

Examination of quantitative evaluation methods of influence of river environment

Budgeted: Grants for operating expenses

River account

Research Period: FY1999-2003

Research Team: Advanced Technology

Author: MURAMATSU Toshimitsu

EMOTO Taira

YOSHIDA Tadashi

HAYASHI Akira

ARAI Takeshi

YOSHINAGA Hiroshi

NITTA Takashi

YAMAGUCHI Takashi

TANAKA Kazushi

Abstract:

To improve prediction accuracy of construction noise, we examined conditions that noise from various machines can be estimated as a point sound source, methods to convert equivalent construction sound level to percentile sound level regulated by Noise Regulation Law, and simple calculation methods of sound attenuation effect by ground surface and sound diffraction effects, which uses representative spectrum. Then we organized prediction calculation methods of construction noise level, and verified improvement of prediction accuracy by actual measurement, and organized data for prediction.

Key words: construction, surface sound source, unit, equivalent continuous sound level, effective sound level, percentile sound level, Noise Regulation Law, sound power level, sound attenuation effect by ground surface, sound diffraction effect

Research on cost-effectiveness methods to alleviate heat island phenomena

Budget: Grants for operating expenses

General account

Research Period: FY2001-2003

Research Team: Hydrologic Engineering

Author: YOSHITANI Junichi

KINOUCHI Tsuyoshi

Abstract:

It is necessary to propose cost-effective measures to mitigate global warming or heat island phenomena by clarifying cost and effect of each measure. This research aims at quantification of social and economic influences of energy-saving effects by heat island mitigation measures such as rooftop greening, surface water restoration, pavement improvement, vehicle exhaust heat reduction, and of effects of reduction of load on atmosphere, and of effects of improvement of living environment, in the light of cost performance. In fiscal year 2003, we developed high-performance heat reflective paint, and actualized heat-shielding pavement with 50% solar reflectance in charcoal color. In addition, we verified operability of watering with residents' participation as a measure against heat island phenomena, and revealed its effectiveness. In conclusion, we quantified cost and benefit of each scenario of measure against heat island, and revealed that greening and reduction of exhaust heat from households are effective and that B/C of rooftop greening (not include reuse) and measures by pavement are smaller than that of other measures.

Key words: heat island, mitigation measures, cost-benefit evaluation, CVM, heat-shielding pavement, social experiment of watering

Research on accuracy improvement of hydrological observation

Budgeted: Grants for operating expenses

General account

Research Period: FY1995-2003

Research Team: Hydrologic Engineering

Author: YOSHITANI Junichi

FUKAMI Kazuhiko

Amou Jun

OTE Masayuki

SHIMIZU Takao

SHINOHARA Tsutomu

Abstract:

Recently, river (and basin) management system and river planning including their social demands are becoming more significant and diversifying. Hydrological observation is also required urgent approaches such as reviewing of observation systems and facilities, securing and improvement of observation data quality, development of technology on hydrological observation, human resource fostering and improvement of data base. Therefore, in this research, we reviewed these issues, and identified problems (error factors) in the hydrological observation and social needs, and examined technical issues especially on water level and discharge, through general investigation of National Hydrological Networks, then proposed matters should be developed technically to overcome those issues. In addition, we focused on securing and improvement of observation data quality and technical development on observation of flood flow quantity. In respect of securing and improvement of observation data quality, we preserved and managed necessary data and functions with a consideration of convenience for actual works, and developed systems to support judging of creation and inspection of HQ rating curve by automating calculation and drawing. In respect of technical development of flood discharge observation, we developed a non-contact current meter, which enables to observe flood discharge safely and continuously. This is expected to become a supplemental system of discharge observation by float type measurement.

