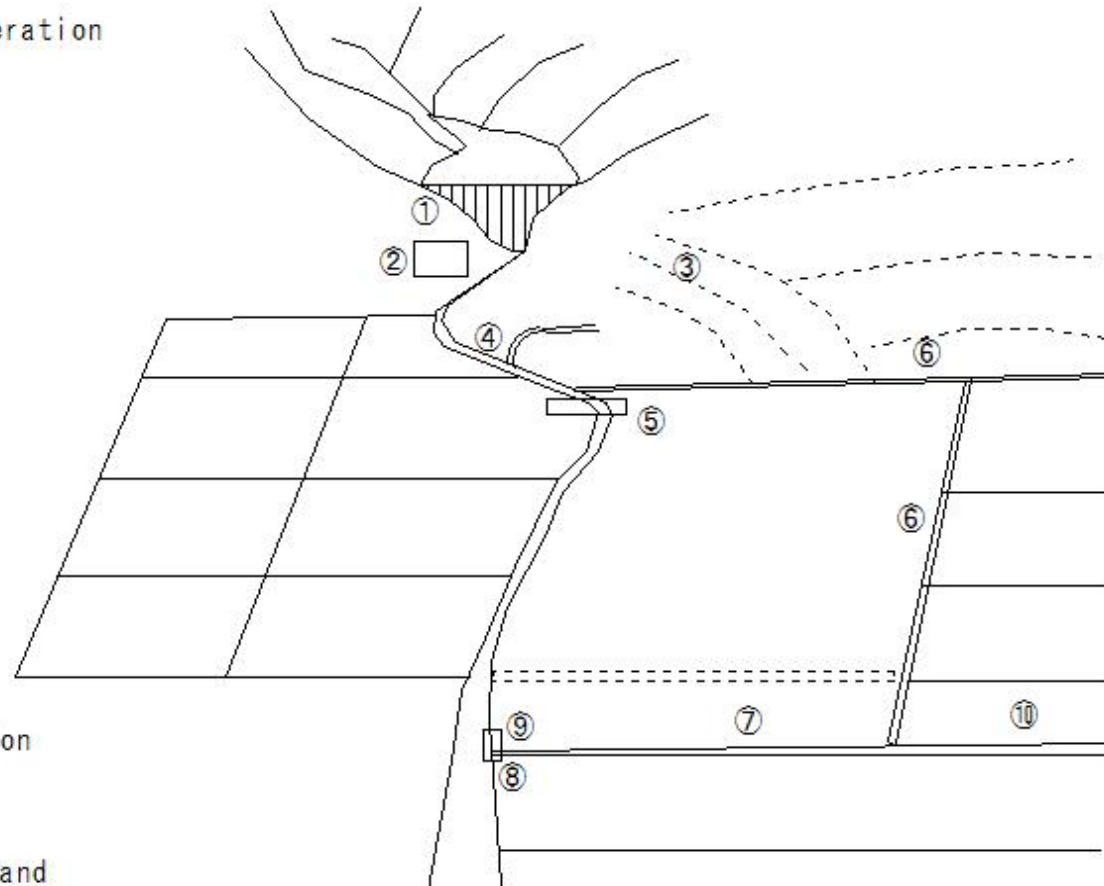
Drought damage prevention

Water management rationalization

○ Drainage improvement

Flooding damage prevention

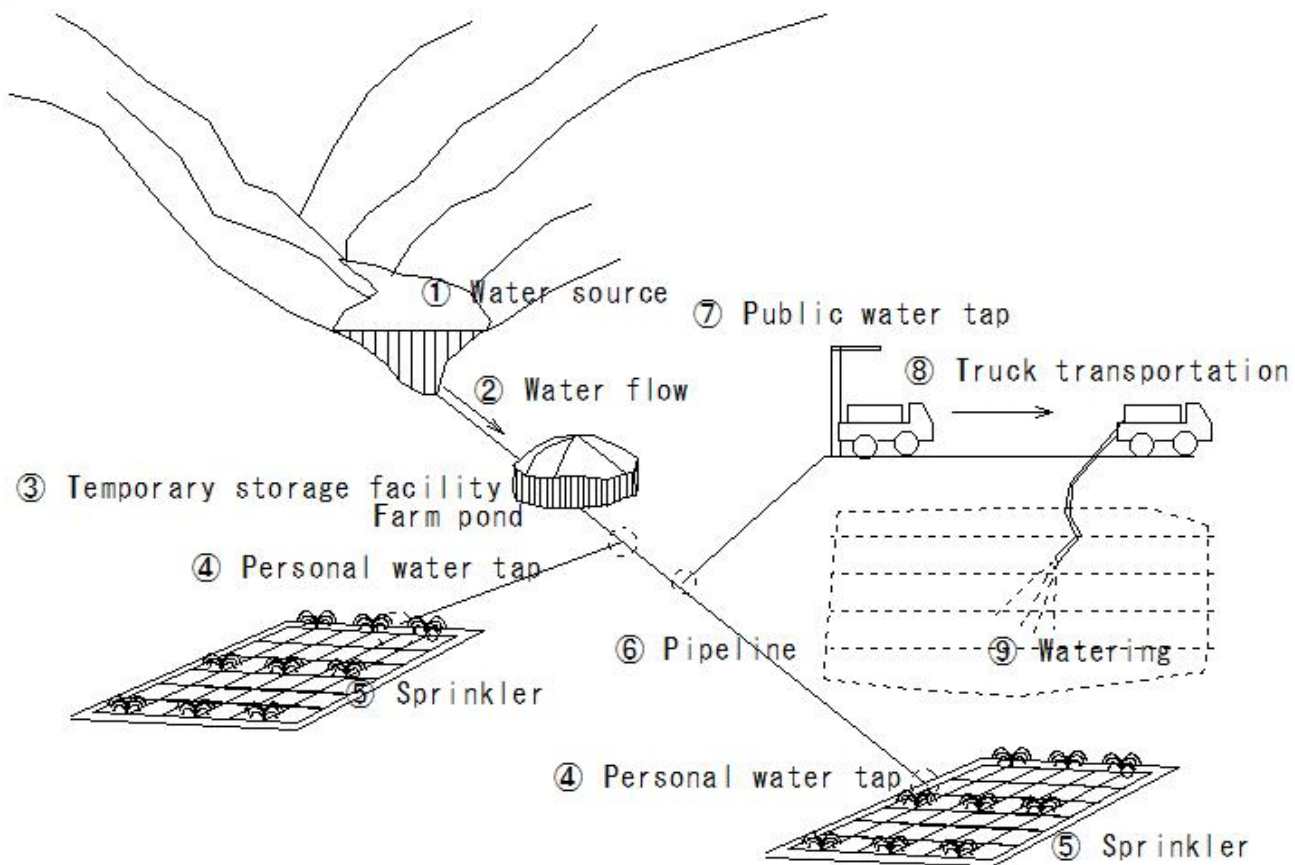
Generalization of cultivated land



(I1030) Field irrigation

(I1030) Field irrigation

Field irrigation

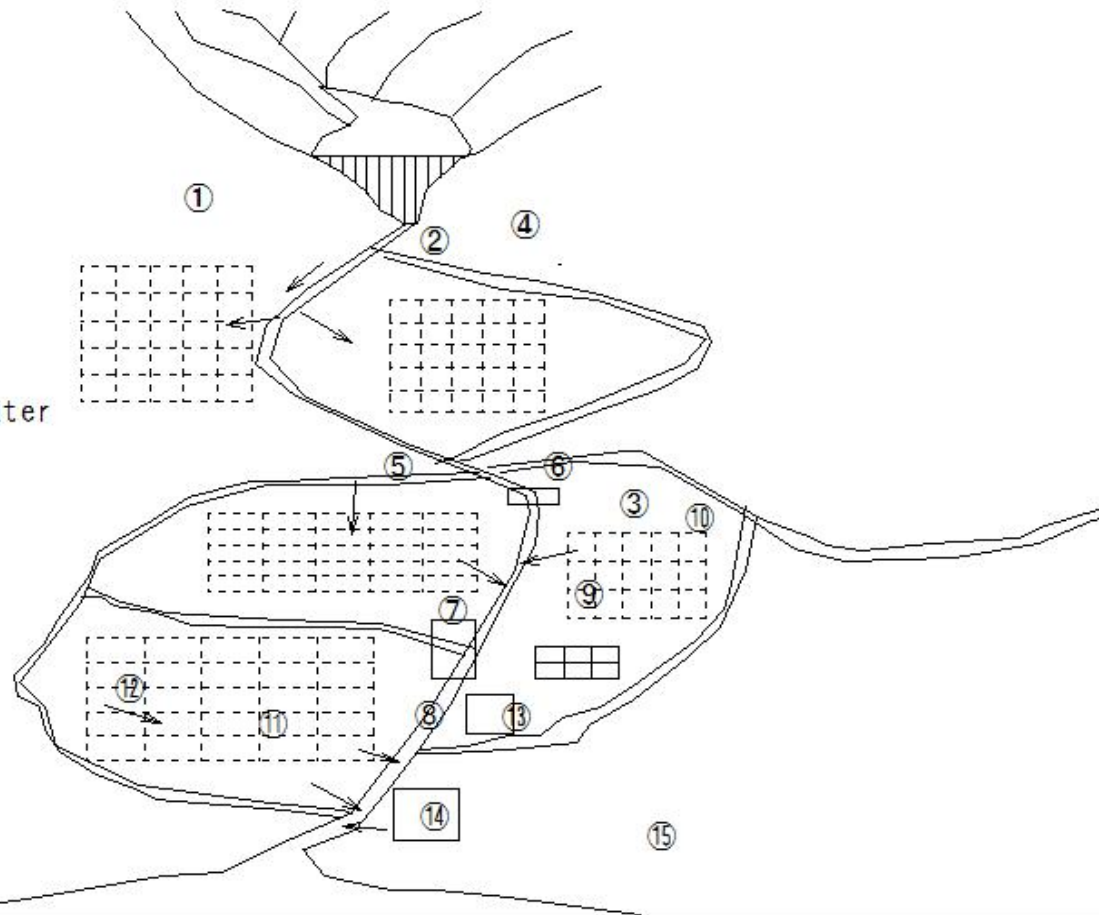


(I1031) Field irrigation

(I1031) Field irrigation

Field irrigation

- ① Grassland
- ② Water intake
- ③ Reservoir
- ④ Field
- ⑤ Water intake
- ⑥ Head works
- ⑦ Pumping station
- ⑧ River
- ⑨ Repeated use: Reuse of wastewater
- ⑩ Groundwater recharge
- ⑪ Repeated use
- ⑫ Return
- ⑬ Water purification plant
- ⑭ Sewage treatment plant
- ⑮ Groundwater use



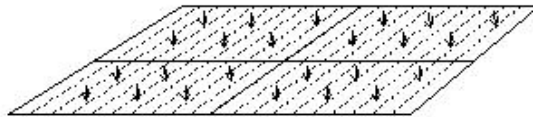
(I1032) Field irrigation

(I1032) Field irrigation

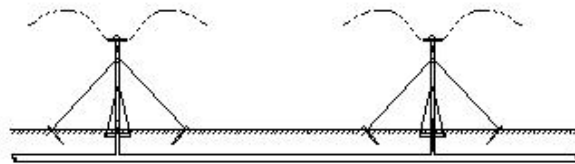
Field irrigation

① Surface irrigation

Irrigating the ground surface by running water or flooding using gravity

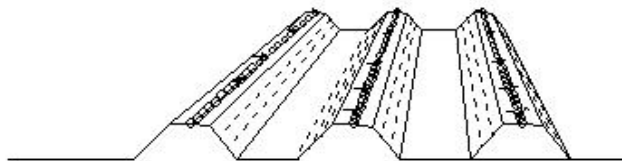


② Sprinkler irrigation



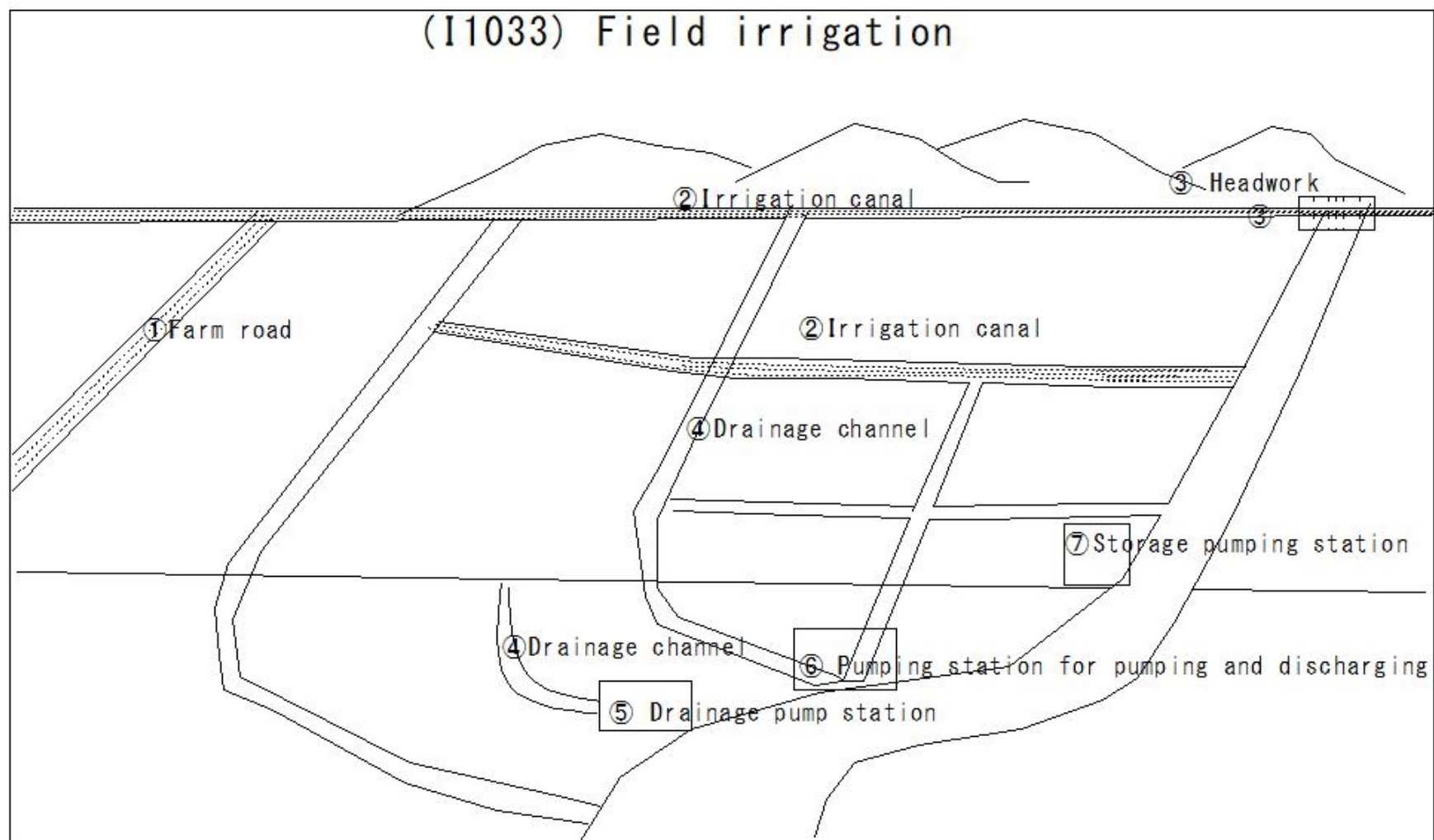
③ Drop irrigation

Irrigation in which water is dripped from pipes stretched throughout the field



I160

(I1033) Field irrigation

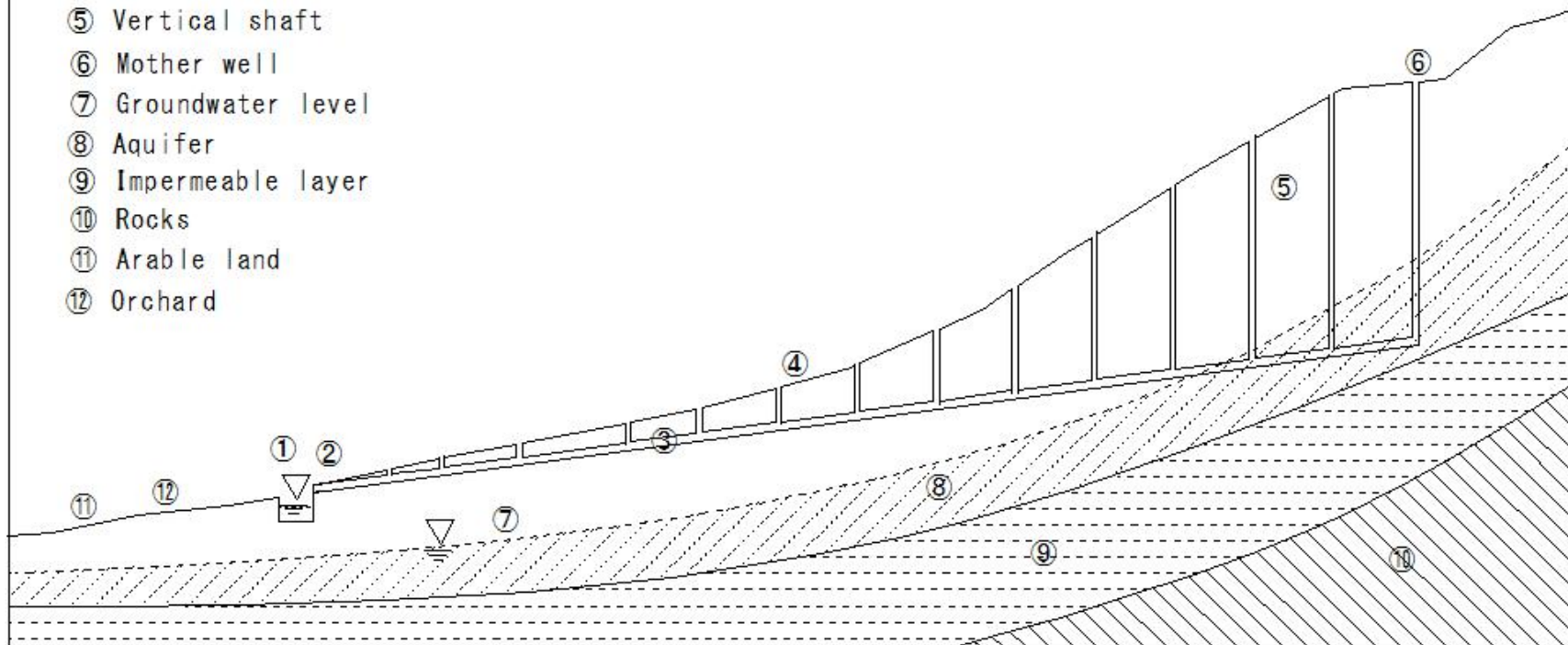


(I1034) Field irrigation

(I1034) Field irrigation

Field irrigation

- ① Foggara canal
- ② Foggara outlet
- ③ Culvert (underground waterway)
- ④ Fan
- ⑤ Vertical shaft
- ⑥ Mother well
- ⑦ Groundwater level
- ⑧ Aquifer
- ⑨ Impermeable layer
- ⑩ Rocks
- ⑪ Arable land
- ⑫ Orchard



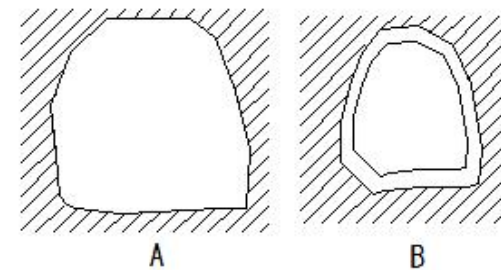
(I1035) Field irrigation

(I1035) Field irrigation

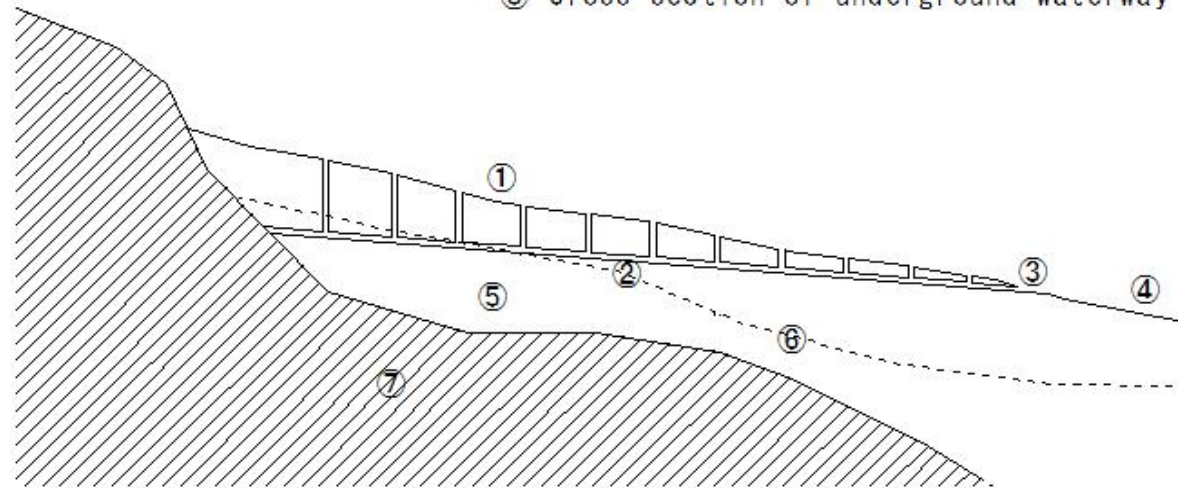
Qanat

Underground waterways in the arid regions of Iran

- ① Vertical well
- ② Underground waterway
- ③ Opening
- ④ Settlement
- ⑤ Alluvial deposits
- ⑥ Groundwater level
- ⑦ Bedrock



⑧ Cross section of underground waterway

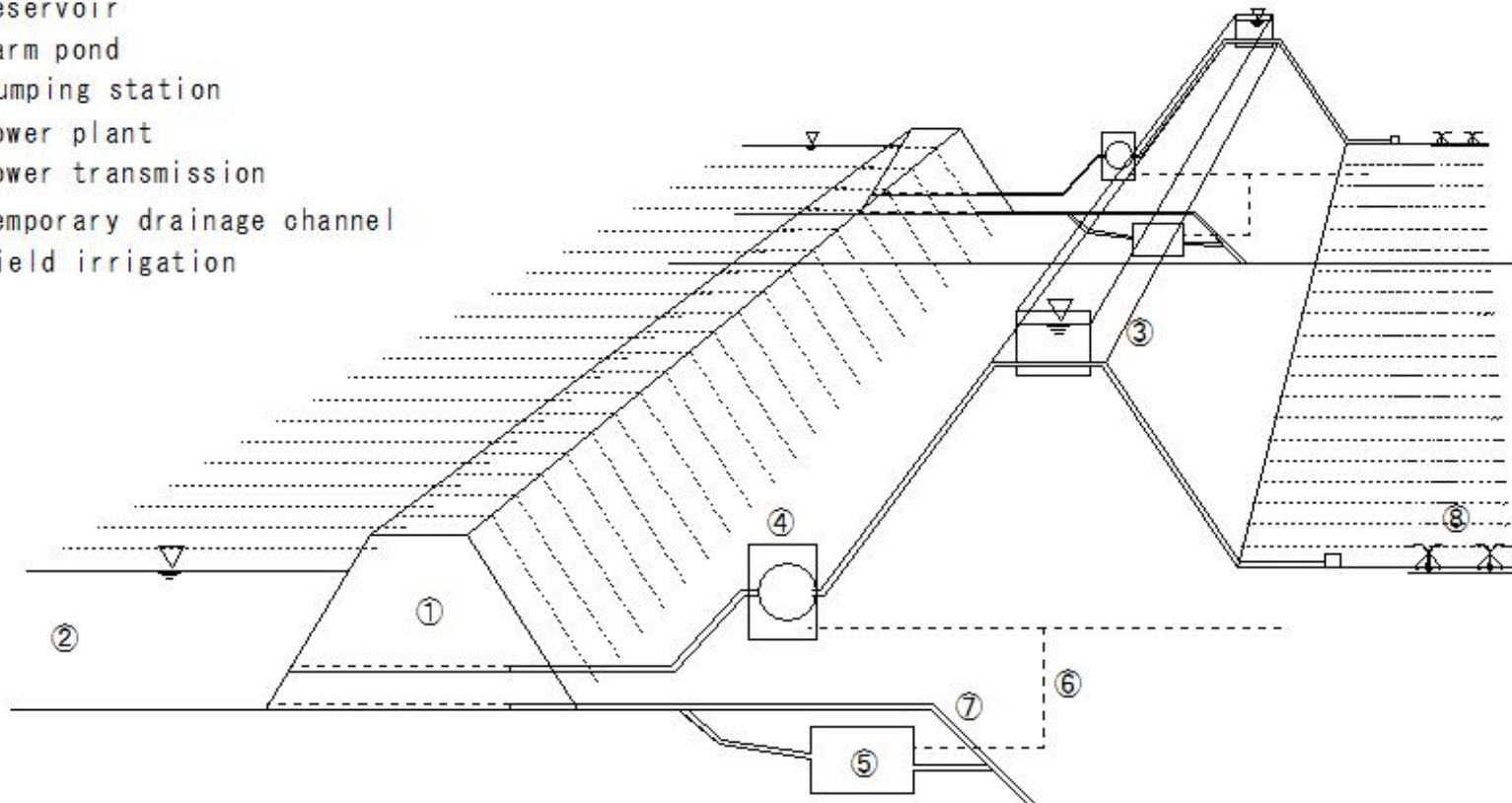


(I1036) Field irrigation

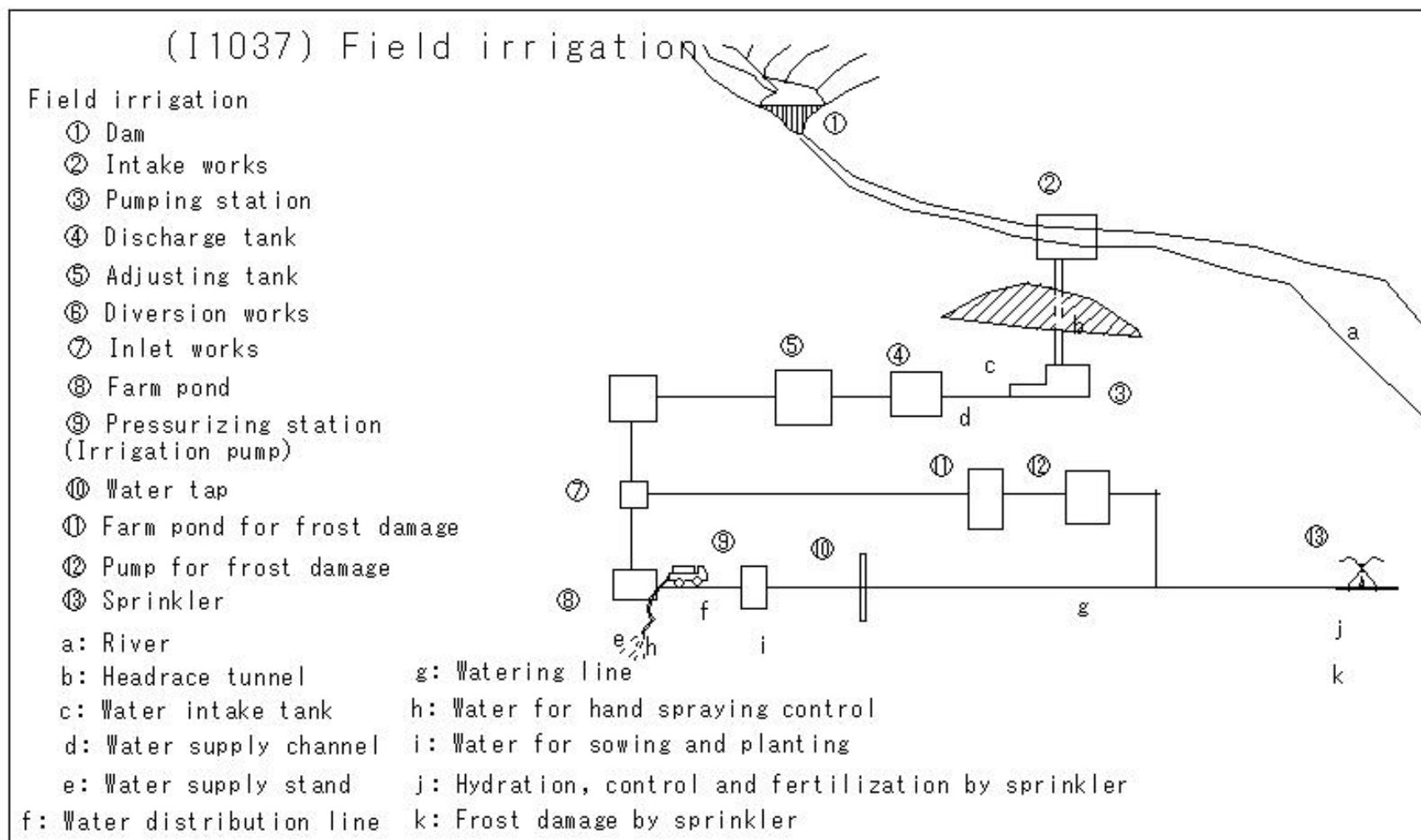
(I1036) Field irrigation

Field irrigation

- ① Dam
- ② Reservoir
- ③ Farm pond
- ④ Pumping station
- ⑤ Power plant
- ⑥ Power transmission
- ⑦ Temporary drainage channel
- ⑧ Field irrigation



(I1037) Field irrigation

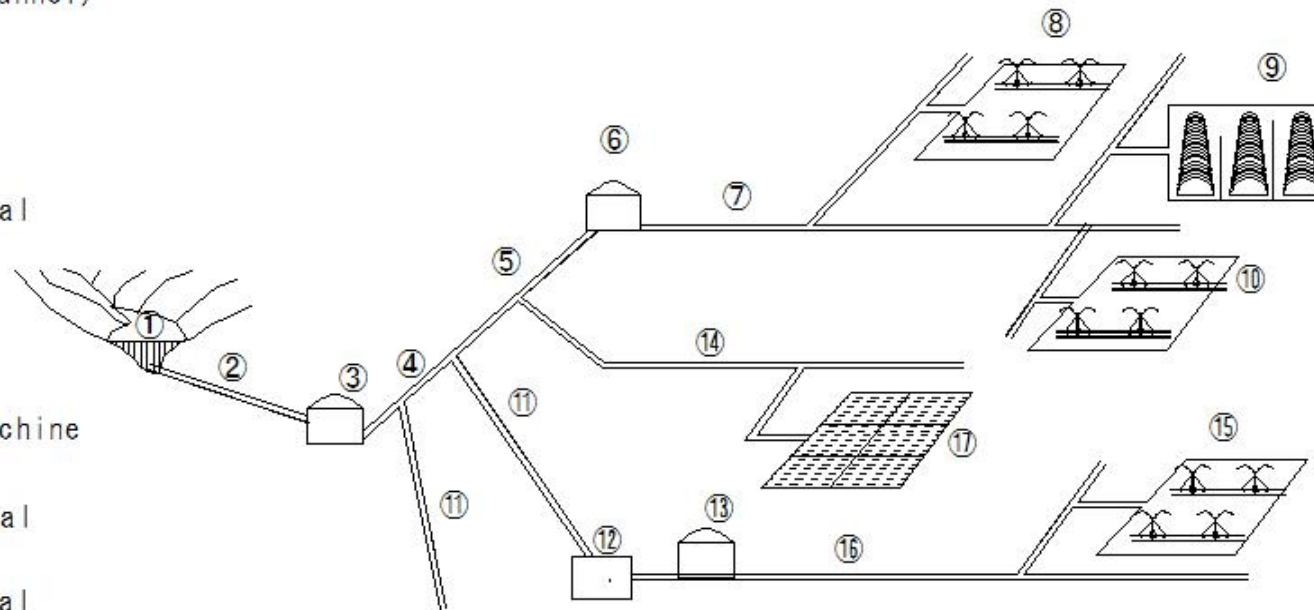


(I1038) Field irrigation

(I1038) Field irrigation

Field irrigation

- ① Dam
- ② Water channel (tunnel)
- ③ Farm pond
- ④ Main canal
- ⑤ Branch canal
- ⑥ Farm pond
- ⑦ Distribution canal
- ⑧ Normal field
- ⑨ House
- ⑩ Field
- ⑪ Branch canal
- ⑫ Water pumping machine
- ⑬ Farm pond
- ⑭ Distribution canal
- ⑮ Field
- ⑯ Distribution canal
- ⑰ Rice field

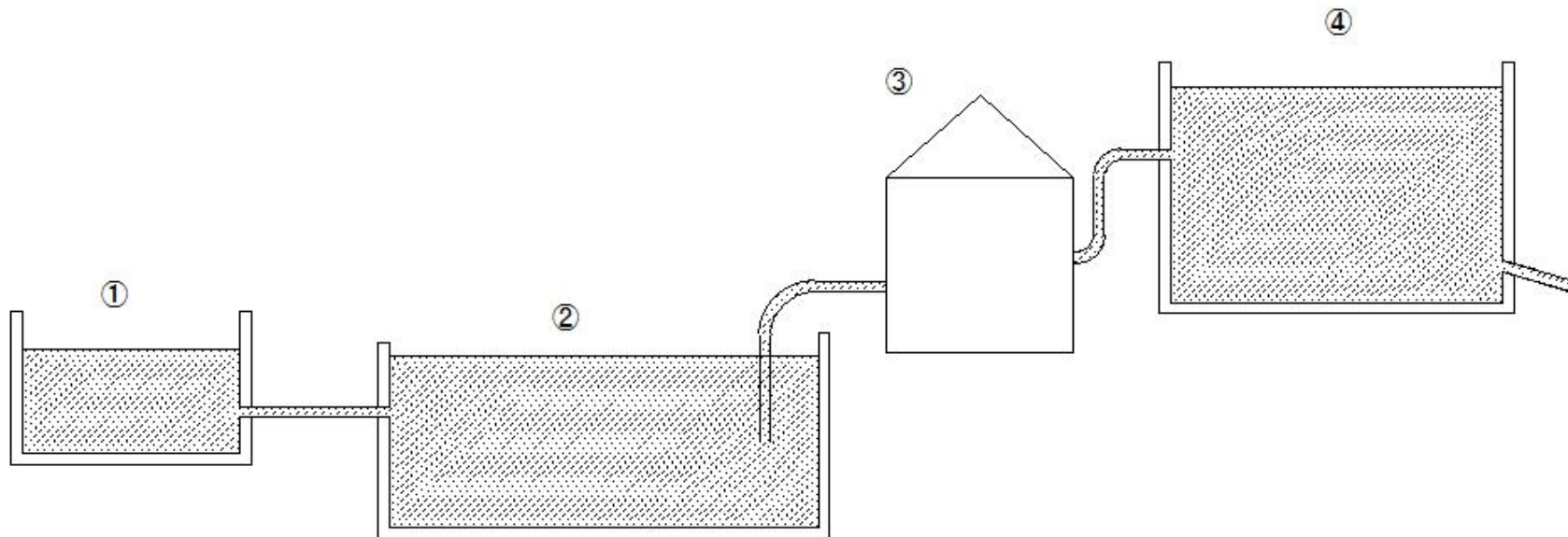


(I1039) Field irrigation

(I1039) Field irrigation

Field irrigation

- ① Irrigation channel
- ② Adjusting reservoir
- ③ Pumping station (pump)
- ④ Farm pond

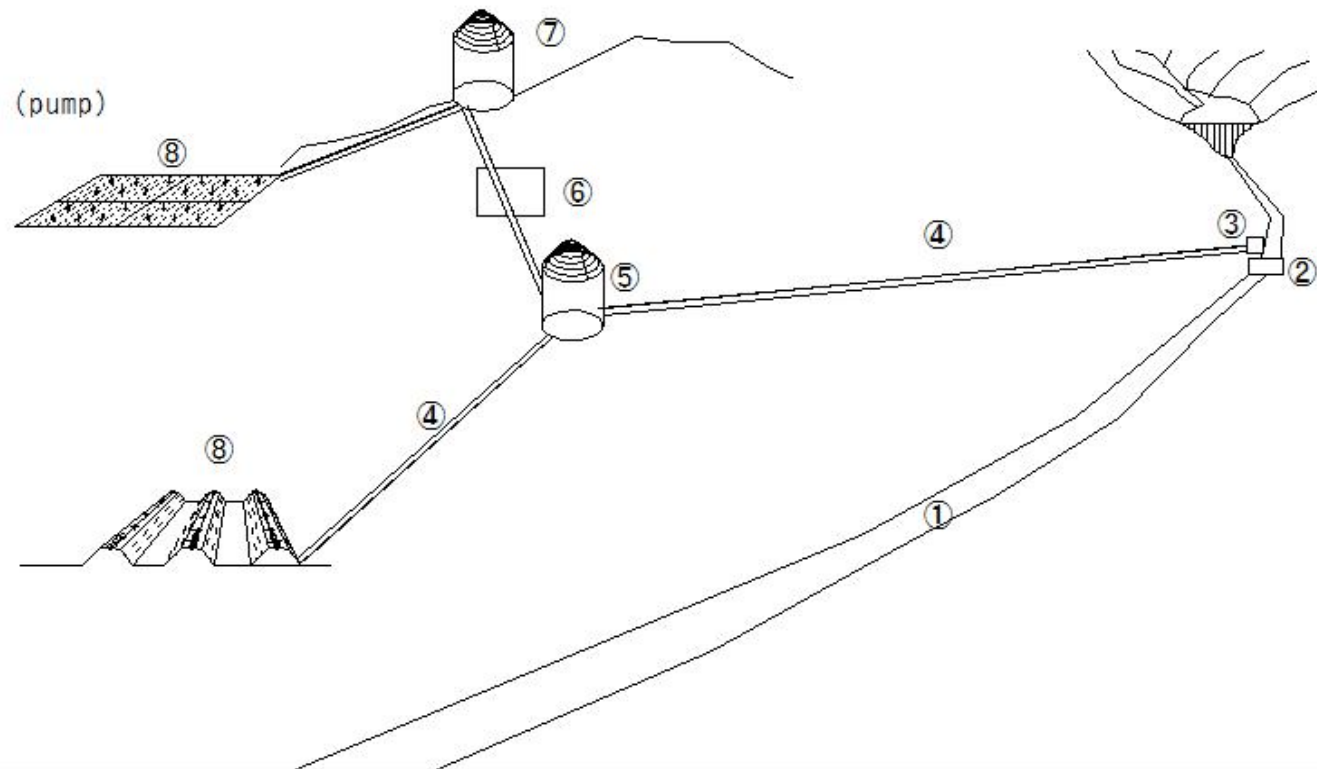


(I1040) Field irrigation

(I1040) Field irrigation

Field irrigation

- ① River
- ② Headworks
- ③ Intake works
- ④ Waterway
- ⑤ Farm pond
- ⑥ Pumping station (pump)
- ⑦ Farm pond
- ⑧ Field

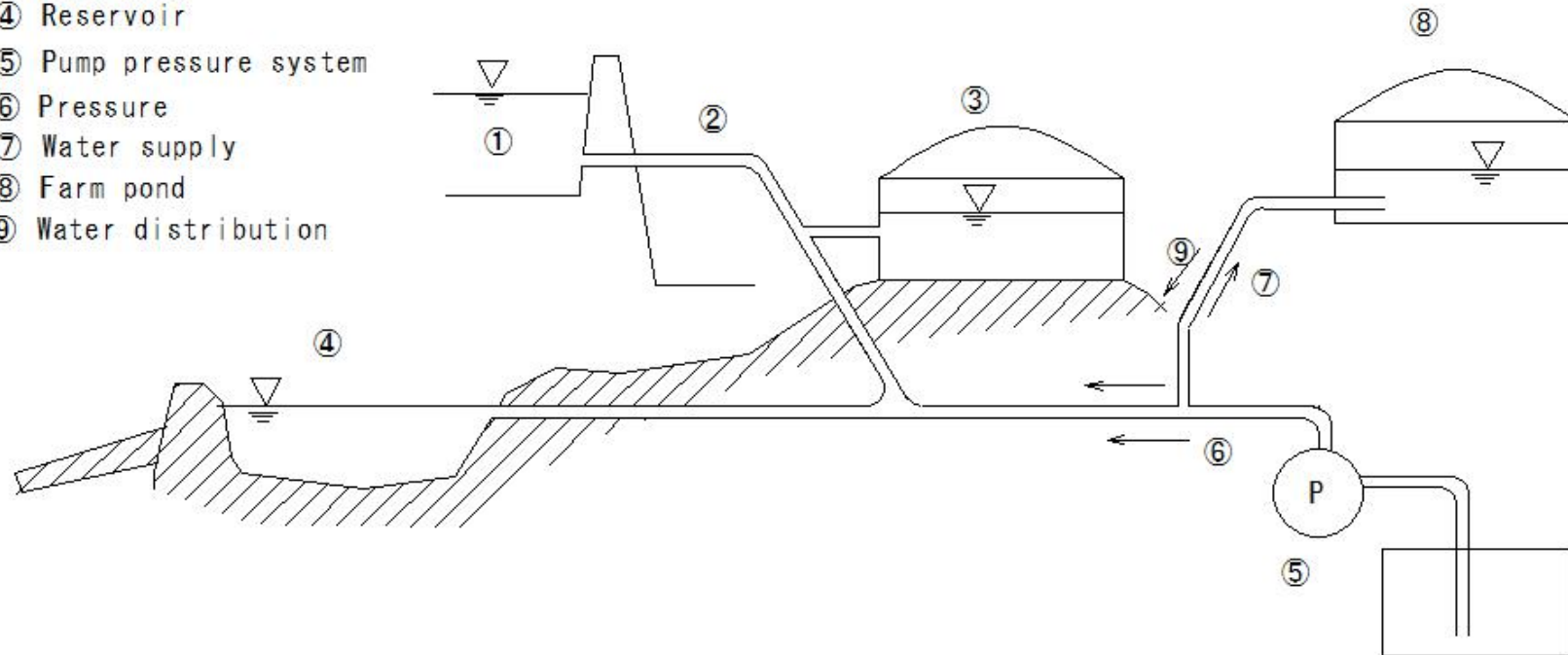


(I1041) Field irrigation

(I1041) Field irrigation

Field irrigation

- ① Reservoir
- ② Gravity flow system
- ③ Farm pond
- ④ Reservoir
- ⑤ Pump pressure system
- ⑥ Pressure
- ⑦ Water supply
- ⑧ Farm pond
- ⑨ Water distribution

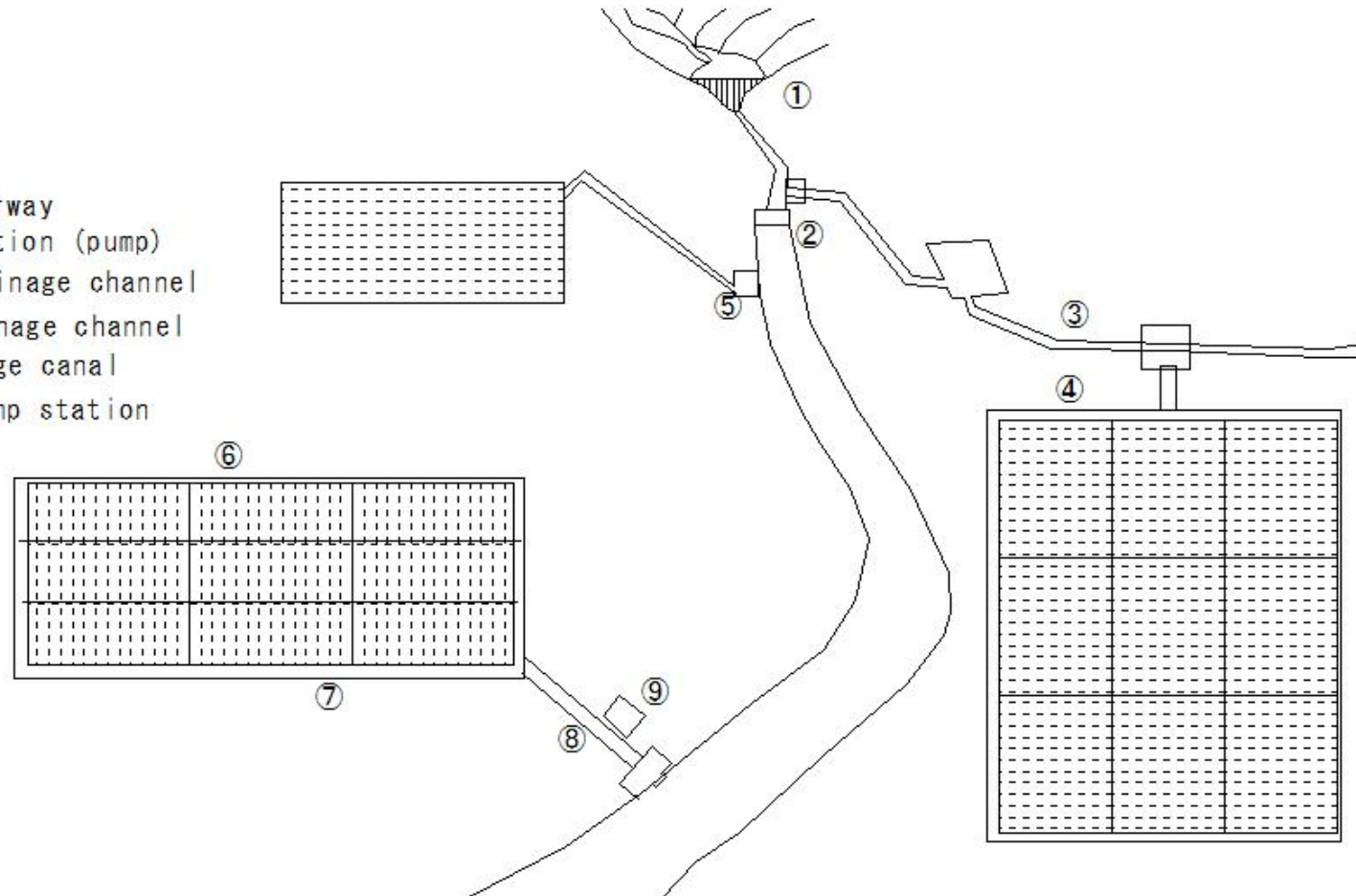


(I1042) Field irrigation

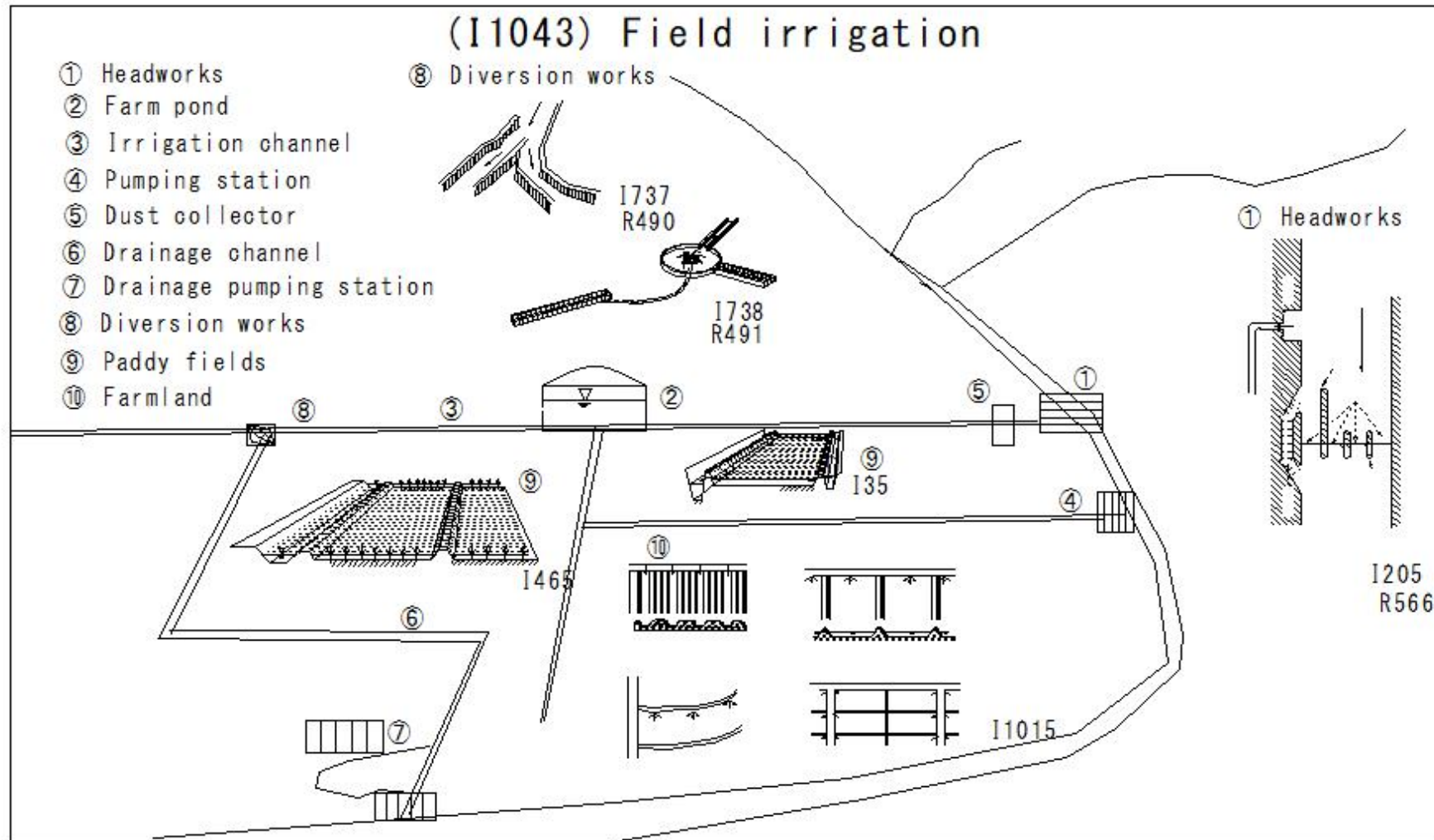
(I1042) Field irrigation

Field irrigation

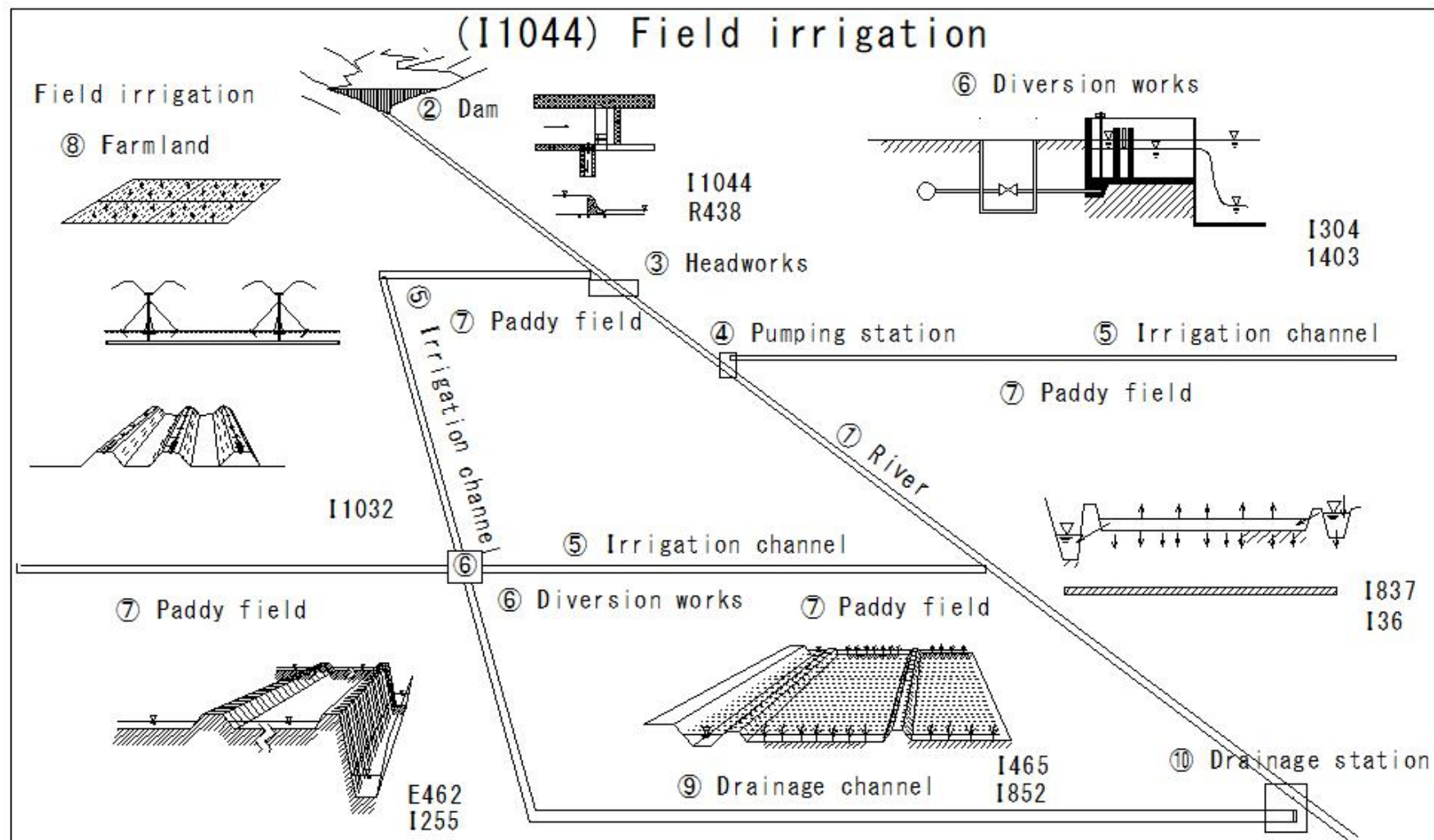
- ① Dam
- ② Headwork
- ③ Main canal
- ④ Branch waterway
- ⑤ Pumping station (pump)
- ⑥ Terminal drainage channel
- ⑦ Branch drainage channel
- ⑧ Main drainage canal
- ⑨ Drainage pump station



(I1043) Field irrigation



(I1044) Field irrigation

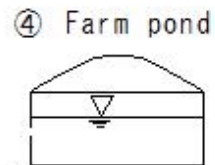
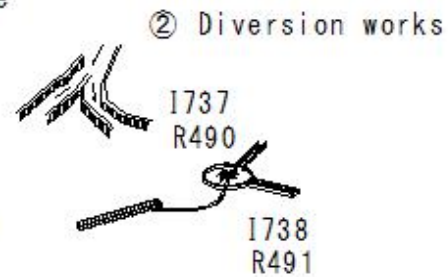


(I1045) Field irrigation

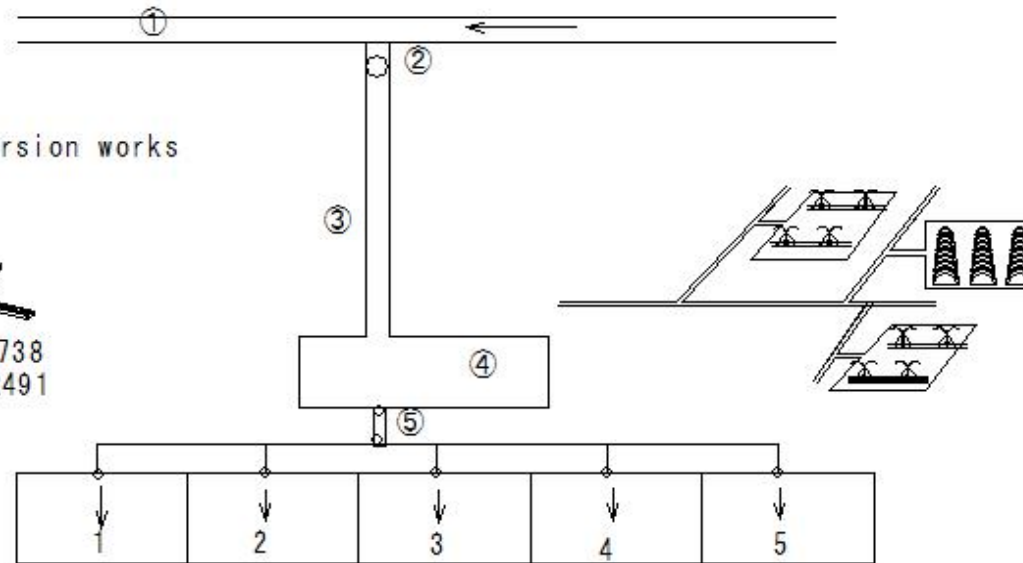
(I1045) Field irrigation

Rotation block and water distribution system

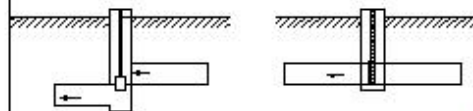
- ① Main irrigation canal
- ② Diversion works
- ③ Branch irrigation canal
- ④ Farm pond
- ⑤ Diversion valve



⑤ Diversion valve



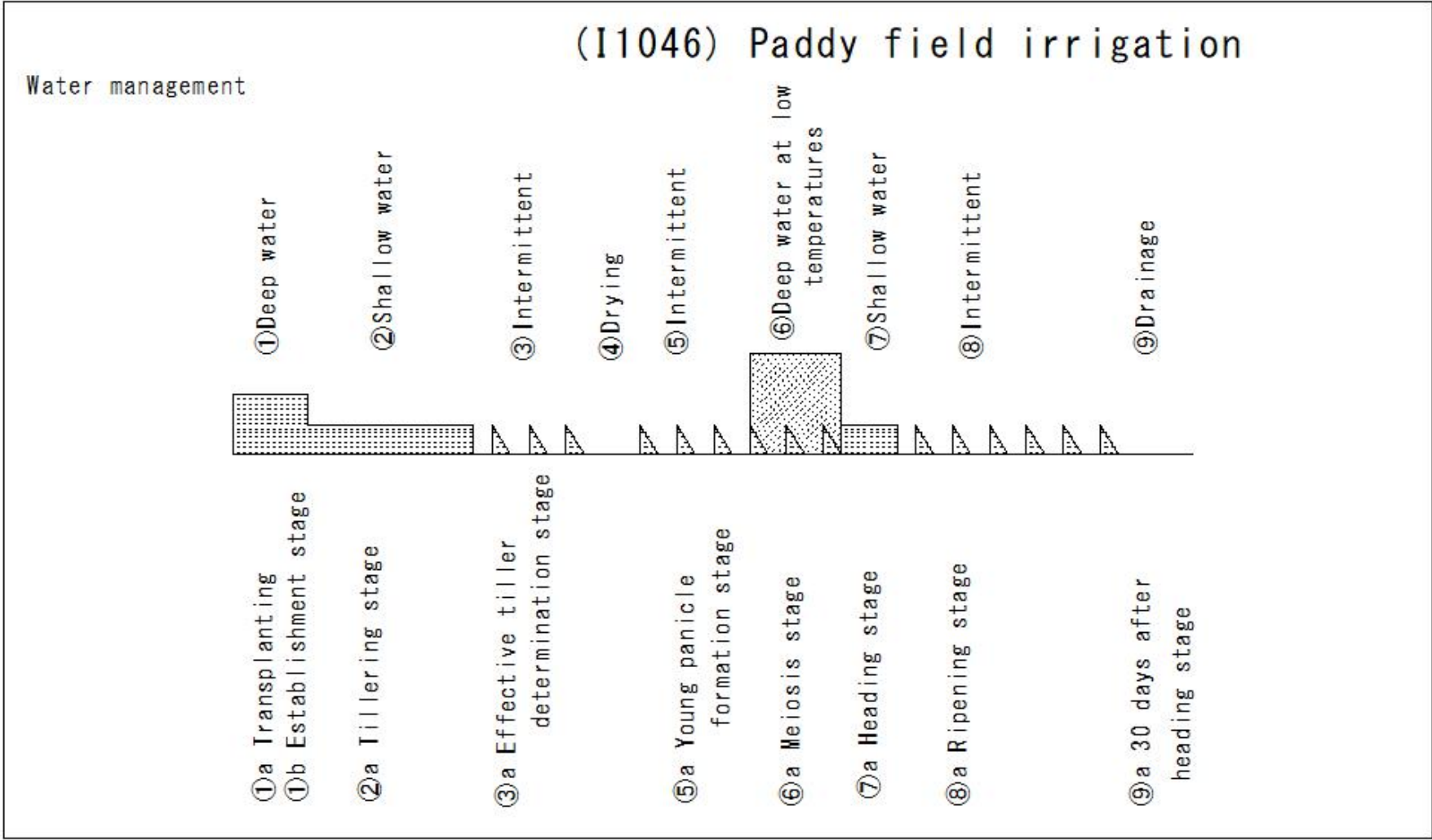
Rotation block and water distribution system



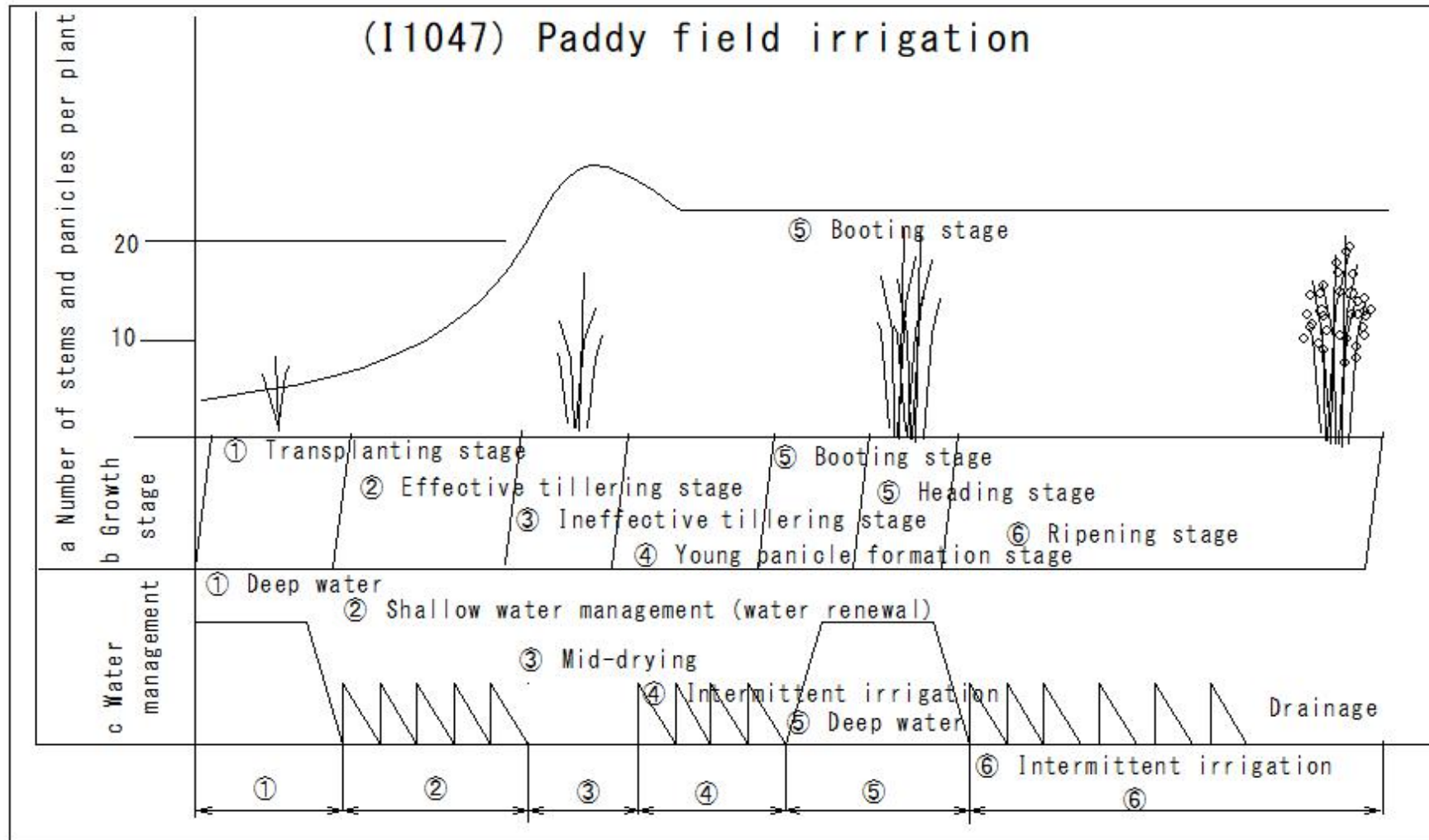
1537

1831

(I1046) Paddy field irrigation



(I1047) Paddy field irrigation

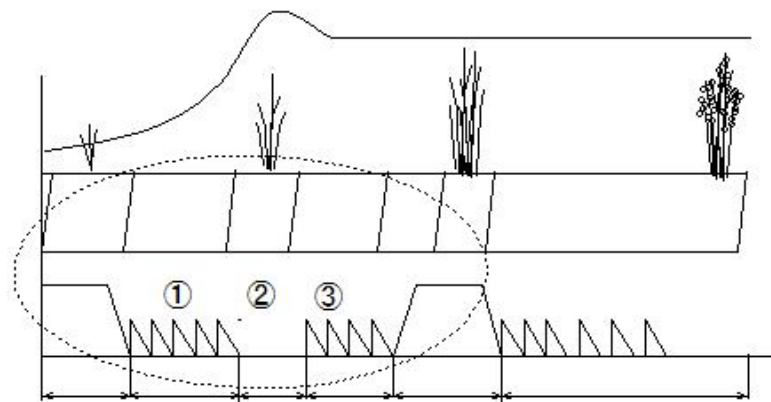


(I1048) Paddy field irrigation

(I1048) Paddy field irrigation

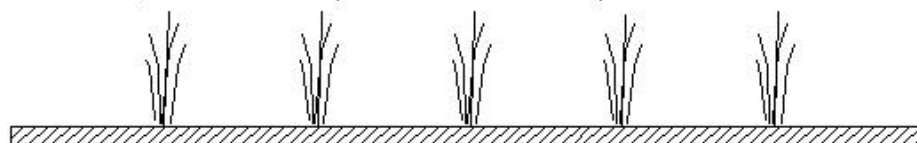
Water management

Intermittent irrigation

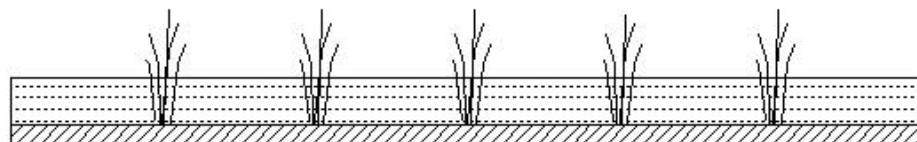


I1047

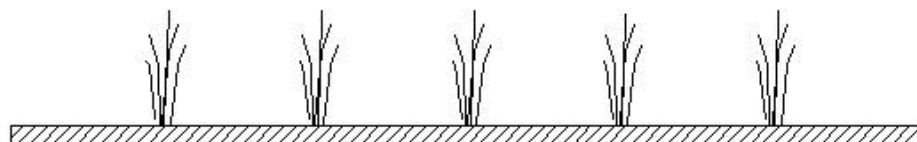
① Mid-drying



② Deep water



③ Mid-drying



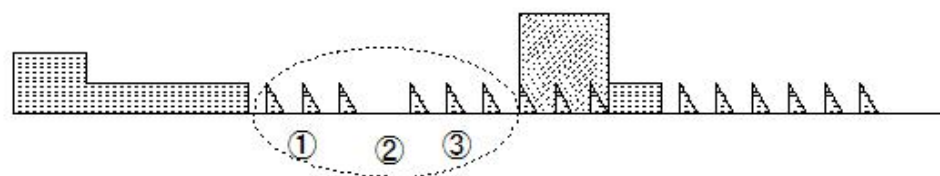
Mid-drying: Gives oxygen to the roots and invigorates the ears

(I1049) Paddy field irrigation

(I1049) Paddy field irrigation

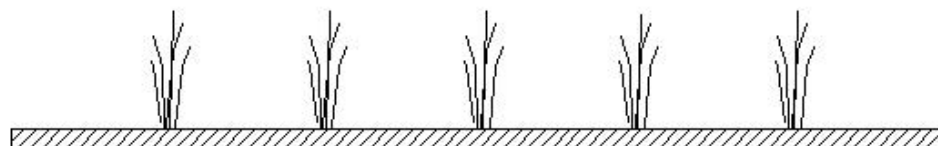
Water management

Intermittent irrigation

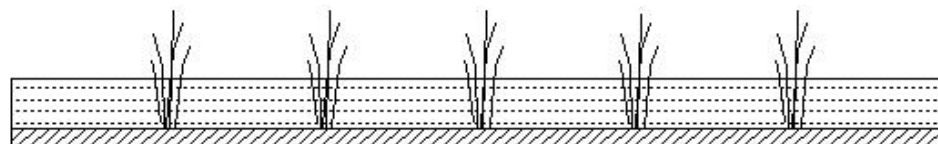


I1046

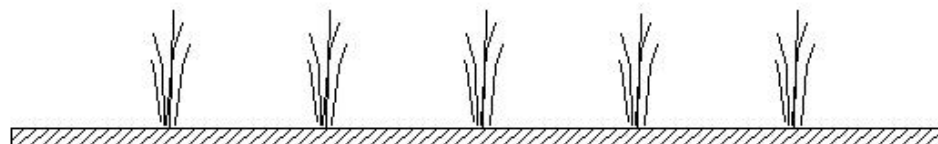
① Mid-drying



② Deep water



③ Mid-drying

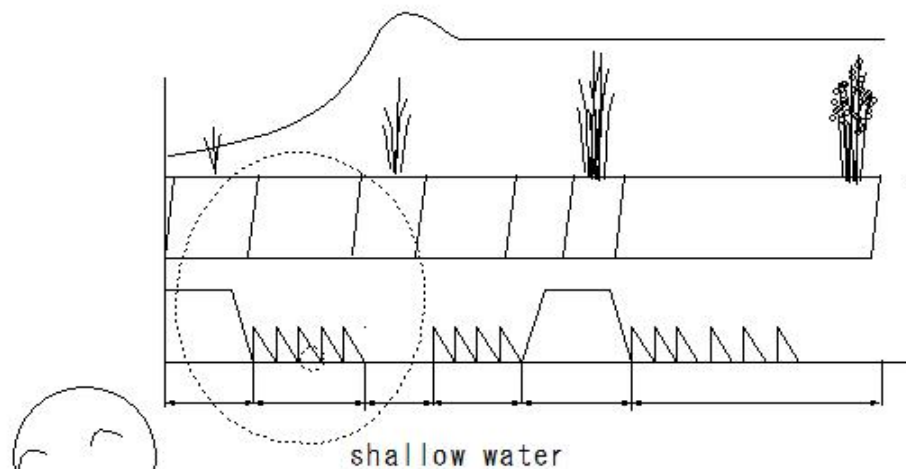


Mid-drying: Gives oxygen to the roots and invigorates the ears

(I1050) Paddy field irrigation

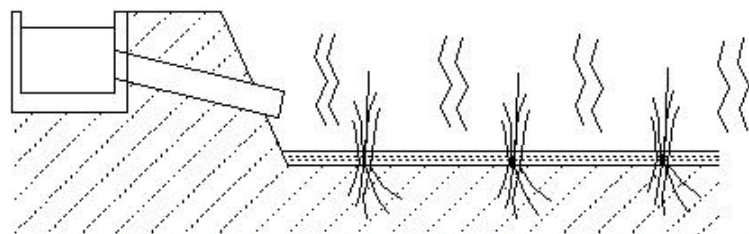
(I1050) Paddy field irrigation

shallow water



I1047

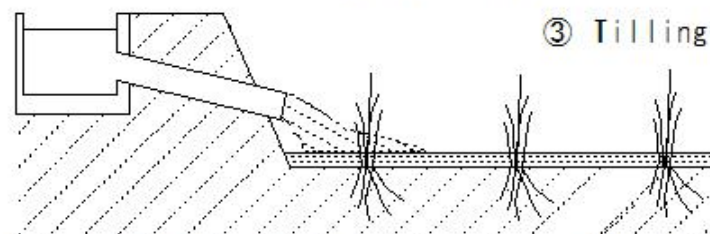
① No water for the day



② Water at night



③ Tilling

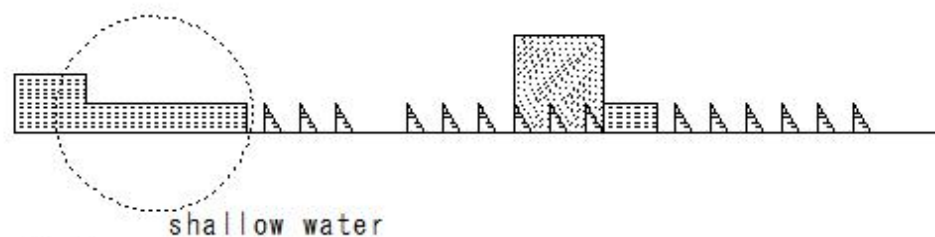


After the plant has taken root, keep the water shallow (2-3cm deep) to promote tilling.

(I1051) Paddy field irrigation

(I1051) Paddy field irrigation

shallow water



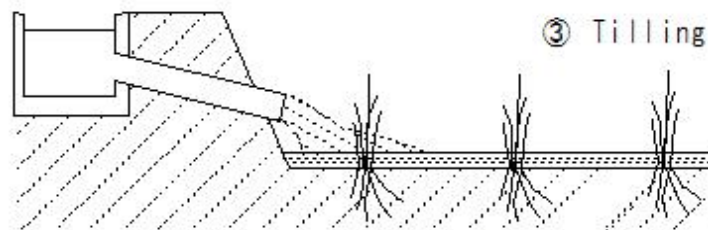
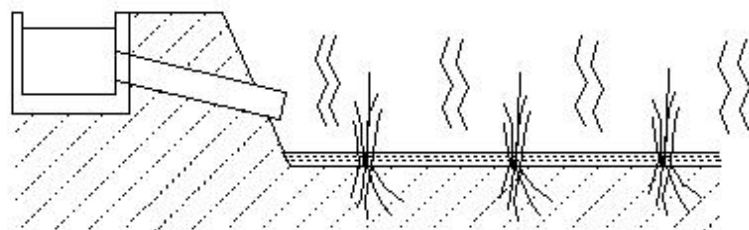
I1046



① No water for the day



② Water at night

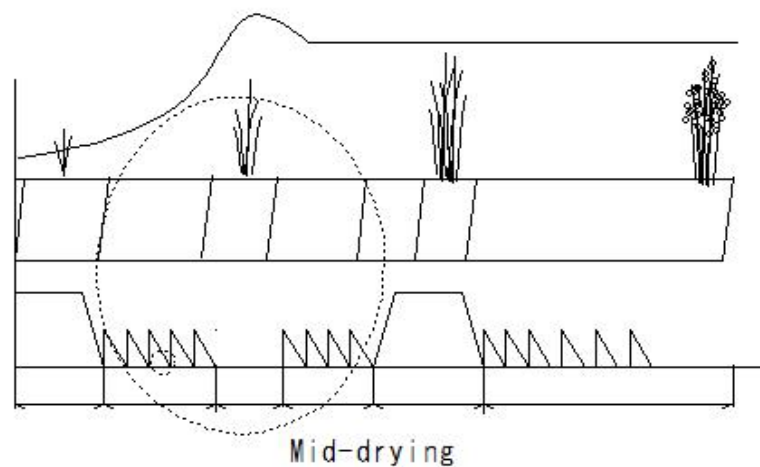


After the plant has taken root, keep the water shallow (2-3cm deep) to promote tilling.

(I1052) Paddy field irrigation

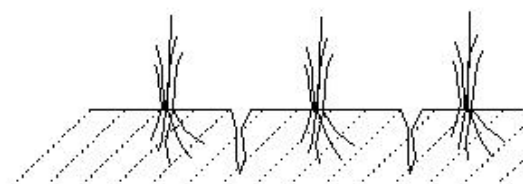
(I1052) Paddy field irrigation

Mid-drying
Level of mid-drying

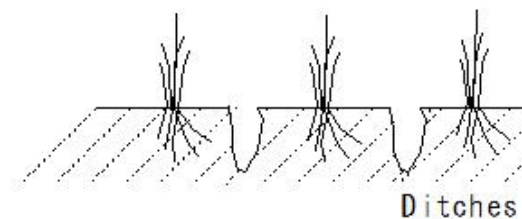


I1047

① Dry until small cracks appear



② Dry fields, dry occasionally

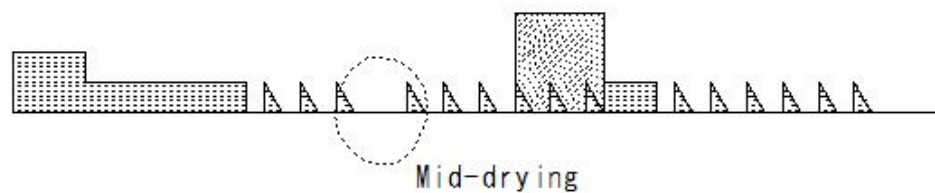


(I1053) Paddy field irrigation

(I1053) Paddy field irrigation

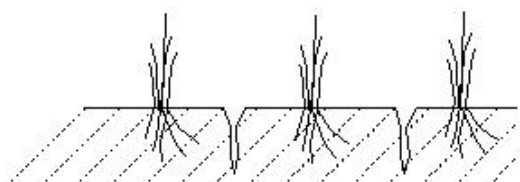
Mid-drying

Level of mid-drying

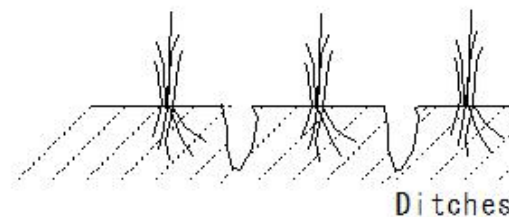


I1046

① Dry until small cracks appear



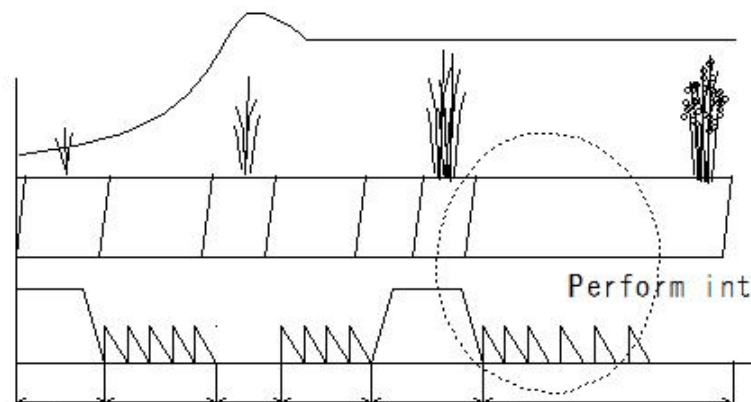
② Dry fields, dry occasionally



(I1054) Paddy field irrigation

(I1054) Paddy field irrigation

Intermittent irrigation



Intermittent irrigation

Up to 20 days after heading

Water down



Water up



Water down

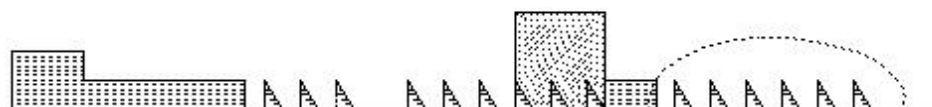


I1047

(I1055) Paddy field irrigation

(I1055) Paddy field irrigation

Intermittent irrigation



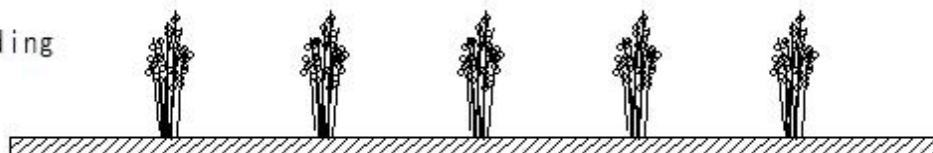
Intermittent irrigation

I1046

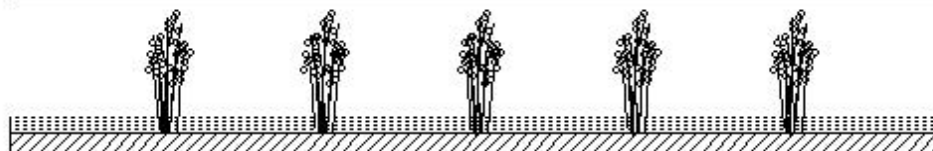
Intermittent irrigation

Up to 20 days after heading

Water down



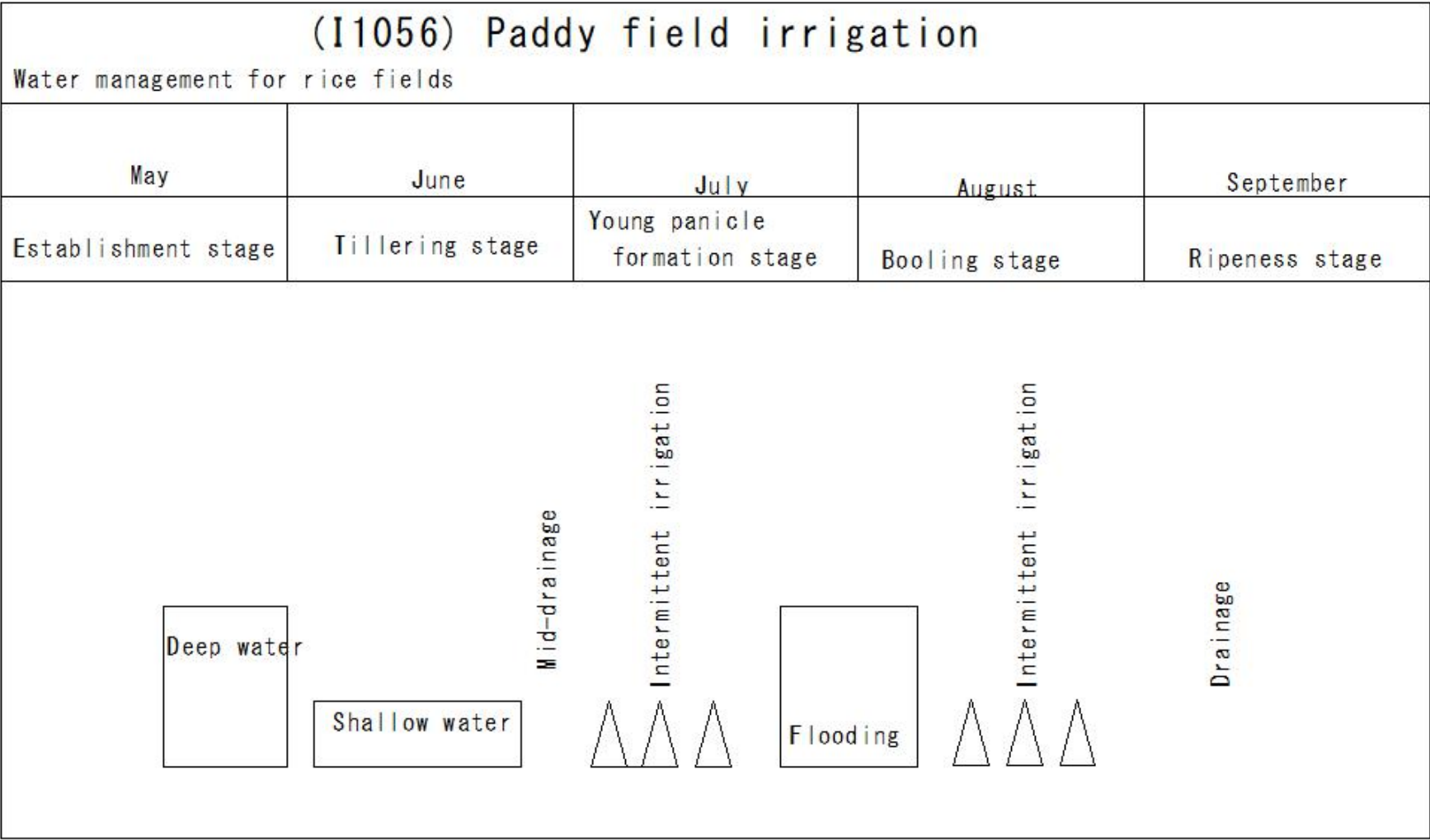
Water up



Water down



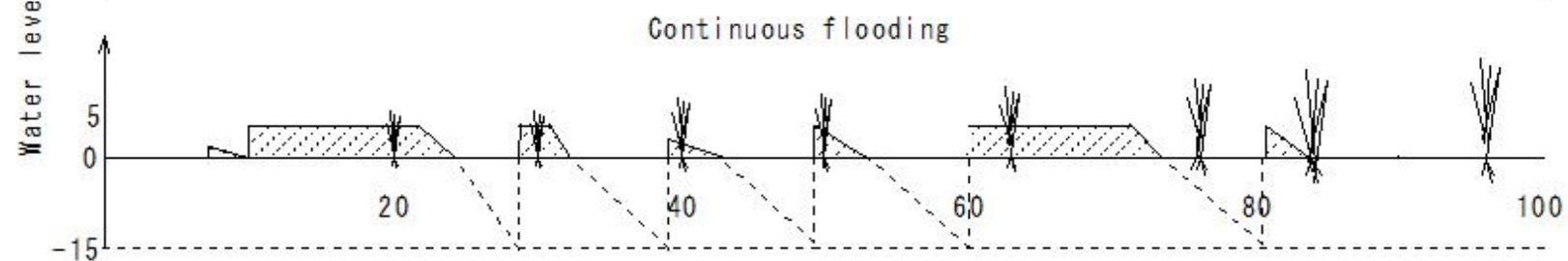
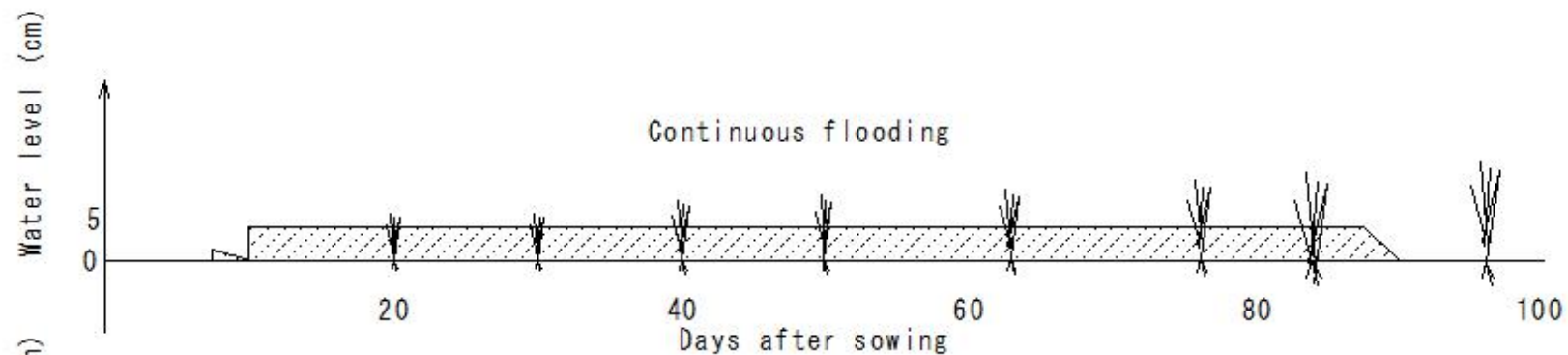
(I1056) Paddy field irrigation



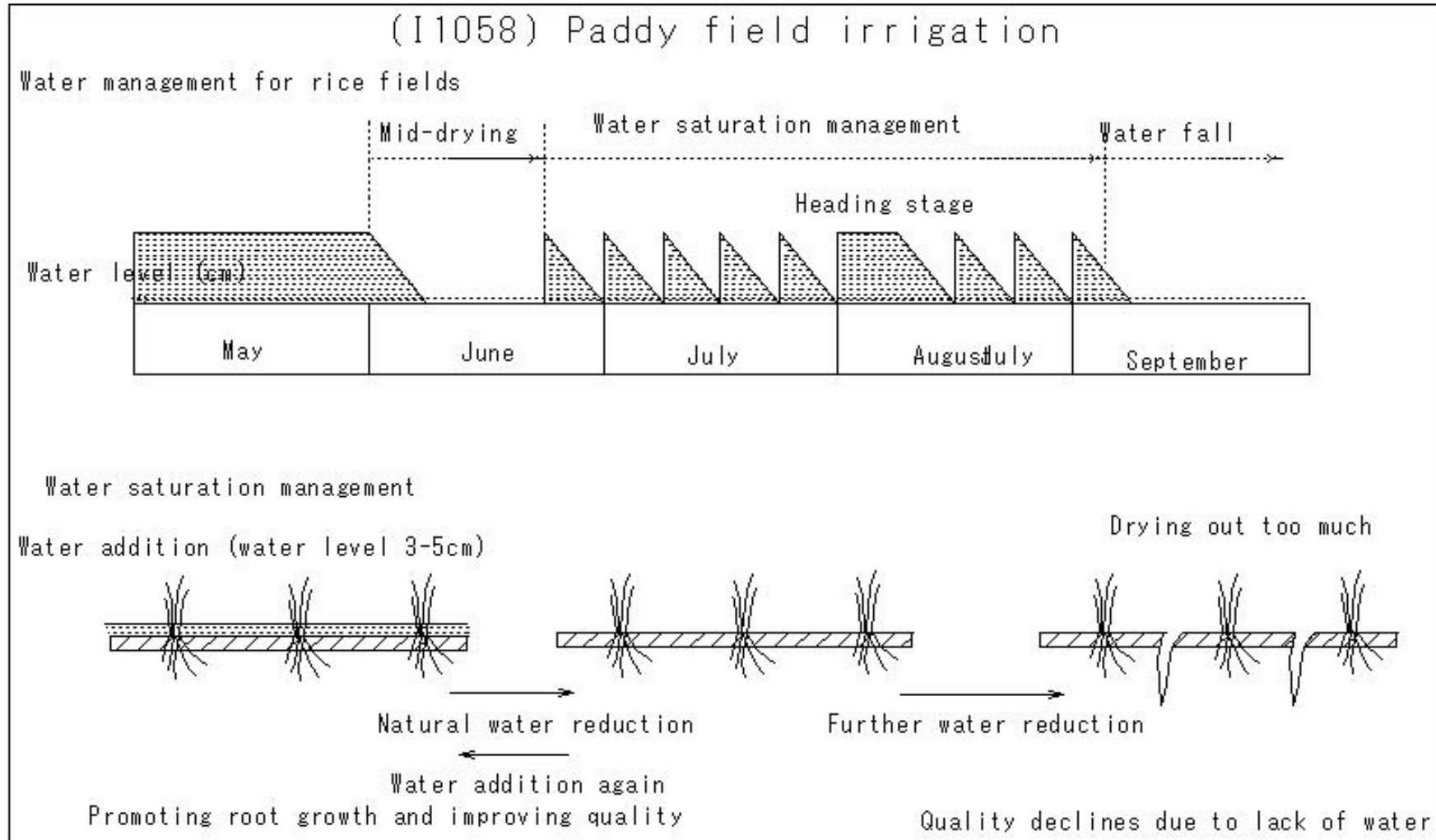
(I1057) Paddy field irrigation

(I1057) Paddy field irrigation

Water management for rice fields



(I1058) Paddy field irrigation

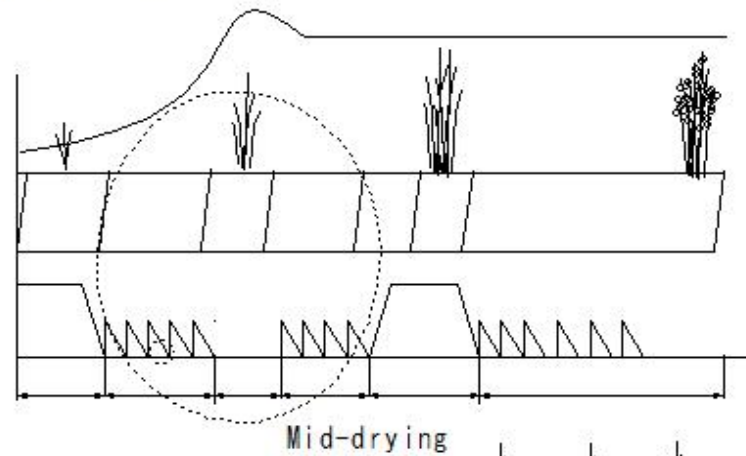


(I1059) Paddy field irrigation

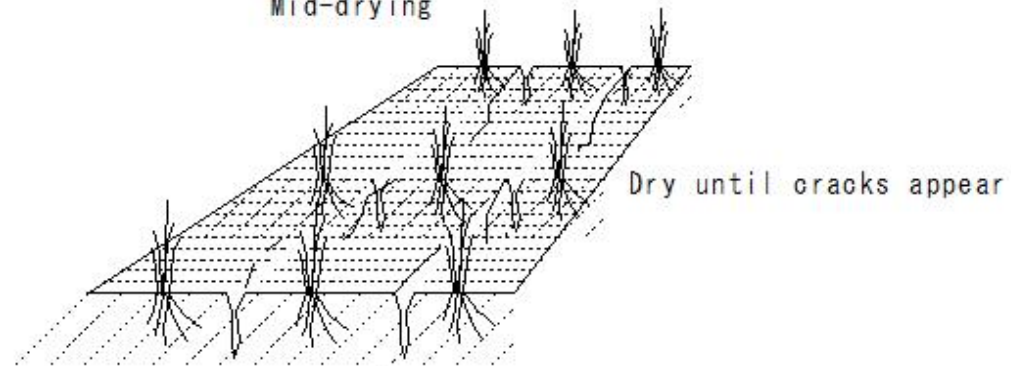
(I1059) Paddy field irrigation

Water management for rice fields

Mid-drying



I1047



(I1060) Paddy field irrigation

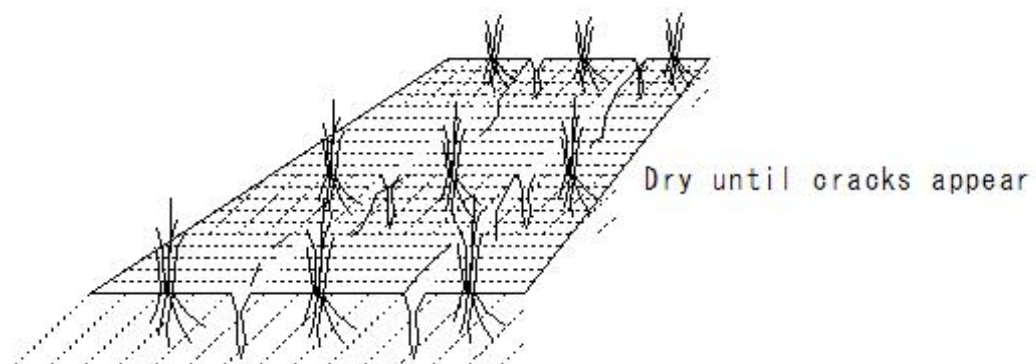
(I1060) Paddy field irrigation

Water management for rice fields

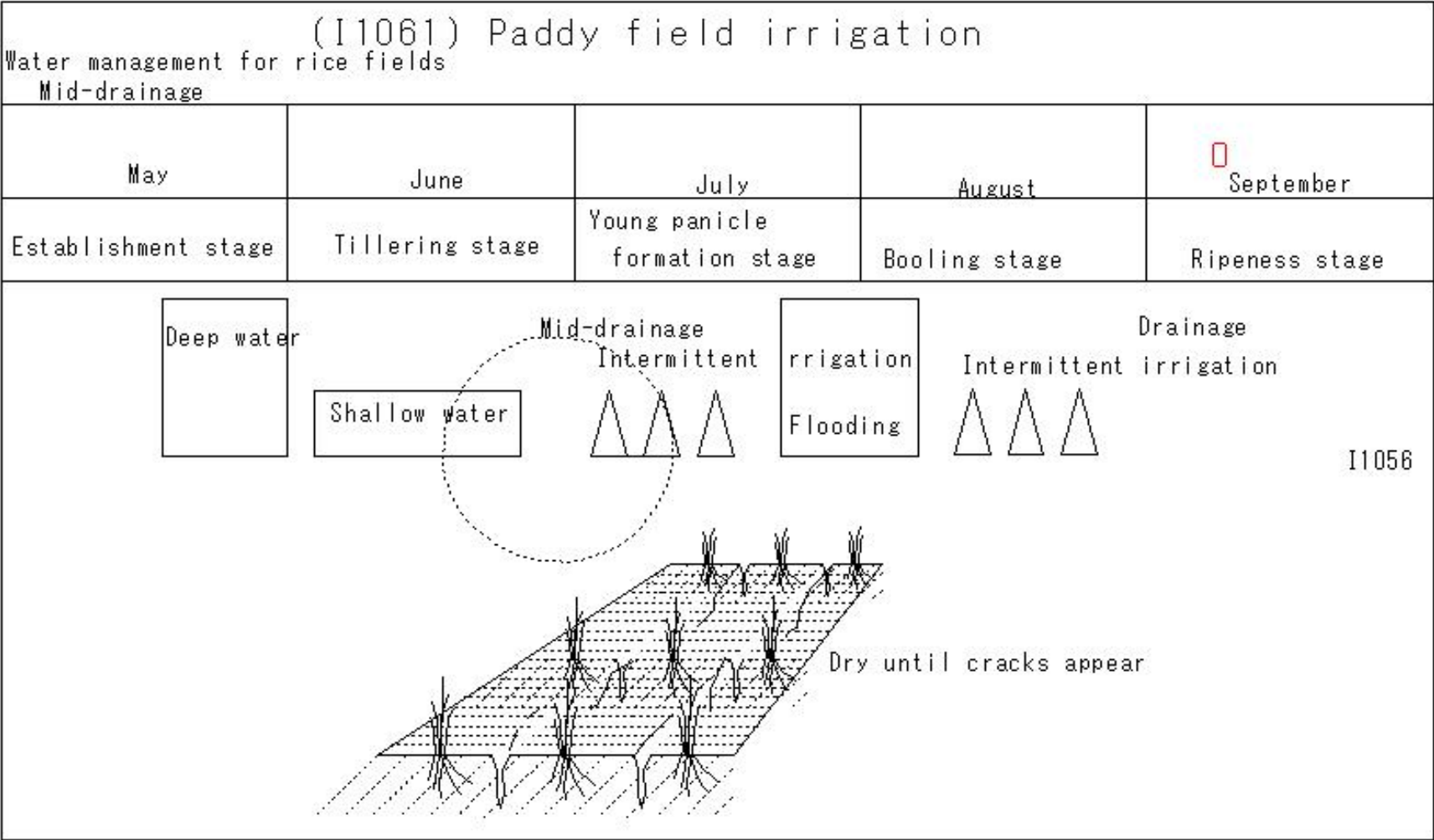
Mid-drying



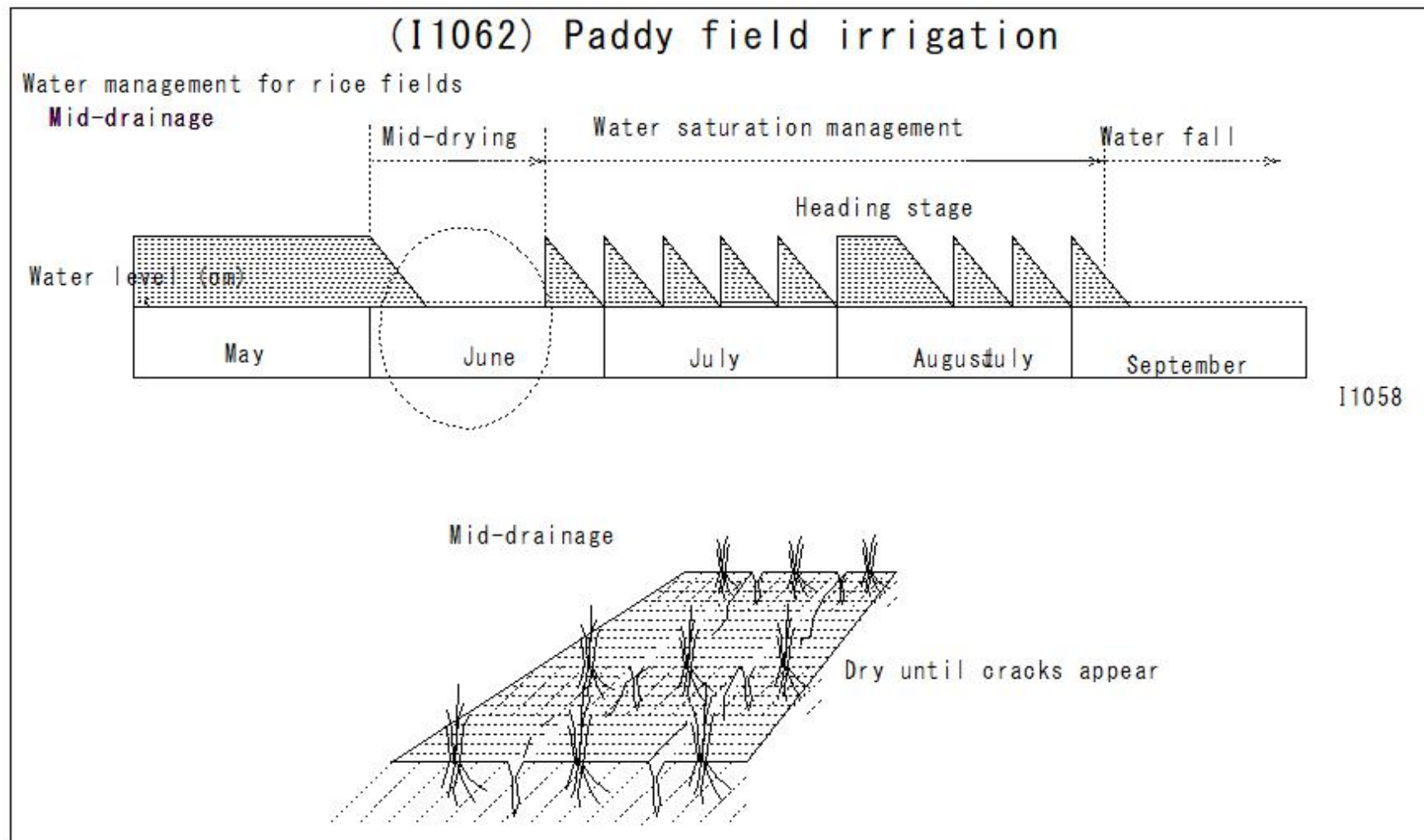
I1046



(I1061) Paddy field irrigation



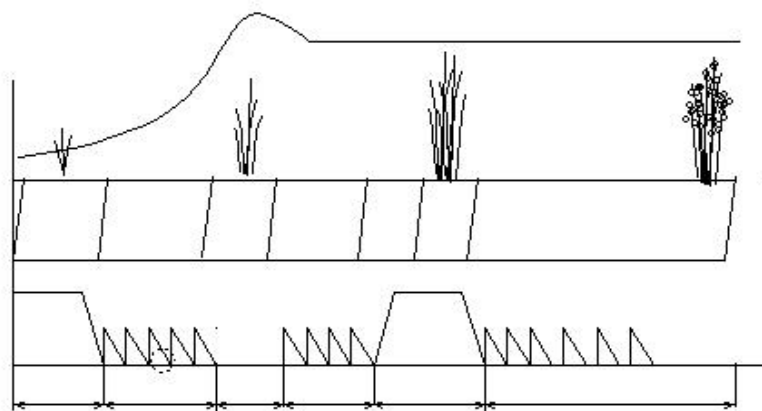
(I1062) Paddy field irrigation



(I1063) Paddy field irrigation

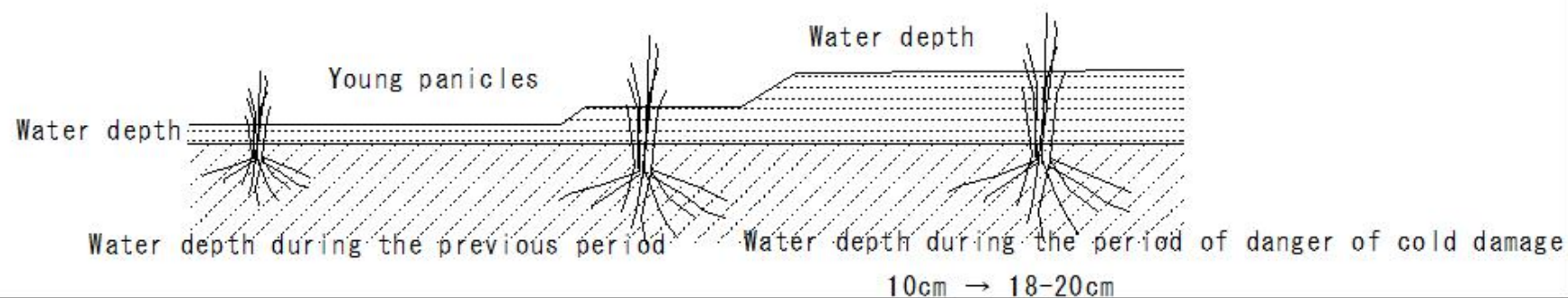
(I1063) Paddy field irrigation

Water management for rice fields



I1047

Water depth during the period of danger of cold damage



(I1064) Paddy field irrigation

(I1064) Paddy field irrigation

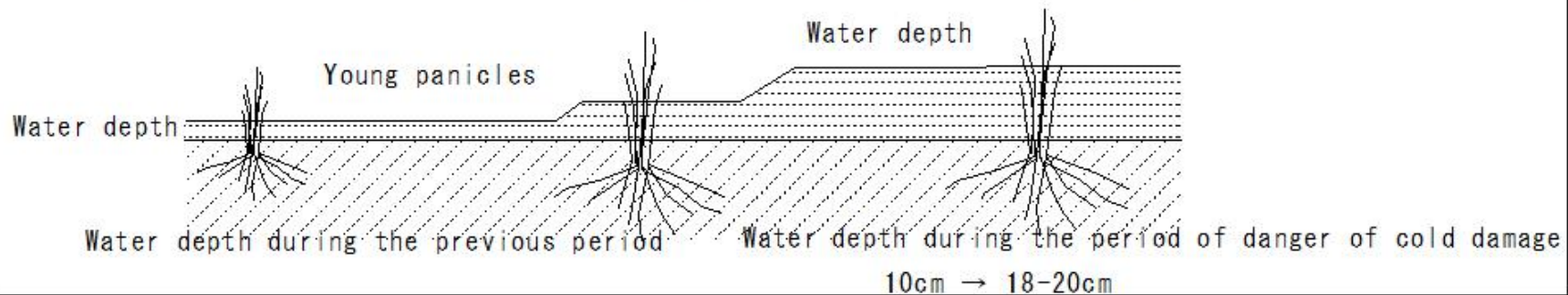
Water management for rice fields

Water depth during the period of danger of cold damage

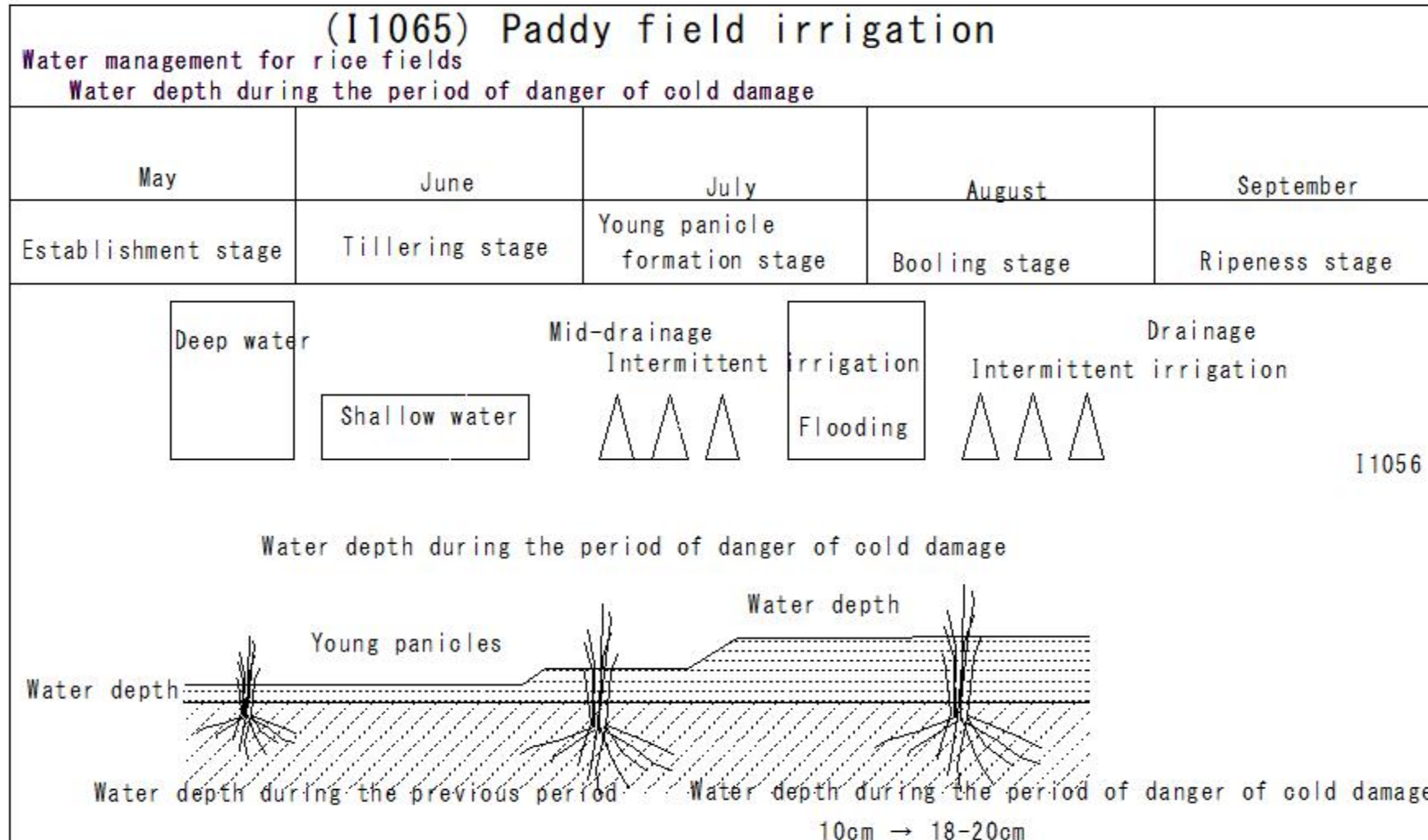


I1046

Water depth during the period of danger of cold damage



(I1065) Paddy field irrigation

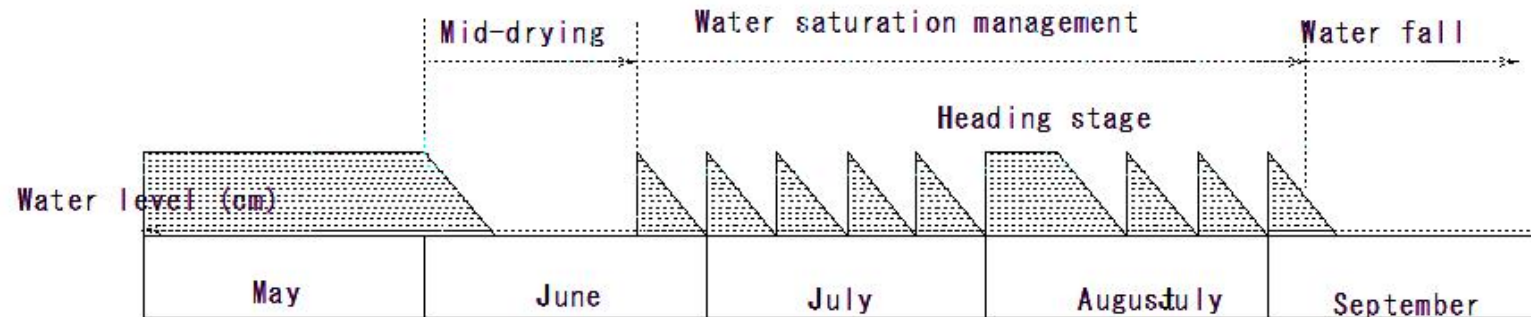


(I1066) Paddy field irrigation

(I1066) Paddy field irrigation

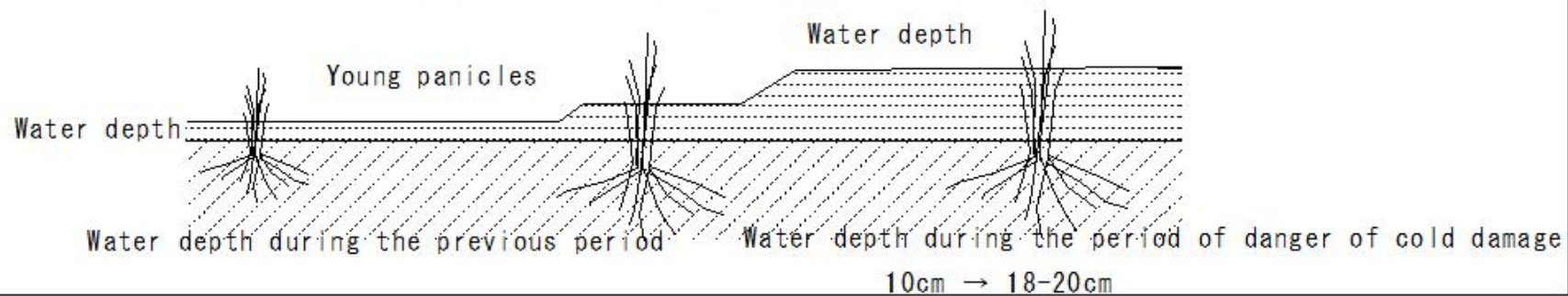
Water management for rice fields

Water depth during the period of danger of cold damage



I1058

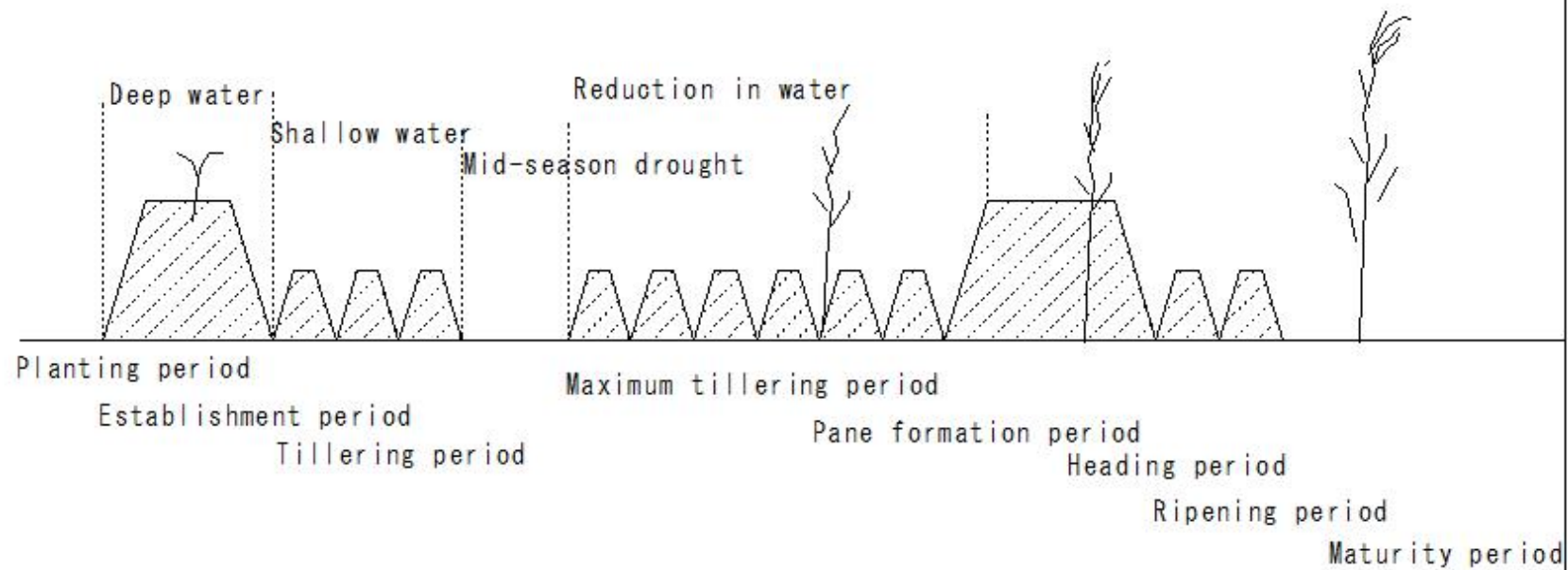
Water depth during the period of danger of cold damage



(I1067) Paddy field irrigation

(I1067) Paddy field irrigation

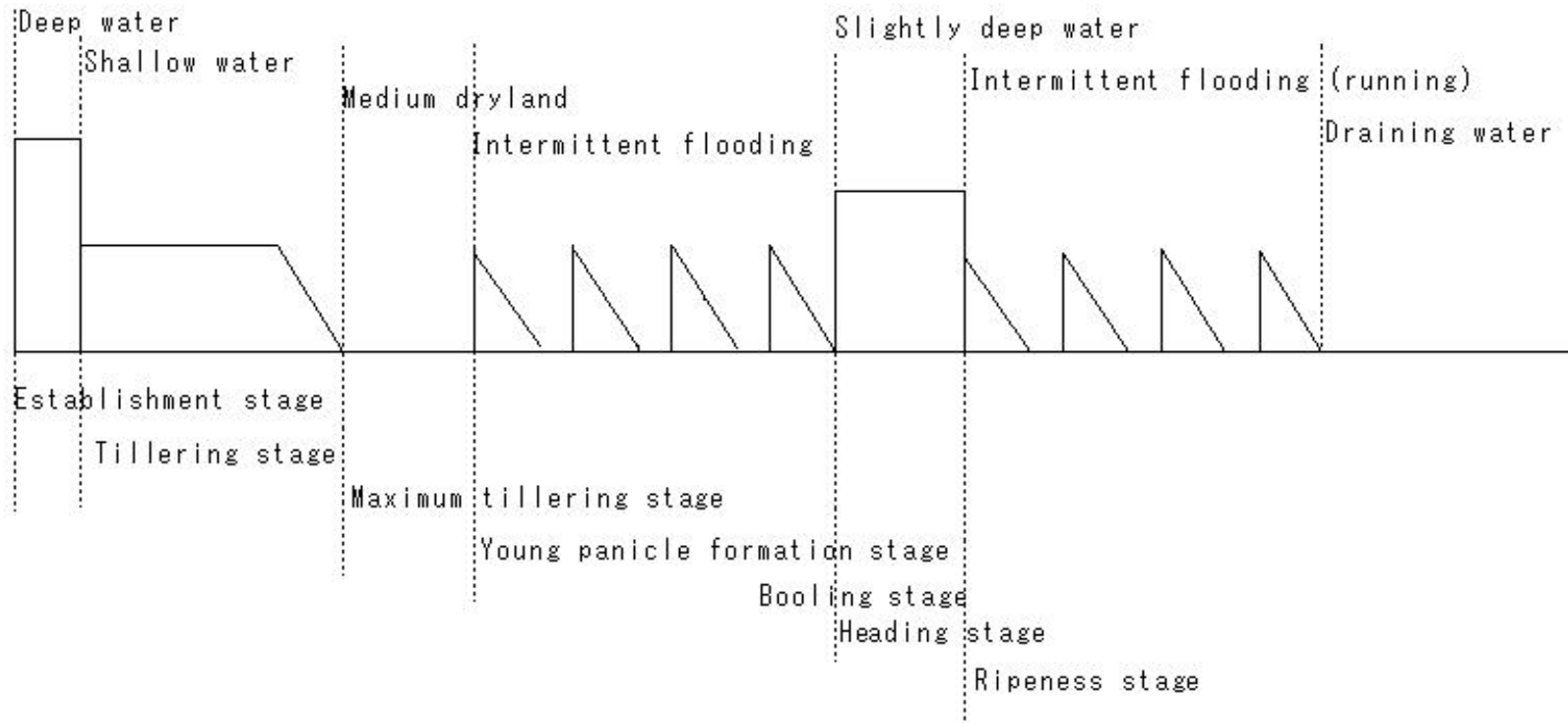
Water management for rice fields



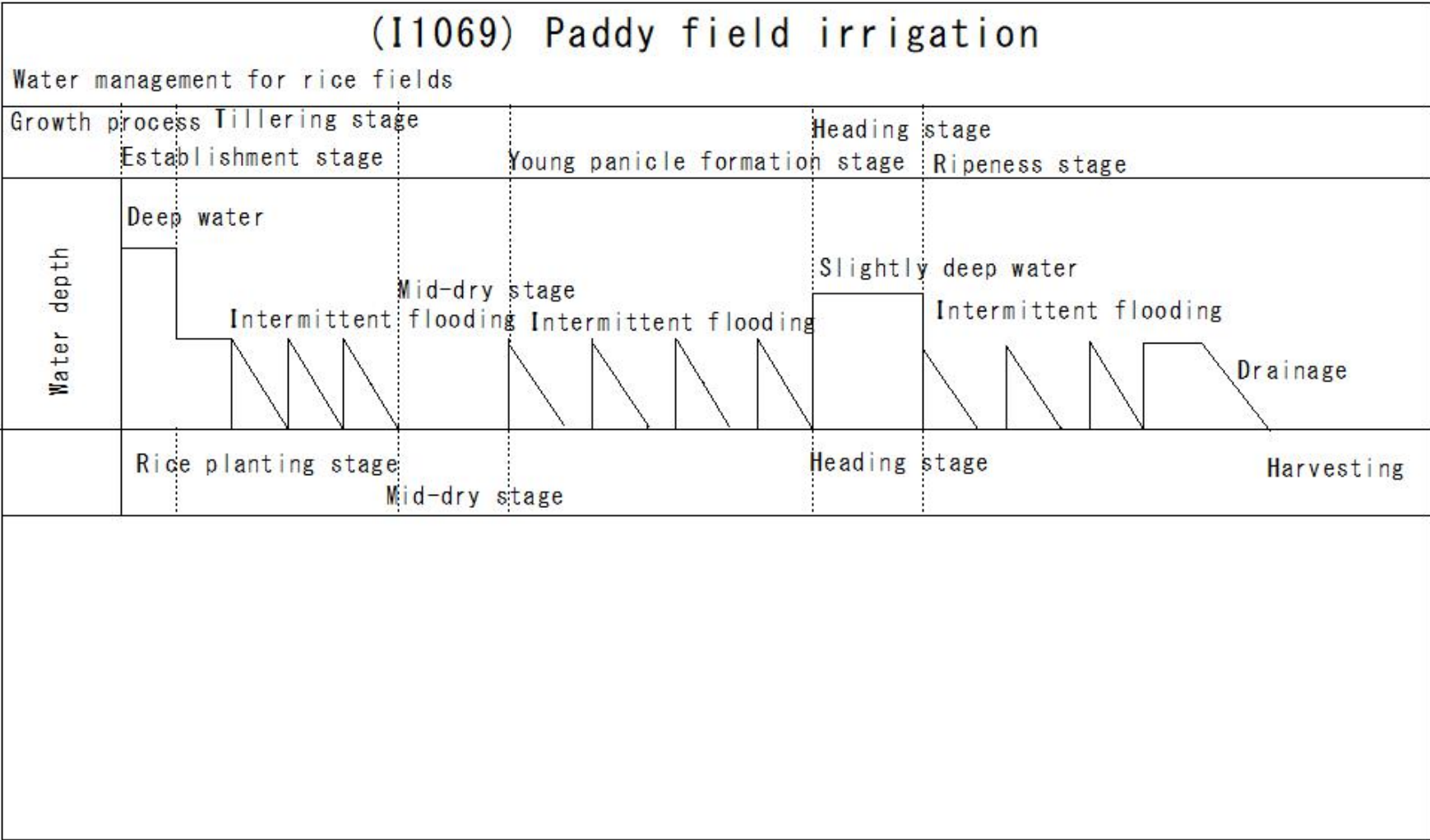
(I1068) Paddy field irrigation

(I1068) Paddy field irrigation

Water management for rice fields



(I1069) Paddy field irrigation

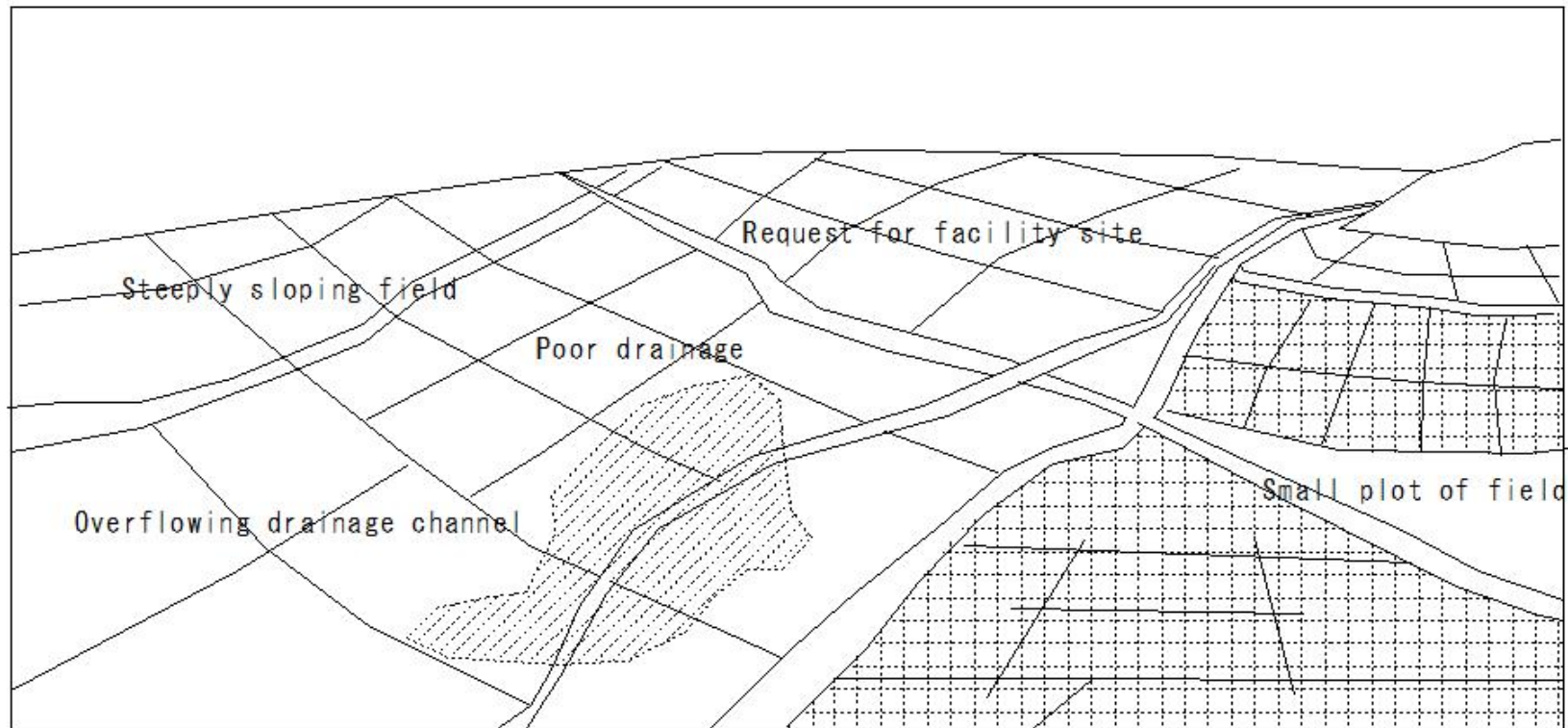


(I1070) Field preparation

(I1070) Field preparation

Field preparation

Before preparation



Farm road difficult to use

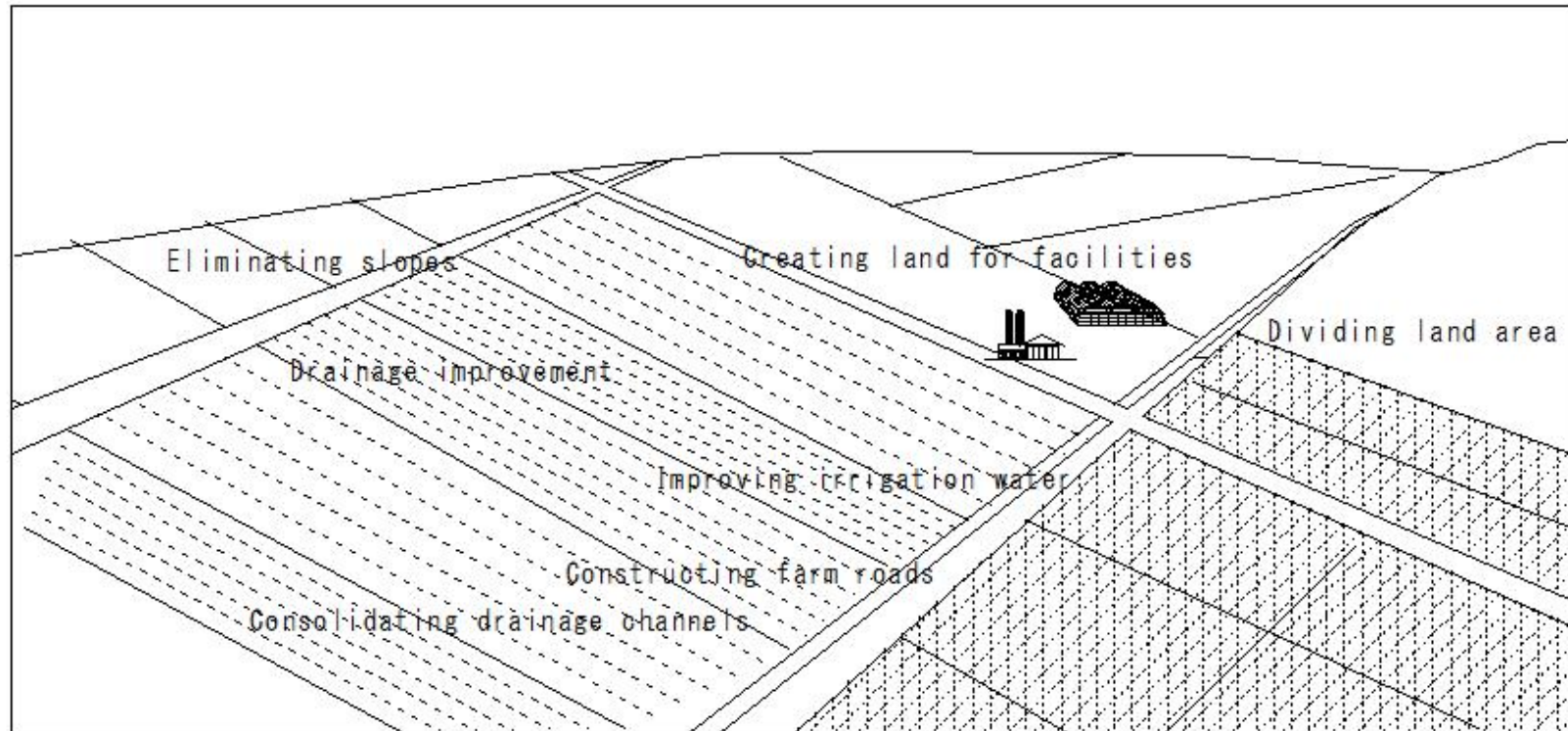
Water shortage/unstable

(I1071) Field preparation

(I1071) Field preparation

Field preparation

After preparation

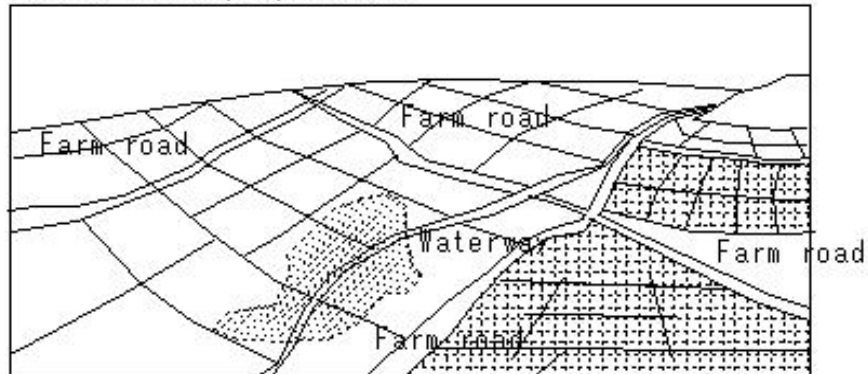


(I1072) Field preparation

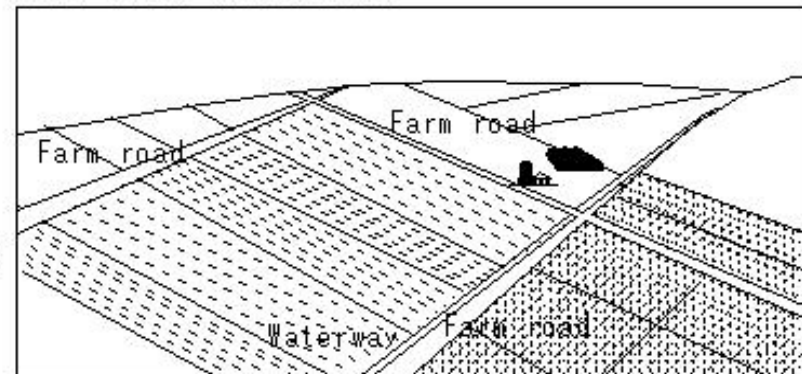
(I1072) Field preparation

Field preparation

Before field preparation



After field preparation



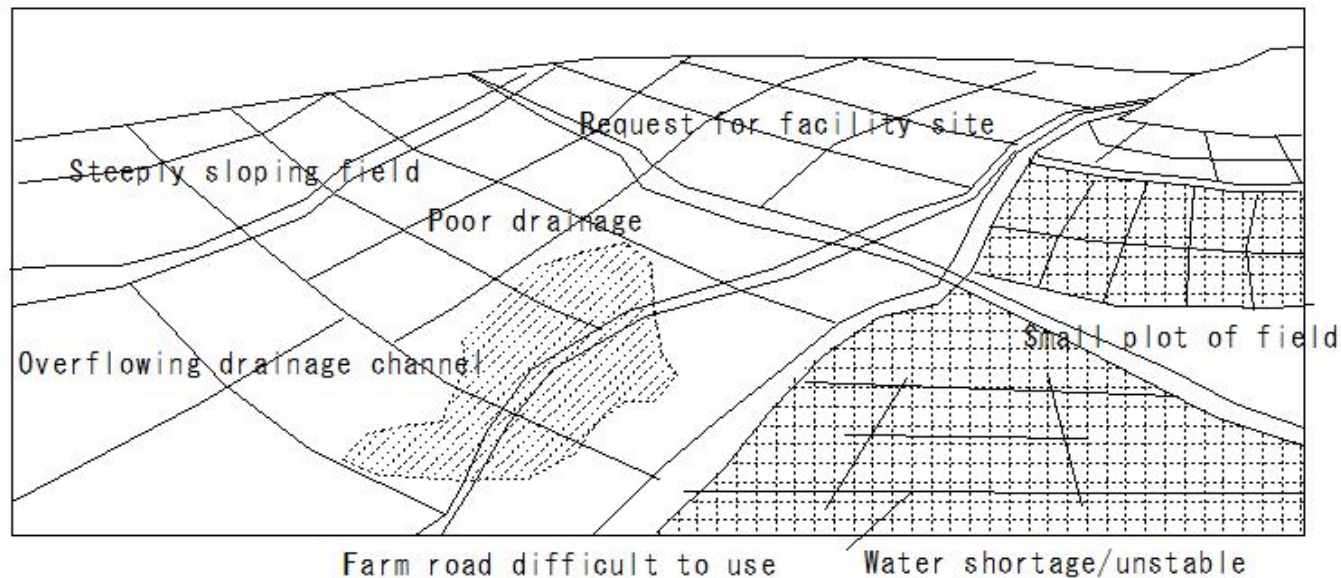
I1071

(I1073) Field preparation

(I1073) Field preparation

Field preparation

Before preparation



- ① Large machinery cannot be introduced and scale cannot be expanded
- ② Agricultural work feels like a burden as the population ages
- ③ Farmland is scattered and inefficient
- ④ There are no successors and the future of the farmland is uncertain
- ⑤ Drainage is poor and crops cannot be changed
- ⑥ Even if farmers want to rent out farmland, they cannot find tenants

