VIA PROCUREMENT WEBSITE

PUBLISHED: June 26, 2025

SUBJECT: Request for Qualifications for Airport Terminal and Rail Integration Opportunity: Town Response No. 3 to RFQ Questions

Dear Prospective Proposers:

Reference is made to the Request for Qualifications for Airport Terminal and Rail Integration Opportunity, issued by the Town of Islip (the "Town") dated April 8, 2025 (as amended from time to time, the "RFQ"). Capitalized terms used in this communication have the meanings given to them in the RFQ.

This communication provides the Town's responses and revisions to certain RFQ Questions pursuant to Section 6.4.3 of the RFQ in Appendix 1. Revised responses are noted as such in the attached Appendix 1. Also, attached as Appendix 2 are certain Reference Information materials that are mentioned in this Town Response No. 3.

Prospective Proposers should note:

- With respect to the Town's responses in Appendix 1, the RFQ Questions may have been consolidated or otherwise edited for clarity or brevity and are not part of the Town's responses.
- In accordance with Section 6.4.3 of the RFQ, the Town's responses to RFQ Questions in Appendix 1 do not themselves modify the provisions of the RFQ. Any corresponding modifications to the RFQ that are formally incorporated by Addendum will take precedence over the Town responses.
- Any provisions of the RFQ not specifically modified by Addendum remain unchanged.

We thank you for your continued interest in the Opportunity and encourage you to reach out with any other questions as they arise.

Sincerely,

Amy Murphy

Amy Murphy
Deputy Town Attorney, Town of Islip
Procurement Contact

Enclosures: Town Response No. 3 to RFQ Questions; Reference Information Attachments

Appendix 1: Town Response No. 3 to RFQ Questions

No.	RFQ Cross-Ref.	RFQ Question	Response
1.	Appendix B	Can the Town confirm when editable versions of the Appendix B Forms will be made available?	As of the publication date of this Town Response No. 3, editable versions of the Appendix B Forms will be separately provided to prospective Proposers that are eligible to participate in the RFQ process on the basis of having previously submitted a timely Notice of Intent Submission in accordance with Section 6.2 of the RFQ. Proposers are reminded that, in accordance with Section 6.6 of the RFQ, they are responsible for ensuring they have received any and all Addenda, including any Forms with modified conditions or requirements.
2.	NA	Has the Town identified future projects using PFCs?	The below response revises and supersedes No. 8 in Town Response No. 2: The Town and Airport identified PFC projects and are currently working on PFC #8, #9 and #10 projects. Please see the listed PFC projects in the following spreadsheets: *PFC 8 and 9 Project Info* and *PFC-5500-1-Attachment-H-2022 ISP Final Rev*, attached in Appendix 2.
3.	RFQ Section 2.4.c	Can you describe the investment made in recent years in the existing terminal, in particular, the technical characteristics of the new baggage handling system?	The below response revises and supersedes No. 15 in Town Response No. 2: Please see the document, *Airport Baggage Handling Specification*, attached in Appendix 2.

Appendix 2: Reference Information Attachments

Reference Information Attachments

Appendix 2-A:	**Airport Baggage Handling Specification**
Appendix 2-B:	**PFC 8 and 9 Project Info**
Appendix 2-C:	**PFC-5500-1-Attachment-H-2022 ISP Final Rev**

Appendix 2-A: Airport Baggage Handling Specification

Remainder of page intentionally left blank. Appendix 2-A follows on the next page.

Long Island MacArthur Airport

AIRPORT BAGGAGE HANDLING SYSTEM SPECIFICATION

Baggage Conveying Equipment

Section 34 77 39

Part One: General

Part Two: Products

Part Three: Execution

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BAGGAGE CONVEYING EQUIPMENT – SECTION 34 77 39

PART 1 – GENERAL

1.1. SUMMARY

A. General

1. This Baggage Handling System (BHS) specification section defines the design intent, manufacturing, installation, testing, operation and maintenance of a specific Baggage Handling System provided by a Baggage Handling System Contractor (BHSC).

2. The Baggage Handling System described herein shall be designed, manufactured, installed, tested, delivered and supported in compliance with the requirements defined in the specification, all requirements of the contract drawings, and all addenda and attachments.

B. The Owner

1. The Owner of reference for this specification is the Long Island MacArthur Airport.

2. The Owner reserves the right to designate representatives to perform functions associated with the Owner described in this specification section.

3. All contract documents associated with this project – including this specification section and associated drawings – shall be considered confidential and not be copied or distributed unless formally approved by the Owner.

C. Related Documents and Specification Design

1. Additional documents associated with this specification section include the Contract Drawings and other specification sections associated with the project.

2. The three parts to this specification section are:

a. Part One: General – defines administrative and procedural requirements specific to the project.

b. Part Two: Products – includes specific information about the BHS and the equipment used in this project.

c. Part Three: Execution – specifies basic onsite work procedures, expectations and requirements.

3. While the specification and contract drawings are intended to help define and detail the Work to be performed for the project, it is the responsibility of the BHSC to abide with not only these documents and their inherent requirements, but to also ensure that all city, county, state and federal laws, standards and regulations are complied with. These include but are not limited to all the safety, labor and environmental rules, codes and regulations.

D. Contract Drawings

1. The BHS shall be designed, manufactured and installed in accordance with the system layout drawings supplied with the specification. Drawings and renderings depicting the BHS are intended to generally outline the baggage handling system desired.

2. The contract drawings provide the intent of the layout and design of the proposed BHS.

    a. It is the responsibility of the BHSC to modify as required the contract drawings the BHSC employs as a base for its design to ensure that the installed BHS is constructed in the intended manner described in this specification and the contract drawings.

    b. The BHSC is responsible for the accuracy, performance and functionality of the final design of the BHS and is the final engineer of record.

3. Exact building dimensions, interferences, project content positions and lengths as determined by exact field measurements are the responsibility of the BHSC, and should be reflected in the BHSC submittal drawings.

4. Contract drawings note modifications and alterations to existing facilities and structures. It is the responsibility of the BHSC to notify the Owner of all modifications that have not been included in the drawings but are required for the BHS to function as specified.

5. Facility drawings for this project are provided by others. It is the responsibility of the BHSC to validate the accuracy of facility-related drawings and the resulting impact on the BHS. It is the responsibility of the BHSC to notify the Owner of any variance.

6. The BHSC shall notify the Owner in writing of any deviation in the specification and the contract drawings.

E. References

The BHSC shall provide appropriate references to the contractor's ability to conduct this work in a timely and acceptable manner within all the constraints that will accompany this work.

F. Bid Response

1. All BHS equipment required for this project shall be designed, manufactured, installed and tested in strict compliance with this Specification.

2. Prior Review and Acceptance – Project Content required by the Specification is based on long-established industry standards and the Owner's requirements for quality, reliability, uniformity, and low cost of ownership.

3. Substitutions – Any substitution of Project Content by the BHSC requires prior acceptance by and express written consent of the Owner.

4. Clarifications – Any request for additional information, clarification, or variance to the Specification shall be submitted by the BHSC to the Owner as a formal Request for Information (RFI).

G. Site Reviews and Inspections

1. All pre-bid site inspections are the responsibility of the BHSC and shall be coordinated with the Owner.

2. Field Measurements – It is the responsibility of the BHSC to be thoroughly acquainted with the project site and to verify all field measurements, obstructions and interferences necessary for the proper design and installation of the Project Content.

3. Periodic Review – The BHSC is subject to periodic review by the Owner during the design, manufacturing, installation and testing phases of the project.

1.2. Scope of Work

A. General

1. The BHSC for this project shall provide a fully operable and maintainable baggage handling system that performs according to specified requirements.
2. The BHSC shall provide drawings depicting the final design and installation of the BHS.
3. The BHSC for this project shall provide a safe environment in which personnel who access, operate and maintain the completed system may conduct their daily responsibilities.
4. All work performed on this project by the BHSC shall be conducted with its own labor or sub-contracted labor. All tools and equipment necessary for the completion of this project are the sole responsibility of the BHSC and its representatives.
5. All supervision regarding the design, manufacturing, implementation and installation for this project is the sole responsibility of the BHSC.
6. All plumbing, mechanical and electrical rights-of-way shall be maintained unless otherwise stated on the Contract Drawings. Any divergence from this shall be first requested and then coordinated, if accepted, with the Owner.
7. It is a requirement that the BHSC visit and become familiar with the site before bidding on this project. The BHSC is responsible for reviewing all drawings, the specification and related documents produced for this project.
8. It is the responsibility of the BHSC for this project to identify and report any obstacle involving the building or other relevant infrastructure that may adversely affect the completion of this project. Any modifications or other changes to these facilities that are necessary shall be reported to the Owner.
9. The BHSC will be responsible for providing technical support personnel, test/monitoring equipment, all test material, personnel for pre-test preparation, handling of test material, handling of test material during testing periods and post-test handling of test material.
10. To ensure proper design of the baggage handling system interface and related methodology, design review meetings will be held between the BHSC and the Owner. The meetings may, at the Owner's discretion, be held via conference call, provided all associated documentation is transmitted to participating parties in advance.
11. The BHSC shall make available terminal strips for door faults and security and fire alarm connections in each MCP for the inbound claim units. The BHS PLC system shall be pre-programmed to accommodate these connections. There shall be jumpers installed at the fire and security alarm connections that will be removed once the fire and security alarms are connected to the terminal strip by the appropriate contractors. The terminal strips shall be clearly marked, and the connections identified on the MCP drawings
12. All BHS related doors shall be capable of being connected through the BHS PLC to the appropriate building interfaces for those doors. The BHSC shall coordinate with the contractors for these building interfaces to ensure the correct completion of these connections if required by the Owner.
13. Any time a conveyor crosses a Security Identification Display Area (SIDA) line, a fire/security door is required with a conveyor split at the door's location. Appropriate fire control logic and emergency power connections are required for the doors and associated conveyors.

14. Large equipment shall not be employed to move BHS components within the public areas. The BHSC shall bring in equipment and components to the actual work site by hand truck and not forklift. The finished floor surface, such as tile flooring and carpet, in the public area shall be protected during working hours and removed during airport operational hours.

15. In public areas, the BHSC shall construct temporary walls with metal studs, vinyl covered gypsum board and visqueen sealed to the ceiling around the equipment prior to demolition and replacement. A hollow core door shall include a lock to keep the public from entering the construction site. The temporary wall shall not limit or otherwise impede access to other operational claim devices. The walls shall be removed upon completion of work.

B. System Overview and Description

1. The Work for this baggage handling system (BHS) project will be conducted at Long Island MacArthur Airport.

2. This specification section and project overview describes the baggage handling system as a result of the Work provided by the BHSC. It also provides some – not to be considered all – of the special conditions the BHSC is required to address during the course of the project.

3. The BHSC shall design, manufacture, install and commission (including Owner's testing) the new equipment and subsystems.

4. Four inbound flat plate devices located in both the public and ramp areas of the terminal shall be demolished and replaced by four new flat plate devices located within the public area only and with single input feed lines loaded from the ramp. These four subsystems include new BHS doors for each of the four feed lines. Key Switches shall be utilized to activate load conveyor control stations.

5. The BHSC to provide a 2" gap and finger guards between identified conveyor locations to allow for the future installation of new ATR/RFID scanners on the load conveyor.

6. The BHSC shall provide a new manually loaded oversize inbound slide with fire door and draft curtain.

7. All equipment located within the public area shall be installed with stainless steel cladding and trim elements.

8. The new inbound equipment shall be powered and controlled by Motor Control Panels (MCPs) and Programmable Logic Controllers (PLCs). The MCPs and PLCs shall be appropriately sized to meet the requirements of the new equipment. Provide an ethernet connection between the MCP PLCs and the master PLC.

9. All equipment shall include associated control features and field devices, such as warning alarms, photocells and control stations, as required. See the Contract Drawings for the types, numbers and locations of these devices.

10. The BHSC shall provide appropriate visual and audible alarms at the load belts in the secure side. See contract drawings for devices and locations.

11. The BHSC shall utilize merge logic for bags moving to the claim devices from the inbound feed belts. The inbound feed belts will also have reverse jog functionality.

12. The BHSC shall also:

    a. Update the existing monitoring and reporting tools to reflect the new equipment with the existing BMS. This includes the fault monitor (text and graphic), the report interface and any relevant workstation features. The BHSC shall ensure that all features of the existing system are maintained in these updates… All work must be coordinated with Emtec.

    b. Provide new electrical and mechanical installation drawings, PLC program ladder logic diagrams and an electronic-based Operation & Maintenance manual set to detail operational and maintenance requirements and procedures for the new equipment and inbound BHS.

    c. Bags shall not stop at the back wall where a person would have to step onto or over the device to retrieve a bag.

    d. Provide protective guard railings as required for the load conveyors and other BHS equipment within the tug areas.

    e. Provide equipment that will have operational longevity for a location that has cold winters, high humidity, and may have hurricane level weather.

    f. Conduct much of the Work during restricted timeframes, primarily during non-operational periods of time at night.

    g. The BHSC shall provide protection of the equipment, ceiling, flooring, TV monitors, advertisements, etc. in and around the area where work is conducted

    h. Ensure that the new claim devices cover the flooring exposed by the demolition of the existing devices. Ensure that the result is a clean and attractive installation of the new devices. Replace carpet tiles as required.

    i. The BHS doors and conveyors immediately upstream and downstream of the BHS door shall also be on Life Safety Power.

13. The project will be a phased implementation that will require a minimum of two (2) claim devices be operational throughout the project. This number will be established after a further review of airport capacity requirements. The BHSC shall coordinate with the Owner to ensure airport capacity needs are met during the project.

1.3. DEFINITIONS AND ACRONYMS

A. General Conditions

The following terms, abbreviations and acronyms are used in this Specification and shall be incorporated into all correspondence, drawings and documentation required under the Specification.

B. General Terminology

1. ACS – Access Control System
2. AFSD – Assistant Federal Security Director (TSA personnel).
3. AGMA – American Gear Manufacturers Association
4. ANSI – American National Standards Institute
5. AOA – Airport Operations Area. The areas on the airport intended for the movement and parking of aircraft.

6. As-Built – The actual as-built status of the BHS, as opposed to the as-designed status.
7. ASTM – American Society of Testing Materials
8. ATO – Airport Ticket Office
9. AWS – American Welding Society
10. BHS – Baggage Handling System shall mean all Project Content, including equipment, installation materials, interfaces, components, hardware, software, installation, coordination, and construction supervision of computers/PLC, controls, and control hardware and software, management and support services required to implement the work and supply a fully functioning system as described by the Contract Documents.
11. BHSC – Baggage Handling System Contractor shall be synonymous with Equipment Contractor, Equipment Supplier, Baggage Contractor, Baggage Handling System Contractor Supplier, and Contractor, and shall mean the firm or company that is responsible for the design, engineering, manufacture, modification, installation, testing warranty and technical support of the conveyor equipment and systems required to implement the work and supply a fully functional system as described by the Contract Documents.
12. Bill of Quantities – A document named therein as a Bill of Quantities issued to tenderers by, or on behalf of, the Owner/Airport Authority, stating quantities of work to be carried out.
13. BIM – Building Information Modeling (or Model)
14. Cat. # – Manufacturer's catalog number
15. CBIS – Checked Baggage Inspection System
16. CEMA – Conveyor Equipment Manufacturers Association
17. Completion – That stage on the execution of the Work under the Contract when the Works are completed and all other things required by the Contract to be performed by the BHSC before completion have been performed and accepted; or,
    a. Where contract and/or Specifications provide a period of time for completion, the last day of the period; or,
    b. If the Owner/Airport Authority grants an extension of time for completion, it means the date resulting from the extension of time granted by the Owner.
18. Contract – Deed of agreement between the Owner/Airport Authority and the BHSC for the performance of the Works, together with all schedules, attachments, annexure, and other documents incorporated into this Contract.
19. Contract Drawings – The Contract Drawings referred to in these written Specifications or the Contract. The Owner and/or Airport Authority may, from time to time, supply modifications/revisions of such drawings and other drawings to the BHS Contractor for the purposes of the Contract.
20. Construction Manager – A firm or person or such other manager as may be appointed by the Owner/Airport Authority for the purpose of the Contract and, so far as concerns the functions exercisable by the Construction Manager, includes his nominated representatives.
21. cw – Clockwise as related to direction of travel

22. Date for Completion – Where the Contract provides a date for completion; or,
    a. Where Contract and/or Specifications provide a period of time for completion, the last day of the period; or,
    b. If the Owner/Airport Authority grants an extension of time for completion, it means the date resulting from the extension of time granted by the Owner; or,
    c. The date certified by the Owner/Airport Authority in a Certificate of Completion to be the date upon which the Works have reached completion.
23. Day – A calendar day
24. DFSD – Deputy Federal Security Director (TSA personnel).
25. DHS – U.S. Department of Homeland Security
26. DOT – U.S. Department of Transportation
27. EOD – End of Day
28. FAA – U.S. Federal Aviation Administration
29. FAS – Fire Alarm System
30. FIDS – Flight Information Display System
31. fpm – Foot/feet per minute
32. FOB – Free On Board
33. FSD – Federal Security Director (TSA personnel)
34. HVAC – Heating, Ventilation and Air Conditioning
35. IATA – International Air Transport Association: Organization that creates working standards within the aviation industry.
36. IEC – International Electrotechnical Commission
37. JIC – Joint Industrial Council
38. LEED – Leadership in Energy and Environmental Design
39. MEP – Mechanical, electrical, and plumbing system
40. NA – Not applicable
41. NEC – National Electrical Code
42. NEMA – National Electrical Manufacturers Association
43. NFPA – National Fire Protection Association
44. NIST – National Institute of Standards and Technology
45. NTEP – National Type Evaluation Program
46. NTP – Notice to Proceed
47. O&M – Operations and maintenance
48. OD – Outside Diameter
49. OEM – Original Equipment Manufacturer.

50. OSHA – Occupational Safety and Health Administration
51. Other Contractor or Other – A firm or person other than the BHSC who shall enter or has entered into a Contract with the Owner/Airport Authority.
52. Owner – The individual, company, partnership, corporation, airline, airport or port authority that will take ownership of the specific Baggage Handling System defined by the Specification.
53. PM – Preventive maintenance
54. P/N – Part number
55. Project – Construction of the Owner/Airport Authority baggage handling system as described in the Specification.
56. Project Content – The mechanical equipment, electrical equipment, control devices, computer hardware, software, PLC logic, or other work product necessary for the completion of the BHS. Project content shall conform to the requirements of the specification, and any variance from the components specified requires a Request for Substitution (RFS) as defined in the Specification.
57. RFI – Request for Information. A formal written request to the Owner from a bidder or BHSC requesting additional information or clarifications to the Specification.
58. RFP – Request for Proposal. A formal written request from the Owner to qualified BHSCs for a proposal on the BHS defined by the Specification.
59. RFS – Request for Substitution. A formal written request to the Owner from a bidder or BHSC requesting permission to substitute an approved equal product, component, service or action from one called out in the Specification.
60. RT – Real time
61. SIDA – Security Identification Display Area. This includes the secured area and other areas that the airport or airport operator feels is appropriate. Each individual in this area is required to have airport-approved photo identification or be escorted by someone who does.
62. SP – Spares
63. Specification – The Specification is that document set composed of a specification and contract drawing(s) that define a specific Baggage Handling System for a specified Owner. The Specification and its component parts are an integral part of the Contract Documents for the specified project.
    a. Specification – As used herein, the document prescribing the requirements and deliverables for the project specific Baggage Handling System.
    b. Contract Drawings – The Contract Drawings
64. Temporary Work – Any work required in the execution of the Contract, but not forming part of the Works.
65. TSA – Transportation Security Administration
66. Work – The whole of the work to be executed in accordance with the Contract, including variations provided for by the Contract.
67. USGBC – United States Green Building Council

68. UL – Underwriters Laboratories
69. Work Under the Contract – Any work the BHSC is, or may be, required to execute under the Contract including variations, remedial work, and Temporary Work.

C. Baggage System Terminology

1. 45-degree Merge – Two conveyor lines that intersect at a 45-degree angle, requiring bags from one conveyor line to be interjected onto the other conveyor line.
2. AC – Alternating Current
3. ACS – Access Control System
4. ALM – Sonalert warning device
5. APB – Alarm silence pushbutton switch
6. Assembly – A collection of parts or components that in a whole performs a common purpose; examples would be products such as vertical or horizontal merge and sort devices.
7. BF – Width between Frames. The conveyor width between side frames of the conveyor bed section.
8. BHS Doors – Doors associated with and controlled by the BHS, including security, fire and environmental doors.
9. BOM – Bill of Material. A listing of raw materials, sub-assemblies, sub-components, parts and the quantities of each needed to manufacture an end product.
10. bpm – Bags per minute
11. Cascade – Usually referred to as cascade stop or cascade start. The process by which conveyors start or stop, one at a time, in a sequential fashion.
12. CB – Circuit Breaker
13. Claim or Claim Unit – A recirculating flat pallet or sloped pallet device in the public view area of a BHS where passengers claim their bags.
14. Component – Generally used to refer to purchased constituent parts of a larger assembly performing a pre-defined operation, more often used with electrical assemblies such as the various electronic components of an automatic tag reader.
15. Control Room – Area where operators are stationed to control and monitor baggage handling system and/or EDS equipment.
16. Controls – Various types of switches, pushbuttons, and status indicators used to control and monitor system operation.
17. CPB – Door close pushbutton switch
18. CRB – Sort controller jam reset pushbutton switch
19. dBA – Unit of measure for sound intensity.
20. DC – Direct Current
21. Downstream – Refers to area(s) of the BHS through which a bag travels after reaching the point of reference.