Key words: discharge measurement, observed data inspection support, non-contact flow meter

Study on discharge water temperature and turbidity control in dam reservoir

Budgeted: Grants for operating expenses

River account

Research Period: FY2001-2003

Research Team: Dam Hydraulic
Engineering

Author: KASHIWAI Josuke

SAKURAI Toshiyuki

SUZUKI Tomoyuki

Abstract:

This research aims to develop an advanced control method for water temperature and turbidity by a curtain system and a selective withdrawal facility, and to develop a numerical simulation model to reproduce a flow and water quality in dam reservoirs. The effect of a curtain system and intake water temperature characteristics of a selective withdrawal facility were examined by a hydraulic model test. A vertical two-dimensional simulation model was improved by introducing a turbulence model and a vertical momentum equation, and verified by field observation data.

Key words: reservoir discharge, water temperature control, turbidity control, curtain system, selective withdrawal facility

Survey on high-degree application system of sludge retention energy

Budget: Income from entrusted research
(expectation)

Research Period: FY2000-2003

Research Team: Recycling

Author: SUZUKI Yutaka

OCHI Shuichi

OCHI Takashi

NAGASAWA Hidekazu

Abstract:

Potential retention energy of sludge is peculiar resource that has possibility of substantial cost saving and energy saving in the whole sewerage system, and is required establishment of systems for high degree development and application of itself. This survey aims to establish electric power and heat recovery systems, which combined a recycling system of methane gas, by converting present combustion process into electric generation process, and by integrating the electric generation process and anaerobic digestion process. In the survey, we developed high-temperature incineration system, which is able to produce energy and adsorption storage system of digestion gas, then evaluated their efficiency through case studies. Developed high-temperature incineration system is integration of the pressure fluidized bed incinerators of which MPa is about 0.3 and dust collector ceramic filter and supercharger, besides, this do not need external power for operation, and is able to supply massive amount of compressed air in aeration tank of sewage system. The adsorption storage system of digestion gas has storage capacity which is 20 to 30 times higher than conventional normal pressure (close to atmospheric pressure) storage method and 3 to 7 times higher than pressure storage method with which pressures is less than 1MPa (less than atmospheric pressure-10).

Key words: sludge, energy, incineration, combustion, power generation, anaerobic digestion, digestion gas, gas storage

Research on geophysical exploration techniques for the near surfaces in urban area

Budgeted: Grants for operating expenses

General account

Research Period: FY2001-2003

Research Team: Construction Technology

Research Department

Author: INAZAKI Tomio

Abstract:

Geophysical exploration techniques were studied to enable to delineate near-surface geological structure at large urban areas, under the collaboration with AIST and five private geophysical survey companies. A land streamer, which was originally designed and developed by the author at PWRI as the field tool applicable even at paved areas, was set to the core tool to be applied to high-resolution near-surface survey, and extended to a special purpose to detect such anomalies as air-raid shelters, cavities originated from abandoned lignite mines.

Fundamental tests were conducted on a 60 m long test sidewalk to clarify the influence of the pavement structure on the data acquisition. As a result, it was cleared that the pavement acts as the surface-wave reduction filter, and provides a preferable homogeneous surface condition for high-resolution seismic survey.

Collaborative field measurements were carried out at three sites to evaluate the performance of the land streamer to levee survey and cavity detection. It was exemplified that the land streamer survey is quite capable for these purposes.

Key words: geophysical exploration, seismic reflection method, land streamer, near-surface, cavity detection

A feasibility study on dating method based upon a paleoenvironment variation for
disaster prediction

Budget: Grants for operating expenses

General account

Research Period: FY1999-2003

Research Team: Geology

Author: SASAKI Yasuhito

SHIBATA Mitsuhiro

ANAN Syuji

Abstract:

We conducted an opal phytolith analysis, magnetic susceptibility measurement, soil color measurement and element analysis in order to compare these variations with paleoenvironment variation. The result of analysis showed the opal phytolith variation and magnetic susceptibility variation were related to global environment changes. These results suggest that opal phytolith and magnetization rate are useful as indexes of dating and stratigraphic correlation.

