

# ECC COLCORD

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## Focus

Civil Aviation is the fastest growing arm of India's transportation infrastructure and the Ministry of Civil Aviation plays an increasingly important role in providing connectivity to air travellers. The increasing projections for both passenger and cargo traffic growth, coupled with the deficient and lagging airport infrastructure in the recent past has called for an urgent need to build and augment India's Aviation Infrastructure.

Realizing this urgent need, the Government of India has planned to build world-class gateway airports including modernizing and upgrading the existing airports with facilities of global standards.

### Largest Airport Builder

ECC, L&T's Construction Division is the largest construction organisation in India. It has vast experience in building a variety of major airport structures in India and abroad. With the construction of the first Greenfield airport at Bangalore on Public Private Partnership basis followed by construction of Hyderabad airport including modernization and expansion of Delhi and Mumbai International airports on engineering, procurement, construction and commissioning basis, L&T is the largest Airport Builder in India when it comes to design and construction of aviation infrastructure. In the following pages, we bring to you ECC's spectacular contribution to the development of airport infrastructure in India.

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# Giving India A Flying Start

Airports being gateways to the respective regions are critical in creating the right impression on the visitors to our country. They also play a major role in the development of business activities and growth of the areas catered by these airports.

Favourable demographics and rapid economic growth point to a continued boom in domestic passenger traffic and international outbound traffic. To meet this ever increasing demand, the Government of India introduced the policy of "Open Skies" some time ago and this has provided a powerful spurt in traffic growth during the last two years. Indian private airlines such as Jet, Kingfisher, Air Deccan, Sahara and Spicejet accounts for around 60% of the domestic passenger traffic. Some of these airlines are also operating international flights.

While there is no doubt about the growth potential, the key question that needs to be addressed is building of airport infrastructure to sustain the boom in the long run.

At present, passenger traffic is concentrated at five major airports. About 70% of this traffic is confined to metros with Delhi and Mumbai airports alone accounting for 45% of passenger traffic. In view of this the Government in addition to expanding the airports in the metros is planning to divert traffic to non-metros for distributing growth evenly and to reduce the pressure on metros.

Several non-metro airports are being developed partly through the PPP model. Airports Authority of India (AAI) is developing the airside facilities and terminal buildings of these airports while city-side

development works are carried out on private partnership basis. It is said that the government has already awarded contracts for terminal building at 15 airports and airside development, contracts have been awarded at 24 airports.

The new Greenfield airport at Hyderabad International Airport developed through PPP is already functional from March 2008 and similarly the Bangalore International airport is ready for operations from May 23, 2008. Modernisation and expansion of the Delhi and Mumbai airports are in progress. Chennai and Kolkata airports are also proposed to be taken up for expansion/modernisation. In order to ensure balanced airport development around the country, a comprehensive plan for the development of 35 non-metro



*Bengaluru International Airport*



*Abu Dhabi International Airport*

airports is also under preparation at an estimated investment of Rs.40,000 crore for modernisation of airport infrastructure.

As traffic moves up, the number of airports would also increase significantly in the years to come. The country is expected to have a good number of private airports, popularly described as merchant airports.

### **Largest Airport Builder**

With the completion of construction of Hyderabad and, Bangalore airports and work in progress at, Delhi and Mumbai International airports, L&T is one of the Largest Airport Builder in this part of the world for Design & Construction of aviation infrastructure. Some of the features of these new generation airports are given below:

### **Bangalore International Airport Limited (BIAL)**

- State-of-the-art terminal building having an area of around 1.00 million sq. ft.
- Construction of a 4km runway and other infrastructure.

- The airport will cater to the projected traffic demand of 11.5 million passengers and handling 3 lakh tons of cargo per annum.
- Modular construction adopted to ensure smooth and seamless expansion to cater to future growth.
- Integrated Cargo handling facilities with of a total built up area of 6.00 lakhs sqft

### **GMR Hyderabad International Airport Limited (GHIAL)**

L&T built the Greenfield International airport at Shamshabad involving terminal building and other airside works including taxiways, runways, etc. The airport is functional and is designed to handle



*Indira Gandhi International Airport, New Delhi*

# Track Record

## ECC's Aviation Infrastructure



### **Air India Hangar, Mumbai**

- India's first maintenance and overhaul hangar for Boeing 747 jumbo jets
- Hangar with overhang of 76.5m in steel. The steel trusses of the roof structure are anchored to columns by tiebacks and struts.
- Columns are anchored to rock by pre-stressed cables
- Executed by ECC in 1971.

### **Abu Dhabi International Airport**

- Passenger terminal building complex involved construction of six main sections:  
Passenger terminal, State reception, Control tower, Satellite concourse, Pre-passage ways & Link gallery
- Airport was designed for parking of eleven aircraft, including five jumbos. This was completed in 1978.

### **Sri Sathya Sai Airport, Puttaparthi**

- This involved construction of air terminal building and control tower including an airstrip
- In-house architectural and structural design was employed
- Length of runway : 2237 rmt
- Width of runway : 45 rmt
- Completed in 1990

### **Indian Airlines Hangar, Mumbai**

- Total length of Roof structure - 152m
- Consists of two cantilevered roof 62.3m each covered by a continuous RCC multiple folded plate system.
- Completed in 1994

### *Runway at Puttaparthi Airport*

### **Indira Gandhi International Airport, New Delhi**

#### **Visitors' Lounge**

- Design and construction of visitors' lounge and expansion of flyover
- Involved architectural and structural design including state-of-the-art electro-mechanical services. This two storeyed structure having an area of 10500 Sq.m was fully air-conditioned and was constructed using RCC grid slab system and columns resting on isolated footings. It accommodates 2500 persons at a time. This was declared open in 1996.

#### **Resurfacing main runway**

This involved strengthening / resurfacing of main operational runway (10/28) and installation of CAT iii lighting system.

- Length of runway : 3810 m
- Width of runway: 45m with 7.50m shoulders on both sides
- Completed in 2000

#### **Royal Flight Hangar at Seeb-Oman**

- A twin bay air-conditioned Hangar, to accommodate two B-747 and A-380 aircrafts.
- Annexe building involving workshops, offices, stores and an operations building to accommodate engineering and Aircrew offices.
- Executed Complete Airfield and other infrastructure works.
- Completed in 2004.

12 million passengers per annum. Some of the features include:

- The seven level Passenger Terminal Building with an area of 1.17 million sq.ft..
- Airside works involved construction of 4.26 km long runway including developing many other infrastructure.

### **Delhi International Airport Private Limited (DIAL)**

A World-class Airport for Delhi is a few years away. L&T is executing the design and construction of terminal building, runway and associated works of Delhi International Airport valued at about Rs. 54.00 billion to be commissioned by 2010 for Commonwealth Games. Some of the features include:

- The Passenger Terminal Building (T3) will cater to both domestic and international traffic and will handle 25 million passengers per annum, more than twice the present traffic. The total built-up area of the new terminal building (T3) will be 5.2 million sq.ft..
- A new code F runway, at 4.43 km, will be one of the longest in Asia



*Close up view of a passenger boarding bridge*

and equipped with CAT IIIB – a landing system.

- All airport facilities like baggage handling systems, IT, communication, passenger boarding bridges, flight information and displays etc.

### **Mumbai International Airport Ltd (MIAL)**

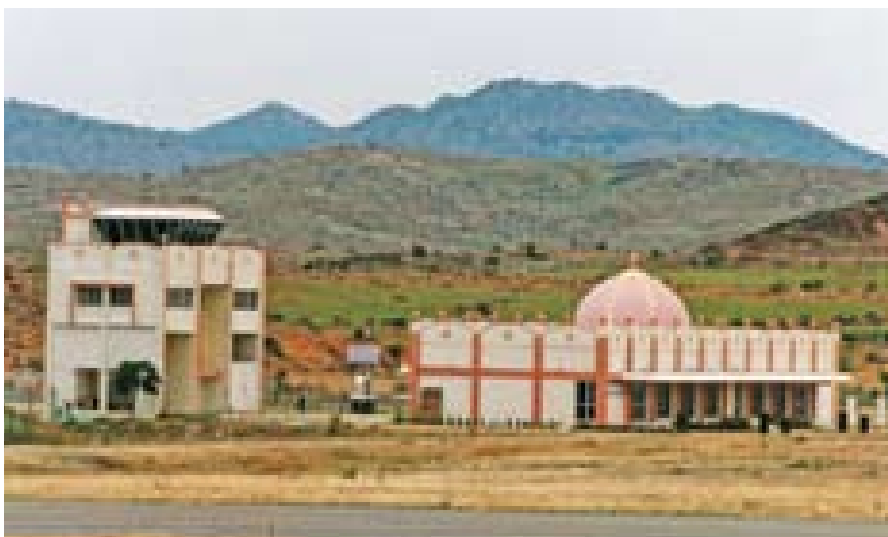
A World-class Airport for Mumbai will also be ready in 4 years. L&T

has been entrusted with design and construction of terminal works, airside works and ancillary facilities at Chhatrapati Shivaji International Airport (CSIA) to be commissioned by 2012. The new terminal (Terminal 2) will come up in the existing international terminal amidst various challenges.

- The terminal will handle 40 million passengers per annum and this will be commissioned in a phased manner from 2010 to 2012. The total built-up area of the new terminal building (T2) will measure 4.84 million sq.ft..
- Airside works including runway reconstruction, construction of new aprons and additional taxi ways.
- All airport facilities like baggage handling systems, IT, communication, passenger boarding bridges, Flight information and displays etc.

### **Calicut Airport**

L&T recently completed the renovation and rebuilding of Calicut airport. The total built up area being 1.74 lakh sq.ft..



*Terminal building and control tower at Puttappathi Airport*

# The New Rajiv Gandhi International Airport at Hyderabad begins commercial operations



*Inside view of the passenger Terminal Building at Hyderabad*

*A Jet Airways flight parked on the apron during the trial run operations*



With the touchdown of Lufthansa flight LH752 from Frankfurt at the Rajiv Gandhi International Airport in Shamshabad at 00.25 hours on Sunday March 2008, the commercial operations began at the new Airport. To receive and welcome the first ever international flight carrying 276 passengers from Frankfurt, Germany the entire airport was fully-lit up, with relatives and friends thronging the arrival area. The same aircraft was scheduled to depart at 2.30 am for Frankfurt, thus becoming the first international flight to take off from the airport.

All passengers and crew members were given a rousing reception on their arrival at the new airport, which was declared open by Mrs. Sonia Gandhi on March 14, 2008.

Passengers reaching the new Hyderabad International Airport for the first time were indeed surprised to see an awe inspiring and an entirely new looking modern airport incorporated with world-class facilities and amenities, unprecedented in the country. This is the first Greenfield airport built in public-private partnership and incorporates the best of facilities in other parts of the globe. With this, the 76-year-old Begumpet airport located in the heart of Hyderabad city was officially shut down.

Passengers who want to reach this airport at Shamshabad have to drive 25 km from the City. All along the

route to the new airport one can see the work in progress of widening of access roads, criss-crossing elevated expressways, new outer ring road, etc – all leading to the new airport.

As one enters the sprawling Shamshabad facility having an area of 5500 acres, for some distance you will see a dry patch of land and from a long distance you can see the towering air-traffic control tower and the passenger terminal building with its massive and design contoured Kalzip roof. However, as you reach closer, you can see the beautiful approaches with divided roads planted with ornamental date palm trees on the median, landscaped gardens with colourful flowering plants along the sides including fountain jets and sprinklers doing their routine of watering the plants.

The airport is a 63:11:13:13 joint venture between Hyderabad-based GMR Hyderabad International Airport Limited (GHIAL), Malaysia Airports Holding Berhad, the Andhra Pradesh government, and the Airports Authority of India.

## AEROTROPOLIS

**A**n aerotropolis is a new type of urban form comprising aviation-intensive businesses and related enterprises extending up to 25 kilometers (15.5 miles) outward from major airports.

It is similar in form and function to a traditional metropolis, which contains a central city core and its commuter-linked suburbs. An aerotropolis has an airport city at its core and is surrounded by clusters of aviation-related enterprises.

Airports have evolved as drivers of business location and urban development in the 21st century in the same way as did highways in the 20th century, railroads in the 19th century and seaports in the 18th century, according to Dr. John D. Kasrada, the American academic who defined the aerotropolis concept in 2000.

Aerotropolises are powerful engines of local economic development, attracting air-commerce-linked businesses to the land surrounding major airports, analogous to the function of central business districts in the downtown areas of major cities.

Aerotropolises typically attract industries related to time-sensitive manufacturing, e-commerce fulfillment, telecommunications and logistics; hotels, retail outlets, entertainment complexes and exhibition centers; and offices for business people who travel frequently by air or engage in global commerce. Clusters of business parks, logistics parks, industrial parks, distribution centres, information technology complexes and wholesale merchandise marts located around the airport and along the transportation corridors radiating from them.



*View of the Passenger Terminal Building as seen from the Air Traffic Control Tower*



*Departure lounge in the Passenger Terminal Building*

Equipped to handle 7.2 million passengers in 2008, the airport (without any expansion) is expected to handle 12 million passengers by 2010, subsequently scaling up to 40 million in the final phase. The corresponding figures for cargo handling is expected to touch 1.0 million tonnes from its present 1.0 lakh ton capacity.

The airport is South Asia's first A-380 aircraft compatible and has India's longest runway at 4,260 metres.

The passenger terminal building having an area of 1.17 million sq. ft. is capable of handling twelve million passengers per annum. It is provided with 42 stands consisting of 12 contact boarding bridges and 30 remote stands. There are 130 check in counters with common user terminal equipment (CUTE), 16 self-check-in kiosks, 46 immigration counters, 30 escalators and 32 elevators. In addition, it has conference facilities for business travellers, hotel facilities, a hospital, retail shops and integrated information technology systems - in short, all the modern gadgets expected of a global standard airport.