22. DR – Powered or non-powered fire, environmental or security door
23. EPB – Emergency stop push/pull switch
24. FAS – Fire Alarm System
25. Head End – The discharge end of a conveyor.
26. Hp – Horsepower
27. Hz – Hertz
28. ID – Identification number
29. I.D. – Inside diameter
30. I/O – Input/Output. Typically, communications traffic into and out of electronic devices.
31. IOP – Input/Output Panel
32. IPB – Illuminated Pushbutton: A manual device that an operator activates to achieve a desired function, which contains a lamp used for status indication.
33. JFB – Forward jog pushbutton switch
34. JRB – Jog reverse pushbutton switch
35. JSW – Jog selector switch
36. KSW – Key-operated switch
37. LED – Light emitting diode
38. Load Conveyor – Conveyors designed for loading and unloading bags.
39. Lower Level Controls – PLC-based control systems that provide control functionality to the BHS equipment, including conveyor start/stop, bag tracking, back-up sort control and other basic control features of the BHS.
40. LPB – Alert lamp reset pushbutton switch
41. LS – Limit Switch: An electro-mechanical device used to detect the presence of an object. This type of device contains an arm, which when activated by another object, will cause on-board electrical contacts (normally open and/or normally closed) to change states.
42. MCP – Motor Control Panel. Power and/or controls enclosure used to distribute power and/or data within a BHS.
43. Merge Point – Location in a BHS where conveyor lines intersect, requiring bags from one or more conveyor lines to be injected onto a single conveyor line.
44. MOL – Motor overload
45. Motor Overload – A device used to detect when a motor is exceeding its rated level of operation.
46. MSD – Motor Safety Disconnect switch: A device used to remove power from a motor by breaking the electrical power circuit.
47. MSP – Motor starter protector
48. MTRF – Motor Fault

49. OPB – Door open pushbutton switch
50. PB – Pushbutton. A manual device that an operator activates to achieve a desired function.
51. PBS – Normal stop pushbutton
52. PE – Photocell: A device that emits a ray of light to a reflective object and contains electrical contacts (normally open or normally closed) that switch positions based on whether or not the ray of light is reflected back to the device. This device is typically mounted in conveyor sideguards and is used in baggage handling systems for the purpose of tracking bag position, measuring bag length, and detecting oversize bags.
53. PLC – Programmable Logic Controller. A digital electronic device that uses a programmable memory to store instructions and to implement specific functions such as logic, sequence, timing, counting, and arithmetic to control machines and processes.
54. PT – Power Turn. Any powered curved section of conveyor
55. PTO – Power take-off
56. PX – Proximity sensor
57. Queue Conveyor – Conveyor designed for frequent starting and stopping.
58. RPB – Jam reset pushbutton switch
59. rpm – Revolutions per minute
60. sg – sideguard
61. SM – System map
62. SPB – Start pushbutton switch
63. SS – Stainless steel
64. SSW – Selector switch. A manual operator device containing multiple positions, which is capable of controlling multiple functions.
65. Sub-Assembly – A subgroup of an assembly that is a collection of parts or components that performs a function within a larger complete assembly; an example of this would be the sorting paddles on a horizontal sort device.
66. Tail End – The input end of a conveyor
67. TEFC – Totally enclosed, fan cooled
68. TOB – Top of belt
69. TPB – Lamp test pushbutton switch
70. Transport Conveyor – Conveyors designed for moving bags; not for loading or unloading bags
71. Upstream – Refers to area(s) of the BHS through which a bag travels prior to reaching the point of reference.
72. Upper Level Controls – Computer-based control systems that include the BHS automated sort control, reporting and monitoring systems.
73. UPS – Uninterruptible Power Supply. A device that provides battery back-up power to equipment in the event of loss of primary power.

74. UTP – Unshielded twisted pair
75. VAC – Volts, alternating current
76. VFD – Variable Frequency Drive. An electronic device that controls motor speed by varying the frequency of the electrical supply.
77. VOM – Volt ohm meter
78. WA – Warning alarm device
79. Warm Back-Up – In the event of a primary component failure (e.g., PLC) the warm back-up has to be manually switched to become the primary component.

1.4. SUBMITTALS

A. General

1. The following describes the submittal requirements for projects under this Specification. Submittals will be reviewed by the Owner and if necessary returned to the BHSC for revision and re-submittal.
2. Subsequent submittals will not be accepted for review until prior submittals are returned with no exceptions.
3. Submittals shall be delivered in a timely and continuous manner and not collected as a group and then submitted. As a rule, no more than two to three individual submittals will be accepted per week for review. The BHSC shall coordinate the development of the submittals to ensure that this requirement is met without a negative effect on the progress of the project. The Owner will endeavor to review and return submittals within two weeks of receipt. This effort cannot be supported when large numbers of submittals are submitted at the same time.
4. The BHSC shall submit a submittal log containing a complete list with current status of all required submittals.
5. Payment for each milestone submittal outlined in the Submittal Schedule will not be approved until the Owner accepts the submittal.
6. Electrical and mechanical installation drawings shall be delivered on the date as described in the submittal schedule as a PDF file.
7. Submittals shall be submitted electronically as PDF files on DVD or other approved portable memory device.
8. PDF drawing files shall be created full size (E size) at a one-to-one setting to allow for detailed printing at any size.
9. No fabrication, development, purchasing or installation shall occur prior to approval of required submittal by the Owner.

B. Typical Controls Device Description

Drawings and a brief narrative describing the operation of control device function shall be submitted to the Owner according to the submittal schedule.

C. Description of Operation

A narrative and flow charts describing the normal and fault mode operations of the BHS, by system and subsystem, as planned by the BHSC, shall be submitted to the Owner in accordance with the submittal schedule.

D. Catalog Cut Sheets

1. The BHSC shall submit catalog cut sheets for all purchased items.
2. The catalog cut sheets shall be completely legible and have the specific items used in the system highlighted with a shaded arrow.

E. Standard PLC Programming Narrative

The BHSC shall provide a narrative and flow charts of the PLC logic and building blocks planned for use in the BHS.

F. Milestone Master Schedule

1. A detailed, resource driven master schedule shall be submitted to the Owner for review and acceptance in accordance with the submittal schedule.
2. The schedule shall be displayed in graphic form sufficiently large enough to allow handwritten updates directly on the graphic form during the course of the project.
3. Principal dates and activity times shall be displayed for each entry. No activity on the schedule shall have a duration longer than 15 working days, with the exception of submittal, acceptance, and procurement activities, unless otherwise approved.
4. The BHSC shall develop the master schedule so that a maximum of two to three submittal packages are submitted for acceptance/review within any given one week time frame.
5. The baseline schedule shall be updated and resubmitted. Completed activities shall accurately reflect as-built information by indicating when activities were actually started and completed. The schedule shall include the following, for each phase of the project:
    a. Beginning and ending of mechanical, electrical, controls and software engineering for each subsystem or construction phase.
    b. Drawing submittal and acceptance.
    c. Purchased equipment submittal and acceptance
    d. Required design reviews
    e. Long lead item order placement and expected delivery date.
    f. Begin and end of fabrication per subsystem or construction phase.
    g. Shipping dates on-site.
    h. On-dock plant to on-site transportation.
    i. Begin and end of mechanical, electrical and controls installation per subsystem or construction phase.
    j. Milestone dates for completion of pertinent facility interfaces, i.e., permanent system power.
    k. Owner furnished materials and equipment, if any, identified as separate activities.

l. Resource and equipment plan.

m. Equipment item test.

n. Submittal of training and test plan.

o. Submittal of operation and maintenance manuals.

p. Operation and maintenance training periods.

q. Submittal of manufacturer's recommended spare parts list.

r. Static and dynamic system testing by system and subsystem.

s. Demonstration test plan

t. Operational dates by subsystem or construction phase.

u. Punch list rectification.

v. Final acceptance testing.

w. Submittal of as-built documentation.

G. Motor Manifest

1. The BHSC shall submit a motor manifest indicating type, part number of driven equipment, power in horsepower, full load amperes, and speed for all motors in the BHS.

2. The motor manifest shall also provide the following:

a. Conveyor ID

b. Type of conveyor

c. Conveyor length

d. Brake

e. Belt speed

f. Required horsepower (HP)

g. Amps – FLA

h. Bearing life calculations

i. Size of speed reducer

j. BHSC selected additional information.

H. List of Lubricants

1. The BHSC is required to submit a complete list of all the lubricants used with the equipment throughout the BHS on this project. This list is to be itemized according the specific equipment and include information on the amounts used within the system.

2. All efforts should be made to standardize and minimize the quantity of lubricants, first with the manufacturer and then with the lubricant in order to keep the inventory requirements manageable for the airport maintenance staff.

I. Sequence of Operation

1. This document shall describe in detail how each component and application functions based on the BHSC's design intent.
2. Each occurrence of a component, device or assembly of components shall be described in how it relates to other functions within the BHS.
3. Each described function shall contain procedures that include detection, recovery, reactions by the monitoring and reporting systems, and other ancillary – including upstream and downstream – reactions associated with the components, devices or assemblies.
4. If the reaction of a device is unique to that device or its associated conveyors or devices, then all occurrences shall be described. Examples of this would be e-stop zones and start-up, jam and timeout ranges of conveyors.
5. A separate document shall be submitted for each MCP for all of the components, devices and assemblies controlled and powered by the MCP.
6. The content used for these submittals shall be used as a base for the project test plans.
7. The BHSC shall submit a detailed description of the electrical controls, encompassing, at a minimum:
    a. Location and operation of control stations
    b. Location and operation of sensors (proximity and limit switches, photocells, etc.)
    c. Location and operation of VFDs
    d. Operation of MCP and all remote enclosures
    e. Operation of PLCs
    f. Operation of e-stop zones
    g. Operation of security/fire door(s)

J. Mechanical Installation Drawings

1. Mechanical Drawing submittals shall include:
2. A plan view of the entire baggage system, showing in labeled, dashed lines, the content of the drawing package.
3. A set of detail drawings which depict the typical structural connections, conveyor attachments and arrangements.
4. Drawings that depict plan views of the conveyors (inclusive of individual components), and related equipment, augmented with section and elevation views as necessary. Motor locations, conveyor labels, lengths and speeds shall be indicated for each component.
5. Some of these drawings may be combined or omitted as long as the requisite information intended to be portrayed is not obscured or eliminated. All drawings shall have match lines, key code, will be to scale (typically 1/4 inch or 1/8 inch = 1 foot), drawing nomenclature, etc.

K. Electrical Installation Drawings

1. The following electrical drawings shall be submitted to the Owner for review and acceptance prior to any electrical installation:

2. Electrical plan view drawings
3. Electrical wiring connection drawings
4. Wiring connection table
5. Conduit routing drawings
6. E-Stop zones
7. Cable drawings
8. Component mounting drawings.

L. Verification Sheets

All empirical data collected by the BHSC prior to static inspection and dynamic demonstrations shall be submitted to the Owner and included in Operation and Maintenance manuals as part of the documentation requirements in the Specification.

M. Submittal Schedule

	Submittal	Due-by Date
2.	Preliminary Motor Manifest	with Proposal
3.	Typical Controls Device Description	20 days after NTP
4.	Description of Operation	20 days after NTP
5.	Milestone Master Schedule	20 days after NTP
6.	Typical Equipment Drawings	30 days after NTP
7.	Catalog Cut Sheets	30 days after NTP
8.	Standard PLC Programming Narrative	30 days after NTP
9.	Emergency Stop Zone Drawings	30 days after NTP
10.	List of Lubricants	30 days after NTP
11.	Controls Architectural	30 days after NTP
12.	Sequence of Operations	30 days prior to Fabrication
13.	Mechanical Installation Drawings	30 days prior to Installation
14.	Electrical Installation Drawings	30 days prior to Installation
15.	As-Built Drawings	15 days after Startup
16.	Job Permits/Security Clearances	20 days prior to Installation
17.	Spare Parts List	Design complete
18.	Acceptance Test Plan	15 days prior to Testing
19.	Inspection and Demonstration Check Sheets	15 days prior to Testing
20.	Verification Sheets	15 days prior to Testing
21.	Training Outline Plan	15 days prior to Testing
22.	O&M Manual-Draft	15 days prior to Startup

23. O&M Manual/Final — 10 days prior to Startup
24. O&M Manual Revisions — During warranty period
25. Completed Punch List — 10 days after Startup

1.5. DOCUMENTATION REQUIREMENTS

A. General

1. This section defines the requirements for mechanical, electrical and software documentation for the BHS project. Additional requirements may be included as part of the Contract Drawings, that require compliance by the BHSC as an integral part of the Specification.
2. All documentation shall be specific for the project defined in the Specification.
3. All documentation in this article shall be provided electronically within the context of a HTML browser-based documentation set, both on DVD or other approved portable memory device and as an updated link at the Workstation. Essentially, a local-based web site shall be created that will provide access all documentation related to this project.

B. System Drawing Requirements

1. All drawings submitted by the BHSC shall become the property of the Owner.
   a. Each drawing and all drawing related sheets shall have a drawing title block. In addition to information normally presented in the drawing, each drawing title block shall provide the following specific information:
      1) Three-letter airport code for the project location
      2) Name of BHS
      3) Drawing title
      4) Drawing number/sheet number
      5) Drawing date
      6) Drawing revision date and revision number
      7) Names of the engineers, drafters, reviewer and the responsible Project Engineer/Manager involved with the drawings
   b. All drawing revisions shall be foot-noted on the drawing face as well as in the drawing title block.
   c. A copy of red line drawings shall be submitted to the Owner after equipment represented on the drawing is installed. Red line drawings will be used by the Owner for checkout purposes during acceptance testing. All red line drawings shall then be revised by the BHSC's AutoCAD/Revit designers and returned in 14 days for review by the Owner.
   d. The most recent red lined drawings shall be kept and maintained in the BHS work area and or Owner's office or, for MCP drawings, in their respective MCP. The Owner will review and agree upon the accuracy of revised red lined drawings before they can replace previous drawings.
   e. All drawings shall be submitted with the final electronic documentation set as scalable PDF files. These files shall be individuality hyperlinked from a representative HTML page within the final browser-based documentation set.

1) For single file drawing sets with multiple sheets, include an index sheet with hyperlinked descriptors for each sheet within the file.

2) Alternatively, instead of using multi-sheet pdf files, use single sheet pdf files with HTML linked descriptors to each sheet.

2. Mechanical Installation Drawing Requirements – All drawings shall include general arrangements and dimensions of all new, modified, and relocated equipment (plan, elevation, details, and sections, as appropriate) for all mechanical, electrical and related BHS support equipment.

   a. All mechanical project content that appears on plan, elevation, and section drawings shall be identified with the BHS nomenclature and ID as defined in Naming Conventions in Part One of this section and on the contract Drawings.

   b. If standard parts are purchased by the BHSC, reproduced details and identifying part numbers shall be provided.

   c. Detailed drawings shall be provided for any equipment designed and manufactured by the BHSC.

   d. All plan views of the BHS shall be based on an overlay of the building structure

   e. All plan, elevation, and section drawings of the BHS shall show the vertical and horizontal clearances between the BHS equipment and the building structure.

   f. Detailed drawings are required for all BHS equipment framing, supports, hangers, stainless, hardware, catwalk, platforms, cross sections and other support equipment. All work shall conform to specification requirements.

3. Electrical Installation Drawing Requirements – The BHSC shall provide the following types of electrical drawings:

   a. All electrical Project Content that appears on plan, elevation, and section drawings shall be identified with the BHS nomenclature and ID as defined in the Contract Drawings and Specification.

   b. Plan view of the BHS noting the identity, description, operation and location of all electrical control, motor and other related equipment.

   c. Detailed wiring connection drawing noting each control device, control station, motor, etc., in block form with a detail of the field wiring numbers and configuration.

   d. Detailed wiring connection table listing all control devices, motors, brakes, control stations, limit switches, safety disconnect switches, etc., with the respective wire numbers.

   e. Detailed conduit routing diagram for power and control conduit as well as separate conduit used for low-voltage communications (such as shaft encoder signals) indicating size of conduit, size and number of conductors per conduit, junction boxes, control devices, motors, safety disconnect switches, MCPs, warning alarms, etc.

   f. Detailed cable drawing depicting cable identification number, number of conductors, total number of pins in cable connectors and actual pin-out of connectors.

   g. Detailed component mounting drawings depicting mounting details for photocells, photocell reflectors, control stations, lanyard cables, lanyard switches, motor safety disconnect switches, limit switches, proximity switches, wire ways/gutters, etc.

h. Emergency stop zone drawings depicting conveyors and devices and the control station EPBs controlling each zone. The information shall also be provided in tabular form on each drawing sheet. Control Station and E-stop zones with overlaps shall be depicted clearly using colors.

i. Detailed block diagram representing internal layout of components within each MCP, etc.

j. Complete set of schematic diagrams reflecting power and control circuitry logic. The schematics shall have detailed descriptors clearly identifying the function of each device and its associated contact rung location.

k. MCP layout drawings showing enclosure size, type, equipment location, and enclosed component general arrangement.

l. Separate I/O list for each PLC or remote I/O in the panel, and I/O assignments with equipment item numbers.

m. Ladder wiring diagram of each MCP, all other electrical supplied equipment (devices and components) shall include their own ladder diagrams and be referenced and included in the MCP wiring diagram.

4. Drawing Approvals – Fabrication, modification, and installation of any equipment shall not commence until the BHSC has received drawing review approval from the Owner.

   a. In the event the BHSC has not received a reply from the Owner within ten working days for the approval of a submittal of system mechanical or electrical design, the BHSC shall contact the Owner as a reminder that the review was not complete and request further direction.

   b. Approval of drawings shall in no way be construed as relieving the BHSC of any responsibility for the proper design, manufacture, fabrication, installation, and successful operation of the BHS.

5. System As-Built Drawing Documentation – Submittal of as-built drawing documentation shall be reviewed and coordinated with the Owner to determine the exact media and their quantities prior to the delivery of the drawings. The BHSC shall be prepared to provide electronic and paper copies of all as-built drawings, including:

   a. Three sets of as-built drawings on DVD or other approved portable memory device in AutoCAD/Revit for all drawings. Only 2-dimensional drawings shall be accepted. Each individual DVD or other approved portable memory device shall be labeled with the following information:

      1) Three-letter airport code for the project location

      2) Name of BHS

      3) Drawing titles

      4) Description of files contained on the DVD or other approved portable memory device

   b. Two sets of E size paper copies for the mechanical drawings.

   c. One set of 11 inch x 17 inch (B size) as-built electrical drawings with one inch margins shall be bound in light grey binders and placed inside the print pocket of each BHS MCP cabinet prior to acceptance testing.

d. Two sets of 11 inch x 17 inch (B size) as-built mechanical and electrical drawings shall be bound in binders and placed within the maintenance/control room.

e. A laminated copy of I/O list shall be placed directly across from the I/O rack in the MCP.

C. PLC Programming Blocks/Ladder Code

1. The BHSC shall provide a complete set of properly documented PLC program ladder logic diagrams for the BHS. PLC ladder logic code shall have detailed rung and sub-routine descriptors, clearly identifying the function of each device.

2. Vendors shall provide a logic narrative and pictorial diagram with description for each standard programmed subroutine of the system. For example, "Tracking Typical" will include a diagrammed section of conveyor with PE locations and shaft encoders along with a logic narrative of the program function.

D. Operation and Maintenance Information Documentation Overview

1. The O&M documentation shall provide the owners, managers, purchasers, and operational and maintenance staff with all the information they will require to safely, successfully and properly use and maintain the baggage handling equipment and system installed for this project.

2. The documentation set shall include separate, comprehensive documents with information directed toward specific tasks and skillsets.

3. Manual Set Division – Links to all documents related to the project shall be included within the same area of an HTML page or on a separate HTML page.

4. Record of Revisions – details of changes made to the documentation including dates of the changes.

5. Electronic Distribution – The information shall be provided as Adobe Acrobat® PDF or HTML files with HTML pages (browser-based) that allow the user to navigate all the information in an orderly and logical manner. The PDF files shall incorporate bookmarks for each document chapter, at a minimum, in the Acrobat navigational panel to assist in navigating through each document.

E. Baggage System Operation Information

1. The operational staff includes baggage handling personnel. The information generated for this group shall contain details that would also supply management and ownership general information regarding the layout and safe operation of the system. How the system was design and intended for use, including the use of all load and unload conveyors, as well as failure modes of operation shall be incorporated within the contents of the operation information. This should not be complicated or overly detailed technical information. It should be concisely written and short enough to introduce personnel to the system in a quick, to-the-point and efficient manner. Efforts should be made to avoid repeating information.

2. The following paragraphs describe divisions, titles and subject matter. It is not a complete list, only a minimum requirement of necessary information.

3. Definition of Terms – contains information on special language.

a. Staff shall have access to definitions of commonly used terms, phrases, conditions and other special language used around baggage handling systems and equipment.

b. They shall also be informed of definitions of abbreviations and acronyms used in system literature and other places related to the system and equipment.

c. This is also the place to define and discuss naming conventions for equipment and conveyor systems and other common nomenclature used within the installation.

4. System Overview – contains a thorough overview of the system with both visual layouts and a narrative that describes the intent of the system, its inputs and outputs and how the baggage is processed through the system.

   a. Visual layouts shall include a complete view of the full installation, plus separate subsystem views of greater definition that will allow staff to both realize the full breath of the system and its more detailed components. Flow charts may also be used if the flow of information provides an accurate and understandable representation of how bags are processed through the system.

   b. Staff shall be informed of the names of conveyor lines and their special equipment as well as notable areas such as load and unload areas. All of this shall be produced with both narrative and layout presentations.

5. Personal Safety – contains safety information. It is obviously important that personnel coming into contact with the baggage system and its equipment must do so in a knowingly safe manner.

   a. Staff shall be shown how to walk through the entire system and know all the danger points – what they may access and what they should avoid.

   b. A clear and concise description of the equipment – both the mechanical and electrical components – in terms of what the equipment does during operation and what it can do to harm unwary staff shall be described.

   c. All the system alarms and warning sights and sounds shall be described in their full detail. Staff shall be shown when and why they are used and what action, if any, they should take when the alarms and warnings occur.

   d. All the warning signs used on the equipment throughout the system shall be displayed and fully described. These shall also be related to their typical locations and usage throughout the system.

   e. Detailed description of equipment Lockout/Tagout procedures – operational staff must have a thorough understanding of the safety procedures they must undertake before they perform an activity that may create a potentially dangerous condition. These procedures shall be current with OSHA, local codes and other accepted industry standards and policies.

6. Baggage Handling Techniques – includes the special requirements for the successful use of the system. All the special baggage handling techniques must be described in full detail.

   a. Staff shall be given a thorough understanding of how to properly handle baggage without causing personal harm.

   b. They shall be shown what can and cannot be loaded onto the system.

   c. They shall be shown how to properly place IATA tags on the bags and know the importance of placing the bags with tags on the conveyors in a manner that will ensure the scanner's ability to read them.

d. They shall be shown the proper way to place bags into the system to ensure the bags will transport through the system without negative consequences.

e. They shall be shown when tubs should be used.

f. They shall be informed of any special equipment such as oversize lines that may be used in certain circumstances.

g. They shall be informed of system processing capabilities and what precautions they should undertake to ensure baggage does not unnecessarily jam due to improper load timing and spacing procedures.

h. Anything else the BHSC may consider important for baggage handling personnel to know about how bags can be and are successfully transported through the system should be included here.

7. System Operation – contains basic system operational information.

a. Staff shall be shown how to start the conveyors using all the procedures they may encounter throughout the system, such as key activated control stations and any other special feature or design.

b. Staff shall be shown how to stop conveyors. They must learn to properly use manual stop pushbuttons. They must fully understand auto-stop functions that are used throughout the system.

c. Staff shall be informed of the use and function of the E-Stop pushbutton. They shall be shown when it is designed to be used, how to use it, when not to use it, and what happens when it is used. They shall also be informed of the full, safe procedures for clearing activated E-Stops.

d. Staff must have a fully developed understanding of all the common faults they may encounter throughout the system. They should be able to recognize jams, oversize, overlength, and other commonly experienced faults. They should know how to safety correct the fault and restart the conveyors.

e. Staff should be confident in dealing with the operation of the conveyors. They should be able to recognize issues that they can respond to and correct, and they should be able to recognize issues that clearly need maintenance staff attention. They should know when to call for help. They also should be versed in various steps they should undertake to troubleshoot and correct any common issue before they call for help.

F. Baggage System Maintenance Information

1. The maintenance staff includes trained mechanical, electrical and PLC personnel who are responsible for properly maintaining and repairing the equipment and system operational controls. Efforts should be made to avoid repeating information.

2. The following paragraphs describe divisions, titles and subject matter. It is not a complete list, only a minimum requirement of necessary information.