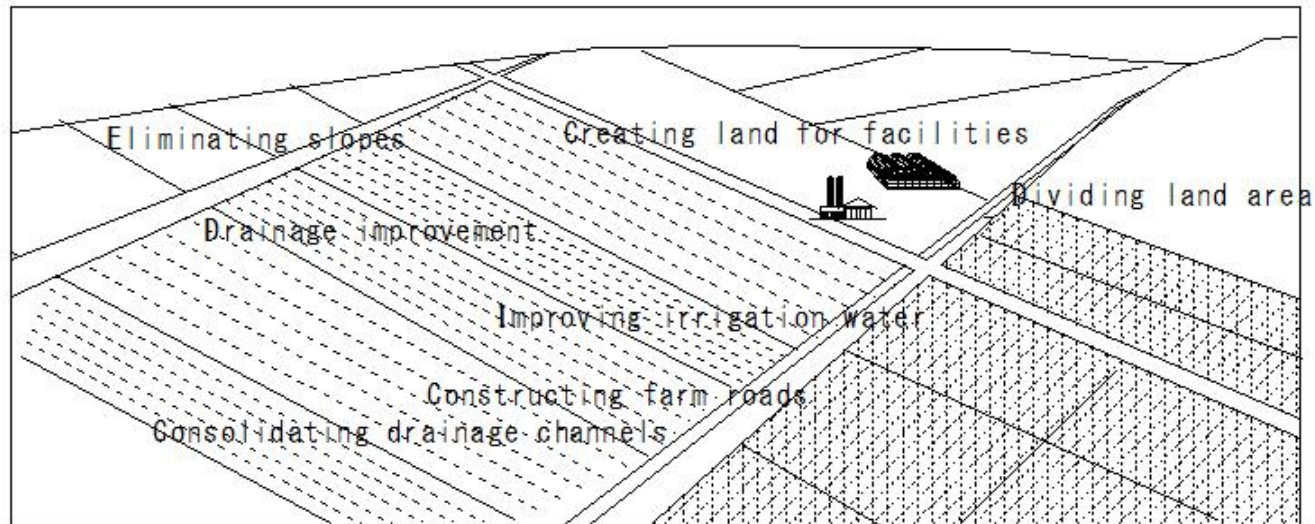
I1070

(I1074) Field preparation

(I1074) Field preparation

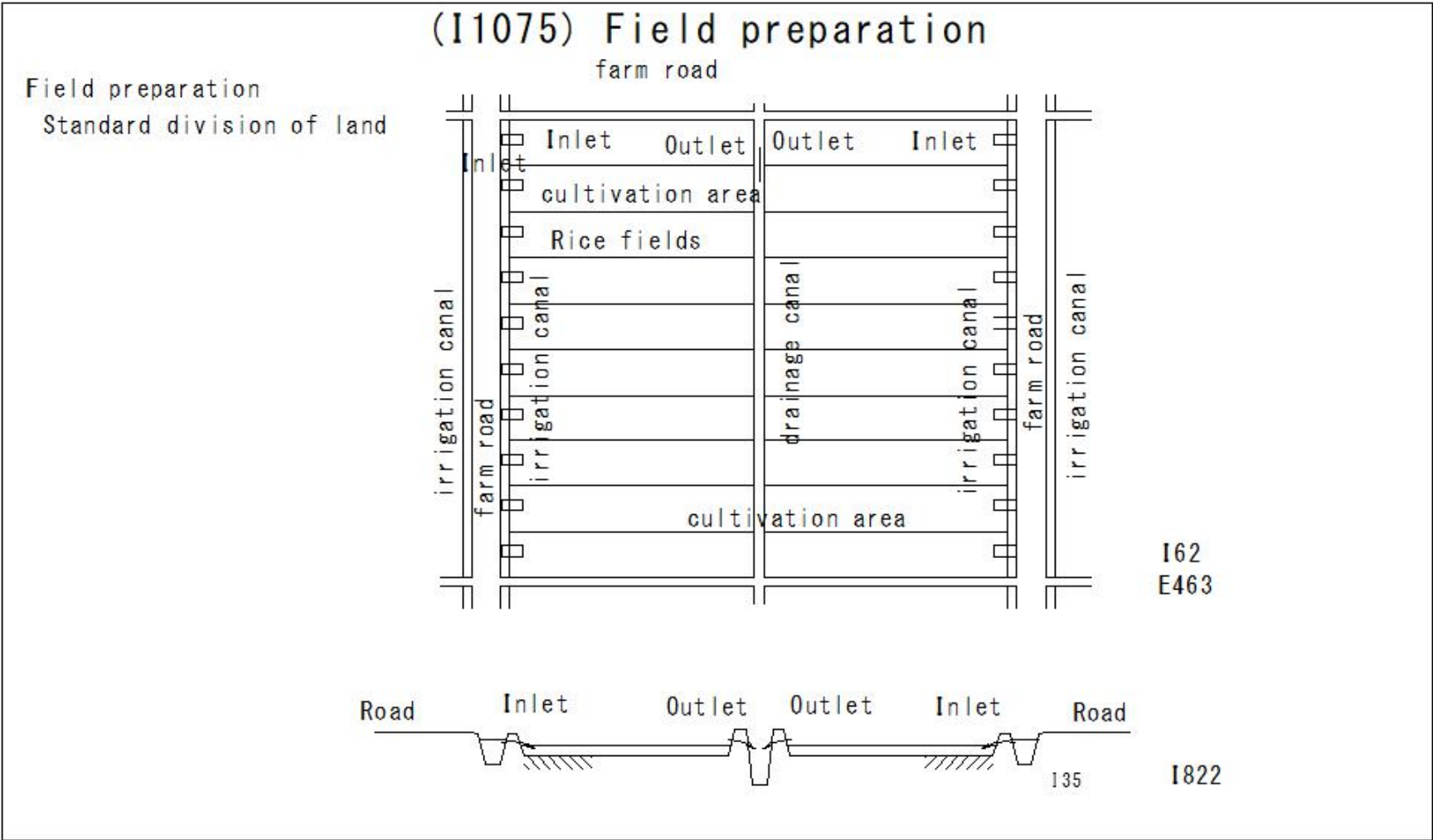
Field preparation

After preparation



- ① Land rezoning
- ② Construction of farm roads
- ③ Construction of agricultural drainage channels, etc.
- ④ Improved farming efficiency
- ⑤ Use of large machinery
- ⑥ Easier management of agricultural water
- ⑦ Improved agricultural productivity

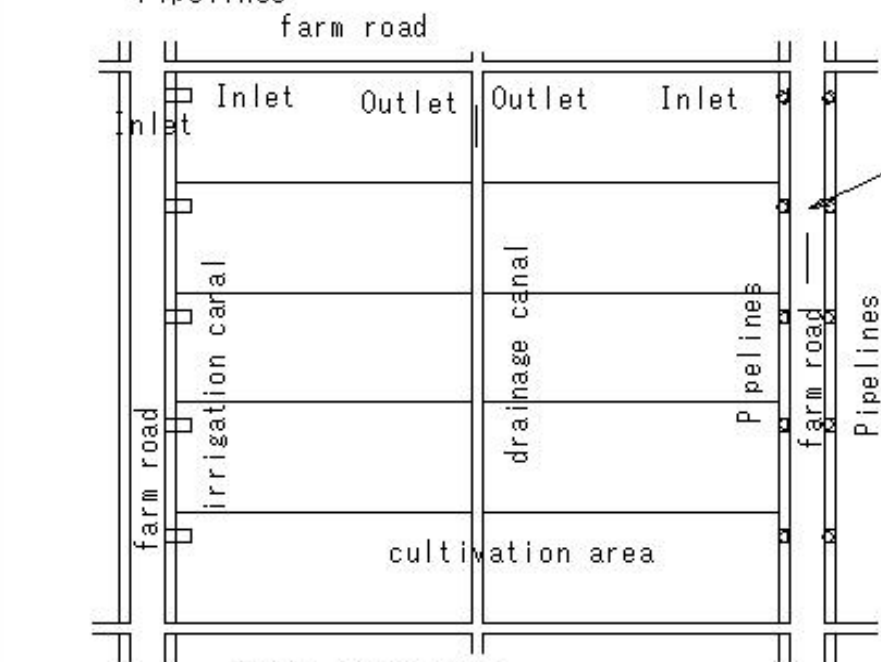
(I1075) Field preparation



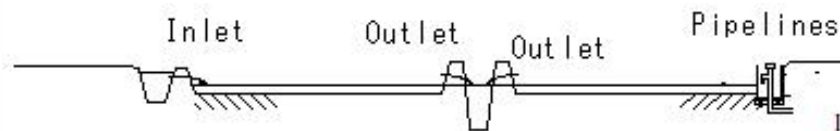
(I1076) Field preparation

(I1076) Field preparation

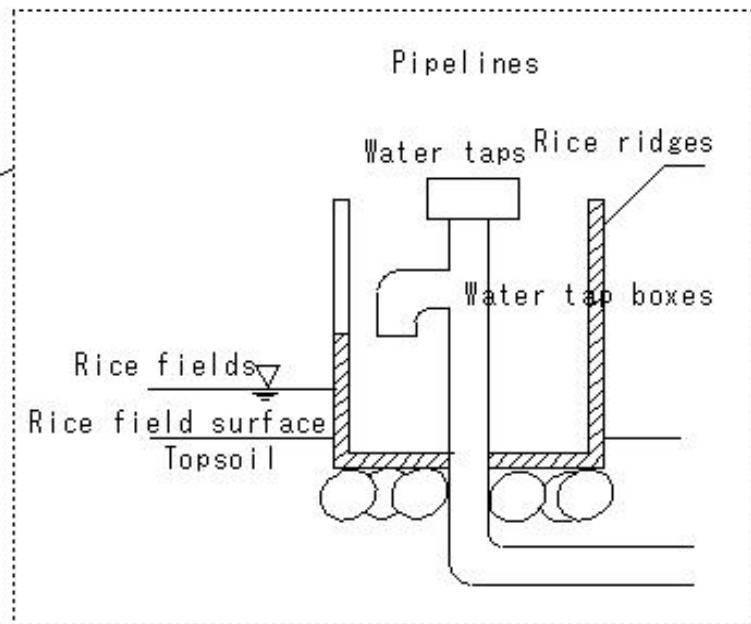
Field preparation
Pipelines



Paddy field plot



1822
162
E463



(I1077) Field preparation

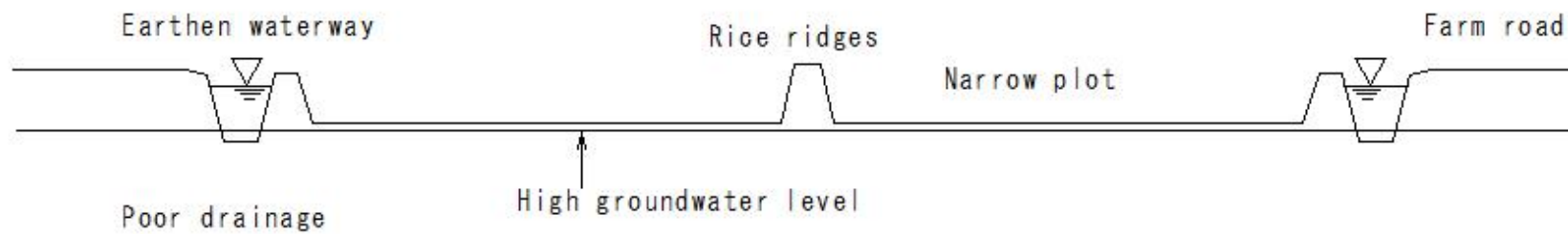
(I1077) Field preparation

Field preparation

Undeveloped rice fields

Rice planted only

Drainage for irrigation and drainage

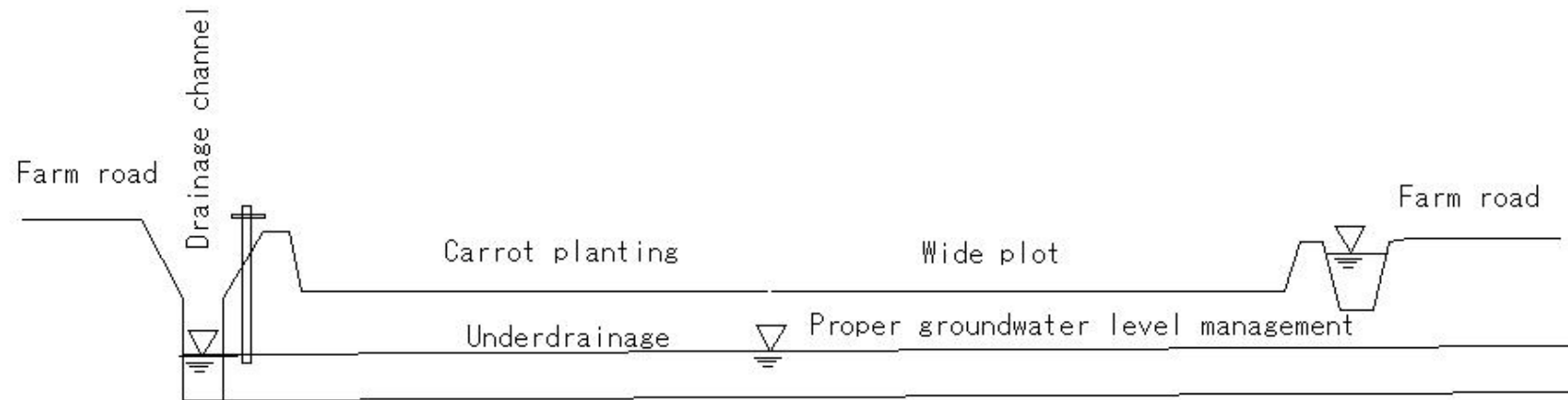


(I1078) Field preparation

(I1078) Field preparation

Field preparation

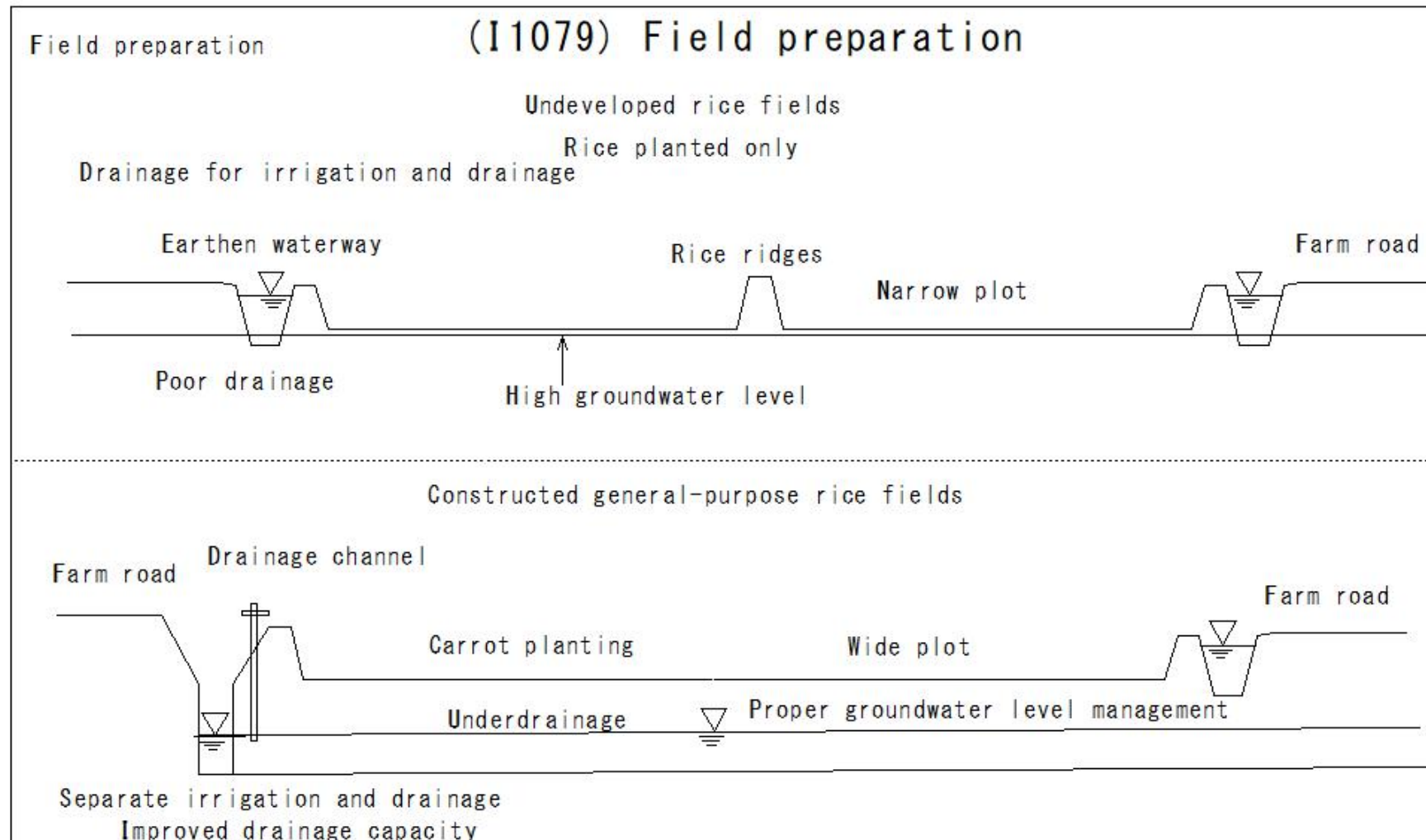
Constructed general-purpose rice fields



Separate irrigation and drainage

Improved drainage capacity

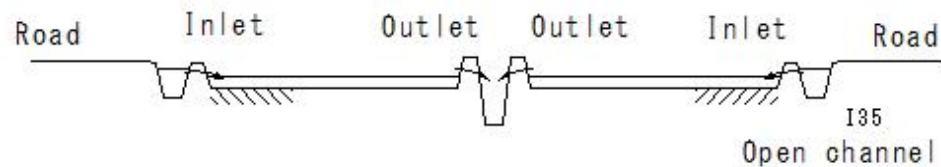
(I1079) Field preparation



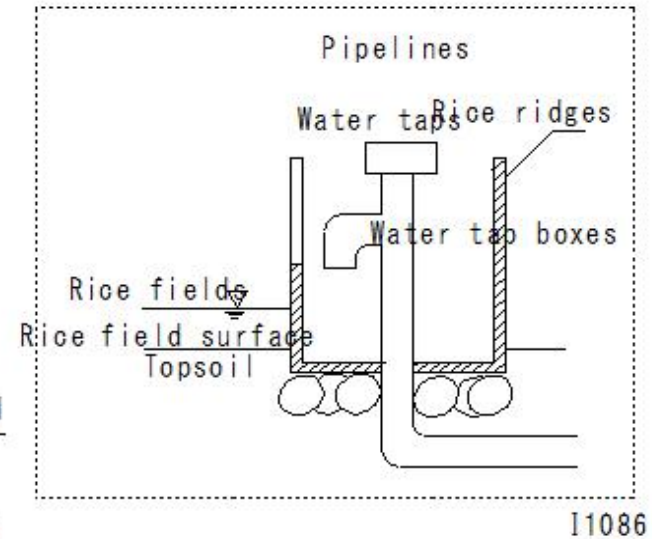
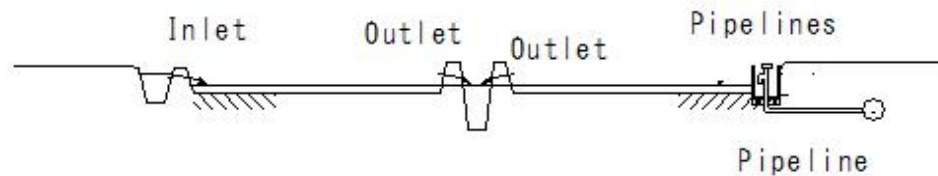
(I1080) Field preparation

(I1080) Field preparation

Pipeline



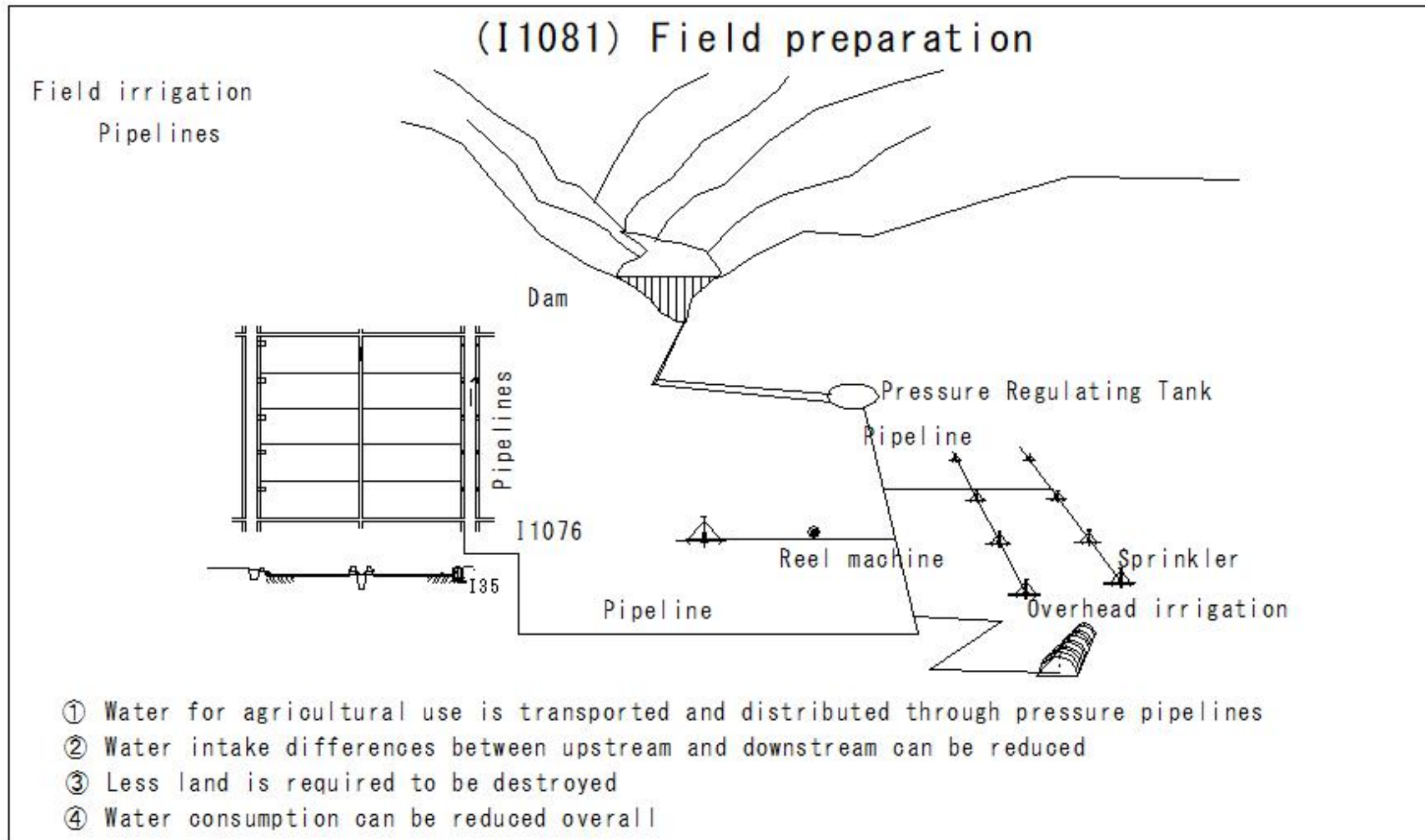
Paddy field plot



I822
I62
E463
I35

- The quality of water intake upstream and downstream can be reduced
- Less land collapse required
- Overall water consumption can be reduced

(I1081) Field preparation

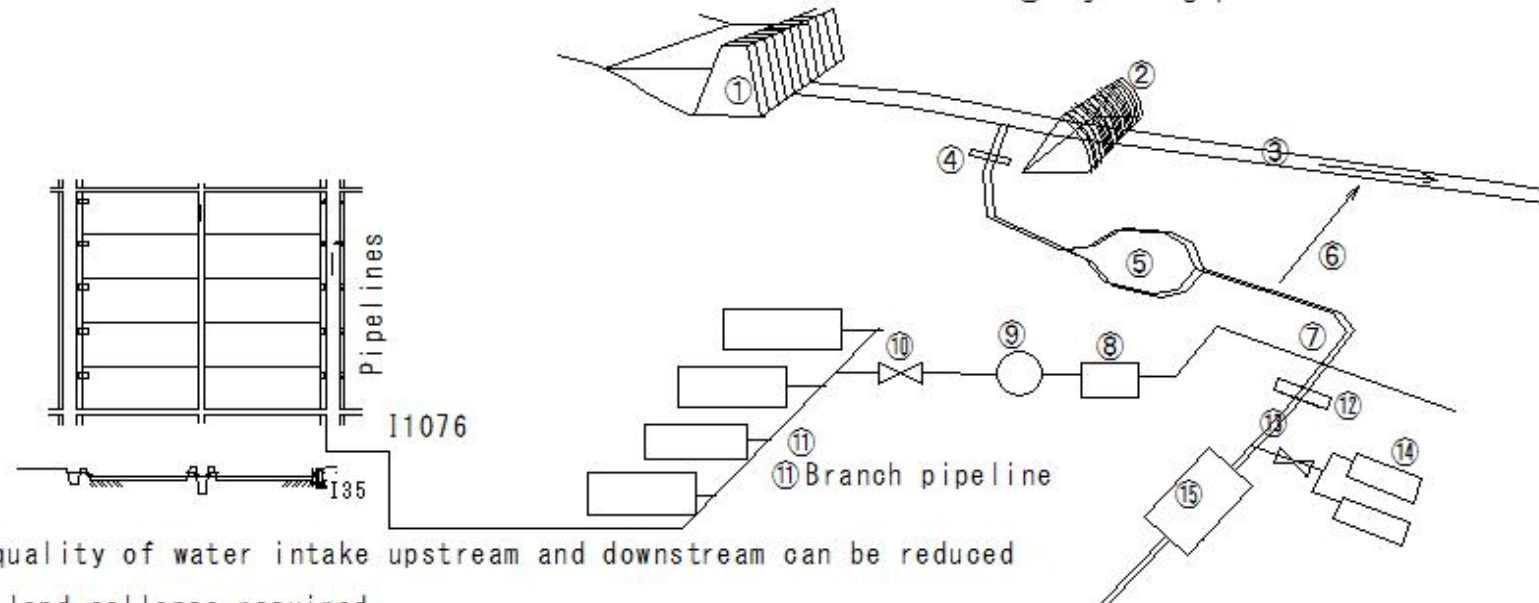


(I1082) Field preparation

(I1082) Field preparation

Pipelining of farm fields

- | | | |
|----------------------|-------------------|----------------------|
| ① Dam | ⑥ Spillway | ⑫ Check gate |
| ② Headworks | ⑦ Diversion works | ⑬ Main channel |
| ③ River | ⑧ Farm pond | ⑭ Irrigated farmland |
| ④ Intake sluice gate | ⑨ Pump | ⑮ Adjusting pond |
| ⑤ Sand trap | ⑩ Diversion valve | |



- The quality of water intake upstream and downstream can be reduced
- Less land collapse required
- Overall water consumption can be reduced

(I1083) Field preparation

(I1083) Field preparation

Pipeline

① River

② Intake

③ Headworks

④ Branch (Lateral canal)

⑤ Check gate

⑥ Main line

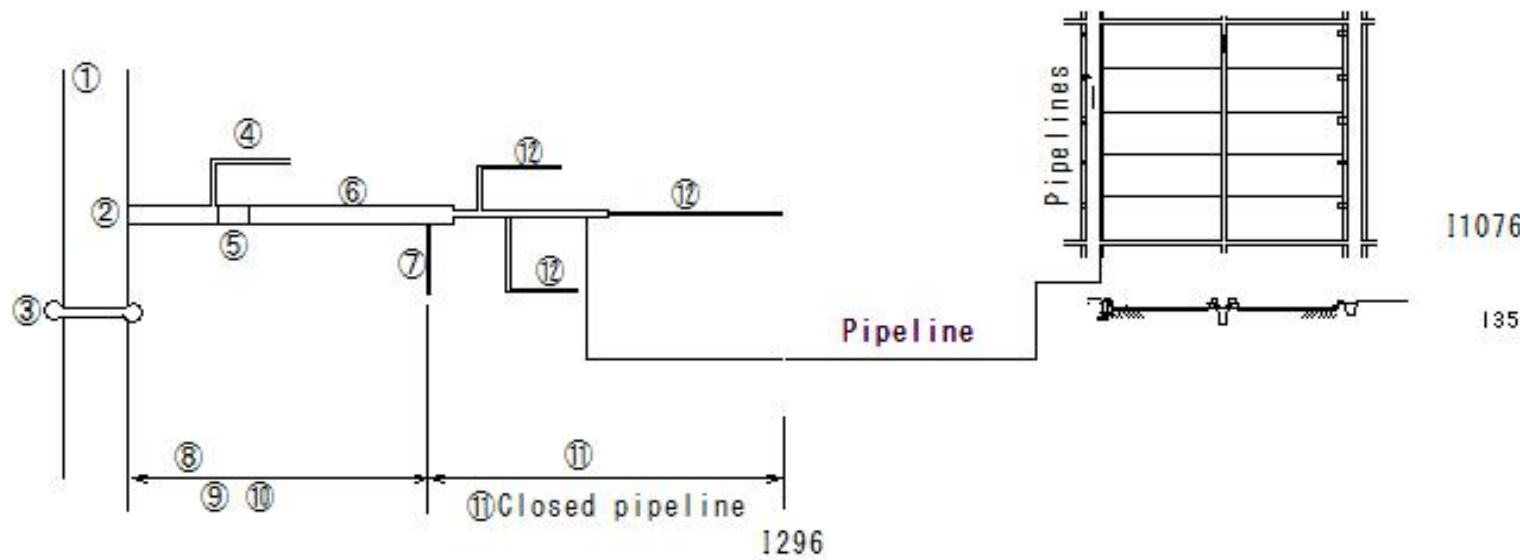
⑦ Spillway

⑧ Open channel

⑨ Tunnel

⑩ Culvert

⑫ Branch (Lateral canal)



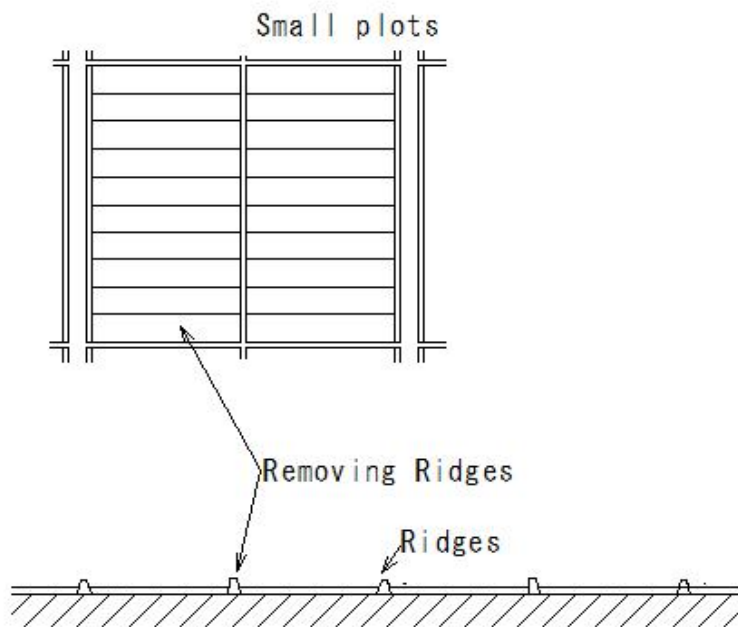
(I1084) Field preparation

(I1084) Field preparation

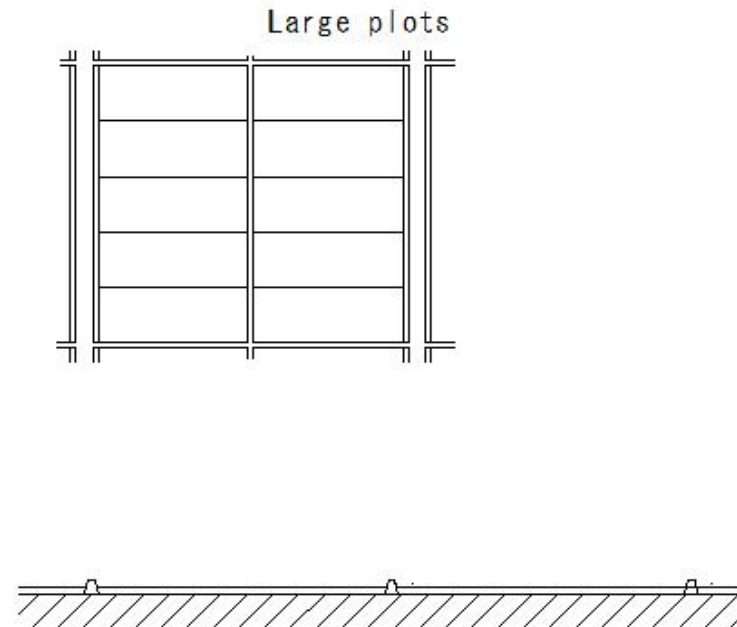
Larger plots created by removing ridges

Simple maintenance

Before



After



I62
E463
I1075

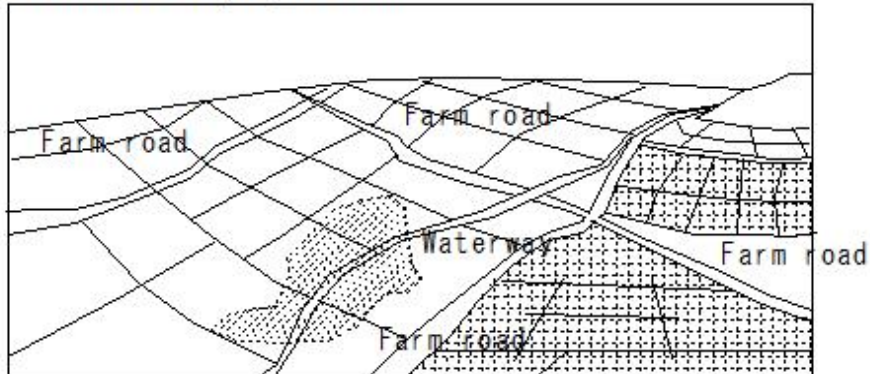
(I1085) Field preparation

(I1085) Field preparation

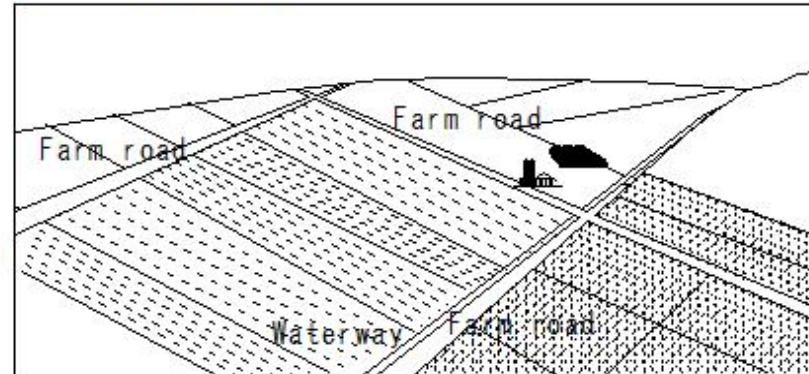
Larger plots created by removing ridges

Simple maintenance

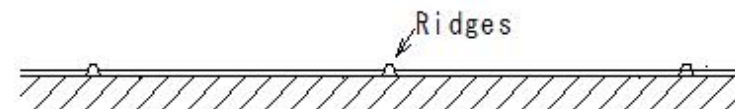
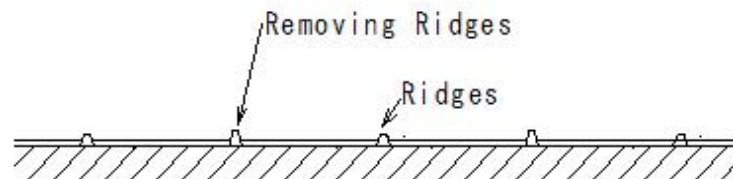
Before field preparation



After field preparation



I1071



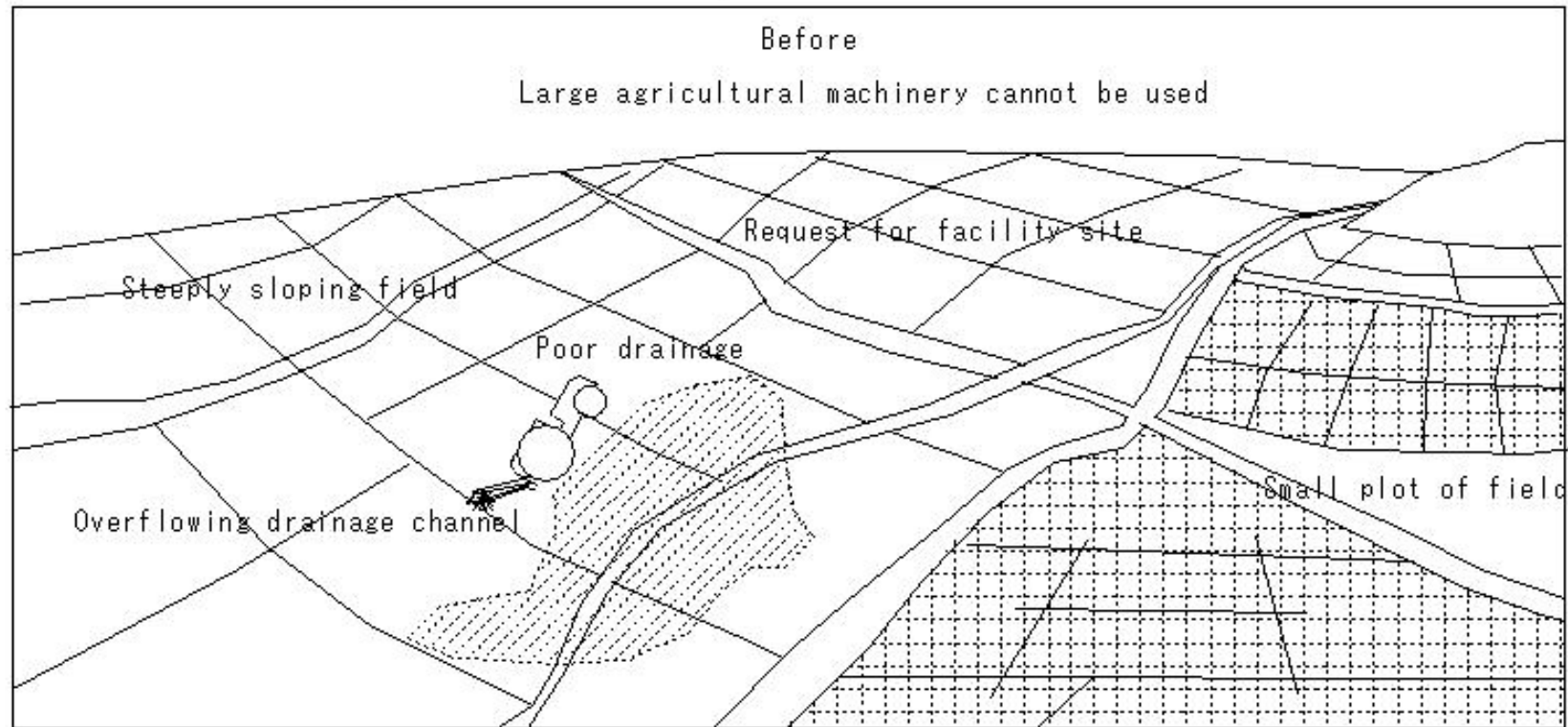
I62
E463
I1075

(I1086) Field preparation

(I1086) Field preparation

Field preparation

Introduction of large agricultural machinery



Farm road difficult to use

Water shortage/unstable

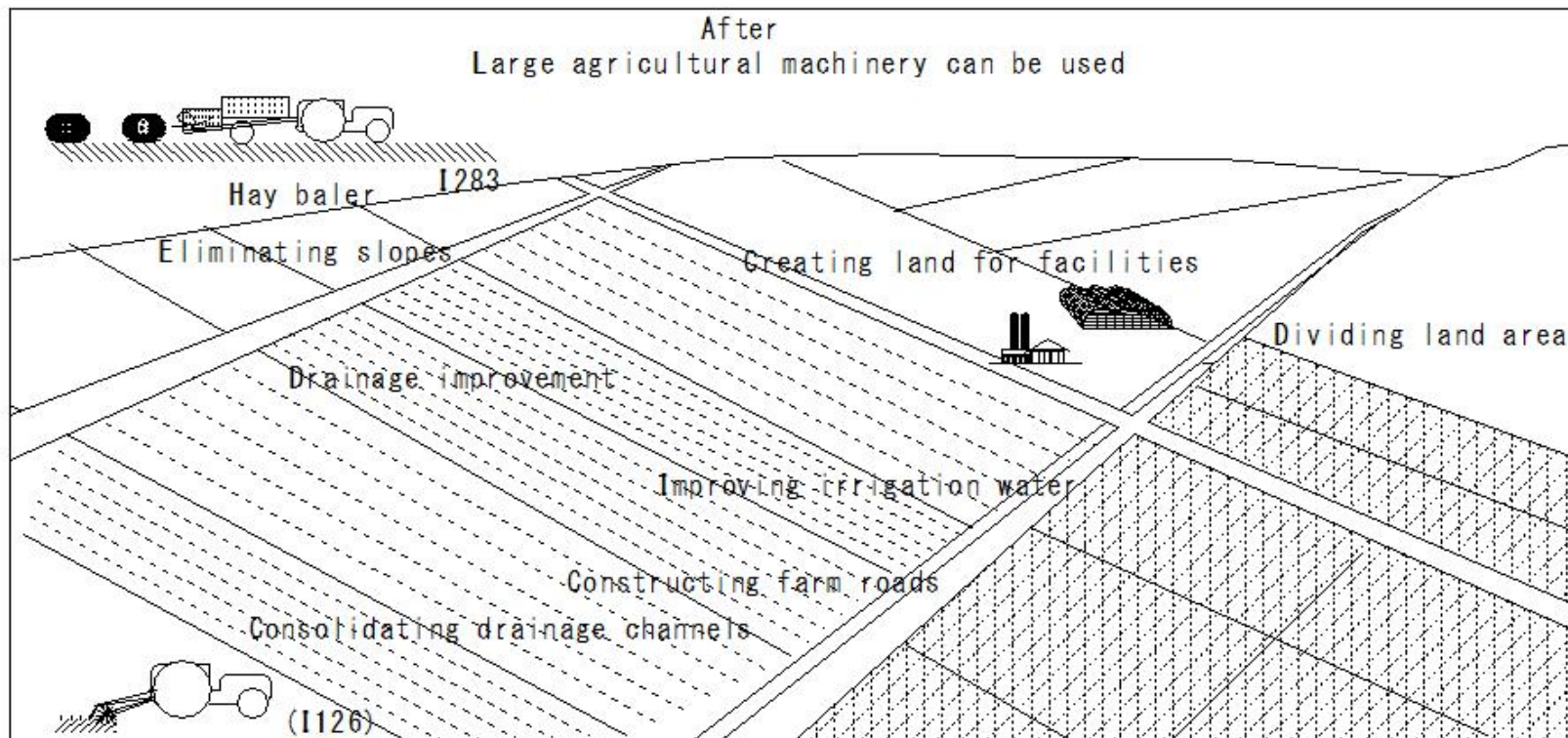
I1070

(I1087) Field preparation

(I1087) Field preparation

Field preparation

Introduction of large agricultural machinery

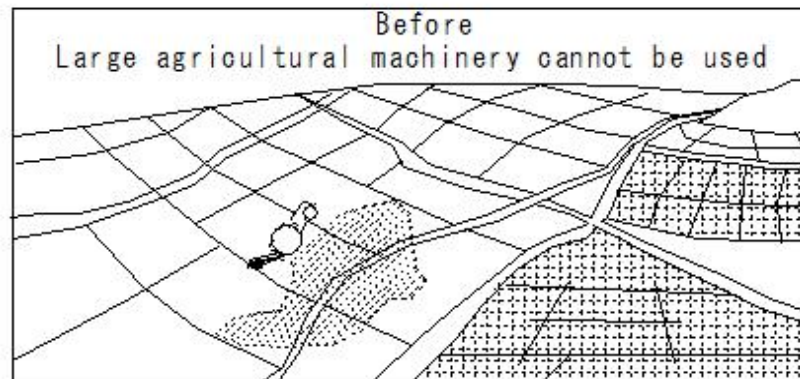


(I1088) Field preparation

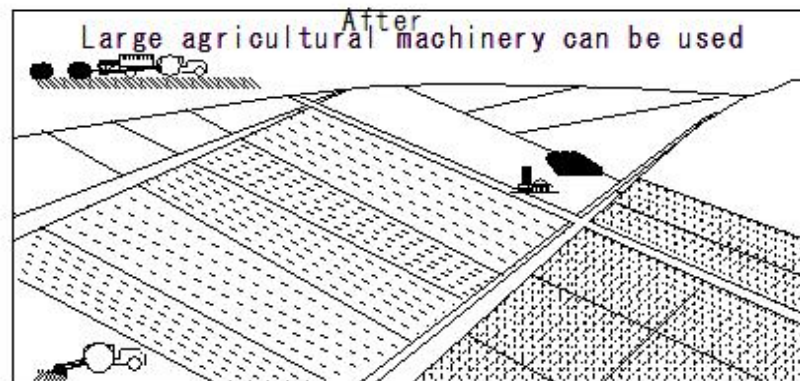
(I1088) Field preparation

Field preparation

Introduction of large agricultural machinery



I1086



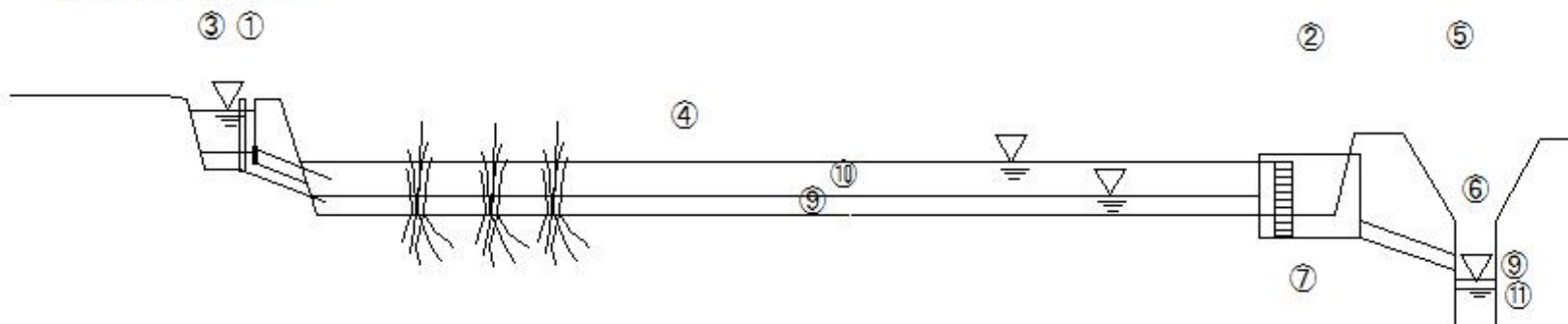
I1087

(I1089) Water inlet (water supply) • Water outlet (drainage)

(I1089) Water inlet (water supply) • Water outlet (drainage)

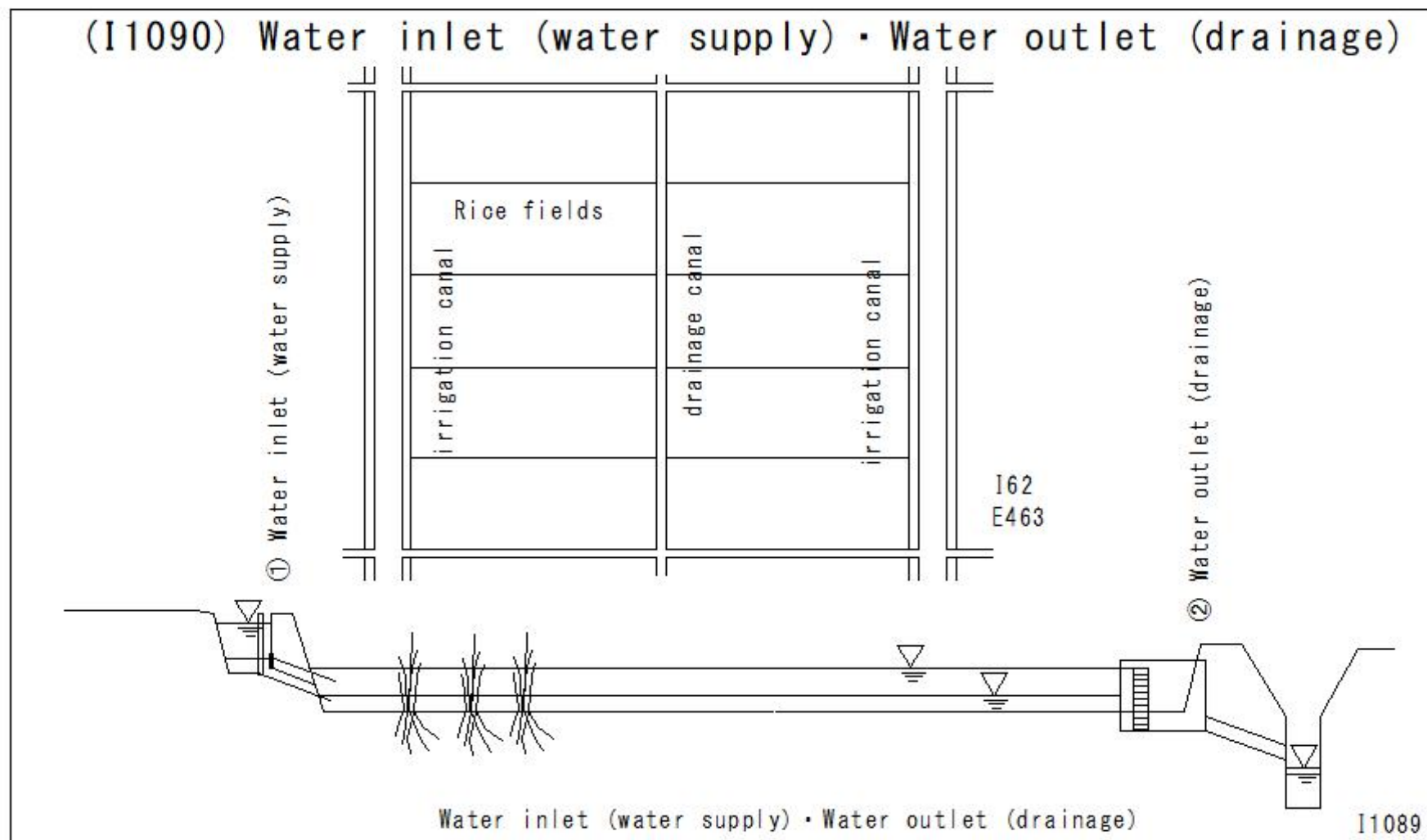
Water inlet (water supply) • Water outlet (drainage)

- ① Water inlet (water supply)
- ② Water outlet (drainage)
- ③ Water channel (water supply channel)
- ④ Paddy field
- ⑤ Drainage channel
- ⑥ Water outlet
- ⑦ Weir plate
- ⑧ Drainage pipe



- ⑨ Conventional water level
- ⑩ Water level stored by rice paddy dam
- ⑪ Water level rise in the channel is suppressed

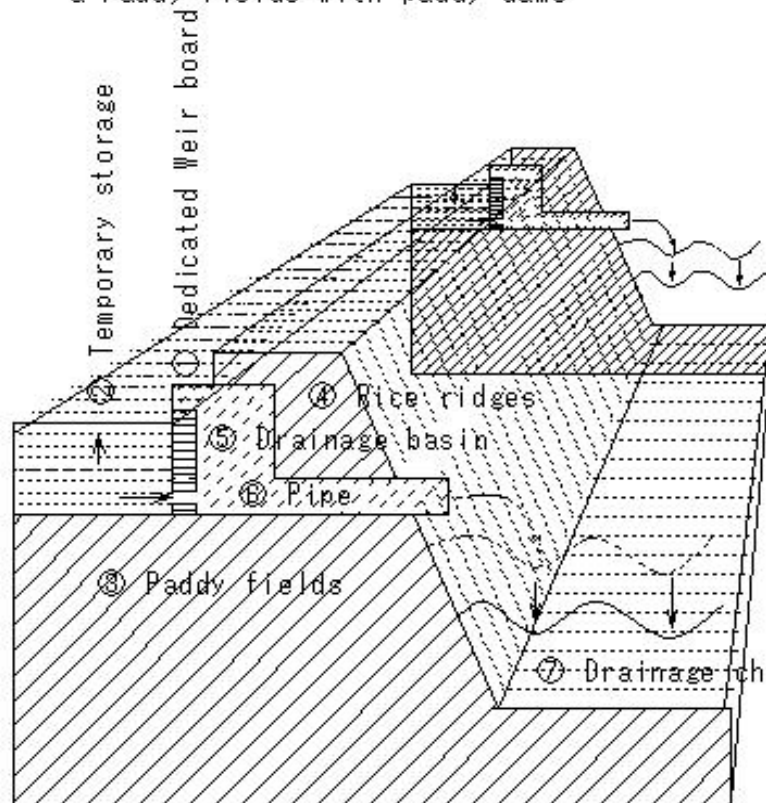
(I1090) Water inlet (water supply) • Water outlet (drainage)



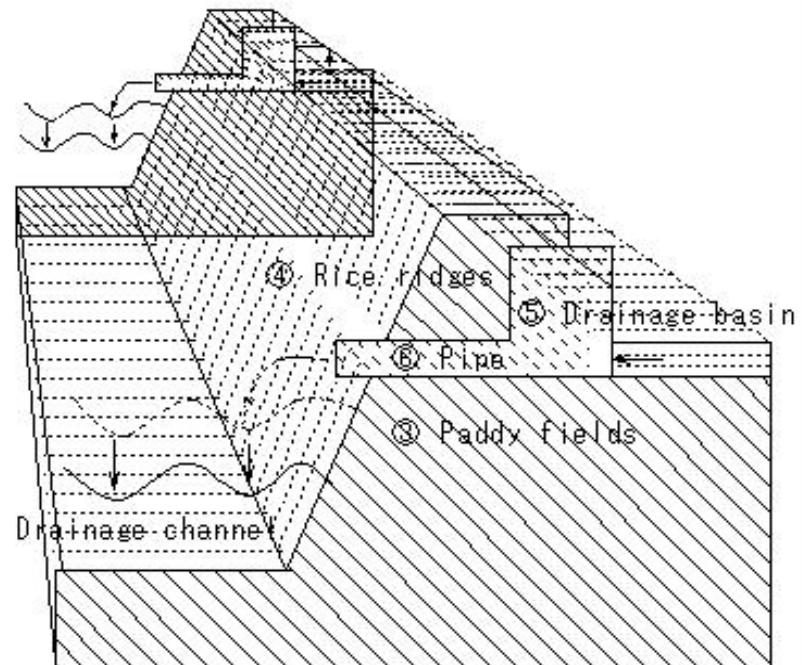
(I1091) Water inlet (water supply) • Water outlet (drainage)

(I1091) Water inlet (water supply) • Water outlet (drainage)

a Paddy fields with paddy dams



b Paddy fields without paddy dams

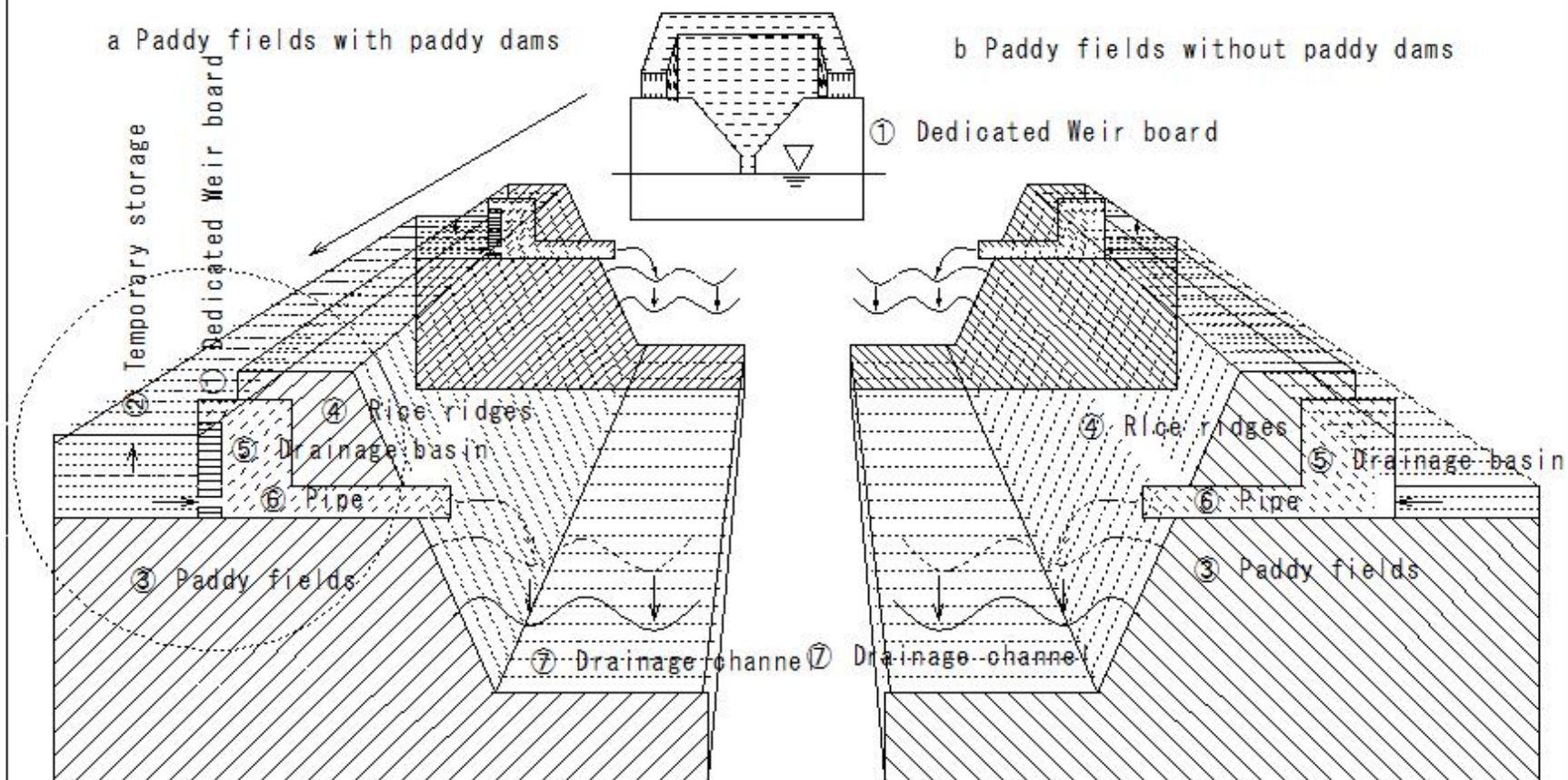


(I1092) Water inlet (water supply) • Water outlet (drainage)

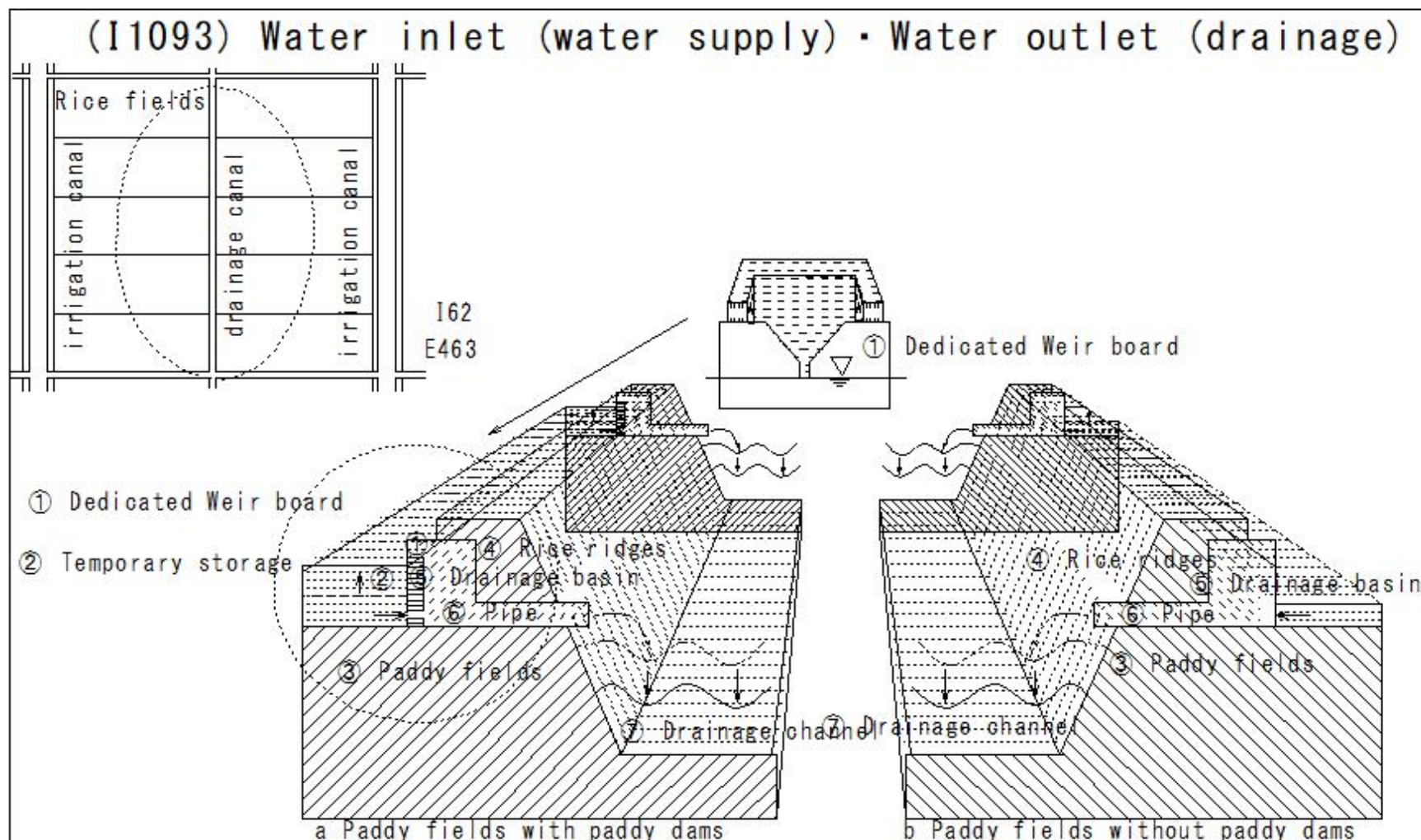
(I1092) Water inlet (water supply) • Water outlet (drainage)

a Paddy fields with paddy dams

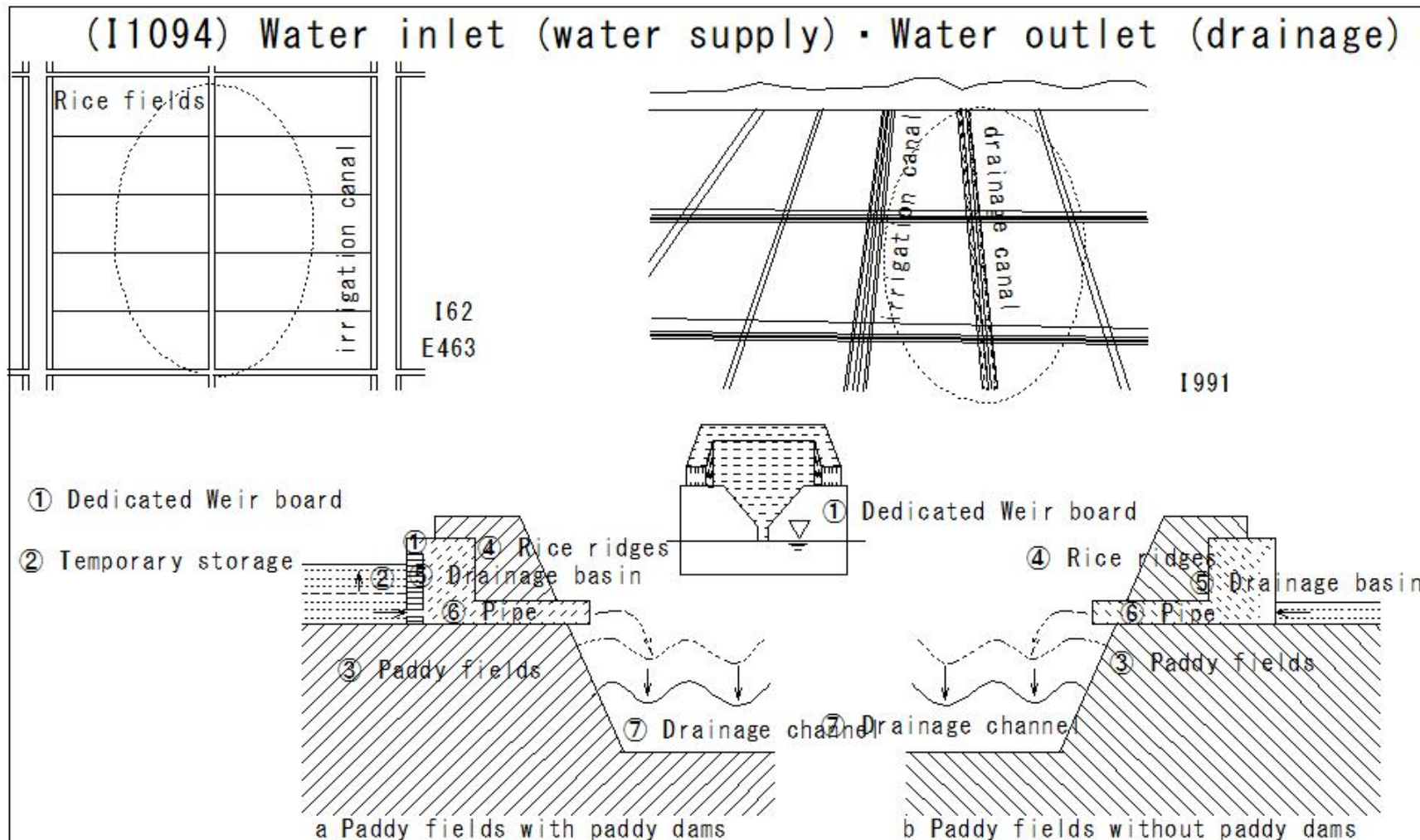
b Paddy fields without paddy dams



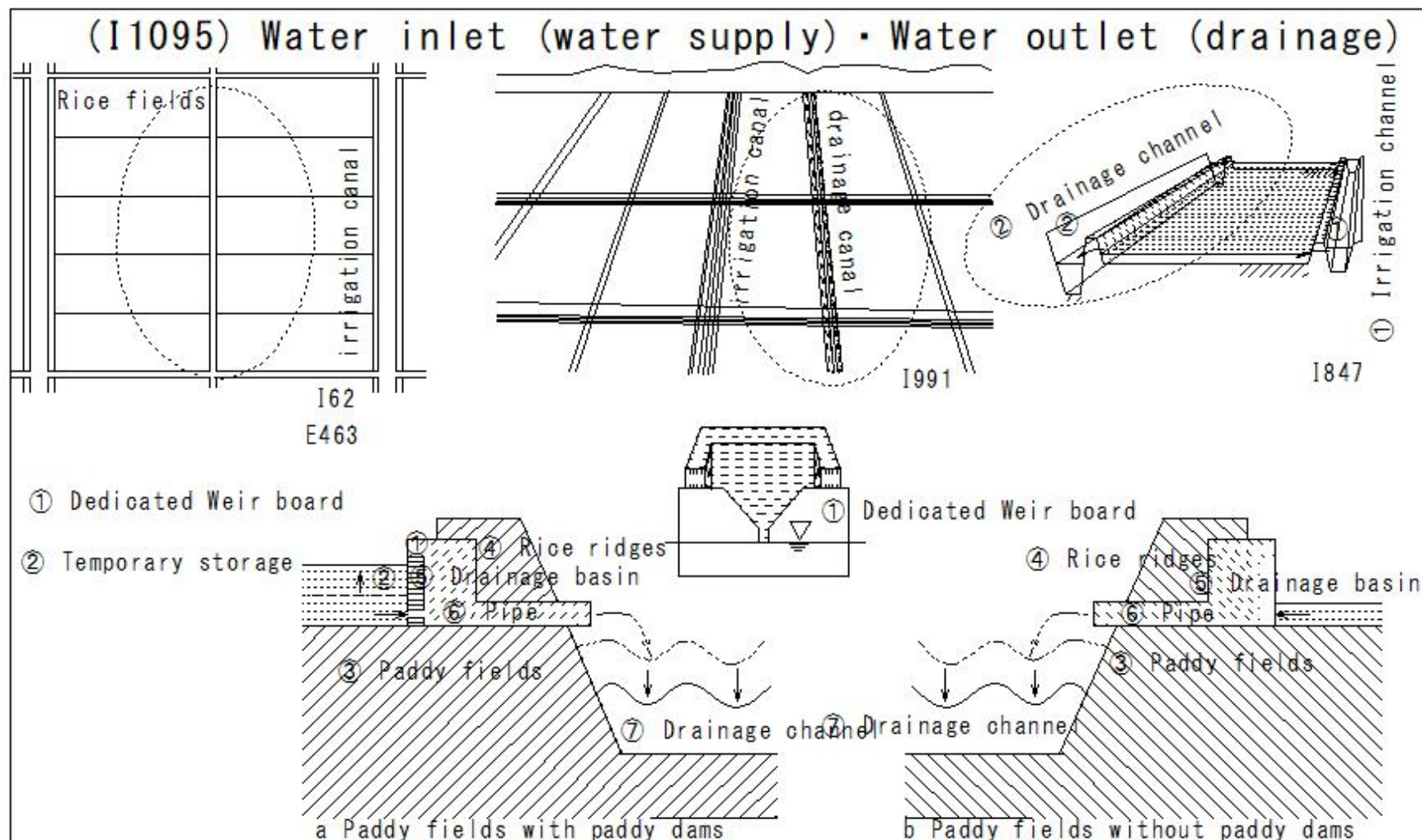
(I1093) Water inlet (water supply) • Water outlet (drainage)



(I1094) Water inlet (water supply) • Water outlet (drainage)

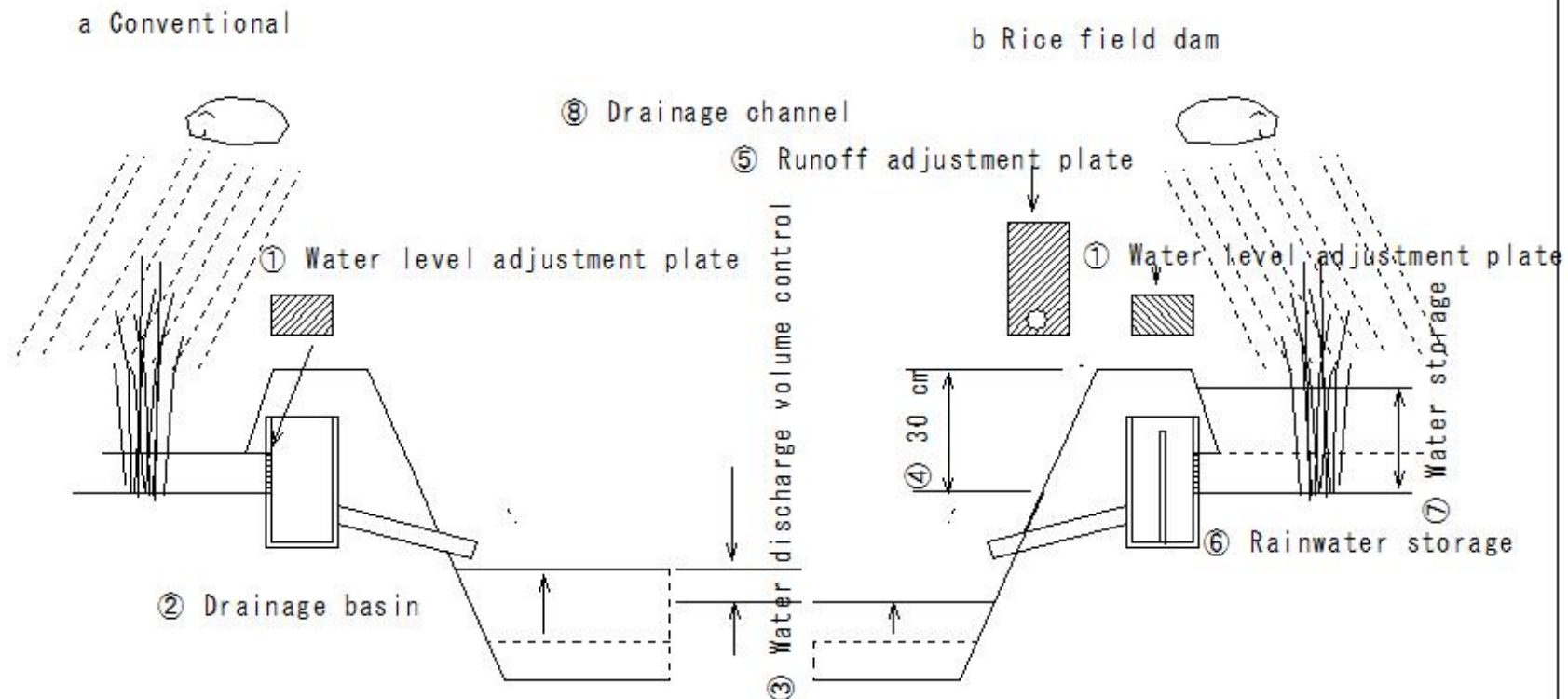


(I1095) Water inlet (water supply) • Water outlet (drainage)

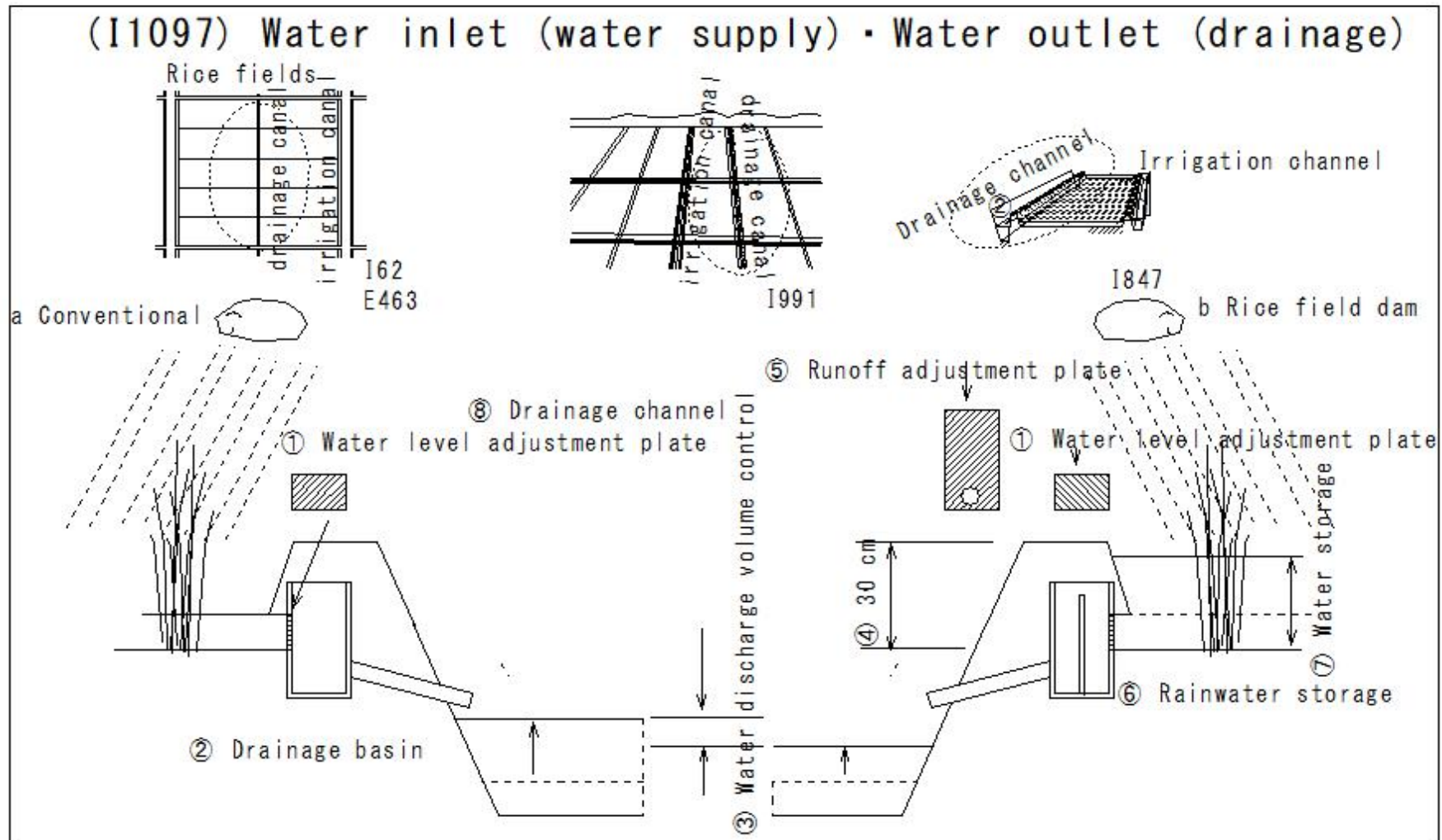


(I1096) Water inlet (water supply) • Water outlet (drainage)

(I1096) Water inlet (water supply) • Water outlet (drainage)



(I1097) Water inlet (water supply) • Water outlet (drainage)

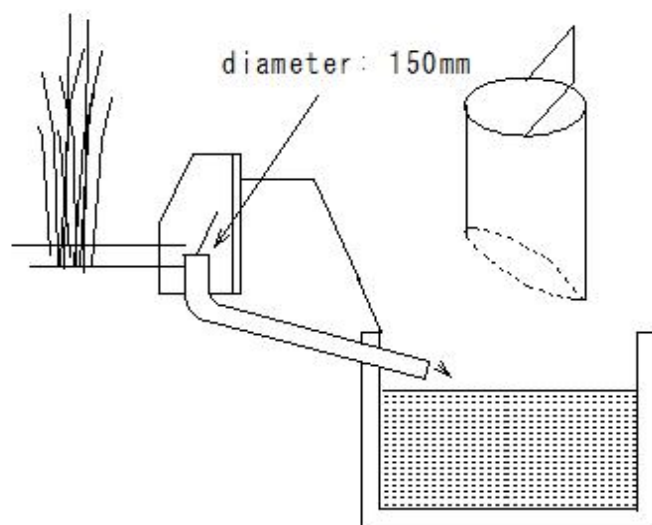


(I1098) Water inlet (water supply) • Water outlet (drainage)

(I1098) Water inlet (water supply) • Water outlet (drainage)

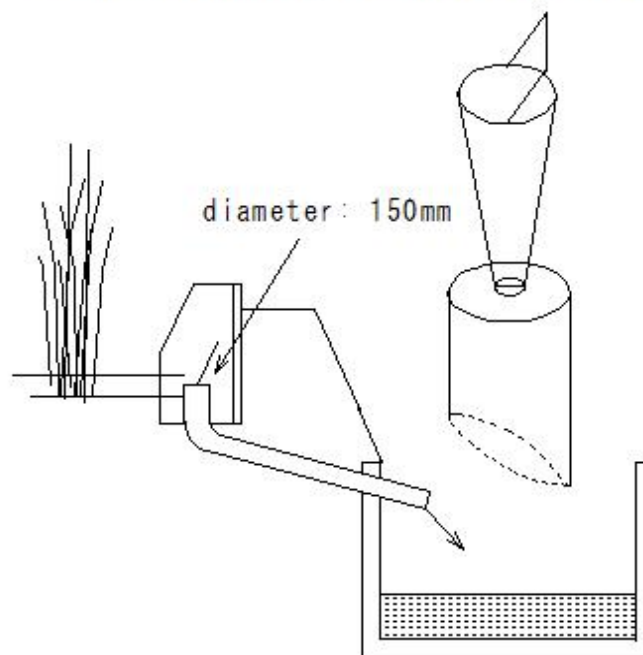
a Conventional

- ① Conventional water distribution pipe Outlet diameter: 150mm
- Rain that falls on rice fields is quickly drained
 - Causes rivers and drainage channels to flood
 - Increases the risk of flooding



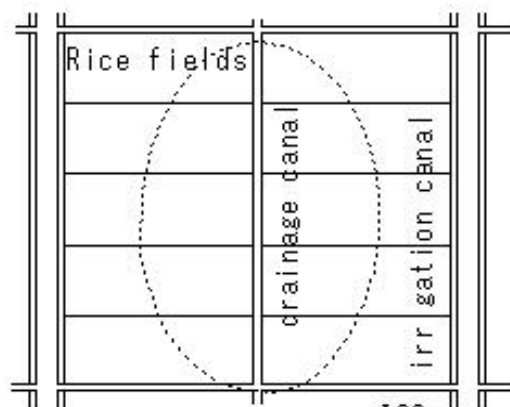
b Rice field dam

- ② Water flow control pipe Outlet diameter: 50mm
- Temporarily stores rainwater in rice fields
 - Drains it little by little over time
 - Reduce flooding in rivers and drainage channels



(I1099) Water inlet (water supply) • Water outlet (drainage)

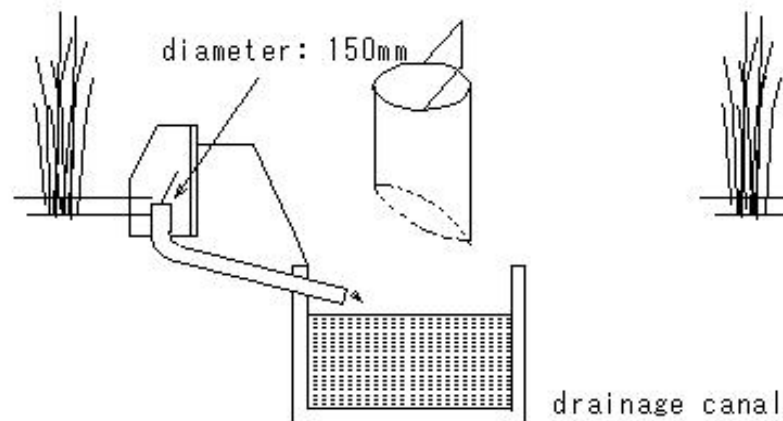
(I1099) Water inlet (water supply) • Water outlet (drainage)



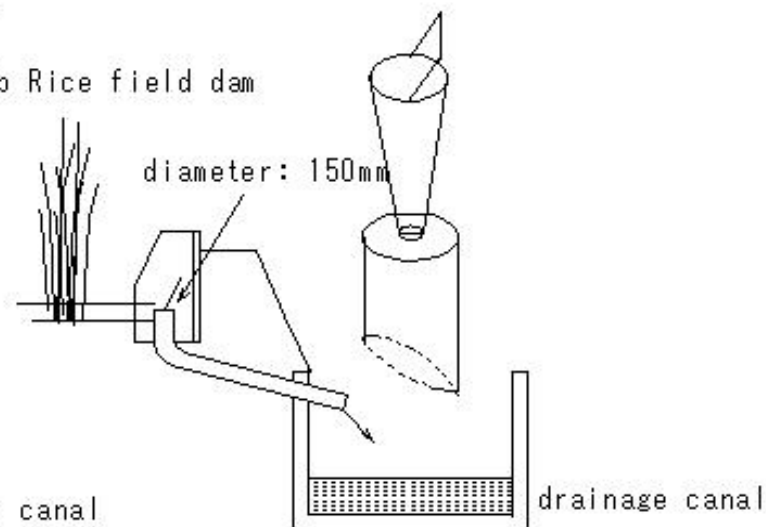
I62

E463

a Conventional

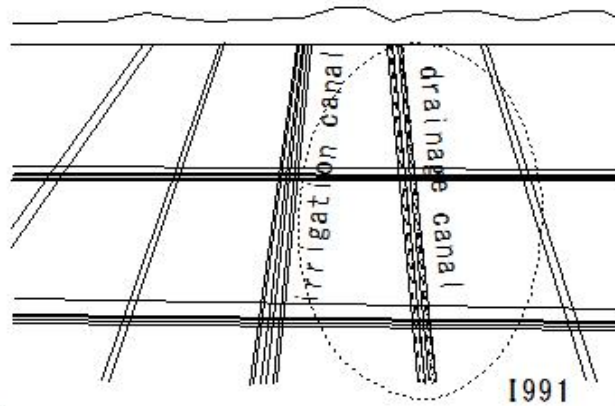


b Rice field dam

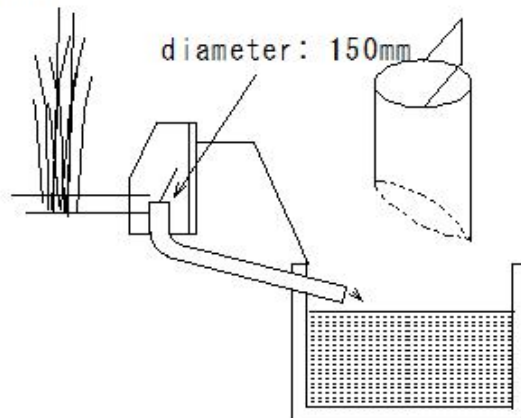


(I1100) Water inlet (water supply) • Water outlet (drainage)

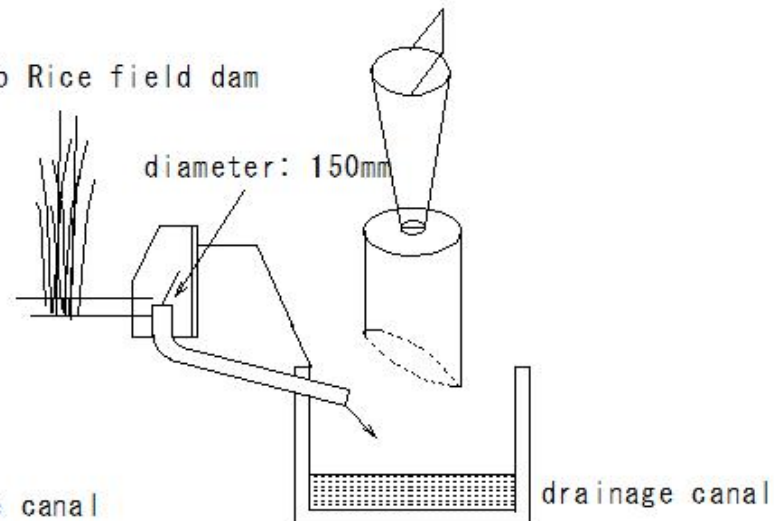
(I1100) Water inlet (water supply) • Water outlet (drainage)



a Conventional

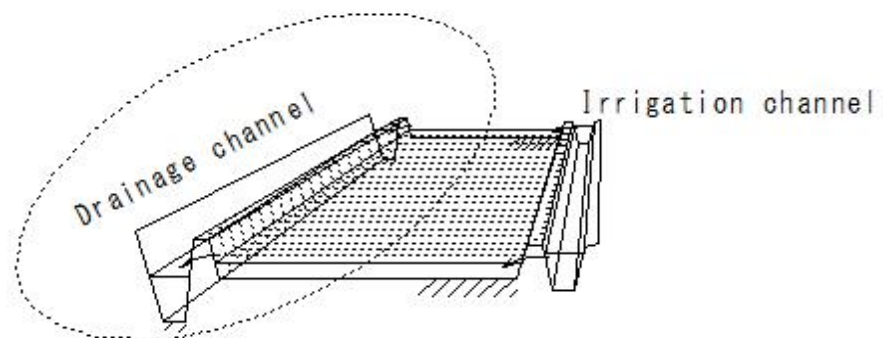


b Rice field dam

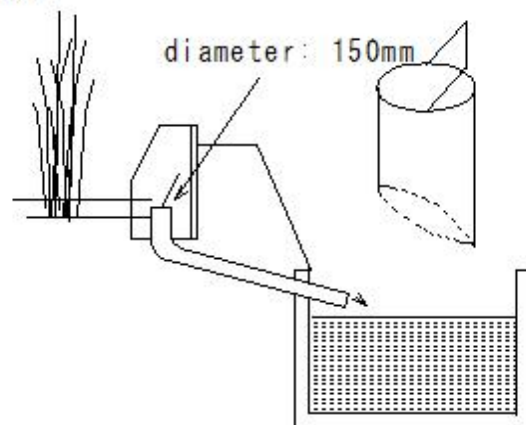


(I1101) Water inlet (water supply) • Water outlet (drainage)

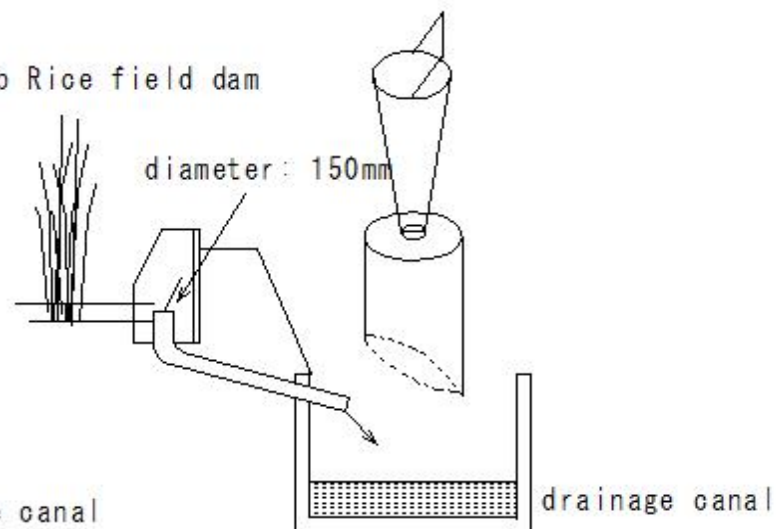
(I1101) Water inlet (water supply) • Water outlet (drainage)



a Conventional



b Rice field dam



(I1102) Water inlet (water supply) • Water outlet (drainage)

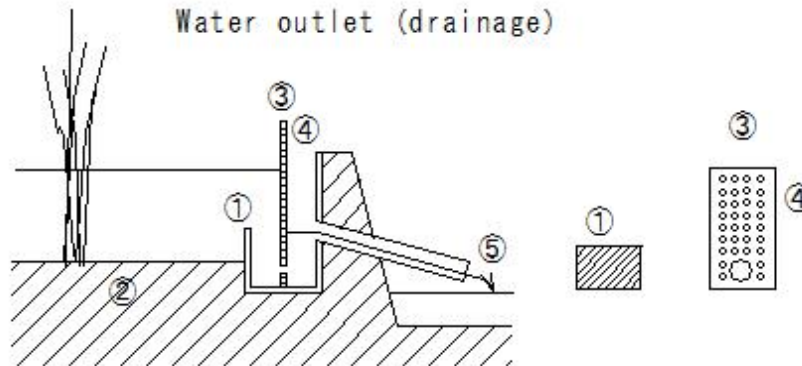
(I1102) Water inlet (water supply) • Water outlet (drainage)

Water outlet (drainage)

- ① A board that stores water
- ② Rice field
- ③ A water level adjustment board
- ④ A small hole that drains water gently
- ⑤ A drainage channel

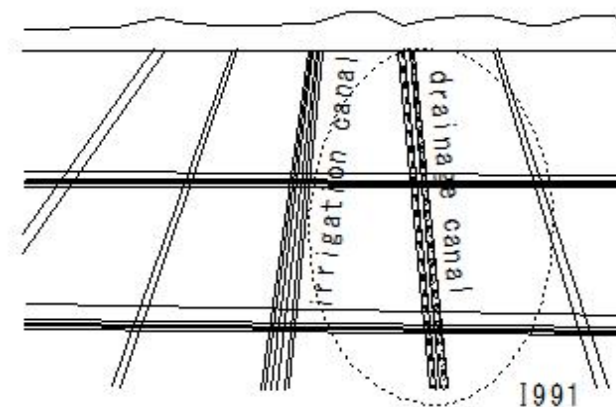
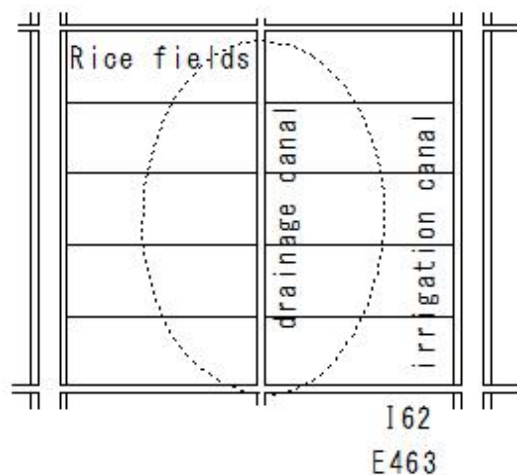
b Rice field dam

Water outlet (drainage)



(I1103) Water inlet (water supply) • Water outlet (drainage)

(I1103) Water inlet (water supply) • Water outlet (drainage)

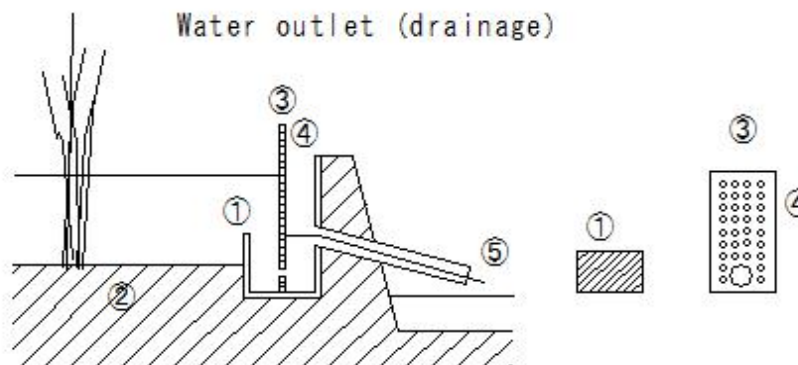


Water outlet (drainage)

- ① A board that stores water
- ② Rice field
- ③ A water level adjustment board
- ④ A small hole that drains water gently
- ⑤ A drainage channel

b Rice field dam

Water outlet (drainage)



(I1104) Water inlet (water supply) • Water outlet (drainage)

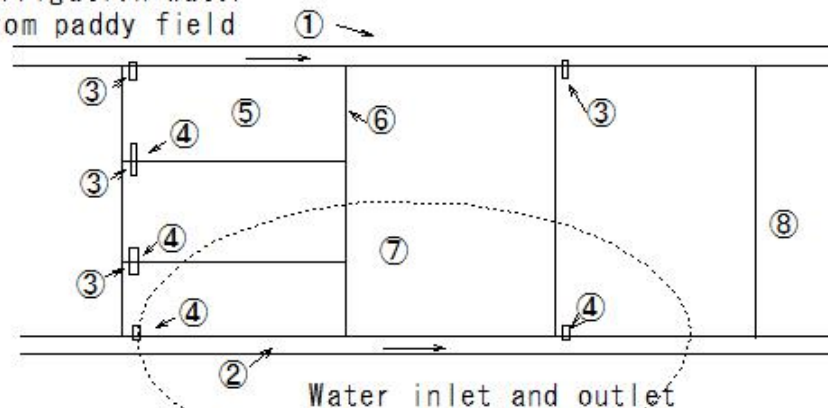
(I1104) Water inlet (water supply) • Water outlet (drainage)

- ① Water channel
- ② Drainage channel
- ③ Water inlet
- ④ Water outlet
- ⑤ Paddy field
- ⑥ Ridge
- ⑦ Rice field crossing
- ⑧ Large paddy field

Paddy sluice-Paddy field Drainage

Intake of irrigation water

Drainage from paddy field



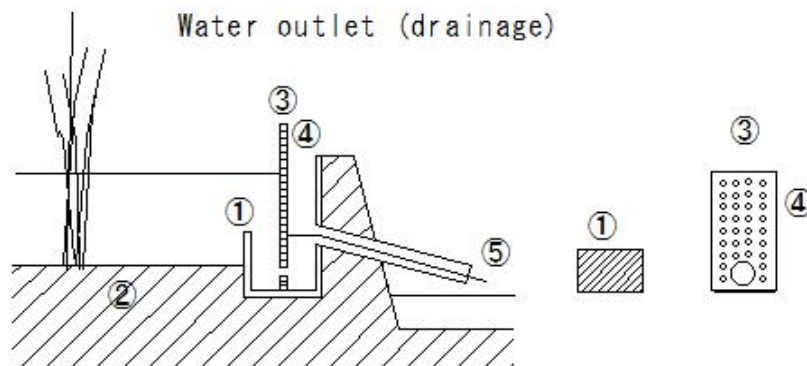
1879
1321

b. Rice field dam

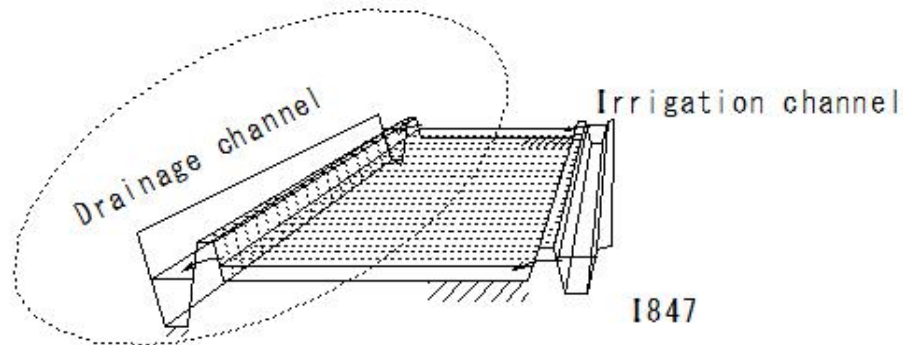
Water outlet (drainage)

Water outlet (drainage)

- ① A board that stores water
- ② Rice field
- ③ A water level adjustment board
- ④ A small hole that drains water gently
- ⑤ A drainage channel



(I1105) Water inlet (water supply) • Water outlet (drainage)

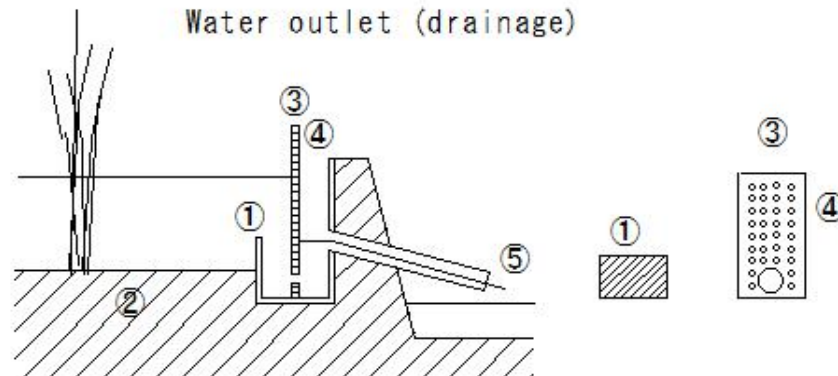


Water outlet (drainage)

- ① A board that stores water
- ② Rice field
- ③ A water level adjustment board
- ④ A small hole that drains water gently
- ⑤ A drainage channel

b Rice field dam

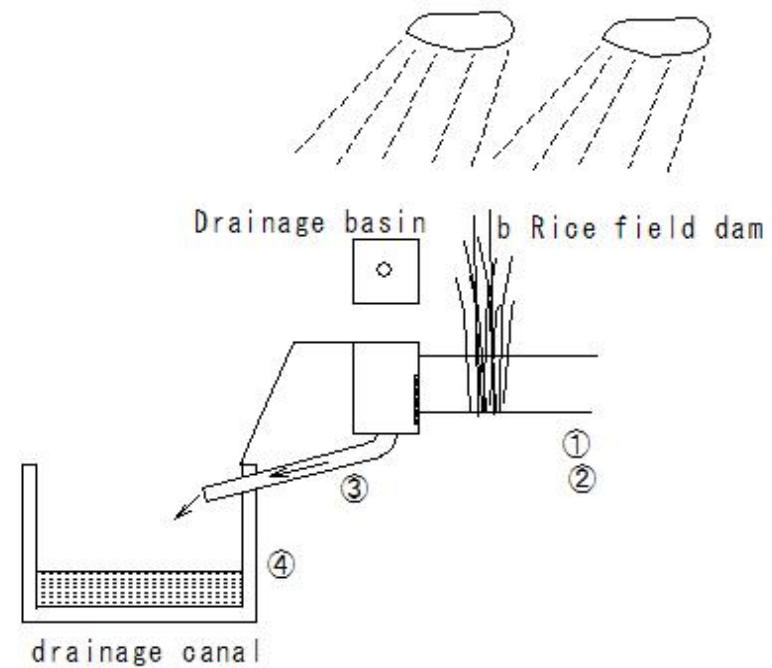
Water outlet (drainage)



(I1106) Water inlet (water supply) • Water outlet (drainage)

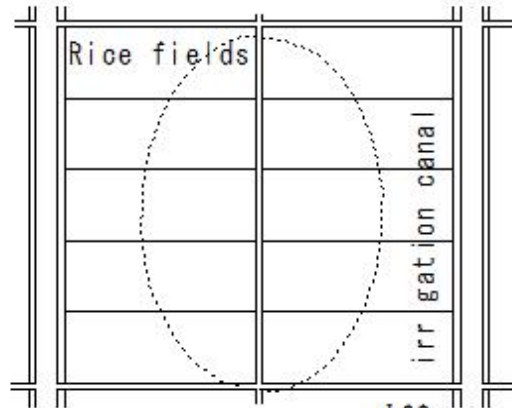
(I1106) Water inlet (water supply) • Water outlet (drainage)

- ① Water level in rice paddy rises
- ② Rainwater is stored in rice paddy
- ③ Slowly drains water from rice paddy
- ④ Reduces drainage flow rate



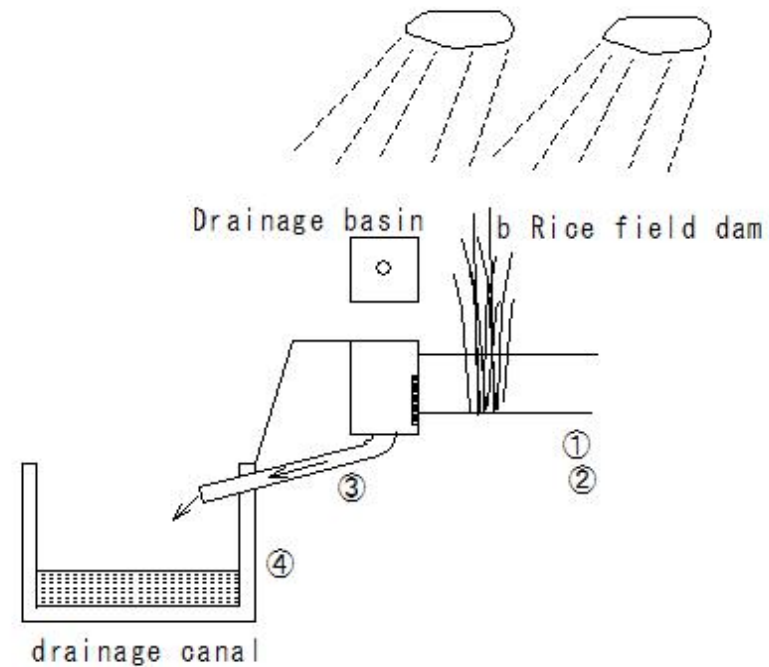
(I1107) Water inlet (water supply) • Water outlet (drainage)

(I1107) Water inlet (water supply) • Water outlet (drainage)



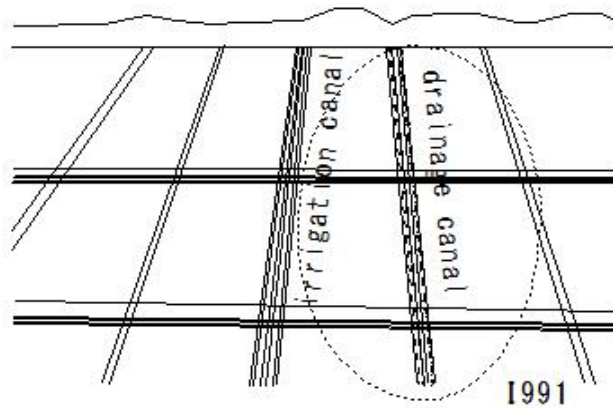
162
E463

- ① Water level in rice paddy rises
- ② Rainwater is stored in rice paddy
- ③ Slowly drains water from rice paddy
- ④ Reduces drainage flow rate

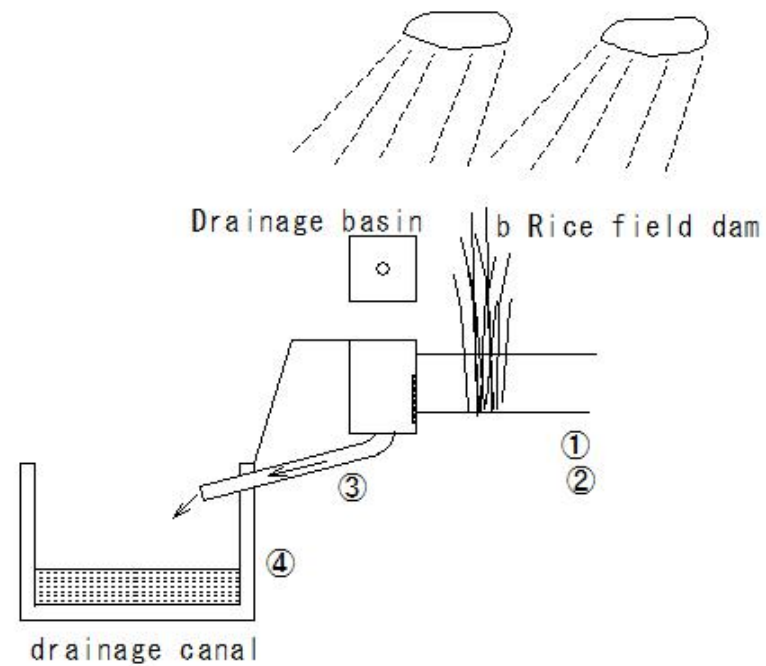


(I1108) Water inlet (water supply) • Water outlet (drainage)

(I1108) Water inlet (water supply) • Water outlet (drainage)

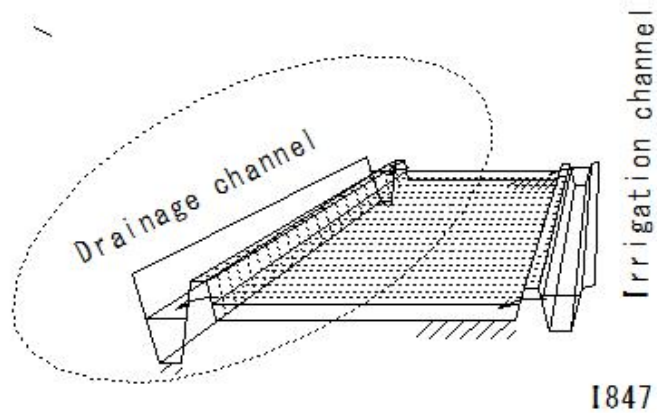


- ① Water level in rice paddy rises
- ② Rainwater is stored in rice paddy
- ③ Slowly drains water from rice paddy
- ④ Reduces drainage flow rate

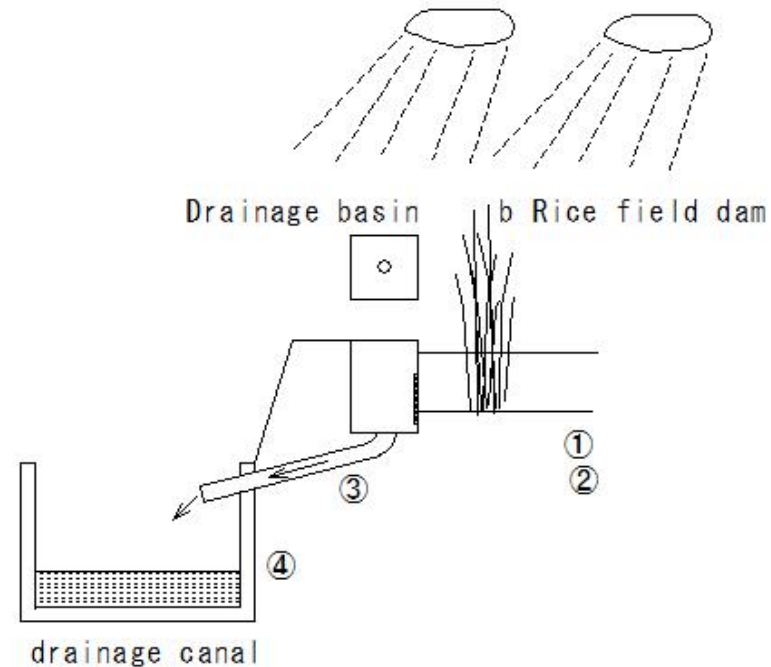


(I1109) Water inlet (water supply) • Water outlet (drainage)

(I1109) Water inlet (water supply) • Water outlet (drainage)



- ① Water level in rice paddy rises
- ② Rainwater is stored in rice paddy
- ③ Slowly drains water from rice paddy
- ④ Reduces drainage flow rate



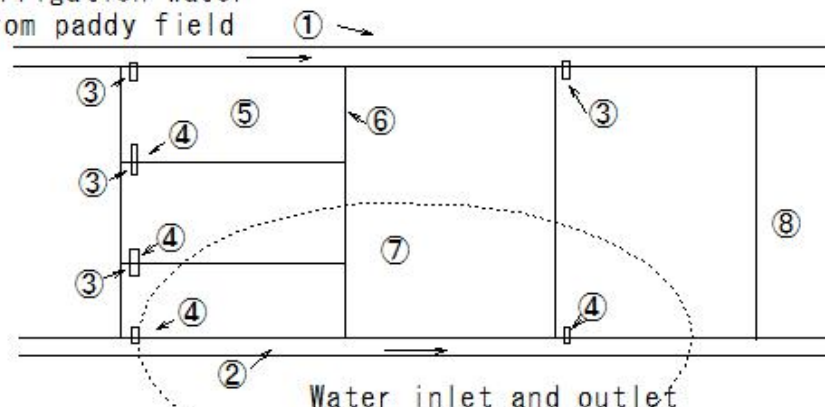
(I1110) Water inlet (water supply) • Water outlet (drainage)

(I1110) Water inlet (water supply) • Water outlet (drainage)

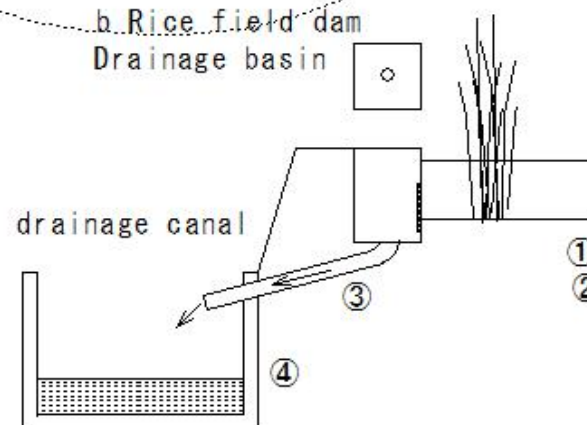
Paddy sluice-Paddy field Drainage

- ① Water channel
- ② Drainage channel
- ③ Water inlet
- ④ Water outlet
- ⑤ Paddy field
- ⑥ Ridge
- ⑦ Rice field crossing
- ⑧ Large paddy field

Intake of irrigation water
Drainage from paddy field



b Rice field dam
b Rice field dam
Drainage basin



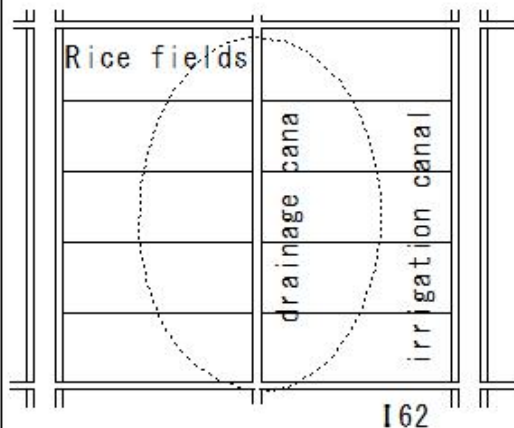
- ① Water level in rice paddy rises
- ② Rainwater is stored in rice paddy
- ③ Slowly drains water from rice paddy
- ④ Reduces drainage flow rate

1879
1321
I1104

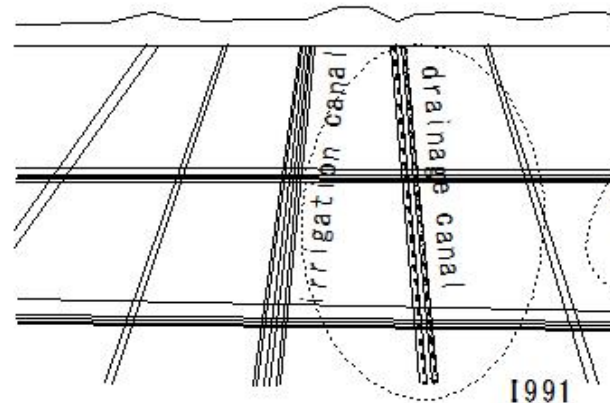
(I1111) Water inlet (water supply) • Water outlet (drainage)

(I1111) Water inlet (water supply) • Water outlet (drainage)

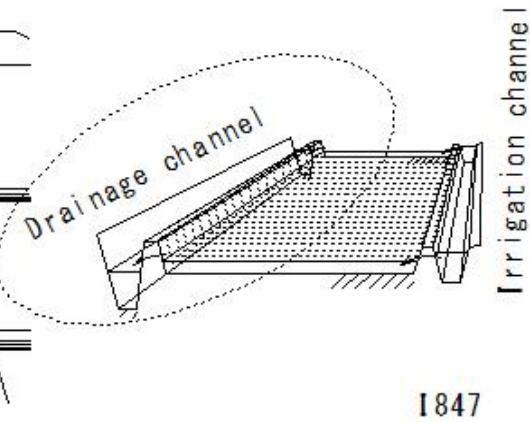
Water outlet (drainage)



E463



1991



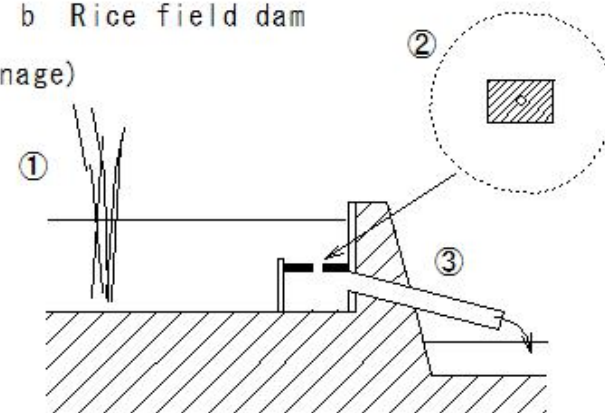
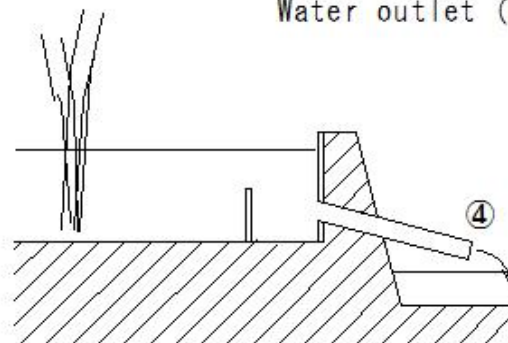
1847

a Traditional rice field

b Rice field dam

Water outlet (drainage)

- ① Storage of rainwater
- ② Adjustment plate
- ③ Slow flow
- ④ Drainage channel



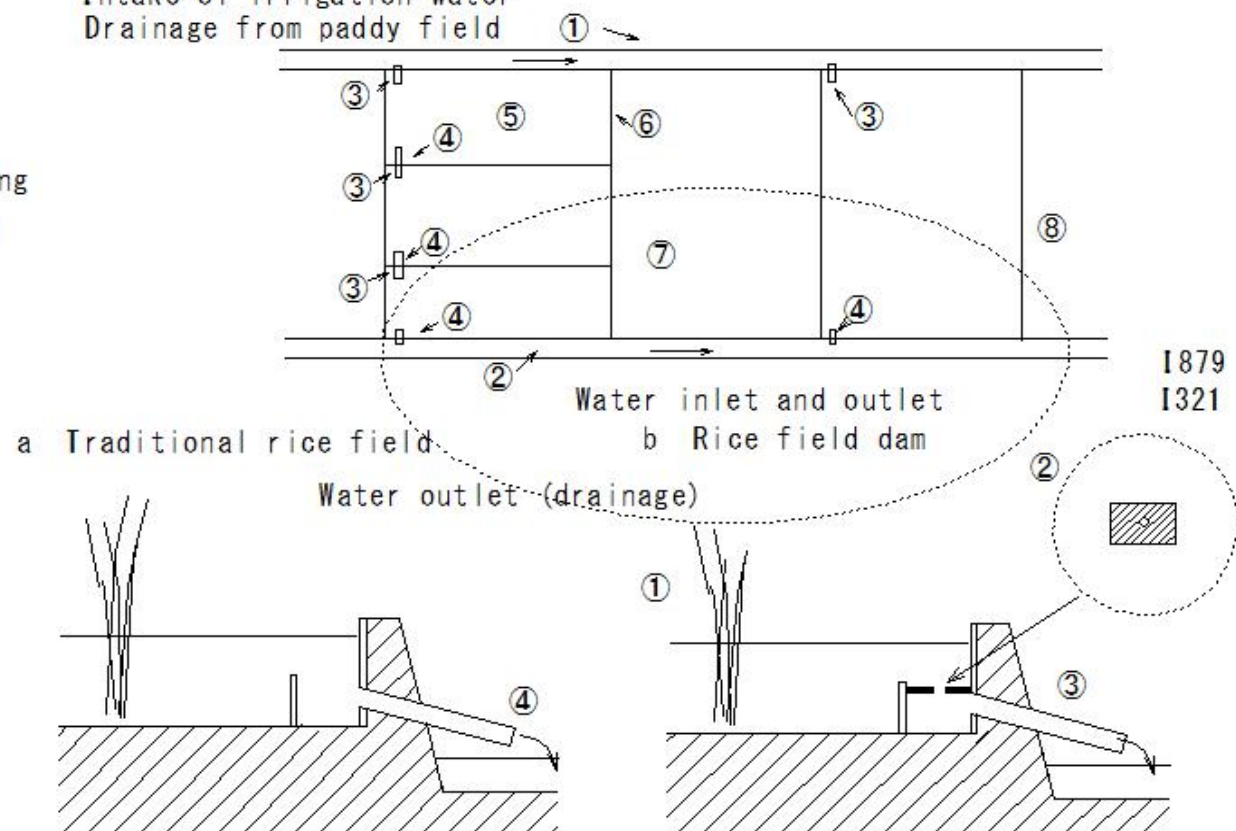
(I1112) Water inlet (water supply) · Water outlet (drainage)

