ATTACHMENT-IV

ITB NO. PVMM/SERVICE/CIVIL/16-17/E-05

ROUTE SURVEY FOR 15KM PIPELINE, TOPOGRAPHICAL SURVEY & GEOTECHNICAL SURVEY AT LPG IMPORT TERMINAL PARADIP, ORRISA FOR IOCL
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<table>
<thead>
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<th>REV NO.</th>
<th>NO. OF SHEETS</th>
</tr>
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<tbody>
<tr>
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<td>2</td>
<td>SPECIFICATION FOR TOPOGRAPHICAL SURVEY FOR PIPELINE ROUTE</td>
<td>PC00101-TS-0207</td>
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</tr>
<tr>
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<td>3</td>
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<td>5</td>
<td>DETAIL B-B, DETAIL D-D PART 1 &amp; 2 DETAIL C-C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>PIPELINE ALLIGNMENT SHEET SOUTH JETTY TO NORTH REFINARY</td>
<td>PC00101-9511-0603</td>
<td>1</td>
<td>4</td>
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<td>7</td>
<td>PIPELINE ALLIGNMENT SHEET NORTH REFINARY TO LPG IMPORT TERMINAL</td>
<td>PC00101-9511-0605</td>
<td>1</td>
<td>4</td>
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<td>SCOPE OF WORK FOR TOPOGRAPHICAL SURVEY AT LPG IMPORT TERMINAL</td>
<td>PC00101-SOW-0203</td>
<td>0</td>
<td>4</td>
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<tr>
<td>9</td>
<td>TECHNICAL SPECIFICATION FOR TOPOGRAPHICAL SURVEY AT LPG IMPORT TERMINAL</td>
<td>PC00101-TS-0209</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>LPG IMPORT TERMINAL TENTATIVE AREA FOR TOPOGRAPHICAL SURVEY</td>
<td>PC00101-9511-0203</td>
<td>0</td>
<td>1</td>
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<td>PC00101-SOW-0202</td>
<td>0</td>
<td>4</td>
</tr>
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<td>0</td>
<td>17</td>
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<tr>
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<td>14</td>
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<td>PC00101-9511-0943</td>
<td>0</td>
<td>13</td>
</tr>
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<td>TOPOGRAPHICAL SURVEY &amp; GEOTECHNICAL SURVEY AT LPG IMPORT TERMINAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TITLE
SCOPE OF WORK
FOR
PIPELINE ROUTE SURVEY

PROJECT
DESIGN CONSULTENCY FOR LPG IMPORT TERMINAL
AT
PARADIP, ODISHA

OWNER
INDIAN OIL CORPORATION LIMITED
MUMBAI

ENGINEERING CONSULTANT
PROJECTS & DEVELOPMENT INDIA LIMITED
VADODARA
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1. INTRODUCTION

IOCL Mumbai has plans to lay two 16” pipeline for their Import Terminal, Paradip, Odisha. The pipeline originates from South jetty to Refinery and Refinery to Import Terminal. Route map is attached with the bid.

Site information:
Length of the pipeline is appended below:

<table>
<thead>
<tr>
<th>Trunk Pipeline</th>
<th>Dia. (Inch)</th>
<th>Nos.</th>
<th>Length (KM)</th>
<th>ROU width (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Jetty To Refinery</td>
<td>16</td>
<td>2</td>
<td>6.5</td>
<td>Refer detail B-B</td>
</tr>
<tr>
<td>Outside &amp; along refinery boundary Wall</td>
<td>16</td>
<td>2</td>
<td>2</td>
<td>Refer detail A-A</td>
</tr>
<tr>
<td>Refinery to LPG Import Terminal</td>
<td>16</td>
<td>2</td>
<td>6</td>
<td>Refer detail D-D (PART-1 &amp; 2), C-C</td>
</tr>
</tbody>
</table>

Total Length of Proposed pipeline to be laid is 15Km approx.

a. Between South Jetty to Refinery pipeline route 1 KM (approx.) length in Santra creek portion, from TP-12 to TP-14 (CH: 4+917.40 to 6+057.602 KM) around 3m width of balance 10.880m ROU as shown in detail B-B is in water. The same to be verified by surveyor.

b. Between South Jetty to Refinery pipeline route 211m (approx.) length in Santra creek portion, from TP-11 to TP-12 (CH: 4+706.02 to 4+917.40 KM) is in water, in these section HDD crossing to be done. The same to be verified by surveyor.

c. From Refinery to LPG import terminal CH: 2+500 KM to 4+500 KM (TP-6 to TP 15/1). Available ROU of 7.288m, as shown in Detail D-D (Part-2) is upto of battery limit of Railway property line only which is shown in the Drawings. The same to be verified by surveyor.