Key words: paleoenvironment, loam, opal phytolith, magnetic susceptibility, soil color

Study on establishment for ground observation method in tunnel construction

Budgeted: Grants for operating expenses

Road account

Research Period: FY1999-2003

Research Team: Tunnel

Author: MASHIMO Hideto

ISAGO Nobuharu

ENDO Takuo

Abstract:

The aim of this study is to propose the evaluation method of face observation and displacement results in order to judge the grade of ground for selecting proper support in accordance with ground condition in constructing road tunnels with the normal tunnel support pattern because of importance to increase the safety in constructing a mountain tunnel and reduce construction cost.

The relation between the data of face observation, displacement and support stress from tunnel construction site and ground grade was analyzed for each rock quality by collecting the data and creating the database. As a result, no clear relation was found between the data of displacement or support stress and ground. The method of evaluating quantitatively the result from face observation by weighted average method was considered and the rough standard was shown by the evaluation of weighting every item of face observation in each rock quality on the basis of the result from multivariate analysis. Also the effectiveness of point load test in site was described as the method of evaluating rock strength more quantitatively.

Key word: tunnel, in situ test, ground grade, face observation, multivariate analysis

Development of Hybrid Vibration Experiment Technique for assessing seismic performance of pile foundations with superstructure

Budget: Grants for operating expenses

General account

Research Period: FY1999-2003

Research Team: Ground Vibration

Author: TAMURA Keiichi

OKAMURA Mitsu

TANIMOTO Shunsuke

Abstract:

Seismic behavior of highway bridges, which typically consist of piles with footing, pier and superstructure, is highly complicated due to dynamic interaction between soil, pile and superstructure. In this study the hybrid vibration experiment technique was developed, which is capable of simulating the seismic response of whole bridge system by combining a physical model with numerical simulation. Effects of liquefaction of foundation soil, existence of non-liquefied soil at ground surface and retrofit technique for bridge piers were investigated through the hybrid vibration experiment.

Key words: seismic performance, hybrid vibration experiment, liquefaction, pile foundation, superstructure

Development of technology for performance evaluation of reinforcement arrangement
for reinforced concrete structures

Budget: Grants for operating expenses

Road account

Research Period: FY2000-2003

Research Team: Earthquake Engineering

Author: UNJOH Shigeki

NISHIDA Hideaki

SHIOJIMA Akihiko

Abstract:

Many tie hoop or intermediate hoop reinforcing bars are arranged in reinforced concrete bridges nowadays. Along with this, construction works of arrangement of tie hoop or intermediate hoop are becoming very complicated. In this research, we aimed to develop new confinement system which enables to improve efficiency of construction works and to reduce construction cost, and proposed a fixing structure at edges of confined concrete that has good workability, and also proposed a new concrete arrangement method for wide rectangular cross-section that arranges concrete by oval interlocking bar arrangement. Then we confirmed its performance by a pulling-out test of reinforced concrete and a reversed cyclic loading test that uses bridge model.

Key words: improvement of efficiency of construction works, tie hoop, intermediate hoop, fixing at edge, interlocking arrangement

Test survey on earthquake resistant limit state design for whole systems of bridge
which considers reliability

Budget: Grants for operating expenses

Road account

Research Period: FY2001-2003

Research Team: Earthquake Engineering

Author: UNJOH Shigeki

NISHIDA Hideaki

Abstract:

In this research, we aimed at establishment of a method to evaluate seismic performance of whole systems of bridge based on reliability theory, and at proposing of resistance structures and hierarchical coefficient of bearing capacity based on the capacity design which is foundation of the evaluation method, and also aimed at proposing of performance evaluation analysis method based on displacement-based design.

We evaluated seismic reliability of reinforced concrete (RC) which satisfies seismic performance level 2 specified in the present specifications for highway bridges, RC bridges-bearing and upper structures with a simultaneous consideration of multiple limit states, then analyzed sensitivity of partial factors, and proposed hierarchy of bearing capacity necessary for inducing damages on bridges. And also, we proposed a method to set equivalent damping factors and equivalent stiffness for improvement of accuracy of presumption of maximum response displacement by assuming that equivalent linearization method is applied when designing bridges based on displacement-based design method.

