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EQUIPMENT

[Version 5]

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1. SCOPE

- 1.1. This specification covers Portnet's requirements for belt conveyors and its associated equipment.

2. GENERAL

- 2.1. The belt conveyor supplied shall be electric motor driven. Troughed belt conveyors are to be to I.S.O. standards but designed generally in accordance with B.S. 2890 (Latest): Troughed Belt conveyors.
- 2.2. The belt conveyor and its associated equipment shall be capable of accommodating the absolute maximum handling rate specified.
- 2.3. The conveyor shall be of robust construction to meet sustained heavy duty demands.
- 2.4. Efficient and readily accessible means of adjustment shall be provided on the head and tail drum shafts for tracking the belt.
- 2.5. The belt conveyor structure shall be designed to allow for easy and simple access for maintenance and replacement of idlers.
- 2.6. An efficient type belt tensioning device shall be provided. The design must be such as to ensure correct tensioning of the belt under all conditions. Design should be for gravity feed take-up or a horizontal take-up with back weight tower.
- 2.7. Take-up travel is to be not less than 2,5 % of the tail and head pulley centres and this will have an effect on the type of belt carcass selected.
- 2.8. Removable protective screens or covers shall be provided around back weights and pulleys.
- 2.9. Back weights shall be provided with suitable stainless steel lugs for the handling of the weights.

The back weights shall be in separately removable sections of no more than 2 ton each. The actual weight shall be cast into the weights.

- 2.10. Protective wind boards are not required on belts provided in galleries, as these will be suitable enclosed. Where belt conveyors are not located in a gallery, protective windboards are to be provided.
- 2.11. Windboards must be quickly removable to ensure that effective cleaning and maintenance can be carried out on the belts.
- 2.12. An efficient belt cleaning device must be fitted to clean the return belt. The commodity removed from the belt must be discharged onto the flow path.
- 2.13. All movable head pulleys shall be provided with an intermediate belt washing position.
- 2.14. Wear liners in areas of high impact or where flow improvement is required, shall preferably be of the ultra high molecular weight polyethylene (UHMWPE) type.
- 2.15. If the belt contains vertical curves, it shall be designed such that the belt does not lift off any of the idlers when the belt is loaded to 25% or more of its capacity. Suitable rollers shall also be provided to limit the lift of unloaded belts.
- 2.16. Flip over return conveyors are preferred unless otherwise specified.
- 2.17. It shall be possible to catch waste product dumped on the belt during cleaning operations at the tail end pulley.
- 2.18. Maximum belt inclination shall suit the product conveyed.

3. CONVEYOR IDLERS

- 3.1. Sufficient number of top idlers shall be provided to ensure that the belt does not sag under maximum load. The spacing must suit product mass and density as well as particular requirements in special areas, transfer chutes, inclines, etc.
- 3.2. Sufficient number of impact absorption idlers shall be provided at all loading points.

- 3.3. Heavy duty idlers manufactured from corrosion resistant materials must be provided and Tenderers must give full details of the selected idlers.
- 3.4. Idlers with a three roll design and 35⁰ troughing angle are preferred. Tenderers may offer a multi-roller system but details must be given as well as the reasons for their preference of the system offered.
- 3.5. Tenderers who offer covered (lagged) pulleys and/or idler rollers should note that the covering should be of non-static material.
- 3.6. Sufficient number of return idlers and guide rollers, where applicable, must be provided to prevent the belt from fouling the framework and/or dragging on the floor of the conveyor enclosure. Return idlers of the two roll, vee-design are preferred.
- 3.7. The conveyor belt shall be effectively trained by self aligning troughing idlers.
- 3.8. Belt training idlers of the vertical guide roll type or any type involving the rubbing of belt edges, shall not be used. The same provisions regarding bearings etc. applicable to troughing idlers, shall apply to training idlers.
- 3.9. Self aligning return idlers shall also be provided. All pivot bearings shall be readily accessible for lubrication.

4. IDLER ROLL DESIGN

4.1. Rolls:

- 4.1.1. The wall thickness of rolls shall be uniform. If rolls are made of tubing, the latter shall be seamless. Outer surfaces shall be perfectly smooth and corners rounded. Each assembly of roll, shaft, bearings, seals etc. shall be perfectly balanced and concentric. Rolls shall not be less than 125 mm outside diameter.