2. SCOPE OF WORK:

2.1 OBJECTIVE:

The objectives of the detailed route survey as minimum but not limited to are as follows:

a. Carrying out Reconnaissance (Recci) Survey.

b. Obtaining topographical details along the pipeline route after physical verification of most optimized route and collecting information about the existing facilities, development plans, restricted areas etc. located along and in the vicinity of the proposed pipeline route.

c. Detailed Engineering Survey along the route of the pipeline.

d. Computation of population density index along the proposed pipeline routes.

e. Obtaining soil stratification, soil resistivity data along the route.
f. FMB (Field Measurement Book) preparation of cadastral maps along the pipeline route in hard copies as well as in soft copies as required.

g. Identification of Govt. land along pipeline route (if any).

h. Obtaining details of crossings en-route pipeline with name and complete address of concerned State / Central Govt. authorities under whom the crossing locations fall.

i. Obtaining details of Forest land including road side forests en-route of Pipeline and its Classification (Social/Protected/Reserved/ Wild Life Sanctuary / National Park), with name and complete address of concerned state / central govt. authorities under whom the forest locations falls.

j. Locating the center line of pipeline on the ground, constructing survey monuments, field measurements for planimetry, profiles, preparation of drawings and documentation.

k. Soil Investigation for the purpose of visual engineering classification of soil along the pipeline route and of receipt/ intermediate/ dispatch terminal stations

l. Topographical Survey of receipt/ intermediate/ dispatch terminal stations.

m. Preparation of all drawings for the Crossing which requires permission from statutory Authorities (Railway/ NH/SH/ Water Bodies (rivers/canal/lake etc), foreign body crossings (pipeline etc) in line with the requirement of the statutory bodies/ authorities.

2.2 SCOPE OF WORK FOR DETAILED ROUTE SURVEY WORK

2.2.1 Scope of work for detailed pipeline route survey for each pipeline shall include, but not limited to the following:

The work described herein shall be carried out as per applicable technical specifications of the bid documents.

Carrying out table top study based on the latest Satellite Images of the area/latest Survey of India Maps/Development plan as received from concerned Authority, reconnaissance survey of routes wherever possible and critical evaluation of route considering survey efficiency & Load Centre* (as close as possible). Techno-commercial feasible route* shall be properly mentioned in the reconnaissance survey report for approval of Owner/Consultant. The Reconnaissance survey report must contain following data in detail.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total distance of the pipeline route from start point to end point.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Distance of Major Cities/Industrial Towns from proposed route</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rocky Terrain</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Details of Wild Life Sanctuary / National Park and distance of nearest such area from proposed route</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Details of Protected forest / Reserved Forest/Social Forest</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Areas reserved for planned development including strategic/defense establishment.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Major crossing of rivers, roads, railways, canals.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Approachability for transportation of material and equipment for construction &amp; future maintenance of the pipeline. Record, if any problems envisaged.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Habituatuated areas, public utilities etc</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Feasibility of pipe line route considering limitations of topography &amp; terrain. Record, if any problems envisaged.</td>
<td></td>
</tr>
</tbody>
</table>
2.2.2 Detailed Engineering Survey:

a. Contractor has to deploy minimum number of survey teams for the Scope of Work as specified elsewhere in the tender. In case progress of work is not as per schedule, number of teams may have to be increased by the contractor as directed by OWNER/CONSULTANT.

b. Carrying out detailed route survey work for the entire route of the proposed pipelines as established by Owner/Consultant.

c. Survey shall also cover an area of 50m on either side of the ROU width, if required.

d. Detailed route survey works shall be carried out in accordance with technical specifications including detailed study of crossings like Railways, Roads, Rivers, Canals, Forest Areas and Hilly Terrains etc.

e. The survey shall also include locating all existing underground pipeline(s), utilities such as cables, water line sewer line etc. using cable / pipeline locators etc. and plotting the same on alignment sheets etc. Underground scans will be taken with appropriate scanning technique to positively identify position of possible pipelines at pinch point. These scans are also to be used to locate other problem front areas. At specific areas trial excavations will be needed to confirm location/details of pipelines, cables etc.

