



PDHonline Course M262 (2 PDH)

Bulk Material Belt Conveyor Specification

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Bulk Material Belt Conveyor Specification

John Andrew P.E.

Course Content

Belt Conveyors

Belt conveyors range in length from a few feet to several miles. They carry everything from small packages to thousands of tons of bulk material per hour. A belt conveyor can unload a barge load of coal and deliver predetermined amounts to several, one hundred feet high silos, a thousand yards away in minutes. Another belt conveyor will precisely meter variable amounts of the coal to a boiler.

54" wide belt conveyor with ship unloading hopper feeding a traveling tripper conveyor for storage



[See full-size image.](#)

www.feeco.com/Portals/0/conveyor-2.jpg

1559 x 1082 pixels - 121k

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original context on the page: www.feeco.com/.../tabid/38/Default.aspx

More information about the Feeco belt conveyors above can be found online at: www.feeco.com.



Belt conveyors pictured above unload coal barges and deliver it to the triangular roofed storage building and to boilers.

Go to www.ubemachinery.co to obtain more information about the conveyors above and below.



A Ubemachinery traveling stacker conveyor is pictured above.



[See full-size image.](#)

www.ubemachinery.co.jp/.../image/conveyor.jpg

252 x 400 pixels - 45k

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original context on the page: www.ubemachinery.co.jp/.../b_hand/conveyor.htm

Belt conveyors are used in the following applications:

Aggregate
Bulk Handling
Coal
Cement
Hard Rock
Steel Production
Foundry
Power Generation

Pulp and Paper
Grain
Baggage Handling
Baggage Handling
Package Handling
Sand and Gravel
Terminals
Wood Products



The Martin discharge chute above is used to direct the flow of bulk material from one belt conveyor to another.

Find Martin engineered conveyor accessories at: www.martin-eng.com.



[See full-size image.](#)

www.martin-eng.com/product_images/MARTIN-INNER...

349 x 349 pixels - 24k

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original context on the page: www.martin-eng.com/products.php?product=124

Martin supplies conveyor belt loading chute components also.

The belt conveyor specification below is a sample and is for reference only.

SAMPLE BELT CONVEYOR SPECIFICATION

ABC CORPORATION

P.O. Box 112233

Pleasantville, MI, 54307 Attention: Mr. Project Manager

1.0 GENERAL

1.1 INTENT AND SCOPE

1.1.1 The intent of this specification together with the following listed attachments shall define the minimum requirements to be met by the vendor in the design, fabrication, and supply of seven belt conveyors complete with drives, galleries, support structures, chutes, accessories, and electrical sensor/transmitters, for the ABC Corporation in Pleasantville, Michigan.

Attachments: _

Inquiry/ Purchase Order, PO 998877.

Electrical Specification For Packaged Equipment, AABB

General Specification For Equipment, DDEE

XYZ Engineering Company Drawings:

G01-001E GENERAL ARRANGEMENT

M -002E RECLAIM PIT

M-007E SECONDARY CRUSHER

M-010E RECLAIM BELT CONVEYOR (48 inch belt)

M-016E TRANSFER BELT CONVEYOR (30 inch belt)

M-020E REVERSING SHUTTLE CONVEYOR (30 inch belt)

M-021E REVERSING CONVEYOR (30 inch belt)

M-022E REVERSING CONVEYOR (30 inch belt)
M-023E REVERSING CONVEYOR (30 inch belt)
M-024E REVERSING CONVEYOR (30 inch belt)
M-030E TRANSFER CONVEYOR CHUTE
M-034E BOILER (A)CONVEYOR (A) (30 inch belt)
M-035E BOILER (B) CONVEYOR (B) (30 inch belt)
M-036E BOILER (C)CONVEYOR (C) (30 inch belt)
M-037E BOILER (D)CONVEYOR (D) (30 inch belt)
M-045E TRANSFER TOWER
M-050E COAL SAMPLER (by others)
M-055E STANDARD DETAILS

1.1.2 Note that the galleries for the Reclaim Conveyor and Transfer Conveyor to Boiler Silos: A, B, C, and D and all support bents will be furnished by LMN Company. See Section 3.0, the drawings above, and contact the LMN Project Engineer by phone 555-666-7777.

