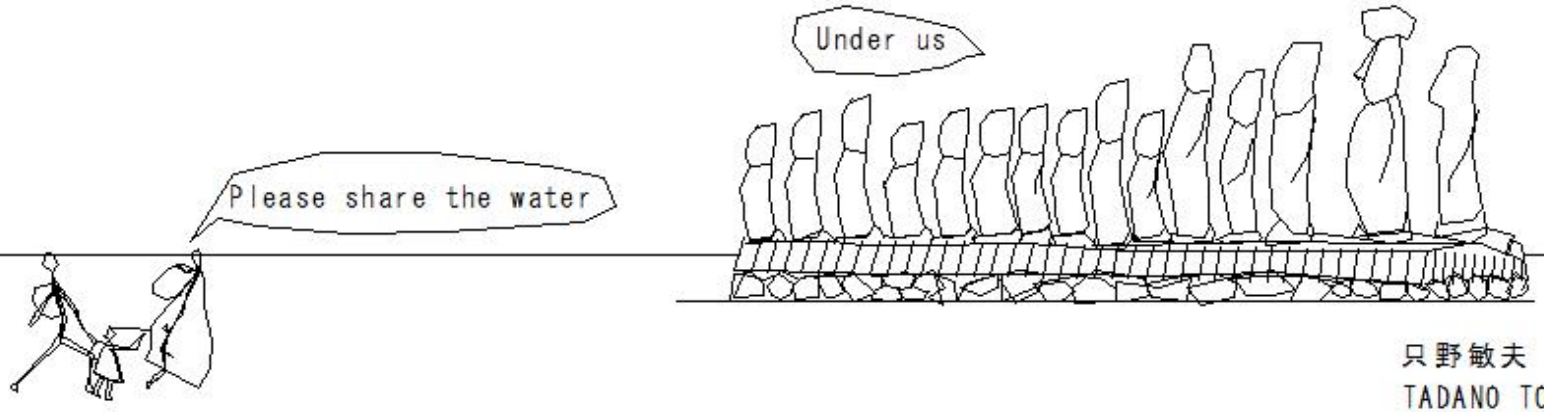
(27)Irrigation(Illustration) in Africa(350-817)

(27)Irrigation(Illustration) in Africa(350-817)

Moai of Easter Island

Moai are monolithic human figures carved by the Rapa Nui people on Rapa Nui in eastern Polynesia between the years 1250 and 1500



只野敏夫
TADANO TOSHIO

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12	農業土木設計 農業土木施工 水循環 Agricultural civil engineering design Agricultural civil engineering construction Water cycle		文部科学省 Ministry of Education, Culture, Sports, Science and Technology
13	かんがい、かんがい施設、農業水文、農地排水 Irrigation, irrigation facilities, agricultural hydrology, farmland drainage		コロナ社 Corona Publishing

只野敏夫
Tadano Toshio

(I350)Shallow well	Shallow well
(I351)Dam(Earth dam)	Dam(Earth dam)
(I352)Dam(Earth dam)	Dam(Earth dam)
(I353)Border lot(Ridge area)	Border lot(Ridge area)
(I354)Arch Dam	Arch Dam
(I355)Amenity	Amenity
(I356)RCD method	RCD method
(I357)Culvert Drainage	Culvert Drainage
(I358)Stabilization work	Stabilization work
(I359)Stone Dyke	Stone Dyke
(I360)Stone masonry	Stone masonry
(I361)Rock Crib Work	Rock Crib Work
(I362)Stone Pitching Work	Stone Pitching Work
(I363)Dam(potential head)	Dam(potential head)
(I364)Sodding	Sodding
(I365)Embankment	Embankment
(I366)Well point method	Well point method
(I367)Wash Load	Wash Load
(I368)Pumice-stone(Floating stones)	Pumice-stone(Floating stones)
(I369)Skelton	Skelton
(I370)Groin(skeleton)-Wire cylinder masonry work(Gabion)	Groin(skeleton)
(I371)Sewerage(storm outfall(Rainwater outlet))	Sewerage(storm outfall(Rainwater outlet))
(I372)Sewerage(street inlet(Rainwater basin))	Sewerage(street inlet(Rainwater basin))
(I373)Furrow irrigation	Furrow irrigation
(I374)Fill in(Backfilling)	Fill in(Backfilling)
(I375)Fill in(Backfilling)	Fill in(Backfilling)
(I376)Vertical frame	Vertical frame
(I377)Slope protection(backing mat method)	Slope protection(backing mat method)
(I378)Water supply and sewerage(rain gauge)	Water supply and sewerage(rain gauge)
(I379)carrying operation	carrying operation
(I380)Groin towards up stream	Groin towards up stream
(I381)Circle of influence	Circle of influence
(I382)Sensitivity ratio	Sensitivity ratio
(I383)liquefaction	liquefaction

(I384)Works for overflow	Works for overflow
(I385)Overflow pipe	Overflow pipe
(I386)Flood Irrigation(Overflow irrigation)	Flood Irrigation(Overflow irrigation)
(I387)Groin over the water	Groin over the water
(I388)Overflow weir	Overflow weir
(I389)Deversoir(overflow)	Deversoir(overflow)
(I390)Apron	Apron
(I391)Pressed embankment	Pressed embankment
(I392)Surcharge process:Pressing embankment method	Surcharge process:Pressing embankment method
(I393)Overlay	Overlay
(I394)Riverbed girdle	Riverbed girdle
(I395)Open cut method	Open cut method
(I396)consolidation work	consolidation work
(I397)lapel method	lapel method
(I398)Orifice	Orifice
(I399)Water supply	Water supply
(I400)Open channel	Open channel
(I401)Sea bottom reclamation（Sea surface reclamation）	Sea bottom reclamation（Sea surface reclamation）
(I402)Stop log	Stop log
(I403)Estuary improvement	Estuary improvement
(I404)Semi-permeable groin -wire cylinder masonry work(gabion)	Semi-permeable groin -wire cylinder masonry work(gabion)
(I405)Semi-permeable groin -wire cylinder masonry work(gabion)	Semi-permeable groin -wire cylinder masonry work(gabion)
(I406)Embankment(raising)	Embankment(raising)
(I407)Embankment(raising)	Embankment(raising)
(I408)Shape of river	Shape of river
(I409)Center of stream in the river	Center of stream in the river
(I410)Open levee	Open levee
(I411)River improvement	River improvement
(I412)River administer	River administer
(I413)River works	River works
(I414)Equilibrated grade of river	Equilibrated grade of river
(I415)Graded condition of river	Graded condition of river
(I416)River Law	River Law
(I417)Water supply(activated carbon method)	Water supply(activated carbon method)

(I418)Embankment(over compaction)	Embankment(over compaction)
(I419)River channel	River channel
(I420)River channel improvement	River channel improvement
(I421)Movable weir(stop log)	Movable weir(stop log)
(I422)Movable weir(Sluice gate)	Movable weir(Sluice gate)
(I423)Movable weir(Stoney Weir)	Movable weir(Stoney Weir)
(I424)Movable weir(Rolling gate)	Movable weir(Rolling gate)
(I425)Movable weir(Tentergate)	Movable weir(Tentergate)
(I426)Movable weir(Drum gate)	Movable weir(Drum gate)
(I427)Movable weir(Overturning weir)	Movable weir(Overturning weir)
(I428)Cover	Cover
(I429)Embankment-drainage method(hooping)	Embankment-drainage method(hooping)
(I430)Drainage method	Drainage method
(I431)Masonry (dry masonry)	Masonry (dry masonry)
(I432)Gully erosion	Gully erosion
(I433)Culvert	Culvert
(I434)Irrigation methods	Irrigation methods
(I435)Environmental Quality Standards	Environmental Quality Standards
(I436)Environment irrigation water	Environment irrigation water
(I437)Intermittent settling tank	Intermittent settling tank
(I438)Fishladder	Fishladder
(I439)Cavitation	Cavitation
(I440)Weir(notch)	Weir(notch)
(I441)Unscreened gravel	Unscreened gravel
(I442)Embankment (wood sinking)	Embankment (wood sinking)
(I443)Strut	Strut
(I444)Pile dyke(groin)	Pile dyke(groin)
(I445)Angle brace	Angle brace
(I446)Broken stone	Broken stone
(I447)Broken stone foundation	Broken stone foundation
(I448)Group of piles	Group of piles
(I449)Estimated high-water level	Estimated high-water level
(I450)Estimated high-water discharge	Estimated high-water discharge
(I451)Design flood discharge	Design flood discharge

(I452)Hydraulic radius	Hydraulic radius
(I453)Border	Border
(I454)Torrent control works	Torrent control works
(I455)Field permeability test	Field permeability test
(I456)Water supply(Elevated tank)	Water supply(Elevated tank)
(I457)Field division(Cultivated area)	Field division(Cultivated area)
(I458)Flood control	Flood control
(I459)Flood protection works	Flood protection works
(I460)Embankment(major bed)	Embankment(major bed)
(I461)Flood control	Flood control
(I462)Time of concenration of flood	Time of concenration of flood
(I463)Broad-crested weir	Broad-crested weir
(I464)Gradient（Grade）	Gradient（Grade）
(I465)Ditch(Ditch-side border)	Ditch(Ditch-side border)
(I466)Bank protection	Bank protection
(I467)Heading	Heading
(I468)Lake bottom or marsh bottom	Lake bottom or marsh bottom
(I469)Lake bottom or marsh bottom	Lake bottom or marsh bottom
(I470)Fixed weir	Fixed weir
(I471)Roller	Roller
(I472)Concrete pitching	Concrete pitching
(I473)Groin (concrete block groin)	Groin (concrete block groin)
(I474)Left bankright bank	Left bankright bank
(I475)Surge-tank	Surge-tank
(I476) Differential surge-tank	Differential surge-tank
(I477)Erosion control works	Erosion control works
(I478)Triangular weir	Triangular weir
(I479)Spray irrigation	Spray irrigation
(I480)Sand drain method	Sand drain method
(I481)Sand pile	Sand pile
(I482)Hillside works	Hillside works
(I483)Hillside works	Hillside works
(I484)Mountainside slope cutter	Mountainside slope cutter
(I485)Hillside covering works	Hillside covering works

(I486)Square weir	Square weir
(I487)Levee burst prevention (hurdle work)	Levee burst prevention (hurdle work)
(I488)Hurdle work(bank protection work)	Hurdle work(bank protection work)
(I489)Tributary	Tributary
(I490)Automatic water gauge	Automatic water gauge
(I491)Axial flow pump	Axial flow pump
(I492)Land slide	Land slide
(I493)Natural head	Natural head
(I494)Natural drainage system	Natural drainage system
(I495)Downward groin	Downward groin
(I496)Gross pump head	Gross pump head
(I497)Control section	Control section
(I498)Bank protection(sodding works)	Bank protection(sodding works)
(I499)Self closing tap	Self closing tap
(I500)Cofferdam	Cofferdam
(I501)Closing dyke	Closing dyke
(I502)Wire cylinder(gabion)	Wire cylinder(gabion)
(I503)Wire cylinder(gabion)	Wire cylinder(gabion)
(I504)Natural Ground	Natural Ground
(I505)Slope failure	Slope failure
(I506)Supercritical flow(shooting flow /rapid flow)	Supercritical flow(shooting flow /rapid flow)
(I507)Boat way	Boat way
(I508)Catchment well(Drainage well)	Catchment well(Drainage well)
(I509)Infiltration gallery	Infiltration gallery
(I510)Free outflow	Free outflow
(I511)Gravity water	Gravity water
(I512)Gravity dam	Gravity dam
(I513)Water-intake	Water-intake
(I514)Intake	Intake
(I515)Intake dam	Intake dam
(I516)Intake dam	Intake dam
(I517)Circular society	Circular society
(I518)Vadose water:Circulating water	Vadose water:Circulating water
(I519)Wetted perimeter	Wetted perimeter

(I520)Water supply (clean water(Purified water))	Water supply (clean water(Purified water))
(I521)Water supply (purification plant)	Water supply (purification plant)
(I522)Intercepting drain	Intercepting drain
(I523)Ordinary flow	Ordinary flow
(I524)Water supply (continuous flow setting basin)	Water supply (continuous flow setting basin)
(I525)Salt Exclusion	Salt Exclusion
(I526)Planted slope protection:Vegetation engineering	Planted slope protection:Vegetation engineering
(I527)River (cut-off)	River (cut-off)
(I528)Silt layer	Silt layer
(I529)Seepage line:Infiltration line	Seepage line:Infiltration line
(I530)Cycle of erosion	Cycle of erosion
(I531)Hydraulic pressure	Hydraulic pressure
(I532)Penstock root	Penstock root
(I533)Stage(water level)	Stage(water level)
(I534)Water-level recorder	Water-level recorder
(I535)Water-level recorder	Water-level recorder
(I536)Water hammer	Water hammer
(I537)Relief well(Water gate)	Relief well(Water gate)
(I538)Water pollution	Water pollution
(I539)Chamber surge tank	Chamber surge tank
(I540)Hydraulic turbine	Hydraulic turbine
(I541)Efficiency of hydraulic turbine	Efficiency of hydraulic turbine
(I542)Water erosion control	Water erosion control
(I543)Spur dyke(groin)	Spur dyke(groin)
(I544)Gate	Gate
(I545)Best hydraulic cross-section	Best hydraulic cross-section
(I546)Hydraulic water depth	Hydraulic water depth
(I547)Conduct type water power	Conduct type water power
(I548)Weir	Weir
(I549)Aqueduct	Aqueduct
(I550)Undermining	Undermining
(I551)Scoop	Scoop
(I552)Rubble-mound breakwater	Rubble-mound breakwater
(I553)Riprap work	Riprap work

(I554)Slope protection-Concrete block masonry
(I555)Preventing water leakage from embankments
(I556)Stoney gate weir
(I557)Sliding surface
(I558)Sewerage(thickner（Sludge scraper）)
(I559)Sewerage(sludge treatment)
(I560)Sluice gate
(I561)Conformity
(I562)Productive green tract of land
(I563)Weir
(I564)Slope crib work
(I565)Backwater curve
(I566)Works for overflow(board work)
(I567)Stone levee
(I568)Formation level-railroad track
(I569)Left bankright bank
(I570)Cellular sheet pile
(I571)Zero air voids curve
(I572)Separation levee
(I573)Fan
(I574)Summer dyke
(I575)Scour
(I576)Water supply (Total head)
(I577)Undercurrent
(I578)Soil stabilizer
(I579)Water supply (water-conveyance equipment)
(I580)Sodding
(I581)Traction
(I582)Laminar flow
(I583)Fascine
(I584)Flowing through capability
(I585)Angle of repose
(I586)Deposition
(I587)Meandering

Slope protection-Concrete block masonry
Preventing water leakage from embankments
Stoney gate weir
Sliding surface
Sewerage(thickner（Sludge scraper）)
Sewerage(sludge treatment)
Sluice gate
Conformity
Productive green tract of land
Weir
Slope crib work
Backwater curve
Works for overflow(board work)
Stone levee
Formation level-railroad track
Left bankright bank
Cellular sheet pile
Zero air voids curve
Separation levee
Fan
Summer dyke
Scour
Water supply (Total head)
Undercurrent
Soil stabilizer
Water supply (water-conveyance equipment)
Sodding
Traction
Laminar flow
Fascine
Flowing through capability
Angle of repose
Deposition
Meandering

(I588)Vertical wire cylinder masonry work(gabion)	Vertical wire cylinder masonry work(gabion)
(I589)Thalweg	Thalweg
(I590)Dam type power	Dam type power
(I591)Dam and conduit type power	Dam and conduit type power
(I592)Prevent water leakage	Prevent water leakage
(I593)Single pile	Single pile
(I594)Fault	Fault
(I595)Ground water level	Ground water level
(I596)Embankment	Embankment
(I597)Rift valley	Rift valley
(I598)Erosion control works	Erosion control works
(I599)Test pit	Test pit
(I600)Geological Survey	Geological Survey
(I601)Bascule bridge	Bascule bridge
(I602)Hydraulic jump	Hydraulic jump
(I603)Finishing stake	Finishing stake
(I604)Tidal power type	Tidal power type
(I605)Impregnation method	Impregnation method
(I606)Bank protection(mattress)	Bank protection(mattress)
(I607)Wooden bridge	Wooden bridge
(I608)Bank protection(patch up method)	Bank protection(patch up method)
(I609)Prevent water leakage(hooping)	Prevent water leakage(hooping)
(I610)Bank protection(back slope protection)	Bank protection(back slope protection)
(I611)Plastic deformation of the soil	Plastic deformation of the soil
(I612)Shaft sinking	Shaft sinking
(I613)Works for overflow	Works for overflow
(I614)Slope foot protection(Filling pile work)	Slope foot protection(Filling pile work)
(I615)Riverside land-land side	Riverside land-land side
(I616)Embankment(riverside land)	Embankment(riverside land)
(I617)Flow(drop down curve(backwater))	Flow(drop down curve(backwater))
(I618)Low water channel work	Low water channel work
(I619)Low -water discharge	Low -water discharge
(I620)Low-water channel	Low-water channel
(I621)Infiltration(percolation) of levee	Infiltration(percolation) of levee

(I622)Slope failure	Slope failure
(I623)Section of levee	Section of levee
(I624)Embankment(levee normal)	Embankment(levee normal)
(I625)Dam(deflector)	Dam(deflector)
(I626)Weir(tainter gate)	Weir(tainter gate)
(I627)Embankment(crown/surface)	Embankment(crown/surface)
(I628)Water supply(earthenware pipe)	Water supply(earthenware pipe)
(I629)Contour line	Contour line
(I630)Reconnaissance	Reconnaissance
(I631)Weir(head works)	Weir(head works)
(I632)Penstock (alluvium)	Penstock (alluvium)
(I633)Coefficient of permeability	Coefficient of permeability
(I634)Equipotential line	Equipotential line
(I635)Uniform flow	Uniform flow
(I636)Training dyke	Training dyke
(I637)Training levee	Training levee
(I638)Special bank	Special bank
(I639)Earthwork	Earthwork
(I640)Roadway diagraph	Roadway diagraph
(I641)Blade bowl	Blade bowl
(I642)Consolidation works	Consolidation works
(I643)Consolidation work	Consolidation work
(I644)Subsoil compacting	Subsoil compacting
(I645)Sediment settling	Sediment settling
(I646)Mass curve	Mass curve
(I647)Debris flow	Debris flow
(I648)Soil profile	Soil profile
(I649)Foundation work	Foundation work
(I650)Ridge line	Ridge line
(I651)Jetty	Jetty
(I652)Sheathing work	Sheathing work
(I653)Slope tamping	Slope tamping
(I654)Rammer	Rammer
(I655)Trafficability	Trafficability

(I656)Trench cut method	Trench cut method
(I657)Batter board	Batter board
(I658)Impermeable wall	Impermeable wall
(I659)Internal impervious wall	Internal impervious wall
(I660)Avalanche gallerry	Avalanche gallerry
(I661)Avalanche jumping	Avalanche jumping
(I662)Avalanche fence	Avalanche fence
(I663)Avalanche stoppage	Avalanche stoppage
(I664)Nappe	Nappe
(I665)Water supply(Water softening)	Water supply(Water softening)
(I666)Double filtration	Double filtration
(I667)Interflow	Interflow
(I668)Strip footing	Strip footing
(I669)Trench excavation	Trench excavation
(I670)Base stone	Base stone
(I671)Penetration	Penetration
(I672)Foot protection	Foot protection
(I673)Foot protection	Foot protection
(I674)Foot protection	Foot protection
(I675)Foot protection	Foot protection
(I676)Foot protection	Foot protection
(I677)Negative friction	Negative friction
(I678)Wheel barrow	Wheel barrow
(I679)Wet masonry	Wet masonry
(I680)Spread foundation	Spread foundation
(I681)Embankment(slope)	Embankment(slope)
(I682)Stability of the slope(slope pile)	Stability of the slope(slope pile)
(I683)Embankment(slope gradient)	Embankment(slope gradient)
(I684)Bank protection(sure-footing)	Bank protection(sure-footing)
(I685)Bank protection(slope covering(lining) works)	Bank protection(slope covering(lining) works)
(I686)Bank protection(slope protection)	Bank protection(slope protection)
(I687)Sand flash gate	Sand flash gate
(I688)Water supply(Water Distribution)	Water supply(Water Distribution)
(I689)Drainage method	Drainage method

(I690)Water supply(water-tower)	Water supply(water-tower)
(I691)Weir(dentated sill)	Weir(dentated sill)
(I692)Weir(sharp crested weir)	Weir(sharp crested weir)
(I693)River(branch river)	River(branch river)
(I694)Baffle pier	Baffle pier
(I695)Walling	Walling
(I696)Parapet	Parapet
(I697)Embankment(sodding)	Embankment(sodding)
(I698)Trailer	Trailer
(I699)Confined ground water	Confined ground water
(I700)Angle brace	Angle brace
(I701)Embankment(secondary levee)	Embankment(secondary levee)
(I702)Stay	Stay
(I703)Secondary levee	Secondary levee
(I704)Bench terraced fields	Bench terraced fields
(I705)Sluice	Sluice
(I706)Embankment(setting back of levee)	Embankment(setting back of levee)
(I707)Flow (unsteady flow)	Flow (unsteady flow)
(I708)Sluice	Sluice
(I709)Standard penetration test	Standard penetration test
(I710)Surface impermeable wall	Surface impermeable wall
(I711)Water supply(surface washing（Surface cleaning）)	Water supply(surface washing（Surface cleaning）)
(I712)Specific discharge	Specific discharge
(I713)Wind erosion control	Wind erosion control
(I714)Wind erosion farm	Wind erosion farm
(I715)Deep well	Deep well
(I716)Deep well method	Deep well method
(I717)Composite drainage basin	Composite drainage basin
(I718)Auxiliary dam	Auxiliary dam
(I719)Secondary levee	Secondary levee
(I720)River bed water	River bed water
(I721)Siphon culvert	Siphon culvert
(I722)Twin float	Twin float
(I723)Footing	Footing

(I724)Plain precipitation(Normal sedimentation)
(I725)Normal water gauge(Ordinary water gauge)
(I726)Unsteady flow
(I727)Impermeable groin(solid spur)
(I728)Impermeability layer
(I729)Non-uniform flow
(I730)Plane of floatation
(I731)Suspended load
(I732)Buoyancy
(I733)Froude number
(I734)Preloading
(I735)Floating dam
(I736)Watershed
(I737)Diversion works
(I738)Diversion works
(I739)Sewerage(Water distribution valve(ferrule))
(I740)Sewerage(separate system)
(I741)Sewerage(Combined type/ Separate type)
(I742)Mean velocity
(I743)Equilibrium slope
(I744)Parallel drainage
(I745)Head tank
(I746)Card-board wicks method
(I747)Boiling
(I748)Groyne net
(I749)Groyne net
(I750)Groyne wood
(I751)Radial drainage
(I752)Flood-way
(I753)Tail-race surge tank
(I754)Windbreak
(I755)Paddy field land
(I756)Artesian well
(I757)Main levee

Plain precipitation(Normal sedimentation)
Normal water gauge(Ordinary water gauge)
Unsteady flow
Impermeable groin(solid spur)
Impermeability layer
Non-uniform flow
Plane of floatation
Suspended load
Buoyancy
Froude number
Preloading
Floating dam
Watershed
Diversion works
Diversion works
Sewerage(Water distribution valve(ferrule))
Sewerage(separate system)
Sewerage(Combined type/ Separate type)
Mean velocity
Equilibrium slope
Parallel drainage
Head tank
Card-board wicks method
Boiling
Groyne net
Groyne net
Groyne wood
Radial drainage
Flood-way
Tail-race surge tank
Windbreak
Paddy field land
Artesian well
Main levee

(I758)Macadam	Macadam
(I759)Earthworks-Characteristics of Earthmoving Machinery	Earthworks-Characteristics of Earthmoving Machinery
(I760)Earthmoving machinery-Compaction machines	Earthmoving machinery-Compaction machines
(I761)Spreading depth	Spreading depth
(I762)Wooden bridge	Wooden bridge
(I763)Wooden bridge	Wooden bridge
(I764)Water bound macadam	Water bound macadam
(I765)Spatter's effect(water splash effect)	Spatter's effect(water splash effect)
(I766)Leveling	Leveling
(I767)Shoulder sodding	Shoulder sodding
(I768)Shoulder sodding	Shoulder sodding
(I769)Wooden beam bridge	Wooden beam bridge
(I770)Submerged orifice	Submerged orifice
(I771)Submerged discharge	Submerged discharge
(I772)Banking	Banking
(I773)Landslide	Landslide
(I774)Land reclamation in natural slope	Land reclamation in natural slope
(I775)Batter board	Batter board
(I776)Effective head	Effective head
(I777)Retarding basin,flood storage basin	Retarding basin,flood storage basin
(I778)Pumped storage power	Pumped storage power
(I779)Pump-up head	Pump-up head
(I780)Landslide restraining works	Landslide restraining works
(I781)Landslide control works	Landslide control works
(I782)Cross-levee(Horizontal levee)	Cross-levee(Horizontal levee)
(I783)Spillway	Spillway
(I784)Quarter crossing joint	Quarter crossing joint
(I785)Extra-banking	Extra-banking
(I786)Freeboard-margin height (extra embankment)	Freeboard-margin height (extra embankment)
(I787)Avalanche stoppage	Avalanche stoppage
(I788)Avalanche jumping	Avalanche jumping
(I789)Turbulent flow -Laminar flow	Turbulent flow -Laminar flow
(I790)Diffusion effect of turbulent flow	Diffusion effect of turbulent flow
(I791)Crawler	Crawler

(I792)Ripper	Ripper
(I793)Ripper(rippability)	Ripper(rippability)
(I794)Sand flash gate	Sand flash gate
(I795)Radial drainage	Radial drainage
(I796)Run-off coefficient	Run-off coefficient
(I797)Thalweg	Thalweg
(I798)Cross sectional area of stream	Cross sectional area of stream
(I799)Flow net	Flow net
(I800)Velocity of flow	Velocity of flow
(I801)Diversion filling	Diversion filling
(I802)Water course	Water course
(I803)Discharge	Discharge
(I804)Water course	Water course
(I805)Method of average end areas	Method of average end areas
(I806)Rill erosion	Rill erosion
(I807)Reynoldsnumber	Reynoldsnumber
(I808)Sounding lead	Sounding lead
(I809)Degraded ferro-deficient paddy field	Degraded ferro-deficient paddy field
(I810)Rate of filtration	Rate of filtration
(I811)Filter film	Filter film
(I812)Filter material	Filter material
(I813)Mixing work on the way	Mixing work on the way
(I814)Water supply(return back of filtration	Water supply(return back of filtration
(I815)Lock	Lock
(I816)Rock fill dam	Rock fill dam
(I817)Cribwork	Cribwork

(I355)Amenity	Amenity
(I445)Angle brace	Angle brace
(I700)Angle brace	Angle brace
(I585)Angle of repose	Angle of repose
(I390)Apron	Apron
(I549)Aqueduct	Aqueduct
(I354)Arch Dam	Arch Dam
(I756)Artesian well	Artesian well
(I490)Automatic water gauge	Automatic water gauge
(I718)Auxiliary dam	Auxiliary dam
(I662)Avalanche fence	Avalanche fence
(I660)Avalanche gallerry	Avalanche gallerry
(I661)Avalanche jumping	Avalanche jumping
(I788)Avalanche jumping	Avalanche jumping
(I663)Avalanche stoppage	Avalanche stoppage
(I787)Avalanche stoppage	Avalanche stoppage
(I491)Axial flow pump	Axial flow pump
(I565)Backwater curve	Backwater curve
(I694)Baffle pier	Baffle pier
(I466)Bank protection	Bank protection
(I610)Bank protection(back slope protection)	Bank protection(back slope protection)
(I606)Bank protection(mattress)	Bank protection(mattress)
(I608)Bank protection(patch up method)	Bank protection(patch up method)
(I685)Bank protection(slope covering(lining) works)	Bank protection(slope covering(lining) works)
(I686)Bank protection(slope protection)	Bank protection(slope protection)
(I498)Bank protection(sodding works)	Bank protection(sodding works)
(I684)Bank protection(sure-footing)	Bank protection(sure-footing)
(I772)Banking	Banking
(I601)Bascule bridge	Bascule bridge
(I670)Base stone	Base stone
(I657)Batter board	Batter board
(I775)Batter board	Batter board
(I704)Bench terraced fields	Bench terraced fields
(I545)Best hydraulic cross-section	Best hydraulic cross-section

(I641)Blade bowl	Blade bowl
(I507)Boat way	Boat way
(I747)Boiling	Boiling
(I453)Border	Border
(I353)Border lot(Ridge area)	Border lot(Ridge area)
(I463)Broad-crested weir	Broad-crested weir
(I446)Broken stone	Broken stone
(I447)Broken stone foundation	Broken stone foundation
(I732)Buoyancy	Buoyancy
(I746)Card-board wicks method	Card-board wicks method
(I379)carrying operation	carrying operation
(I508)Catchment well(Drainage well)	Catchment well(Drainage well)
(I439)Cavitation	Cavitation
(I570)Cellular sheet pile	Cellular sheet pile
(I409)Center of stream in the river	Center of stream in the river
(I539)Chamber surge tank	Chamber surge tank
(I381)Circle of influence	Circle of influence
(I517)Circular society	Circular society
(I501)Closing dyke	Closing dyke
(I633)Coefficient of permeability	Coefficient of permeability
(I500)Cofferdam	Cofferdam
(I717)Composite drainage basin	Composite drainage basin
(I472)Concrete pitching	Concrete pitching
(I547)Conduct type water power	Conduct type water power
(I699)Confined ground water	Confined ground water
(I561)Conformity	Conformity
(I396)consolidation work	consolidation work
(I643)Consolidation work	Consolidation work
(I642)Consolidation works	Consolidation works
(I629)Contour line	Contour line
(I497)Control section	Control section
(I428)Cover	Cover
(I791)Crawler	Crawler
(I817)Cribwork	Cribwork

(I798)Cross sectional area of stream	Cross sectional area of stream
(I782)Cross-levee(Horizontal levee)	Cross-levee(Horizontal levee)
(I433)Culvert	Culvert
(I357)Culvert Drainage	Culvert Drainage
(I530)Cycle of erosion	Cycle of erosion
(I591)Dam and conduit type power	Dam and conduit type power
(I590)Dam type power	Dam type power
(I625)Dam(deflector)	Dam(deflector)
(I351)Dam(Earth dam)	Dam(Earth dam)
(I352)Dam(Earth dam)	Dam(Earth dam)
(I363)Dam(potential head)	Dam(potential head)
(I647)Debris flow	Debris flow
(I715)Deep well	Deep well
(I716)Deep well method	Deep well method
(I809)Degraded ferro-deficient paddy field	Degraded ferro-deficient paddy field
(I586)Deposition	Deposition
(I451)Design flood discharge	Design flood discharge
(I389)Deversoir(overflow)	Deversoir(overflow)
(I476) Differential surge-tank	Differential surge-tank
(I790)Diffusion effect of turbulent flow	Diffusion effect of turbulent flow
(I803)Discharge	Discharge
(I465)Ditch(Ditch-side border)	Ditch(Ditch-side border)
(I801)Diversion filling	Diversion filling
(I737)Diversion works	Diversion works
(I738)Diversion works	Diversion works
(I666)Double filtration	Double filtration
(I495)Downward groin	Downward groin
(I430)Drainage method	Drainage method
(I689)Drainage method	Drainage method
(I760)Earthmoving machinery-Compaction machines	Earthmoving machinery-Compaction machines
(I639)Earthwork	Earthwork
(I759)Earthworks-Characteristics of Earthmoving Machinery	Earthworks-Characteristics of Earthmoving Machinery
(I776)Effective head	Effective head
(I541)Efficiency of hydraulic turbine	Efficiency of hydraulic turbine

(I365)Embankment	Embankment
(I596)Embankment	Embankment
(I442)Embankment (wood sinking)	Embankment (wood sinking)
(I627)Embankment(crown/surface)	Embankment(crown/surface)
(I624)Embankment(levee normal)	Embankment(levee normal)
(I460)Embankment(major bed)	Embankment(major bed)
(I418)Embankment(over compaction)	Embankment(over compaction)
(I406)Embankment(raising)	Embankment(raising)
(I407)Embankment(raising)	Embankment(raising)
(I616)Embankment(riverside land)	Embankment(riverside land)
(I701)Embankment(secondary levee)	Embankment(secondary levee)
(I706)Embankment(setting back of levee)	Embankment(setting back of levee)
(I683)Embankment(slope gradient)	Embankment(slope gradient)
(I681)Embankment(slope)	Embankment(slope)
(I697)Embankment(sodding)	Embankment(sodding)
(I429)Embankment-drainage method(hooping)	Embankment-drainage method(hooping)
(I436)Environment irrigation water	Environment irrigation water
(I435)Environmental Quality Standards	Environmental Quality Standards
(I414)Equilibrated grade of river	Equilibrated grade of river
(I743)Equilibrium slope	Equilibrium slope
(I634)Equipotential line	Equipotential line
(I477)Erosion control works	Erosion control works
(I598)Erosion control works	Erosion control works
(I450)Estimated high-water discharge	Estimated high-water discharge
(I449)Estimated high-water level	Estimated high-water level
(I403)Estuary improvement	Estuary improvement
(I785)Extra-banking	Extra-banking
(I573)Fan	Fan
(I583)Fascine	Fascine
(I594)Fault	Fault
(I457)Field division(Cultivated area)	Field division(Cultivated area)
(I455)Field permeability test	Field permeability test
(I374)Fill in(Backfilling)	Fill in(Backfilling)
(I375)Fill in(Backfilling)	Fill in(Backfilling)

(I811)Filter film	Filter film
(I812)Filter material	Filter material
(I603)Finishing stake	Finishing stake
(I438)Fishladder	Fishladder
(I470)Fixed weir	Fixed weir
(I735)Floating dam	Floating dam
(I458)Flood control	Flood control
(I461)Flood control	Flood control
(I386)Flood Irrigation(Overflow irrigation)	Flood Irrigation(Overflow irrigation)
(I459)Flood protection works	Flood protection works
(I752)Flood-way	Flood-way
(I707)Flow (unsteady flow)	Flow (unsteady flow)
(I799)Flow net	Flow net
(I617)Flow(drop down curve(backwater))	Flow(drop down curve(backwater))
(I584)Flowing through capability	Flowing through capability
(I672)Foot protection	Foot protection
(I673)Foot protection	Foot protection
(I674)Foot protection	Foot protection
(I675)Foot protection	Foot protection
(I676)Foot protection	Foot protection
(I723)Footing	Footing
(I568)Formation level-railroad track	Formation level-railroad track
(I649)Foundation work	Foundation work
(I510)Free outflow	Free outflow
(I786)Freeboard-margin height (extra embankment)	Freeboard-margin height (extra embankment)
(I733)Froude number	Froude number
(I373)Furrow irrigation	Furrow irrigation
(I544)Gate	Gate
(I600)Geological Survey	Geological Survey
(I415)Graded condition of river	Graded condition of river
(I464)Gradient（Grade）	Gradient（Grade）
(I512)Gravity dam	Gravity dam
(I511)Gravity water	Gravity water
(I473)Groin (concrete block groin)	Groin (concrete block groin)

(I387)Groin over the water	Groin over the water
(I380)Groin towards up stream	Groin towards up stream
(I370)Groin(skeleton)-Wire cylinder masonry work(Gabion)	Groin(skeleton)
(I496)Gross pump head	Gross pump head
(I595)Ground water level	Ground water level
(I448)Group of piles	Group of piles
(I748)Groyne net	Groyne net
(I749)Groyne net	Groyne net
(I750)Groyne wood	Groyne wood
(I432)Gully erosion	Gully erosion
(I745)Head tank	Head tank
(I467)Heading	Heading
(I485)Hillside covering works	Hillside covering works
(I482)Hillside works	Hillside works
(I483)Hillside works	Hillside works
(I488)Hurdle work(bank protection work)	Hurdle work(bank protection work)
(I602)Hydraulic jump	Hydraulic jump
(I531)Hydraulic pressure	Hydraulic pressure
(I452)Hydraulic radius	Hydraulic radius
(I540)Hydraulic turbine	Hydraulic turbine
(I546)Hydraulic water depth	Hydraulic water depth
(I728)Impermeability layer	Impermeability layer
(I727)Impermeable groin(solid spur)	Impermeable groin(solid spur)
(I658)Impermeable wall	Impermeable wall
(I605)Impregnation method	Impregnation method
(I509)Infiltration gallery	Infiltration gallery
(I621)Infiltration(percolation) of levee	Infiltration(percolation) of levee
(I514)Intake	Intake
(I515)Intake dam	Intake dam
(I516)Intake dam	Intake dam
(I522)Intercepting drain	Intercepting drain
(I667)Interflow	Interflow
(I437)Intermittent settling tank	Intermittent settling tank
(I659)Internal impervious wall	Internal impervious wall

(I434)Irrigation methods	Irrigation methods
(I651)Jetty	Jetty
(I468)Lake bottom or marsh bottom	Lake bottom or marsh bottom
(I469)Lake bottom or marsh bottom	Lake bottom or marsh bottom
(I582)Laminar flow	Laminar flow
(I774)Land reclamation in natural slope	Land reclamation in natural slope
(I492)Land slide	Land slide
(I773)Landslide	Landslide
(I781)Landslide control works	Landslide control works
(I780)Landslide restraining works	Landslide restraining works
(I397)lapel method	lapel method
(I474)Left bankright bank	Left bankright bank
(I569)Left bankright bank	Left bankright bank
(I487)Levee burst prevention (hurdle work)	Levee burst prevention (hurdle work)
(I766)Leveling	Leveling
(I383)liquefaction	liquefaction
(I815)Lock	Lock
(I618)Low water channel work	Low water channel work
(I619)Low -water discharge	Low -water discharge
(I620)Low-water channel	Low-water channel
(I758)Macadam	Macadam
(I757)Main levee	Main levee
(I431)Masonry (dry masonry)	Masonry (dry masonry)
(I646)Mass curve	Mass curve
(I742)Mean velocity	Mean velocity
(I587)Meandering	Meandering
(I805)Method of average end areas	Method of average end areas
(I813)Mixing work on the way	Mixing work on the way
(I484)Mountainside slope cutter	Mountainside slope cutter
(I426)Movable weir(Drum gate)	Movable weir(Drum gate)
(I427)Movable weir(Overturning weir)	Movable weir(Overturning weir)
(I424)Movable weir(Rolling gate)	Movable weir(Rolling gate)
(I422)Movable weir(Sluice gate)	Movable weir(Sluice gate)
(I423)Movable weir(Stoney Weir)	Movable weir(Stoney Weir)

(I421)Movable weir(stop log)	Movable weir(stop log)
(I425)Movable weir(Tentergate)	Movable weir(Tentergate)
(I664)Nappe	Nappe
(I494)Natural drainage system	Natural drainage system
(I504)Natural Ground	Natural Ground
(I493)Natural head	Natural head
(I677)Negative friction	Negative friction
(I729)Non-uniform flow	Non-uniform flow
(I725)Normal water gauge(Ordinary water gauge)	Normal water gauge(Ordinary water gauge)
(I400)Open channel	Open channel
(I395)Open cut method	Open cut method
(I410)Open levee	Open levee
(I523)Ordinary flow	Ordinary flow
(I398)Orifice	Orifice
(I385)Overflow pipe	Overflow pipe
(I388)Overflow weir	Overflow weir
(I393)Overlay	Overlay
(I755)Paddy field land	Paddy field land
(I744)Parallel drainage	Parallel drainage
(I696)Parapet	Parapet
(I671)Penetration	Penetration
(I632)Penstock (alluvium)	Penstock (alluvium)
(I532)Penstock root	Penstock root
(I444)Pile dyke(groin)	Pile dyke(groin)
(I724)Plain precipitation(Normal sedimentation)	Plain precipitation(Normal sedimentation)
(I730)Plane of floatation	Plane of floatation
(I526)Planted slope protection:Vegetation engineering	Planted slope protection:Vegetation engineering
(I611)Plastic deformation of the soil	Plastic deformation of the soil
(I734)Preloading	Preloading
(I391)Pressed embankment	Pressed embankment
(I592)Prevent water leakage	Prevent water leakage
(I609)Prevent water leakage(hooping)	Prevent water leakage(hooping)
(I555)Preventing water leakage from embankments	Preventing water leakage from embankments
(I562)Productive green tract of land	Productive green tract of land

(I368)Pumice-stone(Floating stones)	Pumice-stone(Floating stones)
(I778)Pumped storage power	Pumped storage power
(I779)Pump-up head	Pump-up head
(I784)Quarter crossing joint	Quarter crossing joint
(I751)Radial drainage	Radial drainage
(I795)Radial drainage	Radial drainage
(I654)Rammer	Rammer
(I810)Rate of filtration	Rate of filtration
(I356)RCD method	RCD method
(I630)Reconnaissance	Reconnaissance
(I537)Relief well(Water gate)	Relief well(Water gate)
(I777)Retarding basin,flood storage basin	Retarding basin,flood storage basin
(I807)Reynoldsnumber	Reynoldsnumber
(I650)Ridge line	Ridge line
(I597)Rift valley	Rift valley
(I806)Rill erosion	Rill erosion
(I792)Ripper	Ripper
(I793)Ripper(rippability)	Ripper(rippability)
(I553)Riprap work	Riprap work
(I527)River (cut-off)	River (cut-off)
(I412)River administer	River administer
(I720)River bed water	River bed water
(I419)River channel	River channel
(I420)River channel improvement	River channel improvement
(I411)River improvement	River improvement
(I416)River Law	River Law
(I413)River works	River works
(I693)River(branch river)	River(branch river)
(I394)Riverbed girdle	Riverbed girdle
(I615)Riverside land-land side	Riverside land-land side
(I640)Roadway diagraph	Roadway diagraph
(I361)Rock Crib Work	Rock Crib Work
(I816)Rock fill dam	Rock fill dam
(I471)Roller	Roller

(I552)Rubble-mound breakwater	Rubble-mound breakwater
(I796)Run-off coefficient	Run-off coefficient
(I525)Salt Exclusion	Salt Exclusion
(I480)Sand drain method	Sand drain method
(I687)Sand flash gate	Sand flash gate
(I794)Sand flash gate	Sand flash gate
(I481)Sand pile	Sand pile
(I551)Scoop	Scoop
(I575)Scour	Scour
(I401)Sea bottom reclamation（Sea surface reclamation）	Sea bottom reclamation（Sea surface reclamation）
(I703)Secondary levee	Secondary levee
(I719)Secondary levee	Secondary levee
(I623)Section of levee	Section of levee
(I645)Sediment settling	Sediment settling
(I529)Seepage line:Infiltration line	Seepage line:Infiltration line
(I499)Self closing tap	Self closing tap
(I404)Semi-permeable groin -wire cylinder masonry work(gabion)	Semi-permeable groin -wire cylinder masonry work(gabion)
(I405)Semi-permeable groin -wire cylinder masonry work(gabion)	Semi-permeable groin -wire cylinder masonry work(gabion)
(I382)Sensitivity ratio	Sensitivity ratio
(I572)Separation levee	Separation levee
(I741)Sewerage(Combined type/ Separate type)	Sewerage(Combined type/ Separate type)
(I740)Sewerage(separate system)	Sewerage(separate system)
(I559)Sewerage(sludge treatment)	Sewerage(sludge treatment)
(I371)Sewerage(storm outfall(Rainwater outlet))	Sewerage(storm outfall(Rainwater outlet))
(I372)Sewerage(street inlet(Rainwater basin))	Sewerage(street inlet(Rainwater basin))
(I558)Sewerage(thickner（Sludge scraper）)	Sewerage(thickner（Sludge scraper）)
(I739)Sewerage(Water distribution valve(ferrule))	Sewerage(Water distribution valve(ferrule))
(I612)Shaft sinking	Shaft sinking
(I350)Shallow well	Shallow well
(I408)Shape of river	Shape of river
(I652)Sheathing work	Sheathing work
(I767)Shoulder sodding	Shoulder sodding
(I768)Shoulder sodding	Shoulder sodding
(I528)Silt layer	Silt layer

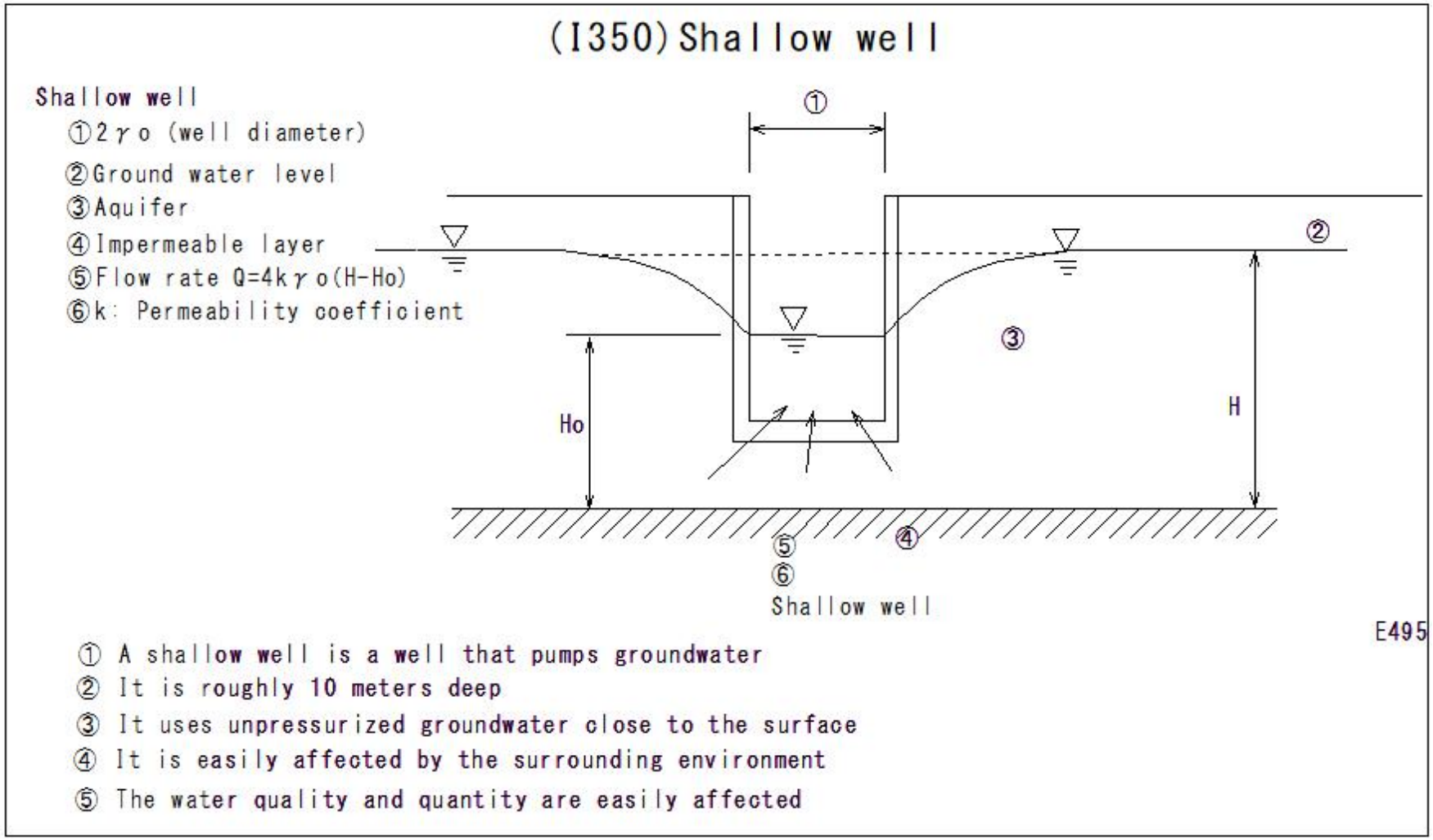
(I593)Single pile	Single pile
(I721)Siphon culvert	Siphon culvert
(I369)Skelton	Skelton
(I557)Sliding surface	Sliding surface
(I564)Slope crib work	Slope crib work
(I505)Slope failure	Slope failure
(I622)Slope failure	Slope failure
(I614)Slope foot protection(Filling pile work)	Slope foot protection(Filling pile work)
(I377)Slope protection(backing mat method)	Slope protection(backing mat method)
(I554)Slope protection-Concrete block masonry	Slope protection-Concrete block masonry
(I653)Slope tamping	Slope tamping
(I705)Sluice	Sluice
(I708)Sluice	Sluice
(I560)Sluice gate	Sluice gate
(I364)Sodding	Sodding
(I580)Sodding	Sodding
(I648)Soil profile	Soil profile
(I578)Soil stabilizer	Soil stabilizer
(I808)Sounding lead	Sounding lead
(I765)Spatter's effect(water splash effect)	Spatter's effect(water splash effect)
(I638)Special bank	Special bank
(I712)Specific discharge	Specific discharge
(I783)Spillway	Spillway
(I479)Spray irrigation	Spray irrigation
(I680)Spread foundation	Spread foundation
(I761)Spreading depth	Spreading depth
(I543)Spur dyke(groin)	Spur dyke(groin)
(I486)Square weir	Square weir
(I682)Stability of the slope(slope pile)	Stability of the slope(slope pile)
(I358)Stabilization work	Stabilization work
(I533)Stage(water level)	Stage(water level)
(I709)Standard penetration test	Standard penetration test
(I702)Stay	Stay
(I359)Stone Dyke	Stone Dyke

(I567)Stone levee	Stone levee
(I360)Stone masonry	Stone masonry
(I362)Stone Pitching Work	Stone Pitching Work
(I556)Stoney gate weir	Stoney gate weir
(I402)Stop log	Stop log
(I668)Strip footing	Strip footing
(I443)Strut	Strut
(I771)Submerged discharge	Submerged discharge
(I770)Submerged orifice	Submerged orifice
(I644)Subsoil compacting	Subsoil compacting
(I574)Summer dyke	Summer dyke
(I506)Supercritical flow(shooting flow /rapid flow)	Supercritical flow(shooting flow /rapid flow)
(I392)Surcharge process:Pressing embankment method	Surcharge process:Pressing embankment method
(I710)Surface impermeable wall	Surface impermeable wall
(I475)Surge-tank	Surge-tank
(I731)Suspended load	Suspended load
(I753)Tail-race surge tank	Tail-race surge tank
(I599)Test pit	Test pit
(I589)Thalweg	Thalweg
(I797)Thalweg	Thalweg
(I604)Tidal power type	Tidal power type
(I462)Time of concenration of flood	Time of concenration of flood
(I454)Torrent control works	Torrent control works
(I581)Traction	Traction
(I655)Trafficability	Trafficability
(I698)Trailer	Trailer
(I636)Training dyke	Training dyke
(I637)Training levee	Training levee
(I656)Trench cut method	Trench cut method
(I669)Trench excavation	Trench excavation
(I478)Triangular weir	Triangular weir
(I489)Tributary	Tributary
(I789)Turbulent flow -Laminar flow	Turbulent flow -Laminar flow
(I722)Twin float	Twin float

(I577)Undercurrent	Undercurrent
(I550)Undermining	Undermining
(I635)Uniform flow	Uniform flow
(I441)Unscreened gravel	Unscreened gravel
(I726)Unsteady flow	Unsteady flow
(I518)Vadose water:Circulating water	Vadose water:Circulating water
(I800)Velocity of flow	Velocity of flow
(I376)Vertical frame	Vertical frame
(I588)Vertical wire cylinder masonry work(gabion)	Vertical wire cylinder masonry work(gabion)
(I695)Walling	Walling
(I367)Wash Load	Wash Load
(I764)Water bound macadam	Water bound macadam
(I802)Water course	Water course
(I804)Water course	Water course
(I542)Water erosion control	Water erosion control
(I536)Water hammer	Water hammer
(I538)Water pollution	Water pollution
(I399)Water supply	Water supply
(I520)Water supply (clean water(Purified water))	Water supply (clean water(Purified water))
(I524)Water supply (continuous flow setting basin)	Water supply (continuous flow setting basin)
(I521)Water supply (purification plant)	Water supply (purification plant)
(I576)Water supply (Total head)	Water supply (Total head)
(I579)Water supply (water-conveyance equipment)	Water supply (water-conveyance equipment)
(I378)Water supply and sewerage(rain gauge)	Water supply and sewerage(rain gauge)
(I417)Water supply(activated carbon method)	Water supply(activated carbon method)
(I628)Water supply(earthenware pipe)	Water supply(earthenware pipe)
(I456)Water supply(Elevated tank)	Water supply(Elevated tank)
(I814)Water supply(return back of filtration	Water supply(return back of filtration
(I711)Water supply(surface washing（Surface cleaning）)	Water supply(surface washing（Surface cleaning）)
(I688)Water supply(Water Distribution)	Water supply(Water Distribution)
(I665)Water supply(Water softening)	Water supply(Water softening)
(I690)Water supply(water-tower)	Water supply(water-tower)
(I513)Water-intake	Water-intake
(I534)Water-level recorder	Water-level recorder

(I535)Water-level recorder	Water-level recorder
(I736)Watershed	Watershed
(I548)Weir	Weir
(I563)Weir	Weir
(I691)Weir(dentated sill)	Weir(dentated sill)
(I631)Weir(head works)	Weir(head works)
(I440)Weir(notch)	Weir(notch)
(I692)Weir(sharp crested weir)	Weir(sharp crested weir)
(I626)Weir(tainter gate)	Weir(tainter gate)
(I366)Well point method	Well point method
(I679)Wet masonry	Wet masonry
(I519)Wetted perimeter	Wetted perimeter
(I678)Wheel barrow	Wheel barrow
(I713)Wind erosion control	Wind erosion control
(I714)Wind erosion farm	Wind erosion farm
(I754)Windbreak	Windbreak
(I502)Wire cylinder(gabion)	Wire cylinder(gabion)
(I503)Wire cylinder(gabion)	Wire cylinder(gabion)
(I769)Wooden beam bridge	Wooden beam bridge
(I607)Wooden bridge	Wooden bridge
(I762)Wooden bridge	Wooden bridge
(I763)Wooden bridge	Wooden bridge
(I384)Works for overflow	Works for overflow
(I613)Works for overflow	Works for overflow
(I566)Works for overflow(board work)	Works for overflow(board work)
(I571)Zero air voids curve	Zero air voids curve

(I350)Shallow well



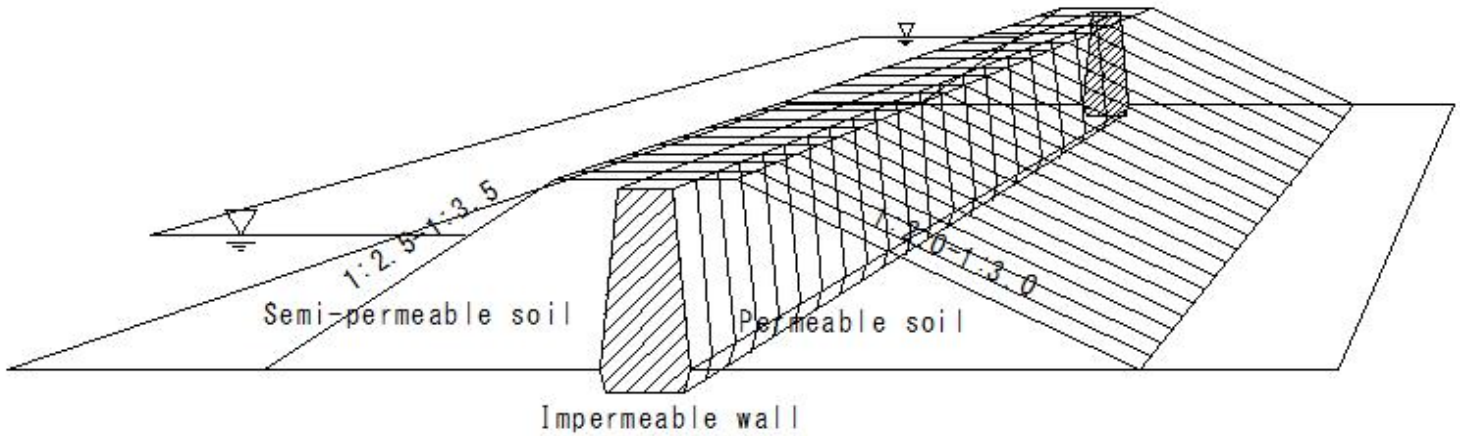
(I351)Dam(Earth dam)

(I351)Dam(Earth dam)

Earth dam

Embankment body is soil

・Can be constructed even in places where the foundation ground (bearing capacity) is small



・Central impermeable wall type

・For imperviousness, carefully compact the sticky soil.

・Reinforced concrete using steel plates, etc.

Earth Dam is a dam constructed primarily using earth and shaped like a trapezoid.

D172

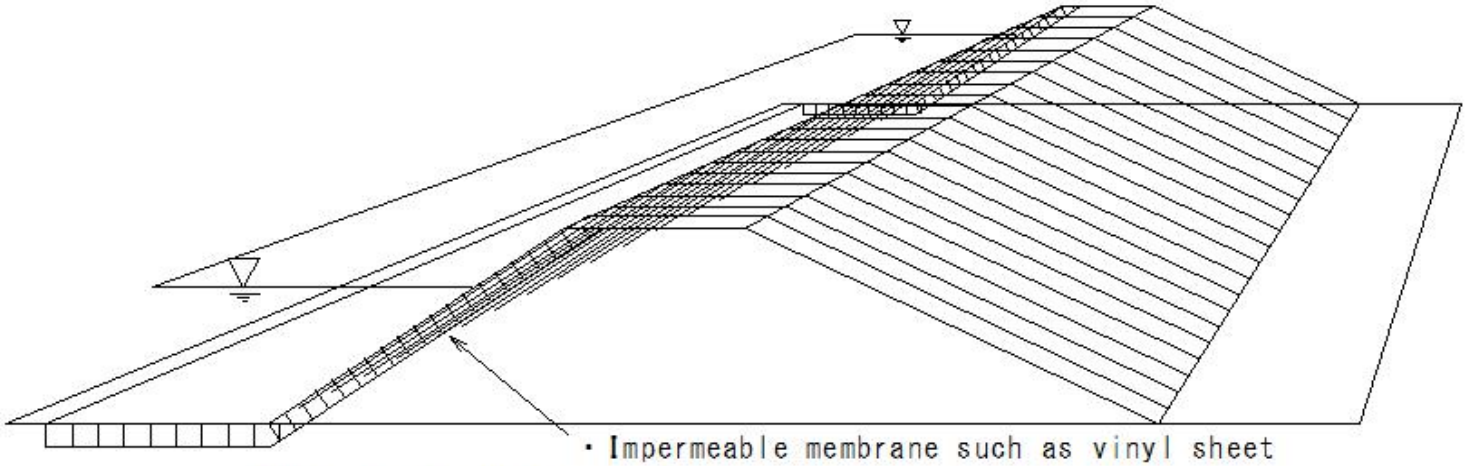
(I352)Dam(Earth dam)

(I352)Dam(Earth dam)

Earth Dam

Embankment body is soil

・Can be constructed even in places where the foundation ground (bearing capacity) is small

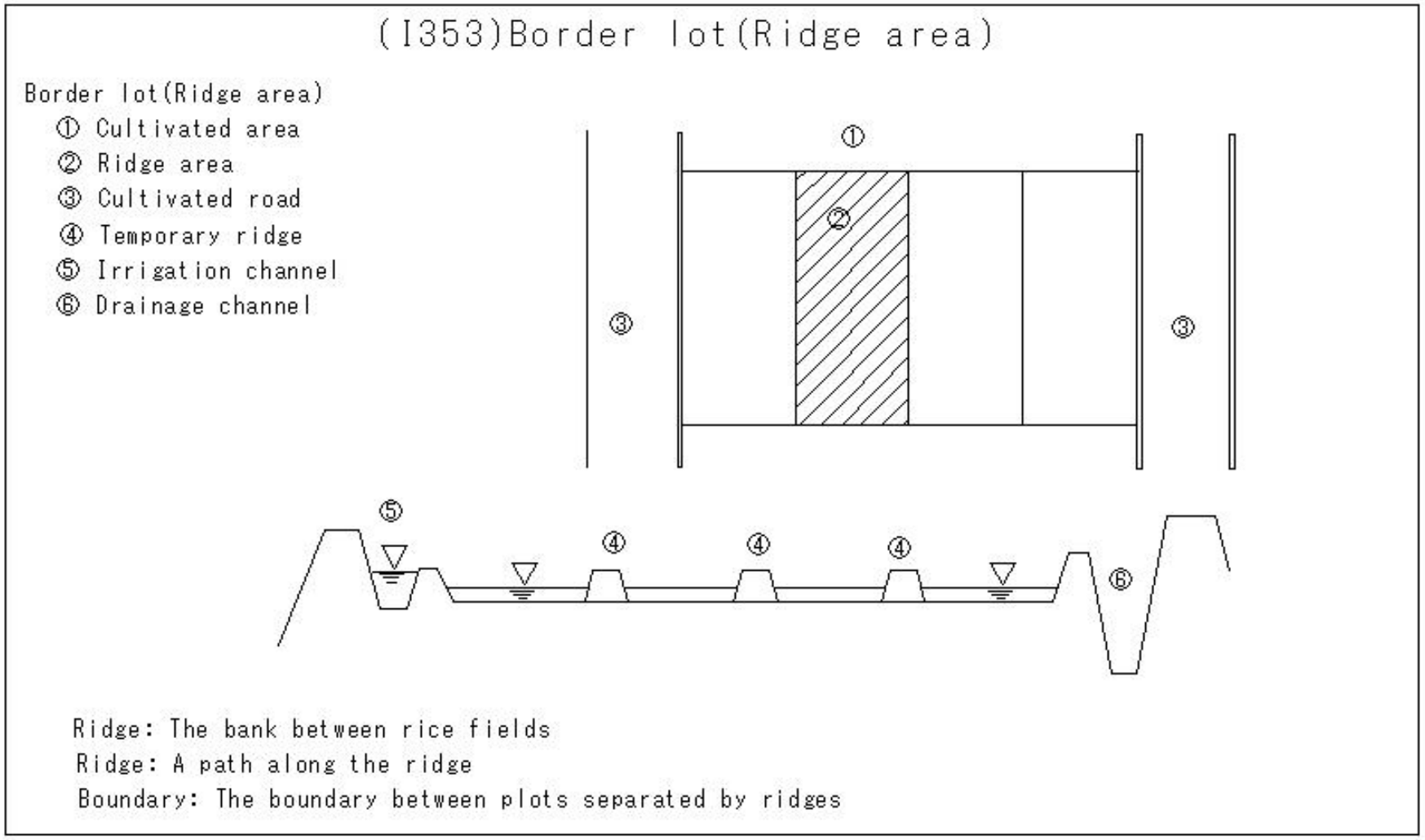


・Impermeable membrane such as vinyl sheet

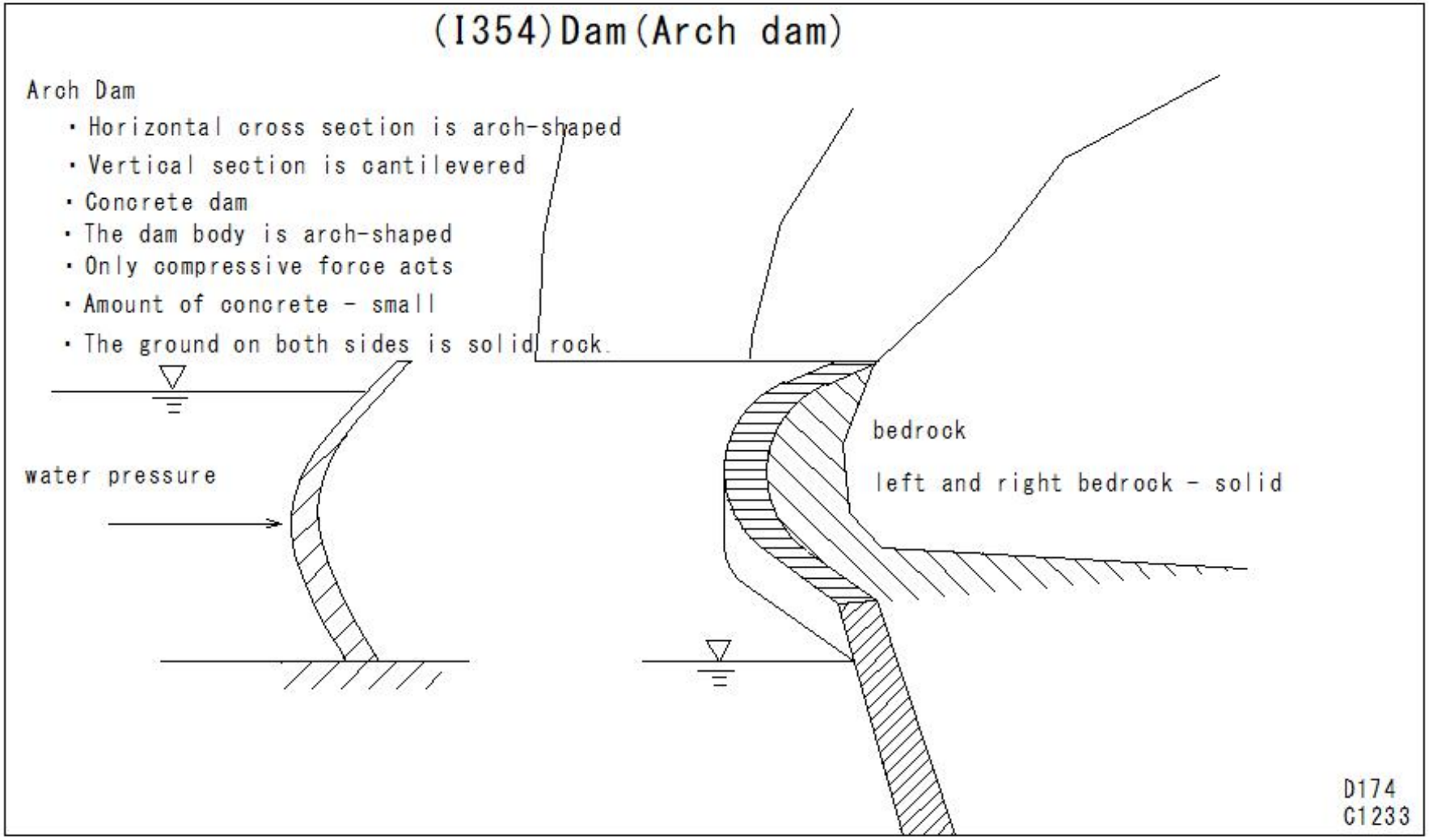
・Front impermeable wall type
Earth Dam

D173

(I353)Border lot(Ridge area)



(I354)Arch Dam



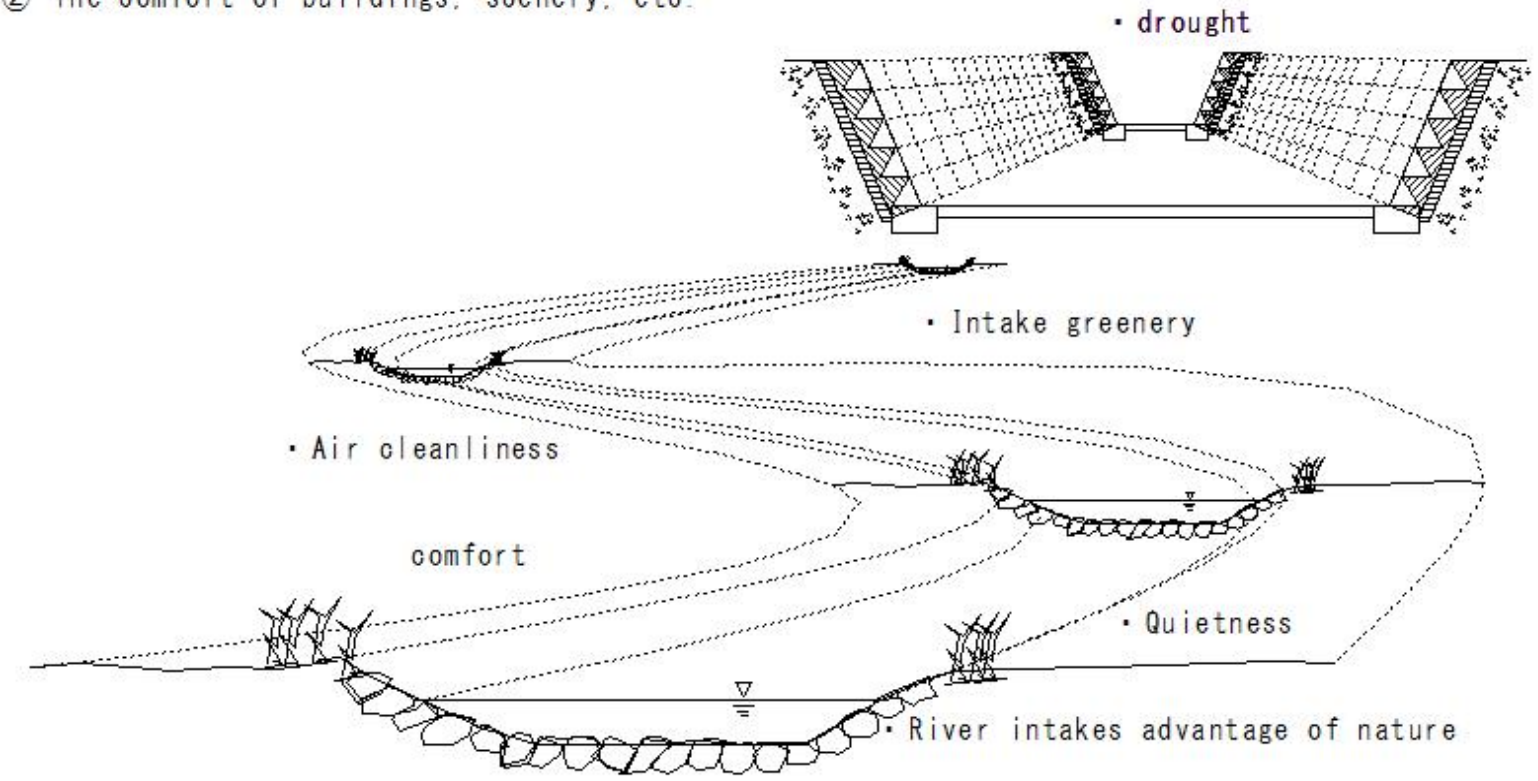
(I355)Amenity

(I355)Amenity

Amenity

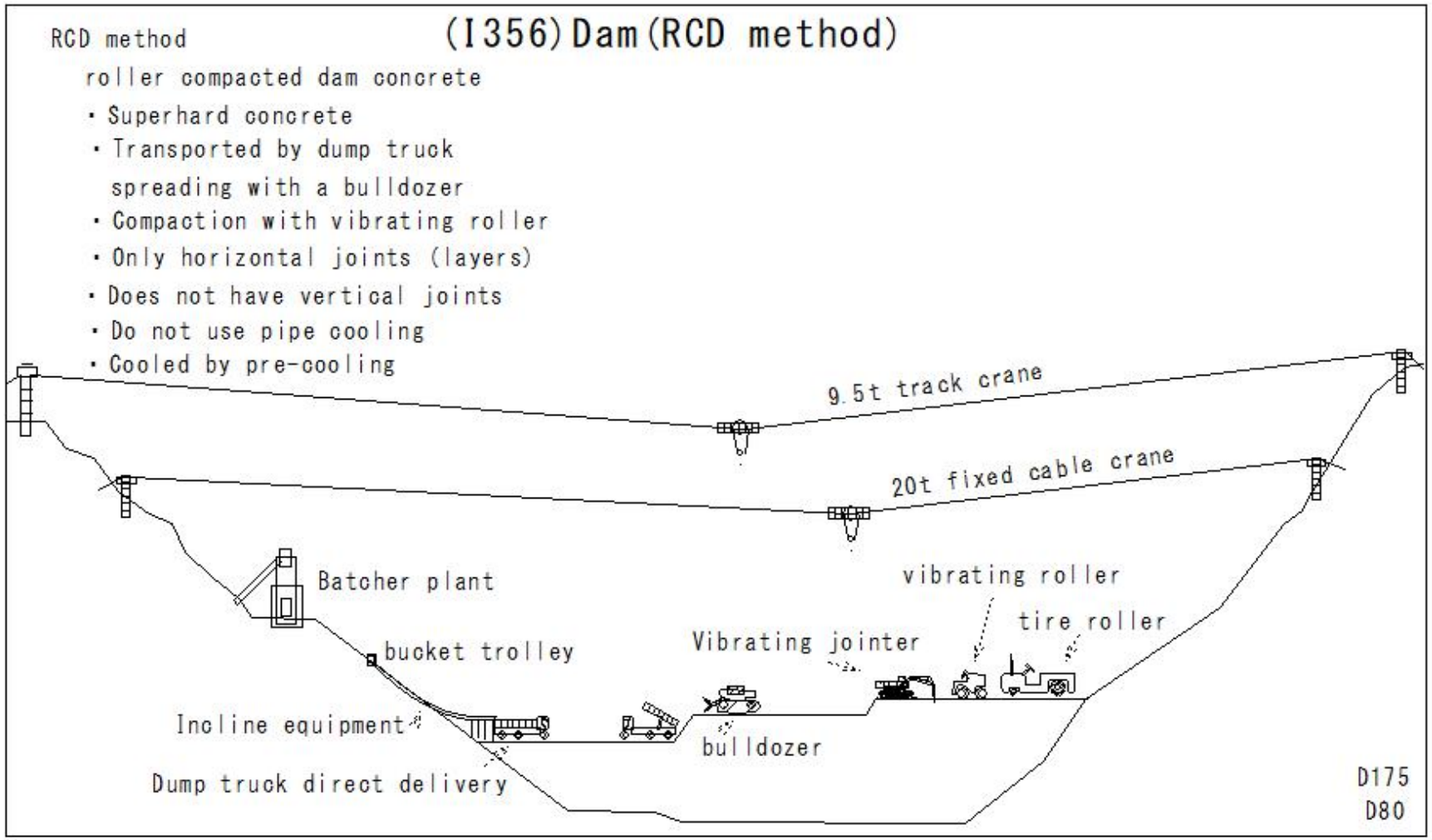
① Amenity is a word that means comfort, coziness, an attractive environment, etc.

② The comfort of buildings, scenery, etc.

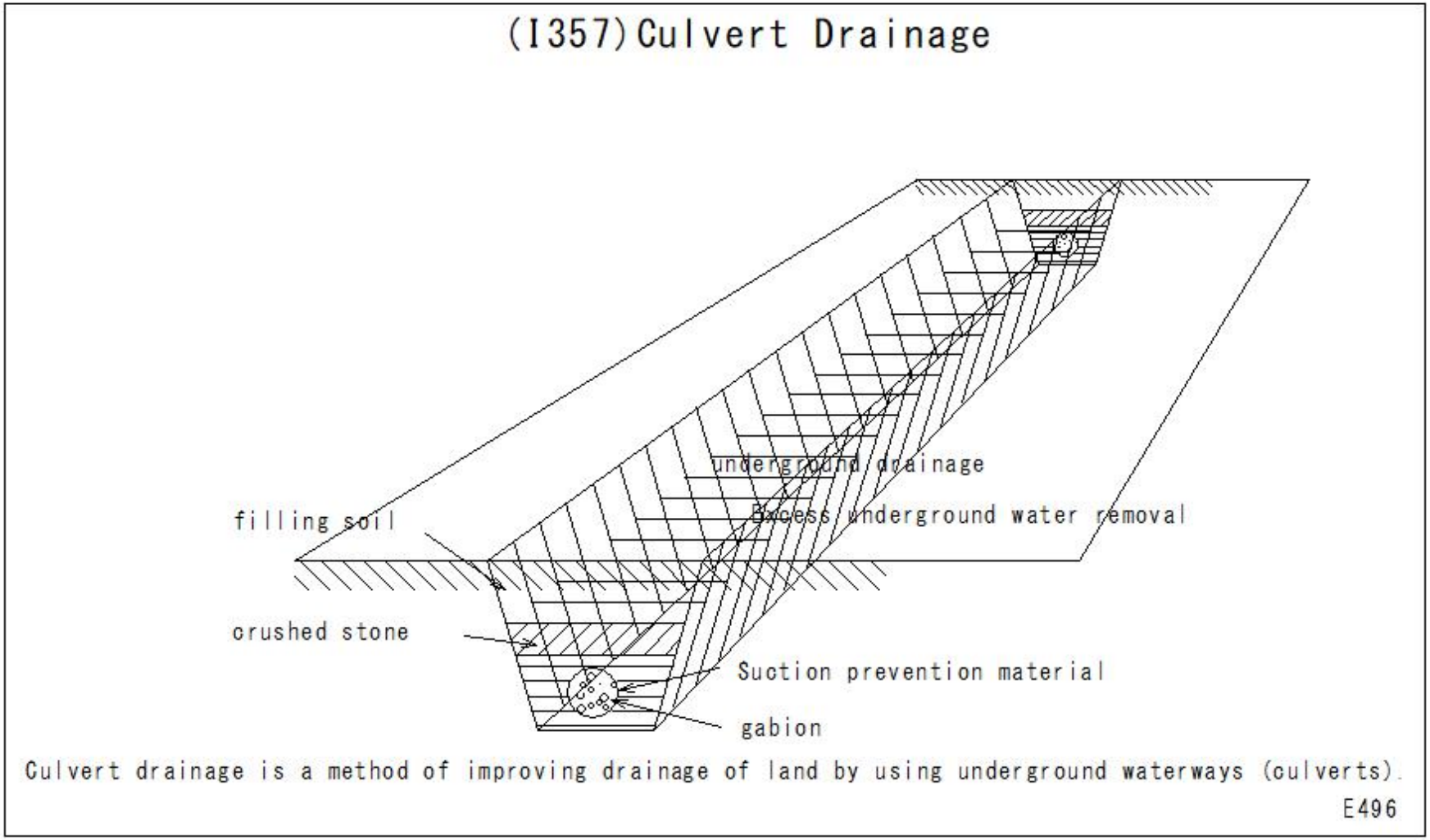


R280

(I356)RCD method



(I357)Culvert Drainage



(I358)Stabilization work

(I358)Stabilization work

Stabilization work

Physical methods

① On-site soil + aggregate → improves particle size distribution

② Wet soil + lime → strength increase

③ Wet soil + cement → soil cement (strength increase)

④ On-site soil + bituminous material → increases adhesion, impermeability, and waterproofing

⑤ On-site soil + (calcium silicate, calcium acrylate) → stabilized by precipitation, addition polymerization, etc.

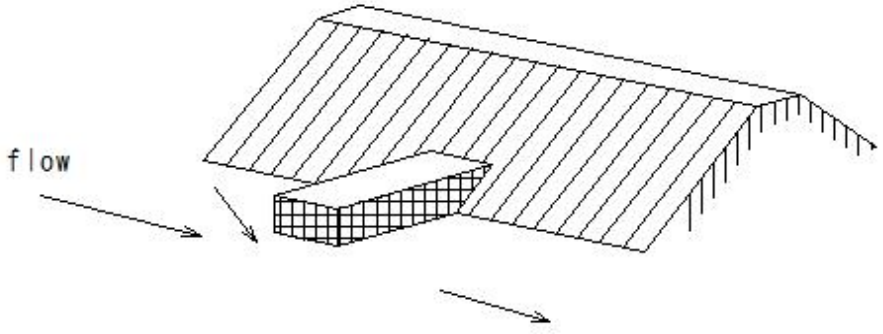
Stabilization work is a method of improving the soil quality of the ground and roadbed, and strengthens the bonds between soil particles by adding stabilizers such as cement and lime.

(I359)Stone Dyke

(I359)Stone Dyke(groin)

Stone Dyke(groin)

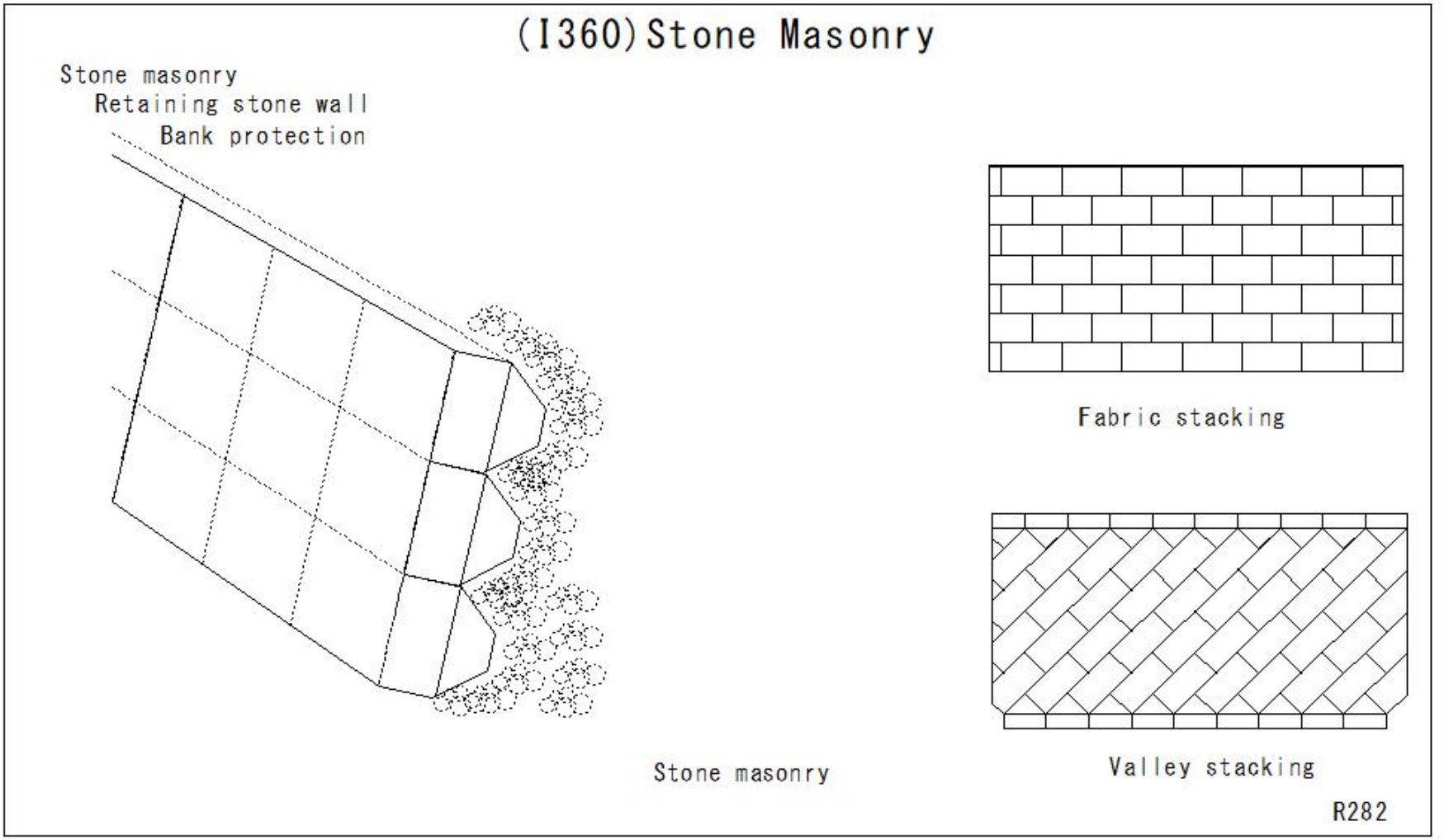
- Weakening the flow force of the river
- Direct flow to the center



stone dyke(groin)
masonry
made of concrete

R281

(I360)Stone masonry



(I361)Rock Crib Work

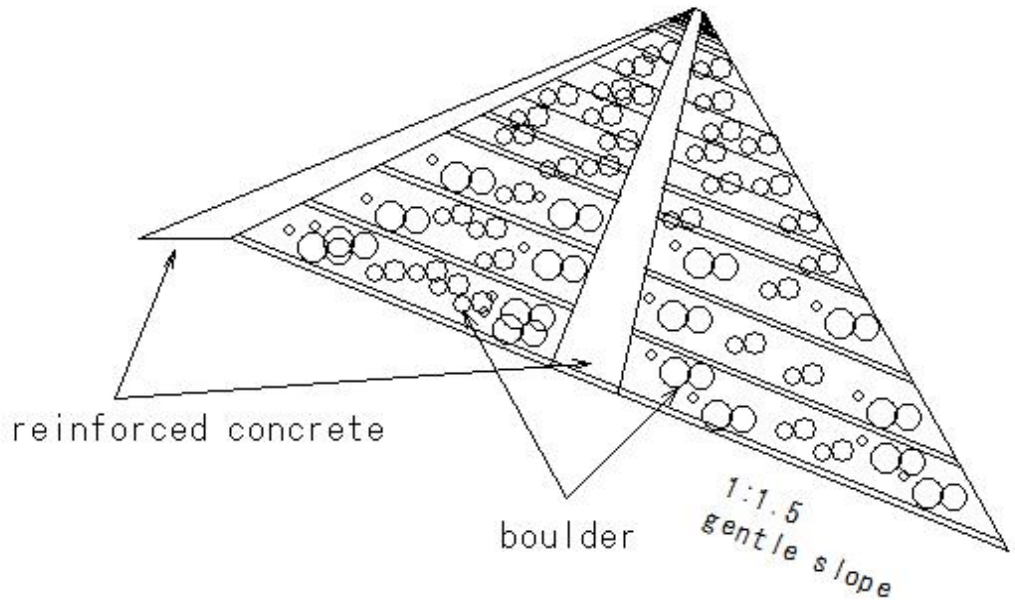
(I361)Rock Crib Work

Rock Crib work

reinforced concrete crib work

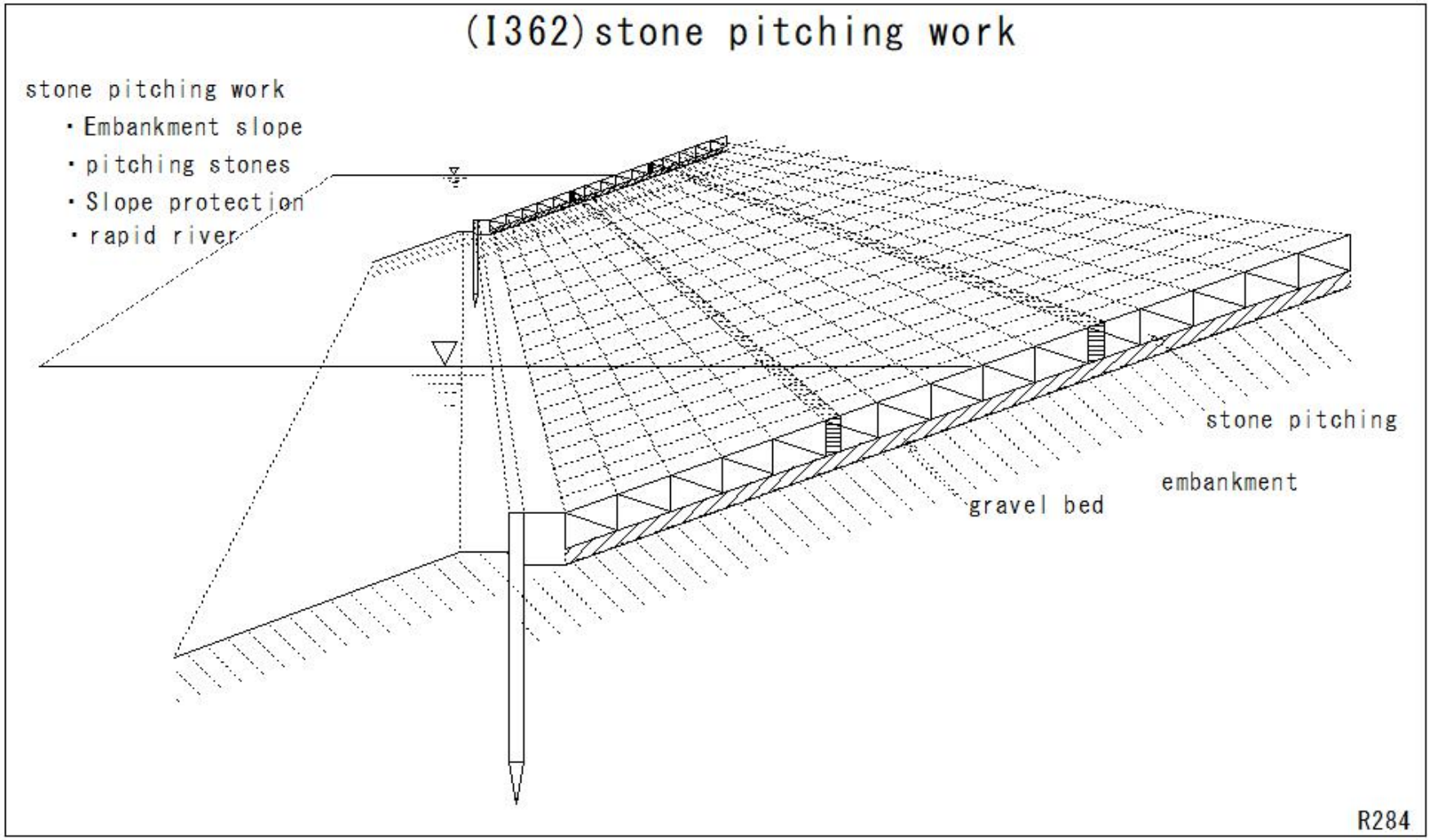
Packing of cobblestones, gravel, and gravel

Assemble a frame on the slope of the embankment



R283

(I362)Stone Pitching Work



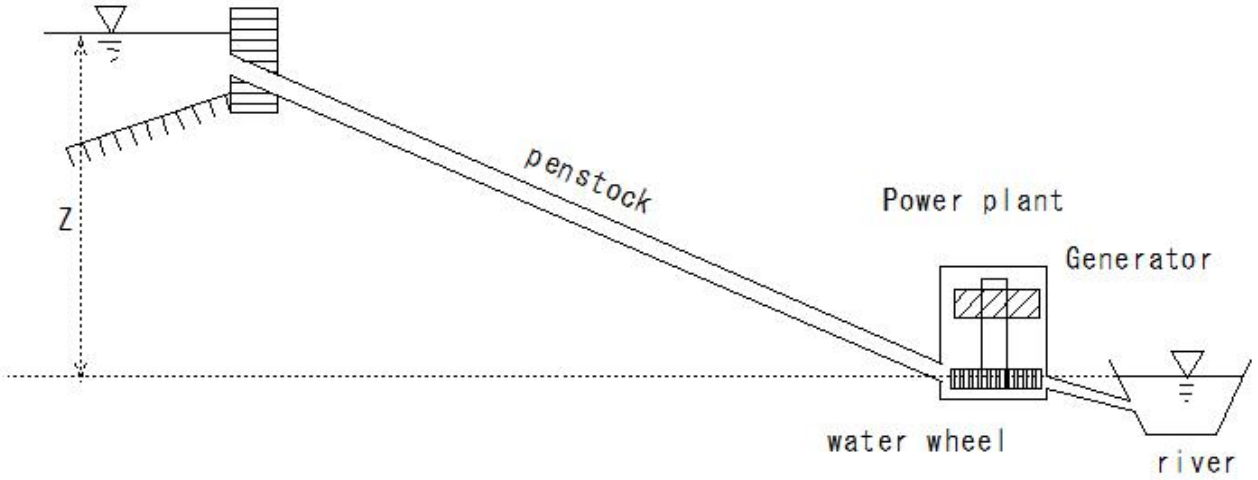
(I363)Dam(potential head)

(I363)Dam(potential head)

potential head

- Bernoulli's theorem
- Express the energy at the position where water is placed in the unit of height (m)
- Convert positional water head into electrical energy

Z (position head) (m) Total head in hydropower generation



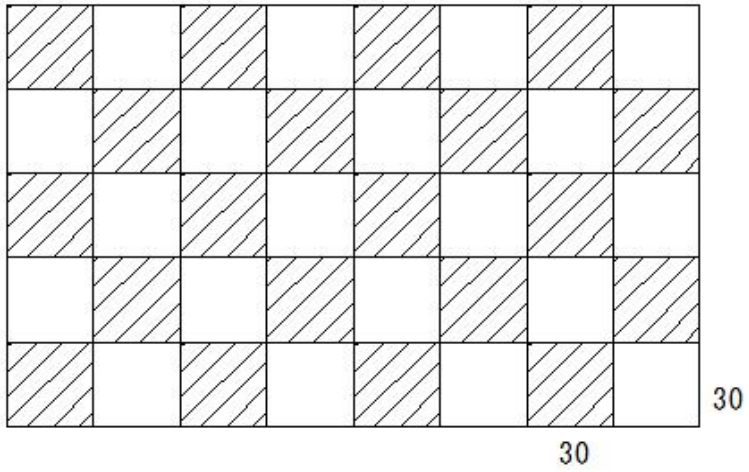
Z : (potential head) (m) Total head in hydropower generation

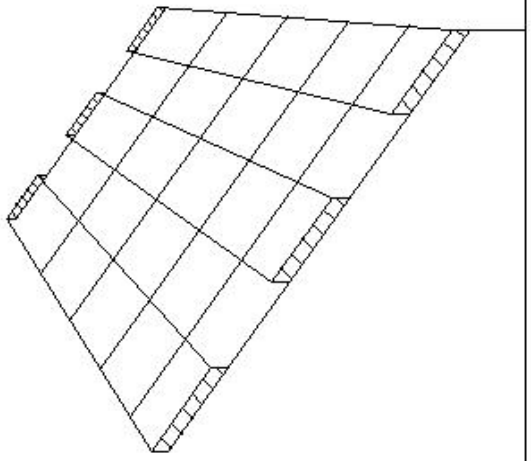
D176

(I364)Sodding

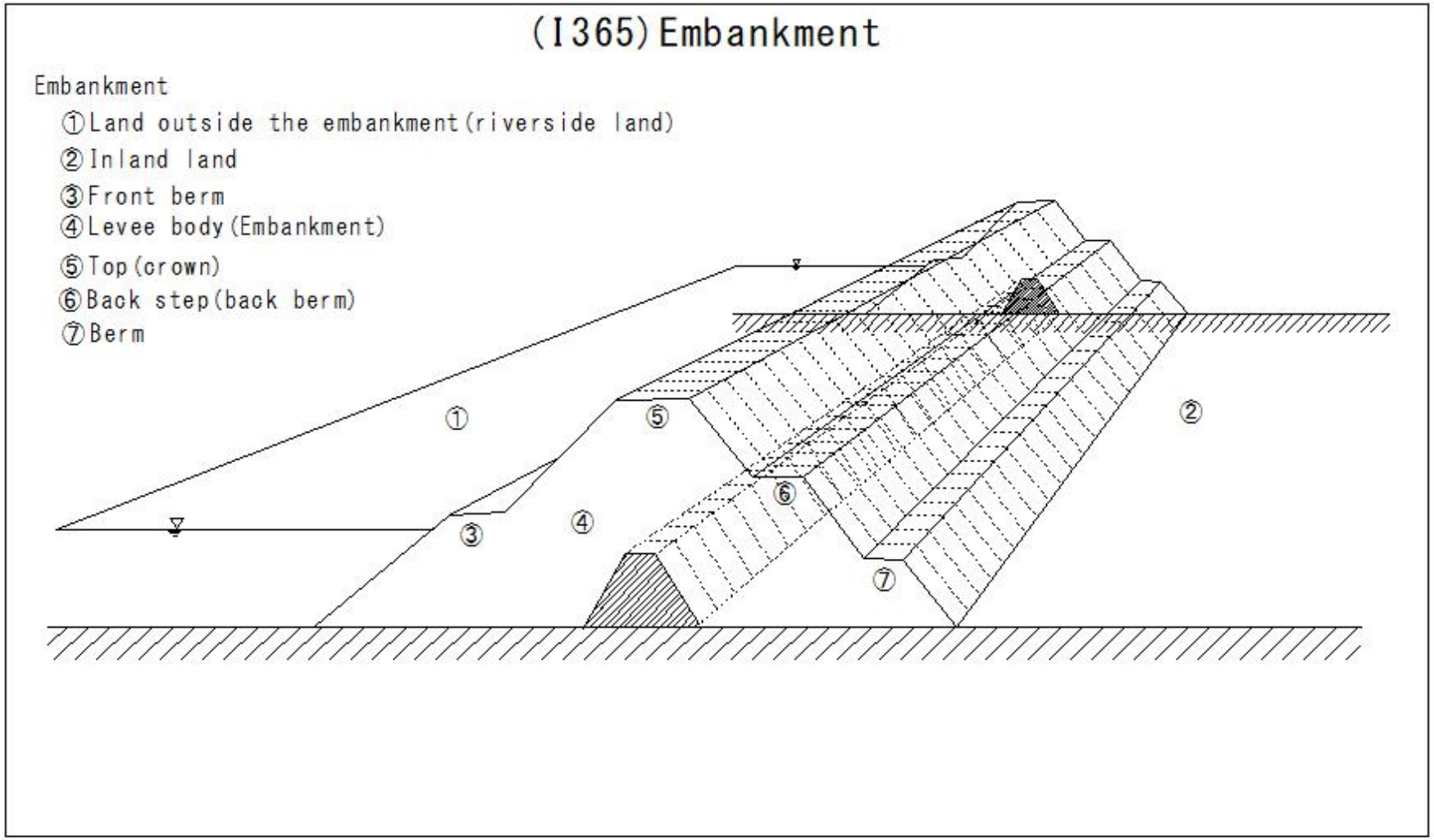
(I364)Sodding

Sodding





(I365)Embankment



(I366)Well point method

(I366)Well point method

Well point method

① Initial groundwater level

② Groundwater level after construction

③ Collection pipe

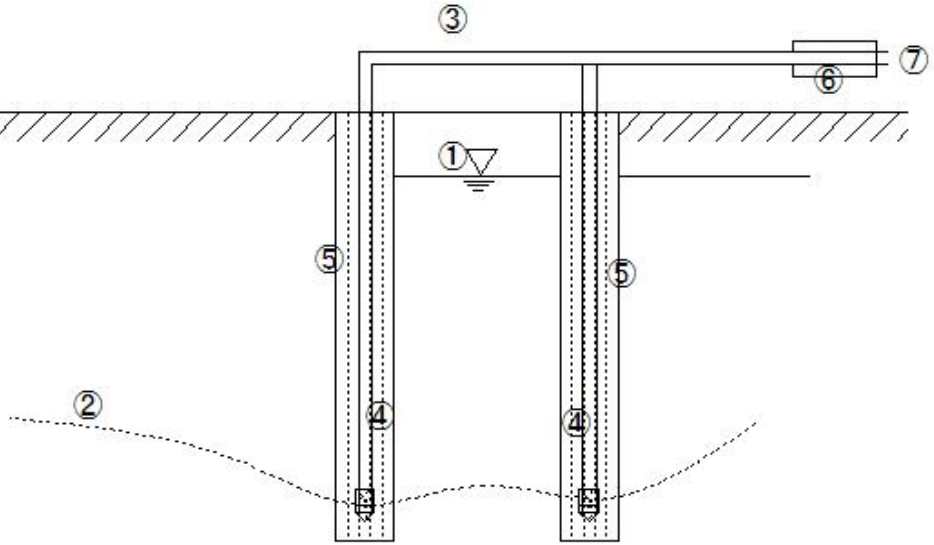
④ Well point

⑤ Filtration layer (sand)

⑥ Vacuum pump

⑦ Drainage

Sandy ground



The well point method is a method of installing many small wells called well points collecting groundwater by vacuum suction and pumping and draining it.

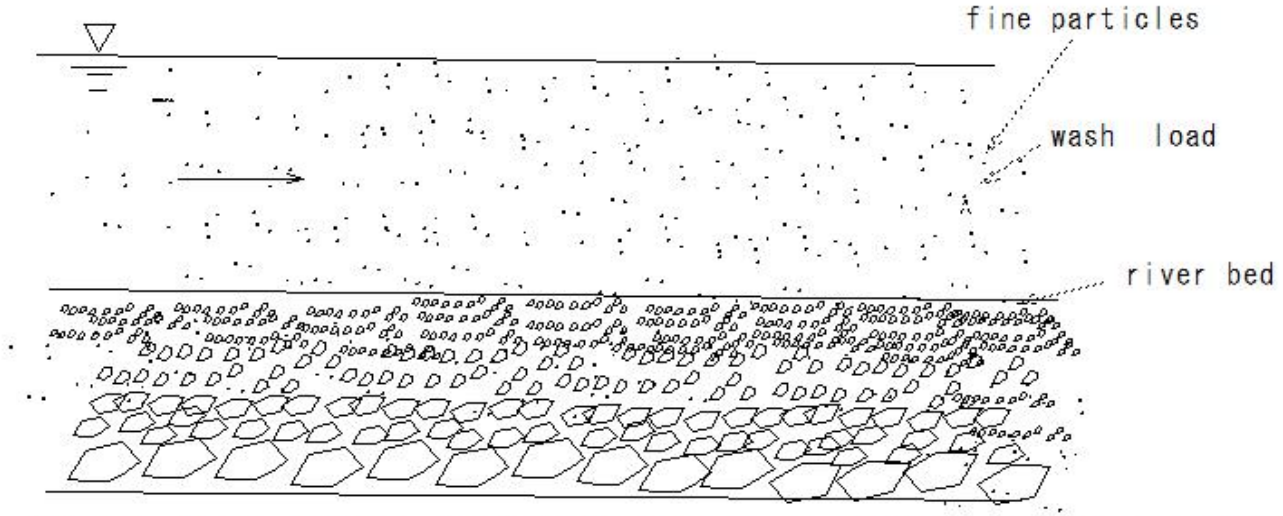
(I367)Wash Load

(I367)Wash Load

Wash load

Fine particles
Transported from upstream

Reservoir - Buried



① A wash load is a type of moving sediment composed of finer grains of soil than the riverbed gravel.
② Even if the flow rate slows, it does not settle easily, so once it is incorporated into the flowing water, it can easily flow long distances.

R607

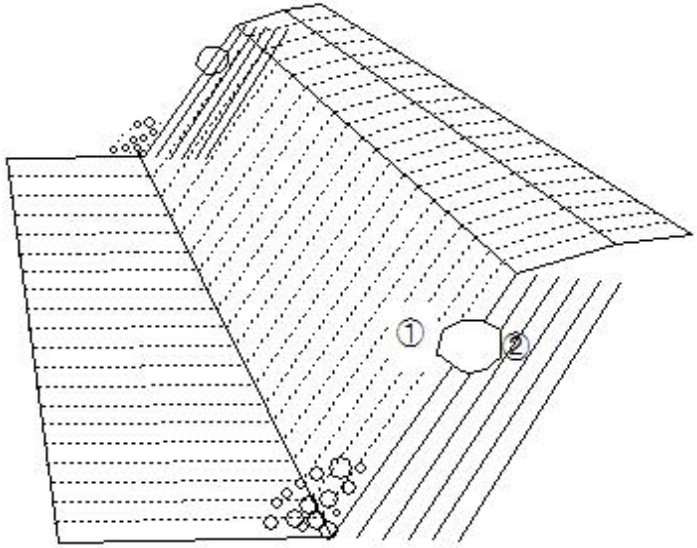
(I368)Pumice-stone(Floating stones)

(I368)Pumice-stone(Floating stones)

Pumice-stone(Floating stones)

①Floating stones

②Cracks



Excavation of the ground

Unstable stones:

These are stones that easily crumble and are often found on slopes in mountainous areas.

(I369)Skelton

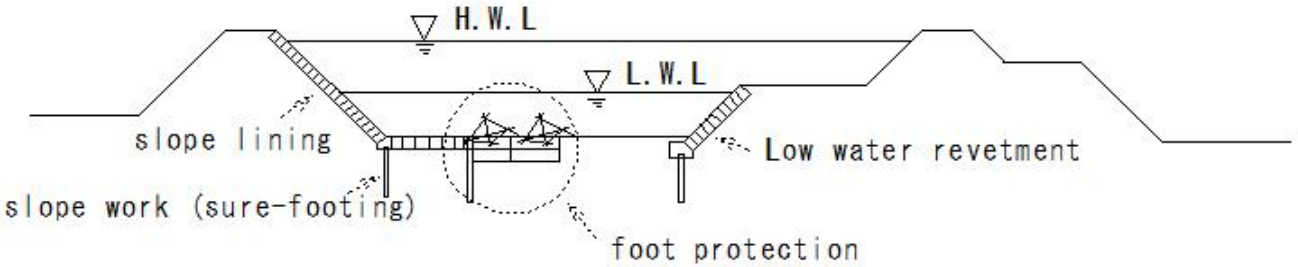
(I369)Skelton

Skelton

① To weaken the force of the water flow

② To prevent erosion of the embankment

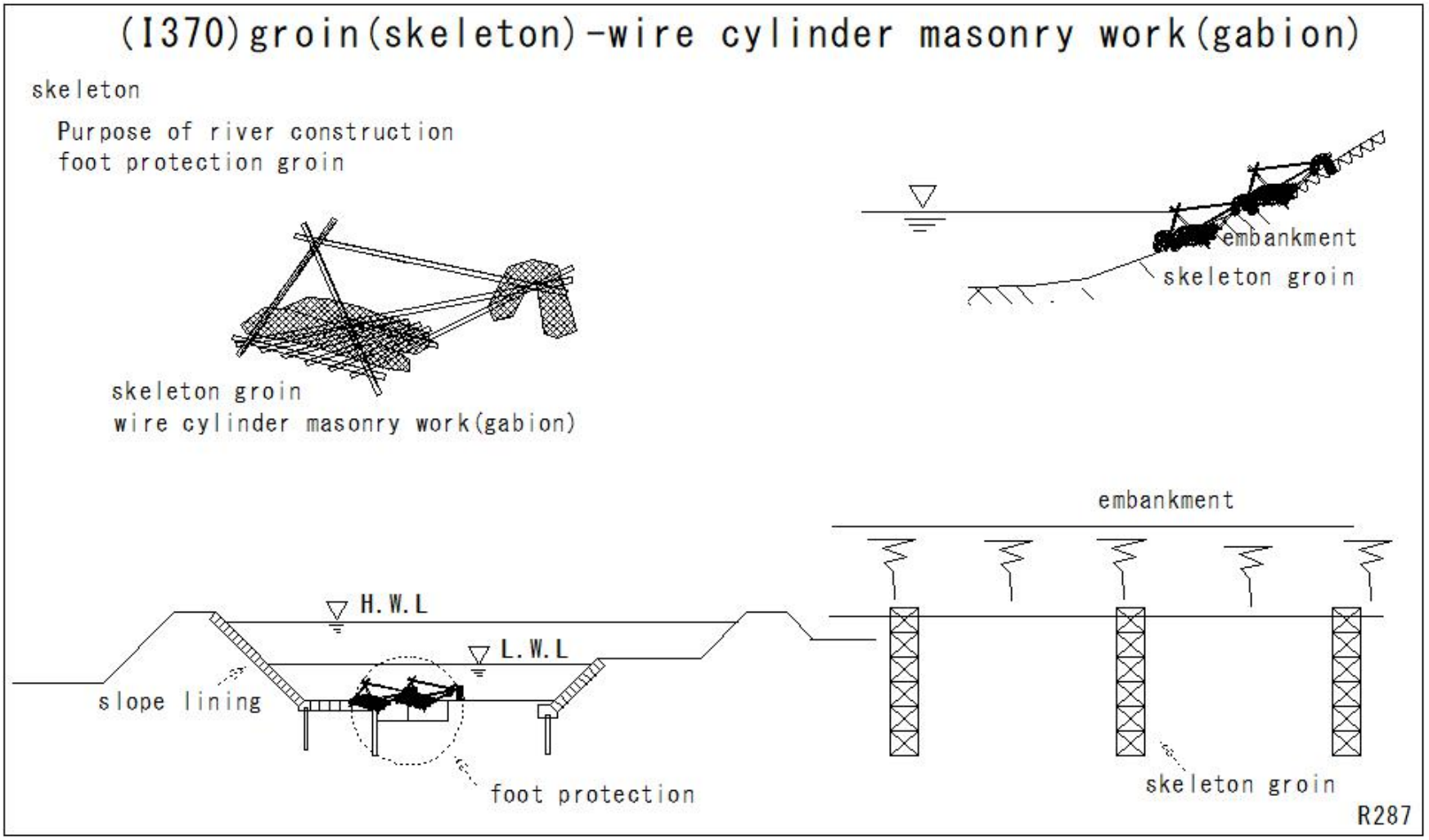
③ Made of wood



Skelton

R113

(I370)Groin(skeleton)-Wire cylinder masonry work(Gabion)



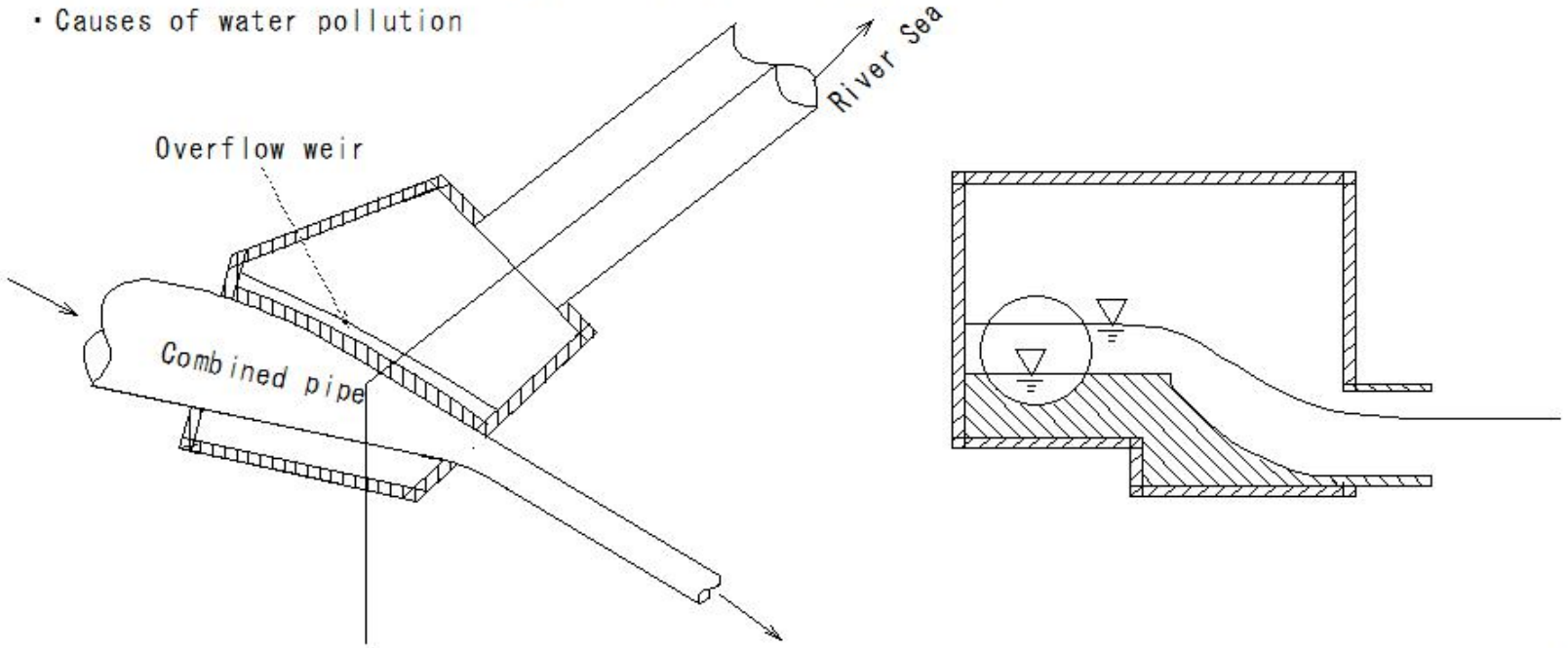
(I371)Sewerage(storm outfall(Rainwater outlet))

(I371)Sewerage(storm outfall(Rainwater outlet))

Sewerage

storm outfall(Rainwater outlet)

- Rainwater - Dirt is diluted
- Sewage volume - 2-3 times or more the amount of sewage
- Other sewage - Overflows the weir and is discharged into the river or sea
- Causes of water pollution



W220

(I372)Sewerage(street inlet(Rainwater basin))

(I372)Sewerage(street inlet(Rainwater basin))

Sewerage

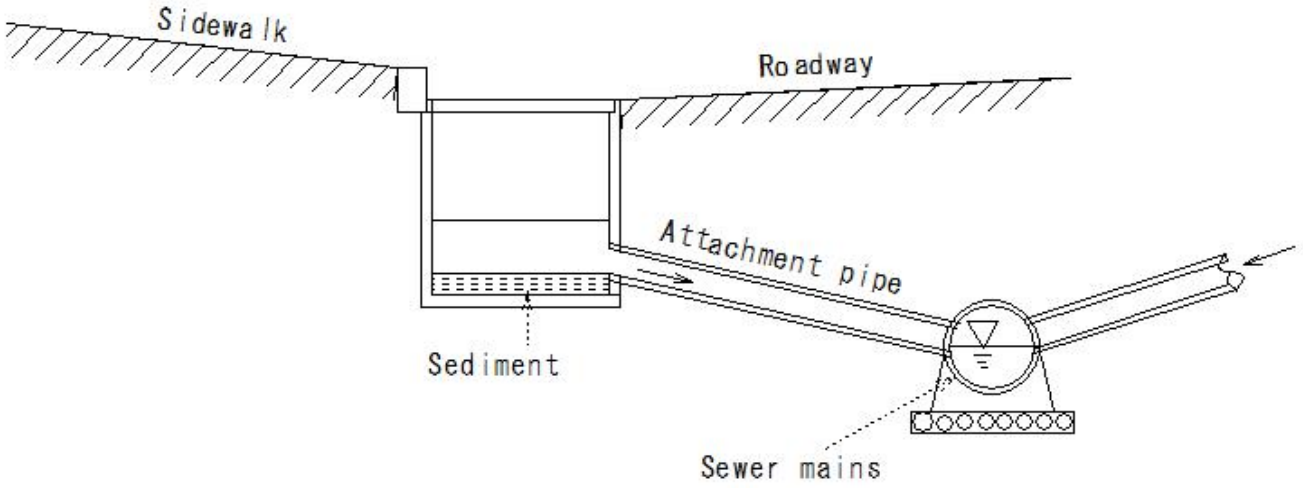
street inlet(Rainwater basin)

Every 30~50m.

round, rectangular, concrete pit

Sediment at the bottom

Prevents sediment from flowing into sewer pipes



W221

(I373)Furrow irrigation

(I373)Furrow irrigation

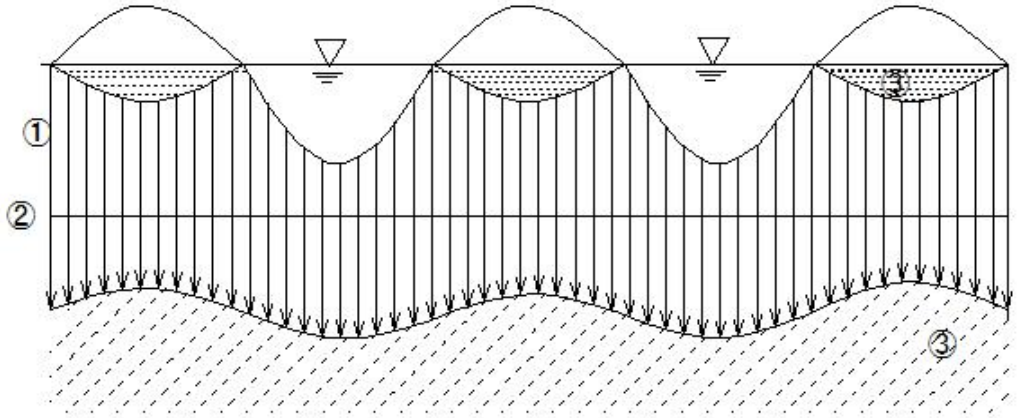
Furrow irrigation

The condition in which water seeps into the furrows

① Gravity water zone

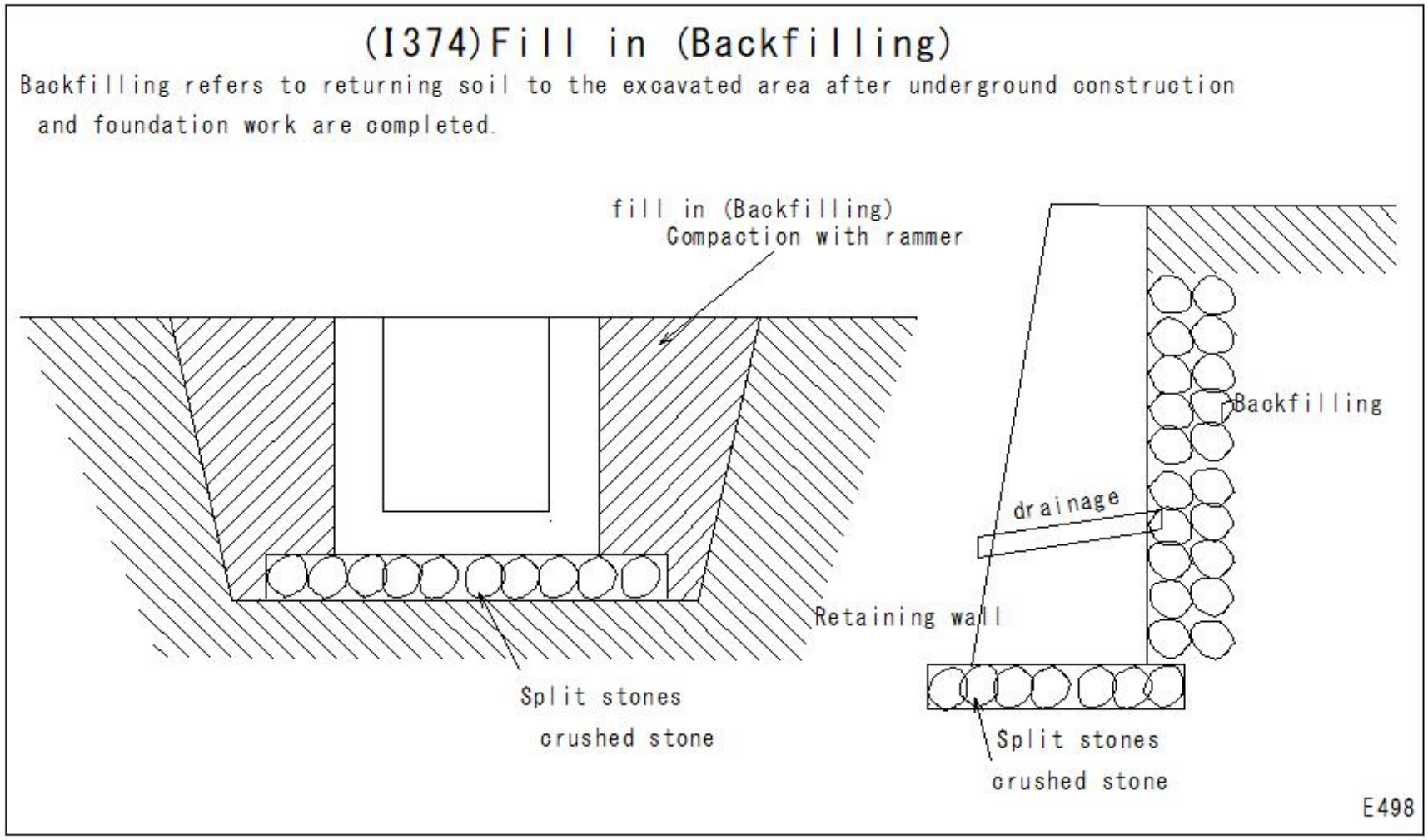
② The boundary between the topsoil and the till pan

③ Capillary water zone



The condition in which water seeps into the furrows

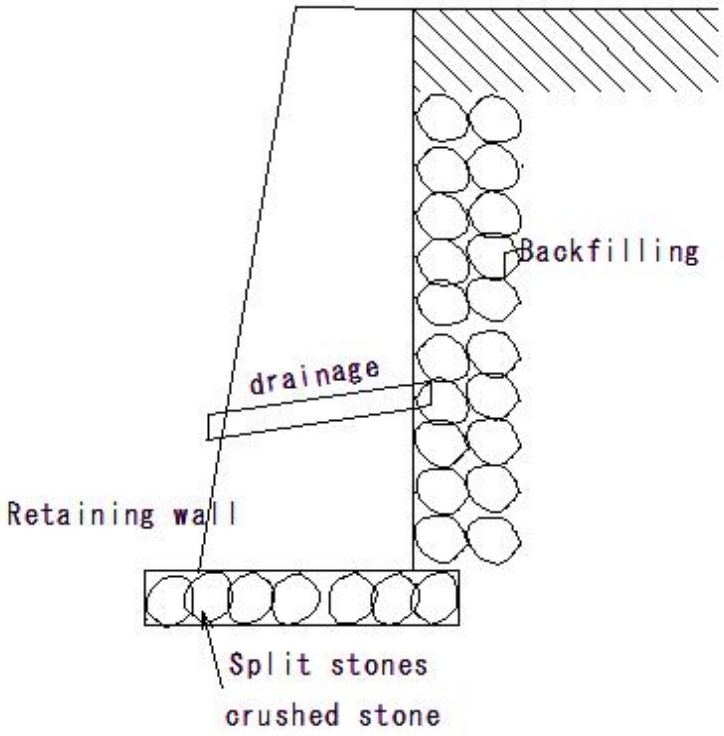
(I374)Fill in(Backfilling)



(I375)Fill in(Backfilling)

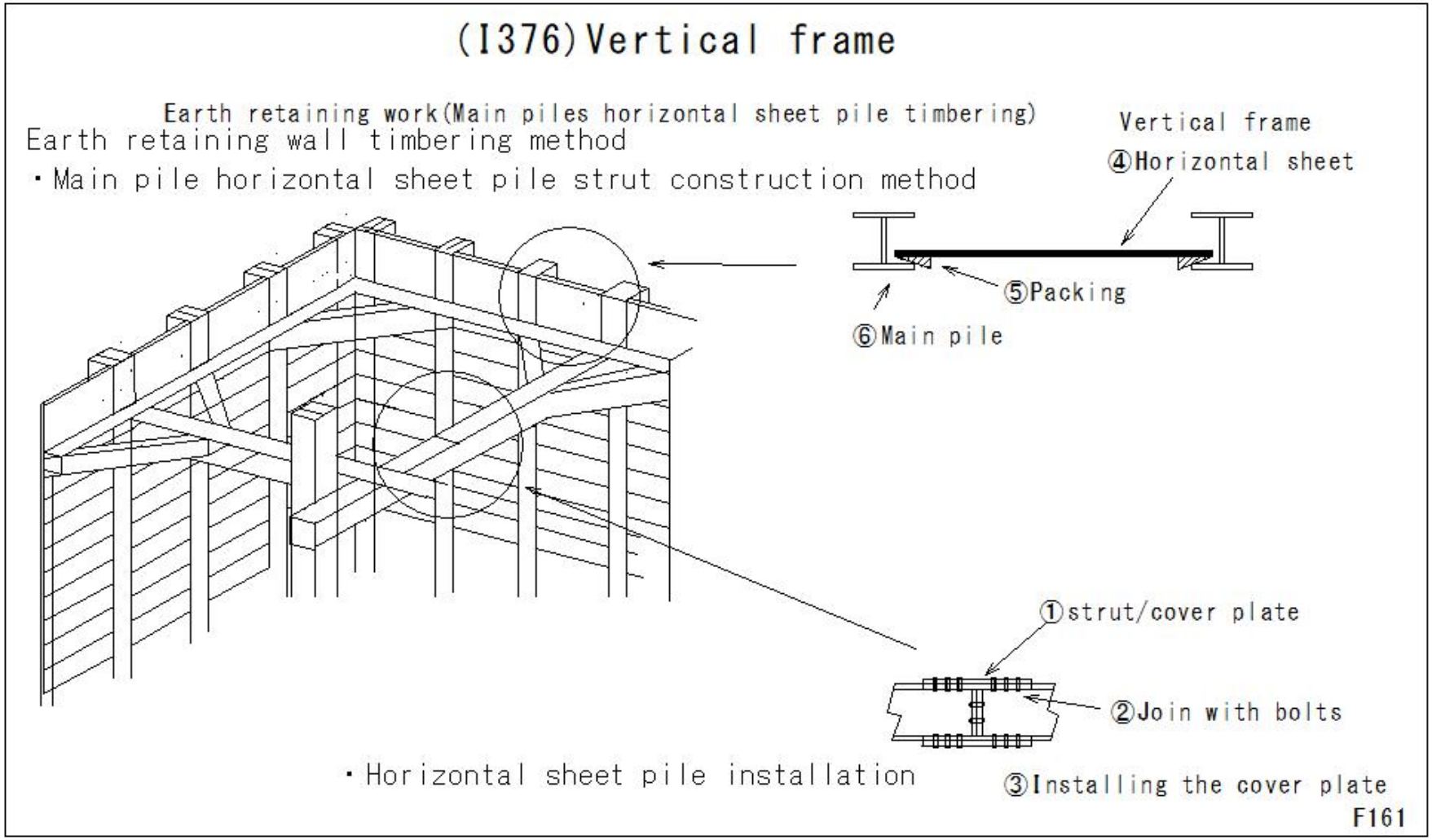
(I375)Fill in (Backfilling)

Backfilling refers to returning soil to the excavated area after underground construction and foundation work are completed.

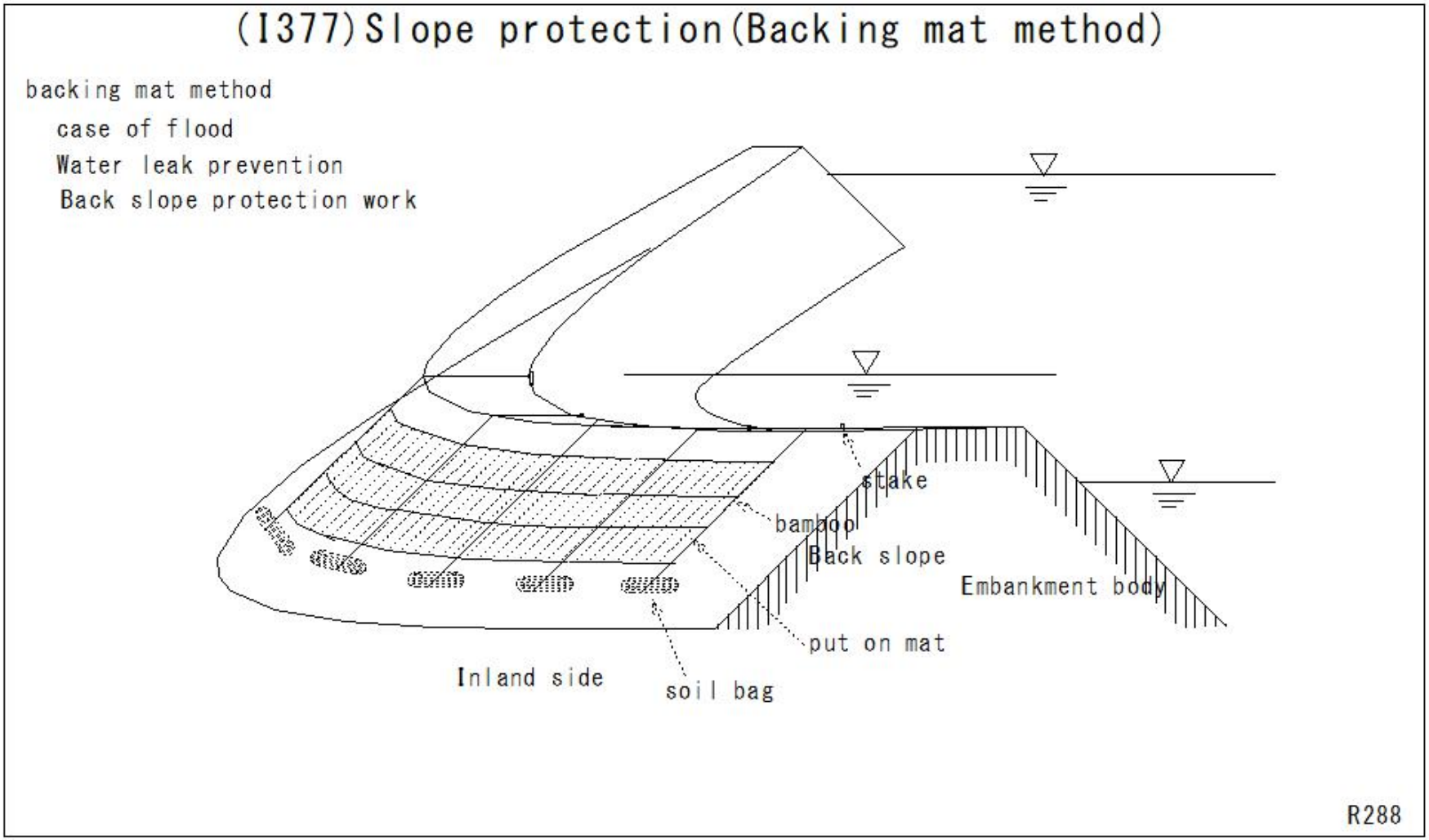


E498

(I376)Vertical frame



(I377)Slope protection(backing mat method)



(I378)Water supply and sewerage(rain gauge)

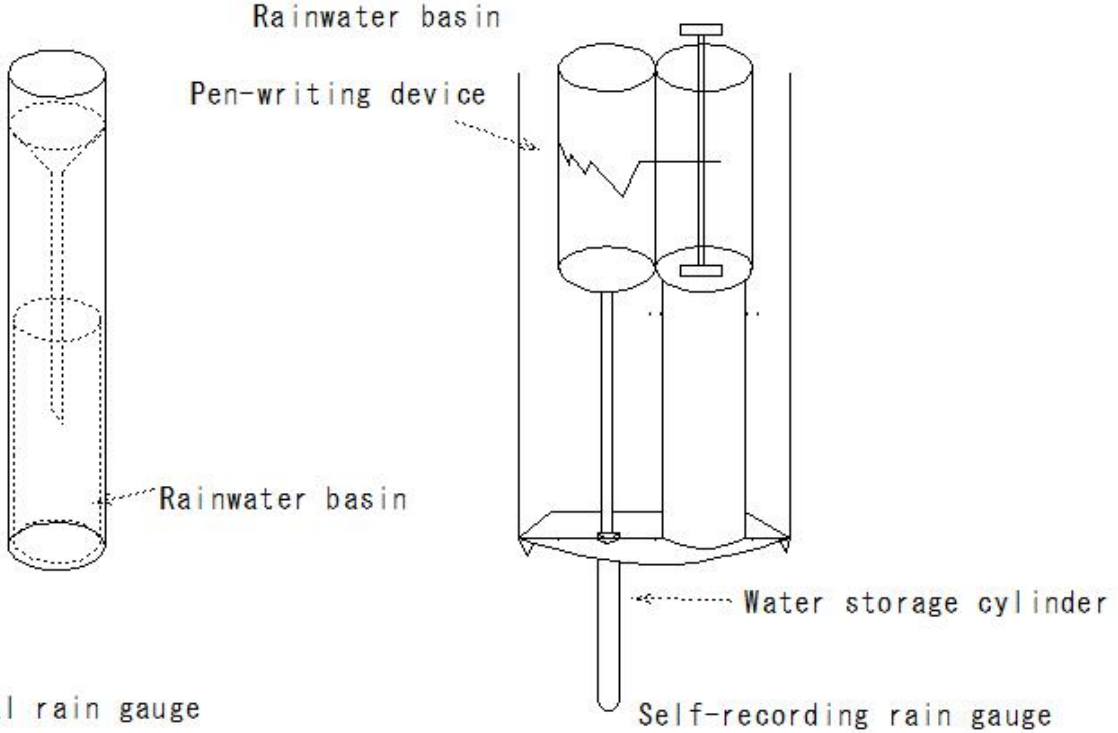
(I378)Water supply and sewerage(rain gauge)

Water supply and sewerage

Rain gauge

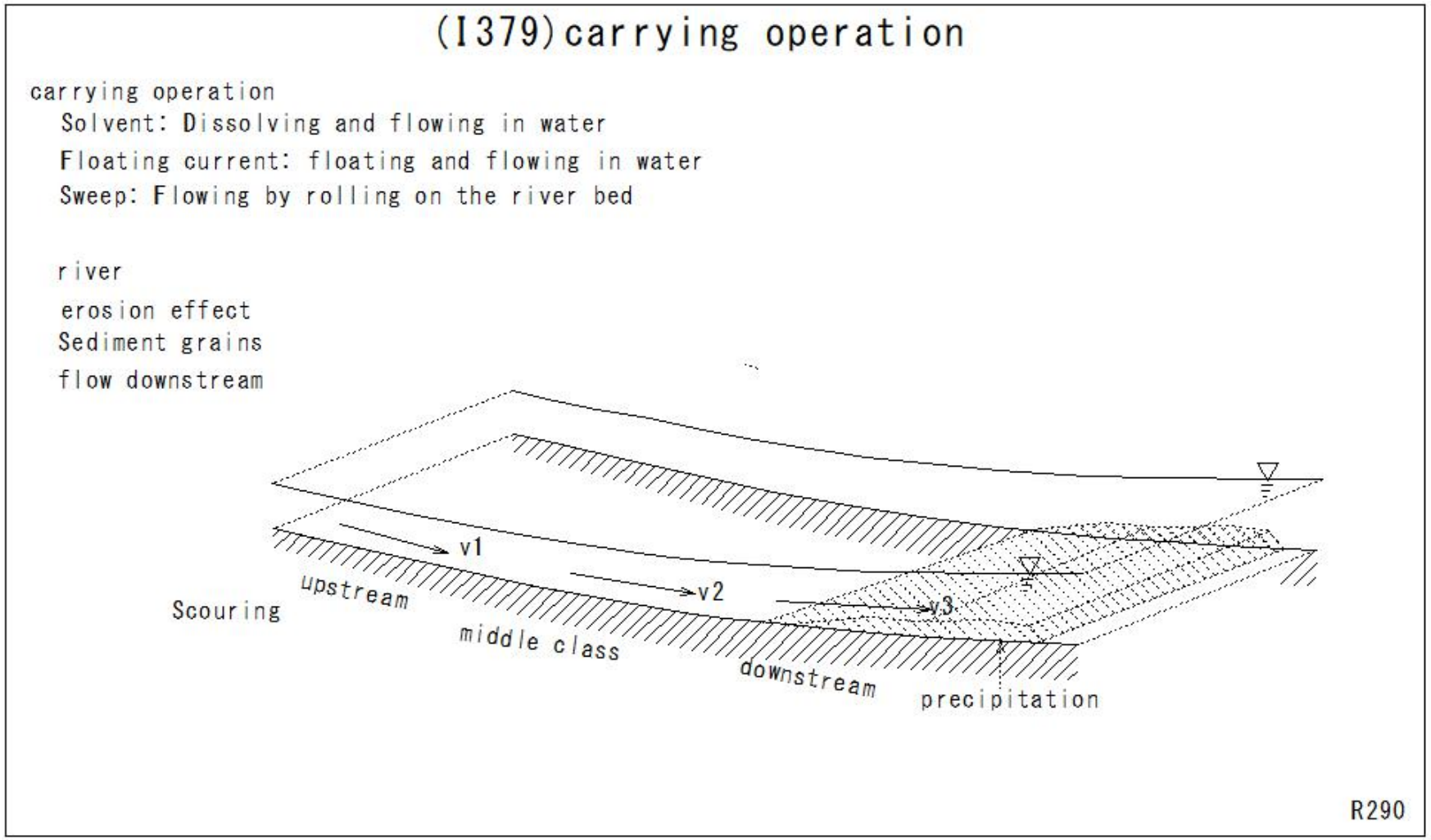
Measures the amount of rainfall by the height of the rainwater in a rainwater basin

Normal rain gauge

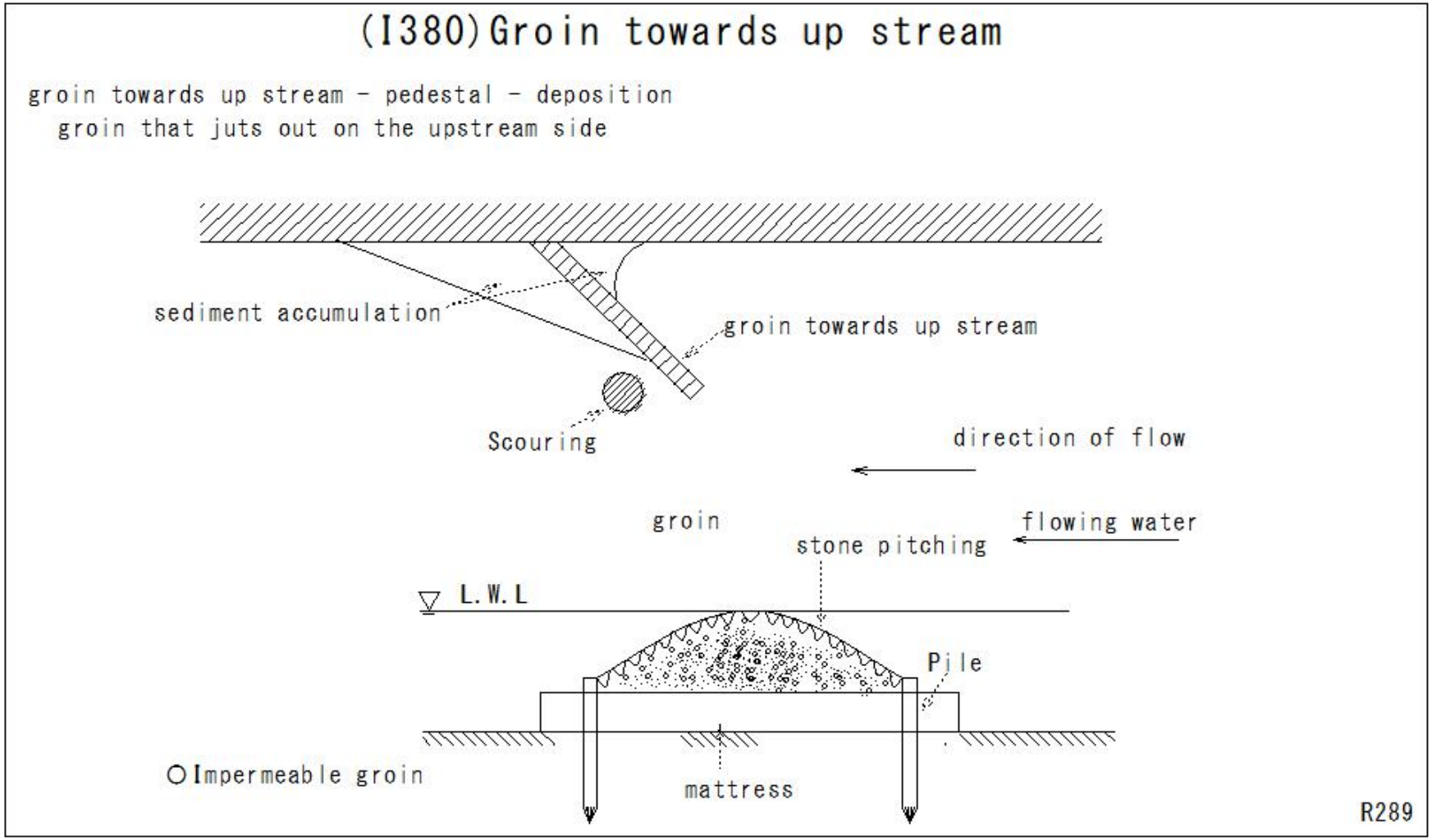


W223

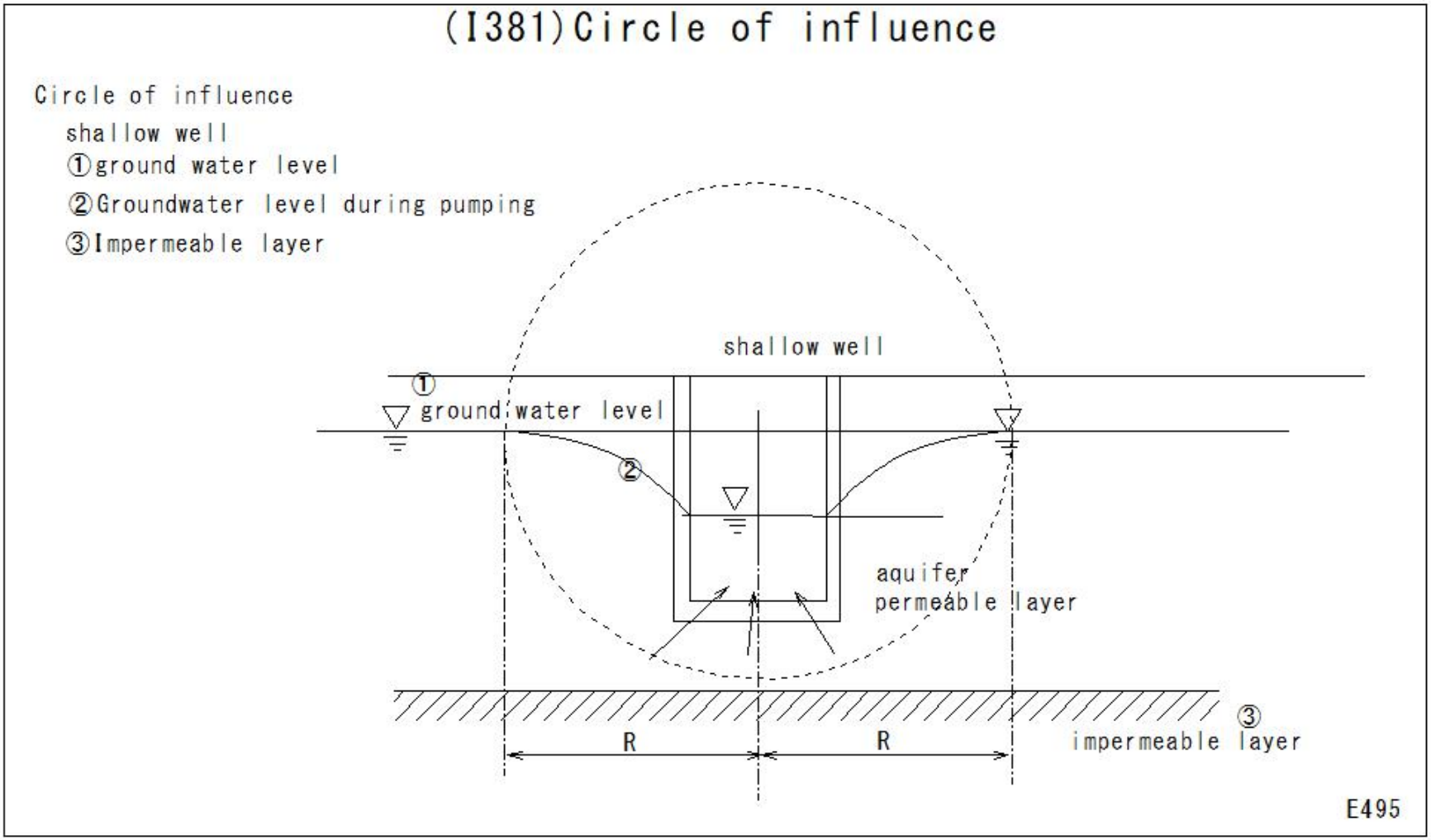
(I379)carrying operation



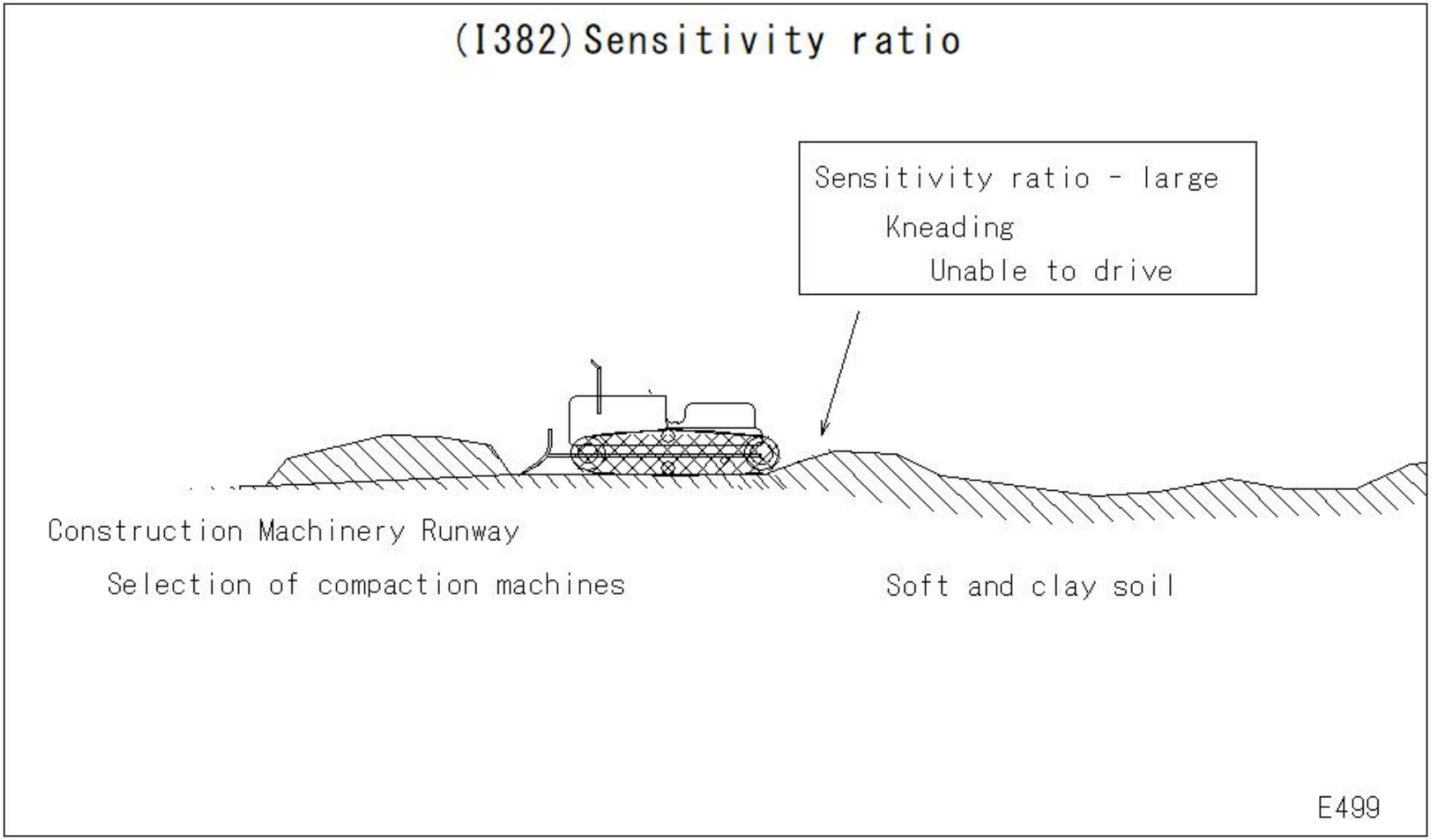
(I380)Groin towards up stream



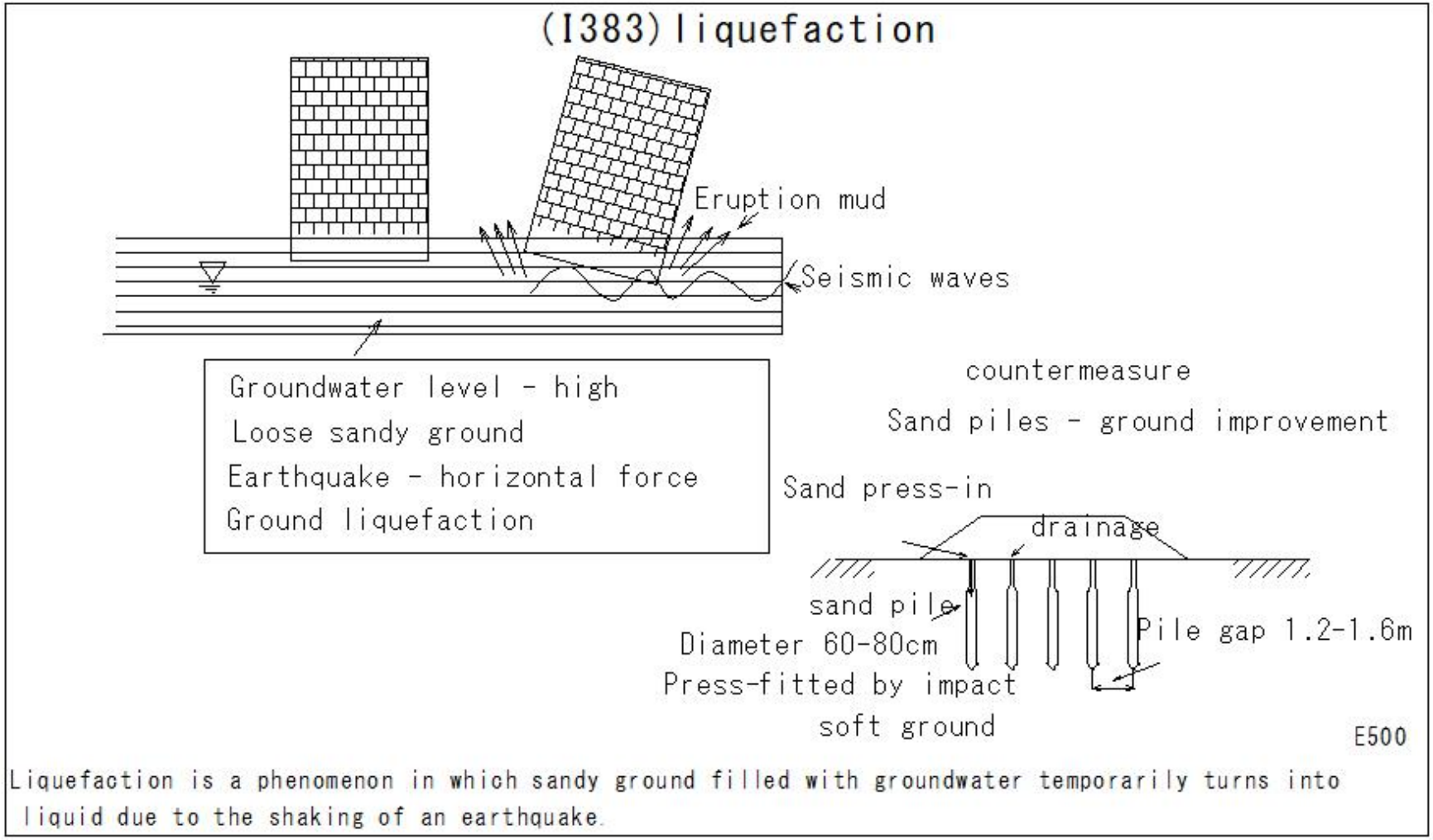
(I381)Circle of influence



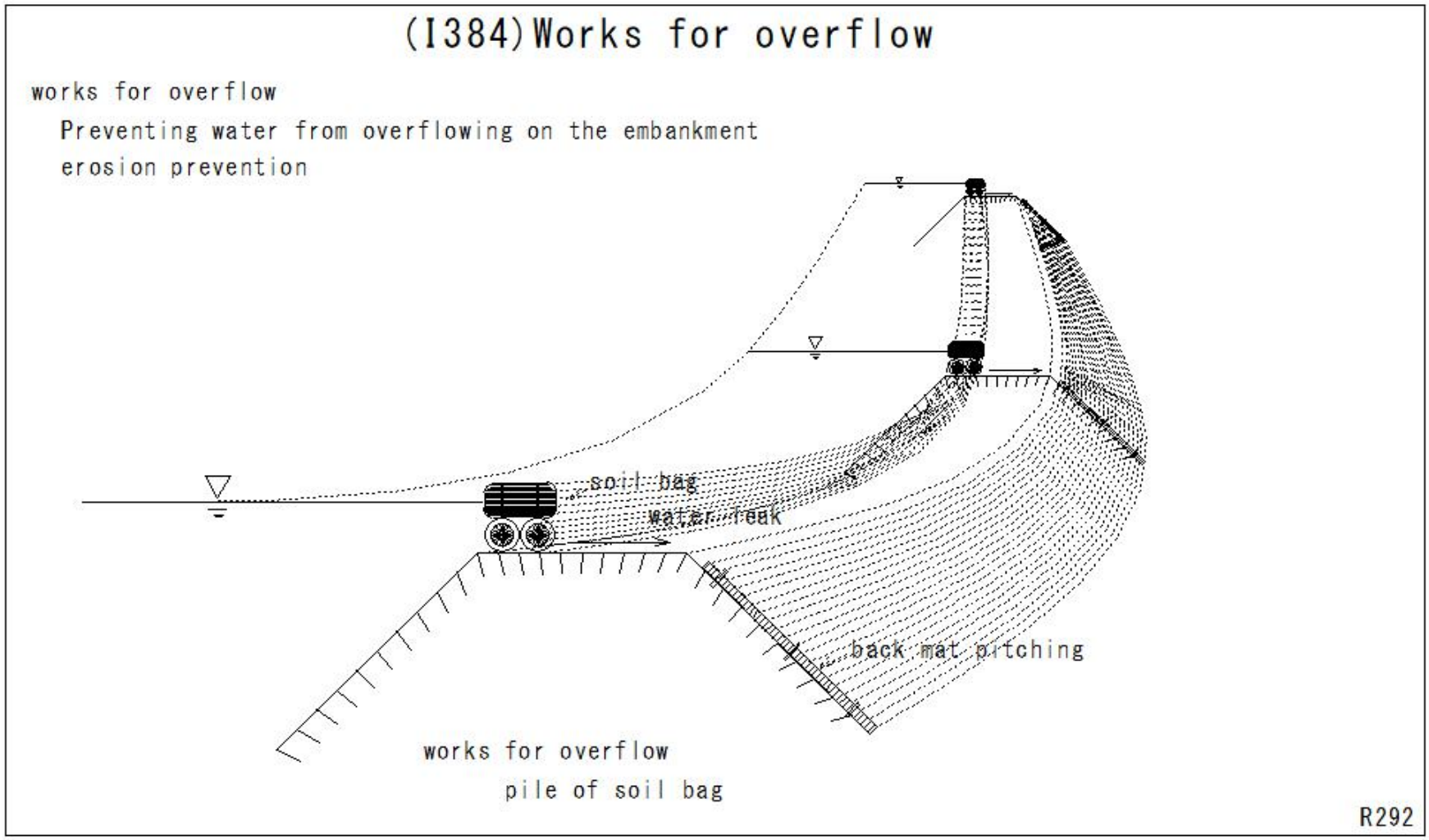
(I382)Sensitivity ratio



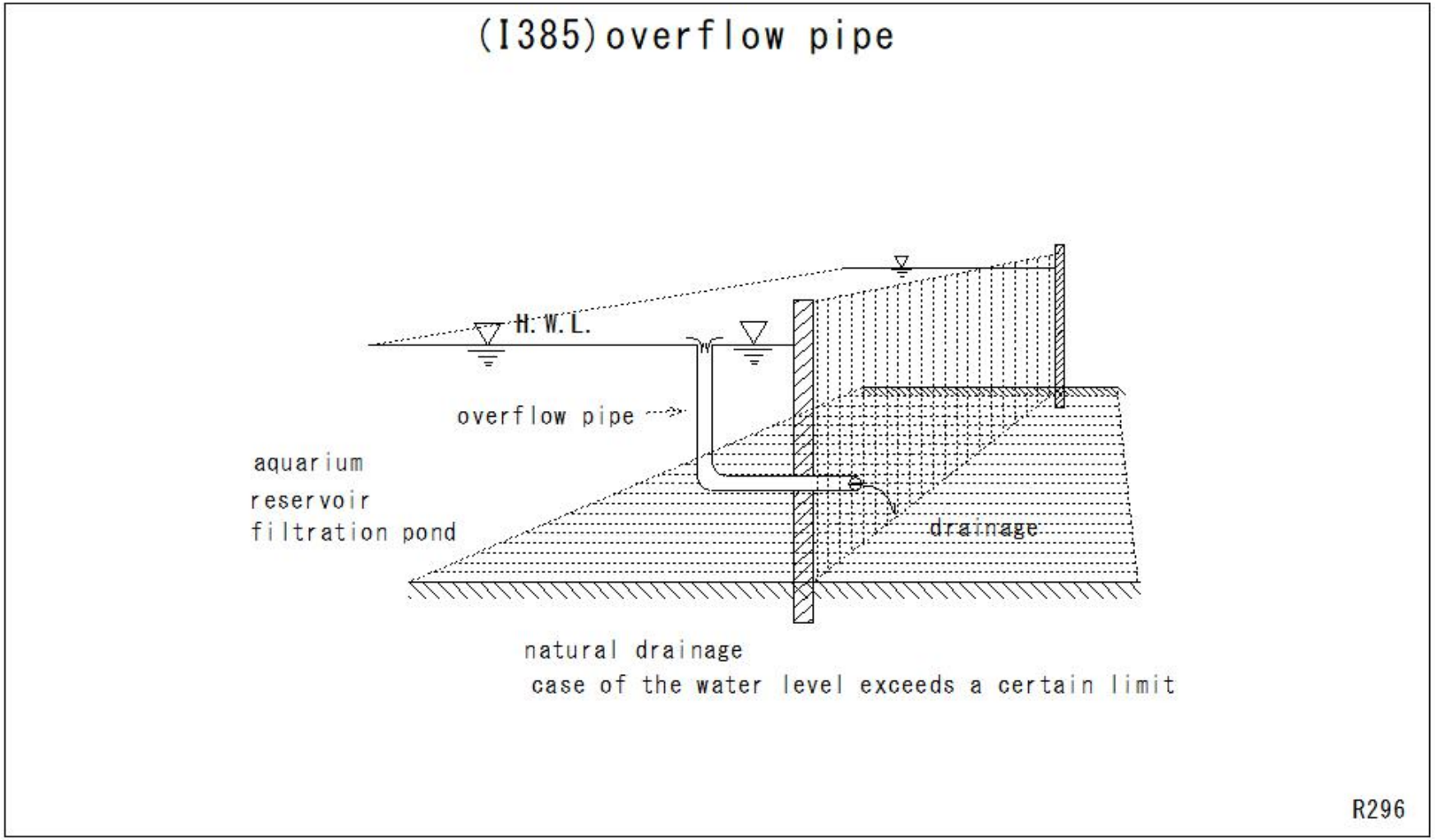
(I383)liquefaction



(I384)Works for overflow



(I385)Overflow pipe



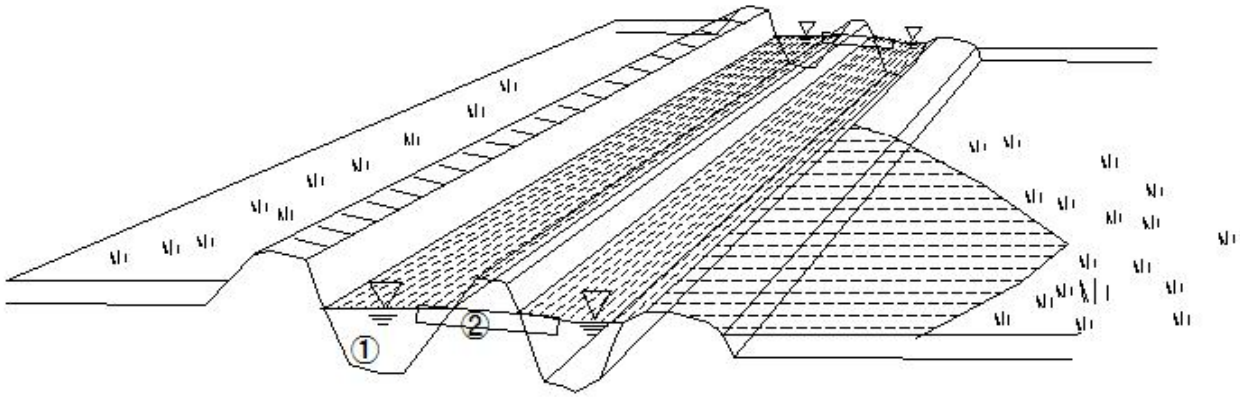
(I386)Flood Irrigation(Overflow irrigation)

(I386)Flood Irrigation(Overflow irrigation)

Flood Irrigation(Overflow irrigation)

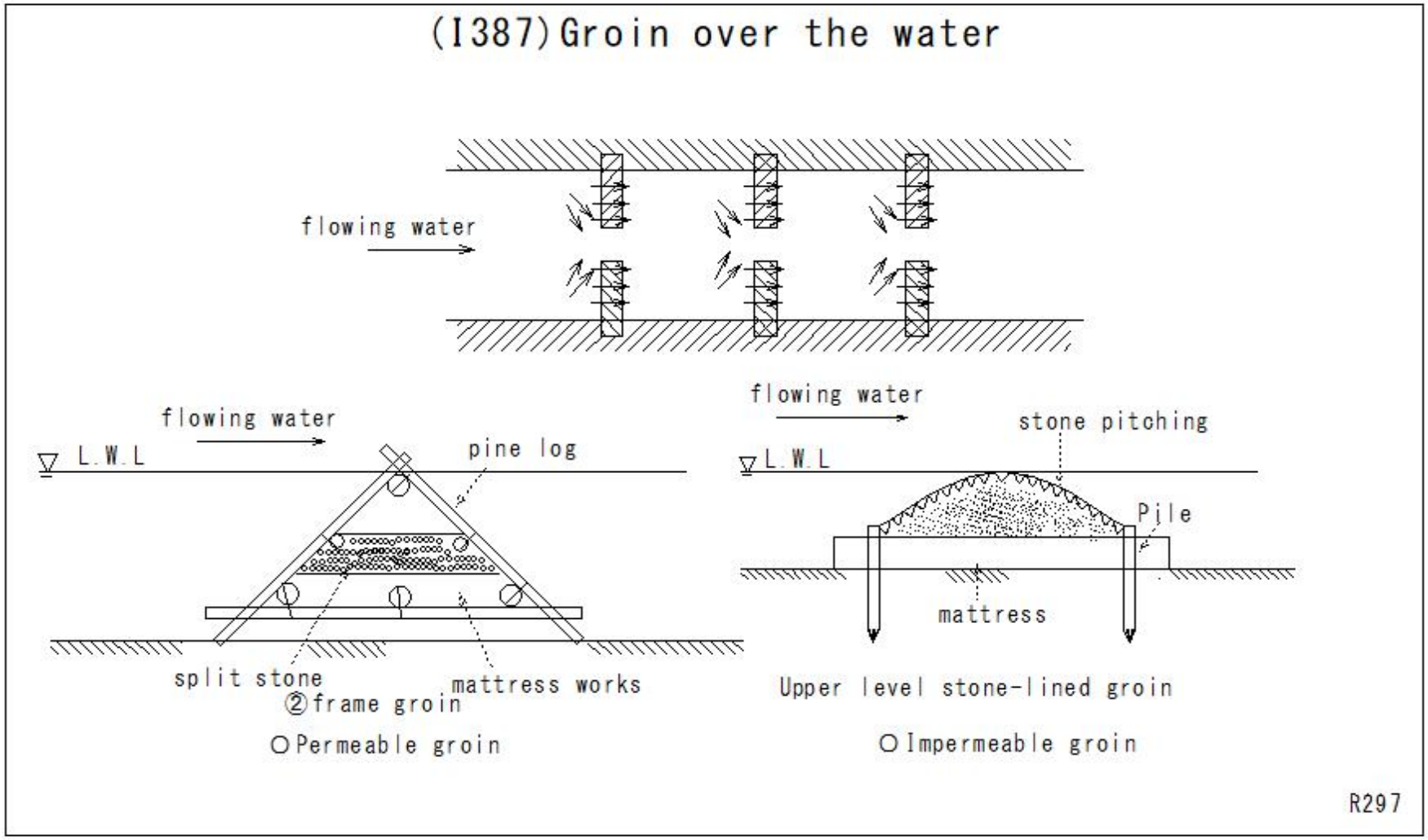
① Branch canal

② Irrigation canal

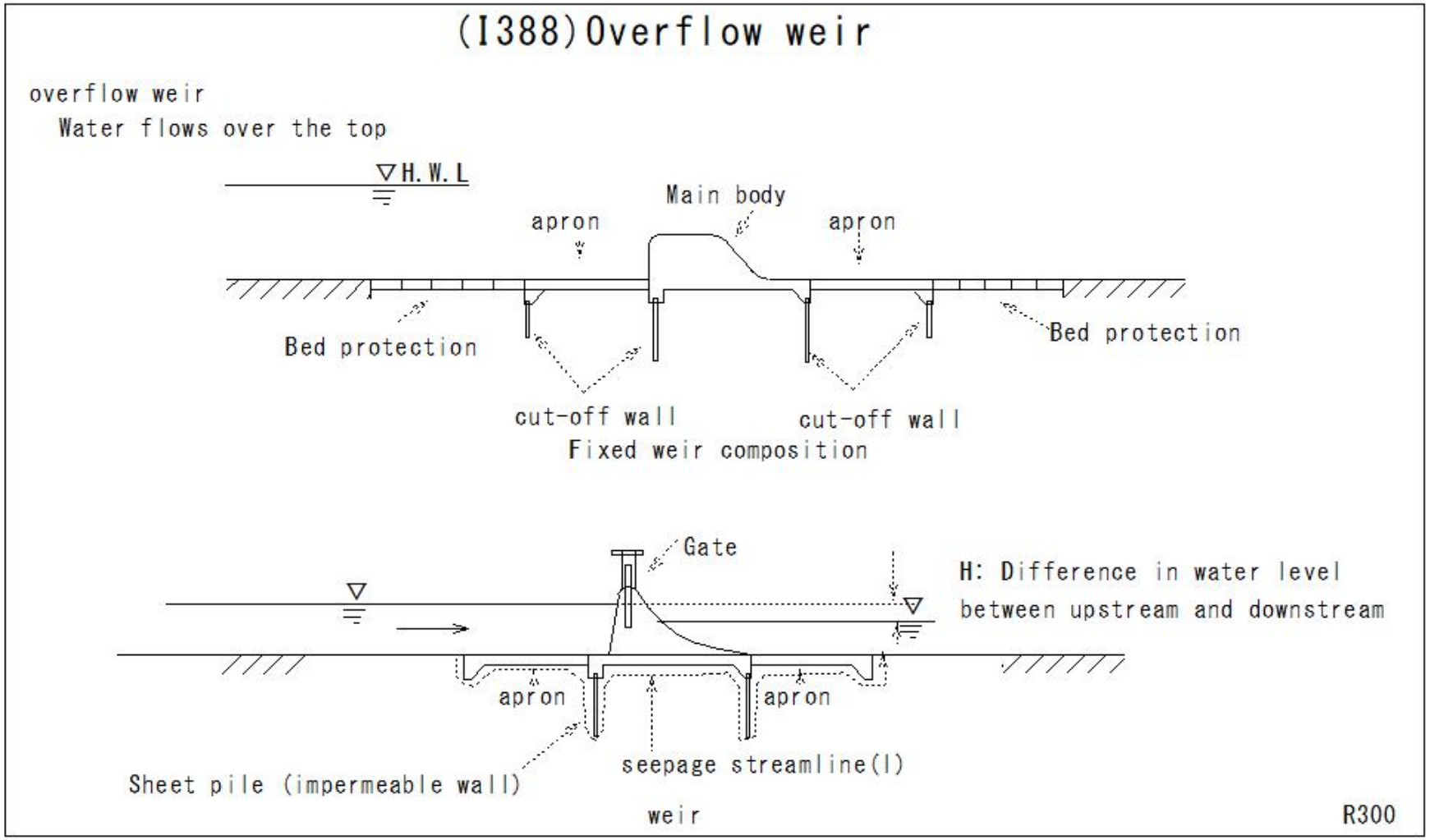


Overflow irrigation is a method of watering crops by allowing water to flow into areas where water accumulates, such as between ridges or in lowlands.

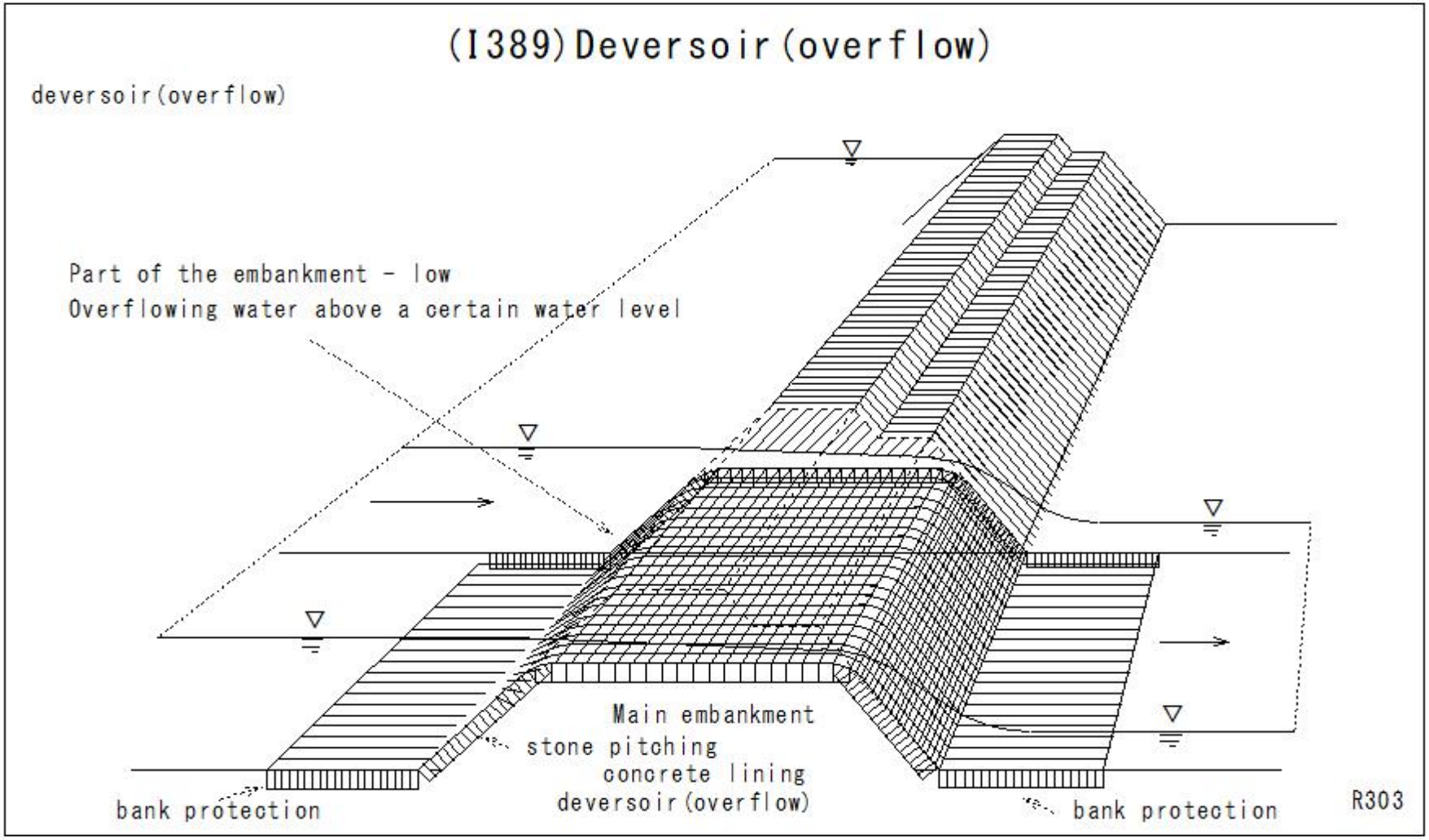
(I387)Groin over the water



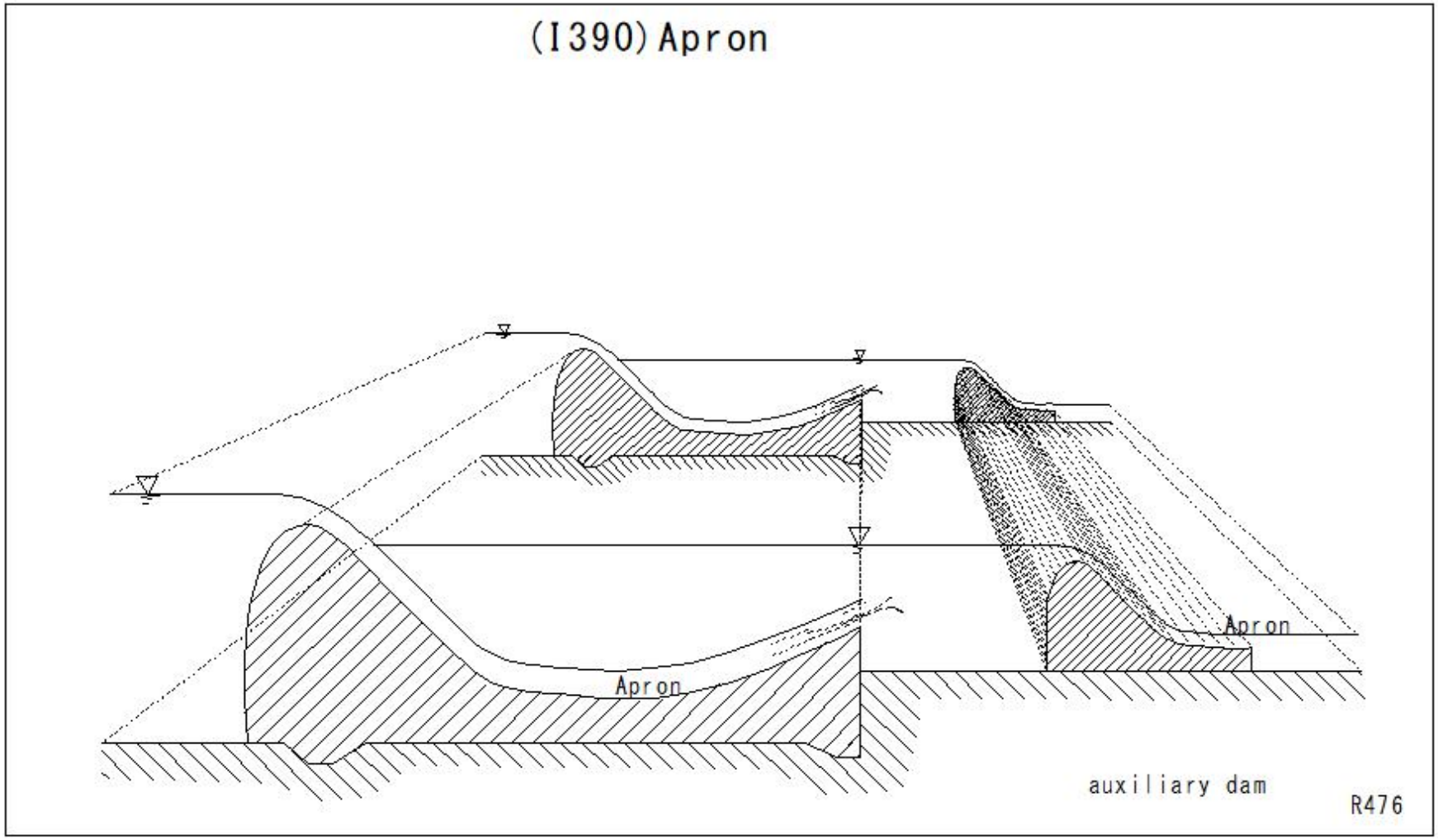
(I388)Overflow weir



(I389)Deversoir(overflow)



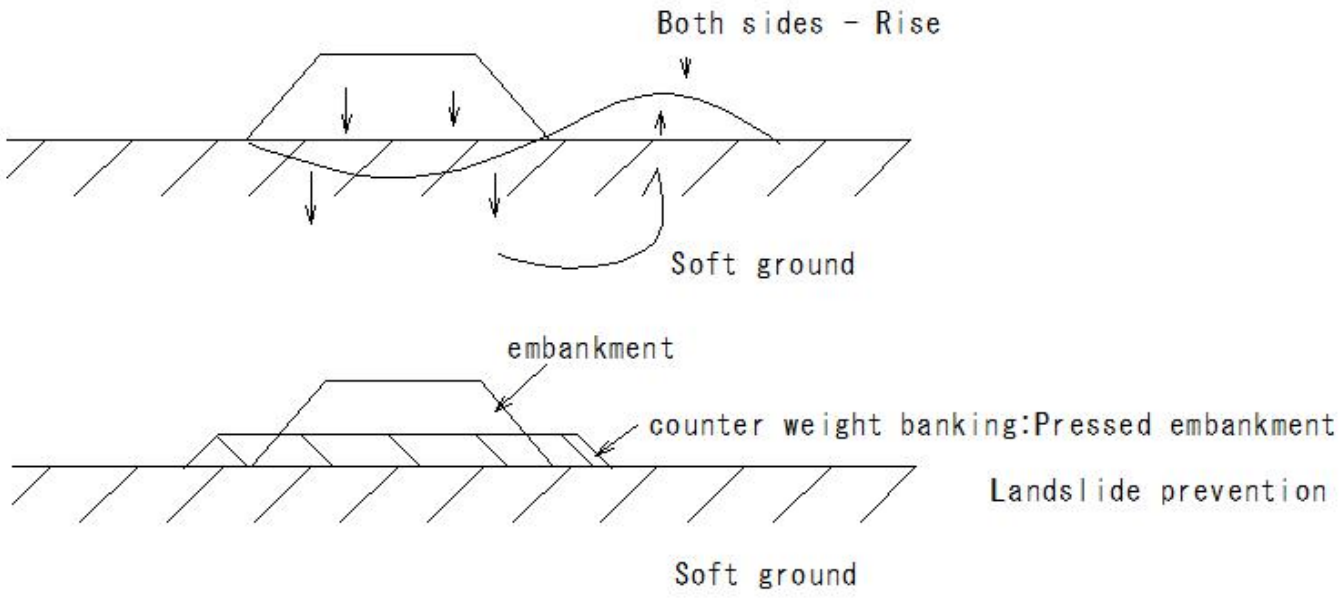
(I390)Apron



(I391)Pressed embankment

(I391)counter weight banking:Pressed embankment

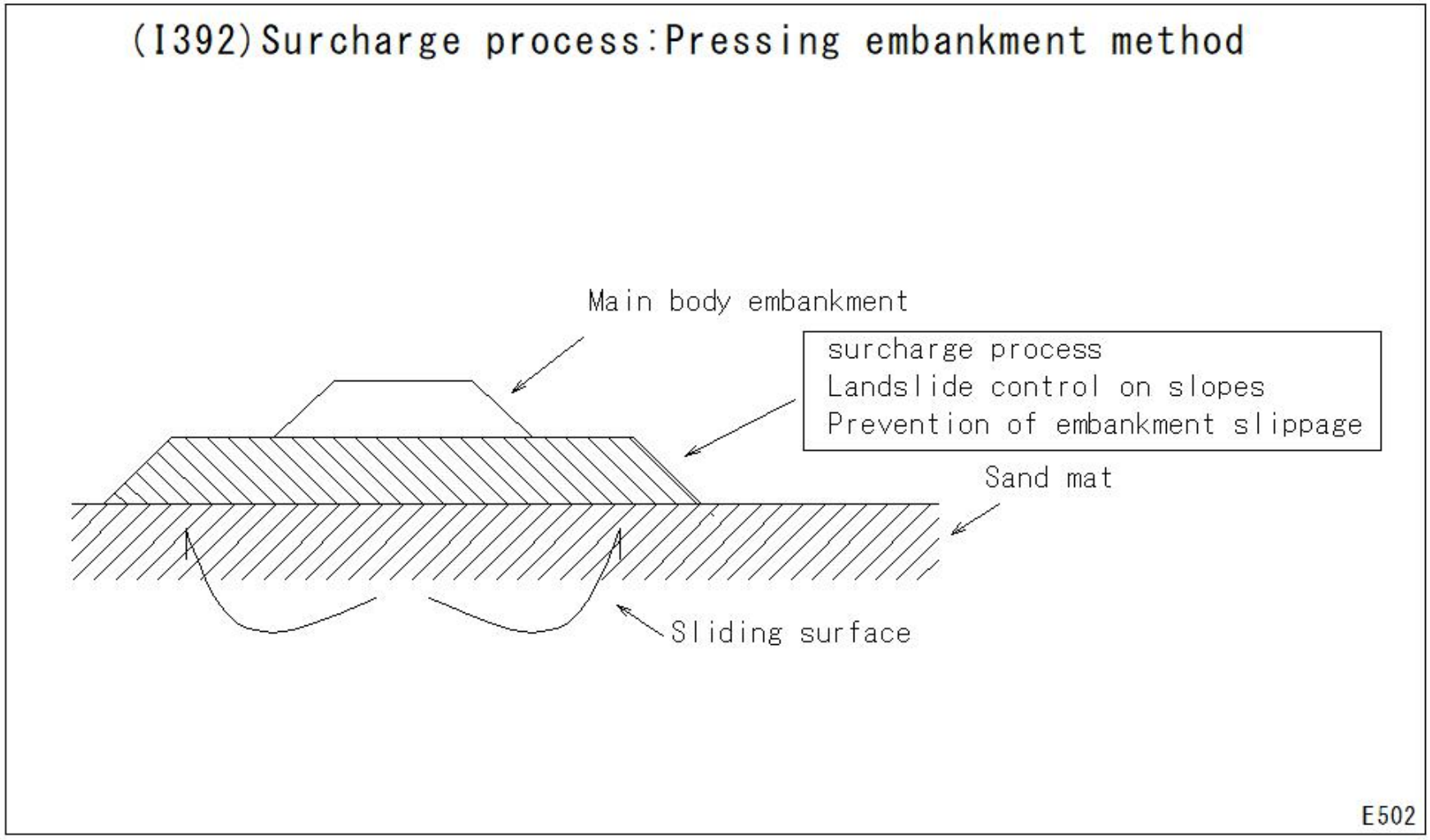
counter weight banking:Pressed embankment



Adding landslide resistance by filling the bottom of the landslide block.

E501

(I392)Surcharge process:Pressing embankment method



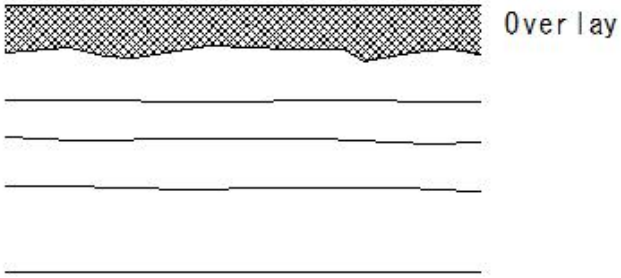
(I393)Overlay

(I393)Overlay

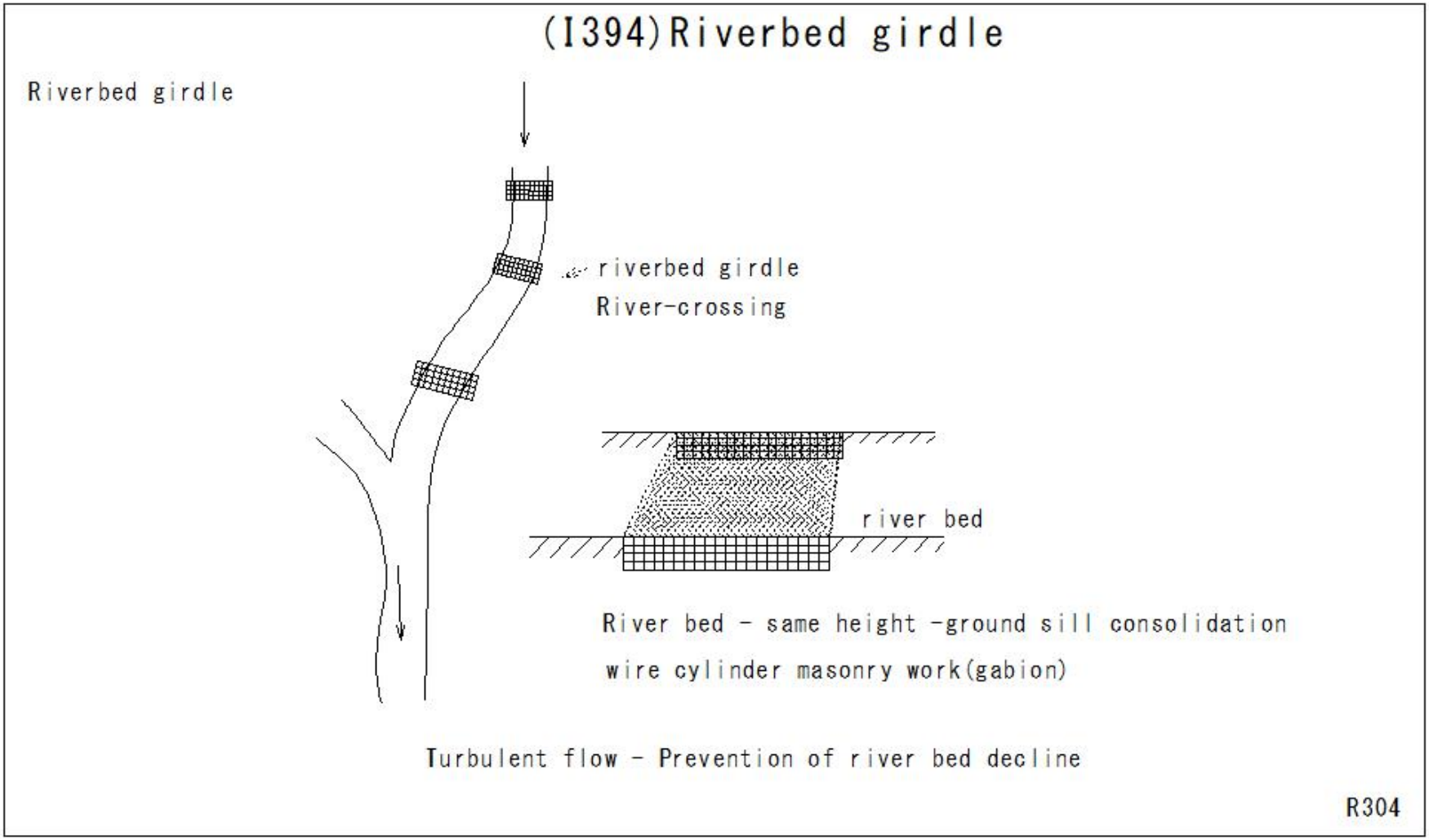
Overlay

Overlay is a method of repairing cracks and fissures that occur mainly on the surface of roads and asphalt.

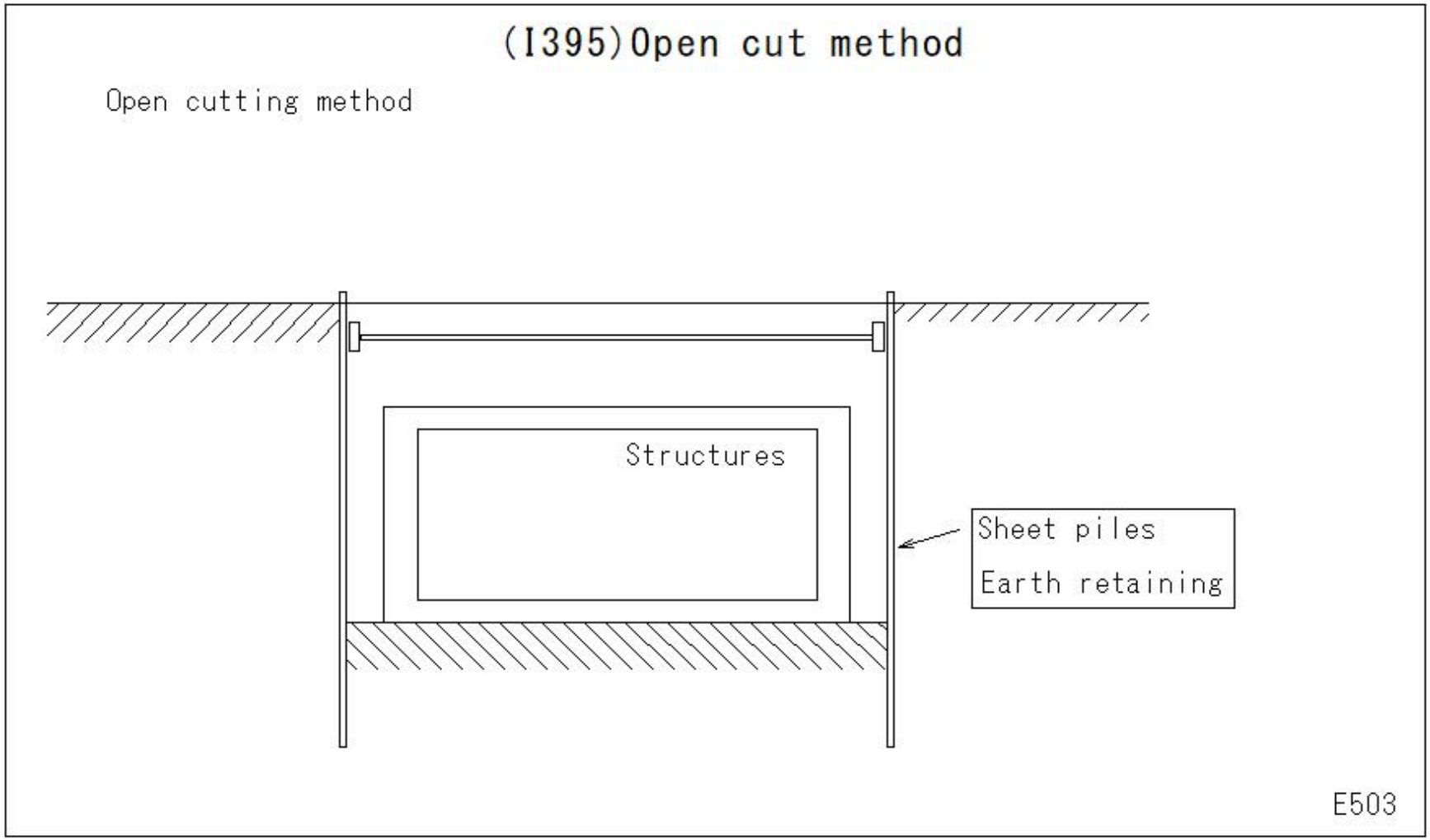
① Repairs can be completed in a short time at low cost.
② The overlay method repairs by adding the work on top of the existing pavement surface.
③ No loud noise or vibrations.
④ No work is required to remove the asphalt.
⑤ No cutting machines or heavy machinery are used.



