INTER PLANT STANDARD IN STEEL INDUSTRY		
IPSS	**DESIGN PARAMETERS FOR SHUTTLE CONVEYOR**	**IPSS:2-03-019-20 (Second Revision)**
	Corresponding IS does not exist	Formerly : IPSS:2-03-019-11 (First Revision)

0. FOREWORD

0.1 This Interplant Standard has been prepared by the Standards Committee on Conveyors, IPSS 2:3, with the active participation of the representatives of all the steel plants and established manufacturers of conveyors. Conveyor equipment and reputed consultancy organizations and was subsequently revised with first revision in 2011 and with second revision in September, 2020.

0.2 **Functions of Shuttle Conveyors**

i) To be mobile on a pair of rails and be capable of traversing in either of the two directions parallel to the rails.

ii) To receive bulk materials from more than one feed points.

iii) To discharge materials at more than one feed points which could be at discrete locations or continuous.

0.3 In the preparation of this Standard, assistance has been derived from IS 11592: 2000 `Code of practice for selection and design of belt conveyors'.

1. SCOPE

1.1 This Inter Plant Standard lays down the design parameters and other requirements of Shuttle Conveyors for use in steel plants.

Reversible conveyors especially those on load have not been covered in this Standard.

2. TERMINOLOGY

2.1 **Head / Drive Frame** – This is a frame constructed of rolled steel sections that support the head pulley (drive), the conveyor drive unit, shuttle drive units, discharge chute and maintenance platform. This frame is mounted on wheels running on a pair of rails.

2.2 **Tail Frame** – This is a frame constructed of rolled steel sections that support the tail pulley, discharge chute (in case of reversible conveyor) and maintenance platform. This frame is mounted on wheels running on the pair of rails.

2.3 **Intermediate Frames** – These are modular frames constructed of rolled steel and support the belt conveyor and are mounted on wheels running on the rails. These frames are connected to head / tail frame / intermediate frame at either end to form the complete length of conveyor. The number of modular intermediate frames required depends upon total length of the Shuttle Conveyor.

2.4 **Traversing Arrangement** – This consists of pairs of wheels supporting the head frame, tail frame and the intermediate frame. One or more pairs of wheels may be driven and other shall be non-driven.

2.5 **Belt Conveyor** – This is a belt conveyor mounted on the frame and could be unidirectional or bidirectional depending upon requirements. This conveyor consists of normal conveyor components as defined in the other relevant standards.

2.6 **Rail Guage** – This is the distance between the inner face of the rails.

2.7 **Tensioning Arrangements (take up)** – This is the arrangement to maintain the required tension in the belt while in service (duty) in a belt conveying system.

3. TYPES OF SHUTTLE CONVEYORS

3.1 Shuttling with uni-directional conveyor (non-reversible type)

3.2 Shuttling with bi-directional conveyor (reversible type)

4. TYPES OF SHUTTLING OPERATIONS

4.1 Stopping at discrete locations automatically through limit switches and starting upon automatic sensing or manual signal, local or remote.

4.2 Stopping only at extreme ends and continuously traversing between these two ends. The reversal at the extreme ends could be automatic through or upon manual signal, either local or remote.

5. CONVEYOR OPERATION

5.1 The conveyor operation could be uni-directional or bi-directional. In case of bi-directional conveyors, the drive unit may be plugging duty type wherein the conveyor could be instantaneously reversed under operation.

5.2 Depending upon the plant layout, material could be fed to this conveyor at its extreme pulley locations or anywhere throughout the length of the conveyor. In case of material fed anywhere on the

conveyor, all the carrying idlers and their spacing shall be suitable for impact load.

5.3 The discharge of the material from this conveyor is normally made between the rails and into receiving elements such as bins, hoppers or bunkers.

6. GENERAL CONSTRUCTIONAL FEATURES

6.1 Head frame, tail frame and intermediate frames-steel Fe 410 WA as per IS 2062:2011.

6.2 **Chutes** – Steel plates of minimum 6 mm thickness as per IS 2062:2011 – Weldable Structural Steel (third revision).

6.3 **Chute Liners** – As decided upon between the supplier and purchaser and depending upon material characteristics.

6.4 **Conveyor Elements** – As defined in relevant IPSS.