The Reclaim and Transfer Conveyor galleries shall be by the conveyor vendor.

1.2 INFORMATION TO BE SUPPLIED BY SELLER IN PROPOSAL

1.2.1 The vendor shall furnish complete belt conveyors, accessories, and specified conveyor galleries.

1.2.2 Vendor's proposed design shall be fully defined and shall be accompanied by drawings and descriptive literature sufficient to describe the details of construction and general equipment arrangement.

1.2.3 Deviations from these specifications are permitted only if vendor outlines in full detail all such deviations and the reason therefore in his proposal and such deviations have to be accepted in writing by the Owner before purchasing from XYZ Engineering Company and the ABC CORPORATION.

1.2.4 Vendor shall furnish recommended listings of instrumentation and controls that should be provided by Owner, to ensure safe and efficient equipment operation.

1.2.5 The Bid Tabulation Sheets have been furnished with this specification. These sheets are to be completed (TYPED) by the bidder and returned with his quotation and will become a

part of his quotation. Quotations returned without these sheets will be considered incomplete.

1.2.6 Certify that he has complied with the specifications.

1.2.7 Enclose complete information as to type, model, size, and weight of the units quoted. This information may be furnished in the form of catalogs and drawings.

1.2.8 Provide the delivery schedule for the units quoted.

1.2.9 Schedule for the submission of approval drawings and certified prints.

1.2.10 Complete specifications for the motors.

1.2.11 List maximum static and dynamic foundation loads.

1.3 WARRANTY

1.3.1 Each Belt Conveyor shall operate as specified before acceptance. However, acceptance will not relieve the manufacturer of his contractual responsibilities.

1.4 DRAWINGS AND REPORT

1.4.1 After receipt of the Purchase Order, the vendor shall furnish certified digital drawings, and operating and maintenance manuals in the quantities listed in the Purchase Order.

2.0 CODES AND STANDARDS

2.1 The following Codes and Standards shall form a part of this specification.

2.1.1 Conveyor Equipment Manufacturers Association (CEMA)

2.1.2 Rubber Manufacturing Association (RMA)

- 2.1.3 Mechanical Power Transmission Association (MPTA)
 - 2.1.4 Federal Coal Mine Health and Safety Act (FCMHSA)
 - 2.1.5 American Society for Testing and Materials (ASTM)
 - 2.1.6 American National Standards Institute (ANSI)
 - 2.1.7 Occupational Safety and Health Act (OSHA)
 - 2.1.8 Standard Building Code (SBC)
 - 2.1.9 Standard Safety Code (USA)
 - 2.1.10 American Welding Society, D1.1 (AWS)
 - 2.1.11 National Electrical Safety Code (NESEC)
 - 2.1.12 National Fire Protection Association (NFPA)
 - 2.1.13 National Electrical Manufacturer's Association (NEMA)
- 2.2 Where there is a conflict in requirements between the applicable codes, the code having legal jurisdiction shall govern. Where there is no legal jurisdiction, the most stringent requirements shall govern.
- 2.3 The equipment described here in shall conform to the requirements of all state and local codes which may govern installations in the State of Wisconsin.

3.0 WORK AND EQUIPMENT BY OTHERS

- 3.1 Concrete foundations anchor bolts, and all conveyor gallery support bents.
- 3.2 The conveyor gallery only (not belt, idlers, drives, etc.) for Boilers C&D Conveyor (A) as specified on drawing AAH-G01-025 and for Boilers C&D Conveyor (B) as specified on drawing AAH-G01-028.
- 3.3 Motors and starters. See Electrical Specification For Packaged Equipment, 16923.

3.4 The successful Vendor shall provide the required conveyor mounting pads, lugs, and expansion joints with associated loads to allow LMN to design the necessary structural supports. Coordination and design review will be by XYZ Company engineers.