Key words: limit state design, reliability theory, displacement-based design method, equivalent linearization method

Evaluation methods of dam safety based on its behavior

Budgeted: Grants for operating expenses

River account

Research Period: FY1999-2003

Research Team: Dam Structure

Author: YAMAGUCHI Yoshikazu

SASAKI Takashi

TOMIDA Naoki

KOBORI Toshihide

Abstract:

In consideration of efficient management of concrete dams, it should be required rationalization of the measurement of dam behavior and diagnosis methods of dam body for safety management.

In order for simplification and rationalization of the behavior measurement of existing concrete dams, measurement items for the safety management should be examined for comprehensive evaluation of the dam safety with taking account of future conditions. Uplift pressure measurement which is considered to be a most effective item to rationalize the measurement was picked up, the uplift distribution and the effect of uplift on the dam safety under various conditions is carried out and the evaluation method of the necessity of the functional recovery of uplift measurement devices was shown. And, because the efficient inspection on the wide surface of the large concrete dam has been required, soundness diagnosis method using infrared camera was proposed.

Key words: safety management, uplift, seepage analysis, deterioration diagnosis, infrared camera

Rationalization of design and execution works of concrete dams

Budgeted: Grants for operating expenses

River account

Research Period: FY2001-2003

Research Team: Dam Structure

Author: YAMAGUCHI Yoshikazu

TOYODA mitsuo

SASAKI Takashi

KOBORI Toshihide

ISHIBASHI Masayoshi

Abstract:

It is necessary to challenge the cost reduction in the construction of concrete dams. In this research, we have dealt with the improvement of efficiency of RCD method and the application of the High-Fluidity Concrete to the construction of whole dam body. The results of this research are summarized below.

•The improvement of efficiency of RCD method

The strength of the construction joint can be ensured to some placing time interval without carrying out the green cut, if the easy wash of joint plane is conducted and the mortar is spread. And, when construction joint processing additives is used, it is necessary to thoroughly remove area of joint surface affected by the additives.

•The application of the High-Fluidity Concrete to the dam

At a mix proportion with the ratio of water to binding material $W/(C+F) = 60\%$, and the fly ash replacement ratio $F/(C+F) = 50\%$ can lower the unit cement content to around 130 kg/m³ for High-Fluidity Concrete with large aggregate. In the case that the good durability for the freeze and thaw action is required, the ratio of water to binding material should not be reduced excessively.

Key words: dam, RCD method, construction joint, shear test, High-Fluidity Concrete, unit cement content

Research on hydraulic design methods of additional discharge facilities for effective use
of existing dam

Budget: Grants for operating expenses

River account

Research Period: FY2000-2003

Research Team: Dam Hydraulic

Engineering

Author: KASHIWAI Josuke

YUKI Kazuhiro

OGURO Maki

Abstract:

In order to use existing stilling basin, additional discharge facilities installed in existing spillway side of a gravity concrete dam should have bent training parts. And the hydraulic design methods for bent training pipe/channel and energy dissipater using existing basin are required to be established. This research cleared the pressure characteristics of bent pipe including straight-pipe-connection type and showed the hydraulic design methods of them to be free from cavitation damage. Also, research proposed the experimental equation of water surface profile along the training wall and jet trajectory to the stilling basin. Equation was obtained for refraction wall (0 radius) and enables the design calculation of wall height and the examination of ways to release the jet. With regard to the energy dissipater, conditions of hydraulic jump and water depth along the training wall of the basin were cleared against the jet from circle outlet pipe. Noise intensity and frequency characteristics of plunging jet were clarified. 2003 is the final year of this research subject, so the examination of above matters was continued and coordinated.