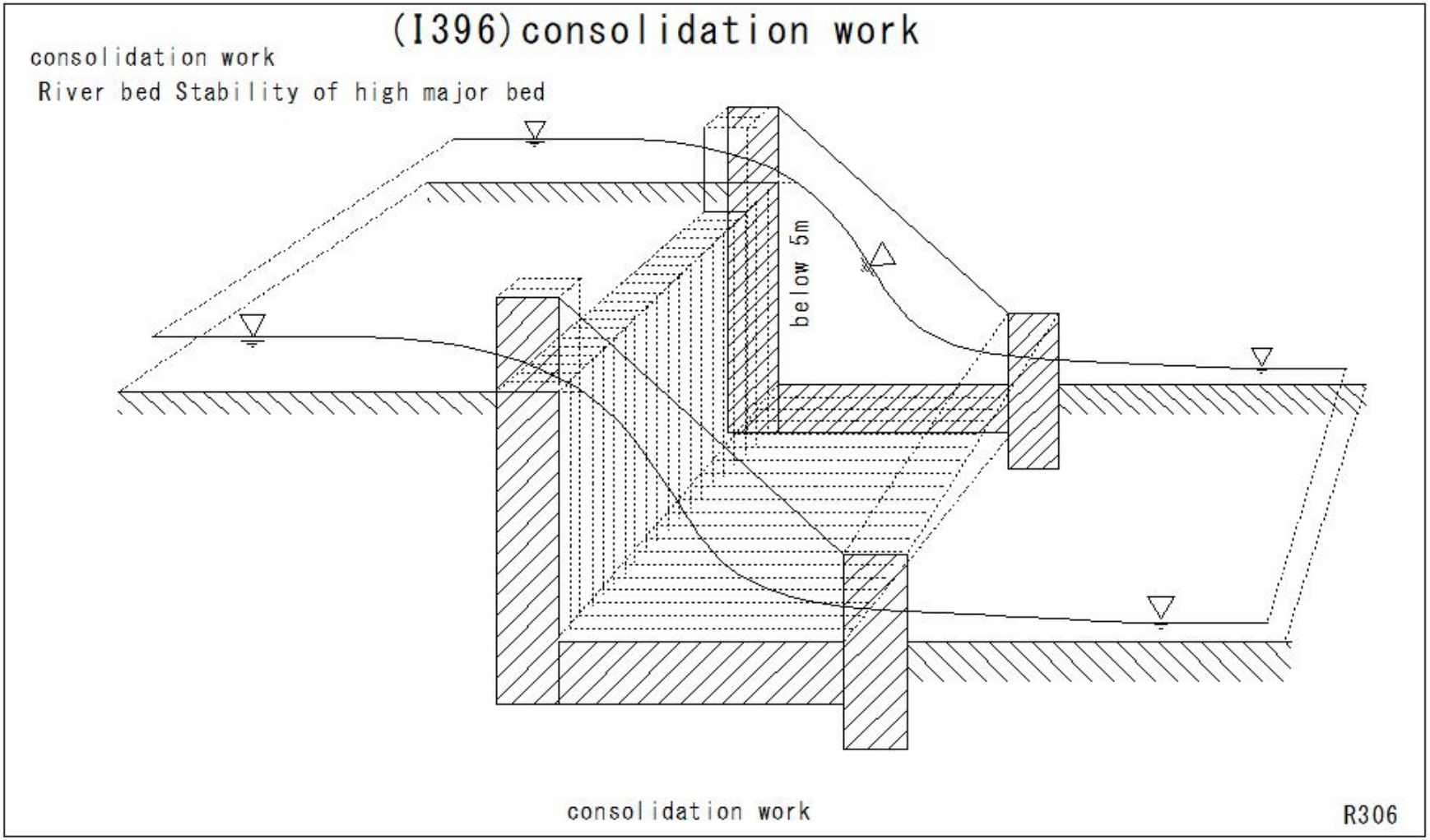
(I394)Riverbed girdle



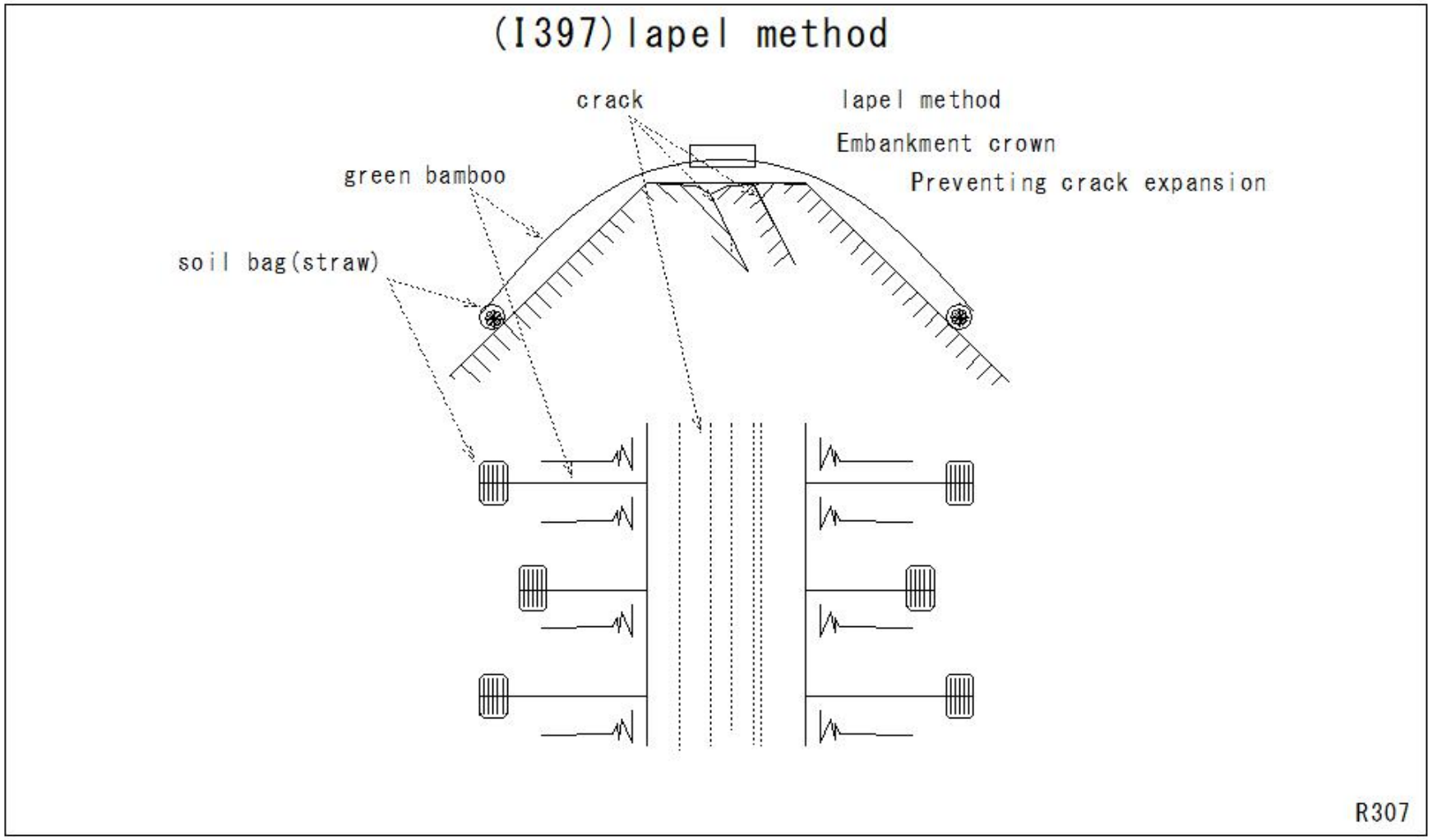
(I395)Open cut method



(I396)consolidation work



(I397)lapel method



(I398)Orifice

(I398)Orifice

Orifice

Standard orifice

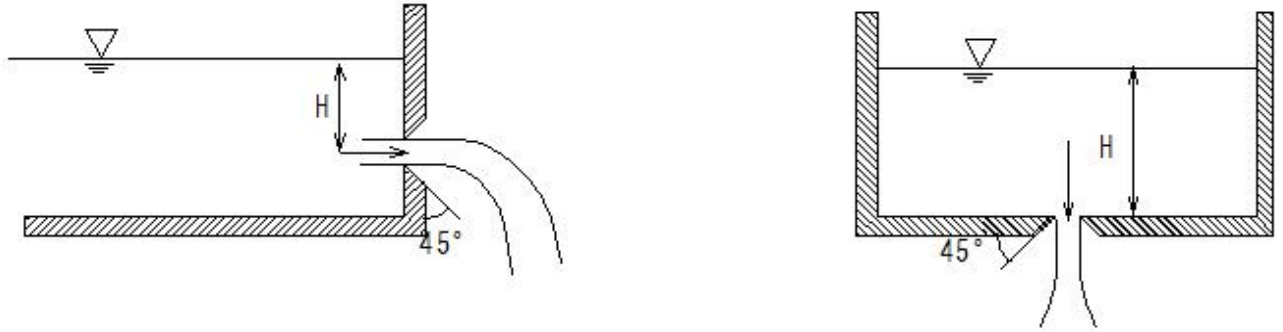
Flow rate $Q = Ca\sqrt{2gH}$

C: Flow coefficient

a: Cross-sectional area of the orifice

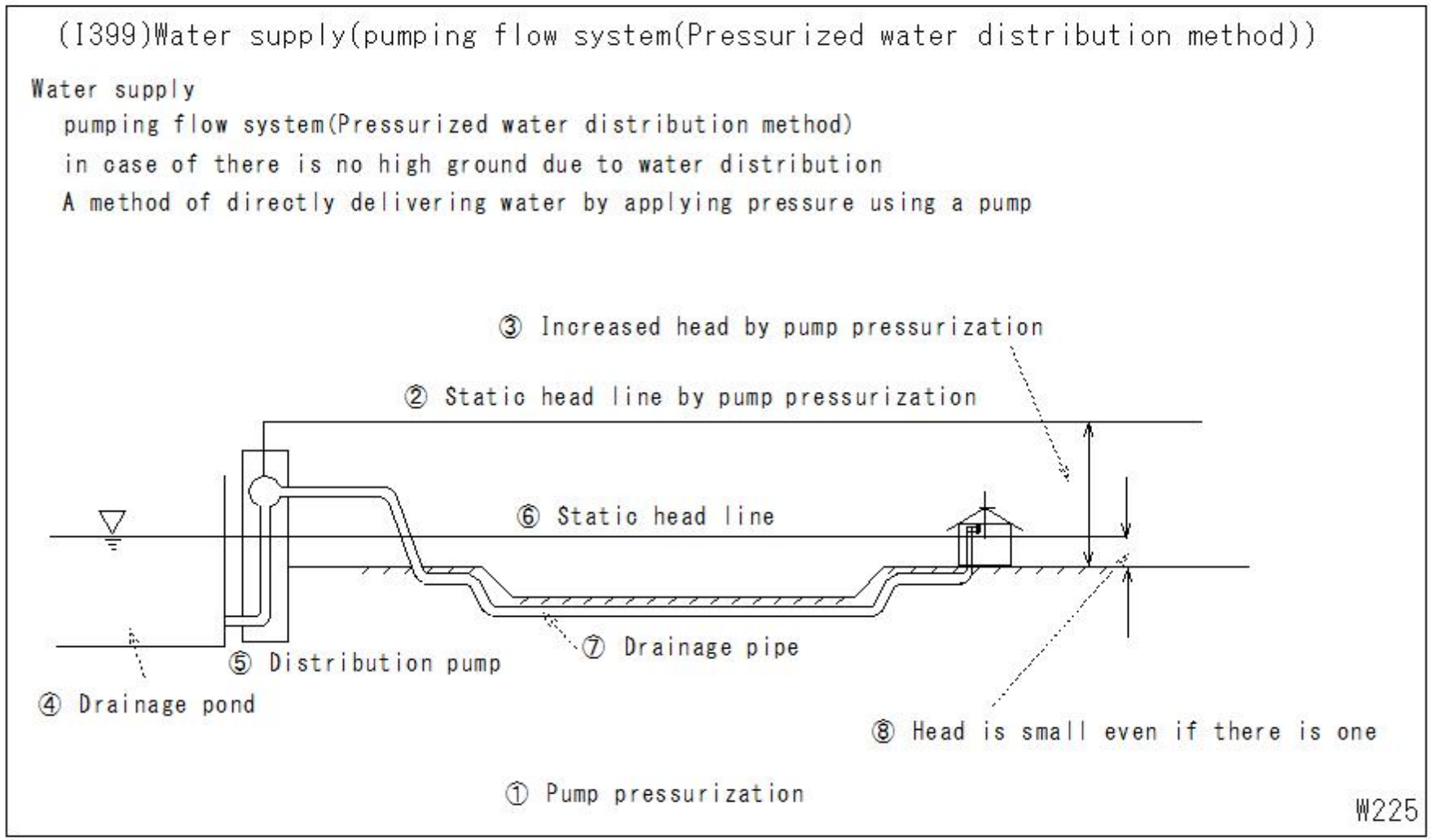
g: Gravitational acceleration

Standard orifice

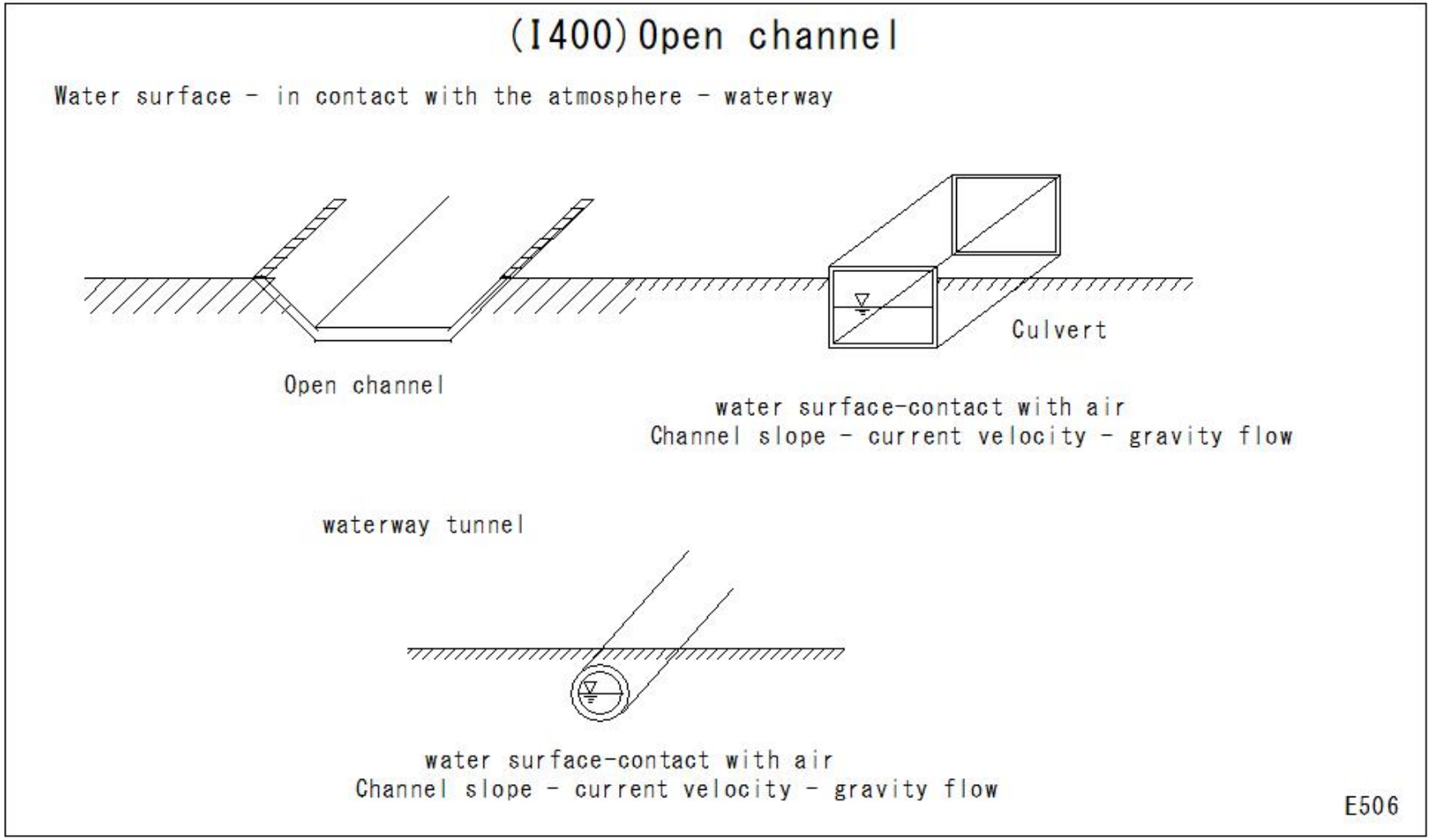


A water outlet opened in the wall of a water tank or a board that blocks running water

(I399)Water supply(pumping flow system(Pressurized water distribution method))



(I400)Open channel

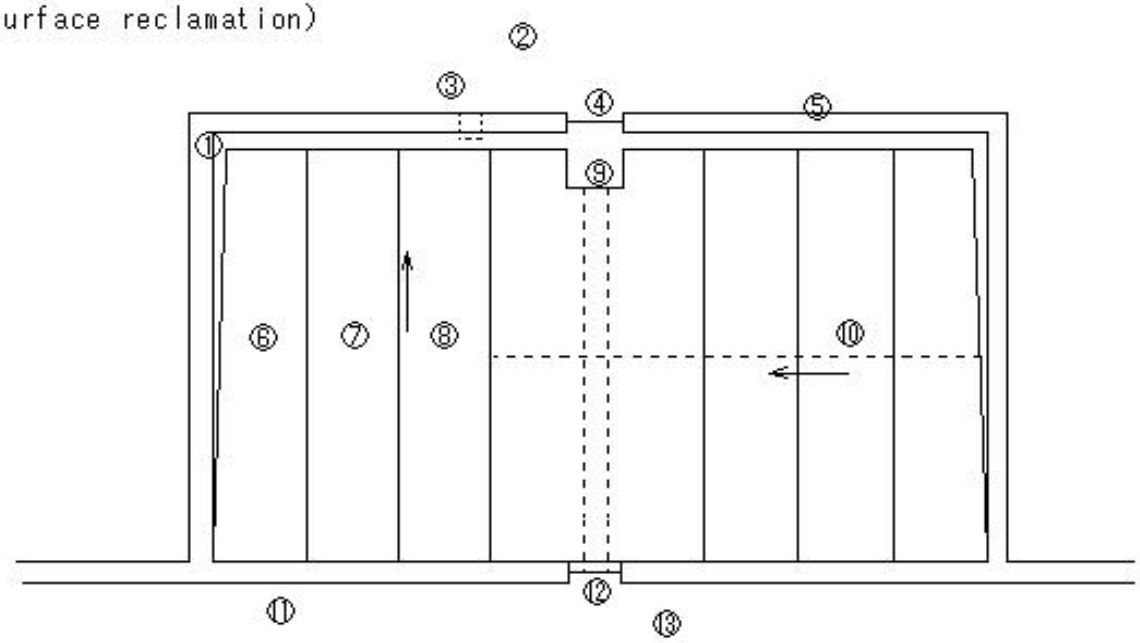


(I401)Sea bottom reclamation（Sea surface reclamation）

(I401)Sea bottom reclamation (Sea surface reclamation)

Sea bottom reclamation (Sea surface reclamation)

① Place with the tide
② Sea surface
③ Tide stop gate
④ Drain gate
⑤ Levee
⑥ Irrigation channel
⑦ Drainage channel
⑧ Irrigation channel
⑨ Reservoir
⑩ Drainage channel
⑪ Levee
⑫ Hindland drainage gate
⑬ Land

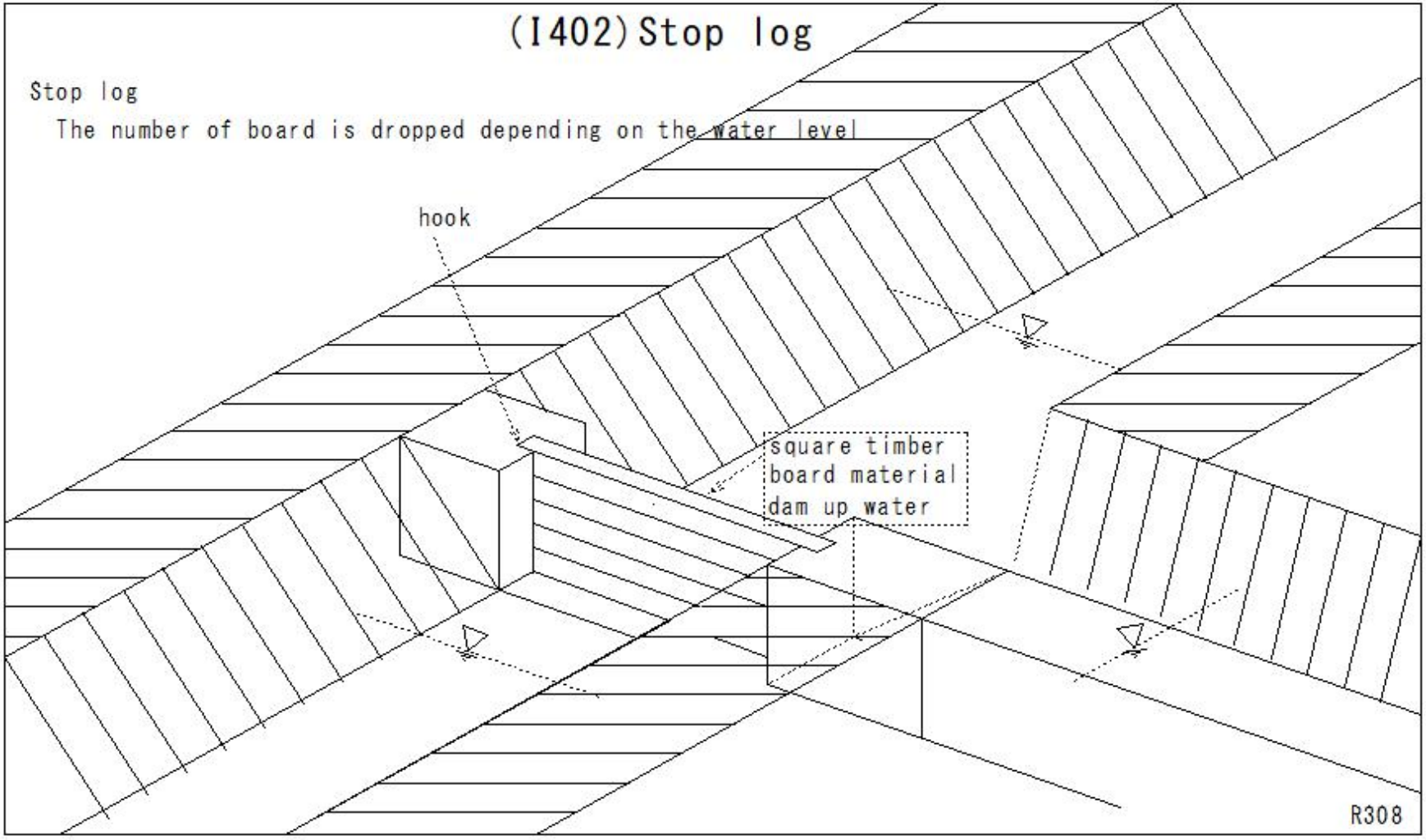


Sea surface reclamation is the process of dividing the sea or wetlands with levees or other structures, draining the water, and turning them into land.

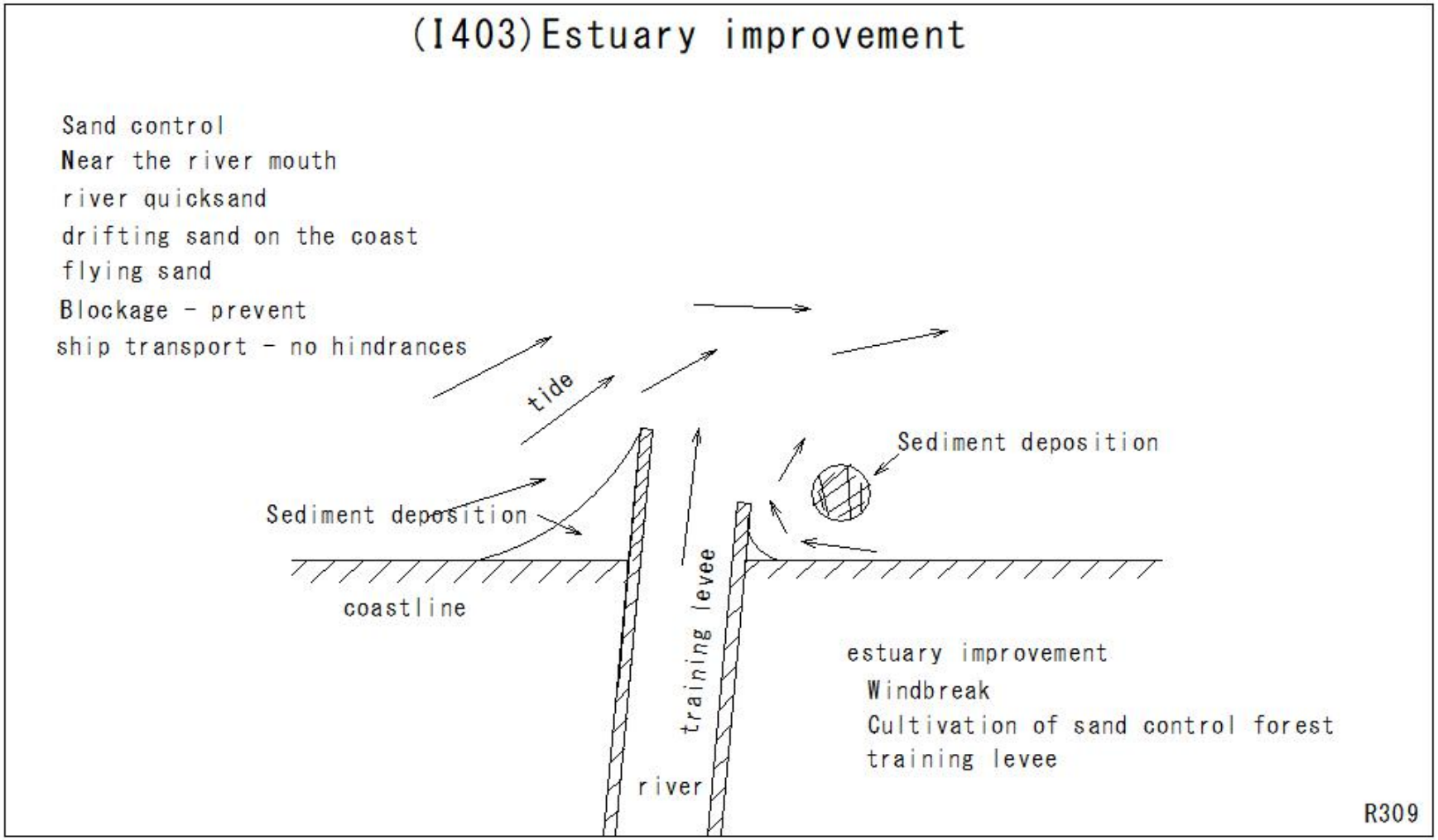
Purpose: Turn the water surface into land and use it for farmland, urban development, etc.

Method: Surround the sea or wetlands with levees, drain the water, bring in soil, etc., and turn the water surface into land.

(I402)Stop log



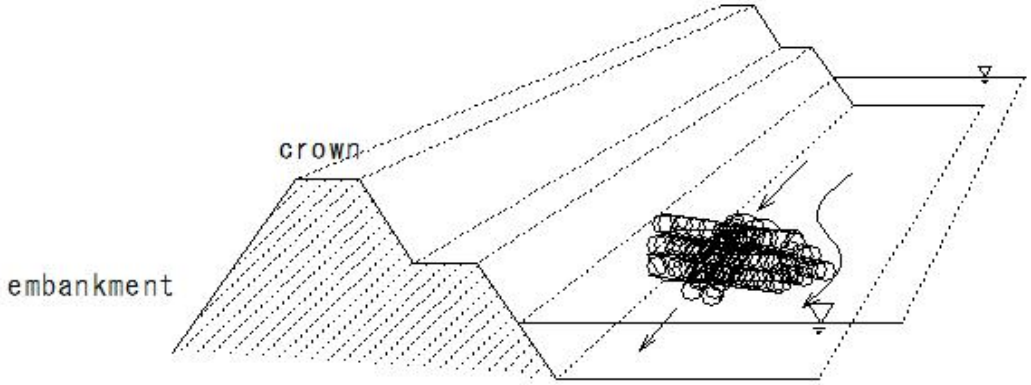
(I403)Estuary improvement

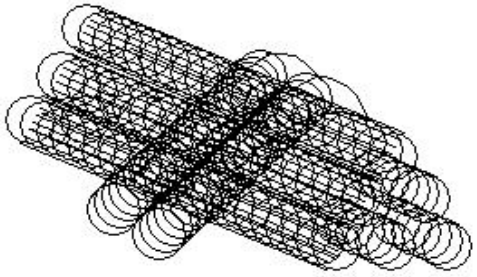


(I404)Semi-permeable groin -wire cylinder masonry work(gabion)

(I404)Semi-permeable groin -wire cylinder masonry work(gabion)

Semi-permeable groin -wire cylinder masonry work(gabion)

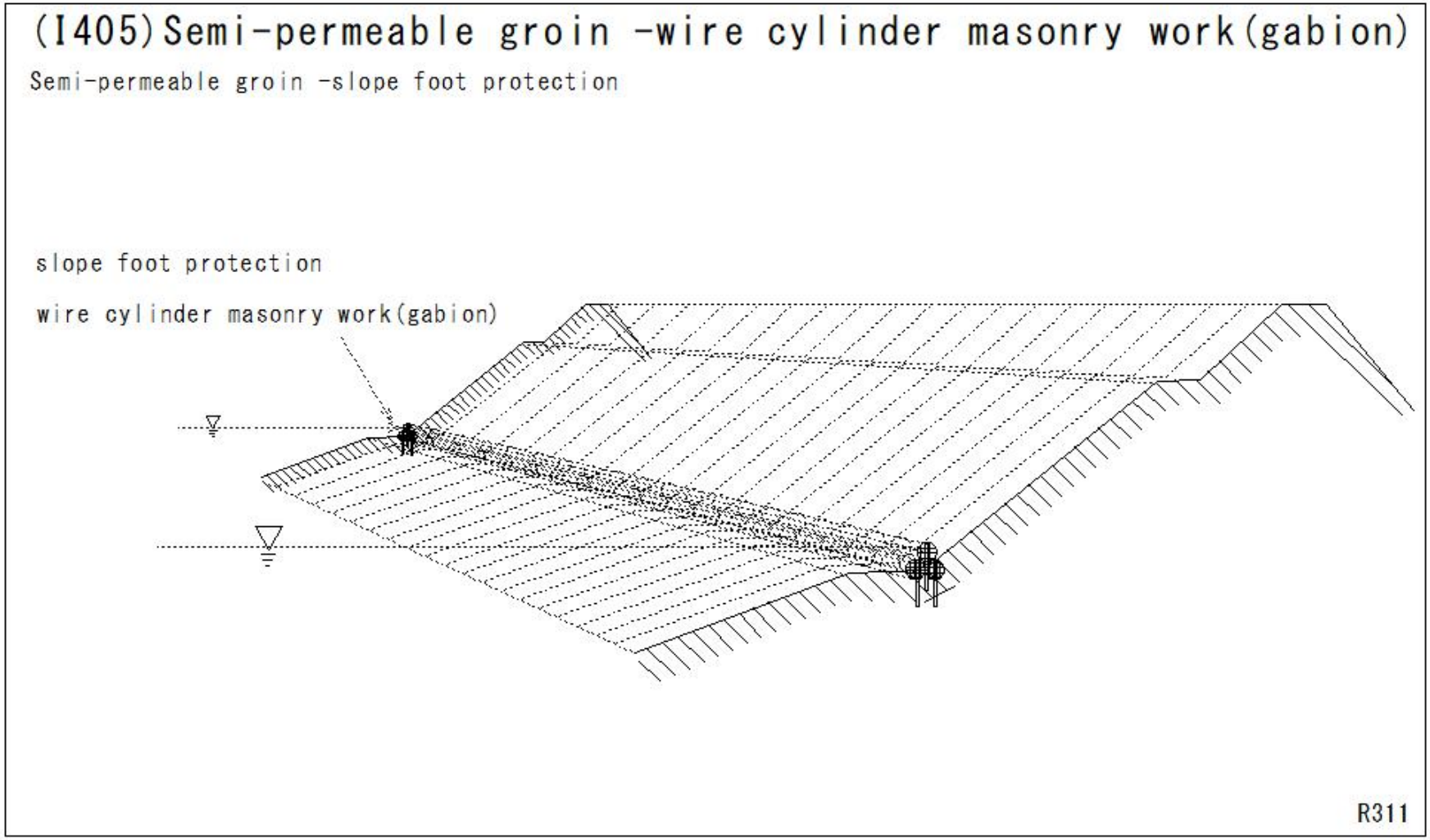




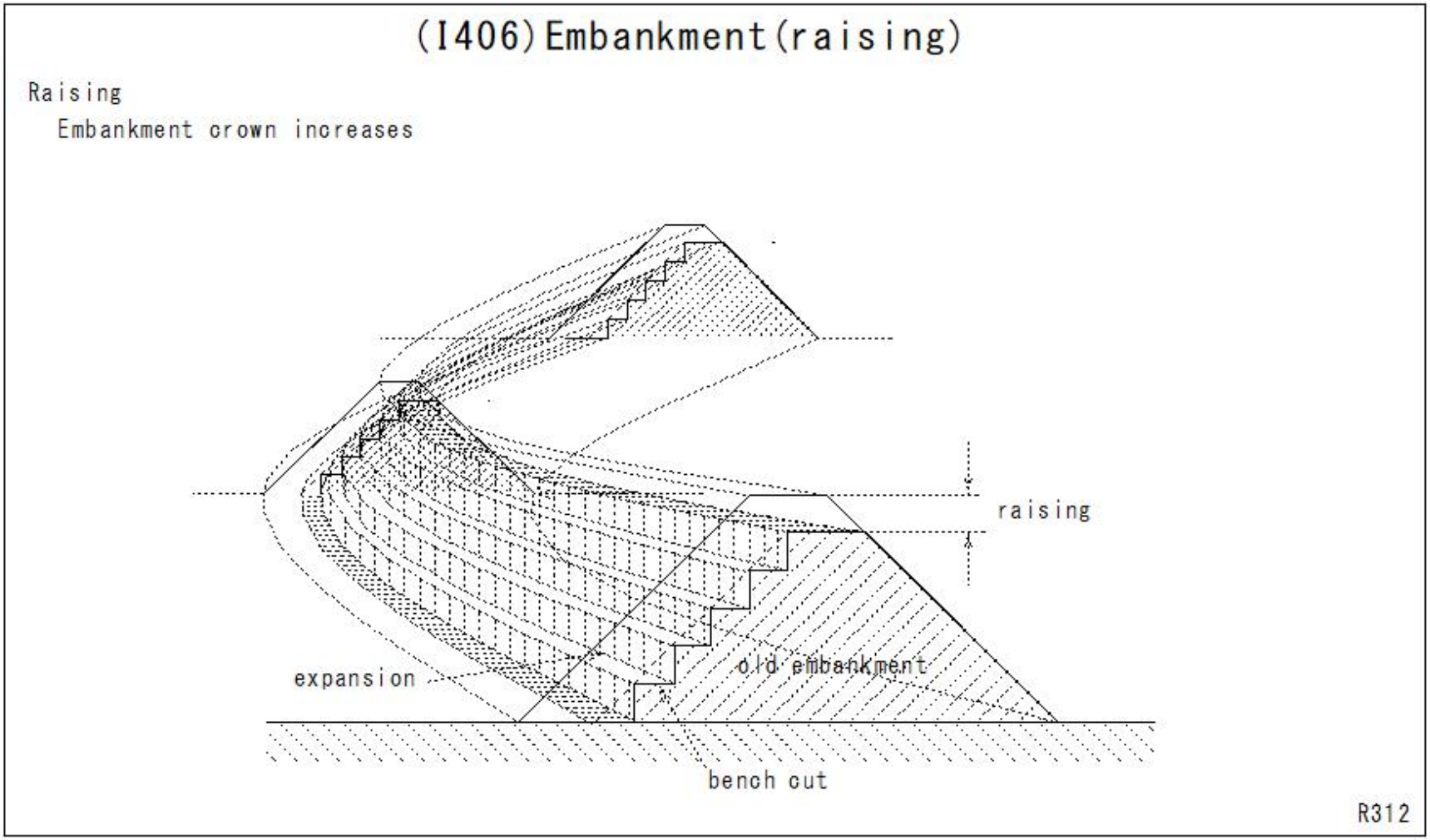
Semi-permeable groin
wire cylinder masonry work(gabion)

R310

(I405)Semi-permeable groin -wire cylinder masonry work(gabion)



(I406)Embankment(raising)



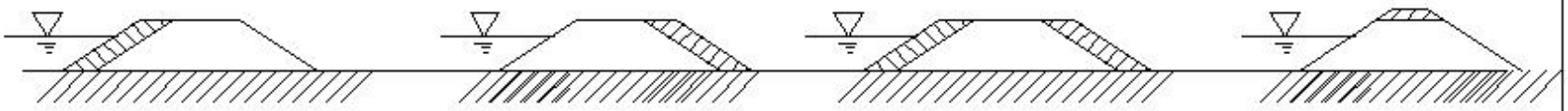
(I407)Embankment(raising)

(I407) Embankment (raising)

Levee - High - Soft - Raised

Settling part - raising

levee widening

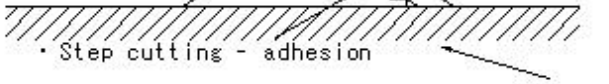


front　　under　　both sides attached　　Raise

・Walling embankment to existing embankment

・Walling embankment

・For rolling compaction, make the layer thin and compact it sufficiently.

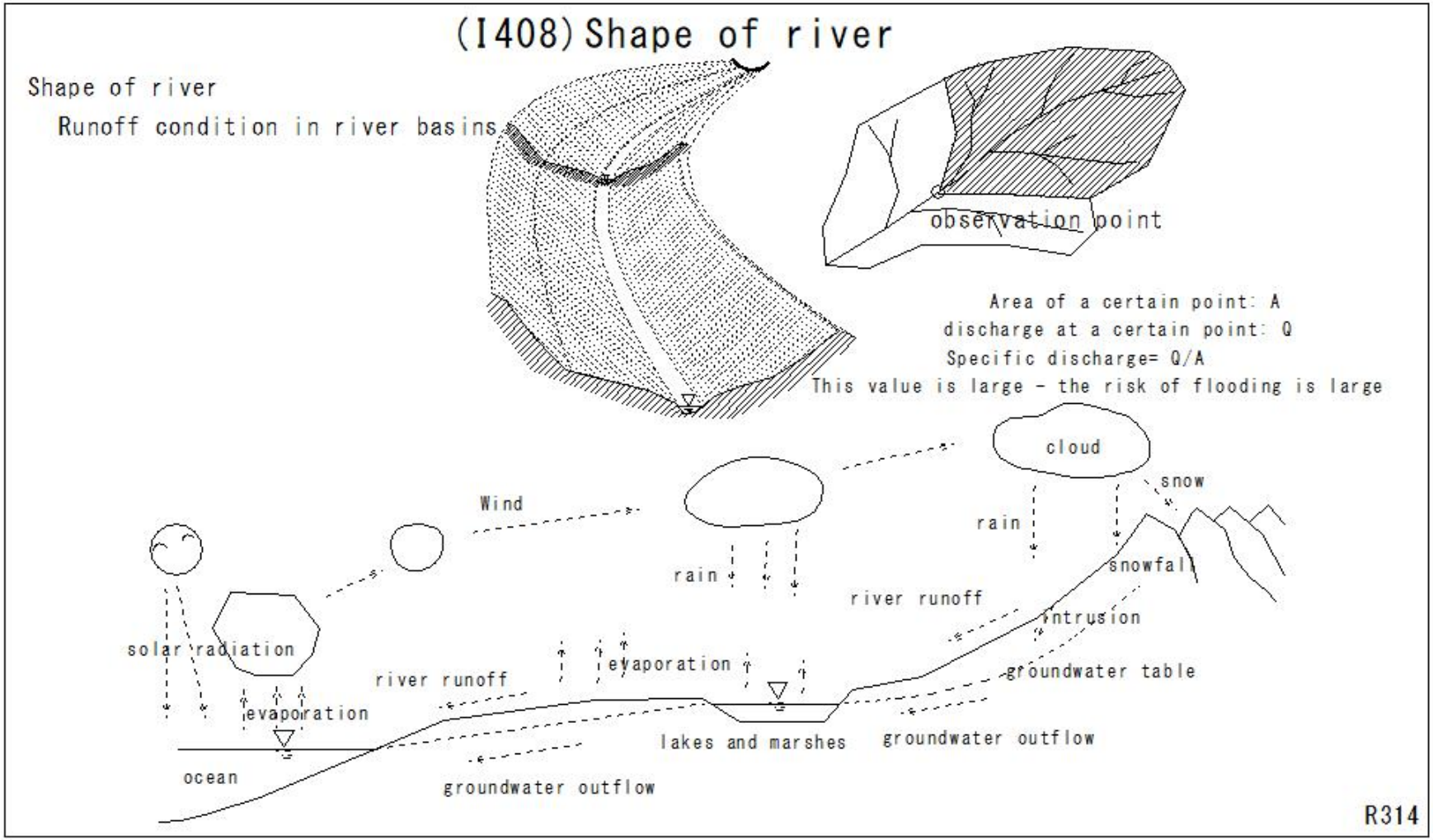


・Step cutting - adhesion

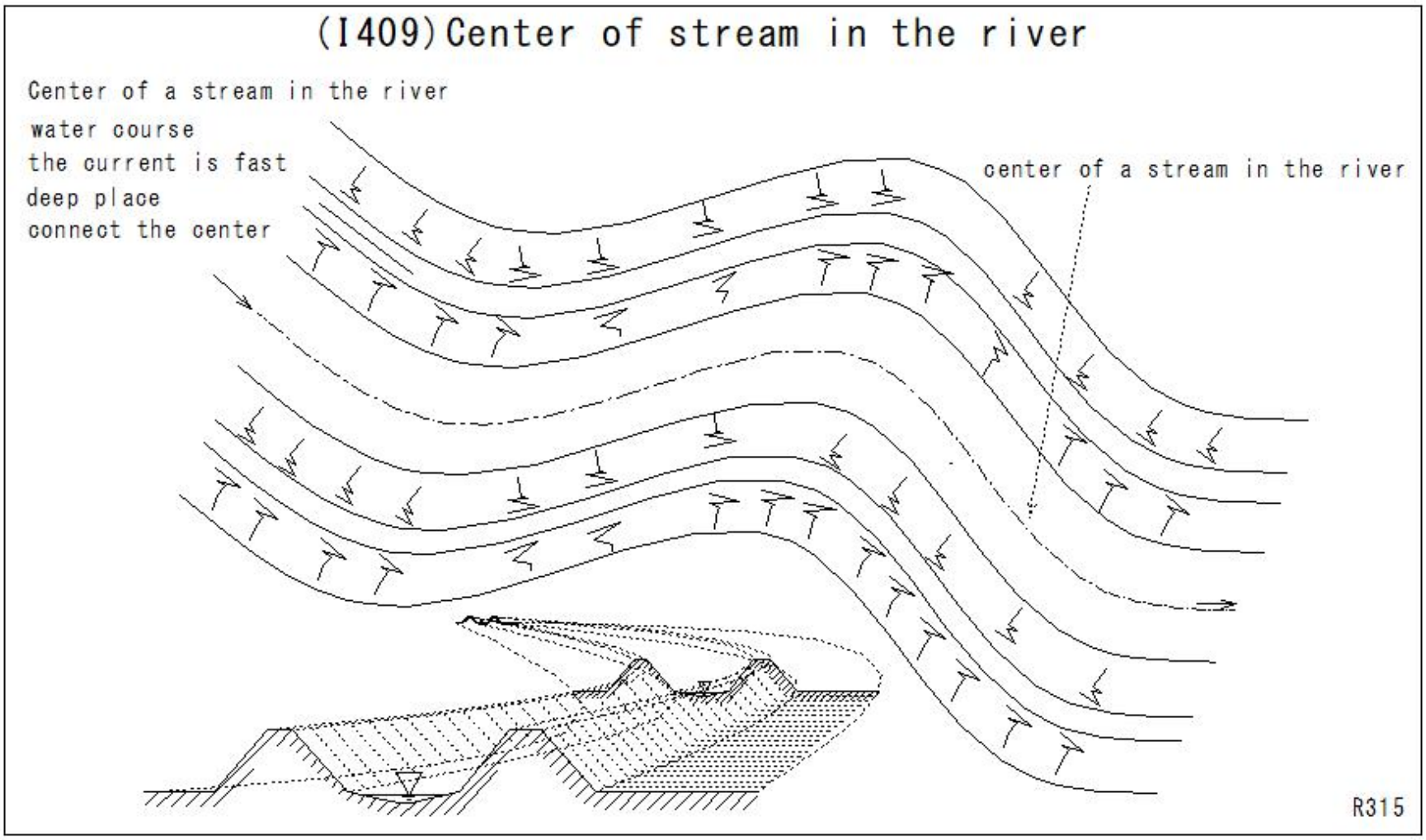
・Soft ground - whole embankment - Settlement

R313

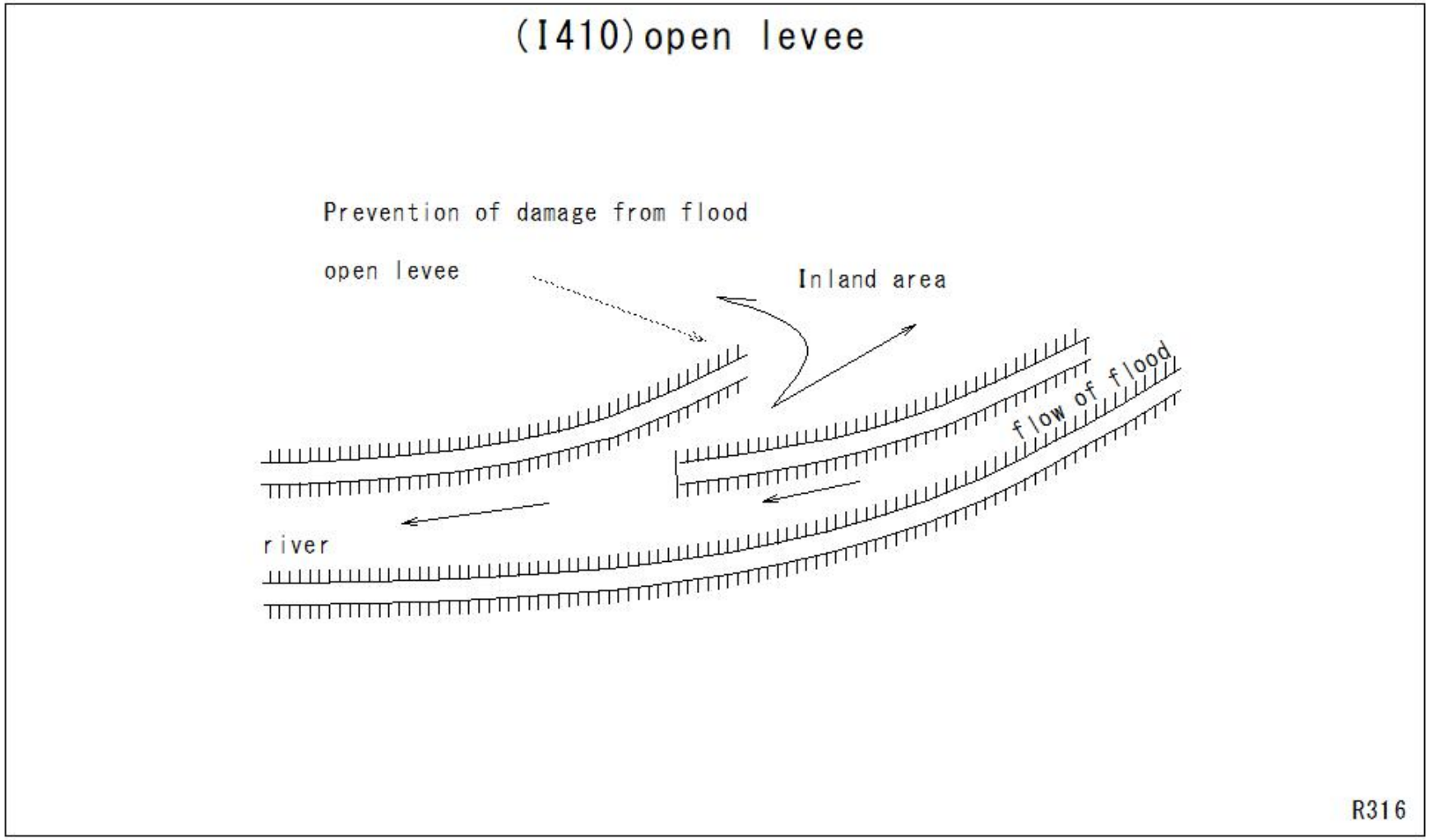
(I408)Shape of river



(I409)Center of stream in the river



(I410)Open levee



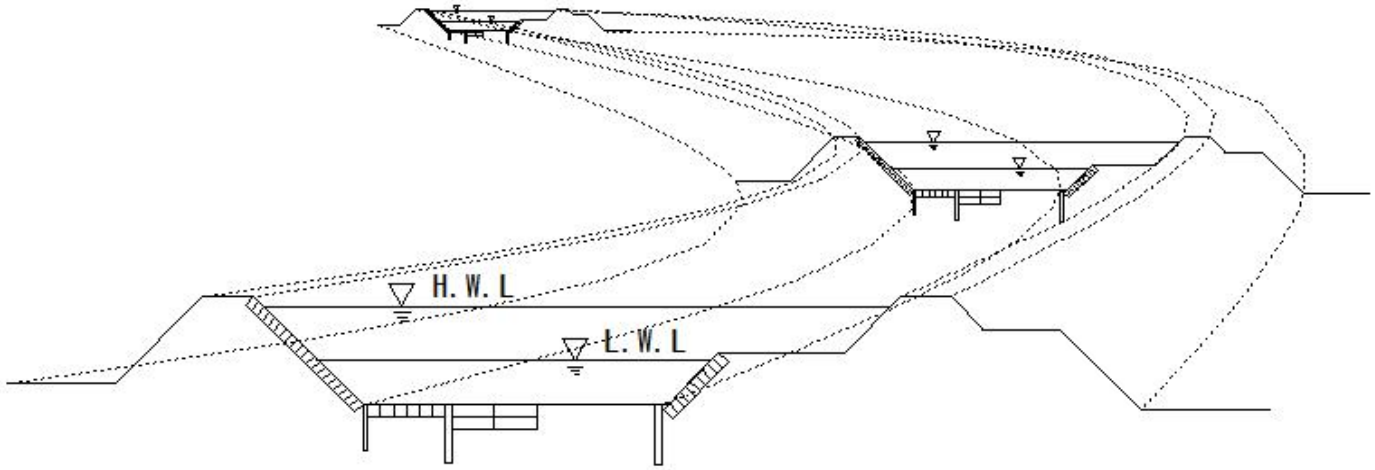
(I411)River improvement

(I411)River improvement

River improvement

①River improvement refers to construction work to prevent disasters such as floods and high tides and improve rivers.

②It includes various measures to ensure the flow capacity of rivers, such as building sand banks and digging riverbeds.



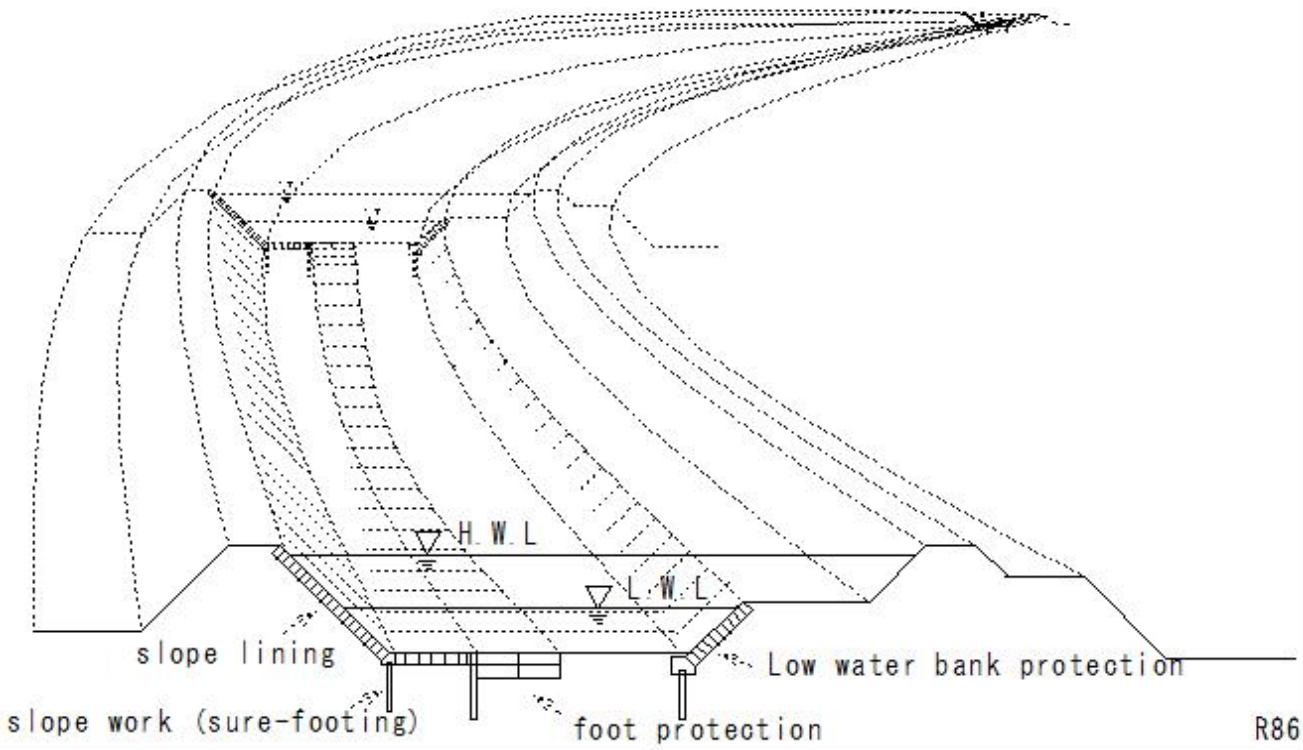
R77

(I412)River administer

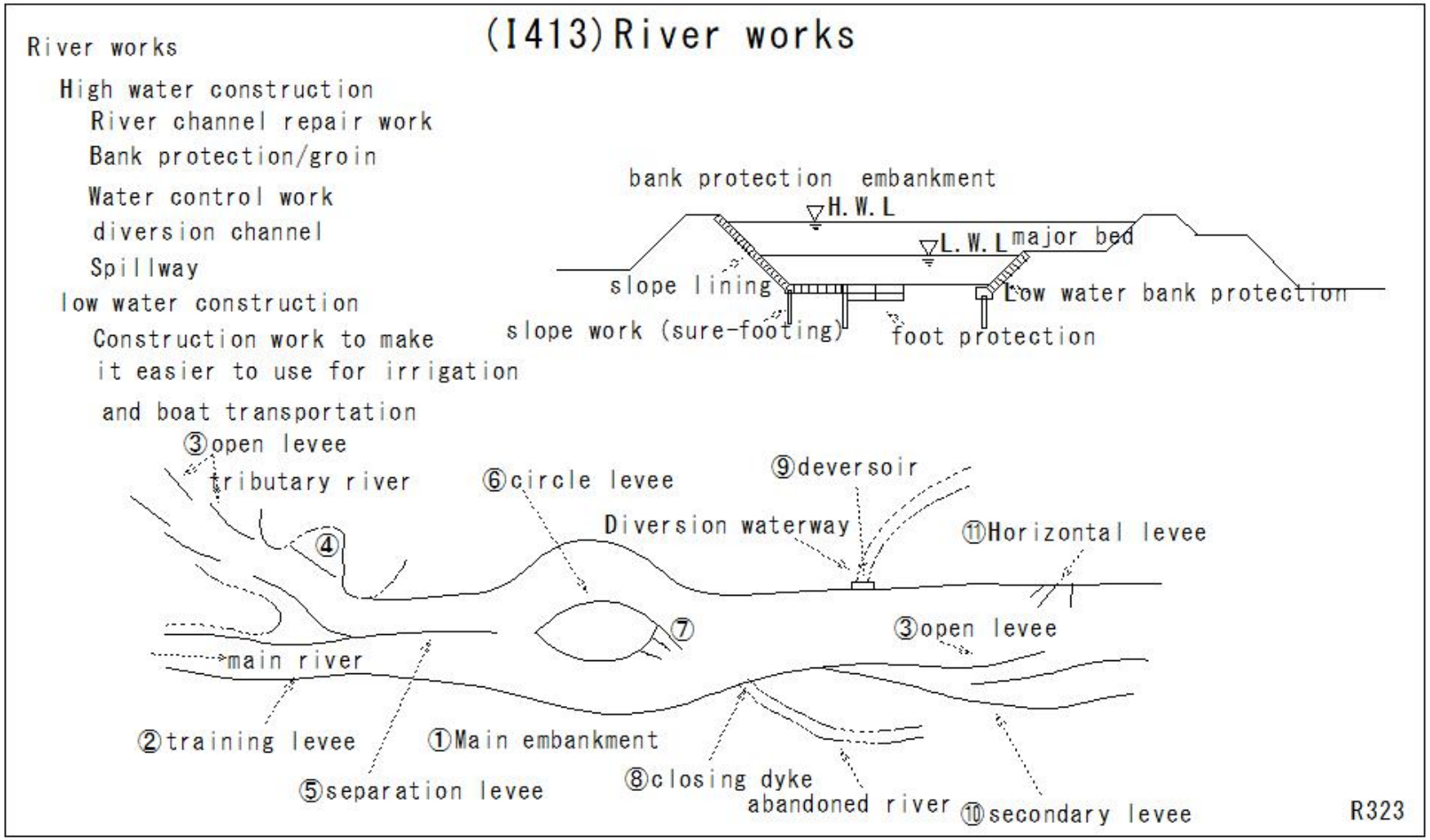
(I412)River administer

River administer

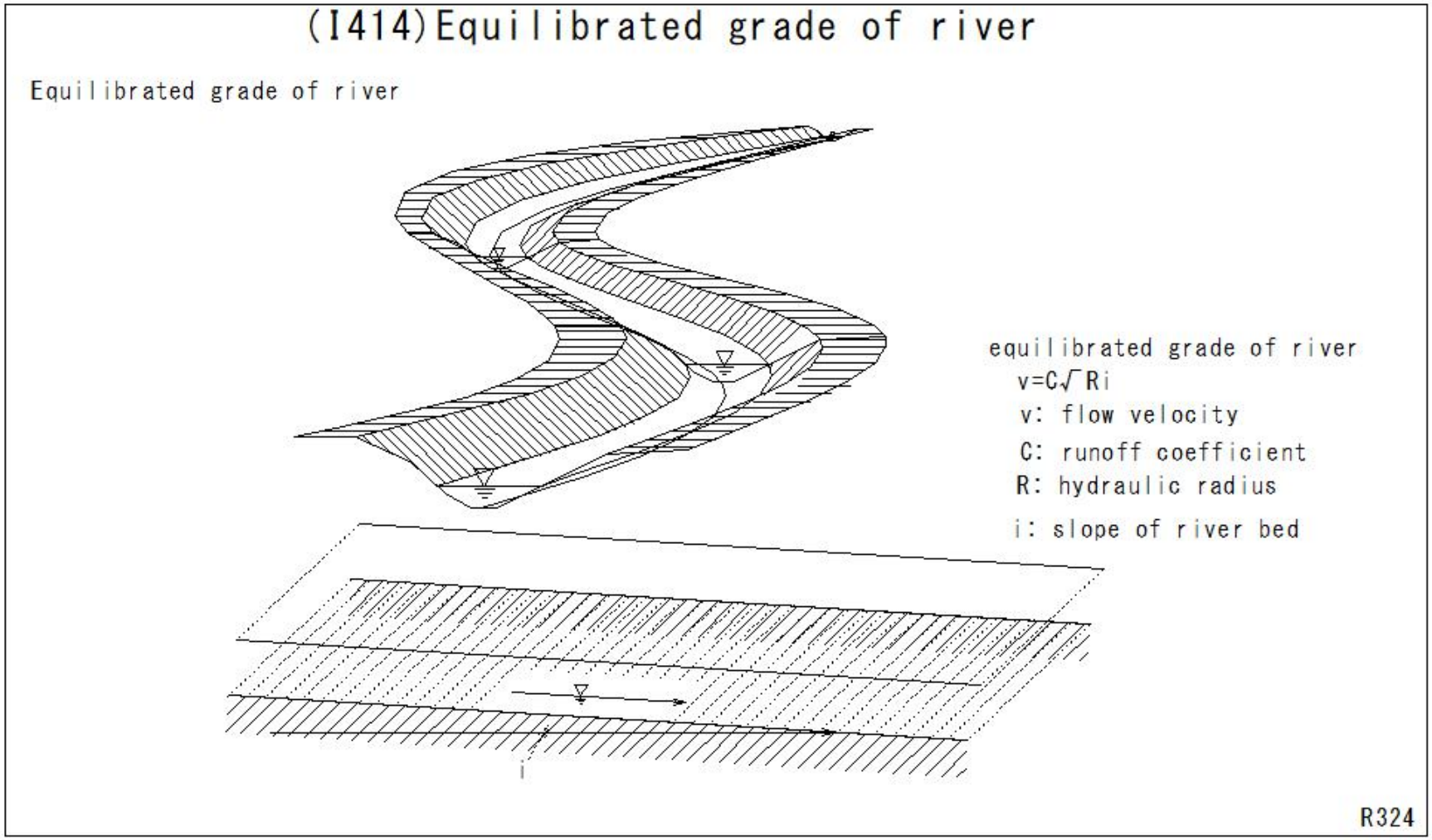
①A river administrator is a person who makes plans for flood control, water use, and environmental improvement of rivers, and who carries out construction and maintenance.



(I413)River works



(I414)Equilibrated grade of river



(I415)Graded condition of river

(I415)Graded condition of river

Graded condition of river

carrying operation

Solvent: Dissolving and flowing in water

Floating current: floating and flowing in water

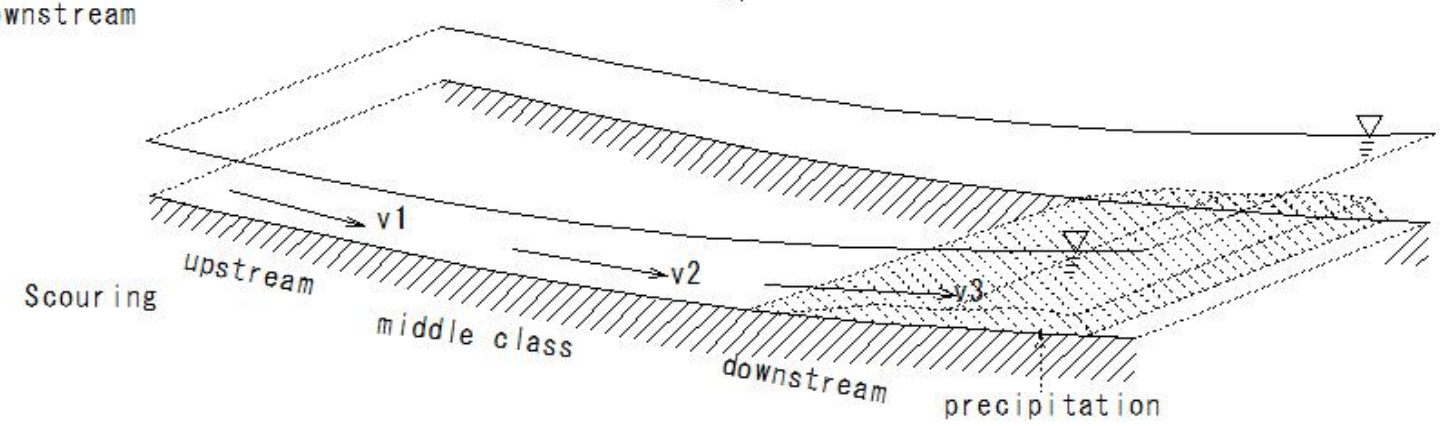
Sweep: Flowing by rolling on the river bed

river

erosion effect

Sediment grains

flow downstream



I379
R290

(I416)River Law

(I416)River Law

River Law

① Prevent the occurrence of disasters caused by floods, tsunamis, high tides, etc.

② Rivers are used appropriately.

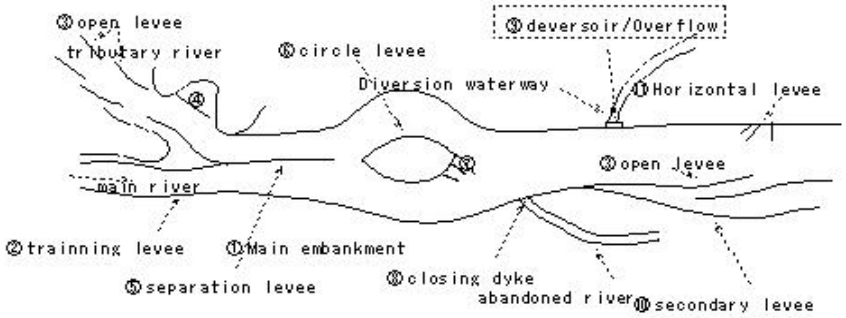
③ The normal function of flowing water is maintained.

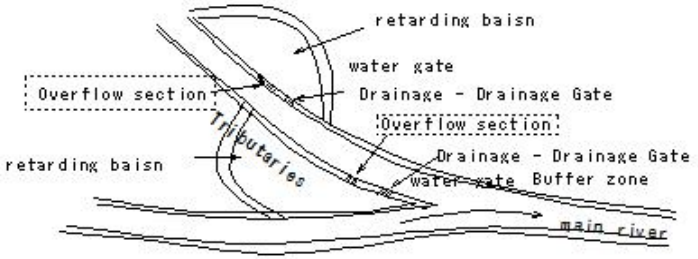
④ River environment is improved and protected.

⑤ Comprehensive management.

⑥ Contribute to the conservation and development of the nation's land.

⑦ Maintain public safety and promote public welfare.





R93

(I417)Water supply(activated carbon method)

(I417)Water supply(activated carbon method)

Water supply

Activated carbon method

Water purification method for drinking water

Odor

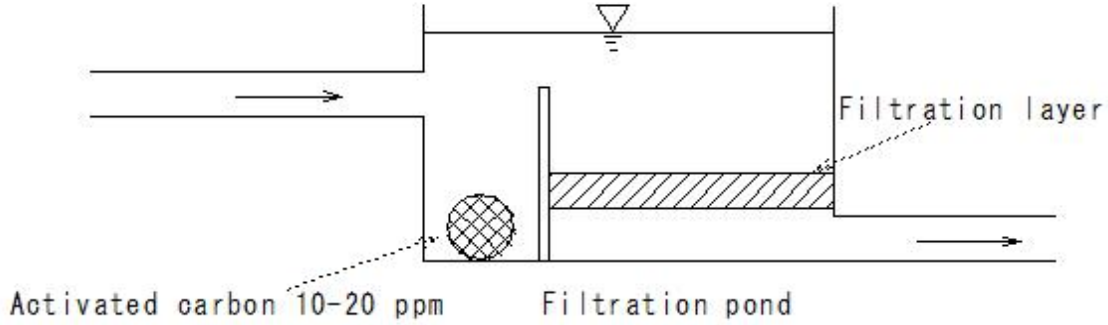
Color

Synthetic detergent

Removing radioactive substances

Uses activated carbon

Combined with ozone treatment

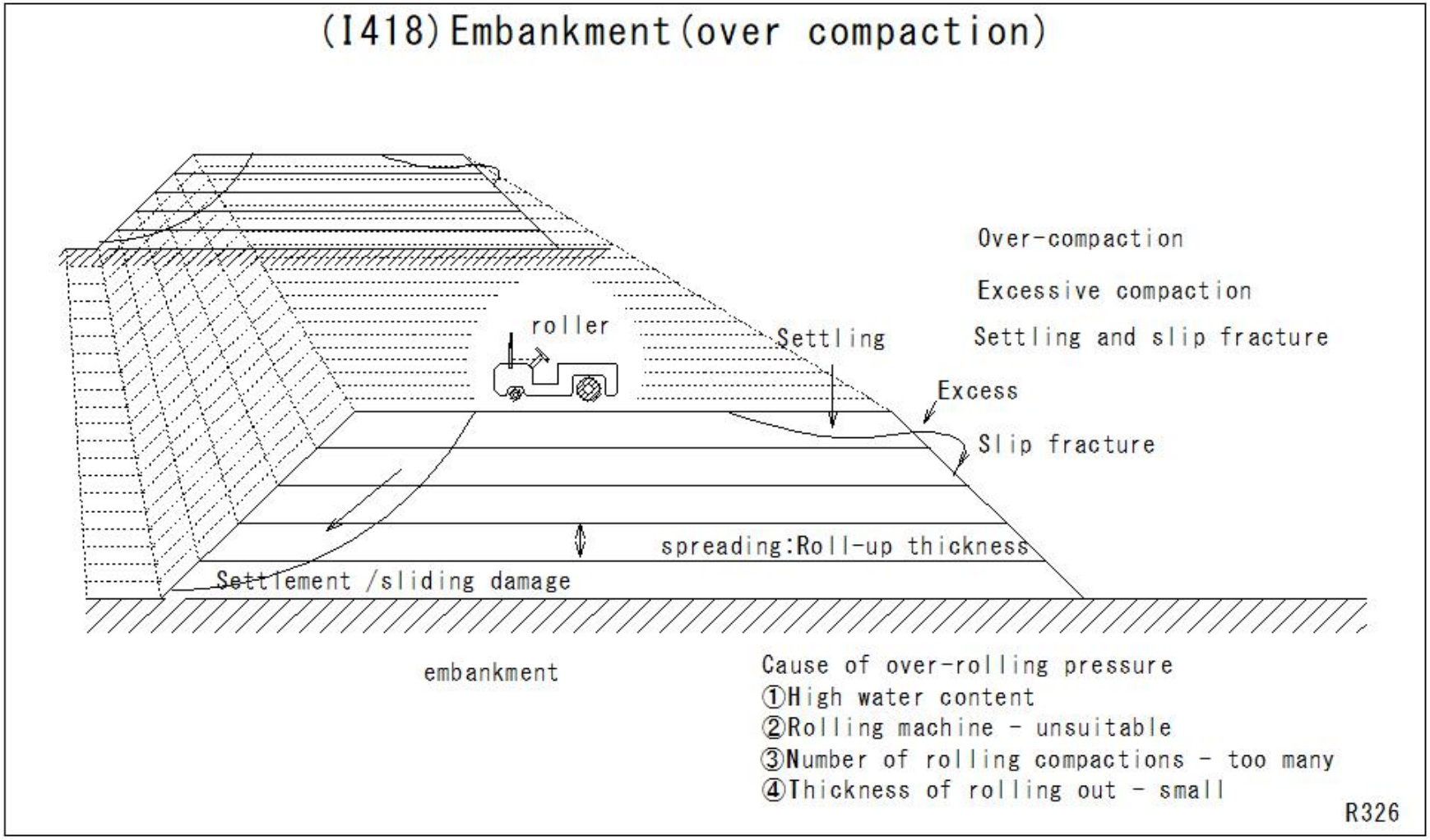


Temporary treatment

W226

W229

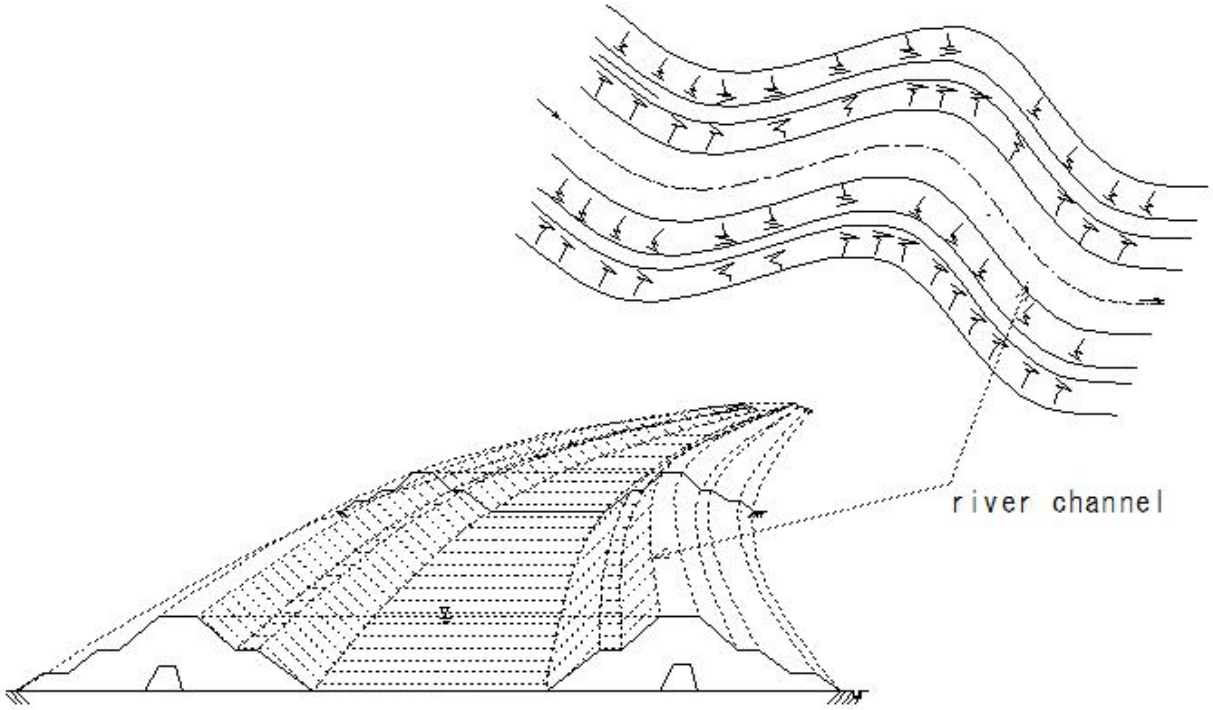
(I418)Embankment(over compaction)



(I419)River channel

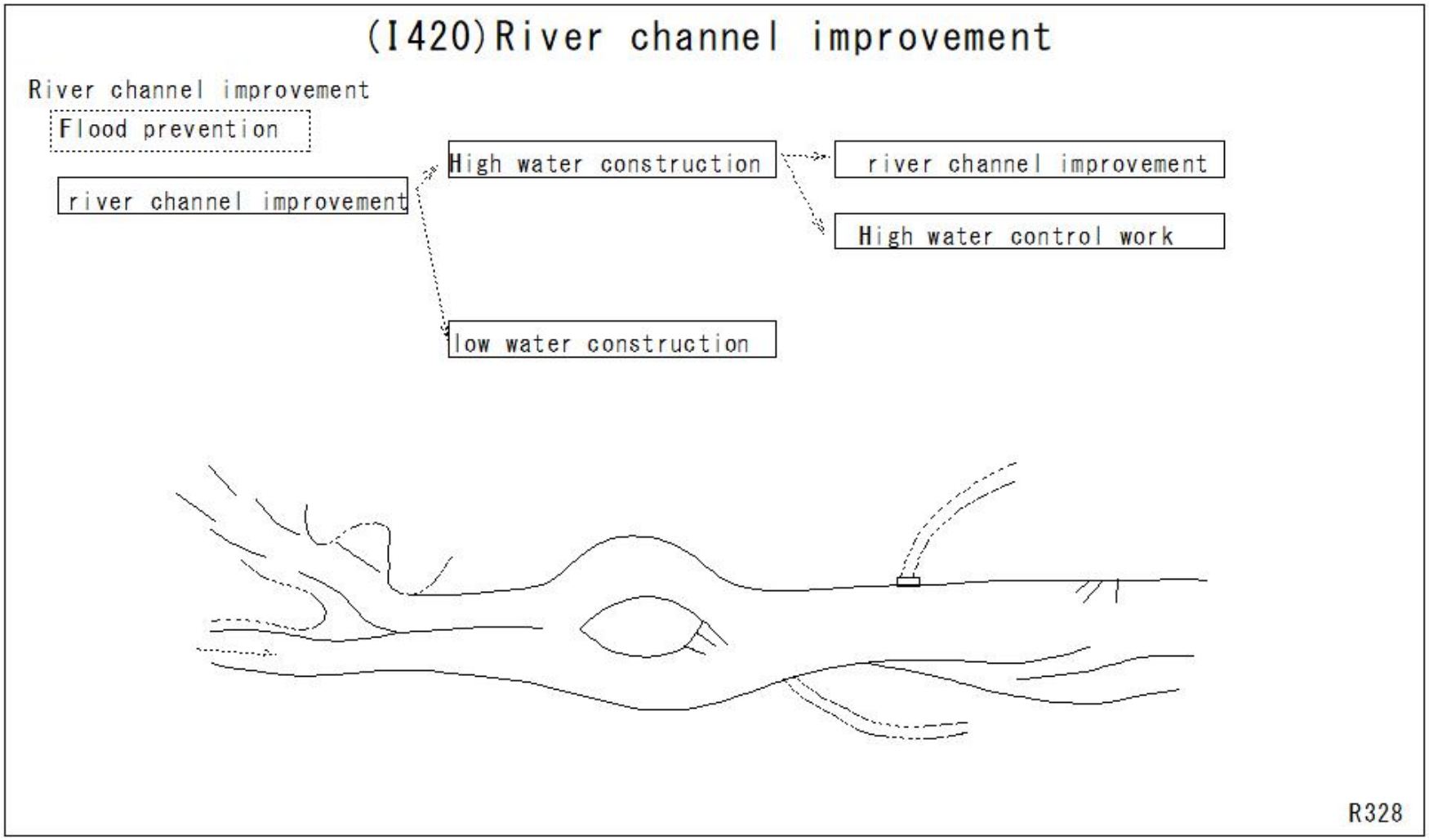
(I419)River channel

River channel
water course through which river water flows

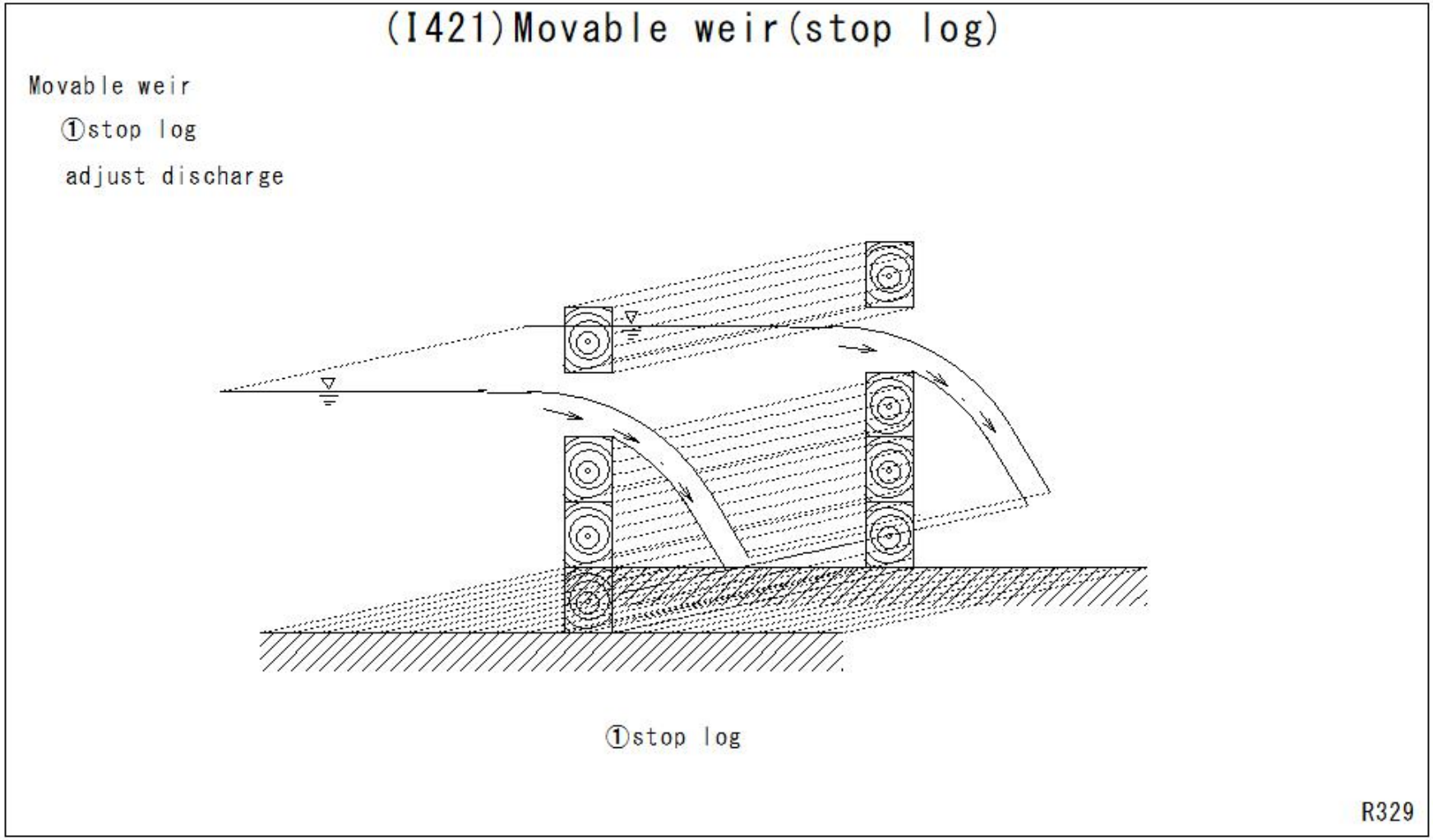


R327

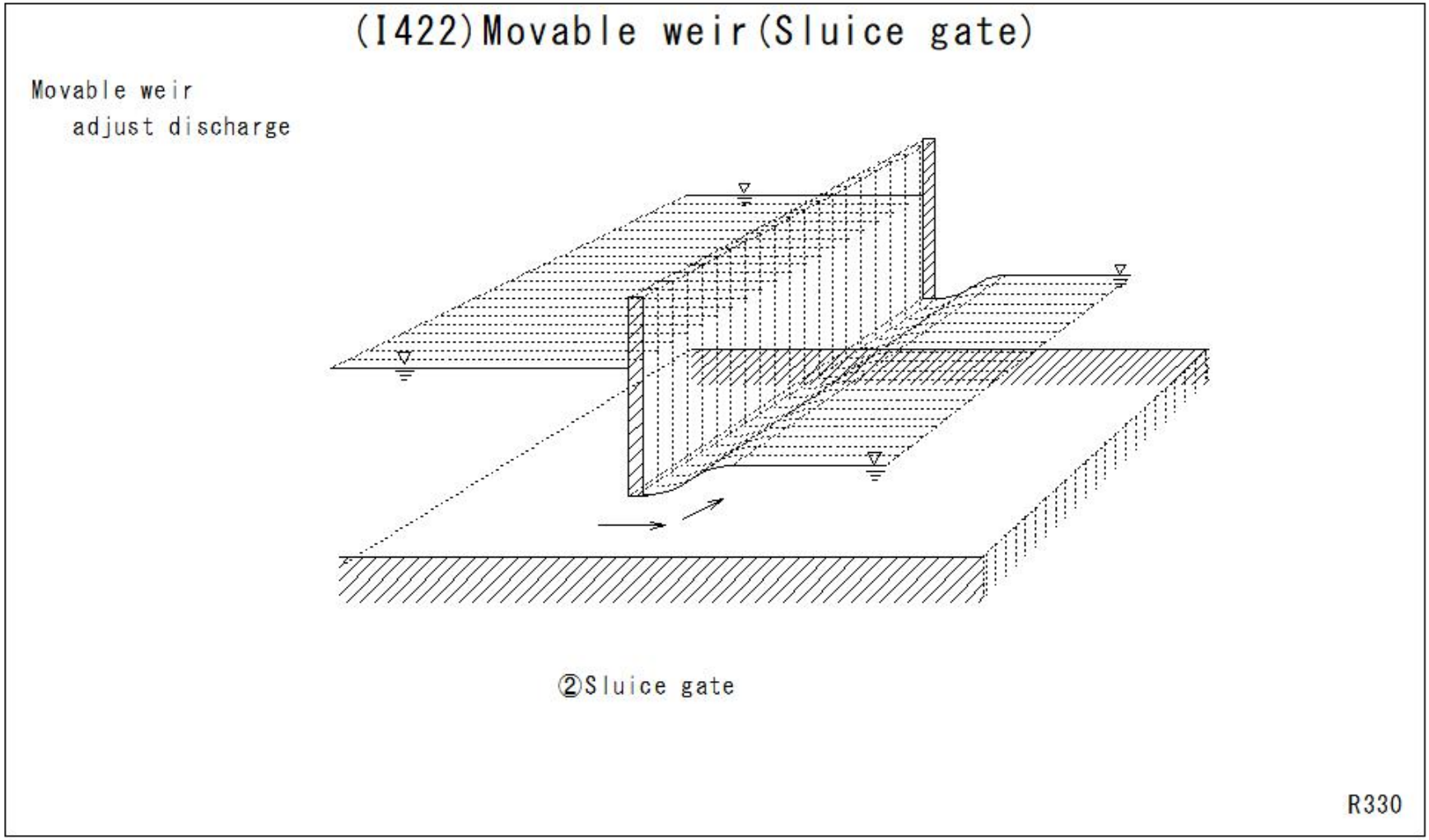
(I420)River channel improvement



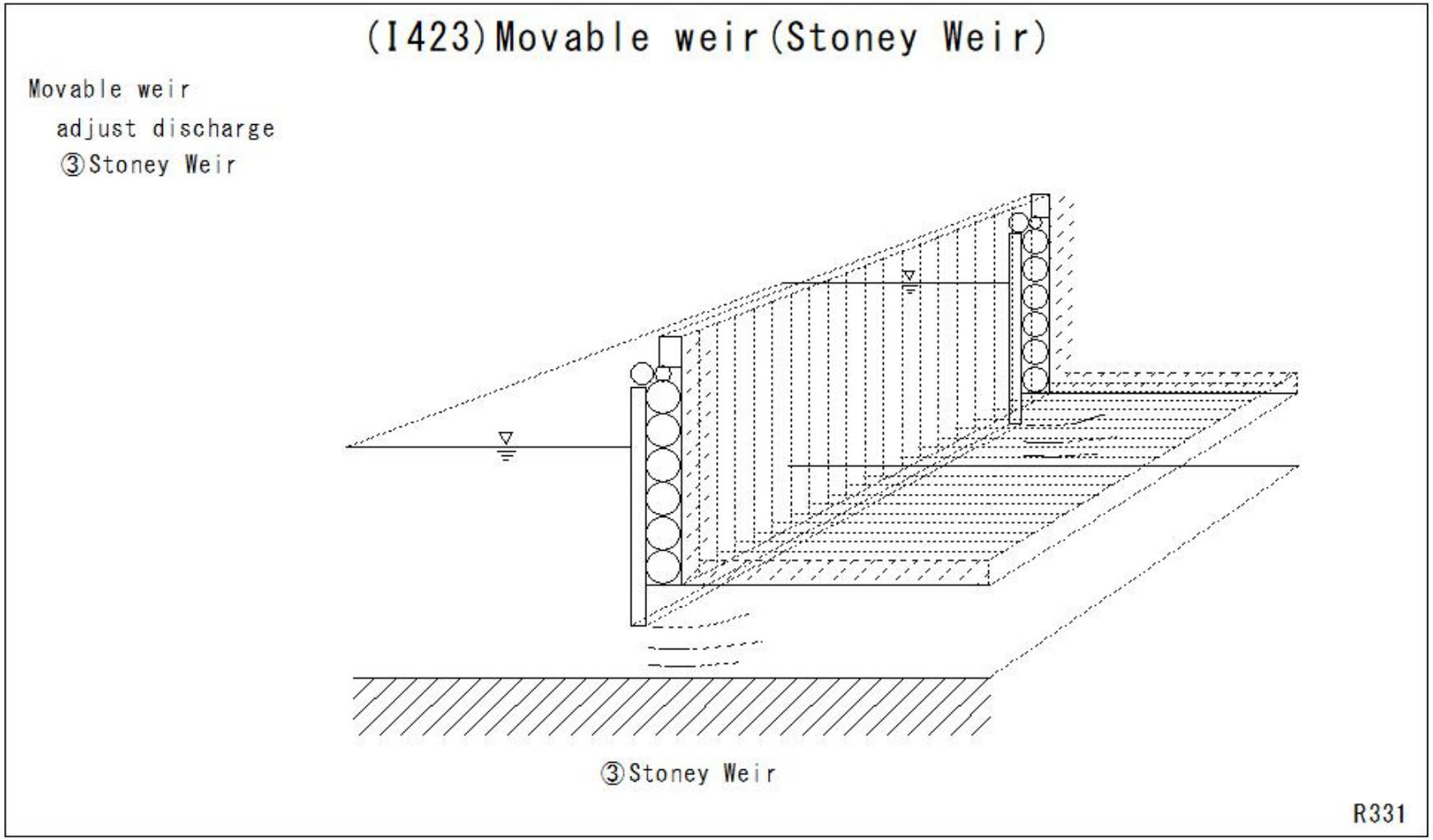
(I421)Movable weir(stop log)



(I422)Movable weir(Sluice gate)



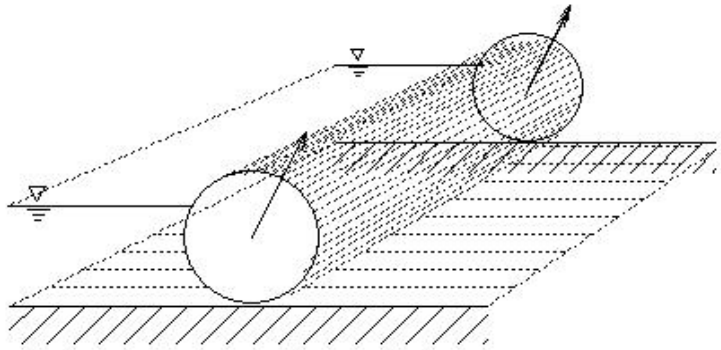
(I423)Movable weir(Stoney Weir)



(I424)Movable weir(Rolling gate)

(I424)Movable weir(Rolling gate)

Movable weir
adjust discharge
④Rolling gate
Don't let the water overflow



④Rolling gate

R332

(I425)Movable weir(Tentergate)

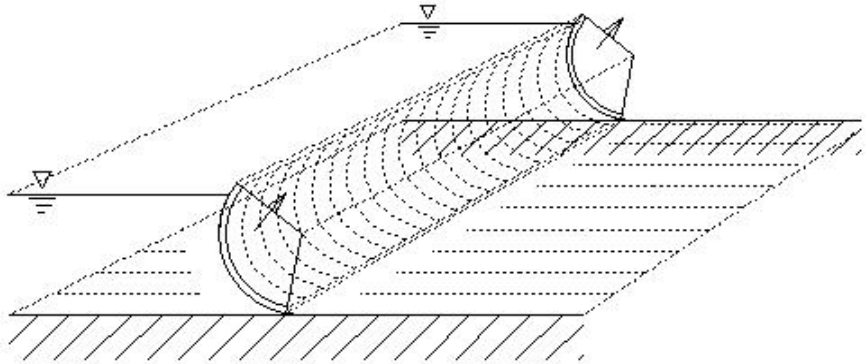
(I425)Movable weir(Tentergate)

Movable weir

adjust discharge

Don't let the water overflow

⑤Tentergate



④Rolling gate

R333

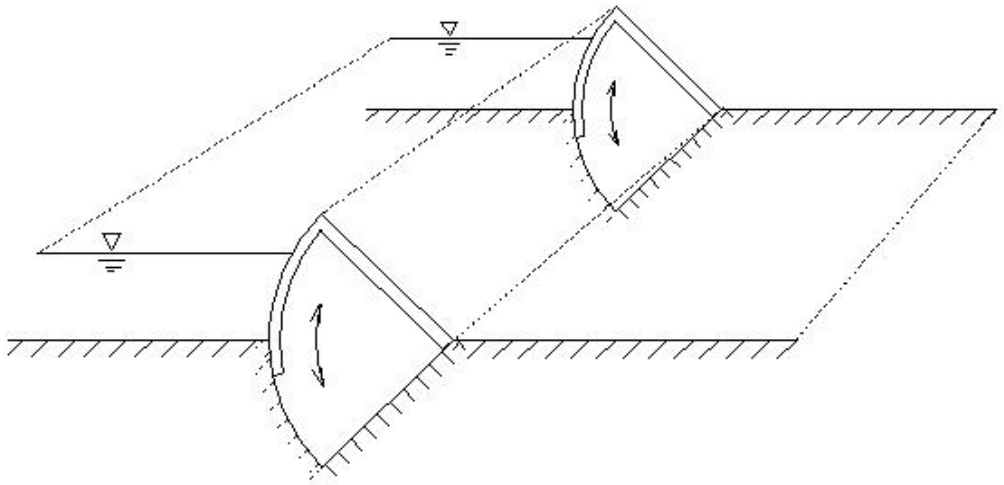
(I426)Movable weir(Drum gate)

(I426)Movable weir(Drum gate)

Movable weir

adjust discharge

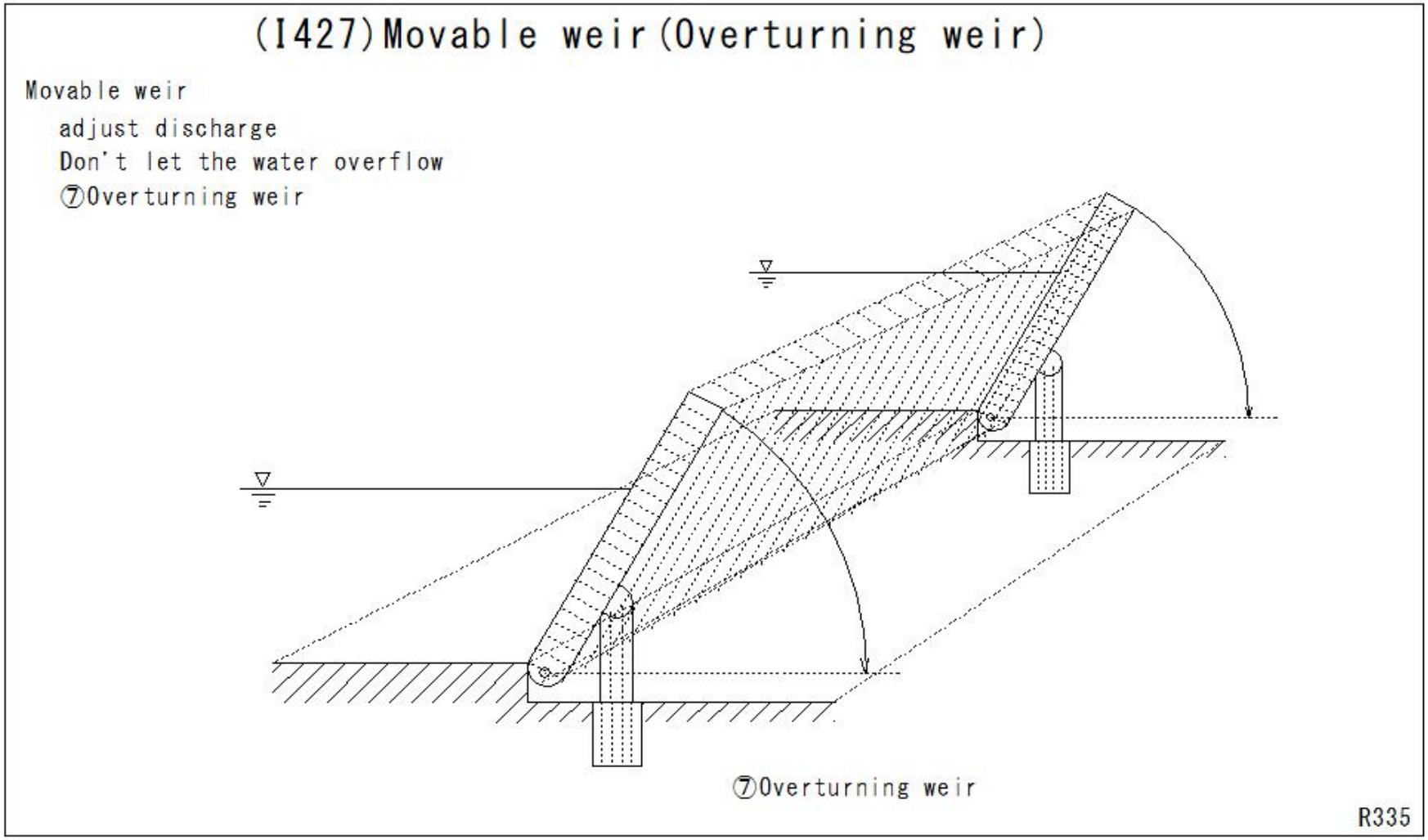
⑥Drum gate



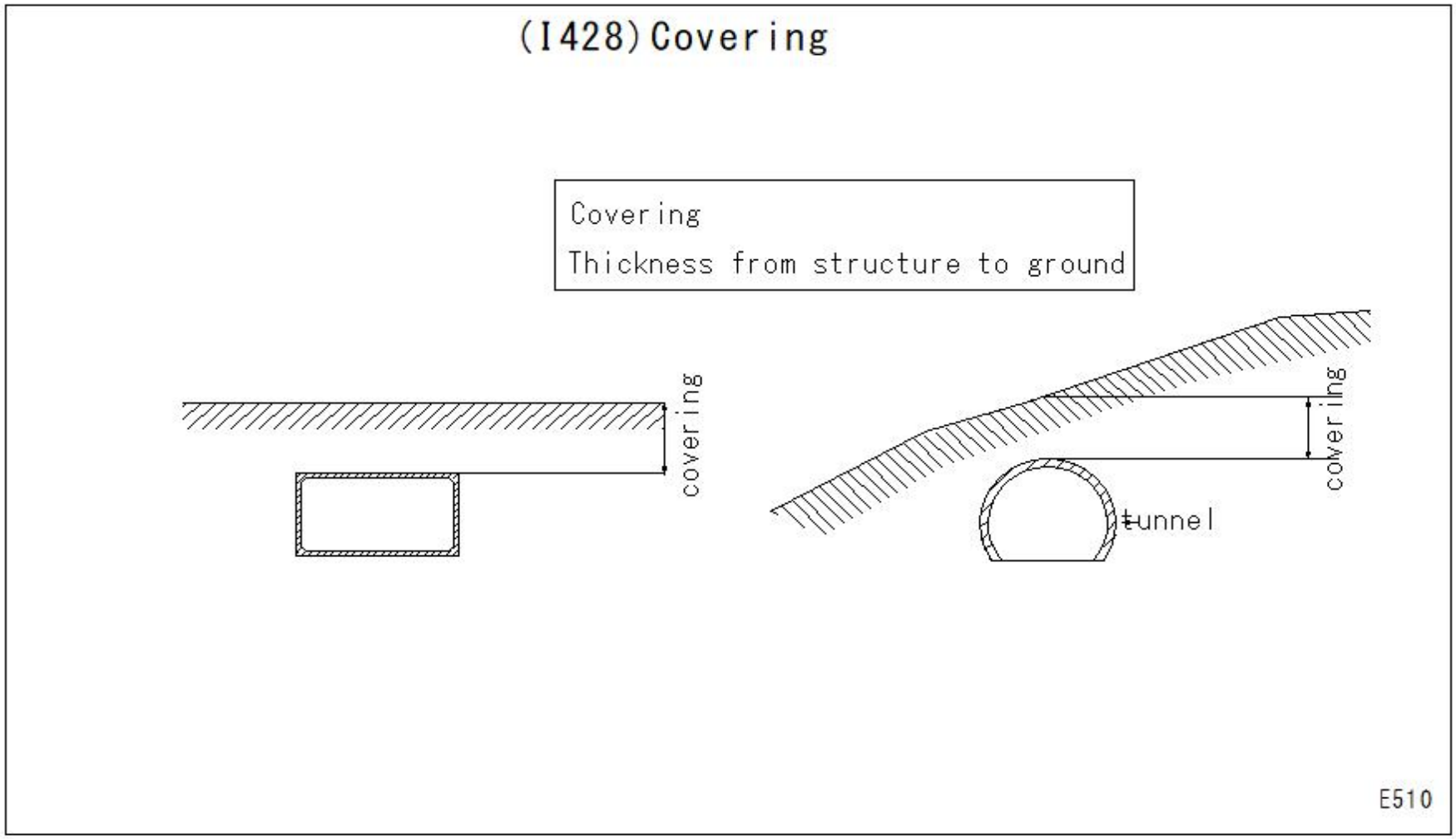
⑥Drum gate

R334

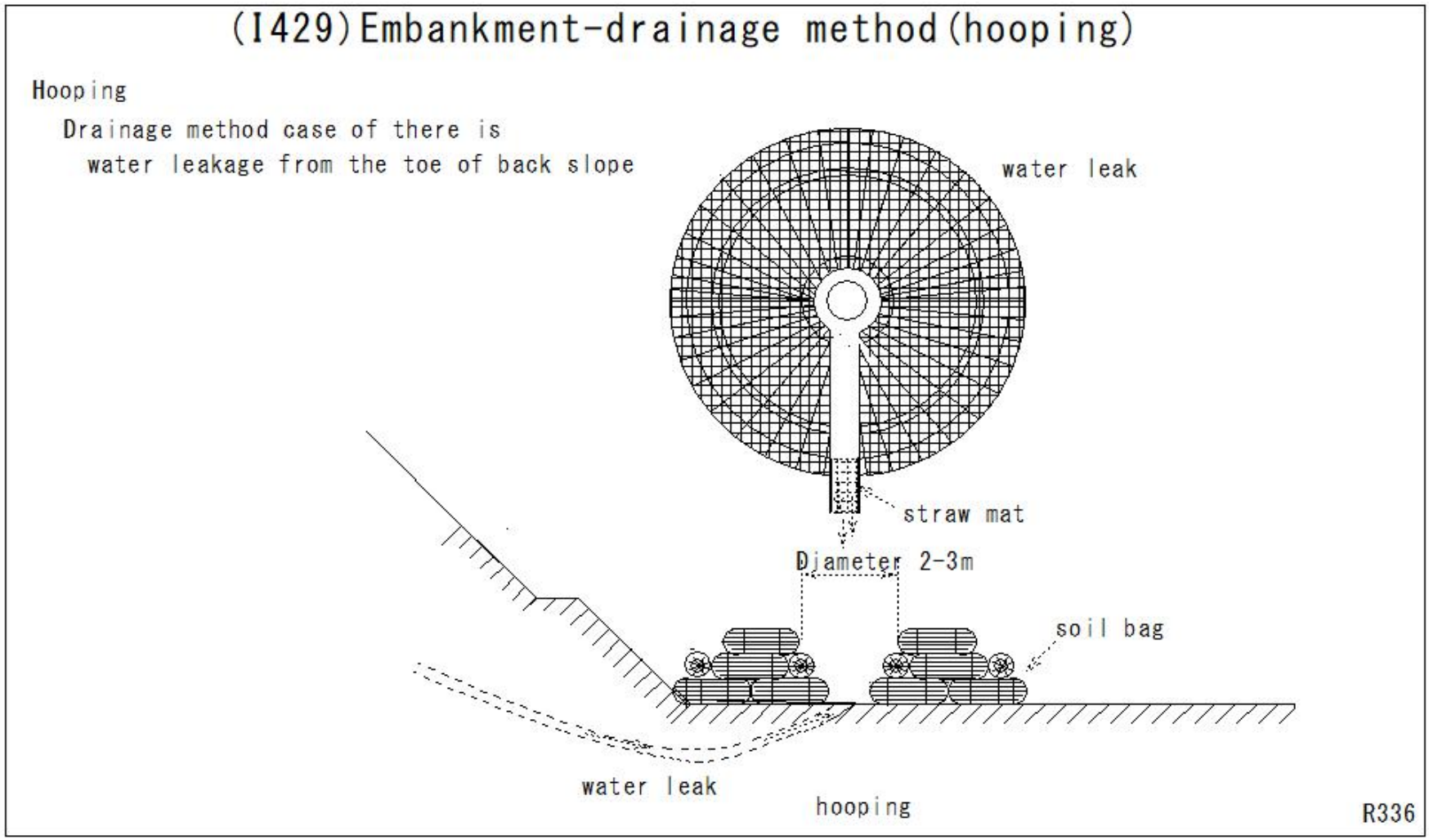
(I427)Movable weir(Overturning weir)



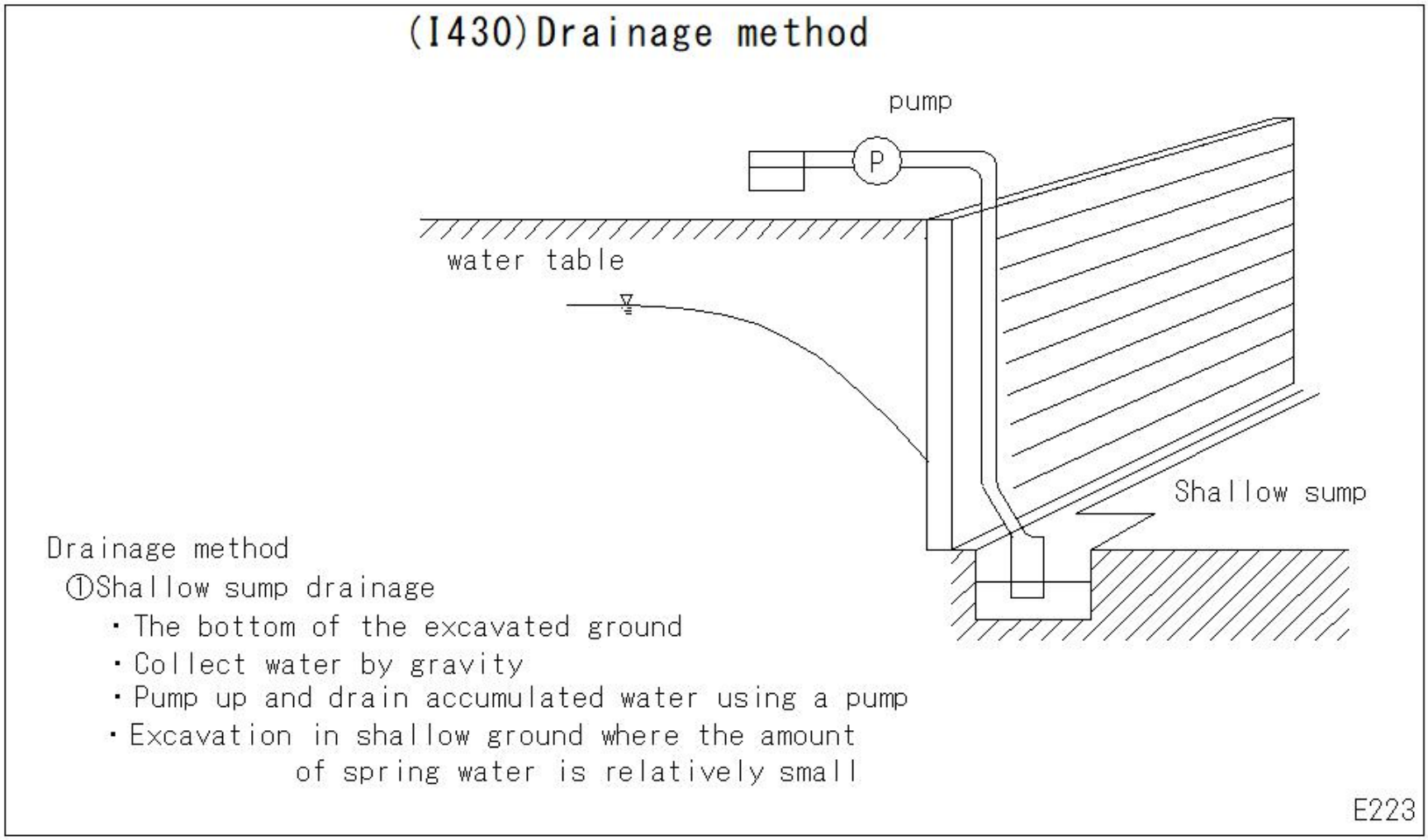
(I428)Cover


(I428) Covering
Covering
Thickness from structure to ground
covering
covering
tunnel
E510

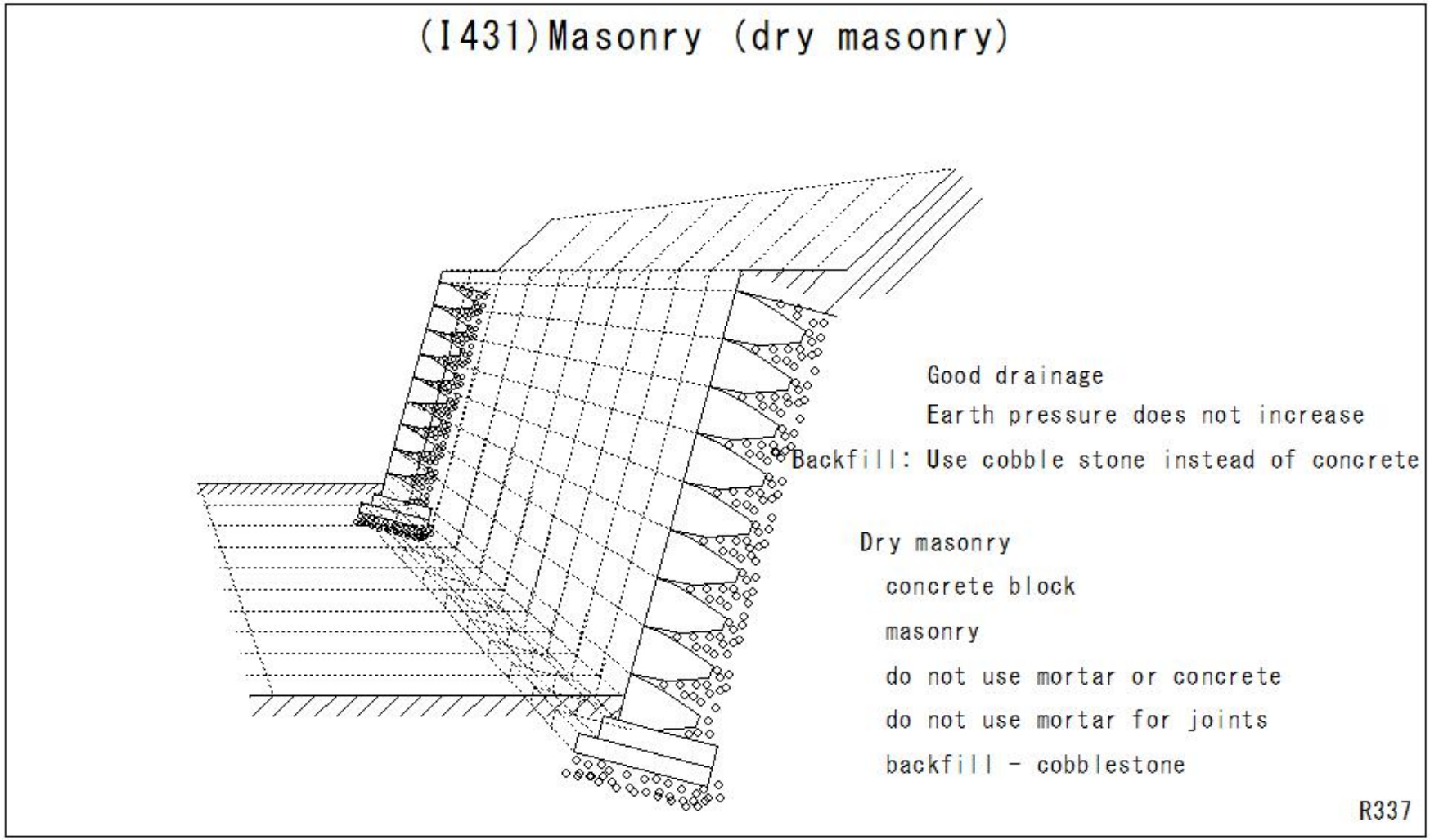
(I429)Embankment-drainage method(hooping)



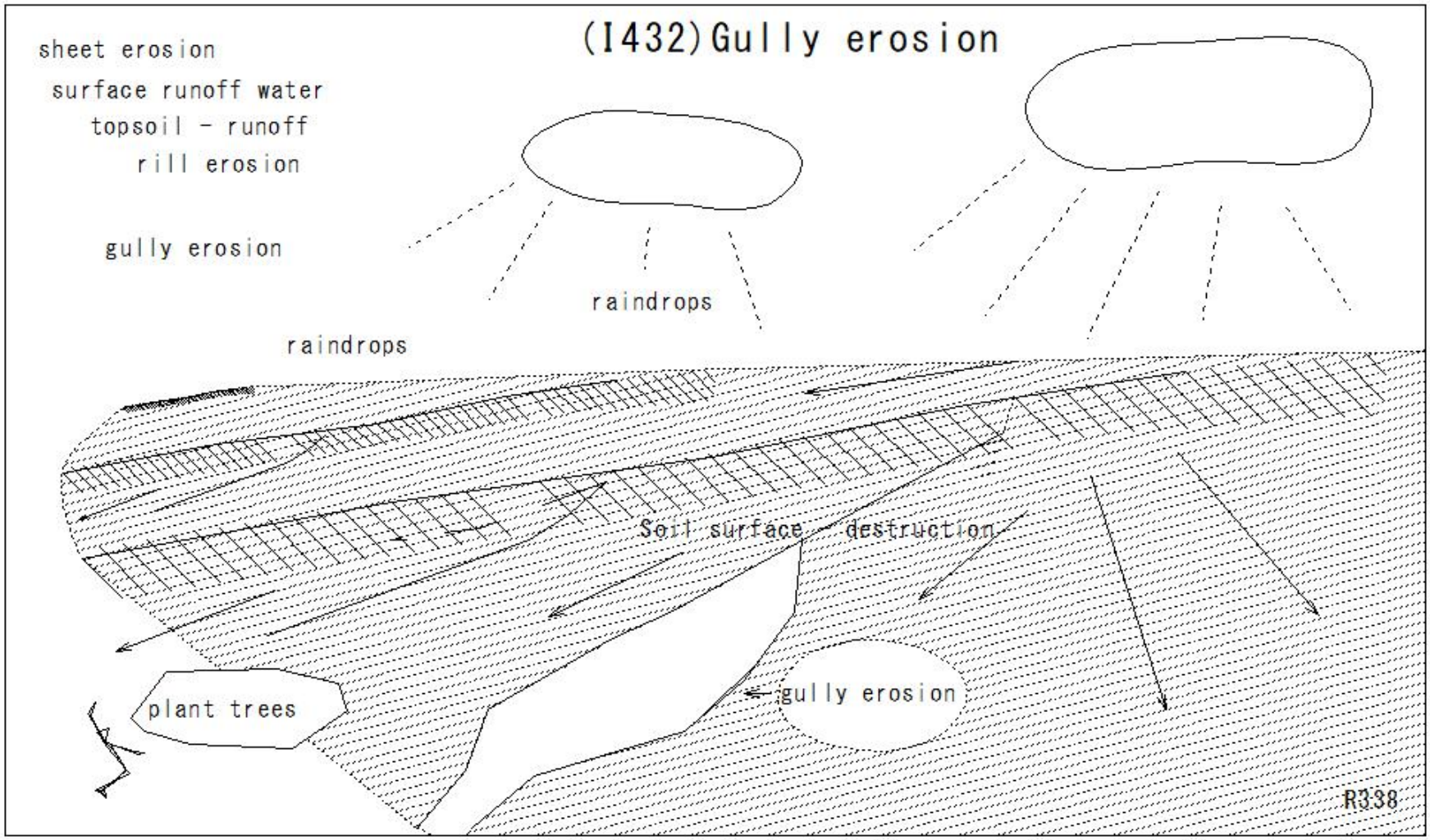
(I430)Drainage method



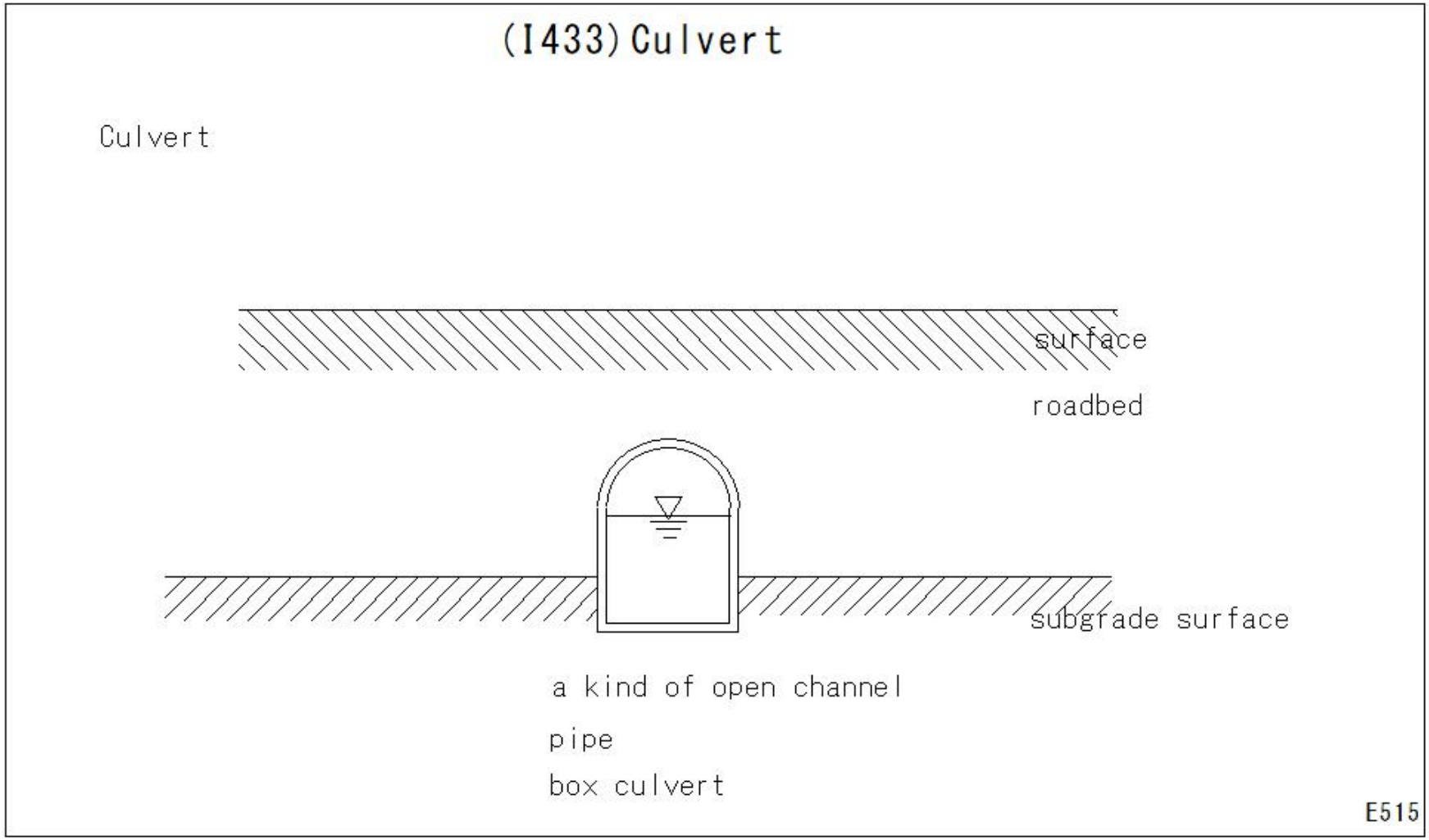
(I431)Masonry (dry masonry)



(I432)Gully erosion



(I433)Culvert



(I434)Irrigation methods

(I434)Irrigation methods

Irrigation methods

① Sewage

② Bed (1-3m wide or more)

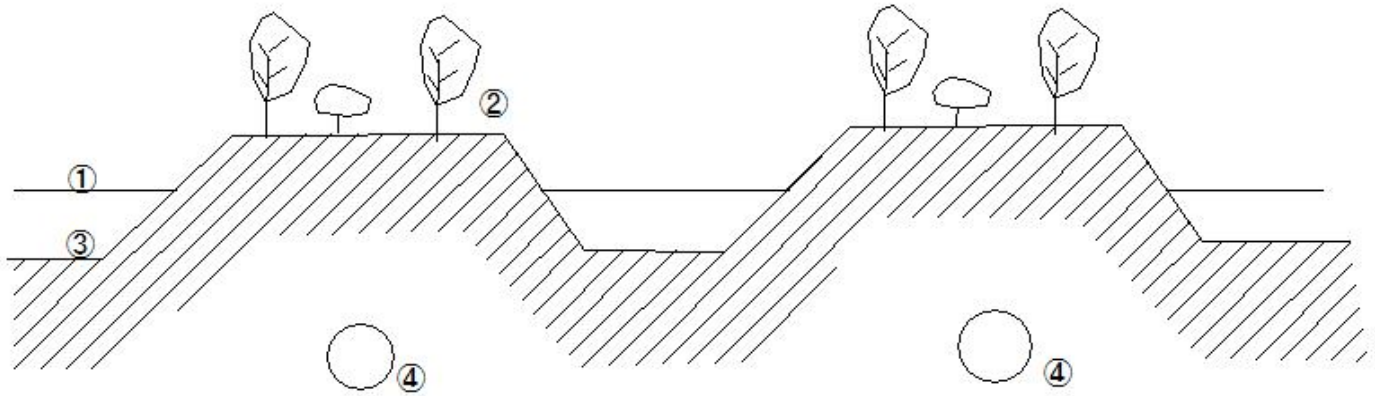
③ Ditch (40-45cm deep, 1-2m wide)

④ Connecting drainage pipe

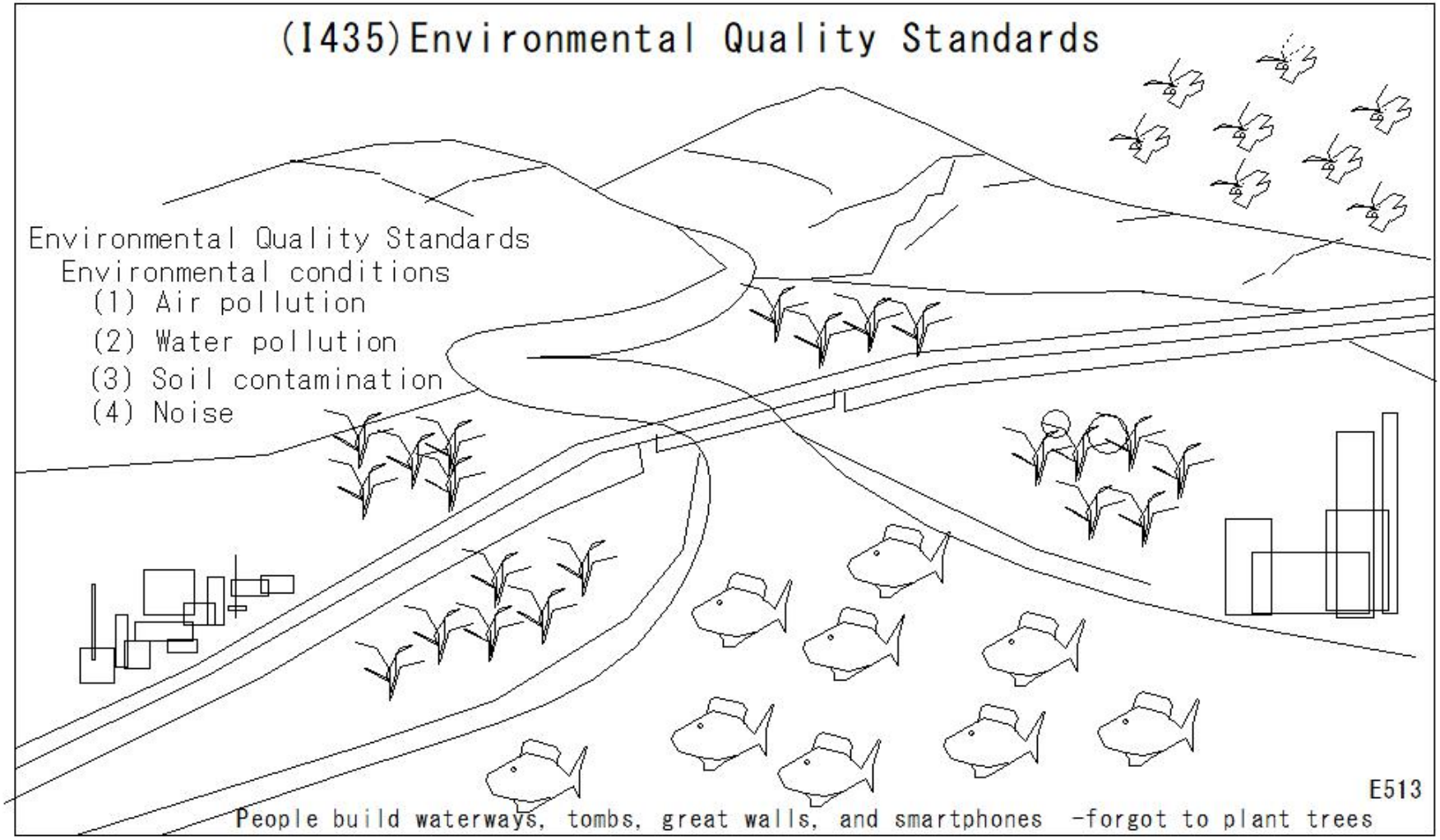
Sewage treatment

Direct sewage to the field and treat it

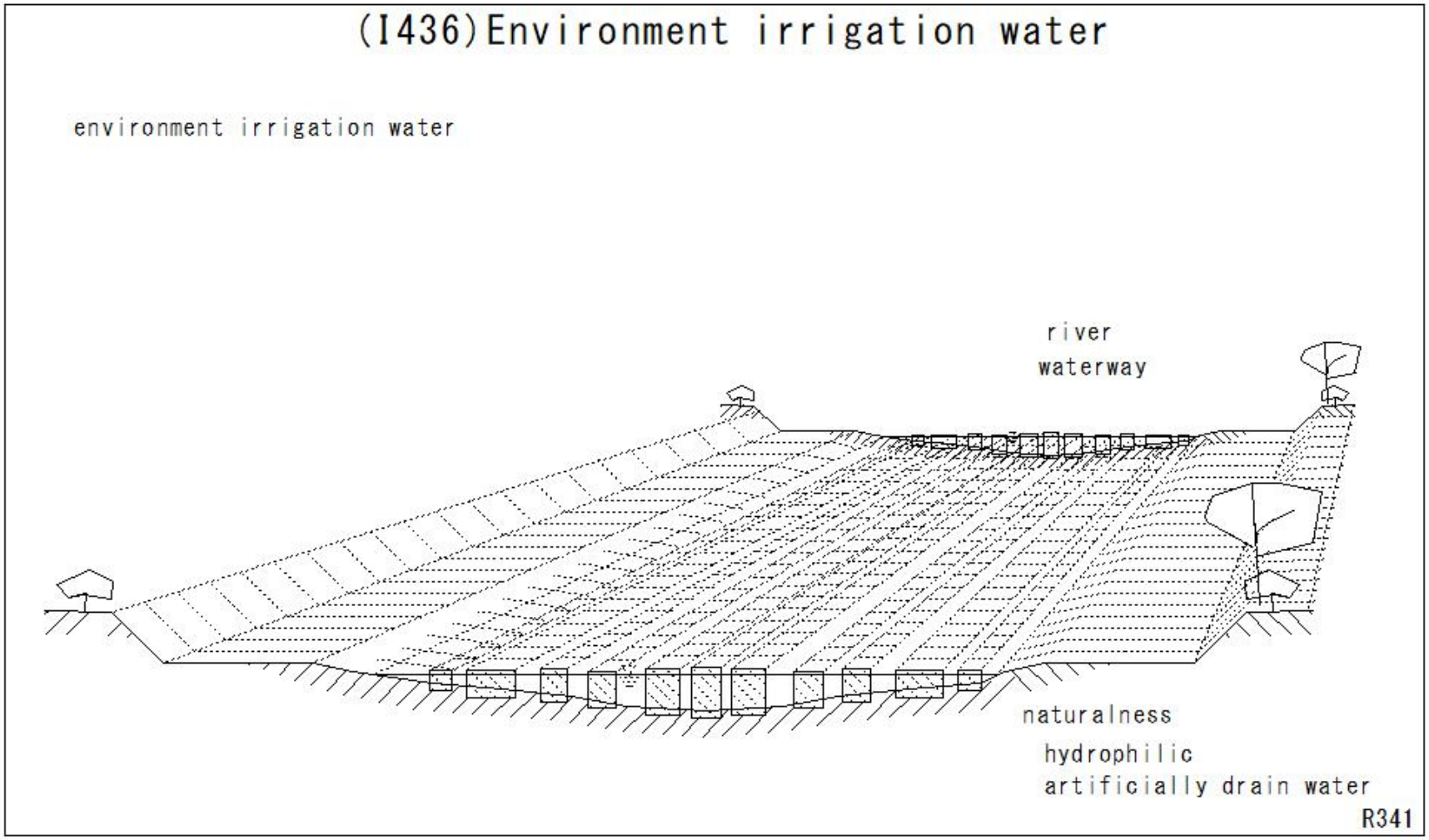
Collect seepage water



(I435)Environmental Quality Standards



(I436)Environment irrigation water

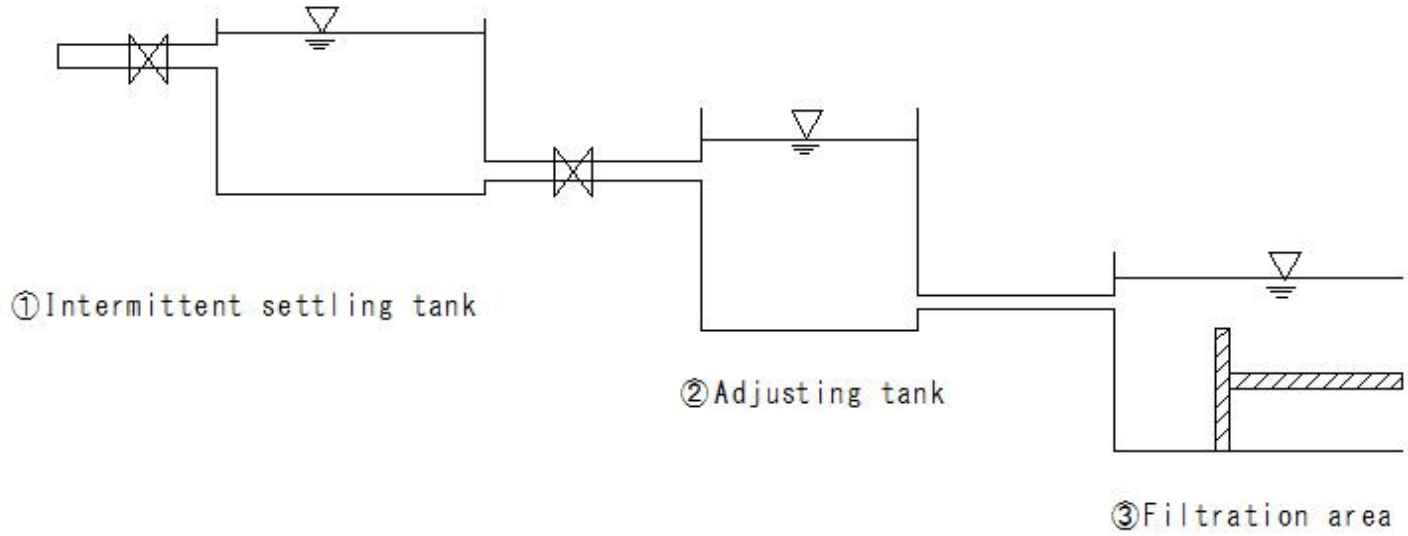


(I437)Intermittent settling tank

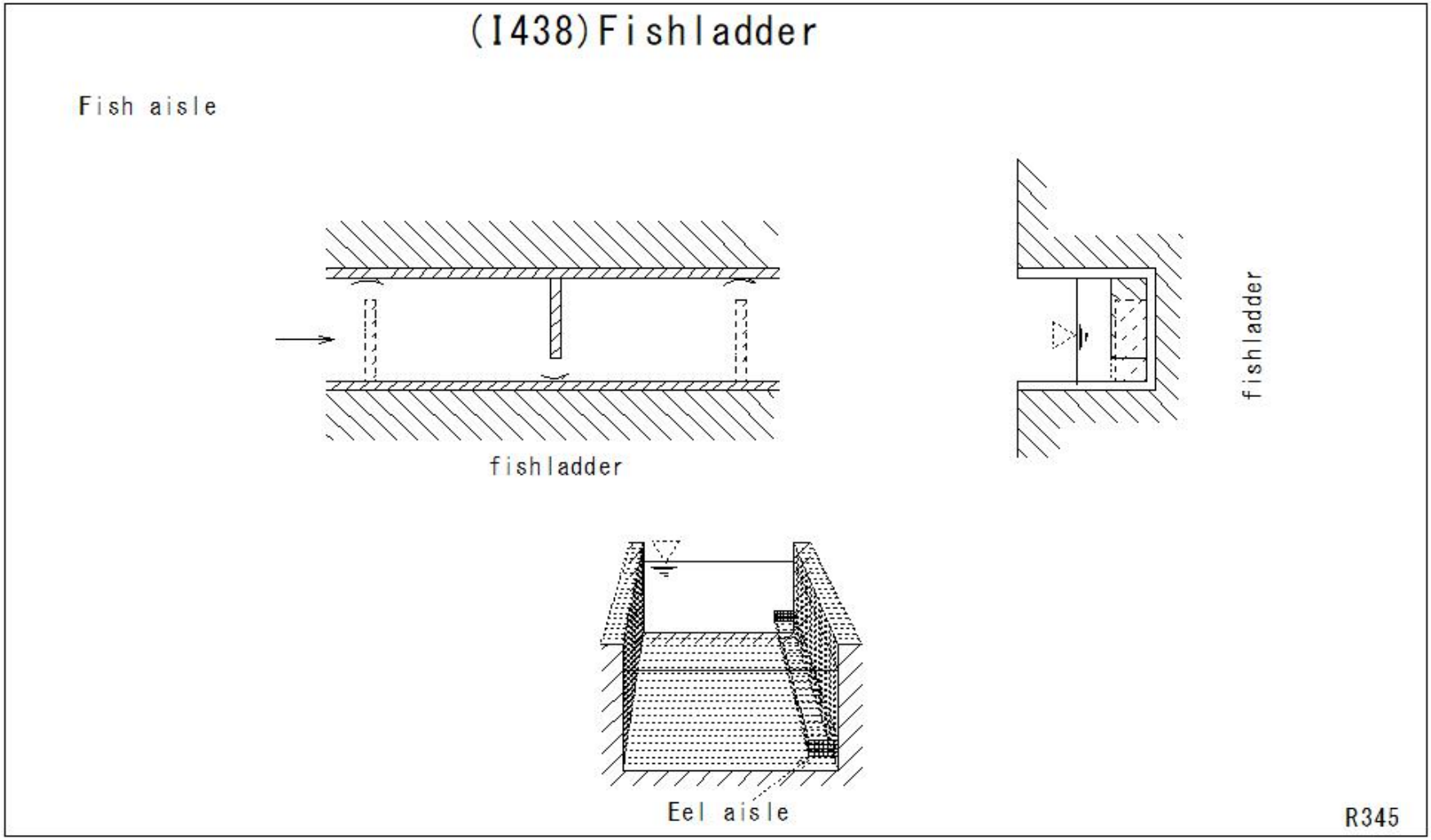
(I437)Intermittent settling tank

Intermediate flow settling basin

In water purification and sewage treatment, this equipment separates solids contained in wastewater by settling them.



(I438)Fishladder

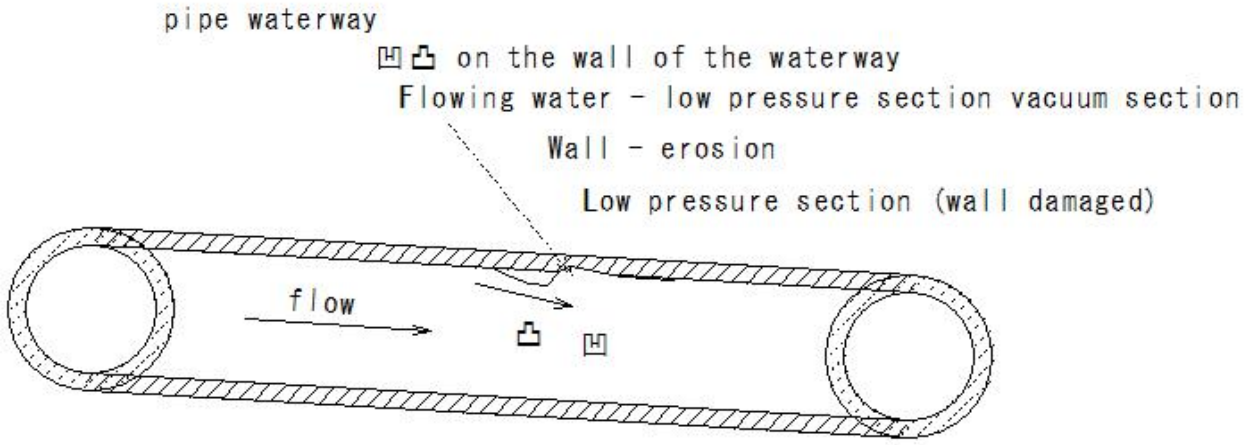


(I439)Cavitation

(I439)Cavitation

Cavitation

Power plant

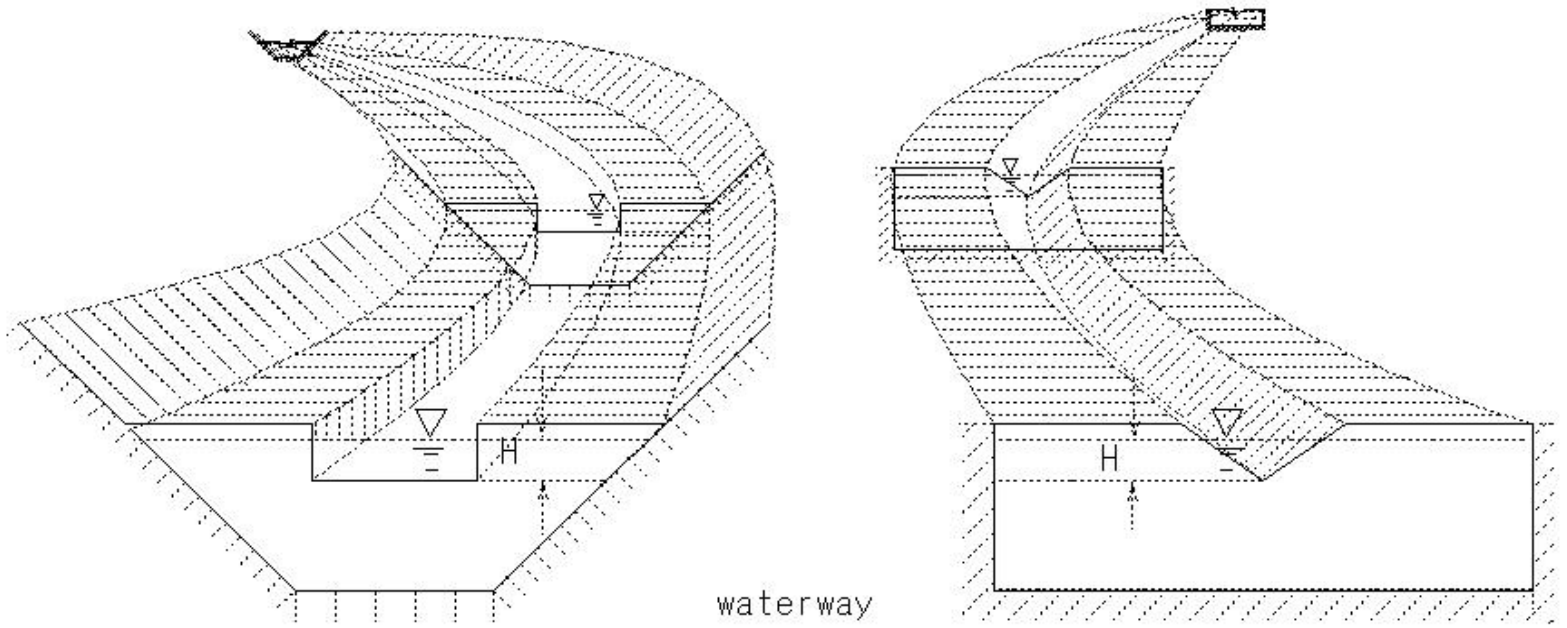


R344

(I440)Weir(notch)

(I440)Weir(notch)

Notch



square shape - cut out

Triangular shape - cut out

Overflow water depth measurement - discharge

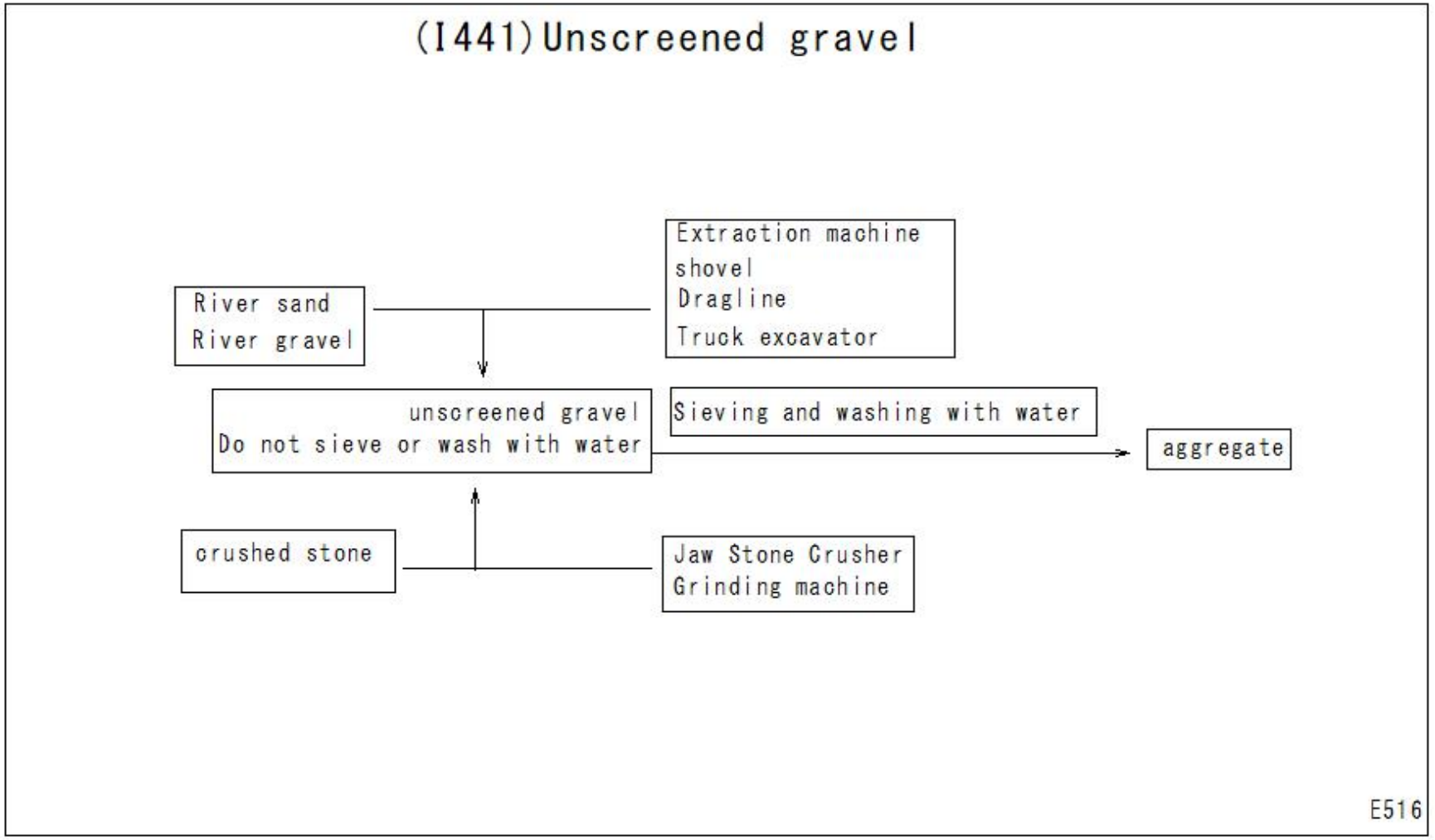
Square shape - square weir

Triangular shape - triangular dam

H: Overflow water depth

R346

(I441)Unscreened gravel



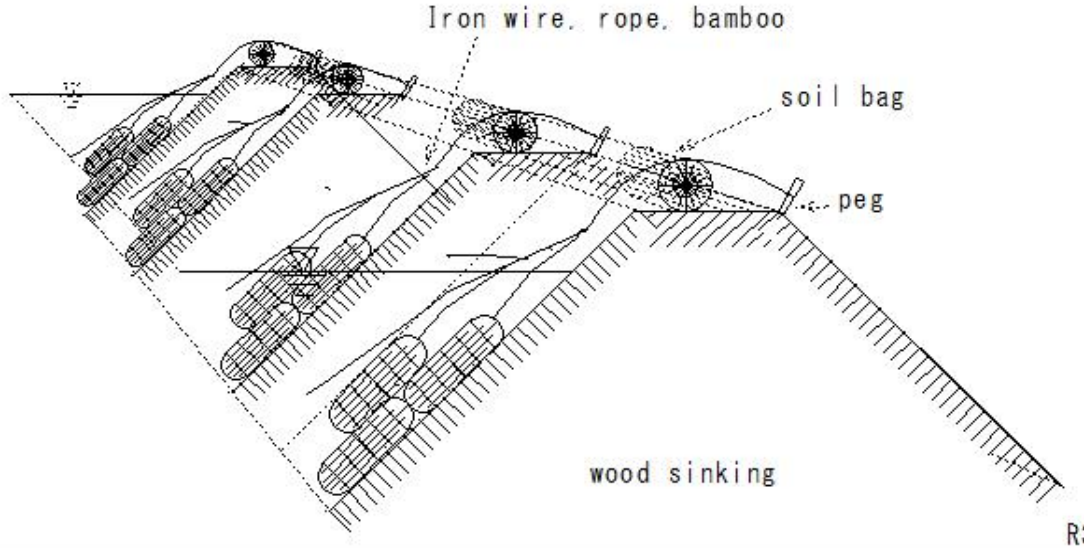
(I442)Embankment (wood sinking)

(I442)Embankment (wood sinking)

wood sinking

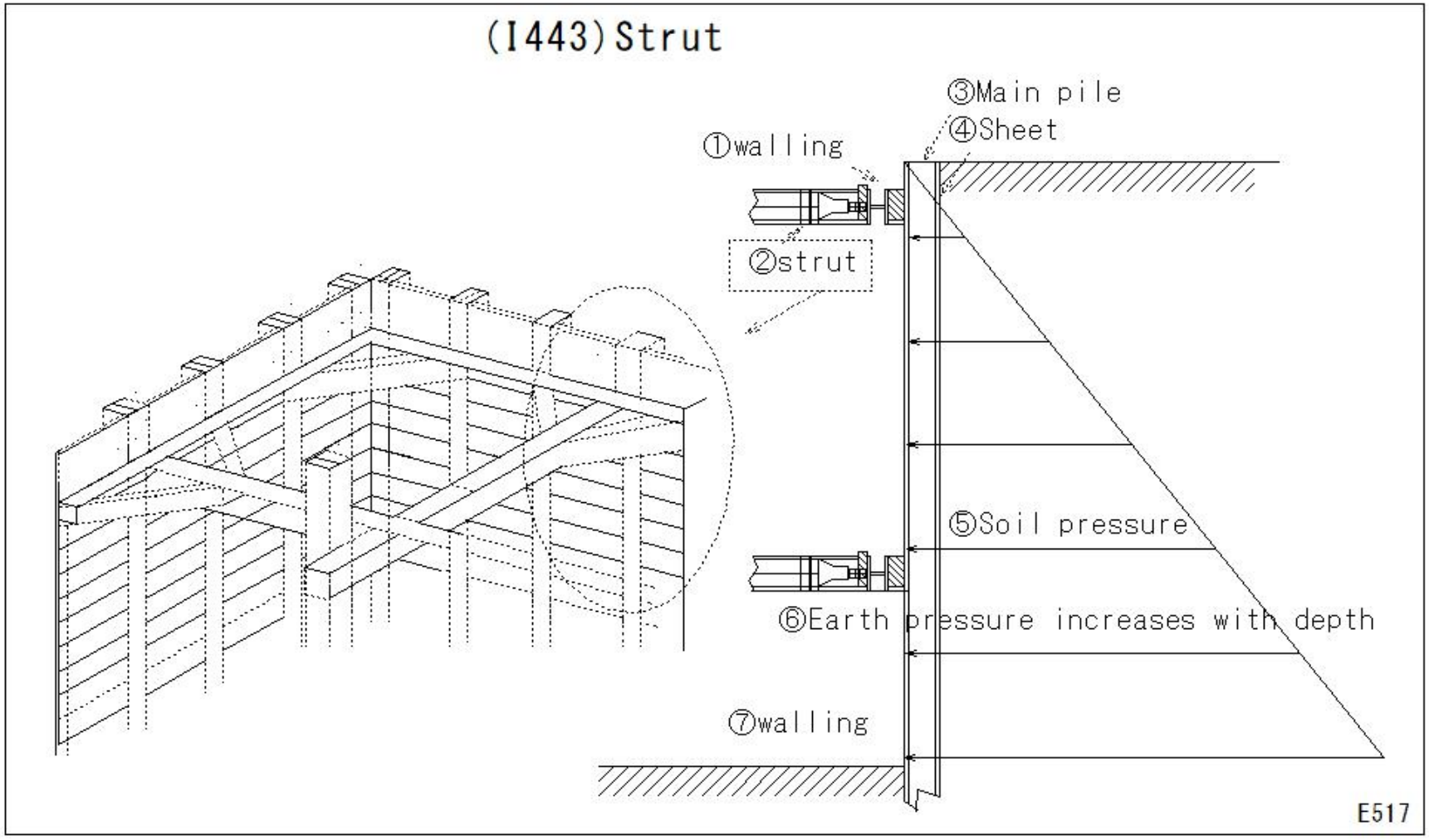
River embankment collapse prevention method

slope protection

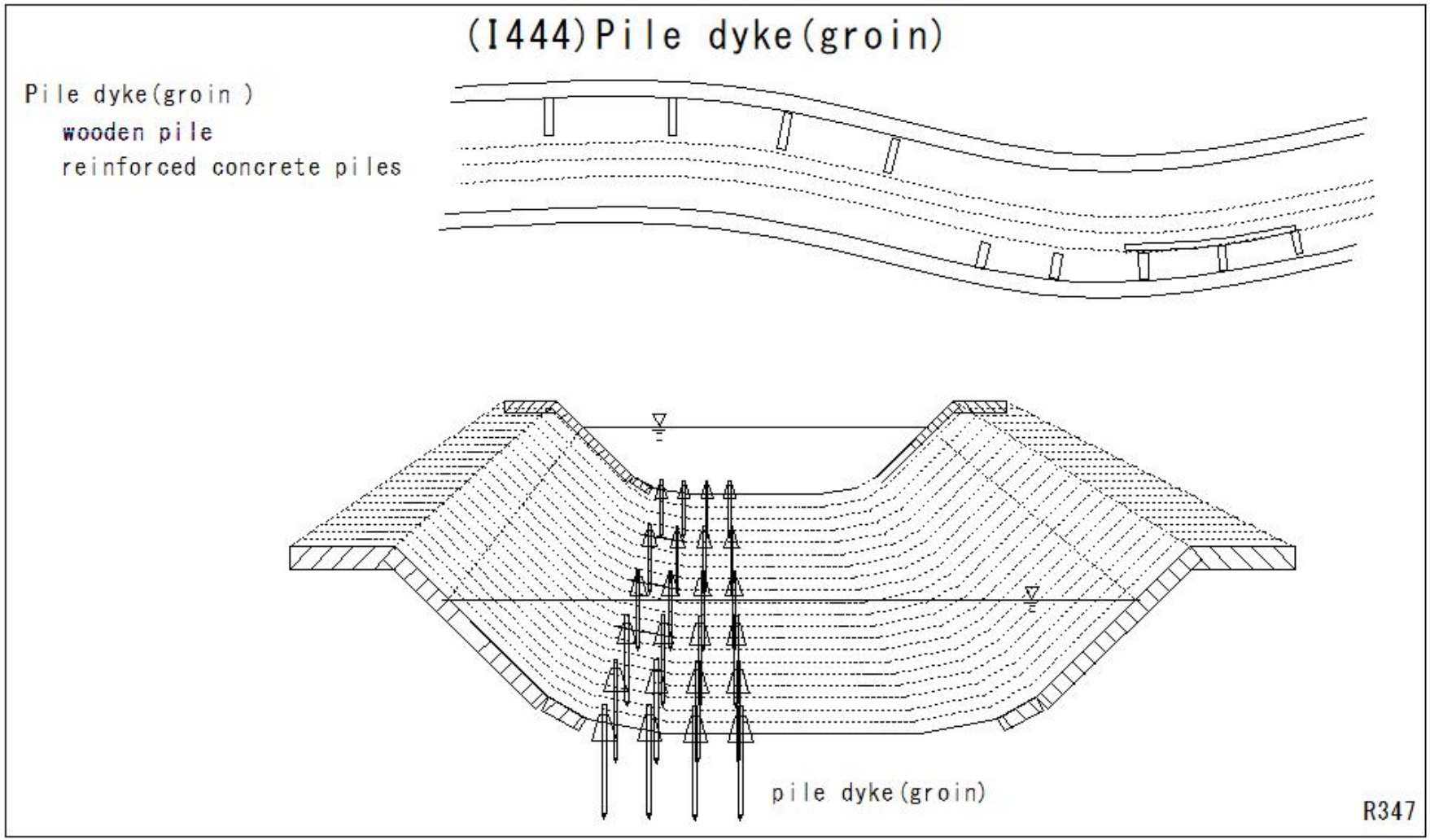


R340

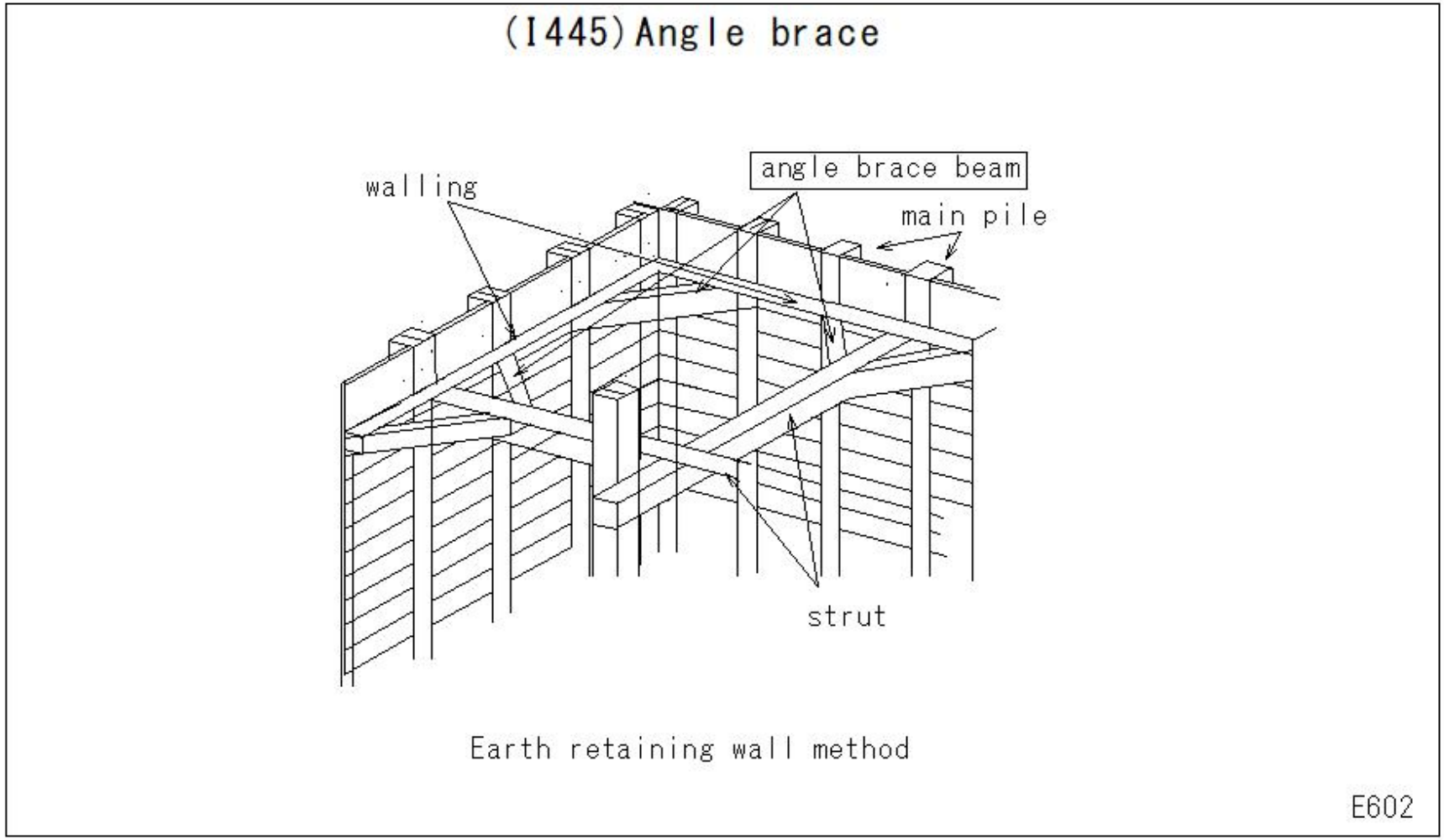
(I443)Strut


(I443)Strut
③Main pile
④Sheet
①walling
②strut
⑤Soil pressure
⑥Earth pressure increases with depth
⑦walling
E517

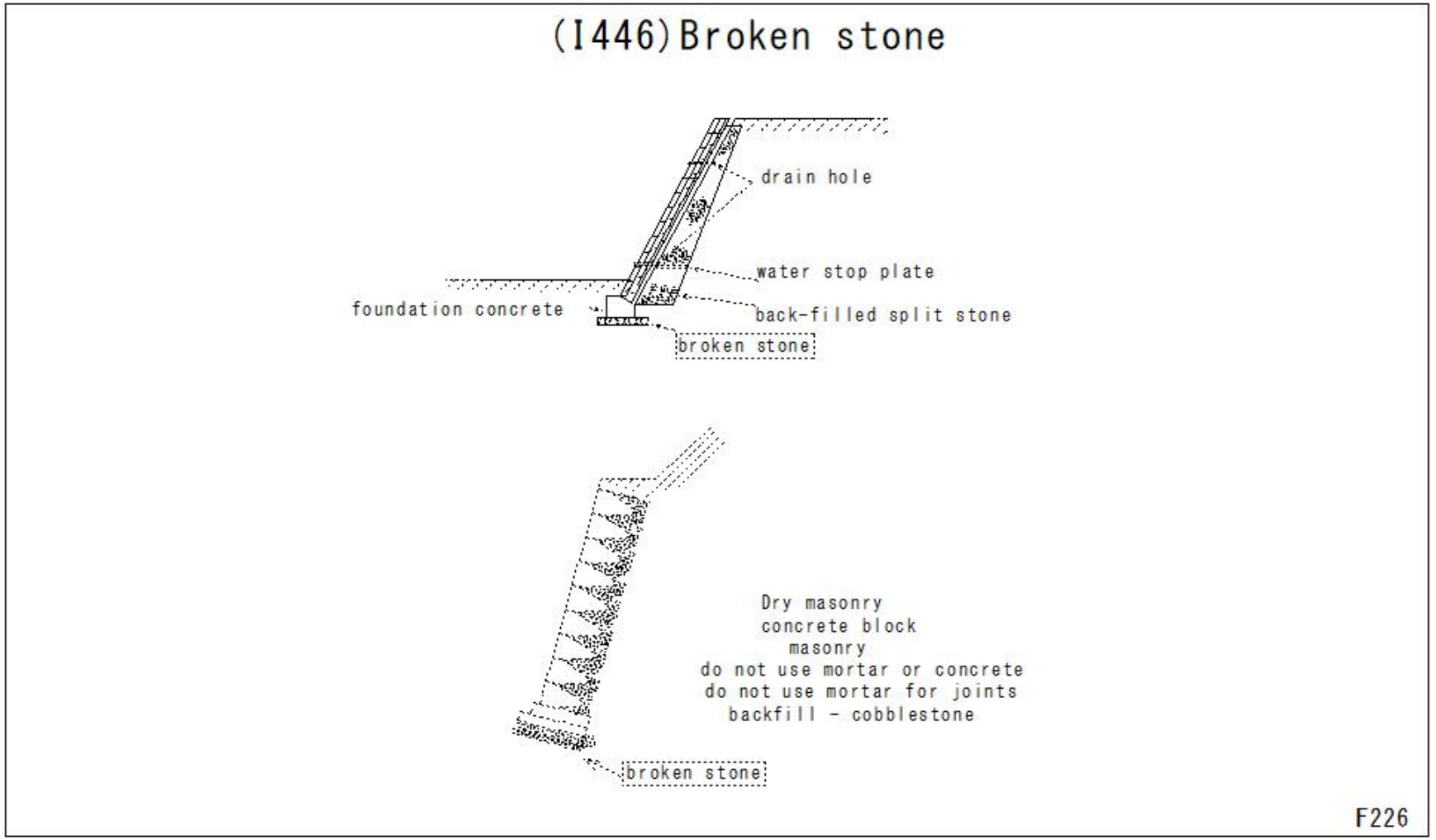
(I444)Pile dyke(groin)



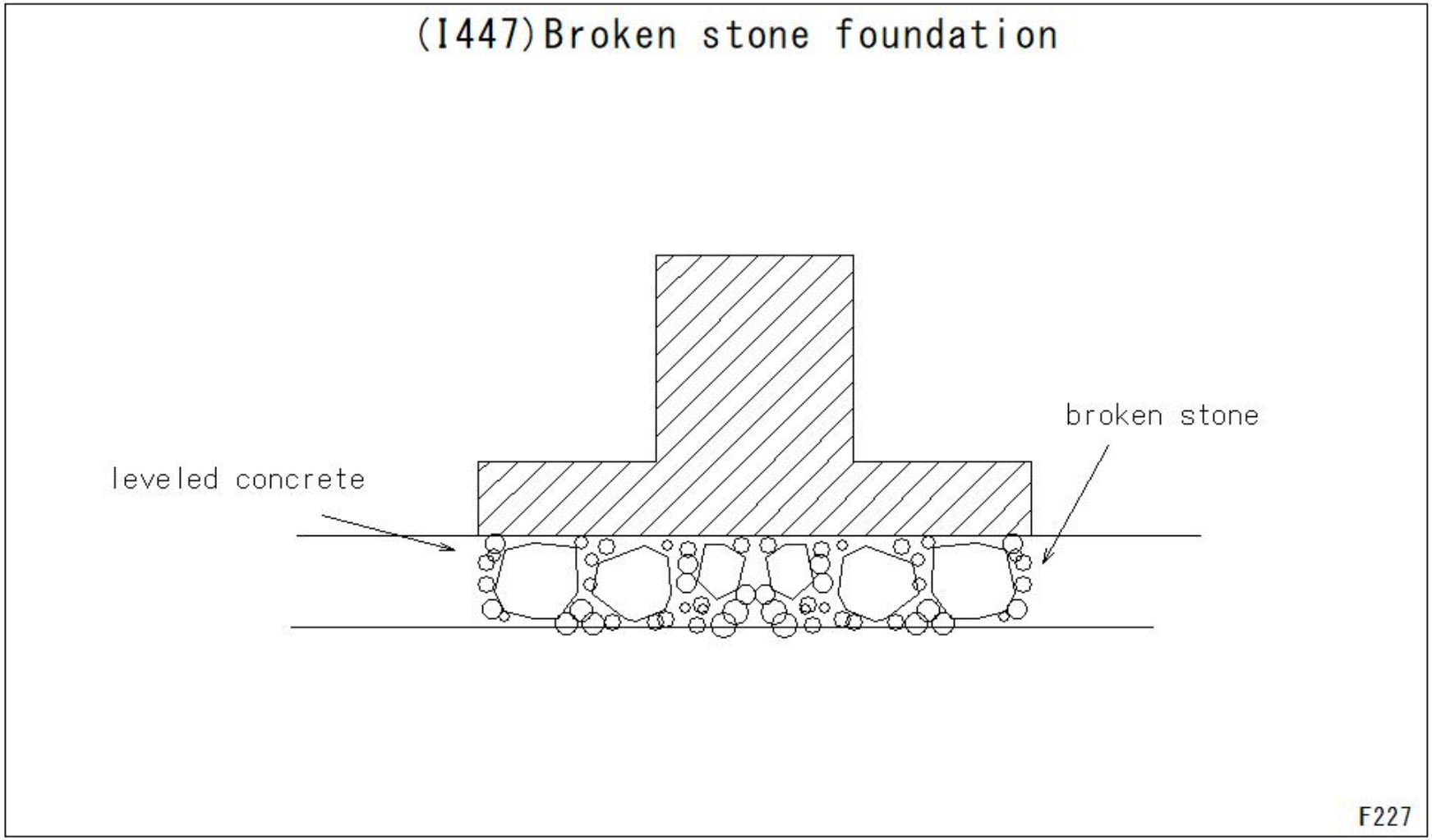
(I445)Angle brace



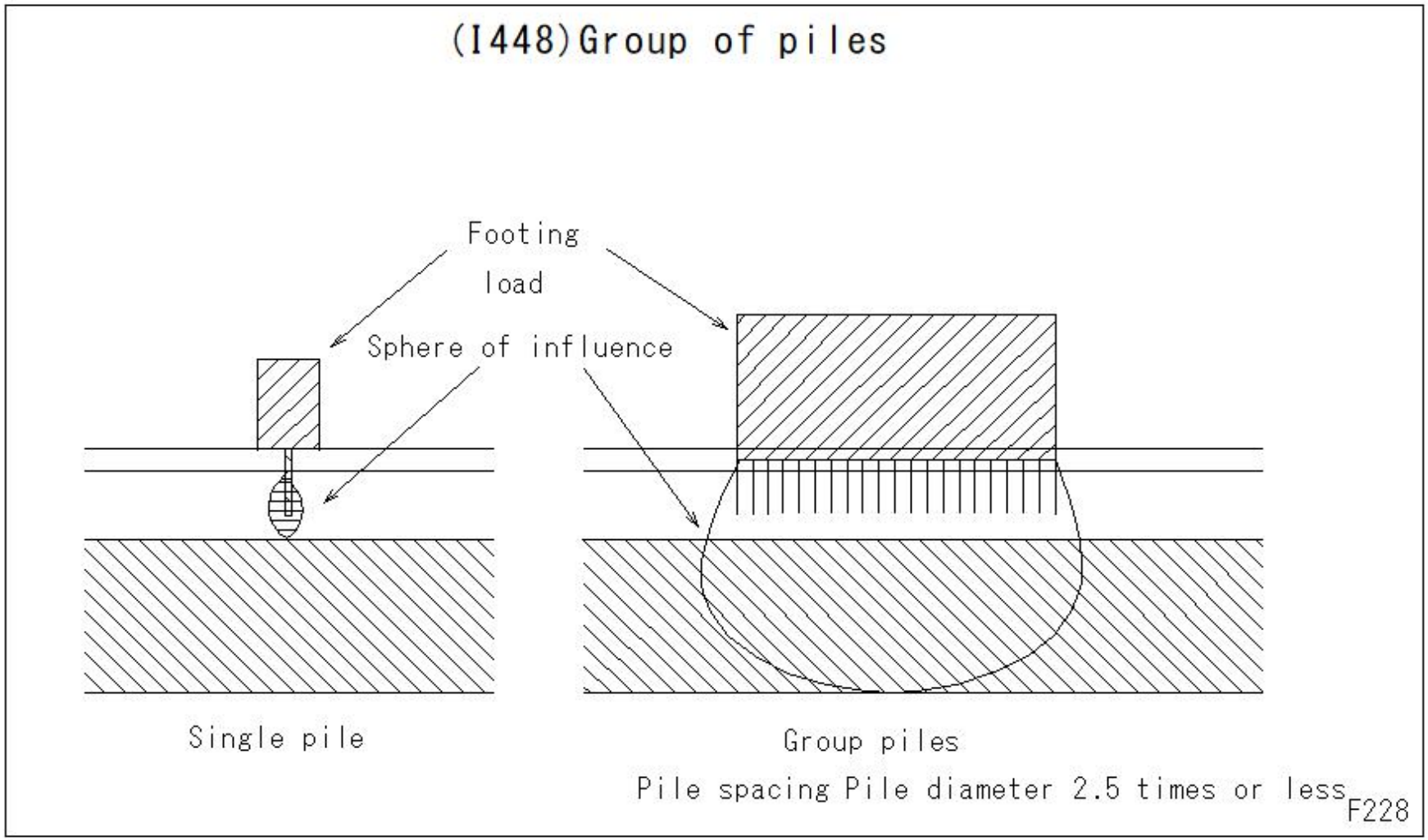
(I446)Broken stone



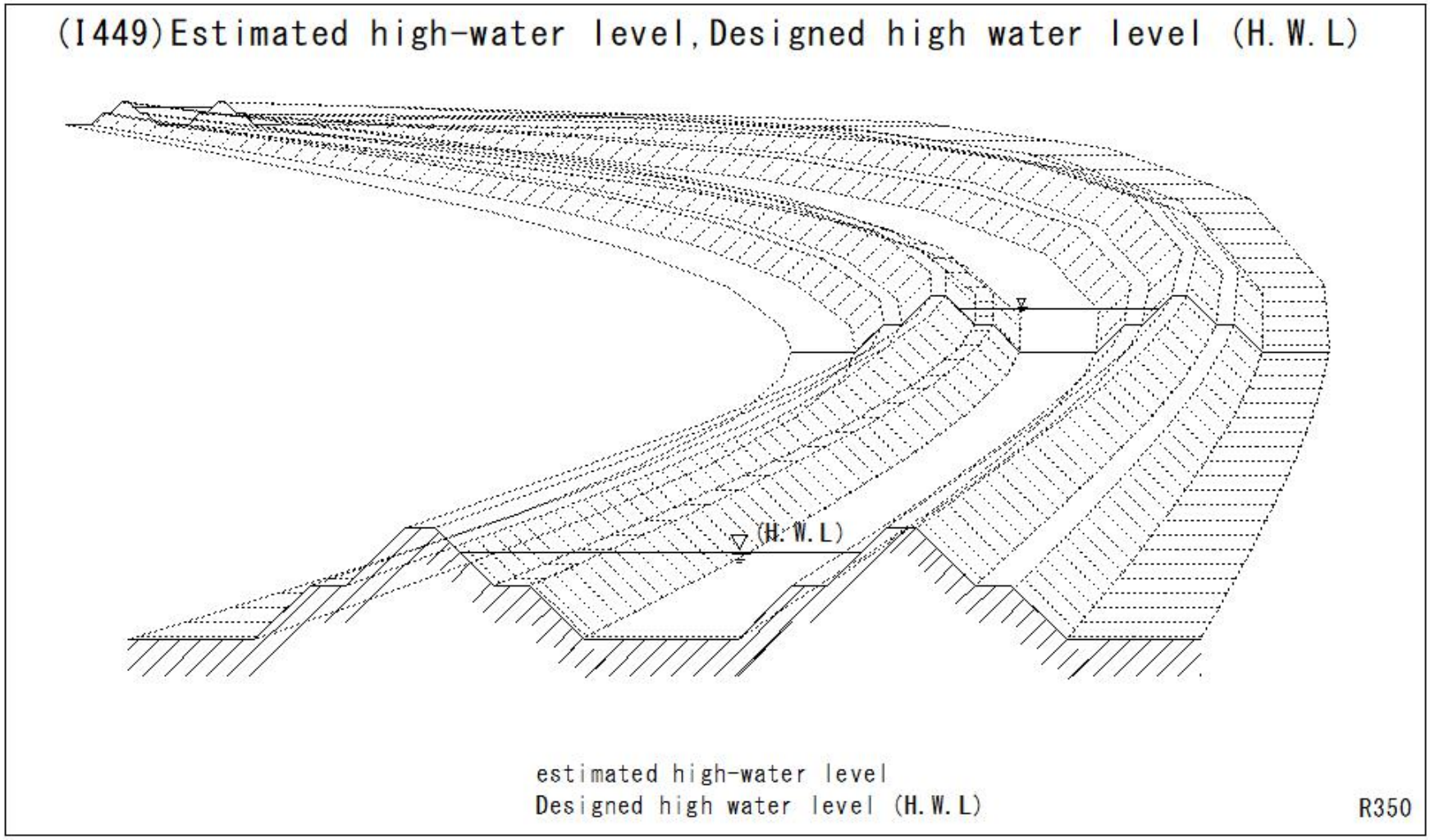
(I447)Broken stone foundation



(I448)Group of piles



(I449)Estimated high-water level,Designed high water level (H.W.L)



(I450)Estimated high-water discharge,design high-water discharge

(I450)Estimated high-water discharge,design high-water discharge

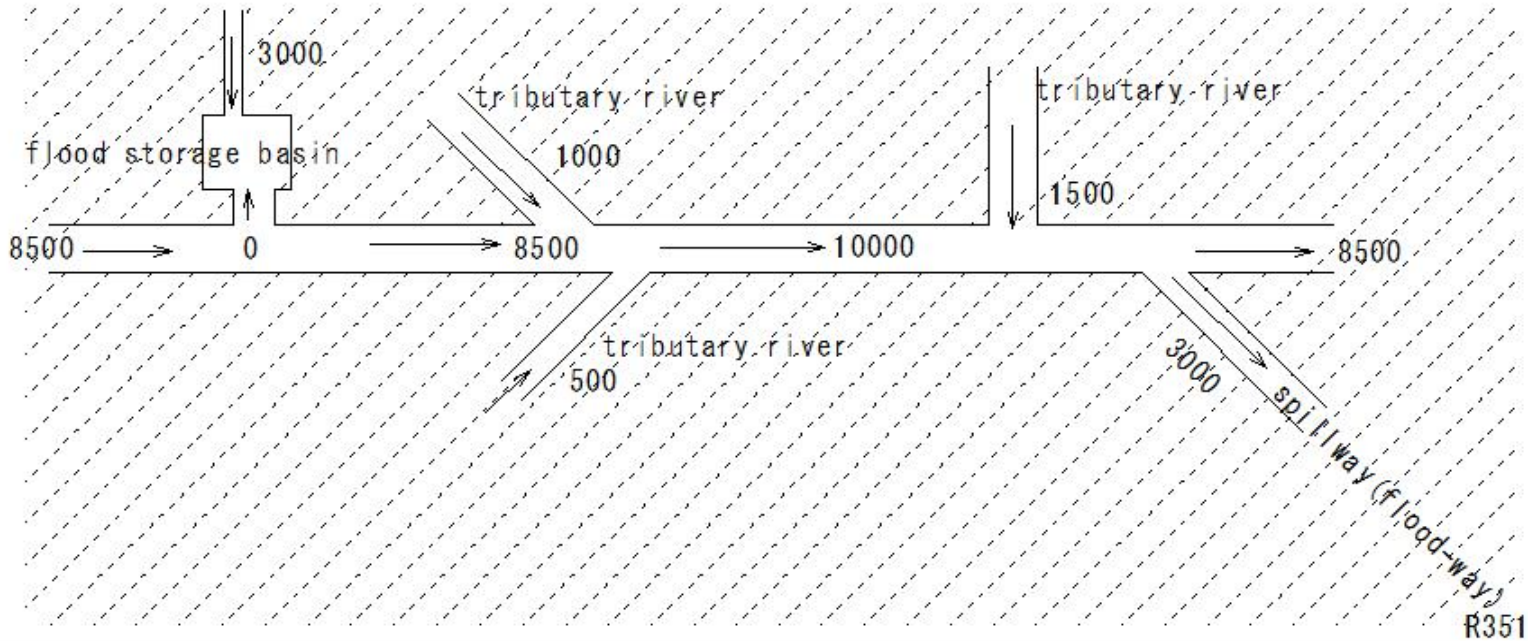
estimated high-water discharge

design high-water discharge

・River channel planning and design

・Retarding pond(flood storage basin) planning

design flood discharge(m3)



(I451)Design flood discharge

(I451)Design flood discharge

Design flood discharge

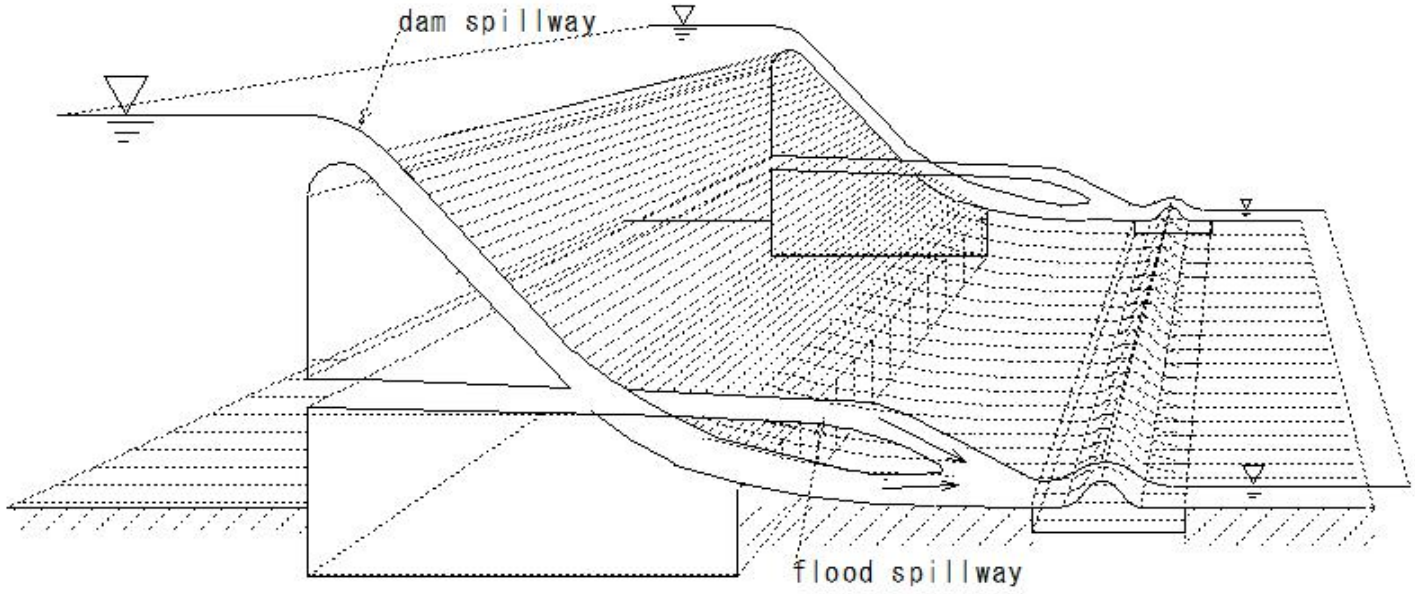
dam design

Concrete dam: once every 100 years

Field flood discharge once every 200 years

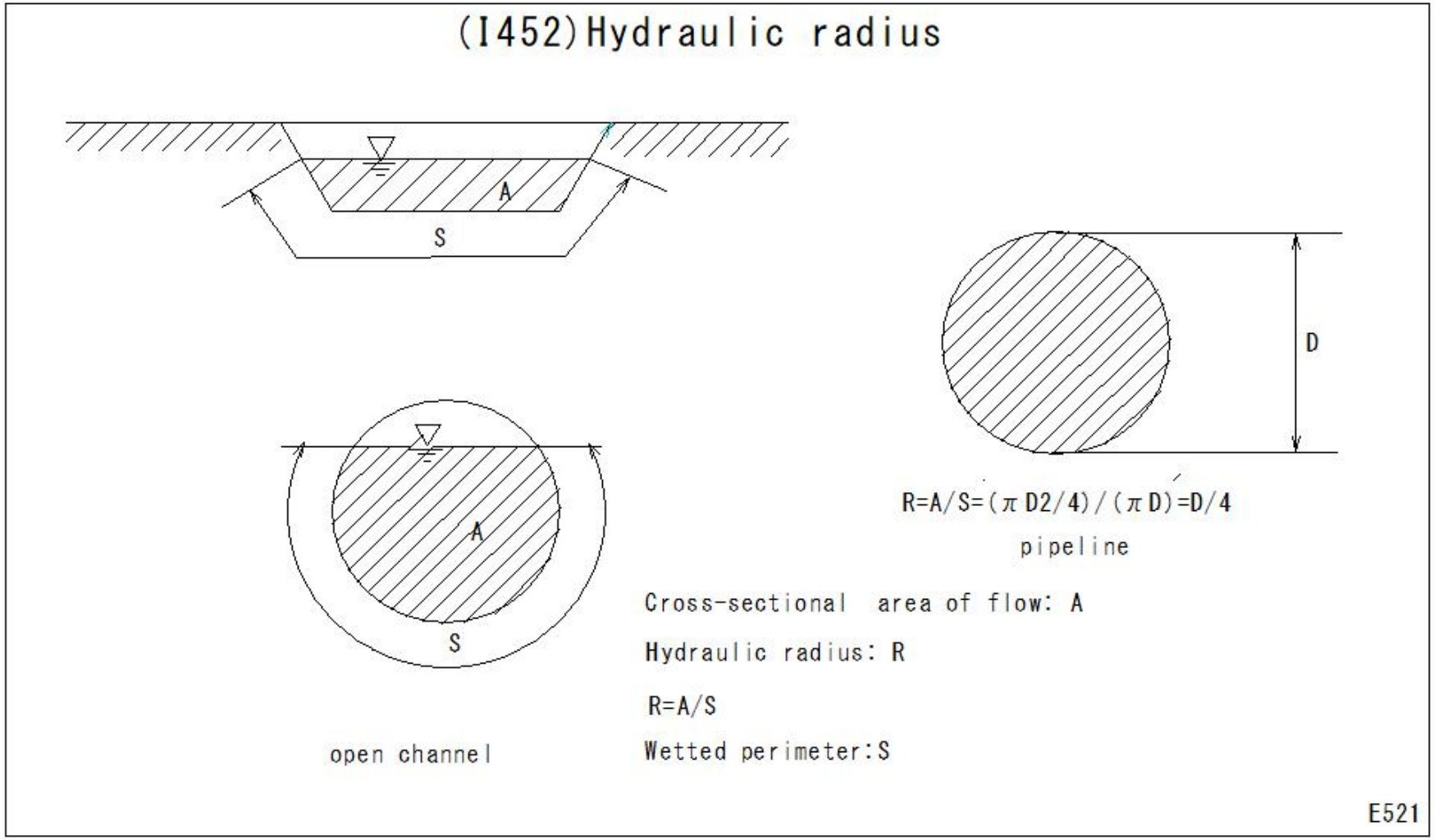
design flood discharge

Designed for safe flow

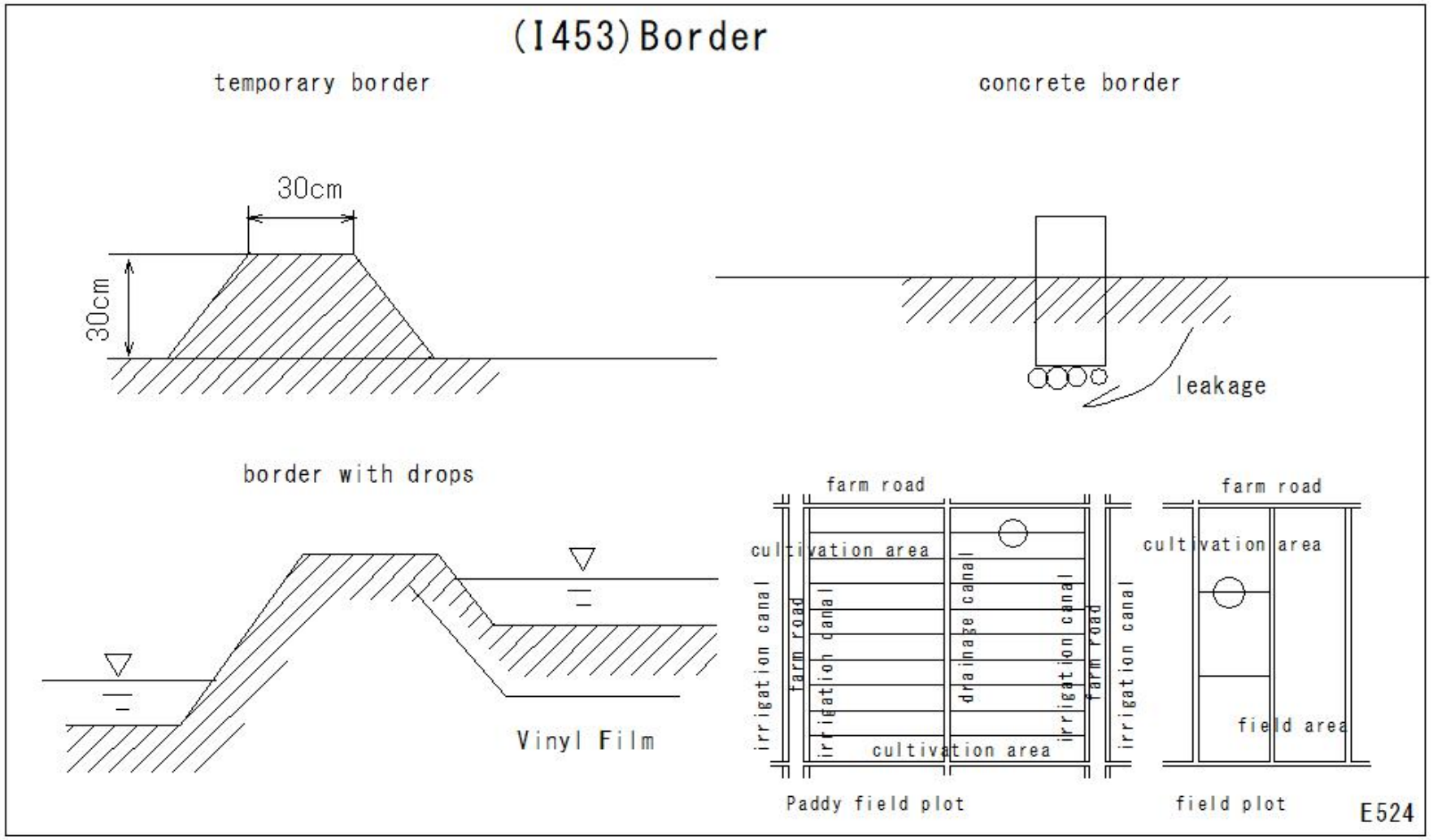


R352

(I452)Hydraulic radius



(I453)Border


(I453)Border
temporary border
30cm
30cm
concrete border
leakage
border with drops
Vinyl Film
farm road
cultivation area
irrigation canal
farm road
irrigation canal
drainage canal
irrigation canal
farm road
irrigation canal
cultivation area
Paddy field plot
farm road
cultivation area
field area
field plot
E524

(I454)Torrent control works

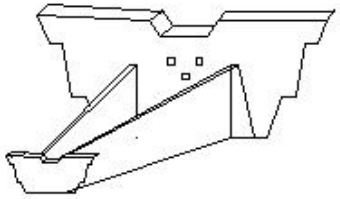
(I454)Torrent control works

Torrent control works

Mountain stream bed stabilization work

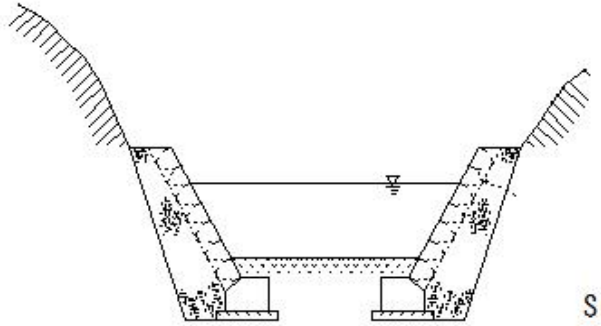
- Preventing sand and gravel from flowing out
- River bed: Prevention of river bank erosion
- Dam construction, bank protection work, revetment, channel construction

check dam



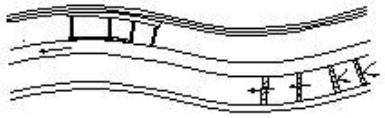
S128

revetment



S67

groin



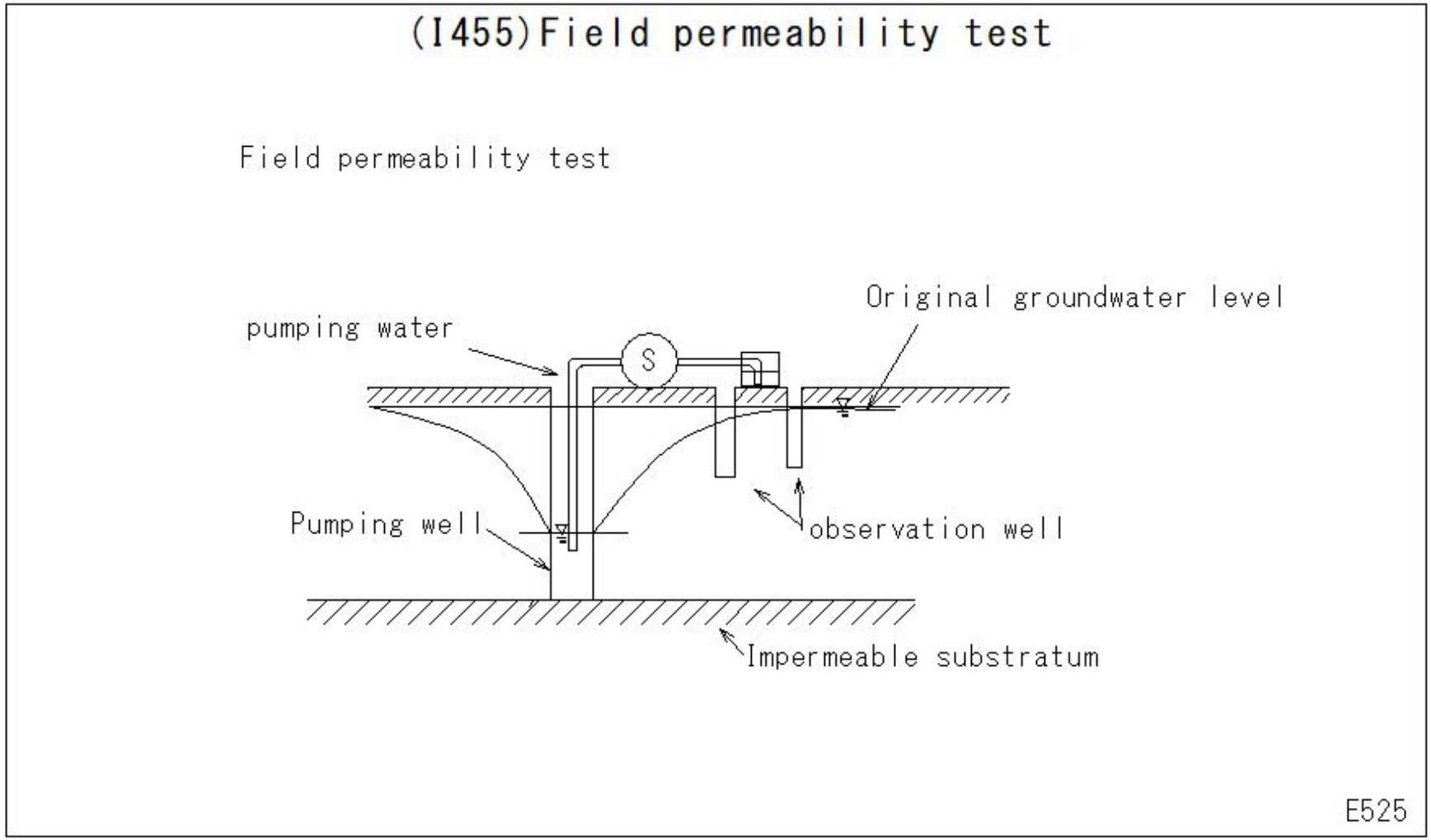
S145

watercourse

S142

S181

(I455)Field permeability test



(I456)Water supply(Elevated tank)

(I456)Water supply(Elevated tank)

Water supply

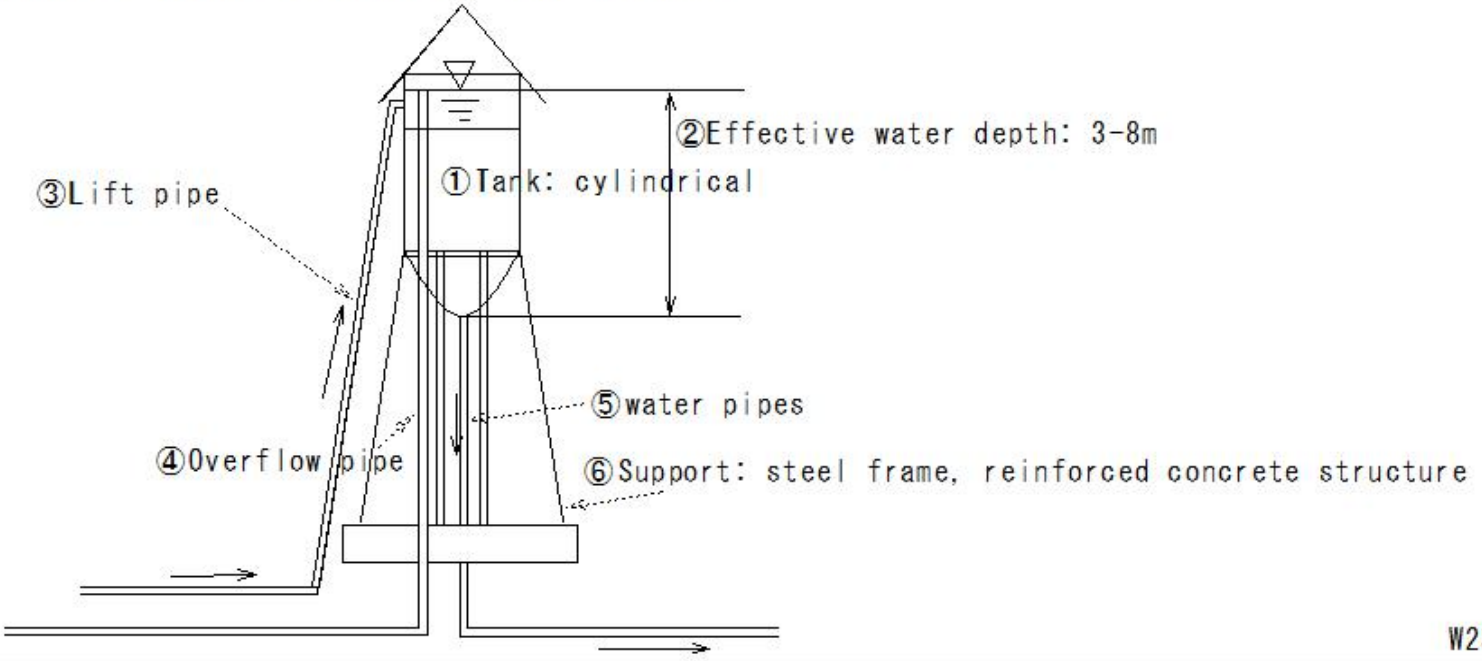
Elevated tank

Residential complexes

Small-scale water distribution area - drainage pond - when high places are not available

A water tank (tank) with an artificially high water level is provided with a pump,

Water supply facilities with natural water pressure



W234

(I457)Field division(Cultivated area)

(I457)Field division(Cultivated area)

Field division(Cultivated area)

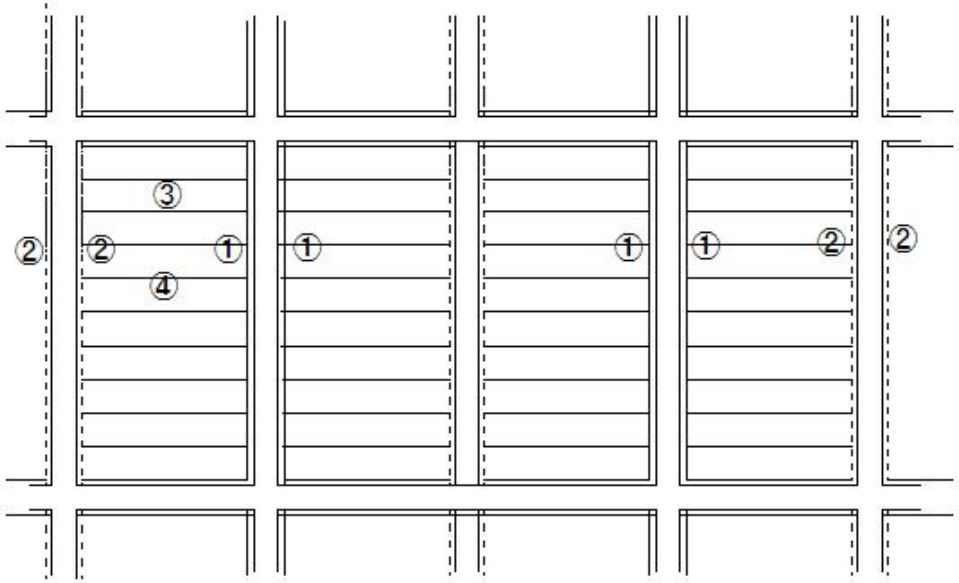
① Small irrigation canal

② Small drainage canal

③ Field division(Cultivated area)

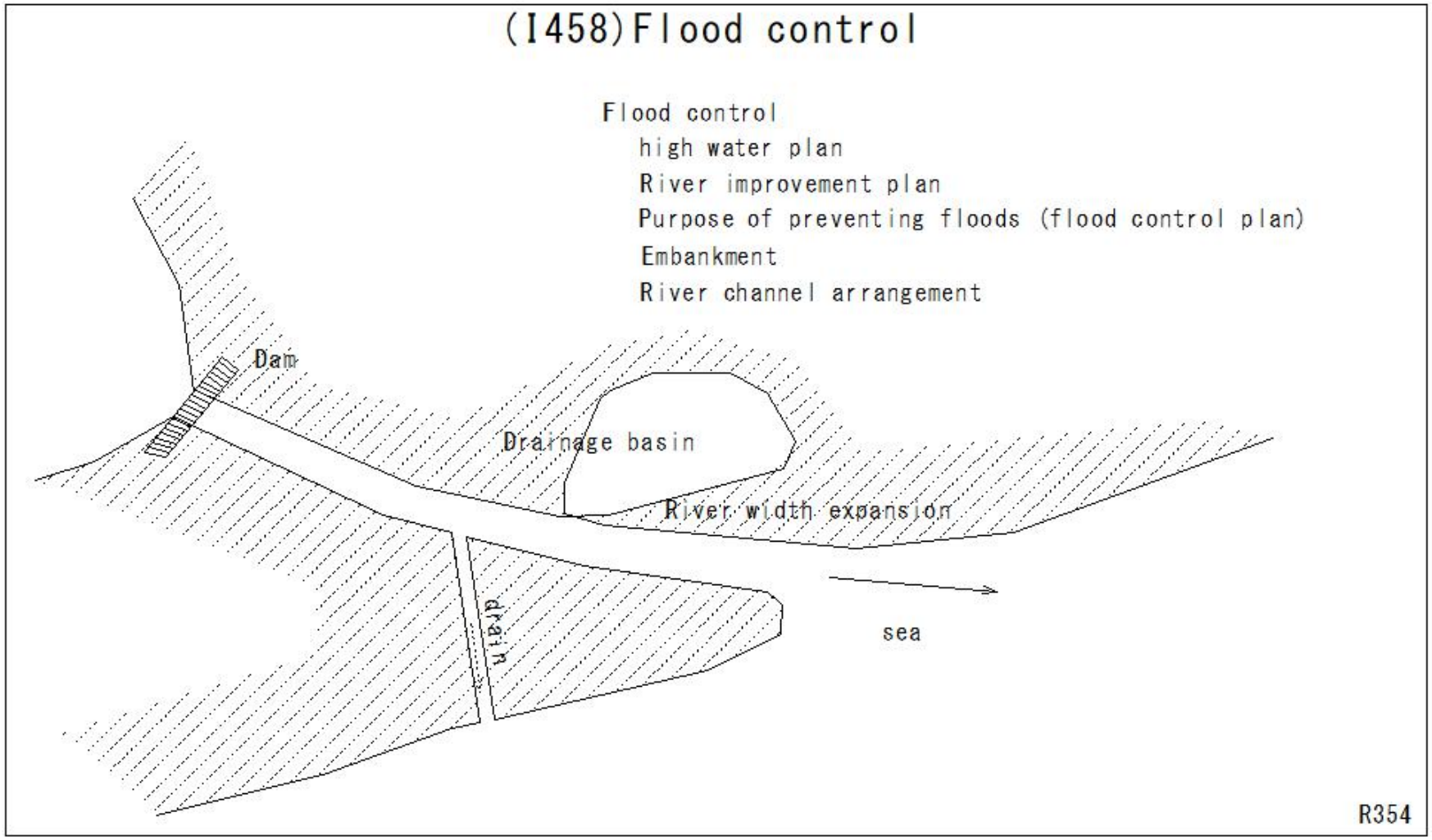
④ Ridge

⑤ Cultivated road

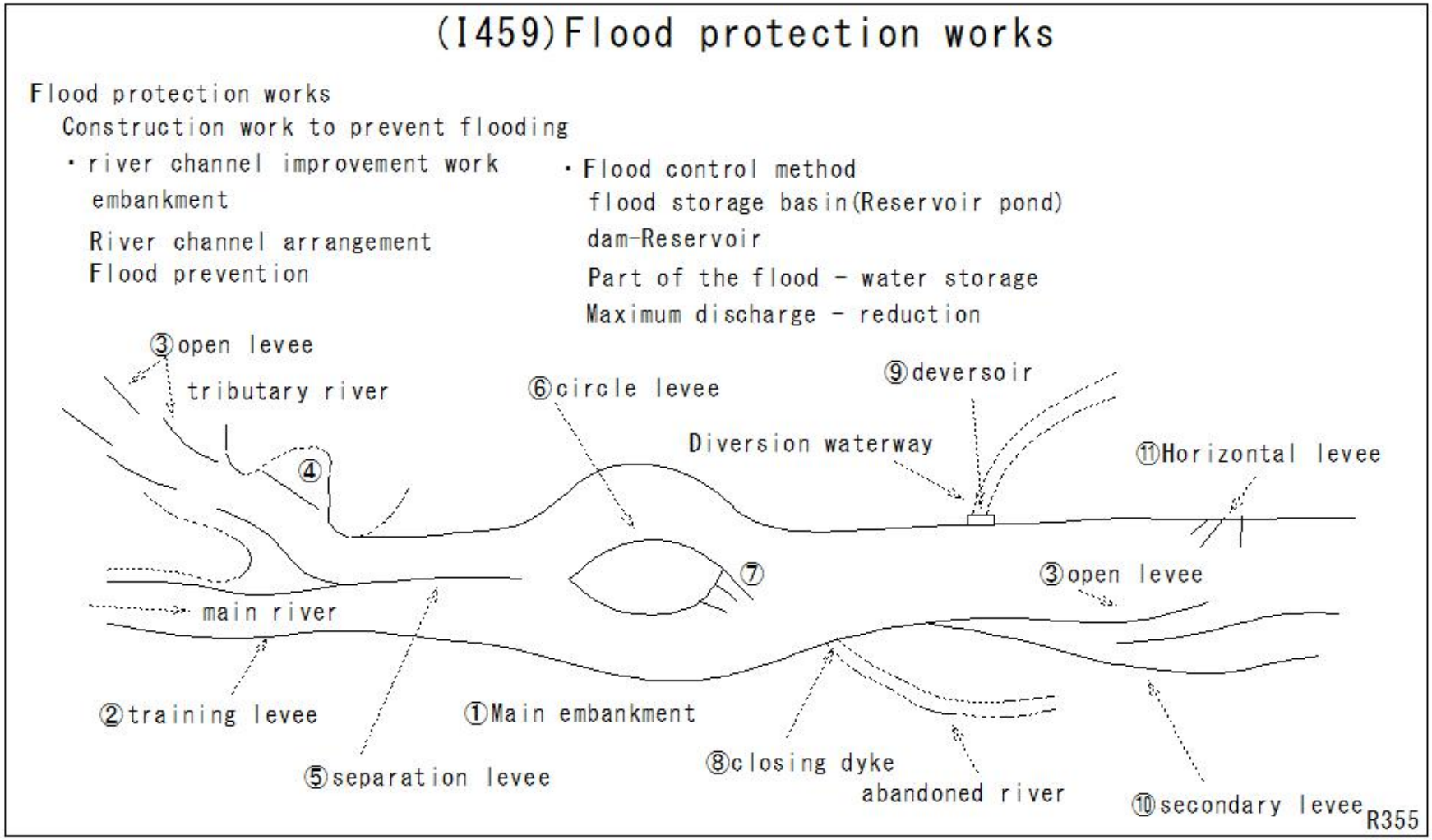


Cultivated areas are plots that are divided into smaller areas by ridges. Cultivated areas are the smallest unit of cultivation, and are plots that allow for efficient work management and appropriate irrigation and drainage management.