4.0 PERFORMANCE

4.1 COAL DATA:

Capacity: 250 tons per hour
Material: Coal
Density: 50 lbs per cubic foot
Grindability: 45 to 65 Hardgrove
Infeed to the receiving hopper;
Lump Size: 6 in to 0
Infeed to the secondary crusher;
Lump Size: 2 in to 0

4.2 The coal will be run of mine unwashed.

4.3 LIMESTONE DATA:

Capacity: 325 tons per hour
Material: Limestone
Density: 65 lbs per cubic foot
Lump size: 3/8 inch to 0 with a high percentage of fines.

5.0 DESIGN AND MANUFACTURE

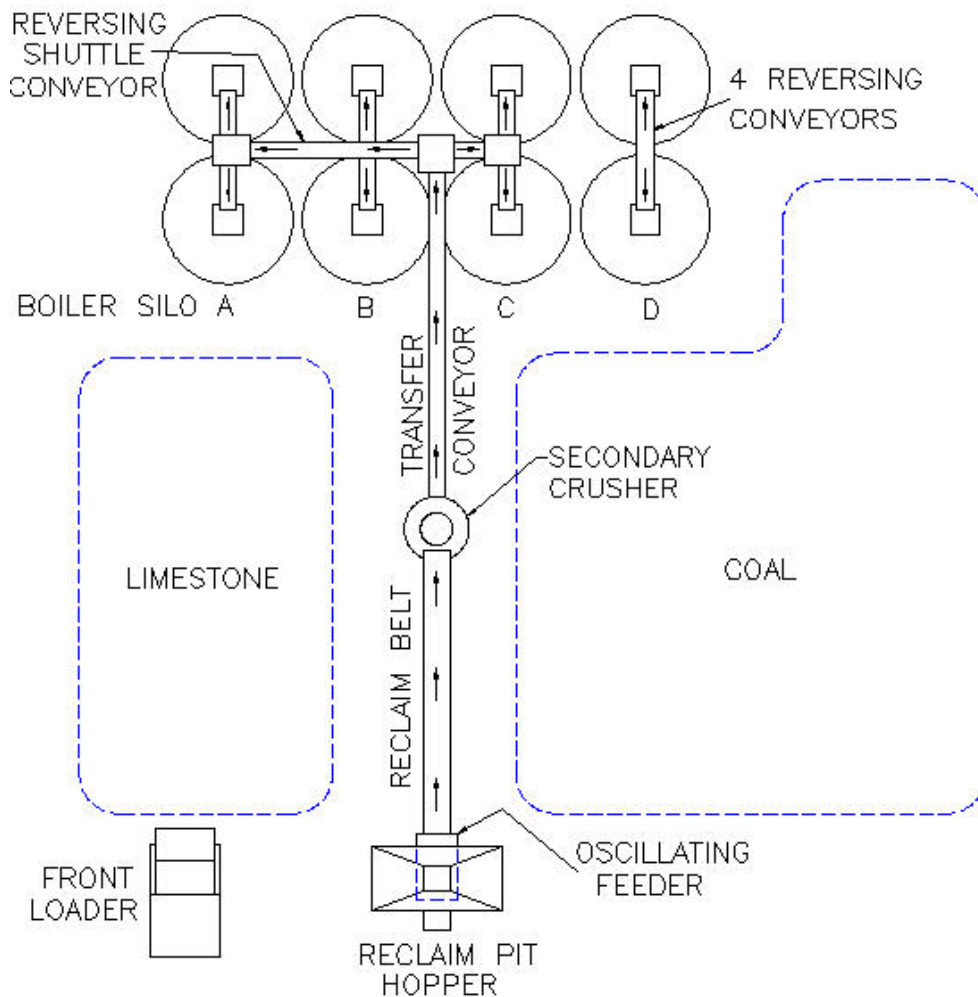
5.1 GENERAL

5.1.1 The Belt Conveyors shall be designed and manufactured for heavy-duty, minimum maintenance, outdoor, 24-hour per day paper mill boiler service.

