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Second International RILEM
Symposium (FRPRCS-2),
August 23-25, 1995, Ghent
BELGIUM

**Fatigue of Reinforced Concrete Beams Externally Prestressed
with Aramid Fibre Cables**

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A large number of old highway bridges are now in need of replacement or some rehabilitation in Japan. An experimental study of rehabilitation method is investigated with using artificially damaged concrete beams. The method is applied to strengthen the damaged concrete beams by external prestressing with aramid fibre cables. Static test as well as fatigue test of the beams for 3 and 4-point bending are conducted in order to investigate the effect of the rehabilitation method. T-cross sectional members are tested in low temperature as well as ordinary temperature to evaluate the effect of temperature on the fatigue properties of externally prestressed reinforced concrete beams.

Second International RILEM
Symposium (FRPRCS-2),
August 23-25, 1995, Ghent
BELGIUM

**Plastic Performance of Reinforced Concrete Beams by Using
External Prestressing of Aramid Fibre Cables**

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External prestressing method is supposed to be one of the most promising strengthening of rehabilitation methods for existing damaged bridges. An experimental study on plastic deformation properties of the beams by external prestressing of aramid fibre cables are investigated with using rectangular and T-cross sectional beams. The numerical calculations of the ulti-

mate strength and the deformation are also conducted, and are compared with experimental results. Finally the allowable stress level for the effective prestressing of external cables are evaluated with comparing the plastic deformation capacity.

International Conference on
Ecological System Enhance-
ment Technology for Aquatic
Environment Ecoset'95, Octo-
ber 29–November 2, 1995,
Tokyo, Japan

Ecological Works Methods of Block Revetment in Small River

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In considering ecological requirements and the prevention of river disaster and in stead of the conservative revetment system covered with the concrete block at the whole surface of riverbed and slope, the proposed system covered with the block partially at the point of course, that is point-fix system in applying the critical zigzag angle of course, and the usage of the air and water permeable concrete may be available to preserve the natural water front. It is reported that the trial test works at small river is carried out to verify the efficiency of the new concept, and the stability of course and the influence of alkali-dissolution from concrete and recycled concrete block are discussed.

Fifth International Conference on Space '96 ASCE,
June 1-6, 1996, Albuquerque,
New Mexico USA

**Study on Lunar Cement Production Using Hokkaido Anorthite
and Hokkaido Space Development Activities**

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This paper presents general information regarding lunar materials and Hokkaido anorthite and the basic concept of lunar cement formulation. Hokkaido anorthite consists of 16wt.% of calcium oxide and is considered a candidate material for the proposed lunar cement production study. An electric furnace was used to conduct several bench burns using Hokkaido anorthite as simulant. The conventional wet mix procedure and the Dry-Mix/Steam-Injection method developed by T. D. Lin were applied to make a series of specimens for compression tests. Scanning Electronic Microscopic analyses and X-Ray diffraction analyses were performed to determine the morphology and chemical compositions of the obtained hydrates. This paper also discusses Japan's current interest and initiatives in the space technology development.

International Congress Concrete In The Service Of Mankind, June 24-28, 1996, Dundee, Scotland UK

Recycled Concrete Aggregate as a Road Base Material in Cold Regions

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The applicability of waste concrete for road base materials is investigated. At first properties of recycled aggregates were estimated. Furthermore these recycled aggregates were practically used as road base and subbase materials. Temperature of the base, behaviour of frost heaving and diffusion of alkali into the earth were observed. It was found that although

the loss of the recycled aggregates by soundness test was comparatively larger than that of natural aggregate, there are not significant differences between them as for frost heaving.

In the distribution of alkali diffusion it occurred high alkali in the ground water under the recycled aggregate base and at the edge of the base, however, any diffusion of alkali was not observed in the neighbourhood around recycled aggregate base.