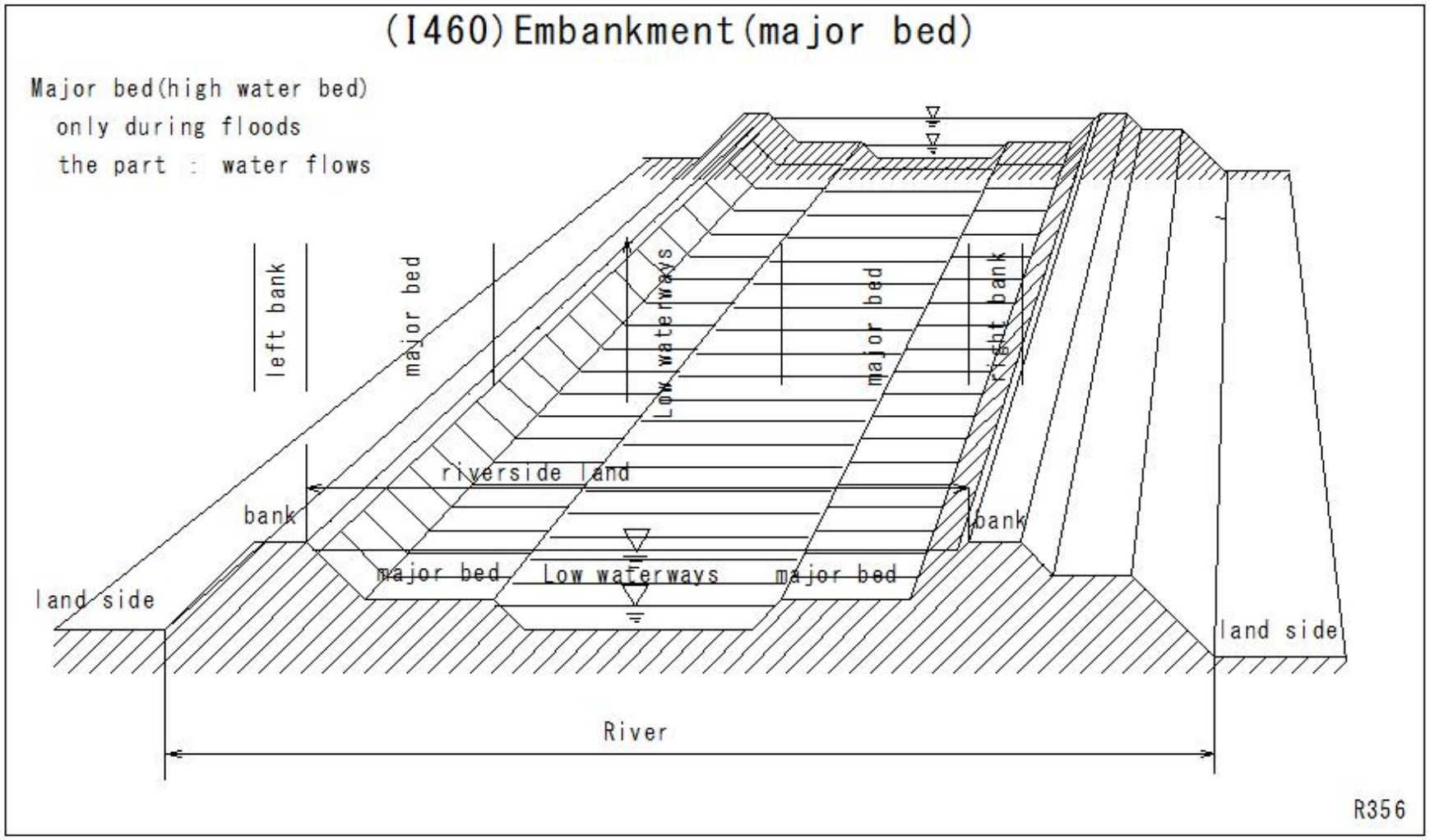
(I458)Flood control



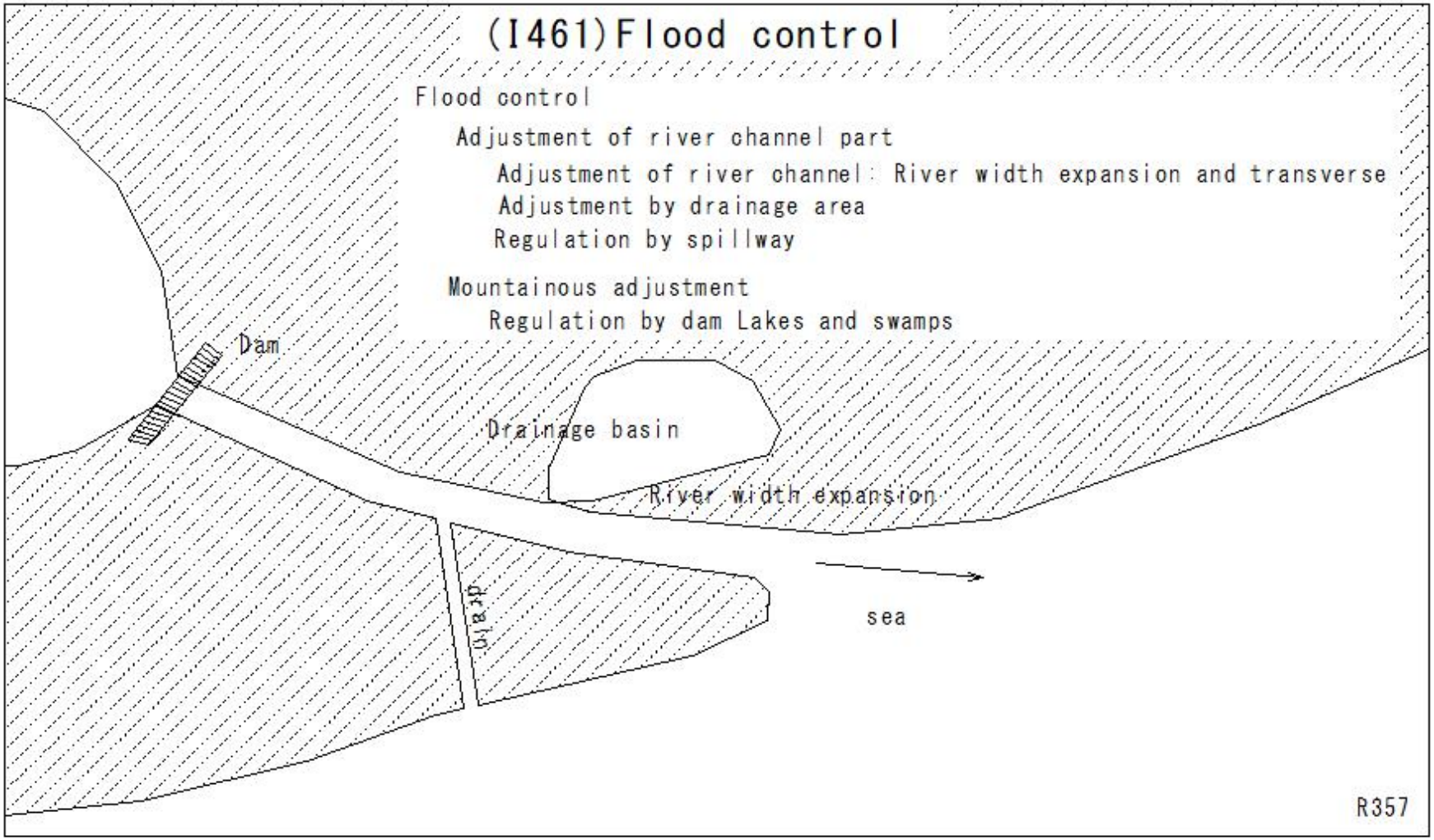
(I459)Flood protection works



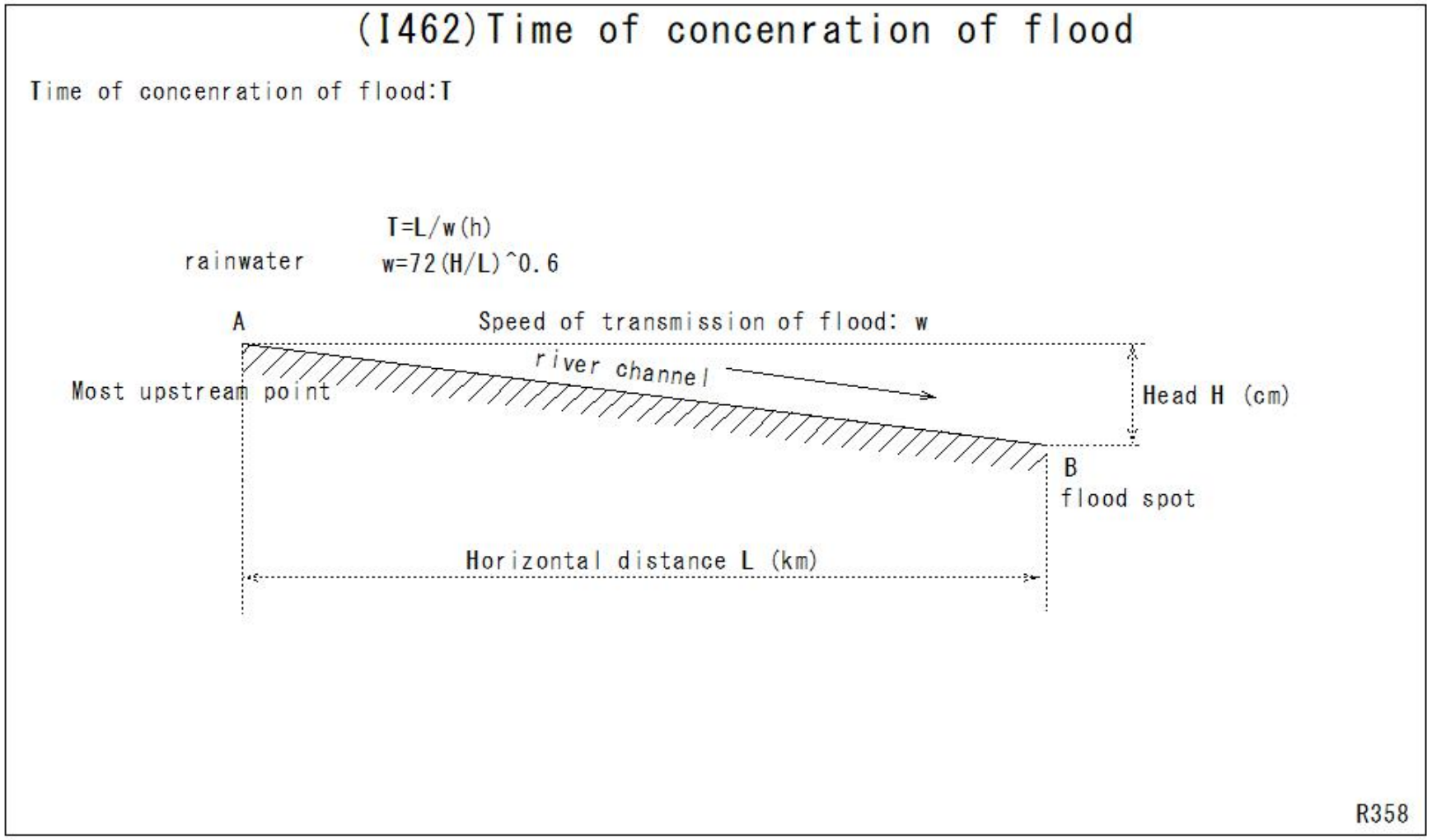
(I460)Embankment(major bed)



(I461)Flood control



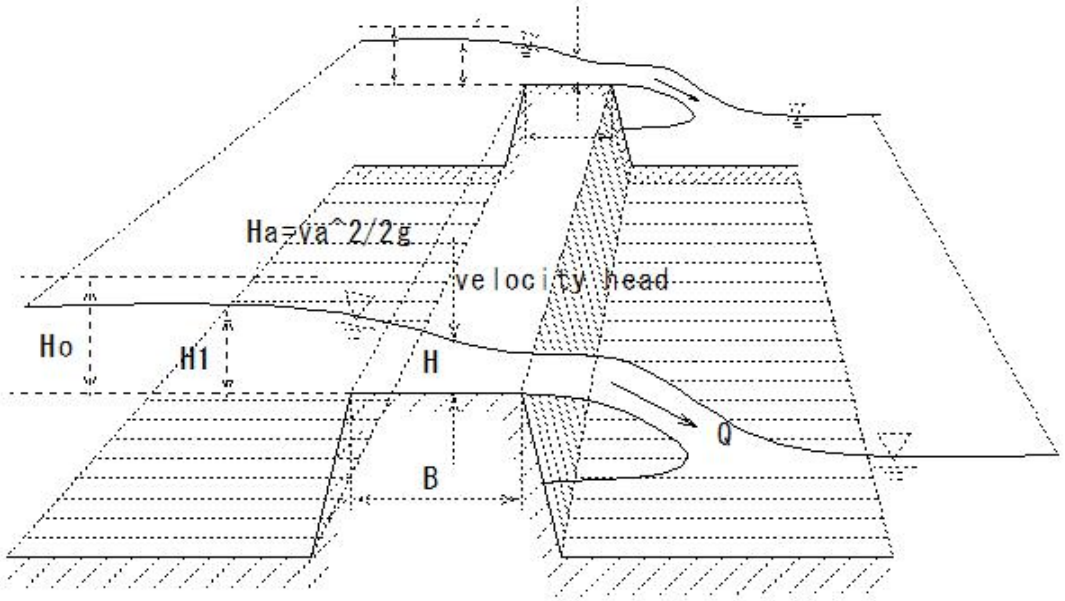
(I462)Time of concenration of flood



(I463)Broad-crested weir

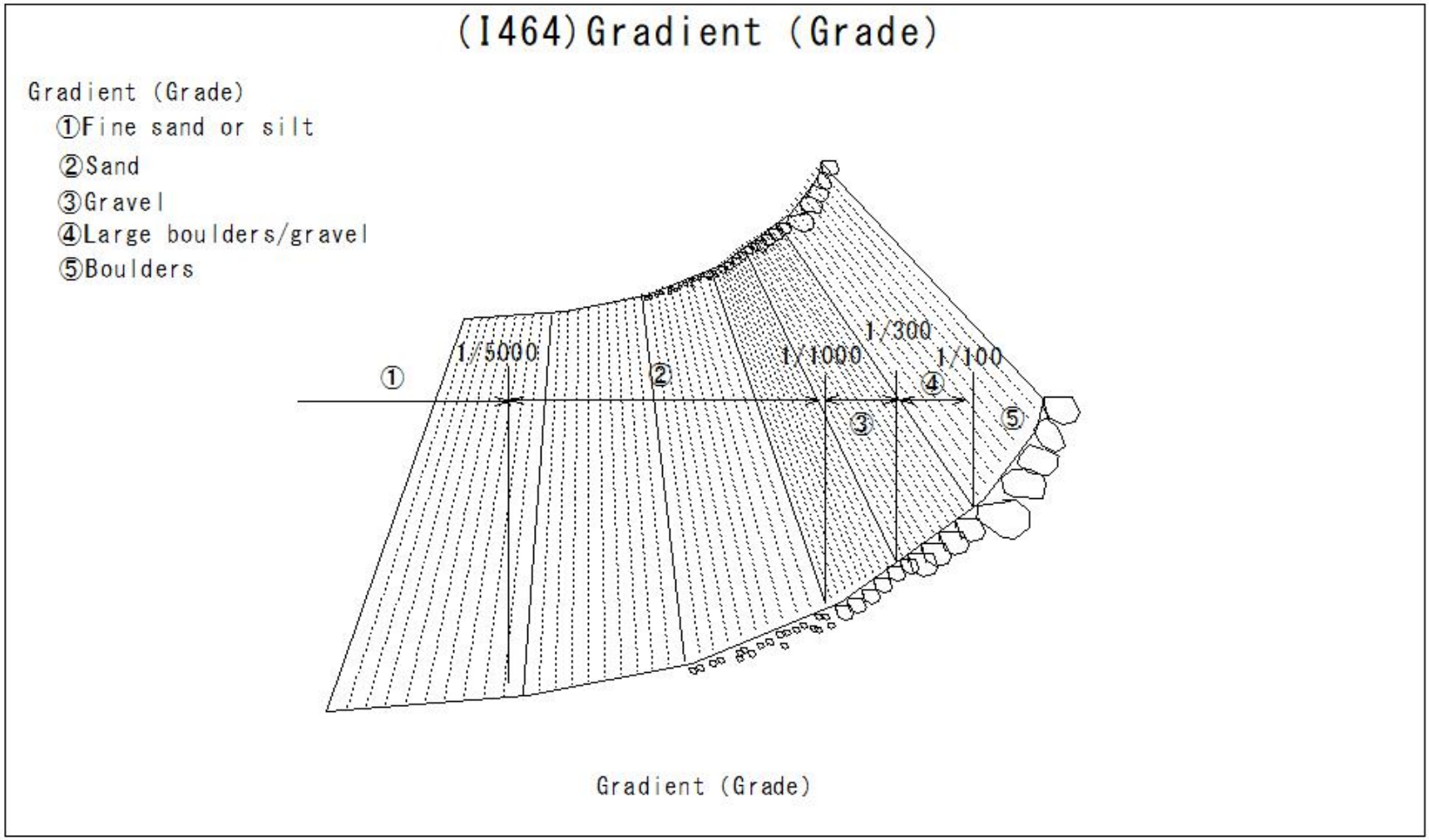
(I463)Broad-crested weir

Broad-crested weir
velocity head
wide width
discharge Q
$Q=CBH\sqrt{(2g(Ho-H)}$
C: flow coefficient
B: Weir width
H: Depth of water at crest
g: gravitational acceleration
Ho: Overflow head (H1+va^2/2g)
va: Approach flow velocity



R359

(I464)Gradient（Grade）



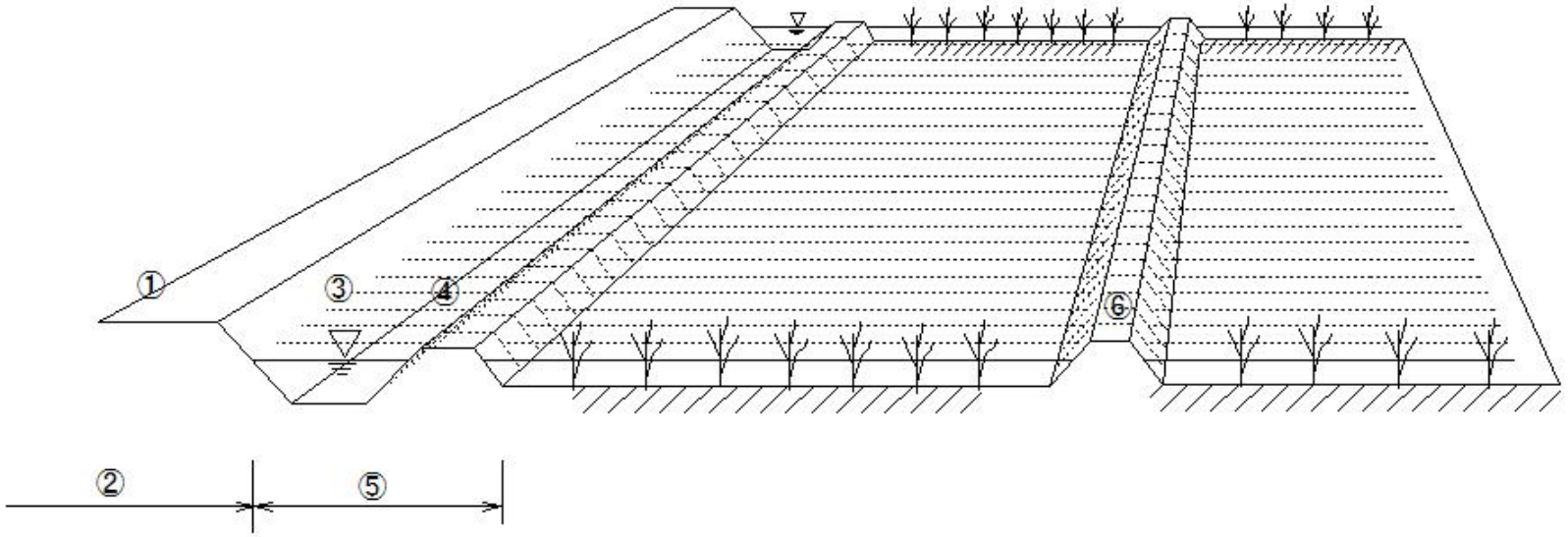
(I465)Ditch(Ditch-side border)

(I465)Ditch(Ditch-side border)

Ditch(Ditch-side border)

Part of the ridge. Mud piled up on the border between rice paddies.

① Farm road
② Land for farm road
③ Small irrigation canal
④ Ditch
⑤ Land for canal
⑥ Ridge

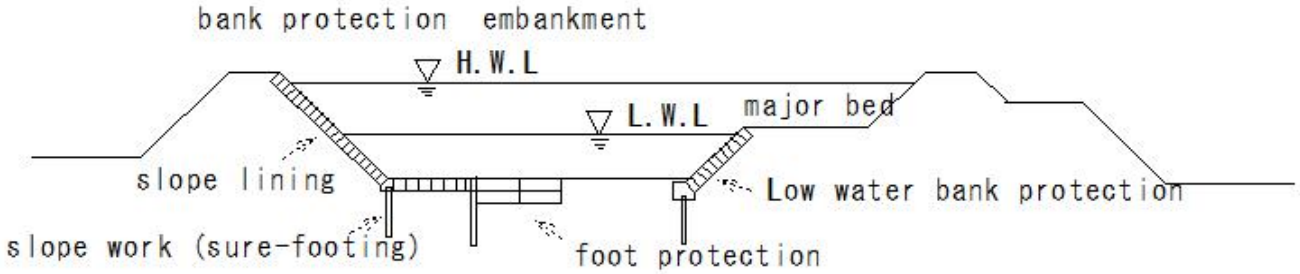


(I466)Bank protection

(I466)Bank protection

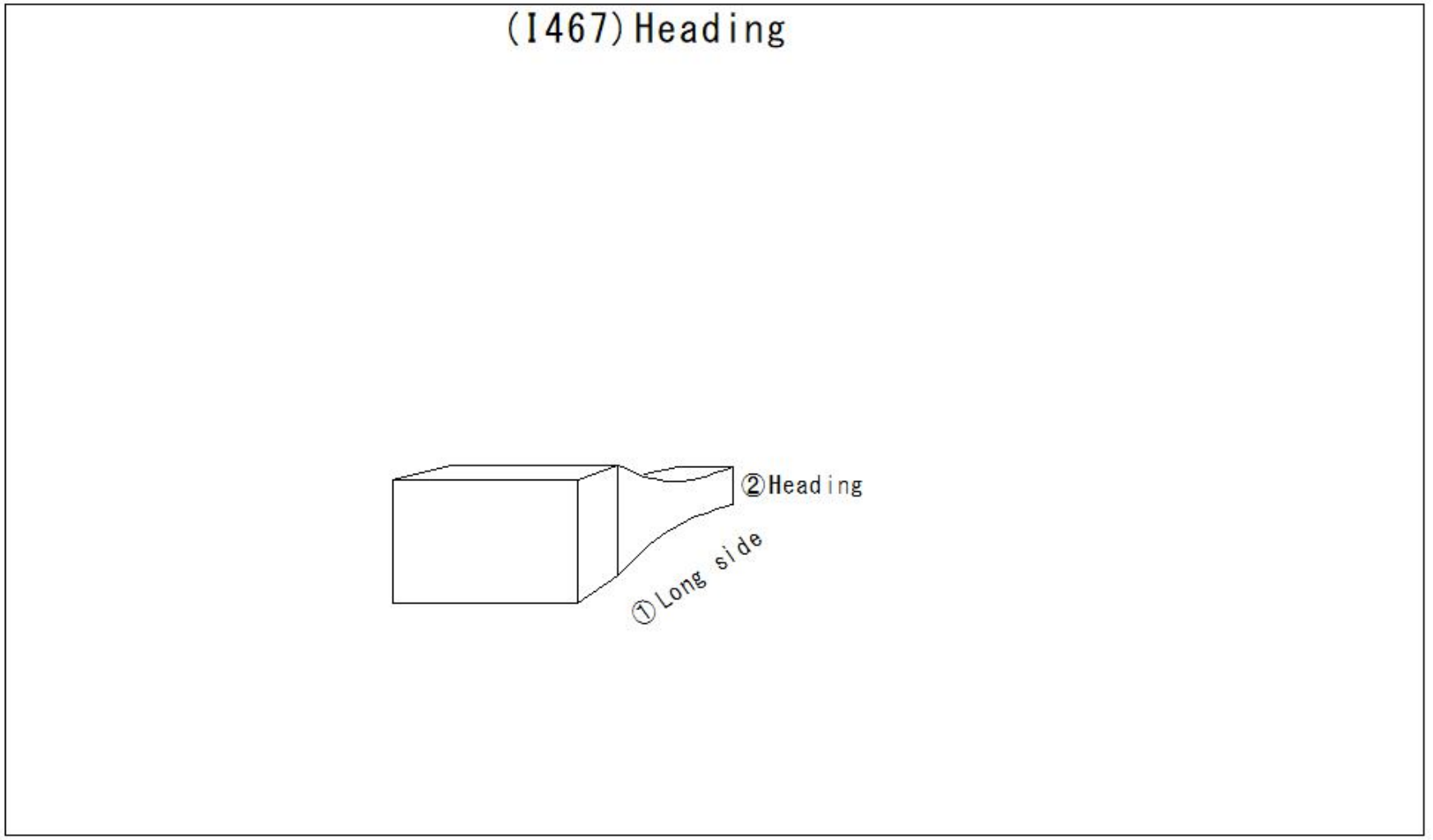
Bank protection

Types of bank protection

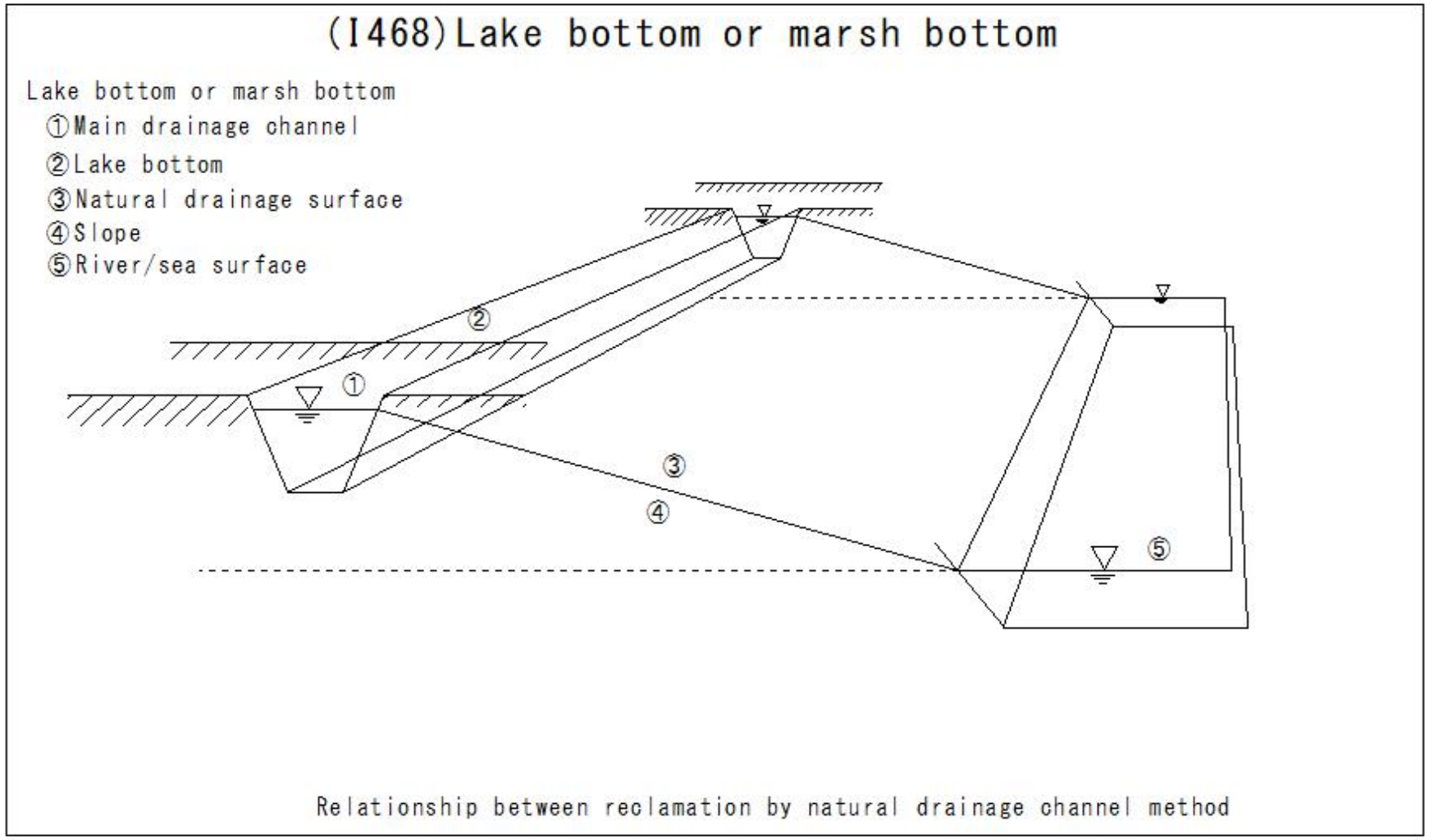


R72

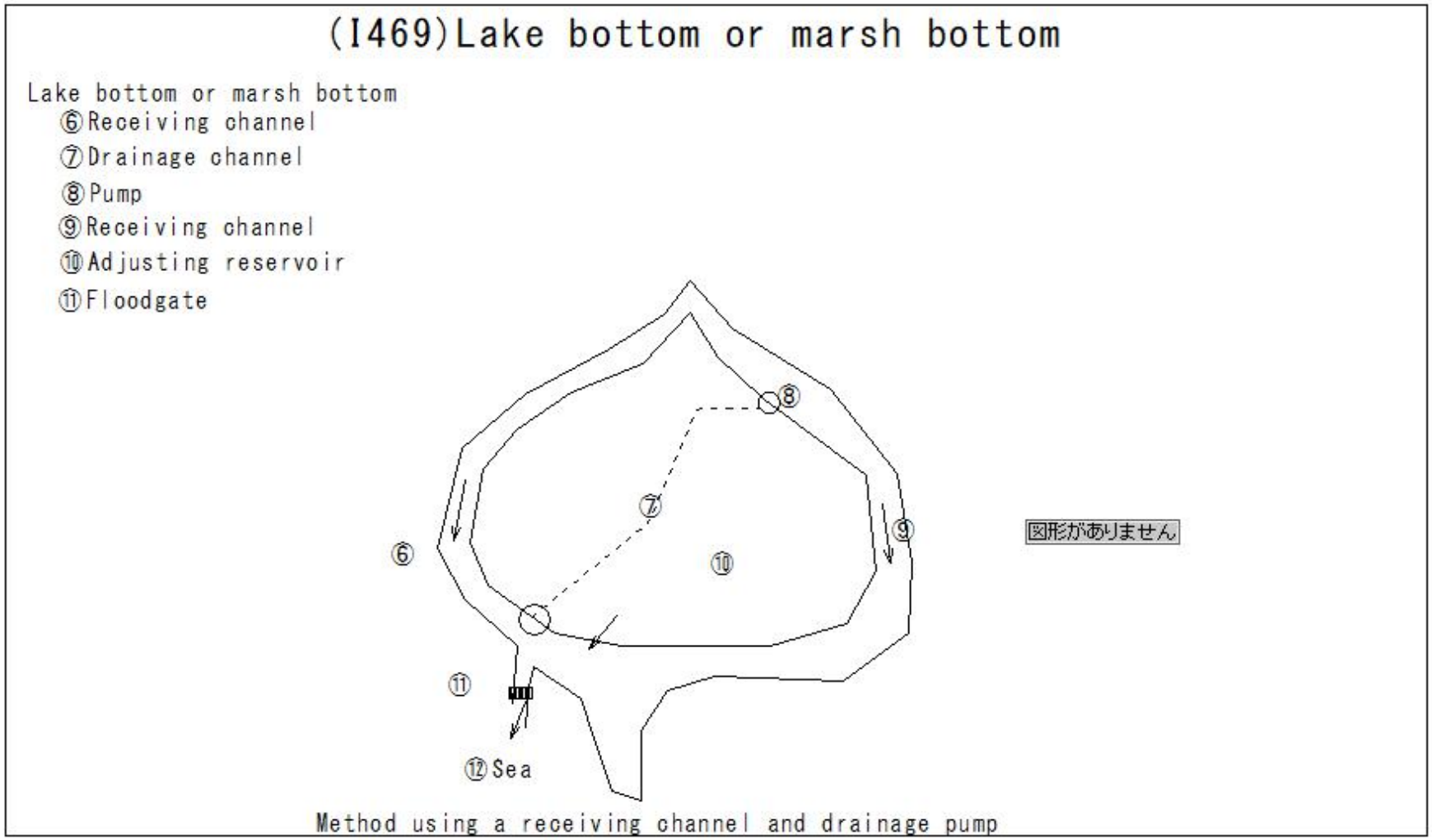
(I467)Heading



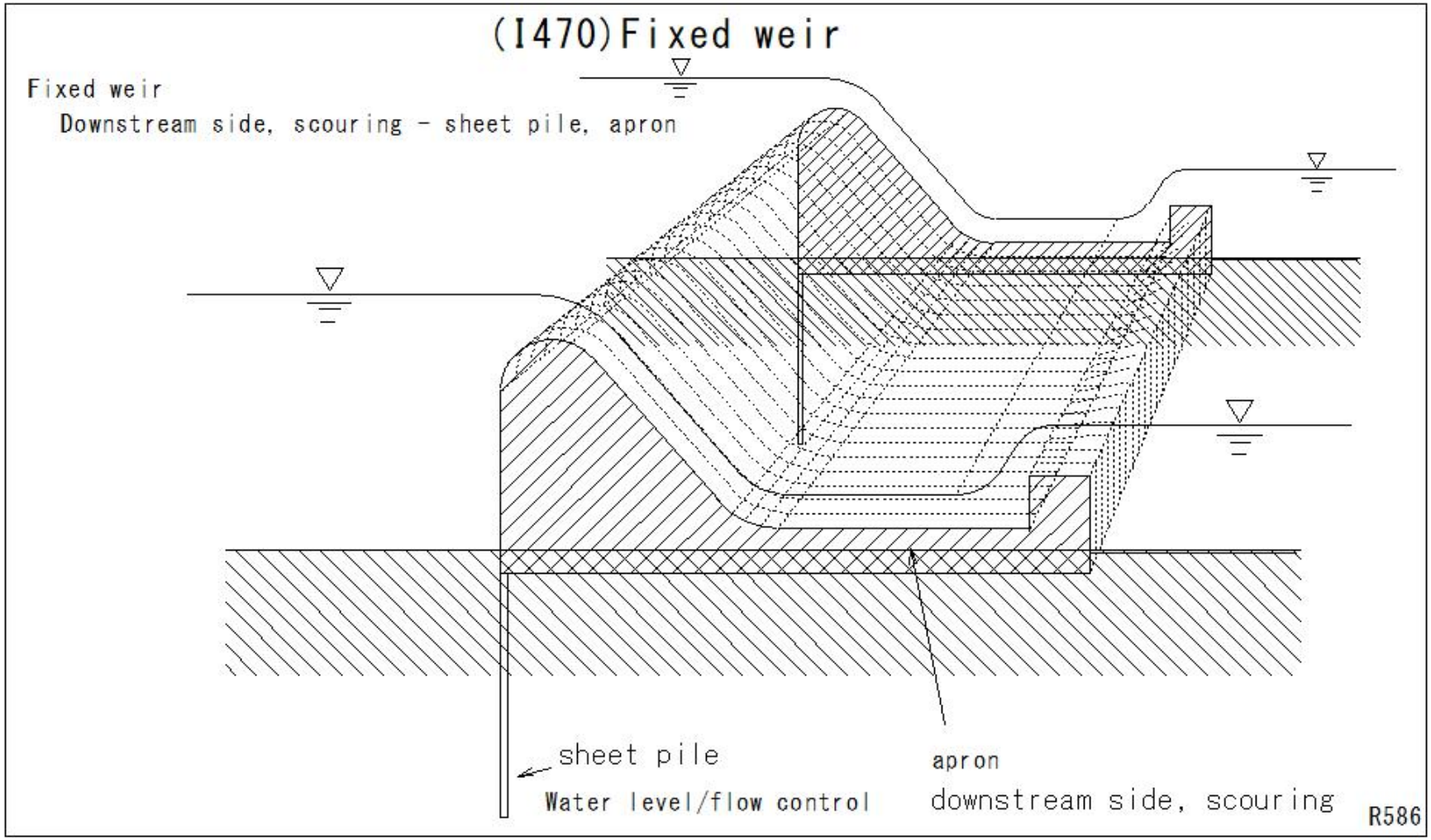
(I468)Lake bottom or marsh bottom



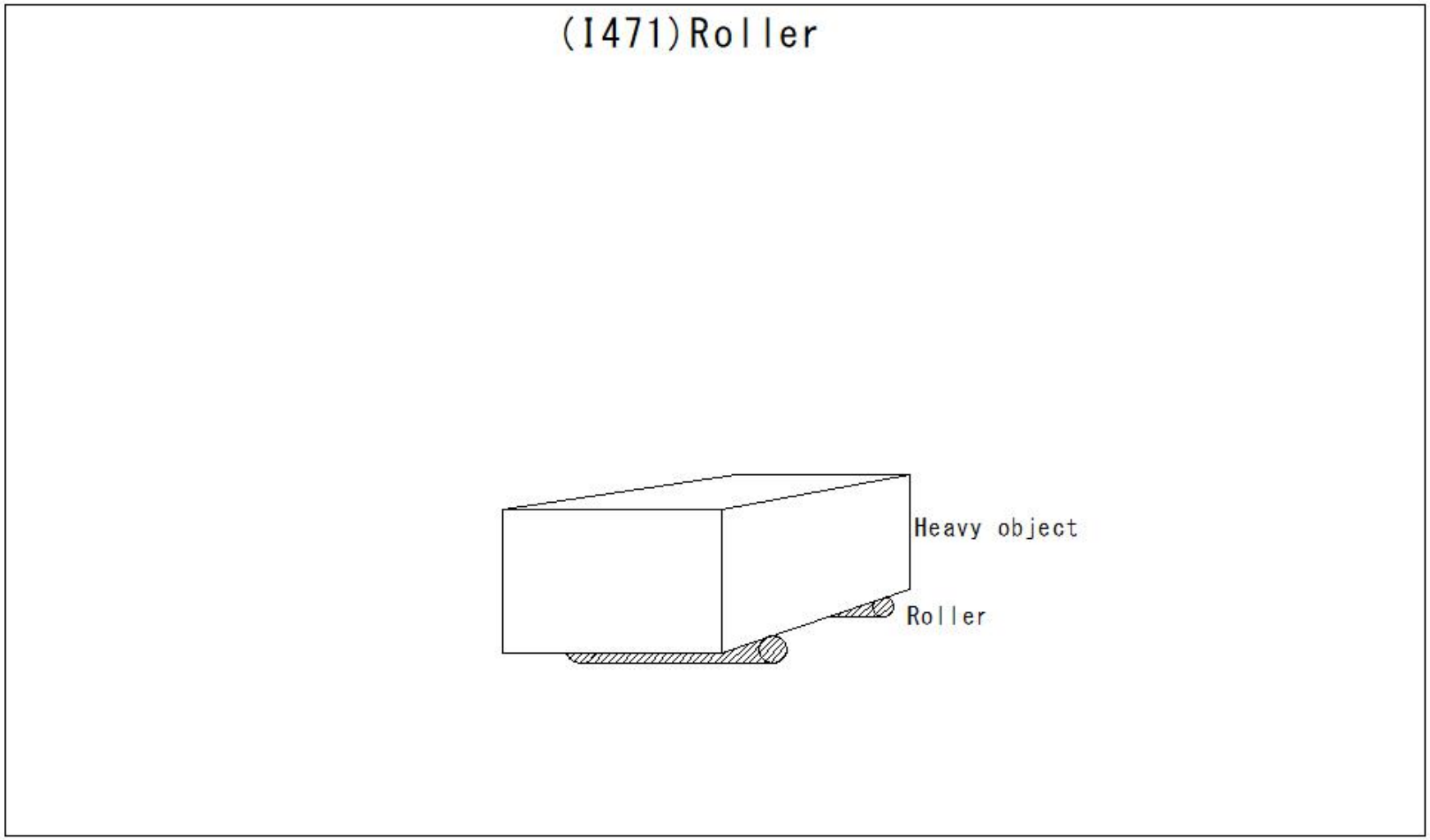
(I469)Lake bottom or marsh bottom



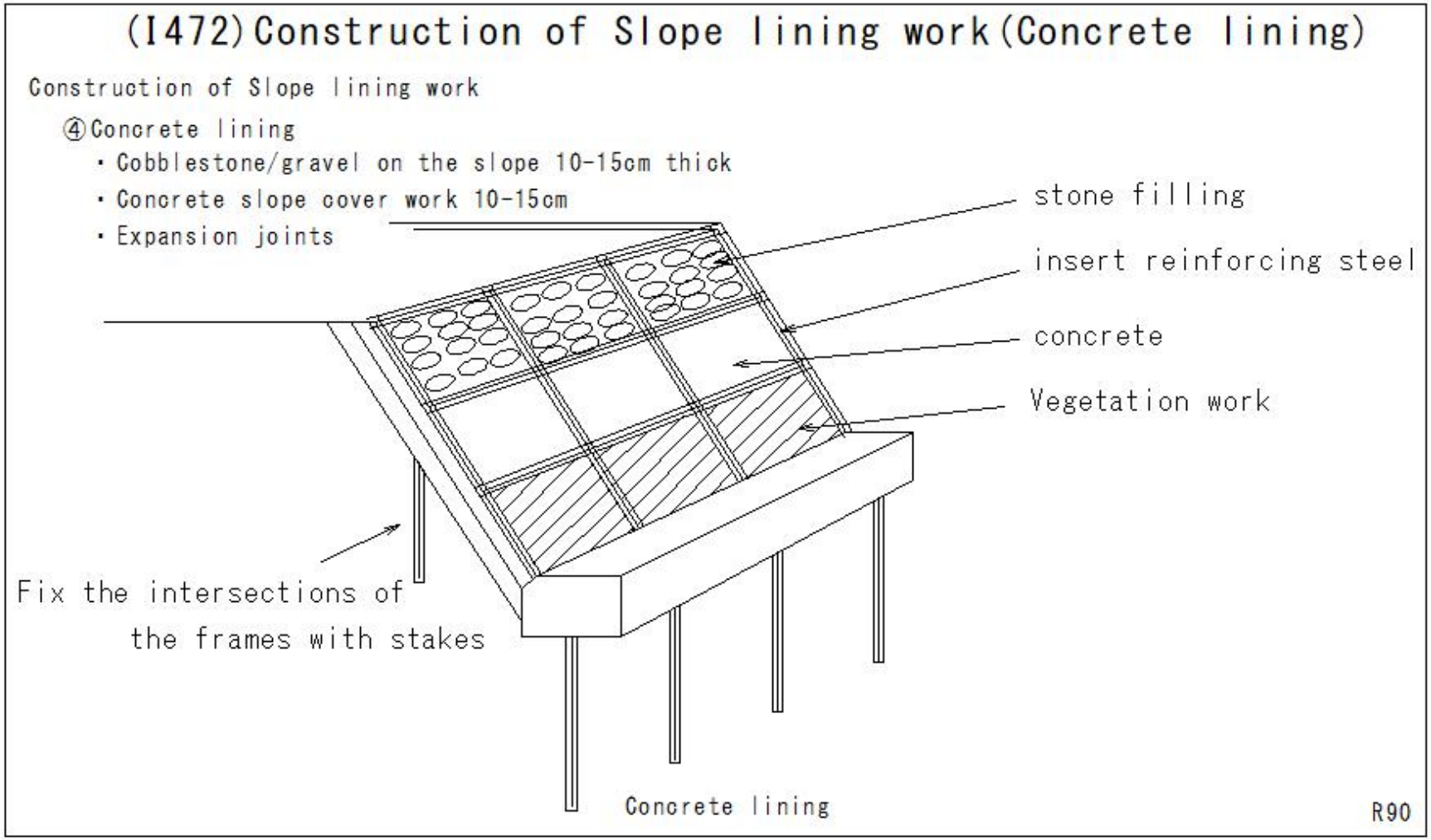
(I470)Fixed weir



(I471)Roller



(I472)Concrete pitching

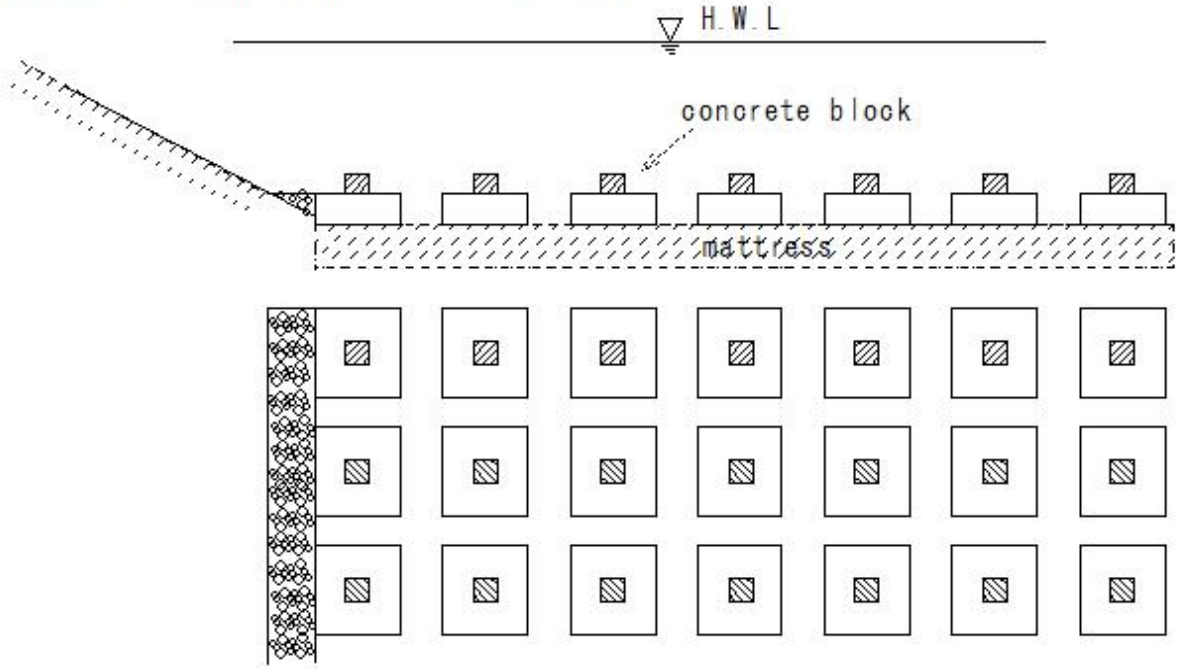


(I473)Groin (concrete block groin)

(I473)Groin (concrete block groin)

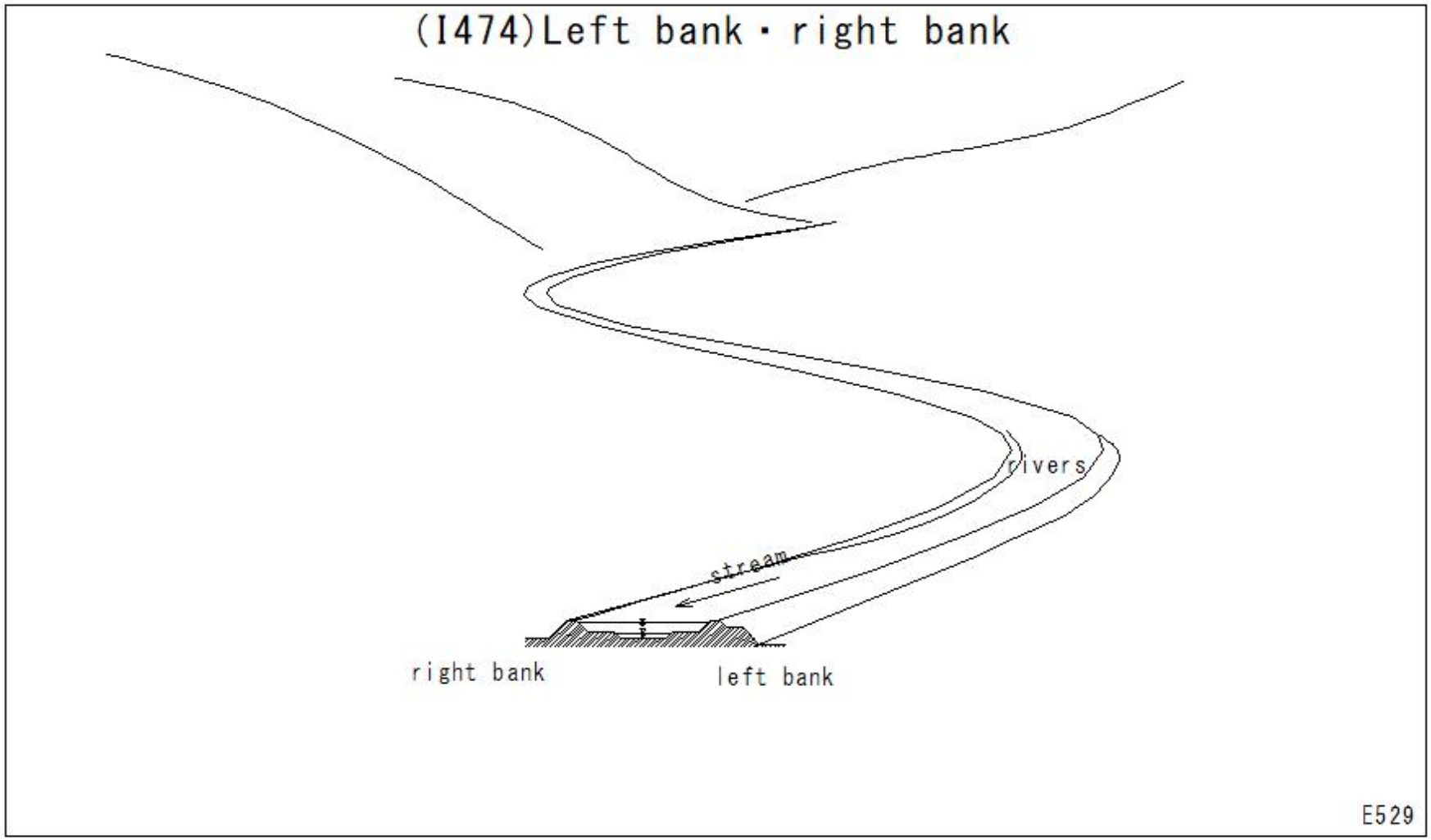
Concrete block groin

- type of groin
- Riverbank erosion prevention
- Suitable for rapid rivers
- Arrange large square blocks on the mattress



R243

(I474)Left bankright bank



(I475)Surge-tank

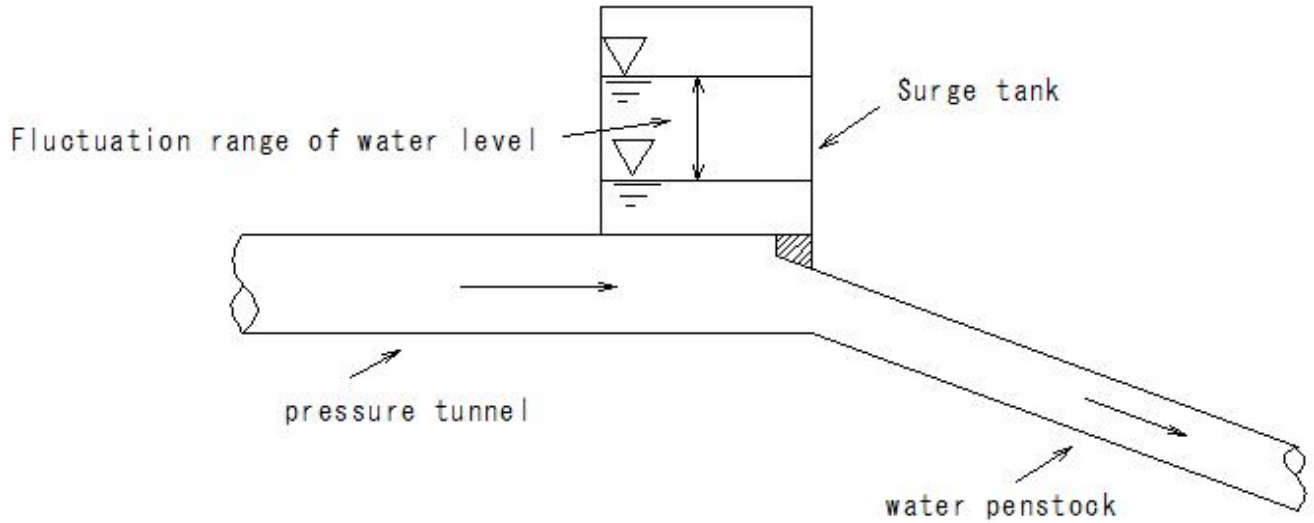
(I475)Surge-tank

Surge-tank

Dam waterway power plant

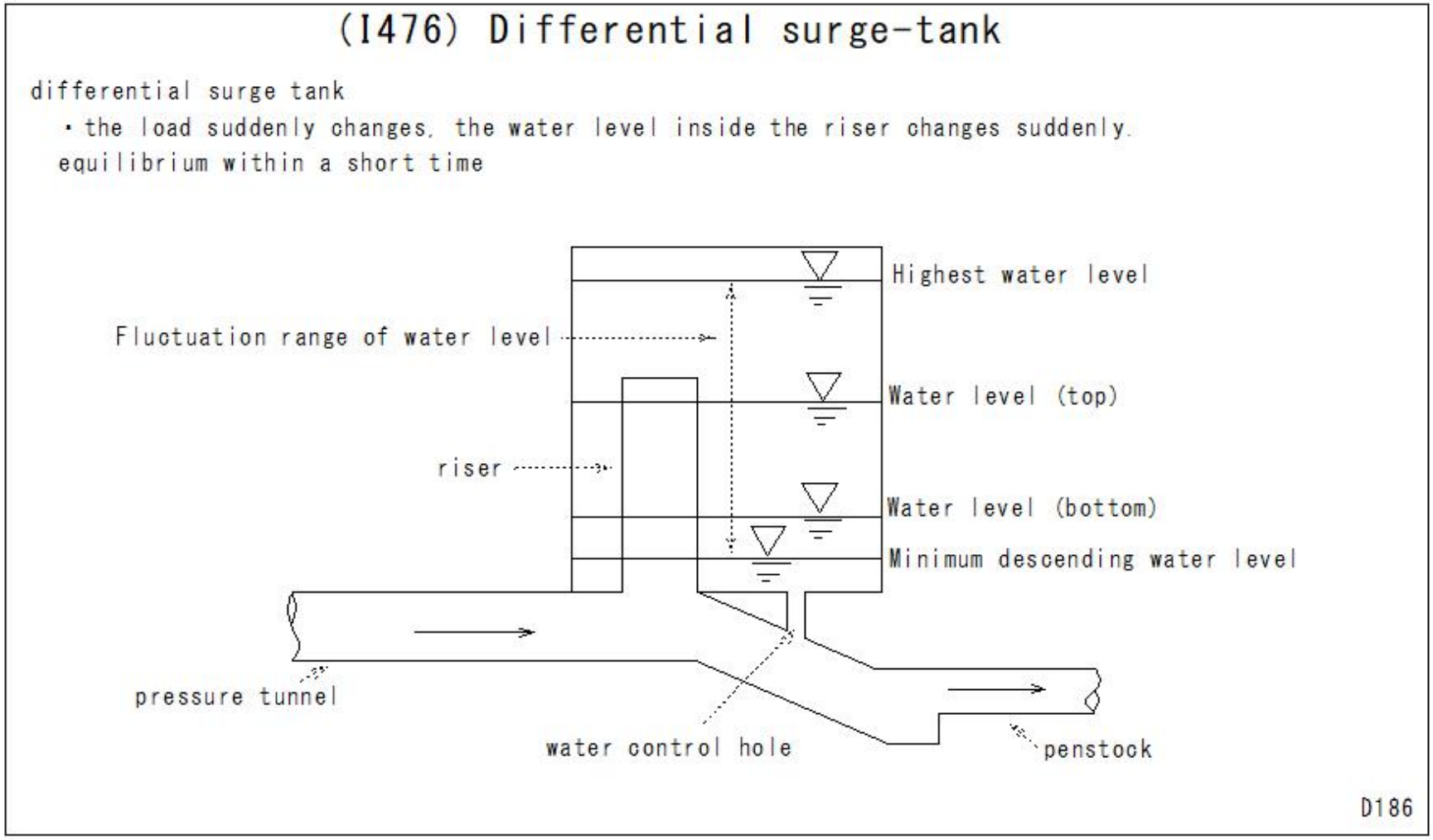
- Reducing water hammer pressure in penstocks
- Absorbs fluctuations in water pressure

Fluctuation range of water level

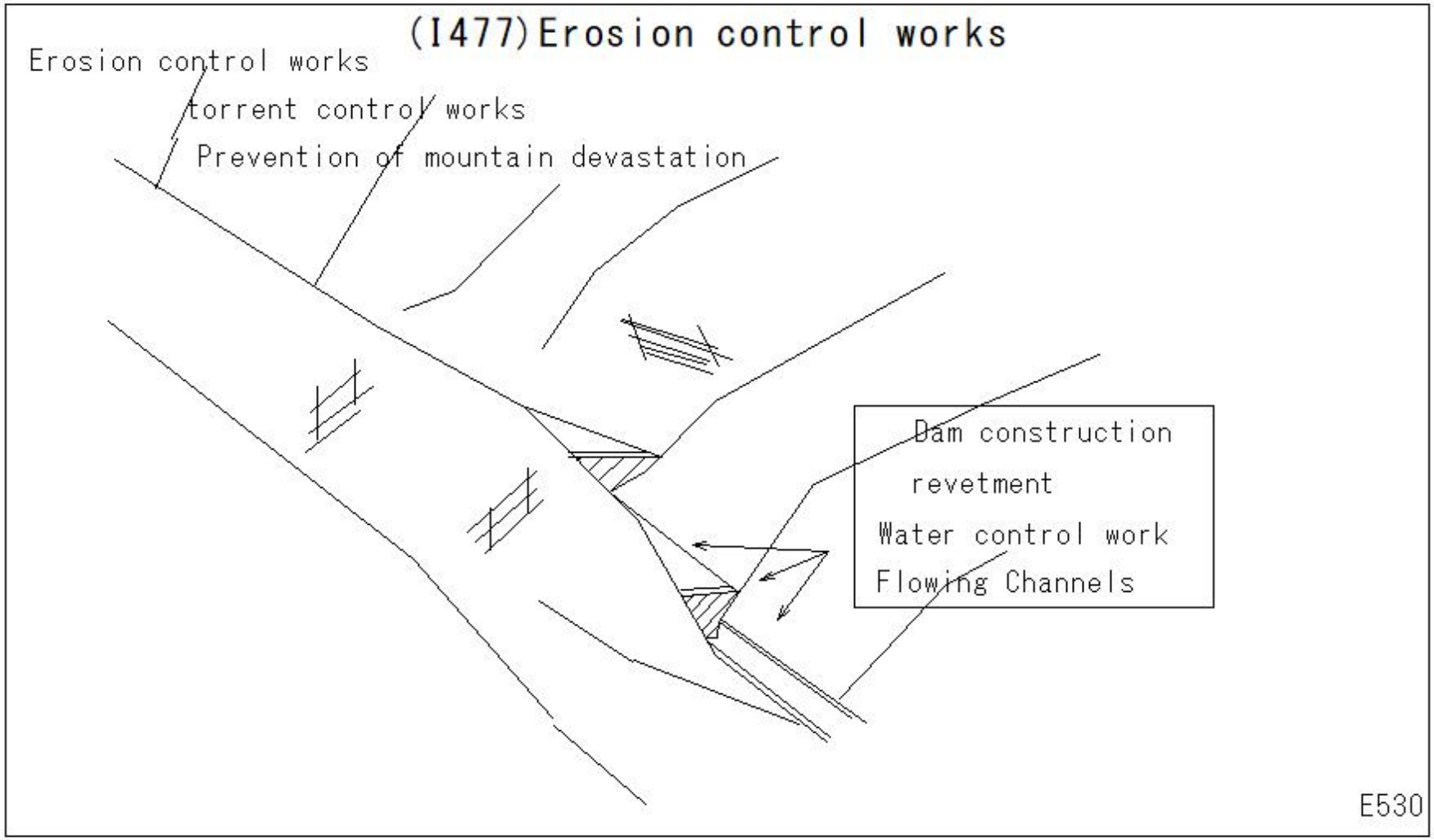


D185

(I476) Differential surge-tank



(I477)Erosion control works



(I478)Triangular weir

(I478)Triangular weir

Triangular weir

Overflow section

Water flow cross section

triangular weir

discharge: Q

$Q=8/15C\tan\theta/2\times(\sqrt{2g}\cdot H^{5/2})$

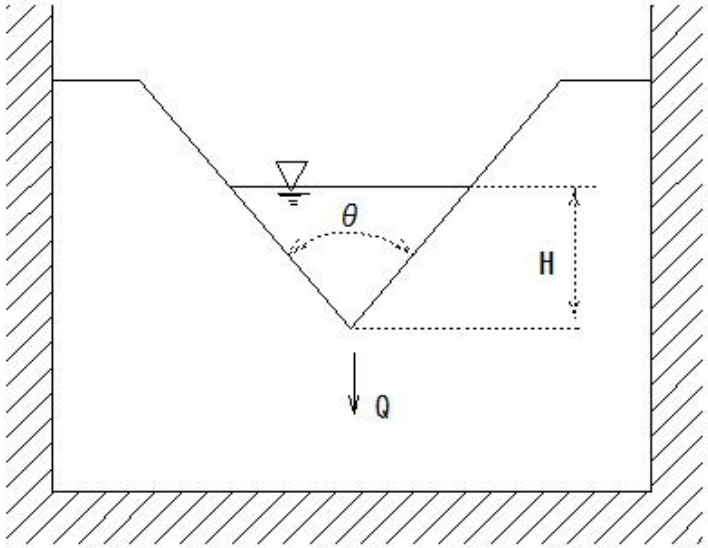
C:discharge coefficient

g: gravitational acceleration

H: Overflow water depth

discharge-a little

Accurate flow measurement



R301

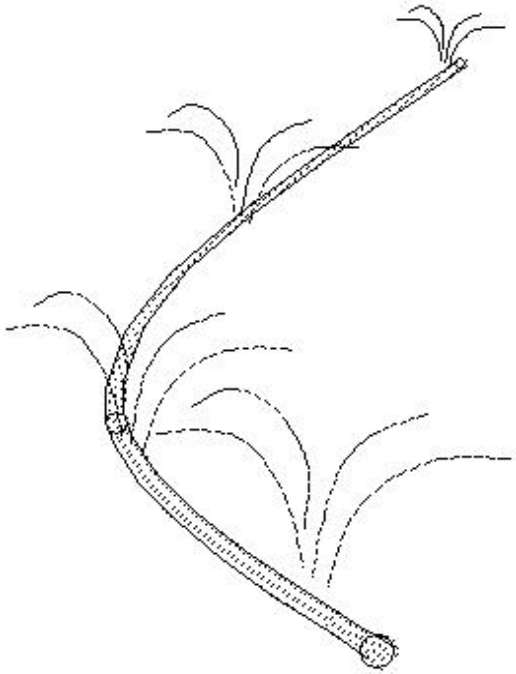
(I479)Spray irrigation

(I479)Spray irrigation

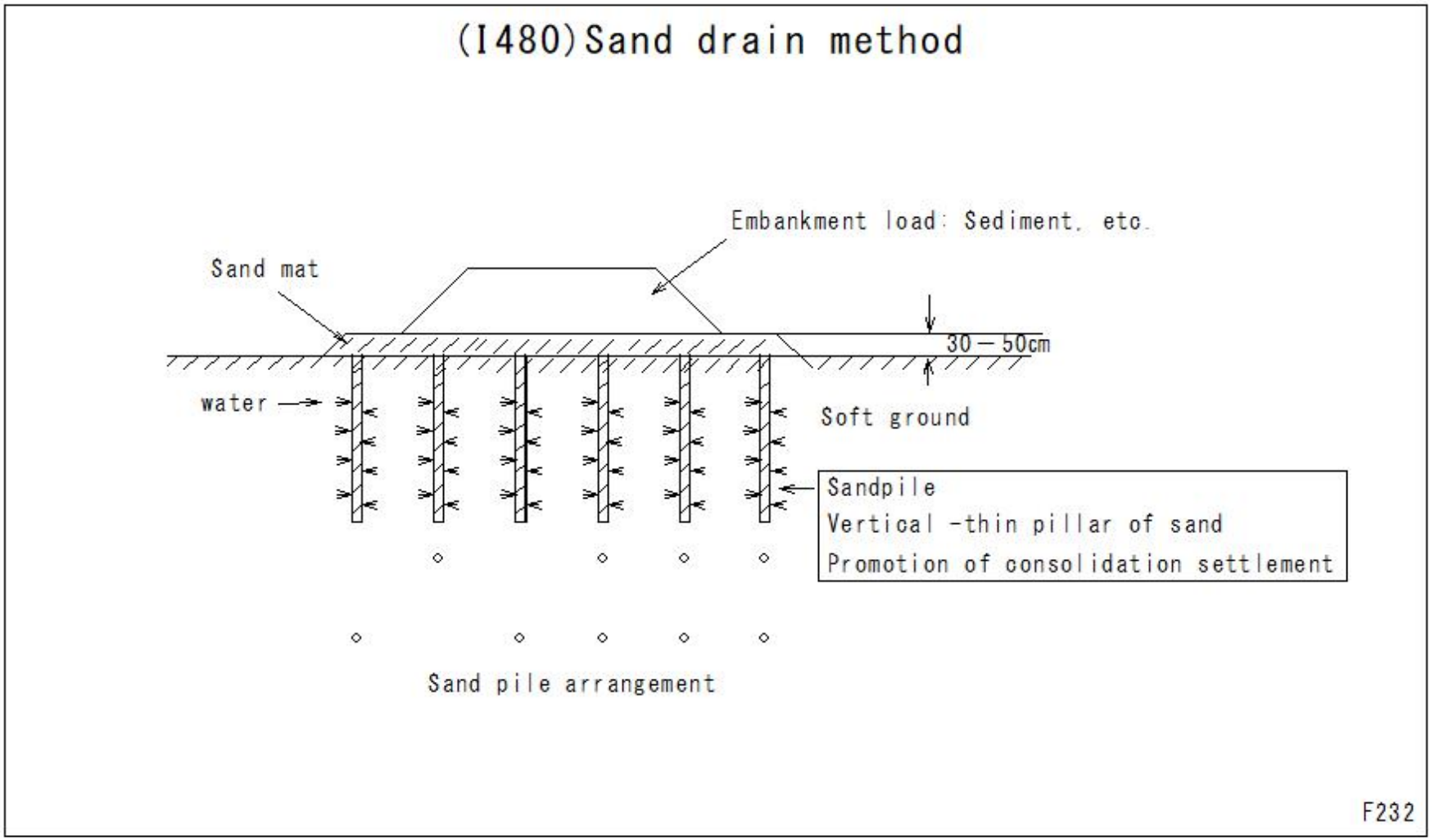
Spray irrigation

①A method of irrigation that uses water pressure to spray water in a mist from nozzles or sprinklers

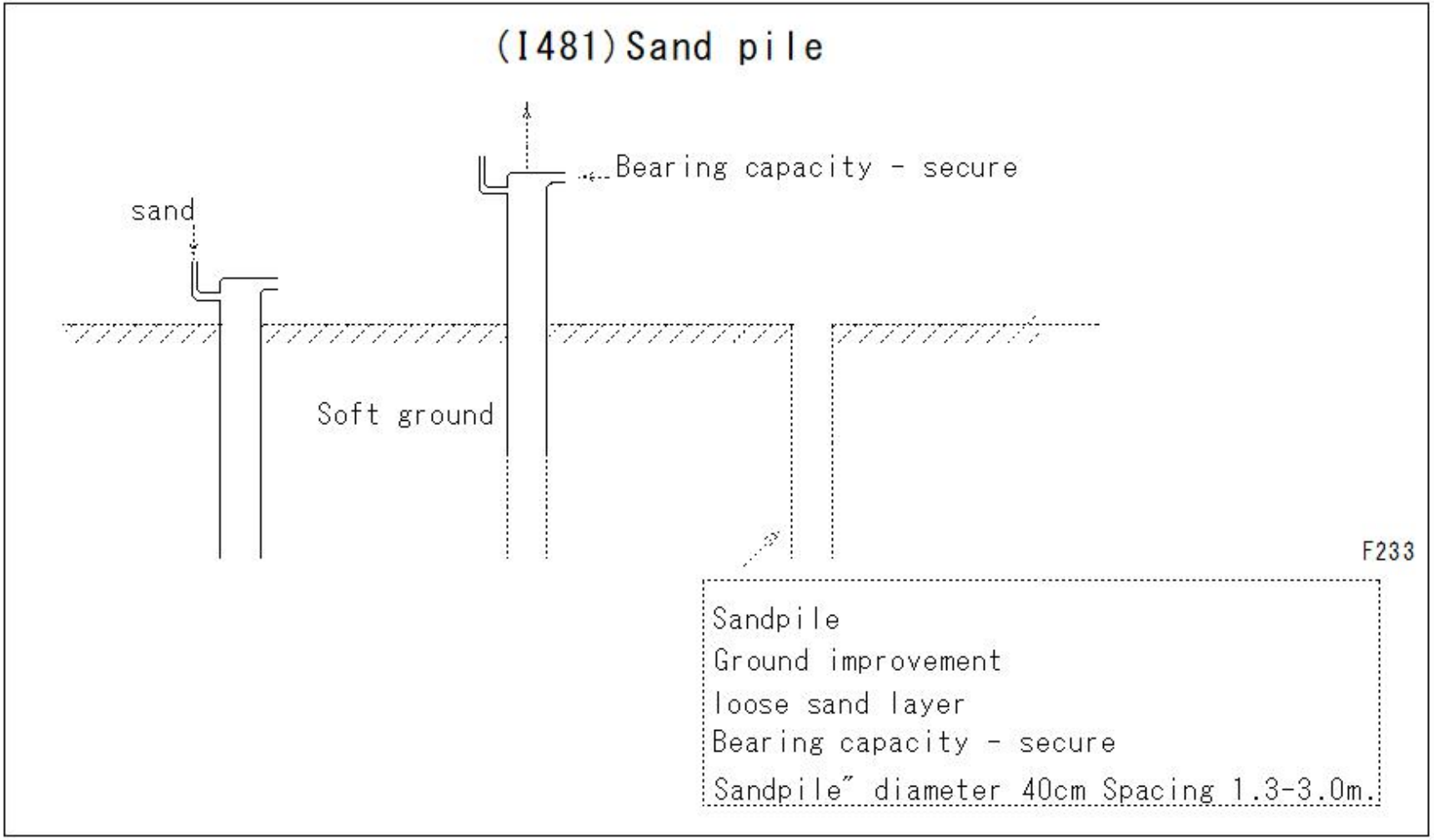
②A method of irrigation that provides water to farmland or orchards



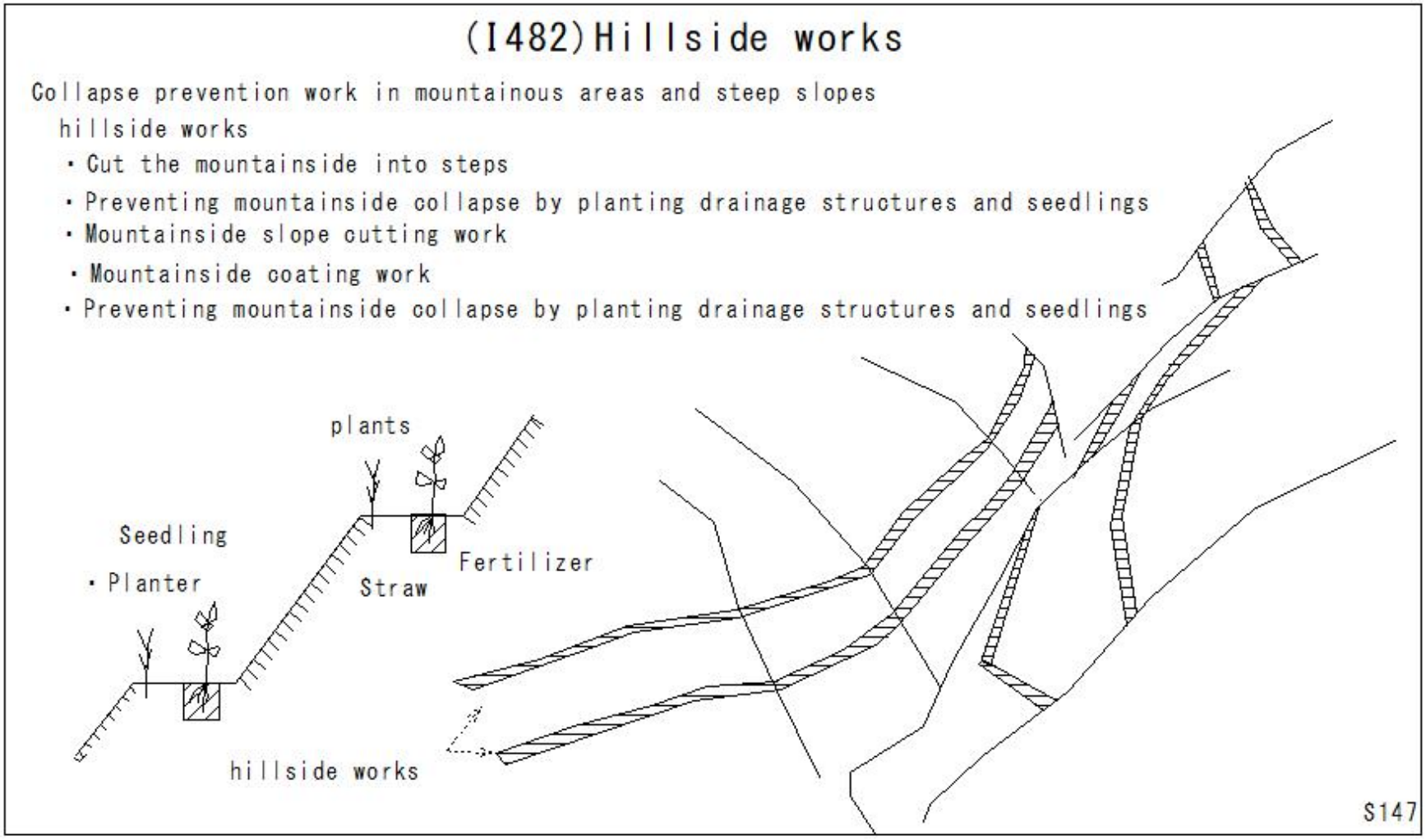
(I480)Sand drain method



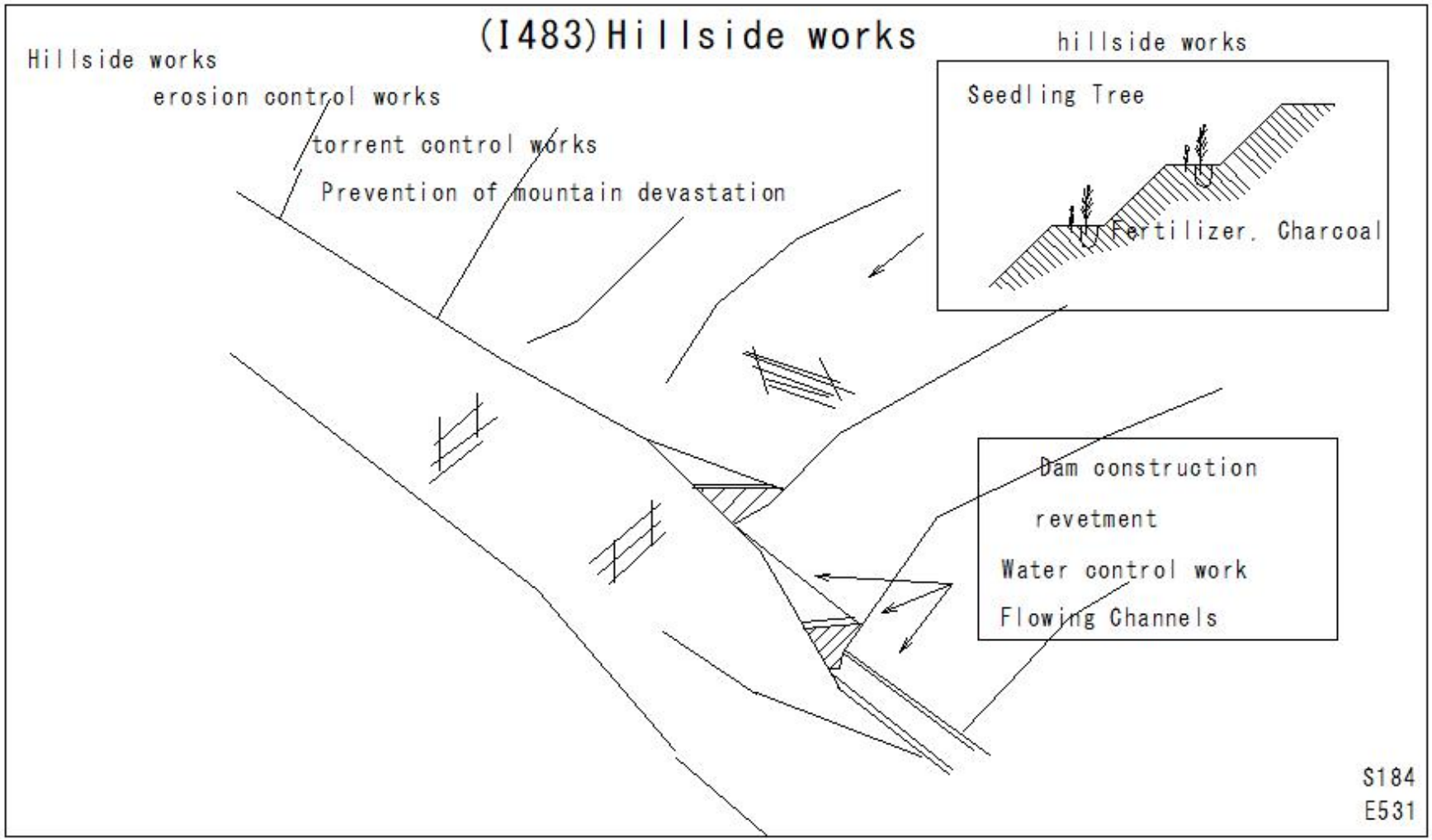
(I481)Sand pile



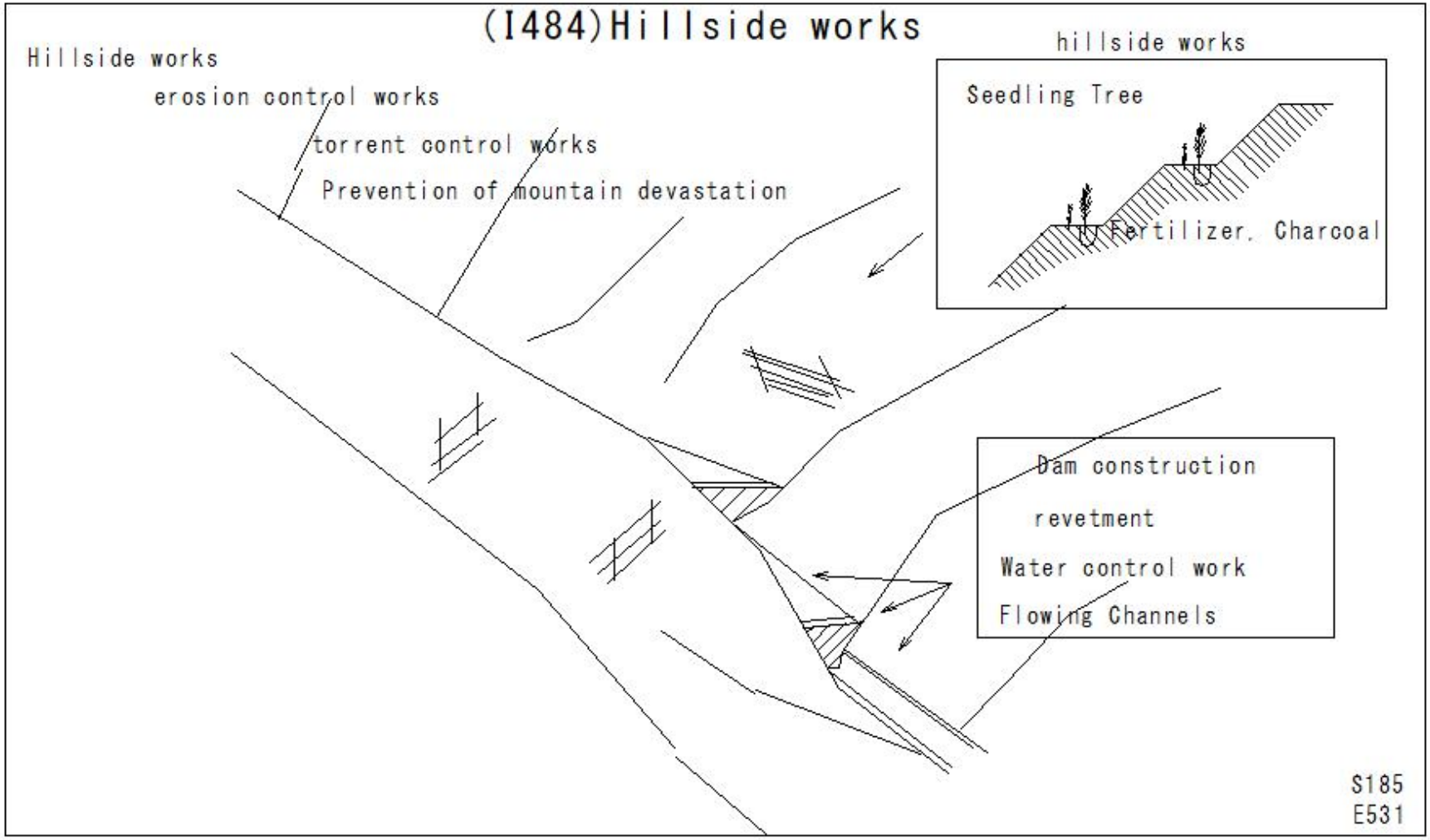
(I482)Hillside works



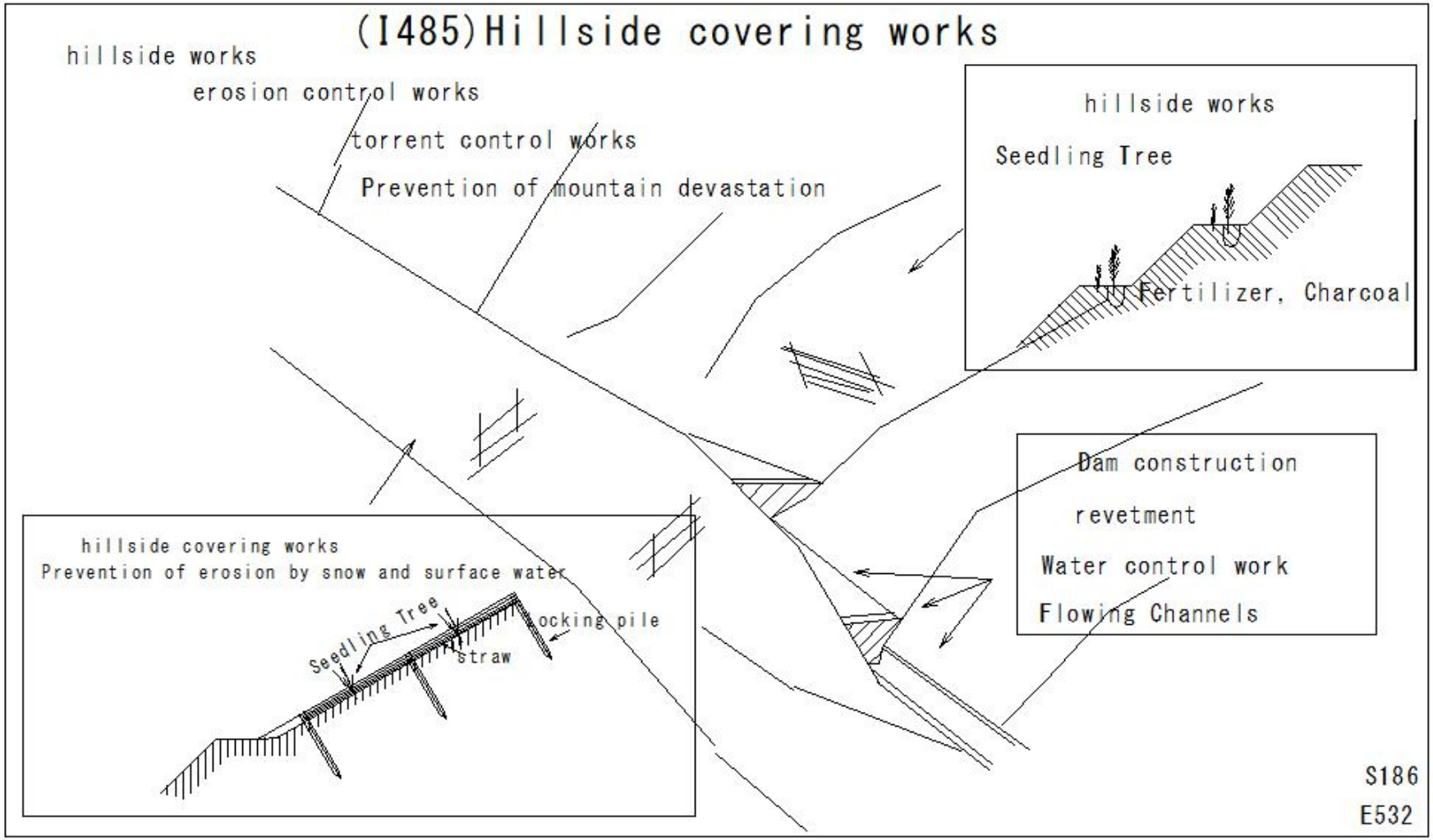
(I483)Hillside works



(I484)Mountainside slope cutter



(I485)Hillside covering works



(I486)Square weir

(I486)Square weir

Square weir

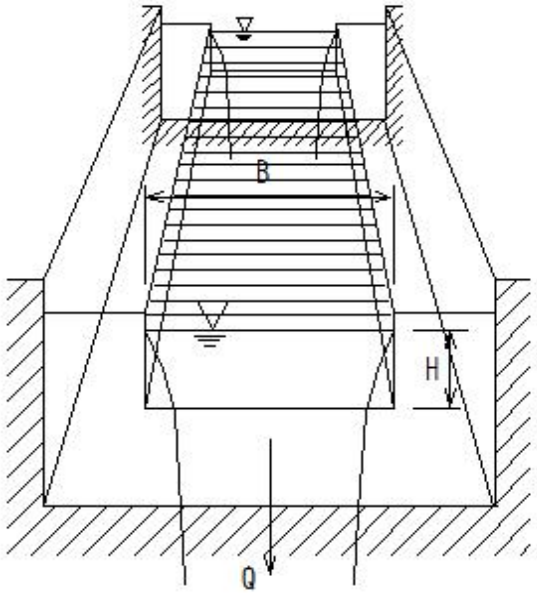
Q＝CBH^(3/2)

C: Discharge coefficient

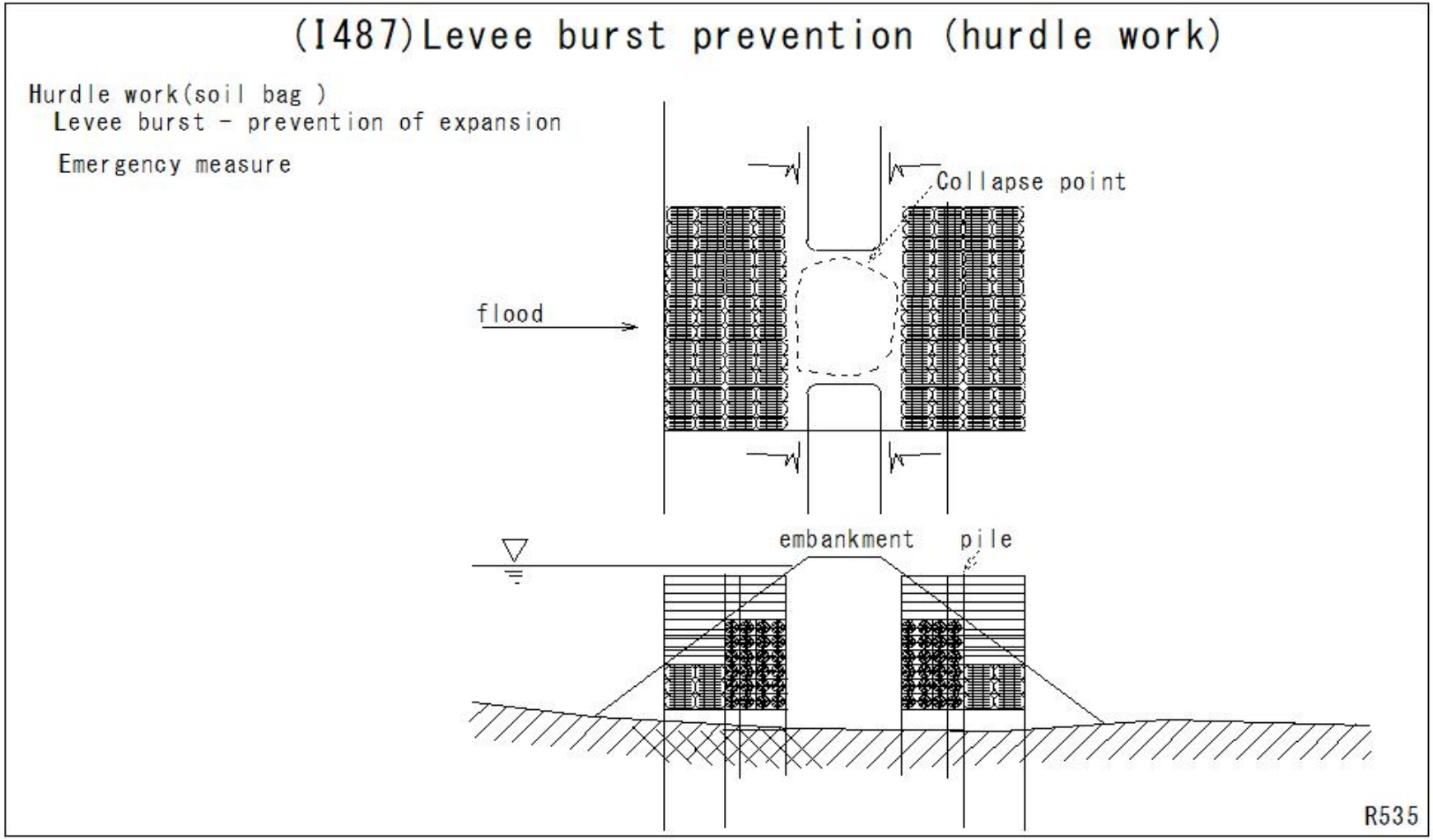
B: Cross-sectional width of water passage

H: Overflow depth

G: Discharge



(I487)Levee burst prevention (hurdle work)

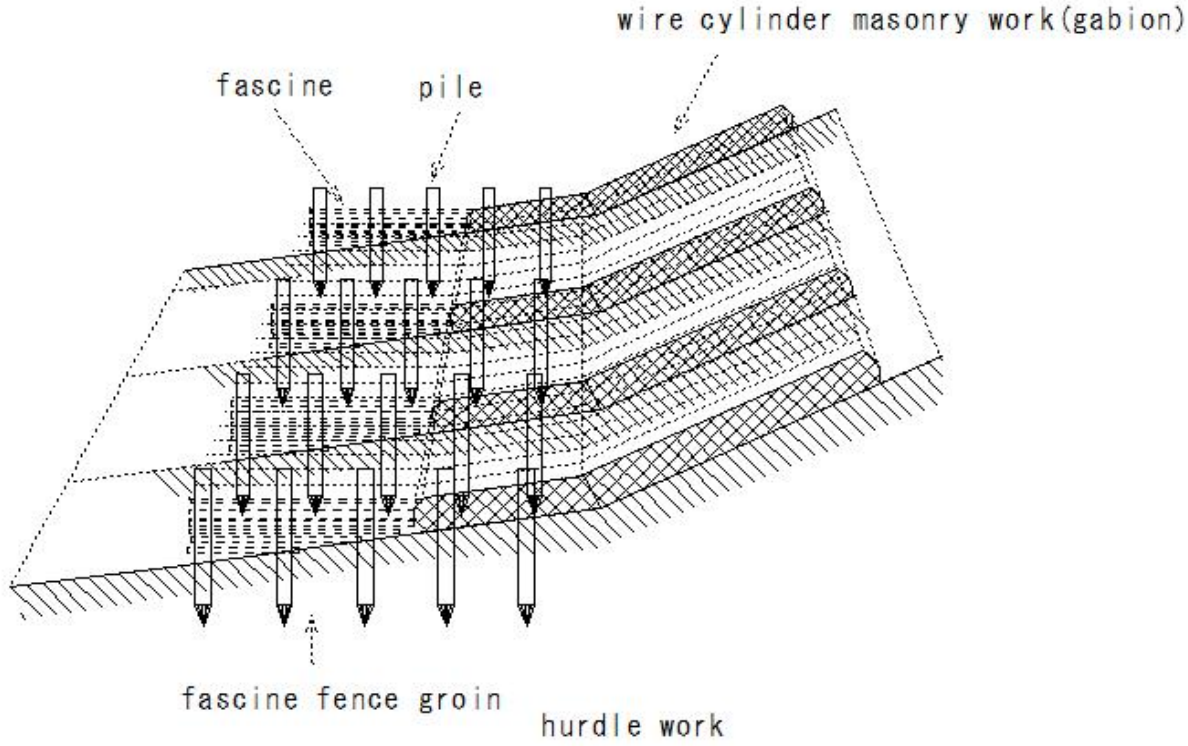


(I488)Hurdle work(bank protection work)

(I488)Hurdle work(bank protection work)

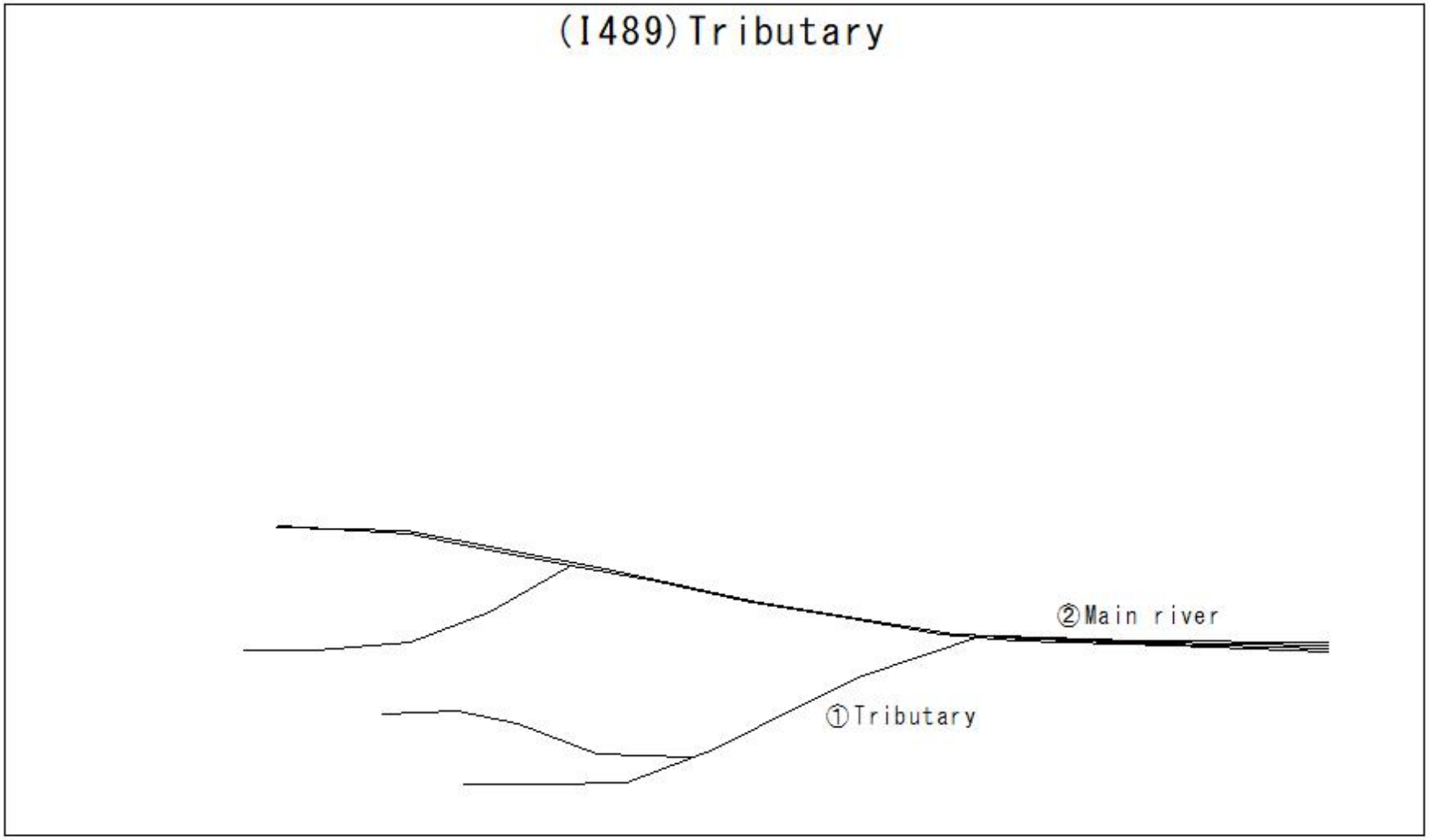
Hurdle work(bank protection work)

- Weaken the flow
- Prevention of scouring



R542

(I489)Tributary



(I490)Automatic water gauge

(I490)Automatic water gauge

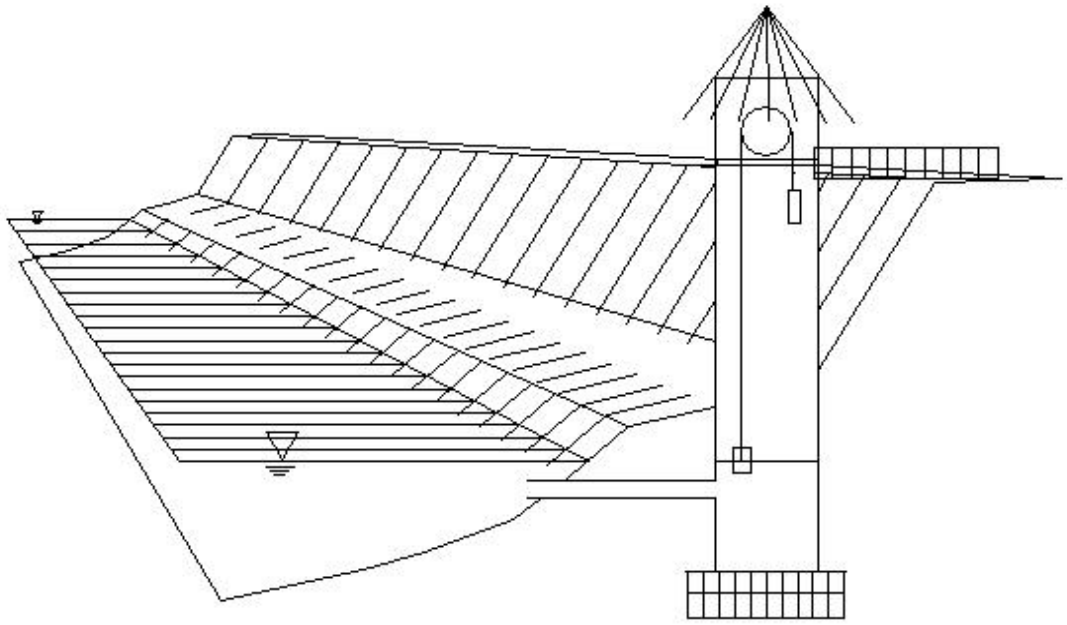
Automatic water gauge

An "automatic water gauge" is a device that automatically records changes in water level.

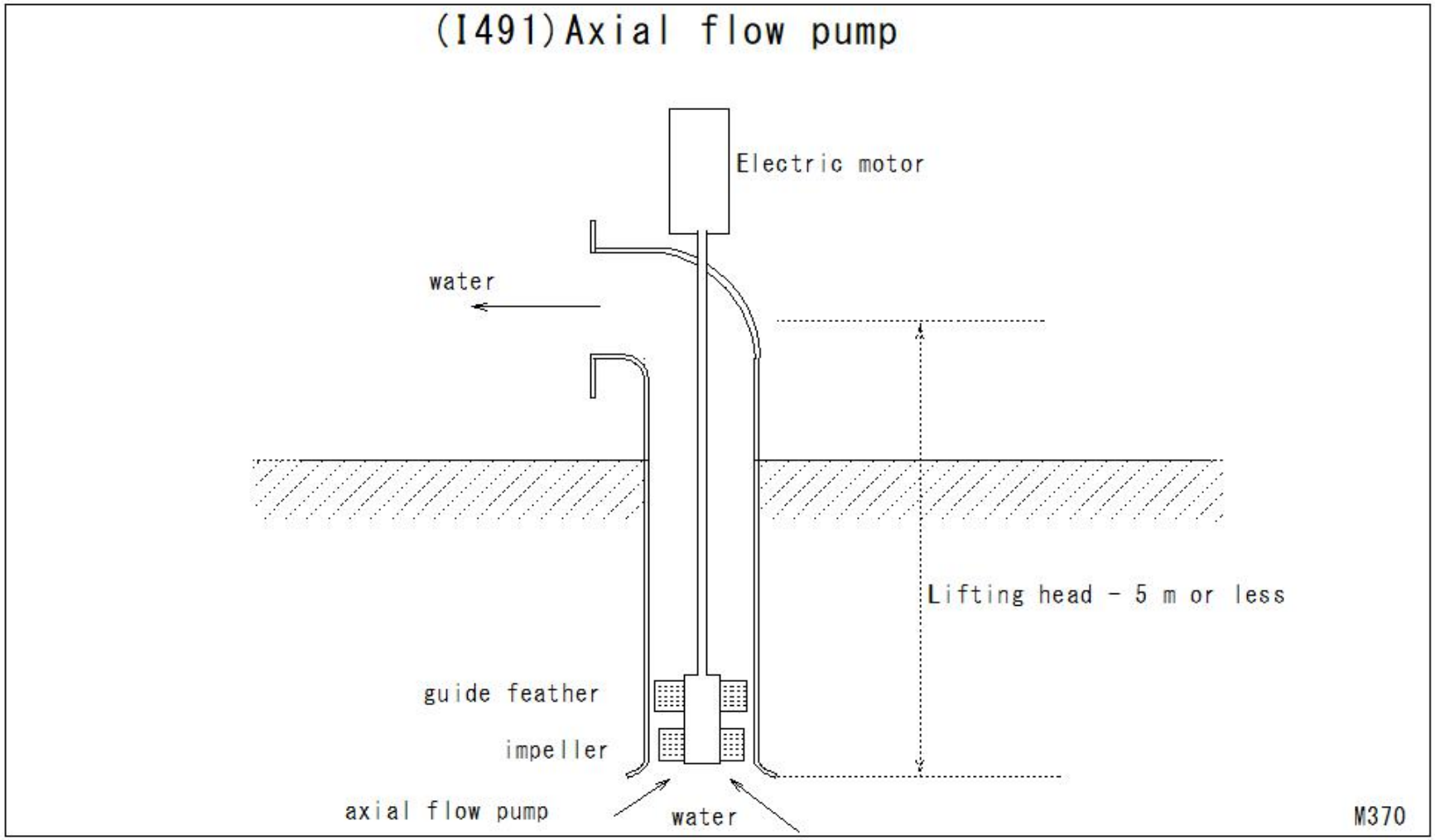
① Automatic recording device

② Observation well

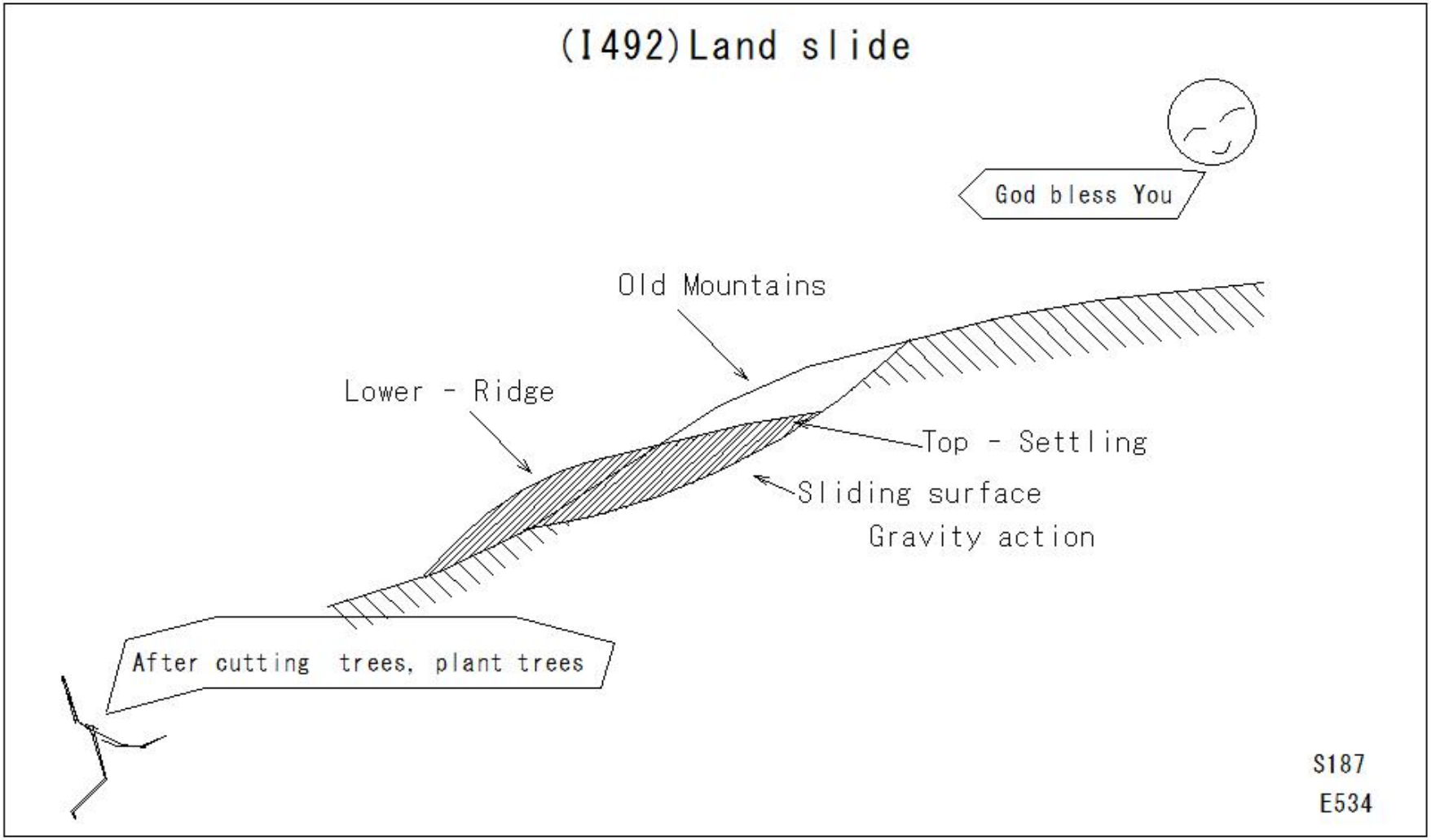
③ Float



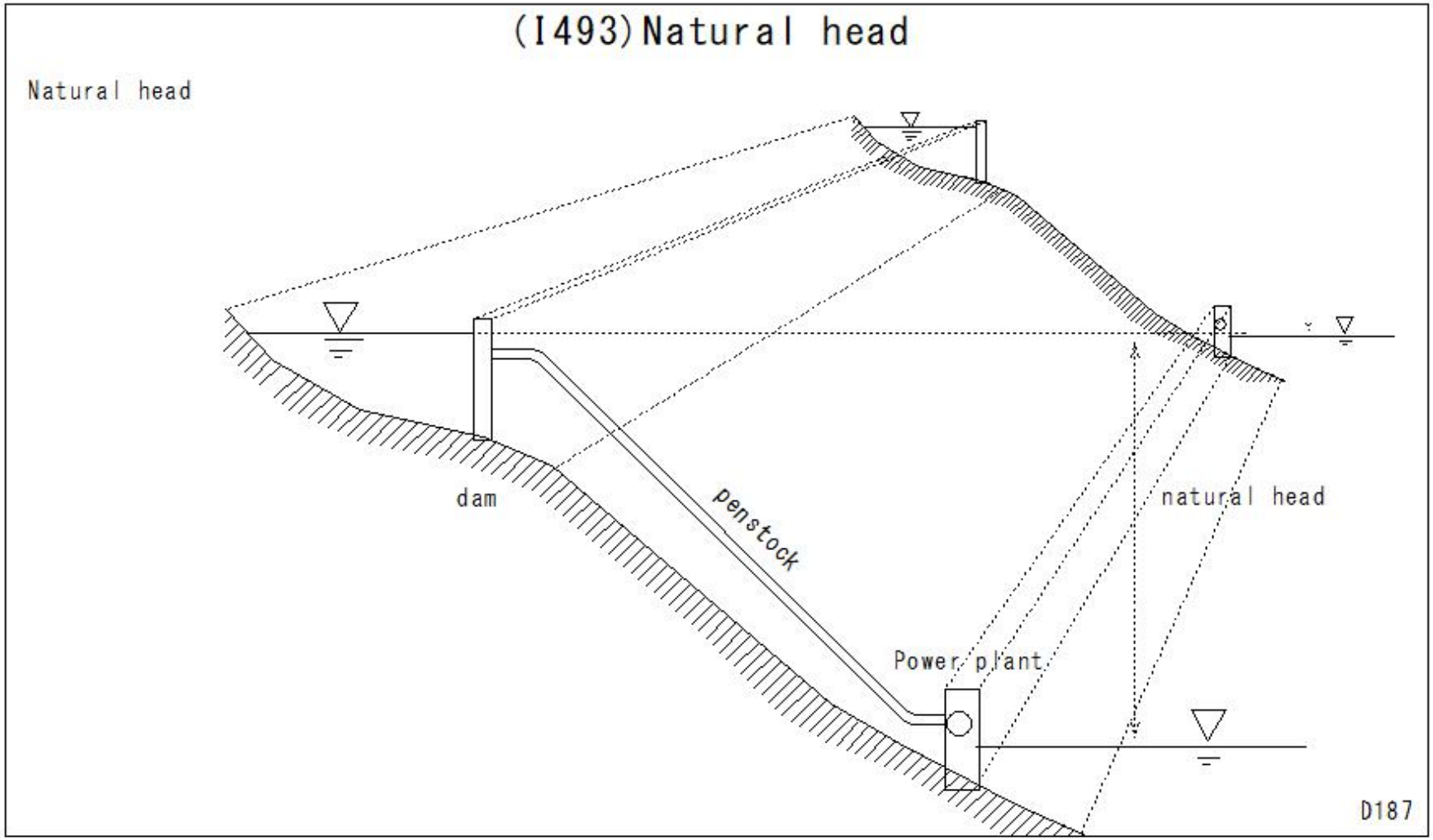
(I491)Axial flow pump



(I492)Land slide



(I493)Natural head



(I494)Natural drainage system

(I494)Natural drainage system

Natural drainage system

The natural flow distribution system is a method of distributing water by setting up a distribution reservoir on high ground and using the difference in elevation to allow

①Water purification plant

②Water pump

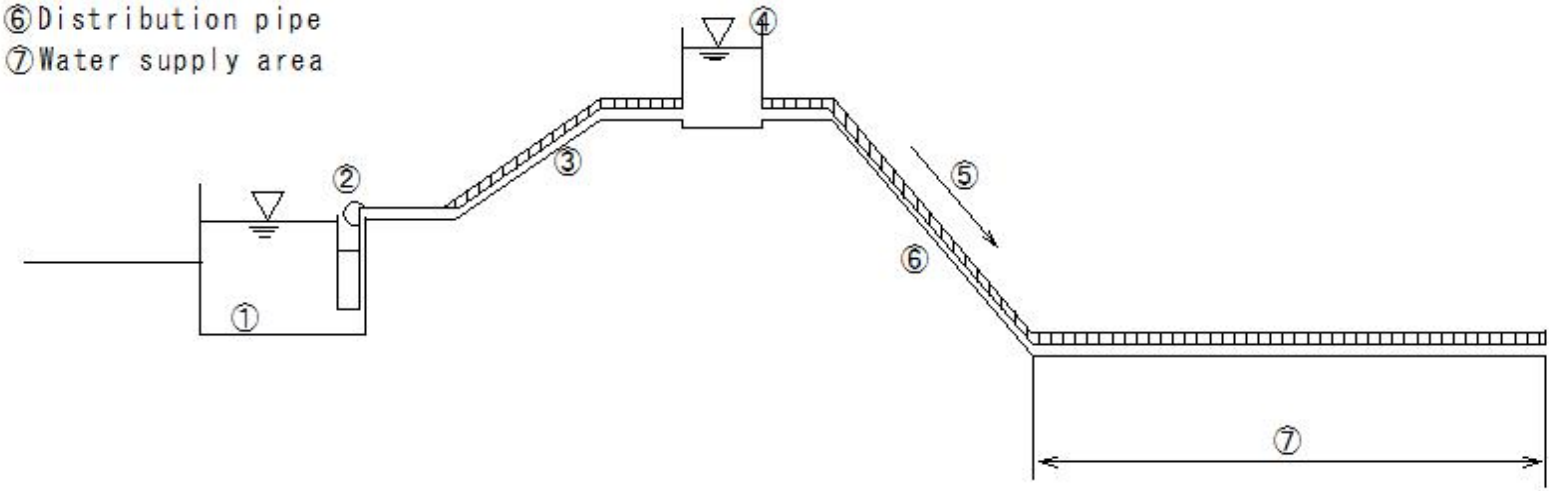
③Water pipe

④Distribution reservoir

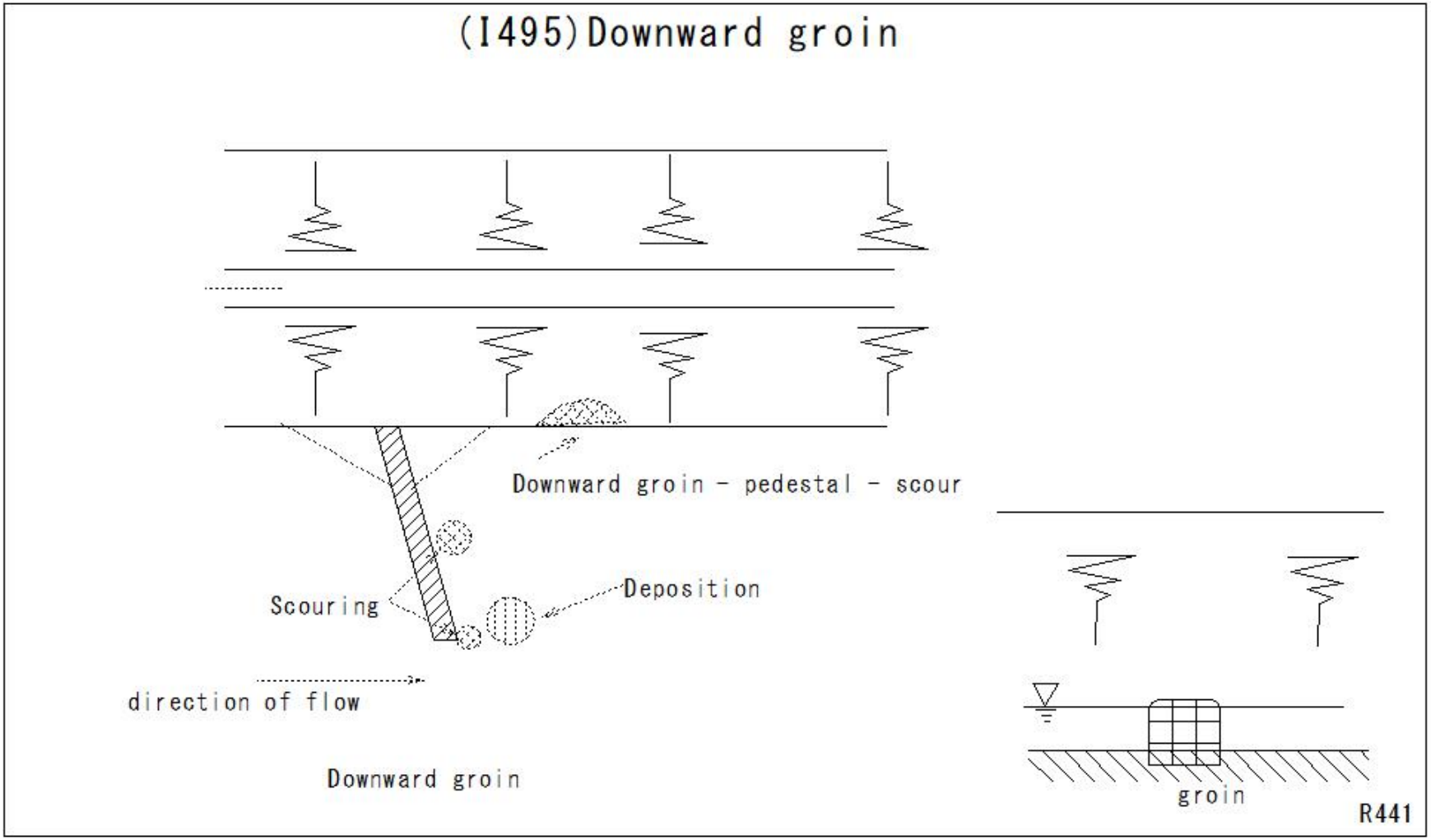
⑤Natural flow

⑥Distribution pipe

⑦Water supply area



(I495)Downward groin



(I496)Gross pump head

(I496)Gross pump head

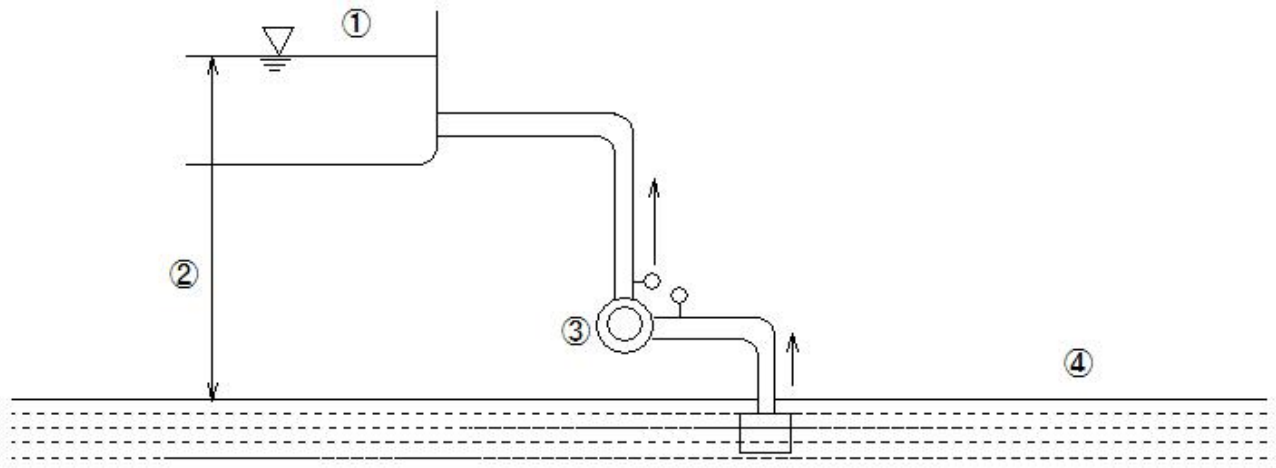
Gross pump head

①Discharge water level

②Actual head

③Pump

④Suction water level



(I497)Control section

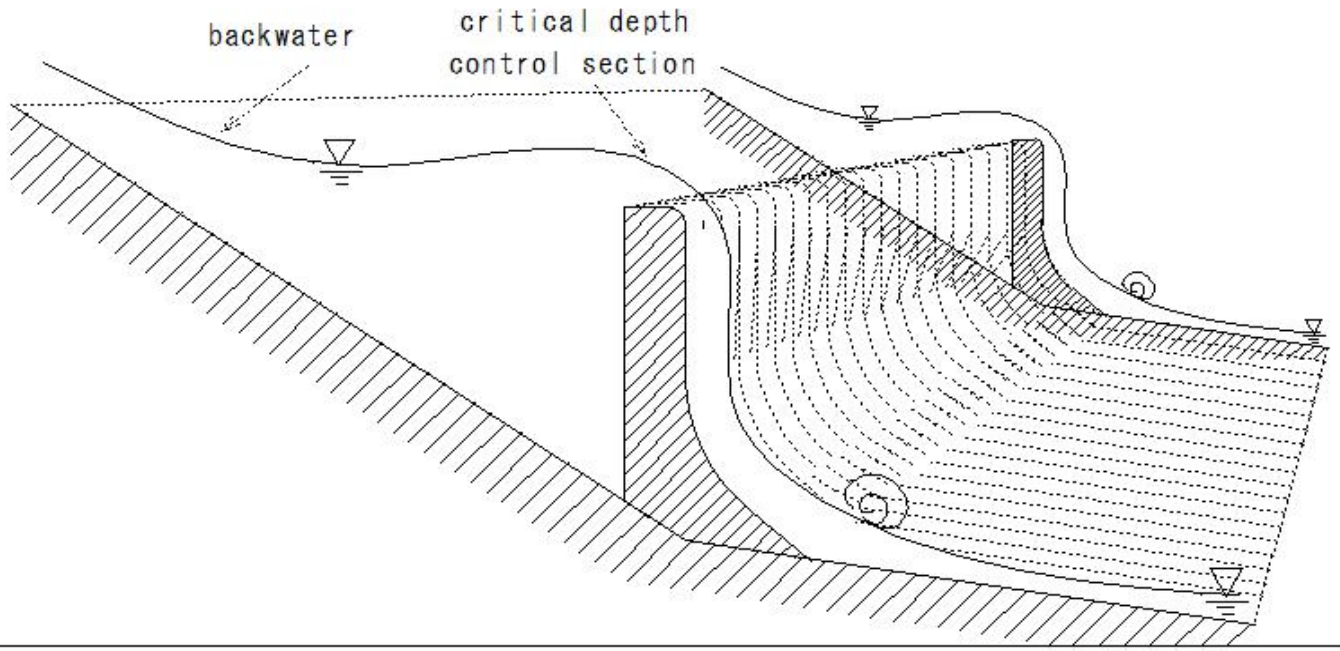
(I497)Control section

Control section : The dominant cross section appears

at the top of the weir.

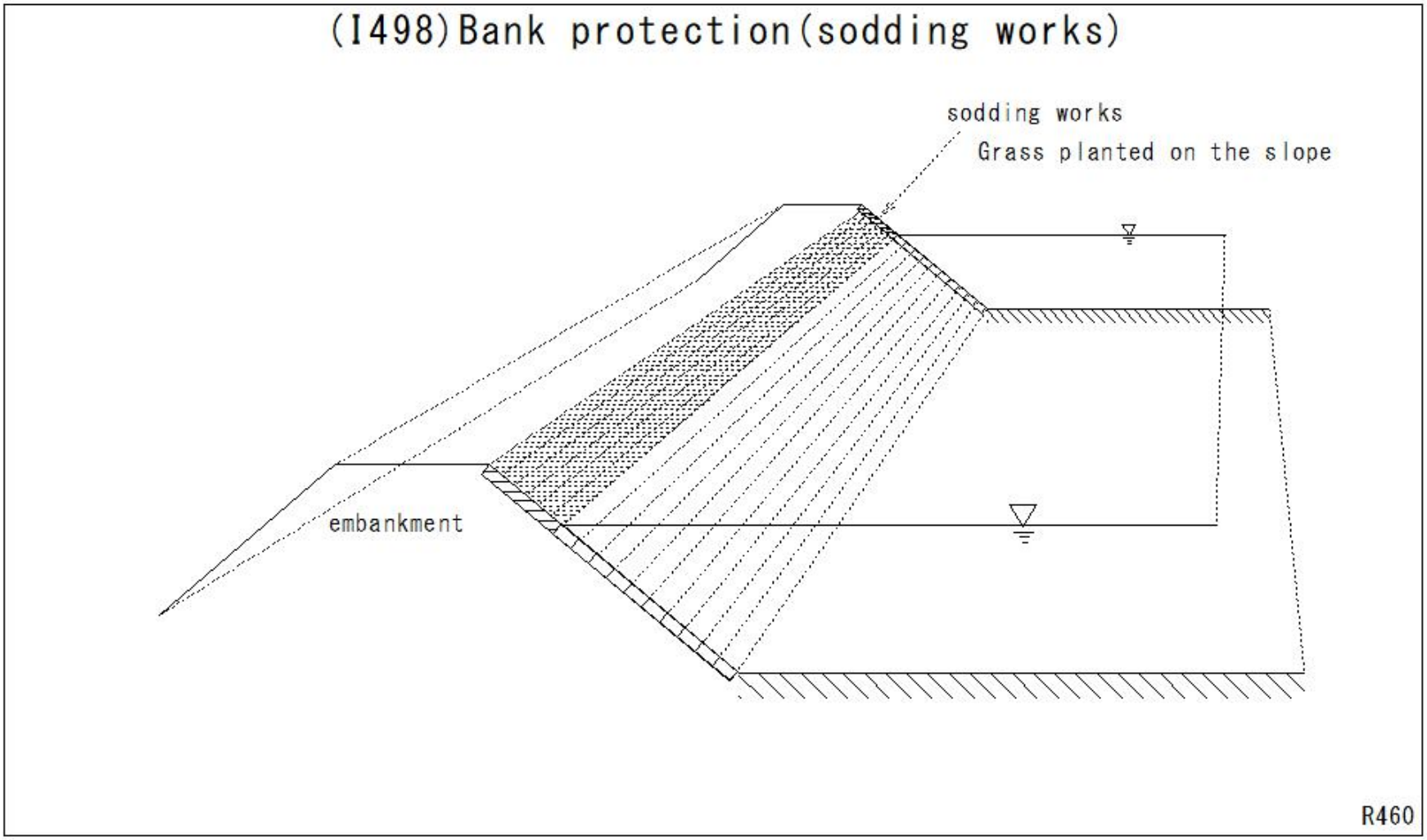
Governing the flow conditions in an open channel

Serves as the starting point for calculating drainage curves.



R360

(I498)Bank protection(sodding works)

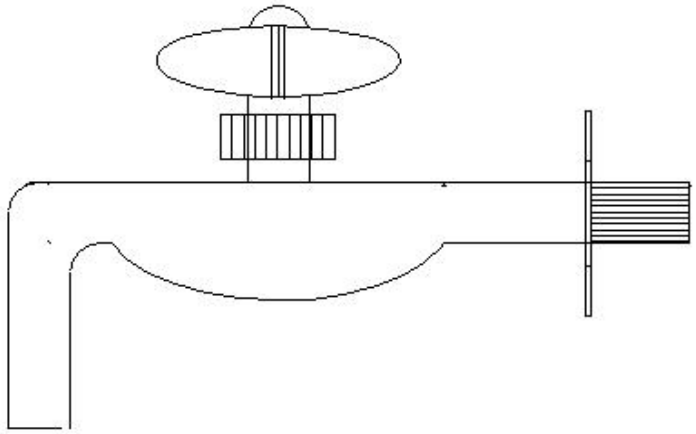


(I499)Self closing tap

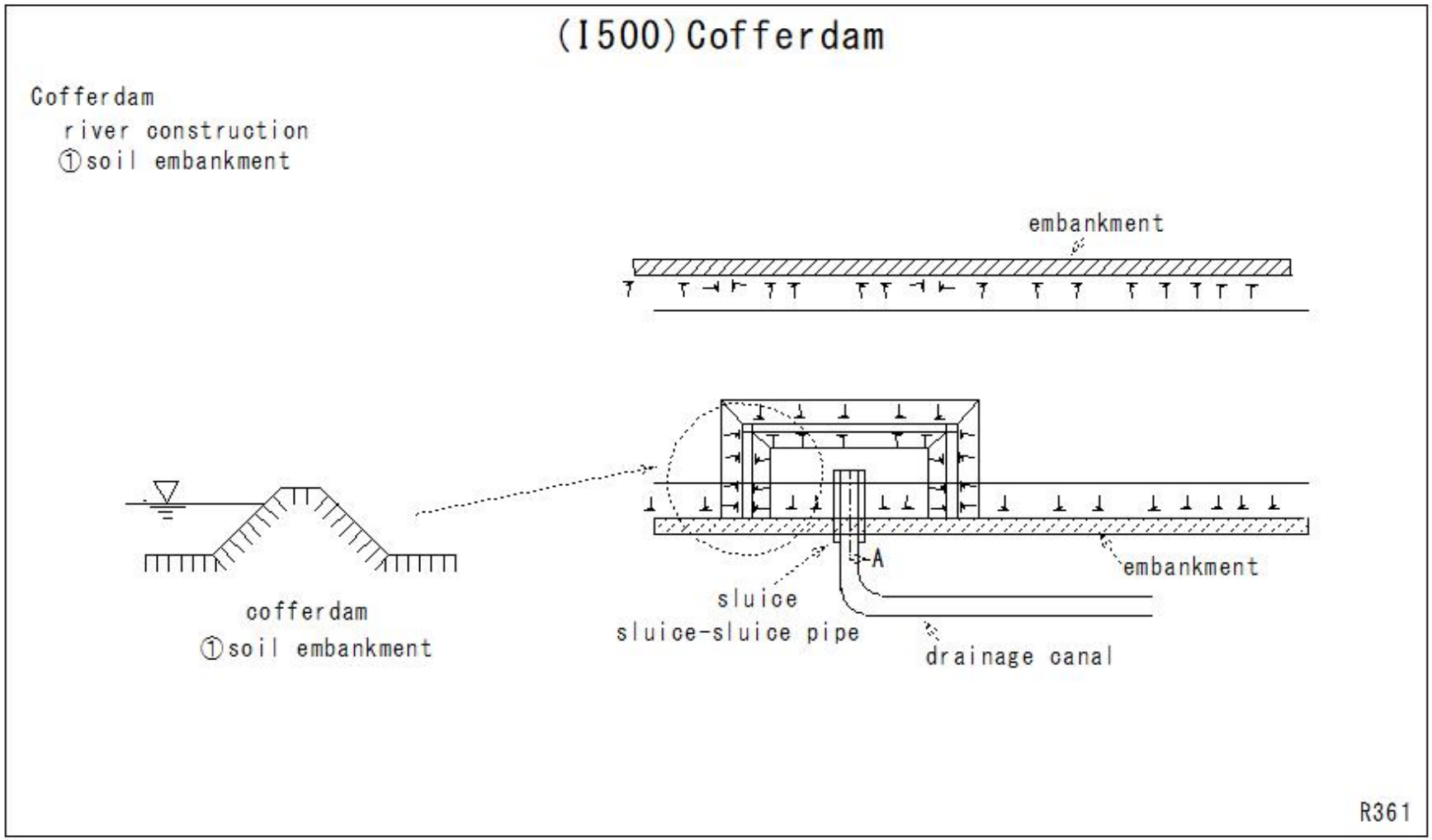
(I499)Self closing tap

Self closing tap

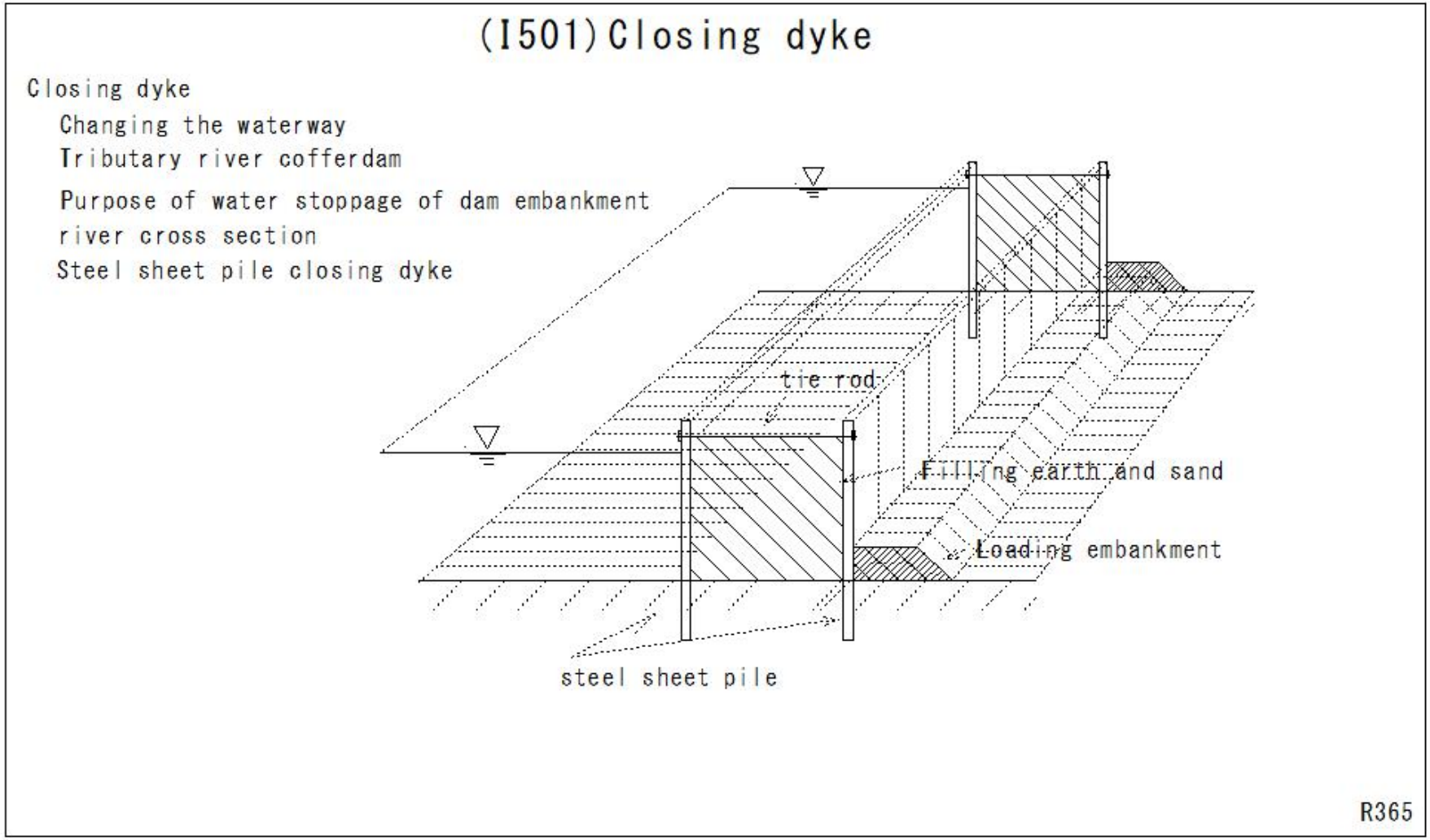
A self-closing faucet is a faucet that starts water flowing when you press the handle or lever once and stops automatically after a certain period of time or when you release the handle.



(I500)Cofferdam



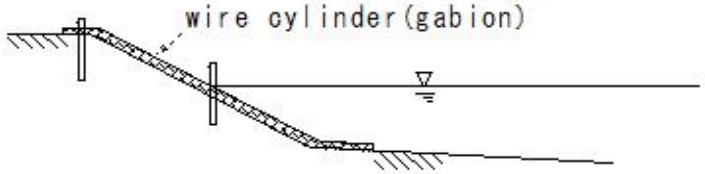
(I501)Closing dyke



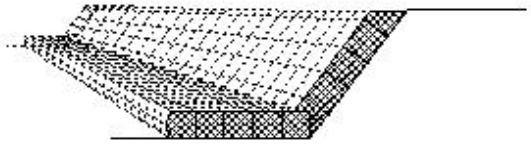
(I502)Wire cylinder(gabion)

(I502)Wire cylinder(gabion)losing dyke

Wire cylinder(gabion)
sluice gate by purpose
Prevention of outflow due to spring water
bank protection
fill with broken stones



wire cylinder masonry work(gabion)

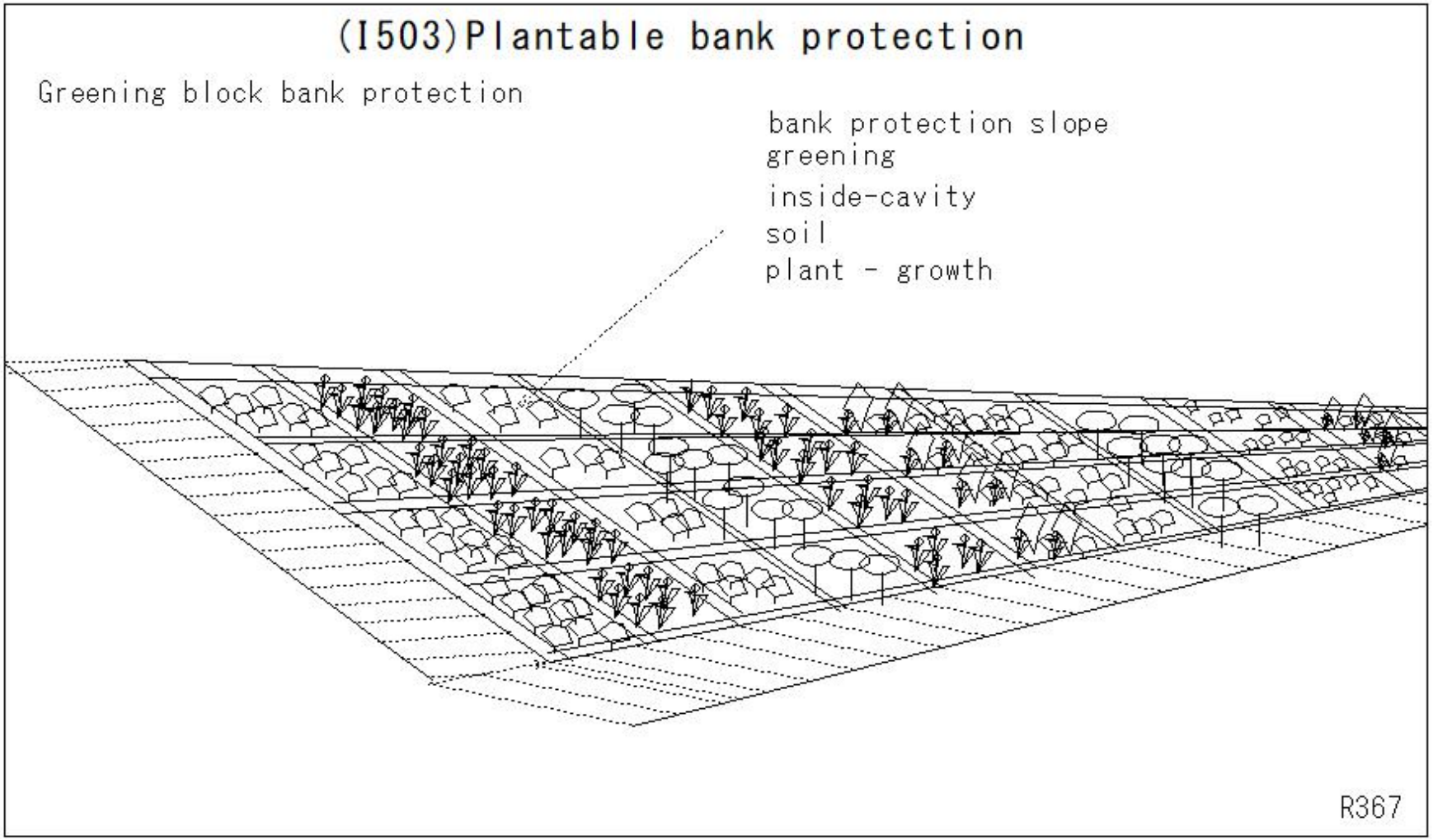


Semi-permeable groin
wire cylinder masonry work(gabion)

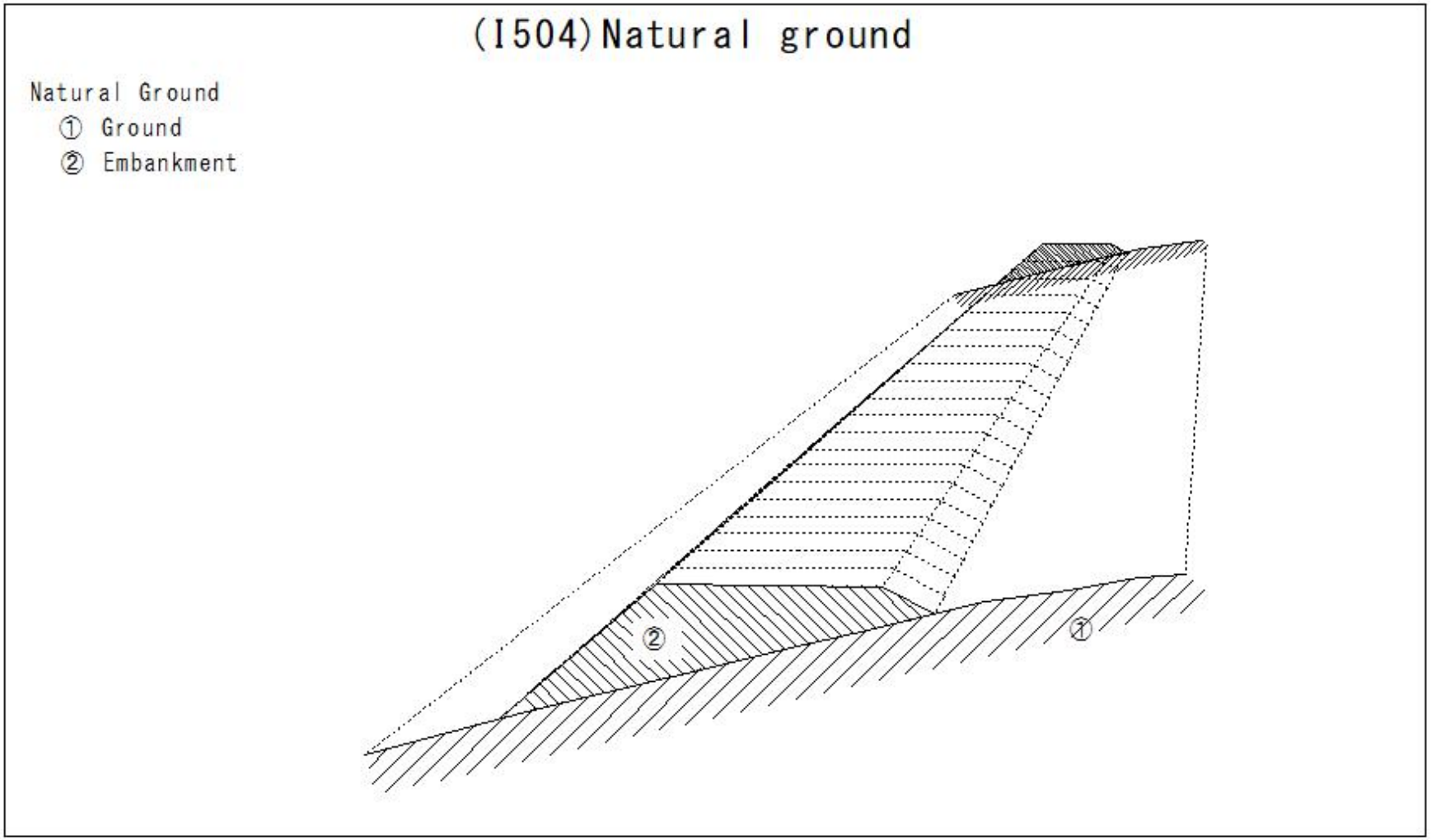
iron wire
Cobblestone/split stone
cylindrical basket
cobblestone
fill with broken stones

R366

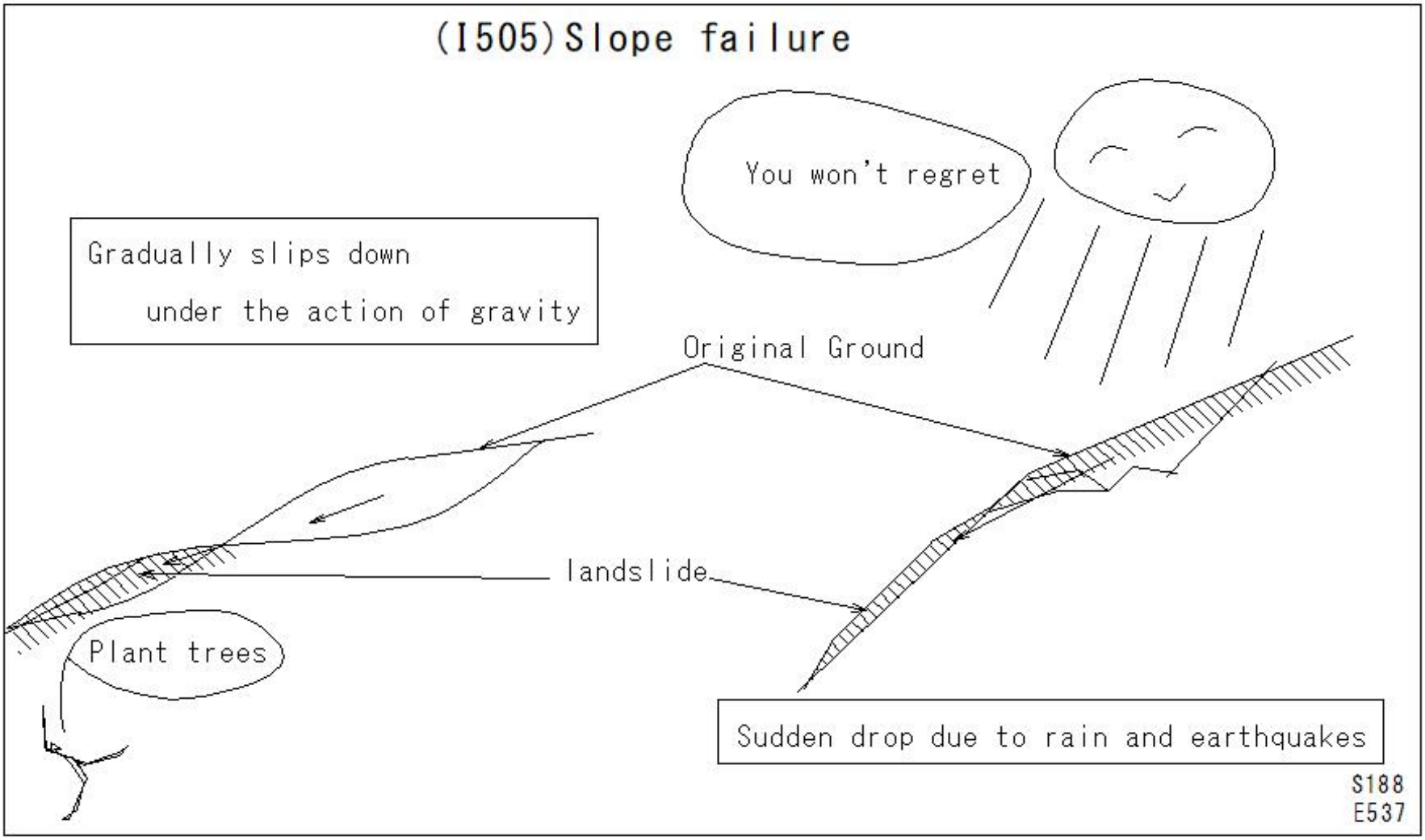
(I503)Wire cylinder(gabion)



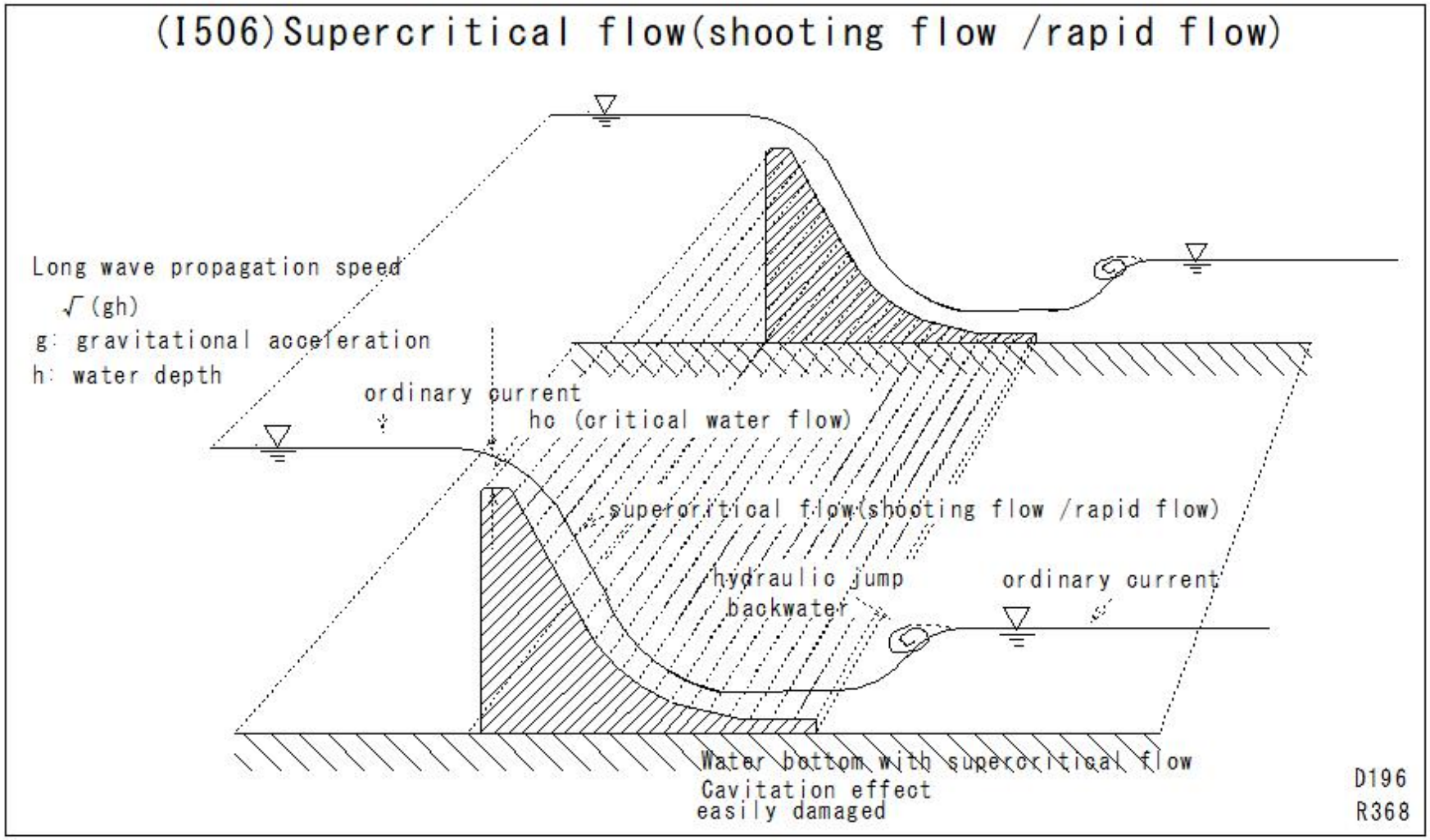
(I504)Natural ground



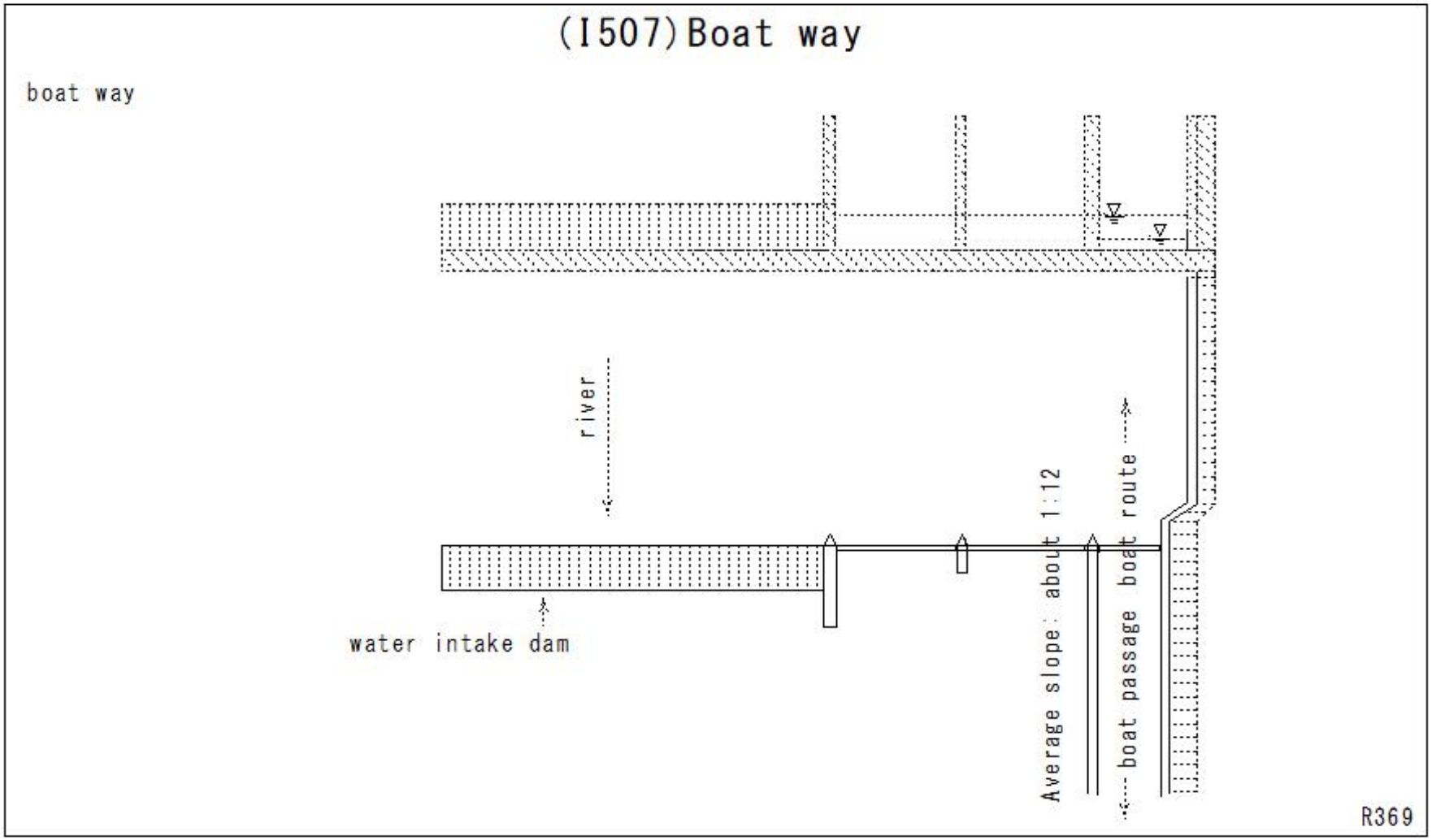
(I505)Slope failure



(I506)Supercritical flow(shooting flow /rapid flow)



(I507)Boat way



(I508)Catchment well(Drainage well)

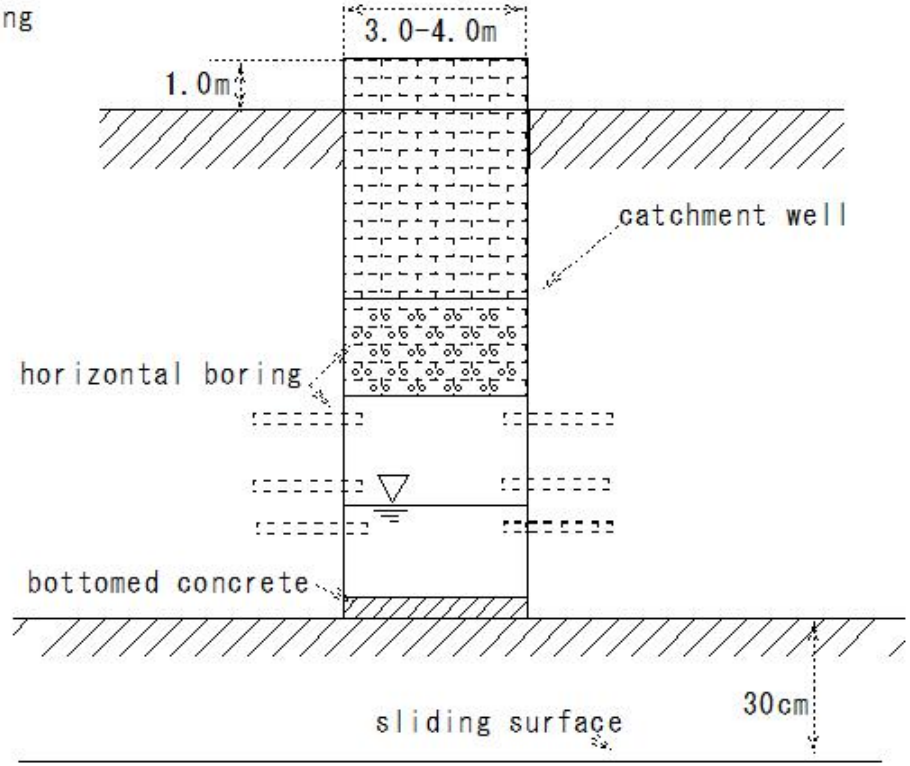
(I508)Catchment well

Catchment well

Landslide surface

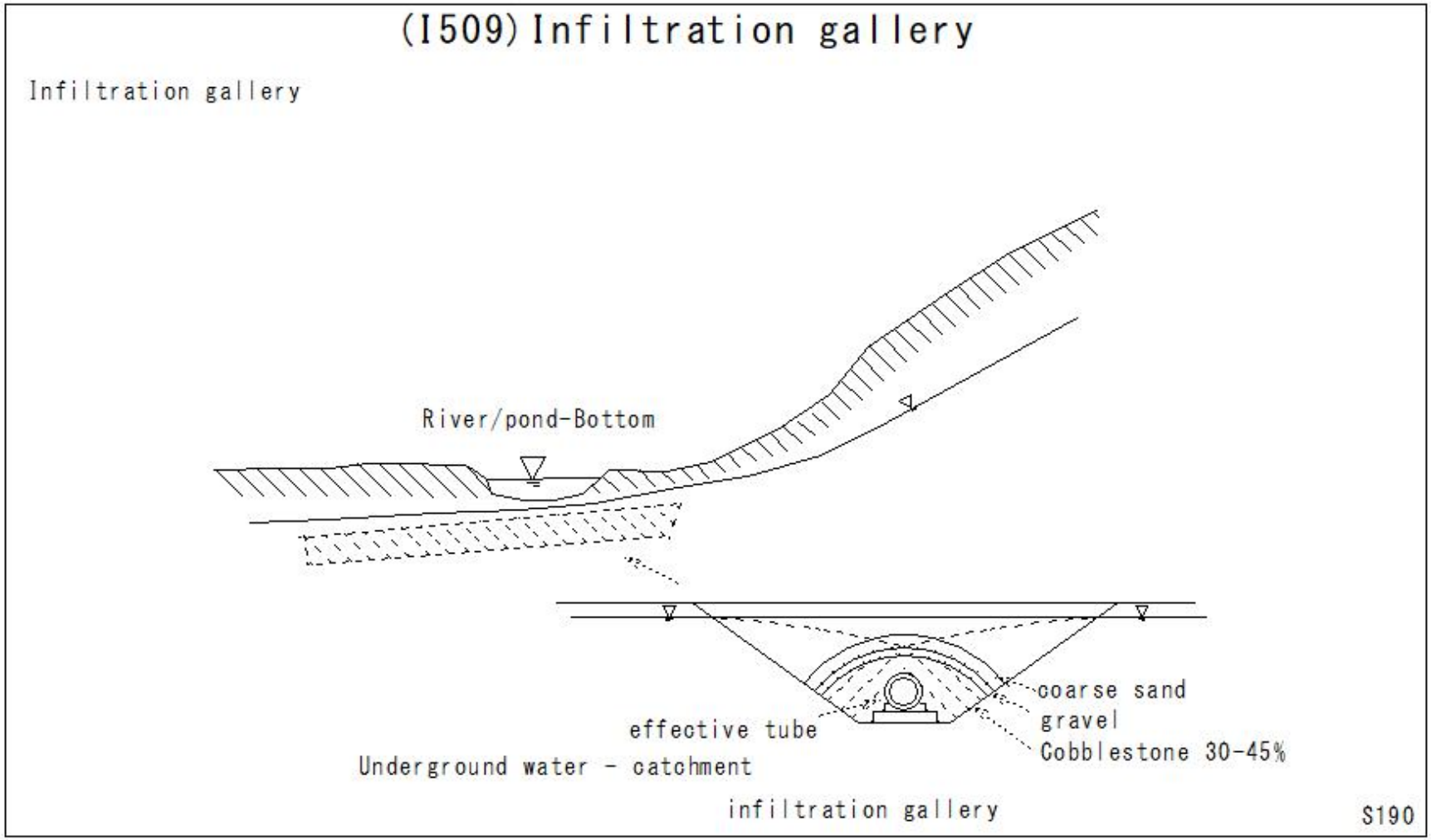
a well collects water above the landslide surface

horizontal boring

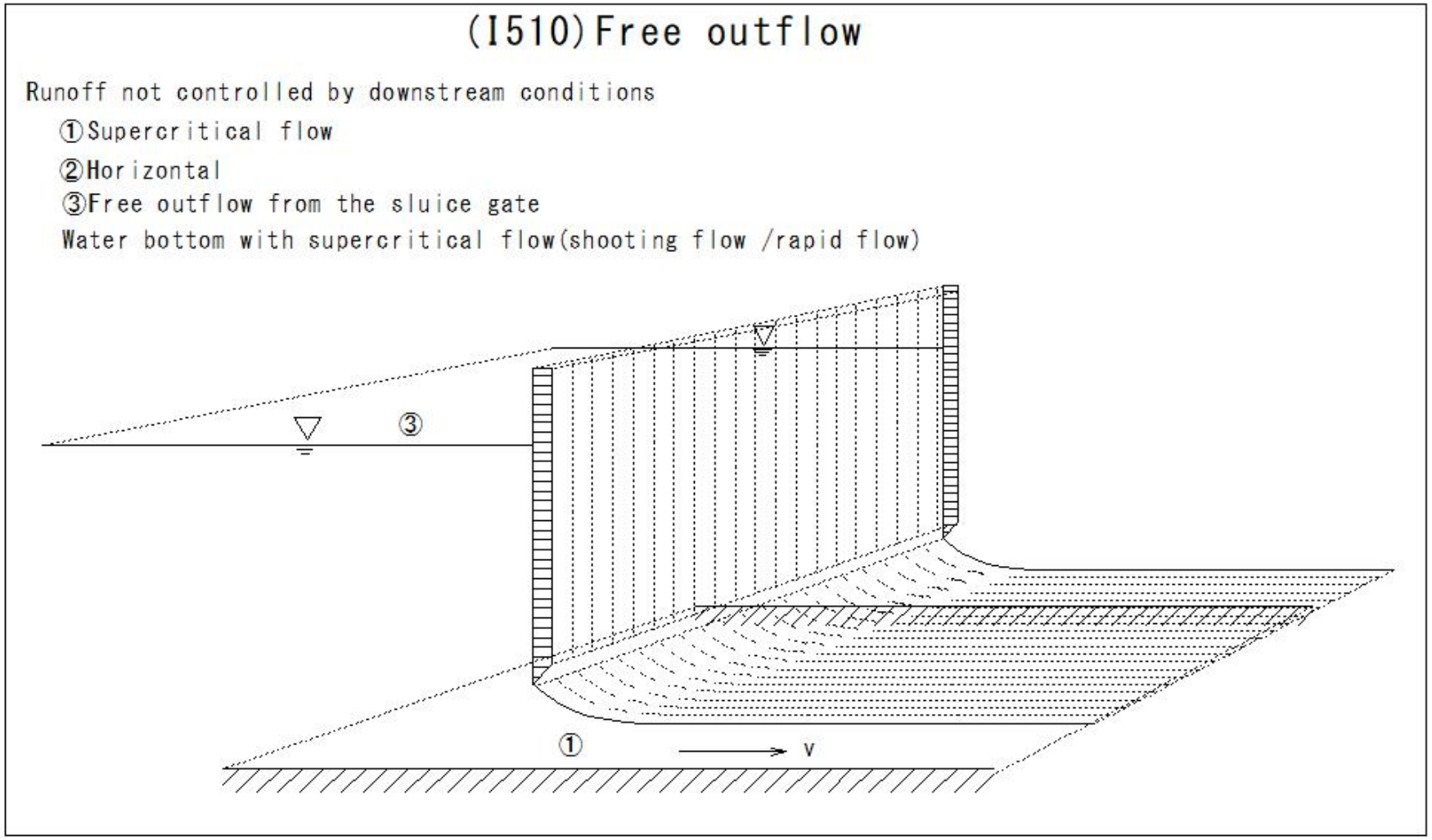


S189

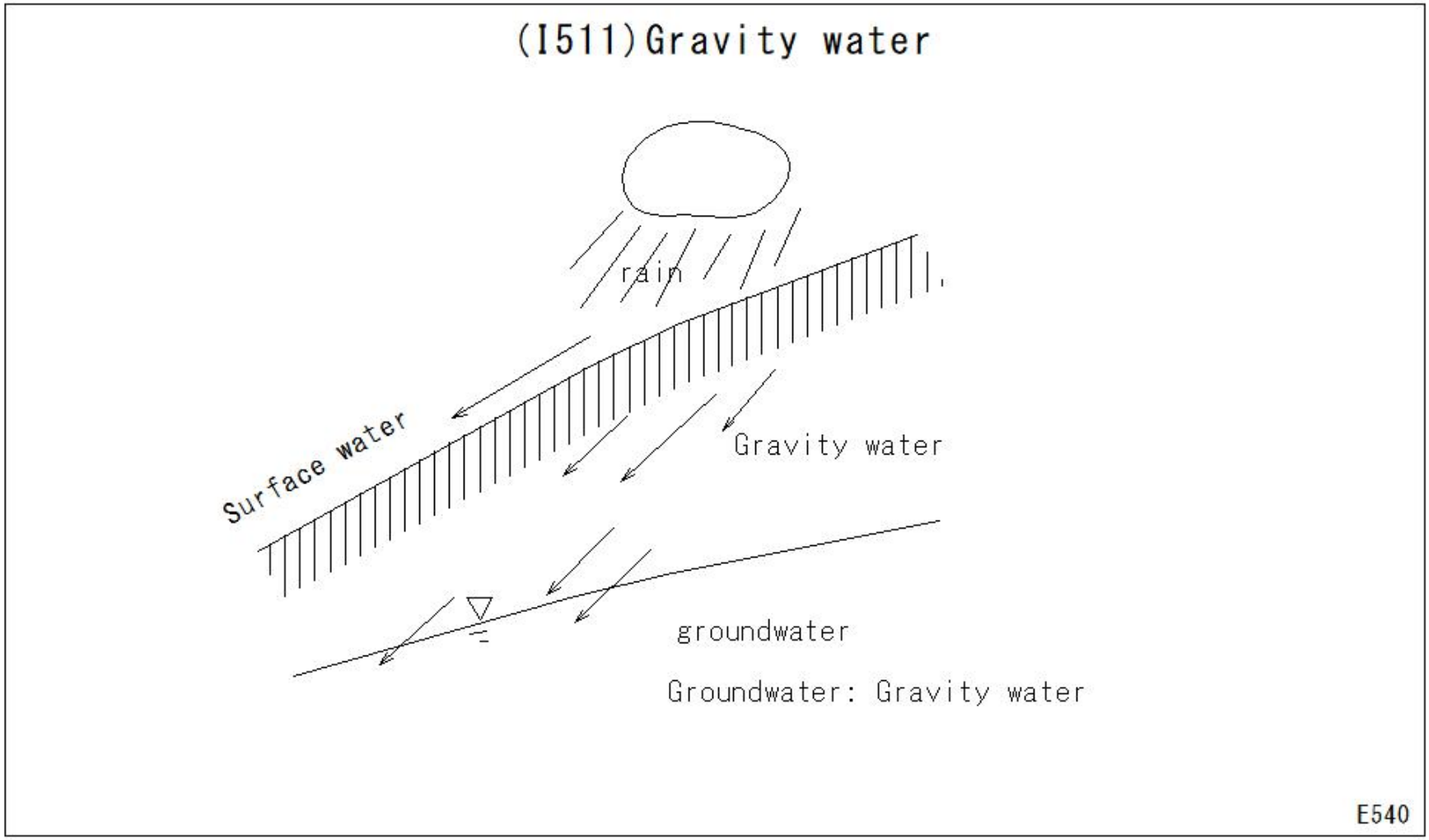
(I509)Infiltration gallery



(I510)Free outflow



(I511)Gravity water

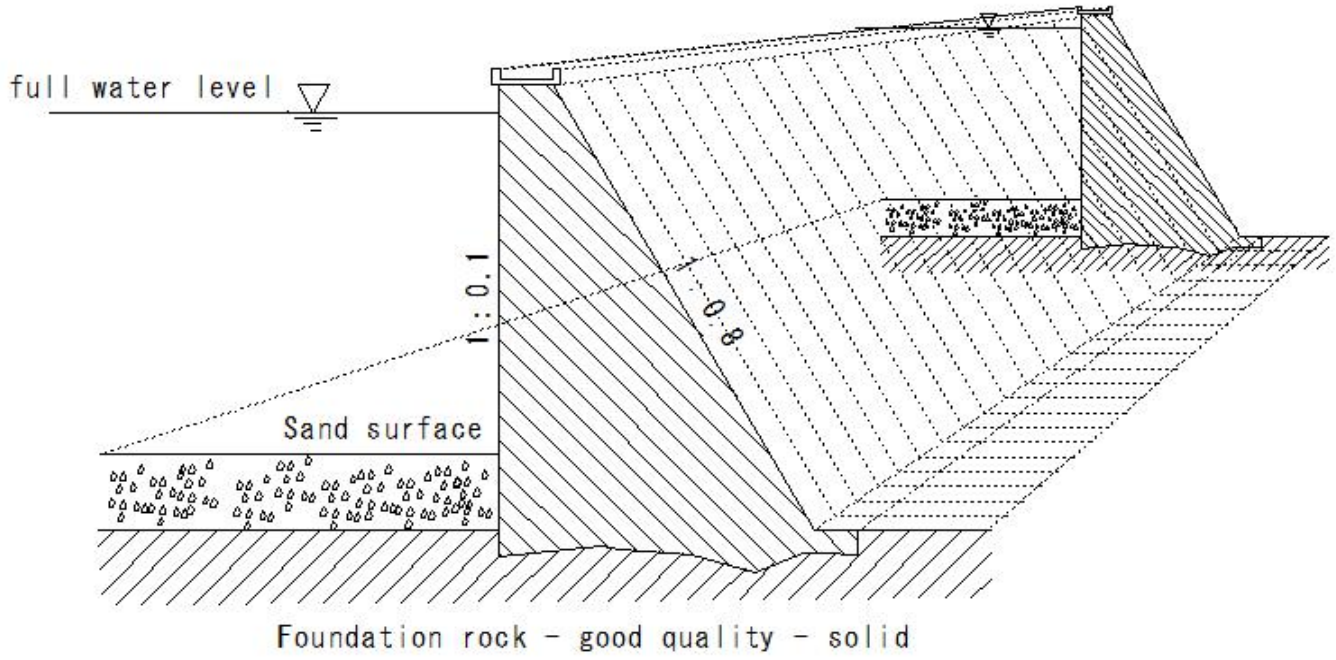


(I512)Gravity dam

(I512)Gravity dam

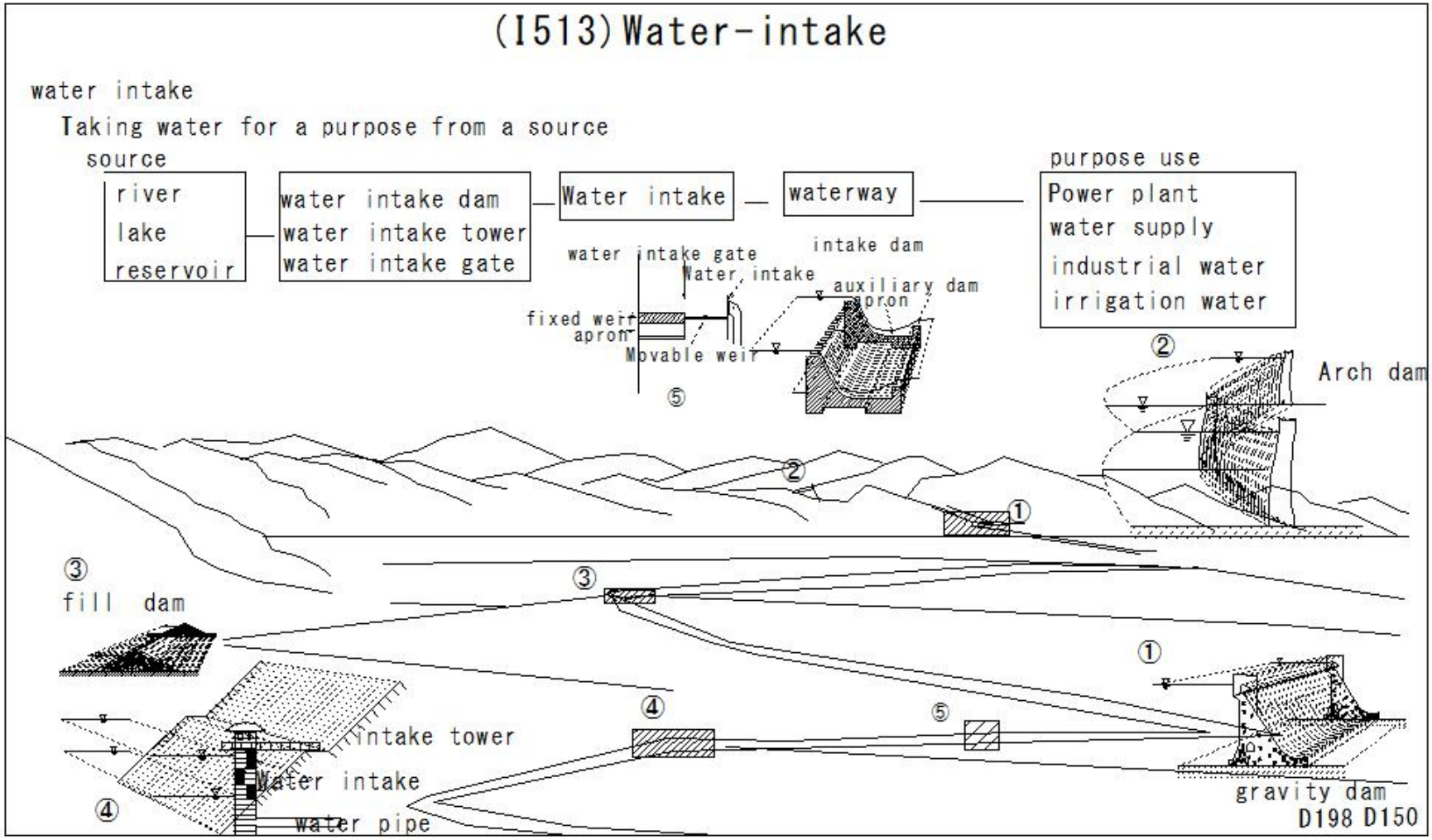
Gravity dam

- Concrete weight of the dam body
- Water pressure: Withstands external forces
- Foundation rock - good quality - solid



D197

(I513)Water-intake

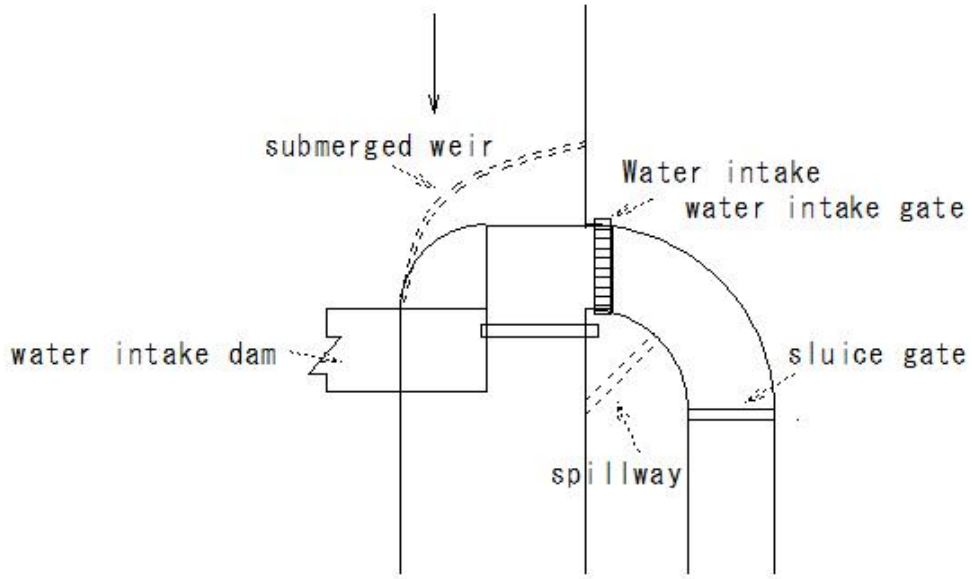


(I514)Intake

(I514) Intake

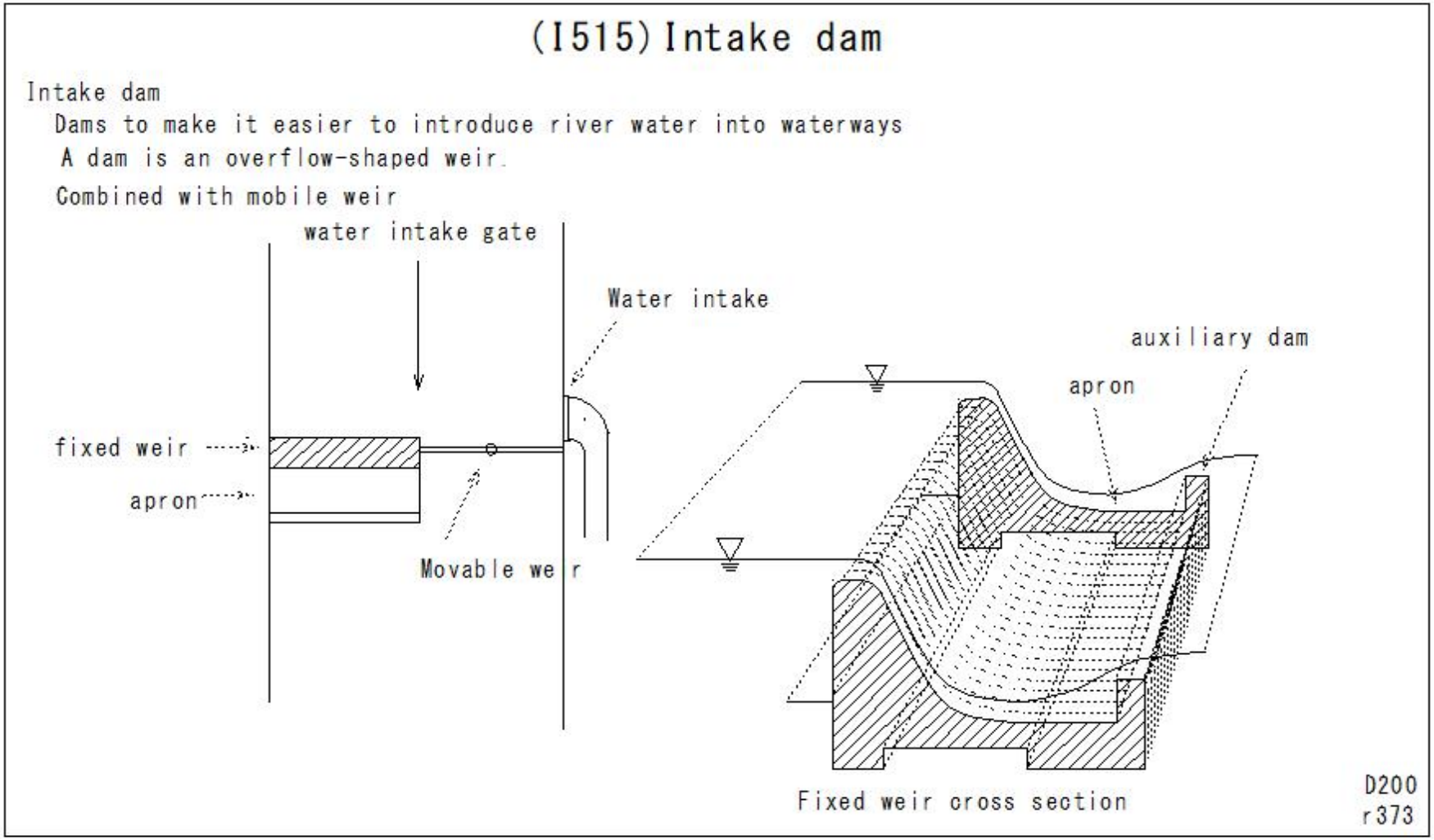
Intake

An inlet that introduces water from a river, lake, or reservoir into a waterway



D199
r372

(I515)Intake dam



(I516)Intake dam

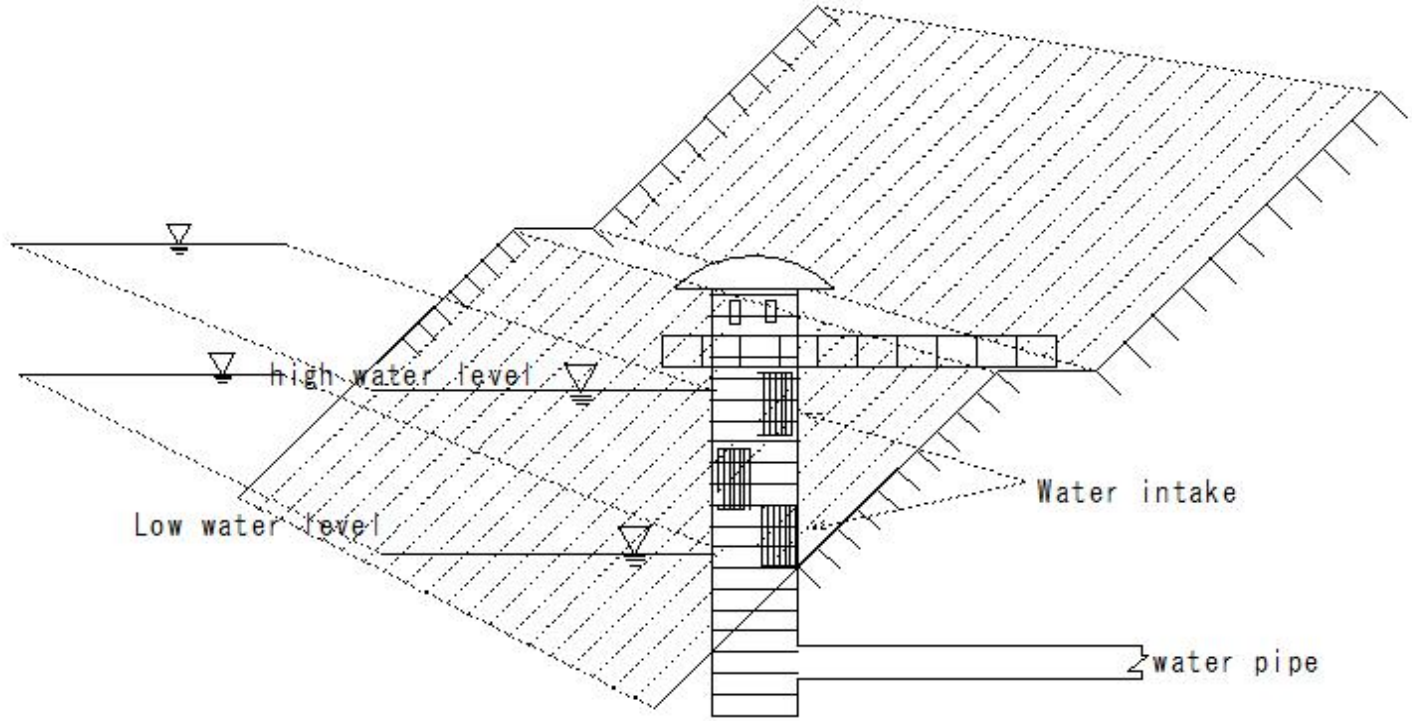
(I516) Intake dam

Intake tower

Tower for taking water at any depth from rivers, lakes, and reservoirs

A tower built underwater

Various water intakes are provided to accommodate changes in water level.



D201
r374

(I517)Circular society

(I517)Circular society

Circular society(Recycling-oriented society)

① Pavement using recycled materials

Low-noise pavement

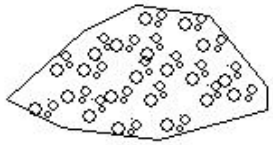
② Construction sludge used as embankment material

③ Concrete structures
(recycled aggregate)

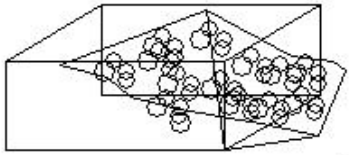
④ Construction sludge

⑤ Recycling facilities

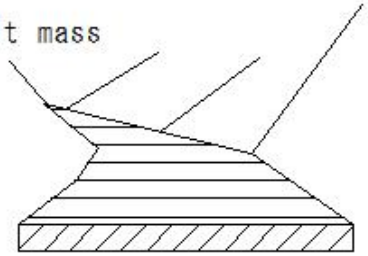
Earth and sand generated during construction



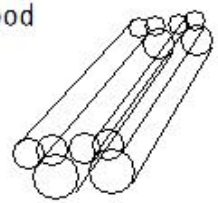
Concrete block: Used as recycled aggregate, etc.



