Project Name	**for laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km-122.150 in the state of Uttar Pradesh.**
Client	**M/s. GREEN GAS LTD**

Job Procedure for

HORIZONTAL DRIECTIONAL DRILLING (HDD)

INDEX

VINAY BHARDWAJ
Chief Manager-Projects /OIC
GREEN GAS LIMITED
Ayodhya & Sultanpur-GA

Project Name	**for laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km-122.150 in the state of Uttar Pradesh.**
Client	**M/s. GREEN GAS LTD**

1.0 SCOPE:

This procedure covers the minimum requirements of various activities to carry out for the Engineering and construction of pipeline crossing using Horizontal Directional Drilling along the route of **for** laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km- 122.150 in the state of Uttar Pradesh.

2.0 EQUIEPMENT & MAN POWER

- HDD Machine & Silicon Roller
- Hydra
- Holiday Crew
- Supervisor
- Holiday Machine
- Welding Machine
- Grinding Machine
- Welding Crew

3.0 METHOD

Pre Construction Survey

GREEN GAS LTD will carry out a pre construction survey along the width of the crossing and prepare a construction drawing accordingly. During pre-construction survey existing underground facilities if any will be located and protected.
After completion of Pre-construction survey a detailed drawing & Design calculation will be prepared with all relevant data such as elevation, levels etc. and will submitted to GREEN GAS LTD for approval.

Design & Engineering

Based on site conditions, survey drawing, equipment & installation technique the limits of each crossing will be determined. The minimum cover of the pipeline after crossing will be maintained as per approved drawings.
If any underground facilities like pipeline, cable etc. are encountered during survey, the same will be crossed with a minimum clearance of 500 mm from the buried utilities or as required by authorities having jurisdiction. The entry & exit point of the section will be fixed on ground level

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as per approved drawings. Calculation for determining the maximum permissible overburden on pipe to check that the empty pipeline is safe from collapse at any points in the drilled crossing section will be submitted to GREEN GAS LTD for approval. Calculation will be made to determine the stresses & power requirements considering following facts and submitted to GREEN GAS LTD for their approval

- Back - reamed diameter.
- Bentonite density
- Pipeline submerged weight in bentonite

Minimum allowable elastic bend radius will be calculated considering the following conditions.
- The maximum longitudinal stress due to tension & bending in the pipeline section will not exceed 90% of SYMS of the pipe material.

- The combined equivalent stress in the pipeline section due to bending & hydro-test will not exceed 90% of SYMS of the pipe material.

- Maximum permissible equivalent stress during service as per the pipeline operating parameters.

Pipeline configuration

Construction drawing will be prepared with levels, profiles, entry angle, exit angle, radius of bend, total length, and maximum tension required on the pull head of the rig etc. and submitted to GREEN GAS LTD for approval. All the works will be carried out in accordance with the approved construction drawings only.

Construction

GREEN GAS LTD will comply with all the conditions and requirements issued by authorities having jurisdiction in the area where the work is to be performed.

Installation procedure

GREEN GAS LTD will submit a detailed installation procedure for approval before commencing any work at site comprising of project organization chart, details of equipment, hydrostatic test procedure, method of installation, calculations, time schedule etc.

String Preparation

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Pipe string will be prepared as a single one for pulling. Welding, Radiographic inspection of joints and field joint coating of the string will be done in accordance with the respective applicable procedures.

Pre-Testing

The complete pipe string will be hydrostatically pre-tested as per the approved procedure. All the welds and pipes will be checked for leakage and the failure if any will be rectified and the hydro test will be repeated after rectification.
After successful completion of pre-hydro testing, the joint coating of the joints will be carried out as per HDD crossing joint coating procedure.

Site Preparation

The centerline of the crossing will be marked and stacked properly.

The HDD machine centerline will be marked with respect to survey.

A pit will be opened for collecting the used betonies slurry & cuttings which will be further connected to the entry point.

Entry & Exit points will be prepared for easy approach and movement of equipment & manpower.

