

**TECHNICAL PROPOSAL
(Q-BDIN-22-297-A1-R9)**

FOR

**DDGS DRYER, DRYER VAPOR INTEGRATION IN EXISTING
NVDPL GRAIN DISTILLERY**

Submitted to:

**NV DISTILLERIES PVT. LTD.
Badhauri, District Ambala,
Haryana.**

Dated: 24th MAY, 2023



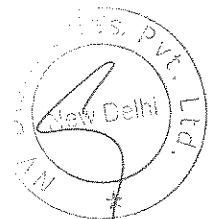
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PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



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PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



INDEX

Annexure No.	Description
A-1	Scope Matrix
A-2	Design Basis
A-3	Input Requirements & Specifications
A-4	Output Generation & Product Specifications
A-5	Performance Parameters
A-6	Equipment List
A-7	Civil & Structural Scope & Specifications
A-8	Static design basis & Specifications
A-9	Material Of Construction
A-10	Piping Scope & Specifications
A-11	Electrical Scope & Specifications
A-12	Instrumentation Scope & Specifications
A-13	Battery Limits
A-14	List of Exclusions from PRAJ scope
A-15	Makes of Bought out Items

18

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023

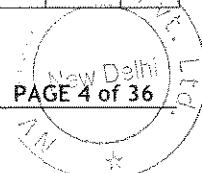


ANNEXURE A-1

SCOPE MATRIX & DEFINITIONS

1.1 SCOPE MATRIX

	PRAJ SCOPE OF WORK					CUSTOMER SCOPE OF WORK				
	D&E	SU	ER	SC	SE	D&E	SU	ER	SC	SE
Process Section										
DDGS Dryer (New)	✓	✓	✓	✓	✓	X	X	X	X	X
Dryer Vapor Integration and Add-on Evaporation (MEE)	✓	✓	✓	✓	✓	X	X	X	X	X
Instrument Air Compressor for Dryer (New)	✓	✓	✓	✓	✓	X	X	X	X	X
Shifting of Decanter alongwith Mag Flow Meters, Thin Slops Tank and Ribbon Mixer (Existing)	✓	✓	✓	✓	✓	X	X	X	X	X
Decantation Other than above equipment	X	X	X	X	X	✓	✓	✓	✓	✓
MCC & Onwards for above sections	✓	✓	✓	✓	✓	X	X	X	X	X
Piping, fitting & valves for above sections	✓	✓	✓	✓	✓	X	X	X	X	X
PLC based Instrumentation for above sections	✓	✓	✓	✓	✓	X	X	X	X	X
In-Plant Lighting for PRAJ Scope (Dryer & Add-On Evap. Section only)	✓	✓	✓	✓	✓	X	X	X	X	X
Process Condensate Treatment Plant	X	X	X	X	X	✓	✓	✓	✓	✓
MS Structure for PRAJ Scope Process Plant	✓	X	X	X	X	X	✓	✓	✓	✓
Balance of Plant										
Liquefaction	X	X	X	X	X	✓	✓	✓	✓	✓
Fermentation	X	X	X	X	X	✓	✓	✓	✓	✓
Existing Distillation	X	X	X	X	X	✓	✓	✓	✓	✓
Existing Standalone Evaporation	X	X	X	X	X	✓	✓	✓	✓	✓
Alcohol storage	X	X	X	X	X	✓	✓	✓	✓	✓
Cooling Tower and Cooling water distribution upto batter limit	X	X	X	X	X	✓	✓	✓	✓	✓
Civil Works for PRAJ Scope Process Plant	X	X	X	X	X	✓	✓	✓	✓	✓
Yard Piping for Praj Scope	X	X	X	X	X	✓	✓	✓	✓	✓



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



	PRAJ SCOPE OF WORK					CUSTOMER SCOPE OF WORK				
	D&E	SU	ER	SC	SE	D&E	SU	ER	SC	SE
Yard Lighting	X	X	X	X	X	✓	✓	✓	✓	✓
Balance of Electrical (PCC Panel, DG Set, transformer, Cabling upto MCC Panel)	X	X	X	X	X	✓	✓	✓	✓	✓
Fire Fighting	X	X	X	X	X	✓	✓	✓	✓	✓
Weigh Bridge	X	X	X	X	X	✓	✓	✓	✓	✓
Lab Equipment's	X	X	X	X	X	✓	✓	✓	✓	✓
Boiler - Turbine and accessories. Steam HP LP piping upto battery limits	X	X	X	X	X	✓	✓	✓	✓	✓
MS Structure for OSBL Scope	X	X	X	X	X	✓	✓	✓	✓	✓
Civil Works for OSBL Scope	X	X	X	X	X	✓	✓	✓	✓	✓

Notes:

1. D & E - Design and Engineering
 - SU - Supply
 - ER - Erection
 - SE - Supervision of Erection
 - SC - Supervision of Commissioning
2. ✓ - Indicates included in scope, X - Indicates NOT included in scope.
3. Scope specified in above scope matrix is summary, for detailed scope clarity refer Scope definition, Equipment list section, Scope of work section.

1.2 SCOPE DEFINITION:

1.2.1 Design Engineering:

1. Basic Engineering
2. Detailed Engineering

1.2.2 Supply: Supply of Engineering as per equipment list and scope of work specified in respective section.

1.2.3 Erection: Erection and supervision of erection work of critical equipment, bought out equipment, site fabricated equipment, Piping fabrication and assembly, Instrument cable and cable tray laying and connection, Electrical cabling and connection as per equipment list and scope of work specified in respective section.

1.2.4 Supervision of Commissioning: Training to customer operators, preparation of joint punch list, water, vacuum, and steam trials, start up, stabilization and performance guarantee runs.

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



ANNEXURE: A-2

DESIGN BASIS

Design Philosophy:

NVDPL has 70 KLPD Extra Neutral Alcohol Plant based on Grain as Feedstock at Bhadauli (Haryana) Unit. This plant is installed and commissioned in 2008 by M/s Praj Industries Ltd.

Project no.: 06N081

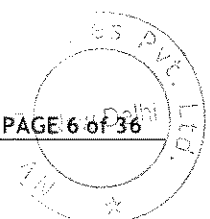
Existing multiple effect evaporation system

The existing evaporation plant is a complete standalone evaporation plant and there is no alcohol vapour integration from distillation section. There are five effects (working). Four (4) Nos. of Falling Film Evaporators (FFE) and One (1) No. of Forced Circulation Evaporator (FCE). No standby effects. The steam is used as a heating medium.

Existing Evaporation Steam Consumption: 0.96 kg/lit of TS

Based on requirement of reduction in existing steam consumption by NVDPL, Praj recommends the add on equipment as mentioned in the Equipment list and by using existing hardware of the plant to produce 70 KLPD of Extra Neutral Alcohol using Broken Rice as a Feedstock.

Parameter	Details
Plant Capacity	75 KLPD TS Grain Plant
Feedstock	100 % Broken Rice as feed flour @ 68 % w/w starch and 10 % moisture
Extra Neutral Alcohol (ENA) with min. 96 % v/v	70 KLPD ENA From Existing Distillation plant with recommended modification and add on equipment
Scope of Work (Equivalent to 75 KLPD TS)	<ul style="list-style-type: none">➤ Decantation (Shifting of existing Decanter)➤ DDGS Dryer - New➤ Dryer Vapor Integration and Add-on Evaporation (MEE)- Part-New



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



A) PROCESS DESIGN BASIS

Sr.No	Particulars	As Existing	After Steam Reduction
1.	Plant Capacity	75 KLPD Total Spirit	75 KLPD Total Spirit
2.	Technical Alcohol Cut (max.)	ENA - 7% of Total Spirit for Grain plant	As Existing
3.	Thin Slop recycle to Liquefaction section	~ 10% (It will vary depending on alcohol conc. in FW)	~ 20% (It will vary depending on alcohol conc. in FW)
4.	Feedstock basis considered for Evaporation and Dryer	Broken Rice	As Existing
5.	Enzymatically convertible starch in Broken Rice	68% w/w	As Existing
6.	Moisture in Broken Rice	10% w/w	As Existing
7.	Alcohol in Fermented Wash	13 % v/v	As Existing