5.1.2 Coal or limestone will be dumped into the below grade reclaim hopper (hopper and pit structure by others) by the owner's front loader, as shown on drawing AAH-G01-002E. A belt feeder (by others) will transfer the coal or limestone to the roll type crusher (by others). The crusher will discharge into the Reclaim Conveyor Feed Chute (by the conveyor vendor). The

coal or limestone will be transferred by the first conveyor which will have a 48 inch wide belt as shown in drawing AAH-G01-010E. The remaining five conveyors shall have 30 inch belts.

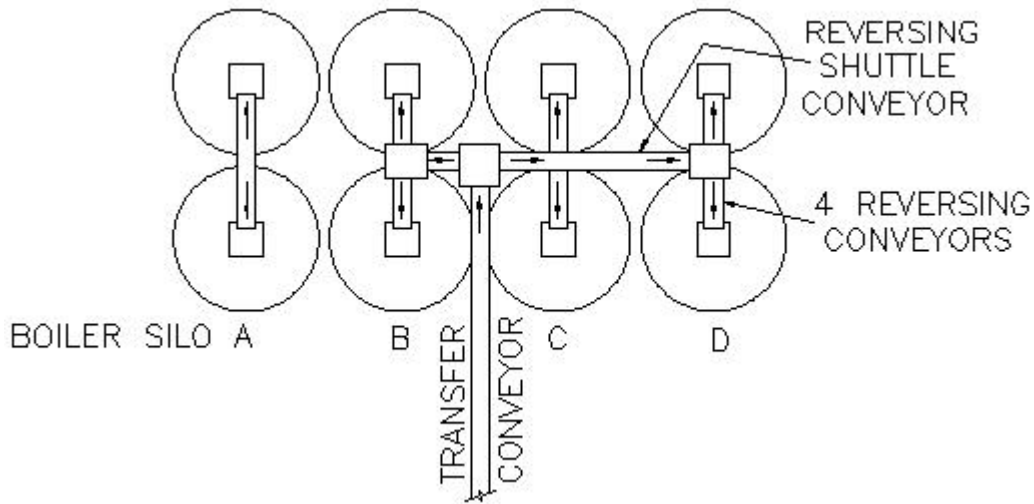
5.1.3 Each Belt Conveyor shall run in heated galleries, tunnels, or buildings.



DRAWING G01-001E GENERAL ARRANGEMENT, above.

5.1.4 Each Belt Conveyor shall be completely assembled with motors coupled to scoop-mount gear speed reducers on adjustable bases, chain drives with oil-tight casings, outlet chutes mating with loading skirtboards, easily replaceable rubber dust seals, and with provision for dust suppression equipment, spray nozzles etc., (to be supplied by others) and all equipment and accessories for a fully functioning unit prior to shipment to the job site, as specified here and in the drawings listed above.

5.1.5 Each Belt Conveyor shall be complete with all necessary mounting pads, guards, view ports, and hinged access doors.



DRAWING G01-002E GENERAL ARRANGEMENT, above.

5.1.6 Each Belt Conveyor shall be fitted with sensor/s that will shut down the drive if the outlet chute becomes plugged, or a 40 % reduction in speed is detected at the head or tail shaft.

5.2 MATERIALS OF CONSTRUCTION AND COMPONENTS

5.2.1 Bearings:

All bearings shall have internal self-aligning spherical roller bearings rated at a minimum B-10 life of 90,000 hours under normal operating conditions, according to the Anti-Friction Bearing Manufacturer's Association Standards, and ANSI Standards.

5.2.1.1 All pulley shafts shall be supported and aligned by adjustable and lockable bearings attached to base pads.

5.2.1.2 Shaft lock-up shall be by tapered adapter sleeves.

5.2.1.3 Bearings shall have multi-labyrinth seals. End caps are not required.

5.2.2 Shafting:

5.2.2.1 All shafts shall have one fixed type bearing; the balance on the shaft shall be expansion type.

5.2.2.2 Pulleys and pulley shafts shall be sized for combined torsional and bending static and fatigue stresses.

5.2.2.3 Shaft keys shall be the square parallel type and keyways adjacent to bearings shall be round end, all other keyways may be the runout type.

