



NASHPA Gas Processing and LPG Recovery Plant

PROC-FC-CB/NASHPA/PROJ-1247/2015

PROJECT NO.: NASHPA 1247



DOCUMENT NO.:
NGP-000-SCW-15.05-2001-00

DESIGN BASIS

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Design Basis for Roads and Paving

REVISION DETAILS

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REVISION HISTORY

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1.0 GENERAL

1.1 Introduction

OIL & GAS Development Company Ltd. (OGDCL) is operating NASHPA Oil & Gas fields in Khyber Pakhtunkhwa of Islamic Republic of Pakistan. OGDCL intends to install LPG Recovery Plant, Compressors & Allied Facilities at Nashpa Oil Field, which including Wellhead facilities, Gas Gathering System and Gas Processing Plant. "NASHPA Gas Processing and LPG Recovery Plant" (the PROJECT) is Gas Processing Plant part. The objective of PROJECT is to construct a gas processing facility at NASHPA to process raw gas of NASHPA and separator gas from MELA Field. The MELA and NASHPA combined gas is the feed for NASHPA Gas Processing Plant (NGP). The NGP will produce LPG, Sales Gas and Stabilized Condensate.

1.2 Purpose

This document is suitable for the roads and paving including plant roads, concrete paving, gravel surfaces, etc.

The purpose of this document is to define the basis for roads and paving design of the project "NASHPA Gas Processing and LPG Recovery Plant PROC-FC-CB/NASHPA/PROJ-1247/2015".

2.0 DEFINITIONS AND ABBREVIATIONS

2.1 Definitions

Throughout this Document the following definitions will apply:

Project	NASHPA Gas Processing and LPG Recovery Plant PROC-FC-CB/NASHPA/PROJ-1247/2015
Company/Owner	Oil & Gas Development Company Ltd.(OGDCL)
Consultant	Zishan Engineers (Pvt.) Ltd.
Contractor	Hong Kong Huihua Global Technology Limited Wholly Owned Subsidiary of China OIL HBP Science and Technology Corporation Ltd.
Manufacturer/Supplier/Vendor	Party(ies), which manufactures and/or supplies material, equipment and service to perform the duties as specified by CONTRACTOR in the scope of supply
Shall	Indicates a mandatory requirement
Should	Indicates a strong recommendation to comply with the requirement of this document

2.2 Abbreviations

The following abbreviations are used in this document:

Table 2-1 Abbreviations



NASHPA Gas Processing and LPG Recovery Plant
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EPCC	Engineering, Procurement, Construction and Commissioning
FEED	Front End Engineering Design
SOW	Scope of Work
AI	Asphalt Institute
ACI	American Concrete Institute
AASHTO	American Association of State Highway and Transportation Officials
IDC	Internal Discipline Check
IFR	Issued for Review
IFA	Issued for Approval
AFD	Approved for Design
HPP	High Paving Point
LPP	Low Paving Point
FGL	Finished Grade Level

3.0 REFERENCES

3.1 Codes and Standards

The applicable & latest version standards and codes listed below but not limited following will be used for the design of this project.

AASHTO-GDPS-4: Guide for Design of Pavements Structures

AI SS-2: Specifications for Pavings and Industrial Asphalt

ACI360R-92: Design of Slab on grade

PCA-Portland Cement Association: Concrete Pavement Design

3.2 Project Specifications, Procedures and drawings

Particular reference is made to the following project specifications:

[1]	Volume II & III of Tender Documents
[2]	Tender Documents: Standard Drawing of Typical Road Cross Section (165-3-CSTD-013)
[3]	Tender Documents: Standard Drawing of Paving Details (165-3-CSTD-015)
[4]	Design Basis for Civil and Steel Structures Works (NGP-000-SCW-15.05-0001)

4.0 ASPHALT ROADS



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4.1 General

Access roads will be provided for the new plant. The design and type of these roads may be similar to the roads in the adjoining existing plant.

Following types of Trucks Loadings and types are being used for design of roads:

Road Type	Truck Type	Total Truck Load	Axle Loading Type	Truck Axle Loading
Primary Road	Large loading truck	100 Tons (1000 kN)	Tridem Axle	45 Tons (450 kN)
Secondary Road	Fire Hydrant Trucks	58 Tons (580 kN)	Tandem Axle	31.5 Tons (317 kN)
Access Road	Fire Hydrant Trucks	58 Tons (580 kN)	Tandem Axle	31.5 Tons (317 kN)

The designed road layout will allow for easy access by heavy trucks to all relevant areas for installation and erection and subsequent operation/maintenance. Road Type (Primary, Secondary or Access ways) will be well defined in Road Layout Drawing for approval.

Road geometry will be so designed to cater for all types of traffic and trucks carrying equipment, i.e. the radii and widths of roads will be adequate to accommodate these criteria. The compressors and any proposed building can be accessed by trucks for delivery and removal of heavy equipment. Adequate turning circles will be provided on all junctions and turning areas and allowance will be given to construction traffic and maintenance vehicles over the life span of the plant.

The width of roads will match with the roads in the existing plant. However no road will be less than a minimum width of 4.5m. In general asphalt roads will be provided matching with the design of the roads in the adjoining existing plant.

They will consist of a wearing course, base course and a sub base according to the design. All asphalt road construction will be founded on a sub-grade and if necessary (in the case of poor ground conditions) a geo-textile layer or replacing existing soil with select fill will be used according to design requirements and recommendations of Soil Investigation Report.