Fifth Asia-Pacific Conference
on Structural Engineering &
Construction, Gold Coast,
Australia, July 25-27, 1995

A Study on Deformational Characteristics of Concrete Column Encased by Double Steel Tubes Subjected to Axial Compression

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An experiment is conducted to investigate the compressive strength and deformational characteristics of the columns. The experimental results are compared with analytical ones obtained by nonlinear finite element analysis. Deformational characteristics of the concrete column encased by double steel tubes subjected to axial compression and stress states of outer mortar are investigated.

Fifth Asia-Pacific Conference
on Structural Engineering &
Construction, Gold Coast,
Australia, July 25-27, 1995

Concrete Model Code for Asian Region and Future Tasks

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A concrete model code for the Asian region is considered to be necessary and feasible. Implementation process and contents of the model code would be different from those for the existing model codes in the western world. An international symposium in Tokyo discussed main feature of the model code for the region. This paper presents a proposal for the future tasks towards the model code.

Fifth Asia-Pacific Conference
on Structural Engineering &
Construction, Gold Coast,
Australia, July 25-27, 1995

**Shear Strength Prediction of Steel-Concrete
Sandwich Members with Full Web**

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Takuzo KAZU and Masanori KINOSHITA
Nippon Steel Corporation, Futtsu, Japan

In this study shear strength of steel-concrete sandwich beams with full web in which core concrete is sandwiched by steel skin plates is investigated. A series of test with changes in the thickness of the full web was conducted. The experimental results are compared with analytical ones obtained by nonlinear finite element analysis. A sandwich beam with thicker full web showed greater shear strength. Based on the results of the experiment and the finite element analysis, the contribution of the full web to the shear strength of the member is investigated.

International Conference on
Concrete under Severe Condi-
tions, Sapporo, Japan,
August 2-4, 1995

**Analytical Evaluation for The Fatigue Strength of
Steel-Concrete Sandwich Beams without Shear Reinforcement**

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This study predicts the fatigue strength of steel-concrete sandwich beams using the finite element method. The analysis was done by using a nonlinear finite element method computer program (WCOMR). The analysis procedure used in this study is based upon reducing the concrete strength and stiffness with increasing the number of loading cycles (N), or increasing the stress range (R). The sandwich beams were analyzed for different external load ranges. The fatigue life for the ultimate failure of the sandwich beams was investigated. The output load-deflection curves are presented. The S-N relationship for the fatigue failure of the sandwich beams is also presented. These analytical results are compared with experimental data.

International Workshop on
Integration of Structural and
Durability Design, Hakodate,
Japan, August 7-8, 1995

Integration of Structural and Durability Design

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This paper presents a way to integrate structural design and durability design. In the form of the limit state design the causes for deterioration of materials, both concrete and reinforcement, are included in "actions" together with loadings. The deterioration mechanisms are described as material models together with mechanical models. "Analysis" includes analyses for both loading effects and deterioration. "Ultimate and serviceability limit states" are considered as in conventional structural design, but ways to examine the limit states are presented for both loading effects and deterioration. A new concept for serviceability limit states is proposed to consider interaction between limit states caused by different actions.

Second International Symposium on Non-metallic (FRP) Reinforcement for Concrete Structures, Ghent, Belgium
August 23-25, 1995

Failure Criteria for FRP Rods Subjected to a Combination of Tensile and Shear Forces

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Fiber reinforced plastics rods (FRP rods) as reinforcement in concrete members are subjected to a combination of tensile and shear forces at crack intersections and their bent portions. The shear force reduces the tensile capacity of the FRP rod. In this study the reduced tensile strengths were observed in experiments of FRP rods at a crack intersection and their bent portion. The experimental results were compared with the results of finite element analyses. The finite element analyses could predict the strength reduction and explain why the strength was reduced. Some important factors for the strength reduction were presented:

Ninth International Conference on the Mechanics of Composite Materials, Riga, Latvia, October 17-20, 1995