B) EVAPORATION DESIGN BASIS

Sr. No	Particulars	Existing Evaporation	Existing Evaporation + New Effect Integrated on Dryer Vapor
1.	Plant Capacity	75 KLPD	75 KLPD
2.	Feed Thin stillage to the Evaporators	384 TPD	317 TPD
3.	Feed Temperature	65 Deg C	65 Deg C
4.	Thin Stillage Solids	2.8 % w/w	4.5 % w/w
5.	RO Reject from Proposed PCTP (Quantity assumed as per PRAJ Norms)	--	50 TPD
6.	Solid in RO Reject	--	1 % w/w
7.	Total Feed to Evaporation	384 TPD	367 TPD
8.	Solids in Total Feed to Evaporation	2.8	4.0 % w/w
9.	Concentrated Stillage quantity	41 TPD	42 TPD
10.	Concentrated Solids	27 % w/w	35 % w/w
11.	Water Evaporated	343 TPD	325 TPD
12.	Steam Consumption	3 TPH	2.4 TPH

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



C) DDGS DRYER DESIGN BASIS

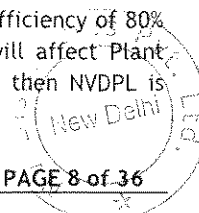
Sr.No	Particulars	Quantity
1.	Feed = Syrup + Wet cake	107 TPD
2.	Feed Solids of Dryer	30 % w/w
3.	DDGS quantity	30 - 34 TPD
4.	Concentrated solids	90 % w/w
5.	Water evaporated	73 TPD

Notes:

1. All existing equipment/ Instrumentation / piping, valves, electrical, structure, etc. being used are assumed to be in good working condition. If any existing hardware, as mentioned above, is found not suitable/ malfunctioning (as per the rated conditions/ designed parameters) during the stage of execution / during commissioning, then the same will be replaced / modified by NVDL at their own cost.
2. During Commissioning/ Guarantee Runs, If there are any shortcomings in the functioning of the existing equipment / Instrumentation (from the designed/rated capacity) leading to the non-achievement of the Plant Performance parameter, then NVDL shall rectify/ replace the same to enable PRAJ to perform the Guarantee runs.
3. All existing sections and equipment including its peripheral hardware and overall performance guarantees will lie with customer (Sections like Liquefaction, Fermentation, Distillation, Evaporation, decantation etc.)
4. Existing plant data is received from NVDL through mail dated 7th April 2023.
5. As per email received from NVDL dated 7th April 2023, Plant existing capacity is 75 KLPD Total Spirit. NVDPL confirmed that existing Evaporation (MEE) is working with an overall Water Evaporation Duty of 343 TPD.
6. The existing Evaporation section will be operated as per existing practice. Dryer vapor will be used for the newly proposed Add-on Evaporation.
7. The feed rate to Evaporation plant in terms of Thin Slop is calculated after 20 % recycle to Liquefaction section. Evaporation plant is designed on Thin slop and RO Reject from Praj Proposed New PCTP only. Though PCTP is presently excluded from Scope of supply at present, the design basis of Evaporation to remain same as proposed.
8. We have considered recycle of Thin Slop (20%), Part Process Condensate and PR and recovery Column Spent Lees to Liquefaction Section to meet the requirement of dilution water in the process. No other effluent streams are considered for dilution in the process.
9. Plant and products capacity is subject to input quantity and specifications as specified in respective sections. Any variation in the same will affect plant overall performance and if any Add on cost incurred during execution of plant due to change in design basis then NVDPL shall bear such cost.
10. Thin slop feed to Evaporation is assumed to have following characteristic:

Parameter	12%	25%	30%	35%
Viscosity (Cp)	3 @ 30 Deg C. 1 @ 80 Deg C.	3 @ 30 Deg C. 2 @ 90 Deg C.	27 @ 30 Deg C. 21 @ 80 Deg C.	100 @ 30 Deg C. 60 @ 70 Deg C.

11. Ratio of suspended solids to Total solids in the feed should not be more than 30-32%.
12. Decanter Centrifuge are considered in NVDPL's Scope, and are assumed to have an efficiency of 80% (min.) and wet solid concentration is min. 30% w/w. Any variation in the same will affect Plant overall performance. If Decanters are performing underrated capacity / efficiency, then NVDPL is responsible to rectify the same.



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



ANNEXURE A-3

INPUT REQUIREMENTS & SPECIFICATIONS

NO.	INPUT MATERIAL	QUANTITY	
1.	Thin Slop Feed to Dryer Vapor Integrated Evaporator	317 TPD @ 4.5 % w/w	
2.	Wet Cake from Decanter	65 TPD	
3.	Solids in Wet Cake	30 % w/w	
4.	STEAM CONSUMPTION (DRY, SATURATED) at 3.5 kg/cm²(g)	Existing, kg/lit of TS	Proposed, kg/lit of TS
	Existing Standalone Evaporation	0.96	0.76
	Total Steam Consumption	0.96	0.76
	DDGS Dryer	1.15	1.15
	Total Steam Consumption including Dryer	2.11	1.91
5.	WATER REQUIREMENT:		
	Cooling Water	As existing	
	Soft Water for Process Pump, Vacuum Pump	15 -20 m3/hr	
6.	CHEMICALS		
	CIP Chemicals	As per Process requirement	
7.	Instrument Air Requirement	As per Process requirement	
8.	Power Requirement (in kW)	Consumed	
	Dryer Vapor Integration and Add-on Evaporation (MEE)	370 - 380 KW	
	DDGS Dryer		

Note:

- The figures given above are for steady state operation & are indicative in nature. These figures may vary slightly. Exact requirements shall be confirmed only after detailed engineering.
- Power consumption figures for the scope of Supply sections are tentative in nature. Power consumption figures may vary based on selection of pumps & machinery during detailed engineering, final plant layout & piping distances.
- Steam Consumption mentioned is NET and without any heat loss and CIP margins. Steam Quantity requirement mentioned is after integration of Dryer Vapors.
 If Dryer Vapors are not available for Integration, then 0.6 kg/Lit of TS Steam will be required additionally.

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



INPUT SPECIFICATIONS

A. RAW MATERIAL: Thin Slops at min. 65 Deg C and with 4.5 % w/w Total Solids.

B. WATER SPECIFICATION :

i. Soft Water: Pump Sealing.

Sr.No	Parameter	Unit	Value
1.	pH	-	6 - 9
2.	Chloride (Cl-) (Expressed as NaCl)	mg / lit	< 250
3.	H2S	mg / lit	Nil
4.	Residual Free Chlorine	mg / lit	< 1
5.	Silica (SiO ₂)	mg / lit	< 50
6.	Total Hardness (Expressed as CaCO ₃)	mg / lit	< 5
7.	Turbidity	NTU	< 10
8.	Total Dissolved Solids	mg / lit	< 750

Note : > Water shall be of potable grade quality,
 ➤ mg/lit - Parts Per Million (ppm)

➤ Cooling water (recirculation water): Cooling Water Supply to CWS Header to be made available by NVDPL at 3.5 bar (g) pressure & 32 Deg C Temp.

Sr.No.	Parameter	Unit	Value
1	pH	-	7 - 9
2	H2S	mg/lit	Nil
3	Residual free chlorine	mg/lit	< 1
4	Total Hardness (Expressed as CaCO ₃)	mg/lit	< 300
5	Total Dissolved Solids	mg/lit	< 2100
6	Silica (SiO ₂)	mg/lit	< 100
7	Chloride (Cl-) (Expressed as NaCl)	mg/lit	< 300
8	Sulphate	mg/lit	< 600
9	Turbidity	NTU	< 10
10	Total suspended solids	mg/lit	< 20

Note: Mg/lit - Parts per Million (PPM).

Suitable chemical treatment is recommended to cooling water in order to avoid corrosion, scaling & microbiological problems.

