

NITRIC ACID PLANT DETAILS

C & I Girdler (Wheatherly USA), mono pressure, High pressure Plant

HNO₃ content - minimum percent per weight – 56%

Design and actual cooling water temp – Summer - Temp. In: 28 Deg. C; Temp. Out: 35 Deg. C; Winter - Temp. In: 26 Deg. C; Temp. Out: 33 Deg. C

**Operating pressure of the plant – Air exit compressor: 8.0 barg
Pressure at Converter head: 7.5 barg
Pressure in Absorption column: 6.8 barg
Tail gas exhaust pressure @ inlet of gas turbine: 6.0 barg**

SPECIFIC CONSUMPTIONS (at 100% concentration actually produced) – 160 MTPD

NH₃ - 310kg / Ton, HNO₃ @ 100

platinum catalyst – 270mg / Ton, HNO₃ @ 100

**export steam - pressure, temperature, – 3.0 Ton / hr, saturated @ 16 barg
cooling water - 1200 cubic metres / hr**

electricity – 180kW / Ton, HNO₃ @ 100 / 1250kWh (average)

import steam during start-up - via an oil fired boiler producing saturated steam @ 16 barg & 3 Tons / hr

AMMONIUM NITRATE SOLUTION PLANT

LIST OF EQUIPMENT (APPENDIX I)

| AMMONIUM NITRATE SOLUTION PLANT | |
|--|--|
| 1. | Ammonia Vapouriser |
| 2. | Ammonia Knock-out Pot |
| 3. | Acid Preheater |
| 4. | AN Reactor |
| 5. | AN Recirculation Pump |
| 6. | Vapour Separator |
| 7. | AN Neutralizer Tank |
| 8. | AN Storage Tank E-20 |
| 9. | AN pH Control System x 2 |
| 10. | Contaminated Steam Condenser |
| 11. | Steam Ejector |
| 12. | Contaminated Condensate Tank |
| 13. | Contaminated Condensate Cooler |
| 14. | Contaminated Condensate Transfer Pump |
| 15. | AN Solution Transfer Pumps x 2 |
| 16. | Interconnecting Process Pipings |
| 17. | Instrumentation & Control Equipment |
| 18. | One 4-level Steel Supporting Structure for ANS Plant |

LIST OF EQUIPMENT

| Equipment Item No. | Equipment Description |
|---------------------------|------------------------------|
| NITRIC ACID PLANT | |
| 1. | Bunker C Tank |
| 2. | Fuel Preparation Unit |
| 3. | Demin Plant A & B |

| | |
|-----|---|
| 4. | Demin Tank + Demin Pumps x 2 |
| 5. | Oil Fired Boiler + 2 BFW Pumps |
| 6. | Boiler Feed Chemical Tank + Pump |
| 7. | Deaerator |
| 8. | AOP Burn Tank (Liquid Ammonia Storage Bullet) |
| 9. | Ammonia Water Vapourizer |
| 10. | Spare Waste Heat Exchanger |
| 11. | Spare Cooler Condenser x 2 |
| 12. | Air Intake Filter (Delbag) |
| 13. | Demag Compressor |
| 14. | 4 x Intercoolers |
| 15. | Process Air Filter (sintered metal) |
| 16. | Air Heater |
| 17. | Gas Mixer |
| 18. | Ammonia Superheater |
| 19. | Ammonia Filters x 2 |
| 20. | Converter (Ammonia Oxidation Reactor) |
| 21. | Tail Gas Reheater |
| 22. | Waste Heat Exchanger + Steam Drum |
| 23. | Platinum Filter |
| 24. | Tail Gas Preheater |
| 25. | Cooler Condensers A & B |
| 26. | Acid Separator |
| 27. | Absorption Column |
| 28. | HEA Column + HEA Pumps |
| 29. | Weak Acid Collector |

| | |
|-----|-----------------------------|
| 30. | Mist Separator |
| 31. | Tail Gas Tempering Heater |
| 32. | ABB Gas Turbine |
| 33. | Siemens (Synchronous) Motor |
| 34. | Epicyclic Gearbox |