3. Overview of System Equipment – includes a detailed description of all the mechanical and electrical equipment, and computer hardware used in the system. These descriptions should give maintenance staff a thorough overview and understanding of the equipment and its use within the system. It should also include descriptions of all special equipment used in the system.

4. Maintenance Safety – contains safety information for maintenance staff.
    a. A clear and concise description of the equipment – both the mechanical and electrical components – in terms of what the equipment does during operation.
    b. All the system alarms and warning sights and sounds shall be described in their full detail.
    c. All the warning signs used on the equipment throughout the system shall be displayed and fully described.
    d. Detailed description of procedures on safe removal of jammed baggage and other fault conditions that maintenance staff will be called upon to correct.
    e. Detailed description of equipment Lockout/Tagout procedures – maintenance staff must have a thorough understanding of the safety procedures they must undertake before they perform maintenance activities. These procedures shall be current with OSHA, local codes and other accepted industry standards and policies.
5. Conveyor Systems and Electrical Control – contains detailed information on the electrical control of the BHS that the maintenance staff may reference for a thorough understanding of the specific control features used in the system.
    a. A thorough overview of the relationship between the mechanical system and the electrical controls for the integrated system.
    b. A motor manifest for all power for the BHS.
    c. Tables with descriptive data on the location, component parts, function and operation of the following control devices (list shall not be considered all that may be necessary to document). These tables shall also be made available as editable spreadsheets for later use in acceptance testing.
        1) MCPs
        2) PLCs
        3) Control stations
        4) Photocells
        5) Security/fire doors
        6) Proximity and limit switches
        7) Visual and audible alarms
    d. Empirical data taken during final testing and checkout for the system that reflects the status of the control and power for the system at the point of beneficial use and final acceptance.
6. Troubleshooting – information in table format describing a Problem Condition, its possible Causes and the proper Correction for the condition. These tables shall be separated by function and shall include all equipment, assemblies and systems.
7. Preventive Maintenance and Equipment Care – contains detailed information on equipment care for the BHS.
    a. This includes a general explanation regarding the servicing requirements for all the equipment – mechanical, electrical, programmable/configurable items, and computer – used in the BHS.

b. Information on how to physically inspect, clean, lubricate and adjust equipment manufactured and installed by the BHSC shall be included.

8. Removal and Replacement of Parts and Components – contains detailed information on procedures for safely removing and installing assembly parts and components – this includes all mechanical, electrical, programmable/configurable items, and computer related parts and assemblies. The information should include but not be limited by:

    a. Safety precautions

    b. List of special tools and equipment required

    c. Torque values

    d. List of lubricants

    e. V-belt tension procedures and values

    f. Drive chain tension procedures and values

    g. Wiring diagrams for the equipment

G. Preventive Maintenance Program

1. Detailed, concise and precise program of when to conduct preventive maintenance procedures.

2. Include week-by-week, month-by-month, semi-annual and annual programs for conducting inspections, cleaning, lubrication, adjustment and replacement of parts and components on assemblies and other equipment within the system.

3. Include all equipment, even that supplied by sources other than the dominant BHS equipment manufacturer.

H. Vendor Supplied Equipment Operation & Maintenance Manuals

1. This area contains O&M manuals and information supplied by the manufacturers for all the purchased assemblies and major components (parts) used in the BHS.

2. The information must be brand specific for the actual equipment/components provided for this BHS.

3. All manufacturer's literature shall include information for proper servicing the assembly, proper operation of the assembly, procedures for programming and calibrating the assembly, and all required information for ordering the assembly. The O&M information shall be no less stringent, descriptive and helpful than the information expected for the general BHS. This is especially important if the BHSC intends to use operations and maintenance information from these manuals in lieu of providing their own information for these assemblies. Failure by the vendor to provide acceptable information will require that the BHSC provide such information within the relevant sections of the larger Operation and Maintenance Information Documentation for this project.

4. All manufacturer's literature shall include parts information with bubbled and exploded illustrations for the various assemblies. The parts information shall include but not be limited to the followings:

    a. Vendor part number

    b. Part description with precise details of the part

c. Quantity each part used

d. Original Equipment Manufacturer of part

e. Manufacturer's part number

5. Assemblies that include integrated electrical control shall include but not be limited to the following:

   a. Detailed wiring connection drawing noting each control device, control station, motor, etc., in block form with a detail of the field wiring numbers and configuration.

   b. Detailed wiring connection table listing all control devices, motors, control stations, limit switches, safety disconnect switches, etc., with the respective wire numbers.

   c. Detailed conduit routing diagram for power and control conduit as well as separate conduit used for low-voltage communications indicating size of conduit, size and number of conductors per conduit, junction boxes, control devices, motors, safety disconnect switches, etc.

   d. Detailed cable drawing depicting cable identification number, number of conductors, total number of pins in cable connectors and actual pin-out of connectors.

   e. Detailed component mounting drawings depicting mounting details for photocells, photocell reflectors, control stations, lanyard cables, lanyard switches, motor safety disconnect switches, limit switches, proximity switches, wire ways/gutters, etc.

6. It is a requirement of this specification that purchased assemblies not include PLC integrated control unless otherwise approved by the Owner. The Owner prefers that PLC control for purchased assemblies be conducted by the BHS's PLCs. If an assembly is accepted and used that does include its own integrated PLC control, then all required PLC and Programmable/Configurable information as described for the BHS equipment shall be included either in the vendor's information/manuals or by the BHSC in the general BHS documentation information.

7. All O&M manuals for manufactured assemblies purchased separately by the BHSC shall include the same warranty and customer service information that is specified for the BHS requirements.

8. All O&M manuals for manufactured assemblies purchased separately by the BHSC shall identify the source of non-proprietary and standard parts used in the assemblies to allow the Owner's direct procurement of the parts.

I. Baggage System Illustrated Parts and Warranty Information

1. This document is designed for management, maintenance and purchasing staff. It shall contain an illustrated parts list, warranty information, and OEM vendor names, addresses and phone numbers. The information within this document shall include anything that will allow convenient purchasing of replacement parts. The following information is considered pertinent to this book.

2. Detailed information regarding the specific BHS warranty conditions and the beginning and expiration dates for the warranty period.

3. Specific instructions regarding the procedures for the documentation and return of failed items under warranty.

4. Customer service point-of-contact names and telephone numbers for warranty questions and concerns.
5. The customer service information shall be provided for normal 8 to 5 Monday through Friday hours and for late-night and weekend emergency access.
6. System Assembly and Component Parts – contains a systematic breakdown of the components used in the BHS. The lists include but are not limited by:
    a. A list in table format of all the major assemblies used in the system relative to their conveyor ID. The list includes the conveyor ID and the assemblies' internal part number and description that can be referenced in the larger consumable parts table.
    b. A list of basic and consumable parts used for each assembly within the BHS with the BHSC part number, description, quantity for the assembly, OEM name and OEM part number. This list shall also contain bubbled and exploded illustrations for the various assemblies that are reference to item numbers within the component table. The illustrations shall be recognizable and display the obvious relationship to each component.
    c. A list of all purchased assemblies used in the system with their conveyor ID, description, OEM model number, and OEM serial number. This also includes software titles, revision levels and serial numbers for computer applications, PLCs, ControlNet cards, system status displays, handheld scanners and other equipment requiring purchased software.
    d. Illustrated Parts List Requirements – This list of parts shall include the following:
        1) Conveyor ID
        2) Assembly level number
        3) Vendor part number
        4) Part description with precise details of the part
        5) Quantity each part used in the BHS
        6) Original Equipment Manufacturer of part
        7) Manufacturer's part number

J. Spare Parts List

1. The BHSC shall submit a consolidated list of consumable parts (mechanical, electrical, computer related and large purchased assemblies) used in the BHS. This information shall recommend spare parts the Owner may purchase for the initial support of the baggage handling system.
2. The BHSC shall provide the Owner a credit value of 1% of the cost of the BHS additions for the purchase of these spare parts as part of the original proposal.
3. Requirements – This list of parts shall be included in the O&M manual. This list of parts shall include the following:
    a. Name of part
    b. Part description with precise details of the part
    c. Quantity each part used in the BHS
    d. Original Equipment Manufacturer of part

e. Manufacturer's part number

f. The BHSC's recommended quantity of spares per each part

g. Unit price (price good for one year)

h. Extended unit price

i. Lead time or availability of part

j. Total cost of recommended spares on list

4. Manufacturer Contacts – A complete list of manufacturers/distributors with addresses and telephone numbers shall also be delivered with the parts list.

5. Critical/Long Lead Items – Those items that are deemed by the BHSC as being critical to the support of the baggage handling system shall be printed in bold-face type. This shall include parts with long lead times. Long lead items shall be described as items requiring greater than two weeks to acquire. The BHSC shall stock these items determined to be critical to the operation of the BHS.

1.6. PRODUCT AND SPARE PARTS SUPPORT

A. General Statement

The BHSC agrees to provide adequate facilities and qualified personnel to fulfill the following product and spare parts support requirements:

B. Requirements

1. Support Duration – The BHSC shall provide product/spare parts support for the equipment required for this project for a minimum period of fifteen years from date of installation.

2. Generic Parts – The BHSC agrees to use standard materials whenever practicable and agrees not to designate such items as proprietary. Switches, bearings, speed reducers, etc., shall be types readily available throughout the U.S.A.

3. Sources – The BHSC agrees to advise the Owner of all non-proprietary and standard parts used in the equipment for this project and identify source of such material to allow the Owner's direct procurement.

4. Written Notice – In the event production facilities for the maintenance of equipment and/or the manufacturing of spare parts peculiar or proprietary to the equipment covered in this project should be discontinued within the fifteen-year period, such discontinuance shall not be effected without reasonable written notice to the Owner. The BHSC shall designate an alternate source of supply to the Owner.

5. Alternates – In the event that the BHSC's vendors cease production of a part and/or component used in the system and/or equipment within the fifteen-year period, the BHSC shall designate a suitable alternate part/component and provide instructions for the installation of the alternate part/component. If the replacement component is not a direct replacement, the BHSC may be contracted to assist in the replacement under a new contract.

6. The BHSC shall provide a depot with start-up and commissioning spare parts at a designated onsite location. These parts shall be used, if necessary, during testing and commissioning of the system. Spare parts purchased by the Owner to support operations after system acceptance shall not be used during this phase. The BHSC may contract with the Owner, upon the Owner's approval, to purchase unused spares acquired for this purpose.

7. Part failures during installation testing and commissioning:

    a. If specific parts fail on multiple (2 or more) occasions during testing and commissioning activities the BHSC shall inform the Owner of a possible problem with the failed items.

    b. The Owner may then request that the BHSC conduct a failure analysis on the failed item(s) to determine the exact cause of the failure.

    c. The failure analysis report shall include a statement of corrective action taken to prevent future similar failures.

1.7. STANDARDS, CODES AND REGULATIONS

A. General

1. The design, manufacturing, installation and testing of the BHS for this project shall conform to all applicable federal, state and local laws, applicable airport requirements, and the following standards, codes and regulations, without exception.

2. In the event of conflict between standards, codes, regulations and the Specification, the most stringent requirements shall apply. The following lists do not excuse the BHSC from complying with standards, regulations and codes not mentioned in this specification, but still relevant to the Project.

B. Standards

1. The design, manufacture, modification and installation of all Project Content provided under the Specification shall conform to the following standards. The BHSC is responsible for ensuring that it references the most current version of these standards.

2. American National Standards Institute (ANSI)

    a. A-1264.1, Safety Requirements for Workplace Floor and Wall Openings, Stairs, and Railing Systems

    b. A14.3 Fixed Ladders

    c. B-20.1, Safety Standard for Conveyors, and Related Equipment

    d. B-29.1M, Precision Power Transmission Roller Chains, Attachments, and Sprockets

    e. B-105.1, Specification for Welded Steel Conveyor Pulleys with Compression Type Hubs

    f. Z-535.1, Marking Physical Hazard Safety Color Code

3. National Electrical Manufacturers Association (NEMA) Standards

    a. ICS-1, Industrial Controls and Systems, General Requirements

    b. ICS-2, Industrial Controls and Systems: Controllers, Contactors and Overload Relays

    c. MG-1, 2011

4. National Bureau of Standards – Handbook H28

5. International Electrotechnical Commission (IEC) Standards

6. American Society of Mechanical Engineers (ASME) – ASME B20.1-2015 Safety Standards for Conveyors and Related Equipment and all Addenda.

7. American Welding Society (AWS) Standards
    a. AWS-A2.0, Standard Welding Symbols.
    b. AWS-C1.1, Recommended Practice for Resistance Welding in Building Construction.
    c. AWS-D1.0, Structural Welding Code.
8. American Gear Manufacturers Association (AGMA) Standards
    a. ANSI/AGMA 6009-A00, Standard for Gear Motor and Shaft Mounted Conveyor Drives
    b. ANSI/AGMA 6034-B92, Practice for Worm Gear Speed Reducers and Gear Motors
9. American Society for Testing and Materials (ASTM) Standards
    a. A-36, Standard Specification for Carbon Structural Steel.
    b. A-167, Standard Specification for Stainless Steel and Heat Resistant Chromium Nickel Plate, Sheet and Strip.
    c. A307-03, Standard Specification for Carbon Steel Bolts and Studs
    d. A-1011, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength, Low-Alloy with Improved Formability.
    e. D378-00 Standard Test Methods for Rubber Belting
10. Conveyor Equipment Manufacturers Association (CEMA) Standards
11. International Air Transport Association (IATA)
    a. Passenger Services Conference Resolution Manual
    b. Recommended Practices 1707, 1740a, 1740b, 1745d, and 1745.
12. National Type Evaluation Program (NTEP) – weights and measures for scales: Handbook 44.
13. Open Device Vendors Association (ODVA) – the organization that supports network technologies built on the Common Industrial Protocol (CIP) — DeviceNet, EtherNet/IP, CompoNet, and ControlNet.

C. Codes
1. The design, manufacture, modification and installation of all Project Content provided under the Specification shall conform to the following codes. The BHSC is responsible for ensuring that it references the most current version of these codes.
2. National Fire Protection Association (NFPA)
    a. NFPA No. 70, National Electrical Code (NEC), with additional emphasis on:
        1) Articles 342 through 362
        2) Article 376
        3) Table 310-16
    b. NFPA No. 75, Standard for the Protection of Electronic Computer/ Data Processing Equipment
    c. NFPA No. 79, Electrical Standard for Industrial Machinery
    d. NFPA 80, Standards for Fire Doors, Fire Windows

3. Underwriters Laboratories (UL)
    a. UL Publication 67, Standard for Panelboards
    b. UL Publication 508, Electrical Motor Control Equipment
    c. UL Publication 845, Electrical Motor Control Center
    d. Amendment 1
4. State and Local Building Codes – Work accomplished under this Specification is governed at all times by the current applicable provisions of state and local building codes.

D. Regulations

1. The design, manufacture, modification and installation of all Project Content provided under the Specification shall conform to the following regulations. The BHSC is responsible for ensuring that it references the most current version of these regulations.
2. Occupational Safety and Health Administration (OSHA)
    a. 29 CFR Part 1910, General Industry Standards Applicable to Construction
    b. 29 CFR Part 1926, Construction Industry Standards for Stairways and Ladders

1.8. PERFORMANCE AND DESIGN PARAMETERS

A. General

1. All BHS Project Content shall be designed to meet the requirements of airline baggage handling and shall adhere to industry standard practices for the safe and efficient transport, sorting and delivery of widely varied baggage payloads, worker safety, durability, reliability and operational efficiency.
2. This section defines the minimum required performance and design parameters for airline baggage handling project content. Additional performance and design parameters may be included in the Contract Drawings, which require compliance by the BHSC as an integral part of the Specification.

B. Units of Measure

All Project Content, drawings, specifications, reports, manuals and communications shall use the U.S. customary units as the primary means of measurement.

C. Language

All drawings, specifications, reports, manuals and communications occurring between the BHSC and the Owner shall be in the English language.

D. Standard Materials

1. All Project Content shall be readily available, generic, non-proprietary materials and equipment whenever practicable, and shall be identified as such. All components such as switches, motors, speed reducers, bearings, bushings, belts, etc. shall be of types readily available throughout the U.S.
2. The BHSC shall advise the Owner of all generic, non-proprietary Project Content and identify the source for direct procurement.

E. Active Airline Operations

1. In the event that airline or airport operations are active concurrent with the installation and testing of the BHS Project governed by this Specification, the BHSC shall conduct all installation and testing activities to ensure that no interruption of the airline or airport operations shall occur without prior approval of the Owner.

2. The BHSC shall notify and coordinate with the Owner a minimum of 72 hours prior to any activities that could impact airline or airport operations.

F. BHS Belt Speed and Throughput Consistency Requirements

1. The BHSC shall meet their own submitted and Owner approved design objectives and system performance criteria. Acceptance of any variance from the stated requirements is at the discretion of the Owner.

2. For testing purposes, system speed and processing rates will be expected to operate within 5% of the approved design criteria.

3. For testing purposes, the number of system (stoppage) fault events (excluding e-stop events) ÷ total bags processed ≤ 0.5%.

4. Bag tag identification shall have a read rate during controlled testing of no less than 98% for the laser arrays and 99% for Radio Frequency Identification.

G. Conveyor Clearance

An 8-foot minimum vertical clearance is required for traffic aisles.

H. Bag Jam Rate Requirements

The maximum acceptable bag jam event rate is one percent. This is calculated by taking the total number of bag jam events divided by the total number of bags in a 24 hour period. No more than three bags, real or virtual, shall be involved in any given bag jam event. CBIS designs shall include measures to facilitate the quick and effective clearing of any bag jam.

I. Materials to be Handled

1. It is the responsibility of the BHSC to produce a system that will safely and successfully transport many different forms of baggage. The following is a list of some of the requirements for the types of material the BHS shall handle. It should not be considered a complete list.

2. Normal – Items which can be processed by the equipment without special handling, including golf bags, garment boxes and duffel bags.

3. Normal Baggage Dimensions and Weight characteristics are:

		Length (in.)	Width (in.)	Height (in.)	Weight (lbs.)
a.					
b.	Maximum	54	24	30	120
c.	Minimum	12	12	4	5

J. System Load Requirements and Processing Rates

1. The Design Load Factor (DLF) for processing loads for all systems provided under this specification shall be the following.

a. The Base Load Factor (BLF) shall be 40 pounds per linear foot.

b. The Speed Factor (SF) shall be the ratio of the load belt speed divided by the current belt speed. As an example, a load belt speed of 90 feet per minute and a transport belt speed of 210 feet per minute would equate to a SF of 0.4285.

c. The Rate Factor (RF) shall be the ratio of the current belt bag per minute rate (bpm) divided by the load belt bag per minute rate. As an example, a load belt rate of 30 bags bpm and a transport belt rate of 33.3 bpm would equate to a RF of 1.11.

d. The equation for calculating the design load factor shall be DLF = BLF x SF x RF. As an example, the DLF using the examples above would be 40 x 0.425 x 1.11 = 19.0 pounds per linear foot.

2. The inbound systems shall operate at 30 bags per minute (bpm) per infeed for claim devices.

K. Length of Service

1. The expected operating life of baggage handling systems provided by the BHSC under this Specification shall be 15 years under normal operating and maintenance.

2. Normal operating conditions are considered to be 20 hours per day, 365 days per year.

L. Environment

1. Baggage systems provided by the BHSC under this Specification shall be designed to meet the following environmental conditions and limitations.

2. Temperature and Humidity – Environmental conditions may be categorized for the application as either "indoor" or "outdoor" depending on the location of the equipment item. In order to determine which category an equipment item shall be required to operate within, the BHSC shall assume the most severe conditions under which the equipment may be exposed.

a. An outdoor or external environment, such as a truck dock or aircraft ramp location, shall have a temperature range of -20°F to 120°F. Relative humidity shall be 0-100%, condensing. Exposure to weather conditions shall be unlimited, as dependent upon the extremes of the local climatic conditions. Electrical requirements shall be protected under a minimum of NEMA-4 code design.

b. Indoor or terminal conditions shall have a temperature range of 25°F to 110°F. Relative humidity shall be 0-100 percent, non-condensing. Indirect exposure to weather conditions shall be assumed. Electrical requirements shall be protected under a minimum of NEMA-12 code design.

c. The design of the BHS related motor control panels (MCPs) and/or workstation (WS) cabinets shall ensure that there is no blockage of air circulation within the MCPs and/or WS cabinets and their related components.

d. Appropriate cooling systems shall be provided for MCPs and/or WS cabinets in conditions where cooling is required in order to properly maintain internal components.

e. MCPs and/or WS cabinets that require forced fresh air circulation for cooling internally mounted components shall be equipped with washable filters on the intake vents of the forced air circulation system.

f. MCPs that contain programmable logic controllers (PLCs) and electronic components that are located in areas of high ambient temperatures that are within 15% of the maximum temperature limit of the related equipment, shall have thermostatically controlled air

conditioners installed to maintain the inside temperature of the enclosure within the temperature limits established by the manufacturers of all components contained therein. The workstation cabinet shall have an audible and visual alarm in the event the temperature is beyond the required range.

3. Radio Frequency Interferences – The equipment provided under this Specification shall not cause interference with communications within the airport or between the airport and aircraft or ground vehicles.

    a. All electrical and electronic equipment, including interconnection wires and cables, shall be designed to operate without malfunction in the presence of normal electromagnetic emissions generated by other equipment installed or used at the airport. The normal airport environments will include various electrical motors and controls, power tools, including welders, automotive vehicles, etc.

    b. Isolation transformers and line suppression, if required, shall be provided by the BHSC.

4. Vibration Limits – The equipment provided under this Specification shall not produce or induce objectionable vibrations into the building.

    a. The BHSC shall provide any and all necessary vibration isolation devices or techniques required to meet this requirement and/or specific vibration limits, as well as any additional specifications that may be imposed at the project site.

    a. The BHSC shall provide certification from a structural engineer registered in the state of the project site that the new equipment does not induce any objectionable vibrations to the building.

5. Noise Limits – The equipment provided under this Specification shall not generate noise which would be annoying or harmful to the public and/or employees. This requirement applies to all equipment in public areas, sort/make-up areas and areas used for manual encoding of baggage.

    a. The requirements defined in the Specification are based on an ambient noise level of 50 dBA in public areas and 60 dBA in non-public areas.

    b. The BHS equipment shall not increase the ambient noise level by more than 15 dBA.

    c. The ambient noise level shall be determined as follows:

        1) All BHS equipment shall be turned off.

        2) All other equipment such as air-conditioning and/or heating equipment shall be on, and outside noise sources shall be normal; i.e., aircraft and mobile ground equipment operating.

        3) Noise level readings shall be taken throughout a zone, 5 feet vertically and 5 feet horizontally from the noise-producing component using a standard ASA sound level meter set to the "A" weighted network.

    d. After the ambient noise level has been determined, the BHS equipment shall be turned on and the total noise level shall be measured at the same points throughout the zone that the ambient levels were measured.

    e. In no case shall the total noise levels exceed 70 dBA above the frequency of 4000 Hz.

6. Seismic Requirements – All equipment shall be designed and installed in accordance with current local, state, and federal seismic codes in effect for the project site. Conveyors shall be laterally and longitudinally sway braced in a manner that restrains the equipment during a seismic event and provides for sufficient clearance or movement relative to adjacent conveyor across the seismic joint.