Asphalt mass

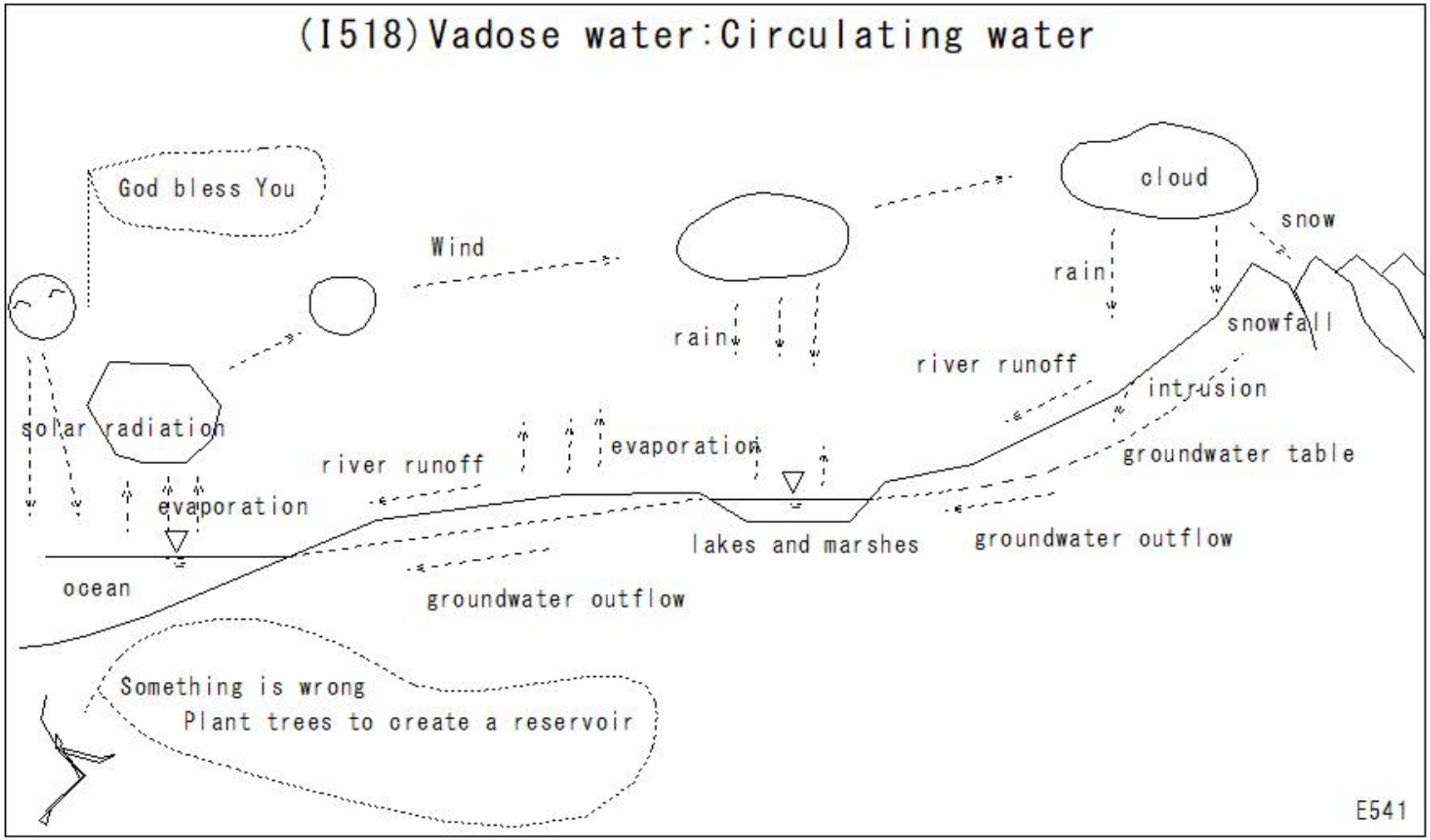


Wood

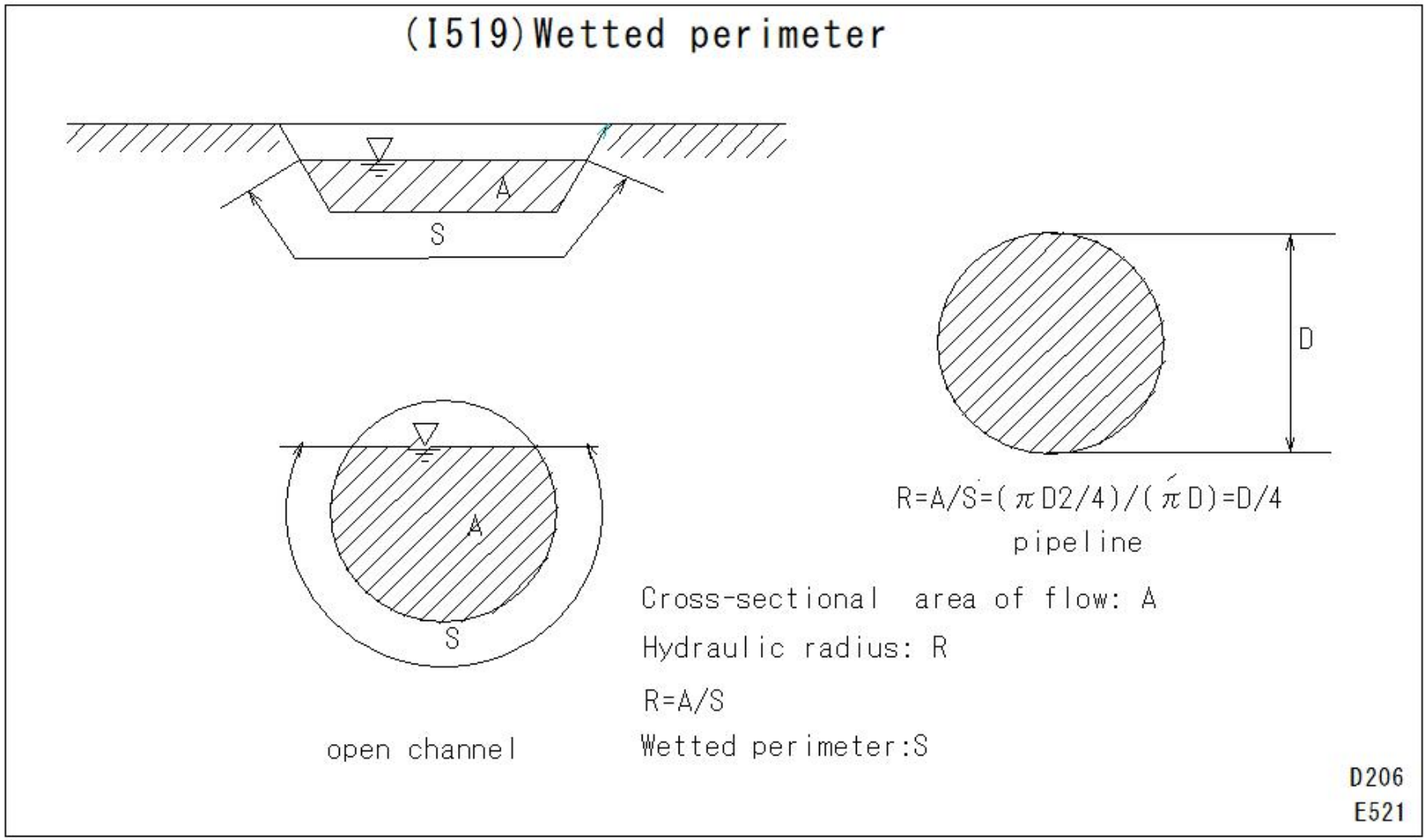


CM939

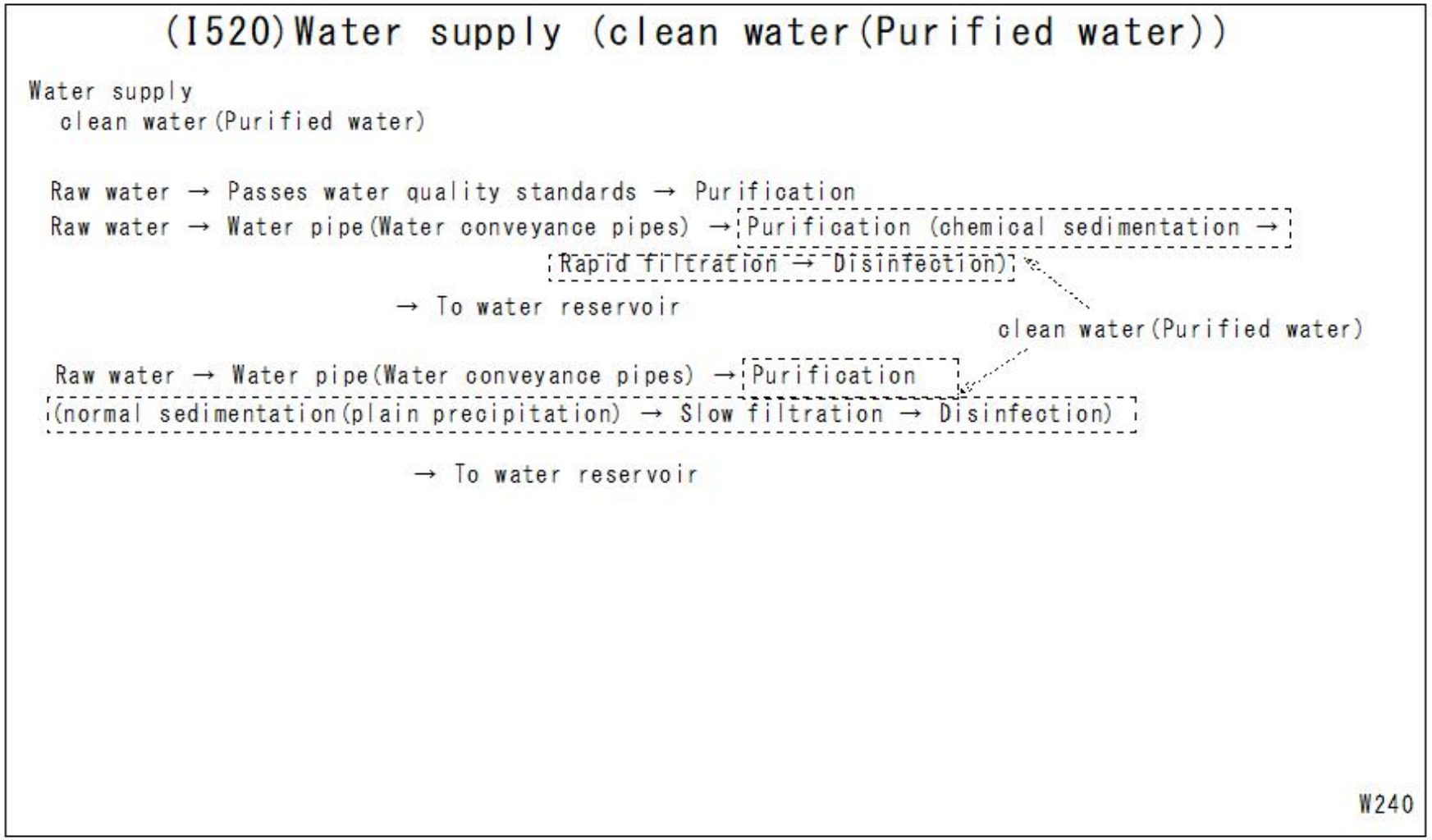
(I518)Vadose water:Circulating water



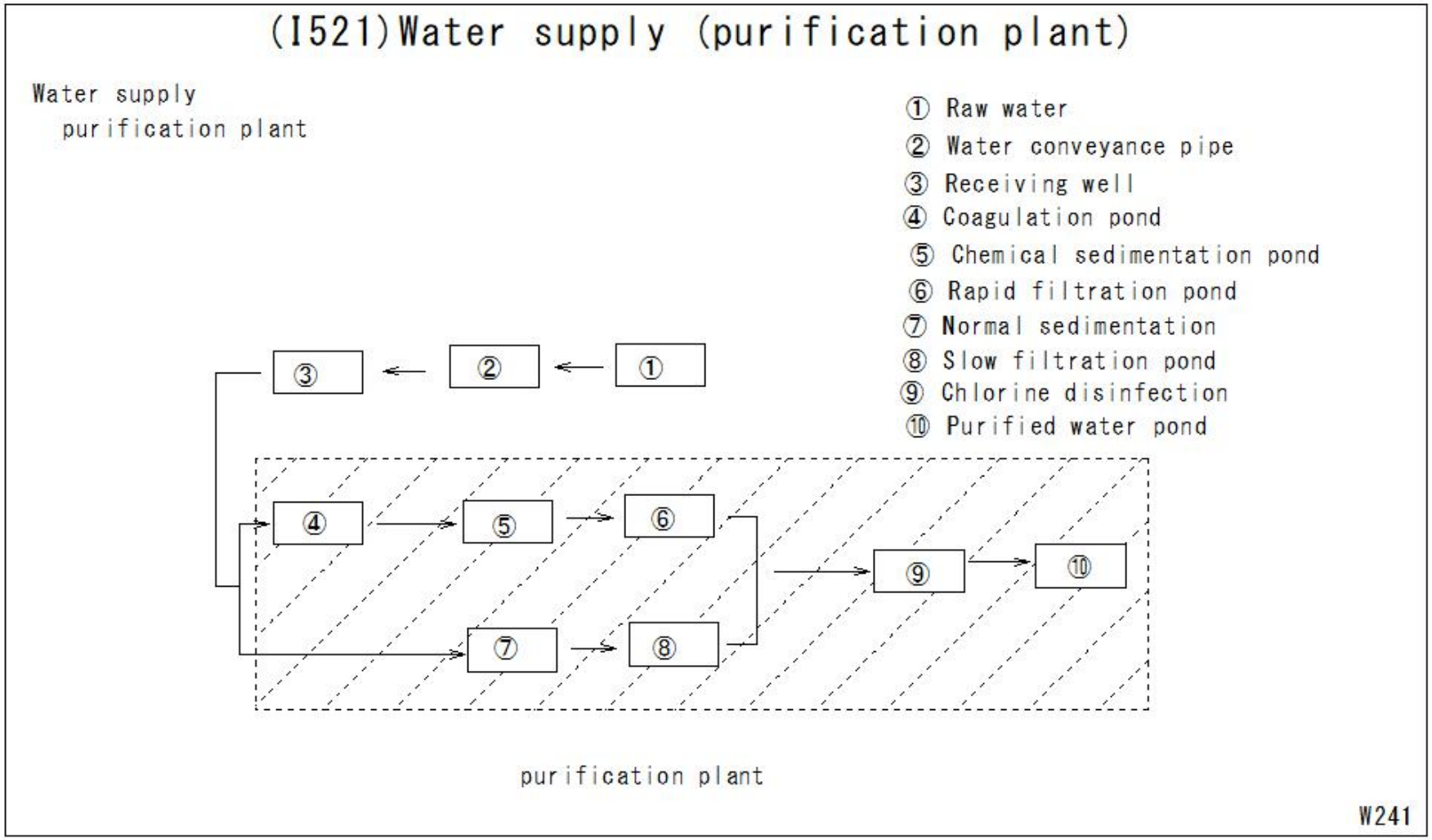
(I519)Wetted perimeter



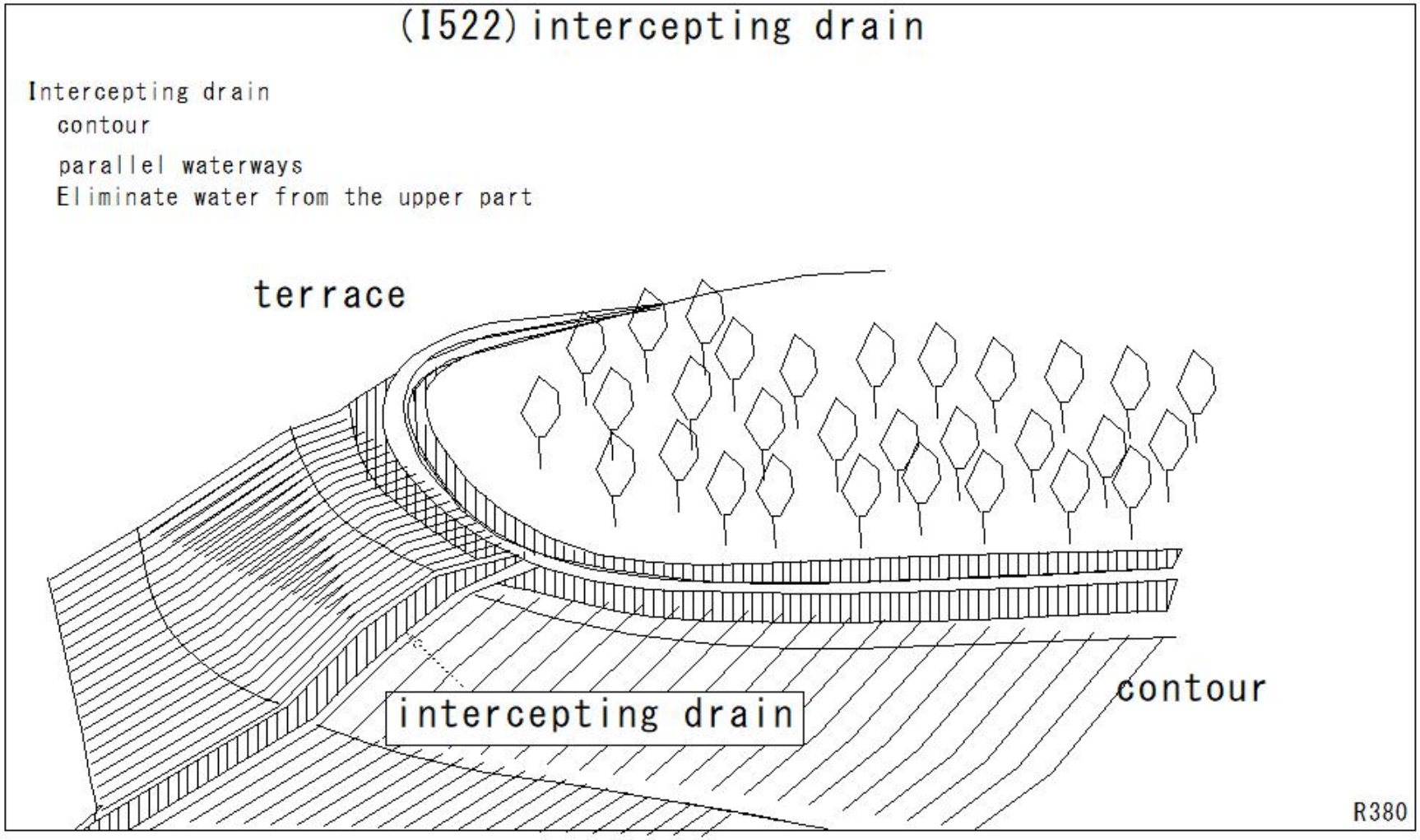
(I520)Water supply (clean water(Purified water))



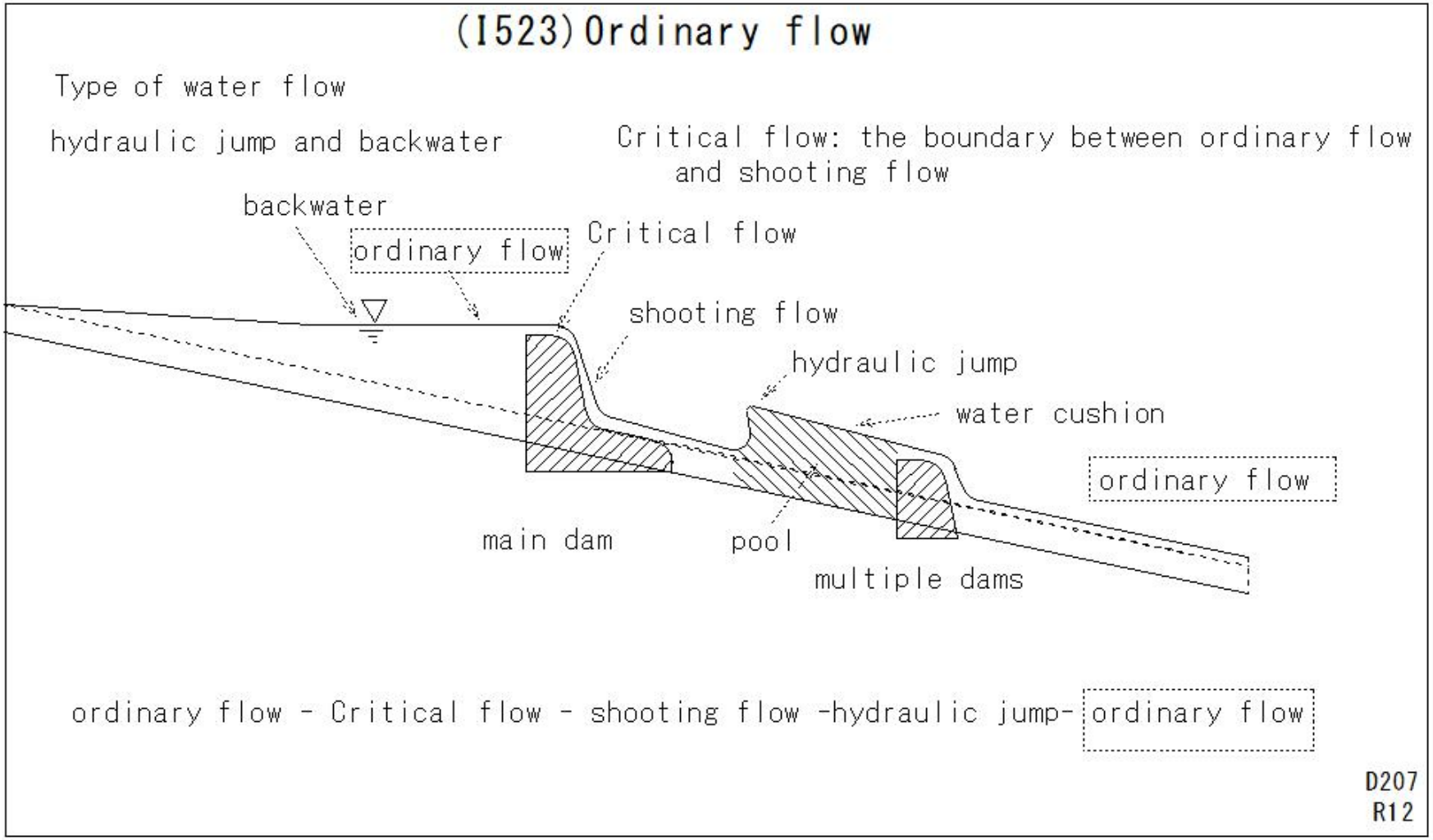
(I521)Water supply (purification plant)



(I522)Intercepting drain



(I523)Ordinary flow



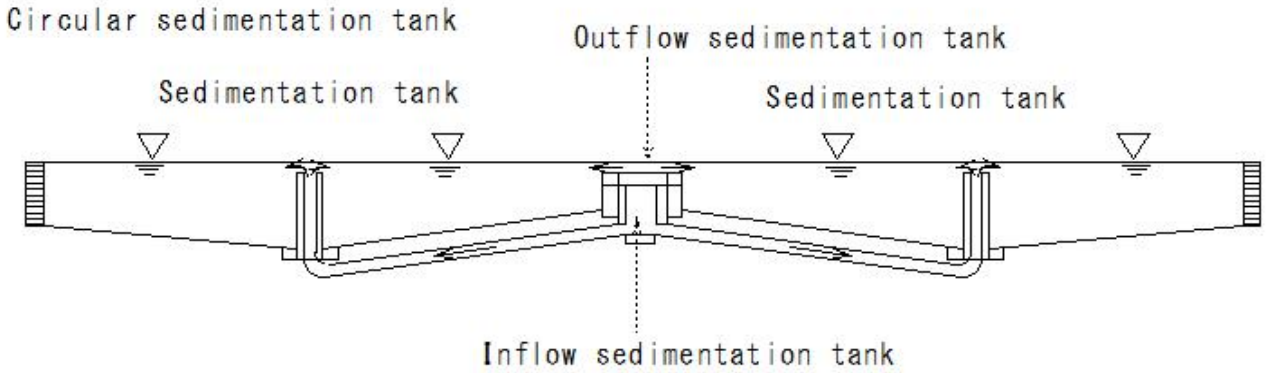
(I524)Water supply (continuous flow setting basin)

(I524)Water supply (continuous flow setting basin)

Water supply

continuous flow setting basin

A type of sedimentation tank for water purification



A type of sedimentation tank for water purification

W242

(I525)Salt Exclusion

(I525)Salt Exclusion

Salt Exclusion

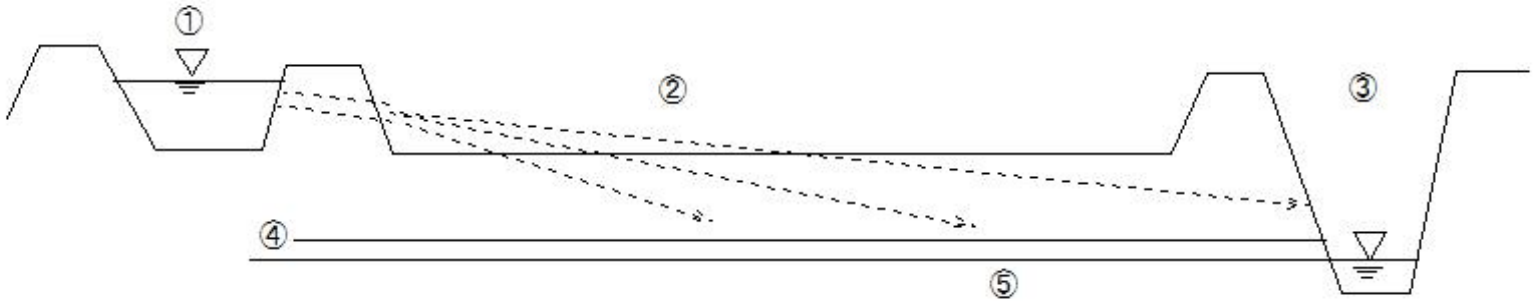
①Fresh water

②Salinity below 3%

③Salt removal tank

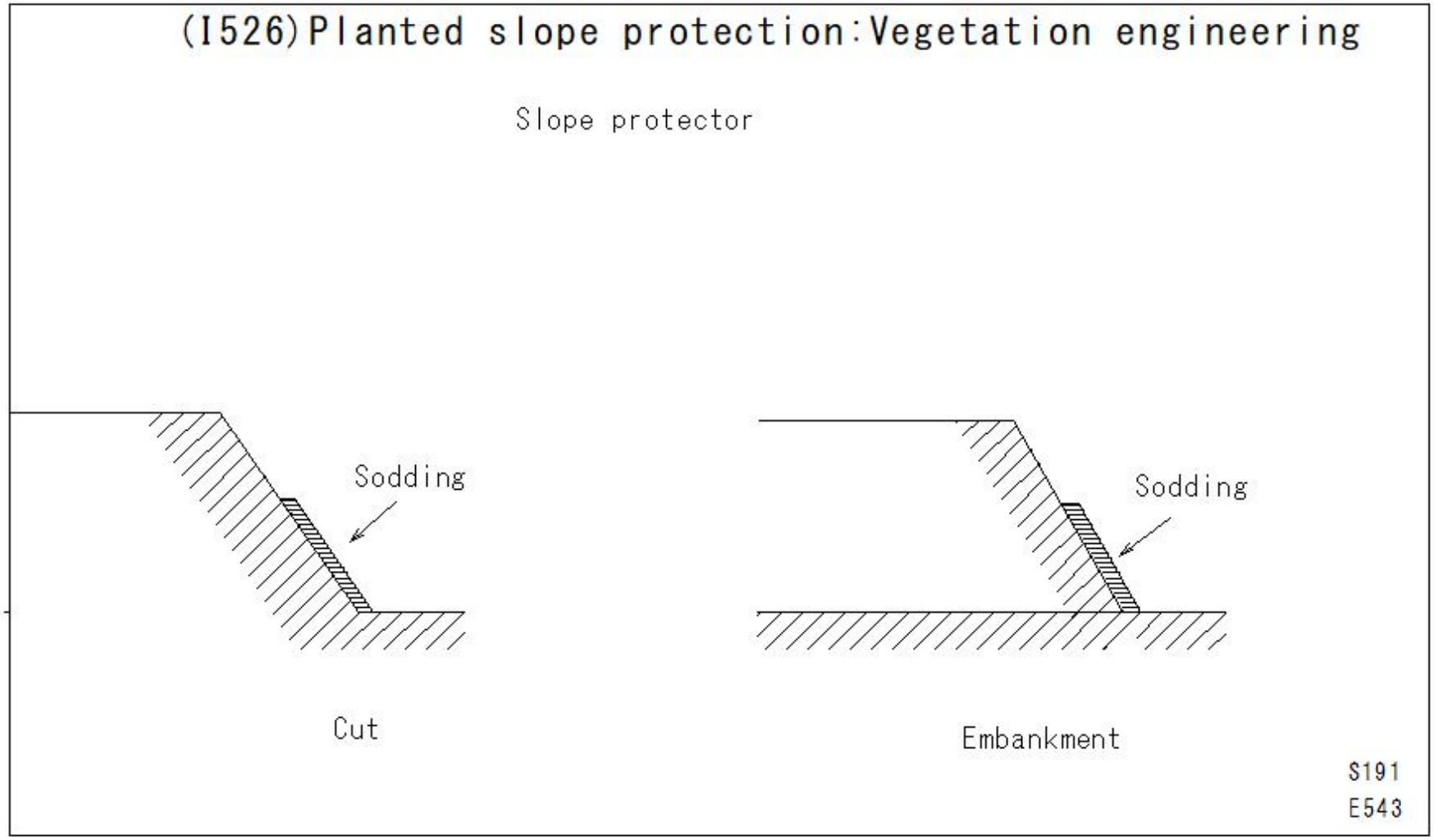
④Groundwater level (below 50cm)

⑤Underground drainage pipe

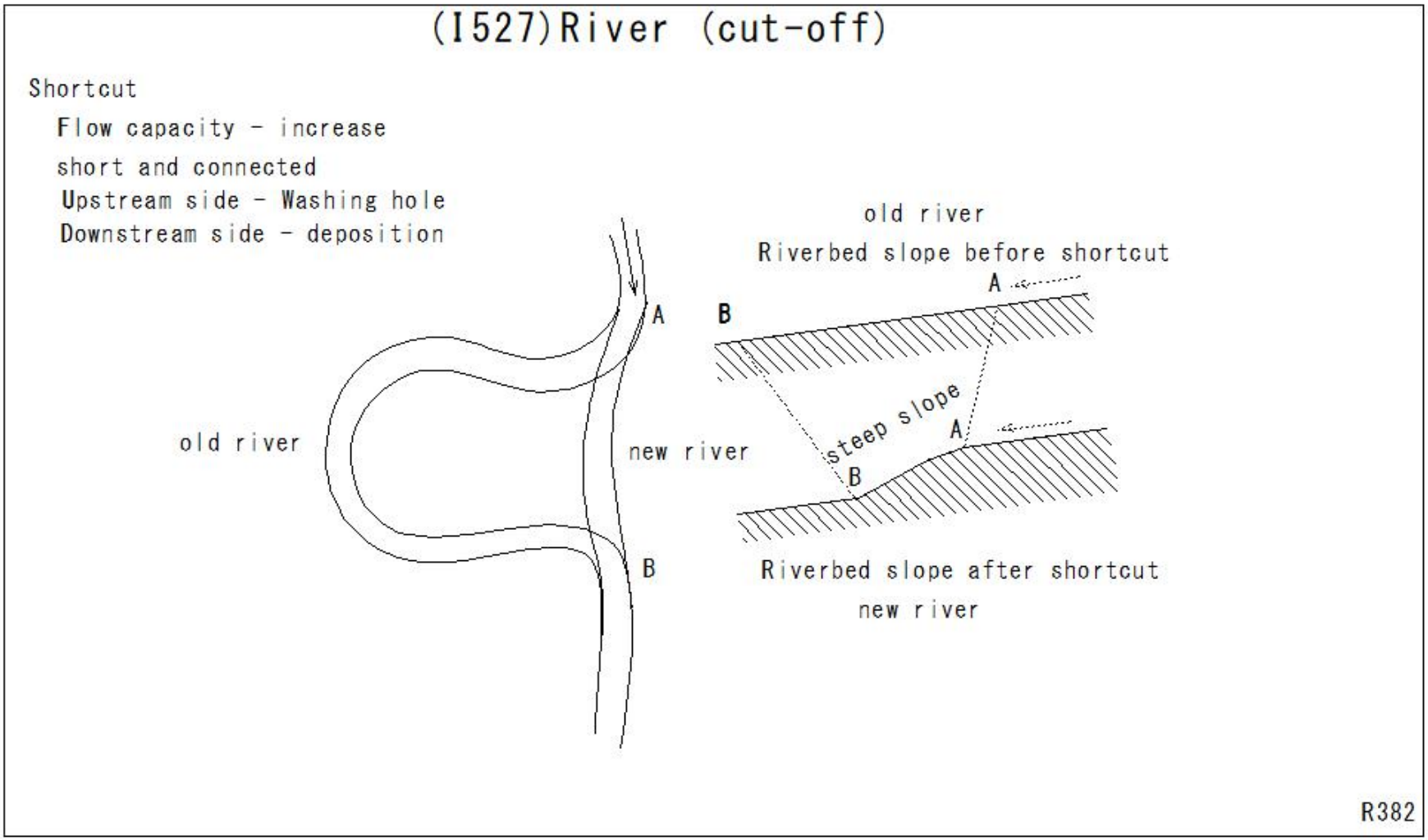


Salt removal is the process of washing away excess salt from the soil, mainly in agricultural land, and neutralizing the salt with soil conditioners.

(I526)Planted slope protection:Vegetation engineering



(I527)River (cut-off)



(I528)Silt layer

(I528)Silt layer

Silt layer

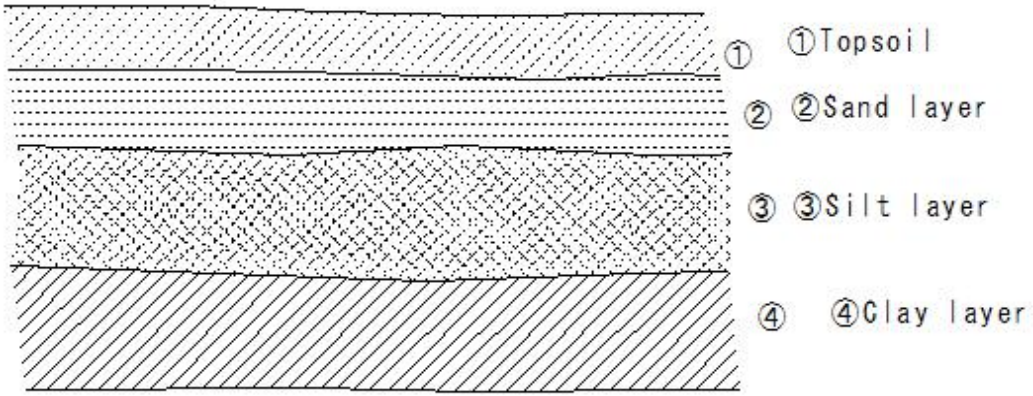
Disadvantages of silt layers

Low frictional resistance

Low compressibility

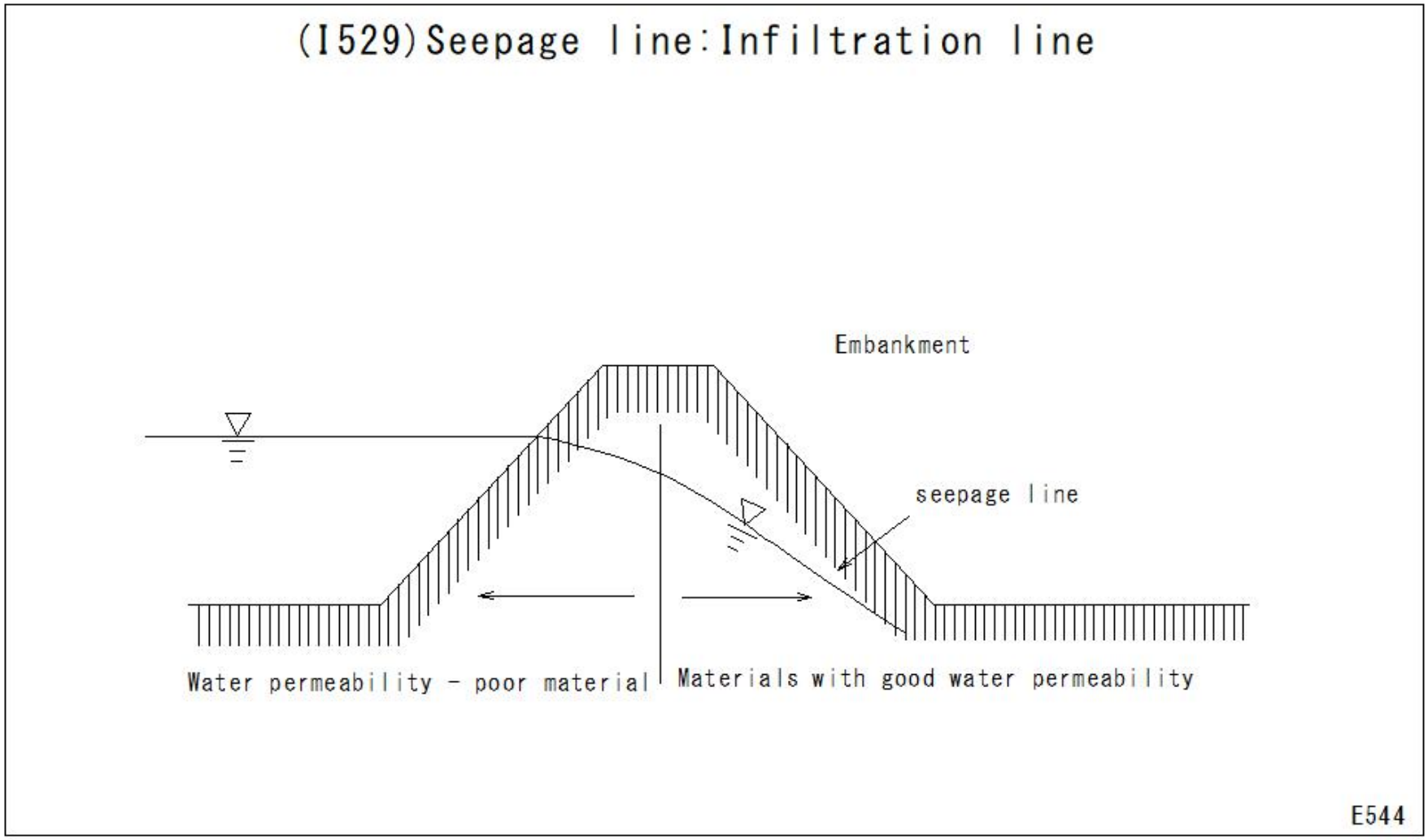
Easy to flow

High capillary action

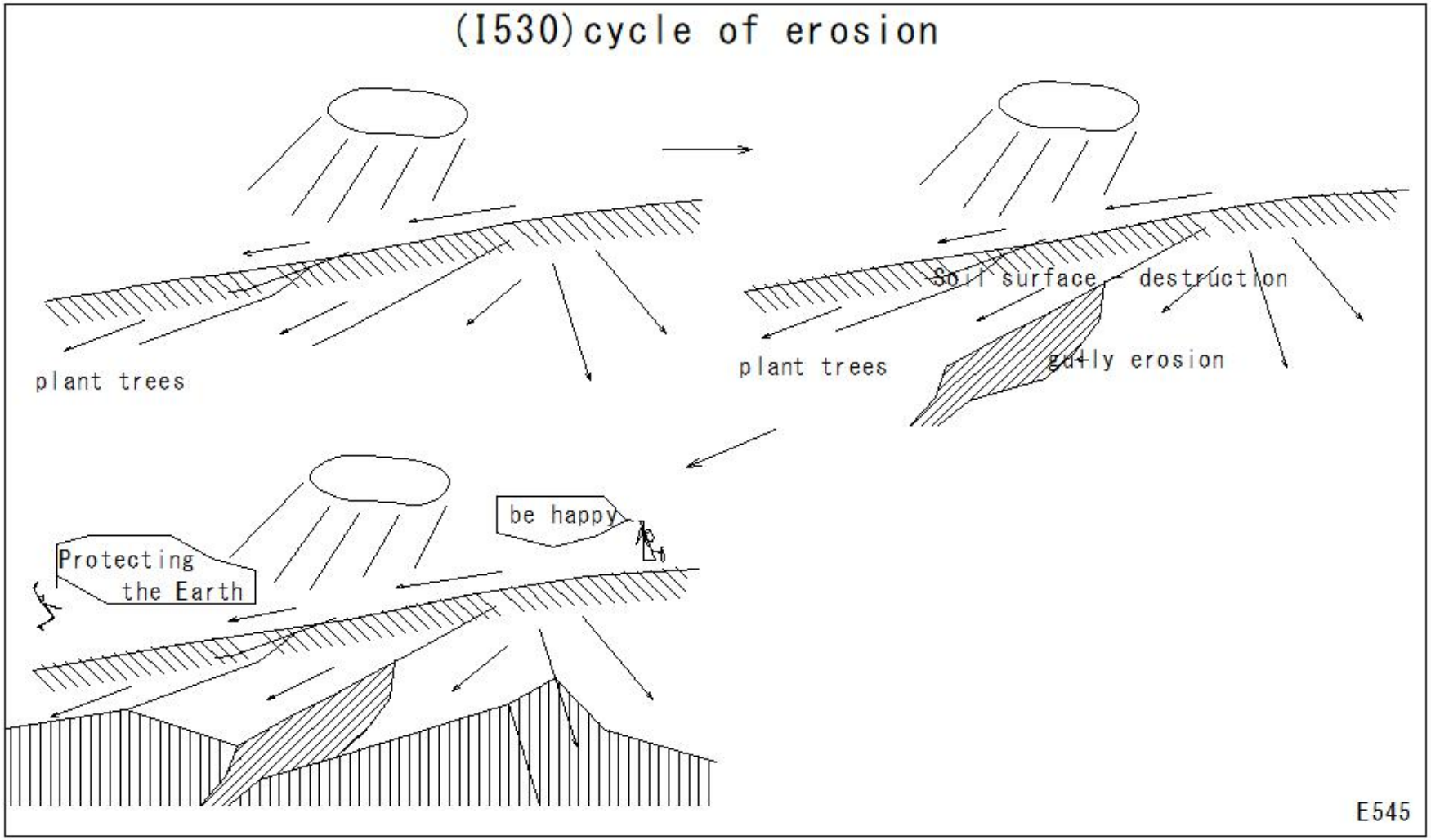


Examples of strata

(I529)Seepage line:Infiltration line



(I530)Cycle of erosion



(I531)Hydraulic pressure

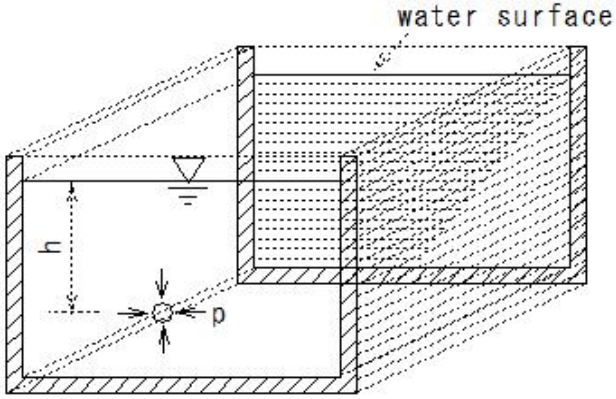
(I531)Hydraulic pressure

Hydraulic pressure

hydraulic pressure p=wh

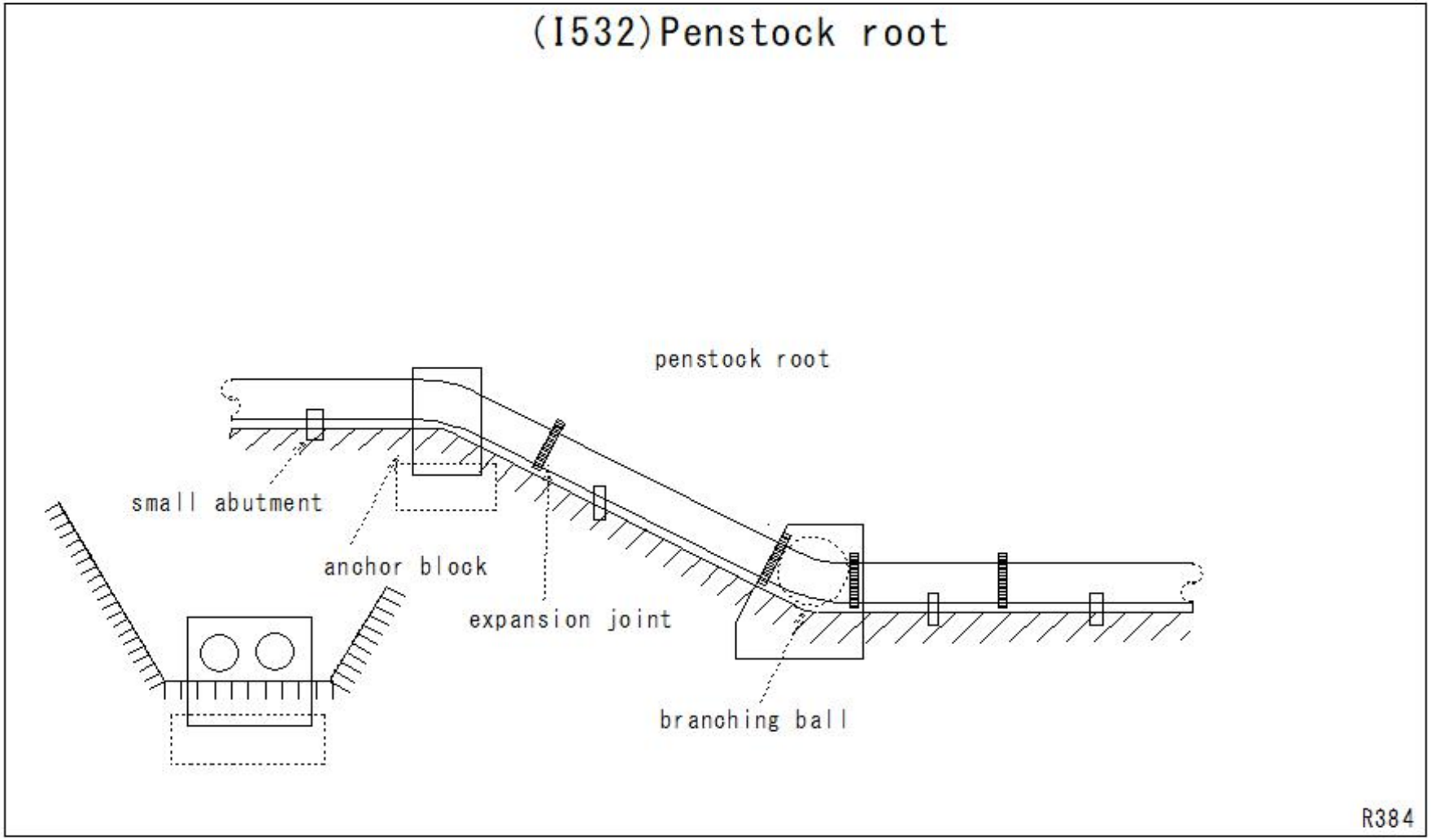
w: unit volume mass of water

h: water depth

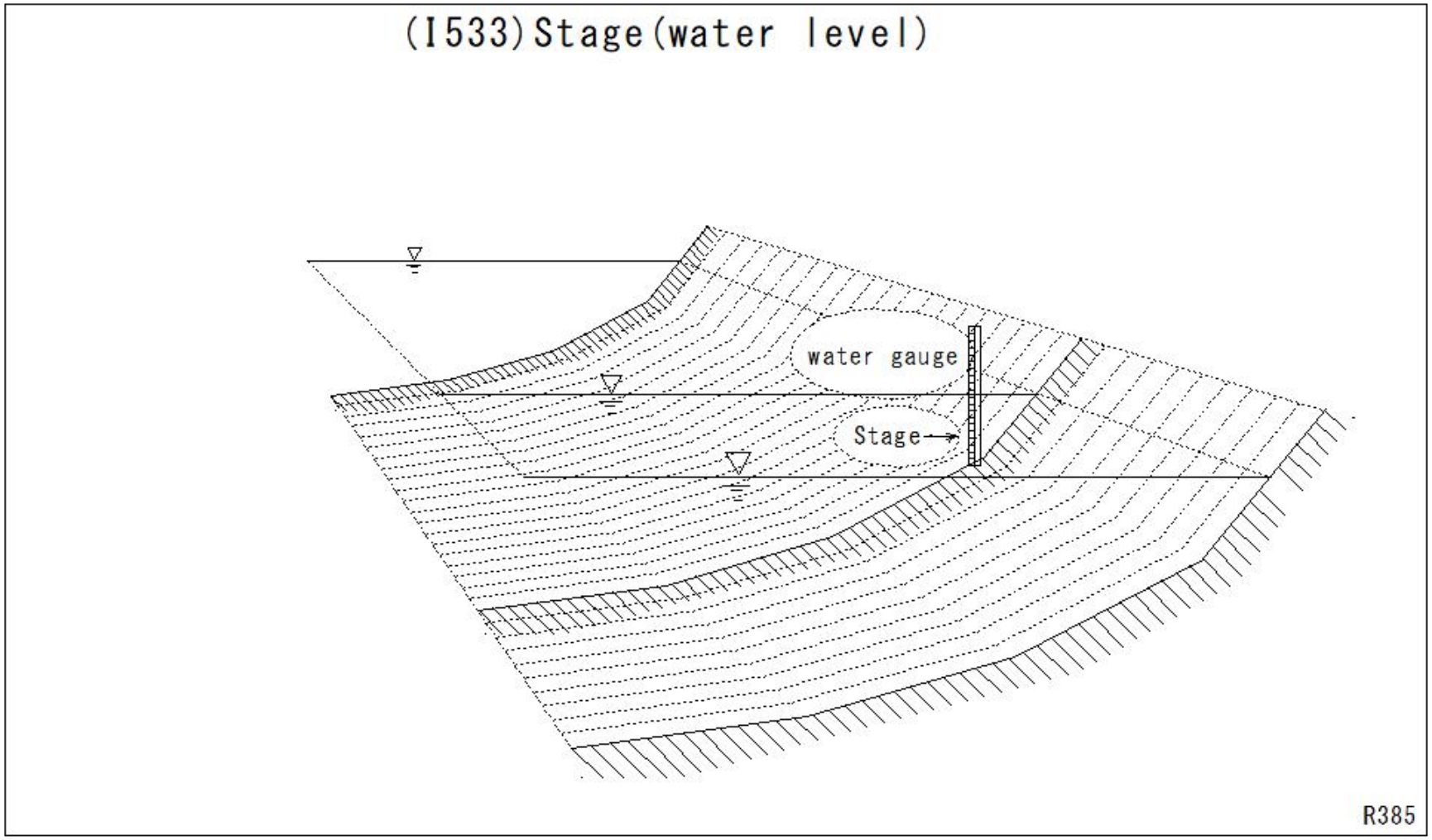


R383

(I532)Penstock root



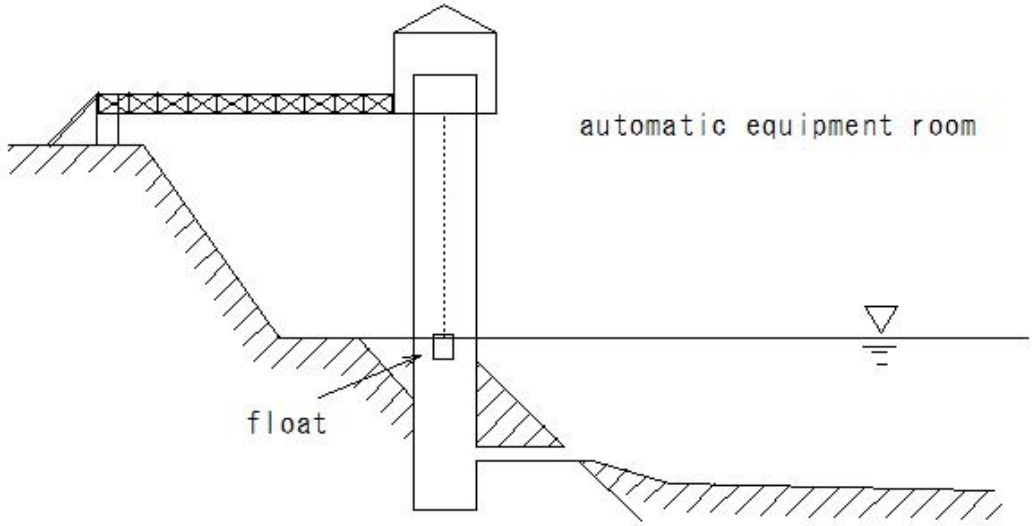
(I533)Stage(water level)



(I534)Water-level recorder

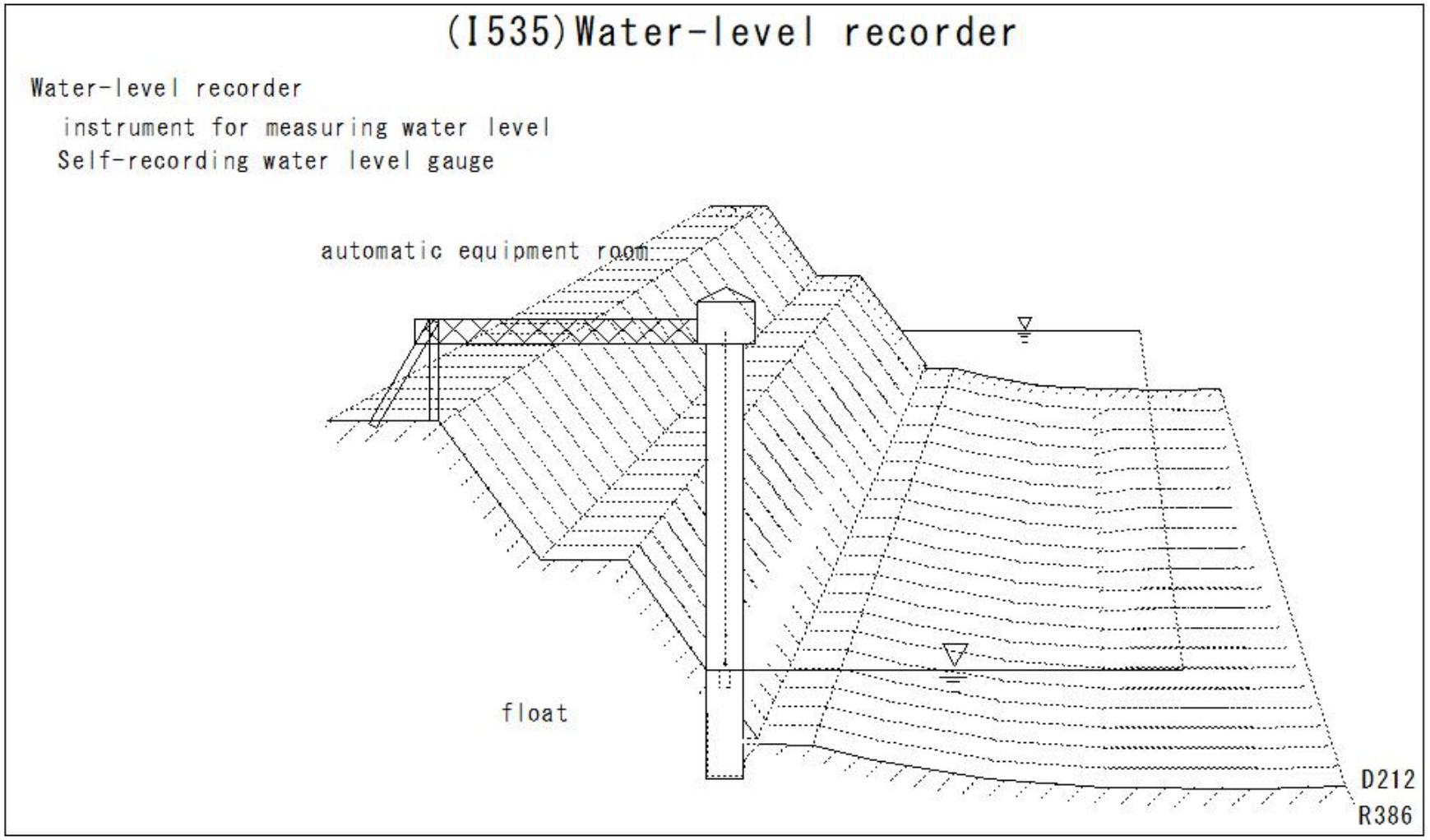
(I534)Water-level recorder

Water-level recorder
water level gauge
nstrument for measuring water level
Self-recording water level gauge

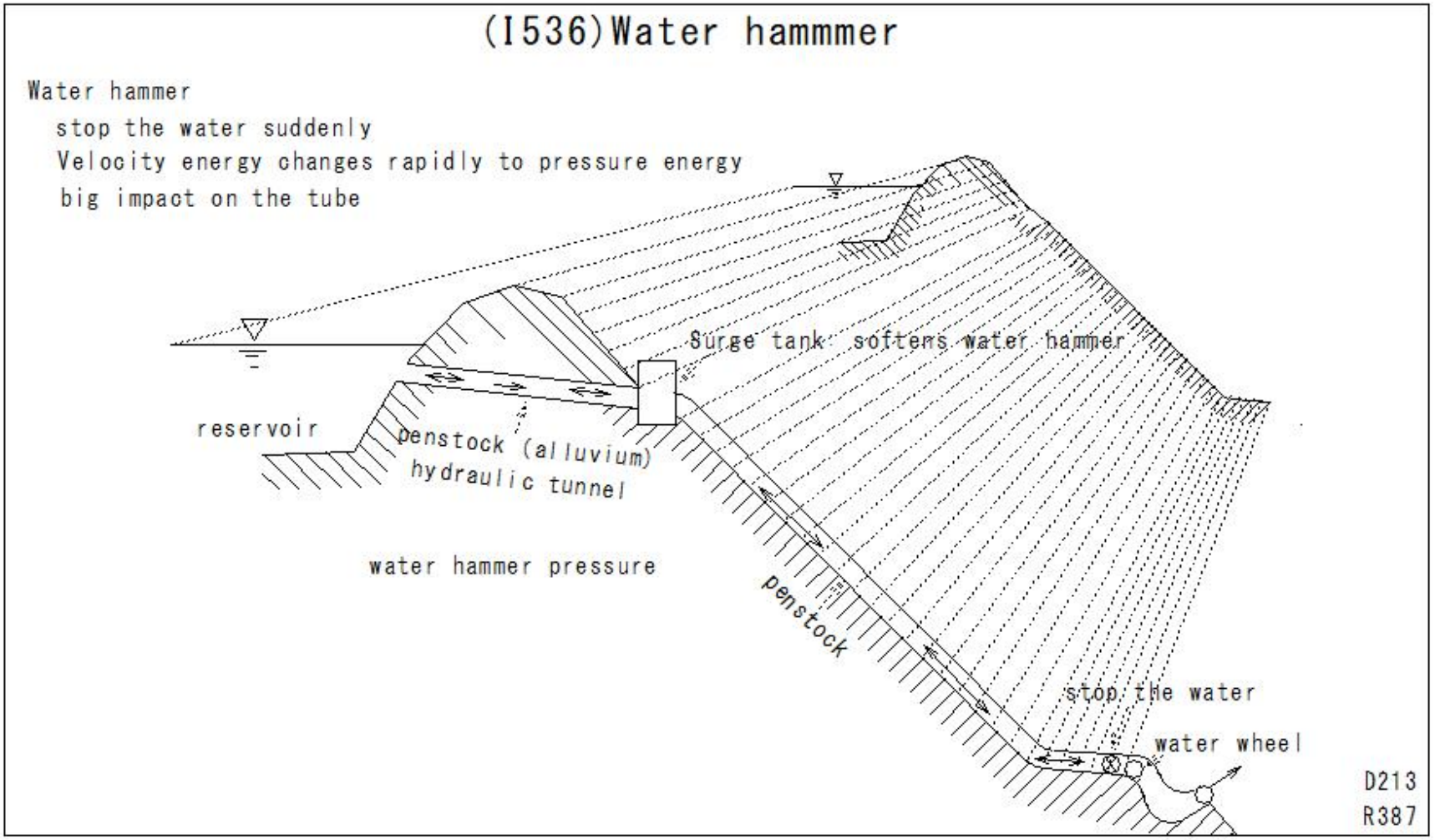


D211

(I535)Water-level recorder



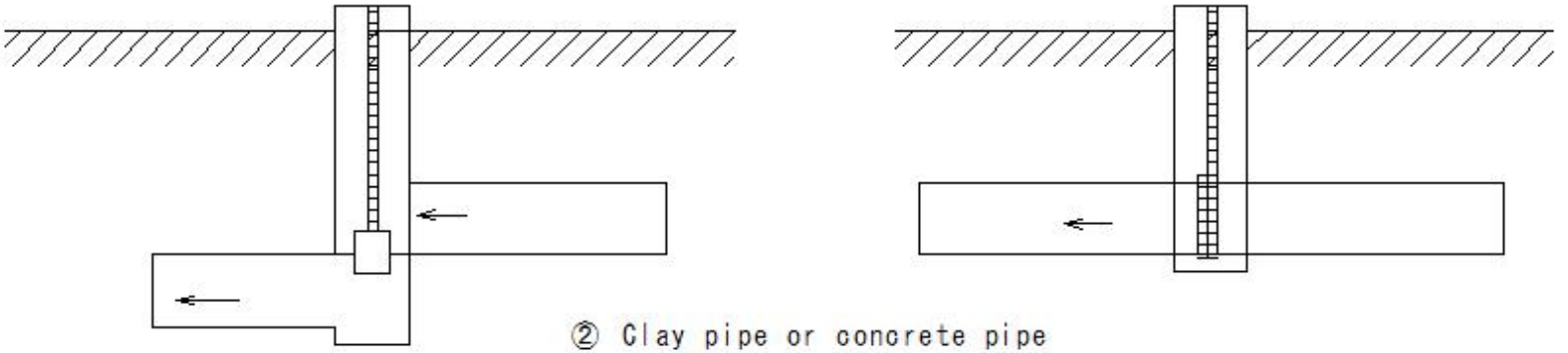
(I536)Water hammmer



(I537)Relief well(Water gate)

(I537)Relief well(Water gate)

Relief well(Water gate)



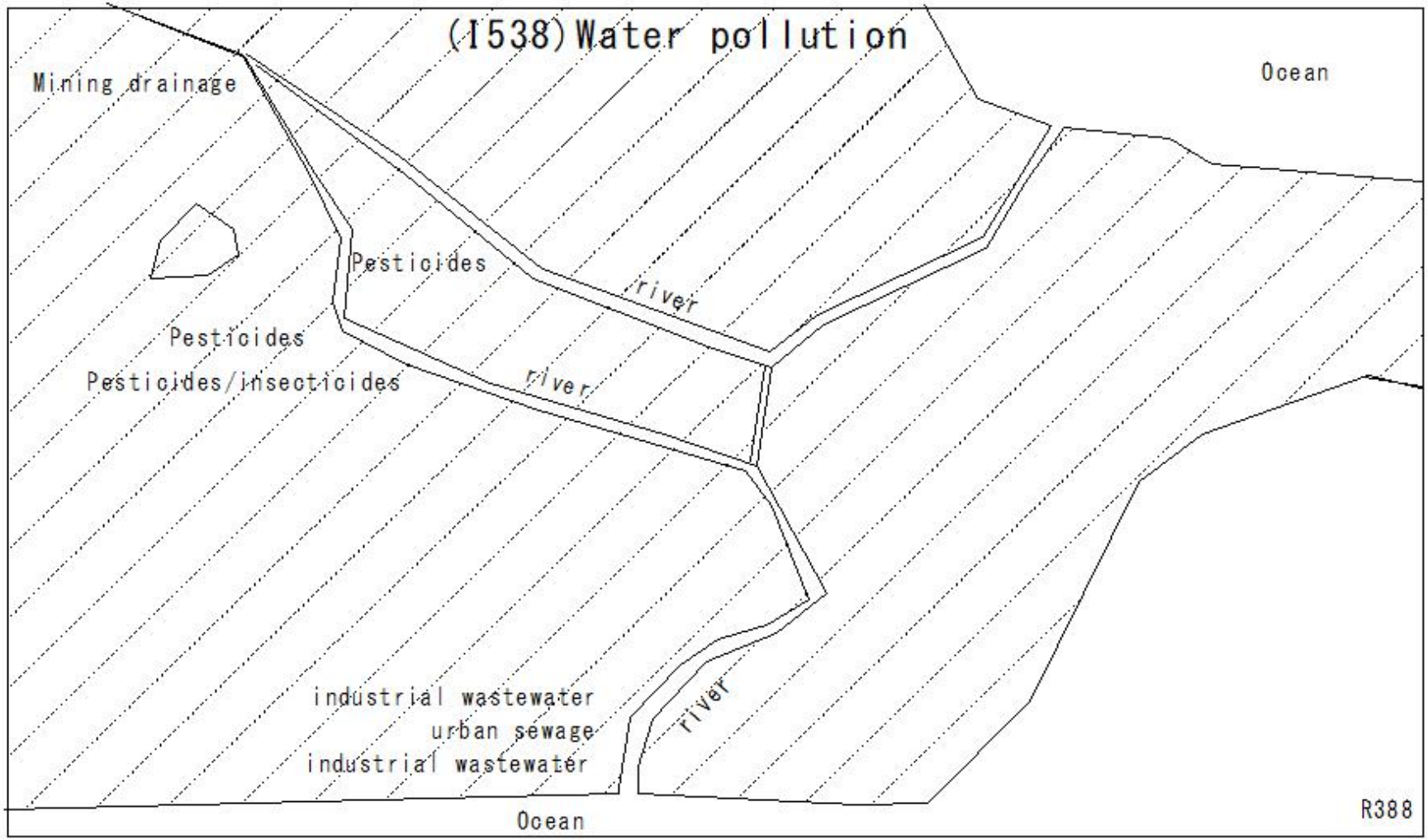
② Clay pipe or concrete pipe

① Drop Relief well(Water gate)

③ Horizontal Relief well(Water gate)

Regulating the flow of water for irrigation etc.

(I538)Water pollution

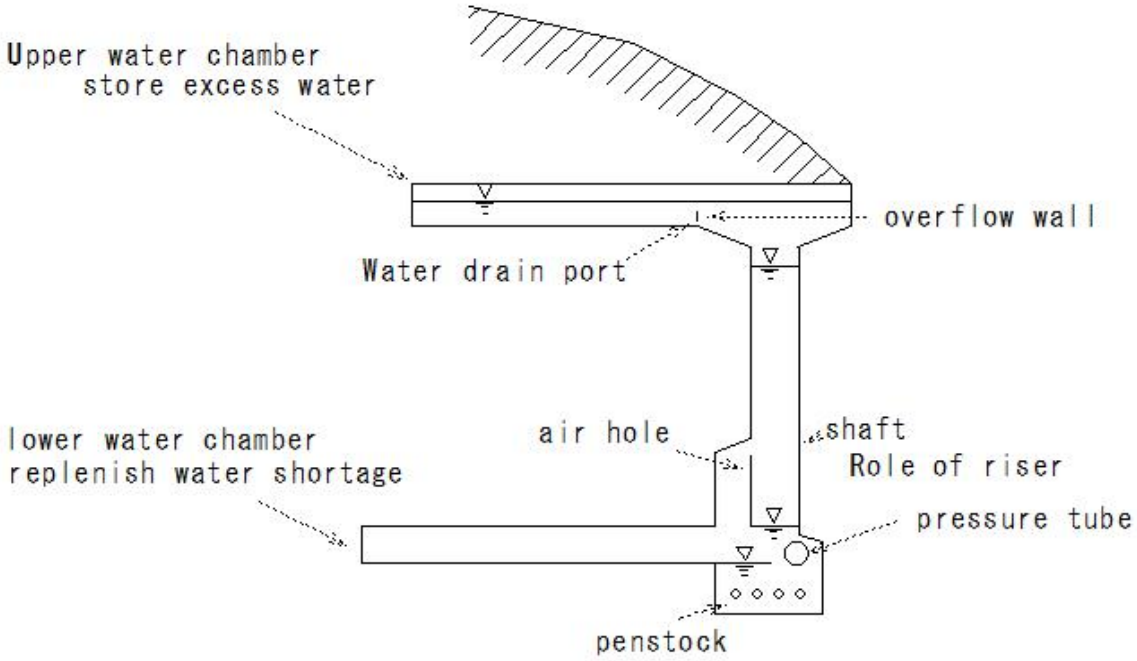


(I539)Chamber surge tank

(I539)Chamber surge tank

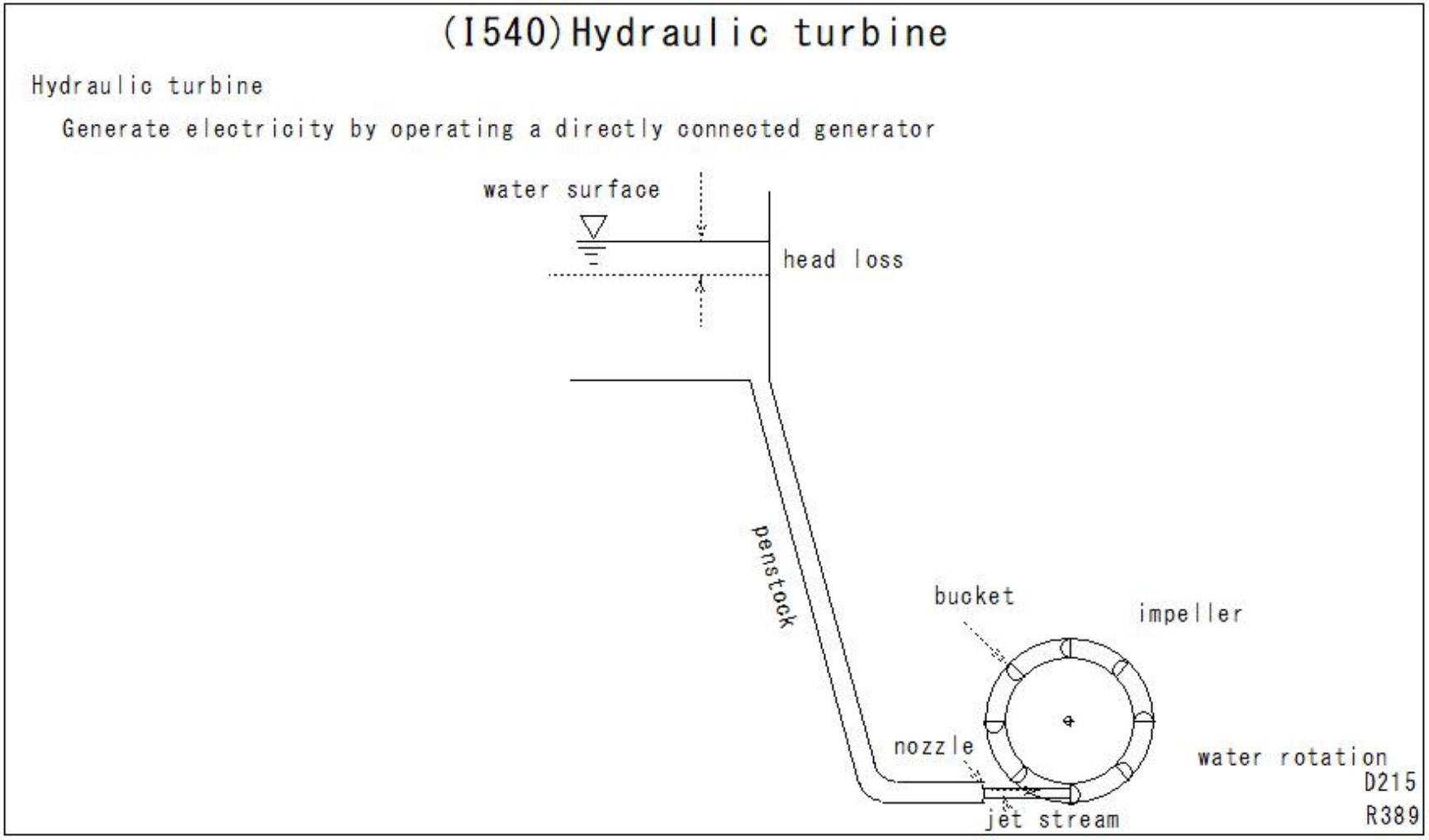
Chamber surge tank

- Water hammer pressure gives a large impact to the pressure channel
- Upper and lower water chambers: Absorbs water hammer pressure



D214

(I540)Hydraulic turbine



(I541)Efficiency of hydraulic turbine

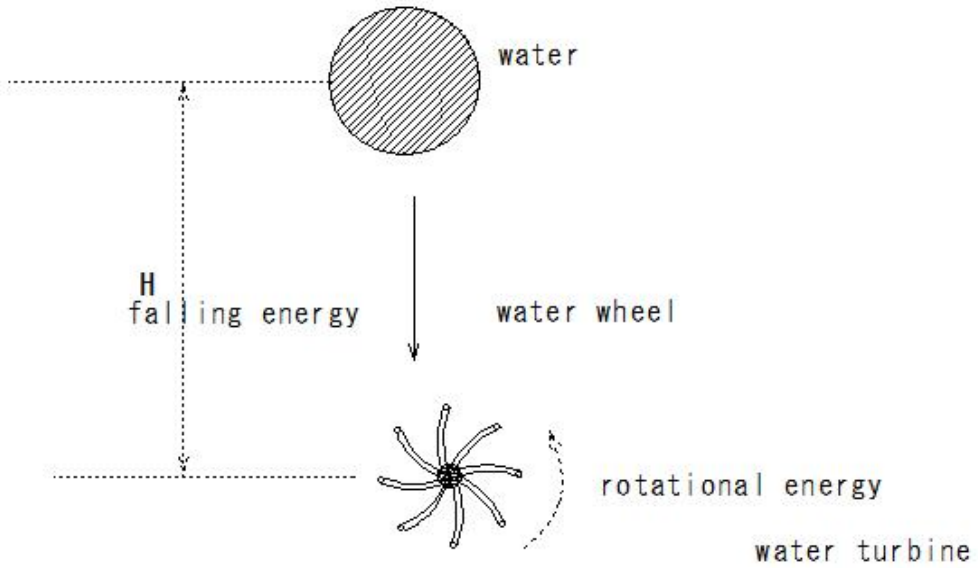
(I541)Efficiency of hydraulic turbine

efficiency of hydraulic turbine

・Water from penstock - water wheel runner - high speed rotation - power generation

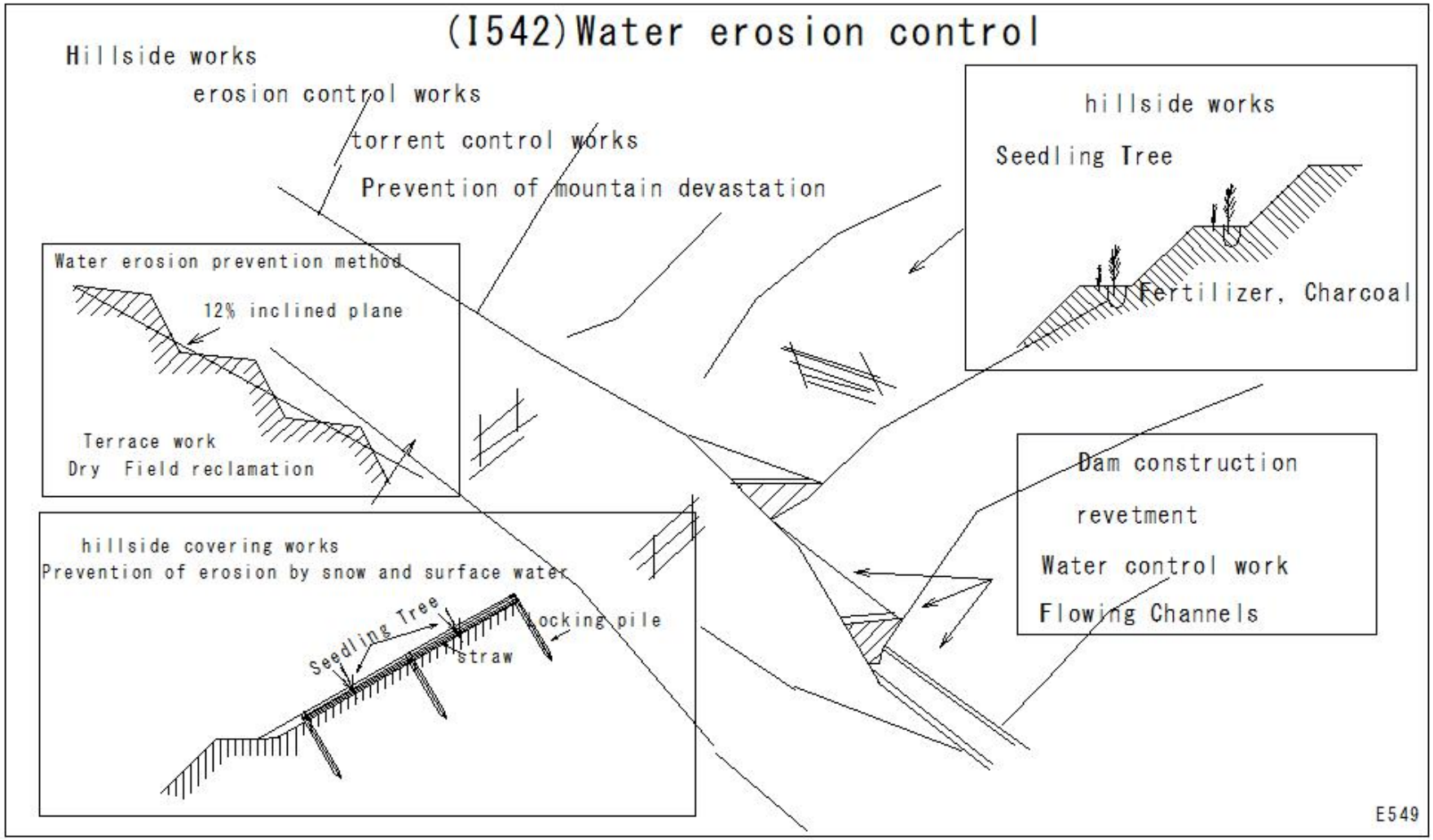
water energy rotational energy

Degree - Efficiency of a water wheel



D216

(I542)Water erosion control



(I543)Spur dyke(groin)

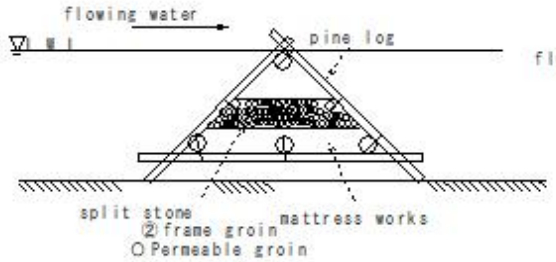
(I543) Spur dyke(groin)

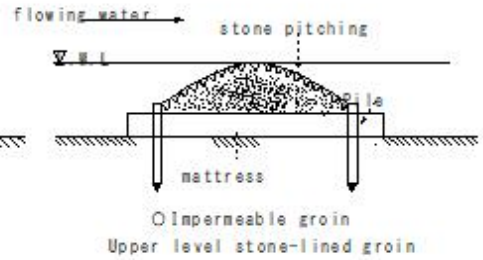
spur dyke(groin)

weaken the water force

Regulates flow direction

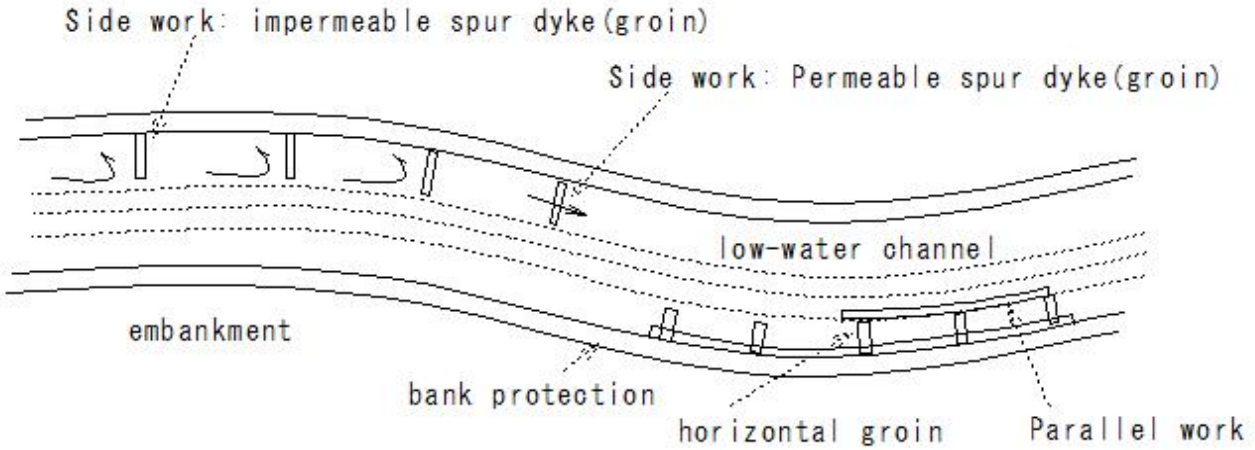
- Sediment precipitation
- Preventing riverbed scouring
- Stability of low waterways





Permeable spur dyke(groin): weakens the force of water

Impermeable spur dyke(groin): water system - overflow



R348

(I544)Gate

(I544)Gate

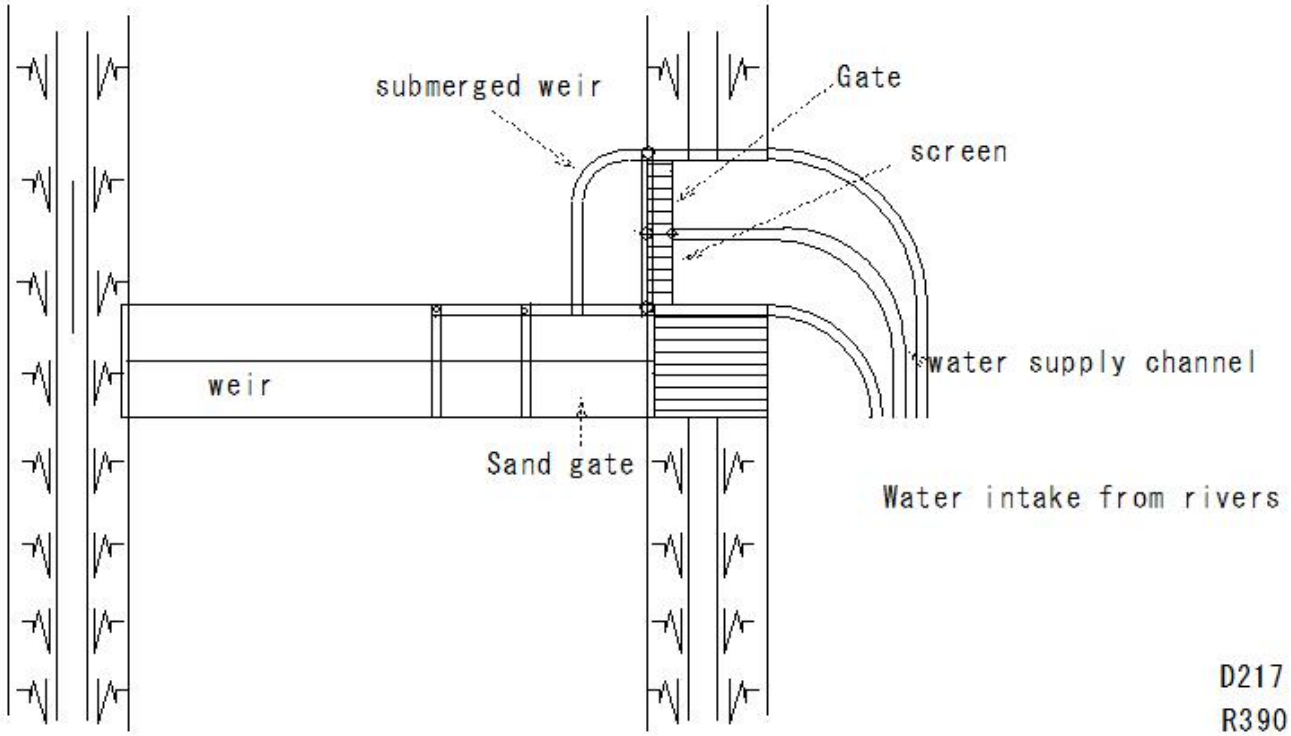
Gate

discharge adjustment

water intake

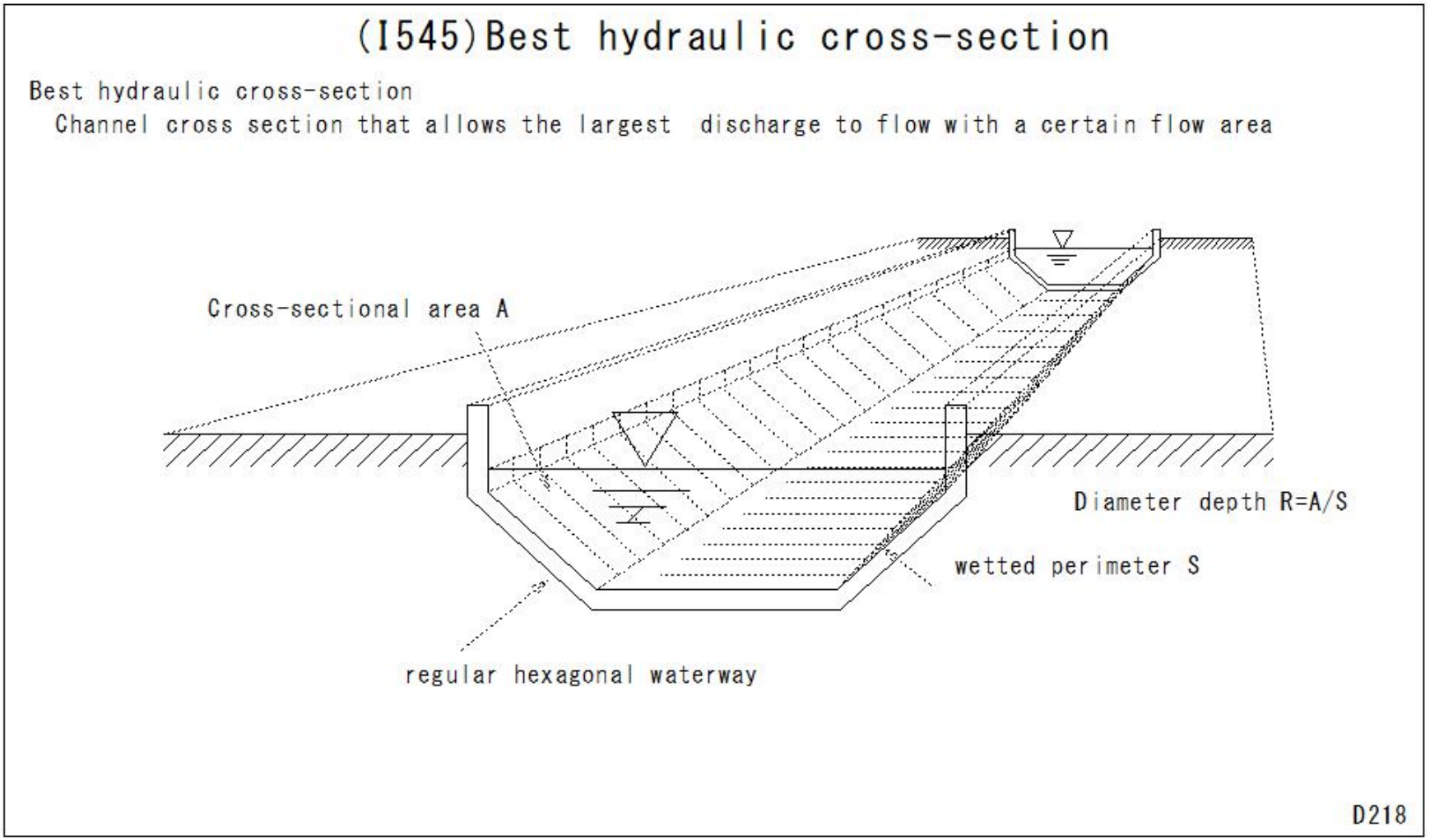
for ship navigation

Movable doors installed across rivers, canals, and embankments

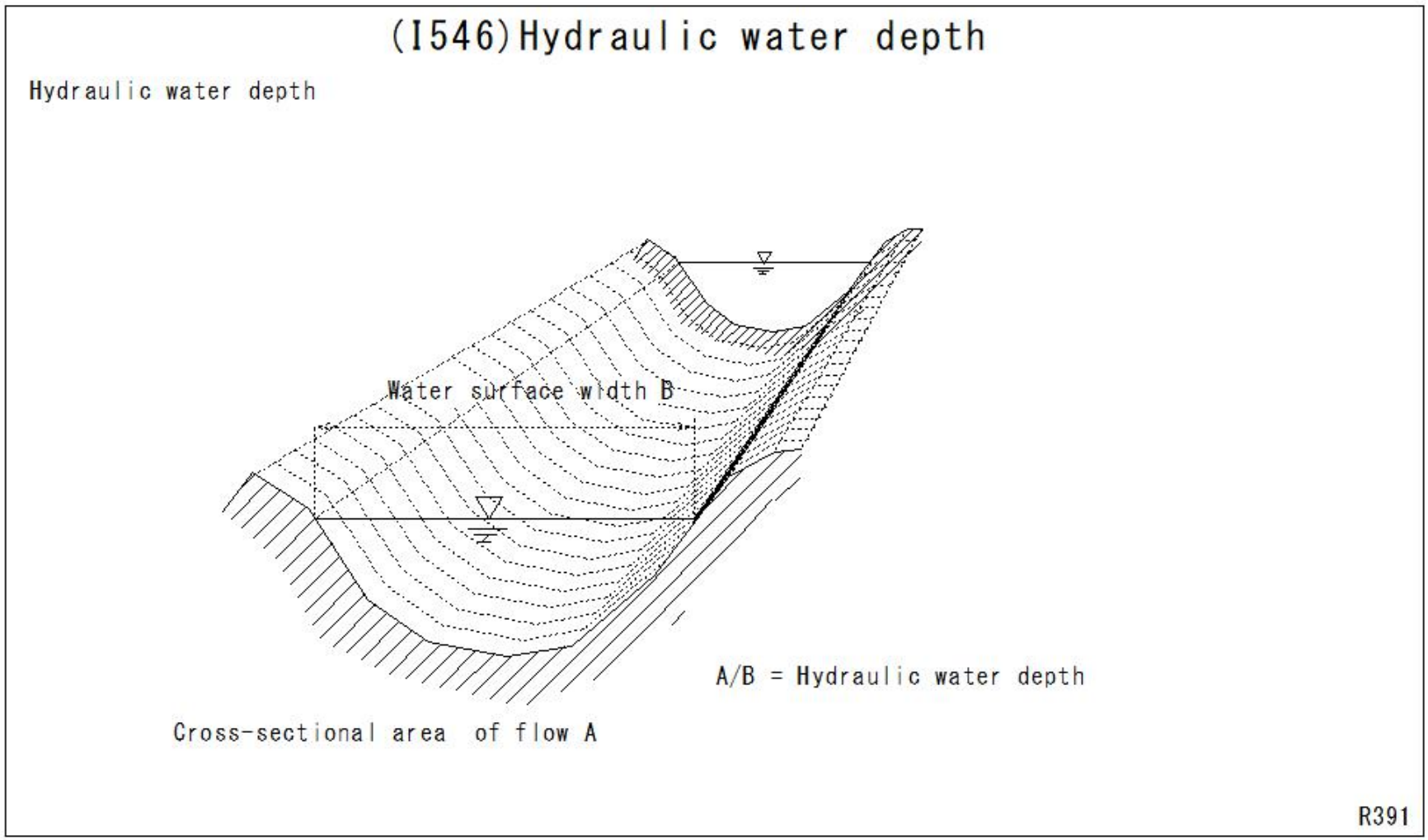


D217
R390

(I545)Best hydraulic cross-section



(I546)Hydraulic water depth



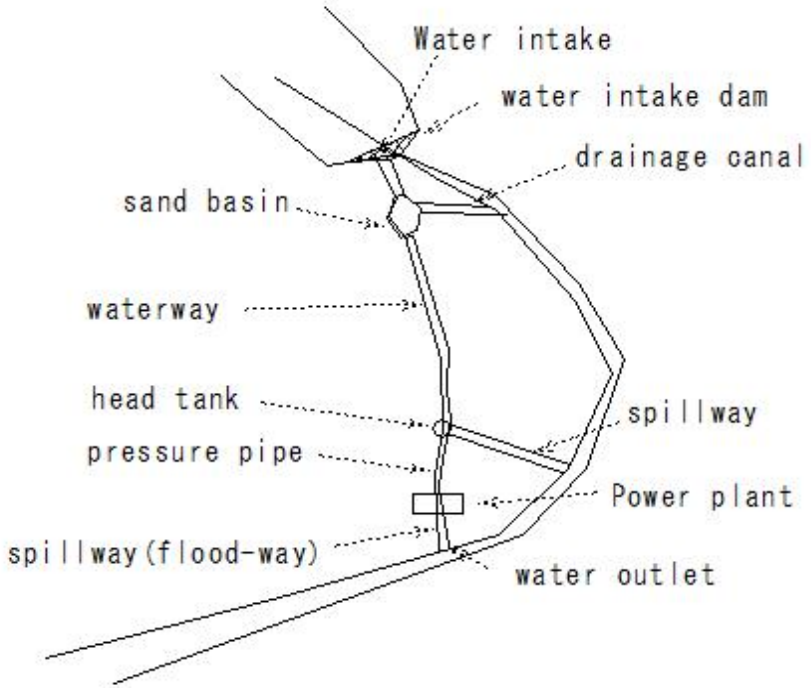
(I547)Conduct type water power

(I547)Conduct type water power

Conduct type water power

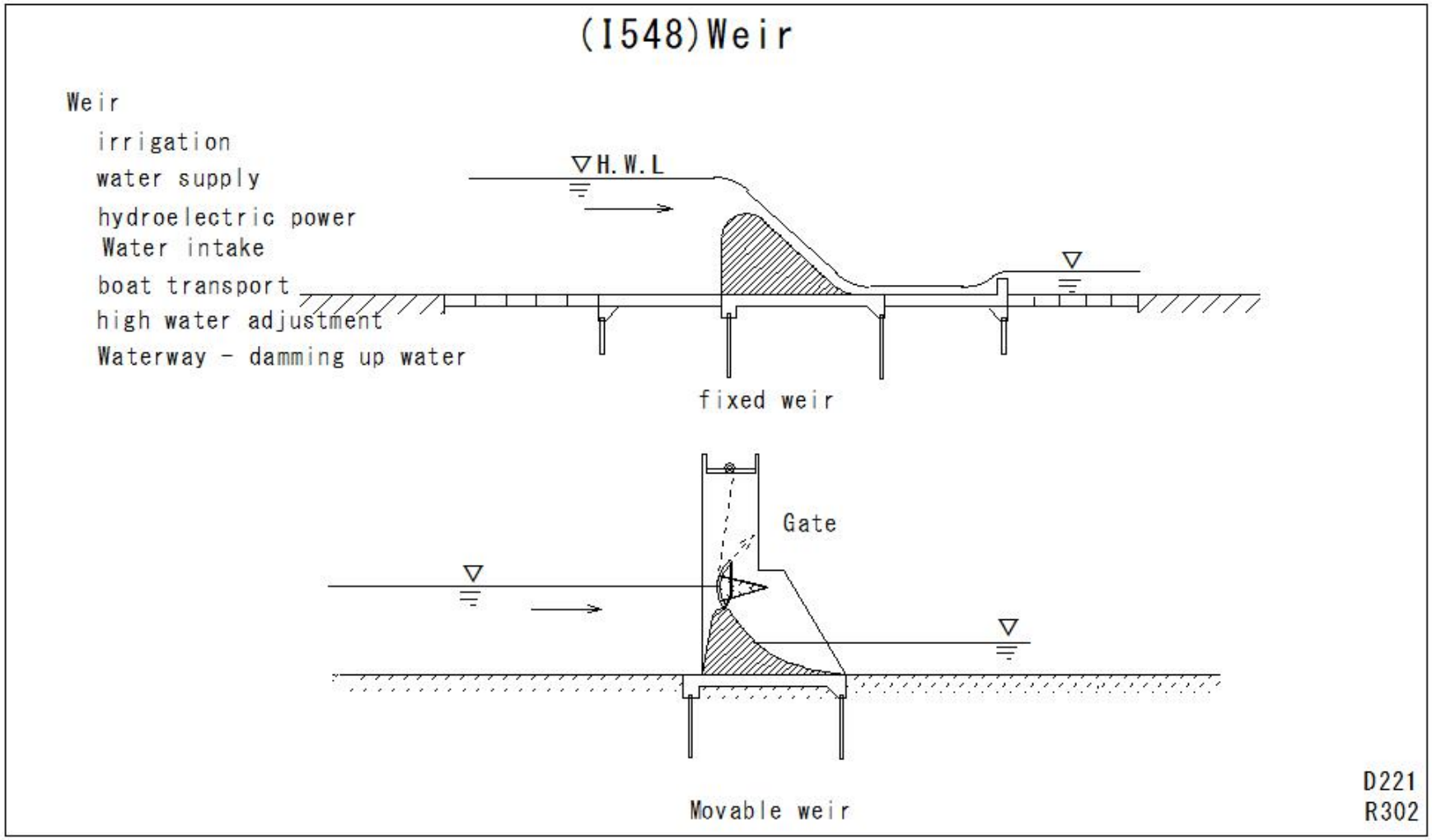
Guide river water through a channel to a point where a large head can be obtained.

Generate electricity by dropping it down with a pressure tube

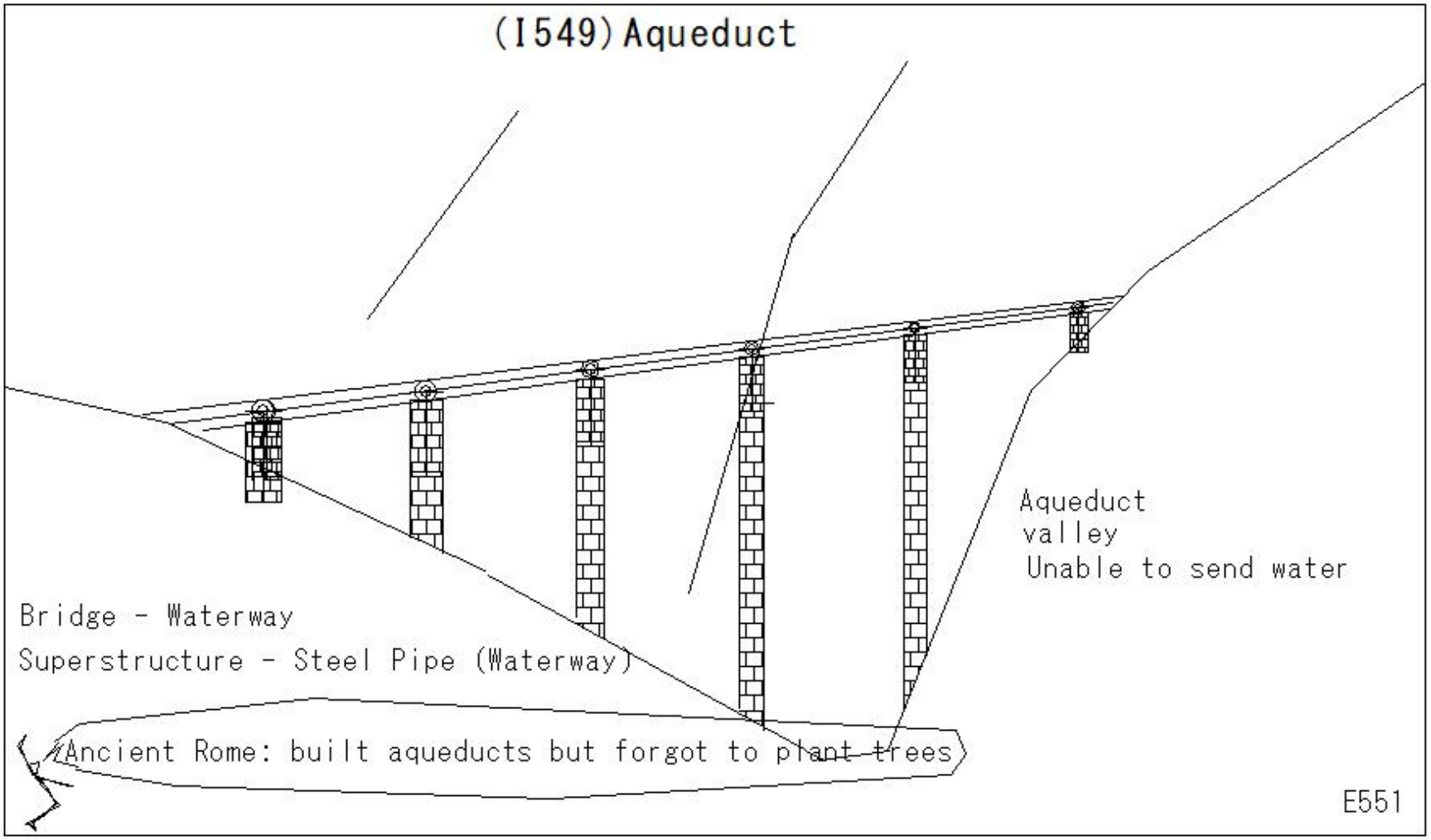


D220
R392

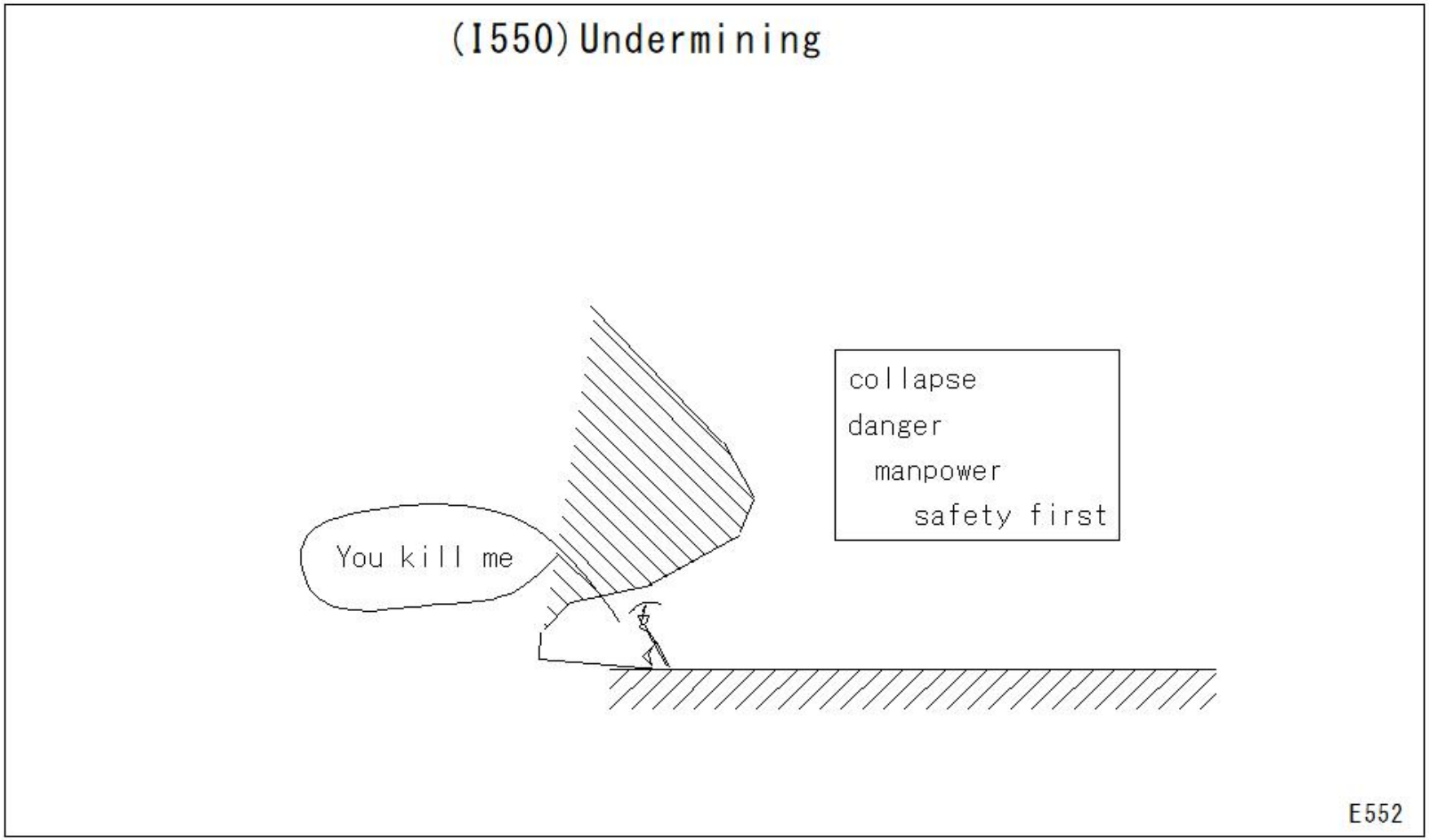
(I548)Weir


(I548)Weir
Weir
irrigation
water supply
hydroelectric power
Water intake
boat transport
high water adjustment
Waterway - damming up water
▽H.W.L
fixed weir
Gate
Movable weir
D221
R302

(I549)Aqueduct

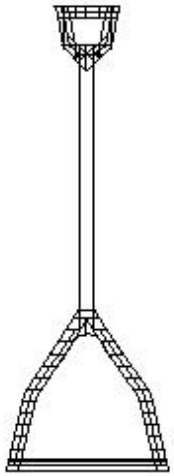


(I550)Undermining



(I551)Scoop

(I551) Scoop

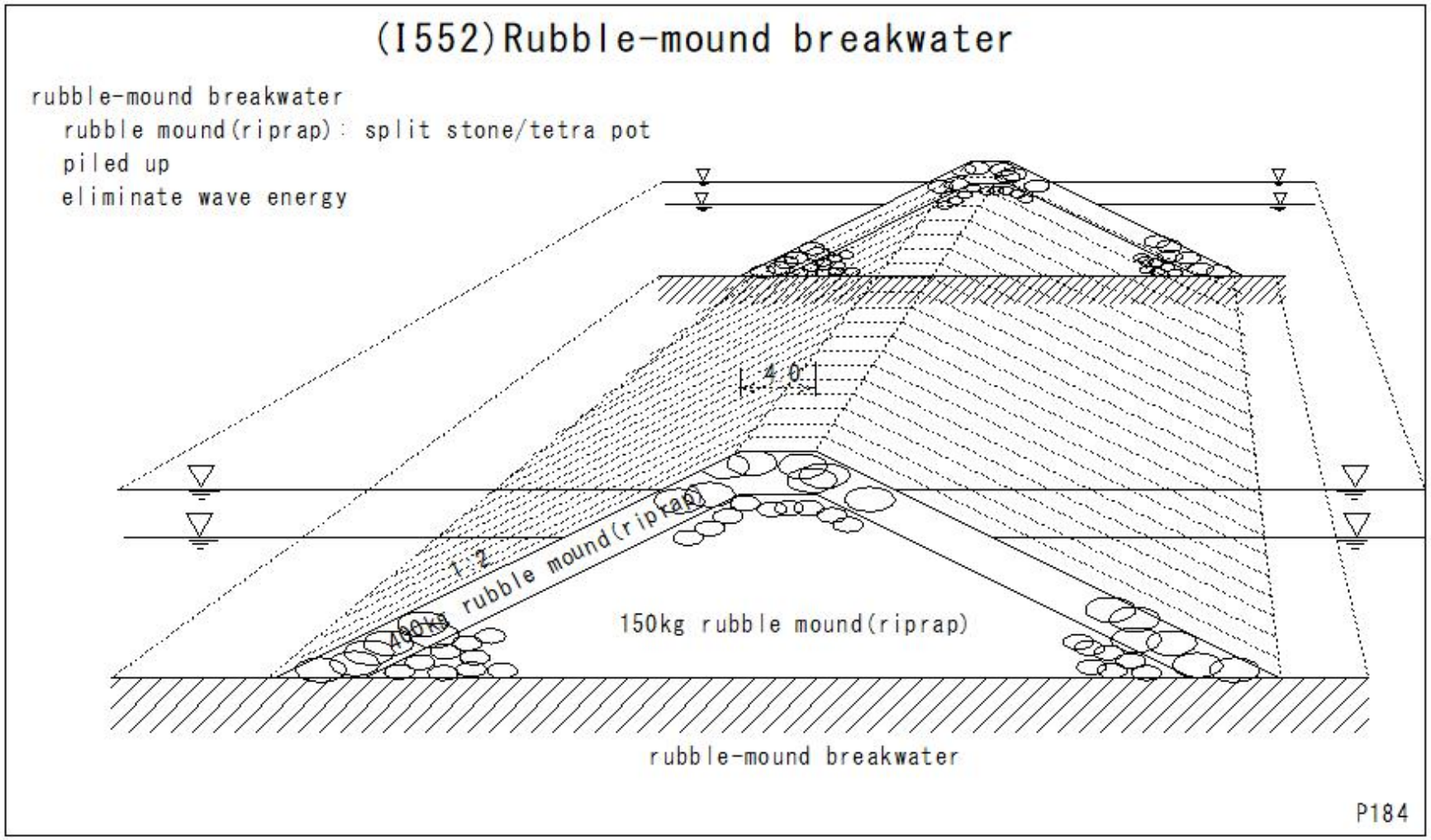


Earthmoving tools

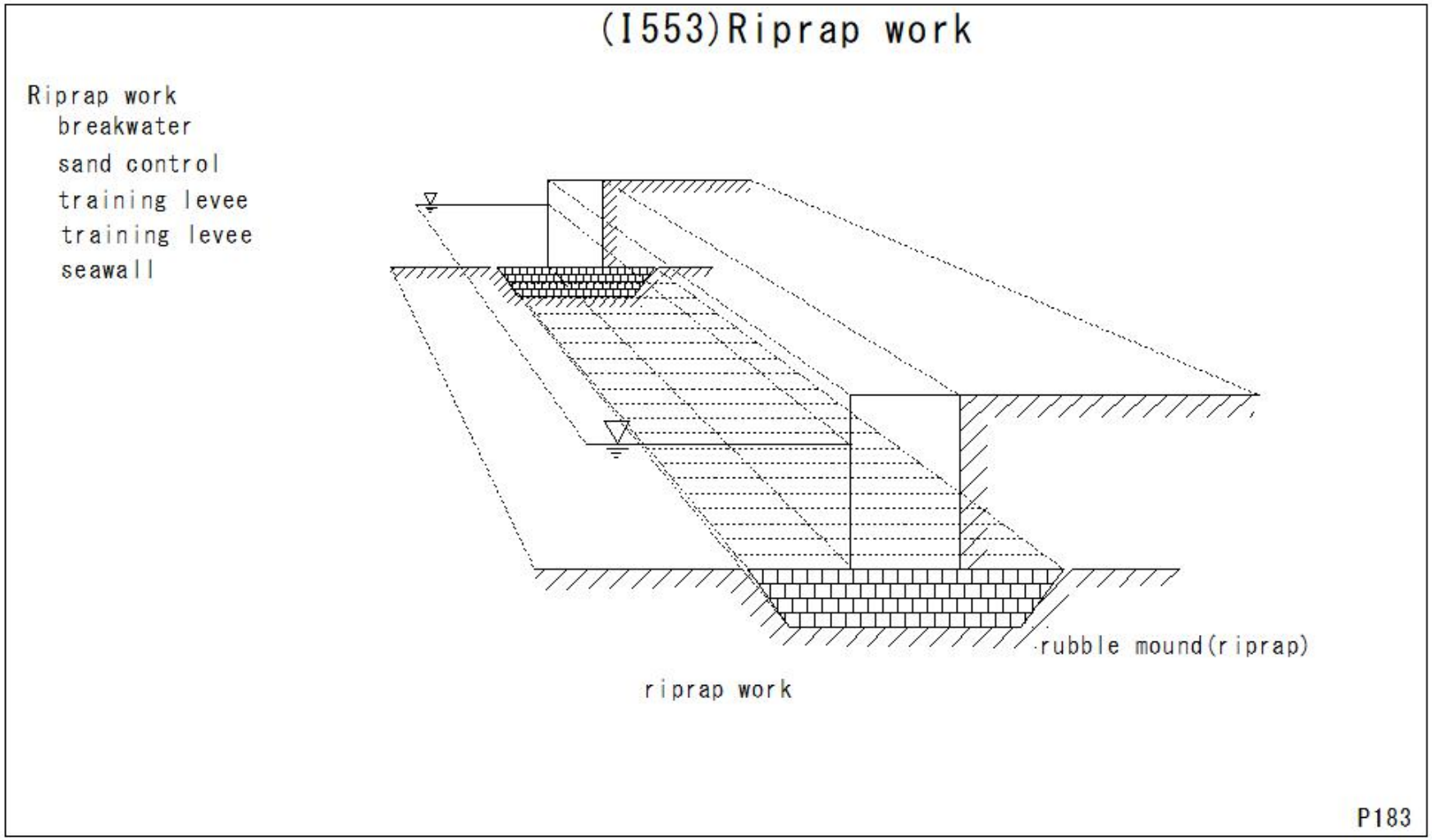
Scooping up sediment

E553

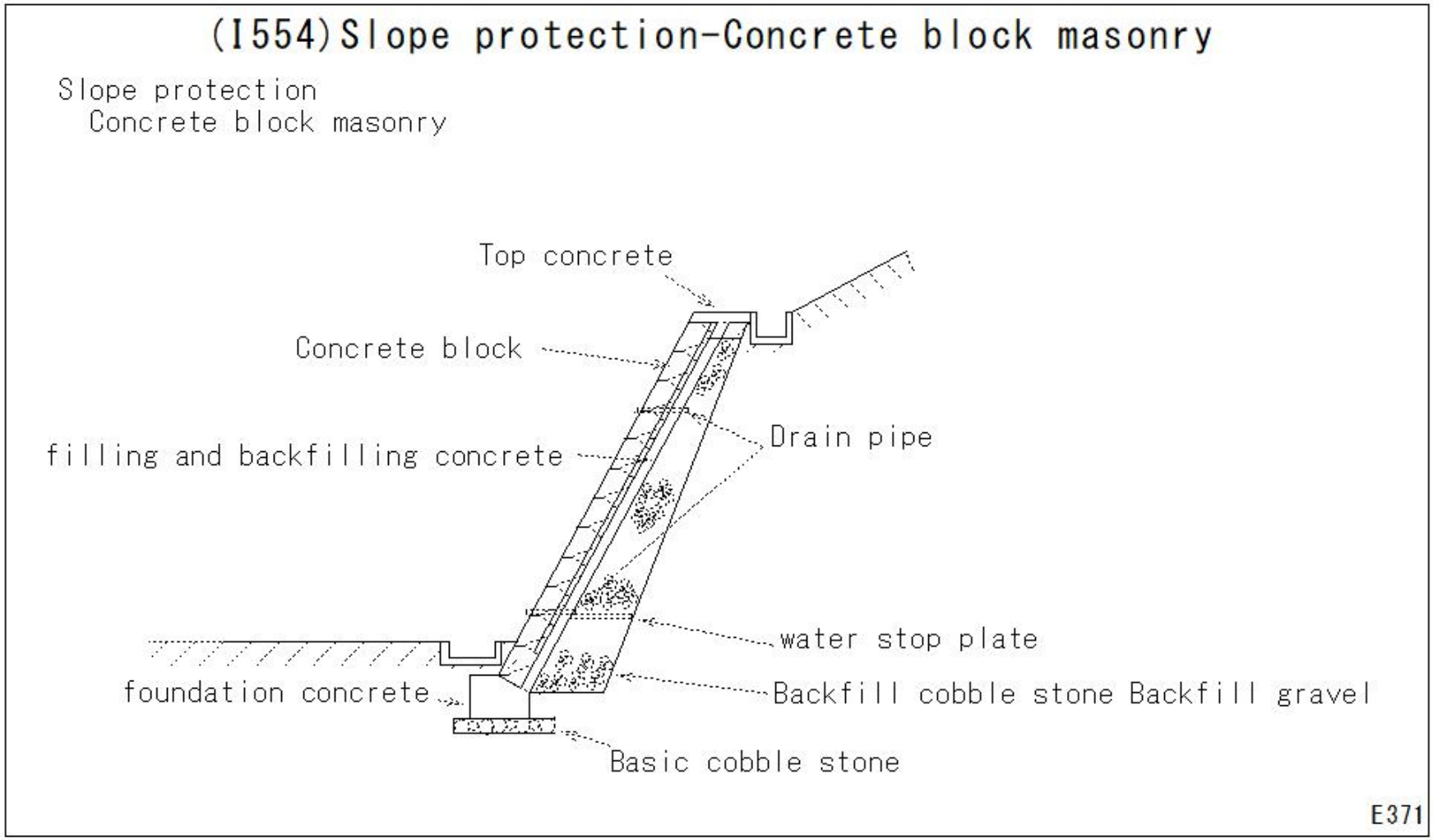
(I552)Rubble-mound breakwater



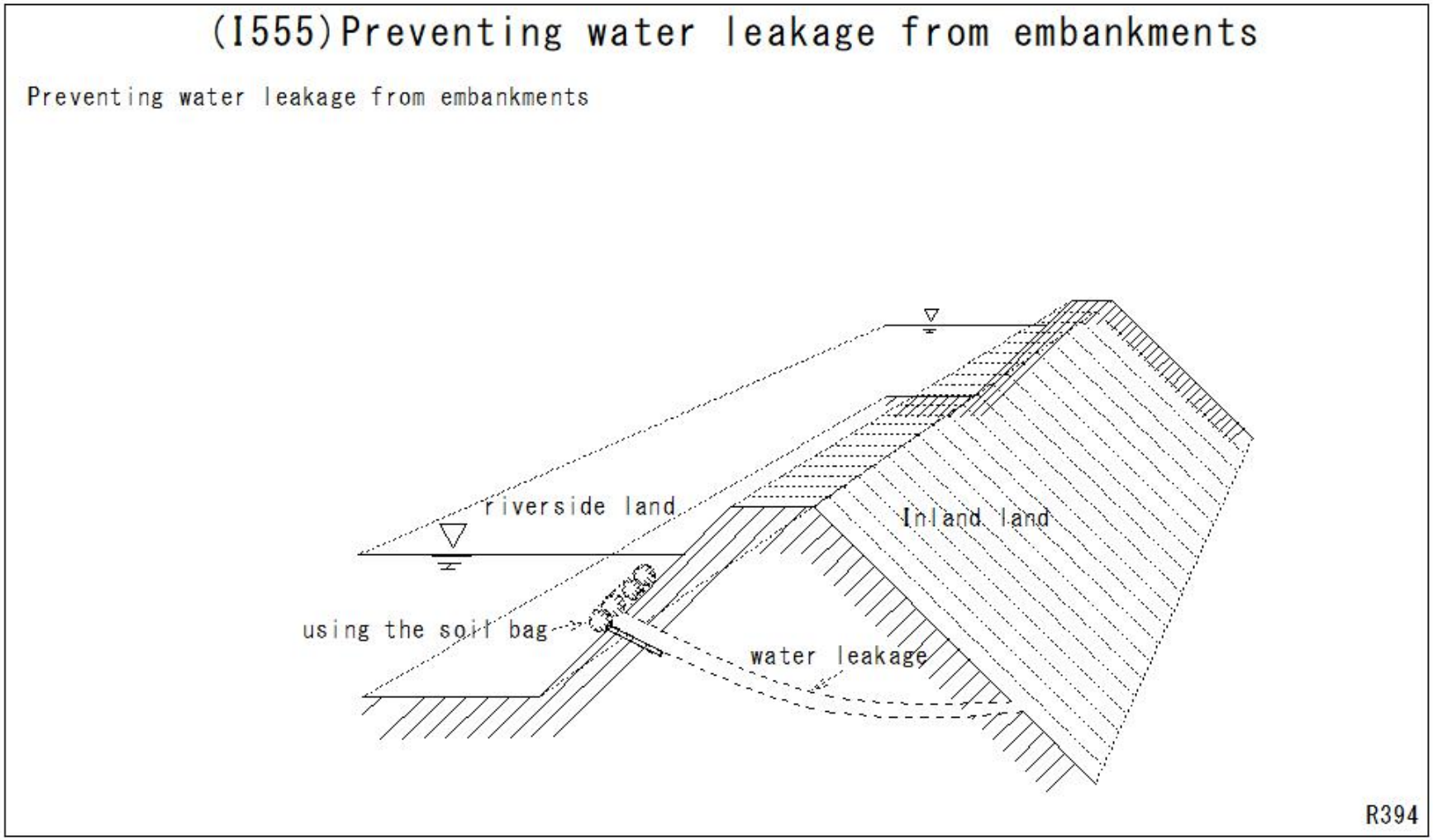
(I553)Riprap work



(I554)Slope protection-Concrete block masonry



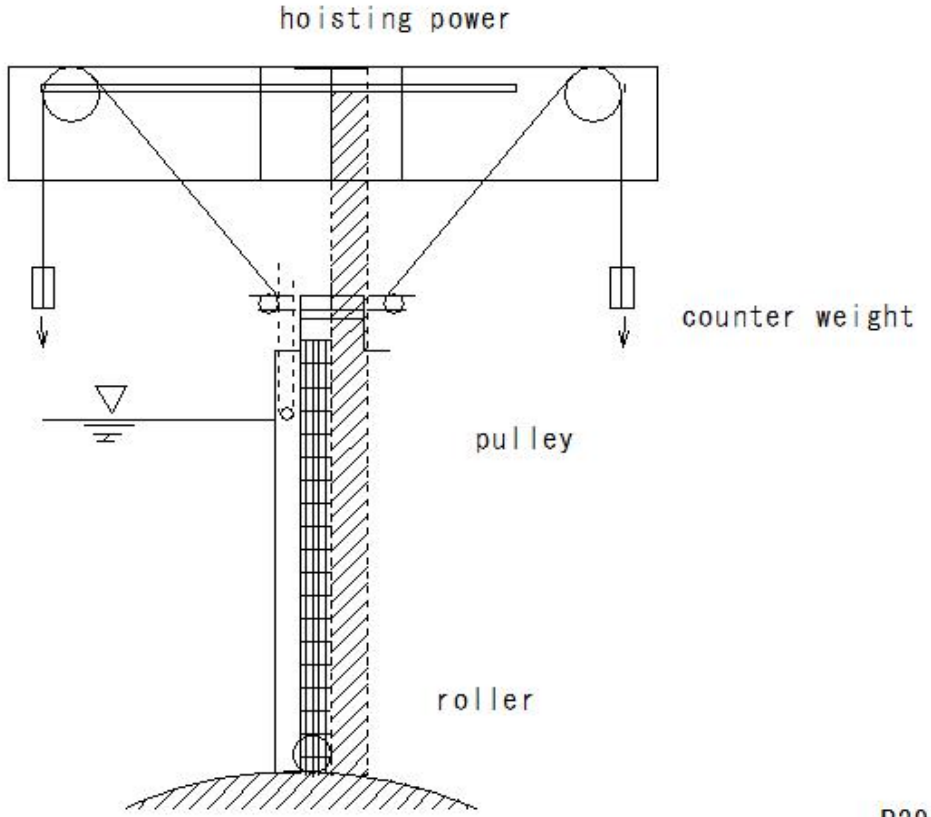
(I555)Preventing water leakage from embankments



(I556)Stoney gate weir

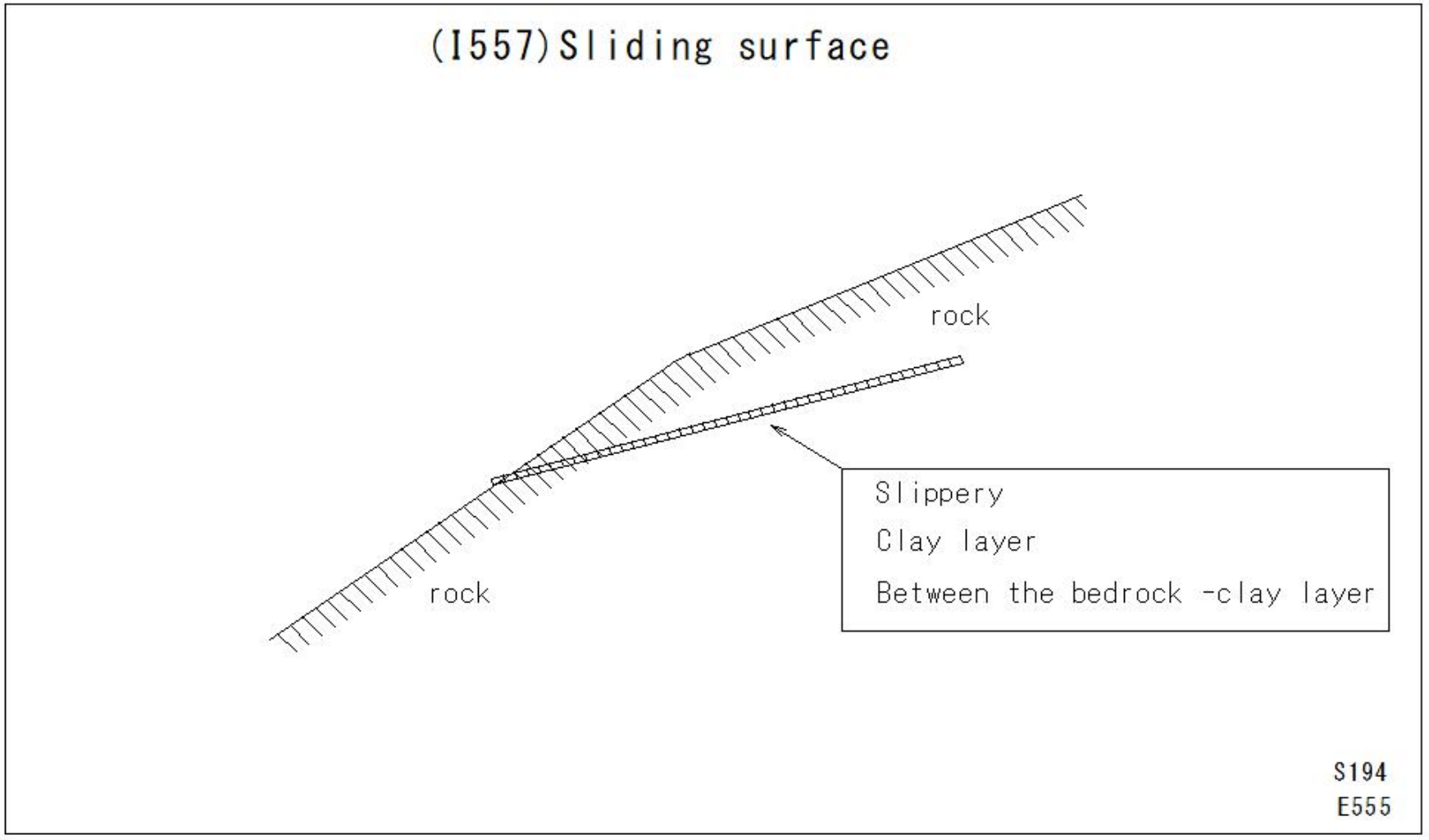
(I556)Stoney gate weir

Stoney gate weir
- sluice gate
- series of rollers
- ・The top and bottom open and close smoothly.



R395

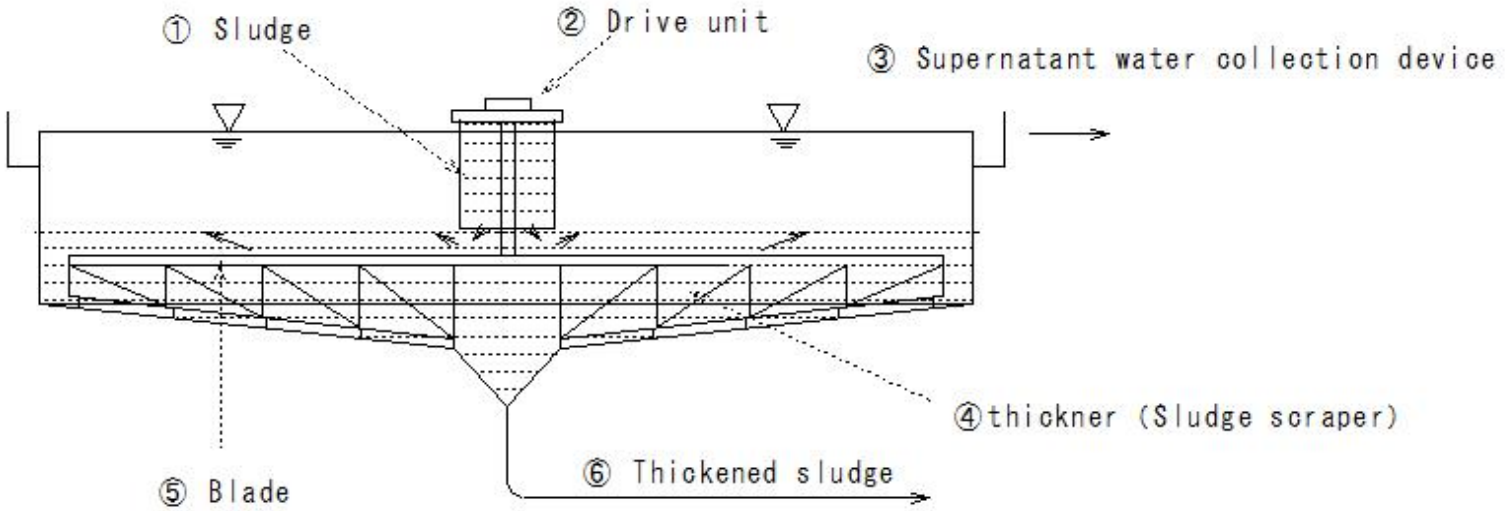
(I557)Sliding surface



(I558)Sewerage(thickner（Sludge scraper）)

(I558)Sewerage(thickner (Sludge scraper))

Sewerage
thickner (Sludge scraper)
Sewage treatment plant
Machine scrapes and collects settled sludge



thickner (Sludge scraper)

W244

(I559)Sewerage(sludge treatment)

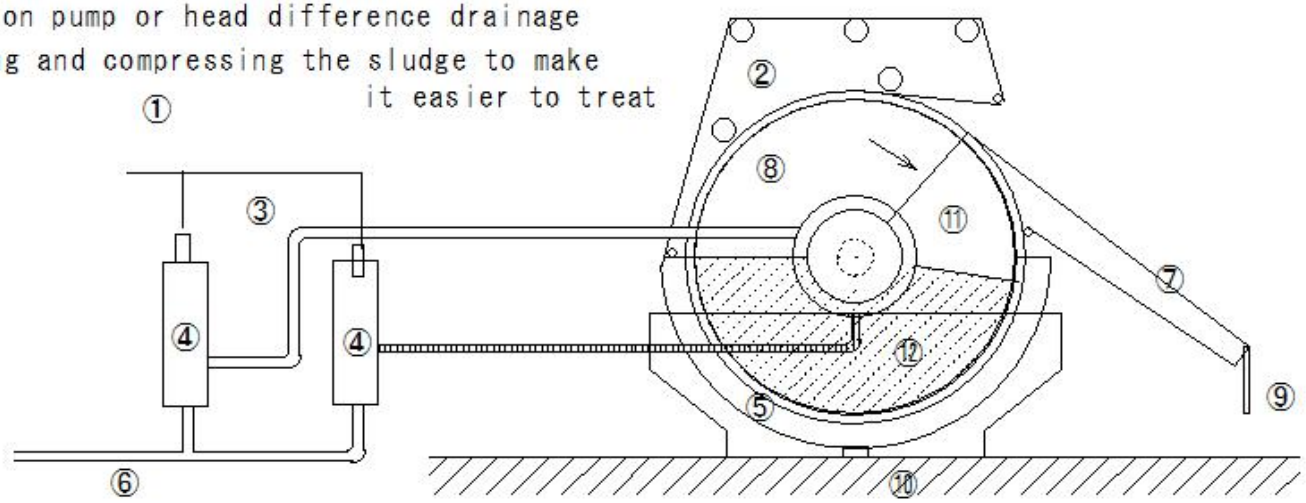
(I559)Sewerage(sludge treatment)

Sewerage

Sludge treatment

The sludge (mud) generated during the sewage treatment process is treated by dehydrating, drying, incinerating, etc.

① Vacuum filter
② Compression roller
③ Vacuum pump
④ Vacuum tank
⑤ Sludge
⑥ Distribution pump or head difference drainage
⑦ Dehydrating and compressing the sludge to make it easier to treat
⑧ High vacuum
⑨ Cake (dehydrated sludge)
⑩ Vacuum filter
⑪ Stripping normal pressure
⑫ Low vacuum



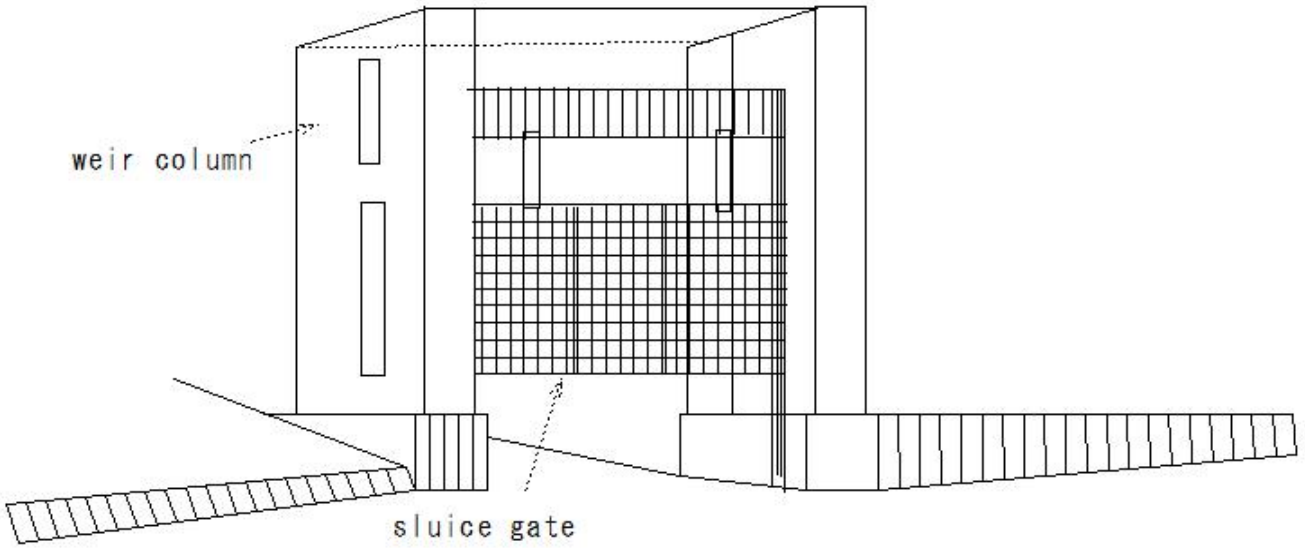
W245

(I560)Sluice gate

(I560)Sluice gate

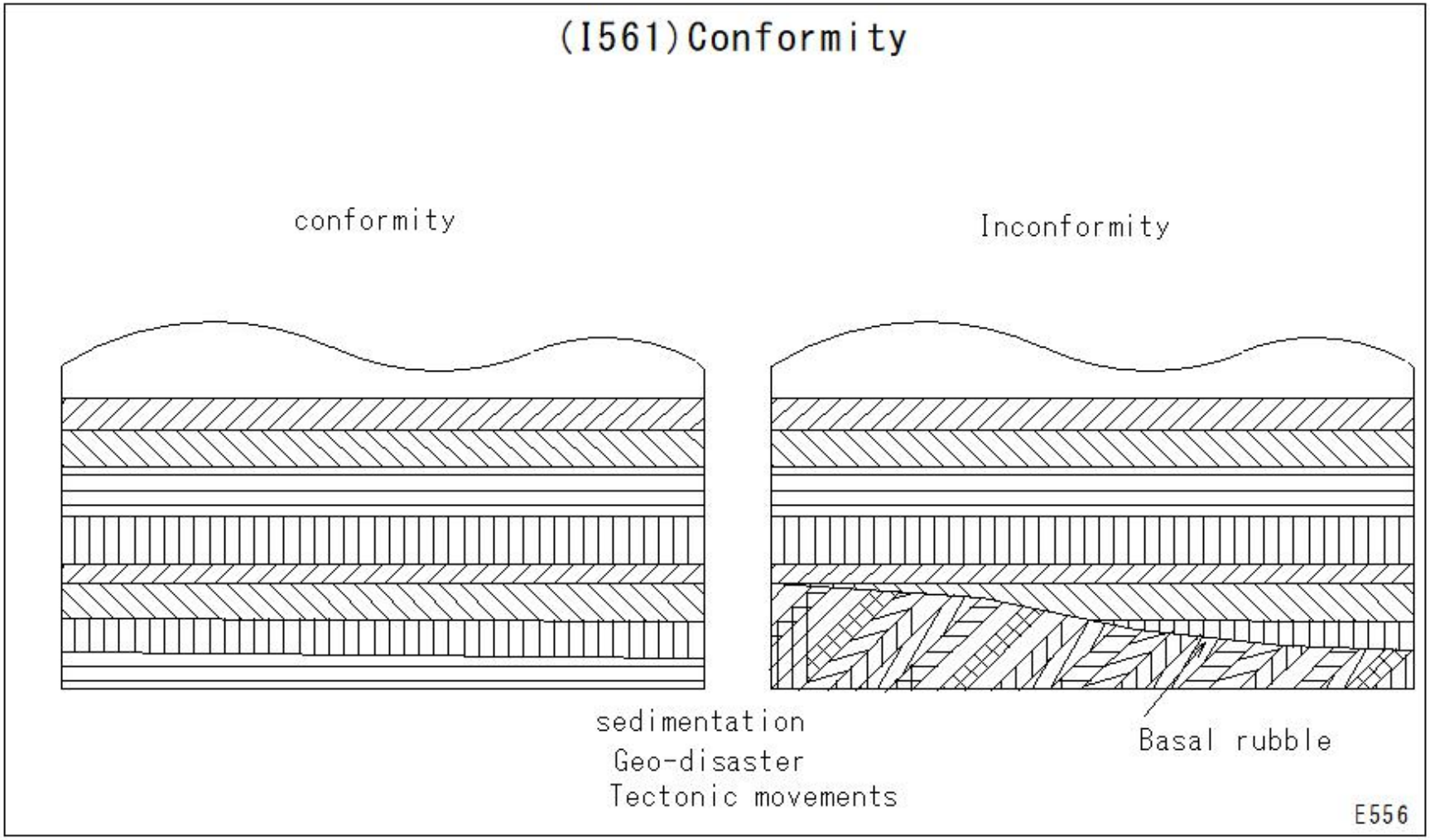
Sluice gate

Rectangular gate that can be opened and closed up and down

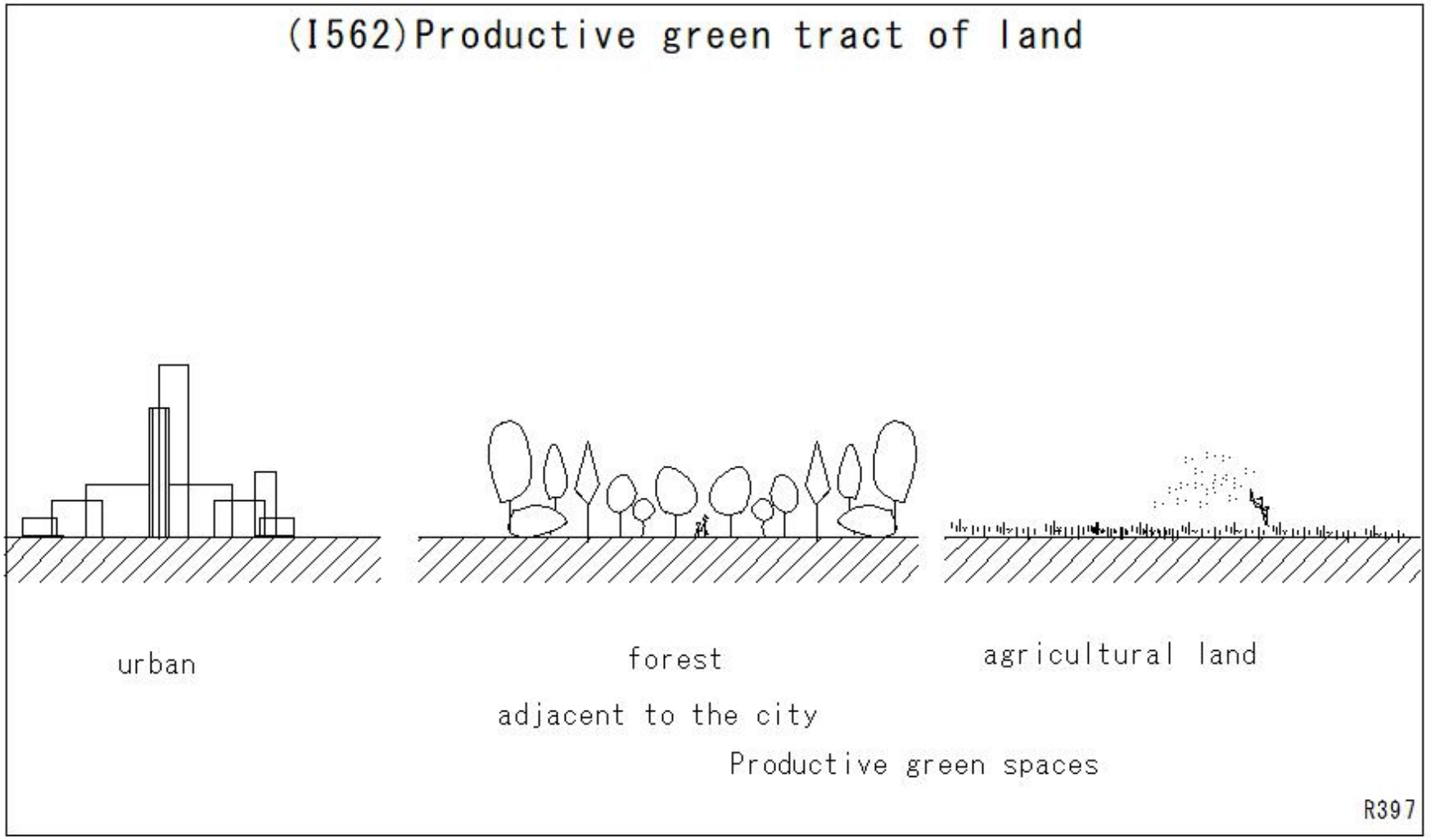


R396

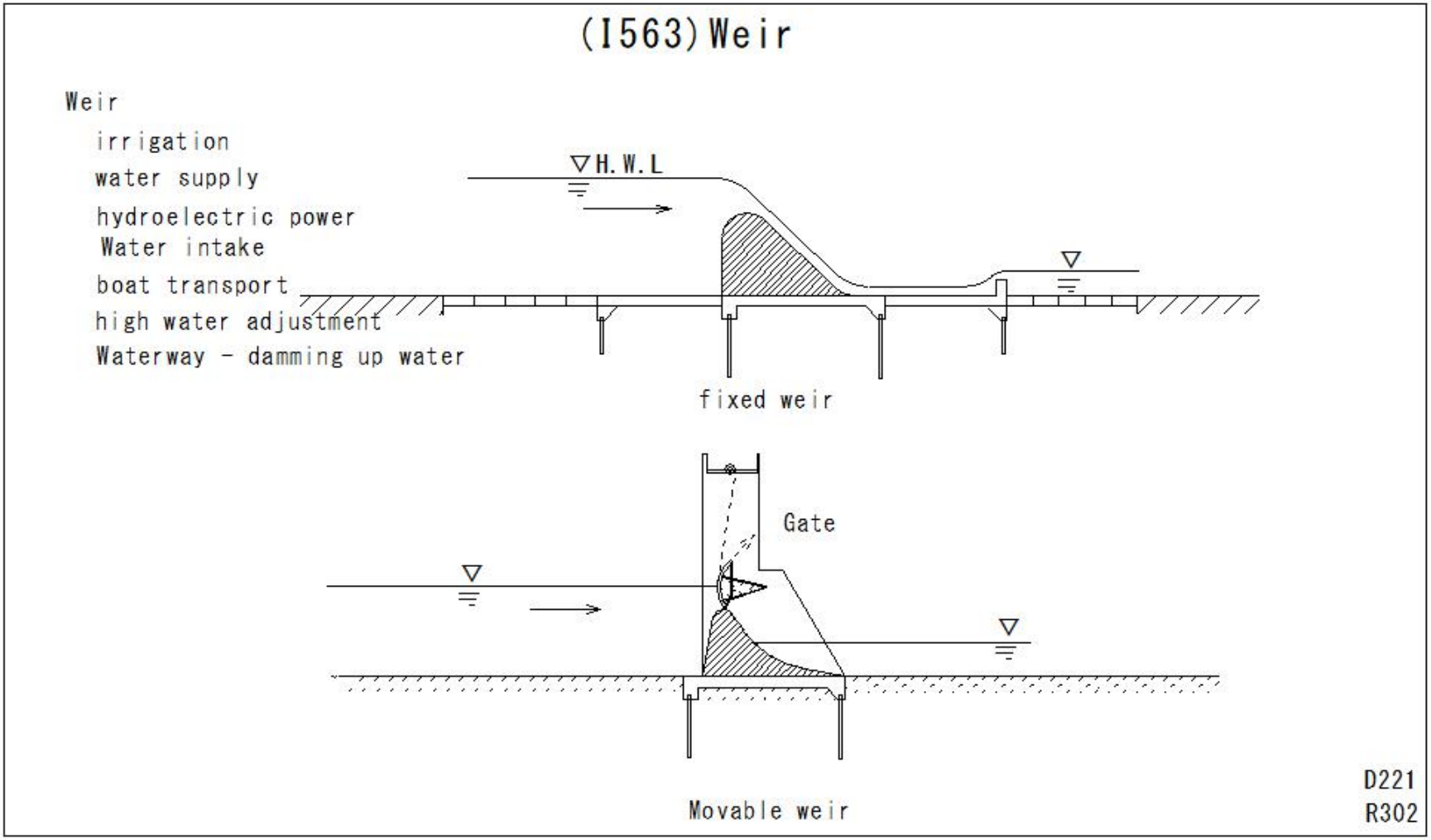
(I561)Conformity



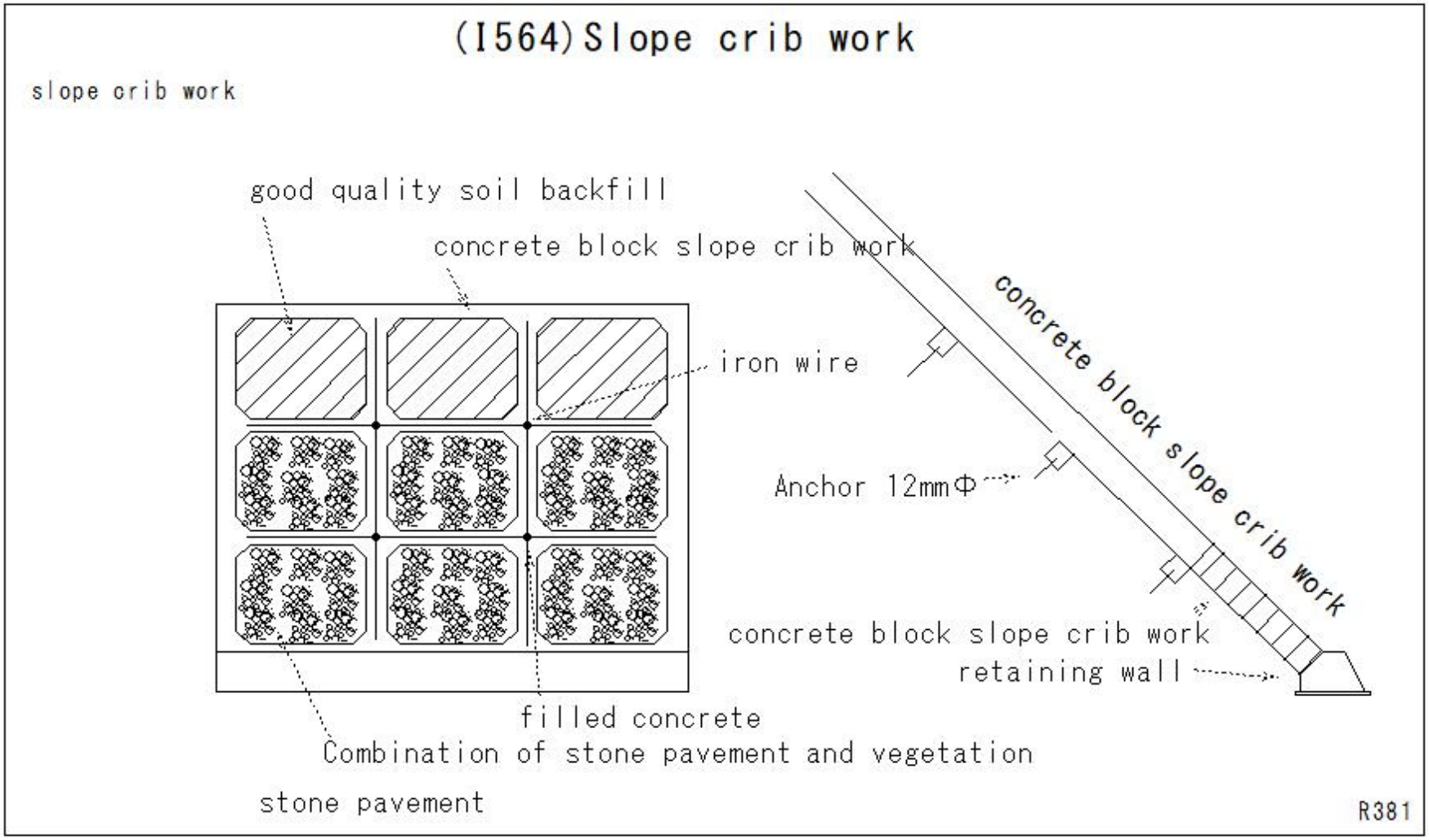
(I562)Productive green tract of land



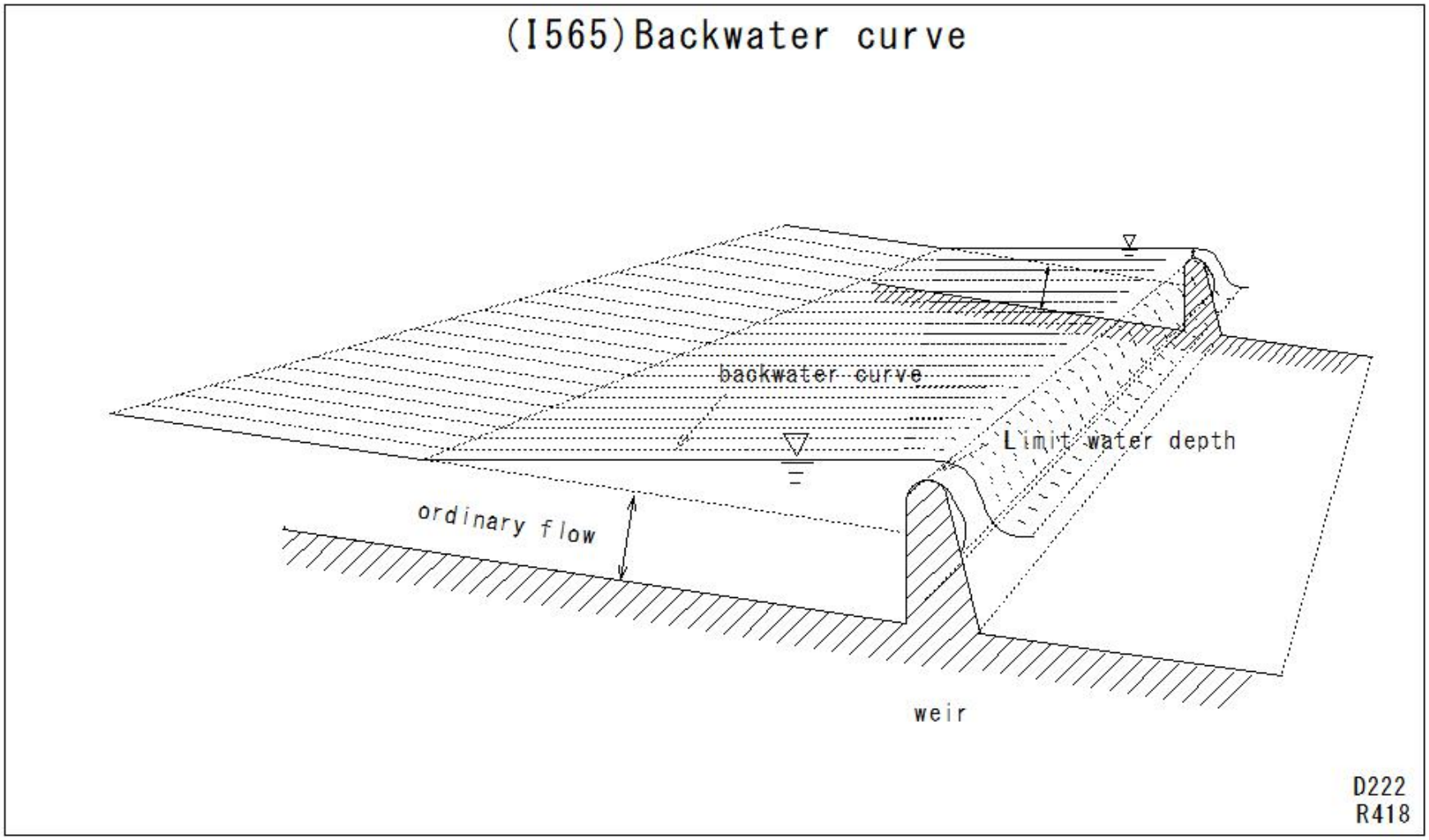
(I563)Weir


(I563)Weir
Weir
irrigation
water supply
hydroelectric power
Water intake
boat transport
high water adjustment
Waterway - damming up water
▽H.W.L
fixed weir
Gate
Movable weir
D221
R302

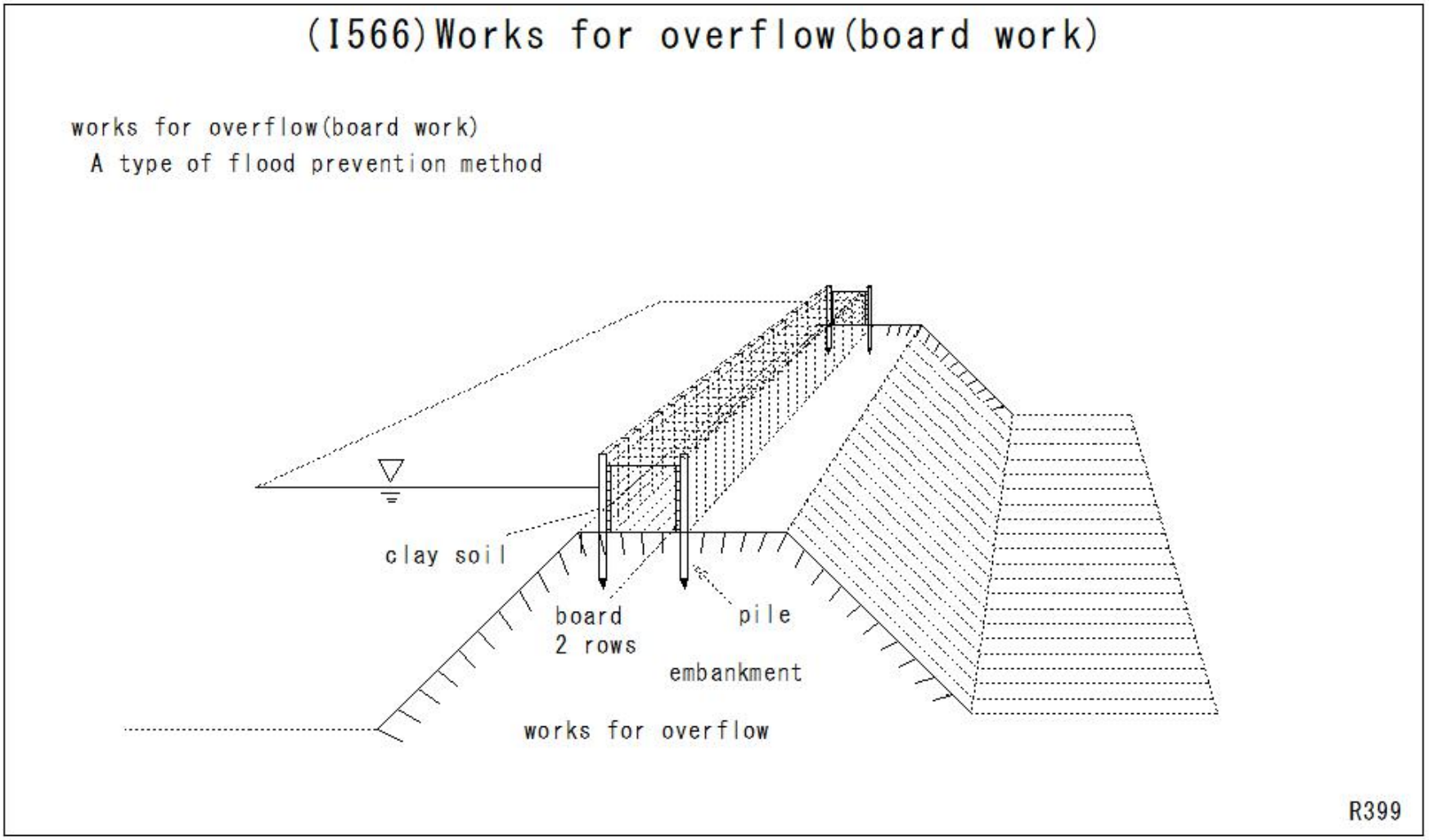
(I564)Slope crib work



(I565)Backwater curve



(I566)Works for overflow(board work)

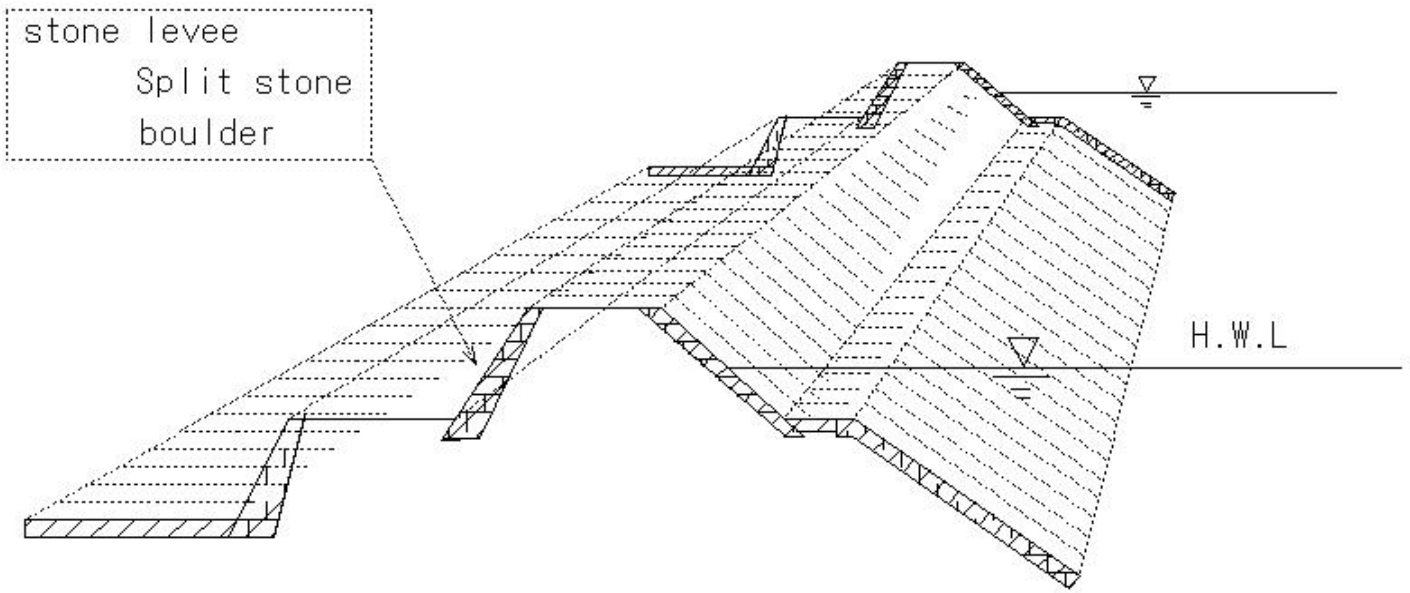


(I567)Stone levee

(I567)Stone levee

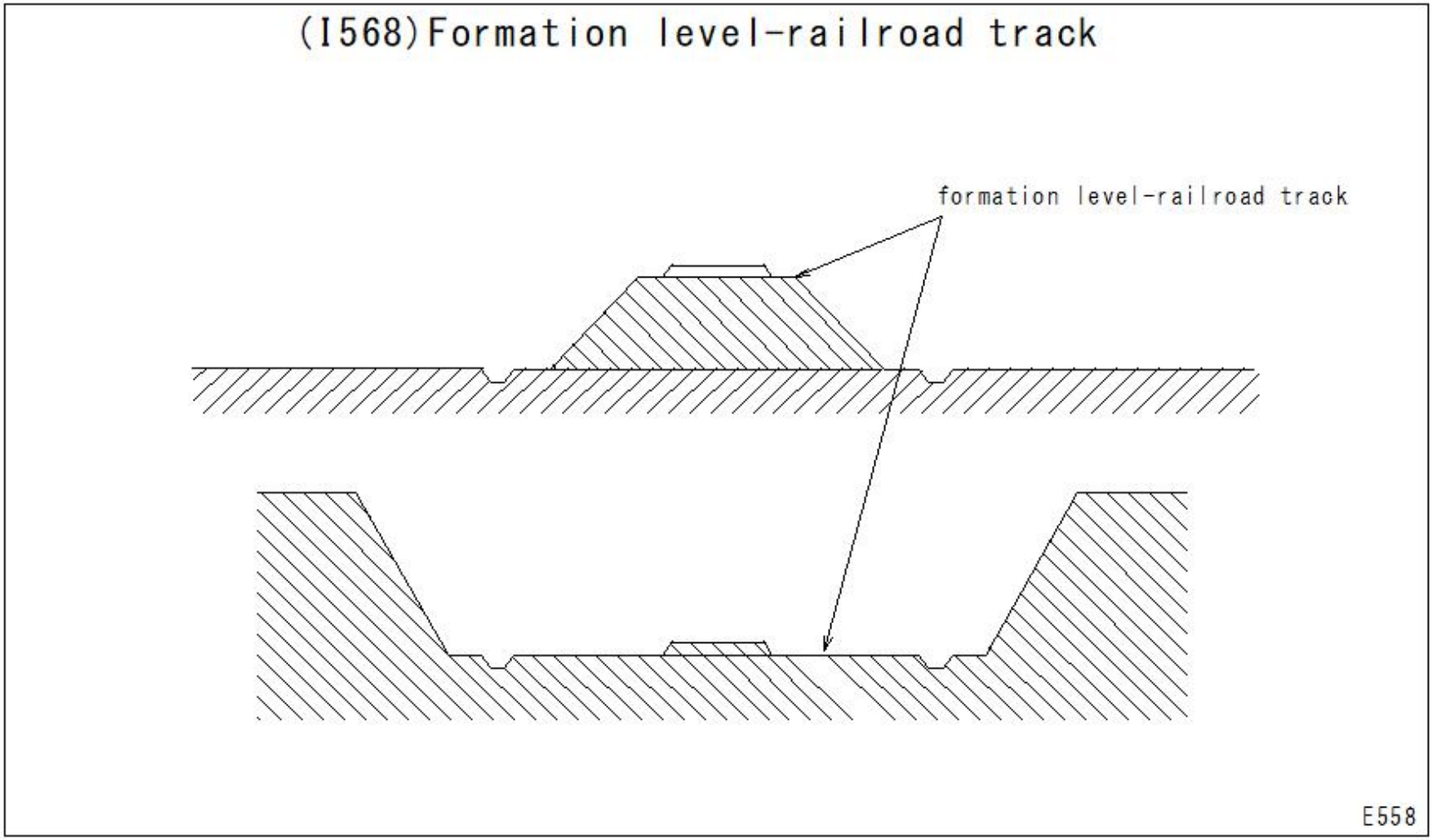
Stone levee

The slope of an embankment is made of broken stones, cobblestones, etc.

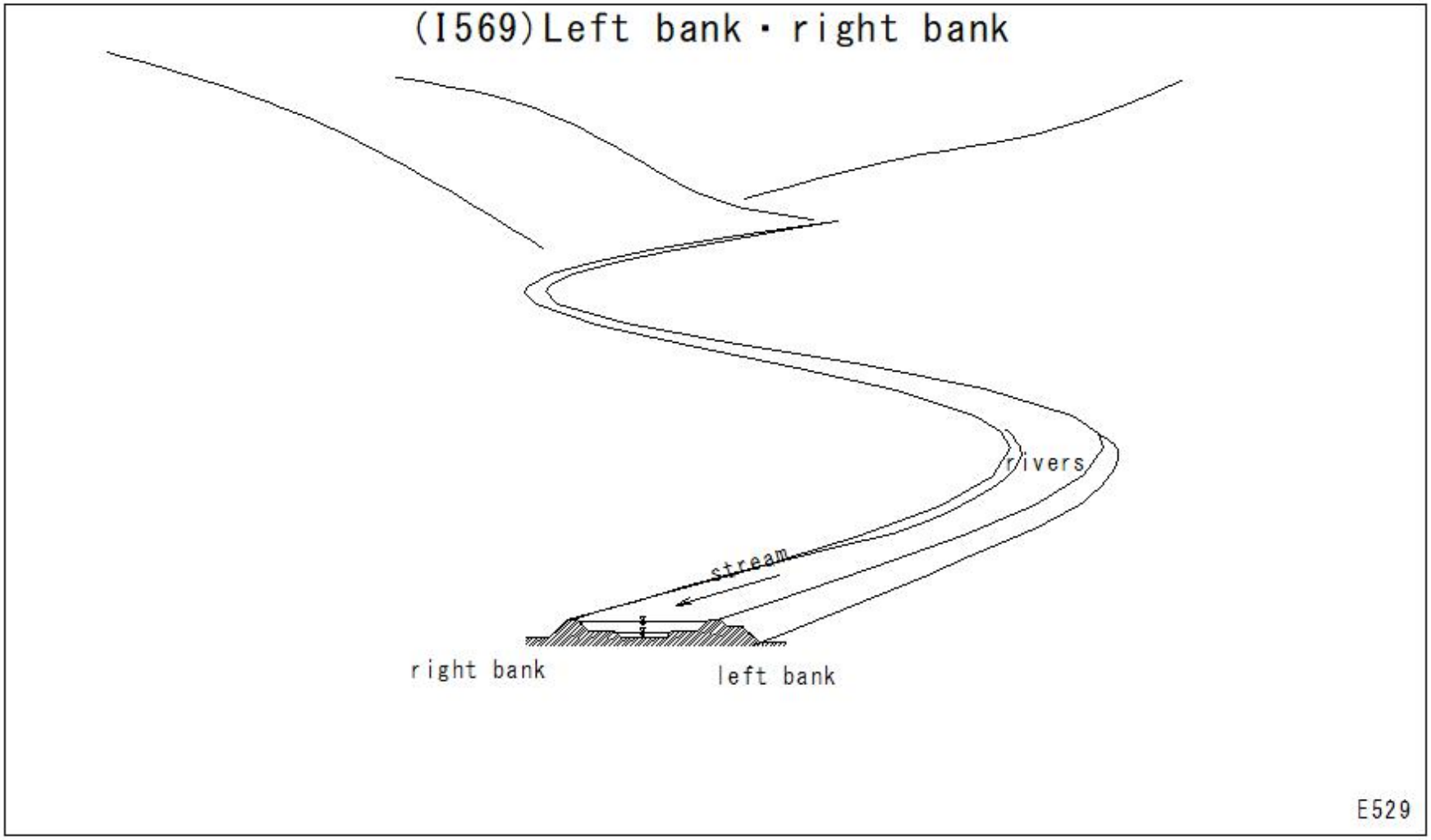


R400

(I568)Formation level-railroad track



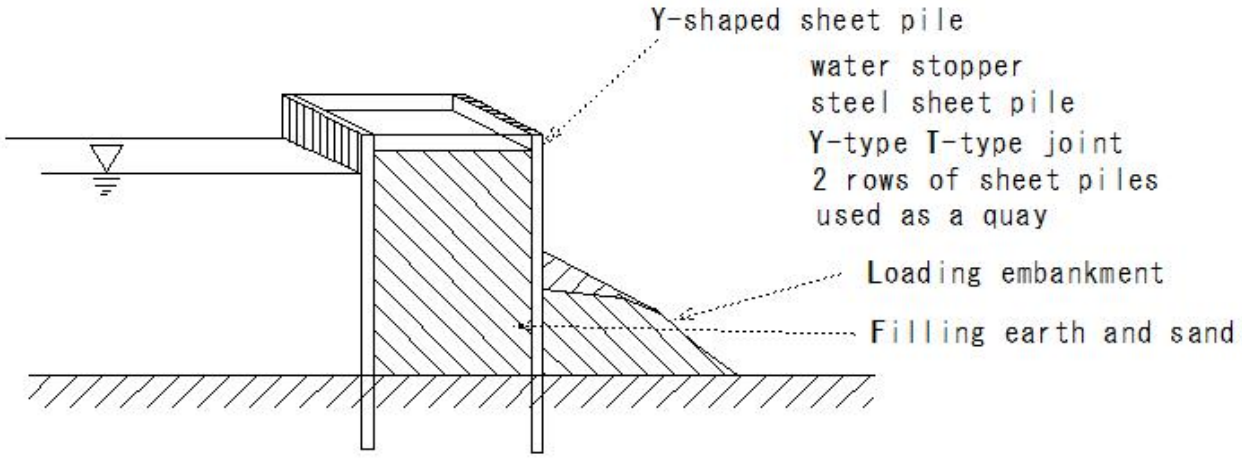
(I569)Left bankright bank



(I570)Cellular sheet pile

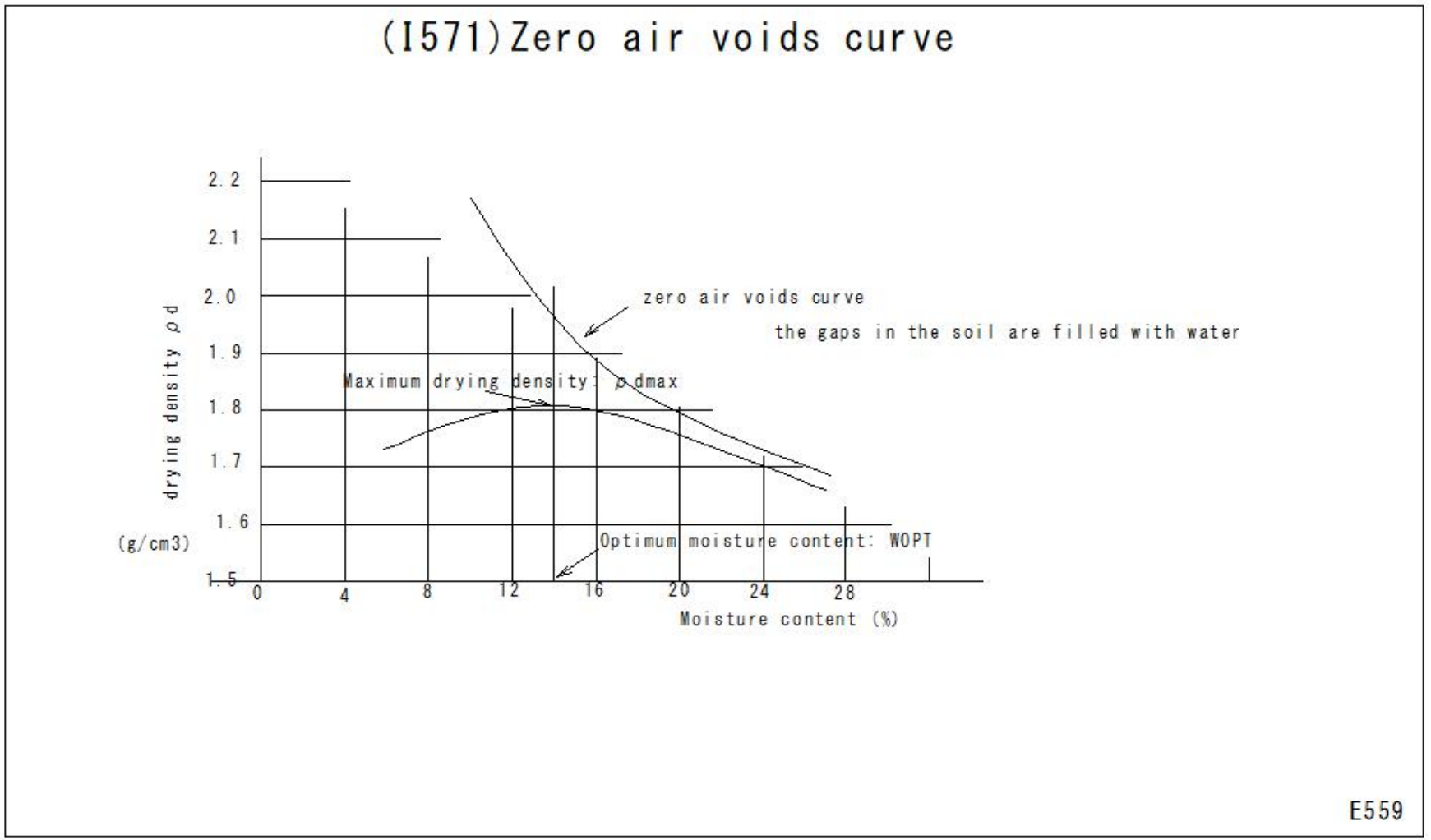
(I570)Cellular sheet pile

Cellular sheet pile



R401

(I571)Zero air voids curve



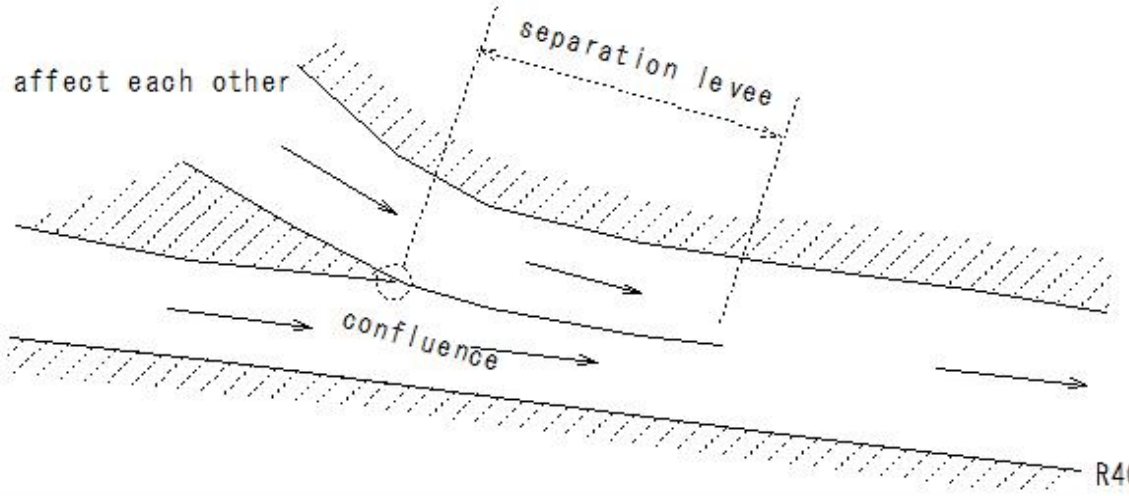
(I572)Separation levee

(I572)Separation levee

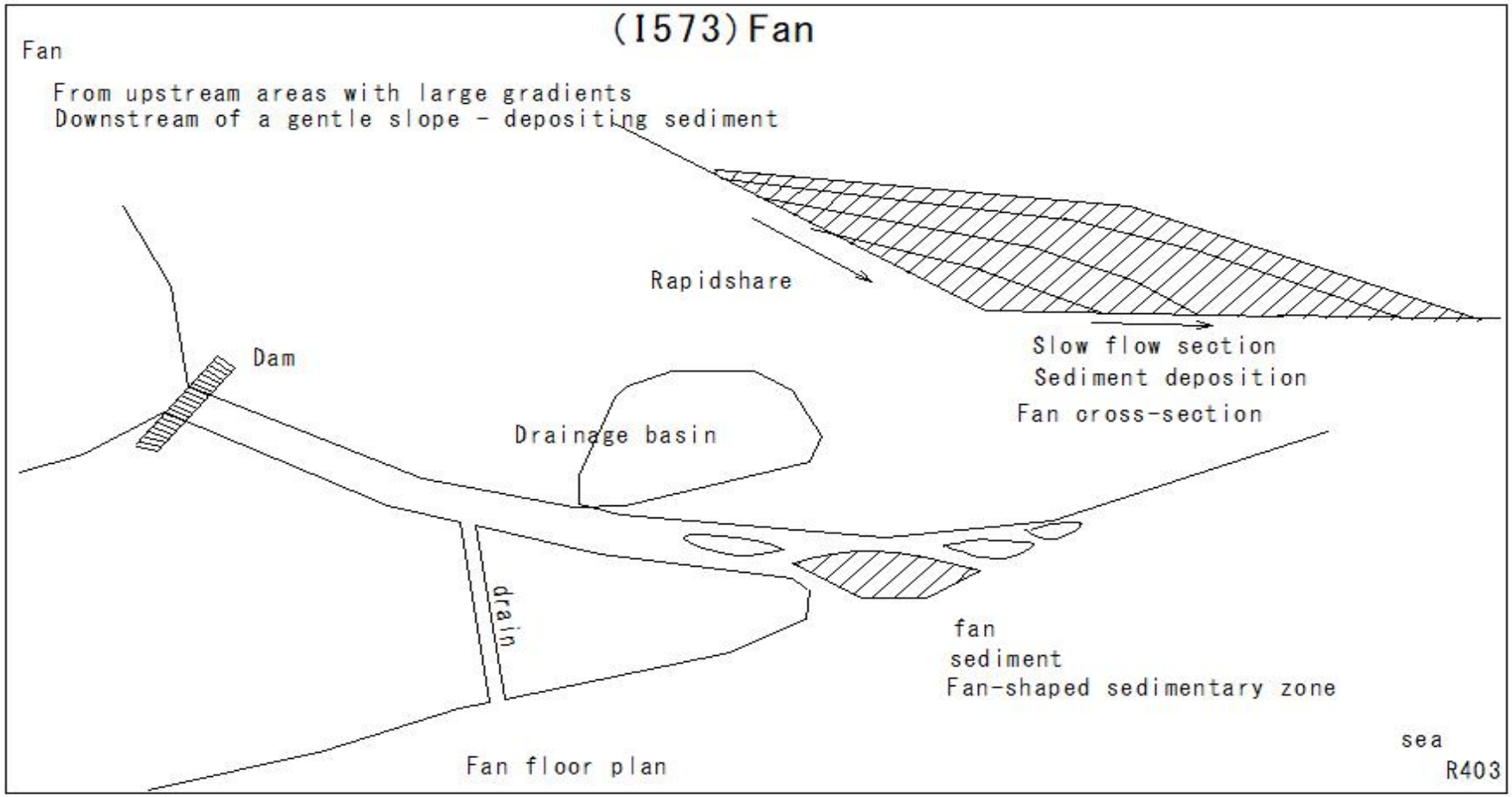
Separation levee
To move the confluence downstream
Embankment between both rivers

Conditions requiring installation
both rivers
①River bed slope
②discharge
huge difference

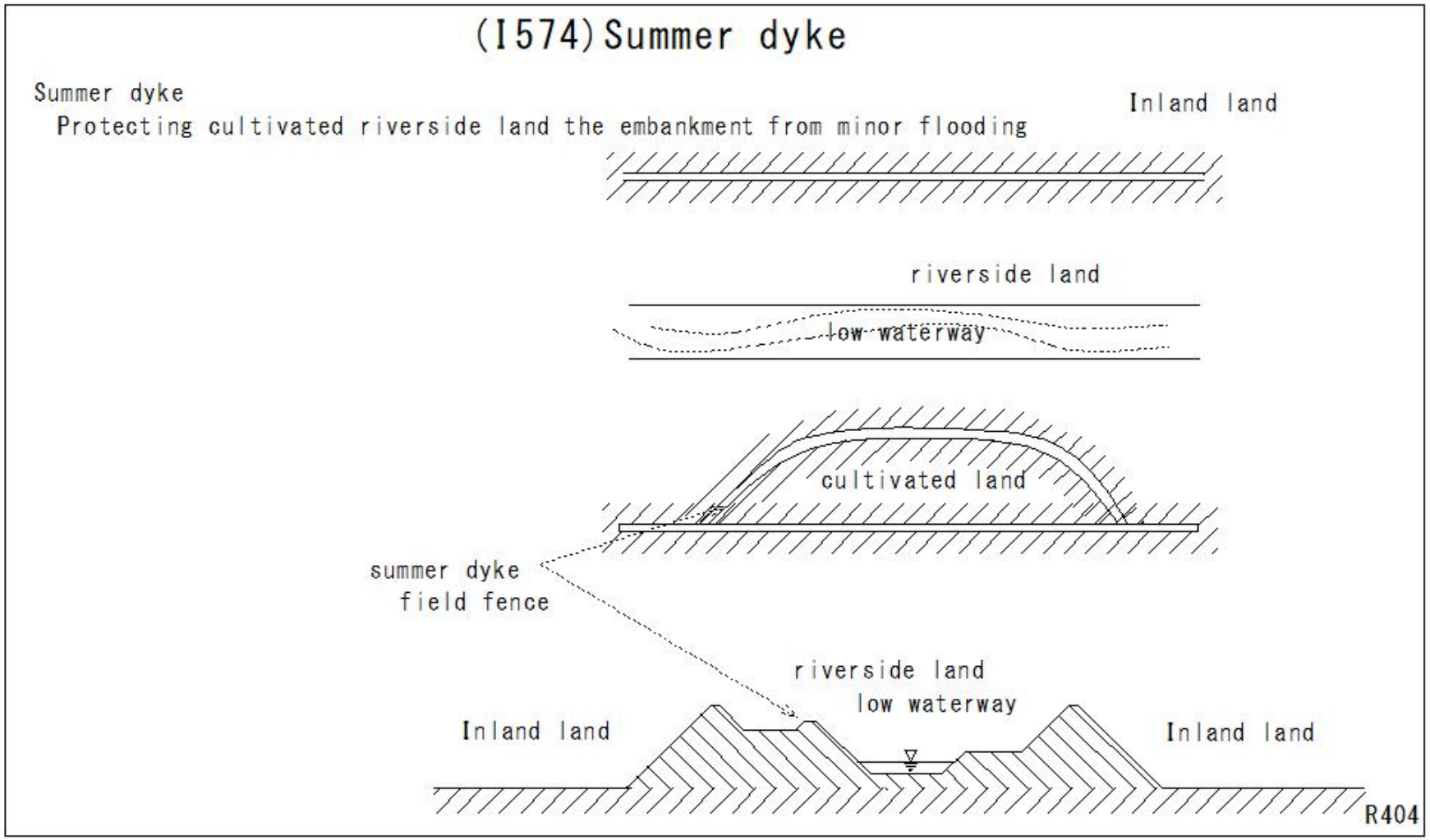
separation levee
Extend to a position : do not affect each other



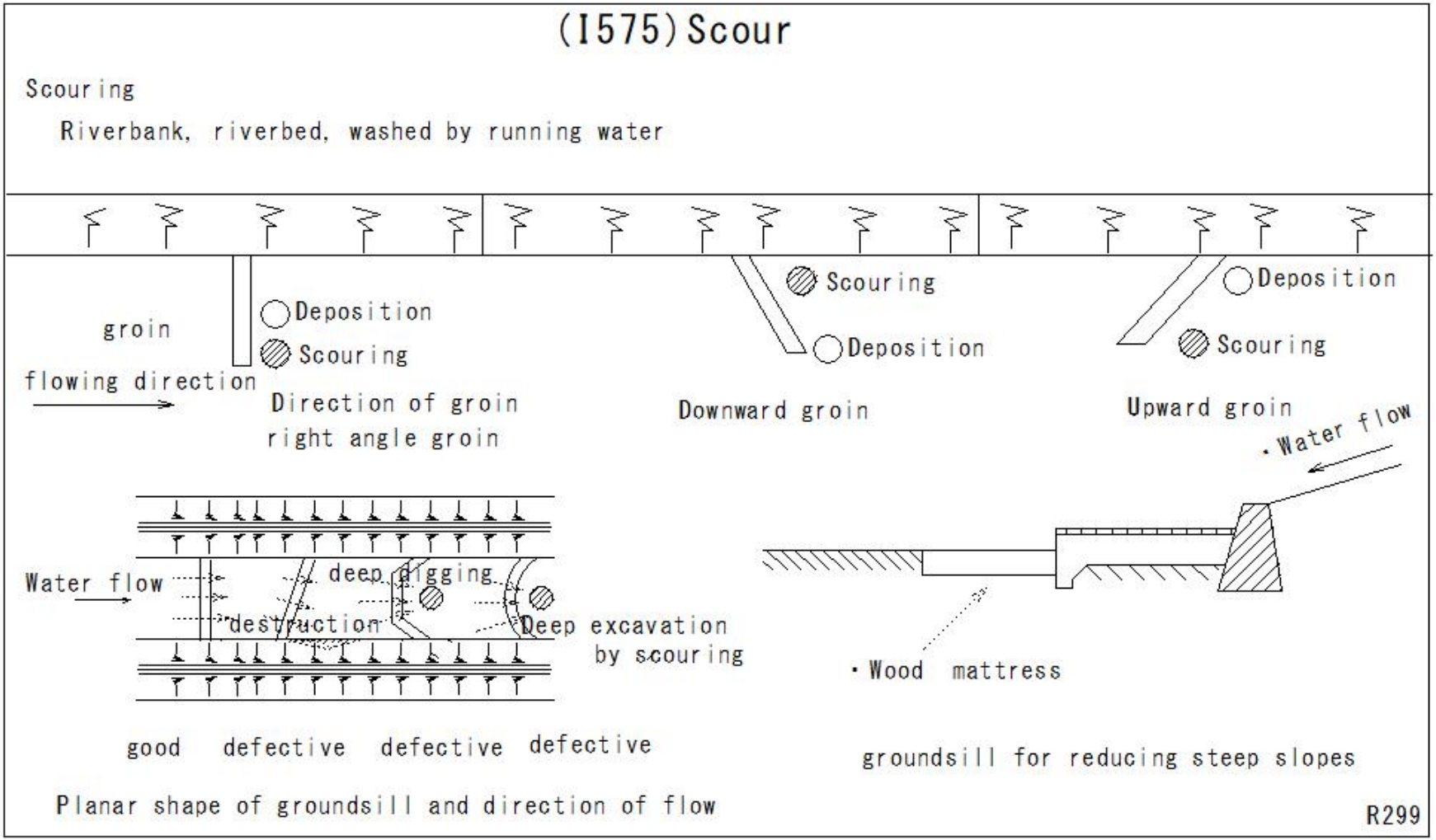
(I573)Fan


(I573)Fan
Fan
From upstream areas with large gradients
Downstream of a gentle slope - depositing sediment
Rapidshare
Slow flow section
Sediment deposition
Fan cross-section
Dam
Drainage basin
drain
fan
sediment
Fan-shaped sedimentary zone
sea
Fan floor plan
R403

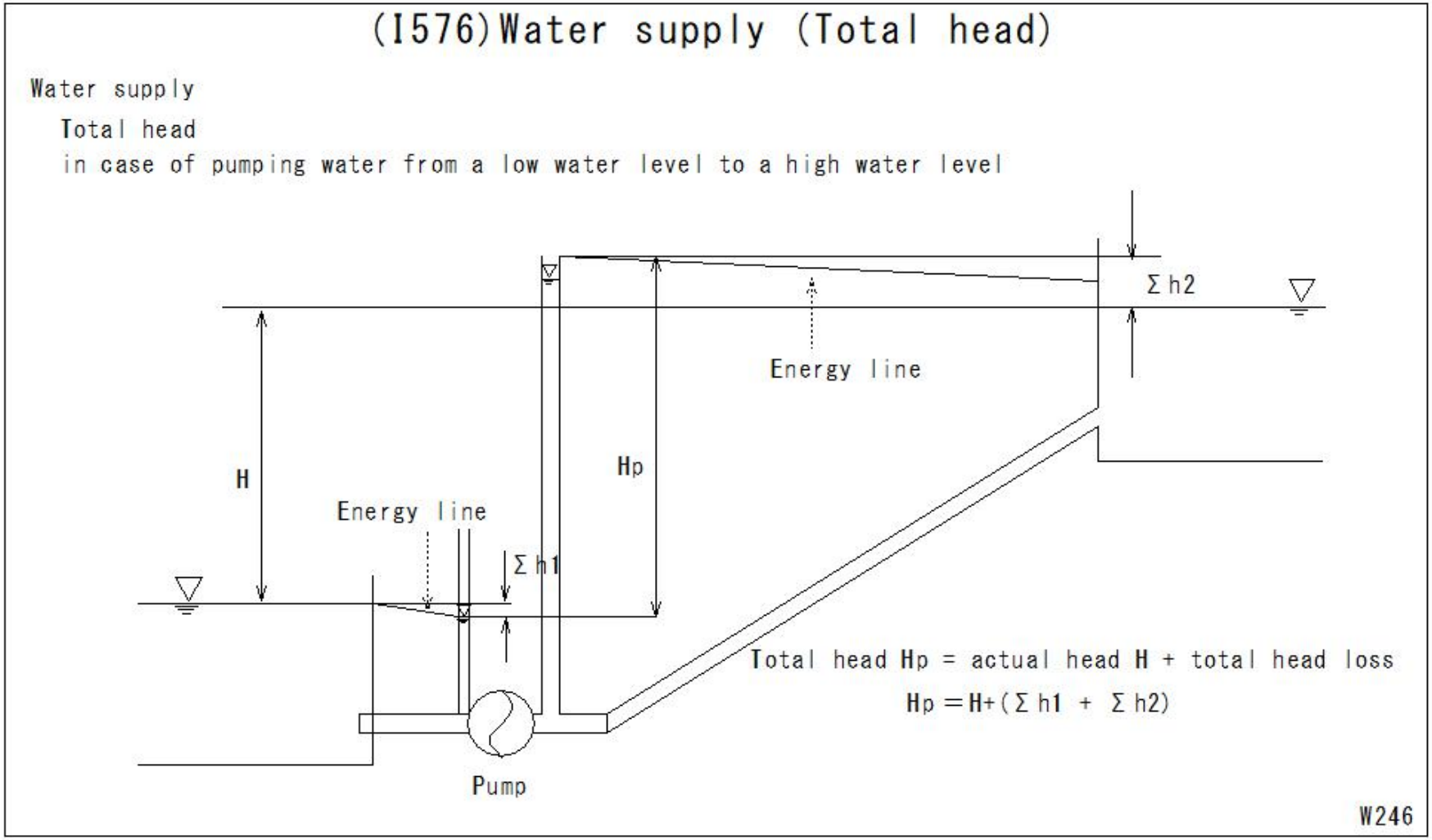
(I574)Summer dyke



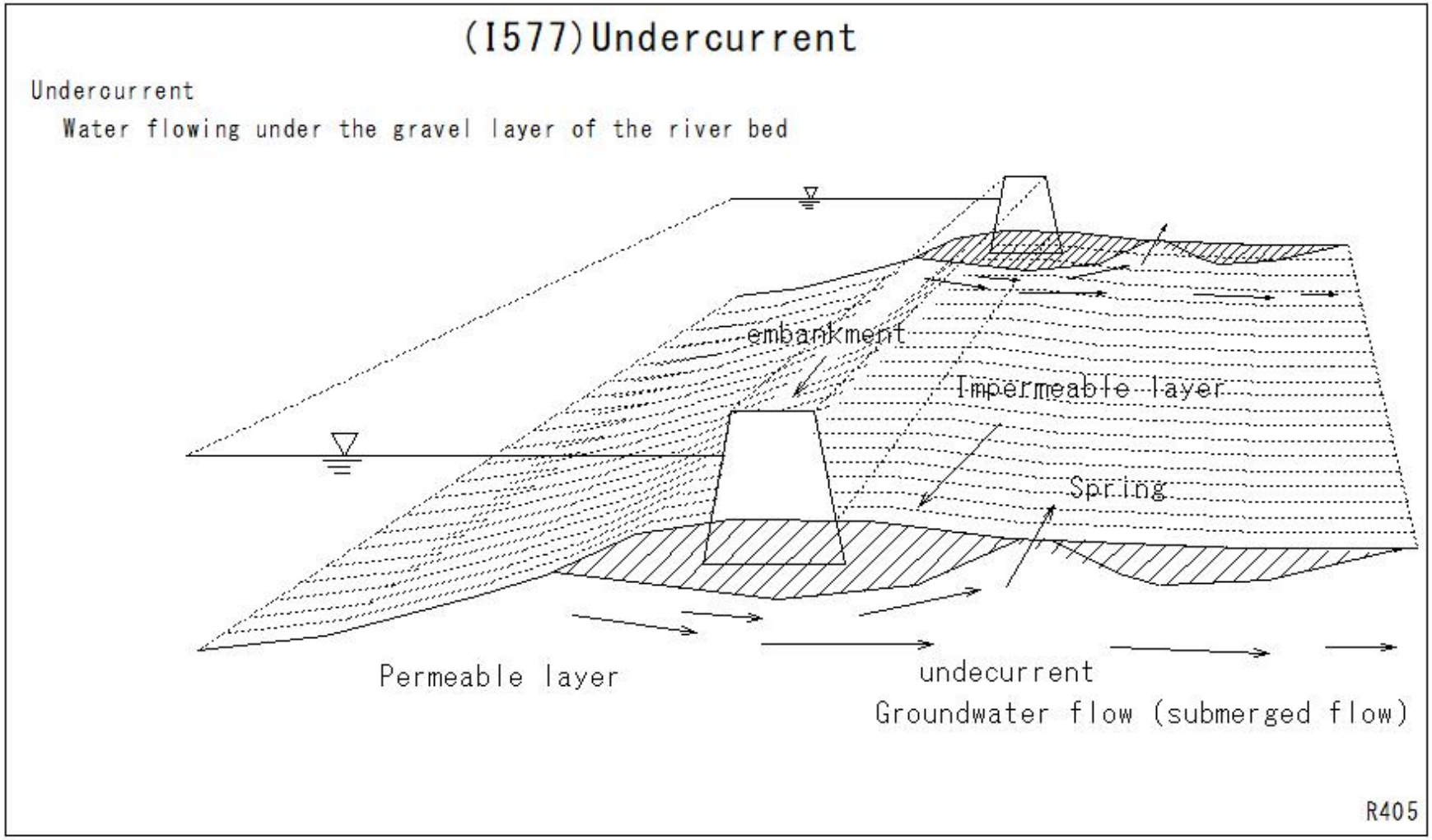
(I575)Scour


(I575) Scour
Scouring
Riverbank, riverbed, washed by running water
groin
flowing direction
Deposition
Scouring
Direction of groin
right angle groin
Scouring
Deposition
Downward groin
Deposition
Scouring
Upward groin
Water flow
deep digging
destruction
Deep excavation
by scouring
good
defective
defective
defective
Planar shape of groundsill and direction of flow
・Water flow
・Wood mattress
groundsill for reducing steep slopes
R299