### **Airport Village**

For the first time in the country an "Airport village" has been created between the terminal building and the public land side at level D. This consists of a shopping arcade with a wide variety of stalls and food courts to serve as a place for people to "meet and greet." Those not using the airport can also drop in here for shopping.

This apart, there is a uniquely designed retail area inside the terminal building based on the walk-through concept that enables customers to move from one shop to another without having to walk in and out of shops. Moreover, plans are afoot for developing the area around the airport as a modern aerropolis.

In every respect, this is not just another airport. It is going to be the nucleus of the country's first aerropolis, a new urban form that would house business parks, hotels, residential units and entertainment areas.

### **L&T's Contribution**

L&T secured two major contracts, against international competitive bidding at GMR Hyderabad International Airport, for the construction of:

#### **Airside and Landside works**

The airside and landside works involved construction of a 4260m long runway, taxiways and aprons to accommodate wide-body planes (code F- aircrafts), including new generation aircraft, such as the A380. In all there are 42 parking bays – 12 contact and 30 remote. This apart, L&T executed the complete airfield lighting system, fire-fighting system, fire rescue station, installation of the aviation hydrant system, etc. involving complete HT/LT electrical power networks as well as sewage and water supply networks.

This also involved construction of more than 60 allied buildings and structures such as a large cargo terminal complex, ground handling workshops, maintenance and engineering buildings, navaid structures, crash fire resource



*Baggage reclaim hall*

stations, underground sumps as well as sewage / water treatment plants, a car park to accommodate over 3200 cars, the main access road as well as connectivity to the passenger terminal building

### **The Passenger Terminal Building (PTB)**

L&T executed the complete civil and facade works of the fully operational passenger terminal building - a seven level modern building having a floor area of 1.17 million sq. ft., 75m high air traffic control tower including design, supply and installation of facade works for glass, glazing and roof.

Both contracts were executed by L&T in less than 30 months, including a three-month airport operational trial period.

### **Design Principle**

The basic design of the passenger terminal building is simple, attractive and loose-fit. The fluid design is such that sequences of spaces are provided to facilitate easy and comfortable movement and orientation. This

spaciously designed PTB ensures rapid transit between its Domestic and International concourses. In fact it has everything that gives one the out-of-the-ordinary feeling. The roof, designed as a Temple Leaf Structure, enables the natural light to filter through. Built with modular construction technique, the passenger terminal building has 16 skylights and this reflects the distinct Indian culture. L&T fabricated and erected the 75m long 3m high trusses for the erection of 40,000 sq.m Kalzip roof.

### **Kalzip Roofing**

Another salient feature of the Passenger terminal building is the Kalzip roof.

The Kalzip roof is a propriety product of Corus Building Systems, Singapore consisting of composite layers including GI liner at the bottom followed by Cement board, vapour barrier, rock wool insulation and kalzip sheet at the top. The system as a whole got excellent thermal and aesthetic properties. The method of construction involved lifting of the

## **Passenger Terminal Building Highlights**

- India's first Greenfield airport
- Integrated Passenger Terminal Building with initial capacity of 12 million passengers per annum
- Unique concept of Airport village
- 130 check-in desks with CUTE and 16 self check-in-kiosks
- 46 immigration counters for Quick processing
- In-line baggage handling system with level-4 security system, the first of its kind in India
- Awarded to L&T ECC on 25th November 2008.
- Completed all the works in a record span of 28 months.
- Built up area – 1.17 million sq.ft..

### **Special features of construction**

- Kalzip roof sheeting
- Temple leaves for tapping natural light with great aesthetics
- Bull Nose cladding surrounding PTB- the most challenging job
- Good aesthetic Interiors including False ceiling, wall cladding, Flooring, etc.

### **Resources**

- Total Man hours (workmen) – 13.5 Million Man hours
- Total staff months – 2000 staff months
- No. of labourers at peak – 3200 Nos.
- No. of staff at peak – 78 Nos.
- No. of tower cranes at peak – 6 Nos.



*Airside view showing the passenger boarding bridges*

Major Quantities	
• Concrete	- 64,500 Cum
• Formwork	- 2,28,500 sq.m
• Structural steel	- 4,400 tons
• Rebar	- 9,500 tons
• Roofing	- 42,500 sq.m
• Flooring	- 97,000 sq.m
• Cladding	- 52,000 sq.m
• Glazing	- 29,500 sq.m
• False Ceiling	- 64,000 sq.m

kalzip roll forming machine to the roof level for forming the corrugated sheets at that level followed by laying and fixing of the sheets with the kalzip accessories.

#### **ATC tower**

The tower structure is of 75m height with conical shape. ECC

encountered many difficulties in arriving at the shape on ground due to the complexity in design – both architectural and structural.

The RC shaft of the tower structure up to 54m height part was completed using Climbing formwork. The conical portion of the tower commences from 5m level and

tapers outside from there till it reach 75m level. The construction imposed several challenges an working at such a height.

A platform specially designed and fabricated was anchored to the RC shaft of the tower at 54 m level. This avoided the costly and cumbersome process of staging from ground.



*Passenger Terminal Building showing the beautiful temple leaf pattern roof, circular columns, check-in counters, etc.*

### First in India

Airport village, a new concept introduced for the first time in India, is the place for retail, restaurants, supermarkets outside the passenger terminal building in level 'D'. The 40,000-odd sq.ft. covered village with free entry is also the place where visitors can meet, greet and see off passengers.

### Access Roads

Incoming vehicles in to the airport can find its way in to 3 different levels as per one's requirement. Passengers reaching the spacious car park at the ground level can take both the ramp or the elevators and reach either level D to pick up the passengers or go for a shopping spree at the airport village. From here one can reach the departure lounge in level F through elevators.

At the same time vehicles can reach level D straight away by taking the second level elevated road in the middle to pick up passengers arriving there. One can also go down the



*Landscaped median on the main access road.*

ramp or elevators to the ground level car park to pick up a pre-paid taxi with automated Flight Information Display System and a separate public transportation centre further away.

ECC faced several constraints and difficulties as follows:

On going designs supplied by Arup Consultants (HK) during the construction period imposed many problems due to frequent revisions in drawings.

As the location of project is totally isolated from the city, the magnitude of cyclones and heavy winds during rainy season was quite high. Particularly, the hurricanes in the month of March 2006 and heavy winds during May and June 2007 posed construction challenges which were successfully scaled.

*K. Sridharan  
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with inputs from  
S. Radhakrishnan  
Construction Manager (PTB)*

*The Airport Village - a place to meet and greet passengers*



# Airside and Landside Facilities

The EPC contract for the construction of the airside and landside (ALS) facilities of the airport was awarded to ECC division of L&T and the entire project involving comprehensive mix of complex and multidisciplinary operations was executed by three different Business Units of ECC – Institutional & Commercial Buildings (I&CB), Roads & Runways (R&R) and Electrical, Instrumentation & Communication (EI&C).

## Scope of Works

The scope of works involved detailed design, working drawings, shop drawings, construction, production, assembling, installation, testing, commissioning and integration of all works for the airside and landside facilities. In brief this involved:

## The airside works

- The runway and taxiway system including adjacent restricted areas. – Runway – 4.26 km, taxiway – 4.36 km, 4 rapid exit taxiways and 12 connecting taxiways
- Aircraft aprons designated for passenger terminal, cargo terminal and aircraft maintenance facility. – Main Apron – 1120 Rm
- Aircraft isolation bay
- Airside service roads
- Aviation fuel hydrant system
- Storm water drains for runway, taxiway, aprons and airside roads, which involved:
  - \* Concrete lined drain – 17.75 km
  - \* Masonry drain – 5.662 km
  - \* Concrete drain – 4.772 km

- \* Pipe drain – 4.257 km

- \* Earthen drain – 24.5 km

- Necessary visual aids on runway, taxiways and aprons to secure that the aircraft can operate safely on a 24 hours basis.
- Civil and building works and utilities required for the communication, meteorological and navigational equipment to be supplied, erected, tested, commissioned and integrated by AAI.

## Landside works

- Main access roads – 8.4 km
- Traffic loop in front of terminal building including upper and lower traffic forecourts.
- Parking areas inside the traffic loop – 2 lakh sq.m



Side view of the Passenger Terminal Building

- Road systems to other airport facilities
- Connectivity road from NH7 to Airport main access road
- Storm water drains for landside roads and other areas
- Utility corridor and trenches connecting various buildings and facilities
- All utilities on the landside and airside
- D G emergency power station

Construction also included some of the other major Buildings, such as:

- Cargo terminal
- Crash and fire rescue (CFR) stations
- Ground handling equipment and maintenance facilities
- Water treatment plant and Sewage treatment plant
- Engineering building for airline operators
- Building for ground handlers Menzes & Air India - SATs
- Miscellaneous buildings such as substations, pumping station and gate houses.

#### Miscellaneous Works

- 11 km airside/landside boundary wall
- Upgradation of 9 km boundary wall to BCAS spec

- Airside fire drill facility
- Operations and maintenance equipment/ facilities

#### Electro-mechanical services

This involved execution of the Fuel Hydrant System, which included:

- 11 km of 18” dia piping with 3 layer polyethylene coating and lining.
- 58 fuel pit valves.
- 14 drains and 14 vents.
- Entire piping pressure tested with JETAI fuel @ 30 bar for 24 hrs.

#### External Water Supply

Water supply system for the airport catering domestic, flushing and AC makeup water with:

- 5 pumping station with 22 pump sets.
- 12 hydropneumatic systems.
- 2 water treatment plants of 2500 KLD capacity.

#### External Sewage System

This involved collecting the sewage from various building clusters of the airport and transporting them to STPs. Basically, this is a closed system with 100% utilization of treated water from STP, which is being used for AC make up and irrigation.

- 14 km of CI and RCC piping.
- 3 sewage pumping stations with

#### Major Quantities of Work - ALS

Excavation	- 37 lakh Cum
Embankment	- 32 lakh Cum
GSB	- 3.70 lakh Cum
WMM/FCR	- 4.70 lakh Cum
Asphalt	- 1.60 lakh Cum
DLC	- 0.52 lakh Cum
PQC	- 0.93 lakh Cum
Structural Concrete	- 0.60 lakh Cum
Filling	- 560000 Cum
Shuttering	- 275431 sq.m
Concrete	- 140000 Cum
Rebar	- 4300 tons
Structural Steel	- 1100 tons
Roof Sheetting	- 16000 sq.m
Tile Flooring	- 4880 sq.m
Kotah Flooring	- 2596 sq.m
Painting	- 29000 sq.m
Textured Painting	- 29156 sq.m
False ceiling	- 6664 sq.m
Water Proofing	- 23163 sq.m
Glazing works	- 650 sq.m
Doors	- 390 Nos
Al joinery works	- 4743 sq.m
Masonry	- 17894 Cum

#### Major Plant & Machinery

1 Batching plant	- 110 Cum / hr.
1 Hot mix plant	- 160 tph / hr.
2 Pug mills	- 100 tph / hr. each
3 Stationary Crushers	- 150 tph / hr. each
1 mobile crusher	- 200 tph / hr.
Excavators at peak	- 30
Heavy duty dumpers	- 120
Sensor pavers	- 4
Slip form paver	- 1
Motor grader	- 10
Rollers	- 25

#### Manpower

200 Staff including approximately 6000 labourers at peak.



View of the PTB seen from the runway.

- 6 heavy duty sewage handling pumpsets with auto operation
- 2 sewage treatment plants of 925 KLD.
- 200 lavatories involved in ALS package with 16 km of internal piping.

#### Fire Fighting System

The fire fighting system with water as medium extended to all buildings in the ALS and the aprons consisting of the following:

- 16 km of piping.
- 2500 sprinklers for cargo bldg.
- 2 pumping stations with 10 pumpsets as per NBC.
- 40 external hydrants.

### HVAC

Heating, Ventilation and Air conditioning for the ALS package involved:

- 182 ventilation fans.
- 230 TR cassette units for engineering buildings.
- Central AC for cargo with 190 TR chillers.
- Central AC for engineering building with 70 TR package unit.
- Precision AC for radar building with 40 TR.
- 80 Split air conditioners for auxiliary buildings.

### Security Equipment:

Security equipments installed at the gatehouses involved:

- Fully integrated Rising bollards and boom barriers for 5 gate houses.
- Motorized swing gates for 3 gate houses.

As a part of the contract, the employer had stipulated the requirement of each of the component of the airport. Taking that as the basis the design was taken up. Expert designers in this field were given the assignment. The designs were progressively prepared and submitted to the employer for their comments and simultaneously works were taken up.

The design team stationed at ECC-HQ, Chennai encompassing all disciplines were provided with adequate and suitable hardware and software to enable detailed engineering of the project. The core design team at site interfaced with clients to get necessary inputs and to schedule delivery of requisite



*A section of the main apron*

drawings / documents to site for timely completion of works.

**Mandatory Requirement** - This included:

- Globally recognized and accepted standards of performance and service in accordance with ICAO standards & IATA guidelines.
- Requirements of statutory agencies viz., Directorate General of Civil Aviation, Bureau of civil aviation security, customs and immigration authorities.
- Conditions, regulations, measures and all requirements of whatever kind set out in order issued by the Ministry of Environment & Forests, government of India and the Andhra Pradesh pollution control board.
- Conditions, regulations, measures and all requirements of whatever kind as set out in defence and DGCA site clearance for the project.
- Conditions, regulations, measures and all requirement of whatever kind imposed by any applicable laws.

## Runway

The runway is the longest and the widest now in Inida. It is also the only runway in India designed and built compliant to the super jumbo Airbus A380 requirements. Currently it is the only runway to be validated by the International Civil Aviation Organisation (ICAO) for its standards and recommended practices.

It is a proud achievement for the team who put in a lot of hard work and toil to stringent standards and practices of the airfield construction. It took a little over 21 months to build this mammoth runway from start to finish.