M. Reliability and Maintainability Requirements

1. Recognizing that reliability and maintainability influence the total cost of equipment ownership, the BHSC shall consider these factors in the design of the equipment. Proposals must reflect an awareness of reliability and maintainability issues. Special provisions, design techniques, etc., incorporated to improve reliability and/or reduce maintenance shall be defined by the BHSC. Proposals reflecting such provisions and techniques will be given favorable consideration.

2. Standardization and Optimization – The BHSC should strive to standardize as much as possible, optimizing the sizing of drive packages (motors and speed reducers) to provide maximum interchangeability of units as well as to minimize spares stocking requirements by the end user.

    a. Standardization of drive packages may require the BHSC to upsize a motor to reduce the number of drive package variations.

    b. For example: A system consisting of (2) 1-1/2 hp motors, (1) 2 hp motor, and (3) 3 hp motors could be upsized to (2) 1-1/2 hp motors and (4) 3 hp motors.

3. Accessibility – The design, construction, and installation of the BHS equipment shall provide maximum accessibility and convenience for inspection, adjustment, lubrication and all other maintenance and operating requirements.

    a. Suitable doors or removable enclosures shall be provided within the actual conveyor equipment for this purpose. The general contractor, based on size and location information as provided by the BHSC shall provide access points within the building structure.

    b. Conduit runs shall be mounted so as to not restrict maintenance access to BHS equipment, conveyors, and system/conveyor components that may require servicing. Conduit runs shall not be run/mounted on outer radius sideguards and/or perimeter chain guards of power turns, or on merge conveyor sideguards.

    c. Design criteria shall include provisions for access to parts and components requiring maintenance and service. Configuration and replacement requirements shall address the goal of no more than two maintenance personnel servicing or replacing a part or component in a period not to exceed two hours.

    d. Precedence of maintenance access shall take priority over fabrication, manufacturing, and installation techniques. Disassembly of components that are not directly involved with the repair or replacement of the affected parts should not be necessary during the repair or servicing functions.

    e. The BHSC shall provide maximum accessibility for the repair or replacement of parts or assemblies in lieu of parts, or other removable and replaceable equipment items without having to move, remove, or dismantle associated equipment, other equipment, or structural items in the area.

    f. Lubrication fittings, lubrication manifolds, electrical controls, etc., shall be located wherever possible with maximum access as a prime design objective. This shall also mean that in areas where there are catwalks, the drive assemblies, motor safety disconnect switches,

photocells, limits switches, control stations, etc., shall be mounted so that they are readily accessible from the catwalk.

g. In areas where the underside of the BHS equipment or conveyor section is inaccessible, the BHSC shall provide means of access on both sides of the BHS equipment and/or conveyor for maintenance purposes.

4. Preventive Maintenance – Preventive maintenance (PM) work influencing the system operation shall be accomplished during "off-peak" periods. In no case shall scheduled PM work require more than two hours of full system shutdown. All components shall be designed for replacement within this period of time.

5. BHS Up-time – The selection of programmable controllers and/or workstations/sort controllers, and their related applications designed for this system shall ensure that the related BHS up-time is not less than 99.9%.

N. Safety Requirements

1. All system control methods, circuitry, mechanical equipment, and operating procedures shall consider the safety of the public and that of operation and maintenance personnel. System design shall also consider minimizing possible damage to equipment and the material being handled. If a conflict should arise between safety to people or equipment, safety to people shall take precedence.

2. Fail-Safe Techniques – Wherever an unsafe condition could develop from an equipment failure or a procedural error, fail-safe techniques shall be used to prevent the occurrence of the unsafe condition.

3. Locking Switches – In public areas, all unattended control stations shall be protected with locking type key switches to prevent operation by unauthorized persons.

4. Protrusions – Equipment shall be free of sharp edges and mechanisms that could catch limbs and/or clothing. The material being handled, or any containers in which the material is being handled, shall also not be damaged due to such items.

5. Operator Controls – BHS operating controls shall be convenient, clearly identified, simple, and safe to use. Any possible chance of error shall be minimized. Emergency stop switches shall be provided as required by the Specification.

6. Motor Disconnects – All motors, including those on powered doors, shall be provided with safety disconnect switches to permit shutting off the motor power circuits.

a. Switches shall be equipped with a means to lock the switch in the off position.

b. Motors shall be equipped with a safety disconnect switch that shall disconnect the motor power circuit.

7. Protective Covers – Protective covers or screens shall be provided over moving mechanisms that could catch limbs and/or clothing of personnel performing maintenance duties as defined under the heading Enclosures and Safety Guards.

8. Fall Protection/Restraint – Ensure appropriate fall protection/restraint where equipment is installed at continuous heights.

9. Walking/Working Surfaces – At elevated working levels, ensure appropriate walking/working surfaces, with ladder systems, are designed and installed.

10. Head Protection – Ensure protective coverings are installed to prevent head injury to personnel.

O. BHSC Requirements

It shall be the responsibility of the BHSC to become thoroughly acquainted with the Work involved and to verify at the project site all electrical circuitry and all measurements necessary for the proper design and installation of the BHS and related conveyor equipment.

P. Design Review Meetings

1. The BHSC shall schedule with the Owner design review meetings to assess the project designed under this specification section. There will be multiple meetings and design review sessions conducted during the course of the project.
2. The BHSC shall schedule with the Owner design review meetings that include but are not limited to the following as the general topics the sessions will follow.
    a. Project schedule and construction phasing for the BHS
    b. Overall mechanical design for the BHS
    c. Overall electrical design for the BHS
    d. Safety and ergonomics for the BHS
    e. General conveyor operational expectations
    f. E-Stop zones for the BHS
    g. Merge control
    h. Fire alarm interface coordination
    i. Security control systems and Access Control System interface coordination with Intelitech
    j. PLC system design and connectivity
    k. BHS faults and the resultant BHS actions
    l. Special construction and installation considerations
    m. Testing and commissioning plans

Q. Design Information and Calculations

All mechanical and electrical design information and calculations used for the baggage handling system shall become the property of the Owner.

1.9. WARRANTY

A. General Warranty

1. BHSC shall guarantee quality of all materials incorporated in this project and workmanship of all work performed on this project shall be free from defects under normal use and conditions when operated and maintained in accordance with BHSC's suggested instructions and maintenance program as provided pursuant of compliance with the specifications of this project.
2. BHSC warrants materials and equipment furnished for project as defined in the Specification will be new and of good quality unless otherwise required or permitted by the Specification,

the work will be free from defects not inherent in the quality required or permitted and the work will conform to requirements of the Specification and applicable law.

3. Work not conforming to these requirements, including unapproved and unauthorized substitutions, may be considered defective.
4. The BHSC shall promptly, after receipt of written notification of a defect, correct such defect by repairing or replacing the part(s) of baggage handling system found to be defective within a period of one year from date of beneficial use or of final acceptance of baggage system, whichever first occurs. Beneficial use is defined as the point in time that the Owner begins using the baggage handling system equipment to transport and sort baggage.
5. The BHSC shall also promptly correct and/or repair or replace any damage the BHSC may cause to other work or owner's property in the process of correcting the defective part(s).
6. Following correction of defective part(s) of BHS, BHSC agrees to warrant corrected part(s) for one year from date of correction.
7. The BHSC's warranty obligations and duties shall continue in full force and effect and shall not be altered or voided in any manner, shape or form due to, arising from or relating to owner's operation and/or maintenance of any completed phase of the project.
8. Normal wear and tear, lack of performing regular maintenance and overhaul in accordance with the BHSC's established maintenance and operation manuals (as provided for this project) shall not constitute a defect as provided under this warranty.
9. The foregoing guarantees are exclusive and in substitution for all other warranties, obligations and liabilities of BHSC with respect to baggage handling system's warranties, except as specifically set forth below.
10. The foregoing guarantees and obligations shall not deprive the Owner of any action, right or remedy otherwise available for breach of any of the provisions of the project contract documents. The periods referred to above shall not be construed as a limitation on the time in which the Owner may pursue such other action, right or remedy.

B. General Warranty Terms

Warrant the baggage handling system for one year against defective parts and labor from the date of beneficial use of the baggage handling system, and for five years against defective design beginning on the final acceptance date of the complete baggage handling system.

C. Warranty Labor

1. The BHSC is liable for normal warranty labor repair expenses during the warranty period. The BHSC may contract with a third party with the approval of the Owner in order to meet this requirement.
2. The BHSC shall provide all labor for work related to design deficiencies.

D. Parts Warranty Terms

1. BHSC to be liable for providing new replacement parts for any defective and/or failed components, over and above those failures caused by normal system wear and tear, for a period of one year from the date of beneficial use of each phase of the baggage handling system.
2. New warranty replacement parts shall be shipped freight pre-paid to the location specified by owner.

3. Failed/malfunctioned parts shall be returned to the BHSC, FOB, within thirty days of notification of detection of such failed/malfunctioned parts.

4. Spare Parts

   a. The BHSC shall provide the Owner with a recommended spare parts list as per the submittal schedule.

   b. The Owner may, on BHSC recommendations, purchase and stock onsite necessary spare parts.

   c. If the baggage handling contractor has cause to believe item(s) may require stocking pursuant to the terms and conditions of warranty provisions that the Owner declines to stock, the BHSC shall stock such items separately at no cost to the Owner. In no case shall the absence of appropriate spare parts be construed in any way to abridge or interfere with the responsibilities of the BHSC for warranty services as defined herein.

E. Failure Analysis Report

1. The BHSC shall conduct a failure analysis on warranty return items to determine the exact cause of the failure.

2. BHSC shall submit failure analysis report to the Owner. Included in failure analysis report will be a statement of corrective action taken to prevent future similar failures.

F. Design Warranty Terms

1. BHSC shall warrant, for a period of five years from date of final acceptance of the complete baggage handling system, that the design of the delivered baggage handling system and its related equipment is free of design faults and defects in design, will conform to the functional and technical requirements and the project specifications and drawings contained herein; will comply with all laws, statutes, ordinances and codes applicable at the installation site; and will be suitable for the intended purposes.

2. Design failure

   a. In event design failure occurs during warranty period, BHSC shall replace all such components, assemblies or devices utilizing design in a similar application where the failure occurs by components, assemblies or devices redesigned to prevent such occurrences at no cost to the Owner; submit proposed redesign drawings and re-selected component designations to the Owner for approval; and issue a new warranty period upon the replacement of redesigned items.

   b. Components, assemblies or devices shall be considered as design failures if any of the following occurs during the warranty period:

      1) Frequent activation of overload protection elements in similar devices.

      2) Loosening of anchoring or attachment provisions on similar devices.

      3) An increasing level of noise being generated by similar devices.

      4) A structural failure.

      5) Inappropriate action of control or sensor elements during operational conditions.

      6) Occurrence of an accident or safety hazard revealed during operational conditions.

7) Uncovering of a condition of specification non-compliance or degradation of specified functional requirements during operation.

G. Warranty Procedures

1. If, within five years from the date of final acceptance of the complete baggage handling system, the baggage handling system or any equipment or material is found, in any respect, not to conform to the design warranty set forth herein, within 48 hours of notification by the Owner, initiate the following series of steps to correct the deficiency:

a. Determine cause of failure and prepare drawings showing recommended design changes and submit to the Owner.

b. The Owner will comment with a change request or approval.

c. After the Owner has reviewed and approved the design changes, the BHSC shall ensure that all components of the system incorporating the same design deficiency will be modified as agreed.

d. The parts warranty period and the design warranty period beginning with the date that a defective design change has been incorporated for those components related specifically to the design change, shall be for a period of one year.

2. If an occurrence of the type listed above can be isolated to a particular portion of the BHS and/or to an isolated part of component, and as such, may not reasonably need to be treated as an over-all design defect affecting all other similar sections of the system or any other like parts or components. The actions taken by the BHSC when such a design defect claim is made by the Owner shall be to:

a. Investigate and correct the claimed defect at the earliest possible date.

b. Prevent occurrence of the event.

c. Minimize the down time of the baggage handling system.

PART 2 – PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS AND CONTRACTORS

A. General

1. The following is a list of assembly and manufactured components that may be used in the BHS. Substitutions shall be compatible and approved by the Owner. The Owner retains the right of approval for all equipment used in this installation.

2. All components, parts and assemblies shall be the latest proven version of the equipment and shall be approved by the Owner.

B. BHS Equipment

1. Mechanical Assemblies

a. Power and Spiral Turns

1) Portec

2) Transnorm

b. 45° Merges
    1) Jervis B. Webb
    2) Transnorm
c. Flat Plate Claim and Make-up Devices
    1) Jervis B. Webb
    2) Van Der Lande Industries
d. BHS Doors – Powered Fire/Security
    1) Airport Equipment Specialists, Inc.
    2) Vigneaux

2. Mechanical Components
    a. AC Motors
        1) Baldor
        2) SEW Eurodrive
        3) Reliance
    b. Shaft Mounted Reducers
        1) Browning
        2) Dodge ABS-TXT, Quantis
        3) Link-Belt
        4) Morse
        5) SEW Eurodrive
    c. C Face Reducers
        1) Dodge
        2) Link-Belt
        3) SEW Eurodrive
    d. Bearings
        1) Dodge – D-LOK Series
        2) Sealmaster – MH or Gold Line Skwezloc
        3) Peer – GR Series
    e. Belting
        1) Ammeraal Beltech
        2) Forbo/Siegling
        3) Habasit Globe International
    f. Belt Lacing – Clipper Belt Lacing

g. Lacing Pin – Nylon Covered Steel Cable

3. Electrical Components
   a. Enclosures – Motor Control Panels and Surface Mounted
      1) Allen-Bradley
      2) Eaton B-Line Series
      3) Hoffman
      4) Saginaw Control & Engineering
   b. Motor Starters/Protectors
      1) ABB
      2) Allen-Bradley
   c. Motor Safety Disconnect Switches
      1) ABB
      2) Allen-Bradley
      3) Cutler Hammer
      4) General Electric
   d. Main Panel Disconnect Switches
      1) Allen-Bradley
      2) General Electric
   e. Relays
      1) Allen-Bradley
      2) General Electric
   f. Soft Start Devices
      1) ABB
      2) Allen-Bradley
   g. Photocells
      1) Allen-Bradley
      2) Cutler-Hammer
   h. Selector Switches and Pushbuttons
      1) Allen-Bradley
      2) Cutler-Hammer
   i. Key Operated Switches
      1) Allen-Bradley
      2) Best Lock Co.

j. Limit and Proximity Safety Switches - Allen-Bradley

k. Variable Frequency Devices

    1) SEW

    2) ABB

    3) Allen-Bradley

    4) Mitsubishi

l. Indicator Lamps

    1) Allen-Bradley

    2) Crouse-Hinds Lamps

    3) Federal Signal Corp.

    4) Sylvania

m. Emergency Stop Pushbuttons - Allen-Bradley

n. Audible Warning Alarms

    1) Edwards Co.

    2) Federal Co.

    3) Mallory Sonalert

o. Visual Warning Alarms

    1) Allen-Bradley

    2) Federal Co.

p. Uninterrupted Power Supply

    1) American Power Conversion (APC) Smart-UPS

    2) Ferrups Best Power

q. Terminal Strips and Blocks - Allen-Bradley

r. Hour Meters

    1) ENM co.

    2) Hobbs Corp.

s. Power Distribution Blocks

    1) Allen-Bradley

    2) Bussman

t. Transformers

    1) Acme

    2) SOLA

4. Network Appliances
    a. EtherNet Switches
        1) Allen-Bradley
        2) Cisco
        3) Hewlett Packard
    b. Routers
        1) Allen-Bradley
        2) Cisco
        3) Hewlett Packard
5. Computer Systems Hardware/Software
    a. System Status Displays/Computers
        1) Allen-Bradley
        2) Mitsubishi
    b. Programmable Logic Controllers - Allen-Bradley

2.2. MECHANICAL DESIGN PARAMETERS

A. General

1. This section defines the required mechanical performance and design parameters for airport baggage handling Project Content. Additional requirements may be included as part of the Contract Drawings, which require compliance by the BHSC as an integral part of the Specification.
2. Applicable Standards – BHS Project Content shall conform to all applicable standards, codes and regulations as described in the Specification.
3. Steel – Steel used in the fabrication of the equipment shall be clean and free from rust, rust pits, nicks, and sharp bends. Material forming shall be accomplished by methods that will not fracture or otherwise damage the metal.
    a. Burrs, sharp edges, and sharp corners shall be removed. All parts shall be formed and cut properly to ensure uniformity.
    b. All joints shall be smooth and all corners rounded.
    c. Holes for photocell beams in metal sideguards shall be punched, not burned, dimpled from the inside to the outside and painted to prevent rust.
    d. Unused photocell openings are unacceptable. They are to be closed by using an 11 gauge metal plug, welded-in and ground flush on the sideguard's inside surface, then properly painted.
4. Fasteners – All fasteners shall have a SAE J995/J429 Grade 5 proof strength minimum and be zinc-plated. For structural attachments, the BHSC structural engineer shall specify bolt type and grade as determined by his structural calculations. All fasteners shall be locked with locknuts or nuts and lock washers. All fasteners shall be of an appropriate size for their use and be uniformed throughout the installation.

B. Conveyor Design Parameters

1. Conveyor vertical clear height above the belt should not be less than 36 inches.
2. The live load and dead static load imposed on the building – composed of conveyor components, supports and baggage – used for designing structural elements shall be 100 pounds per linear foot. This will not be the case for merges and conveyors designated as oversize conveyors, which shall be 150 pounds per linear foot.
3. All conveyor equipment shall be capable of supporting a single concentrated static load of 250 pounds.
4. Conveyor Length – No single conveyor shall exceed 50 feet in total length unless formally requested and agreed upon by the Owner. Load belt conveyors shall not exceed 30 feet in total length unless formally requested and agreed upon by the Owner.
5. Bed Frames – The conveyor bed frame shall support the uniformly distributed static load on 10-foot centers (maximum).
    a. Conveyor framework and slider beds shall be constructed of a minimum of 11-gauge steel and shall provide a level surface for smooth movement of baggage, increased belt life and reduced noise.
    b. Conveyor framework and slider bed shall be galvanized where exposed to excessive moisture or corrosive conditions when noted on Contract Drawings.
    c. Slider bed construction shall use a strong and well-braced frame consisting of a minimum of 11-gauge steel formed channel side frame rails with cross braces on a maximum of 3 feet, 4 inch centers on transport lines and 2 feet, 6 inch centers on loading lines. Integral sideguards are acceptable.
    d. Slider bed cross bracing reinforcements shall be a minimum size of 1-1/4 inch x 1-1/4 inch x 3/16 inch steel angle. Vertical and horizontal butt coupling joints shall be provided.
    e. All conveyor bed section horizontal and vertical butt coupling joints shall be bolted together.
    f. The design and manufacture of the bolted horizontal butt coupling joints for bed sections shall ensure the adjacent bed section butt coupling joints are totally drawn together.
    g. Designs that incorporate chamfered horizontal butt coupling joints on the horizontal slider section of the conveyor bed sections are not required to be bolted.
    h. BHSC design standards and manufacturing practices shall be employed that prevent warping, racking or excessive flexing of slider beds under load (audible oil canning). Conveyor bed sections that demonstrate audible oil canning at 40 lbs. per linear foot are not acceptable.
    i. Welding slider bed/frame/bearing support assembly joints is not acceptable.
    j. The use of epoxy, such as Bondo brand, for leveling slider bed butt joints is not acceptable.
    k. All stainless steel (SS) trimmed conveyors shall have a filler plate added to the slider bed to eliminate elevation difference between the horizontal surface of the SS trim and the slider bed.
        1) The filler plate shall extend to within one inch of the stainless steel trim.

2) The lack of such a filler plate causes unacceptable scuffing of the bottom of the belting material and deformation of the belt.

l. Bed frames that restrict access for maintenance or repair of internal parts shall provide service openings on the top or side frame.

6. Conveyor Sideguards – Vertical sideguards shall be formed channel of 12 inch x 12-gauge minimum steel with vertical bracing of 1-1/4 inch x 1-1/4 inch x 3/16 inch steel angle stiffeners on a maximum of 3 feet, 4 inch centers on transport lines and 2 feet, 6 inch centers on loading lines. Actual sideguard height is delineated in the Contract Drawings.

a. Unless otherwise noted, sideguards shall be required on both sides of the conveyor except where baggage is being loaded or unloaded, where only one sideguard shall be required.

b. The BHSC shall use extreme care in the design and installation of the sideguards at the point of intersection with the conveyor fire/security doors. This interface point shall not act as a snag/catch point for baggage or baggage tags.

c. Conveyor sideguards shall be flared on the downstream side of the intersection with fire/security doors subsystems and the downstream transition from no sideguard to sideguard bed sections.

d. All joints shall be flush and ground smooth after installation for a snag-free surface. This includes joints between the sideguards and the bed sections. Welding of joints is not permitted.

e. Adjacent sideguard joints shall be bolted, butt-coupled joints. Coupling of adjacent sideguards or head/tail pulley supports to power turns shall be in alignment with the effective bed width of the power turn to prevent interference with baggage movement. The sideguards of power turns shall not be welded to adjacent straight conveyor sideguards.

f. Transitions in sideguard height require the addition of 45^{o} sideguard transition elements.

g. The use of epoxy, such as Bondo brand, for smoothing adjacent sideguard joints may be acceptable in some cases with prior submittal and acceptance by the Owner.

h. Mounting mechanical or electrical equipment on the outside radius sideguard of merges and power turns is not acceptable as it restricts maintenance access to the outer perimeter chain or guide bearings.

i. In some applications, conveyor control stations may be recess-mounted into the top flat or sloped surface of the conveyor back guard.

C. Conveyor Belting

1. The following requirements provide an example of the belting expectations, exact specifications for the belting may differ slightly for each approved manufacturer.

2. Conveyor belting shall be 3 inches less than conveyor between-frame width (BF) and have a minimum acceptable working tension of 120 pounds per inch of width at 1.5% maximum elongation. All belting shall meet ASTM D-378 with 60-second flame out.

3. Conveyor belting shall be energy efficient and utilize the lowest coefficient of friction as possible for the application. Premium pricing differentials shall be proposed to the Owner for approval of the final selection of belting.

4. In public view areas, for level applications such as load, unload and transport conveyors shall include matte finish with 0.5mm cover friction, low noise bottom <70 dB(A), laterally stiff, 2-ply multi-mono construction.
5. Belting for level applications in non-public-view areas, such as load, unload or transport conveyors:
    a. Thickness Minimum: 0.141 inches
    b. Weight Minimum: 0.6 lbs/sq ft
    c. Rated Load: 120 PIW
    d. Elongation at Rated Load: 1.5% maximum
    e. Modulus: 10,000
    f. Coefficient of Friction (Cover): 0.28 nominal
    g. Coefficient of Friction (Bottom): 0.24 maximum
    h. Working Temperature: 0°F - 180°F
    i. Transverse Rigidity: 0.300
    j. Weave Pattern: Straight warp "A" weave, per attached.
6. Belting for standard use queue conveyors:
    a. Thickness Minimum: 3.1mm
    b. Weight Minimum: 3.3 kg/m2
    c. Strength: 8 N/mm at 1% elongation (Dynamic)
    d. Coefficient of Friction (Cover): 3.00 as manufactured
    e. Coefficient of Friction (Bottom): 0.18 as manufactured
    f. Working Temperature: 14°F - 158°F
    g. Lateral Stiffness: 2-ply multi-mono construction
7. Belt lacing size shall be specified by the belt supplier. BHSC shall provide pulley diameter information.
8. Belt lacing for all straight conveyor applications including conventional merges shall be Clipper Co. Unibar type stainless steel fastener. Unibar type shall not be acceptable in 45-degree merge conveyor application.
9. Belt lacing connecting pins shall be nylon-covered steel cable of appropriate diameter with leader pin.
10. Belting and lacing shall be trimmed in a 1 inch "V" notch fashion. Pin shall be cut and finished per lacing manufacturer's recommendation to ensure it is secure.
11. One Dutchman that is larger than the circumference of the drive pulley may be used on conveyors longer than 20 feet. Dutchmen are not allowed on conveyors less than 20 feet in length.
12. Endless or seamless belting is not acceptable.

