

### **Contents**

| Sl. No. | Document Title                                                      | Document No.          | No. of Sheets |
|---------|---------------------------------------------------------------------|-----------------------|---------------|
| 1.      | 33kV DC TRANSMISSION LINE 2<br>PLAN & PROFILE AND TOWER<br>SCHEDULE | TCE-7219B-765-RA-6201 | 7             |

**NTPC DOC. NO. : 0370-572-PVC-C-353**

**Rev-02**

**DOC. TITLE: Report of Route survey , tower spotting and transmission line Profile for 33KV D/C transmission line**

NABINAGAR POWER GENERATION CO. PVT. LTD.  
(A JV OF NTPC LTD. & BIHAR STATE POWER (HOLDING) CO. LTD.)

400/132 kV SWITCHYARD AT NABINAGR STPP (3X660MW)  
& 400 KV SWITCHYARD EXTENSION AT NABINAGAR TPP(BRBCL)  
NOA Number :CS-0370-572-2-FC-NOA-0009 DATED 12-02-2013



BHARAT HEAVY ELECTRICALS LTD.  
TRANSMISSION PROJECTS DIVISION  
NEW DELHI

W.O. Number : 81004

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**BHARAT HEAVY ELECTRICALS LIMITED  
NEW DELHI**

**400kV & 33kV TRANSMISSION LINES AT  
NABINAGAR, BIHAR**

**33kV DC TRANSMISSION LINE 2  
PLAN & PROFILE AND TOWER SCHEDULE**

**NTPC DRG. NO: 0370-572-PVC-C-353  
TCE DRG. NO: TCE-7219B-765-RA-6201**



**TATA CONSULTING ENGINEERS LIMITED**

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**OCTOBER 2014**

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| TOWER ABSTRACT (LINE 2 - 33 kV DC TRANSMISSION LINE) |    |    |    |    |     |       |
|------------------------------------------------------|----|----|----|----|-----|-------|
| Tower Type\Extn                                      | +0 | +3 | +6 | +9 | +12 | Total |
| DA                                                   | 13 | 1  | 0  | 0  | 0   | 14    |
| DB                                                   | 1  | 1  | 0  | 0  | 0   | 2     |
| DC                                                   | 6  | 1  | 0  | 0  | 0   | 7     |
| Total                                                | 20 | 3  | 0  | 0  | 0   | 23    |
| Gantry                                               | 2  | 0  | 0  | 0  | 0   | 2     |