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| Equipment Item No. | Equipment Description |
|---------------------------|---------------------------------------|
| NITRIC ACID PLANT | |
| 35. | Oil Cooler |
| 36. | Dilution Fan |
| 37. | Exhaust Stack |
| 38. | Acid Storage Tank A |
| 39. | Acid Transfer Pumps |
| 40. | MCC A.O.P |
| 41. | Boiler Control Panel |
| 42. | AOP Control Panel |
| 43. | Demag Control Panel |
| 44. | Siemens Control Panel |
| 45. | Expander Control Panel |
| 46. | AOP Building |
| 47. | Overhead Crane |
| 48. | Process Pipings |
| 49. | Instrumentation and Control Equipment |
| 50. | Ammonia Stripper |
| 51. | WHE Blowdown Vessel |

2.1. DEMAG COMPRESSOR SYSTEM

TAG No: 01-V-1101

REQUISITION No: 01-150

SUPPLIER: BECSA

MANUFACTURER: DEMAG

PURCHASE ORDER: 4018-Br-01-1

MANUFACTURER'S REFERENCE: Order no: 2.022.2600-2609

Serial no: 6492

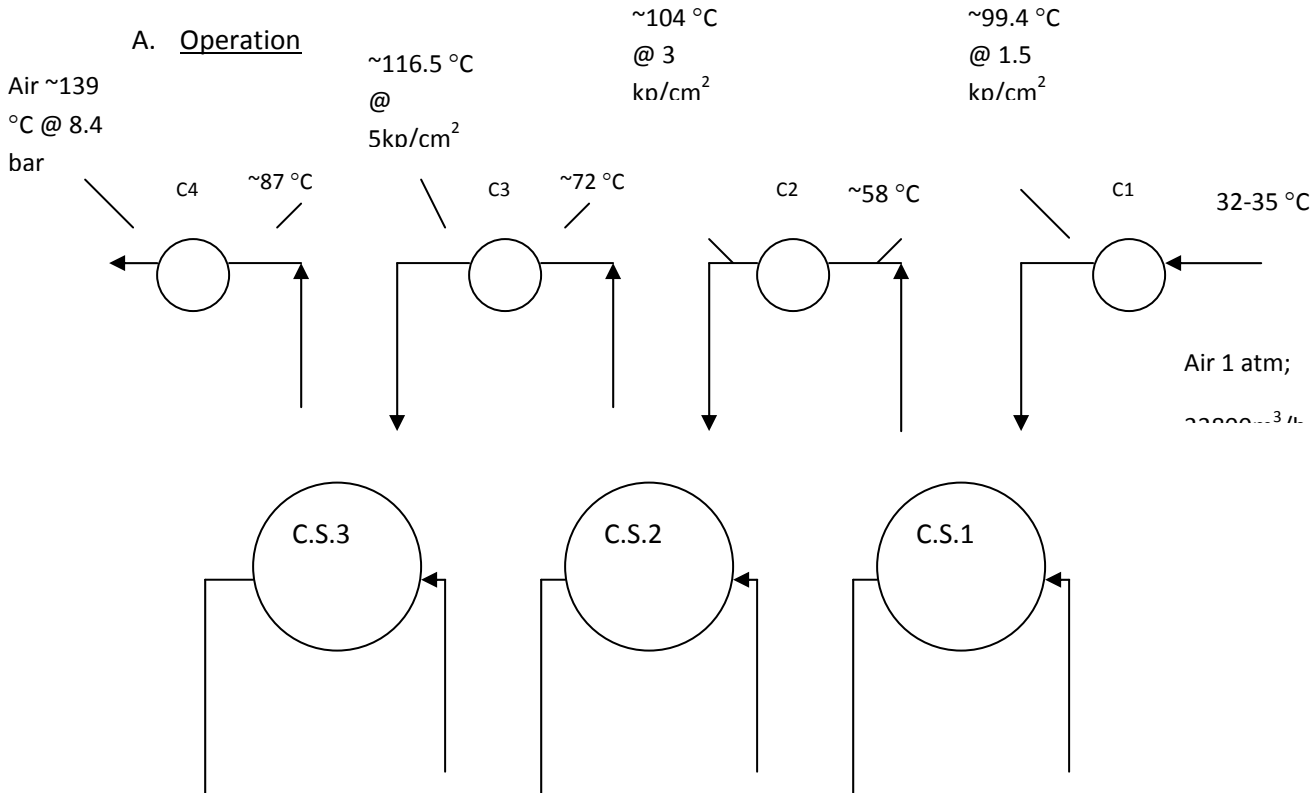
TYPE – GENERAL DESCRIPTION:

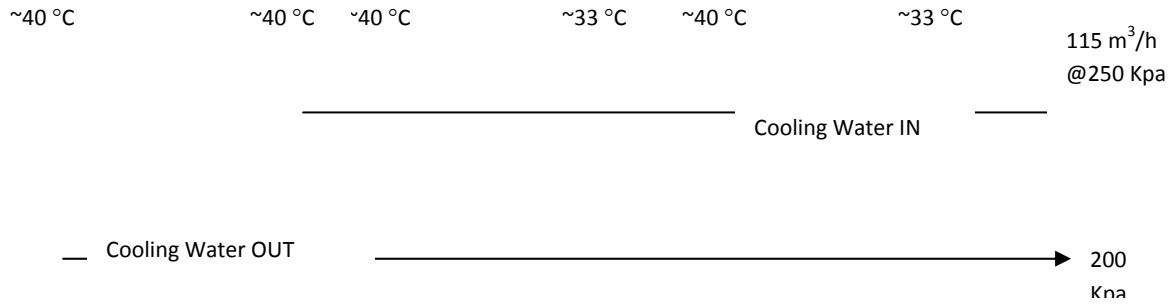
4 – Stage geared turbo compressor VK32 with motor drive

TYPE – GENERAL DESCRIPTION:

Provides compressed (~8.4 bars) air for ammonia oxidation

TECHNICAL DATA:





Demag Compressor Schematic

2.2. DEMAG COMPRESSOR SYSTEM CONTD.

B. Speed (rpm)

Stage I & II : 8441
 Stage III & IV : 13105
 Drive Speed : 1500
 Power Requirement : 3190 KW

C. Oil

- (i) Lubrication
 - Type :
 - Viscosity : 4.5 degree E @ 50°
 - Quantity : 3000 Litres
- (ii) Oil temperature @ Oil cooler
 - Inlet : 52.5 °C
 - Outlet : 40 °C

D. Physical Properties of Gas (Air)

Constant : 29.7 kpm/kp
 Relative Humidity : ~67%
 Cp/Cv : 1.4

MOTOR SYSTEM:

1.Compressor

Make: 1.5 MW- 3 Phase synchronous Siemens Motor
Type: 1 DM 3129-3-BE02-2 serial no:D71.234.006.01
Ratings: 6.6 Kv-150A-1500 kw-1500 rpm
Power Factor: 0.9 cap
Stand still heating: 220V – 13A
Excitation: 57V – 250A
Starting Current: 5.5 x rated current

2. High Pressure Pump

Make: AEG
Type: AM90 SZ4
Ratings:230/400V- 4.75/ 2.15A- 1.1KW –1400rpm

2.3. DEMAG COMPRESSOR SYSTEM CONTD.

3. Intercoolers

Make: Siemens
Serial #: 1LA 3166-4AA90Z
Type: Shell & Tube heat exchanger (with gas on shell side)

4. Auxiliary Oil Pump

Make: Siemens

Type: 1LA3 166 – (90S – 160L)

ACCESSORIES:

Intake guide unit (gas): Ref: Demag Cat.- Sect 2

Overflow valve (oil): Ref: Demag Cat.- Sect 3

Couplings for gearbox: II II II - Sect 6

Silencers: II II II - Sect 8

Gears: II II II - Sect 10

Intake vane: II II II - Sect 11 & catalogue 1929

Pumps (main oil): II II II - Sect 14

(Auxiliary gear pumps): II II II - Sect 14

Filter (duplex): II II II - Sect 15

Oil Cooler: II II II - Sect 16

KKK Turbine for oil pump: II II II - Sect 18 +

file 01-150

Intake Air Filter: II II II - Sect 20 +

file 01-117

22.1. ABSORPTION COLUMN

TAG No: 01-K-1101

REQUISITION No: 01-101

SUPPLIER: Phoenix-Rheinrohr

PURCHASE ORDER: 4018-Br-01-3 of Jan, 1972

GENERAL DESCRIPTION:

Vertical cylindrical tank with dished head and bottom

EQUIPMENT PURPOSE:

Absorption of nitrous oxide (from process gas) in water to form nitric acid.