### Key Parameters

The length of the runway designated 09-27 is 4260m is at an elevation of 610m above MSL. The width of the runway is 60m of carriageway and 7.5m of paved shoulders on either side. The runway design took into consideration a realistic fleet mix of aircrafts based on a 20 year



projection of traffic. LEDFAA design programme was used to design the structure of the runway. Essentially, the runway cross section consists of prepared sub-grade of 95% modified MDD of CBR 12%, selected fill of CBR 12% to 98% MMDD, granular subbase (GSB), fine crushed rock (FCR), wearing course consisting of DBM and BC. The finished surface of the runway has a constant cross slope of 1.5% on the carriageway and a longitudinal slope the runway of not more than 1.4%.

For the first time in India fine crushed rock (FCR) was used for runway works. International experts have

#### Major Quantities

The following are the major quantities executed for the completion of the runway.

Earthwork	365,695 Cum
GSB	59,296 Cum
FCR	89,088 Cum
DBM	16,586 Cum
BC	15,722 Cum
DLC	6,812 Cum
PQC	12,642 Cum

appreciated the fine workmanship and quality standards maintained in laying of this material. Sensor pavers were used for the first time to achieve the strict tolerances on the surface. To test the surface for loose spots on the FCR and sub-grade a proof roller with 507 weights was deployed for the first time in India.

The other firsts included the use of SSI primer on pavements as against SS2 normally used. This was because of the higher penetration that was specified. The runway wearing course was laid with polymer modified bitumen to maintain a higher quality of the pavement - as opposed to ordinary grade bitumen that was recommended by the clients. To reduce the variance in the levels of the asphalt surface (down to 3mm) an averaging beam was installed at the edges of the paver which doubled up as a sensor. The surface level tolerances specified were  $\pm 3\text{mm}$  for BC and  $\pm 6\text{mm}$  for DBM. Both were strictly adhered to.

The runway works were also interfaced successfully for the provision of the airfield ground

lighting ducts and utility duct banks across the runway cross section. This apart, the runway works were interlaced by intermittent extensions of connecting rapid exit taxiways. In the month of November 2006 two new rapid exitways were introduced. In the month of May 2007 another two new rapid exitways were introduced increasing the intersections on the runway to ten from the original figure of four. It is quite commendable in these circumstances that the runway works were successfully completed on schedule by August 2007.

A major challenge faced in the beginning of the project was the filling up of three major wells on the runway. This was accomplished successfully by the technique of filling with river sand and quarry dust.

**Sreechand Sreedhar**  
*Engineering Co-ordinator*  
*with inputs from*  
**M.R. Choudhary (CM-B&F)**  
**Vijayakumar (CM-BUCC)**  
**Manish Agarwal (CM - R&R)**

# Electrical Works for Illumination and Distribution

The Electrical works involved in the project were grouped in to Airside and Landside works (Package 4 Contract), which included Airfield Ground Lighting System, HT Power Distribution and LT Electrical Distribution. The Contract Particulars are given below.

Contract value : Rs. 1500 million

Contract start : September 2005

Contract period : 30 months

Staff man months : 400

Labour man months : 1000.

Safety statistics : "ZERO" Accident

## Standards & Specifications were furnished by:

- International Civil Aviation

Organization (ICAO), Montreal, Canada.

- Federation Aviation Administration (FAA), USA.
- DGCA, Civil Aviation Requirements (CAR), New Delhi.

Though the contract value increased by 85%, the contract period remained the same. The E&I project team took up this as a big challenge and acted upon to complete the same within the stipulated period to the entire satisfaction of the Client. The major quantities executed involved- 300 km of AGL cabling and 400 km of HT/LT cabling, 2000 lights on the Runway/taxiway, 45 transformers of various rating, 250 HT/LT Panels,

55km of road lighting network and 26 substations.

The above works were executed by ECC on a war footing basis in a vast area of 2000 acres, spread on a 8km x 6km plot.

The Standards and specifications of electrical items were world class and latest in technology. The imported items were 60% in terms of value. Material management had been done in a perfect way such that at any point of time the work did not stop due to non-availability of materials.

The airfield ground lighting systems (AGLS) are fully operational with the following features.

- PAPIs (precision approach path indicators)



*Illuminated view of main PTB apron during night*

- Runway approach lighting, Centreline lighting, edge lighting, end lighting and threshold lighting system
- Taxiway centreline lighting, edge lighting system
- Taxiway guidance signs

The following systems were commissioned and fully operational on real time basis by L&T. Moreover, this is somewhat unique and the new Hyderabad International Airport is the first indian airport having these world-class facilities.

- AGL remote control and monitoring system, commissioned at ATC tower - State of the art touch screen operation with OFC backbone online control and monitoring system
- Taxiway centreline lights individual lamp monitoring system is a facility to monitor individual lamps of taxiway center lights and to provide specific path to the pilot from runway to apron parking stand.
- Emergency DG backup system involved: 11kV DGSets, 2000KVA each - 6 Nos auto changeover / synchronize / load sharing / load shedding mode for power back



*View of ATC & apron service road with lighting masts*

up to AGL critical circuits within 15 secs (CAT-I requirement) and other passenger terminal building facilities within 60 secs, using high end programmable Logic controllers (PLCs) with redundant facility.

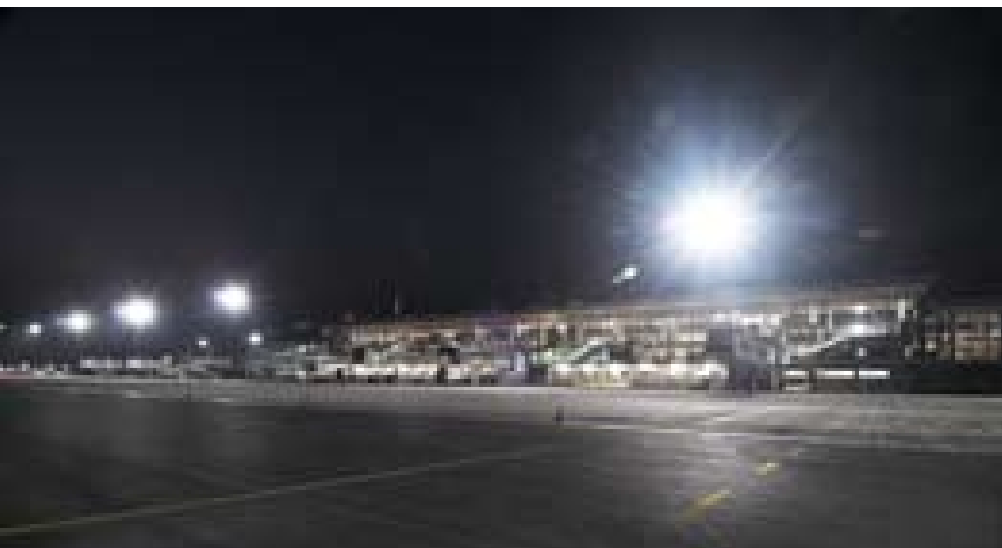
- 11kV HT power distribution in ring main configuration for 20

cluster substations (11/0.433kV) having a length of 55km with central monitoring facility at airport operation control center (AOCC).

- Zero change over time facility for runway centre line lights, edge lights, end lights and threshold lights circuits of airfield ground lighting system (AGLS).
- Unique world class apron lighting control and monitoring system by using common Airport Community OFC Network
- Hotline communication facility, crash fire alarm system between Air Traffic Control tower, fire station and AOCC.

This project is yet another milestone in L&T-ECC's journey towards building its capability of constructing world-class international airports on EPC basis.

*A. Dhanapal,  
Construction Manager  
(Electrical), HIAL Project*



*Illuminated view of the Airport, seen from the airside*

# New Bengaluru International Airport Ready for Commissioning

The long awaited swanky new Greenfield International Airport at Bengaluru is ready for commercial operations from May 23, 2008.

Devanahalli, a sleepy village 35 km away from the Bangalore City, suddenly shot in to limelight in 1991, when the Central and State Governments decided to shift the existing HAL airport to this new Greenfield location. Construction work on this first ever Greenfield Airport at Devanahalli which

commenced in July 2005 was completed on schedule by Larsen & Toubro (L&T) in 30 months. Test run of the commercial flight operations were conducted on March 7, 2008 and Air Deccan, Kingfisher, Jet Flights including L&T K-7 aircraft & IAF aircrafts touched down the virgin 4000m runway heralding a new era of air traffic.

At peak of construction, more than 200 engineers and administrative staff with 5200 workmen wearing yellow and blue safety helmets carried

out the construction of this airport bustling with various activities, non-stop for 30 months under devastating weather conditions like heat, cold, rain, noise, dust and pollution.

With hardly any infrastructure in place for access, transport and accommodation, this virgin land on a remote location was transformed by battalions of workmen. Till end of March 2008, this was a beehive of buzzing activities and what stands today on this barren ground is a



*The Passenger Terminal Building at Bengaluru International Airport, Devanahalli*

landmark structure dotted with a 4000m long runway and 71,000 sq.m terminal building, a 65m high air traffic control tower with many other amenities and facilities for a passenger friendly air-traffic. The runway is designed and built to ICAO standards and it is compatible for B-747 aircrafts.

Of the total 4,000 acres of land, around 2,000 acres are occupied by the runways, terminal buildings, air traffic control tower, parking bays and other structures. The remaining land is used for other related infrastructure including phase-II expansion, extended air cargo terminals and cold storage including hotels, landscaping and horticulture facilities.

The air traffic control tower attracts every visitor as one approaches the airport and this leads you in to the

sprawling transparent passenger terminal building with its beautiful parking bays, ticketing counters, reception and spacious visitor lounges before one enters the departure bays.

The exuberance of architectural and structural elements like the large glass facade panels, extensive black granite floor studded with granite clad columns standing tall and the entire area capped with specially designed precast shell roof elements with north light glazing stretching from one end to the other is totally awe inspiring and gives you a feeling of transparency, warmth and openness. One can bubble with energy in this new environment, which is the most striking feature of this passenger terminal building. The entire structure glows with pride like a shining star during the night.

The airport went through some last-minute design changes in December 2005 to accommodate an increase in the expected passenger traffic for the projected opening in 2008. The estimated traffic flows which stood at 6.7 million passengers during 2005-06 was expected to touch 8.5 million by 2010. Hence this necessitated an increase in the size of the passenger terminal building, number of aircraft stands, taxiways, passenger boarding bridges and the main access road enabling the airport to match the expected traffic in the coming years. The new airport has the capability to handle 11 million passengers per year and 45 aircraft per hour.

#### **Public - Private Participation**

Built on public-private participation, the airport was executed by Bangalore



*Close-up view of shell roof elements and the glass facade at the entrance to the Passenger Terminal Building*



*Towering view of the Air Traffic Control Tower*

International Airport Limited (BIAL), a consortium of companies comprising Siemens, Zurich Airport and Larsen & Toubro holding 74% stake while the state government & AAI holds the remaining 26%. The detailed equity holdings held by the government and private promoters are as follows:

- Airports Authority of India: 13%
- Government of Karnataka: 13%
- Siemens Project Ventures: 40%
- Larsen & Toubro: 17%
- Unique Zurich Airport: 17%

The airport has been designed by Kaufmann and Van der Meer Planer AG of Switzerland. However, the structural, architectural & mechanical services design, detailing, procurement and construction have been carried out by ECC, L&T's Construction Division.

The supply, engineering and installation of airfield lighting, the IT and communication systems, the baggage handling system as well as the power supply and the building services automation system were all executed by Siemens.

Construction of the airport mainly involved major works as follows:

### **Site Preparation**

Site preparation involved site grading and clearance of thick bushes as well as putting up temporary structures including major earthwork excavation to the tune of 70,20,000 Cum.

### **Airside Infrastructure**

Building the airside infrastructure involved construction of a 4000 meter long 60 meter wide asphalt paved runway including 7.5m shoulders on either side; 1,80,000 sq.m of allied taxiways; 3,66,000 sq.m of aprons with rigid pavement, aircraft isolation bay and the civil works for the airfield lighting. The

runway is designed to cater to B-747 aircraft.

### **Passenger Terminal Building**

The moment passengers descend from his or her vehicle in front of the passenger terminal building (PTB), they are led in to the spaciouly designed and sheltered passenger drop-off area, which can receive a large number of passengers, well-wishers and other visitors. Making an entry in to the PTB, one can see the vastness of space with a clear view of the two levels – the ground and first floor levels. The ground floor is provided with an array of 54 Common User Terminal Equipment (CUTE) with passenger check-in counters, which look very beautiful with its trim and sleek design, just to ensure quick verification and issue of boarding passes.

Automatic x-ray screening of check-in baggage helps passengers to move quickly to the security check without wasting time and take their seat in the security lounge either in the ground floor or first floor and await their boarding call. Special display system ensures operation of any counter at any point of time by any airline by selecting the required name. Vertical transportation as well as elevators and stair cases help passengers to reach the first floor level.

In addition there will be 18 express counters in peak hours for facilitating quick movement of passengers with just one hand baggage. Swing gates are provided for ease of operation and flexibility. There are seven baggage handling units. Around 1700 chairs imported from Switzerland are installed in various holding areas.

Also 5 massage chairs – one in the VVIP lounge and 4 in the terminal are installed for the benefit of passengers to ease out their tension.

### **Construction Marvel**

The passenger terminal building (PTB) is an outstanding example of marvellous construction by L&T. Having a floor area of 71,000 sq.m and built in three levels, the PTB is specially created for a hassle-free flow of passengers. The terminal building is 218m long, 147m wide and 15.7m high and at peak, this can handle more than 2700 passengers at a time.

Keeping in mind all comforts of air passengers, the terminal building is proposed as a single, fully air-conditioned structure catering to every international and domestic



*Inside view of the spacious Passenger Terminal Building*

# Innovative Erection Method for the Unique Roof Element...

The Unique 'S' shaped precast concrete roof element used in the passenger terminal building at Bangaluru International Airport called for special techniques for fabrication and erection.