Water outlet (drainage)

- ① Water channel
- ② Drainage channel
- ③ Water inlet
- ④ Water outlet
- ⑤ Paddy field
- ⑥ Ridge
- ⑦ Rice field crossing
- ⑧ Large paddy field

Paddy sluice-Paddy field Drainage

Intake of irrigation water
Drainage from paddy field



(I1113) Water inlet (water supply) · Water outlet (drainage)

(I1113) Water inlet (water supply) · Water outlet (drainage)

Rice field dam

a Traditional rice field

b Rice field dam

① Rice field dam dam plate

② Water storage function is improved

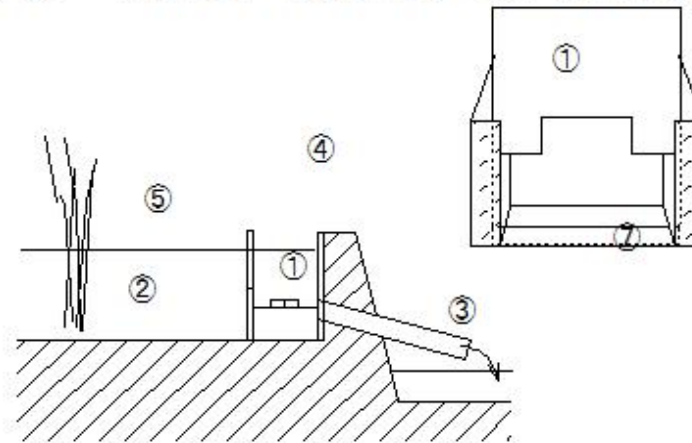
- ③ Prevents flooding downstream

④ Flood control without cost

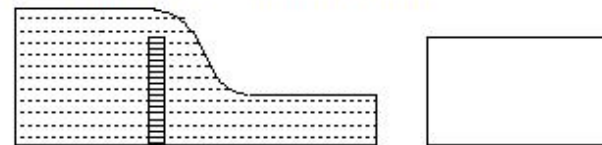
⑤ Rice field dam that stores water

⑥ Flood control

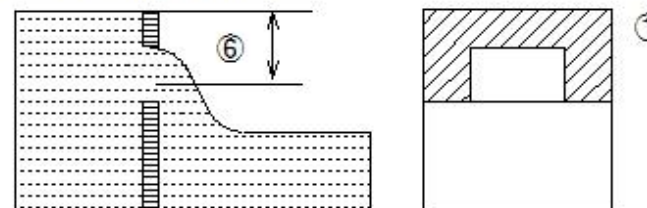
⑦ Weir plate used for normal water management



a Traditional rice fields



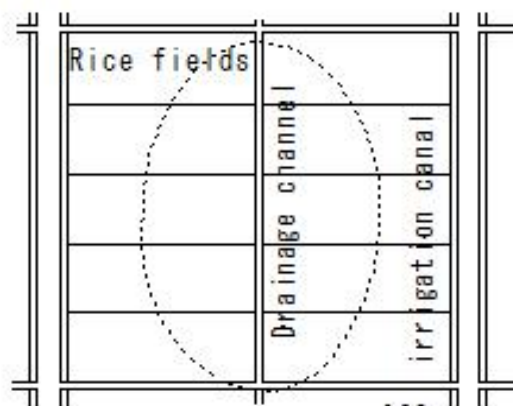
b Rice field dam



(I1114) Water inlet (water supply) • Water outlet (drainage)

(I1114) Water inlet (water supply) • Water outlet (drainage)

Rice field dam



162
E463

a Traditional rice field

b Rice field dam

① Rice field dam dam plate

② Water storage function is improved

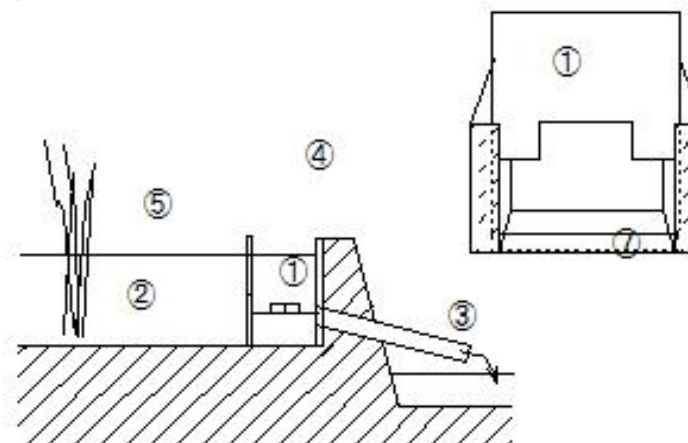
③ Prevents flooding downstream

④ Flood control without cost

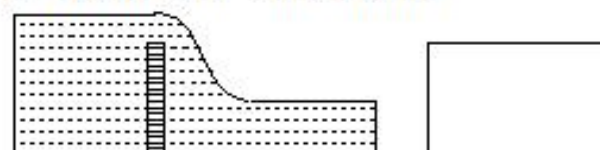
⑤ Rice field dam that stores water

⑥ Flood control

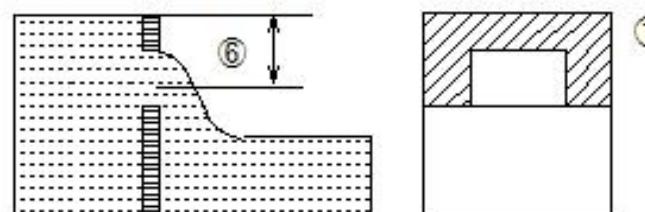
⑦ Weir plate used for normal water management



a Traditional rice fields



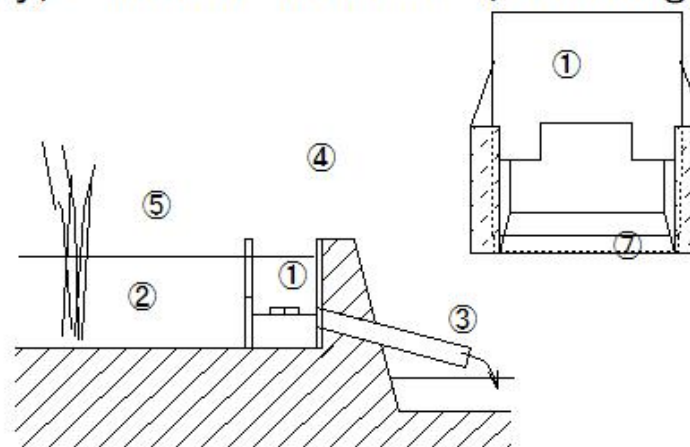
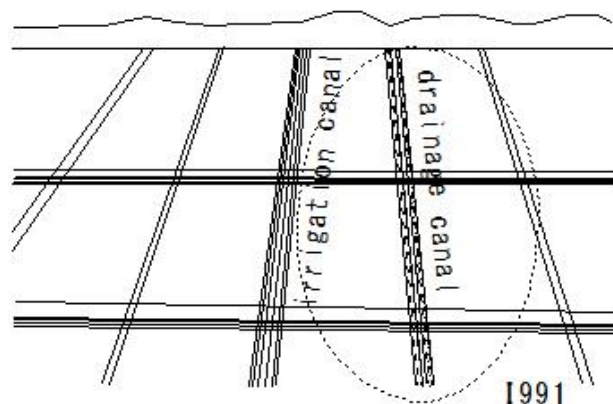
b Rice field dam



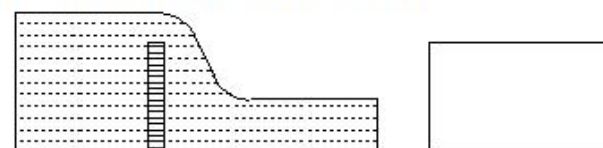
(I1115) Water inlet (water supply) • Water outlet (drainage)

(I1115) Water inlet (water supply) • Water outlet (drainage)

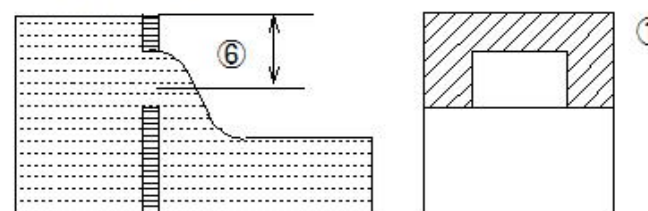
Rice field dam



a Traditional rice fields



b Rice field dam

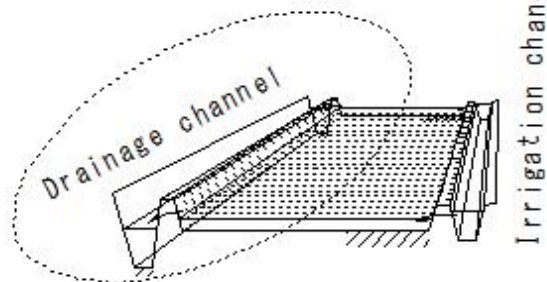


- a Traditional rice field
- b Rice field dam
- ① Rice field dam dam plate
- ② Water storage function is improved
- ③ Prevents flooding downstream
- ④ Flood control without cost
- ⑤ Rice field dam that stores water
- ⑥ Flood control
- ⑦ Weir plate used for normal water management

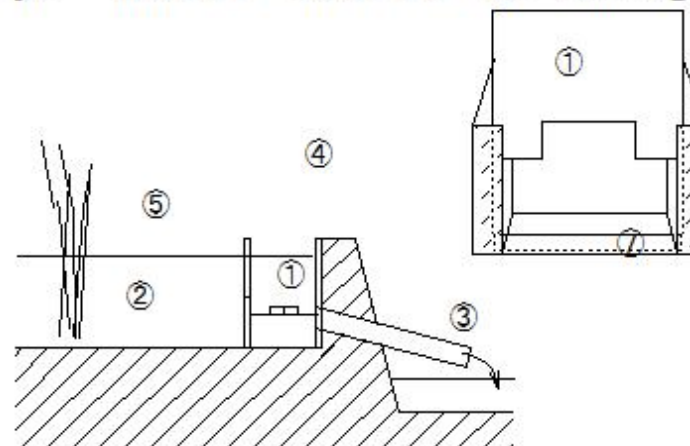
(I1116) Water inlet (water supply) • Water outlet (drainage)

(I1116) Water inlet (water supply) • Water outlet (drainage)

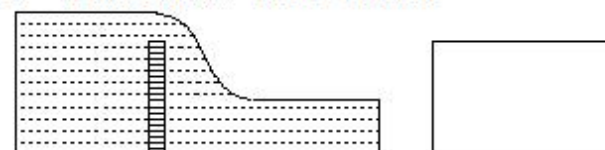
Rice field dam



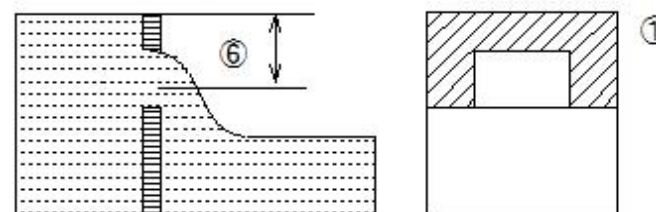
1847



a Traditional rice fields

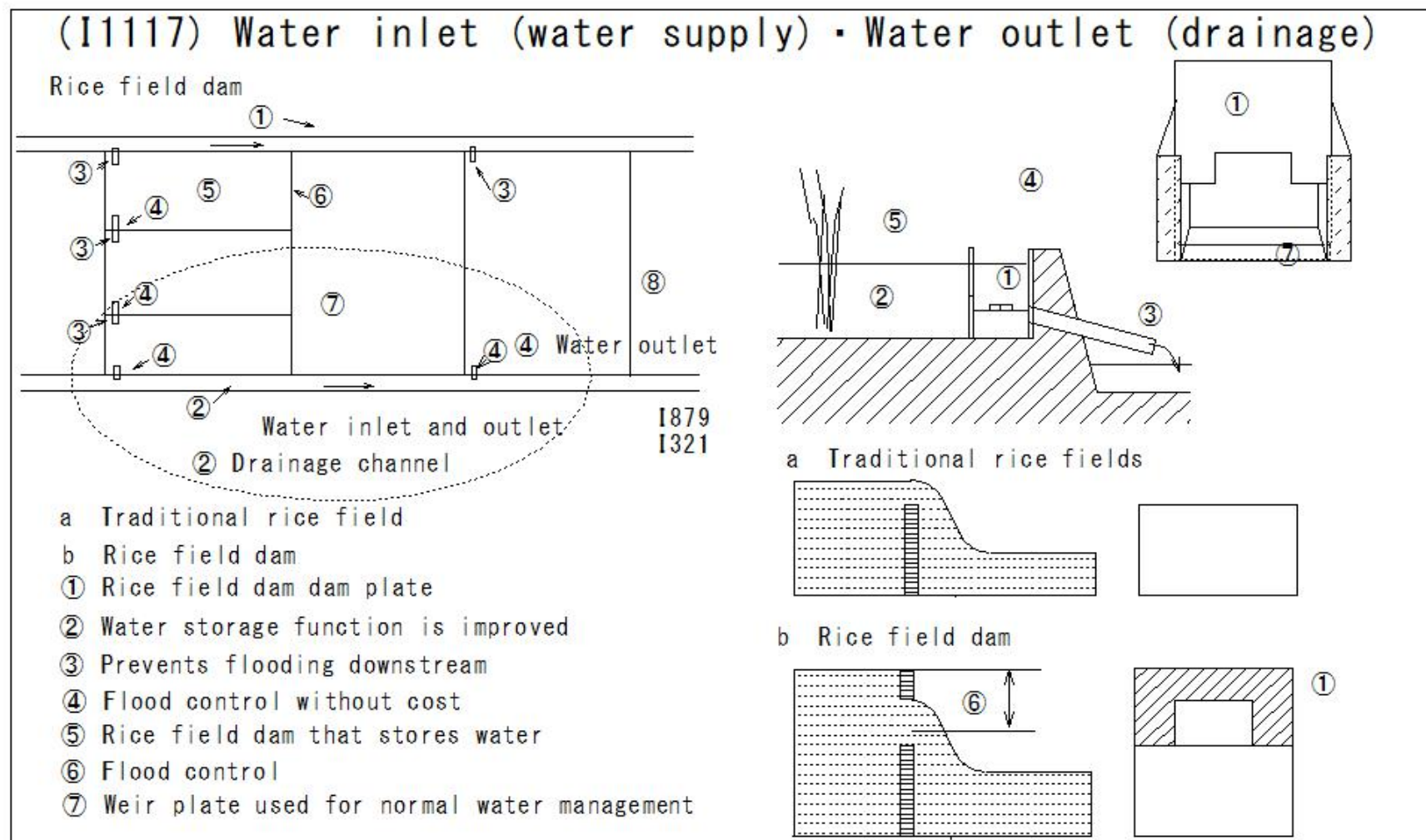


b Rice field dam



- a Traditional rice field
- b Rice field dam
- ① Rice field dam dam plate
- ② Water storage function is improved
- ③ Prevents flooding downstream
- ④ Flood control without cost
- ⑤ Rice field dam that stores water
- ⑥ Flood control
- ⑦ Weir plate used for normal water management

(I1117) Water inlet (water supply) • Water outlet (drainage)

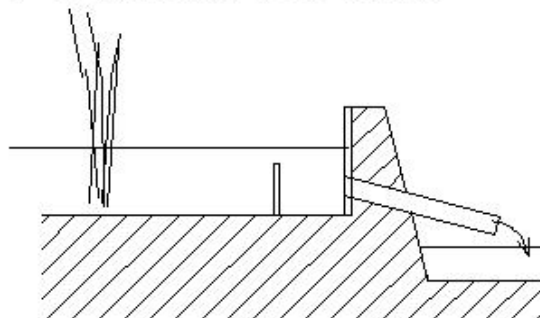


(I1118) Water inlet (water supply) • Water outlet (drainage)

(I1118) Water inlet (water supply) • Water outlet (drainage)

Rice field dam

a Traditional rice fields

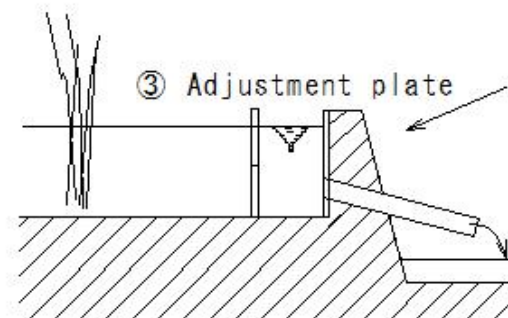


② Water level - low

① Water volume: high

⑥ Adjustment plate (weir plate) for rice field dam

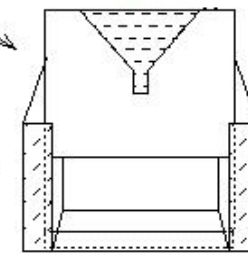
b Rice field dam



③ Adjustment plate

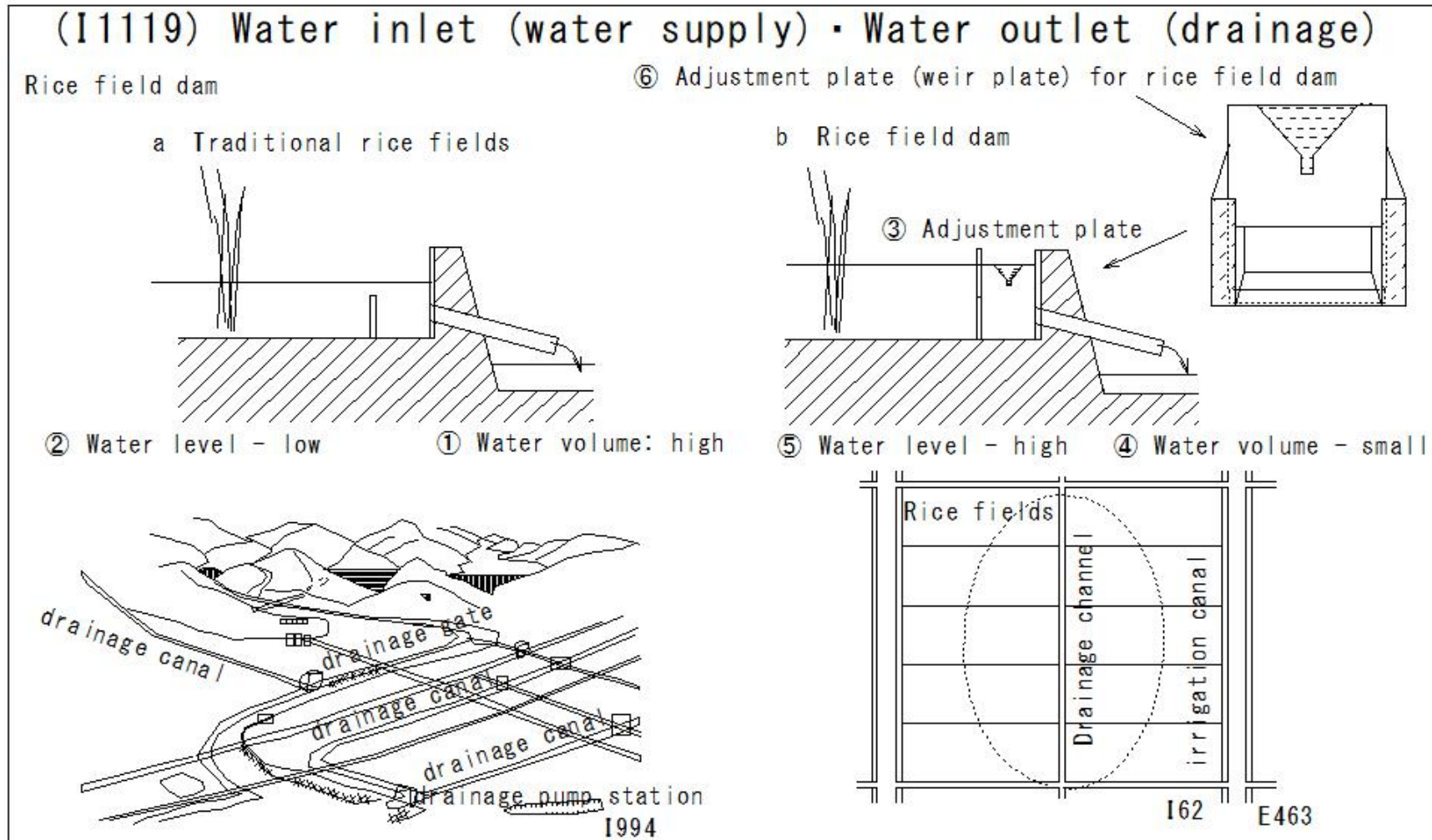
⑤ Water level - high

④ Water volume - small



- Rice field dam: During heavy rain, downstream of the basin: Reduce flood damage
- Rice field drainage outlet: Install weir plate: Temporarily store rainfall: Reduce downstream flood damage

(I1119) Water inlet (water supply) • Water outlet (drainage)



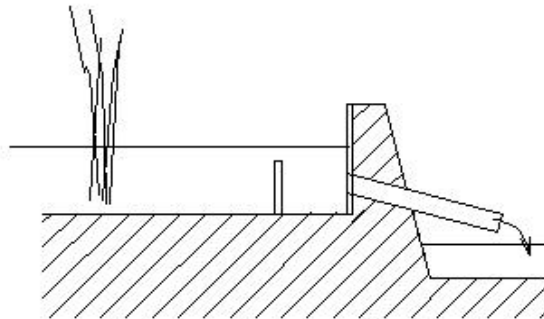
(I1120) Water inlet (water supply) • Water outlet (drainage)

(I1120) Water inlet (water supply) • Water outlet (drainage)

Rice field dam

⑥ Adjustment plate (weir plate) for rice field dam

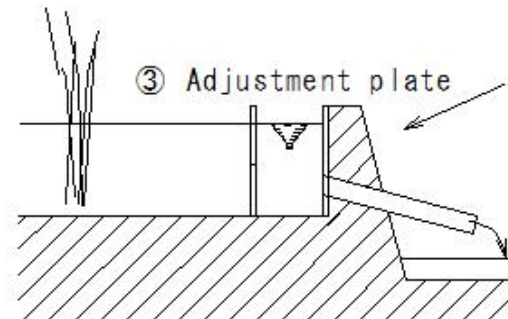
a Traditional rice fields



② Water level - low

① Water volume: high

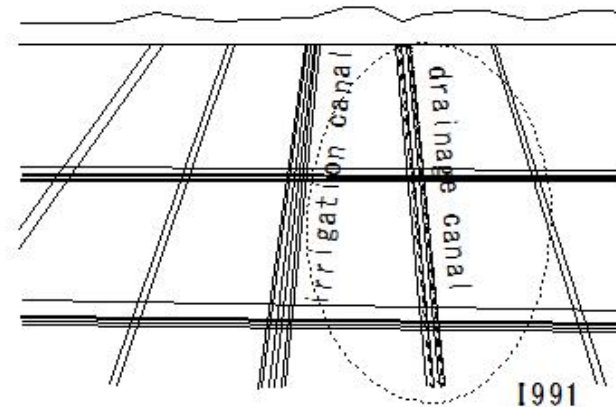
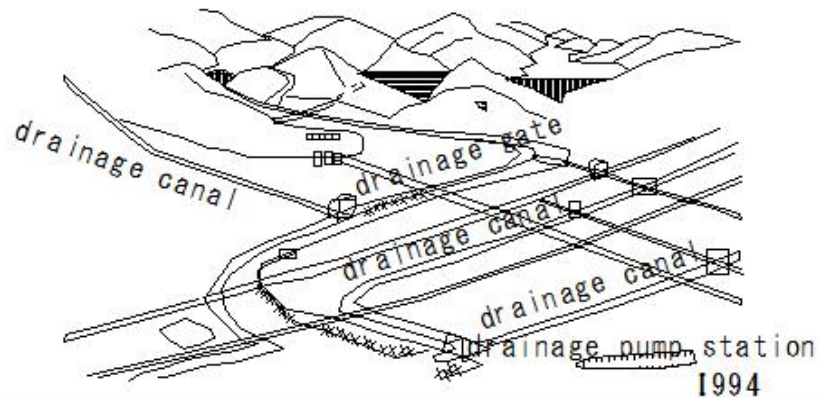
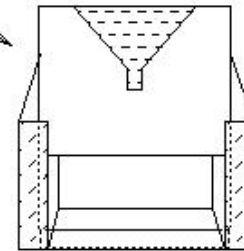
b Rice field dam



③ Adjustment plate

⑤ Water level - high

④ Water volume - small



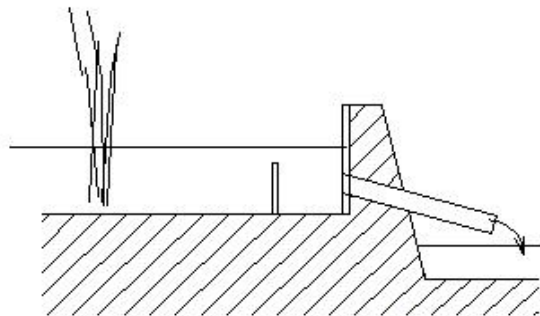
(I1121) Water inlet (water supply) • Water outlet (drainage)

(I1121) Water inlet (water supply) • Water outlet (drainage)

Rice field dam

⑥ Adjustment plate (weir plate) for rice field dam

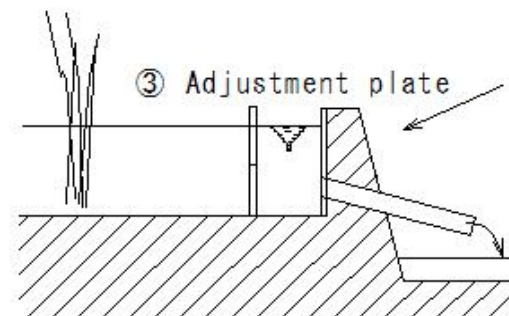
a Traditional rice fields



② Water level - low

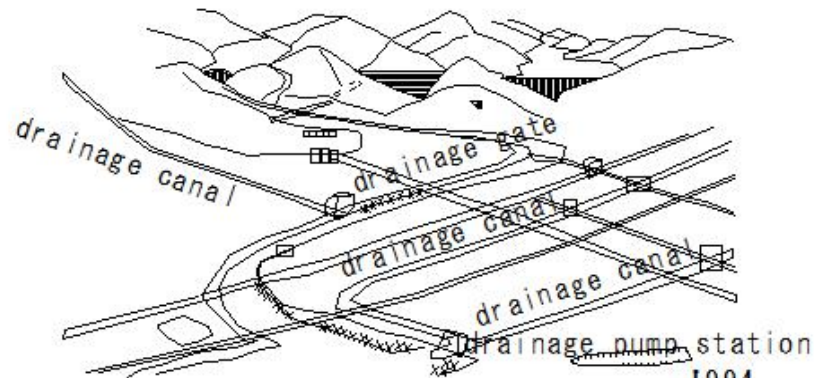
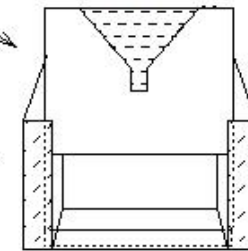
① Water volume: high

b Rice field dam

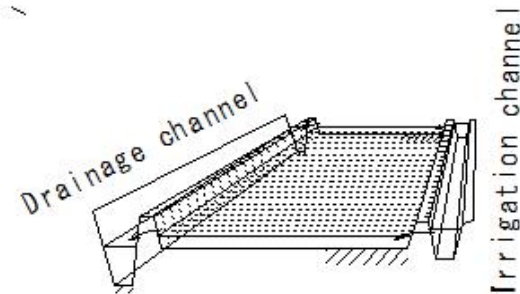


⑤ Water level - high

④ Water volume - small



1994



1847

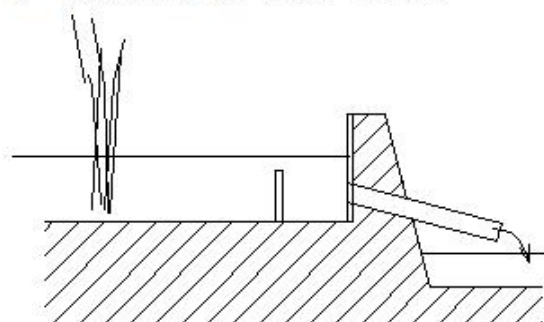
(I1122) Water inlet (water supply) • Water outlet (drainage)

(I1122) Water inlet (water supply) • Water outlet (drainage)

Rice field dam

⑥ Adjustment plate (weir plate) for rice field dam

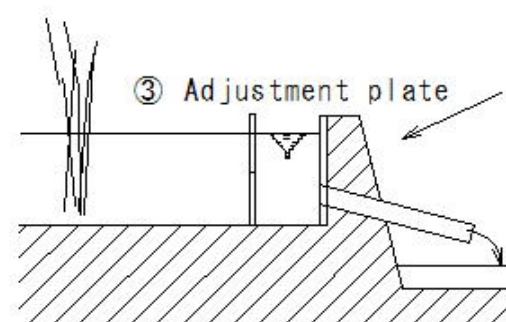
a Traditional rice fields



② Water level - low

① Water volume: high

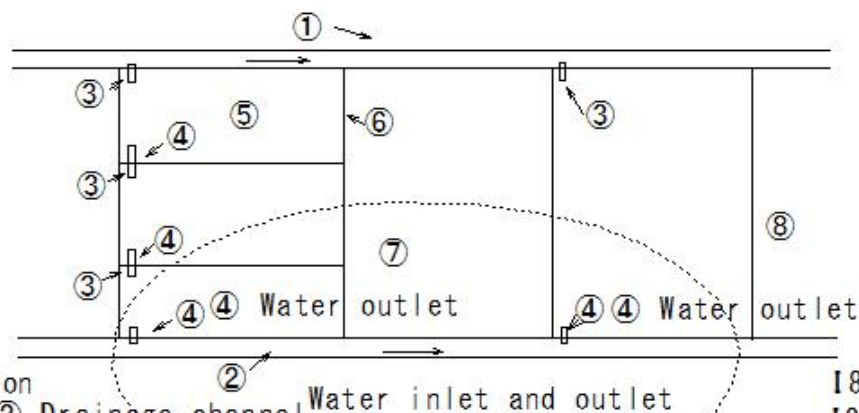
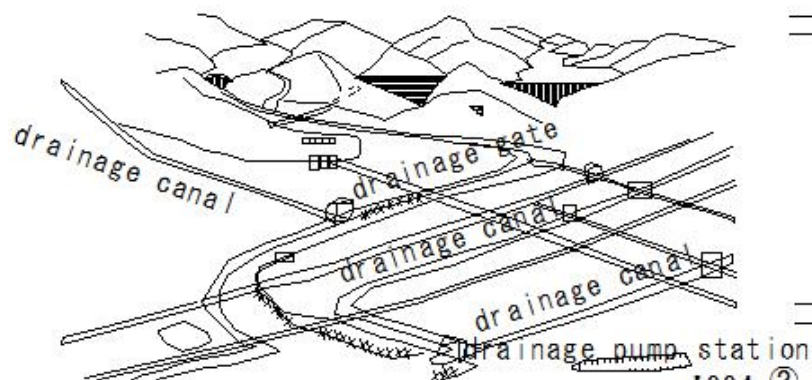
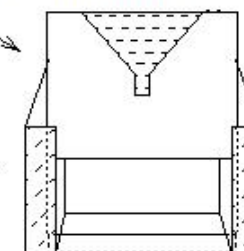
b Rice field dam



③ Adjustment plate

⑤ Water level - high

④ Water volume - small



1994

② Drainage channel

Water inlet and outlet

1879

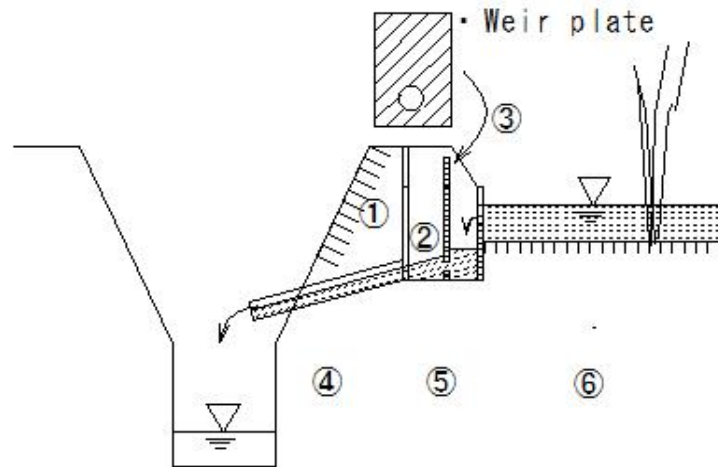
1321

(I1123) Water inlet (water supply) • Water outlet (drainage)

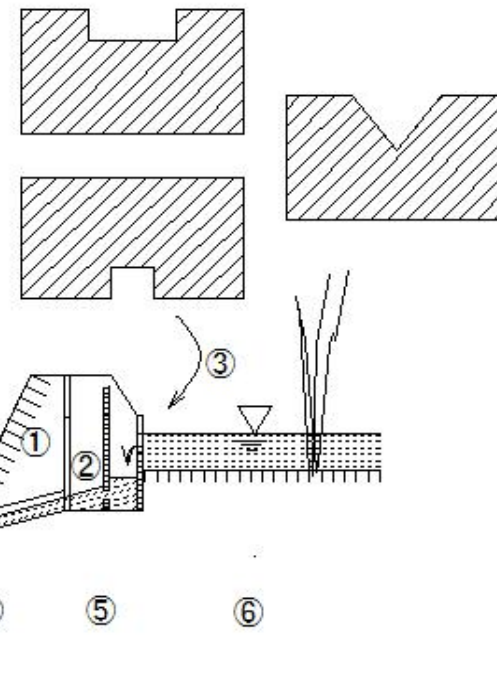
(I1123) Water inlet (water supply) • Water outlet (drainage)

- ① Rice ridge
- ② Flow control point
- ③ Installation position
- ④ Drainage channel side
- ⑤ Drainage basin
- ⑥ Rice field side

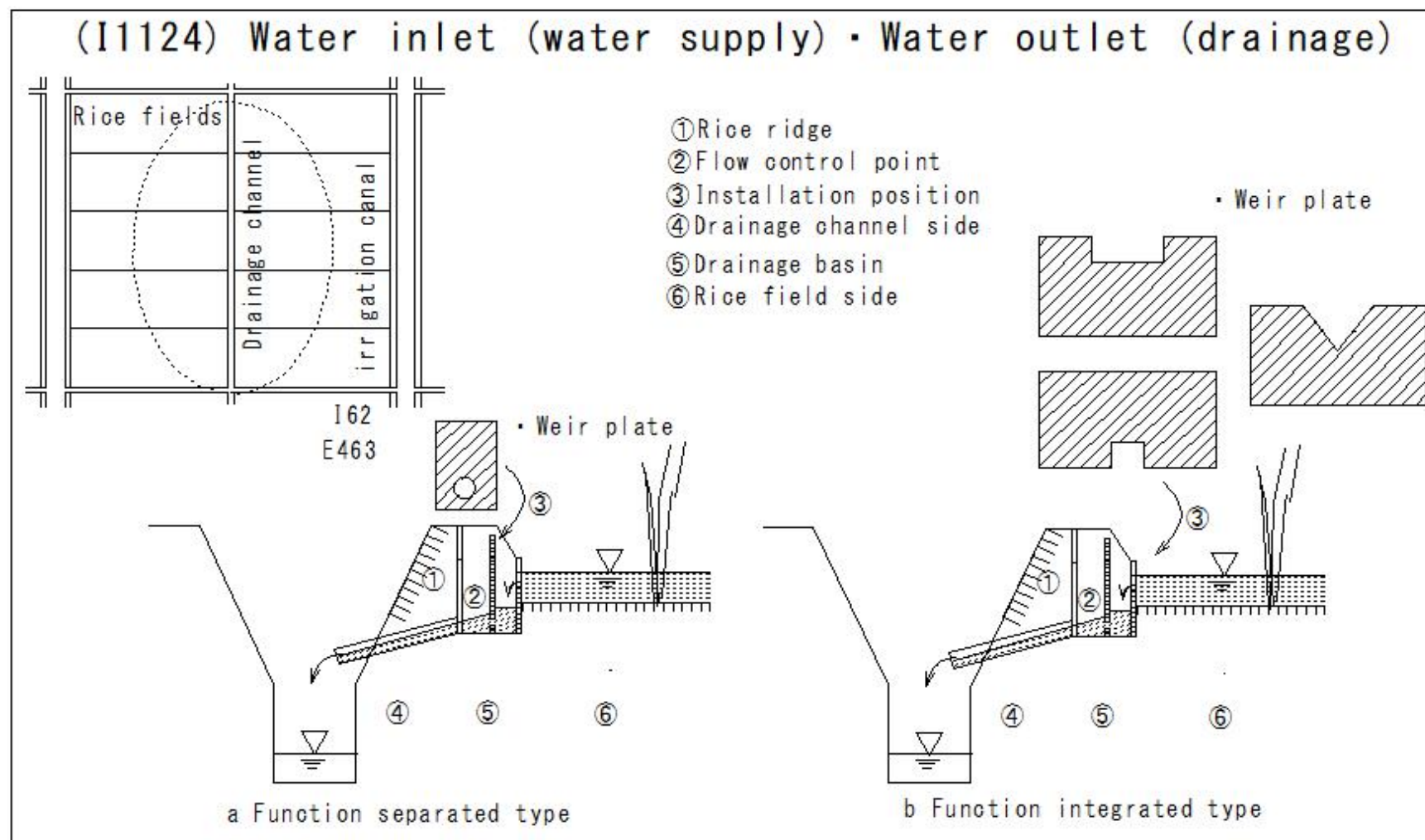
a Function separated type



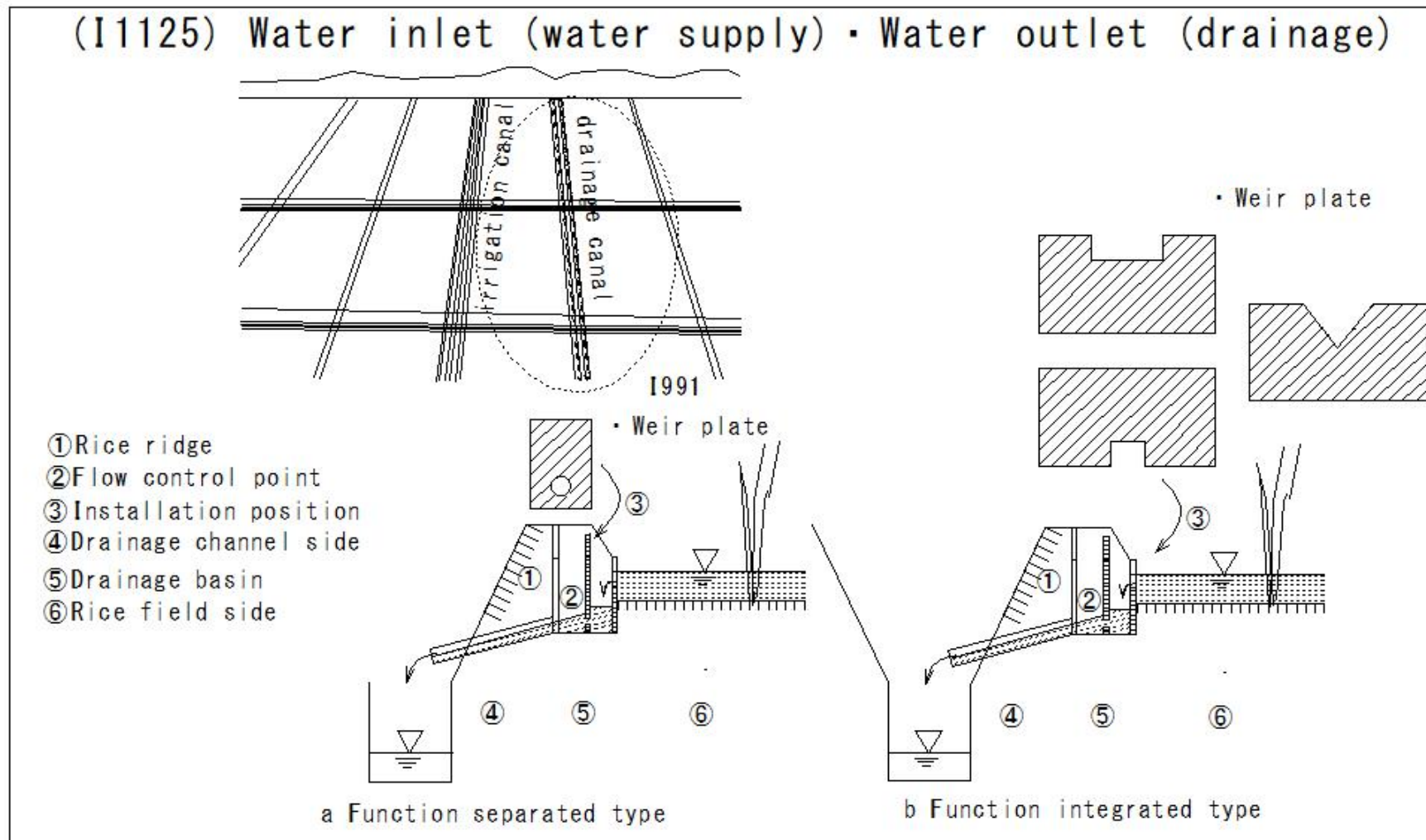
b Function integrated type
• Weir plate



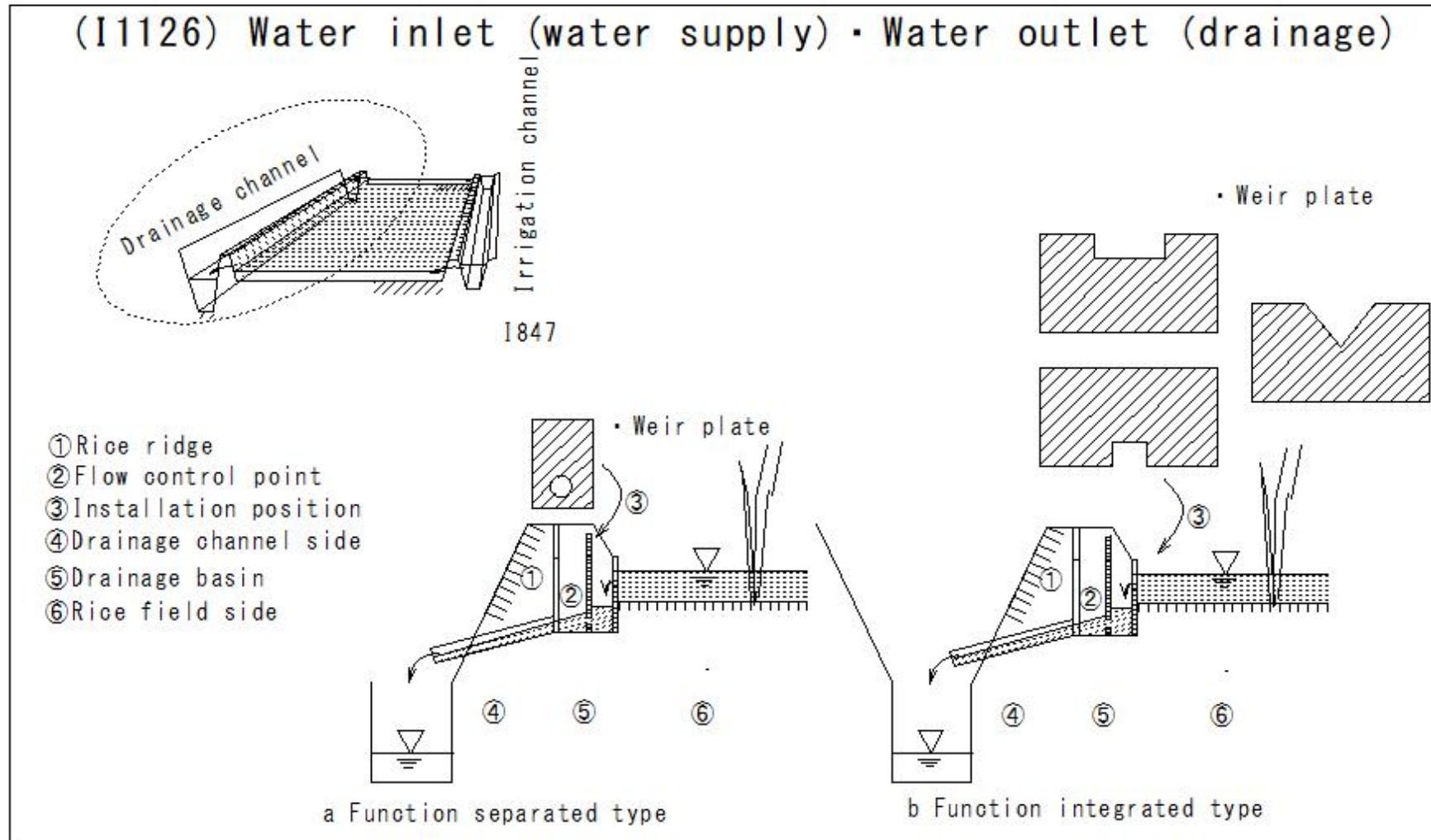
(I1124) Water inlet (water supply) • Water outlet (drainage)



(I1125) Water inlet (water supply) • Water outlet (drainage)

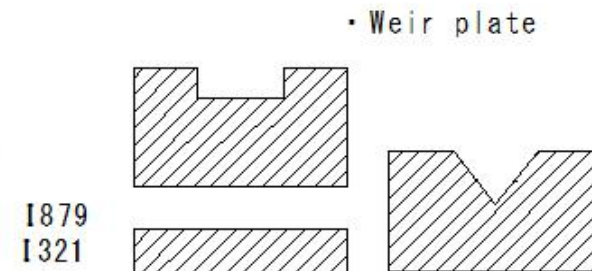
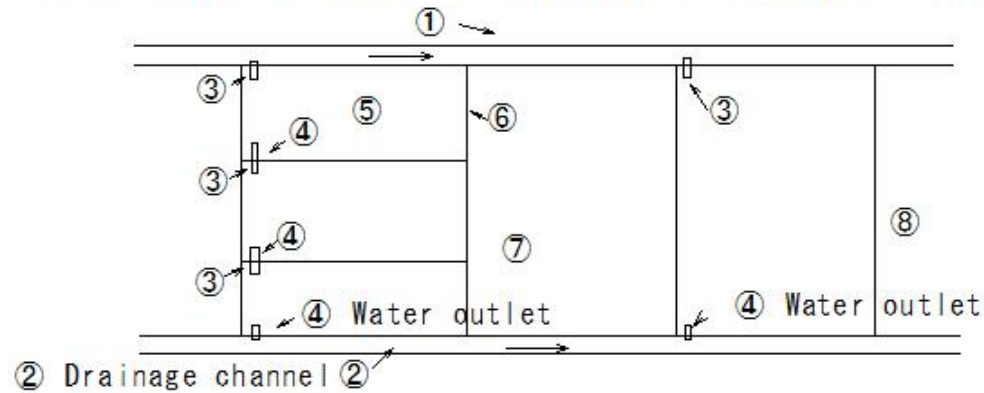


(I1126) Water inlet (water supply) • Water outlet (drainage)

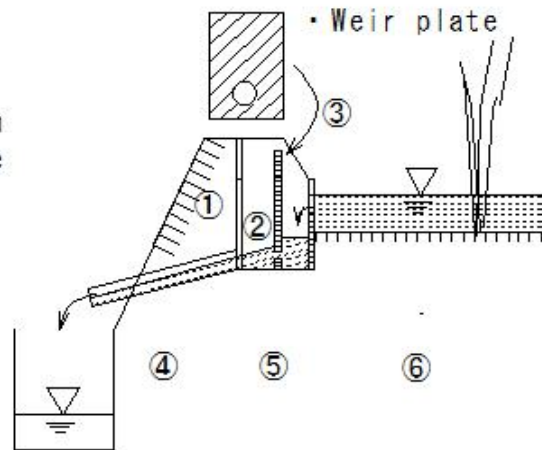


(I1127) Water inlet (water supply) • Water outlet (drainage)

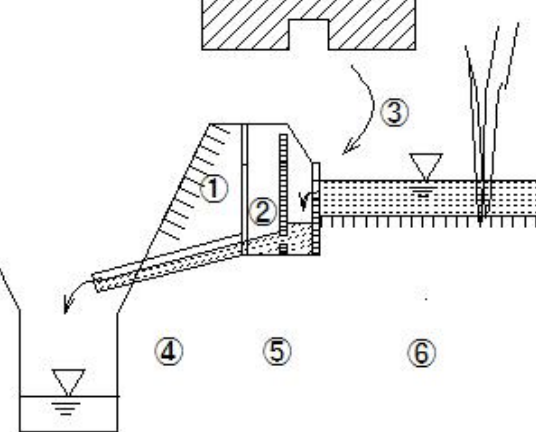
(I1127) Water inlet (water supply) • Water outlet (drainage)



- ①Rice ridge
- ②Flow control point
- ③Installation position
- ④Drainage channel side
- ⑤Drainage basin
- ⑥Rice field side



a Function separated type



b Function integrated type

(I1128) Water inlet (water supply) • Water outlet (drainage)

(I1128) Water inlet (water supply) • Water outlet (drainage)

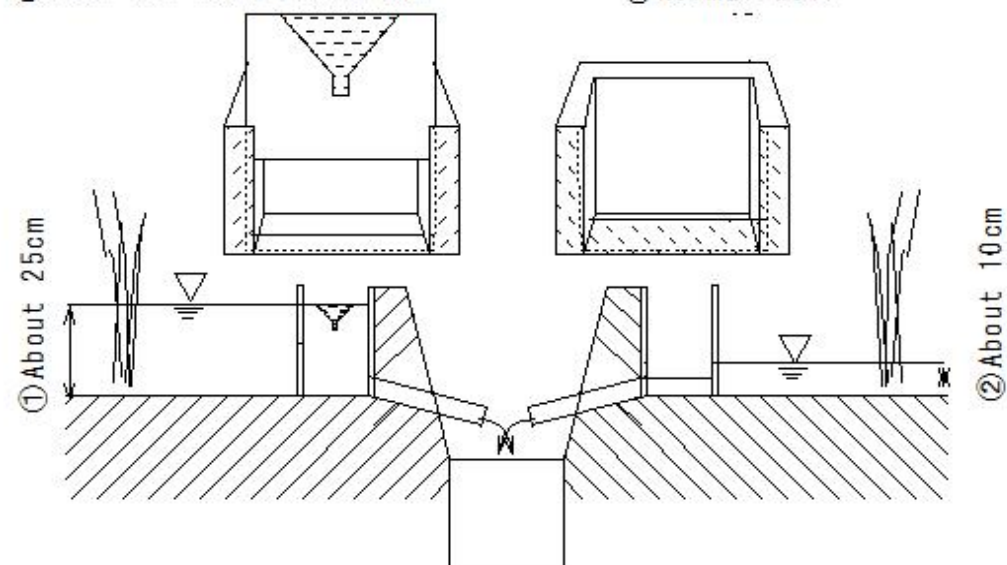
Rice field dam

b Rice field dam

a Traditional rice paddy

③ Weir for rice field dam

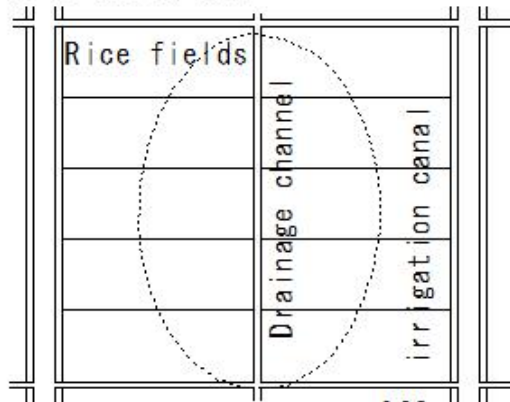
④ Normal weir



(I1129) Water inlet (water supply) • Water outlet (drainage)

(I1129) Water inlet (water supply) • Water outlet (drainage)

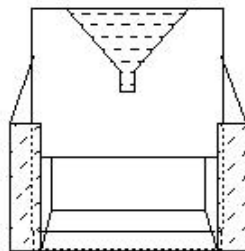
Rice field dam



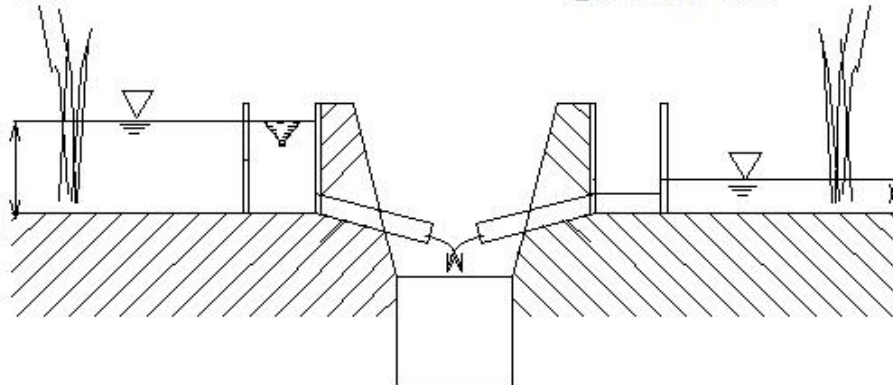
I62

b Rice field dam E463

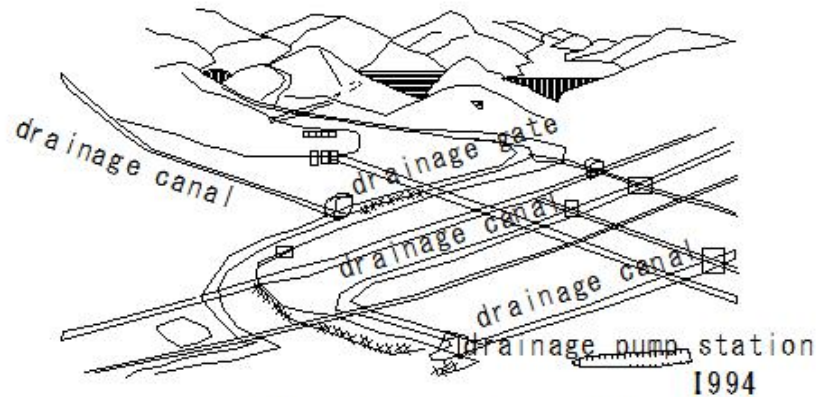
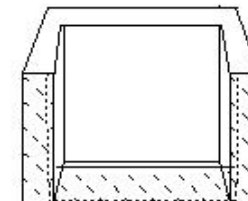
③ Weir for rice field dam



① About 25cm



② About 10cm



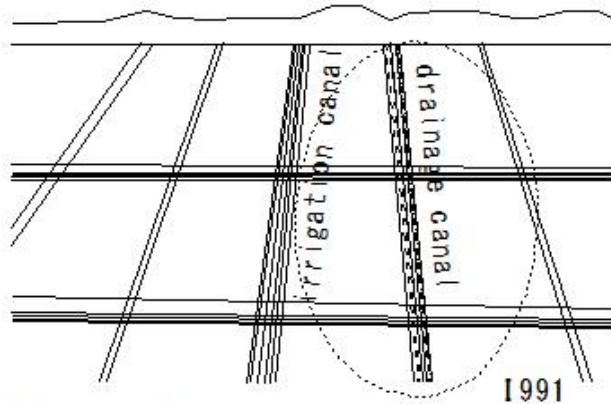
a Traditional rice paddy

④ Normal weir

(I1130) Water inlet (water supply) • Water outlet (drainage)

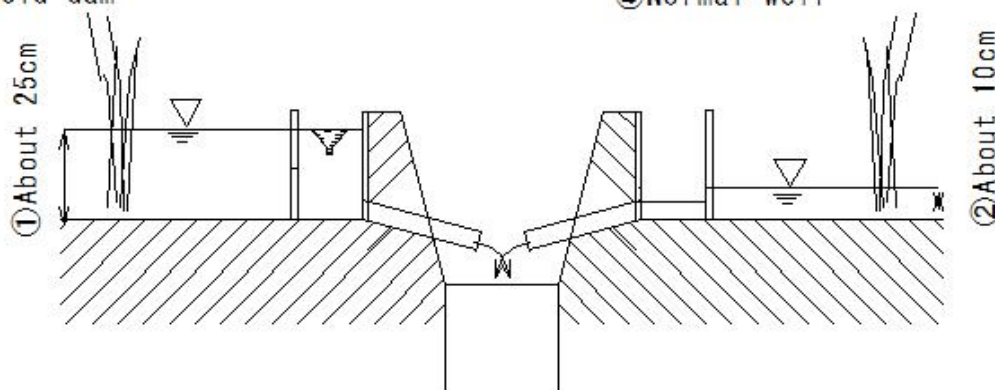
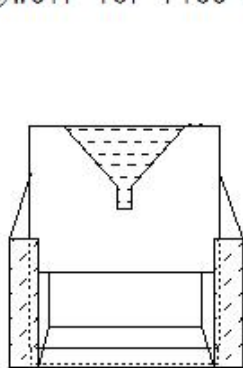
(I1130) Water inlet (water supply) • Water outlet (drainage)

Rice field dam



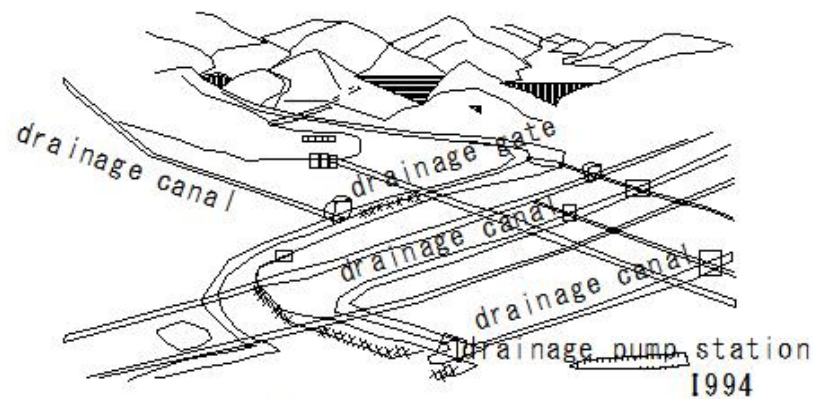
b Rice field dam

③ Weir for rice field dam



a Traditional rice paddy

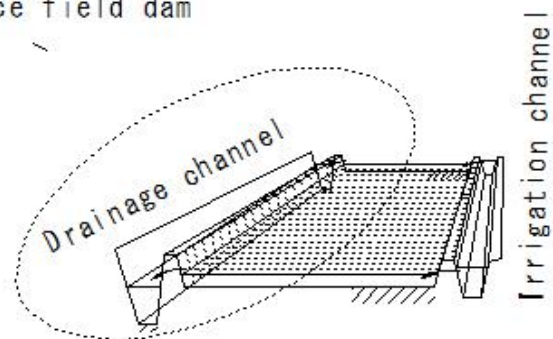
④ Normal weir



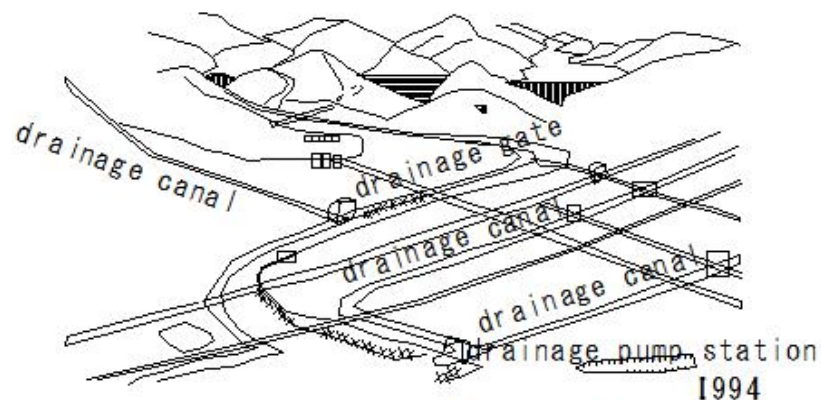
(I1131) Water inlet (water supply) • Water outlet (drainage)

(I1131) Water inlet (water supply) • Water outlet (drainage)

Rice field dam



1847



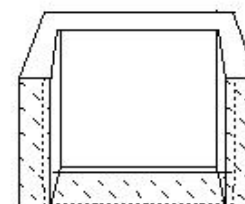
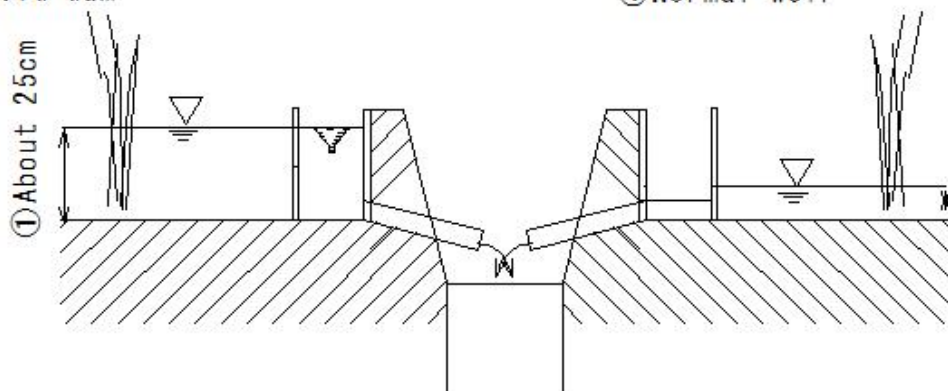
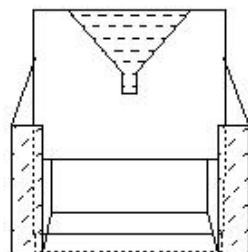
1994

b Rice field dam

a Traditional rice paddy

③ Weir for rice field dam

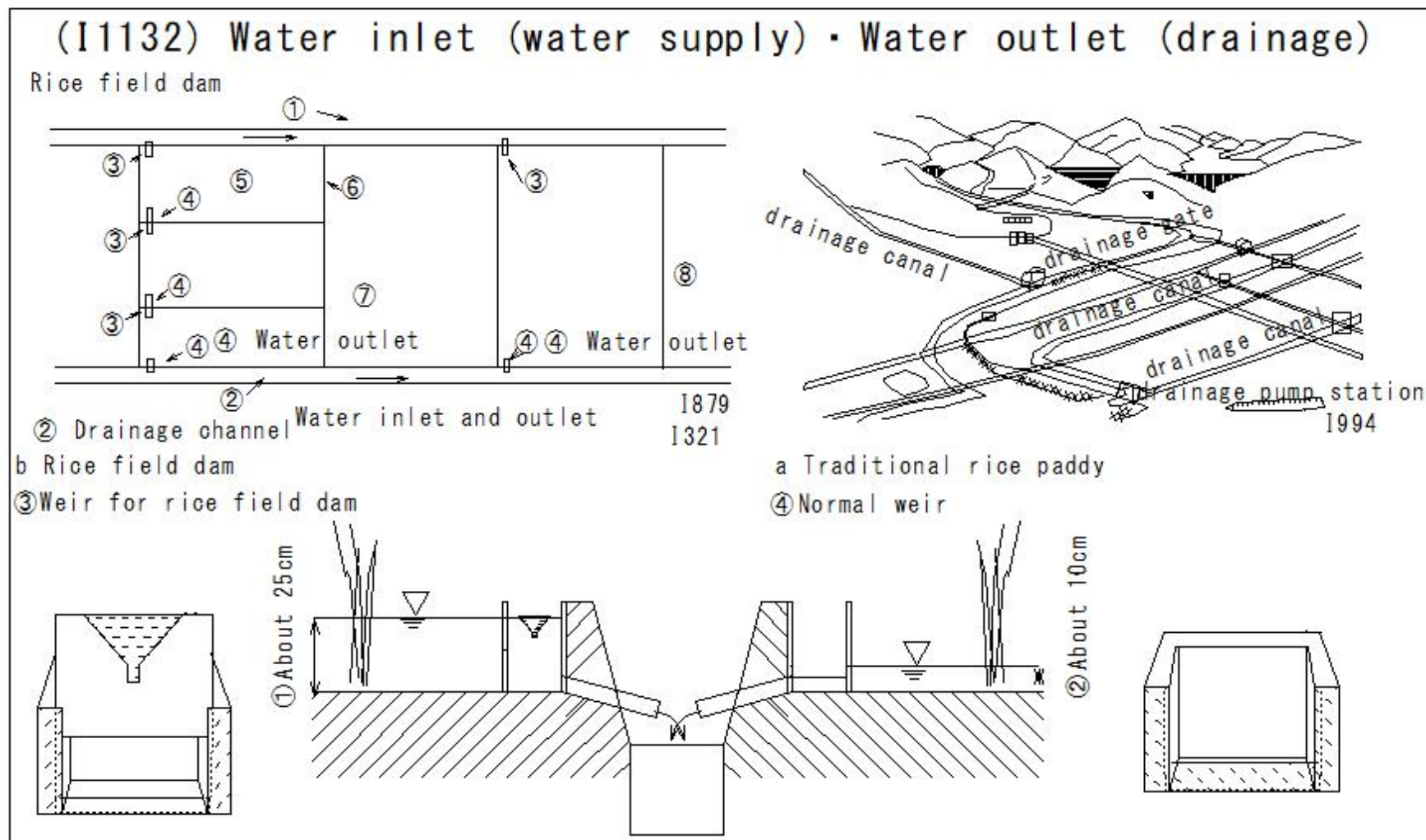
④ Normal weir



① About 25cm

② About 10cm

(I1132) Water inlet (water supply) • Water outlet (drainage)

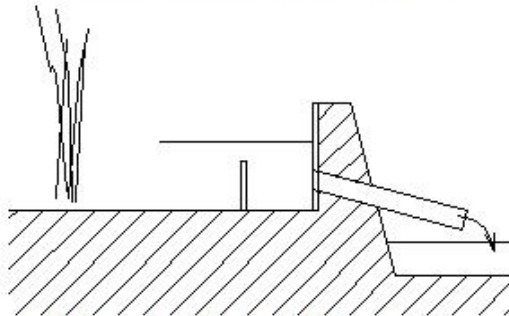


(I1133) Water inlet (water supply) • Water outlet (drainage)

(I1133) Water inlet (water supply) • Water outlet (drainage)

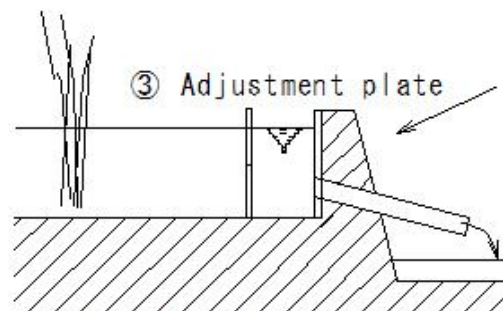
Rice field dam

a Traditional rice fields

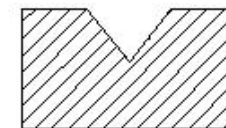
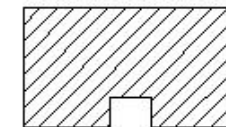
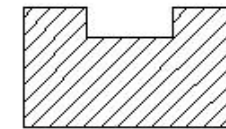
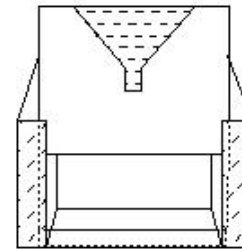


⑤ Increased runoff volume

b Rice field dam

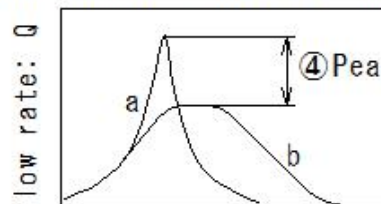


⑥ Runoff volume - slow I1118



I1123

① Comparison of flow rate adjustment



② Flow rate: Q

③ Time: t

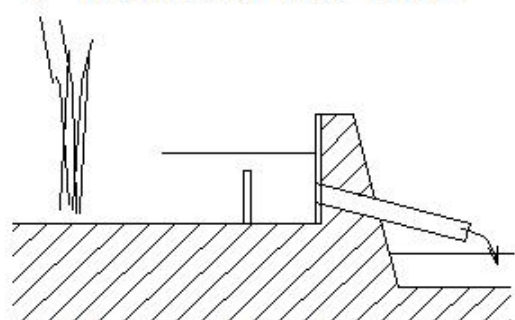
④ Peak flow rate decreases

(I1134) Water inlet (water supply) • Water outlet (drainage)

(I1134) Water inlet (water supply) • Water outlet (drainage)

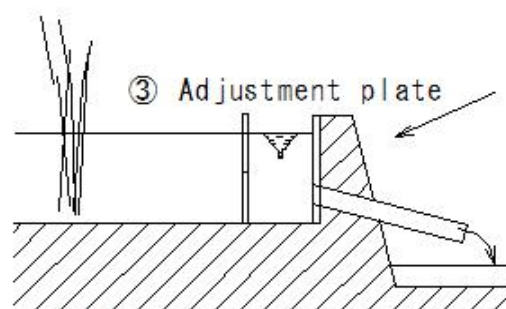
Rice field dam

a Traditional rice fields



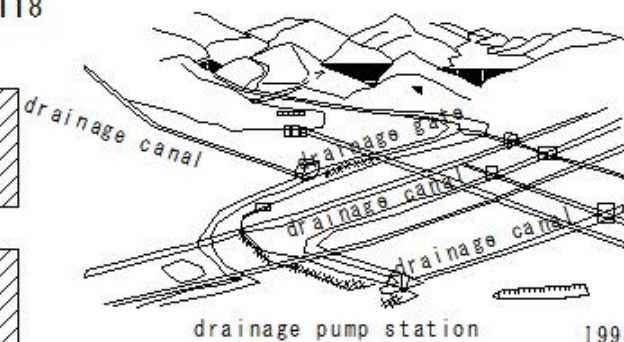
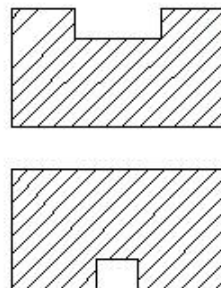
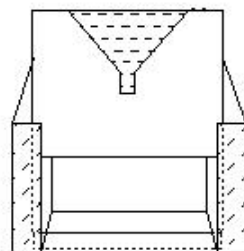
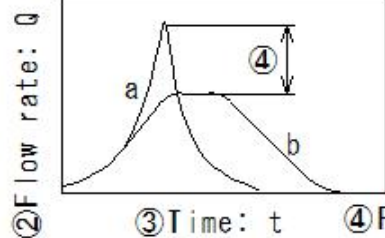
⑤ Increased runoff volume

b Rice field dam

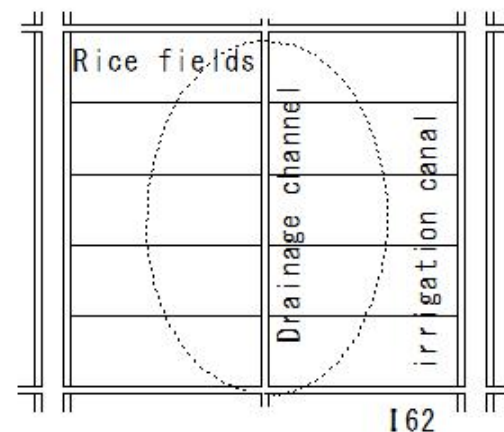


⑥ Runoff volume - slow I1118

① Comparison of flow rate adjustment



I1123



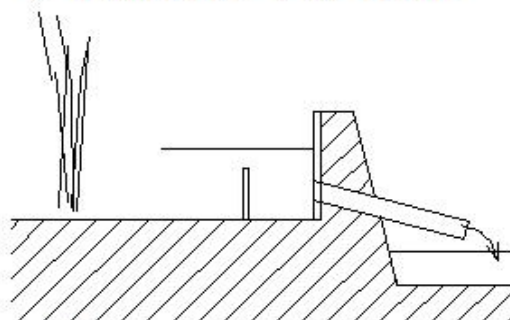
1994

(I1135) Water inlet (water supply) • Water outlet (drainage)

(I1135) Water inlet (water supply) • Water outlet (drainage)

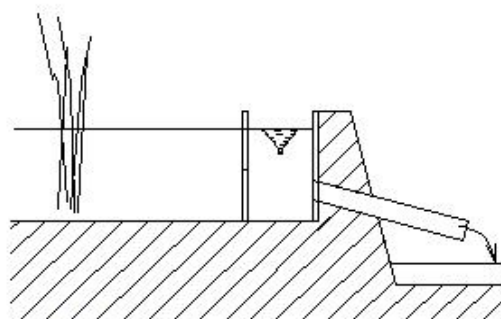
Rice field dam

a Traditional rice fields

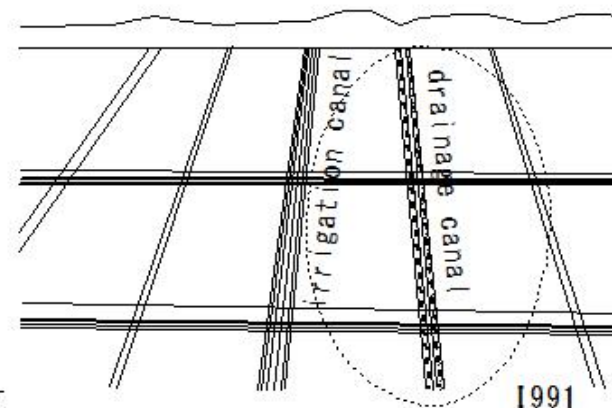


⑤ Increased runoff volume

b Rice field dam



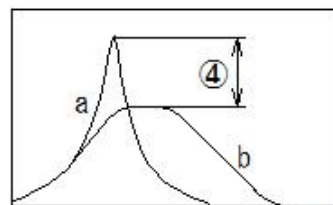
⑥ Runoff volume - slow I1118



1991

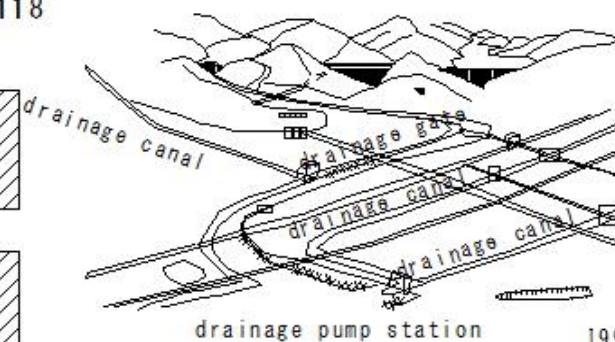
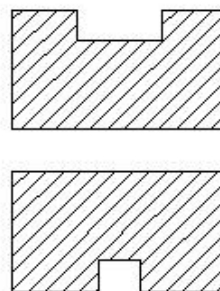
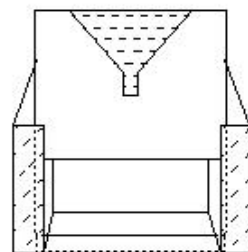
① Comparison of flow rate adjustment

② Flow rate: Q



③ Time: t

④ Peak flow rate decreases

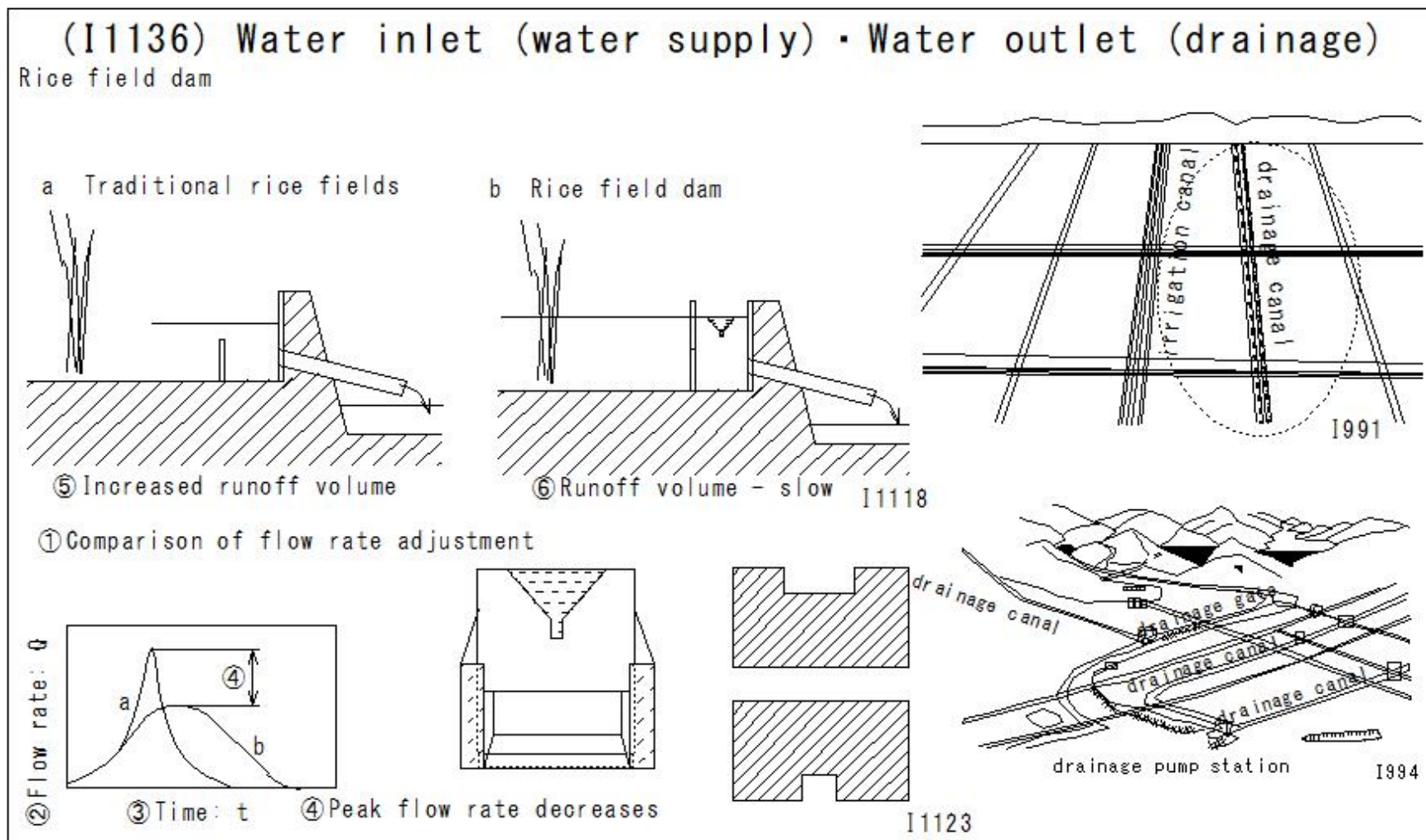


drainage pump station

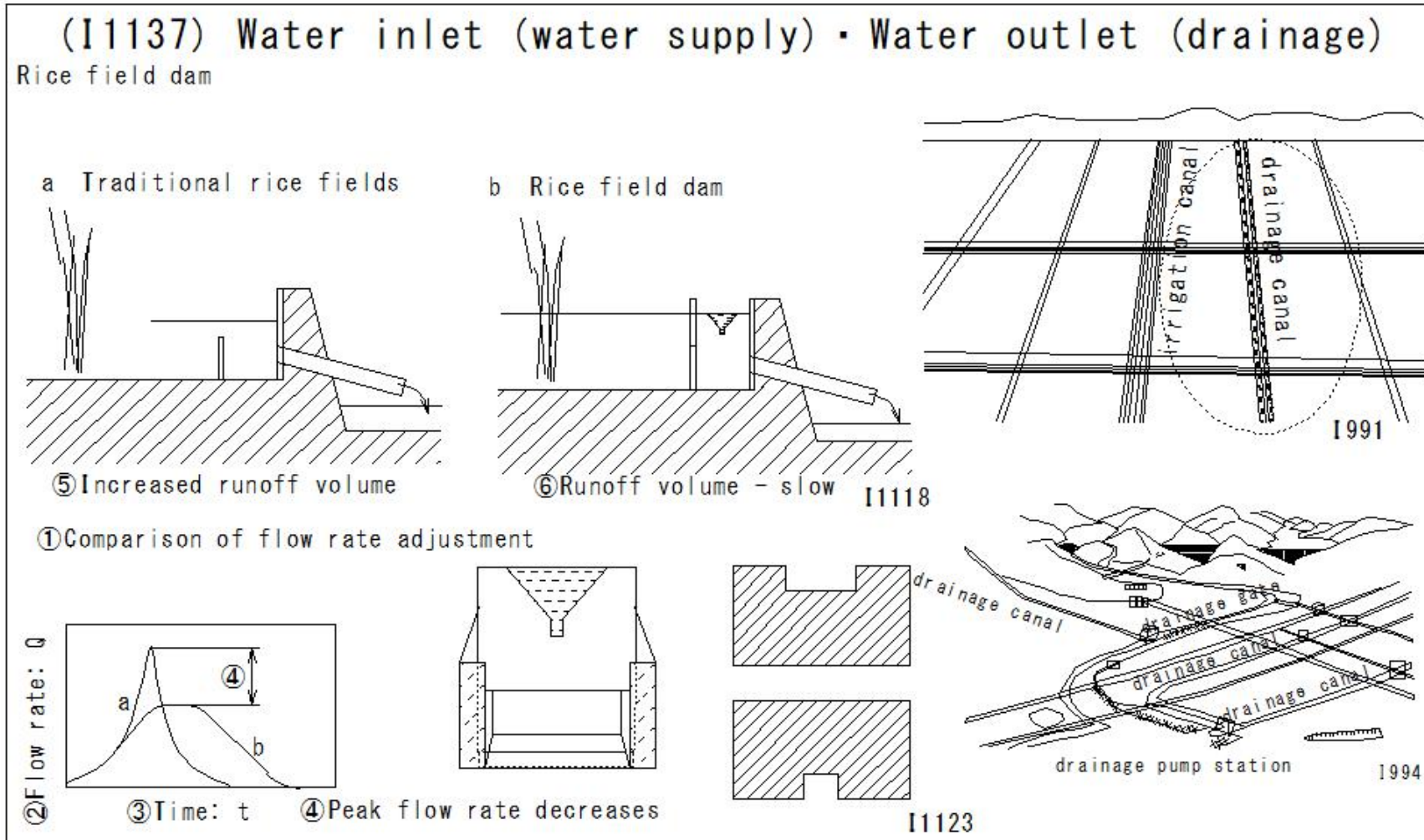
1994

I1123

(I1136) Water inlet (water supply) • Water outlet (drainage)



(I1137) Water inlet (water supply) • Water outlet (drainage)

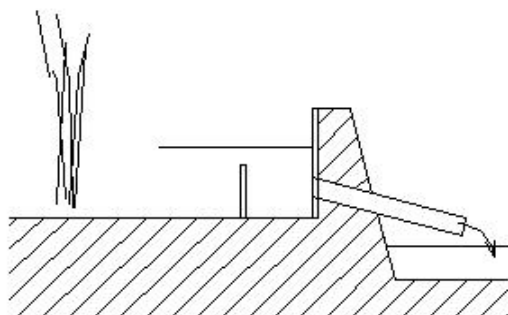


(I1138) Water inlet (water supply) • Water outlet (drainage)

(I1138) Water inlet (water supply) • Water outlet (drainage)

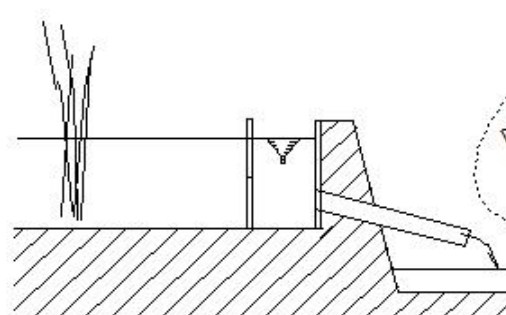
Rice field dam

a Traditional rice fields

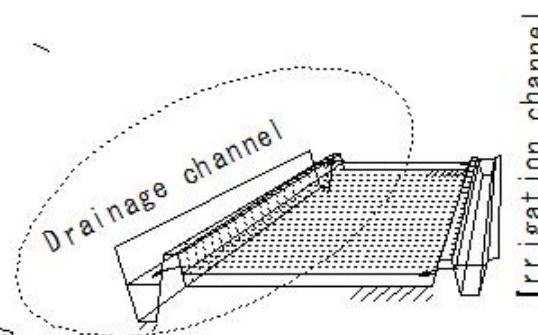


⑤ Increased runoff volume

b Rice field dam

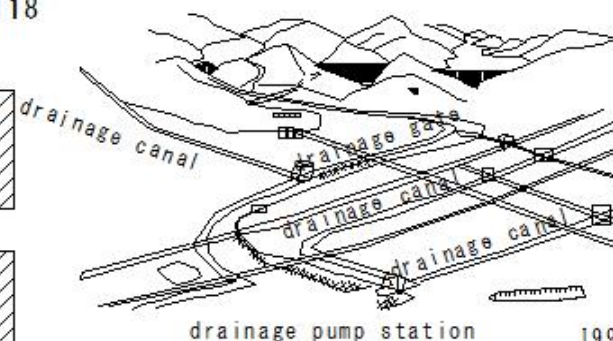
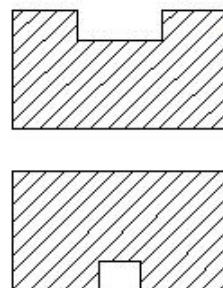
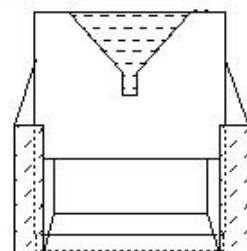
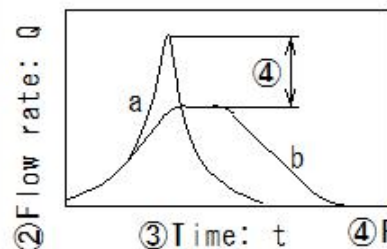


⑥ Runoff volume - slow I1118



Irrigation channel

① Comparison of flow rate adjustment

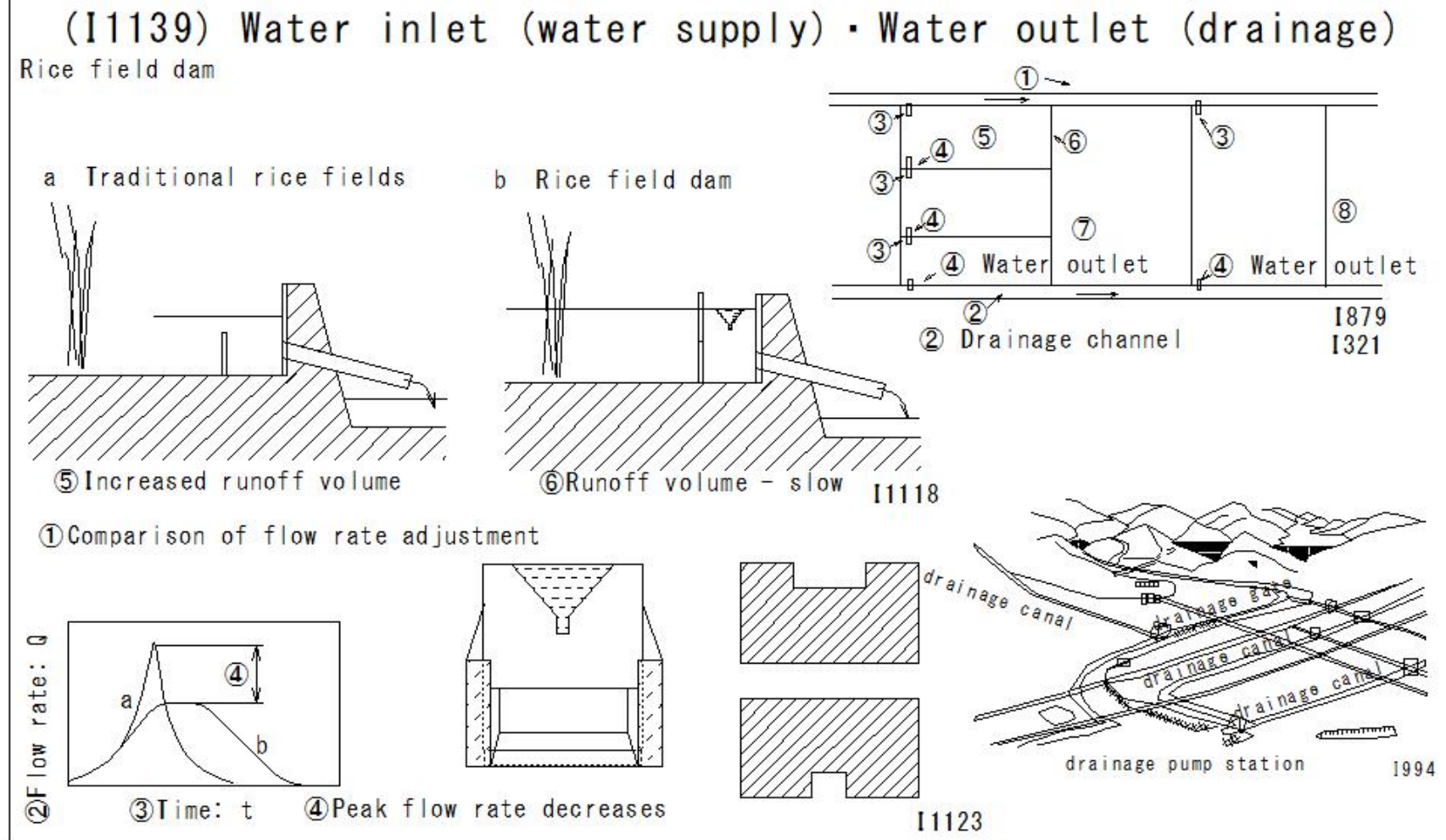


drainage pump station

1994

I1123

(I1139) Water inlet (water supply) • Water outlet (drainage)



(I1140) Water inlet (water supply) · Water outlet (drainage)

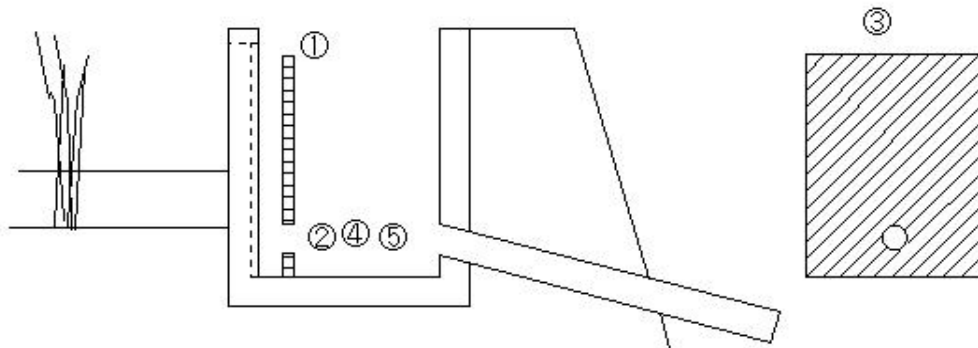
(I1140) Water inlet (water supply) · Water outlet (drainage)

Rice field dam

Drainage adjustment

- ① In heavy rain, water is stored in the paddy field up to the height of this plate
- ② Normal drainage flows out from the round hole
- ③ Water fall adjustment plate
- ④ Rainwater is drained from a hole of about 5 cm
- ⑤ Always installed

Drainage adjustment

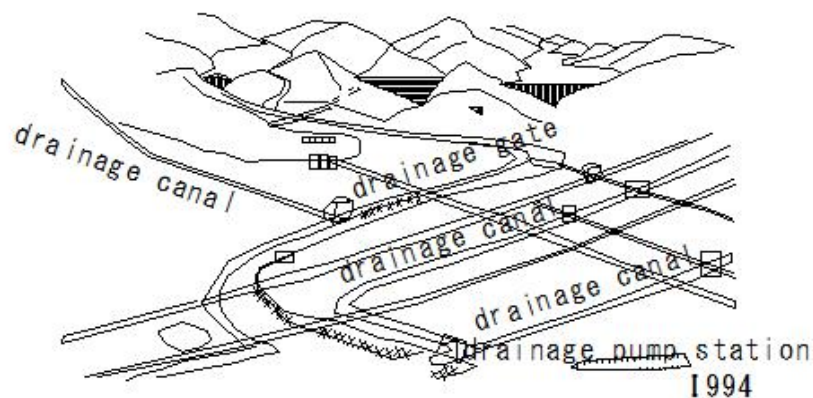
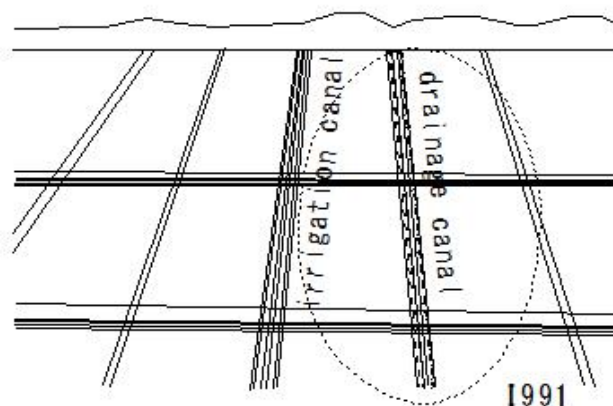


b Rice field dam

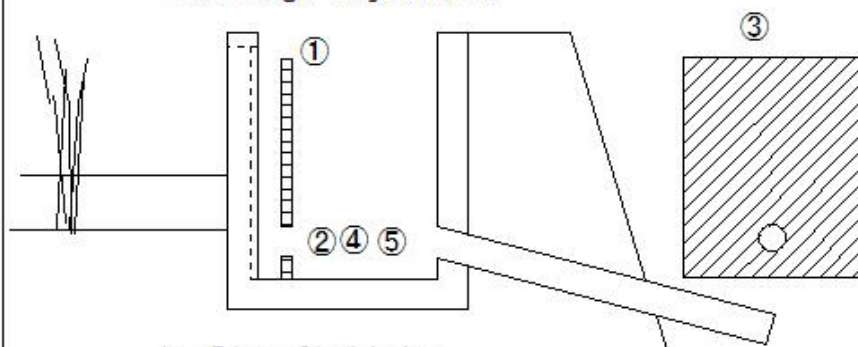
(I1141) Water inlet (water supply) • Water outlet (drainage)

(I1141) Water inlet (water supply) • Water outlet (drainage)

Rice field dam



Drainage adjustment



b Rice field dam

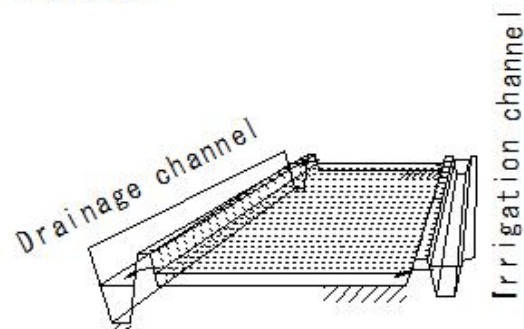
Drainage adjustment

- ① In heavy rain, water is stored in the paddy field up to the height of this plate
- ② Normal drainage flows out from the round hole
- ③ Water fall adjustment plate
- ④ Rainwater is drained from a hole of about 5 cm
- ⑤ Always installed

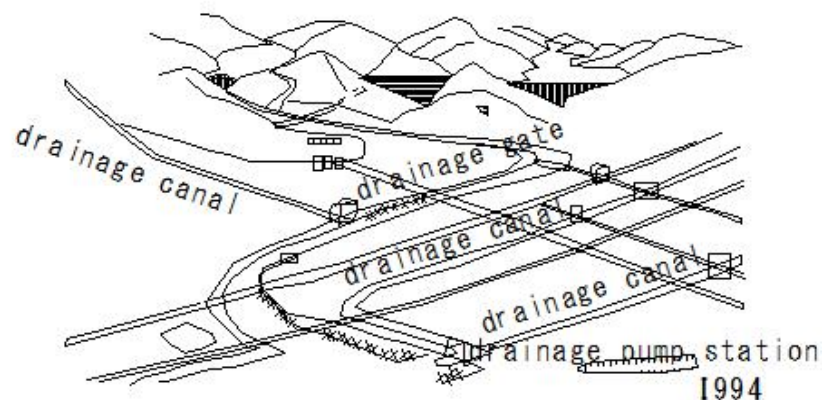
(I1142) Water inlet (water supply) • Water outlet (drainage)

(I1142) Water inlet (water supply) • Water outlet (drainage)

Rice field dam

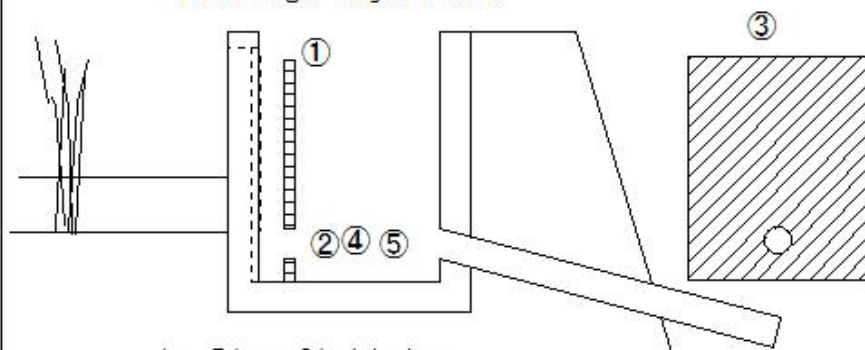


1847



1994

Drainage adjustment

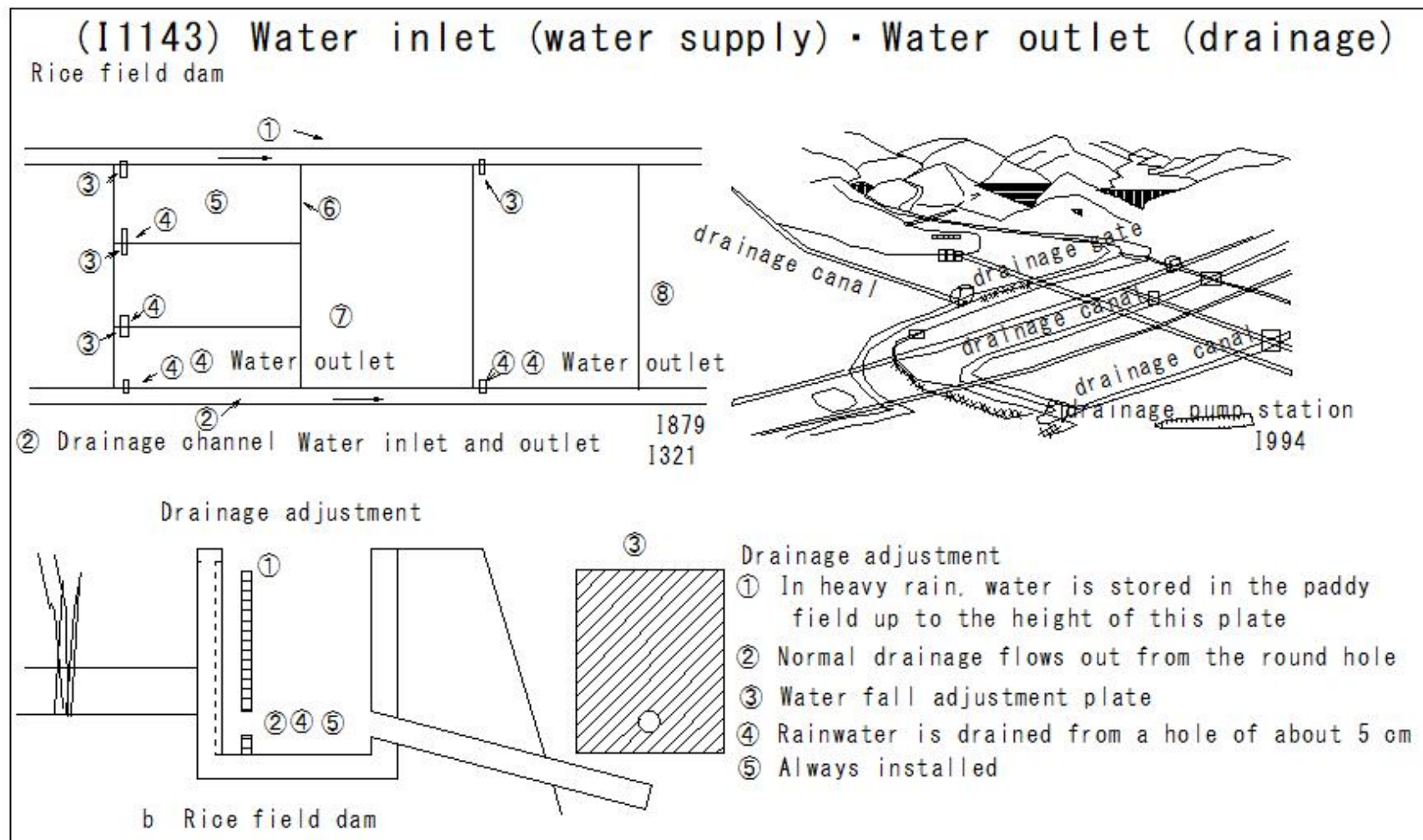


b Rice field dam

Drainage adjustment

- ① In heavy rain, water is stored in the paddy field up to the height of this plate
- ② Normal drainage flows out from the round hole
- ③ Water fall adjustment plate
- ④ Rainwater is drained from a hole of about 5 cm
- ⑤ Always installed

(I1143) Water inlet (water supply) • Water outlet (drainage)

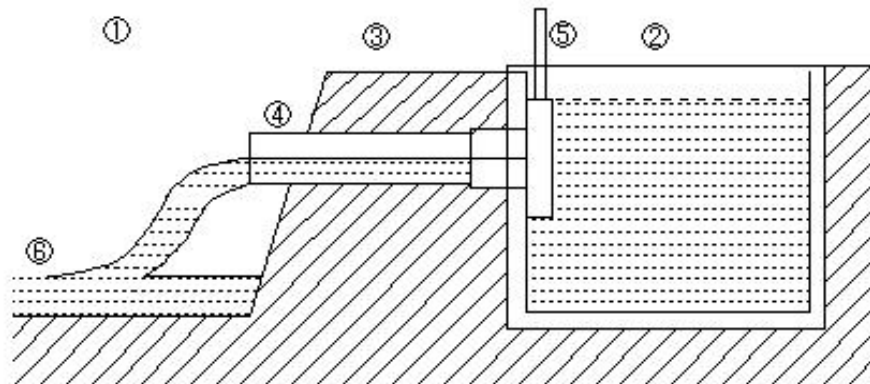


(I1144) Water inlet (water supply) • Water outlet (drainage)

(I1144) Water inlet (water supply) • Water outlet (drainage)

Water supply

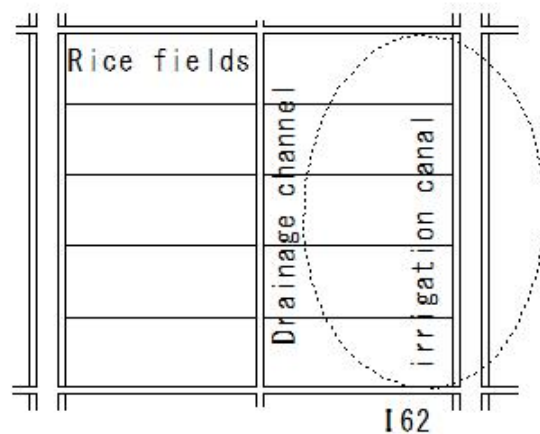
- ① Water supply
- ② Irrigation canal
- ③ Ridge
- ④ PVC pipe
- ⑤ Adjustment board
- ⑥ Paddy fields



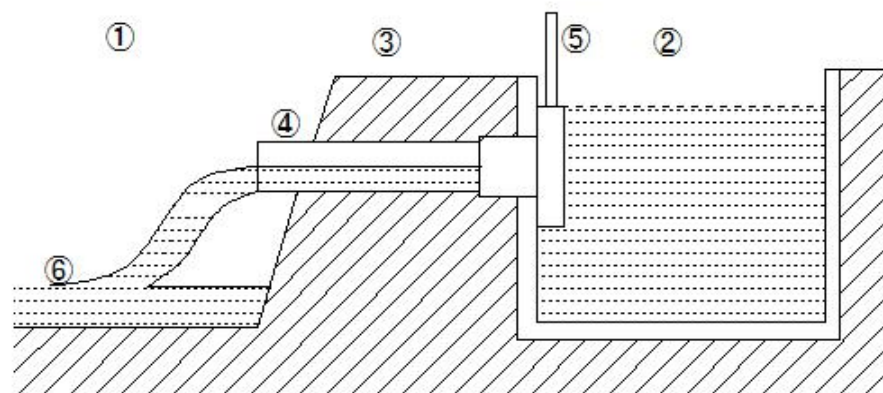
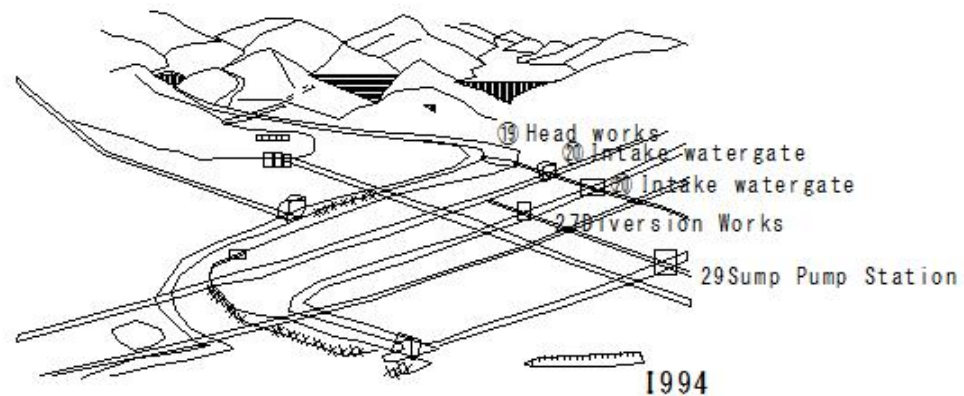
(I1145) Water inlet (water supply) • Water outlet (drainage)

(I1145) Water inlet (water supply) • Water outlet (drainage)

Water supply



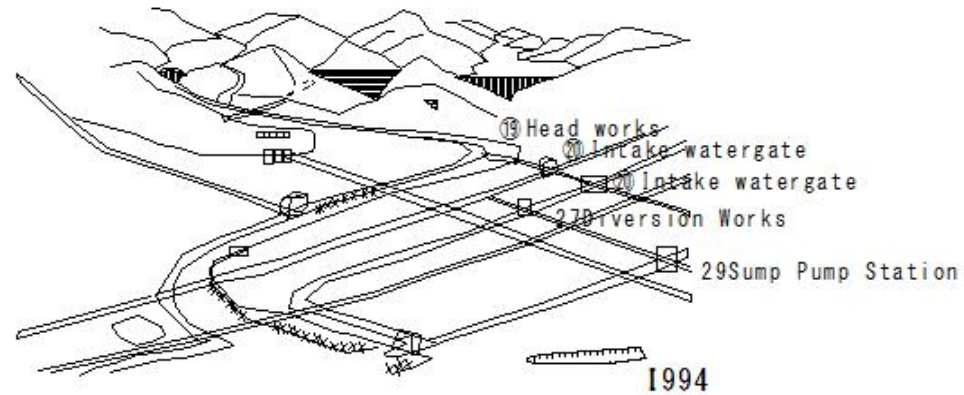
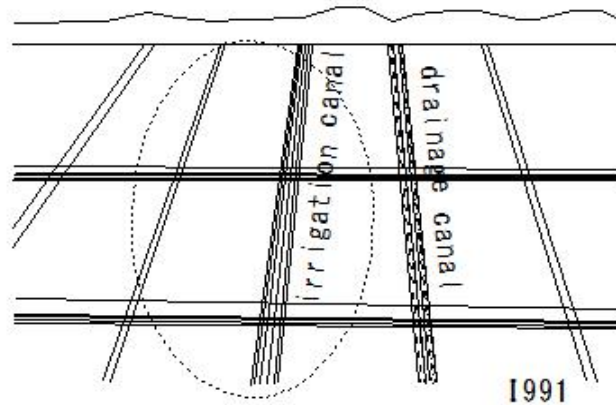
- ① Water supply
- ② Irrigation canal
- ③ Ridge
- ④ PVC pipe
- ⑤ Adjustment board
- ⑥ Paddy fields



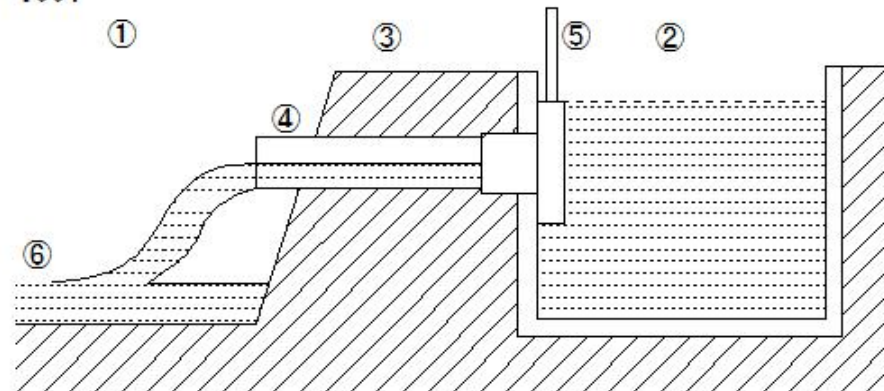
(I1146) Water inlet (water supply) • Water outlet (drainage)

(I1146) Water inlet (water supply) • Water outlet (drainage)

Water supply



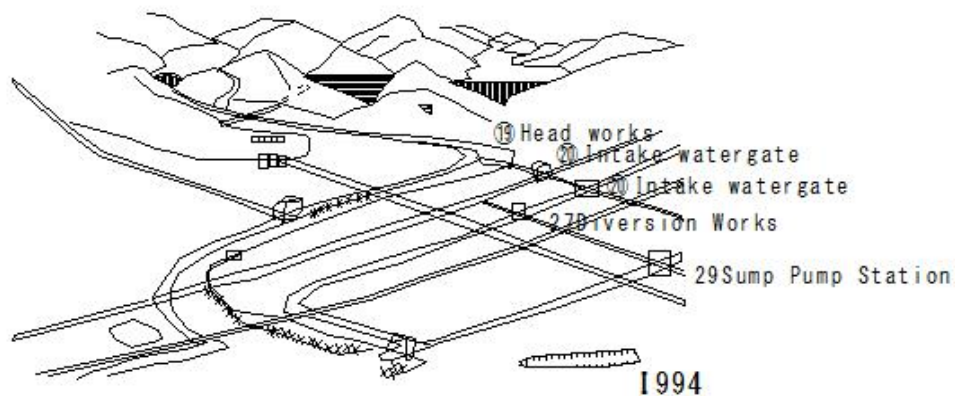
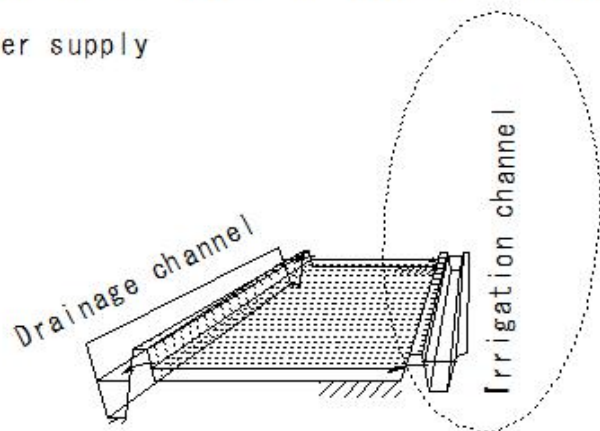
- ① Water supply
- ② Irrigation canal
- ③ Ridge
- ④ PVC pipe
- ⑤ Adjustment board
- ⑥ Paddy fields



(I1147) Water inlet (water supply) • Water outlet (drainage)

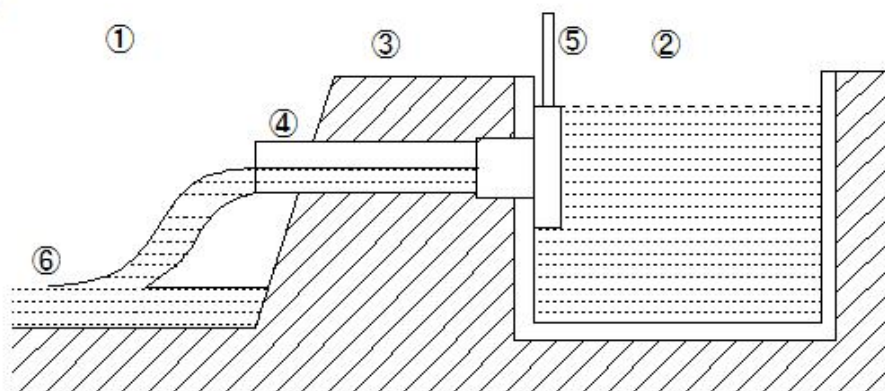
(I1147) Water inlet (water supply) • Water outlet (drainage)

Water supply



1847

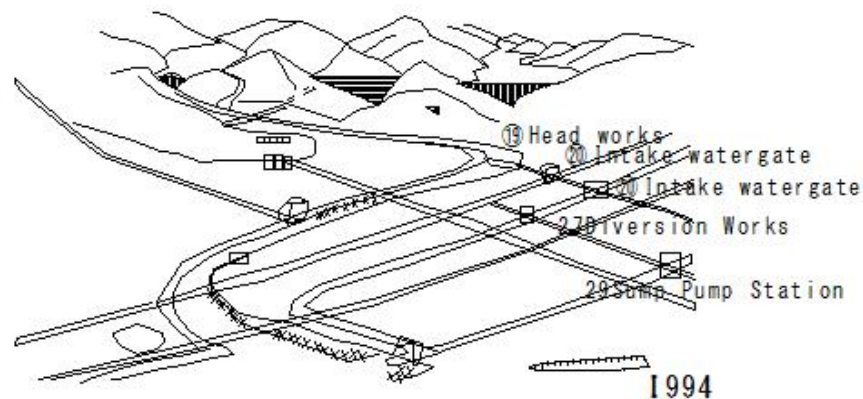
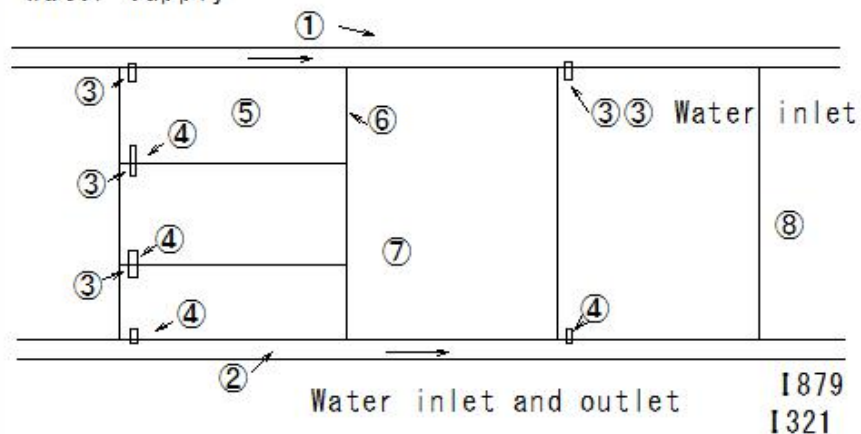
- ① Water supply
- ② Irrigation canal
- ③ Ridge
- ④ PVC pipe
- ⑤ Adjustment board
- ⑥ Paddy fields



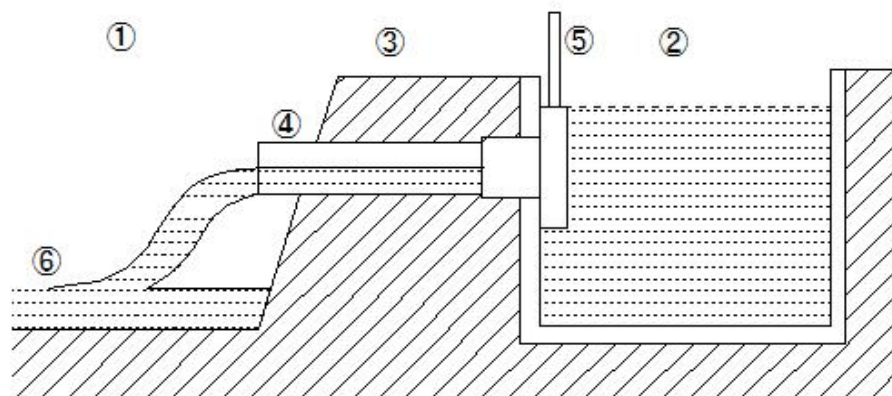
(I1148) Water inlet (water supply) • Water outlet (drainage)

(I1148) Water inlet (water supply) • Water outlet (drainage)

Water supply



- ① Water supply
- ② Irrigation canal
- ③ Ridge
- ④ PVC pipe
- ⑤ Adjustment board
- ⑥ Paddy fields



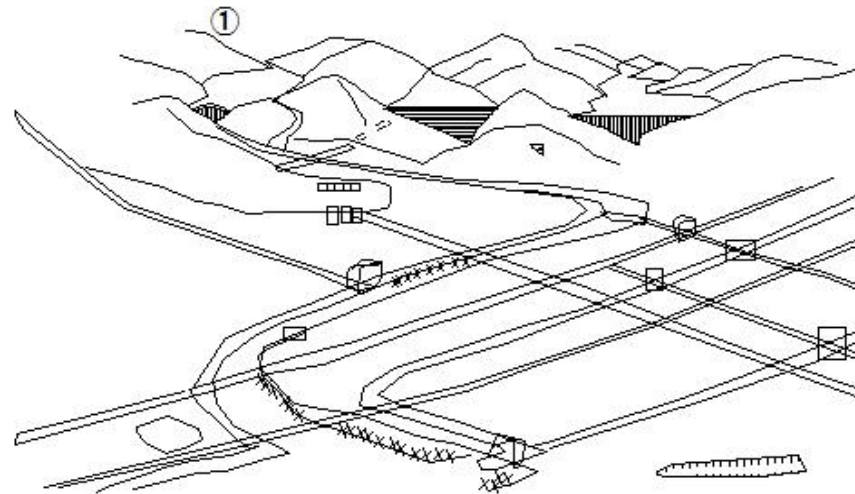
(I1149) Agricultural water and drainage facilities

(I1149) Agricultural water and drainage facilities

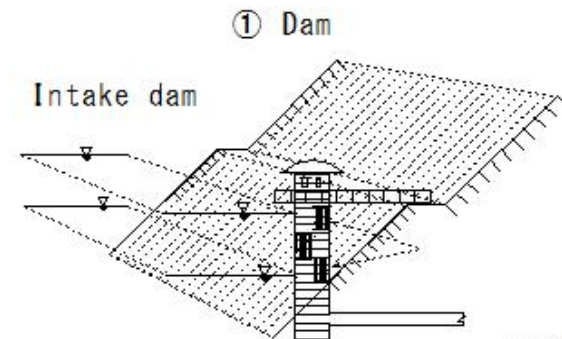
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



1994



1516

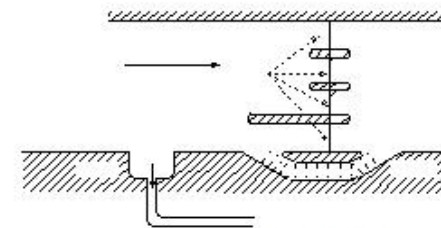
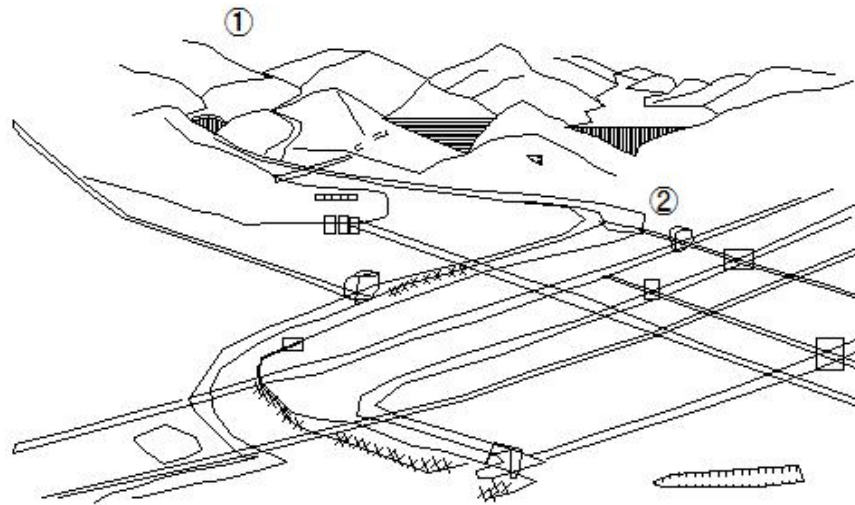
(I1150) Agricultural water and drainage facilities

(I1150) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



② Headworks R566
I205

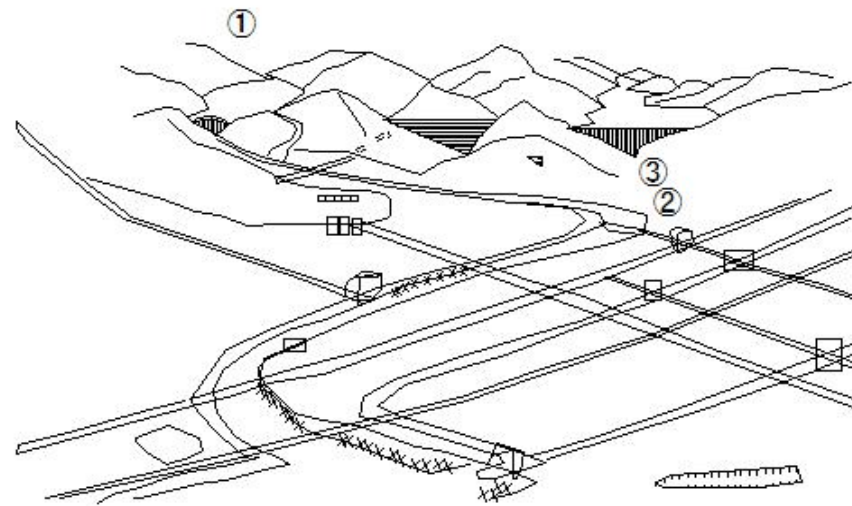
(I1151) Agricultural water and drainage facilities

(I1151) Agricultural water and drainage facilities

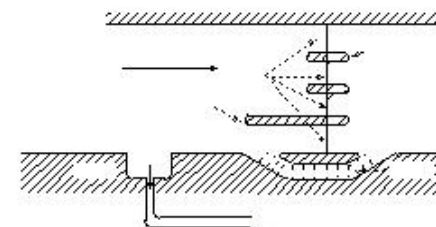
Agricultural water

Agricultural water and drainage facilities

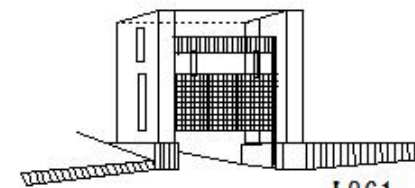
- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



1994



② Headworks R566
I205



③ Intake sluice gate I861
I560

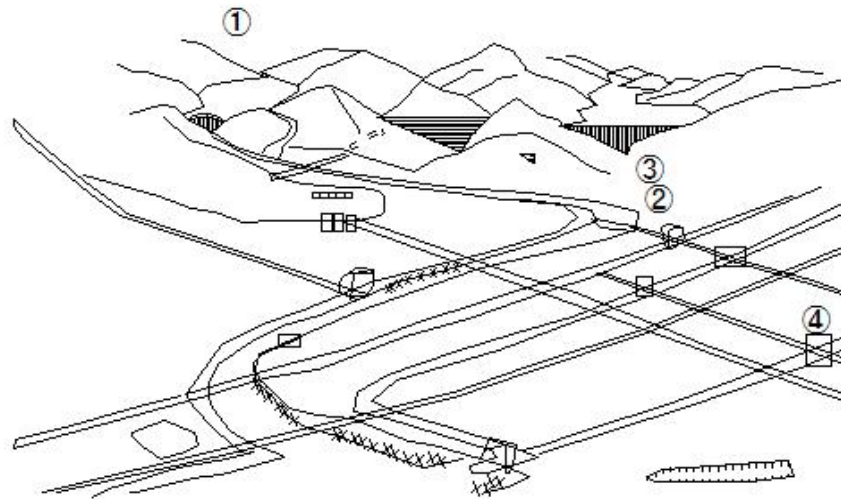
(I1152) Agricultural water and drainage facilities

(I1152) Agricultural water and drainage facilities

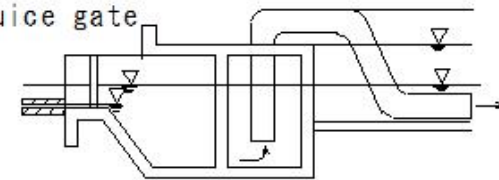
Agricultural water

Agricultural water and drainage facilities

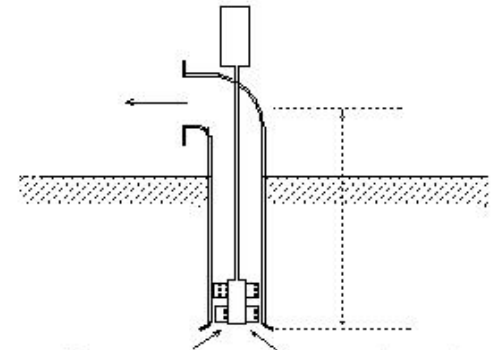
- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
 ⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
 ⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
 ⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
 ⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