C. STEAM SPECIFICATION :

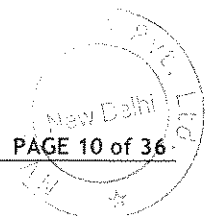
Steam : At the inlet Steam Header in Evaporation & DDGS Dryer Section at 3.5 ± 0.05 kg/cm² (g.) pressure and at 148 Deg C, Dry & Saturated temperature

D. ELECTRICITY :

Electric supply should be 415 ± 5 V, 3 Phase, 50 Hz, 4 wire supply, At the inlet of MCC.

E. Instrumentation Air:

Oil free Instrument Air should be available at 7.0 kg/cm² (g) with dew point of 5-6 °C. Instrument Air will be taken from existing Instrument Air Compressor for Proposed Evaporation.



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



ANNEXURE A-4

EXPECTED OUTPUT GENERATION

OUTPUT	UNIT	QUANTITY
Main Products		
DDGS Generation (Theoretical)	TPD	37-40
By Product		
Steam condensate	Return from respective Praj scope of Section	- 80 % of Total Steam Consumption will be available as Steam Condensate @ 45-50 Deg. C
Evaporation Process Condensate + Dryer Vapor Condensate	TPD	280-300
Effluent generation		
Purge from Dryer Recovery System	TPD	As per Process
Dryer Exhaust Vapor (Vent to Atmosphere)	TPD	

Notes:

1. The above expected output generation are subject to Plant Design basis considered in respective section.
2. The above expected other output generation are subject to process described in respective section.
3. The above expected other output generation are subject to requirement of inputs & specifications specified in respective section.
4. All rated capacities are expected under steady state condition of the plant & utilities and uninterrupted supply of utilities.
5. Values are subject to the measurement accuracy of the instruments used.

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



ANNEXURE A-5

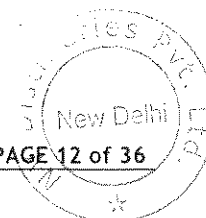
PERFORMANCE PARAMETERS

STEAM CONSUMPTION (DRY, SATURATED) at 3.5 kg/cm ² (g)	Existing, kg/lit of TS	Proposed, kg/lit of TS
Steam Consumption including Dryer	2.11*	1.91

Note:

- Constant availability of inputs like feed and utilities at desired specifications are essential for the consistent quality of product.
- Any variation in feed characteristics and specification will affect the performance of plant.
- “*” in the existing steam consumption, Dryer Steam is added to show the comparison.
- Steam Consumption mentioned is NET and without any heat loss and CIP margins. Steam Quantity requirement mentioned is after integration of Dryer Vapors.

If Dryer Vapors are not available for Integration, then 0.6 kg/Lit of TS Steam will be required additionally.



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023

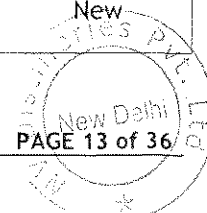


ANNEXURE A-6

EQUIPMENT LIST

6.1 NEW EVAPORATION INTEGRATED ON DRYER VAPOR AND DRYER VAPOR RECOVERY SYSTEM

Sr. No.	Description	Tech. Specs.	MOC	Qty.	Remark
1.	Dryer Vapor Recovery System	As per PRAJ Design Norms	AISI 304	1 Lot	New
2.	Falling Evaporator	Film Designed based on Falling Film principle. Construction: Shell & Tube Type.	Shell: SS 304 Tubes: SS 304 Tube sheet: SS 304	1	New
3.	Vapor Separators	Liquid Construction: Vertical, with tangential / snail entry for effective vapor separation.	Shell: SS 304	1	New
4.	Recirculation cum Transfer Pump for FF	Type - Centrifugal Pump	Wetted Parts: CF8	1	New
5.	Motor for Recirculation cum Transfer Pump for FF	Non - Flameproof		1	New
6.	Surface Condenser	Shell and Tube heat exchanger	Shell: SS 304 Tubes: SS 304 Tube sheet: SS 304	1	New
7.	Sealing water Tank for Vacuum Pump	Cylindrical / Vertical	SS 304	1	New
8.	Sealing Water Transfer Pump for Vacuum Pump	Type - Centrifugal Pump	Wetted Parts: CF8	1	New
9.	Motor for Sealing Water Transfer Pump for Vacuum Pump	Non - Flameproof		1	New
10.	Vacuum Pump	Water Ring Type	CI	1+1	New
11.	Motor For Vacuum Pump-Evaporation	Non - Flameproof		1+1	New
12.	Process Condensate Cooler	Type - PHE	Frame: MS, Plate: AISI 316	1	New



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
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Sr. No.	Description	Tech. Specs.	MOC	Qty.	Remark
13.	Seal Water cooler for Vacuum Pump	Type - PHE	Frame: MS, Plate: AISI 316	1	New
14.	Piping, Fittings & Valves	Refer Annexure no. 10		1 Lot	
15.	Electricals	Refer Annexure no. 11		1 Lot	
16.	Instrumentation	Refer Annexure no. 12		1 Lot	

Note:

1. All existing equipment's/ Cooling Tower and pumps/ Instrumentation / piping, Valves, electrical, structure etc. to be used are assumed to be in good working condition. If any existing hardware as mentioned above is not found suitable/ malfunctioning (as per the rated conditions/ designed parameters) during the stage of Order Execution / during the commissioning, then same will be replaced / modified by client at his own cost.
2. During commissioning/ guarantee runs If there are any shortcomings in the functioning of the existing equipment / Instrumentation (from the designed/rated capacity) leading to the non-achievement of the Plant Performance parameter then the client has to rectify/ replace the same to enable PRAJ to perform the guarantee runs.
3. All existing sections and equipment including its peripheral hardware and overall performance guarantees will lie with customer (Sections like Liquefaction, Fermentation, Distillation, Evaporation, etc.)

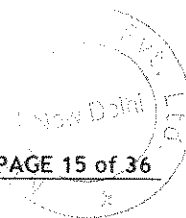
6.2 ROTARY STEAM TUBE BUNDLE DRYER FOR DWGS: (HA-95)

S. N.	Equipment	MOC	Qty
(I)	DWGS DRYER		
1.	Dryer Housing	Dryer Lower & Upper Trough in SS 304. End cover of trough Mild Steel with SS304 Cladding. Outer supports are in Mild Steel Base frame in Mild Steel	1 Set
2.	Rotating Steam Tube Bundle with shovels & shovels carrying angle	Special Alloy Mild Steel Tube Tube Sheet in Mild Steel, dish ends in Mild Steel, Shovels are in SS304 and shovel carrying angles are in MS.	1 Set
3.	Set of Rotary Joints	Housing in Cast Iron with standard rotary joints for steam inlet & outlet	1
4.	Steam Trap	Cast Steel with standard supply	Lot
5.	Drive Arrangement	Gear Wheel & Pinion arrangement driven by a set of drive comprising Gear Box & Motor mounted on MS base frame	1 Set

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



S. N.	Equipment	MOC	Qty
6.	Feed screw	Main screw flight with trough and end covers in SS 304 and support parts in MS	1 Set
7.	Conveying screw	Main screw flight with trough and end covers in SS 304 and support parts in MS	1 Set
8.	Dosing screw	Main screw flight with trough and end covers in SS 304 and support parts in MS	1 Set
9.	Haul off Screw	Main screw flight with trough and end covers in SS 304 and support parts in MS	1 Set
10.	Discharge screw	Main screw flight with trough and end covers in SS 304 and support parts in MS	1 Set
11.	Vapor ducting	MS / SS 304 as per application.	Lot
12.	Cyclone Separator	SS 304	1 Set
13.	Rotary Air lock Valve	Mild Steel	1 Set
14.	Exhaust Vapor Fan	Mild Steel	1 Set
15.	Rupture Discs	SS 304	1 Set
16.	Steam Condensate Tank	MS	1
17.	Steam Condensate transfer pump	Centrifugal MOC: CI	1+1
(II) COOLING AND CONVEYING			
1.	Cooling & conveying	System comprising Air Blower with Rotary Valve, etc. in Mild Steel	1 Set
(III) DDGS STORAGE			
1.	Product (DDGS) Storage Silo along with required Accessories and bin activator	Capacity: 8 hrs storage; MOC: MS	1
(IV) SEMI Automatic DDGS Bag filling System			
1.	Semi-Automatic DDGS Bag Filling system	Type: Semi-Automatic	1
2.	Instrument Air Compressor with Motor	Lubricated, Screw type with refrigerated type dryer	- 1+1
3.	Piping, Fittings & Valves	Refer Annexure no. 10	- 1 Lot
4.	Electricals	Refer Annexure no. 11	- 1 Lot
5.	Instrumentation	Refer Annexure no. 12	- 1 Lot



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



Note :

In the DDGS bagging system offered, the Operator is required to hold the Bags onto the holding clamp manually. Pneumatically operated Bag Holding Mechanism will automatically clamp the Bag. Once the bag is filled, the operator has to move the filled bag manually to the stitching machine where stitching of the bag has to be done by operator manually.

