CSE
Computer Science and Engineering

CE
Civil Engineering

EECE
Electrical, Electronic and Communication Engineering

ME
Mechanical Engineering

NAME
Naval Architecture and Marine Engineering

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

EWCE
Environmental, Water Resources and Coastal Engineering

Centre for Advisory and Testing Services (CATS)

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CATS-MIST

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

CATS-MIST

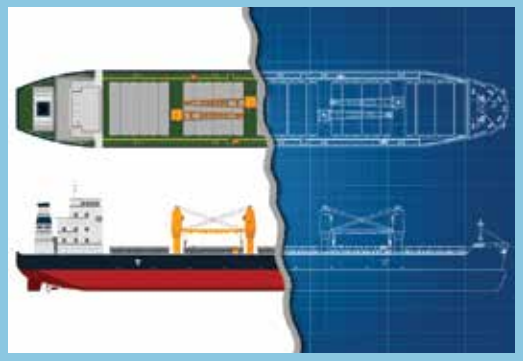
Military Institute of Science & Technology (MIST)
Mirpur Cantonment, Dhaka-1216

CATS-MIST (CE)

CATS-MIST (CSE)

CATS-MIST (EECE)

CATS-MIST (ME)



CATS-MIST (NAME)

CATS-MIST (EWCE)

TECHNOLOGY FOR ADVANCEMENT
CENTRE OF EXCELLENCE

Table of Contents

MESSAGE FROM THE COMMANDANT

Since inception, Centre for Advisory and Testing Services (CATS) has been providing contemporary and real time practical engineering knowledge to the students of both undergraduate and postgraduate level. It facilitates extensive engineering research in MIST on the subjects of both national and international interest. It also provides quality advisory and testing services to different engineering projects.

For the first time, CATS has taken an endeavor to publish it`s activities through the booklet titled CATS-MIST.

Heartfelt appreciation and warmest thanks to CATS-MIST team.

Major General Md Wahid-Uz-Zaman, ndc,aowc,psc,te
Commandant
Military Institute of Science & Technology (MIST)

CATS-MIST

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EDITORIAL

CATS-MIST

CATS-MIST is dedicated for providing testing and consultancy services to various government, semi-government, non-government organizations, private entrepreneurs and industries in the field of engineering and technology related projects. The publication CATS-MIST presents a brief overview of the testing and consultancy services provided to the receiving organizations by CATS-MIST.

The booklet portrays objectives, capabilities and laboratory test facilities available in each CATS to provide testing and consultancy services to the valued clients. Besides this, it presents description of the projects of national interest and other (both completed and ongoing) projects with which CATS-MIST has been involved with.

For this booklet, we would like to express our sincere gratitude to the Chief Patron, Major General Md Wahid-Uz-Zaman, ndc, aowc, psc, te, Commandant, MIST for giving us directives and valuable guidance for it`s preparation. It is solely his inspiration for which this publication could be made possible. I also convey my heartfelt thanks to the editorial advisers, directors of CATS-MIST, coordinating officers and other members who provided me active support in preparing the booklet.

This booklet is a humble beginning of it`s kind related with CATS-MIST. We hope CATS- MIST will continue it`s endeavor in future also.

ABOUT MIST

Military Institute of Science & Technology (MIST) is the pioneer technical institute of Bangladesh Armed Forces. It is purely a government educational institution focusing on engineering education and research. The institute started it`s journey since 19 April 1998. It was the visionary dream of Honourable Prime Minister of the Peoples` Republic of Bangladesh, Sheikh Hasina to establish this institute. The outfit is located on the northwest part of Dhaka City at Mirpur Cantonment which is well known as the Education Village of Bangladesh Armed Forces.

Inauguration of MIST by Prime Minister of the Peoples` Republic of Bangladesh, Sheikh Hasina on 19 April 1998

Academic program of MIST was launched on 31st January 1999 with the maiden batch of 40 military students in Civil Engineering (CE) Department. Later on starting from year 2000 to 2016, twelve more departments of various engineering discipline and one Science & Humanities Department have been established with a view to providing quality engineering education both at graduate and post-graduate levels to the students of Bangladesh Armed Forces personnel as well as civil students of home and abroad.

Thirteen departments (twelve engineering departments and one Science & Humanities Department) of the institution have got the mix of young, energetic, experienced, highly qualified, knowledgeable and dedicated to the profession faculty members along with 110 laboratories (108 laboratories of various engineering discipline, one physics and one chemistry laboratory). These laboratories have expert manpower and are equipped with sophisticated, latest technology based state-of-the-art lab equipment.

Geo-tech Engineering Lab of Civil (CE) Engineering Department

Power System Lab of Electrical, Electronic and Communication Engineering (EECE) Department

Avionics and Ground Electronics Lab of Aeronautical Engineering (AE) Department

Chemistry Lab of Science & Humanities Department

Being a renowned engineering institution, MIST focuses on developing quality technical education and research. To enrich students and faculty members with updated technical knowledge and skill, MIST regularly arranges seminars, conferences, workshops, short courses, industrial tours/visits etc. throughout the academic year.

Seminar on "Growing Cyber Threats around the World and Preparedness for Bangladesh" held on 04 August 2019 at MIST

International Conference on "Electrical Engineering and Information & Communication Technology" held on 13-15 September 2018 at MIST

For expanding research capability and undertaking faculty-students exchange program, MIST has signed Memorandum of Understanding (MoU) with number of organizations and universities both in home and abroad. Industrial training is regularly organized by the departments to get the students familiarized with the current professional practice. This training program is also monitored by the Industrial Advisory Panel which is composed of prominent professionals, academicians, experts and representatives from industry sector of various fields.

Industrial Advisory Panel Meeting held on 17 November 2018 at MIST

MoU Signing Ceremony between Robi Axiata Limited and MIST held on 29 September 2019 at MIST as part of industry- academia collaboration

In the quest of reaching international level of accreditation, MIST has already adopted the Outcome Based Education (OBE) system to comply with the accreditation requirement of the Washington Accord. As it had been included in the OBE system of learning, through their exposure to practice in solving complex engineering problems, it is expected that graduates of MIST will be more relevant to industry and other stakeholders than it had been before. Four Departments of MIST namely, CE, EECE, ME, CSE Departments have already achieved accreditation from Board of Accreditation for Engineering and Technical Education (BAETE) and five Departments namely, CE, EECE, ME, CSE and AE have already applied to BAETE for accreditation as per OBE system requirement. MIST is hopeful that more than one department will get accreditation in the OBE system this year.

Visit of BAETE Evaluation Team for Renewal of Accreditation of BSc in CE Program held on 22-24 September 2019 at MIST

Workshop on " Preparation of a Program for Accreditation Following OBE" held on 29 August 2019 at MIST

As a premier military technological institute, MIST is already on steady stride in upholding its motto **'Technology for Advancement'** and remains committed in contributing to the wider spectrum of national educational arena. With highly professional and motivated faculty members, modern infrastructure and adequate testing and lab facilities, MIST by now has emerged as one of the frontier engineering institutions in the country.

Cabinet Secretary Khandker Anwarul Islam was invited as an honorable Guest Speaker in "Faculty Development Programme" held on 05-09 January 2020 at MIST

Top Notch Writer Anisul Haque is talking to faculty members attending "Faculty Development Programme" held on 05-09 January 2020 at MIST

BACKGROUND AND PURPOSE OF CATS-MIST

Six departments of MIST namely, Civil Engineering (CE), Computer Science and Engineering (CSE), Electrical, Electronic and Communication Engineering (EECE), Mechanical Engineering (ME), Naval Architecture and Marine Engineering (NAME), Environmental, Water and Coastal Engineering (EWCE) Department operate Centre for Advisory and Testing Services (CATS) to provide real-life related practical engineering knowledge to the students of both undergraduate and postgraduate level for attaining OBE system compliance which is one of the prime objectives of the institution. Other objectives of CATS-MIST are: to encourage extensive engineering research in MIST, to undertake elaborate program of research on matters of national interest, to develop close relations with other universities and organizations, to make provisions for advisory, research and consultancy services including supervision, material testing and to enter into suitable agreement with any person, private entrepreneurs and industries, government/ semi-government organization and autonomous bodies.

CATS-MIST is designed to undertake extensive engineering research by the faculties, pertaining to specific technological needs of the institute itself and providing knowledge-based world class testing and consultancy services in the field of engineering and technology related projects.Based on requirements, advisory and consultancy services are also drawn at times from other reputed institutes/organizations like BUET, Institute of Water Modeling (IWM), Department of Public Health Engineering (DPHE), Bangladesh Council of Scientific and Industrial Research (BCSIR) etc. Nonetheless, all faculty members, lab technicians, equipment and facilities of MIST are dedicated towards providing active services throughout the year to it`s valued clients.

Department of Mechanical Engineering acquired and assembled Super-Flow Dynamometer for CATS –MIST (ME) on 24 January 2020

Biomedical Engineering Department of MIST developed Prototype Emergency Ventilator (Ambubag System)

Cadence software is being used in VLSI Lab of
CATS-MIST (EECE) for simulation of Integrated Circuit Design

Quality Control and Validation of locally made
Prototype Ventilator is ongoing at MIST under the guidance and
cooperation of the Ministry of Information Technology

CATS multitudes of activities ensures that infrastructure, lab equipment, testing facilities and services of MIST in general and CATS in particular are better utilized. It provides opportunities for the students and young faculty members of the institute to be updated with the latest trend of technological development of the globe. Competent faculty members find it as an appropriate outfit to enhance their academic and administrative capabilities, and to utilize their professional knowledge and expertise towards the technological advancement of the country as a whole.

Workshop on "Hydraulic System Design and Control"
was held on 14 March 2020 at MIST

Training on Engineering Materials Testing and Laboratory Equipment Handling was held from 28-30 January 2020 at MIST

Commandant, MIST visits Karnafuly Dockyard, accompanied by CATS-MIST (NAME) members on 28th October 2019

Activities of CATS of few departments have already earned reputation at the national level. Details of the activities of CATS-MIST are being presented in the subsequent pages of this booklet. Sizeable number of modern and latest technology based equipment are going be added in the inventory of the laboratories of each department within a few months to make CATS-MIST more vibrant than it had been before. With the active involvement of the CATS operating departments and support from other departments of MIST, the outfit continually strives to meet the demand of the institution, the society and the nation. MIST is working with the goal that each degree awarding department will operate CATS independently in near future. In fact, multitude and multidisciplinary activities of military and civil students of both undergraduate and postgraduate level, professional expertise of dedicated and learned faculty members, modern infrastructure and state-of-the-art testing equipment and lab facilities of MIST are aimed at driving the institution towards a "Centre of Excellence".

GOC 7 Infantry Division visits to the bank protection work of Sheikh Hasina Cantonment on 06 February 2021 accompanied by Director of CATS-MIST (EWCE)

Shear strength of soil is being carried out by Tri- axial Machine at Geo-technical Engineering Lab of CATS-MIST (CE)

Angle of internal friction of cohesion-less soil is being carried out by Direct Shear Machine at Geo-technical Engineering Lab of CATS-MIST (CE)

CE Department holds its glory for being the pioneer department of MIST. The Department started it`s journey in 1999 with 40 military students. It produces top-notch engineers and leaders for the next generation. Presently 26 faculties are serving in the department of whom 07 are PhD qualified. It is now providing the most sophisticated and updated technological support in the field of CE. It`s programs provides students with ample opportunity to put their knowledge into practice by solving real-world problems under the guidance of it`s readily approachable faculty members.

CATS-MIST (CE) started its journey in the year of 2008 with a view to providing material testing and consultancy facilities. Under the direct involvement and supervision of highly qualified professionals, the outfit has successfully conducted a huge number of consultancy works. It plays a very important role in the country`s infrastructural development. Many important construction works and projects of national interests in the field of structural, geotechnical, transportation and environment engineering are carried out with the consultancy services of this outfit.

The associated laboratories are: Concrete Laboratory, Structural Mechanics Laboratory, Solid Mechanics Laboratory, Geotechnical Engineering Laboratory, Transportation Engineering Laboratory, Water Resources Engineering Laboratory, Environmental Engineering Laboratory and Geographic Information System Laboratory. Till today it is continuing the works with the best possible integrity and quality and it`s activities by now, has established a strong reputation among the engineering community of both home and abroad.

CATS-MIST (CE)

Civil Engineering (CE) Department

MAJOR CONSULTANCY PROJECTS CONDUCTED BY CONCRETE LAB OF CATS-MIST (CE):

TABLE 01: Completed National Level Projects

Project Title	Duration
Post-fire damage assessment of 7th, 8th & 9th Floor of FR Tower 32 Kemal Ataturk Avenue, Banani, Dhaka.	July 2020- September, 2020

TABLE 02: Ongoing National Level Projects

Project Title	Duration
Construction of elevated expressway from Lalkhan Bazar to Shah-Amanat Airport in Chattogram Town, Chattogram.	February 2020- Till to date

PROJECT DETAILS

Name of the Project#1

Post-fire damage assessment of 7th, 8th & 9th Floor of FR Tower, 32 Kemal Ataturk Avenue, Banani, Dhaka.

Duration: July 2020 - September 2020.

Description:

On 28th March (Thursday), 2019, a fire broke out on the seventh floor of the 23-storey building of FR Tower, Road No 17, Banani around 1:00 pm and immediately engulfed the 8th & 9th floor of the building. Besides, huge smoke was also created in the process. The height of the fire burnt floors is around 30 m from the road level that makes it very difficult to rescue.The fire was brought under control after 3 hours and 45 minutes in the afternoon of that day (at around 4:45 pm). The 7th, 8th & 9th floor of the high-rise building were badly affected by the fire as many objects intensified the fire, causing huge smoke. Since fire burned the building nearly for four hours, it is expected that the building materials may have deteriorated from the standard conditions

In view to ensure safety and avoid further damage to the building, the authority decided to close the entire building before technical assessment of the building is completed. Under these circumstances, the FR Tower Owner's Society requested CATS-MIST (CE) for detailed structural assessment and analysis to figure out the building`s actual condition after the fire and also to provide remedial measures to bring the building in serviceable conditions. CATS-MIST (CE) formed an expert team for conducting the technical assessment of the building and started the work on 5th July 2020. FR Tower authority has submitted two sets of architectural drawings with two different number of stories- one is with 18-storey and the other with 23-storey including two basements.

The damage state of different structural elements of 7th, 8th & 9th floor of the FR Tower have been determined by using visual inspection, non-destructive test (NDT), and the removal of concrete and testing of reinforcement samples.

There are several non-destructive and laboratory-based tests available to aid in the diagnosis of the Reinforced Concrete (RC) component's condition. The most direct method of estimating the compressive strength of in situ concrete is by testing cores cut from the structure.

Tensile test of the fire-burnt exposed rebar has been done to predict the severity of rebar condition. The Ultrasonic Pulse Velocity (UPV) test has been carried out for the estimation of concrete strength based on the relationship between pulse velocity and compressive strength. Carbonation depth has been found by spraying a freshly broken/drilled surface with phenolphthalein indicator.

Figure 1: Core collection from FR Tower, Banani, Dhaka

Name of the Project #2:

Construction of elevated expressway from Lalkhan Bazar to Shah-Amanat Airport in Chattogram Town, Chattogram.

Duration: February 2020-Till to date.

Description:

Construction of elevated expressway from Lalkhan Bazar to Sha-Amanat Airport in Chattogram town is one of the most important projects of Bangladesh Government.

Role of MIST: Vetting of structural and geotechnical design drawing.

The length of the expressway is 16.5km, with two lanes in either direction. The expressway sits on 450 supports in all and the work is being carried out in three phases.

The route will carry traffic between Lalkhan in the north of the city and Shah Amanat International Airport, helping to reduce the chronic congestion that occurs at peak periods.