2.2.3 All Other Surveys:

a) Carrying out soil investigation / soil stratification along the proposed pipeline route including road & water crossing as per specification enclosed with Tender Document.

b) Collection of disturbed soil samples from bore holes for visual classification of soil as per specifications in the tender and submission of reports.

c) Carrying out corrosion survey including measurement of soil resistivity, chemical analysis of soil/water as per specification in the bid for Corrosion Survey. The test to be carried out through govt. authorized labs and collection of related data along the pipelines route and submission of lab reports.

d) Topography survey as per specification for receipt / intermediate and dispatch Terminal stations.

e) Land schedules giving the survey numbers, area and details of owners as per the latest official revenue records. The Detail shall be provided as follows.

The information / details as above are required to be provided in all respect for ROU acquisition purpose. Width of ROU proposed to be acquired shall generally be 30/20/15m as specified in the site information table above. No change in the ROU width shall be done by contractor, unless otherwise specific instruction is given regarding change in ROU width during the survey by IOCL. In restricted area, the width of ROU shall be decided in consultation with IOCL and as per Municipal/Local Government Laws.

Entire database shall be developed into a unified GIS (Geo-Spatial Information System) and LIS (Land Information System) compatible format.

Note:
1) Contractor shall be fully responsible for collection of correct and Up-to-date records/data.
2) Any defects noticed in above information shall be rectified at the risk and cost of the Contractor.

f) Supply and installation of the survey markers as per requirements of the specifications and instructions of IOCL.

g) Contractor shall also identify the earthquake prone area along the pipeline route and shall define the seismic zone and its category with proper marking on the route map. A separate list of elevation difference to be submitted, wherever major differences have occurred.

h) Preparation of survey reports/drawings/documents and submission of the same by the Contractor to Owner/Consultant for review & approval.

i) Locating all buried/above ground pipelines, cables and other utilities within the ROU width, with the help of pipelines/cables locator or other suitable instruments (Wherever necessary as directed by Owner/Consultant).

j) The scope of work shall also include any other item/activity required to complete the work in all respects as per specifications, drawings, implementation schedule, and instructions of Owner/Consultant whether specifically mentioned herein or not, but is required to fulfill the intended purpose of this tender document.

2.2.4 CHECK-LIST

Check list points as detailed below to be covered in Detailed route survey reports:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Activities</th>
<th>Status/Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Re-confirmation and Fixing of start and end locations of survey.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Transfer of nearby benchmarks. Fixing of Co-ordinates of start / end locations.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Check for calibration/accuracy / performance of Total station &amp; other instruments used for Survey. Indicate details of instruments used</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Check for the Surveyor experience and their operating skills of survey instruments.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Certification for route not passing through CRZ / National park / Sanctuary / Coral reef / Ecologically sensitive areas including LNG terminals</td>
<td>Certificate to be Provided in the survey report itself</td>
</tr>
<tr>
<td>6</td>
<td>Certification for route not passing through Critically Polluted areas as per MoEF Notification dated 15-03-2015</td>
<td>Check for any other existing underground cables / pipeline, using cable/pipeline locators and determination of cover (depth).</td>
</tr>
<tr>
<td>9</td>
<td><strong>Major Highlights of the Pipeline Route-</strong></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Major Highlights of the Pipeline Route</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>Co-ordinates of starting point</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Co-ordinates of Terminating point</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Total Chainage</td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>Total IP points</td>
<td></td>
</tr>
<tr>
<td>f</td>
<td>Total TP Points</td>
<td></td>
</tr>
</tbody>
</table>
2.2.5 SCOPE OF SUPPLY:

Owner/Consultant shall not supply any materials, manpower or equipment for the work including transportation to site and other places as required and this shall be the responsibility of the Contractor.