Effect of Shear Stiffness and Concrete Wedge Cone Failure on Fracture of a Fibre Reinforced Plastic Rod at an Intersection with a Concrete Crack

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Tatsuo OBARA and Akihisa IMAMURA

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Experimental results of model specimens in which FRP rods fractured due to local deformation at a crack intersection in a concrete member were analyzed by 3D nonlinear finite element method in which orthogonal anisotropy of the FRP rod was considered. The analytical results indicated that accurate prediction of shear modulus of the FRP rod and size of concrete wedge cone failure around the FRP rod was significant to predict deformation and fracture of the FRP rod. For FRP rods as reinforcement in concrete members, the small shear modulus, because of the orthogonal anisotropy and the wedge cone failure, may prevent the FRP rod from fracturing at a very low tensile stress due to the local deformation at the crack intersection.

The Second International
RILEM Symposium, Non-
Metallic Reinforcement for
Concrete Structures, June 23-
25, 1995, Ghent, Belgium

**Initiatives in Developing the Specifications for Design
and Construction of Concrete Structures Using FRP in Japan**

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H. SEKI

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T. UOMOMOTO

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New materials in the form of continuous fiber reinforcing materials (CFRM) offer a potential solution to corrosion problems of steel reinforcements in concrete structures. Japan Society of Civil Engineers (JSCE) has taken initiatives toward the development of specification for design and construction of concrete structures using CFRM. The first committee on CFRM was setup in 1989 and the design concepts were formulated giving design engineers a good reference guide. In 1992 JSCE established the second committee on CFRM to make further studies into many pending issues. The results of the works of this committee are reported in this paper.

The Fifth East Asia-Pacific
Conference on Structural
Engineering and Construc-
tion, Gold Coast, Australia,
July 25-27, 1995

**A Study on Shear Strengths of Reinforced Concrete
Deep Beams with Shear Reinforcement**

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Finite element analyses are carried out in order to clarify the shear resisting behavior of

deep beams with stirrup and horizontal shear reinforcement. Based on the analysis, the JSCE equation for shear strength of deep beams without shear reinforcement is modified to predict the shear strength of deep beams with shear reinforcement. The shear strengths calculated by the modified JSCE equation are compared with the previous experimented results.

Second International Symposium on Non-Metallic Reinforcement for Concrete Structures, Ghent, Belgium, August 23-25, 1995

Ultimate Shear Capacity of Concrete Beams Reinforced with FRP Rods

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The shear resisting model for concrete beams reinforced with FRP rods in which shear compression failure occurs, is modified to predict diagonal tension strengths. The modification of the model is based on experimental results. The modified shear resisting model can estimate the shear strengths of concrete beams not only with shear reinforcement but also without shear reinforcement.

Proceedings of the International Conference on Concrete under Severe Conditions CONSEC '95 Sapporo, Japan 2-4 August 1995

The Mechanism of The Abrasion of Concrete Structures Due to The Movement of Ice Sheets

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In this study, the authors experimentally clarified the mechanism of the abrasion of concrete structures due to the movement of ice sheets, when these structures are constructed in sea

water where ice movement is active or in rivers which freeze over. The authors used the sliding abrasion test equipment to test various factors which may influence the mean abrasion rate of concrete structure surfaces, i. e. the degree of abrasion (mm per km of the ice sheet movement.) Consequently, the authors confirmed (1) the major factors which determine the mean abrasion rate of concrete surface caused by the movement of ice and (2) the mechanisms of abrasion.

Proceedings of the International Conference on Concrete under Severe Conditions CONSEC '95 Sapporo, Japan 2-4 August 1995

**Evaluation of Test Methods of Abrasion
by Ice Movements on The Surface of Reinforced Concrete Structures**

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The surface of reinforced concrete structures is subject to abrasion when they are constructed in rivers which freeze over in winter or in sea water where ice movement is active. Abrasion occurs due to the friction force between ice sheets and the structure caused by the ice force working on the loss of structural stability because rusting of the reinforcing bars tends to weaken the yield strength of the structure itself.