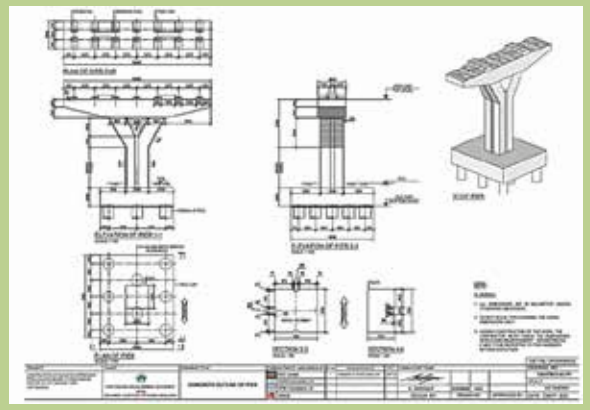


Figure 2: Structural drawing of Chattogram Elevated Expressway

LAB TESTS CARRIED OUT BY CONCRETE LAB OF CATS-MIST (CE)

Ser No	Name of the Laboratory	Test facilities	Test Capabilities
1	Concrete Lab	Bricks	Absorption (ASTM / BS)
2			Crushing strength (ASTM / BS)
3			Size & shape (ASTM / BS)
4			Unit weight (ASTM / BS)
5			Efflorescence
6			Initial rate of absorption/suction for bricks
7	Concrete Lab	Hollow /special brick block	Compressive strength of hollow bricks paving/concrete blocks, etc.
8			Compressive strength of road kerbstone
9			Absorption
10			Unit weight
11			Compressive strength of hollow bricks, paving/concrete blocks, etc. (including unit weight)
12	Concrete Lab	Cement concrete	Concrete cylinders (100 x 200 mm)
13			Concrete cylinders (150 x 300 mm)
14			Cubes (< 200 mm)
15			Cubes (200 mm – 300 mm)
16			Cubes (> 300 mm), each core cutting & testing

17	Concrete Lab	Cement concrete	Concrete spun
18			Concrete beam in flexure
19			Concrete slab in flexure
20			Test on admixture (mineral) for cement/concrete
21	Concrete Lab	Concrete Mix Design	Concrete mix design without admixture (up to 25 MPa)
22			Concrete mix design using admixture (up to 25 MPa)
23			Concrete mix design without admixture (> 25 MPa)
24			Concrete mix design using admixture (> 25 MPa)
25	Concrete Lab	Destructive & NDT Test	In-situ per core cutting & testing (without scanning
26			In-situ per core cutting & testing (with quick scanning)
27			In-situ per core cutting only (without scanning)
28			In-situ per core cutting only (with quick scanning)
29			In-situ hammer test - per spot / location
30			In-situ rebar scanning - per spot / location
31			In-lab block/kerb per core cutting & testing
32			In-lab supplied core testing (per core)
33			In-situ UPV test- per spot / location (min for 3 Tests)
34	Concrete Lab	Cement	Compressive strength of cement mortar 3, 7, 28 days
35			Fineness
36			Setting time (only)
37			Normal consistency (only)
38			Density/Sp Gravity

39	Concrete Lab	Cement	Soundness of cement by autoclave method
40			Soundness of cement by Le-Chatelier's method
41			Cement and mortar shrinkage (sample prepared by client)
42			Cement and mortar shrinkage with sample preparation
43	Concrete Lab	Cement (EN Standard)	Compressive strength 2, 7 & 28 days
44			Setting time
45	Concrete Lab	Tiles	Size & shape
46			Absorption (with flexural needs additional 5 nos.)
47			Flexural/modulus of rupture
48	Concrete Lab	Calibration	Compression/tension testing machine (>1000 kN)
49			Compression/tension testing machine (<1000 kN)
50			Pressure gauge/ dial gauge
51			Hydraulic jack (calibration range up to 300 ton)
52			Hydraulic jack (calibration range up to 1500 ton)
53			Deflection dial
54			Proving ring (<100 KN)
55			Proving ring (100 KN to 500 KN)
56			Proving ring (>500 KN)
57			Weight/balance
58	Concrete Lab	Outside Laboratory / In-situ Calibration	Compression/tension testing machine (>1000 kN)
59			Compression/tension testing machine (<1000 kN)

EQUIPMENT AVAILABLE IN THE CONCRETE LAB OF CATS-MIST (CE)

Name: Vicat apparatus
Brand: ELE, UK
Test Capabilities: To determine the setting time of cement

Name: Mortar mixer machine
Brand: Local brand
Test Capabilities: Mixing the concrete

Name: Los angeles abrasion machine
Brand: ELE, UK
Test Capabilities: To perform abrasion test

Name: Concrete core drilling
Brand: Matest, Italy
Test Capabilities: To cut the core from the concrete structure

Name: Compression machine for mortar
Brand: ELE, UK
Test Capabilities: To determine the compressive strength of cement mortar

Name: Compression machine for concrete
Brand: ELE, UK
Test Capabilities: To determine the compressive strength of concrete

Name: Sieve shaker
Brand: ELE, UK
Test Capabilities: To determine the fineness modulus of sand

Name: Blaine's Apparatus
Brand: ELE, UK
Test Capabilities: To determine the fineness of the cement

Name: Specimen grinding machine
Brand: Cooper Technology, UK
Test Capabilities: To grind concrete cylinders/cubes

Name: Corrosion measurement tester
Brand: ELE, UK
Test Capabilities: Corrosion measurement of reinforcement in concrete

Name: Automatic pull-off tester
Brand: Proceq, Switzerland
Test Capabilities: To determine the pull-out strength of mortar/epoxy

Name: Concrete surface resistivity tester.
Brand: Proceq, Switzerland
Test Capabilities: Non-destructive test of concrete

PICTURES OF TESTS CARRIED OUT BY CONCRETE LAB OF CATS-MIST (CE)

Figure 3: Batching plant calibration for Dhaka Elevated Expressway PPP Project Tranche 2 & 3 at Tejgaon Plant, Dhaka

Figure 4: Post-fire damage assessment of 7th, 8th & 9th floor of FR Tower, Banani, Dhaka

MAJOR CONSULTANCY PROJECTS CONDUCTED BY GEO-TECH ENGINEERING LAB OF CATS-MIST (CE):

TABLE 04: Completed National Level Projects

Ser No	Test Capabilities	Duration	Remarks
1	Consultancy services for the procurement of different sizes cutter suction dredger, ancillary vessel and other accessories along with design of infrastructure for dredger base like office building, ware house, dormitory etc. in 6 (six) areas.	2017-19	CE related portion only
2	Protection, maintenance and construction of Marine Drive Road, Cox's Bazar	2018	
3	Geotechnical assessment of Balukhali-Gundhum road construction project, Cox's Bazar.	March 2016-August 2016	
4	Environmental monitoring and reporting for package no. CP-01 construction of civil works for soil improvement land development and retaining	2018	
5	Economic and social impact assessment of border road	2019	Border road connecting Rangamati-Khagrachari-Bandarban in CHT districts
6	Alikadam & Powamori road project	2019	
7	Ground improvement of soft sub-soil sites along Akhaura-Laksam section between km. 161+000 and km. 166+000 and construction of new double track dual gauge railway embankment.	January 2019-August 2019	
8	Construction of pedestrian underpass near Shaheed Ramizuddim Cantonment School and College	September 2018-December 2019	

Ser No	Test Capabilities	Duration
9	Sub-soil investigation of MRT Depot	2017-18
10	BEPZA-MIST Green Laboratory Testing Services (DEPZ & CEPZ)	April-2016
11	Assessment of foundation, floor load capacity and earthquake resilience of newly constructed 10 (ten) storied factory building of Department of Immigration and Passport at Plot No – 4, Road No. 1, Blk. I, Sector – 16, Uttara, Dhaka.	April 2019-June 2019

TABLE 05: Ongoing National Level Projects

Ser No	Project Title	Duration
1	Construction of elevated expressway from Lalkhan Bazar to Shah-Amanat Airport in Chattagram town, Chattagram.	February 2020-Till to date
2	Plate load test of MRT	November 2020-Till to date

TABLE 06: Completed Other/Army Projects

Ser No	Project Title	Duration
1	Foundation analysis of one 7 storied over existing 5 storied (14 unit) at BGB Headquarters, Peelkhana, Dhaka.	January 2017-May 2017
2	Construction of 3rd & 4th faculty tower (12 story with 14 storied foundation over GL with 2x basement) including ancillary woks for expansion of physical facilities	May 2019-July 2019
3	Proposed multi- storied Officer's Mess, MIST, Mirpur Cantonment.	February 2019-May 2019

Ser No	Project Title	Duration
4	Gabion wall at Ramu Cantonment	2018
5	Hydro-morphological feasibility study of Sheikh Hasina Cantonment	January 2019- Till to date
6	Assessment of Multi-Story Cultural Centre at DOHS, Mirpur	February 2019
7	Feasibility study of Bangabondhu Maritime University	2020
8	Sub-soil investigation of Bangladesh Army International University of Science and Technology.	2019
9	Consultancy service of foundation analysis For 11 storied service building at ICCDR	2019

TABLE 07: Ongoing Other/Army Projects

Test facilities	Duration
Preparation of detail plan, drawings, design, bills of quantity and supervision for repair, replacement and renovation works of existing damaged jetty NB-1 And NB-2 at BN Dockyard, Chattogram.	2017- Till to date

TABLE 08: Lab Tests carried out by Geo-tech Engineering Lab of CATS-MIST (CE)

Ser No	Test facilities	Test Capabilities
1	Plate load test	To determine the bearing capacity of the soil.
2	Design and analysis of shallow and deep foundations	To determine the actual size of foundation.
3	Design and analysis of embankments	To classify the soil and get the shear resistance factors.

Ser No	Test facilities	Test Capabilities
4	Design and analysis of earth retaining structures	To determine factor of safety considering sliding, overturning and bearing capacity of the soil.
5	Planning of soil investigation program	To identify the gradation and classification of soil.
6	Planning and design of soil improvement schemes	To get the gradation and find the density of the soil and proposed appropriate improvement technique.
7	Seismic design of foundation	Seismic vulnerability assessment of foundation under seismic excitation.
8	Seismic hazard analysis	Seismic vulnerability assessment of foundation under seismic excitation.

EQUIPMENT AVAILABLE IN THE GEO-TECH ENGINEERING LAB OF CATS-MIST (CE):

Name: Tri-Axial Machine
Brand: ELE, UK
Test Capabilities: To measure the shear resistance factors of soil.

Name: Consolidation Apparatus
Brand: ELE, UK
Test Capabilities: To measure the pre -consolidated pressure of the soil.

Name: Direct Shear Test Machine
Brand: ELE, UK
Test Capabilities: To measure the frictional angle of the soil.

Name: Unconfined Compression Test Machine
Brand: ELE,UK
Test Capabilities: To measure the Cohesion of the soil.

Name: Permeameter
Brand: ELE, UK
Test Capabilities: To measure the water passing capacity of the soil for the design of embankment.

Name: Horizontal Automated Extruder
Brand: COOPER, USA
Test Capabilities: To be used for the extraction of undisturbed soil.

Name: Auto Soils Consolidator (ASC)
Brand: ELE, UK
Test Capabilities: To measure the pre -consolidated pressure of the soil.

Name: Vertical Permeability Apparatus
Brand: TBT, China
Test Capabilities: To measure the permeability of the geotextiles.

Name: Cone Penetrometer
Brand: ELE, UK
Test Capabilities: To measure the liquid limit of the soil.

Name: Pinhole Apparatus
Brand: Controls, USA
Test Capabilities: To evaluate the erodibility of clay soils by flowing water through a small hole that is drilled through the compacted specimen.

Name: Moisture Conditioning Value Apparatus
Brand: ELE, UK
Test Capabilities: To measure moisture content of the soil.

Name: Lab Vane Shear Apparatus
Brand: ELE, UK
Test Capabilities: To measure the shear strength of soil.

Pictures of Tests carried out by Geo-tech Engineering Lab of CATS-MIST (CE):

Name: Field Moisture Content Tester
Brand: ELE, UK
Test Capabilities: To measure the moisture content of soil at field conditions.

Name: Field Vane Shear Tester
Brand: ELE, UK
Test Capabilities: To measure the shear strength of soil.

Figure 5: Soil investigation of Balikhali- Gundhum construction project, Cox`s Bazar

Figure 6: Mass rapid transit (MRT), plate load test, station 9

Name of the Project #3:

Construction and widening of road from ECB Chattar to Manikdi and Jashimuddin to Uttara 3rd phase project.

Duration: 14 August 2020 -Till to date.

Description: The proposed construction work is intended for the construction and widening of road from ECB Chattar to Manikdi and Jashimuddin to Uttara. The whole project was divided into four road sections. CATS-MIST (CE) is asked to investigate program for sub-soil for the proposed construction and widening of the mentioned road. Field tests were carried out from 14 - 26 August 2020 according to the number and location required by the project on ground by 'Dhaka Soil' under supervision of CATS- MIST (CE). The purpose of the proposed sub-soil investigation program is to provide adequate information on sub-surface and surface conditions for the foundations and other sub-structures for the proposed project, leading to their economical and safe designs.

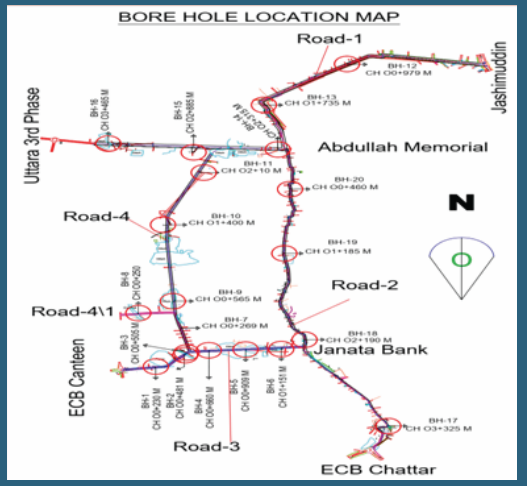


Figure 8: Layout of bore- hole location

Name of the Project #4:

Proposed Bangladesh Army International University of Science and Technology (BAIUST) at Cumilla Cantonment.

Duration: 06 December 2019 - 30 December 2019.

Description: CATS-MIST (CE) is asked for the sub-soil investigation of the Proposed Bangladesh Army International University of Science and Technology (BAIUST) at Cumilla Cantonment. A sub-soil investigation program was carried out by CATS-MIST (CE) at proposed permanent campus of BAIUST, Cumilla. The field investigation program was followed by laboratory tests with a view to providing guidelines for foundation design. The sub-soil investigation carried out through drilling 78 boreholes followed by conducting field Standard Penetration Test (SPT) and required lab tests in accordance with agreed scope of works.

Figure 9: Soil sample collections of BAIUST campus at Cumilla Cantonment

Name of the Project #5:

Plate load tests on locations of exit/entry foundations and generator rooms for different stations, MRT Line 6, CP-03&04.

Duration: November 2020-Till to date.

Description:

CATS-MIST (CE) is asked to investigate the Plate Load Tests on Locations of Exit/Entry Foundations and Generator Rooms for different Stations, MRT Line 6, CP-03&04. Plate load tests of different stations, MRT Line-6 were carried out by CATS-MIST (CE) from November to December 2020, for 07 selected points for each station.

The tests were conducted according to the user's required guidelines and ASTM D1194-94. From the performed test, bearing capacity of soil was determined which can be used in soil investigations and for the design of foundations.

Figure 10: Data collection using Linear Variable Differential Transformer (LVDT) for plate load test of MRT

MAJOR CONSULTANCY PROJECTS CONDUCTED BY TRANSPORTATION ENGINEERING LAB OF CATS-MIST (CE)

TABLE 10: Completed National Level Projects

Ser No	Project Title	Duration
1	Traffic study for the feasibility study of the proposed campus location of Bangabandhu Sheikh Mujibur Rahman Maritime University (BSMRMU).	October 2017-December 2017
2	Report on identifying the location(s) for foot-over-bridge near Jamuna Future Park and Bashundhara no 1 Gate to facilitate the smooth and uninterrupted flow of pedestrians across Progoti Shoroni and along the walkway/ footpath of Dhaka North City Corporation (DNCC), Dhaka.	November 2019-December 2019
3	Traffic survey for "Multi-purpose Complex near Matikata MP Check Post" for Logistics Area	January 2020-February 2020
4	Excavation and development of 100 feet wide khal along both side of Purbachal Link Road (from Kuril to Balu River) project	January 2020-March 2020
5	Traffic management options in-between Balu Bridge -2 and Grade Intersection-3	January 2020-March 2020
6	Feasibility study for construction and widening of road from ECB Chattar to Manikdi and Jashimuddin to Uttara 3rd phase project	January 2020-March 2020

TABLE 11: Ongoing National Level Consultancy Project

Ser No	Project Title	Duration
1	Traffic study for development of Old Buriganga Channel project	14th August 2020-Till to date
2	Alignment of the elevated expressway between Lalkhan Bazar and Shah Amanat Airport of Chottogram.	1st February 2021-Till to date

TABLE 12: Lab Test- based Project

Ser No	Project Title	Duration
1	Dhaka Mass Rapid Transit Development Project, MRT Line-6, CP-06	12th November 2020- Till to date
2	Dhaka Mass Rapid Transit Development Project, Line-6, Contract CP-07. Dhaka, Bangladesh	20th December 2020- Till to date
3	Upgrading and widening of pavement with the provision of BRT lanes and construction of flyovers and BRT stations including access to stations (Ch. 0+000 to 2+600 and 7+100 to 20+200) under greater Dhaka sustainable urban transport project (BRT, Gazipur-Airport). [Contract no. GDSUTP (BRT, Gazipur-Airport) RHD/ICB/PW-01]	25th December 2020- Till to date
4	Cumilla Export Processing Zone, upgradation of existing damaged road from plot no 141 to 165 in Cumilla EPZ, Cumilla	30th August 2020- Till to date
5	Construction of carpeting road to establishing a 99 Composite Brigade for the Padma Multipurpose Bridge Project's safety and security at Janzira, Shariatpur: CA No.	January 2020- March 2020
6	Construction of truck lane at west side & civil works for installing 4 no weigh scale lane and booth at both sides of Bangabandhu Bridge, Bhuapur, Tangail/Sirajgonj.	5th January 2021- Till to date
7	Construction of two-storied (prefabricated steel building) learning centre under UNICEF at Camp 8W, Camp 13, Camp 19 and Camp 20 Extension, Kotupalong, Ukhiya, Cox's Bazar	7th January 2021- Till to date
8	Improvement of roads, drain, footpath & median of F-Block at administrative area of Agargaon, Sher-E-Bangla Nagar,	15th January 2021- Till to date
9	Bangladesh Bridge Authority, approach road of Mukterpur Bridge from Panchabati to Mukterpur Bridge in the district of Narayanganj and Munshiganj	17th January 2021- Till to date
10	Construction of cable bridge at Balu River, Purbachal	20th January 2021- Till to date

Ser No	Project Title	Duration
11	Construction of 1 x school building (2 stories with 5 storied foundations) including ancillary works for Jalalabad Cantonment Board High School at Jalalabad Cantonment	22nd January 2021- Till to date
12	Gandharbpur Water Treatment Plant	25th January 2021- Till to date

Name of the Project #6:

Feasibility study for construction and widening of road from ECB Chattar to Manik-di and Jashimuddin to Uttara 3rd phase project.