DIMENSIONS AND TECHNICAL DATA:

A. Dimensions

1. Shell: 2300 ϕ x 13 mm thickness

Length: (a) excluding dished heads : 11990 mm

(b) with dished heads : 13106 mm

2. Foot shell: 964 x 2326 ϕ x 13 mm

1. Accessories:

No. of trays: 35 bubble trays

2 bleacher trays

Spacing : 305 mm

Cooling coils: ~12100 x 26.9 ϕ x 2.9 mm

Quantity: 180 (semi Circular)

B. Operating Conditions

1. Process Gas (IN)

Pressure: 6.5 kg/cm²

Temperature: 40~42 °C

2. Tail Gas (OUT)

Pressure: 6.1 kg/cm²

Temperature: 37 °C

22.2. ABSORPTION COLUMN CONTD.

3. Acid (OUT)

Concentration: 50-54%

Temperature: 40 °C

4. Cooling Water

IN: 40 °C

OUT: 38 °C @ 3.5 kg/cm²

RATE: 2700 GPM

5. Demin Water (IN)

Temperature: 36 °C

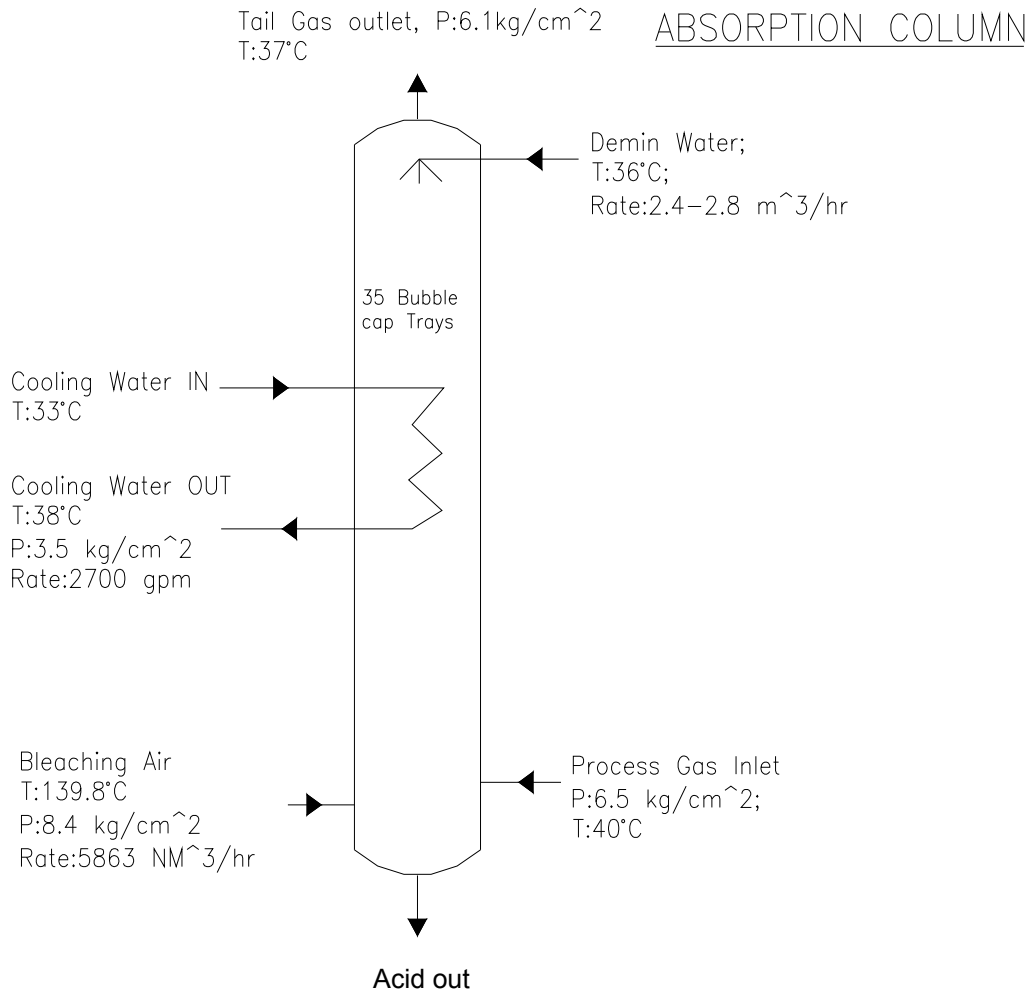
RATE: 2700 GPM

6. Bleaching Air (IN)

Temperature: 139.8 °C

RATE: 5863 Nm³/hr

Pressure: 8.4 kg/cm²



22.3. ABSORPTION COLUMN CONTD.

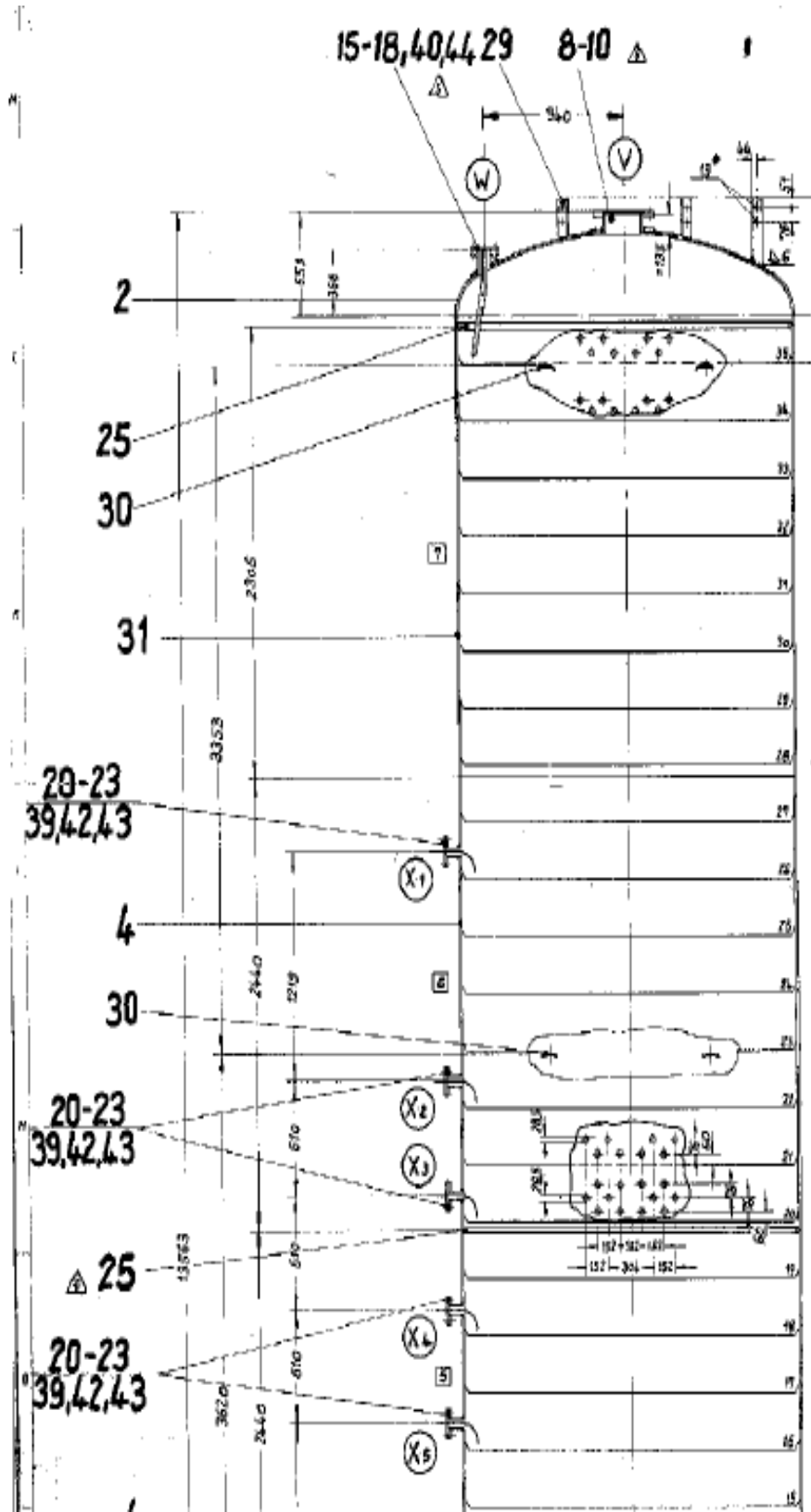
C. Construction Material

- 1.Shell: Sigr 18/8, Type 304L
- 2.Footshell: C.Steel
- 3.Pipefittings:ASTM A120 Gr.A or B (Ms.63.1)

