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<p style="text-align: center;">FUNCTIONAL SPECIFICATION FOR SUBMARINE PIPELINE ROUTE SURVEYS</p> <p style="text-align: center;">OIL AND NATURAL GAS CORPORATION LTD. INDIA</p>																
K.P.V			Reproduced from Rev 2 and issued for Bid	17	12-01-05	2										
B.P.M			Reproduced from Rev 2 and Issued for Bid	17	10.5.04	2										
	A.K.S.	V.K.K.	REVISED & REISSUED	17	01.12.2003	2										
A.K.M.			RE-PRODUCED FROM REV.1 & ISSUED FOR BID	17	23.7.03	1										
A.K.S		V.K.K.	REVISED & RE- ISSUED FOR BID	21	15.5.97	1										
			ISSUED FOR BID	21	17.12.90	0										
PREPARED BY	REVIEWED BY	APPROVED BY	REMARKS	NO. OF PAGES	DATE	REV.										
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<p>1.0 SCOPE</p> <p>This specification describes the technical requirements for the performance of all operations and incidental works related to pre- engineering / pre-construction and post-construction surveys of the submarine pipeline to be laid. The submarine pipelines to be laid are given in the bid document elsewhere.</p> <p>The proposed pipeline route is indicated in the enclosed field layout drawing and pipeline route survey drawing. The drawings are enclosed in Part IV of the bid package.</p> <p>The surveys shall cover the corridor along the proposed pipeline alignment and location survey of existing pipelines. The proposed route is crossing over a few lines and runs as indicated in field layout drawing.</p> <p>The pre-engineering / pre-construction route surveys shall consist of minimum 3 longitudinal lines, with one line along pipeline and two wing lines 200 m apart on either side of proposed pipeline route incorporating side scan sonar, sub-bottom profiler, echo-sounder, magnetometer, shallow soil sampling and associated positioning system. The side scan sonar shall be operated on 150 m range giving a minimum 100 m overlap between lines. Transverse lines for full swath (700 m) shall be run at 500 m intervals to cover the existing pipeline with in proposed pipeline corridor. The configuration shall be as per the drgs. enclosed with this specification.</p> <p>In addition, sector-scan sonar/video recorder shall be used to delineate existing pipeline at platform and crossings.</p> <p>The post-construction survey of the installed pipeline system shall be carried out with all the above-mentioned equipment and matching configuration and geodetic controls as used in the pre-engineering surveys.</p> <p>The work shall include furnishing of all personnel, materials, equipment and tools etc. necessary for carrying out the complete work as described herein.</p>				
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<p>As used in this specification, the following definitions shall apply :</p> <p>Company : OIL AND NATURAL GAS CORPORATION LTD.</p> <p>Contractor : SURVEYOR/INSTALLATION CONTRACTOR/ TRUNKY CONTRACTOR</p> <p>The Contractor shall obtain Company's written approval for any deviation from the requirements of this specification and the drawings referenced herein.</p> <p>This document is not intended to be all inclusive and the use of the guidelines set forth does not relieve the Contractor of his responsibility to collect and furnish survey data capable of providing the requirement inputs for planning, designs, engineering and application.</p> <p>The pipeline route to be surveyed shall be developed from the field layout enclosed and shall be submitted for Company approval along with route alignment co-ordinates, section lengths and directions etc.</p> <p>During survey, the work reports attached at the end of this specification shall be filled in by the Contractor and signed by the Contractor and Company's Representative.</p> <p>2.0 PREPARATION FOR THE SURVEY WORK</p> <p>Prior to the beginning of the survey work, Contractor's Chief Surveyor, responsible for the management and execution of the entire job, shall plan the complete work with the Company/Company's Representative.</p> <p>The Chief Surveyor shall then prepare a procedural document indicating as a minimum the following :</p> <ol style="list-style-type: none"> Proposed equipment including vessels with all requisite details. Sequence/location of profiles <p>Geodetic controls and horizontal control of survey</p>				