Duration: July 2020 - November 2020.

Description:

Dhaka city has been experiencing rapid expansion towards the north. The expansion process has seen Mirpur area's growth and Uttara New Model Town's planned development. The 3rd phase of Uttara New Model Town is now at an advanced stage of implementation.

Under the 3rd phase of Uttara, an elaborate network of the road has already been built. Therefore, to expand transport infrastructure capacity for catering significant growth potential between Mirpur and Uttara, 17 Engineer Construction Battalion (ECB) of Bangladesh Army undertook the initiative to construct a four road project. 17 ECB has requested CATS-MIST (CE) for conducting a feasibility study for the proposed construction and widening of the mentioned road.

CATS-MIST (CE) has done traffic demand model, traffic forecasting, intersections performance evaluation, geotechnical investigation, storm-water and cross drainage design and EIA.

Figure 11: Proposed alignment for the four road project

Figure 12: Transcad Model for four road project

Figure 13: Micro-simulation model for four road project

Name of the Project #7:

Report on identifying the location(s) for foot-over-bridge near Jamuna Future Park and Bashundhara no 1 gate to facilitate the smooth and uninterrupted flow of pedestrians across Progoti Shoroni and along the walkway/ footpath.

Duration: August 2019 - November 2019.

Description:

Crash occurrences and crash related injuries in Dhaka city caused due to collision between pedestrian and vehicle is a growing concern now- a- days. It is hypothesized that if enough road crossing facilities are provided, interference between pedestrian and vehicle would be less and pedestrian risk of involving in crashes may be minimized. For minimizing the risk of pedestrians' accident frequency, alternative road crossing facility will be introduced in Pragati Sharani roadway segment near Jamuna Future Park. This study has been undertaken for selecting the best possible location for constructing a foot-over bridge for pedestrian road crossing. Though already a road-crossing facility existed in the area but it is oversaturated with pedestrians and is not functioning well. In this backdrop, Dhaka North City Corporation (DNCC) has asked CATS- MIST (CE) to carry out a study which includes road geometric survey, classified vehicle count, pedestrian survey, video and photo-graphic survey.

The study of the outfit has identified 08 key locations to under-stand the pedestrian movement around the Jamuna Future Park area. It has found that total 4800 pedestrian/hour cross the Pragati Sharani and 59% of them use the foot over bridge (FOB).

It is also depicted that 43% of the pedestrians around Jamuna Future Park cross the Pragati Sharani Road using the FOB and two illegal Zebra Crossing facilities.

CATS-MIST (CE) has carried out the study and identified four potential spots, having a risk for vehicle-pedestrians collision. The two illegal Zebra Crossing points have high risk of pedestrian-vehicle collision as they are not signalized. For pedestrian demand management and safety, two alternatives have been recommended. Alternative 1 is near the Entry/Exit point of Jamuna Future Park. It can be a possible location for FOB as it will reduce the pedestrians' congestion in the footpath. Alternative 2 is at the south side of existing FOB. Pedestrians coming from the Bashudhara area can use this proposed FOB and will help to reduce the congestion in the existing FOB.

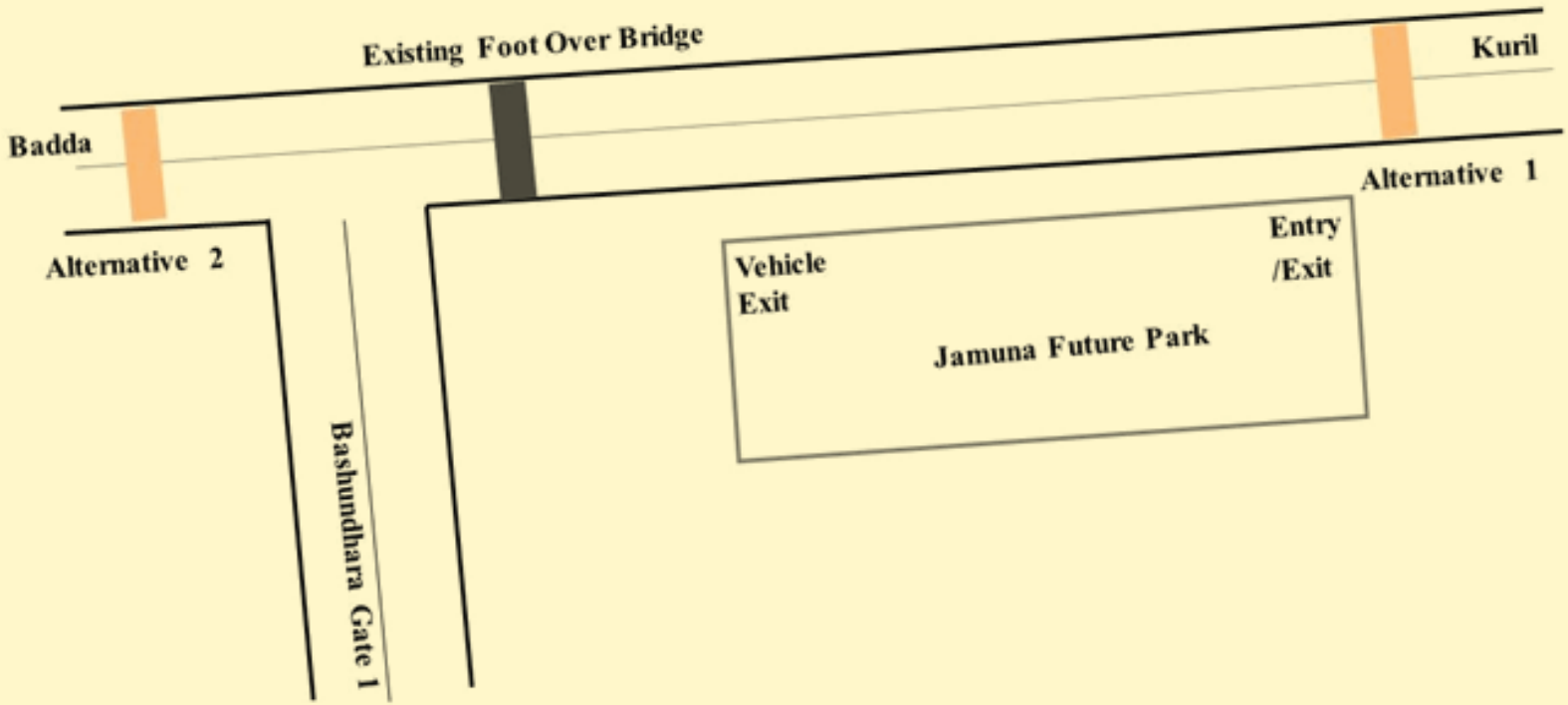


Figure 14: Proposed alternative locations for foot over bridge

Name of the Project #8:

Excavation and development of 100 feet wide khal along both side of Purbachal Link Road (from Kuril to Balu River) project.

Duration: February 2020 – April 2020.

Description:

Forecasted traffic in Purbachal Link Road area submitted by the design consultant, Datex (Data Experts Pvt. Limited), was not based on base year survey. In this backdrop, CATS-MIST (CE) was requested by Managing Director of the project, to review the Purbachal Link Road design report (Kuril flyover to Kanchan Intersection).

Accordingly, the outfit decided to conduct a detailed traffic survey on the Purbachal Link Road and Bashundhara Residential Area connecting roads to get baseline information on vehicular flow.

The study engaged the Highway Development and Maintenance (HDM) Division of RHD to conduct Initial Rate of Return (IRI) and FWD tests on the Purbachal Link Road.

With no further development of road facilities, Purbachal Link Road would be heavily congested. Taking this consideration in view, CATS-MIST (CE) conducted several laboratory tests on the collected cored samples from the road to evaluate pavement layers' physical and mechanical properties.

Several meetings were arranged with the Project Director and the consultant to create a shared understanding regarding the projects.

The study checked the road's geometry and thickness requirements as per the guidelines of Highway Capacity Manual, AASHTO 1993 and RHD geometric and pavement design guides. For VISSIM analysis, this study considered traffic generating from the neighbouring residential areas after 10 years and 15 years of area development.

Although, CATS-MIST (CE) has used the forecasted traffic data by the design consultant for the regular traffic, however, it has forecasted the modal distribution of the Sheikh Hasina International Cricket Stadium bound traffic under few assumptions as narrated in the main report.

It has considered MRT Line-1 as a potential model for the stadium bound traffic and determined its modal share based on an Regional Strategic Transport Planning (RSTP) study.

Figure 15: Collection of core samples

Figure 16: Collection of core samples

The study reviewed the thickness design of the Design Report prepared by DATEX and found that the thickness of the base layer is overdesigned for the expressway. Moreover, a condition survey was not conducted on the recently built existing pavement to assess the possibility of preserving it.

This study reviewed as-built thickness by Debogram - Pragati Connecting Road Project of RAJUK and found it satisfactory for the design Equivalent Single Axle Load (ESAL) for 10 years' performance period of this project.

The study recommends keeping the existing expressway where proposed geometry allows after implementing a 50 mm bituminous overlay. It is less likely that inter-district truck traffic will use the service road. However, since Purbachal, Jolshiri and Bashundhara area will be developed, trucks may use the service roads to carry construction materials and equipment. This study recommends layer thicknesses of service roads as proposed by Datex.

The southern part of the existing service road may be kept as a part of the proposed new service road after implementing necessary strengthening works. However, the northern part of the service road will be covered by the proposed green areas and cannot be used as a service road. The study recommends reusing/recycling of the layer materials of the northern side of the service road. The study proposed to locate bus-bays in the service lane (in the lane adjacent to the median between service road and expressway) for buses exiting/entering on the expressway to/from the service lanes.

Planned Green-space/Bus Bay area (5.5m width) between Expressway and service road may be utilized for grade-separated U-Turn facilities in the future.

While simulating the traffic flow, the study has created three base models by VISSIM for three basic situations: traffic flow at the regular time, traffic flow just before a sports event at the stadium and traffic flow just after the end of the sports event.

The study has identified that queue length is maximum just before a sports event at the stadium. With such findings, the study implemented several management options by VISSIM and explored its capabilities to reduce the queue length. In addition to the VISSIM simulations, the study has considered the critical comments by the stakeholders during the presentation at Headquarters, 24 Engineer Construction Battalion (ECB).

Figure 17: Traffic Micro-simulation in Vissim

MAJOR CONSULTANCY PROJECTS CONDUCTED BY WATER RESOURCES ENGINEERING LAB OF CATS-MIST (CE):

TABLE 13: Completed National Level Projects

Project Title	Duration
Consultancy services for the safety against Padma River bank erosion beside Zazira Cantonment.	September 2020– October 2020

TABLE 14: Ongoing National Level Projects

Ser No	Project Title	Duration
1	Feasibility study of Sheikh Russel Water-based Children's Park.	February 2021– April 2021
2	Vetting of drainage and sewage network design for Jolshiri Abashon.	November 2020– Till to date.

Name of the project #9:

Feasibility study of Sheikh Russel Water-based Children's Park.

Duration: February 2021 – April 2021.

Description:

Sheikh Russel Water-based Children's Park has been proposed to be constructed in Ghatachar, Keraniganj village within the Dhaka city. It has been planned around 16.46-acres of land as a boundary in this proposed project.

The project is included to build amphitheater, community center, office house, watch tower, gymnasium, restaurant, bi-cycle lane, footpath, lane, electrical sub-station, green area including 32.38% water body, lake etc. and all those are initially done as layout in the plan.

The objective of this project is: to create entertainment place for the people of the capital Dhaka city, to control flood and water-logging of the immersed Ghatarchar area by conservation of reservoirs, to control the illegal occupation of Government's land and it's use, and to create a public open space for the common people.

CATS-MIST (CE) was offered to play the role as a consultant to carry out the feasibility study of the Water-based Children's Park.

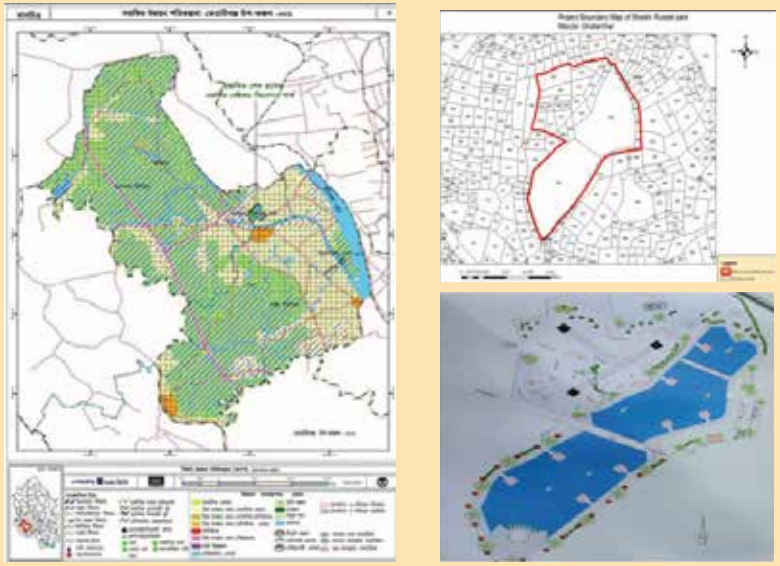


Figure 18: Proposed project area's map

Name of the project #10:

Vetting of drainage and sewage network design for Jolshiri Abashon.

Duration: November 2020-Till to date.

Description:

Jolshiri is a residential area developed by Jolshiri Abashon Corporation, a sister concern of Army Officers Housing Scheme, in Rupganj Upazila, Narayanganj district. It is exclusively built for Bangladesh Army Officers.

CATS-MIST (CE) was offered for vetting the design of the drainage and sewage network of Jolshiri Abashon developed by Shanghai HuaDu Architecture and Urban Design Group (HDD). The aim of consultancy services is to optimize the design done by HDD of both drainage and sewage network developed for the whole Jolshiri Abashon of approximate 13.76 km^2 of land.

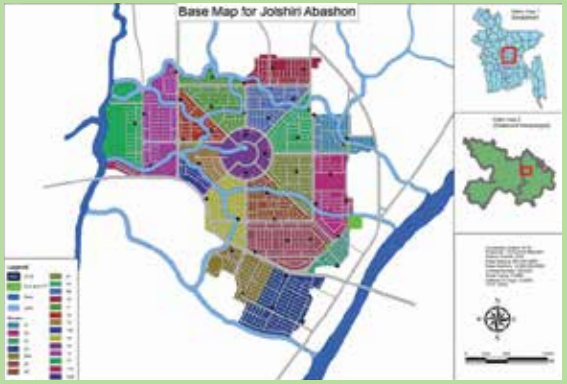


Figure 19: Catchment area of Jolshiri Abashon

Name of the project #11:

Consultancy services for the safety against Padma River bank erosion beside Zazira Cantonment.

Duration: September 2020 – October 2020.

Description:

Zazira Cantonment is located beside the newly constructed Padma Bridge. Frequent river bank erosion was observed beside the Ekuria Cantonment, located near the bridge.

CATS-MIST (CE) was asked to check the reason and identify approximate solution to protect the Cantonment against future erosion scenarios.

Figure 20: Layout of the area of Padma Bridge project

MAJOR CONSULTANCY PROJECTS CONDUCTED BY ENVIRONMENTAL ENGINEERING LABORATORY OF CATS-MIST (CE)

TABLE 14: Completed National Level Projects

Ser No	Project Title	Duration
1	Social and Environmental Impact Assessment (EIA) of border roads (Rangamati-Khagrachari-Bandarban in CHT districts) construction project phase-1.	July 2019-September 2019

Ser No	Project Title	Duration
2	Environmental and Social Impact Assessment (ESIA) of four road project to Manikdi and Jashimuddin to Uttara 3rd phase project.	July 2020– October 2020

TABLE 15: Completed Other Projects

Ser No	Project Title	Duration
1	Establishment of Advanced Climate Change Laboratory at MIST Higher Education Quality Enhancement Project (HEQEP) CP-3143	June 2014– December 2017
2	Training program on environmental monitoring at economic zone areas.	17 – 20 November 2019
3	Training program on environmental monitoring and assessment.	

TABLE 16: Ongoing Other Projects

Project Title	Duration
Green Laboratory Testing Services (GLTS): Bangladesh Export Processing Zones Authority (BEPZA)	April 2016– December 2021

Name of the project #12:

Green Laboratory Testing Services (GLTS) (Ongoing)

Duration: 01 April 2016 – 31 December 2021

Description:

GLTS Project is the outcome of the collaboration of BEPZA and CATS-MIST (CE). The main purpose of GLTS is to generate and report high quality testing data that identifies and defines the physio-chemical and biological characteristics of wastewater, drinking water, ambient air quality and the characteristics of the industrial Effluent Treatment Plant (ETP) sludge in the Export Processing Zones (EPZs).

