DICT
DAEWOO INSTITUTE OF
CONSTRUCTION TECHNOLOGY

CONTENTS

What is imaginable by everyone is no longer the new…

Newness is what lies beyond the now!

Daewoo Institute of Construction Technology (DICT) – stepping forward “Beyond the New”

Malaysia Telecom Building

Songdo Northeast Asia Trade Center

BEYOND NEW THING

DICT Is Dedicated to State-of-the-Art Technology Attuned to the Global Environment!

The world we live in harmonizes humanity with nature, under the countless structures of houses, buildings, roads, bridges, railways, subways, and more. Here, the unique history and culture of humankind breathes along with contemporary cultivation and technology that have changed the path of humanity.
DICT is at the frontier of researching the latest construction technology, helping people to live more comfortably with safety and eco-friendliness.

INTRODUCTION

Our New Differentiated Technology Opens a Future that Transcends Simple Newness!

At DICT, we are constantly thinking of tomorrow, and envisioning a better future … Proud to have been pioneers in the history of Korean construction technology, we have played a leading role in a field critical to the enhancement of our nation's competitiveness. In particular, our incorporated reinforcement of on-site support systems and technological infrastructure, as well as our development of new technology and engineering methodology, has spurred DICT to take the leap into a world-leading construction R&D institute.

Institute's Objectives of Management

Profit Maximization Through Technological Innovation

Objective of Foundation

DICT was founded with the aim of improving technologies applicable to the overall construction field, as an R&D center affiliated with Daewoo Engineering & Construction through which the institute gets closer to the company's targets of creating an affluent living environment and contributing to social development by effectively tackling social demands.

Operational Goals

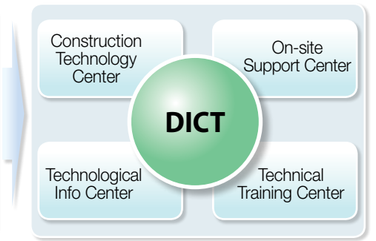
To secure a technological bridgehead through dedicated R&D for new and applied technologies in the construction field, and by putting them into practical use.

To contribute to quality assurance and productivity improvement by supporting and distributing design and construction-related technologies based on our accumulated technical data and achievements in R&D.

To create an arena for R&D by actively propelling technological collaboration and human exchange with construction-related organizations and associations, both domestically and overseas, while broadly collecting and streamlining the technological information.

Business Scope

- Establishment of company-wide technological strategies, and the management thereof
- Development and practicalization of new technology and engineering methods
- Support of technical issues in the field and engineering support related to contracting
- Performance of profitable businesses
- Operation of dedicated testing building and authorized certification institution
- Technological promotion and cultivation of dedicated technical personnel
- Selective participation in governmental task projects



FACILITIES

A Vision for Nature and Humans Makes the Potential Come True

A technology for nature and humans, DICT is a place where visions come true. Government bodies, private institutions, and numerous domestic and foreign enterprises & institutes are striving to realize the technologies that have yet to be made.

The Research & Administration Building, Realized with 71 Technologies and Methods, is the Symbol of DICT

Architecture

Archictectural Plan

01. Adopting double skin
02. Sunlight shielding by the Louver
03. Adopting twin core
04. Decreasing window area
05. Optimizing defense of the building
06. Utilizing underground space
07. Decreasing the number of stories (low-rise)
08. Decreasing the height of stories
09. Installing wind-wall at entrance
10. Installing room against wind
11. Applying skylights for staircase and washroom
12. Color plan of the exterior walls of the building
13. Sunlight shielding of the roof
14. Designed for natural ventilation
15. Green planting surrounding the building

Building Insulation

16. Fixing insulation windows (Insulation shutter)
17. Increasing air permeability and insulation of the window frame (System window)
18. Applying special double glazing
19. Enforcing the insulation of exterior wall
20. Underground insulation construction
21. Applying earth berming

Electric Equipment

Saving Lighting Energy

22. Applying the TAL system
23. Applying card key switches
24. Controlling lighting fixtures at window side (using daylight)
25. Using daylight for restrooms and staircases
26. Controlling forced lights off during break time
27. Considering the interior finishing color of the building
28. Controlling taxi light
29. Controlling lighting pattern
30. Controlling restroom doors
31. Applying a high reflect, low luminance reflecting lampshade
32. Using energy saving electronic ballast
33. Using low-consumption fluorescent
34. Blackout control

Decreasing Power Consumption

35. Improving power factor
36. Using low-loss transformer
37. Controlling the number of transformers

Mechanical Equipment

Utilizing Solar Heat

38 .Solar heat for air conditioning and heating
39. Solar heat for hot water supply
40. Solar heat for radiation heating

Deceasing the Heat Load

41. Decreasing load through energy saving lighting system
42. Exchanging heat using underground duct (cool tube)
43. Optimizing positions of external air intakes
44. Controlling external air conditioning
45. Controlling external air quantity for precooling and pre-heating
46. Controlling ventilation inside the double skin
47. Controlling minimum external air quantity

Saving the Bounce Energy

48. Using low leakage dampers
49. Applying the VAV method
50. Adopting big temperature difference method
51. Decreasing the resistance of piping systems
52. Adopting the VVVF motor system (AHU, Elev. Pump)
53. Addressing air leakage of duct system (leakage prevention)
54. Utilizing natural ventilation to the maximum extent (office fixture room, etc.)
55. Local ventilation
56. Controlling the number of pumps
57. Designating heat source capacity based on normal load

Increasing the Utility Efficiency

58. Utilizing heat storage system
59. Increasing the temperature of cooling water for cooling system
60. Using temperature-rated heat storage containers
61. Controlling the operation of cooling tower fans
62. Using high-efficiency heat source equipment
63. Applying ventilation evaporating humidifiers
64. Controlling the optimized operation of heat source equipment
65. Controlling optimized operation
66. Enforcing the insulation of heat storage containers
67. Enforcing the insulation of piping systems
68. Controlling the schedule of vending machines

Sanitary System

69. Using a water-saving apparatus
70. Decreasing water pressure of the closet (low tank)
71. Water drain through natural discharge

A World-Class Research Institute Equipped with Highly Advanced Equipment and Large-Scale Experimental Facilities

New technologies that will open the future of the construction industry are being born in various laboratory buildings, which are equipped with highly-advanced equipment and large-scale experimental facilities, as well as the Research & Administration building, which was the first ultra energy saving building in Korea.

Research & Administration Building

This is an ultra energy–saving, eco-friendly green building, equipped with highly advanced facilities and applying 71 state of the art technologies, such as Double Skin, Cool Tube etc.

Central Laboratory

Multipurpose testing facilities consisting of concrete, soil mechanics, and environmental test laboratories for construction-related tests.

Large Scale Structure Laboratory

The laboratory doing the evaluation of structural performance for real scale structure (e.g. 3rd story structure) and 20m long girder under various external forces such as earthquakes, typhoon, and soil pressure.

Wind Tunnel Laboratory

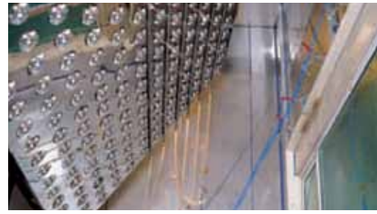
The experimental facilities evaluate influences on structures, which are buildings, bridges, and large-span structures, against wind. It is possible that securities of serviceability and structural stability from evaluation of pressure, forces, vibration, and wind-environment.

Geotechnical Experiment Building

In this building, Operated is Geotechnical Centrifuge that is conducting model tests of geo structures (Reviewing construction and design feasibility and securing the reliability of the results of new engineering method studies), along with various physical/mechanical tests of geo materials.