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<p>c. Location of soil samples etc.</p> <p>d. Instrument calibration procedures</p> <p>e. Survey Schedule</p> <p>Contractor shall ensure incorporation of all Company's comments before submission of final survey.</p> <p>SCHEDULE</p> <p>Daily work sheets indicating the length of profiles, type of equipment and/or sampling operations shall be maintained. These records shall be included in the final report submitted to the Company.</p> <p>Preliminary interpretation of the side-scan, sub-bottom profiler and echo sounder records shall be performed on board to delineate the existing pipeline, and to assess the acceptability of each of the pipeline routes. No delays will be accepted for this reason, as this preliminary interpretation should be performed almost simultaneously with the recording and completed within 24 hours after completion of the surveys.</p> <p>The Company shall have the option to designate its engineer(s) to supervise the data collection and interpretation on board. The vessel shall have suitable accommodation for at least 3 Company's Representatives.</p> <p>3.0 POSITIONING SYSTEM AND COMMUNICATION</p> <p>The Contractor shall install a horizontal positioning system capable of giving the location of the ship with less than 2-meter error. This system shall be able to work continuously 24 hours per day. Vessels shall have a permanent link with the Company's shore base, by means of radio network, to inform the progress of the work at any time. This system shall not cause interference with the above positioning system. Radio communication describing daily work shall be established periodically minimum once every day with the Company's Base.</p>				
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<p>The layout and UTM/geographical (Everest 1830) co-ordinates of the pipeline terminal points are given in the referenced drawings. Accurate positioning of pipeline terminal points shall be the Contractor's Responsibility.</p> <p>4.0 MARINE SURVEY</p> <p>The marine survey includes all operations required to obtain the bathymetry, morphology of the sea bottom and shallow geology as described herein.</p> <p>All works required to install and operate the survey ship positioning system are also included. The width of the corridors to be investigated shall be 700 m which shall comprise new pipeline to be installed and existing pipelines, if any. The survey area includes the platform area from where the pipelines originate/terminate and a corridor along the pipeline routes. The platform area and the pipeline route should be investigated by means of 3 (three) longitudinal profiles run at 200 meter spacings with 700 m long transverse profiles run at a maximum of 500 meter intervals. Additional transverse profiles shall be run wherever necessary for clear delineation of existing pipeline.</p> <p>At every pipeline crossing, two additional longitudinal profiles at 350 m on either side of the proposed pipeline shall be run for a distance of at least 200 m on either side of the existing pipeline, so that the existing pipeline elevation with respect to seabed is clearly indicated.</p> <p>The Contractor shall simultaneously analyze the records on board. In case, obstructions are discovered on assigned routes, alternate routes should be selected in the field and survey profiles run/made for the alternate routes subject to Company's approval.</p> <p>Shallow Soil Sampling</p> <p>Piston gravity corer (modified kullenberg) having 6 m barrel fitted with an interval PVC liner and a cutting shoe at the bottom shall be deployed for collecting soil samples. In case of sands, a core catcher shall be provided in side the shoe to assist retention of the sample during retrieval of the sampler. Alternatively a vibro-corer can be employed for collecting soil samples in granular soils.</p>				
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<p>Based on interpretation of shallow seismic profiles determined by the Contractor, the spacing between sample locations shall be such that different types of strata encountered along the route are covered. However, the spacing between two consecutive sample locations shall not exceed 1 km. Additional soil samples shall be collected at all envisaged pipeline crossing and other such pipeline features.</p> <p>At location where sand with shale fragments/gravel is encountered and piston gravity corer refuses to penetrate the seafloor on repeated attempts, grab samples shall be collected if the Company Representative is satisfied that piston sample cannot be collected.