6.3 Electrical MCC & Onwards

Praj Scope related to Electrical MCC & Onwards is as given in following table

Section Name	Design Engg	Supply	Erection	SE	SC
Dryer Vapor Integration and Add-on Evaporation (MEE)	✓	✓	✓	✓	✓
DDGS Dryer	✓	✓	✓	✓	✓

6.4 Piping, fitting & valve

Praj Scope related to Piping, fitting & valves is as given in following table

Section Name	Design Engg	Supply	Erection	SE	SC
Dryer Vapor Integration and Add-on Evaporation (MEE)	✓	✓	✓	✓	✓
DDGS Dryer	✓	✓	✓	✓	✓

6.5 Instrumentation

Praj Scope related to Instrumentation is as given in following table

Section Name	Design Engg	Supply	Erection	SE & SC	Scope
Dryer Vapor Integration and Add-on Evaporation (MEE)	✓	✓	✓	✓	PLC Based
DDGS Dryer	✓	✓	✓	✓	PLC Based



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



ANNEXURE A-7

CIVIL & STRUCTURAL SCOPE & SPECIFICATIONS (NVDPL SCOPE)

(A) Civil Works : NVDPL SCOPE

1. PRAJ to only provide Civil Load Data & Civil Foundation Drawings for their scope of Supply sections.
2. Procurement, Construction, execution & supervision of all Civil Works will be in NVDPL scope.

(B) MS Structural works : NVDPL SCOPE

- 1) PRAJ to provide Engineering & MS Structural Drawings for Equipment in their scope of supply.
- 2) Procurement, Fabrication & supervision of Site Erection of MS Structural works for following sections will be undertaken by NVDPL.
 1. Dryer Vapor Integration and Add-on Evaporation (MEE)
 2. DDGS Dryer

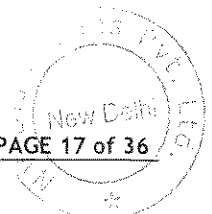
Sr. No.	Section	Structure Items
1.	Dryer Vapor Integration and Add-on Evaporation (MEE)	As applicable as per Praj standard practice.
2.	Dryer and Decantation	Single Building in Structure with Roof on top. Upto 3 meter brick work. RCC will be in NVDPL Scope, Steel Structure in PRAJ Scope RCC Slab for Decanter.
3.	Foundation Bolts	As per PRAJ specifications / procurement by NVDPL

NOTE: MS Structure considered as per PRAJ Norms and specifications given below.

MS STRUCTURAL WORK SPECIFICATIONS : Structural material will be confirming to Indian Standards as follows:

Sr. No	Sections	Grade / Specification
1.	Structural steel like Beam, columns, Channels & angles etc.	IS 2062 Grade A
2.	Painting	One Coat of Red Oxide and two coats of Enamel Paint with proper surface preparation.
3.	Gratings	25 mm thick MS Painted
4.	MS painted Checkered plate	5.0 mm Thick
5.	MS painted Hand Railing	Top rail, & Vertical post shall be 32 NB and Mid Rail 25 NB MS medium class Pipe. Mid Rail along with 100 x 6 mm MS Toe guard at all Floor periphery and stairways side.
6.	Roofing Sheet	Color coated metallic sheets of Tata / Jindal 0.5 mm (PPGL)

Note: All connections shall be welded connections.



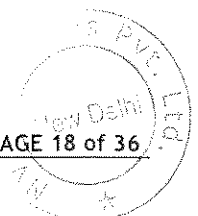
PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



YARD PIPING NVDPL SCOPE :

1. Additions / changes in the existing piping from Analyzer Bottom Transfer Pump to Decantation Section located above proposed New Dryer.
2. Partial Concentrated syrup from stage I to Standalone Evaporation.
3. Additions / changes in the existing piping from Decantation Section located above proposed New Dryer to Liquefaction section / Distillation Section.
4. Transfer of Wet cake from Decanter to Double Shaft Mixer in Proposed Dryer Section.
5. Any Intermediate piping / Yard piping other than Praj Scope.

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PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



ANNEXURE A-8

STATIC DESIGN BASIS & SPECIFICATIONS

A) Mechanical Engineering Consideration:

1.1.1	EQUIPMENT DESIGN CONSIDERATION, ALLOWANCES AND MARGINS:		
	<ul style="list-style-type: none"> All pressure equipment having pressure equal to or greater than 15 psig, Dish & shell thickness shall be designed as per ASME and other component's as per GEP, except for Copper Equipment's, Copper Equipment's shall be designed as per Praj proven practice /GEP All Atmospheric vessels shall be Design as per Praj proven practice /GEP Heat Exchanger Dish and shell thicknesses shall be as per ASME and other components will be designed as per Sound Engineering Practice/GEP Distillation Column thicknesses (Dish & shell) as per ASME, other components as per GEP, Columns shall be designed as per operating design condition. CS / SS atmospheric storage tanks shall be designed as per Sound engineering Practice/GEP 		
1.1.2	NOZZLE FLANGES/STUBEND		
	Nozzle Flanges: Up to DN/N 500	LJFF FLANGES WITH SS STUB END FOR SS&MS EPOXY EQUIPMENTS-LJFF TYPE) / IS2062 E 250 BR(MS EQUIPMENTS-SORF TYPE)	Dimensions as per ASME B16.5,150#
	550 DN/NB TO 600 DN/NB	IS 2062-E250-BR SOFF flange Without hub, With SS304/ 304L/316/316L Liner (For SS / MS EPOXY Eqpts-SORF TYPE)/ IS 2062-E250-BR (For MS Equipment-SORF TYPE)	Dimensions as per ASME B16.5,150#
	650 DN/NB & Above	IS 2062-E250-BR SOFF flange Without hub, With SS 304/ 304L/316/316LLiner (For SS / MS EPOXY Eqpts-SORF TYPE)/ IS 2062-E250-BR (For MS Equipment)	Dimensions as per ASME B16.47, 75# or 150#, Series-A
	ALL DOW Cu Nozzles	IS 2062-E250-BR -LJFF TYPE	Dimensions as per ASME B16.5,150#

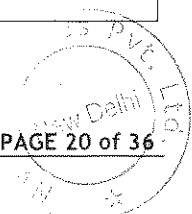
PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



ANNEXURE A-9

MATERIAL OF CONSTRUCTION

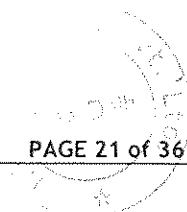
DESCRIPTION	MATERIAL OF CONSTRUCTION	REMARK
PLATES		
SS Plate (Pressure / Non Pressure Parts)	SA240 TYPE 304 / 304 L / 316 / 316 L / AISI 304 / 316 / 304 L / 316 L	(As per Process Requirement)
Carbon Steel Plate (Pressure Parts)	IS2062 E250 GR.BR	
Carbon Steel (Non Pressure Parts)	IS2062 E250 GR.BR	Parts like Skirt, Gusset, Support Lug, Lifting Lug etc.
NOZZLE PIPE / SUPPORT PIPE		
Carbon Steel Pipe (Non-Pressure Parts)	IS 1239 Part-I / IS 3589 /	Leg Supports / Trunnion Pipes, Railings, Process Nozzles of Tanks & Vessels with Pressure < 14.7 psig
SS Nozzle Pipe up to DN 300	SA312 TP 304 / 304 L / 316 / 316 L	Welded Pipe
SS Nozzle Pipe for DN 350 & above	SA240 TYPE 304 / 304 L / 316 / 316 L	Rolled from Plate
CS Nozzle Pipes for Carbon Steel Equipment	IS 1239 Part-I / IS 3589 / IS2062 E250 GR.BR	
EQUIPMENT BODY FLANGE		
CS Body Flange for Heat Exchanger & Column	IS2062 E250 GR.BR	With SS Weld Overlay.
HARDWARE		
Flange Bolts and Nuts (Up to size DN 150)	IS 1367 Gr. 4.6/4.8/10.9	(Green Passivated - Contains Zinc)
Flange Bolts and Nuts (Size DN 200 and above)	IS 1367 Gr. 4.6/4.8/10.9	(Green Passivated - Contains Zinc)
Bolts and Nuts (Internal)	AISI 304	
Setting Bolts	IS 1367 Gr. 4.6/4.8/10.9	(Green Passivated - Contains Zinc)
Foundation Bolts	IS2062/ EN 8	