D. Conveyor Supports

1. The requirement for support spacing is a maximum 5-foot centers for loading, unloading and oversize conveyors and a maximum ten-foot centers for all other applications.
2. Floor supports shall be standard "H" type design with vertical adjustment of ±3 inches. Floor support vertical members shall be constructed of 10-gauge, hot-rolled formed-steel channel with 10-gauge, hot-rolled universal foot and head plates.
    a. Perpendicular x-bracing is required on all conveyor supports greater than 60 inches in height.
    b. Longitudinal knee-bracing is required on all conveyor supports greater than 72 inches in height.
3. The foot plate shall be attached to the floor with expansion type anchor bolts of a size and number to be identified and submitted by BHSC to the Owner. The number of anchor bolts required for the foot plate shall be determined by the BHSC's structural engineer's calculations.
4. All conveyors shall be adequately sway-braced in lateral and longitudinal directions, and in a manner that meets or exceeds local seismic regulations and codes. Spacing shall not exceed 20 feet.
    a. Additional sway bracing shall be required for any baggage diverting devices, such as high speed-diverters, etc.
    b. All sway bracing connections and points of attachment shall be through-bolted rather than through-welded.
    c. Threaded rod shall not be used for sway bracing.
5. Explosive type anchors are not acceptable.
6. All support structure shall be installed so that maintenance access to conveyor components is not inhibited.

E. Enclosures, Safety Guards and Covers

1. Enclosures, safety guards, covers, etc., shall be designed to permit easy removal and replacement.
2. Conveyors accessible to the public and operations personnel shall be protected by pulley finger guards.
3. All exposed moving parts of conveyors such as, but not limited to, pulleys, rollers, lower or return belts, shafts with projecting set screws, and couplings less than 7 feet-6 inches above the floor, work platforms and stairways, shall be effectively guarded. The guards shall be constructed of at least 14-gauge steel.
    a. Guarding shall be provided for all drive-assembly chain or V-belts. Such guarding shall be a clam-shell design, joined at both ends with long hair pin clevis pins to facilitate quick removal of the top half.
    b. Guarding shall be constructed of at least 14-gauge steel. Use of expanded metal is not acceptable for guard construction.
    c. The BHSC shall paint all enclosures, safety guards and covers safety yellow.

d. Guarding shall be designed with a screened inspection window permitting inspection of chain or V-belts without removal of the guard. Design of the guarding and its installation shall not restrict normal maintenance access, including adjustment of chain or V-belts, and shall not be supported by the motor/speed reducer.

e. Unguarded, exposed sharp corners, edges of items such as support legs, braces, and trim, shall be rounded or removed to prevent injury to personnel or damage to clothing or baggage.

4. Load conveyors shall have a tail pulley end cap to prevent injury to personnel.

a. Load conveyor tail pulley end caps in non-public areas shall be painted and in public area shall be stainless steel.

b. Tail pulley end caps shall not permit vertical deflection when heavy items are placed on the horizontal surface of the end cap.

c. Tail pulley end caps shall permit quick removal of the end cap assembly for servicing conveyor tail pulley components.

5. All BHS Project Content shall prominently display CEMA recommended Danger, Warning and Caution Safety labels on equipment identifying known potential hazards associated with human operation in and around conveying equipment.

F. Stainless Steel Conveyor, Cladding and Trim

1. In public view areas, cladding and trim for all conveyors, claims, scales and wall penetration frames shall be constructed of type 304, 12-gauge stainless steel (SS) with #4 brush finish.

2. All exposed end brackets in public view areas shall be made of stainless steel.

3. The BHSC shall ensure that all SS cladding and trim elements are smooth and flush without opening or projections on which baggage, bag tags, straps or clothing may snag.

4. Back guards shall have flush butt joints and no exposed fasteners.

5. All flat head screws used to attach SS cladding under conveyor belting shall be undercut Phillips head screws.

a. They shall be completely countersunk so that no portion of the screw head extends above the surface.

b. Grinding or filing screw-heads flat is not acceptable.

6. All stainless steel trim shall be designed and installed in a manner that allows it to be removed and reinstalled without significant difficulty.

7. No blemishes in SS fit and finish shall be accepted.

8. Extra photocell and reflector holes and patched extra photocell and reflector holes are not acceptable.

9. Photocell and reflector holes shall be dimpled toward the outside of the conveyor section.

10. All painted surfaces under SS cladding shall be painted black.

11. Stainless steel shall be protected with adhesive-backed paper or plastic during shipping and installation.

G. Painting and Finishing

1. All mechanical equipment in the BHS shall be protected from corrosion and wear by powder coating, painting or galvanizing, depending on the requirements of this project. The BHSC shall submit color chips of powder coating and paint to the Owner prior to fabrication.

2. Painting and Powder Coat Finishing – Conveyor bed frames, sideguards, enclosures, guarding, supports, catwalk, bridges, stairs, ladders, platforms, electrical enclosures, etc. for installation indoors and manufactured of hot rolled sheet and structural steel shall be powder coated or painted with industrial grade enamel according to the colors defined in the Specification, with the following exceptions:

   a. The color shall be approved by the Owner in answer to a formal request.

   b. Conveyor slider beds shall not be painted on any surface that comes into contact with belting.

      1) The powder coating method of painting the entire slider conveyor frame is acceptable. The BHSC is responsible for any issues that arise from this coating method.

      2) The BHSC will provide a document that summarizes the powder coat process utilized by BHSC on its BHS conveyor sections prior to commencement of equipment painting. BHSC will add an activity to its work plan for periodically checking of powder coat performance on a small sample set of conveyors during fabrication and painting. BHSC will create an audit form for review and approval and once approved will track the test results versus published performance criteria for each weekly periodic check. The results of these test results will be forwarded weekly and when all painting is completed for permanent records.

   c. Shafts, pulleys and rollers shall not be painted or powder coated.

   d. Slides and chutes shall be electro-galvanized or fabricated from a minimum of 12-gauge stainless steel.

   e. Pre-painted housings for components such as motors, gear reducers and bearings shall be used as received from component manufacturers.

   f. Unfinished surfaces shall be protected with a suitable rust inhibitor during shipping and installation.

3. Powder Coat Finishing – Thermosetting powder coating materials based on epoxy resins or hybrids of epoxy resins and polyester are the preferred coating material for conveyor equipment in interior installations. The BHSC shall prepare surfaces to be powder coated in accordance with manufacturers' requirements.

   a. Prior to application of powder, all surfaces shall be subjected to an alkaline wash, followed by a freshwater rinse. This is followed by a phosphatizing wash, a second freshwater rinse, and a final rust-inhibiting sealer.

   b. Material is then dried in a furnace prior to electro-static coating. Coated material is then cured in an oven at the powder manufacturers' recommended temperature and time period. Typical times are 10-30 minutes at 400 degrees F.

   c. Typical properties required for powder coating are:

      1) Film Thickness 2-3 mils

2)	Gloss @ 60° Angle	5-10
3)	Hardness	4H
4)	Flexibility	1/8 inch
5)	Adhesion	5b (100%)
6)	Abrasion 500 g	Wear Index 13
7)	Impact (Direct/Indirect)	160 in/lbs
8)	Chemical Resistance	Very good to Excellent
9)	Salt Spray	200 hrs < 1/8 inch

d. Field touch-up of damaged powder coating shall conform to the painting requirements using color-matched touch-up paint.

4. Painting – The BHSC shall prepare surfaces to be painted in accordance with paint manufacturers' requirements and/or as described below. Suitable precaution should be taken to ensure cleanliness during the period between cleaning and other finishing processes. Paint that is flaking, crazing or chipping shall not be accepted.

   a. Prior to the application of any finish, all surfaces shall be free of dirt, grease, oil, flux, flash metal, spatter metal, sand, rust, scale, or oxides, and all other debris that might interfere with the effective application of the finish. Surfaces shall be cleaned immediately before the finishing operation.

   b. For galvanized surfaces, prepare surfaces so prime coat bonds well and adheres permanently. Use a compatible chemical solution such as phosphoric metal etches. Thoroughly remove solution with water and allow to dry.

   c. Apply primer and enamel to provide a surface of high quality appearance free from runs, sags, cracks, flaking, peeling, blushing, or other defects which may affect drying characteristics, durability, and appearance of the painted surfaces. Apply primer and enamel by brushing, spraying, or dipping.

   d. Finish surfaces with not less than one coat of primer and one coat of enamel. Apply the primer and one coat of enamel at the factory. The touch up of enamel, if required, shall be applied at the installation site, after erection, by brushing. When primer and/or enamel applied to the equipment prior to erection has been burned, chipped, or otherwise removed during erection, or where new unfinished metal is installed, finish the exposed surfaces with not less than one coat of primer and a finish coat of enamel of the same color and type as originally painted, after sanding the surface to be painted down to the bare metal. After installation, clean and touch up all scuffed or otherwise marred surfaces, as above.

   e. That part of the bed section that supports the conveyor belt shall not be painted.

   f. Do not obscure equipment nameplates, identification plates, or other identifying markings when painting equipment. Whenever possible, apply plates and markings after painting. In all cases where they cannot be applied after painting, mask or otherwise protect them to retain their legibility. After painting, thoroughly and effectively remove all masking and/or protective coatings.

5. Conveyor Equipment Identification – Equipment such as conveyors, queues, powered and slave-driven, power turns, tapered pulley assemblies, merge conveyors, claim devices, shall be permanently and indelibly marked with the identification number (ID) as defined in the Specification and depicted on the Contract Drawings.

    a. In non-public view areas, the ID shall be carefully and neatly stenciled in four inch black or white (contrasting) characters in a conspicuous location on both sides of the conveyor or device adjacent to the conveyor or device drive assembly. The stenciled IDs shall be readily visible from floor level, use six inch letters if necessary.

    b. Conveyor identification shall be stenciled on a minimum of ten foot centers.

    c. The identification shall be located on the conveyor where it is easily viewed from the ground or from a catwalk or platform. Preferred ID placement is on drive sections and head and tail ends of conveyor.

    d. In public view areas and on queues, the ID shall be in two inch characters in a conspicuous location on the conveyor or device drive.

    e. Temporary ID markings on the conveyors, devices, or other equipment shall be easily removed with water or a readily available commercial solvent that does not damage the paint or other finish.

    f. The BHSC shall coordinate with the Owner for optimum conveyor ID location when specification requirements are problematic or cannot be achieved.

H. Pulley, Shaft and Roller Requirements

1. The maximum shaft run-out of all installed pulleys, shafts and bearings under a no-load condition, measured from the center line of the bearing to the end of the shaft furthermost from the conveyor shall not exceed 0.0075 inches per inch. The maximum run-out of any pulley shell shall not exceed 0.060 inches. All pulley shafts shall be designed to ANSI/CEMA Standards.

2. Intermediate Drives – Drive pulleys for intermediate drives shall be lagged with a minimum 3/8 inch thick vulcanized lagging of 80-90 durometer machined flat faced and equipped with taper bored hubs compatible with Taper Lock, QD, HE, or approved equal bushings and 1-7/16 inch minimum diameter ground and polished AISI 1045 CRS shafts mounted in concentric locking type precision ground flange type ball bearing units.

3. Minimum acceptable belt wrap on drive pulleys shall be 210 degrees. Drive pulley and shaft sizes are determined by maximum belt pull, which fall into three classes:

    a. Normal duty (500 lbs. maximum belt pull) – Consists of an 8-3/4 inch minimum diameter drive pulley and a 1-11/16 inch minimum diameter shaft. Roller chain, if used, shall be not less than RC-60.

    b. Intermediate duty (1,000 lbs. maximum belt pull) – Consists of a 10-3/4 inch minimum diameter drive pulley and a 1-15/16 inch minimum diameter shaft. Roller chain, if used, shall be not less than RC-60.

    c. Heavy duty (1,500 lbs. maximum belt pull) – Consists of a 12-3/4 inch minimum diameter drive pulley and a 2-7/16 inch minimum diameter shaft. Roller chain, if used, shall be not less than RC-80.

4. End Drives/PTOs – Drive pulleys for end drives or power take-offs (PTOs) shall be lagged with a minimum 3/8 inch thick vulcanized lagging of 80-90 durometer, and be 6 inch minimum

diameter, machined crown faced and equipped with taper bored type hubs compatible with Taper Lock, QD, HE, or approved equal bushings and 1-7/16 inch minimum diameter ground and polished AISI 1045 CRS shafts mounted in concentric locking type precision ground flange type ball bearing units.

a. End type drive units shall not be used for conveyors exceeding 25 feet in length.

b. Self-centering pulleys shall be used on all end rollers.

c. End drive pulleys shall be statically balanced when operating at speeds less than 100 rpm, and dynamically balanced when operating at speeds greater than 100 rpm.

5. Head and Tail Pulleys – Non-powered head and tail pulleys shall meet the following requirements:

   a. Head and tail pulleys shall be steel, crowned, and equipped with taper bored type hubs compatible with Taper Lock, QD, HE, or approved equal bushings, and 1-7/16 inch minimum diameter ground and polished AISI 1045 CRS shafts mounted in concentric locking type precision ground flange type ball bearing units.

   b. Head and tail pulleys shall be a minimum 6 inch diameter x 10 gauge wall. Pulleys shall be single-piece steel construction with steel end discs attached to the rim by continuous welding.

   c. Conveyors 15 feet or less in length shall have trapezoidal crowned pulleys.

   d. Head and tail pulleys shall be equipped with jacking bolts for adjustment. Jacking bolts shall be equipped with jam nuts to prevent jacking bolts from loosening.

   e. The gap between the end edge of the slider bed section and the edge of the end pulley nearest to the slider bed section shall be no more than 2 inches.

   f. The gap between adjacent conveyor end pulleys shall not exceed 1 3/4 inches with one inch as the design objective.

   g. All other head and tail pulleys for units not covered under this section shall conform to the requirements described in the Specification.

6. Take-Up Pulleys – Take-up pulleys shall be a minimum of 4 inch diameter steel, flat faced and equipped with taper bored type hubs compatible with Taper Lock, QD, HE, or approved equal bushings and 1-7/16 inch minimum diameter ground and polished AISI 1045 CRS shafts mounted in concentric locking type precision ground flange type ball bearing units.

   a. Take-up pulleys shall be mounted on threaded take-up devices having a minimum of 6 inches of adjustment. All conveyors shall be provided with take-up devices for field adjustment of a minimum of two percent of the conveyor bed length or six inches, whichever is greater. Take-up devices may be an integral part of the drive frames.

   b. Take-up pulleys used in heavy-duty or high-speed applications may require a minimum six inch diameter steel shell, effectively reducing the pulley RPM, to comply with bearing L10 life.

   c. Automatic take-ups devices are to be used:

      1) Where conveyor belts are subject to stretch/shrinkage that will cause weekly adjustment.

2) Where conveyor belt is subjected to extreme temperature and humidity changes such as in outside locations.

d. All take-up pulley bearing adjusters are to be chain coupled so that both bearings are moved simultaneously.

1) For belts greater than 20 feet in length, take-ups shall be positioned initially at 25 percent (±5 percent) of its adjustment range.

2) For belts less than 20 feet in length, take-ups shall be positioned initially at 50 percent (±5 percent) of its adjustment range.

3) Initial positioning of the take-up pulley adjusters shall be completed prior to conditional acceptance inspection.

7. Snub Pulleys – Snub pulleys shall be installed on all conveyors at all points where the non-load-carrying portion of the conveyor belt makes a change in vertical direction. At a minimum, such points of vertical change of belt direction shall include:

a. Immediately adjacent to head, tail, take-up and drive pulleys.

b. Snub pulleys shall be used to ensure 210 degree belt wrap around the drive pulley.

c. Snub pulleys shall be a minimum of 4 inch diameter equipped with taper bored type hubs compatible with taper lock, QD, or approved equal bushings and 1-7/16 inch minimum diameter ground and polished AISI 1045 CRS shafts mounted in concentric locking type precision ground flange type ball bearing units.

d. Snub pulleys used for belt tracking shall be equipped with jacking bolts for adjustment. Jacking bolts shall be equipped with jam nuts to prevent jacking bolts from loosening.

8. Bearings – All bearings except for those on return idlers are to be externally mounted.

a. Flanged and take-up bearings shall be grease-packed for life, self-aligning, anti-friction, and sealed with pinning for anti-rotation of the outer race.

b. Flanged and take-up bearings shall meet the following minimum requirements:

1) Bearings shall have a minimum L-10 life of 70,000 hours. To compensate for the wide variance of loading throughout a full day's operation, the bearing load is to be computed using a 50 percent reduction of the specified live load. Bearing life shall be based on manufacturers' published load rating data for each bearing used throughout the BHS.

2) The BHSC shall furnish bearing calculations to the Owner for review.

3) Bearings and shaft ends exposed at load conveyors, unload conveyors, encoding areas, workstations, or any other work areas, shall be covered by bearing covers or a continuous sheet metal enclosure.

4) Bearings shall be equipped with concentric locking type collar arrangement to secure the bearing to the shaft.

5) All externally mounted bearings shall be equipped with appropriately sized jacking bolts to facilitate bearing position adjustment.

a) Bearing jacking bolts shall be installed so that the base, or cup, of the bolt, not the bolt head, is in direct contact with the bearing housing.

b) Bearing jacking bolts shall be installed with jam nuts.

c) Bearing jacking bolts shall be of the proper length for the application. Use of any extension devices such as socket wrench drive adapters will not be accepted.

I. Drive Assembly Components

1. The following describes the requirements for power units used to drive BHS conveyors and subsystems.

2. Motors and Speed Reducers – Conveyors shall be driven by motors that conform to IEEE and NEMA standards.

a. Motors shall be sized for Class II speed requirements under continuous operations (minimum 1-1/2hp) and shall be capable of withstanding shock caused by frequent starting and stopping under load where applicable.

b. Motors shall be of the constant speed (1750 rpm), continuous service, high efficiency, low-energy type, ball bearing type, with Class H insulation for outdoor equipment and Class F for indoor equipment.

c. Motors controlled by MCPs shall be NEMA-MG-1, TEFC, controlled by starters having thermal overload protection.

d. Motors shall be controlled by VFDs where appropriate to maintain defined belt speeds, to meet drive assembly standardization requirements for reducing spare parts, and where required by the specification.

e. Motors controlled by VFDs shall be VFD rated.

f. Motors shall be appropriately rated to be the most energy efficient for the intended application. Cycle rates for conveyors determine appropriate efficiency rating standards for the motors.

g. The design service factor for motor and speed reducer equipment shall be 1.50; however, actual motor nameplate service factor shall be a minimum of 1.15.

h. Motors with horsepower greater than 5hp shall use soft start controllers or VFDs. For maintenance and spare parts reasons, motors greater than 5hp shall be approved by the Owner.

i. All drive motors and/or speed reducers shall be equipped with drip pans.

1) Drip pans shall be constructed of minimum 14-gauge steel.

2) Drip pans shall be appropriately mounted for the actual application where the pan can be secured and mounted level with a minimum of two bolts.

3) Drip pans shall not be mounted to the speed reducer. Such mounting shall not limit maintenance access.

j. Prewired plug connectors for motor power and communication. Receptacles as follows:

1) Power 4-pin male receptacle

2) Communication 8-pin female receptacle

k. Permanently attach a white phenolic plate engraved with black type located at the drive motor assembly stating the conveyor ID and belt speed of the conveyor associated with the drive assembly.

l. All hollow bore reducers shall use twin tapered bushings for mounting to the drive shaft. Output shaft bushings in work areas shall have protective covers.

m. A split lock washer shall be used at the attachment point between the torque arm and the related mounting bracket.

n. Motor mounts, speed reducer mounts and speed reducer torque arm mounts are to be properly designed to minimize flexing.

o. Gear box orientation shall be vertical and/or horizontal.

p. In low profile applications where shaft mounted speed reducers are not practical, right angle or parallel may be substituted.

q. Drives shall employ shaft mounted reducers with motors mounted to the reducer.

r. Motor bearing life expectancy shall exceed 100,000 hours.

s. When using C face mounts on direct couple drives, use flexible, spider type couplings between motor and reducer shafts at the C face coupling adapter mount. The flexible coupling shall provide protection against any VFD induced bearing currents building up in the motor.

t. Direct drive packages do not require C face mounts.

3. Motorized Pulleys – Motorized pulleys shall not be used unless expressly requested in writing and approved by the Owner. Placing these drives on a drawing for approval is not sufficient; a specific written request must be made to the Owner.

4. Drive Assembly Component Installation Requirements – All drive sprockets and/or V-belt sheaves shall be taper bored hub type, compatible with Taper Lock, QD, HE or approved equal bushings.

a. Sprockets shall be steel with a minimum of 13 Type-B form teeth.

b. Installation practices for the alignment of shafts sheaves and/or sprockets shall be accomplished with a steel straight edge. The use of string for alignment of these components is not acceptable.

c. Roller chain shall be lube-for-life type sized to meet torque and horsepower requirements but shall not be less than RC-60. Roller chain ends shall be connected with a removable connection link.

J. Power Turns

1. Power turn shafts shall be 1-7/16 inch diameter, ground and polished AISI 1045 CRS.

2. Power turn sprockets and sheaves shall be steel.

3. Standard model power turns shall be constructed of steel body frames or bolted extruded aluminum.

4. Angle iron frame supporting the outer sideguard shall be fabricated in two sections on power turns greater than 90^{o} to facilitate quick removal for repairs and maintenance.

5. The gap between adjacent conveyor and power turn end pulleys shall not exceed 1 3/4 inches with one inch as the design objective.
6. The distance between power turn sideguards shall be equal to that of the adjacent straight conveyor's sideguards. All sideguards shall mate so their inside surfaces fit smooth and flush. Baggage conveyor surfaces shall fit so there are no obstructions protruding into the baggage path.
    a. Exceptions may be granted where a narrow straight conveyor joins a wider downstream power turn or a narrow power turn joins a wider downstream straight conveyor, as in ticket counter areas.
    b. The inner radius sideguard of the power turn shall align exactly with the appropriate straight conveyor sideguard.
7. The inside sideguard radius shall be 48-inches.
8. Belt speeds shall be measured at the center of the belt width.
9. Laced belts are required on all power turns.
10. Control devices and conduit shall not be attached to the outside sideguards of turns.
11. Transnorm turn end rollers are factory set and marked, and then moved to release tension for storage and shipping. Rollers shall be readjusted to the factory-determined marks one week prior to the start-up of the system.
12. Portec end rollers are factory set and marked and the bearing position shall be maintained until adjustments are made after the run-in period.