</p> <p>All samples shall be extruded in the field and carefully examined and visually classified on board the vessel. Samples shall be tested in the on-board laboratory for classification purposes and for broad assessment of strength. Representative samples shall be properly sealed and carefully packed for transportation to onshore laboratory for additional examination and testing. Testing facilities on board the vessel shall include, but not limited to, the following :</p> <ol style="list-style-type: none"> Natural moisture content Dry and bulk density Torvane Motor vane Tricon (unconsolidated un-drained triaxial compression test). <p>Selected samples transported to onshore laboratory shall be tested to determine the following properties to supplement the information obtained in the field which together shall be used to determine soil parameters for pipeline design and installation :</p> <ol style="list-style-type: none"> Carbonate content Specific gravity Grain size distribution 				
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<p>iii. Atterberg limits</p> <p>iv. Indicative shear strength parameters of soils</p> <p>v. Coefficient of friction between pipeline and soils</p> <p>vi. Liquefaction potential</p> <p>vii. Electrical resistivity</p> <p>viii. Chlorides and sulphates</p> <p>All the shallow seismic survey results shall be correlated with soil data. Segment by segment profile and its geotechnical characteristics shall be developed. Contractor shall generate all the necessary soil parameters and submit for Company approval before use in analysis and design.</p> <p>Operation will be stopped at the discretion of the Contractor, when the sea state becomes too excessive (greater than BF-3) to obtain quality survey results.</p> <p>The Contractor shall supply vessels capable of working in the offshore Arabian Sea continuously 24 hours per day. The vessel shall have installed on it, all the equipment, before the beginning of the work, so that the survey will begin when the vessels arrives at site. The vessel shall have a data interpretation room with all auxiliary facilities to do the preliminary on board interpretation.</p> <p>4.1 Bathymetry</p> <p>The surveyor shall use a dual channel echo-sounder with heave compensator, filter etc. to obtain a complete representation of the sea bottom along each of the designated pipelines routes, and be able to define contours with a maximum relative accuracy of 0.05 meter. For the wide band surveys, bathymetric contours with 1meter interval are acceptable. The water depth shall be referenced to Chart Datum (Indian Spring Low Water).</p> <p>4.2 Side Scan Sonar</p> <p>A survey of the sea-bottom by means of side-scan sonar shall be carried out to complete a morphology map of the zone investigated. Double coverage and beam angle shall be such that no blind zones exist in the designated survey areas. The</p>				
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<p>towed vehicle positioning system shall be such that the vehicle location relative to the ship is known at any moment.</p> <p>The maximum towing speed shall not exceed 5-6 kmph (3 knots). The records obtained by means of this equipment shall be suitable to form a complete morphological map of areas investigated.</p> <p>4.3 Sub Bottom Profile</p> <p>To establish the geometry, structure and configuration of the geological strata along the pipeline corridors, sub bottom profiling shall be performed with a system suitable to giving minimum penetration of 10 m or bedrock, whichever is shallower. The resolution shall be of the order of 15 cm at the surface. Vertical profiles of the shallow sediments shall be obtained. A pipeliner (pipeline profiler) shall be deployed for obtaining the above information.</p> <p>Considering the longer shallow water section and sandy bottom expected, interface equipment with profiler to improve data quality shall be implemented.</p> <p>Magnetometry</p> <p>The Contractor shall check for the presence of any metal objects on the sea floor, such as existing pipelines and communication cables, etc. and/or basic rock with a magnetometer. The location of these shall be given in the report.</p> <p>4.4 Riser Clamps</p> <p>4.4.1 Where risers are to be provided on existing platforms, Contractor shall carry out a survey of the jacket bracing members, where new clamps are to be located and of the existing clamps, where these are to be used, along with pre engineering route survey.</p> <p>4.4.2 Surveys will be carried out from the hanger flange to the lowest jacket member (by divers) and shall cover :</p> <ul style="list-style-type: none"> - An area of 1 m either side of proposed riser center line. - Identification of jacket, face, member, mudmat etc. 				