Currently, a total of seven types of abrasion test equipment have been developed in the world, including one developed by the authors. In this research, the authors looked into the characteristics of each test equipment and evaluated its benefits and defects. In summary, the authors discuss the most reasonable abrasion test equipment in terms of reproducing the abrasion by ice movement.

Proceedings of the International Conference on Concrete under Severe Conditions CONSEC'95 Sapporo, Japan 2-4 August 1995

**Prediction of The Degree of Abrasion of Bridge Piers
by Fresh Water Ice and The Protective Measures**

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The authors have conducted surveys and experimental research for several years on the abrasion of bridge piers due to the movement of river water ice. In this study we systematically organized results of past surveys and research on the abrasion of concrete structures, especially bridge piers, by such fresh water ice and established a method for predicting the degree of abrasion. We also report on protective measures.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
kaido, Japan

**Monographs of Vertical Ice Load Acting on Vertical Structure with
Elliptical Cross-section Due to Changes of Water Level**

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In cold regions vertical ice forces act upon offshore structures, including bridge piers and intake towers, with ice sheets adfrozen to them as the water level changes.

The objective of this research is to analyze the vertical ice forces which act upon elliptical cross-sectional structures. It may seem rational to compute the ice forces using the basic equation of deflection in the elliptical coordinate instead of the circular cylindrical coordinate were mapped by a mapping function to compare ice forces acting upon circular cylindrical structures with those upon elliptical cross-sectional structures.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
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Impact Ice Load Acting on Flat Plate Due to Wave Action

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The Okhotsk Sea coast of Hokkaido is covered with ice floes during winter. Aota et al. showed that the temperature in this region has been rising every winter, and in the last ten years the amount of sea ice has been decreasing. Therefore the period of coexistence of waves and ice floes has become more longer and it is very important problem to make clear the impact ice load acting on offshore, harbor and coastal structures which are constructed on Okhotsk Sea coast of Hokkaido. Saeki et al and Tskahashi et al reported that the velocity of ice floes due to wind wave, overtopping over breakwater and tsunami was about 4-8 m/s.

In this paper, the authors clarified the impact ice load acting on flat-rigid plate through the systematic experiments.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
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**Countermeasure for Ice Floes Overtopping over Breakwater
Due to Wave Action**

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In the winter of 1991, ice floes were carried beyond Breakwater due to high waves (Called ice overtopping in this study) at Abashiri port which is located on the Okhotsk sea coast of Hokkaido, Japan. The ice overtopping at that time caused great damage to the dolphins and pipelines for oil tankers built behind the breakwater.

Therefore, when harbor facilities are used in the winter, ice overtopping creates serious problems to be solved of safety of the people and protection of the various facilities. As the authors have studied on mechanism of ice floes overtopping over breakwater, they proposed several kinds of countermeasures for ice floes overtopping over breakwater due to wave action in this paper.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
kaido, Japan

Hydraulic Resistance acting on Ice Floes

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Major environmental force acting on ice floes is flow resistance created by water. Flow resistance is consisting drag force by flow and shearing force between under surface of ice floes and water. In generally, the shearing force is larger than the drag force.

Auto have done series of experiments with the drag force and the shearing force. The authors now reported the results of these experimental study and discuss with the shearing force and friction coefficient between ice floes and water.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
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Abrasion of Various Kinds of Stones Due to a Movement of Ice Sheet

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The surface of concrete structures is subject to abrasion when they are constructed in winter or in sea water where ice movement is active. Abrasion occurs due to the friction force between ice sheets and the structure caused by the ice force working on the structure.