K. Merge Conveyors
1. Merge conveyors shall meet the design and manufacturing requirements for other conveyors as defined in the Specification.
2. 45° Merge Conveyors – 45° merges are high-speed conveyors fed by upstream queue conveyor(s), depending on the application as defined in the Contract Drawings.
    a. 45° merges shall be capable of up to 400 fpm belt speed.
    b. 45° merges shall be capable of stop/start cycles of up to 45 cycles per minute without heat-build-up or adverse wear on the merge and its component parts.
    c. The drive motor on indexing 45° merges shall be controlled by a VFD, and controls designed to stop the merge if no baggage has been detected by an upstream photocell in a preset period of time, initially 10 seconds.
    d. Merge design and manufacturing shall provide for easy access for belt removal, replacement and tracking.
    e. The top of the belt on merges shall be a minimum of 2 inches but not more than 2.5 inches above the downstream conveyor.
    f. Merge speed relationship to take-away belt speed shall ensure that merged items are not skewed on the take-away conveyor.
    g. Merge conveyor equipment and speed shall ensure successful transfer of hard case bags onto downstream conveyors so that jam problems are minimized.

h. Control devices and conduit shall not be attached to sideguards on the drive side of Transnorm merges.

i. The BHSC shall follow the manufacturer's specification for the installation and control of this equipment, and how it interacts with the BHS.

L. Queue Conveyors

1. Queue conveyors shall include the same features as described for standard conveyors in addition to the following requirements.
2. Queue conveyors shall be capable of 400 FPM belt speed.
3. The gap between adjacent conveyor end pulleys shall not exceed 1 3/4 inches with one inch as the design objective.
4. Queue conveyors shall be capable of stop/start cycles at a rate of 60 cycles per minute without heat build-up or adverse wear on the queue conveyors and its component parts.
5. The drive motor on queue conveyors shall be controlled by a VFD.
6. Standard model queues shall be constructed of steel body frames or bolted extruded aluminum.
7. Queue conveyors shafts shall be 1-7/16" diameter, ground and polished AISI 1045 CRS.
8. Queue conveyor sprockets and sheaves will be steel.
9. Queue conveyors design and manufacturing shall provide for easy access for belt removal, replacement and tracking.
10. Queue conveyors design should be such that the conveyor length can be as short as the belt is wide without having an adverse effect on the belt's tracking.
11. Two pulley queues are not acceptable for bag loading applications.
12. All queue conveyors require positive belt tracking.

M. Flat Plate Claim and Sort Devices

1. Flat plate devices shall be heavy-duty crescent plate recirculating conveyors of approved design, as reviewed and approved by the Owner, based on actual operating, maintenance and reliability data. Flat plate devices shall be capable of being automatically fed by an in-feed conveyor system or manually loaded.
2. Design Requirements – the operating rate for flat plate devices shall be 90 feet per minute (fpm). Minimum overall width shall be 35 inches with a minimum width of 29 inches for the conveying surface.
    a. The device shall be installed parallel to the floor, up to two degrees from horizontal. If this maximum requirement must be exceeded per slope of the building floor, the Owner shall be advised and consulted before the device is manufactured, delivered and installed.
    b. The flat plate device shall operate with a maximum structural load of 200 pounds per linear foot. Normal conveying load shall be 50 pounds per linear foot.
    c. The frame shall consist of standard modular assemblies bolted together to form a support structure and guide for the flight assemblies. The track shall be of rolled or formed structural steel.

d. The flights shall be crescent-shaped-steel conveying platforms at least 1/4 inch thick supported by heavy-duty wheels or rollers.

    1) Crescent plates in public areas shall have a molded urethane coating on the conveying surface.

    2) Crescent plates in non-public areas may be painted on the conveying surface.

    3) Flight assemblies shall include self-aligning, interconnecting chain links and guide rollers.

    4) Gaps between adjacent crescent plate pallets shall not exceed 1/8 inch.

    5) Gaps between top of crescent plate pallet and underside of perimeter/finger guards shall not exceed 1/8 inch.

    6) Elevation differences between adjacent crescent plate pallets shall not exceed 1/16 inch.

e. Outer radius transition sideguards shall be installed on both sides of each wall penetration. The upper edge of each sideguard shall be rolled to prevent accidental injury to personnel. Sideguards in the public view areas shall be SS.

f. The vertical and horizontal alignment of the adjacent butt joints of the finger/perimeter guards of the device shall not be misaligned, nor shall there be any gap between the adjacent guards.

g. Side rails shall be formed channel of 10-gauge steel. This channel shall also serve as a support for the baggage and finger guard angle.

h. A claim device shall be mounted so that the conveying surface of the device is 12 inches above the floor. The device shall be equipped with adjustable legs.

i. A make-up device shall be mounted so that the conveying surface of the device is between 29 inches to 33 inches above the make-up area floor. The device shall be equipped with adjustable legs.

j. Inner perimeter sideguards shall be provided for the entire inner perimeter of the sort device to prevent baggage from dropping into the eye of the sort device. For baggage claim application, inner perimeter sideguards shall be required for the entire perimeter in the non-public-view loading area.

k. Toe space shall be provided at the base of the device. Black vinyl cove molding shall be installed at the back of the toe space and shall be flush with the finished floor.

l. The design of the sort/claim flat plate device shall incorporate a means of expansion to offset wear in the main link bushings/connecting link pins, etc., and shall include, as a minimum:

    1) Overlapping design of the cam follower guide track so that the cam follower surface is always in contact with some portion of the guide track at the expansion joint.

    2) Heavy-duty jacking bolt arrangement to assist in expanding the device when needed.

m. Special attention shall be given to the design, manufacture, and installation of the inner and outer perimeter finger guards as well as the vertical front face skirting at the expansion point.

1) The design, manufacture, and installation of the special expansion joint perimeter finger guards shall ensure that they do not create a snag point.

2) To further reduce the potential of snagging baggage at these expansion joints, the special finger guards shall be factory welded and ground smooth on the upstream end of each special guard.

3. Drive Assemblies – Drive assembly circuitry shall open the device control circuitry whenever the motor disconnect switch is turned off. When the disconnect switch is turned back on, it shall reactivate the device start controls, thus allowing the drive motor start-up to be controlled by the soft start controller.

   a. The drive and idler shaft sprocket hubs shall have double (2) set screws to prevent any lateral movement of the sprockets on the respective shafts.

   b. Install the number of drives on each device as indicated in the contract drawings.

   c. Drive design and motor applications for those devices using more than one drive motor shall provide for the potential of variations in actual motor speeds so that all drive motors are equally loaded. Motors for dual (2) drive applications shall be of high slip design.

   d. Drive motor and drive assembly component sizing for devices having more than one drive shall allow the device to run with one drive, in the event of the second drive fails. Drive assemblies shall be designed in a manner that allows the drive chain/belt to be disengaged from the carrier flight assemblies. Loading for such conditions shall be 70 percent.

   e. Devices shall be driven by motors that conform to IEEE and NEMA standards.

   f. Motors shall be sized for Class II speed requirements under continuous operations.

   g. Motors shall be of the constant speed (1750 rpm), TEFC, high efficiency, low-energy type, ball bearing type, with Class "H" insulation for outdoor equipment and Class "F" for indoor equipment.

   h. Drives with soft start controllers shall use high-slip motors.

   i. The design service factor for motor and speed reducer equipment shall be 1.50; however, actual motor nameplate service factor shall be a minimum of 1.15.

   j. Each drive assembly shall be provided with a soft start controller or VFD.

   k. Motors controlled by VFDs shall be VFD rated.

   l. Mounted bearings shall meet the following minimum requirements:

      1) Bearings shall have a minimum L-10 life of 70,000 hours.

      2) Mounted bearings shall be equipped with concentric or squeeze locking type collar arrangement to secure the bearing to the shaft.

   m. The drive mechanism shall engage a minimum of two plate assemblies at all times on chain driven devices.

   n. A 110 VAC duplex outlet shall be provided under the deck at each drive section of the device. Both shall be connected electrically to the building's power supply so that they still will operate with the device's control panel turned off.

4. Decking – For installation as public-view claim devices, the device shall be provided with a 3/4 inch fire-resistant tongue-and-groove plywood deck supported by a framework designed for a live load of 75 pounds per square foot.

    a. The framework may be constructed of structural steel or fire-resistant lumber. The framework may not be constructed of sheet metal-type drywall studs.

    b. All plywood joints shall be supported by the decking-related framework.

    c. The decking shall be 6 inches above the conveying surface of the device. Hinged access door(s) shall be provided at the top of the drive section(s) and shall be of sufficient size to permit removal of drive assembly components. A recessed ring installed on the access door shall be provided for the purpose of opening and closing the door. A flush-mounted, keyed, dead-bolt lock shall be provided to secure the door hatch.

    d. The decking carpet or tile and any other finishing features will be provided and installed by others.

5. Public Areas – Claim devices shall be trimmed with type 304 stainless steel (SS) in a #4 brush finish where portions of the device are in the public-view-area. SS trim shall conform to that established under the Specification.

    e. A 3 inch high toe space shall be provided at the base of the peripheral guards. The toe-space kick plate shall be painted black on claim units and extend to the finished floor on all devices. An approved cove base molding shall be provided.

    a. All SS trim shall be 12-gauge for device decking and shall consist of a formed angle trim element 6 inches from the top of the claim device to the top of the deck with a one inch cap covering the carpet.

    b. The formed angle trim acts as a vertical skirting for the elevation difference between the crescent plates and the raised decking.

    c. All in-feed conveyors feeding the claim device(s) that are in the public-view areas shall be trimmed with SS.

    d. Feed conveyors from above the claim device that are exposed within the public area shall require the underside and all other exposed portions of the conveyor to be trimmed with stainless steel. Special care shall be given to these conveyors to ensure an aesthetic presentation of the conveyors in keeping with the surrounding public area.

    e. SS trim elements shall be properly aligned both vertically and horizontally. Butt Joints of adjacent trim elements shall provide a smooth snag-free surface. Voids between adjacent element joints are not acceptable. Sharp edges on any of the trim elements shall not be accepted. All radii of trim elements shall match.

N. BHS Doors – Fire Doors, Security Doors, Environmental Doors and Draft Curtains

1. Following are the requirements for doors and draft curtains that are required as part of the BHS. Special requirements may be delineated in the Contract Drawings.

2. All BHS doors shall be provided by the same manufacturer unless requested in writing by the BHSC and approved by the Owner.

3. Items that are not a part of the BHS door assembly shall not be field attached to any component of a rolling steel fire door.

4. All powered BHS doors shall not include PLC integrated control provided by the door vendor unless otherwise approved by the Owner. PLC control for the doors shall be conducted by the BHS PLCs. Electrical control features such as photocells for bag present and door close and open notification shall be provided by the BHSC using the same controls as with those used on the BHS and not be separately provided by the door vendor.
5. Draft Curtains (Strip Doors) – The BHSC shall supply and install appropriately sized black flexible draft curtain strip doors, 1/16 inch thick black polyvinylchloride strip, eight inches wide, beaded edge, with 75 percent strip overlay.
    a. Approximate sizes and locations of the strip doors are shown on the Contract Drawings.
    b. Actual sizing of the doors is the responsibility of the BHSC.
    c. Dual draft curtains shall be provided on each side of the door openings for doors that separate conditioned and non-conditioned areas.
6. Powered Roll-Up Security/Fire Doors – The BHSC shall supply and install motorized drum type powered, roll-up type, 3-hour fire rated security/fire doors that use a fusible link for closure at the locations noted on the Contract Drawings.
    a. Appropriately sized doors shall be provided for the conveyor wall penetrations noted on the Contract Drawings. Approximate sizes and locations of the roll-up doors shall be shown on the Contract Drawings. Actual door sizing is the responsibility of the BHSC.
    b. The BHSC is responsible for the design and installation of the door controls as defined in the Specification.
    c. Doors shall conform to all mechanical and electrical requirements of the Specification.
    d. Power for the door and controls shall be designed and installed by the BHSC within the appropriate system and/or subsystem MCP.
    e. Doors shall be controlled by the BHS PLCs unless approved by the Owner.
    f. The BHSC shall ensure that all electrical and mechanical drawings applicable to the installed door are incorporated into the project O&M manuals and as-built drawing package.
    g. The door shall be equipped with externally mounted photocells. The photocells shall be mounted so that the fully open and fully closed position of the door can be detected by the BHS controls circuitry.
    h. Doors located in public view areas shall also meet the SS trim requirements of the Specification.
    i. The door drive assembly shall be designed and installed so the door can be raised or lowered manually through the quick release, crank or chain operated type of manual disengagement of the powered drive assembly.
    j. The door shall be secure in such a manner as to not be possible to physically raise the door without the use of control activated power. A solenoid lock shall be installed to ensure this protection.
    k. The BHSC shall install 12-gauge steel trim/filler elements for the wall penetrations to stop drafts when the door is closed.

l. The BHSC shall design and install the conveyor with sideguards that will ensure there is no snag point at the required side-guard opening for the door path of travel. The downstream portion of the sideguard at the door location shall have a flared section to deflect baggage.

O. Protective Guard Railings

1. The BHSC shall provide and install protective guard railings for the conveyors listed on the Contract Drawings. The horizontal member shall be constructed of 4 inch OD Schedule 40 pipe with adequately sized and spaced vertical members welded to the horizontal member and to floor plates. A gusset stiffener shall be welded to the back side of the vertical member and the floor plate.

2. Guard Railing Heights – Guard railing adjacent to load or unload conveyors shall match the height of the load or unload conveyor but shall not exceed 21 inches.

3. Other Requirements – Guard railing shall be mounted so that its outside surface is no greater than six inches from the side of the conveyor.

a. Floor plates shall not extend beyond the front (side from which personnel are accessing the sort conveyor) of the vertical support element of the railing any more than one inch.

b. Design and installation of railings shall not restrict any maintenance access to items such as drive assemblies, pulleys, bearings, etc.

c. Protective guard railing shall be constructed to withstand normal and customary impact from baggage handling ground support equipment and installed as listed on the Contract Drawings. It may be either core-drilled or surface-mounted bollards.

d. If surface mounted, shim or use non-shrinking grout to maintain plumb. Use HSL ¾" x 5 ½" embedment anchors.

e. Bollards shall be filled with concrete and capped.

f. All guard railing shall be painted safety yellow.

P. Baggage Slides – Manually Loaded

1. Baggage slides shall be installed at the locations shown on the Contract Drawings.

2. Design Requirements – Baggage slides shall conform to the following:

a. Baggage slides are constructed of 10-gauge stainless steel for public claim areas.

b. Baggage slides are constructed of 10-gauge galvanized steel for non-public make-up areas.

c. Baggage slides have a decline slope of 30°.

3. Installation – Baggage slides are secured to the floor surface with anchors of the appropriate size and type for the floor material.

2.3. ELECTRICAL DESIGN PARAMETERS

A. General

1. This section defines the required electrical performance and design parameters for airline baggage handling Project Content. Additional requirements for control stations, control station devices and control devices may be included on the Contract Drawings, which require compliance by the BHSC as an integral part of the Specification.

2. Applicable Standards – BHS Project Content shall conform to all applicable standards, codes and regulations as described in the Specification.

3. Controls Requirements – Controls shall operate on a maximum of 120 VAC. Control components shall not be subject to operation under loads exceeding manufacturer recommendations.

4. The mounting and placement of all control devices shall be accessible, on the working side of the conveyor and appropriate to the application for the device. The final placement shall be coordinated with the Owner.

B. Electrical Service

1. The General Contractor or others will furnish 480 VAC, 3-Phase, 60 Hz for BHS service to the MCP unless otherwise required in the Contract Drawings.

2. The General Contractor or others will furnish 120 VAC for BHS service to the MCP unless otherwise required in the Contract Drawings.

3. The General Contractor will furnish service feeds located within 20 feet above MCPs and the BHSC shall terminate the feeds.

C. BHS Power

1. The BHSC shall supply all electrical service to the BHS from the MCPs. Conductors for all branch circuits and control circuits shall be sized to ensure voltage drop does not exceed two percent.

2. Controls Power – Furnish all 120 VAC single-phase controls power.

   a. Sola Hevi Duty MCR transformers shall be used where dirty power, caused by impulses, swell, sags, brownouts and waveform distortion can damage equipment.

   b. Acme dry type transformers shall be used where dirty power cannot damage devices, such as relays, contactors and other hardened devices.

3. Power Requirements – The BHSC shall specify all the power requirements for the BHS, including 120 VAC lighting circuits provided by others for MCPs, and submit these requirements to the general contractor and to the Owner in accordance with the Submittal Schedules in the Specification.

4. Preliminary power calculations are provided by the Owner in the motor manifest to assist in determining approximated power requirements. The provided power loads include an additional 15% for control power and contingency. Final power loads shall be provided by the BHSC prior to pulling power from the power distribution panel. Design review coordination meetings shall be conducted to ensure no design changes have occurred. Conductors shall be sized accordingly. Voltage drop shall not exceed two percent.

5. Installation Requirements – The BHSC shall furnish and install all panel boxes, wire ways, conduits, conductors, transformers, fuses, equipment, and materials required to complete the electrical power distribution for the operation of the BHS.

D. Control Stations

1. Control stations and control devices are defined in the Contract Drawings.

2. Control stations and control devices are located as required on the Contract Drawings.

3. Control stations shall be located in an easily accessible manner and shall be visible relative to the conveyors and devices they control.
4. All components within a control station shall be physically wired to one, and only one, power source and communications source.
5. Maintenance Access – The BHSC shall locate control stations and control devices in a manner that provides maximum access for operations and maintenance of the BHS and/or replacement of the devices. Example: All jam-detector, head-end-sensors, etc., photocell devices are to be mounted so they are accessible.
6. Protective Guarding – In certain areas, protective guarding may be required to protect the control stations and control devices. The design and installation of protective guarding shall provide maximum possible access to the devices for adjustment, servicing or replacement.
7. Control Station Mounting – Control stations shall be located and mounted to the conveyor side or back guards as noted in the Specification. Under no circumstances shall control stations be mounted on gutters or wire ways.
    a. Any supporting bracket that may be required for the back or sideguard mounting of a control station shall be welded to the conveyor back or sideguard. Bolting brackets to the conveyor back or sideguards is not acceptable. The use of beam type clamps is not acceptable.
    b. Control stations shall be located at and mounted to the conveyor they are intended for. Specific control station mounting locations shall be coordinated with the Owner prior to installation.
    c. Control stations shall not be mounted on removable sideguards.
    d. Control station and control device mounting practices shall conform to basic requirements established in the Contract Drawings and the Specification.
    e. Control stations located in public view areas shall be flush mounted with stainless steel (SS) cover plates.
        1) SS cover plates shall be secured to the adjacent conveyor trim member with either truss-head or oval-head Phillips SS machine screws. Pan-head screws are not acceptable.
        2) The design, manufacture, and installation of sideguards for load conveyors shall reflect this requirement.
        3) All control stations located in public view areas on flat plate claim devices shall be mounted at the base of the SS trim element in the toe plate of the claim device as depicted in the Contract Drawings.
    f. Control stations located in non-public view area load conveyor applications shall be mounted on the horizontal portion of a control station mounting assembly bridging the load conveyor.
        1) This assembly shall be located and built to also act as an over-height bag restraint.
        2) When required, the control station mounting assembly may also use the vertical element of the assembly for mounting and the protection of photocells as depicted in the Contract Drawings.

8. Control-stations in non-public areas shall be painted OSHA Yellow.
9. Public area hole-plugs are not acceptable. Hole-plugs may be used in non-public control stations if standard boxes are not available for a specific use, and with the approval of the Owner.

E. Electrical Equipment and Components

1. The following electrical equipment and components are the approved equipment and components for Project Content under this specification section. Additional requirements may be called for in the Contract Drawings. Any alternate to these requirements requires prior written acceptance by the Owner.
2. Device Identification – All devices shall be identified with phenolic tags. The tags shall be permanently affixed to the device they identify unless the device can be expected to be replaced (such as photocells and shaft encoders). Tags for these devices shall be affixed to a permanent location near the device.
3. Non-Illuminated Pushbutton Switches – Pushbutton switches shall be of the momentary-contact type compatible with those manufactured by Allen-Bradley (800T Series). Non-illuminated Pushbutton Color Codes shall be as follows:

a.	Function	Color
b.	Jam Reset	Yellow
c.	Lamp Test	Gray
d.	Normal Stop	Red
e.	Start	Green
f.	Others	Black

4. Emergency Stop Switches – Pushbutton switches used for emergency stop applications shall be maintained-contact push to stop illuminated red mushroom head switches. The E-Stop switch shall include locking bar hardware.
5. Illuminated Pushbutton Switches – Illuminated pushbutton switches shall be momentary contact type, with guards and appropriate color-coded lens. Illuminated Pushbutton Color Codes shall be as follows:

a.	Function	Color	OEM Part Number
b.	Jam Reset	Amber	800T-QAH2AD1
c.	Over-Height Reset	White	800T-QAH2WD1
d.	Over-Length Reset	White	800T-QAH2WD1
e.	Start	Green	800T-QAH2GD1

6. Selector Switches – All selector switches shall be the appropriate type based on use compatible with those manufactured by Allen-Bradley (800T Series).
7. On/Off and Start Key Operated Switches – Off/on-function and start function key-operated switches for application in public view areas, including baggage claim devices located within the public area, shall be 7-pin lock cylinder and core type.
    a. The Owner will provide and install the actual operational core.

b. The BHSC is responsible for the removal of any construction core that may be provided by the lock company prior to the delivery to the project site.

c. The BHSC is responsible for providing the lock company's plastic lock core sleeve unit that permits operation of the lock without a core. This ensures the core pins are not damaged.

d. The BHSC shall coordinate with the Owner for the installation of the operational lock cores.

8. IEC Motor Contactors – IEC motor contactors shall consist of 3-pole, single-throw, magnetic across-the-line contactor, each with a holding contact and auxiliary contacts as required. Motor contactors shall be protected with motor starter protectors (MSPs) on all three phases with a manual reset. Reversing motor contactors shall have electrical and mechanical interlocks. Electrical and Mechanical interlocks are required for reversing applications. Acceptable motor contactors and MSPs are (or compatible):

	Manufacturer	Function	OEM Series
a.	Allen-Bradley	Direct Inline Contactors	190S
b.	Allen-Bradley	Motor Contactors	100
c.	Allen-Bradley	MSPs	140

9. Soft Start Devices – Soft start devices shall be required on flat plate baggage claim devices. The soft start devices shall be sized for the specific application. Acceptable soft start devices are Allen-Bradley 150 Series or compatible.