1994



④ Pumping station (pump) 1915



④ Pumping station (pump) M370 1491 1916

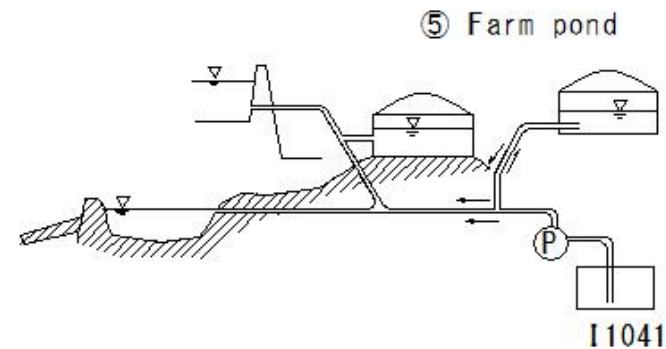
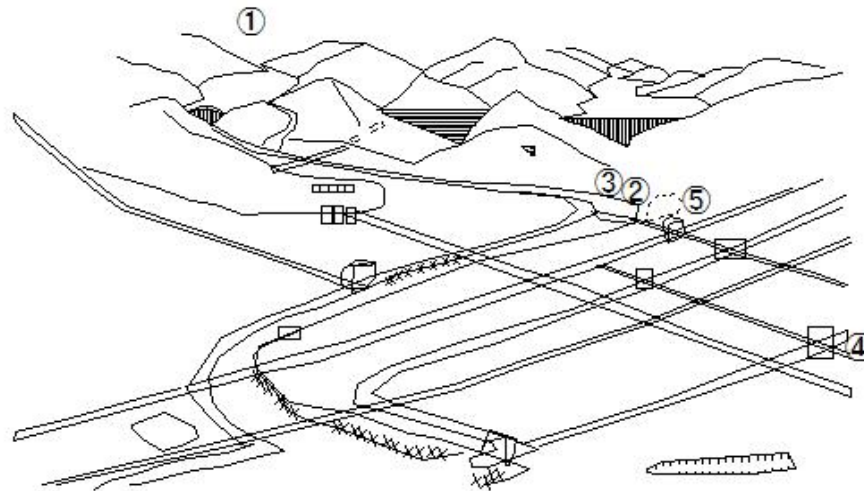
(I1153) Agricultural water and drainage facilities

(I1153) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



1994

I1041

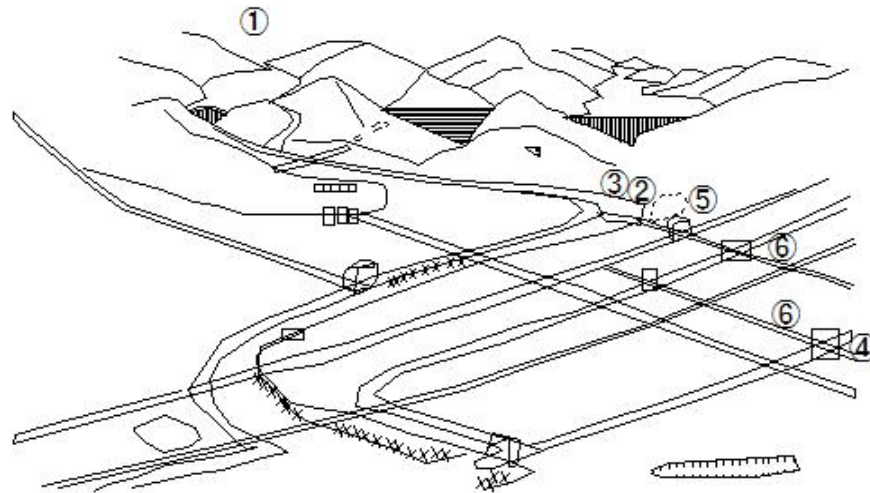
(I1154) Agricultural water and drainage facilities

(I1154) Agricultural water and drainage facilities

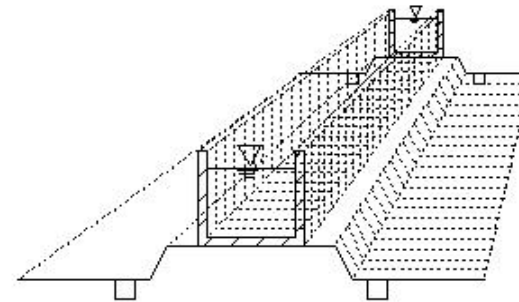
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



⑥ Main irrigation channel (open channel)



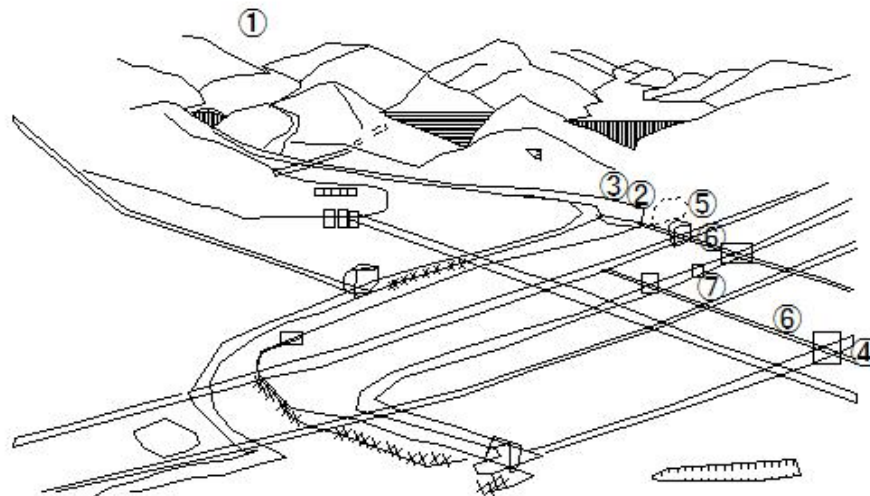
(I1155) Agricultural water and drainage facilities

(I1155) Agricultural water and drainage facilities

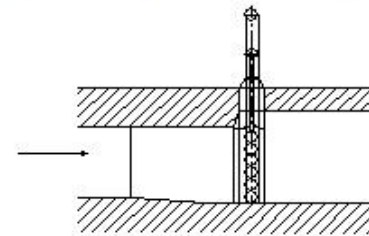
Agricultural water

Agricultural water and drainage facilities

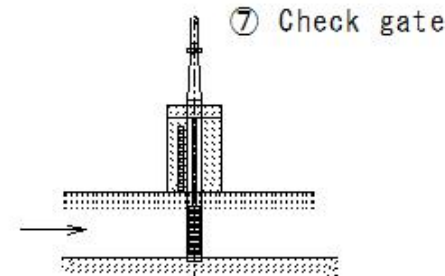
- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate ⑦ Check gate



1994



I87
R544



I149
R554

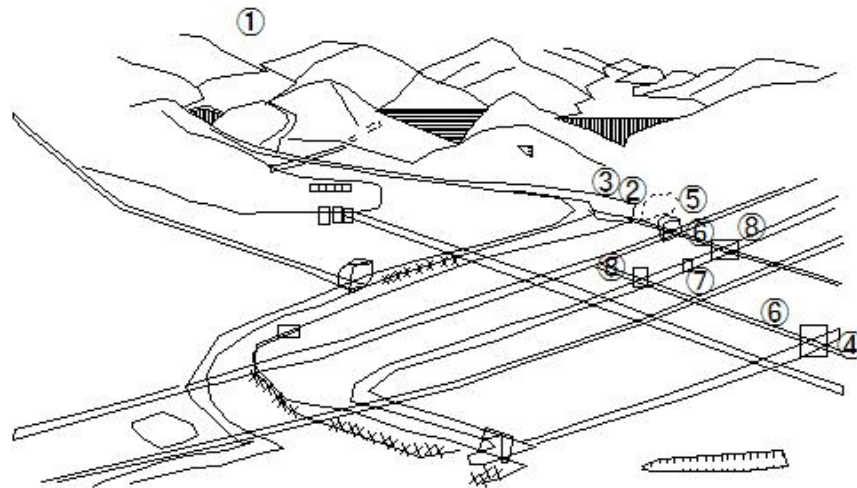
(I1156) Agricultural water and drainage facilities

(I1156) Agricultural water and drainage facilities

Agricultural water

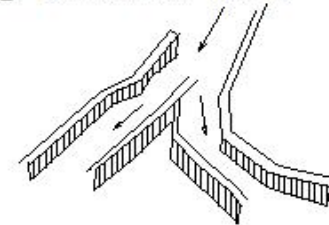
Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



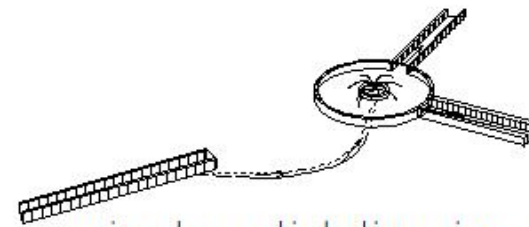
1994

⑧ Diversion works



shooting flow diversion works

I737
R490



circular radial diversion works

I738
I917
R491
I864

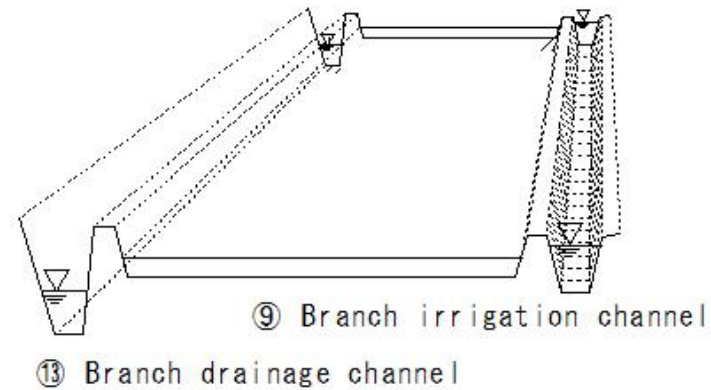
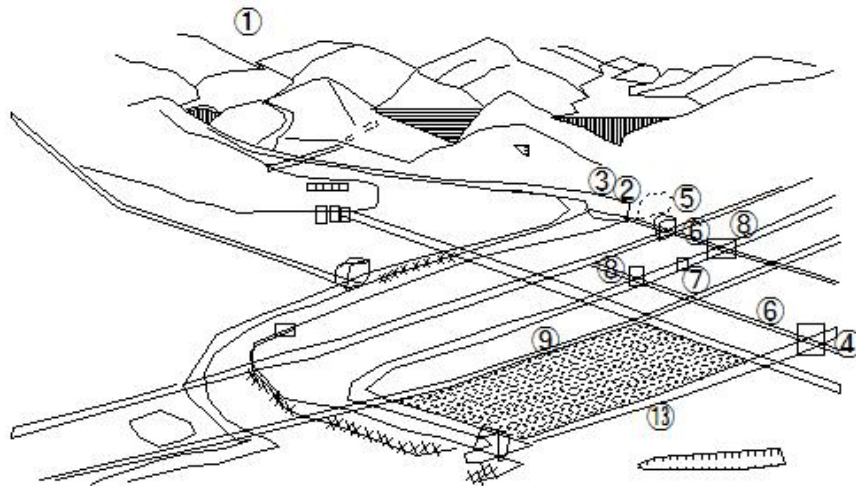
(I1157) Agricultural water and drainage facilities

(I1157) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



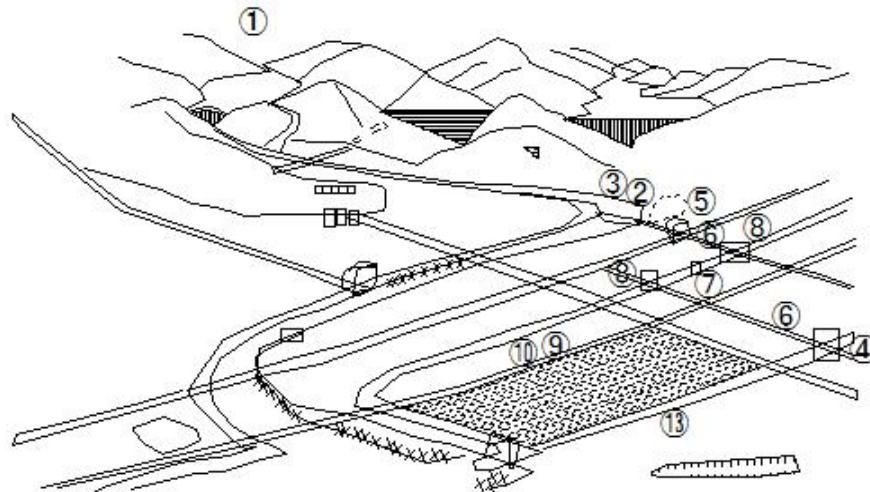
(I1158) Agricultural water and drainage facilities

(I1158) Agricultural water and drainage facilities

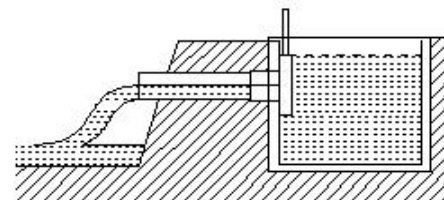
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



⑩ Water inlet (supply)



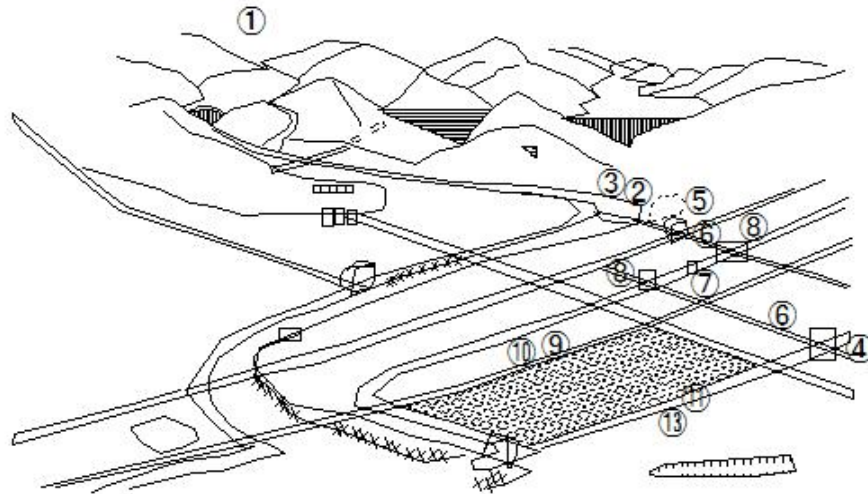
(I1159) Agricultural water and drainage facilities

(I1159) Agricultural water and drainage facilities

Agricultural water

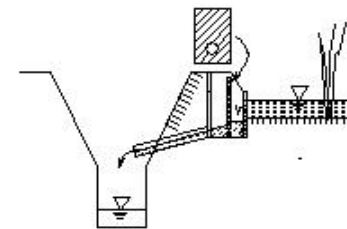
Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



1994

⑪ Water outlet (drainage)



I1123

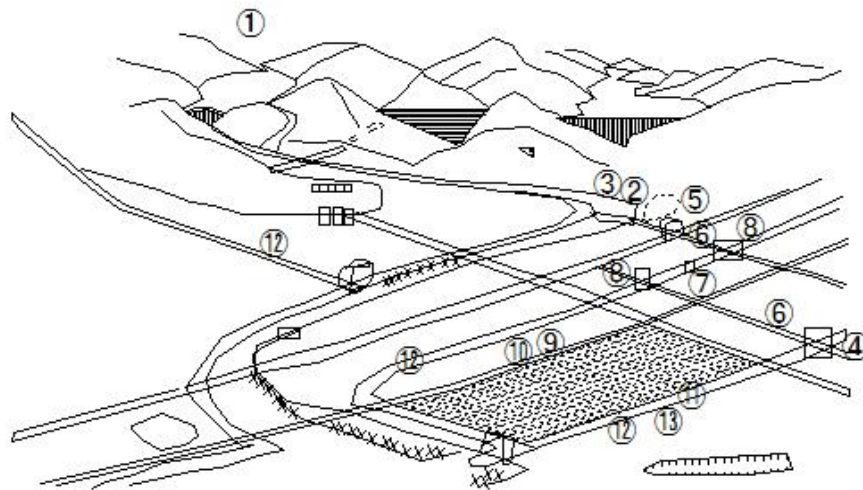
(I1160) Agricultural water and drainage facilities

(I1160) Agricultural water and drainage facilities

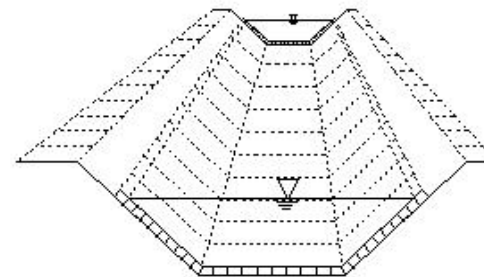
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



⑫ Main drainage channel (open channel)



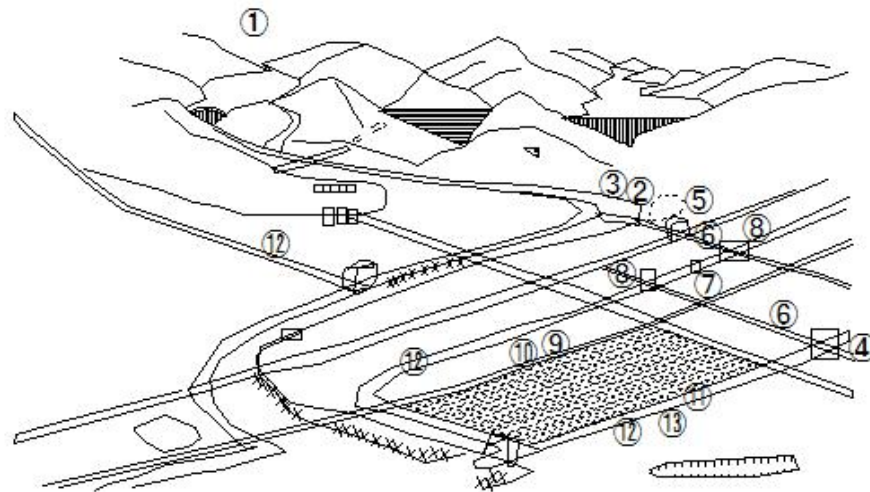
(I1161) Agricultural water and drainage facilities

(I1161) Agricultural water and drainage facilities

Agricultural water

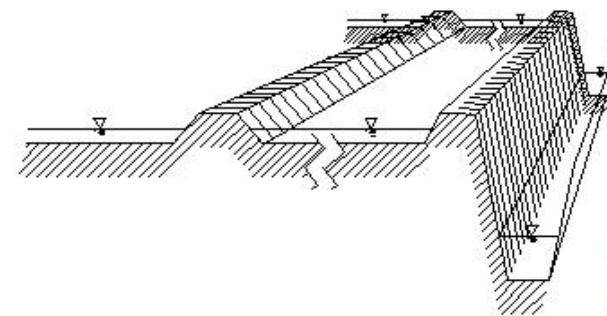
Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



I994

⑬ Branch drainage channel



I853
I255
E462

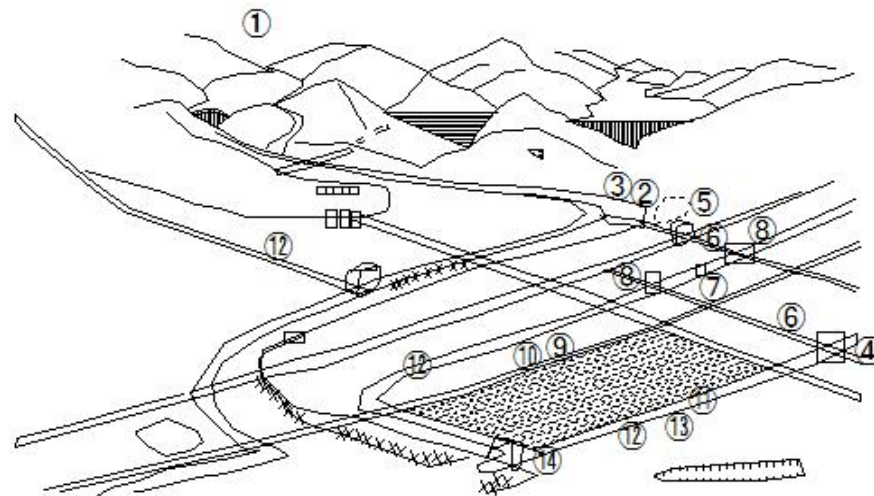
(I1162) Agricultural water and drainage facilities

(I1162) Agricultural water and drainage facilities

Agricultural water

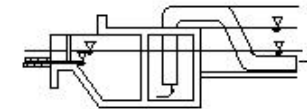
Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate

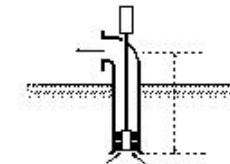


1994

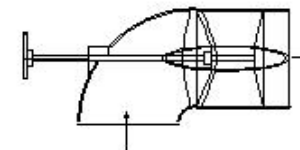
⑭ Drainage station



1915



M370
1491
1916



1917

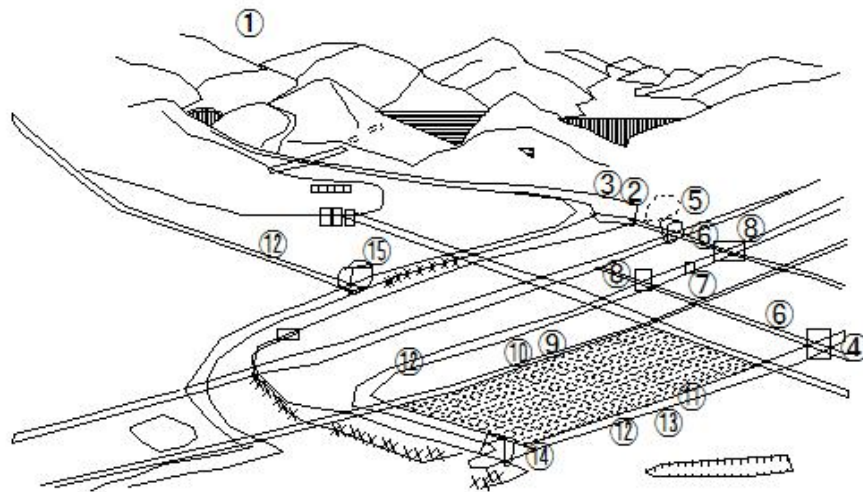
(I1163) Agricultural water and drainage facilities

(I1163) Agricultural water and drainage facilities

Agricultural water

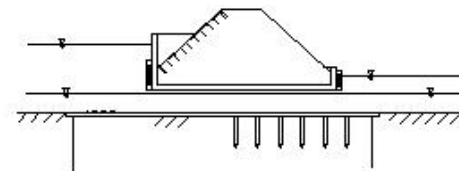
Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate

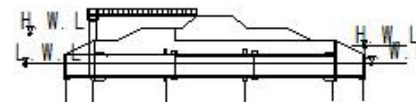


1994

⑮ Drainage sluice gate

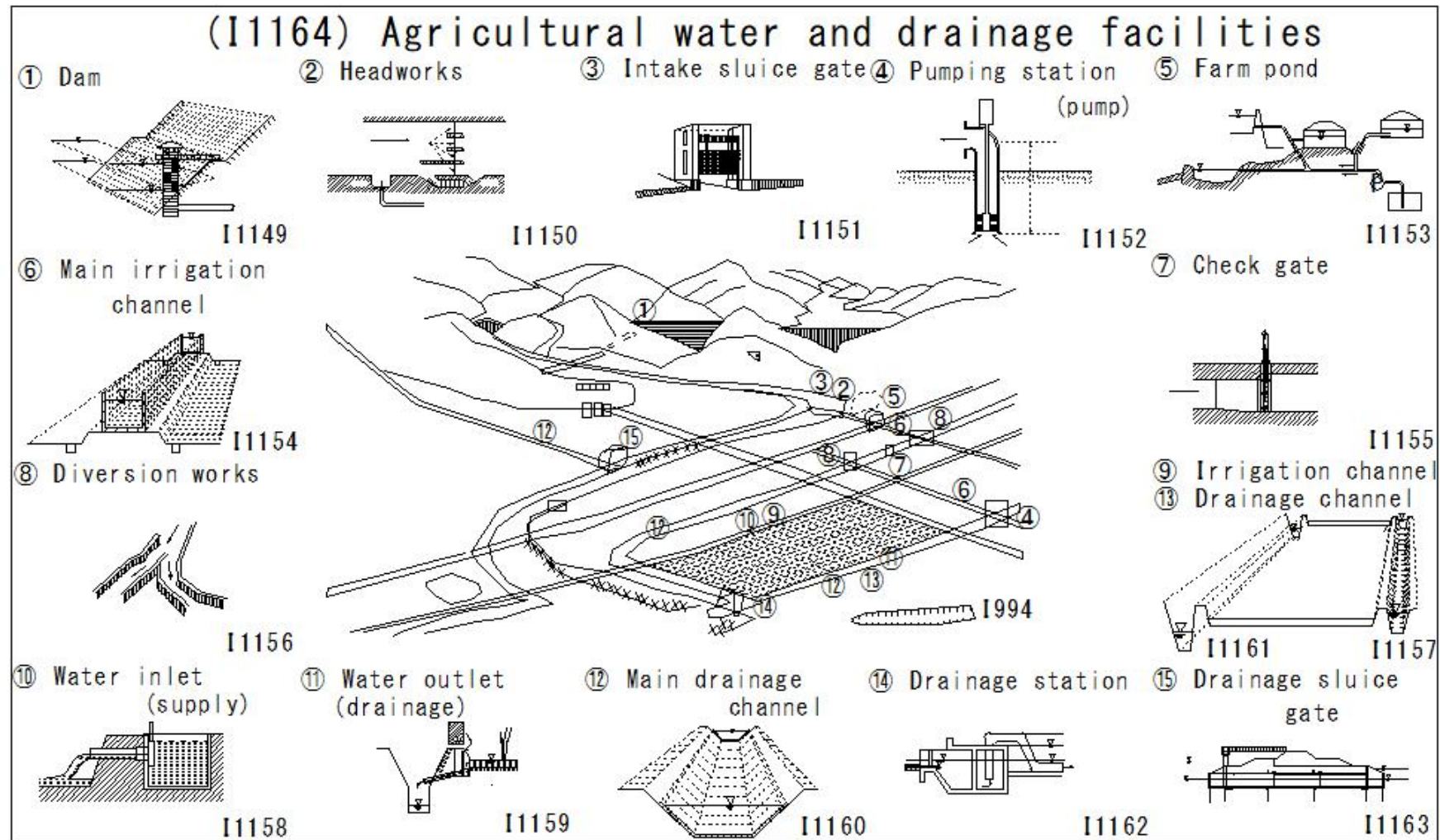


R143
I892



I895

(I1164) Agricultural water and drainage facilities



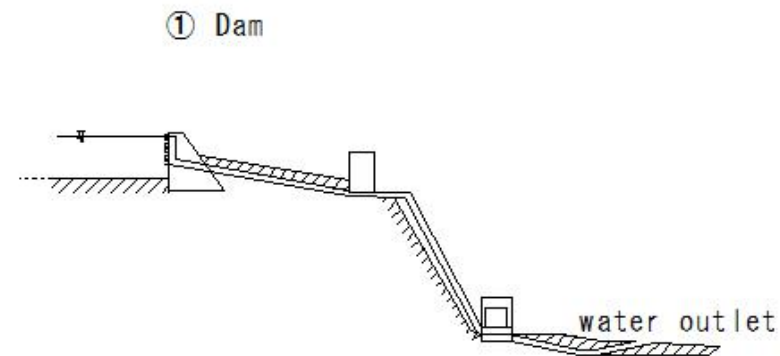
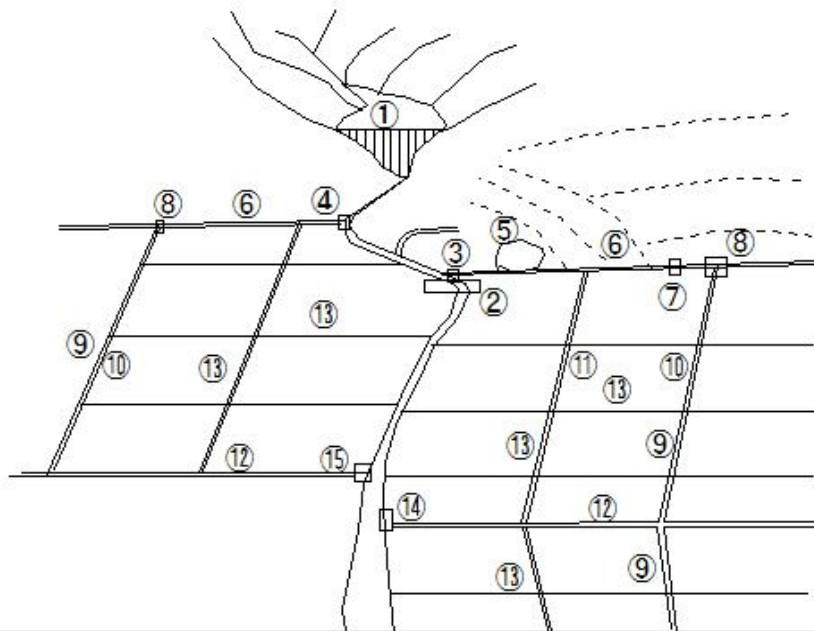
(I1165) Agricultural water and drainage facilities

(I1165) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



D270

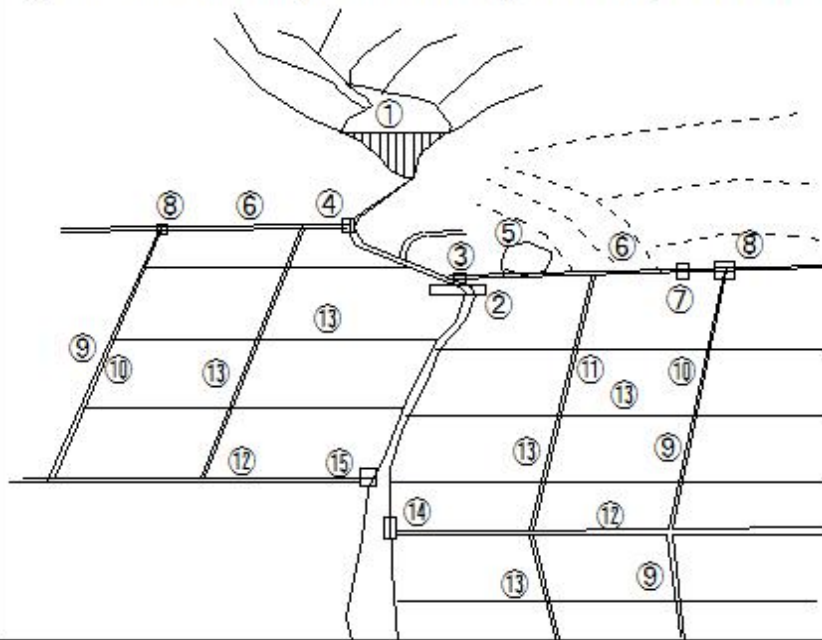
(I1166) Agricultural water and drainage facilities

(I1166) Agricultural water and drainage facilities

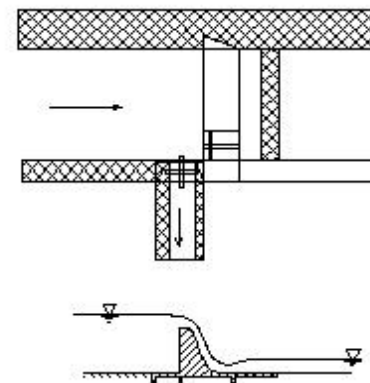
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



② Headworks



R438
I631

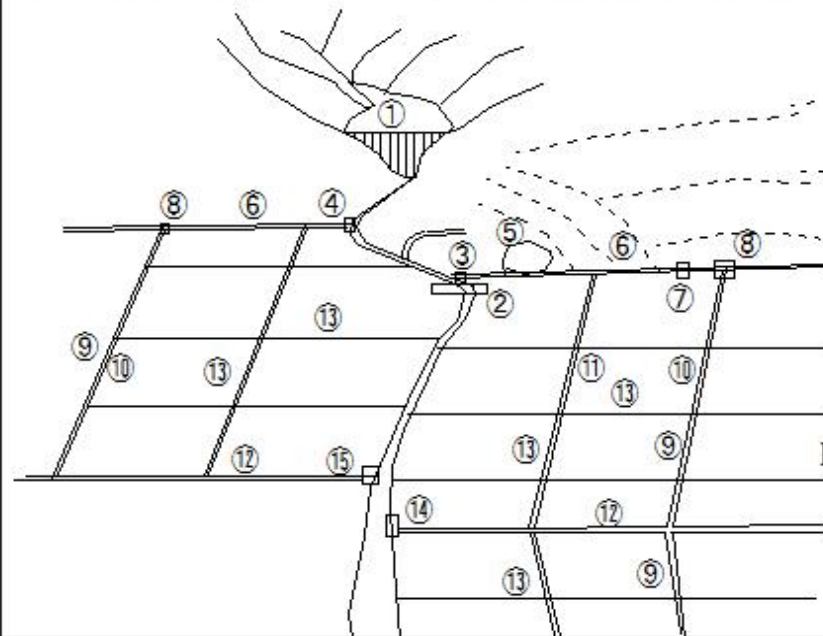
(I1167) Agricultural water and drainage facilities

(I1167) Agricultural water and drainage facilities

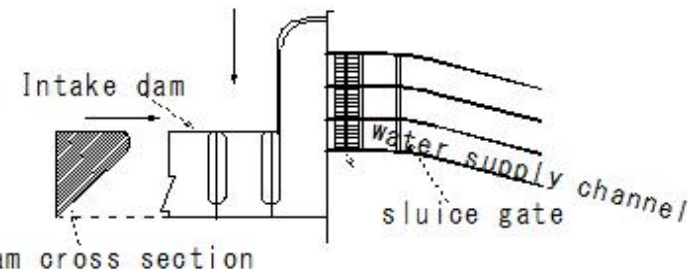
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



③ Intake sluice gate



R510
1687

(I1168) Agricultural water and drainage facilities

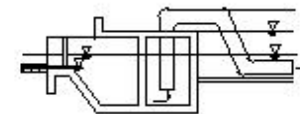
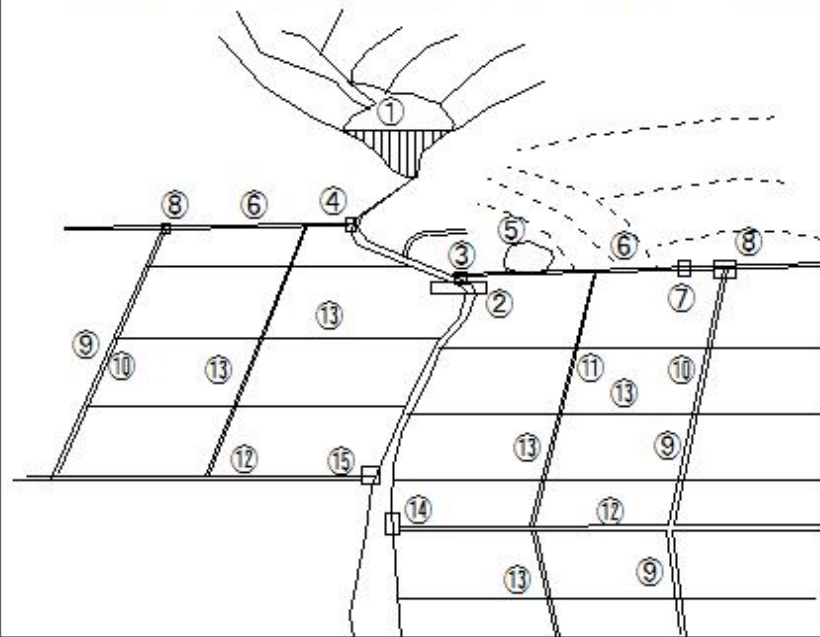
(I1168) Agricultural water and drainage facilities

Agricultural water

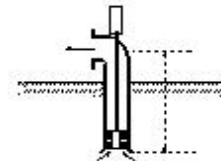
Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
 ⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
 ⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
 ⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
 ⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate

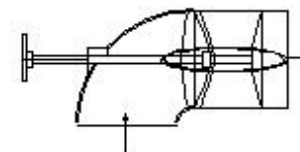
④ Pumping station (pump)



I915



M370
I491
I916



I917

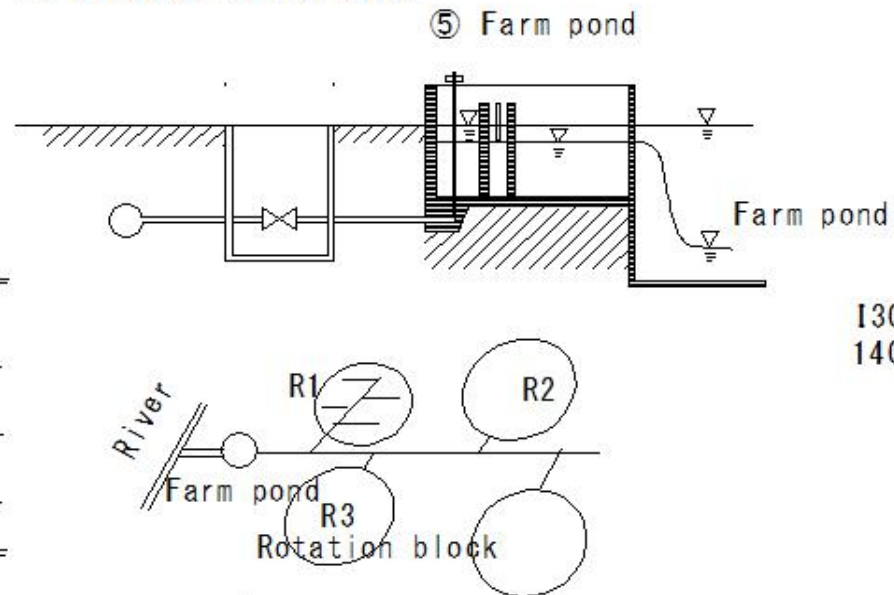
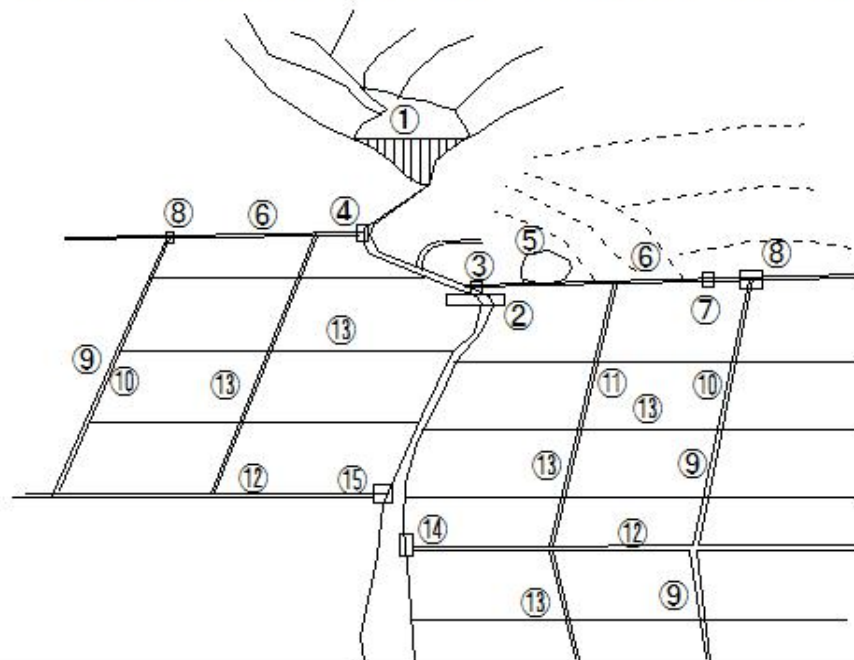
(I1169) Agricultural water and drainage facilities

(I1169) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
 ⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
 ⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
 ⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
 ⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



I304
I403

I349

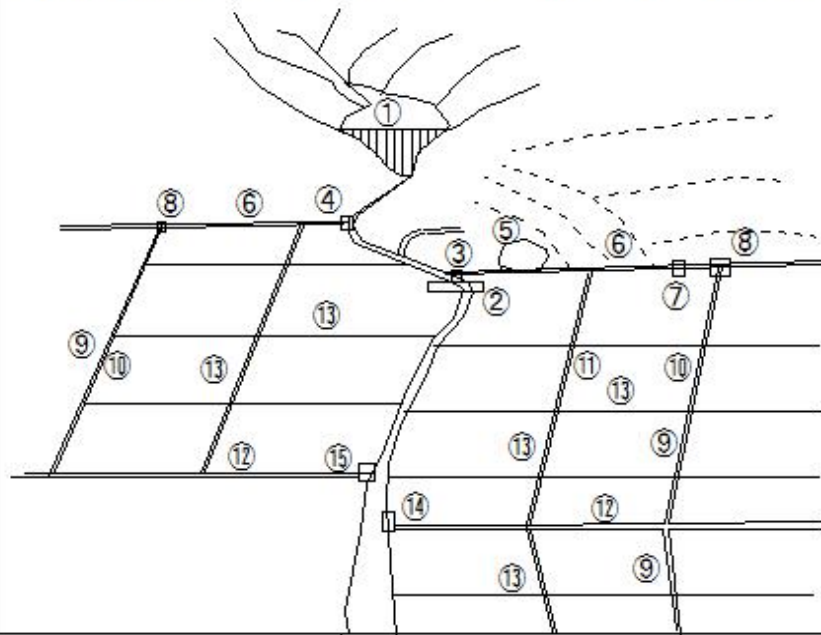
(I1170) Agricultural water and drainage facilities

(I1170) Agricultural water and drainage facilities

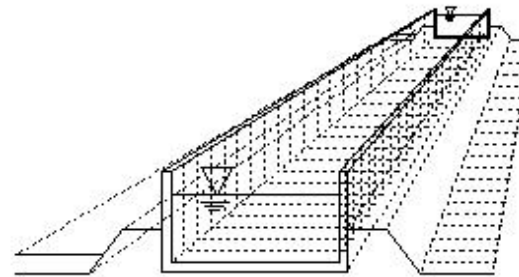
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



⑥ Main irrigation channel (open channel)



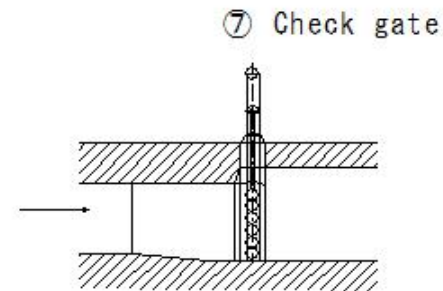
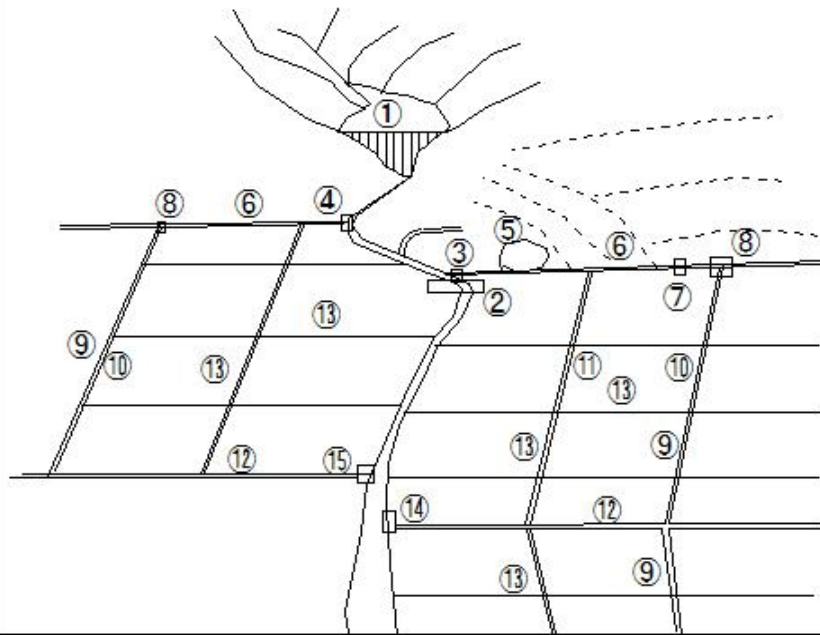
(I1171) Agricultural water and drainage facilities

(I1171) Agricultural water and drainage facilities

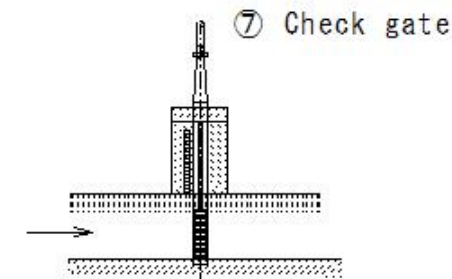
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



I1155
I87
R544



I1155
I149
R554

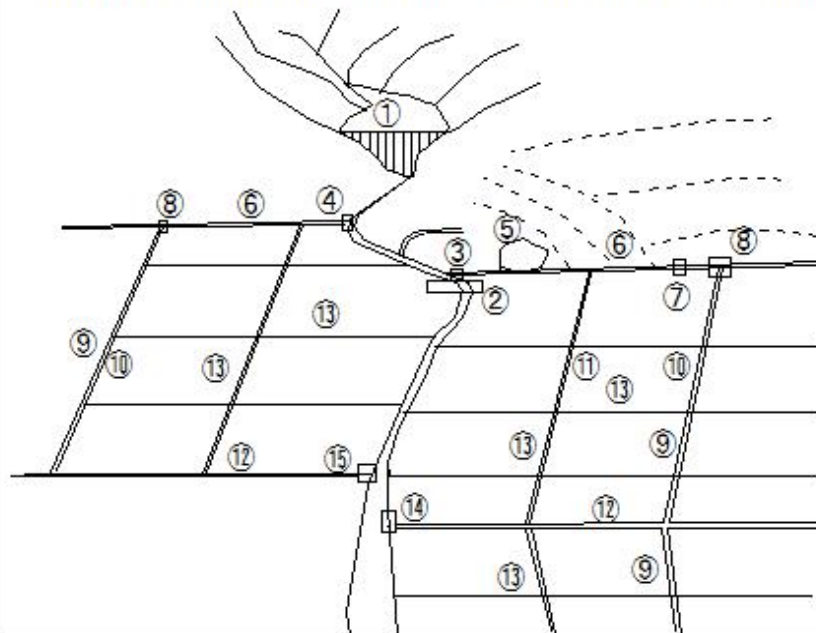
(I1172) Agricultural water and drainage facilities

(I1172) Agricultural water and drainage facilities

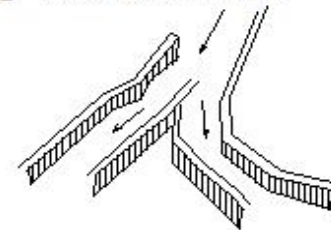
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate

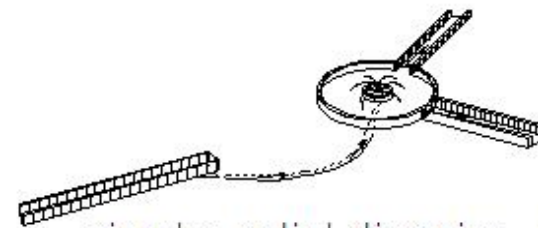


⑧ Diversion works



shooting flow diversion works

I1156
I737
R490



circular radial diversion works

I1156
I738
I917
R491
I864

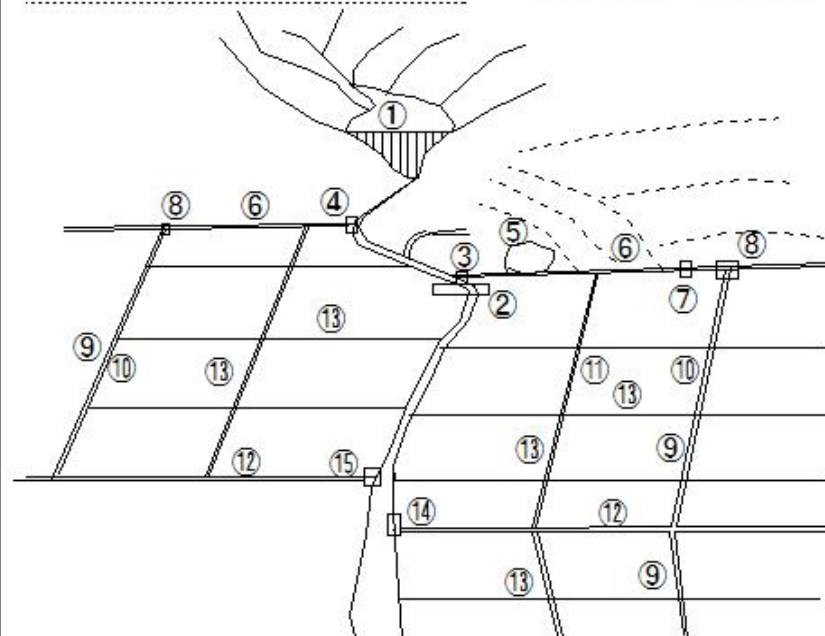
(I1173) Agricultural water and drainage facilities

(I1173) Agricultural water and drainage facilities

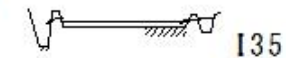
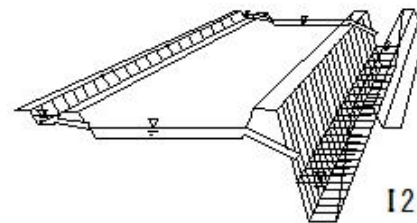
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate

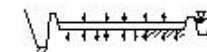


⑨ Branch irrigation channel



I35

⑬ Branch drainage channel



I36

I272

I909

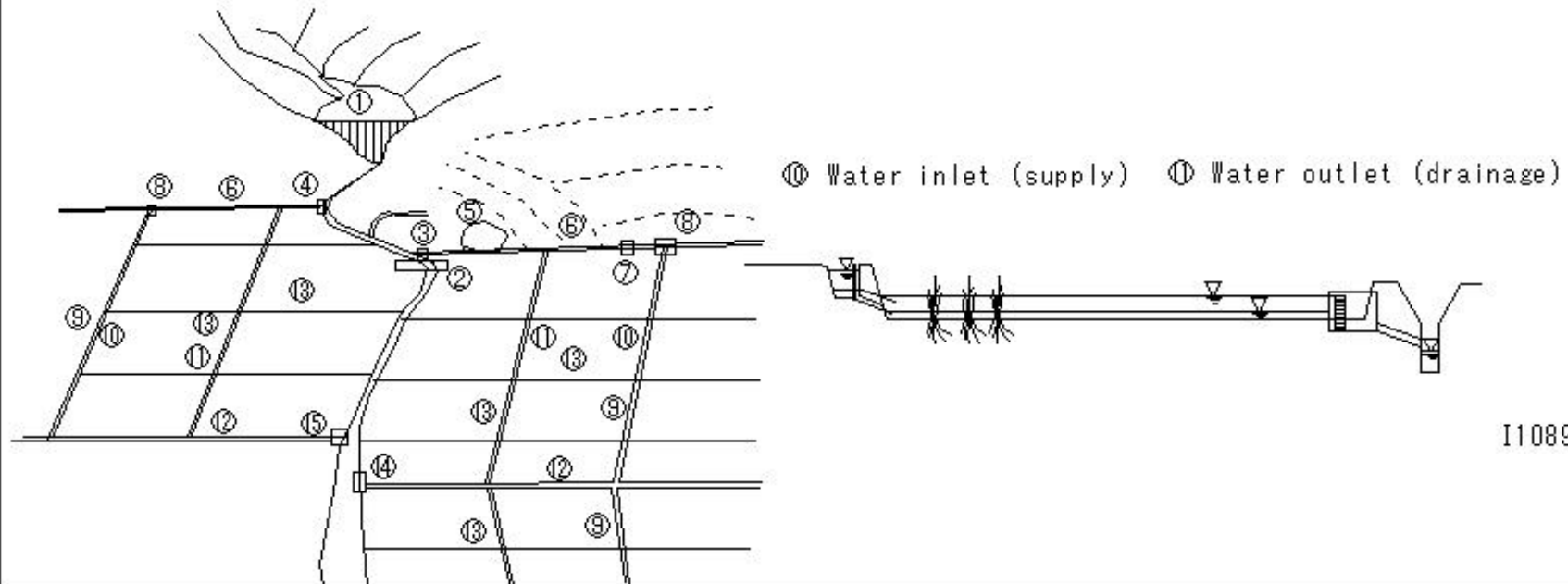
(I1174) Agricultural water and drainage facilities

(I1174) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate→
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



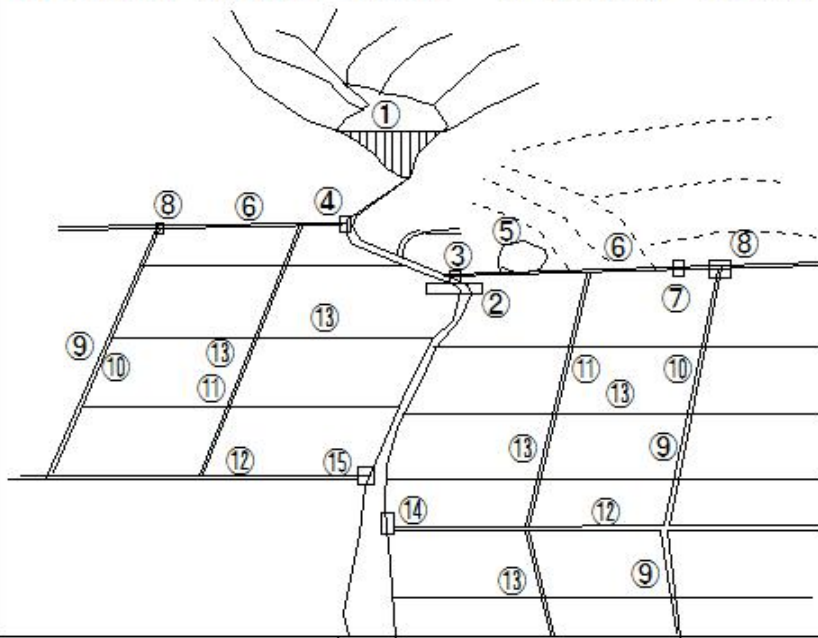
(I1175) Agricultural water and drainage facilities

(I1175) Agricultural water and drainage facilities

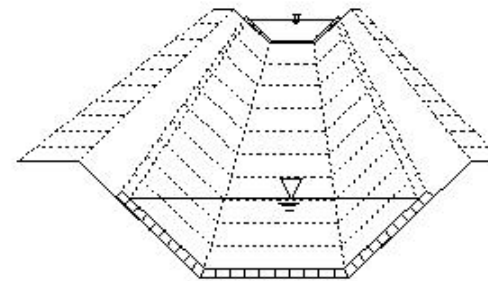
Agricultural water

Agricultural water and drainage facilities

- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



⑫ Main drainage channel (open channel)



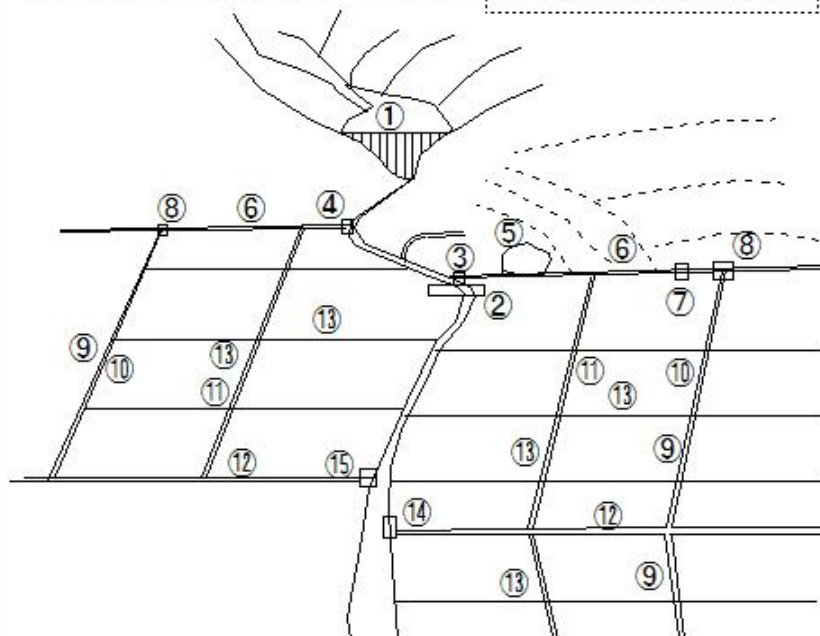
(I1176) Agricultural water and drainage facilities

(I1176) Agricultural water and drainage facilities

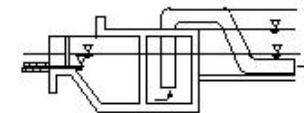
Agricultural water

Agricultural water and drainage facilities

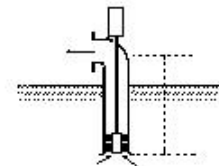
- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



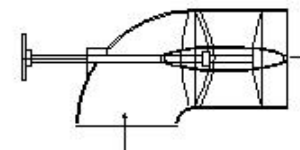
⑭ Drainage station



I915



M370
I491
I916



I917

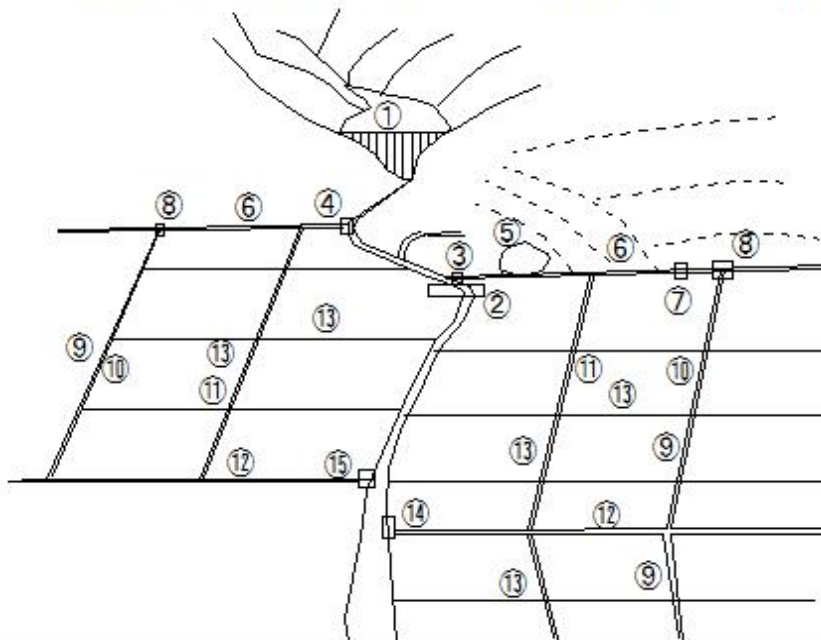
(I1177) Agricultural water and drainage facilities

(I1177) Agricultural water and drainage facilities

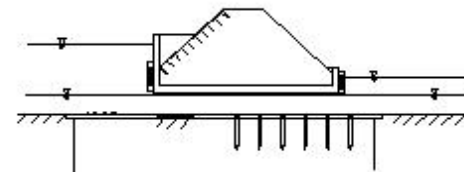
Agricultural water

Agricultural water and drainage facilities

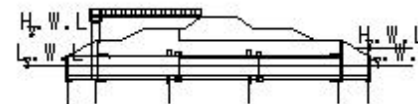
- ① Dam→② Headworks→③ Intake sluice gate→④ Pumping station (pump)→
⑤ Farm pond→⑥ Main irrigation channel (open channel)→⑦ Check gate
⑧ Diversion works→⑨ Branch irrigation channel→⑩ Water inlet (supply)→
⑪ Water outlet (drainage)→⑫ Main drainage channel (open channel)→
⑬ Branch drainage channel→⑭ Drainage station→⑮ Drainage sluice gate



⑮ Drainage sluice gate

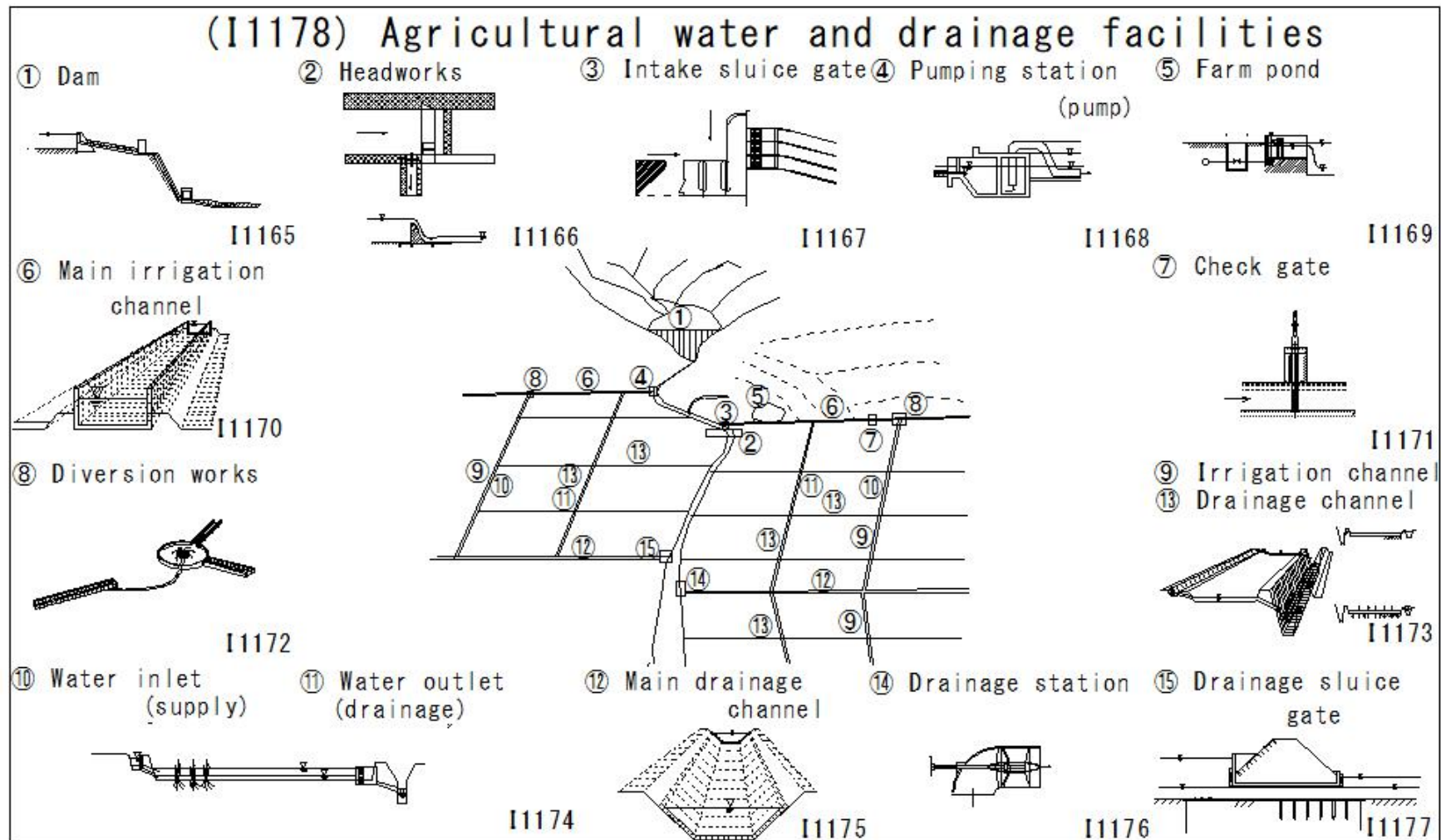


R143
1892



1895

(I1178) Agricultural water and drainage facilities



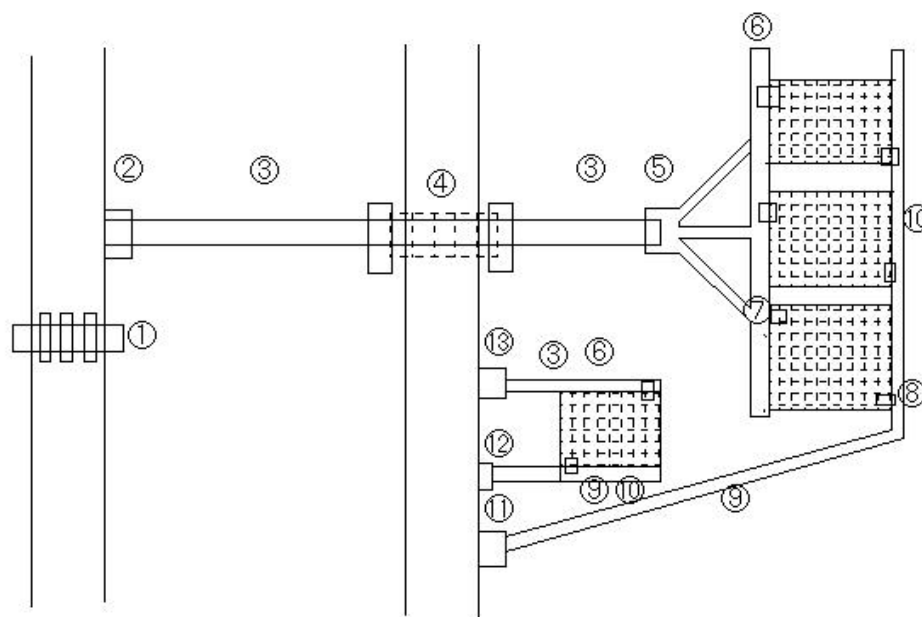
(I1179) Agricultural water and drainage facilities

(I1179) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



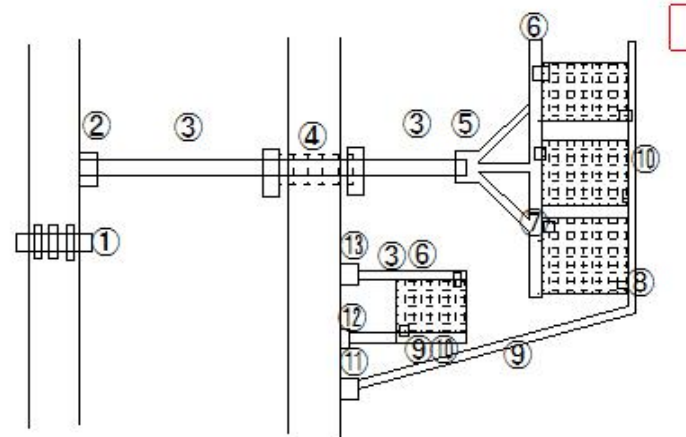
(I1180) Agricultural water and drainage facilities

(I1180) Agricultural water and drainage facilities

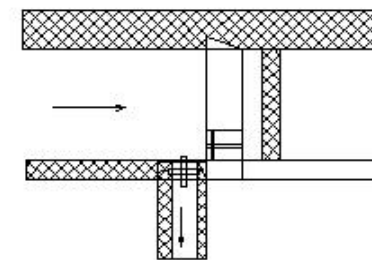
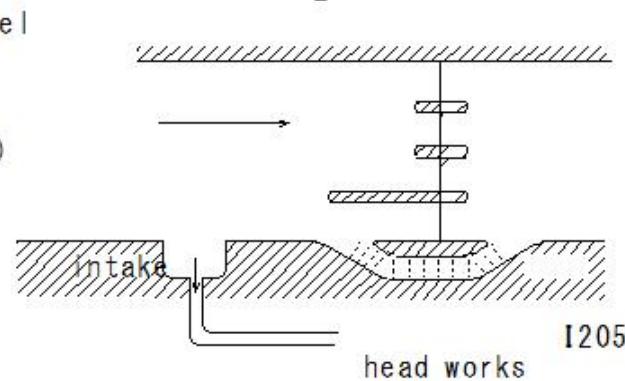
Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



① Headwork



R566

1859

1631

R438

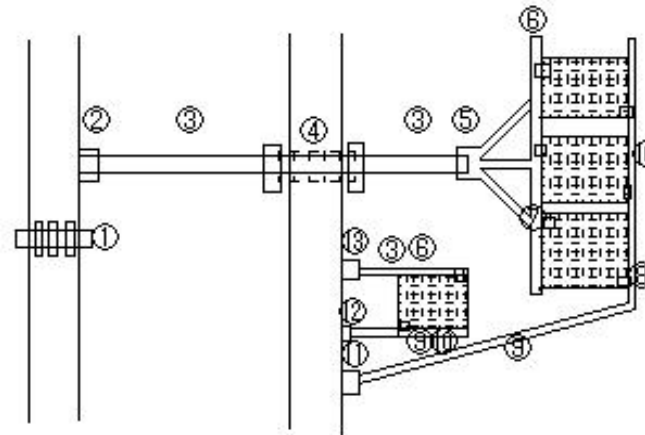
(I1181) Agricultural water and drainage facilities

(I1181) Agricultural water and drainage facilities

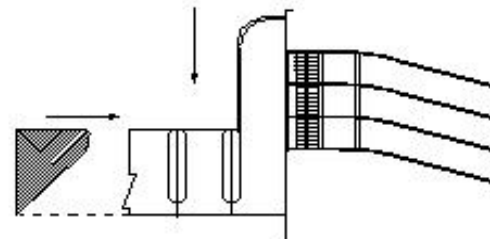
Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



② Intake water gate



I687
R510

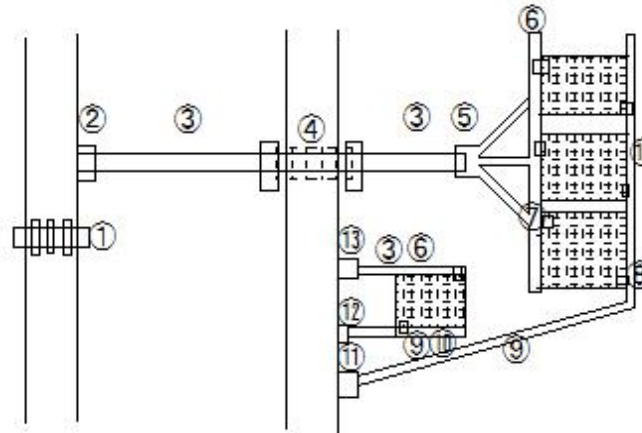
(I1182) Agricultural water and drainage facilities

(I1182) Agricultural water and drainage facilities

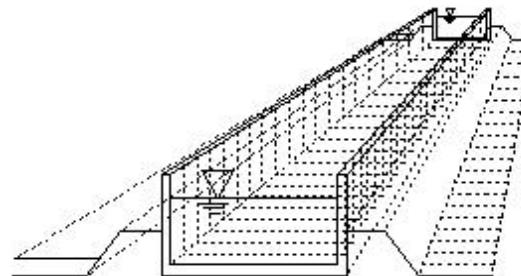
Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



③ Main canal (open canal)



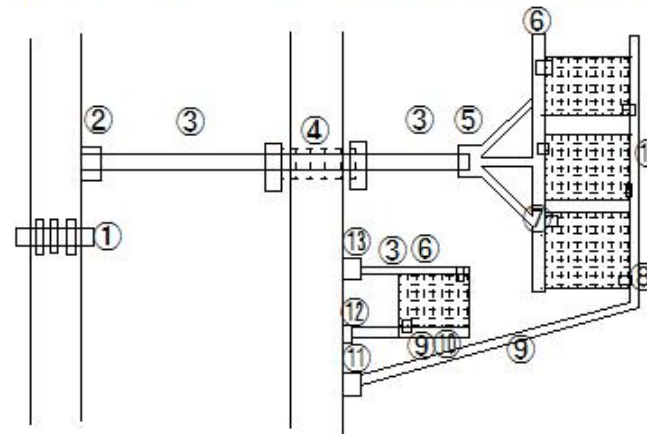
(I1183) Agricultural water and drainage facilities

(I1183) Agricultural water and drainage facilities

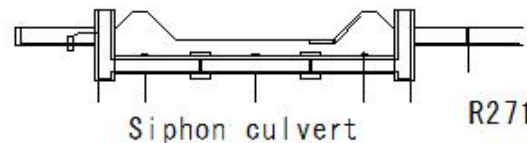
Agricultural water

Agricultural water and drainage facilities

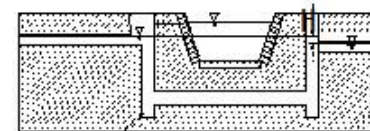
- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



④ Siphon



R271



I 869
R612



I 868
R602

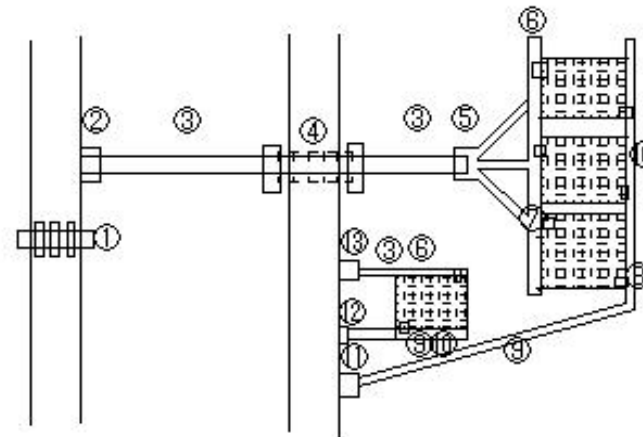
(I1184) Agricultural water and drainage facilities

(I1184) Agricultural water and drainage facilities

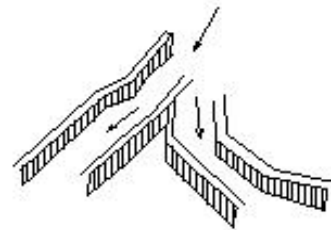
Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)

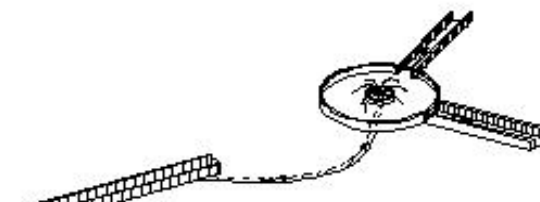


⑤ Diversion works



shooting flow diversion works

I1156
I737
R490



circular radial diversion works

I1156
I738
I917
R491
I864

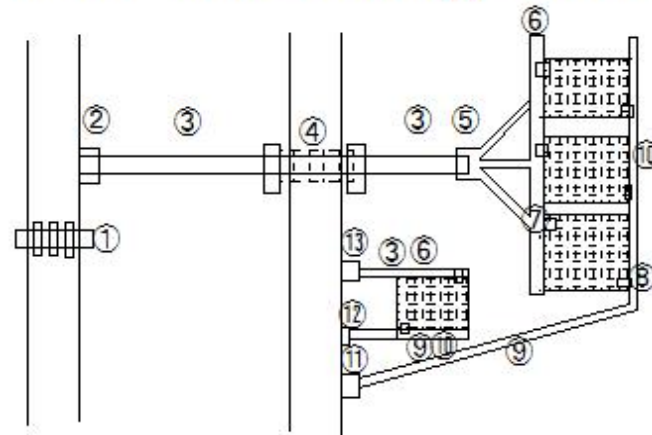
(I1185) Agricultural water and drainage facilities

(I1185) Agricultural water and drainage facilities

Agricultural water

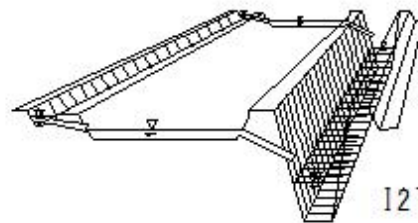
Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)

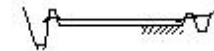


⑥ Branch waterway

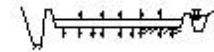
⑩ Branch drainage channel



1272



135



136

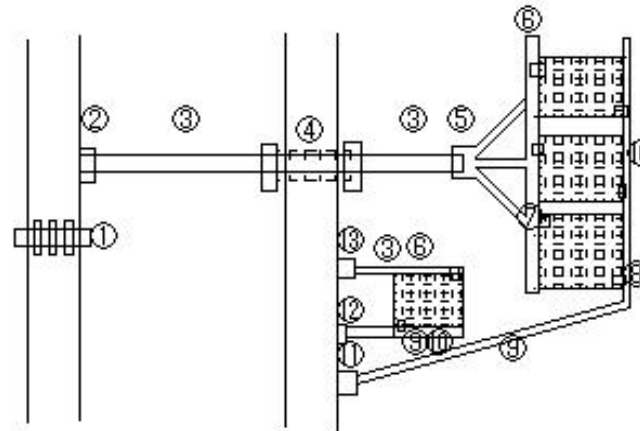
(I1186) Agricultural water and drainage facilities

(I1186) Agricultural water and drainage facilities

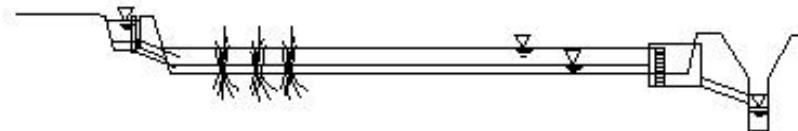
Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑦ Water outlet (water supply) ⑧ Water outlet (drainage)



I1089

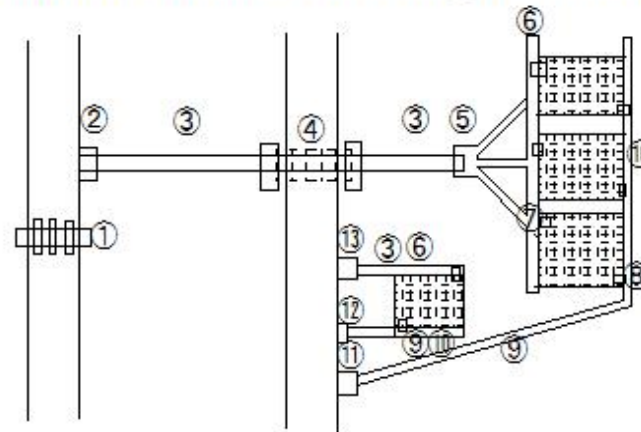
(I1187) Agricultural water and drainage facilities

(I1187) Agricultural water and drainage facilities

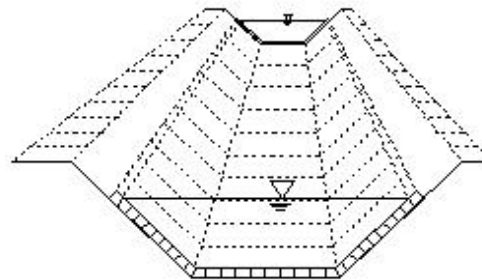
Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑨ Main drainage channel (open channel)



I1160

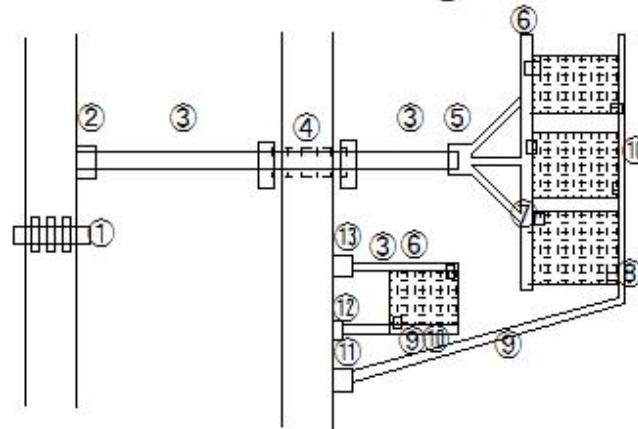
(I1188) Agricultural water and drainage facilities

(I1188) Agricultural water and drainage facilities

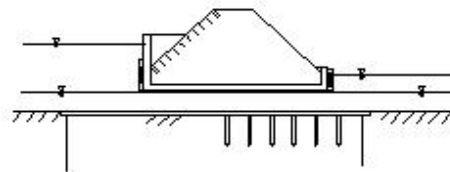
Agricultural water

Agricultural water and drainage facilities

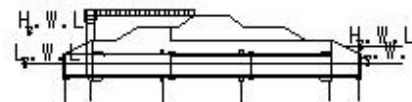
- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑫ Drainage sluice gate



R143
1892



1895

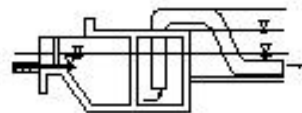
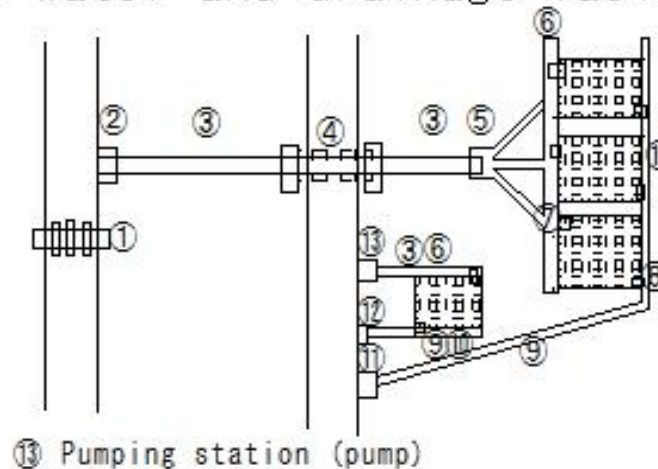
(I1189) Agricultural water and drainage facilities

(I1189) Agricultural water and drainage facilities

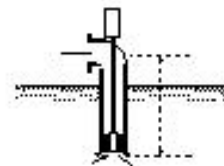
Agricultural water

Agricultural water and drainage facilities

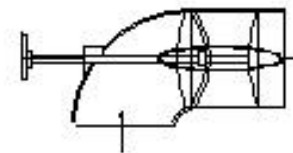
- ① Headwork
- ② Intake water gate
- ③ Main canal (open canal)
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch waterway
- ⑦ Water outlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel (open channel)
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



1915

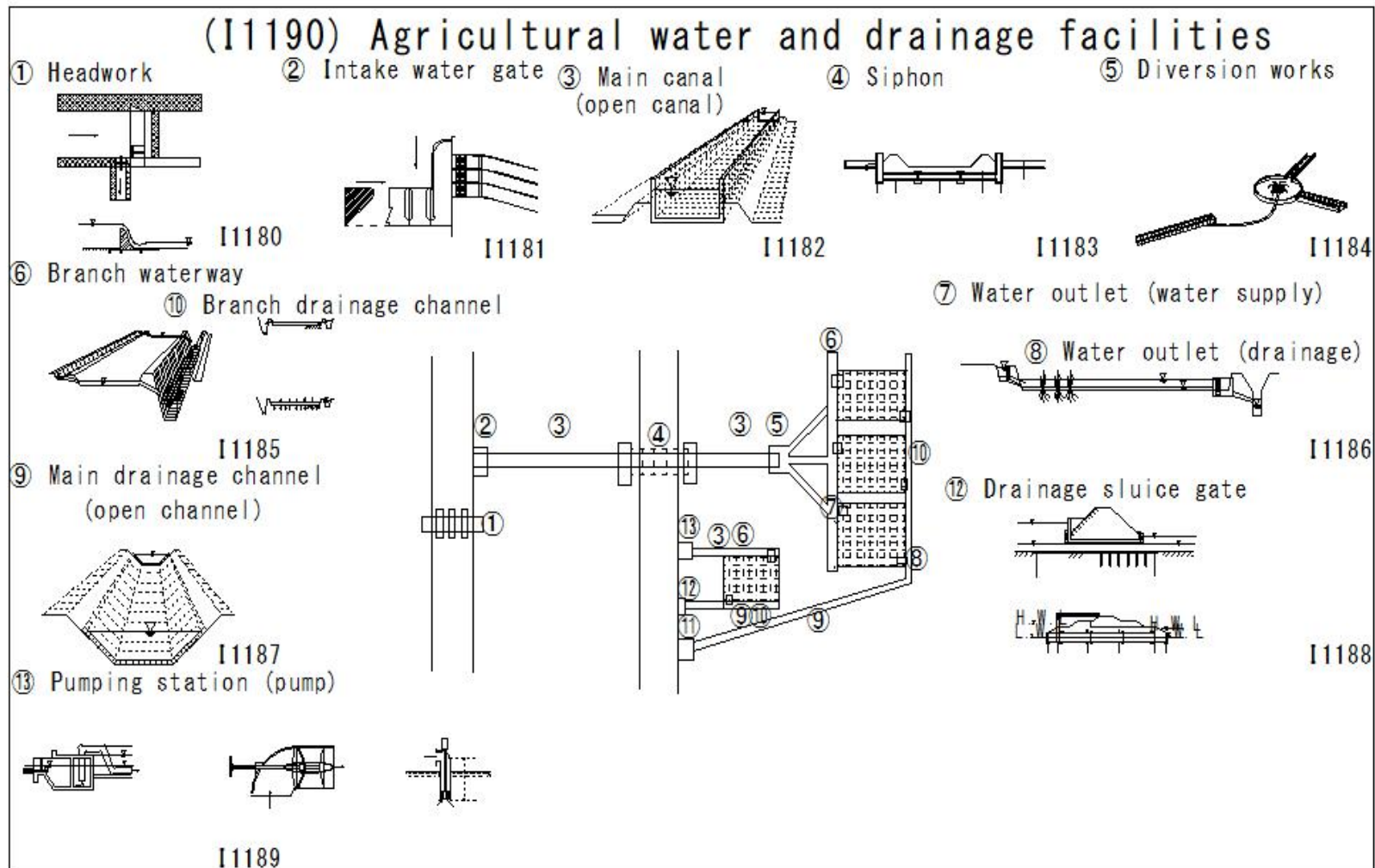


M370
1491
1916



1917

(I1190) Agricultural water and drainage facilities



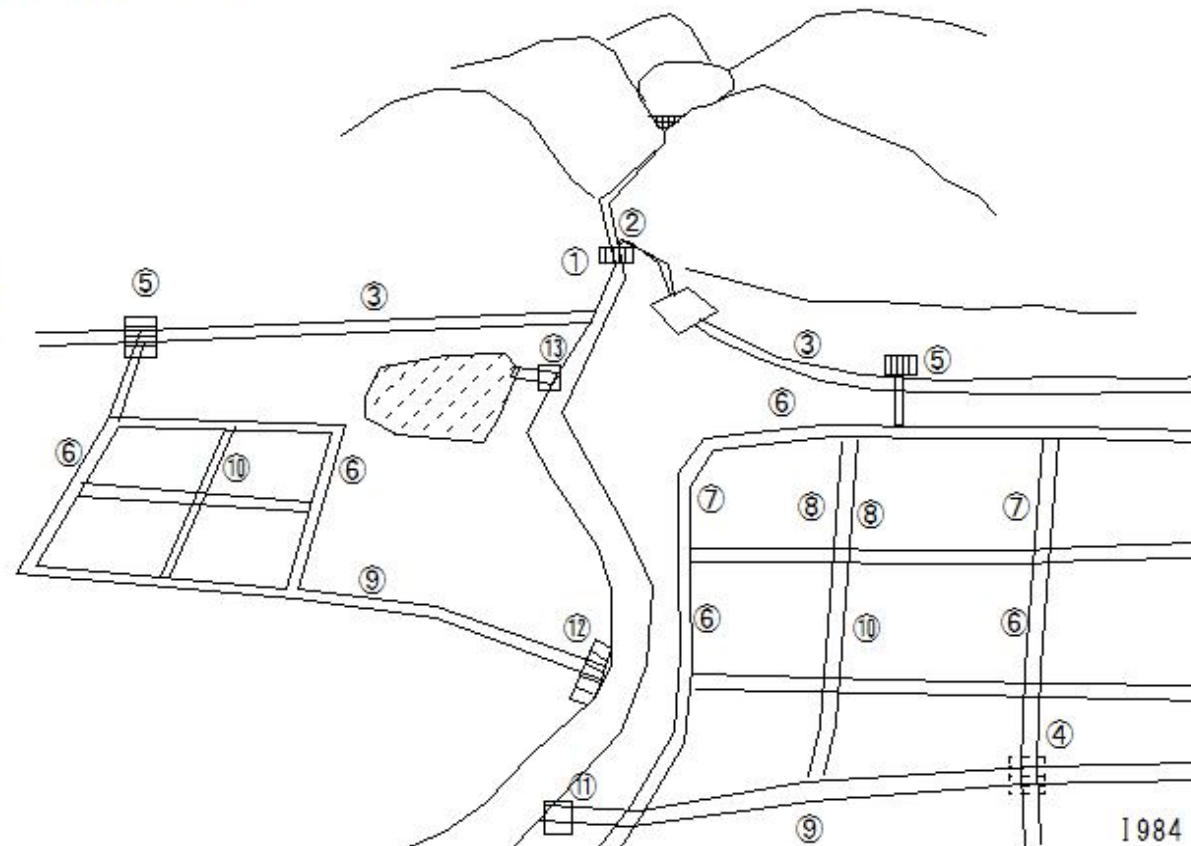
(I1191) Agricultural water and drainage facilities

(I1191) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



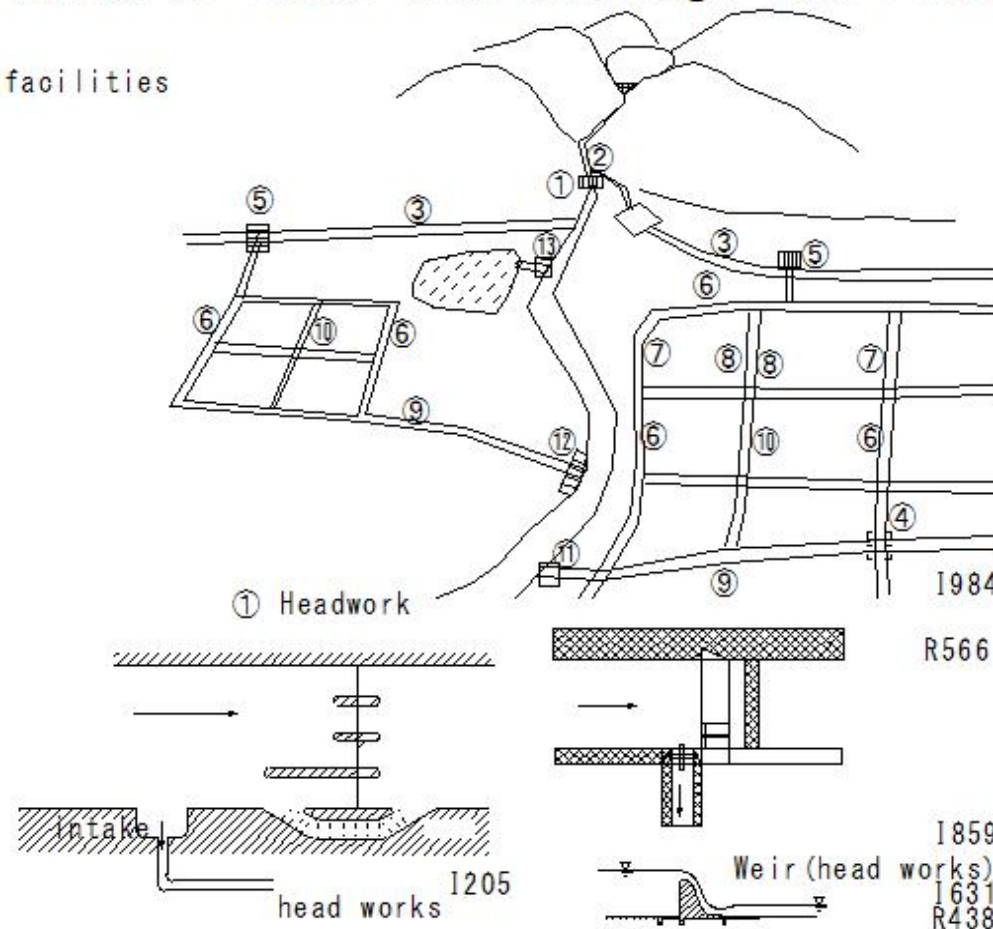
(I1192) Agricultural water and drainage facilities

(I1192) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



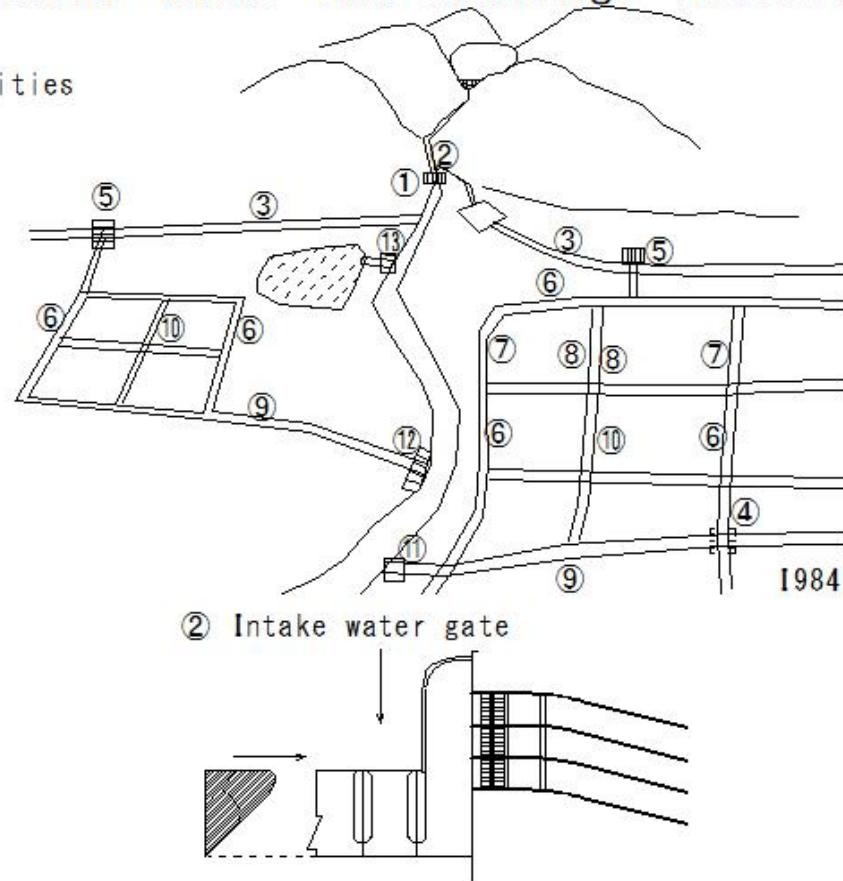
(I1193) Agricultural water and drainage facilities

(I1193) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



I687
R510

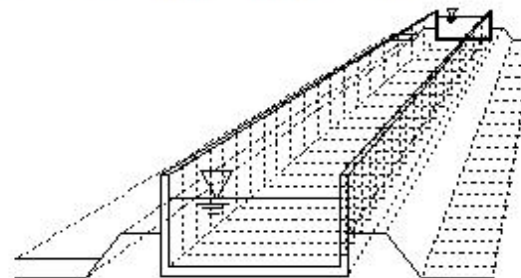
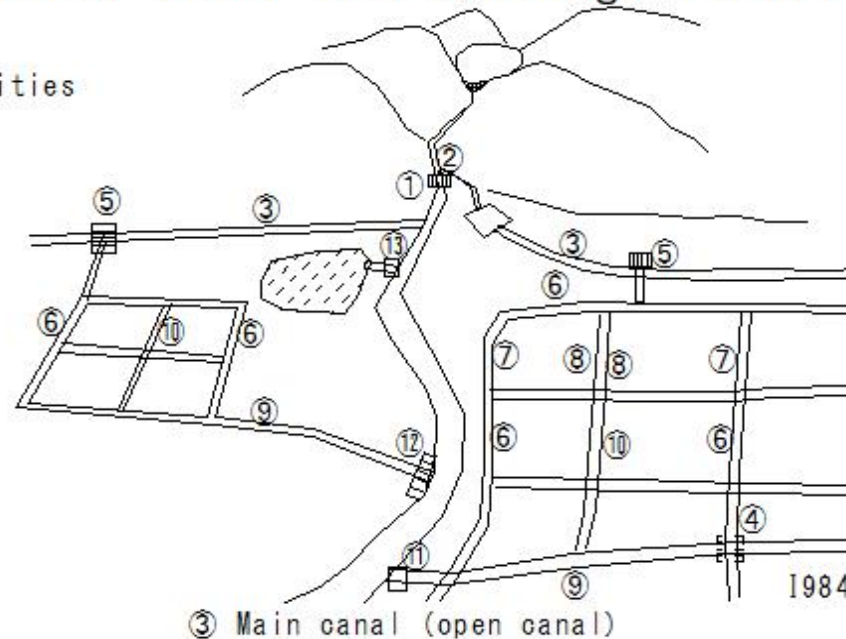
(I1194) Agricultural water and drainage facilities

(I1194) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



I1170

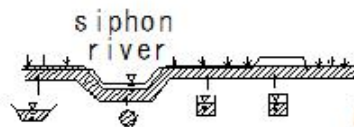
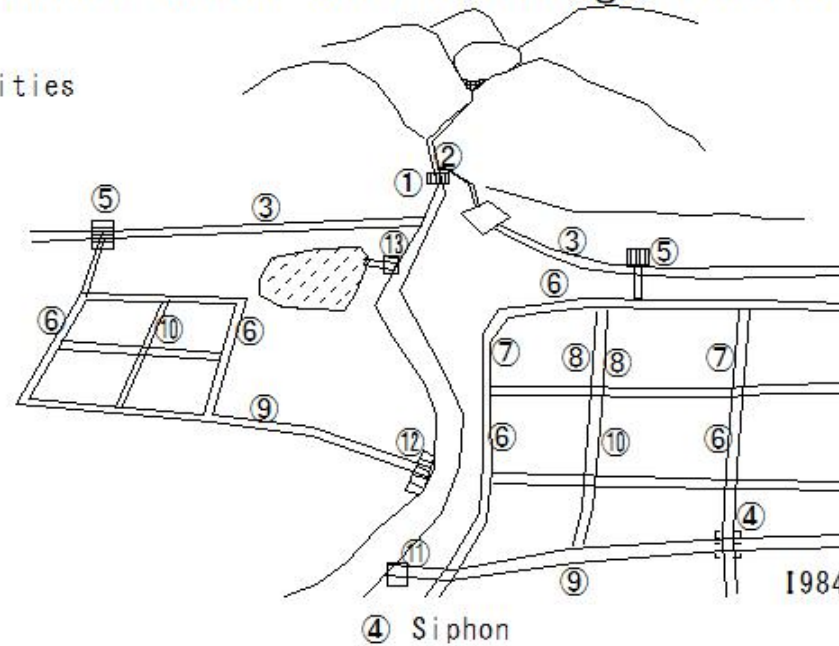
(I1195) Agricultural water and drainage facilities

(I1195) Agricultural water and drainage facilities

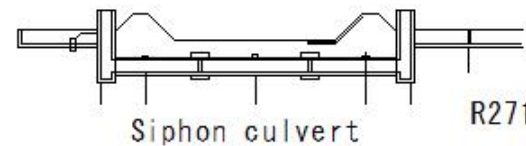
Agricultural water

Agricultural water and drainage facilities

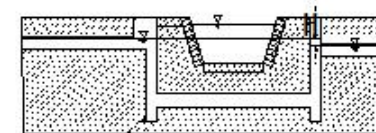
- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



1868
R602



1868
R271



1869
R612

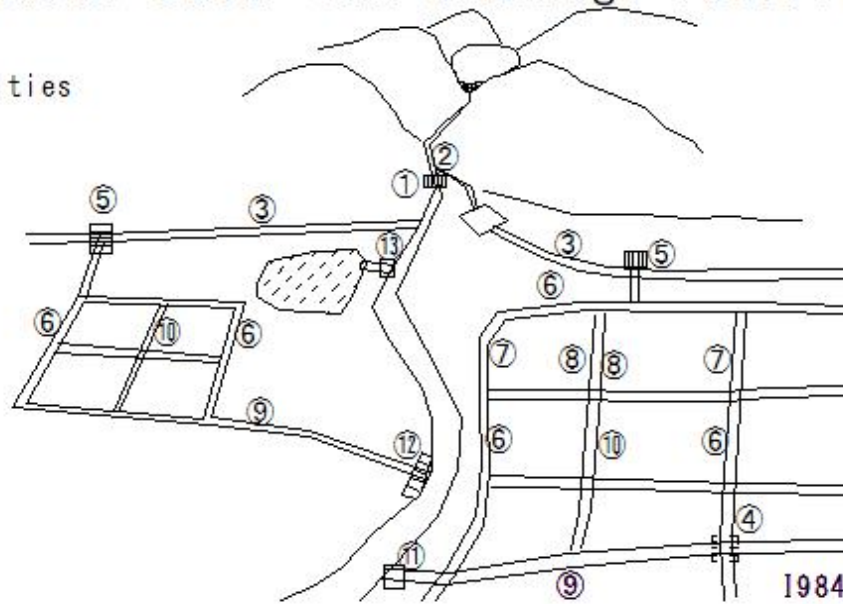
(I1196) Agricultural water and drainage facilities

(I1196) Agricultural water and drainage facilities

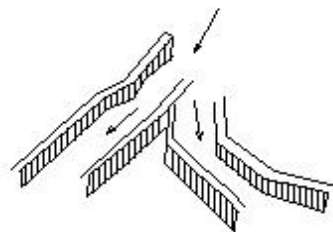
Agricultural water

Agricultural water and drainage facilities

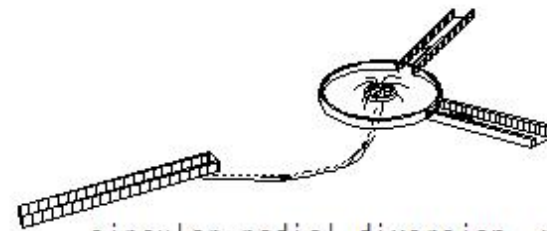
- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑤ Diversion works



R490



R491

circular radial diversion works

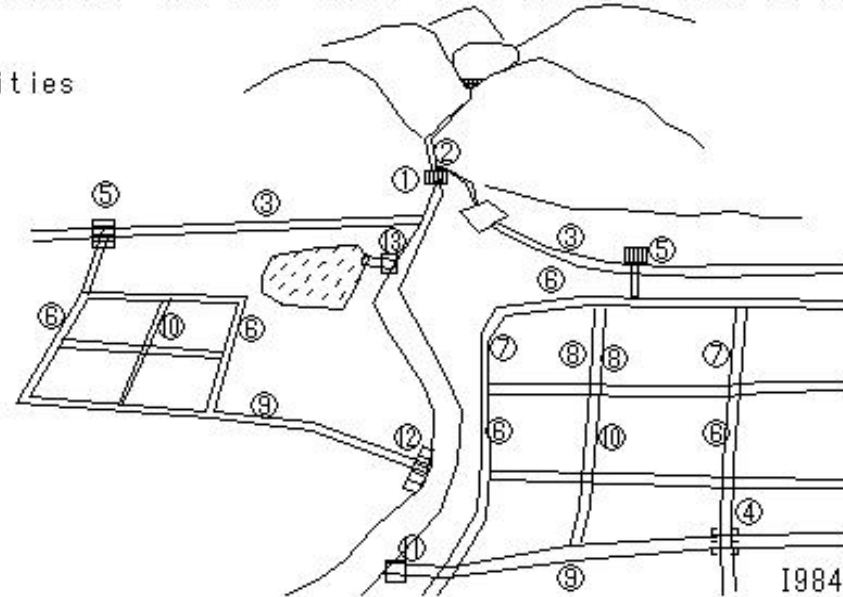
(I1197) Agricultural water and drainage facilities

(I1197) Agricultural water and drainage facilities

Agricultural water

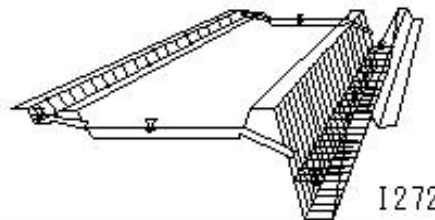
Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑥ Branch waterway

⑩ Branch drainage channel



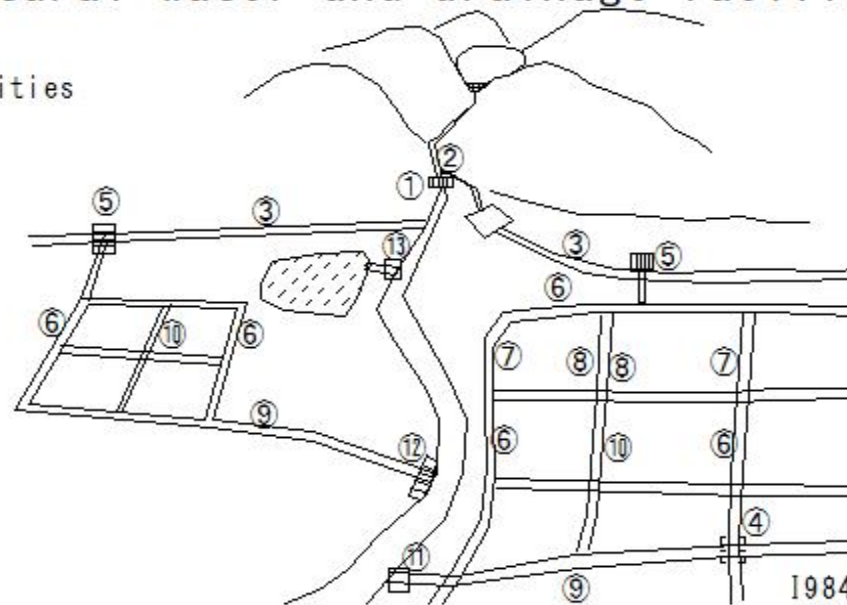
(I1198) Agricultural water and drainage facilities

(I1198) Agricultural water and drainage facilities

Agricultural water

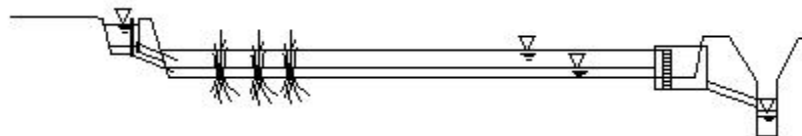
Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑦ Water inlet (water supply)

⑧ Water outlet (drainage)



I1089

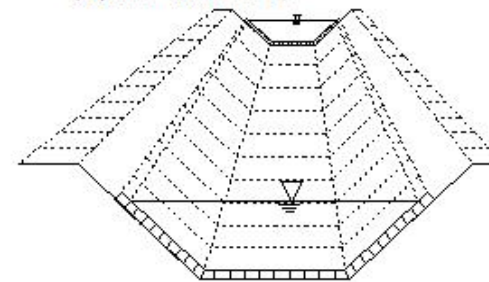
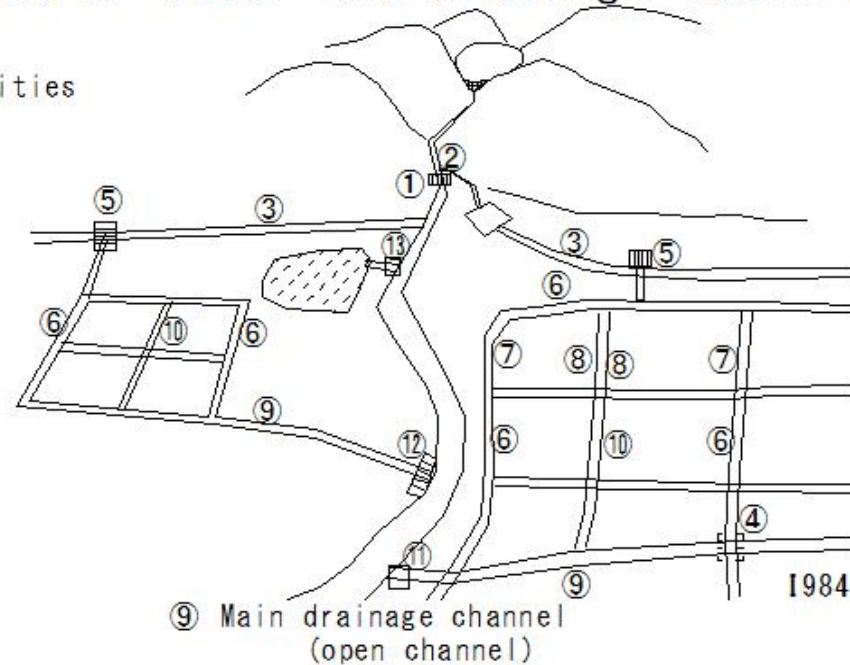
(I1199) Agricultural water and drainage facilities

(I1199) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



I1160

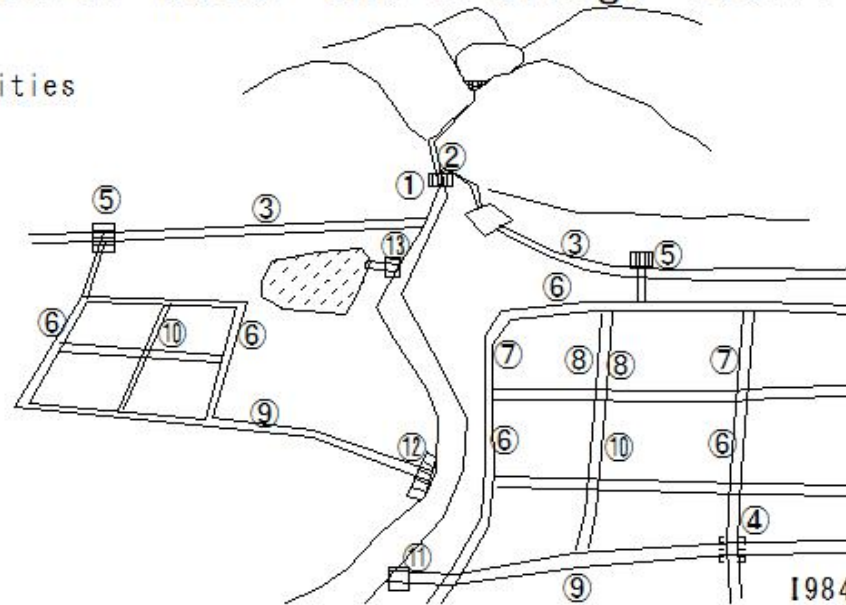
(I1200) Agricultural water and drainage facilities

(I1200) Agricultural water and drainage facilities

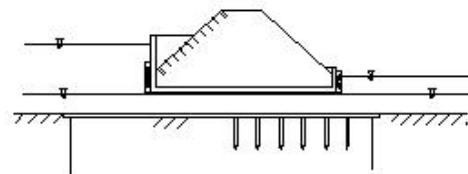
Agricultural water

Agricultural water and drainage facilities

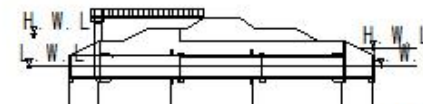
- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



⑫ Drainage sluice gate



R143
I892



I895

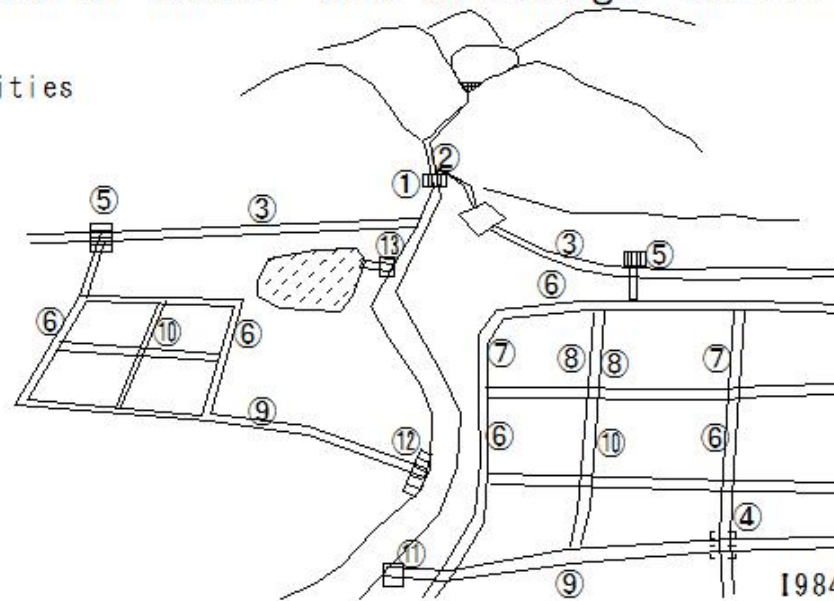
(I1201) Agricultural water and drainage facilities

(I1201) Agricultural water and drainage facilities

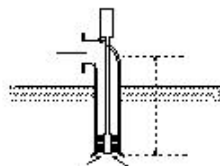
Agricultural water

Agricultural water and drainage facilities

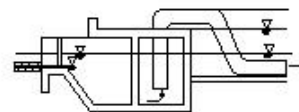
- ① Headwork
- ② Intake water gate
- ③ Main irrigation channel
- ④ Siphon
- ⑤ Diversion works
- ⑥ Branch irrigation channel
- ⑦ Water inlet (water supply)
- ⑧ Water outlet (drainage)
- ⑨ Main drainage channel
- ⑩ Branch drainage channel
- ⑪ Drainage pump station
- ⑫ Drainage sluice gate
- ⑬ Pumping station (pump)



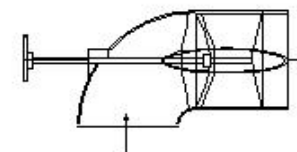
⑬ Pumping station (pump)



M370
I491
I916

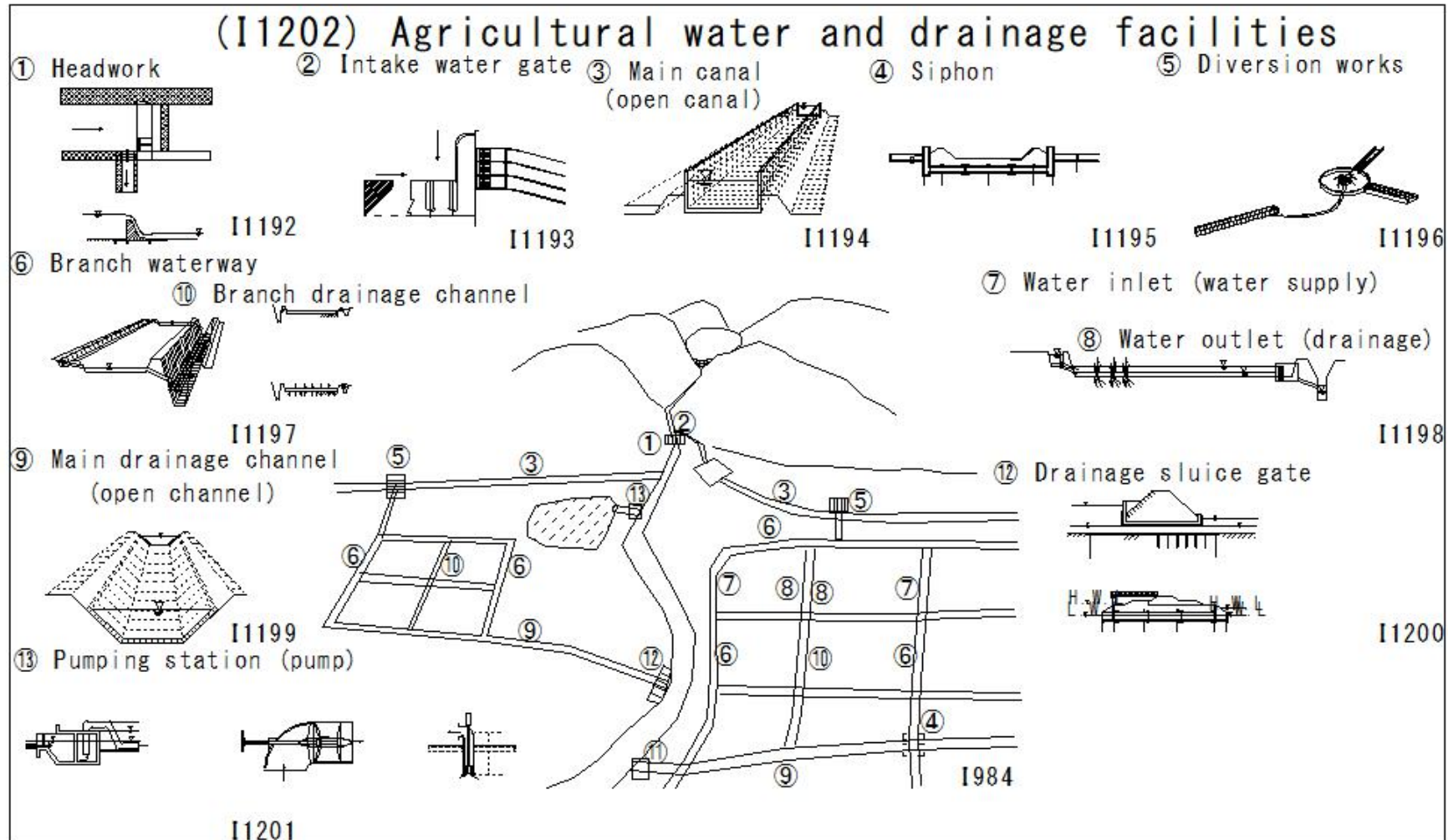


1915



1917

(I1202) Agricultural water and drainage facilities



(I1203) Agricultural water and drainage facilities

(I1203) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

① Rice field dam

Rice field/temporary storage

Water inlet (water supply)

Water outlet (drainage)

② Reservoir

Water level management

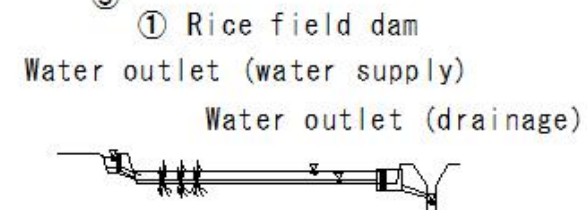
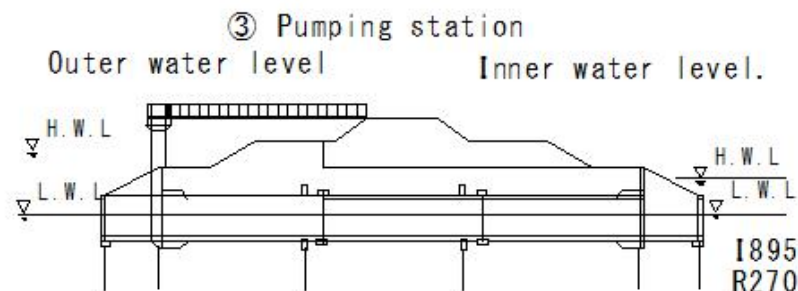
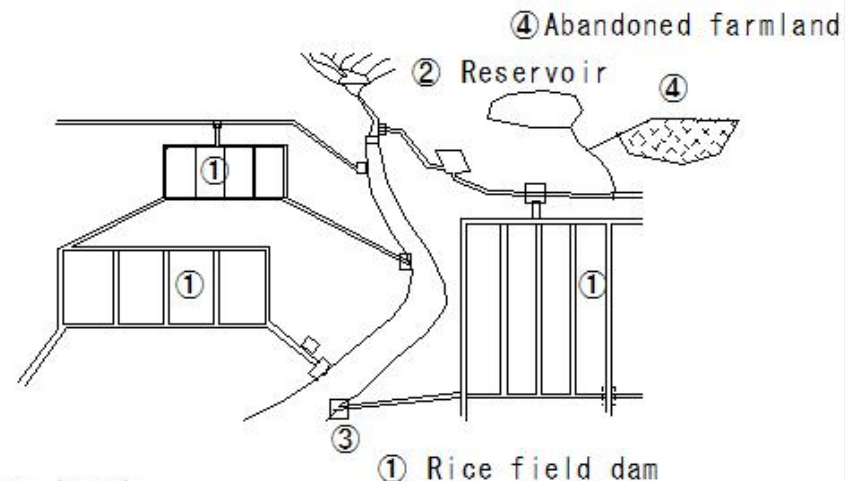
Water level management

③ Pumping station

Even if inland water overflows,
the gates are closed to prevent flooding

at the pumping station

④ Storage of rainfall using abandoned farmland



I1186

(I1204) Agricultural water and drainage facilities

(I1204) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

a Stable supply of agricultural water

b Drainage improvement

c Construction of dams, headworks, irrigation and drainage channels, and irrigation and drainage pumping stations

d Maintenance

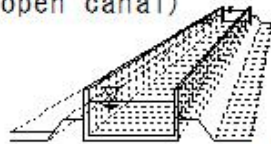
Irrigation water operation

Pump repair

Waterway repair

⑬ Pumping station (pump)

③ Main canal
(open canal)



I1194

I1201

① Headwork

② Intake water gate

③ Main irrigation channel

④ Siphon

⑤ Diversion works

⑥ Branch irrigation channel

⑦ Water inlet (water supply)

⑧ Water outlet (drainage)

⑨ Main drainage channel

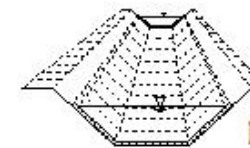
⑩ Branch drainage channel

⑪ Drainage pump station

⑫ Drainage sluice gate

⑬ Pumping station (pump)

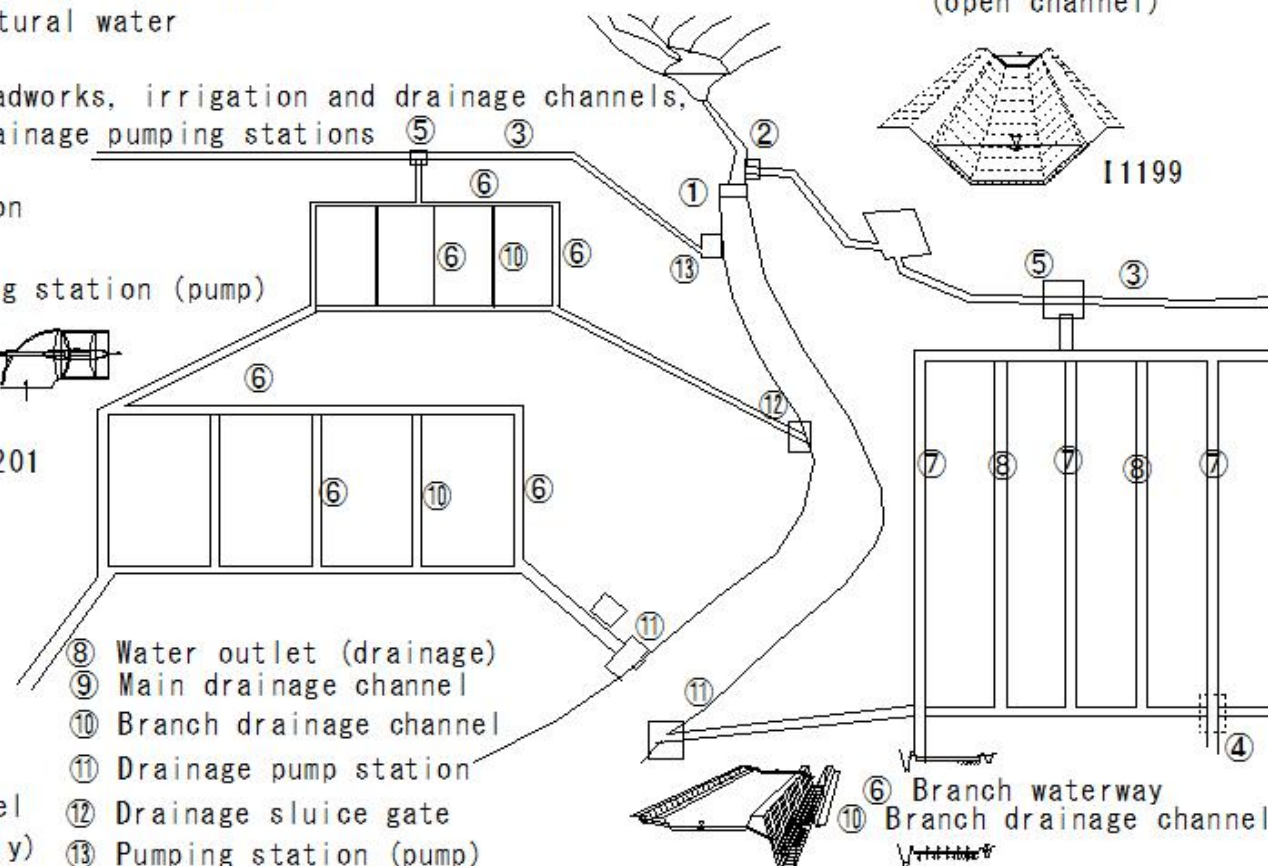
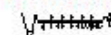
⑨ Main drainage channel
(open channel)