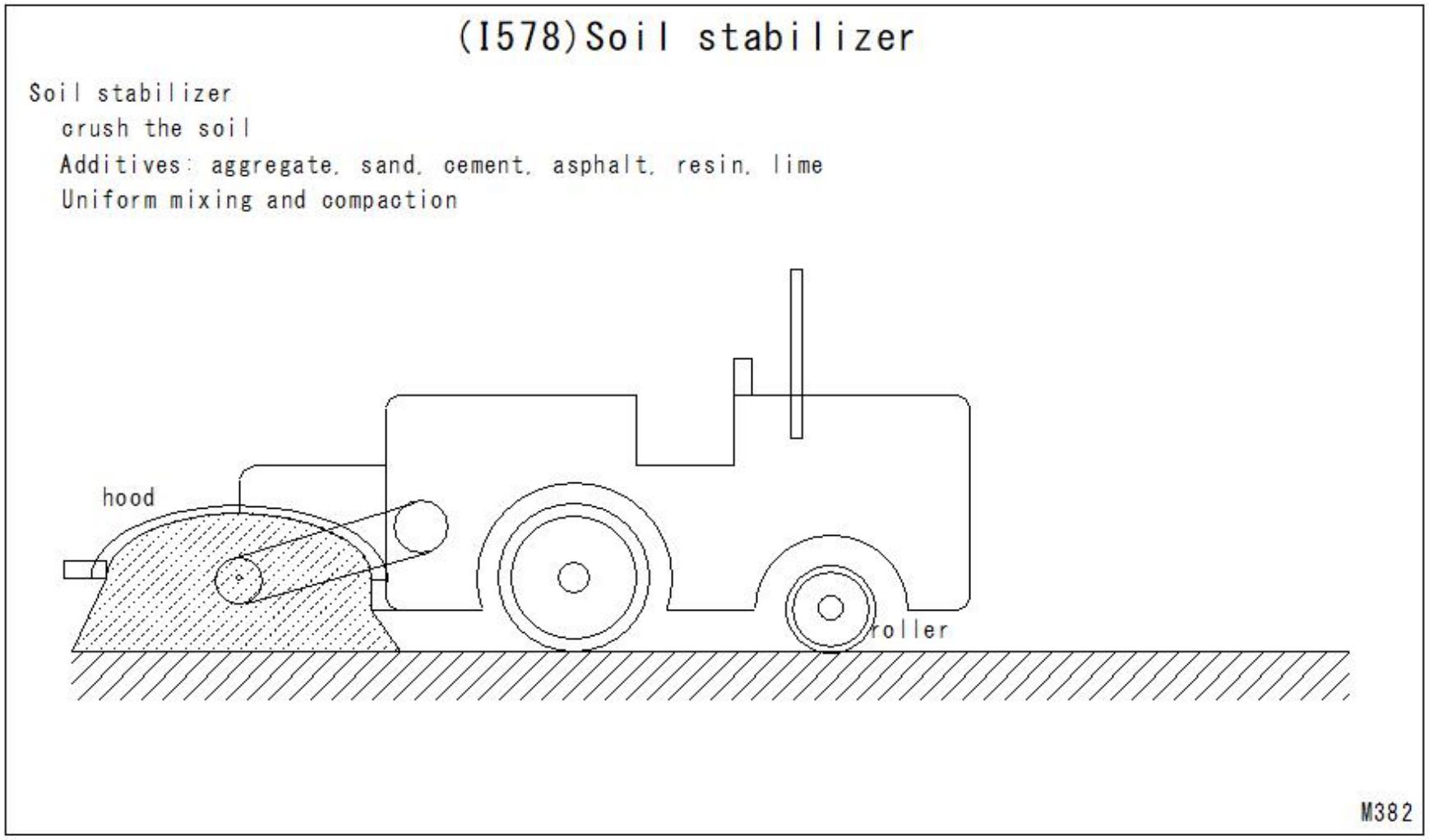
(I576)Water supply (Total head)



(I577)Undercurrent



(I578)Soil stabilizer



(I579)Water supply (water-conveyance equipment(Water supply facility))

(I579)Water supply (water-conveyance equipment(Water supply facility))

Water supply

water-conveyance equipment(Water supply facility)

Water supply pipe from water purification area

Pumping to water supply reservoir

①Filtration pond

②Water supply pump

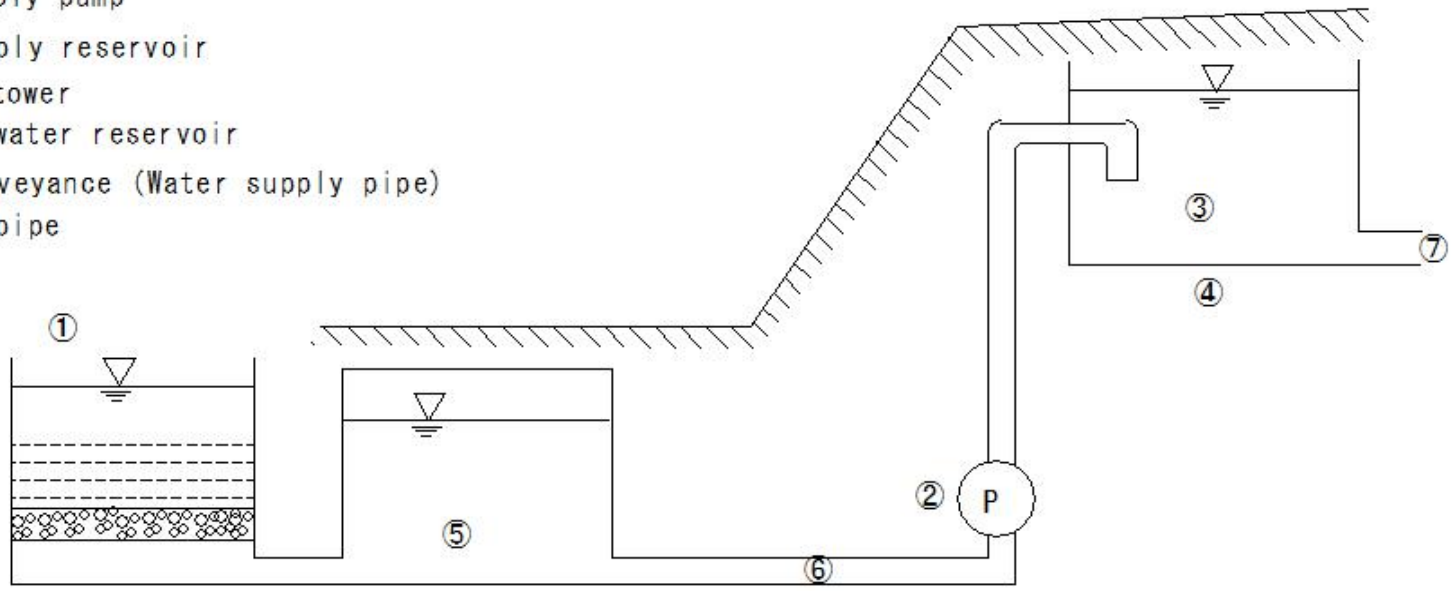
③Water supply reservoir

④Drainage tower

⑤Purified water reservoir

⑥water-conveyance (Water supply pipe)

⑦Drainage pipe



water-conveyance equipment(Water supply facility)

W247

(I580)Sodding

(I580)Sodding

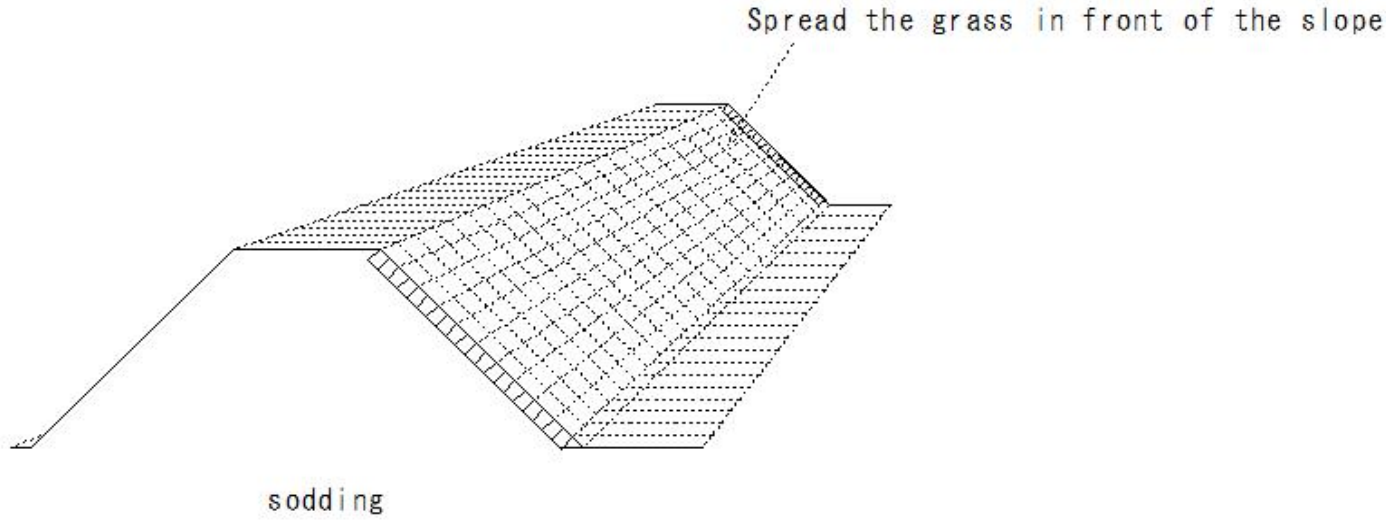
Sodding

slope protection

plant grass in front

slope covering(lining) works

Used on river surface of river embankment



R406

(I581)Traction

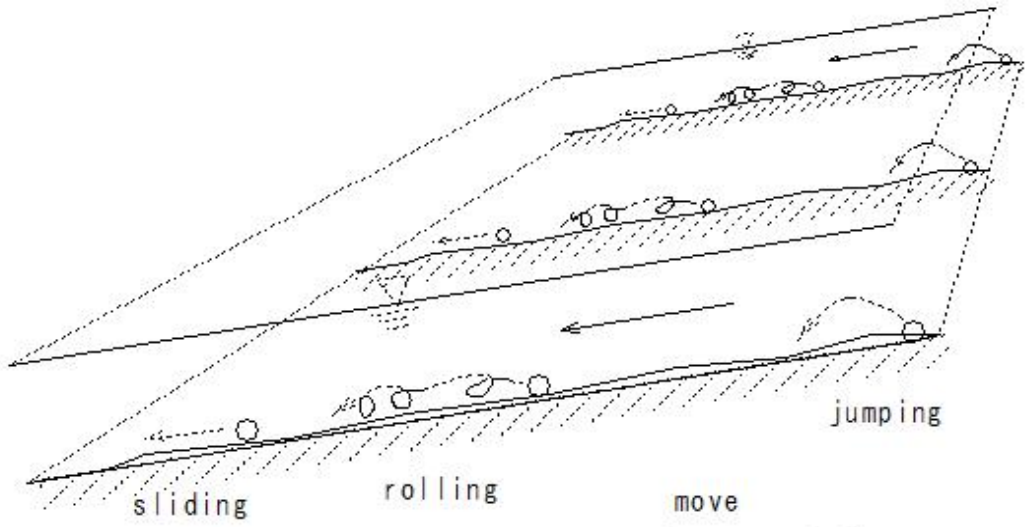
(I581)Traction

Traction: Flowing by rolling on the river bed

Sediment on the riverbed is Scouring

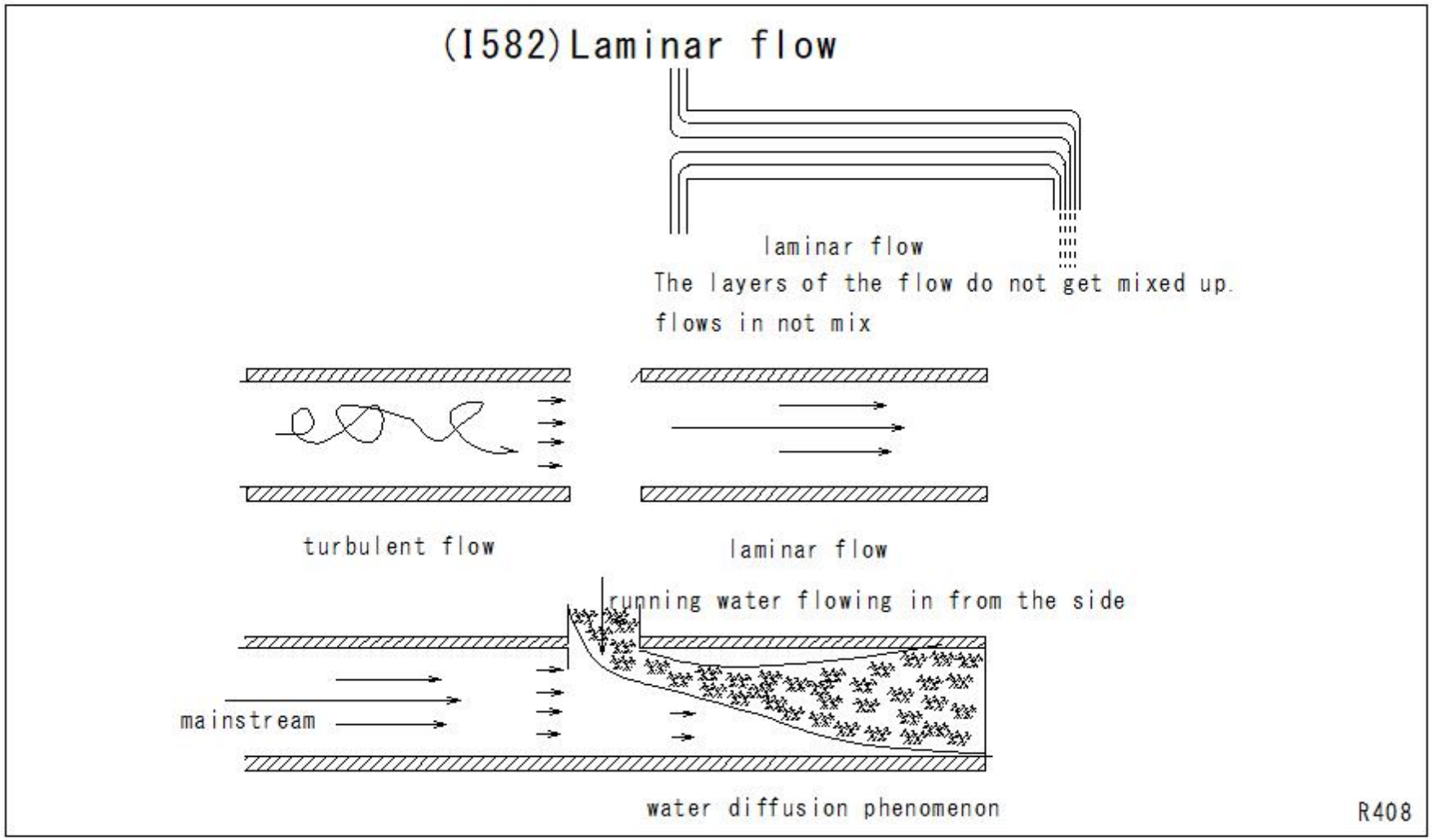
flow out

Sediment on the river bed

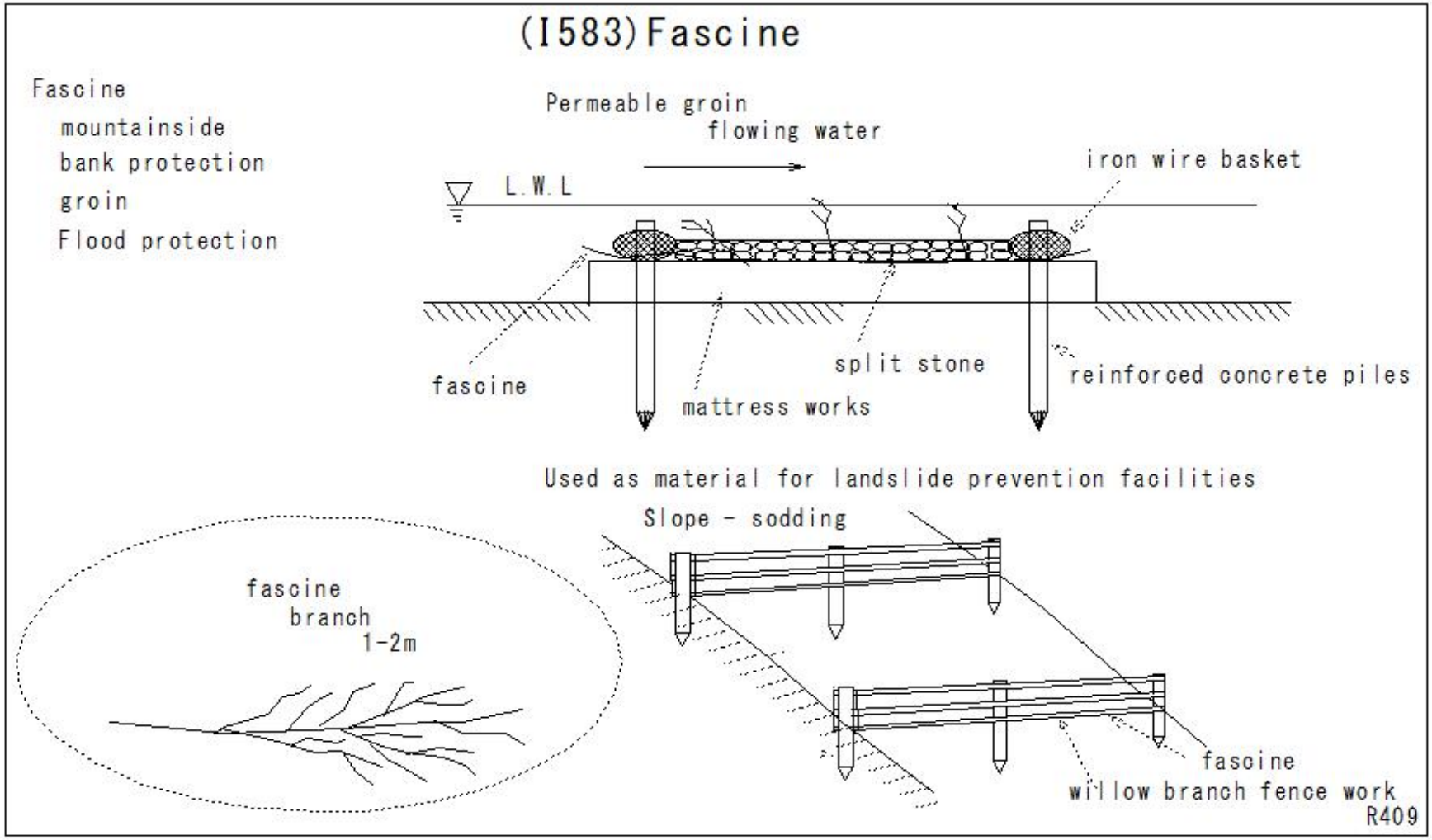


R407

(I582)Laminar flow



(I583)Fascine



(I584)Flowing through capability

(I584)Flowing through capability

Flowing through capability

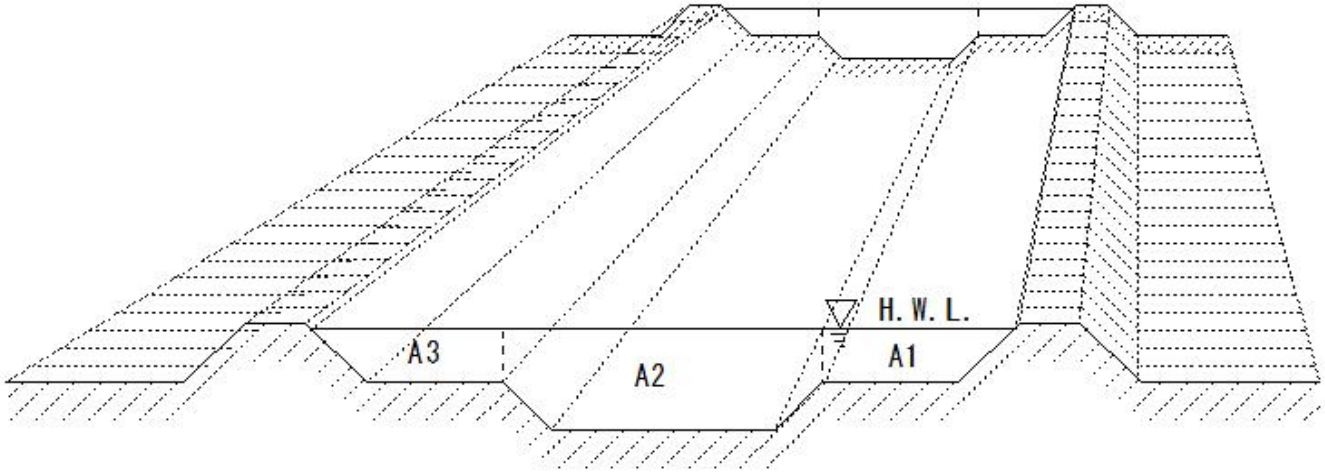
The limit to which rivers can safely carry flood waters

Divide the river cross section into 2-3 sections

Average flow velocity v1 v2 v3

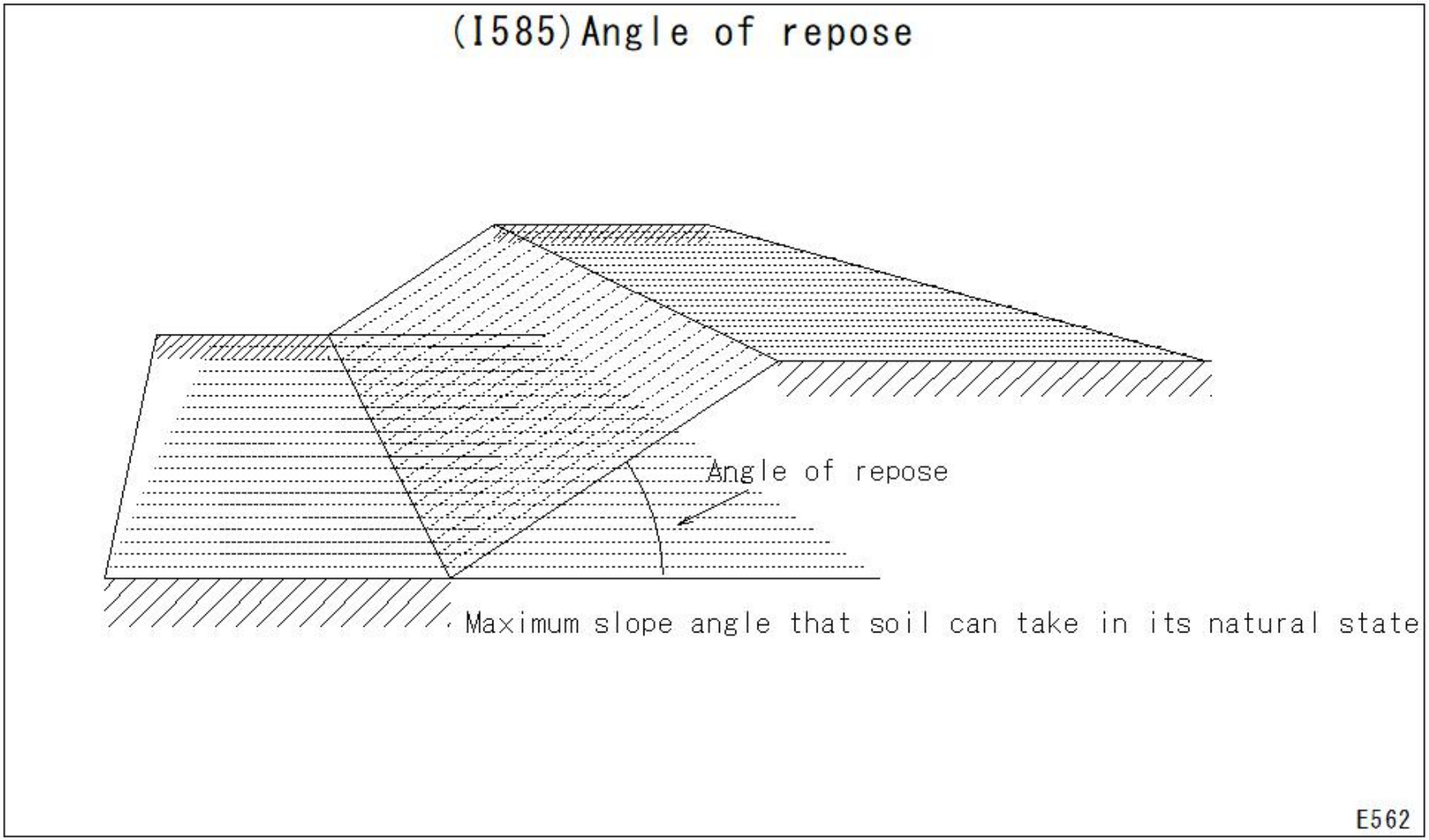
River area A1 A2 A3

Q=A1v1+A2v2+A3v3

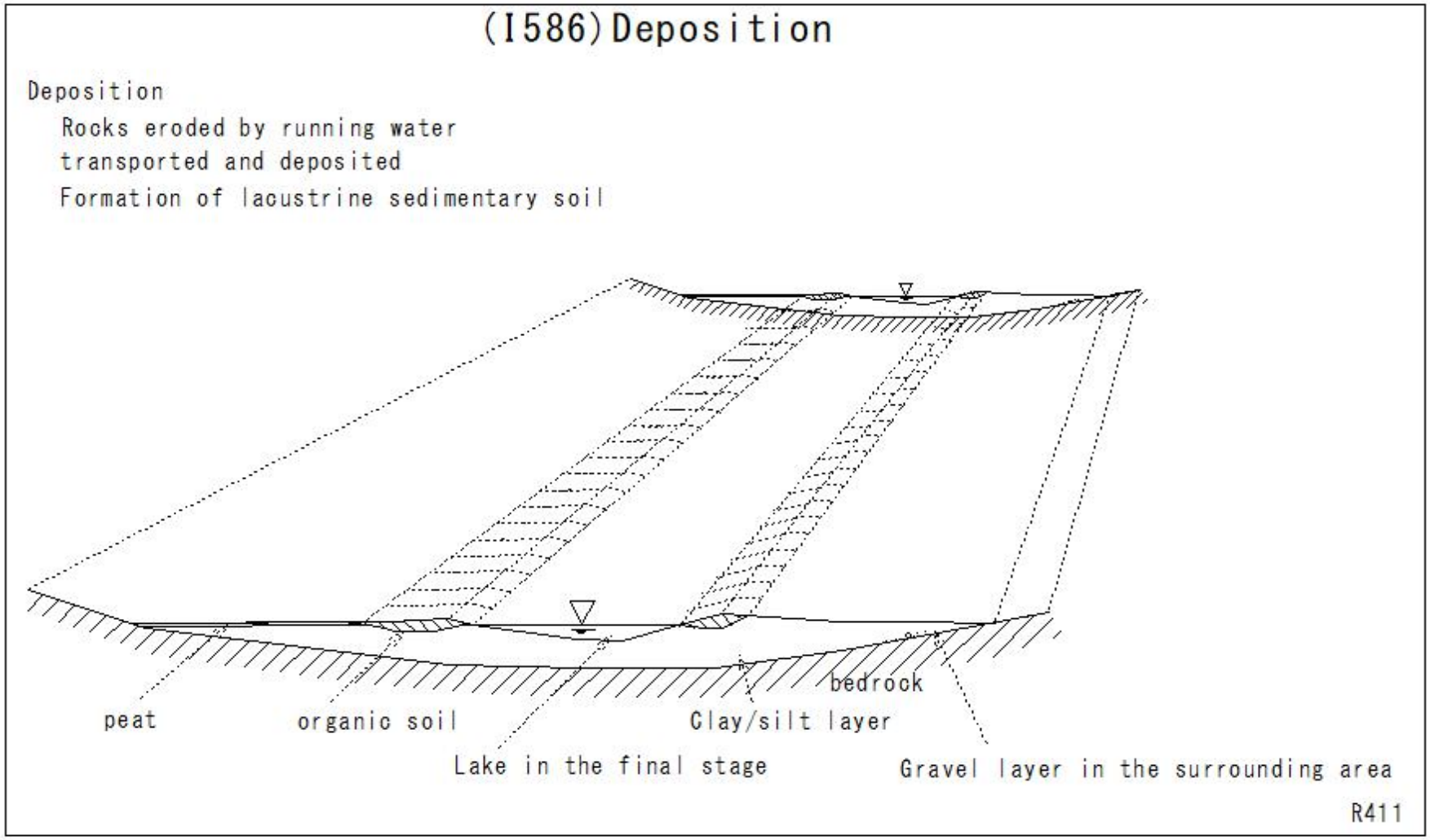


R410

(I585)Angle of repose



(I586)Deposition



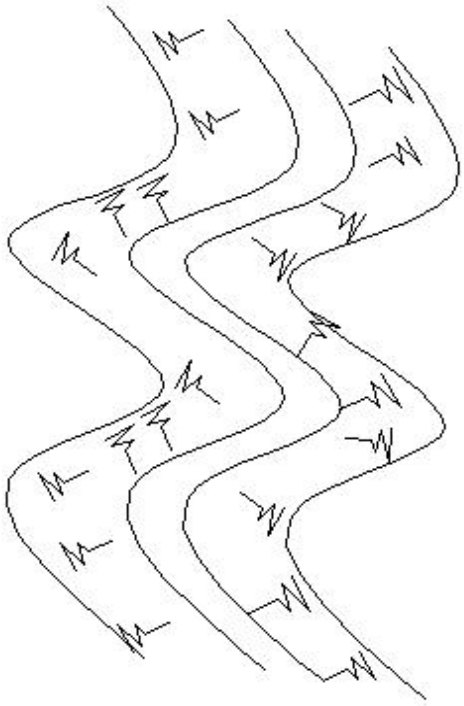
(I587)Meandering

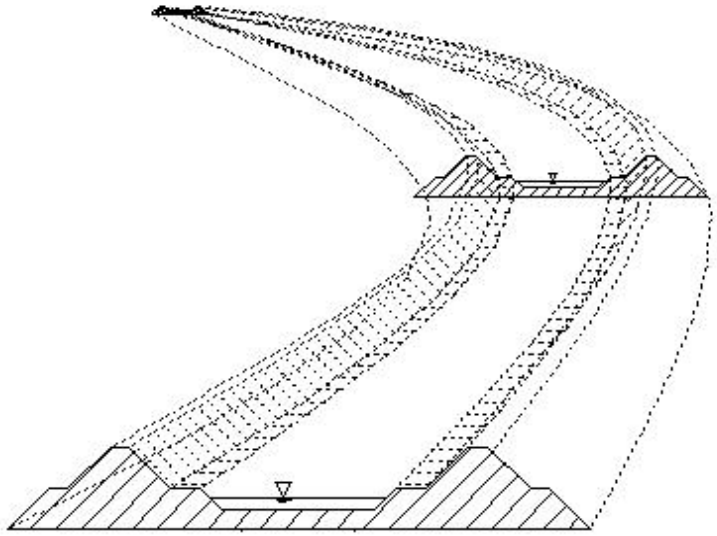
(I587)Meandering

Meandering

River - meandering like a snake

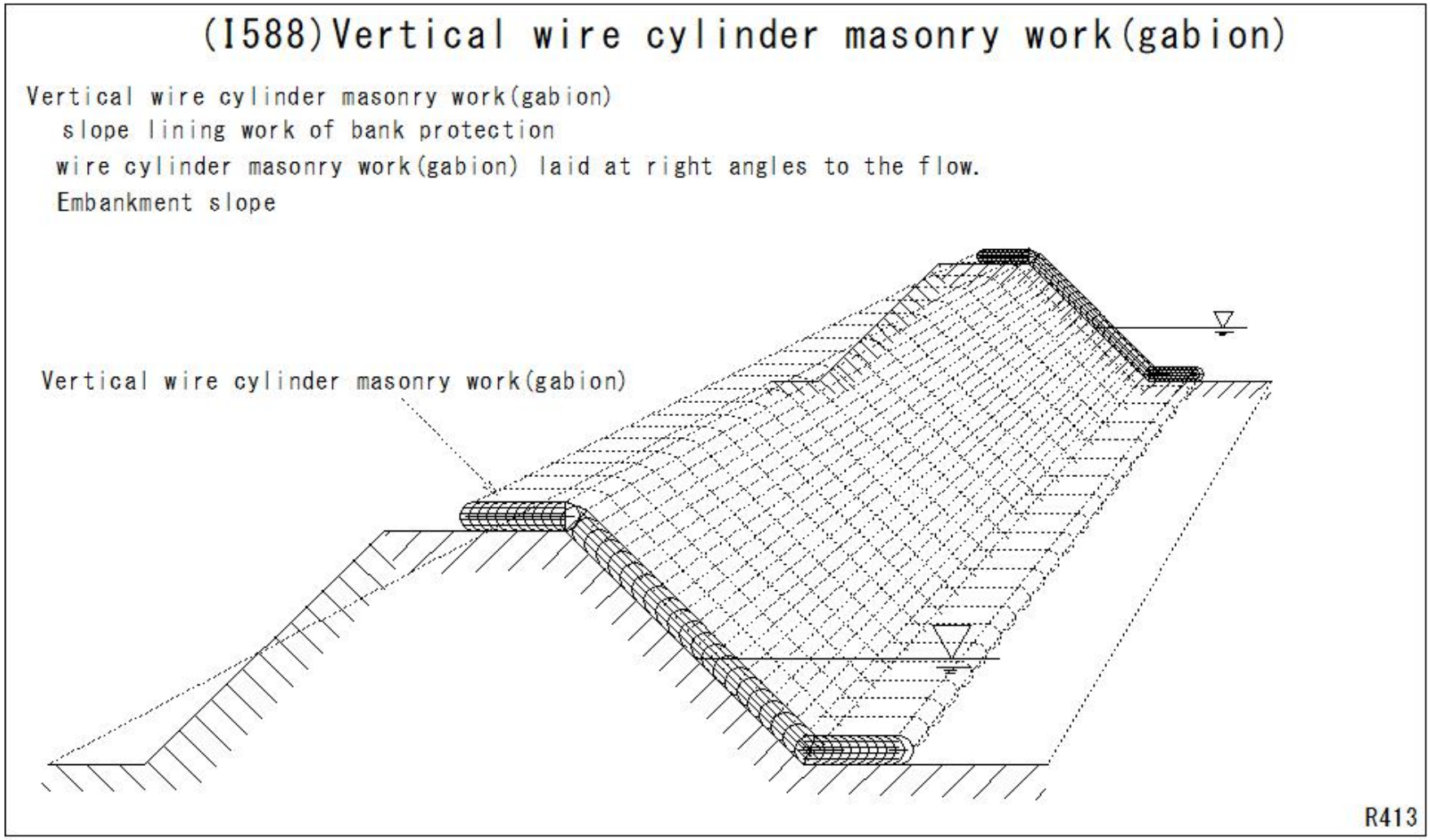
The river flow -natural slope.



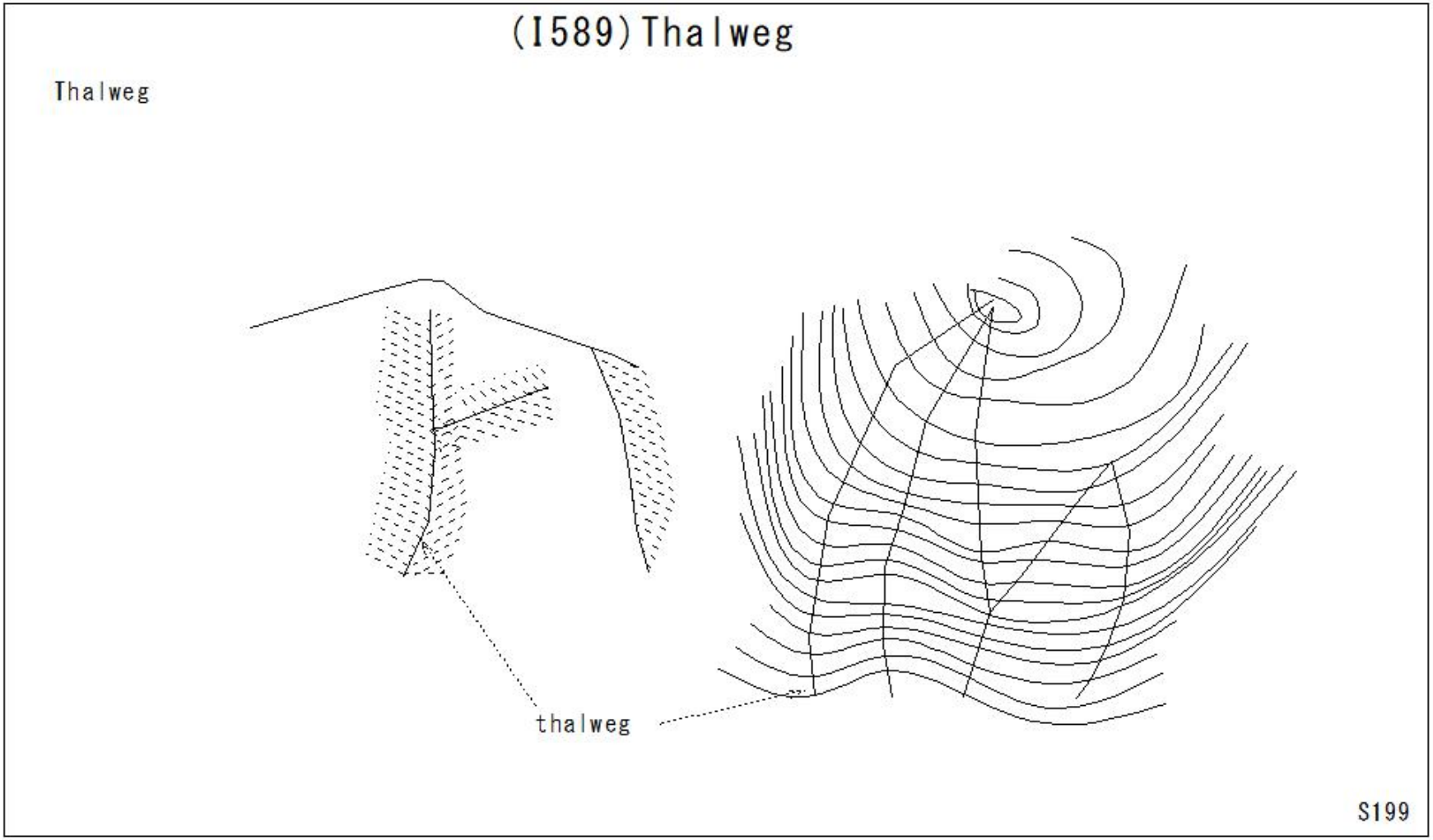


R412

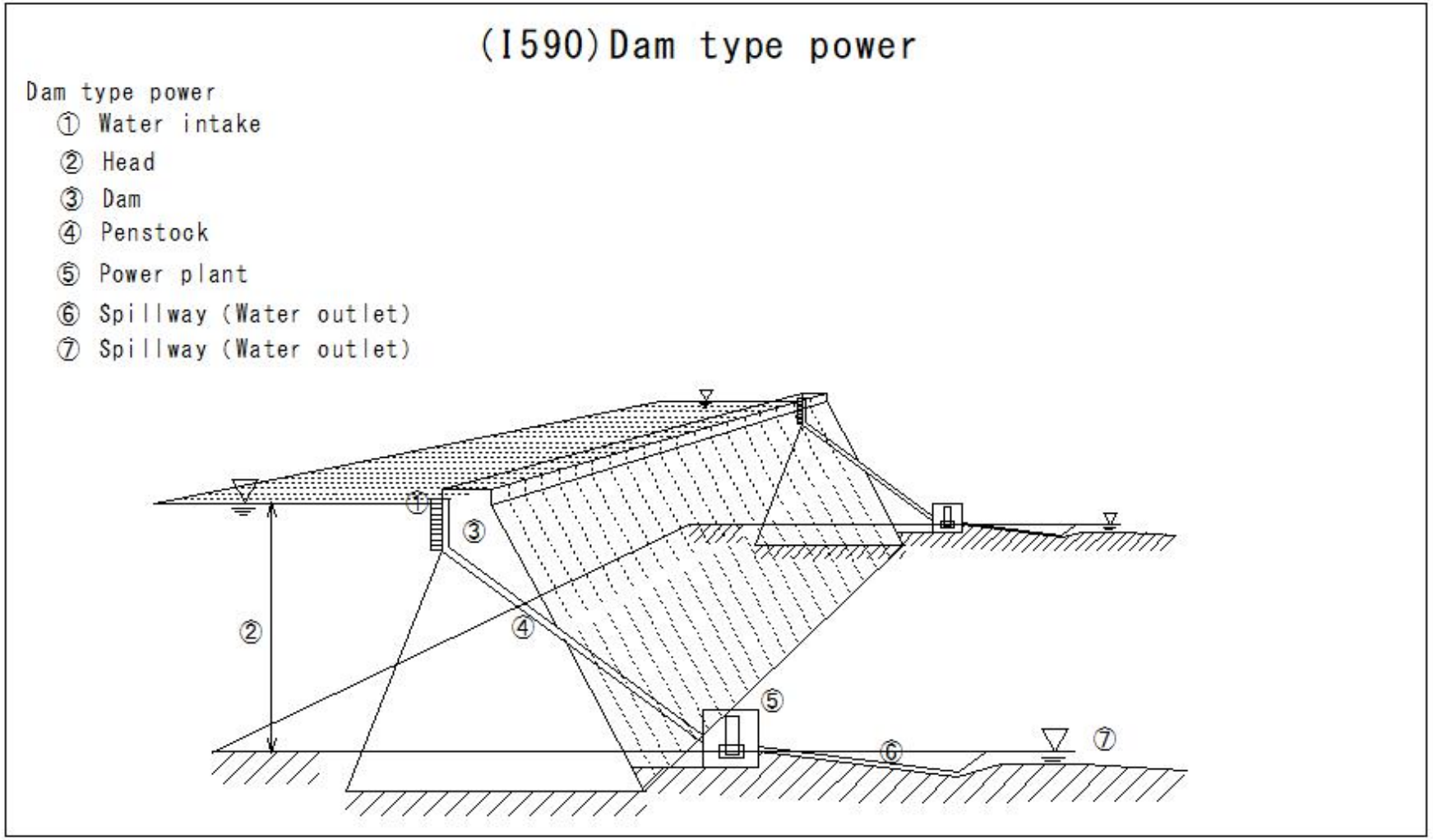
(I588)Vertical wire cylinder masonry work(gabion)



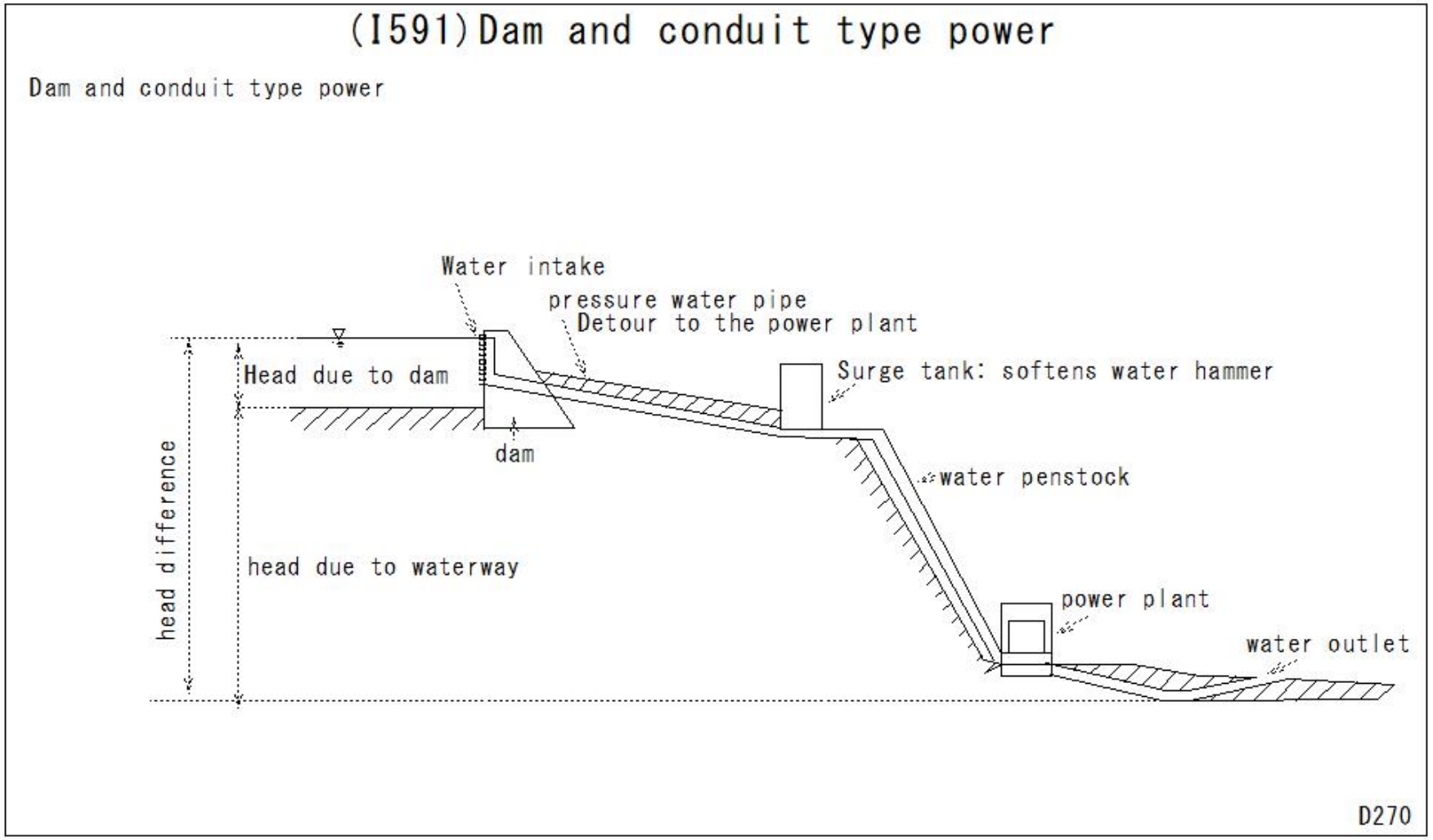
(I589)Thalweg



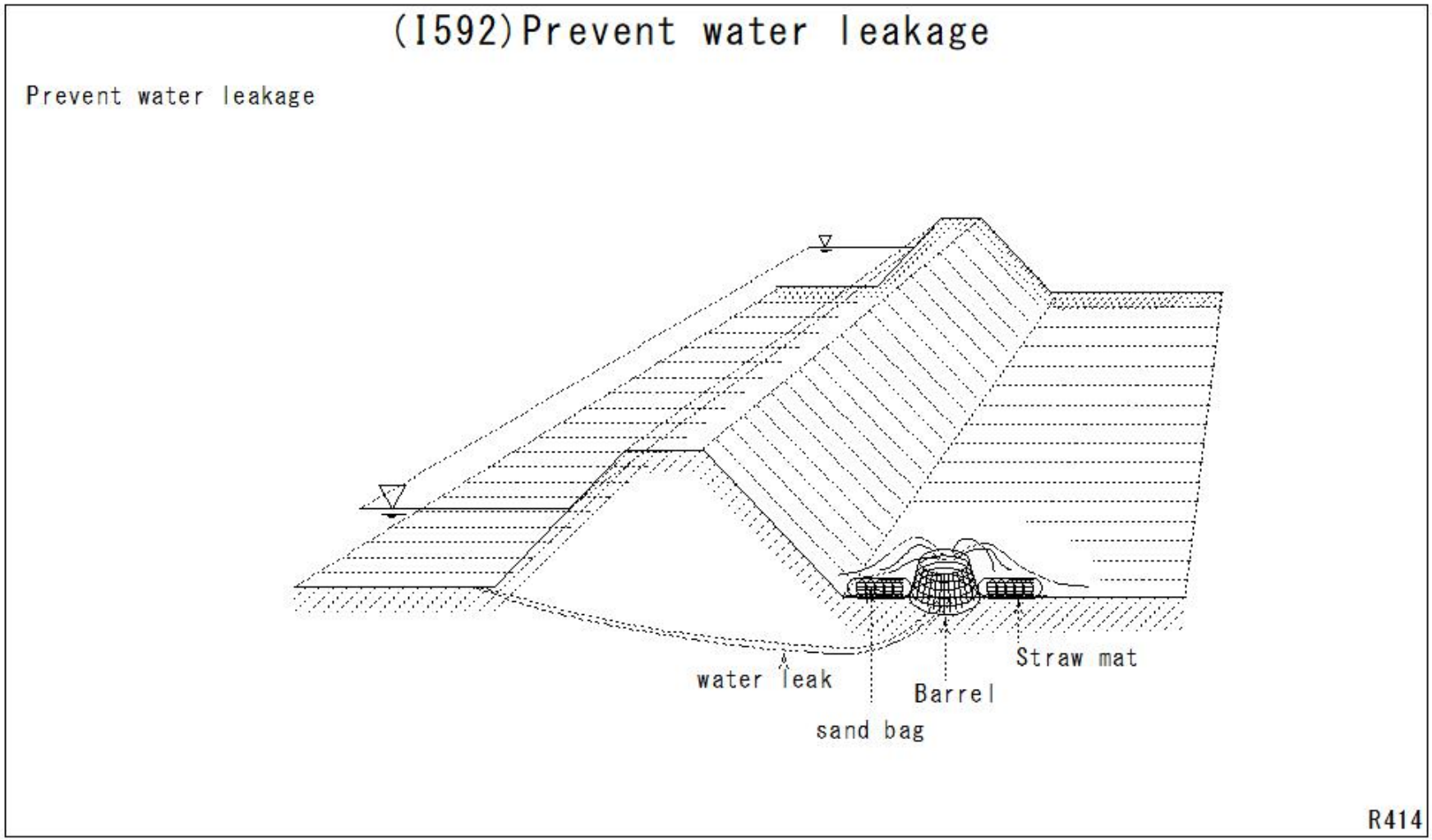
(I590)Dam type power



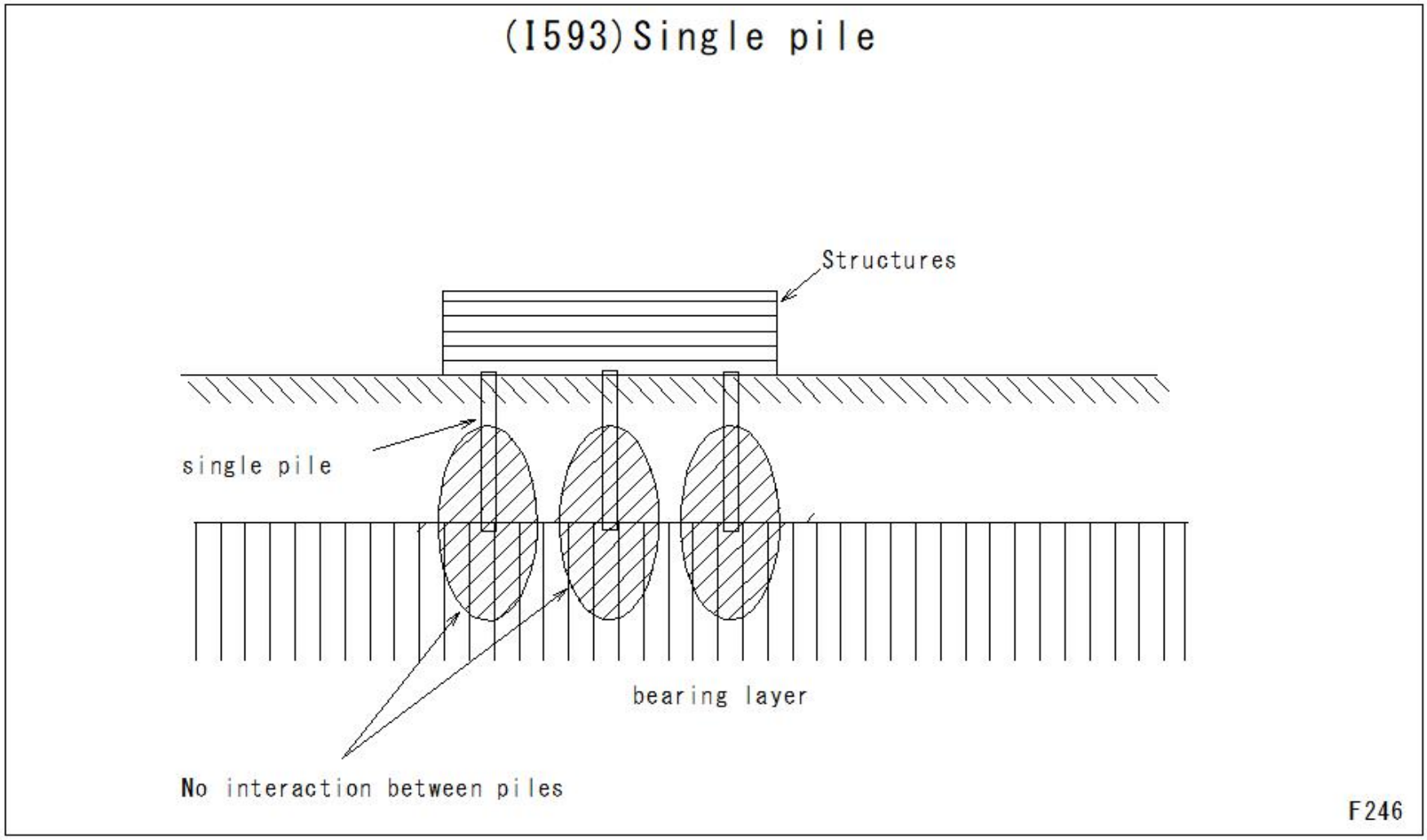
(I591)Dam and conduit type power



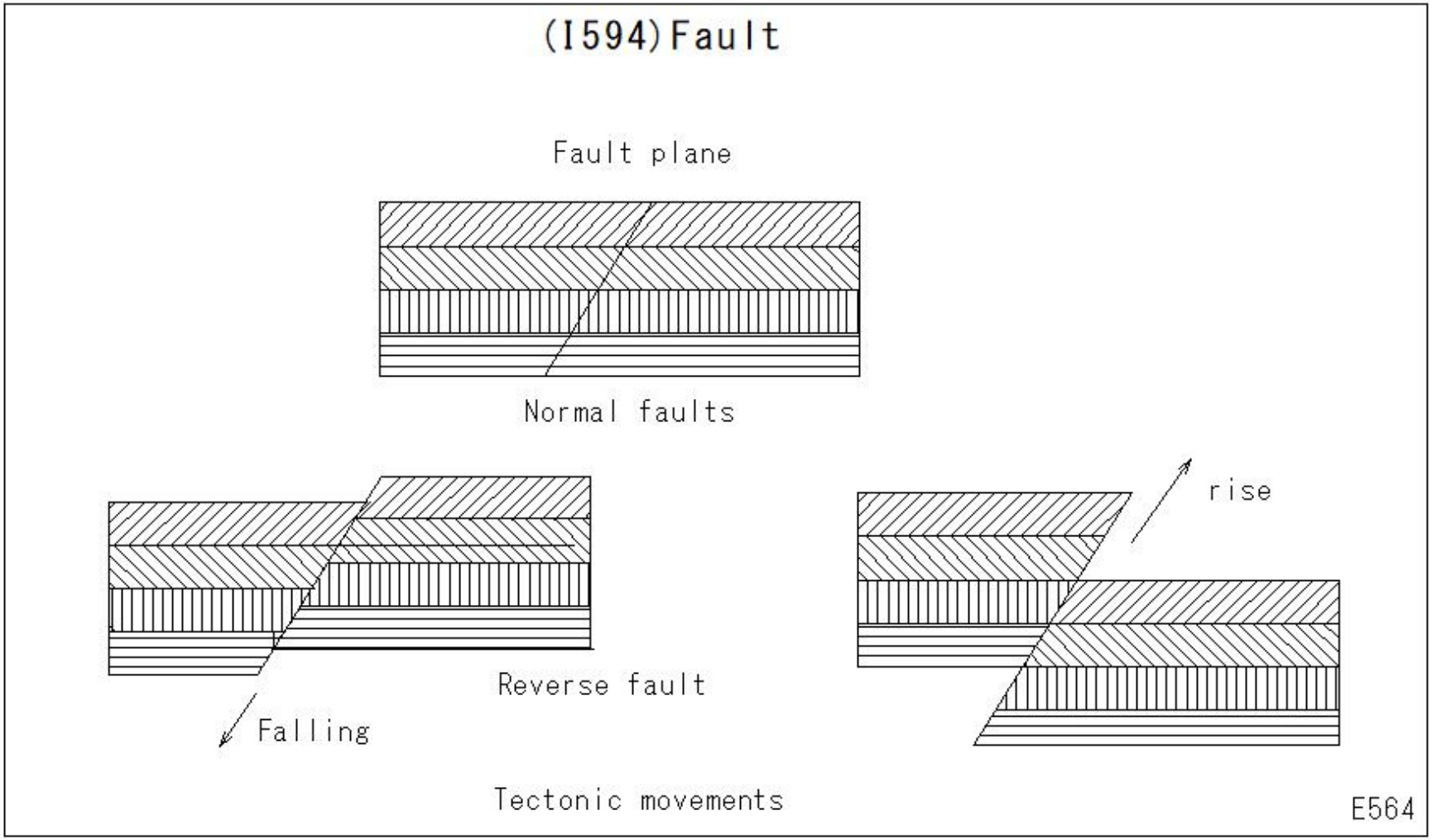
(I592)Prevent water leakage



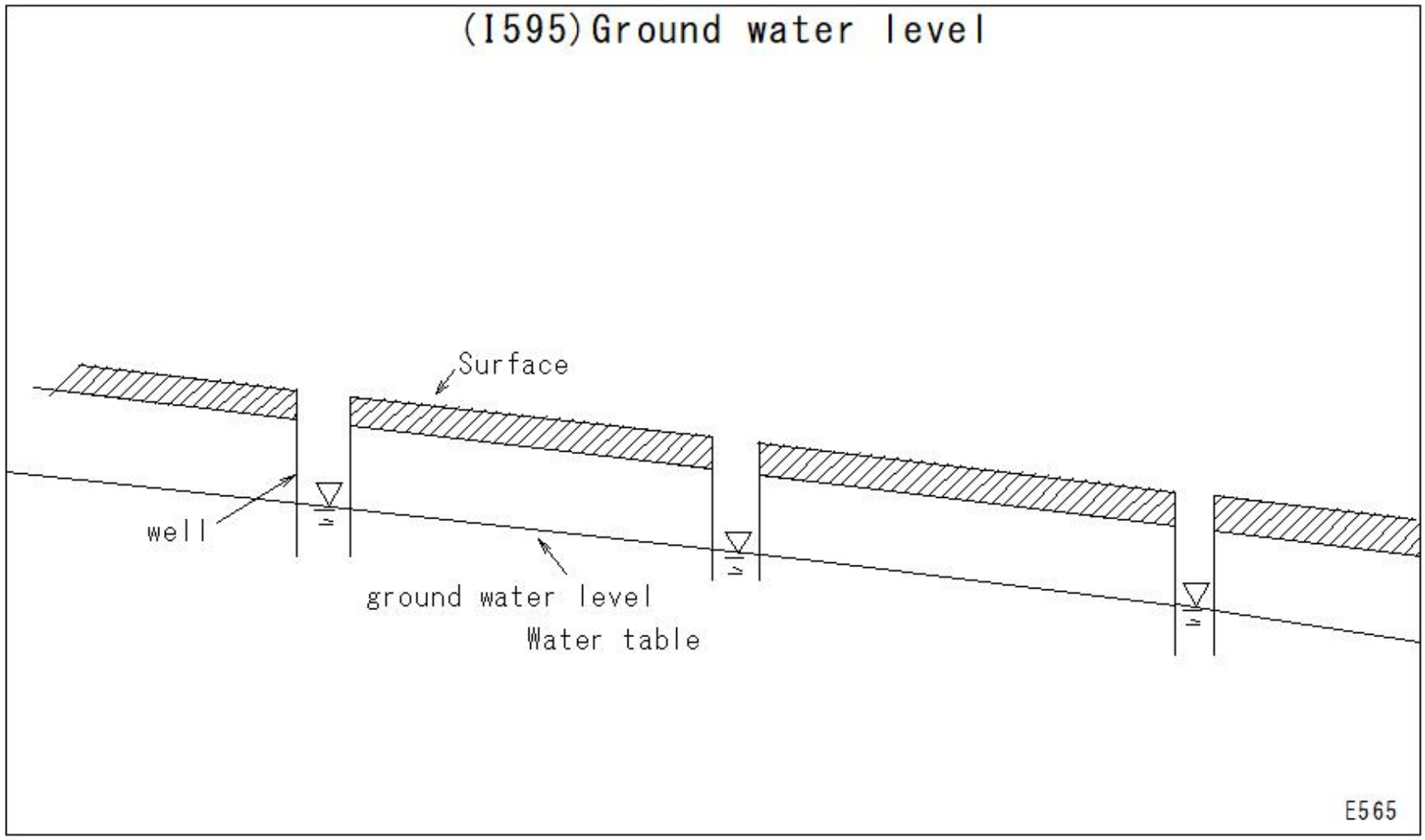
(I593)Single pile



(I594)Fault


(I594)Fault
Fault plane
Normal faults
rise
Reverse fault
Falling
Tectonic movements
E564

(I595)Ground water level

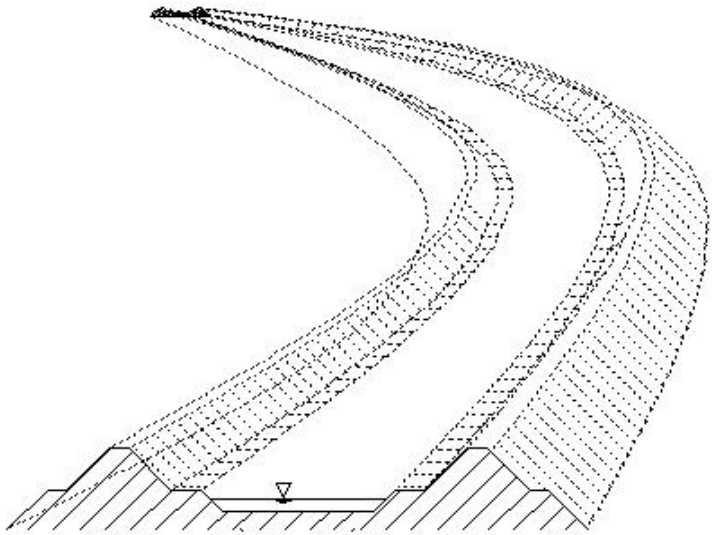


(I596)Embankment

(I596)Embankment

Embankment

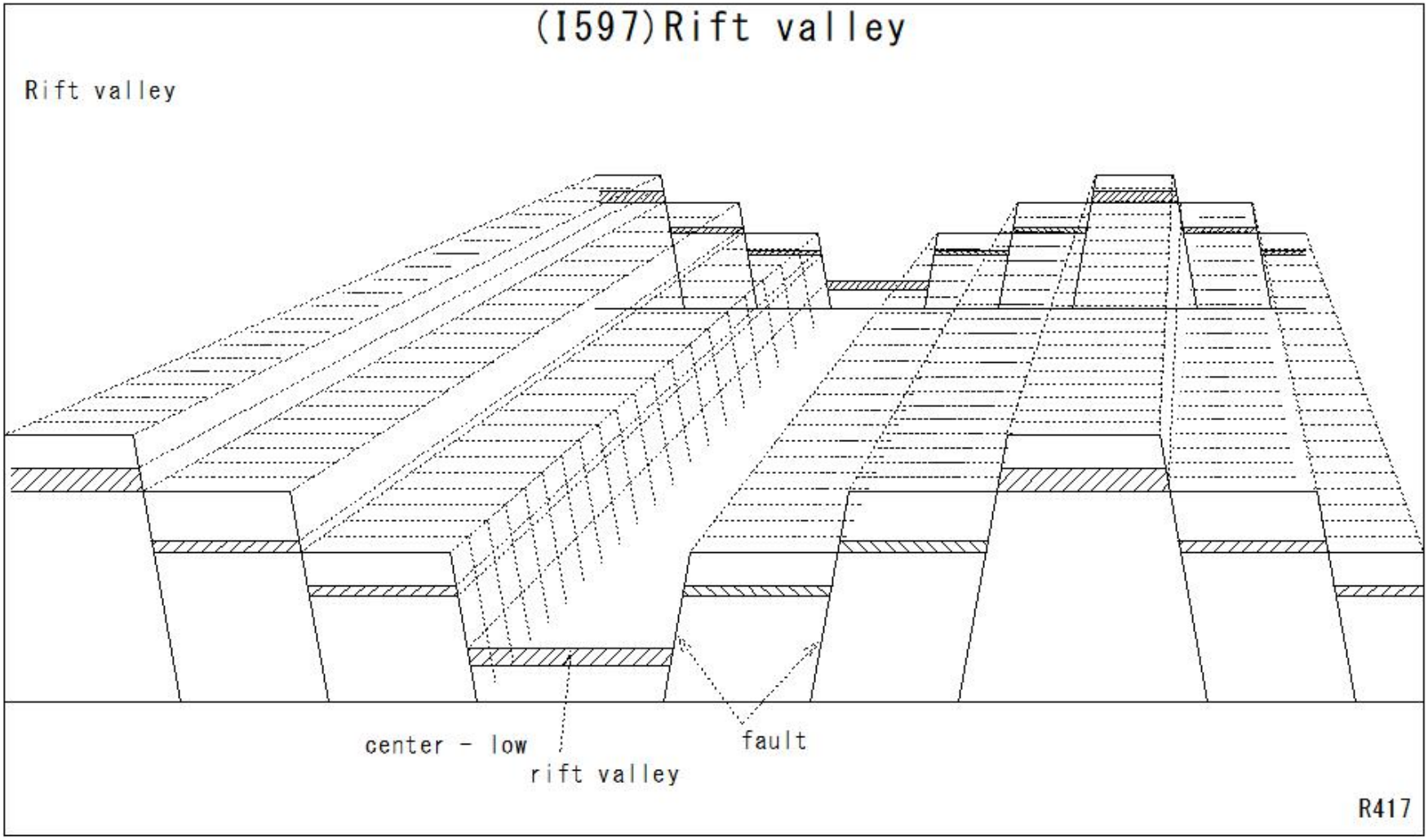
long and narrow embankment



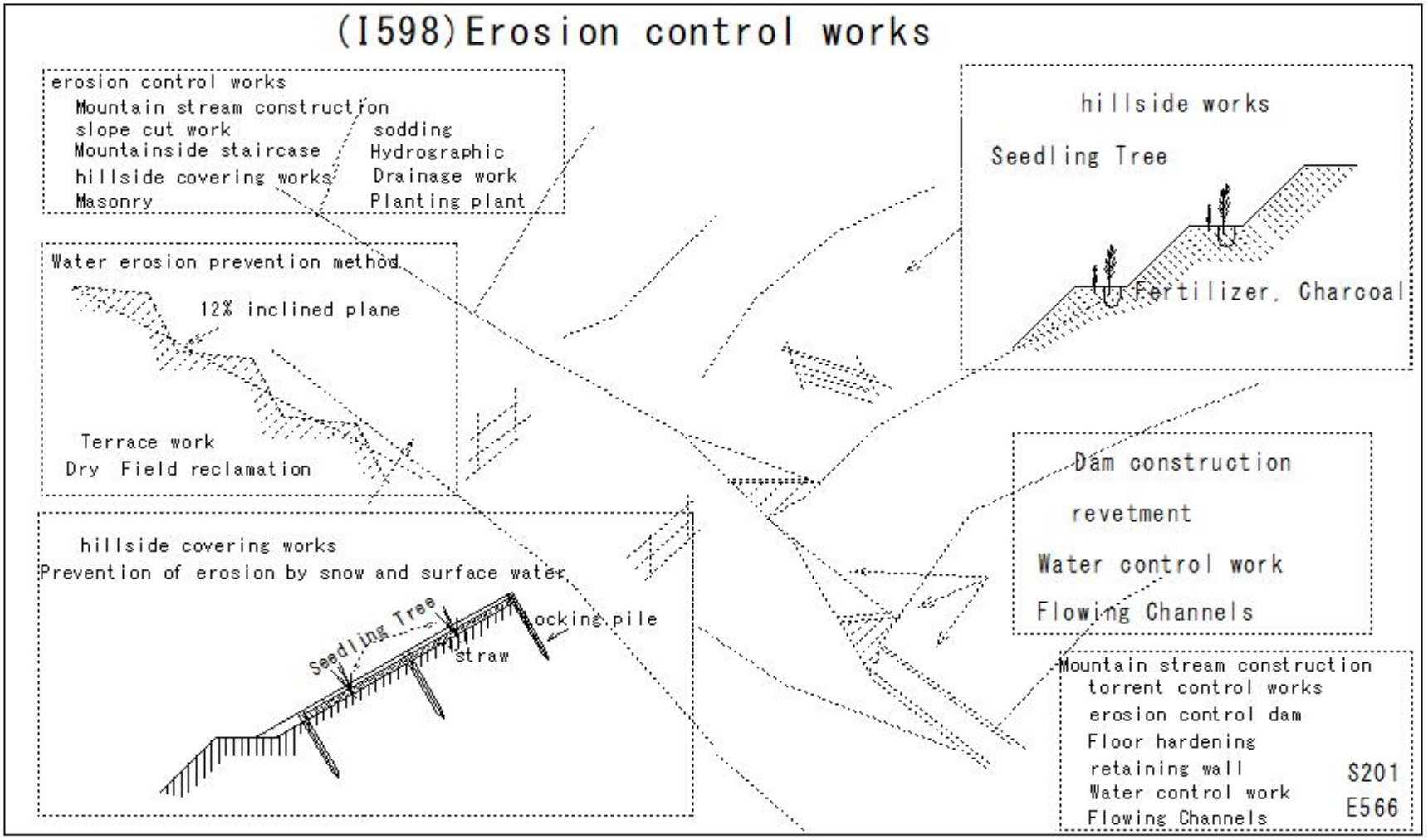
embankment

R416

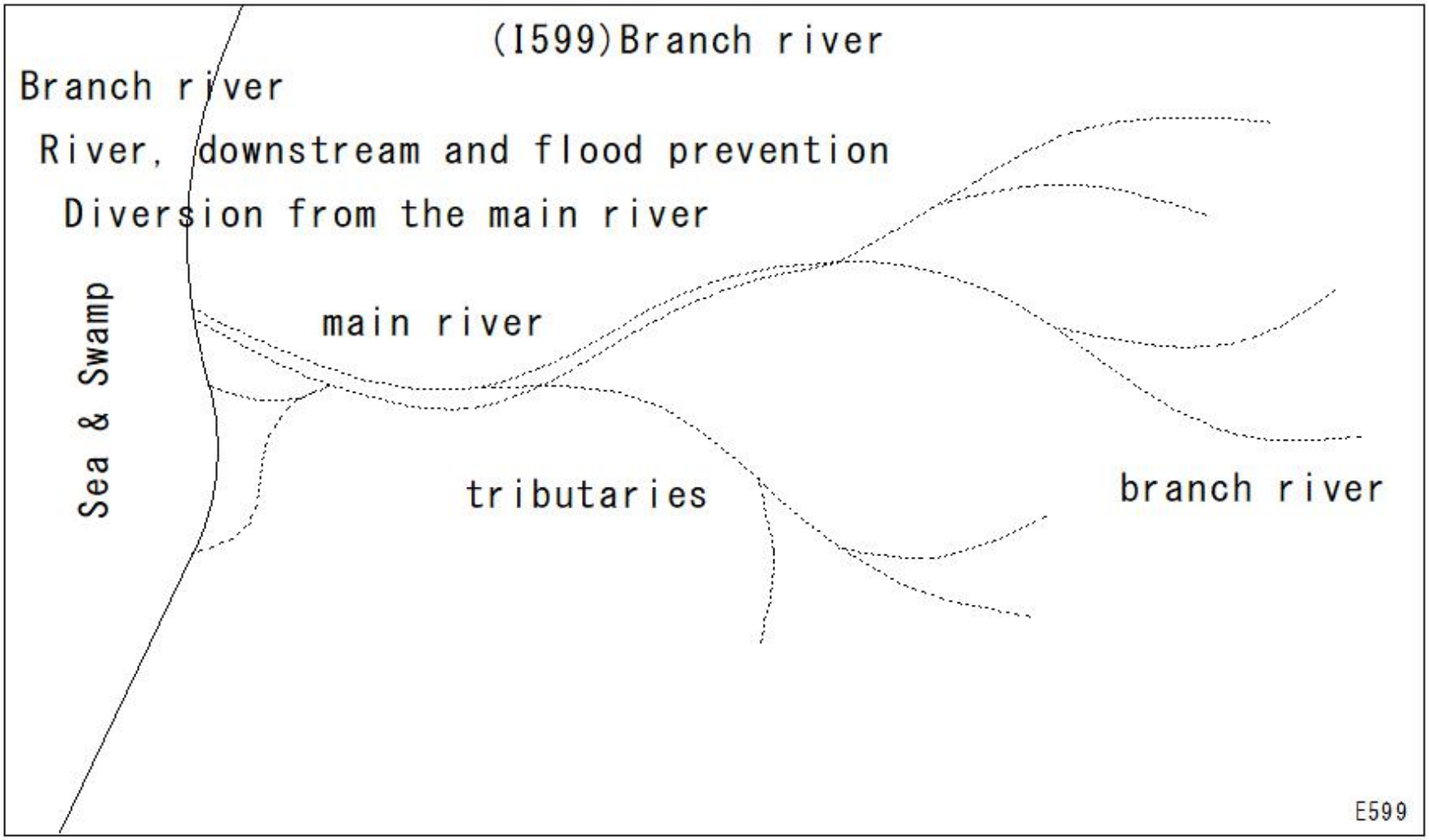
(I597)Rift valley



(I598)Erosion control works



(I599)Test pit

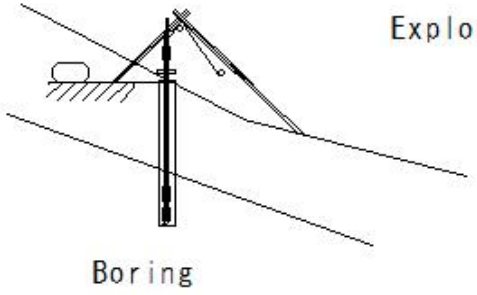


(I600)Geological Survey

(I600)Geologic survey

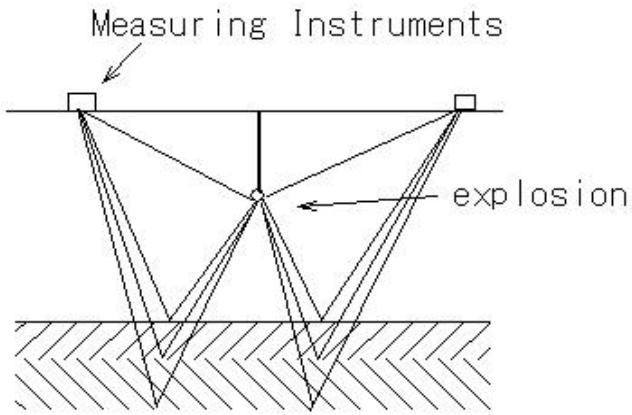
・Geological survey

Types of rocks
Distribution state
Geological structure



Boring

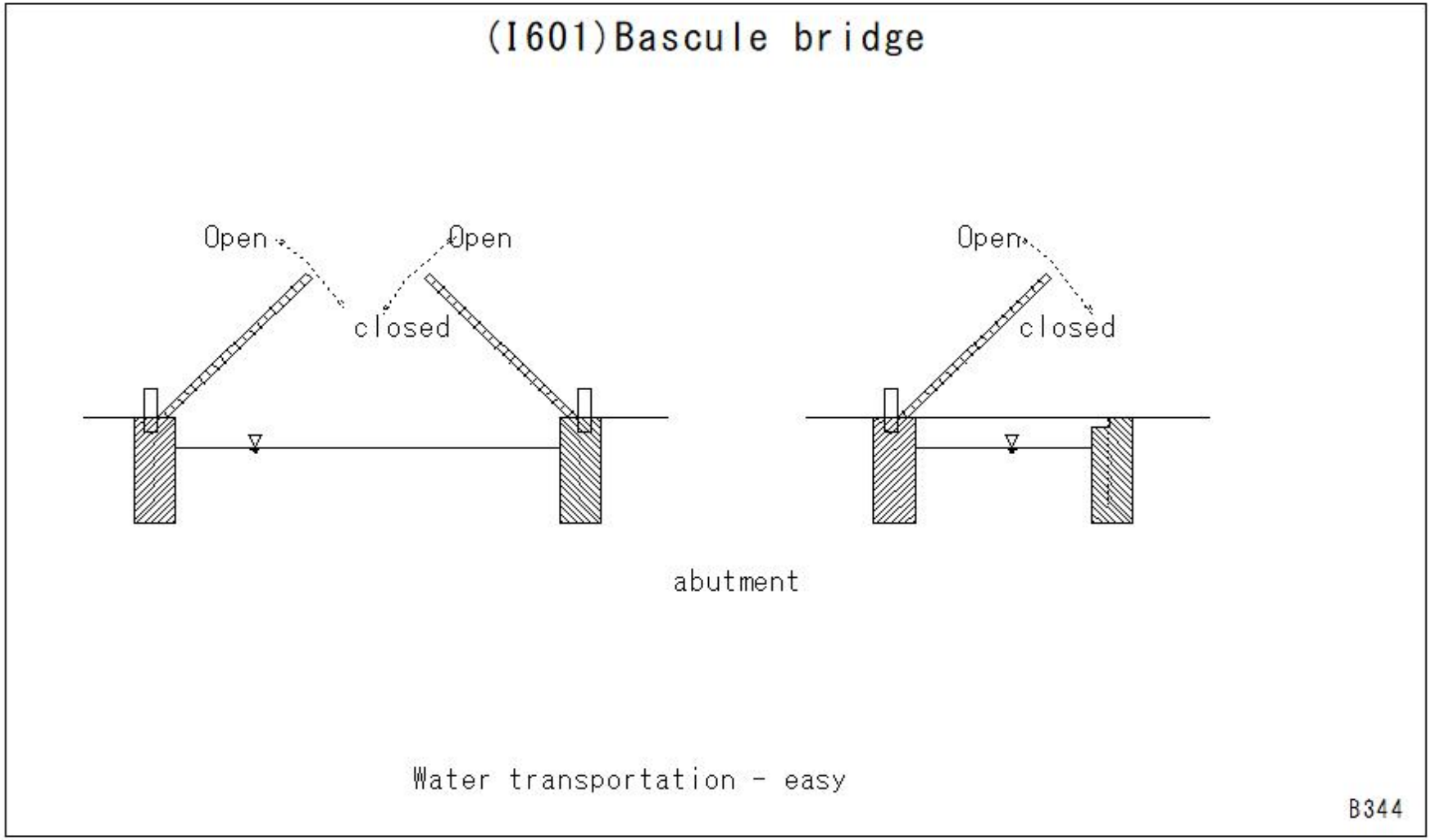
Exploration of the earth's surface



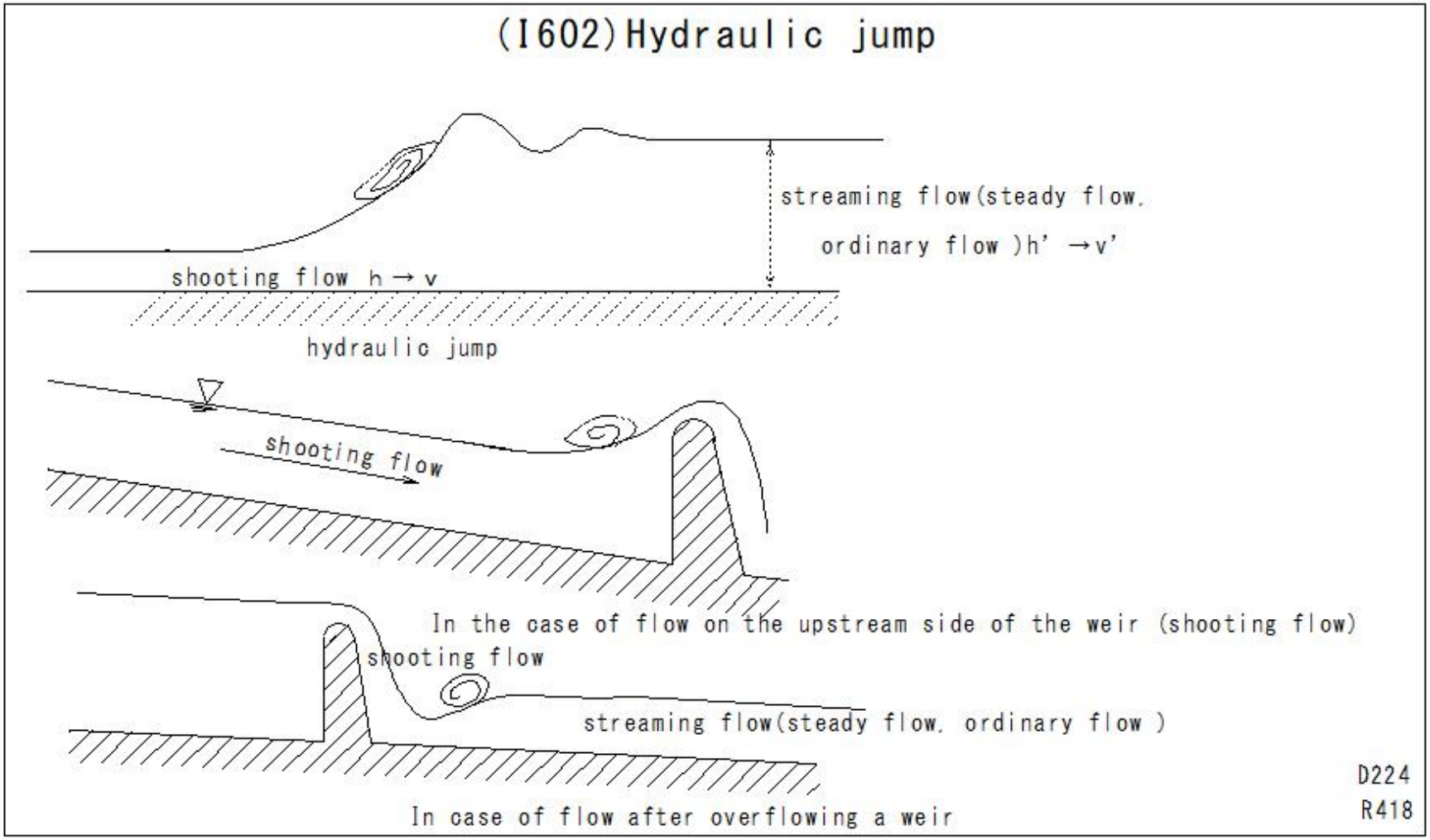
Geophysical Exploration Method

E567

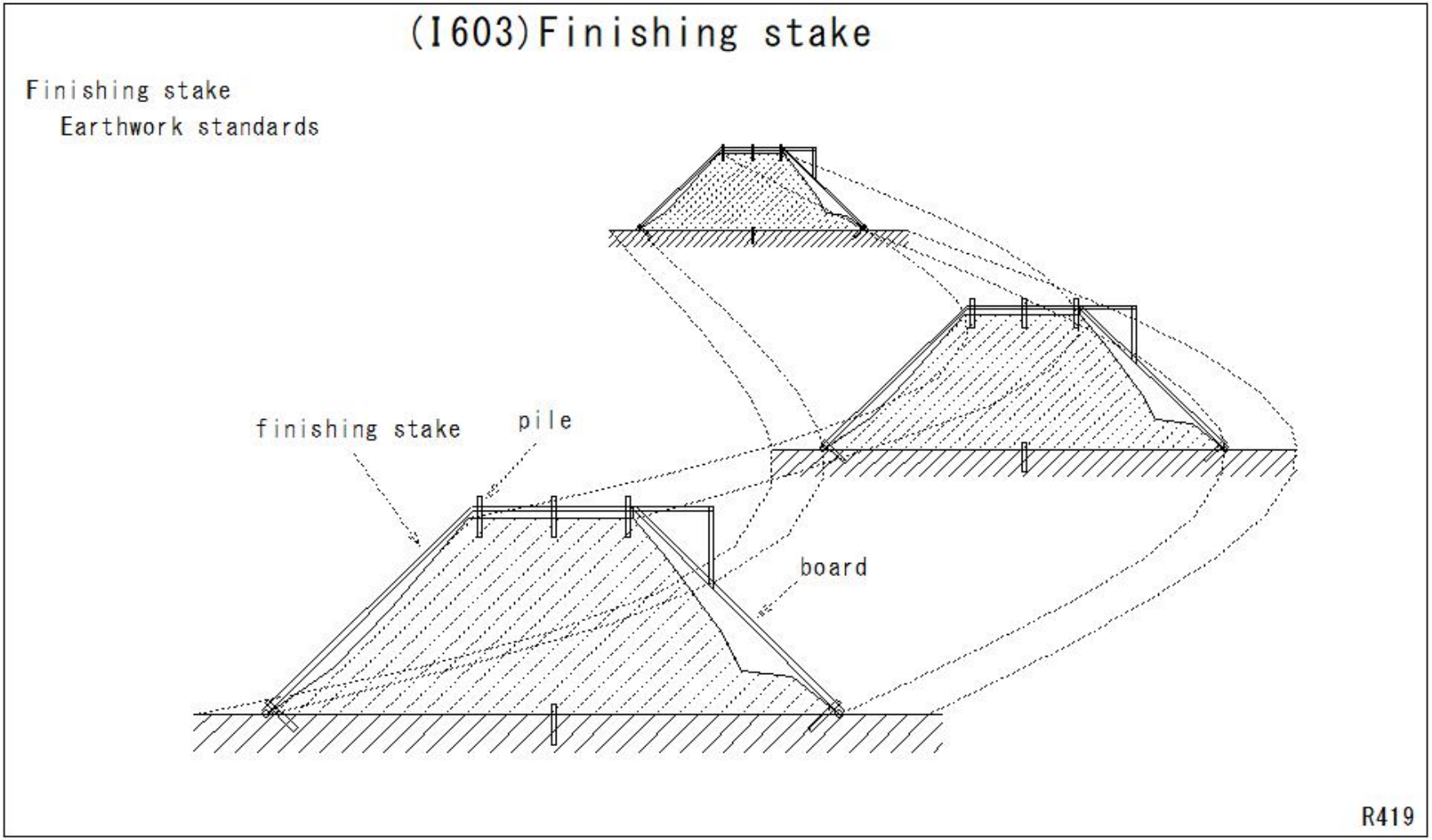
(I601)Bascule bridge



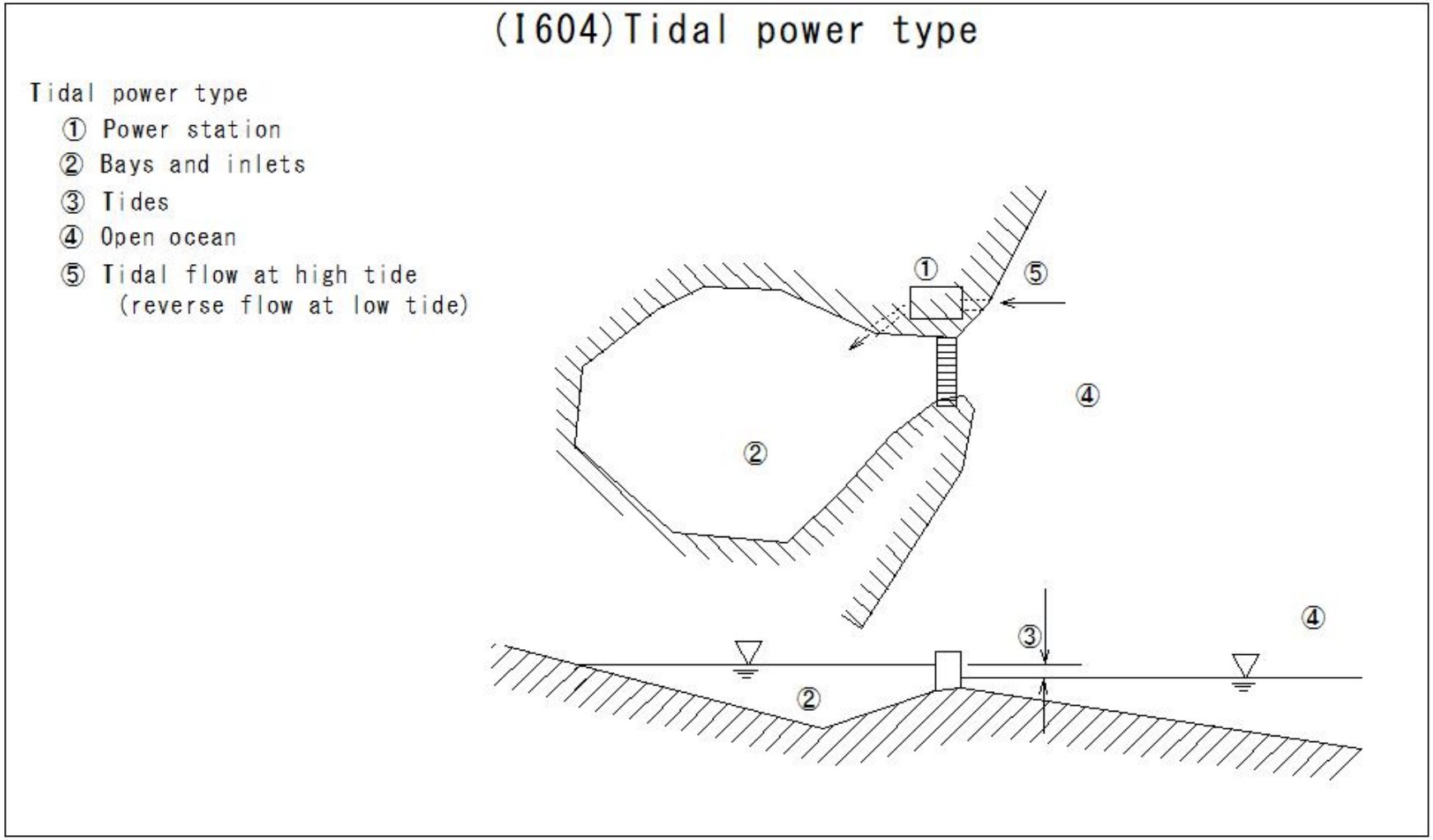
(I602)Hydraulic jump



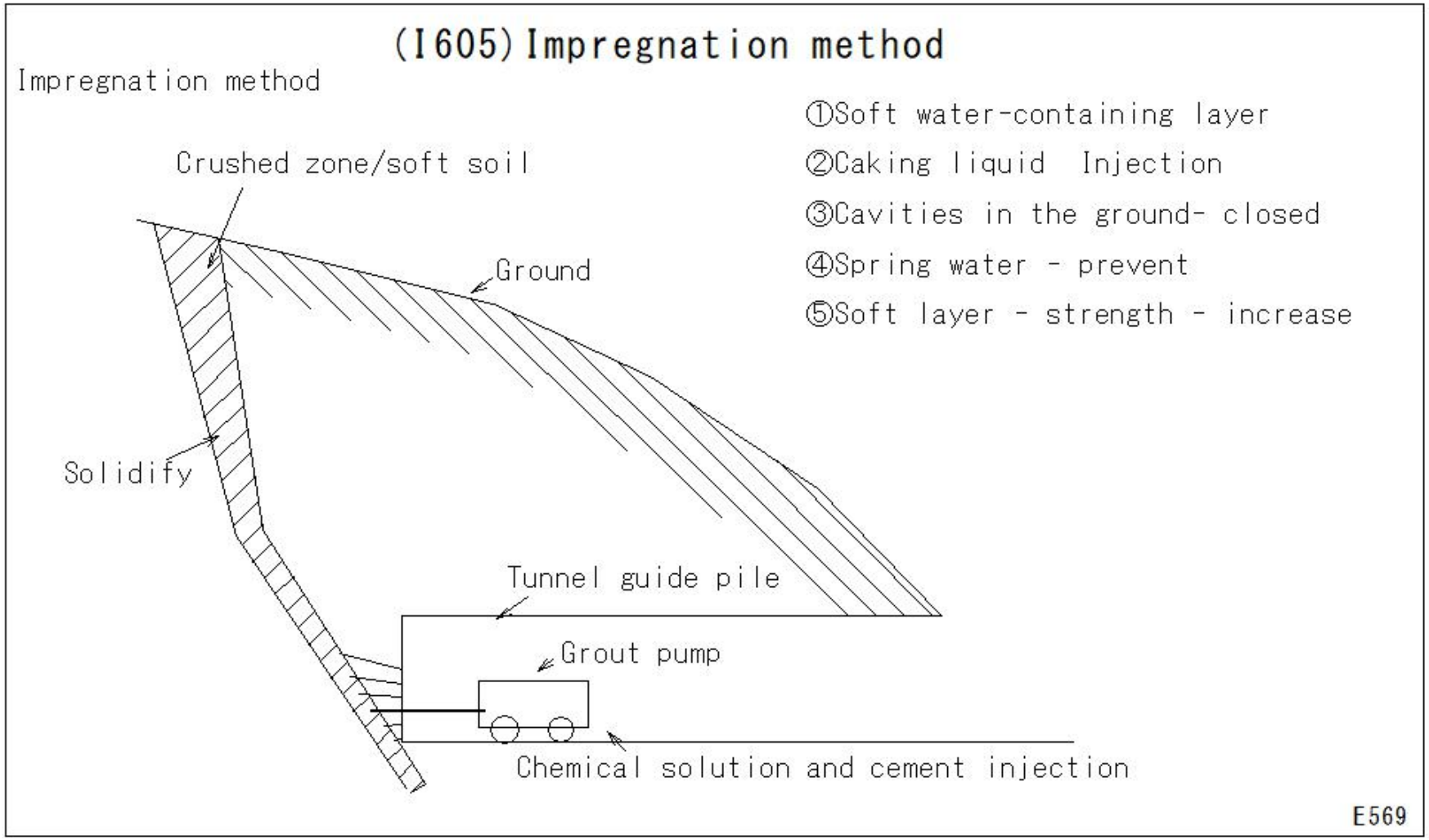
(I603)Finishing stake



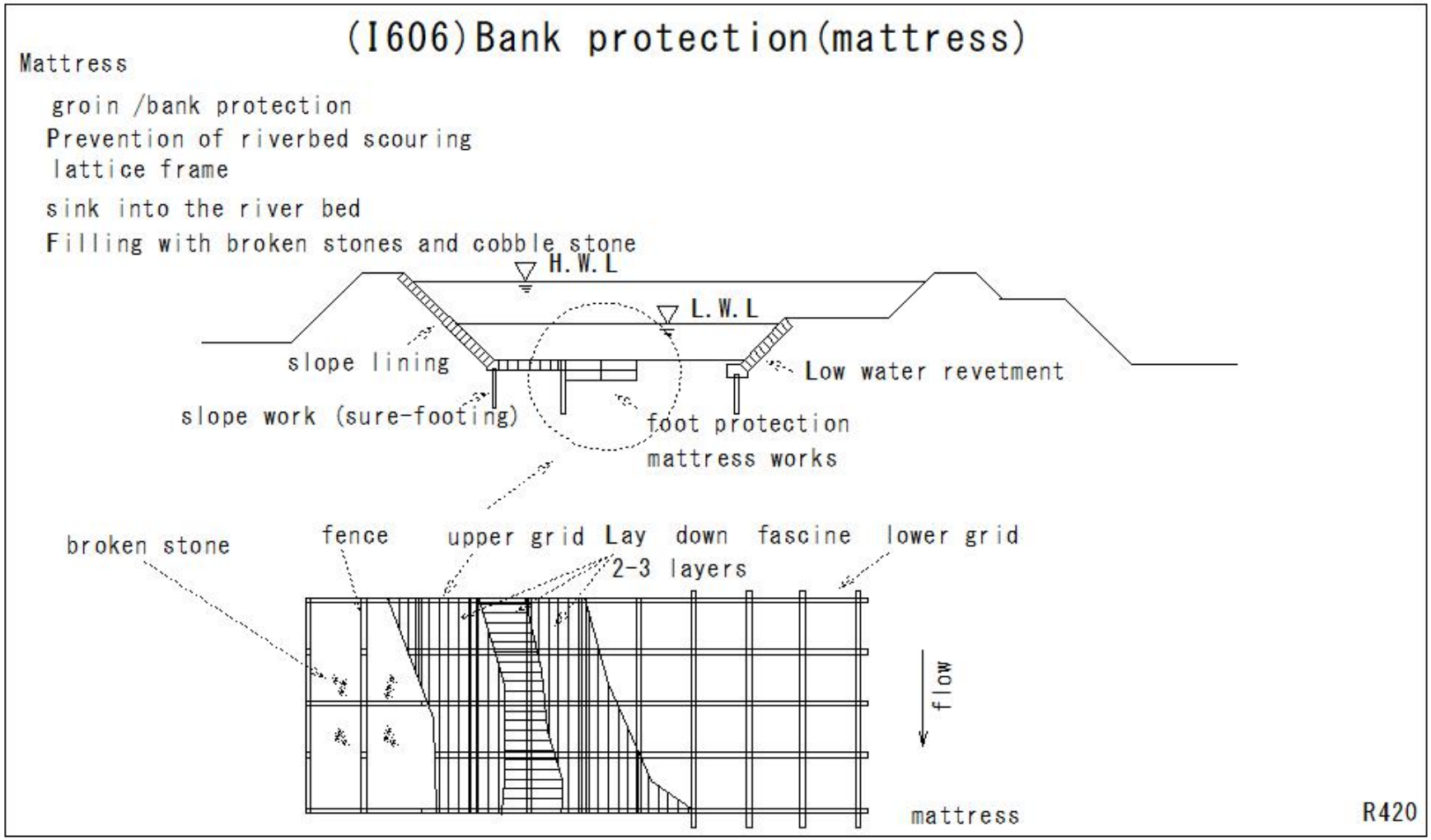
(I604)Tidal power type



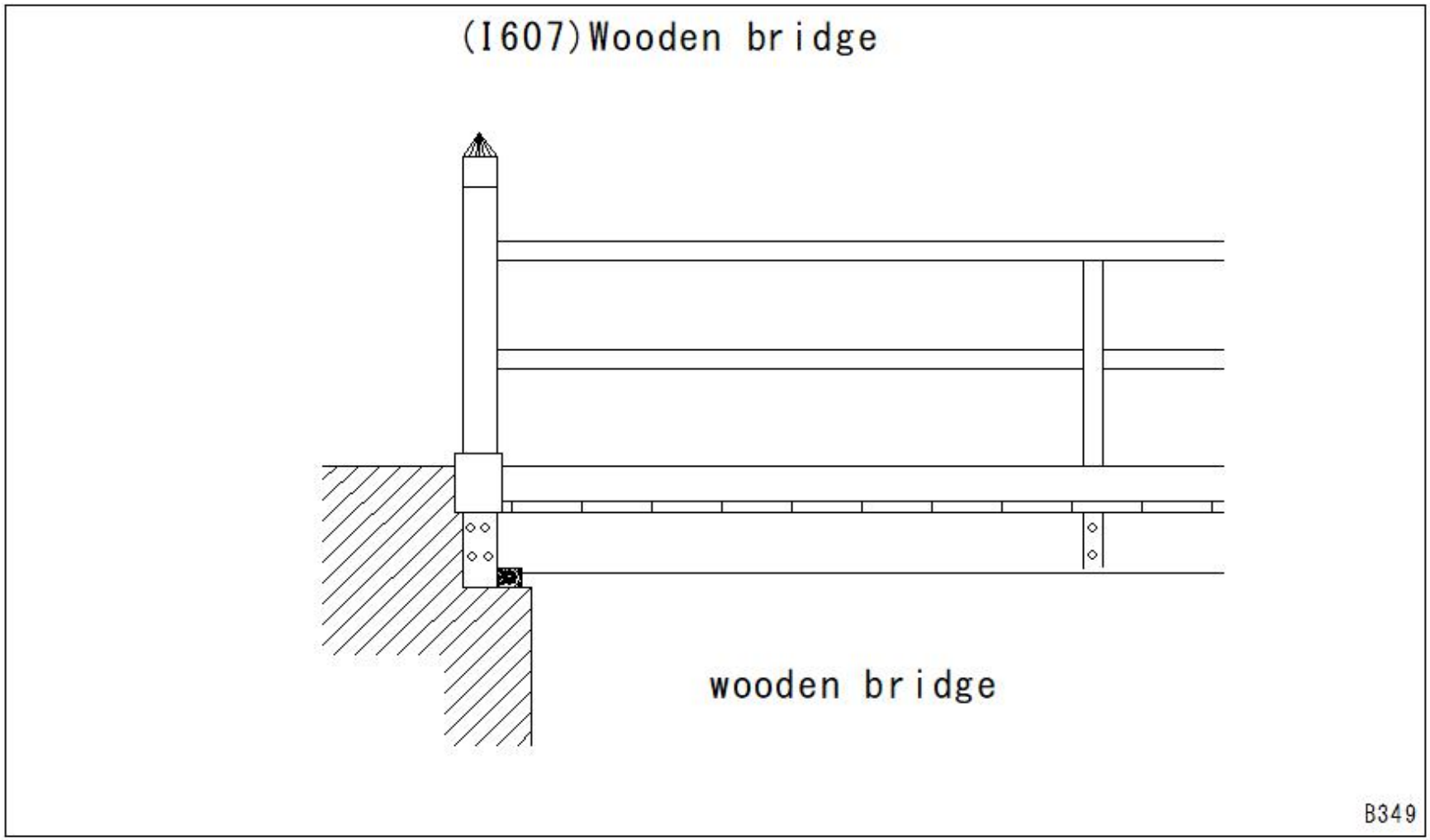
(I605)Impregnation method



(I606)Bank protection(mattress)



(I607)Wooden bridge



(I608)Bank protection(patch up method)

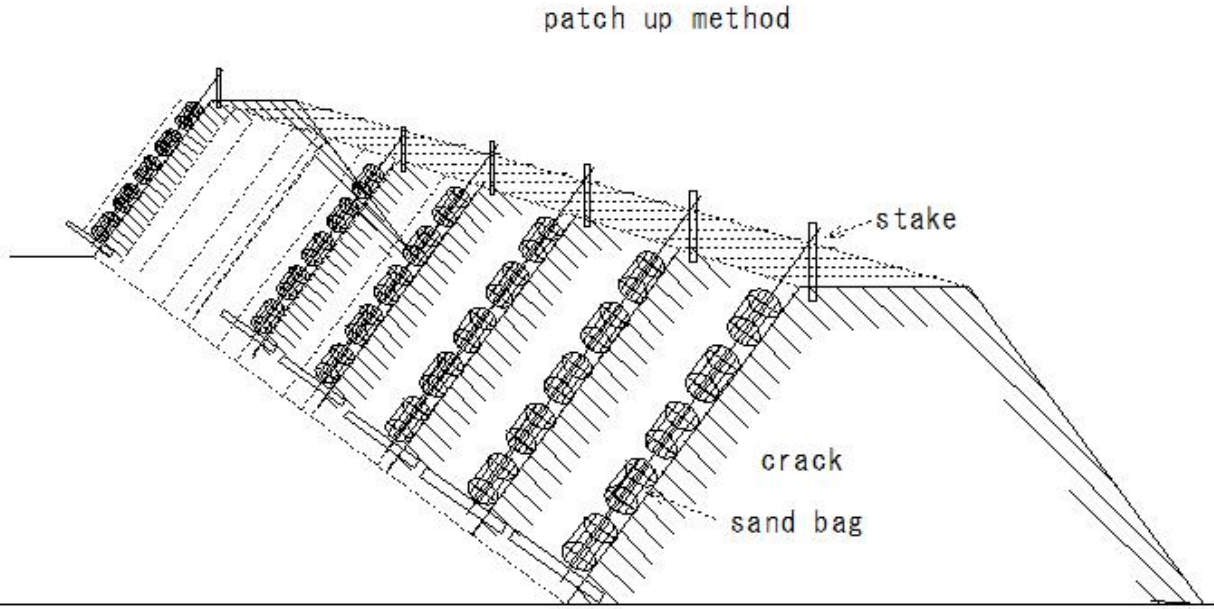
(I608)Bank protection(patch up method)

Bank protection(patch up method)

A type of flood prevention method

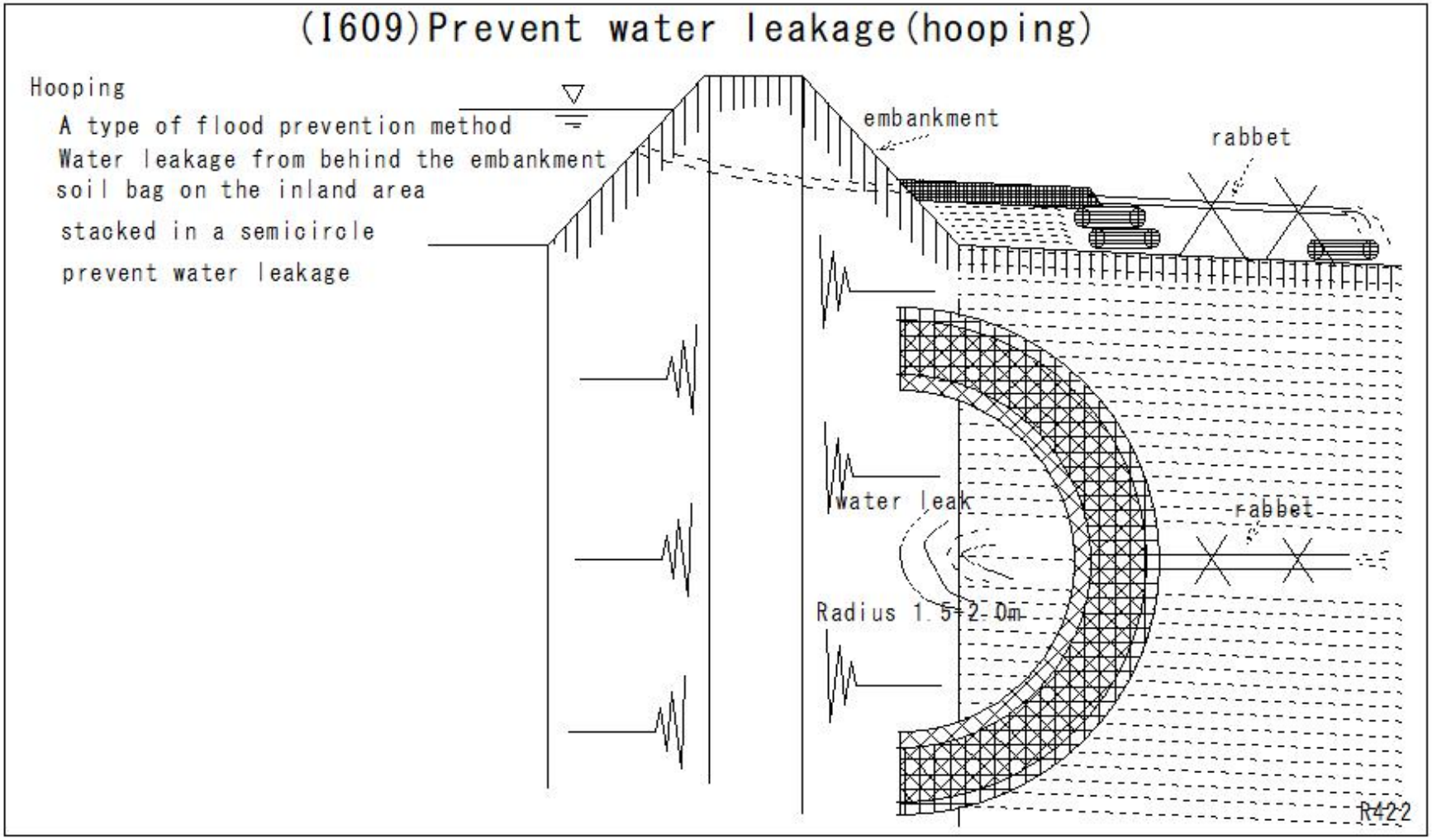
Preventing water leakage and collapse due to cracks in embankments

Repairing the slope with the sand bag

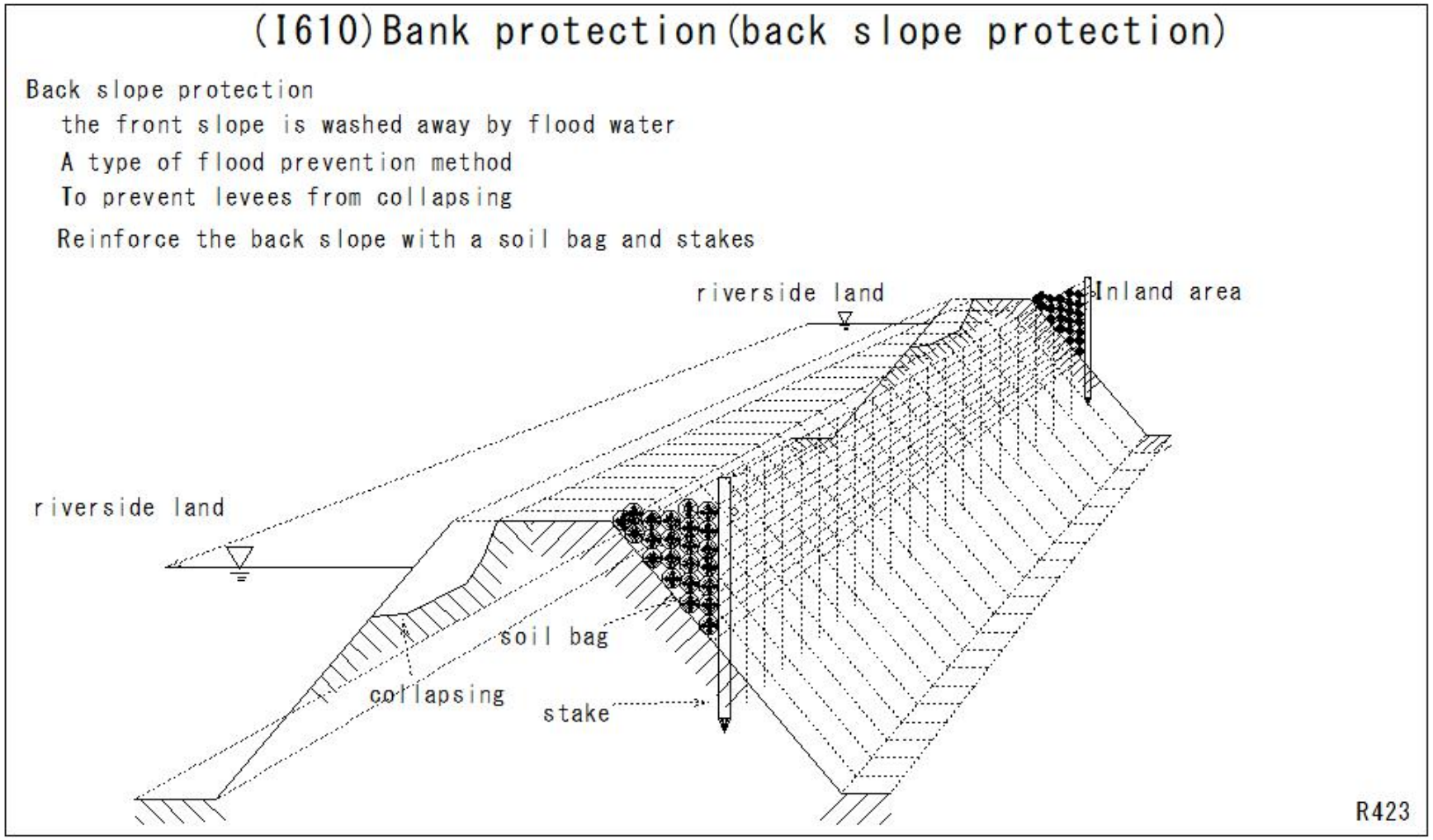


R421

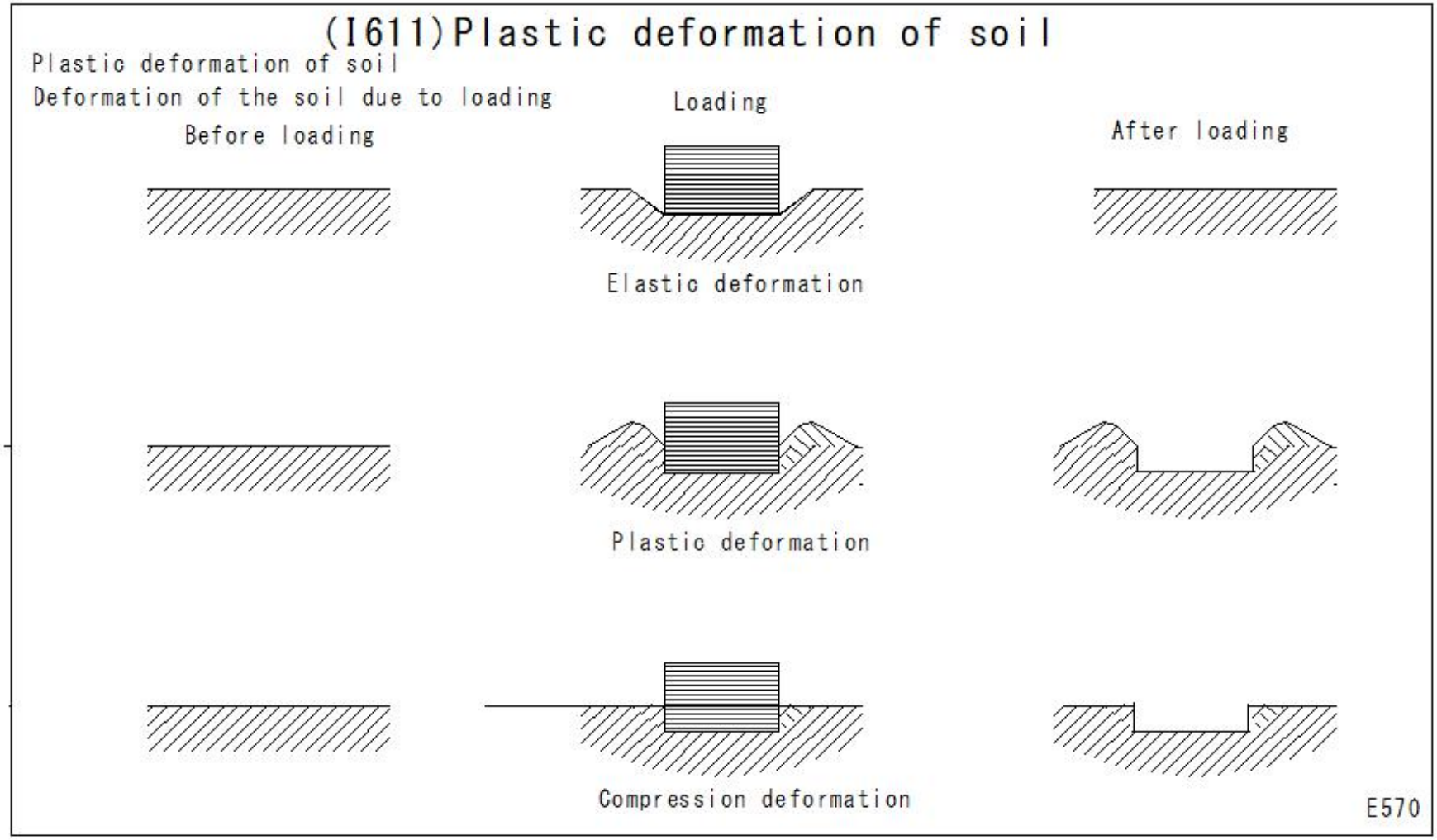
(I609)Prevent water leakage(hooping)



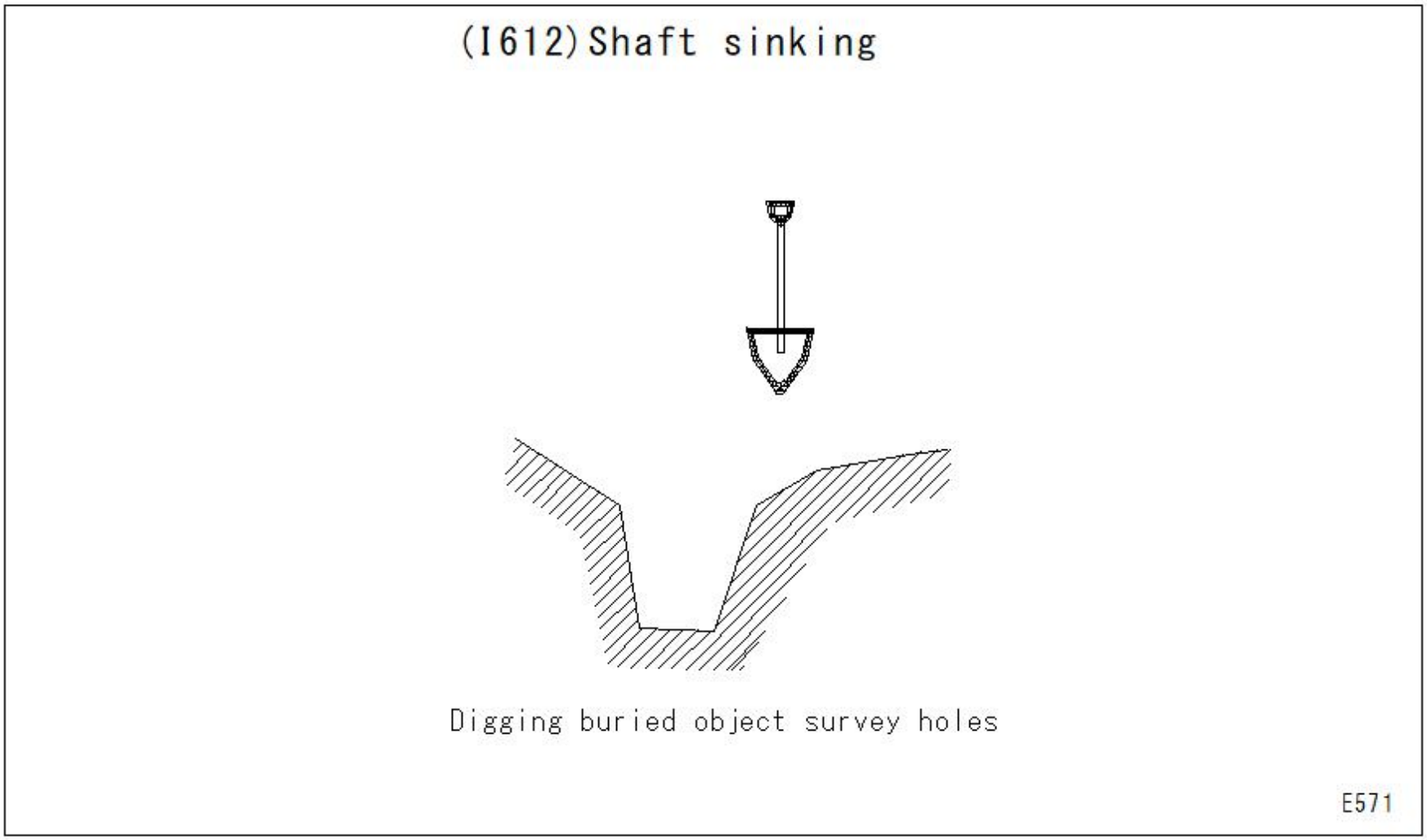
(I610)Bank protection(back slope protection)



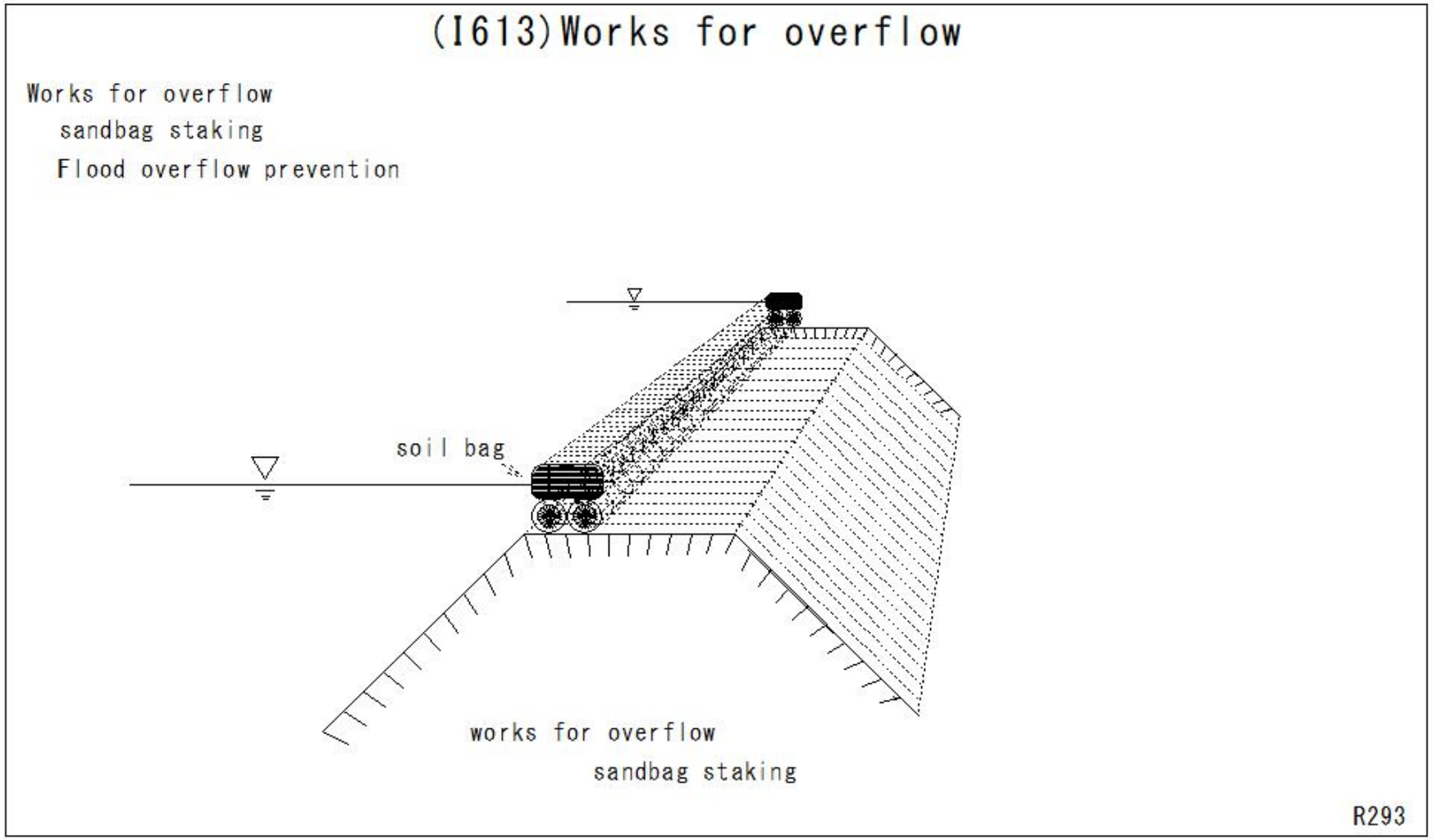
(I611)Plastic deformation of the soil



(I612)Shaft sinking



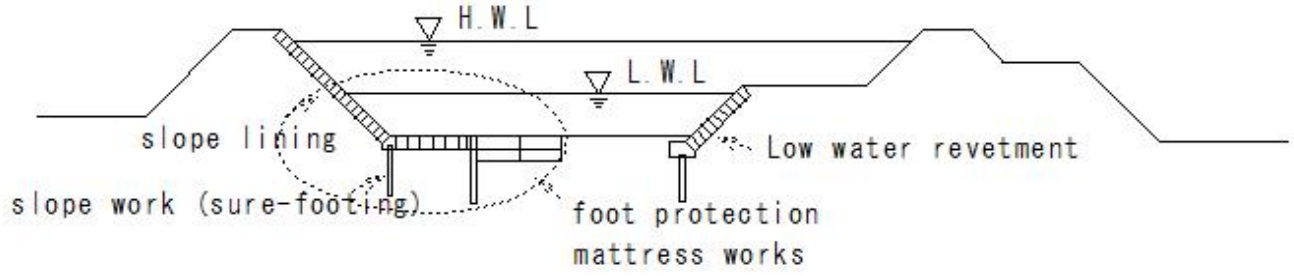
(I613)Works for overflow

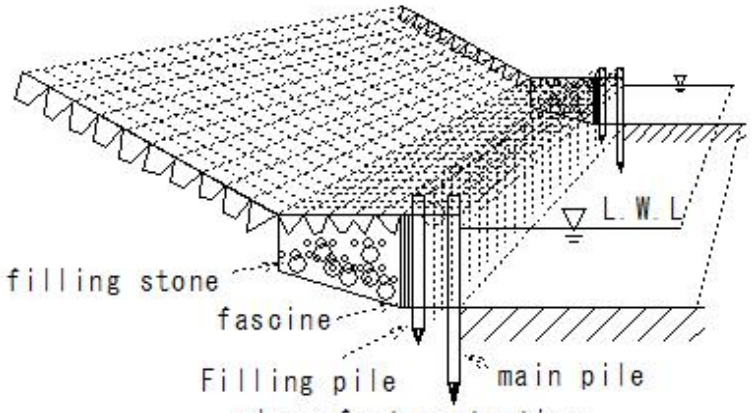


(I614)Slope foot protection(Filling pile work)

(I614)Slope foot protection(Filling pile work)

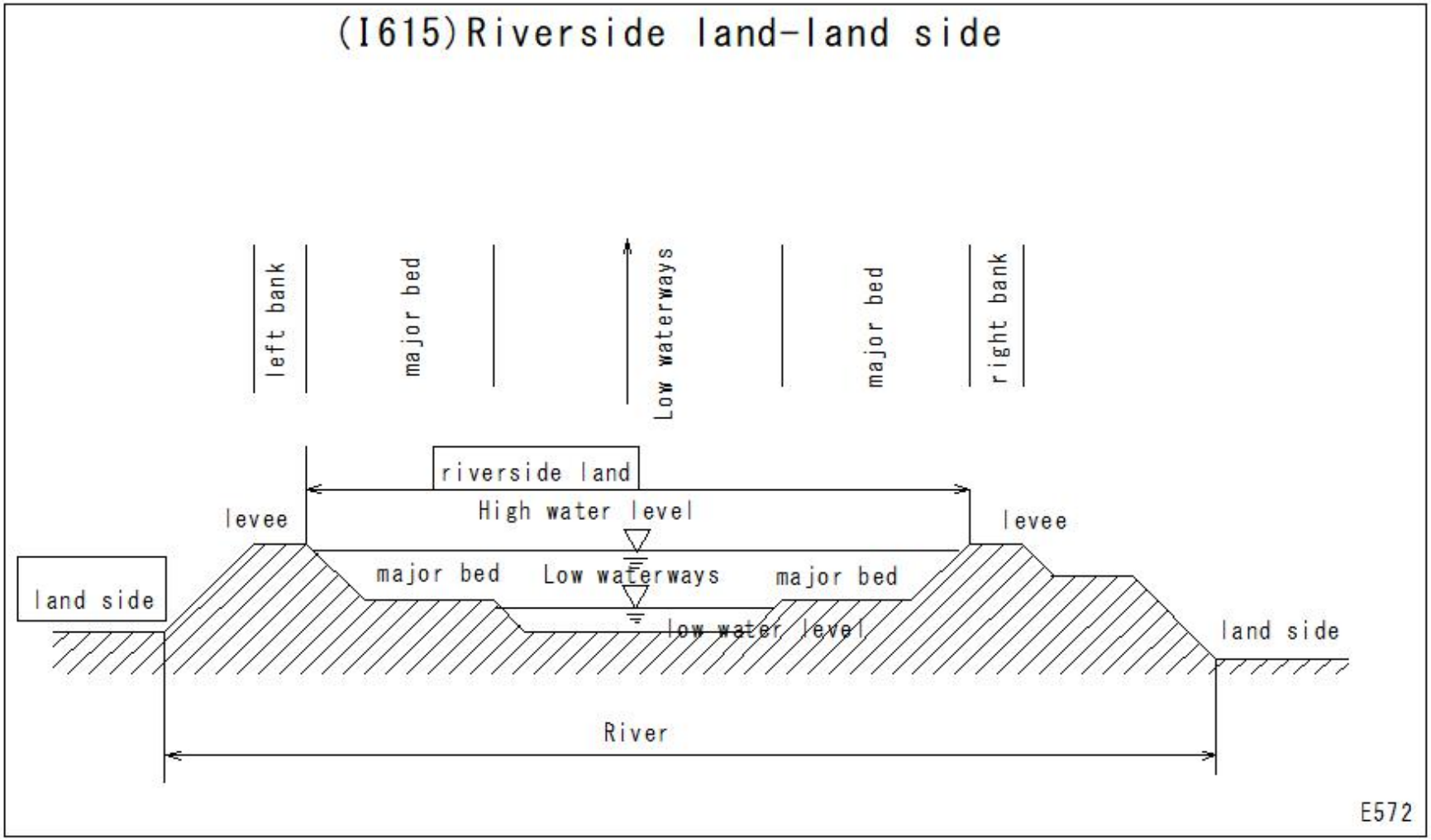
slope foot protection
Filling pile work
Foundation work for river embankments



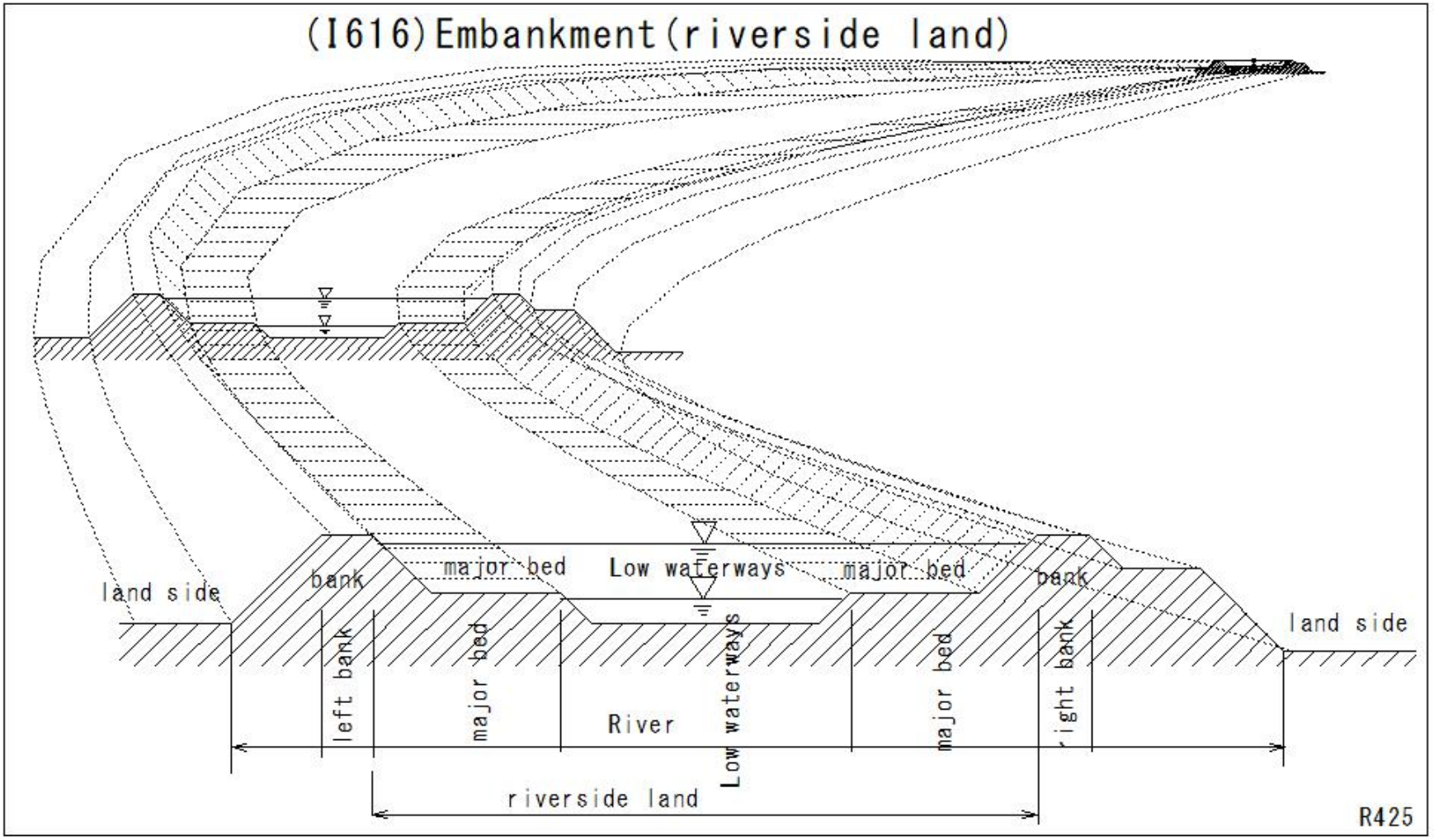


R424

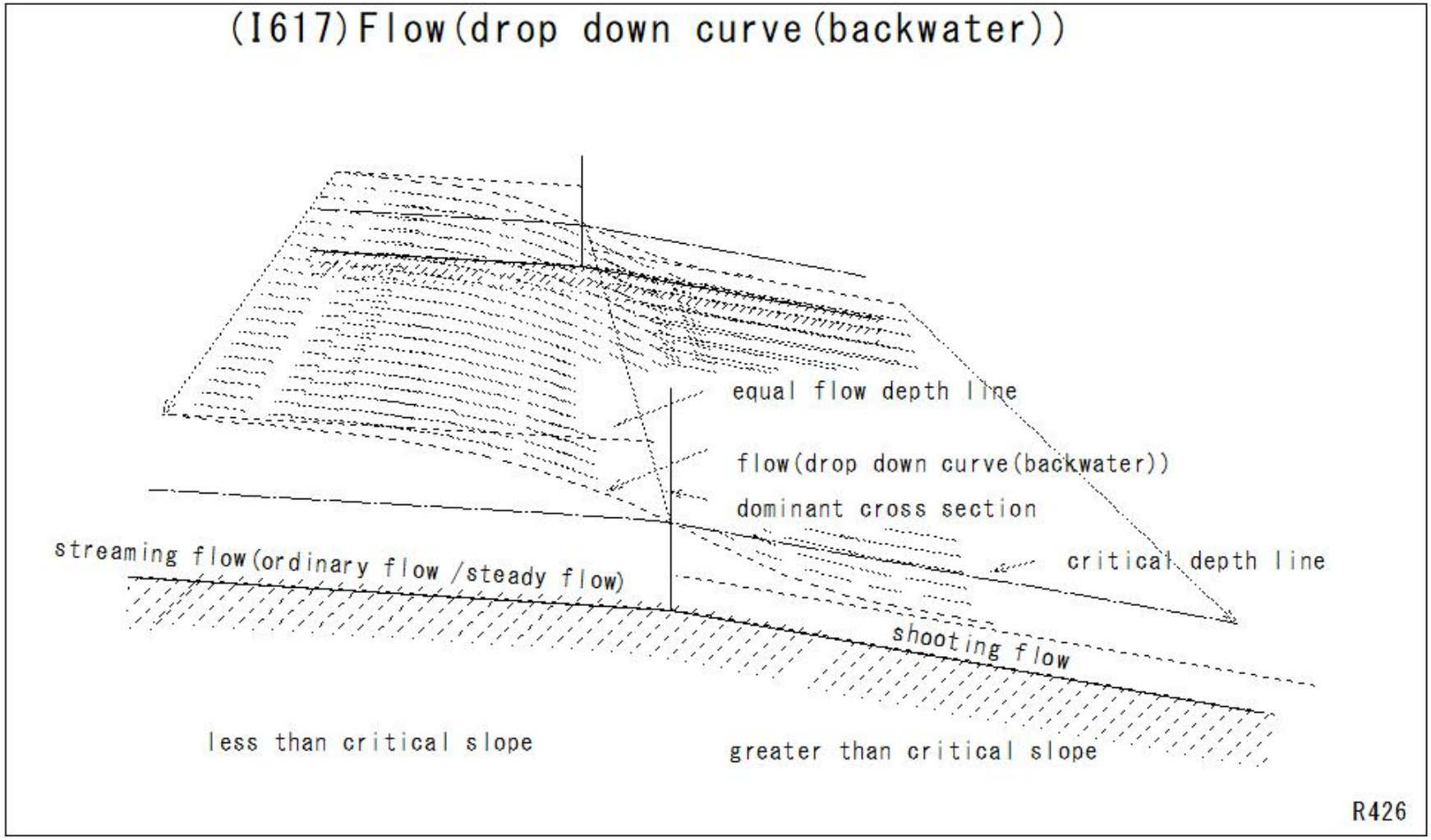
(I615)Riverside land-land side



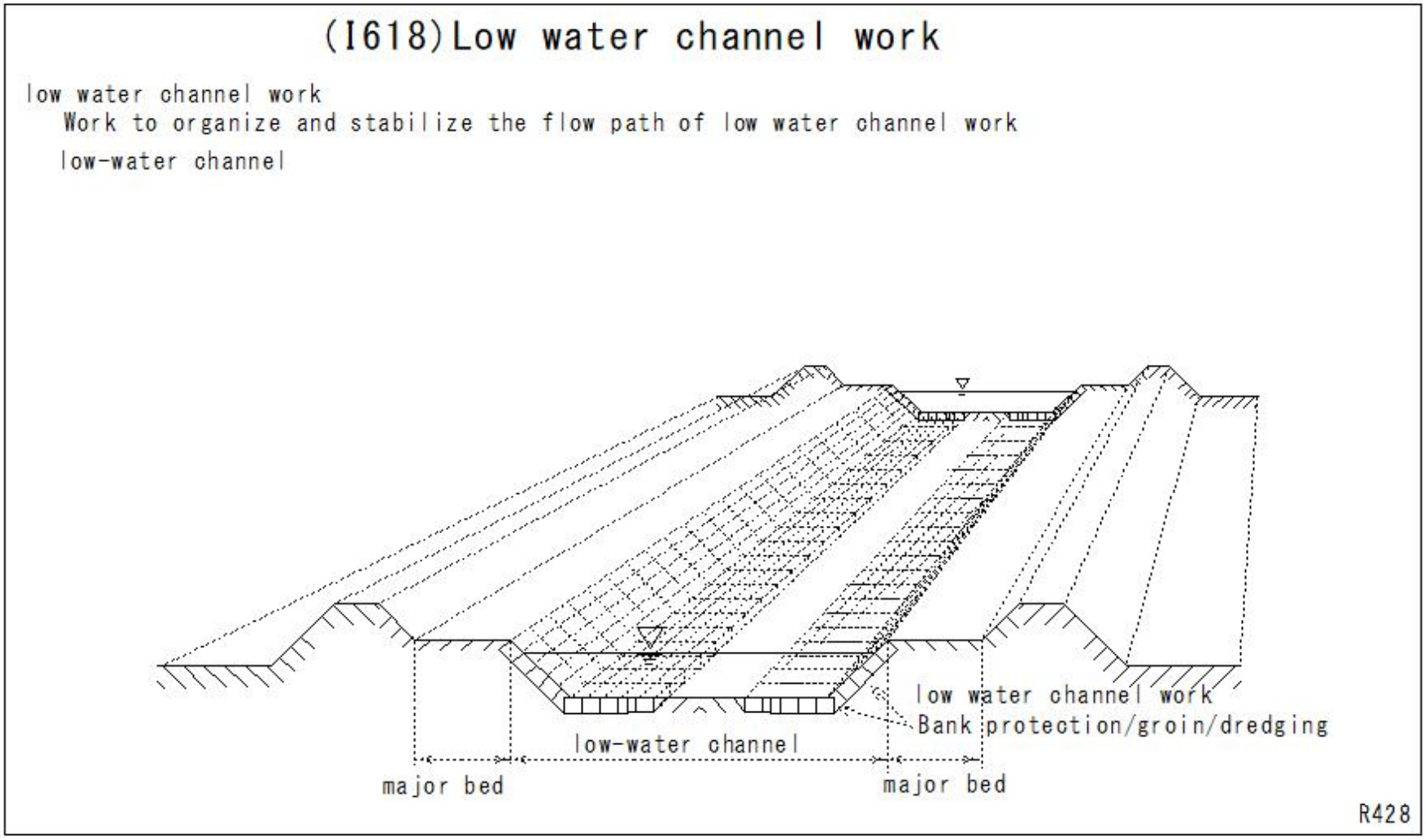
(I616)Embankment(riverside land)



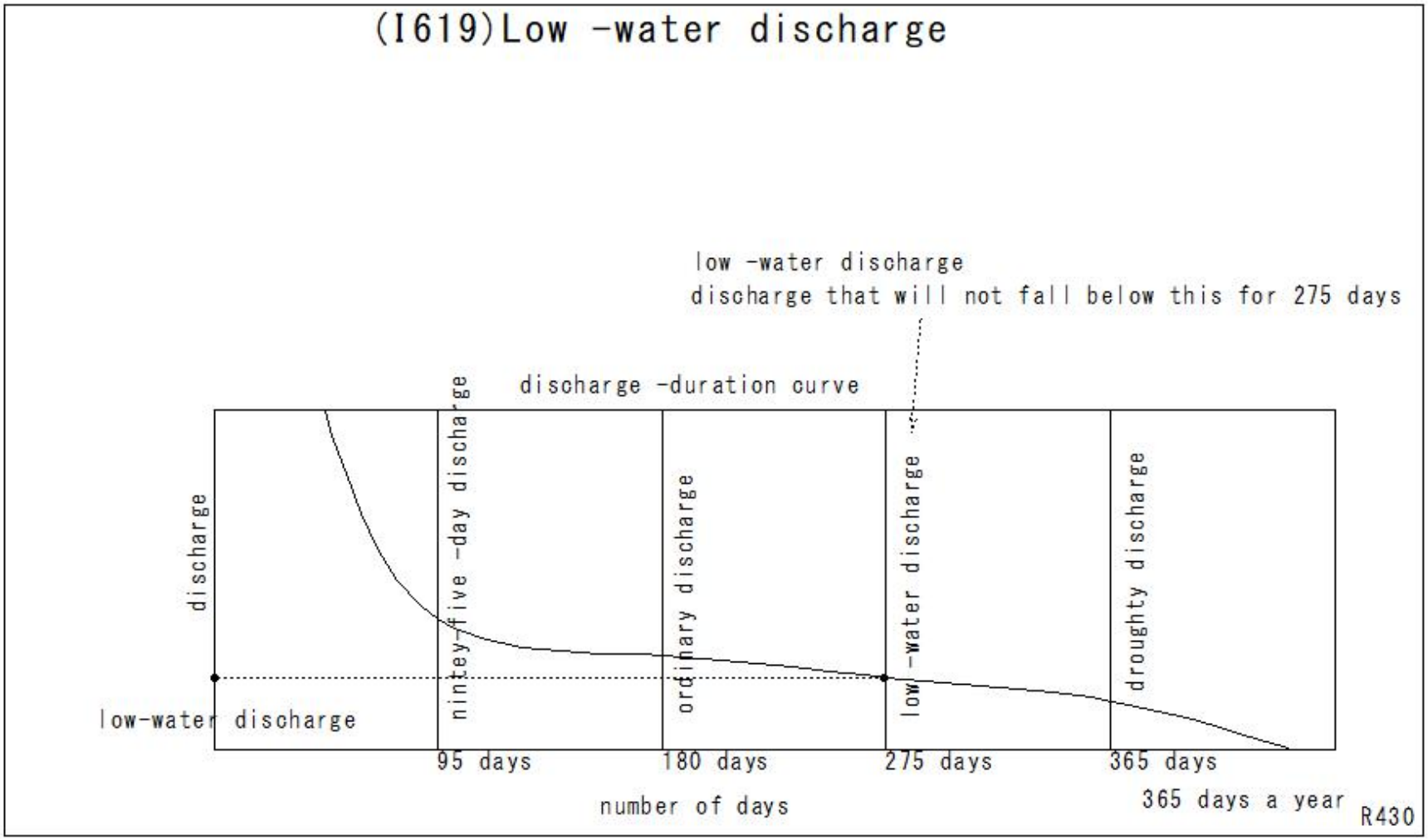
(I617)Flow(drop down curve(backwater))



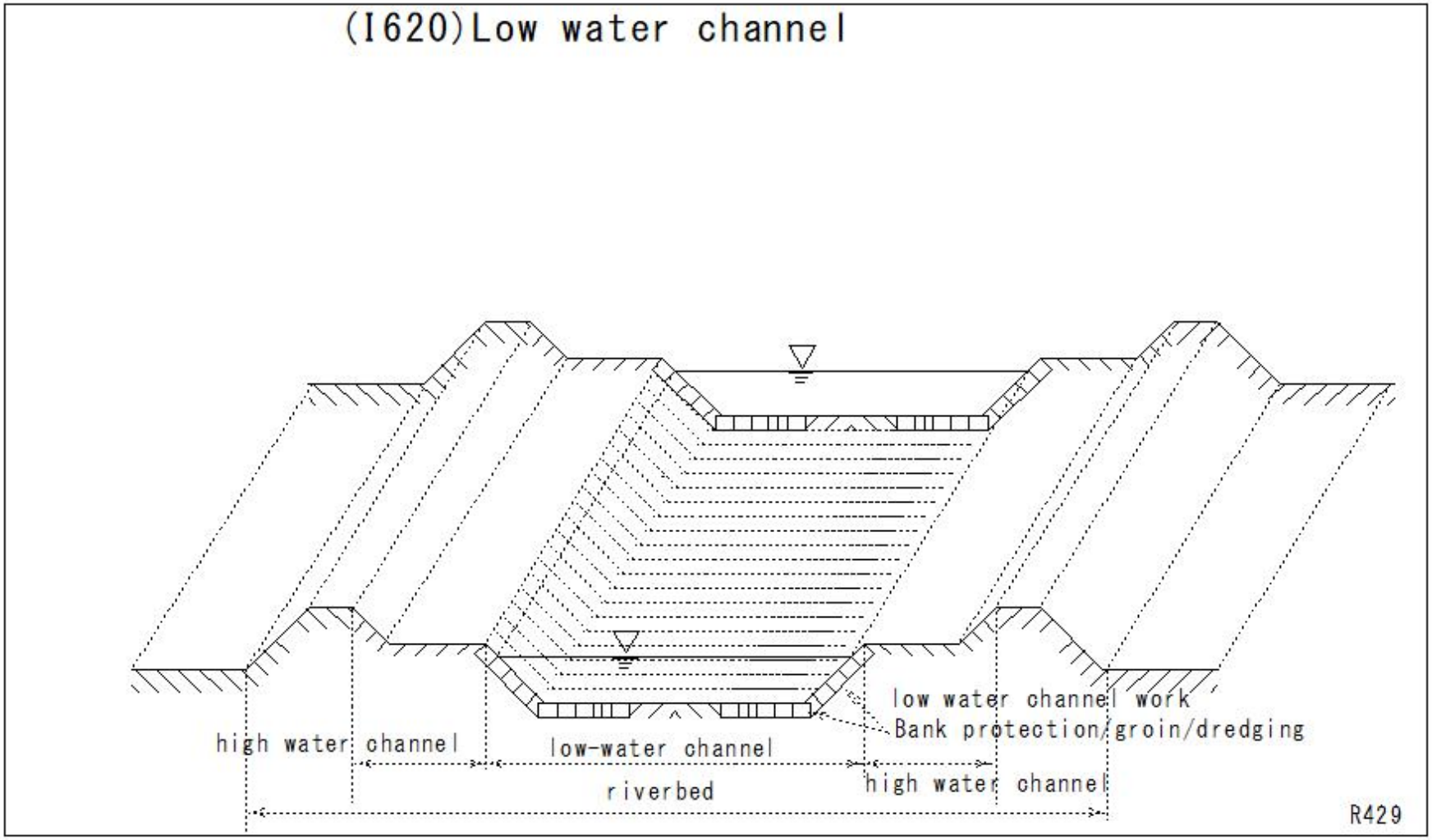
(I618)Low water channel work



(I619)Low -water discharge



(I620)Low-water channel



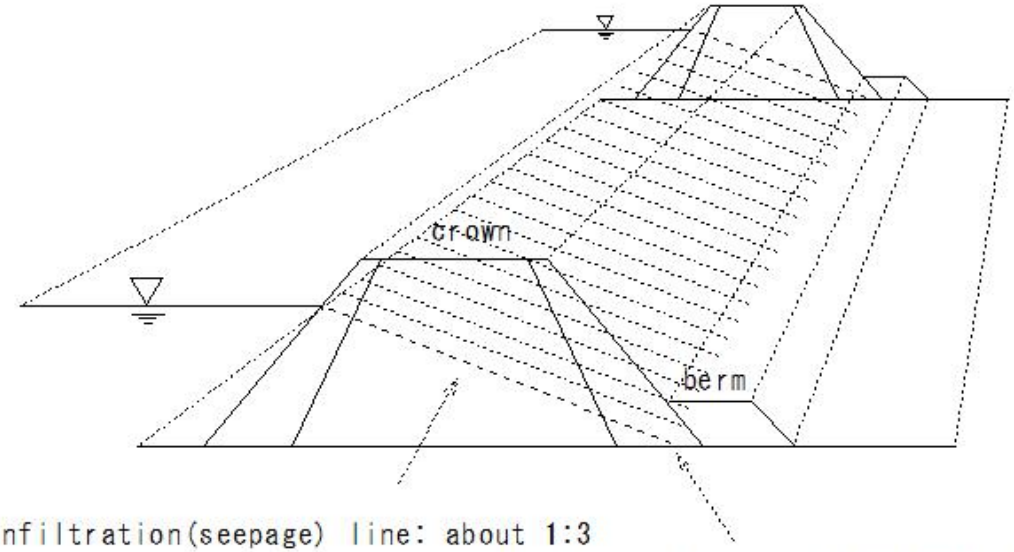
(I621)Infiltration(percolation) of levee

(I621)Infiltration(percolation) of levee

infiltration(percolation) of levee

case of the back slope intersect, it will be destroyed at that point.

Make sure the back slope does not mix with the infiltration line.

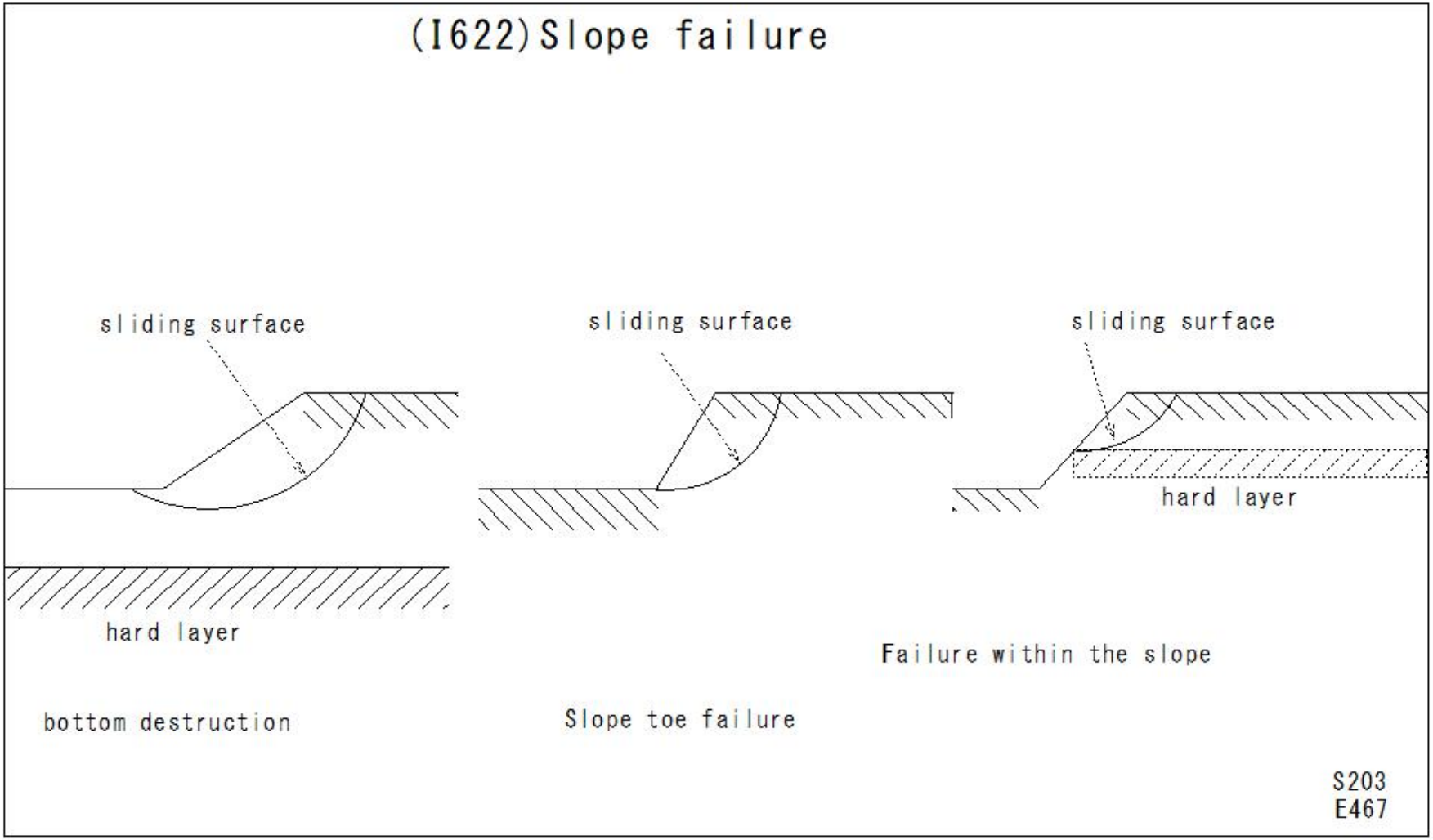


infiltration(seepage) line: about 1:3

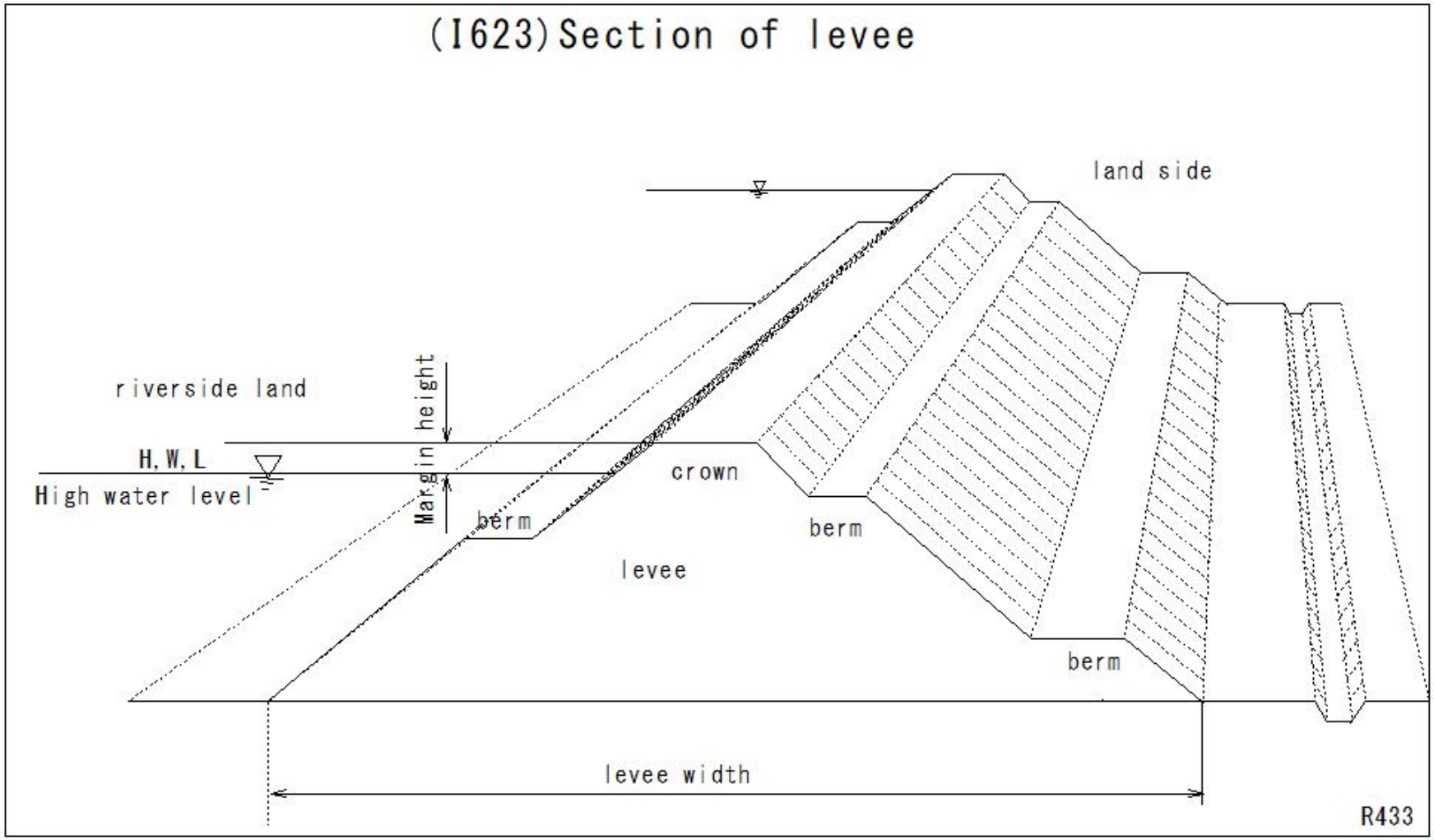
Decide the crown width and back gradient

R431

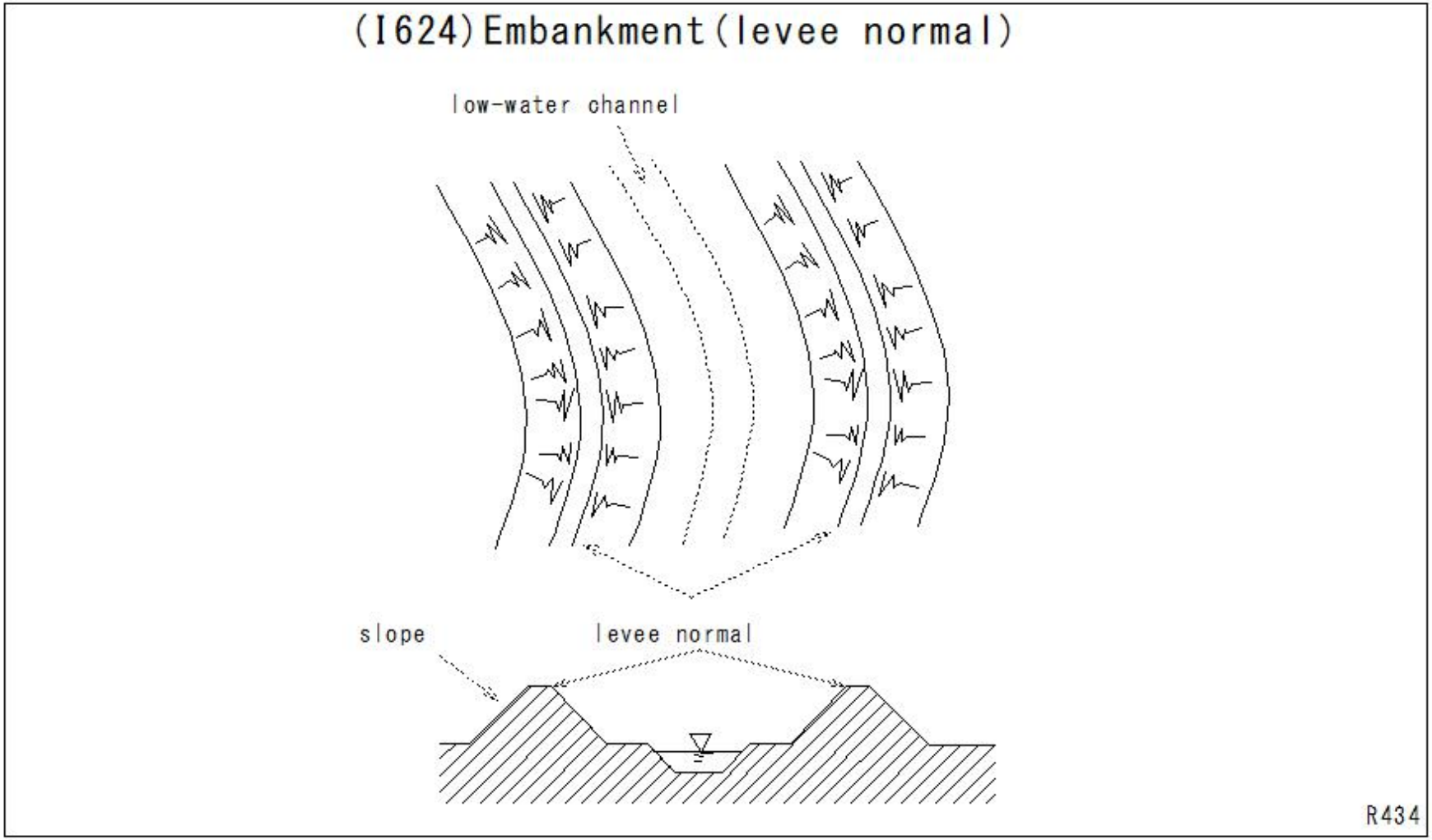
(I622)Slope failure



(I623)Section of levee



(I624)Embankment(levee normal)

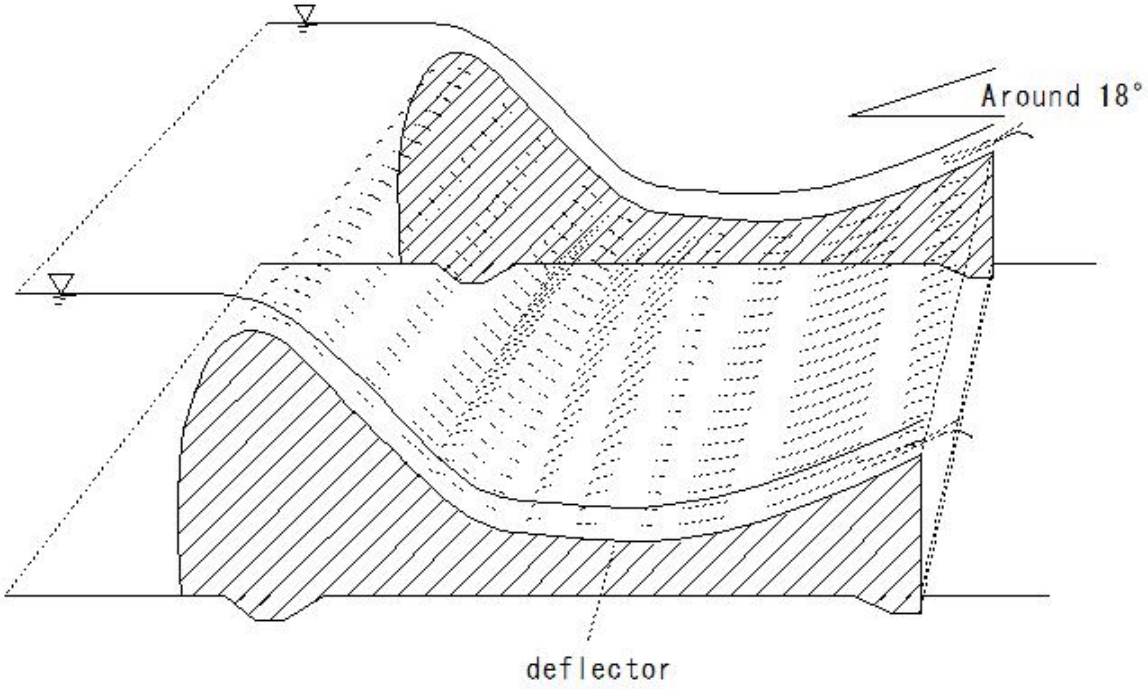


(I625)Dam(deflector)

(I625)Dam(deflector)

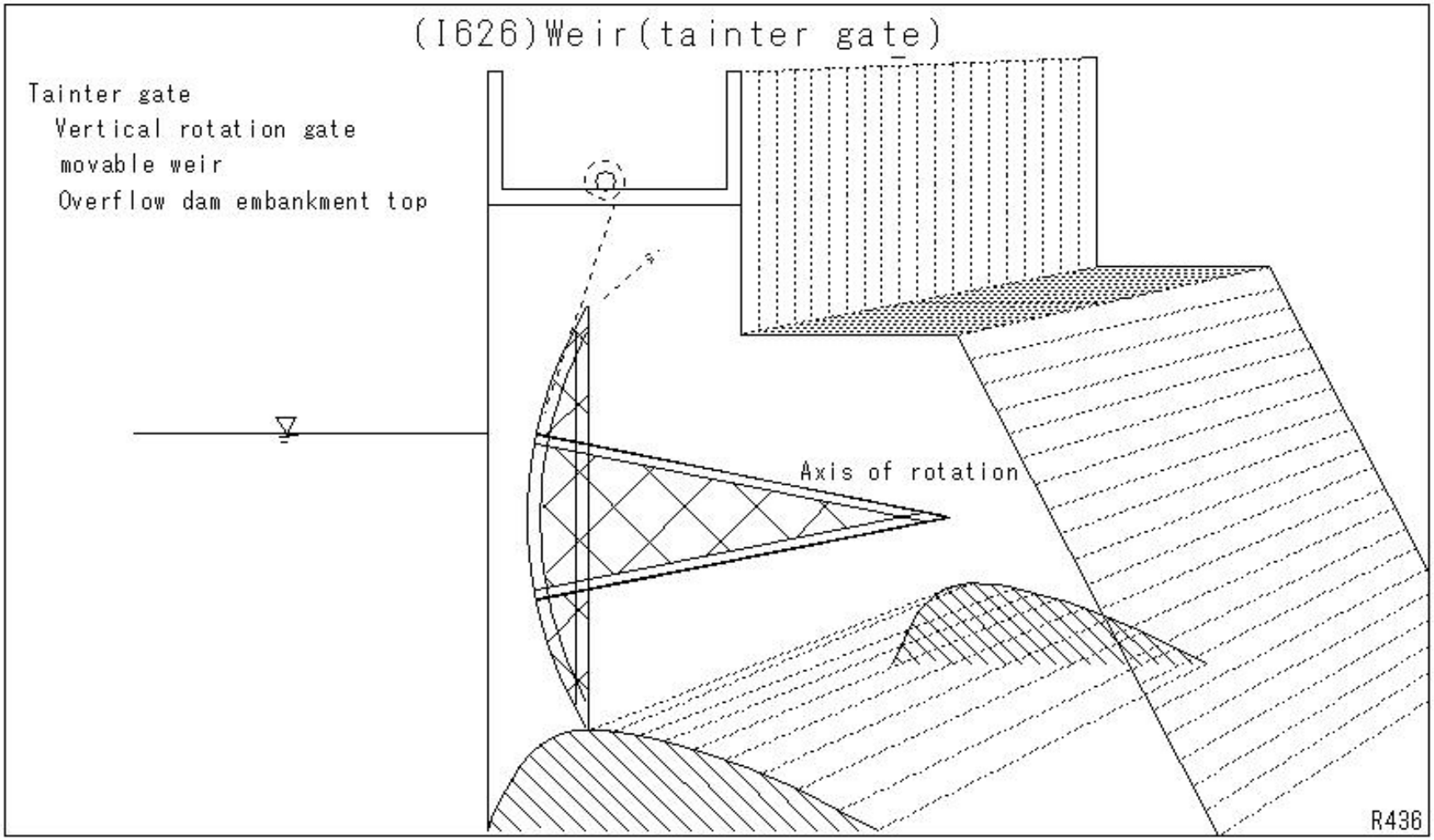
Deflector

A structure that consumes the energy of water that overflows a dam.