Over the past ten years The authors have been conducting experiments with many types of concrete and their possible coating materials to find their characteristics of abrasion due to movements of ice sheet with different contents. In recent years some bridge piers in estuaries have been built with stone faces, and it is conceivable to coat the surface of concrete offshore structures with stone to harmonize the structures with their surrounding landscapes. Thus, in this experiment The authors calculated the abrasion rates (average amount of abrasion per 1 km movement of ice sheets) of various kinds of stone needed to estimate the abrasion amount due to movements of ice sheets, and The authors also clarified the mechanism of abrasion.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
kaido, Japan

Uniaxial Compressive Strength of Sea Ice in Okhotsk Sea

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The sea ice region in Japan is the Okhotsk Sea coast of Hokkaido and this region is the southern bound of sea ice formation in northern hemisphere. In this region, formation of sea ice usually begins in late December or early January and drift ice appears in early January. The sea ice season usually ends in early April. Dr. Truskov have carried out the experiments on uniaxial compressive strength of sea ice which were collected from Chavo Bay, Sakhalin island. In this study, the authors investigated the properties of uniaxial compressive strength of sea ice in Okhotsk Sea by using Truskov's and Saeki's test results, and compared the mechanical properties of ice in Okhotsk Sea with those in another ocean.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
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**Effective Utilization of Fishery Harbor Located
on Okhotsk Sea Coast of Hokkaido**

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Pack ice reaches the area along the Okhotsk Sea coast of Hokkaido in every winter. Then outside of harbors is covered with the pack ice, and inside of the harbor freezes up. therefore all activities in fishery harbors stop completely in every winter. The authors have located in this area in winter : (1)Utilization of ice sheets in harbors, (2)Utilization of sea area in harbors as facilities for a fish and shell preserve.

Now, the authors have been conducting field investigation on the water and bottom materials qualities in Motoineppu, Toppushi and Tokoro fishery harbors, and the results of possibilities of the utilization as facilities for fish and shell preserve will be reported near future.

In this paper, the authors analyzed the bearing capacity of ice sheet under various boundary conditions for safety utilization of ice sheet.

First International Conference on Marine Technology
ODRA 95 Sep. 10-13,
Szczecin, Poland

Vertical ice loads on offshore structures due to changes in water levels

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In snowy cold regions, vertical ice forces act on offshore structures, including bridge piers and intake towers, with ice sheets adfrozen to them as the water level changes. When the water level rises, vertical forces act upward to uproot the structure and when the water level falls, vertical forces act downward to buckle the structure. Therefore, the effects of vertical forces should be considered when designing structures upon which ice forces are exerted.

In this report, The authors explain mathematically these ice forces, and The authors give tables and figures for the practical computation of the ice forces with attention to destructions by adfreezing and bending. Although all the tables and the figures cannot be shown due to page limitation, we have selected the important ones to discuss the procedure to calculate vertical ice forces.

In addition, the interaction between the ice and the structure made of multiple piles was theoretically produced.

First International Conference
on Marine Technology
ODRA 95 Sep. 10-13,
Szczecin, Poland

**Ice loads acting on structures to which ice sheets are adfrozen
during flooding and measures to decrease ice loads**

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In frozen sea waters, when the water level rises with the ice sheet adfrozen to a structure, sea water gathers on the ice sheet near the structure. This phenomenon is called flooding and arises when sea water rises to the ice surface through brine channels and cracks of the ice sheet. Under these conditions, where flooding occurs, the ice sheet functions as bearing and is affected by elasticity. However, under the conditions where flooding has no influence, the sheet is affected only by buoyancy.

In this research, we logically clarified the upward vertical ice loads action on the structure due to the rise of the water level when flooding occurs. Also, we made a comparison of ice loads when flooding occurs with when it does not. We have systematically proven the method to gradually decrease ice loads caused by the change in the water level because ice loads are smaller when flooding occurs. In various materials and the ice sheet, which is needed for the calculation of ice loads caused by the change in the water level.