NOTES: 1.Selected Technical drawings available overleaf

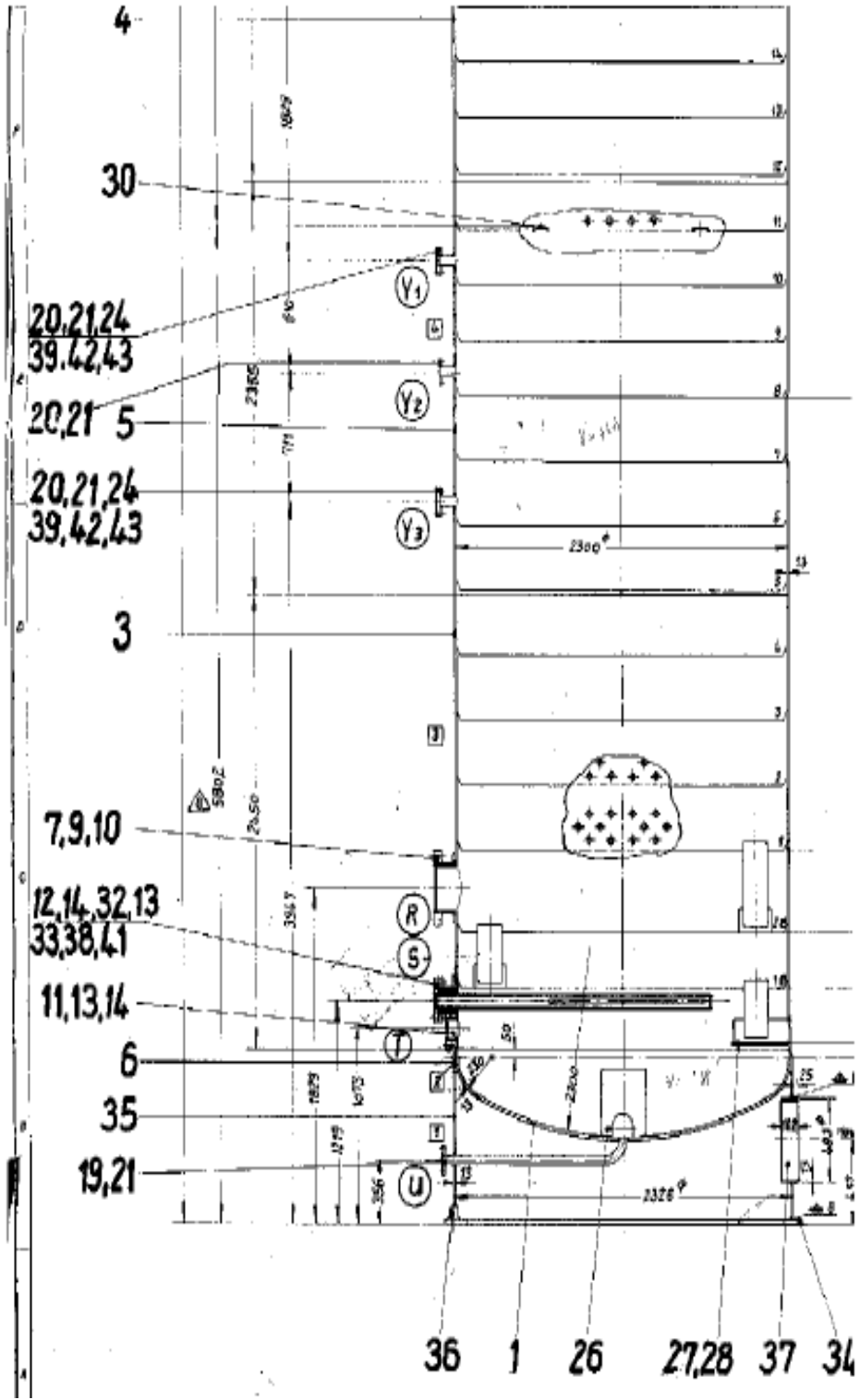
2. Additional drawing inc. access ways& supports available in Absorption column archives

