



TERMINAL TRIUMPHS

DPG sets a new record of breathtaking size and scope at Kolkata's new airport.



A high-flying team...a high-altitude achievement.

At Kolkata, the Netaji Subhas Chandra Bose International Airport (NSCBIA) is nearing completion. Around December 2012, Voltas will finish the last stages of commissioning its MEP works. It will then be yet another world-class airport in a portfolio that includes Hyderabad airport, Chennai airport and numerous others.

But it's not *just* another airport. NSCBIA represents a new peak of performance for Voltas in terms of the awesome magnitude and scale of the job – as you'd expect in an airport spanning 180,000 sqm of built-up area, designed for an annual passenger traffic of 20 million. The 12,000TR chilled water plant is the largest ever installed by Voltas in the domestic market, and one of the largest to be found in India...and that's just one amongst many mind-boggling numbers.

To cope with the enormity of the challenge, the Domestic Projects Group (DPG) consolidated and sharpened its built-up learnings in tackling large-scale tightly-scheduled MEP jobs. Though there were engineering challenges in plenty, it was project management that stole the show and wrote the book – so to speak – that will be pulled out and consulted for many such projects to come. It's a virtual manual that includes contributions from MEP experts from multiple locations like Hyderabad, Chennai and Delhi, as well as insights on design features, project documentation and design review systems, gained from exposure to the international main contractor, consultants and vendors.

In the words of P Kondal Rao, Project Director, "What our team did and learnt on the Kolkata Airport project adds up to a

tried-and-tested methodology for everything from bidding strategy to timely paperwork. That basic approach can be adapted and replicated on many other large-scale jobs."

Best practices for best results

Make yourself useful early in the game Consider how the Voltas team gained a bidding edge



P Kondal Rao, Project Director.



right at the outset. The international consortium of ITD-ITD Cementation was up against favourites like L&T and Punj Lloyd. The Voltas bidding team, led by N Sridhar, worked with them, step by step, right from the conceptualization stage, supporting them at every turn.

When their bid succeeded, they were more than happy to give Voltas the status of 'preferred bidder'. With previous works like Godrej Waterside and Hyderabad



N Sridhar
GM - Business Development

International Airport already under its belt, winning the MEP contract was almost a foregone conclusion.

From self-sufficiency comes speed and decisiveness

At Kolkata, all necessary resources were concentrated under one roof: that of an autonomous project office with independent planning and commercial teams, and its own SAP connectivity. Managers and engineers were brought in from branches like Hyderabad and Chennai on full-time deputation,

especially for the MEP design stage. As a result, all the expertise needed was right there to hand. More importantly, decision-making was quick and streamlined, responsive to the day-to-day urgencies of a high-pressure job.

Self-reliance even extended to the fabrication of ducting, which was done entirely with imported equipment at an on-site duct plant spanning a 4000 sq ft area, fed with flat duct cut sheets from the Dadra plant. More than two-thirds of transportation cost was saved, amply repaying the initial investment.

Make it clear...get it cleared

It was just too risky to take an on-the-job decision with fingers crossed, hoping for the client's OK later. There were just too many parameters and variables. So a number of advance-clearance processes were developed:

- For items not listed in the original Bill of Quantities (BOQ), written approval was first obtained. Rates were then settled with the client, and change requests submitted within 14 days.
- Technical data was submitted and approved for all materials prior to ordering them.
- Dispatch clearances for materials were obtained from manufacturer/supplier locations, to keep the client in the loop about quantities being executed.
- When materials were received, or some stage of installation completed, Work Inspection Requests were promptly submitted to the client, so as to speed up joint certification as well as bill processing.

Before any item of work was initiated, statements about methods and procedures were submitted and approved. The point was to pre-empt the need for reworking later, or falling short of the standards set.



Vast spaces built to handle 20 million travellers annually.



One of the four 2500TR centrifugal chillers.



Mind-numbing numbers capture the scope & scale of DPG's airport achievement

HVAC

- 4 x 2500 TR 11 KV HT chillers
- 2 x 1000 TR LT chillers
- 6 x primary chilled water pumps
- 7 x variable frequency secondary pumps
- 6 x condenser water pumps
- 12 x 1000 TR cooling tower
- 205 AHUs (Voltas Ltd)
- 12 TFAs (Voltas Ltd)
- 72 roof smoke extract fans
- 52 x 40000 CFM centrifugal blowers
- 224 x 20000 CFM axial flow ventilation fans
- 1,50,000 sq m ducting (Voltas Ltd)
- 1,10,000 sq m duct Insulation
- 28km piping
- Electrical works for HVAC system: 254 MCC panels, 24 KM power & control cabling with cable tray