Since the project required a large number of roof elements, to begin with a dedicated production yard had to be established near the terminal building with necessary facilities like casting moulds, handling equipments like gantries for lifting and placing etc. Precast elements were produced using custom-built steel moulds with near zero deflection, employing prefabricated reinforcement cage and self compacting concrete. After pre-stressing, elements were shifted to storage area by high speed long stroke hydraulic jacks. From storage yard, elements were transported by a special trolley to the terminal building site for erection after attaining the required strength.

Lifting and placement of each element was carried out by custom built two tier portal gantry cranes. While the lower gantry facilitated lifting of elements by top level gantry directly from the shifting trolley, this also enabled shifting the top gantry to next bay after completing the erection in each and every bay. Similarly, the top gantry equipped with strand jacks, carried out the lifting of element from trolley, moving it and

placing the same in its final position including alignment in one single operation. The most challenging aspect of erection was the handling of delicate elements, each 24m long and placing them at a height of 19m with a clearance of only 25mm. To ensure safe & trouble free operations, the entire set of erection equipment was load tested before commencing the erection works. Moreover, the entire production and erection scheme was devised in such a manner, that no element was over stressed at any stage during the erection operation.



Yet another significant aspect of this innovative erection method included the elimination of high capacity lifting cranes and avoidance of any type of modification to the main structure. This apart, every major activity was automated using hi-speed hydraulic jacks resulting in optimum cycle times and reduced manpower. Using this technique, a total of 234 elements were erected in a short span of five months with an average of 2 elements per day.

The complete erection methodology including the design of enabling structures was done in-house by an expert team of Construction Method engineers. Meticulous planning in design of enabling structures coupled with automation of activities ensured that the fabrication and erection of roof elements were completed ahead of schedule with excellent quality standards, setting a new benchmark for similar works in future.

*K. Senthilnathan  
Head (EDRC - Transportation & Infrast)*

*View of the Passenger Terminal Building as seen from the car park*



flight passengers. Salient features of this include easy check-in, ease of movement to departure gates, minimal queuing as well as comfortable shopping and waiting areas. Thus, the entire PTB functions like a Central Processing Building, for departures and arrivals, baggage handling, security check, departure lounges, and arrival baggage claim.

Moreover, the design reflects the best of airline industry practices and caters for 24-hour-operations, under all weather conditions, meeting complete requirements of the IATA standards.

#### **Concrete Shell Roof**

According to Mr. Javeed Shakil, Project Manager of L&T at BIAL

project, “Bangalore International Airport is the only Airport in India which is provided with a concrete shell roof. The north light glazing is an excellent design concept which not only provides a solution for the day-lighting, but also enhances the architectural beauty as well as the functional efficiency of the building. Moreover, this is eco-



*Illuminated view of the PTB*



friendly being incorporated with green concepts. The large glass facades and integrated columns induce a feeling of spaciousness. Since modular design concept has been adopted for the building, it can be easily dismantled and expanded whenever and wherever required for enhancing the passenger amenities”.

“The PTB has nine bays and there are 26 precast shell roof elements installed in each bay. Each element is 24m long and 7m wide. All the elements were cast in one single yard at site and transported to the point of erection. Self Compacting Concrete was used for high quality finish of the roof element”, says Mr. Shakil.

### Terminal parking

A beautiful car park in front of the terminal building at the ground level has been developed with aesthetic landscaping and garden provided with fountains, etc. for the convenience of passengers and visitors to the airport.

### Ancillary Buildings

The strategically located Air Traffic Control (ATC) Tower having a height of 65m enables complete view of Airside Operations for all Phases of the Airport. It is one of the few Airports which have the Tower on the landside. In addition to the above infrastructure, a number of ancillary structures have been constructed to meet various requirements for the operation of the airport. This includes:

- A three level Administration/Canteen/Security/Technical Block (5260 sq.m),
- Maintenance Buildings – Civil & Electrical and Mechanical (2909 sq.m),
- Aircraft Rescue and Fire Fighting Building (1457 sq.m),
- Ground Support Equipment Building (1984 sq.m),
- Other Buildings – DG Power House, Main Power Substation, Compact Stations, Navaid Buildings (4107 sq.m),
- VVIP terminal (282 sq.m),

- Watch towers (145 sq.m),
- Security cabins (75 sq.m),
- Public amenities (326 sq.m)

### Landside Infrastructure

- A four lane main Access Road
- Secondary access road
- Access roads to buildings
- Car park and bus park – departure car drop-off for 100 vehicles Arrival car pick-up for 58 vehicles Car park for 1550 vehicles, Bus bay for 10 vehicles includes Private Taxi Parking.
- Traffic Loop in front of terminal building
- 1.3 km of main access road connecting trumpet flyover outside the boundary
- Civil works for electrical services
- Landscaping and irrigation – landscape is along the main access road including rotaries, in front of terminal building and car park. Landscape design has been done to ensure that no fruit bearing trees which attracts bats and birds are planted.

## Test Run of Commercial Flights at the New Bengaluru International Airport

With the first touchdown of a chartered Kingfisher flight from Mumbai with invited passengers and media persons at Devanahalli airport on March 7, 2008 at 9.50 am-10 minutes ahead of scheduled arrival, the swanky new Bengaluru International airport was all set for opening to air traffic.

The aircraft taxied down the apron as the two snorkel fire tenders threw water jets in to the air, creating a 'Water Arch', in a spectacular way, much to the cheer of the media and guests.



*Touch down of commercial flights at Bengaluru International Airport.*

Following this, Mr. K.V. Rangaswami, President (Construction) & Member of the Board Larsen & Toubro arrived from Mumbai by the L&T aircraft.

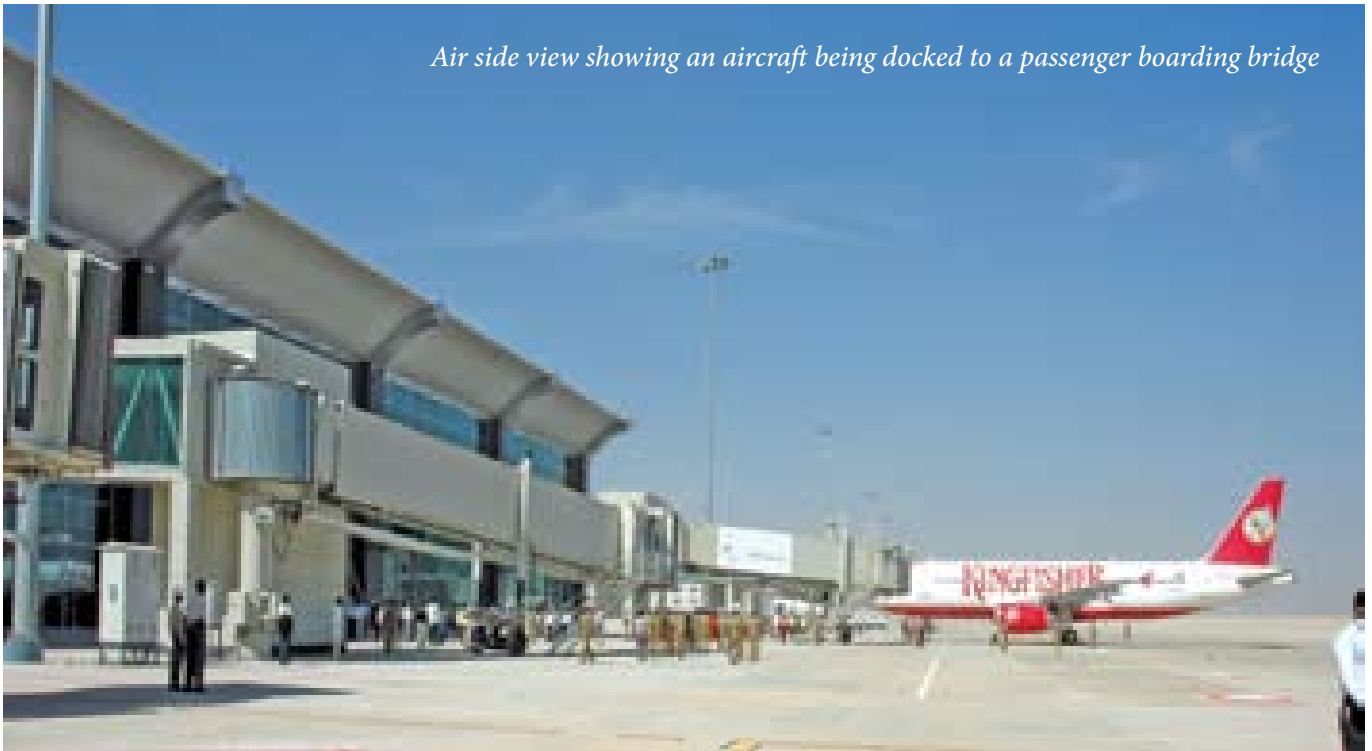
Two defence aircraft also took part in the test flights. The Air Deccan flight, which took off from the HAL airport then landed in the new airport, culminating the day's itinerary of flight arrivals.

Mr. Albert Brunner, CEO of Bengaluru International Airport Limited (BIAL) received KVR as well as all other passengers. A media meet arranged in the terminal saw Mr. Brunner address the invitees and media persons on the facilities in the airport as well as his future plans and operation strategies. KVR also interacted with the media.



*Mr. K.V. Rangaswami, President (Construction) and Member of the Board L&T (second from right) along with L&T colleagues after successful completion of trial run of commercial flights at the New Bengaluru International Airport.*

*Air side view showing an aircraft being docked to a passenger boarding bridge*



Water supply, sewage and storm water drainage

- Water supply and distribution system, including fire water supply, pump houses
- Sewage supply lines, collection wells and pumping stations,
- Sewage treatment plant,
- Storm water drainage network including rain water harvesting.

#### **Miscellaneous Works**

- IOTL fuel pipelines and hydrants
- Cargo complexes for handling 300,000 tons capacity annually
- Trumpet flyover
- 5 star hotel with 321 rooms, restaurants and a world class spa.

#### **Future Opportunities**

The Airport Land is likely to see

large commercial development. Likely jobs include

MROs, ISP provider building, Golf course, IT hub, Commercial development – Airport City, Railway station, Airport expansion

*K. Sridharan  
CCD-ECC HQ,  
Chennai*

*The 4,000m long runway at Bengaluru International Airport*



# Calicut International Airport

Calicut Airport is one of the three international airports located in Kerala. Calicut Airport was given the status of international airport on February 2, 2006, thereby paving the way for the improvement of the infrastructure there for handling international flights.

Calicut International Airport is located at Karippur in Malappuram district, near Calicut (Kozhikode), Kerala, India.

The airport, was sanctioned after a long period of struggle which began in 1977 under the leadership of freedom fighter late K.P. Kesava

Menon. Funds were collected from Gulf Malayalis for its development in the 1990s when the Union Government said it did not have funds. To raise the funds needed for airport development, the Malabar International Airport Development Society was constituted. Later major



*The new Calicut International Airport after renovation.*



*Inside view of the Passenger Terminal Building*

development of facilities, such as extension of runway from 1800m to 2700m to facilitate operation of big-body aircraft were carried out with loans from HUDCO.

The approach to Calicut airport runway is surrounded by hills and valleys. Airports Authority of India have provided runway lead-in lighting system for the first time in India at Calicut airport as per the recommendations of the Directorate General of Civil Aviation.

The system has been put into service for night operations since October 2003. Supplementing the above lead-in lighting system, solar-powered aviation obstruction lights are also provided at eight critical hilltops around the Calicut Airfield.

Airlines currently operating from Calicut Airport are Air India, Air Deccan, Indian Airlines, Jet Airways, and Sri Lankan Airlines

### **Calicut International Airport**

Kozhikode International Airport also known as Karipur Airport, is located at Karipur in Malappuram district, near Kozhikode (Calicut), Kerala, India. The airport is located 26 km from the Calicut Railway Station and 27 km from Manjeri town. The closest railway station is Feroke.

### **Recent Renovation, Upgradation and Expansion**

Due to the recent Rupees one billion upgradation of existing facilities, the infrastructure at Kozhikode International Airport is ready to receive international flights.

An inline baggage system, the first of its kind in India that will do away with the separate X-ray of baggage, is installed at the airport. Several airlines have sought night parking facility at the airport, which has presently 10 parking bays. Permitting night parking at the airport will soon

greatly improve air-connectivity. Airports Authority of India (AAI) will provide three aerobridges (plus options for two extras) at the airport which will help passengers directly enter the terminal while alighting from an aircraft.

A 15,000-sq.m international arrival terminal has been opened to passengers, similar to the modern and spacious international departure terminal that became operational on May 14, 2007. Three modern and user-friendly conveyor belts are installed at arrival terminal and 800 stainless steel chairs for passengers in the security-hold area.

Escalators and elevators are also installed inside and outside the terminal building. Facilities for the passengers and visitors like fast-food counters, luggage room, jewellery shop, handicraft stall, traffic direction poles, restaurant, and cyber café are also opened at the airport.



The plush and practical interiors and convenient facilities, including leather sleeperettes for transit passengers, has definitely brought the airport to international standards; a great improvement from the stuffy and cramped area it once was.

### **Lead-in lighting system**

The approach to Kozhikode airport runway is surrounded by hills and valleys. The approach funnel area of the runway 28 is having 30 70-m deep undulated valley up to a distance of 6000m, immediately following the tabletop runway, 2860m long. This called for a special type of approach guidance / lighting system to enhance safety for aircraft operations both during night and during rains with poor visibility conditions.

Airports Authority of India thus provided runway lead-in lighting system for the first time in India at Calicut airport as per the recommendations of the Directorate

General of Civil Aviation, at a cost of Rs. 170 lakhs.

The lead-in lighting system is a positive visual guidance to the pilot along a specific approach path for reasons such as avoiding hazardous terrain, etc. It facilitates the pilot to follow the desired approach path. The system is designed in such way that one group of lights is sighted from the preceding group of lights, finally leading the aircraft to the proximity of threshold of the runway.

As per standards the runway lead-in lighting system, consist of groups of lights positioned on the desired approach path at an interval of not more than 1600 m on the extended approach path of the runway. The desired approach path could be curved or straight line.