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



DESCRIPTION	MATERIAL OF CONSTRUCTION	REMARK
FITTINGS		
SS Fittings (Elbows, Tees, Reducers, Bends, End Caps)	SA403 WP / AISI 304 / 304 L / 316 / 316 L	
CS Fittings (Elbows, Tees, Reducers, Bends, End Caps)	SA234 WPB / IS 1239 Part-II	
HEAT EXCHANGER TUBES		
Heat Exchanger Tubes	SA249 TP 304 / 304 L / 316 / 316 L	Welded Tubes
OTHERS		
Gaskets for Nozzle Flanges / Heat Exchanger Channel Flanges / Body Flanges	NACF (Non-Asbestos Compressed Fiber)	---
Gaskets for Pass Partition Plates in Heat Exchanger	EPDM (Ethylene Propylene Diene Monomer)	C-Type
Surface Finish	Mill Finish	---
Surface treatment Stainless Steel	ASTM A 380	Pickling and Passivation for external surfaces prior to shipment
Painting for MS parts	Epoxy Paint	Sand Blast cleaned SA 2 ½ & Epoxy painted
Insulation	Insulation Material: 100 kg/m ³ Mineral wool/ Rockwool slabs Insulation Cladding: 24 SWG Aluminum Sheet (With Zinc Containing)	



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023

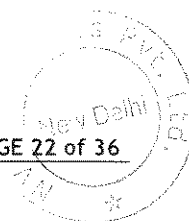


ANNEXURE A-10

PIPING SCOPE & SPECIFICATIONS

Following are the applicable dimensional and material standards,

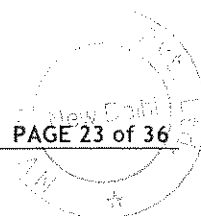
Dimensional Standard			
Items		Carbon Steel	Stainless Steel
Pipes		IS 1239 PART-1 / IS 3589 / ASME B36.10	ASME B36.19 / ASME B36.10
Fittings		IS 1239 PART-2 / ASME B16.9 / ASME B16.11	MSS SP-43 / ASME B16.9 / ASME B16.11
Flanges		ASME B16.5 / PRAJ design flanges as per ASME Section VIII & bolt drilling dimensions according to ASME B 16.47 Series 'A'	ASME B16.5 / PRAJ design flanges as per ASME Section VIII & bolt drilling dimensions according to ASME B 16.47 Series 'A'
Gaskets		ASME B16.20 / ASME B16.21	ASME B16.20 / ASME B16.21
Bolts		IS 1363 Part-1 / ASME B 18.2.1 (Note-9)	IS 1363 Part-1 / ASME B 18.2.1 (Note-9)
Nuts		IS 1363 Part-3 / ASME B 18.2.2 (Note-9)	IS 1363 Part-3 / ASME B 18.2.2 (Note-9)
OD based Pipe & Fittings		-	ISO 2037 / Vendor Standard
Material Standards			
Items	Size (DN)	Carbon Steel	Stainless Steel
Pipe	Up to 150	IS 1239 PART-1 / A 106M (Note-9)	ASTM A 312M
	200 & above	IS 3589 / A 106M (Note-9)	ASTM A 312M ASTM A 240M (Fabricated Pipe for DN 400 & above, Note-3)
Fittings (Note-7)	Up to 150	IS 1239 Part-2 (Note-11) / ASTM A 105M (Note-10) / ASTM A 234M	AISI 304/ AISI 304L/ AISI 316/ AISI 316L/ ASTM A 182M (Note-10) / ASTM A 240M (DN400& above)
	200 & above	ASTM A 234M	
Flanges	15 to 500	IS 2062 (Note-6) / ASTM A 105M (Note-9)	IS 2062 (LJFF)
	550 & above		IS 2062 + AISI 304 / 316 Weld Overlay (Note-8)
Blinds	Up to 100	IS 2062 / ASTM A105M (Note-9)	ASTM A182M
	150 & above	IS 2062 / ASTM A105M (Note-9)	IS 2062 + AISI 304/316 Liner (Note-8)



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



Material Standards			
Items	Size (DN)	Carbon Steel	Stainless Steel
OD Based Pipe & fittings	All Sizes	-	AISI 304 / AISI304L / AISI 316 / AISI 316L / As per vendor standard
Gaskets	All Sizes	As per process requirement	
Bolts (Note-5)	All Sizes	IS 1367 Gr 4.6 / A193M GR B7 (Note-9)	
Nuts (Note-5)	All Sizes	IS 1367 Gr 4.8 / A194M GR 2H (Note-9)	
Dimension Standards for Valves			
Gate Valves		API 602 / ASME B 16.10	
Globe Valves		API 602 / ASME B 16.10	
Butterfly Valves		API 609	
Check Valves		API 594 / API 6D	
Ball Valves		API 608 / ASME B 16.10	
OD Based Butterfly Valves		As per vendor standard	
Manufacturing Standards for Valves			
Gate Valves		ASME B 16.34 / API 602	
Globe Valves		ASME B 16.34 / API 602	
Butterfly Valves		ASME B 16.34 / API 609	
Check Valves		ASME B 16.34 / API 6D / API 594	
Ball Valves (Refer Note-13)		ASME B 16.34 / API 608	
OD Based Butterfly Valves		AISI 304 / AISI304L / AISI 316 / AISI 316L / As per vendor standard.	
Other Standards			
Valve Inspection and Testing		As per PRAJ Quality Assurance Plan / API 598	
Insulation			
Material		Rock wool density (100 kg/m³) - Mattresses	
Cladding		Up to 150NB - 26 SWG Aluminium Cladding 13/8 GI Screw 200 NB and above - 24 SWG Aluminium Cladding 13/8 GI Screw	
Binding Wire		24 SWG and Material Galvanized Iron	



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



Notes :

1. All Pipe threads will be "NPT" type.
2. Detailed Pipe, Fitting and Valve specifications will be prepared based on Process parameters.
3. Stainless Steel pipe DN 400 & above will be fabricated from ASTM A 240M plate material.
4. Pipe Wall thickness, Flange Rating will be finalized as per Process Design parameters and Design Conditions.
5. All hardware's shall be Green Passivated.
6. Plate flanges manufactured from IS 2062, bolting dimensions as per ASME B16.5 / ASME B16.47 Series A without hub.
7. Fittings shall be butt welded.
8. Plate flanges manufactured from IS 2062, bolting dimensions as per ASME B16.5 / ASME B16.47 Series A and fluid contact surface will be AISI Lining / Weld Overlay.
9. For Steam Service (IBR and Non IBR) only.
10. For socket weld and threaded fittings only.
11. For elbows DN15 to DN150 only.
12. (*) GEP Standard - General Engineering Practice.
13. Socket Welded Ball Valves up to DN100 will be used wherever applicable.

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PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



ANNEXURE A-11

ELECTRICAL SCOPE & SPECIFICATIONS

Electrical design basis (MCC and onwards) (Confirming IS Standards)

MOTOR CONTROL CENTRE (MCC) & Cabling Upto Motors:

MCCs shall be made from MS Powder coated. MCCs shall be Non-compartmentalized fuse-less based, non-draw type, Double front and suitable to install in safe area, suitable for 50kA fault level.