Mechanical & Electronical Laboratory

This is a specialized experiment building that enables collective research on architectural environments and equipments the study of environmental changes. It has various experiment rooms, including an artificial weather experiment room that can reproduce any possible environmental conditions, and the IAQ experiment room for preparing a pleasant air environment. It also has a thermal camera and multi-gas monitors, etc. for improving dwelling environments.



Acoustic Laboratory

This is a facility to evaluate the acoustical performance of construction materials, and is equipped with an anechoic chamber and reverberation chambers that meet Korean Standard (KS) and International Standard Organization (ISO) standards, as well as scale model experiment room.

Brain House

A building with 1 basement level and 4 floors above ground (total floor area 4,168m2, capacity of 200 persons), where technical education programs are developed by title and theme, while internal and external company technical education is conducted.

BEYOND NEW THING

The Study of Future Construction Culture and the Leading Technology

A technology evolution makes all humans happy. Not building a simple building or a bridge, but creating a new urban city and a great newness where the wired-wireless convergence is harmonized with the nature – this is where DICT begins.

- ECO-FRIENDLY CONSTRUCTION MATERIALS
- INFRASTRUCTURE
- ENVIRONMENT & ENERGY
- GREEN ENERGY
- BUILDING & HOUSING
- DISASTER PREVENTION
- U-CITY, U-PUBLIC

ECO-FRIENDLY CONSTRUCTION MATERIALS

Take the Lead from the Basis for a Highly Qualified Structure

Concrete – the most basic material for construction DICT is researching and developing various concrete technologies which are stable in any environment on Earth.

Eco-friendly Construction Materials

Ultra-high Flowing Concrete (FlowCrete)
High-durable Marine Concrete
High-early Strength Concrete
Low Carbon Nass Concrete
Super-long-span Bridge : High Performance Concrete and its Application Technology

▶ Geoga Bridge Immersed Tunnel

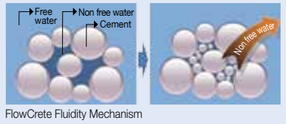
Eco-Friendly Construction Materials


Songdo ATT site

Ultra-high Flowing Concrete (FlowCrete)

The key of ultra-high flowing concrete technology is an absence of compaction during concrete placement because of its highly packing and flowing ability. Since the new concrete secures higher fluidity(Slump-flow over 800mm) than the current high flowing concrete, stable construction and quality control are enabled for ultra high-rise buildings or ultra large-sized structures with highly dense reinforcement bars. The technology for manufacturing and construction of ultra-high flowing concrete has been secured through carrying out korean national research project; Concrete Corea. Also it has been applied to LNG storage tank, Songdo ATT, etc.

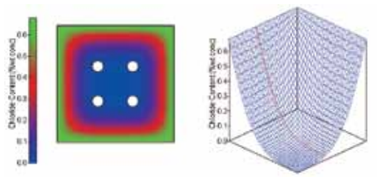

Ultra-High Flowing Concrete (FlowCrete) Placement



FlowCrete Fluidity Mechanism

High-durable Marine Concrete

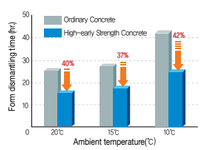
High-durable marine concrete keeps concrete structures safely from chloride and sulfate attacks in marine environment. This technology has been applied to GK Project, Sihwa tidal plant, etc.




Sihwa tidal plant site

High-early Strength Concrete

This is a technology to shorten concrete structure construction during cold weather by using high early strength binders(fine particle cement + lime stone powder). This technology has been applied to a number of buildings such as Daedok Business Hub Center, Paju Prugio, etc.



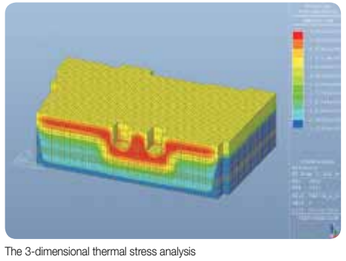
High-early strength development


Daedok Business Hub Center site

Low Carbon Mass Concrete

This is a concrete technology that lowers carbon dioxide emissions by minimizing cement content and using lots of industrial by-products. It deducts heat of hydration of mass concrete and leads faster early strength development than current mass concrete. Also, it can be applied for the same or less cost than the current cement. This technology has been applied to high rise buildings such as KLCC project in Malaysia, Cheongla Prugio, etc.


Bugok Prugio site


The 3-dimensional thermal stress analysis

Super-long-span Bridge : High Performance Concrete and its Application Technology

As a key material research for constructing a super-long-span-bridge, we have an aim to develop high-functional concrete materials and application technology. For these purposes, we have conducted the research about a high-pumpable concrete to construct a pylon, a super-low-heat concrete to construct an anchorage and a multi-purpose concrete to construct a marine-foundation.


Geoga Bridge

INFRASTRUCTURE

Visit an Economic and Safe Construction Site

Civil engineering research team is researching a future-oriented practical technology of low carbon-green growth, as well as a technology to shorten the term of work and reduce costs by analyzing the various problems that can occur on construction sites.

Next-Generation Bridge

Whole Prefabricated Bridge
Super-long-span Bridge : Structural Analysis and Geometry Control
Rapid Construction Technology on Maglev Train Guideway

Atomic Energy / LNG

Structural Analysis of Nuclear Reactor Containment Buildings
Structural Analysis and Design of Large 250,000kl LNG Storage Tanks
Underground Radioactive Waste Disposal Construction Technology

Marine Space

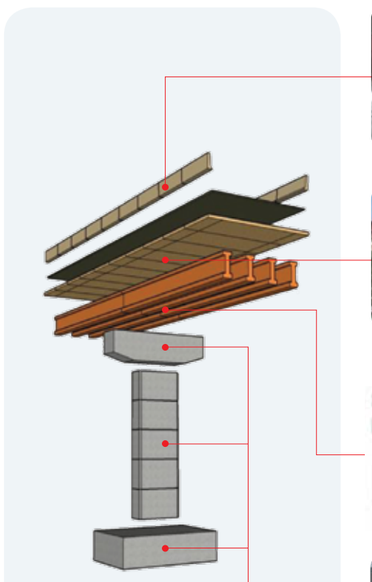
Suction Pile / Embedded Suction Anchor Method
Pulse Pile / Pulse Anchor Technology
Connection Technology of Immersion Tunnel Segments in the Deep Sea

▶Geoga Bridge (bridge connecting Busan and Geoje)

Next Generation Bridge

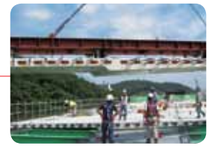
Whole Prefabricated Bridge

The whole prefabricated bridge, which was developed by DAEWOO for rapid construction and high quality, is comprised of piers, decks, barriers and girders. The components of bridge are made in the factories and they will be assembled with minimum process in site. To develop of the whole prefabricated bridge, DAEWOO has been researching precast decks system, PnP girder system, precast pier system, precast barrier system and segmental CFT girder system.



≫ DPB, Daewoo Precast concrete Barrier System

The precast concrete barrier system is a method of rapid construction using precast concrete barriers. Structural performances such as the failure mode and the load-carrying capacity are verified by structural tests and have shown that the proposed system provides similar structural capacity to a conventional cast-in-place system. The system has the advantage of more rapid construction with improved constructibility and quality.



≫ DPS, Daewoo Precast concrete Slab

“DPS(Daewoo Precast concrete Slab)” full-depth precast concrete deck system uses precast method to construct bridge slab instead of using the conventional cast-in-place method. This system achieves over 50% reduction in construction time, prolongation of slab’s life cycle by using high-strength concrete, and form-free construction. Therefore, this innovate system guarantees high economical efficiency, enhanced constructability, improved safety, and easy maintenance.