Key words: straight-pipe-connection bent, shock wave, hydraulic jump, noise characteristics of energy dissipater

Study on rational design method of shield tunneling]

Budgeted: Grants for operating expenses

Road account

Research Period: FY2001-2003

Research Team: Tunnel

Author: MASHIMO Hideto

ISHIMURA Toshiaki

MORIMOTO Satoshi

Abstract:

Shield tunneling method is a fundamental one to build tunnel structure under the condition in overcrowded urban area because it has less impact on peripheral environment and is advantageous in terms of construction safety and construction term comparing with mountain tunneling method and cut and cover method, while there is a problem about the expensiveness of its construction cost. The analysis of soil pressure, water pressure and stress in segment rebar acquired from in-situ measurement in the shield tunneling site, and the experiment with centrifugal model were carried out in this study. The design method of load at design stage for hard ground, the concept at design about self-weight of segment and the evaluation method of influence in twin tunnel construction by numerical analysis using in-situ measurement data were proposed.

Key word: shield tunneling method, segment design, load, segment self-weight, twin tunnel

A study on application of FEM analysis to the design of steel girder bridges

Budgeted: Grants for operating expenses

Road account

Research Period: FY2001-2003

Research Team: Bridge Structure

Author: MURAKOSHI Jun

TAKAHASHI Minoru

Abstract:

By recent development of design tools by computer, FEM has been widely used in structural design for various structures. From the point of view of rational design of steel girders, FEM-based design combined with optimization procedure is expected to be more effective than that based on beam theory analysis. In this study, a 3D-FEM model was first made for a continuous steel girders on which truck loading experiment was conducted, and validity of the model was checked compared with the measured stress data. Weight reduction effect of girders by re-designing using FEM influence line analysis was examined.

Key Words: FEM, influence line analysis, plate girder bridge, optimum design

A study on the design method for floating bridges

Budget: Grants for operating expenses

Road account

Research Period: FY2002-2003

Research Team: Bridge Structure

Author: MURAKOSHI Jun

FUMOTO Koichiro

Abstract:

New technologies have been required to build low-cost long highway structures which will connect regions that are separated by straits. Main purpose of this research is to develop design methodology of floating bridge which can omit substructure by using buoyancy. In this research, specifically, a computer program for estimation of dynamic response of floating bridge subjected to both wind and wave load was developed, then accuracy of the program was verified by hydraulic experiments. Finally, applicability of floating bridge was studied.

Key words: floating bridge, dynamic response, computer program

A study on effective utilization of laumontite-bearing rocks as a dam concrete aggregate

Budgeted: Grants for operating expenses

River account

Research Period: FY2000-2003

Research Team: Geology

Author: SASAKI Yasuhito

ANAN Syuji

ITO Masami

Abstract:

We conducted a number of experiments in order to clarify a deterioration mechanism of concrete due to laumontite. The result of observation on the deteriorated mortars showed that there were no expansive hydration minerals. The result of expansion tests on laumontite showed that expansion pressure was produced when laumontite was immersed in water. This pressure repeatedly occurred by wetting and drying. These results suggested that the mechanism of mortar deterioration due to laumontite is fatigue failure induced by repeated expansion pressure of laumontite.

Key words: laumontite, aggregate, expansion pressure, fatigue failure

The research on the pavement structure which considered urban environment

Budget: Grants for operating expenses

Road account

Research Period: FY2000-2003

Research Team: Pavement

Author: ITO Masahide

NITTA Hiroyuki

KIDO Hiroshi

Abstract:

In the urban area, there are frequent occurrence of urban flood damage by heat island phenomenon and local severe rain, etc., and the countermeasure to these is promoted in various quarters. Though the pavement of which road surface temperature effect of decreasing is high as a control technology from the pavement is noticed, verification of these effects and confirmation of the durability, etc. are problems. Then, this study carried out function evaluation and evaluation of the durability on the pavement of which road surface temperature effect of decreasing was high, and it carried out observation investigation and simulation analysis on thermal environment improvement effect by them.