The Eleventh International
Symposium on Okhotsk
Sea & Sea Ice 25-28 Febru-
ary 1996, Mombetsu, Hok-
kaido, Japan

Relation between Gouging Force And The Shape Of Ice Floe

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When ice floes with a deep draft move toward the shore, they gouge sandy sea bottoms. Some of them ride up on the land and pile up there. Due to ice gouging, marine resources along the shallow sandy coast area damaged. For example, sea shells (littleneck, surf clam, etc.) are carried with ice floes onto land or killed by the pressure of the weight of ice. In addition, damage to buried structures, such as pipelines, are reported.

The authors have been conducting experimental and theoretical Studies on the mechanism of ice gouging due to movement of ice floes with our dynamic model. In previous studies The authors used rectangular parallelepiped ice floes, but in this paper The authors report on the gouging mechanism of trapezoid ice floes. The authors inclined the front of the ice models to make them trapezoid, a shape closer to real ice than the former model. The authors compared the results of this experiment with our previous experiments of find the difference in ice forces working on sandy ground and the shapes scraped by the ice floes. Our study aims to understand the mechanism of ice gouging and obtain basic knowledge floes. Their study aims to understand the mechanism if ice gouging and obtain basic knowledge necessary to take preventive measure in future against damage by ice floes.

Transportation Research
Board Seventy-Fifth Anni-
versary Annual Meeting Jan-
uary 7-11, 1996 Washington,
DC

**SNOW AND ICE CONTROL SYSTEM
BASED ON SLIPPERINESS DATA TRANSMITTED BY DRIVERS**

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To simply and precisely detect the slipperiness of a road surface in winter, a monitoring system, in which the slipperiness was judged from the personal sensitivity of drivers, was examined. To evaluate the suitability of such slipperiness data, three investigations were carried out: 1) the relationship between the road condition classification and the slipperiness index, 2) the effectiveness of the subdivision of road classification, and 3) the comparison of slipperiness indices with the actual friction coefficients. To address the first problem, the road conditions were investigated for a month with the cooperation of 10 taxi companies. For the second problem, a similar investigation to the first one was performed by subdividing the road conditions into more classes. Finally, for the third problem, it was clarified that the subjective slipperiness indices more or less agree with the actual friction coefficients.

Transportation Research
Board Seventy-Fifth Anni-
versary Annual Meeting Jan-
uary 7-11, 1996 Washington,
DC

**Traffic Control at Work Zone on Two-Lane Roads
Operated by Flaggers**

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To clarify the traffic flow characteristics and the signal timings at work zones controlled by flaggers, traffic flows at some work zones were measured. Using the measurement data, a computer simulation program based on the microscopic traffic flow model was developed. First, the delay characteristics at short work zones were investigated. Next, three methods of how to estimate the green intervals under flaggers' control were presented; nomograph, regression equation, and analytical optimization. The first two methods were obtained directly from

the simulation results, while the third method was derived by describing both the queuing and the acceleration delays with a regression equation and minimizing the total delay. The signal timings produced by a nomograph and a regression equation can be installed into pre-timed traffic lights as a substitute for flaggers, while the optimized ones can be installed into actuated lights combined with traffic detectors.

Transportation Research
Board 75th Annual Meeting
January 7-11, 1996 Washin-
gton, D. C.

Visibility of Laser Beams and an Illuminated Delineator as a Function of Fog Density

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In dense fog, adequate visibility of the delineator is important for providing the driver with road geometry cues. The present paper proposes a new illuminated delineator that employs laser beams. Very little data has been published with regard to the visibility of laser beams in fog. However, laser beams can be expected to be highly visible in dense fog due to their high intensity, high energy, and directivity that is both monoclinic and strong. The study was conducted to evaluate the visibility of laser beams in fog. The effectiveness of two types of laser heads and an illuminated delineator containing two 10-W glow lamps was investigated in artificial fog. The dependent variables were luminance at a specific point on the laser beam and estimated brightness. The major independent variables were fog density and illuminance in the observation room. The laser beams were observed as sharp lines of light in dense fog. The visibility of the laser beams in fog had an inverse relationship to that of normal light. In addition, subjects reported that the directivity of the laser beams could effectively indicate the direction of the highway. However, the visibility of the laser beams was strongly affected by the illuminance in the observation room, and care must be taken in order to prevent drivers from looking directly at redundant laser beams. Based on the results of the present study, we conclude that laser beams may be useful lighting sources in dense fog if this safety problem can be overcome.