2.2.6 CONTRACTOR’S RESPONSIBILITIES:

a) Contractor to arrange all manpower and equipment etc. required to complete the work as per bid and as directed by Owner/Consultant.

b) Contractor to arrange work permissions from concerned authorities and other support facilities etc to complete work.

c) Any dispute arising out of any damages caused by Contractor or Contractor’s workmen during the execution of the work has to be settled by the contractor.

d) Ground profile shall be prepared based on MSL.

e) Collection of all information and proposed development plans in nearby vicinity of proposed pipeline

f) Arranging of SOI maps in scale of 1:50,000 / 1:25000 as per the requirement.

g) Contractor shall carryout all works in strict compliance with applicable specifications as per the bid and as directed by Owner/Consultant.

h) All maps procured by the Contractor under this contract shall be property of the Owner/Consultant and shall be handed over to Owner/Consultant after completion of work.

i) Procurement of all required Survey of India maps / Satellite imageries / any other map necessary to undertake detail route survey of proposed pipeline shall be in contractor’s Scope of Work, without any additional cost to Owner/Consultant. However, assistance in procurement of maps, if required, shall be provided by Owner/Consultant.

2.2.8 DOCUMENTS / DATA SUBMISSION

a) Contractor has to submit survey data, drawings etc. which shall be reviewed / approved by OWNER/CONSULTANT in the initial stage.

b) Two sets of hard copy of sample drawings/ data/ documents covering at least 10km. Stretch, shall be submitted by the Contractor for Owner/Consultant’s review in the form of draft report for entire activities. Suggestions/ Comments of Owner/Consultant (if any) shall be incorporated by the Contractor. This report can be demanded in parts and in different phases as per discretion of Owner/Consultant.
c) All drawings, reports, formats etc. forming the part of submission to Owner/Consultant shall be prepared on approved computer package. All drawings, including, but not limited to alignment sheets, crossing drawings, soil profiles, crossings drawings etc. shall be prepared using latest version suitable package. All reports, formats, write-ups, charts shall be prepared on computer using software package compatible with MS Office latest version.

d) The reports, data and drawings submitted shall be in approved GIS package and shall be submitted per details below:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Drawings/Documents</th>
<th>No. of Copies</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Alignment Sheets (in the scale of 1:2,500/4,000)</td>
<td>03 (In Colour)</td>
<td>Drawing should contain Key Map with Details for Locating the Crossings at Site</td>
</tr>
<tr>
<td>B</td>
<td>Crossing Drawings</td>
<td>03 (In Colour)</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Route Map</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>In the Scale of 1:50,000 or 1:25,000</td>
<td>06 (In Colour)</td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Overall Route Map in the Scale of 1:500,000 or 1:10,00,000</td>
<td>06 (In Colour)</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>Route map as required for CCOE application including all details of village, tehsil, police station &amp; TP Point Ch. wise in the scale of 1:50,000</td>
<td>06 (In Colour)</td>
<td>Report should cover all engineering details, details of length in each Village, Crossings with Authority List, Details of Social/ Reserved/ Protected Forest, National Park and Sanctuaries, Area under Coastal Regulatory Zone, Ecologically Sensitive Area, and Critically/ Severely Polluted Area etc. en-route proposed route, water logging area along the Pipeline route.</td>
</tr>
<tr>
<td>D</td>
<td>Soil Resistivity</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Detailed Engineering Survey Report</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Topo Survey of terminals</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>All Crossing drawings requiring permission from statutory Authorities (Railway/ NH/SH/ Water Bodies (rivers/canal/lake etc), foreign body crossings (pipeline etc)</td>
<td>6 sets each</td>
<td>Drawings shall be prepared in line with the requirement of obtaining the permissions from Statutory bodies / other Authorities</td>
</tr>
</tbody>
</table>

The Editable soft copies of all Drawings and Reports as mentioned above shall be submitted in one set of CD and one in Pen drive.
2.2.9 LIST OF ENCLOSURE

Following specifications shall be a part of bid document.

i. Specification for Topographical Route Survey.

ii. Specification for Cadastral Survey.

iii. Pipeline route survey data sheet.

iv. Specification for Topo Survey Terminal

2.2.10 DEPLOYMENT OF MANPOWER

Simultaneously, a separate team with suitable no of persons for collection of revenue records from respective offices and soil investigation, stone fixing team shall be deployed by the contractor. In order to complete the work in schedule time, contractor has to deploy sufficient survey and other equipment at site.
TITLE
SPECIFICATION FOR TOPOGRAPHICAL SURVEY
FOR
PIPELINE ROUTE

PROJECT
DESIGN CONSULTENCY FOR LPG IMPORT TERMINAL
AT
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3. Technical Specification 4
1. GENERAL

The intent of the survey program for the proposed sites is to obtain sufficient topographical data for finalizing all engineering works and establishment of permanent bench marks and grid pillars for reference during construction of the project.