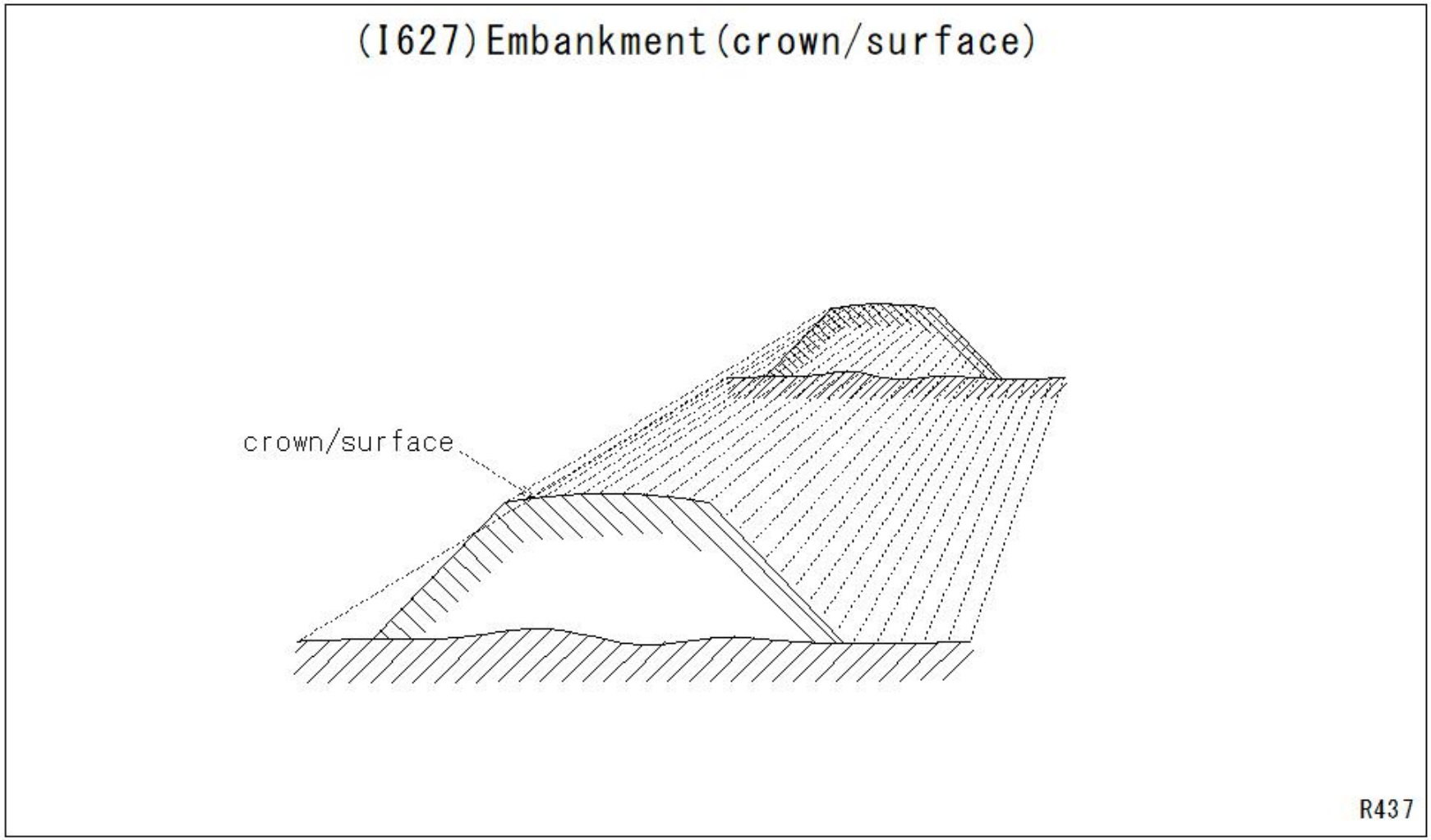


R435

(I626)Weir(tainter gate)



(I627)Embankment(crown/surface)

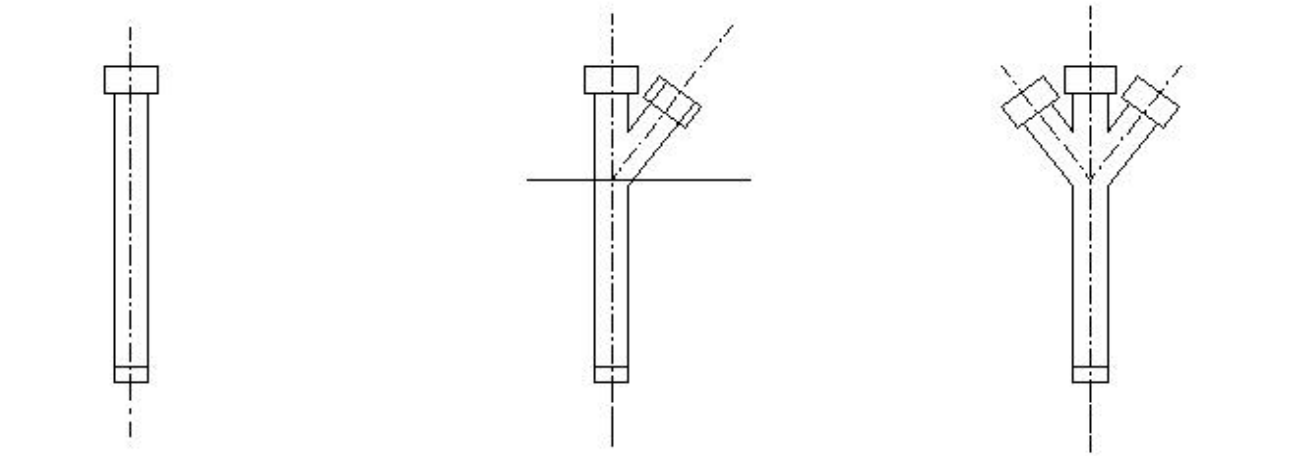


(I628)Water supply(earthenware pipe)

(I628)Water supply(earthenware pipe)

Water supply

earthenware pipe1(Ceramic pipe)
Clay - Extruder - After drying - Glaze - Firing



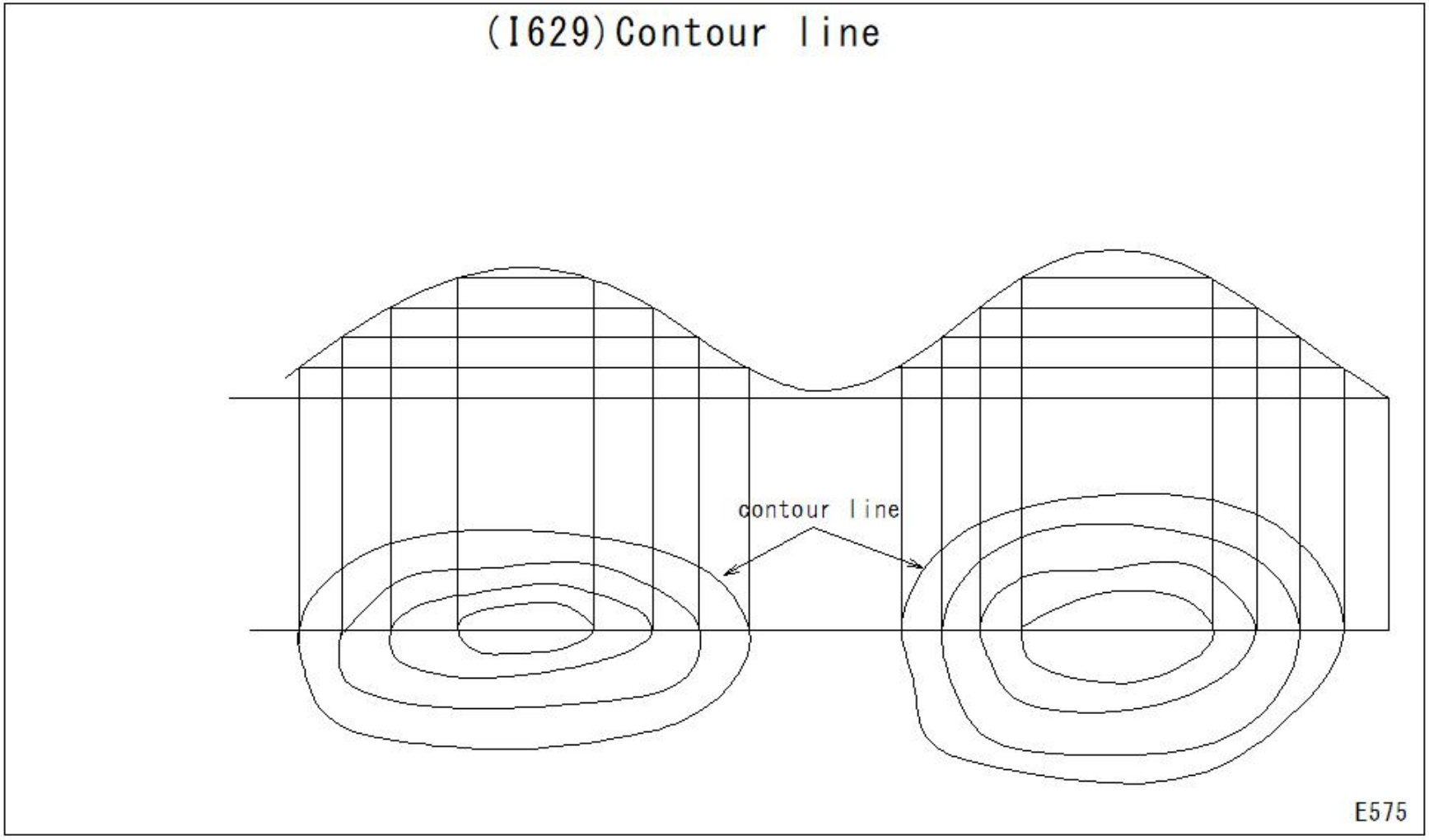
① Straight pipe

② Branched pipe

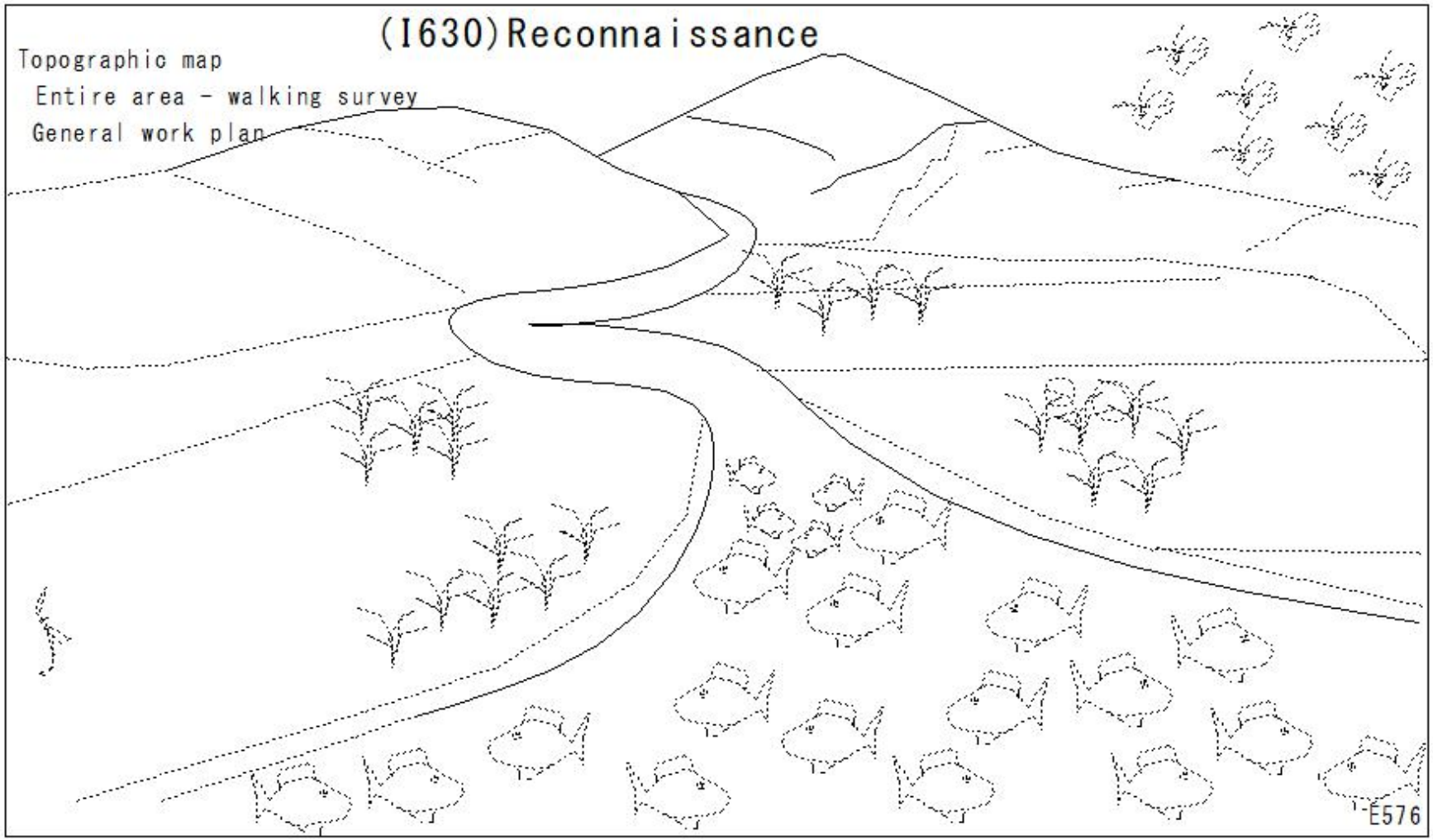
③ Double branch pipe

W206

(I629)Contour line



(I630)Reconnaissance

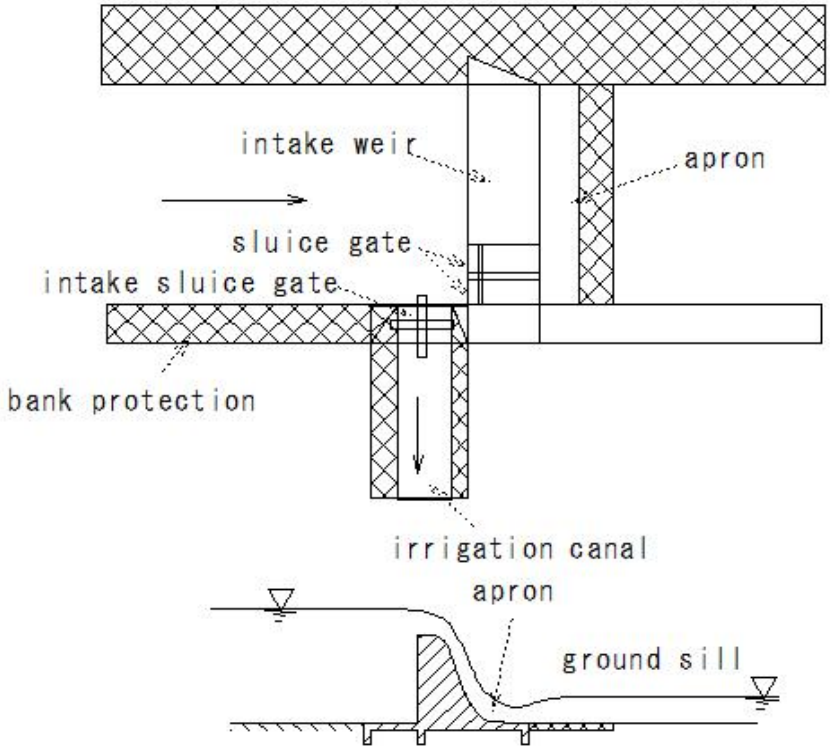


(I631)Weir(head works)

(I631)Weir(head works)

Weir(head works)

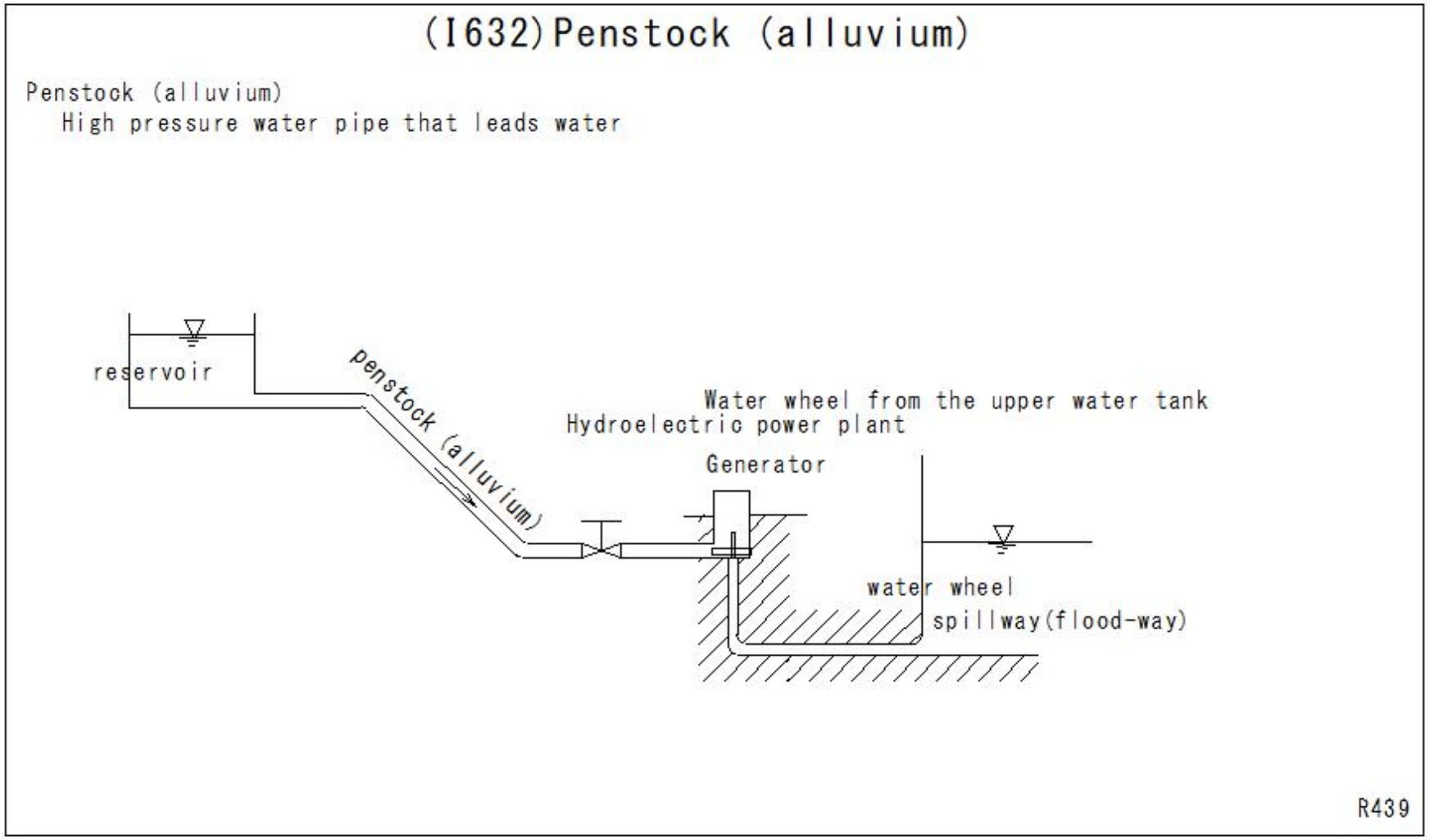
Facilities that draw water from lakes, rivers, etc. to irrigation canals



Weir cross section

R438

(I632)Penstock (alluvium)

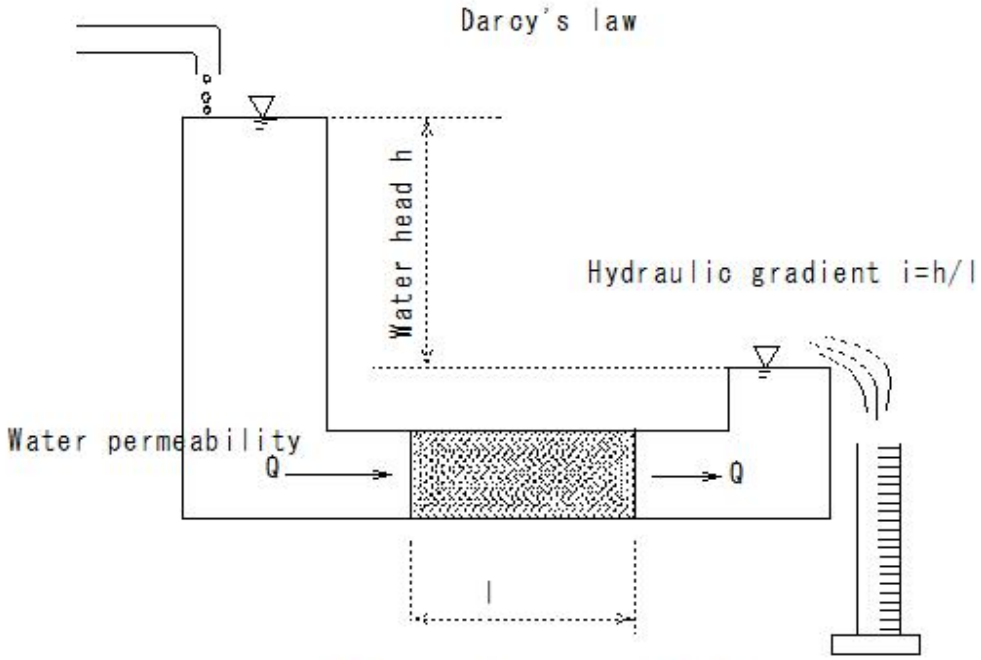


(I633)Coefficient of permeability

(I633)Coefficient of permeability

coefficient of permeability

Amount of water flowing through a unit cross-sectional area of soil per unit time, unit: cm/s

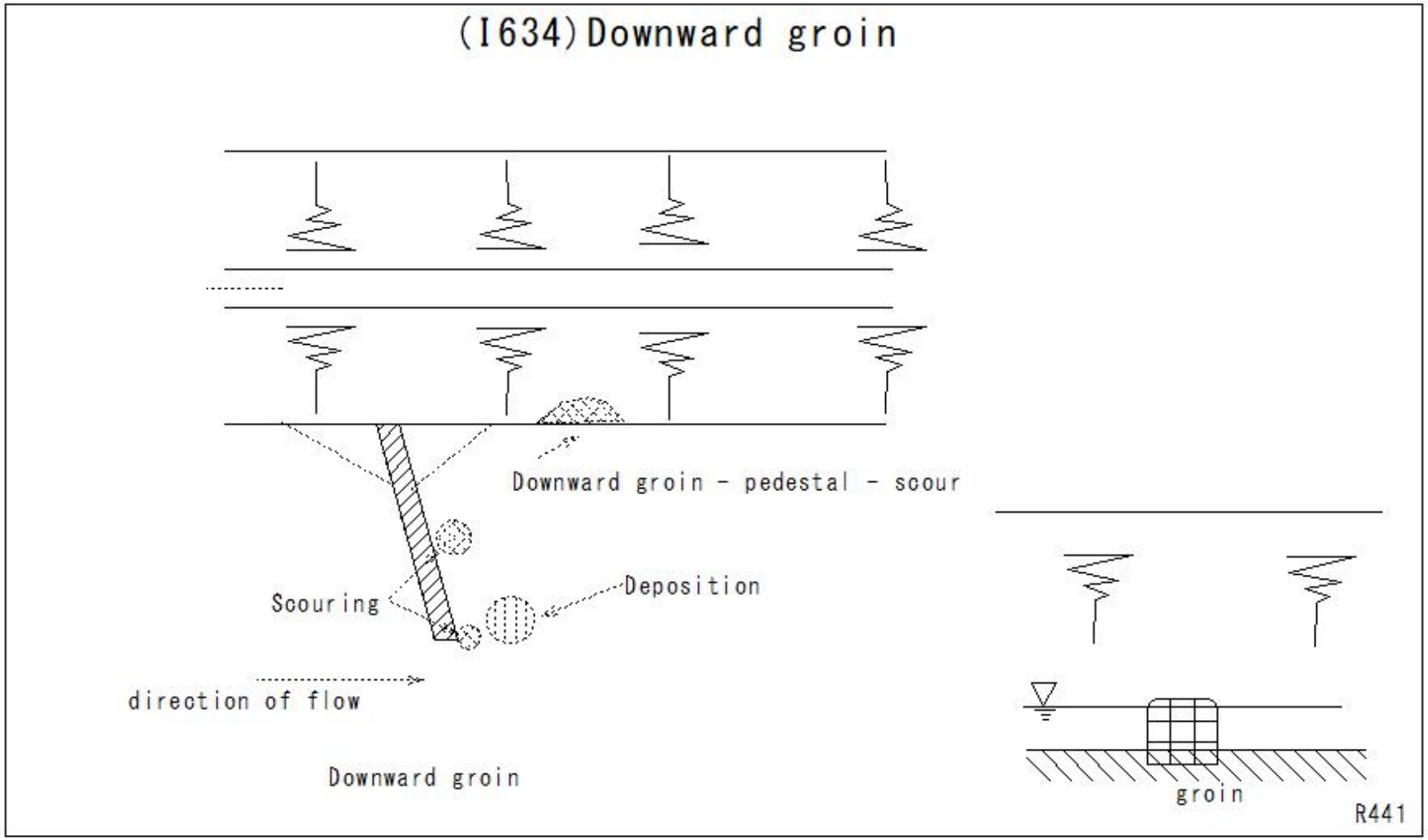


coefficient of permeability K

Sample cross-sectional area A

R440

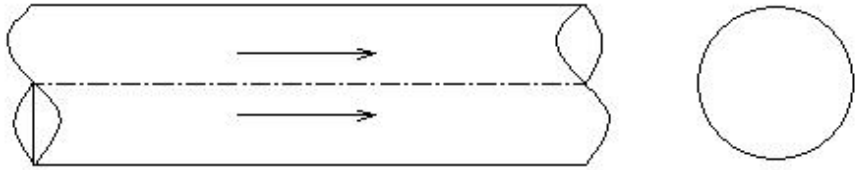
(I634)Equipotential line



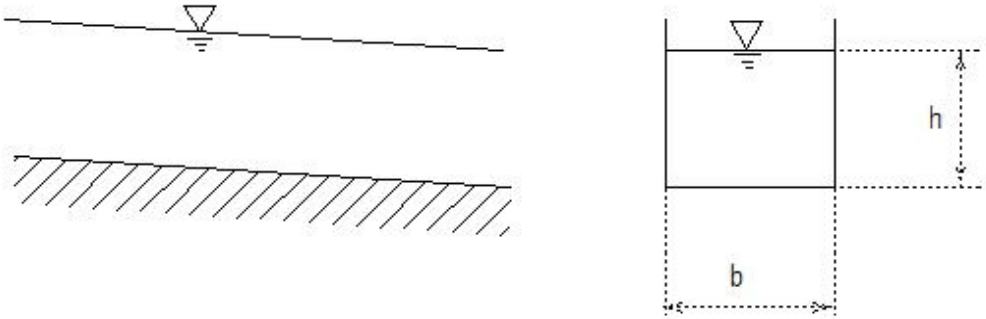
(I635)Uniform flow

(I635)Uniform flow

Uniform flow
  steady flow(ordinary flow)
  fow with equal velocity and volume



flow in a pipe channel with a uniform cross section

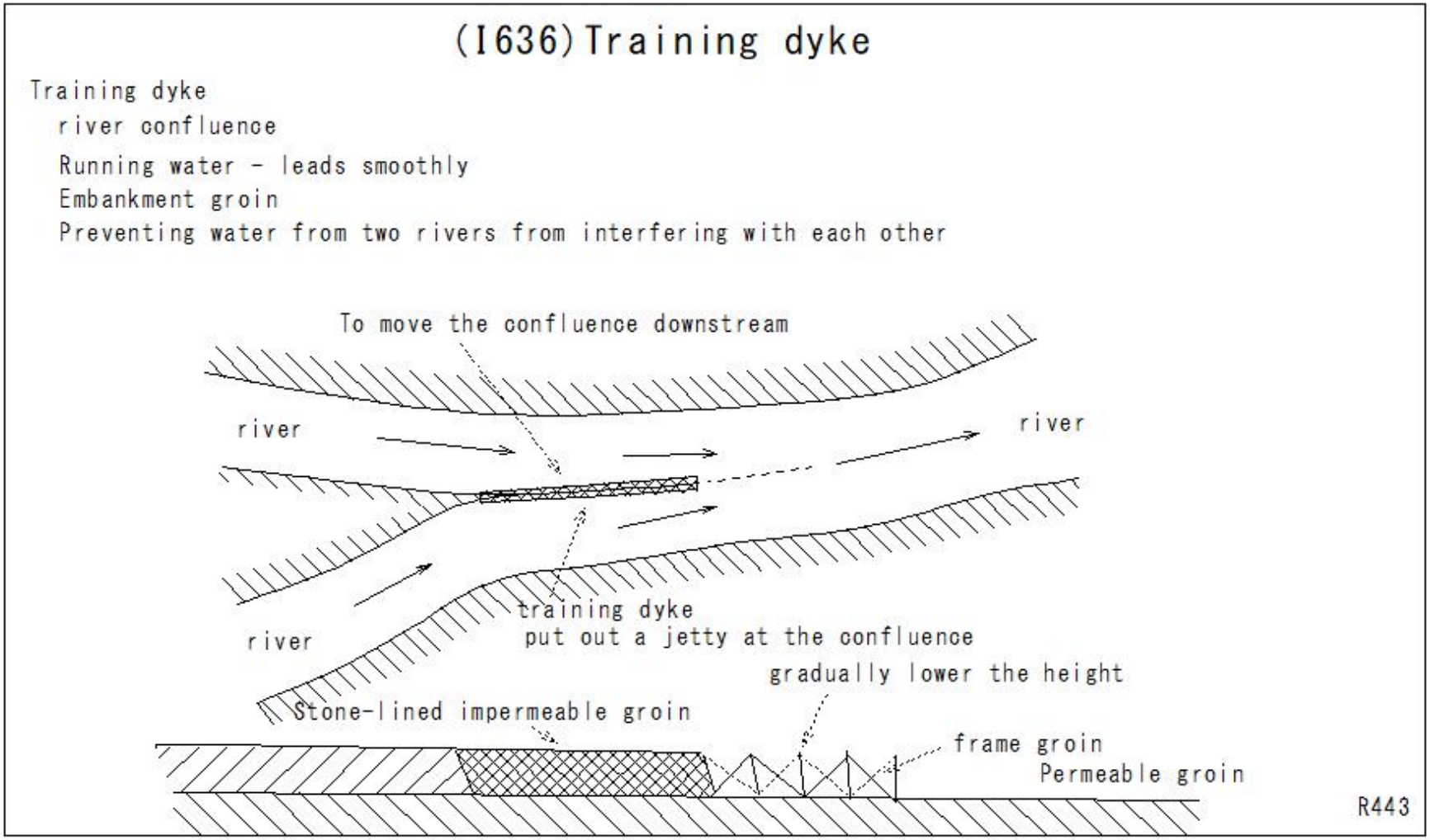


flow in an experimental open channel with uniform cross section

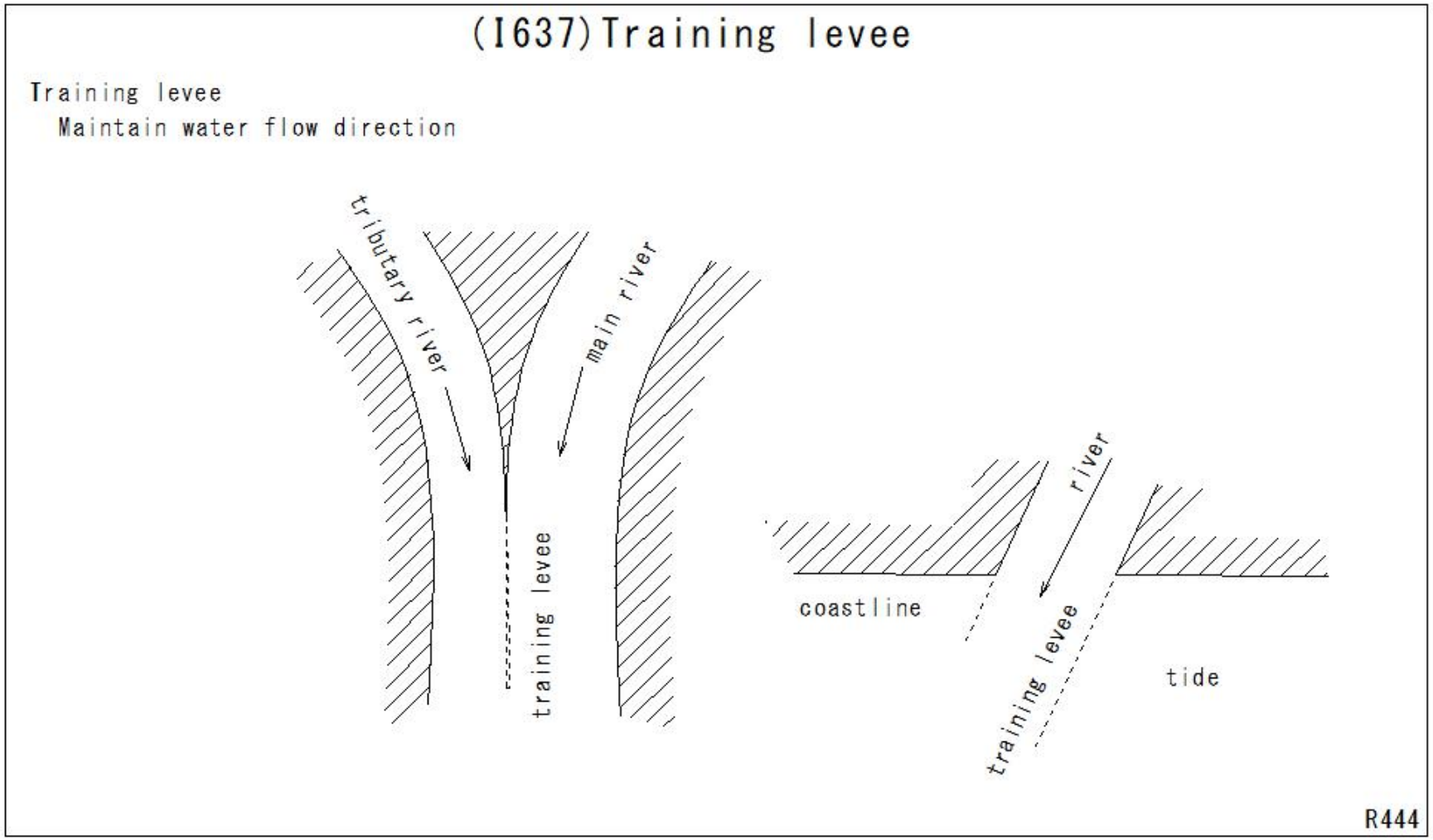
i b h: constant

R442

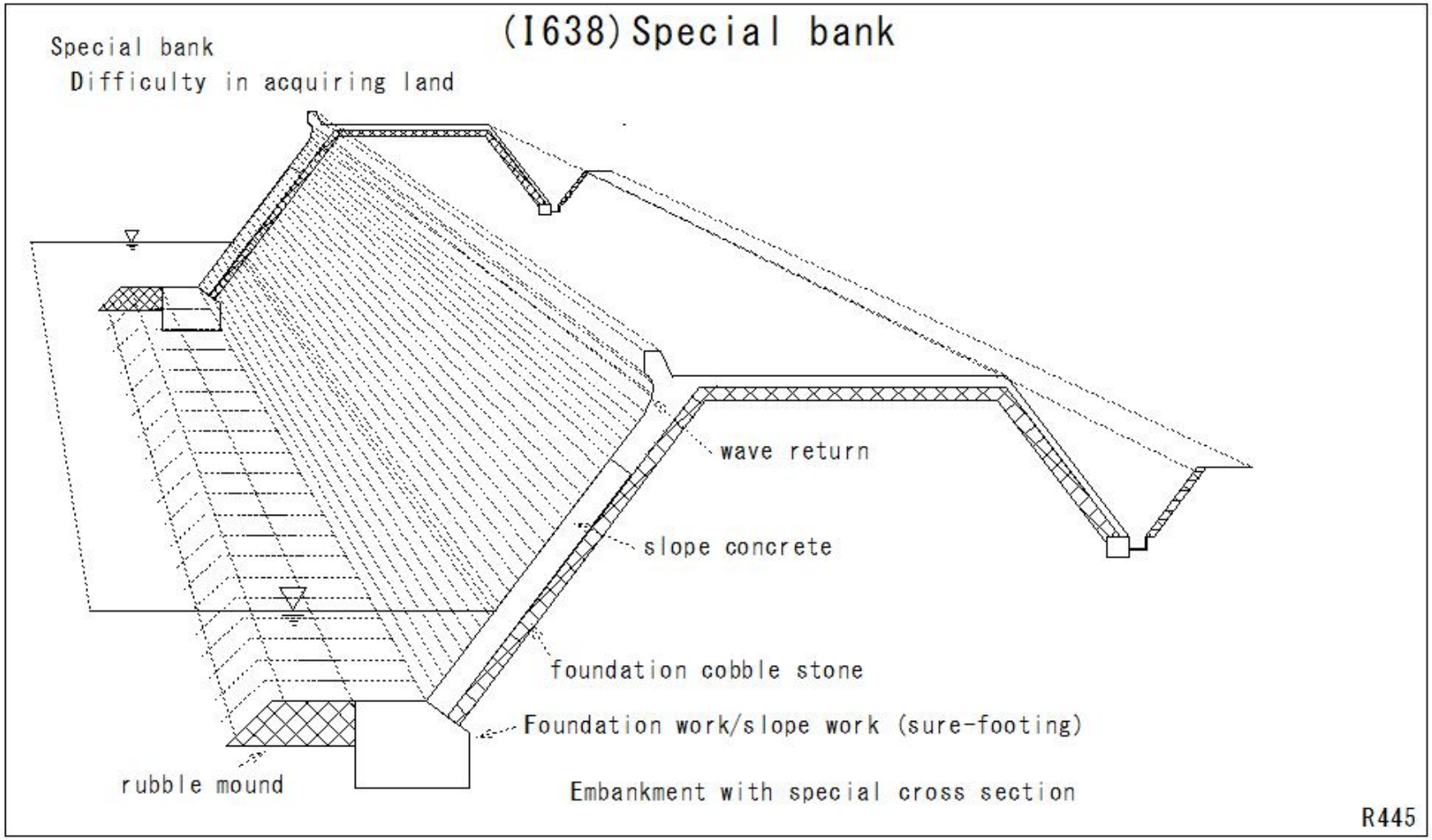
(I636)Training dyke



(I637)Training levee



(I638)Special bank

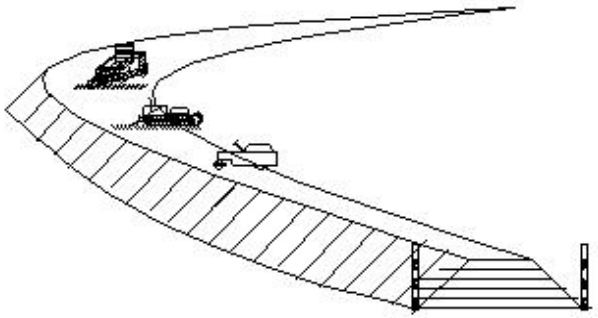


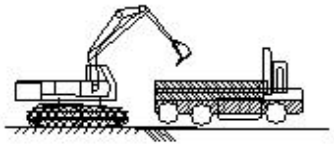
(I639)Earthwork

(I639)Earthwork

Cutting and embankment of soil

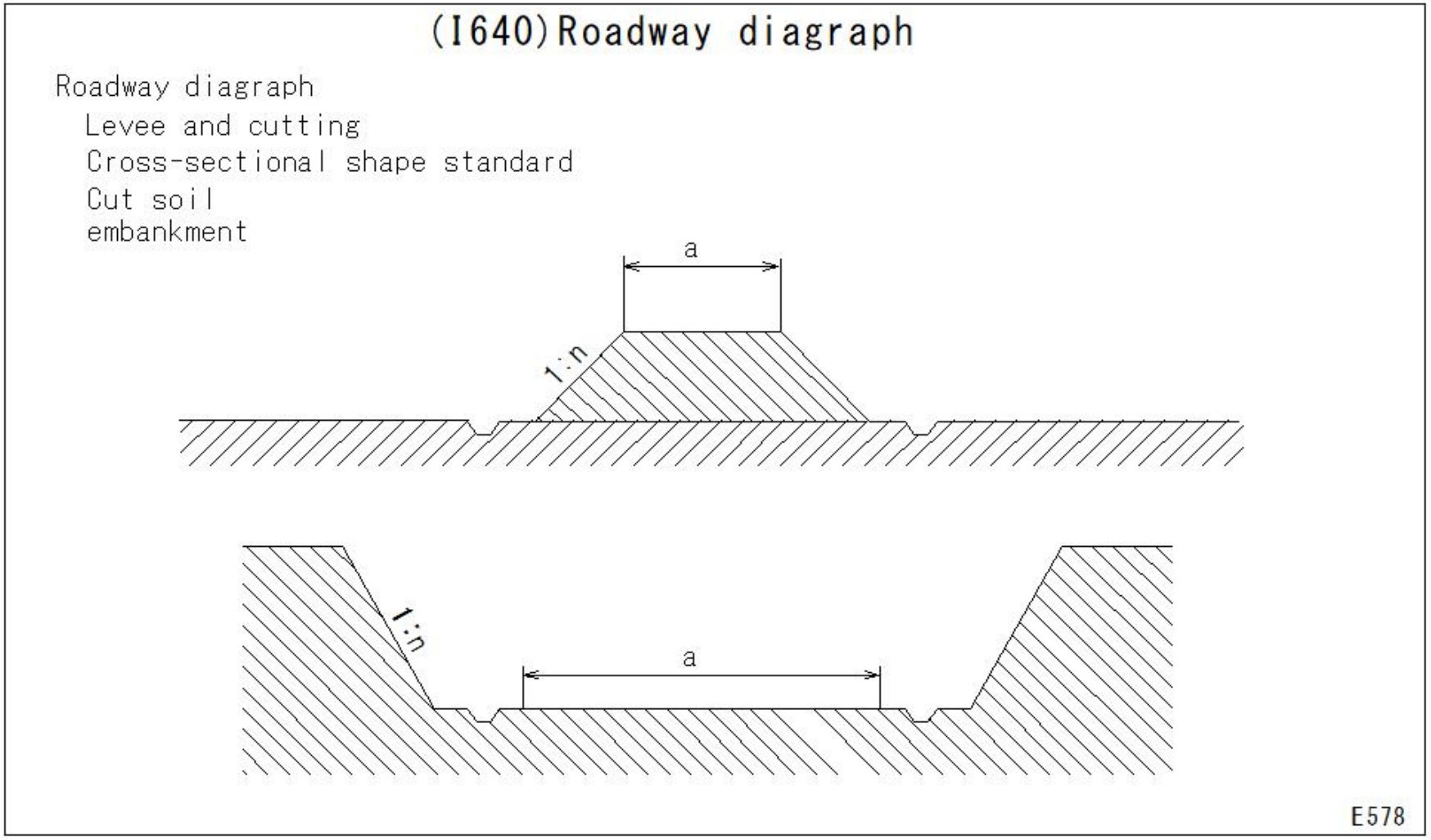
- Cut soil
- transport
- embankment
- Compaction
- Finish
- Mechanical earthwork



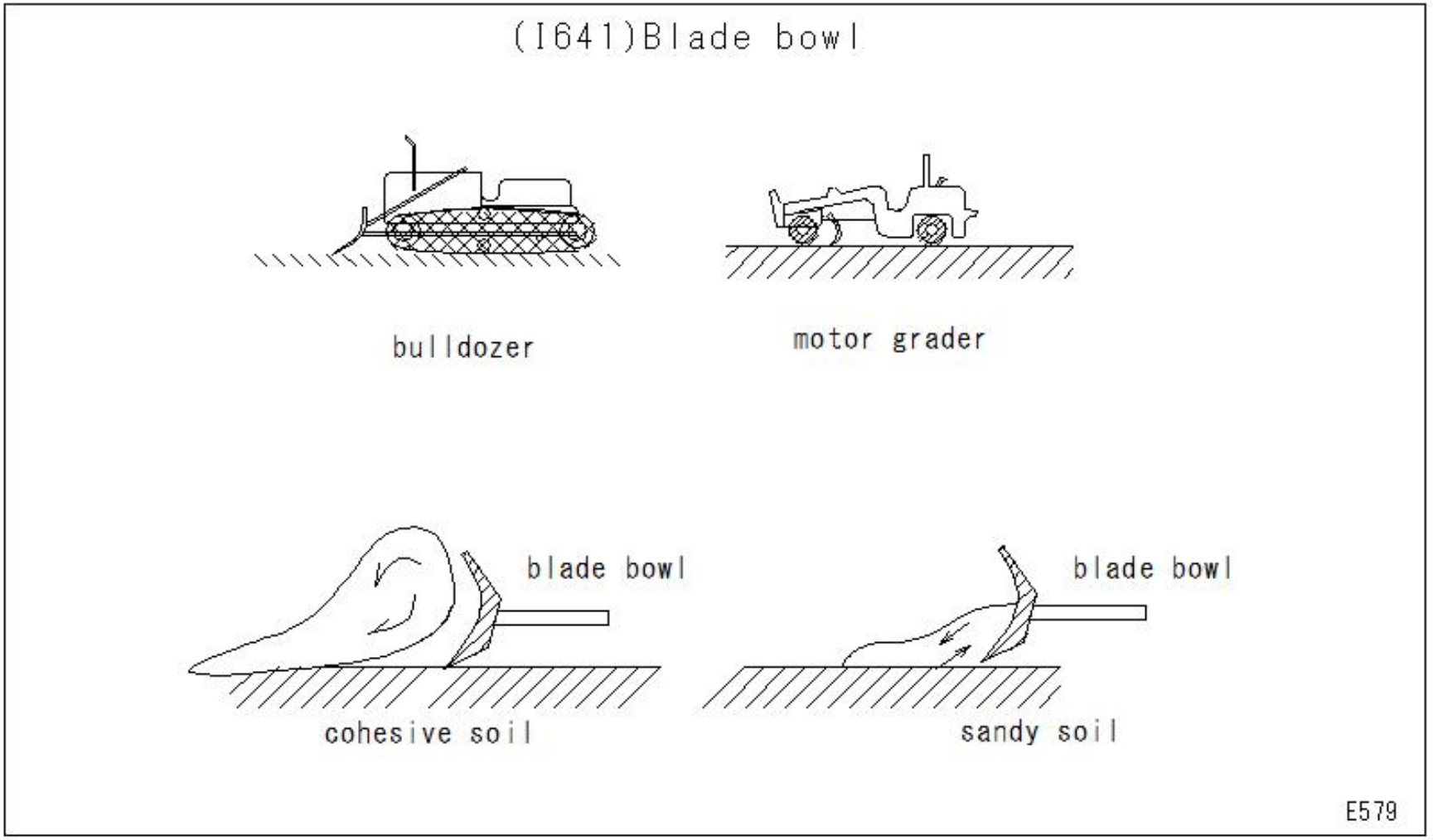


E577

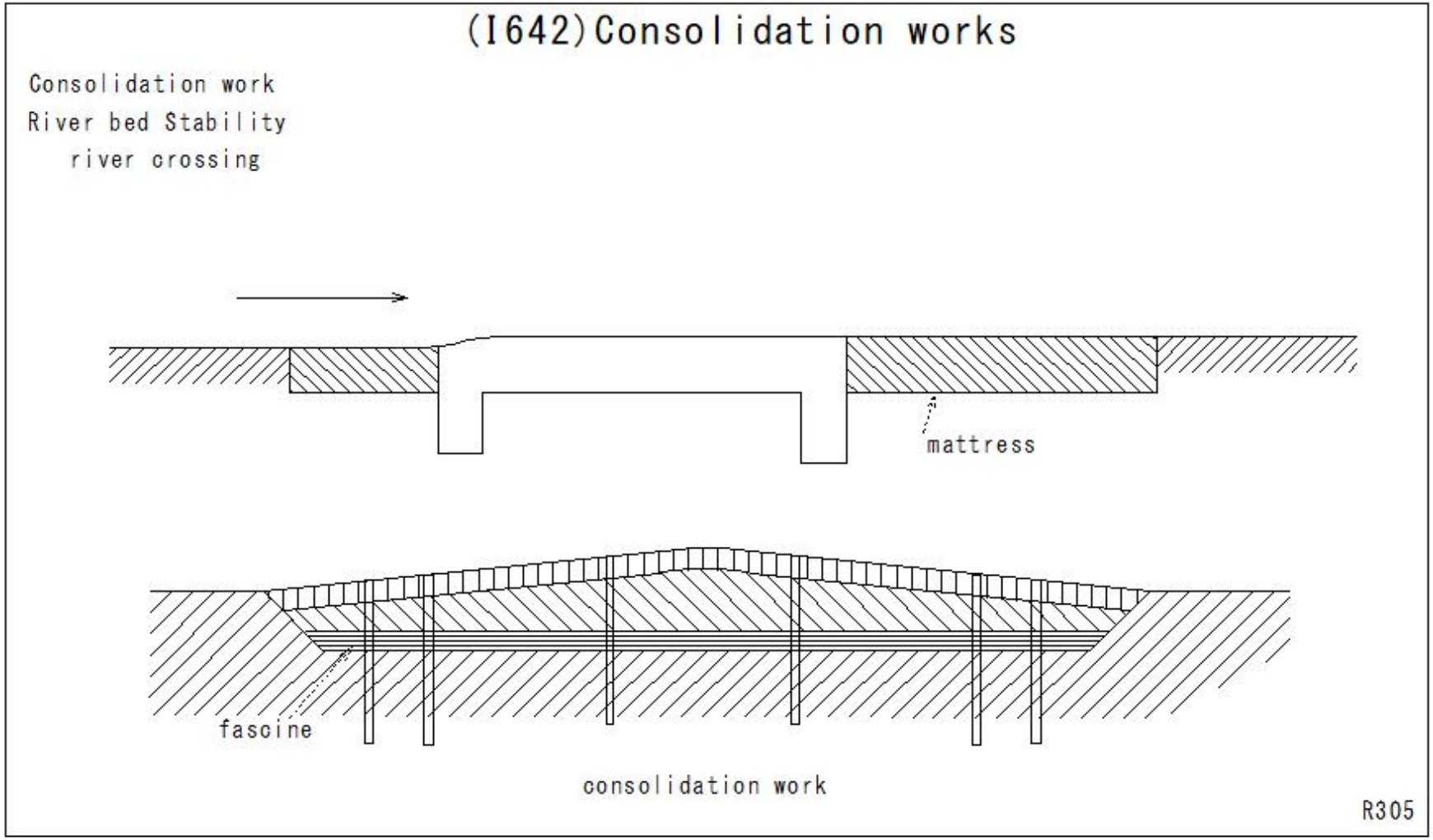
(I640)Roadway diagraph



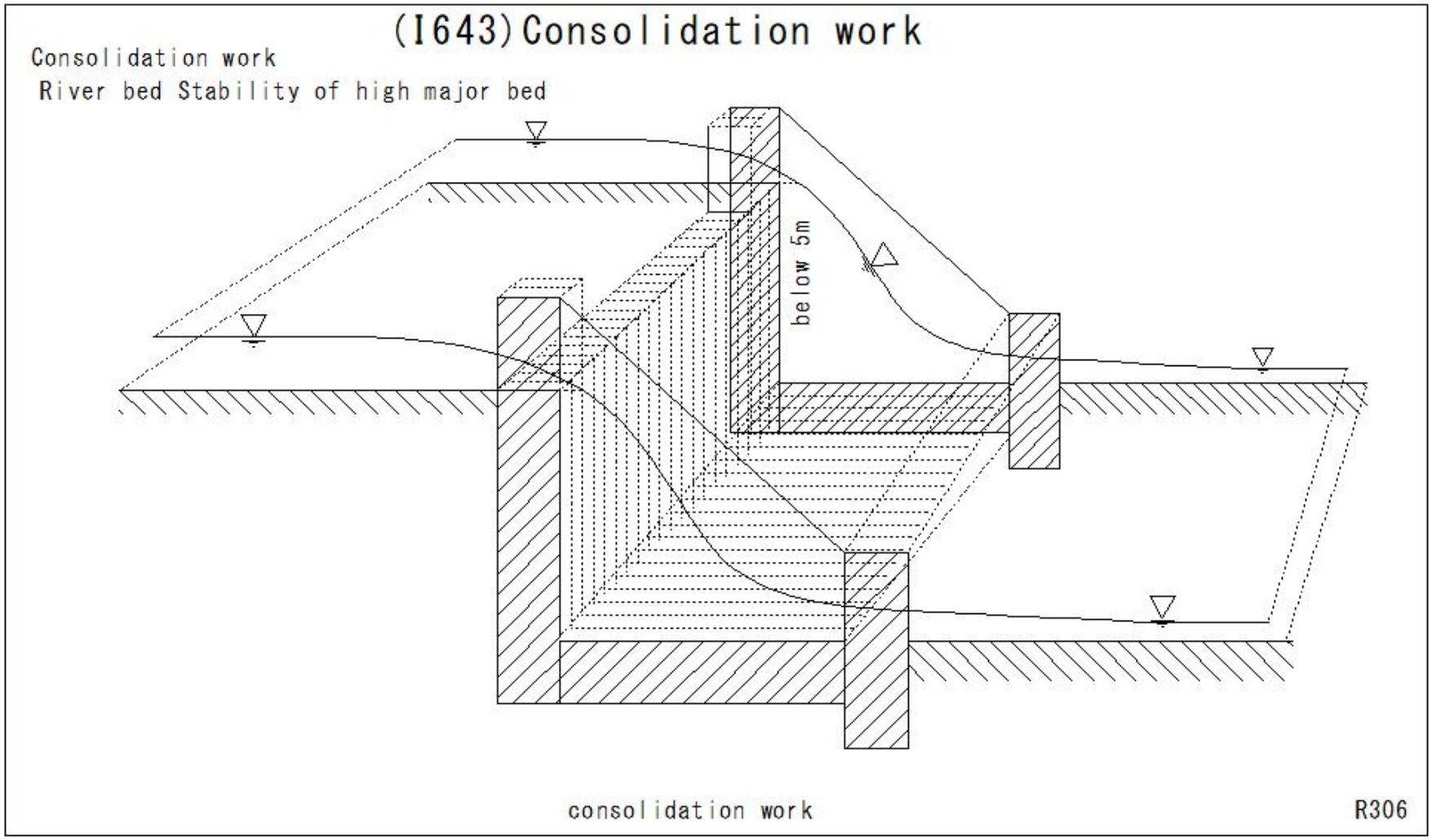
(I641)Blade bowl



(I642)Consolidation works



(I643)Consolidation work



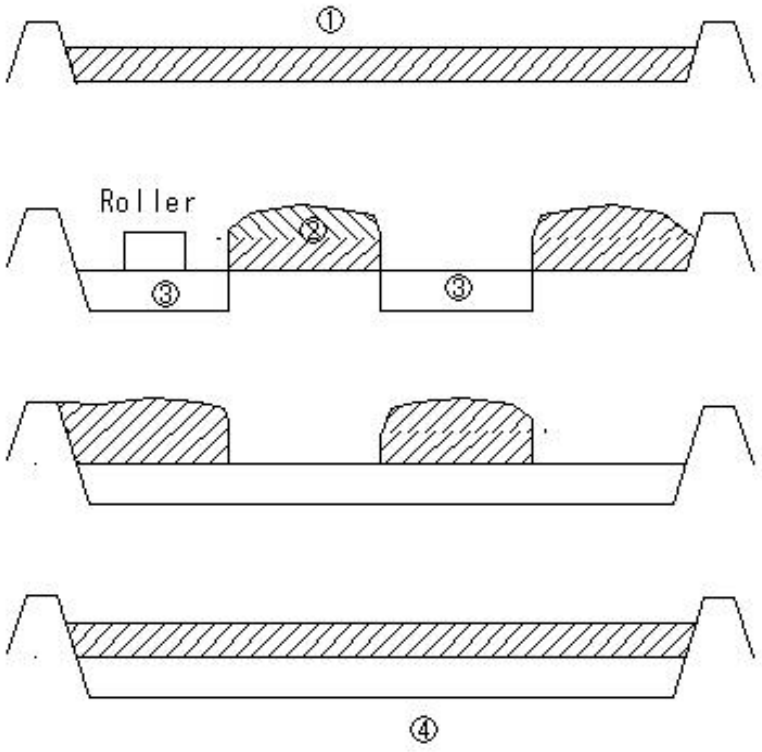
(I644)Subsoil compacting

(I644)Subsoil compacting

Subsoil compacting

Compacting the soil layer to improve the permeability of paddy fields

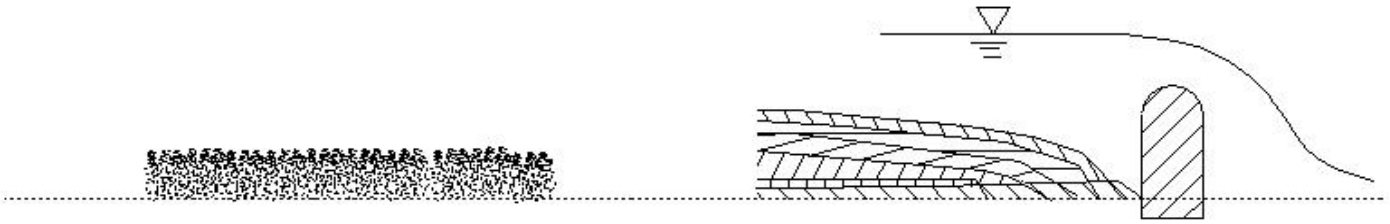
① Plow soil
② Subsoil
③ Subsoil compacting
④ Subsoil



(I645)Sediment settling

(I645)Sediment settling

Sediment settling
- Water flow
- Stationary soil pressure
- Sediment in water - precipitation

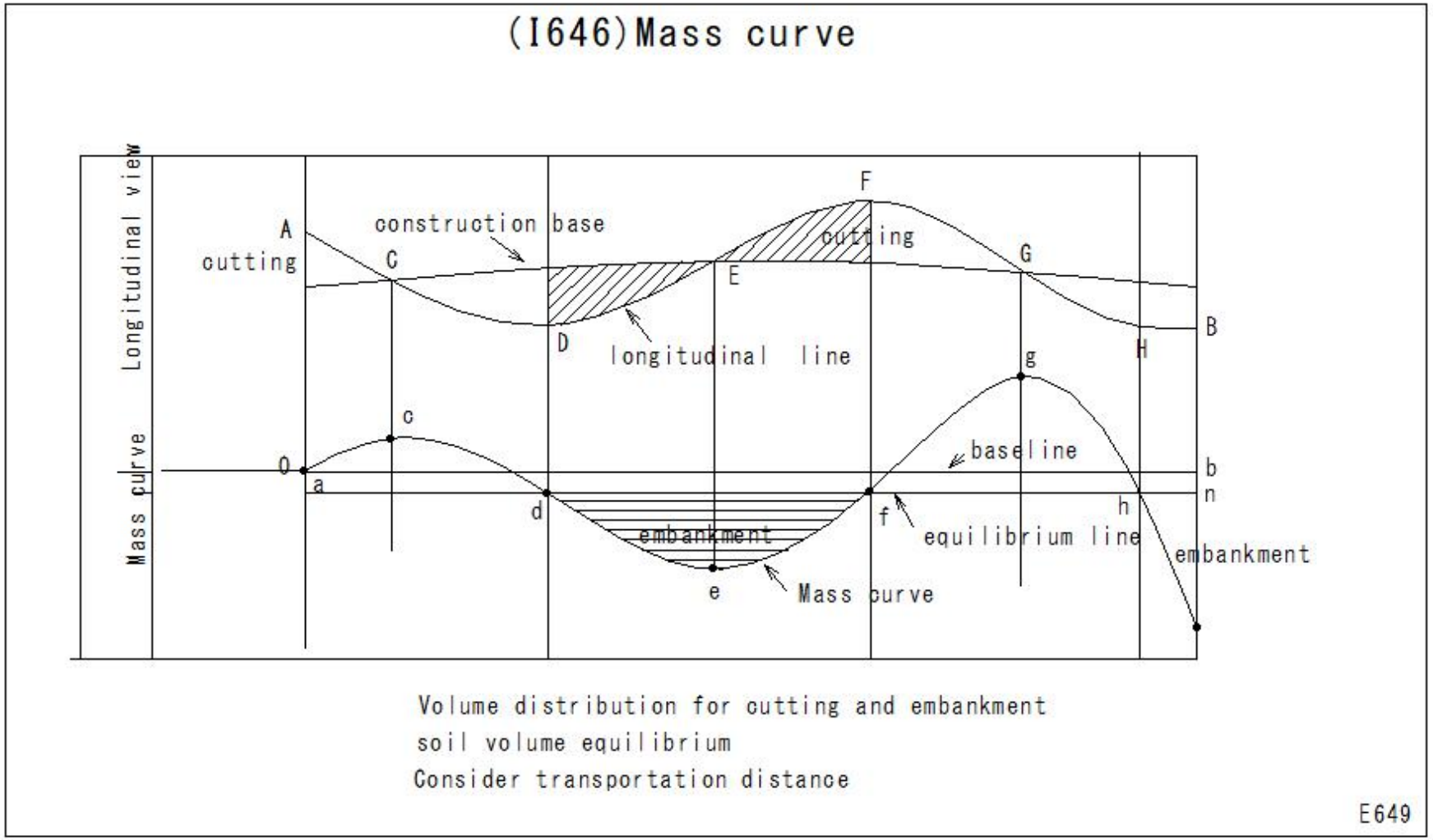


Precipitation in still water
The lower layer has a larger particle size

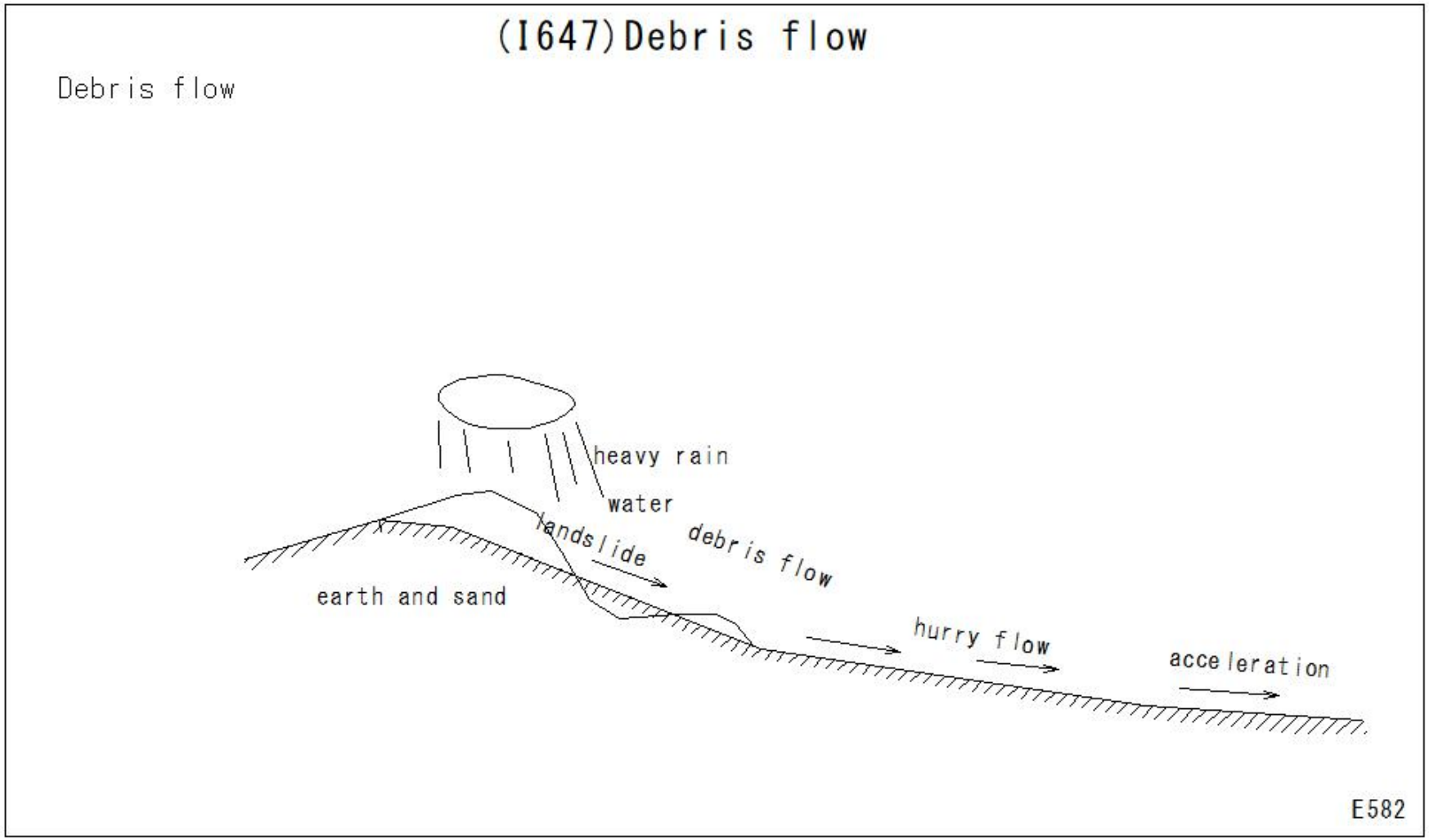
The tip is attached to the dam
Deposition

D228
E580

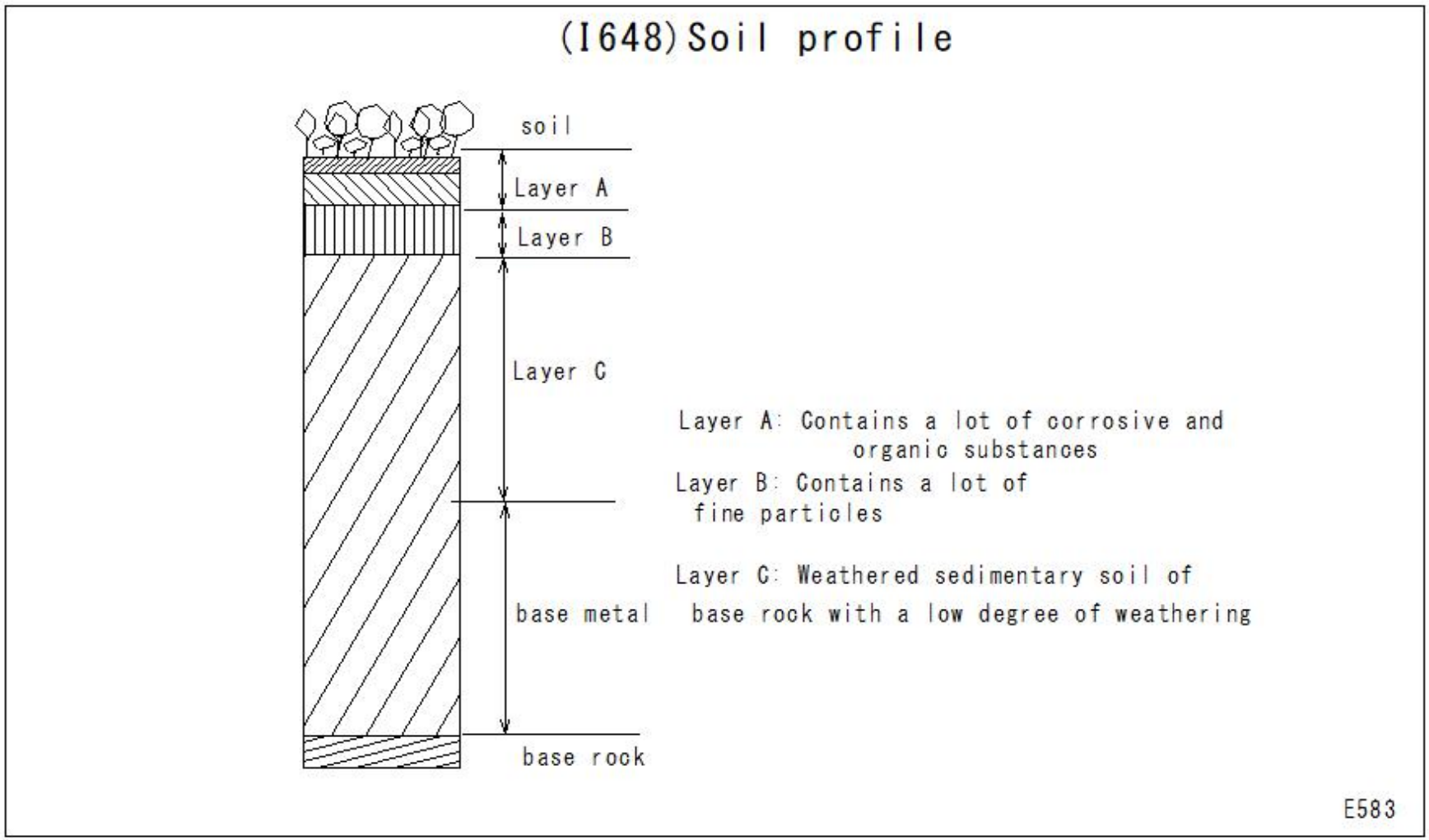
(I646)Mass curve



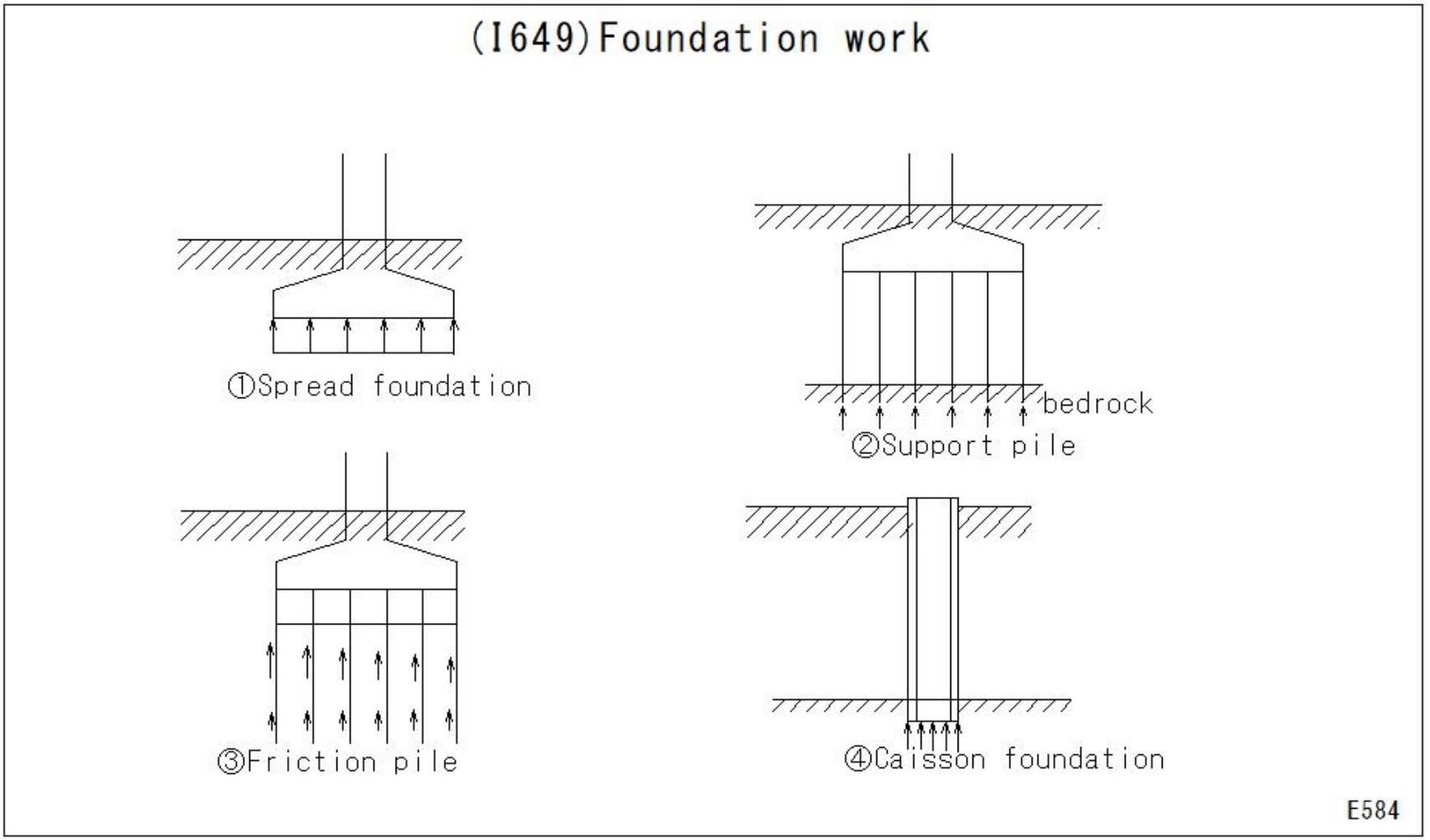
(I647)Debris flow



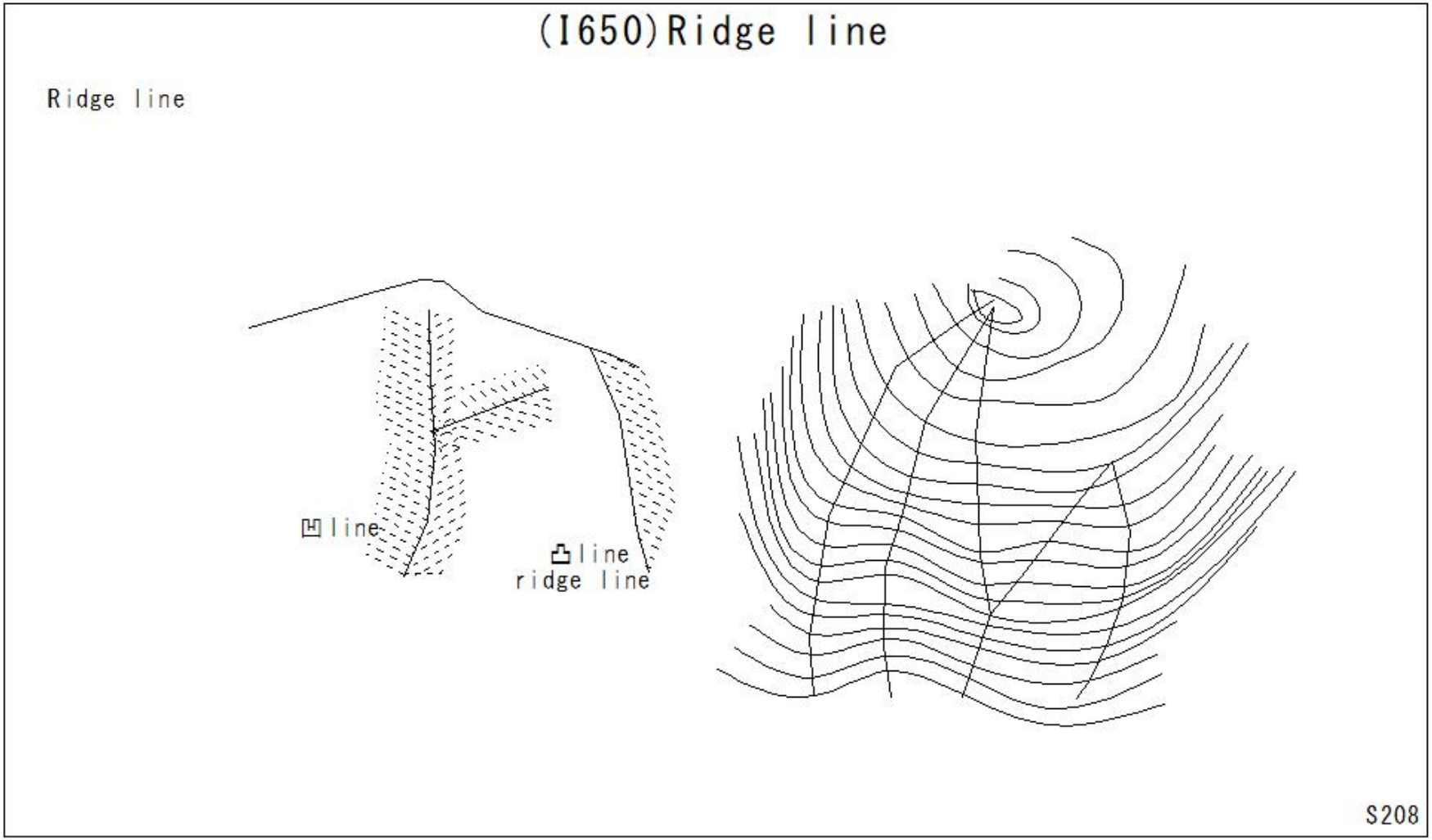
(I648)Soil profile



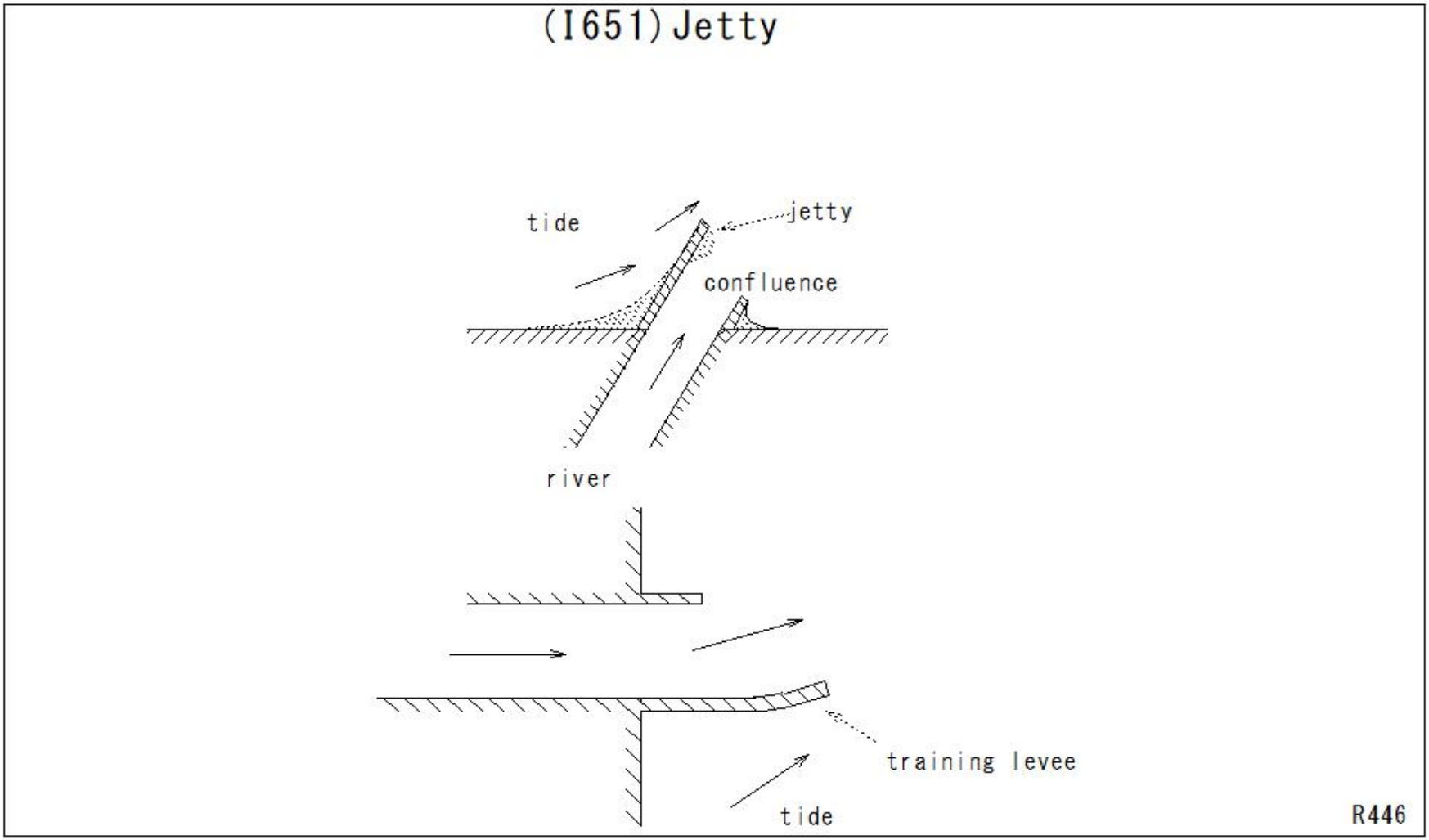
(I649)Foundation work



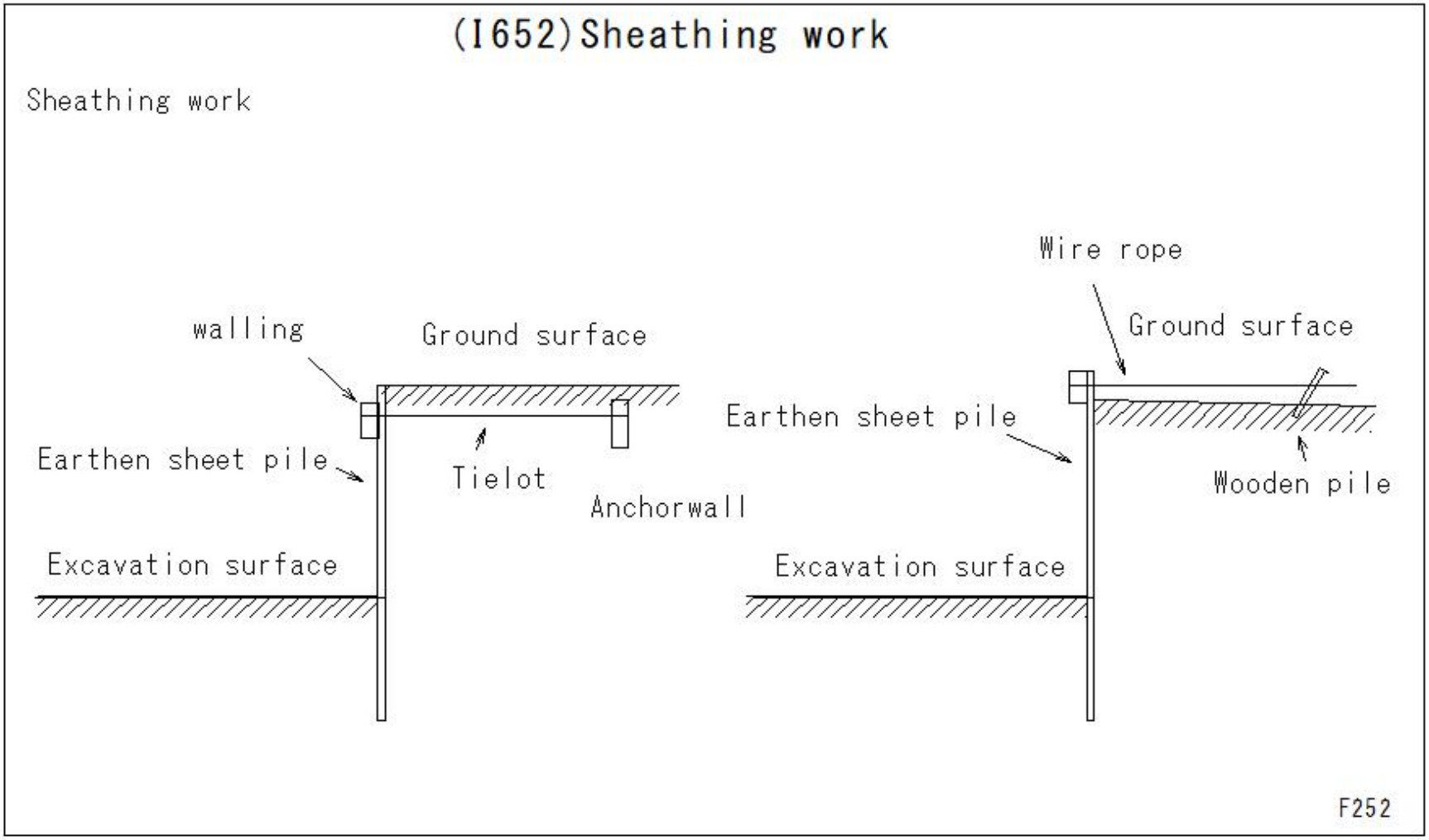
(I650)Ridge line



(I651)Jetty


(I651)Jetty
tide
jetty
confluence
river
training levee
tide
R446

(I652)Sheathing work



(I653)Slope tamping

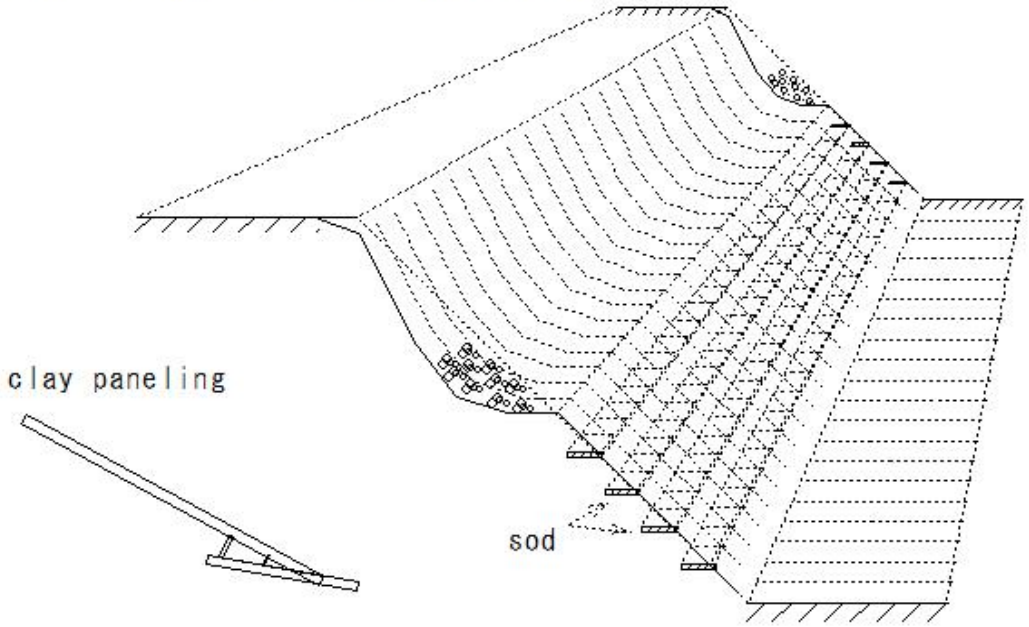
(I653)Slope tamping

Slope tamping

Plant sod on the slope of the embankment

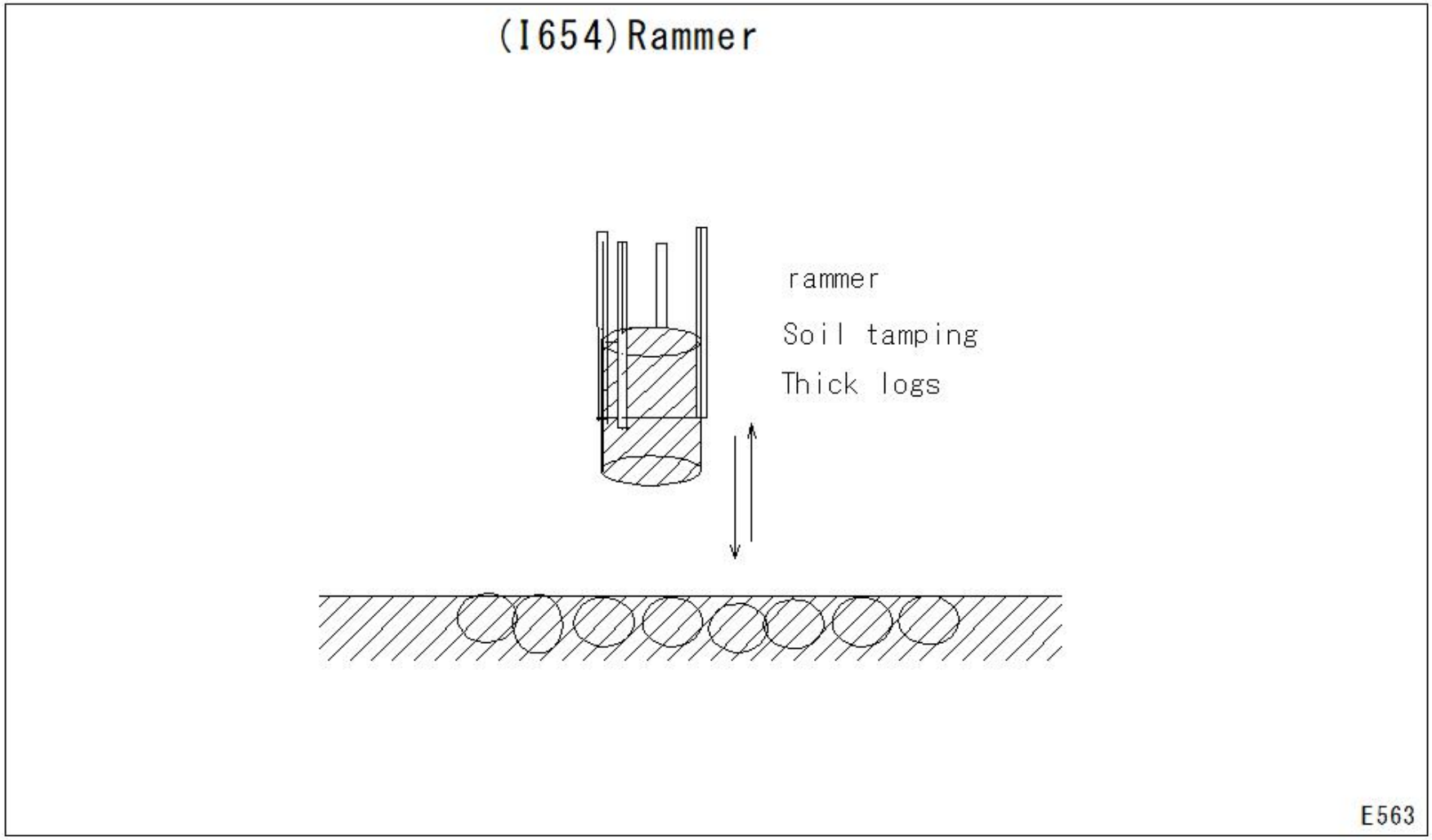
Compact and finish the slope surface

Compact the slope by pounding it with clay panels.



R447

(I654)Rammer



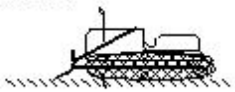
(I655)Trafficability

(I655)Trafficability

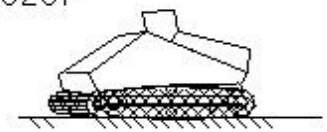
Trafficability

Degree of runnability of the machine	Cone Index (kN/m2)
1 Wetland bulldozer	over 300
2 Scrape Dozer	600 or more
3 Bulldozer	500-700 or more
4 towed scraper	700-1000 or more
5 Motor Scraper	1000-1300 or more
6 Dump Truck	1200-1500 or more

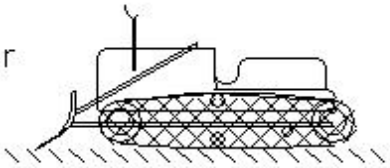
1 Wetland bulldozer



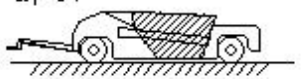
2 Scrape Dozer



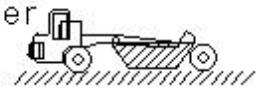
3 Bulldozer



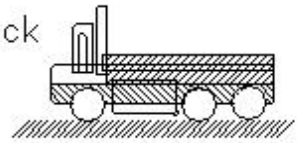
4 towed scraper



5 Motor Scraper

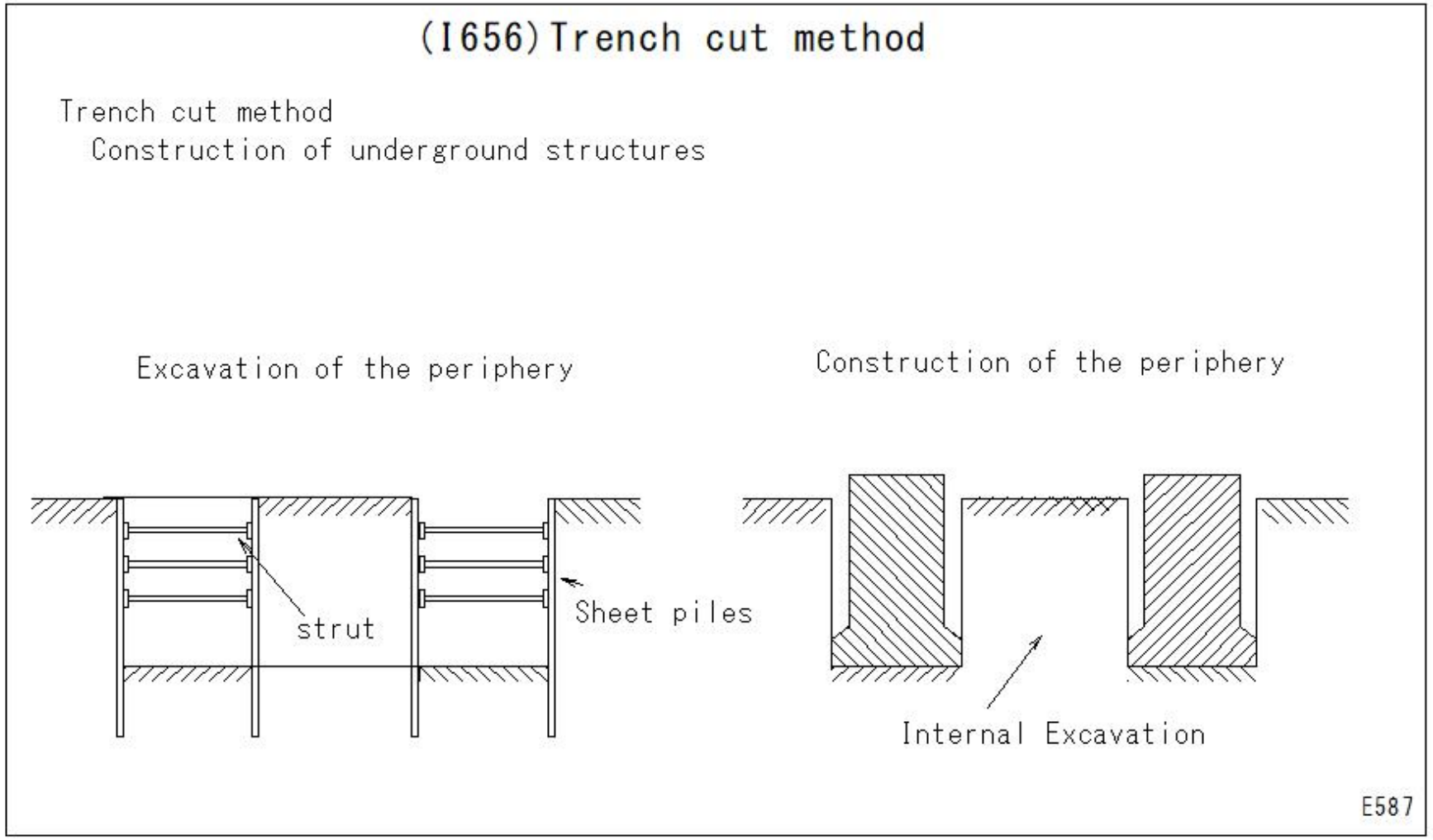


6 Dump Truck

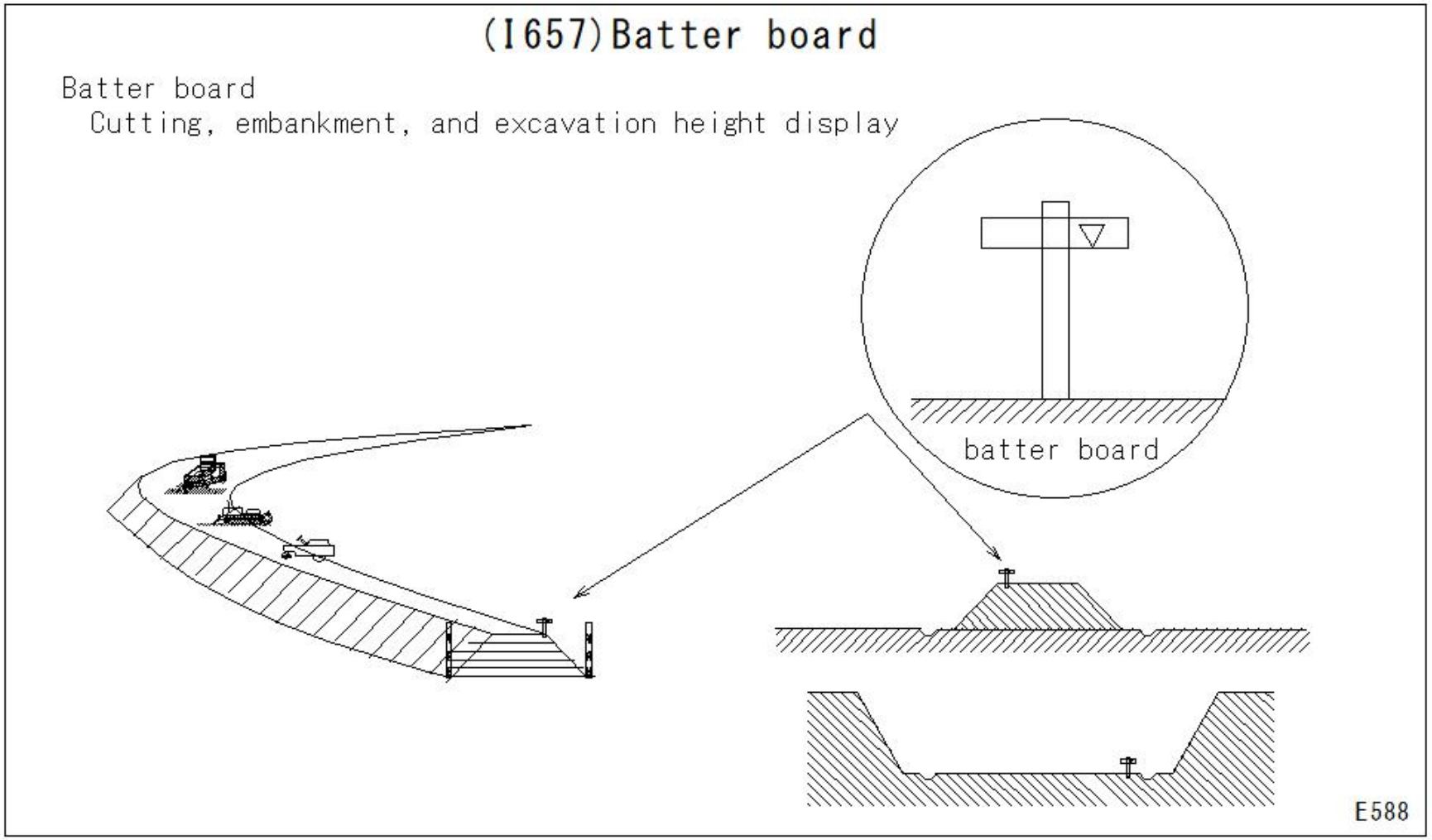


E585

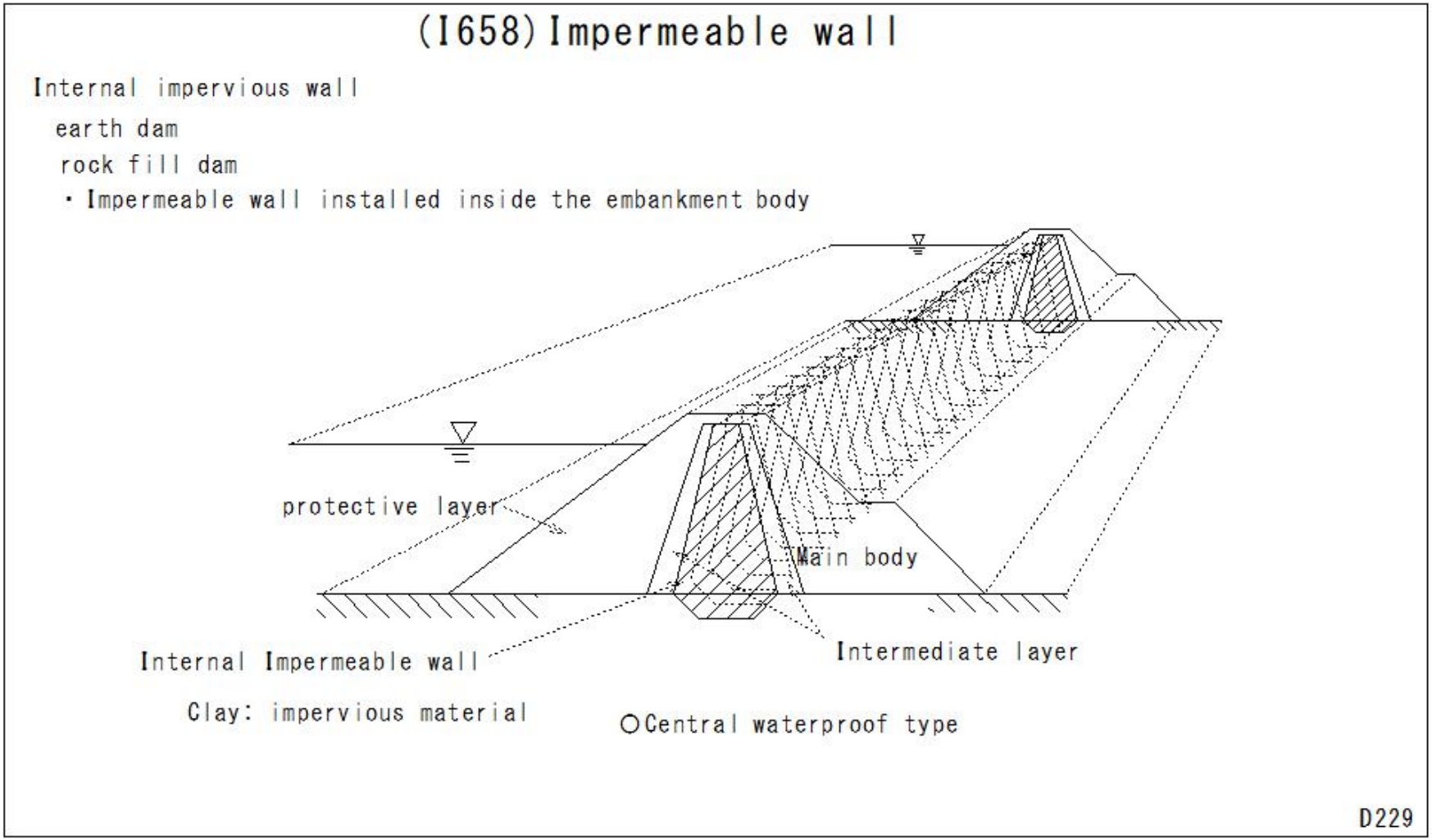
(I656)Trench cut method



(I657)Batter board



(I658)Impermeable wall



(I659)Internal impervious wall

(I659)Internal impervious wall

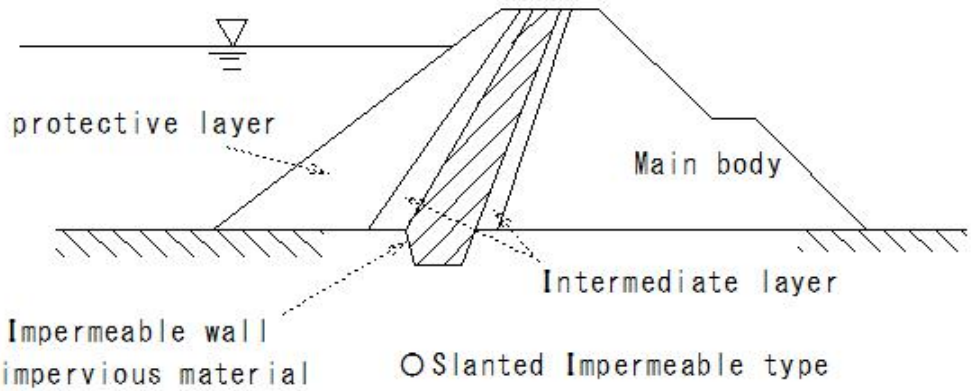
Internal impervious wall

earth dam

rock fill dam

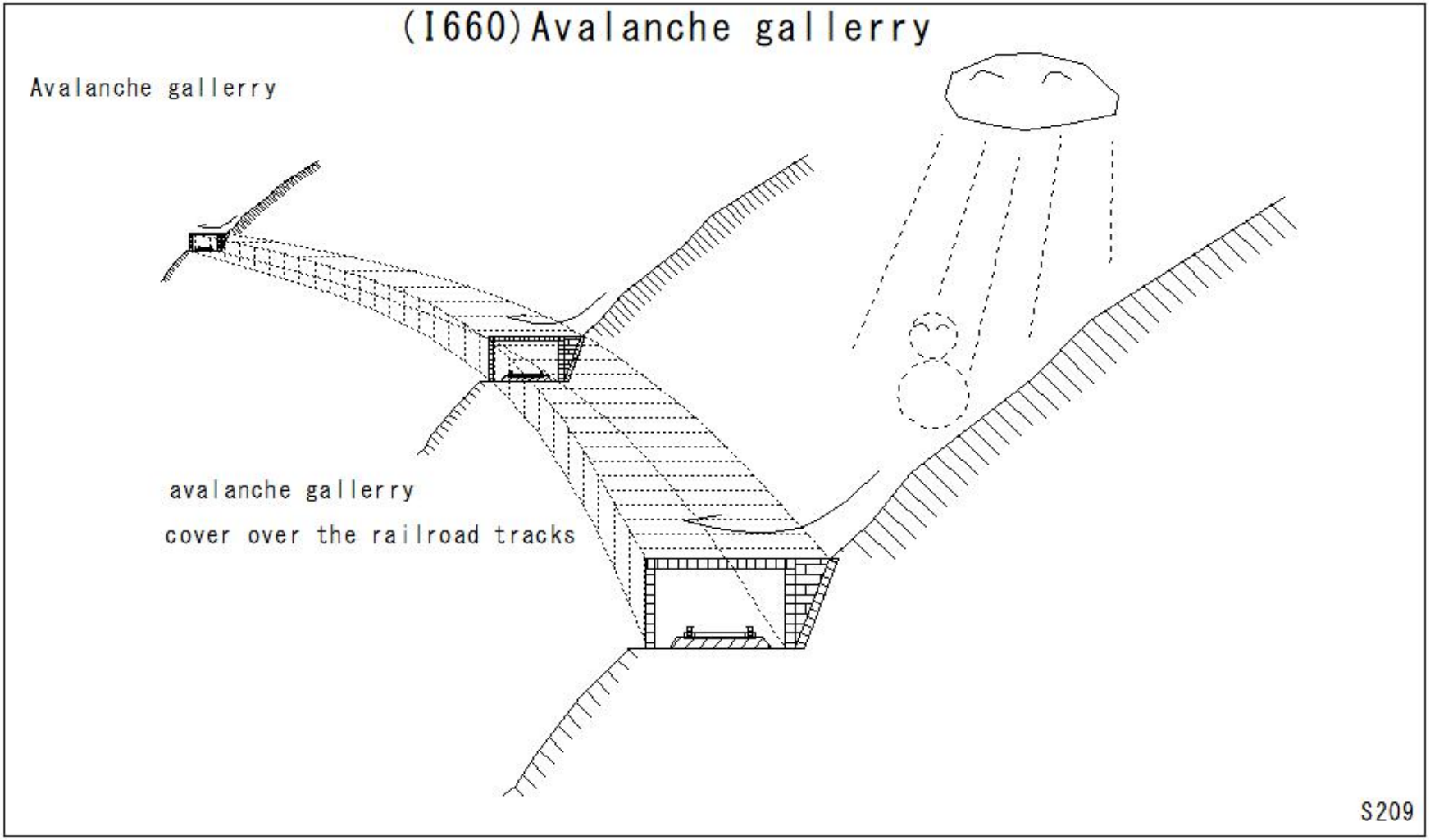
・Impermeable wall installed inside the embankment body

○Slanted Impermeable type

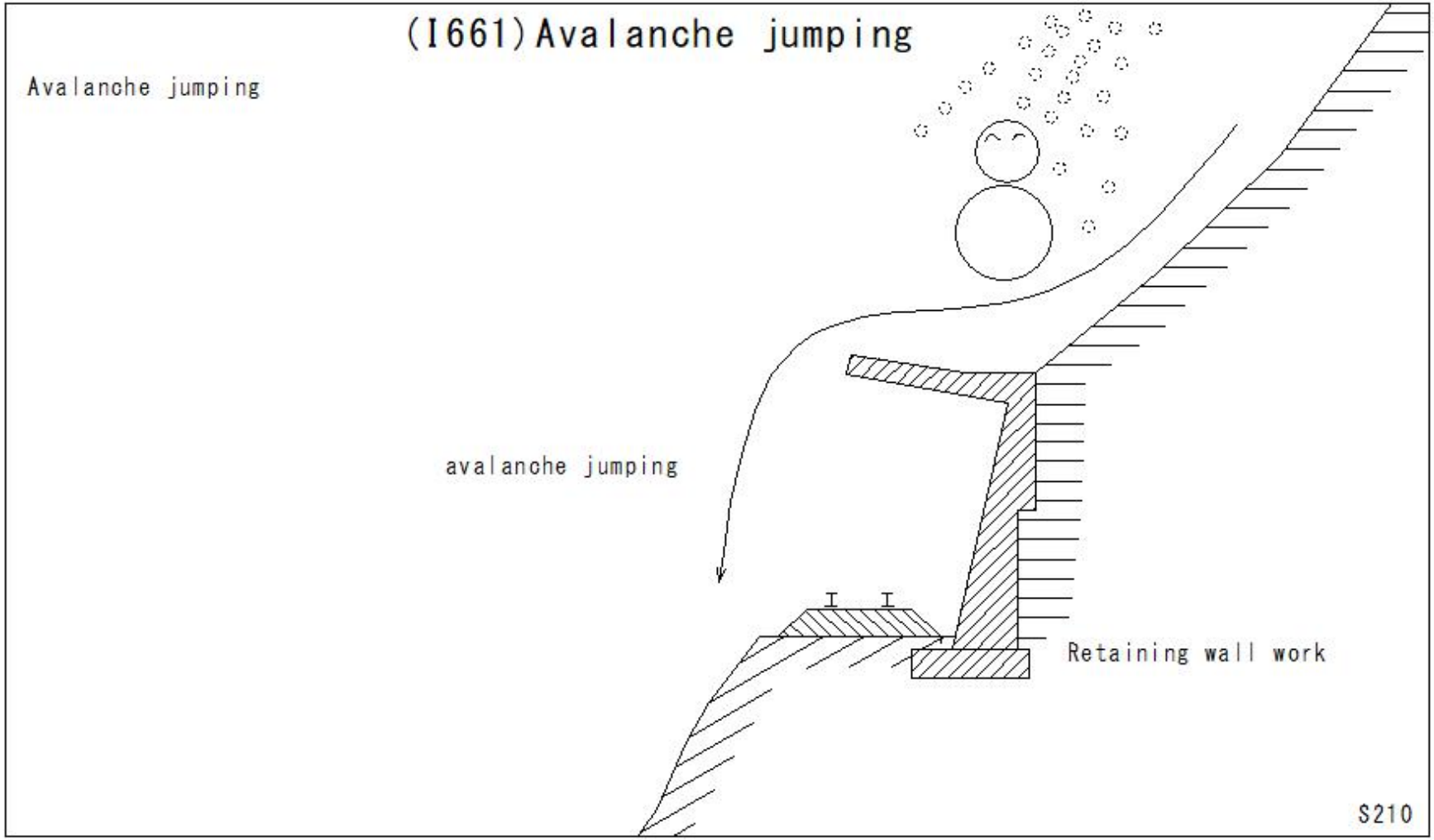


D230

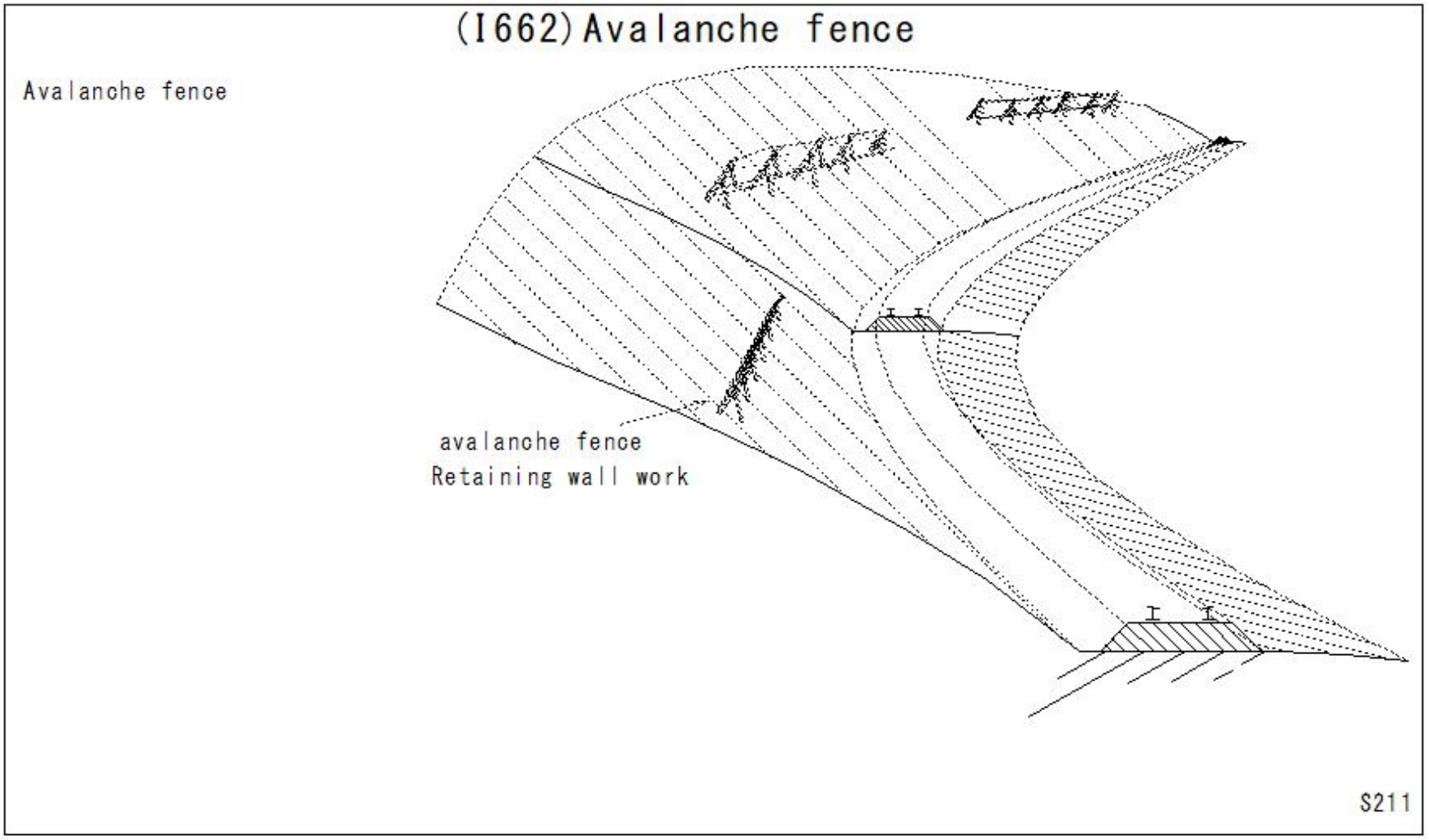
(I660)Avalanche gallerry



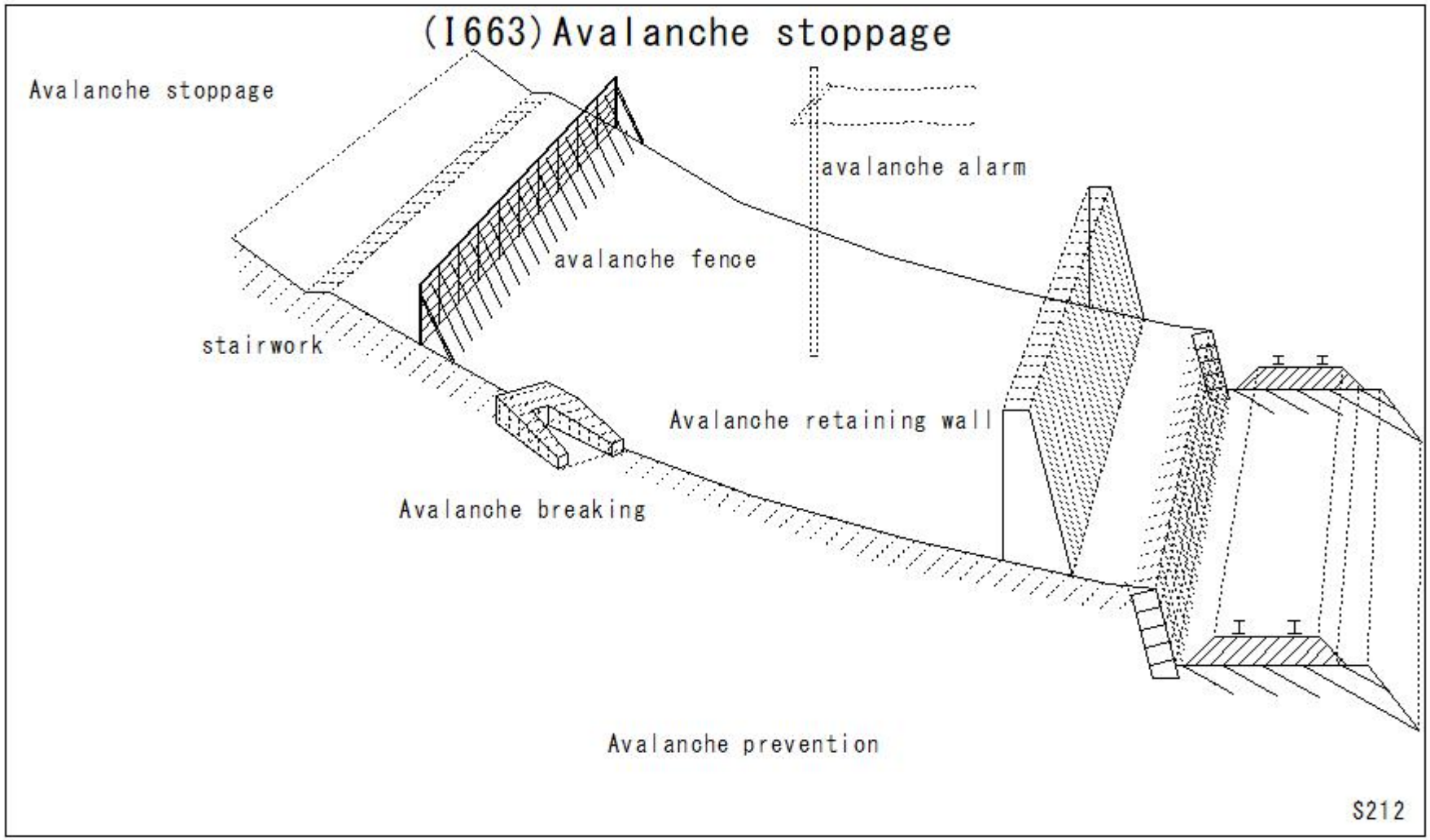
(I661)Avalanche jumping



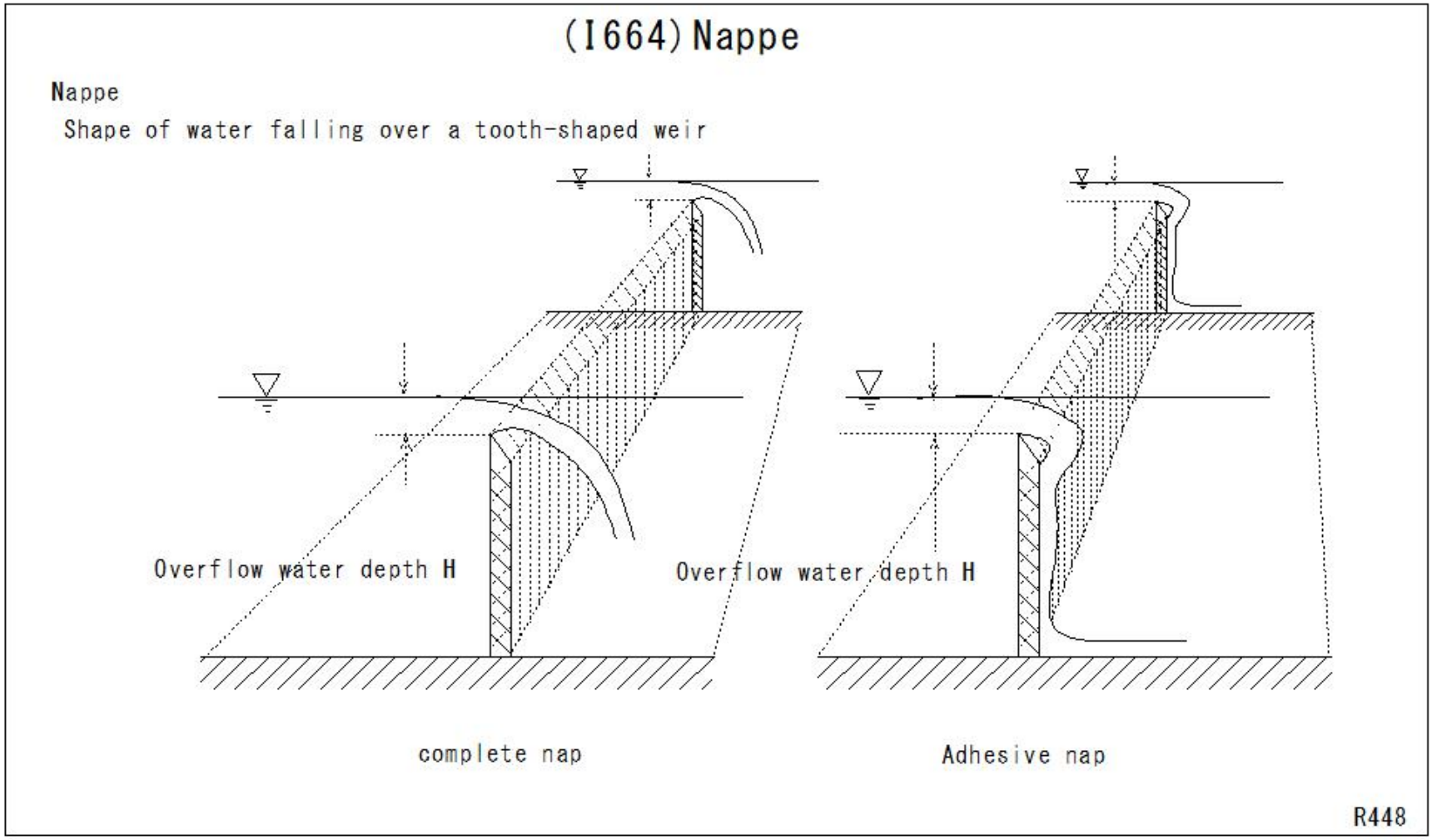
(I662)Avalanche fence



(I663)Avalanche stoppage



(I664)Nappe

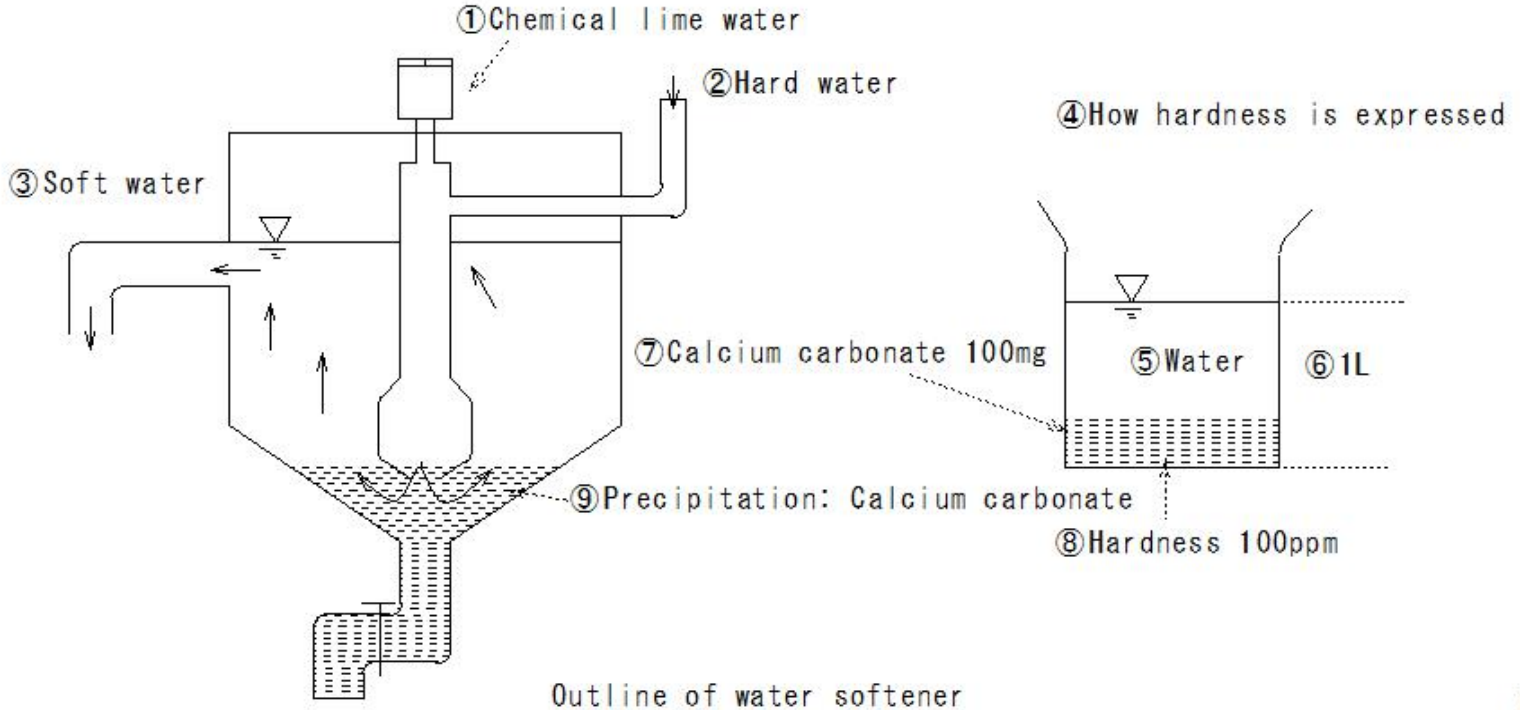

(I664) Nappe
Nappe
Shape of water falling over a tooth-shaped weir
Overflow water depth H
Overflow water depth H
complete nap
Adhesive nap
R448

(I665)Water supply(Water softening)

(I665)Water supply(Water softening)

Water softening method

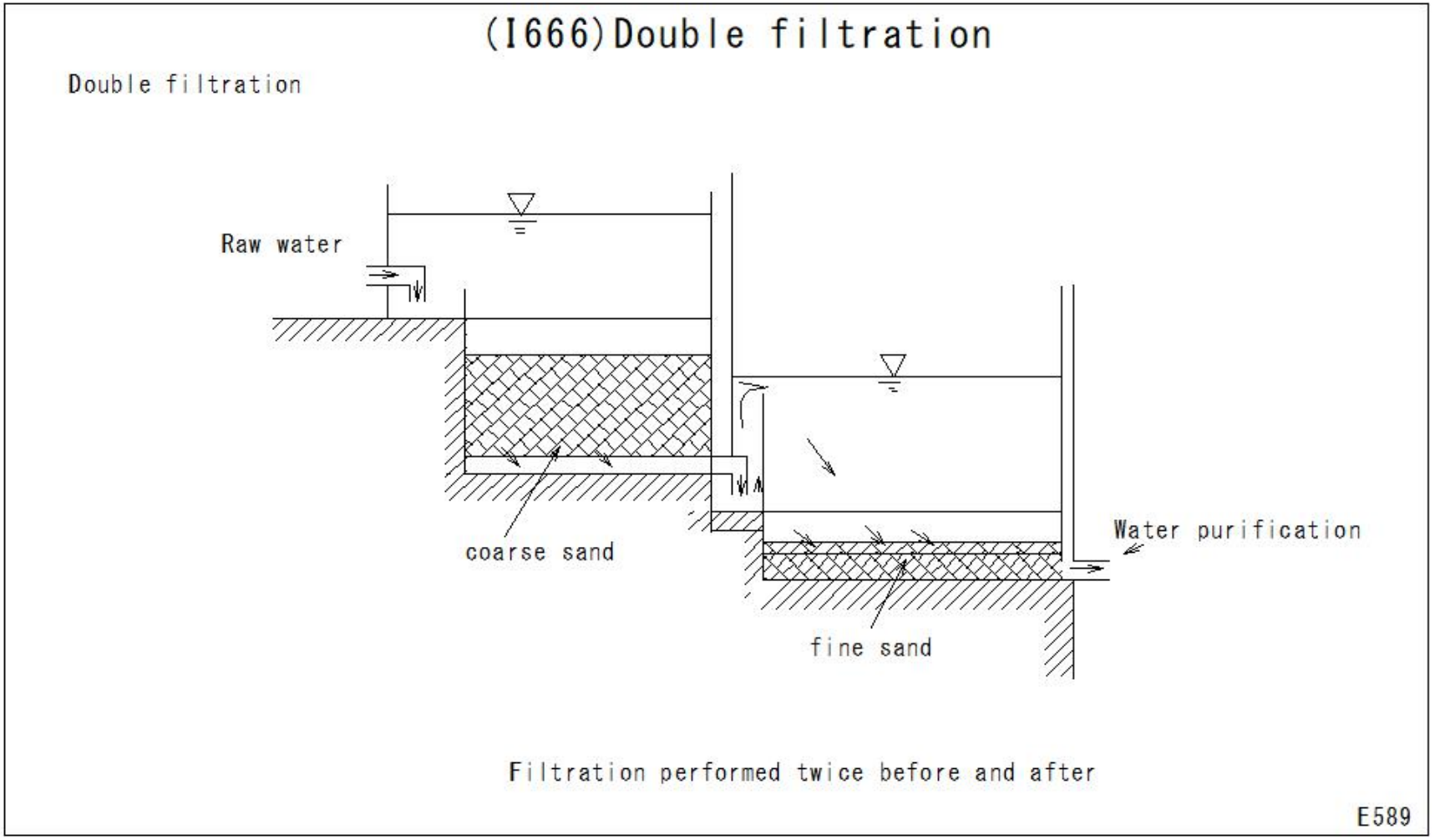
How to treat hard water to make it soft
Lowering water hardness
Soft water: calcium carbonate in water 100ppm or less



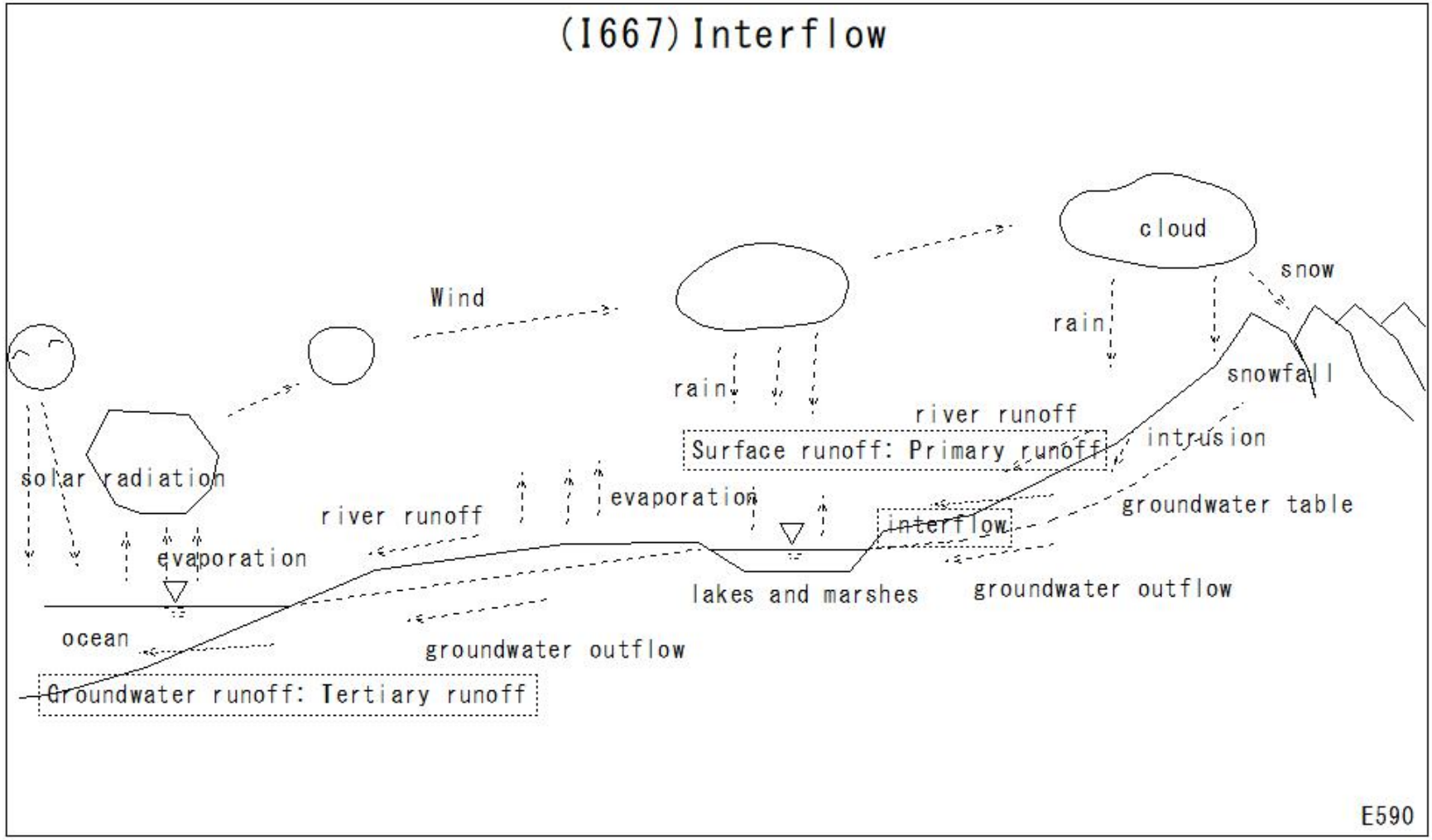
Outline of water softener

W204

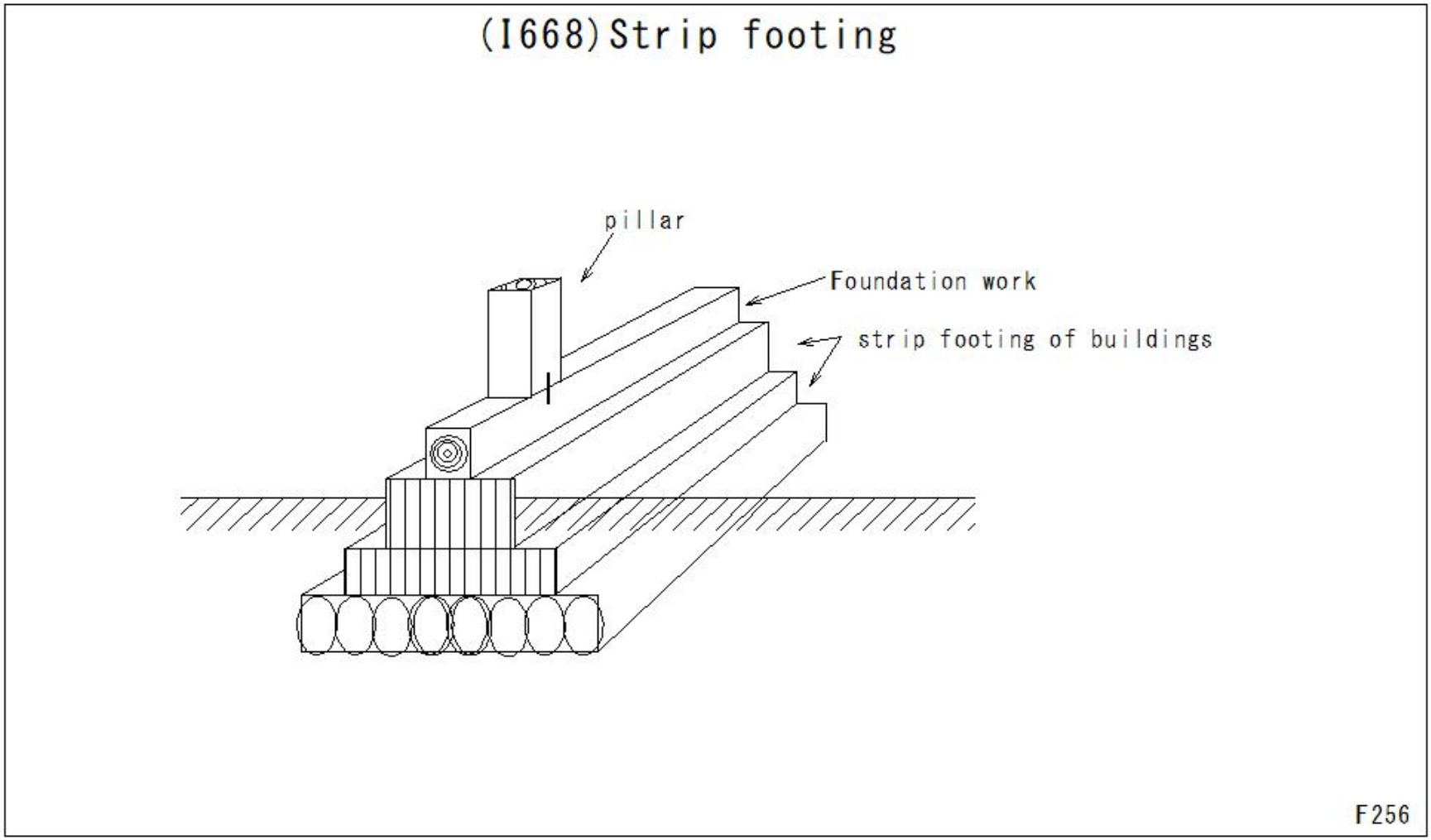
(I666)Double filtration



(I667)Interflow



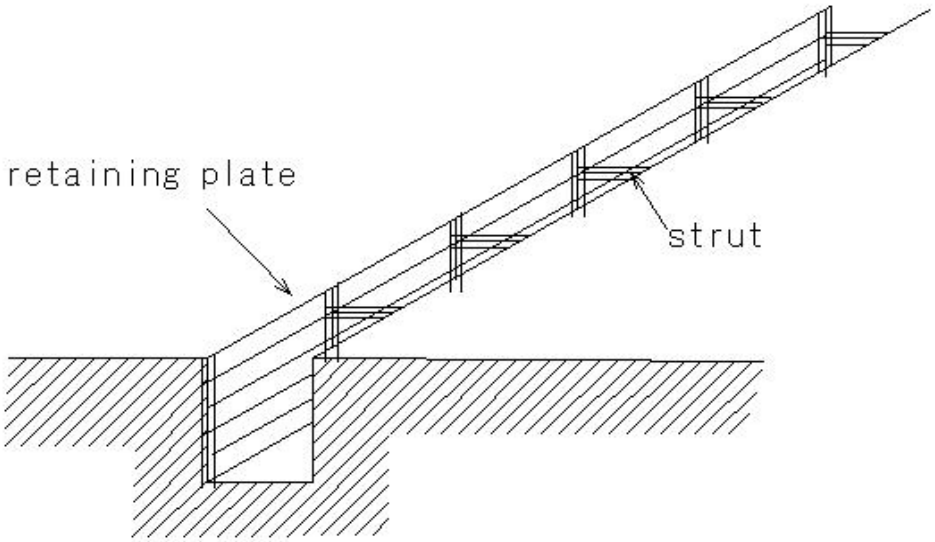
(I668)Strip footing



(I669)Trench excavation

(I669)Trench excavation

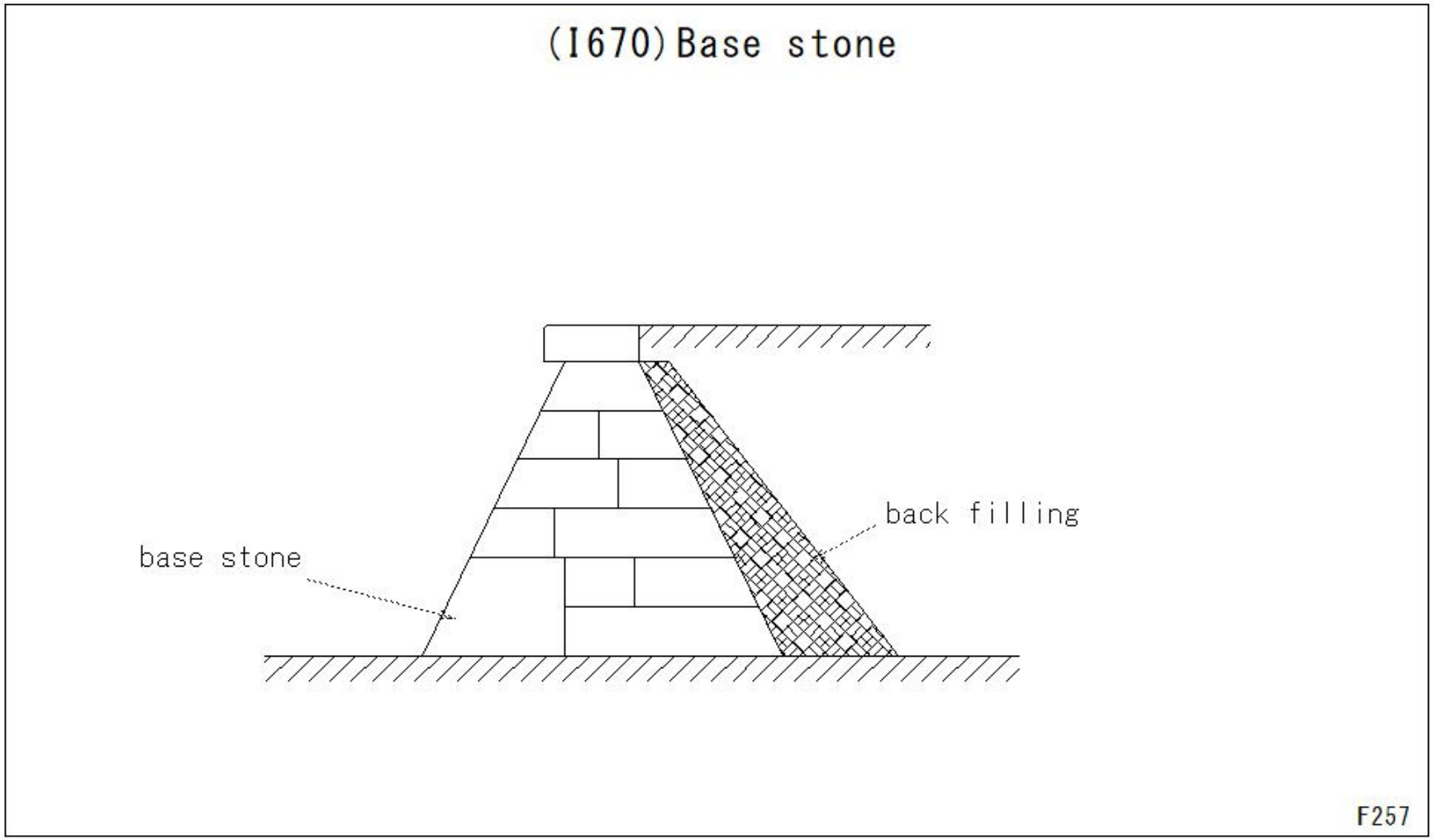
Trench excavation



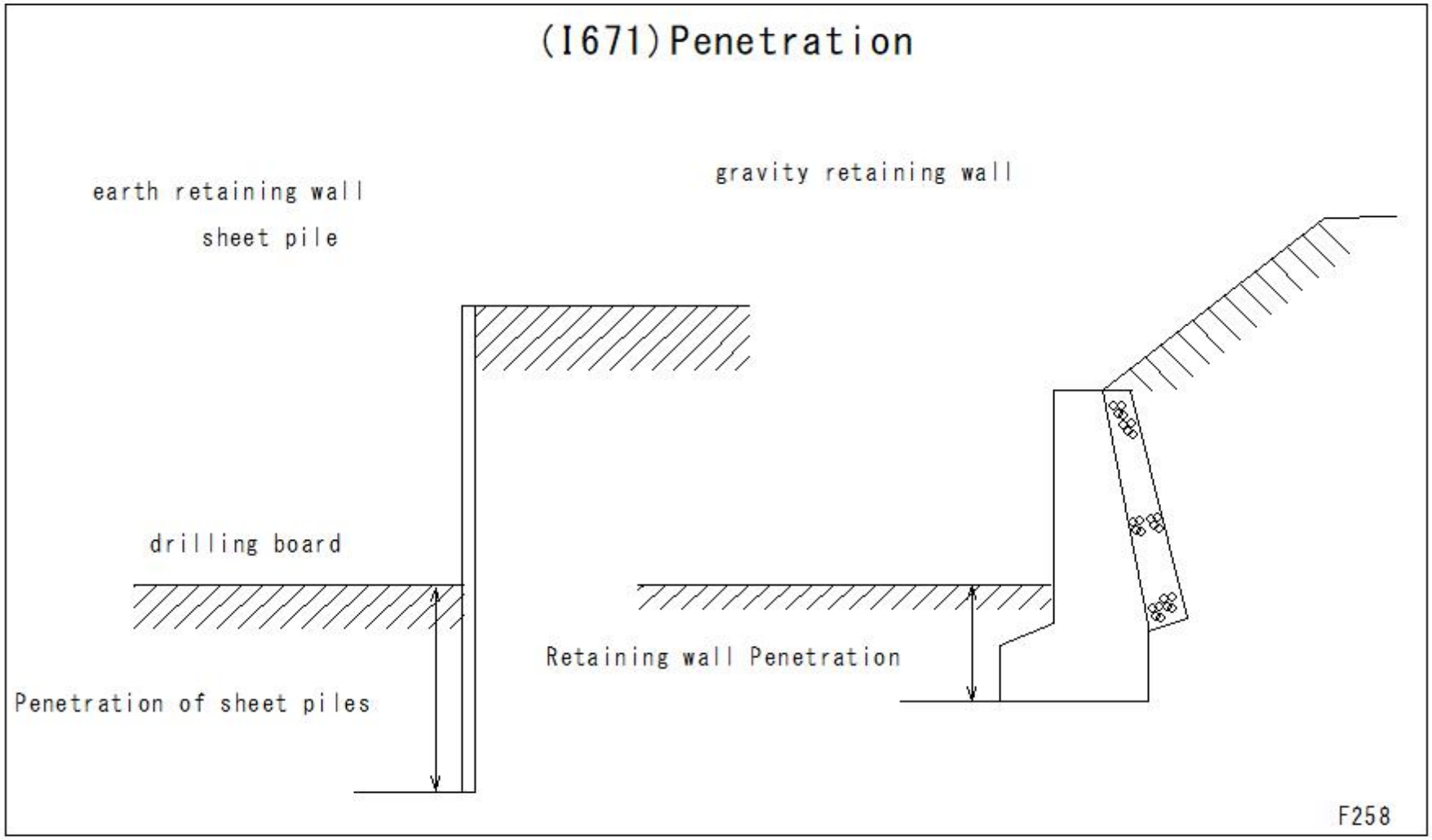
Excavation in the shape of an elongated groove

E591

(I670)Base stone



(I671)Penetration

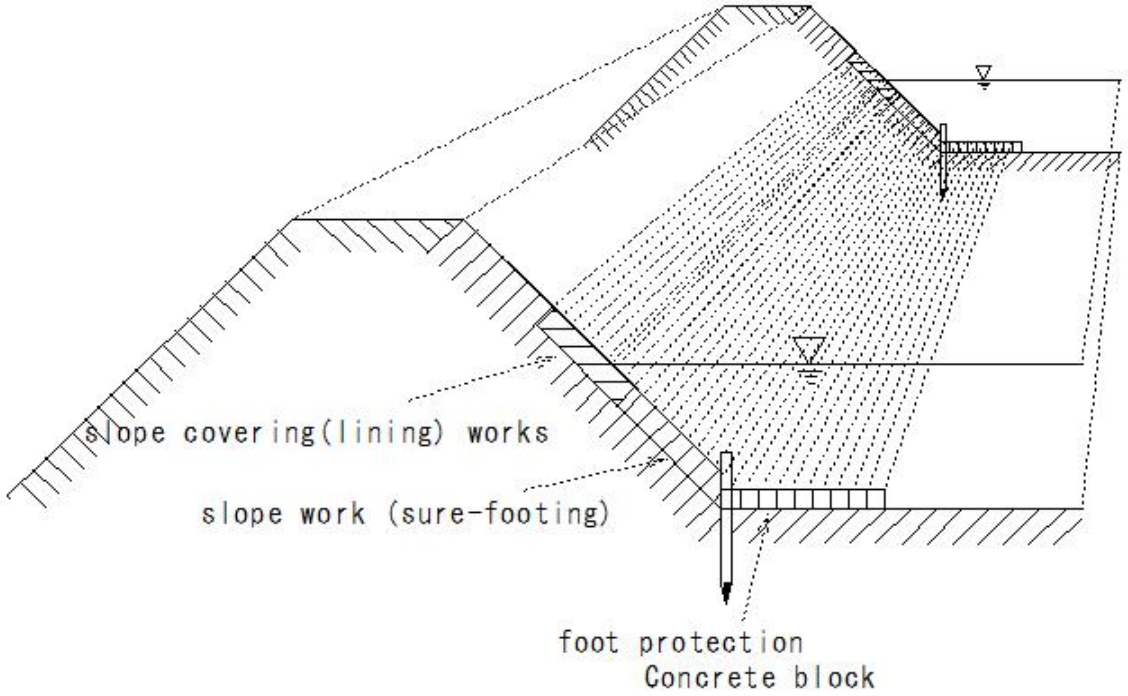


(I672)Foot protection

(I672)Foot protection

foot protection

The toe of slope in front of the bank protection
Prevent from being destroyed by scouring



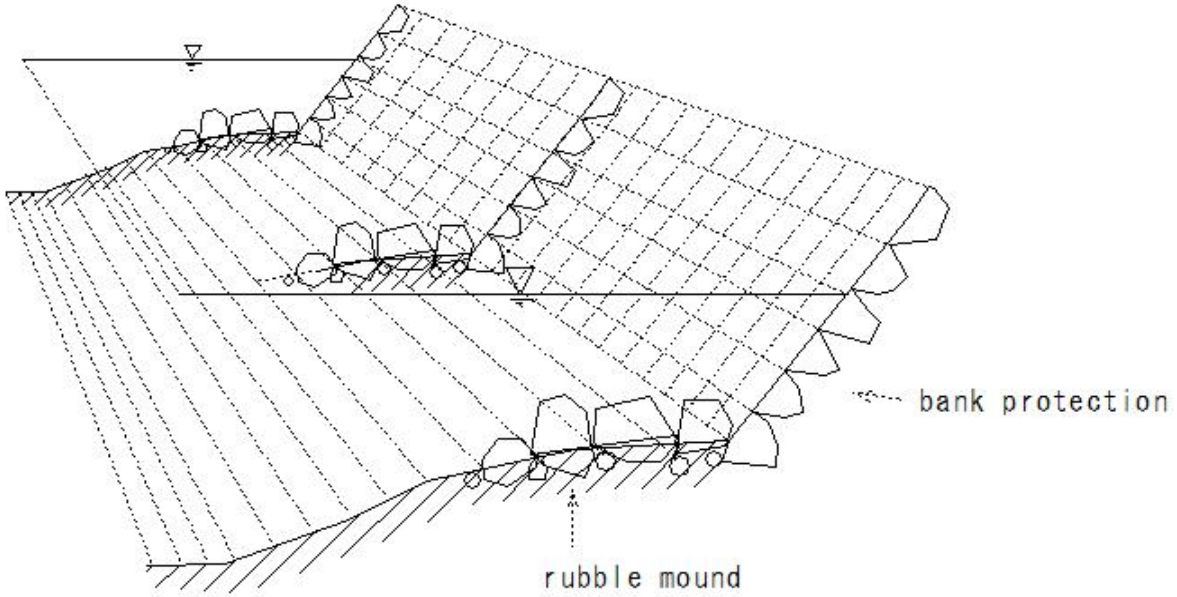
R450

(I673)Foot protection

(I673)Foot protection

Foot protection

Prevent bank protection- toe of slope from being destroyed by scouring



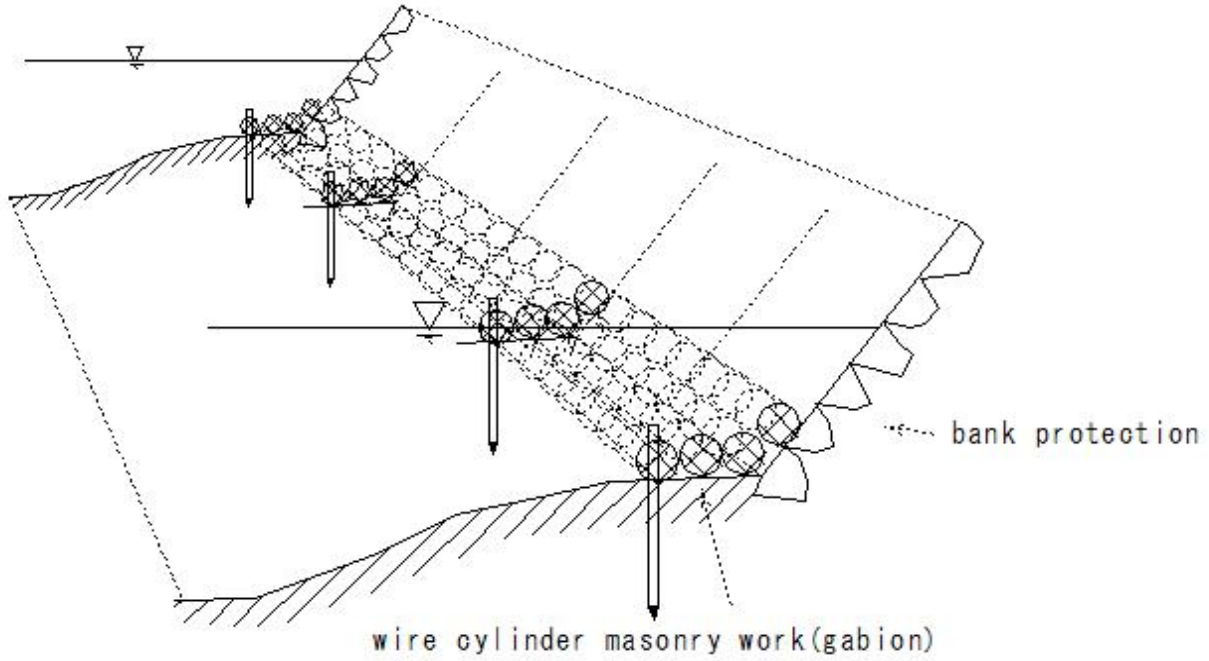
R451

(I674)Foot protection

(I674)Foot protection

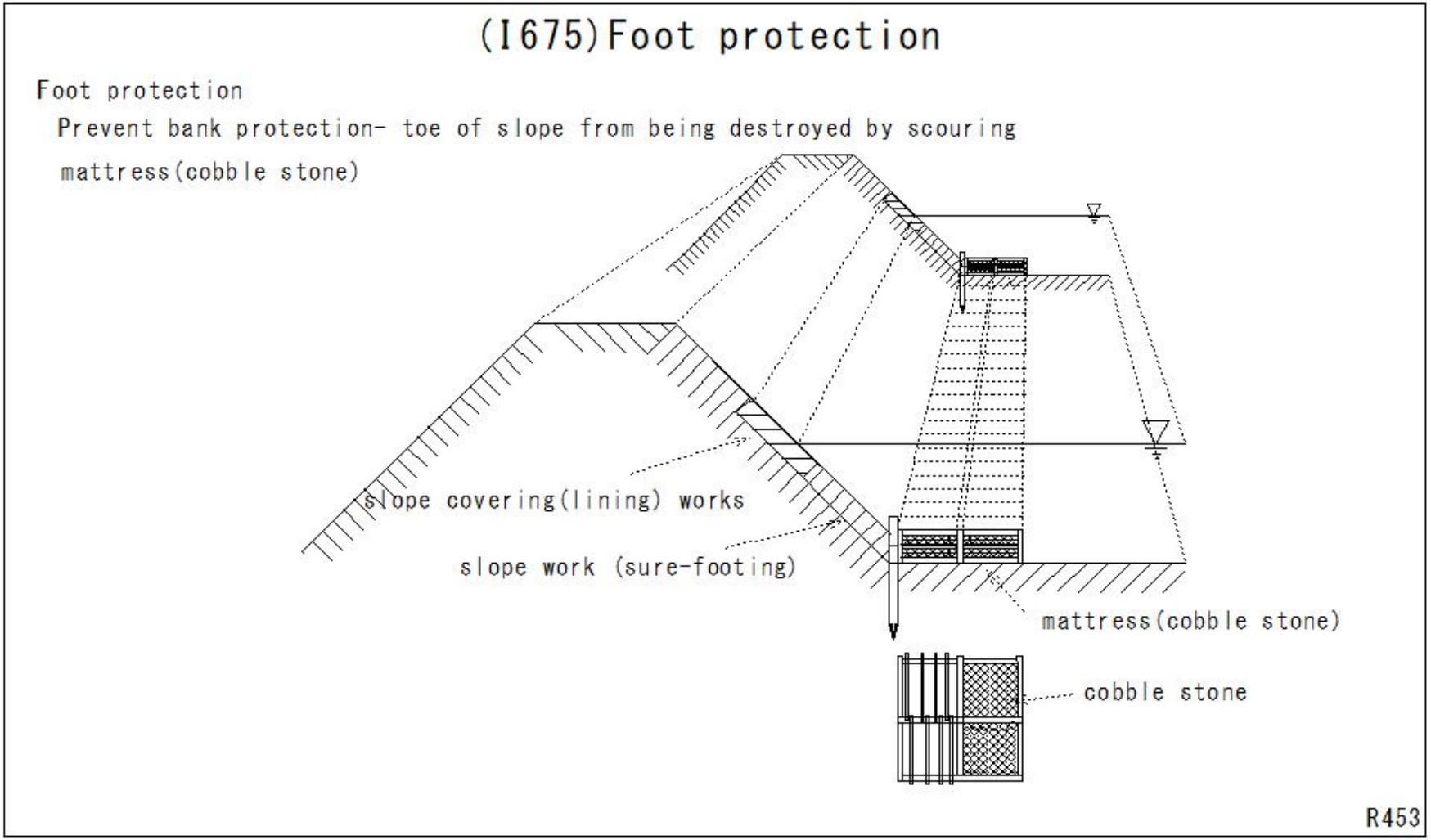
Foot protection

Prevent bank protection- toe of slope from being destroyed by scouring

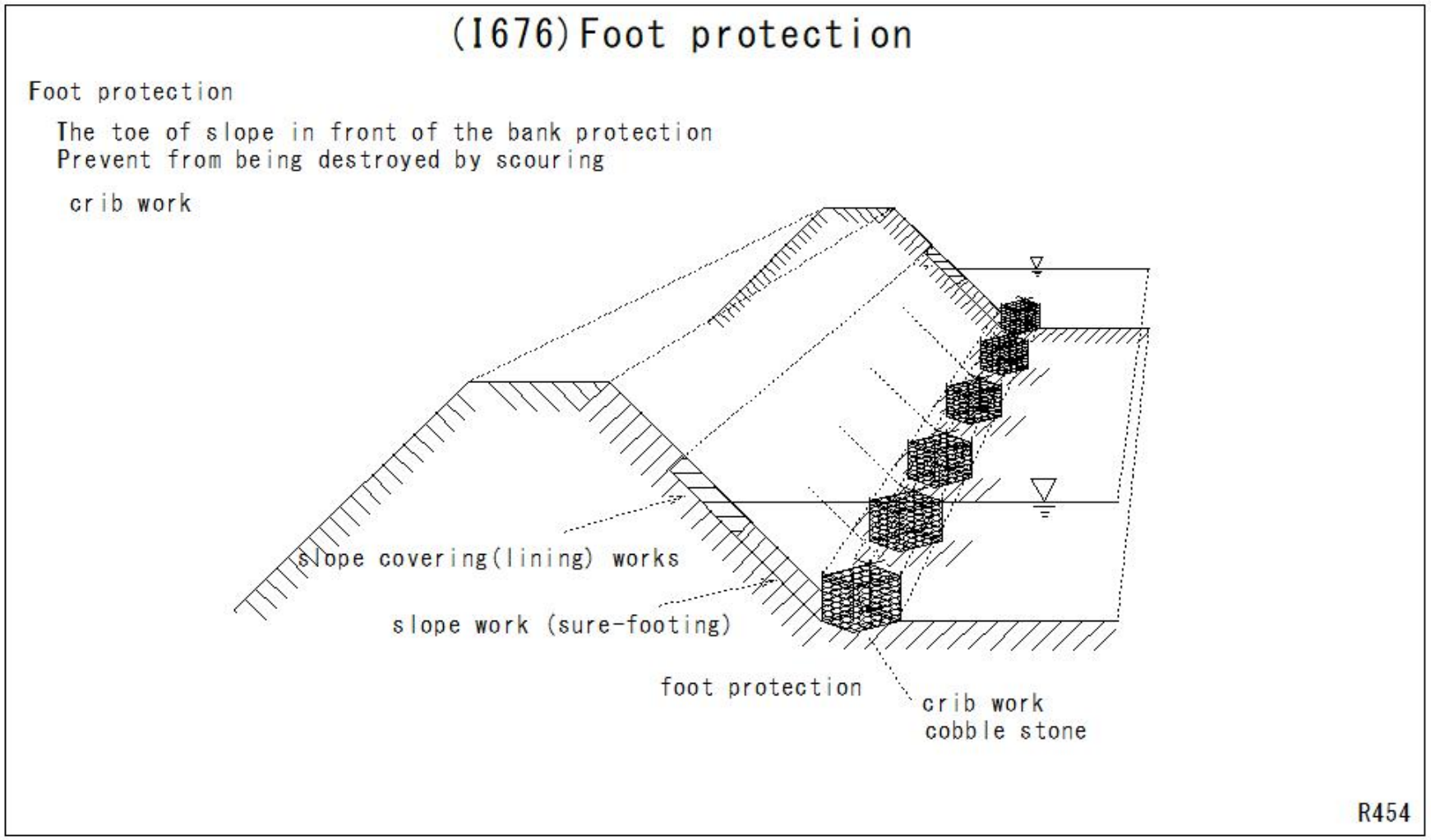


R452

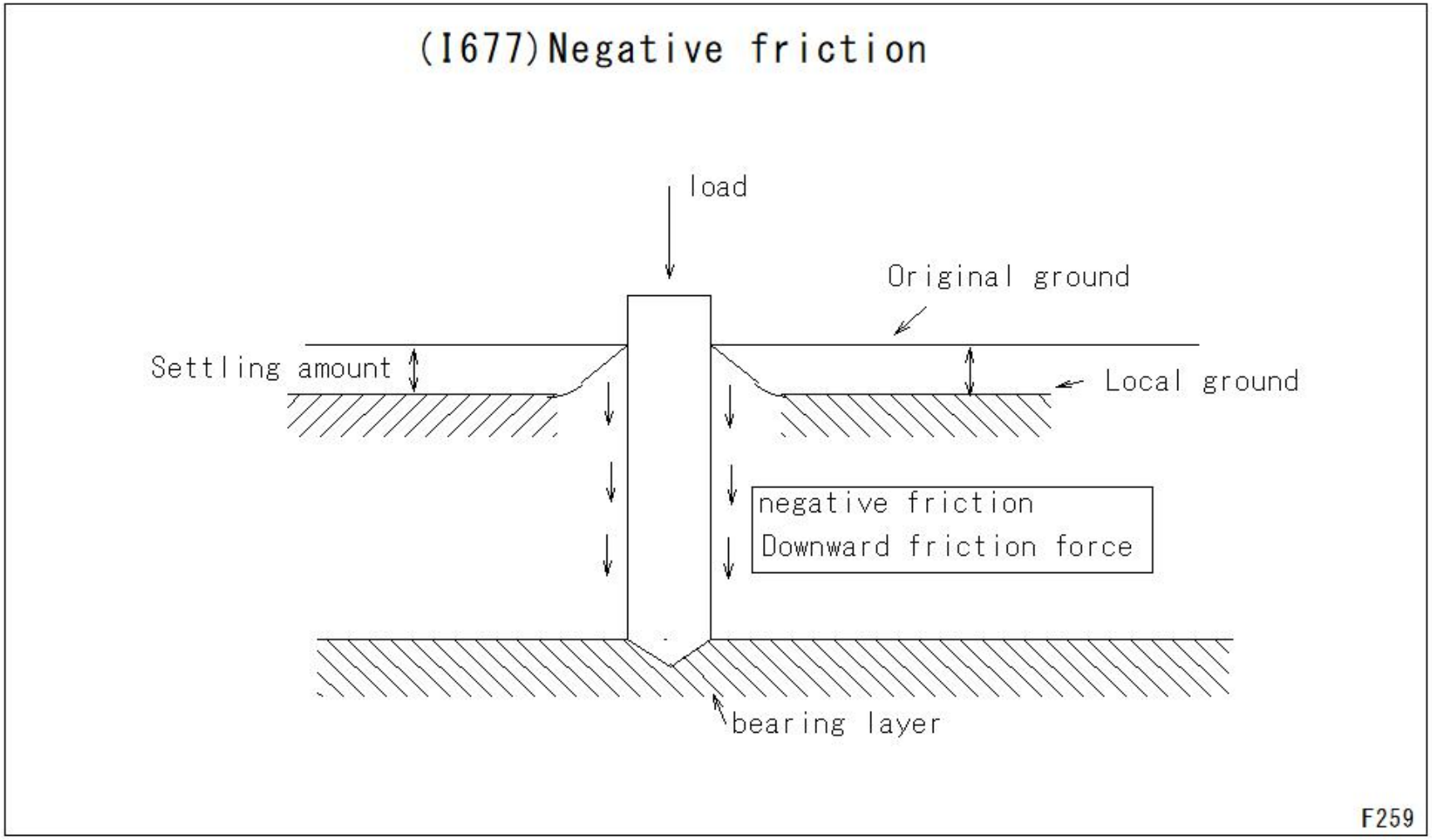
(I675)Foot protection



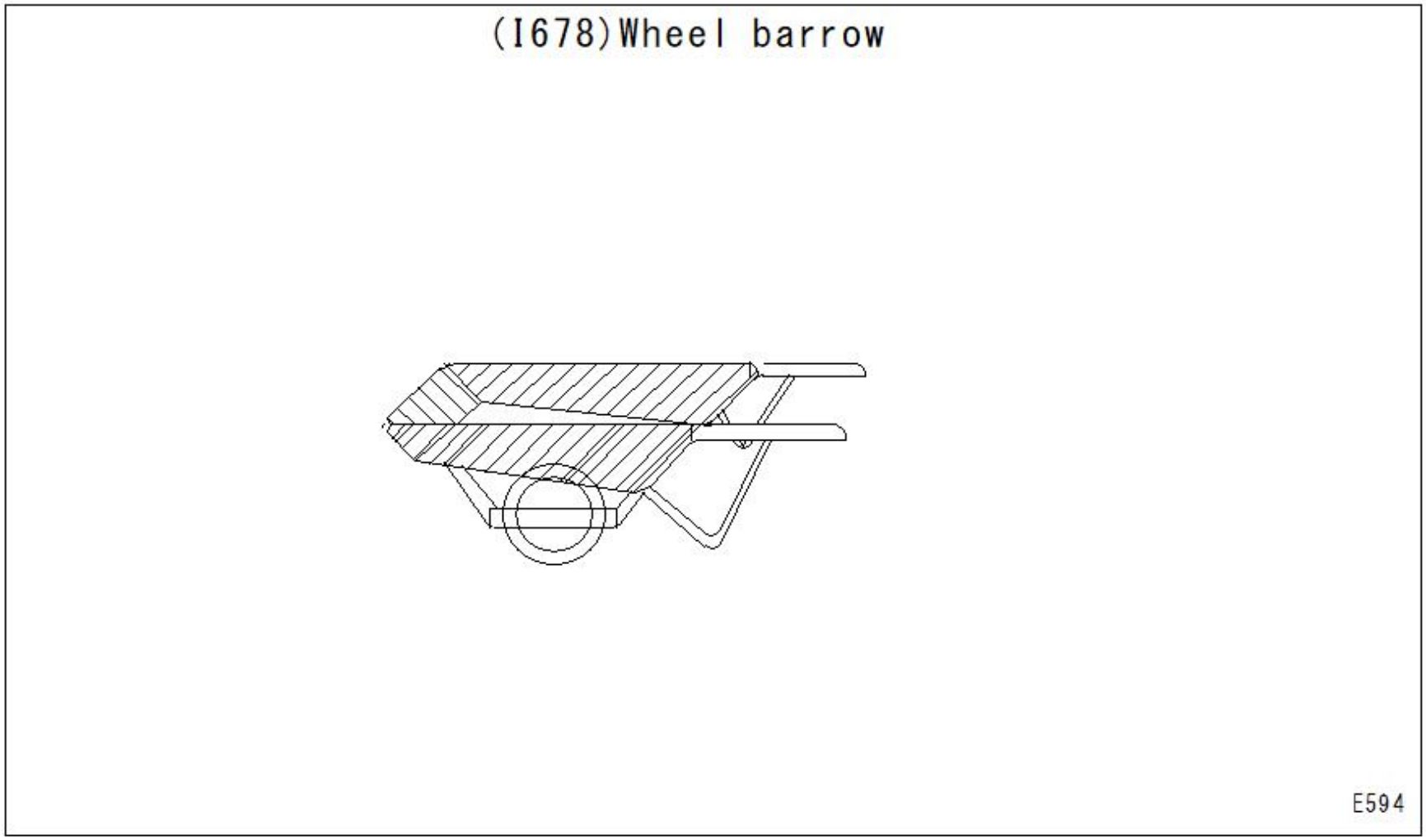
(I676)Foot protection



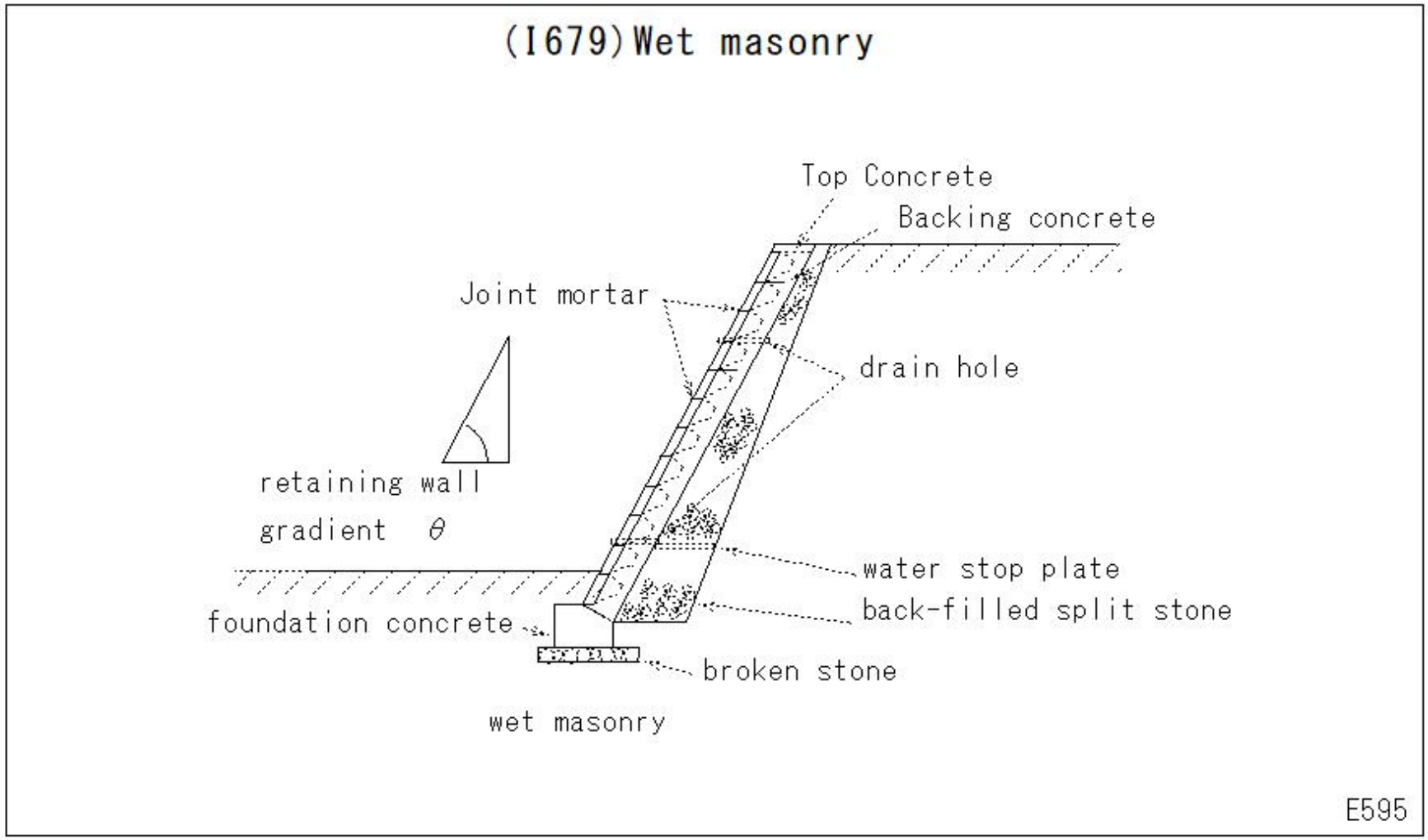
(I677)Negative friction



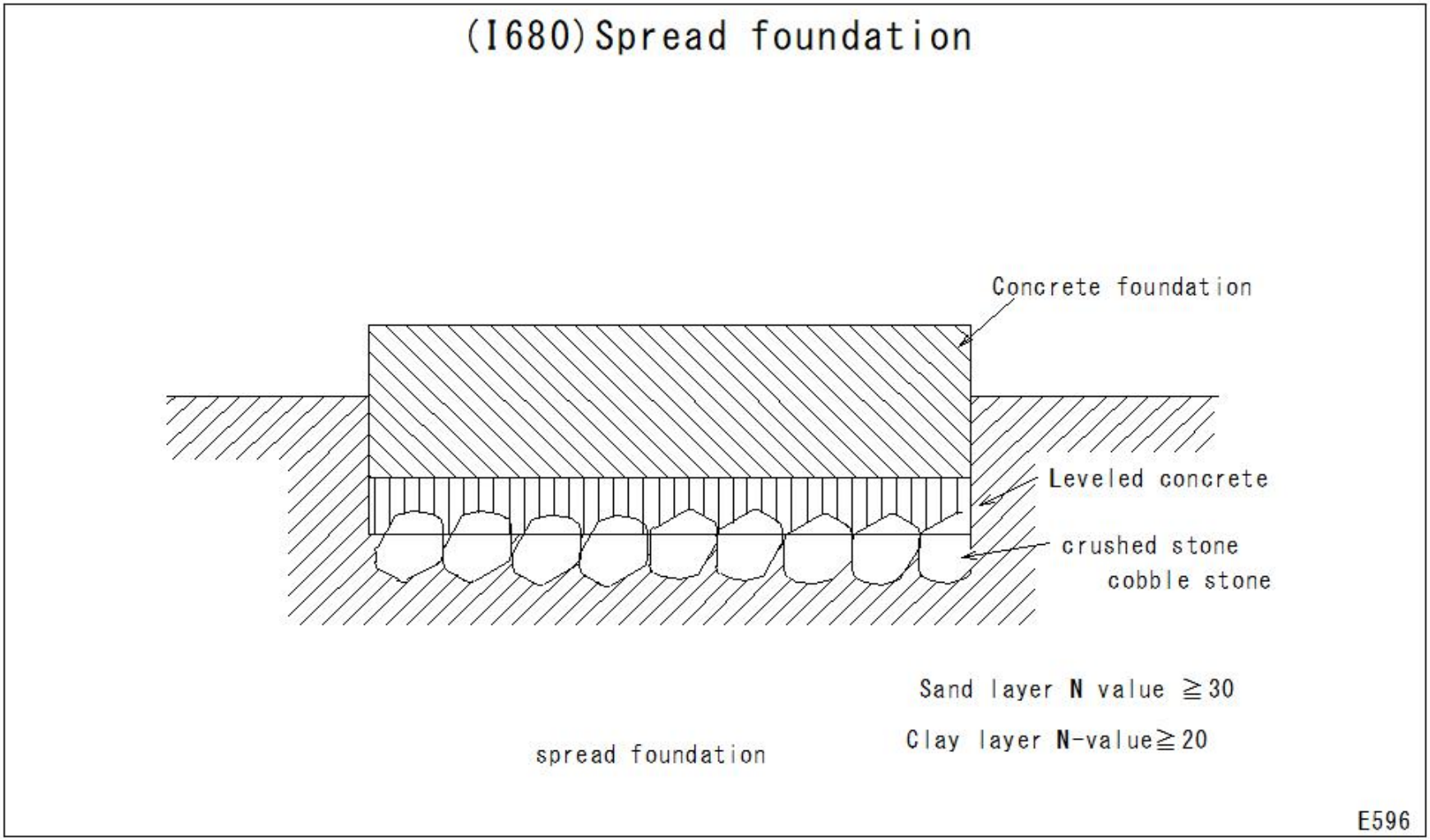
(I678)Wheel barrow



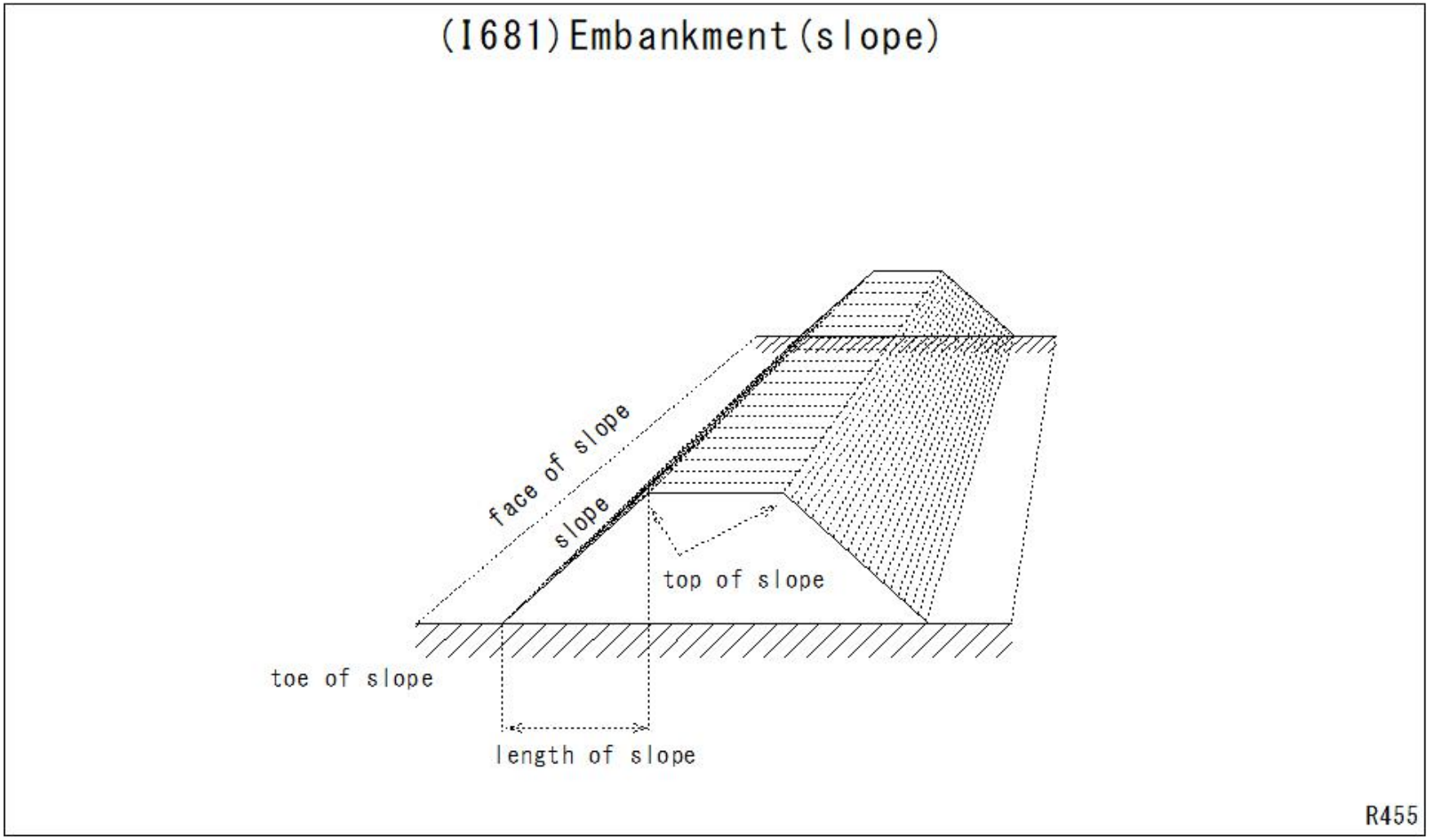
(I679)Wet masonry



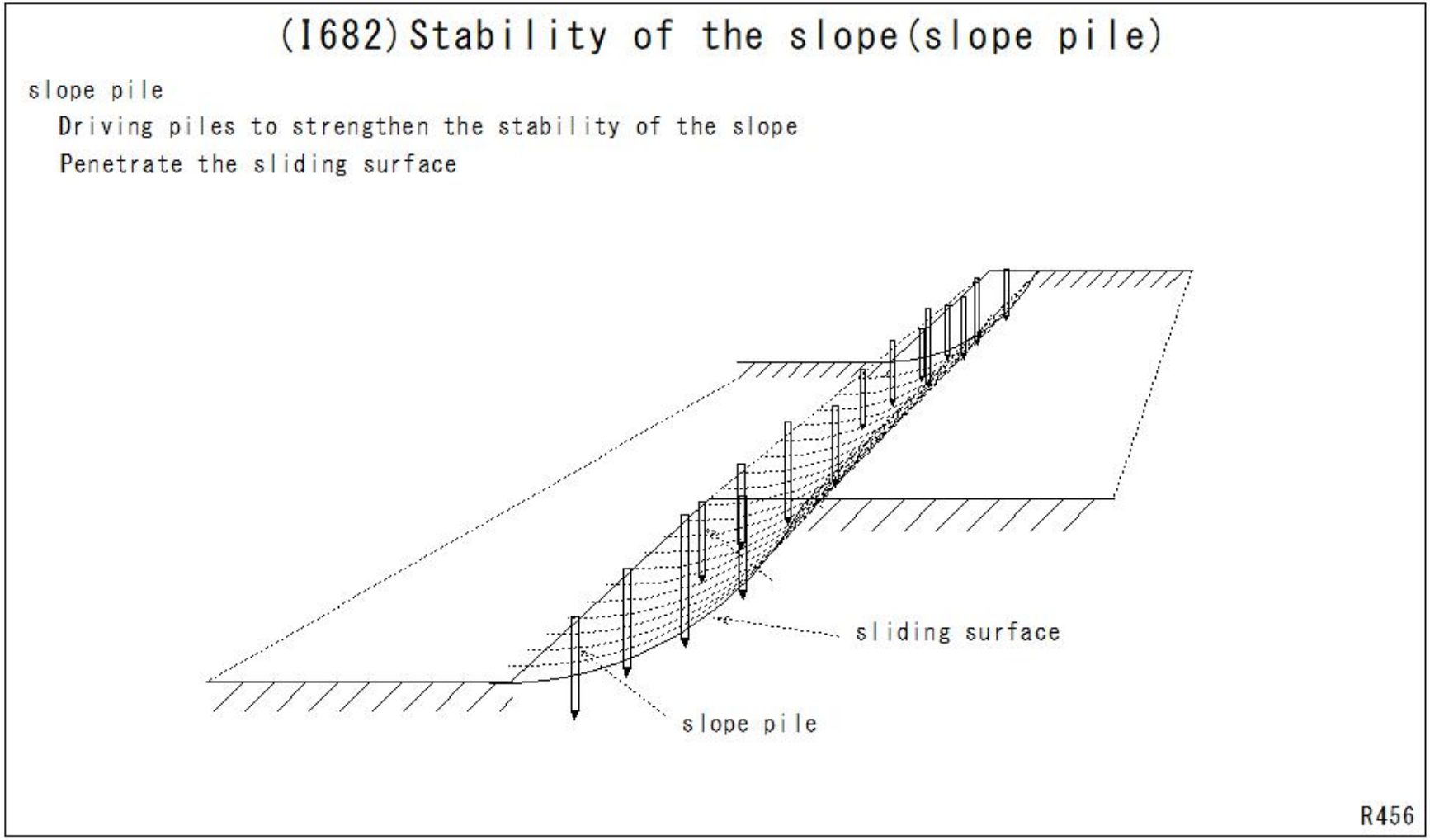
(I680)Spread foundation



(I681)Embankment(slope)



(I682)Stability of the slope(slope pile)

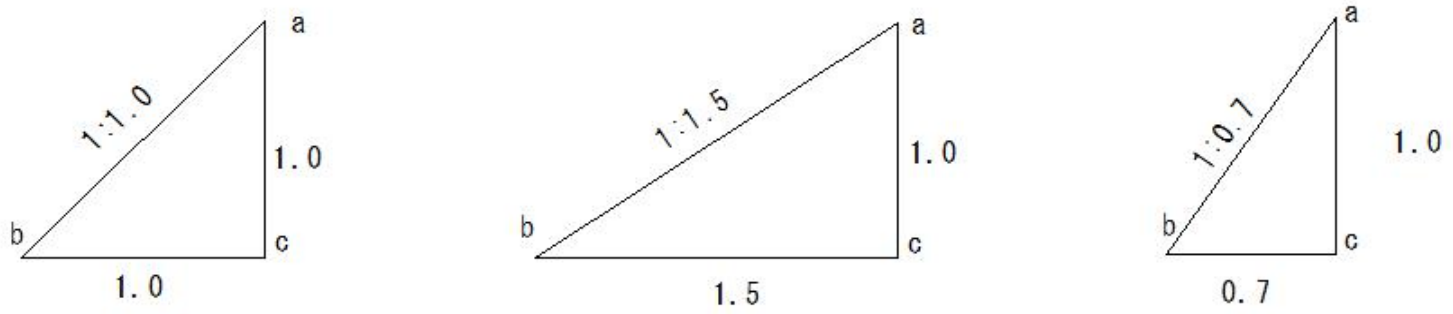


(I683)Embankment(slope gradient)

(I683)Embankment(slope gradient)

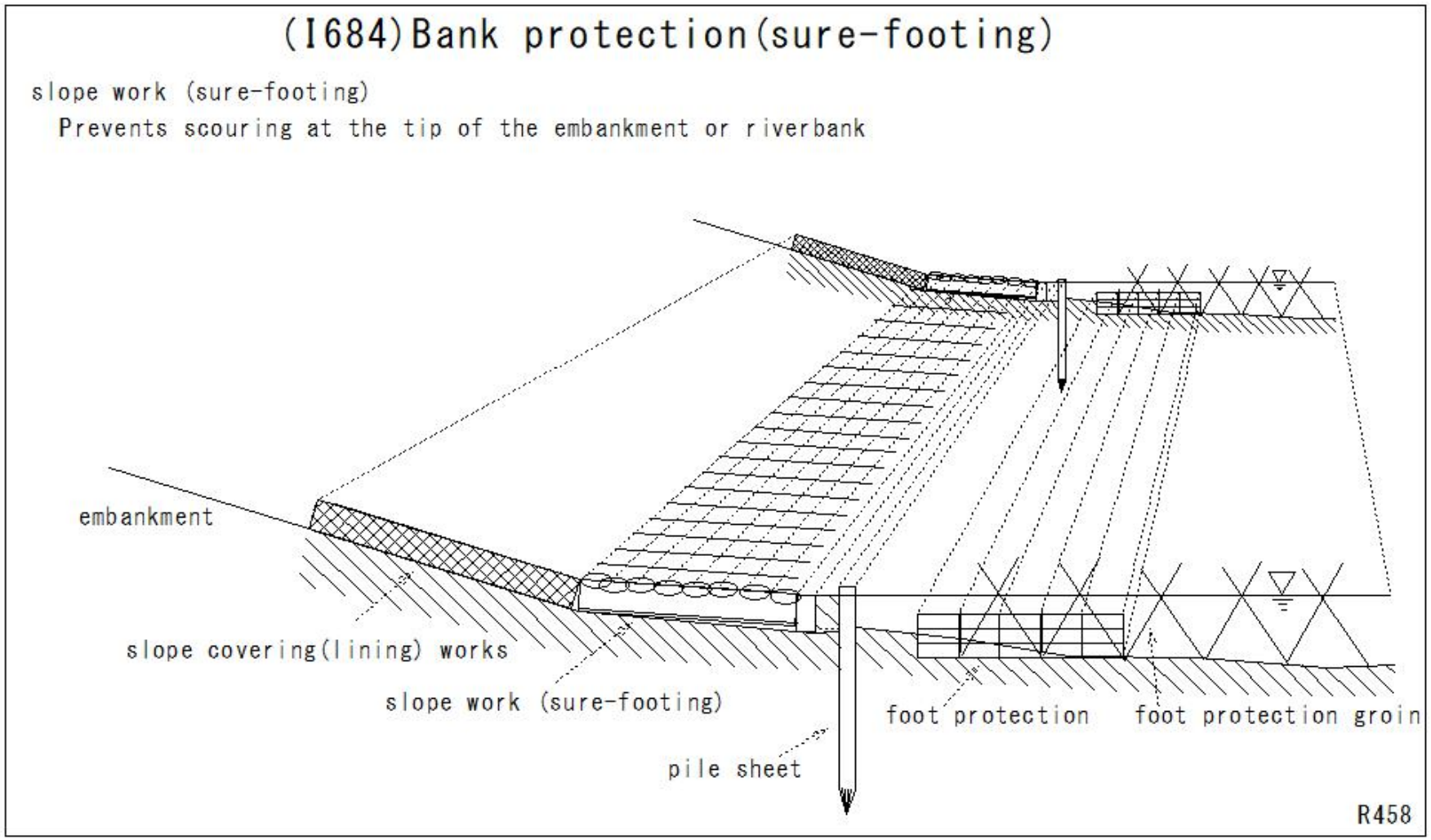
slope gradient (split)

Degree of inclination of the slope

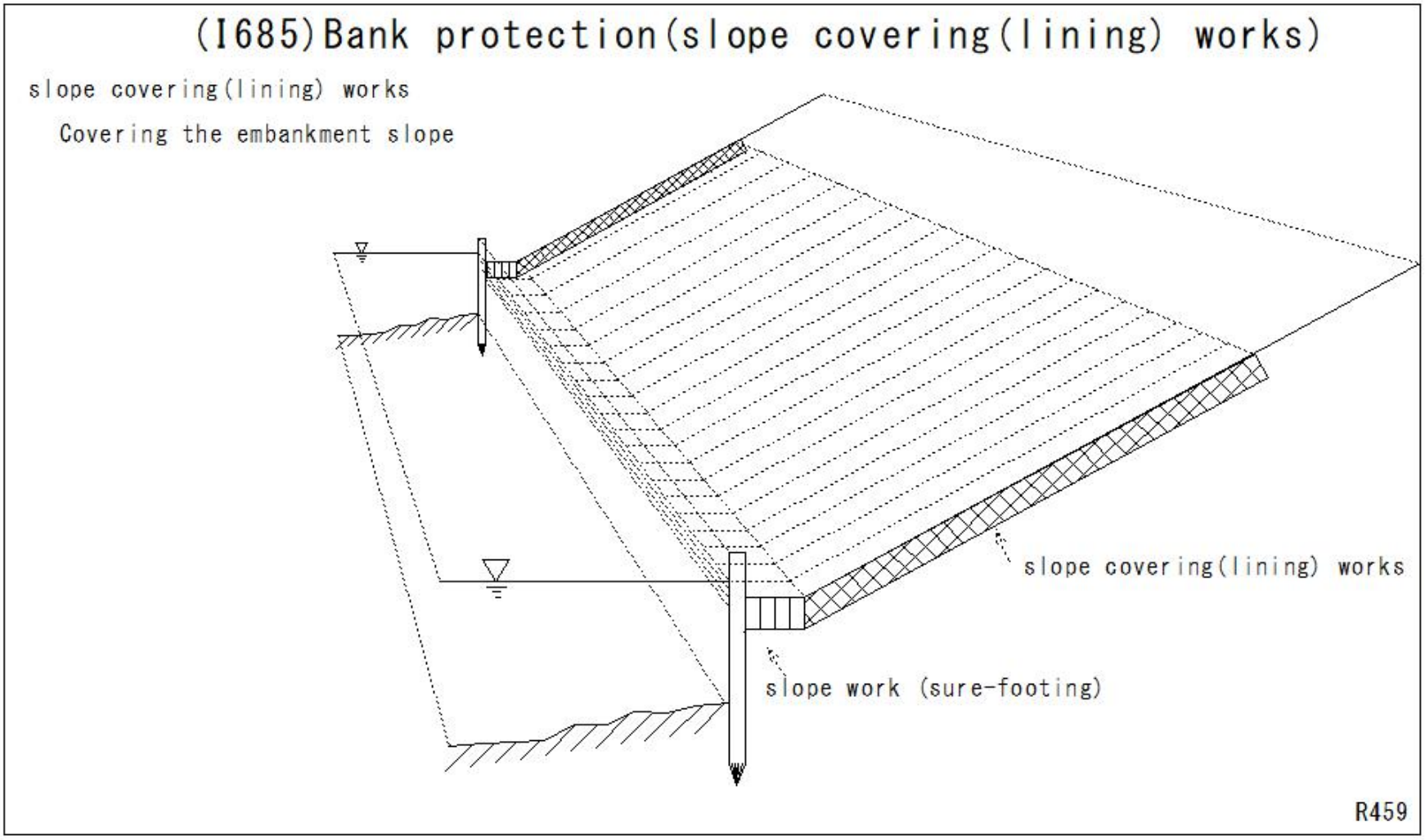


R457

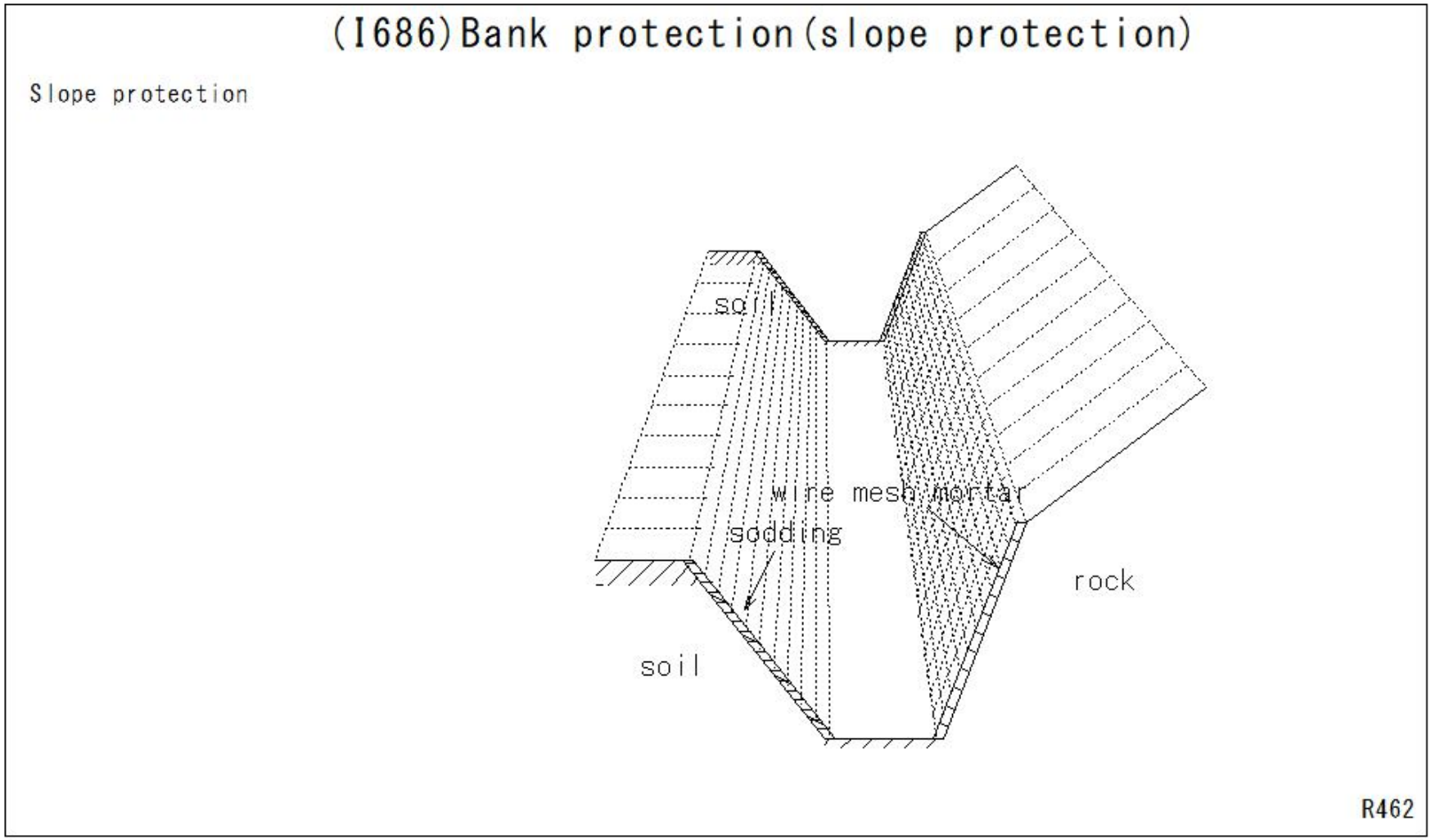
(I684)Bank protection(sure-footing)



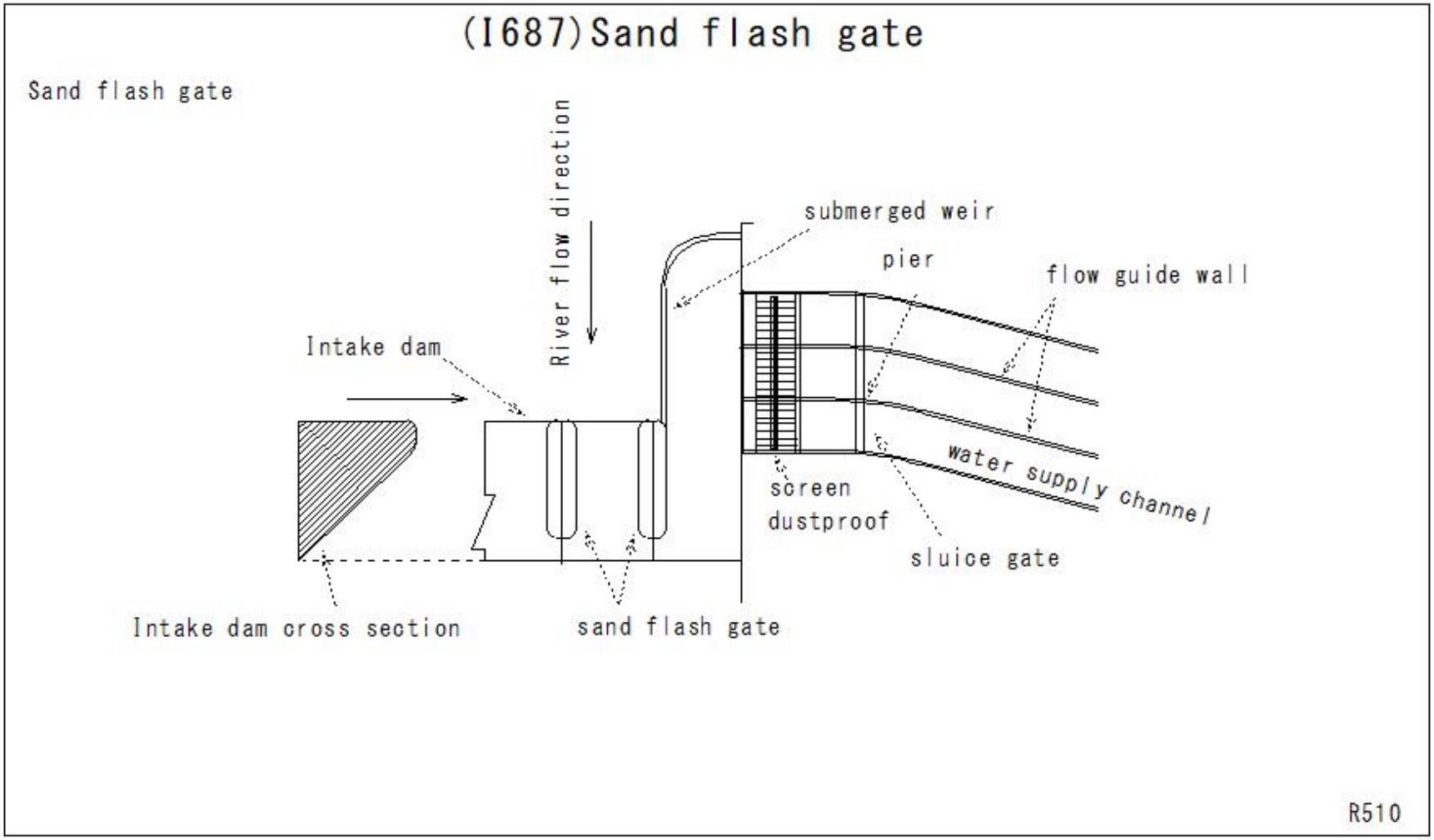
(I685)Bank protection(slope covering(lining) works)



(I686)Bank protection(slope protection)



(I687)Sand flash gate



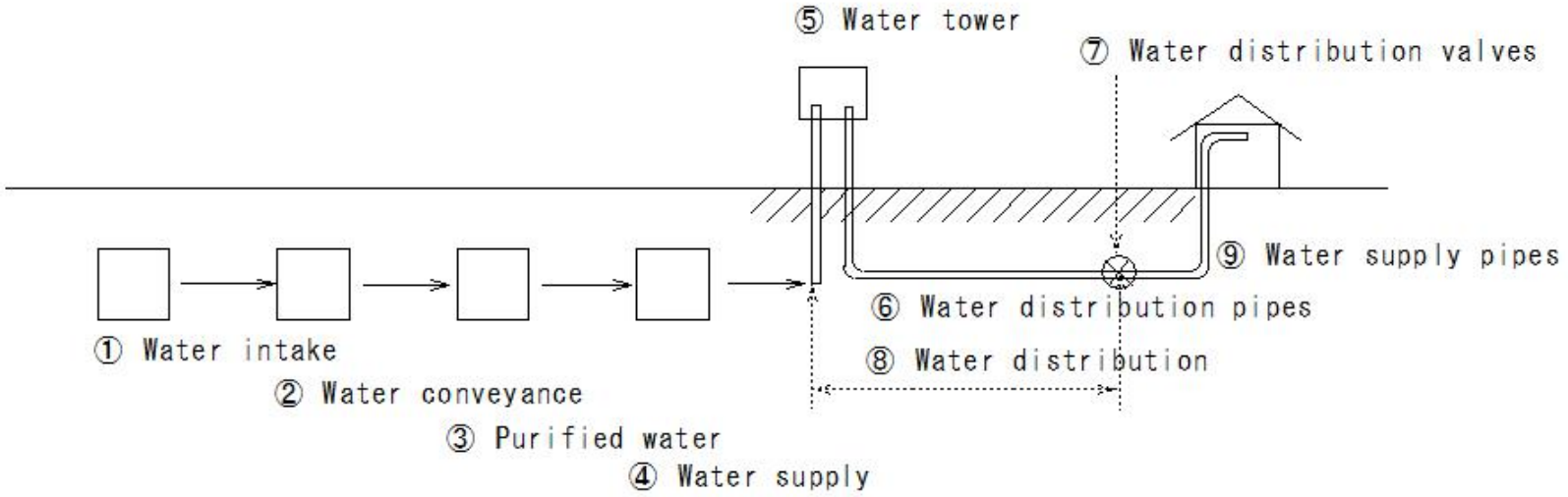
(I688)Water supply(Water Distribution)

(I688)Water supply(Water Distribution)

Water supply

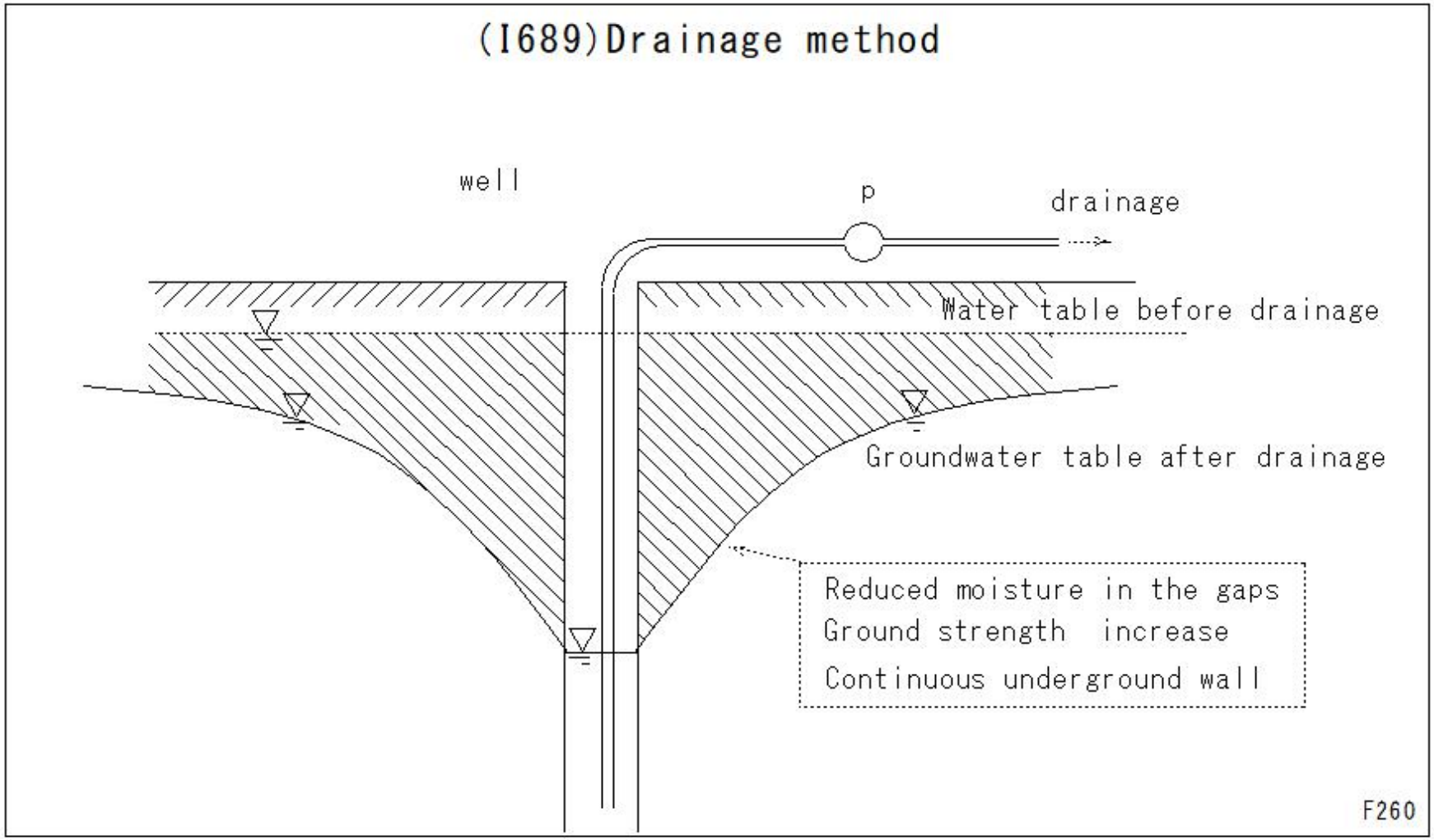
Water Distribution

Reservoirs and towers: Sending water from pump stations to distribution areas



W199
W5

(I689)Drainage method

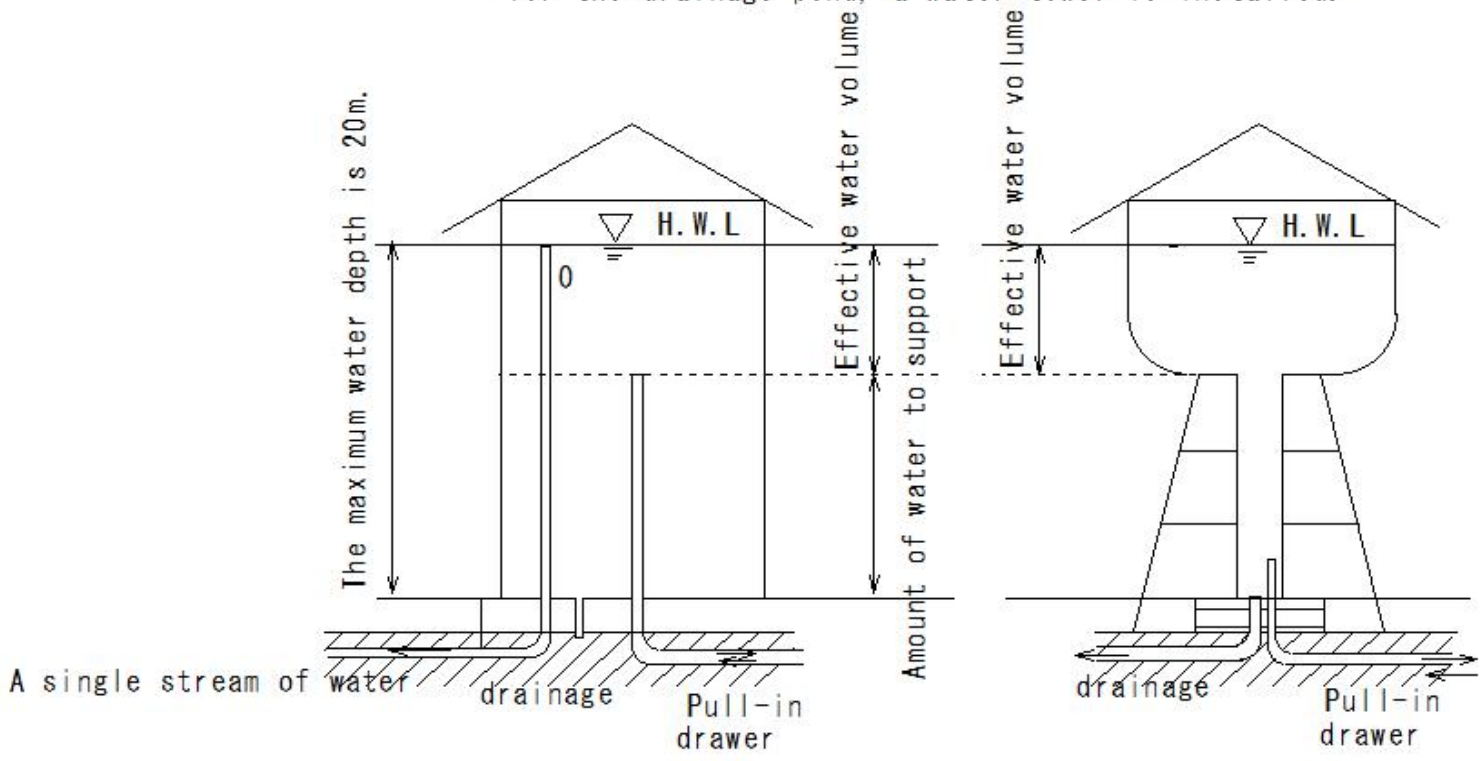


(I690)Water supply(water-tower)

(I690)Water supply(water-tower)

Water-tower

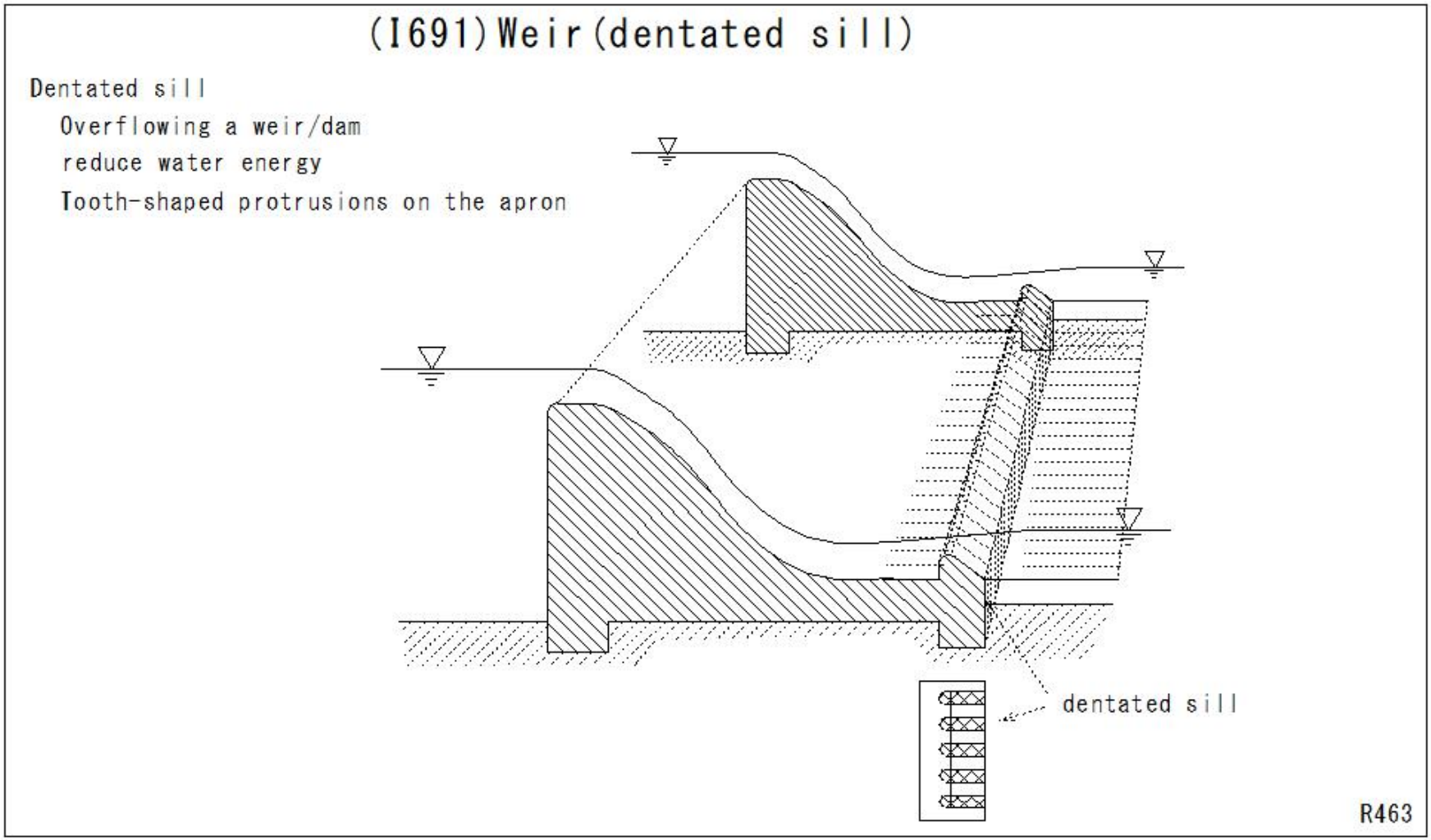
Near the water supply area - in case of a suitable elevation cannot be obtained for the drainage pond, a water tower is installed.