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<p>- Measurements</p> <p>- Inspection of the existing clamps and jacket bracing members, with reference to marine growth, anode location, corrosion, other obstruction, availability of clamps, bolts etc.</p> <p>- Video recordings with identification of platform location, elevation and proposed riser.</p> <p>- Two clear photographs of each existing clamp to be used and of the bracing member where proposed/planned clamps are to be installed.</p> <p>- If the proposed location of riser or use of existing clamps or proposed location of new clamps, found unsuitable for the intended purpose, the surveyor shall propose alternate location, survey the same and submit both the reports for Company's review.</p> <p>4.5 Video Recording Sector Scan Sonar</p> <p>To establish the configuration of risers and clamps, existing pipelines at platforms and at crossings, video recordings/sector-scan sonar survey shall be made. At each location the configuration and identification shall be presented in the recording.</p> <p>The coverage shall be to at least 100 meters either side of the existing line if visible and not buried. The coverage at platform complex shall be carried out on parallel lines at 50 meter intervals, keeping parallel to the face of the jacket for a distance of at least 500 meters.</p> <p>5.0 EQUIPMENT</p> <p>Contractor's equipment intended to be used for the surveying work shall be in excellent condition and properly calibrated to obtain accurate and quality data. The Contractor shall submit the details of equipment proposed to use in the survey to the Company for their approval.</p>				
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<p>6.0 SURVEYS RECORDS</p> <p>6.1 The Contractor shall conduct the survey and maintain proper records in order that all information required for route alignment selection, design & engineering, laying, trenching burial and back filling of pipelines can be obtained from these records.</p> <p>6.2 The Contractor shall submit minimum 3 sets of the preliminary survey report on board the vessel on completion of survey work. The preliminary report shall contain the following minimum information:</p> <ul style="list-style-type: none"> i. Brief description of survey procedures, including instrument calibration details. ii. Bathymetric data iii. Locations of soil samples iv. Brief description of samples v. Identification of any sub sea obstruction and/or seafloor instability. <p>6.3 The Contractor shall submit minimum six sets of the final analyzed survey report and photographs and three copies of all video recording/sector scan records along with three sets of video playback (including slow motion playback) for audio visual monitor (PAL VHS System) to the Company within six weeks from the completion of field survey. The final report shall contain the following information as a minimum :</p> <p>a. Pipelines</p> <ul style="list-style-type: none"> i. Description of survey methods, procedure, equipment and instrument calibration data. ii. Bathymetric chart and isopach of sediments, scale of 1:5000. iii. Identification of shallow subsea bed gas pockets, bed rock etc. iv. Identification of any subsea obstructions and/or seafloor instability. v. Soil data results. 				
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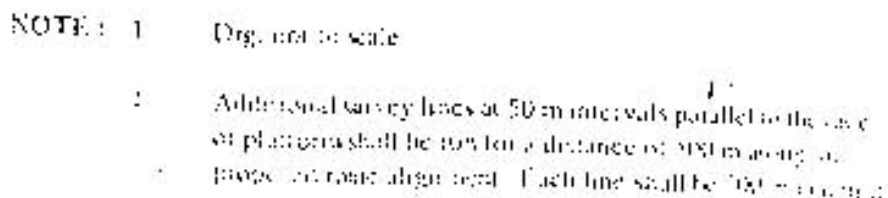
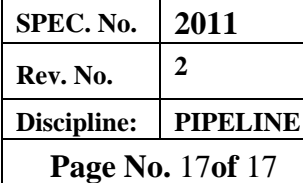
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<div> <div>vi. Identification of sub bottom sediment layer.</div> <div>vii. Presence of any metallic objects and/or debris on the sea floor</div> <div>viii. Tentative pipeline routes, scale of 1:5000. Approaches to platform complex scale of 1:500.</div> <div>ix. Condition of existing pipe, including position with respect to seabed, through on the route (356 OWF and 324 OWF).</div> <div>x. Longitudinal geological profile of the proposed pipeline routes.</div> <div>xi. Drawings indicating the orientations of connecting platforms and pipeline (with curvatures, co-ordinates etc).</div> <div>xii. Photographic copies of raw survey recordings identifying features of interest such as pipelines, crossings, anchors, metallic objects, subsea obstructions etc. and bathymetric and sub bottom discontinuities from the echo sounder, sub bottom profiler, side scan sonar and magnetometer.</div> <div> b. Riser Clamps <div>i. Drawing showing elevation and plan of riser clamps and bracing members.</div> <div>ii. Details of all relevant measurement performed.</div> <div>iii. Details of bolts available, condition of hinge and neoprene liner.</div> <div>iv. Description of anomalies of damage/or obstructions in case of new clamps.</div> <div>v. Photographic copies as specified.</div> </div> <div>6.4 All raw field data gathered on board shall be submitted to the Company on completion of the work.</div> </div>				