4.2. Bearings:

- 4.2.1. Bearings shall be of the high-grade, high speed, seize-resistant sealed for life type heavy duty design and so arranged that no contact with the commodity handled will be possible.
- 4.2.2. Tenderers to state on how many hours bearing (L10 life) were bearings selected.

4.3. Seals:

- 4.3.1. Bearings shall be adequately sealed to retain the lubricant and effectively prevent the entrance of dirt and moisture.

4.4. Lubrication:

- 4.4.1. "Lubricated for life" type idlers are preferred. If not lubricated for life, then each roll shall be lubricated individually, high pressure grease fittings shall be used and shall be easily accessible from the walkway side of the conveyor. If walkways are provided on both sides then grease fittings shall be accessible from one side only.

5. DRIVES AND PULLEYS

- 5.1. Tenderers may offer floor or shaft mounted drives. Allowance must be made for belts being started from rest under maximum load. Drives shall consist of an electric motor driving through fluid couplings, helical gear reducers and flexible couplings. Gearboxes are not to be mounted directly onto shafts. All guards around fluid couplings shall be of solid plate and no mesh construction will be accepted. Wear parts of flexible coupling should be replaceable without moving the gearbox or motor.
- 5.2. Drive pulleys are to be chevron lagged with non-static material.
- 5.3. All other pulleys are to be suitably lagged with a non-static material.
- 5.4. Pulley shafts shall be fitted with dust flingers to offer protection against ingress of commodity into plummer block bearings and seals.
- 5.5. All plummer blocks to be fitted with button head grease nipples.
- 5.6. Drive pulleys to be fitted with a split bearing arrangement on the coupling side to facilitate ease of maintenance and/or replacement.
- 5.7. The entire drive system shall be designed such that belt oscillations is not set up during start-up, stopping or running.

6. CONVEYOR BELTING

- 6.1. In the selection of conveyor belting for the troughed belt conveyor offered cognisance must be taken of the following:-
- 6.1.1. The commodities to be handled;
 - 6.1.2. Compatibility of these commodities and the possibility of contamination creating an obnoxious mixture;
 - 6.1.3. Possibility of explosion and/or fire which could result from contamination or dust build up;
 - 6.1.4. The heavy duties required of the belt.
- 6.2. In order to standardise as far as possible, tenderers should select suitable belting from the list of 1 350 mm belting given below and must conform to S.A.B.S. 1173/latest. Any deviation from this list should be pointed out clearly and reasons furnished with the offers.

<u>Belt Class</u>	<u>No. of plies</u>	<u>Top cover</u>	<u>Bottom cover</u>
400	4	3,2	1,6
500	4	3,2	1,6
500	4	6,3	1,6
500	5	6,3	1,6
630	4	3,2	1,6
630	4	6,3	1,6
800	4	6,3	1,6
1 000	4	6,3	1,6
1 600	4	6,3	1,6

- 6.3. An anti-static belt is required in grain silos.
- 6.4. The belting offered shall be resistant to cuts and abrasions.
- 6.5. The belting offered must be compatible with the drive and belt arrangement offered.
- 6.6. There shall be good adhesion between the carcass and outer covering.
- 6.7. The belt supplied must be free of defects.
- 6.8. It is required that the joints in the belt be properly spliced and vulcanised.
- 6.9. On mobile machines with conveyors, suitable space and a 3 phase power point shall be provided on the machine to do belt splices.

7. INFORMATION TO BE SUBMITTED

- 7.1. Tenderers must submit drawings of the belt conveyer offered. Full details including the following must be given:-
- 7.2. Details of dust sealed enclosures.
- 7.3. kW rating, mass and speed of motors.
- 7.4. Details of motor to gearbox couplings.
- 7.5. Details of gearbox i.e. make, size, type, power rating, lubrication, mass, etc.
- 7.6. Details of slip detection.
- 7.7. Details of drive to head shaft.
- 7.8. Details of head and tail drums and shaft sizes.
- 7.9. Spacing of troughed idlers and return idlers in the various areas.
- 7.10. Detail of all bearings and protection against the ingress of dust and grit.
- 7.11. Details of adjustment on head and tail drum shafts for belt tracking.
- 7.12. Details of belt tensioner.
- 7.13. Detail of belt speed transducers and indicators.
- 7.14. Details of belt cleaning device.
- 7.15. Detail of pull wire switches.
- 7.16. Positions and type of emergency stop buttons.
- 7.17. Details of device for locking transfer chute in position when belt is operating.
- 7.18. Details of conveyor framework including materials used in construction.
- 7.19. Speed of belt in m/s.
- 7.20. Full details of the belt offered must be given including the following:-