≫ PnP, Preloading and Progressive girder

PnP girder system is a new bridge construction technology that is tensioning prestressing tendons incrementally, in which process the dead load of precast bridge decks is utilized. Highly efficient PSC girder, extending the span length and rapid construction of bridge can be achieved by this system.

≫ Precast segmental Pier System

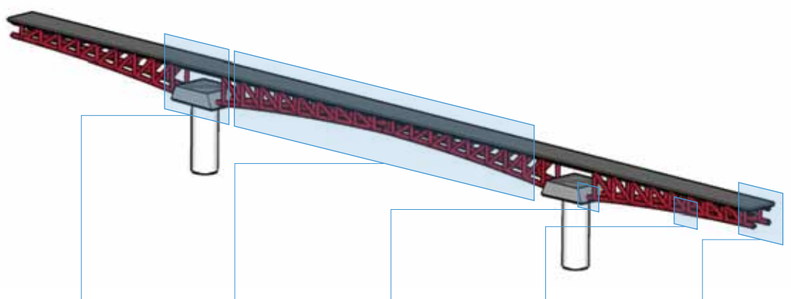
The precast segmental prestressed concrete bridge pier system is a method of rapid construction. Testing and field application have shown that the System provides similar structural capacity to a conventional cast-in-place system. the system has the advantage of more rapid construction with improved quality. Furthemore, new research(modular pier system using the CFT) is being carried out to improve the advantage of prefabricated method

Super-long-span Bridge : Structural Analysis and Geometry Control

Geometry control of cable-stayed bridge is required so that a completed bridge may have the geometry, the force of cables and stress of steel girder specified in design. Geometry control is done according to the following steps. Firstly, phase analysis based on a realistic material model and precise loads should be prepared. Secondly, errors should be evaluated by comparing the result of analysis and data obtained from survey and monitoring. Finally, instruction for compensating errors should be given. For an optimized geometry control, systematic process which includes adequate software, exact modeling, precise survey, and control forms for the erection of steel girder and cables should be developed.

Prefabricated Segmental CFT(Concrete Filled Tube)

A new composite bridge constructed by segmental method consists of concrete filled steel tubular girders and prefabricated concrete decks. CFT bridges as a state-of-the-art structure are expected to be widely applied for the multi-purpose of aesthetics, light weight, easy fabrication and rapid erection.



The test of continuous support

The full model test

Composition of chord and pier

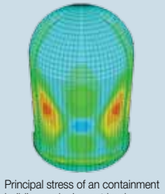
Connection of the CFT girders

Composition of the precast decks

Atomic Energy/ LNG

Structural Analysis of Nuclear Reactor Containment Buildings

Nonlinear finite element models have been developed to verify the ultimate capacity and to predict the behavior of nuclear containment buildings subjected to internal pressure, aircraft impact load and fire, etc.



Principal stress of an containment building under impact load

Temperature in a fire-exposed containment building

Structural Analysis and Design of Large LNG Storage Tanks

Design procedure of the world's largest above-ground LNG storage tank with a large capacity of 250,000kL has been developed to apply into the international LNG tank project and to accumulate advanced structural analysis techniques of circular storage tanks.

The LNG Receiving Terminal in Tongyeong

Underground Radioactive Waste Disposal Construction Technology

Korea, where nuclear power is absolutely necessary because of the low production of fossil fuel, has to guarantee the safety of radioactive waste disposal and nuclear power plant itself to continue to develop new and become a leader in nuclear power export. Daewoo E&C is leading the successful construction of Kyoungju radioactive waste disposal through the accumulated techniques and know-hows resulted from the previous construction experience and the development of economical and efficient reinforcement method of underground space.

The Radioactive Waste Disposal in Kyoungju

Marine Space

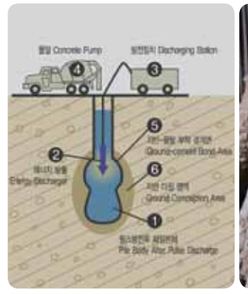
Suction Pile/ Suction Anchor Method

Suction pile is a skirt pile that is driven by applying an active suction pressure inside the pile. Suction piles have normally been used as anchors of floating structures and foundations of marine structures in deep-water locations. Suction piles have several technical advantages over conventional piles and anchors; fast and easy installation at any depth of water, extremery large resistance due to its huge size, and easy retrieval by applying a positive suction pressure inside the pile. The embedded suction anchor (ESA) is a type of permanent offshore foundation that is installed by a suction pile. The cross-sectional shape of the ESA is circular with its diameter being the same as that of the suction pile that is used to drive it into the sea-floor. Once the ESA reaches the desired depth, the suction pile is retrieved by applying a positive water pressure inside the pile, leaving the ESA permanently in the seafloor soil.

The Floating Break Water of Wonjeon Port

Pulse Pile / Pulse Anchor Technology

The pulse pile and anchor are advanced technologies which are able to improve resistance capacities effectively by the expansion of holes by means of electrical power. In these technologies, a shock wave enables a bore hole to be expanded, and therefore results an increase of shear strength of soils and an adhesion between the ground and grout. Due to this, the effective construction cost and time can be achieved.

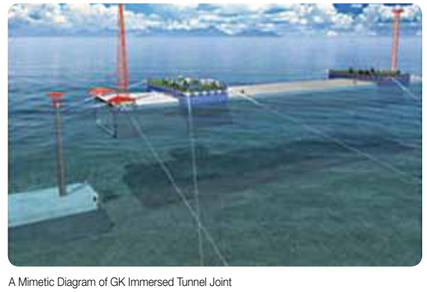


Pulse Pile Technology

Pulse Pile

Connection Technology of Immersion Tunnel Segments in the Deep Sea

The immersion tunnel segments are initially connected by using EPS(External Positioning System) which is manufactured for an accurate installation of the segments under the condition of high water pressure in the deep sea. Then the final connection is followed by usage of external water pressure. Despite of the first Gina Gasket deformation which is developed because of the difference between the inner and the outer water pressure during the final connection, a safe and accurate construction can be achieved by controlling the pressure difference and working velocity by means of compressive air.



A Mimetic Diagram of GK Immersed Tunnel Joint

ENVIRONMENT & ENERGY

Keep Nature Clean with a New Concept

A technology that gives comfort to the trees, wind, water and the air- DICT develops an advanced technology to make new ideas for saving and caring for the earth come true.

Water Treatment

- Advanced Wastewater Treatment for Nitrogen and Phosphorous Removal (DNR)
- Advanced Wastewater Treatment by Membrane Separation (DMBR)
- Advanced Wastewater Treatment System to the Quality of Recreation Water (I^2 System)
- Membrane Filtration Process for Advanced Water Treatment (DIMS)
- Automatic Control System of DIMS (Wise-DIMS)
- Seawater Desalination Process by Forward Osmosis (DFOS)

Renewable Energy / Waste Treatment

- Biogas Production Technology Using High Strength Organic Wastes (DBS)
- Pretreatment and Dewatering Process of Sewage Sludge (DSM)
- Dual Bag Filter Process (DBF)
- Filter Bag De-NOx System with Powder Type Catalysts (DCF)
- Thermal Remediation of Soils Contaminated with Petroleum (DTRS)

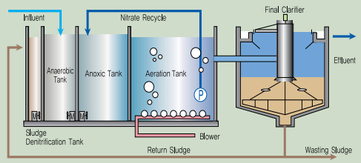
▶The GUUI Water Purifying Center

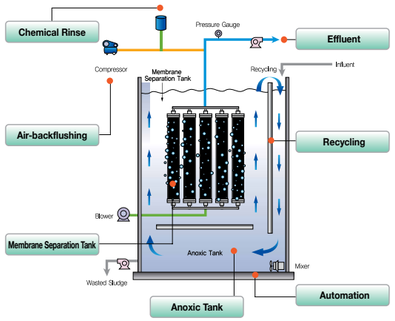
Water Treatment


Cheonan Wastewater Treatment Plant

Advanced Wastewater Treatment for Nitrogen and Phosphorous Removal (DNR)

DNR(Daewoo Nutrient Removal) is the first biological nutrient removal process developed in Korea, and removes 90% of BOD and suspended solid, 70% of nitrogen and 85% of phosphorous in municipal wastewater. It has been applied to 31 sites, and has been proven to supply a perfect solution for wastewater treatment through several years of operation.