Pipe section will be placed over rubber lined rollers to avoid any coating damages during pulling operation.

HDD Drilling Operation

The Drill Rig will be anchored in position at entry side.

Drilling operation will start with Pilot drilling. During drilling operation, the high-pressure bentonite slurry will be pumped through the drill bit and the drilling is to be carried out continuously equivalent to one length of drill pipe. A new length of drill pipe will be added at the end of each finished drill pipe.

The line of drilling will be monitored using tracker system, the sensing unit fixed at the rear of the steering tool. The sensing unit transmits the location of the drill bit back to the tracking unit on the surface. The information will be conveyed to the driller for the necessary corrective action if any.

VINAY BHARDWAJ
Chief Manager Projects /GGL
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Once the drill bit exits at the exit point of the drill hole, the drill bit, steering tools etc. will be detached and reamer will be attached to the drill steering. During the reaming process betonies slurry will be pumped under high-pressure through the reamer. As the reamer is pulled back by the drill rig, drill pipes will be attached continuously behind the reamer for the subsequent reaming and pipe pulling operations. The reaming operation will be repeated to achieve the required size of the hole.

Exit point offset of the pilot hole from the theoretical exit point will be maintained as less than 0.5% of string length.

Length tolerance will be controlled within 1% of crossing length3.

The size of the back reamed hole will be maintained approximately at 1.5 times the pipeline diameter.

Pulling

A pull head will be welded with the hydro tested pipe section.

The pull head will be connected to the drill rig.

It will be ensured that the pipe section is longer than the drilled hole.

The pipe string is then pulled from the exit point to entry point by using rig.

During pulling, buoyancy of the pipeline will be controlled by suitable method so as to maintain the buoyancy as close as possible to zero during pull back.

Betonies slurry of specified viscosity will be pumped into the hole to prevent hole from collapsing & protect the coating.

Integrity of the corrosion coating

Before pull back operation, meager test will be done for the entire pipeline string made for the crossing. After pull back operation, again meager test will be done for the installed string before tie-in with the mainline. The observed meager value before and after pulling has to be almost same. However, if the integrity of coating cannot be established by the above method, temporary impressed current system will be set up and current density will be calculated to establish the integrity.

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Sultanpur-GA

Project Name	for laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km-122.150 in the state of Uttar Pradesh.
Client	M/s. GREEN GAS LTD

Post Hydro-test

After installation, the complete string will be hydrostatically tested for 24 Hrs. (if needed).

Final Clean up

After completion of HDD operations, the site will be cleared off all balance materials, debris & betonies slurry.

4.0 Health, Safety & Environment:

- Proper barricading has to be done for this work
- PPE is a must in this activity
- Machine operator involved shall be an experienced person.
- It is to be noted that the special care to be adopted against snake / insects bite.
- Only trained rigging personnel to be deployed for this activity.
- All Measuring & Test Equipment used shall be well maintained.
- All lifting devices & Tolls used shall be well maintained

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Chief Manager-Projects /OIC
GREEN GAS LIMITED
Ayodhya & Sultanpur-GA

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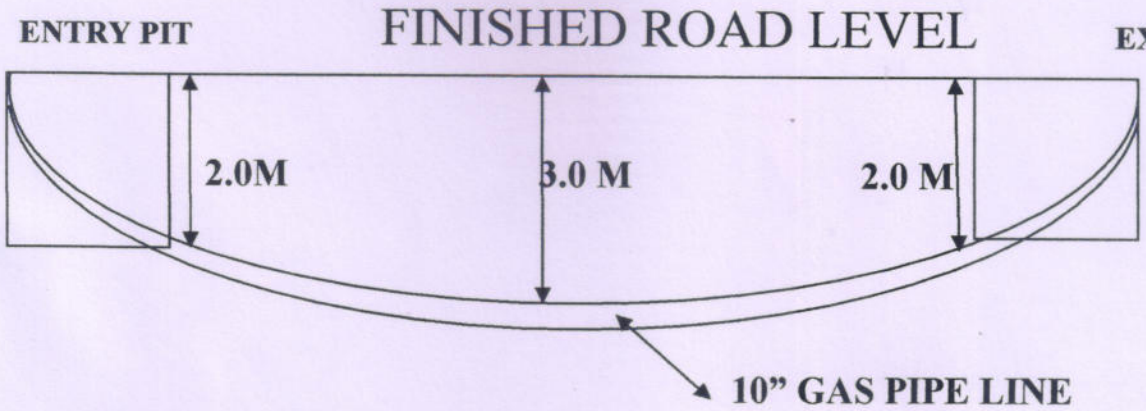
Client	**M/s. GREEN GAS LTD**