7.0 WORK REPORT				
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<p>a. Geological and Geophysical Survey</p> <p>Run No.</p> <p>From</p> <p>To</p> <p>Whether along/across the proposed route or across the existing line</p> <p>Side Scan Record</p> <p>Width of Sea bed covered (Reqd. minimum = 150m)</p> <p>Distance between two parallel runs (required – 200 m)</p> <p>Echo Sounder Record</p> <p>Seabed Contour Resolution (Required = 0.5m)</p> <p>Remarks</p> <p>Sub Bottom Profile</p> <p>Penetration in the soil strata (Required minimum = 10 m or bed rock)</p> <p>Sub Bottom Profile</p> <p>Resolution (Required minimum = 15 cm at surface)</p> <p>Remarks</p> <p>(Signatures)</p> <p>Contractor's Representative</p> <p>Company's Representative</p> <p>b. Tidal Observation for Water Depth Correction</p>														
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<p>Location Coordinates</p> <p>Type of instrument required : Admiralty Tide Staff</p> <p>Recording Interval : Required 15 minutes.</p> <p>c. Shallow Soil Sampling</p> <p>Eqpt. Used : Piston gravity Corer (Kullenberg)/Grab</p> <p>Penetration : Required Minimum : Clay 3 m, sand 2m.</p> <p>Sample Condition : Disturbed/undisturbed on board classification</p> <p>Color photograph attached or not color with ref. Standard code</p> <p>Note : Samples to be handled in horizontal position only.</p> <p>8.0 PROJECT SPECIFIC REQUIREMENTS</p> <p>Due to the variable nature of area/routes to be surveyed this project has special requirements. Surveyor shall ensure to implement all of these.</p> <p>8.1 Existing Pipeline Configuration</p> <p>Surveyor shall ensure that existing pipeline configuration falling within the survey corridor, shall be clearly delineated/charted.</p> <p>If required, for the above requirement bidder shall run additional tracking runs to delineate the existing pipeline accurately.</p> <p>8.2 To establish the depth of burial and configuration of buried line, a pipeline tracker shall be used in the post construction as laid/as built survey. Surveyor shall develop a detailed deployment and survey plan for all congested areas and submit to Company for approval.</p> <p>8.3 Geodetic Control</p>				
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<p>Surveyor shall ensure before commencement of each survey phase that coordinates of all reference/base stations envisaged to be used shall be of required accuracy and approved by Company.</p> <p>8.4 Minimum Technical Requirements & Characteristics</p> <p>The positioning system proposed shall comply with the following requirements as minimum.</p> <ul style="list-style-type: none"> - Shall have minimum three (3) base station set up if a radio-positioning system is used. - Shall have a prefixed reference station with radio/satcom link, if a DGPS system is used. - Shall have the capability of covering all the work area. - Shall have 24 hours per day operability - The on board receiver shall acquire at least three (3) LOP (lines of position) at all times. - The system accuracy, RMS (Root mean Square) shall be better than 1 meter in the complete work area. - A standard survey navigation software shall be used for survey navigation. <p>The station location shall be selected taking into consideration the following minimum requirements.</p> <ul style="list-style-type: none"> - Angle of intersection between LOP shall always be greater than 30 and less than 150 for a combination of three (3) ranges. - Sufficient back up stations to ensure correct positioning incase of the station system. - An uninterrupted coverage of work area. <p>8.5 On board data handling system</p>				
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<p>Minimum requirements of data handling system shall be as given below:</p> <p>An automatic data handling system along with plotter data logger shall be connected to the survey receivers to monitor and record the ship's position at all times. The ships position shall be fixed at intervals not exceeding 20 second whilst surveying.</p> <p>A hard copy of fix data shall be printed after each fix and shall as a minimum include :</p> <ul style="list-style-type: none"> - Fix number - Position (intum grid) - Raw Position data <p>Standard process-soft ware such as Delph-I shall be used for processing of shallow seismic data and the recording shall be done on standard SEG-Y format.</p> <p>8.6 Data Record on Floppy Disk</p> <p>All survey data shall be digitally recorded and information shall be supplied to the Company additionally on Floppy Disks.</p> <p>The acquisition methods used for geophysical data shall also be valid for isopaches of sediments.</p> <p>Different disks properly labeled shall be used for raw and analysed data.</p>				
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ODS/SOF/004B	ODS/SOP/008 TO 015	01	01	15/10/2003