Total Line Length = 2880.5 m

Bee Line Length = 2350.2 m

Total No. of DA Towers = 14

Total No. of DC (including DB) Towers = 9

Height of Normal DA Type Tower = 15.855 m

Height of Normal DC Type Tower = 16.150 m

Height shall be as per calculations

Note: DC Type Towers to be used in place of DB Type Towers



| PROJECT : 400 & 33 kV TRANSMISSION LINES AT NABINAGAR, BIHAR     |         |            |                       |          |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
|------------------------------------------------------------------|---------|------------|-----------------------|----------|--------------------|--------------|---------------|---------------|-------|-------|--------------------|--------|--------|-------------------|-------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------|-----------|----------------------|---------------|-------------------|----------|--|--|
| CUSTOMER : NABINAGAR POWER GENERATION COMPANY                    |         |            |                       |          |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| CONTRACTOR : BHARAT HEAVY ELECTRICALS LIMITED                    |         |            |                       |          |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| CONSULTANT : TATA CONSULTING ENGINEERS LIMITED                   |         |            |                       |          |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| TOWER SCHEDULE (LINE 2 - 33 kV DOUBLE CIRCUIT TRANSMISSION LINE) |         |            |                       |          |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| Sl. No                                                           | Twr No. | Tower Type | Deviation Angle (DMS) | Span (m) | Section Length (m) | Chainage (m) | Wind Span (m) | Adjacent Span |       |       | Weight Span (Cold) |        |        | Weight Span (Hot) |       |       | Major Crossings (with in 15m either side from CL)/Remarks                                                                                                                                                                | UTM Coordinate (Zone - 45)    |               |           | Spherical Coordinate |               | Local Coordinates |          |  |  |
|                                                                  |         |            |                       |          |                    |              |               | Left          | Right | Total | Left               | Right  | Total  | Left              | Right | Total |                                                                                                                                                                                                                          | Easting                       | Northing      | Elevation | Longitude            | Latitude      | Easting           | Northing |  |  |
| 1                                                                | GANTRY  | GANTRY     |                       |          | -                  | 0.0          | 32.4          | 0.0           | 64.7  | 64.7  | 0.0                | -40.5  | -40.5  | 0.0               | 14.6  | 14.6  | NPGC End<br>Height of Switchyard take off gantry : 8.0m<br>(Ground Clearance required: 5.35m & Ground Clearance available: 7.74m)                                                                                        | 2,12,209.500                  | 27,44,033.000 | 117.920   | 84°09'13.5" E        | 24°47'02.5" N | 427.35            | 2522.36  |  |  |
|                                                                  |         |            |                       | 64.7     |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 2                                                                | AP1B    | DC+00      | 1°12'16" (LT)         |          | 64.7               | 64.7         | 89.9          | 64.7          | 115.0 | 179.7 | 105.2              | 52.2   | 157.4  | 50.1              | 56.2  | 106.3 | Dead End Tower<br>(Ground Clearance required: 5.35m & Ground Clearance available: 7.38m)                                                                                                                                 | 2,12,248.000                  | 27,44,085.000 | 117.800   | 84°09'14.9" E        | 24°47'04.2" N | 448.09            | 2583.64  |  |  |
|                                                                  |         |            |                       | 115.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 3                                                                | 1B/1    | DA+00      |                       |          |                    | 179.7        | 113.6         | 115.0         | 112.2 | 227.2 | 62.7               | 54.8   | 117.5  | 58.8              | 55.7  | 114.5 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.82m)                                                                                                                                                   | 2,12,314.470                  | 27,44,178.840 | 118.010   | 84°09'17.2" E        | 24°47'07.3" N | 482.65            | 2,693.32 |  |  |
|                                                                  |         |            |                       | 112.2    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 4                                                                | AP2B    | DC+00      | 57°31'04" (LT)        |          | 227.2              | 291.9        | 71.7          | 112.2         | 31.1  | 143.3 | 57.3               | 266.6  | 324.0  | 56.5              | 78.00 | 134.5 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.0m)                                                                                                                                                    | 2,12,379.310                  | 27,44,270.380 | 118.060   | 84°09'19.4" E        | 24°47'10.4" N | 516.37            | 2800.31  |  |  |
|                                                                  |         |            |                       | 31.1     |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 5                                                                | AP2B1   | Gnt        |                       |          |                    | 323.0        | 46.5          | 31.1          | 61.9  | 93.0  | -241.1             | -77.30 | -318.4 | -46.9             | 4.58  | -42.3 | Gantry Tower HT : 7.00 m<br>132 kV line crossing (Clearance in between 132 kV & 33 kV conductors required: 3.05m & Clearance available: 4.1m).<br>(Ground Clearance required: 5.35m & Ground Clearance available: 7.0m). | 2,12,367.555                  | 27,44,299.173 | 118.050   | 84°09'15.8" E        | 24°47'11.2" N | 496.37            | 2824.13  |  |  |
|                                                                  |         |            |                       | 61.9     |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          | Comments as marked on drawing |               |           |                      |               |                   |          |  |  |
| 6                                                                | AP3B    | DC+00      | 38°01'04" (RT)        |          | 93.0               | 384.9        | 96.0          | 61.9          | 130.0 | 191.9 | 137.0              | 67.6   | 204.6  | 57.3              | 65.9  | 123.2 | (Ground Clearance required: 5.35m & Ground Clearance available: 6.71m)                                                                                                                                                   | 212344.15                     | 2744356.50    | 117.62    | 84°09'18.1" E        | 24°47'13.1" N | 456.55            | 2871.54  |  |  |
|                                                                  |         |            |                       | 130.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 7                                                                | 3B/1    | DA+00      |                       |          |                    | 514.9        | 130.0         | 130.0         | 130.0 | 260.0 | 62.4               | 67.6   | 130.0  | 64.2              | 65.8  | 130.0 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.41m)                                                                                                                                                   | 2,12,379.570                  | 27,44,481.590 | 117.500   | 84°09'19.3" E        | 24°47'17.2" N | 451.99            | 3,001.47 |  |  |
|                                                                  |         |            |                       | 130.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 8                                                                | 3B/2    | DA+00      |                       |          |                    | 644.9        | 130.0         | 130.0         | 130.0 | 260.0 | 62.4               | 68.7   | 131.1  | 64.2              | 66.2  | 130.4 | (Ground Clearance required: 5.35m & Ground Clearance available: 6.88m)                                                                                                                                                   | 2,12,415.000                  | 27,44,606.690 | 117.380   | 84°09'20.4" E        | 24°47'21.3" N | 447.44            | 3,131.41 |  |  |
|                                                                  |         |            |                       | 130.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 9                                                                | 3B/3    | DA+00      |                       |          |                    | 774.9        | 130.0         | 130.0         | 130.0 | 260.0 | 61.3               | 71.1   | 132.4  | 63.8              | 66.9  | 130.7 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.39m)                                                                                                                                                   | 2,12,450.420                  | 27,44,731.780 | 117.210   | 84°09'21.6" E        | 24°47'25.4" N | 442.88            | 3,261.34 |  |  |
|                                                                  |         |            |                       | 130.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 10                                                               | 3B/4    | DA+00      |                       |          |                    | 904.9        | 130.0         | 130.0         | 130.0 | 260.0 | 58.9               | 72.4   | 131.3  | 63.1              | 67.4  | 130.5 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.68m)<br>Village Road 4 m wide                                                                                                                          | 2,12,485.850                  | 27,44,856.870 | 116.930   | 84°09'22.8" E        | 24°47'29.5" N | 438.34            | 3,391.27 |  |  |
|                                                                  |         |            |                       | 130.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 11                                                               | 3B/5    | DA+00      |                       |          |                    | 1,034.9      | 125.0         | 130.0         | 120.0 | 250.0 | 57.6               | 61.4   | 119.0  | 62.6              | 60.5  | 123.1 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.70m)                                                                                                                                                   | 2,12,521.270                  | 27,44,981.960 | 116.590   | 84°09'23.9" E        | 24°47'33.6" N | 433.78            | 3,521.20 |  |  |
|                                                                  |         |            |                       | 120.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 12                                                               | 3B/6    | DA+00      |                       |          |                    | 1,154.9      | 117.0         | 120.0         | 113.9 | 233.9 | 58.6               | 55.2   | 113.8  | 59.6              | 56.4  | 116.0 | (Ground Clearance required: 5.35m & Ground Clearance available: 7.98m)                                                                                                                                                   | 2,12,553.970                  | 27,45,097.430 | 116.530   | 84°09'25.0" E        | 24°47'37.3" N | 429.58            | 3,641.14 |  |  |
|                                                                  |         |            |                       | 113.9    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 13                                                               | AP4B    | DB+00      | 15°45'28" (RT)        |          | 883.9              | 1,268.8      | 129.5         | 113.9         | 145.0 | 258.9 | 58.7               | 86.5   | 145.2  | 57.5              | 77.0  | 134.5 | (Ground Clearance required: 5.35m & Ground Clearance available: 6.83m)                                                                                                                                                   | 2,12,585.000                  | 27,45,207.000 | 116.600   | 84°09'26.0" E        | 24°47'40.9" N | 425.59            | 3754.95  |  |  |
|                                                                  |         |            |                       | 145.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 14                                                               | 4B/1    | DA+00      |                       |          |                    | 1,413.8      | 147.5         | 145.0         | 150.0 | 295.0 | 58.5               | 70.1   | 128.6  | 68.0              | 73.4  | 141.4 | (Ground Clearance required: 5.35m & Ground Clearance available: 6.46m)                                                                                                                                                   | 2,12,660.910                  | 27,45,330.540 | 115.880   | 84°09'28.6" E        | 24°47'45.0" N | 460.06            | 3,895.79 |  |  |
|                                                                  |         |            |                       | 150.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 15                                                               | 4B/2    | DA+00      |                       |          |                    | 1,563.8      | 147.5         | 150.0         | 145.0 | 295.0 | 79.9               | 80.3   | 160.2  | 76.6              | 75.0  | 151.5 | (Ground Clearance required: 5.35m & Ground Clearance available: 6.90m)                                                                                                                                                   | 2,12,739.440                  | 27,45,458.340 | 116.140   | 84°09'31.3" E        | 24°47'49.2" N | 495.71            | 4,041.49 |  |  |
|                                                                  |         |            |                       | 145.0    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |
| 16                                                               | 4B/3    | DA+00      |                       |          |                    | 1,708.8      | 146.4         | 145.0         | 147.8 | 292.8 | 64.7               | 76.6   | 141.3  | 70.0              | 74.8  | 144.8 | (Ground Clearance required: 5.35m & Ground Clearance available: 6.03m)                                                                                                                                                   | 2,12,815.350                  | 27,45,581.880 | 115.740   | 84°09'33.9" E        | 24°47'53.2" N | 530.18            | 4,182.33 |  |  |
|                                                                  |         |            |                       | 147.8    |                    |              |               |               |       |       |                    |        |        |                   |       |       |                                                                                                                                                                                                                          |                               |               |           |                      |               |                   |          |  |  |