There are two labs under this project, one is situated in the Dhaka Export Processing Zone (DEPZ, Ganakbari, Savar, Dhaka) and another is in the Chattogram Export Processing Zone (CEPZ, South Halishahar, Chattogram).

Figure 21: Chemical Laboratories of DEPZ and CEPZ

Figure 22: Biological Laboratories of DEPZ and CEPZ

Green Labs of DEPZ and CEPZ collect samples from several industries of surrounding EPZs. DEPZ lab collects samples from Adamjee, Ishwardi, Uttara and Mongla EPZs and CEPZ collects from Karnaphuli and Cumilla EPZs. They perform physio-chemical and biological tests on wastewater (22 parameters) and drinking water (30 parameters) samples and measure ambient air quality (SOx, NOx, CO, SPM, PM10, PM2.5, VOCs, CO_2) and sound level. The outfit provides all the logistic support to the labs to run the project efficiently.

Calibration of laboratory instruments, lab reports generation, verification and authentication, procurement of reagents/chemicals/spare parts etc. are some of the main tasks of CATS-MIST (CE). Team members of the outfit visit these labs every month and sit with EPZ personnel for improvement of the lab and it's performance.

Name of the project #13:

Establishment of Advanced Climate Change Laboratory at MIST under Higher Education Quality Enhancement Project (HEQEP) (CP-3143).

Duration: June 2014 – September 2017.

Description:

This project is the collaboration between University Grants Commission (UGC) of Bangladesh and CATS-MIST (CE).

Climate Change Lab at MIST was established with a competitive research grant of HEQEP, UGC and World Bank. Numerous researchers worked on different research domain including: evaluating ecosystem effects, developing strategies for mitigation and adaptation, assessment of water and food security, salinity intrusion in coastal regions, hydrodynamic model for Bay of Bengal, water quality assessment, and assessing climate variability and change. Under this project, several field visit have been carried out in the coastal region of Bangladesh to collect water and soil samples, to investigate local people's perception through questionnaire survey and focus group discussions etc. Following are some illustrations of field visit.

Figure 23: Conducting Questionnaire Surveys

Figure 24: Conducting Focus Group Discussions

Figure 25: Testing Water Quality Parameters

LAB TESTS CARRIED OUT BY ENVIRONMENTAL ENGINEERING LABORATORY OF CATS-MIST (CE)

Regular wastewater, drinking water, and sound parameters are investigated in collaboration with CATS- MIST (EWCE).

TABLE 17: Equipment available in the Environmental Engineering Laboratory of CATS-MIST (CE):

Name: Portable Biogas Analyzer
Brand: GrayWolf, UK
Test Capabilities: Measures concentration of different gas including Methane

Name: Advance Environmental Instruments
Brand: GrayWolf, Ireland
Test Capabilities: PM_{10}, $PM_{2.5}$ and other air quality parameters

Name: Air Particle Monitoring Equipment
Brand: CEL 712 Micro Dust Pro, UK
Test Capabilities: PM_{10}, $PM_{2.5}$ and other air quality parameters

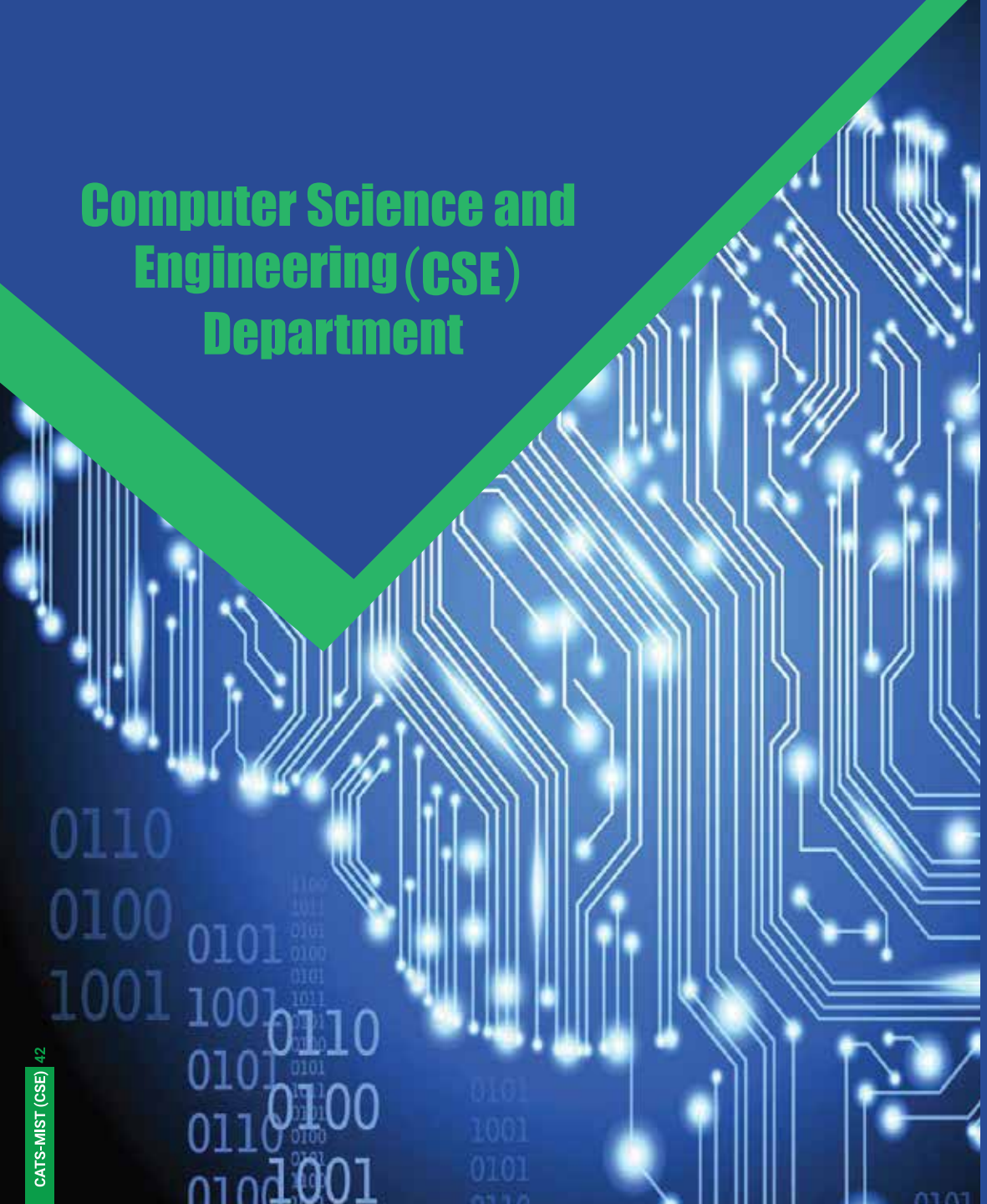
Name: Digital Anemometer
Brand: PEAK METER, China
Test Capabilities: Wind Speed and Air Volume

Name: Air Visual Pro
Brand: IQAir, China
Test Capabilities: PM_{10}, $PM_{2.5}$ and other air quality parameters

TABLE 18: Software available in the Environmental Engineering Laboratory of CATS-MIST (CE):

Ser No	Name of the Software	Use	Remarks
1	Visual MODFLOW Flex	Groundwater flow and Contaminant Transport Model	Groundwater, salinity, and contaminant assessment
2	AIRMODVIEW	Air Dispersion Model	Industrial air emission assessment

Computer Science and Engineering (CSE) Department



CATS-MIST (CSE)

Computer Science and Engineering (CSE) Department started session in 2000-2001 as Computer Science and Information Technology (CSIT) under the Faculty of Electrical & Computer Engineering.

From a modest beginning, offering undergraduate BSc program to only military students, the department has now evolved as one of the largest departments of MIST with both military and civilian students. The department of CSE now offers BSc program at the undergraduate level, MSc and MEngg at the postgraduate level, as well as PhD degree.

The first batch of BSc graduates was awarded their degree in the year 2004. Since then, a total of over 981 students have graduated and the alumni are contributing immensely to the various industries, academia and Armed Forces of Bangladesh.

The department got accreditation from BAETE since September 2013.

Department of CSE boasts of having highly qualified faculties, along with state-of-the-art learning infrastructure which provides an ideal platform for students to the perfection of their skills in the field of computer sciences. The faculties are drawn in from diverse nationalities, diverse prior professional exposure (military, industry and academia), diverse educational qualification and background, thus provide large areas of expertise for students to benefit. The department provides an ideal environment for the students to specialize in contemporary fields of computer science namely, artificial intelligence, robotics, machine learning, data analytics, network and data security etc. It also collaborates with both the industry and government organizations and agencies thereby establishing a symbiotic leadership for both stake holders which are especially beneficial for the students.

Department of CSE provides a conducive learning environment for the students in the form of state-of-the-art classrooms and well-equipped laboratories. While the classrooms provide an opportunity to learn the technical aspect on the subject, the laboratories provide opportunity for the students to have an “hands on" experience on technology and thus innovate. The airconditioned classrooms with broadband Wi-Fi, projection system, smart board, document readers are an ideal place for collaborative learning.

Students attending class on Artificial Intelligence

Students attending practical class on Microprocessor

Labs and Testing Facilities Available in CSE Department

In addition to the existing 08 laboratories, Artificial Intelligence (AI) Lab, Postgraduate Research Lab, Network Lab, and a Cyber-gym are being funded by the Department of ICT, Bangladesh.

Artificial Intelligence and Robotics Lab

- AI based system development, testing, and quality assurance
- Robot functionality and performance test

Postgraduate Research Lab

- Research and development
- System design, development, and testing
- Training on research and development

Microprocessor & Microcontroller Lab

- Project development
- Enhance knowledge on the latest trends and technologies
- Training on microprocessor & microcontroller architecture, programming, and interfacing

Digital Lab

- Cool mine security & safety using IoT
- Weapon zending system and warriors range efficiency analysis
- Automated hydroponics system
- Automated fishery management
- Automated system for agriculture

The Cyber-gym will provide an ideal platform for students to specialize in the field of cyber-attack and cyber defense. As the labs are well equipped with modern instruments and facilities, the department contributes not only in better practical education to the students but also in providing technical assistance and advice. Testing, evaluation, and consultancy to a real-life problem and practical situation aid faculty members and laboratory technicians to increase their professional knowledge and skills.

Highly motivated faculties and state-of-the-art laboratories provide an ideal environment for the students to carry out their research, undertake projects, and publish their results in international/national journals and conferences.

The faculties of the department lead these research works and mentor the students so that the students acquire the necessary skill sets. Among various software projects developed in the CSE Department laboratories, BARTA is one of the most prominent mobile applications for end-to-end encryption messaging service. Recent research works of our faculties and students have resulted in 12 journal/book chapter publications and over 80 conference papers, having a global footprint in countries like USA, UK, Japan, India, South Korea, Malaysia, and Spain etc. are some of the few.

The department also collaborates actively with the industry to carry out research work on areas of mutual interest. Very recently a MoU for collaborative projects in the field of Machine Learning, Artificial Intelligence and Data Analytics have been signed between Department of CSE and “Robi Axiata Ltd”.

Other Labs and Testing Facilities Available in CSE Department

Software Engineering Lab

- Training on software design and development
- Software testing
- Software Quality Assurance (SQA)

Network Lab

- Computer networking-based project development
- Enhance knowledge on the latest trends and technologies of networking
- CISCO certified network associate courses

Multimedia & Graphics LAB

- Training on computer graphics design and implementation
- Computer graphics design and testing
- Mathematical analysis and application
- Programming and problem solving

Mobile Application Development LAB

- Training on mobile application design and development
- Application testing
- Mobile application-based research

Our students excel in various contests and have certainly made their mark on both national and international arena with over 16 prizes (in 2019 alone) and have over the years participated in the Mars Rover Challenge in the USA, the European Rover Challenge, UVC-PURGE UK Robotics Challenge, International Collegiate Programming Contest (ICPC), National Collegiate Programming Contest (NCPC), Inter University Programming Contests (IUPC), Hackathons and so on.The department, through its Computer Club, grooms the students with weekly classes. The department also proudly hosted the first MIST IUPC in February 2019 with an overwhelming response of 120 teams from 55 universities nationwide. With the success of IUPC, MIST also got the honor of hosting the NCPC 2020 in 22nd February 2020.

In the professional arenas, students of CSE Department have footprints in some of the renowned international industries like International Business Machines (IBM) Corporation, Cisco Systems, Inc. (CISCO), Oracle, Microsoft, etc. in addition to some of the leading companies in Bangladesh like Grameenphone, Robi, Banglalink, Bangladesh Bank, Bangladesh Power Development Board (BPDB), Bangladesh Telecommunication Regulatory Commission (BTRC), Enosis Solutions, etc. Our students have also distinguished themselves as faculties in both national and international universities of repute.CSE Department has a separate alumni association of its own, in addition to MIST Alumni Association (MISTAS).

Events and Projects of CSE Department

Team MIST 'UVC-PURGE' wins championship in Medical Robotics Challenge for Contagious Disease 2020

First-ever in Bangladesh, students of MIST have developed a semi-autonomous UVC disinfection robot named 'UVC-PURGE' to fight against Covid-19 pandemic.

Team MIST participated in the Medical Robotics Challenge for Contagious Disease 2020 organized by UK Robotics & Autonomous Systems (UK-RAS) Network. Six prizes were awarded in application, design, and innovation category. Among all the finalists, Team MIST raised the Flag of Bangladesh securing the Championship in application category.

The other two champion teams are: John's Hopkins University (USA) in Innovation, and Leeds University (UK) in design category. As a sign of recognition, Team MIST 'UVC-PURGE' received £5,000 GBP as a prize-money and grant for their research.

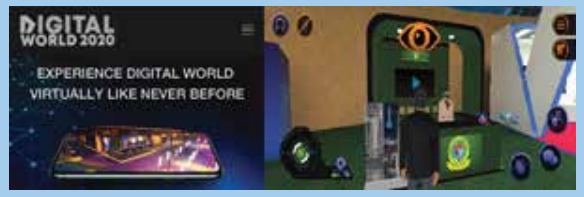
The judging panel was from John's Hopkins University (USA), Imperial College London (UK), Intuitive Surgical (USA) and KUKA Deutschland GmbH (Germany).

MONGOL BAROTA - a fully functional, stand-alone mobile platform rover, participated in URC 2014, USA

Mongol Barota - a fully functional, stand-alone mobile platform rover which is capable to act as a human assistant to perform various scientific tasks in extreme adversities.

The control system of the rover is designed in such a way that it can be commanded from a blind station within 1 kilometer range. It has successfully taken part in 8th annual University Rover Challenge (URC) organized by the Mars Society at the Mars Desert Research Station (MDRS) in the remote, barren desert of southern Utah, USA in late May 2014.

It has been traced out as the first entrance in this competition from Bangladesh and occupied 12th position out of 31 registered teams from 06 countries of 04 continents.



MIST participated in Digital World 2020 (DW 2020): The first ever virtual project exhibition in Bangladesh

"Digital World" is a brand event of the Government of Bangladesh and is organized in Public-Private Partnership (PPP). It is one of the largest ICT expositions and knowledge sharing platforms in South Asia.

It provides a platform for sharing the best practices in ICT adoption, achievements and experiences, networking among IT & ITES industry leaders, experts, policy makers, government officials, entrepreneurs, and academicians.

In addition, Digital World helps to flaunt many potentials of digital technologies as policy makers, national and international organizations, academic institutions, start-ups, IT entrepreneurs and young people participate in this event. The event facilitates communication and cooperation between foreign and local investors, venture capitals, icons from the IT world and futurists.

MIST being a premium educational institution of Bangladesh has proudly participated in Digital World 2020 through the exclusive installment of virtual stall along with the biggest franchisees of Bangladesh. Amidst the pandemic challenge in 2020, through the visionary and kind guidelines of Commandant, MIST the department continued to thrive for excellence through multiple research projects.

The virtual stall of MIST has demonstrated UVC-PURGE, a semi-autonomous virus disinfection robot for the safe destruction of Covid-19 virus and Thermique, a temperature monitoring system for the mass crowd using thermal imaging. This is a unique milestone towards promoting innovativeness and technological advancement in this critical time of pandemic.

DW2020 app is available in Play-store/App-store and can be installed to gain the unique experience of visiting virtual project exhibition.

Department of CSE hosted NCPC 2020

NCPC-2020, the biggest and most prestigious national level programming contest in Bangladesh, was hosted by Computer Club of MIST under the auspices of CSE Department on 20-22nd February 2020.

The participants were over 150 teams from 78 universities and institutes nationwide.

Honorable State Minister, Ministry of Posts, Telecommunications and Information Technology, Bangladesh, Zunaid Ahmed Palak, MP was present as the chief guest in this prestigious event.

“Muktomon”, Virtual Therapy and Mental Health App

A mobile application that offers mental health resources and online/virtual therapy for users.

The app was targeted towards the mental health issues that may arise from this pandemic.