The lead-in-lighting system at Calicut airport provides desired approach path in the extended centerline of the runway. Group of light units are installed on the top of the 30 m

high lattice towers at four locations: 1826 m, 3121 m, 4721 m and 6193 m from the threshold of runway 28. Each group of light consists of three sequential flashing lights in linear configuration. The lead-in-light units are powered through solar power system at each tower locations with battery banks and inverters. The lead-in-light system is planned with radio control units for remote operation. The System operates in three pre-selected intensity level at a flashing rate of 120 flashes per minute to meet the various ambient conditions.

The system has been put into service for night operations since October 2003. The Radio Frequency control for remote operations of the system from ATC tower is also planned.

Supplementing the above lead-in lighting system, solar-powered aviation obstruction lights are also provided at eight critical hilltops around the Calicut Airfield

# Delhi International Airport

## Moving on Fast Track

L&T is executing the Rs. 5400 crore Engineering, Procurement & Construction Contract for GMR Group which holds a majority stake in the recently privatized Delhi International Airport Limited (DIAL). The project scope involves Concept Enhancement, Design, Procurement and Construction of Delhi International Airport by L&T in a very tight schedule of 39 months.

The Project aims at enhancing the traffic handling capacity of the airport from the existing 12 million

passengers per annum (MPPA) level to 37 MPPA upon completion. This means from the existing capacity of 33000 passengers per day it is expected to be enhanced to 1 lakh passengers per day by 2010 Delhi Commonwealth Games. Currently, the existing runway and terminal facilities are severely overstressed by more than 150% of its capacity utilization at peak hours resulting in tremendous discomfort to all. Hence this fast track project has been kick started and L&T was chosen to execute this project in this stringent timeframe.

### Scope of Works

The Scope of work involves construction of an additional runway, taxiways, aprons, new terminal building - T3 for international and domestic passengers with all international standard state-of-the-art specialist Airport systems like airfield ground lighting, aviation fuel hydrant system, satellite rescue & fire fighting, visual docking & guidance system, baggage handling system, passenger boarding bridges, integrated airport IT systems, etc. To support the airport infrastructure,



*A section of the existing Terminal Building at the Indira Gandhi International Airport, New Delhi*

*Perspective view of the T-3 passenger terminal building under construction at IGIA, New Delhi*



the project also involves design and construction of many ancillary structures like multi level car park, airport services building, sewage and water treatment plants, electrical substations with large backup power facility, etc.

### **Indira Gandhi International Airport**

The Indira Gandhi International Airport (IGIA) at New Delhi serves as the prime gateway to international passengers for the North and North-West India, providing domestic air links to all metropolitan cities and many other cities in the country.

Located on the southern outskirts of the city, approximately 15 km from the city centre, the airport is contained within an extensive land holding of over 22 square kilometers.

The Airport presently has two runways and separate terminal complexes for domestic and

international operations with the domestic complex consisting of three buildings. The two runways are designated 09/27 and 10/28. The current southern runway 10/28, is the duty runway and is used nearly 90% during the year, due to the prevailing wind direction. Runway 10/28 is 3,810m long x 45m wide while Runway 09/27 is 2,813m long x 45m wide.

### **Project Background**

In 2005, the Airports Authority of India (AAI) initiated the process of selection of joint venture partners for the modernisation and upgrading of the Indira Gandhi International Airport at New Delhi under an Operation, Maintenance & Development Agreement (OMDA).

In February 2006 a Consortium led by the GMR Group was declared as the successful bidder for works. The consortium comprises the GMR Group, Fraport AG, Malaysia

Airports Niaga Sdn Berhad and Infrastructure Development Fund. In April 2006 Delhi International Airport Private Limited (DIAL) was incorporated as an independent Joint Venture Company comprising the Consortium 74% and AAI 26% shareholding.

DIAL took over the operations management of Delhi airport with effect from May 3, 2006. The prime objective of DIAL is operating, maintaining, developing, designing, constructing, upgrading, modernising, financing and managing the Airport. The vision formulated by DIAL is to build, operate and manage the airport to international standards with emphasis on two areas:

- World class development and expansion
- World class airport management

In addition to operations and the development of the existing Terminal

T1 (Domestic) and Terminal T2 (International) DIAL shall implement a 20 year airport Major Development Plan (MDP) developed by the Lead Technical Advisor (LTA) consultant group comprising of, Mott MacDonald, HOK Architects and Pell & Fishman.

Thus MDP envisages developments in four stages with the current Project being Phase 1. Phase 1 comprises of a new runway, passenger terminal building (T3) and other supporting infrastructure.

The Phase 1 of the Project is conceived in two stages, the first (Phase 1A) is to provide an operational new runway and taxiway by February 2008 (extendable up to June 2008) while the second (Phase 1B) is to complete the remainder of the works by February 2010 to coincide with the 2010 Commonwealth Games being hosted by the Government of India.

**EPC Contract**

L&T is executing the EPC contract for the new development of Delhi International airport in Phase-1 which was awarded on December 9, 2006.



*Canyon view image of the Passenger Terminal Building under construction*

DIAL engaged Parsons Brinckerhoff Ltd., (PB) as the Project Management Consultant (PMC) for the Phase 1 of project.

**Scope of Works**

**Phase 1A**

Construction of new run way 11R/29L to 4430m x 60m along with a parallel taxiway and connecting rapid exit taxiways.

**Remote Aprons**

To be constructed to provide the additional stands required due to the new runway.

**Airfield Ground Lighting and Power Supply**

The navigation lights on the runway, taxiway and the aprons for navigating the aircrafts to the landing and stands

**Satellite Rescue & Fire Fighting**

Facility housing airport rescue fire fighting facility with high speed/foam appliances available all time to reach any part of aircraft operational surface within 3 minutes of fire accidents.

**Precast Boundary Wall**

To secure the runway and taxiway and form the boundary between airside and landside including.

Storm Water drainage and Sanitary Drains

**Phase 1B**

Passenger terminal building (T3) catering to domestic and international travel including all MEP, IT and special airport related services, such as:



*Work in progress at the new Terminal Building*



*Phase 1A Taxiway Asphaltting works in progress*

- Forecourt
- Passenger Boarding Bridges
- Visual Docking & Guidance System
- Landscaping
- Baggage Handling System
- Multi Level Car Park
- Airport Services Building
- Airport wide IT Systems
- Contact Aprons
- Twin Parallel Taxiway
- Airside & Landside Roads
- WTP & STP
- PTB link to the DMRC airport station and improving the road network.
- Fuel farms & Aviation Fuel Hydrant System

### **Project Organization**

This Task Force Project emulates a unique model, where 3 different SBU's synergize to ensure completion of the project in a record time. The complexity and enormity of the project has been abbreviated by continuous interaction for interfacing works. Leveraging strengths and inter BU resource sharing to achieve optimization at higher levels in the project are certain unique features of this Project.

The project also forms a glorious example of inter-divisional camaraderie – where L & T Infotech

is lending its expertise in IT design and converting user requirements into vendor specifications.

### **Current Status**

The design & procurement activities of the project have reached very advanced stage of completion and 13 international specialist vendors have already been brought on board. The detailed design for airside design is almost complete and the for the basic architecture for the terminal building structure and all the specialist systems design have been finalized. The ongoing design activities are mainly detailed design for terminal building structure, IT system schematic design and finalization of terminal building interior and exterior finishes.

At site, the construction works are going on in full swing with the two major packages of airside construction for Phase 1A and terminal building structure, finalized in July 2007. The work on the runway construction is completed. The airside construction team has completed the Phase 1A airside works.

The construction works of terminal building is also going on in full swing round the clock with over 16,000 workmen and 1200 design and construction staff deployed by L&T in a short time.

The peak workmen strength is likely to exceed 23000. A full fledged workmen colony with dedicated construction skills training centers have been constructed as site infrastructure.

More than Rs. 150 crores worth P&M has already been deployed by L&T to execute this challenging project.

The project being of a very high profile nature with national importance, there is a continuous media focus on the developments taking place. The project is given the utmost attention and support by L&T management with our Chairman himself being part of the Executive committee which includes the Chairman of GMR.

*R. Shankar Narayanan  
Planing Manager*



*Phas 1A - Remote Apron 301 to 305 stands handed over & operational*

# Chhatrapati Shivaji International Airport (CSIA)

## A strategic alliance between MIAL & L&T

As a crucial step forward in the modernization and expansion of Chhatrapati Shivaji International Airport (CSIA), Mumbai International Airport Pvt. Ltd (MIAL) on October 30, 2007 awarded the EPC contract to India's leading technology, engineering and construction company Larsen & Toubro (L&T). According to the contract, L&T has been mandated to build the new integrated passenger terminal and expand the existing facilities, which will also include the airside and landside works to be executed on a turnkey basis. Accordingly, the new terminal, catering to both domestic and international passengers is expected to double the passenger-handling capacity to 40 million passengers per annum. The total built up area of the new terminal will be 4.84 million sq.ft.

The scope of works apart from civil and structural works in the passenger terminal building involves finishing works, electrical and mechanical installations, passenger boarding bridges, elevators, and escalators, IT systems, security systems, flight information display systems, baggage handling systems, building management systems, furniture and signage, etc.

The airside works includes reconstruction of the runway (RW 09-27, RW 14-32), taxiways of 4.0 lakh sq.m and aprons of 8.00 lakh sq.m which will accommodate large wide bodied Code-F aircrafts, airfield ground lighting system, ARFF station and equipment and other airport support buildings.

Ancillary facilities include construction of new international cargo terminal of approximately 1.0 lakh sq.m, new air traffic control tower at Santa Cruz, new multi-storey car parks at Sahar and Santa Cruz, etc.

The entire project will be commissioned in a phased manner from 2010 to 2012.

### About MIAL

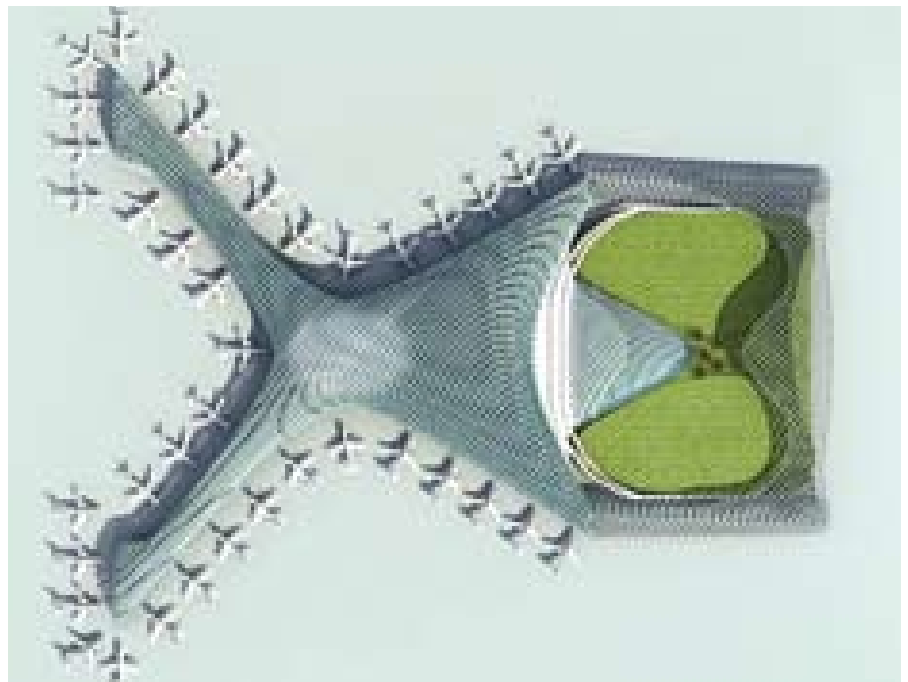
Mumbai International Airport Pvt. Ltd. (MIAL) is a joint venture between the GVK-SA consortium and Airports Authority of India. MIAL was awarded the mandate of modernizing and upgrading Chhatrapati Shivaji International

Airport (CSIA) in April 2006. CSIA is India's busiest airport and will cater to 26 million passengers and 520,000 tonnes of cargo in 2007-08. MIAL's vision is to transform CSIA to one of the world's best airports that consistently delights customers and be the pride of Mumbai.

### GVK

GVK is amongst India's largest infrastructure developers with experience and expertise spanning areas including power, roads, airports and urban infrastructure. Till recently GVK has invested over Rs. 5,000 crore into infrastructure projects and has on-hand projects in the pipeline of over Rs. 12,000 crore.

*Perspective view of the Chhatrapati Shivaji International Airport, Mumbai*





# Kaleidoscope

## New Orders

### Rs. 3,500 crore Order for Construction of IT Parks, Hotels & Malls

L&T Construction Division has recently secured orders on Design and Build/Turnkey basis from leading Developers/ Owners. Prominent amongst these include Rs. 2000 crore orders from M/s. Kingston Properties Pvt. Limited for construction of various office & residential buildings in Mumbai, to be developed in a span of 4 years.

Apart from this project, secured orders for many assignments including Rs. 665 cr design & build contract from M/s. Cognizant Technology Limited for their development centres in Chennai and Kolkatta.

Rs. 187 crore turnkey order from M/s. ITC Hotels Limited for their Grand Chola Hotel at Chennai. The scope involves construction of 1.52 million sq.ft. area to house 600 rooms.

Rs. 408 crore contract from M/s. ICICI Bank for construction of their office building at Hyderabad. The scope involves construction of 4.0 million sq. ft. area of building, having basement plus 16 floors.

Rs. 300 crore order from M/s. CSJ Infrastructure Pvt. Ltd for construction of 3.00 million sq.ft. building at Chandigarh for development of malls, office space & hotel.

In the first 9 months of this financial year, the Buildings & Factories business unit has bagged contracts

worth approximately Rs. 12,500 crore including Mumbai International Airport Limited (MIAL).