10. Variable Frequency Drives – A VFD is an electronic device that changes the frequency of the AC power going to a motor, thereby varying the motor speed.

    a. VFDs shall include a removable, configured keypad that stores the VFDs program and can be transferred to another VFD. The VFD shall also be capable of storing its own program when the keypad is removed. All settings that differ from factory settings shall be recorded in the empirical data information included in the documentation set. The standard target setting shall be 60 hertz relative to the conveyor belt speed (fpm) as defined in the motor manifest.

    b. VFDs shall not be used for making large changes in conveyor speeds. Changes made to the 60 hertz setting shall not result in a setting less than 30 hertz or more than 70 hertz.

    c. VFDs shall employ dynamic braking to ensure proper belt stoppage in tracking areas.

    d. VFDs shall use a braking resistor to prevent overheating on conveyors with high cycle rates.

    e. The manufacturer shall include a separate device for disconnect, ground-fault/short-circuit protection, and surge/lightning protection as required by the National Electrical Code. Power shall not be switched between the motor and VFD thus a monitored switch and contactor shall be used.

    f. Auxiliary cooling shall be employed for VFDs where the ambient temperatures exceed the level in which the VFDs are rated to operate.

    g. VFDs shall be mounted in self-contained enclosures at the conveyors or devices they control and not in centralized MCPs.

    h. VFDs shall require VFD rated motors.

11. Control Relays – All control relays shall be rated at the required voltage for the application. Where time delay feature is required, the BHSC shall furnish control relays with time delay ranges as required for the actual application. Acceptable control relays are Allen-Bradley 700 Series, Type P or compatible.
12. Timers – All timing functions shall be provided by PLCs.
13. Photocells – Photocells are used for jam detection, head end sensors, auto-shutdown, bag tracking data sensors, and other control related functions.
    a. For typical photocell applications that cross perpendicularly between sideguards, the Allen-Bradley/Photo Switch type 42GRU-9002-QD or compatible may be used.
    b. For applications requiring a small photocell with right angle optics, The Cutler-Hammer Comet series, model 14101RQD03 or compatible shall be used.
    c. Photocell and associated hardware shall conform to the following:
        1) All photocells and reflectors mounted on flat plate devices shall be guarded by backguards attached to the flat plate device or by means of a protective guard railing.
        2) All photocells and reflectors shall be mounted on structural members of the conveying machinery so that minimum vibration is transmitted to the units. Such mounting methods shall reduce the potential for misalignment due to impact from personnel, baggage or equipment.
        3) Photocells requiring penetrations in the sideguards or backguards of the conveyor equipment shall be limited to only two per photocell, i.e., one penetration for the photocell and one penetration for the photocell reflector. The penetrations shall have a diameter of 1-1/2 inches.
        4) Photocells shall be located at the proper distance from the conveyor head and/or tail to maintain positive bag location and to stop a bag as close as possible to the head of a stopped conveyor without that bag proceeding on to the tail of the next downstream conveyor. The use of PLC programming time delays shall not be allowed as an alternative to achieving the proper placement distance of photocells from the conveyor leading edge and/or trailing edge.
        5) Holes for photocell beams in metal sideguards shall be punched, not burned, dimpled from the inside to the outside and painted to prevent rust.
        6) Photocells and reflectors for baggage sensing functions for all BHS conveyors shall be mounted where the center of the photocell and related reflector is 1-1/2 inches above the top of the conveyor belt or flat plate. Owner approval is required for design exceptions.
        7) Photocell reflector covers shall be ergonomically designed and not impede the placement of bags on load conveyors.
        8) Photocell reflectors shall be mounted using a sheet metal pocket that keeps the reflector tight to the side of the conveyor and allows for quick removal.
            a) The reflector shall be sized as such to fill the sideguard opening.
            b) The reflector shall (in non-public areas) be a full reflective surface within its defined area. This may not be appropriate in public areas.

9) Photocells shall be mounted so that the indicator lights are readily visible for maintenance personnel.

10) Photocell mountings shall be directly attached to the conveyor structure. Use of shims between the conveyor structure and the photocell is not acceptable.

11) Hex head 1/4-20 bolts, flat washers, lock washers and nuts shall be used for photocell mounting. Round head bolts are not acceptable.

12) Photocell cable shall be protected from damage and be no longer than 24 inches with minimum slack.

13) The appropriate 3/4 inch watertight compression cord grip connector, as manufactured by Appleton is to be threaded into the 3/4 inch conduit coupling with an inverted locking ring, with the locking ring teeth engaging the shoulder of the coupling.

14. Warning Alarms – Start-up warning alarms mounted at control stations located in higher ambient noise level locations, a Sonalert device of higher frequency and dBA rating shall be used. Selection by the BHSC shall be based on actual survey of the location. Selection and location of the devices shall be coordinated with the Owner prior to installation.

a. Design of start-up warning alarm circuits using Sonalert devices shall be such that no voltage feedback occurs when the alarm is not activated.

d. Start-up warning alarms for public locations shall be of appropriate frequency and volume levels for the application.

e. All alarms shall be employed throughout the system in quantities that ensure adequate coverage.

1) Visual alarms shall be visible from the floor.

2) Audible alarms shall be adjustable not to exceed maximum dBA as defined in this specification.

15. Safety Switches – The following are the requirements for safety switches in BHS applications.

a. Limit switches shall be non-plug-in type such as manufactured by Allen-Bradley (802T Series) or compatible.

b. Proximity switches other than photocell and limit switches shall be as manufactured by Allen-Bradley or compatible.

c. Motor safety disconnect switches for motors up to 5 hp shall be 3-pole with optional auxiliary, single throw, AC manual motor starting switch without overload protection, with safety lock-out tabs, in a NEMA 4 or NEMA 12 enclosure. The auxiliary contacts shall be provided if positive feedback to the PLC is needed to determine status.

d. Motor safety disconnect switches shall be mounted to the back guard or sideguard of the conveyor with the drive motor. Mounting safety disconnect switches on wire ways is not acceptable.

e. Motor safety disconnect switches shall be mounted at a location that is readily accessible. Mounting of the devices shall be coordinated with the Owner prior to installation.

f. Supporting brackets for back guard or sideguard mounting of safety disconnect switches shall be welded to the conveyor back or sideguard. Bolting brackets to the conveyor back or sideguards is not acceptable.

g. All safety disconnect switches shall be identified with white phenolic I.D. tags with engraved black type.

16. Fuses – All fuses shall be of the appropriate type and sizes of the FRN, FRS, or LPJ dual element type.

17. Motor Control Panels, Workstations and Remote Status Panels – Motor control panels (MCP), workstations (WS), and remote status panels shall have a painted exterior as required in the Contract Drawings. The mounting plane within the MCP, WS, and/or remote status panels shall be white.

    a. MCP Design parameters and requirements include:

        1) Any plug-in type device such as a relay or clutch/brake power supply shall be equipped with a spring clip type restraint to prevent the plug-in device from becoming loose in its socket.

        2) Wire runs, including field wiring in the MCP, WS, and remote status panel door shall be contained in Panduit brand wire race way.

        3) Splicing control or power wiring within any of the devices is not acceptable. All wiring, including spares, shall be terminated at the appropriate MCP, WS, and remote status panel terminal strips.

        4) All terminal strip terminal points shall be labeled with the same identification as the wire or cable to which they are associated.

        5) Appropriately sized phenolic/fiber bushings shall be installed on all conduit or conduit fittings that enter the MCP, WS, and remote status panels prior to the pulling of any wires, conductors, and/or cables.

        6) Use of split bushings on conduits entering an MCP is not acceptable.

        7) The design and installation of MCPs requires a clearance airspace of not less than 1-1/2 inches nor more than 4 inches between the bottom of the cabinet and the floor or mounting pad.

        8) MCPs shall be anchored with a minimum of two anchors per panel door. Minimum anchor size is 3/8 inch diameter.

        9) To incorporate safety, the control fuses shall be touch-safe with blown fuse indications. Bussman compatible touch-safe fuse holders are acceptable.

        10) Power distribution blocks shall be equipped with a clear plexi-glass safety shield or a touch-safe alternative.

        11) The MCP main power disconnect and fuses shall be equipped with a clear plexi-glass safety shield.

        12) Finger-safe guards on all MCP devices are required.

        13) The design of MCPs that are not equipped with a status panel, shall be equipped with a fault indicator lamp. This lamp shall be illuminated for each and every fault associated with the MCP. The fault indicator lamp will not extinguish until all faults have been properly cleared and reset.

        14) MCP designs shall be submitted to the Owner prior to assembly.

15) All MCPs shall be UL listed.

16) Provide MCP with adequate ventilation and/or cooling to maintain equipment within its designed operating temperature.

17) MCPs shall be protected from impact by appropriate guards per NEC code.

b. Each MCP and remote status panel shall be identified with an I.D. tag mounted on the outside face of the device door to the immediate left of the main disconnect. The ID tag will identify:

1) BHS or subsystem.

2) Conveyors or devices controlled by the MCP, WS, or remote status panel.

3) Torque requirements for all termination points.

4) A placard shall be attached to each MCP and remote status panel stating the specific source of power, including but not limited to:

a) Room number

b) Panel number

c) Bus location, etc. (if applicable)

5) The ID tag shall be constructed of a white phenolic plate with a minimum thickness of 1/8 inch, engraved with black type. The ID tag engraved characters shall be a minimum height of 1 inch or greater as required for readability.

6) The ID tag shall be appropriately secured to the MCP and remote status panel door surface.

c. MCPs shall have an appropriately sized, internally mounted fluorescent/LED light installed for illumination.

1) The fluorescent/LED light shall be fed from a 120 VAC power source external of the MCP power so the light will remain on regardless of the power condition of the MCP. The fluorescent/LED light shall be turned on whenever the MCP door is opened.

2) One 120 VAC, 5 amp duplex receptacle fed from the same circuit as the panel illumination circuit shall be installed in all MCPs.

3) The external source for the 120 VAC power shall be clearly labeled inside and outside of the MCP identifying the location of the power source. These warning labels shall clearly inform staff that the wiring is powered even if the MCP is not.

d. MCP and remote status panel component identification shall be provided. All relays, starters, overloads, fuses, etc., shall be identified in a manner as to be easily read when the MCP and remote status panel doors are opened. The ID tag shall be constructed of a white phenolic plate, engraved with black type.

F. Identification of Control Devices

1. In addition to all OEM nameplates, all electrical and mechanical control items mounted in or on panels and control stations shall be identified by permanently attached white phenolic plates engraved with black characters. Direct thermal printed and Dymo-type labels are not acceptable in BHS applications.

2. Pushbutton Switches – Control station control devices, such as pushbutton switches, excluding those for emergency stop devices, and photocell identification descriptors shall be clearly identified by permanently attached white phenolic plates engraved with black type.
3. Emergency Stop Switches – Emergency stop devices shall have red phenolic plates with white type showing their operational relationships to the systems/sub-systems, including the associated E-Stop zone and its conveyors.
4. Control Stations – Each control station shall be identified with a permanently attached white phenolic plate, engraved with black type, providing identification of the control station as defined in the Contract Drawings.
5. Control Station Functions – Control station function ID tags shall be positioned for reading ease with the legend on the front side of the device facing the operator.

G. Conduit and Wire Way Requirements

1. Rigid Conduit – Minimum acceptable size of rigid conduit is 3/4 inch.
2. EMT Conduit – Minimum acceptable size of EMT conduit is 3/4 inch.
3. IMC Conduit – IMC conduit is not acceptable for any BHS application.
4. Liquid Tight Flexible Conduit – Minimum acceptable size is 1/2 inch. All flexible conduit shall be of the Anaconda Sealtite type EF liquid-tight type and shall be used with the appropriate liquid-tight conduit fittings. Greenfield type flexible conduit is not acceptable in any BHS application.
5. A single wire way or conduit may be used with dividers for separating AC high, AC low, and DC voltage wiring. These three voltages may either be placed in separate wire ways or conduits, or placed in a single wire way or conduit with the diverters separating them. Ensure compliance with NEC 725 for class of circuits.
6. Communications wiring shall be separated from all voltage wiring, including VFD wiring.
7. Conduit Hangers – The use of Beam Clamps or Caddy Clip brand and similar type of conduit hangers are not acceptable.
8. Reducing Washers – The use of conduit-opening-reducing washers is not acceptable. All conduit openings in junction boxes, pull boxes, MCPs, WSs shall be of the appropriate size for the conduit.
9. Conduit Fittings – All conduit fittings shall be electro-galvanized.
    a. Rigid conduit fittings shall be of malleable steel with standard threads as used for conduit.
    b. Rigid conduit joints shall be coupled with rigid threaded couplings.
    c. EMT conduit and liquid tight flexible conduit connectors shall be provided with insulated throats with steel lock nuts/rings.
    d. Conduit entering junction boxes, pull boxes, MCPs, WSs, etc. shall be equipped with plastic bushings. These bushings shall be installed at the same time as the conduit and or connector.
    e. All EMT conduit fittings shall be the watertight type of fitting, not of the set screw type.
10. Conduit Installation – No conduit shall be installed underground or in floor slabs without prior written acceptance by the Owner.

a. Floor mounted conduit runs are to be avoided. If conduit runs must be floor mounted, they shall be supported off the floor on 1-5/8 inch Unistrut. Floor-mounted runs shall not cross any access, walk or track aisles.

b. Conduit shall be of the rigid type in areas where it may be possible to damage it. This includes areas accessible by personnel, such as all baggage cart areas, areas with catwalk, areas where baggage may cause damage, and areas where personnel may be able to stand on the conduit.

c. Wall-mounted conduit shall be installed with a minimum space of 1/4 inch, maximum space of 7/8 inch between the conduit and the structure wall.

d. The installation of conduits shall not impact or restrict operational and maintenance access to the conveyors.

e. Conduit runs shall not be installed on outside radius sideguards of any brand of power turn.

f. Conduit runs shall not be installed on merge conveyor deflectors.

g. Liquid-tight flexible conduit runs shall be allowed only for vibration isolation and containment of wires between motors, limit switches, safety disconnect switches, VFDs and similar devices. These devices shall not be rigidly connected to the conduit system.

h. Liquid-tight flexible conduit runs shall not exceed lengths of 3 feet with a support every two feet.

i. Additionally, runs of the liquid-tight flexible conduit shall be properly supported so that neither conduit nor conduit fittings are in stress.

j. All conduit fittings exiting wire ways shall be installed near the top of the wire ways but shall not interfere with the closing of the wire way cover.

11. Wire Ways – Use of wire ways requires prior acceptance by the Owner.

    a. Wire ways are not acceptable for areas subject to vehicular traffic.

    b. Wire ways shall be of the lay-in type to avoid the need to thread wires through wire way end and transition connectors.

    c. The wire way rating shall be NEMA 1 when installed inside the building and NEMA 3R shall be used when installed outside of the building.

    d. Bolt-on-Barrier kits shall be installed when wire ways are used for multiple categories of wiring and cable. Nylon Channels shall also be installed at the end of the barriers.

    e. The design and installation of wire ways shall provide a fully accessible solid top hinged cover that uses captive screws for fastening.

        1) At locations where wire way must be modified for length, additional hinges are required for a minimum of 2 points per lid/cover. Typically, 3 points of connection are desired if on full length (~10') section.

        2) Access to the cover and its opening swing shall not be impacted by the operation of the conveyors.

        3) Wire ways shall be installed with the cover at the top and the hinge opposite conveyors.

4) Wire ways installed at MCPs shall be placed with the cover to the front (like the MCP doors) and the hinge opening toward the MCP.

f. Wiring within the wire ways shall not be strung so tightly that sufficient slack is not available for maintenance purposes.

g. Terminations such as terminal blocks, wire nuts or other splices are not allowed in wire ways.

h. Factory conduit knockouts are not acceptable on wire ways.

12. Wire Way Installation – Wire ways for conveyors shall be designed and installed with the hinged cover on top, not the side or bottom.

a. Wire ways shall be installed with Owner approved insulating pads on the inside radius of internal beds at all elevation and horizontal changes. These vinyl mastic pads shall protect the wiring from sharp edges and external pressures during installation.

b. All edges along the wire way shall be round and smooth to protect conductors during installation.

c. Wires, conductors, or cables installed within a wire way shall not be bundled or tied together in any manner. Quick pull wire is not acceptable.

d. It is not acceptable to mount any control station, control device, safety disconnect switch, etc. on a wire way.

e. Wire way support brackets attached to a conveyor back guard or sideguard shall be welded – not bolted – to the conveyor. Unistrut may be welded to the back guard or side guard and the wire ways may then be bolted to the unistrut.

f. Wire ways shall be accessible from conveyor catwalk when catwalks are installed. Where catwalk is not installed, wire ways shall be installed on the drive motor side of the conveyor.

g. Conduit access to wire ways shall only be allowed at the ends of wire ways and through the front vertical surface. Any other conduit access to the wire way is not acceptable.

h. The BHSC shall request an inspection by the Owner of installed wire way prior to installing actual wiring associated within the wire way. The Owner will inspect for proper installation of the wire ways and the BHSC shall correct all found deficiencies before wire installation begins.

H. Wiring Requirements

1. All wiring shall be of an appropriate gauge THHN stranded. Enclosure wiring shall use THHN or MTW.

2. Single solid conductor wire is not acceptable.

3. Power Circuits – The minimum acceptable wire gauge for any power circuit wiring is #12 AWG.

4. Control Circuits – The minimum acceptable wire gauge for any control circuit wiring is #14 AWG outside the MCP and #16 AWG inside the MCP.

5. Pre-Wired Harnesses – If the BHSC can show a cost savings, pre-wired harnesses may be used internal to the MCP from input/output modules to terminal strip. This requires prior acceptance by the Owner.

6. Pre-Wired Devices – Factory pre-wired devices with blown fuse indicator are acceptable in MCPs only.
7. Wire Nuts – Phenolic wire nuts, such as Ideal brand, of appropriate size shall be used for splicing wires. Scotch brand wire nuts are not acceptable.
8. Neutral and ground wiring shall be spliced only at junction boxes.
9. Splicing control power and signal wiring is not acceptable.
10. All wiring shall terminate on a control device or a terminal strip/block.
11. All terminal strip terminal points shall be labeled with the same identification as the wire or cable to which they are associated.
12. Motor Power Wiring – Splicing motor power wiring is not acceptable.
13. Terminal Blocks/Strips – The BHSC shall use terminal blocks/strips in all junction boxes.
14. Additional Wire – All control wiring conduit shall contain a minimum of 10% spares in the longest run, or two wires, whichever is greater, for later use by the Owner.
    a. These spares shall be labeled SP followed by a sequential number.
    b. Spares shall be numbered at both ends, terminated on terminal blocks located in the MCP. Enough wire shall be left in the junction box, rolled and tied neatly and capped, to allow for use at furthest downstream device.
    c. These spare wires shall be identified in the conduit route drawings as to the field device junction box location, allowing for convenient locating of the spare wires.
15. Concentric Knock-outs – Use of junction boxes, pull boxes and other fittings with concentric knock-outs is not acceptable.

I. Identification of Electric Wire and Cable

1. All electric wire and cable, including jumper wires but excluding flat solid copper manufactured jumpers, shall be color coded and shall have wire numbers, as described in the Contract Drawings. Wire numbers shall be affixed to both ends of each wire.
2. Line Side Power Wiring – All neutral wires, including those on starters and relays, shall be white. The following color code applies to all power wiring from source to the line side of the fuse in the MCP. The neutral, if applicable, shall terminate at the terminal board. Line Side Wiring Color Code shall be as follows:

		120/208 VAC	277/480 VAC
a.	Phase A	Black	Brown
b.	Phase B	Red	Orange
c.	Phase C	Blue	Yellow
d.	Neutral	White	Gray
e.	Mechanical Ground	Green	Green

3. Load Side Power Wiring – The color code for power and control wiring from the load side of the fuses in the MCP to and from all other devices to control transformers and all motors shall be as follows: Load Side Wiring Color Code

		24 VAC	120/208 VAC	277/480 VAC
a.	Phase A		Black	Brown
b.	Phase B		Red	Orange
c.	Phase C		Blue	Yellow
d.	AC Control Common Hot		Red w/Black Tracer	
e.	DC Control Positive		Blue w/Black Tracer	
f.	DC Control Negative		Blue w/White Tracer	
g.	Neutral		White	
h.	Mechanical Ground		Green	
i.	Foreign Common Hot	Blue w/Yellow Tracer	Yellow	
j.	Foreign Common Neutral	Blue w/Gray Tracer	Gray	
k.	120 AC signal wiring		Red	

4. Foreign Voltages – All MCPs with foreign voltages shall carry warning tags both on the outside face of the MCP door as well as adjacent to the foreign voltage related terminal blocks within the MCP. All foreign voltages shall be UL compliant.
5. Coils – Neutrals on any control devices with 120 VAC coils such as starters, relays, etc., shall be white.

J. Programmable Logic Controllers

1. Systems shall utilize programmable logic controllers (PLCs) to control the conveyors and other devices.
2. Capacity – The PLC system shall be designed and installed with a minimum of 15 percent memory and 15 percent I/O capacity over and above the requirements established in this Specification for the potential of any future system requirements.
3. Transformers – The PLC system, including any remote I/Os shall be equipped with appropriately sized power transformers to ensure that the BHS will not be impacted by power fluctuations, spikes, etc. Power transformers manufactured by Sola Corp are acceptable.
4. Spares – The BHSC shall supply spare processors or memory modules as is appropriate for the type of PLC used, programmed with the actual operating programs for each PLC or memory module in actual use of the operating controller.
5. Visual I/O Status – The wiring within each I/O module shall have visual indication of the status of each I/O point, including a visual indication of the signal to the input module and a visual indication of the signal from the output module.
6. Identification – The wiring within each I/O module shall be identified, point by point, with appropriate labels designating the device being controlled or the device that is providing the input signal. Example: An input module point that receives a signal from photocell PE/T1-05 would have an ID label of PE/T1-05.

7. Operating Temperature – Design considerations and installation of the PLC system devices within any enclosure shall ensure that temperatures encountered within the operating the enclosure will not cause a failure of the PLCs.
8. PLC Programming – Unused inputs, outputs, coils, rungs, labels, variable names, and subroutines shall be deleted from the PLC program. Only elements that are applicable to the Work shall be included.
9. Delivered As-Built PLC Source Code shall include code capable of being read and loaded onto all the PLCs used in the project. As an example: the file type for Allen-Bradley ControlLogix processors is *.acd.
10. The software and equipment versions shall be the latest revisions at the point where development begins and shall be published and approved in design review meetings.

K. Communication Cabling

1. All communications cabling shall be physically redundant and contained in separate conduits with different pathways for the conduit. This requirement shall not include communication cabling between redundant pair components.
2. The cabling shall be terminated in the same way so that it can be connected to the source in the same manner.
3. The redundant cabling shall be identified with the ID of the destination and an "A" for one and a "B" for the other.
4. The BHSC shall contract a third party to certify the signal strength of the all cabling to ensure that it meets the manufacturer's specified requirements. The results of the verification shall be submitted to the Owner with all other empirical data. This testing shall occur prior to commissioning.

L. Network Appliances

1. All switches, at a minimum, shall be managed.
2. All field mounted switches shall be industrial rated or protected by an industrial rated enclosure.
3. Patch panel and cabling shall be provided when there is more than one connection point within an enclosure or rack.
4. All switches shall be approved by the Owner.

M. BHS Device Control Networks

1. Control networks shall conform to the most current recommended standards set forth by the related protocols standards organization or OEM vendor recommendations and best practices within their respective protocol class.
2. The following are examples of these networks: (CIP, Device Net, EtherNet/IP, Control Net, Profibus, Profinet, Modbus, Seriplex, Interbus, Fieldbus, etc.)
3. Control networks shall maintain a separation between the Host/Common Data Provider network, BHS computer systems and PLC systems.

