

Tender – Specifications for ZSM – Piping systems on Koidu mine

1. Scope:

Freely suspended pipe 200 m 300 nb pipe – anchored on Ground level with base frame structure.

Underground in haulage on compensator and Ductfoot.

2. Safety:

To ensure adequate Safety for staff working in proximity of this pipe system certain Safety criteria have been used in the design of this system. No point is left to chance – all factors are covered by calculated certified formulas with ample safety factors.

This document enables the Engineers and safety team on the mine to access suppliers on the market that offer Piping – Systems with a ZSM – Connection.

To ensure you will be offered and receive proper and reliable products which fulfill up to date Safety – Standards and Technical Specifications it is mandatory to set some parameters. It is necessary to ensure the pipes can handle not just the pressure – rate but also the total weight of the system, very often hanging freely suspended in a well, or a shaft where personnel is hindered or any other kind of installation with people involved in the installation – area. As long as the system is safe enough for people it also must be ensured all possible technical risks are considered.

ZSM Column Pipes should fulfill the following standards:

Galvanized/Epoxy Coated S355	NB 80	NB 100	NB 150	NB 200	NB 250	NB 300
Max. OD Coupling						
OD of Riser Pipe						
Wall thickness						
Weight (kg/m)						
Permissible tensile strength load						
Max. Pressure allowed (bar)						

Stainless Steel AISI	NB 80	NB 100	NB 150	NB 200	NB 250	NB 300
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Max. OD Coupling						
OD of Riser Pipe						
Wall thickness						
Weight (kg/m)						
Permissible tensile strength load						
Max. Pressure allowed (bar)						



To fulfill the above mentioned requirements it is essential to use the best parts that allow to be safe:

To ensure correct material a relevant water analysis is required.

- 2 Chain – rods made ofSS orSS for the SS – Connectors. The steel is carbonized to ensure a long life cycle.
- 2 O-Rings to be double – safe on the pressurized side of the column.
- 1 O-Ring to prevent mud entering the chain – rod area.
- Cover plates for closing the chain – rod entry area.
- For all standardized sizes the tensile strength test and the FEM – calculations are part of the documentation.
- All Calculations for the standardized sizes shown in the table above are done with a safety – factor of 2.
- The safety - factor against a Water Hammer is 30 % over and above safety factor of 2

3. Technical Planning and Static Calculation

All prefabricated parts need to be designed to reach **2 – time Safety –factor** against yield strength. The following needs to be satisfactorily shown in the documentation by static calculations:

- FEM Calculation for the ZSM – Components against internal pressure
- FEM Calculation for the ZSM – Components against axial forces
- FEM Calculation of the pipes against internal pressure
- FEM Calculation of the assembling table
- FEM Calculation of the supporting pipe
- FEM Calculation of the pump adaptor
- FEM Calculation of the lifting device
- Stability analysis of the riser pipes against the overturning of the electrical motor
- The layout design of the anti – twist – protection must be calculated against the torque of the used pump/motor

According the executed calculations a tensile test (destructive) has to be made to determine the effectively breaking load.

Also a hydraulic – pressure test needs to be done with 1.5 x operating pressure (highest pressure the used pump can reach).

4. Permissions and Certificates

To ensure a safe and proper manufacturing process the following Permissions and Certificates are the basis for production and need to be part of the documentation:

- | | |
|---------------------------------------|------------------------------|
| - Quality management system | DIN EN ISO 9001:2008 |
| - Welding quality requirements | DIN EN ISO 3834-3 |
| - Certificate of the production shops | PED 97/23/EC |
| - In-house quality control | EN 1090-1:2009 + A1:2001 |
| - Manufacture of steel structures | EN 1090-2 exc. 3 |
| - Process inspections | DIN EN ISO 15641-1 |
| - Welding staff | DIN EN 287-1 and DIN EN 1418 |
| - NDT (RT, PT, MT, VT) | DIN EN 473 – Level 2 |



5. Tests during Manufacturing

- All semi – finished materials need to be delivered with a material quality certificate according APZ 3.1 acc. EN 10204
- All ZSM – Parts need to be quality – checked by a 3D – Measurement and Monitoring – Device.
- X-Ray of circumference welds (100%)
- Dye penetrant testing or magnaflux test (100%)

All Tests must be traceable by batch – numbers on pipes and coupling – parts.

6. Documentation

The documentation will be transmitted in Paper – Form (DIN A4 2x) and on a digital device (2x) and includes the following:

- All test certificates stated in this document
- Drawings necessary for Installation
- Parts – Lists with Article – Numbers