22.4. ABSORPTION COLUMN CONTD.

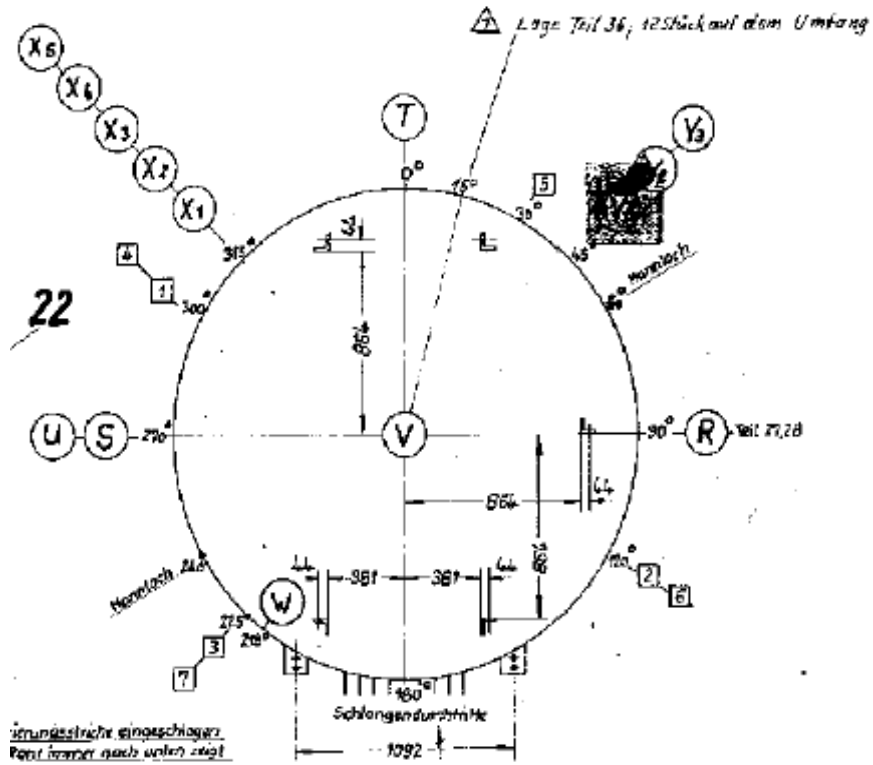


Absorption column (top section)

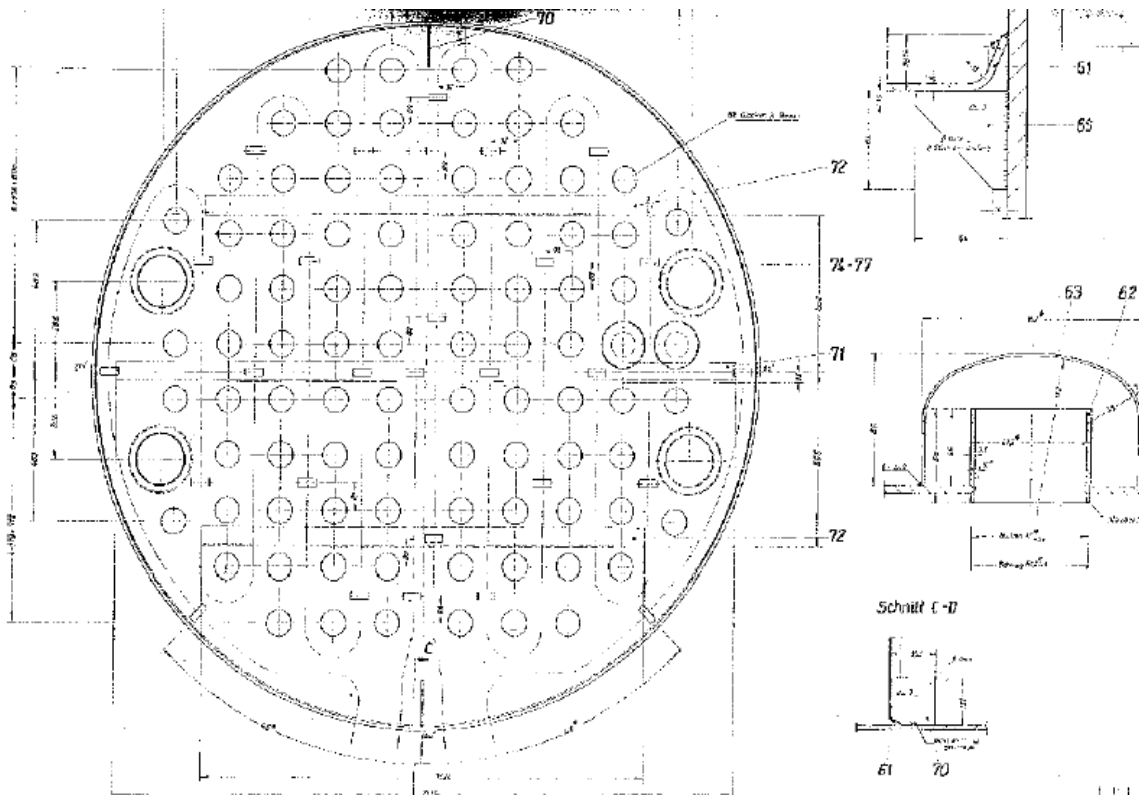
22.5. ABSORPTION COLUMN CONTD.