MCCs shall be floor mounting, suitable for indoor installation, dust, vermin- proof with IP42 degree of protection. Cable entry shall be from the bottom as a standard feature. Top cable entry may be provided, if reqd.

Each starter of MCC will consist of:

1. Motor Protection Circuit Breaker (With inbuilt overload relay)
2. Contactor
3. ON and Tripped indication
4. Emergency stop stay-put type push button.

For motors up to & including 37 kW, DOL starters shall be provided. For motors above 37 kW, Star Delta Starter shall be provided. For motors above 30 kW, CT will be provided in Y-phase with analogue Ammeter to read the starting and load current.

For motors including & above 160 kW Electronic Soft Starters shall be provided.

Incomer of MCC will be:

1. MCCB for rating up to & including 1000 A.
2. ACB for rating including and above 1001 A.

Selection of all components will be based on manufacturers type-2 co ordination chart only.

MOC of busbar will be of Aluminium with current density 0.8 A/mm².

The Incomer of the MCC panel shall have digital kW, KWh meters (Class : 1.0) Analogue Ammeter, Voltmeter (Class 1.0).

INTERNAL POWER WIRING:

All the power wiring inside MCC will be carried out by using multi-strand Copper conductor, PVC insulated wires. Wires sizes will be as follows:

For DOL Starter:

Motor Rating	Up to 5.5 kW	7.5 Kw	9.3 Kw	11 kW	15 kW
Wire size	2.5 sq. mm	4.0 sq. mm	4.0 sq. mm	6.0 sq. mm	10 sq. mm

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



For DOL Starter:

Motor rating	18.5 kW	22 kW	30 kW	37 kW
Wire size	10 sq. mm	16 sq. mm	25 sq. mm	35 sq. mm

For Star-Delta Starter:

Motor rating	45 kW	55 kW	
Wire size [supply side upto contactor]	35 sq. mm	50 sq. mm	
Wire size [motor side from contactor to terminal]	16 sq. mm	25 sq. mm	

For 75 kW and above feeder, suitable sized aluminium bus bar will be provided.

The wire sizes mentioned above are indicative and may change during detail engineering.

POWER AND CONTROL CABLES:

Individual motors will be connected to MCC by 690/1100 V grade, XLPE cables.

Multi stranded copper conductor will be used for cable sizes 2.5mm² and below cross section.

Multi stranded aluminium conductor will be used for cable sizes including 4 mm² and above.

Cable sizes for motor will be designed for 5% voltage drop during running and 15% drop during starting of motors.

Control cables selected will be of Armoured, Copper conductor, size 1.0 mm² cross section.

EARTHING and lightning protection system:

Earthing below ground:

It is in client's scope which includes main earth grid, excavation, material for GI earthing pits along with C.I covers, risers from earthing grid near to motor /equipment.

Earthing above ground:

It is in Praj's scope which includes cable/ earth strip from risers to motors /equipment earthing terminal.

Earthing of Local Push Button Station will be carried out with 8/4 SWG GI Wire.

Lightning protection:

Lightning protection above ground shall be in Praj scope which includes Lightning Arrestor, Lightning grid/mesh above roof and down conductor upto earth pit. GI lightning pits along with covers.

Client's scope includes excavation for Lightning Pit.

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



PUSH BUTTON STATION:

Start Push button and Key lockable Emergency stop Push button station will be provided near motor(s) wherever required. Flameproof push button station (as per IS 2148) will be provided for hazardous area / section and weatherproof push button station will be provided for "Safe" area / section.

CABLE TRAYS:

Trays without covers shall be designed to accommodate all cables in Praj's scope only. Hot dipped galvanized iron cable trays are considered for indoor application. Cables will be directly buried in the ground for outdoor areas.

Following sizes will be used.

- Perforated type without cover - 2 mm thickness for GI tray, Up to 100 mm width x 25 mm height
- Ladder type without cover - 2 mm thickness for GI tray, Above 100 mm width x 50 mm height

Mesh type cable trays also provided as an option to perforated & ladder type tray.

LT MOTORS:

LT Motors of following features will be considered:

Squirrel Cage Induction Motor, TEFC construction, Degree of Protection IP-55, Efficiency Class IE-2 as per (as per IS/IEC-12615), Insulation will be Class F with temperature rise limited to Class B. Paint shade shall be as per Manufacturers standard.

Explosion proof motors suitable for Zone 1, Group IIA/IIB & Temperature class T3 will be used for Hazardous area, while weatherproof (Non-explosion proof) motor will be used for equipment in safe area.

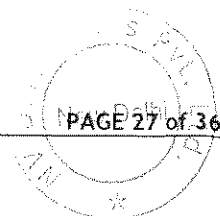
VFD application motors will be offered with VPI impregnated winding insulation. Insulated bearing will be considered for VFD application motor with frame size 280 and above.

Illumination System:

The normal process area lighting will generally comprise LED fittings.

Plant lighting in Praj process sections, excluding civil building (room) is considered.

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PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



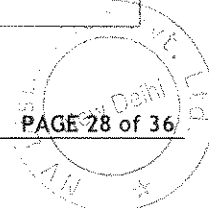
ANNEXURE A-12

INSTRUMENTATION SCOPE & SPECIFICATIONS

• GENERAL DESIGN CONSIDERATIONS:

No.	PARTS	Description
1.	Design	Generally, as per ISA guidelines
	Manufacturing	As per Manufacturer's Standard
	Inspection and Testing	As per PRAJ QAP
	Painting	As per Manufacturer Standard
2.	Area Classification - Section Wise	MSDH: - Zone I, Gas Group IIA/IIB, Temp. Class T3 as per IEC Utility etc. - Safe area plant sections.
3.	Control Room	Located in safe area and 16 meter away from Hazardous area. Main control system will be located in the existing plant control room near fermentation section.
4.	PLC Panel	For Dryer - New PLC
5.	Field Instrument Protection Category - Section Wise	Dryer vapor Integrated Evaporation, Dryer Vapor recovery Unit, Dryer - Weatherproof, IP 65
6.	Flange Standard	ANSI B16.5 / ANSI B 16.36
7.	Threading Standard	NPT
8.	Hygienic Connection Standard	SMS-Not Applicable in this project
9.	Instrument Air	7 Kg/cm ² (g), Instrument quality
10.	Junction Box Protection Category - Section Wise	Dryer vapor Integrated Evaporation, Dryer Vapor recovery Unit, Dryer - Weatherproof to IP 65
11.	Instrument Cables	Analog Signal- Multi strand copper conductor, XLPE/PVC Insulated, Shielded, PVC sheathed Armoured, Pair cable. Digital Signal / Power cable - Multi strand copper conductor, XLPE Insulated, PVC sheathed Armoured, Core cable. All instruments signal cables will be with blue color. Inst power & Digital I/O signal cable will be black or gray color. Cables will be as per IS/BS standard.
		On Trays tied with cable ties for indoor installation
12.	Cable Installation	On Trays clamped with Aluminum clamp for outdoor installation
13.	Cable Tray	Galvanized Iron
14.	Earthing	Copper flexible wire for signal earth with dedicated earth pit.

Notes:



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



1. Local digital Indicators will be provided to all transmitters except Temperature transmitter and control valve electro pneumatic positioner.
2. For all 4 wire instruments operating voltage will be 24 VDC OR 230 VAC, 1 phase, 50 Hz
3. Temperature transmitters & control valve positioners will not be with HART compatibility & will be without digital display.
4. On/Off valve to control panel interface philosophy.

Sr. No.	Signal	Description
1.	1 DI	Valve Open or Close feedback (single acting actuator)
2.	2 DI	Valve Open & Close feedback (double acting actuator)
3	1DO wetted (24 V DC)	Valve Open / Close command

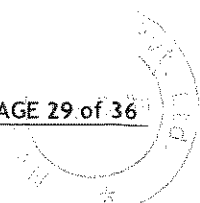
• **INSTRUMENT STANDARDS (AS APPLICABLE):**

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- International Society of Automation (ISA) Standards and Practices.
- National Electrical Manufacturers Association (NEMA) Publications.
- American Society of Mechanical Engineers (ASME)
- National Fire Protection Association (NFPA)
- International Electro-Technical Commission (IEC)
- American Petroleum Institute (API)
- National Electrical code (NEC)
- ATEX -Atmosphere explosive (European directives)
- British Standards (BS)
- Indian Standards (IS)

Notes: In case of package items vendor to confirm the list of applicable standards during detailed engineering.