“BARTA” a Cross-Platform End-to-End Encryption Messaging Service

BARTA is a cross-platform (Android and iOS) end-to-end encryption messaging service developed by MIST. BARTA uses corporate mobile numbers as unique identifier and secures all communication amongst BARTA users with end-to-end encryption. Nothing is stored or recorded in BARTA server and the server acts as a network facilitator only. BARTA is not hosted in 'Play/Apple Store', thus does not sync message to a cloud, keeping everything on user devices. Only authorized and registered users are allowed to install the app.

It restricts fetching/sharing contact list from GSM, WhatsApp, Viber etc. Users are restricted to copy, forward, or share from BARTA to other apps. However, message from other apps can be shared/forwarded to BARTA. Message ‘Forwarding/Sharing’ is allowed amongst BARTA users only. BARTA has a distinctive feature “Self-destructive Chat” which allows users to set a self-destructive timer for every message in conversation at set time.

BARTA also restricts recoding of conversation and capturing screen shot of Chat Window. All data/photos/media are stored in a ‘Protected Vault’ / ‘Sandbox’ on user mobile with proper encryption.

Electrical Electronic and Communication Engineering (EECE) Department of MIST started functioning in 2003 under the faculty of Electrical and Computer Engineering. 858 students have already completed graduation and currently 287 students are receiving education in the undergraduate level. Post graduate program under this department started functioning since October 2013. 23 students have already earned Msc/ MEngg degree and presently 88 and 08 students are pursuing for Msc/ MEngg and PhD degree respectively in this department. The department got accreditation from BAETE since September 2010.

EECE Department has 38 faculty members of which 05 are PhD qualified.

All the faculty members are competent having diverse experiences in three fields of areas: Power, Electronics and Communication. Major areas of specialties of EECE Department faculties are: power system analysis, renewable energy, Distribution Side Management (DSM), smart grid, energy market and smart energy management system in the power field, VLSI technology, advanced semiconductor device modeling and thin film technology, photo voltaic cells and materials in the electronics field, satellite navigation, space engineering, radar detection and tracking, optical fiber communication, free space optical communication and wired and wireless communication in the communication field.

Electrical, Electronic and Communication Engineering (EECE) Department

The department has 09 well established laboratories and 14 laboratories with advance technology are going to be established soon. The existing labs are: Electrical Circuit Lab, High Voltage Lab, Power System and Switchgear Protection Lab, Digital Signal Processing Lab, Electrical Machine Lab, Electronics and Digital Electronics Lab, VLSI Lab, Analog and Digital Communication Lab, Satellite Communication & Microwave Engineering Lab.

These laboratories have well experienced laboratory technicians and are equipped with modern gadgets and test facilities which contribute in providing real-life and goal oriented education to the students to achieve Course Outcome (CO), Program Outcome (PO) etc. as per requirement of the OBE learning system of the Washington Accord.

The inclusion of the new labs will provide wider opportunities in carrying out extensive research by the students of postgraduate level and academia in meeting goal oriented specific requirement of various organizations, industry sector etc. of the country.

CATS-MIST (EECE) was established in 2017 by EECE Department with a view to providing consultancy, advisory and testing services to public and privateorganizations including personal in the areas of electrical, electronic and communication engineering and to conduct collaboration and research activities with national and international academia and industry. With the availability of expert manpower, infrastructure and lab facilities, the outfit is capable to provide consultancy service related to vetting/ evaluation of technical specification, carry out field test, inspection/survey and vetting of design, drawings, test reports etc. in respect of electrical, electronic, and communication equipment as per the national and global standards.

CURRENT TESTING FACILITIES

CATS-MIST (EECE) has built up the expertise to cater for most of the services required by the power sector covering generation, transmission, and distribution with a competitive and qualitative attitude. Some of the important test facilities of the outfit are tabulated below:

Ser No	Name of the Test	Ser No	Name of the Test
1	Power transformer test	11	Hot stick test
2	Distribution transformer test	12	All types of overhead line insulator test
3	Transformer oil test	13	Single phase motor, three phase motor test
4	HT, LT power, and all type of cables test	14	Ceiling fan test
5	MCCB, VCB, ACB and MCB test	15	CFL bulb test
6	HT, LT switchgear panel test	16	LED bulb test
7	PFI panel test	17	Battery charging/ discharging test
8	AVR panel test	18	All types of electrical accessories test
9	Drop out fuse test	19	Generator test
10	Lightning arrester test	20	Solar panel test

COMPLETED ROUTINE WORKS

So far CATS-MIST (EECE) has carried out various transformer tests of capacity ranging from 50 KVA to 5 MVA, 11/0.415 KV transformer. The performed tests are: high voltage withstand test, no load loss and full load loss test, insulation and winding resistance test, vector group test , insulation resistance test, DC resistance test, high voltage withstand test, temperature rise test, copper purity test and cable test of both domestic and power cables. Other tests include: Solar pump controller performance test, domestic electrical appliance test, performance test of switches, sockets, MCBs, MCCBs, VCBs, ACBs, LT/HT panel test, PFI test, generator /motor performance test and performance test for measuring instruments.

It`s important client are: BRB Cable Industries Ltd, Poly Cable Industries Ltd , Super-Sign Cable Ltd, Bizli Cable Industries, BBS Cables Ltd, Evana Cable Industries, Revere Power Ltd, System Engineering Ltd, Rahim Afroz, Hamco Batteries Industries Ltd, Super Star Renewable Company, Satco Electrical Industries Ltd, Renewable Energy Company, Government Organizations namely Rural Electrification Board (REB), Public Works Department (PWD), Department of Public Health Engineering (DPHE), Military Engineering Services (MES) of Armed Forces etc.

Completed Consultancy Services

Currently the outfit has provided consultancy services to 24 Engineer Construction Battalion (ECB) of Dhaka Cantonment in laying high voltage underground cable from DESCO Ring Main Unit (RMU) to 11 KV sub-station at Mirpur Cantonment. It carried out detailed study of user requirement and then prepared technical specification of cable, the layout plan, cable trenches, Single Line Diagram (SLD), specification of HT switchgear panel and location plan etc. Team of the outfit visited BRB Cable Industries Ltd Factory at Kustia on 22 December 2020 and 28 January 2021 to inspect partial discharge, high voltage withstand, insulation, DC resistance etc. of 11KV 300 & 500 RM cable.

CATS- MIST (EECE) team`s visit to BRB Cable Industries Ltd Factory at Kustia, to inspect partial discharge, high voltage withstand, insulation, DC resistance etc. of 11KV 300 & 500 RM cable

CATS- MIST (EECE) team`s factory visit in Basic Power Engg Ltd at Tongi, to inspect and test LT /HT Panel and Load Break Switch (LBS) of 11 /0.415 KV Sub-station of Mirpur Cantonment

Equipment Available in the Lab of CATS-MIST (EECE)

Relay test set, Ponovo, China.

Used for measuring relay trip time.

High voltage testing equipment, India.

Used for partial discharge test for transformer, cable, lightning arrestor, insulator etc.

Voltage- up transformer.

Used for full load loss of power transformer, distribution transformer etc.

CT/PT test with variac & current injector.

Used for ratio, insulation, polarity test of CT/PT, loading test of MCB, MCCB, VCB, ACB, power cable etc.

EXPANSION OF RESEARCH AND TESTING CAPABILITY

Presently the outfit is performing it`s role with limited capability. European origin high quality, precise and accurate high voltage testing equipment are going be added in the inventory of the High Voltage System Lab of the outfit within a few months. Following are some of the equipment:

Name: High Voltage Impulse Generator

Brand: HIGHVOLT, Germany

Major Test Capabilities:
Impulse test for applied voltage, 75KV, 170KV, 232KV, 300KV etc. Can perform power lightning withstand test of distribution transformer 11/0.415 KV upto 5 MVA, power transformer 33/11KV upto 50 MVA, cable, lightning arrestor etc.

Name: High Voltage Test Set

Brand: Megger, Germany

Major Test Capabilities:
Can perform power frequency withstand test and also measure breakdown voltage, puncture voltage etc. upto 200 KV.

Name: Insulation Test Set

Brand: Megger, UK

Major Test Capabilities:
Can measure insulation resistance upto 10 KV. The equipment is capable to perform timed insulation resistance, Polarization Index (PI), Stepped Voltage (SV), Dielectric Absorption Resistance (DAR) test, Dielectric Discharge (DD) test etc.

Name: Portable Oil Test Set

Brand: Megger, UK

Major Test Capabilities:
Can measure breakdown voltage of transformer oil upto 100 KV.

Name: Loss Measurement Test Bench (for Distribution Transformer & Power Transformer)

Brand: Yakogawa, Japan

Major Test Capabilities: Used for measuring load loss, no-load loss, harmonic test, over induced tests etc. The test system is capable of performing the tests on distribution transformer 11/0.415KV, 5MVA, power transformer 33/11KV, 50MVA and auxiliary transformer.

Name: Megger Portable Power Quality Analyzer

Brand: Megger, UK

Major Test Capabilities: The equipment is capable of measuring- Power parameters (KW, KVAR, KVA, DPF, TPF), energy parameters (KWH, KVARH, KVAH), voltage sags/dips and swells, current sags/dips and swells, transient down to 1 m sec, power harmonics, phase angle deviation etc.

Name: Induced over voltage test set

Brand: NTPL, India

Major Test Capabilities: Test of withstand capability of double voltage, double /triple/quadruple frequency of power transformer & distribution transformer with a duration of 60 seconds.

Name: Electrostatic Voltmeter (for KV measurement)

Brand: Phenix, USA

Major Test Capabilities: Can measure voltage upto 40 KV.

Name: Digital Clamp on Power Meter

Brand: Yakogawa, Japan

Major Test Capabilities: Can measure voltage upto 600V and current upto 1000 A.

Name: Earth Leakage Clamp Meter

Brand: Megger, UK

Major Test Capabilities: The equipment is capable of measuring leakage current during high voltage application up to 300A.

Along with these equipment the outfit will have other equipment and will be able to carry out all tests of power transformer 33/11KV upto 50 MVA and distribution transformer, 11/0.415 KV upto 5 MVA. With the inclusion of these high-voltage testing equipment it is expected that CATS-MIST (EECE) will achieve the capability to deliver better consultancy and testing services to our valued clients than it had been providing before.

Mechanical Engineering (ME) Department

CATS-MIST (ME)

ME Department of MIST started its journey in January 2003 with 45 students in undergraduate program and till January 2019, 711 students have graduated as mechanical engineers from this department. In the postgraduate category the Department offers MSc, MEng, M.Phil and PhD program in mechanical engineering. Currently, 263 students are enrolled in BSc program while 67 students are pursuing post-graduation. This department aims to provide high-quality mechanical engineering education and contribute new knowledge through research in mechanical engineering and allied disciplines. BSc in mechanical engineering (BSc ME) degree program of MIST was accredited by BAETE, back in March 2010 with a grade as 'Good' because of its excellent professional views and capabilities of teaching. It was accredited again in April 2018 and scored the same grading.

CATS-MIST (ME) started its journey in the year of 2015 with the aim for excellence in testing services and with a view to facilitating policy making regarding engineering standards in the national and international level. The associated laboratories of the outfit are Automobile Laboratory, Solid Mechanics Laboratory, Materials Laboratory and Pump Test Bench. Under the direct involvement and supervision of highly qualified professionals, it has successfully conducted quite a good number of consultancy and testing works. This established a strong reputation and till today it is continuing the works with the best possible integrity and quality.

In its journey from beginning, CATS- MIST (ME) has carried out a lot of tests among which performance and parameter tests of Two-Wheeled and Four-Wheeled Vehicles, Hydraulic Pumps, Material Properties, Engine Performance etc. are the most important ones.

The range of tests include Automobile Engineering Testing: CNG Auto- Rickshaw Test and Type Approval of all types of Vehicles, Fluid Mechanics Testing: Pump and Pipe Test, Material Test: Determination of Yield Strength, Ultimate strength, Composition, Hardness etc.

The outfit started with three- wheeler CNG testing and now extended its range to test four wheelers too. Pump Test Bench of CATS-MIST (ME) is capable of testing the deepest submersible pumps presently available in the country. It carries out tests for different types of pumps from WASA and many other private organizations.

Material testing machine of CATS-MIST (ME) can detect the exact amount of element present in a certain part of a product. With the help of heat treatment furnace, it can also test the phase of iron present in the part. In recent times it has carried out hardness and fatigue test of different motorcycle parts and also hardness test of different materials.

Vehicle Testing

CATS-MIST (ME) started vehicle testing of Bangladesh Road Transport Authority (BRTA) from 23rd December 2018 with three-wheeler CNG testing. The outfit has now expanded its range to test four wheelers as well.

Testing of vehicles involves emission test, fuel efficiency test, brake test, acceleration test, engine performance test, material test etc.

Brake-power Testing

Brake-power testing encompasses practically every aspect of a vehicle's drive train: transmissions, transaxles, transfer cases, rear axles, U-joints, half-shafts, and complete driveline systems. A unique test exposes propeller shafts to hot, cold, salt/sand slurry, torque and speed while monitoring the bearing temperatures with infrared cameras.

Accessory drive components can be exposed to high rpms, salt, hot, cold with simultaneous performance testing. Following are few of the equipment which are used for this test in the Automobile Laboratory of CATS-MIST (ME).

Figure 1: Superflow dynamometer for testing automobile engines

Figure 2: Dynamometer control unit

Emission Testing

Emission tests on highly dynamic engine test benches are a major stage in the development of innovative catalyst systems. By simulating actual road conditions these tests can often replace tests on the roller dynamometer. Their advantage lies in a highly reproducible and largely automated test procedure, which comes very close to the target of zero failure.

For the purpose of emission test, Exhaust Gas Analyzer (Model MDO-2 LON) is used for diesel engines and Exhaust Gas Analyzer (Model MGT-5) is used for petrol engines. In this particular test exhaust from vehicles are taken and the percentage of Carbon Monoxide, Carbon Dioxide and Hydro-Carbons are determined.

Figure 3: Test carried out in exhaust gas analyzer

Vibration Testing

Driving creates constant vibrations on the vehicle's frame and components. As vibrations occur in all forms of transportation, safety and longevity of parts both rely on being able to withstand constant and erratic movements. To see how much a component can withstand such vibrations, the component must undergo vibration testing.

Vibration testing in our CATS helps in improvement of component design by identifying weak points when the part gets subjected to random vibrations until failure. The subject vibration testing puts the car through extremes to ensure durability of the equipment under test.

During vibration testing, ambient movements in the building itself where the machine has been installed, can affect the results but our facility take cares for movement in a controlled environment by using high-mass bases and air-bearing pads. These devices and procedure of test ensure accuracy of the result of our test.

Brake Performance Test

A common test for evaluating the performance of braking systems is the trigger activated test to standstill. A pressure switch is added either to the face of the brake pedal, or into the hydraulic system, to detect when the brake pedal has been pressed. This signals the start of the test and it ends when the vehicle comes to a complete stop.

The distance between these two points is then calculated to measure braking performance. As this test starts when the pedal is pressed, it measures both the response of the braking system, as well as the performance of the tyre, brake pads, discs and other components.

Another popular assessment of performance is the brake test between two different speeds.These speeds are usually chosen in order to eliminate the response time of the braking system, which is usually during the more linear part of the deceleration period. These tests are useful for analysing the performance of tyres due to the consistency of braking distances recorded.

Following are few of the equipment which are used for this test in the Automobile Laboratory of CATS-MIST (ME):

Figure 4: Four post hydraulic car lift

Figure 5: Wheel balancing machine

Figure 6: Chassis dynamometer

Figure 7: Four post lift (computerized part)

Auto-Rickshaw Testing

CATS-MIST (ME) carries out Auto-Rickshaw testing of BRTA. The objective of this test is to check: Complete overhauling of the engine, changing the hood cover and seat of the auto-rickshaw including repainting of the whole body of the auto-rickshaw, repairing the body, suspension, brake, transmission etc. hydraulic pressure test of the cylinder and checking the fuel system and other parts of the engine as per the requirement of BRTA.

Pump Test Bench

CATS-MIST (ME) started pump testing of Public Health Engineering Department (PHED) from 4th September 2019. Pump Test Bench of the outlet is able to assess the deepest submersible pumps currently available in the country. Different organizations like WASA and PHED send their pump for testing purpose.
During pump test the parameters checked are: head, rated speed, rated power, power factor, rated current, operating voltage, cable size and standard efficiency etc.

Following are few of the equipment which are used for this test in the Pump Test Bench of CATS-MIST (ME):

Figure 8: Pump test bench

Material Testing

The following tests are carried out in CATS-MIST (ME):

Ser No	Name of the Test	Purpose
1	Determination of micro-structure of steel and cast-iron and their composition.	To determine the composition of metals and to check their microstructure under microscope. The purpose of this test is to determine any defects or cracks in metal after welding.
2	Ultrasonic crack tester	The main objective of this test is to find out surface cracks and thickness of cylinders, pipes etc.
3	Determination of the amount of galvanized zinc coatings and uniformity of coatings on iron and steel articles	The purpose of this test is to determine if the amount of galvanized zinc coating present in steel and iron is correct according to the standard BS 729 : 1971.

Fatigue Testing

The purpose of a fatigue test is to determine the lifespan that may be expected from a material subjected to cyclic loading. The fatigue life of a material is the total number of cycles that a material can be subjected to under a single loading scheme.

