In service 20 hours a day for Vancouver's SkyTrain

There is some hard work going on in Vancouver, the Canadian Pacific metropolis. Two LEICA TCA2003 total stations with automatic target seeking operate up to twenty hours daily along the route of a new stretch of SkyTrain track. "The beauty of the Leica Geosystems automatic target recognition instrument is that we can also work nights", says Don Murray.

Above: The overhead erection truss system works its way along the support columns on stilts, spanning them with elements that are joined together on site. Below: LEICA TCA2003 total station operate up to 20 hours a day with survey teams working in shifts. 90,000 track anchoring points need measuring – and that's just part of the job!

Don Murray and his 21-strong team are responsible for all surveying work on the 17-kilometre SkyTrain expansion. 13 new "stations in the sky" are simultaneously taking shape along the new stretch of elevated guideway that runs primarily through industrial areas, high above existing road and rail corridors.

Pace setting elevated guideway

The key to the success of Greater Vancouver's SkyTrain is the elevated guideway. Just like the construction work presently underway, SkyTrain passengers travel quickly and efficiently without getting tangled in traffic. The SAR joint venture building the elevated guideway uses innovative construction and survey methods, like an overhead erection truss system and target-seeking total stations.

Planned for a century of service

The awesome quality demands placed on the SkyTrain elevated railway are dictated by its design life of 100 years. More than 500 columns are required to support the guideway. The concrete columns are cast in situ about 37 metres apart. Once the columns are in place the guideway beams are assembled using an overhead erection truss system which straddles the guideway columns. The track runs on reinforced concrete beam segments that are slotted together before the erection truss moves on to the next section.

Custom casting

Each segment is individually cast with its own geometry depending on the angle and incline of the guideway at SAR Transit's precast facility. Guideway assembly typically involves hoisting

12 segments, each 3.2 metres long, then drawing them together with steel cables to form a solid guideway span. There are 6,000 segments used in the formation of the guideway.

Work includes measuring 90,000 anchor points

Precise measurement is crucial in this densely built-up area criss-crossed by transportation routes. Don Murray: "The first step was to establish a fixed point control network along the entire projected route. We did the job with two LEICA TCA2003 total stations. For more than a year now, we have been using the same instruments to measure finished sections of guideway. This includes 156–212 pairs of as-built inserts per segment, which alone adds up to around 90,000 measurement points!" It is therefore unsurprising that the surveyors work shifts like the rest of the construction crew in order to record this quantity of points and maintain rapid progress. As a result, their LEICA TCA2003 total stations operate for up to twenty hours a day. "Precision is paramount", says surveying specialist Don Murray. "The specified tolerance is just ±3 mm. Furthermore, each measurement must be repeatable with similar precision. And of course, instrument downtime is the last thing we can afford. In short, there were many reasons behind our choice of Leica TCA2003 total stations."

About one third faster – amongst other benefits

Asked to compare the benefits of automated target focussing with conventional methods based on his

experience with this project, Don Murray concludes: "When establishing the fixed point network, we were able to acquire considerably more data in the time available. Measuring new control points on the elevated guideway structure required just two-thirds of the time originally scheduled, which corresponds to a one-third saving in work hours and personnel. We could also minimise any positioning errors while marking the control bolts." There is another point which Don Murray feels should not be underestimated: "The automated total stations target-seeking 'eye' stays on top form even after 20 hours' work, which is why this project has not been dogged by discrepancies resulting from observer fatigue, followed by pain-staking tracking-down of errors!"

Train service to commence shortly

For efficiency and schedul-ing reasons, the SkyTrain guideway is being built in several areas simultaneous-ly. Thanks to the latest construction and survey technology, the project managers were able to minimise diversions and disruptions along existing traffic routes. After a construction period of just one and a half years, the first SkyTrains are set to start gliding elegantly along the expansion stretch as early as May 2001, high above regular traffic. ***Stf***

Vancouver's new stretch of SkyTrain elevated railway runs largely alongside existing traffic routes.