I1199

⑥ Branch waterway

⑩ Branch drainage channel



(I1205) Agricultural water and drainage facilities

(I1205) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

a Farmland development

Large-scale division of farmland

General use

Field irrigation facilities

b Agricultural water facilities

Dams

Weirs

Irrigation channels

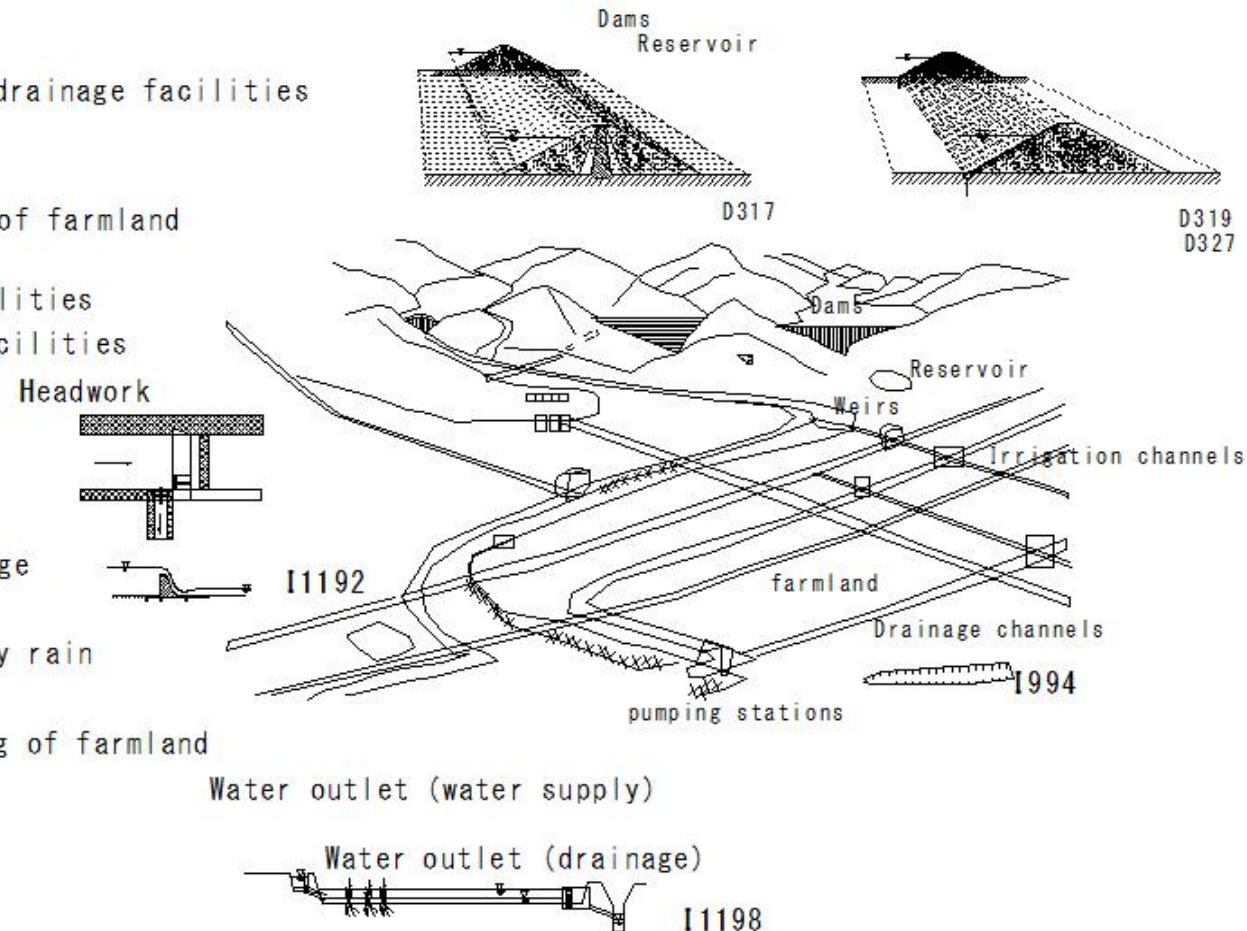
Drainage channels

Irrigation and drainage
pumping stations

c Measures against heavy rain
and earthquakes

Prevention of flooding of farmland

Reservoir repairs



(I1206) Agricultural water and drainage facilities

(I1206) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

○ Development projects

a Larger division and general use of farmland

b Infrastructure development for field

irrigation facilities

c Agricultural land consolidation

and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

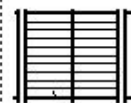
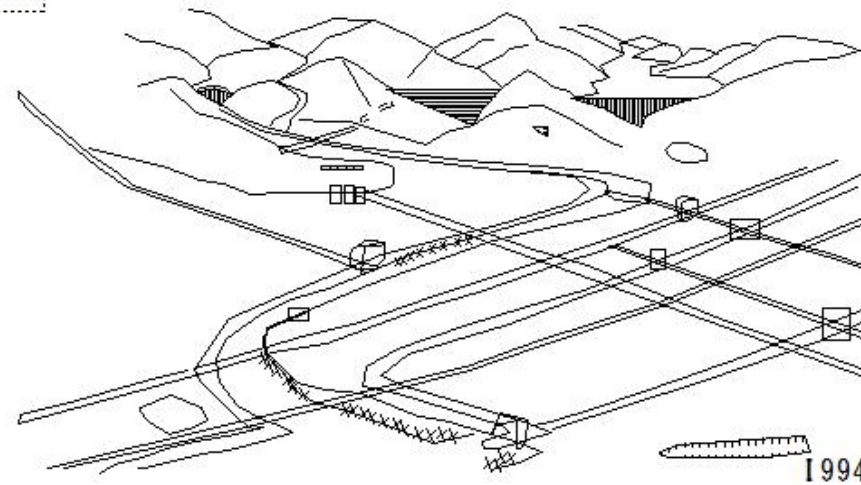
g Irrigation and drainage facilities

h Soil layer improvement

i Agricultural work roads

j Agricultural land conservation

k Division development a Larger division and general use of farmland



Removing Ridges

Ridges



I1075

I1084

(I1207) Agricultural water and drainage facilities

(I1207) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

O Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

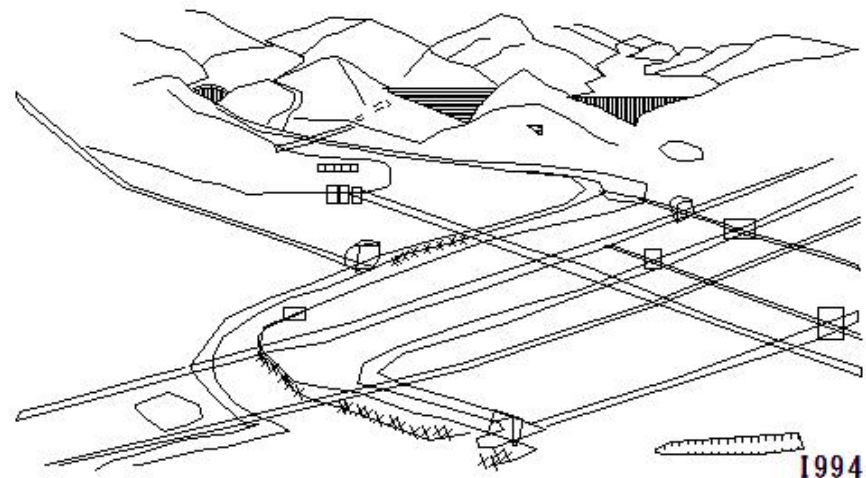
g Irrigation and drainage facilities

h Soil layer improvement

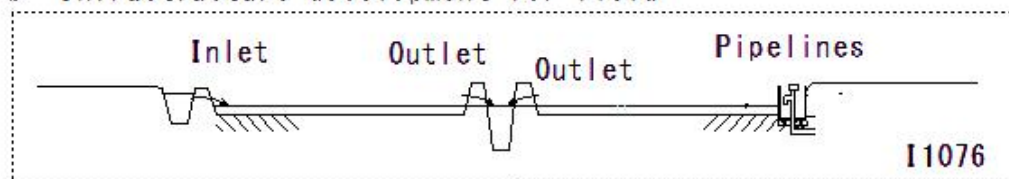
i Agricultural work roads

j Agricultural land conservation

k Division development



b Infrastructure development for field



(I1208) Agricultural water and drainage facilities

(I1208) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

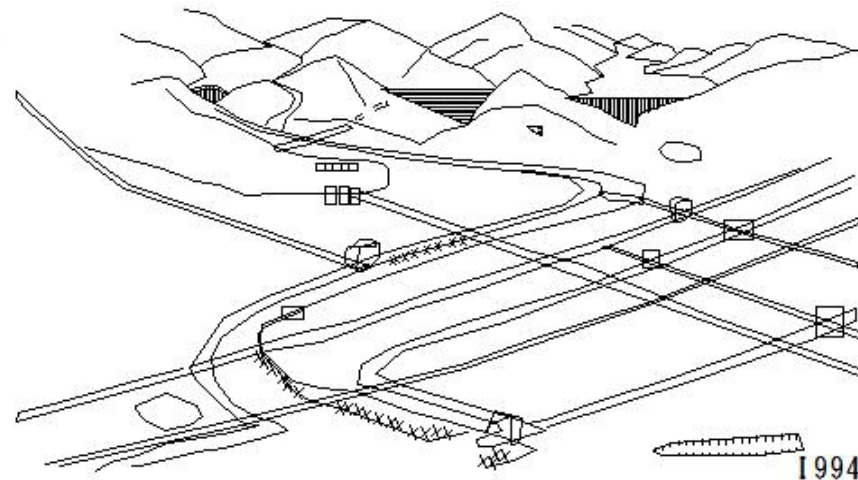
g Irrigation and drainage facilities

h Soil layer improvement

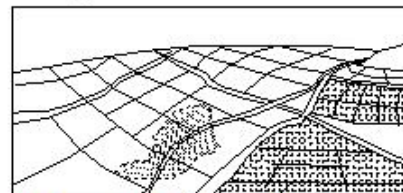
i Agricultural work roads

j Agricultural land conservation

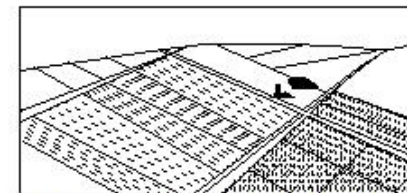
k Division development



c Agricultural land consolidation



Before field preparation



After field preparation

I1072

(I1209) Agricultural water and drainage facilities

(I1209) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

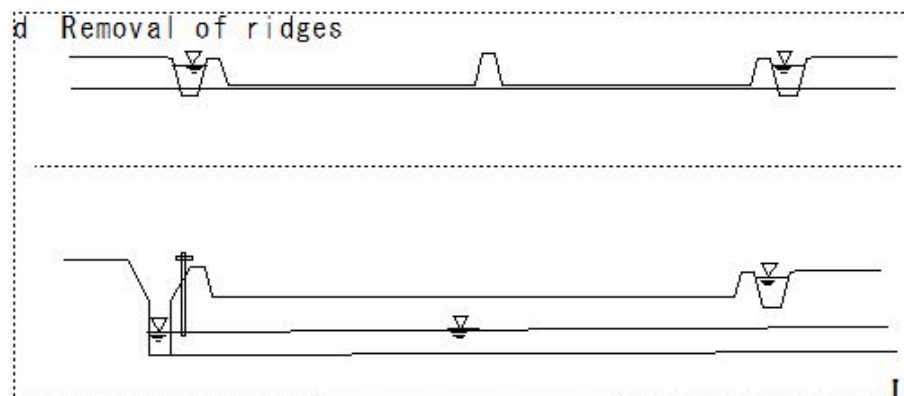
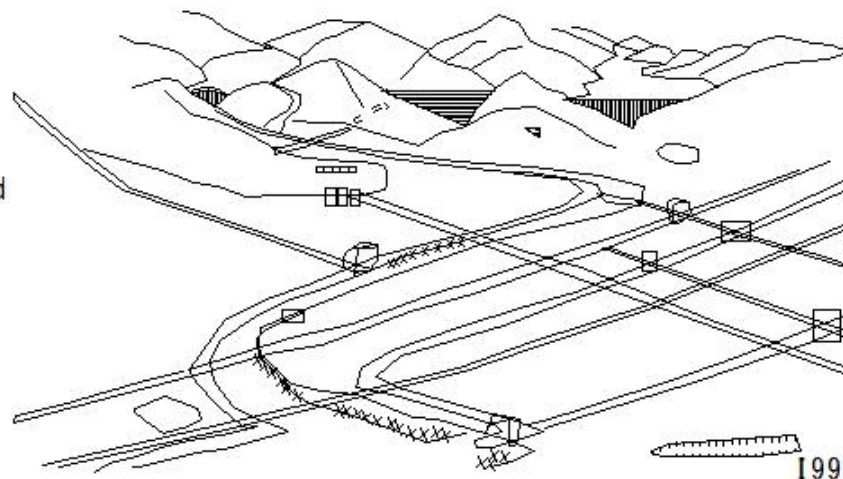
g Irrigation and drainage facilities

h Soil layer improvement

i Agricultural work roads

j Agricultural land conservation

k Division development



(I1210) Agricultural water and drainage facilities

(I1210) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

○ Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

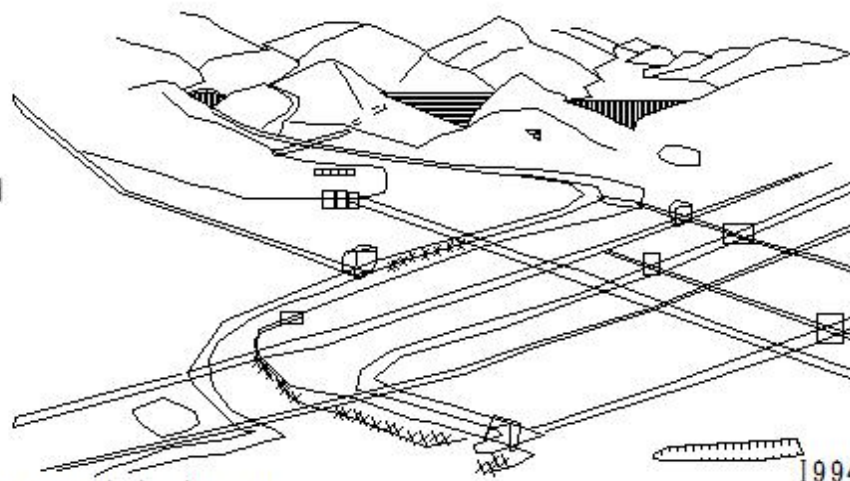
g Irrigation and drainage facilities

h Soil layer improvement

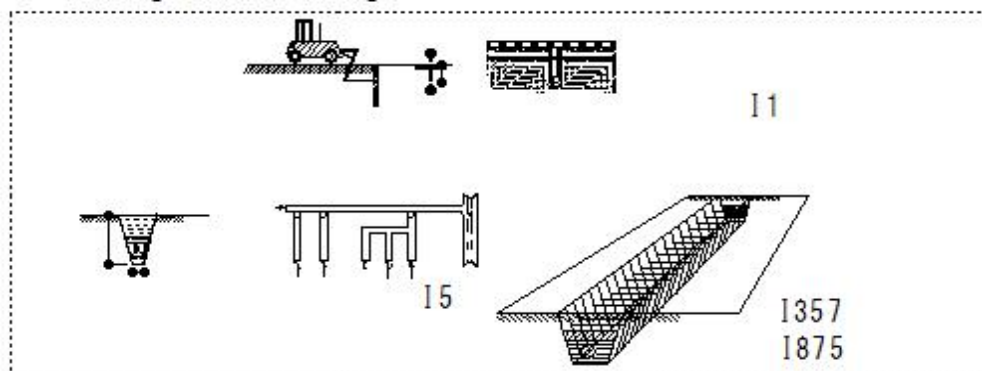
i Agricultural work roads

j Agricultural land conservation

k Division development



e Underground drainage



(I1211) Agricultural water and drainage facilities

(I1211) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

○ Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

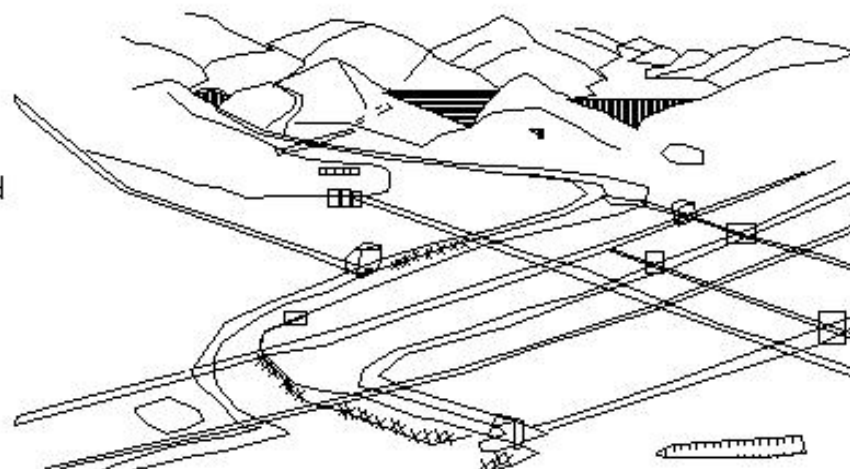
g Irrigation and drainage facilities

h Soil layer improvement

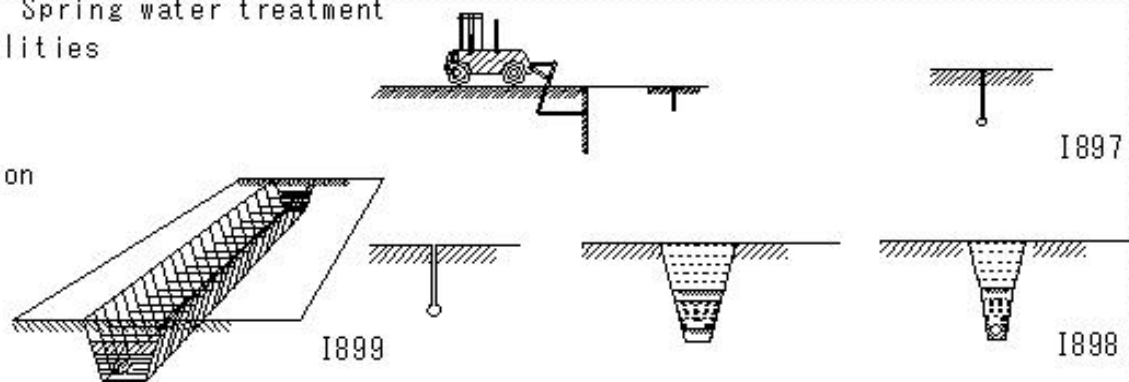
i Agricultural work roads

j Agricultural land conservation

k Division development



f Spring water treatment



(I1212) Agricultural water and drainage facilities

(I1212) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

○ Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

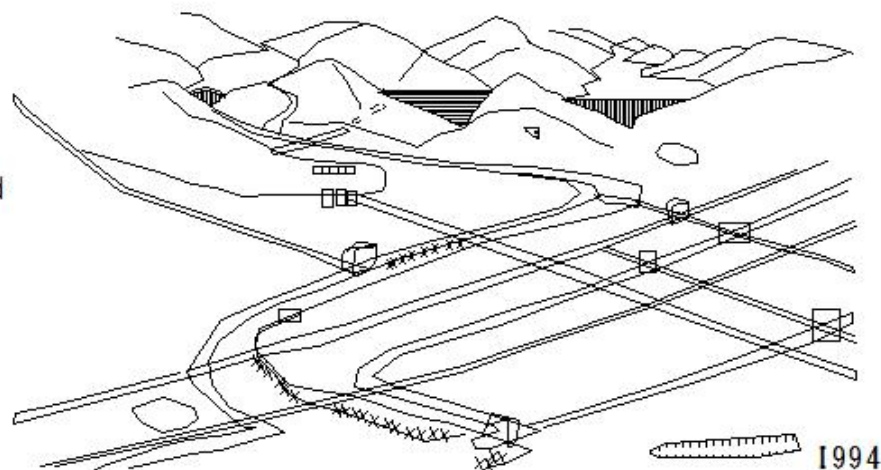
g Irrigation and drainage facilities

h Soil layer improvement

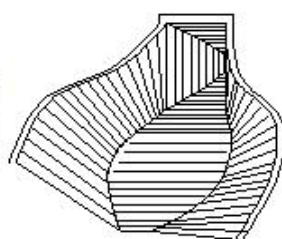
i Agricultural work roads

j Agricultural land conservation

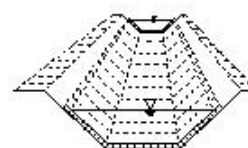
k Division development



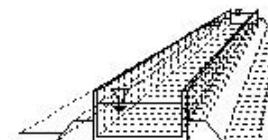
g Irrigation and drainage facilities



R576



I1160



I1170

(I1213) Agricultural water and drainage facilities

(I1213) Agricultural water and drainage facilities

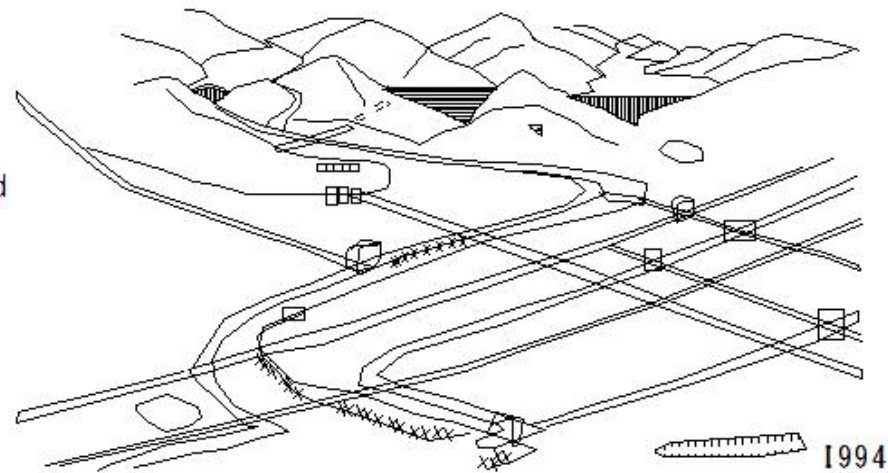
Agricultural water

Agricultural water and drainage facilities

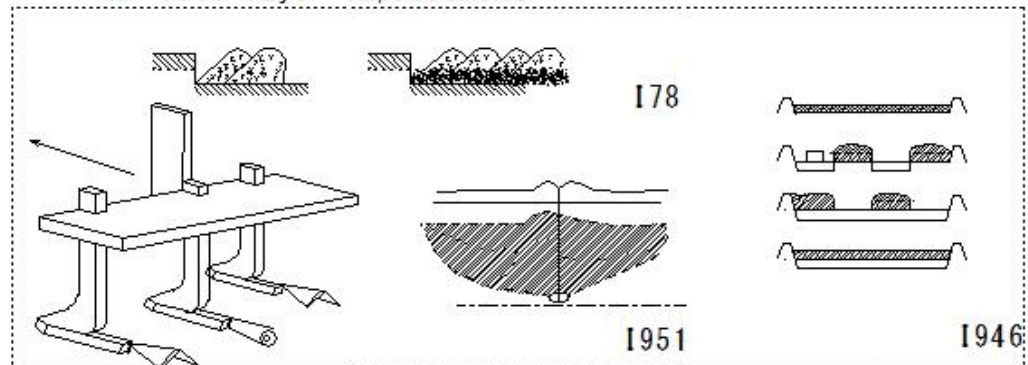
Development projects

○ Development projects

- a Larger division and general use of farmland
- b Infrastructure development for field irrigation facilities
- c Agricultural land consolidation and intensification
- d Removal of ridges → division expansion
- e Underground drainage
- f Spring water treatment
- g Irrigation and drainage facilities
- h Soil layer improvement
- i Agricultural work roads
- j Agricultural land conservation
- k Division development



h Soil layer improvement



(I1214) Agricultural water and drainage facilities

(I1214) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

○ Development projects

a Larger division and general use of farmland

b Infrastructure development for field
irrigation facilities

c Agricultural land consolidation
and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

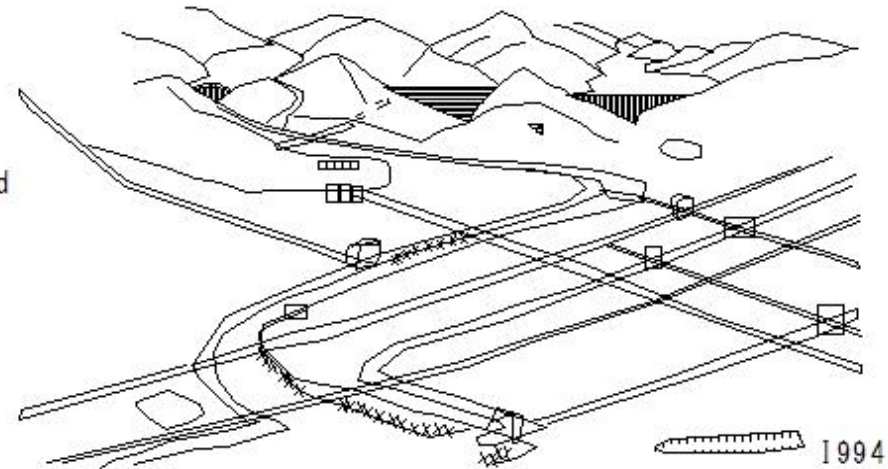
g Irrigation and drainage facilities

h Soil layer improvement

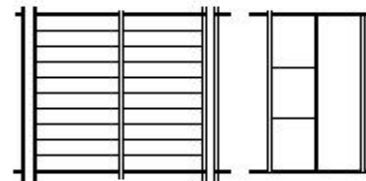
i Agricultural work roads

j Agricultural land conservation

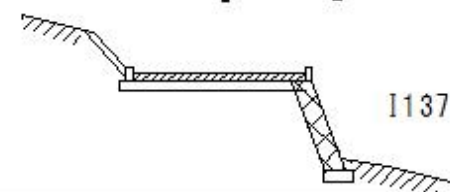
k Division development



i Agricultural work roads



I215



I137

(I1215) Agricultural water and drainage facilities

(I1215) Agricultural water and drainage facilities

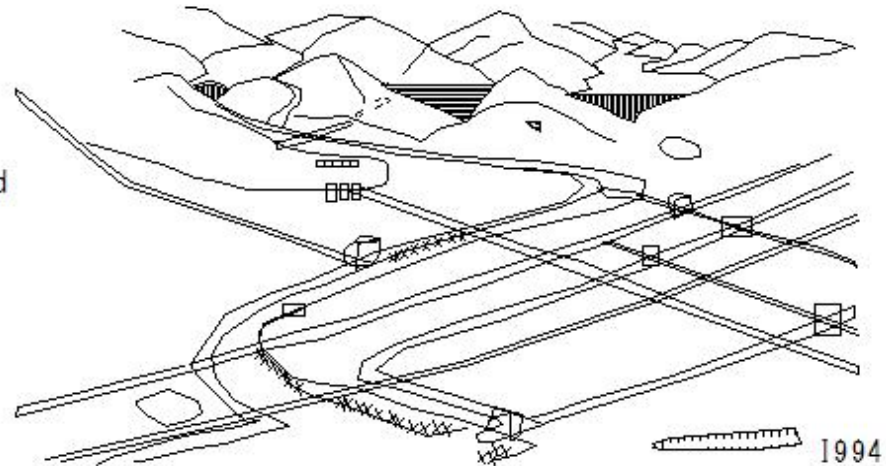
Agricultural water

Agricultural water and drainage facilities

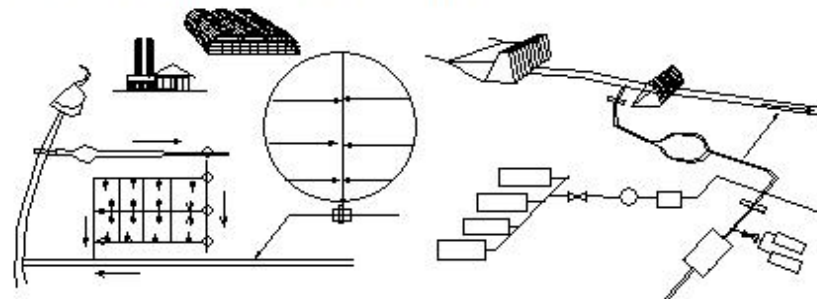
Development projects

○ Development projects

- a Larger division and general use of farmland
- b Infrastructure development for field irrigation facilities
- c Agricultural land consolidation and intensification
- d Removal of ridges → division expansion
- e Underground drainage
- f Spring water treatment
- g Irrigation and drainage facilities
- h Soil layer improvement
- i Agricultural work roads
- j **Agricultural land conservation**
- k Division development



j Agricultural land conservation



(I1216) Agricultural water and drainage facilities

(I1216) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

Development projects

○Development projects

a Larger division and general use of farmland

b Infrastructure development for field

irrigation facilities

c Agricultural land consolidation

and intensification

d Removal of ridges → division expansion

e Underground drainage

f Spring water treatment

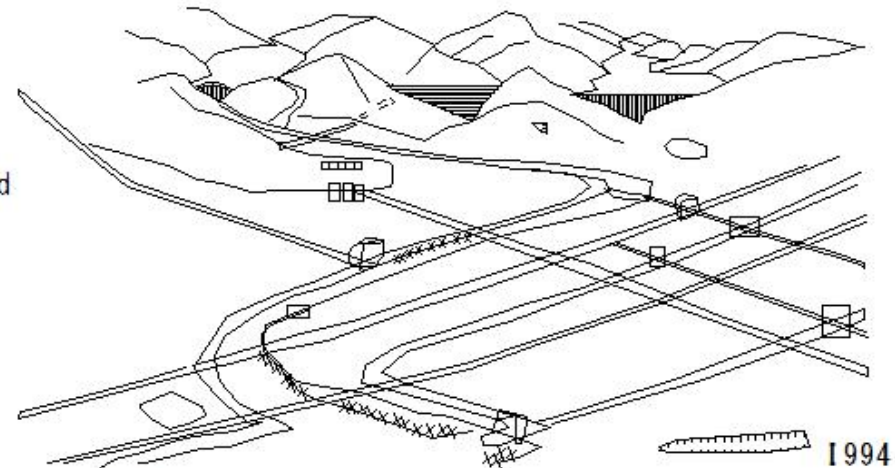
g Irrigation and drainage facilities

h Soil layer improvement

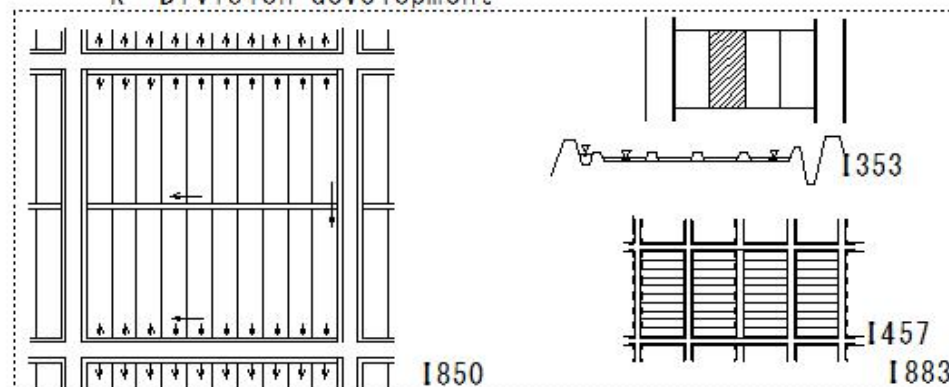
i Agricultural work roads

j Agricultural land conservation

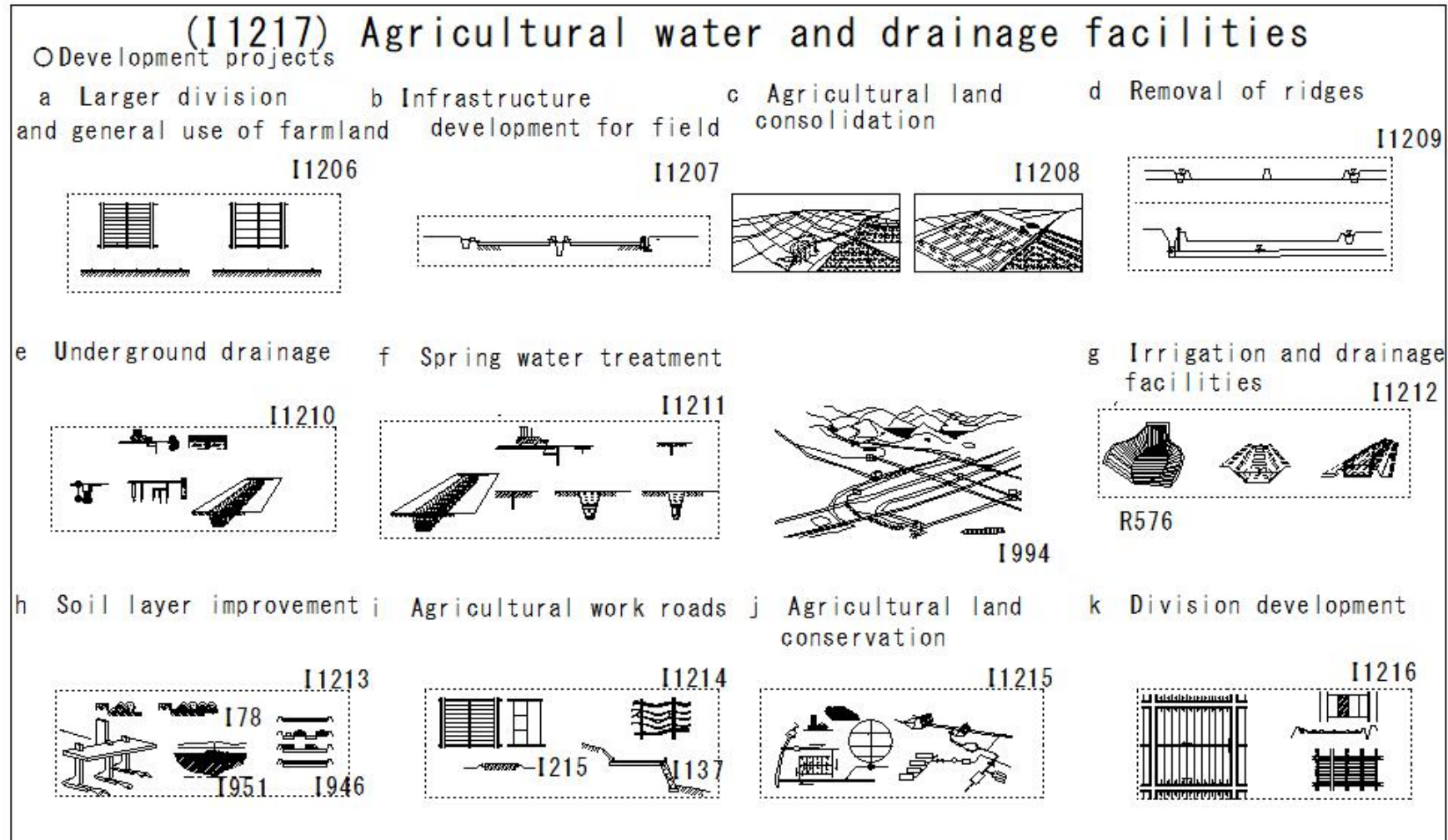
k Division development



k Division development



(I1217) Agricultural water and drainage facilities



(I1218) Agricultural water and drainage facilities

(I1218) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

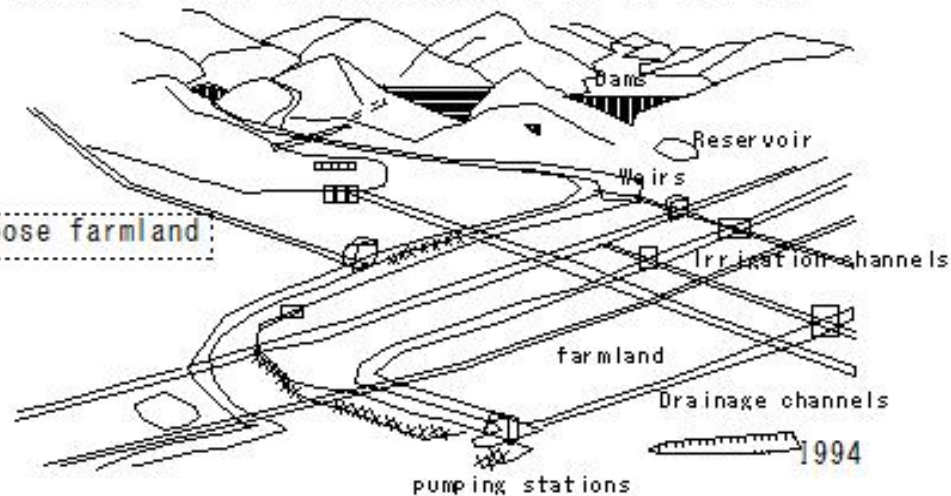
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

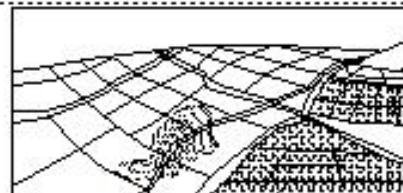
c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

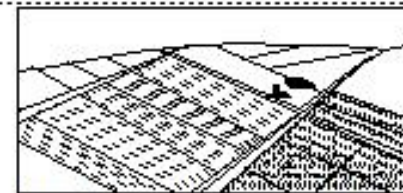
c-2 Reservoir renovation



a-1 Large-scale division and general-purpose farmland



Before field preparation



After field preparation

11072

(I1219) Agricultural water and drainage facilities

(I1219) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

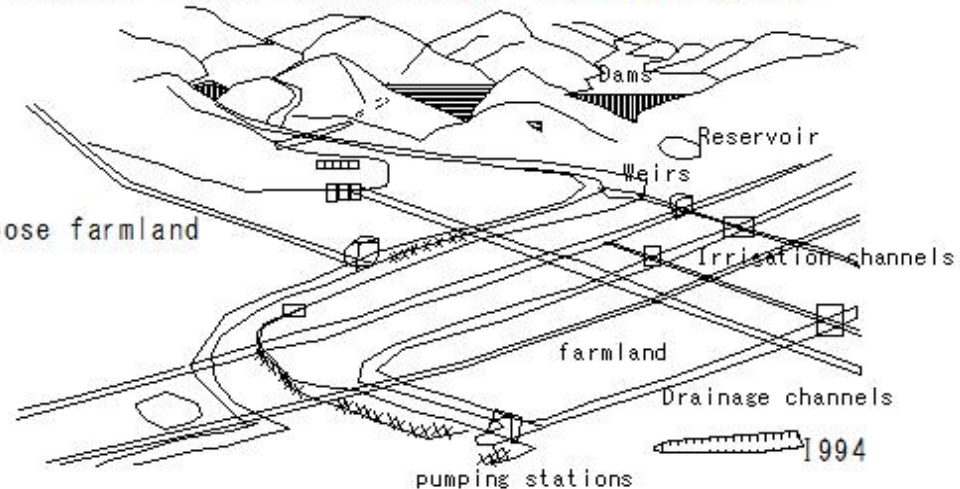
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

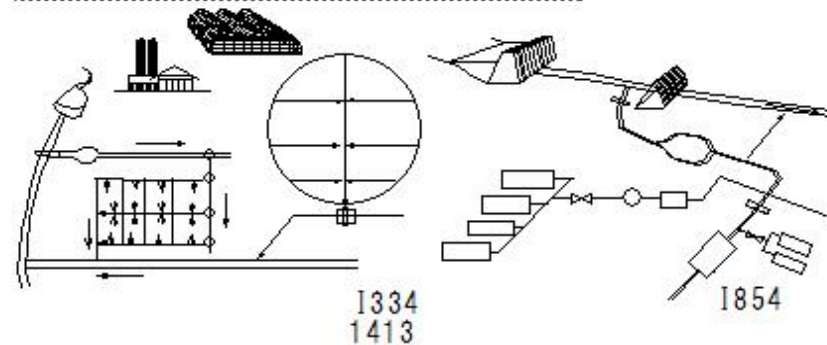
c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

c-2 Reservoir renovation



a-2 Field irrigation facilities



1856

(I1220) Agricultural water and drainage facilities

(I1220) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

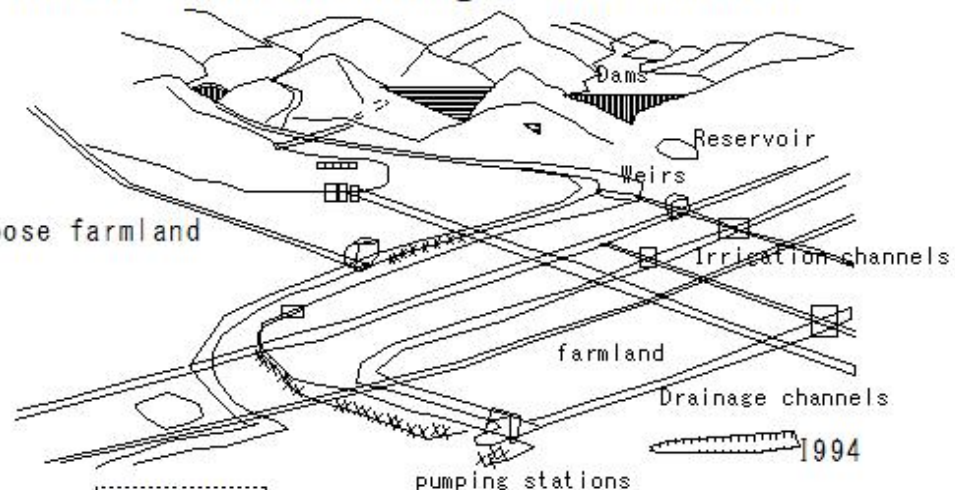
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

c-2 Reservoir renovation



b-1 Dams



D327

(I1221) Agricultural water and drainage facilities

(I1221) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

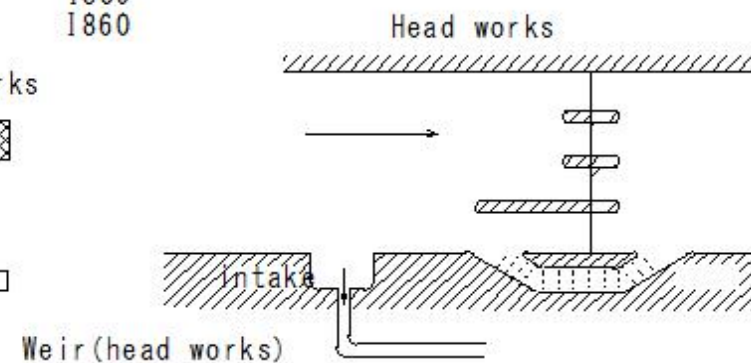
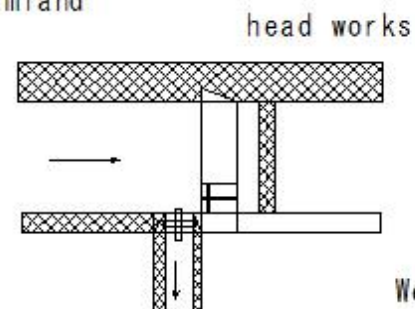
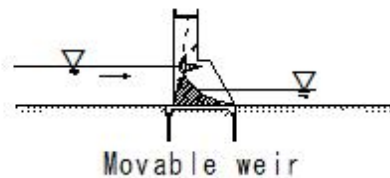
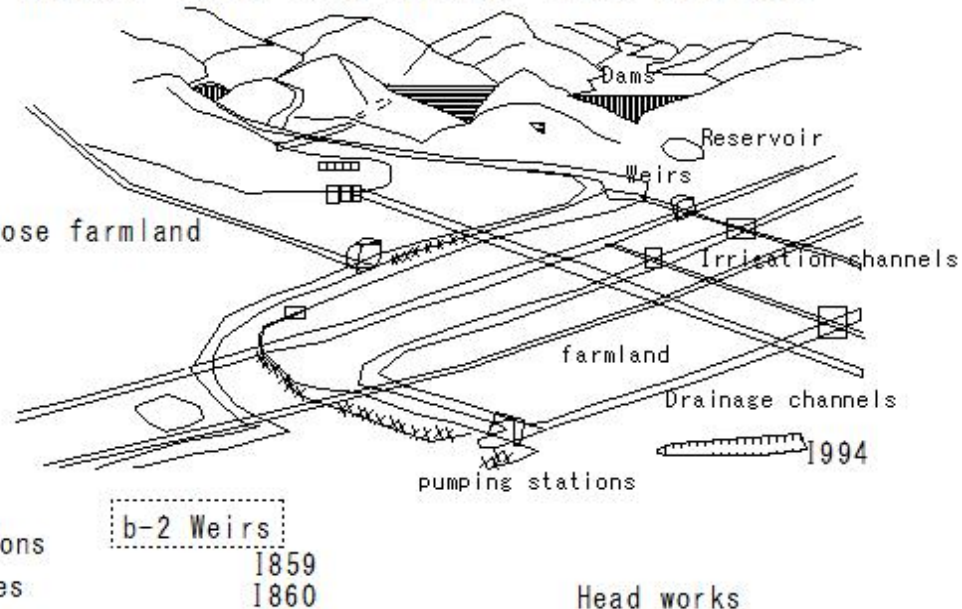
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

c-2 Reservoir renovation



(I1222) Agricultural water and drainage facilities

(I1222) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

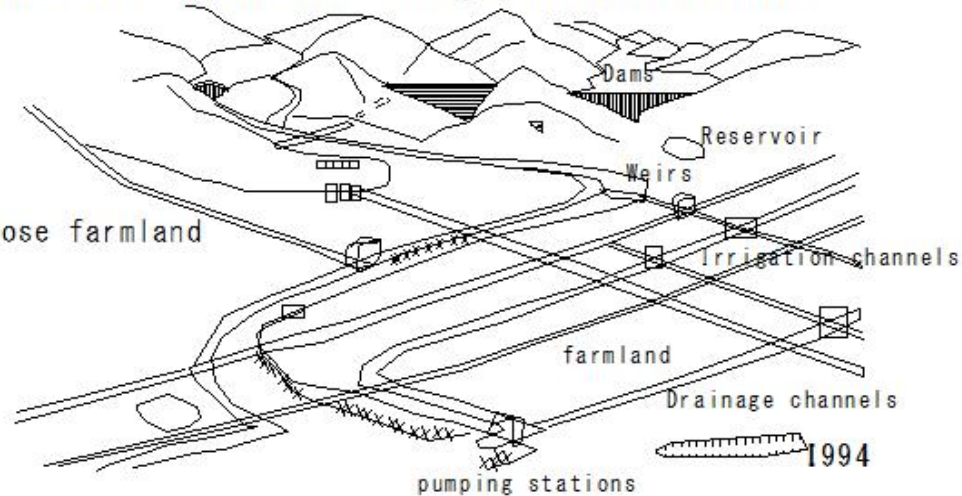
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

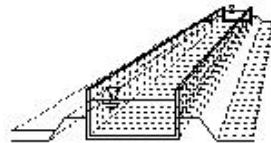
c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

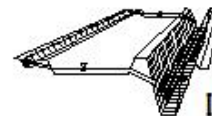
c-2 Reservoir renovation



b-3 Irrigation channels



I1170



I272

V 135



I36

(I1223) Agricultural water and drainage facilities

(I1223) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

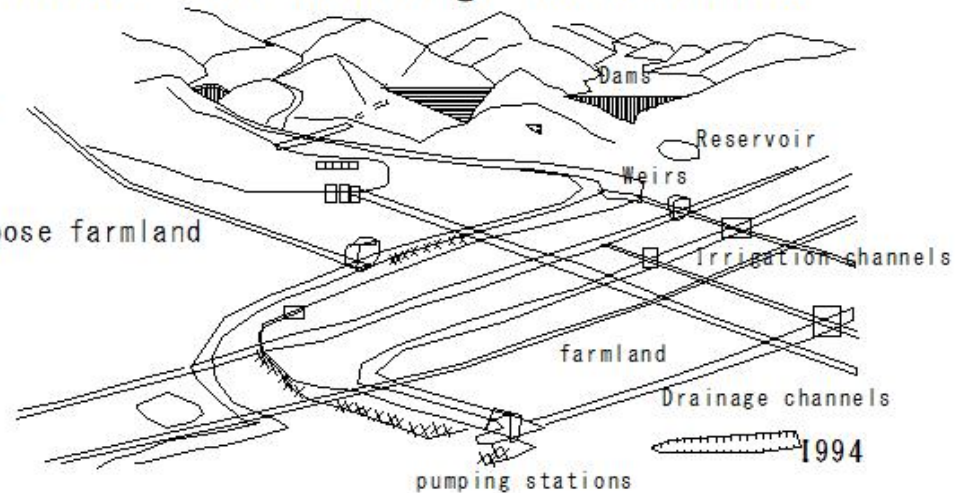
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

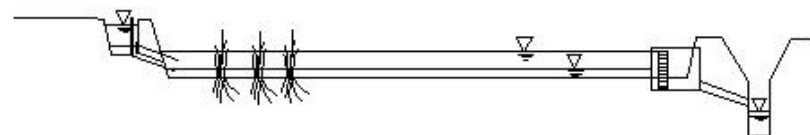
c-2 Reservoir renovation



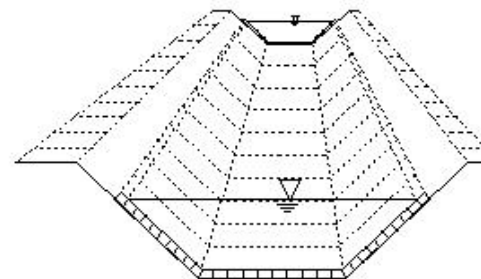
b-4 Drainage channels

Main drainage channel

Water outlet (drainage)



I1089



I1160

(I1224) Agricultural water and drainage facilities

(I1224) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

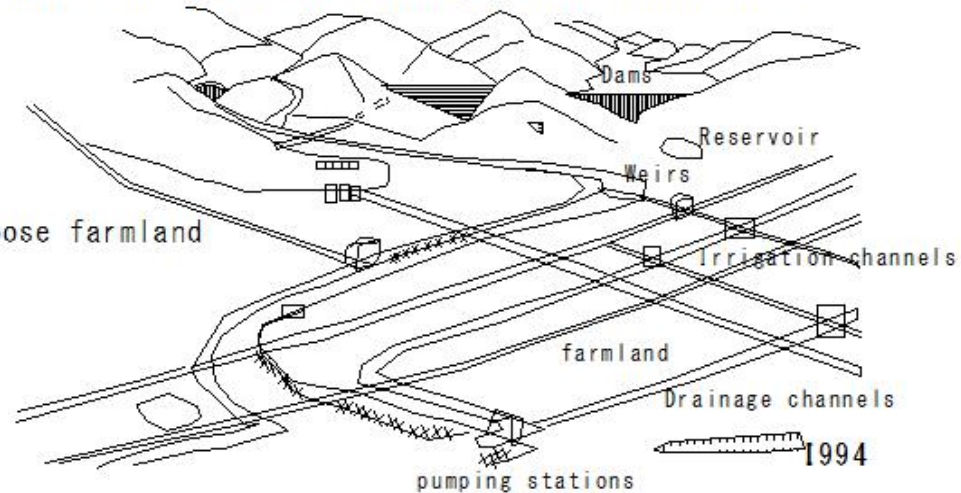
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

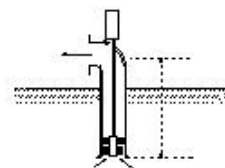
c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

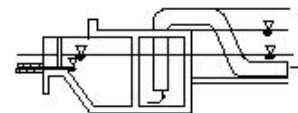
c-2 Reservoir renovation



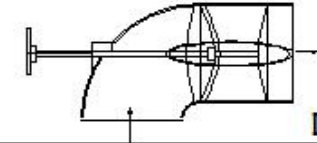
b-5 Irrigation and drainage pumping stations



M370
1491
1916



1915



1917

(I1225) Agricultural water and drainage facilities

(I1225) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

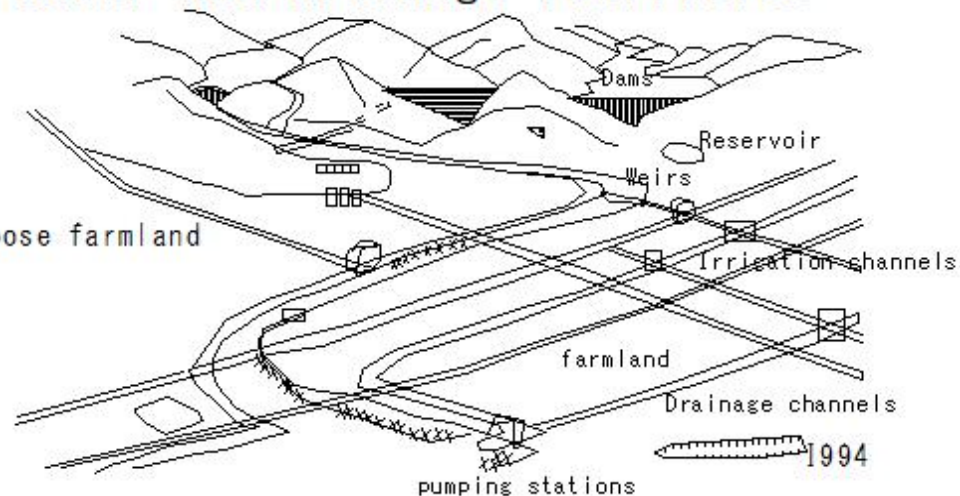
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

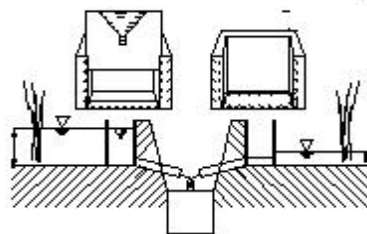
c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

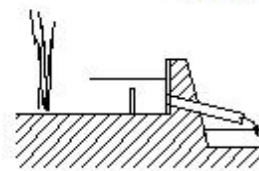
c-2 Reservoir renovation



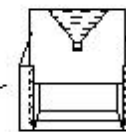
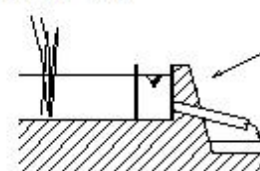
c-1 Preventing flooding of farmland



Rice field dam



Rice field dam



I1123

I1128

(I1226) Agricultural water and drainage facilities

(I1226) Agricultural water and drainage facilities

Agricultural water

Agricultural water and drainage facilities

○ Development projects

a Farmland development

a-1 Large-scale division and general-purpose farmland

a-2 Field irrigation facilities

b Agricultural water facilities

b-1 Dams

b-2 Weirs

b-3 Irrigation channels

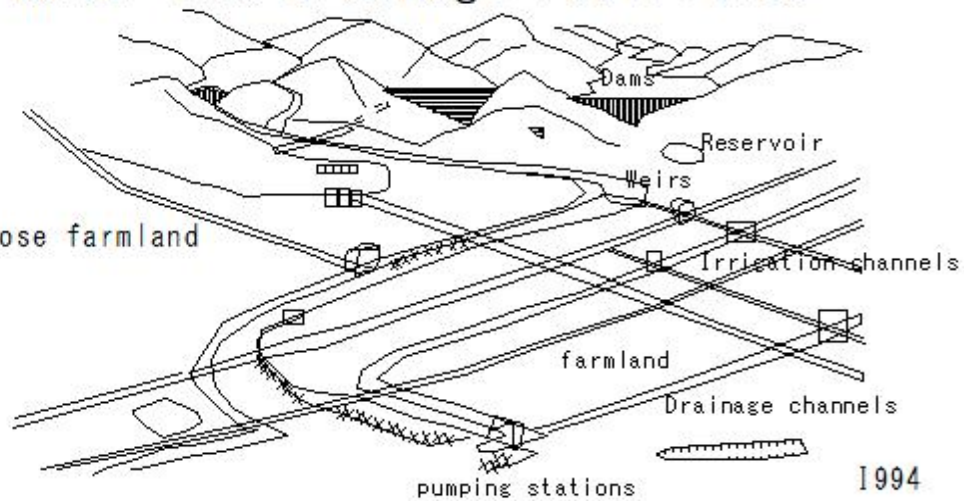
b-4 Drainage channels

b-5 Irrigation and drainage pumping stations

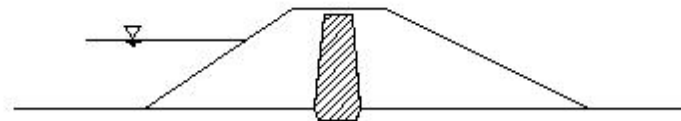
c Measures against heavy rain and earthquakes

c-1 Preventing flooding of farmland

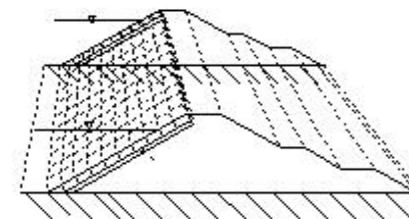
c-2 Reservoir renovation



c-2 Reservoir renovation



D172



R474
D157

(I1227) Agricultural water and drainage facilities

(I1227) Agricultural water and drainage facilities

○ Development projects

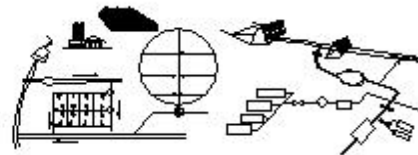
a-1 Large-scale division a-2 Field irrigation facilities

b-1 Dams

b-2 Weirs



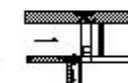
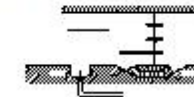
(I1218)



(I1219)



(I1220)

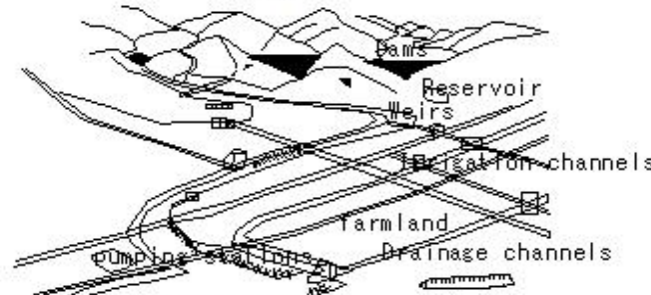


(I1221)

b-3 Irrigation channels

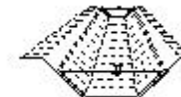


(I1222)



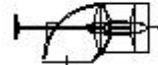
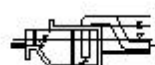
1994

b-4 Drainage channels
Main drainage channel



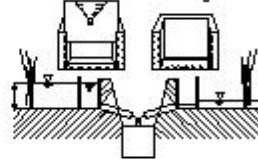
(I1223)

b-5 Irrigation and drainage pumping stations



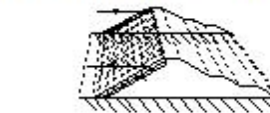
(I1224)

c-1 Preventing flooding of farmland



(I1225)

c-2 Reservoir renovation

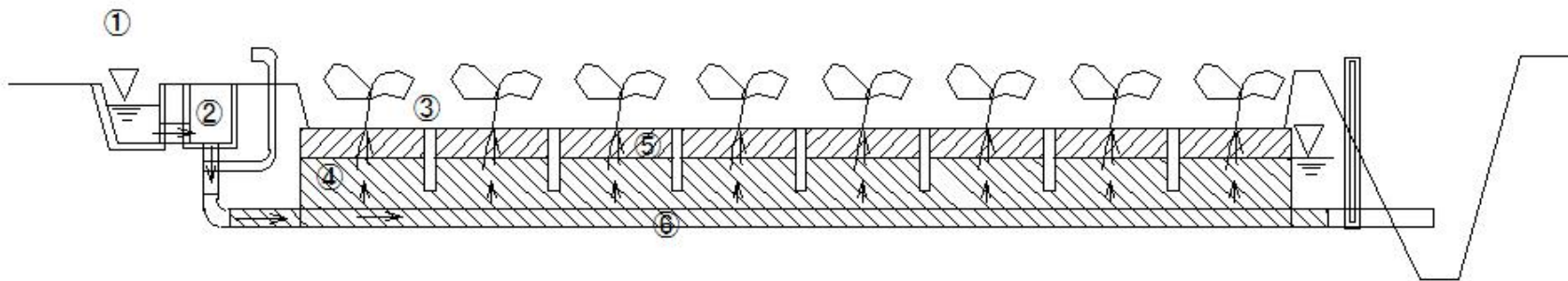


(I1226)

(I1228) Underground irrigation

(I1228) Underground irrigation

- ① Waterway
- ② Centralized management manhole
- ③ Auxiliary culvert
- ④ Hydrophobic material
- ⑤ Plowed soil layer
- ⑥ Culvert (submerged drain)
- ⑦ Groundwater level
- ⑧ Drainage channel

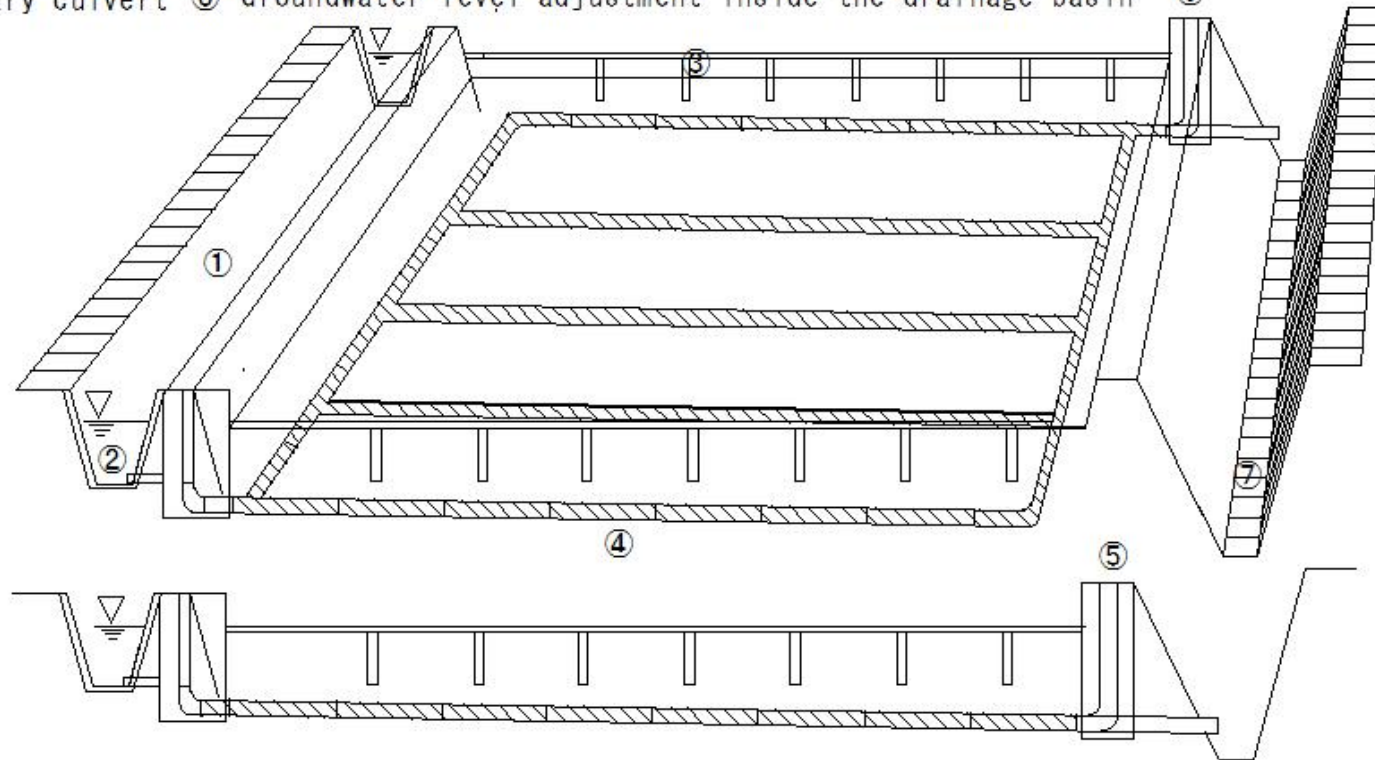


(I1229) Underground irrigation

(I1229) Underground irrigation

Underground irrigation

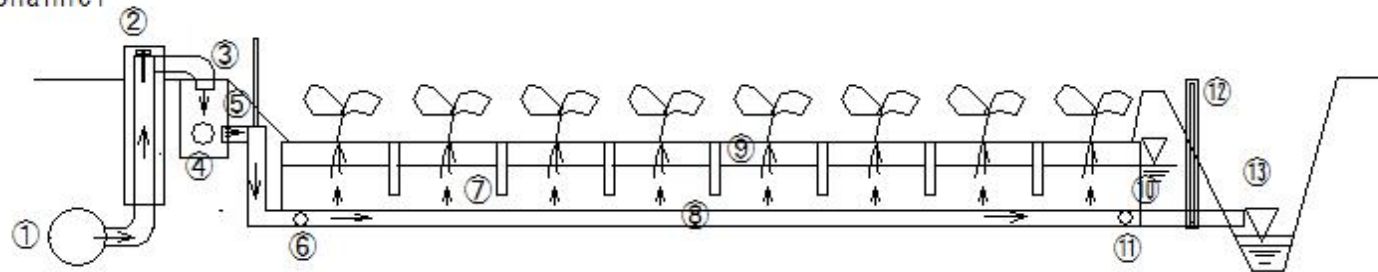
- ① Waterway
- ② Water inlet
- ③ Auxiliary culvert
- ④ Unglazed ceramic pipe 75mm gradient 1/500-1/1000
- ⑤ Water level adjustment with riser pipe
- ⑥ Groundwater level adjustment inside the drainage basin
- ⑦ Drainage channel



(I1230) Underground irrigation

(I1230) Underground irrigation

- ① Water supply
- ② Water tap
- ③ Centralized control hole
- ④ Water distribution tap (water supply from the ground)
- ⑤ Water distribution tap (water supply from underground)
- ⑥ Connecting pipe (upstream)
- ⑦ Hydrophobic material (larch chips)
- ⑧ Culvert (water absorption culvert)
- ⑨ Soil layer
- ⑩ Groundwater level
- ⑪ Connecting pipe (downstream)
- ⑫ Water level adjustment sluice
- ⑬ Drainage channel



(I1231) Underground irrigation

(I1229) Underground irrigation

○ In the case of farm fields

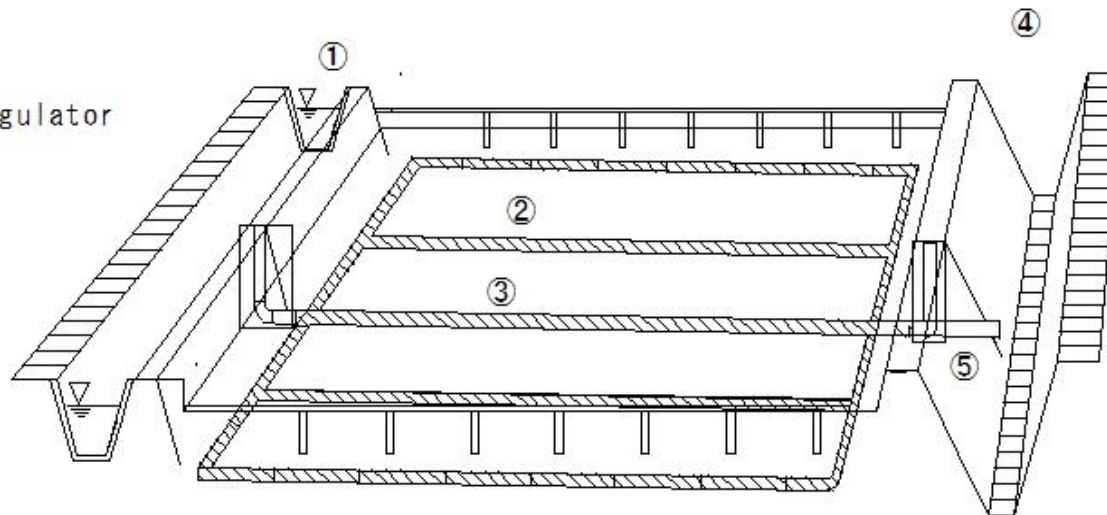
① Waterway

② Branch pipe

③ Main pipe

④ Drainage channel

⑤ Groundwater level regulator



(I1232) Underground irrigation

(I1232) Underground irrigation

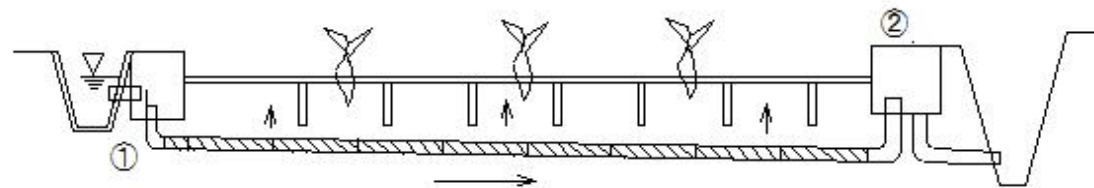
○ In the case of fields

① Main line and branch pipes

② Groundwater level regulator

○ Main crops used

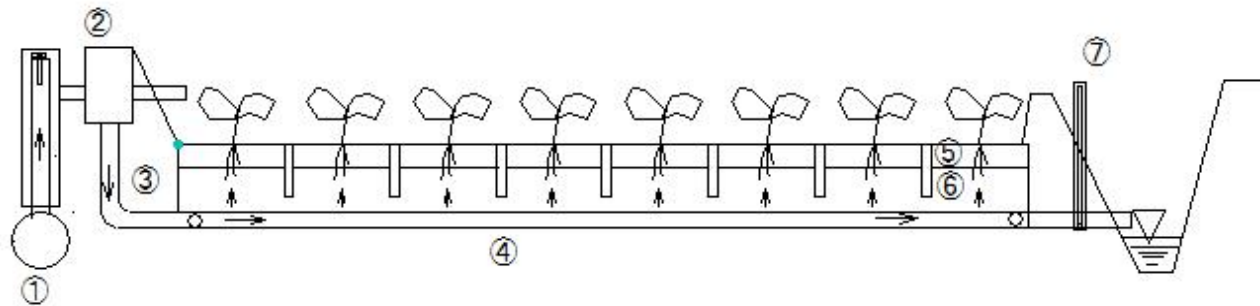
Beans, rice, buckwheat, onions



(I1233) Underground irrigation

(I1233) Underground irrigation

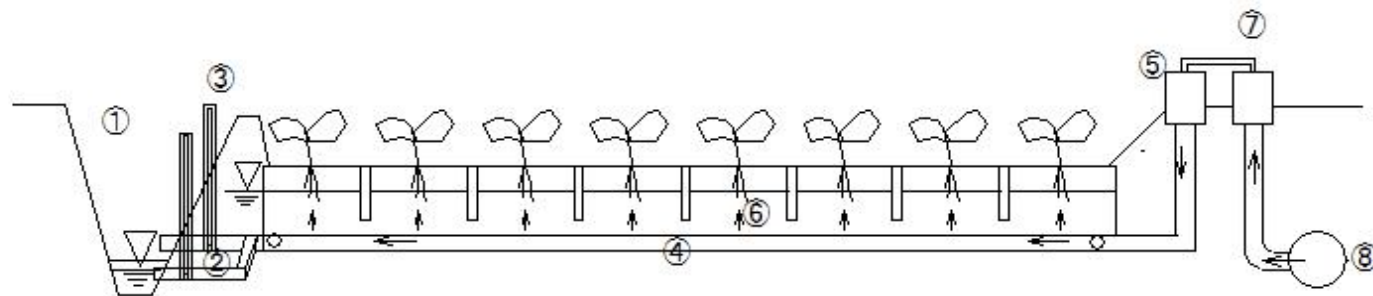
- ① Irrigation canal
- ② Centralized management hole
- ③ Underground irrigation
- ④ Culvert (water supply culvert)
- ⑤ Soil layer
- ⑥ Hydrophobic material
- ⑦ Water level adjustment sluice



(I1234) Underground irrigation

(I1234) Underground irrigation

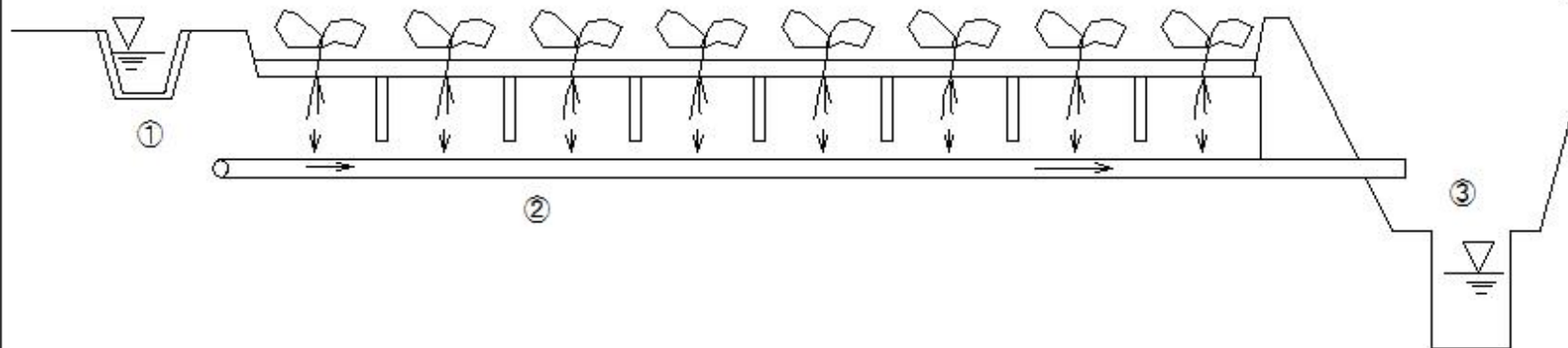
- ① Drainage channel
- ② Groundwater level regulator
- ③ Water gate
- ④ Underground irrigation facility
- ⑤ Water injection facility
- ⑥ Field hole (rice husk)
- ⑦ Water tap
- ⑧ Irrigation channel



(I1235) Underground irrigation

(I1235) Underground irrigation

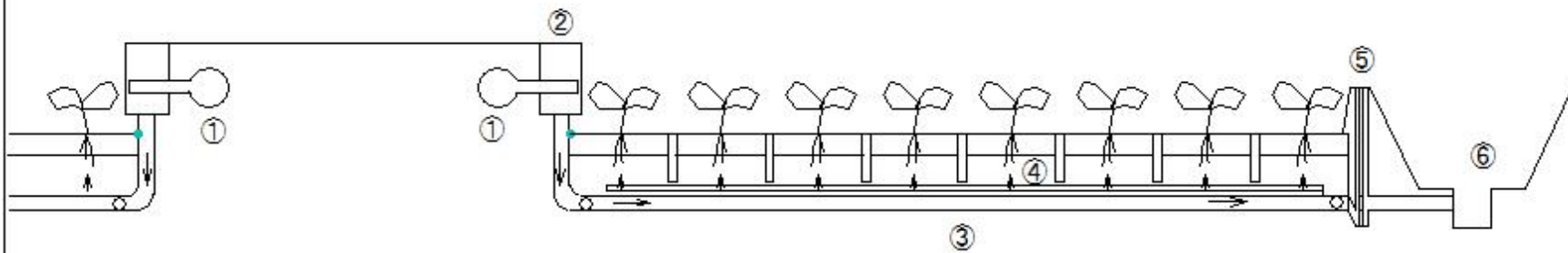
- ① Irrigation canal
- ② Culvert
- ③ Drainage channel



(I1236) Underground irrigation

(I1236) Underground irrigation

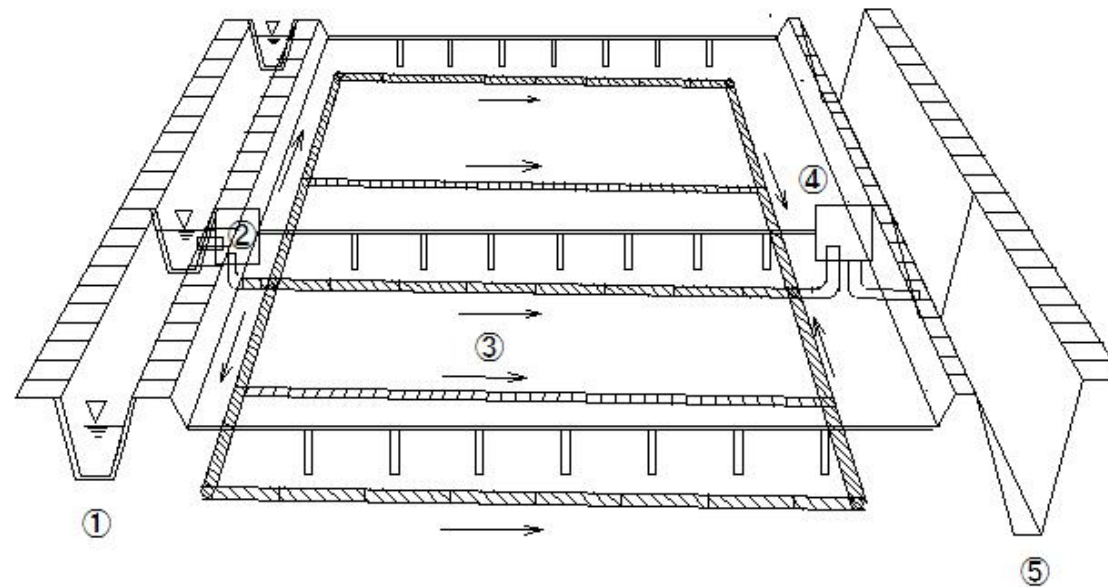
- ① Water pipeline
- ② Water drainage box
- ③ Main pipe
- ④ Branch pipe
- ⑤ Water level regulator
- ⑥ Small drainage channel



(I1237) Underground irrigation

(I1237) Underground irrigation

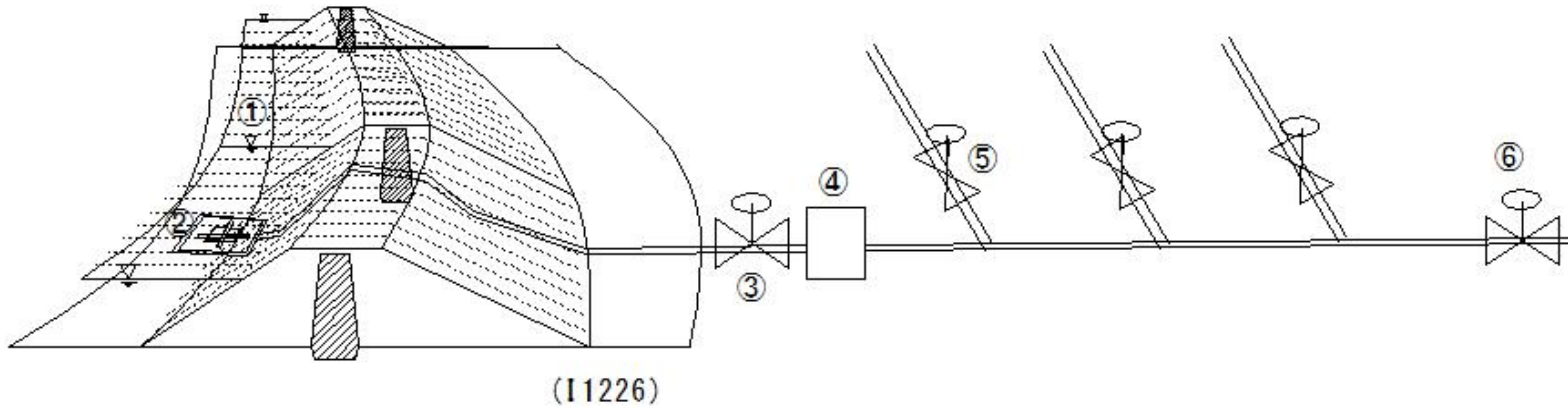
- ① Water channel
- ② Underground irrigation water supply pit
- ③ 7.5-10m polyethylene perforated pipe ϕ 60mm-75mm
- ④ Drain pit
- ⑤ Drainage channel



(I1238) Underground irrigation

(I1238) Underground irrigation

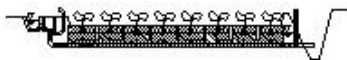
- ① Reservoir
- ② Water intake float
- ③ Siphon gate valve
- ④ Siphon air valve
- ⑤ Field water supply valve
- ⑥ Pipeline terminal gate valve



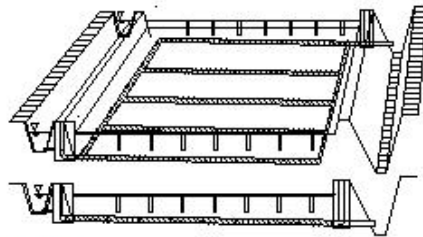
(I1239) Underground irrigation

(I1239) Underground irrigation

I1228



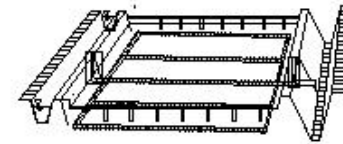
I1229



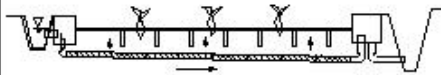
I1230



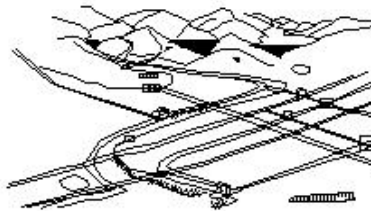
I1231



I1232



I1233



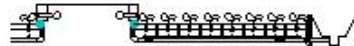
I1234



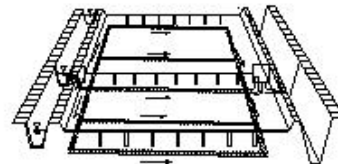
I1235



I1236



I1237



1994

I1238

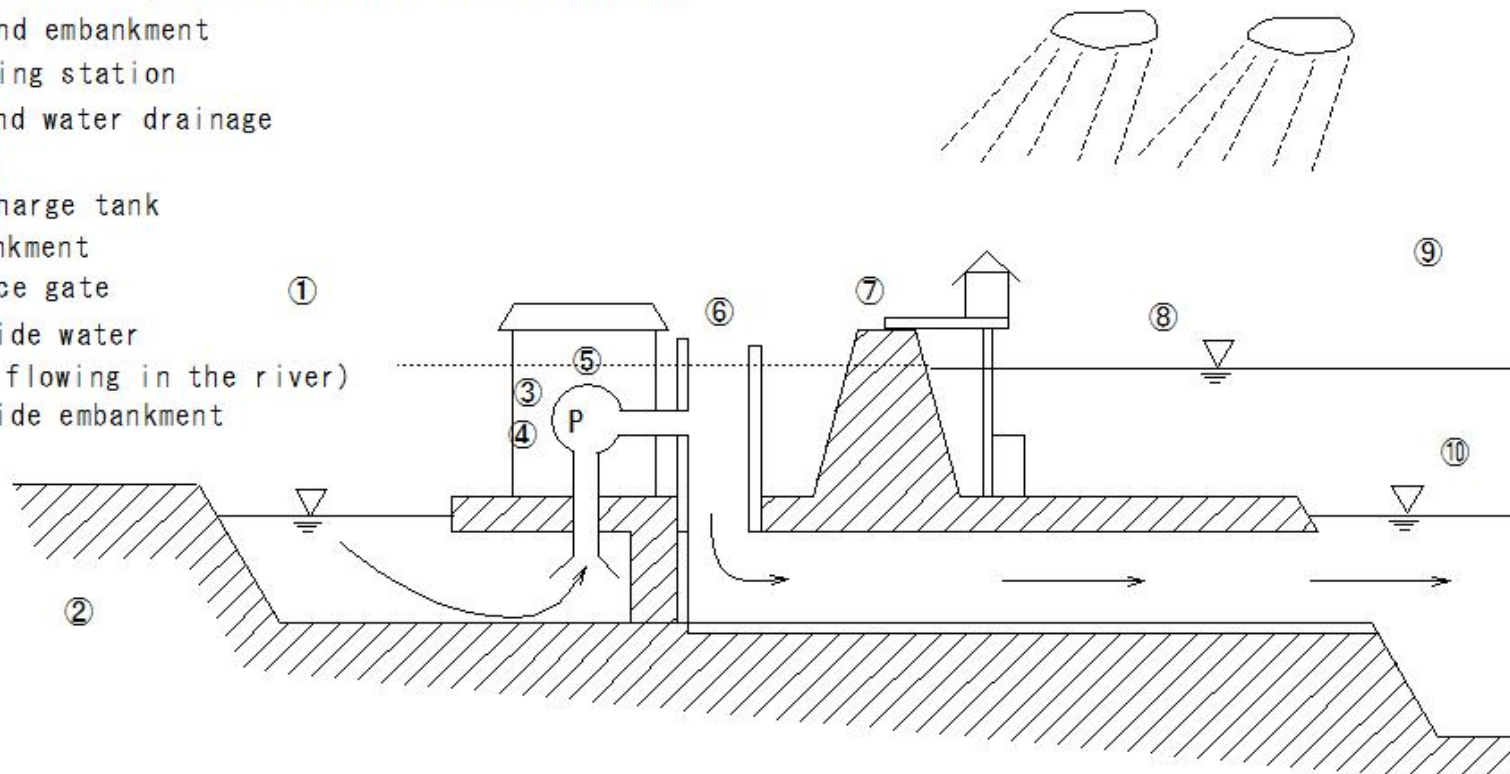


(I1240) Pumping station

(I1240) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment

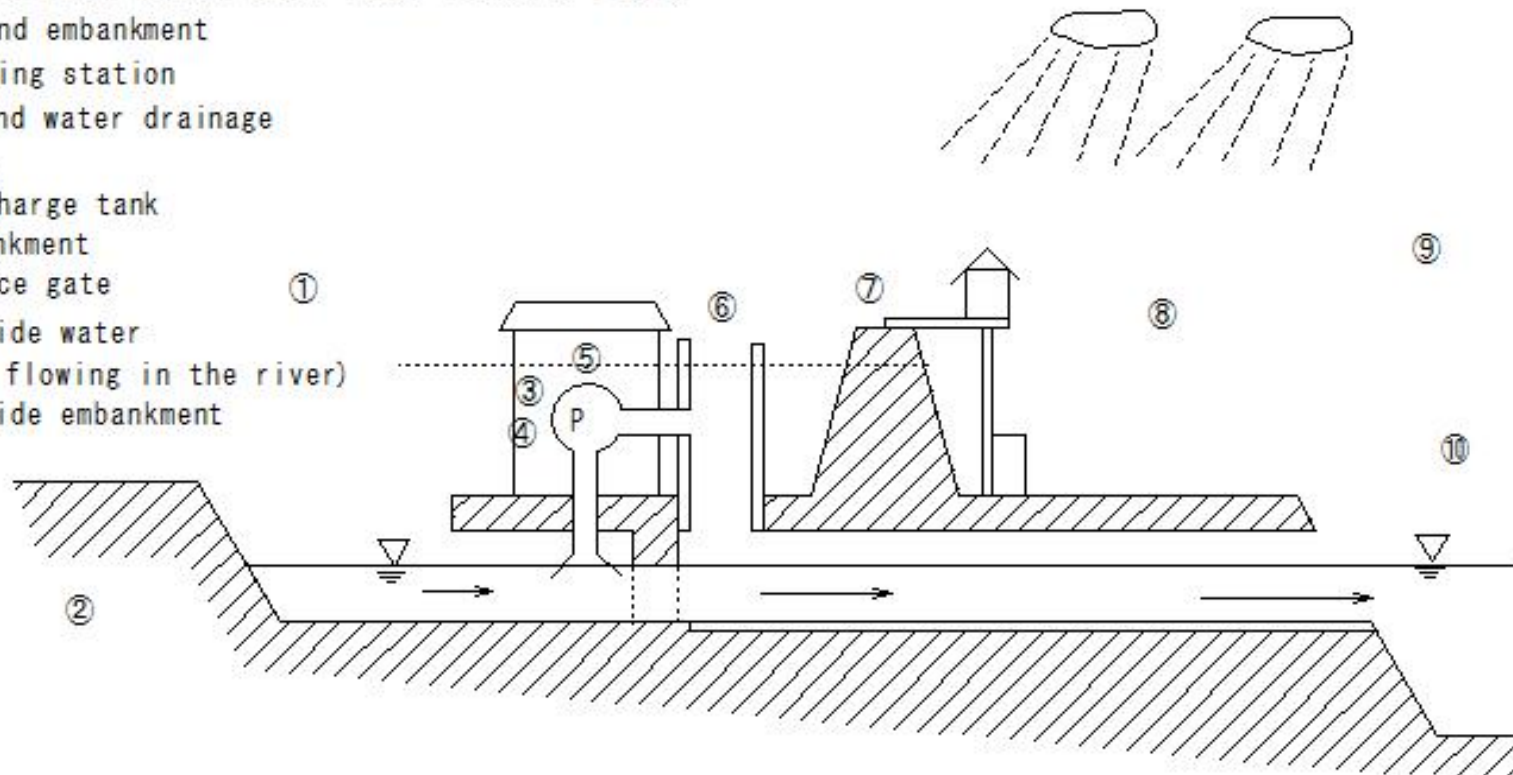


(I1241) Pumping station

(I1241) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment

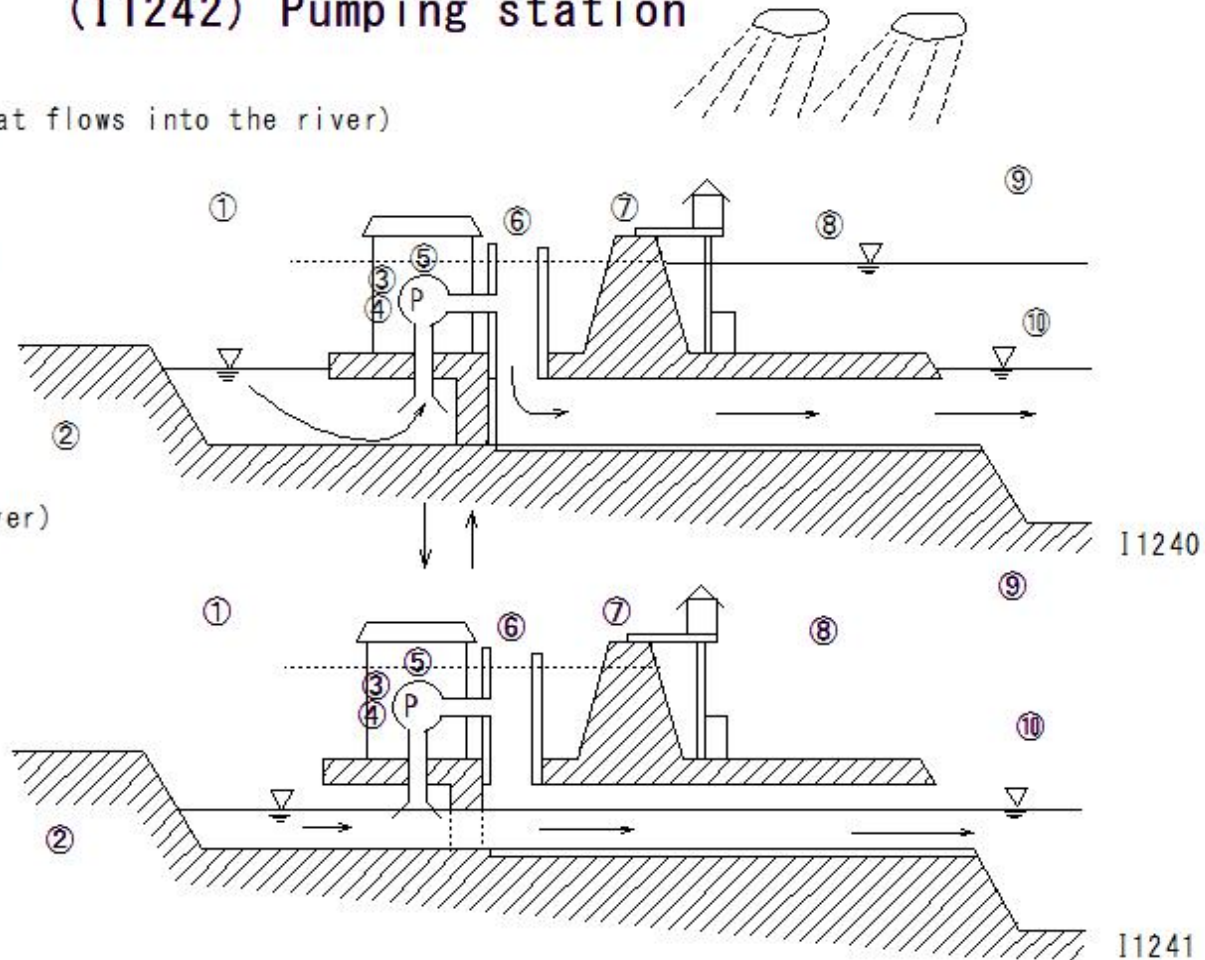


(I1242) Pumping station

(I1242) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment

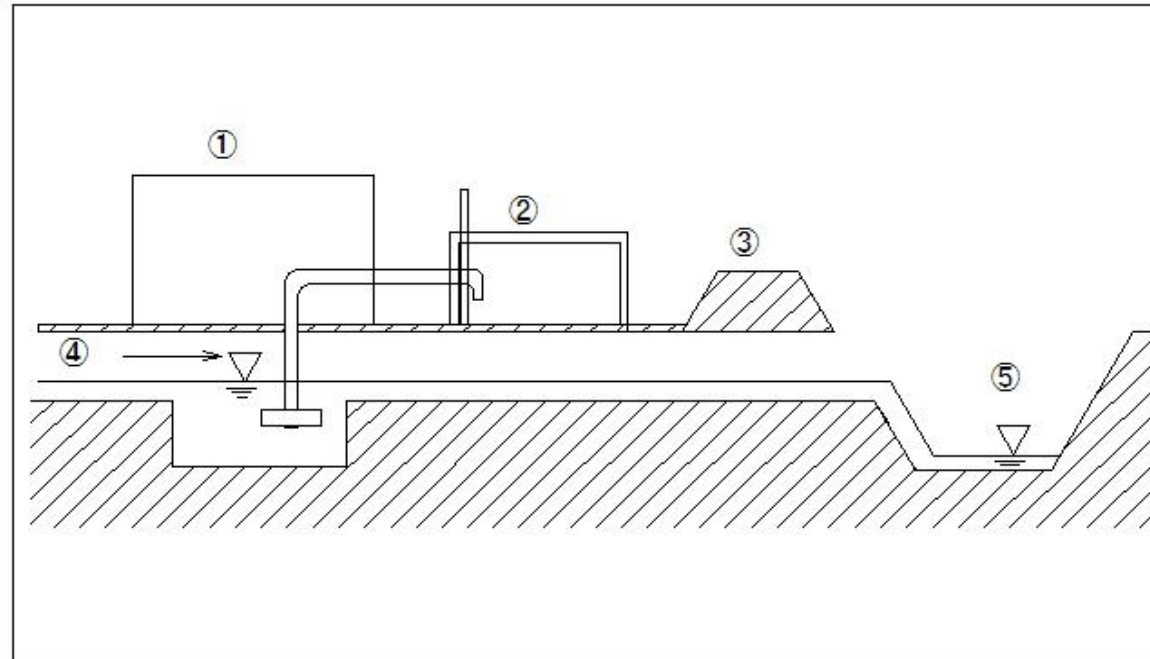


(I1243) Pumping station

(I1243) Pumping station

Pumping station

- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river



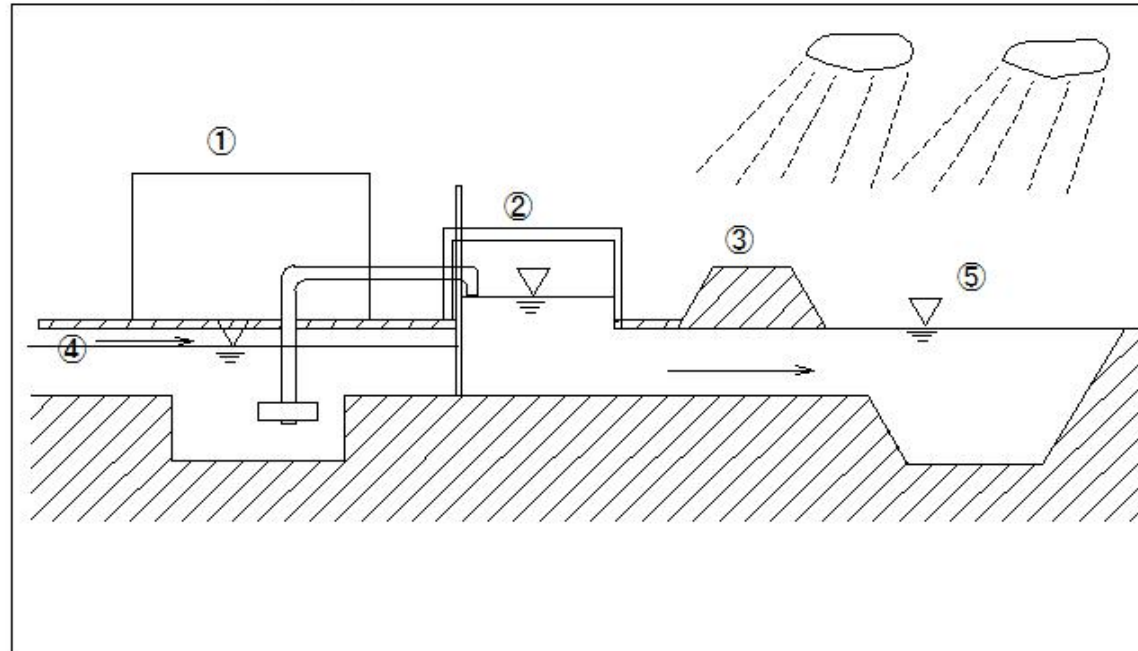
- a: Normally, the water from the tributary flows into the main river
- b: During heavy rain, the water level of the main river becomes higher than that of the tributary
- c: Water from the main river flows back
- d: The gate is closed to prevent backflow
- e: The tributary overflows
- f: The water from the tributary is forcibly drained into the main river by a drainage pump

(I1244) Pumping station

(I1244) Pumping station

Pumping station

- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river



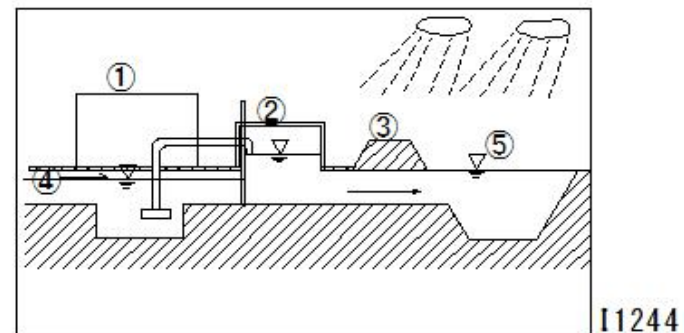
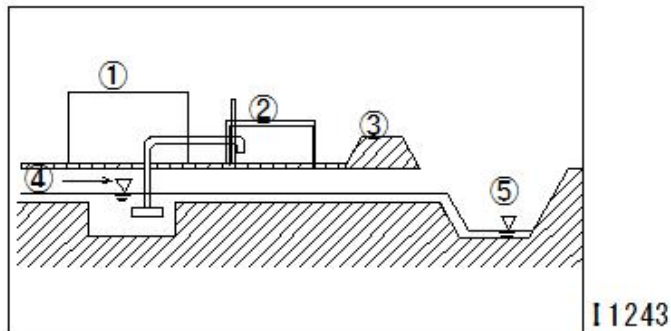
- a: Normally, the water from the tributary flows into the main river
- b: During heavy rain, the water level of the main river becomes higher than that of the tributary
- c: Water from the main river flows back
- d: The gate is closed to prevent backflow
- e: The tributary overflows
- f: The water from the tributary is forcibly drained into the main river by a drainage pump

(I1245) Pumping station

(I1245) Pumping station

Pumping station

- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river



- a: Normally, the water from the tributary flows into the main river
- b: During heavy rain, the water level of the main river becomes higher than that of the tributary
- c: Water from the main river flows back
- d: The gate is closed to prevent backflow
- e: The tributary overflows
- f: The water from the tributary is forcibly drained into the main river by a drainage pump

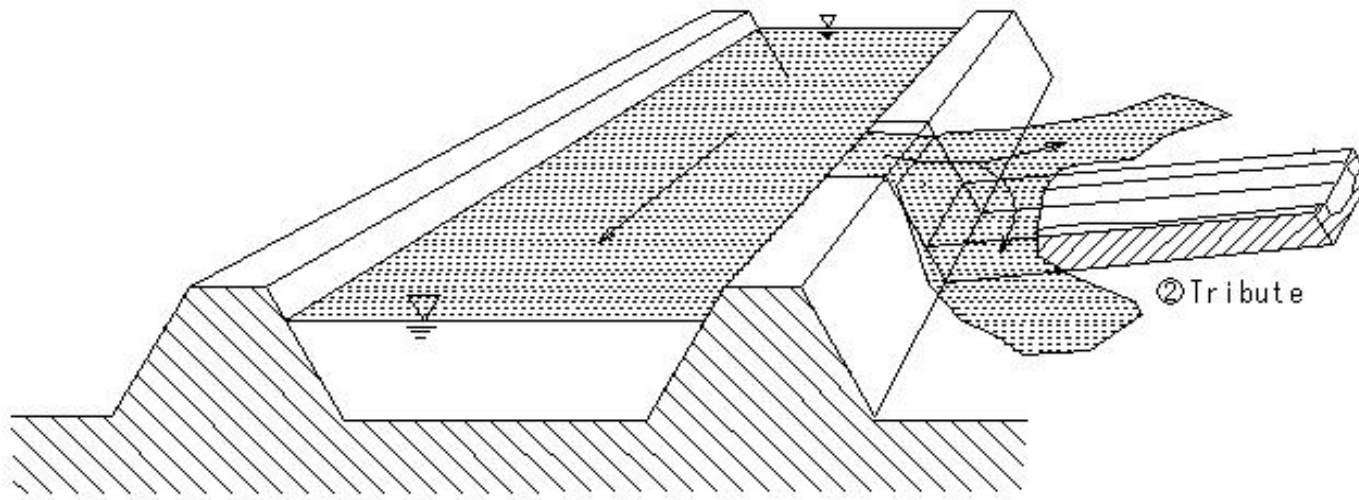
(I1246) Pumping station

(I1246) Pumping station

Pumping station

○ In case of there are no floodgates or gates

① When the main river is flooded

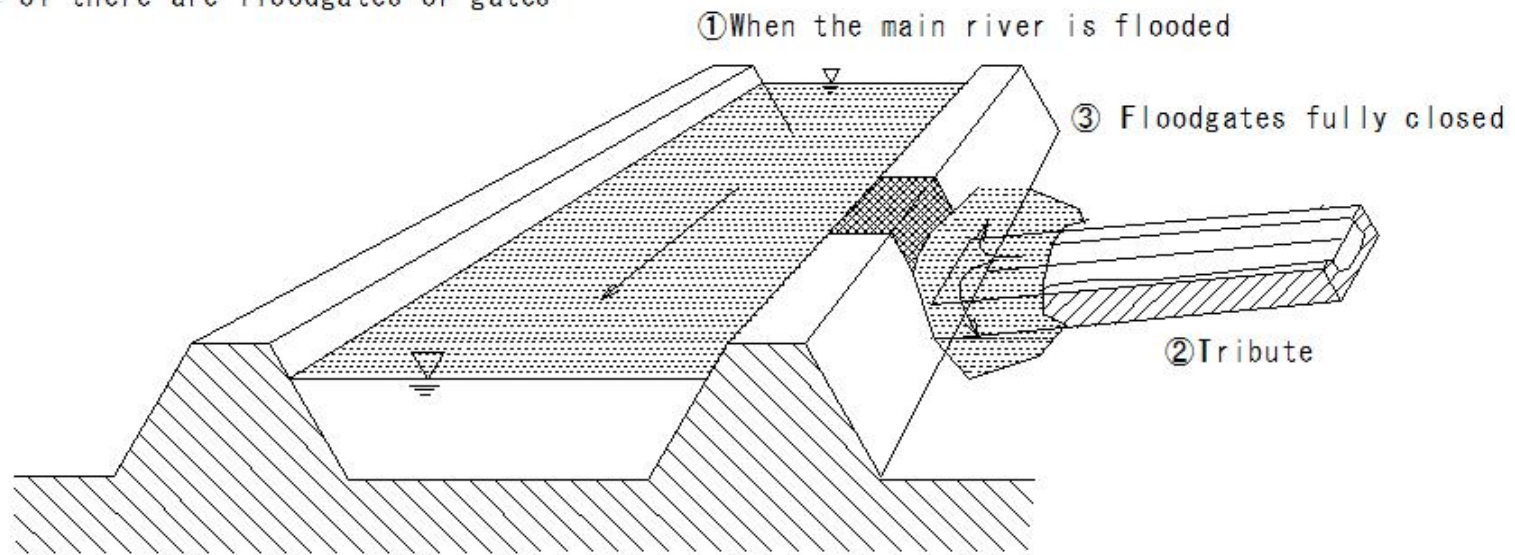


(I1247) Pumping station

(I1247) Pumping station

Pumping station

○ In case of there are floodgates or gates



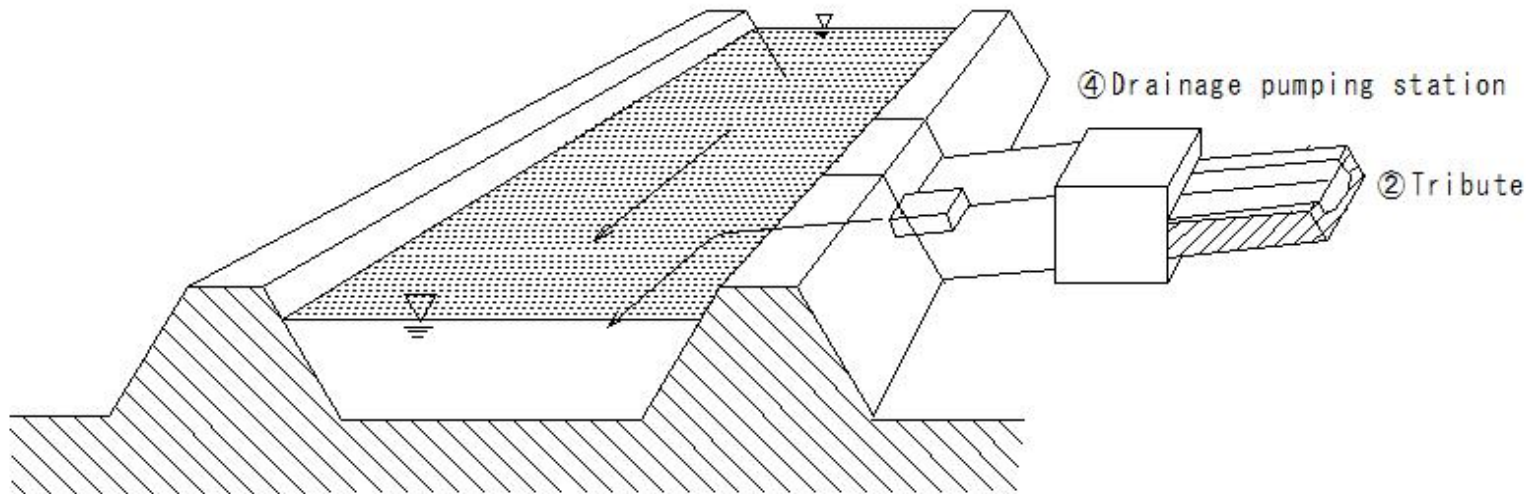
(I1248) Pumping station

(I1248) Pumping station

Pumping station

○ In case of there are floodgates or gates

① When the main river is flooded

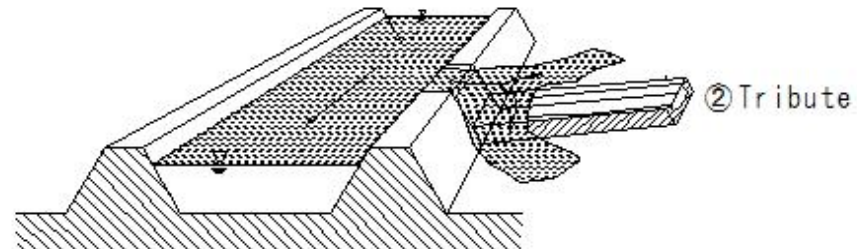


(I1249) Pumping station

(I1249) Pumping station

○ In case of there are no floodgates or gates

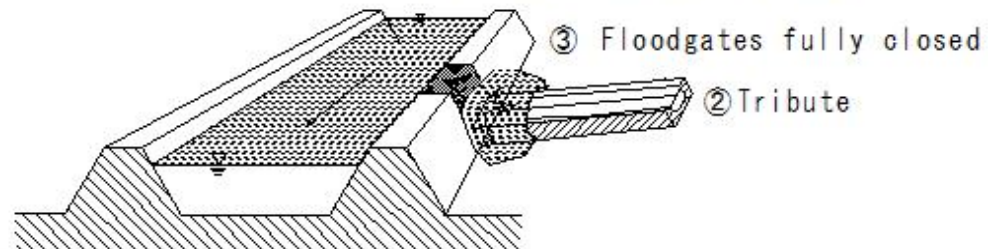
① When the main river is flooded



I1246

○ In case of there are floodgates or gates

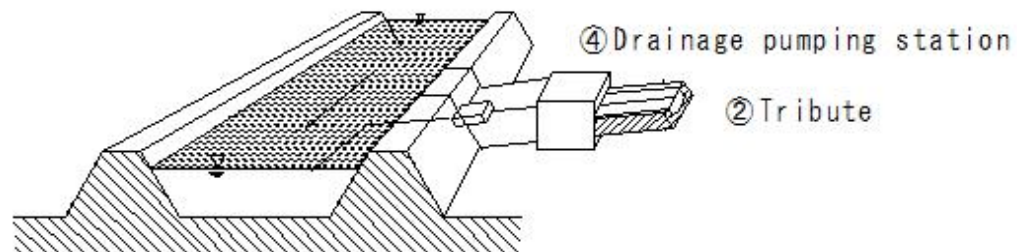
① When the main river is flooded



I1247

○ In case of there are floodgates or gates

① When the main river is flooded



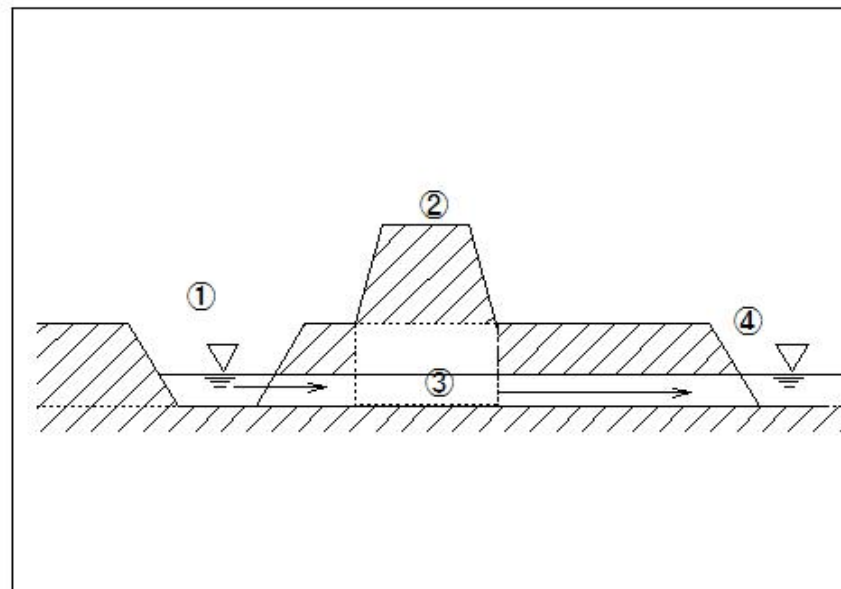
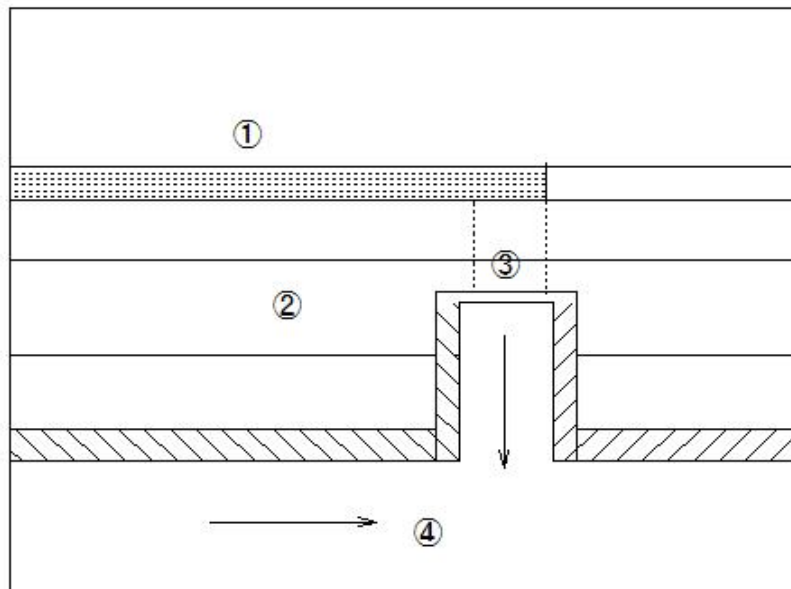
I1248

(I1250) Pumping station

(I1250) Pumping station

Pumping station

- Role of the gate
- ① Drainage channel
- ② Levee
- ③ Tunnel waterway
- ④ River



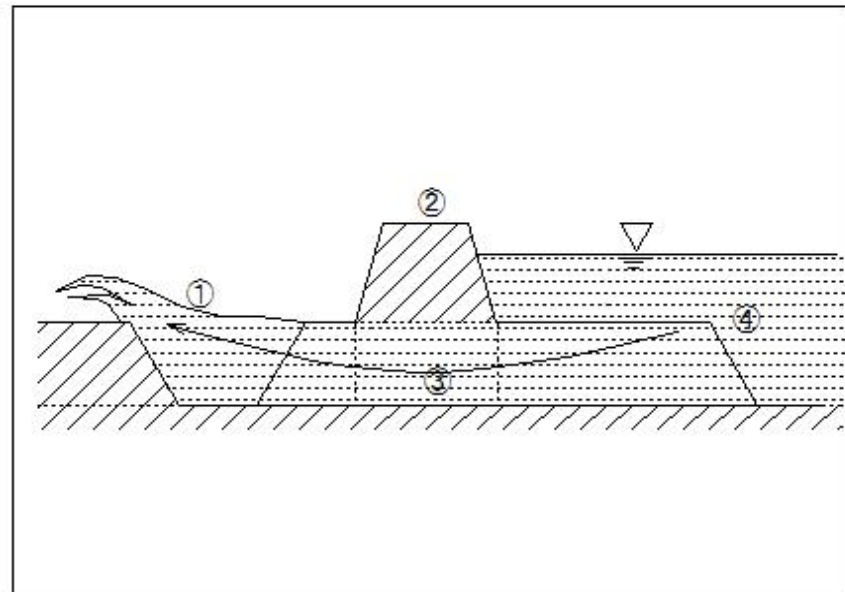
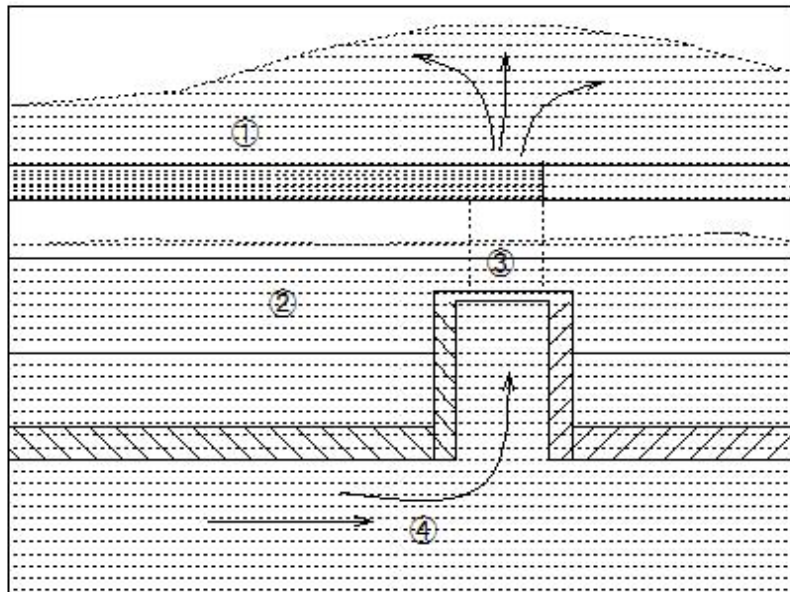
○ Water from the drainage channel flows into the river through the waterway under the levee

(I1251) Pumping station

(I1251) Pumping station

Pumping station

- Role of the gate
- ① Drainage channel
- ② Levee
- ③ Tunnel waterway
- ④ River



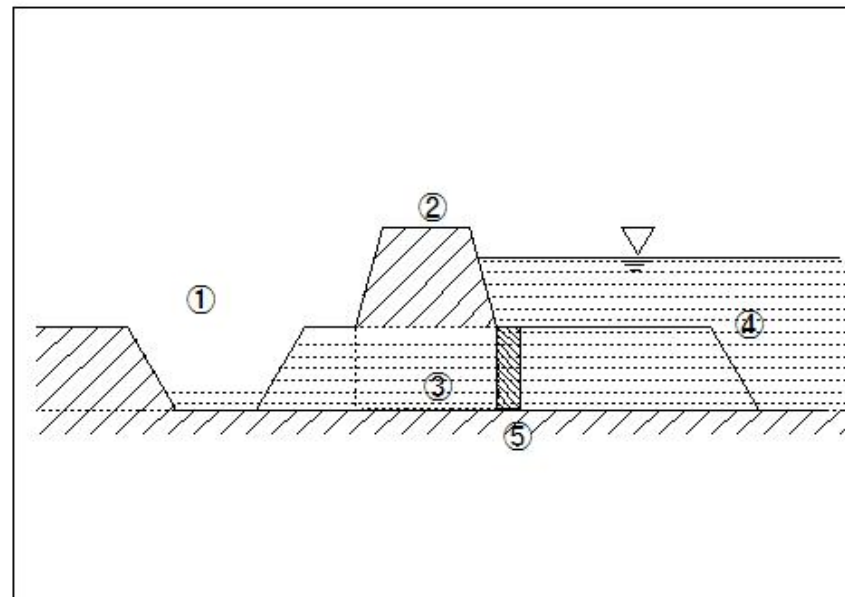
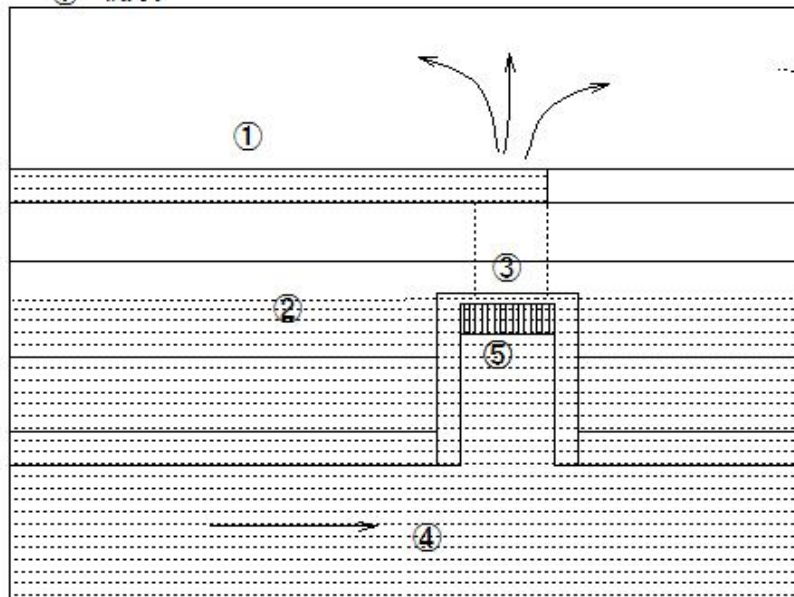
○ When the water level rises, water backs up from the waterway

(I1252) Pumping station

(I1252) Pumping station

Pumping station

- Role of the gate
- ① Drainage channel
- ② Levee
- ③ Tunnel waterway
- ④ River
- ⑤ Gate



○ Closing the gate prevents backflow

(I1253) Pumping station

(I1253) Pumping station

Pumping station

○ Role of the gate

① Drainage channel

② Levee

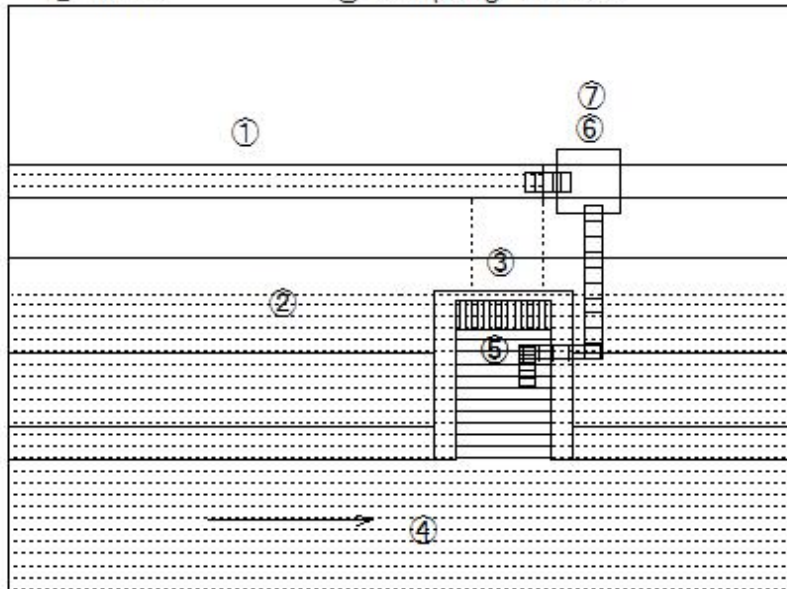
③ Tunnel waterway

④ River

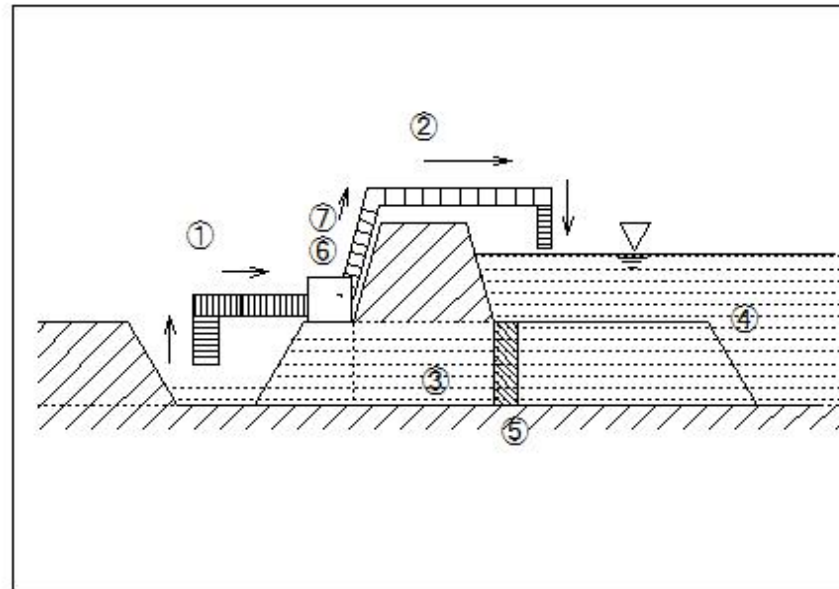
⑤ Gate

⑥ Drainage pump

⑦ Pumping station



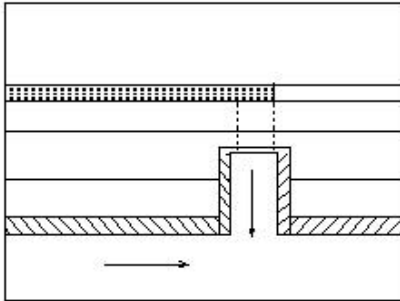
○ Pumps out the water inside the river



(I1254) Pumping station

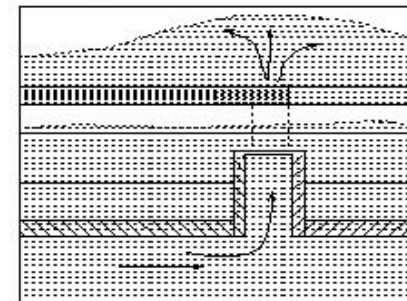
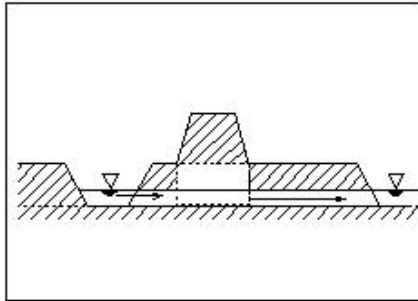
(I1254) Pumping station

I1250

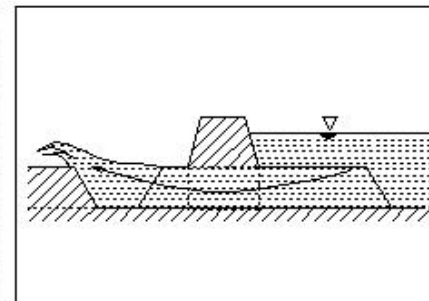


○ Water from the drainage channel flows into the river through the waterway under the levee

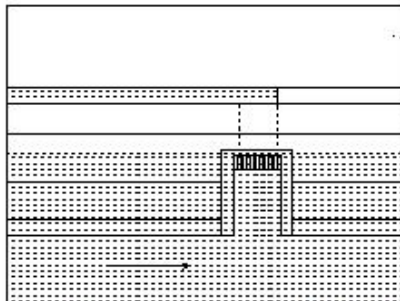
I1251



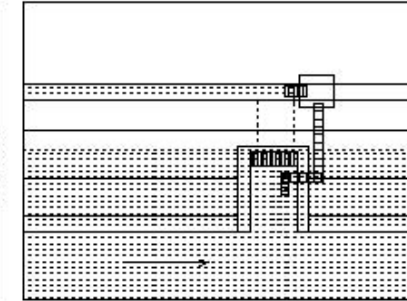
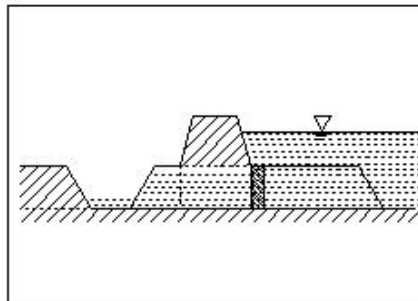
○ When the water level rises, water backs up from the waterway



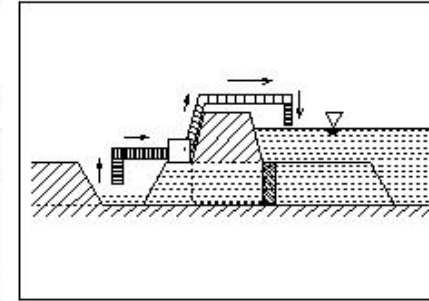
I1252



○ Closing the gate prevents backflow



I1253



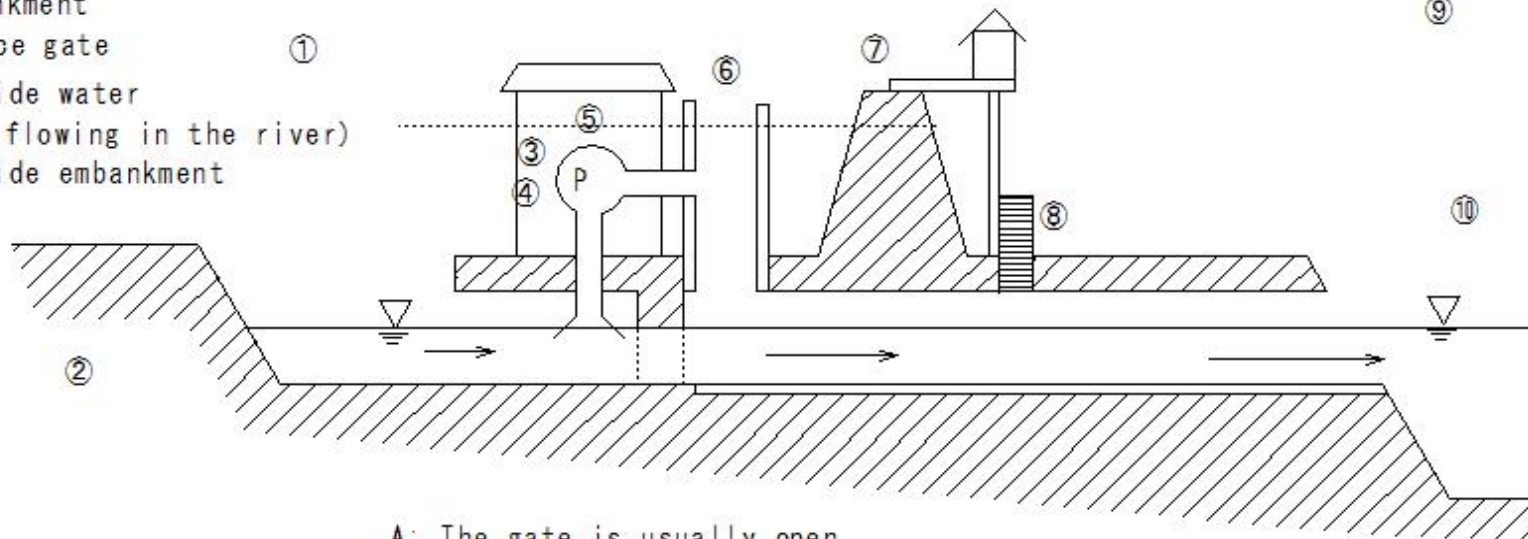
○ Pumps out the water inside the river

(I1255) Pumping station

(I1255) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment

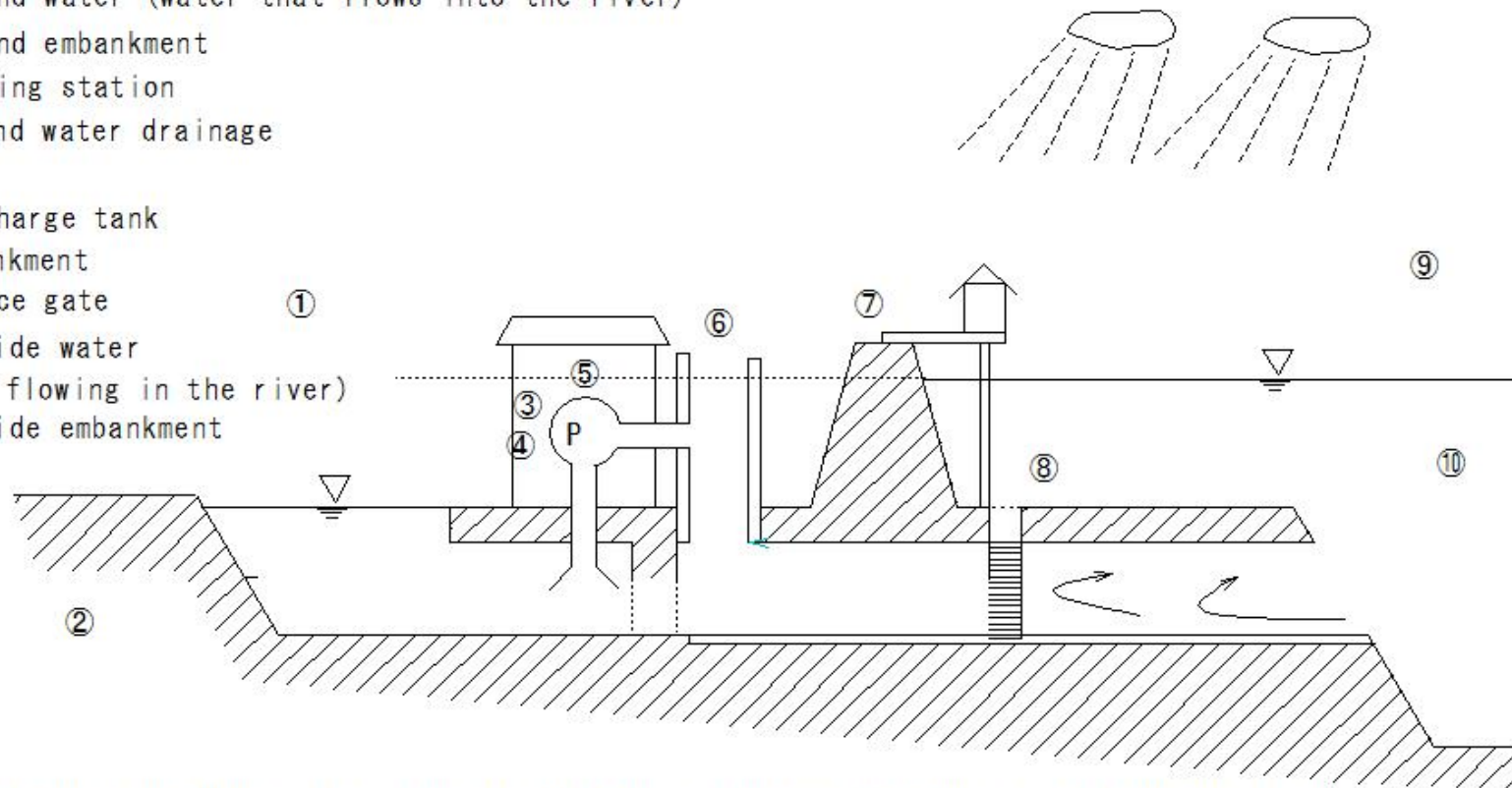


(I1256) Pumping station

(I1256) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment



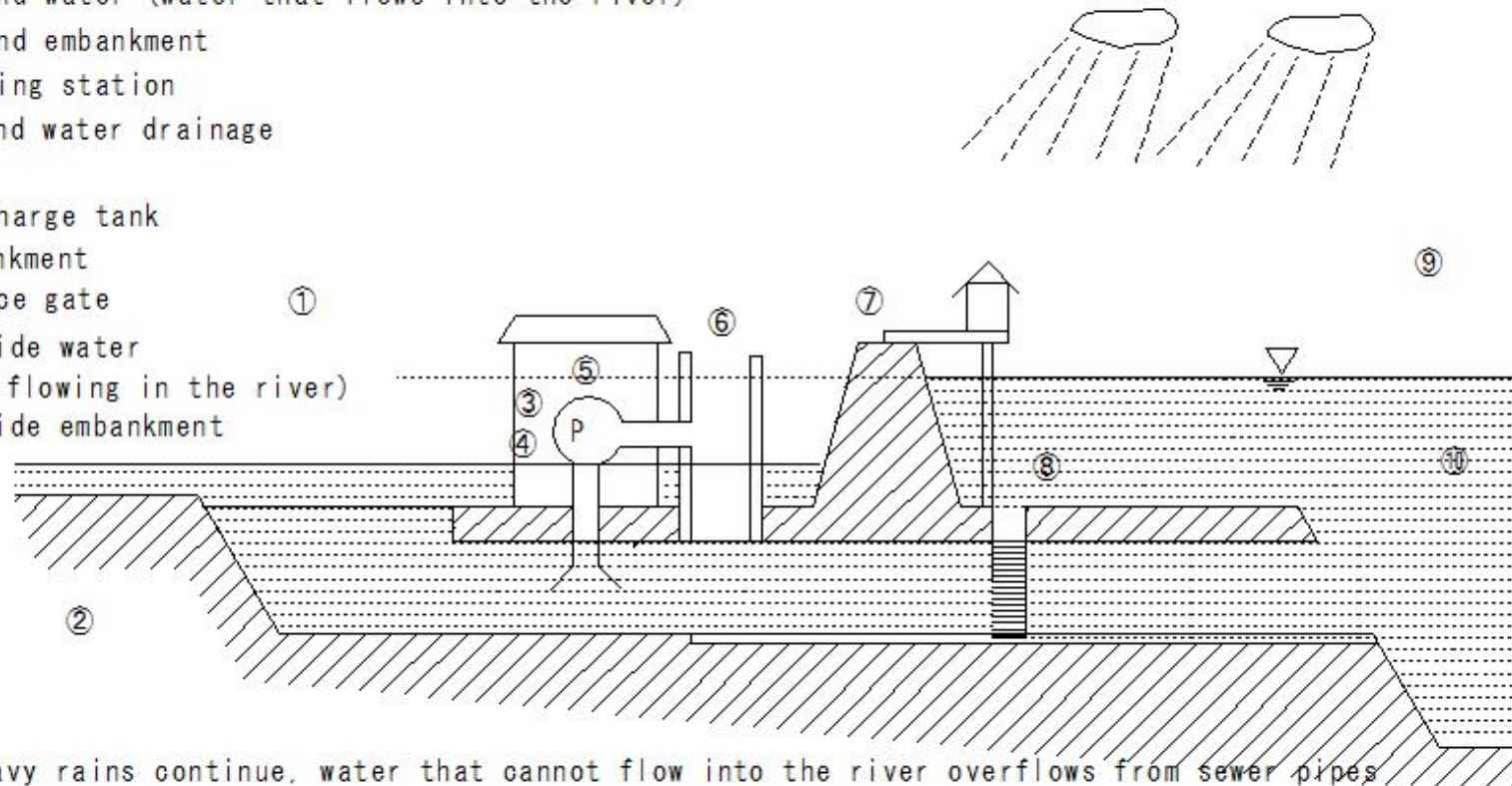
B: When heavy rains occur, the gates are closed to prevent the river water from backing up.