First, power on the system is turned on by pulling up all the circuit breaker “ON” in the Sub-Distribution Box (SDB) board of the machine. Water flow is checked by turning on the ball valve located on water line. The motion software from desktop is turned on. The cosine cycles, frequency, amplitude and number of cycles are selected. The sample dimensions are measured. The total number of cycle at sample failure, stress amplitude and offset are noted after each sample failure.

Figure 9: Fatigue testing machine

Tensile Testing

A tensile test applies tensile (pulling) force to a material and measures the specimen's response to the stress. By doing this, tensile tests determine how strong a material is and how much it can elongate.

First the average cross-sectional dimension of the specimen is measured with the help of slide calipers and the gauge length is also measured. A small load is applied slowly and simultaneous observations of load and elongation at equal intervals are recorded. The loading is continued until the yield point at which the rate of elongation shows a sudden increase.

Next load is applied continuously and the percentage of elongation is recorded until the specimen ruptures. The maximum and breaking loads are recorded. Finally the broken specimen is removed and dimension at the smallest section is measured.

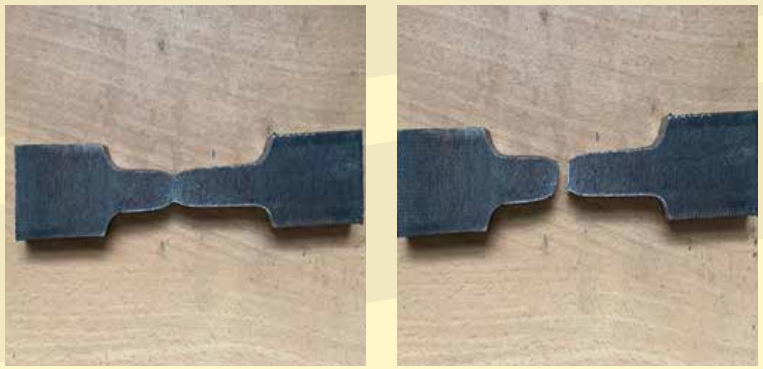


Figure 10: Specimen of mild steel before and after tensile test

Fire Door Testing

CATS-MIST (ME) has developed a kind of positive pressure fire door testing chamber that can test the fire resistance of a fire door for different hour ratings. The outfit has tested sample fire door and currently is working on the full size fire door testing chamber.

The chamber is natural gas fired and it`s inside temperature is more than 1000 °C. The test door was exposed to 1023 °C for two hours rating. The temperature was measured by a custom made thermocouple and temperature controller.

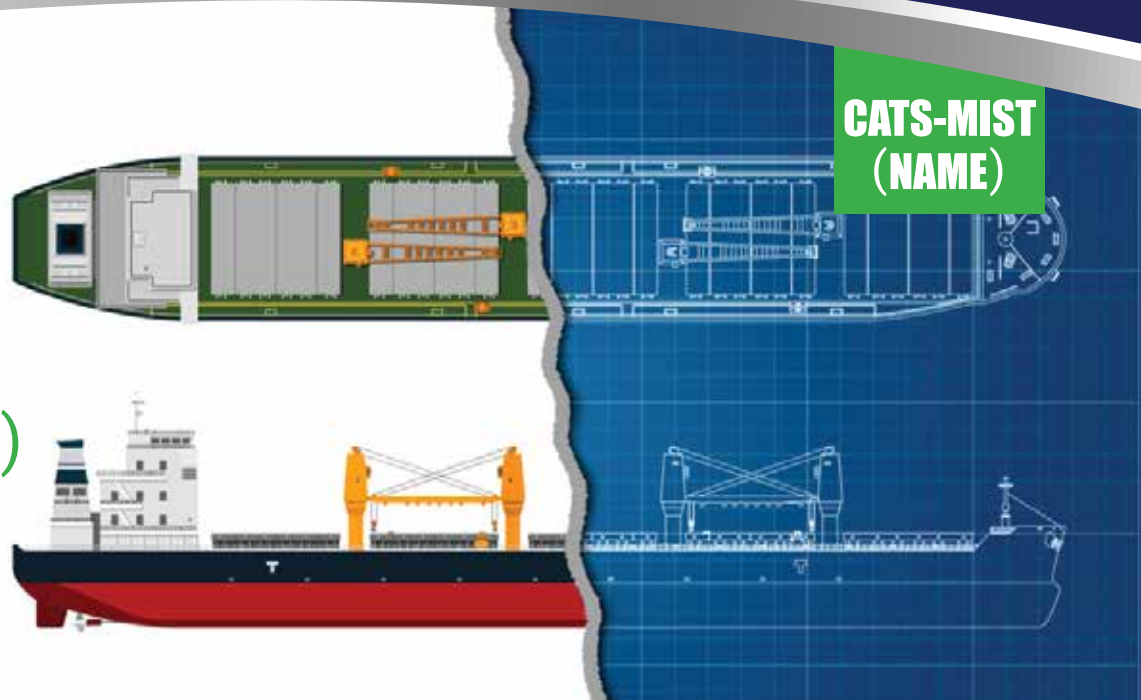
Figure 11: Fire chamber for testing fire resistant door

Department of Naval Architecture & Marine Engineering (NAME) started its journey in the year of 2013 with an undergraduate program consisting of 32 students. Within last seven years the department has provided graduation to four academic batches and currently is running four academic batches having almost 150 students. From April 2020, NAME department has also started MSc and PhD in Naval Architecture and Marine Engineering courses along with a vision to develop the state-of-the-art facilities and expert manpower to expand the research and consultancy service capabilities of the department.

On this premise the outfit, CATS - MIST (NAME) started its journey in 2016 with a view to provide knowledge-based world class technical services to satisfy the needs of individuals, industry and society. The vision of the outfit is to excel in providing research, investigation and development based intellectual and technical services to meet the demand of the fast changing technological needs of the society and the nation.

A group of highly professional faculties consisting of six professors, eight associate professors, eight assistant professors and four lecturers deliver their expertise to the students of MIST as well as the industrial fields of the nation through CATS - MIST (NAME). These faculties are drawn in from military, industry and reputed academic fields having diverse educational qualification and background. So far CATS - MIST (NAME) has been involved with three of the government projects of which two had already been completed and the other one is about to be completed by the middle of this year. Our strengths lie on providing consultancy services as per requirements with the highest level of technical confidence, honesty and sincerity.

Naval Architecture & Marine Engineering (NAME) Department



MAJOR CONSULTANCY PROJECTS CONDUCTED BY CATS-MIST (NAME)

TABLE 01
Completed National Level Projects

Ser No	Project Title	Duration
1	Feasibility study for procurement of 01 no. High Speed Boat and 01 no. High Speed Pilot Boat for Chittagong Port Authority (CPA).	February 2017– May 2018
2	Detailed feasibility study for procurement of 01 (one) 26 inches & 01 (one) 20 inches Cutter Suction Dredger with other ancillary crafts & accessories for CPA.	February 2017– September 2018

TABLE 02
Ongoing National Level Projects

Project Title	Duration
Consultancy services for the procurement of Cutter Suction Dredgers of different sizes, various ancillary vessels and other accessories along with design of infrastructure for dredger base like office building, warehouse, dormitory etc. in 06 (six) areas.	December 2016– Till to date

TABLE 03

Lab Tests carried out by CATS-MIST (NAME)

Name of the Laboratory	Test Facilities	Test Capabilities
Ship Fabrication Lab	Corrosion Thickness Gauge	To measure the thickness change of plates used in shipbuilding due to corrosion.
	Paint Coating Thickness Gauge	To measure the thickness of paint coating on the surface of materials used to build ships.
	Marine Engine Emission Analyzer	To test exhaust emission of ships
	Electro Magnetic Yoke for Surface Crack Detector	To detect the fractures at and near the surface of the plates used to build marine structures.
	Hand Held X-Ray Fluorescent for Material Composition Analysis	To measure the contents of different elements and compounds in solid materials used in shipbuilding sector.
	Charge Coupled Device (CCD) Laser Displacement Sensor	To scan roughness of different surfaces of materials used in ship-building due to corrosion and other effects.

EQUIPMENT AVAILABLE IN THE LABS OF CATS-MIST (NAME)

Name: Corrosion Thickness Gauge
Brand: Elcometer, UK
Test Capabilities: To measure the thickness change of plates used in ship-building due to corrosion.
Tests Carried out: Plate thickness measurement in Karnafuly Dockyard for consultancy project of BIWTA to procure Dredgers and Ancillary Vessels.

Name: Pain Coating Thickness Gauge
Brand: Elcometer, UK
Test Capabilities: To measure the thickness of paint coating on the surface of materials used to build ships.
Tests Carried out: Paint thickness measurement on hulls of various ships for consultancy project of BIWTA to procure Dredgers and Ancillary Vessels.

Name: Marine Engine Emission Analyser
Brand: Enerac, USA
Test Capabilities: To Test exhaust emission of ships
Tests Carried out: Marine Diesel Engine emission analysis for consultancy project of BIWTA to procure Dredgers and Ancillary Vessels.

Name: Hand Held X-Ray Fluorescent for Material Composition Analysis
Brand: Olympus, Japan
Test Capabilities: To measure the contents of different elements and compounds in solid materials used in shipbuilding sector.
Tests Carried out: Composition of materials test of plates for consultancy project of BIWTA to procure Dredgers and Ancillary Vessels.

Name: Electro Magnetic Yoke for Surface Crack Detector
Brand: Magnaflux, USA
Test Capabilities: To detect the fractures at and near the surface of the plates used to build marine structures.
Tests Carried out: Surface crack detection of plates for consultancy project of BIWTA to procure Dredgers and Ancillary Vessels.

Name: Charge Coupled Device (CCD) Laser Displacement Sensor
Brand: Omron, Japan
Test Capabilities: To scan roughness of different surfaces of materials used in shipbuilding due to corrosion and other effects.
Tests Carried out: Surface roughness measurement of plates for consultancy project of BIWTA to procure Dredgers and Ancillary Vessels

TESTS CARRIED OUT BY CATS-MIST (NAME)

Figure 1: Inspection of discharge pipes and floaters of dredgers

Figure 2: Inspection of bollard pull of pipe carrying barge

Figure 3 - Inspection of the cutter ladder and gantry crane of dredger 450 mm

Figure 4: Inspection of ladder winch installation of dredger 650 mm

Name of the project #1:

Consultancy services for the procurement of Cutter Suction Dredgers of different sizes, various ancillary vessels and other accessories along with design of infrastructure for dredger base like office building, ware house, dormitory etc. in 06 (six) areas.

Duration: December 2016 – Till to date.

Description: This development project concerning the procurement of 20 nos. of dredgers, 92 nos. of ancillary vessels, 14 types of ancillary items & other accessories along with construction of infrastructure for dredger base like office building, warehouse, dormitory etc.in 06 (six) areas, were adopted by BIWTA through the approval of Ministry of Shipping under Annual Development Programs of Bangladesh.

Figure 5: Construction work of Tug Boats in Karnafuly Dockyard, Chattogram

Provision for consultancy services like the scrutinization of design, construction supervision, assistance in test trial and assistance in acceptance of dredgers, ancillary crafts with other accessories are included in the DPP. Consultancy services also include detailed surveys, soil test design, preparation of drawings, specification, cost estimate etc. for dredger base infrastructure in the 06 (six) different stations.

The whole project work is divided into two parts, namely Part-A (Construction of infrastructure for dredger base like office building, warehouse, dormitory etc. in 06 (six) areas) & Part-B (Consulting services for the procurement of different sizes cutter suction dredger, ancillary vessel and other accessories). Part-A consists of civil works for six dredger stations and Part-B includes procurement, construction etc. works for 112 vessels & other ancillary items.

For the above stated consultancy work, BIWTA entrusted in MIST, who has long consultancy experience in different fields of engineering. BIWTA asked MIST for EOI (Expression of Interest) and financial proposal for the consultancy work.

After 06 months negotiation, they gave work order for the consultancy work of 20 Dredger Project & 06 Dredger Stations to MIST and a contract agreement has been signed between BIWTA as the client and CATS-MIST (NAME) as the consultant on 12th December 2016.

CATS-MIST(NAME) is the leading outfit responsible for execution of Part – B of the stated consultancy work.

The construction of 89 watercrafts have already been completed so far under the supervision of the NAME department, MIST at Karnafuly Shipyard in Narayanganj and Karnafuly Dockyard in Chattogram. It can be expected that these types of collaborative work with the maritime industry would help the faculty members to be updated with the most recent maritime developments in Bangladesh. Nevertheless, the students of the NAME Department of MIST will also be benefited as well. The project is expected to be completed by June of 2021.

Figure 6: Launched Dredger Vessel from Karnafuly Dockyard, Chattogram

Figure 7: Self-propelled Water Burge construction in Karnafuly Dockyard, Chattogram

Name of the project #2:

Feasibility study for Procurement of 01 no. High Speed Boat and 01 no. High Speed Pilot Boat for Chittagong Port Authority (CPA).

Duration: February 2017 – May 2018.

Description: Chattogram Port, the largest sea port of Bangladesh, handles about 92 percent of country's maritime trade. The growth rate of the volume of imports and exports through Chattogram port is about 10-14 percent per year. With the remarkable change in cargo handling in international maritime trade and introduction of open market economy with trade computerizing during nineties, cargo handling at Chattogram port has increased over time. Being consistent with the improvement of modern ports around the world, efforts are continuing to develop this port as a modernized one.

With this end in view, a range of development programs have been undertaken by the CPA. Among those, one of the projects is this one i.e. procurement of a high speed boat and a high speed pilot boat which will be operated in the CPA area comprising the river Karnafuli and outer anchorage of the port in the Bay of Bengal.

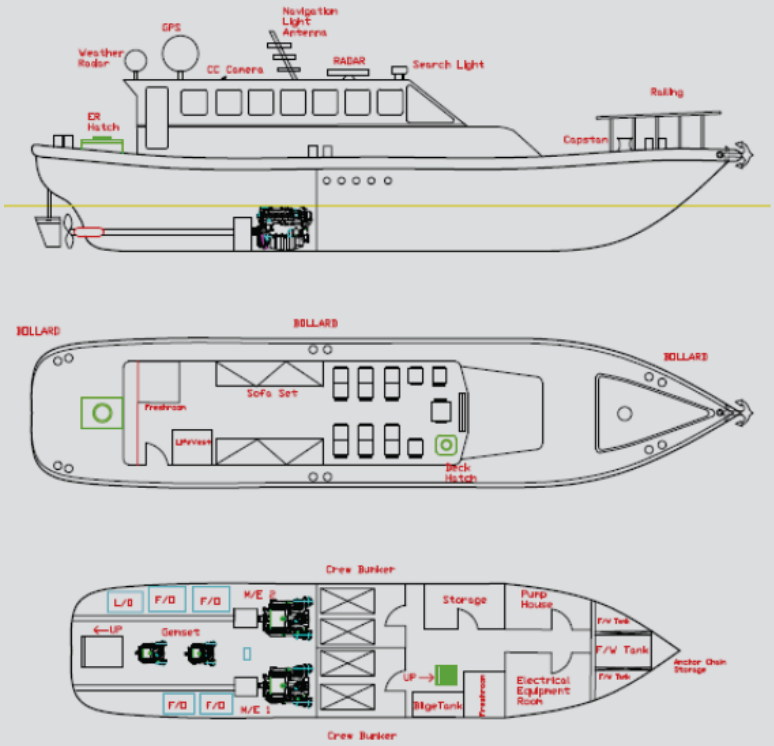


Figure 8: General Arrangement Plan for Pilot Boat

CATS-MIST(NAME) was offered to play the role as a consultant to carry out the feasibility study for the procurement of those vessels. The consultancy service also demanded the requirement of selection of size and particulars of the high speed boat and the high speed pilot boat, which is optimum for the particular services within budget justification. Preparation of technical specification, quality assurance, code classification, certification, origin of all materials, machineries, equipment, systems, appliances, services, supplies, reports, which were required to construct the boats, were also part of the study.

To comply with the requirements of CPA- the design, installed power, minimum speed and fuel consumption, which are acceptable and optimum for each of the ships, were calculated through a detailed cost estimation of all items and services required to build the ships.

After several visits to Chattogram Port, the CATS-MIST (NAME) team had submitted the feasibility study report, cost estimation report and tender document for the procurement of high speed boat and pilot boat for CPA by June of 2017. The project was completed by CPA sometime at around May of 2018.

Name of the project #3

Detailed feasibility study for procurement of 01 (one) 26 inches & 01 (one) 20 inches Cutter Suction Dredger with other ancillary crafts & accessories for CPA.

Duration: February 2017 – September 2018.

Description: To be consistent with the improvement of modern ports around the world, by now a range of development projects have been undertaken by the Chittagong Port Authority (CPA). Among these projects, procurement of one 500 mm (20 inches) Cutter Suction Dredger and one 650 mm (26 inches) Cutter Suction Dredger are notable. These are being procured with a view to facilitating deep channel to accommodate large incoming as well as outgoing vessels in the existing terminal at Karnahuli River and also in the newly proposed Bay Terminal, Mirsarai Terminal, etc.