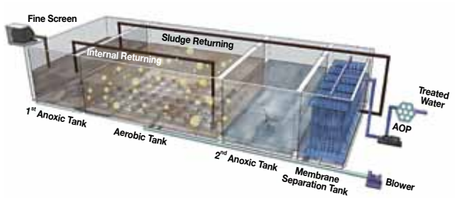




Advanced Wastewater Treatment by Membrane Separation (DMBR)

DMBR(Daewoo Membrane Bio-Reactor) is a wastewater treatment technology that biologically removes organics, nitrogen and phosphorous, and separates suspended solids and e-coli from mixed liquor using hollow fiber membrane submerged in the aeration tank. Its unpowered internal recycling and integrated process make it possible to reduce costs by more than 40% compared with the conventional systems, and DMBR is recommendable for water reuse and reclamation.

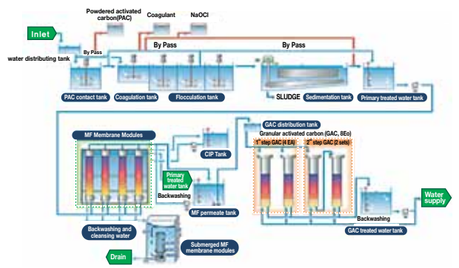

Dang-jin Wastewater Treatment Plant



Advanced Wastewater Treatment System to the Quality of Recreation Water (I^3 System)

As one of the world's best wastewater treatment processes which secure its excellence and economical efficiency, Innovation^3 system is an economical process that reduces the costs for construction and O&M by reducing area requirement and adopting an intelligent operation control system. I^3 system guarantees the stable quality of treated water with less than T-N 5 mg/l, and T-P 0.5 mg/l. Its additional AOP process removes even micro-pollutants in the water.

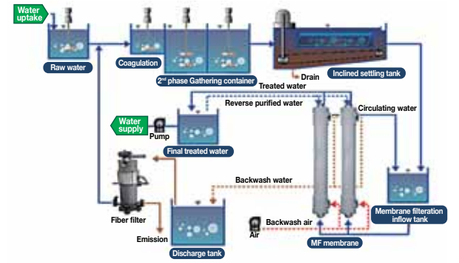

Guri Wastewater Treatment Plant



Membrane Filtration Process for Advanced Water Treatment (DIMS)

DIMS(Daewoo Integrated Membrane System) is a water treatment process using pressurized microfiltration which removes pathogens and micro-pollutants to produce safe and tasty drinking water. DIMS can be easily applied to the existing or new water treatment plant and meet the regulatory standards of drinking water which are being more reinforced.

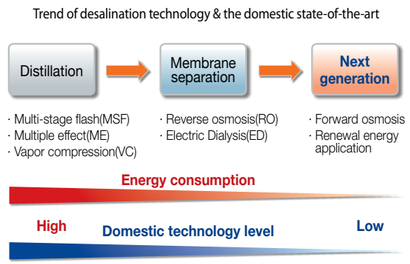

DIMS Pilot Plant in Seoul



Automatic Control System of DIMS (WISE-DIMS)

WISE-DIMS(Web-based, Intelligent, Smart and Efficient DIMS) can achieve the automation of pretreatment(coagulation/sedimentation) and membrane cleaning by adopting a model considering water quality of influent and the index of the membrane fouling. WISE-DIMS is a highly advanced technology that secures both the safety of drinking water and convenience for the operator.


Yeongdeungpo Arisu Center



Seawater Desalination Process by Forward Osmosis (DFOS)

Ever-increasing water demand in countries that lack water resources, such as the Middle Eastern countries, and the polarization of water resources around the world, will inevitably lead to major expansion in the sea water desalination market, which is expected to grow to 32 billion $ by 2015. DICT is developing DFOS(Daewoo Forward Osmosis System) as an emerging desalination process to meet this market trend, which aims to reduce the production cost to over 50% compared with reverse osmosis dominating the market.


The World's Biggest Sea Water Desalination Plant (Israel)

Renewable Energy / Waste Treatment


Daegu Food Waste Biogas Production Facility

Biogas Production Technology Using High Strength Organic Wastes (DBS)

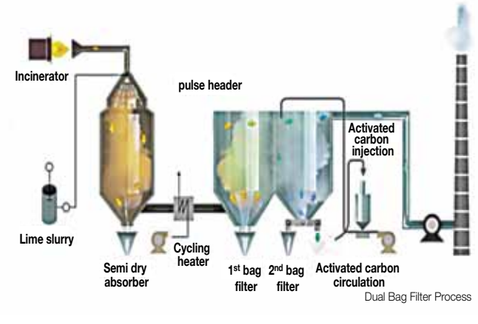
DBS(Daewoo Bio-waste Total Solution) is a technology that produces biogas and organic fertilizer utilizing organic wastes, such as sewage sludge, livestock manure, and food waste, from which generates electricity and heat. It produces high-purity biogas (over 75% for methane contents) within a minimum retention time (10 days) keeping the removal efficiency of organic wastes over 80%. It has already been applied to the facilities for food waste in Daegu and Jinju (300 and 100 tons/day respectively), and for livestock manure in Jangsu (100 tons/day) in Korea. Also it has been exported to Italy. We will go to the global market which expands to $ 25 billion by 2030, and compete with other leading technologies.


DSM Volume Reduction Facility (Treatment time: 1 hour)

Pretreatment and Dewatering Process of Sewage Sludge (DSM)


DSM Applied to Wangsong Water Treatment Plant

DSM(Daewoo Sludge Management using Microwave) is a technology that economically and efficiently reduces the volume of sewage sludge from wastewater treatment plant by 67~75%, reducing water content to 20~60% using microwave and hot air, which makes the reuse and disposal of sludge efficiently. It increases the efficiency by 1.5~2 times compared with the conventional hot air processes, and settle the public complaints by decreasing odors.



Dual Bag Filter Process

Dual Bag Filter Process (DBF)

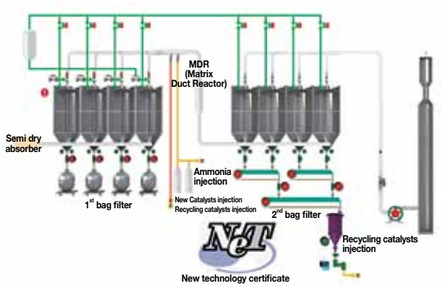

DBF Applied to an Industrial Waste Incinerator in the Sihwa Industrial Complex

DBF(Dual Bag Filter) technology is a high-efficiency process that simultaneously treats hazardous gases from the incinerator containing specific toxic materials. DBF, removing dioxins by over 99%, is easy to operate, and recycles its activated carbon to reduce operating costs by over 20% compared with the competing processes.

Filter Bag De-NOx System with Powder Type Catalysts (DCF)

DCF(Daewoo Catalytic Filter) is a technology that treats NOx discharged from incinerators or power plant facilities using powder type catalysts and bag filters, and doesn't require any additional heating. It can treat NOx and dioxins simultaneously, and reduce the capital and operation costs by over 50% compared with the conventional process by recycling the powder type catalysts.