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Board Seventy-Fifth Anni-
versary Annual Meeting Jan-
uary 7-11, 1996 Washington,
DC

Evaluation of the effects of winter road surface control methods on vehicle traffic

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The objective of this study is to evaluate the effects on vehicle traffic of two winter road surface control methods, deicing materials application and freeze-forming control pavements. Calcium magnesium acetate (CMA) and calcium chloride were applied. Nine types of freeze-forming control pavement were measured. The study procedures are: 1) Traffic study at a signalized intersection both in summer and in winter; 2) Field measurement of skid resistance between road surfaces and tires, and of acceleration/deceleration values on winter roads with a test vehicle; 3) Traffic simulation. Results are as follows: 1) no apparent difference was shown between two types of applied materials on the slipperiness improvement, 2) the site characteristics such as local weather conditions seemed more important than the difference of deicer types, 3) pavements with some elastic materials seemed to have somewhat of an advantage over coarse surface pavements; however, more data collection is required.

The Second World Congress
on Intelligent Transport Sys-
tems, 95 YOKOHAMA
(November 9-11, 1995, Yo-
kohama Japan)

Estimation of Model Parameters for Reconstructing Traffic Accidents

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Even intelligent transportation systems are not always free from traffic accidents. Conversely, the more systems become complicated, the more the methods of analyzing traffic accidents have to be advanced and sophisticated. This paper focuses on how model parameters for

reconstructing traffic accidents are estimated analytically. To describe vehicle behaviors and occupant movements in an accident, Sakai's tire model and two-wheel equivalence model were combined with an impact model. There are four parameters in the driving models; friction coefficient, steering angle, slip ratio of the front tires and slip ratio of the rear tires. In the impact model, there are two unknown parameters; normal and tangential restitution coefficients at the impact center. The main purpose here is to establish an optimization method for estimating those parameters. Box's complex algorithm method was applied so as to minimize an objective function which is defined as the difference between estimated and observed rest positions of two vehicles. First, to examine the validity of Box's method, an artificial accident data was introduced. And then, the model parameters of two actually observed traffic accidents were estimated. It was concluded that the method proposed here was effective for estimating the unknown model parameters.

11th European Conference
on Soil Mechanics and Founda-
tion Engineering, May 28-
June 1, 1995, Copenhagen,

Characterization of small-strain shear modulus of Tokyo Bay clay

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Shear modulus at small strains (less than 1 percent) to Holocene clay deposit in Tokyo Bay was characterized. The profiles of both shear modulus and void ratio are well defined in laboratory cyclic loading tests using the intact samples. Interpretation of the test results focuses on pseudo-elastic shear modulus G_{\max} associated with shear strains less than 0.002% which is examined with reference to the shear modulus from in-situ seismic cone test. The shear modulus of the normally consolidated clay is successfully characterized by taking account of the separate effects of the current mean effective stress and void ratio.

10th Asian Regional Conference on Soil Mechanics and Foundation Engineering, Aug. 29-Sept. 2, 1995, Beijing, China

Strength and deformation of sand in direct simple shear

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A series of consolidated-drained tests were performed in a newly developed direct shear box apparatus using dry specimens of two kinds of standard sands having different grain sizes. It has been demonstrated that the peak strength of the sands reached to a stable value while it reduced in magnitude as the opening between the upper and lower halves of the box, maintained at a constant value in each test, increased in steps. A size of opening being equal to, or slightly larger than, the thickness of shear band is recommended to provide the strength as well as the angle of dilatancy close to those of simple shear. The relationship between mobilized angle of shearing resistance and the angle of dilatancy is quantified in a single form over a broad range of the shearing from the pre-peak, through the peak, to the residual state, irrespective of the density and the pressure level examined.