• **INSTRUMENT GENERAL SELECTION PHILOSOPHY IN PROCESS PLANT :**

No.	Process parameters	General Type of Instruments
1	Temperature	a) Resistance Temperature Detector with Temperature Transmitter
		b) Temperature Gauges
2	Pressure	a) Pressure Transmitter
		b) Pressure gauges



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



No.	Process parameters	General Type of Instruments
3	Flow	a) Differential pressure with orifice as flow measuring element in case of clear liquid, vapor, cooling water. b) Magnetic flow meter in case of slurry or viscous services but for conductive liquid. c) Vortex flow meter in case of product flow meter like ethanol flow measurement. d) Annubar in case of low differential flow measurement.
4	Level	a) Differential pressure level transmitter in case of closed tank. b) Hydrostatic type transmitter in case of tank opens to atmosphere. c) Level Gauges
5	Control valves	a) Globe Type of control valves for steam, clear liquid flow control up to maximum 8" size. b) Butterfly type control valve in case of slurry or viscous liquid, steam flow, vapor flow, Utility and low pressure drop requirement and also in case of all valve size above 8". c) Ball control valve in case of highly viscous liquid and in case of small line size.

Notes:

The type of instruments mentioned above is tentative and final selection and type will also depend on application, process parameters and operating conditions during detailed engineering. Instruments will be given and selected based on PRAJ Process Requirement.

• **GENERAL GUIDELINES FOR STRAIGHT RUNS AND END CONNECTIONS FOR INSTRUMENTS**

Sr. No	Type of Instrument	End Connection	Up - stream	Down - stream	Installation Guidelines
Control Valves:					
1	Globe Control Valve	Flanged ANSI	3 * D	2 * D	On Horizontal Line
2	V-notch Ball Control Valve	Wafer ANSI	2 * D	2 * D	On Horizontal / Vertical Line With Upward Flow Direction.
3	Butterfly Control Valve	Wafer ANSI	3 * D	2 * D	Horizontal Line / Vertical Line With Upward Flow Direction.
4	HPBV (MSDH Sieve Seq. Valve)	Wafer ANSI	N.A.	N.A.	On Horizontal Line
5	On-Off Valve (Ball)	Flanged ANSI	N.A.	N.A.	On Horizontal / Vertical Line
6	On-Off Valve (Butterfly)	Wafer ANSI	N.A.	N.A.	On Horizontal / Vertical Line
7	PRDS / De-Superheating Station	Flange / Direct Weld	N.A.	12 Mtr	4 Meter Straight Run Strictly Required and for Remaining 8 Meter Run, Bends are acceptable in horizontal plane only.
8	PRS Station	Flanged	N.A.	N.A.	On Horizontal Line

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



Sr. No	Type of Instrument	End Connection	Up - stream	Down - stream	Installation Guidelines
Flow Meters:					
1	Orifice & Flange Assembly	Weld Neck	10 * D	5 * D	On Horizontal Line
2	Integral Orifice	Flanged ANSI	N.A.	N.A.	Total Length of Spool Piece is 1000 mm
3	Magnetic Flow Meter	Flanged ANSI	5 * D	2 * D	On Vertical Line With Upward Flow Direction.
4	Vortex Flow Meter	Flanged ANSI	15 * D	5 * D	On Horizontal / Vertical Line With Upward Flow Direction. Vibration Free Support Is Must
5	Orifice for Bypass Rotameter	Wafer	10 * D	5 * D	On Vertical Line With Upward Flow Direction
6	Thermal Mass Flow Meter	Flanged ANSI	20 * D	10 * D	
7	Glass Tube Rotameter	Flanged ANSI	3 * D	2 * D	On Vertical Line With Upward Flow Direction
8	Metal Tube Rotameter	Flanged ANSI	2 * D	Min. 150m m	On Vertical Line With Upward Flow Direction
9	Density Meter	Flanged ANSI	N.A.	N.A.	On Vertical Line With Upward Flow Direction
10	Annubar	N.A	12 * D	8 * D	On Horizontal Line
11	Conditioning Orifice Flow Meter	Flanged ANSI	2 * D	2 * D	On Horizontal Line
12	Flow Switch	N.A	5 * D	5 * D	On Horizontal Line
13	PD Meter (Oval gear type)	N.A	N.A.	N.A.	On Horizontal Line
Other Instruments:					
1	Pressure Gauge	NPT Threaded - ½"	N.A.	N.A.	For Clear Liquid
		Flanged- 40 NB ANSI	N.A.	N.A.	For Viscous Liquid
2	RTD	NPT Threaded - ½"	N.A.	N.A.	In some of the cases, end connection size may change as per wake freq.sizing calculation.
3	Pressure Switch	NPT Threaded- ½"	N.A.	N.A.	
4	Temperature Gauge	NPT Threaded- ½"	N.A.	N.A.	
5	Conductivity Level Switch	NPT Threaded - 1 ½"	N.A.	N.A.	Connection On Equipment will be 2 ½" Flanged
6	Float Type Level Switch	Flanged-50 NB ANSI	N.A.	N.A.	
7	Level Transmitter - D.P. Type	Wafer / Flanged- 80 NB ANSI	N.A.	N.A.	For Viscous Liquid & Large capacity tanks. (E.g. Storage tank.) not applicable

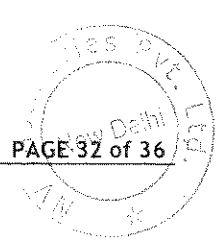
PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



Sr. No	Type of Instrument	End Connection	Up - stream	Down - stream	Installation Guidelines
		NPT Threaded - 1/2"	N.A.	N.A.	For Clear Liquid isolation valves will be provided to Impulse tubing
8	Pressure Transmitter	NPT Threaded - 1/2"	N.A.	N.A.	For Clear Liquid. with isolation valves
		Flanged-50 NB ANSI	N.A.	N.A.	For Viscous Liquid & on Adsorbe Bed with isolation valves
9	Level Gauge	Flanged-25 NB ANSI	N.A.	N.A.	

Notes :

1. D = Diameter of the Instrument size.
2. Instrument type and End Connection details may change at detail engineering stage.



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



ANNEXURE A-13

BATTERY LIMITS

Sr.No.	Parameter	Battery Limit
1.	Thick Slop from existing Decantation Section to Decanter new Location.	At the inlet of Decanter in Proposed (new) Dryer-Decantation Section.
2.	Thin Slop from Decanter New Location to Thin Slop Tank in existing Decantation section	At the outlet of Decanter.
3.	Feed to Evaporation - Thin Slop	As existing.
4.	Concentrated Syrup	At the outlet of Product transfer pump in existing evaporation plant
5.	Wet Cake from Decanter New Location to Dryer	At the inlet of Double Shaft Mixer at specified conditions given in Ann. 3.
6.	DWGS Feed to Dryer	At the inlet of Double Shaft Mixer in DDGS Dryer Section.
7.	DDGS	At the outlet of bagging machine in DDGS Dryer Section.
8.	Steam	At the inlet of steam header with isolation valve in respective section at required pressure as per Praj process specifications.
9.	Steam condensate	At the outlet nozzle of Steam Condensate Transfer Pump in respective section. (Pump Head Max. 35 m)
10.	Process Condensate (From Evaporation & Dryer)	At the outlet of Process Condensate Transfer Pumps in Dryer cum (part) Integrated Evaporation Section
11.	Cooling Tower Blowdown	At the outlet of Cooling Tower Basin
12.	Process water	At inlet of Process Water header in respective sections.
13.	Soft Water	At inlet of Soft Water header in respective sections.
14.	Instrument Air	At the inlet of Instrument Air header in respective sections.
15.	Equipment Vent	At the outlet of respective equipment.
16.	Equipment Drain	At the outlet of respective equipment.
17.	Dryer Vapor vent	Up to safe elevation of 1m above the respective Equipment.
18.	Purge from Dryer Vapor Recovery System	At the outlet of Dryer Recovery System.
19.	Cooling Water Supply	At the inlet of Cooling Water Supply Header in respective Section
20.	Cooling Water Return	At the outlet of Cooling Water Return Header in respective Section
21.	Electricals	At the incomer of respective MCC Panels.