As the result, water supplied pavement solar radiation reflective pavement light colored pavement there road surface temperature effect of decreasing original durability was confirmed the water supplied pavement .However, the following have not been grasped : Water supplied pavement, solar radiation reflective pavement , durability of road surface temperature reduction performance of the light color pavement. And, it is future problem on solar radiation reflective pavement lightness of the light color pavement and color tone.

Temperature effect of decreasing of about 1°C was confirmed in the observation investigation by the field trial of the water supplied pavement in the specific area.

The area of which road surface temperature effect of decreasing was expected after 35 as 100% at the installation area rate became trial result of about 12% in the examination of the business possibility, when the road surface temperature reduction pavement was constructed in Tokyo.

Key words: heat island phenomenon, roadway permeable pavement, solar radiation reflective pavement, water supplied pavement, light colored pavement

Study on application of new materials to structures

Budgeted: Grants for operating expenses

General account

Research Period: FY2002-2003

Research Team: Bridge Structure

Author: MURAKOSHI Jun

ARAI Keiichi

NAGAYA Yuko

Abstract:

Application of new materials which have characteristics of lightweight, high strength and high durability are expected. In this research, focusing on aluminum alloy and FRP (fiber reinforced plastics), the technical and economical issues on application of new materials to bridge structure were investigated from the point of view of design, fabrication and construction through trial bridge design.

The major findings are that steel bridges are economically advantageous compared to those made of new materials, even taking the advantages of lightweight and high durability into consideration, and that new materials have the several critical technical subjects.

Key words: new materials, aluminum alloy, FRP (fiber reinforced plastics)

Evaluation and development of road constructions, which reduce influence on road traffic

Budget: Grants for operating expenses

Road account

Research Period: FY2000-2003

Research Team: Construction Technology

Author: OSHITA Takeshi

ONODERA Seiichi

ITANI Masashi

Abstract:

Although the construction work on the existing road such as pavement repair and underground pipe laying is indispensable to develop the lifeline network and to ensure the safety traffic, it has much impact on surrounding environment because of traffic congestion, noise and vibration during the work. Owing to the implementation of various measures such as concentration of works, the number of on-street work has decreased, however, the demand of further reduction of number and impact of on-street work is still high. Therefore, it is necessary to evaluate the new technology contributing to the reduction of adverse impact during work properly, and to promote the utilization of these effective technologies. In this study, through the process analysis and examination of potential problems of on-street work, direction of technology development was proposed, and effectiveness of new technology was evaluated on trial using the proposing evaluation method in consideration of conversion of adverse impact to external cost. And "Guidebook for evaluation and development of construction technology of on-street work" was made up based on the results of studies.

Research on maintenance and management planning of concrete structures

Budgeted: Grants for operating expenses

General account

Research Period: FY2000-2003

Research Team: Structure Management
Technology

Author: KAWANO Hirotaka

WATANABE Hiroshi

KATAHIRA Hiroshi

HISADA Makoto

KOGA Hirohisa

Abstract:

Recently maintenance technologies for existing concrete structures are rising in importance, since many concrete structures has been used as social capital and those become rather old. The following researches were carried out in this project;

- (1) Survey on the soundness of 2,099 concrete structures all over Japan
- (2) Detailed investigation of soundness of four actual bridges
- (3) Experimental study on the test method for half-cell potentials of re-bars in concrete structures
- (4) Experimental study on the test method for concrete strength using rebound hammer
- (5) Experimental study on the test method for chloride ion content in hardened concrete
- (6) Experimental study on the effect of cracks of concrete on the corrosion of re-bars in concrete
- (7) Revision of the manual for the investigation of soundness of concrete structures using non-destructive tests
- (8) Development of a support program for investigation and record of the soundness of concrete structures

As a result of this project, "The manual for the investigation of soundness of concrete structures using non-destructive tests" was published. In addition, some informative materials, such as "Six points to be considered with rebound hammer testing" and many other research papers were produced.