2. SCOPE OF WORK

The Terminal plots along with approaches to the plots which are to be surveyed have been identified in the enclosed Tender Document and shall also be clarified by the Engineer in charge during execution of work.

a) A desk study of all matters pertaining to the satisfactory performance of the work.

b) Obtaining all relevant licenses, permits, clearances, certifications, insurances etc.

c) Calibration of instruments.

d) Preliminary examinations to identify all existing survey control points in the vicinity and, by local enquiry, establish their reliability.

e) Transfer of level datum (Chart Datum) from the designated location.

f) Setting up of traverse control points and local level datum.

g) Preparation and submission of preliminary topographical Survey drawings and maps. All measurements shall be in metric units.

h) Topographical survey complete as required. Preparation of contour survey maps, with spot levels. Establishment of base line and grid system for defining the co-ordinates of the various sites. Preparation of survey maps.

i) Keeping of field records.

j) Preparation of Survey Report.

k) Submission of endorsed final Survey drawings and Survey Report

l) The Surveyor shall ascertain from the relevant irrigation authorities the high flood levels and indicate these on the Survey Plans

2.1 The Contractor shall carry out detail survey of the area showing:-

a) Physical features, spot levels, invert levels of existing drains and culverts with their cross sections, transmission/ telephone/ service (Under/ above ground) lines etc. land survey by triangulation or other suitable method.
b) Topographical survey shall indicate existing, permanent, and temporary structures including levels & limits.

c) Drawing of terrain.

d) Detailed levels and coordinates of existing roads and other units.

e) Preparation of survey drawings with descriptive note on terrain.

f) Setting of grid lines and bench marks and construction of reference pillars.

3. TECHNICAL SPECIFICATION

The details to be covered in the contract work shall include the following;

3.1 Leveling work:

The leveling work shall be based on the bench marks available in the vicinity or any permanent existing features. Vertical control based on existing bench marks shall be established based on closed level network. Suitable instruments shall be used for establishing the bench marks and for doing the general leveling work.

All survey points, reference pillars, shall be protected in such a way so that they are not disturbed during the construction period. The size of pillars shall be (traverse stations) shall not be further than 250m apart. They shall be well formed concrete pillars 150mm x 150mm or 150mm diameter and 1000mm deep in dimension, protruding between 150mm to 200mm above ground level. Each pillar shall have a brass or stainless steel bolt marked with a central depression or cross cut into its top which shall be the point of reference. All pillars shall be indelibly marked with their reference number. Working plate shall be embedded true to level on the top of the pillar and a stud shall be provided. The plate shall have full contact with the concrete. Reference point for the grid system shall be nearest to the existing permanent features.

3.2 Survey Details:

It is the general survey work, carried out for engineering purposes. The survey shall be oriented towards furnishing information for project planning and detailed engineering work. The survey shall show all the existing features along with levels and important dimensions. Existing features such as roads, railway tracks, buildings, drains, man-holes, overhead & underground service lines, communication and supply lines, and similar permanent and temporary structures shall be shown. Each survey drawing shall show sets of perpendicular grid lines parallel to actual North, South, East, and West with respect to reference point. These are needed for the purpose of orienting and matching the survey drawings with layout of the unit.

Ground levels shall be shown on rectangular grid pattern at intervals of 10m. Additional levels shall show sudden change of levels if any shall also be indicated. Contours are to be drawn at 0.50 m intervals. Inverts levels of existing drains at regular intervals shall be taken.
Top levels of Man-holes shall also be taken. Existing levels at regular intervals and at all junctions for roads, top levels, width, curvature at turning points shall be shown. Any other important detail shall also be covered.

Co-ordinates of all existing buildings/ structures, hutments and other dwellings including power transmission lines, towers etc. Within the area shall also be indicated. Bench marks, reference points, triangulation stations, any existing bore-holes, oil wells trial pits etc. shall be clearly identified in the drawing indicating their values/co-ordinates. Co-ordinates mentioned above shall be surveyed with respect to the reference axes N-S and E-W.

All survey data collected during the day shall be plotted on the drawing sheet on the same day. These drawings shall be used for following day-to-day progress of work and for any quick reference.

### 3.3 Survey Drawing, Scale and Field Report:

All survey drawings shall be made in metric units. Survey drawings which shall be submitted to Owner/Consultant shall be in color on white paper. The Tracing of the drawings shall be on plastic reproducible paper. Four copies each of drawings and one tracing for each drawing shall be submitted to the Owner/Consultant along with an editable soft copy.