DCF Process applied to an Industrial Waste Incinerator in Mokpo

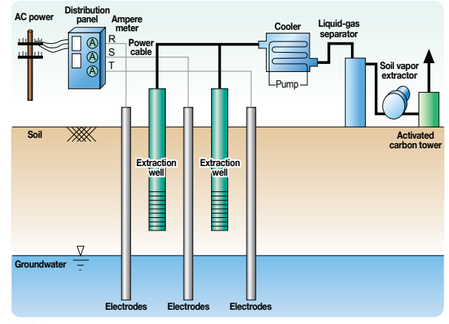


DCF Process

Thermal Remediation of Soils Contaminated with Petroleum (DTRS)

DTRS (Daewoo Thermal Remediation System) is a thermally enhanced in-situ remediation process of highly contaminated soils with petroleum or solvents, applying electrical resistance heating by electrical conductivity of soils. Soil heating by DTRS enhances volatility and mobility of organic compounds in soil pore, and significantly shortens the remediation time compared with soil vapor extraction and bioremediation. In case of highly contaminated soils with diesel, it can remove 90% of the contaminants over 70% faster than the conventional soil vapor extraction.


Case study: Soil remediation by DTRS (00 military Base, Yongin)



DTRS Process

GREEN ENERGY

A Promising New Technology Creates Clean Energy

In the era of high oil prices, Techniques which change the waste into the resources are the most promising technology.
DICT promotes enormous capability to grow throughout various researches which keep preservation of nature and are able to reuse from energy.

Green Energy

- Green Energy Technology applied to Sihwa Tidal Power Plant
- Building Integrated Wind Power (BiWP)
- Photovoltaic Power Generation
- Marine Wind Power Plant
- Optimal Hydrogen Production Process Using Waste

▶Sihwa Tidal Power Plant

Green Energy

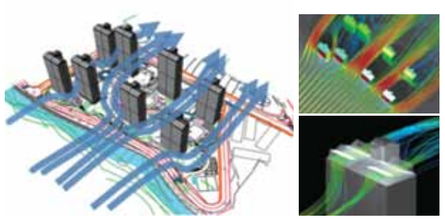

Sihwa Tidal Power Plant

A Green Energy Technology applied to Sihwaho Tidal Power Plant

Tidal power plant generates electricity using water level difference between outer and inner seas due to ebb and flood tides. The inner sea is a manmade lake which is constructed at river mouth or gulf/bay by blocking off water with tide embankment. Sihwa tidal power plant, once completed, is able to generate electricity up to 552 million kWh/year which is capacity for a half million people. It also has effects on 862,000 barrels of petroleum replacement and 315,000 tons of carbon dioxide reduction. In addition, it will contribute to national added value creation by selling carbon credit to the advanced countries which have obligation of greenhouse gas reduction.

Building Integrated Wind Power

The technique, which maximizes efficiency of wind power generator throughout augmenting the maximum wind on the building and optimal arrangement location of wind power generators from the results of analysis and assessment of the wind resource, will apply to an apartment houses and ultra high-rise buildings, etc. which produce the necessary energy themselves.


Analysis and Assessment of the Wind Resource


Optimal Arrangement Design of Wind Power Generators (SANGAM DMC)

Photovoltaic Power Generation

This is a technology that directly converts solar light to electrical energy by utilizing the Photovoltaic Power Generation System (a solar battery, a module, a condenser and an inverter). It can be installed on the roof or in an empty space, and provides higher efficiency when it is installed on the exterior of a building, such as the wall or windows.


Installation in OKAM PRUGIO of Mokpo

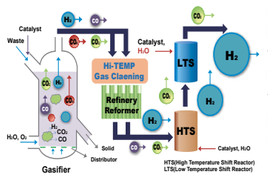
Marine Wind Power Plant

This is installed in the sea and generates energy through the pressure power difference when water is discharged from the inside of the pile, is easier to secure space for than plants on land, doesn't have any restrictions on height, and produces no noise. It can be utilized as a basis for marine wind generation.


A suction pile is the basis of wind power generation

Optimal Hydrogen Production Process Using Wastes (DWH)

DWH (Daewoo Waste to Hydrogen) process, which produces hydrogen, an energy source of the future, consists of a gasifier, a catalytic reactor and a separation process. DWH generates the gases with over 60~70% hydrogen contents, and furthermore, it produces high-purity hydrogen through the following gas purification at low cost.



Wastes to Hydrogen Process

BUILDING & HOUSING

Future of Beautiful and Convenient Spaces begins

Splendid landscape of high-rise buildings creating beautiful skyline and surprising changes in a dwelling space of dreams now begins with DICT.

Structural and Construction

- Movement Control for High-Rise Building during Construction
- BIM-Based Construction Technology
- Erection Engineering
- Optimized Rebar Construction

Building Environment

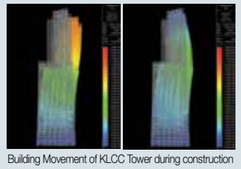
- Reduce Indoor Noise
- Reduce Environmental Noise
- Reduce Construction Site Noise
- Provide Architectural Acoustics Design
- Prevent Condensation and Design the Optimal Insulation
- Conserve Energy by Building Envelope
- Assess the Performance of Construction Equipment
- Measure the Indoor Air Quality
- Realize Zero Energy Houses

▶CHEONGNA PRUGIO of Incheon

Structural and Construction

Movement Control for High-Rise Building during Construction

Building movement control is a highly advanced technology that meets the needs of both stability of the structure and serviceability requirements through analyzing, monitoring and controlling structure's displacement, which may occur during the construction of a high-rise building. Through elaborate analysis of a 3-dimensional displacement based on time-dependent characteristics of the concrete and construction sequence, the displacements of structure is predicted before construction and an assessment of the predicted displacements by material testing and measuring at the site is conducted during construction.



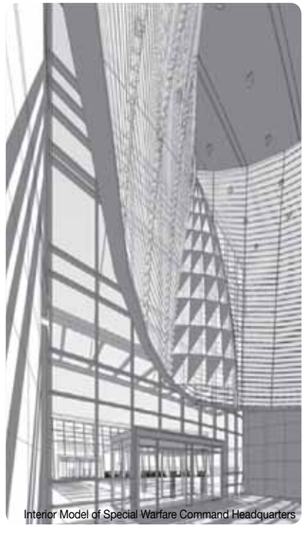
Building Movement of KLCC Tower during construction

Songdo NEATT

BIM-Based Construction Technology

A technology that maximizes the efficiency of construction by assessing potential problems that may happen during construction based on 3-dimensional building information model. It can also be applied throughout the whole lifecycle of a building for maintenance after the construction.

Construction Simulation of KLCC Tower in Malaysia

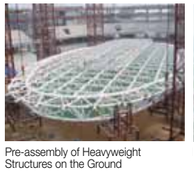


Interior Model of Special Warfare Command Headquarters

Gwangmyeong Cycle Velodrome

Erection Engineering

An integrated technology for lifting very large-sized heavy structures, such as roofs of domed stadium, and hangar, observation platforms, and connecting bridge for high-rise buildings up to the specified position with hydraulic systems. It requires the optimal division of the structure and the detailed analysis of each construction stage, design for hydraulic systems and various measuring systems.



Pre-assembly of Heavyweight Structures on the Ground

Lift-up of Structure

High-rise Complex in Yongsan Hanggangno

Optimized Rebar Construction

Constructability and quality of Re-bar works can be improved using mechanical anchorage, mechanical splice, and pre-fabrication. Especially, a splice plate, consisting of mechanical splice, mechanical anchorage, and steel plate with shear key, was developed and can enhance the structural behavior of core-slab/beam joint in tall buildings where the core walls are usually pre-constructed and slabs and beams are followed.