5.2.3 Pulleys:

5.2.3.1 The head pulley on the Reclaim Conveyor (AAH-G01-010E) shall be welded 304-SS so as not to interfere with tramp metal removal by the magnet.

5.2.3.2 All pulleys shall be welded steel crown faced, selected in accordance with ratings established by the Mechanical Power Transmission Association Standard No.301-1965 and U.S.A.

Standard No.B105.1-1966. In no case shall the pulley shaft loads as listed in the rating tables of these standards be exceeded.

5.2.3.3 All pulleys shall be crowned.

5.2.3.4 All drive pulleys shall be furnished with 1/2 inch thick vulcanized herringbone grooved lagging.

5.2.3.5 Snub pulleys adjacent to drive pulleys shall have a minimum diameter of 16 inches.

5.2.4 Idlers:

5.2.4.1 All idlers shall be CEMA-5. Trough idlers shall be 35 degree and have equal length rolls, and slotted bases for alignment.

5.2.4.2 Impact idlers shall be furnished in belt loading areas.

5.2.4.3 All idler assemblies shall be grease-able from the walkway side, with visible grease release on the other side.

5.2.4.4 One 20 degree transition idler shall be installed adjacent to each tail pulley and each head pulley.

5.2.4.5 Training idlers of the positive action type shall be furnished on both carrying and return runs, spaced no more than 100 feet or more than 50 feet from either terminal pulley.

5.2.4.6 Return idlers shall be spaced a maximum of 10 feet apart.

5.2.4.7 Seals shall be combination contact and multi-labyrinth seals with material deflector caps.

5.2.4.8 The maximum roll gap shall be 3/8" on trough idlers.

5.2.5 Roller Chain Drives:

5.2.5.1 All conveyors shall be furnished with scoop mount motor reducers with roller chain drives.

5.2.5.2 The maximum sprocket ratio shall be 3.00 and the small sprocket shall have a minimum of 18 teeth.

5.2.5.3 All sprockets shall be steel with flame hardened teeth and with hubs having one set screw over a square key and a second set screw at 90 degrees.

5.2.5.4 All sprockets and roller chains shall be ANSI Standard and sprockets shall be fitted with square keys located with one set screw over the key and a second set screw at 90 degrees.

5.2.5.5 All chain drives shall be furnished with easily removable oil tight casings with drain plugs, fill caps, sight glass and observation ports at the top of each sprocket.

5.2.5.6 Roller chain drives shall conform to ANSI Standard and shall be selected according to the service and power ratings established by the standard.

5.2.6 Conveyor Drives:

5.2.6.1 A 1.5 service factor and a momentary starting overload of 100 % shall be applied to calculated mechanical and thermal power when selecting each speed reducer.

5.2.6.2 All speed reducers shall be AGMA rated, Falk or approved equal.

5.2.6.3 All speed reducers shall be provided with oil level

indicators, drain plugs, and lifting lugs.

5.2.6.4 Speed reducer bases shall have a minimum of 4 inches travel for chain tightening.

5.2.6.5 Gearing shall be helical, herringbone, or a combination of the both, and gears shall be high strength alloy steel, hardened and precision shaved or lapped.

5.2.6.6 All speed reducers shall be shipped without oil and clearly tagged as such and the conveyor vendor shall furnish sufficient oil, of the type recommended by the reducer manufacturer, for one filling. Manufacture's lubricant identification shall be shown on the reducer.

5.2.6.7 Couplings between motors and reducers shall be Falk Steelflex or approved equal. Coupling guards shall be installed.

5.2.6.8 Reducers shall be designed for continuous heavy duty service under dusty conditions. Reducers shall be Falk or owner approved equal.

5.2.6.9 All reducers shall be furnished with an extended input shaft.

5.2.6.10 Reducer bearings shall be anti-friction roller type, selected in accordance with AFBMA and ANSI standards. All bearings shall be protected by lip type seals.