Electrical works

- Wiring 2200 kms
- Cable tray 35 kms
- Cable laying 125 kms
- 6 x Main LT panels
- Automatic Power Factor Correction panel for 800 KVAR
- 17 x capacitor bank panels
- 261 x sub LT panels
- 39000 x lighting fixtures (surface and recessed type)
- 900 x distribution boards
- 35km earthing with CU strip
- 43 x UPS system
- 11 x Advanced Lightning Protection system
- 15000 rmt under floor trunking system
- 4.5 km sandwich-type bus ducts

Plumbing

- 370 x wall-hung water closets
- 243 x urinals with touchless auto-flushing
- 473 x wash-basins
- 20km of MS & GI piping
- 3.5km SS piping
- 10km CI piping

Water Treatment

- 4 x 100 cu m/hr Water Treatment Plant, for re-cycling into primary drinking & personal wash water, and cooling tower make-up water
- 2 x 750 cu m/day Sewage Treatment Plant, for re-use in cooling towers, toilet flushes and horticulture

Other vital statistics

BUILT UP AREA (sq m)	1,80,000
CHECK-IN COUNTERS	104
CONVEYOR BELTS	23
IN-LINE XRAYS	8
ELEVATORS	16
TRAVELLATORS	13
ESCALATORS	16
AEROBRIDGES	18
TOILETS	29
CAR PARKING SLOTS	2400
ENTRY GATES	4
EXIT GATES	4
PASSENGERS PER ANNUM	20,000,000

Keep an eye on document

movement When it came to documents and communications, there was tight control on who sent what to whom. Letter-heads indicated who was authorized to sign every variety of correspondence, or send emails to client, or submit drawings or data or Requests for Information (RFI). Likewise, for every inbound document, there was a clear path for its routing and final destination.

Map out and monitor every milestone

A baseline 'milestone' program was created in MS Project with a detailed plan

for engineering, procurement, installation and other phases. Progress curves were generated for fortnightly comparison of achievement against planned progress. Weekly and fortnightly reports were sent to the client, along with notices of delay on any front – such as civil, commercial, or design – to ensure transparency while safeguarding Voltas' contractual interests.

Remain in negotiation mode

This was a necessary mind-set, given the upward creep of costs over the three-year project period. Price escalation partially covered the risk, but for serious mitigation,

it was a question of constant and careful negotiation with vendors and sub-contractors.

Coping with change, dealing with delay

At every turn, the team was keenly aware that MEP works had to be in sync with the work of civil and other agencies. If they went off schedule, MEP too could be tripped up and thrown off track. Such was the case with the baggage-handling system, whose vendor was finalized by AAI only after basement-level 1st and 2nd fixes were done. The Voltas team was forced to rework



it, dismantling the AC ducting and the suspender racks for light fittings. They then had the trying task of redesigning the layouts so as to salvage as much ducting as possible, for reuse elsewhere. It was also an opportunity for some value-engineering on the types and locations of electrical fittings, to reduce their numbers and save installation time.

A further ripple effect of the baggage-handling delay: the lighting layout was also changed, and clearance to start work on it was held back until the baggage-handling system was completed. Since this occupied much of the basement area, the team had to resort to portable man-lifts to install conduits, wires and fixtures at the proper 7.3m height. Plumbing and sanitation systems

In the words of appreciative clients



“Voltas approached the project very professionally with a good project team. Demanding timelines were rarely missed. The overall experience was good, and we are happy to associate with Voltas as a partner on the project.”

Mr Mongkol Suvakhkan

Chief Project Manager, ITD-ITD Cem JV

“Over the more than three years that I have worked with Voltas for execution of works at Kolkata Airport Project, I would like to say that I have appreciated the capability of the Voltas team and am happy to work with this team for the success of project works in the near future.”

Mr Suchai Ratchaya

Project Manager – MEP

ITD-ITD Cem JV



One of many substations – nerve centres for the intricate electrical works.



The mega-sized chiller plant room with its record-setting 12,000 TR capacity.

too had to be specially proofed against leakage that could damage the high-cost conveyor system; it was kept covered by tarpaulin, and flushed through a network of header lines and branch lines.

Possibly the most severe squeeze on time-lines occurred because the entire civil handover was way behind schedule due to delays in design finalisation by the clients. The Project Management team had to make back-up plans, hire multiple subcontractors and engage more than 800 workers to work day and night on 3 packages.

Don't disrupt the flight schedule

That was an important caveat for all the agencies working on the new terminal: keep the old one going, without disrupting operations or passenger services. The old AC plant room and electrical substation had to be demolished to build the new terminal's Zone 1. This called for substitution of 800m of chilled water piping and 8000m of cabling from the new plant room and substation



The water treatment plant yields 400 cu m per hour – the primary supply for wash-basins and drinking water.