ENTRY PIT DIMENSION

LENGTH 2.00 MTR
WIDTH 1.0 MTR
DEPTH 2.0 MTR

ENTRY PIT DIMENSION

LENGTH 3.00 MTR
WIDTH 1.0 MTR
DEPTH 2.0 MTR

HDD CROSS SECTION

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GREEN GAS LIMITED
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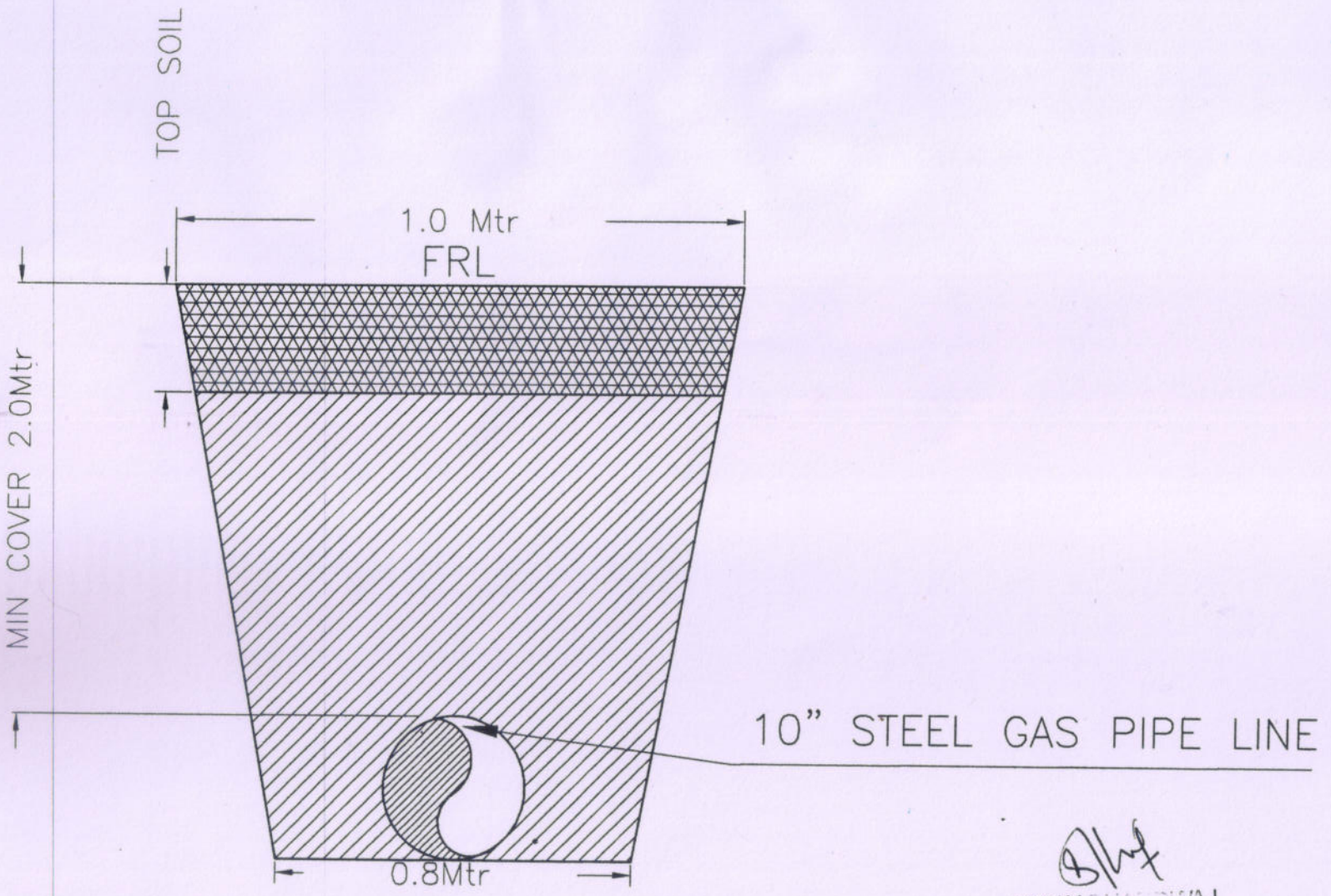