4.2 Roads Definition and Description

Unless otherwise specified, all road width within the plant area will comply with the following:

Primary Roads	7.0m + 1.0m shoulder (Consist of two lanes 3.5m wide, Shoulders will be provided on both sides)
Secondary Roads	6.0m + 1.0m shoulder (Consist of two lanes 3.0m wide, Shoulders will be provided on both sides)
Access ways	4.5m wide (Single lane, unrestricted vehicular traffic)
Minimum radius for intersection of Primary Roads (edge of Wearing course)	Heavy traffic and 12.0m minimum internal curve radius will be considered (external edge of lane)
Minimum radius for intersection of Secondary Roads	Normal traffic and 12.0m minimum internal curve radius will be considered (external edge of lane)



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Minimum radius for intersection of Access Ways	Controlled access for vehicle maintenance and 7.0m minimum internal curve radius will be considered (external edge of lane)
Longitudinal Slope of roads	0% to 4% (6% maximum)
Transverse Slope	Primary and secondary roads will be of two-sloped cross profile. Slope will be 2% with the high point on the axis of the road Shoulders will be sloped 4%
Vertical Clearance	Over primary and secondary roads: 6.0m (Over full width of road) Over maintenance roads: 4.8m (Over full width of road)

Road Type (Primary, Secondary or Access ways) will be well defined in Road Layout Drawing for approval.

Storm water drain channels will also be part of road cross section as per Storm Water Drainage Layout Plan.

4.3 Thickness Design

Asphalt road thickness will be designed as per AASHTO Guide for Design of Pavement Structures and with the design parameters such as Reliability, Standard Deviation, Initial/Final Serviceability Indexes, Drainage Coefficient and soil resilient modulus will be determined for the project.

Unless otherwise required by project specifications or by soil investigation report, the following data can be used as a reference for asphalt paving design:

a) Primary Roads:

- Reliability (R): 90%
- Standard deviation (So): 0.45
- Traffic:
 - 8.000.000 ESAL during plant life
- Soil resilient modulus (Mr) and CBR values: As per information in Soil Investigation Report
- Initial serviceability index po: 4.2
- Final serviceability index pt: 2.5
- Drainage coefficient m: 1.20

b) Secondary Roads:

- Reliability (R): 90%
- Standard deviation (So): 0.45
- Traffic:
 - 800.000 ESAL during plant life



• Soil resilient modulus (Mr) and CBR values: As per information in Soil Investigation Report

• Initial serviceability index po: 4.2

• Final serviceability index pt: 2.0

• Drainage coefficient m: 1.20

5.0 CONCRETE PAVING

RCC pavement for all process area or any equipment where flammable or hazardous liquids may be spilled for operation and maintenance will be provided. Paved area will be graded and drained to a suitable drainage area. Contractor will provide the following as minimum:

5.1 Light duty paving

Light duty paving will be used in areas not subjected to vehicle traffic, or occasionally subjected to transit of light movable equipment. Reinforced Concrete slab will be of uniform thickness as per design requirements to withstand a maximum axle load of 10kN plus impact.

5.2 Heavy Duty Paving

Heavy duty paving is provided for areas subjected to heavy traffic and to transit of maintenance vehicles. Reinforced Concrete slab will be of uniform thickness as per design requirements to withstand a maximum axle load of 60kN plus impact.

5.3 General Design Requirements

- 1) Reinforced concrete paving will be foreseen in areas in which may be hydrocarbon/polluted spillage. Paving in areas liable to the spillage of either caustic or acid solutions will be curbed and proofed according to project specifications.
- 2) Curbs, where required to retain spilled material, will generally be 150mm height x100mm width reinforced concrete, cast integrally with the paving.
- 3) Concrete paved areas will be parted into rectangular sections limited by contraction joints. Spacing of joints will be calculated as per design calculations and will extend to the full depth of concrete paving. Contraction joints will be 25mm width and will be filled with hot bitumen or with suitable material hydrocarbon resistant. Lower part of joint will be filled with polystyrene or with suitable non-extruding material.
- 4) In correspondence of contraction joints will be foreseen dowel bars for transferring at least 20% of the load across the joint. Arrangement of these dowel bars shall be as per Standard drawings provided in tender, (Standard Drawing of Paving 165-3-CSTD-015).
- 5) Construction joints will not be more than 4.5 m apart and will extent to the full depth of concrete paving. Construction joints will be 8mm width and will be filled with hot bitumen or with suitable material hydrocarbon resistant. Lower part of joint will be filled with polystyrene or with suitable non-extruding material.
- 6) Control joints will not be more than 6 m apart. They will be 6 mm wide and 10 mm deep filled with suitable material non-extruding. The cut in concrete will be made after casting.
- 7) Isolation joints will be foreseen between paving and foundations projecting above grade.



6.0 GRAVEL SURFACES

Gravel (size 40 mm down) paving will be placed over compacted ground to minimize soil erosion due to wind and rain. The thickness of gravel layer will be 75 mm.

7.0 MEASURING UNITS

Calculations and drawings for all works covered by this document will be carried out using International System Units (S.I.).

In particular, the following units will be used:

- Length:

meter m

millimeter mm

- Area:

square meter m²

square millimeter mm²

- Force:

Newton N

kilo Newton kN

- Mass:

kilogram kg

- Pressure:

Kilo Pascal kPa = kN/m²

Mega Pascal MPa = N/mm²

- Density:

kilogram per cubic meter kg/m³

- Specific weight:

kilo Newton kN

per cubic meter kN/m³

- Temperature:

degree Celsius °C

- Flow rate:

Cubic meter per Second m³/s