22.6. ABSORPTION COLUMN CONTD.



Absorption Column (Plan)



Absorption Column (Internals)

23.1. HEA COLUMN

SUPPLIER: Chaudronnerie des Roches (CDF)

PURCHASE ORDER: 300202, June 1990

CONSTRUCTION CODE: CODAP 85 Categorie:C

REFERENCE: FSP-00-1040-90

GENERAL DESCRIPTION:

Vertical cylindrical tank with dished heads

EQUIPMENT PURPOSE:

Maximize No_x absorption

DIMENSIONS AND TECHNICAL DATA:

A. Dimensions

1. Shell: 2800 ϕ x 10 mm thickness

Length: (a) excluding dished heads : 11620mm

(b) with dished heads : 13600 mm

2. Foot shell: 2000 x 2800 ϕ

1. Accessories:

No. of trays: 7 sieve trays

Spacing : 1500 mm

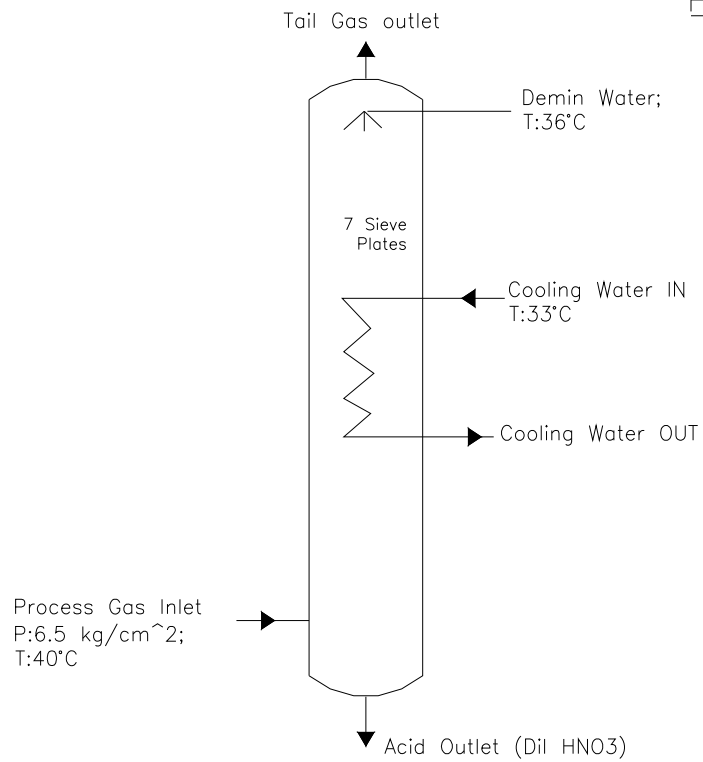
Cooling tubes: 33.7 ϕ x 2 mm

B. Operating Conditions

| | Temperature ($^{\circ}$ C) | Pressure (Bar Abs) |
|-----------|-----------------------------|--------------------|
| Design | 60 | 8 |
| Operating | 40 | 7 |

23.2. HEA COLUMN CONTD.

HEA COLUMN



C. Construction Material

| | | |
|--------------------------------|---|-------------|
| 1.Shell: | } | Z 2CN 18.10 |
| 2.Skirt: | | |
| 3.Trays + supports: | | |
| 4.Vessel heads: | | |
| 5.Internal + External bolting: | | Z 6CN 18.09 |

D. Weight

Empty: 19595 kg

Full of water: 106395 kg

Capacity: 86800 dm³