- 7.20.1. Width of belt.
- 7.20.2. Mass per m².
- 7.20.3. Thickness of belt and tolerance allowed across width.
- 7.20.4. Description of carcass i.e. materials used in construction, number of plies etc.
- 7.20.5. Details of covering including thickness and materials used.
- 7.20.6. Details of jointing process used.
- 7.20.7. % Elongation of belt at full rated load.
- 7.20.8. Breaking strength of belting.

8. **TRANSFER CHUTES**

- 8.1. This section is applicable to all transfer chutes that may be necessary for the effective transfer of product.
- 8.2. Easily removable wear plates of a material compatible with the variety of commodities to be handled and of suitable thickness must be fitted to transfer chutes.
- 8.3. Chutes must be completely enclosed and be supplied with a dust-proof hinged inspection door for inspection and cleaning. No apertures or ridges must be present in order to prevent spillage or build-up of material.
- 8.4. The sides of chutes shall be so designed that material will not build up in the chute and cause an obstruction to material flow.
- 8.5. The design of chutes must be such that the commodity does not spill over moving parts.
- 8.6. All chutes shall be provided with blocked chute detectors and indication.
- 8.7. All chutes shall be painted internally and externally to the full paint specification prior to the fitting of the wear plates.
- 8.8. Tenderers must furnish drawings depicting all chutes offered as well as full details which must include the following:-

- 8.8.1. Materials used in the construction of chutes.
- 8.8.2. Total mass of chute.
- 8.8.3. Type of seal between chute and receiving device.
- 8.8.4. Details of wearplates and type of material.
- 8.9. Chutes must direct the flow of material such that the relative velocity of the belt and material before impact is minimised. Product degradation and dust emissions must also be minimised.
- 8.10. Where required chutes shall have removable covers for extraction of waste product off belts during cleaning operations.

9. RECEIVING HOPPER

- 9.1. This section is applicable to all receiving hoppers that may be necessary for the effective receipt of product, feeding a conveyor.
- 9.2. Hoppers must be so designed and installed that no dust will escape when commodity is received in the hopper.
- 9.3. Easily removable wear plates of a material compatible with the variety of commodities to be handled and of suitable thickness must be fitted to all hoppers. No apertures or ridges must be present in order to prevent spillage or build-up of material.
- 9.4. The opening at the bottom of hoppers must be completely dust sealed on the receiving chute of the conveyor.
- 9.5. The sides of hoppers shall be so designed that material will not build up in the hopper and cause an obstruction to material flow.
- 9.6. All hoppers shall be painted internally and externally to the full paint specification prior to the fitting of wear plates.
- 9.7. Where the flow characteristics of the product might cause bridging, tunnelling or other discharge problems, aeration pads, vibratory feeders, apron feeders or other devices to prevent blockage must be fitted. Full details must be provided.
- 9.8. Tenderers must furnish drawings depicting all hoppers offered as well as full details which must include the following:-

- 9.8.1. Materials used in the construction of the hopper.
- 9.8.2. Method of securing hopper to structures.
- 9.8.3. Total mass of hopper.
- 9.8.4. Details and type of seals used between hopper and receiving chute.
- 9.8.5. Type of material used on wear plates.

10. **SAFETY SYSTEMS**

- 10.1. Emergency stop buttons must be provided at all accessible sides of each drive end, tail end and transfer point.
- 10.2. Plastic covered stainless steel pull wires and switches shall be provided on both sides of the conveyor, along the entire length.
- 10.3. Belt tracking sensors shall be provided to monitor belt tracking and stop the belt before it can contact the structure or start to run off the pulleys.
- 10.4. Under and overspeed switches shall be provided where necessary.
- 10.5. Emergency brakes shall be provided, capable of safely stopping a fully laden belt, and keeping a fully laden belt at maximum inclination from running back.

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