Development of repair technology for existent concrete structures

Budgeted: Grants for operating expenses
General account, Road account
Research Period: FY2000-2003
Research Team: Structure Management
Technology
Author: KAWANO Hirotaka
WATANABE Hiroshi
KATAHIRA Hiroshi

Abstract:

This report describes research results on conventional rehabilitation methods such as crack injection and concrete repair for reinforced concrete structures. Accelerated chloride induced corrosion tests for crack repaired concrete specimens were carried out to investigate the effect of the repair. We carried out experimental study on some concrete repair systems and discussed their performance on workability, strength and durability. We summarized the technical advice for proper choice of the repair method.

An investigation on the efficiency of non-destructive inspections for concrete structures

Budget: Grants for operating expenses
Road account
Research Period: FY2001-2003
Research Team: Structure Management
Technology
Author: KAWANO Hirotaka
WATANABE Hiroshi
HISADA Makoto
KOGA Hirohisa

Abstract:

It has been becoming more important to ensure enough durability for concrete structures. According to a survey of existing concrete structures, it is cleared that some of them, even not aged, have been already retrofitted due to rebar corrosion by the insufficient depth of cover concrete. For both of new and existing concrete structures, the adequate information of concrete cover by using non-destructive tests is quite essential to estimate their durability. Therefore, the matters to be considered and its corresponding techniques in non-destructive measurement of cover concrete were investigated in this study.

In 2002, depth of cover concrete of a large size specimen was measured by using non-destructive test equipments which were already available in market. Through these results, recommendations to obtain accurate cover thickness which non-destructive test were summarized in a technical advice note. In addition, in 2003, a study on the influence of concrete properties on the accuracy of the results of concrete cover measured by radar methods was carried out.

Through these investigations, following results were summarized:

1. Through the measurement results of large size specimen, the maximum range, in which cover depth can be measured with 10 - 20% of accuracy, was nearly 100mm when electromagnetic induction method was applied. In addition, the maximum range with 10 - 20% of accuracy was nearly 250mm when radar method was applied with providing a proper calibration of relative dielectric constant of concrete.
2. The relative dielectric constant of hardened concrete influences the accuracy of measurement results of concrete cover measured by radar methods, and moisture condition of concrete affects the relative dielectric constant of concrete. Therefore, it can be considered that the relative dielectric constant of concrete in water saturated condition can give the accurate information about the depth of cover concrete.
3. It is experimentally clarified that the relative dielectric constant of concrete measured at low frequency can also provide some other concrete properties.

Research on application of pavement management systems

Budgeted: Grants for operating expenses

Road account

Research Period: FY2001-2003

Research Team: Pavement

Author: ITO Masahide

TANIGUCHI Satoshi

OHASHI Sachiko

Abstract:

Effective pavement management becomes more important because of advent of aging society and reduction of investments for roads. This study mentioned criteria for pavement management and life-cycle cost analysis from the viewpoint of not only road administrators but also road users and socials. Pilot survey for foreign pavement management criteria and establishing tentative manual for life-cycle cost analysis were conducted till 2002. In 2003, concepts of pavement management criteria were collated and trying tentative manual to site.

The following things became clear as a result of this examination.

- ① Concepts of pavement management criteria were established from the viewpoint of road administrators, road users and so on.
- ② Items for life-cycle cost analysis items were established from the viewpoint of road administrators, and tentative manual was established.

Key words: pavement, performance of road surface, pavement maintenance, required serviceability level

The improvement of construction performance of the thin pavement on bridge

Budgeted: Grants for operating expenses

Road account

Research Period: FY2002-2003

Research Team: Pavement

Author: ITO Masahide

NITTA Hiroyuki

Abstract:

As one of the methods which reduces the construction cost of a large-scale bridge, the method of making pavement on a bridge thin was studied. Although SMA is good for the mixture suitable for thin pavement, since there is a tendency for the temperature of a mixture to tend to fall on a bridge, it is clear that sufficient function may not be got. For this reason, the method of construction in consideration of the temperature fall at the time of a construction was developed.

