



**METRO
DE PANAMA**

EL METRO DE PANAMA

ACTION STATIONS



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Political will, fiscal capability and technical ability have come together in Panama to help alleviate traffic congestion in the capital city with an elegant solution – El Metro de Panama

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An underground system is being constructed under the heart of the city

Traffic congestion in Panama City has reached crisis point, but it is in the fortunate position of being able to do something about it. The country is in a construction boom with three megaprojects on the go. There is very little unemployment, and the construction industry is in good shape with plenty of low to middle income homes being put up to redress the imbalance of the past that saw expensive condos and villas being built at the expense of affordable housing. Panama's prosperity is reflected in the level of new car sales over the last three years – about 4,000 a month. But that only exacerbates the problem of congestion. In 2009 the Cinta Costera or coastal beltway was completed at a cost of \$189 million, but it was nowhere near enough to compensate for all these cars.

**4,000
A MONTH**

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New car sales in Panama

In the same year as the Cinta Costera was completed Ricardo Martinelli was elected president, promising that one of his aims while in office would be “to solve the problems of the people.” One of the problems that needed solving was Panama City's steadily increasing traffic congestion. The capital is home to just under a quarter of the country's population and responsible for approximately 55 percent of Panama's GDP, and its main public transport system was a fleet of refurbished US school buses known locally as ‘red devils.’

These are being phased out in exchange for a new modernized fleet called Metrobus

but what the capital really needed was a modern, fast and frequent light railway to connect the city with its suburbs and take traffic off the streets. A number of options were considered. Trams were not really an option because they would share the road space with the traffic. An elevated railroad was a better idea but was finally rejected because it was found the columns would restrict the carriageway almost as much; in addition an elevated railway would be unpopular in the narrow downtown streets, running past the windows of offices and homes at first floor level, ruining the view, adding to noise and pollution and, it had to be said, providing a convenient shelter for the homeless and lawless to congregate in the covered areas it would create - a serious problem in some other Latin American countries where elevated railways have been built.

In the end it was decided that a dual solution would be best. An underground system would be constructed under the constricted heart of the city, emerging once it reached the roomier suburbs to run on elevated tracks above the 60 meter wide boulevards. The new system known as El Metro de Panama, or the Panama Metro, will eventually consist of four principal lines, and the first one will cost an estimated \$1.9 billion, of which \$1.5 billion is related to the turnkey EPC contract entered into by the Government of Panama with the Linea Uno Consortium between Construtora Norberto

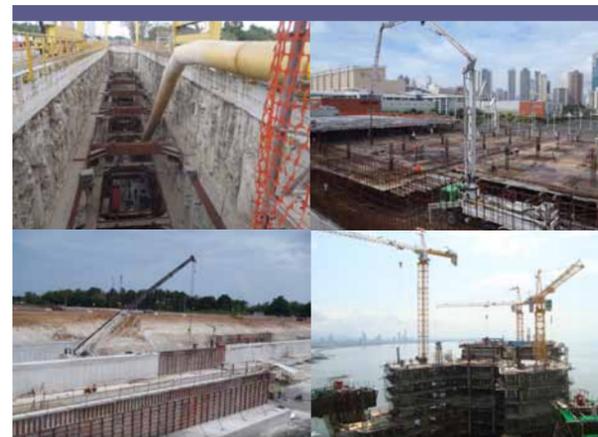
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The project is now a year and a half into construction

Odebrecht of Brazil and Fomento de Construcciones y Contratas (FCC) of Spain. Both these companies have experience in building metro rail systems though they haven't worked together on one until now.

Roberto Roy, executive director of this massive project, explains that though Line 1, a 14 kilometer line linking the northern suburb of Los Andes with Albrook in the south west is well under construction and due to be completed next year, Line 2 to the east and Line 3 to the west are still to

some extent on the drawing board, as is Line 4, a second east-west link. "The master plan which covers the next 30 years allows for four lines but Lines 1, 2 and 3 are the backbone of the system giving us mobility to three main compass points." However, the current project to build Line 1 and its 13 stations is the most crucial as well as the most expensive, since it incorporates the control center with capacity to manage the entire system as well as the maintenance and marshaling depot.