Mechanical anchorage of rebars

Embedded Steel Plate for Rebar splice

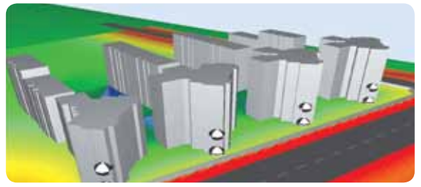
Building Environment

Technology to Reduce Indoor Noise

This is a technology to reduce indoor noise, such as floor impact noise, plumbing noise, noises between dwellings and other various noises from equipments, in order to provide the comfortable acoustic environment. It has been applied to current construction projects.

Technology to Reduce Environmental Noise

DICT provides solutions to reduce adverse effect of environmental noise, such as transportation noise through on-site measurements, and by using a computer simulation to evaluate acoustical environment and realize acoustic comfort.

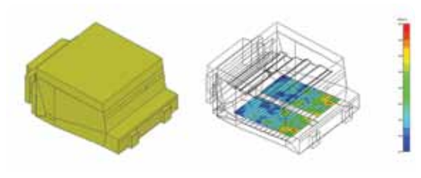


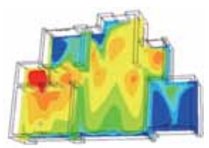
Technology to Reduce Construction Site Noise

In order to reduce the inconveniences to neighboring residents caused by noises on a construction site, DICT monitors noise levels on construction site and predicts noise levels to provide proper noise reduction plans with themporary soundproof walls.

Technology to Provide Architectural Acoustics Design

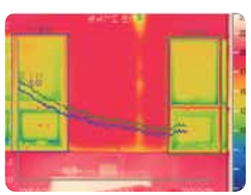
In order to realize the optimal acoustical environment for each purpose of rooms and spaces through acoustical performance evaluation of construction materials and indoor acoustical environment designing, using a computer simulation.





Technology to Prevent Condensation and Design the Optimal Insulation

In order to diagnose the potential for condensation by analyzing the results of the artificial weather test, DICT suggests the optimal design method for insulation, finishing materials and various equipments.



Technology to Conserve Energy by Building Envelope

To assess the material performance, DICT suggests a solution to save energy by improving the insulation of the exterior skin of a building by a convergence of skin material element technologies using the experimental results of artificial weather machines, thermal photographs and a CFD/Energy simulation.

Technology to Assess the Performance of Construction Equipment

DICT conducts an assessment of construction equipment such as switchboards, ventilation equipments, HVAC system for offices, components, etc. in order to supply pleasant interior environments and energy-saving operation methods.

Technology to Measure the Indoor Air Quality

DICT checks the effect of improvements made by the use of eco-friendly material and ventilation through the precise measuring of formaldehyde and volatile organ compounds, and suggests a plan to improve the situation.

Technology to Realize Zero Energy Houses

This is a technology that realizes energy independence by producing its own energy using a Passive technology that minimizes the energy required for heating, ventilation, and air conditioning of the building, and an Active technology that recycles renewable energy so that it doesn't require any fossil fuel from outside.

DISASTER PREVENTION

Complete Solutions for Structural Designs

Disaster Prevention Team provides complete solutions which are guaranteeing constructability, cost-effectiveness, and structural safety, for ultra high-rise buildings, large-scale spatial structures, and long-span bridges through the development of protection technologies against natural hazards such as earthquakes and hurricanes.

Vibration Control

TMD (Tuned Mass Damper) Technology for Long-span Bridge Over the Sea
Outrigger Damper System
Hybrid Vibration Control System

Wind and Earthquake Structural Design

Advanced Wind Engineering and Earthquake Engineering Technology for High-rise and Large Span Structures
Wind Engineering Technology for Super Long Span Bridges

SHM (Structural Health Monitoring)

SHM for Architectural Structures
SHM for Bridges

▶North-East Asia Trade Tower at Songdo, Incheon

Vibration Control

Air View of the Busan-Geoje Fixed Link

TMD (Tuned Mass Damper) Technology for a Long-Span Bridge Over the Sea

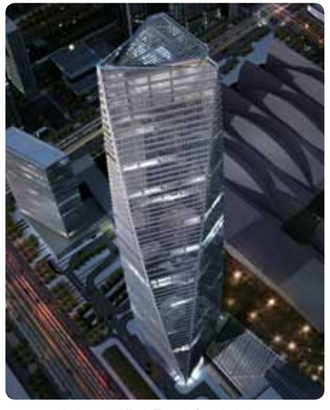
To secure the stability of long-span bridge under construction, TMD(Tuned Mass Damper) is considered and installed at the top of the pylon instead of the temporary tied-down cables. Continuous resistance and stability against wind can be obtained by tuning the frequency of the TMD according to the construction stages. This stabilizing method of construction by TMD does not need any temporary foundations. Thus it could solve the environmentally constrained problems by excavation or dredging of the ground and the risk of the ship collisions. Moreover, it is more economical and workable in comparison with the temporary tied-down cables.

TMD installing (Improved)

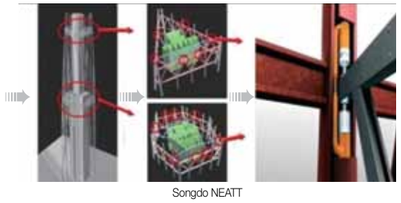
Temporary tied-down cables installing (Unimproved)

Outrigger Damper System

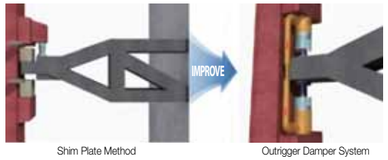
The differential shortening between exterior columns and interior cores in outrigger system could induce unexpected structural damages during construction of tall buildings. Also, a method to reduce wind-induced responses and wind loads is required for tall buildings. The outrigger damper system, therefore, is developed to automatically compensate the differential shortening during construction. Additionally, low structural costs and improved vibration serviceability could be achieved using the outrigger damper system.



Northeast Asia Trade Tower in Songdo, Incheon



Songdo NEATT



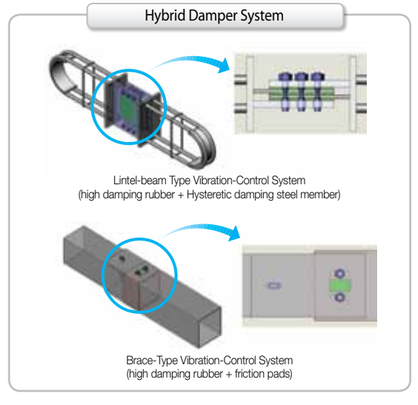
Shim Plate Method

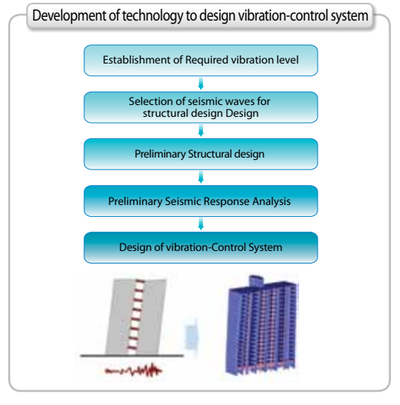
Outrigger Damper System

Auto Compensation of Differential Shortening between RC Core and Columns during construction

Hybrid Vibration Control System

Structural system for a tall building of 30 to 40 stories height could be optimized by concurrently controlling wind- and earthquake-induced vibrations. Currently, however, used vibration control systems could control only wind- or earthquake- induced vibrations. Using the hybrid vibration control system, optimized structural costs and enhanced structural safety can be achieved by controlling vibrations induced by both of earthquake and wind.