A descriptive note regarding the site conditions and special features shall also be submitted in field reports in two copies. These notes will complement the drawing and will contain information which could not be covered in the survey drawings. The entire survey report shall also be submitted in editable soft copy. The scale of the drawings shall be 1:100, A-1 size sheets shall be used for drawings.

### 3.4 Instruments, Tools and Tackles:

The use of proper instruments is paramount important factor in survey work. The Contractor shall arrange his own instruments, accessories, tools and tackles, necessary for conducting the survey as per precision required. Experienced and qualified engineers, surveyors and draughtsman shall be engaged to carry out the work. All the final drawing and reports shall be duly signed and certified by surveyor.

### 3.5 Accuracy of Work for General Survey:

a) Angular accuracy: Least count x Number of station in the closed traverse.

b) Linear measurement : 1 in 10,000

c) Equipment setting : ± 1.0 mm general accuracy

d) Leveling : ± 5mm x Km
e) True North.

f) Grids at 5m internal shall be established parallel to true north. Working reference point "A" to be fixed at site with reference to some permanent bench mark.

g) Any Angle between grid North & true North.

h) Check the co-ordinations of existing roads and other units.

i) Survey of 5M length beyond the periphery of the proposed boundary all around the proposed site.
NOTES:

1. AS THE LAST EXISTING PIPELINE (950-P-200-0035-5L60-NI) IS NOT TO BE COMMISSIONED TILL THE PLANNED PIPELINES ARE LAID, SO MINIMUM CLEAR DISTANCE OF 3 MTR. IS MAINTAINED FROM SECOND EXISTING DURATION PIPELINE (850-P-200-5259-5L60-NI) AS PER OSD 141.

2. TOTAL SPACE REQUIRED FOR LAYING OF NEW 2 NOS. 16" PROPAINE/BUTANE PIPELINES IS 1.936 MTR. INCLUDING CONCRETE COATING IN THE PIPELINES.

3. TOTAL SPACE REQUIRED FOR LAYING OF NEW 4 NOS. (Φ18"-REFORMATE, Φ12"-Fx, Φ10"-MEG & Φ6"-BENZENE) PIPELINES IS 3.355 MTR. INCLUDING CONCRETE COATING IN THE PIPELINES.

4. INSTRUMENT FO CABLE SHALL BE LAID IN HOLE CONDUIT AT A DISTANCE OF 200 MM FROM NEW PIPELINE TRENCH.

5. NEW HT CABLES ARE PLANNED ON THE OTHER SIDE OF ROW (3.256 MTR FROM EXIST. PIPELINE NO. 200-P-205-5375-A333-NI). NEW HT CABLES SHALL BE LAID ONLY IN CASE POWER IS NOT AVAILABLE FOR SOU FROM PPT.

6. SPACE BALANCE IN THE ROW AFTER LAYING 2 NOS. 16" NEW PIPELINE & 4 NOS. (Φ18"-REFORMATE, Φ12"-Fx, Φ10"-MEG & Φ6"-BENZENE) PIPELINE IS 0.850 MTR.
REFERENCE DRAWINGS / DOCUMENTS

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<th>DRAWINGS / DOCUMENTS TITLE</th>
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<tr>
<td>PIPELINE - ALIGNMENT SHEET NORTH REFINERY TO MARKETING TERMINAL (LPG LINE)</td>
<td>PDRP-A056-8210-83-000-0002 (FROM CH: 4+500.00KM TO CH: 5+764.12KM) SHEET 4 OF 4</td>
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SURVEY REQUIREMENT:
1. SURVEYOR TO VERIFY ROU WIDTH AS MARKED ✱
2. PHYSICAL DEMARKATION OF ROU WIDTH MARKED ✱
3. TO LOCATE UNDERGROUND UTILITIES WITHIN ROU WIDTH MARKED ✱
4. ALL OTHER REQUIREMENTS, REFER SPECIFICATION.