5.2.6.12 Units shall be run-in at the factory and protected with an oil soluble rust preventive coat.

5.2.6.13 Elevating conveyors shall be furnished with one hold-back on the high speed shaft of the speed reducer and a backup hold-back on the head pulley shaft.

5.2.7 Belting:

5.2.7.1 Conveyor belts shall be Goodyear Pylon coal and limestone boiler feed service.

5.2.7.2 All belts shall have vulcanized splices but shall have enough strength to operate at full capacity with mechanical splices.

5.2.7.3 Conveyor belt width variation shall not exceed +/- 1 %, or 1.0 inch, which ever is smaller.

5.2.7.4 Gravity take-up pulleys and counter weights shall be enclosed by safety cages, and a hinged door fitted with padlock shall be provided for access to the counter weight.

5.2.7.5 Gravity take-ups shall be fitted with shock absorbers designed to protect the surrounding structure from impact due to free fall of the counter weight. The calculated impact loads with and without shock absorber at each take-up shall be submitted to the owner with the first approval drawings from the vendor.

5.2.7.6 Type and weight of take-up shall be specified by the vendor. Weight shot, concrete, etc., shall be furnished by others.

5.2.8 Chutes:

5.2.8.1 All connecting chutes shall be fabricated with a telescoping connecting flange shipped loose (wired to chute) for field fit and weld.

5.2.8.2 Chutes shall be constructed of individual flanged and bolted sections allowing installation and removal of any chute section without the removal of any conveyor component and without cutting.

5.2.8.3 All chute-work and enclosures shall be ASTM A-36 steel with a minimum thickness of 3/16 inches unless noted otherwise.

5.2.8.4 All chute wear surfaces shall be lined with 3/8 inch thick AR 360 BHN plate bolted for easy replacement.

5.2.8.5 Access doors shall be provided for plug chute clean-out and wear plate replacement.

5.2.8.6 A minimum valley angle of 60 degrees is required in all chutes, unless otherwise noted._

5.2.8.7 Bent plates are preferred in contact with coal rather than welded joints.

5.2.8.8 Nip guards extending 4 feet from pinch points shall be provided at all pulleys covering all sides

5.2.8.9 Flop gates shall be designed and installed to allow removal for maintenance. Gates shall be fitted with bolted, removable

1/4 inch AR 360 wear plates.

5.2.8.10 Gates shall be operated by pilot operated solenoid valve controlled, air cylinder, and lever arm keyed and locked to the pivot shaft.

* Electric motor type actuators shall be quoted as an alternative.

5.2.9 Conveyor Structures and Accessories:

5.2.9.1 Each conveyor shall be provided with Martin Trac-mount dual cleaner and a doctor blade at head pulleys.

5.2.9.2 A rubber V-plow shall be provided on the return belt adjacent to the tail pulley on each conveyor.

5.2.9.3 Pitched deck plating shall be provided in all loading areas to prevent spillage onto the return belt.

5.2.9.4 Skirt boards fabricated from 1/4 inch steel plate shall be at least 10 feet long at each loading point, with covers and easily replaceable/adjustable flexible flaps for dust containment and flow control.

5.2.9.5 Conveyor galleries shall be fabricated structural steel truss design with insulated galvanized and painted corrugated steel roof and siding. Floor shall be lightweight concrete with reinforcing wire mesh on galvanized corrugated decking. Concrete and wire mesh by others.

5.2.9.6 Conveyor gallery design should allow for the installation of a 4 inch sch 40 pipe for steam heating and a fire protection line. Pipe and installation by LMN.

5.2.9.7 Conveyor sections and structures shall be pre-assembled and fabricated in a minimum number of subassemblies for shipment to the job site.

5.2.9.8 Field assembly of the structures will be provided for with bolted connections for installation prior to final welding.

5.2.9.9 Vendor shall provide all necessary field bolts, which shall be high strength ASTM A325, hot dip galvanized with ASTM A563 Grade C or ASTM A194 Grade 2H nuts, hot dip galvanized.