### Rs. 2000 Crore Bombay Dyeing Contract

L&T's Construction Division has recently secured a major order from Bombay Dyeing valued at Rs. 2000/- crore for developments at the Textile & Spring Mill complexes at Worli and Wadala regions of Mumbai respectively.

The turnkey project involves construction of mixed-use developments of approximately 4.00 million sq. ft. at the Textile Mills at Worli and 5.00 million sq. ft. at the Spring Mill developments at Wadala to be completed in the next 46 months by the end of December' 2011.

### Rs. 287 crore Elevated Access Road Contract to Mumbai International Airport

ECC has secured a Design and Build contract from Mumbai Metropolitan Region Development Authority (MMRDA) for the construction of Elevated Access Road from Western Express Highway (WEH), Mumbai, to the Chatrapathi Shivaji International Airport (CSIA).

Valued at Rs. 287.37 crore, this is to be completed in 30 months. The scope of work involves design and construction of 1850m-long, 6-lane corridor consisting of pedestrian and vehicular subways, resurfacing of roads at Western Express Highway

including the construction of a 1150m long, 6-lane elevated access road as well as one 165m long tunnel. The elevated access road will be built using segmental construction technique.

When completed, this critical project will provide easy and quick access to and from Chatrapathi Shivaji International Airport being developed by Mumbai International Airports Limited.

### Rs. 1107 crore Order from SAIL-IISCO

ECC has bagged orders worth Rs. 1107 crore from SAIL for the turnkey construction of Coal & Coke Handling Plant and Base Mix Preparation plant at IISCO Steel Plant, Burnpur, in West Bengal.

The scope of work for this order include basic and detail engineering; supply, erection of mechanical, electrical and instrumentation works; complete civil and structural works including testing and commissioning of the same. This turnkey project is to be completed in 26 months.

Mr. K.V. Rangaswami, President (Construction) and member board of Larsen & Toubro said "L&T is a leading player in the field of Bulk Material Handling Projects, and has been active in this field for over 27 years, catering to Steel, Power, Port and Cement sector requirements. Further, L&T is well known for its track record of high quality and on-time delivery."



*Mr. K.G.Hariharan (Right) Sr. Vice President, IP&U, receiving the initial mobilization advance cheque of Rs. 74.33 crore from Mr. Neeraj Singal, Managing Director - Bhushan Steel Limited in the presence of Mr. Brij Bhushan Singal - Chairman - Bhushan Steel Limited and Mr. T Azhaguvel - Regional Manager - Kolkata.*

He further added “L&T has already signed a contract for executing the Sinter Plant Package for SAIL at IISCO Burnpur Steel Plant on a turnkey basis. With these orders L&T has emerged as the largest partner in the implementation of 2.5 mtpa modernization project at IISCO Burnpur”.

#### **Rs. 1687 crore Orders for Water Supply Project, Steel Plants and Coal Handling Plant**

ECC has bagged four orders worth Rs. 1687 crore from the Government of Rajasthan, Bhushan Steel-Orissa, SAIL Bokaro Steel Plant and the Damodar Valley Corporation (DVC). The orders are for water supply projects, sinter plant and cold roll mill and a coal handling plant.

An EPC contract worth Rs. 635 crore secured from the Public Health Engineering Department, Government of Rajasthan, is for Design, Supply, Build and Commissioning of Barmer Water Supply Project.

The scope of work involves laying of pipelines of various diameter in Mild Steel extending to approximately 220 km; design and construction of 172 MLD Water Treatment Plant, Raw Water Reservoirs including supply and installation of Pumping machinery, Electrical, Instrumentation and Automation control systems . The project is scheduled to be completed in 18 months.

When completed this project will cater safe drinking water to the people of Jaisalmer and Barmer including Army bases located there, benefitting the public at large.

In another development – ECC in consortium with Outotec GmbH has bagged a Rs. 555 crore Sinter Plant order from Bhushan Steel Limited (BSL). The project is located at Meramandali, Orissa. To be commissioned in 30 months, this Sinter Plant will have a grate area of 2 x 204 sq.m with a gross production capacity of 4.60 million tons per annum (MTPA).

The scope of work for Outotec covers basic engineering, supply of imported proprietary and special equipments as well as technical services while L&T’s scope covers detailed engineering, supply of indigenous mechanical equipment, electrical and instrumentation works including complete site services comprising of civil, structural and erection work. L&T’s scope of work in the project is valued at Rs. 450 crore.

L&T - Outotec Consortium has recently completed a 2.3 MTPA Sinter Plant (SP#4 – 1x204 sq.m) on turnkey basis at Tata Steel, Jamshedpur. This consortium is currently executing a 1 x 496 sq.m Sinter Plant, for Tata Steel at Kalinganagar, Orissa and a 2 X 204 sq.m Sinter Plant, for SAIL-ISP Steel Plant at Burnpur, West Bengal. This new order re-confirms L&T-Outotec’s leadership position in the Steel Industry for construction of Sinter Plants.

Outotec, GmbH is the world leader in Sintering and Pelletising technology.

It is known worldwide for providing innovative and environmental friendly solutions, for a wide variety of customers, in metals and minerals Industry.

Apart from these two orders ECC has bagged a Rs. 272 crore order from SAIL Bokaro for the construction of Civil Works for New Cold Roll Mill. To be completed in 24 months, the scope of work includes construction of foundations for shop buildings as well as for all other equipment.

This New Cold Roll Mill complex will be part of SAIL's program of expanding its capacity at Bokaro to 7 MTPA. L&T has executed similar projects for TATA STEEL for their Cold Rolling Mill complex at Jamshedpur.

In yet another significant development, ECC has secured a Lump sum Turnkey Contract worth Rs. 330 crore from Damodar Valley Corporation (DVC) for Coal Handling Plant at their Koderma Thermal Power Project Stage-1 (2 x 500 MW) in Jharkhand. This Green Field project is to be completed in 30 months.

L&T secured this EPC contract against international competitive

bidding. The scope of work includes basic and detail engineering; supply, erection of mechanical, electrical and instrumentation works; complete Civil and Structural works including testing and commissioning of the same.

### Transmission Line Orders

ECC has bagged three orders totaling Rs. 458 crore for transmission line projects. The company has received a Rs. 238 crore order from M/s. Jaypee Powergrid Limited (A Joint Venture between M/s. Jaiprakash Hydro Power Limited & M/s. Power Grid Corporation of India Limited) for the construction of 155 km of Transmission Line for evacuation of power from the 1000 MW Kacham-Wangtoo Hydro Electric Project.

The scope of work for the project to be executed by ECC involves Survey, Fabrication & Supply of Transmission Line Towers and Erection of 155 km. of Transmission Line from Karcham-Wangtoo to Rampur in Himachal Pradesh through Hilly / Mountainous Terrain. ECC bagged

this contract against international competition and the project will be completed in 30 months.

In another development, L&T has also secured two orders from M/s. Power Grid Corporation of India Limited (PGCIL) for the construction of 166 km of 400 kV D/C Transmission Line associated with Parbati III HEP Transmission System and 255 km of 400 kV D/C Gorakhpur - Lucknow Transmission Line associated with Northern Region Strengthening Scheme - II.

The scope of work to be executed by ECC involves Detailed Survey, Fabrication and supply of Transmission Line Towers and Erection of 421 km. of Transmission Line. Valued at Rs. 220 crore, the PGCIL projects are to be completed in 24 months.

### Rs. 1057 crore Order in the Gulf Region

L&T group has bagged orders worth Rs. 1057 crores in the Gulf Region. L&T (Oman) LLC, a subsidiary of L&T and one of the leading engineering and construction majors in Oman, has bagged three EPC contracts worth USD 116 million (Rs. 457 crore), from Oman Electricity Transmission Company (OETC) for Electrical Grid Stations and associated Transmission System in Oman. It has also received another order to build a USD 48 million (Rs. 189 crore) factory complex in Oman.

L&T has also bagged an EPC order valued at Rs. 411 crore (USD 105 million/ AED 383.62 million) from the Al Ain Distribution Company (AADC) for the construction of 5 electrical substations and associated MV Cabling in the Al Ain city of Abu Dhabi.



*Rs. 635 Crores contract agreement signed with PHED Rajasthan for Barmer Lift Water Supply Project. Mr K Asok Kumar (Left), General Manager & Head (WET BU) exchanging the agreement with Mr K M Mathur, Chief Engineer, PHED, Jodhpur*



According to the terms of the contract, L&T will Design and Build these 33/11kV primary substations to the specifications of the international consultant PB Power & will be completed within 24 months.

Each substation consists of 33 kV gas insulated switchgear, 11 kV air insulated switchgear, 15/20 MVA 33/11 kV transformers, Substation Control and Monitoring System, Protection and telecommunication system, DC system and auxiliaries. The contract encompasses design and construction of civil buildings with complete set of utilities such as air conditioning, fire protection and lighting systems.

The EPC contracts comprise orders for two Grid Stations valued at US\$ 89 million (Rs. 351crore) for strengthening the Transmission

System in and around Seeb International Airport Area to meet the increasing load demand for New International Airport and other townships coming up in this Area. The scope involves construction of a new 220/132/33kV substation, 2x500MVA Grid Station and associated 220kV Transmission Line System as well as construction of new 132/33kV 3x50MVA Grid Station and associated 132kV EHV Cable Transmission System.

The contract also includes an order valued at US\$ 27 million (Rs.106 crore) for the construction of a new 132/33kV 2x125MVA Grid Station and an associated 132kV Transmission Line System. This involves strengthening the Transmission System in Sohar Industrial Area to meet the growing demand in this industrial hub.

These projects will be executed by the Power Transmission & Distribution Sector of L&T Oman, and are to be completed in 15 months, under the consultancy of M/s Energoprojekt Entel LLC.

At present L&T is already executing 6 Nos 33/11 kV Substations at Al Ain, and this new contract will offer considerable synergies in construction. The order was secured against stiff international competition.

These L&T-built substations inside the Al Ain City will reinforce the region's power distribution network, and will help to meet the increased demands for power in the region.

LTO secured yet another order valued at US\$ 48 million (Rs.189 crore) from a reputed business Group of Oman for construction of a workshop including associated buildings and other infrastructure facilities. This is to be completed in 18 months under the supervision of consultants of International repute.

#### L&T (Oman) LLC bags Orders worth Rs. 646 crores in Oman

##### Rs.457 crore orders from OETC:

Larsen & Toubro (Oman) LLC, a subsidiary of L&T and one of the leading Engineering and construction major in Oman, received three EPC contracts totaling US\$ 116 million (Rs.457crore), from Oman Electricity Transmission Company (OETC) for Electrical Grid Stations and associated Transmission System in Oman. This involves:

- Orders for two Grid Stations valued at US\$ 89 million (Rs.351crore) for strengthening the Transmission System in and around Seeb International Airport Area to meet the increasing load demand for New International Airport and other Town Ships

## P&M Technical Training Centre, Inaugurated



*Mr. S.J. Punnose, General Manager, Plant & Machinery inaugurating the P&M Technical Training Centre, at Kancheepuram, on march 2008 in the presence of Mr. Babu Raj Singh (BRS), Regional Manager, Chennai Region and Mr. P.K. Viswambharan (PKV), Regional Plant Manager*



coming up in this Area. The scope involves construction of new 220/132/33kV substation, 2x500MVA Grid Station and associated 220kV Transmission Line System as well as construction of new 132/33kV 3x50MVA Grid Station and associated 132kV EHV Cable Transmission System.

- The other order valued at US\$ 27 million (Rs.106 crore) is for the construction of new 132/33kV 2x125MVA Grid Station and associated 132kV Transmission Line System. This involves strengthening the Transmission System in Sohar Industrial Area to meet growing demand in this Industrial Hub.

These projects will be executed by the Power Transmission & Distribution Sector of L&T Oman and are to be completed in 15 months, under the consultancy of M/s Energo-projekt Entel LLC.

#### **Rs. 189 crore Factory Building:**

LTO secured yet another order valued at US\$ 48 million (Rs.189 crore) from a reputed business Group of Oman for construction of workshop including associated buildings and other infrastructure facilities. This is to be completed in 18 months under the supervision of consultants of International repute.

#### **L&T to Build India's First Heated Pipeline for Crude**

Secures another Major Order from Cairn India for Oil and Gas Pipelines

Mumbai, February, 21, The Engineering and Construction Projects Division of Larsen and Toubro Limited (L&T) has been awarded another major contract by Cairn India for the Engineering

Procurement and Construction (EPC) services for the Export Crude Oil Insulated Pipeline and Gas Pipeline from Barmer, Rajasthan to Salaya, Gujarat.

The scope of work involves the laying of a cross country 24 inch skin heat traced pipeline with PUF insulation for crude oil transportation from the Mangala terminal, located at Barmer, Rajasthan to the Salaya Oil Export terminal, near Jamnagar.

The pipeline travels 330 Kilometres (kms) south from the Mangala Field to a pump station and oil take off point at Viramgam.

From Viramgam the pipeline continues for 261 kms south west up to an Export Oil terminal at Salaya.

Another pipeline of 8 inch diameter will be laid for transporting Natural Gas from the Raageshwari Fields which will be laid alongside the 24 inch pipeline to the Salaya receiving facility for feeding the Gas generator sets located at 32 sites enroute. These Gas generator sets are meant primarily for producing electricity for 'Skin Effect Heat Management System' (SEHMS) to maintain the fluidity of the waxy crude.

L&T's Pipeline Engineering Centre – L&T Gulf located at Faridabad, is a Joint Venture of L&T and Gulf Interstate, Houston. It will provide complete engineering services for the cross country pipeline and the intermediate facilities for this project.

The multi million dollar order was secured by L&T against stiff competition and the project is slated for commissioning by June 2009.

Cairn has a resource base of 3.6 billion barrels of oil equivalent in place. Field developmental activities

have already commenced with a targeted production level of more than 150,000 bopd.

Completion of this export oil Pipeline will match the evacuation plans of Cairn for H2 2009.