(I1257) Pumping station

(I1257) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment



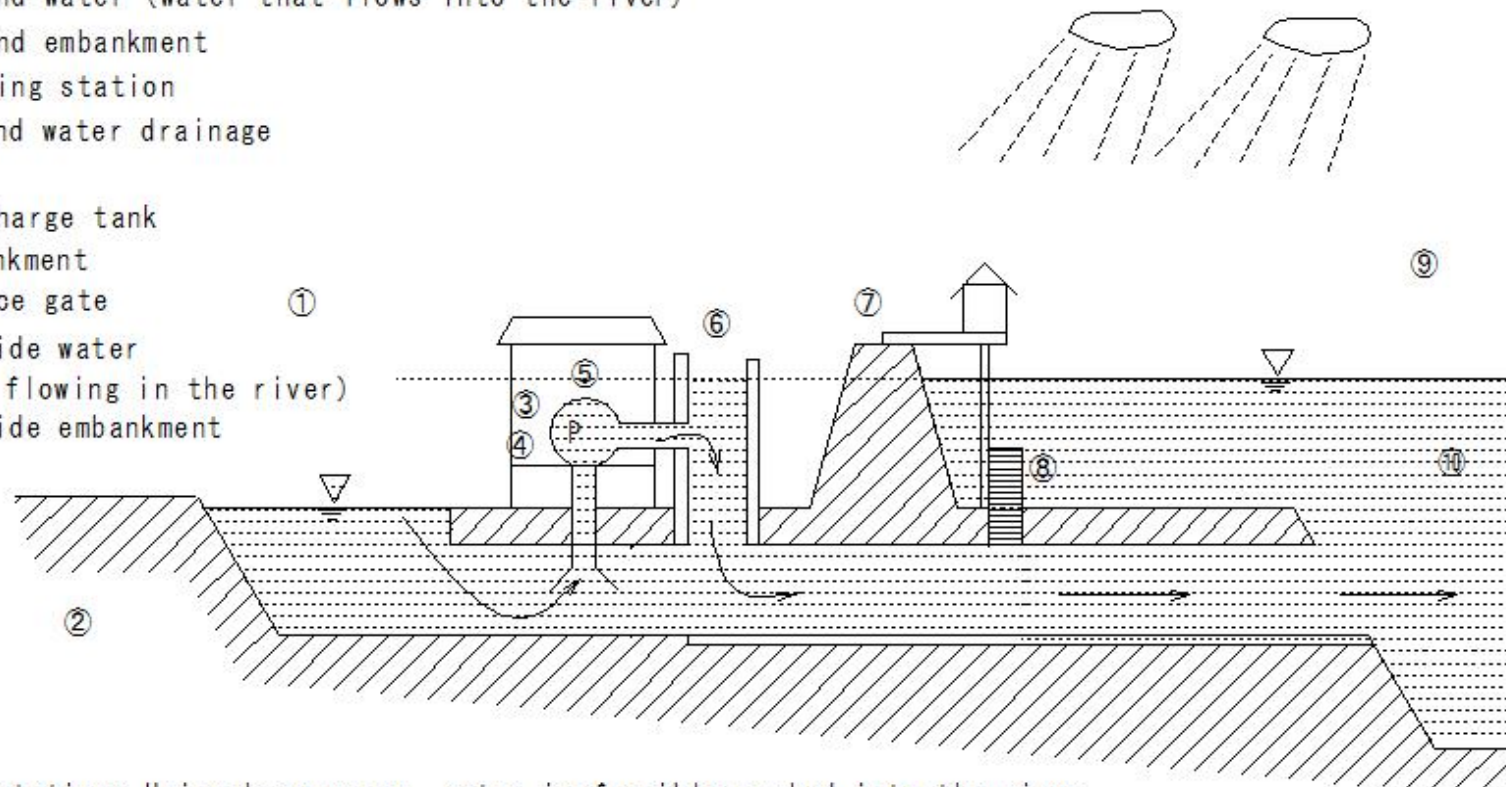
C: When heavy rains continue, water that cannot flow into the river overflows from sewer pipes and irrigation channels into residential areas and fields.

(I1258) Pumping station

(I1258) Pumping station

Pumping station

- ① Inland water (water that flows into the river)
- ② Inland embankment
- ③ Pumping station
- ④ Inland water drainage
- ⑤ Pump
- ⑥ Discharge tank
- ⑦ Embankment
- ⑧ Sluice gate
- ⑨ Outside water (water flowing in the river)
- ⑩ Outside embankment

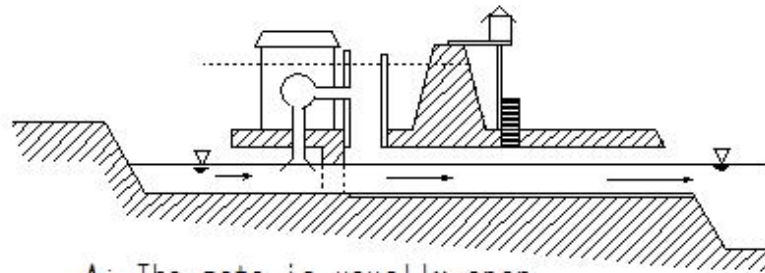


D: Pumping station: Using huge pumps, water is forcibly pushed into the river when the water level is high.

(I1259) Pumping station

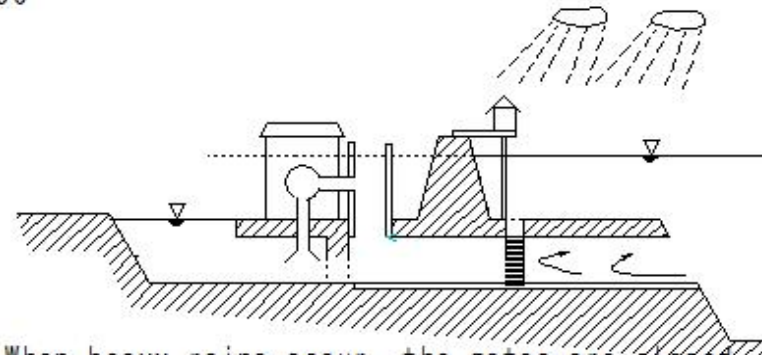
(I1259) Pumping station

I1255



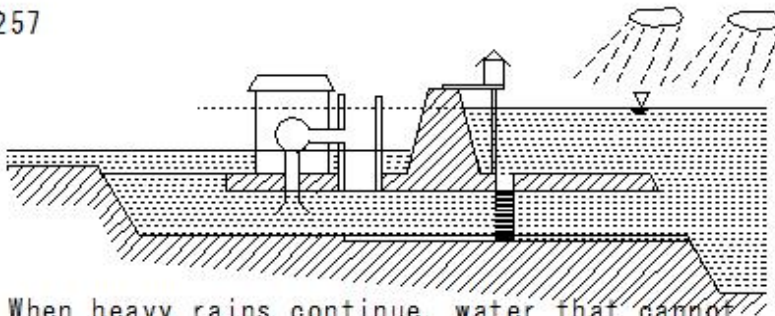
A: The gate is usually open.

I1256



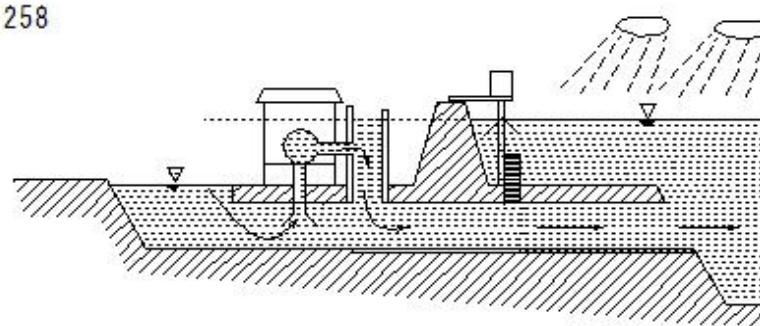
B: When heavy rains occur, the gates are closed to prevent the river water from backing up.

I1257



C: When heavy rains continue, water that cannot flow into the river overflows from sewer pipes and irrigation channels into residential areas and fields.

I1258



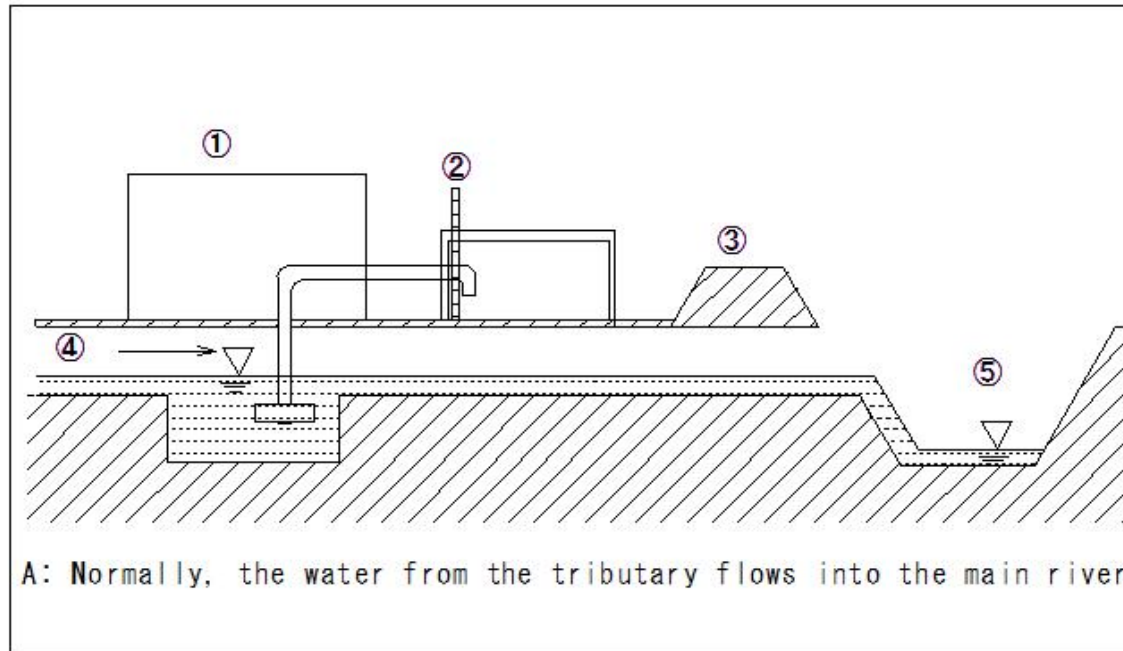
D: Pumping station: Using huge pumps, water is forcibly pushed into the river when the water level is high.

(I1260) Pumping station

(I1260) Pumping station

Pumping station

- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river

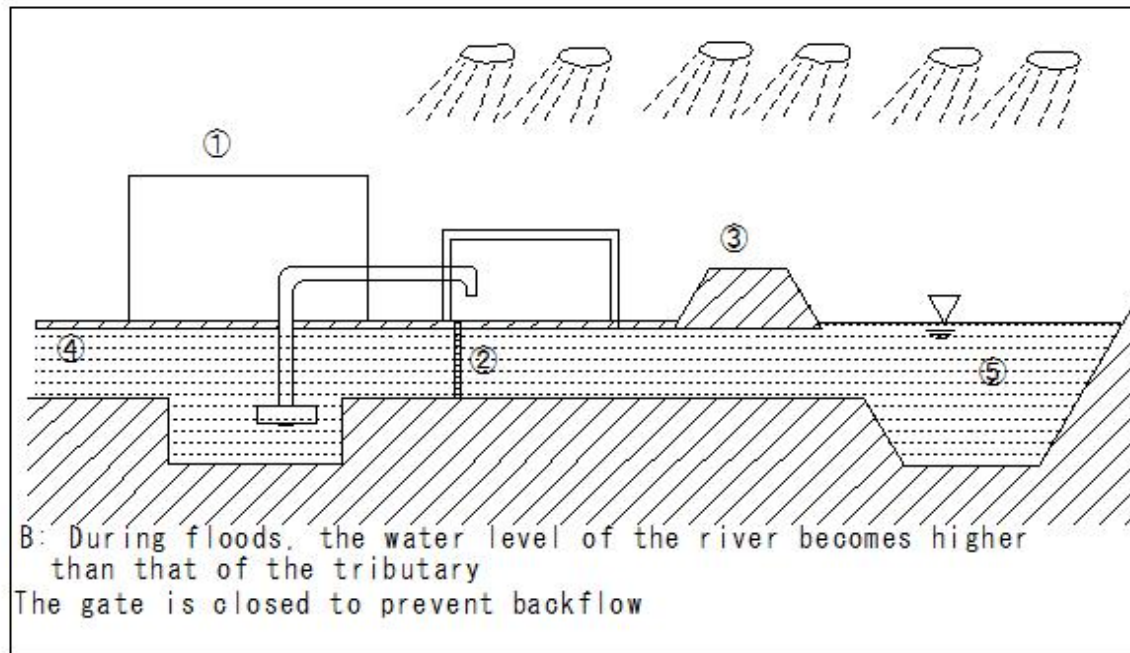


(I1261) Pumping station

(I1261) Pumping station

Pumping station

- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river

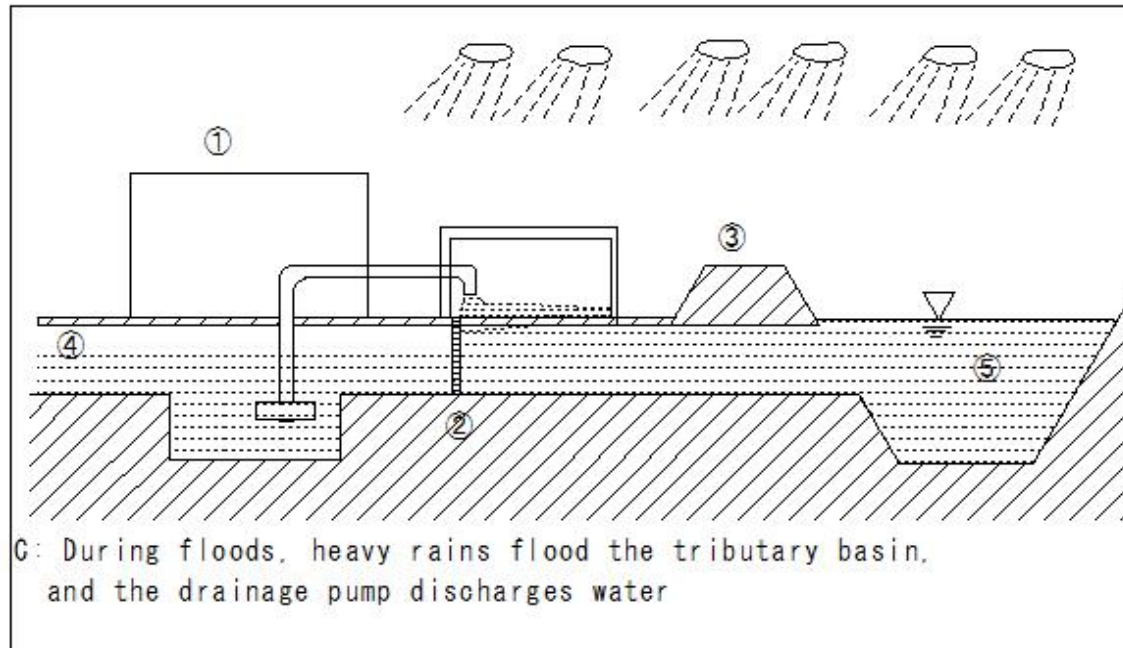


(I1262) Pumping station

(I1262) Pumping station

Pumping station

- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river

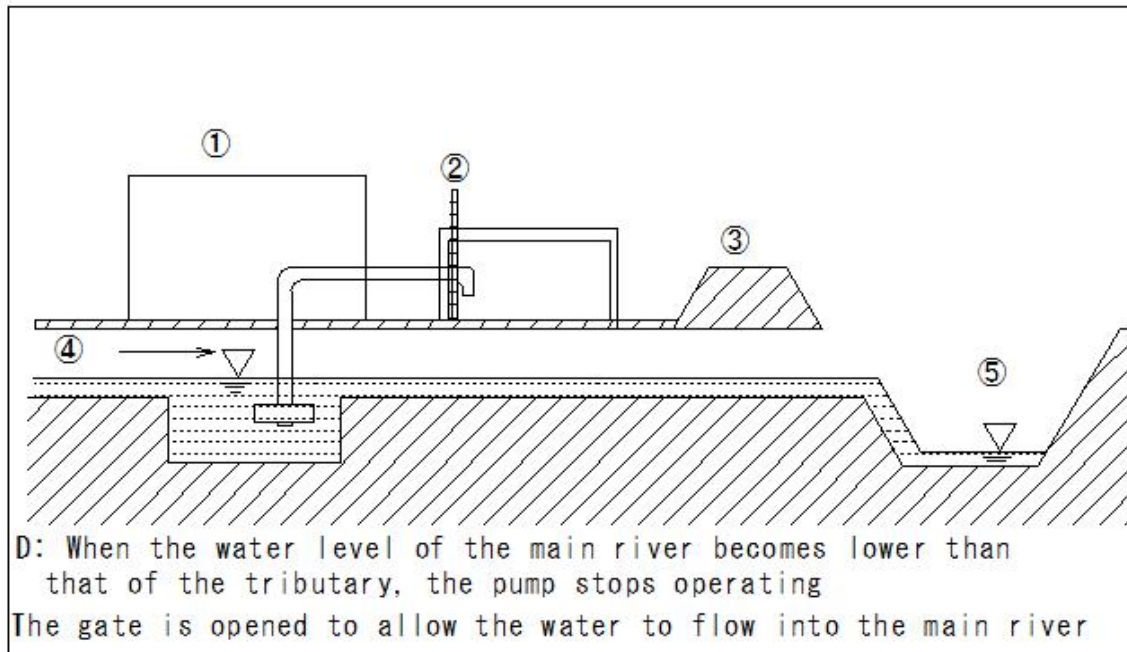


(I1263) Pumping station

(I1263) Pumping station

Pumping station

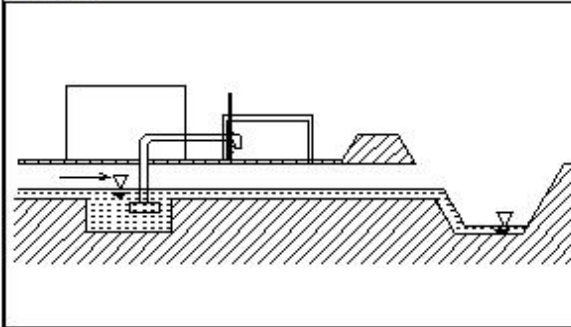
- ① Pumping station
- ② Gate
- ③ Embankment
- ④ Tributary river
- ⑤ Main river



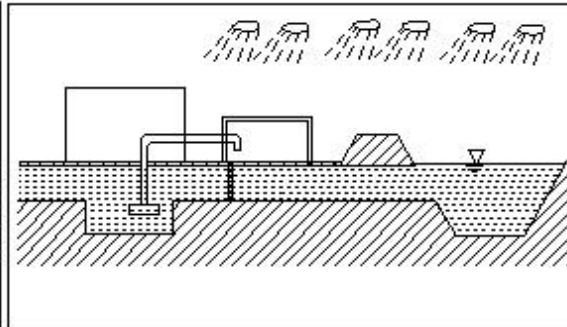
(I1264) Pumping station

(I1264) Pumping station

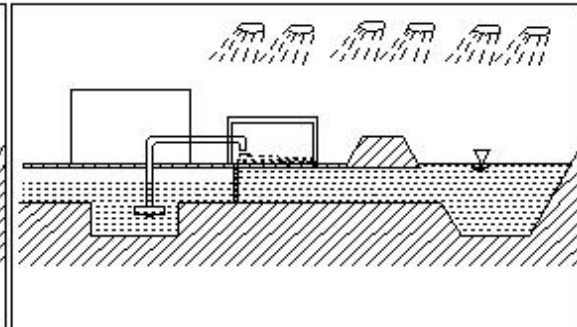
I1260



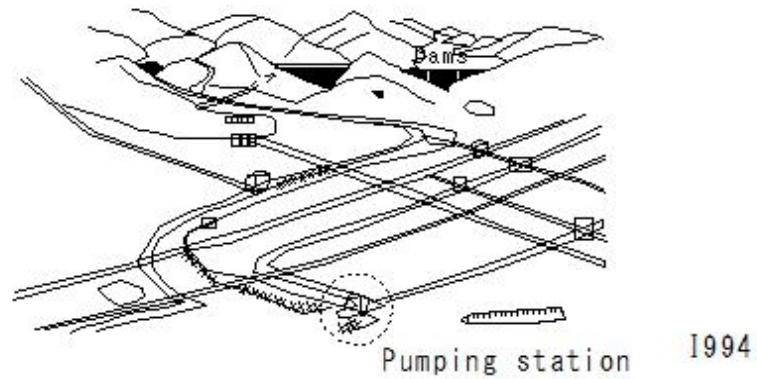
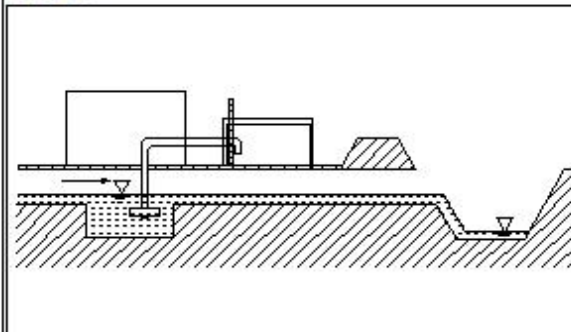
I1261



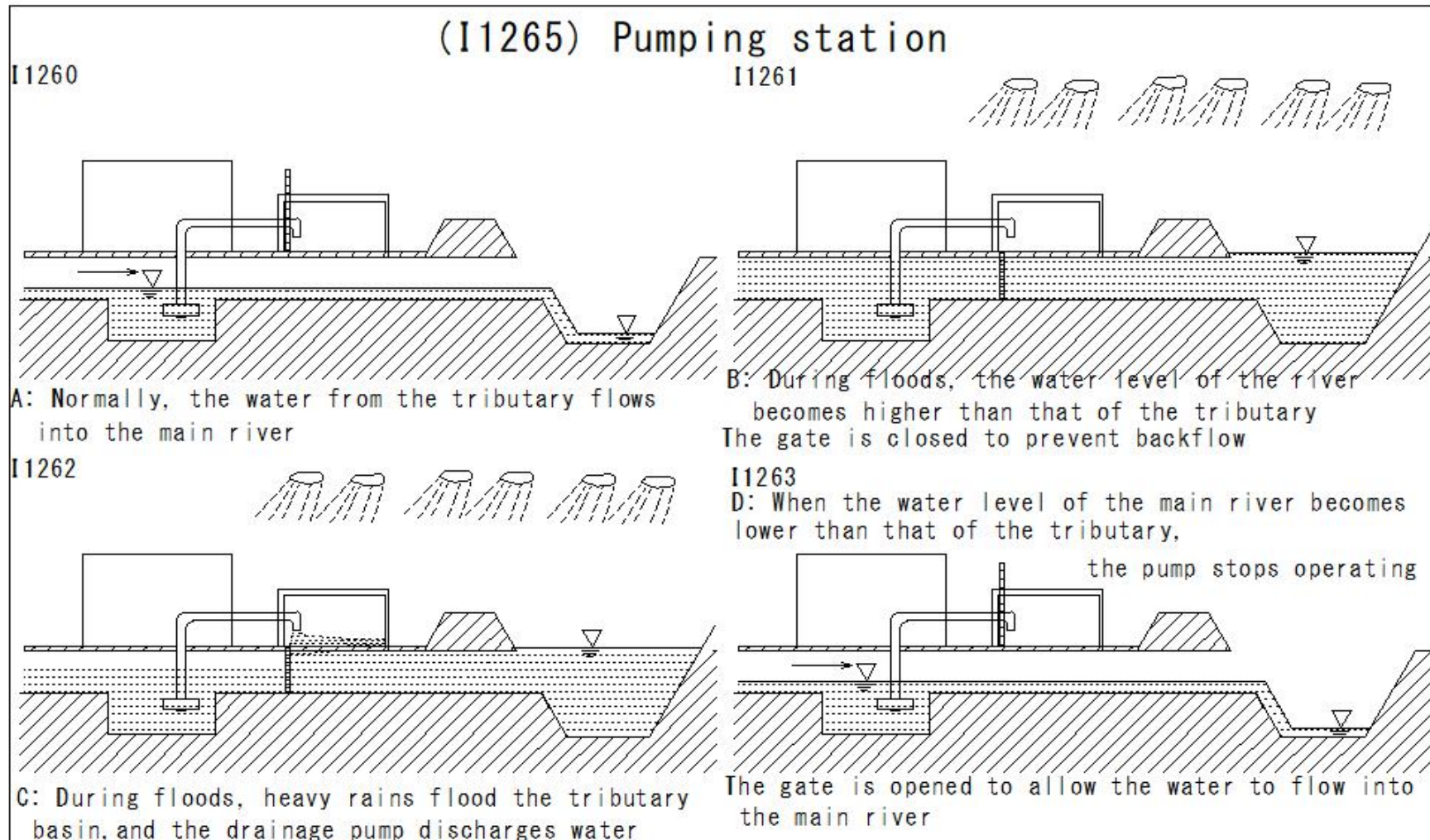
I1262



I1263



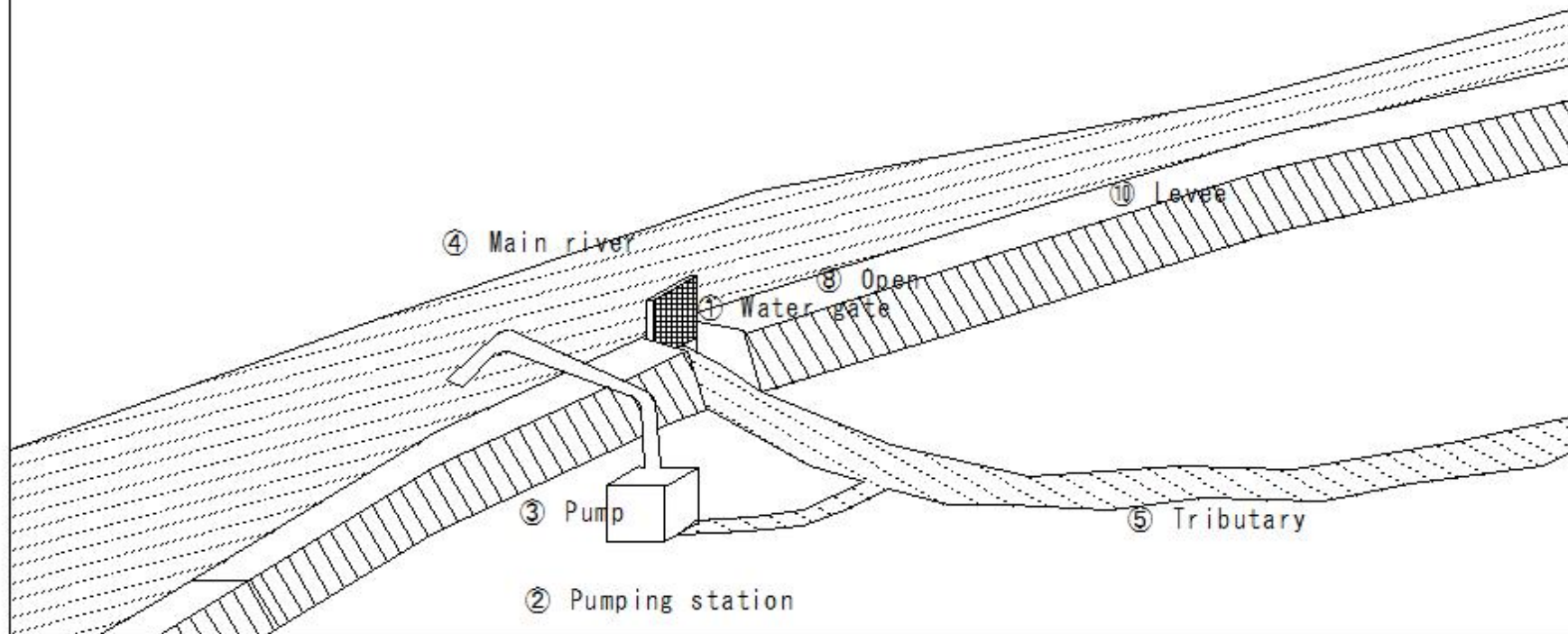
(I1265) Pumping station



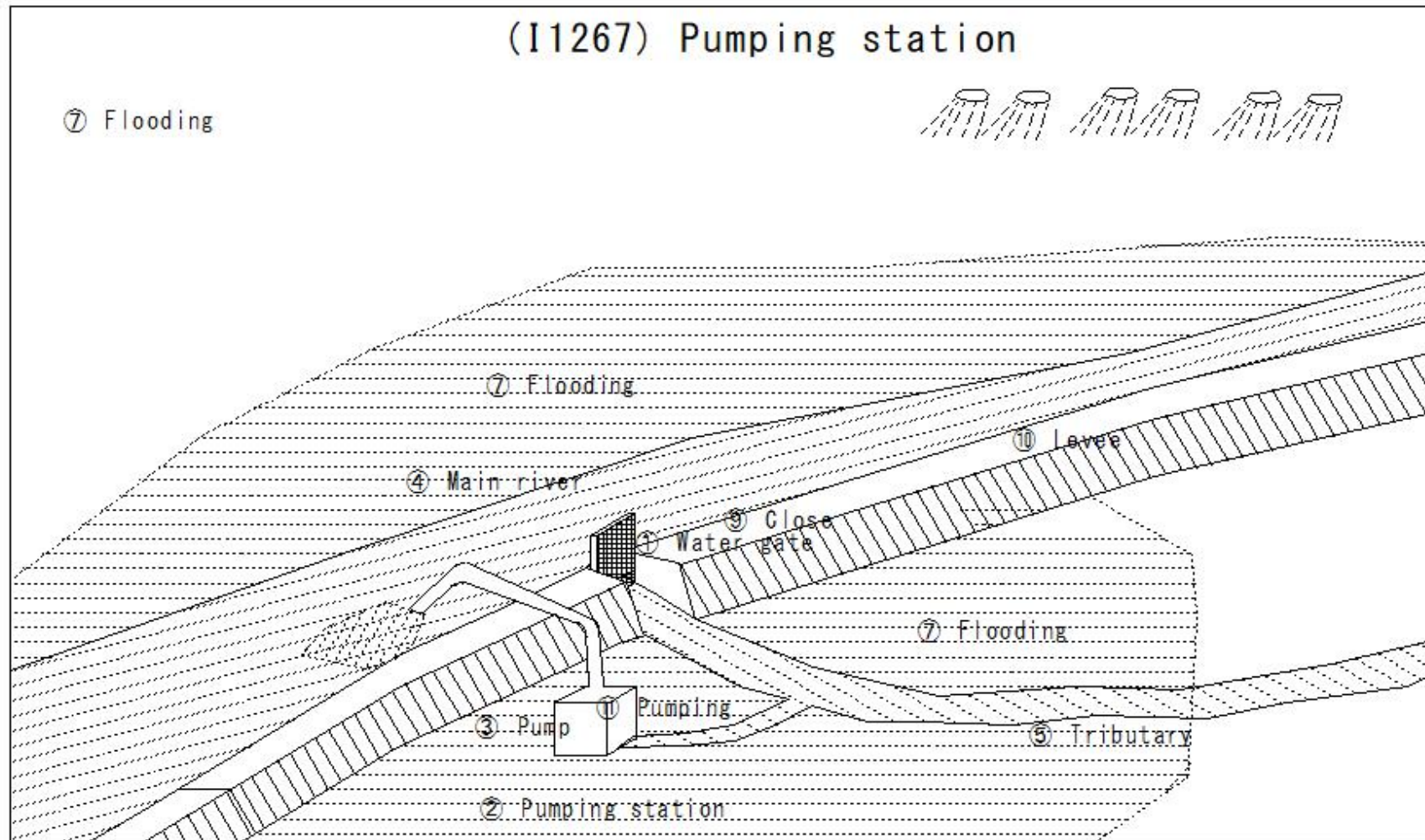
(I1266) Pumping station

(I1266) Pumping station

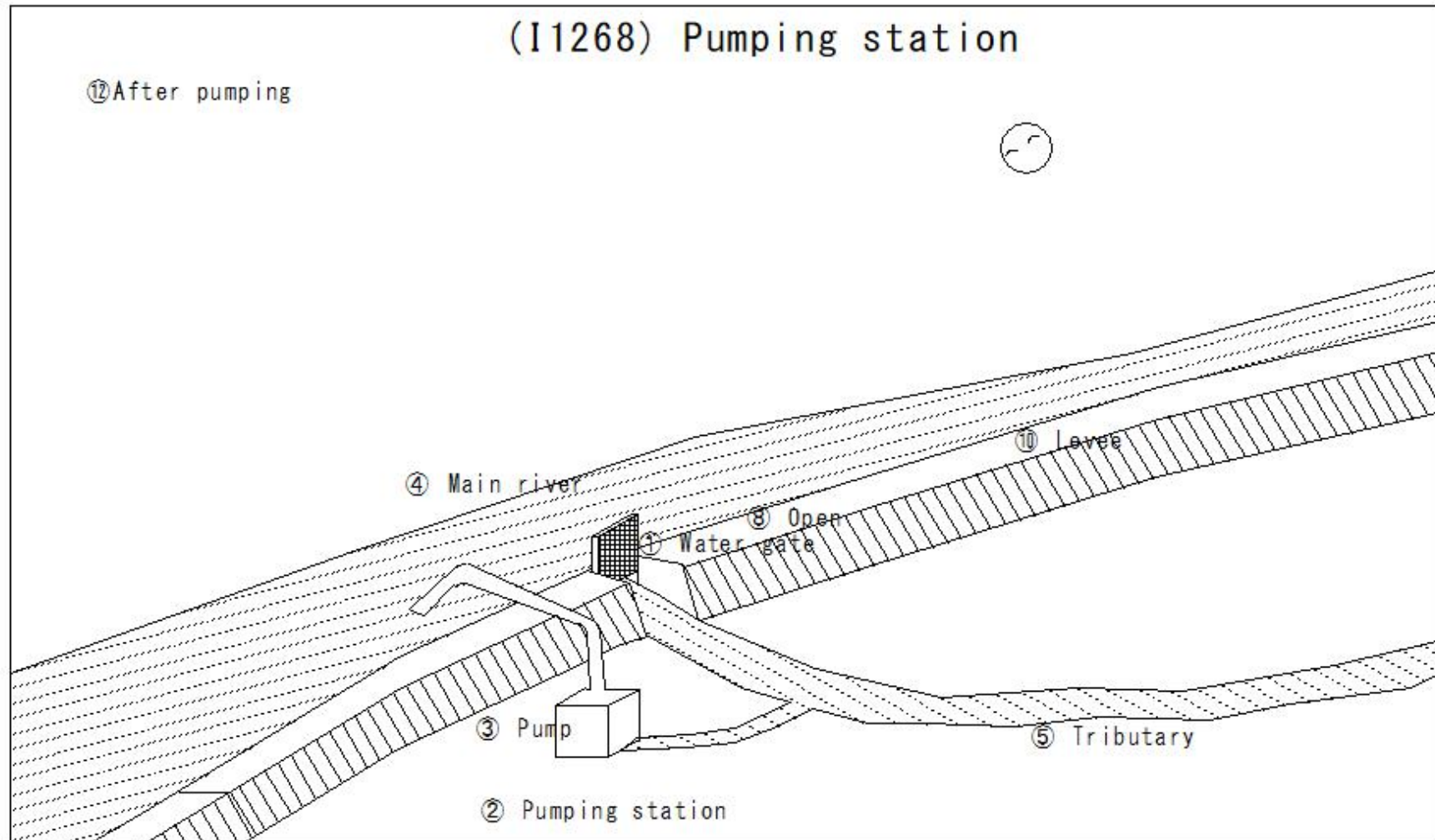
⑥ Normal times



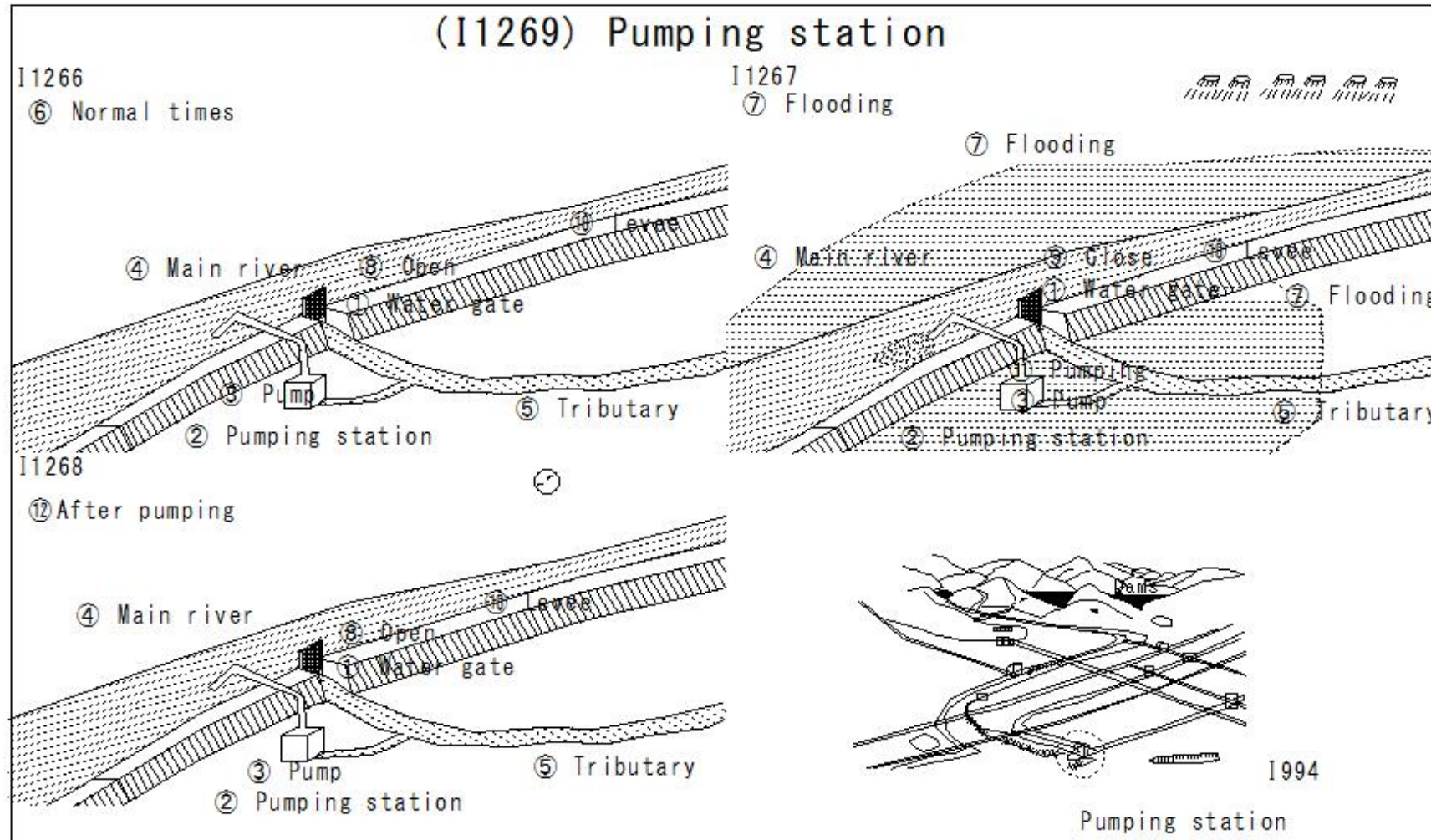
(I1267) Pumping station



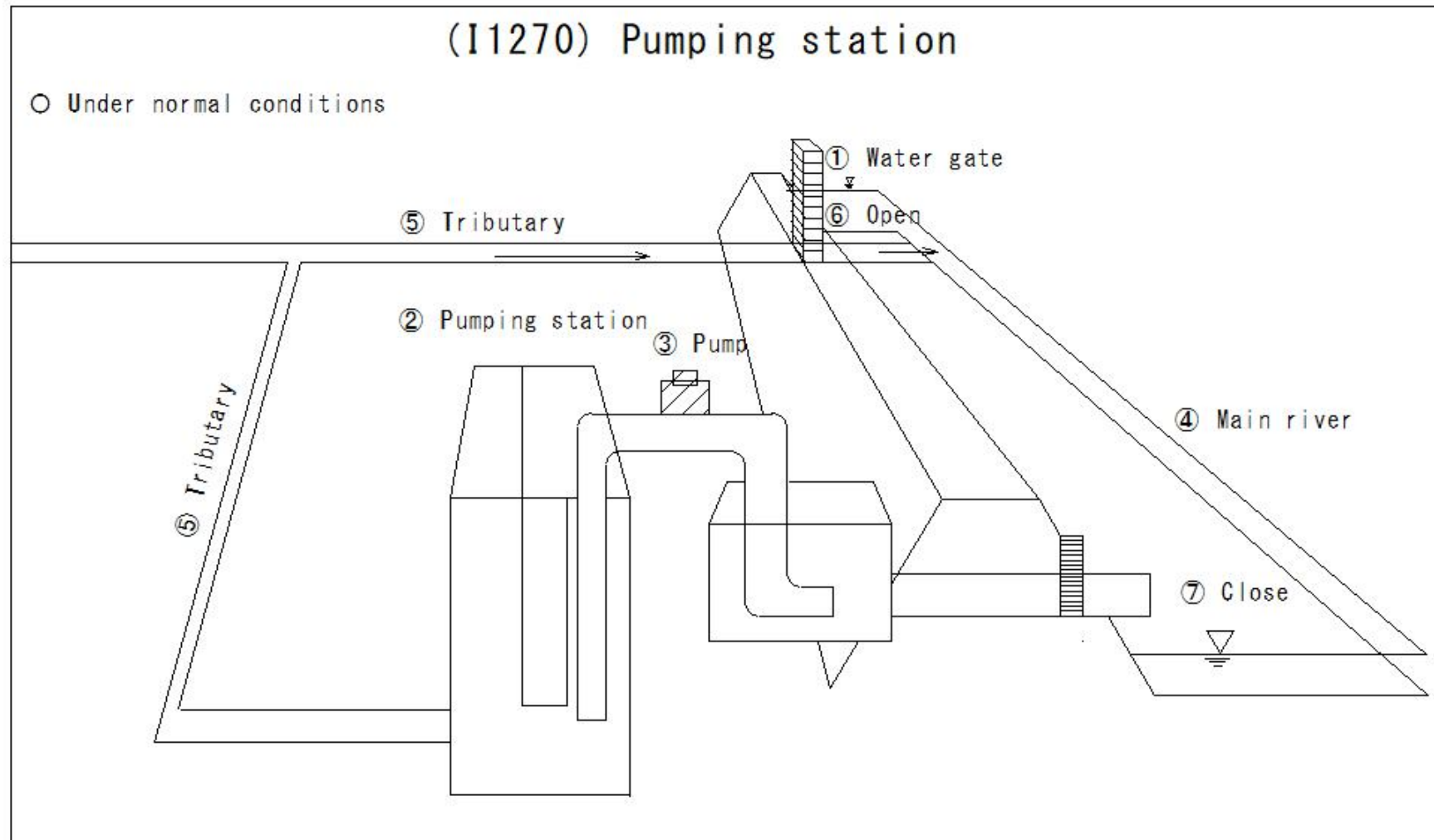
(I1268) Pumping station



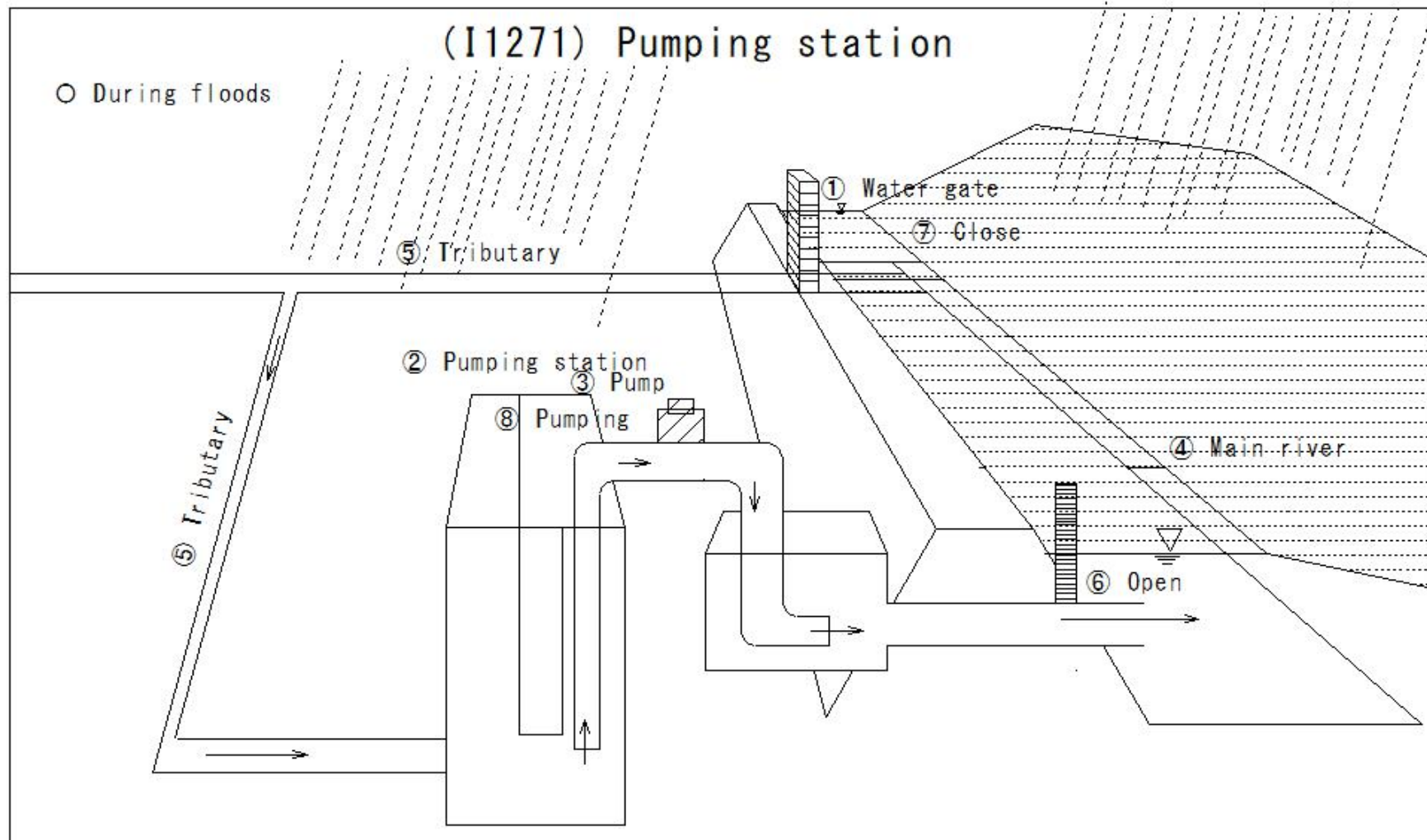
(I1269) Pumping station



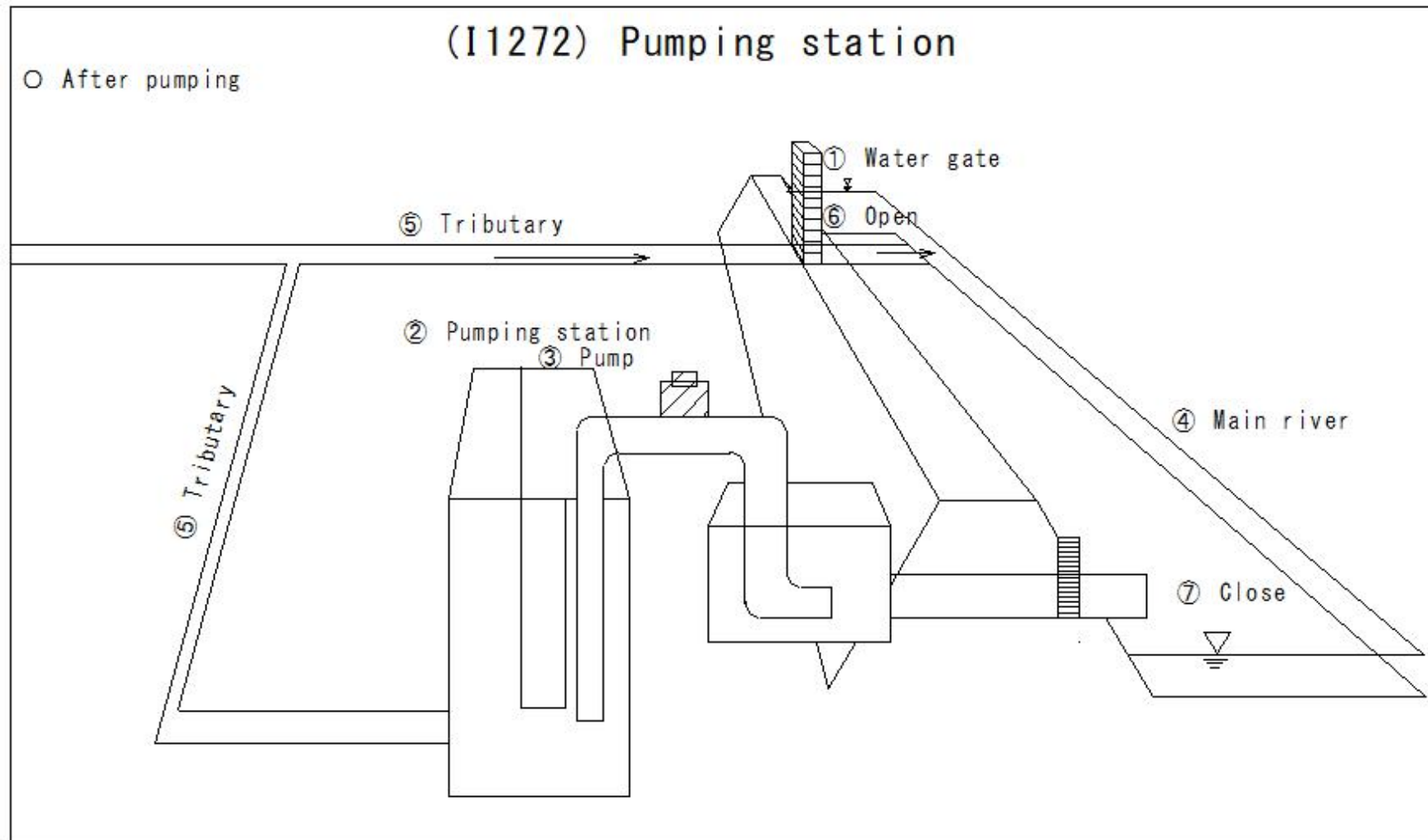
(I1270) Pumping station



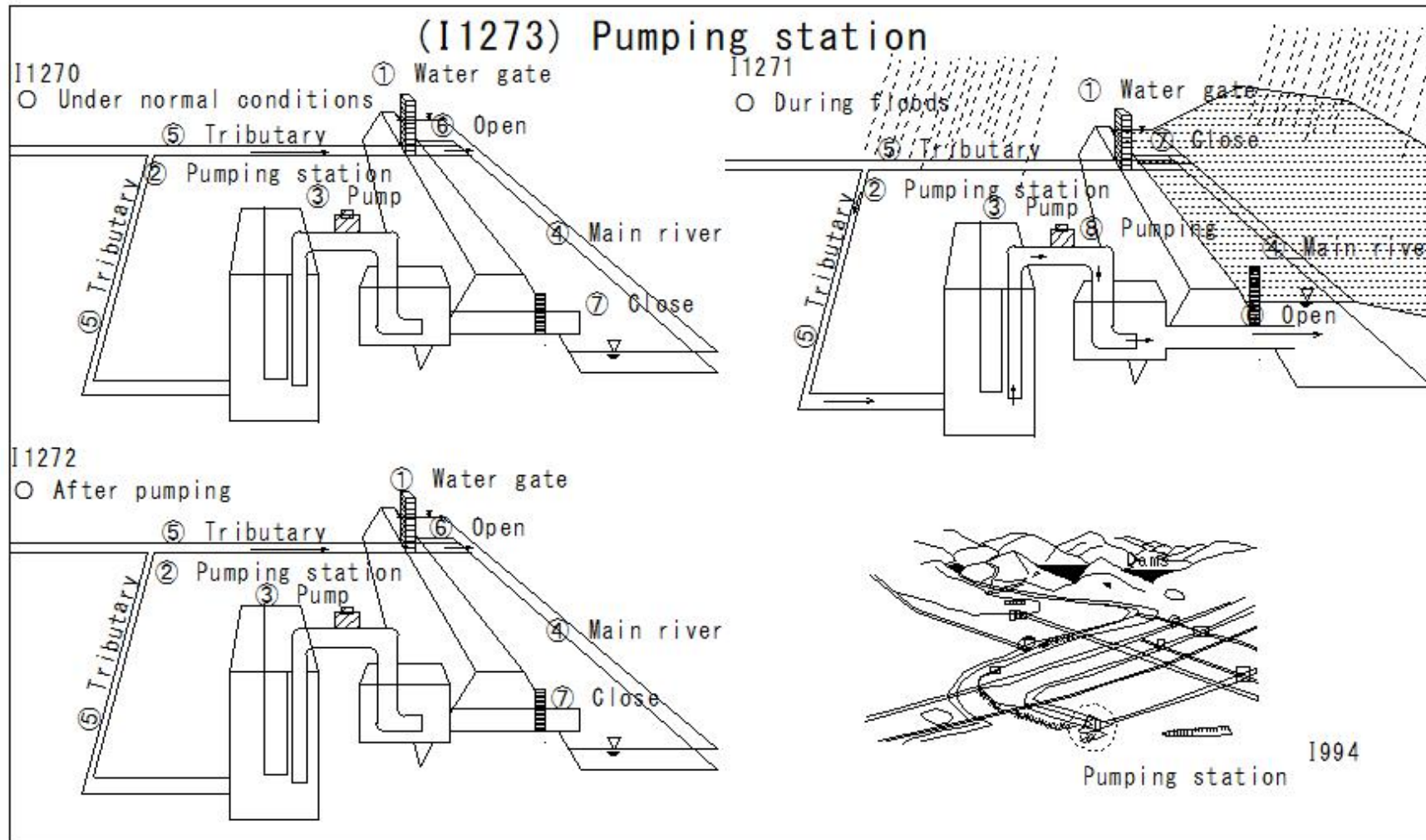
(I1271) Pumping station



(I1272) Pumping station



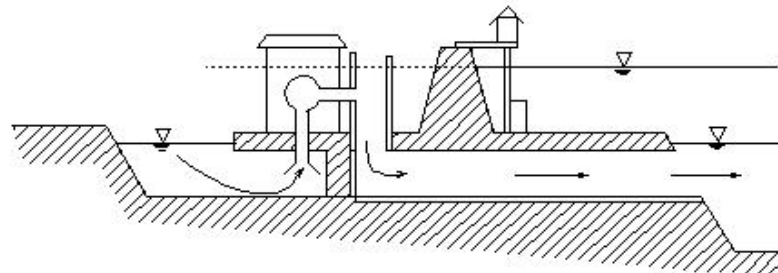
(I1273) Pumping station



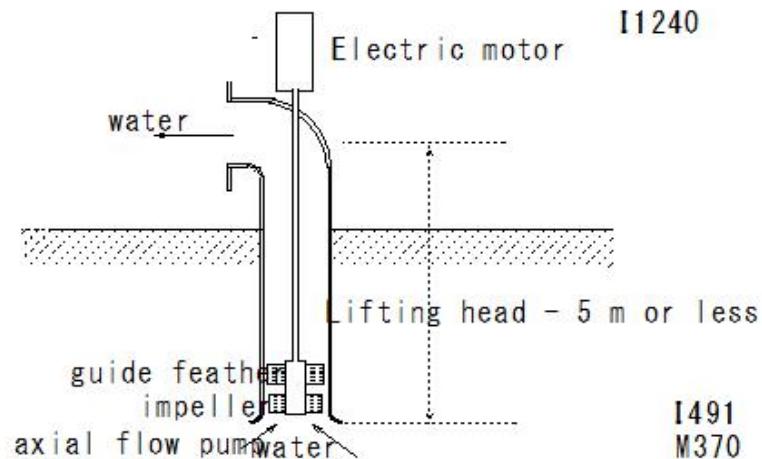
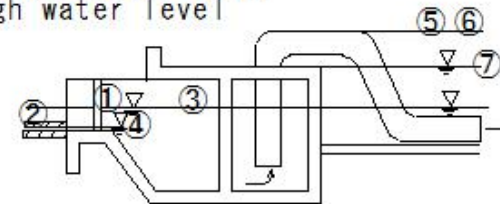
(I1274) Pumping station

(I1274) Pumping station

Pumping station

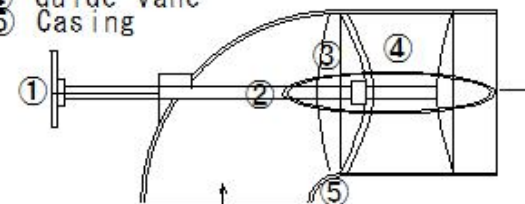


- ① Inner water level
- ② Lowest rice field level
- ③ High water level
- ④ Low water level
- ⑤ Outer water level
- ⑥ Highest water level
- ⑦ High water level



1915

- ① Power source
- ② Main shaft
- ③ Impeller
- ④ Guide vane
- ⑤ Casing



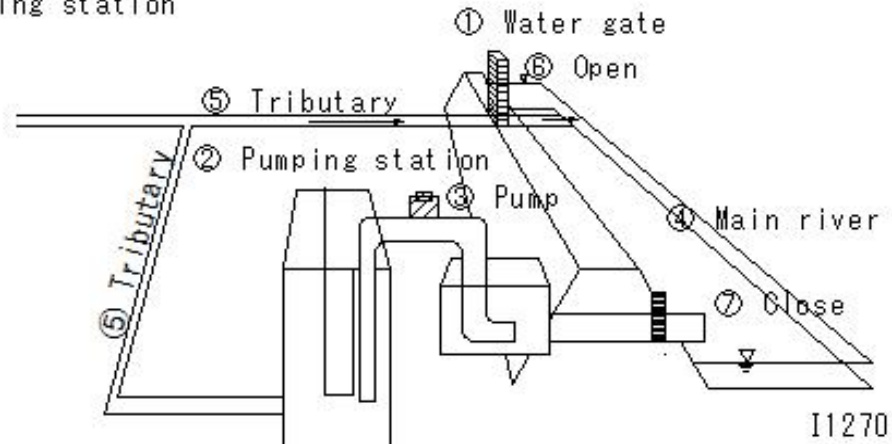
Axial flow pump

1917

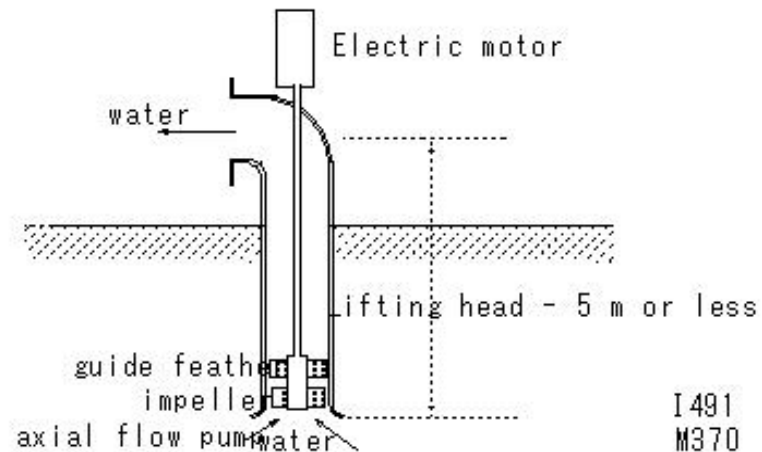
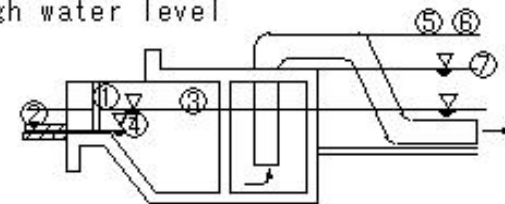
(I1275) Pumping station

(I1275) Pumping station

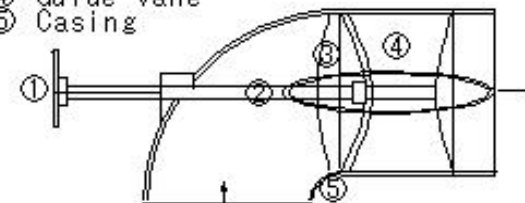
Pumping station



- ① Inner water level
- ② Lowest rice field level
- ③ High water level
- ④ Low water level
- ⑤ Outer water level
- ⑥ Highest water level
- ⑦ High water level



- ① Power source
- ② Main shaft
- ③ Impeller
- ④ Guide vane
- ⑤ Casing



Axial flow pump

I915

I917

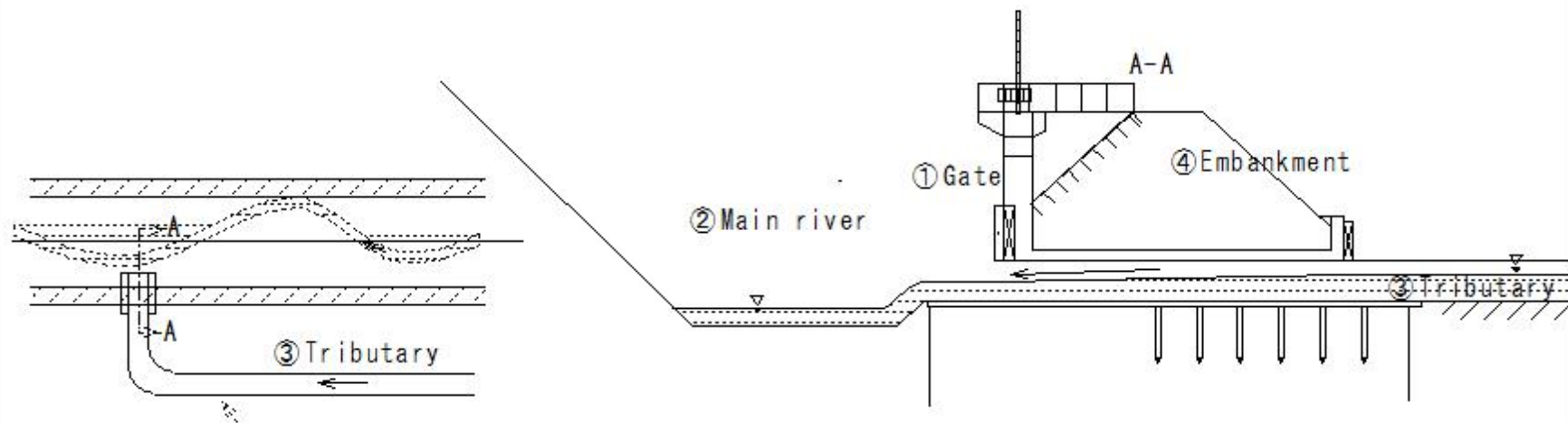
(I1276) Gate

(I1276) Gate

Gate

A: Normal

- Gate is open
- The water from the tributary flows into the main river

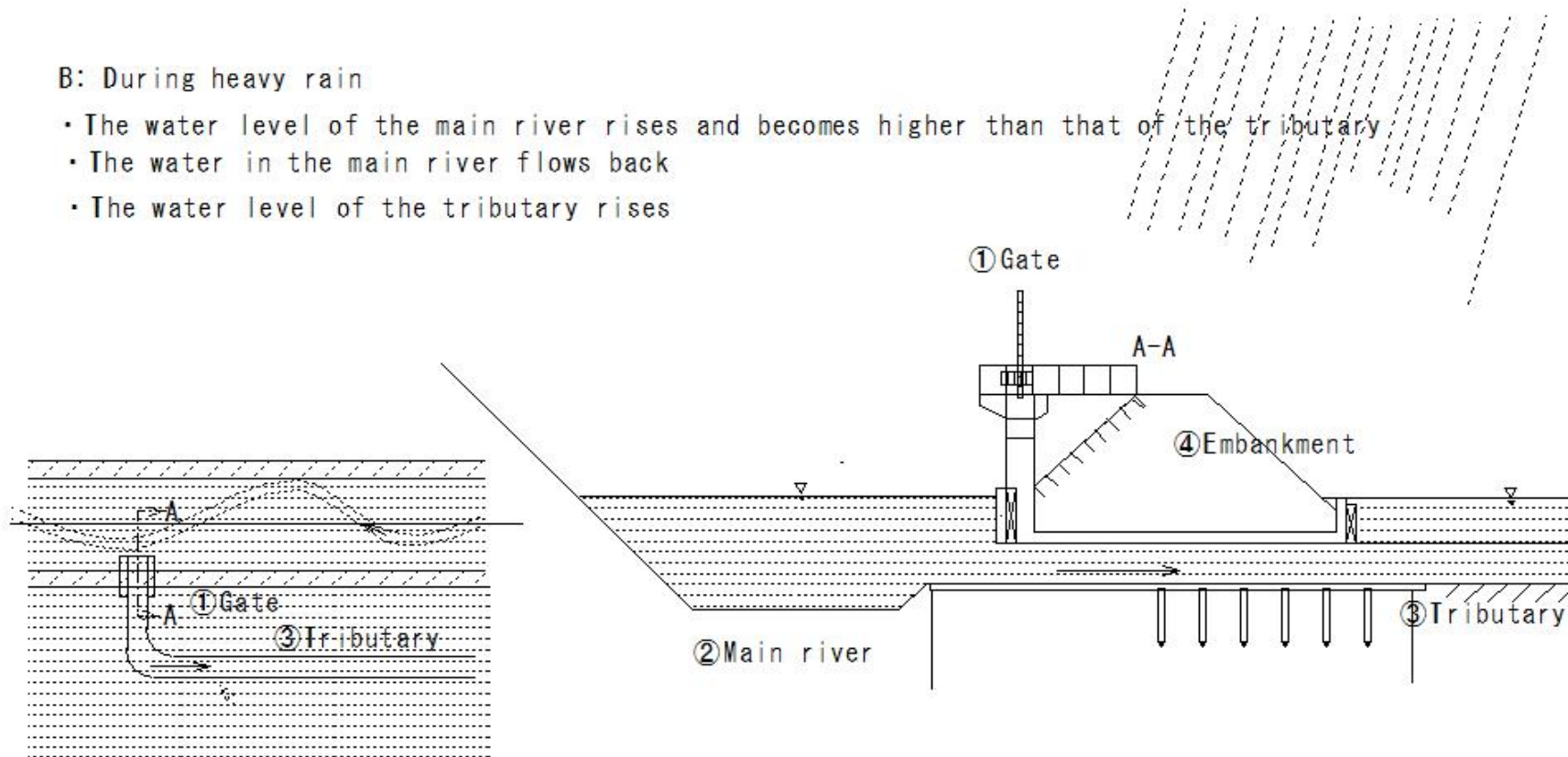


(I1277) Gate

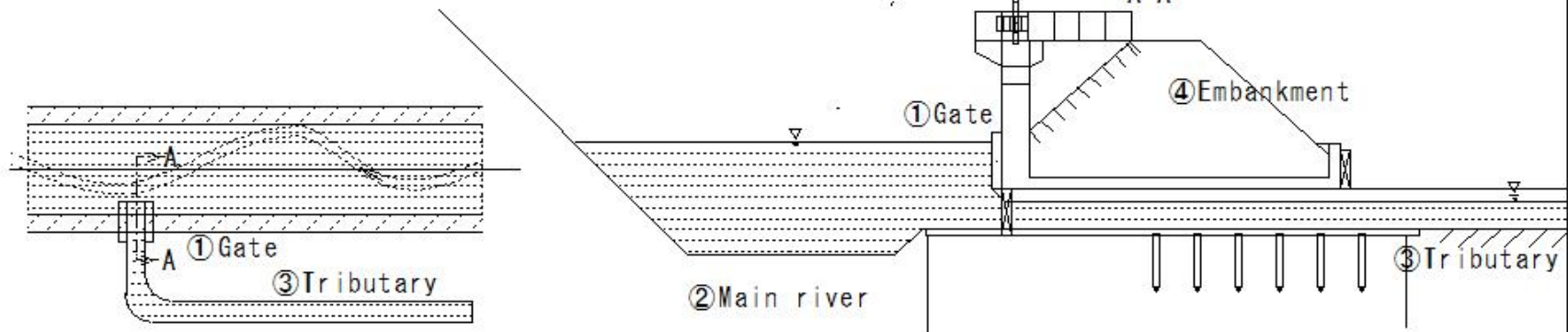
(I1277) Gate

B: During heavy rain

- The water level of the main river rises and becomes higher than that of the tributary
- The water in the main river flows back
- The water level of the tributary rises



(I1278) Gate



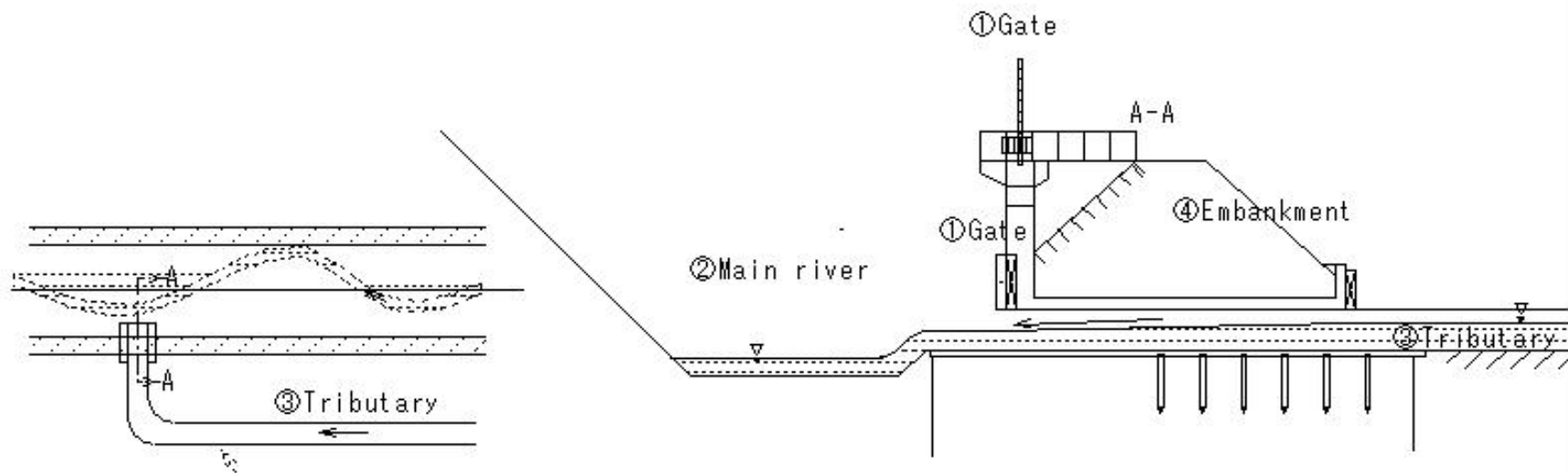
(I1279) Gate

(I1279) Gate

Gate

D: The water level of the main river is lower than that of the tributary

- The Gate is opened, and the water from the tributary flows into the main river



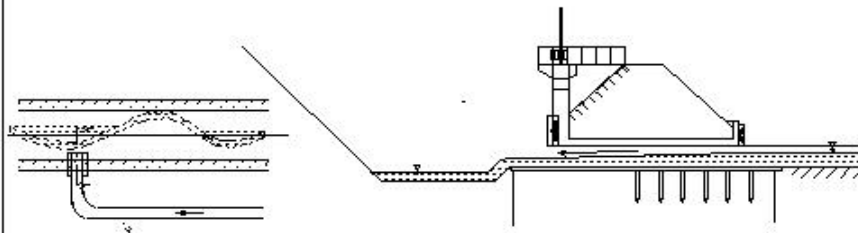
(I1280) Gate

(I1280) Gate

I1276

A: Normal

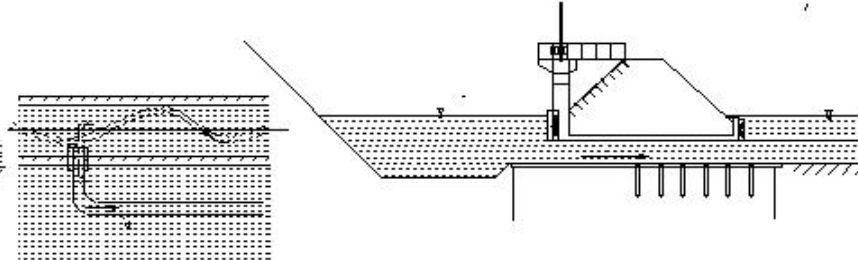
- Gate is open



I1277

B: During heavy rain

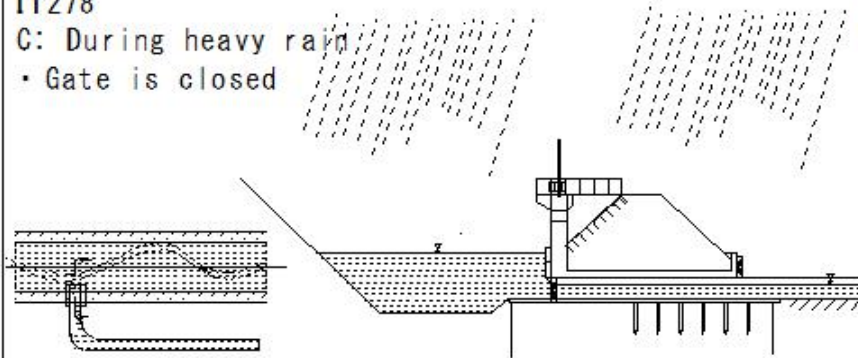
- Gate is open



I1278

C: During heavy rain

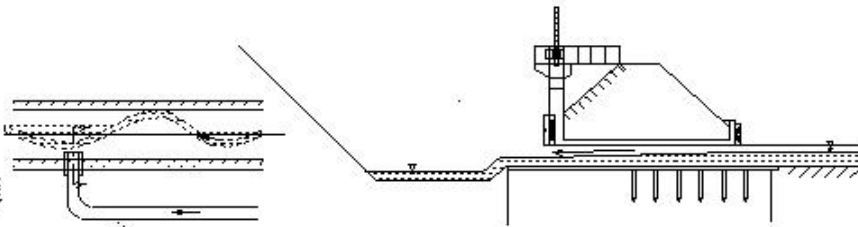
- Gate is closed



I1279

D: After heavy rain

- Gate is open



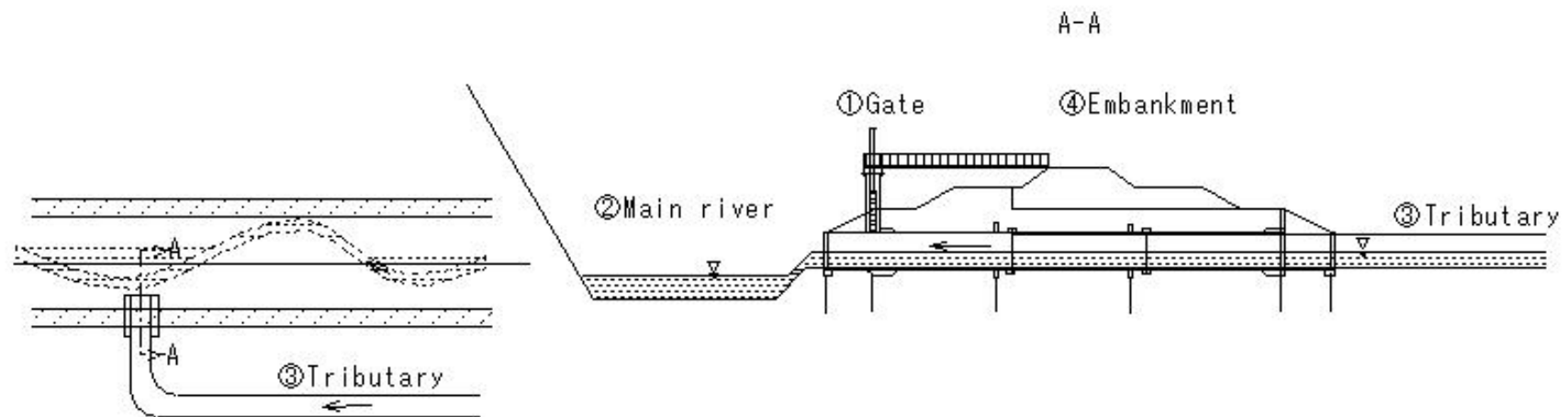
(I1281) Gate

(I1281) Gate

Gate

A: Normal

- Gate is open
- The water from the tributary flows into the main river



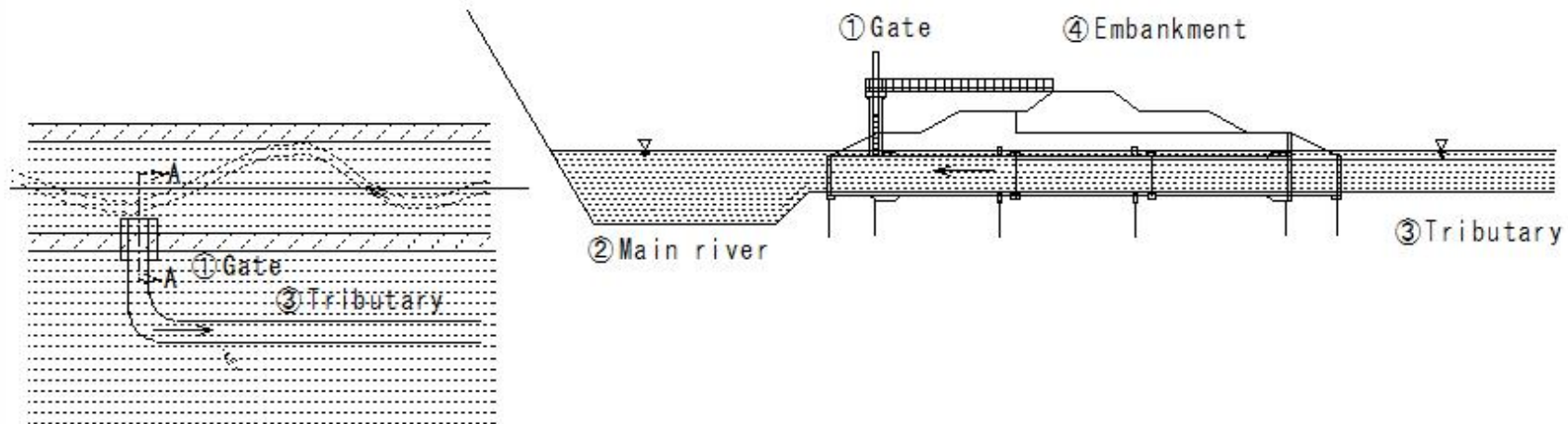
I1276
R634

(I1282) Gate

(I1282) Gate

B: During heavy rain

- The water level of the main river rises and becomes higher than that of the tributary
- The water in the main river flows back
- The water level of the tributary rises



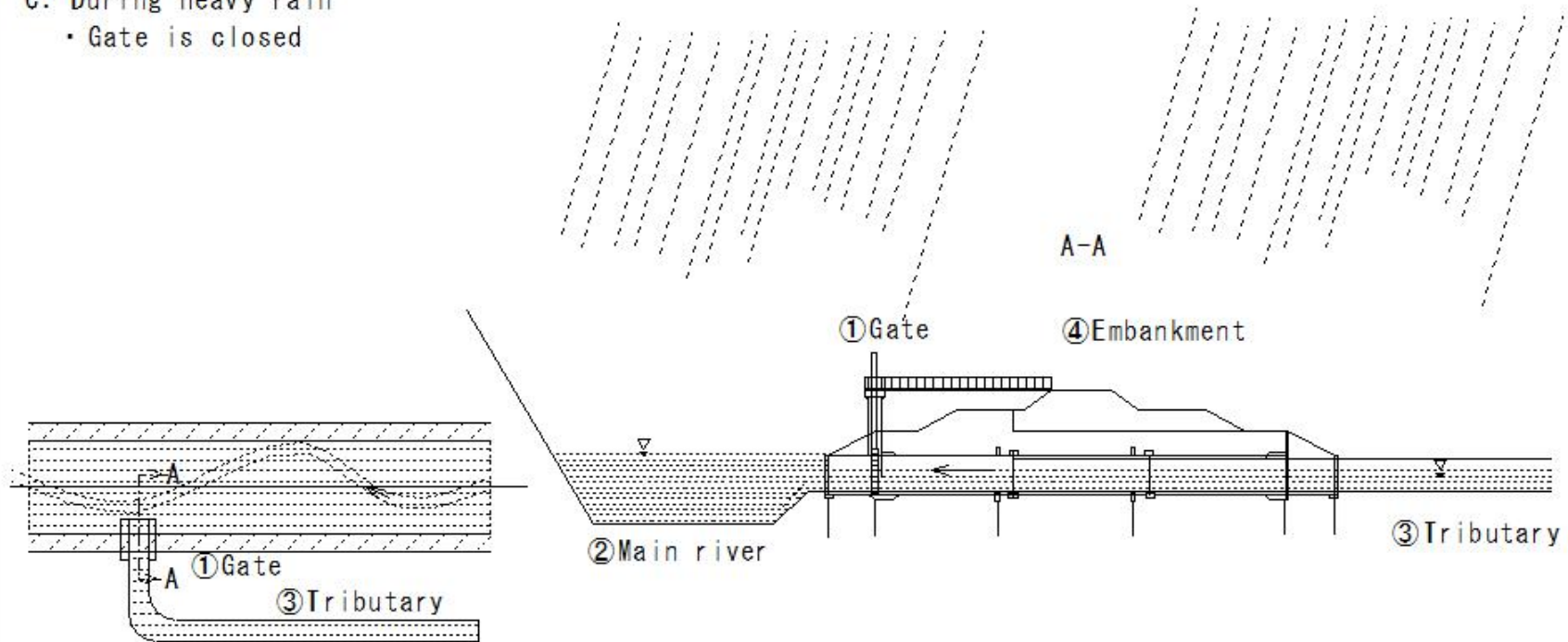
I1277
R634

(I1283) Gate

(I1283) Gate

C: During heavy rain

- Gate is closed



I1278
R142

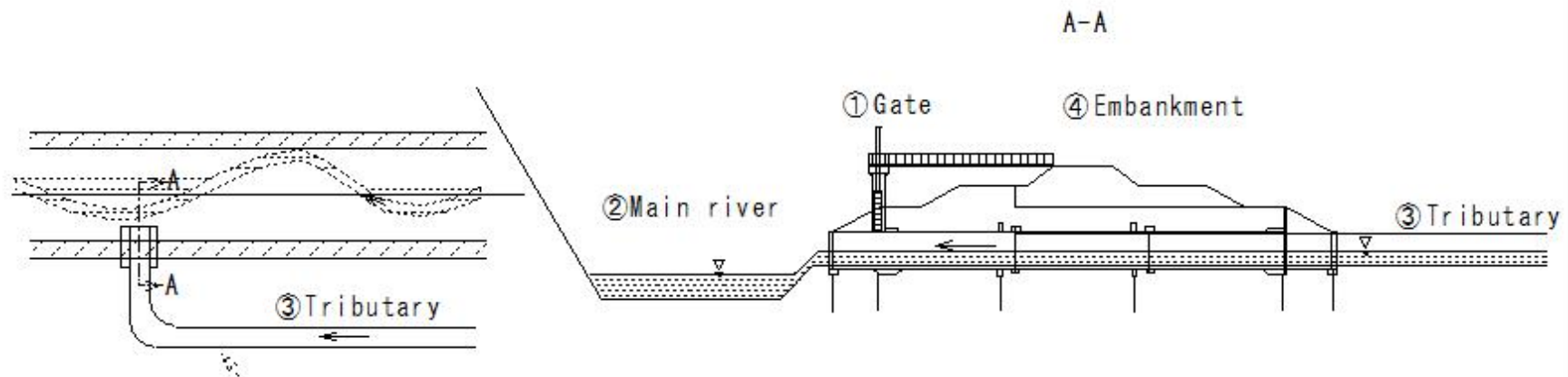
(I1284) Gate

(I1284) Gate

Gate

D: The water level of the main river is lower than that of the tributary

- The Gate is opened, and the water from the tributary flows into the main river



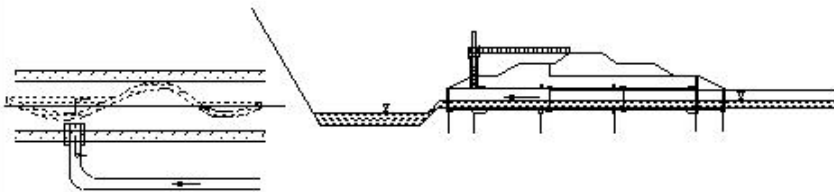
(I1285) Gate

(I1285) Gate

I1281

A: Normal

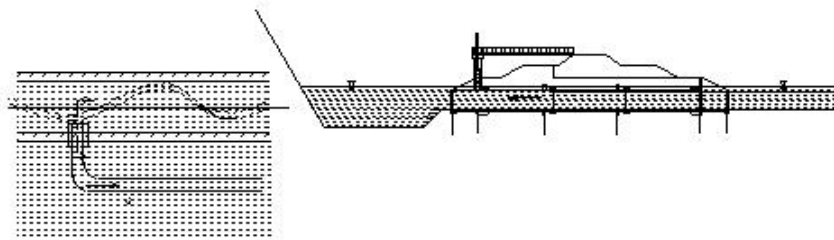
- Gate is open



I1282

B: During heavy rain

- Gate is open

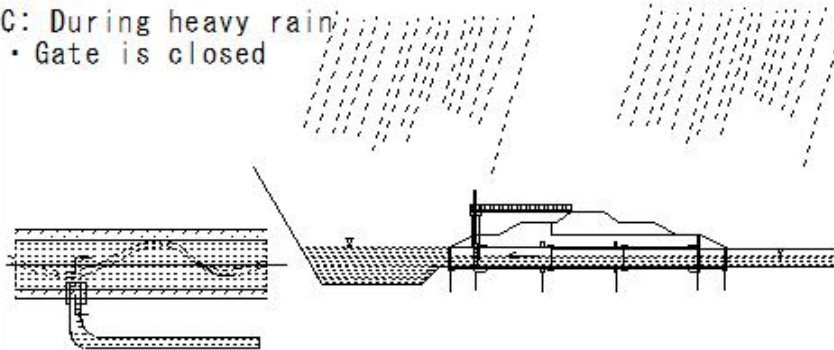


I1281

I1283

C: During heavy rain

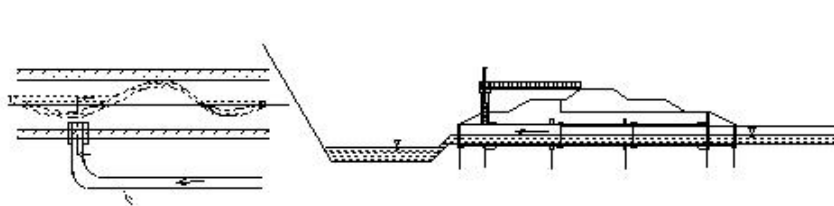
- Gate is closed



I1284

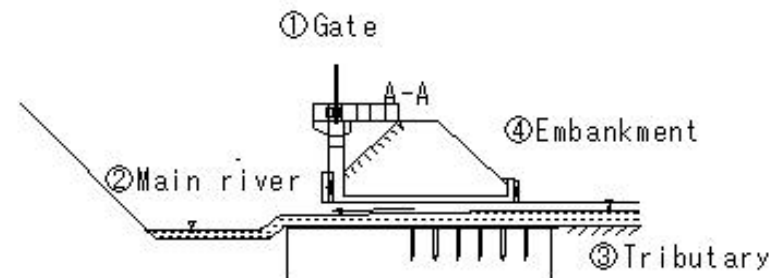
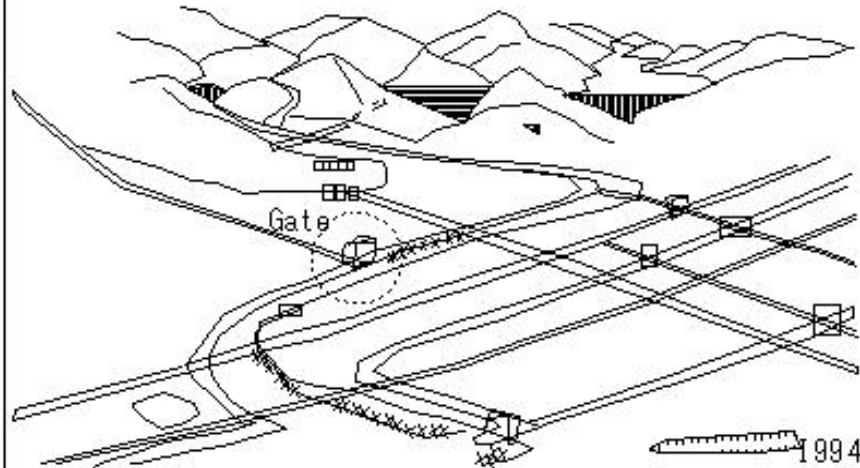
D: After heavy rain

- Gate is open

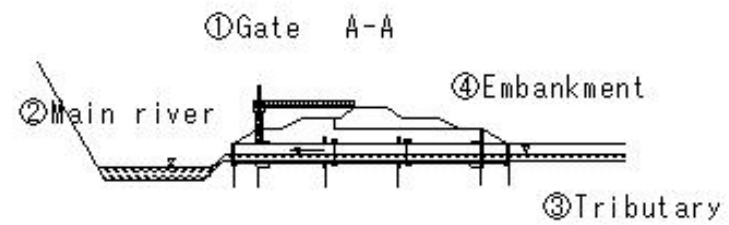


(I1286) Gate

(I1286) Gate



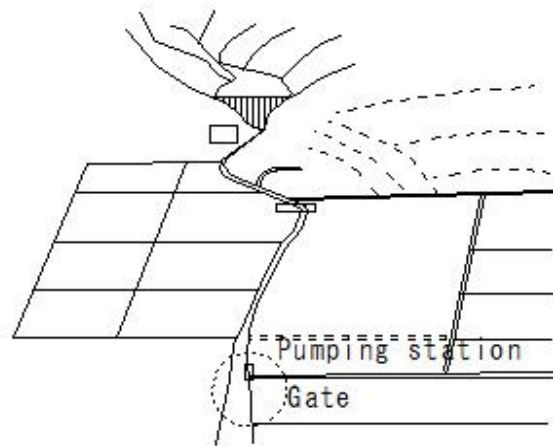
I1276
R142



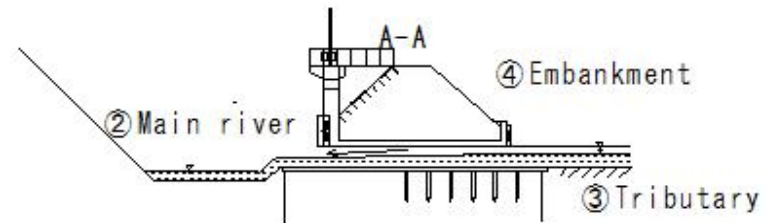
I1281
R634

(I1287) Gate

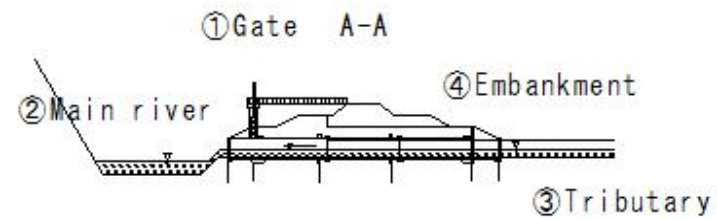
(I1287) Gate



I1029



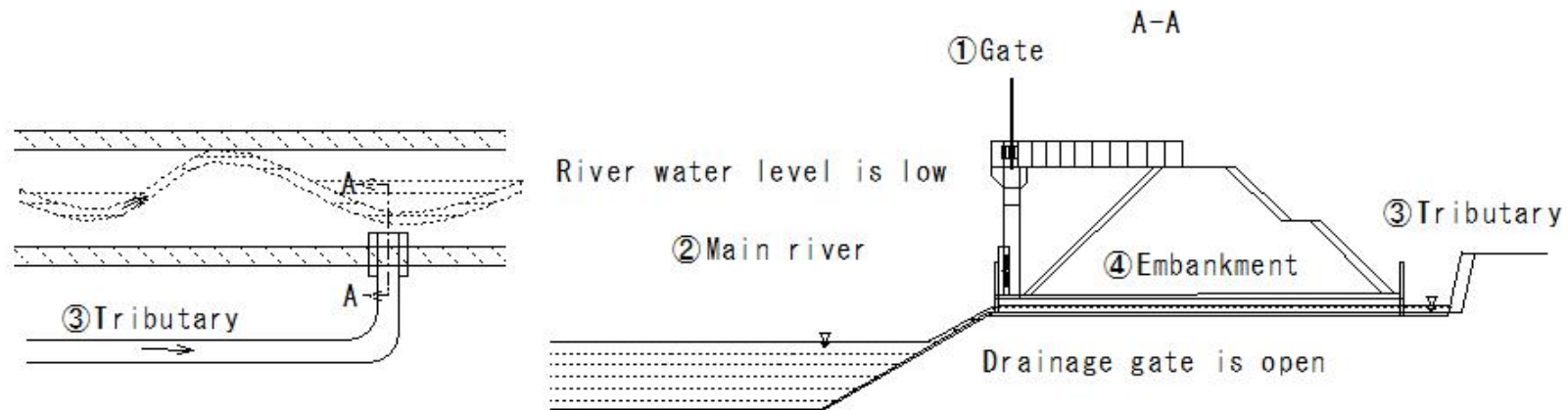
I1276
R142



I1281
R634

(I1288) Gate

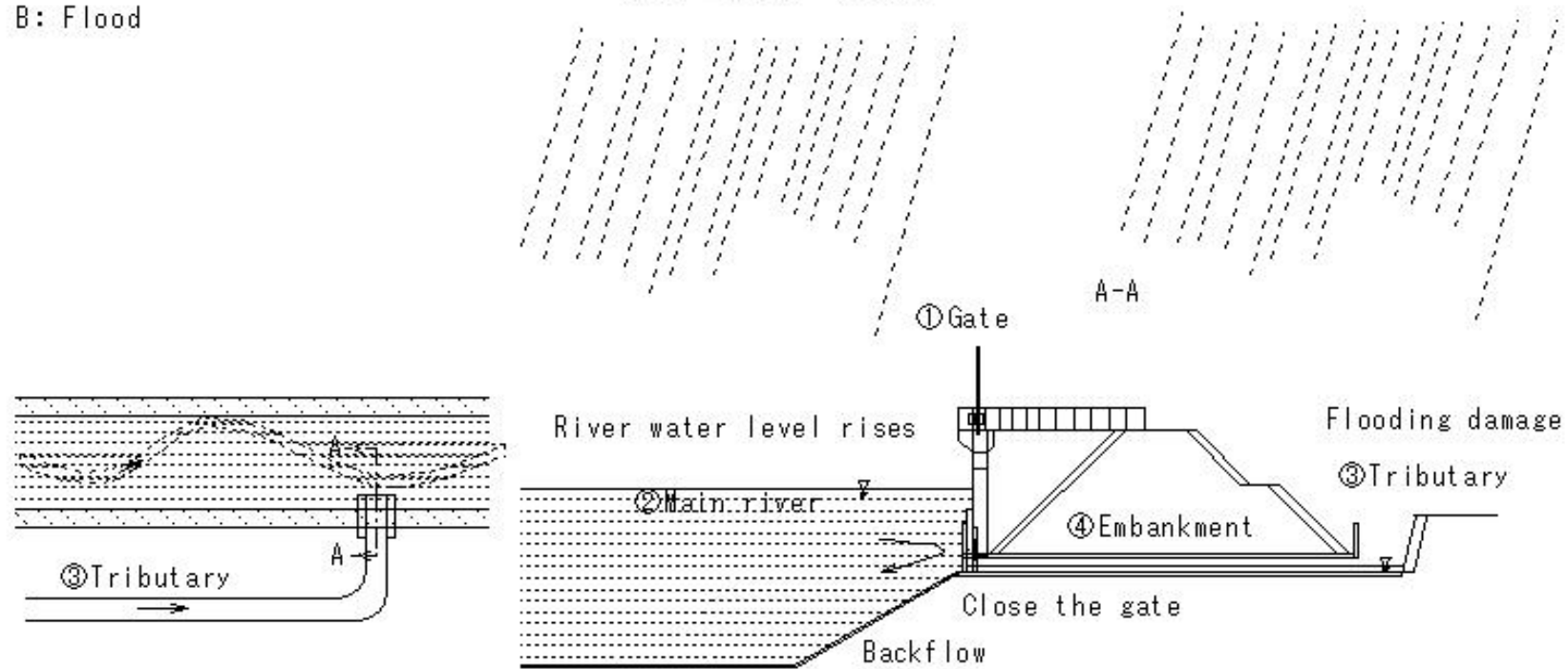
A: Normal



(I1289) Gate

B: Flood

(I1289) Gate



R470

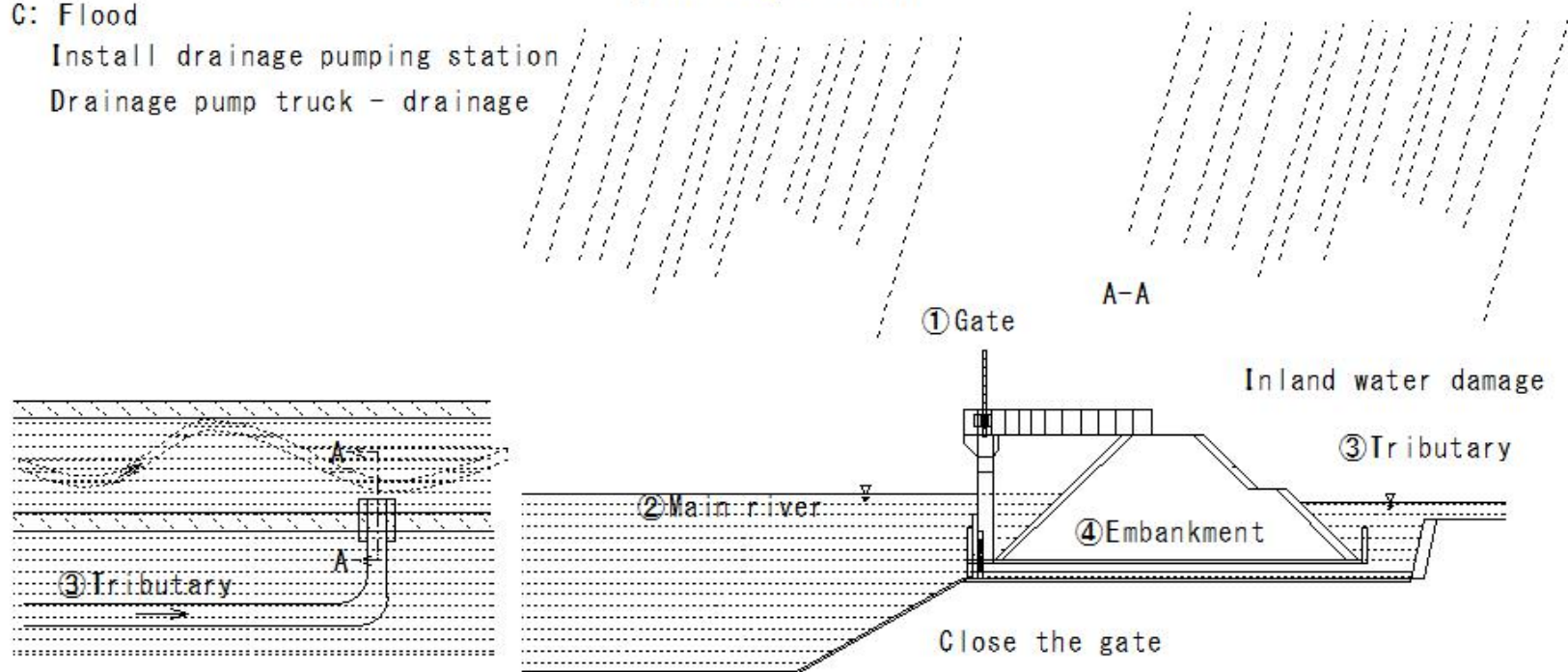
(I1290) Gate

C: Flood

Install drainage pumping station

Drainage pump truck - drainage

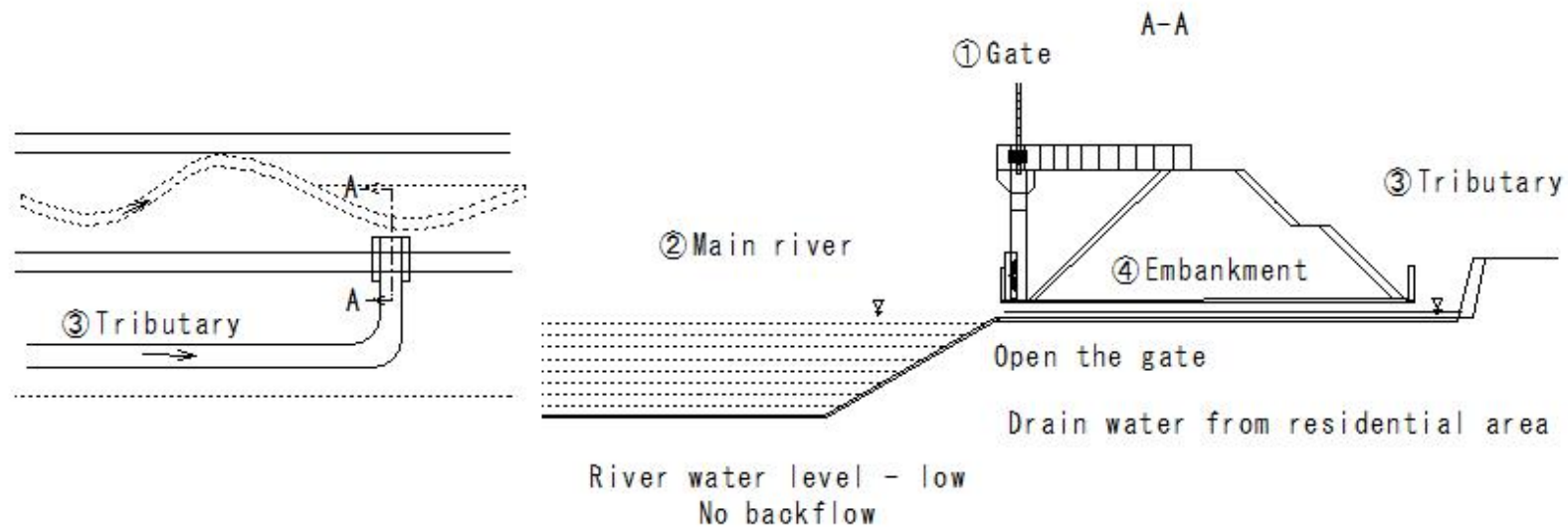
(I1290) Gate



(I1291) Gate

(I1291) Gate

D: After flood
Open the gate



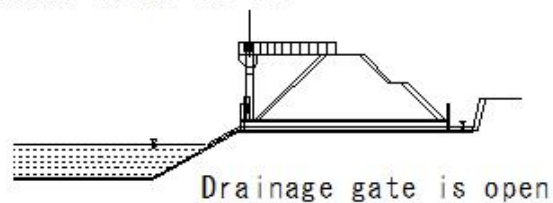
(I1292) Gate

(I1292) Gate

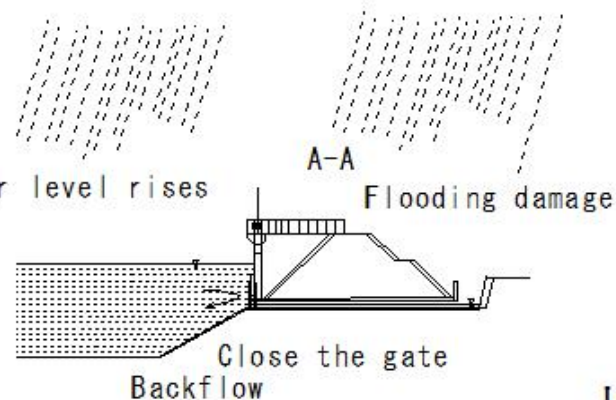
A: Normal

B: Flood

River water level is low

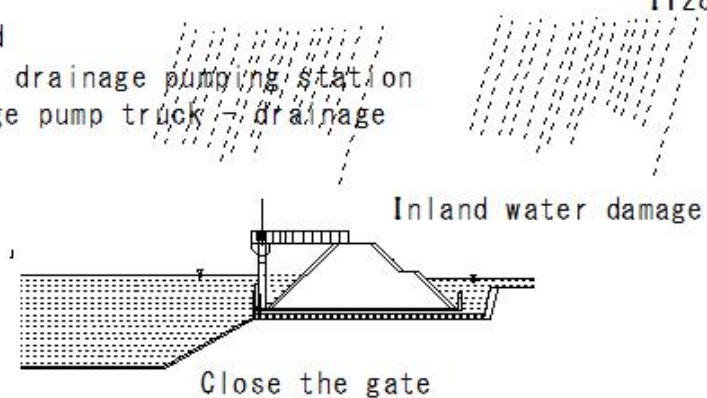


River water level rises

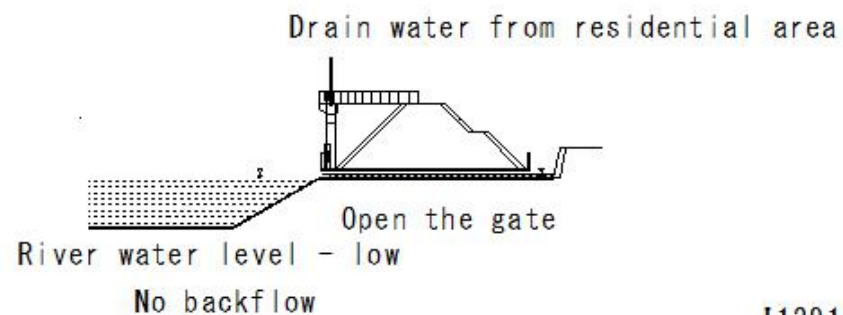


C: Flood

Install drainage pumping station
Drainage pump truck - drainage



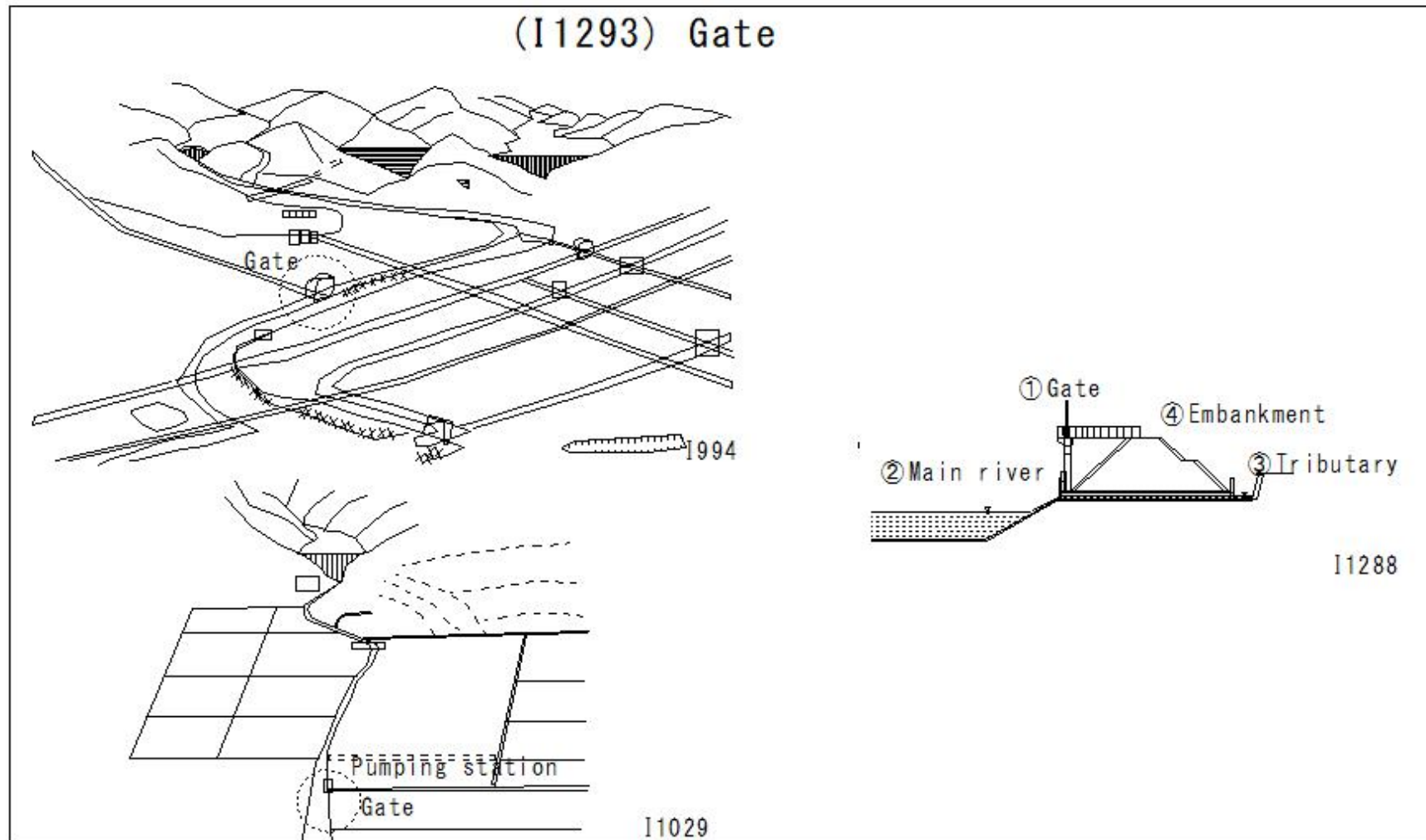
D: After flood
Open the gate



I1290

I1291

(I1293) Gate



(I1294)Water gate

(I1294)Water gate

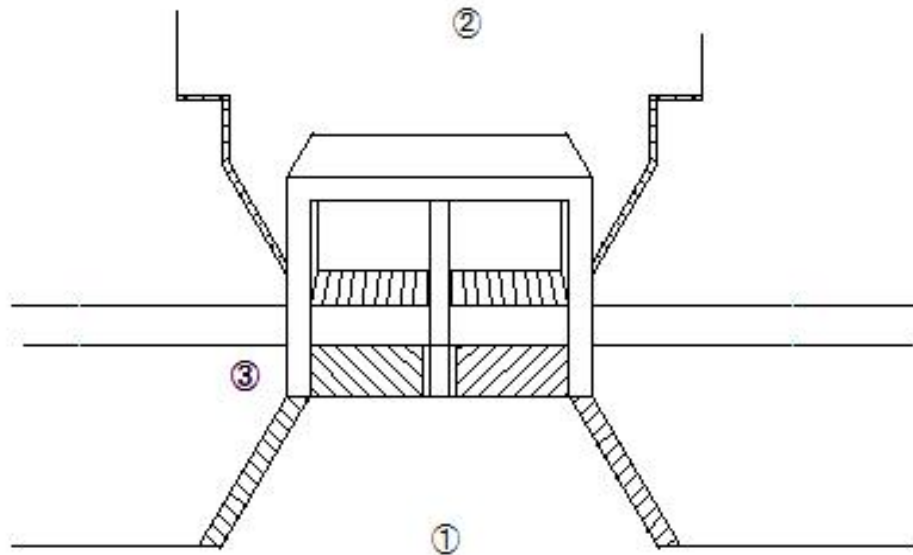
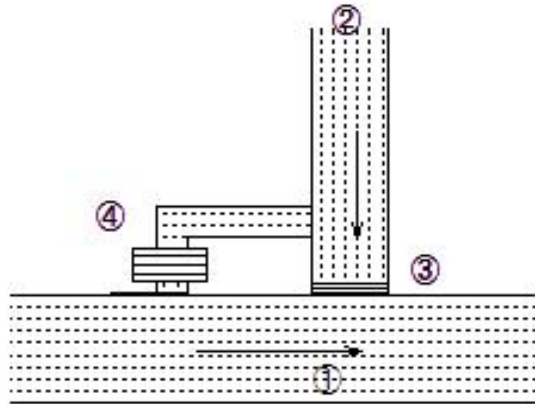
Water gate

Water gate: Open the gate to allow the water from the tributary to flow into the main river

Prevents backflow into the tributary

Installed at the confluence of rivers

- ① Main river
- ② Tributary
- ③ Water gate/sluice gate
- ④ Drainage pumping station



(I1295)Water gate

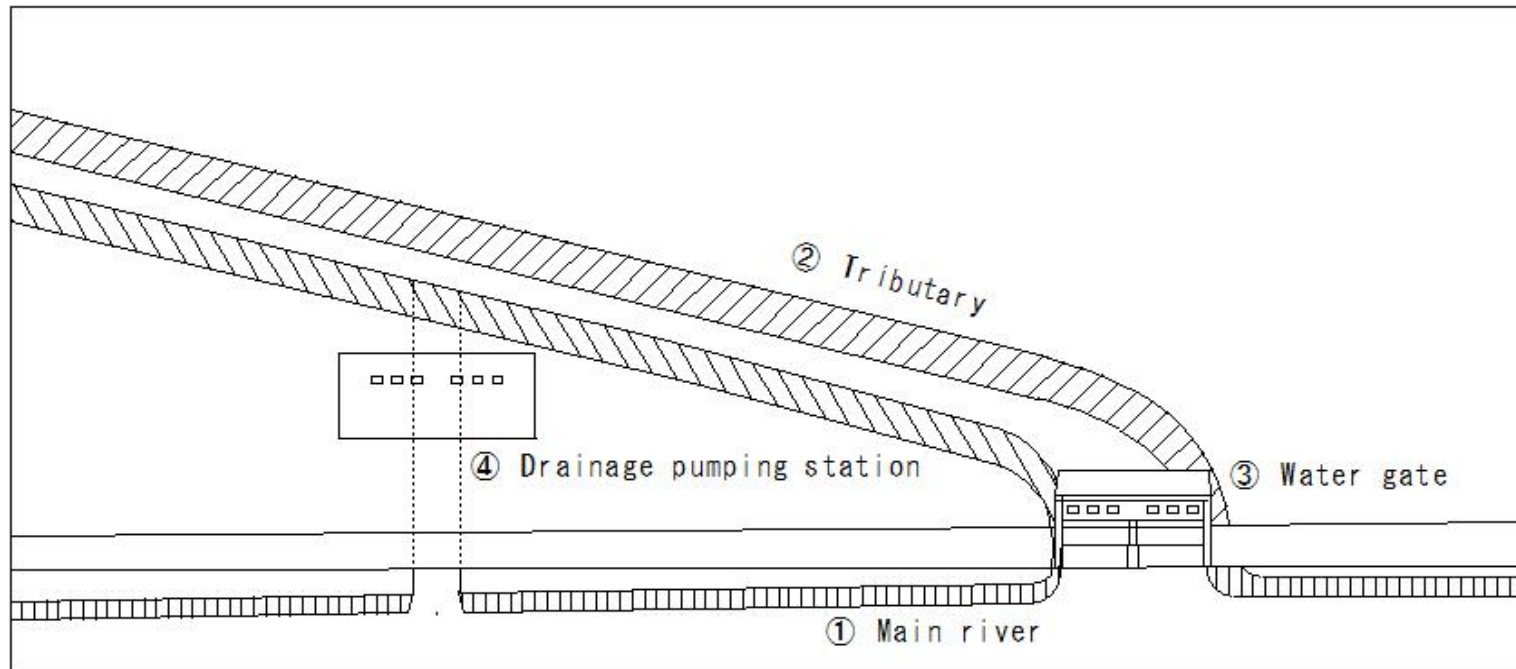
(I1295)Water gate

Water gate

Water gate: Open the gate to allow the water from the tributary to flow into the main river