Elevated water tank

W198

(I691)Weir(dentated sill)



(I692)Weir(sharp crested weir)

(I692)Weir(sharp crested weir)

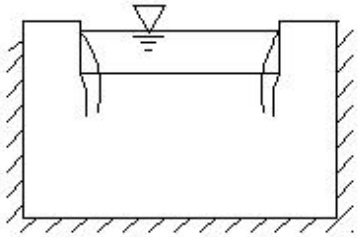
sharp crested weir

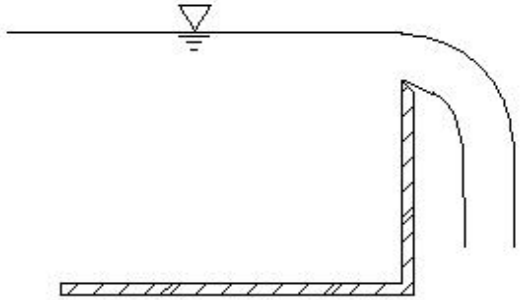
The overflow part is sharp.

blade shaped weir: Stable nap

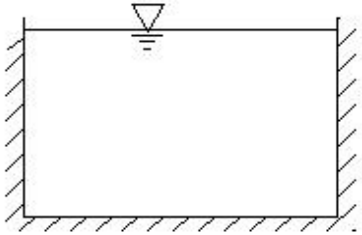
Easily measure overflow depth

Open channel flow measurement

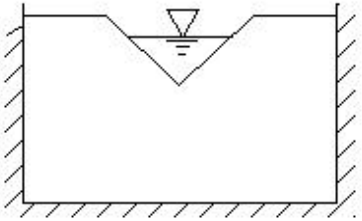




square cough



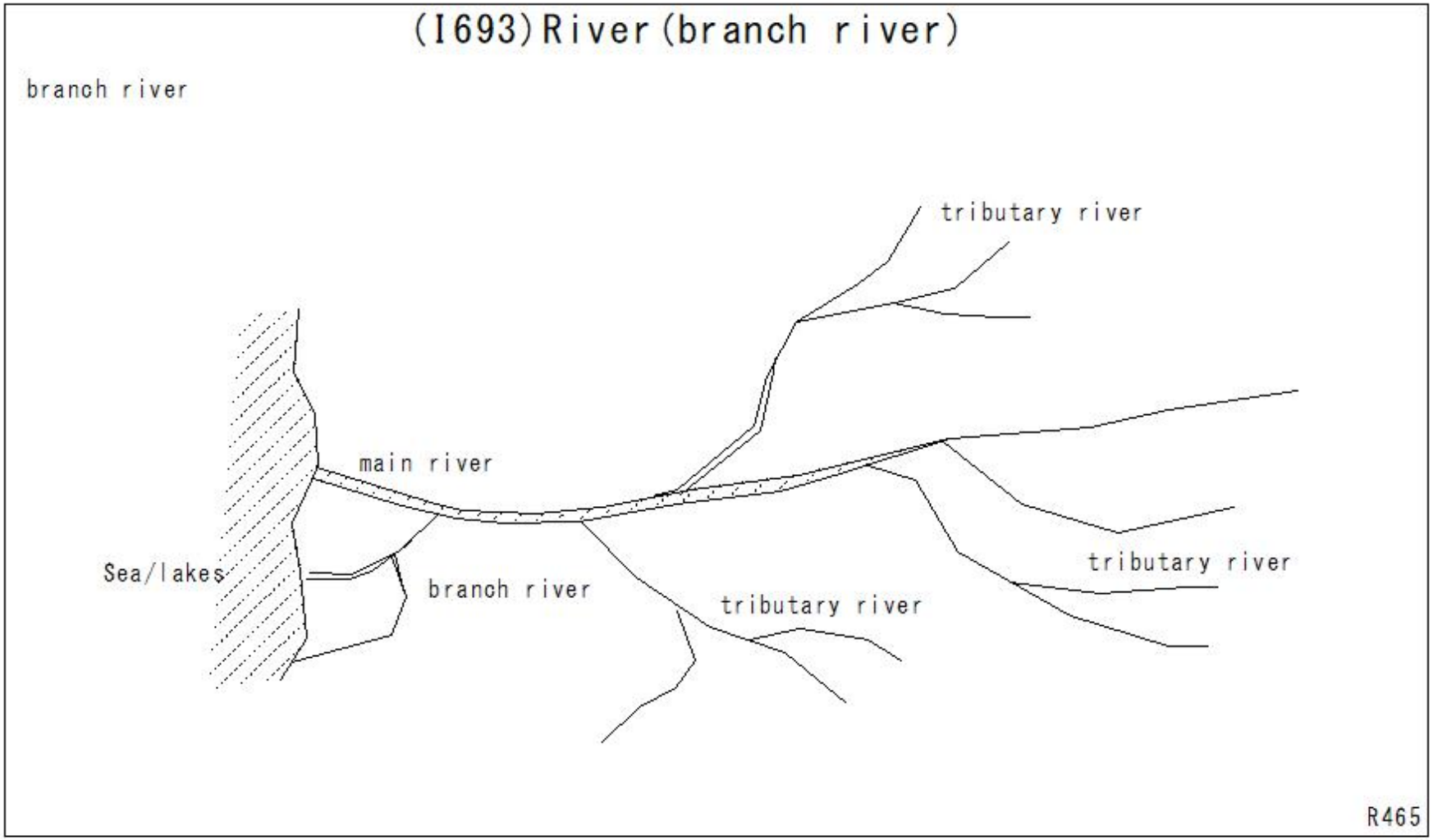
full width weir



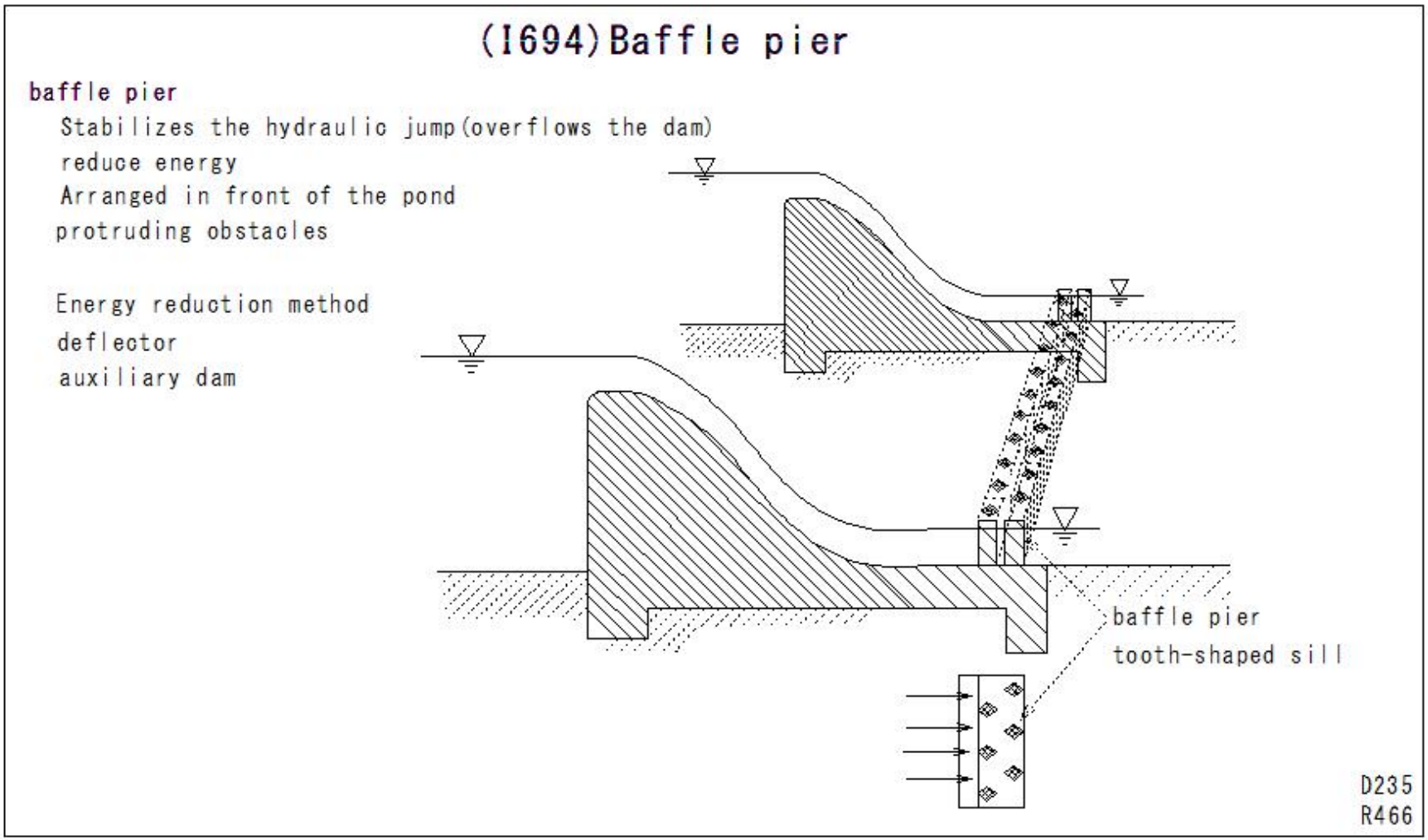
triangular weir

R464

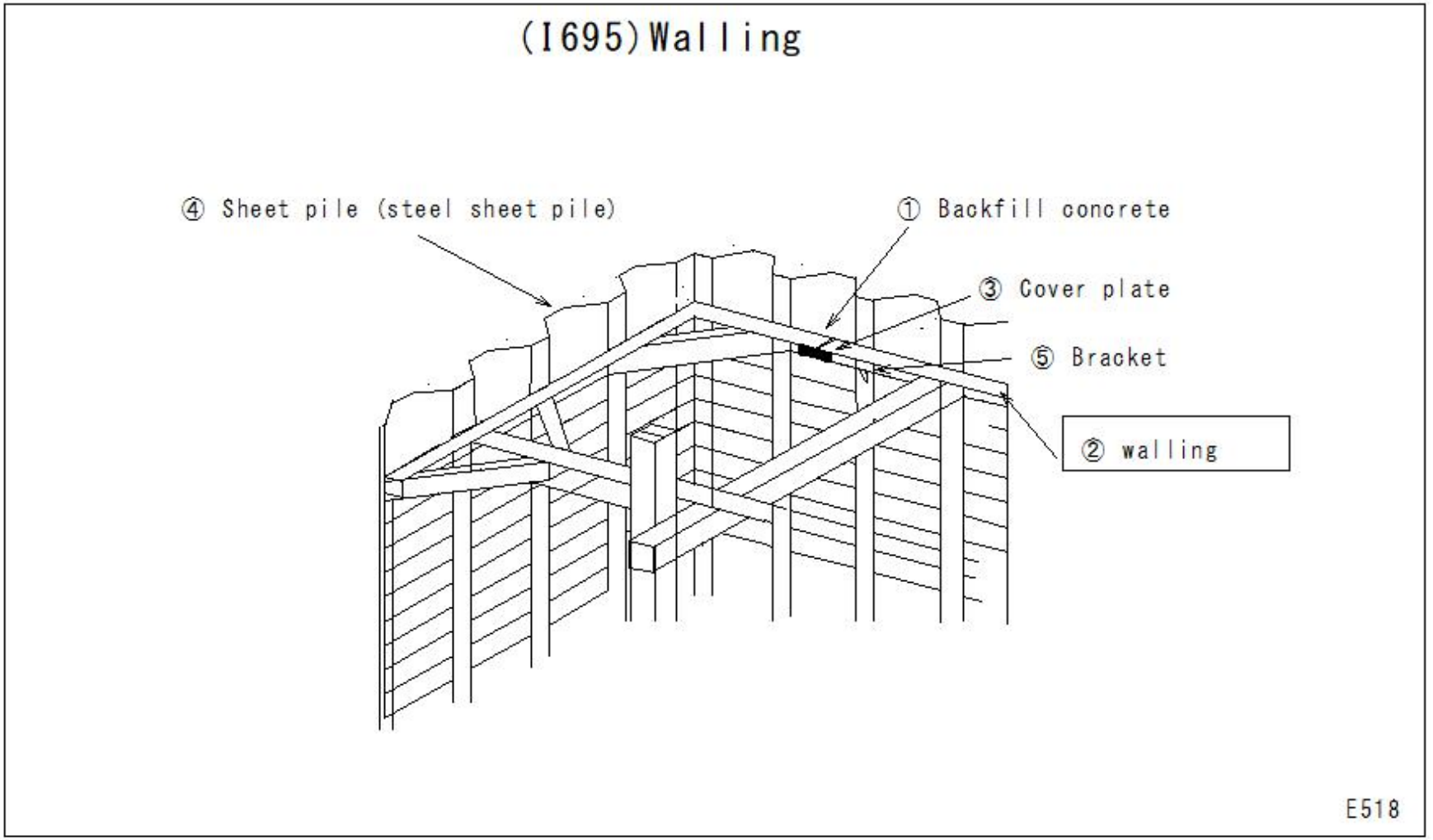
(I693)River(branch river)



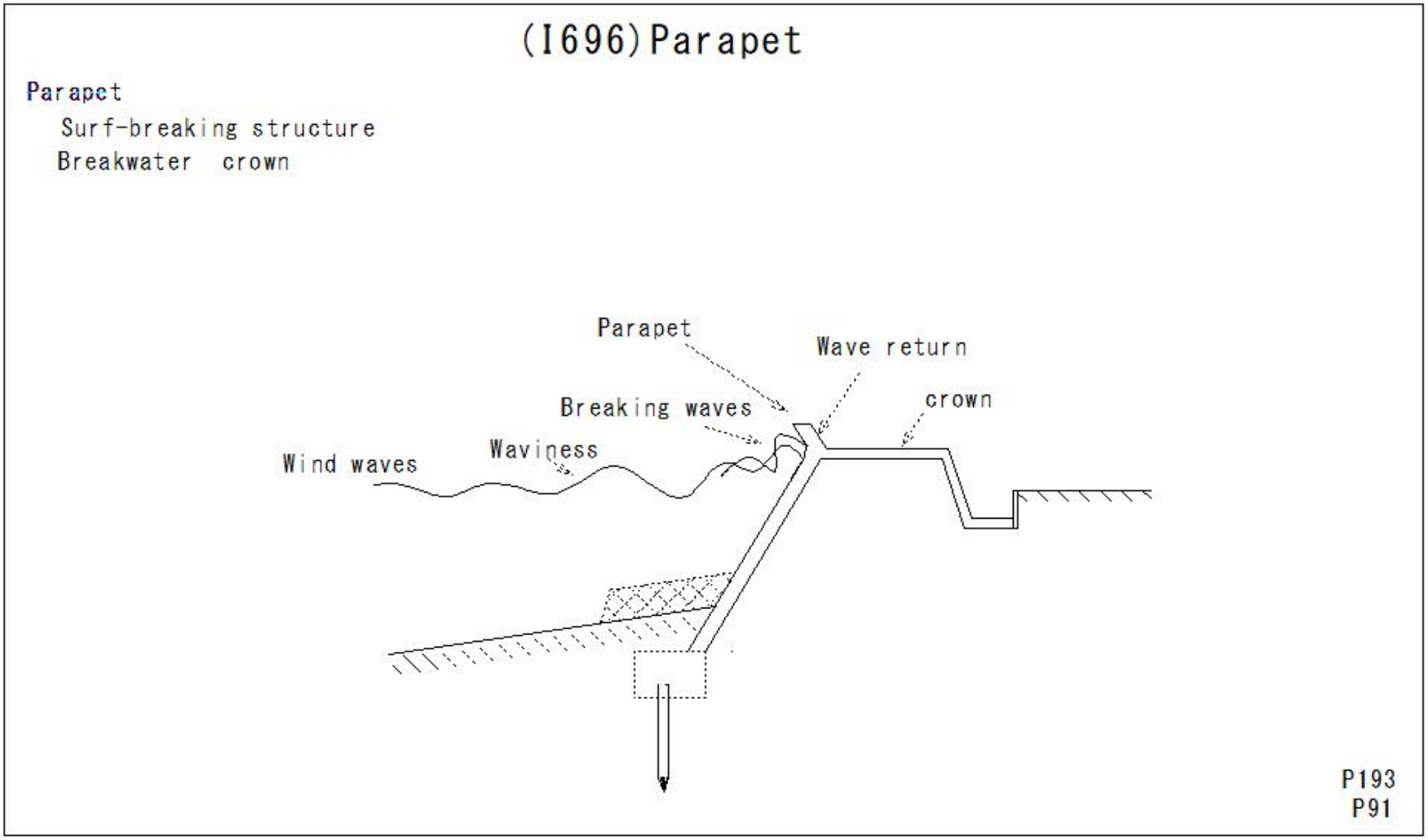
(I694)Baffle pier



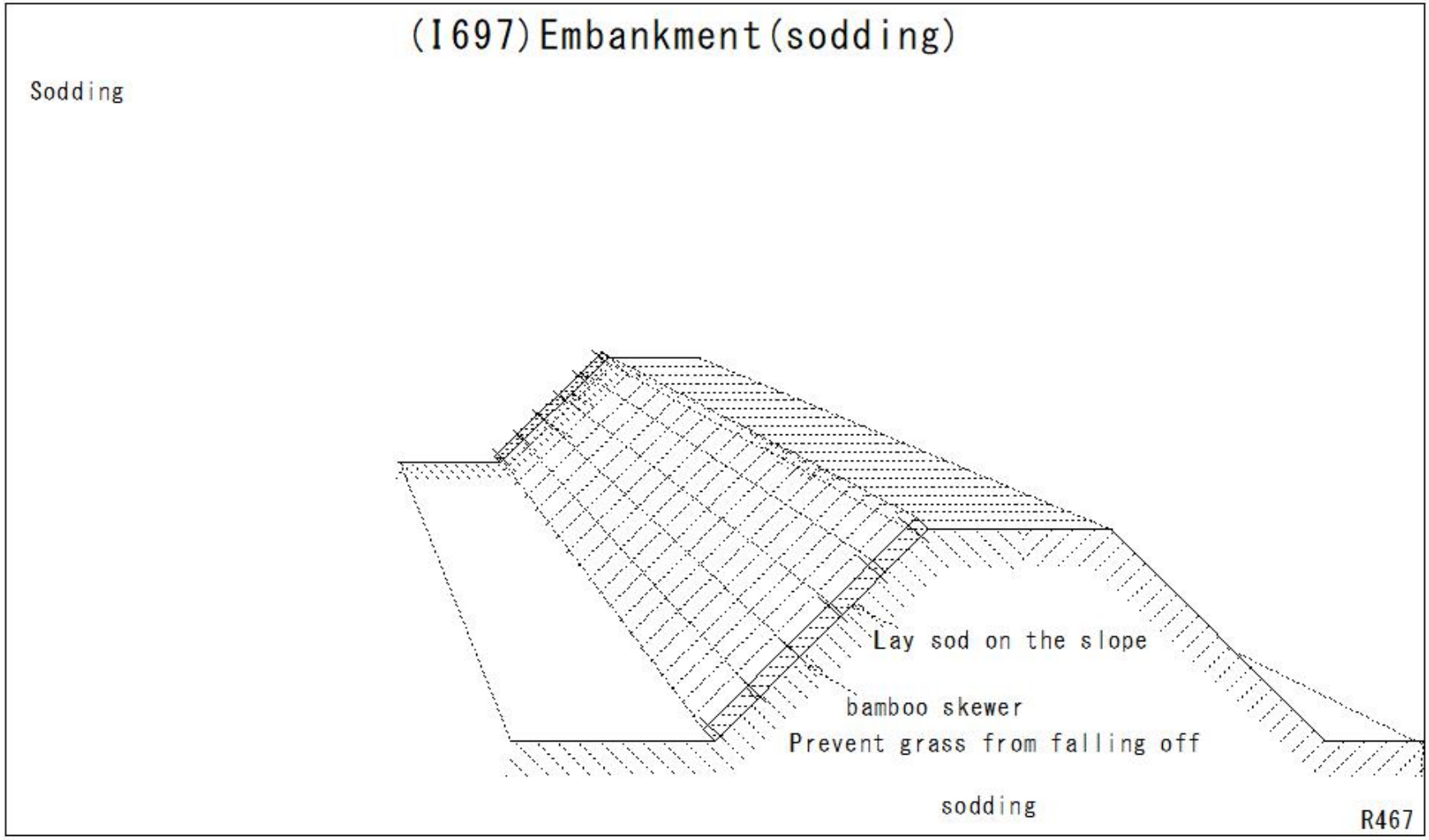
(I695)Walling



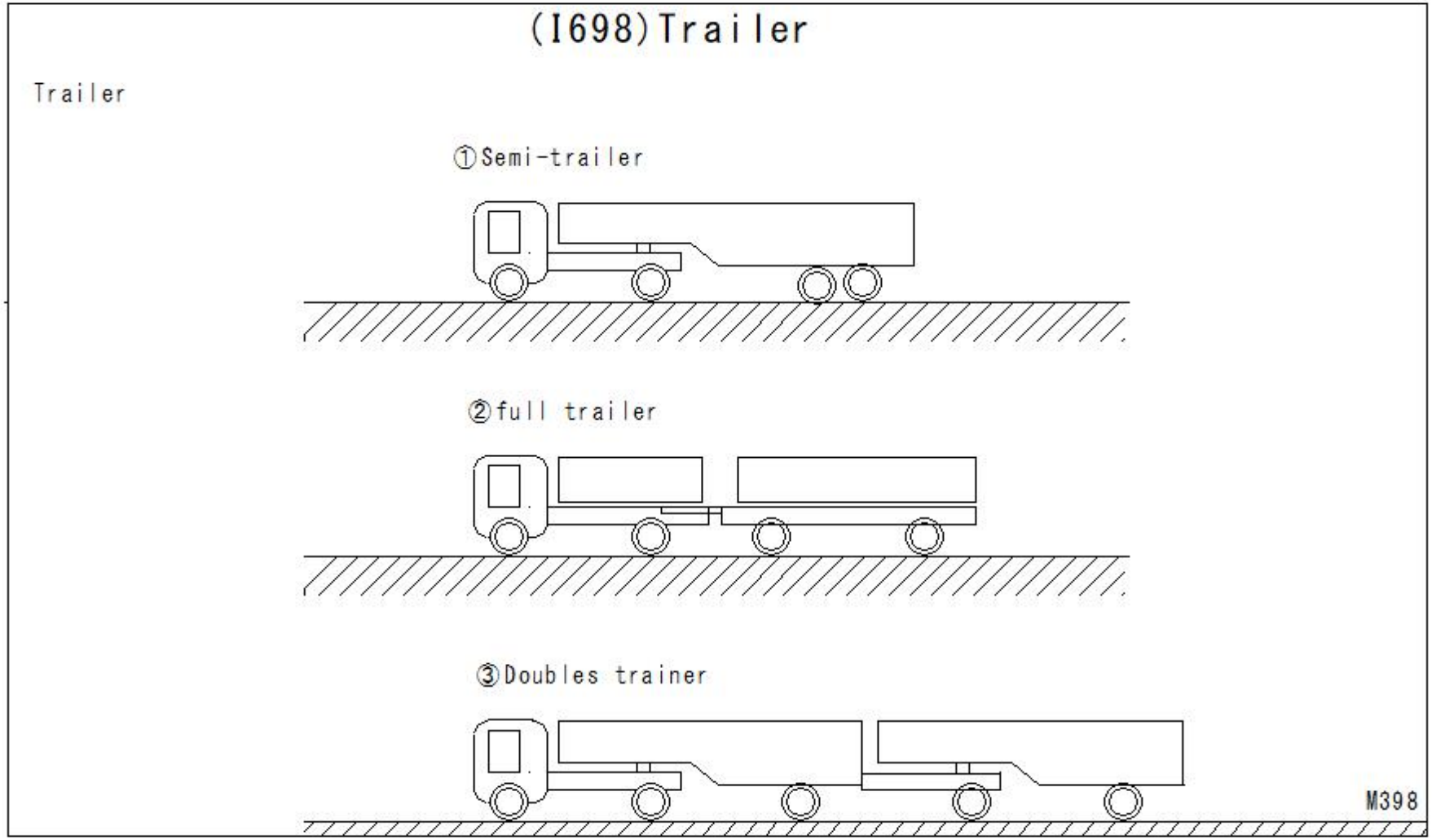
(I696)Parapet



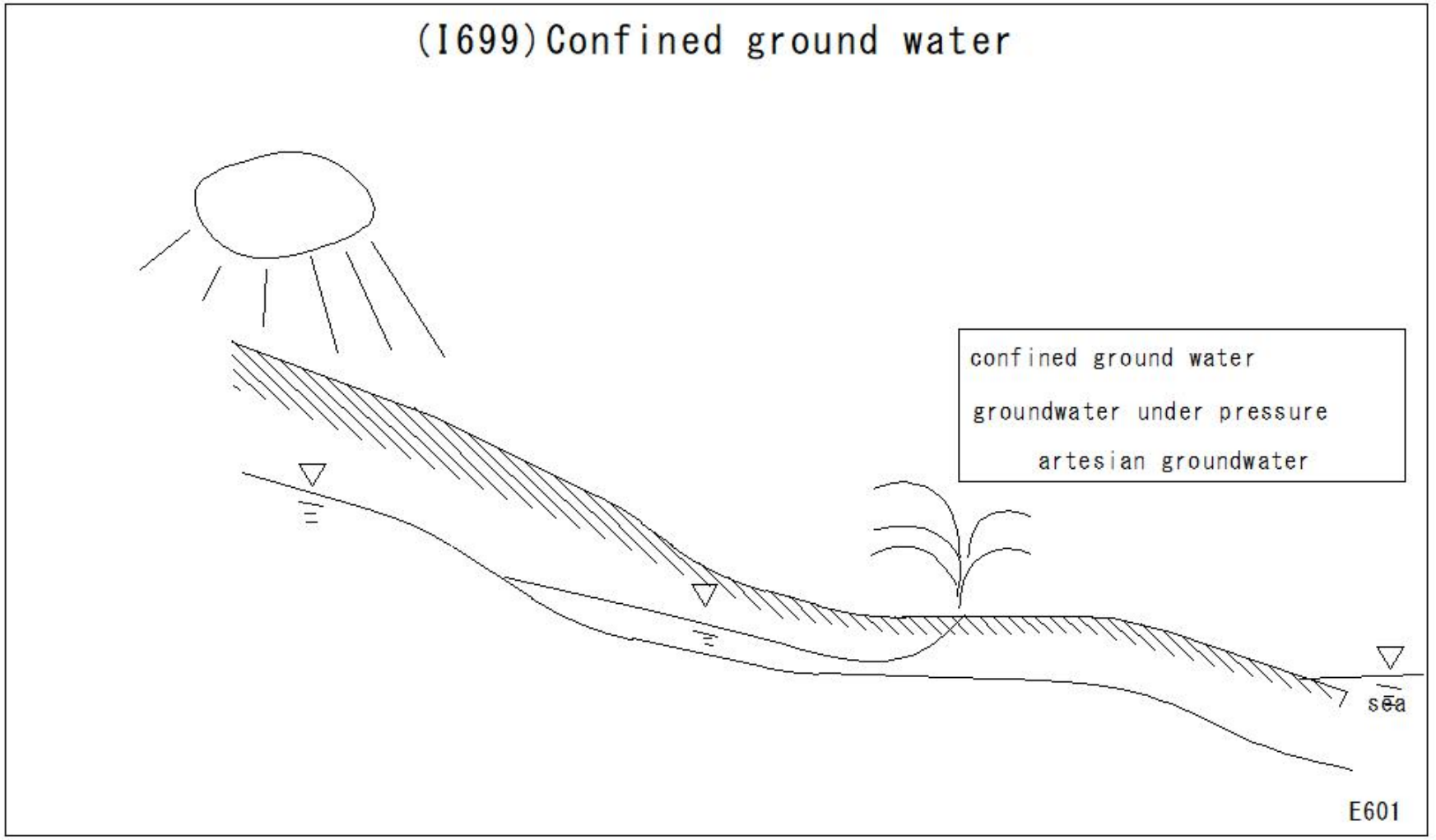
(I697)Embankment(sodding)



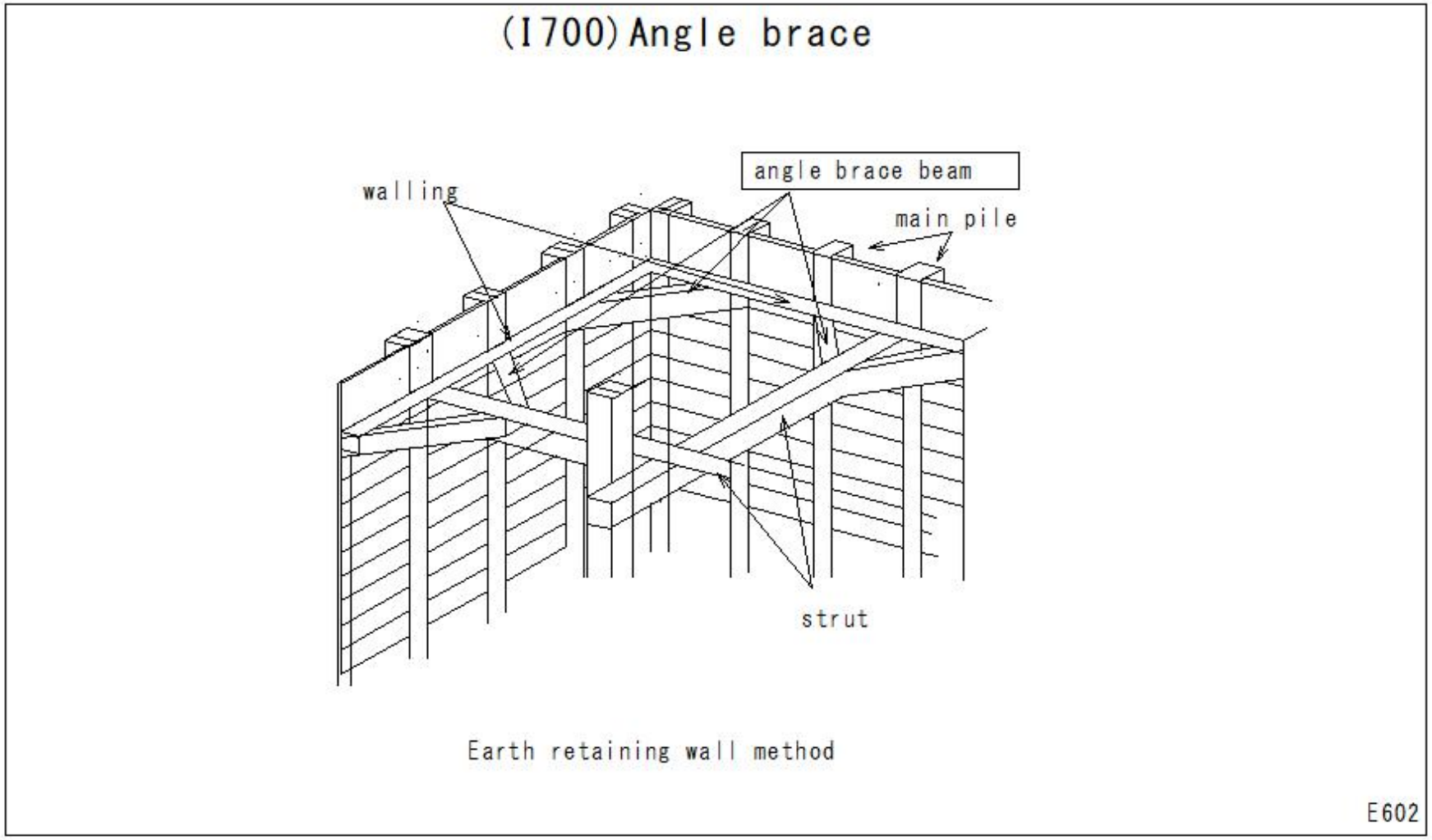
(I698)Trailer



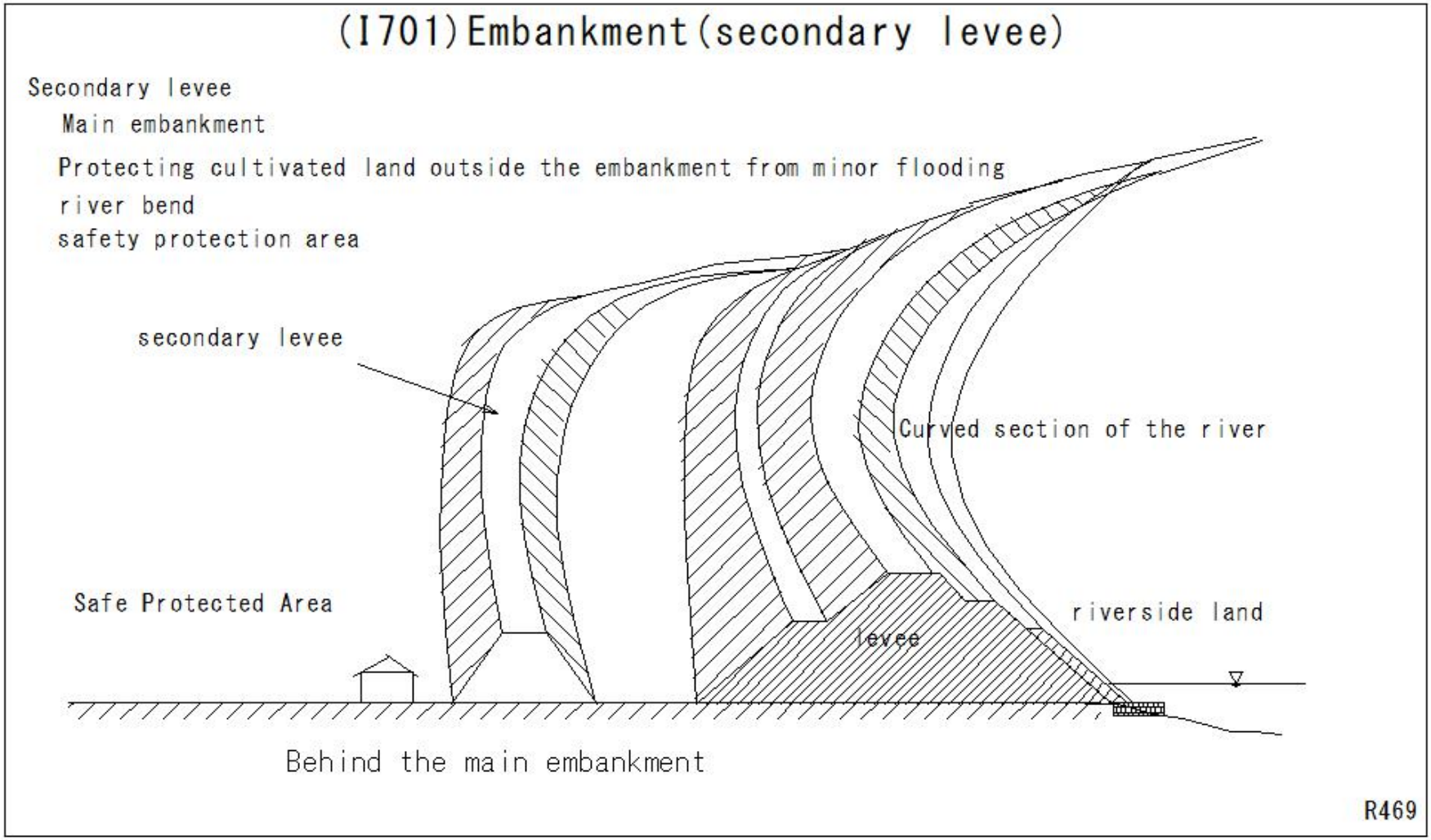
(I699)Confined ground water



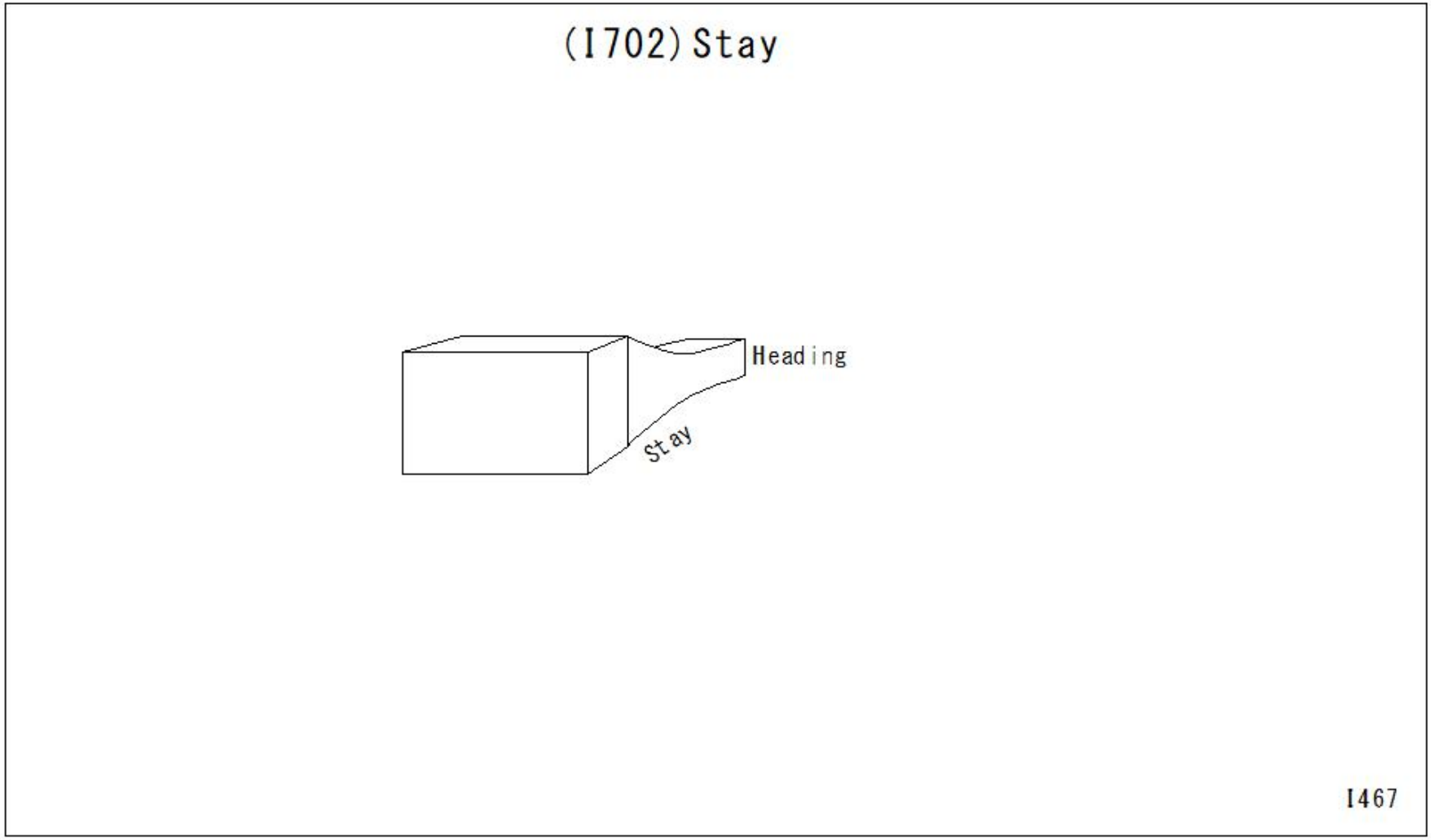
(I700)Angle brace



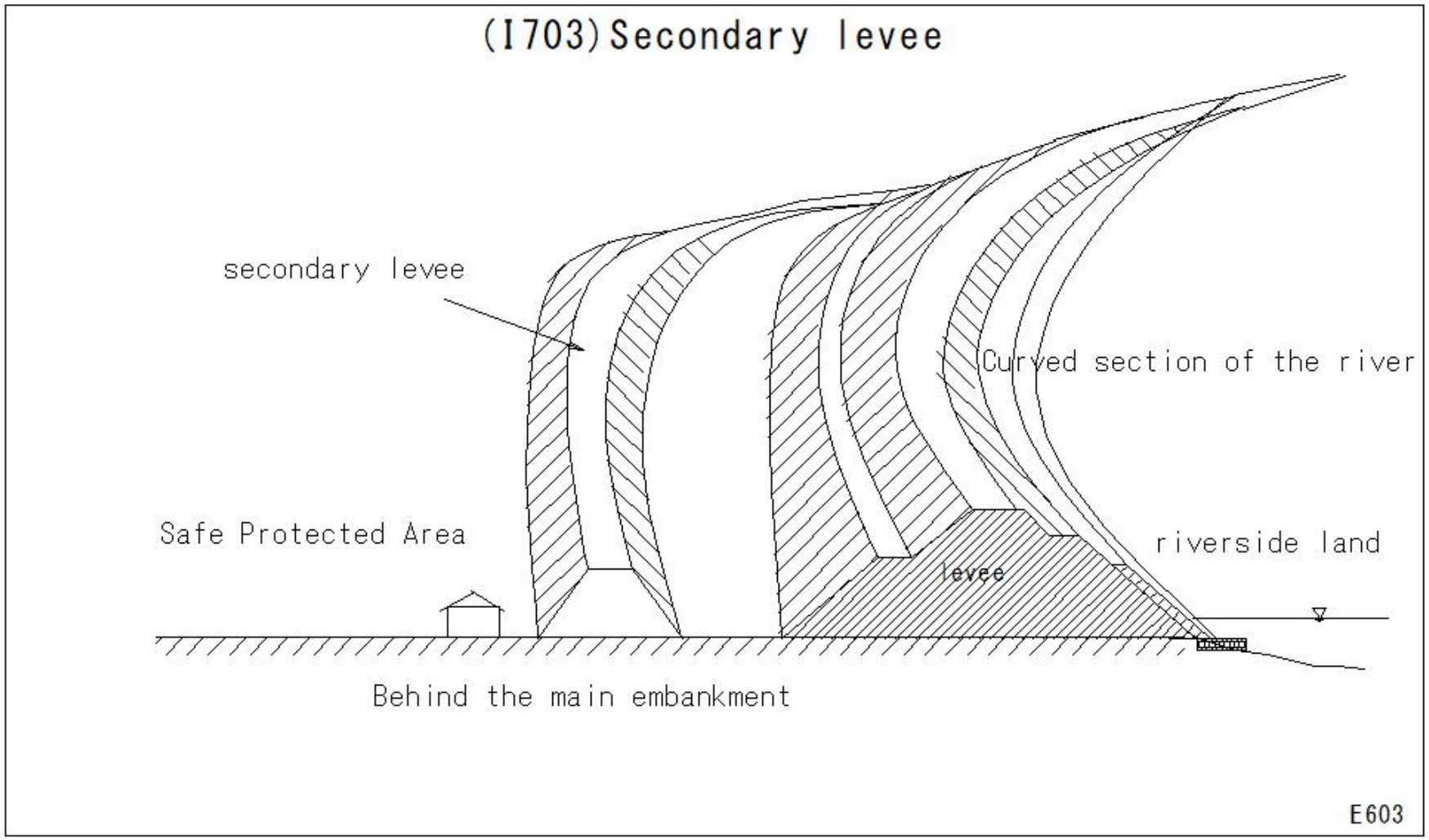
(I701)Embankment(secondary levee)



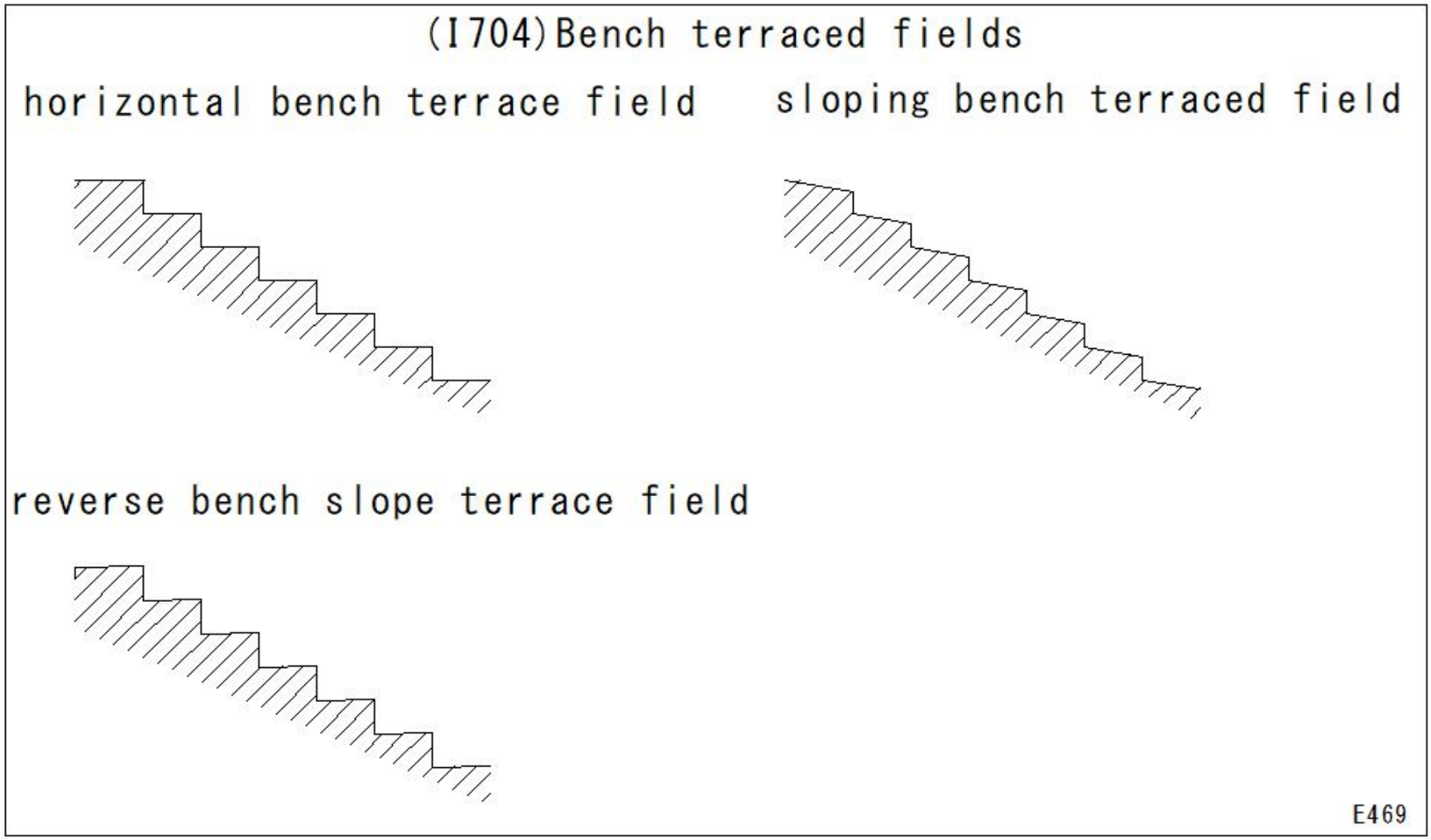
(I702)Stay



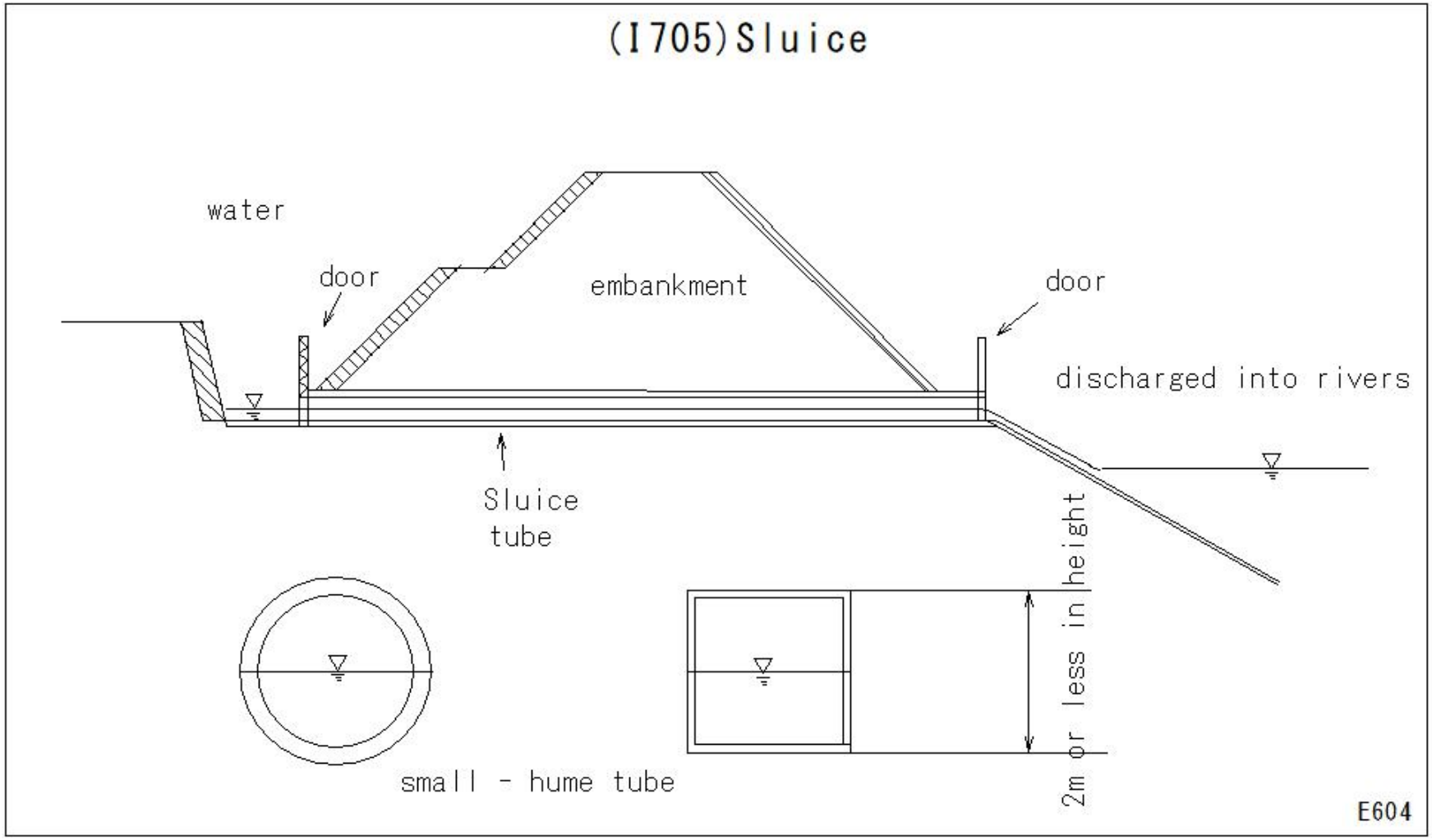
(I703)Secondary levee



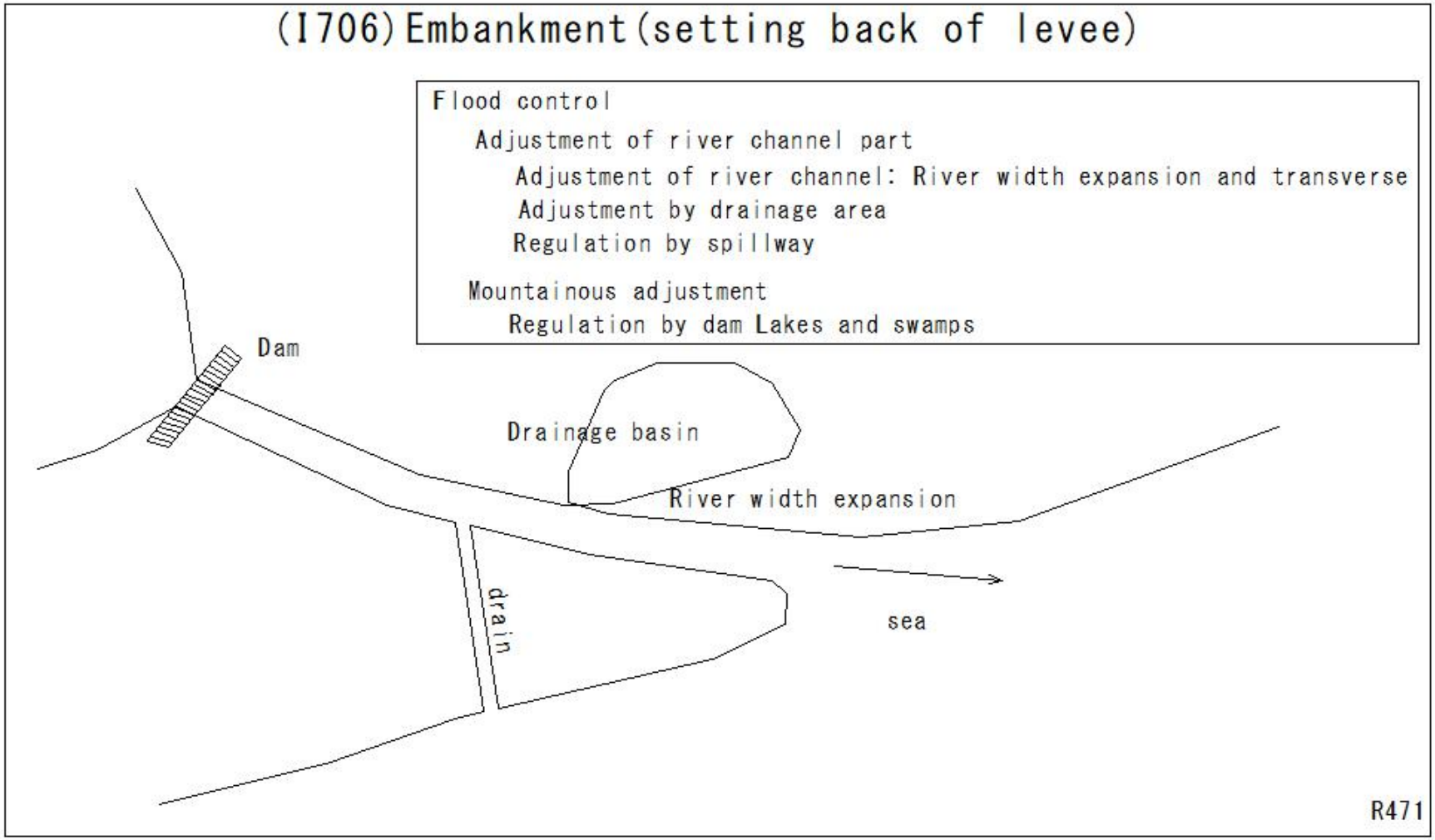
(I704)Bench terraced fields



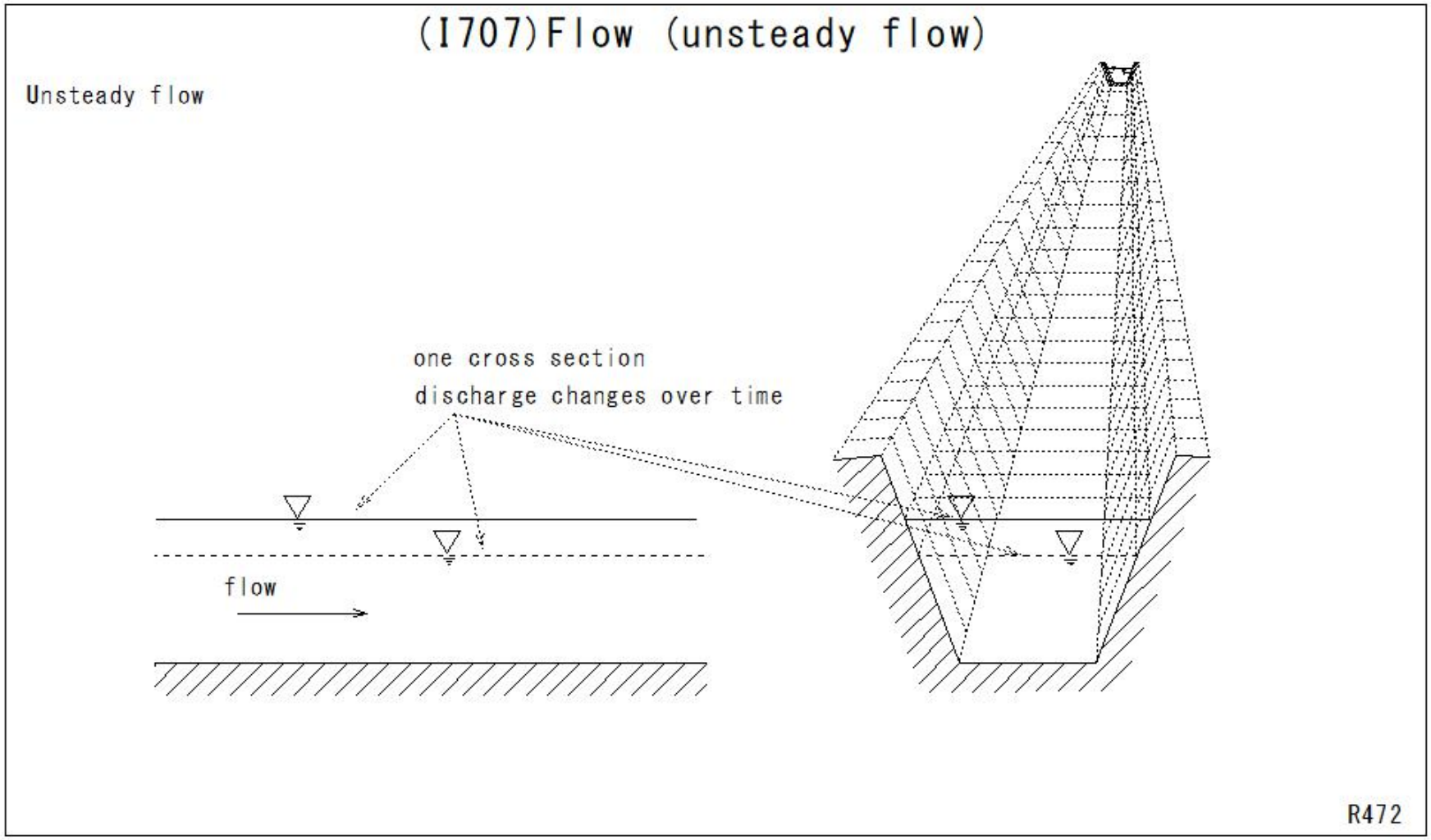
(I705)Sluice


(I705)Sluice
water
door
embankment
door
discharged into rivers
Sluice
tube
2m or less in height
small - hume tube
E604

(I706)Embankment(setting back of levee)



(I707)Flow (unsteady flow)



(I708)Sluice

Sluice

Water intake from rivers

drainage to rivers

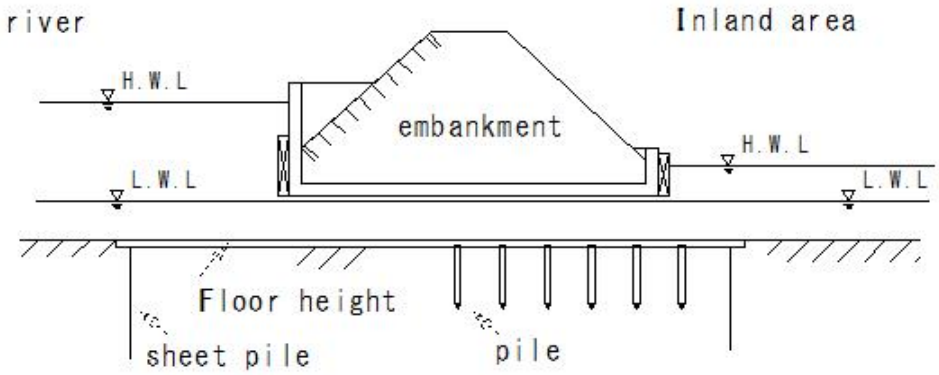
Embankment crossing - culvert

Small sluice pipe

2m or more-sluice

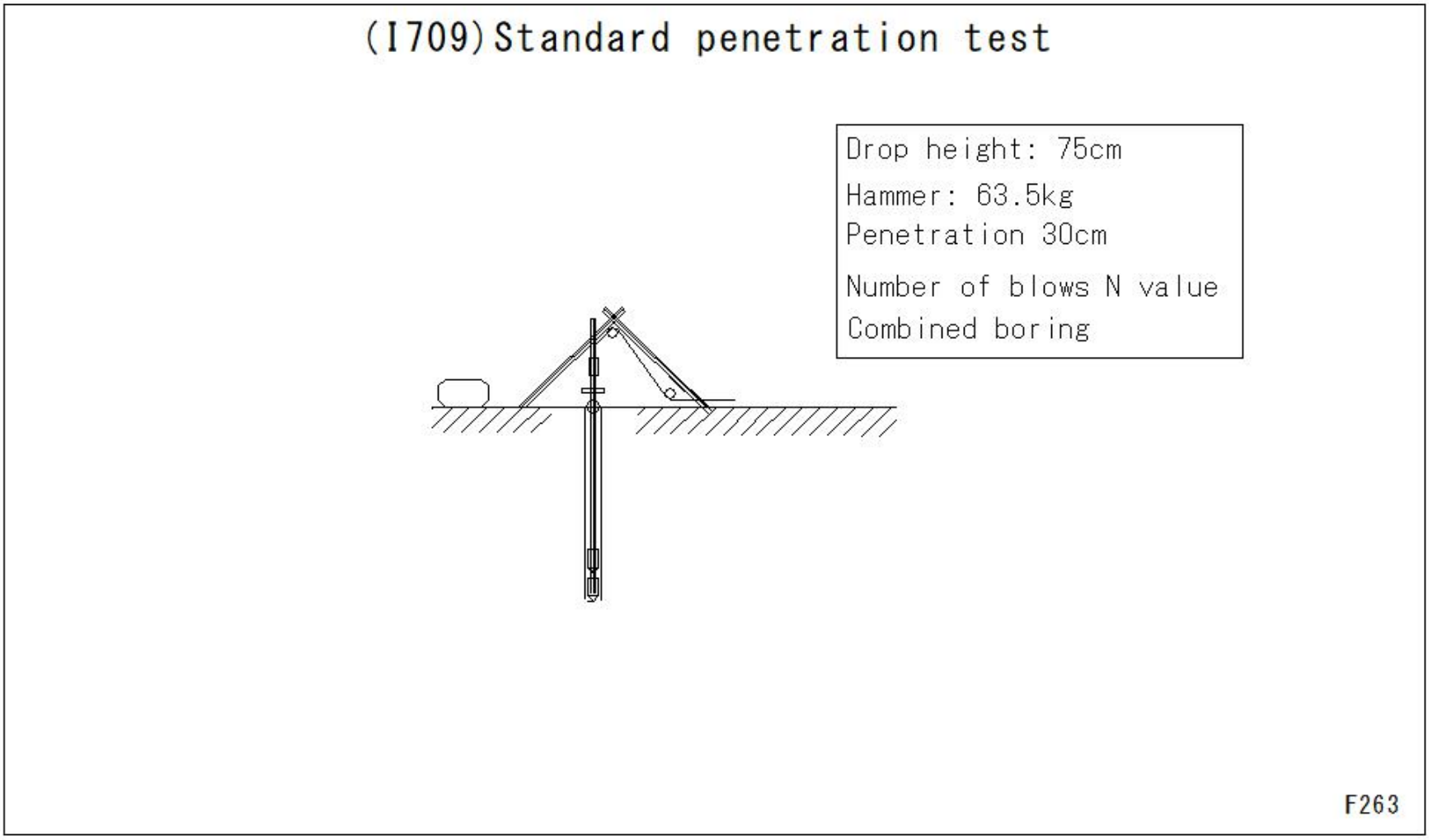
Higher than the embankment - sluice gate

cross section

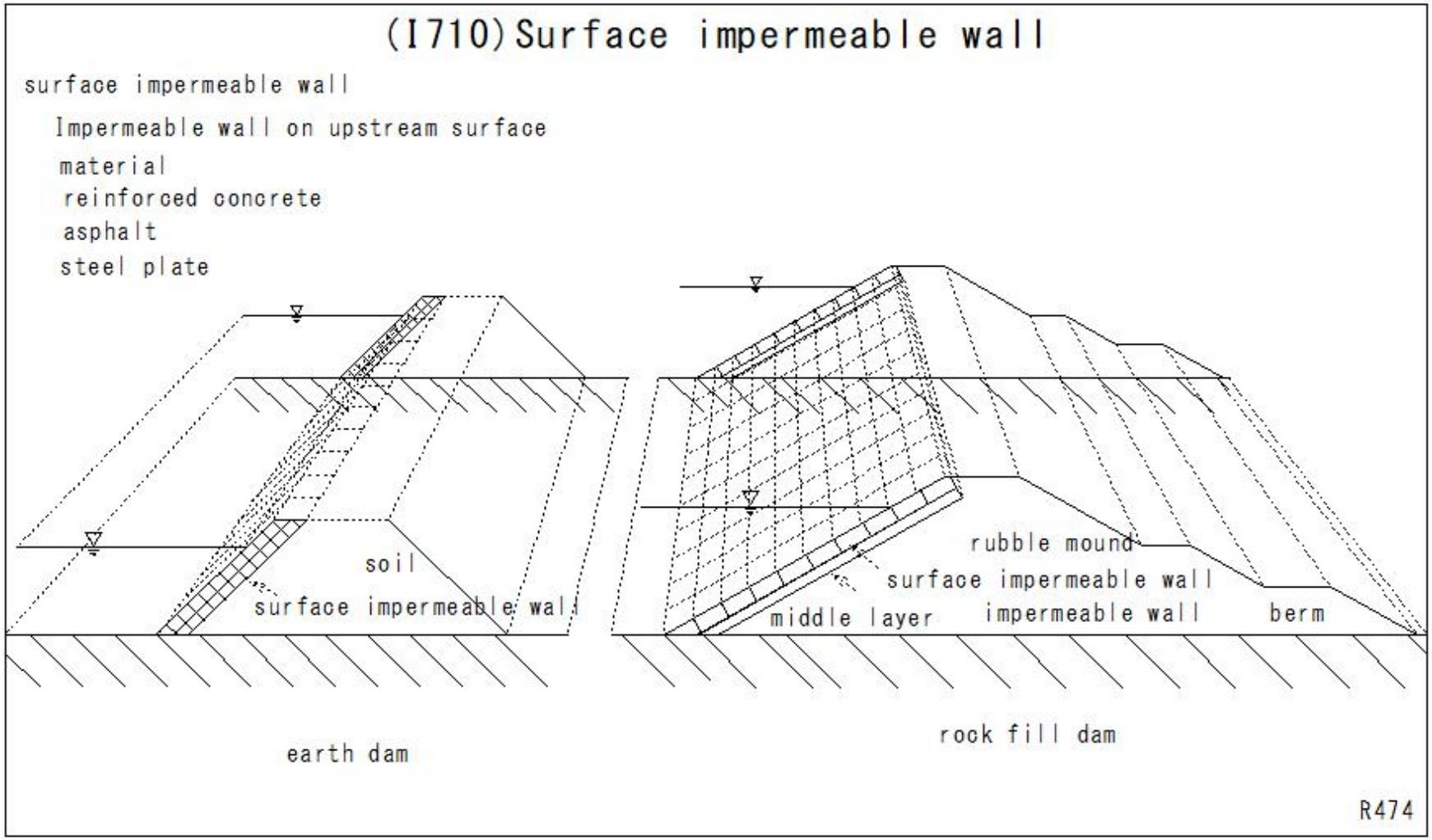


R473

(I709)Standard penetration test



(I710)Surface impermeable wall



(I711)Water supply(surface washing（Surface cleaning）)

(I711)Water supply(surface washing (Surface cleaning))

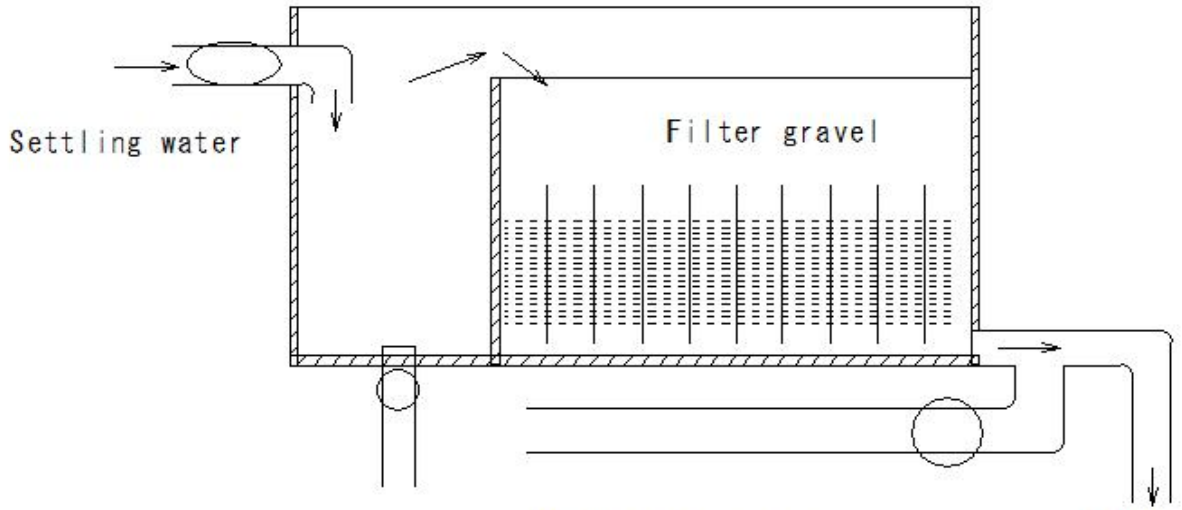
Surface washing (Surface cleaning)

Rapid filtration of water supply

Backwash cleaning of filter pond

Sand layer surface - spraying cleaning water

Rotary

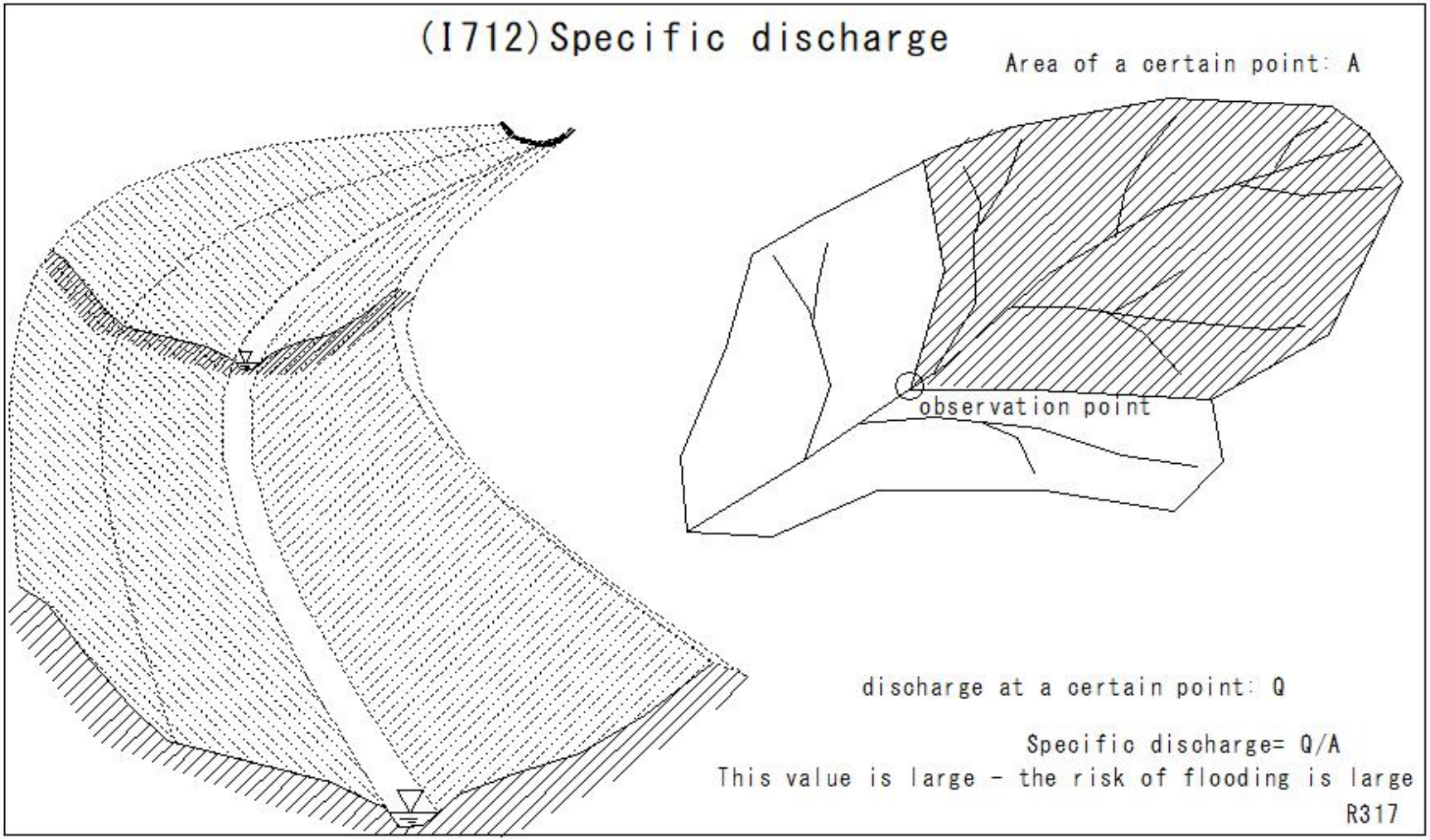


① Filtration state

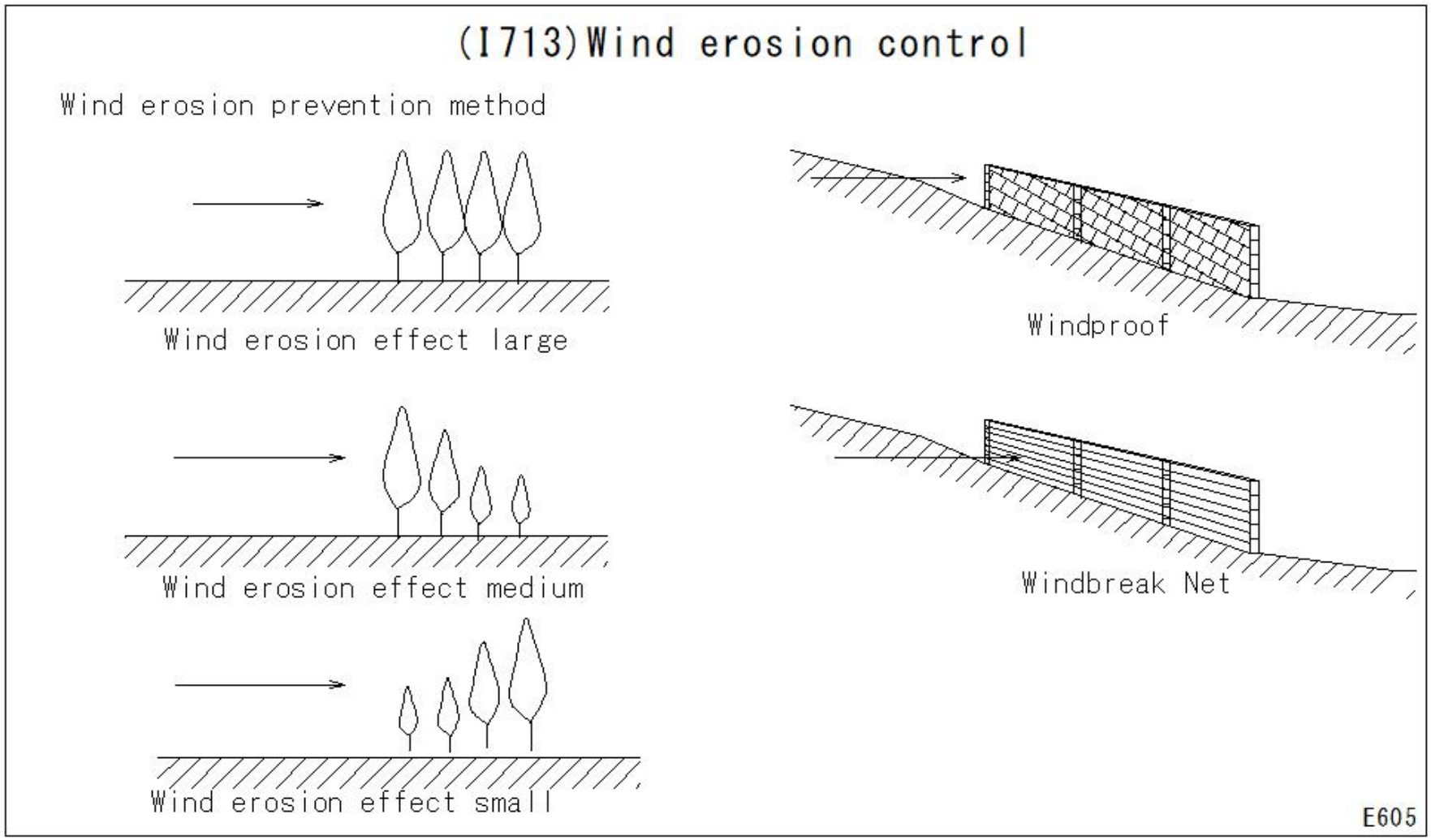
Washing wastewater

W189

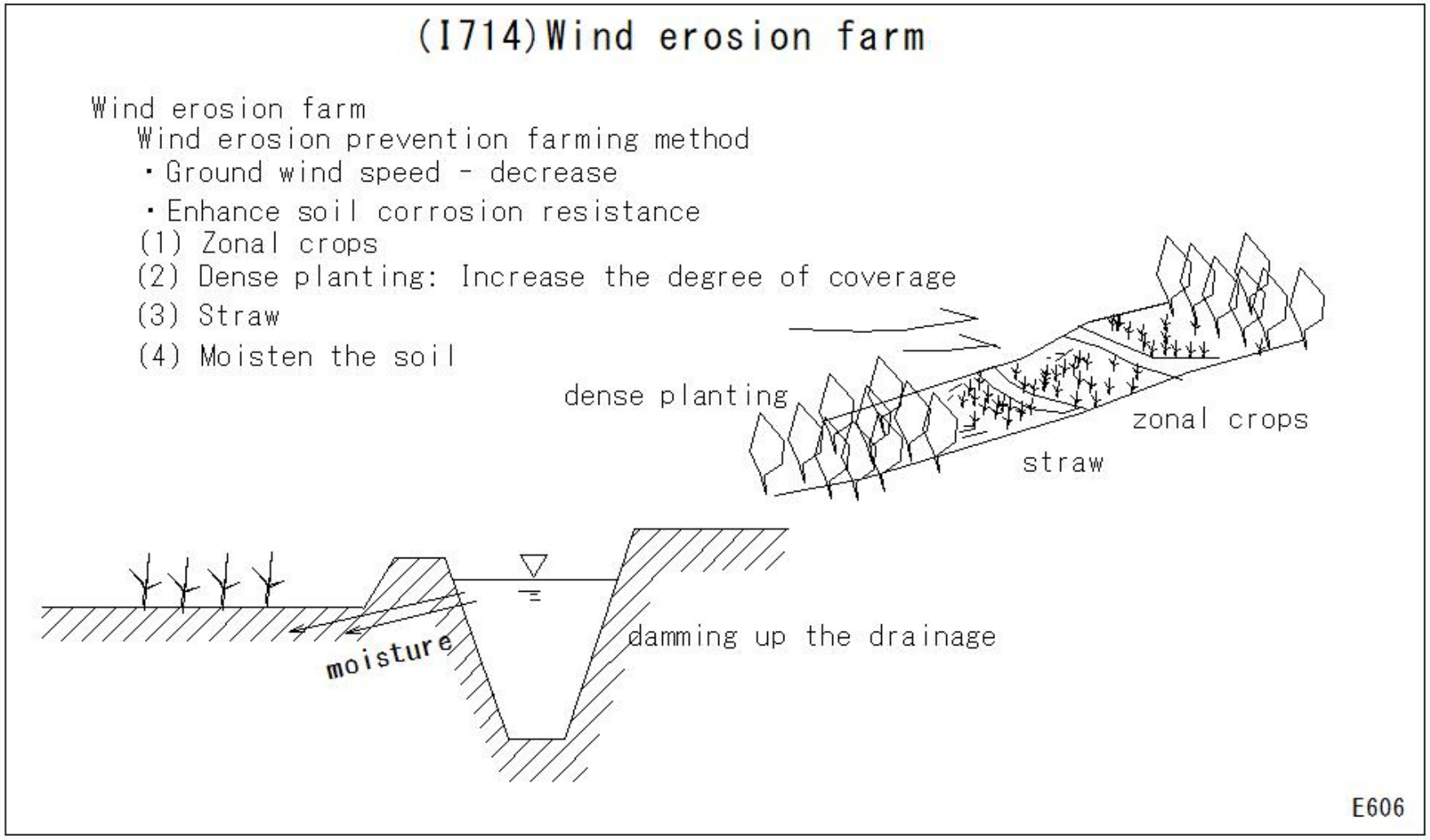
(I712)Specific discharge



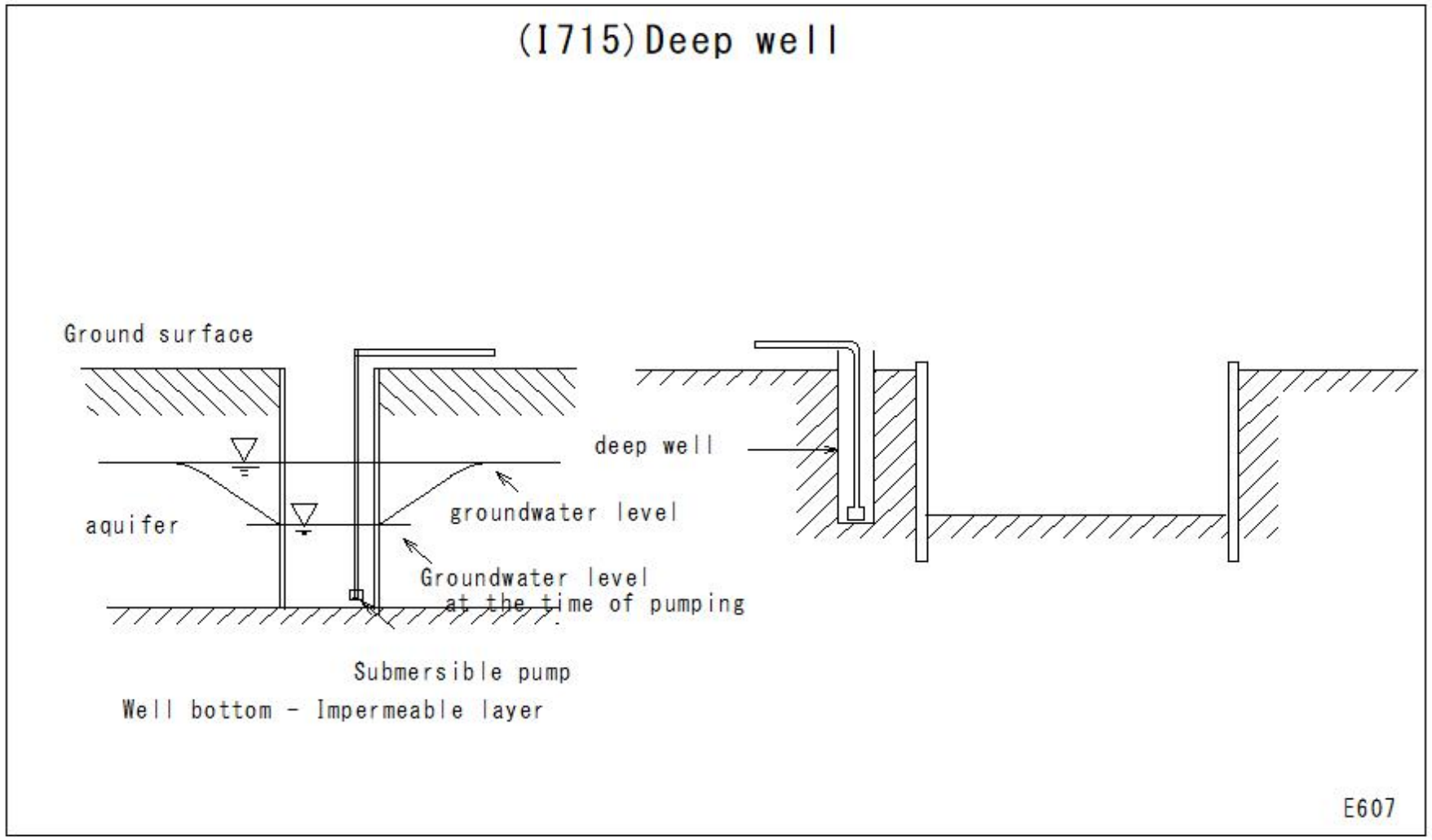
(I713)Wind erosion control



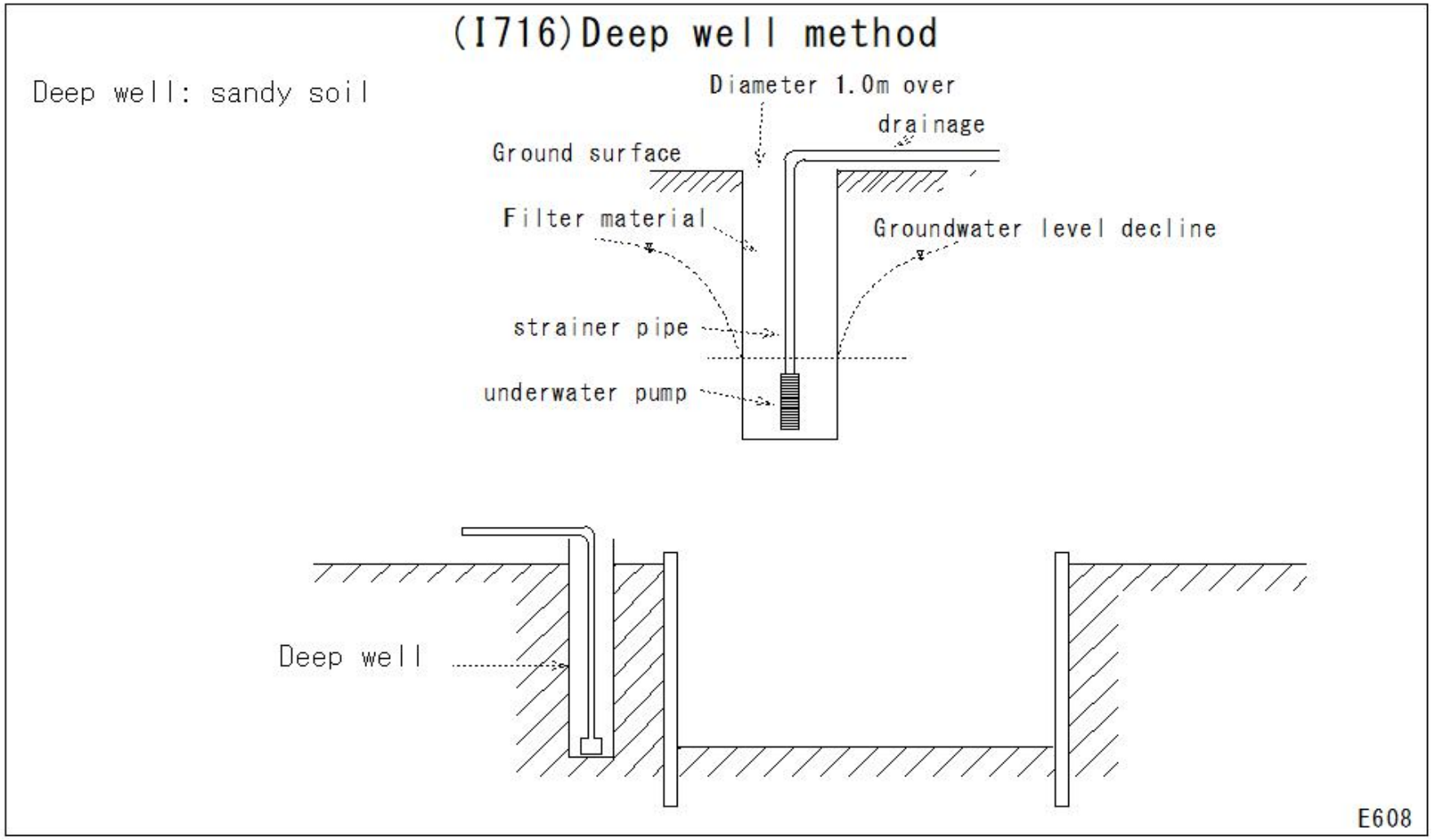
(I714)Wind erosion farm



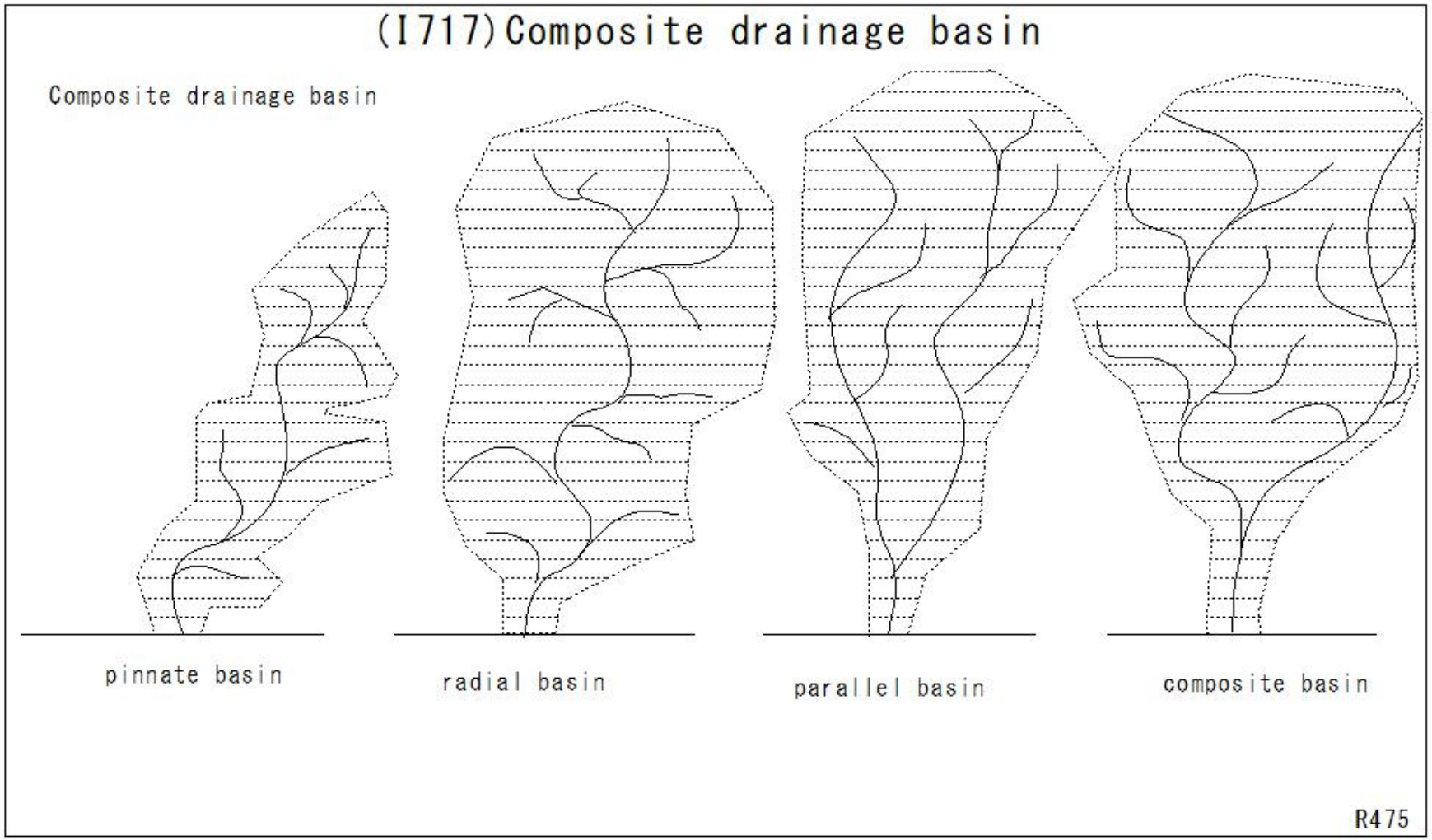
(I715)Deep well



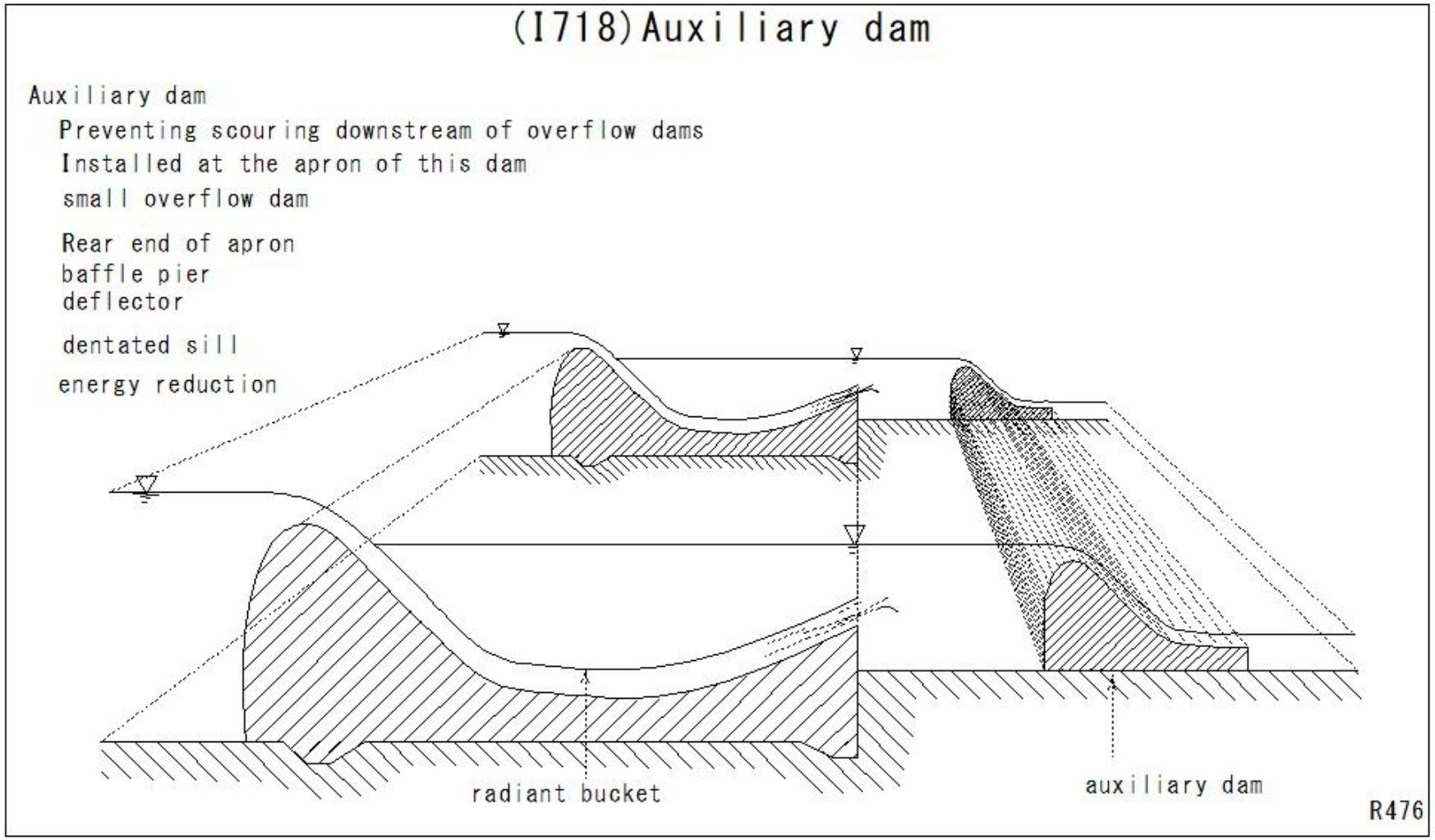
(I716)Deep well method



(I717)Composite drainage basin



(I718)Auxiliary dam

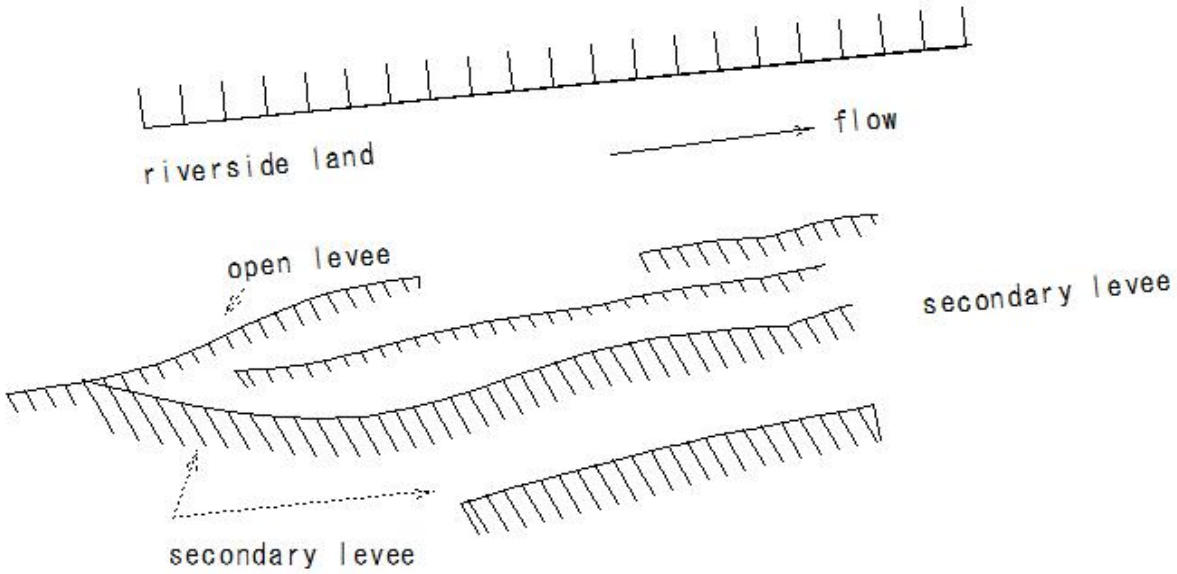


(I719)Secondary levee

(I719)Secondary levee

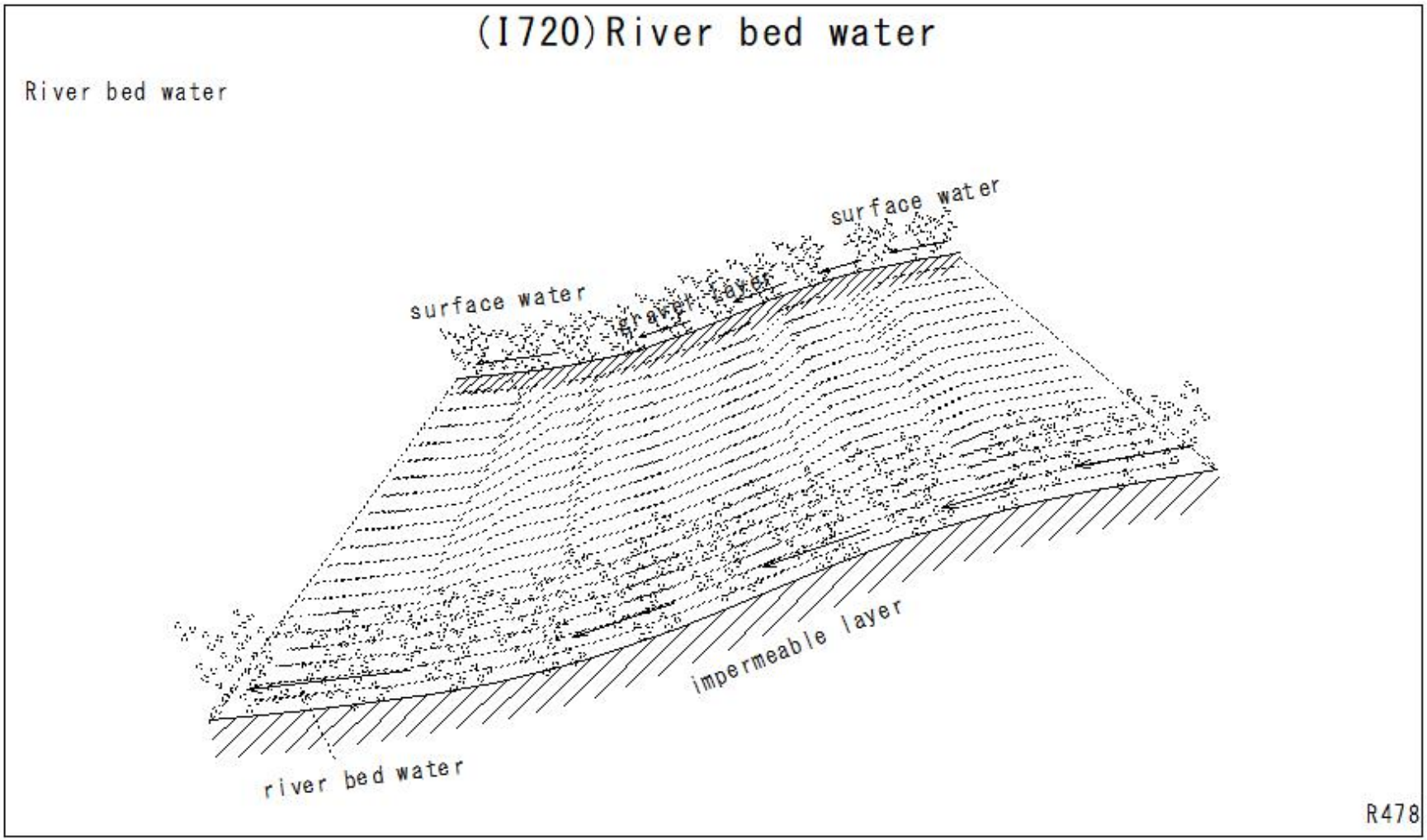
Secondary levee

Embankment parallel to the main embankment



R477

(I720)River bed water

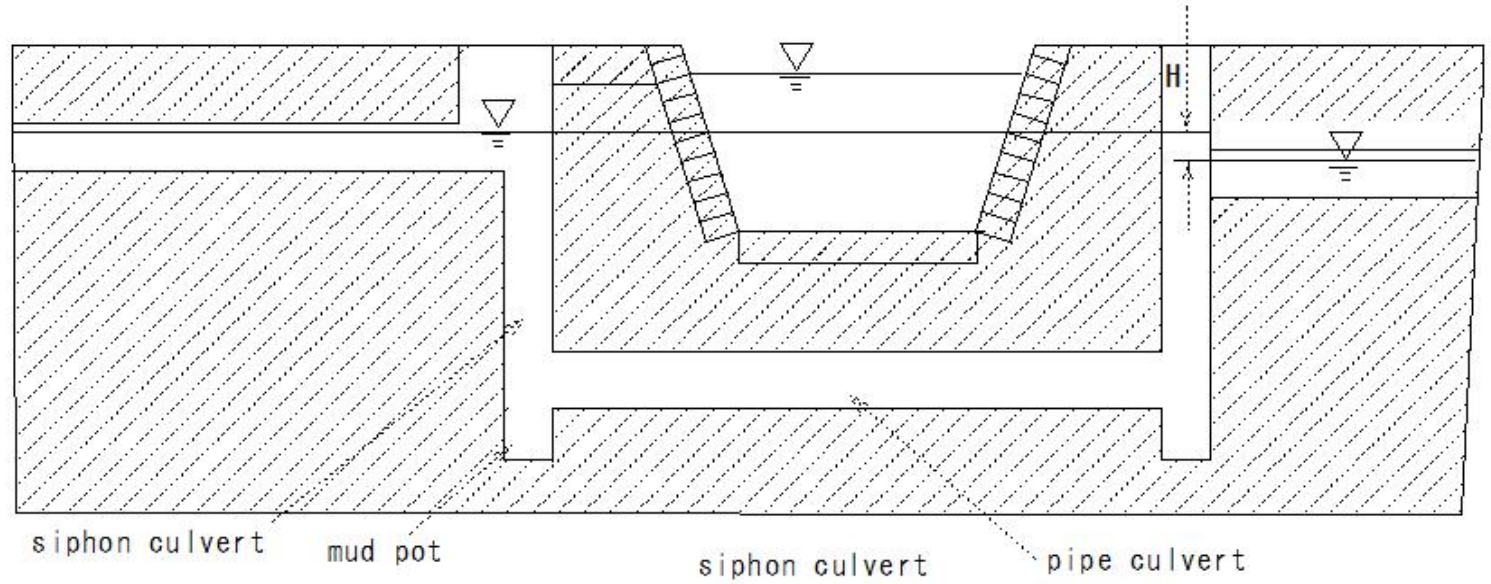


(I721)Siphon culvert

(I721)Siphon culvert

siphon culvert

Waterways that cross under waterways, railways, and roads



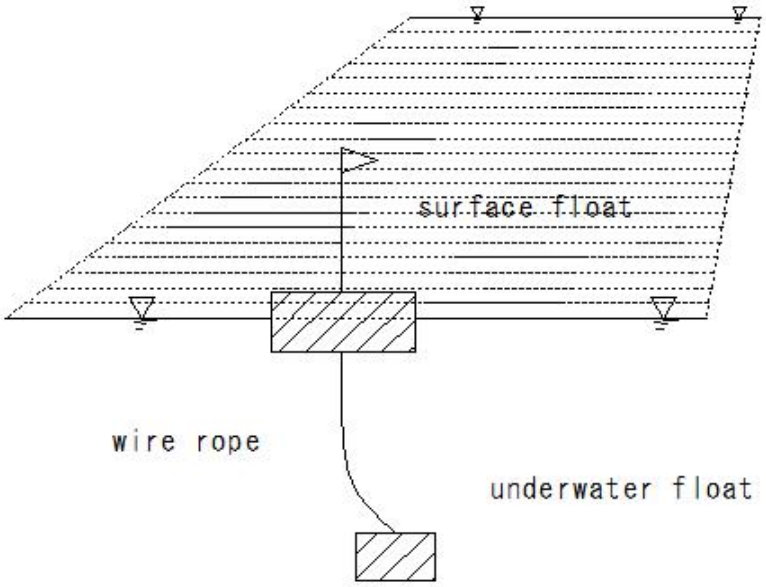
R612

(I722)Twin float

(I722)Twin float

Twin float

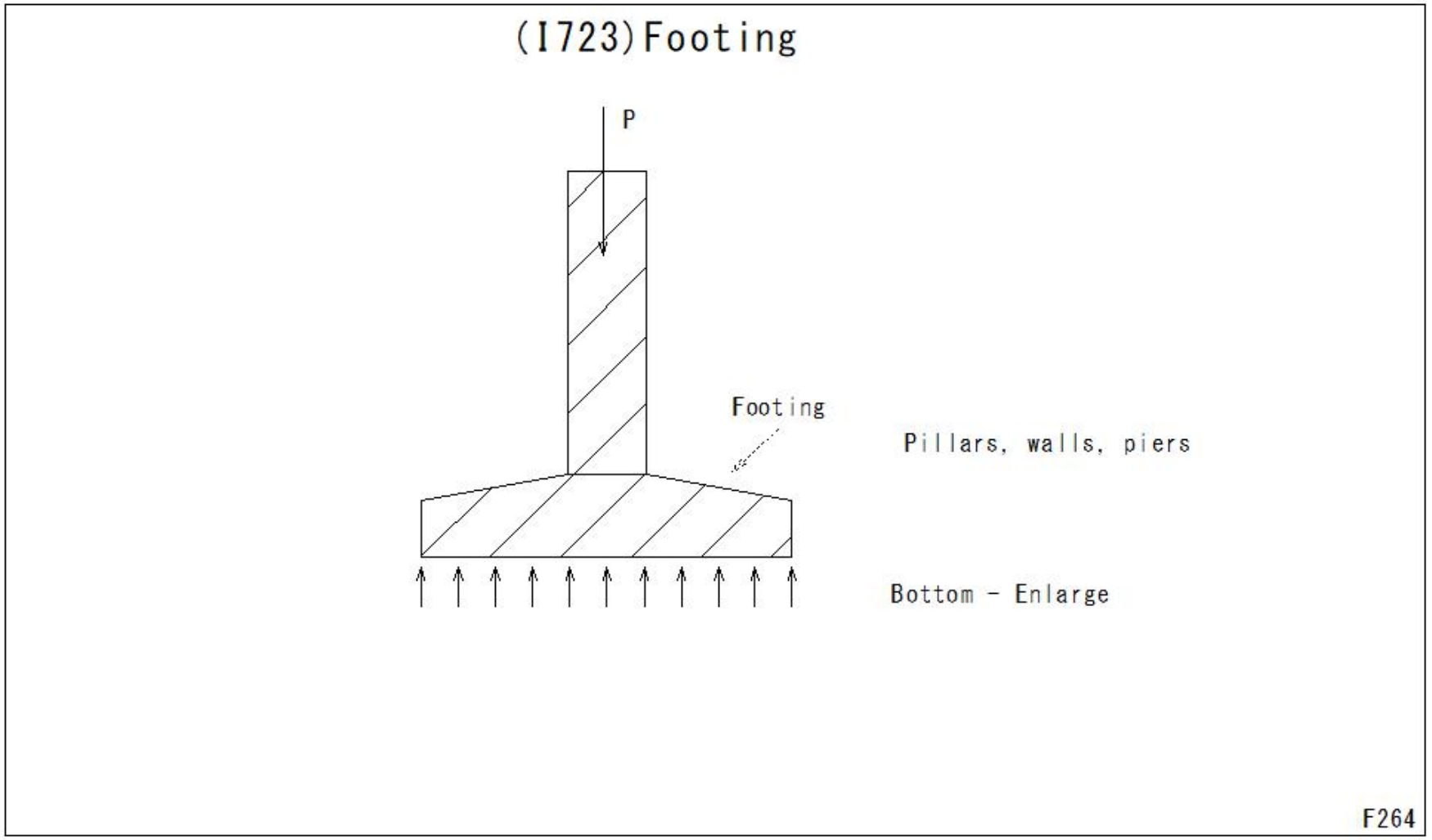
A float that connects a surface float and an underwater float with a wire.
Measurement of flow velocity in rivers at peak times



twin float

R479

(I723)Footing



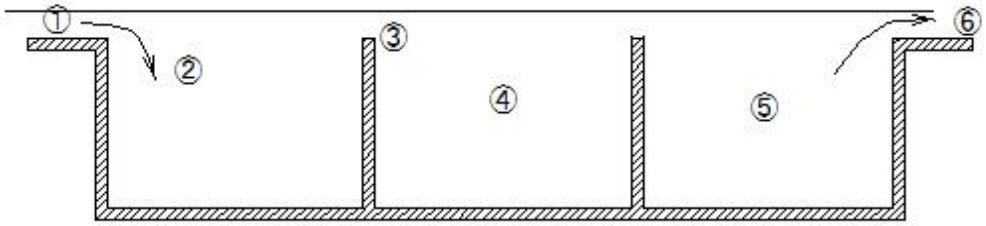
(I724)Plain precipitation(Normal sedimentation)

(I724)Plain precipitation(Normal sedimentation)

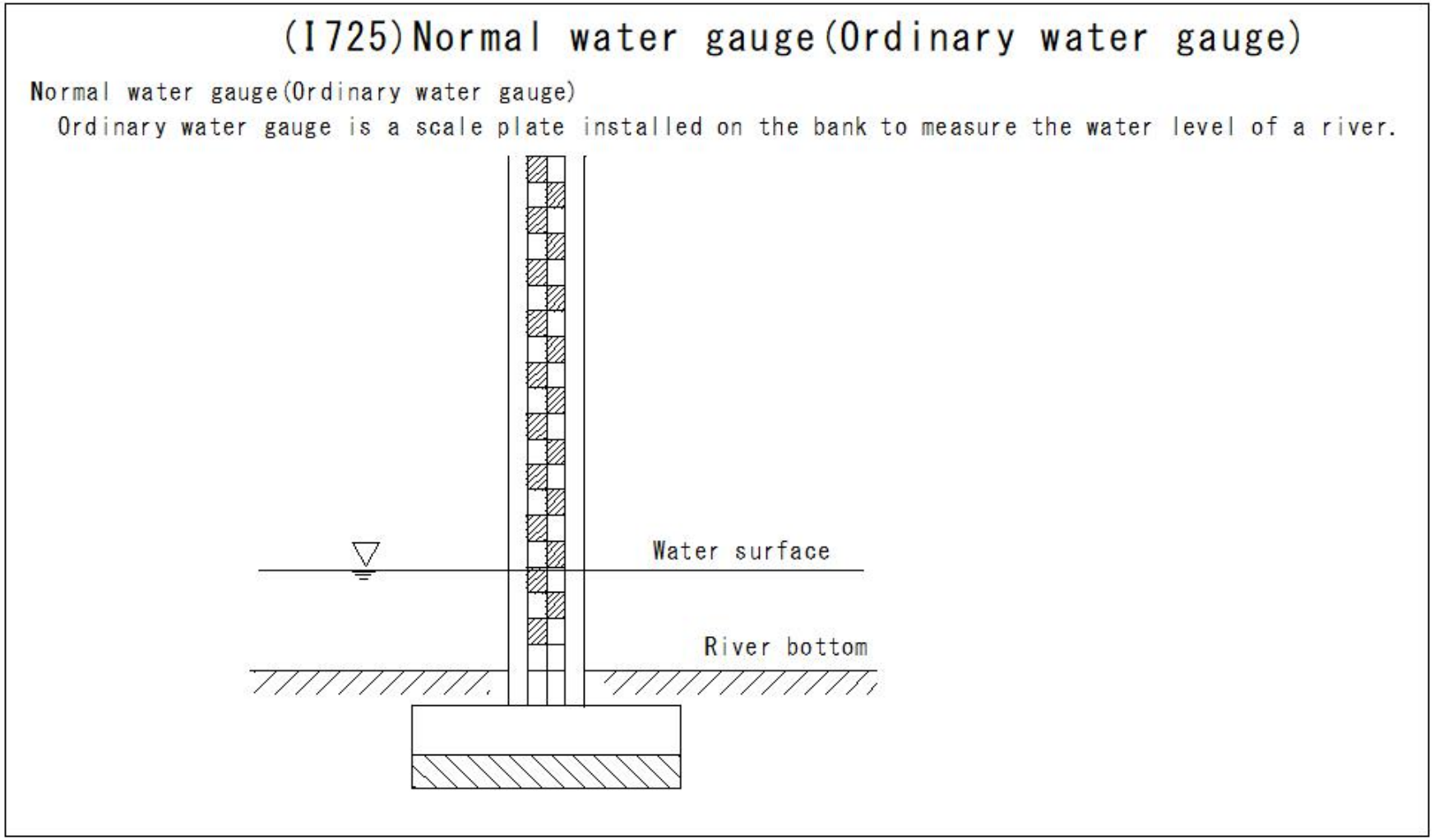
Plain precipitation(Normal sedimentation)

Normal sedimentation is a method of separating solid components in water by allowing them to settle by gravity without adding coagulants.

① Raw water
② Sedimentation time: 12 hours is standard
③ Flow straightening wall
④ Flow rate: within 30cm/min
⑤ Water depth: 3-4m
⑥ Outlet



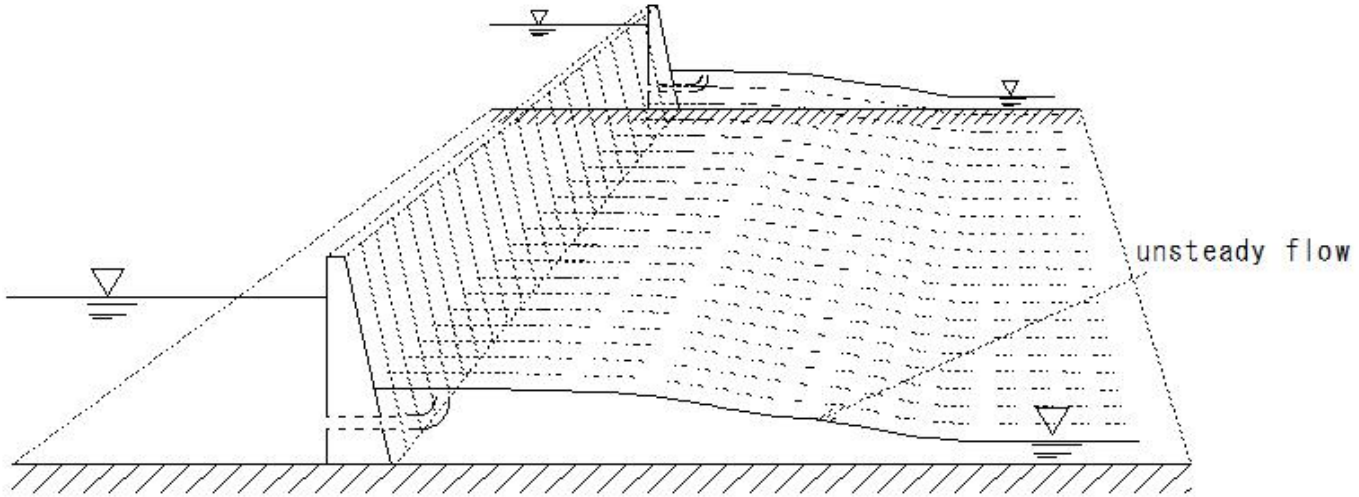
(I725)Normal water gauge(Ordinary water gauge)



(I726)Unsteady flow

(I726)Unsteady flow

Unsteady flow
waterway
flow:volume and velocity change over time
dam discharge



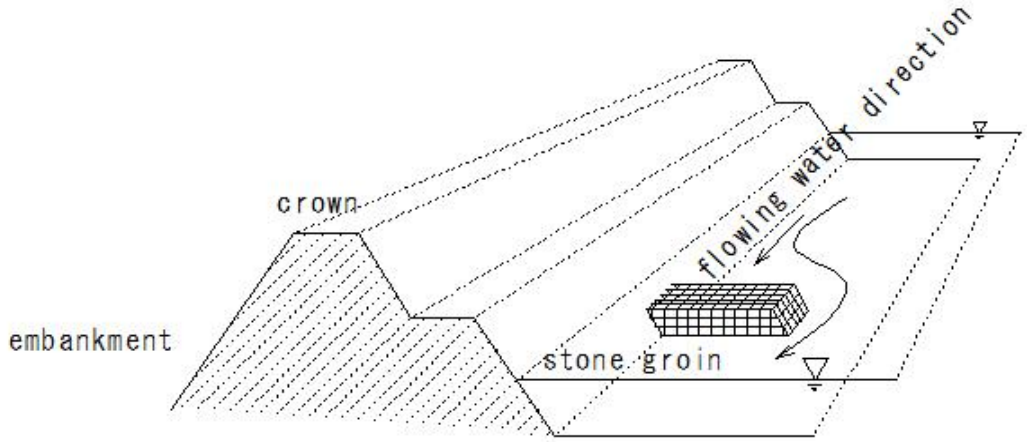
R481

(I727)Impermeable groin(solid spur)

(I727) Impermeable groin(solid spur)

Impermeable water system

Water system that water cannot pass through



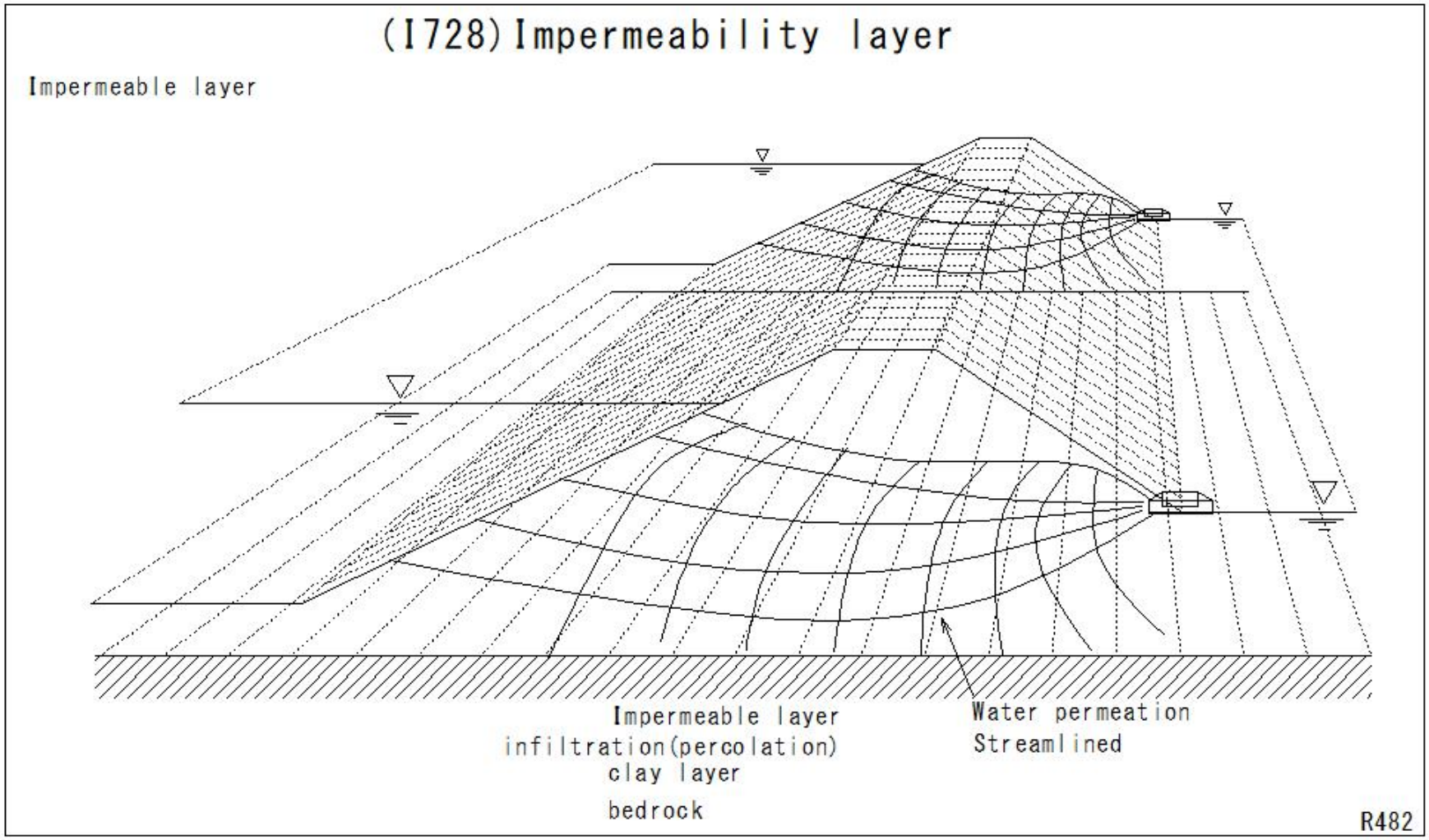
Resistance - large

Scouring - big

Water control effect - large

R298

(I728)Impermeability layer

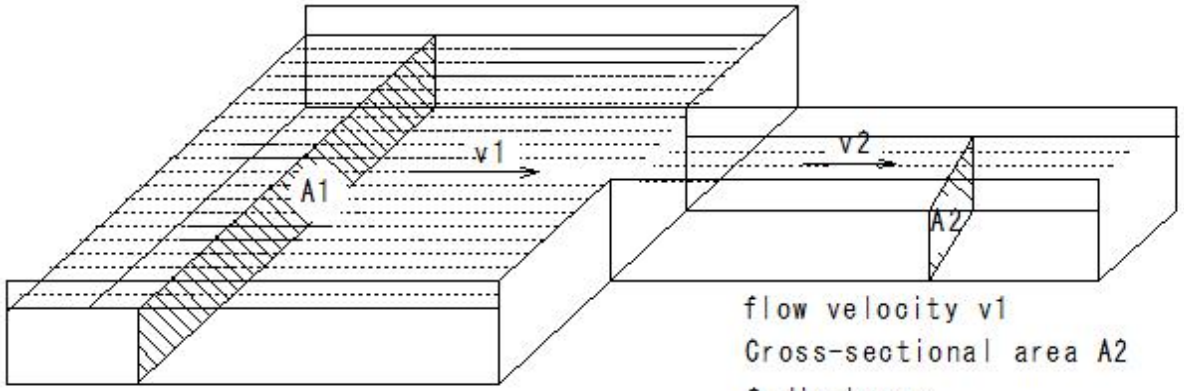


(I729)Non-uniform flow

(I729)Non-uniform flow

Non-uniform flow

Constant discharge
waterway
flow with changing flow velocity and volume



flow velocity v1
Cross-sectional area A2
Q:discharge
Q=A1v1=A2v2

R483

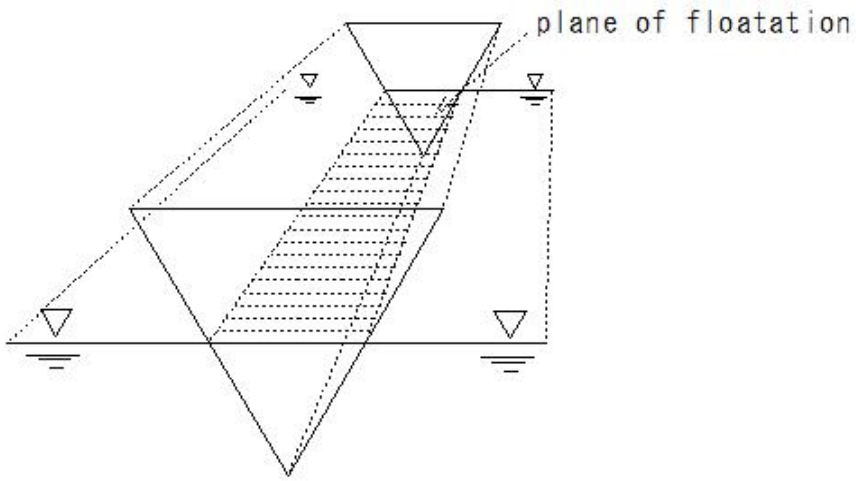
(I730)Plane of floatation

(I730)Plane of floatation

Plane of floatation

objects floating in water

Virtual cross section : cut by the water surface



R484

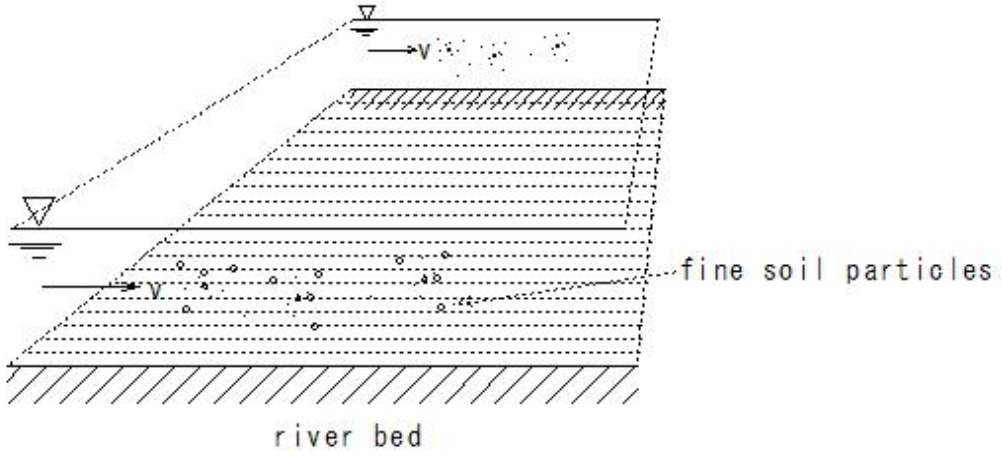
(I731)Suspended load

(I731) Suspended load

Suspended load

suspended load: floating and flowing in water

A phenomenon in which fine soil particles leave the river bed and float in the water.



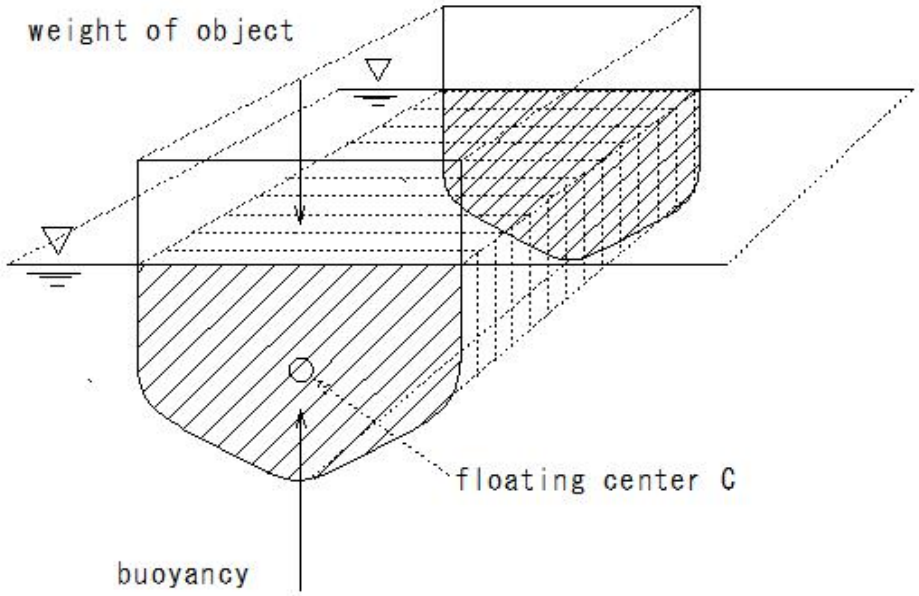
R485

(I732)Buoyancy

(I732)Buoyancy

Buoyancy

Buoyancy: Volume of object below the water line: Weight of water: Buoyancy



R486

(I733)Froude number

(I733)Froude number

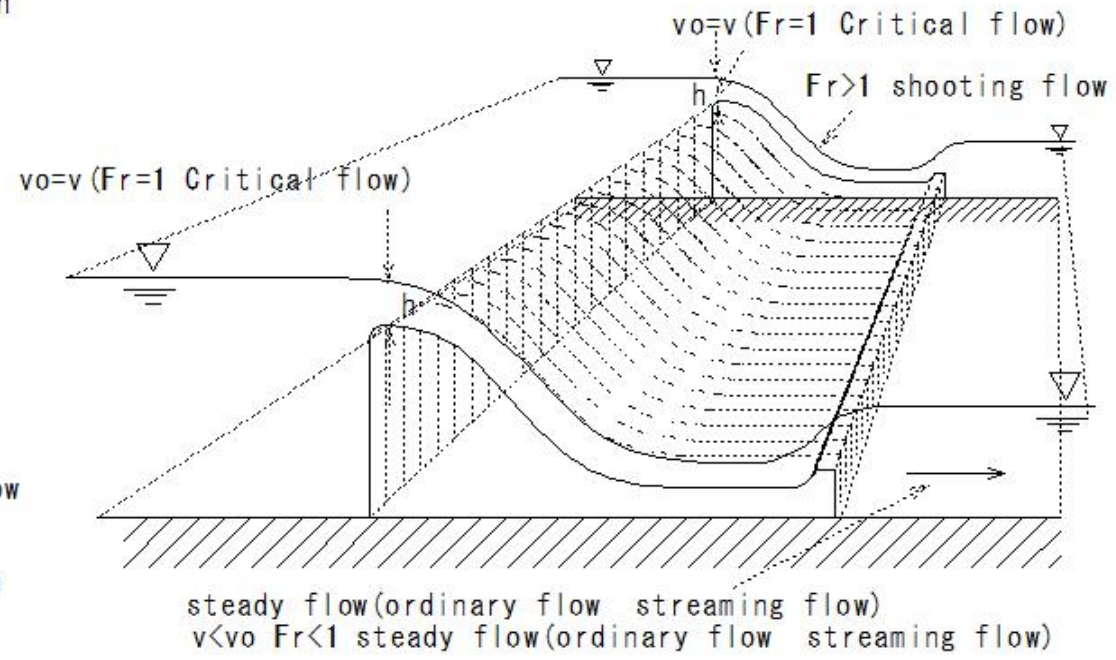
Froude number

open channel

Flow velocity v

Wave propagation speed vo(=√gh

Froude number Fr=v/vo=v/√gh



Fr>1 shooting flow

Fr=1 Critical flow

Fr<1 steady flow(ordinary flow streaming flow)

g: gravitational acceleration

h: water depth

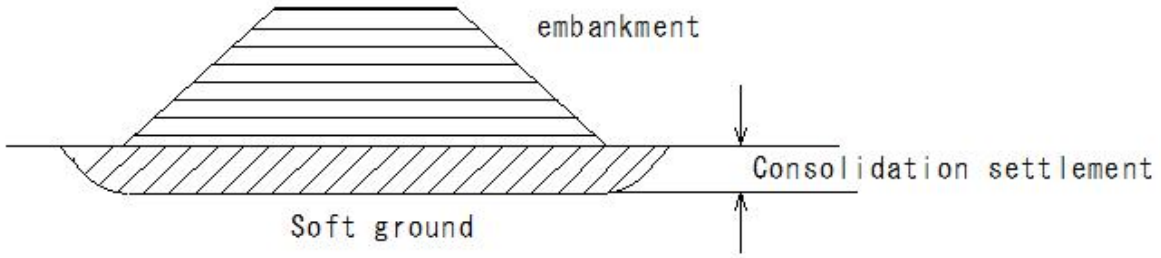
R487

(I734)Preloading

(I734)Preloading

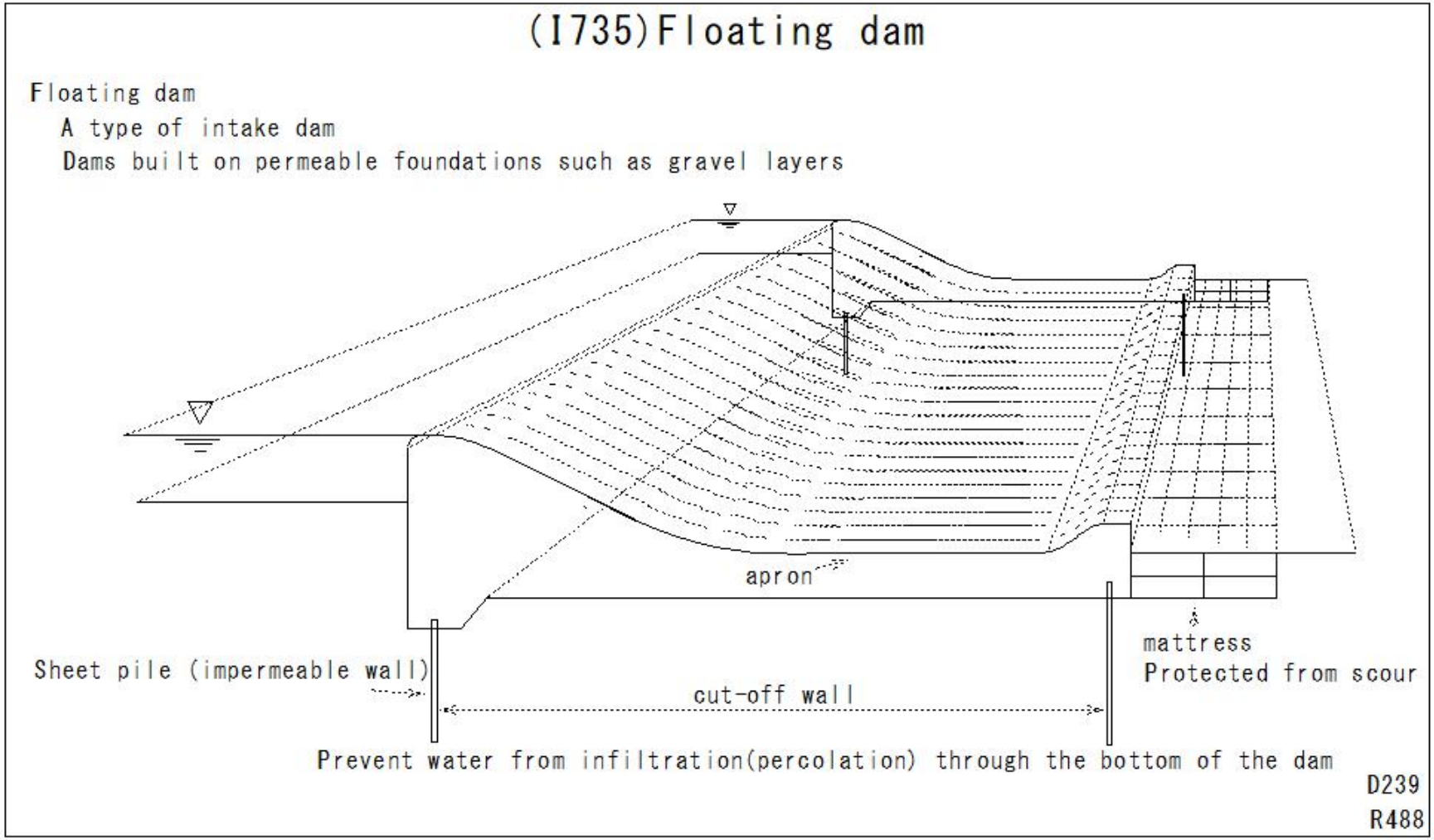
Preloading

Promotion of consolidation settlement

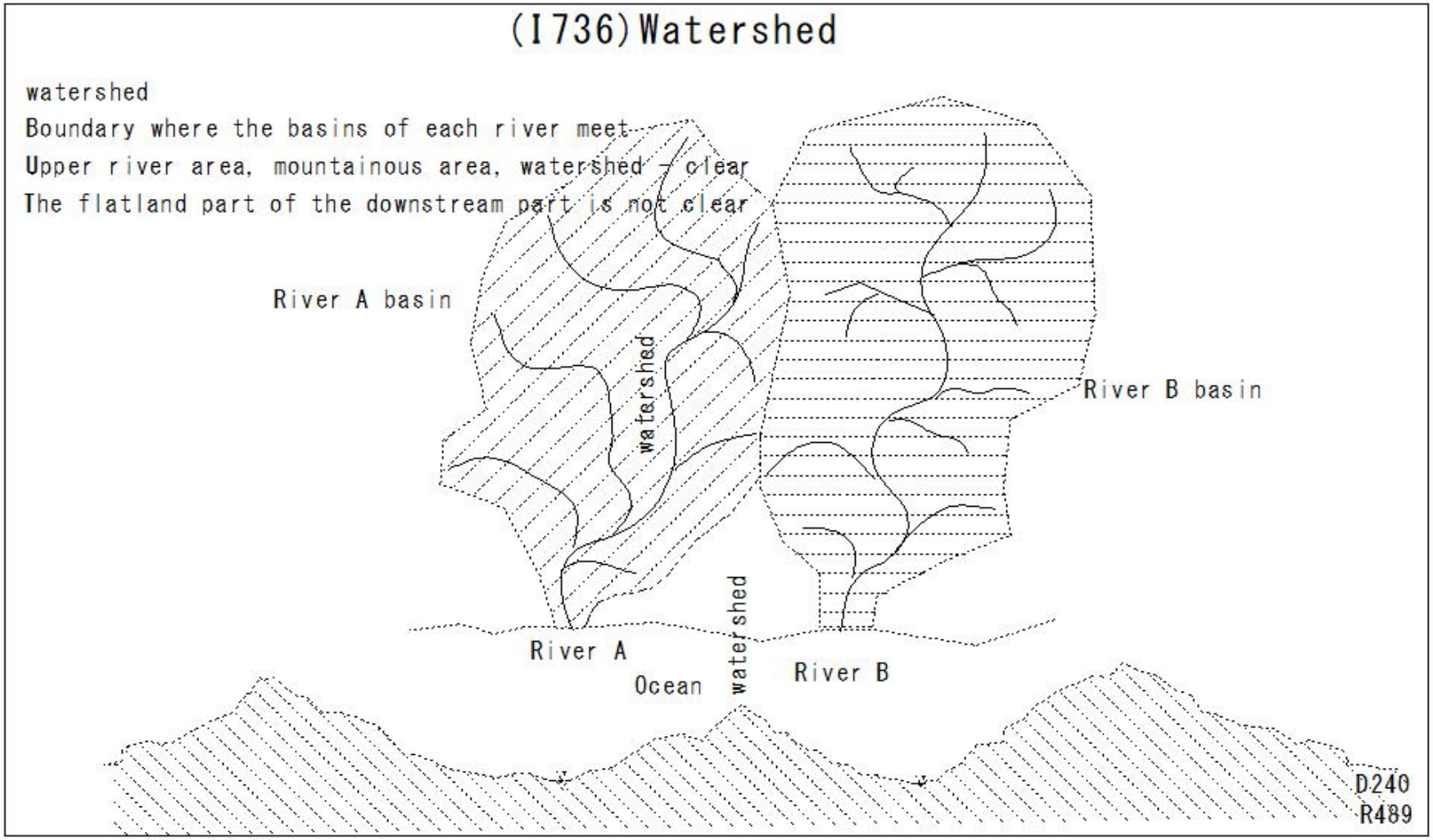


E610

(I735)Floating dam



(I736)Watershed

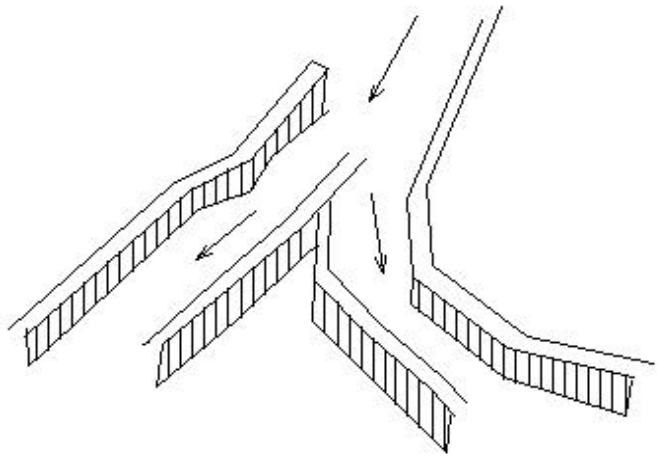


(I737)Diversion works

(I737)Diversion works

Diversion works

A structure that divides irrigation water according to the irrigated area.



shooting flow diversion works

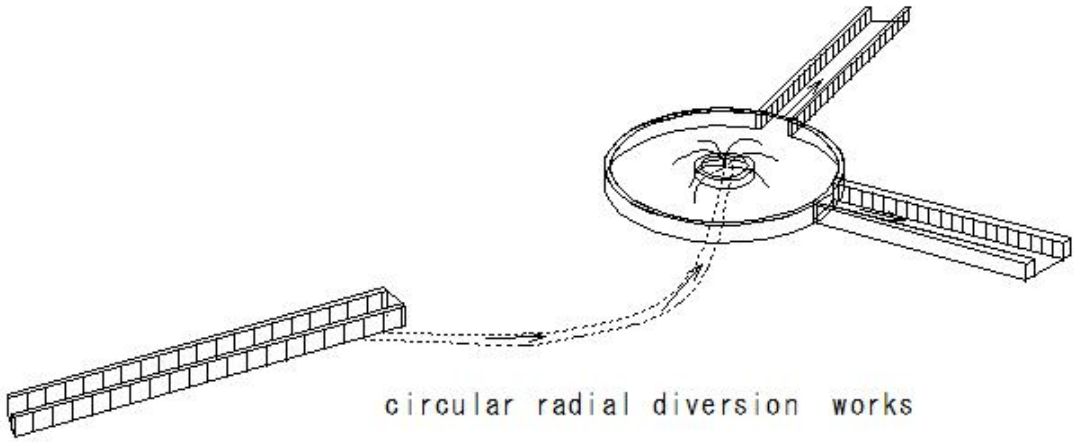
R490

(I738)Diversion works

(I738)Diversion works

diversion works

A structure that divides irrigation water according to the irrigated area.



circular radial diversion works

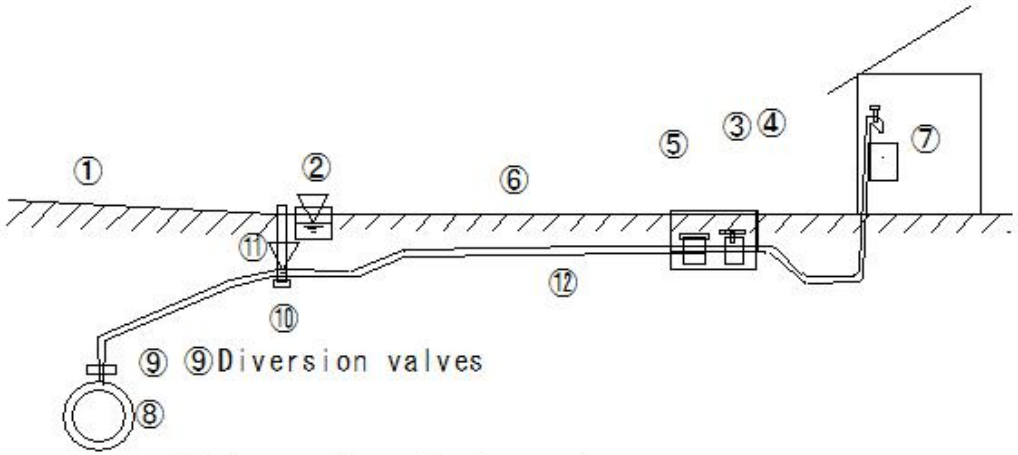
R491

(I739)Sewerage(Water distribution valve(ferrule))

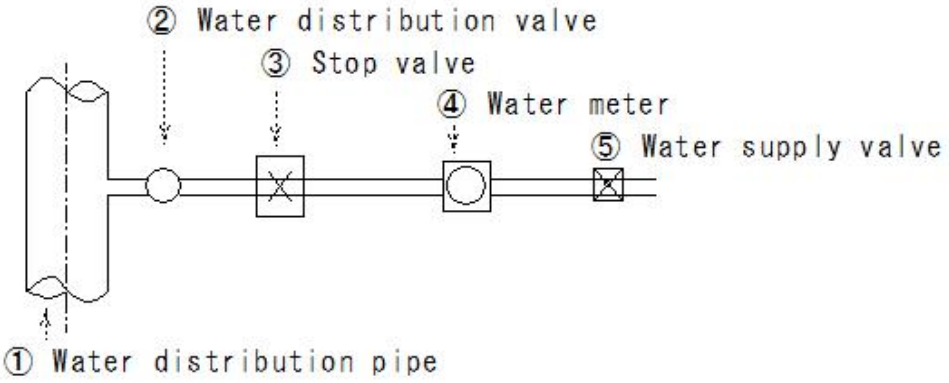
(I739)Sewerage(Water distribution valve(ferrule))

Water distribution valve(ferrule)

A device is installed in case of branching off a water supply pipe from a distribution pipe



W49,50



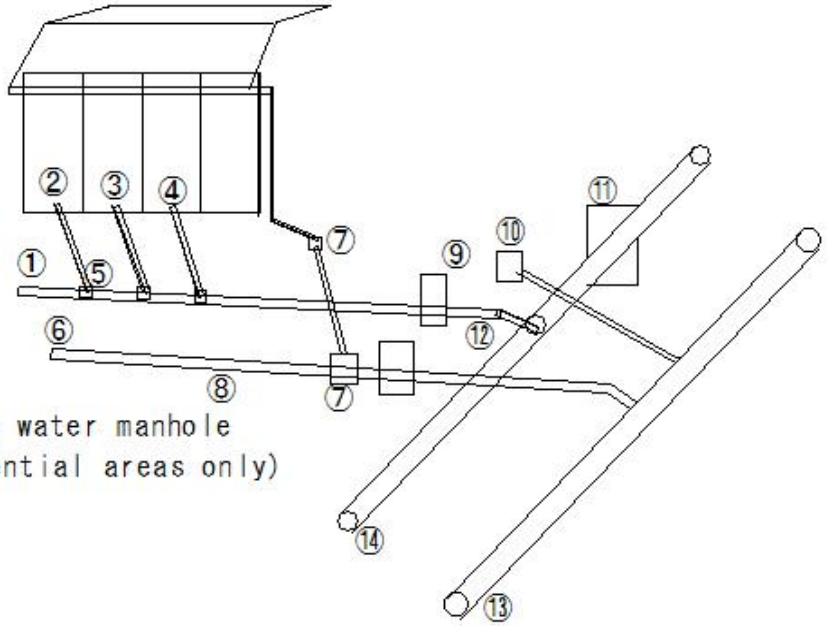
W182

(I740)Sewerage(separate system)

(I740)Sewerage(separate system)

Sewerage

Separate type



① Water distribution pipe (sewage pipe)
② Kitchen
③ Bathroom
④ Toilet
⑤ Sewage manhole
⑥ Drainage pipe (storm water pipe) Storm water manhole
⑦ Public storm water manhole (for residential areas only)
⑧ Rainwater attachment pipe
⑨ Public sewage manhole
⑩ Public storm water manhole
⑪ Sewage manhole
⑫ Sewage attachment pipe
⑬Sewer pipes (rain water pipes)
⑭ Sewer pipes (sewage pipes)

W181

(I741)Sewerage(Combined type/ Separate type)

(I741)Sewerage(Combined type/ Separate type)

Sewerage

Sewerage planning

⑤ Wastewater removal method

① Combined type

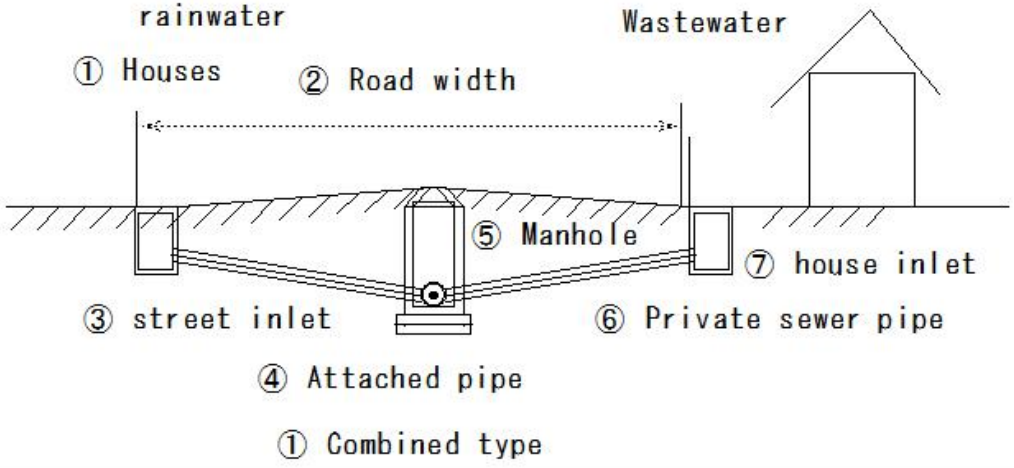
Wastewater and rainwater are discharged through the same pipe

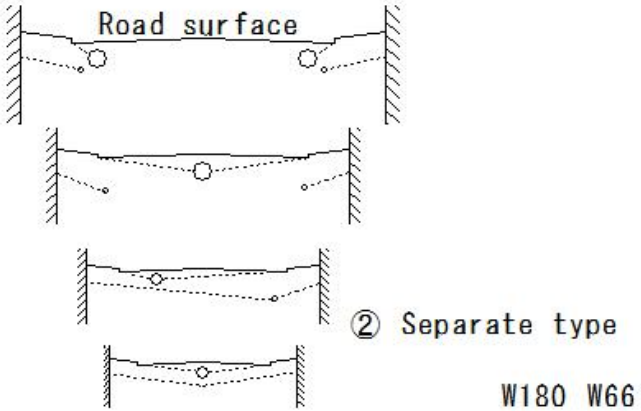
in case of there is a lot of rainfall → Discharged without treatment

② Separate type

Wastewater and rainwater are discharged through separate pipes

Wastewater is treated and then discharged → Water quality is maintained Cost → High





W180 W66

○: Large circle: water pipe

◦: Small circle: sewage pipe

(I742)Mean velocity

(I742)Mean velocity

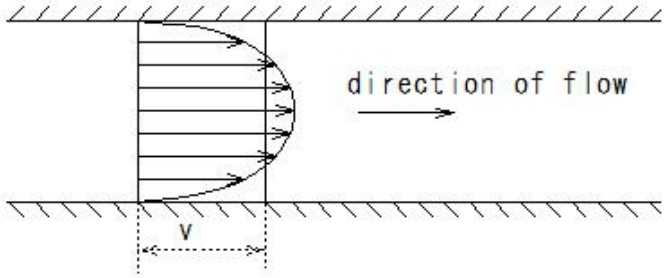
Mean velocity

flow velocity v1 v2 v3

mean velocity V=Q/A

Q: discharge

A: cross sectional area of stream



R492

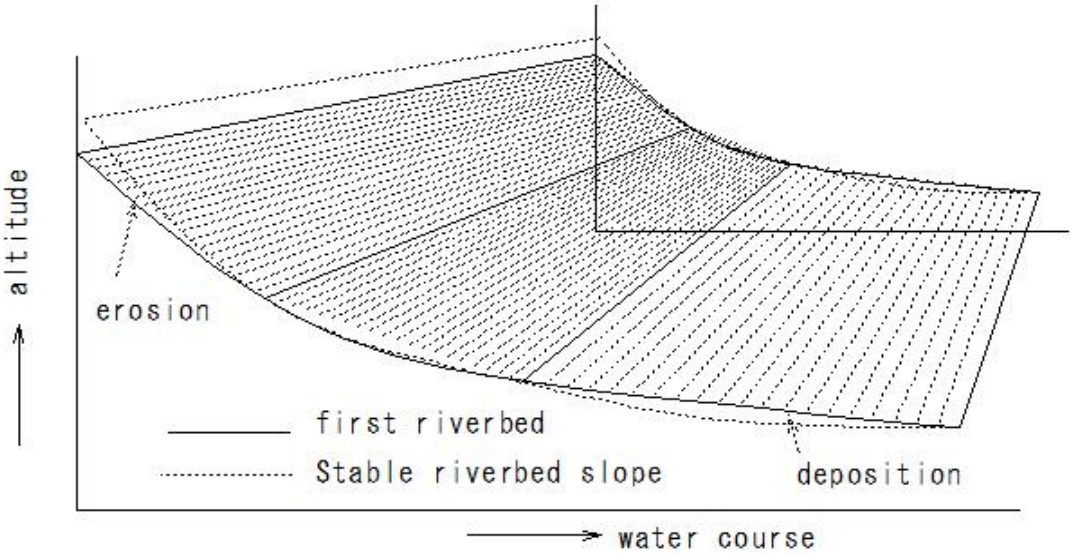
(I743)Equilibrium slope

(I743)Equilibrium slope

Equilibrium slope

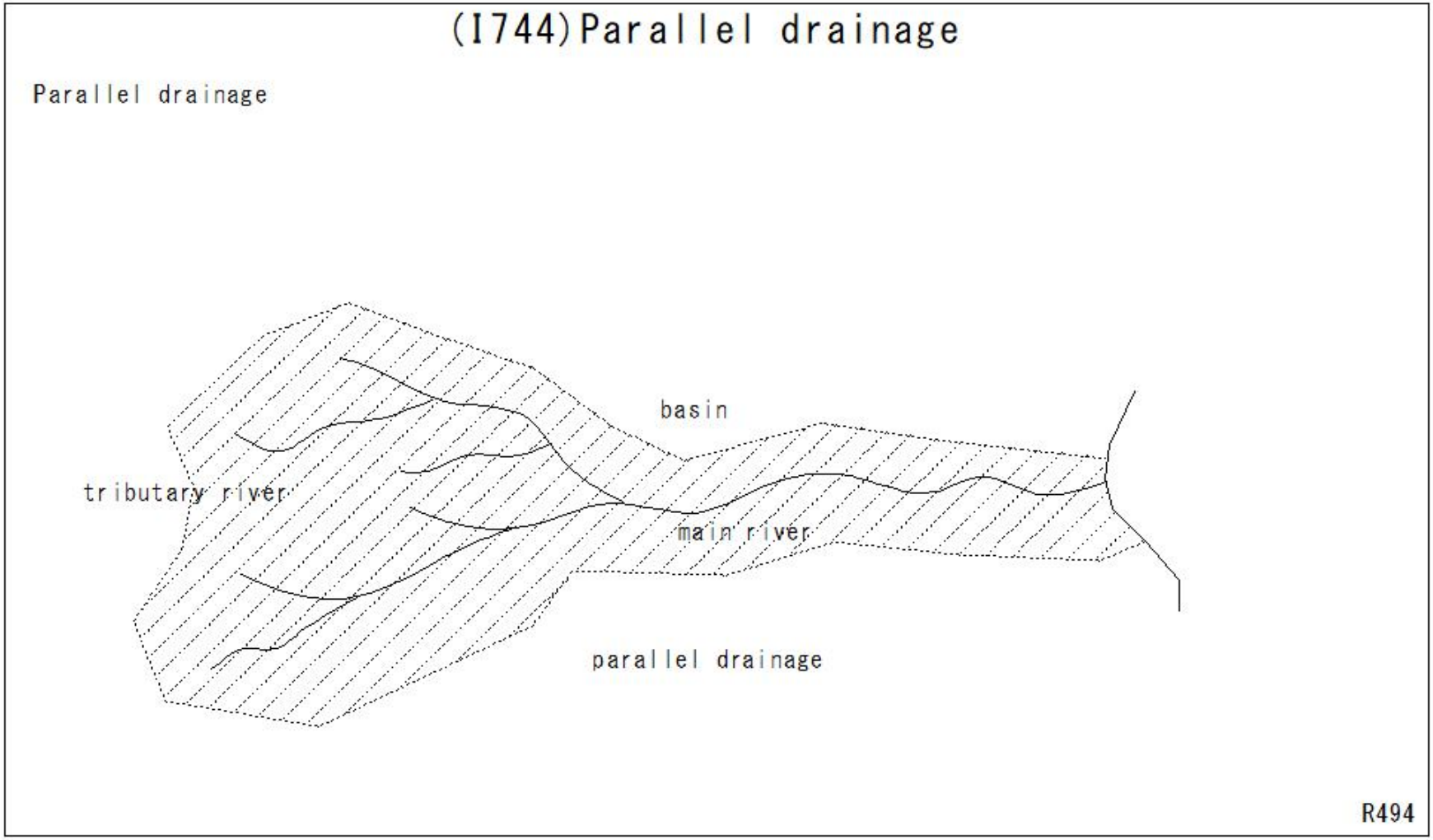
In a river with an equilibrium gradient, neither sedimentation nor scouring occurs.

River water flow, erosion, transportation, deposition



R493

(I744)Parallel drainage



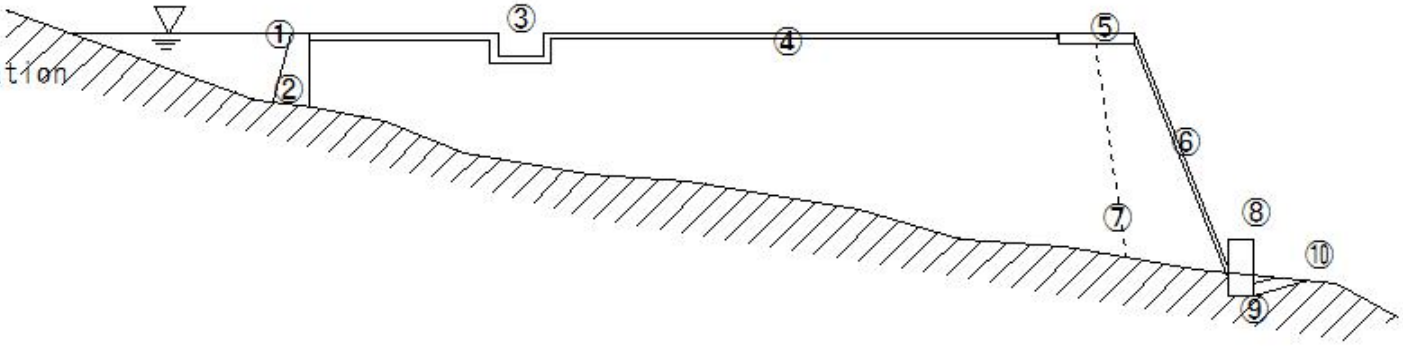
(I745)Head tank

(I745)Head tank

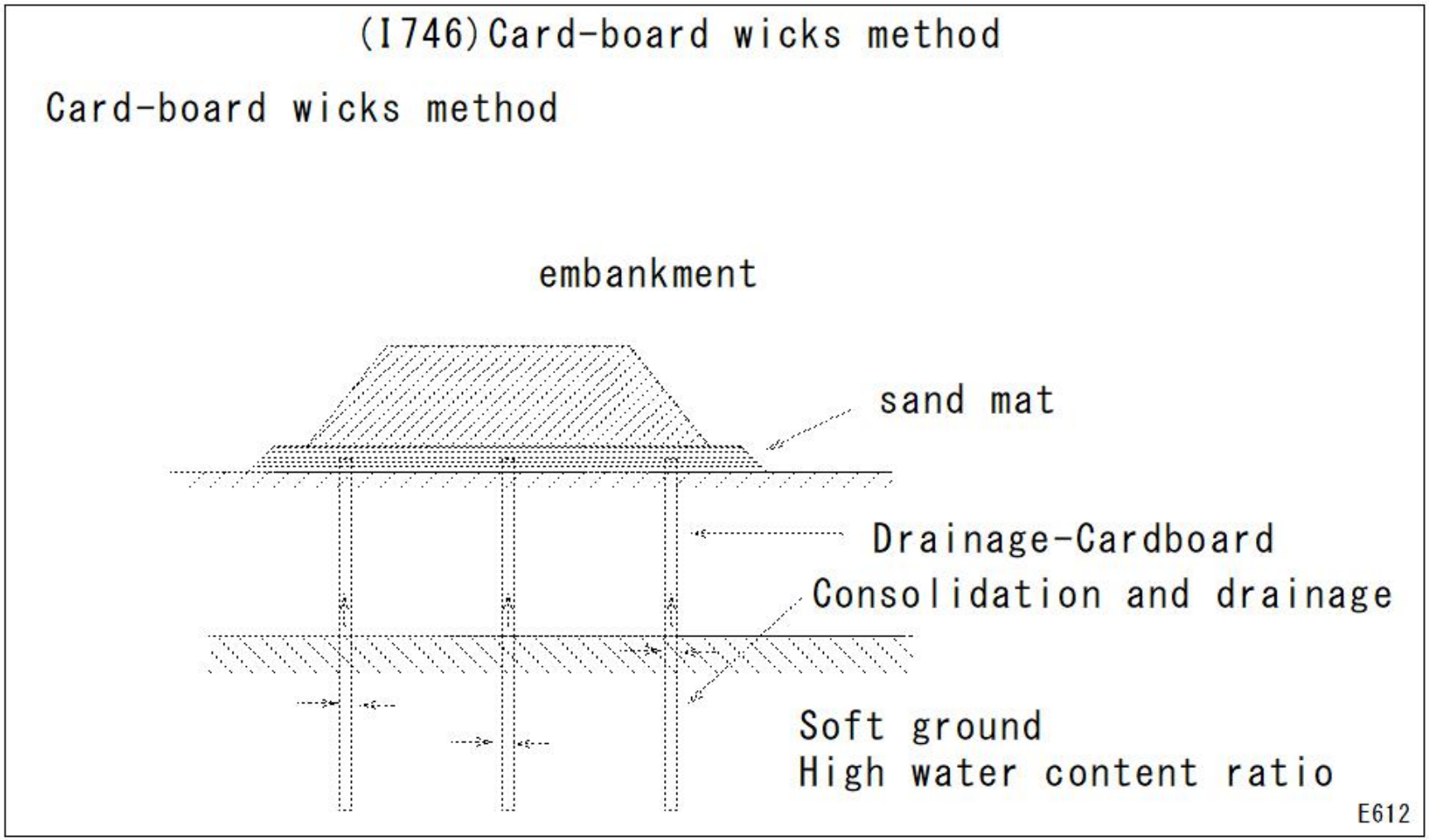
Head tank

- A head tank is a water tank located between the waterway and the penstock at a hydroelectric power plant
- A water tank located between the waterway and the penstock
- Prevents water hammer caused by load fluctuations
- For short-term water volume adjustment, overflow of surplus water, and removal of obstacles such as sediment

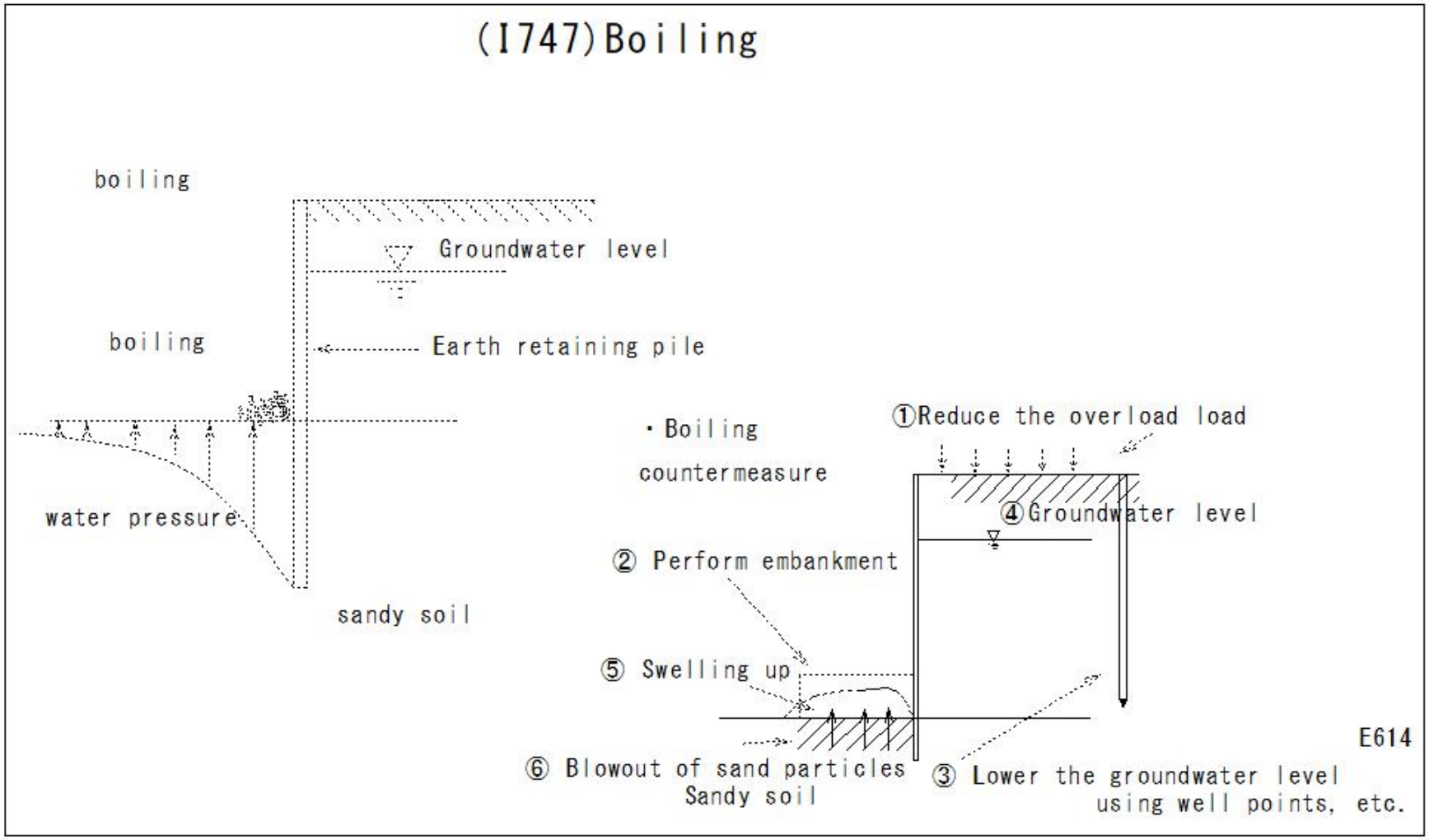
① Intake
② Dam
③ Settling basin (Grit chamber)
④ Conduit
⑤ Head tank
⑥ Penstock
⑦ Spillway
⑧ Power station
⑨ Outlet
⑩ Outlet



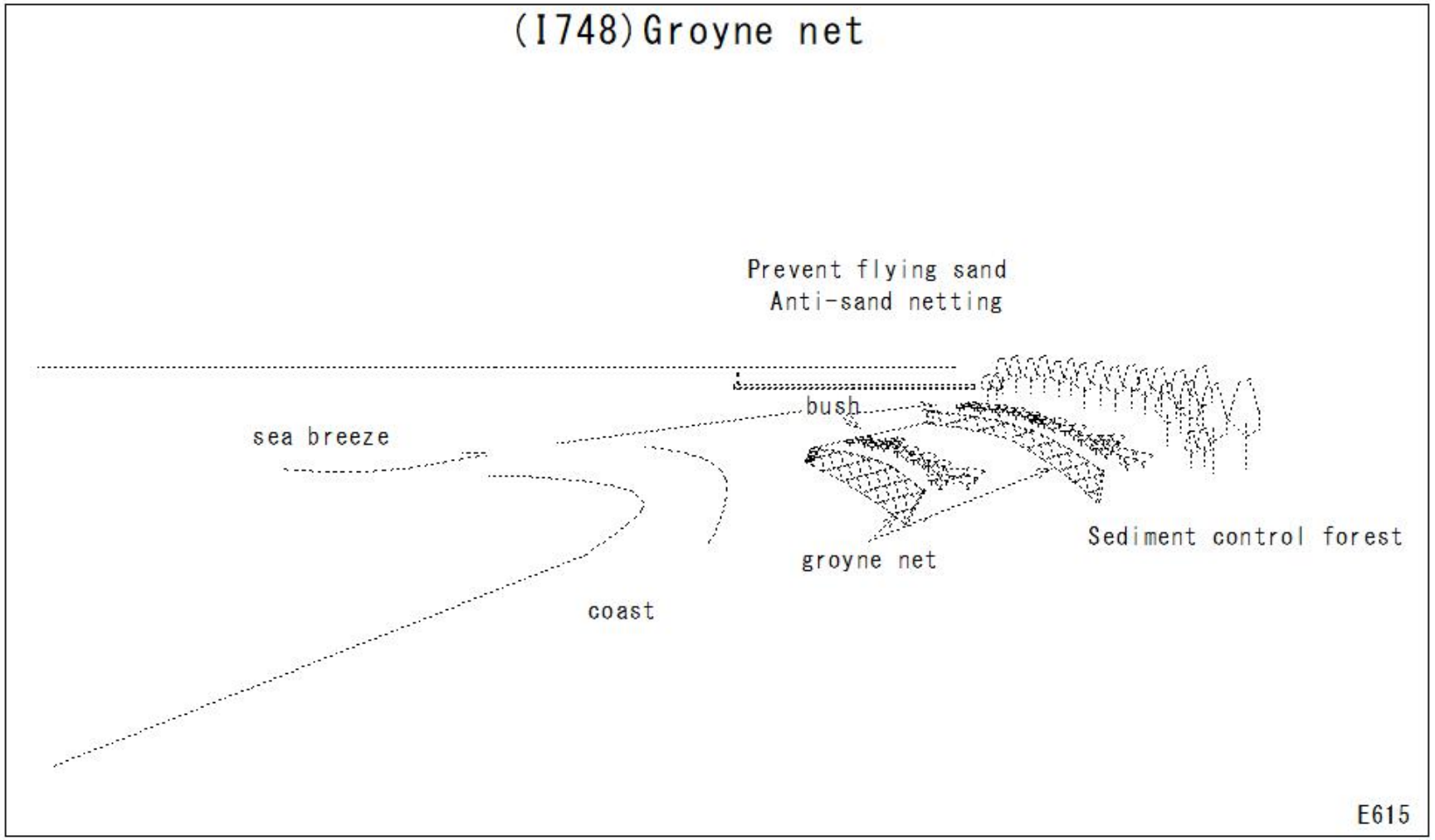
(I746)Card-board wicks method



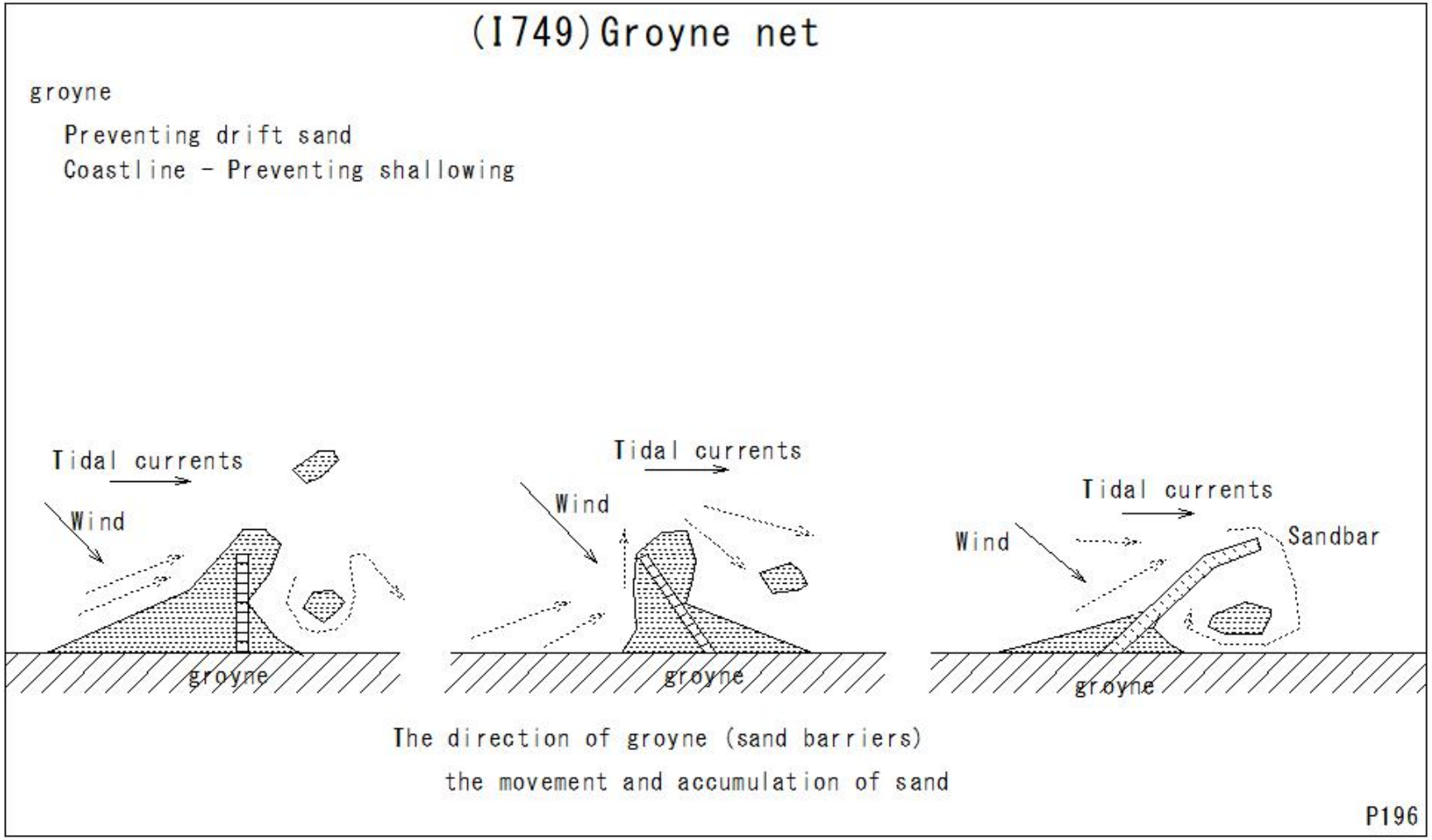
(I747)Boiling



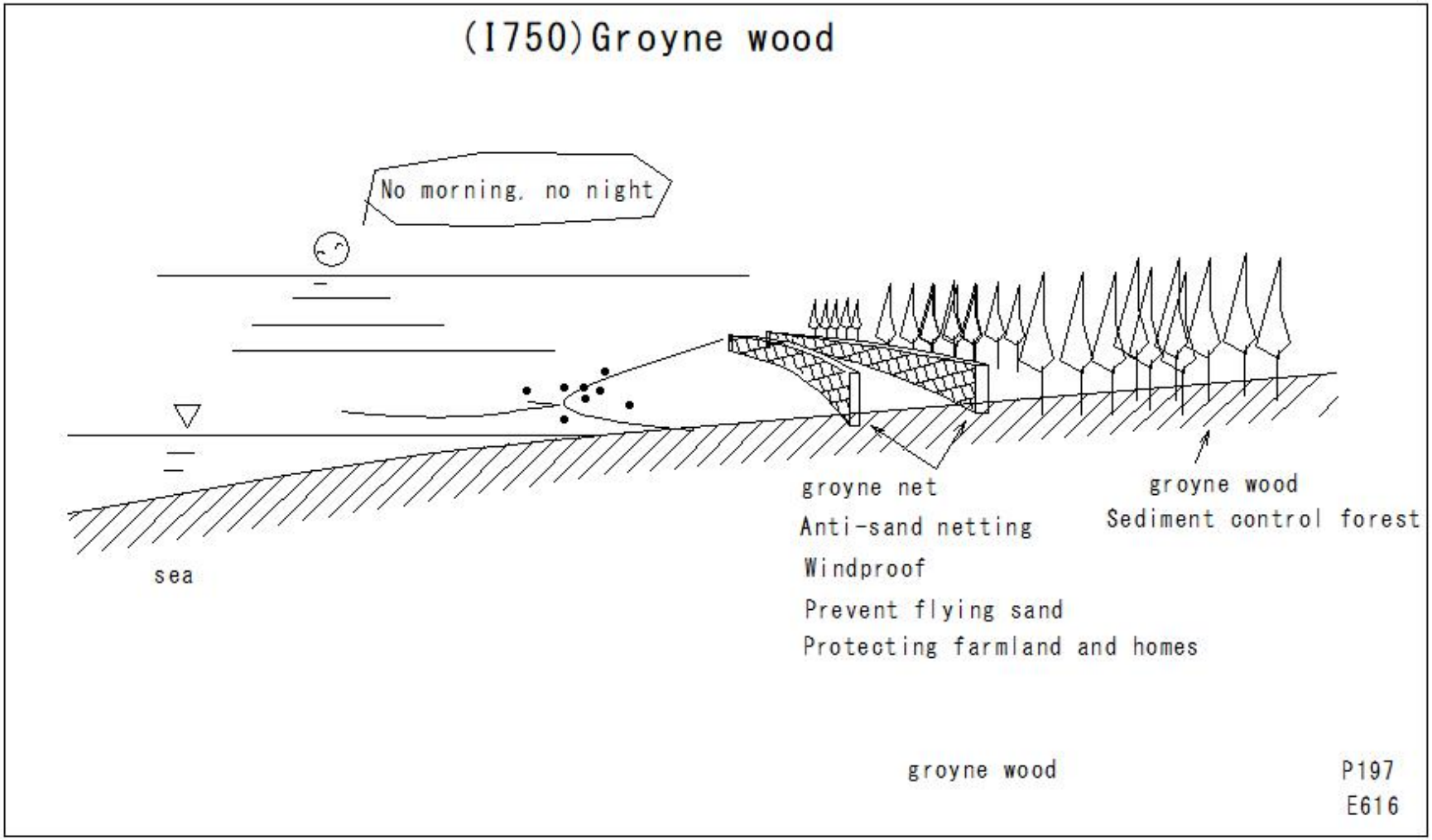
(I748)Groyne net



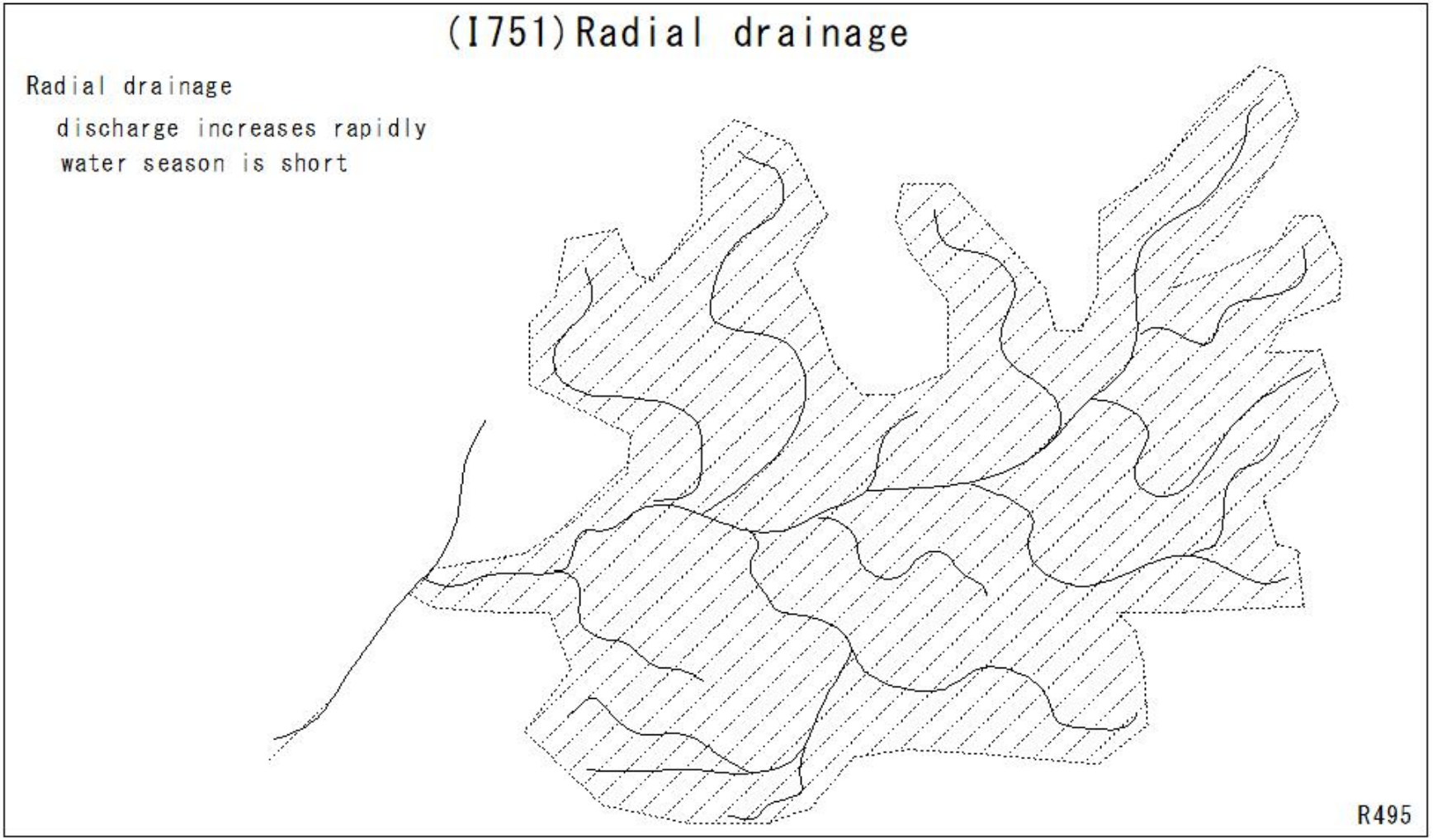
(I749)Groyne net



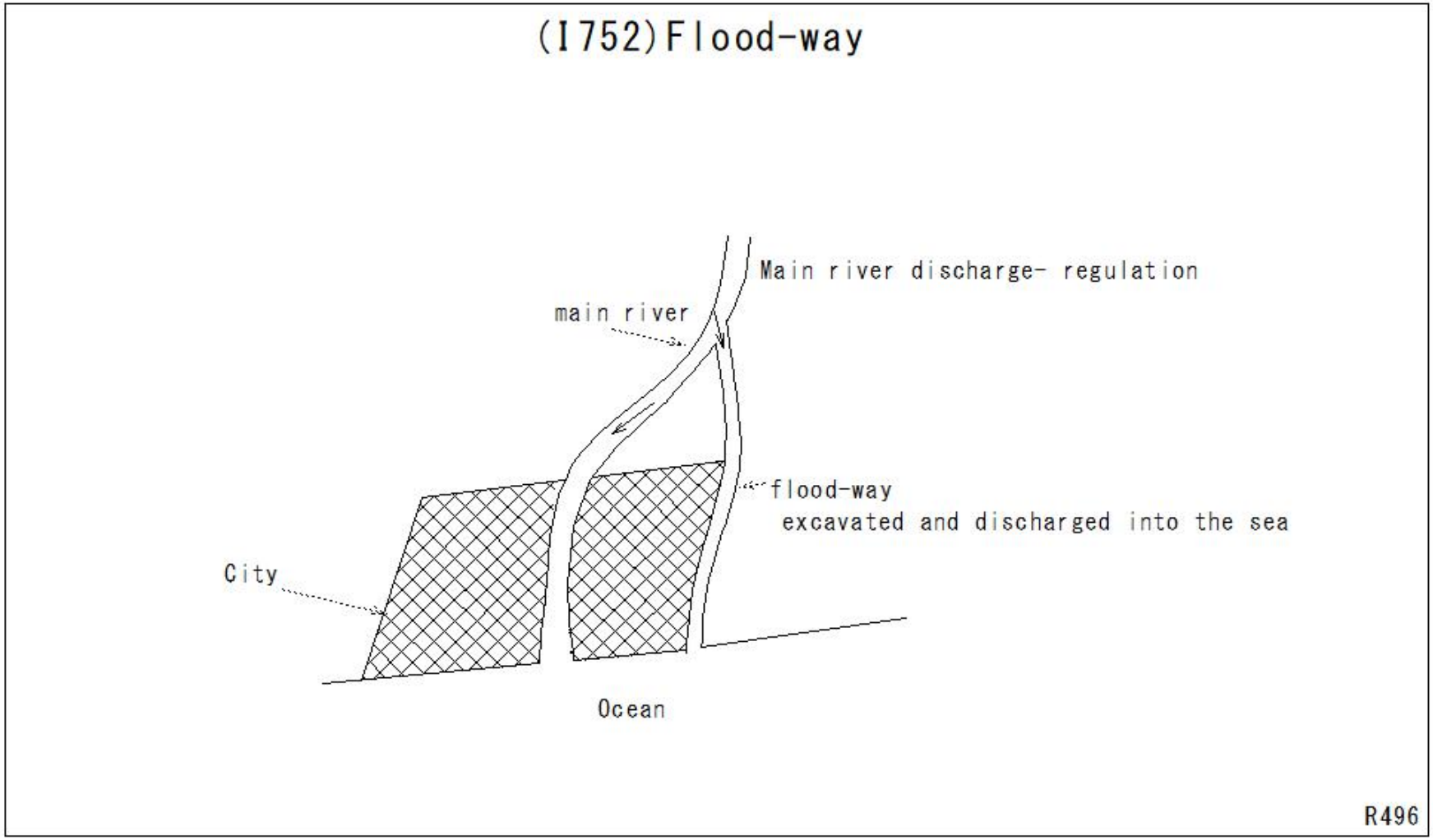
(I750)Groyne wood



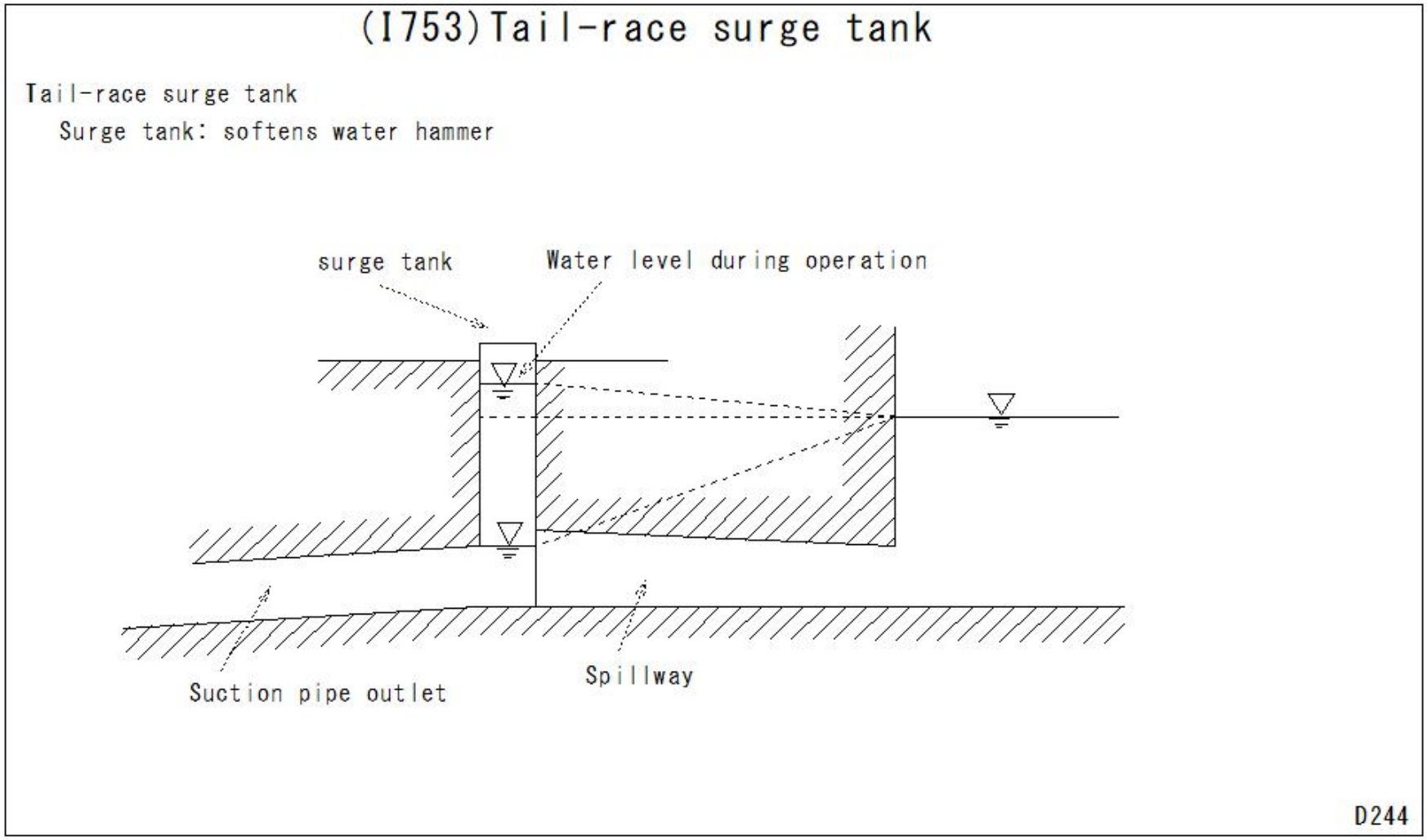
(I751)Radial drainage



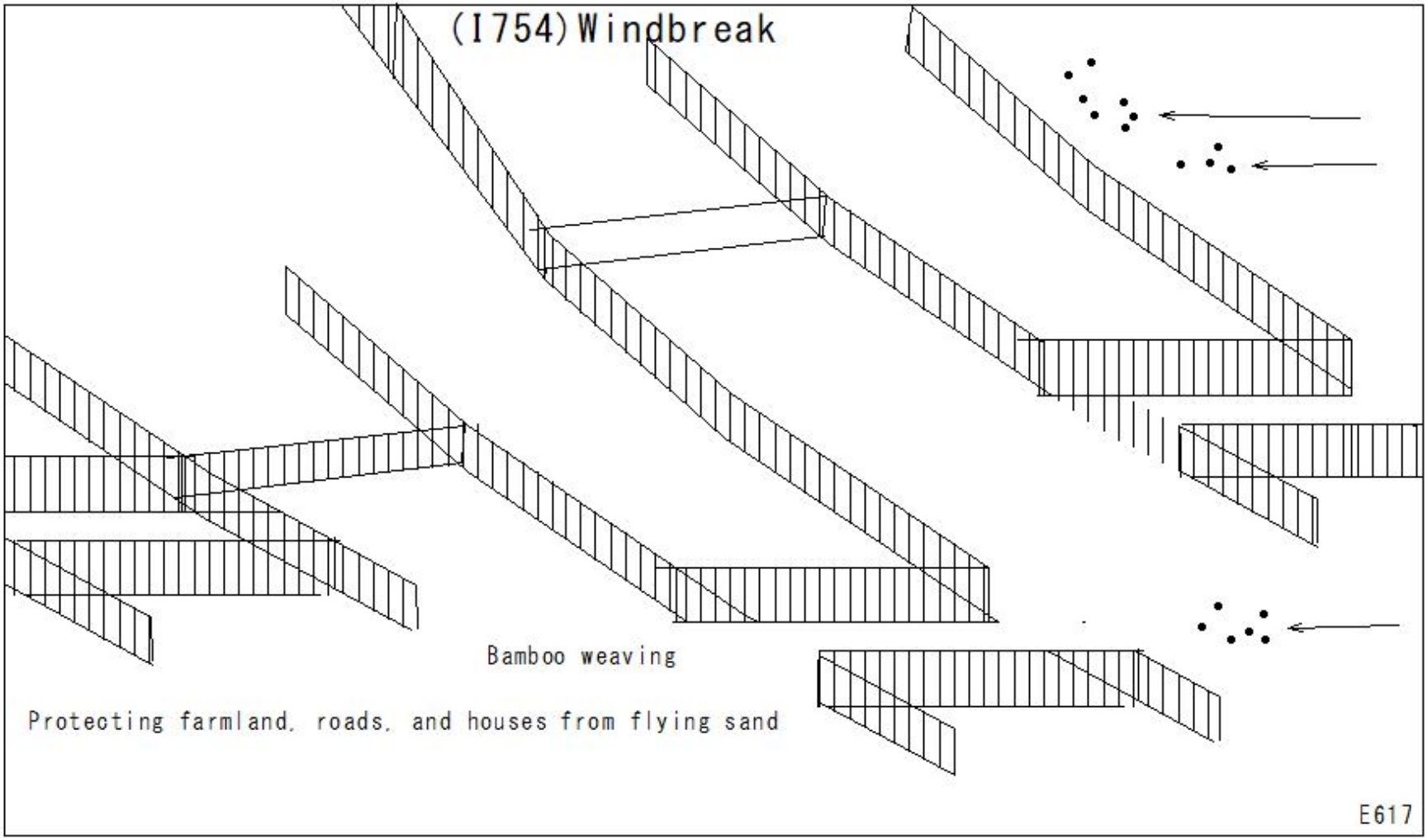
(I752)Flood-way



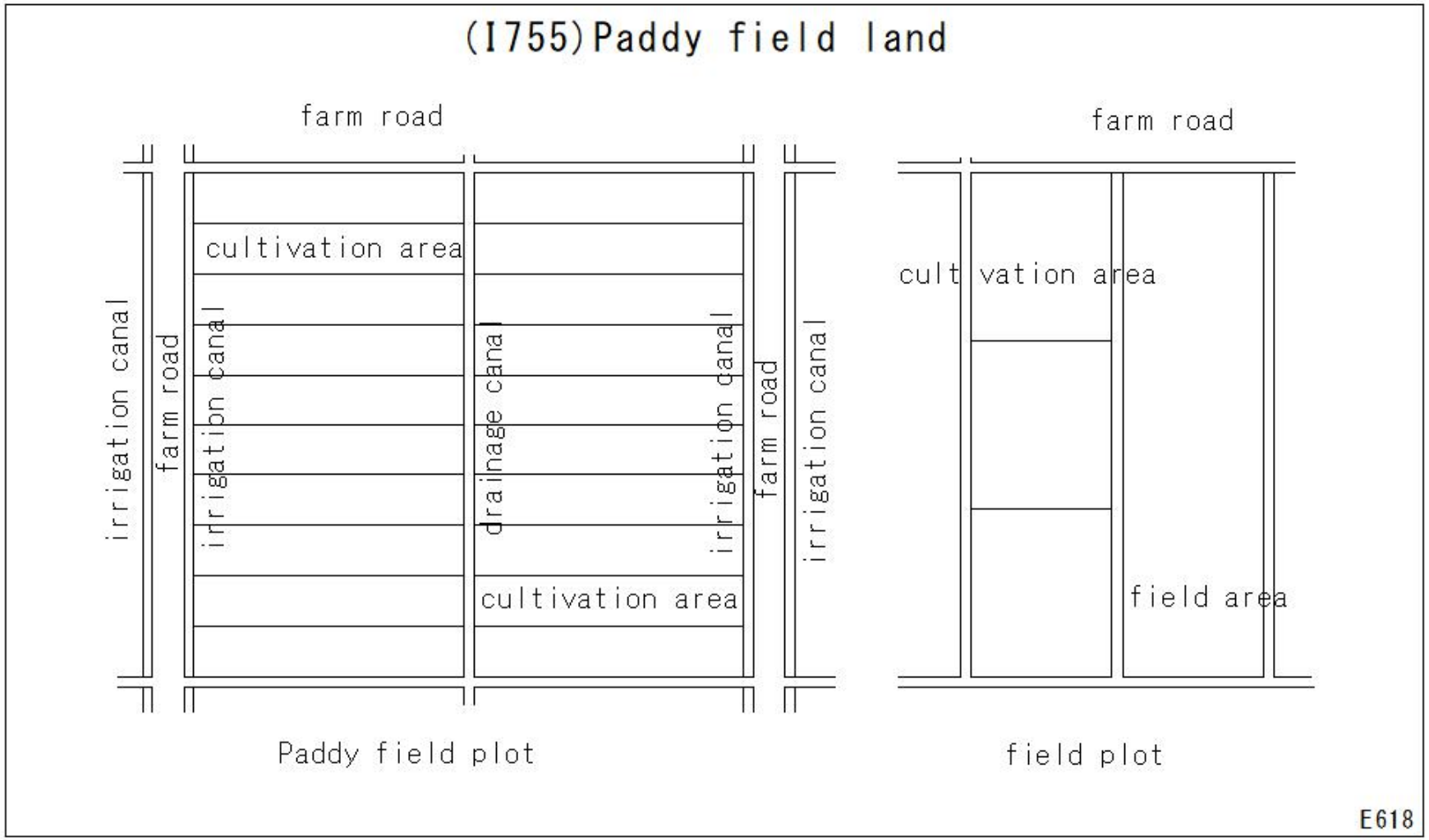
(I753)Tail-race surge tank



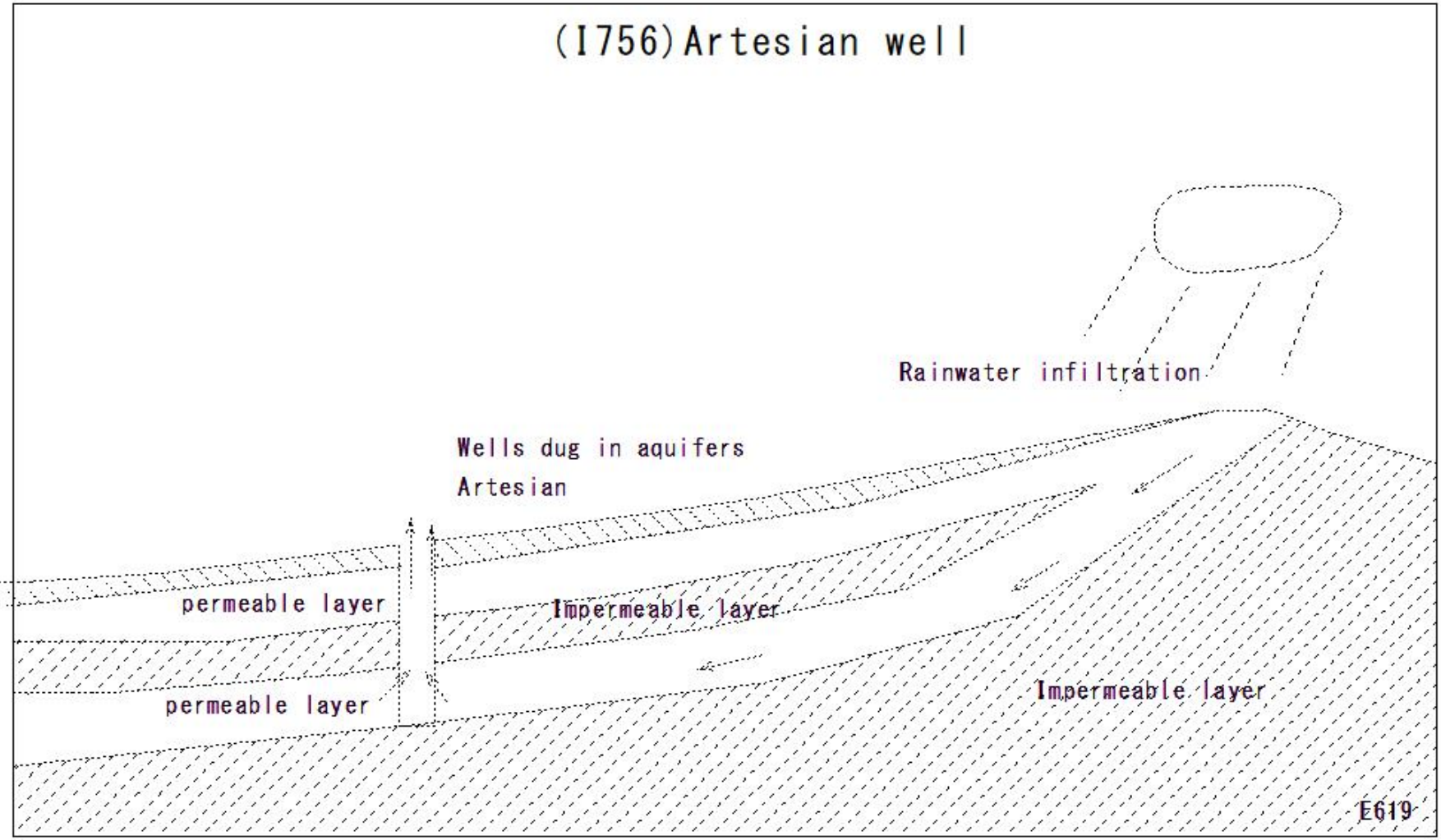
(I754)Windbreak



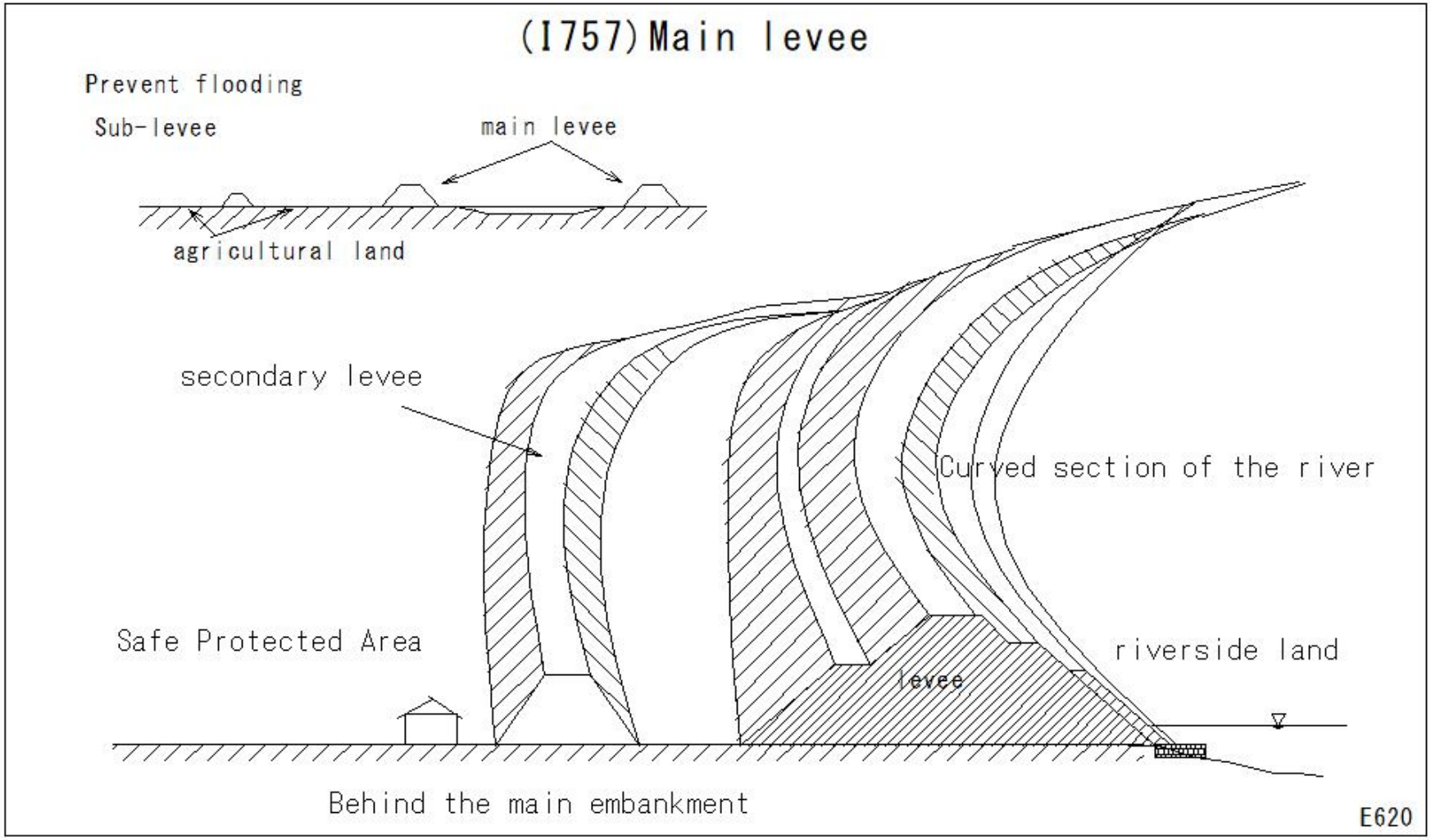
(I755)Paddy field land



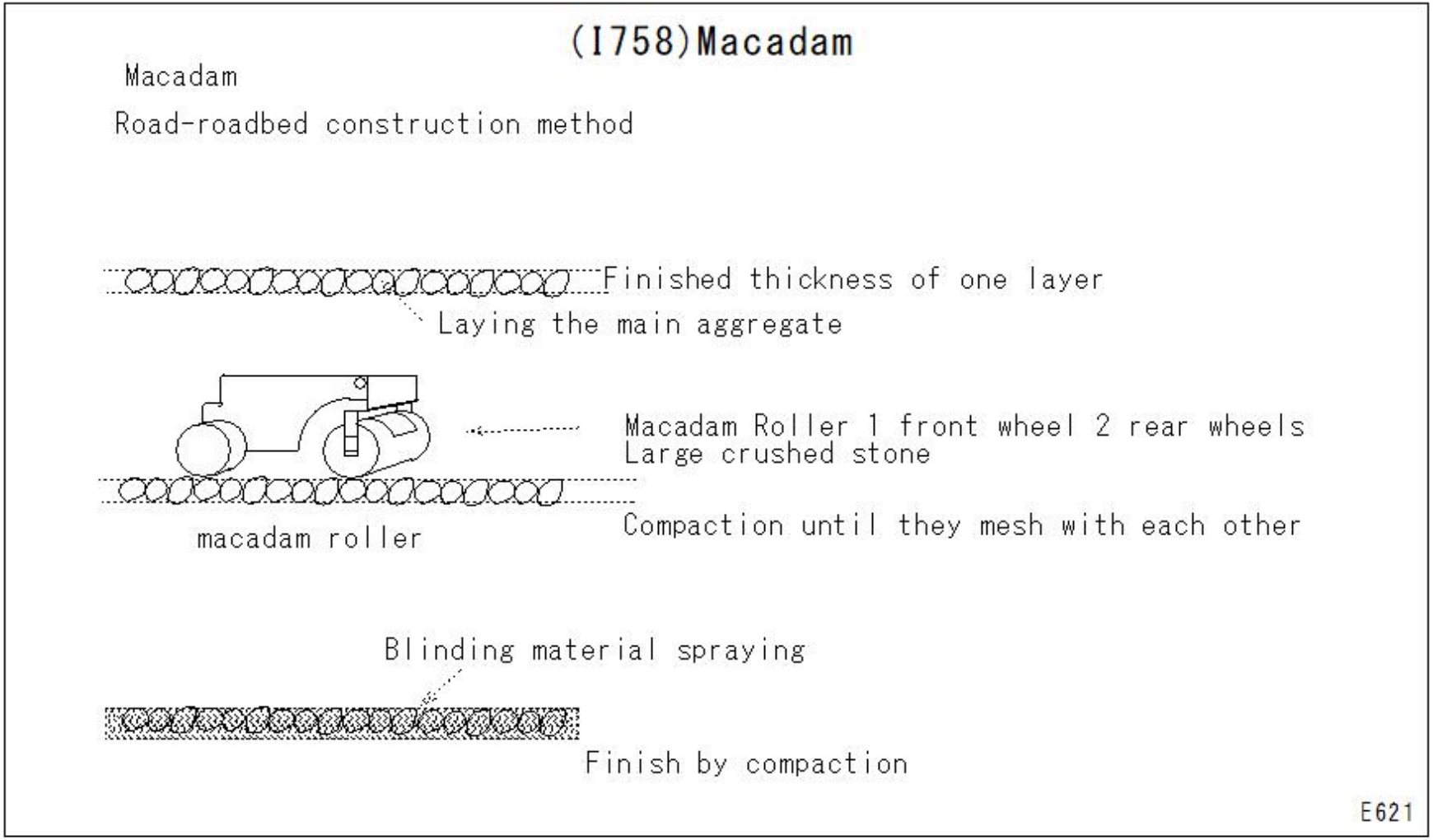
(I756)Artesian well



(I757)Main levee



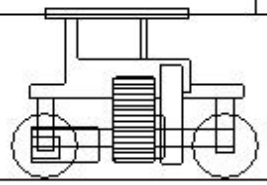
(I758)Macadam



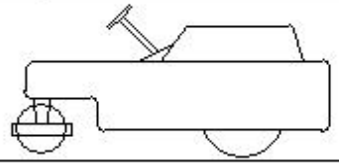
(I759)Earthworks-Characteristics of Earthmoving Machinery