LEGENDS:
- EXISTING FACILITY (AS SHOWN IN BLACK)
- NEW FACILITY BY MARKETING DIVISION (AS SHOWN IN RED)
- NEW FACILITY BY REFINERY (AS SHOWN IN BLUE)

NOTES:

1. AS PER IOSD 141 MINIMUM 3 mtr. CLEAR DISTANCE FROM EXISTING BURIED PIPELINE IS MAINTAINED.
2. TOTAL SPACE REQUIRED FOR LAYING OF NEW 2 NOs. 16" PROPAINE/BUTANE PIPELINES IS 1.906 mtr. INCLUDING CONCRETE COATING IN THE PIPELINES.
3. TOTAL SPACE REQUIRED FOR LAYING OF 1 NO. 12" NEW REFORMATE PIPELINE IS 0.700 mtr. INCLUDING CONCRETE COATING IN THE PIPELINE.
4. INSTRUMENT FO CABLE SHALL BE LAYED IN HDPE CONDUIT AT A DISTANCE OF 1 MTR FROM PIPELINE TRENCH.
DETAIL D-D (PART 1)

(LOOKING FROM DIRECTION OF FLOW FROM REFINERY TO TERMINAL)

(NORTH REFINERY TO MARKETING TERMINAL—LPG LINE, CH: 0+000.000Km TO 2+000.000Km)

SCALE: 1:150

LEGENDS:
- EXISTING FACILITY (AS SHOWN IN BLACK)
- NEW FACILITY BY MARKETING DIVISION (AS SHOWN IN RED)
- NEW FACILITY BY REFINERY (AS SHOWN IN BLUE)

NOTES:
1. AS PER OISD 141 MINIMUM 3 mtr. CLEAR DISTANCE FROM EXISTING BURIED PIPELINE IS MAINTAINED.
2. TOTAL SPACE REQUIRED FOR LAYING OF NEW 2 No. 16" PROPANE/BUTANE PIPELINES IS 1.906 mtr. INCLUDING CONCRETE COATING IN THE PIPELINES.
3. TOTAL SPACE REQUIRED FOR LAYING OF 1 No. 12" NEW REFORMATE PIPELINE IS 0.700 mtr. INCLUDING CONCRETE COATING IN THE PIPELINE.
4. INSTRUMENT FO CABLE SHALL BE Laid IN HOPE CONDUIT.
5. 1 No. 12" NEW REFORMATE PIPELINE TO BE LAYED BY REFINERY IN FUTURE
6. SPACE BALANCE IN THE ROW AFTER LAYING 1 No. 12" NEW REFORMATE PIPELINE IS 0.450 MTR.

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<td>PDRP-A056-8210-83-000-0002 (FROM CH: 0+000.000Km TO CH: 1+500.000Km) SHEET 1 OF 4</td>
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<tr>
<td>NORTH REFINERY TO MARKETING</td>
<td>(FROM CH: 1+500.00km TO CH: 4+500.00km)</td>
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<tr>
<td>TERMINAL (LPG LINE)</td>
<td>SHEET 2 &amp; SHEET 3 OF 4</td>
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SURVEY REQUIREMENT:
1. SURVEYOR TO VERIFY ROU WIDTH AS MARKED
2. PHYSICAL DEMARKATION OF ROU WIDTH MARKED
3. TO LOCATE UNDERGROUND UTILITIES WITHIN ROU WIDTH MARKED
4. ALL OTHER REQUIREMENTS, REFER SPECIFICATION.

NOTES:
1. AS PER OISD 141 MINIMUM 3 mtr. CLEAR DISTANCE FROM EXISTING BURIED PIPELINE IS MAINTAINED.
2. TOTAL SPACE REQUIRED FOR LAYING OF NEW 2 NOs. 16" PROPAINE/Butane PIPELINES IS 1.906 mtr. INCLUDING CONCRETE COATING IN THE PIPELINES.
3. TOTAL SPACE REQUIRED FOR LAYING OF 1 NO. 12" NEW REFORMATE PIPELINE IS 0.700 mtr. INCLUDING CONCRETE COATING IN THE PIPELINE.
4. INSTRUMENT FO CABLE SHALL BE LAID IN HOPE CONDUIT.
5. 1 NO. 12" NEW REFORMATE PIPELINE TO BE LAYED BY REFINERY IN FUTURE
6. SPACE BALANCE IN THE ROW AFTER LAYING 1 NO. 12" NEW REFORMATE PIPELINE IS 0.450 MTR.

LEGENDS:
- EXISTING FACILITY (AS SHOWN IN BLACK)
- NEW FACILITY BY MARKETING DIVISION (AS SHOWN IN RED)
- NEW FACILITY BY REFINERY (AS SHOWN IN BLUE)
- NEW SHIFTED LOCATION OF HT CABLES