| Sl. No | Twr No. | Tower Type | Deviation Angle (DMS) | Span (m) | Section Length (m) | Chainage (m) | Wind Span (m) | Adjacent Span |       |       | Weight Span (Cold) |       |        | Weight Span (Hot) |       |       | Major Crossings (with in 15m either side from CL)/Remarks                                                                                                                                    | UTM Coordinate (Zone - 45)    |               |           | Spherical Coordinate |               | Local Coordinates |          |
|--------|---------|------------|-----------------------|----------|--------------------|--------------|---------------|---------------|-------|-------|--------------------|-------|--------|-------------------|-------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------|-----------|----------------------|---------------|-------------------|----------|
|        |         |            |                       |          |                    |              |               | Left          | Right | Total | Left               | Right | Total  | Left              | Right | Total |                                                                                                                                                                                              | Easting                       | Northing      | Elevation | Longitude            | Latitude      | Easting           | Northing |
| 17     | AP5B    | DC+00      | 53°46'33" (LT)        |          | 587.8              | 1,856.7      | 91.9          | 147.8         | 36.0  | 183.8 | 71.2               | 246.7 | 317.9  | 73.1              | 90.8  | 163.9 |                                                                                                                                                                                              | 2,12,892.750                  | 27,45,707.850 | 115.600   | 84°09'36.6" E        | 24°47'57.4" N | 565.32            | 4325.94  |
|        |         |            |                       | 36.0     |                    |              |               |               |       |       |                    |       |        |                   |       |       | (Ground Clearance required: 5.35m & Ground Clearance available: 5.95m)                                                                                                                       |                               |               |           |                      |               |                   |          |
| 18     | AP5B1   | Gnt        |                       |          |                    | 1,892.7      | 46.5          | 36.0          | 57.0  | 93.0  | -210.7             | -86.6 | -297.3 | -54.9             | -8.2  | -63.0 | Gantry Tower HT : 7.00 m                                                                                                                                                                     | 212879.143                    | 2745741.179   | 115.44    | 84°09'32.9" E        | 24°47'58.4" N | 542.16698         | 4353.50  |
|        |         |            |                       | 57.0     |                    |              |               |               |       |       |                    |       |        |                   |       |       | 132 kV line crossing (Clearance in between 132 kV & 33 kV conductors required: 3.05m & Clearance available: 6.3m).<br>(Ground Clearance required: 5.35m & Ground Clearance available: 7.0m). | Comments as marked on drawing |               |           |                      |               |                   |          |
| 19     | AP6B    | DC+00      | 40°43'43" (RT)        |          | 36.0               | 1,949.7      | 88.5          | 57.0          | 120.0 | 177.0 | 143.6              | 56.7  | 200.3  | 65.2              | 58.9  | 124.1 |                                                                                                                                                                                              | 2,12,857.590                  | 27,45,793.970 | 115.010   | 84°09'35.3" E        | 24°48'00.2" N | 505.49            | 4397.17  |
|        |         |            |                       | 120.0    |                    |              |               |               |       |       |                    |       |        |                   |       |       | (Ground Clearance required: 5.35m & Ground Clearance available: 7.13m)                                                                                                                       |                               |               |           |                      |               |                   |          |
| 20     | 6B/1    | DA+00      |                       |          |                    | 2,069.7      | 123.4         | 120.0         | 126.8 | 246.8 | 63.3               | -7.5  | 55.8   | 61.1              | 40.8  | 101.9 |                                                                                                                                                                                              | 2,12,895.710                  | 27,45,907.750 | 115.150   | 84°09'36.6" E        | 24°48'03.9" N | 506.97            | 4,517.16 |
|        |         |            |                       | 126.8    |                    |              |               |               |       |       |                    |       |        |                   |       |       | (Ground Clearance required: 5.35m & Ground Clearance available: 8.24m)                                                                                                                       |                               |               |           |                      |               |                   |          |
| 21     | AP7B    | DC+03      | 55°50'51" (LT)        |          | 246.8              | 2,196.5      | 113.7         | 126.8         | 100.6 | 227.4 | 134.4              | 60.1  | 194.5  | 86.0              | 53.4  | 139.4 |                                                                                                                                                                                              | 2,12,936.000                  | 27,46,028.000 | 115.330   | 84°09'37.9" E        | 24°48'07.8" N | 508.53            | 4643.97  |
|        |         |            |                       | 100.6    |                    |              |               |               |       |       |                    |       |        |                   |       |       | 33 kV line crossing (Clearance in between 33 kV conductors required: 2.44m & Clearance available: 4.60m).<br>(Ground Clearance required: 5.35m & Ground Clearance available: 10.97m)         |                               |               |           |                      |               |                   |          |
| 22     | AP8B    | DB+03      | 17°53'00" (LT)        |          | 100.6              | 2,297.1      | 112.8         | 100.6         | 125.0 | 225.6 | 40.5               | 62.0  | 102.5  | 47.2              | 62.4  | 109.6 |                                                                                                                                                                                              | 2,12,875.000                  | 27,46,108.000 | 114.980   | 84°09'35.7" E        | 24°48'10.4" N | 425.98            | 4701.47  |
|        |         |            |                       | 125.0    |                    |              |               |               |       |       |                    |       |        |                   |       |       | 33 kV 2 no. line crossings (Clearance in between 33 kV conductors required: 2.44m & Clearance available: 3.10m).<br>(Ground Clearance required: 5.35m & Ground Clearance available: 10.57m)  |                               |               |           |                      |               |                   |          |
| 23     | 8B/1    | DA+03      |                       |          |                    | 2,422.1      | 130.0         | 125.0         | 135.0 | 260.0 | 62.9               | 131.8 | 194.7  | 62.6              | 88.0  | 150.6 |                                                                                                                                                                                              | 2,12,772.350                  | 27,46,179.320 | 115.000   | 84°09'32.0" E        | 24°48'12.6" N | 306               | 4738     |
|        |         |            |                       | 135.0    |                    |              |               |               |       |       |                    |       |        |                   |       |       | 11 kV line crossing (Clearance in between 11 kV & 33 kV conductors required: 2.44m & Clearance available: 3.30m).<br>(Ground Clearance required: 5.35m & Ground Clearance available: 8.52m)  |                               |               |           |                      |               |                   |          |
| 24     | 8B/2    | DA+00      |                       |          |                    | 2,557.1      | 125.0         | 135.0         | 115.0 | 250.0 | 3.2                | 79.2  | 82.4   | 47.0              | 64.4  | 111.4 |                                                                                                                                                                                              | 2,12,661.480                  | 27,46,256.350 | 114.930   | 84°09'28.0" E        | 24°48'15.0" N | 177               | 4777     |
|        |         |            |                       | 115.0    |                    |              |               |               |       |       |                    |       |        |                   |       |       | (Ground Clearance required: 5.35m & Ground Clearance available: 7.65m)<br>Village Road 7 m wide                                                                                              |                               |               |           |                      |               |                   |          |
| 25     | 8B/3    | DA+00      |                       |          |                    | 2,672.1      | 115.4         | 115.0         | 115.7 | 230.7 | 35.8               | 120.0 | 155.8  | 50.6              | 77.7  | 128.3 |                                                                                                                                                                                              | 2,12,567.040                  | 27,46,321.970 | 114.050   | 84°09'24.6" E        | 24°48'17.1" N | 67                | 4811     |
|        |         |            |                       | 115.7    |                    |              |               |               |       |       |                    |       |        |                   |       |       | (Ground Clearance required: 5.35m & Ground Clearance available: 7.92m)                                                                                                                       |                               |               |           |                      |               |                   |          |
| 26     | AP9B    | DC+00      | 41°36'34" (LT)        |          | 490.7              | 2,787.8      | 104.2         | 115.7         | 92.7  | 208.4 | -4.2               | 144.3 | 140.1  | 38.1              | 77.6  | 115.7 | Dead End Tower                                                                                                                                                                               | 2,12,472.000                  | 27,46,388.000 | 111.510   | 84°09'21.1" E        | 24°48'19.2" N | -43.37            | 4844.72  |
|        |         |            |                       | 92.7     |                    |              |               |               |       |       |                    |       |        |                   |       |       | (Ground Clearance required: 6.1m & Ground Clearance available: 6.68m)<br>(Road Clearance required: 5.35m & Proposed Road Clearance available: 7.59m)                                         |                               |               |           |                      |               |                   |          |
| 27     | GANTRY  | GANTRY     |                       |          | 92.7               | 2,880.5      | 46.4          | 92.7          | 0.0   | 92.7  | -51.7              | 0.0   | -51.7  | 15.1              | 0.0   | 15.1  | Make-up Water End Side<br>Height of Switchyard take off gantry : 8.0m                                                                                                                        | 2,12,380.000                  | 27,46,377.000 | 110.050   | 84°09'17.9" E        | 24°48'18.8" N | -127.59           | 4806.09  |