Calligraphy of Tagore quotes adorns the ceiling over the magnificent departure area.



A panoramic spread of cooling towers.



Washrooms with world-class standards of hygiene and convenience.

respectively. Because these had to be laid down under existing road crossings, it was all done overnight and backfilled before dawn. Even the termination was completed overnight, panel by panel, with no more than 2 hrs of shutdown each.

Incidentally, the new AC plant room had ceiling slabs that were not designed to bear the weight

of suspended piping of as much as 1100mm diameter. Nor could they accommodate the gantry crane which AAI wanted above the chillers and pumps, to help shift them for maintenance purposes.

Some new thinking was called for. So Voltas worked with a structural consultant to develop special floor-pipe supports;

this was then cross-checked by specialists at Jadavpur University, and approved by client-nominated architects and structural engineers.

Heights of achievement

A good deal of expertise backed by equipment went

into making it safe, speedy and practical for workers to operate at the considerable heights involved. There were ■ two man-lifts going up to 13.5m height ■ 23 special aluminium scaffolding rigs, which were easy to erect, dismantle and move ■ 3 hand pallets with forklifts at the site ■ large cranes always at hand to, say, unload and position giant items of equipment like centrifugal chillers.

In some special instances, altitudes were even more extreme. The team had to instal 2800 light fittings, 72 smoke extraction fans, 3000m of cable tray, 3000m of trunking and 100km of wiring at a height of 25-30m. Special teams were put together, manned by those experienced in working at elevations. Special working platforms of 90m length were created, complete with safety



Dr B P Sharma (Executive Director, AAI) welcomes football star Bhaichung Bhutia for the inaugural test flight arrival.



handrails. This was especially useful in the departure slab, which would not have borne the weight of a boom lift.

In this, as in so much else, the key learning was that it pays to have the right hardware on-site, whether it's an advanced seam locker



M Gopi Krishna
EVP & COO - DPG

machine for duct boxing, or aluminium latticework for scaffolding wherever needed.

As summed up by M Gopi Krishna (EVP & COO - DPG): "After Hyderabad and Chennai, Kolkata completes our hat-trick of major airport

projects of international size, scope and calibre. At Kolkata, we also re-tested and reaffirmed our accumulated learnings, and can safely claim that we have substantial *experience* in handling all types of challenges. We have



P Kondal Rao discusses a point with (l-r) Bhabani Mishra, S Ganesh and N Lokeswara Rao.

developed the requisite *expertise*. And we know what types of *equipment* to bring to the special needs of the job. For major airports – indeed, for any large project of similar scale – we are more than pre-qualified. We are pre-eminent."

THE PROJECT TEAM

- P Kondal Rao** - Project Director
- C T Satish** - MEP Design Manager
- S Ganesh** - Construction Manager MEP
- Bhabani Mishra** - Construction In-charge (Electrical) - RIEL
- N Lokeswara Rao** - Area Manager (Planning)
- Sumit Poddar** - Executive (Finance & Commercial)
- Trushant Thakur** - Sr Manager (Strategic Sourcing)
- A K Saha** - Head Projects (Urban & Special WMBD)

Electrical	
Execution	Design
Suman Dhar	S Ramasamy
Sumit Chowdhury	Ranjan Saha
Brajesh Kumar	Pijush Kanti Das
R K Maity	
Kamlendra Chowdhury	
Swapnendu Sil	
Partha Santra	
Sandip Chatterjee	
Shivraj Roshan	
Pijush Sharma	

HVAC	
Execution	Design
Pratan Sarkar	Sanchita Roy
Sudhanshu Mishra	P Venu Gopal
Suvankar Chatterjee	Anupriya Ghosh
Biplab Nath	
Anupam Sasmal	

Plumbing	
Execution	Design
Babu Arumugham	Ananda Das
Deepak Chandra Kumar	T S Ramesh
Rintu Pal	

WMBD	
Execution	
Diptiman Basak - Manager Projects	

Testing & Balancing	
N Bhojaraj	
Prasenjit Banerjee	
Khushroo Homi Dubash	
H A Chandrasekhar	
A Goswami - WMBD	

Safety: Vinod Kumar Munda, Sudhir Biswal | *Procurement:* Ajit Singh, Ranjit Das, A K Jha, Amitaba Chakraborty | *Accounts:* Nidhi Doshi | *Stores:* Uttam Kumar Mahanty, Swapan Kumar Ganguly | *Project Planning:* Dipshika Chowdhury | *Document Control:* Debasree Mondal | *Co-ordination Drawings:* Sai Prasad | *Commissioning Support:* Kamal Dasgupta, Mohd. Sabir