Announcing the order, Mr K. Venkataramanan, President (Engineering & Construction Projects) & Member of L&T's Board said, "L&T is proud to be associated with Cairn in being able to leverage our own strengths to build the unique mega pipeline of this kind, for the first time in India. Our technical expertise in engineering and construction, and a dedicated team, will enable us to deliver the job on time"

Rahul Dhir Chief Executive Cairn India said: "This is another key milestone in the development of these valuable resources from Rajasthan and we remain confident of achieving first oil in the second half of 2009."

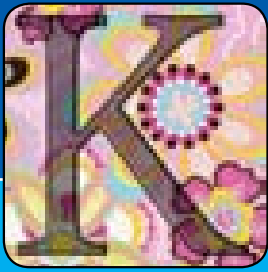
#### **Background**

L&T is a USD 7 billion technology, engineering and construction group with global operations. It is one of the largest and most respected companies in India's Private sectors.

A strong customer-focused approach and the constant quest for top-class quality have enabled L&T to attain and sustain leadership in its major lines of business across 7 decades.

L&T is presently executing an 80 MMSCMD onshore Gas Processing Terminal for M/s Reliance at Kakinada. It is also executing an Aviation Fuel Oil terminal with Pipelines for M/s Kuwait Aviation Fuel Company, Kuwait.

Cairn India is headquartered in Gurgaon on the outskirts of Delhi, with operational offices in Chennai, Gujarat, Andhra Pradesh and Rajasthan.



### Bucket Wheel Excavator supplied to Neyveli Lignite Corporation

As part of its expansion plans to augment lignite production capacity from 10.5 MTPA to 15 MTPA, Neyveli Lignite Corporation Limited (NLC) placed an order for 3 Nos. of 1400L Bucket Wheel Excavator (BWE) on L&T (in collaboration with Voest Alpine Material Handling, Austria).

The scope includes Design, Engineering, Supply, Erection, Testing, Commissioning and maintenance for 4 years. The total value of the project is Rs. 221crores. This is for the first time that an Indian contractor is involved in manufacturing and supplying this type of giant machinery. The duration of the project is 34 months.

These Specialized Mining equipment, move on 6 crawlers and they are used in excavation of overburden and lignite. These equipment moves on rough terrains and are subjected to high levels of stress during operation. Hence quality of fabrication and erection has to be the best for long life of the machine.

Brief Specifications of the Equipment are as follows:

Effective Guaranteed output on long term basis : 6500 tph  
Traveling speed : 8 m/min  
Approx weight of each equipment: 2600 tons  
Bucket wheel operating requirement height (maximum) : 30m  
Scope of work includes fabrication and supply of approximately 6000 tons of

structures; sourcing and supply of components like bearings, gearboxes, winches, idlers, motors, bucket teeth, couplings, brakes, rollers, shafts, axles, pulleys, sheaves, rings, bushes, pumps, gears, fasteners, etc. of various sizes from different vendors from India as well as abroad.

L&T executed the fabrication and supply under stringent quality requirements. Accordingly it has completed the supply and erection of two equipment. One machine has been in successful operation since March 2008. Functional tests are being conducted on the second machine. Erection works are under progress for the third machine and this is expected to be completed soon.



*Bucket Wheel Excavator supplied to NLC at Neyveli Lignite Mines*

#### NEW HYDEL BU OFFICE

ECC's Hydel BU office is functioning from a new location as follows:

All mails or documents intended for this BU may be sent to this new address

**Larsen & Toubro Limited,  
ECC Division,  
III Floor,  
12/4 Delhi Mathura Road,  
Near Sarai Khawaja Chowk,  
Faridabad - 121 003.  
(Haryana)**

**Phone: 0129-4291708**

**e-mail: [hydelbu@Intecc.com](mailto:hydelbu@Intecc.com)**



## First Indian LPG Cavern Commissioned

The 60,000 capacity Liquefied Petroleum Gas (LPG) cavern near the Dolphin's Nose hill at Vizag, the deepest in the world (181 metres below mean sea level) executed by L&T on EPCC (Engineering, Procurement, Construction and Commissioning) basis was successfully commissioned on January 14, 2008 in presence of Honorable Mr. Murali Deora,

Minister of Petroleum & Natural Gas presided by high level delegation team from Petroleum Ministry and HPCL. The facility is first of its kind not only in India but in the entire South East Asia.

The ECC team under leadership of Mr. K S R K Verma, Project Manager and Mr. C R Sahoo, Construction Manager (AG Works) undertook immense efforts for successful

completion of the project. The works involved extreme engineering like underground cavern construction, interface engineering (UG to AG), typical procurement from all parts of world (Australia to USA), stringent commissioning activities viz. cavern acceptance test which has been recognized as ever best among all cavern (Cavern Engineering Specialist).



*LPG Cavern during construction*



## LPG cavern creates history

The Liquefied Petroleum Gas (LPG) cavern at vijag created history during April 2008 by storing as high as 57,277 tonnes of LPG.

This is the first time in any part of India where such a huge storage is maintained at a single point. This is just short of some 2,700 tonnes against its full capacity of 60,000 tonnes.

As the ship from Saudi Arabia – Maharishi Bharadwaj, a very large gas carrier (VLGC) with the capacity of 40,000 tonnes, started unloading the gas into the 60,000 tonnes cavern, the storage figure moved up.

This is despite the HPCL and other agencies continuously retrieving LPG from the cavern for their use. It is to be noted that the Gas Authority of India Limited (GAIL) is moving LPG from here to Hyderabad via Rajahmundry and Vijayawada through an underground pipeline.

The two caverns are owned and managed by the South Asia LPG Company Private Limited (SALPG), a 50:50 joint venture between the HPCL and Total, an oil major of France.

## Safety award

SALPG Chief Executive Officer P. Dwarakanath told The Hindu that the cavern project had won the award for safety from the British Safety Council.

A letter to this effect had been received from the council and the award would be given both to the contractor (L&T, who built the caverns) and their employer (SALPG).



*Mr. K.V. Rangaswami, President (Construction) and Member of the Board, L&T, in discussion with ECC colleagues, at the LPG Cavern project, Vizag.*

He recalled that a few months ago a similar award was given by the national safety council to the project.

the country that the entire fighting system is made fully automatic and the project has such huge storage capacity of water on ground to

### SPECIAL APPRECIATION from SALPG Vizag

**“SALPG is happy to declare commissioning of “The First Indian Cavern”** with series of commissioning activities starting with, sending the first drop of LPG in to the Cavern on December 20, 2007 and concluding with the completion of the first ever Indian port LPG VLGC discharge with full parcel in to the cavern on December 28, 2007. With the above commissioning, SALPG Project enters in to Business phase.

The above task would not have been possible without L&T’s complete involvement, support and dedicated engineering activity for the last 3-4 years. On behalf of SALPG, I wish to thank L&T for their efforts & support. L&T has been a part of the core management, engineering team which made the country proud by pioneering in this Cavern – Marine terminal construction in the country with us.

**P. Dwarakanath**  
(CEO, SALPG)

Another uniqueness of this Rs.333-crore project, which has already exceeded the international standards of such LPG storage – BS EN 1918-4, is that this is the first time in

sustain the emergency operations continuously for six hours, though the world standard is only four hours.



## L&T Tech Park Launched at Kochi

Hon'ble Chief Minister of Kerala, Shri. V.S. Achuthanandan inaugurated Tejomaya – phase I project of L&T Tech Park and laid the foundation stone for its proposed phase II project – “Signature Tower” both located in the Infopark campus at Kakkanad, Kochi on March 15, 2008. Shri. S. Sharma, Hon'ble Minister of Fisheries and Registration, Shri. K. Chandran Pilai, Member of Parliament – Rajyasabha, Shri. K. Babu, Member of Legislative Assembly and many other government officials' dignitaries and IT clients were present during the launch function.

With a total built up area of 1.1 million sq.ft.. coming up in two phases and spread across 7.5 acres, L&T Tech Park is set to catalyze the IT boom in Kochi by providing world class work space for companies having Tier-2 City Expansion plans.

With its proximity to airport and the city and many other operational advantages, Infopark has emerged as an ideal destination for the IT and ITES companies planning for expansion in Kochi. Being a special economic zone, the tenants can enjoy the benefit of tax and duty exemptions offered by the government of Kerala.

**TEJOMAYA**, the first Phase of the project at Infopark is ready for occupation and offers column free space with larger floor plates, high-end Security systems and Infrastructure facilities for continuous IT/ITES operations. The interiors and exteriors of the building are designed for a congenial working environment with modern lifestyle. IT majors TCS, IBS, Arbitron Inc., L&T Infotech, etc. have already booked space in Tejomaya.

Consisting of ground plus nine floors, Tejomaya also houses 250 seat cafeteria, health club and gymnasium, business centre, ATMs,



*Completed view of Tejomaya, the L&T Tech Park at Kochi*



*Panchavadyam artists and Elephants giving a traditional Kerala Welcome to the Chief Minister*

100% power back-up. It is complete with all building management system and offers the best plug and play facility.

Signature Tower, the Phase II project envisages the development of a Twin tower of 6.75 Lakh sq. ft and is designed as a Landmark for IT Infrastructure at Kochi. The project is planned to be ready by 2009. The design and construction of the facilities will integrate green building concepts for making the facilities more energy efficient and to provide maximum human and machine comfort. Eco-sensitive architecture and energy conservation systems will be the salient features of this landmark structure. Moreover, a helipad is planned on the terrace for emergency evacuation.

L&T Tech Park has a whopping 4.5 lakh sq.ft. of multi-level car parking at a parking ratio 1:550 built on 5 floors.

Kerala's commercial capital Kochi is leading to become one of the best hubs for growing knowledge based industries like IT. Kerala's

infrastructure is growing with premium educational institutions like NIT, CUSAT, 83 Engineering Colleges, 300+ Arts & Science Colleges and 2 international Airports. High-end life-style Apartments, Malls & Multiplexes, Super Specialty Hospitals, 6-Lane Highway connecting airport and seaport are already part of Kochi. With a proactive Government, excellent talent pool and lowest attrition rate and employee cost, it

is a green signal for IT companies to set up their operation in Kochi.

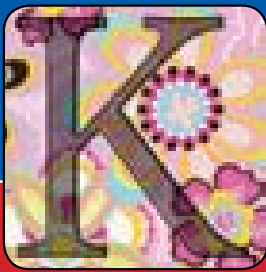
Speaking at the function, Mr. K.V. Rangaswami, Member of the Board and President (Construction), L&T said "L&T Tech Park at Kochi is an ideal place to meet the present and future needs of all types of knowledge based industry. Many software giants are moving to Kerala because of its emergence as IT hub". They all can benefit from the intelligent work space of L&T Tech Park, he added.

### **Background**

L&T Tech Park Ltd is a subsidiary company of Larsen & Toubro Urban Infrastructure Limited (L&T UIL) set up for the development of IT infrastructure projects in the country. L&T has joined hands with Pragnya fund 1, a Mauritius based private equity fund focused on Indian real estate, to fund this project. Pragnya has worked with L&T and have successfully executed large projects both in the domestic as well as the international markets. Its investment in L&T Tech Park is a vote of confidence in the potential for growth of IT industry in Kerala and more specifically Infopark, Kochi.



*Mr. V.S. Achuthanandan, Hon'ble Chief Minister of Kerala, addressing the audience after inaugurating Tejomaya - phase I project of L&T Tech Park at Kochi*



# Kaleidoscope

## Papers Presented

### Expanded Blast Design - A case study



**M**r. A. Ravi Kumar, Manager (Mines), ECC-HQ, Chennai presented a technical paper titled “*Expanded Blast Design for Tight Controlled Hard Rock Trenching Adjacent to Twin Buried Live Oil Pipe Lines*” – A Case Study, at 34th Annual Conference on Explosives & Blasting Techniques held at New Orleans, Louisiana, USA during January 27- 30, 2008. Only two presentations were made from India and L&T’s paper was one among them. Nearly 2000 explosive engineers attended the conference and appreciated the presentation. By virtue of the selection and publication of this paper, the technical cell (Quarry and Crushing) of ECC has proved its strength and capability in the world of explosives engineering practice.

#### Synopsis

Trench blasting adjacent to twin buried charged pipelines has been

a challenging task in view of super sensitive structures, complex geology, side effects of blast induced ground vibration, fly rock and tight project schedule.

These pipelines are laid in a trench under the ground by excavation, where width is less than 4m. If the trench is to be constructed in soil (or) ripable strata, the excavation poses no serious problem. However, difficult conditions are encountered when the trench has to be made in a rough terrain or hard rock, requiring massive drilling and blasting operations. The risk also manifolds when sensitive live pipelines pass parallelly.

Rock installations present a unique set of challenges particularly when trenching through rock. However, experience, knowledge and expertise makes the real difference as demonstrated in this project by

developing a new custom made blast design.

For this purpose, suitable blast parameters and custom designed blast operations were executed to accelerate the advance per blast, suiting the site geology and conducting few trials. Milli-Second Delay detonators, were used for utilization of explosive energy in breaking the rock in an optimized way and leaving very less percentage of unutilized energy. This reduces ground vibration, fly rock and throw to a great extent. Increasing the practical burden also helps in expanding the blast design.

The expanded blast design developed and implemented in this project is a unique example of an impossible task successfully carried out with utmost safety, precision and timely execution, meeting all the constraints set forth by the project.

### Modern Trends in Controlled Blasting



Mr. A. Ravi Kumar also made a key note address titled “*Modern Trends in Controlled Blasting*” in the National Level students Technical Symposium held at Anna University Chennai on Feb 28, 2008, Mr. P.K. Govindaswamy, Head - Quarry and Crushing Operations (First from left) participated in the symposium along with other colleagues.

# Evaluation of the Robustness of Self Compacting Concrete



**Mr. Shaik Nawaz Shareef, Assistant Manager, B&F, HITEC City 2 Project, Hyderabad,** presented a paper titled "Evaluation of

Robustness of Self Compacting Concrete" for his M.Tech Thesis (2006) which was published at the International Conference on Self Compacting Concrete held in Spain.