Prevents backflow into the tributary

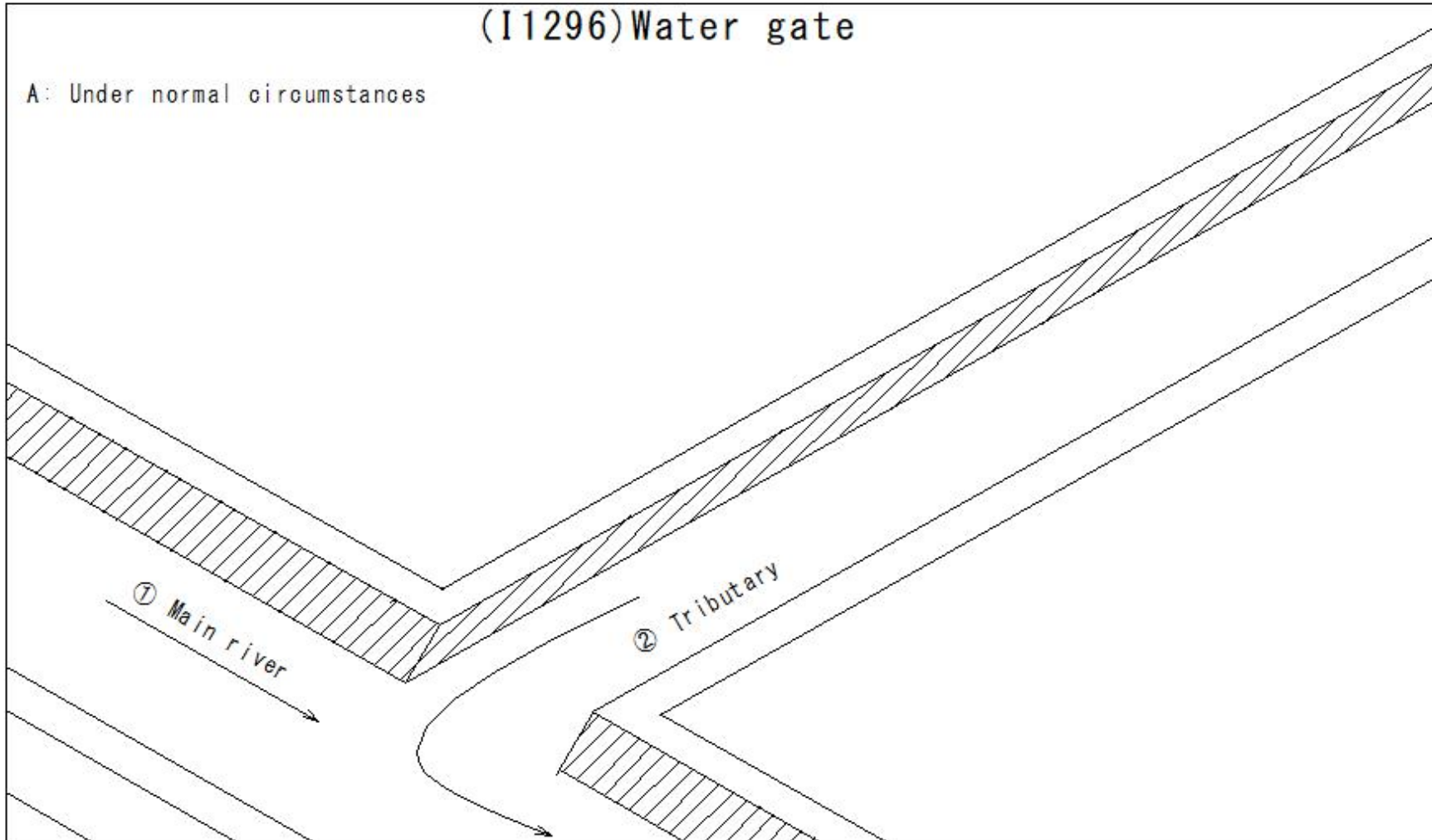
Installed at the confluence of rivers



(I1296)Water gate

(I1296)Water gate

A: Under normal circumstances

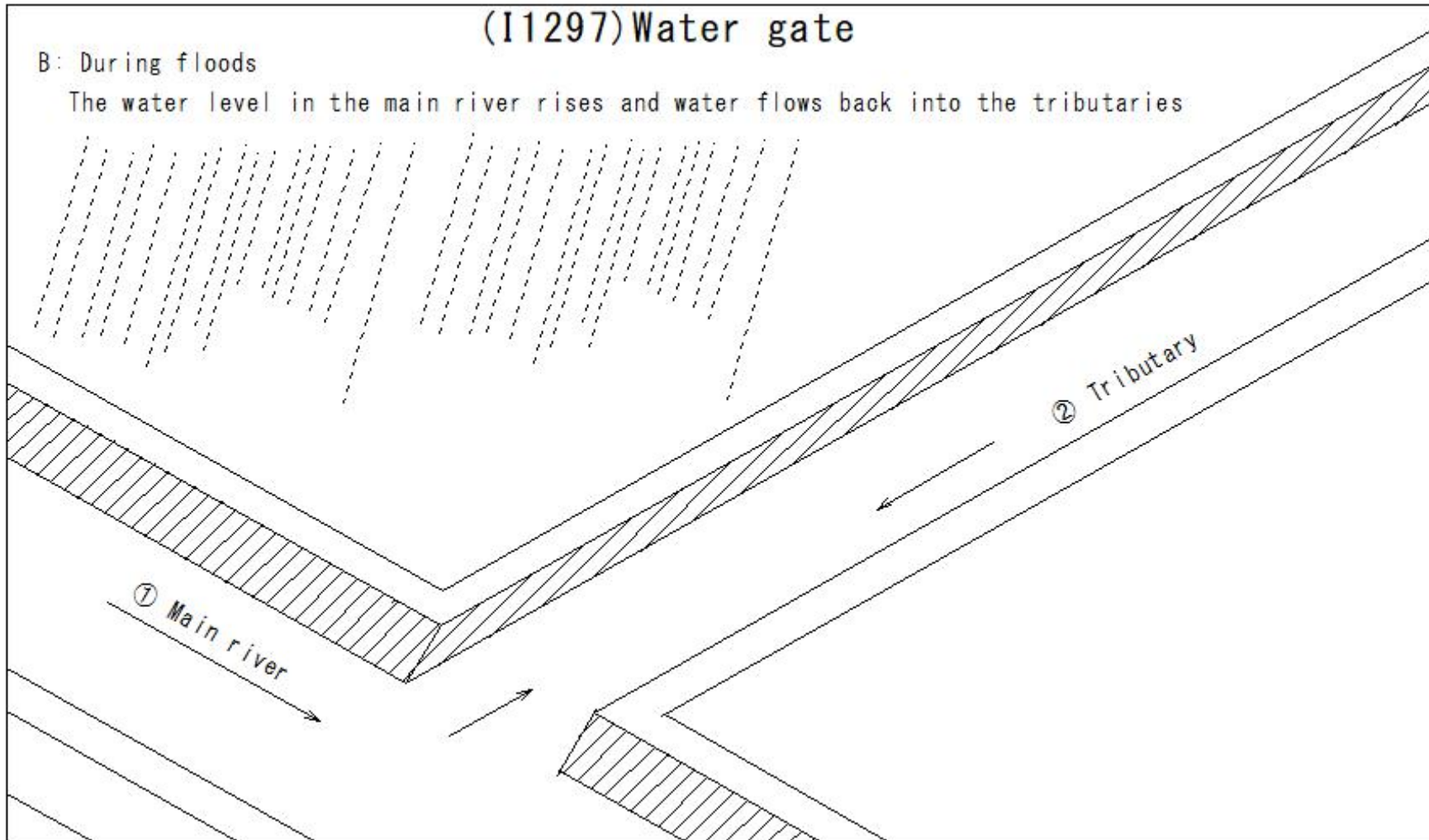


(I1297)Water gate

(I1297)Water gate

B: During floods

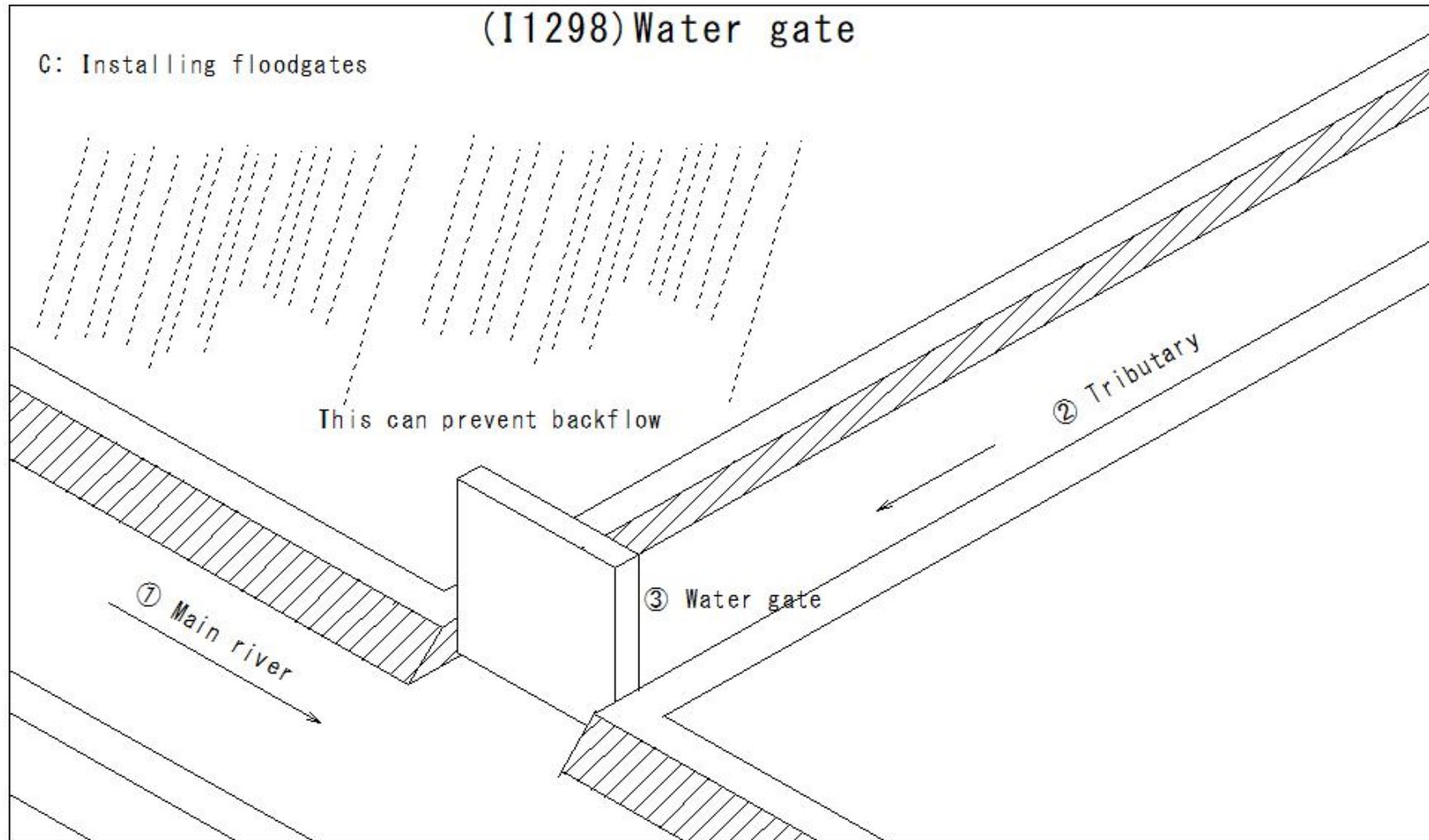
The water level in the main river rises and water flows back into the tributaries



(I1298)Water gate

(I1298)Water gate

C: Installing floodgates

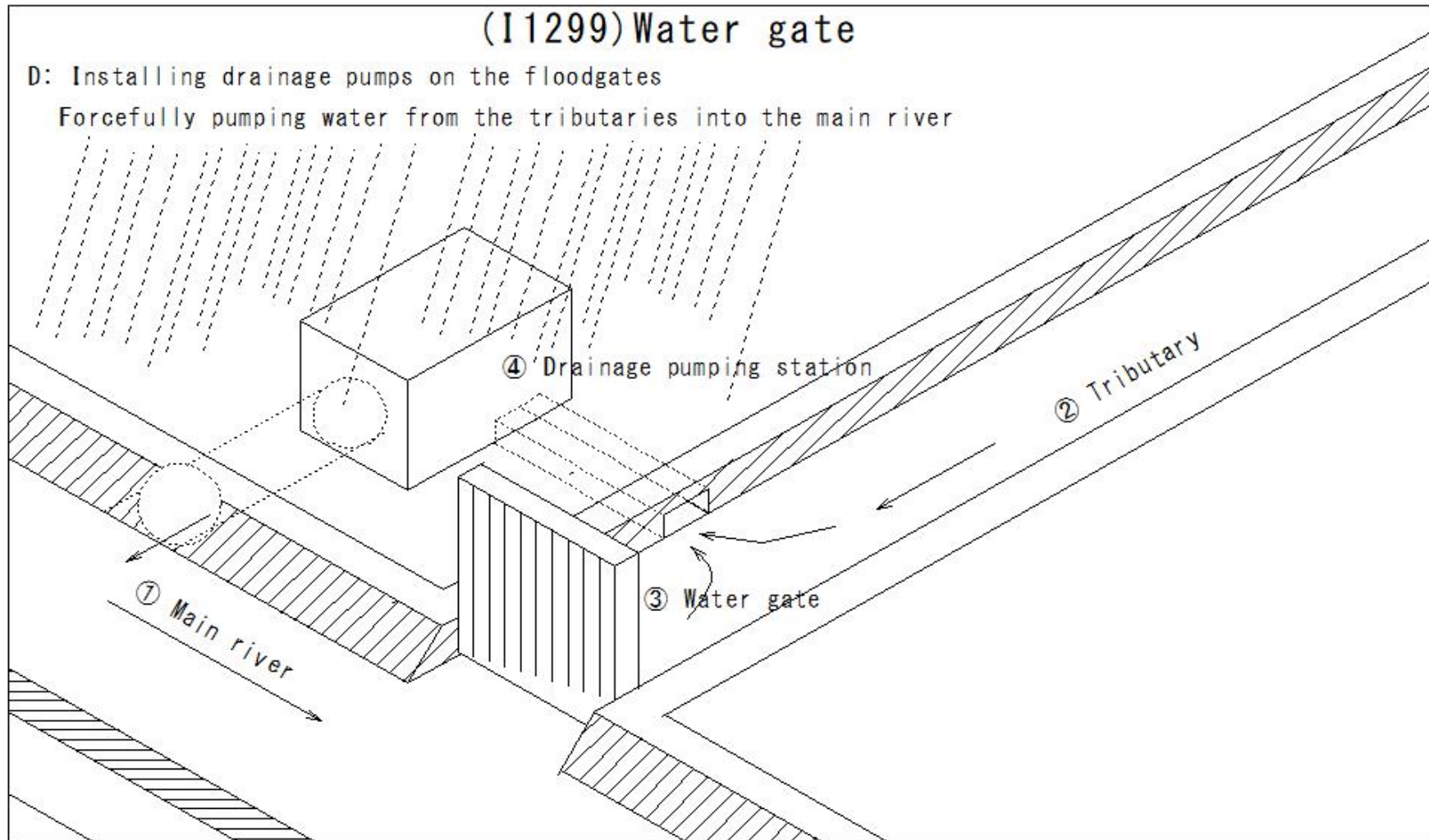


(I1299)Water qate

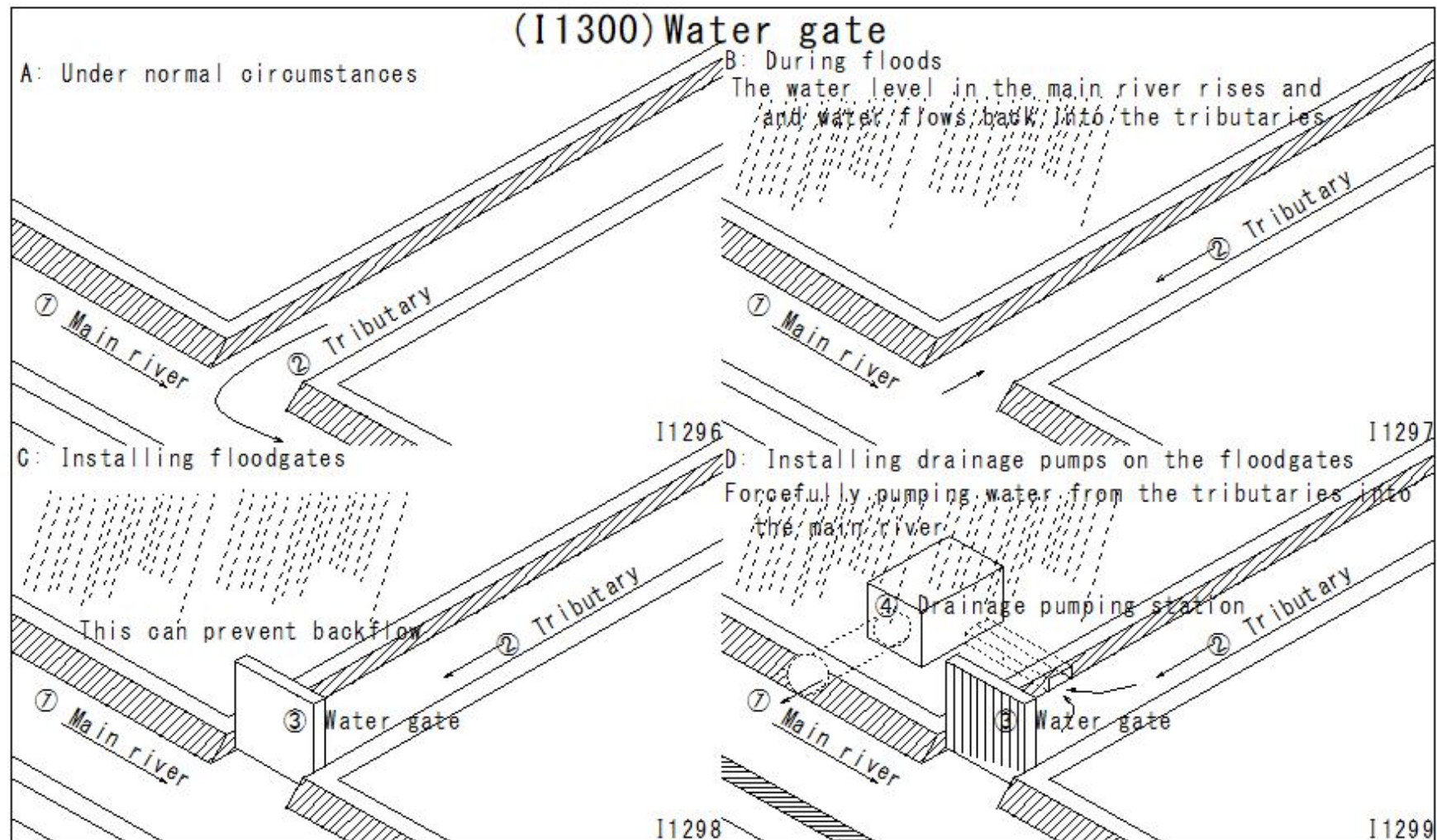
(I1299)Water gate

D: Installing drainage pumps on the floodgates

Forcefully pumping water from the tributaries into the main river



(I1300)Water gate



(I1301)Water gate

(I1301)Water gate

Water gate

A: Normal

River water level is low

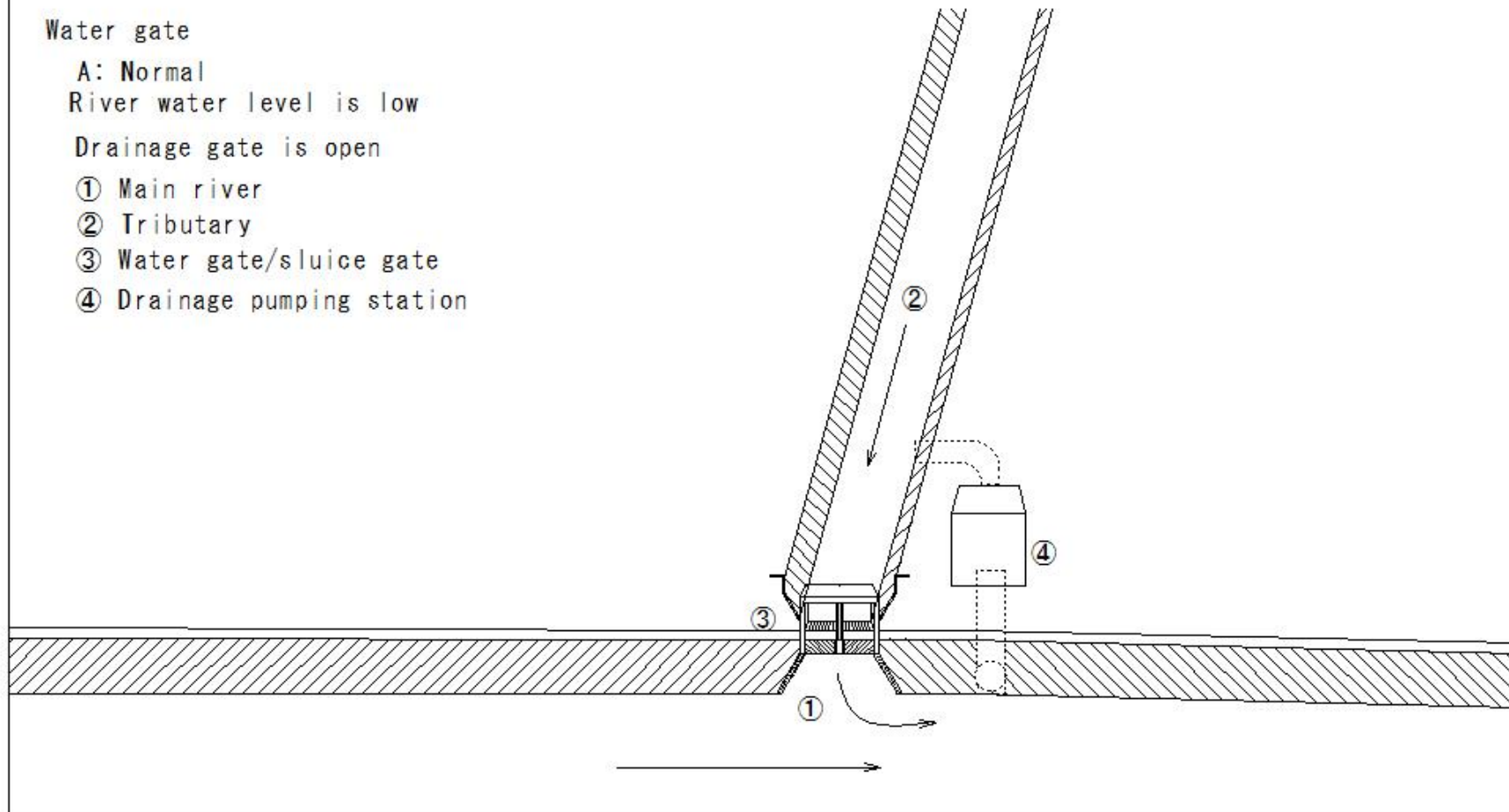
Drainage gate is open

① Main river

② Tributary

③ Water gate/sluice gate

④ Drainage pumping station



(I1302)Water gate

(I1302)Water gate

Water gate

B: Flood

River water level rises

Backflow

Flooding damage

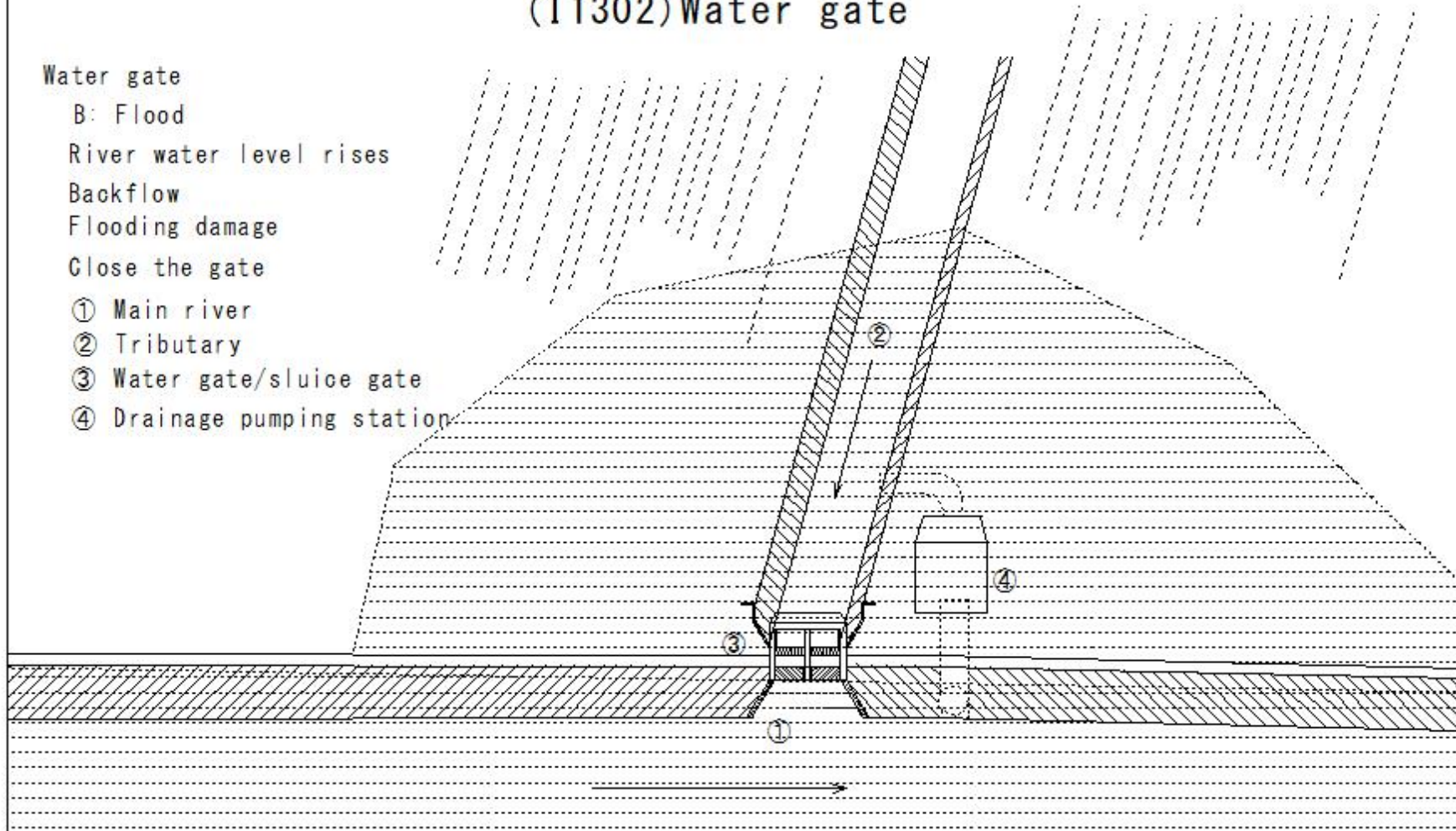
Close the gate

① Main river

② Tributary

③ Water gate/sluice gate

④ Drainage pumping station



(I1303)Water gate

(I1303)Water gate

Water gate

C: Flood

Close the gate

Inland water damage

Install drainage pumping station

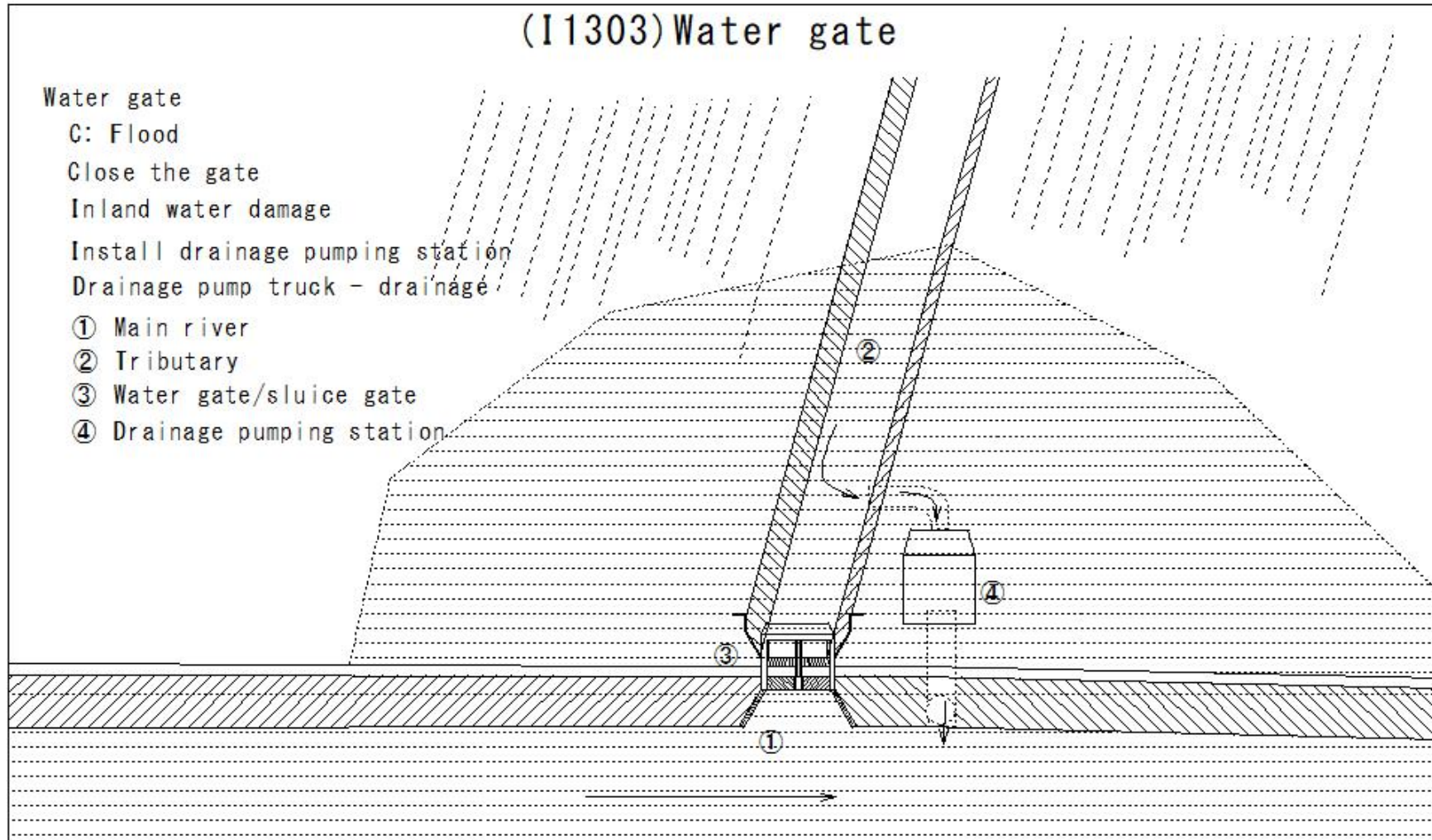
Drainage pump truck - drainage

① Main river

② Tributary

③ Water gate/sluice gate

④ Drainage pumping station



(I1304)Water gate

(I1304)Water gate

Water gate

D: After flood

River water level - low

No backflow

Open the gate

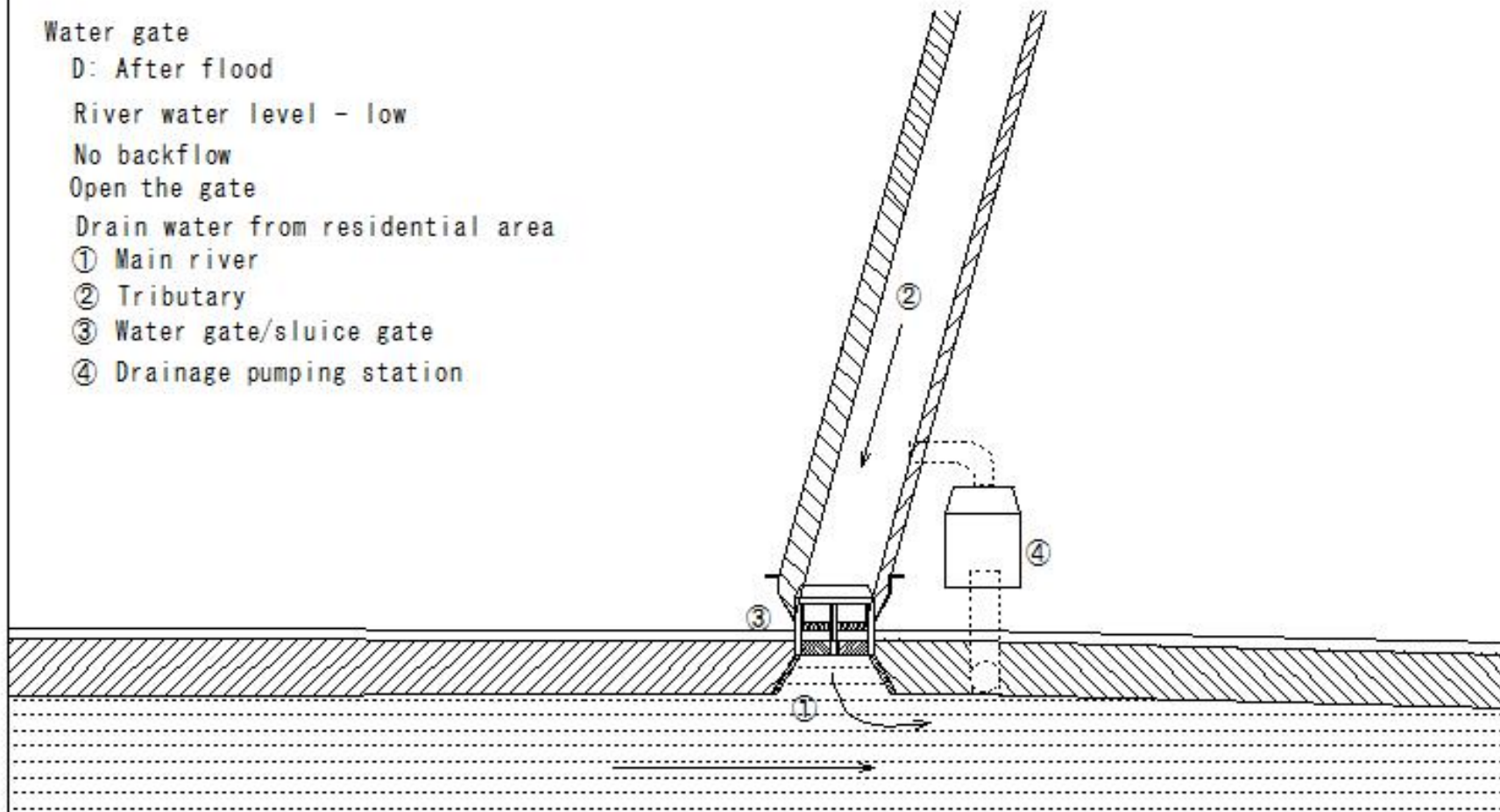
Drain water from residential area

① Main river

② Tributary

③ Water gate/sluice gate

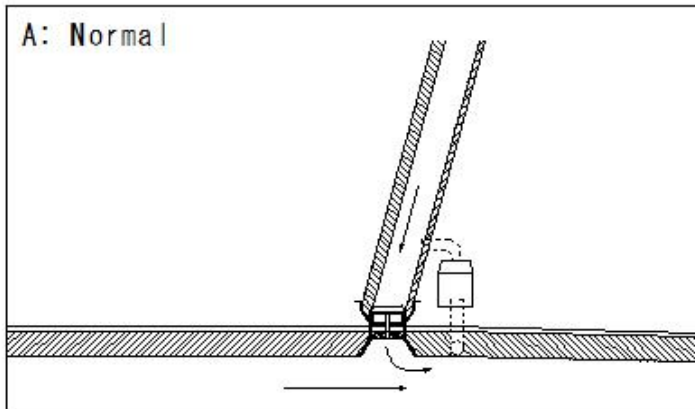
④ Drainage pumping station



(I1305)Water gate

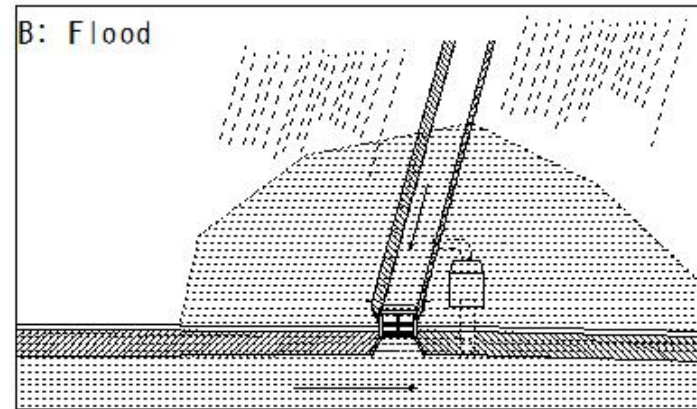
(I1305)Water gate

A: Normal



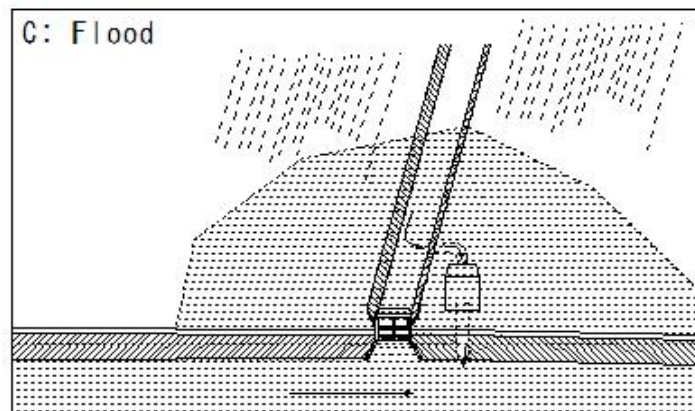
I1301

B: Flood



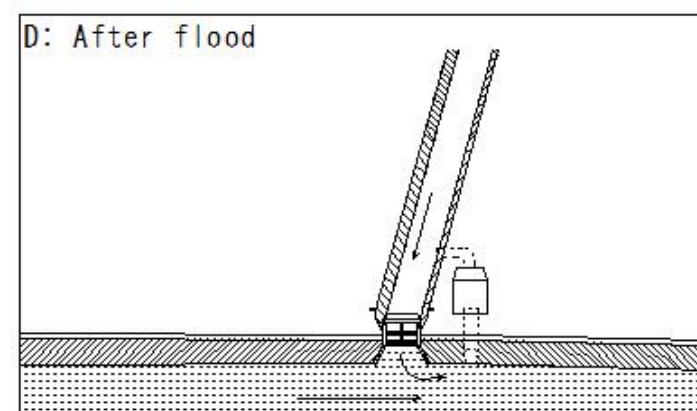
I1302

C: Flood



I1303

D: After flood



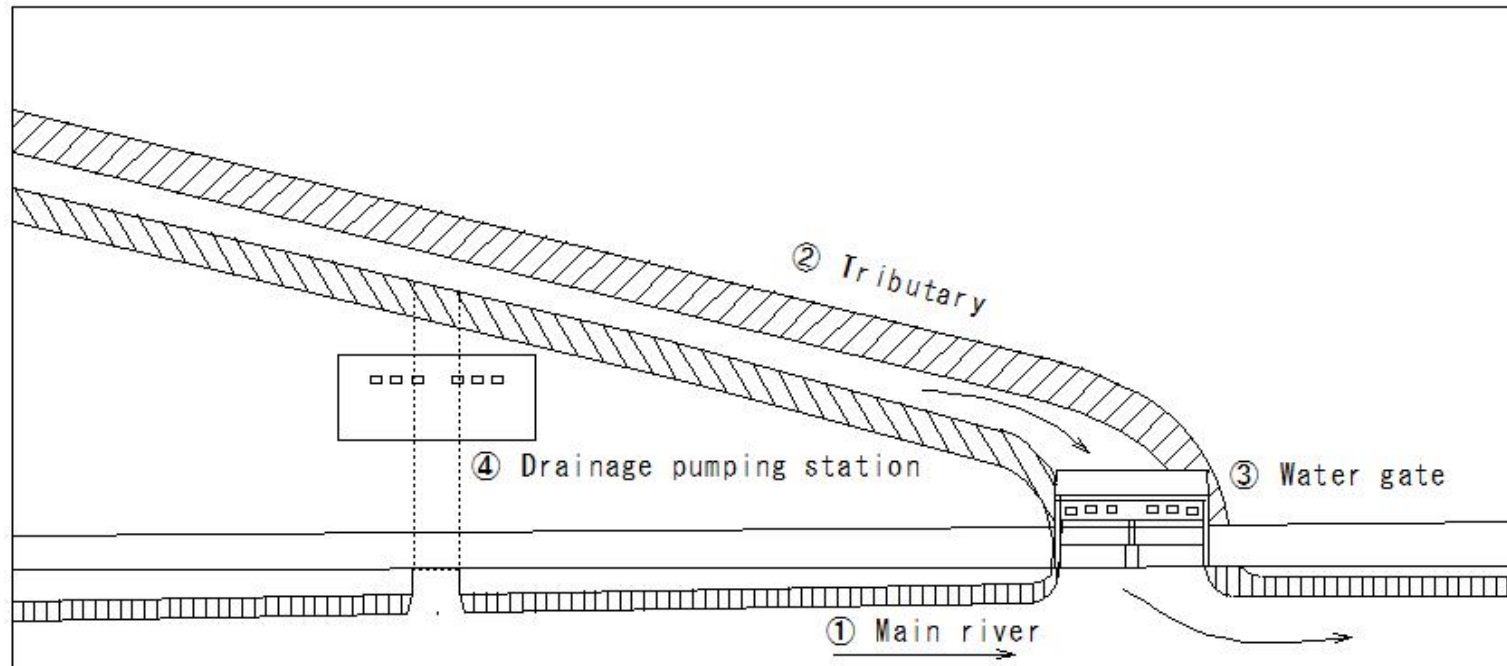
I1304

(I1306)Water gate

(I1306)Water gate

Water gate

A: Normally, the water from the tributary flows into the main river



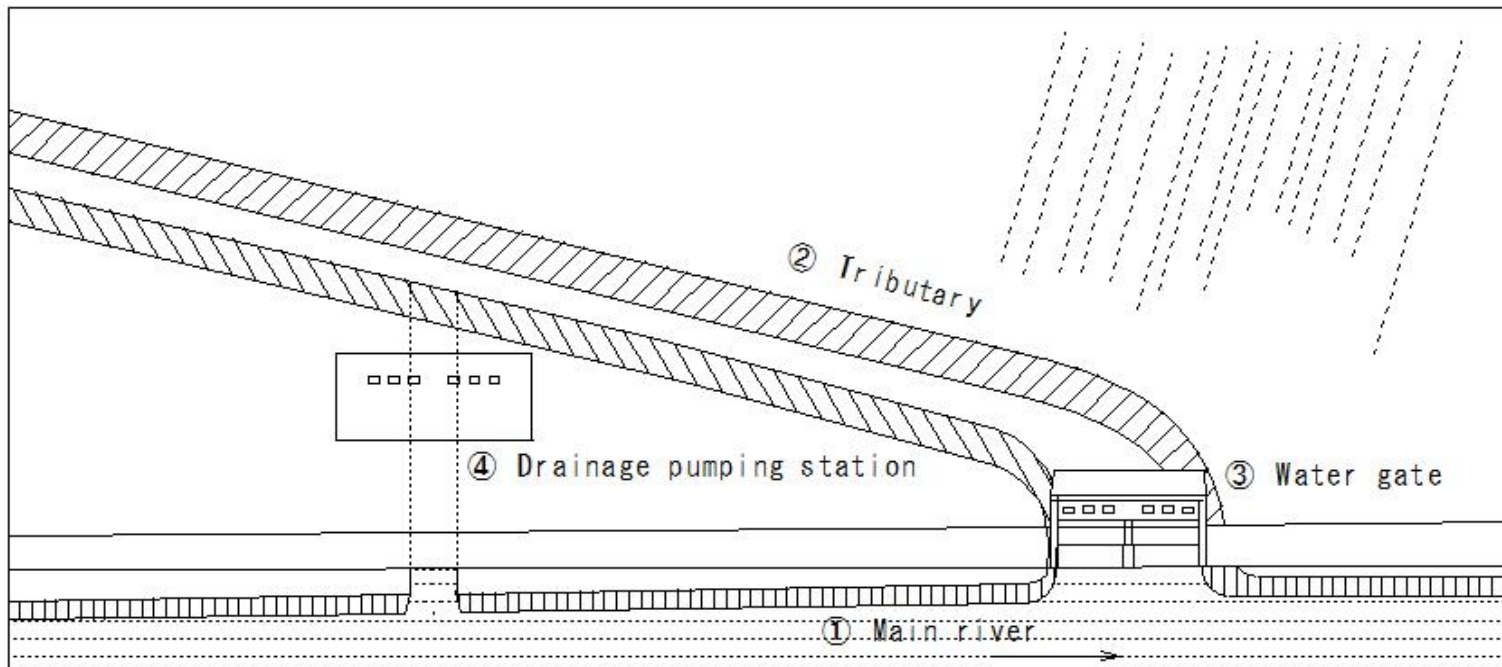
I1295

(I1307)Water gate

(I1307)Water gate

Water gate

- B: During floods, the water level of the river becomes higher than that of the tributary
The gate is closed to prevent backflow

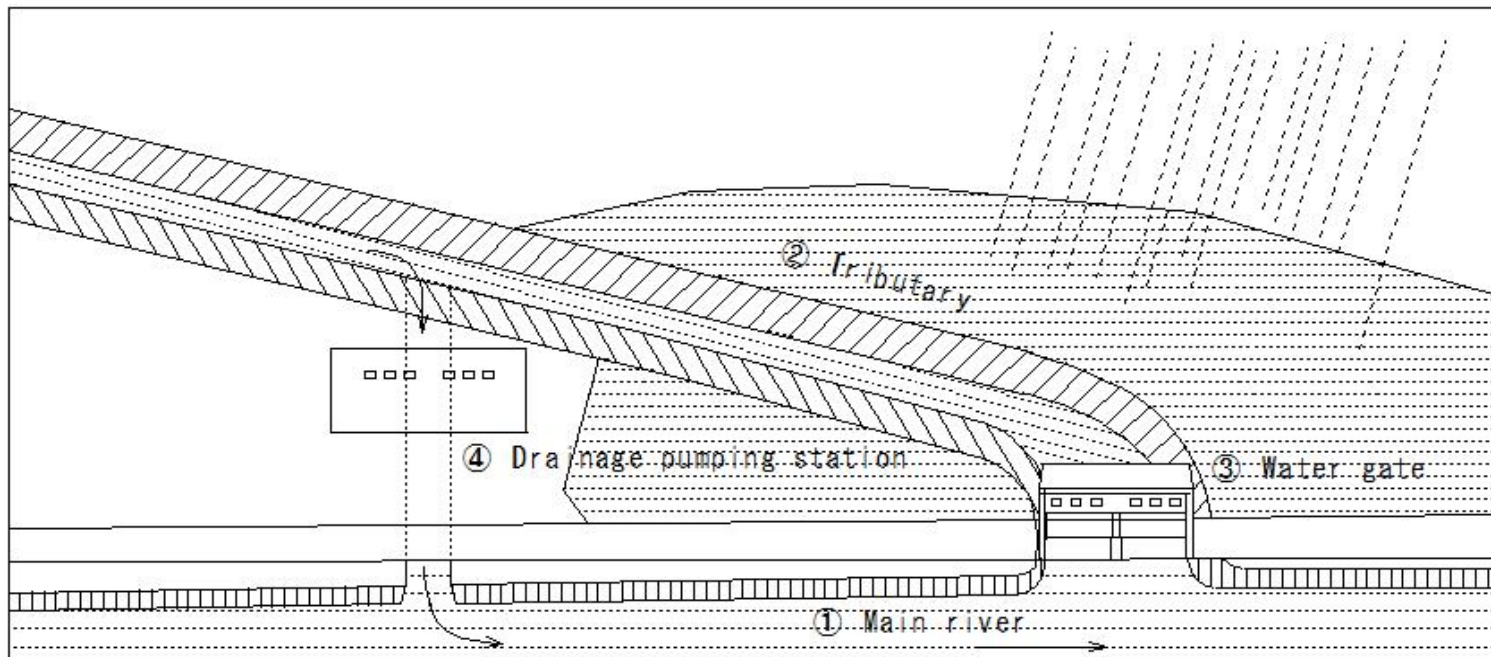


(I1308)Water gate

(I1308)Water gate

Water gate

C: During floods, heavy rains flood the tributary basin, and the drainage pump discharges water



I1295

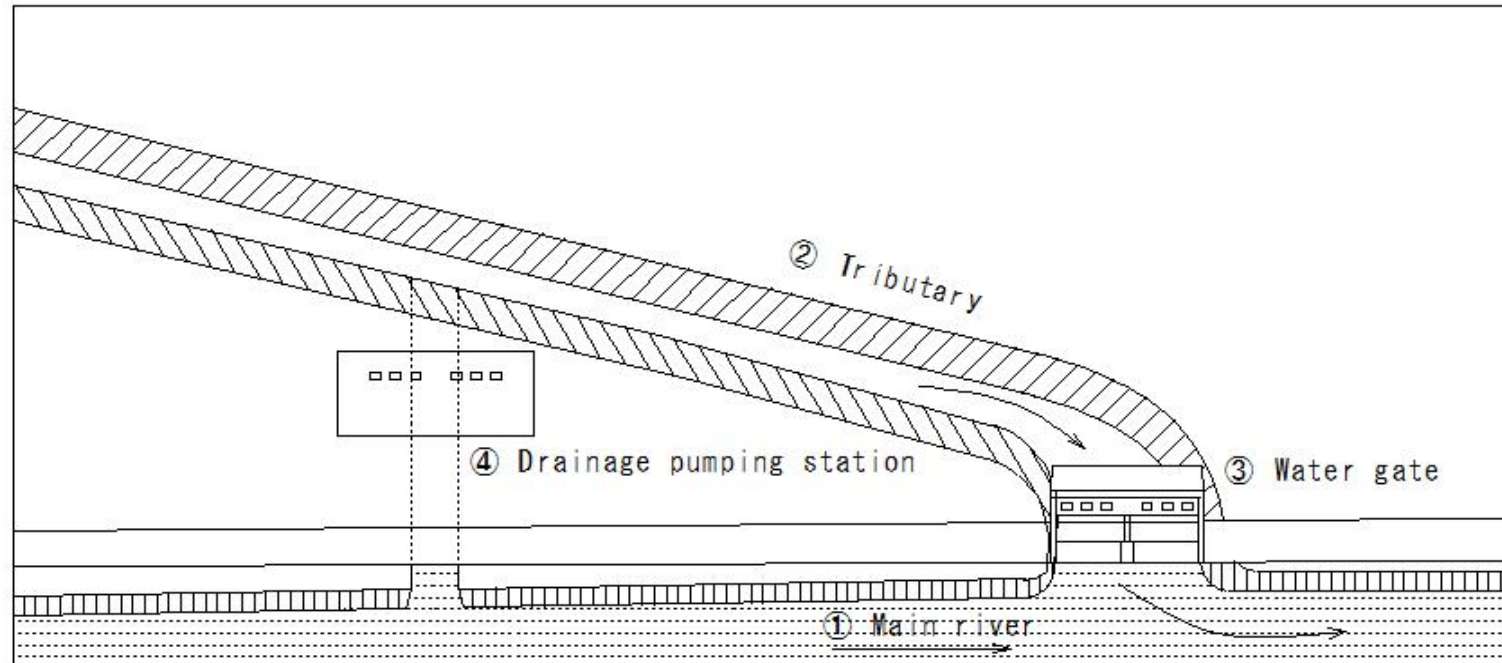
(I1309)Water gate

(I1309)Water gate

Water gate

D: When the water level of the main river becomes lower than that of the tributary,
the pump stops operating

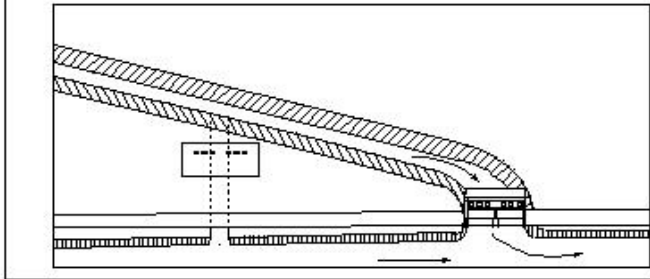
The gate is opened to allow the water to flow into the main river



(I1310)Water gate

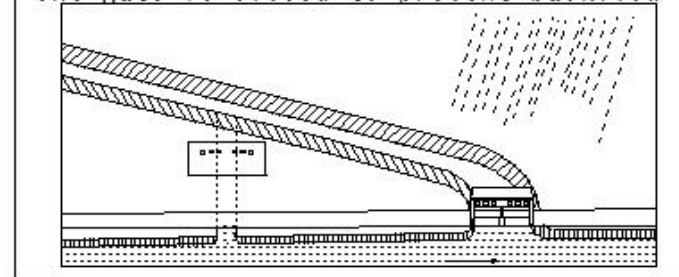
(I1310)Water gate

A: Normally, the water from the tributary flows into the main river



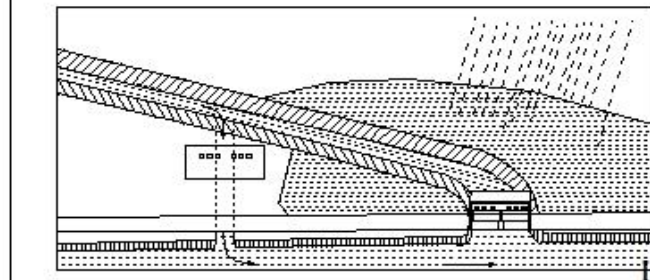
I1306

B: During floods, the water level of the river becomes higher than that of the tributary. The gate is closed to prevent backflow



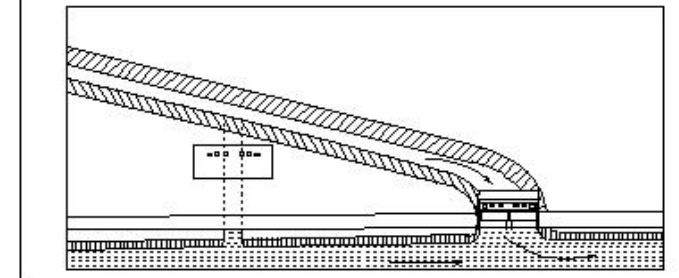
I1307

C: During floods, heavy rains flood the tributary basin, and the drainage pump discharges water



I1295 I1308

D: When the water level of the main river becomes lower than that of the tributary, the pump stops operating

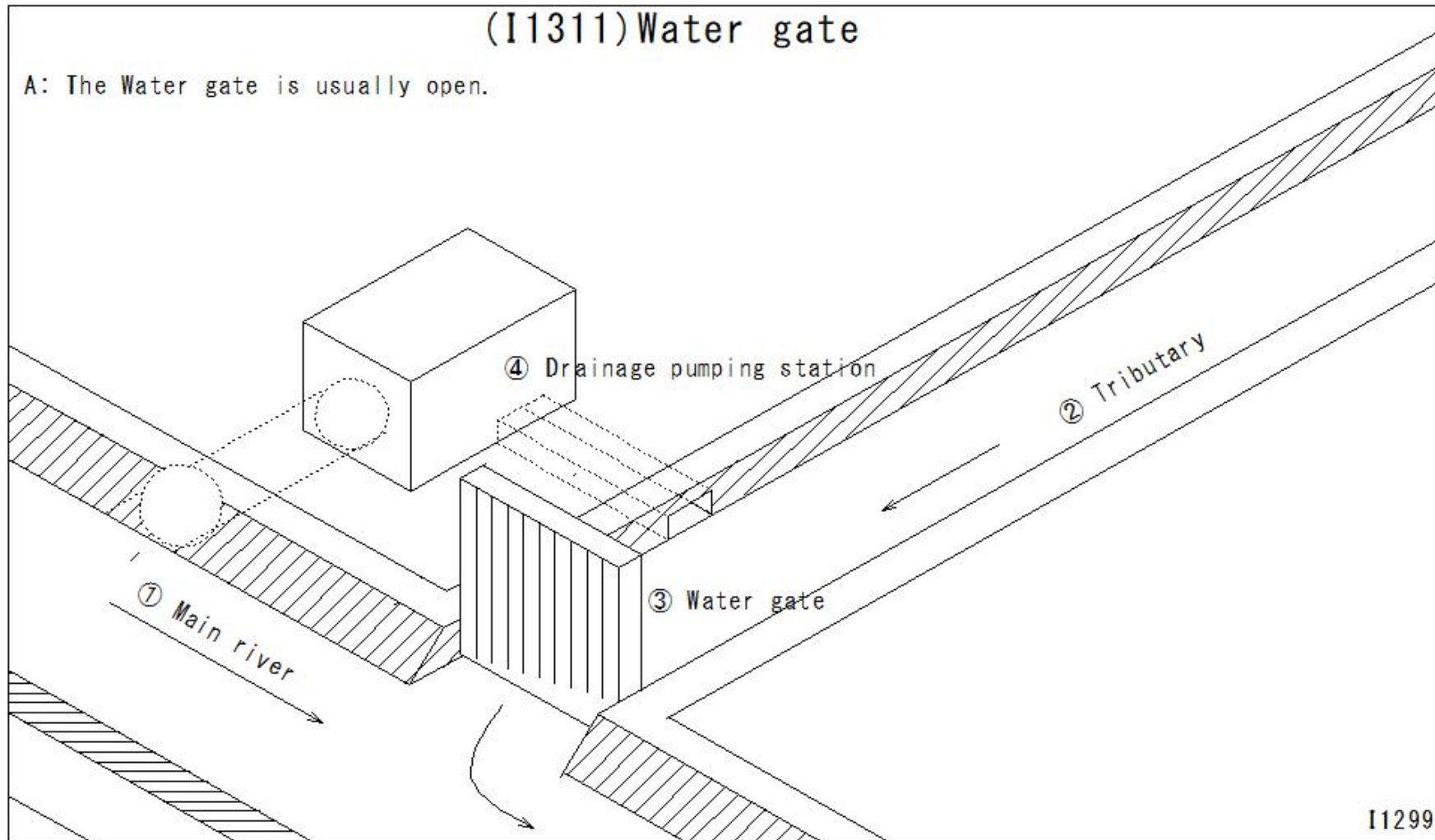


I1309

(I1311)Water gate

(I1311)Water gate

A: The Water gate is usually open.

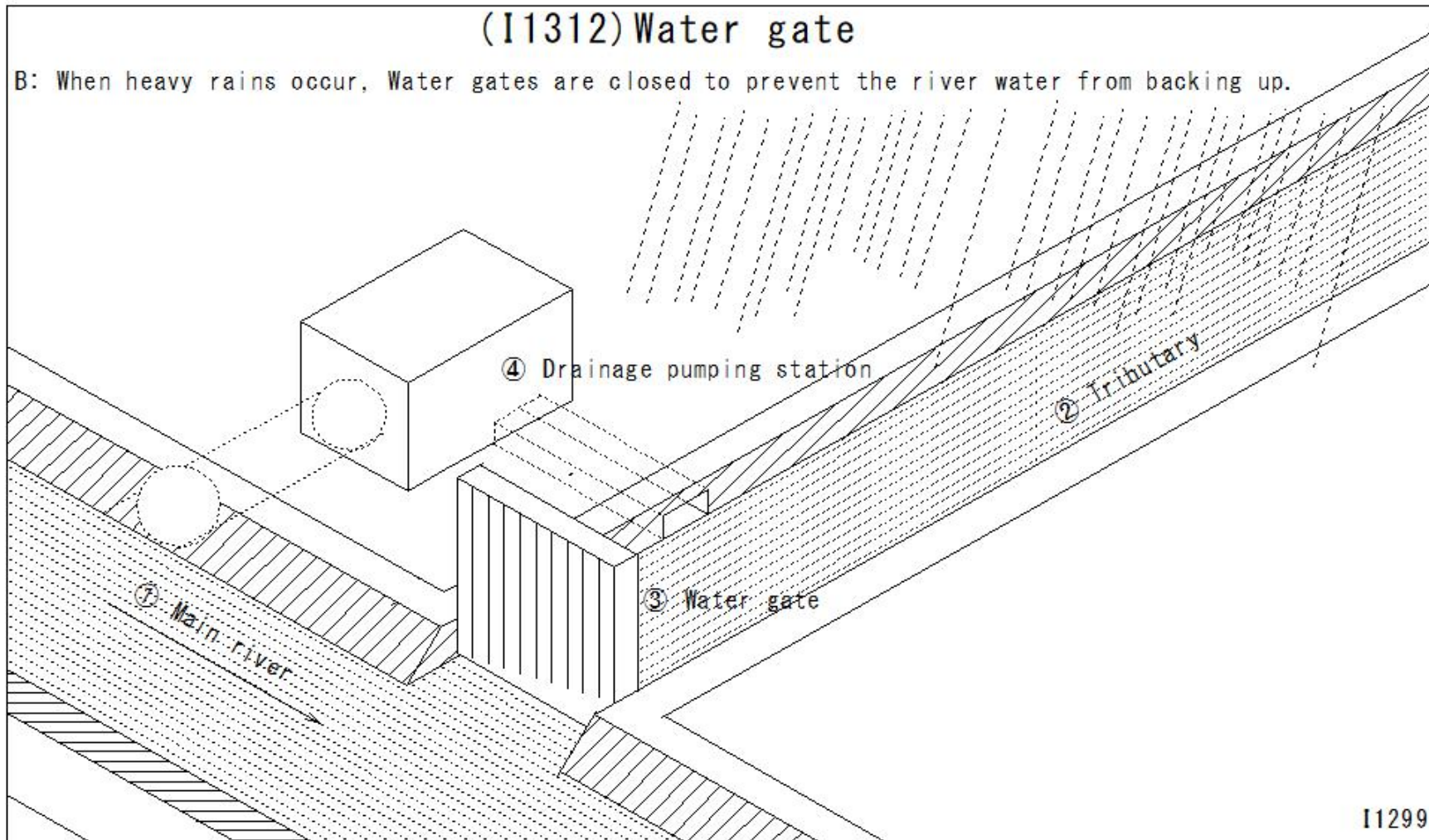


I1299

(I1312)Water gate

(I1312)Water gate

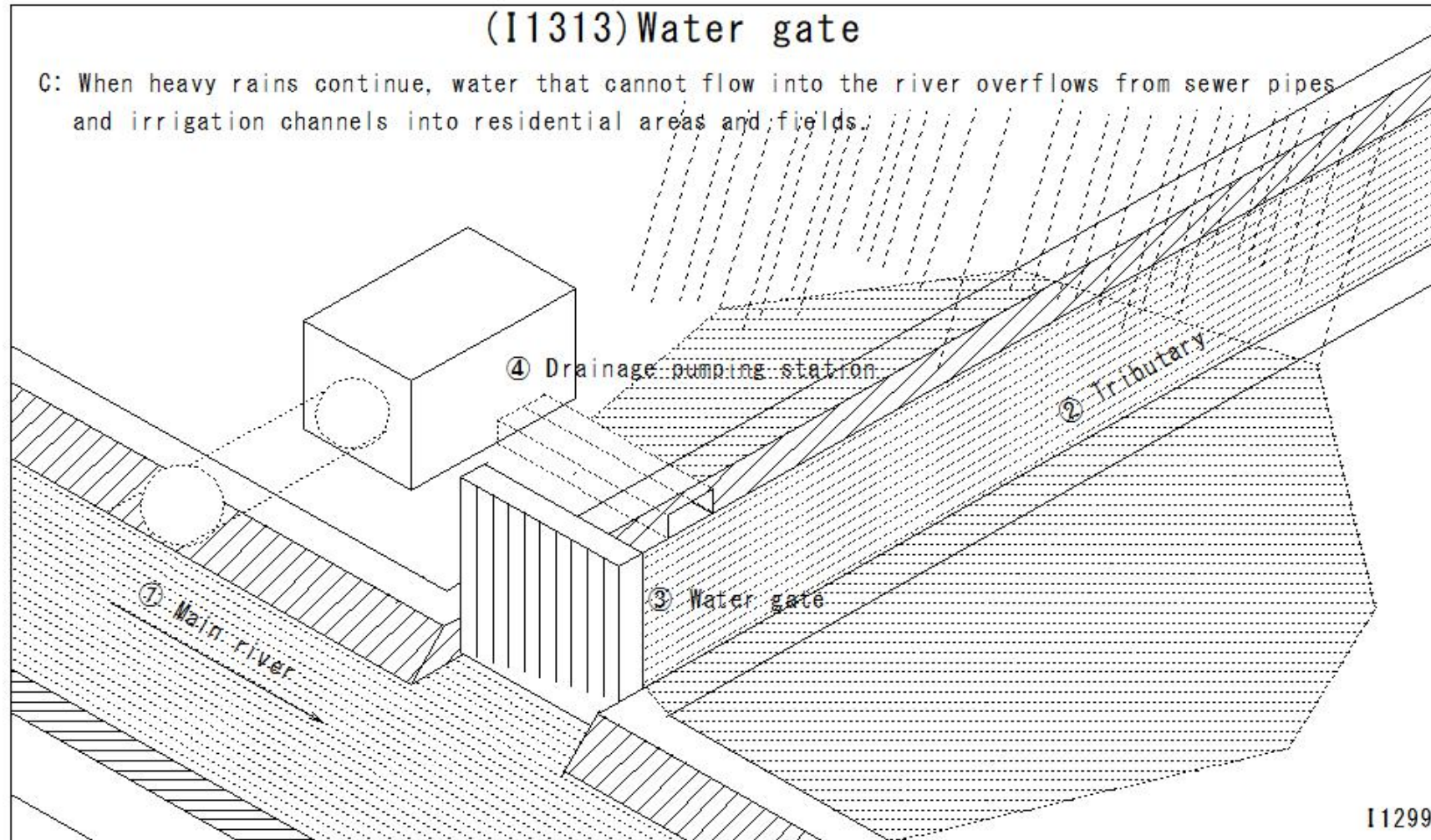
B: When heavy rains occur, Water gates are closed to prevent the river water from backing up.



(I1313)Water gate

(I1313)Water gate

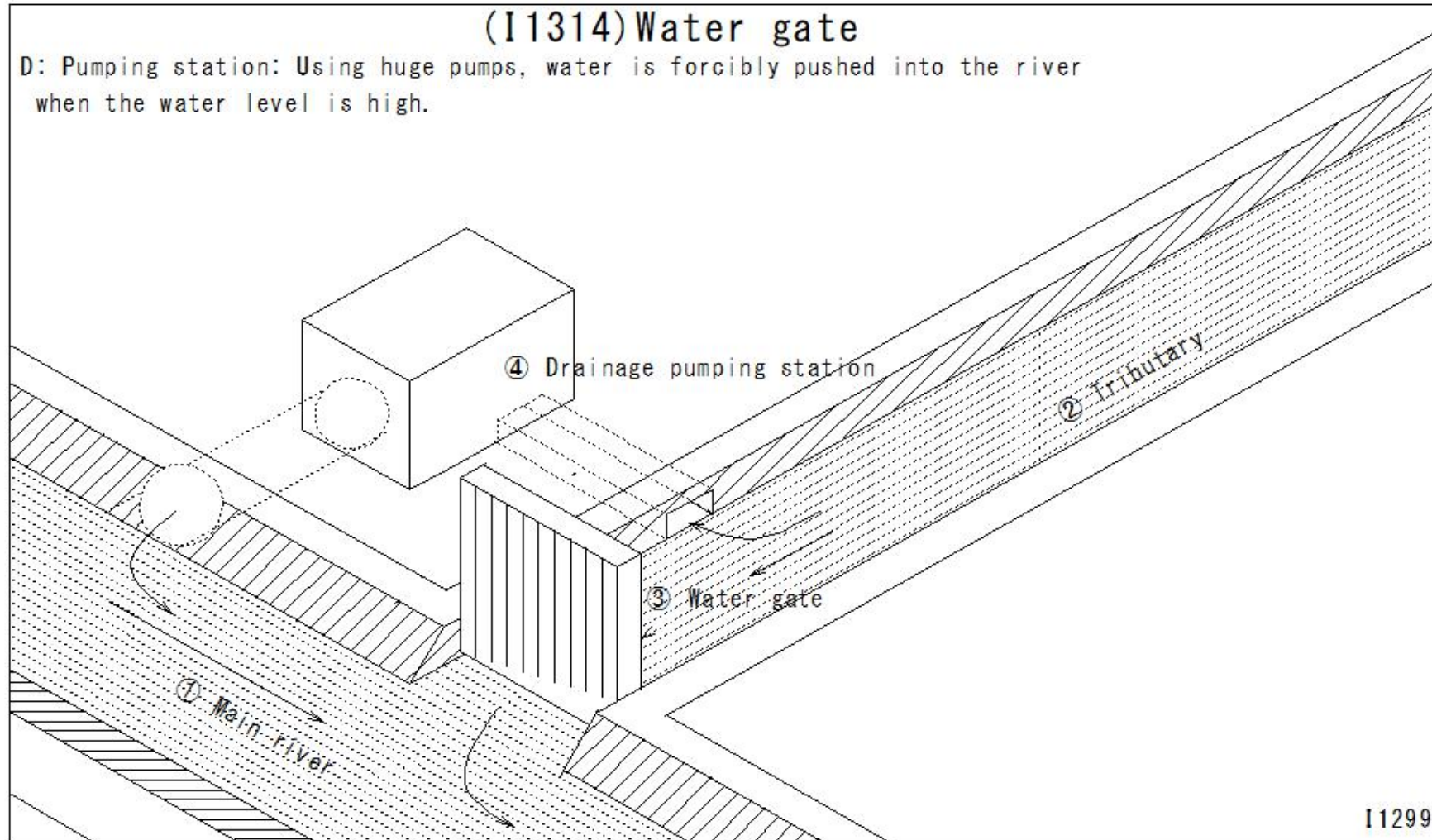
C: When heavy rains continue, water that cannot flow into the river overflows from sewer pipes and irrigation channels into residential areas and fields.



(I1314)Water gate

(I1314)Water gate

D: Pumping station: Using huge pumps, water is forcibly pushed into the river when the water level is high.

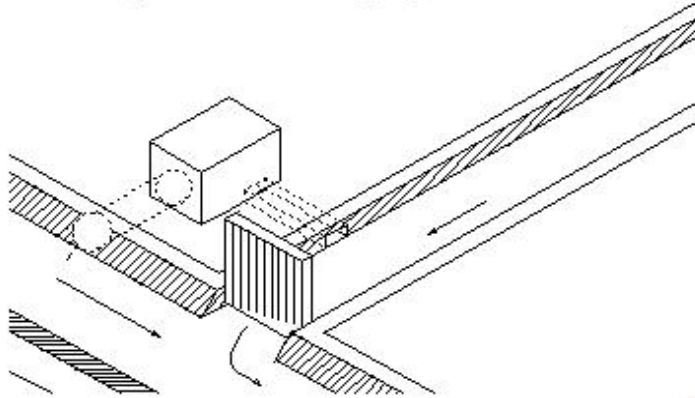


I1299

(I1315)Water gate

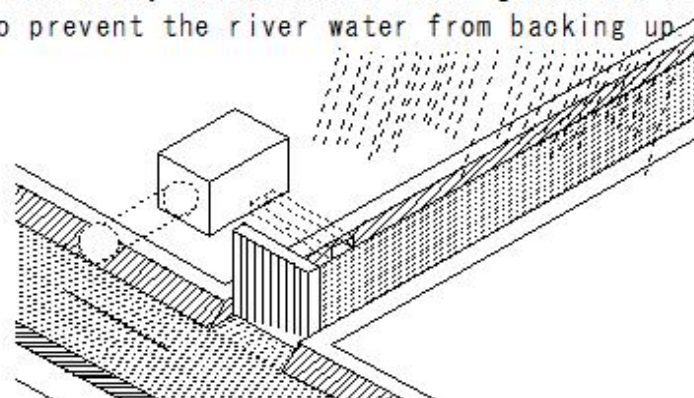
(I1315)Water gate

A: The Water gate is usually open.



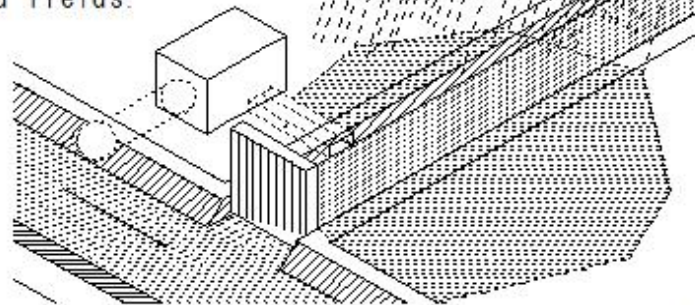
I1311

B: When heavy rains occur, Water gates are closed to prevent the river water from backing up.



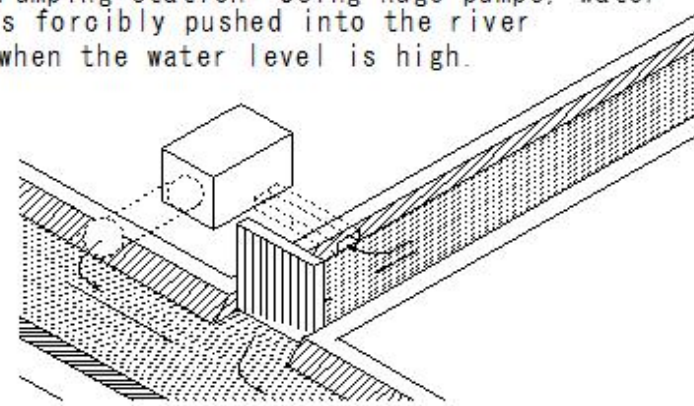
I1312

C: When heavy rains continue, water that cannot flow into the river overflows from sewer pipes and irrigation channels into residential areas and fields.



I1313

D: Pumping station: Using huge pumps, water is forcibly pushed into the river when the water level is high.



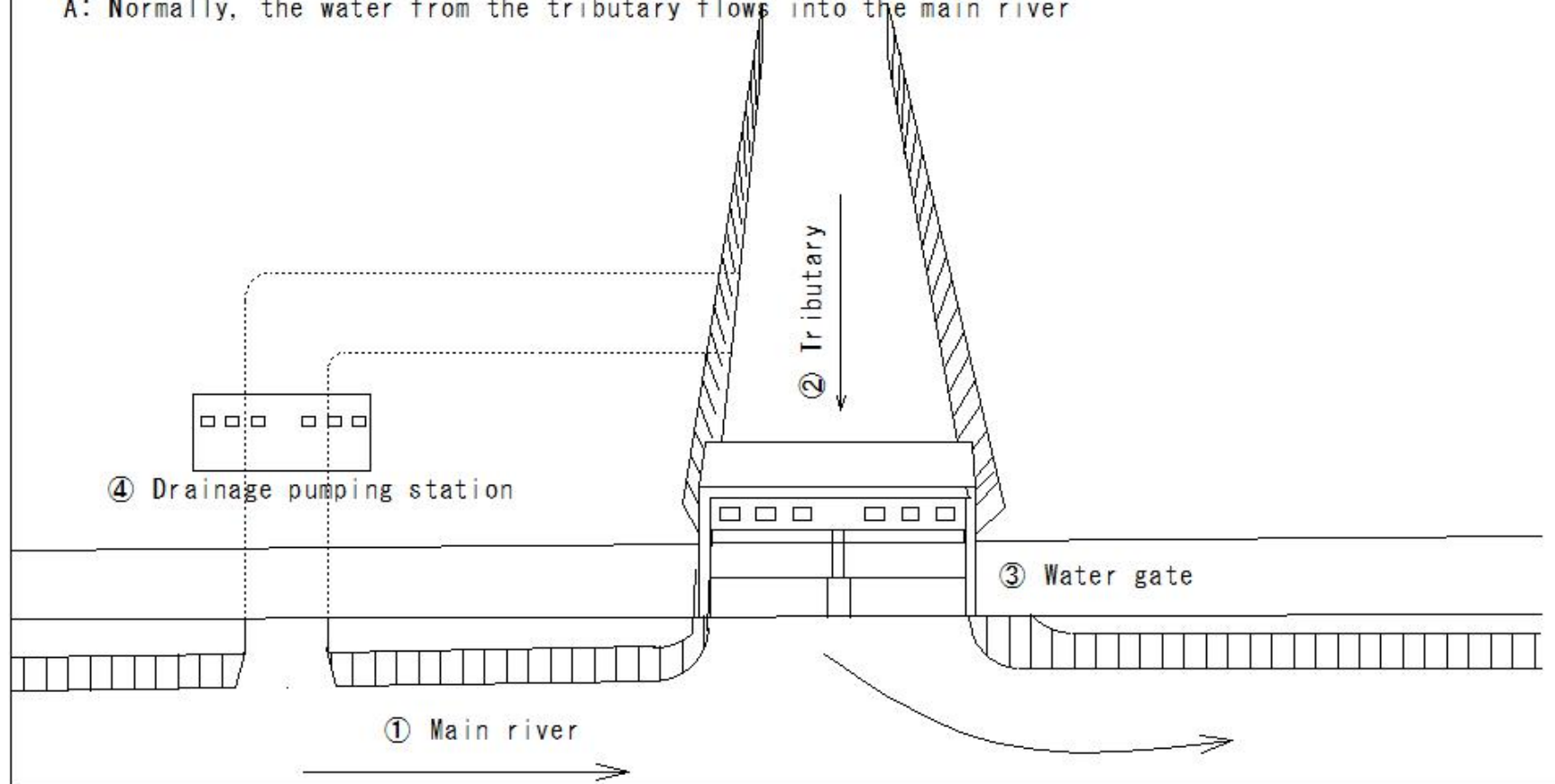
I1314

(I1316)Water gate

(I1316)water gate

Water gate

A: Normally, the water from the tributary flows into the main river

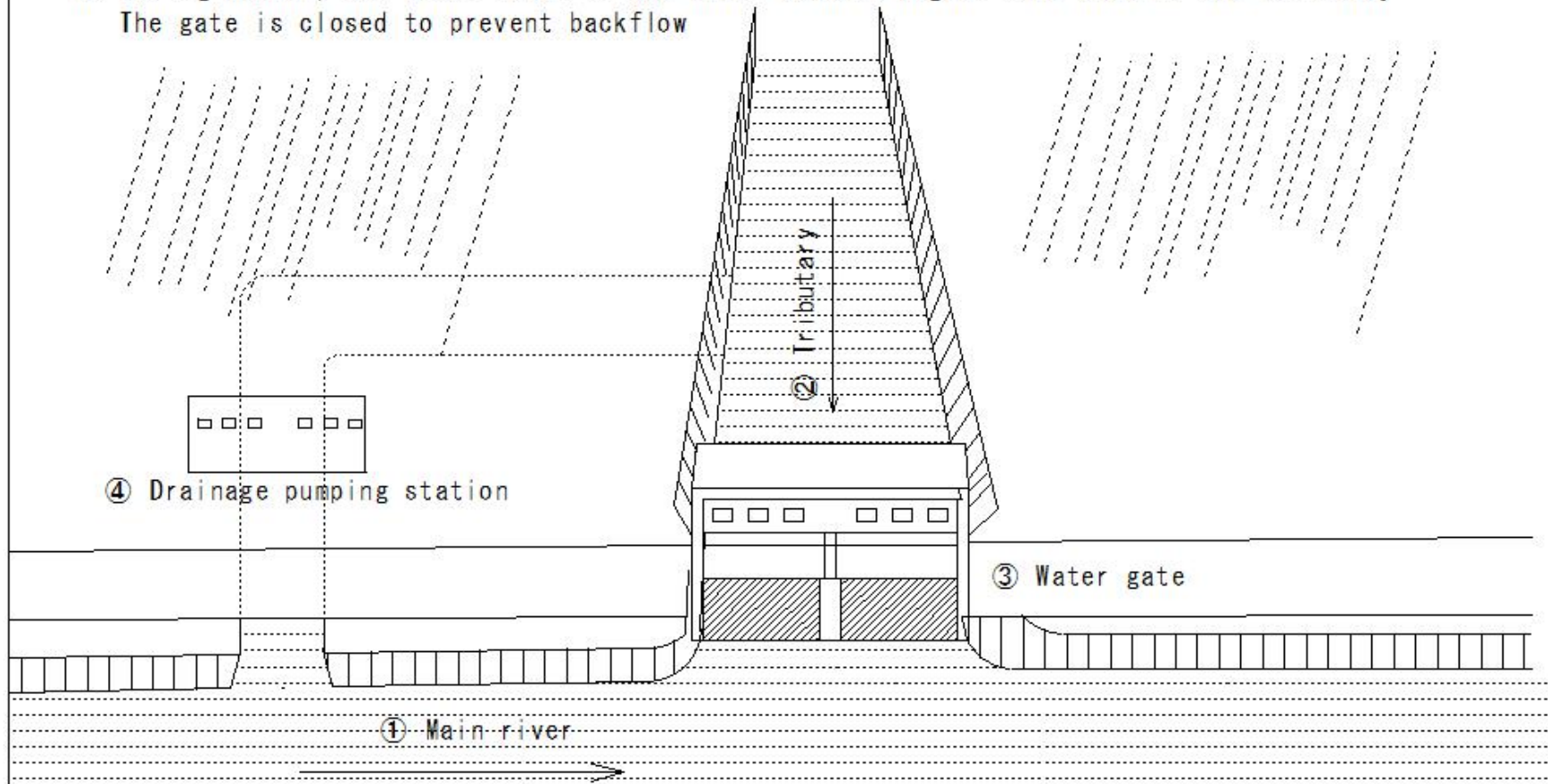


(I1317)Water gate

(I1317)water gate

Water gate

B: During floods, the water level of the river becomes higher than that of the tributary
The gate is closed to prevent backflow

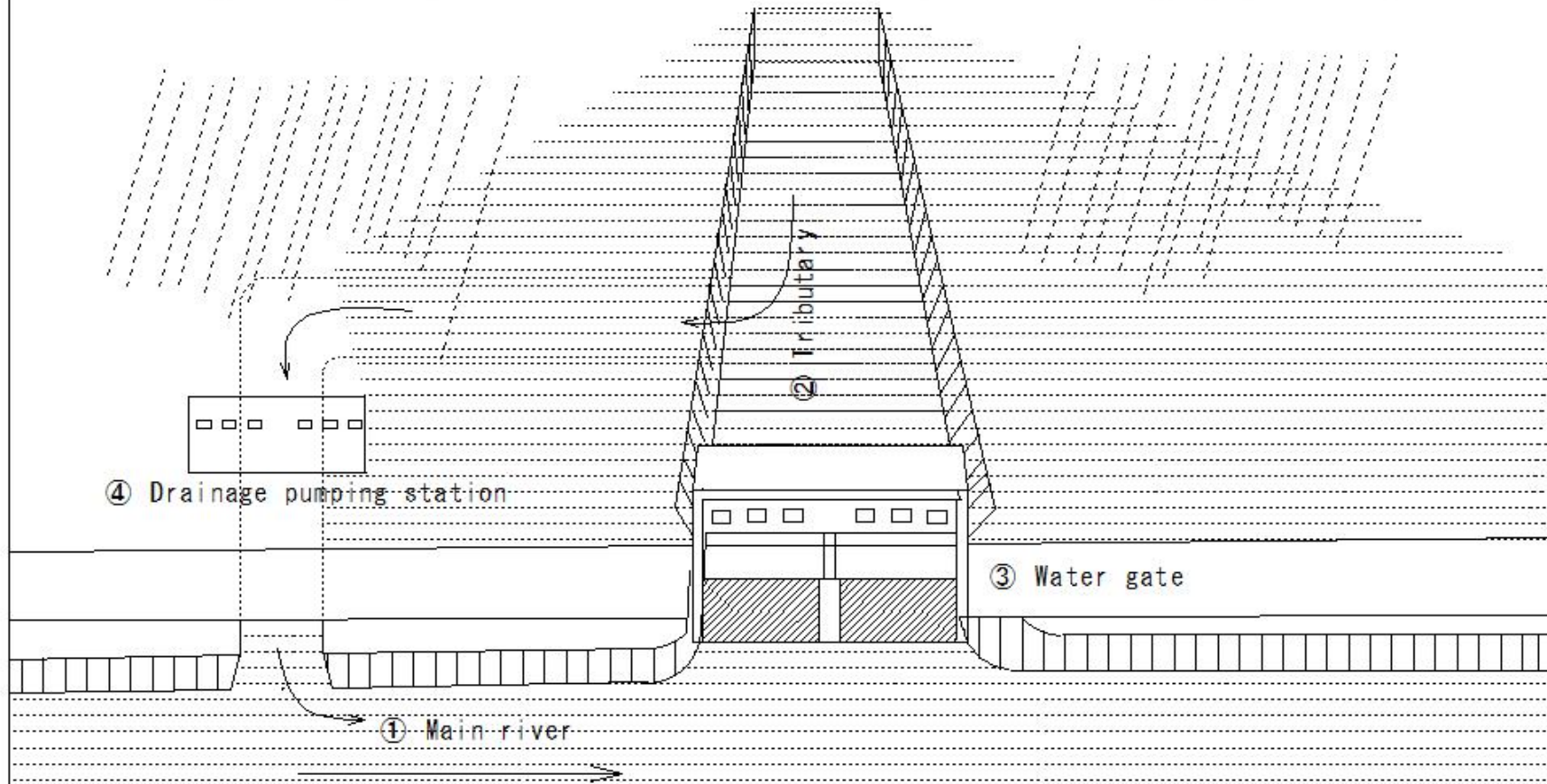


(I1318)Water gate

(I1318) water gate

Water gate

C: During floods, heavy rains flood the tributary basin, and the drainage pump discharges water



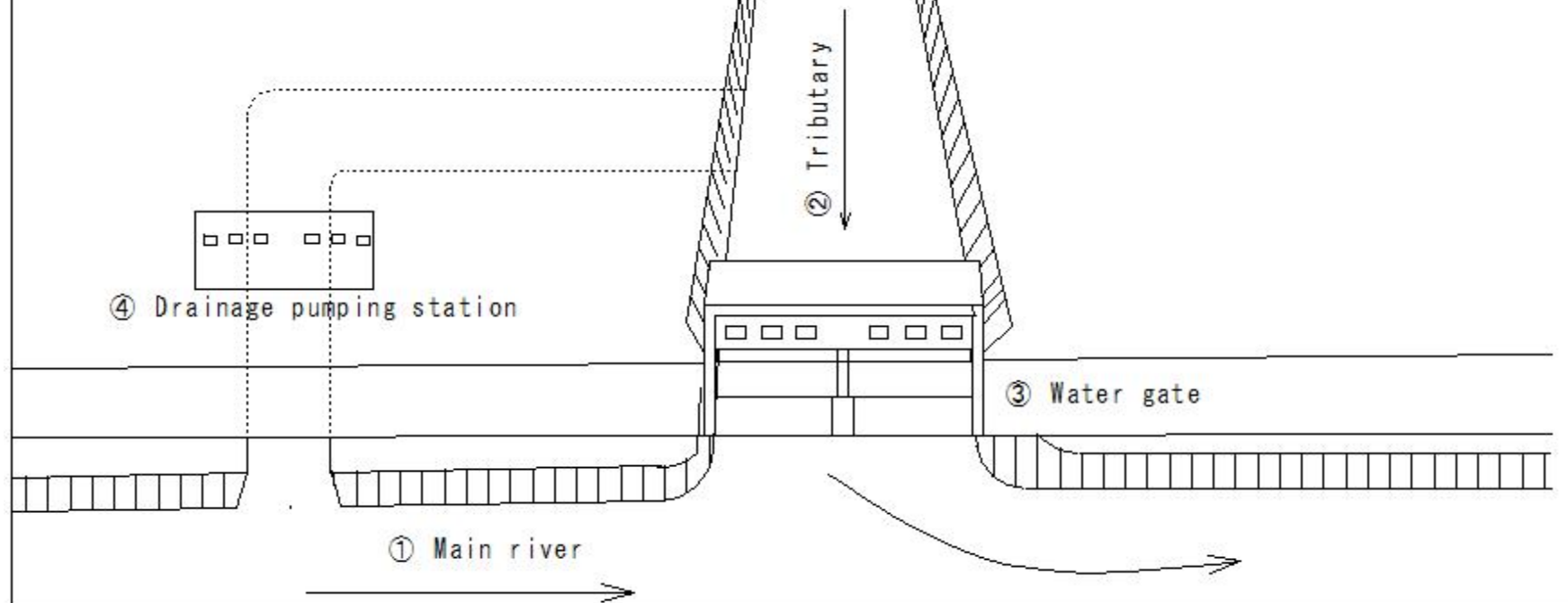
(I1319)Water gate

(I1319)water gate

Water gate

D: When the water level of the main river becomes lower than that of the tributary,
the pump stops operating

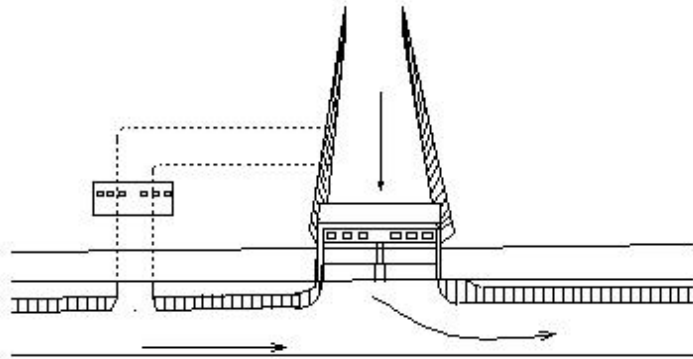
The gate is opened to allow the water to flow into the main river



(I1320)Water gate

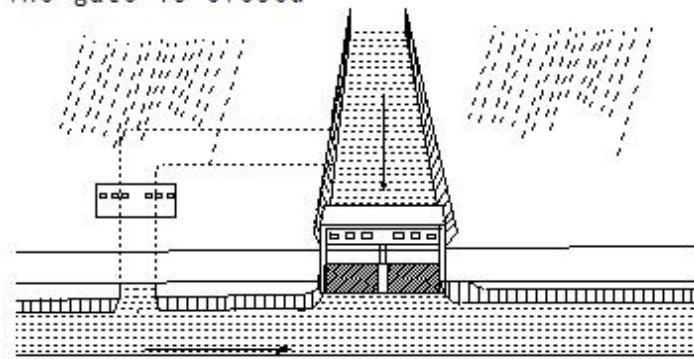
(I1320)water gate

A: Normally



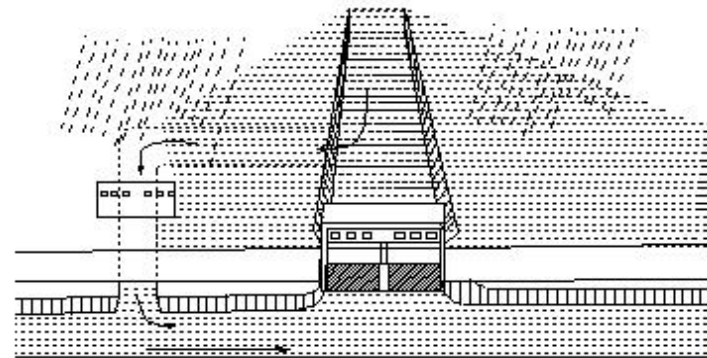
I1316

B: During floods
The gate is closed



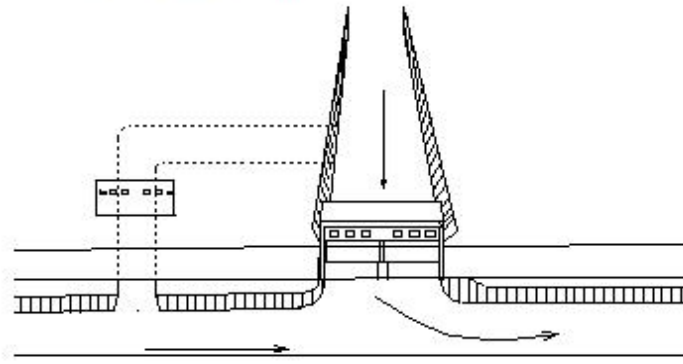
I1317

C: During floods
The drainage pump discharges water



I1318

D: The pump stops operating
The gate is opened

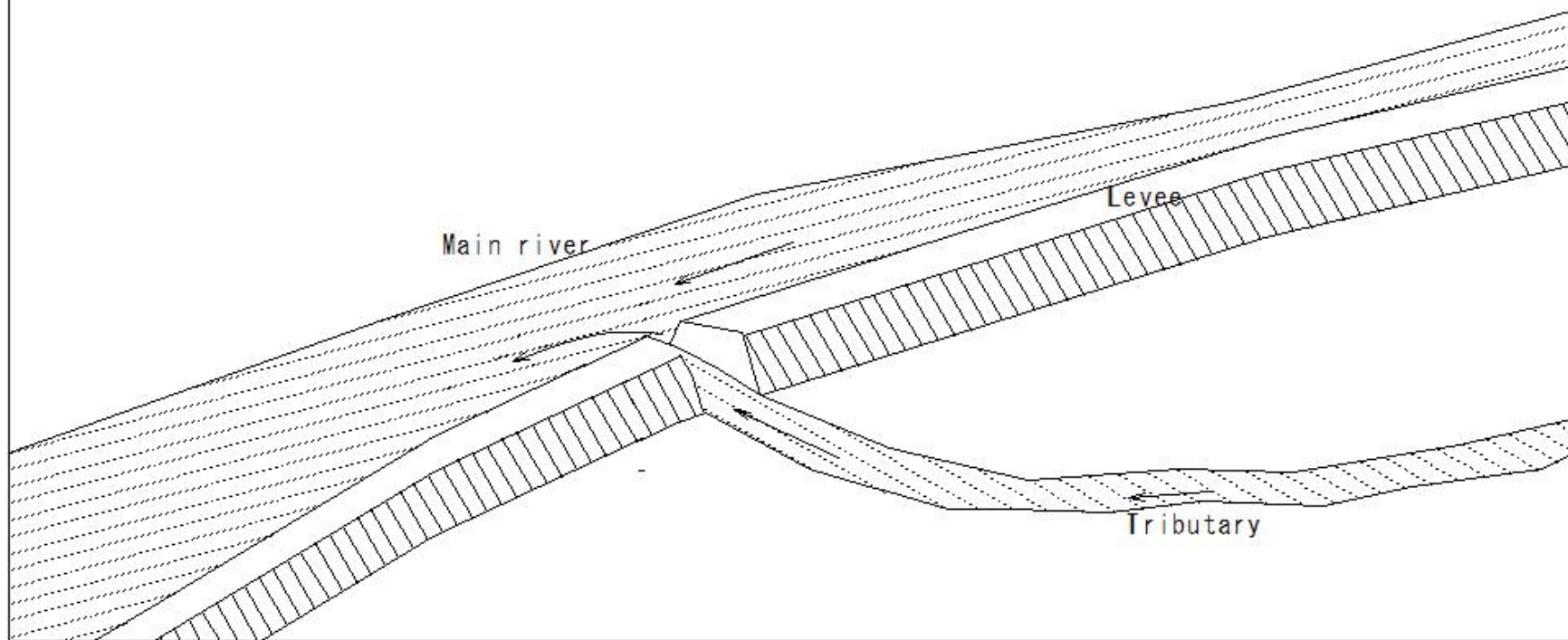


I1319

(I1321)Water gate

(I1321)Water gate

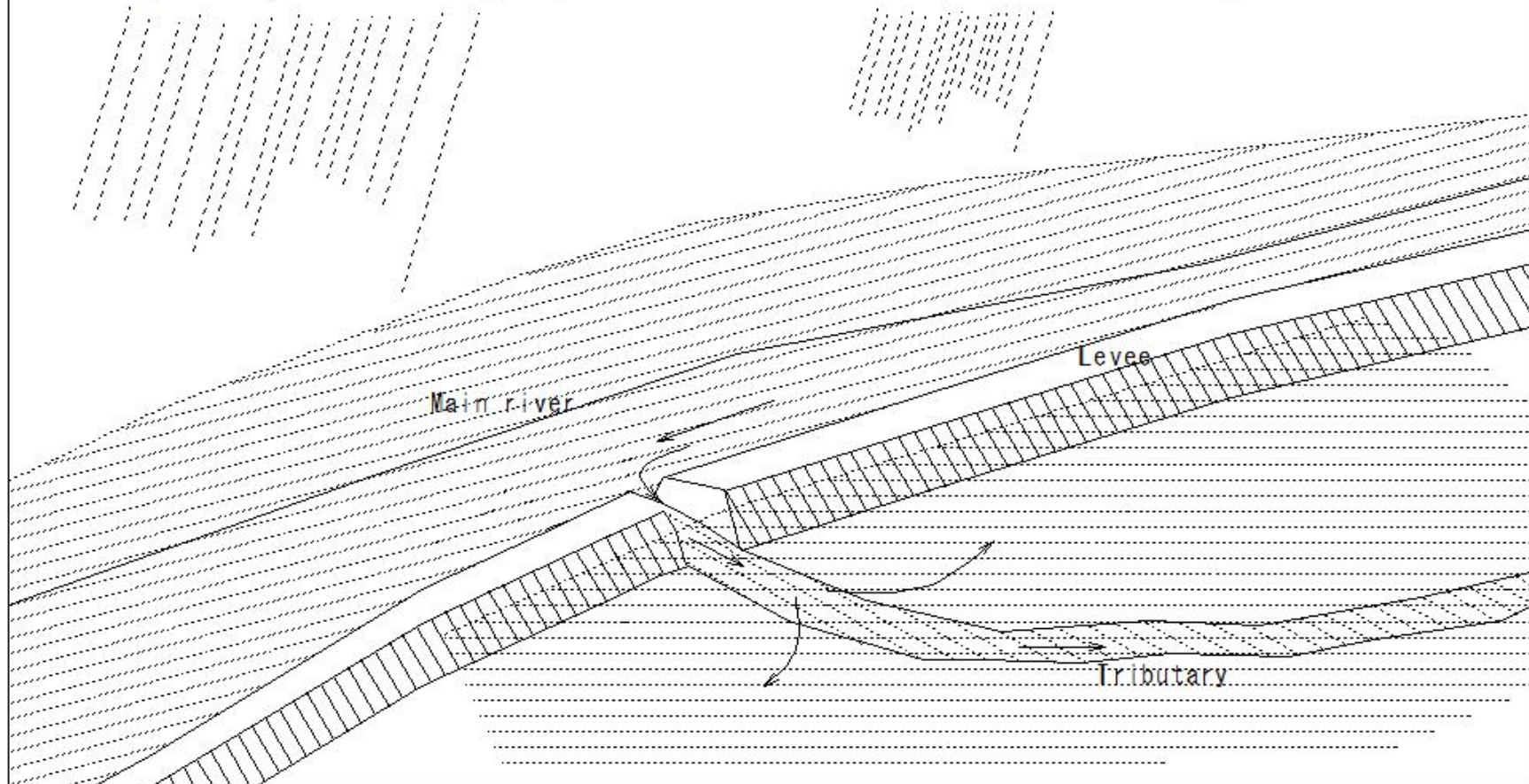
A: Normal



(I1322)Water gate

(I1322)Water gate

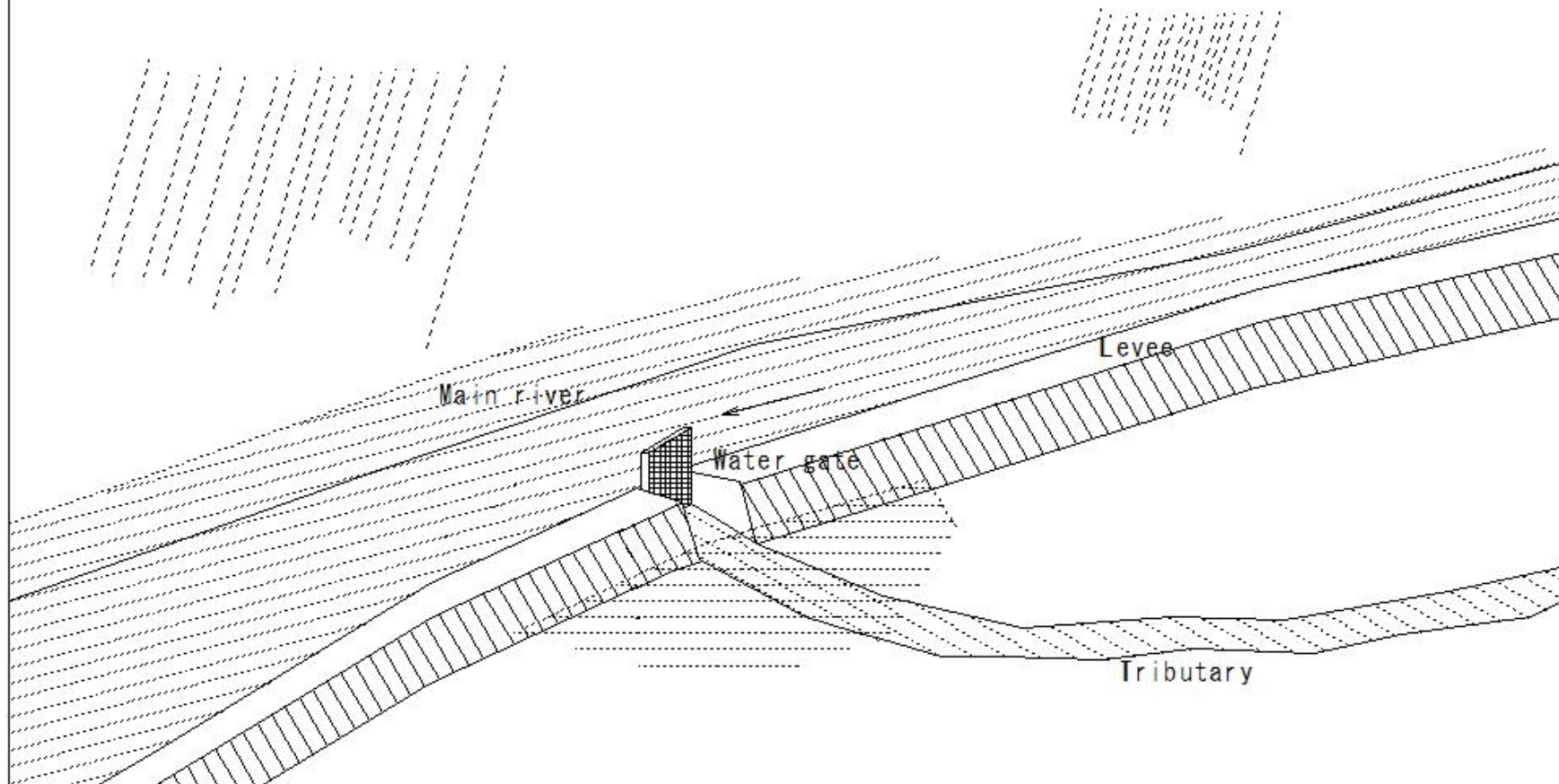
B: During floods, without floodgates, floodwaters would back up and cause flooding.



(I1323)Water gate

(I1323)Water gate

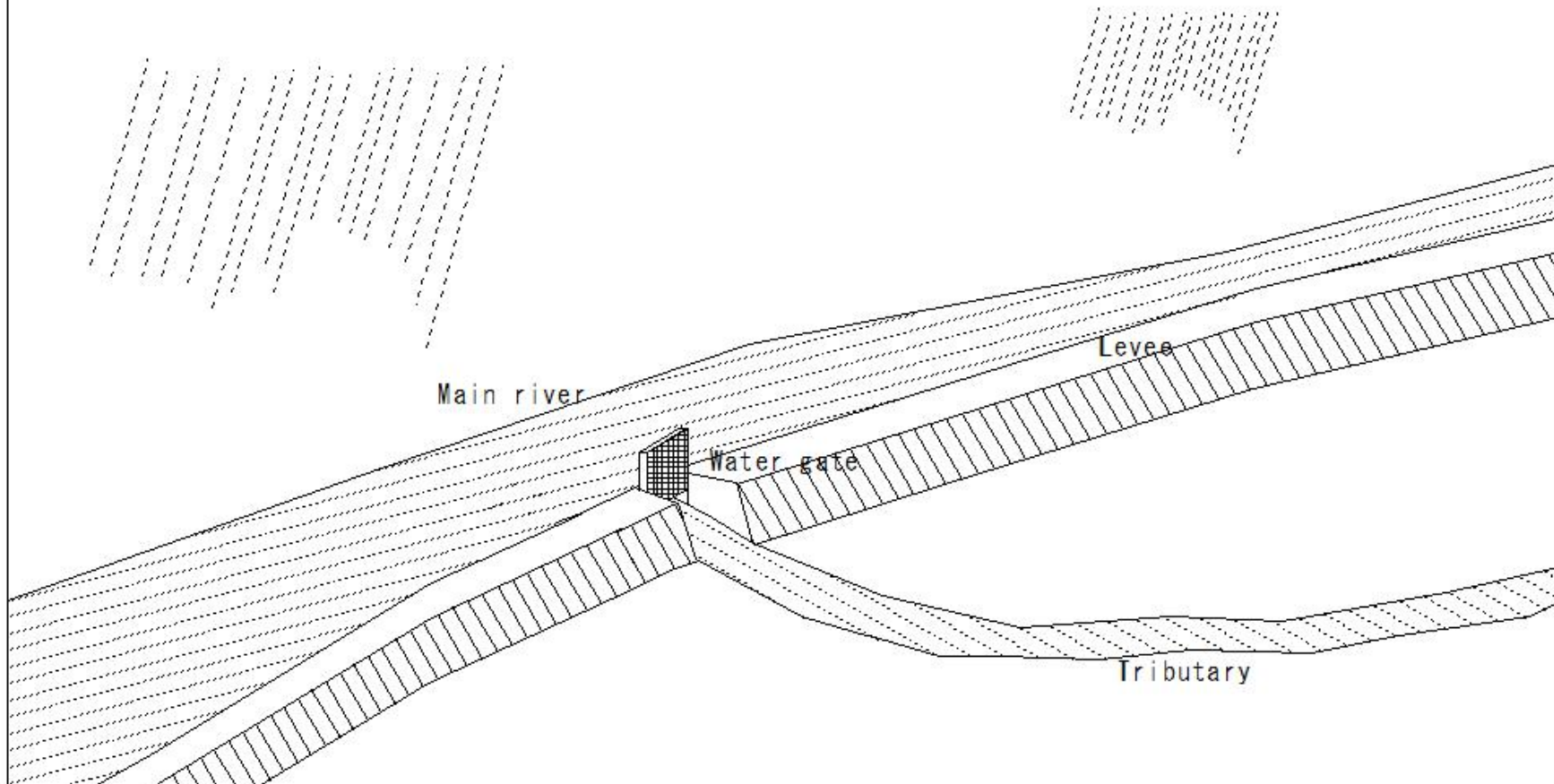
C: During floods, floodgates and levees are used to close the floodwaters and prevent backflow.



(I1324)Water gate

(I1324) Water gate

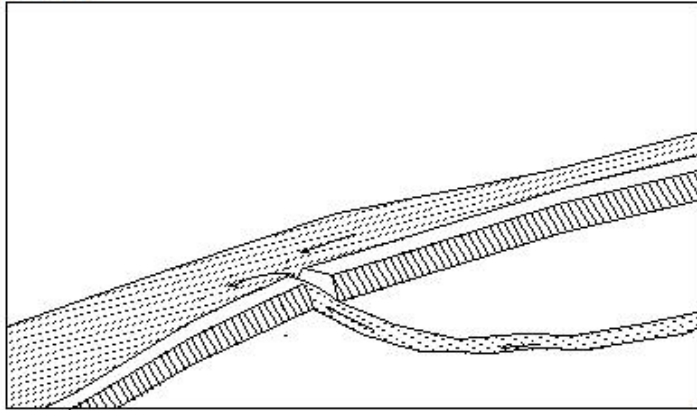
D: Opening the floodgates after a flood



(I1325)Water gate

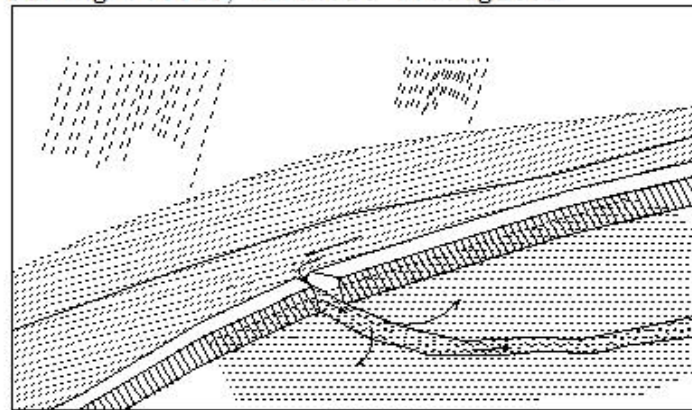
(I1325)Water gate

A: Normal



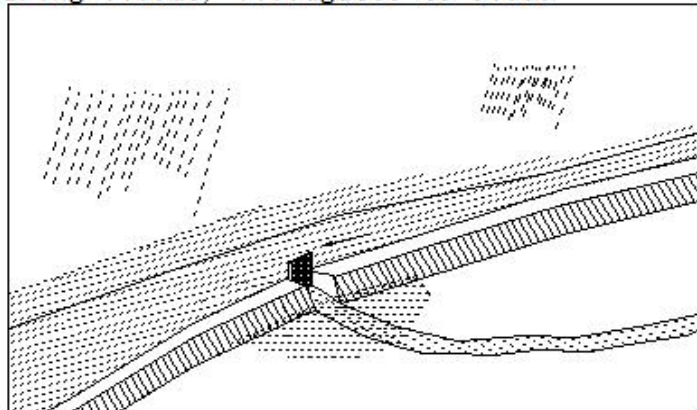
I1321

B: During floods, without floodgates



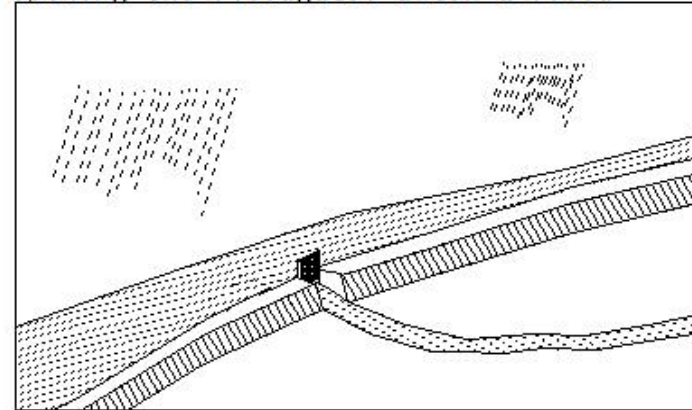
I1322

C: During floods, floodgates to close



I1323

D: Opening the floodgates after a flood



I1324

(I1326)Water gate

(I1326)Water gate

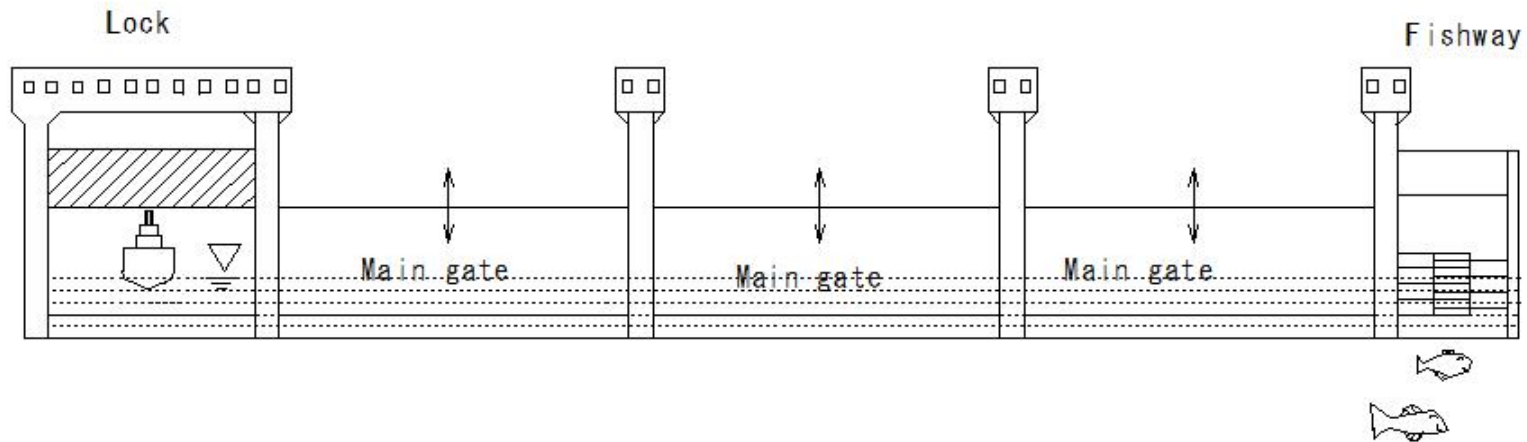
Lock: Ships pass through

Main gate: Gate is raised and lowered to adjust the amount of water flowing

Fishway: Fish pass through

Normal: Gate is raised

Flood: Lower the gate to prevent backflow



(I1327)Water gate

(I1327)Water gate

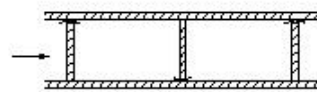
Lock: Ships pass through

Main gate: Gate is raised and lowered to adjust the amount of water flowing

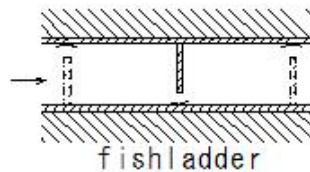
Fishway: Fish pass through

Normal: Gate is raised

Flood: Lower the gate to prevent backflow



fishladder R202

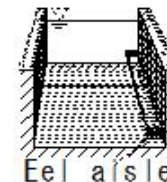


fishladder

Fish aisle



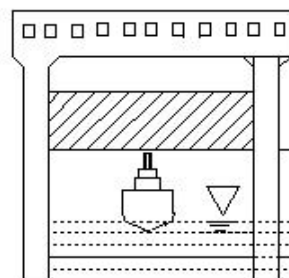
fishladder



Eel aisle

R345
I438

Lock



Main gate



Main gate



Main gate

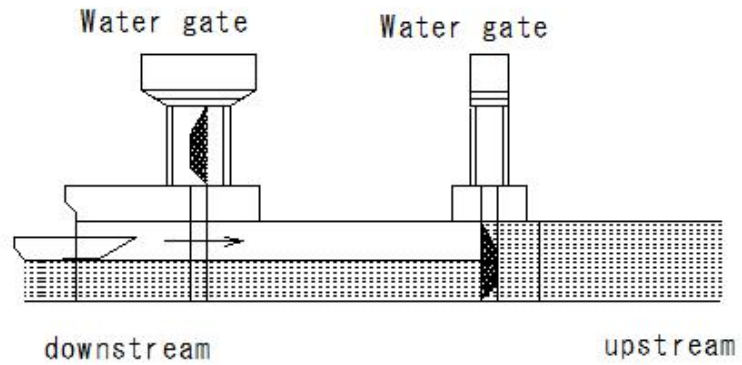
Fishway



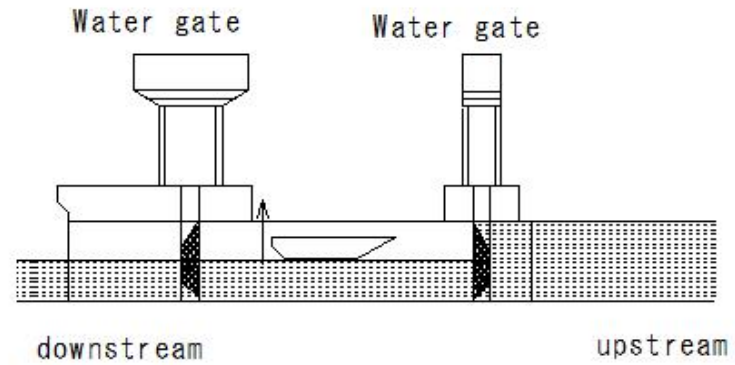
(I1328)Water gate

lock gate

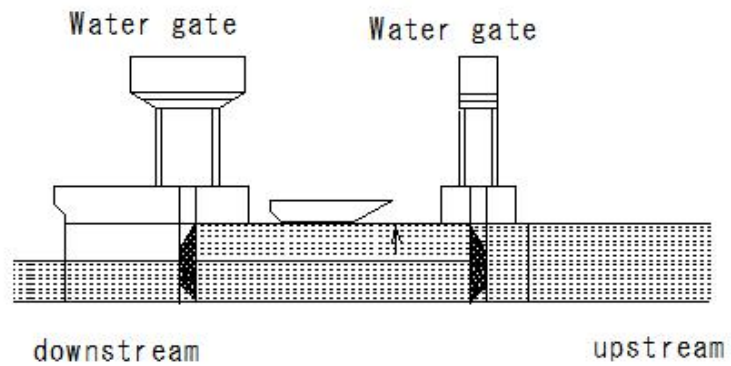
①



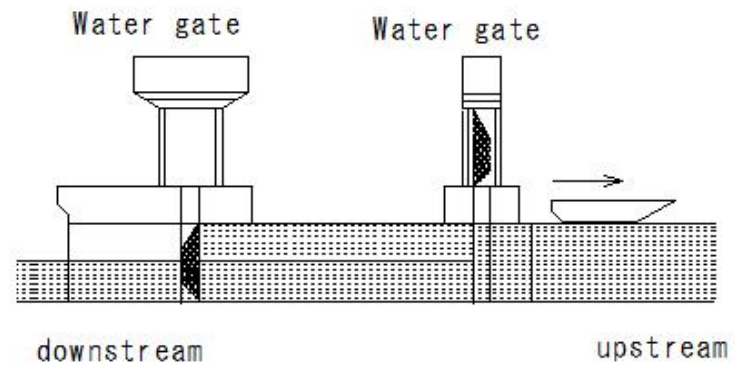
②



③



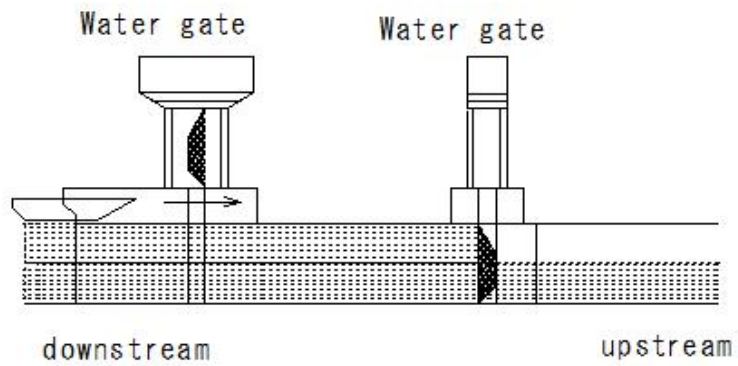
④



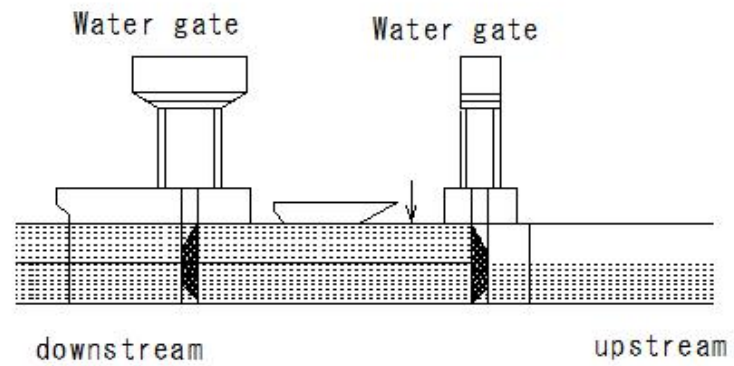
(I1329)Water gate

lock gate

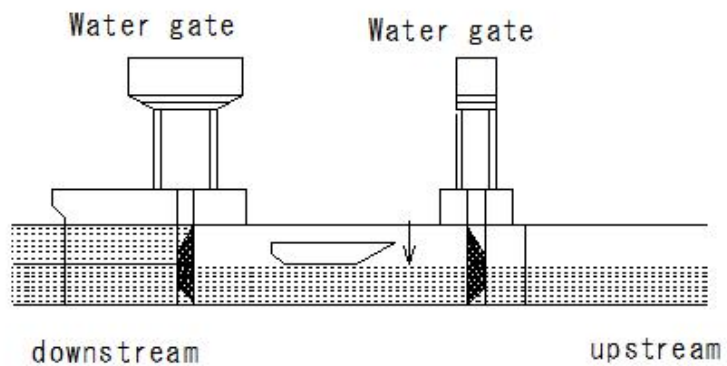
①



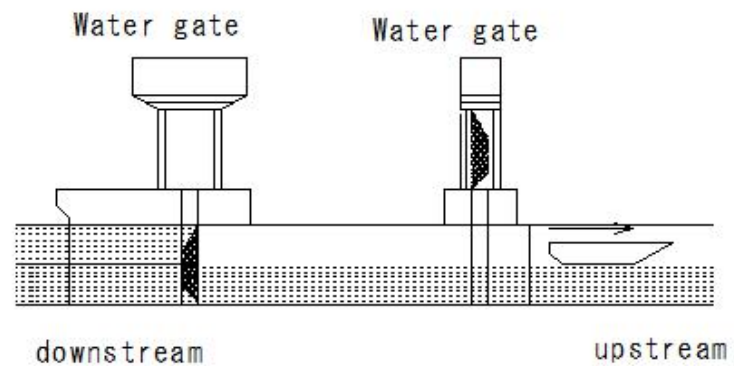
②



③



④



(I1330)Water gate

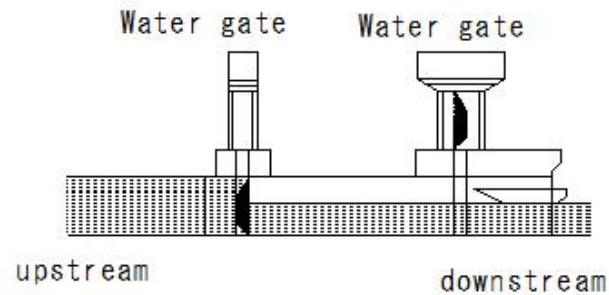
(I1330)Water gate

Lock: Ships pass through

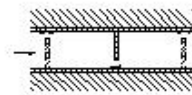
Main gate: Gate is raised and lowered to adjust the amount of water flowing

Fishway: Fish pass through

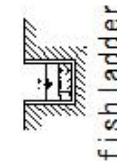
lock gate



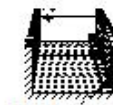
Fish aisle



fishladder



fishladder

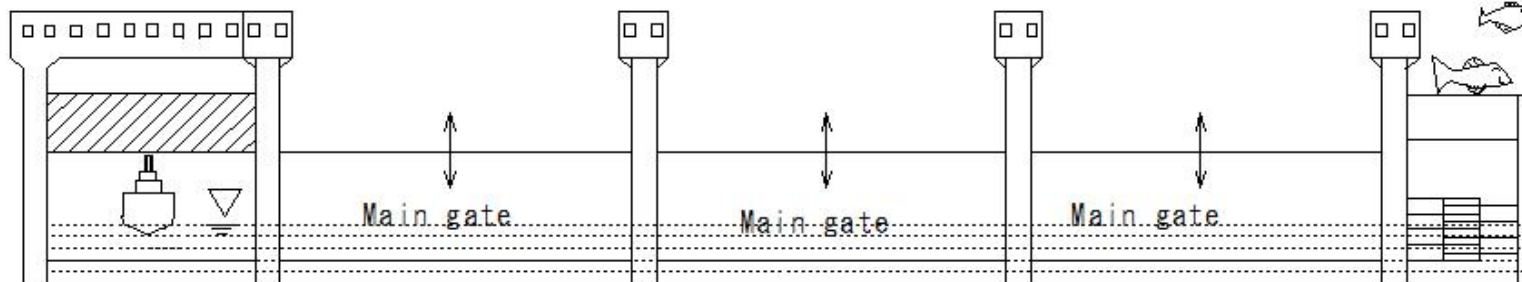


Eel aisle

R345

I438

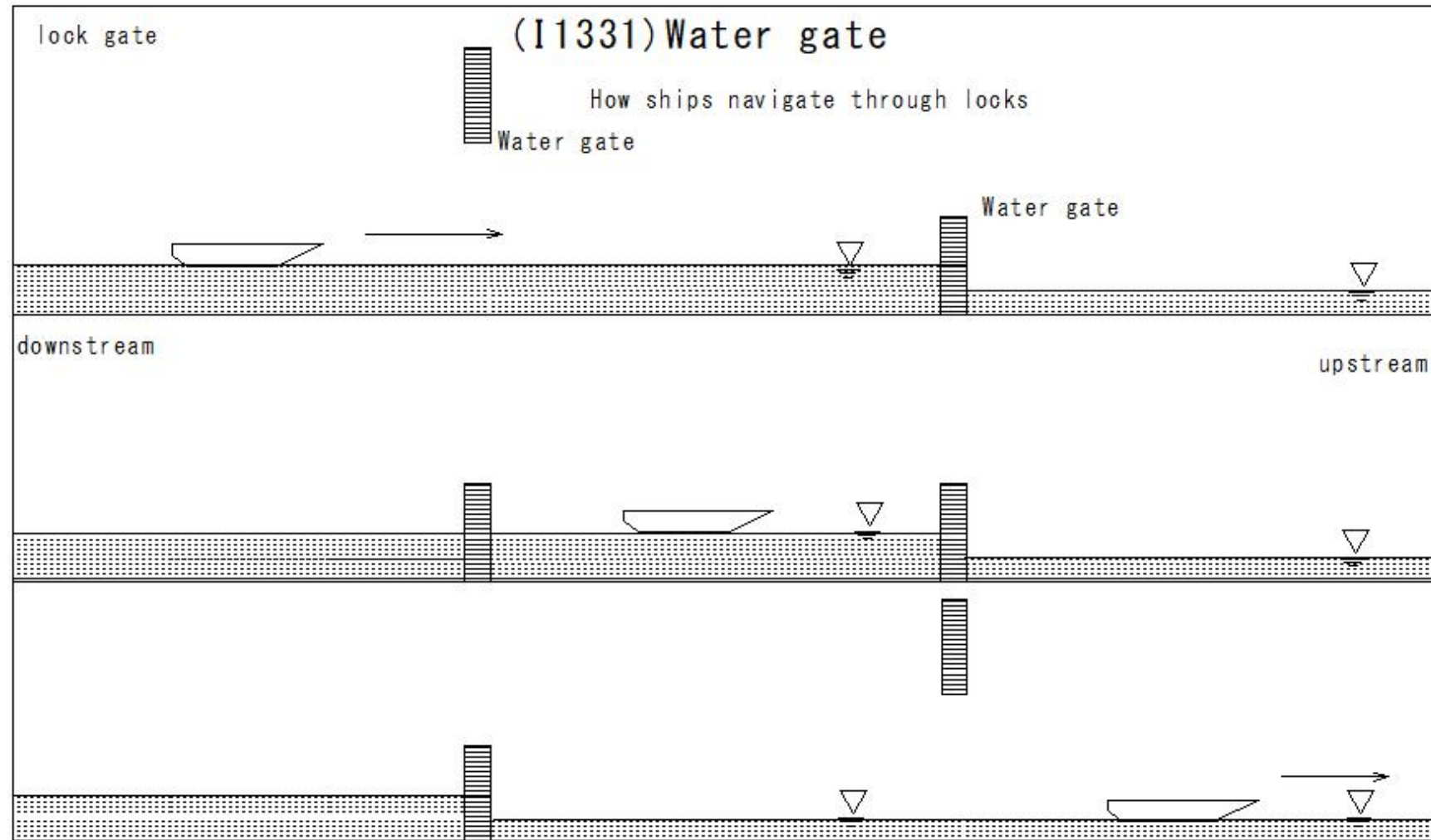
Lock



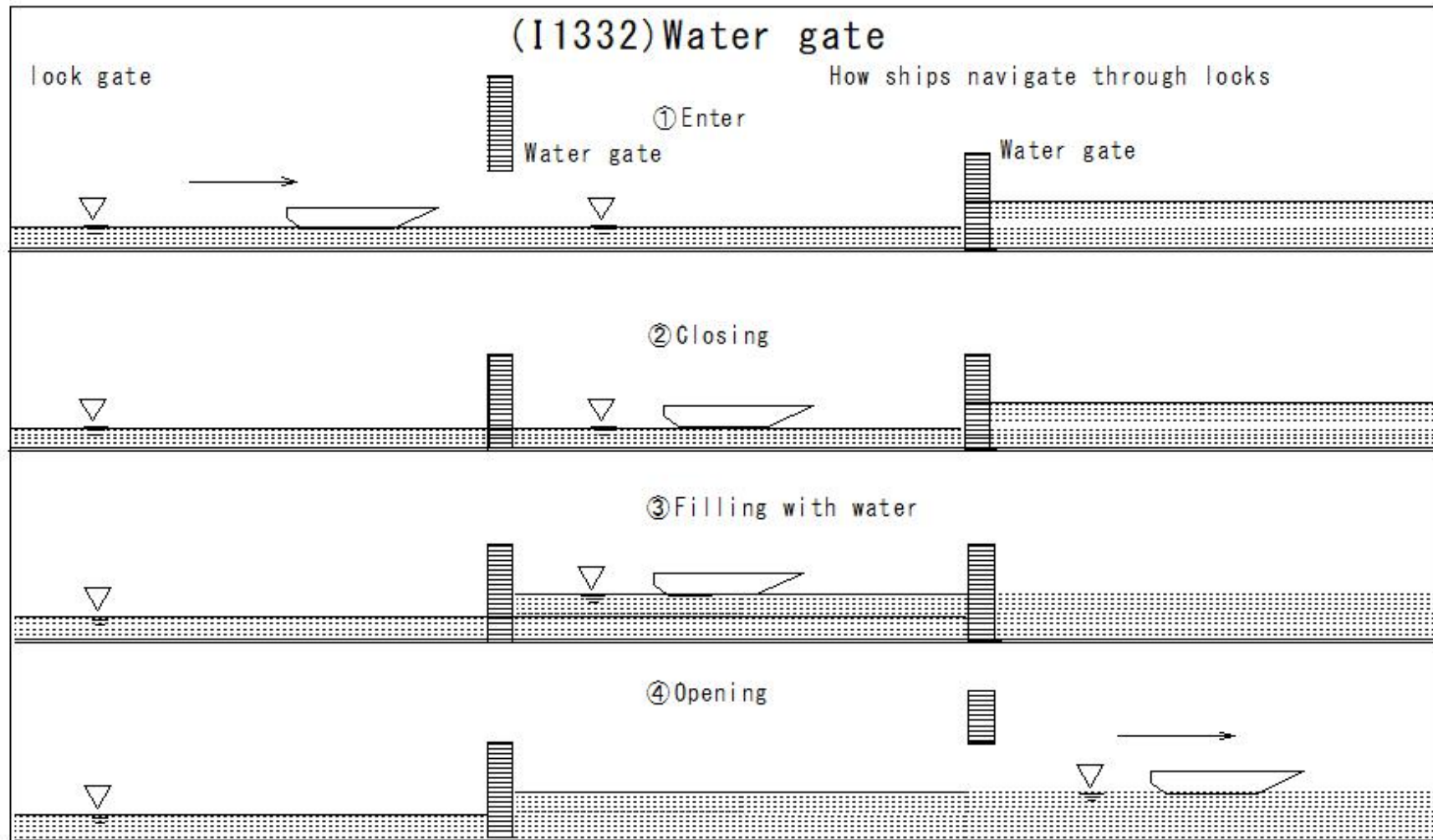
Fishway

I1327

(I1331)Water gate



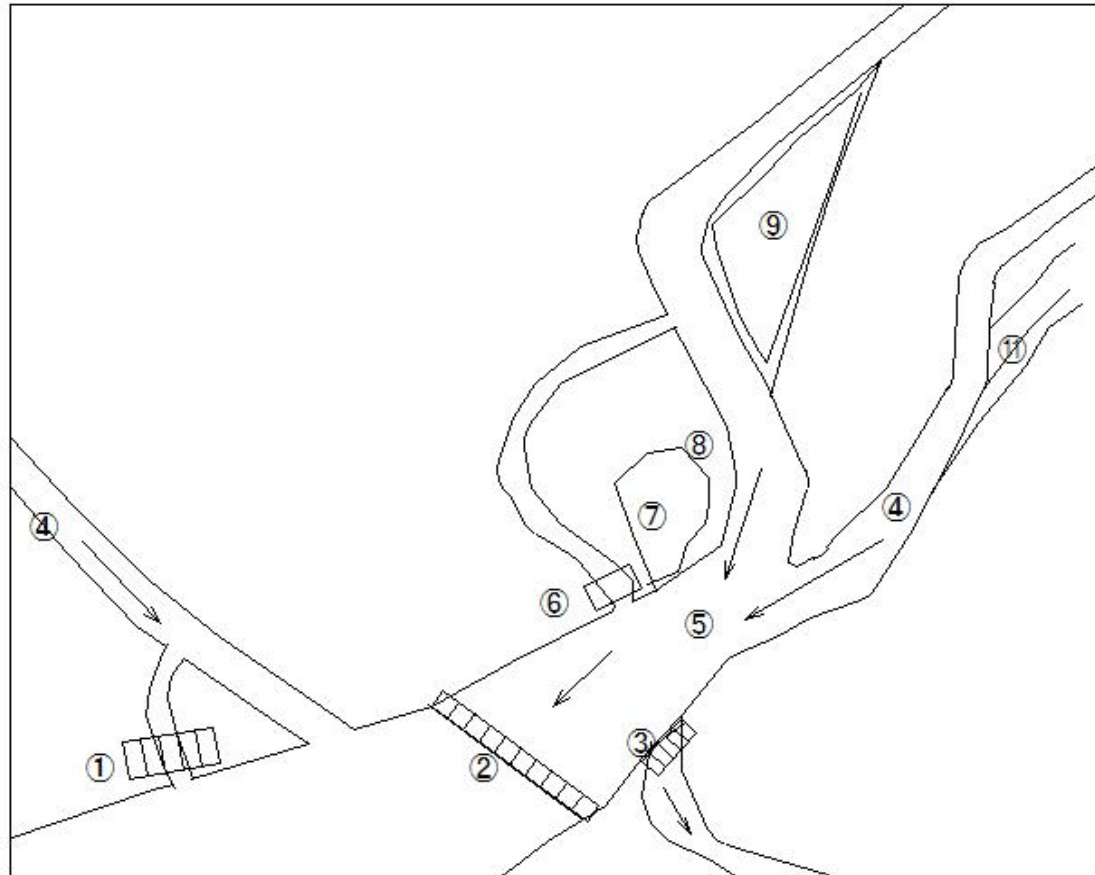
(I1332)Water gate



(I1333)Water gate

(I1333)Water gate

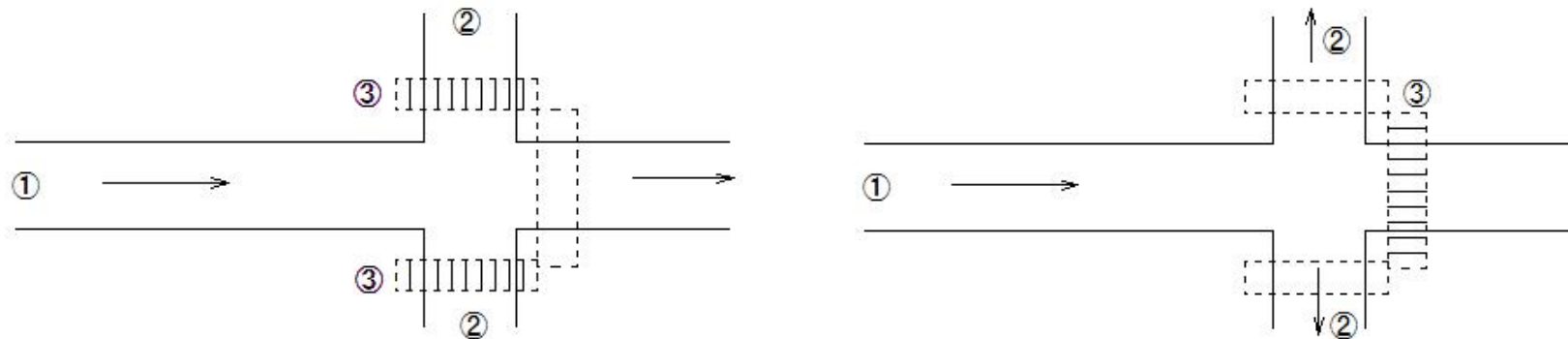
- ① Drainage pump station
- ② Weir
- ③ Floodgate
- ④ Branch river
- ⑤ Main river
- ⑥ Sluice gate
- ⑦ Retarding pond (regulating pond)
- ⑧ Overflow
- ⑨ Circle levee
- ⑩ Tributary river
- ⑪ Open levee