PROPOSAL NO. : Q-BDIN-22-297-A1-R9
CUSTOMER : NV DISTILLERIES PVT. LTD.
Dated : May 24, 2023



ANNEXURE A-14

EXCLUSIONS FROM PRAJ SCOPE

1. GENERAL

- Continuous supply of adequate power and water free of cost throughout the work under installation, erection and commissioning of complete plant and machinery.
- Gauging of tanks, Tube / bore wells
- Insulation of equipment other than PRAJ's scope of supply.
- Man power for testing, commissioning and operating the plant, which are to be provided by the customer.
- Fully furnished Site Office with AC and other miscellaneous equipment.
- Storage & security for PRAJ supplied equipment, Raw material on site.
- EAR Policy, Stoppage, Dealcoholisation, Barricading of existing plant.

2. Civil & Structural :

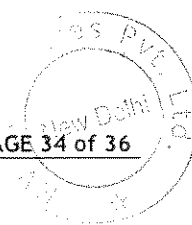
- Design & Engineering, Procurement, construction, supervision, & execution of entire Civil Works including that for PRAJ scope of Sections.
- Design & Engineering, Procurement, construction, supervision, & execution of entire MS structural work other than Praj Scope and Procurement, construction, supervision, & execution of entire MS structural work for Praj Scope.
- Landscaping, land levelling, land survey, contour plotting, soil strength test / analysis.
- Dismantling & demolishing of any existing civil and structural work.
- Sludge Drying Bed and other civil tanks required in PCTP section.

3. Electrical & Instrumentation:

- Complete Electrical up to MCC Panel for PRAJ Scope of Sections.
- Complete Yard lighting.
- Complete instrumentation other than PRAJ scope of sections.
- Interconnection between existing PLC & new PLC.

4. OTHER SECTIONS:

- Cooling Tower and Cooling Water Piping & distribution upto battery Limit.
- Transfer of CT Blowdown upto the inlet of PCTP Plant.
- Process Condensate Treatment Plant (PCTP) / Condensate Polishing Unit (CPU).
- Alcohol Storage Tanks, Tank gauging, etc.
- Emergency diesel Pump etc. with piping up to battery limit.
- MS Structure for Decantation & DDGS section, DDGS storage/ Godown with Shed.
- WTP and transfer piping up to battery limit.
- Transfer and treatment of effluents like Sludge, Floor Washings, WTP & Boiler blowdown Rejects, & Purge, spent lees, RO Reject etc. And any other effluent stream.
- Storage, treatment & disposal of Sludge from Evaporation PCTP/CPU.
- Yard Piping from section to section and respective structure as per battery limit.
- Complete Boiler section with all accessories.
- Grain Unloading, Handling, Preclearing and Storage silos.
- Complete Turbine section with all accessories.
- Complete Control System.
- PRDS and related peripheral items including, pumps, piping etc.
- Steam HP piping LP piping.
- Diesel Generator (DG), Fire Fighting, Weigh Bridge etc.
- Any modification in existing plant.



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023

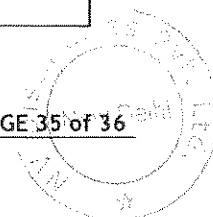


- Any other items / activity, not specifically mentioned in PRAJ scope of work and in equipment list.

ANNEXURE A-15

MAKES OF BOUGHT-OUTS

S.NO.	ITEM DESCRIPTION	APPROVED MAKES
A	MECHANICAL BOUGHT OUTS	
1.	Vacuum Pumps	PPI System / TMVT Industries
2.	Plate Heat Exchangers	Alfa Laval / Kelvion (GEA Ecoflex) / Tranter India / Sondex
3.	Centrifugal Pumps- Process	Microfinish Pumps / SPX Flow Technology / Sintech / KSB / Wilfley / Investa
4.	Agitators	Acme / Galaxy
5.	Air Compressors	Chicago Pneumatics / ElGI / FS Curtis
B	MANUAL VALVES	
1.	Manual Butterfly Valves	Delval / Omkar / Crane / Rappid / Stafford / Pappilon / Aira / Intervolve / Khimji flow
2.	Manual Ball Valves	Rappid Valves / Khimji Flow / Aqua Control / Aira / Delta Valve
3.	Gate/ Globe/ Lift Check Valves	Rappid Valves / Khimji Flow / Flowjet / Delta Valve
4.	Pressure Safety Valves	Fainger Lasser / Nirmal industries
5.	Non Return Valves	Omkar Valves / Khimji flow/ Rappid
6.	Breather Valves	Fainger Engineering/ Regport
C	Electrical & Instrumentation	
7.	Globe Control Valves	Forbes Marshall -Arca / Samson / Teknik / Dembla / Inditech
8.	Butterfly control / On/off Valve	Delval Flow Controls / Bray Controls / Crane / Intervolve / Rappid
9.	Magnetic /Vortex/ Mass Flow meters	Emerson / Endress & Hauser / Eureka / Khrona Marshall
10.	D.P. Flow / Level Transmitters	Emerson / E&H / ABB / Yokogawa
11.	Pressure/ Temperature Gauge	General Instruments / Forbes Marshall / Itec Measures / Walchandnagar
12.	Level Gauges	Pune Techtrol
13.	RTD with Temp transmitter	Radix / Itec Measures / Techno Instruments / Wika
14.	Glass Tube Rota meters	Eureka
15.	Electrical Cables	Gemscab / RR Kabel/ Polycab/ Glostar / Centurion
16.	Instrumentation cables	Gemscab/ Thermo cables / PolycabOR Glostar / Centurion



PROPOSAL NO. : Q-BDIN-22-297-A1-R9
 CUSTOMER : NV DISTILLERIES PVT. LTD.
 Dated : May 24, 2023



S.NO.	ITEM DESCRIPTION	APPROVED MAKES
17.	Electrical Motors	Laxmi Hydraulics / Bharat Bijlee / Crompton
18.	Electrical Switchgears	L&T / Schneider / Siemens / ABB
D.	Raw Material	
19.	Structure	Prime Ispat / SKS Ispat / Mahaveer steel Industries / Equivalent.
20.	SS RM	Jindal stainless LTD/ Eternal tsingshan
21.	HE Tubes	Mittal/ Maxim/ Jindal Saw/ Apex
22.	MS Plates	SAIL/ Jindal/ Uttam Value steel
E.	Makes of BO for DWGS Dryer	
23.	Screw Conveyors / Bucket Elevator / Double Shaft Mixer	Eminence Equipment's Pvt Ltd. Pune
24.	Rotary Air Lock Valve	Jagdamba Engineers & Consultancy / BSA Engineering Company
25.	Product Collector (Bag Filter) / Bin Activator /	Jagdamba Engineers & Consultancy
26.	Vapor Fan for Cyclone / Conveying Air Blower	Phoenix Fans Pvt Ltd, Pune / EVG Engicon Airtech Pvt Ltd
27.	Pulveriser	Kaps Engineers/ Premium Pulman
28.	Semi-Automatic Bagging Machine	Precia Molen India Pvt Ltd
29.	Rotary-Joint	Carbon Rotofluid Pvt. Ltd
30.	Float type steam trap	Forbes Marshall Pvt Ltd
31.	Gear Box	Max Gear
32.	Flexible Hose	Real Hydrofit & Co
33.	Rupture disc	BS&B Safety Systems

Notes :

- Any change in above makes on account of client during the execution of plant would call for the change in the price and other commercial terms.
- Bought out may source the equipment based on their global sourcing strategy worldwide.
- In order to meet overall delivery schedule given makes may vary and equivalent make will be provided after consultation with Client.