(I759)Earthworks-Characteristics of Earthmoving Machinery

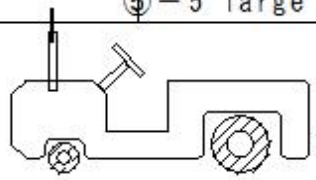
Characteristics of Earthmoving Machinery				
①Work	②model	③Transportation	④Soil quality	⑤Work conditions
①－5 static pressure				
	②－5 macadam roller			
		③－5 Working speed	2km/h	
			④－5 Rock mass, gravel, sand, sandy soil	
				⑤－5 large work area
①－5 static pressure				
	②－5 tandem roller			
		③－5 Working speed	2.5km/h	
			④－5 Rock mass, gravel, sand, sandy soi	
				⑤－5 narrow workplace space
①－5 static pressure				
	②－5 tire roller			
		③－5 Working speed	3km/h	
			④－5 sandy soil clayey soil	
				⑤－5 large work area



macadam roller



tandem roller



tire roller

E186

(I760)Earthmoving machinery-Compaction machines

(I760)Earthmoving machinery-Compaction machines

Earthmoving machinery

Compaction machines

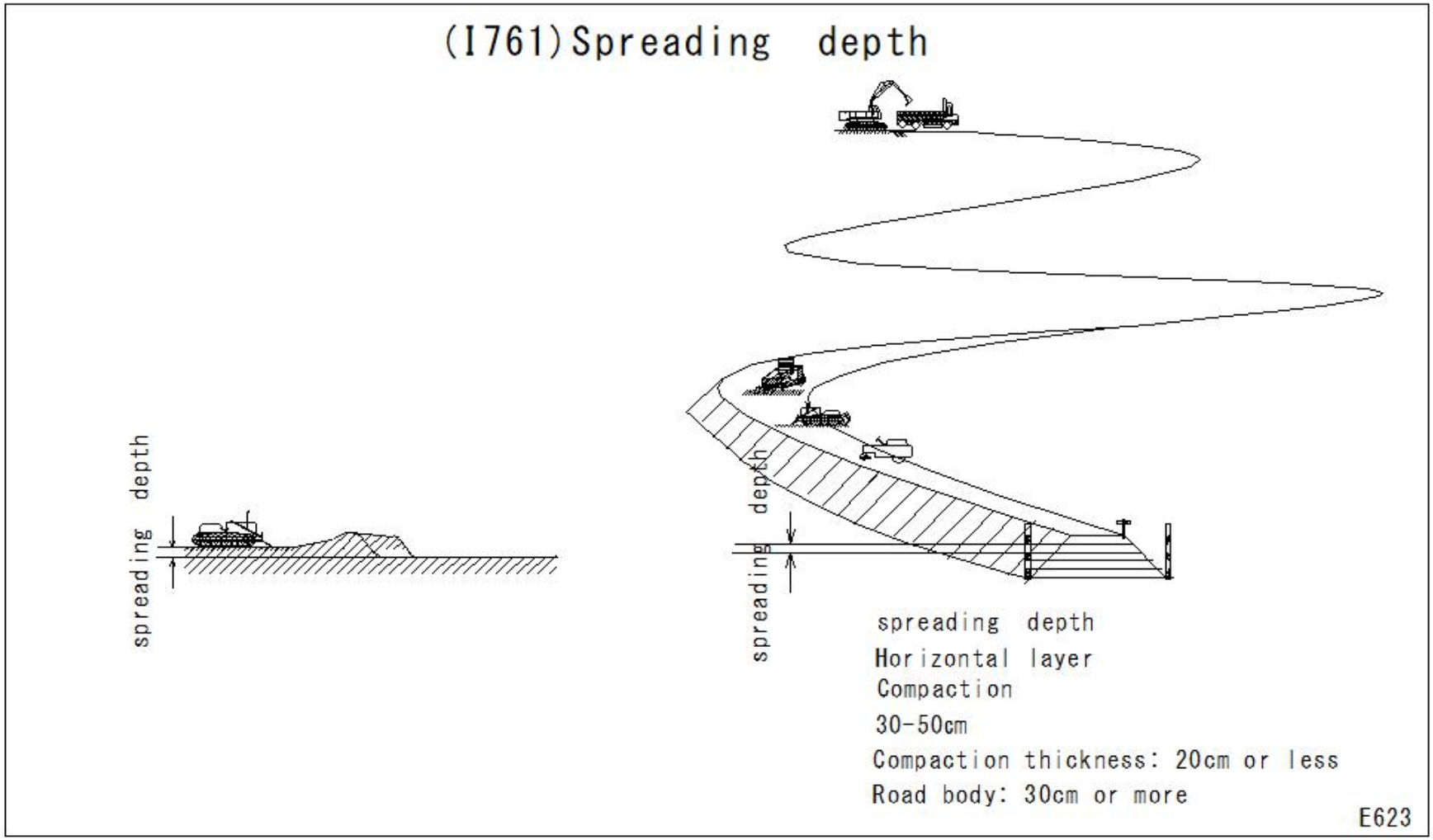
・Types of compaction machines

①Compaction machine

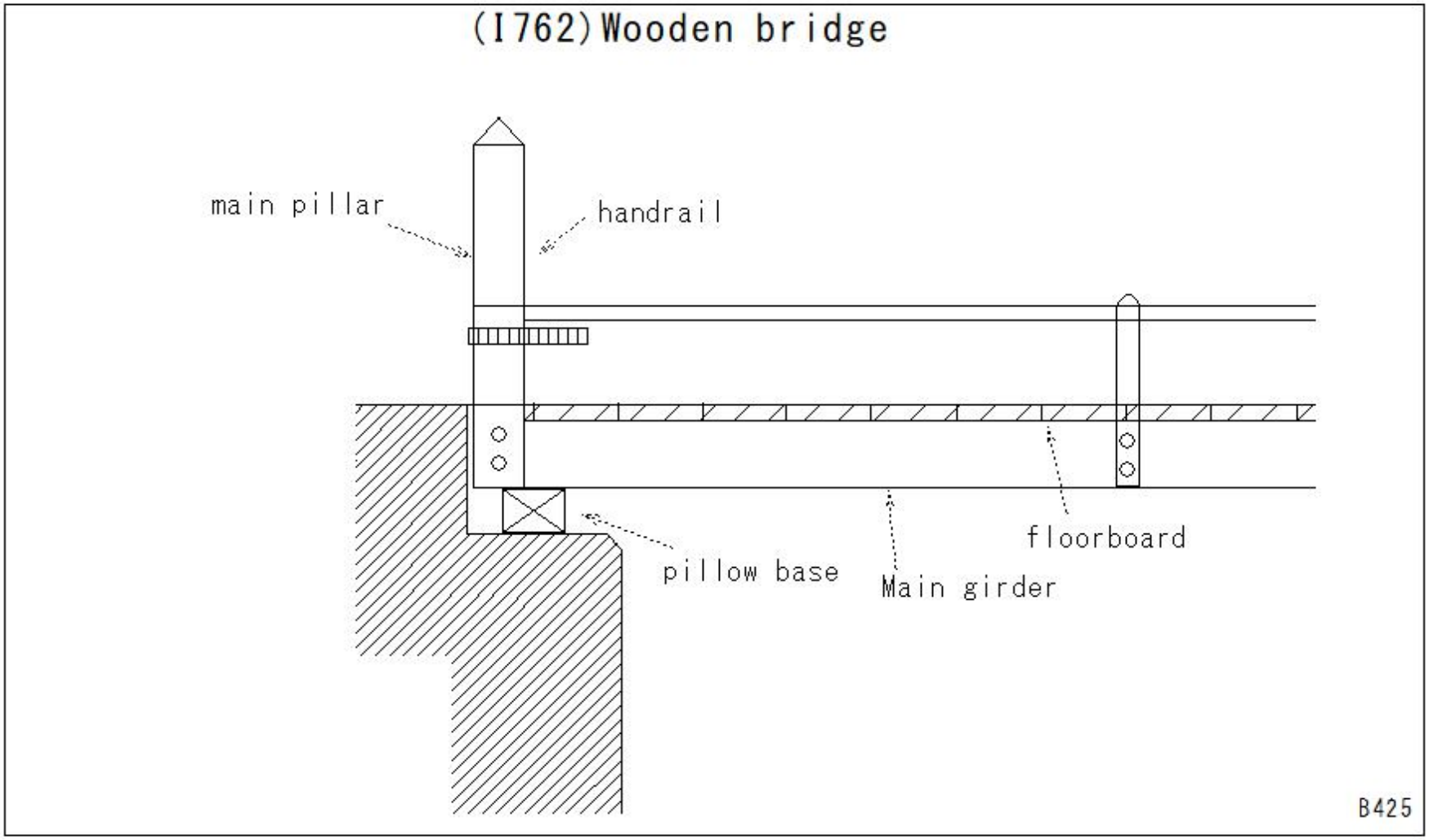
- ②Static
  - ⑤Iron wheel (road roller)
    - ⑫Self-propelled
      - 21Macadam roller
      - 22Tandem roller
      - 23 3-axis tandem roller
    - ⑬Towed style
  - ⑥Tire (tire roller)
    - ⑭Self-propelled
    - ⑮Towed style
  - ⑦Iron wheel + tire (combined roller)
  - ⑧Iron ring (vibration roller)
    - ⑯Self-propelled
    - ⑰Towed style
- ③Dynamic
  - ⑱Band guide type
  - ⑨Tire (vibrating roller)
    - ⑲Self-propelled
    - ⑳Towed style
  - ⑩Flat plate (vibrating compactor)
- ④Shocking
  - ⑪Flat plate (tamper, rammer)

E310

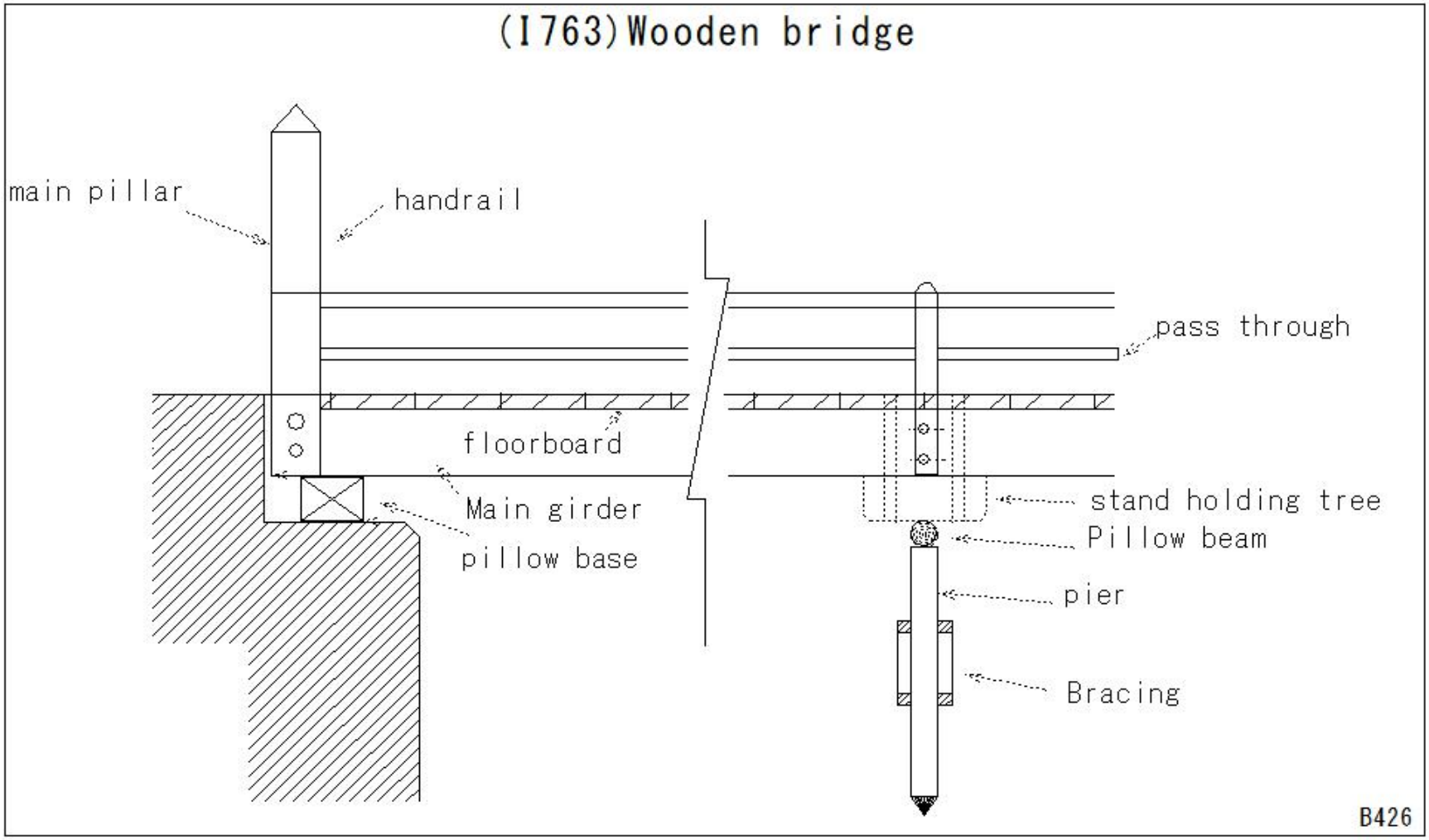
(I761)Spreading depth



(I762)Wooden bridge



(I763)Wooden bridge

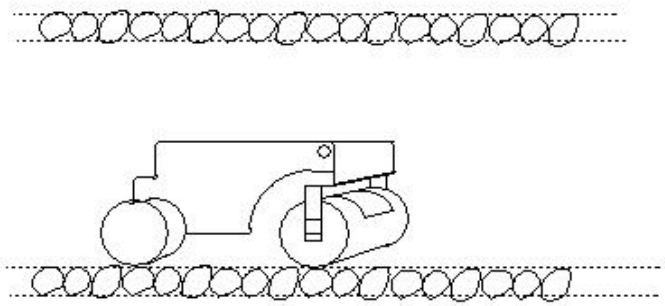


(I764)Water bound macadam

(I764)Water bound macadam

Water bound macadam

Macadam method



Water + crushed stone mixture - spraying

Laying the main aggregate

Crushed stone (diameter 20 mm or less)

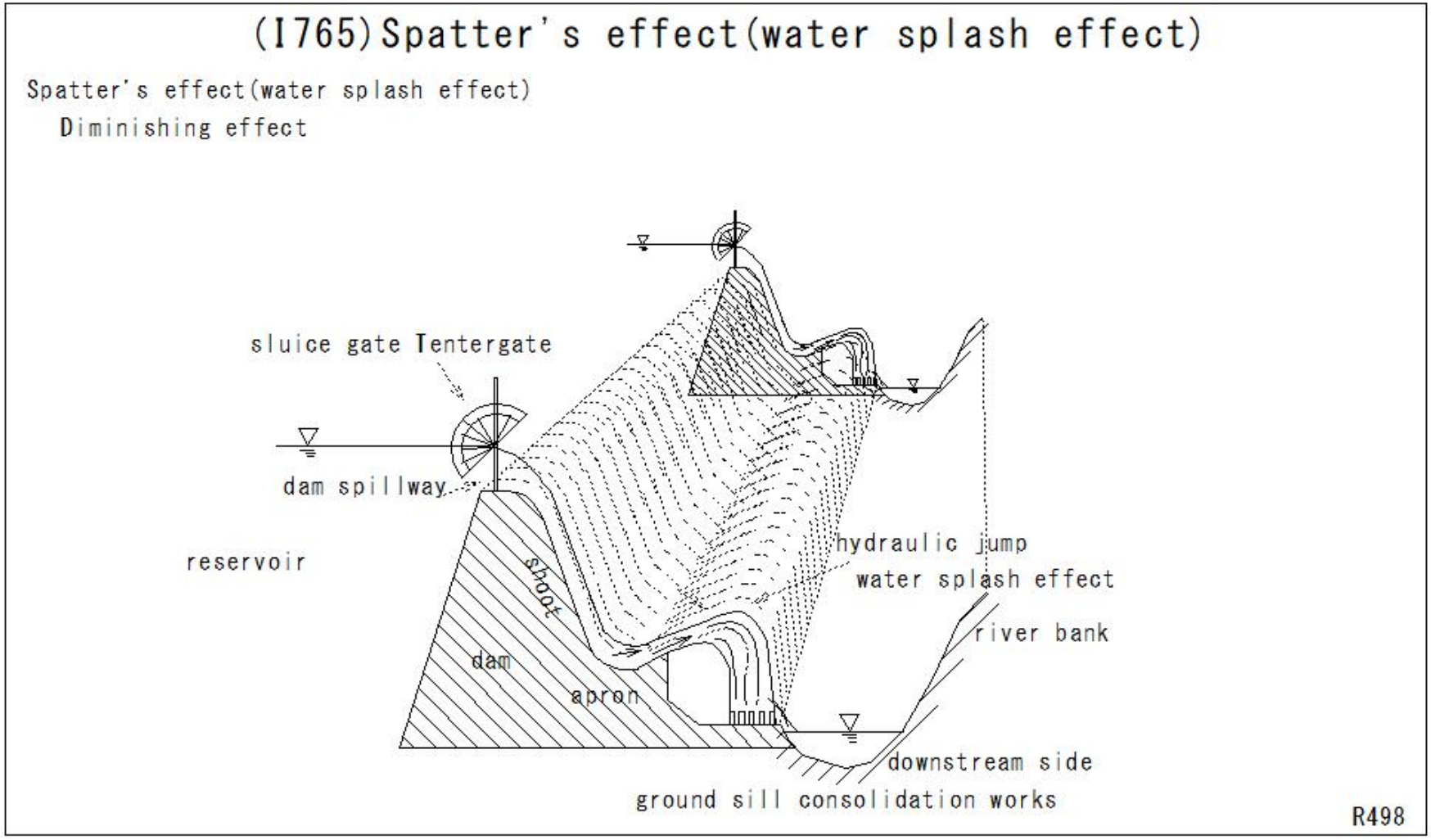
Compaction poured with water

Last-5-13mm crushed stone spraying finish

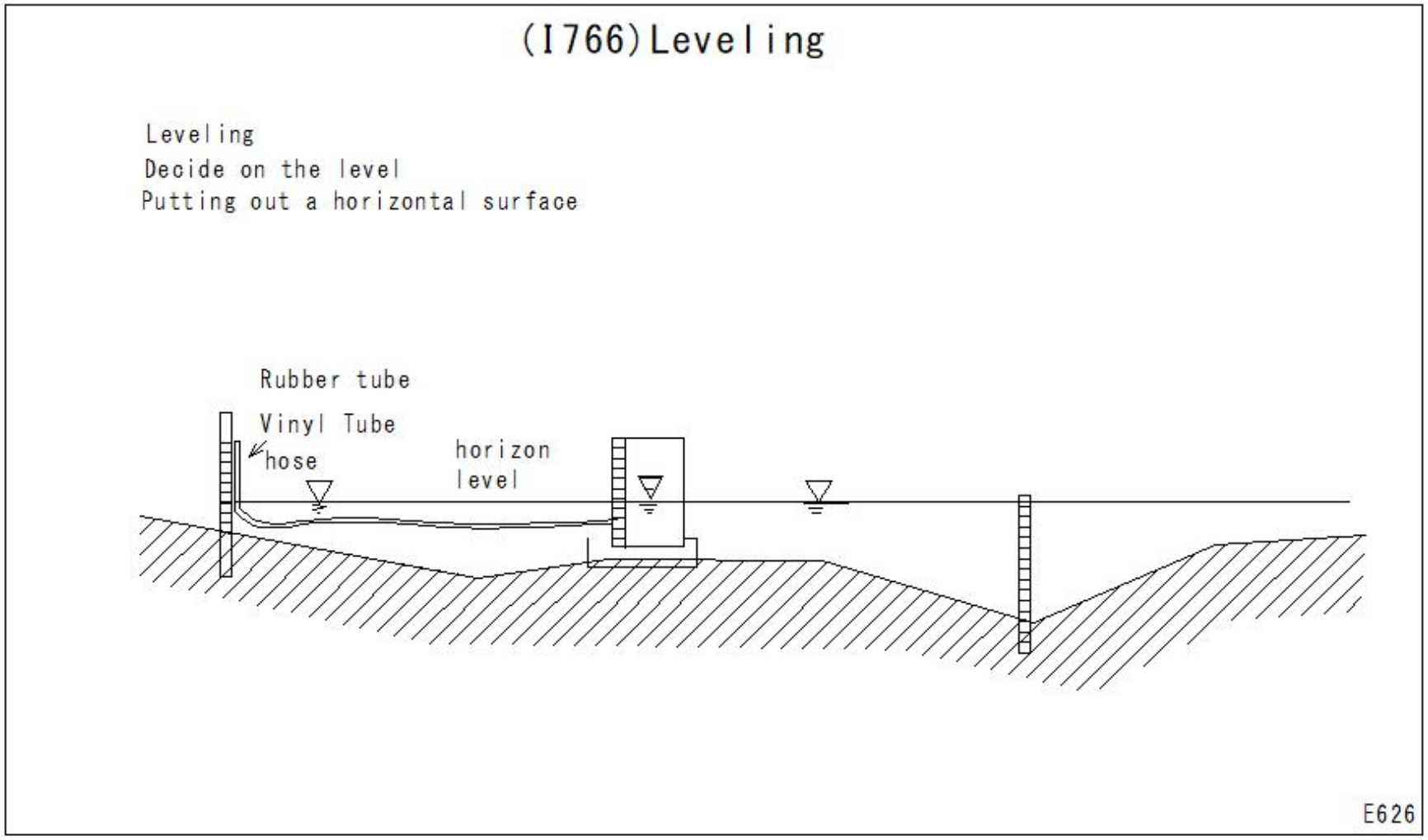
Compaction with macadam rollers

E625

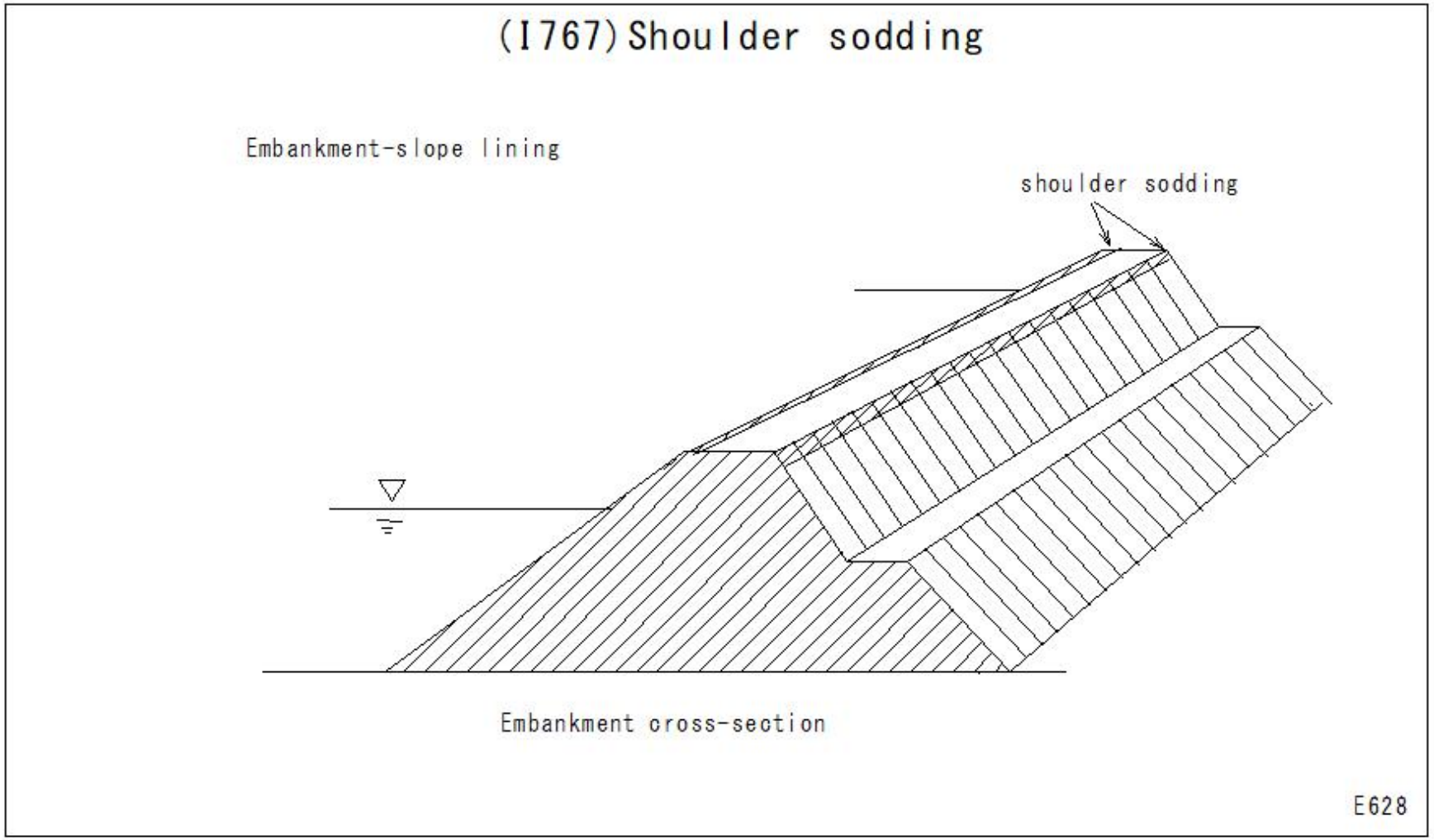
(I765)Spatter's effect(water splash effect)



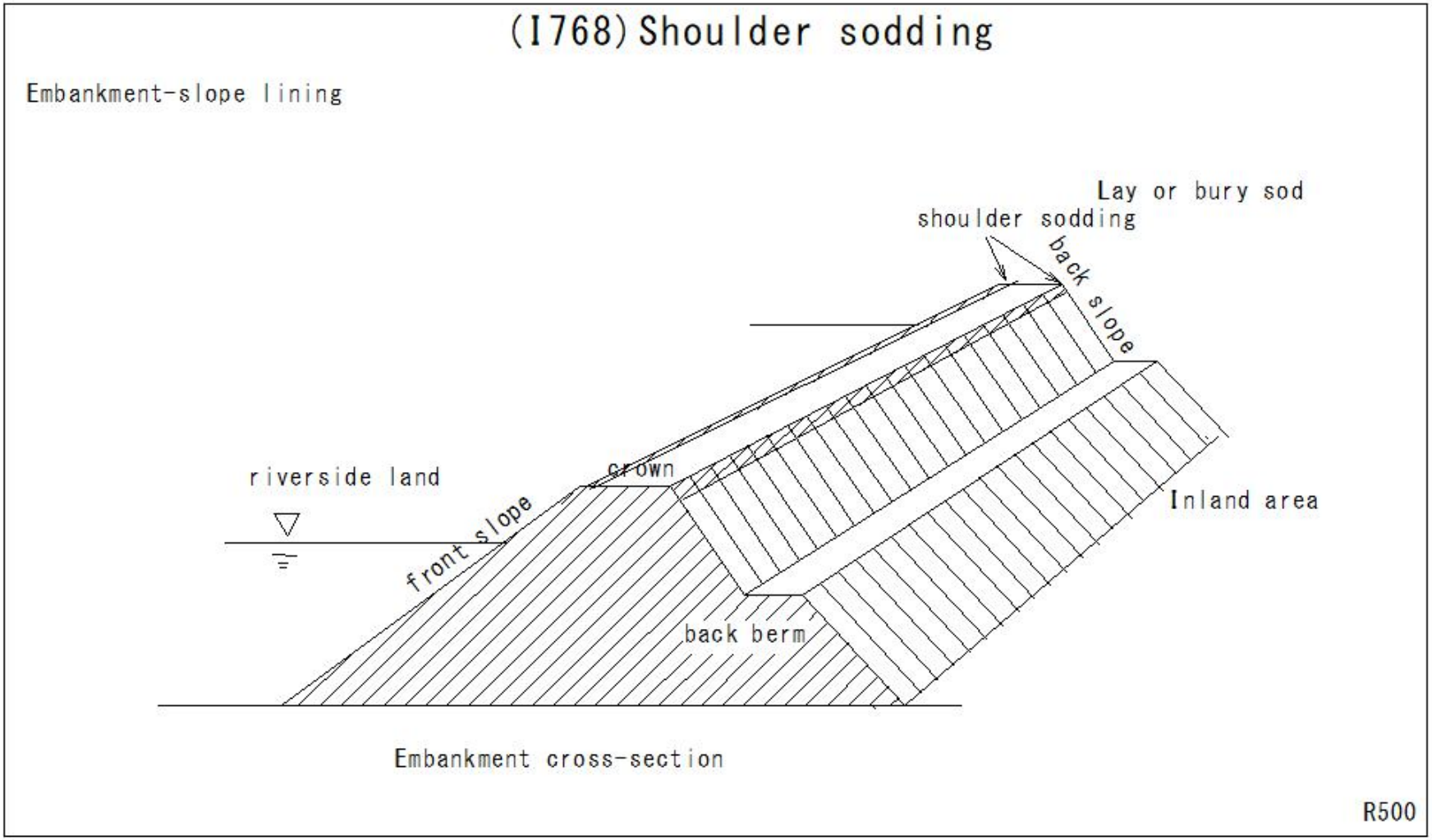
(I766)Leveling



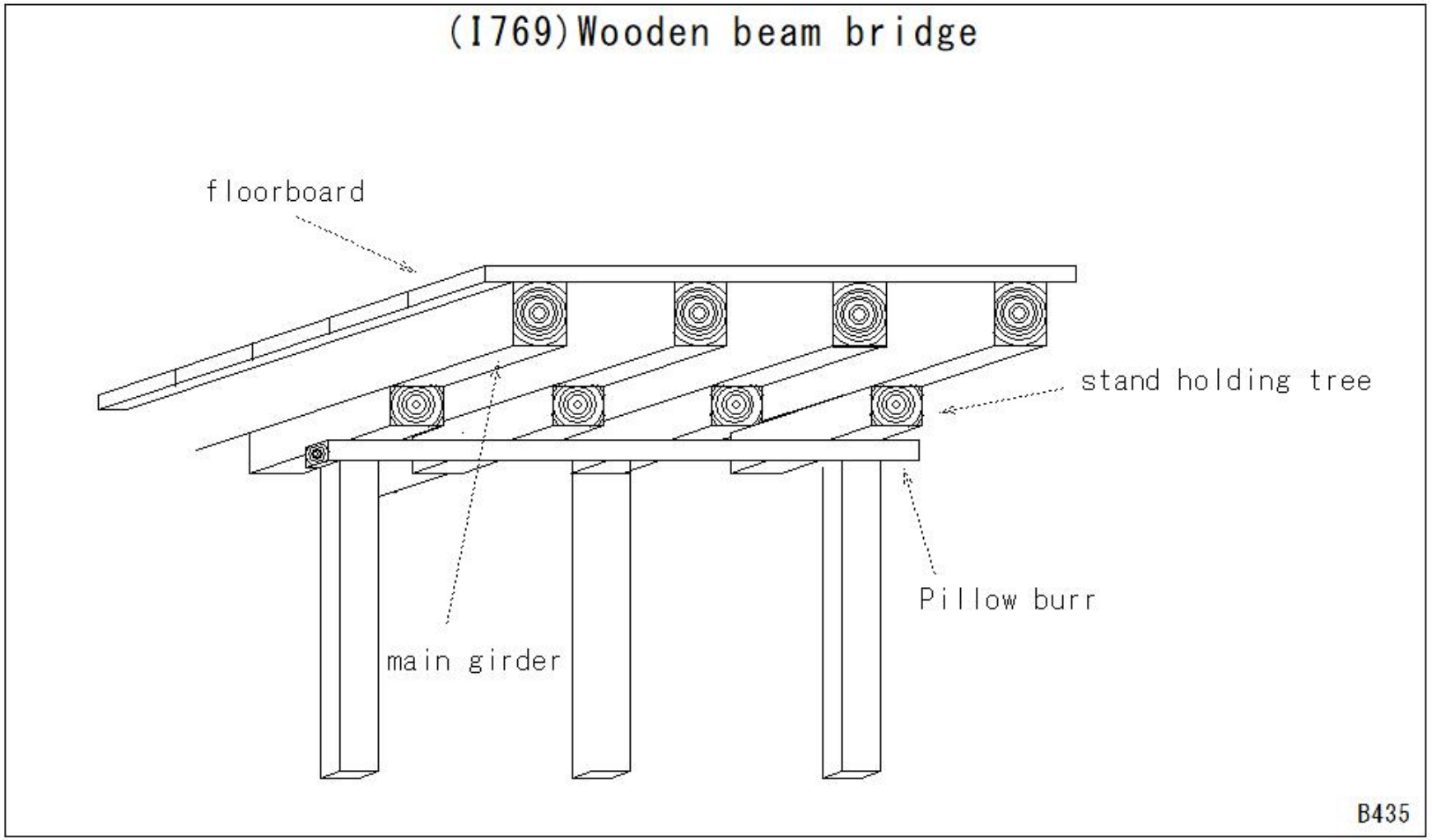
(I767)Shoulder sodding



(I768)Shoulder sodding



(I769)Wooden beam bridge



(I770)Submerged orifice

(I770)Submerged orifice

Submerged orifice

$Q=Ca\sqrt{2g(H1-H2)}$

a: Cross-sectional area of orifice

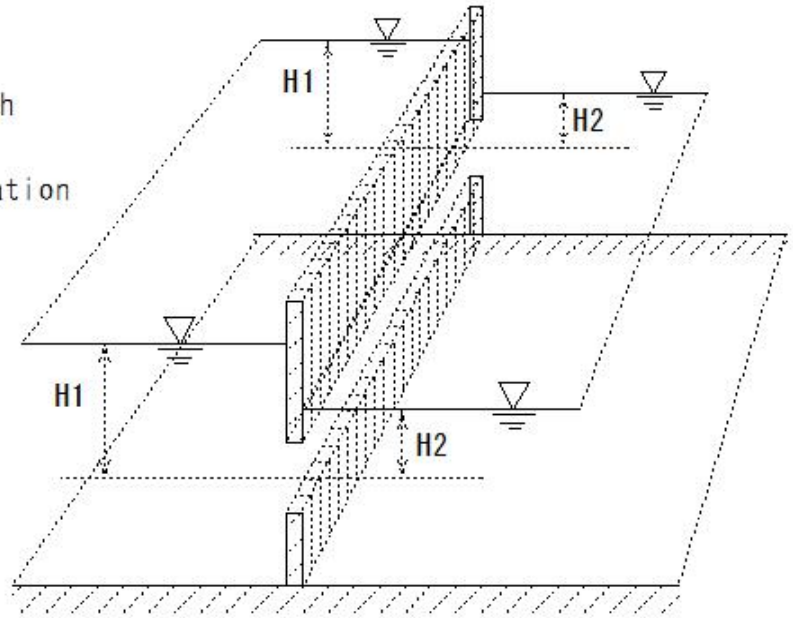
C:discharge coefficient

H1: Upstream water depth

H2: Downstream water depth

Q:discharge

g: gravitational acceleration



R501

(I771)Submerged discharge

(I771)Submerged discharge

Submerged discharge

Condition of the flowing out of the gate

case of the water depth on the downstream side is deep

Leaked while submerged in water

$Q=CaB\sqrt{2g(H1-H2)}$

Q: submerged discharge

C: submerged discharge coefficient

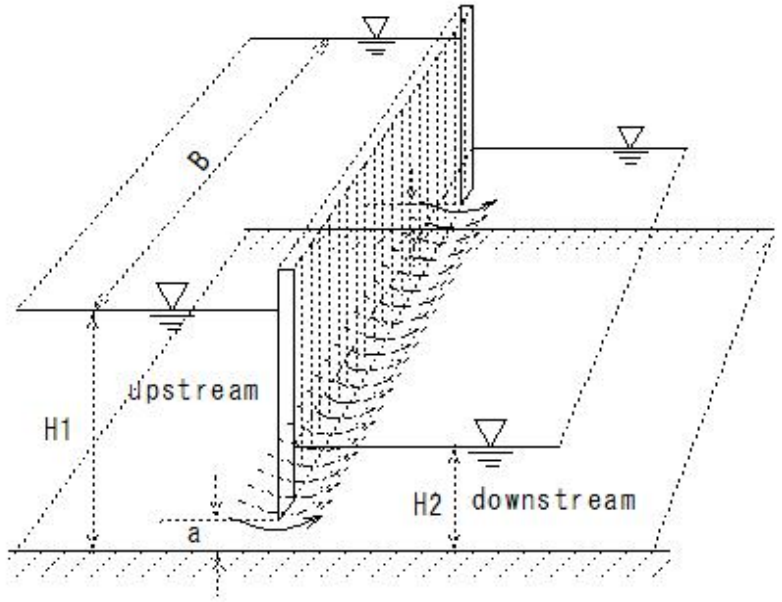
a: Gate opening

B: Channel width

H1: Upstream water depth

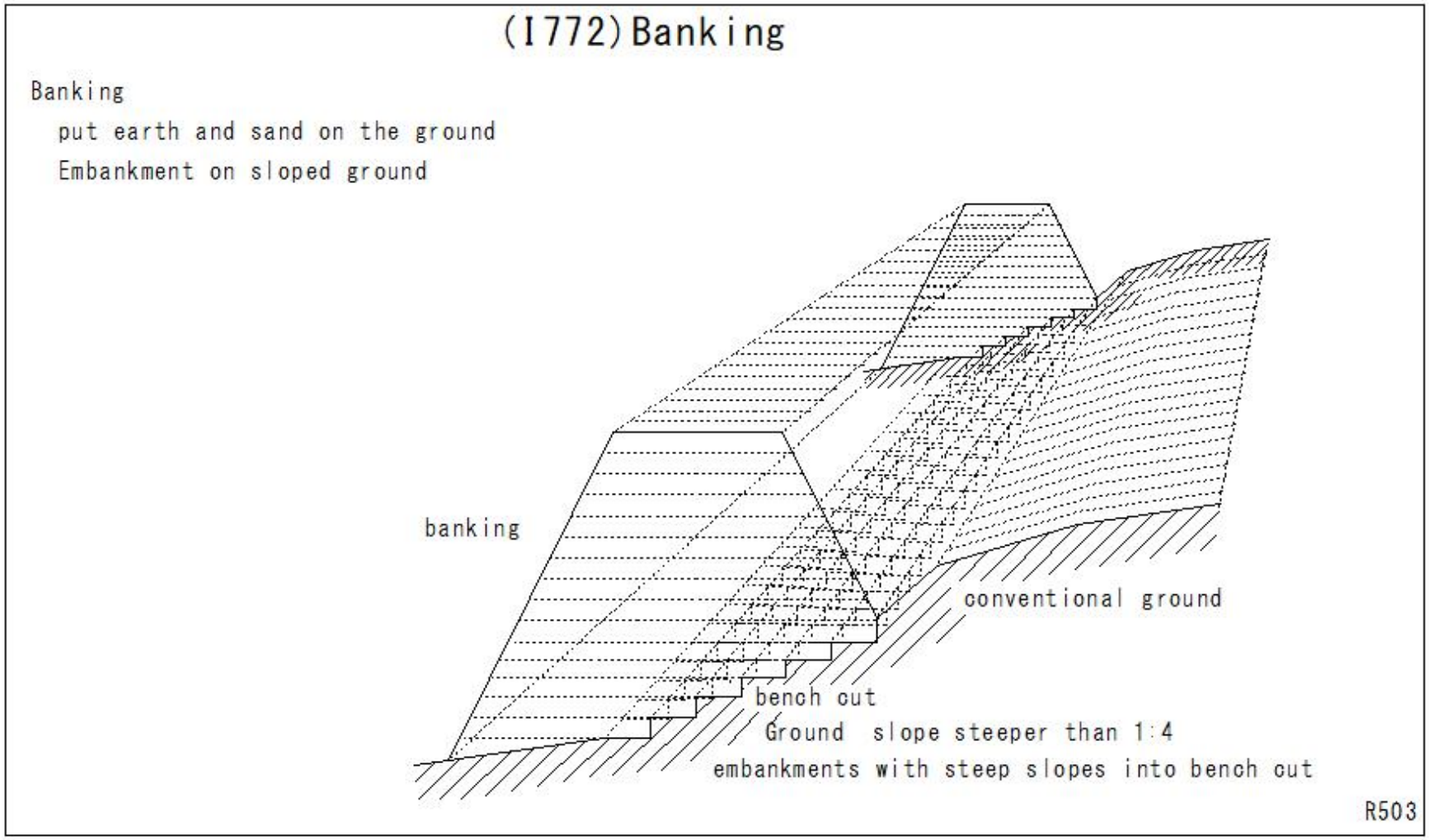
H2: Downstream water depth

g: gravitational acceleration

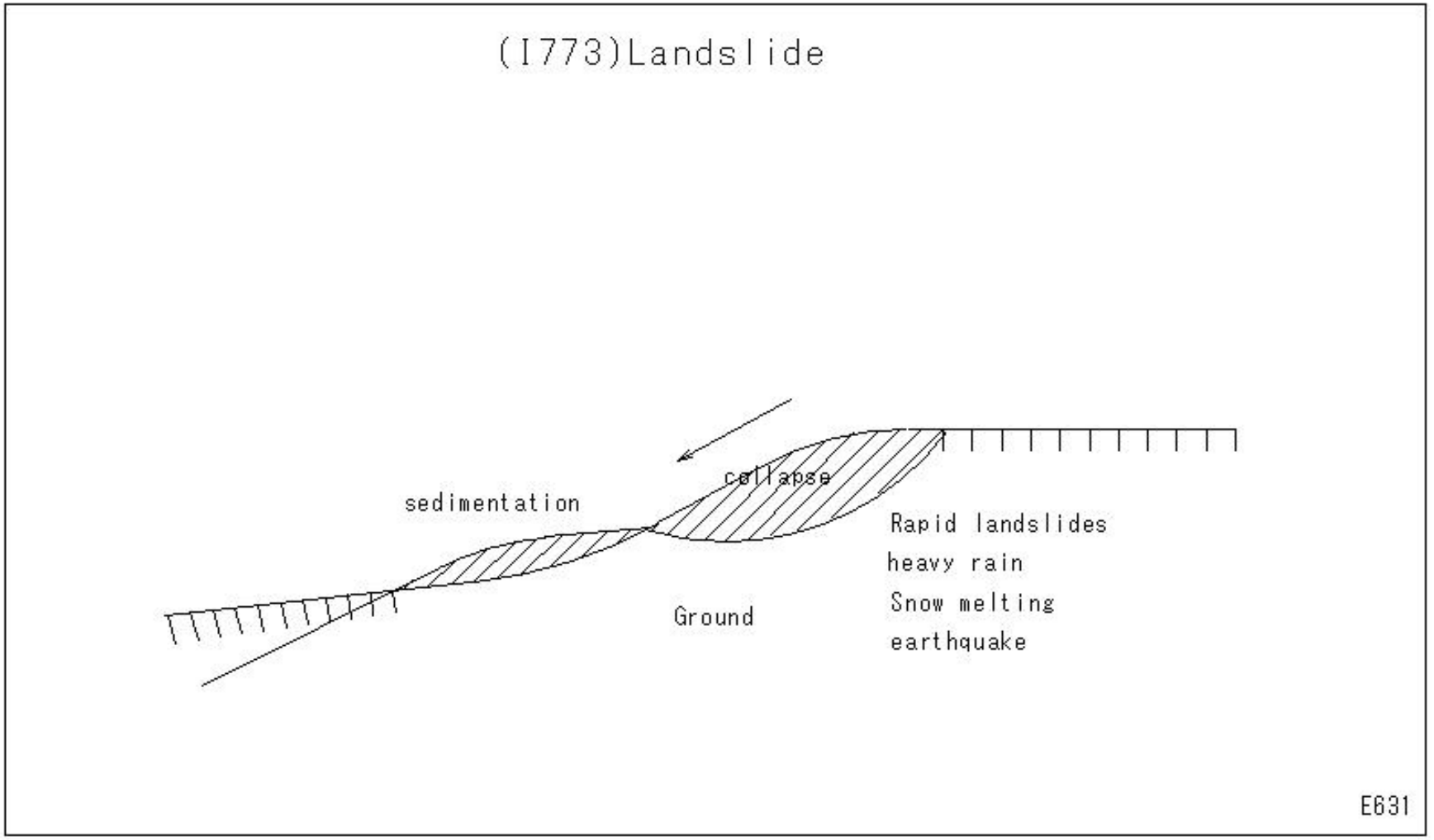


R502

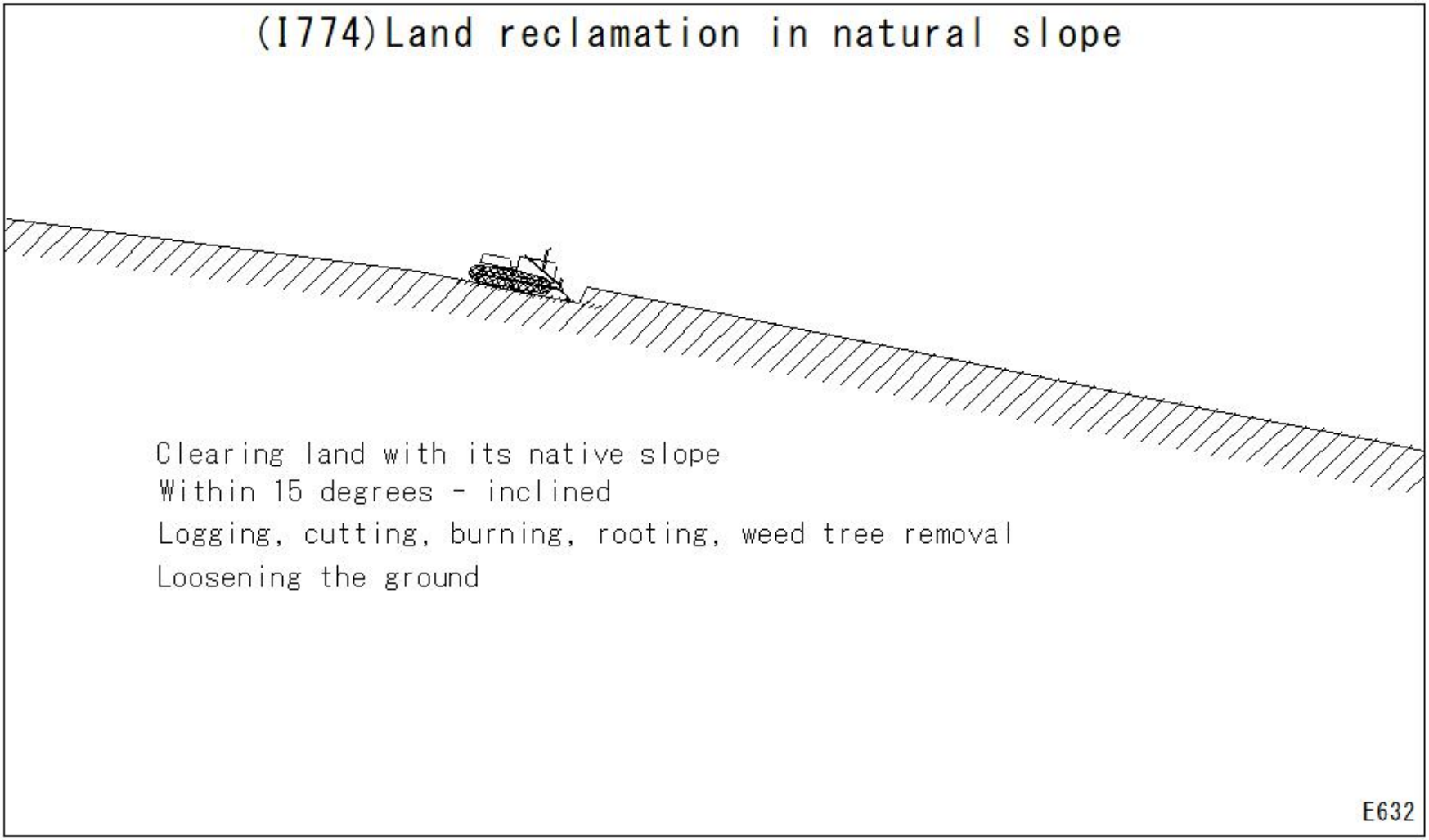
(I772)Banking



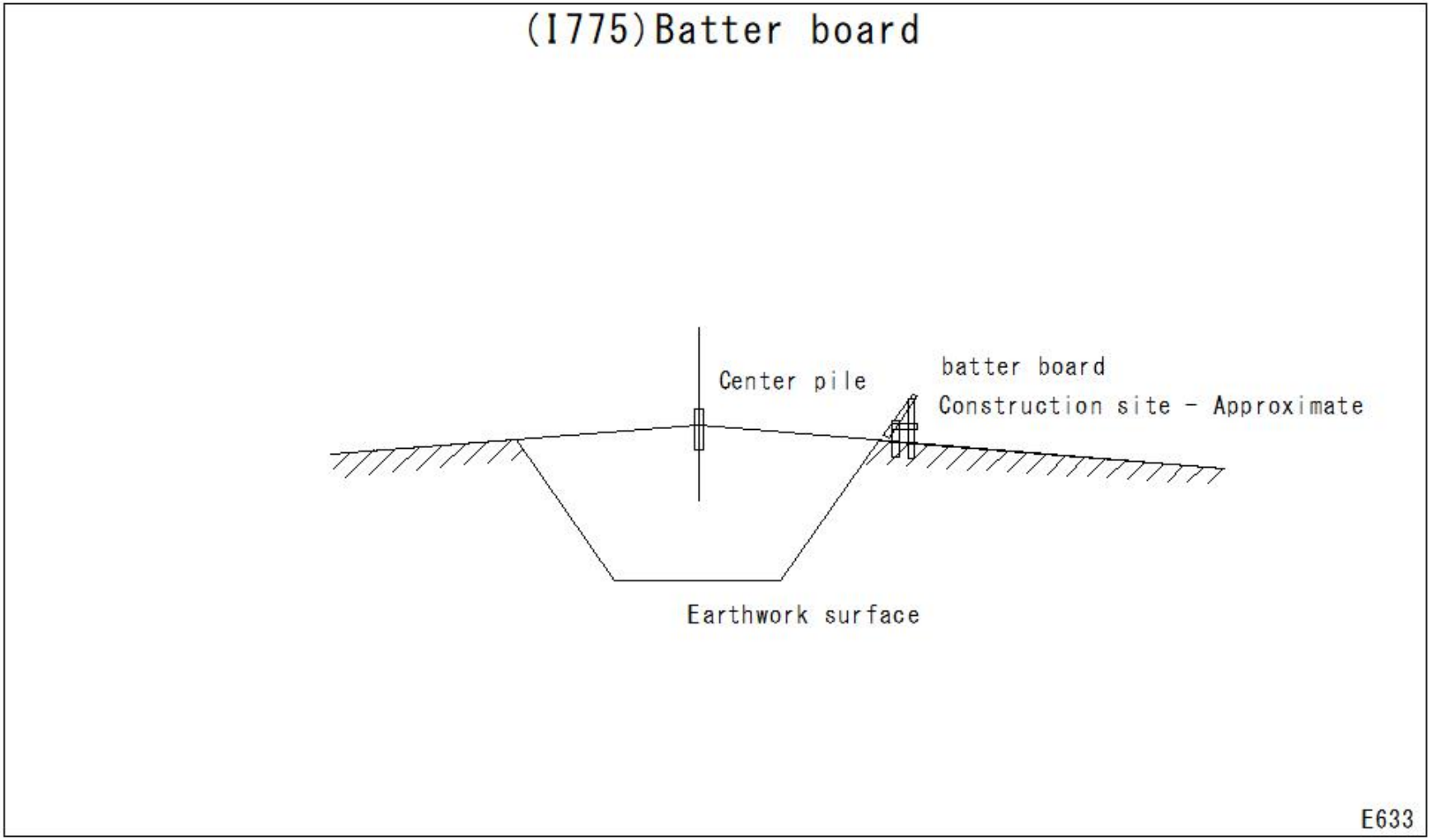
(I773)Landslide



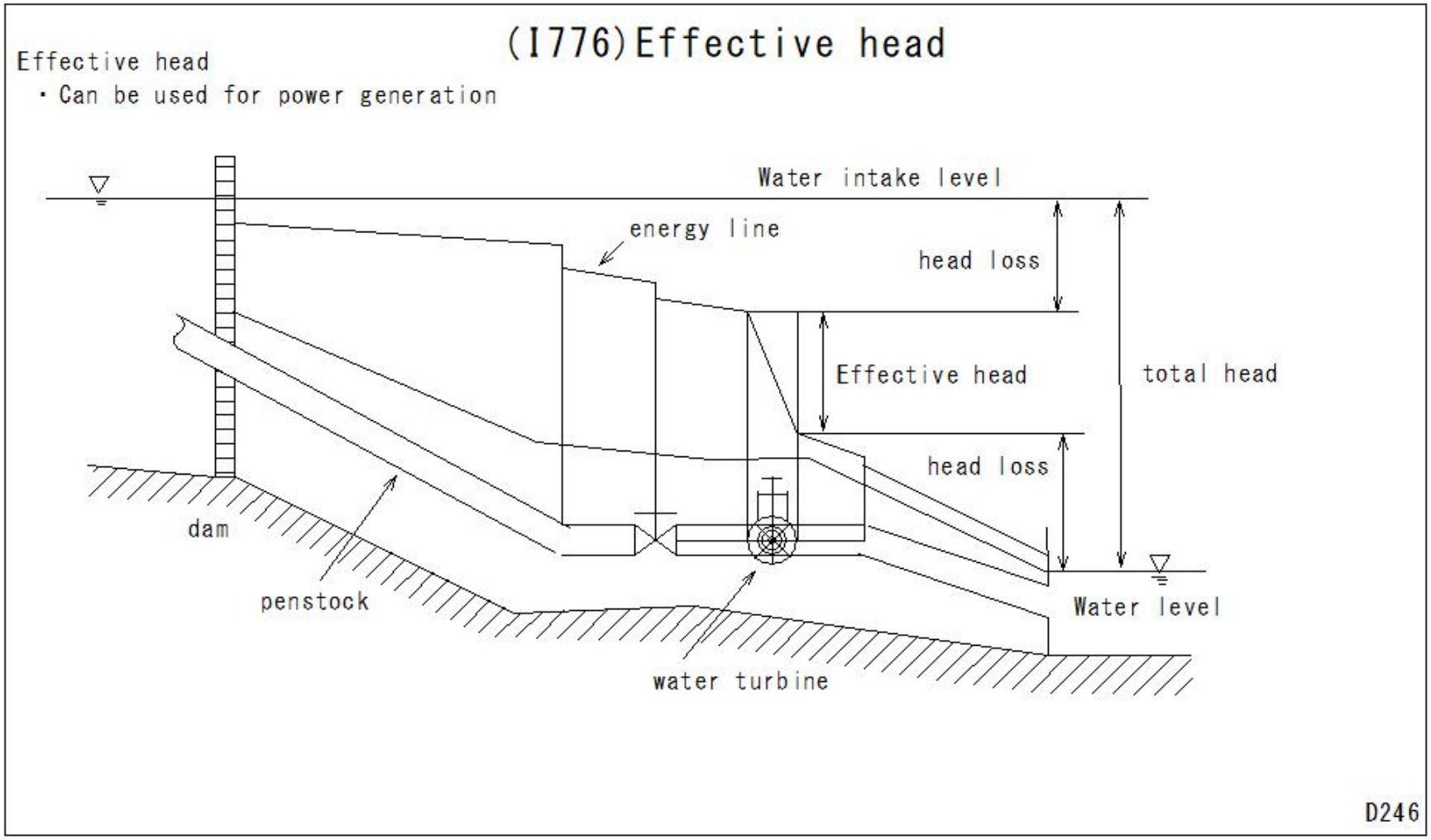
(I774)Land reclamation in natural slope



(I775)Batter board



(I776)Effective head



(I777)Retarding basin,flood storage basin

(I777)Retarding basin,flood storage basin

Retarding basin,flood storage basin

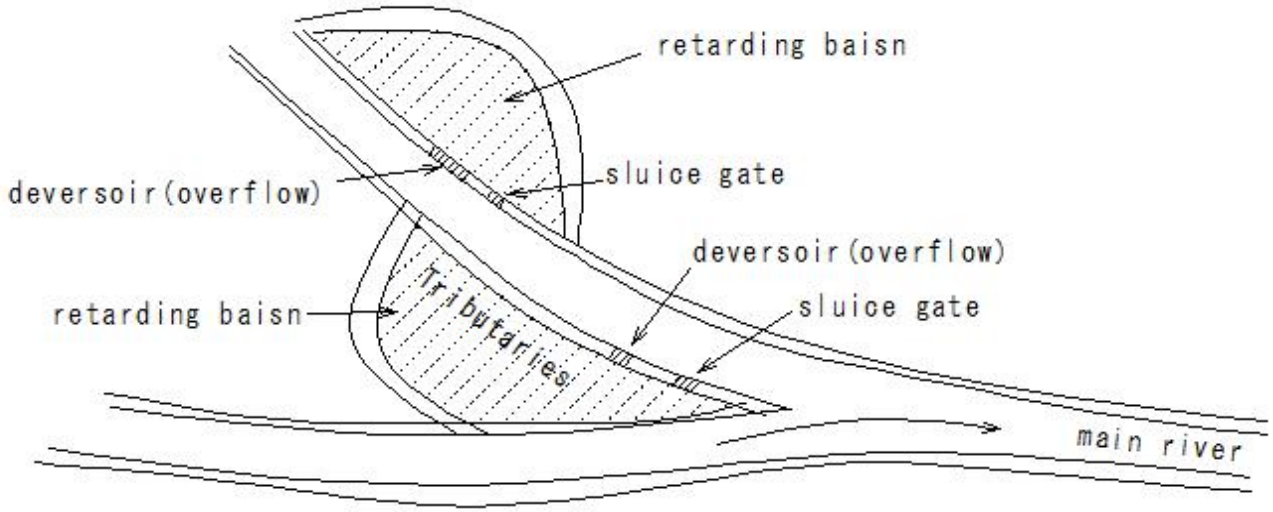
river confluence

Temporarily stored to prevent flood waters from merging at the same time.

A pond that releases water at a later date

deversoir(overflow) dam is installed on a part of the embankment.

Drainage is done through the drain gate.



R504

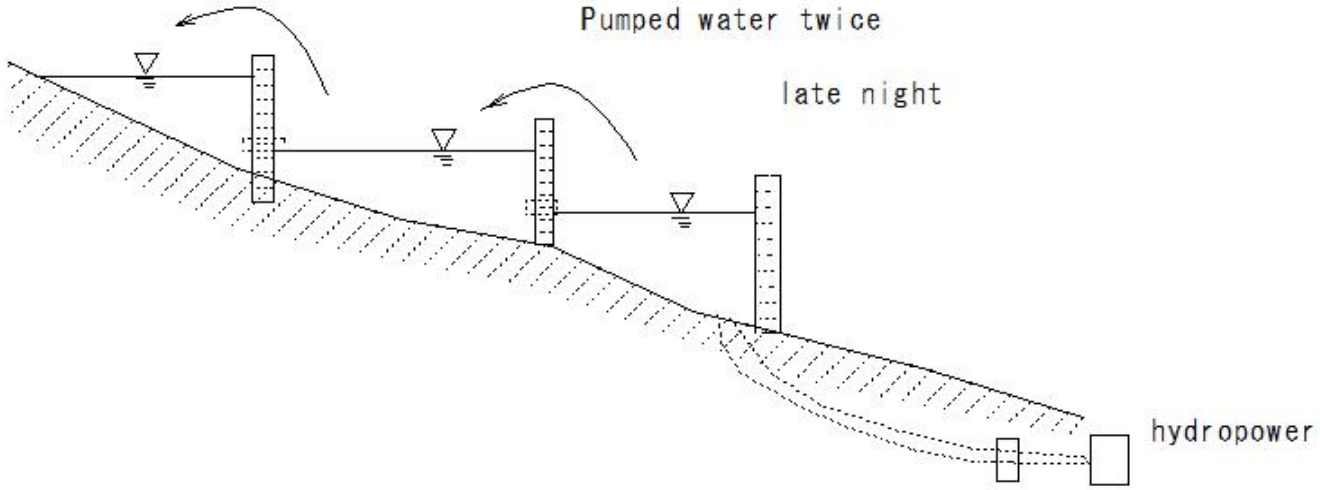
(I778)Pumped storage power

(I778)Pumped storage power

Pumped storage power

- Water storage downstream of the dam
- electricity is available
- Uses electricity and pumps water

Generate electricity by letting water flow when there is a power shortage

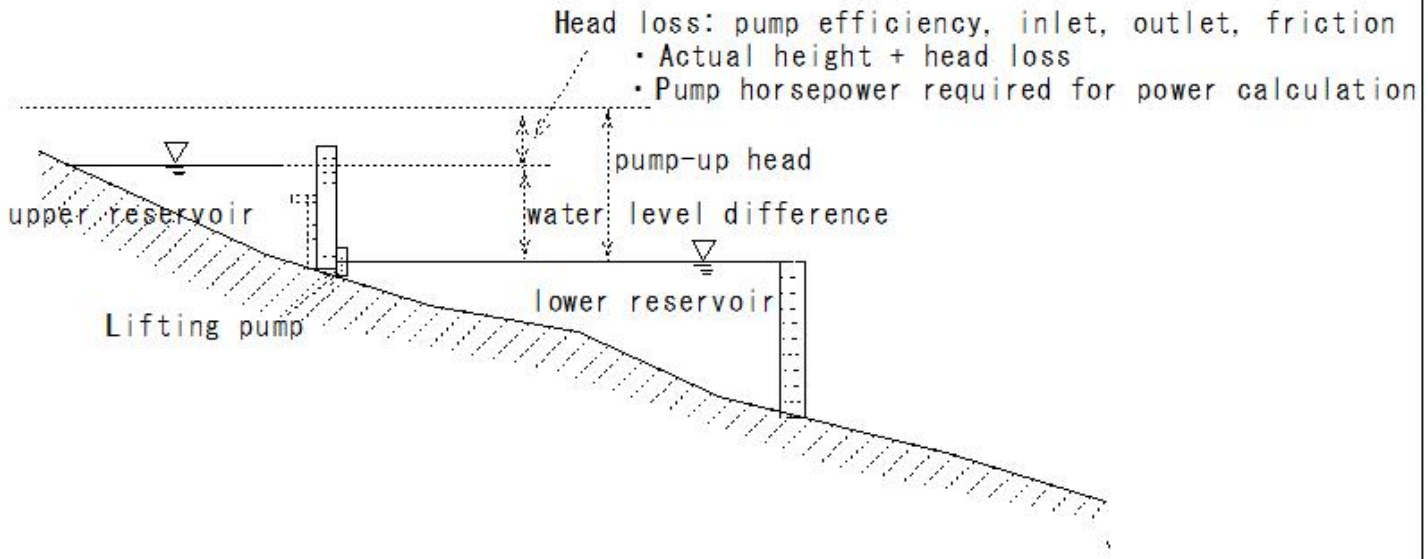


D247

(I779)Pump-up head

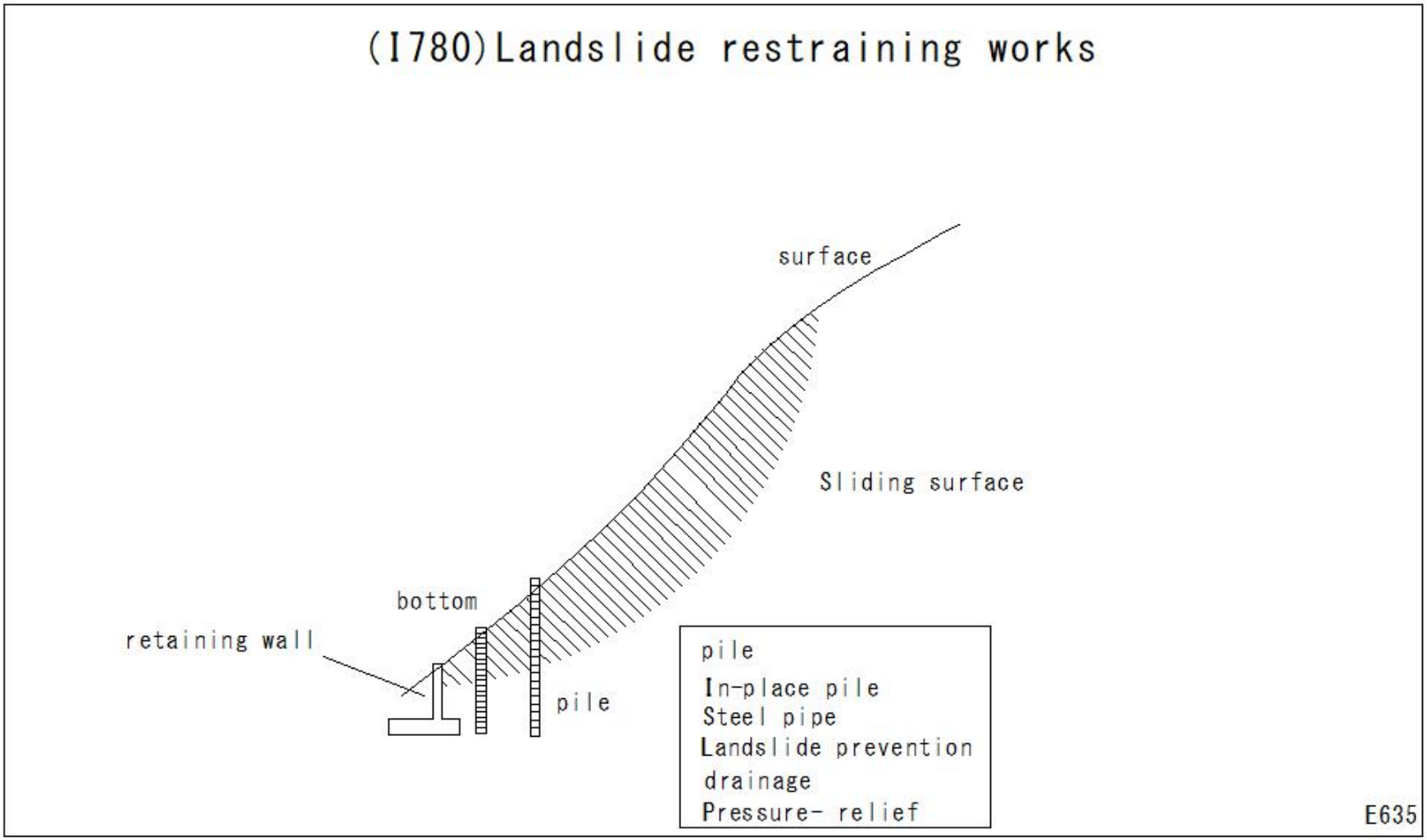
(I779)Pump-up head

Pump-up head
- Pump water
- height considering loss

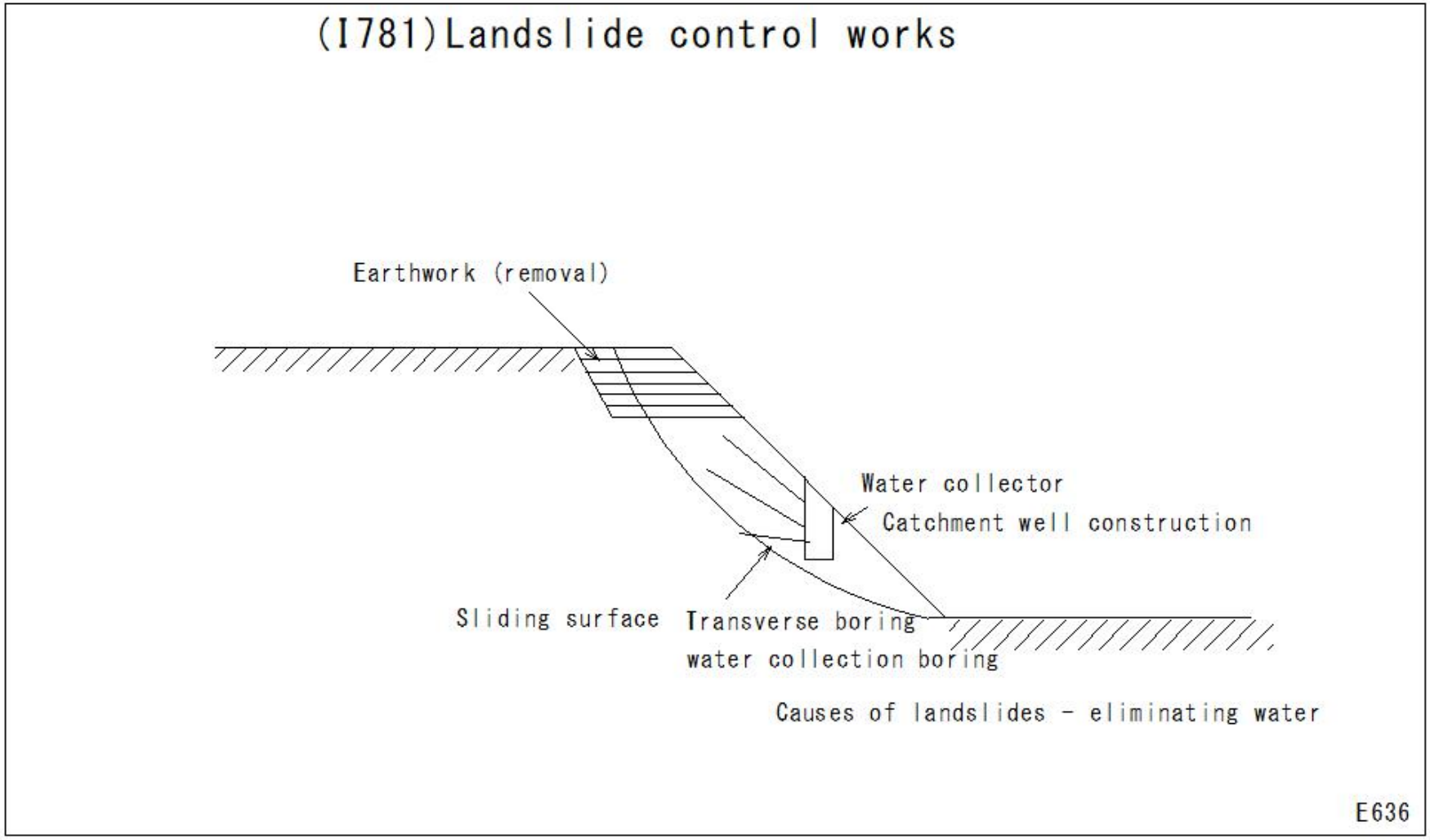


D248

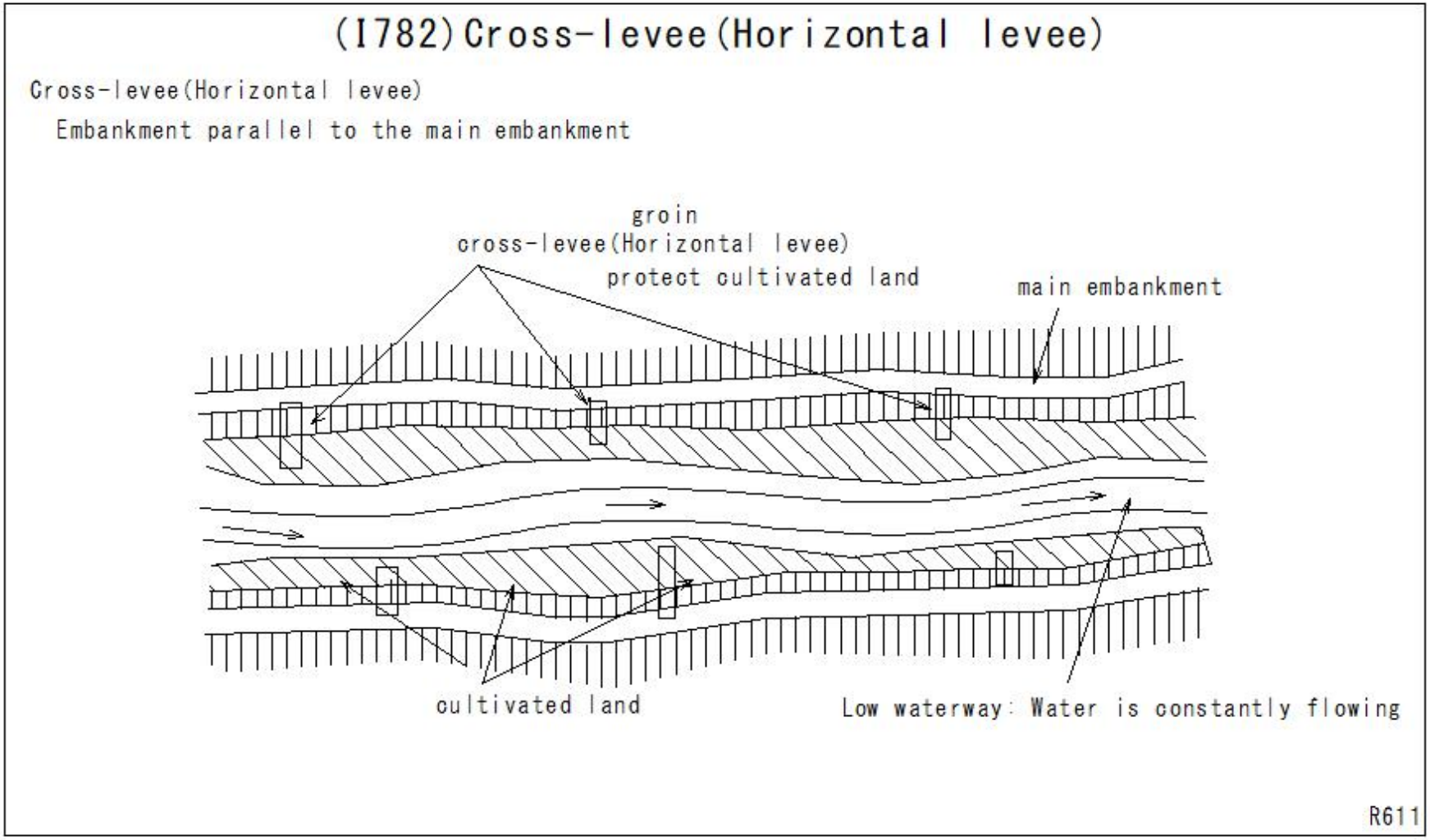
(I780)Landslide restraining works



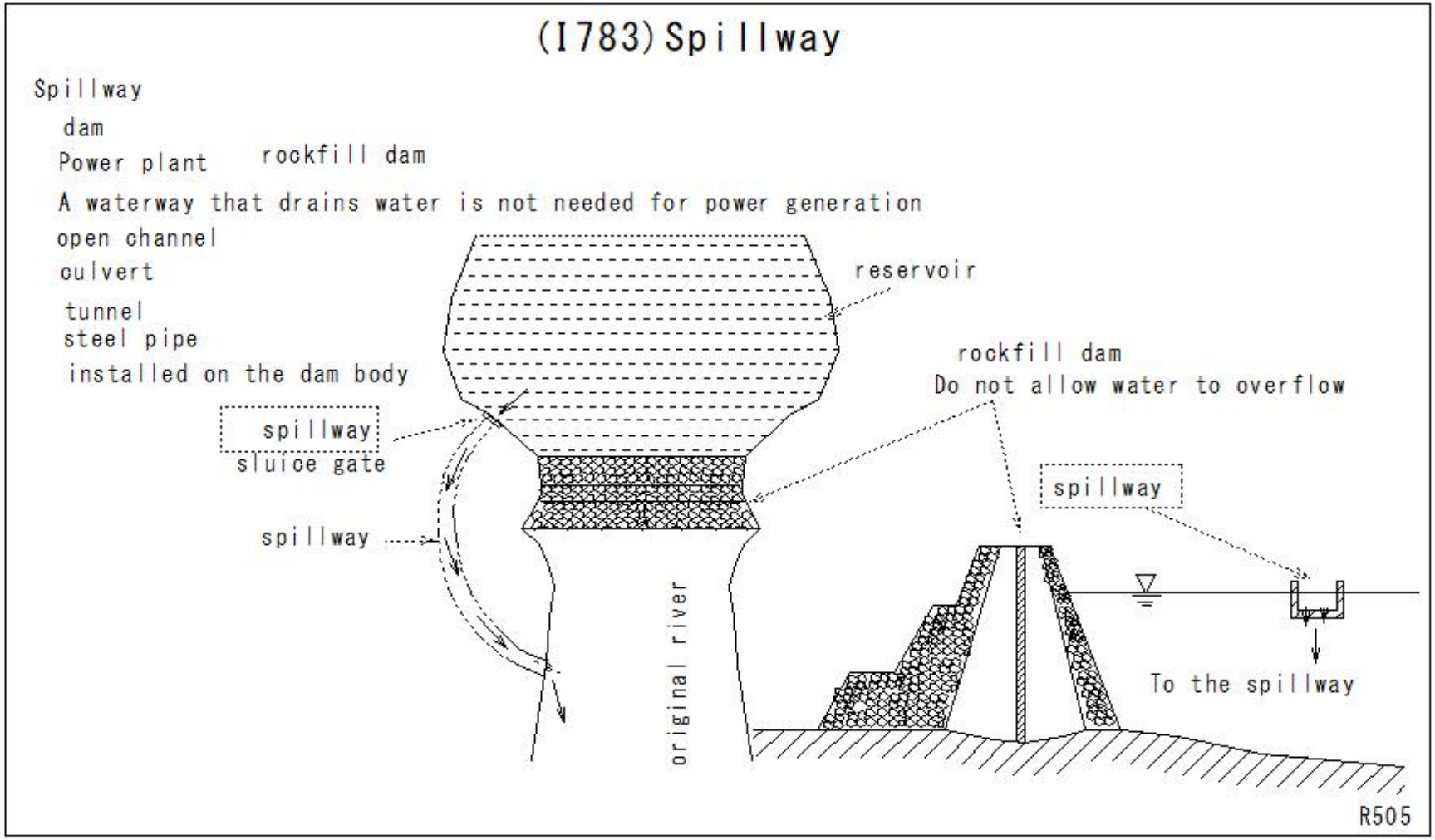
(I781)Landslide control works



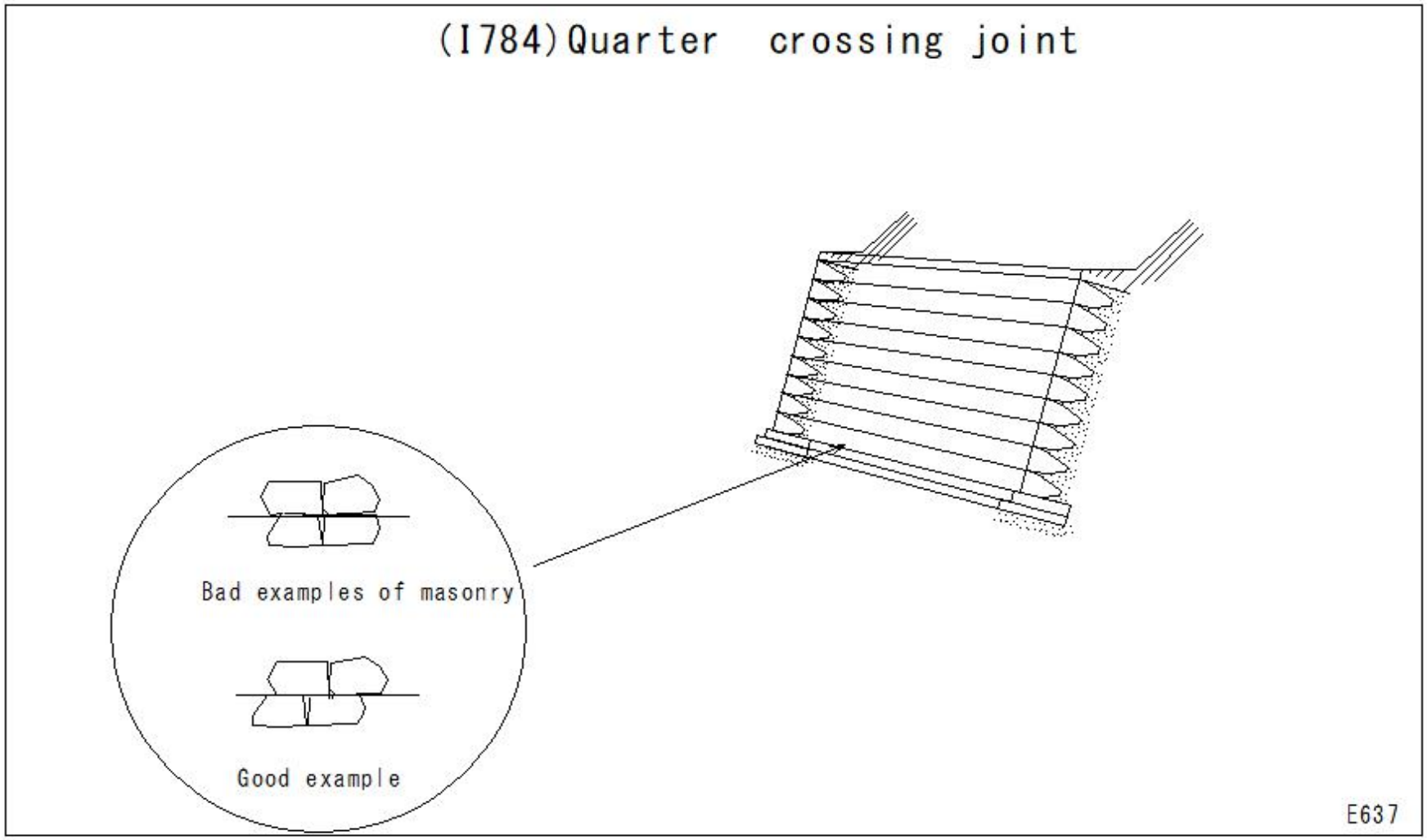
(I782)Cross-levee(Horizontal levee)



(I783)Spillway



(I784)Quarter crossing joint

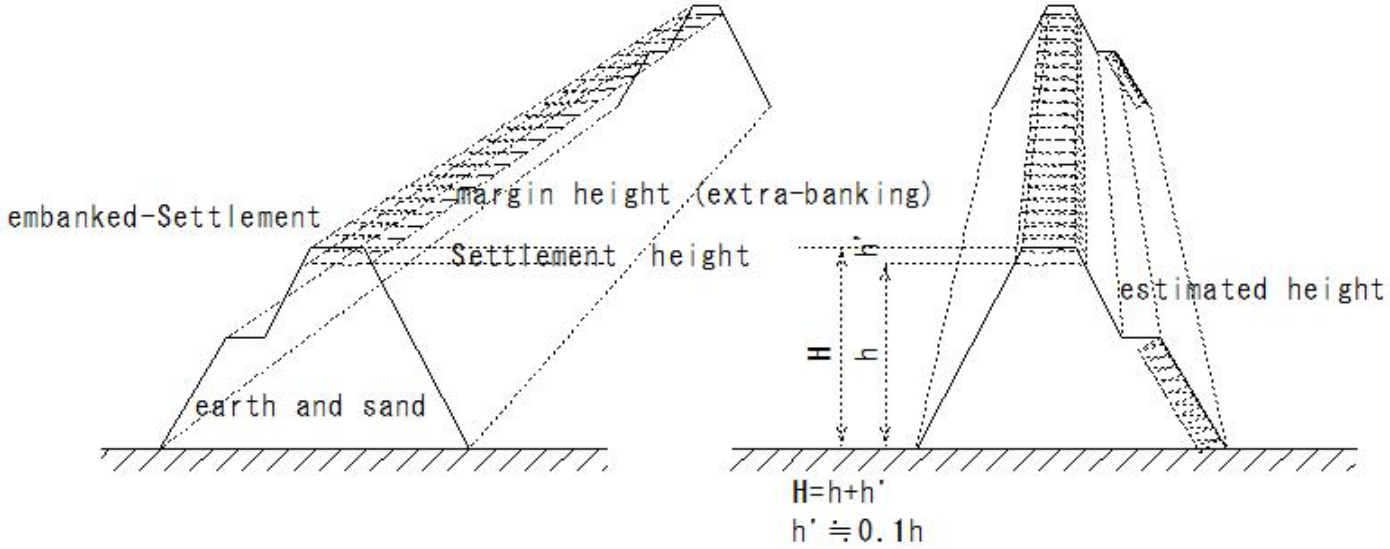


(I785)Extra-banking

(I785)Extra-banking

Extra-banking

Estimating the amount of settlement due to the embankment
river embankment
Approximately 10% of the estimated high-water level
embanked-Settlement



R506

(I786)Freeboard-margin height (extra embankment)

(I786)Freeboard-margin height (extra embankment)

freeboard-margin height (extra embankment)

the height of the embankment

Height with a margin above the estimated high-water level

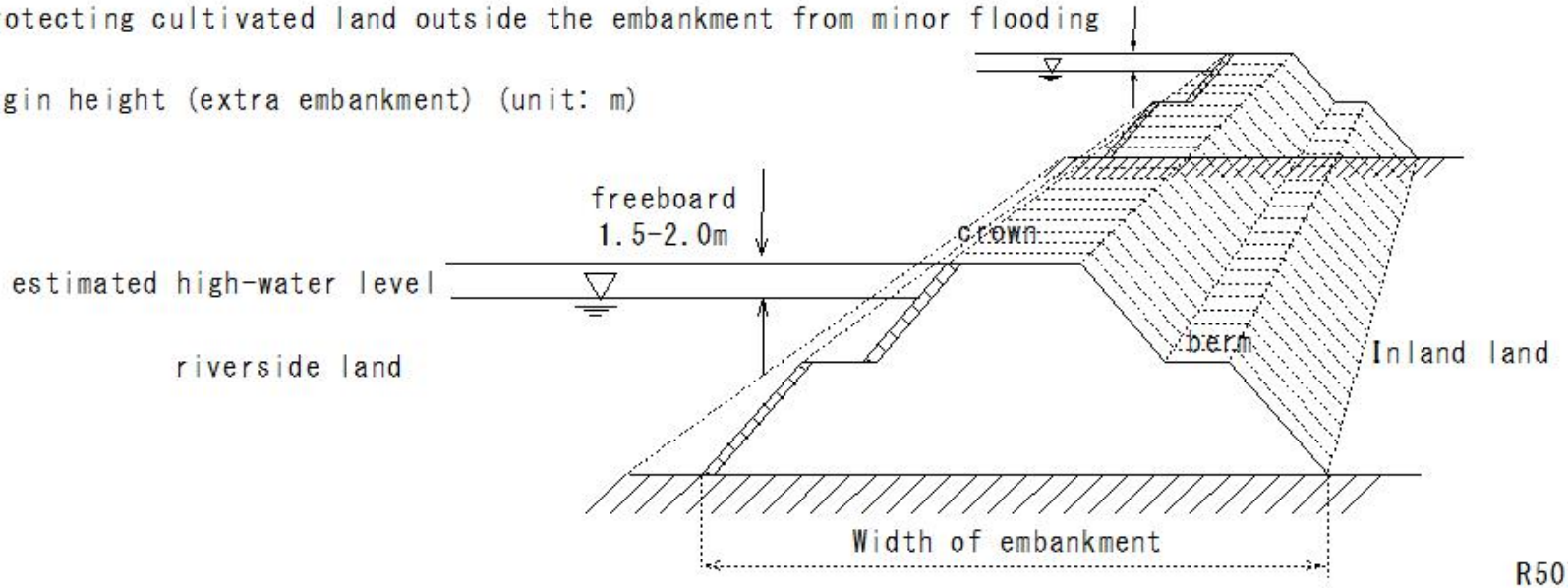
Large river 1.5-2.0m

Small and medium river 1.0m

estimated high-water level

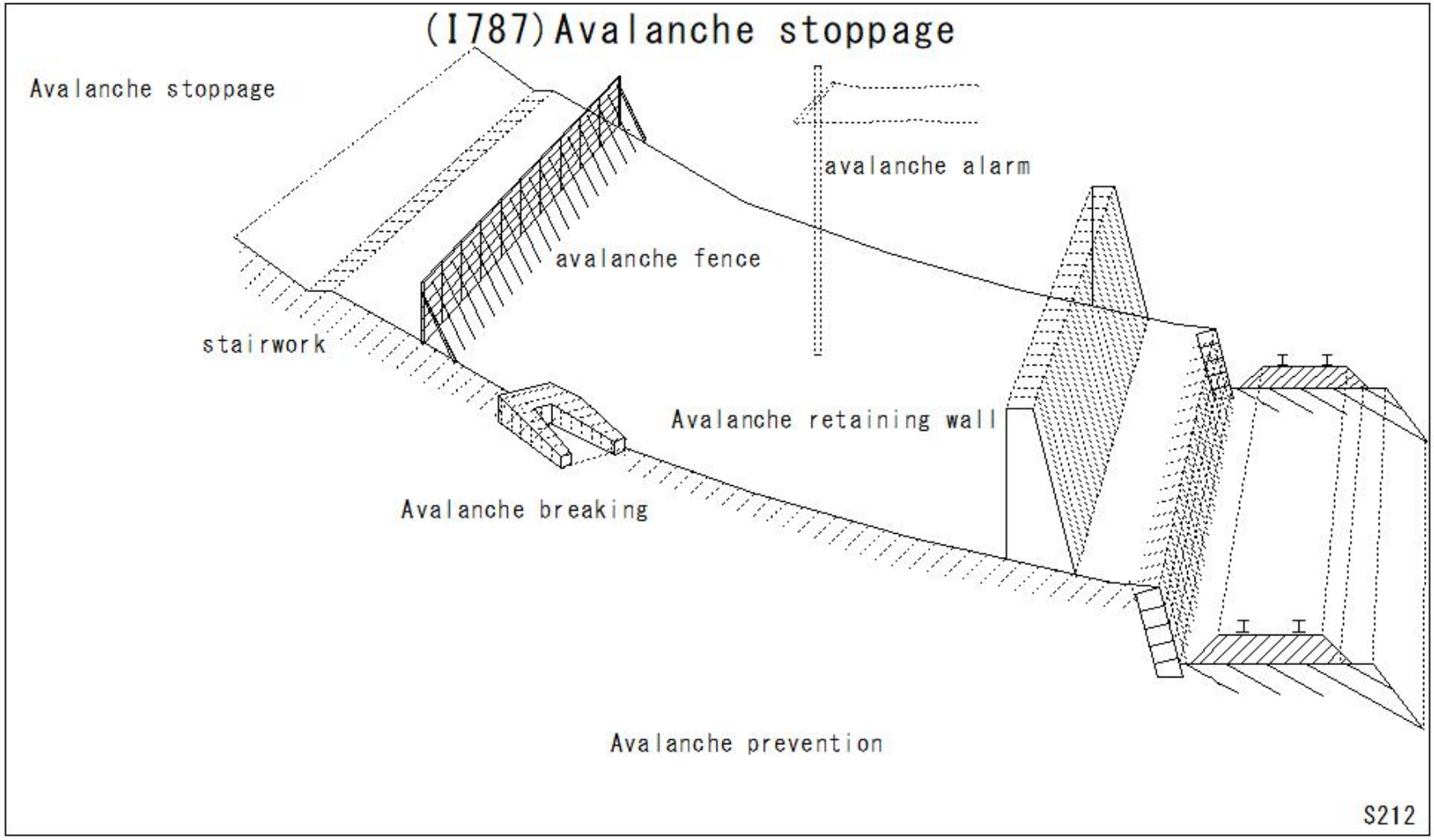
Protecting cultivated land outside the embankment from minor flooding

margin height (extra embankment) (unit: m)

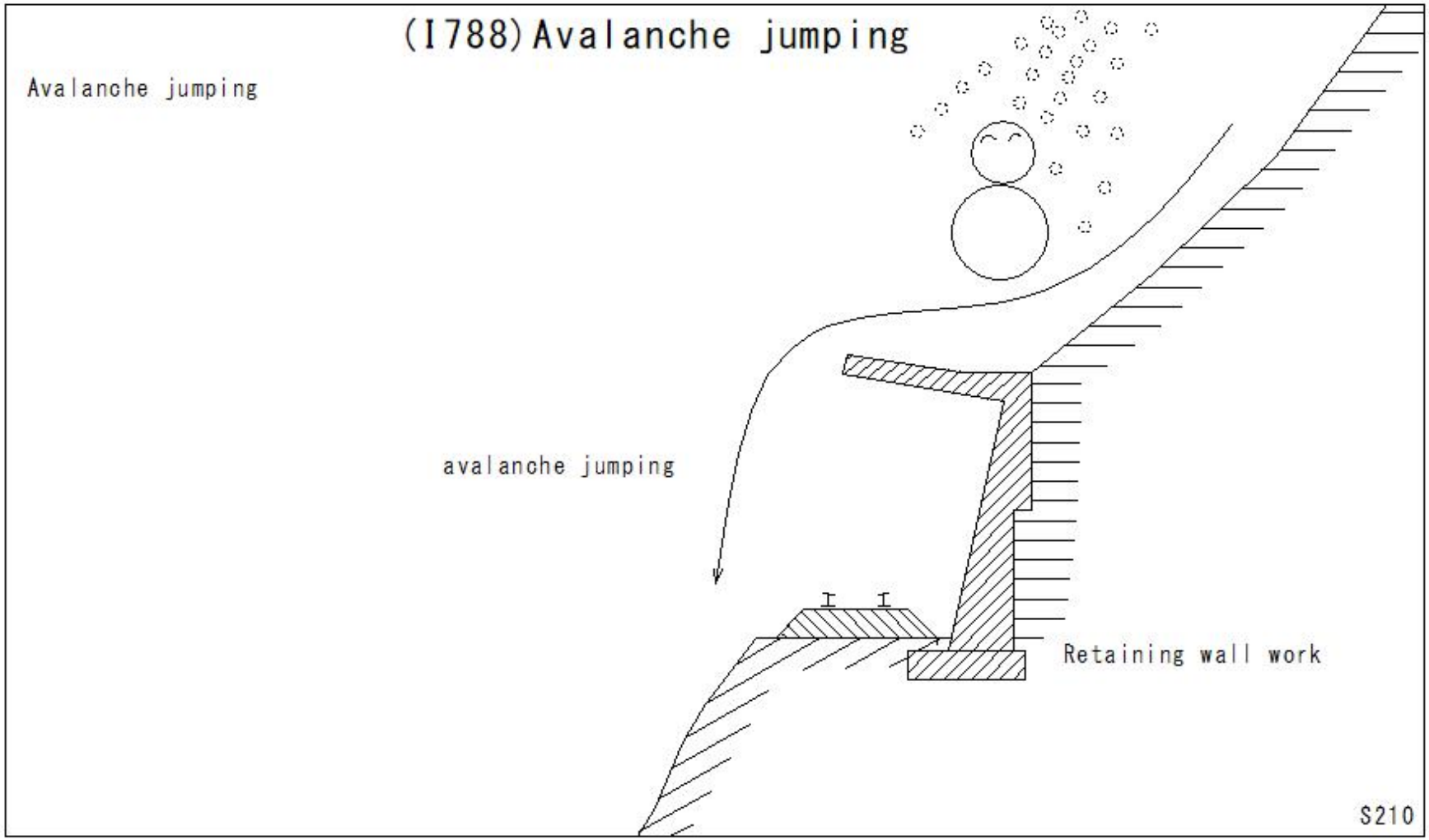


R507

(I787)Avalanche stoppage

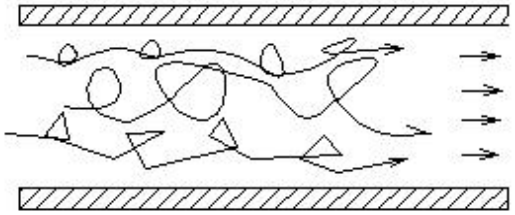


(I788)Avalanche jumping

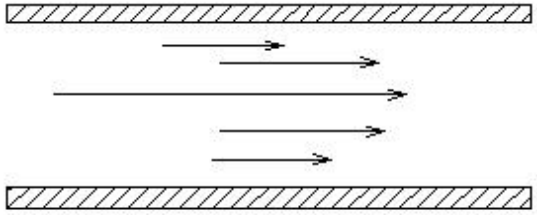


(I789)Turbulent flow -Laminar flow

(I789)Turbulent flow -Laminar flow



turbulent flow
A flow in which water molecules are turbulent



laminar flow
Laminar flow: A flow in which water molecules flow in a fixed direction

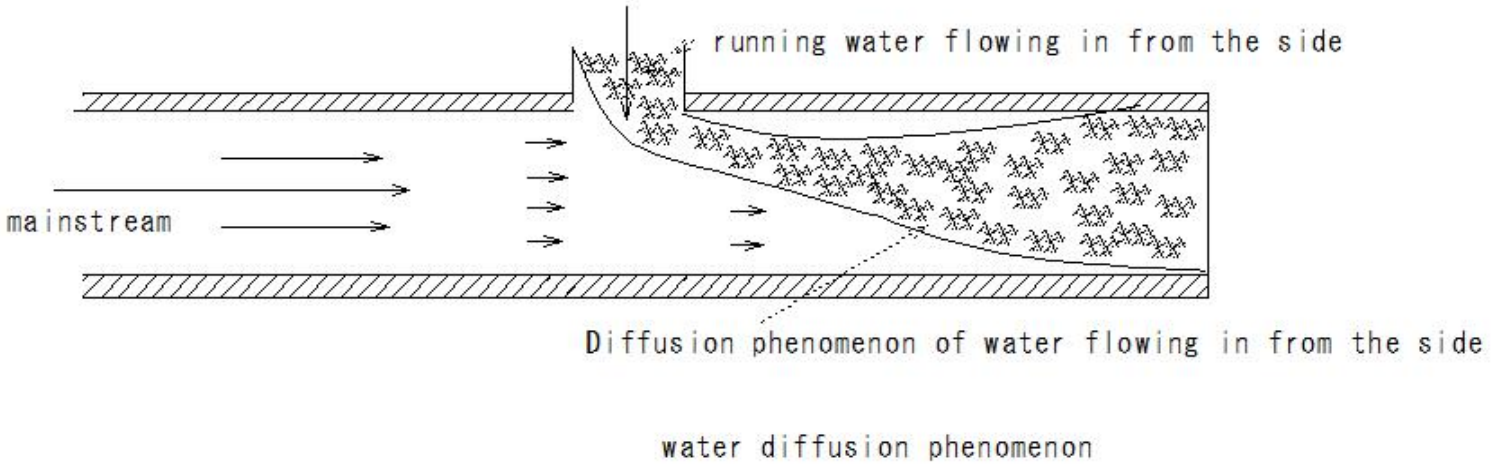
Expressing sexuality with Reynolds number R508

(I790)Diffusion effect of turbulent flow

(I790)Diffusion effect of turbulent flow

Diffusion effect of turbulent flow

case of the flow changes from laminar to turbulent, the flows mix with each other and swirl.



water diffusion phenomenon

R509

(I791)Crawler

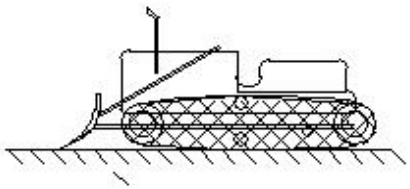
Crawler

Features

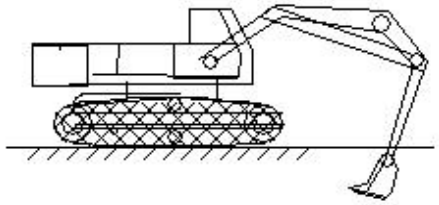
Ground pressure - small
soft ground

steep slope
uneven ground
snow work

Working speed - slow
a lot of wear and tear on the tracks.

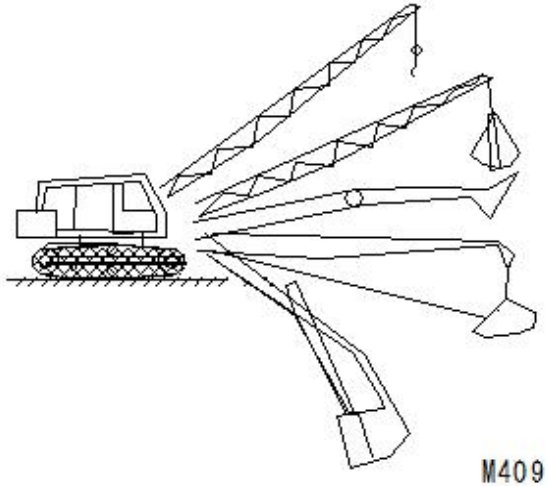


M11



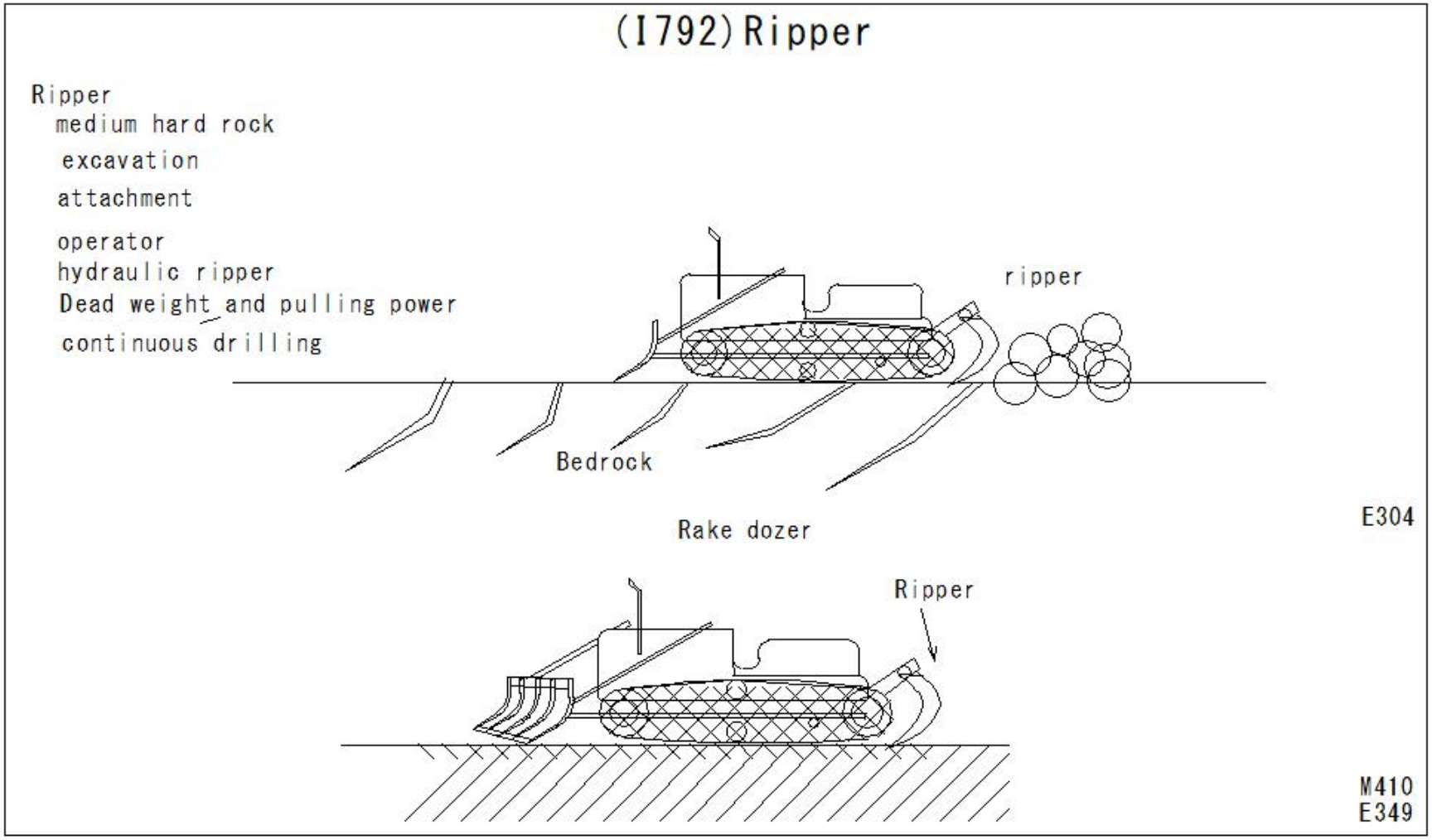
Crawler type

M12



M409

(I792)Ripper

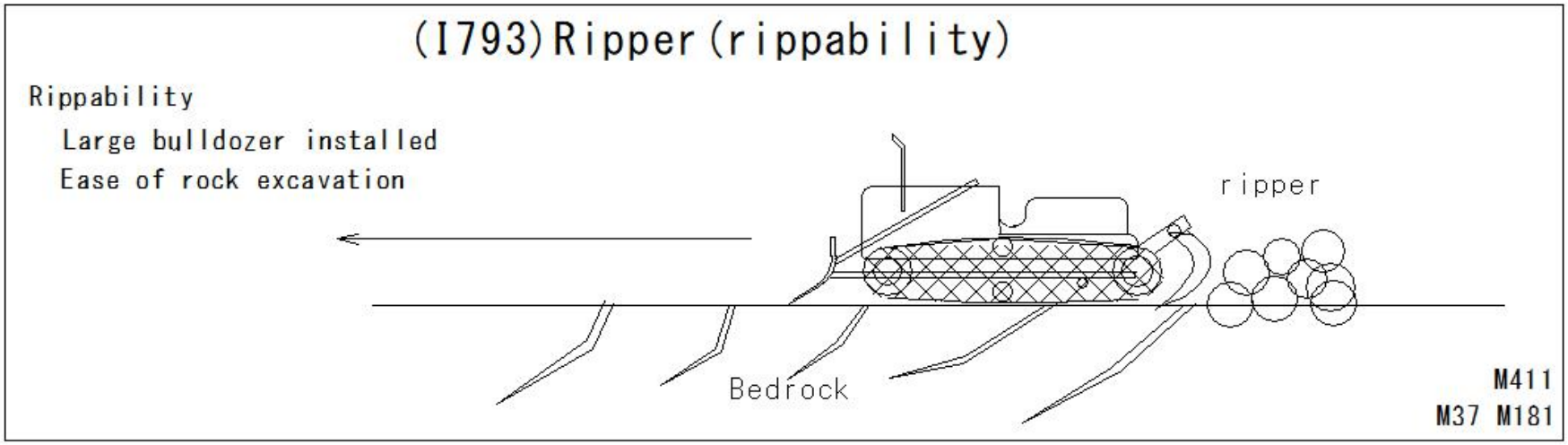

(I792) Ripper
Ripper
medium hard rock
excavation
attachment
operator
hydraulic ripper
Dead weight and pulling power
continuous drilling
ripper
Bedrock
E304
Rake dozer
Ripper
M410
E349

(I793)Ripper(rippability)

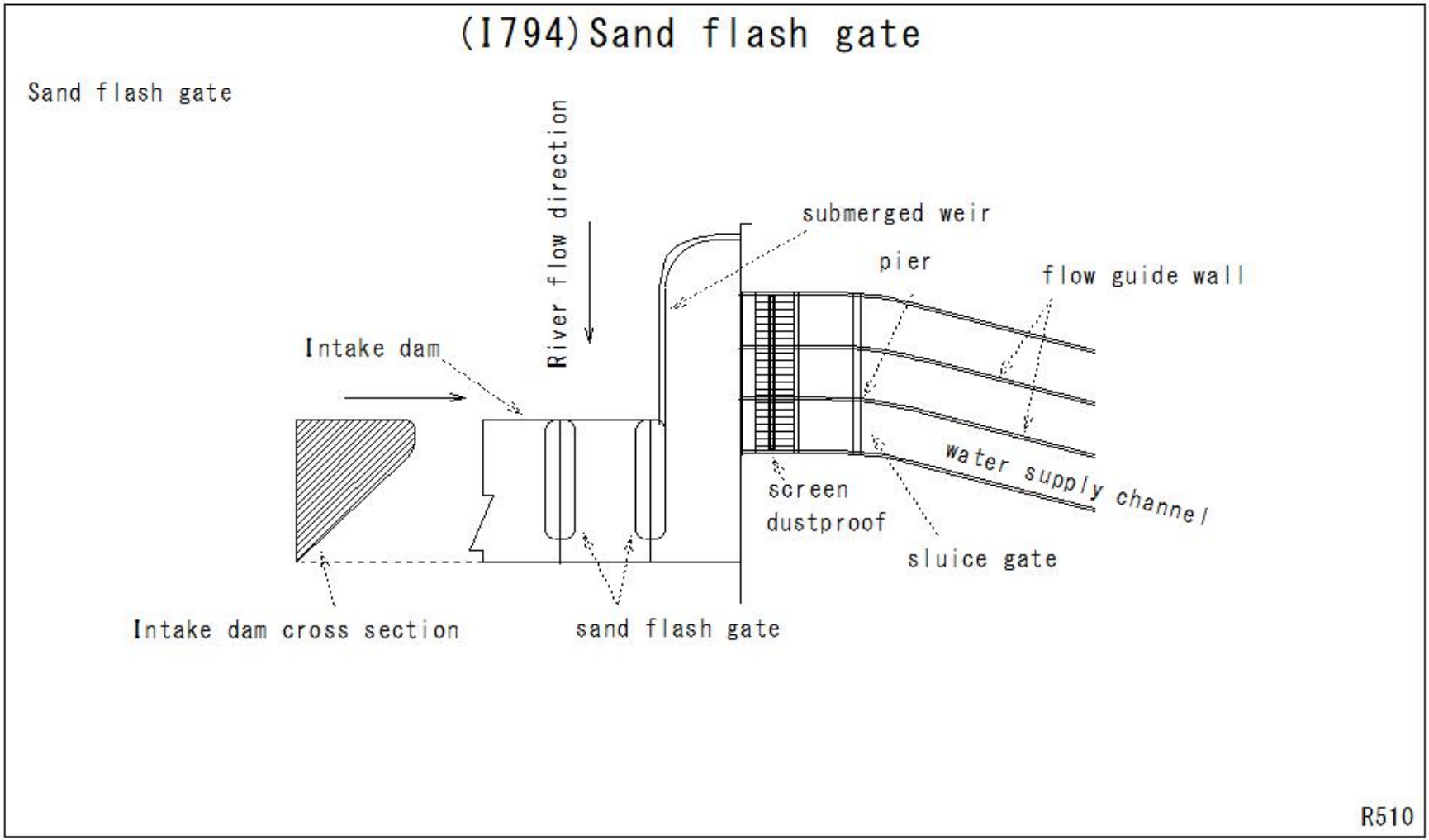
(I793)ripper(rippability)
ripability
Large bulldozer installed
ripability

Elastic wave velocity of the ground (m/sec)

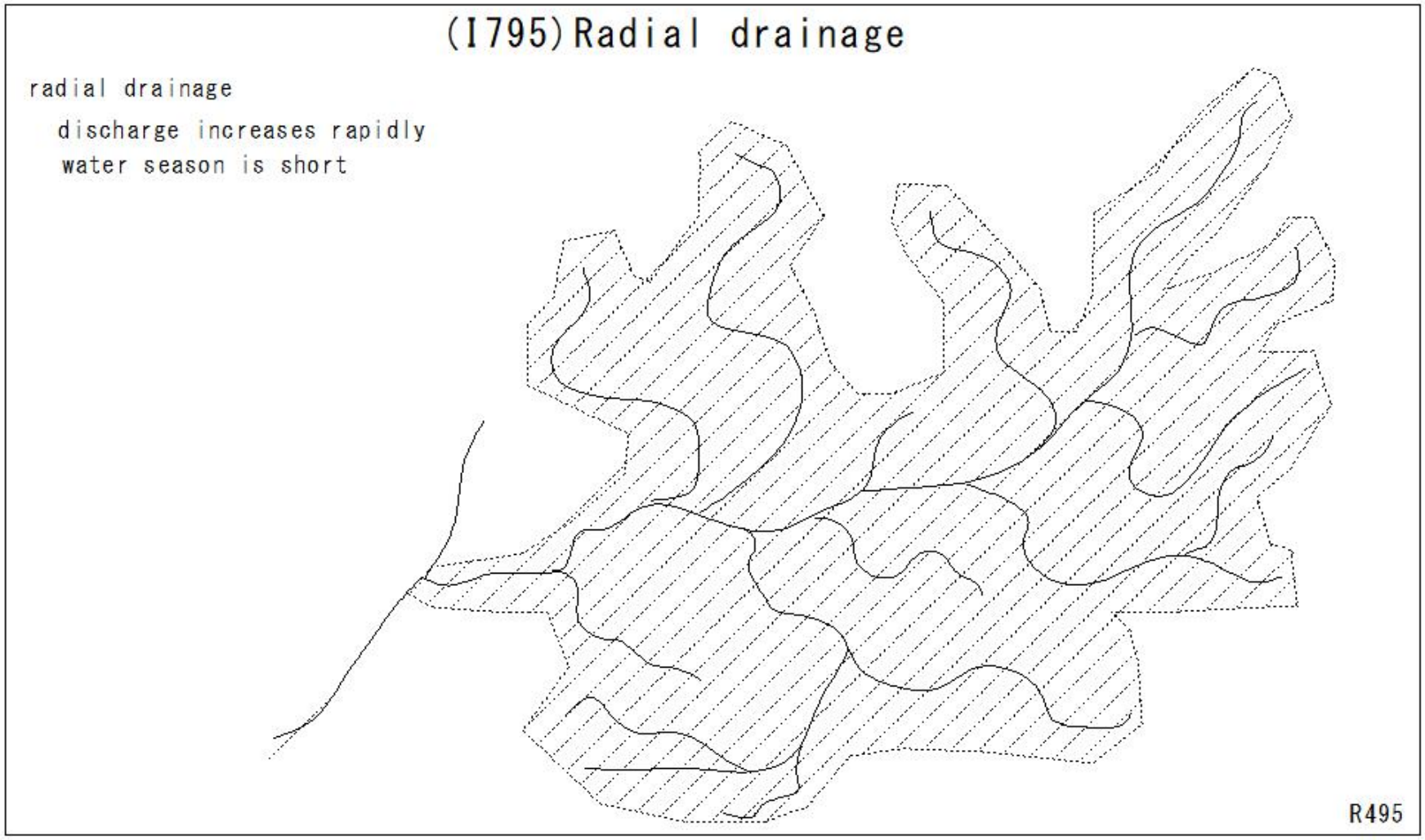
	A group of rocks	B group of rocks	21t class	31t class
	600below	900below	3	3
Number of claws	600-1000	900-1400	2	3
21t class	1000-1400	1400-1800	1	2
31t class	1400―1700	1800-2100		1



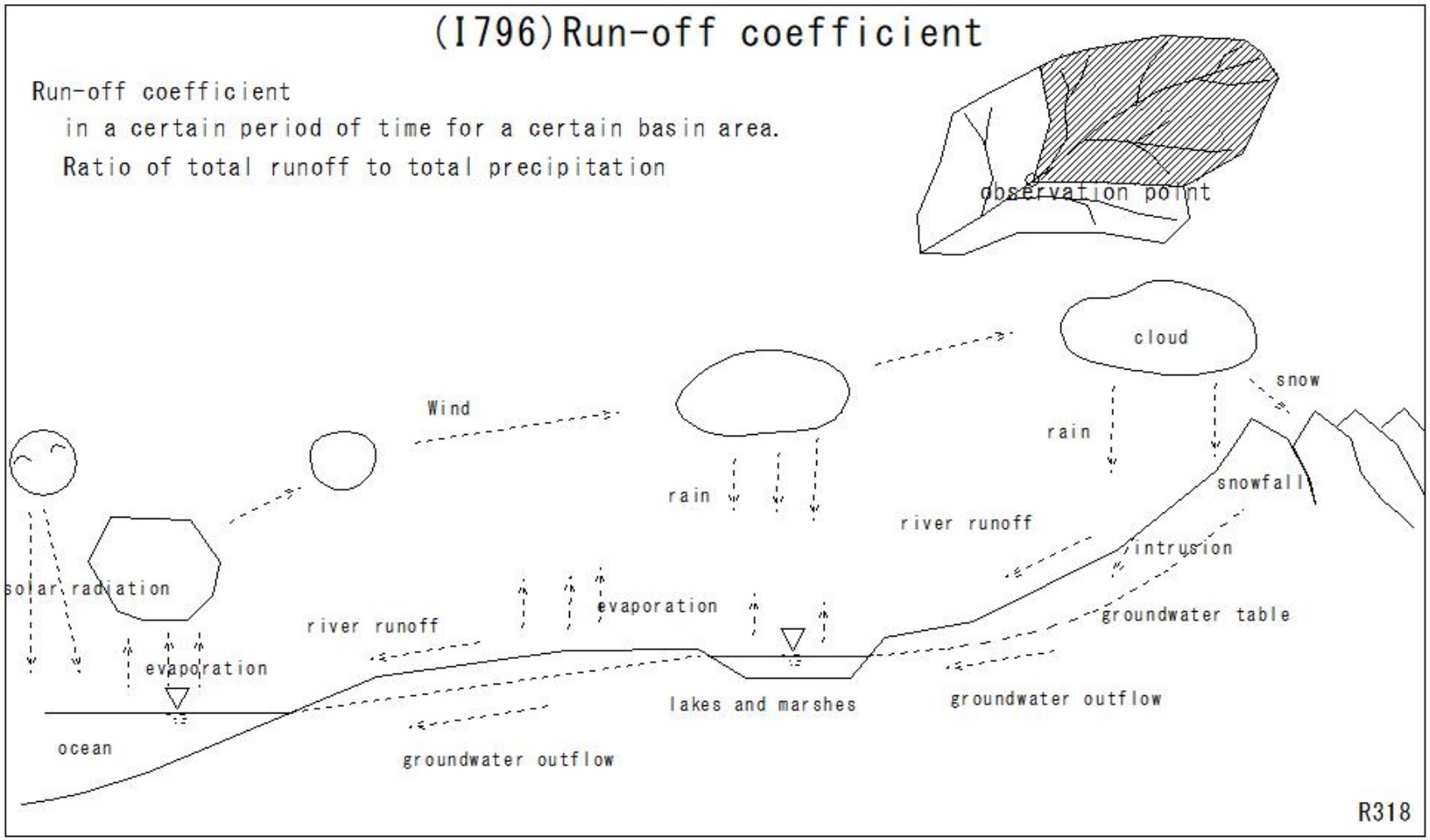
(I794)Sand flash gate



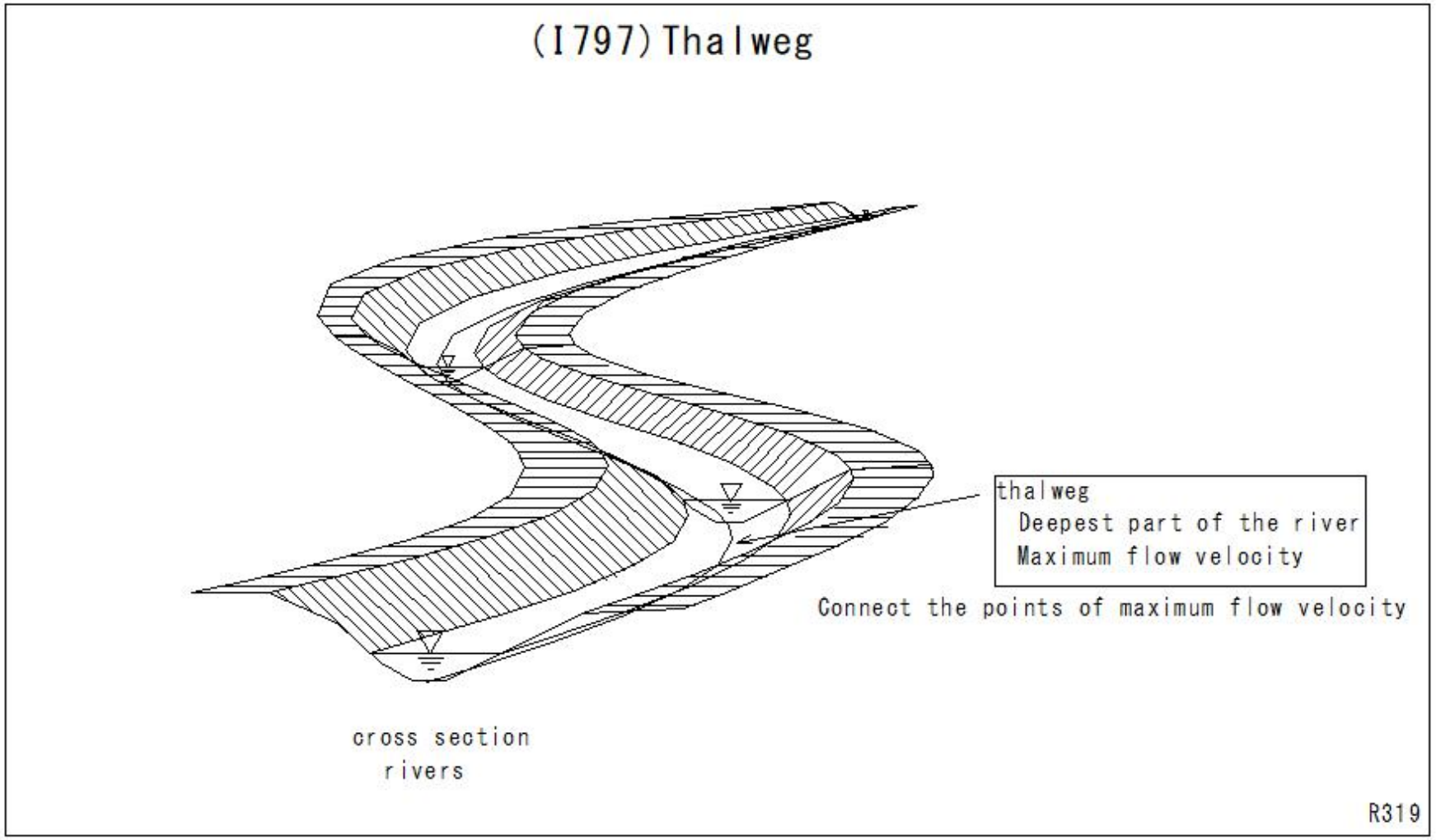
(I795)Radial drainage



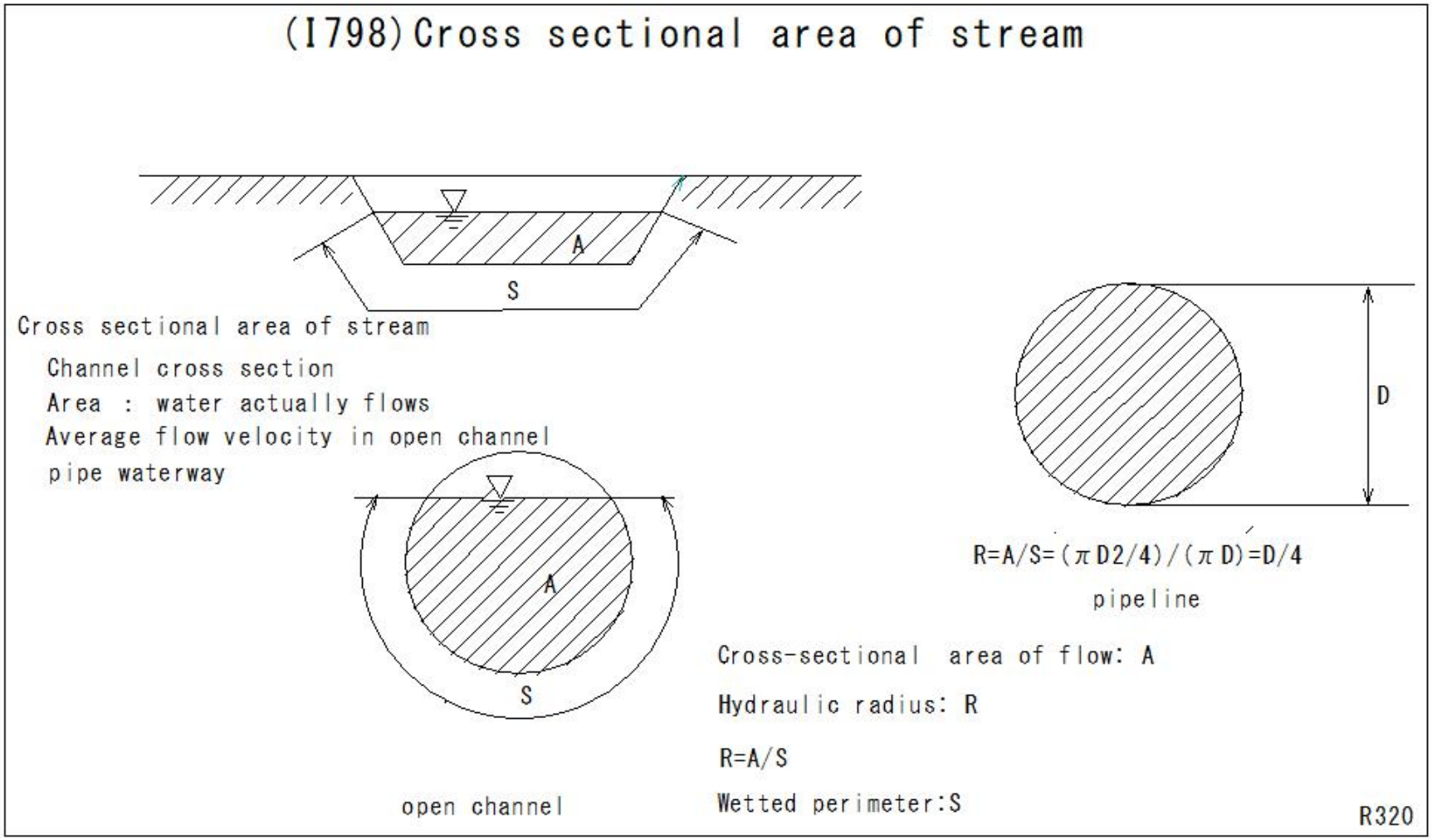
(I796)Run-off coefficient



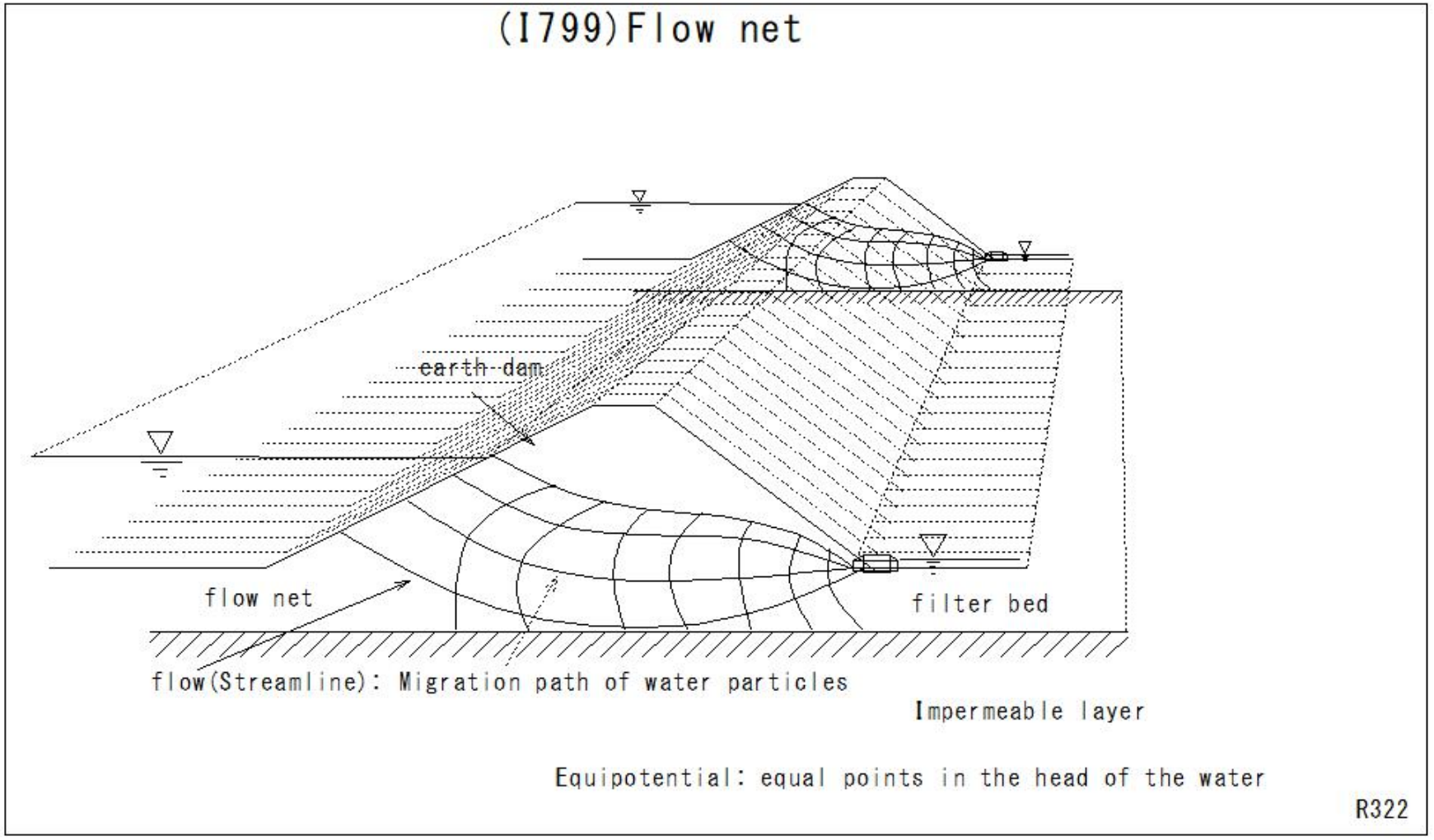
(I797)Thalweg



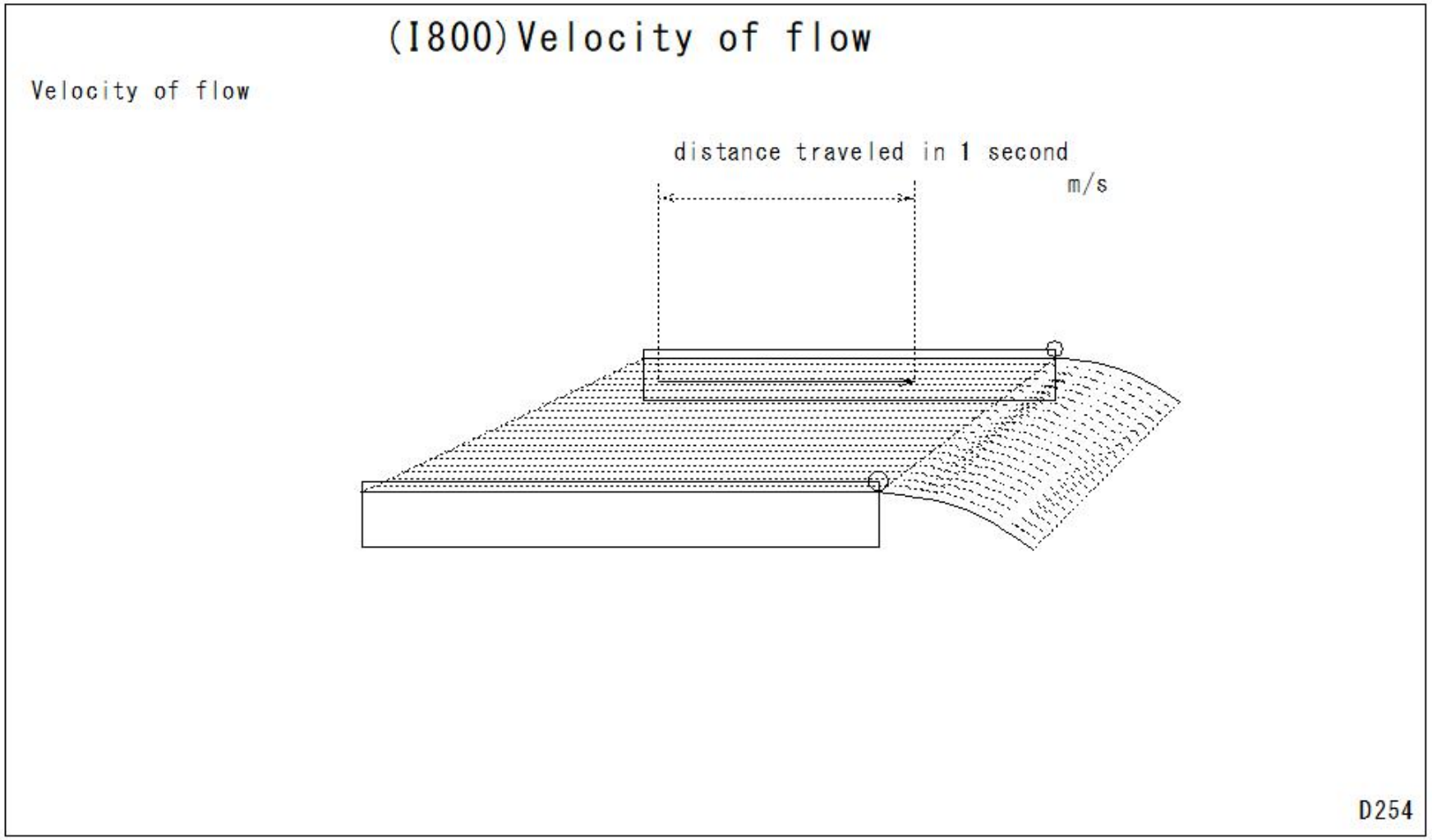
(I798)Cross sectional area of stream



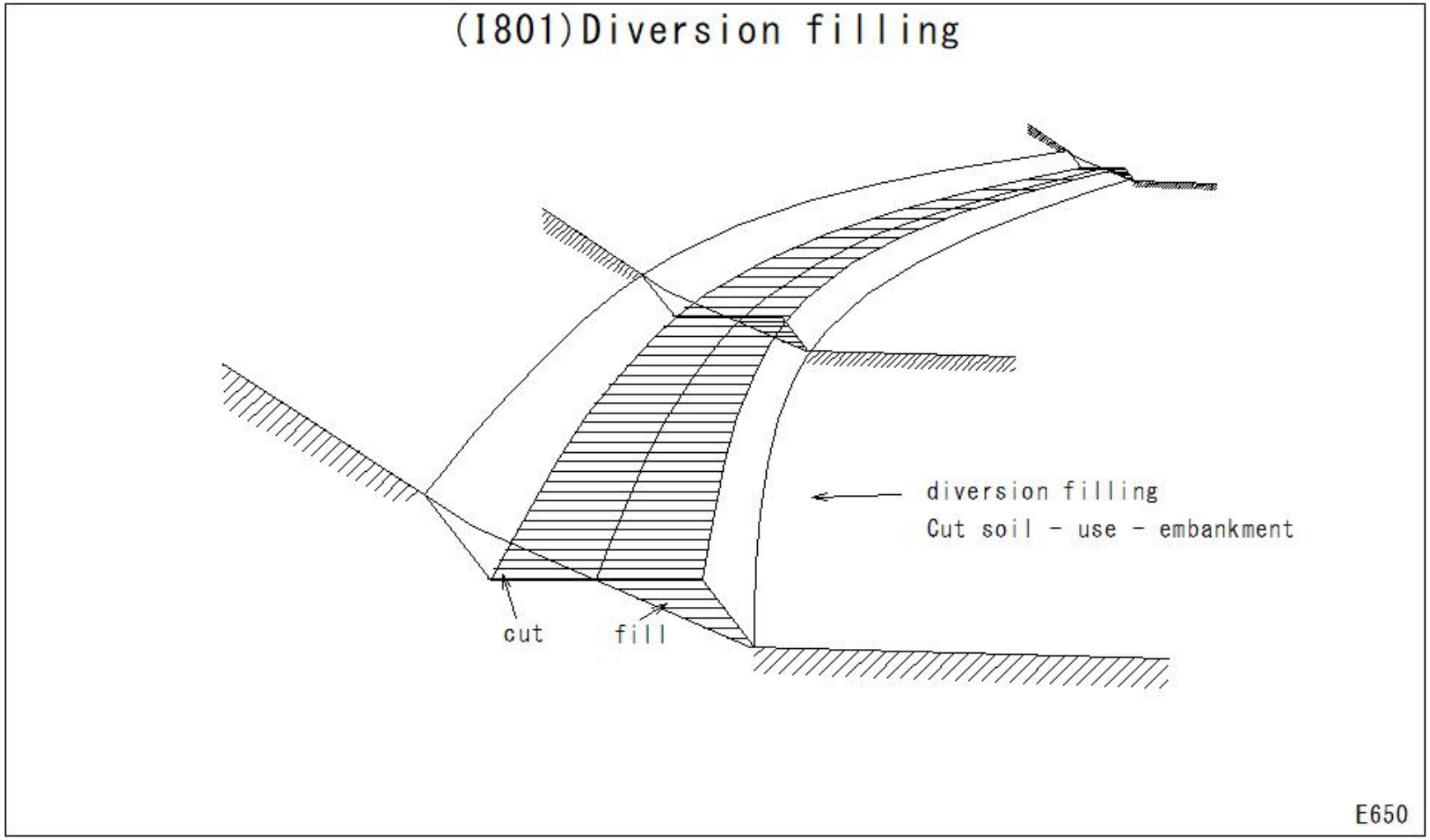
(I799)Flow net



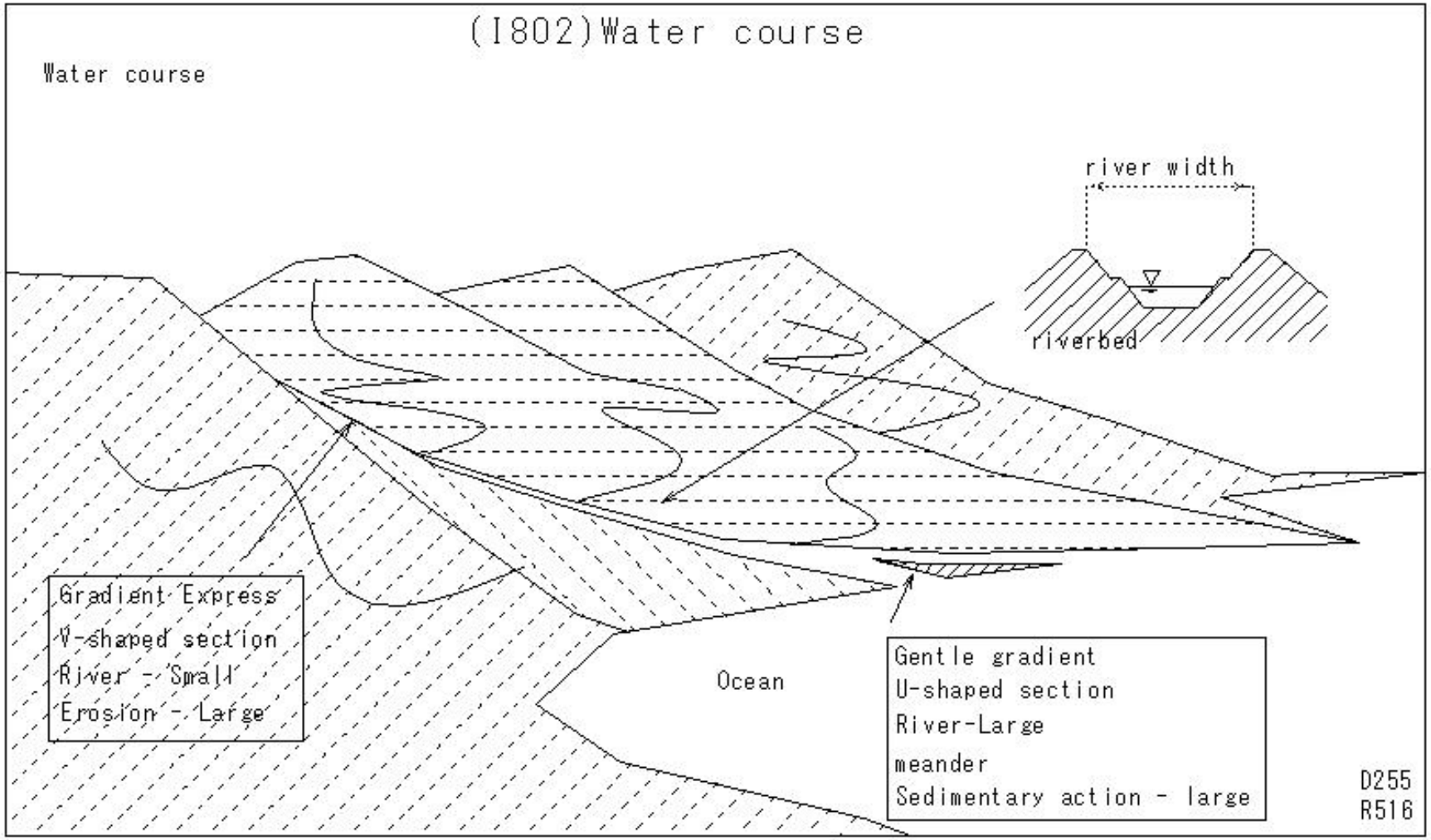
(I800)Velocity of flow



(I801)Diversion filling



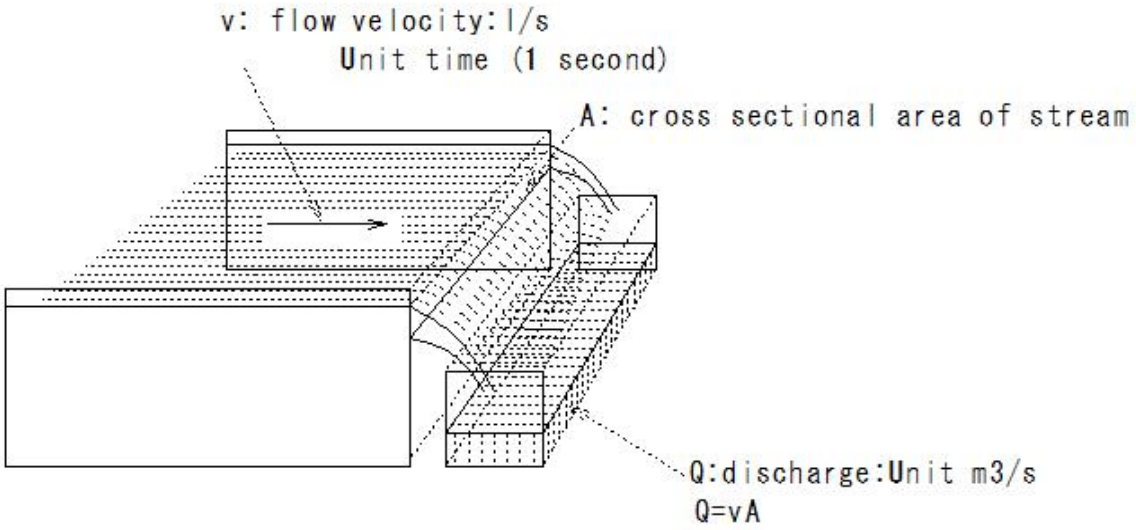
(I802)Water course



(I803)Discharge

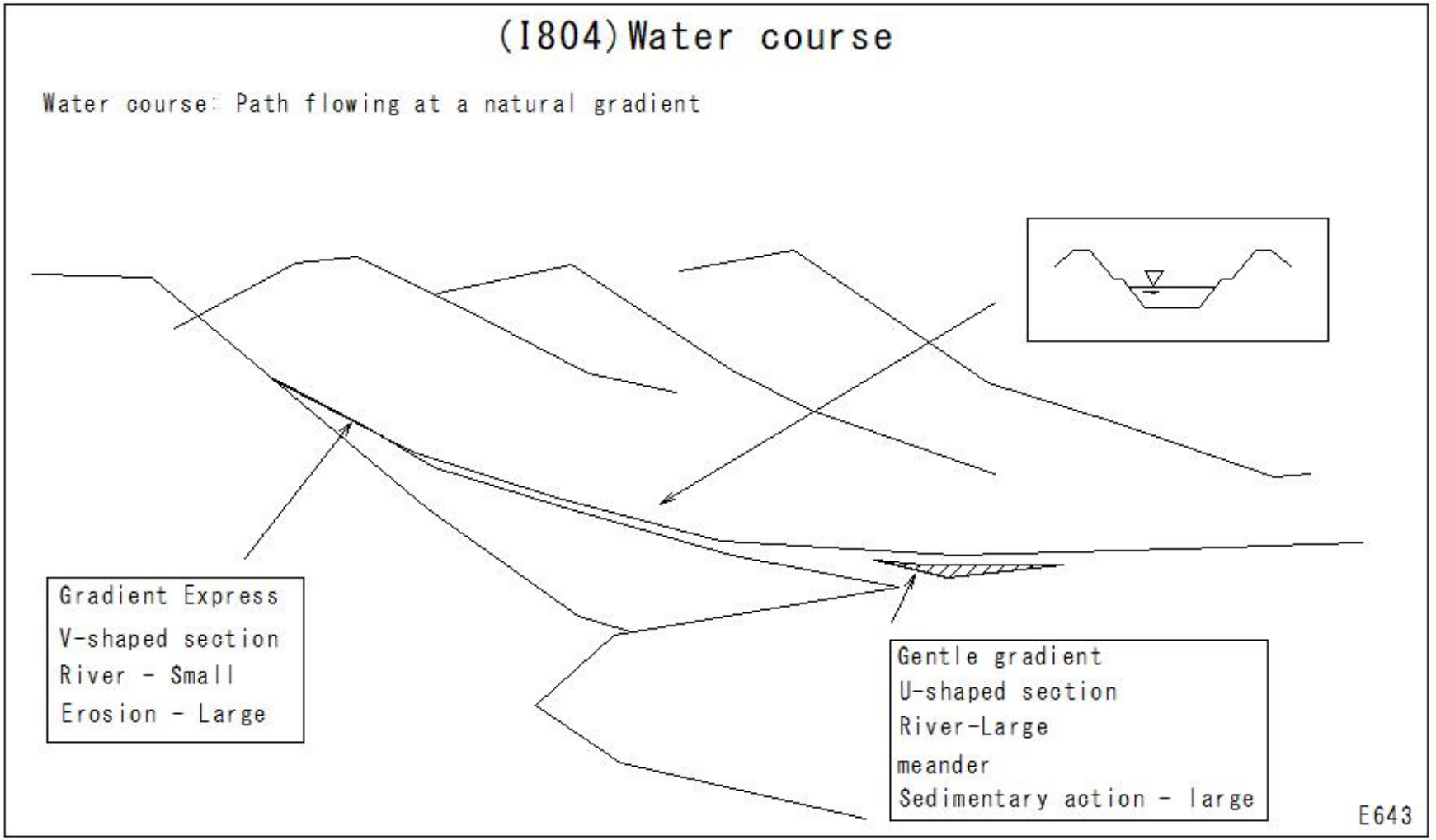
(I803)Discharge

Discharge

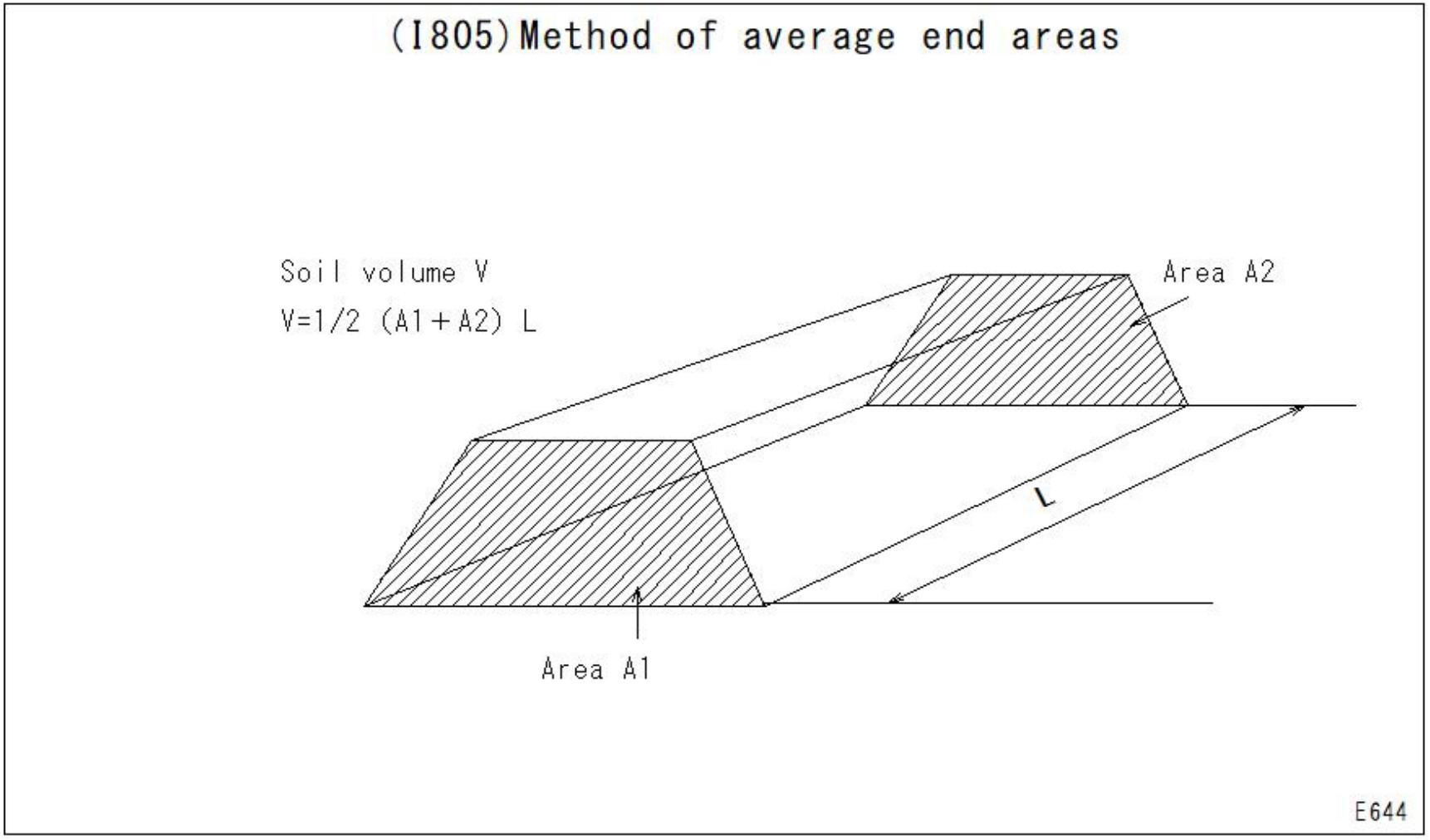


R514

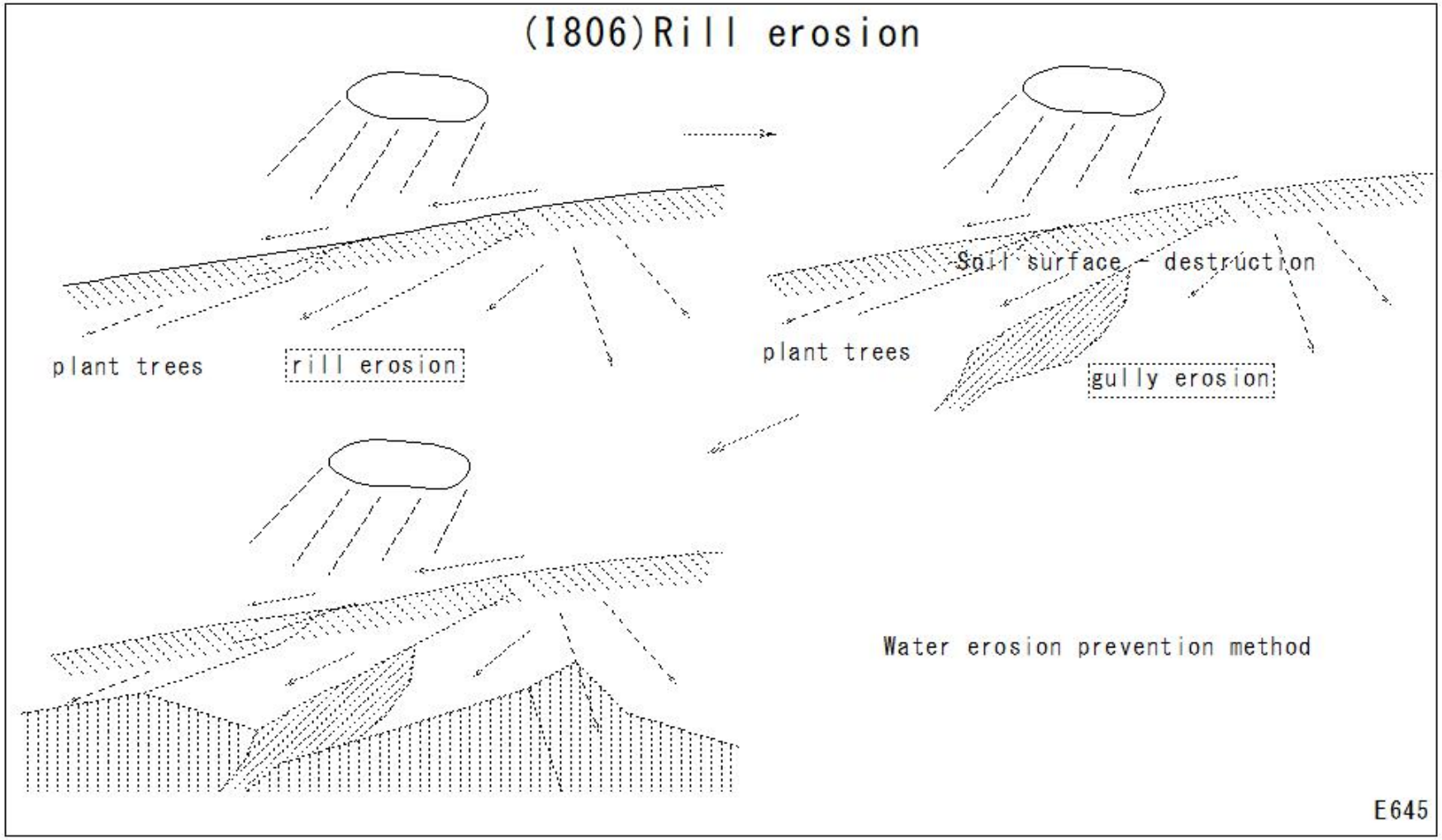
(I804)Water course



(I805)Method of average end areas



(I806)Rill erosion



(I807)Reynoldsnumber

(I807)Reynoldsnumber

Reynoldsnumber

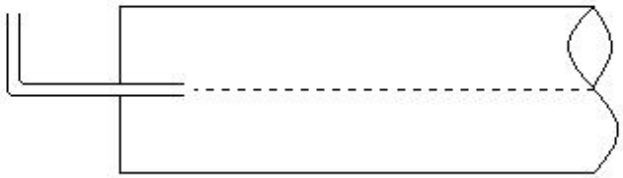
Determine whether fluid flow is laminar or turbulent

v1: flow velocity

d: Pipe inner diameter

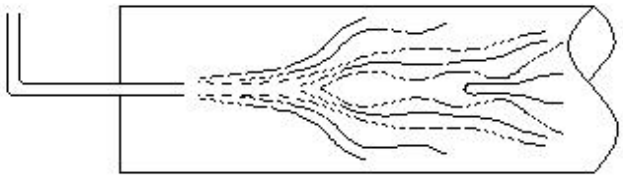
v2: Kinematic viscosity coefficient

Re＝v1d/v2



laminar flow

Re≦2320



turbulence

Re＞2320

R518

(I808)Sounding lead

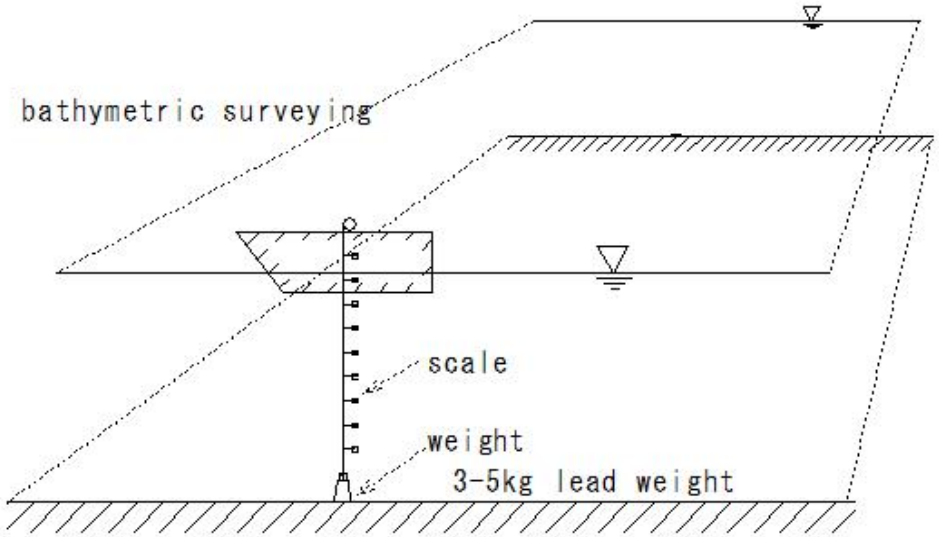
(I808)Sounding lead

Sounding lead

deep water

Flow velocity - small

Read the river water level on the scale



R519

(I809)Degraded ferro-deficient paddy field

(I809)Degraded ferro-deficient paddy field

Degraded ferro-deficient paddy field

Degraded ferro-deficient paddy field are paddies where iron and other nutrients in the soil have leached out, adversely affecting rice growth.

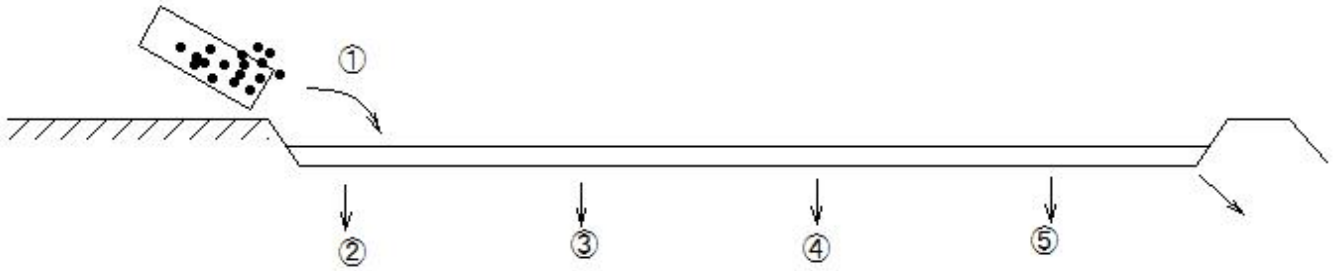
①Soil addition

②Iron

③Manganese

④Lime

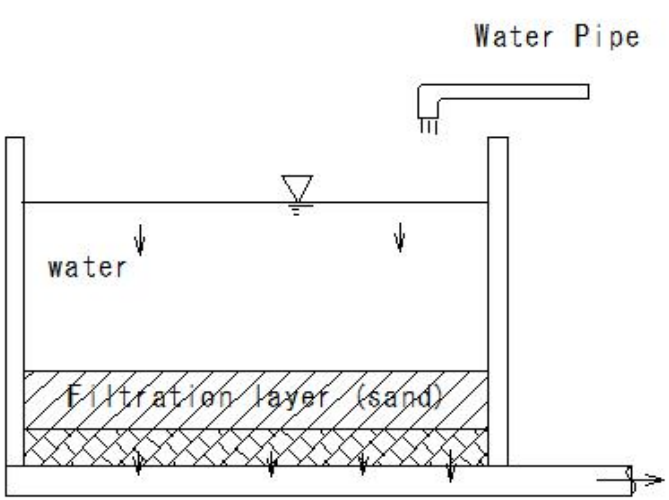
⑤Magnesium

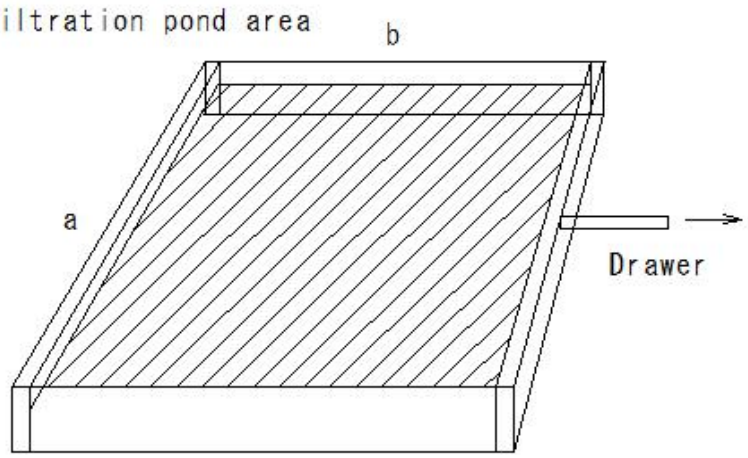


Degraded ferro-deficient paddy field

(I810)Rate of filtration

(I810)Rate of filtration





Filtered water volume

rate of filtration

Unit: m3/day

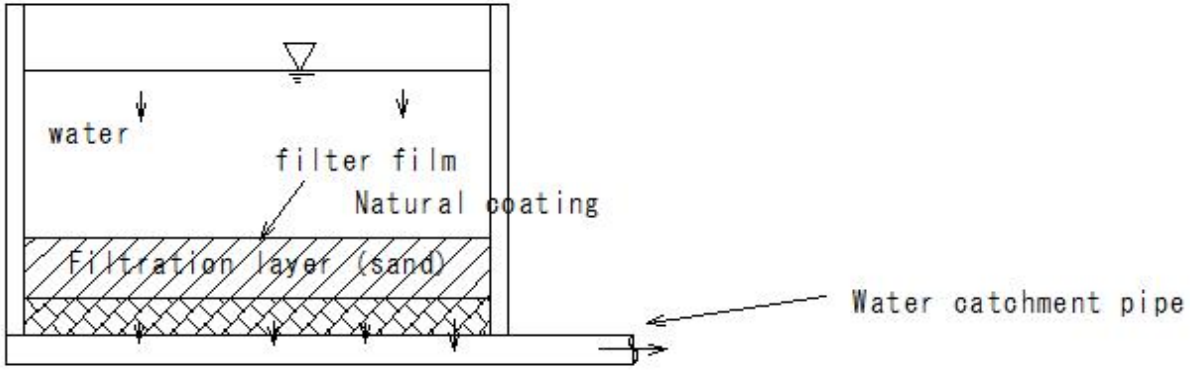
rate of filtration=Daily filtration rate／Filtration pond area=Q/ab(m3/day)

E646

(I811)Filter film

(I811)Filter film

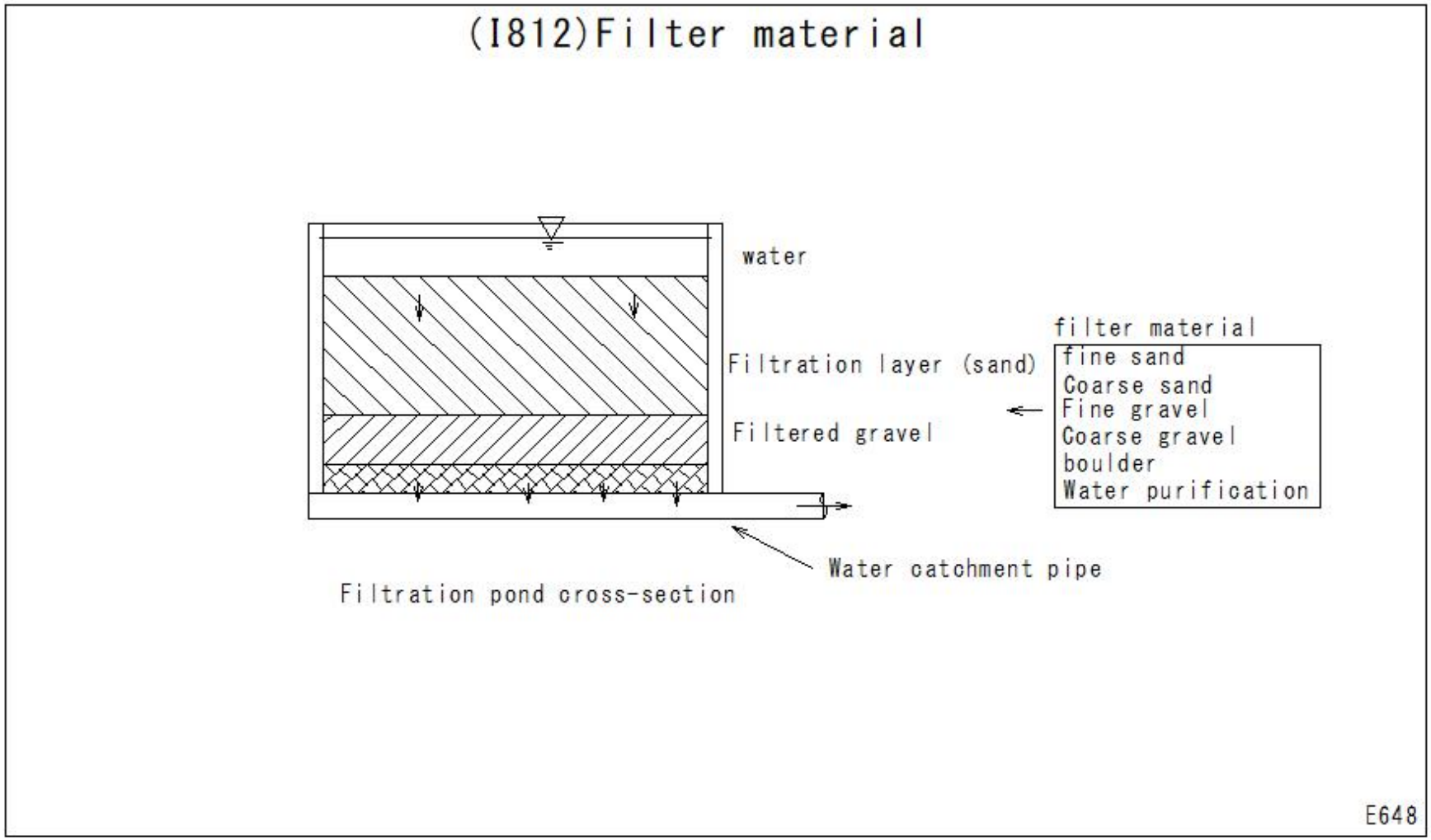
Filter film



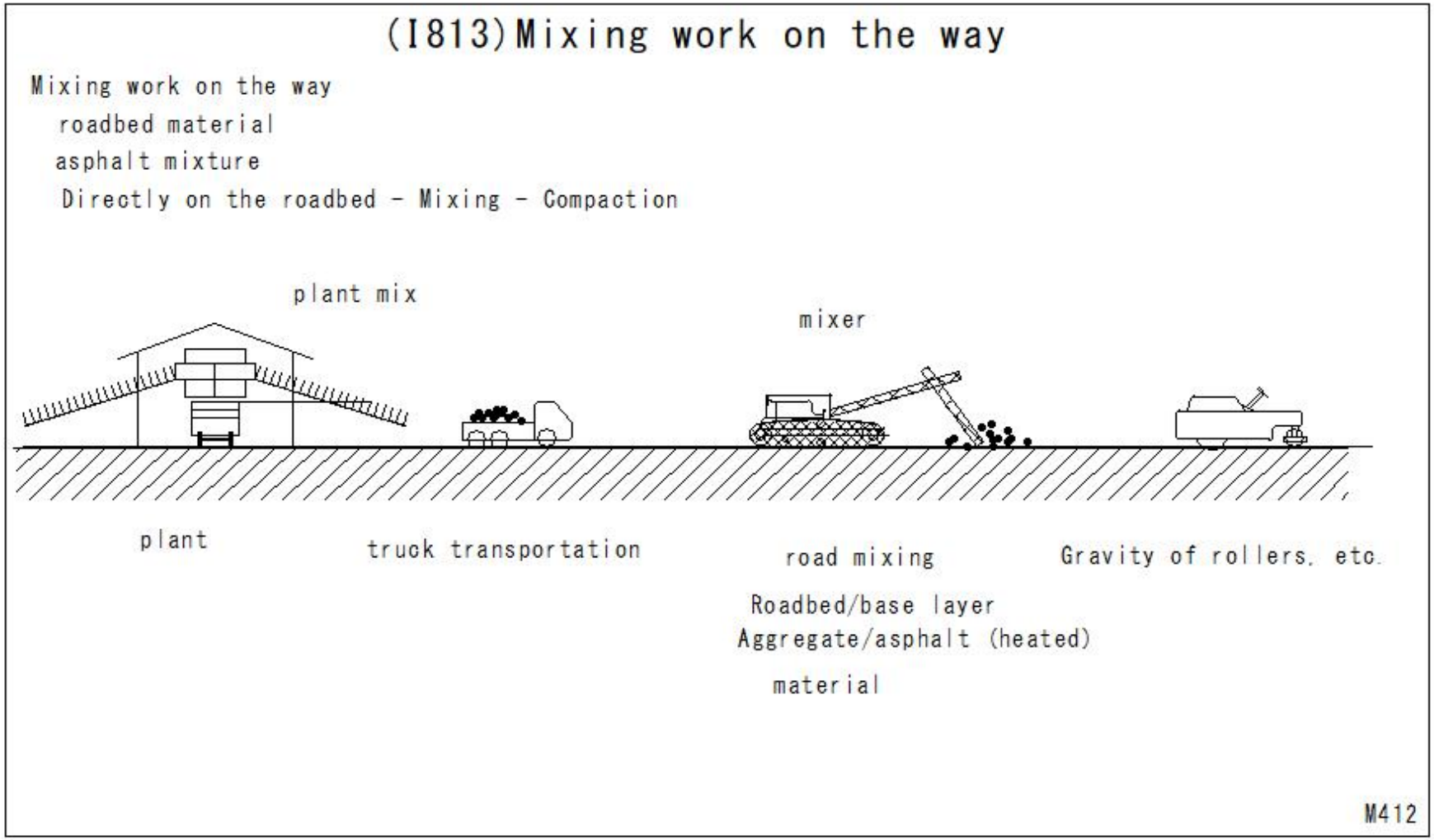
Filtration pond cross-section

E647

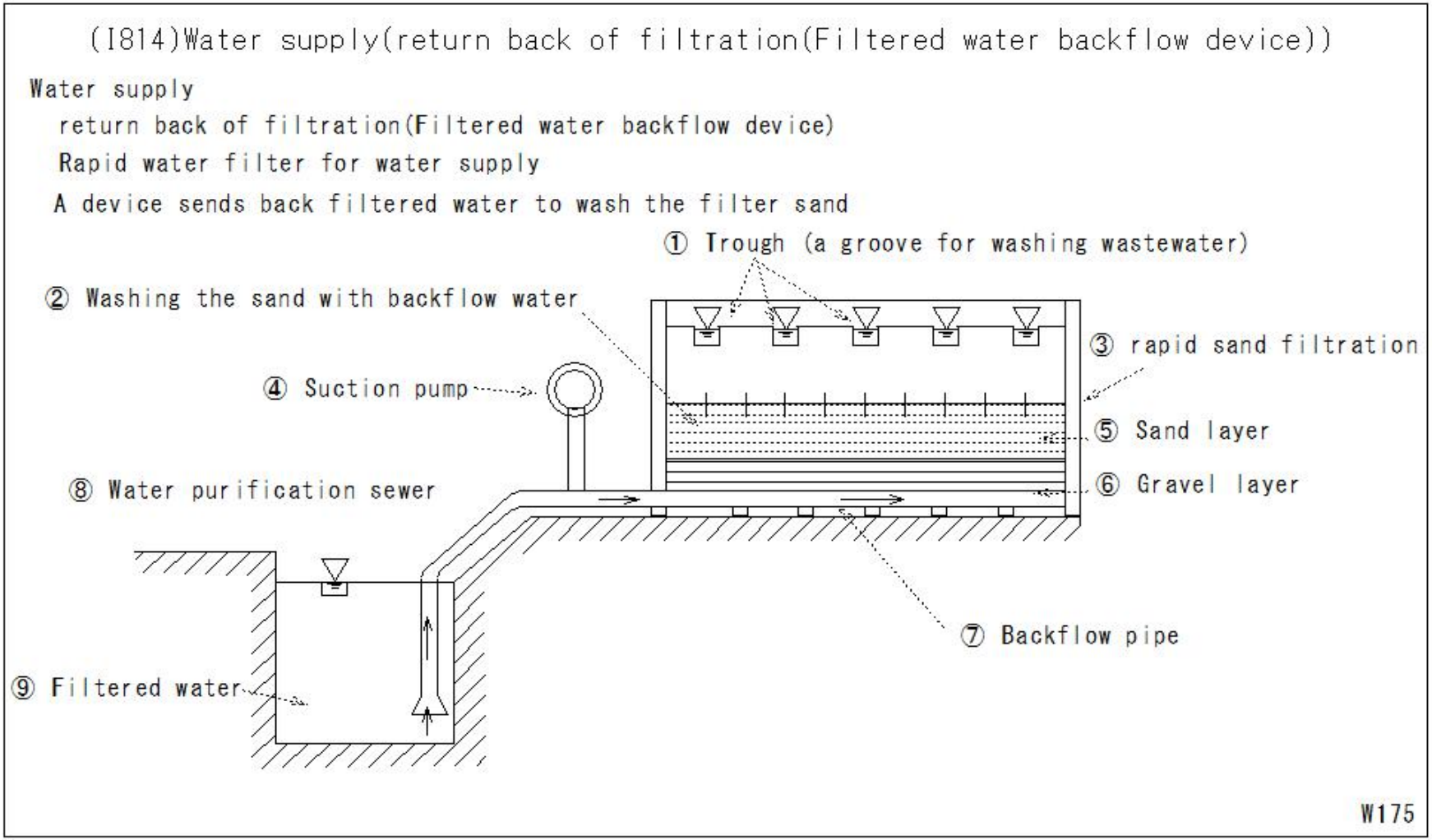
(I812)Filter material



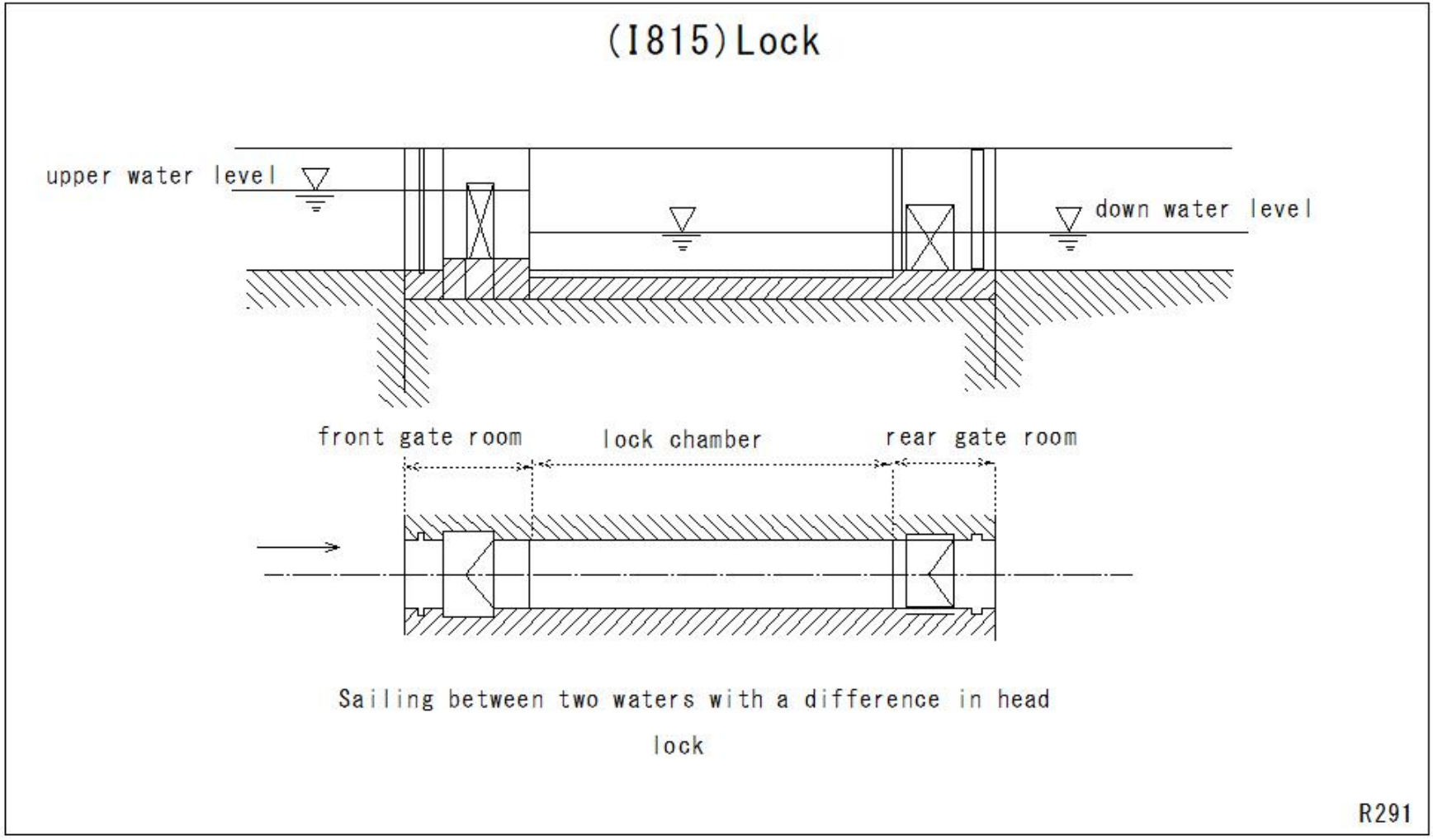
(I813)Mixing work on the way



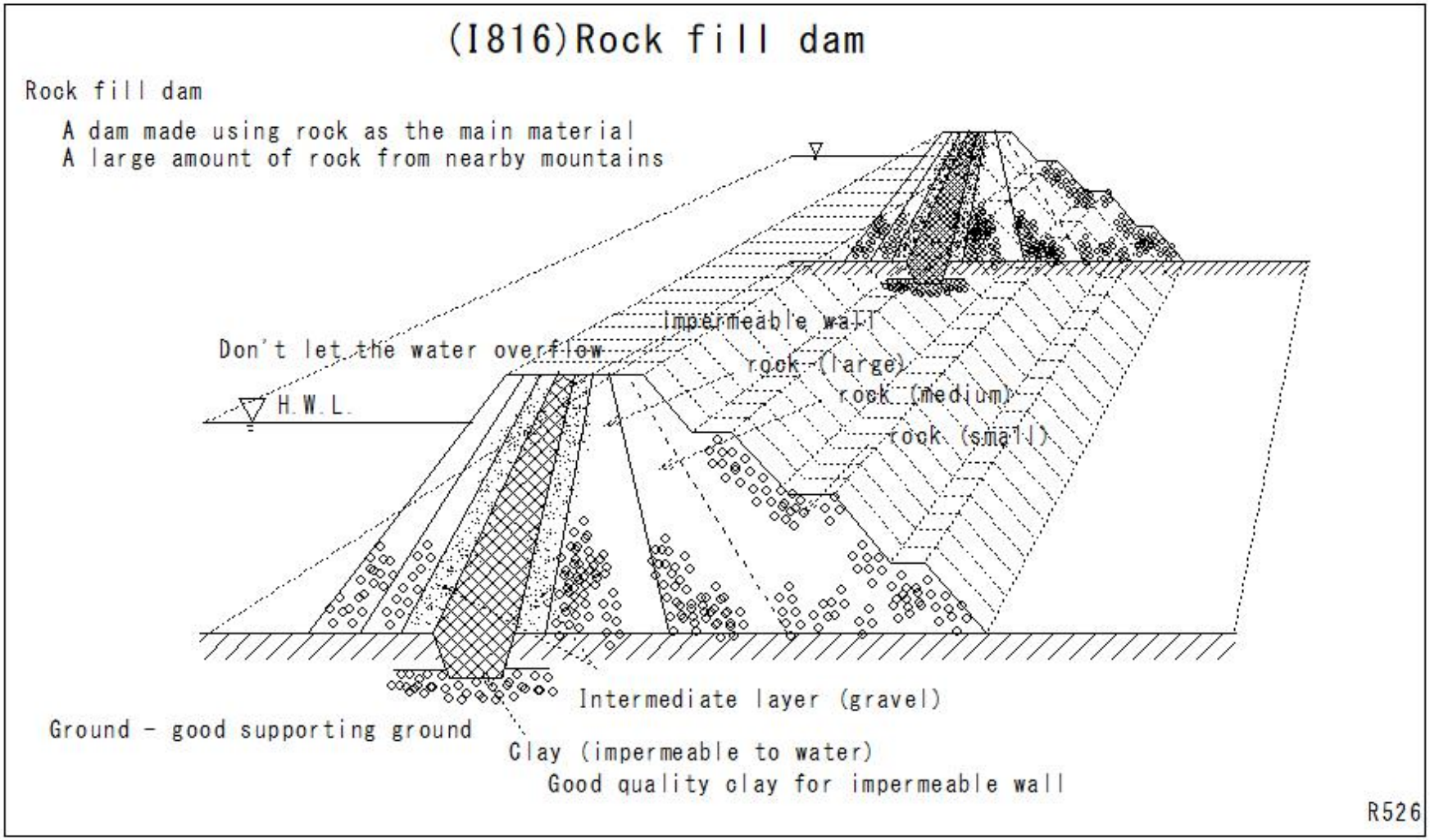
(I814)Water supply(return back of filtration(Filtered water backflow device))



(I815)Lock


(I815)Lock
upper water level
down water level
front gate room
lock chamber
rear gate room
Sailing between two waters with a difference in head
lock
R291

(I816)Rock fill dam



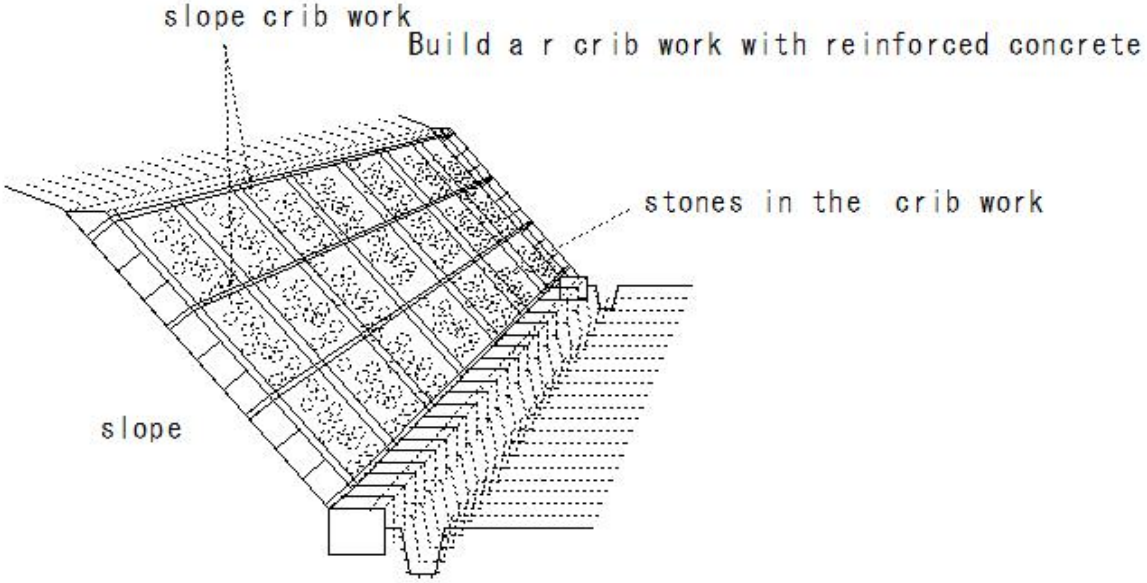
(I817)Cribwork

(I817) Cribwork

Cribwork

Embankment - slope reinforcement

Slope - crib work



R523