(I1334)Water gate

(I1334)Water gate

- ① Rivers
- ② Agricultural irrigation channels
- ③ Water gates
- ④ Open and close multiple combined water gates to take in water only when needed
- ⑤ Install water gates on rivers - obtain a stable amount of water



(I1335)Water gate

(I1335)Water gate

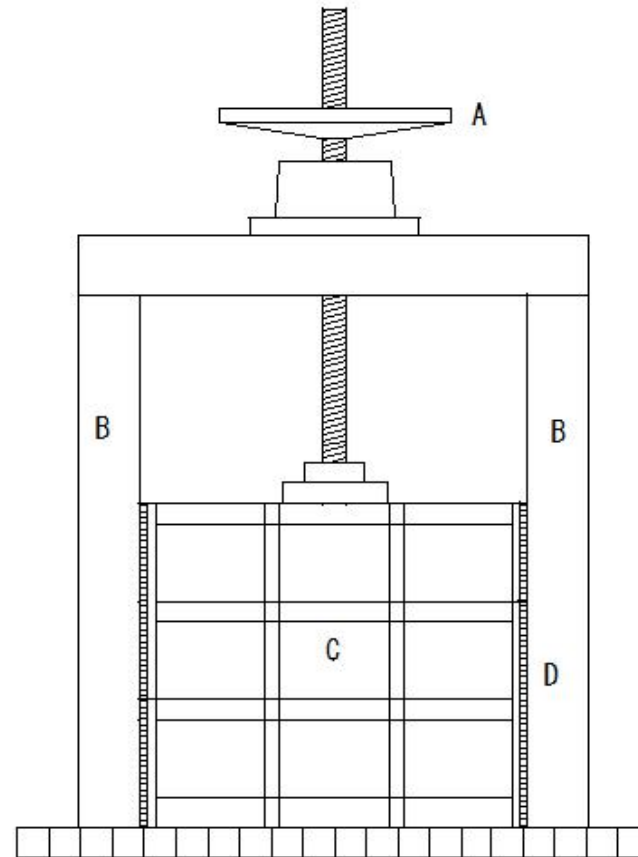
Water gate (gate)

A: Winding mechanism

B: Door stop

C: Gate body

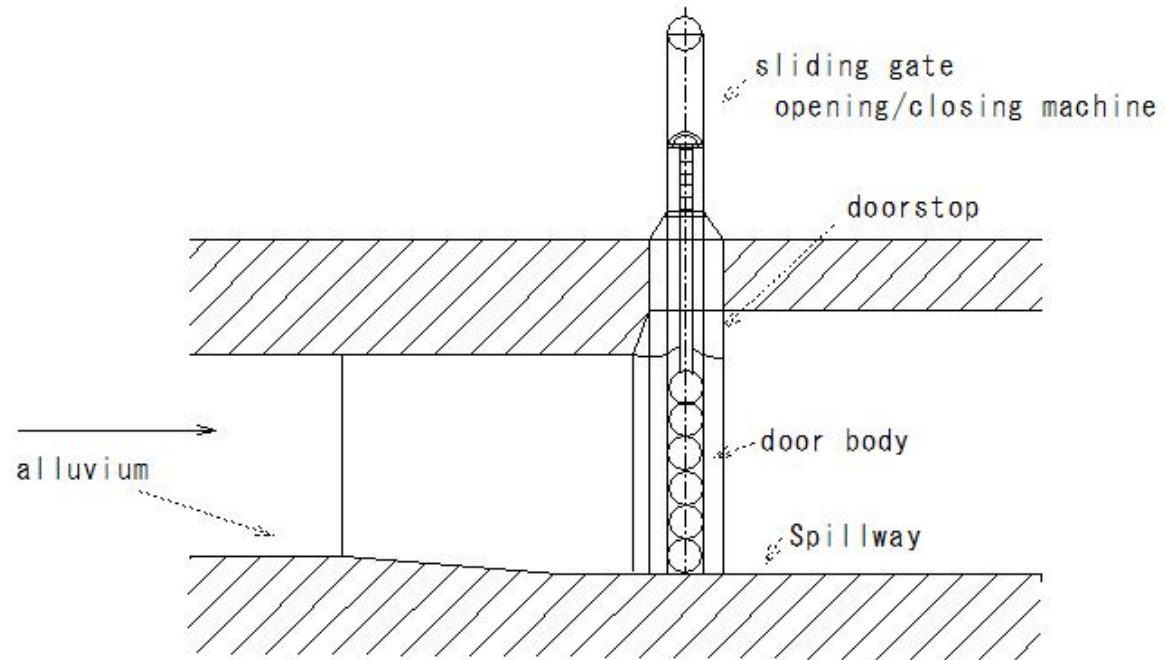
D: Watertight rubber



(I1336)Water gate

(I1336) Water gate

jet flow gate

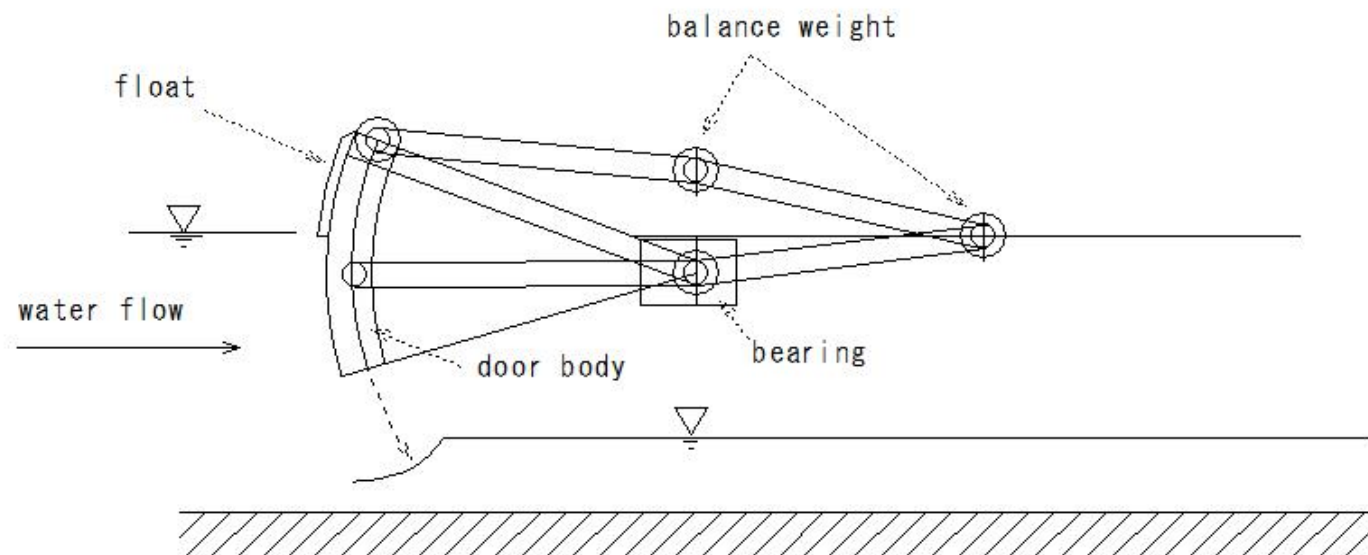


jet flow gate

(I1337)Water gate

(I1337)Water gate

automatic cross regulator



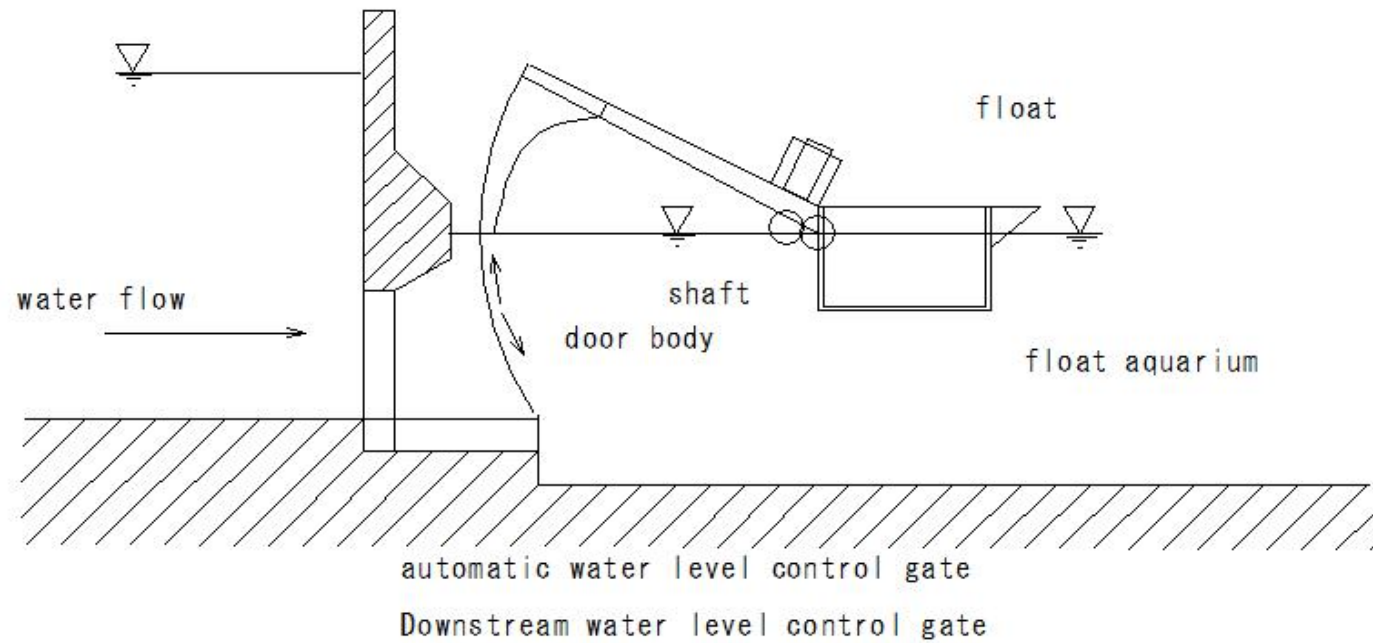
automatic water level control gate

automatic cross regulator

(I1338)Water gate

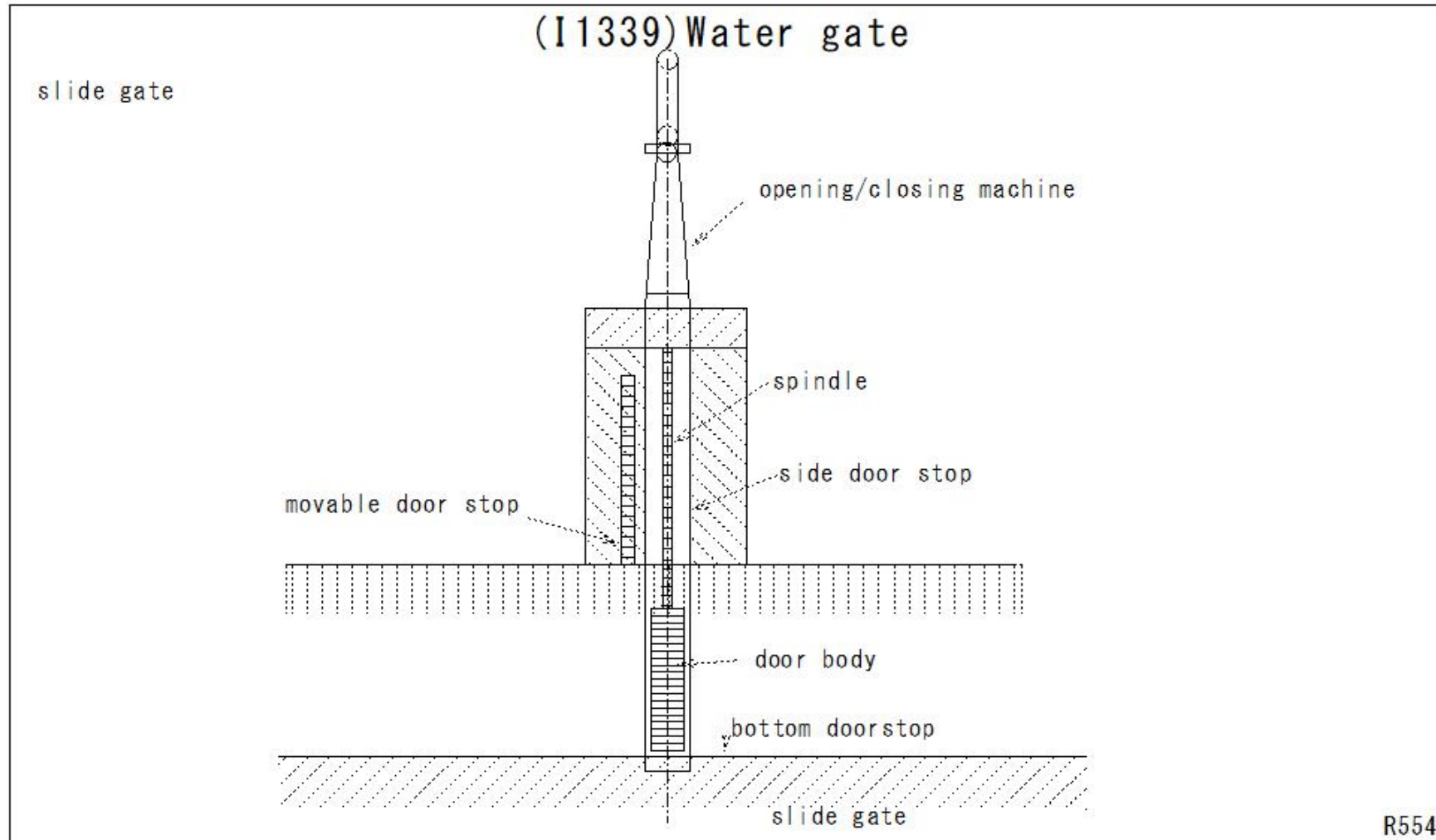
(I1338) Water gate

automatic cross regulator



R546

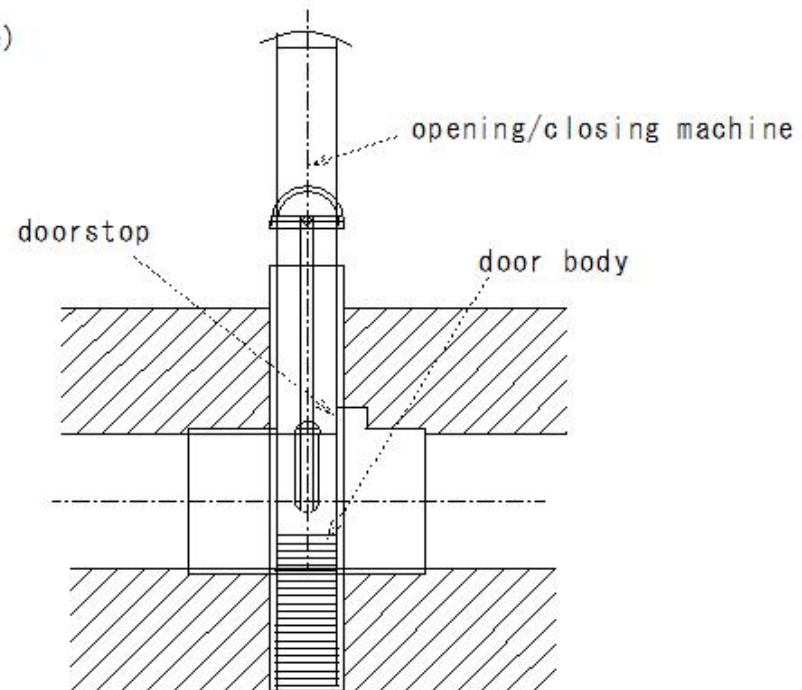
(I1339)Water gate



(I1340)Water gate

(I1340) Water gate

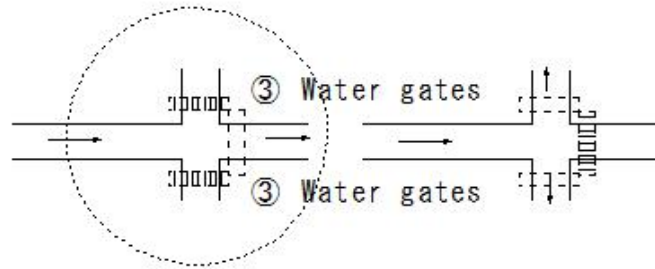
fixed wheel gate(roller gate)



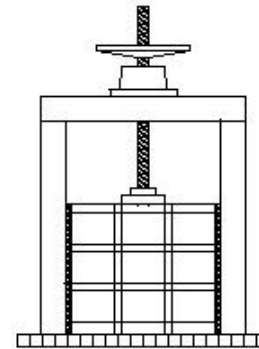
ring seal gate(roller gate)

(I1341)Water gate

(I1341) Water gate

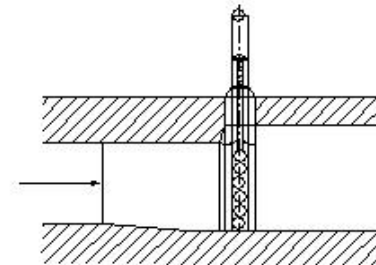


I1334



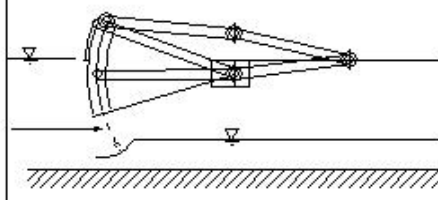
I1335

jet flow gate

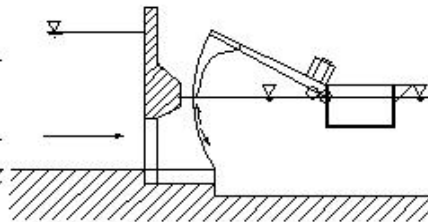


R544
I1336

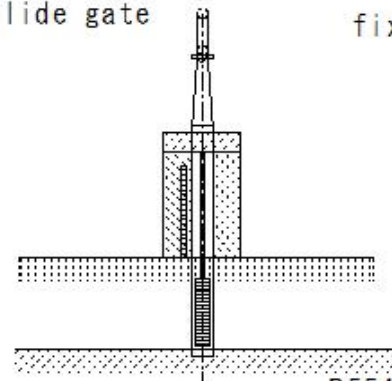
automatic cross regulator automatic cross regulator slide gate



R545
I1337

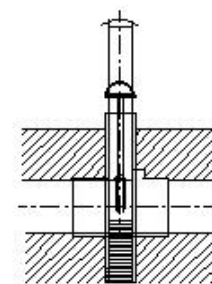


R546
I1338



R554
I1339

fixed wheel gate(roller gate)

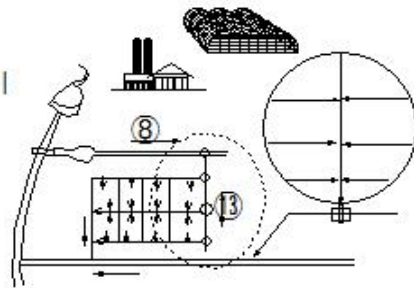


R600
I1340

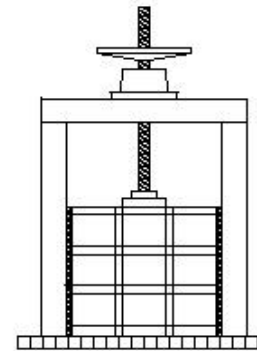
(I1342)Water gate

(I1342)Water gate

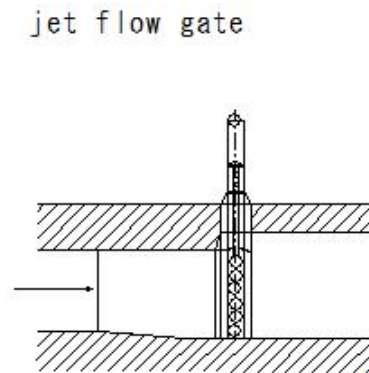
- ⑧ Main irrigation channel
⑬ Branch irrigation channel



I334

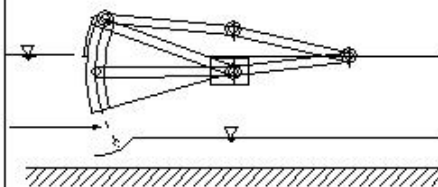


I1335

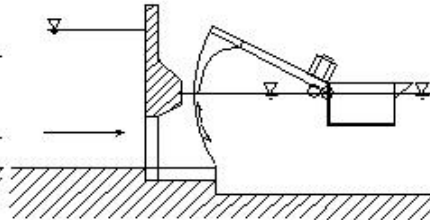


R544
I1336

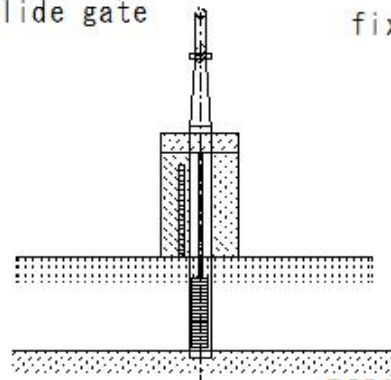
automatic cross regulator automatic cross regulator slide gate



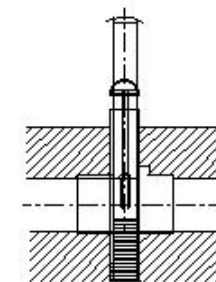
R545
I1337



R546
I1338



R554
I1339

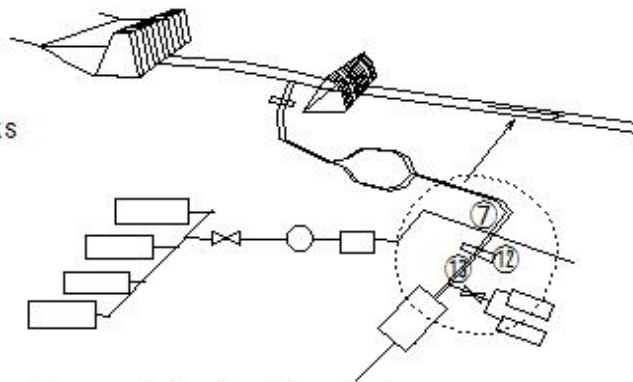


R600
I1340

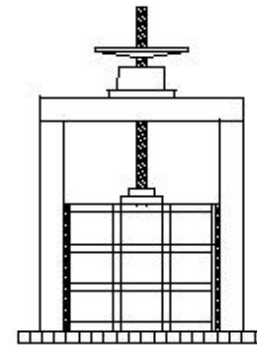
(I1343)Water gate

(I1343)Water gate

- ⑦ Diversion works
- ⑫ Check gate
- ⑬ Main channel

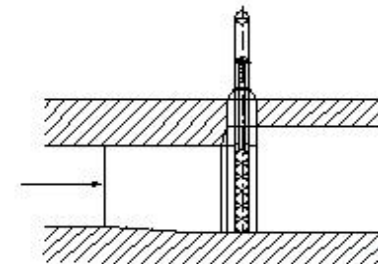


Flow of irrigation water I854



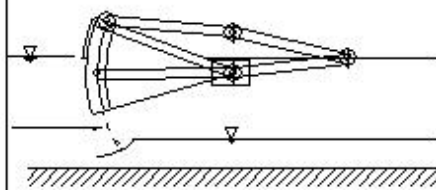
I1335

jet flow gate

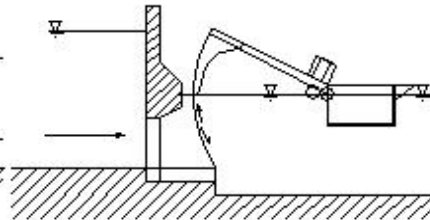


R544
I1336

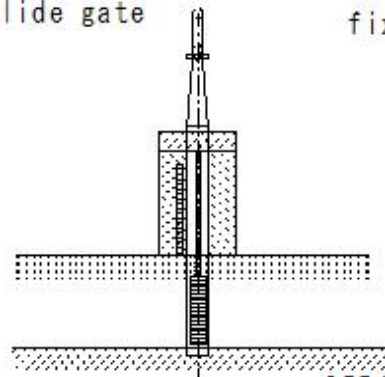
automatic cross regulator automatic cross regulator slide gate



R545
I1337

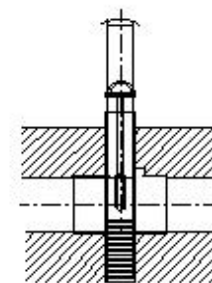


R546
I1338



R554
I1339

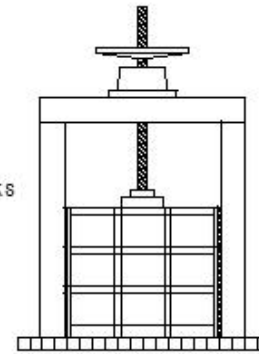
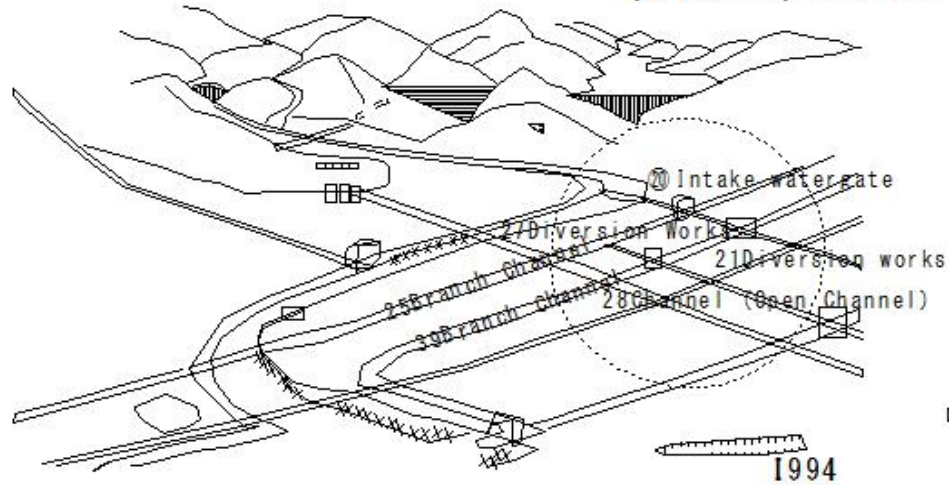
fixed wheel gate(roller gate)



R600
I1340

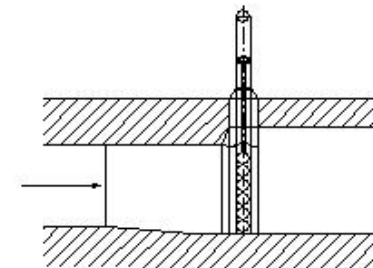
(I1344)Water gate

(I1344)Water gate



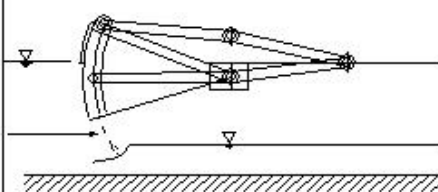
I1335

jet flow gate

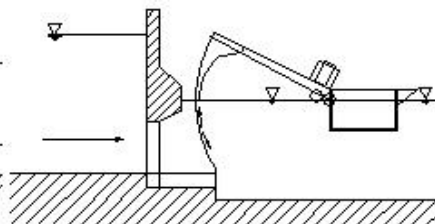


R544
I1336

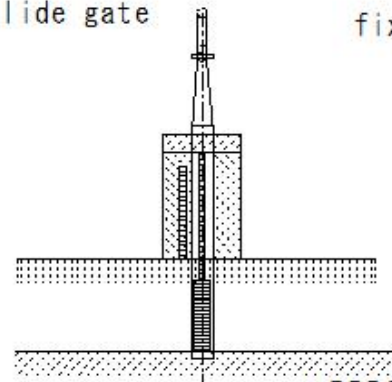
automatic cross regulator automatic cross regulator slide gate



R545
I1337

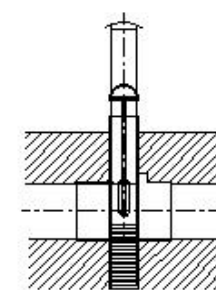


R546
I1338



R554
I1339

fixed wheel gate(roller gate)

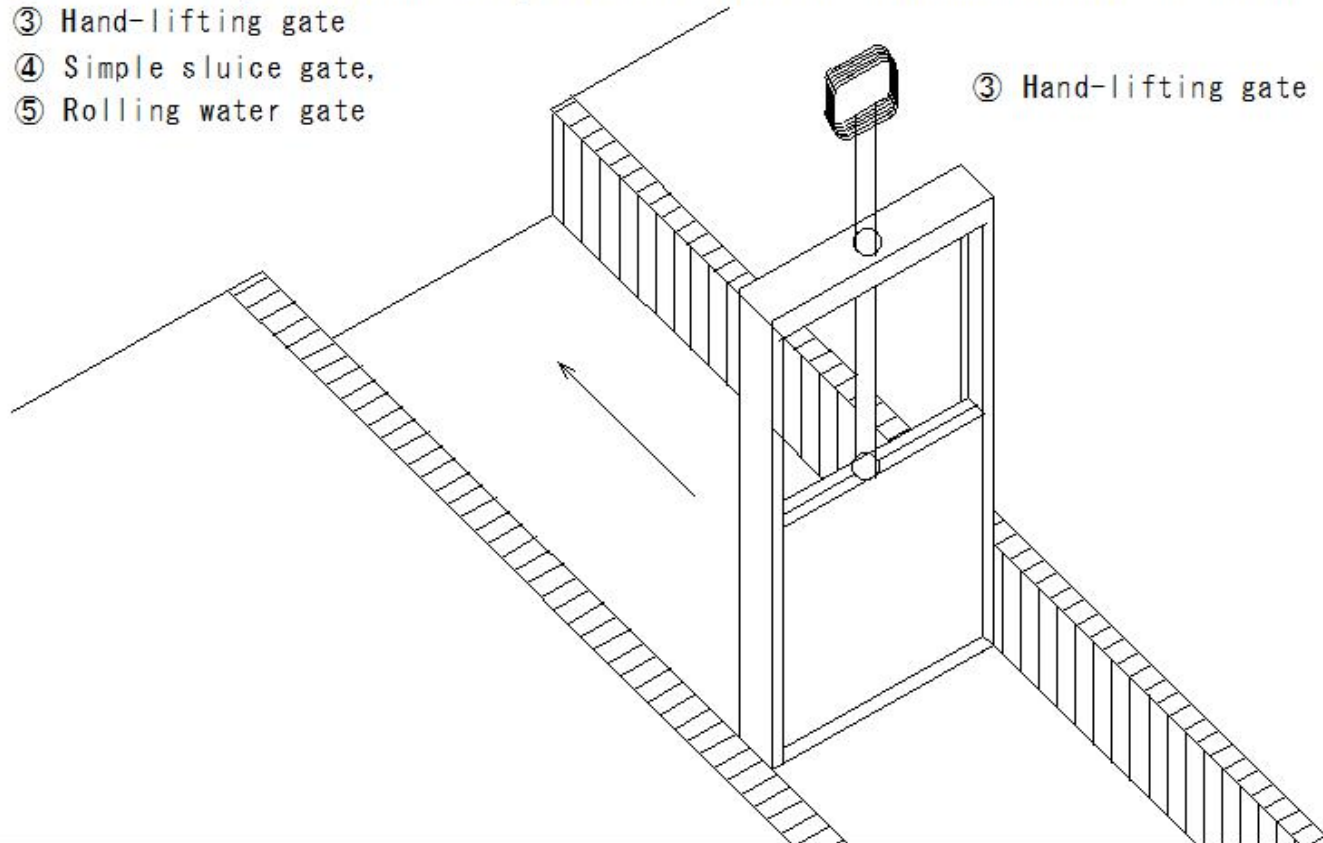


R600
I1340

(I1345)Water gate

(I1345) Water gate

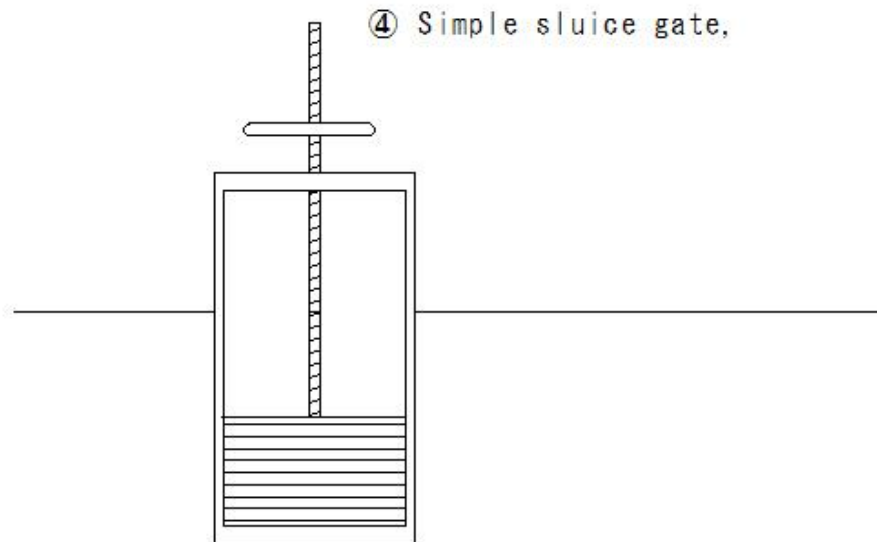
- ① A water gate installed in an irrigation channel for agricultural use
- ② It is mainly intended to regulate the amount of water and block the channel
- ③ Hand-lifting gate
- ④ Simple sluice gate,
- ⑤ Rolling water gate



(I1346)Water gate

(I1346) Water gate

- ① A water gate installed in an irrigation channel for agricultural use
- ② It is mainly intended to regulate the amount of water and block the channel
- ③ Hand-lifting gate
- ④ Simple sluice gate,
 - Water use and water stoppage for agricultural irrigation channels
 - Simple structure
- ⑤ Rolling water gate

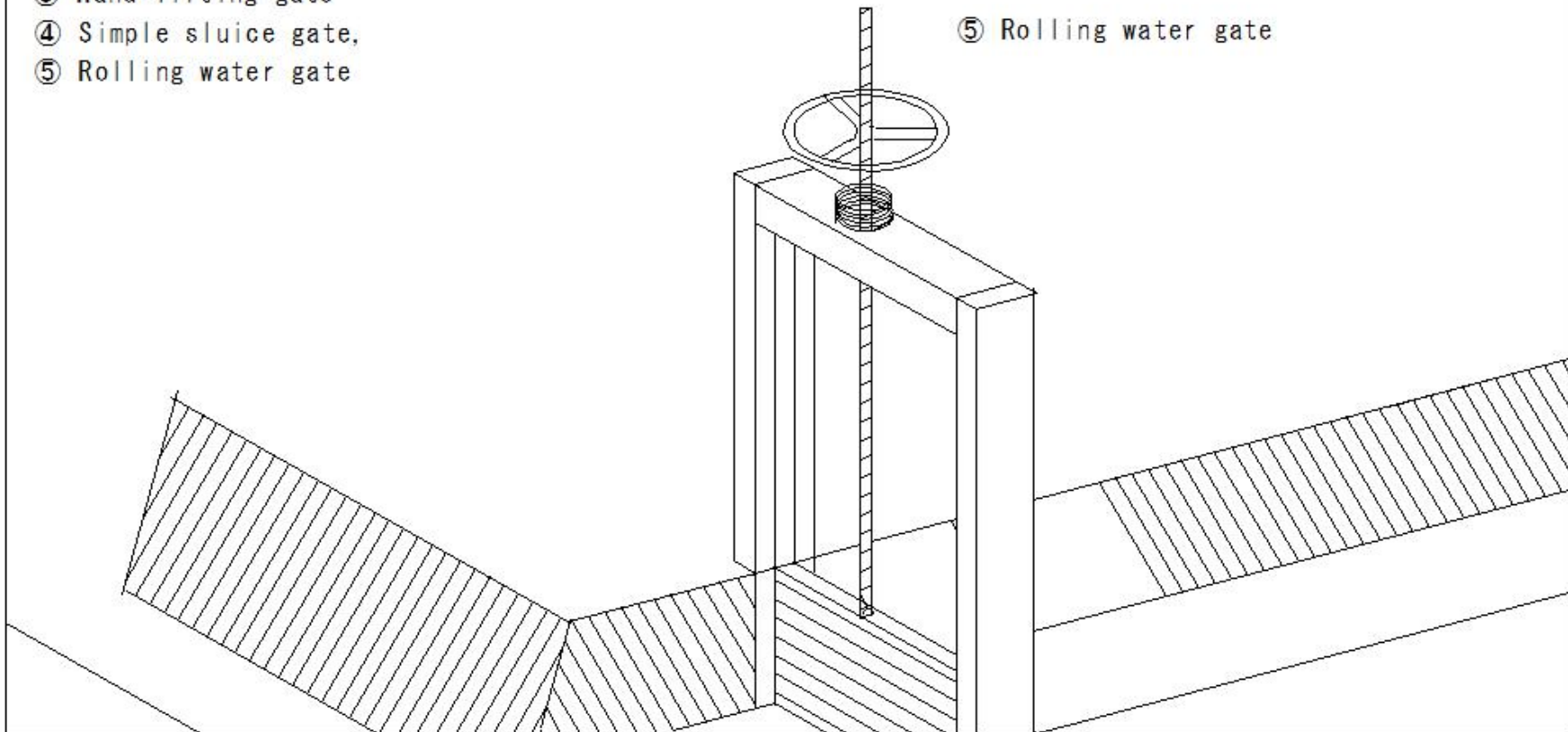


(I1347)Water gate

(I1347) Water gate

- ① A water gate installed in an irrigation channel for agricultural use
- ② It is mainly intended to regulate the amount of water and block the channel
- ③ Hand-lifting gate
- ④ Simple sluice gate,
- ⑤ Rolling water gate

⑤ Rolling water gate

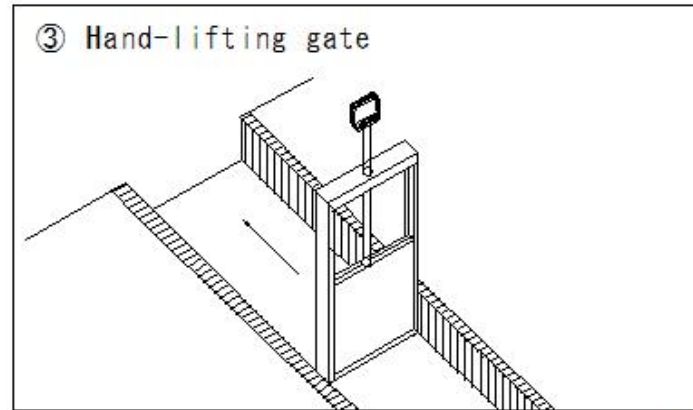


(I1348)Water gate

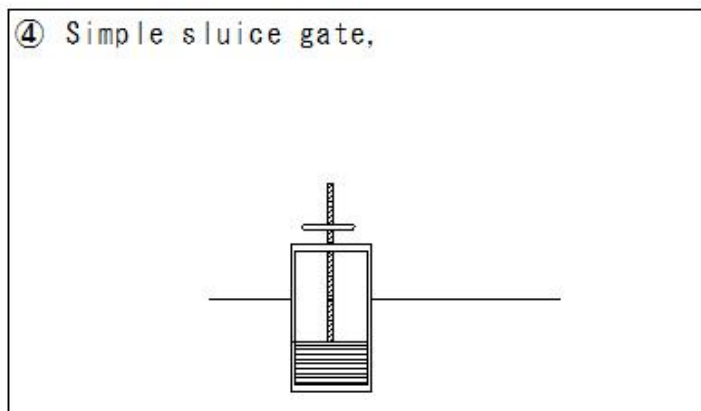
(I1348) Water gate



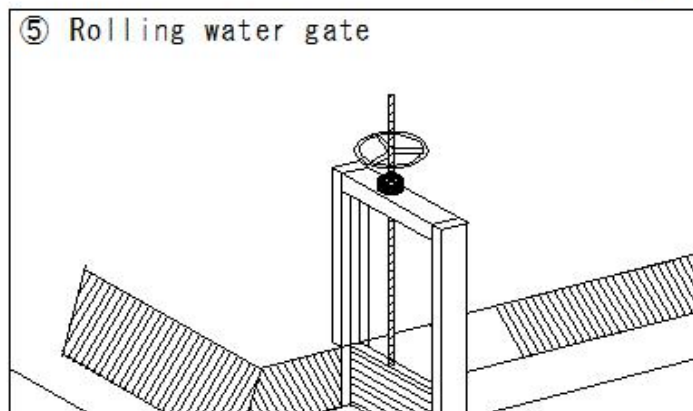
I 984



I1345



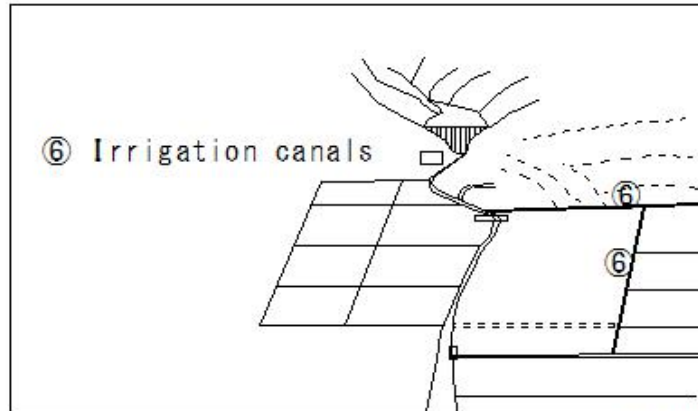
I1346



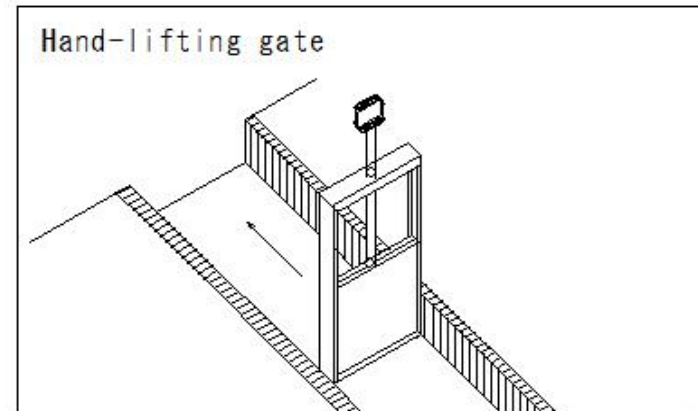
I1347

(I1349)Water gate

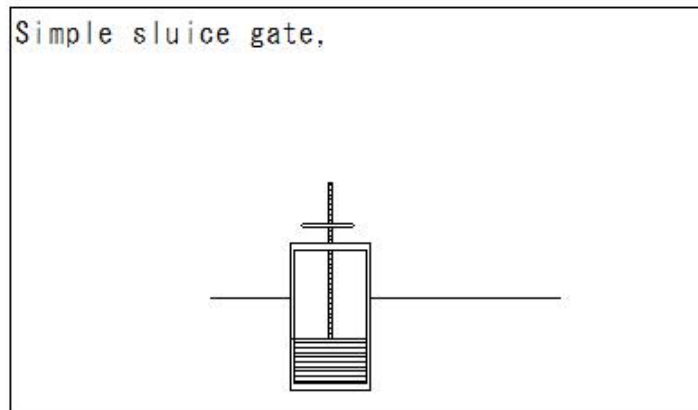
(I1349) Water gate



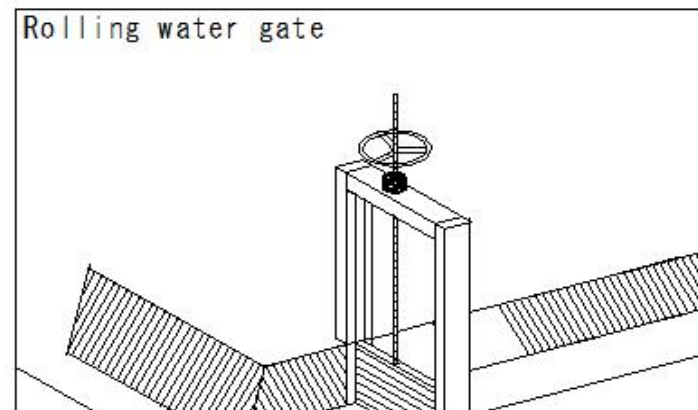
I029



I1345



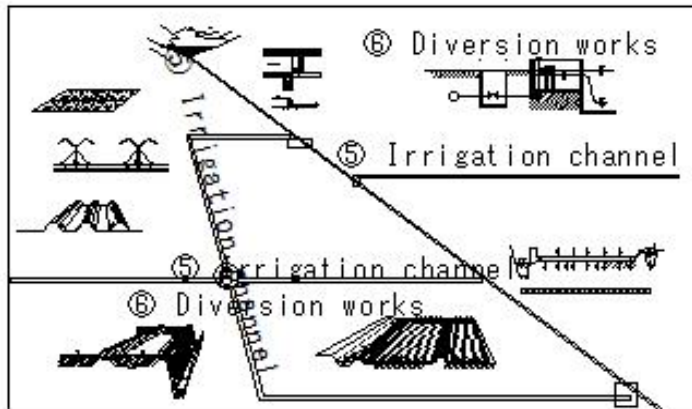
I1346



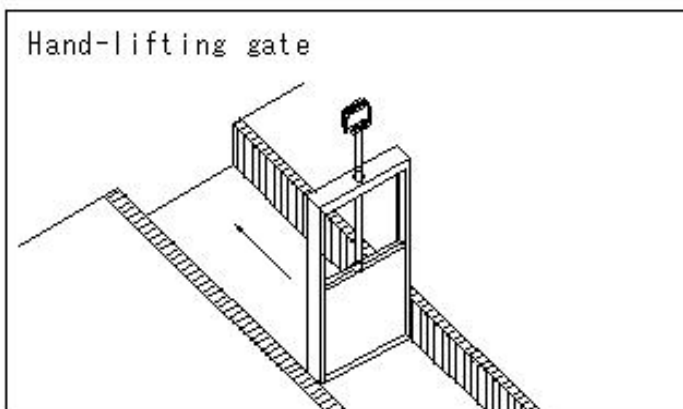
I1347

(I1350)Water gate

(I1350) Water gate

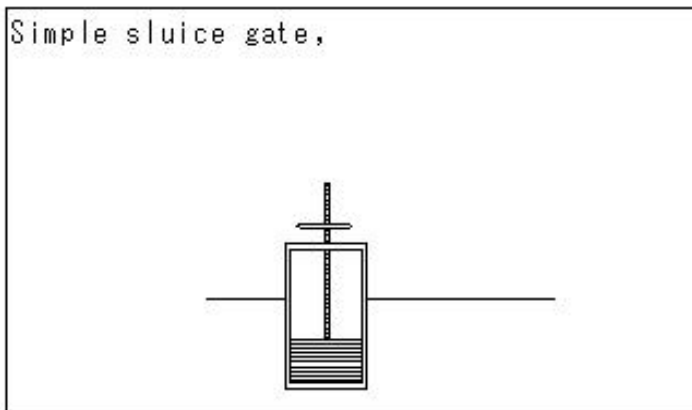


I044



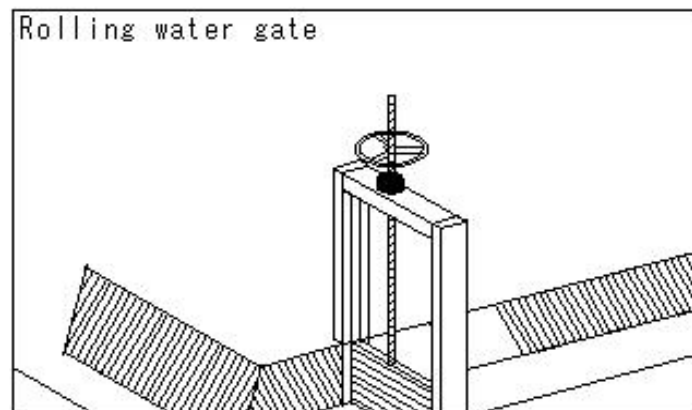
I1345

Simple sluice gate,



I1346

Rolling water gate



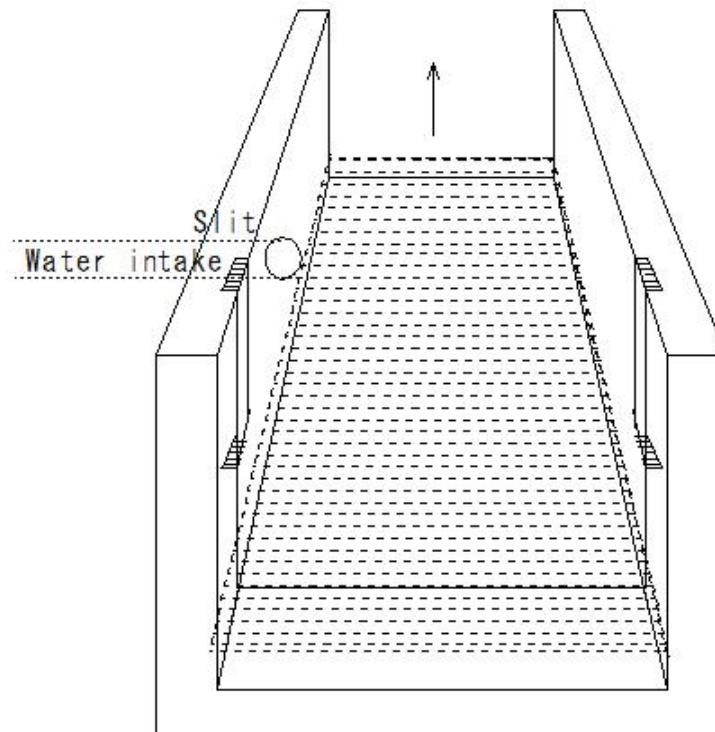
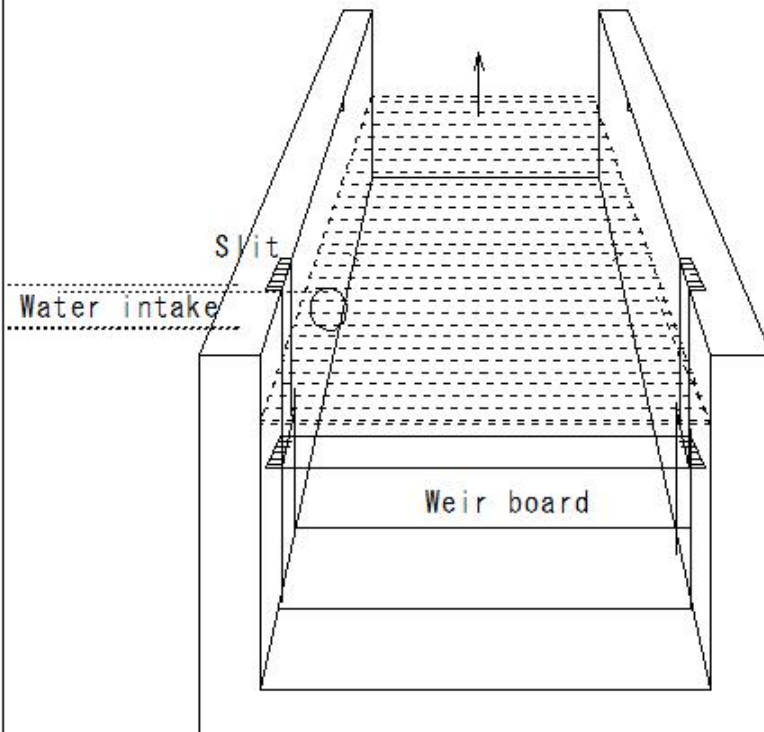
I1347

(I1351)Water gate

(I1351) Water gate

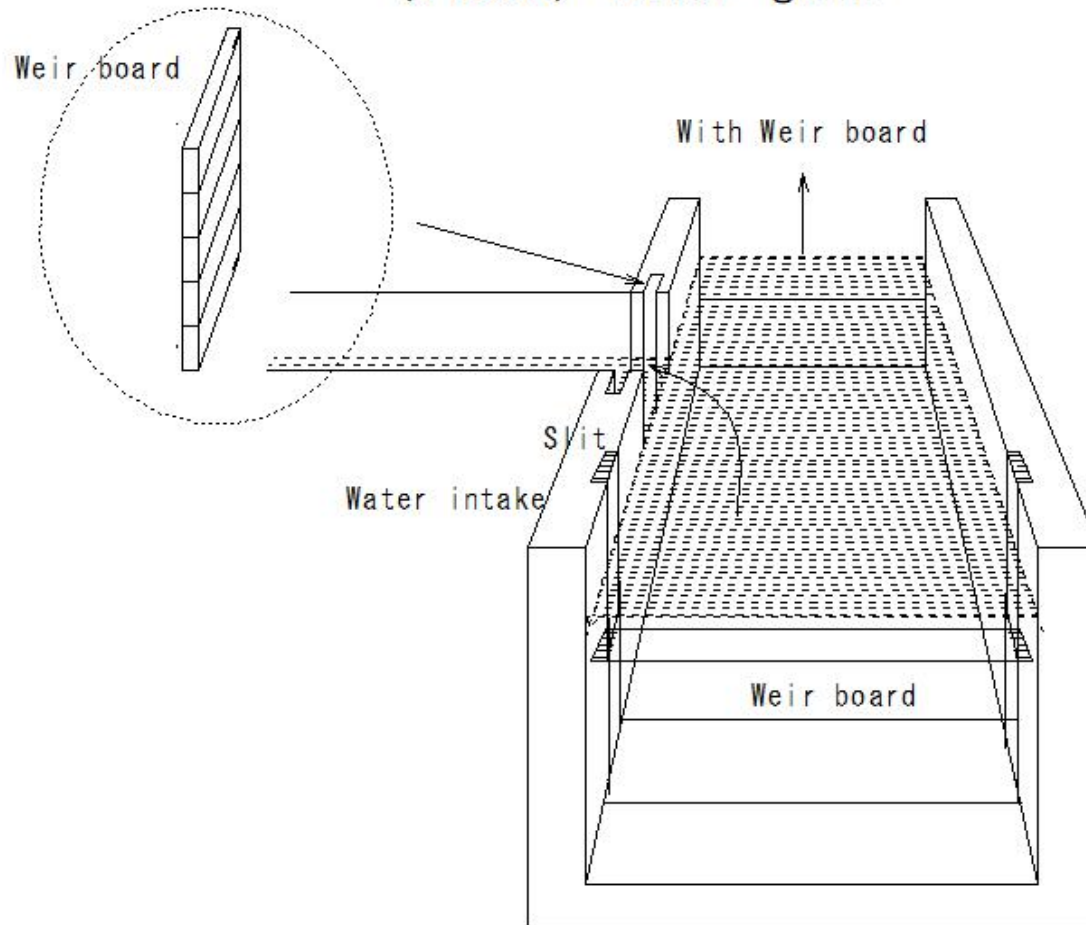
With Weir board

Without Weir board



(I1352)Water gate

(I1352) Water gate

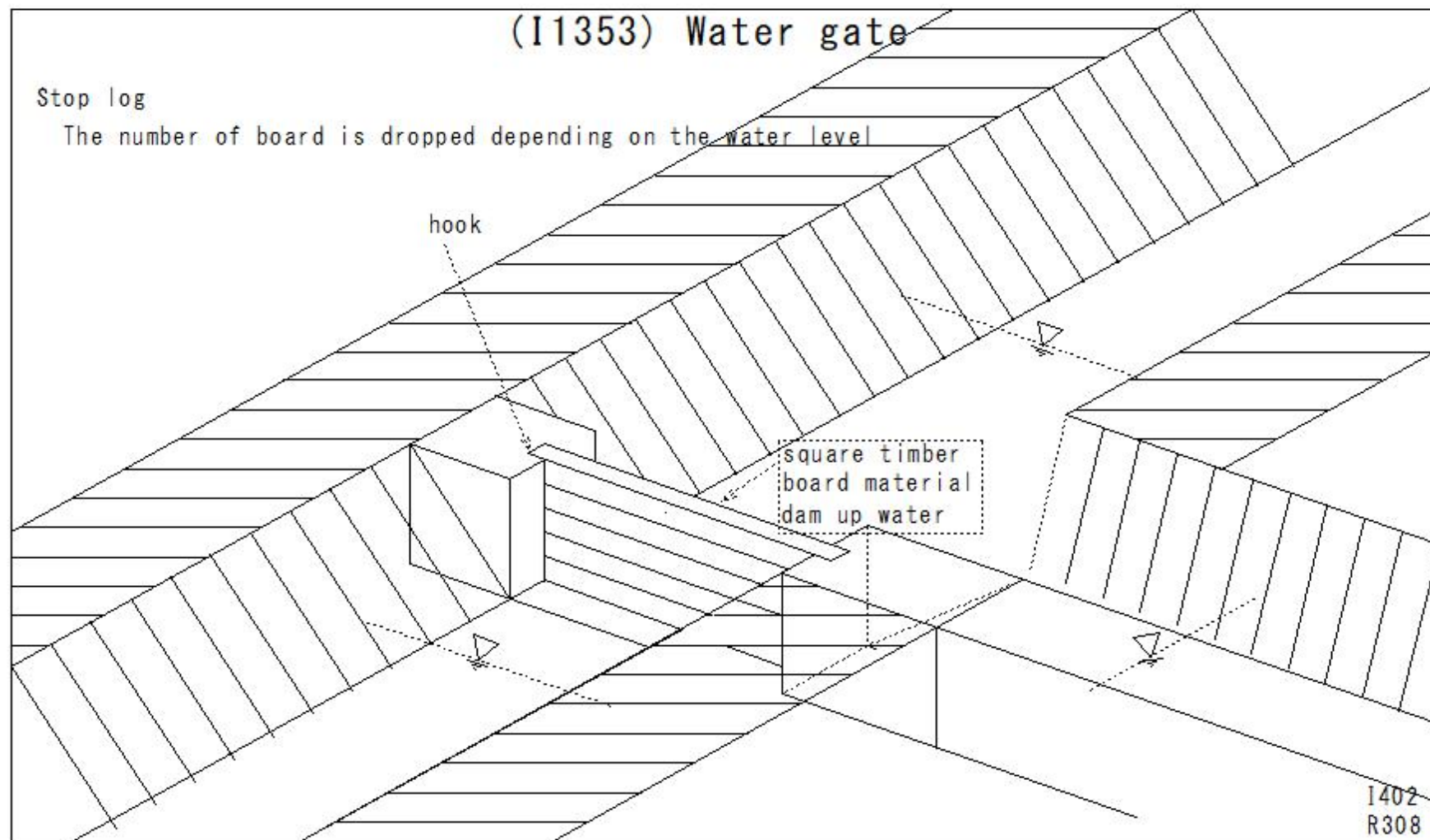


(I1353)Water gate

(I1353) Water gate

Stop log

The number of board is dropped depending on the water level



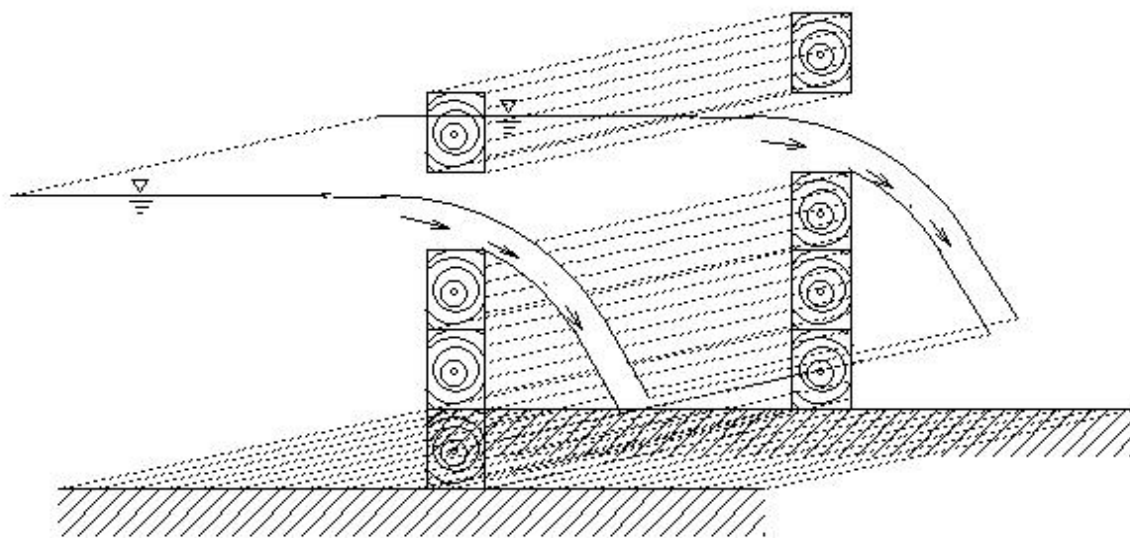
(I1354)Water gate

(I1354) Water gate

Movable weir

①stop log

adjust discharge

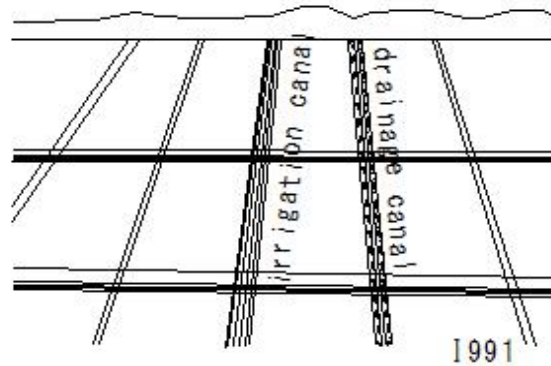


①stop log

R329
I421

(I1355)Water gate

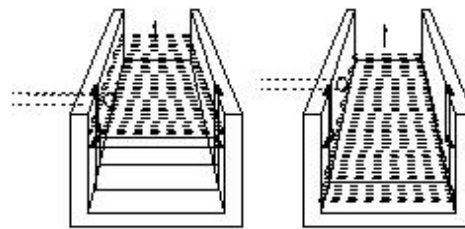
(I1355) Water gate



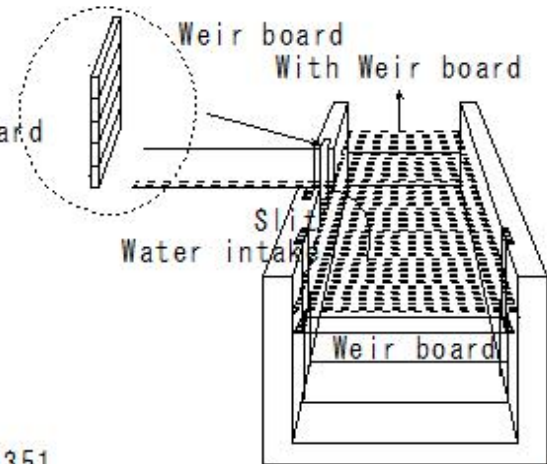
1991

With Weir board

Without Weir board



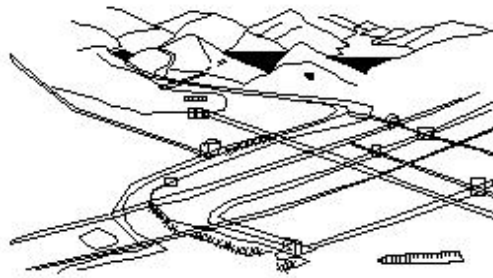
I1351



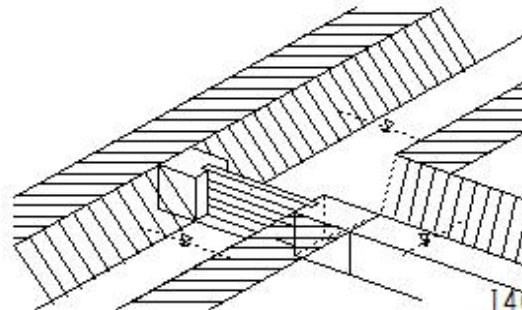
I1352

Stop log

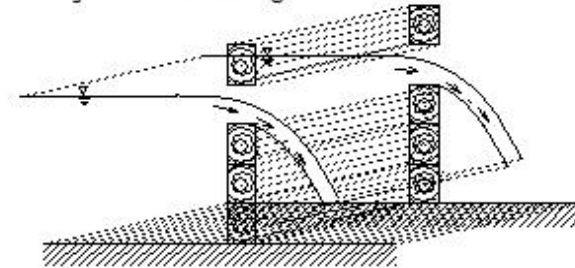
① stop log
adjust discharge



1994



1402
R308
I1353

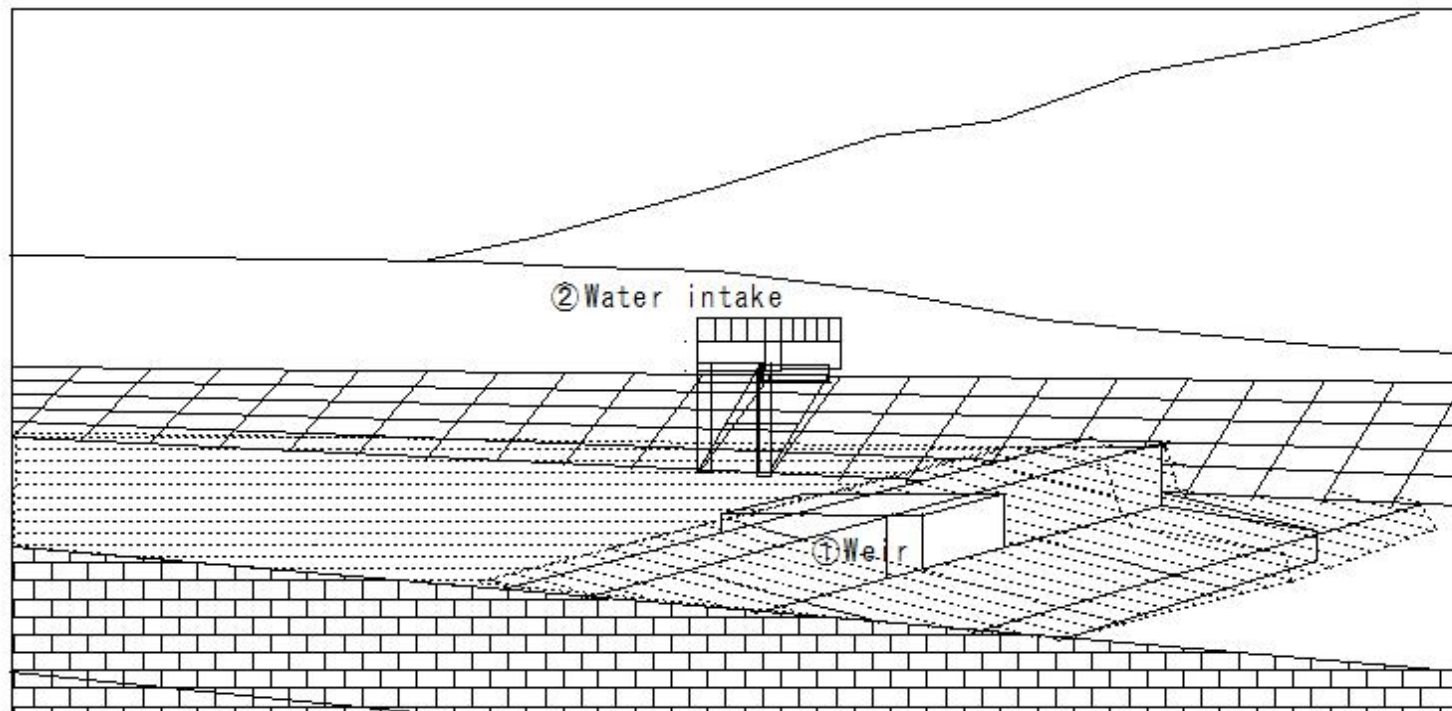


① stop log

R329
1421
I1354

(I1356)Headwork

(I1356) Headwork



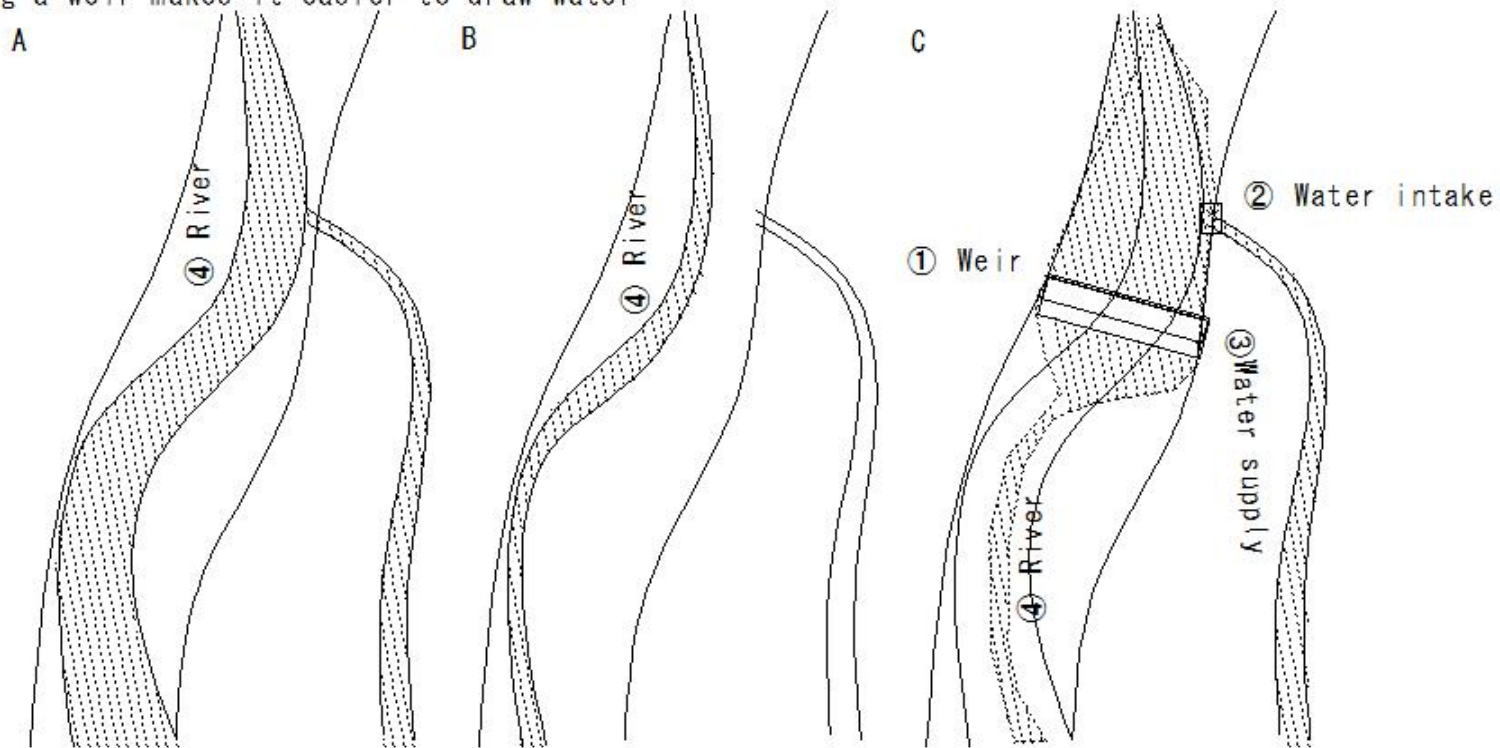
(I1357)Headwork

(I1357) Headwork

A:Drawing water from the river

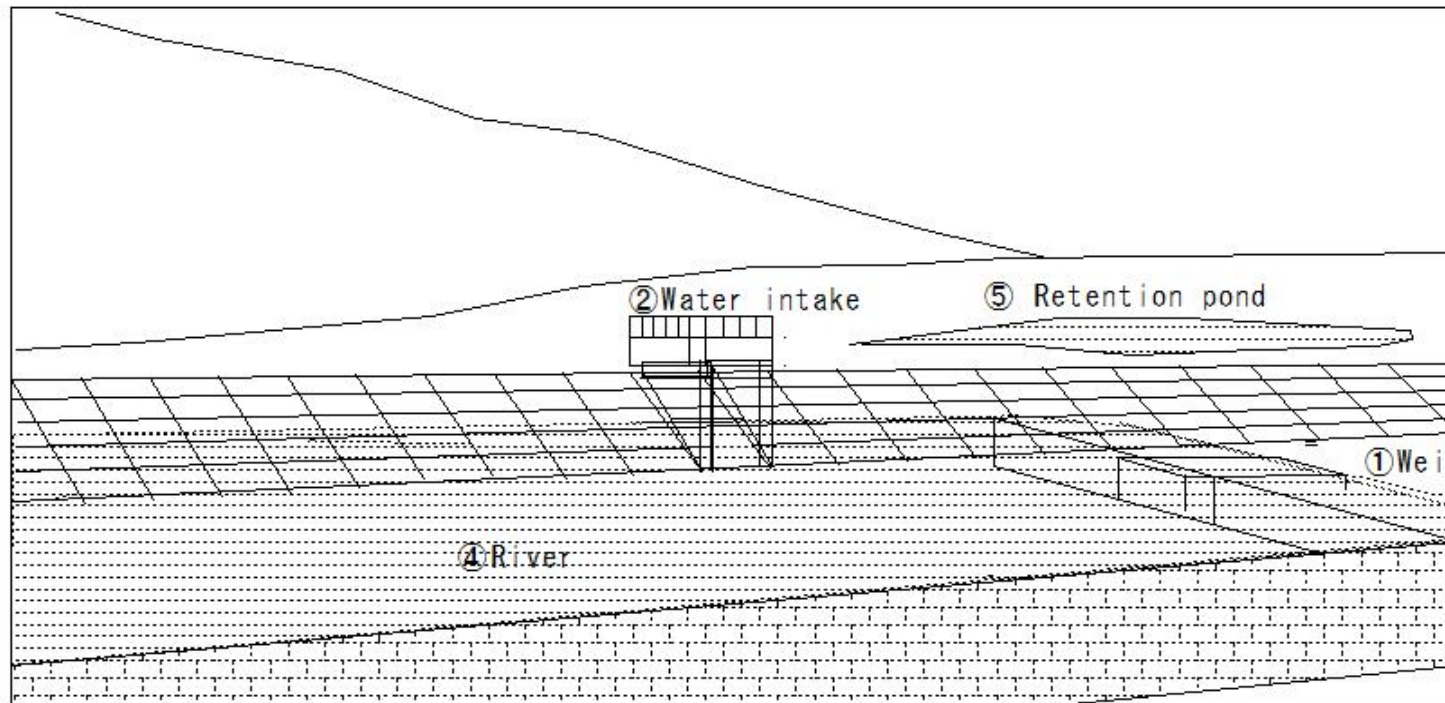
B:In case of there is little water, water cannot be drawn if the flow changes

C:Building a weir makes it easier to draw water



(I1358)Headwork

(I1358) Headwork

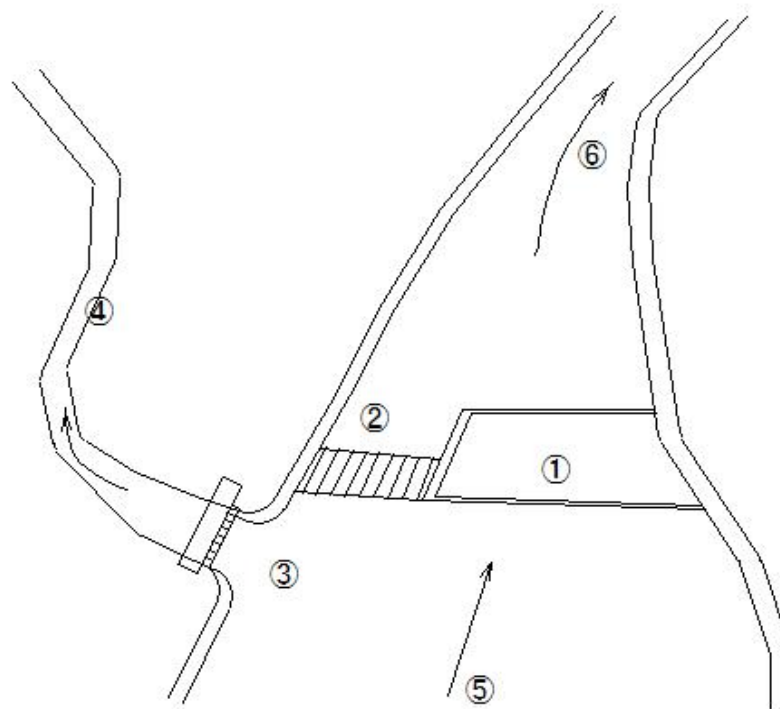


(I1359)Headwork

(I1359) Headwork

- a. Build a dam
- b. Store water
- c. Open and close a sluice gate
- d. Take water into an irrigation channel

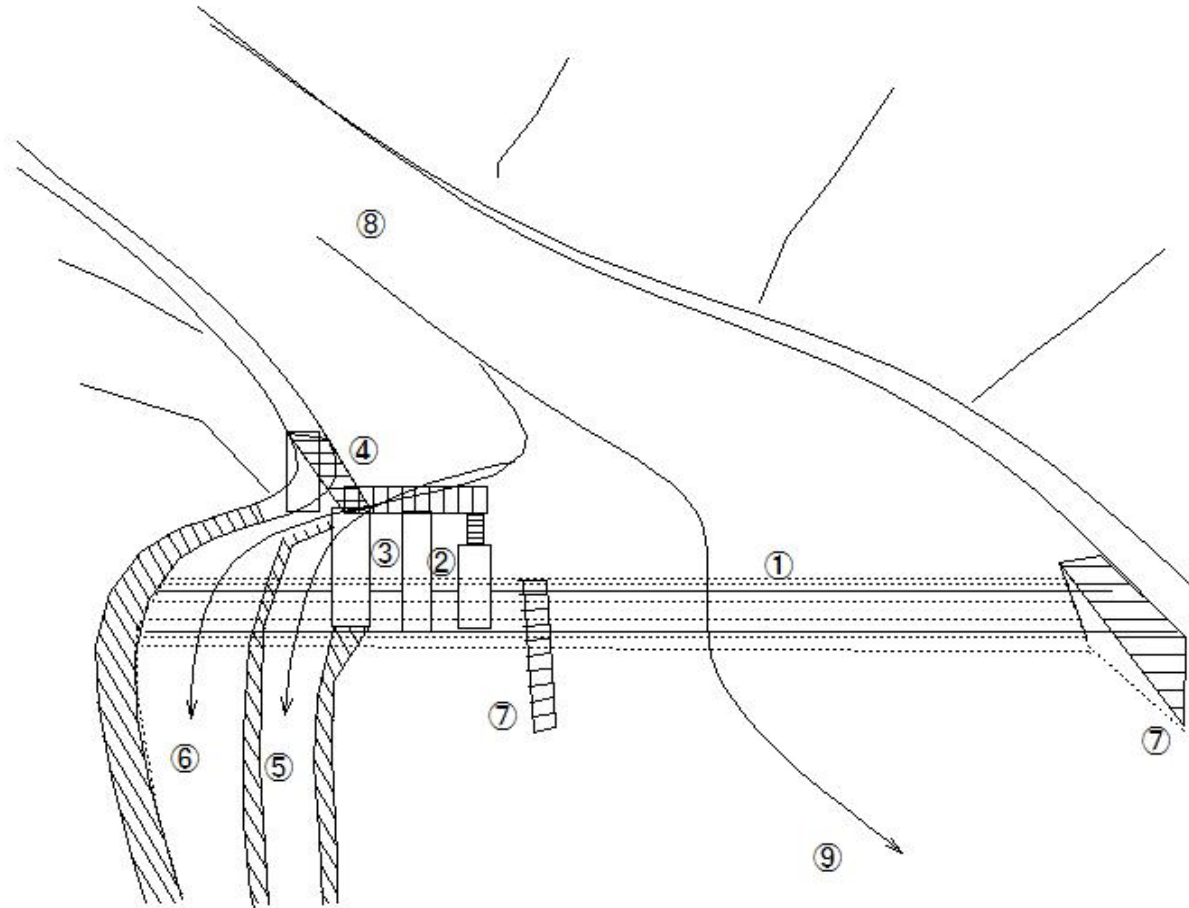
- ① Fixed weir
- ② Movable weir
- ③ Floodgate
- ④ Irrigation canal
- ⑤ Upstream
- ⑥ Downstream



(I1360)Headwork

(I1360) Headwork

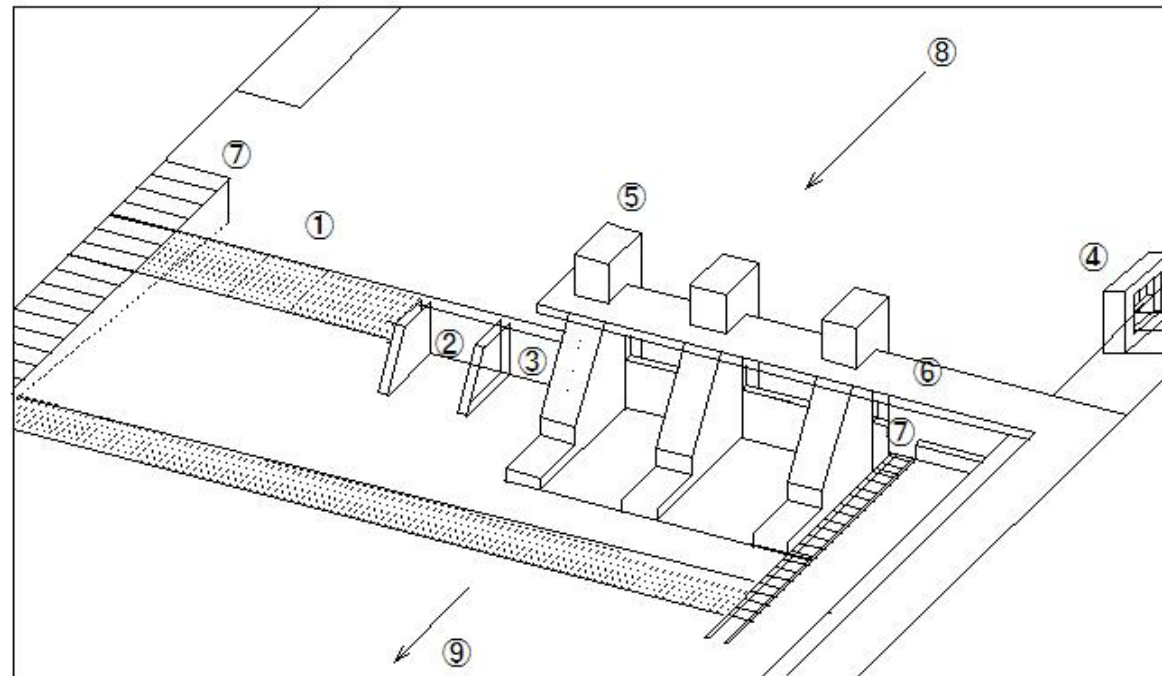
- ① Fixed weir
- ② Flood gate
- ③ Sediment discharge gate
- ④ Water intake gate
- ⑤ Agricultural water
- ⑥ Power generation water
- ⑦ Fishway
- ⑧ Upstream
- ⑨ Downstream



(I1361)Headwork

(I1361) Headwork

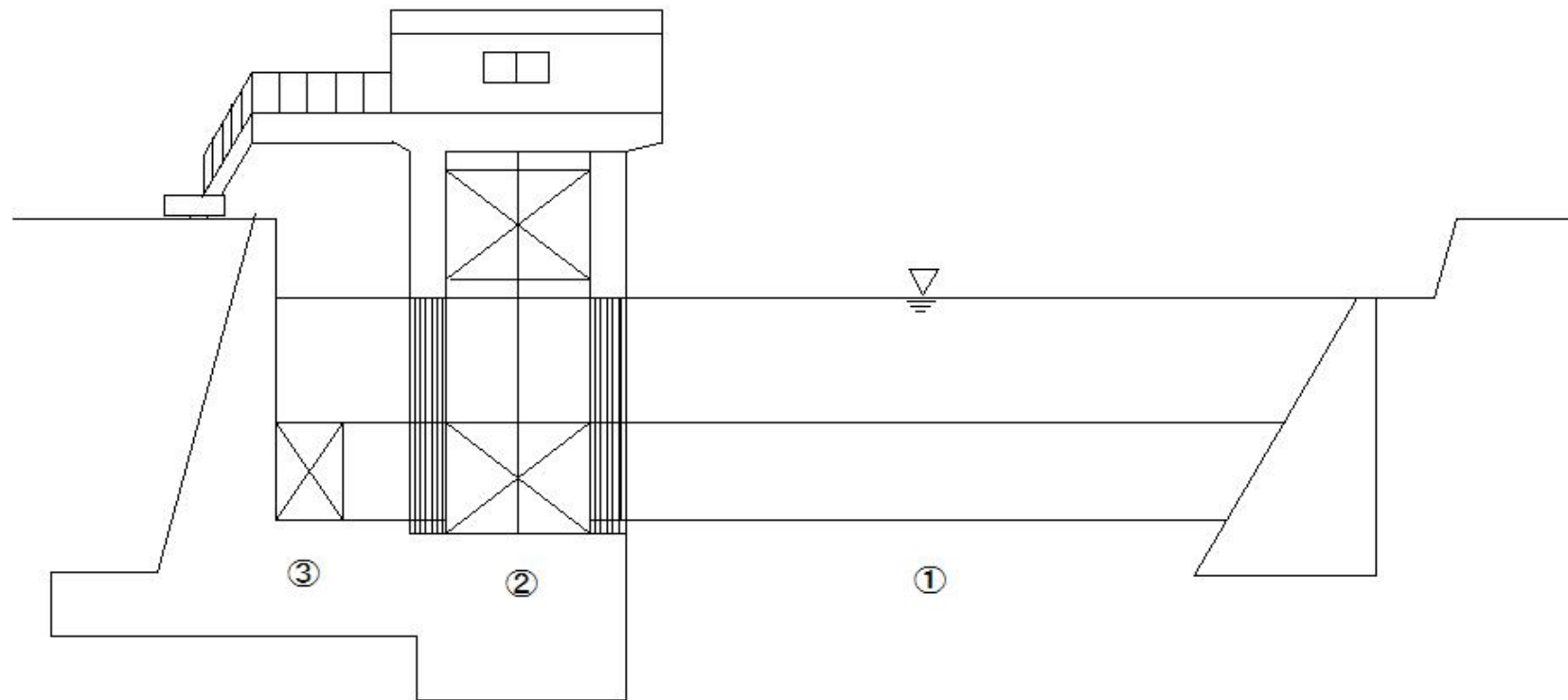
- ① Fixed weir
- ② Flood gate
- ③ Sediment discharge gate
- ④ Water intake gate
- ⑤ Gate operation room
- ⑥ Control bridge
- ⑦ Fishway
- ⑧ Upstream
- ⑨ Downstream



(I1362)Headwork

(I1362) Headwork

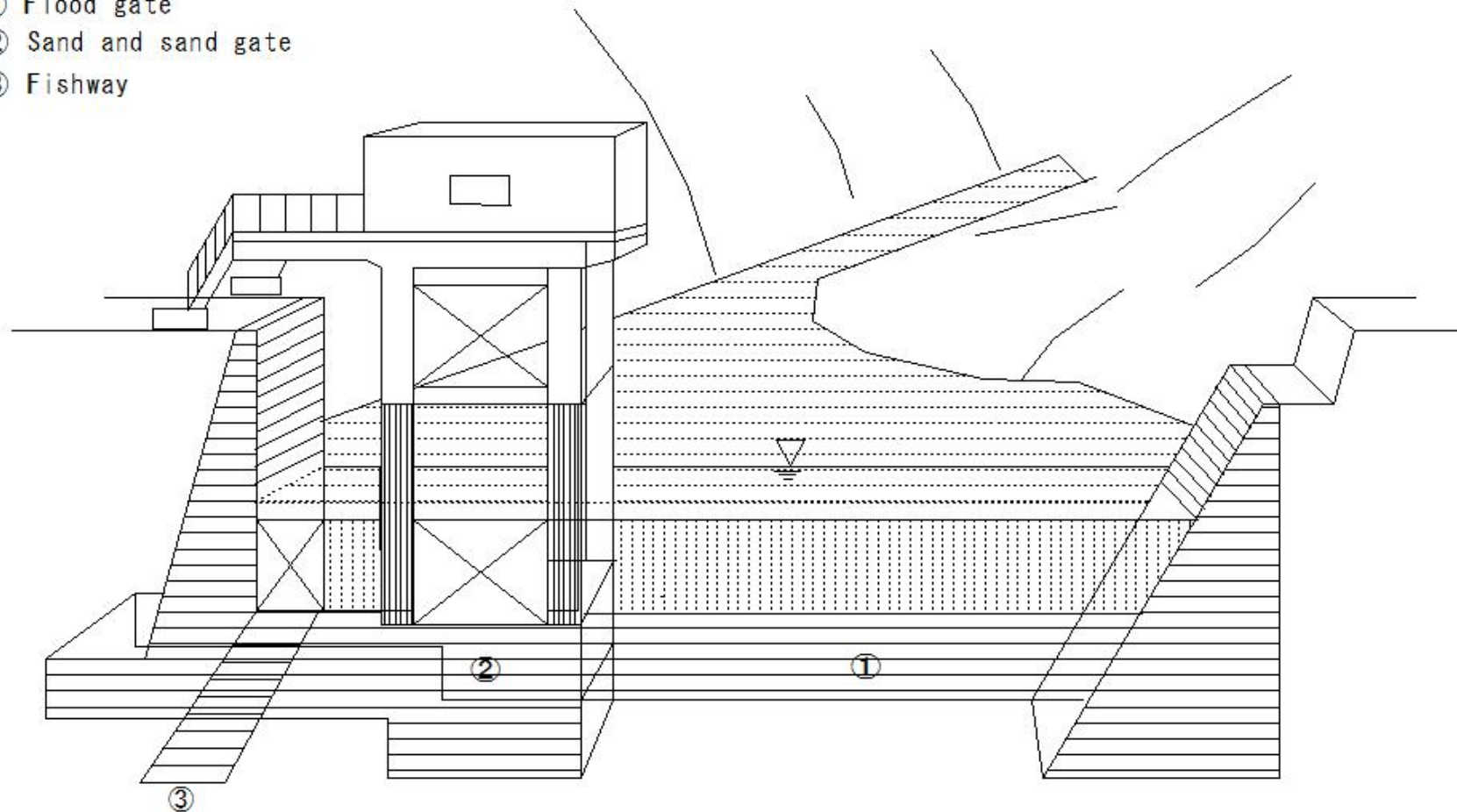
- ① Flood gate
- ② Sand and sand gate
- ③ Fishway



(I1363)Headwork

(I1363) Headwork

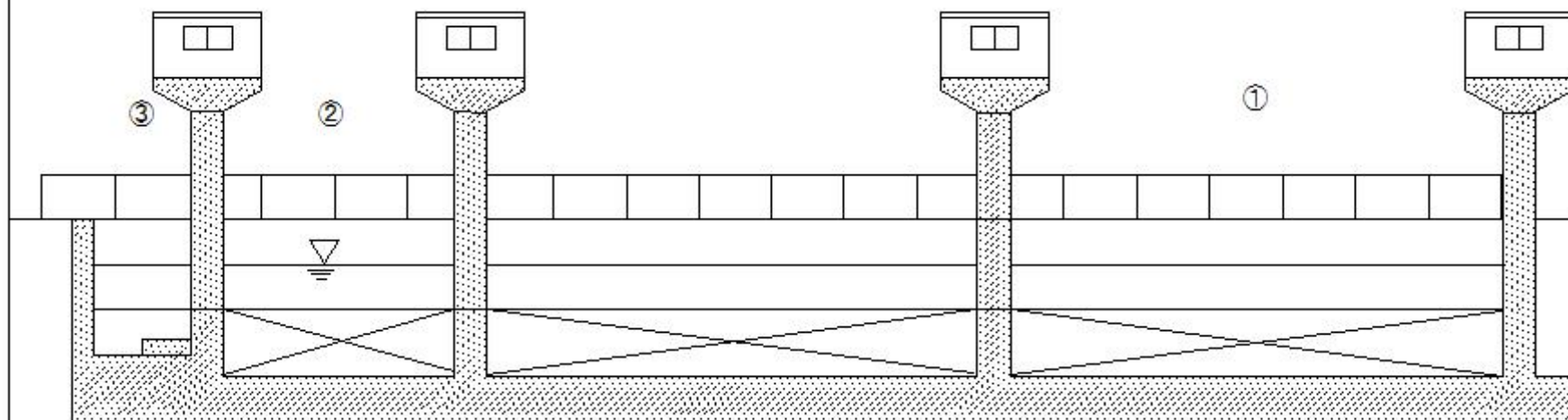
- ① Flood gate
- ② Sand and sand gate
- ③ Fishway



(I1364)Headwork

(I1364) Headwork

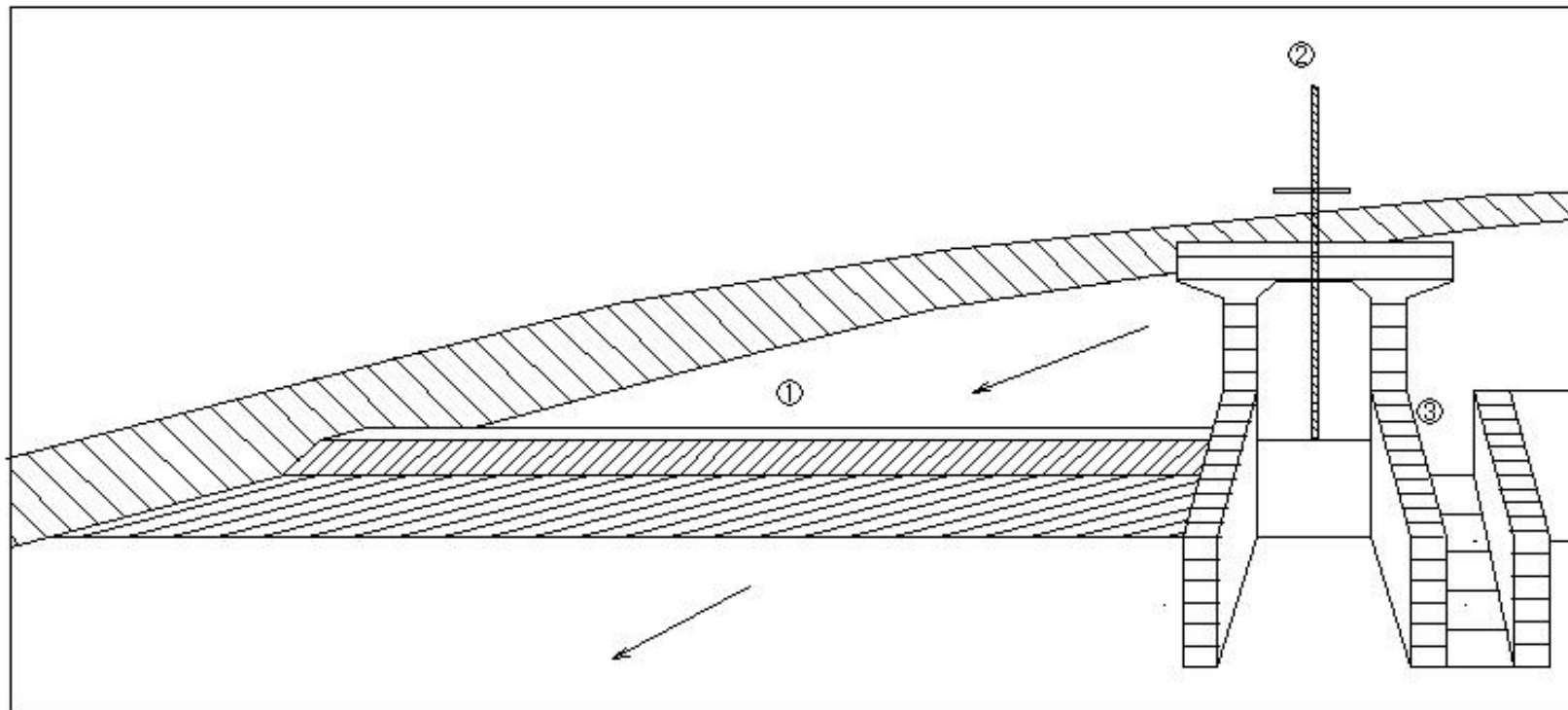
- ① Flood gate
- ② Sand and sand gate
- ③ Fishway



(I1365) Headwork

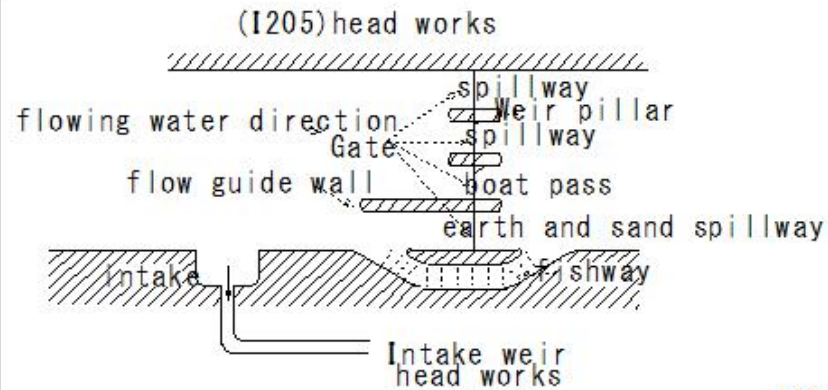
(I1365) Headwork

- ① Flood gate
- ② Sand and sand gate
- ③ Fishway

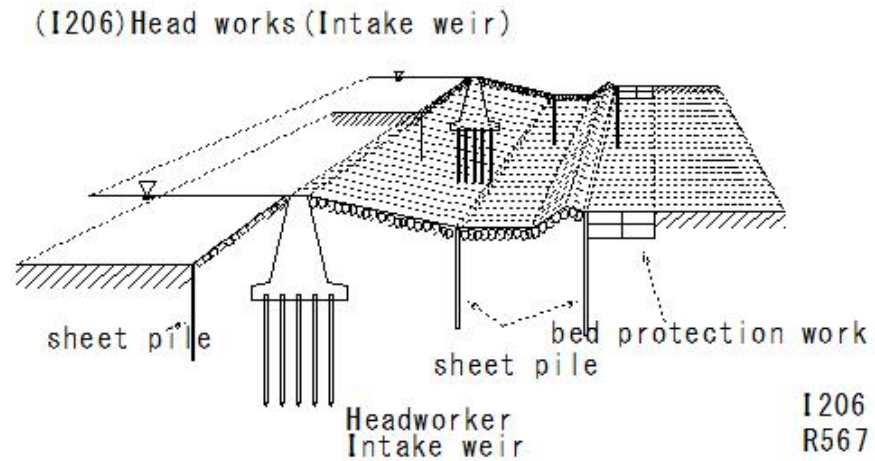


(I1366) Headwork

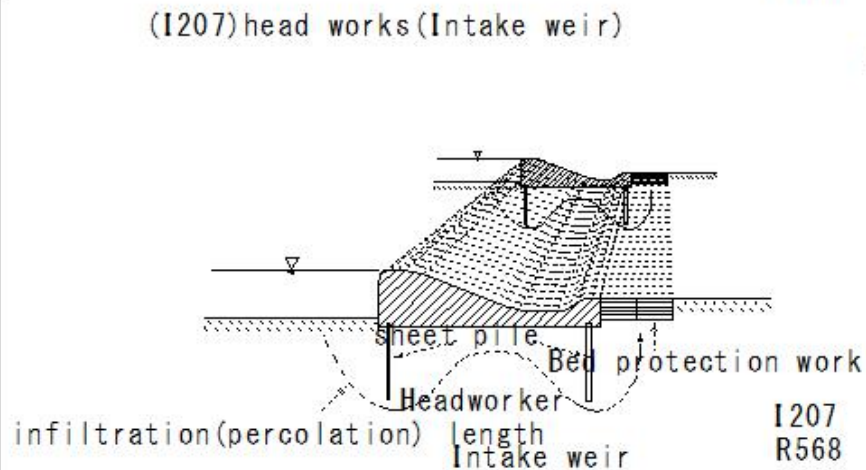
(I1366) Headwork



I205
R566

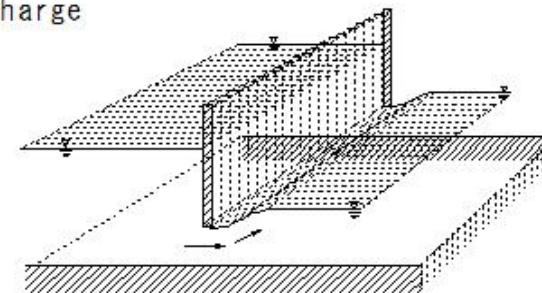


I206
R567



I207
R568

(I422) Movable weir (Sluice gate)
Movable weir
adjust discharge



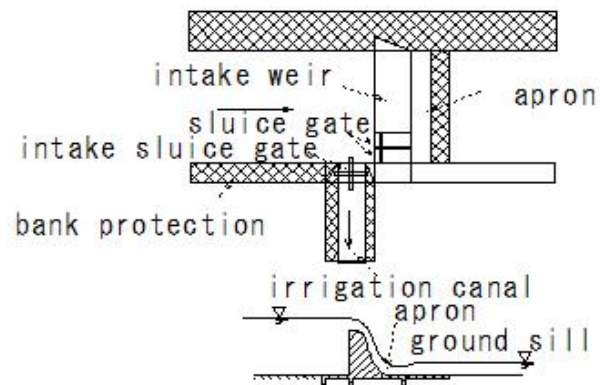
② Sluice gate

I422
R330

(I1367) Headwork

(I1367) Headwork

(I631) Weir (head works)



Weir cross section

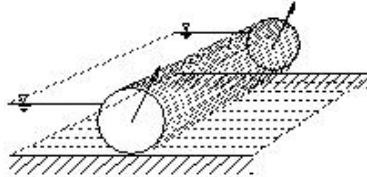
(I424) Movable weir (Rolling gate)

adjust discharge

Movable weir

④ Rolling gate

Don't let the water overflow

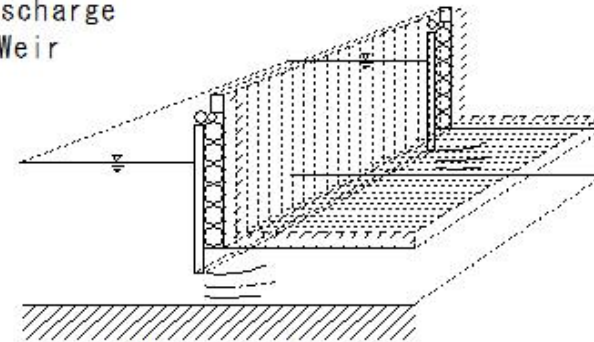


④ Rolling gate

(I423) Movable weir (Stoney Weir)

Movable weir
adjust discharge

③ Stoney Weir



③ Stoney Weir

I631
R438

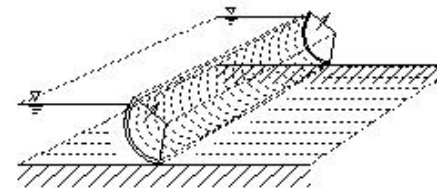
I423
R331

(I425) Movable weir (Tentergate)

Movable weir
adjust discharge

Don't let the water overflow

⑤ Tentergate



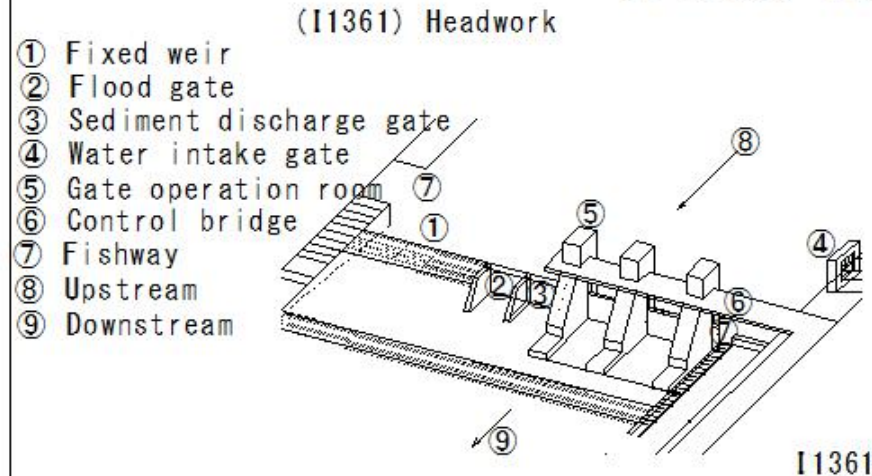
④ Rolling gate

R333

I424
R332

(I1368) Headwork

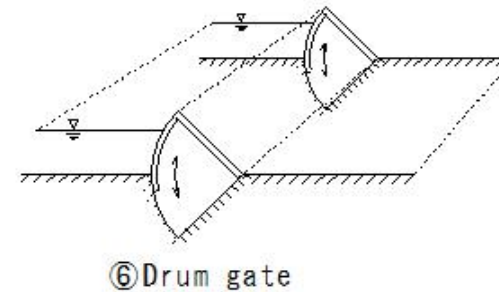
(I1368) Headwork



(I426) Movable weir (Drum gate)

Movable weir
adjust discharge

⑥ Drum gate

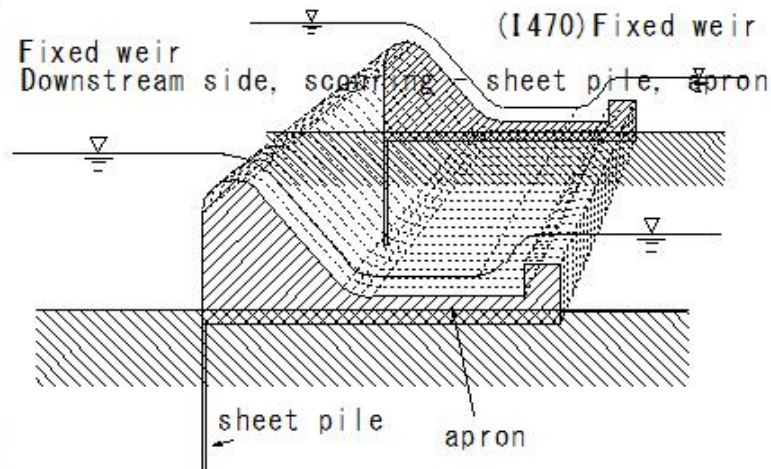
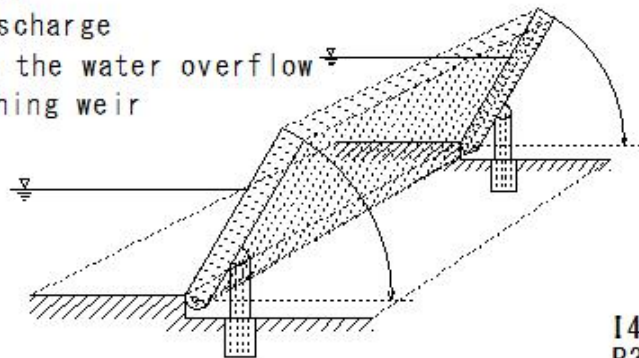


I426
R334

(I427) Movable weir (Overturning weir)

Movable weir
adjust discharge
Don't let the water overflow

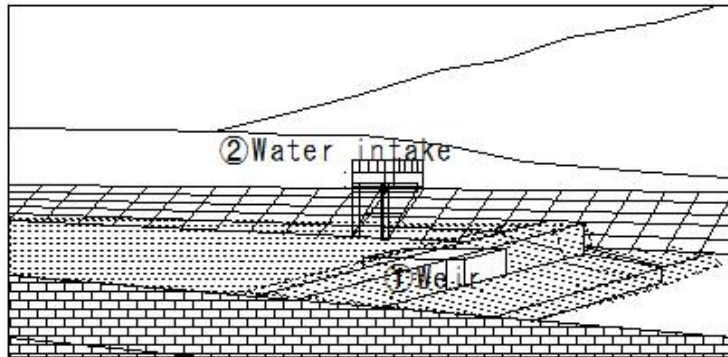
⑦ Overturning weir



(I1369) Headwork

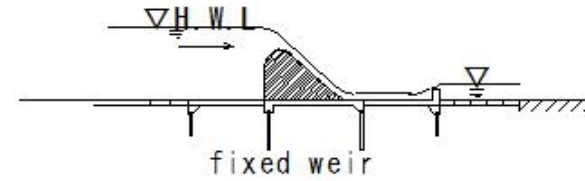
(I1369) Headwork

(I1356) Headwork

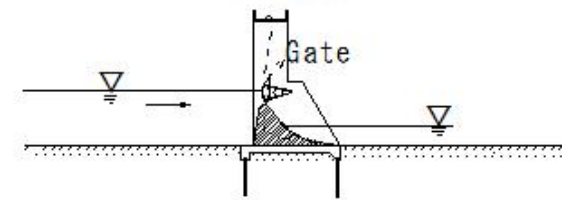


I1356

(I548) Weir



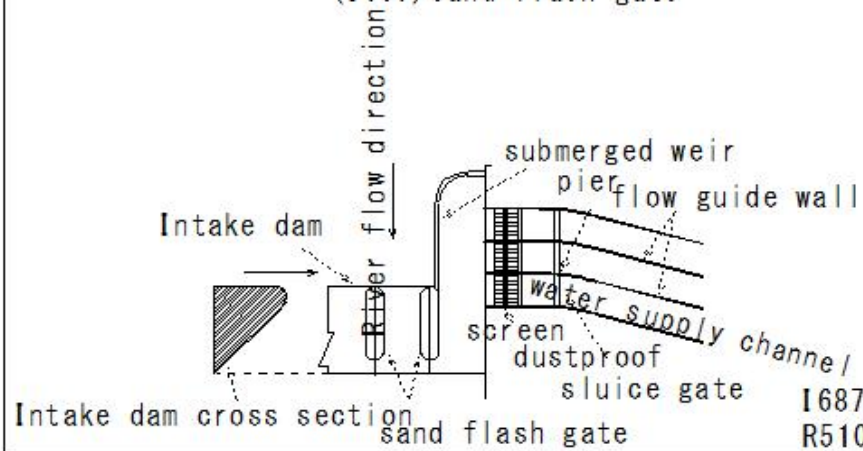
fixed weir



Movable weir

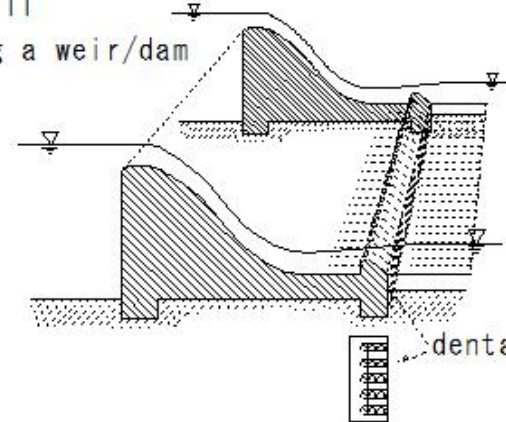
I 548
D221
R302

(I687) Sand flash gate



Dentated sill
Overflowing a weir/dam

(I691) Weir (dentated sill)

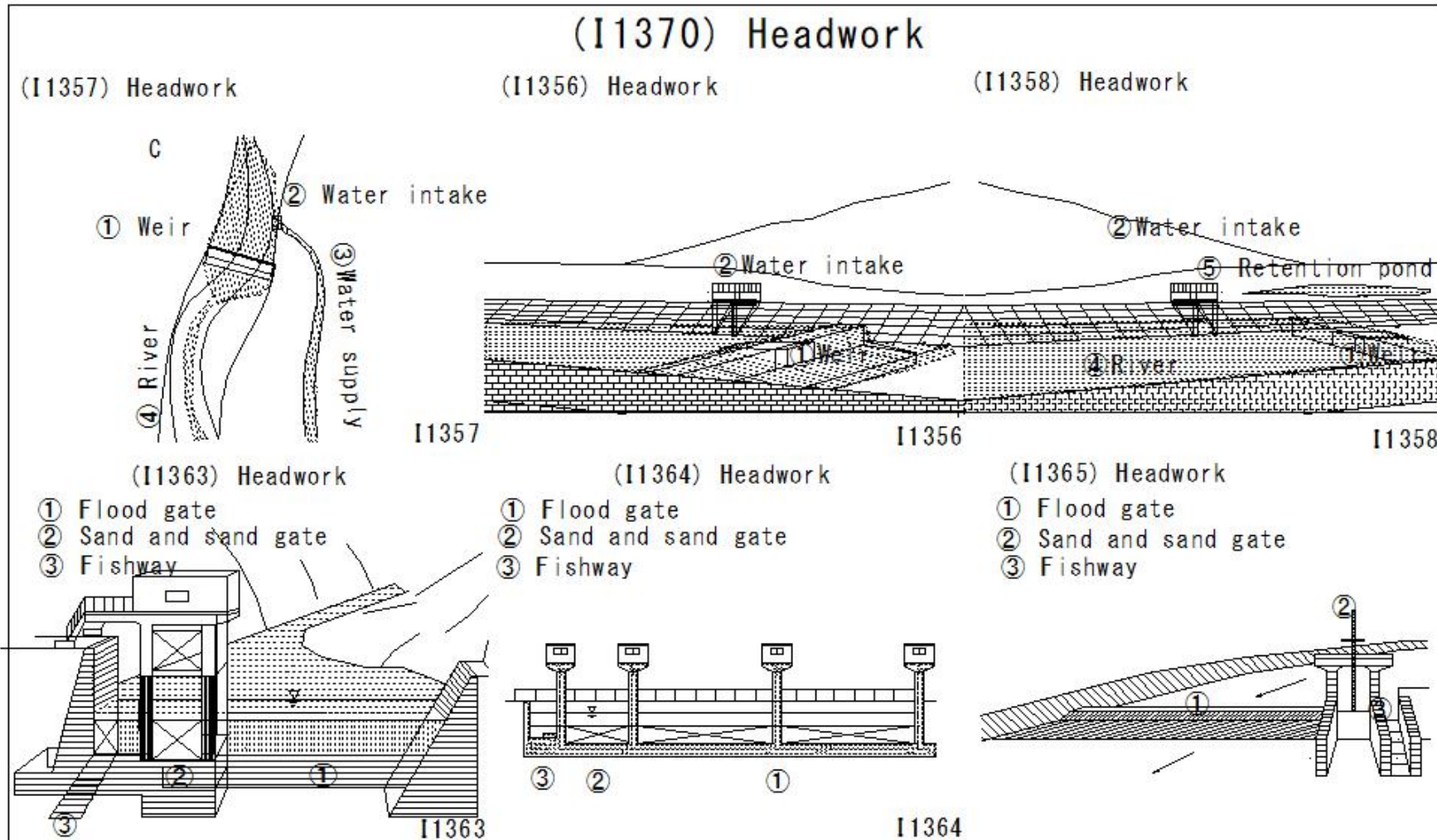


dentated sill

I 691
R463

I687
R510

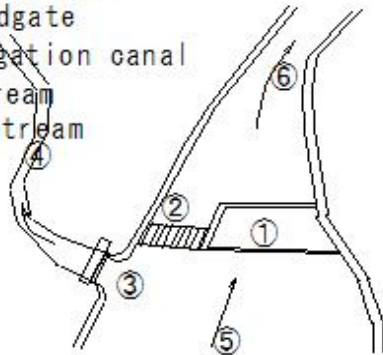
(I1370) Headwork



(I1371) Headwork

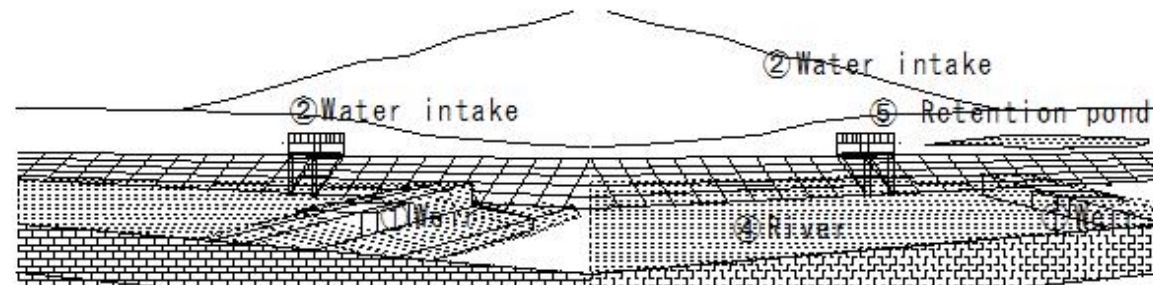
(I1371) Headwork

- ① Fixed weir
- ② Movable weir
- ③ Floodgate
- ④ Irrigation canal
- ⑤ Upstream
- ⑥ Downstream



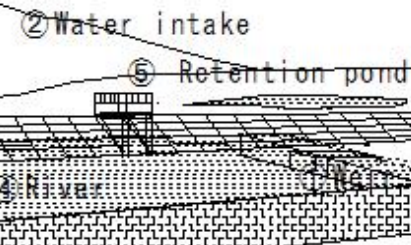
I1359

(I1356) Headwork



I1356

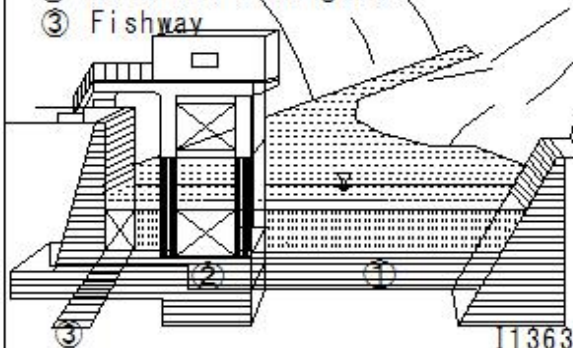
(I1358) Headwork



I1358

(I1363) Headwork

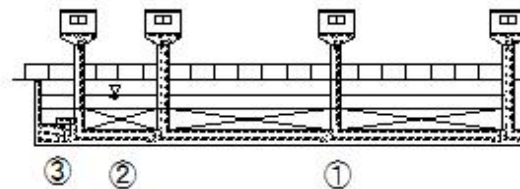
- ① Flood gate
- ② Sand and sand gate
- ③ Fishway



I1363

(I1364) Headwork

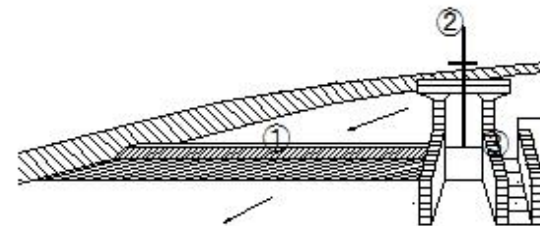
- ① Flood gate
- ② Sand and sand gate
- ③ Fishway



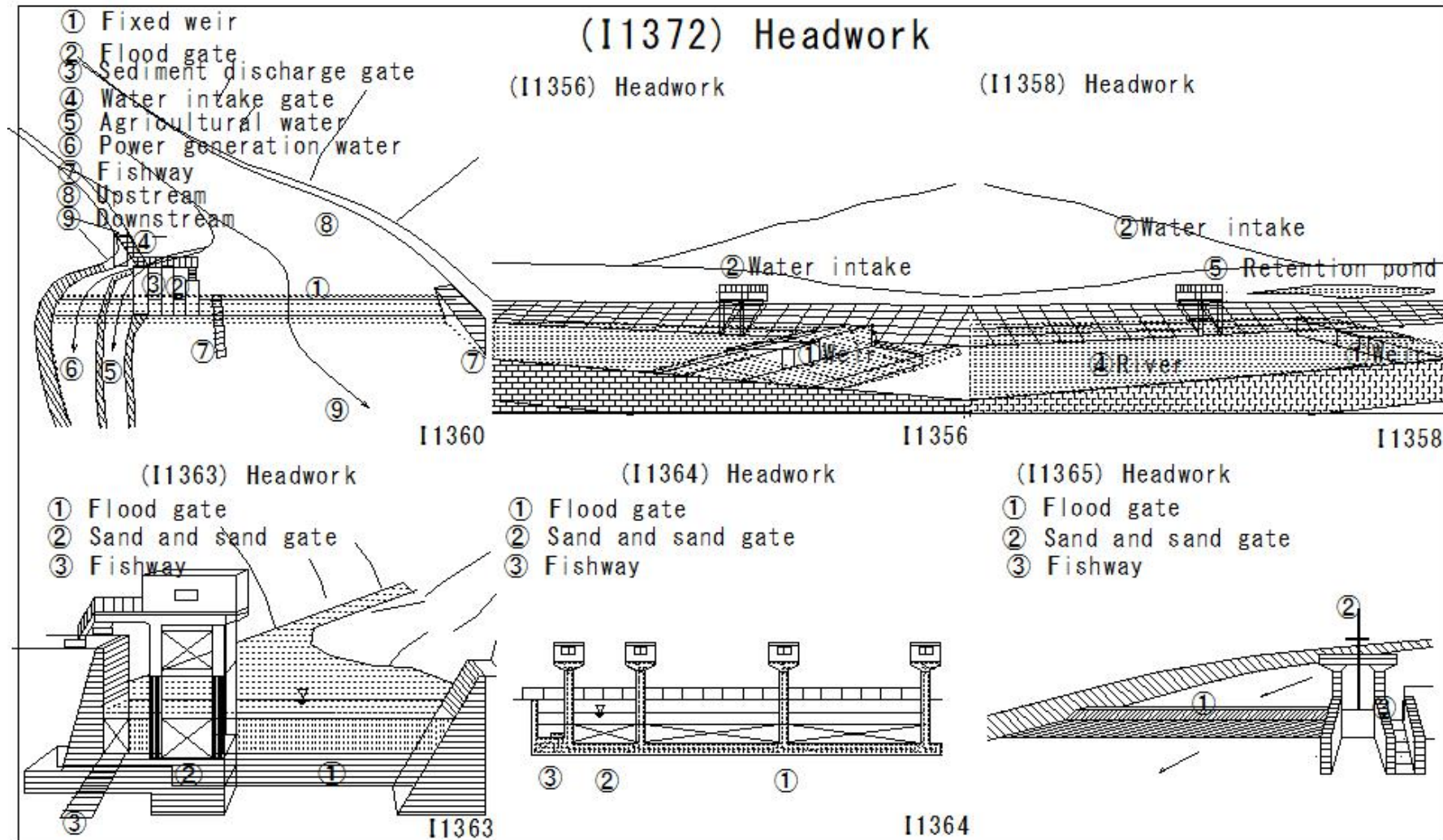
I1364

(I1365) Headwork

- ① Flood gate
- ② Sand and sand gate
- ③ Fishway



(I1372) Headwork



(I1373) Headwork