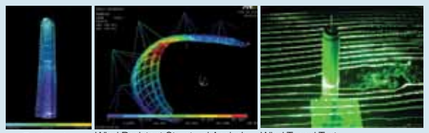


Suwon Ingye-dong Multiplex

Wind and Earthquake Structural Design

Advanced Wind and Earthquake Engineering Technologies for Highrise and Large Span Structures

Efficient structural system with high performance could be acquired by accurately evaluating wind and earthquake loads. An evaluation procedure is developed by combining advanced structural analysis and wind tunnel test. Also, non-linear analysis to evaluate collapse mechanism is developed to simulate the earthquake effect to structures.



Earthquake Structural Analysis | Wind Resistant Structural Analysis | Wind Tunnel Test

Wind-resistant Design Technology for a Super Long Span Bridge Over the Sea

The aerodynamic stability of a super long-span bridge under construction is more problematic than in the complete state by wind load. It is definitely necessary to secure the stability of the bridge under construction against wind. Wind Tunnel Test and CFD(Computational Fluid Dynamics) analysis are performed to evaluate the wind effects on the structure and investigate the stability of the bridge for the design of a super long span Bridge regarding aerodynamics.

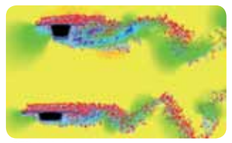
3-D Aeroelastic model test – Cable-Stayed Bridge

3-D Aeroelastic model test – Suspension Bridge

Free-Standing Pylon Test

Sectional Model Test

Airflow Visualization

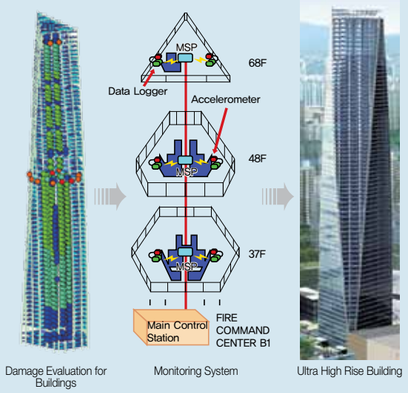


CFD Analysis

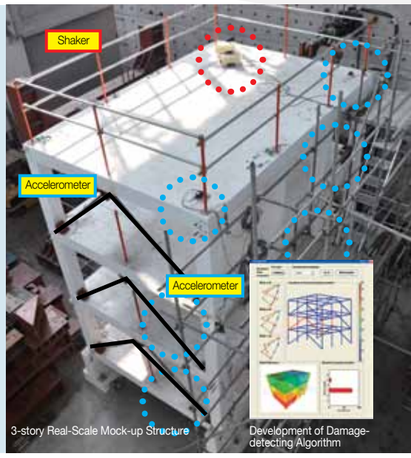
SHM(Structural Health Monitoring)

SHM for Architectural Structures

Incorporating wireless measurement technology with damage evaluation method, the SHM system enables a building itself to evaluate current structural condition and provide proper countermeasures for maintaining structural safety. In addition, the system provide residents with realtime structural status and analytical evaluation results regarding any structural defect caused by an earthquake to prevent unnecessary social disorder and human catastrophe.



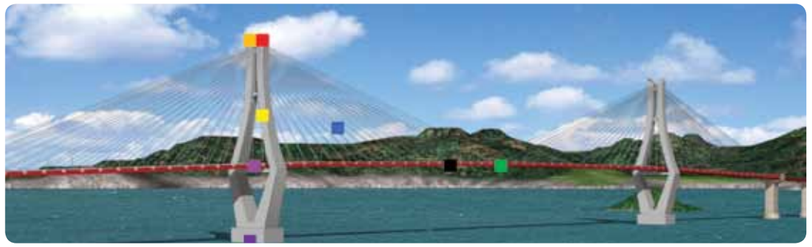
Damage Evaluation for Buildings | Monitoring System | Ultra High Rise Building

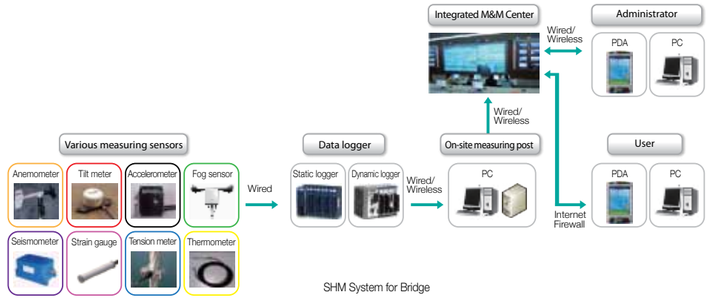


3-story Real-Scale Mock-up Structure | Development of Damage-detecting Algorithm

SHM for Bridges

Structural health monitoring techniques are useful for maintaining the bridge status such as natural frequency, mode shape, and damping ratio. Using this results, the damage detection of the bridge structure and economical maintenance management are performed. The monitoring system for the bridge provides the essential information to check the general conditions and prevent large-scale damages in advance.





SHM System for Bridge

U-CITY, U-PUBLIC

Our Research Focuses on the Cities of Tomorrow, Which Are Filled with Leading-Edge Conveniences

Through fusion with various technologies that go beyond the mere scope of construction, our research is concentrated on state-of-the-art u-cities to converge a broad spectrum of urban services.

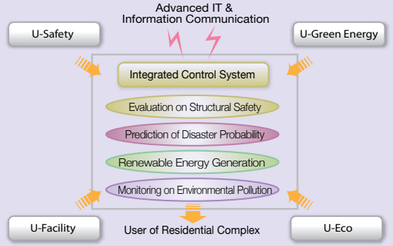
U-City, U-Public

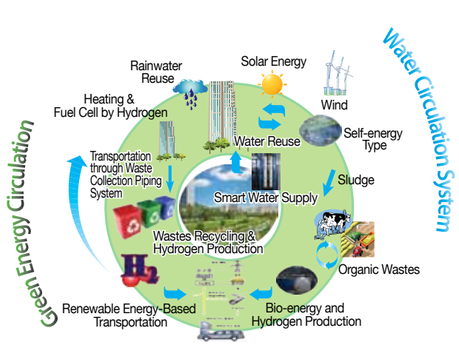
- U-City
- Zero Carbon City
- ITS (Intelligent Transport System)
- Construction Technology of Eco-Environmental Artificial Ground & Floating Structure
- Seabed Tunnel Construction

▶Busan U-City

U-City

DICT researches a sustainable intelligent urban space where is managed by an integrated control system which includes ubiquitous services, disaster prevention systems of buildings, these facilities and urban space throughout fusion of advanced IT and ecological technology.





Zero Carbon City

In an attempt to construct eco-friendly green cities of the future, we are integrating low-carbon green growth technologies such as smart water supply, wastewater reuse, hydrogen energy using waste materials, and biogas production from organic waste, in order to achieve the top-class sustainable environments.

GK Immersed Tunnel (the nation's first immersed tunnel)

ITS (Intelligent Transport System)

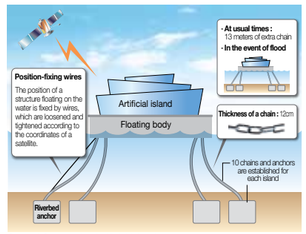
ITS(Intelligent Transport System) provides more convenient and safe transportation environment through the IT(Information technology) which efficiently makes connection between the main elements of transport system like humans, roads, and vehicles. Recently various research works are performed in order to graft the advanced IT technology to road construction and operation system.

※Image source : KICTEP

Construction Technology of Eco-Environmental Artificial Ground & Floating Structure

An artificial island is a man-made geostructure. It first begins by a lake house and extends to industry and leisure such as, offshore airport. The artificial island has mainly been made by reclamation, and caused many problems such as ecosystem destruction and oceanic current interruption. The technologies of floating structures are composed of a floating body, a mooring system and material of the artificial ground.