PLEASE UPDATE THE TOWER COORDIANRS AT MAKE UP WATER END IN THE 33 KV STRUCTURAL LAYOUT DRAWING

| GROUND LEVEL (m) | CHAINAGE (m) |
|------------------|--------------|
| 117.620          | 0.0          |
| 117.662          | 20.0         |
| 117.584          | 40.0         |
| 117.585          | 60.0         |
| 117.547          | 80.0         |
| 117.529          | 100.0        |
| 117.520          | 120.0        |
| 117.602          | 140.0        |
| 117.644          | 160.0        |
| 117.606          | 180.0        |
| 117.438          | 200.0        |
| 117.419          | 220.0        |
| 117.461          | 240.0        |
| 117.385          | 260.0        |
| 117.385          | 280.0        |
| 118.073          | 300.0        |
| 117.982          | 320.0        |
| 117.691          | 340.0        |
| 117.699          | 360.0        |
| 117.398          | 380.0        |
| 117.117          | 400.0        |
| 117.090          | 420.0        |
| 117.091          | 440.0        |
| 117.095          | 460.0        |
| 117.096          | 480.0        |
| 116.995          | 500.0        |
| 116.991          | 520.0        |
| 116.863          | 540.0        |
| 116.895          | 560.0        |
| 116.549          | 580.0        |
| 116.549          | 600.0        |
| 116.538          | 620.0        |
| 116.572          | 640.0        |
| 116.602          | 660.0        |
| 116.625          | 680.0        |
| 116.603          | 700.0        |
| 116.597          | 720.0        |
| 116.541          | 740.0        |
| 116.536          | 760.0        |
| 116.569          | 780.0        |
| 116.596          | 800.0        |
| 116.529          | 820.0        |
| 116.501          | 840.0        |
| 116.573          | 860.0        |
| 116.600          | 880.0        |

TURNING ANGLE: 38°10'10" (RT)

Span: 130.0m

Span: 130.0m

Span: 130.0m

Span: 130.0m

Span: 130.0m

Span: 130.0m

Span: 120.0m

Span: 113.9m

AP3B

380/1

380/2

380/3

380/4

380/5

380/6

AP4B

FENCE

FENCE

880.0

|    |
|----|
| GR |
|    |

| ROUND LEVEL<br>(m) | CHAINAGE<br>(m) |
|--------------------|-----------------|
| 116.600            | 0.0             |
| 116.608            | 20.0            |
| 116.299            | 40.0            |
| 116.337            | 60.0            |

TH-27.1

Span: 14

TURNING ANGLE: 15°45'28" (RT)

AP4B

Figure 10 shows the elevation of the bridge deck at the abutments. The diagram illustrates a cross-section of the bridge deck, highlighting the central span of 150.0m and the side spans of 5.0m. The elevation is measured in meters above sea level (m a.s.l.). The central pier has a height of 116.221m. The abutments have heights of 116.089m, 116.596m, 115.884m, 115.887m, 116.076m, 116.131m, 116.184m, and 116.221m. The deck is shown with a slight dip in the center, with a depth of 32.2m indicated.

Figure 10 is an elevation profile of the bridge deck. The profile shows a series of points connected by a line, with elevations ranging from 115.171 to 116.445. The horizontal distance is 145.0m. The profile is labeled 'LINE' and 'TH=26.7'.

| Station | Elevation |
|---------|-----------|
| 0+00    | 115.171   |
| 0+20    | 115.158   |
| 0+40    | 116.445   |
| 0+60    | 116.120   |
| 0+80    | 116.049   |
| 1+00    | 115.978   |
| 1+20    | 115.908   |
| 1+40    | 115.837   |
| 1+60    | 115.820   |

Figure 10 is a line graph showing the variation of the maximum value of the normalized vertical deflection,  $w_{max}$ , in mm, with the span length,  $L$ , in m. The x-axis represents the span length  $L$  from 0 to 100 m. The y-axis represents the maximum deflection  $w_{max}$  from 0 to 115,000 mm. A dashed line shows the deflection increasing with span length. A solid line shows the deflection decreasing with span length. The two lines intersect at a span length of 147.8 m, which is labeled as the 'Span: 147.8m'.

|         |         |
|---------|---------|
| 115,642 | 115,600 |
| 587,0   | 587,8   |

TURNING ANGLE:  
53°46'33" (LT)

APSB

| FLS-CADD Profile Drawing of 33kV                         |                                                 |  |               |  |
|----------------------------------------------------------|-------------------------------------------------|--|---------------|--|
| Tower Spotting Data for 33kV D/C LT (Wind Zone-4, 47m/s) |                                                 |  |               |  |
| 1.                                                       | Conductor                                       |  | Single AAAC   |  |
| 2.                                                       | Cable Diameter                                  |  | 12.78mm.      |  |
| 3.                                                       | Area of Conductor                               |  | 100.0 Sq. mm. |  |
| 4.                                                       | Unit Weight of Conductor                        |  | 0.2728 Kg./M. |  |
| 5.                                                       | Normal Span (Ruling Span)                       |  | 200 Mtr.      |  |
| 6.                                                       | Maximum Sag @ 70° Temperature, No Wind          |  | 4.363 Mtr.    |  |
| 7.                                                       | Ground Clearance (Including Sag error of 0.15m) |  | 5.35 Mtr.     |  |
| 8.                                                       | Sag Tension For Hot Curve (75° Temp. No Wind)   |  | 313.0 Kg.     |  |
| 9.                                                       | Sag Tension For Cold Curve (0° Temp. No Wind)   |  | 743.0 Kg.     |  |

| Legends |                                                   |
|---------|---------------------------------------------------|
| No.No.  | Description                                       |
| 1.      | Alignment                                         |
| 2.      | Power Line Corridor                               |
| 3.      | Hot Curve / Cold Curve                            |
| 4.      | Ground Clearance / Ground Profile                 |
| 5.      | House / Ground Profile Side Hill                  |
| 6.      | Railway Track                                     |
| 7.      | National Highway / State Highway                  |
| 8.      | Road / Cart Track                                 |
| 9.      | Existing 110KV / 132KV / 220KV / 400KV & above TL |
| 10.     | 66KV / 33KV Line                                  |
| 11.     | 11kV Line / LT Line                               |
| 12.     | Telephone Line / Fence                            |
| 13.     | Pond / Canal / Nala / River                       |
| 14.     | Bund / Wall / Tube Well / Tree                    |

**Notes:-**

- All Dimensions are in Metre Otherwise Stated
- UTM (Zone - 45) coordinate system has been adopted for detailed survey

| Revision | Description                               | Date       | Drawn |
|----------|-------------------------------------------|------------|-------|
| R0       | Released for Approval                     | 28-09-2013 | MS/SB |
| R1       | Released for Approval along revised route | 04-04-2014 | MS/SB |
| R2       | Released for Approval as per NTPC comment | 04-07-2014 | MS/SB |
| R3       | Released for Approval as per NTPC comment | 28-10-2014 | MS/SB |

|             |              |                 |         |             |          |       |            |
|-------------|--------------|-----------------|---------|-------------|----------|-------|------------|
| Sheet Name: | GENTRY- APSB | Section Length: | 1856.7m | Paper Size: | 24" Roll | Date: | 28-10-2014 |
|-------------|--------------|-----------------|---------|-------------|----------|-------|------------|

Scale:-

Horizontal Scale

Vertical Scale

DO NOT SCALE

FOR APPROVAL

|             |                                                                                                                                  |                |
|-------------|----------------------------------------------------------------------------------------------------------------------------------|----------------|
| DWG NO:     | 0370-572-PVC-C-353                                                                                                               | (SHEET 1 OF 2) |
| CUSTOMER:   | NABINAGAR POWER GENERATION COMPANY                                                                                               |                |
| PROJECT:    | 400KV & 33KV TRANSMISSION LINES AT NABINAGAR, BIHAR                                                                              |                |
| CONTRACTOR: | BHARAT HEAVY ELECTRICALS LIMITED<br>TRANSMISSION PROJECT DIVISION<br>NEW DELHI                                                   |                |
| TITLE:      | 400V & 33KV TRANSMISSION LINES AT NABINAGAR, BIHAR<br>ROUTE ALIGNMENT SURVEY PLAN & PROFILE<br>FOR 33KV DC TRANSMISSION LINE - 2 |                |
|             |                                                                                                                                  | (SHEET 1 OF 2) |