In order to investigate the necessities of the same with respect to the fulfillment of mandated responsibility of CPA, the technical feasibility study has been carried out by the CATS- MIST (NAME) through the agreement made between CPA and MIST on February 2017. The background of the study includes review of the mandated responsibilities of CPA, present status, objective of the project and scope of the consultancy services with respect to the specific need of Cutter Suction Dredgers for the CPA including necessary purpose and description of the project.

Scope of services to be provided by CATS- MIST (NAME) included feasibility study, design and drawing of the proposed dredger and ancillary crafts, Environmental Impact Assessment (EIA), estimation of total procurement cost, bill of quantities, preparation of technical specifications, preparation of tender documents for the procurement of above mentioned dredgers and

ancillary vessels and defining the requirements of manpower with specific qualifications for the operation of those vessels.

In this context, a review of the different worldwide dredger builders and the available standard dredgers of the similar type have been carried out.

The selection of appropriate type of dredgers considering relevant different factors and their applicability to the expected needs of the intended requirement has been conducted from the comparative study of the parameters and performances of different alternatives of each type of dredgers being constructed by different reputed manufacturers.

Finally, the operating environment of the dredgers has been reviewed and the selection of optimum size for the selected dredgers with necessary facilities have been accomplished considering the available dredger models of different manufacturers and the existing types of dredgers as operated by different organizations within the country. The procurement cost of the proposed dredgers have been assessed with respect to the international market price of each individual items, material of construction, different necessary systems, machinery and equipment to be facilitated in the dredgers and also the financial feasibility of the proposed dredgers has been studied based on the consideration of the procurement cost and annual operation and maintenance costs.

Figure 9: Construction of dredger for CPA

Figure 10: Dredger under construction

OTHER ACTIVITIES OF CATS- MIST (NAME)

Besides the above mentioned projects, CATS-MIST (NAME) is constantly providing consultancy services to the Army and Navy as and when required. Following are some of the projects where the outfit provided their expert opinions:

Ser No	Project Title	Consultancy Receiving Organization
1	Procurement of Vessel Type "A" (LCT) (sea- worthy).	14 Independent Engineer Brigade, Dhaka Cantonment
2	Procurement of Vessel Type "B" (TCV) (sea- worthy).	Engineer Directorate, Engineer- in-Chief's Branch, Army Headquarters
3	Procurement of Out Board Motor (OBM) 300 HP (150x2) boat with accessories.	Engineer Directorate, Engineer- in-Chief's Branch, Army Headquarters
4	Procurement of Broad Keel (BK) Barge.	14 Independent Engineer Brigade, Dhaka Cantonment
5	Procurement of Vessel Type "A" (LCT) (river- worthy).	14 Independent Engineer Brigade, Dhaka Cantonment
6	Procurement of Vessel Type "C" Landing Craft Vehicle & Personnel (SCVP).	14 Independent Engineer Brigade, Dhaka Cantonment

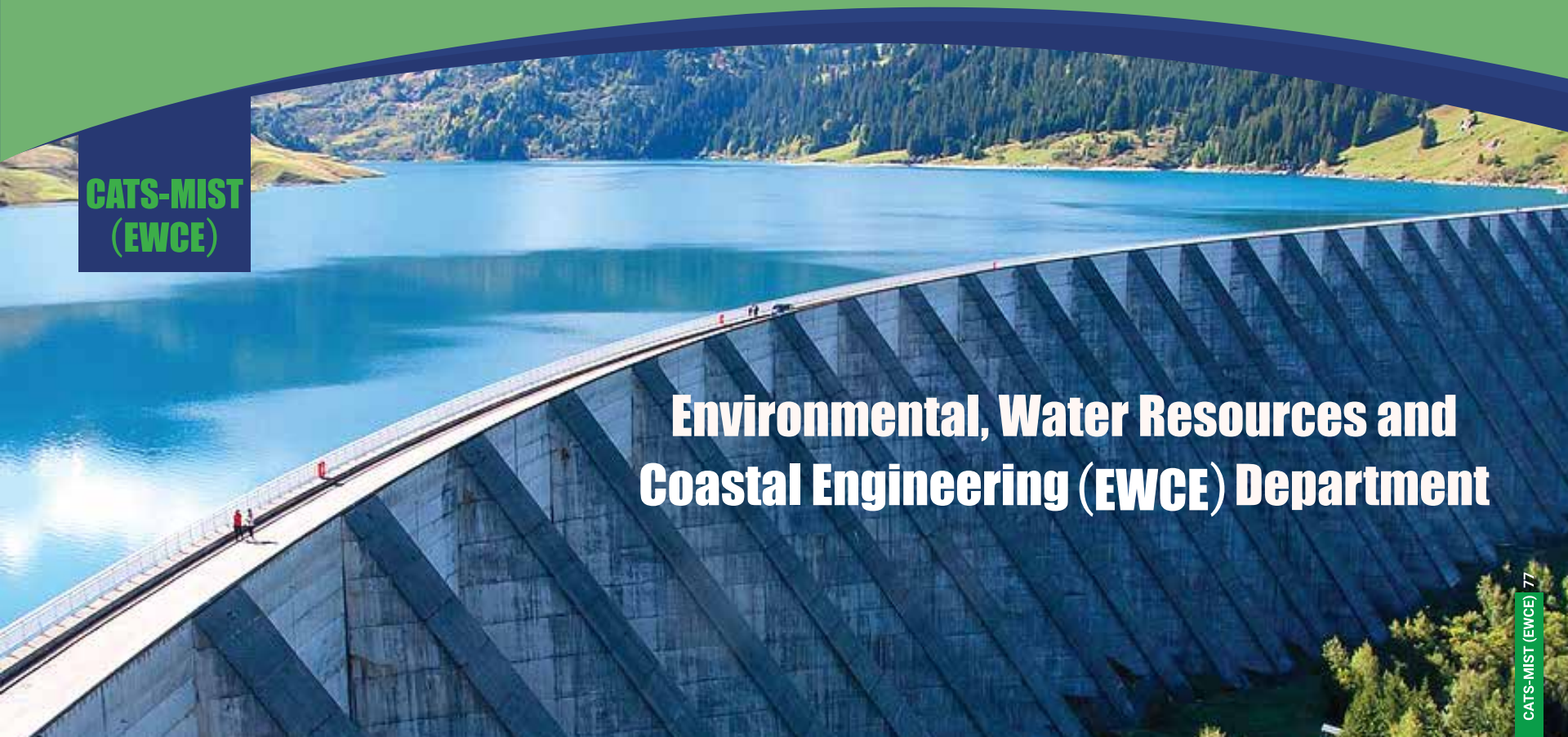
Ser No	Project Title	Consultancy Receiving Organization
7	Procurement of Reconnaissance & Survey Craft.	14 Independent Engineer Brigade, Dhaka Cantonment
8	Procurement of Salvage & Recovery Craft.	14 Independent Engineer Brigade, Dhaka Cantonment
9	Procurement of Vessel Type "C" (Commander Vessel).	14 Independent Engineer Brigade, Dhaka Cantonment
10	Procurement of VesseL Type "D" (river- worthy).	Engineer Directorate, Engineer- in-Chief's Branch, Army Headquarters
11	Procurement of Motor Tug (MT).	Padma Multipurpose Bridge Project, Engineer Directorate, Engineer- in-Chief's Branch, Army Headquarters
12	Procurement of 02xMetal Shark Aluminum Boat (Sea Horse).	Padma Multipurpose Bridge Project, Engineer Directorate, Engineer- in-Chief's Branch, Army Headquarters
13	Preparation of technical specification and design for the procurement of Hilsha Fish Research Vessel.	Bangladesh Fisheries Research Institute, Riverine Station, Moishadi, Chadpur

With the vision of developing specialized personnel on Environmental Engineering, Water Resources Engineering and Coastal Engineering fields, EWCE department have started functioning since January 2015 with undergraduate program.

Previously it worked under the department of Civil Engineering. Within last five years the department has provided graduation to two academic batches and currently is running four academic batches and has a subsequent plan for offering higher studies.

EWCE Department is run by well experienced, energetic and motivated group of faculties and staff. CATS MIST (EWCE) started its journey in January 2018. With two well established laboratories namely, Water Resources Engineering Laboratory and Environmental Engineering Laboratory, the outfit provides research as well as consultancy services.

Since its inception, apart from academic activities it has been involved in many development projects of national interest. The remarkable ones are:



CATS-MIST (EWCE)

Environmental, Water Resources and Coastal Engineering (EWCE) Department

Major Consultancy Projects of CATS-MIST (EWCE):

TABLE 01: Completed National Level Projects

Ser No	Project Title	Duration
1	Detailed technical feasibility study for integrated development of Jahizzer Char (Swarnadeep)	2014-2016
2	Improvement of the water logging situation through enhancing the existing drainage capacity of the Naval Base BNS Issa Khan and its two isolated colonies in Chattogram.	2014-2015
3	Water modeling and hydro-morphological feasibility study of Sheikh Hasina Cantonment.	2015 -2017
4	River bank protection work and dyke construction for sand filled islands of Sheikh Hasina Cantonment.	2017-2018
5	Environmental Impact Assessment (EIA) And Traffic Impact Assessment (TIA) of Proposed Ekuria Cantonment.	December 2017
6	Feasibility study to solve water logging problem and drainage network design to implement a master plan of Mymensingh Cantonment.	2016-2018
7	Detailed feasibility study on sand filling and land development in low lying haor areas of proposed Sylhet Cantonment.	October 2018-May 2019
8	Feasibility study to ensure safe water supply system of Artillery Center & School (AC & S) Halishahar, Chattogram.	October 2018-January 2019
9	Feasibility study and Environmental Impact Assessment (EIA) of the proposed Kumira to Hathazari and Hathazari Field Firing Range to Charia Field Firing road project.	September 2020-November 2020
10	Design of deep tube-well for safe drinking water supply.	November 2019 and March 2020 (two projects)
11	EIA of construction project of road and seawall in first 1.60 km damaged portion of Marine Drive (Kolatoli to Shampan Hotel).	January 2021-February 2021

TABLE 02: Ongoing National Level Projects

Ser No	Test Capabilities	Duration	Remarks
1	Construction of 03 Impermeable Groin (River Bank Protection Work) along Island-6 of Sheikh Hasina Cantonment, Lebukhali.	June 2019- till to date	70% Completed
2	Restoration of Old Buriganga River.	March 2019- till to date	1. Contract between MIST and DNCC is in progress. 2. Initial reconnaissance survey has been completed. 2. Project proposal and estimated cost is provided.
3	Hydro-morphological feasibility study for proposed Olympic Village.	June 2019- till to date	1. Initial feasibility study report is submitted. 2. Scope of work and project proposal are in progress.
4	Manganese and iron removal of the supply water of Bangabandhu Senanibash.	August 2018- till to date	1. Checking the existing filtration system is in progress. 2. Better treatment facilities is recommended. 3. Changing of sand filter and water testing at regular interval.
5	Quarterly air, water and noise monitoring for the Dhaka Mass Rapid Transit (DMRT) project.	July 2017- till to date	1. Testing are being done quarterly every year since 2017. a. Measuring SPM, PM2.5, PM10 of air. b. Measuring SOx, NOx, CO and other toxic materials. c. Testing for water quality parameters. d. Noise level monitoring.

COMPLETED PROJECTS

Name of the Project #1:

Detailed technical feasibility study for integrated development of Jahizzer Char (Swarnadeep).

Duration: 2014 – 2016.

Description:
Jahizzer Char is a newly accreted island located in the Meghna Estuary bordering the Bay of Bengal to the south covering approximately 299 sq km (2015). The shoreline of this char had been experiencing severe erosion. Analysis of satellite images showed that the area had been experiencing erosion and deposition over the years and is morphologically very dynamic. Implementation of any development work in this type of Dynamic Island is very complex and challenging since it experiences submergence during high tide, cyclonic storm surge, erosion and accretion.

Embankment considering storm surge and drainage system with regulator for draining the rainfall runoff in the island is required for the safety of the proposed infrastructure. Study for development of Jahizzer Char was carried out considering the prevailing driving forces and future external drivers of change where CATS-MIST (EWCE) had a remarkable participation in all respect.

The objective of this study was to carry out the detailed technical feasibility study for planning and design of peripheral embankment, drainage systems and erosion protection measures for

Figure 1: Location map of Jahizzer Char (Swarnadeep)

integrated development of Jahizzer Char (Swarnadeep) in the perspectives of technical and environmental aspects.

The study addressed analysis of the time series satellite images, data of water level, water flow and sediment, development of Digital Elevation Model (DEM), and updating and calibration of hydrodynamic model. It was carried out to develop Morphological and Storm Surge Models, calibration of models and establishment of Storm Surge Levels, Cyclonic Wave Model, Drainage Model, inundation depth of present condition and planning options, establishment of wave run-up, design embankment crest level to find out the best location of harbor and cross-dam. Also the study accomplished the design of hydraulic structures and bank protection work, cost estimation, land zoning plan and Environmental Impact Assessment (EIA).

Name of the Project #2:

Improvement of the water logging situation through enhancing the existing drainage capacity of the Naval Base BNS Issa Khan and its two isolated colonies in Chattogram.

Duration: 2014 – 2015.

Description:

For the people of southeast Bangladesh, "Water-logging" is a pressing concern at the backdrop of climate change. Naval Base in Chattogram (BNS Issa Khan) and its two sailor`s colonies (Sailor`s Colony-1 and Sailor`s Colony-2) are located near the meeting point of the river Karnaphuli and open ocean. Every year during rainy season these areas go under water and causes water logging. Roads, colony buildings, play grounds, road side shops etc. go under three to four feet of water particularly the low-lying areas of Sailor`s Colony-2 which causes suffering to thousands of residents as it`s catchment area is lower than the surrounding. Naval Base area, Chattagram being one of the existent worst-case scenarios of water logging problem in Bangladesh needs appropriate attention. The aim of the project was to find out the present drainage condition, the existing regulatory systems to control the back-flow which is the major reason to create water logging situation of the three locations and suggest necessary alternatives to improve the existing water logging situation.

Figure 2: Location map of Naval Base BNS Issa Khan Chattogram

Name of the Project #3:

Water modeling and hydro-morphological feasibility study of Sheikh Hasina Cantonment.

Duration: 2015 – 2017.

Description:

Sheikh Hasina Cantonment is located beside the north-west bank of the Payra River between Barisal and Patuakhali districts with an approximate area of 1576 acres.

The hydro- and morpho-dynamic behavior of the river was studied jointly by CATS- MIST (EWCE) and BUET particularly for the establishment of the cantonment within a vulnerable flood-plain area. There was dense network of drainage channels inside the cantonment site which maintains connectivity between the upstream catchment area with the downstream main river.

Figure 3: Location map of Sheikh Hasina Cantonment, Lebukhali, Barisal

The study recommended to retain four major drainage channels connected with the peripheral northern canal to maintain hydraulic connectivity between the upstream catchment and the downstream main river. The remaining minor channels or nullahs were closed and filled up to certain level by dredged sand to make the catchment area serviceable as a cantonment area.

Name of the Project #4:

River bank protection work and Dyke construction for sand filled islands of Sheikh Hasina Cantonment.

Duration: 2017 – 2018.

Description:

Initially, Island-4 was selected to start the development activities of Sheikh Hasina Cantonment. Accordingly, it was filled with dredged sand to raise the Reduced Level (RL) of ground by around 12 feet from existing level.

This filled up area was planned to protect from toe and slip failure by constructing peripheral dyke with wooden log fixed with drum sheet and also geo-bags filled with sand for maintaining a slope of at least 3:1.

Later the ground was compacted, followed by grass turf and construction of drainage network to protect the reclaimed land (Island-4) from any unwanted erosion due to rain.

Bolli Driving

Buttun Fixing

Bamboo Slice Fixing

Drum Sheet Lining

Figure 4: River bank protection work of Sheikh Hasina Cantonment

Name of the Project #5:

Environmental Impact Assessment (EIA) and Traffic Impact Assessment (TIA) of proposed Ekuria Cantonment.

Duration: December 2017 - November 2018.

Description:
To ensure security of the dream project of the nation- the Padma Bridge, Government of Bangladesh planned to develop a new cantonment in Ekuria, Keraniganj located along the east side of Dhaka - Mawa highway. The project required construction of buildings, roads, drainage network, establishment of hospital, workshop, school, residential area etc. Construction and operation of these facilities and development works may have significant impacts on surrounding environment.

Figure 5: Location map of Ekuria Cantonment, Keraniganj, Dhaka

Due to the construction of the Padma Bridge, and the approach road to Dhaka-Mawa Expressway, Ekuria Cantonment and other socio-economic development works surrounding the area, the overall transport network and traffic scenario will change significantly. The future traffic demand may put stress on the already available transport network and may cause traffic congestion, accident and pollution. In this perspective, CATS- MIST (EWCE) was asked to conduct Environmental Impact Assessment (EIA) and Traffic Impact Assessment (TIA) for the proposed Ekuria Cantonment. The EIA has been carried out to analyze both positive and negative impacts of the development work on the surrounding environment and to suggest suitable Environmental Management Plan (EMP). The TIA has been carried out to analyze impacts on surrounding road network and on overall traffic movements.

Name of the Project #6:

Feasibility study to solve water logging problem and drainage network design to implement a master plan of Mymensingh Cantonment.

Duration: 2016 – 2018.