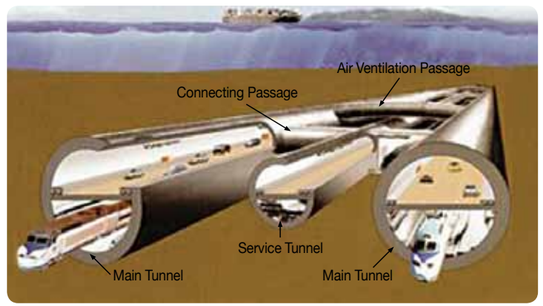
Floating Island of Han River



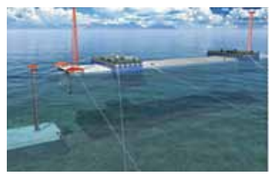
Control System for Artificial Island

Seabed Tunnel Construction

Many seabed tunnelling methods are developed such as Drill & Blast, Immersion and Shield TBM for connecting countries and islands. Especially, Daewoo E&C which has the construction experiences of Sol-An tunnel which is the longest Drill & Blast tunnel in Korea and GK immersed tunnel and Han-river bed Shield TBM tunnel which is the first in seabed tunnel in Korea, has the technologies to construct a seabed tunnel and lead the new silkroad construction of the 21st century.



Schematic Drawing of Seabed Tunnel



GK Immersed Tunnel (the nation's first immersed tunnel)

Shield TBM Tunnel (the nation's first tunnel under the Hangang (River))

▸Daegu Biogas Production Facility from food wastes (300T/day)

INTELLECTUAL PROPERTY RIGHTS

We Are Writing a New Chapter in the History of Korea's Construction Culture with Our World-Class Advanced Technologies

Armored with unchallengeable expertise in design and construction, we are leading the future of the construction industry thanks to our world-class new technologies, in areas ranging from housing to buildings, bridges, U-cities and green energy.

Authorization of National Certification Institution

Division	Business type & class	Initial license date	Permitted by	Relevant laws
Certification for safety diagnosis	Bridge, tunnel, harbor, constructional repair	Sep. 13, 1995	Seoul Metropolitan & Disaster Management Dept	Art. 9, Special Act on Safety Control for Infrastructure
Certification for quality inspection	Civil engineering	Dec. 30, 1995	Ministry of Land, Transport and Maritime Affairs	Art. 28, Act on Construction Technology Management
International certified testing institution (KOLAS)	Dynamics, acoustics	Sep. 27, 1994	Korean Agency for Technology and Standard	Art. 23, National Standards Act
Certification for maintenance and management of facility	Maintenance and management of facility	Nov. 27, 1995	Jung-gu District Office of Seoul	Framework Act on the Construction Industry

Industrial Property Rights

as of Jan, 2012

Division	Effective	Content
New technology	13	Marine concrete and construction method using organic—inorganic hybrid nano silica and industrial by—products, etc.
Green Certification	2	Daewoo Biowaste total Solution(DBS), etc.
Patent	212	A resizable protector for an existing tunnel enlargement in operation, etc.
Etc.	64	Injection system of oxidizing agent for flue gases, etc.
Total	291	

HISTORY

The History of DICT Defines the History of Korea's Construction Technology

Having witnessed the past, the present and the future of Korea's construction industry, the DICT is still leading the new era, toward a bright future.

1983
- Founded the Construction Technology Institute, the 1st Korean institute in the field

1988
- Published the first issue of Daewoo Construction Technology

1993
- Completed the 1st stage of construction for DICT (R&D building, Central Testing building)
- Awarded the 1st Construction Management Grand Prize (technology development section)
- Moved to newly constructed institute at Suwon; held construction completion ceremony

1994
- Designated as a nationally authorized certification institution (by Korean Agency for Technology and Standards), a 1st for an institute in the construction field
- Organized FAIR 1994 of DECC Technology
- Awarded the 2nd Construction Management Grand Prize (technology development section)

1995
- Designated as an authorized institution for safety diagnosis and analysis
- Designated as an authorized institution for quality inspection
- Designated as an authorized institution for maintenance and management of facility

1996
- Awarded a Bronze Tower, also known as an Order of Industrial Service Merit, in the Contest for Encouraging Energy Saving 1996
- Awarded the 3rd Construction Management Grand Prize (technology development section)
- Completed the 2nd stage of construction for DICT (large-scale structural testing building, wind behavior testing building, facility testing building)

1997
- Awarded the 4th Construction Management Grand Prize (technology development section)
- Awarded the 1st Best Research Environment Prize targeted toward R&D centers and institutes (organized by the Ministry of Science and Technology)

1998
- Additionally designated as a nationally authorized certification institute regarding sections of wind behavior and large-scale structures
- Finally completed DICT (including geotechnical engineering testing building, acoustic testing building)
- Awarded the Energy Winner Prize (green building section) by Hankook Economic Daily Newspaper

1999
- Contracted testing performance regarding MOB project with the US Navy

2000
- Awarded the Presidential Prize as the Best Corporate R&D Institute (construction section) organized by the Ministry of Science and Technology
- Founded DICT Newsletter

2001
- Awarded the Best Technology Prize by Korea Concrete Institute
- Awarded the 5th Environmental Technology Prize by the Ministry of Environment

2003
- Awarded the Silver Prize of 10th Korea's Atomic Technology (organized by Korea Atomic Energy Research Institute)
- Held ceremony to mark the 10th anniversary of being certified for New Technology (KT Mark) by the Ministry of Science and Technology
- Awarded corporate medal of merit by the Prime Minister

2004
- Awarded Medal for Scientific Technology in commemoration of opening 10,000th corporate institute
- Performed the construction work to replace the floor plate of Cheongju Bridge
- Additionally designated as a nationally authorized certification institute regarding sections of sound and vibration

2005
- Made job-collaboration contract with RIST
- Made a technology contract to design LNG tank with Dasan Consultants Co.
- Technology FAIR 2005 organized by Daewoo E&C

2006
- Renamed DICT
- Daewoo E&C awarded the Presidential Medal on 2006 Construction Technology Day

2007
- Awarded the 8th Environmental Technology Prize by the Ministry of Environment
- Awarded the Best Technology Prize by Korea Concrete Institute
- Designated as a holder of 100 best technologies in the renewable energy production technology category (DBS) by the Ministry of Science and Technology

2008
- Awarded the Bronze Prize in Korea Best Technology Contest for DMBR engineering technique
- Awarded the Best Technology Prize by Korea Concrete Institute
- Awarded the 1st and 2nd prizes in the 5th Best Technology Contest by Kumho Asiana
- Made investment contract with Jeollanam-do provincial government to construct bio gas generation plant from livestock excrement
- Entered sisterhood relation with Happy House (a sanatorium for the elderly) for social contribution

2009
- Awarded the Silver Prize in Korea's Best Technology Contest, DBS engineering technique designated as one of Korea's 10 Best Technologies
- Performed the work to replace floor pates of Oryun Bridge in Seoul, a wide-width bridge, 4 times by adopting pre-cast concrete engineering method
- Made technology licensing contract on DBS engineering method with an Italian firm

2010
- Digital Exhibition Hall open
- The first National Green Technology Certificate in construction industry

2011
- The emergency restoration construction of Bucheon overpass bridge in the Seoul Ring Expressway (Deawoo Precast Concrete Deck System)
- Completion of Yongdeungpo pressurized membrane treatment plant

There Will Always Be Greater Challenges for Humankind and Nature/

With more and more apartments, with higher-rising buildings, and with denser and more complex roads, we have to consider the future of humankind. In our research on new technology, DICT considers the needs of the environment and humanity, to bring happy and affluent lives to many in the near and distant future. Our leading-edge technology makes bigger goals imaginable. – **Daewoo Institute of Construction Technology**

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