HDD CROSS – SECTION

VINAY
Chief Manager
GREEN

Project Name	**for laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km- 122.150 in the state of Uttar Pradesh.**
Client	**M/s. GREEN GAS LTD**

Job Procedure for TRENCHING

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GREEN GAS LIMITED
Ayodhya & Sultanpur-GA

Project Name	**for laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km- 122.150 in the state of Uttar Pradesh.**
Client	**M/s. GREEN GAS LTD**

1.0 PURPOSE

The purpose of this work instruction is to establish guidelines and requirements to control the trenching activity to be used for laying of 10" Carbon Steel Gas Pipeline from NH Ch. Km-90.373 (Near Muskan Dhaba) to NH Ch. Km- 148.825 (Near Sanjay Gandhi Polytechnic College, Jagdishpur) along the National Highway No-731 and Crossing of NH at NH Ch. Km- 122.150 in the state of Uttar Pradesh.

2.0 SCOPE

This scope covers the Trenching in all type of soil or in rock for pipeline for Construction. It also covers the blasting of trench and removal of scattered rock and debris from ROW.

3.0 EQUIPMENTS & MAN POWER

JCB : As Per Requirement
Civil Labour : As Per Requirement
Supervisor : 01 Nos.

4.0 METHODOLOGY

As a sequence operation trenching is to start with a reference line marked as the centerline of the trench. Trail Pits shall be prepared wherever required to locate the OFC, Power Cable, existing pipeline crossing or any other obstacles.

If deemed necessary by GREEN GAS LTD or concerned authorities where numerous utilities may be encountered, GREEN GAS LTD should carry out the excavation normally. The areas identified for existing utilities shall be marked with temporary painted post and uncovering/exposing of same shall be done manually. Use of excavator bucket is not permitted. In case of damage of any existing utilities GREEN GAS LTD and concerned authority should be informed immediately without any delay. Rectification for same shall be done by the contractor at his own cost.

For normal soil trench shall be prepared as per detail TYPE 1 (typical trench detail in normal soil) as stipulated in standard drawing, TEIND-STD-G-M-2002 (released for construction). For

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5.0 HEALTH, SAFETY & ENVIRONMENT

- Machine operator involved shall be an experienced person.
- PPE shall be used in this activity.
- Only trained operators to be deployed for this activity.
- Personnel around the machine (if any) should be cautious about overhead falling objects.
- During the movement of earth moving equipment the operator should blow horn to caution the people around.
- All Measuring & Test Equipment used shall be well maintained.
- Excavated Area should be barricaded.
- Provide ladders wherever possible for better approach to the working area if Depth is > 1Mtr.
- Shoring all around the pit shall be checked prior to start of excavation and if required adequate amount of shoring to be done.
- Minimum persons should go in to the pit.
- Only certified and validated tools & tackles to be used.
- Underground pipe to be located by pipe locators prior to start of Trenching.
- First aid box to be maintained at site.
- Emergency contact number to be installed on site.