**TATA CONSULTING ENGINEERS LIMITED**

**MUMBAI**

|                                    |          |     |                                                         |
|------------------------------------|----------|-----|---------------------------------------------------------|
| SCALE: 1:500<br>OFFICE MODEL: DWVA | APPROVED | JOB | DATE: 01/10/2014<br>BY: P.B.<br>(DATE CANCELLED) (SIGN) |
| DRW: INVJ<br>CHKD: PVP             |          | ICK | JOB                                                     |
| TCE-7219B-765-RA-6201              |          |     |                                                         |



# PLS-CADD Profile Drawing of 33kV

Tower Spotting Data for 33kV D/C TL (Wind Zone-4, 47m/s)

|                                                     |                |
|-----------------------------------------------------|----------------|
| 1). Conductor                                       | Single AAAC    |
| 2). Cable Diameter                                  | 12.70mm.       |
| 3). Area of Conductor                               | 100.9 Sq. mm.  |
| 4). Unit Weight of Conductor                        | 0.27266 Kg./M. |
| 5). Normal Span (Ruling Span)                       | 200 Mtr.       |
| 6). Maximum Sag @ 75° Temperature, No Wind          | 4.363 Mtr.     |
| 7). Ground Clearance (Including Sag error of 0.15m) | 5.35 Mtr.      |
| 8). Sag Tension For Hot Curve (75° Temp. No Wind)   | 313.0 Kg.      |
| 9). Sag Tension For Cold Curve (0° Temp. No Wind)   | 743.0 Kg.      |

## Legends

| Sl.No. | Description                                       | Symbol  |
|--------|---------------------------------------------------|---------|
| 1).    | Alignment                                         | -----   |
| 2).    | Power Line Corridor                               | -----   |
| 3).    | Hot Curve / Cold Curve                            | / ----- |
| 4).    | Ground Clearance / Ground Profile                 | -----   |
| 5).    | House / Ground Profile Side Hill                  | -----   |
| 6).    | Railway Track                                     | -----   |
| 7).    | National Highway / State Highway                  | -----   |
| 8).    | Road / Cart Track                                 | -----   |
| 9).    | Existing 110kV / 132kV / 220kV / 400kV & above TL | -----   |
| 10).   | 66kV / 33kV Line                                  | -----   |
| 11).   | 11kV Line / LT Line                               | -----   |
| 12).   | Telephone Line / Fence                            | -----   |
| 13).   | Pond / Canal / Nala / River                       | -----   |
| 14).   | Blind / Well / Tube Well / Tree                   | -----   |

## Notes:-

1. All Dimensions are in Metre Otherwise Stated
2. UTM (Zone - 45) coordinate system has been adopted for detailed survey

| Revision | Description                               | Date       | Drawn |
|----------|-------------------------------------------|------------|-------|
| R0       | Released for Approval                     | 28-09-2013 | MS-VS |
| R1       | Released for Approval along revised route | 04-04-2014 | MS-VS |
| R2       | Released for Approval as per NTPC comment | 04-07-2014 | MS-VS |
| R3       | Released for Approval as per NTPC comment | 28-10-2014 | MS-VS |

Sheet Name: AP5B - GANTRY Section Length: 1023.8m Paper Size: 24" Roll Date: 28-10-2014



DO NOT SCALE FOR APPROVAL

PROJECT NO: 0370-572-PVC-C-353 (SHEET 2 OF 2)

CUSTOMER: NABINAGAR POWER GENERATION COMPANY

PROJECT: 400KV & 33KV TRANSMISSION LINES AT NABINAGAR, BIHAR

CONTRACTOR: BHARAT HEAVY ELECTRICALS LIMITED  
TRANSMISSION PROJECT DIVISION  
NEW DELHI

TITLE: 33KV & 33KV TRANSMISSION LINES AT NABINAGAR, BIHAR  
ROUTE ALIGNMENT SURVEY PLAN & PROFILE  
FOR 33KV DIC TRANSMISSION LINE - 2 (SHEET 2 OF 2)