Therefore, it turns out that waterproof and adhesive selection of the SMA mixture should be taken into consideration. And in order to raise a performance, it turns out that use of construction temperature lowering technology and use of waterproofing material are effective.

Key words: pavement for bridge, stone mastic asphalt mixture, waterproof, construction temperature lowering technology, repeated shear test

Research on the economical method for the excavation of long tunnel

Budgeted: Grants for operating expenses

Road account

Research Period: FY1999-2003

Research Team: Tunnel

Author: MASHIMO Hideto

ISAGO Nobuharu

ENDO Takuo

Abstract:

Application of Tunnel Boring Machine (TBM) to construction of road tunnel is considered as the rational and economical tunneling method because rapid excavation and reduction of support lead to cost reduction. It is desired to establish the method of ground estimation and selection of proper support in TBM excavation.

In this study, the relation between support pattern and tendency of machine data variances excavated by TBM were examined, and load acting on support was calculated and compared with rock quality and support pattern. It was found that some of machine data had relation with support pattern and that load acting on support was decided by the characteristic of ground when the ground condition was poor while it was not when the ground condition was good.

Key words: tunnel, tunnel boring machine, machine data, load, support pattern

A study on monitoring technology of the degradation of a steel structure

Budgeted: Grants for operating expenses

Road account

Research Period: FY2000-2003

Research Team: Bridge Structure

Author: MURAKOSHI Jun

FUMOTO Koichiro

TAKAGI Shinya

Abstract:

The monitoring technology is one of methods for grasping the phenomenon effectively that decreases the safety of structures in the maintenance of the highway bridges. We research on monitoring technology using a variety of sensors for grasping the states of the steel bridge, such as deterioration and damage. In 2003, we analyzed the arrangement of subjects for monitoring technology, the evaluation of the application of monitoring technology using strain and displacement by 3-D FEM analysis of Test Bridge, and the stress changes in long-term monitoring of real bridge including the live load and the temperature stress.

Key words: bridge, monitoring, deterioration and damage, maintenance, strain, displacement, 3-D FEM analysis

Test survey on upgrading of functions of bridge base structure construction

Budgeted: Grants for operating expenses

Road account

Research Period: FY2000-2003

Research Team: Foundation Engineering

Author: FUKUI Jiro

TAKEGUCHI Masahiro

UMEBARA Takeshi

Abstract:

We surveyed actual situations of salt damage and reinforcement and reconstruction of bridges, and examined efficient evaluation method for bearing force by aiming at rational recycling of base structures of bridge at reconstruction.

As a result, we revealed that, in many cases, reinforcement of base structures and reconstruction of bridges are executed due to scour, salt damage, aging and deterioration other than earthquake, and that proper evaluation of penetration ratio of salt or incoming salt quantity in concrete enable to estimate approximate availability period of base structures of bridge where received salt damages, and that effective utilization of shock and vibration test enables to grasp approximate health of base structures of existing bridges.

Key words: base structure, recycle, bearing force evaluation, shock and vibration test, reinforcement

Test survey on aging and deterioration of surface water and underground water
drainage facilities at landslide slope

Budget: Grants for operating expenses

River account

Research Period: FY2000-2003

Research Team: Niigata Experimental
Laboratory

Author: TAKESHI Toshiya

MARUYAMA Kiyoteru

YOSHIDA Katsumi

KOJIMA Shin-ichi

Abstract:

Since 1958 (the year The Landslide Prevention Act), many drainage wells, drainage borings and water channels have been constructed in many landslide areas for landslide prevention. Some of these facilities have seen many years pass since their construction. Recently, these older facilities have been prone to damage and malfunction due to a lack of management and maintenance.

This paper outlines the condition and problems related to management and maintenance at the facilities at several landslides. And, it became clear to the structure of these facilities, check points and number of intervals of inspection.