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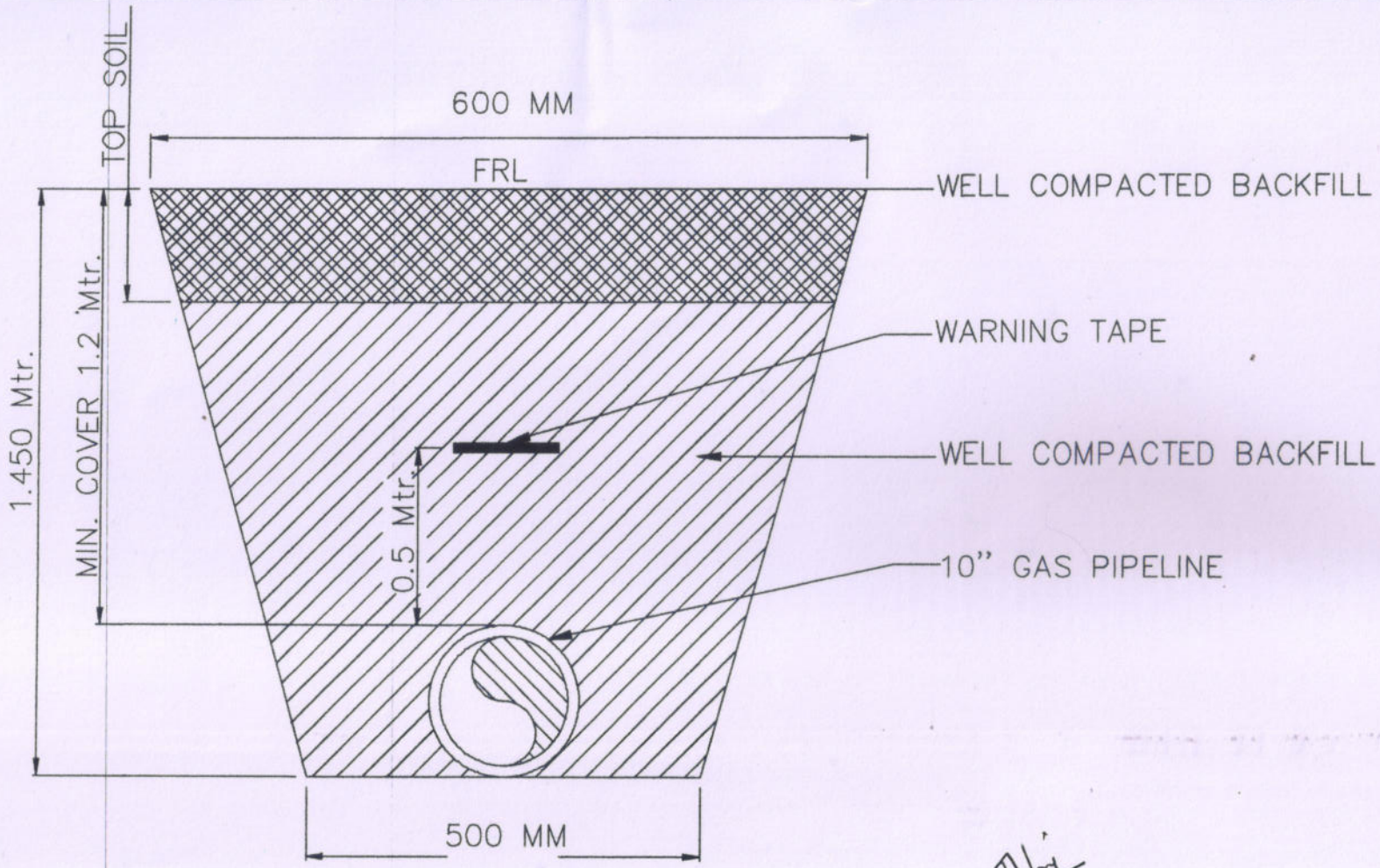

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TYPICAL TRENCH
DETAILS IN NORMAL SOIL