DATE: 06/05/2014

SCALE: 1:100

OFFICE DESK: DIV-IV

DATE: 06/05/2014

CHKD: UP

TCE: 7219B-765-RA-6201

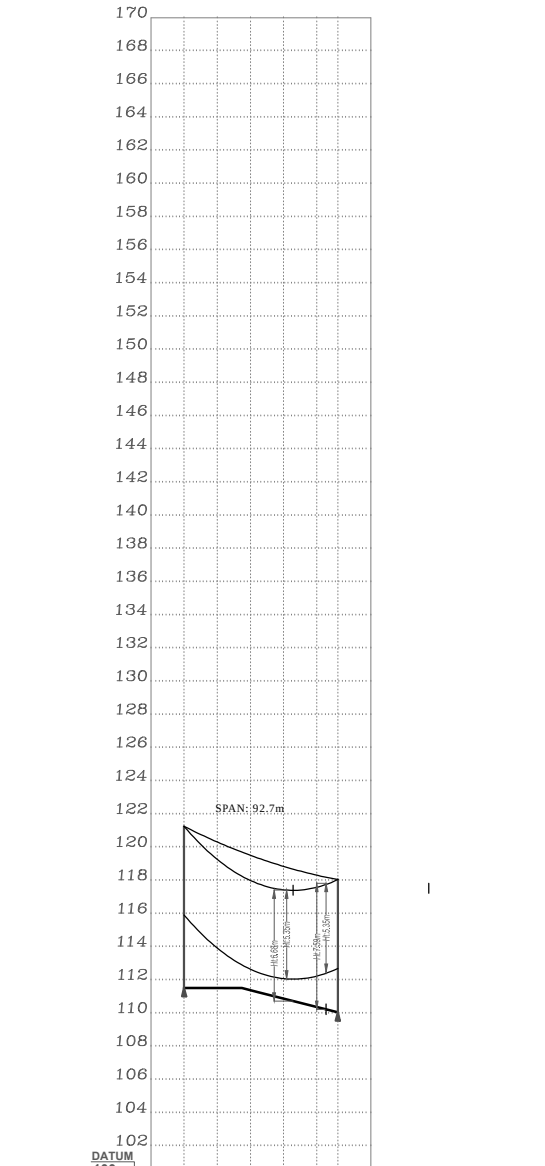
APPROVED: MS-VS

DATE: 06/05/2014

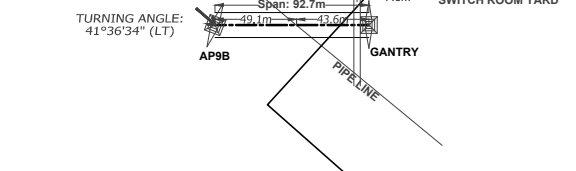
CHKD: UP

TCE: 7219B-765-RA-6201

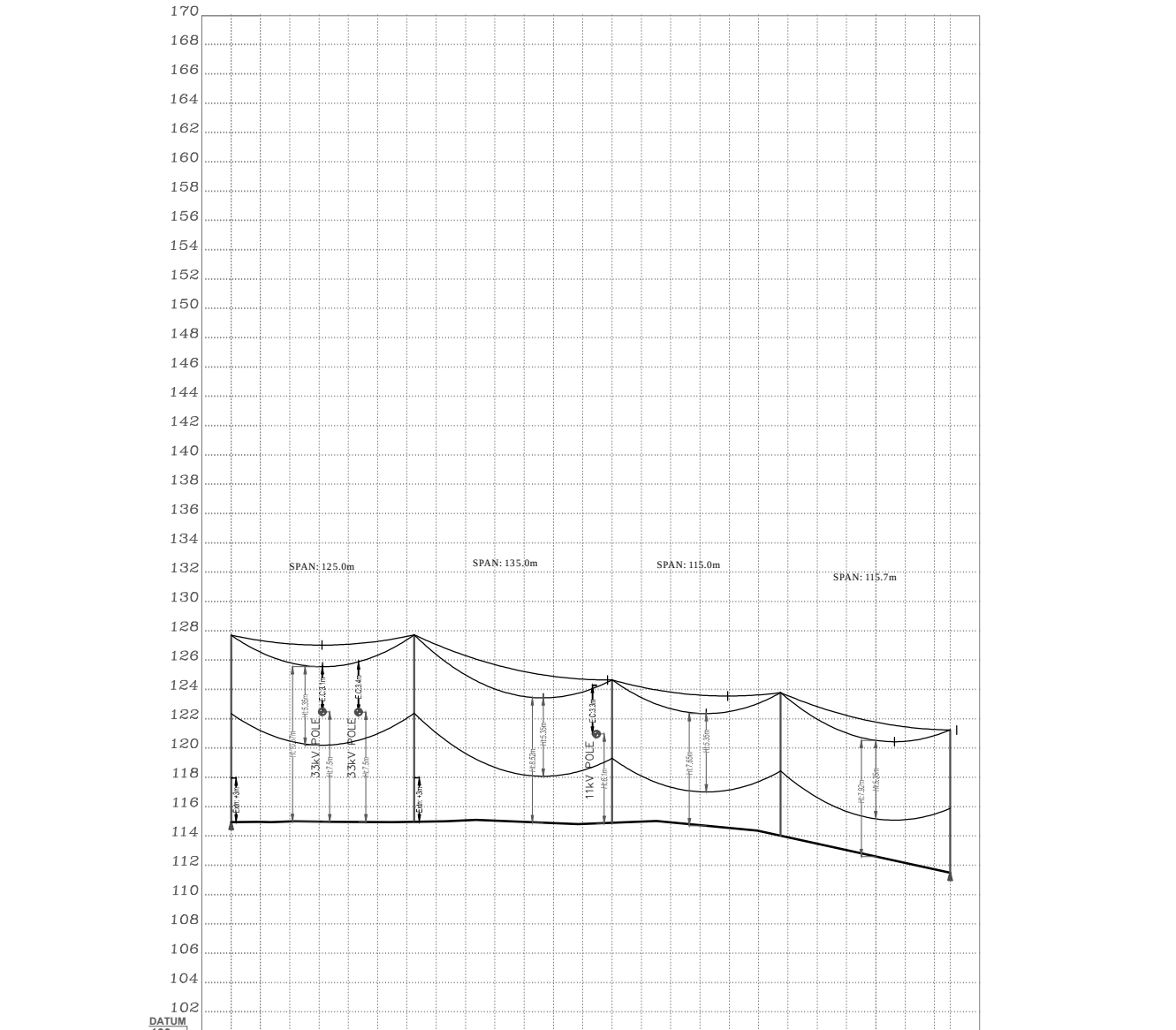
| LOC NO: AP5B                           | LOC NO: GANTRY                         |
|----------------------------------------|----------------------------------------|
| TOWER TYPE: DC+00 (53°46'33" (LT))     | TOWER TYPE: GANTRY                     |
| WIND SPAN: (L147.8+R138.9)/2=193.3m    | WIND SPAN: (L192.7+R192.7)/2=192.7m    |
| WT. SPAN (L): 171.4+R:166.7=169.0m     | WT. SPAN (L): 191.7+R:193.7=192.7m     |
| WT. SPAN (H): (L173.1+R169.9)/2=171.5m | WT. SPAN (H): (L191.7+R193.7)/2=192.7m |
| LATITUDE: 24°47'57.4" N                | LATITUDE: 24°48'18.8" N                |
| LONGITUDE: 84°59'28.8" E               | LONGITUDE: 84°59'27.8" E               |
| ELEVATION: 115.650                     | ELEVATION: 115.650                     |



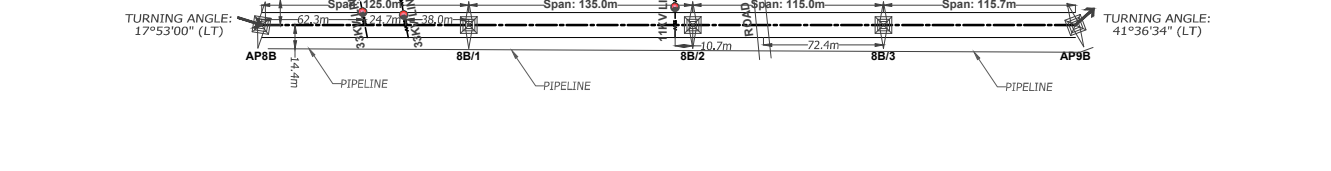
| GROUND LEVEL (m) | CHAINAGE (m) |
|------------------|--------------|
| 115.599          | 0.0          |
| 115.599          | 20.0         |
| 115.599          | 40.0         |
| 115.599          | 60.0         |
| 115.599          | 80.0         |
| 115.599          | 100.0        |
| 115.599          | 120.0        |
| 115.599          | 140.0        |
| 115.599          | 160.0        |
| 115.599          | 180.0        |
| 115.599          | 200.0        |



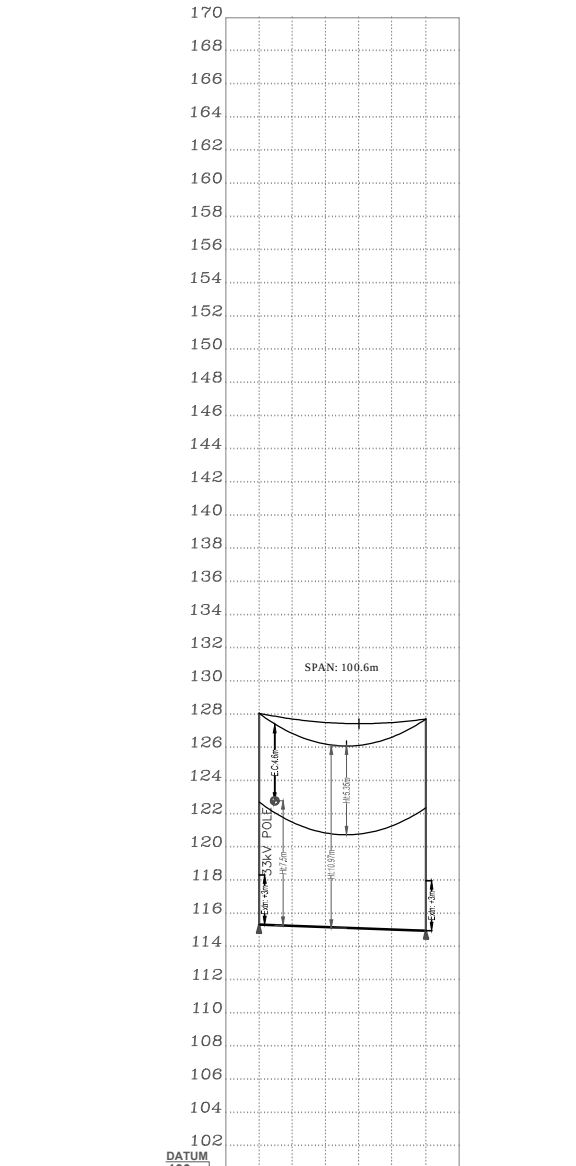
| LOC NO: AP5B                           | LOC NO: BB-1                           | LOC NO: BB-2                           | LOC NO: BB-3                           | LOC NO: AP5B                           |
|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| TOWER TYPE: DC+03 (17°53'00" (LT))     | TOWER TYPE: DA+03                      | TOWER TYPE: DA+00                      | TOWER TYPE: DA+00                      | TOWER TYPE: DC+00 (41°36'34" (LT))     |
| WIND SPAN: (L100.6+R125.0)/2=112.8m    | WIND SPAN: (L125.0+R125.0)/2=125.0m    | WIND SPAN: (L115.0+R115.0)/2=115.0m    | WIND SPAN: (L115.0+R115.0)/2=115.0m    | WIND SPAN: (L115.7+R122.7)/2=119.2m    |
| WT. SPAN (L): 140.6+R:145.0=142.8m     | WT. SPAN (L): 140.6+R:145.0=142.8m     | WT. SPAN (L): 140.6+R:145.0=142.8m     | WT. SPAN (L): 140.6+R:145.0=142.8m     | WT. SPAN (L): 140.6+R:145.0=142.8m     |
| WT. SPAN (H): (L140.6+R145.0)/2=142.8m | WT. SPAN (H): (L140.6+R145.0)/2=142.8m | WT. SPAN (H): (L140.6+R145.0)/2=142.8m | WT. SPAN (H): (L140.6+R145.0)/2=142.8m | WT. SPAN (H): (L140.6+R145.0)/2=142.8m |
| LATITUDE: 24°48'18.4" N                | LATITUDE: 24°48'18.4" N                | LATITUDE: 24°48'18.4" N                | LATITUDE: 24°48'18.4" N                | LATITUDE: 24°48'18.4" N                |
| LONGITUDE: 84°59'28.8" E               | LONGITUDE: 84°59'28.8" E               | LONGITUDE: 84°59'28.8" E               | LONGITUDE: 84°59'28.8" E               | LONGITUDE: 84°59'28.8" E               |
| ELEVATION: 114.980                     | ELEVATION: 114.980                     | ELEVATION: 114.980                     | ELEVATION: 114.980                     | ELEVATION: 114.980                     |