The research work highlighted that Self-compacting concrete (SCC) is generally less tolerant to changes in the characteristics and dosages of its constituents. To substantiate, this work was carried out to analyze the robustness of a typical SCC, in terms of the fresh properties and strength, when changes are made in the dosages of the constituents within the tolerances that could occur in ready mix concrete plants.

The results indicated that the most critical changes that can render an SCC unacceptable are excess cement, excess fly ash, less fly ash, less water, excess superplasticizer, excess sand and excess gravel. It was also observed that the most sensitive tests for robustness evaluation are the slump flow and the J-ring tests.

It was concluded that the incorporation of a viscosity modifying admixture significantly improved the robustness of the SCC. Mr. Kingsley J.D. Earnest, Head Concrete Technology Cell and Professor Ravindra Gettu from IIT Madras guided Mr. Shareef for the thesis.

# Guest Lecture at Centre for Environmental Studies, Anna University



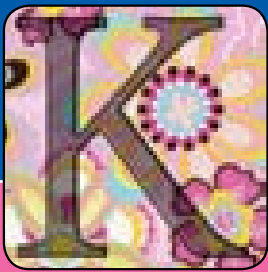
Upon the initiative from CPHEEO (Central Public Health and Environmental Engineering Organization)

guest lecture series on various environmental issues were organized at the Centre for Environmental Studies – Anna University Chennai.

**Mr. K. Vijayakumar, Manager, Commissioning, WET-BU, ECC-Chennai** delivered the first lecture "Commissioning of Treatment Plants" on March 20, 2008. 52 students pursuing masters' degree in environmental engineering, environmental management and environmental chemistry attended the session which was well received with extensive interaction. The lecture series was inaugurated by Dr.

Thanasekaran, Director, Centre for Environmental Studies.

In yet another significant event, Mr. K. Vijayakumar, delivered two lectures on 'Overview of Treatment methods and Application areas' and 'O&M and Process Control of ETP' at Hotel Vestin Park, Chennai, during January 2-3, 2008, as a part of the two day training programme organised by SGS India on "How to Make Best Use of Effluent Treatment Plant". 50 odd participants from various public sector and private sector companies took part in the programme.



# Kaleidoscope

## Awards

### ECC Microsoft Project, Hyderabad wins RoSPA Silver Award

The Royal Society for the Prevention of Accidents (RoSPA) has adjudged the prestigious RoSPA Silver Award for Occupational Health & Safety to ECC's Microsoft Project in Hyderabad.

Having achieved 20 million safe man-hours during the construction of the project for more than 4 years since commencement, this award is an apt recognition of ECC's excellence in occupational health and safety performance. The award will be given away during the presentation ceremony scheduled on May 14, 2008 at Birmingham, U.K.

The project involved construction of a total built up area of 19 lakh sq.ft. of structures with complete amenities and parking facility to accommodate 1428 cars.

In recognition of this great achievement, Mr. V. Moorthy, Project Manager and Mr. Umesh Chandra Swain HSE Manager of Microsoft Project were presented with an award by Mr. Izrail Grinshteyn, Account

Manager, Microsoft Global Real Estate amidst a glittering function in Hyderabad.

Incidentally, this project also won the prestigious Safety Award for construction sector in 2005 presented by National Safety Council of India.

### ECC wins two international safety awards from British Safety Council

Two ECC projects have won the prestigious "International Safety Award" from The British Safety Council - one of the world's leading occupational health, safety and environmental (OHSE) organisations. The award winning projects are:

- Software Development Complex of Cognizant Technology Solutions at MEPZ - Chennai and
- The 3 x 660 MW Barh Super Thermal Power Project of NTPC in Bihar

It is a matter of delight that ECC has been winning these international safety awards from British Safety Council for the third consecutive year.

The adjudicating panel, after gruelling tests, chose these two projects in line with the award scheme's objective of recognising and rewarding excellence in health & safety. Parameters which stood up the evaluation include significant continual health & safety improvements achieved by

ECC during the award period, effective implementation of HSE Management Systems as well as HSE training imparted to workmen.

While the CTS project Chennai achieved an accident free record of 8 million safe man hours, the Barh Super Thermal Project site clocked 6 million safe man hours. ECC takes pleasure in congratulating Mr. T. Nanadakumar, Project Manager and Mr. J. Karthik, HSE Officer, CTS-Chennai as well as Mr. R. Shukla, Project Manager and Mr. M. Indu, HSE Officer at Barh project for achieving this unique recognition.

### L&T (Oman) wins RoSPA Silver Award for Bait Al Barakah Villa No1 Project

The Royal Society for the Prevention of Accidents (RoSPA) has awarded the prestigious RoSPA Silver Award for Occupational Health & Safety to L&T (Oman)'s Bait Al Barakah Villa No 1 Project in Muscat.

This project has been selected by RoSPA in recognition of having achieved 7 million safe man-hours during construction phase, spanning for 3 years. The award will be given away during the presentation ceremony scheduled on May 14, 2008 at Birmingham, U.K.

The Royal Residence of 26 m height is a four storied structure with more than 300 identified areas of high interior finishes comprising of main suite, entourage area, entrance hall, reception hall, Arabic Majlis,





European Majlis, lounge, library, formal dining, Arabic dining multipurpose hall and waiting hall etc. Construction also involved a prayer hall, swimming pool, changing rooms and landscaping of 50,000 sq.m.

This project which commenced in Oct 2004 was completed in March 2008 and clocked 8.63 million man-hours.

Incidentally, the project is a winner of Quality Trophy Award – 2007 (for Major Job Site category) and runner up in the Annual House-keeping Trophy-2007. Also, this is the second RoSPA Award won by L&T Oman. The first one being the RoSPA Gold Award - 2007 for F-16 facilities at Thumrait Airbase Project.

#### AMN Felicitated as 'Distinguished Alumnus'

Our Chairman & Managing Director, Mr. A. M. Naik was felicitated as a 'Distinguished Alumnus' by his alma mater – the Birla Vishwakarma Mahavidyalaya (also known as



*Mr. A. M. Naik receiving the honour of Distinguished Alumnus from Dr. Abdul Kalam, watched by Mr. Narendra Modi.*

BVM Engineering College), Vallabh Vidyanagar, Baroda. Adding special significance to the occasion was the fact that the felicitation was performed on March 31, by India's much respected former President and scientist Dr. Abdul Kalam in the presence of the Chief Minister of Gujarat, Mr. Narendra Modi.

Founded in 1948, BVM is one of the oldest engineering colleges in the country and the first in Gujarat. Its rolls include several people who have made a mark in India and abroad, in industry, the public sector and academia. Mr. Naik stood out among this meritorious group through the success he has achieved in transforming L&T into the company that is at the frontline of India Inc.

Speaking after the felicitation function, AMN said that while he had secured a host of national and international awards and trophies, being recognised by his alma mater is something he would always cherish.

#### The Institution of Engineers honours our Chairman & Managing Director, Mr. A.M. Naik

Appreciating the contribution by Mr. A. M. Naik, Chairman & Managing Director, to the fields of engineering and technology, and to the country's growth, the Kolkata based the Institution of Engineers India (IEI), has honoured him with IEI Engineering Personality trophy.

The award was announced at the 22nd Indian Engineering Congress held in Kolkata recently.

IEI is the first professional body of engineers founded in India in 1920 to promote the arts, science and practice of engineering and technology. IEI functions with and amongst engineers, academicians and research workers, and provides



a vast array of technical, professional and supporting services to the Government, the industries, the academic and the engineering community.

#### L&T's Annual Report bags ICAI Gold Shield

The Institute of Chartered Accountants of India (ICAI), New Delhi, has adjudged the Annual Report & Accounts of L&T for 2006-07 as the best for its annual 'ICAI Awards for Excellence in Financial Reporting' Competition 2007. L&T received the Gold Shield in the category: 'Infrastructure & Construction Sector'.

The coveted award was presented at a function held in New Delhi on February 4, 2008. Mr. Y. M. Deosthalee, Chief Financial Officer & Member of the Board, and Mr. P. S. Banerjee, Vice President, Corporate Accounts and Chief Risk Officer, L&T, received the award from the Union Minister for Civil Aviation, Mr. Praful Patel, in the presence



*Mr. Y. M. Deosthalee and Mr. P. S. Banerjee (left) receiving ICAI award from Mr. Praful Patel (second from right).*

of President & Vice President of the ICAI and other distinguished members.

ICAI is a statutory body established under the Chartered Accountants Act, 1949 for the regulation of the chartered accountancy profession in India. During fifty-eight years of its existence, the ICAI has achieved wide recognition, both nationally and internationally, as a premier accounting body for its contribution in the fields of education, professional development, and maintenance of high accounting, auditing and ethical standards.

The ICAI has been holding an annual competition for excellence in financial reporting since 1958 to recognise and encourage excellence in the presentation of financial information so as to further standards in financial reporting.

It may be recalled that L&T had earlier received a Silver Shield in 2006 for its Annual Report & Accounts for 2004-05 from the ICAI under the same category.

#### Danish Knighthood for AMN

Our Chairman and Managing Director, Mr. A. M. Naik, has been appointed Knight of the Order of the Dannebrog by the Queen of Denmark, Her Majesty Queen

Margarethe. The Knight Cross was formally presented to Mr. Naik by the Ambassador of Denmark, Mr. Ole Lansmann Poulsen, in Mumbai on February 25, 2008. Mr. Naik is the Honorary Consul General of Denmark in Mumbai.

In a brief acceptance speech, Mr. Naik said, "I am proud that this honour has come at a significant moment. This is a landmark year for L&T as the company has completed 70 years since its formation, and we are also celebrating the birth centenary of L&T's co-founder Henning Holck-Larsen".

Mr. Naik reiterated the close ties between L&T and Denmark and also spoke about the contribution of L&T's Danish founders in laying the building blocks of what has become one of the most admired corporate entities in India today.

L&T will continue to play an important role in furthering economic and cultural ties between Denmark and India, Mr. Naik said.



*Mr. Ole Lansmann Poulsen, Ambassador of Denmark pins the Knight Cross on Mr. A. M. Naik.*

# L&T, TIDCO sign JV agreement to build Shipyard cum Port Complex in Tamil Nadu



*Mr. K. V. Rangaswami, President (Construction) and Member of the Board, L&T, exchanging documents with Mr. S. Ramasundaram, IAS, Chairman and Managing Director, TIDCO in the presence of Dr. Kalaignar M. Karunanidhi, Chief Minister of Tamil Nadu*

L&T and Tamil Nadu Industrial Development Corporation Limited (TIDCO) signed a joint venture agreement on April 15, 2008 to set up an integrated Shipyard Complex of global standards with a port facility at a total investment of about Rs. 30,000 million (Rs. 3,000 crore) in the Kattupalli village, near Ennore in Tiruvallur District of Tamil Nadu.

The joint venture agreement was signed in Chennai in the presence of the Hon'ble Chief Minister of Tamil Nadu, Dr. Kalaignar M. Karunanidhi and L&T's Chairman and Managing Director, Mr. A.M. Naik. The JV agreement was signed by Mr. S. Ramasundaram, IAS, Chairman and Managing Director, TIDCO, and Mr. K.V. Rangaswami,

Member of the Board and President (Construction), L&T.

The feasibility report for the project has been completed. Necessary environment studies are under progress. Construction will start by the end of 2008, and the project will be completed in 24 months.

The proposed shipyard complex will include facilities for commercial ship building including Very Large Cargo Carriers, specialized cargo ships for liquid / gas transportation and cruise vessels. It will also have the capability to build vessels for the defence sector, off-shore platforms & floating production cum storage facilities for the Oil & Gas sector.

The shipyard will also have the facilities for refitting and re-

engineering of commercial and defence vessels, and heavy engineering fabrication and components production for ship building purposes.

The shipyard complex will promote several ancillary units for manufacture of components & spares for this shipyard, and for exports. When it becomes operational, the shipyard will become a nucleus for the heavy engineering industry (for fabrications and components manufacturing).

L&T's foray into shipbuilding is expected to bridge the gap between India's shipbuilding industry and that in developed countries, and will result in a paradigm shift in the shipbuilding capabilities in our country.

# Best Managed Company Award



*Mr. Kamal Nath, Union Minister for Commerce and Industry presenting the India's Best Managed Company Award to Mr. A.M. Naik, Chairman & Managing Director, Larsen & Toubro (L&T)*

- Detailed profiling (involving interviews with top management)
- The following companies were winners in various sector - ICICI Bank, Reliance Industries, Tata Steel, Tata Motors, Grasim Industries, ITC, Bharati Airtel, Great Eastern Shipping & L&T (in the Industrial Products sector)
- From the above winners, L&T was judged 'Best of the Best' across all sectors

The eminent jury comprised Mr. Bakul Dholakia, Mr. Amal Ganguli & Mr. Subir Raha.

A survey conducted by the country's leading business magazine Business Today and consultancy firm Ernst & Young has given L&T a coveted honour - 'The Best Managed Company in India.'

Commenting on the award Chairman & Managing Director, Mr. A. M. Naik said, "It is a tribute to the enlightened and professional management team at L&T, where empowerment and accountability are of paramount importance. In 70 years of existence, L&T has created a management culture that is rooted in ethics, integrity, and a deep sense of patriotism. We sincerely believe that nation building is at the core of all our activities. L&T is a truly professionally managed company, with no promoter family, but where

every employee has a strong sense of ownership".

The Business Today-Ernst & Young survey is among the most respected in the industry. The study was comprehensive in its scope and analytical in its approach. All companies listed either on the BSE or the NSE - a tally of 2900 - were rated on several parameters that included leadership, best practices, corporate governance, corporate social responsibility, business & operational strategies, growth, profitability, operating efficiency & wealth creation for all stakeholders.

This was followed by a rigorous four-step short listing based on:

- Financial Performance
- Qualitative Assessment