Description:
Mymensingh Cantonment is one of the key landmarks of the city, situated in the north-western side, encompassing 279.8295 acres of land. During monsoon season, the cantonment experiences flooding like the surrounding city area. In recent years, the problem has become more severe. To address the issue, Army Headquarters requested for assistance from CATS- MIST (EWCE) to find out a feasible solution to mitigate the water

logging problem. Later on, the authority has decided to implement a New Master Plan incorporating the newly extended portion of the Cantonment.

Figure 6: Location map of Mymensingh Cantonment

In this regard, CATS- MIST (EWCE) has been assigned to do the topographic survey and design the storm-water drainage network system to be incorporated in the New Master Plan. Expert teams from the outfit visited the Cantonment site several times for surveys. Survey by the team had revealed the problem that caused the water logging problem. After the field observations and analytical calculation, it was found that the capacity of the Box Culvert located in the area is not enough to drain out the excess water resulting in the water logging problem. To eliminate the problem of the Cantonment, a drainage network is designed.

At the same time detailed map of the Cantonment area is also prepared for the implementation of the New Master Plan.

Project Details

Name of the Project #7:

Detailed feasibility study on sand filling and land development in low lying haor areas of proposed Sylhet Cantonment.

Duration: October 2018 to May 2019.

Description:

Considering the strategic and socio-economic development of the country, the government decided to establish a cantonment in the north-western region of the country, in the district of Sylhet.

The proposed cantonment area is located adjacent to and on the east of Sylhet-Jaflong bypass road and north of Surma River and Sylhet-Kanaighat road. Establishment of the Cantonment involves the partial filling up of low-lying areas. The earmarked cantonment site was a natural wetland before 15-20 years. Construction of the bypass road, urbanization/ new development activities along the bypass road, and fragmentation of the land have led to wet-land filling and interrupted natural eco-system and bio-diversity. Establishment of cantonment might have further impact on bio-diversity.

However, appropriate planning and proper implementation of the project (giving due importance to the environment and natural eco-system) may reduce or mitigate the negative environmental and bio-diversity impacts. From this perspective, Bangladesh Army felt the necessity of undertaking Environmental Impact Assessment (EIA) for the mentioned area.

Figure 7: Location map of Sylhet Cantonment

In this regard, CATS- MIST (EWCE) was assigned to carry out a detailed feasibility study. The study aims at investigating impacts of the Cantonment on natural bio-diversity of the area with a view to proposing appropriate mitigation or management measures.

The study includes hydrological and hydrodynamic model development, wet-land, flood water level and drainage analyses and environmental and bio-diversity impact assessment.

Name of the Project #8:

Feasibility study to ensure safe water supply system of AC&S Halishahar, Chattogram Cantonment.

Duration: October 2018 - January 2019.

AC&S is located in the southern part of Bangladesh in the port city Chattogram and very close to the Bay of Bengal. The cantonment is planned for about 4,000 personnel encompassing 149.84 acres of land. Estimated water demand of the Cantonment is approximately 6,00,000 litres per day (lpd). But the supply of water particularly drinking water is a long-lasting problem for the Cantonment. No suitable internal source for drinking water could be identified so far. People have been using the Chattogram WASA (CWASA) supplied water. But the break out of a large-scale water- borne diseases in 2018, added a new dimension to the problem.

Now people were afraid of drinking CWASA supplied water and were meeting their daily need with limited boiled water. Therefore, it was necessary to study the matter with a view to recommending a safe and sustainable solution for AC&S.

Figure 8: Location map of AC&S Halishahar, Chattogram Cantonment

Being asked, CATS- MIST (EWCE) team tried to explore all possible sources of water, both surface and ground water including internal and external sources.

In every case, both the quality and quantity were taken into consideration. The team from the outfit visited the possible sites, collected samples for necessary testing and consulted with the concerned expertise and stakeholders. The study report highlighted the weaknesses of water supply system, explained possible alternatives and finally put forward few recommendations.

Name of the Project #9:

Feasibility Study and Environmental Impact Assessment (EIA) of the proposed Kumira to Hathazari and Hathazari Field Firing Range to Charia Field Firing Range road project.

Duration: September 2020 to November 2020.

Description:

Kumira-Hathazari road is about 16.1 km in length (including nine box culverts, seven bridges and four bus stops) is situated in the Chattogram district. It is one of the most important corridors in the region connecting the two areas to shorten the Dhaka-Khagrachari travel distance. These areas are far behind good communication with Upazila Headquarters and also other adjacent major cities. People of these two areas had to suffer from day to day communication as they cannot use transport in the rainy season because of the slippery condition of the road. Students also had to suffer from going to their educational institutions.

The proposed roads from Kumira to Hathazari is one of the most important roads that is essential for the people of these areas for maintenance of day to day communication, business opportunities, education, health care system and other important fields of social services.The project involves construction of a road from Kumira to Hathazari and Hathazari Field Firing Range to Charia Field Firing Range.

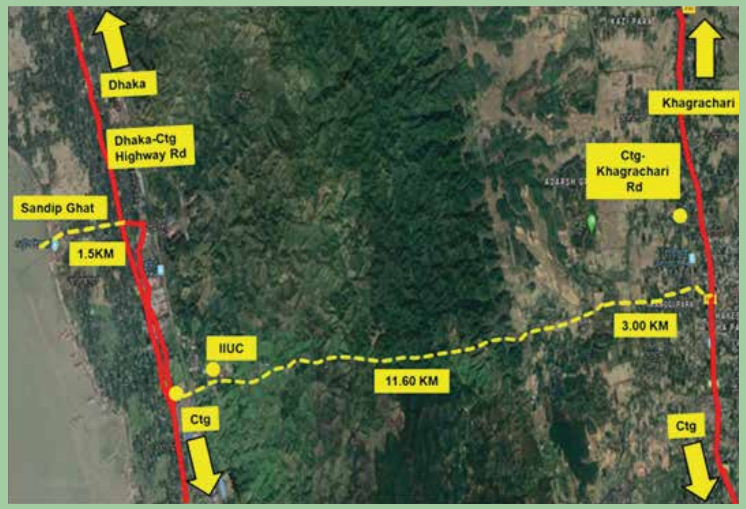


Figure 9: Location map of Kumira to Hathazari and Hathazari Field Firing Range to Charia Field Firing Range Road, Chattogram

The EIA includes an overview of the potential environmental impacts and their severity, proposes necessary mitigation measures and environmental management plan for each of the identified impacts.

Name of the Project #10:

Design of deep tube-well for safe drinking water supply.

Duration: November 2019 and March 2020 (two projects).

Description:

Project-1: Based on the grain size distribution of the aquifer sediments of different depth interval (300-830 ft), design of a deep tube well for Dhaka Export Processing Zone (DEPZ) was accomplished in November 2019.

Project-2: Based on the grain size distribution of the aquifer sediments of different depth interval (1- 1000 ft), design of a 1 × 400 ×200 mm deep tube- well for 'C/D' type Officer's Quarter (Shapla), Mirpur Cantonment was accomplished in March 2020.

Name of the Project #11:

EIA of construction project of road and seawall in first 1.60 km damaged portion of Marine Drive (Kolatoli to Shampan Hotel).

Duration: January 2021- February 2021.

Description:

Cox's Bazar is a southeastern tourist city of Bangladesh, famous mostly for the longest sea beach in the world. Currently hotels and tourism centers are in danger for not having any road or embankment in front of them. Marine Drive Road along the sea beach from Cox's Bazar (Kalatali to Teknaf) have been washed away into the sea from Kolatoli towards Inani due to increased mean sea level. This report states the Environmental Impact Assessment (EIA) for the reconstruction of 1.6 km Marine Drive Connecting Road. Since the location of the project is very close to sea, rain water is the only source of water which will be draining out by drainage system.

This EIA study also considers the design criteria of Curved Seawall in details, hydrodynamic analysis, geotechnical and structural design for a viable guideline. Considering the national interest and future tourism prospect this project is undertaken with predominance.

Figure 10: Location map of 1.6 km Marine Drive connecting road

ONGOING PROJECTS

Name of the Project #12:

Restoration of Old Buriganga River.

Description:

On December 24, 2018, in a public gathering at Kamrangichar, Honorable Prime Minister of the People's Republic of Bangladesh Sheikh Hasina directed Dhaka South City Corporation (DSCC) to revive the Old Buriganga River and to turn the river-side area into an environment friendly recreation center.

Accordingly a "Committee for the Preparation of the Project Proposal" for the development of Old Buriganga River project has been formed.

Decision was taken by the Committee to mark the boundary of the Old Buriganga River, prepare list of illegal occupations alongwith their relocation plan, formulate a Master Plan and preparation of Detailed Project Proposal (DPP) by a consultant firm.

It was decided that CATS- MIST (EWCE) will implement the project with the help of BUET and Institute of Water Modelling (IWM). At present alignment finalization, EIA, traffic studies and hydrodynamic modeling are being conducted.

Figure 11: Location map of proposed Olympic Village

Name of the Project#13:

Hydro-morphological feasibility study for proposed Olympic Village.

Duration: June 2019 - Till to date.

Description:

Establishment of the Olympic Village has strategic and socio-economic importance. It is likely to have positive impacts on the socio-economic and cultural condition of the people, communication system, administrative facilities etc. of the whole area.

The area in general is 2-3 meters lower than the highway and surrounding developed areas. The area is used as flood- plain for the central part of the country. Establishment of various installations of the Olympic Village involves filling up of low-lying areas. The Government of Bangladesh (GOB) has formulated number of policies, rules and regulations for using such types of land.

There are international guidelines too in this regard. The river Arial Kha, which is very dynamic in nature, is running nearby the proposed Olympic Village area. Any development activities in this area by filling up flood plain may influence the natural course of the river. That in turn, may adversely affect the surrounding environment and infrastructures. Therefore, before going for any physical intervention, a detailed feasibility study is very essential.

Figure 12: Location map of proposed Olympic Village

Name of the Project#14:

Quarterly air, water and noise quality monitoring of the DMRT project.

Duration: July 2017- Till to date.

Description:

The air quality monitoring team from CATS- MIST (EWCE) measures the air quality parameters at various sites. HAZ-SCANNER EPAS is used for sampling of SPM (Suspended Particulate Matter), Particulate Matter PM10 and PM2.5 and to determine the concentration of NOx, SOx and CO present in air of the sampling sites.

The monitoring team collects the surface and ground water samples from the selected sites. The water samples are collected using new sterilized white HDPE (High Density Poly Ethelene) bottles.

Then the collected water samples are carried to the Environmental Engineering Laboratory of the outfit and corresponding tests are performed. Noise monitoring team of the outfit visits the selected sites and measures the noise levels. The noise data are recorded at every 1-minute intervals during day time.

Figure 13: Water quality measurement in Environmental Engineering Lab of CATS- MIST (EWCE)

Figure 14: Air quality monitoring of DMRT project

Name of the Project#15:

Construction of impermeable groin (river bank protection work) along Island-6 of Sheikh Hasina Cantonment, Lebukhali.

Duration: June 2019 - Till to date.

Description:

Sheikh Hasina Cantonment is situated along the right bank of Pyra River between Barisal and Patuakhali districts. Bank erosion is a key concern for the development of this cantonment.

Army headquarters has given tasks to MIST for taking action to minimize the bank erosion along Island-6. Accordingly, 5 groins were established between June to December 2019. Currently under the supervision of CATS- MIST (EWCE), maintenance work is going on.

Experts from the outfit have recently visited the construction site on 05 January, 2021. The maintenance work will safeguard the boundary line of Island-6 till the permanent bank protection work is executed.

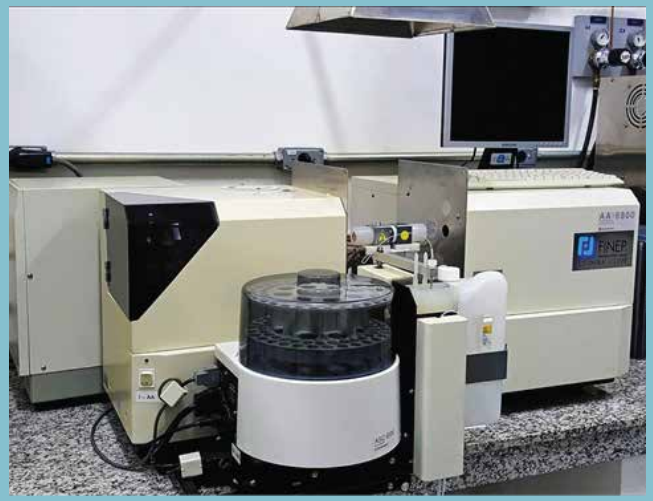
Name of the Project#16:

Drinking water and wastewater quality test.

Duration: 2018- Till to date.

Description:

Conductivity, turbidity, pH, color, salinity, Total Dissolved Solid (TDS), Total Suspended Solid (TSS), iron, sulfate, chloride, nitrate, nitrite, chlorine, hardness, cupper, fluoride, zinc, sulfide, phosphate, ammonia, Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), Bio-chemical Oxygen Demand (BOD), aluminum, arsenic, boron, barium, calcium, cadmium, cobalt, chromium, magnesium, sodium, potassium, nickel, lead, selenium, titanium, bacteria count etc. of water samples are being carried out in the Environmental Engineering Laboratory.



Name: Atomic Absorption Spectrophotometer (AAS) Content Tester
Brand: Shimadzu, Japan
Test Capabilities: To measure heavy metal and other metals present in groundwater as well as surface water.
Tests Carried out: Water samples from different government and private companies are tested with the AAS.

Equipment Available in the Labs of CATS-MIST (EWCE):

Name: Multi-meter for DO, EC, pH
Brand: Hach, USA
Test Capabilities: To measure dissolved oxygen, pH, electrical conductivity of water sample.
Tests Carried out: Water samples from different government and private companies are tested with the multi-meter.

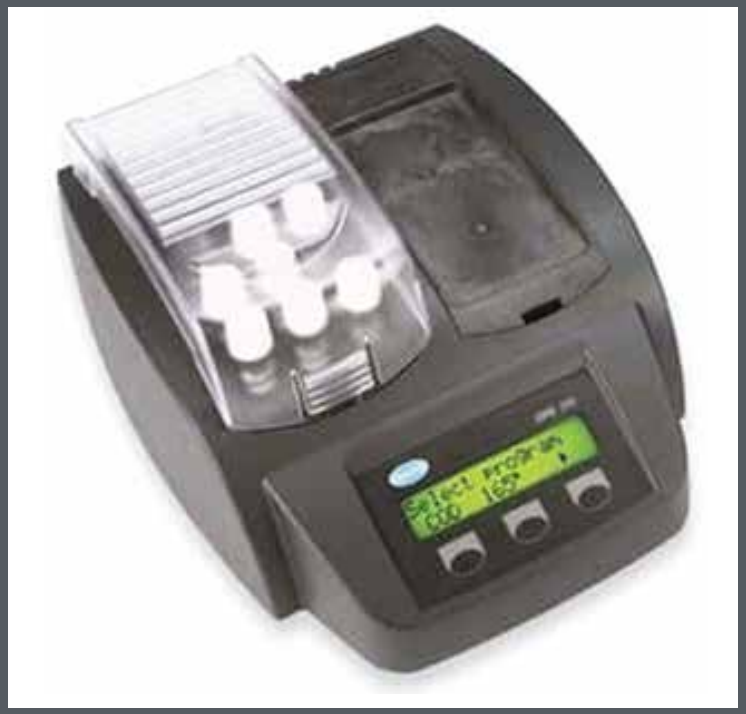
Name: Vertical Laminar Air Flow Unit
Brand: WLC-v1200, Germany
Test Capabilities: To detect bacteria in drinking water sample.
Tests Carried out: Drinking water samples from different government and private companies are tested.

Name: Spectrophotometer Measuring Equipment
Brand: Hach, USA
Test Capabilities: To detect chemicals in water samples.
Tests Carried out: Water samples from different government and private companies are tested.

Name: Ambient Air Quality Measuring Equipment
Brand: Hach, USA
Test Capabilities: Water samples from different government and private companies are tested.
Tests Carried out: To conduct quarterly air quality monitoring of the Dhaka Mass Rapid Transit (DMRT) Project and to perform the EIA of different projects.

Name: Casella Sound Level Meter
Brand: CEL-24 X, UK
Test Capabilities: To measure sound levels in a standardized way.
Tests Carried out: To conduct quarterly noise monitoring of the Dhaka Mass Rapid Transit (DMRT) Project and to perform the EIA of different projects.

Name: Modular Flow Channel
Brand: GUNT, Germany
Test Capabilities: To measure flow over control structures: weirs (sharp-crested, broad-crested, ogee-crested) and discharge under gates.



Name: COD Reactor
Brand: Hach, USA
Test Capabilities: To digest water sample for the measurement of chemical oxygen demand (COD).
Tests Carried out: Drinking water and waste water samples from different government and private companies are digested with the COD reactor.

Name: TOC Analyzer
Brand: UL STD, USA
Test Capabilities: To measure organic carbon in water and wastewater sample.
Test Capabilities: Water samples from different government and private companies are tested.

Name: Turbidity Meter
Brand: Hungary
Test Capabilities: To measure turbidity of water and wastewater sample.
Tests Carried out: Water samples from different government and private companies are tested.

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