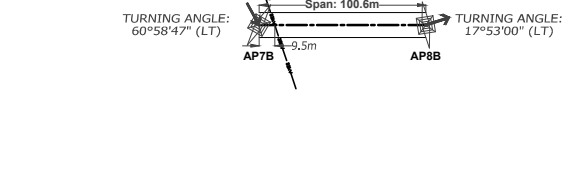
| GROUND LEVEL (m) | CHAINAGE (m) |
|------------------|--------------|
| 114.980          | 0.0          |
| 114.980          | 20.0         |
| 114.980          | 40.0         |
| 114.980          | 60.0         |
| 114.980          | 80.0         |
| 114.980          | 100.0        |
| 114.980          | 120.0        |
| 114.980          | 140.0        |
| 114.980          | 160.0        |
| 114.980          | 180.0        |
| 114.980          | 200.0        |



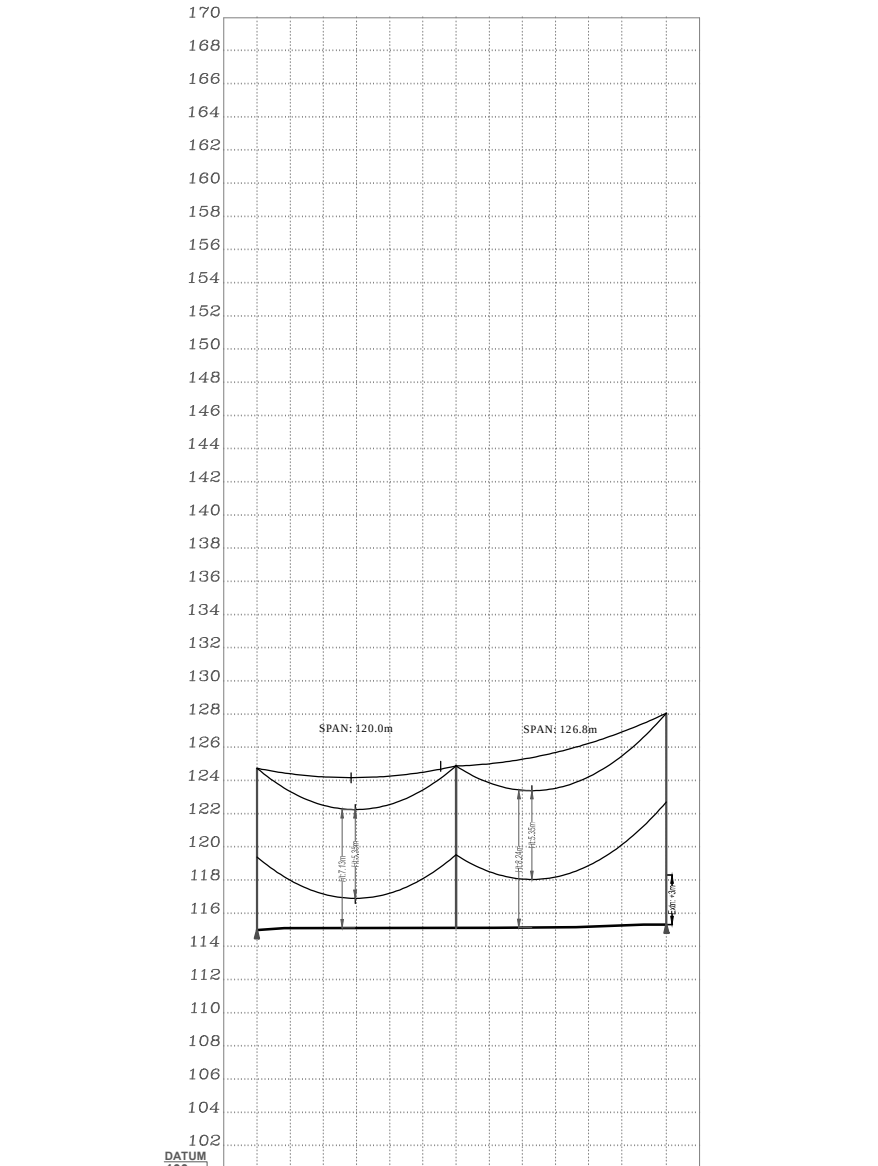
| LOC NO: AP7B                           | LOC NO: AP5B                           |
|----------------------------------------|----------------------------------------|
| TOWER TYPE: DC+03 (55°50'51" (LT))     | TOWER TYPE: DC+03 (17°53'00" (LT))     |
| WIND SPAN: (L126.8+R126.8)/2=126.8m    | WIND SPAN: (L100.6+R125.0)/2=112.8m    |
| WT. SPAN (L): 134.4+R:139.6=137.0m     | WT. SPAN (L): 140.6+R:145.0=142.8m     |
| WT. SPAN (H): (L134.4+R139.6)/2=137.0m | WT. SPAN (H): (L140.6+R145.0)/2=142.8m |
| LATITUDE: 24°48'07.8" N                | LATITUDE: 24°48'18.4" N                |
| LONGITUDE: 84°59'27.8" E               | LONGITUDE: 84°59'28.8" E               |
| ELEVATION: 115.330                     | ELEVATION: 114.980                     |



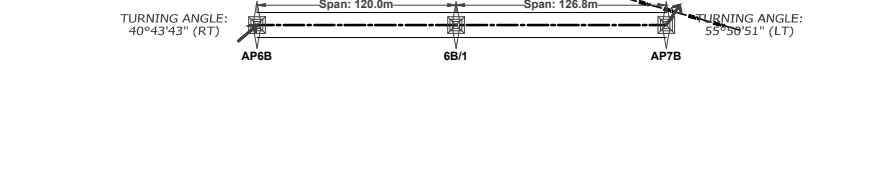
| GROUND LEVEL (m) | CHAINAGE (m) |
|------------------|--------------|
| 115.330          | 0.0          |
| 115.330          | 20.0         |
| 115.330          | 40.0         |
| 115.330          | 60.0         |
| 115.330          | 80.0         |
| 115.330          | 100.0        |
| 115.330          | 120.0        |
| 115.330          | 140.0        |
| 115.330          | 160.0        |
| 115.330          | 180.0        |
| 115.330          | 200.0        |



