APPENDIX B:
CONSTRUCTION PROCESS FOR TRANSMISSION LINES

CONSTRUCTION PROCESS FOR TRANSMISSION LINES

1. Construction Camps

The entire construction workforce is usually accommodated on a "construction camp" that will be situated at some point along the Transmission line route (refer to Photographs B1 and B2). The location is selected by the contractor who will take into account such aspects as access to the construction site, access to services, access to materials, etc. The contractor will enter into an agreement with a landowner for the establishment of the construction camp. The various teams will travel from the camp to the construction site each day. The site moves continuously with the progression of the line, so the teams will perhaps travel a greater distance to the site each time. All materials are stored at the construction camp with the exception of the steel towers (which may come direct from the factory) and concrete (unless the site is very remote, when concrete may be mixed on site). As a rule, there is usually one construction camp per 100 km of Transmission line.

2. Construction Process for Transmission Lines

The following construction process will be followed for the entire route of the new Transmission lines. Each activity will follow the previous one, such that at any one point an observer will see a chain of events with different working teams involved. At any one time, some or all of the different teams may be working at different points along the line. Construction of this line will take approximately 24 months to complete, and is anticipated to begin early 2004.

Activity	Approx team size	Approx duration of activity at a point
Survey of the route	By air	-
2. Determination of the conductor type and Selection	-	-
of best-suited conductor, towers, insulators,		
foundations		
Define final centre line		
Determine co-ordinates of each bend in the line		
Undertake aerial survey to obtain an accurate		
profile of the area		
Identify optimal tower sizes and positions		
3. Final design of line and placement of towers	-	-
4. Issuing of tenders, and award of contract to	-	-
construction companies		

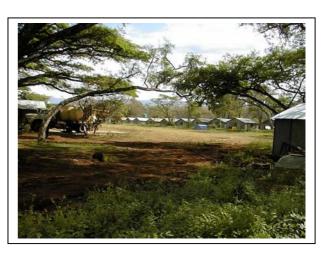
	Activity	Approx team size	Approx duration of activity at a point
5.	Vegetation clearance -centre line (light vehicle access required)	5 - 15	1 - 2 days depending on local site
•	Clear vegetation along centre line, with the aid of a surveyor		conditions
•	Undertake vegetation clearing in accordance with the minimum standards to be used for vegetation clearing for the construction of the proposed new Transmission lines (Eskom, 2000)		
6.	Centre line pegging and identification of requirements and locations for new gate (light vehicle access required)	3	1 day
7.	Access negotiations (light vehicle access required)	1	1 day
•	Develop and agree on an access plan (Eskom, contractor and landowner)		
•	Agree to rehabilitation measures Take photographs of pre-construction conditions of site		
•	Establish access roads (where required)		
8.	New gate installation (light vehicle access required)	5	1 day
9.	Vegetation clearance (tower positions)	5 - 15	1 - 2 days
	Class form thing (40 mg to 40 mg to 500 CDC		depending on
•	Clear four strips (40 m x 40 m square for CRS towers and 20 m x 20 m for the self-supporting		local site conditions
	towers) for assembling and erection purposes at each tower position marked		conditions
10.	Foundation nominations for main structure and anchors (heavy vehicle access required)	5	2 days
	Check soil types to determine foundation requirements Dig trial pits at main foundation points (usually		
	using mechanical back-actor/auger method, although manual labour may be used)		

Activity	Approx team size	Approx duration of activity at a point
11. Excavation of foundations (heavy vehicle access required)	15	2 days
 Excavate foundations of up to 4 m x 4 m square and up to 4 m deep depending on soil conditions (mechanically where access to tower sites is readily available (refer to Photograph B3), and dug by hand where access is poor) Cover or fence off foundation pit until foundation is poured (refer to Photograph B4) 		
12. Foundation steelwork –reinforcing (heavy vehicle access required)	10	2 days
 Make up steelwork at base camp and transport to site by truck Undertake fitting and wiring on site (limited welding on site) 		
13. Foundation (concrete) pouring (heavy vehicle access required)	20	2 days
 Shuttering Use of standard concrete truck Where access problems exist, mix concrete on site 28 day period required after concrete has been laid Heavy usage of access/service roads during this stage 		
14. Delivery of tower steelwork (heavy vehicle access; extra long trucks used)	5	1 day
 Deliver steelwork in sections and assemble on site (refer to Photograph B5) Mark access roads clearly to ensure the correct tower is delivered to each site (as towers are individually designed for each location) 		

Activity	Approx team size	Approx duration of activity at a point
15. Assembly team/punching and painting (light vehicle	10	3 days
access required)		
Assemble steelwork on the ground		
Punch nuts and paint with non-corrosive paint		
16. Erection (abnormal load vehicle access required)	20	2 days
• Final assembly of towers by cranes (minimum of 50 tons; refer to Photograph B6)		
17. Stringing (abnormal load vehicle access required)	50	7 days
 Place cable drums within servitude (refer to Photograph A6) 		
 Undertake stringing in both directions (5 – 10 km can be strung from one station) 		
Working are at each drum will be as long as 130 m, but will be within the servitude area		
Intensive vehicle activity is likely within the working		
areaPilot tractor cable will place cable on the ground		
Pull up cable through use of a pulley		
Ensure conductors never tough the ground		
18. Sag and tension (heavy vehicle access required)	10	3 days
Tension the line from each station to ensure that minimum ground clearance heights are achieved (i.e. 8,4 m for 400 kV lines)		
19. Rehabilitation (heavy and light vehicle access	5 - 15	2 - 10 days
required)		depending on local site
Continuous process throughout the construction phase		conditions
Will typically only commence after the first 100 towers are constructed		
There is a one year guarantee on the contractors		
work during which rehabilitation must be concluded		



Photograph B1: Typical construction camp



Photograph B2: Typical construction camp



Photograph B3: Drilling of foundations



Photograph B4: Cover over foundations



Photograph B5: Towers are erected on site



Photograph B6: Erection of towers by