5.2.9.10 All structural steel shall be ASTM A-36.

5.2.9.11 Vendor shall provide adequate expansion joints.

5.2.9.12 Handrails shall be 1.5 inch schedule 40 pipe.

5.2.9.13 Steel grating shall be hot dipped galvanized 1.25 inch x 3/16" bar minimum._

5.2.9.14 Stair treads shall have steel plate abrasive nosing.

5.2.9.15 Provide a 4 inch high toe plate at open sided edges of platforms and walkways.

5.2.9.16 Vendor shall hold bent and tower locations as shown on the drawings listed in this specification.

5.2.10 Machinery Guards:

5.2.10.1 All exposed moving parts shall be provided with guards in compliance with all safety regulations and safe operating practice.

5.2.10.2 All guards shall be hinged and easily removable for maintenance access.

5.2.10.3 Coupling guards shall be 16 gauge minimum thickness.

6.0 ELECTRICAL AND INSTRUMENTATION

6.1 The equipment vendor shall supply the instrument manufacturers name, model numbers, description and calibration. Any brackets, clamps, or other mounting devices required for the instrument sensors shall be installed by the equipment manufacturer, according to the instrument vendors specifications.

6.2 Instrument sensors shall be mounted and pre-wired where practical. Each instrument shall be supplied with a stainless steel tag attached containing the instrument tag number as furnished by XYZ Company.

6.3 All electrical and electronic equipment shall meet the

requirements for a class II, Division 1, Group G atmosphere, as stated in Articles 500 and 502 of the National Electrical Code._

- 6.4 All motors shall be explosion proof.
- 6.5 All electrical controls shall be contained in NEMA 9 enclosures fitted with hinged access doors.
- 6.6 Each conveyor shall be equipped with emergency stop stainless steel cables on the walkway side. Maximum distance between switches shall be 200 feet.
- 6.7 All conveyors shall be furnished with zero speed switches in NEMA 9 enclosures that detect a 40 % reduction in speed at the head or tail shaft.
- 6.8 All transfer chutes shall be provided with plugged chute indicators in NEMA 9 enclosures.
- 6.9 Belt drift switches in NEMA 9 enclosures shall be provided at the approach to the head pulley.
- 6.10 Lock out protection (by others) shall be provided when a conveyor is stopped for servicing or inspection.

7.0 FIRE PROTECTION

- 7.1 Fire lines and sprinklers that satisfy NFPA 13 and 15 requirements together with Field Marshall and Underwriter requirements shall be installed with approved couplings, for field fit, prior to shipping.
- 7.2 Vendor shall quote his alternate price for assembly of the fire line in his shop.

8.0 CONVEYOR HEATING

- 8.1 A 4 inch schedule 40 pipe shall be installed in each conveyor gallery with 150 lb flange couplings, for field connection prior to assembly.

9.0 SURFACE PREPARATION AND SHOP PAINTING

9.1 Shall be manufacturer's standard.

9.2 Surface preparation, primer coating and finish paint specification, thickness, and manufacturer shall be described.

9.3 Paint color shall be _____ .

10.0 INFORMATION TO BE SUPPLIED BY SELLER IN PROPOSAL

10.1 Bidder's proposed design shall be fully defined and shall be accompanied by drawings, schematics, and descriptive literature sufficient to describe the details of construction and general equipment arrangement.

10.2 Deviations from these specifications are permitted only if Vendor outlines in full detail all such deviations and the reason therefore in his proposal.

10.3 Controls shall be fully outlined in the proposal including manufacturer's names and model numbers.

10.4 Vendor shall furnish as a separate price his quotation for installation of each system and shall define the scope of his installation service.

10.5 A bid tabulation sheet has been furnished with this specification. This sheet is to be completed (typed) by the Bidder and returned with his quotation and will become a part of his quotation.

11.0 DRAWING AND REPORTS

11.1 After receipt of the Purchase Order, the Vendor shall furnish certified drawings, reproducible of drawings and operating and maintenance manuals in quantities listed in Purchase Order.

11.2 Vendor shall describe his drafting method in the Bid