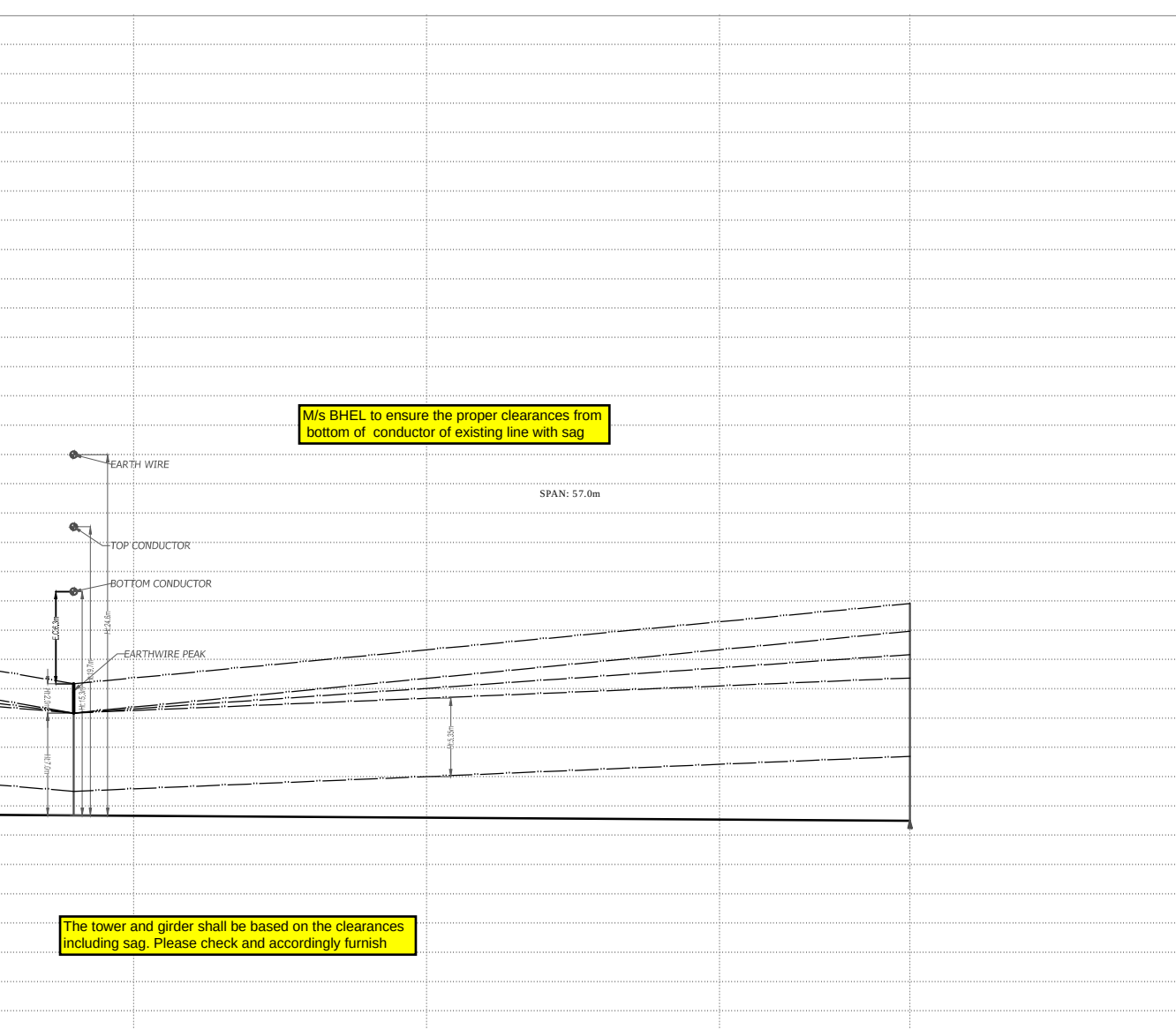
| LOC NO: AP5B                           | LOC NO: BB-1                           | LOC NO: AP7B                           |
|----------------------------------------|----------------------------------------|----------------------------------------|
| TOWER TYPE: DC+00 (40°43'43" (RT))     | TOWER TYPE: DA+00                      | TOWER TYPE: DC+03 (55°50'51" (LT))     |
| WIND SPAN: (L137.0+R126.0)/2=131.5m    | WIND SPAN: (L126.8+R126.8)/2=126.8m    | WIND SPAN: (L126.8+R126.8)/2=126.8m    |
| WT. SPAN (L): 137.0+R:126.0=131.5m     | WT. SPAN (L): 134.4+R:139.6=137.0m     | WT. SPAN (L): 134.4+R:139.6=137.0m     |
| WT. SPAN (H): (L137.0+R126.0)/2=131.5m | WT. SPAN (H): (L134.4+R139.6)/2=137.0m | WT. SPAN (H): (L134.4+R139.6)/2=137.0m |
| LATITUDE: 24°48'08.2" N                | LATITUDE: 24°48'07.8" N                | LATITUDE: 24°48'07.8" N                |
| LONGITUDE: 84°59'28.8" E               | LONGITUDE: 84°59'27.8" E               | LONGITUDE: 84°59'27.8" E               |
| ELEVATION: 115.910                     | ELEVATION: 115.330                     | ELEVATION: 115.330                     |



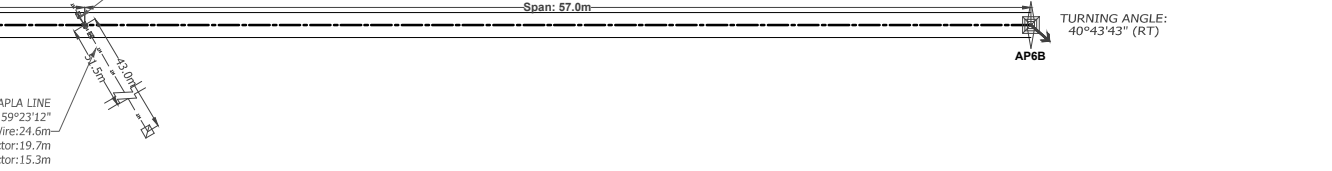
| GROUND LEVEL (m) | CHAINAGE (m) |
|------------------|--------------|
| 115.910          | 0.0          |
| 115.910          | 20.0         |
| 115.910          | 40.0         |
| 115.910          | 60.0         |
| 115.910          | 80.0         |
| 115.910          | 100.0        |
| 115.910          | 120.0        |
| 115.910          | 140.0        |
| 115.910          | 160.0        |
| 115.910          | 180.0        |
| 115.910          | 200.0        |



| LOC NO: GANTRY                         |
|----------------------------------------|
| TOWER TYPE: GANTRY                     |
| WIND SPAN: (L136.0+R136.0)/2=136.0m    |
| WT. SPAN (L): 136.0+R:136.0=136.0m     |
| WT. SPAN (H): (L136.0+R136.0)/2=136.0m |
| LATITUDE: 24°47'57.4" N                |
| LONGITUDE: 84°59'28.8" E               |
| ELEVATION: 115.440                     |



| GROUND LEVEL (m) | CHAINAGE (m) |
|------------------|--------------|
| 115.440          | 0.0          |
| 115.440          | 20.0         |
| 115.440          | 40.0         |
| 115.440          | 60.0         |
| 115.440          | 80.0         |
| 115.440          | 100.0        |
| 115.440          | 120.0        |
| 115.440          | 140.0        |
| 115.440          | 160.0        |
| 115.440          | 180.0        |
| 115.440          | 200.0        |



M/S BHEL TO ENSURE THAT ADEQUATE CLEARANCES ARE MET WITH RESPECT TO THE EXISTING FACILITIES WITHIN 9 M DISTANCE ON BOTH SIDES OF THE C/L OF ROUTE.

M/S BHEL to ensure proper clearances as per specification/ standards.