"THE MASTER PLAN WHICH COVERS THE NEXT 30 YEARS ALLOWS FOR FOUR LINES"

Line 2 interchanging with Line 1 at San Miguelito and running to the eastern suburb of La Doña with 10 stations in between will probably be an elevated railway all the way, says Roy, but Line 3 to the west will be much more complicated. It has to cross the Panama Canal to reach the rapidly growing communities of Howard, Arraiján and terminating at La Chorrera, 30 kilometers to the west of Panama City. A new bridge is

to be built by the Panama Canal Authority (ACP), and one option would be for the metro line to piggyback on that bridge. That would take longer than the alternative of creating a new tunnel beneath the canal, but would clearly be cheaper.

Meanwhile Roy's time is fully occupied with the construction of Line 1. Two Herrenknecht tunnel boring machines (TBM) are already working at opposite

“SOMETIMES HALF THE CUTTING WHEEL IS WORKING IN SOFT MATERIAL WHILE THE OTHER IS IN HARDER MATERIAL, AND THAT STRESSES THE ROLLERS UNEVENLY”



The Metro will run on elevated tracks in the suburbs



The tunnel will be ready in a year's time

ends of the seven kilometer long underground section. The rock, he explains, is not particularly hard but it is “blocky” so it is very challenging to cut through. “Basically we are faced with two types of rock in what geologists call La Boca formation – that means in places it can be soft, in others containing blocks of rock. Sometimes half the cutting wheel is working in soft material while the other is in harder material, and that stresses the rollers unevenly.”

The tunnel is sealed as the machine proceeds, installing concrete rings which are prefabricated at a dedicated factory outside.

**\$1.9
BILLION**

.....
Cost of first Metro line

These rings are then sealed with a waterproof grout. “The tunnel itself will be ready in a year's time,” promises Roy. “The two machines are digging towards each other and will be meeting at El Carmen Church, more or less at the center of the line.

At that station the machines will be disassembled and taken out.”

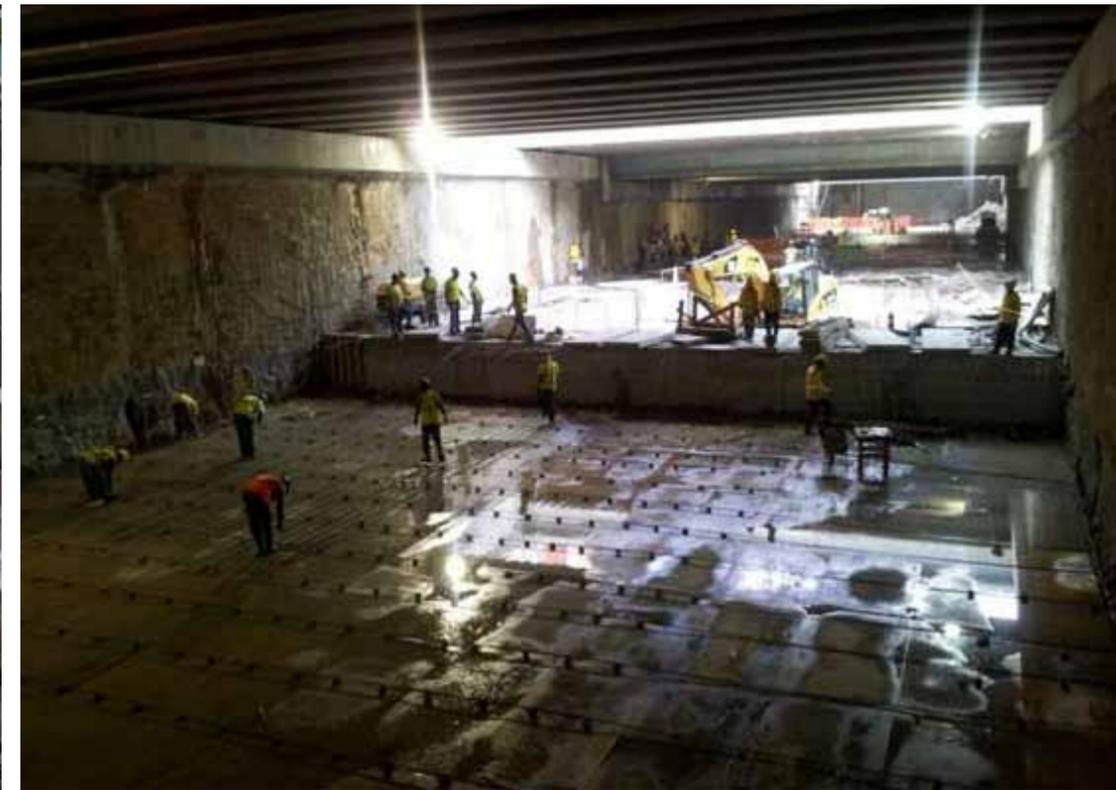
As well as the tunneling, station construction is under way at all 13 stations, and the elevated section to the north is being built. “We are building the whole thing all at once,” he says. Around 3,000 people are directly employed by the consortium with a further 5,000 involved