6.5 **Wheels** – Wheels shall be made of cast steel as per IS 1030:1998 `Carbon Steel Castings for general engineering purposes (fourth revision)' or IS 2707:1996 `Carbon Steel castings for surface hardening (third revision) or forged steel as per IS 2004:1991 `Carbon steel forgings for general engineering purposes (third revision). The tread hardness shall be 50-60 HRC. The wheels shall be double flanged having tread with 20 mm more than the width of the rail.

6.6 **Wheel Axles** – Wheel axles shall be made of rolled steel 45 C8 as per IS 1570 (Part 2 / Sec 1):1989 `Schedule for wrought steels: Part 2 Carbon steels (unalloyed steels) Section 1 Wrought products (other than wire)' with specified chemical composition and related properties (first revision) or forged steel 14C6 as per IS 2004:1991.

6.7 **Wheel Bearings** – Anti-friction mounted on cast steel plummer blocks or internal with wheels.

6.8 **Rails** – As per IRS-T.12160 / BS-11.

6.9 In both unidirectional and bidirectional, all pulleys shall be lagged with plain diamond pattern.

6.10 **Switches** – As per IPSS:1-04-003-89 `Mechanically operated limit switches for control circuit for voltages upto & including 1000 V ac or 1200 V dc'.

6.11 **Idlers** – As per IPSS:2-03-004-20 `Design parameters for idlers and idler set.

6.12 **Screw Take Up** – Only screw take up shall be used.

6.13 **Dust Sealing Arrangement** – Suitable dust sealing arrangements shall be provided.

6.14 **Plugging Duty Motor** – Plugging duty motor shall be provided for instant reversal of drive pulley of the conveyor.

7. DRIVE ARRANGEMENTS

7.1 **Traverse Drive** – One or more driving pair of wheels (through the axle) shall be driven by means of transmission chain or driven directly on the wheel shaft through hollow shaft worm or helical gearboxes. However, hollow shaft drive shall be preferred. Suitable brakes conforming to IPSS Standard (under preparation) shall be installed between motor and gearboxes, or alternatively on the extended shaft of the motor. Rail clamps are normally not required.

7.2 **Conveyor Drive** – This shall consist of ac induction motor (reversible if required), brake (or fly wheels) if required from coasting time considerations, gear box and low speed coupling (if gearbox is not shaft mounted type).

7.3 **Location of Drive** – Conveyor drive and traverse drive shall preferably be located at two different places for ease of maintenance.

8. ELECTRICAL EQUIPMENT

8.1 **Power Feeding** – Power and control cables normally used for operation of shuttle conveyors shall be fed through spring or motorized cable reeling drums. Alternatively, power may be fed through cable trolley type festooning arrangement/ drag chain arrangement.

8.2 **Safety Devices** – Normal safety devices for belt conveyors namely pull cord switch, belt sway switch, zero speed switches and chute jamming device shall be provided. Limit switches for traverse of the shuttle conveyor shall be mounted along the rail track at desired locations.

9. SPECIAL DESIGN / CONSTRUCTION FEATURES

9.1 In order to cater for manufacturing tolerances and rail track-laying tolerances, the connection of the various frames to each other shall be done by means of pivot connection at one end and rigid connection at the other.

9.2 Suitable belt training idlers or vertically mounted guide rollers shall be provided to train / contain the belt within reasonable tolerances.

10. DESIGN PARAMETERS

10.1 **Length** – The length of the shuttle conveyor shall preferably be within 100 m.

10.2 **Drive Power & Speed** – Drive power for shuttle traverse shall be decided depending upon capacity, length and duty condition of shuttle

conveyors. The traverse speed shall be in the range of 5 m/min to 18 m/min.

10.3 Recommended Rail Guage

Belt Width	Rail Guage (inner to inner)
650 mm	1150 mm
800 mm	1300 mm
1000 mm	1560 mm
1200 mm	1760 mm
1400 mm	1960 mm
1600 mm	2160 mm

11. LUBRICATION

11.1 Because of the nature of operations, all bearings should be lubricated and sealed for life, however, manual lubrication (centralized or otherwise) of pulley bearings and the wheel bearings may also be done.

12. SAFETY FEATURES

12.1 Safety features shall conform to IPSS:1-11-026-16 `Safety Standard for Operation and Maintenance of Conveyor belt in Steel Industry'