1st International Conference on Earthquake Geotechnical Engineering, Nov. 14-16, 1995 Tokyo, Japan

Cyclic deformation properties of a man-made loose sand deposit

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To evaluate the cyclic deformation properties of a loose sand deposit in the laboratory test, a series of cyclic triaxial tests was performed using undisturbed and reconstituted samples. The undisturbed samples were retrieved by in-situ freezing method and conventional tube sampling methods from a recently reclaimed loose sand ground in Tokyo Bay. The test results showed that: (i) the shear modulus at small strain levels of the conventional tube samples was slightly higher than that of in-situ frozen samples due to the densification involved in the tube sampling; (ii) the shear modulus and damping ratio of the in-situ frozen samples

were almost equal to those of reconstituted samples having the similar density.

1st International Conference
on Earthquake Geotechnical
Engineering, Nov. 14-16,
1995, Tokyo, Japan

Effects of sample disturbance on G_{\max} of soils-A case study

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Effects of sample disturbance on G_{\max} were carefully examined with attention paid to pseudo-elastic shear modulus G_{\max} of laboratory specimens originated from Holocene deposit in Tokyo Bay. The small-strain stiffness of the fill sand was examined in laboratory cyclic tests using the samples retrieved by in-situ freezing technique. The disturbance of the in-situ frozen sample was quantitatively evaluated on the grounds that if the sample were free from any disturbance, G_{\max} from the laboratory tests should coincide with that from in-situ seismic survey; the latter involved little disturbance to the original subsurface. Similar examination was also made for the underlying deposit of clay, the intact samples of which were retrieved with a thin-wall tube sampler.

International Workshop on
Engineering Characteristics
and Behavior of Peat, Feb.
27-Mar. 2, 1995, Sapporo,
Japan

Deformation analysis of peaty soft ground

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Most Deformation analyses of peaty soft ground which have been performed for practical purposes are based on Terzaghi one-dimensional consolidation theory. The purpose of this study is to check the validity of the practical use of the analysing system using personal computer for two dimensional elasto-plastic finite element analysis of peaty soft ground. The method of determining soil parameters and the effect of variation of the parameters on the

analytical results is also discussed.

Second International Conference On Soft Soil Engineering,
May 27-30, 1996, Nanjing,
China

A new approach to evaluate undrained strength of clays by unconfined compression test with suction measurement

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Unconfined compression tests have been widely used in Japan for the purpose of determining undrained strengths of clay samples, but the unconfined compressive strengths are usually scattered even if specimens tested seem to have been subjected to the same stress history. In order to make clear the cause of scattering of the measured strengths, a series of test simulating the process from sampling to unconfined and triaxial compression test for saturated clay samples was performed with a remolded clay and three undisturbed clays, and the influence of stress release and mechanical disturbance of test specimen on the undrained strength was examined. Based on the test results, a new method for predicting in situ undrained strength of clays from the results of conventional unconfined compression test with suction measurement was proposed.

Second International Conference On Soft Soil Engineering,
May 27-30, 1996, Nanjing,
China

Correlation between cone penetration resistance and unconfined compressive strength of peat

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The correlation between cone penetration resistance and unconfined compressive strength of normally and overconsolidated peat is investigated. Specimens, 100 mm in diameter and 200 mm in height for cone penetration test, and 70 mm in diameter and 160 mm in height for

unconfined compression test were trimmed from undisturbed peat samples. After normal and overconsolidation, two series of test, cone penetration by using a newly designed laboratory cone penetration apparatus and conventional unconfined compression, were carried out. It has been found that the cone penetration resistance of peat is greatly influenced by the consolidation stress history. It has also been found that the cone penetration resistance versus undrained shear strength relationship obtained from laboratory test results well coincides with that obtained in situ.