through suppliers and subcontractors to the project. Though many of them are local skilled and unskilled workers, this is a highly cosmopolitan venture with people from 21 nationalities working together. He is very happy with progress so far. “I just hope not to find any nasty surprises – that could certainly happen, but we don’t foresee anything right now!” The project has gone smoothly from the time of its approval in 2009, he adds, with the entire process of design, specification, tendering and contract signing completed in just 18 months. “We are now a year and a half into construction and we have a little under two years to finish it. I remain confident that we will do that.”

The TBMs are one example of the use of the best available technology in construction, and so is the new rolling stock. Built by the French company Alstom at its Barcelona plant, these are the latest generation in transportation, though some concessions are made to human concerns. “We will have an almost entirely automated system,” he says, “but focus groups and questionnaires told us that they would feel safer if there was a real person in charge!” Accordingly the trains will be manned though there will be little for the conductor to do other than supervising the closing of the doors. Initially the trains will



Aerial view of excavation operations



It’s a 24 hour-a-day operation

run every three or four minutes. The design capacity of the system, initially, is for 19 trains of three carriages each, transporting 15,000 persons per hour per direction, and can eventually transport 40,000 PPD with five carriage trains every 90 seconds. Something approaching that frequency might be seen in 2025 when the entire network has been built and Panama’s citizens have become accustomed to using it.

Roberto Roy says the two contractors have worked together reasonably well on this difficult project, despite having different corporate cultures and speaking different languages – at the end of the day, the Portuguese speaking Odebrecht people are comfortable with Spanish, the language of Panama. Project management is carried out by a consortium of Metro de Barcelona, AYESA from Seville, and Inelectra.

President Martinelli says: “The new Metro will change the lives of Panamanians who in the past have gone through hardships, getting up early for a transportation system that really does not work.” For the time being though, one of Roy’s headaches is trying not to make the problems worse. “One of our

main problems has been the disposal of the excavated rock. We can’t always avoid going through busy streets, and we work 24 hours a day so we can’t limit ourselves to night time movements. On top of that we have to make sure the streets are kept clean because the trucks create a lot of dust, and when it rains that turns to mud.” The material is taken to landfill spots.

“It is very complicated, but my team and I are having a lot of fun building something totally new and never seen before in Panama!” concluded Roy. **BE**

“WE HAVE TO MAKE SURE THE STREETS ARE KEPT CLEAN BECAUSE THE TRUCKS CREATE A LOT OF DUST, AND WHEN IT RAINS THAT TURNS TO MUD”

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