N. BHS Local Area Network (LAN)

1. The system servers, PLC network, components and peripheral devices shall be connected on redundant private BHS Local Area Network (LAN) conforming to IEEE 802.3 Ethernet topology.

2. Cabling – Cabling shall be Ethernet 10/100/1000BaseT with shielded twisted pair (STP), fiber optic or a combination thereof.

    a. The STP cables shall be plenum rated (as needed) Cat 6 Cable, at a minimum, defined by EIA/TIA-568B and ISO/IEC11801 standard capable of 350Mhz. All connections shall be made with RJ-45 connectors.

    b. All connectors shall carry the same rating as the above cable.

    c. The network cabling plant shall be arranged in a star configuration with a 10/100/1000BaseT switch in the center. Linear topography and Device Level Ring (DLR) topography may be used in appropriate conditions upon prior approval of the Owner.

    d. All LAN cables shall be identified at both ends of the cable noting the controller or connection port. This shall also be reflected on all associated system drawings.

    e. All cabling shall be tested for cross-wiring, resistance, and length utilizing a minimum of a Fluke (brand) DSP-4000 cable meter, or equivalent test equipment. These results shall be submitted with the as-built documentation.

    f. Cable standards for BHS computer systems and PLC systems are different. Type of cabling shall conform to industry standards as defined for the application.

3. Redundancy – The LAN shall be designed in such a manner as to ensure full network capability in case of any single network component failure.

PART 3 – EXECUTION

3.1. SITE PREPARATION

A. General

1. All site work is to be coordinated and performed so there is minimal impact to airline related operation and the airport operation. Removal of, modifications to or replacement of any equipment and installation of new equipment and associated tie-in to outbound baggage handling systems shall be carefully coordinated with the airlines and airport site personnel and accomplished during periods coordinated with other construction and installation phasing unless otherwise noted herein.

2. All work is to be coordinated with the general contractor and related subcontractors (as many as may be required), all associated airlines and the Owner.

B. Project Requirements

1. Facilities Modification Notice – The BHSC shall provide the Owner detailed listings of any building and facilities modification required for the successful installation of the BHS.

2. Vibration Abatement – The BHSC is required to submit specifications for vibration dampening and isolation material that are planned for use on this project to the Owner.

3. Completeness – The BHSC shall provide for the complete mechanical and electrical installation of the baggage handling system, including all necessary material for support of the related BHS conveyor equipment.

4. Licensing Requirements – All installation of the BHS and/or its conveyor equipment shall meet the licensing requirements in force at the project site.

5. Work and Job Permits – The BHSC shall obtain all work and job permits and security badges that are required for BHSC personnel and installation crews as well as for any subcontractors used by the BHSC.
6. Building Permits – The BHSC is responsible for obtaining and payment of all building permits, licenses, building/system inspections, professional seals and/or other seals, etc., required for the project site and the installation of the BHS.
7. Temporary Power – The BHSC is responsible for providing all temporary power and lighting that may be required for and during the course of the installation of the BHS.
8. Cleanliness – The BHSC shall establish and enforce among his employees' regulations requiring cleanliness and proper disposal of garbage and waste to help prevent the start and spread of infections or contagious diseases and to prevent the creation of a nuisance at the project site on any property, either public or private.
    a. During the installation of the BHS, the BHSC shall always keep the project site free from accumulation of waste materials and/or rubbish created by his operation.
    b. At the time of conditional acceptance of the BHS, and in preparation for the beneficial use of the baggage handling system, the BHSC shall remove all waste materials and/or rubbish created by his operation from the project site, as well as all his tools, construction equipment, temporary structures, machinery, and surplus materials, and shall clean all floors, equipment, metal surfaces, etc., thereby leaving the project site clean and ready for operation.
9. Toilet Facilities – The BHSC may be required to provide suitable and adequate toilet facilities for BHSC personnel during the installation of the project.
10. Site Materials – The BHSC is responsible for the on-site receiving, unloading, storage, and distribution of materials and equipment used for the installation of the BHS.
    a. The BHSC is responsible for any temporary on-site storage that may be required for the equipment and materials used in the installation of the baggage handling system.
    b. Such temporary storage facilities for the material and equipment shall prevent damage and/or theft of the items. All off-load and storage areas shall be coordinated with the Owner.
11. Fire Proofing – The BHSC is required to replace or patch all fire proofing material that is removed or damaged as a result of the installation of the BHS. Fire proofing material shall conform to the requirements in force at the project site.
12. Parking and Transportation – The BHSC is responsible for BHSC employee parking and any related transportation that may be required to and from the project site.
13. Escort Requirements – The BHSC is responsible for all escort service for any transportation of material and/or employees on the air-side of the facilities.
14. Structural Attachment Points – The BHSC shall provide detailed drawings to the Owner indicating all structural attachment points where the BHS is supported by the building structure.
    a. The structural information shall provide detailed information on the type of anchor devices planned for use and amount of load imposed at point of attachment structure to building.

b. Review of submitted data shall in no way be construed as relieving the BHSC's contractual obligation of any responsibility for the proper design, manufacture, installation, and the successful operation of the BHS.

15. Engineering Stamps – Installation Drawings and As-Built Drawings as provided by the BHSC shall be properly stamped and sealed by a professional engineer registered in the state of the project site when required by state and local code.

16. Material Safety Data Sheets (MSDS) – The BHSC shall submit to the Owner material safety data information sheets for all lubricants that shall be required for the operation and maintenance of the BHS.

17. Access Openings – Openings required in the walls of the facilities for conveyor maintenance access shall be noted on the BHS layout drawings. The BHSC shall verify that these openings are properly located and sized.

18. Electrical Service Requirements – The BHSC shall submit to the Owner the baggage handling system's total system horsepower, amperage (based on full load nameplate data), total electrical service requirements, and locations of service drops for the BHS related MCPs.

3.2. EQUIPMENT MANUFACTURING STANDARDS

A. General

1. Specific material and equipment shall allow for component standardization and spare parts support of the baggage handling system. Such standardization of spares is of significant value to reduce operating expenses.

2. Whenever an article or any class of articles, devices or materials is specified by the trade name, or by the name of any patentee, manufacturer, dealer or by reference to the catalog of any such patentee, manufacturer or dealer, it shall be taken as intending to mean and specify the articles, devices or materials specified and none other.

B. Substitutions

If the BHSC desires to use any articles, devices or materials which are believed to be equal in quality, finish, durability and equally as suitable for the purpose for which intended as the articles, devices or material specified, the BHSC shall indicate the desire for review and approval to the Owner by providing a written RFS to the Owner. The same is true for control system processes and procedures.

C. Variance

1. The articles, devices, materials, processes or procedures specified shall not be changed except with the written consent and approval of the Owner. The BHSC shall not contract, purchase or cause to be delivered any substitute articles, devices or materials prior to obtaining such consent and approval of the Owner.

2. Any request for information, clarification or variance from this Specification is to be submitted by the BHSC to the Owner as a Request for Information (RFI).

3.3. ACCEPTANCE OF EQUIPMENT DELIVERIES

A. General Plan

1. The BHSC shall develop a plan of action for accepting delivery of equipment that does not interfere with airport operations.

2. The BHSC shall also plan for a safe, secure and protected storage of all equipment delivered before its actual installation.

B. General Responsibilities

1. All equipment shall be kept from the degrading effects caused from exposure to the elements.

2. All loss of equipment due to improper storage shall be the responsibility of the BHSC.

3.4. DEMOLITION REQUIREMENTS

A. General

1. The project will require the removal and demolition of certain conveyors and associated controls and devices identified in the demolition drawings.

2. Demolition and removal activities, including all equipment and control operational features, shall not adversely affect retained equipment and control operations.

3. Sequencing – The demolition work shall be accomplished on an expedited basis as noted in the various project-phasing steps within this specification and the contract drawings.

4. List of Equipment – The baggage handling system contractor shall prepare a list of the specific equipment that will be removed and potentially disposed of. This list will be submitted to airport authority's maintenance and engineering department prior to project commissioning. The maintenance and engineering will determine and notify the BHSC as to what items of the removed equipment are to be retained and salvaged for use by the airport authority's maintenance and engineering department.

5. Salvage – The baggage handling system contractor shall place all removed equipment on pallets and take to a location designated by the airport authority's maintenance and engineering department so that the maintenance personnel can salvage any components.

6. Disposal – The baggage handling system contractor will be responsible for the disposal of any of the removed or demolished equipment that airport authority's maintenance and engineering department chose not to salvage.

B. Finishing Process

1. Electrical – All unused electrical equipment including conduit, wiring, junction boxes and control or wiring devices rendered unused by the demolition process shall be removed in its entirety. Exception: abandon in place the imbedded portion only of any imbedded conduit after removing all conductors. Where a conduit passes through a floor or wall, the unused conduit shall be cut flush with both surfaces of such floor or wall and the section within the floor or wall shall be abandoned if it cannot be removed without breaking masonry. In addition, any unused starters, control devices, wiring, and other components within the related MCP shall be removed.

2. Mechanical – Support steel including header beams and attachments that is rendered unused by the demolition process shall be removed in its entirety. Anchor bolts flush with floor, wall, or ceiling shall be removed by burning or cutting.

3. Repair Work – Any area where material has been cut away shall be left in a clean and flush condition with no holes or protrusions showing. Where removal creates an indentation in the concrete, chip away the surrounding concrete, cut the material (such as, anchor bolts and conduit) below floor level and fill flush with cement repair material approved by the Owner.

4. Fireproofing – The repair and replacement of fire proofing materials shall be accomplished by the BHSC or the BHSC's fire proofing sub-contractor.

3.5. INSTALLATION

A. General

1. The BHSC is responsible for the all phases of installation during this project.
2. All workmanship and quality control shall adhere to and comply with industry construction standards.

B. Compliance with Drawing Package

1. All construction of the BHS shall follow the prescribed and agreed upon installation drawings.
2. Any divergence from these drawings will be considered out-of-specification and will be rejected unless changes are agreed upon prior to installation.
3. As-Built drawings shall accurately reflect these changes.

C. Work Duration

1. The BHSC is responsible for the timely completion of the project during the installation phase.
2. Any divergence from the schedule must be agreed upon by all parties and when necessary actions shall be undertaken by the BHSC to accelerate the installation process.

D. Employee Work Conditions

1. All tools and other construction equipment will be provided for by the BHSC.
2. All workspaces shall be kept clean and safe for employees and others who must access these areas.
3. The BHSC is responsible for the safety of all its employees while on the job site.
4. All applicable rules and regulations regarding employee behavior shall be followed.
    a. Employees shall not engage in drug or alcohol use within the facility
    b. Employees shall not, at any time, be under the influence of drugs or alcohol while at the job site.
    c. Employees shall not engage in any illegal activities while at the job site.
    d. Smoking is prohibited except in designated areas.

3.6. OPERATIONAL SYSTEM CONTROL PARAMETERS

A. General

System operational control will follow the standards and conventions as described in the following paragraphs.

B. System Start-up

1. The BHSC shall coordinate with the Owner in making provisions to tie into the Airport's Access Security Control System to ensure that only approved personnel may initiate start-up procedures for the conveyor system and subsystems.

2. System Start-up Pre-Conditions

    a. The main disconnect switch on XXX-XX must be in the "ON" position.

    b. All safety disconnect switches, located near the motors, must be in the "ON" position.

    c. All emergency stop pushbuttons must be pulled out/reset.

    d. All jam conditions must be cleared and reset.

    e. All motor starter protectors must be on/reset.

    f. All door control stations selector switch must be in the "NORMAL" position.

    g. If applicable, all safety disconnect switches located on the VFD Enclosure must be in the "ON" position.

C. Jam Detection

1. Jam detection devices and controls shall be provided at all jam prone points of the BHS. The locations of jam detection photocells are noted on the Contract Drawings.

2. Bag jams occur at jam-prone points in the conveyor system. A bag jam occurs when a photocell at a jam point has been continuously blocked for a predetermined period of time.

    a. The BHSC shall install jam detection devices at all points where bag jams might occur.

    b. All jam detection circuit timers shall be controlled through the PLC system. Jam timers shall be adjustable from 0 to 10 seconds. The initially set time shall depend on belt speed and the time required to detect two consecutive maximum sized bags. If baggage blocks the jam detection photocell for the timed interval, the device or conveyor on which the jam detection photocell is mounted and the adjacent downstream device or conveyor and certain upstream devices or conveyors shall stop running.

    c. Jams prior to power turns will stop the conveyor with the jam photocell, the power turn, and the conveyor immediately downstream of the power turn. The conveyor immediately downstream of the power turn shall not stop if the photocell at the head end of the power turn is a jam detection photocell.

    d. Jams prior to merges will stop the merge conveyor and the immediately downstream conveyor that the merge delivers baggage to. Jams at merges will stop the pre-merge conveyor, merge conveyor and the conveyor that the merge delivers baggage to.

    e. Jams at claim devices shall stop the claim device and the conveyor associated with the device.

3. Annunciation and Reset Function – A warning alarm horn at the MCP or workstation shall sound and an amber indicator illuminated on the system status display and/or visually and audibly annunciated at the workstation.

    a. The warning alarm horn may be silenced by activating the warning alarm silence pushbutton. The amber indicating lamp shall remain illuminated until the jam has been cleared and the jam reset pushbutton (RPB) activated.

    b. After clearing the jam and unblocking the jam detection photocell, the RPB shall be activated to reset the jam detection circuitry and to restart the devices or conveyors stopped by the jam condition.

c. The RPB shall be located adjacent to the jam detection photocell. The jam detection circuitry shall only function when the device or conveyor on which the jam detection photocell is mounted is running; thus, if a device or conveyor stops running and, as a result, a bag blocks the jam detection photocell, a false jam indication will not be generated.

d. In certain conditions, a single RPB may be used to reset multiple jams.

1) The use of a single reset for multiple jams requires prior acceptance by the Owner.

2) A Phenolic ID tag shall itemize the associated conveyors relative to the fault/jam and shall be located adjacent to the control station with the associated RPB.

e. The RPB shall remain illuminated until the related jam detector photocell has been unblocked and the RPB has been activated to reset the jam detection circuitry. The illuminated RPB shall be illuminated at the same time and for the same time period as the jam indicator on the system status display is annunciated at the WS.

D. Oversize Bags

1. Over-Length/Over-Height Bag Detection – The BHSC shall employ over-height and over-length photocells located at the discharge end of the load conveyors to ensure that bags exceeding the size capability of the BHS conveyors are not placed into the system.

a. When an over-height bag detection photocell is blocked the load conveyor and the next sequential downstream conveyor will stop.

b. When over-length bag detection photocell is blocked for a set time-period that determines a bag is too long for the system the load conveyor and the next sequential downstream conveyor will stop.

c. An illuminated white oversize reset momentary contact pushbutton located at the load conveyor shall be illuminated. The BHS fault/status monitoring system shall illuminate a white lamp or text message indicating an oversize condition.

d. When the oversize bag is removed, the load conveyor may be restarted by activating the white illuminated over-height/length bag detection reset pushbutton. This extinguishes the illumination of the reset pushbutton and clears the oversize bag indicator from the BHS fault/status monitoring system.

2. A knock-down bar shall be used for over-height bag restraint. A control station mounting assembly bridging the load conveyor, located and built to also act as an over-height bag restraint can be used for this purpose.

E. Motor Failure Due to Motor Overload (MOL) Trip or Motor Fault (MTRF)

1. The control design of the BHS shall be such that any one motor overload trip or motor fault will result in the cascade shutdown of the affected conveyor or device and all upstream conveyors to the nearest device or conveyor equipped with a head end sensor.

2. BHS Conveyors and Single-Drive Devices – The MOL trip or MTRF shall illuminate a blue indicator on the system status display on the MCP.

a. Devices or conveyors downstream of the affected device or conveyor shall continue to operate.

b. A fault warning alarm horn mounted at the MCP shall sound at the time of the MOL trip or MTRF. The fault warning alarm may be silenced through use of the alarm silence

pushbutton switch (APB) located on the MCP. The activation of the APB shall not affect the illumination of the blue MOL/MTRF warning indicator on the MCP.

c. The indicator shall remain illuminated until the tripped MOL or MTRF has been reset.

3. Dual-Drive Devices – A single MOL trip or MTRF on a claim unit with dual drives shall stop the device and illuminate a blue indicator on the system status display on the MCP.

a. A fault warning alarm horn mounted at the MCP shall sound at the time of the MOL trip or MTRF. The fault warning alarm may be silenced through use of the alarm silence pushbutton switch (APB) located on the MCP. The activation of the APB shall not affect the illumination of the blue MOL/MTRF warning indicator on the MCP.

b. The local disconnect to the failed drive can be shut off, allowing the tripped overload to be reset. The device can then be restarted.

c. The indicator shall remain illuminated until the tripped MOL or MTRF has been reset.

d. Circuit design shall be such that activation of a claim device tripped MOL or MTRF reset mechanism shall not automatically restart that device, claim or sort device; i.e., a device that has experienced a MOL/MTRF situation can only be restarted after the MOL/MTRF has been reset and the SPB activated.

F. Auto-Start Circuit Function

1. Circuit design shall ensure that if a downstream auto-shutdown zone has timed out due to an auto-shutdown, the zone shall be automatically restarted if a bag is diverted or conveyed to that zone. This shall be enacted upon at a sufficient location upstream of that zone to provide an appropriate time for the conveyors within the zone to restart.

2. An auto-start function shall be created at an upstream photocell on the operating line of the diverter or the conveyor directly feeding the conveyors within the zone. This photocell will be used to initiate the auto-start sequence of the auto-shutdown zone to which the bag is conveyed to ensure the stopped line is operating for the oncoming bags.

3. Timing Reset – When conveyors are restarted by the auto-start function, the auto-shutdown zone timer setting shall reset to the default value.

G. Auto-Shutdown Circuit Function

1. Circuit design shall ensure that all timing functions are bypassed and will not time out when the auto-shutdown zone is stopped due to a jam, MTRF, cascade shutdown or activation of an EPB.

2. Auto-Shutdown Timing – Auto-shutdown timers shall reset to the pre-set time value any time a bag-present photocell blockage, jam, MTRF, or emergency stop has occurred.

3. Default Values – Initial timer values for each zone shall be determined during design review meetings. This value shall be adjustable. The following is an estimate of the initial settings.

a. Automatic shutdown circuitry for inbound feed conveyors within the public area shall be set initially at 30 seconds.

b. Automatic shutdown circuitry for claim devices shall be set initially at 300 seconds.

4. Auto-Shutdown Zones – The zones shall be the same as motor groups that are defined as groups of conveyor sections separated by BHS doors, merges, diverters, vertical sorters, vertical merges, or other alternate baggage flow paths.

5. Timing Reset – When the conveyors within the affected auto-shutdown zone are restarted the auto-shutdown timing shall begin to time-out from the maximum preset time period set.

H. Head End/Cascade Shutdown

1. BHS conveyors identified on Contract Drawings shall be equipped with head end sensor photocells to permit an orderly cascade shutdown of each individual device or conveyor when its head end sensor has been blocked.

2. When downstream conveyors stop for any reason, cascade logic shall be enabled.

   a. If the conveyor upstream of the stopped belt is installed with a photocell, the belt shall continue to run until the photocell is blocked.

   b. In cases where the conveyor upstream of the stopped belt does not have a photocell, the belt shall stop immediately once the downstream belt is known to have stopped.

3. The conveyor with the head end photocell along with all associated conveyors up to the nearest upstream head end photocell or available sorting device capable of creating an alternative path, will stop.

4. Latch Circuits – When latch circuits are employed, one of the following override options shall be provided as delineated in the Contract Drawings. A key type override switch shall permit operational and maintenance personnel to override the latch function of the head end sensor photocells

I. Start Alarms

1. Alarms shall be placed in a sufficient number that ensures all areas of the BHS are warned before conveyors are started.

2. These alarms shall be both visual and audible.

3. The sound and intensity of the alarms shall be designed to match the needs of the area for which they are intended.

4. The alarms shall conform to all safety and health requirements as defined in this specification and according to all federal, state and local codes and regulations.

J. Fault Warning Alarm

1. An audible fault warning alarm shall be provided for each system on the MCP.

2. Jam and MOL/MTRF Warnings – The fault warning alarm and its APB shall be used for both jam and MOL and MTRF fault conditions. In either case, activation of the APB shall not have any effect on the indicators that are illuminated on the MCP.

3. Circuitry – The design of the control circuitry shall be such that multiple faults always sound the fault warning alarm; i.e., if a jam condition has caused the alarm to sound and the alarm has been silenced but the actual fault not yet corrected, a second fault occurring after the alarm has been silenced should cause the fault warning alarm to sound.

4. Feedback – The circuit design shall cause no feedback to the Sonalert warning alarm device.

K. Motor Control Panel (MCP)

1. MCPs for the BHS shall be designed with controls to provide the functions described in this Specification.

2. Location of the MCPs shall be as shown on the Contract Drawings.
3. MCP Control Stations – Control stations mounted on the MCP door are to consist, at a minimum, of the following switches:
    a. Alarm silence = APB
    b. Emergency stop = EPB
    c. System start = SPB
    d. Motor Overload = PBB
4. MCP XXX-XX has a lockable, external, switch handle to disconnect motor and control power from the panel components.
5. The input side of the disconnect switch remains energized when in the off position and only qualified personnel should open panel doors. Wires connected to the panel lights and receptacle as well as interface connections from other MCPs remain energized when the main disconnect is off.

L. Emergency Stop (E-Stop) Controls
1. The following is a description of the required E-Stop control functions for the BHS.
2. E-Stop Zones – Conveyor E-Stops shall be divided into E-Stop zones as defined in Contract Drawings.
3. All E-Stop circuitry shall comply with NFPA 79, Category 0, which states that the stop function is an uncontrolled stop that immediately removes power to the machine actuators.
4. All E-stop interlock groupings that are associated with more than one power source shall not be wired between the associated control stations; instead, they shall be wired together between the related power sources via dry contact switches.
5. E-Stop Activation – Activating any zone or subsystem E-Stop switch shall:
    a. The control power is removed from the conveyors listed on the E-Stop's function tag, stopping those conveyors. Also, all associated conveyors up to the nearest upstream head end photocell or sorting device in divert all, will stop.
    b. Illuminate in a flashing mode the E-Stop pushbutton that was activated and in a steady mode for all other EPBs within the zone.
    c. Illuminate the appropriate E-Stop red indicator on the system status display and/or annunciate at the WS. The graphical representation on the system status monitor shall be driven by internal PLC latch that can only be reset by SPB.
    d. After resetting (deactivating) the zone’s activated EPB, the following shall occur.
        1) The E-Stop pushbutton that was activated stops flashing and illuminates in a steady mode.
        2) The other E-Stop indicator lamps from the zone are no longer illuminated.
        3) The stopped device or conveyors shall only be restarted using the start pushbutton switch (SPB) at the specific control station with the illuminated activated/deactivated E-stop.

4) This shall cause the affected system or subsystems to restart in the normal start-up sequence.

6. If the affected devices or conveyors are not restarted within a set time-period (initially set at 30 seconds) once an E-Stop pushbutton has been reset after it was activated, security/fire doors in the affected zone shall automatically close. The PLC verifies the door clear photocell is clear of baggage before the door is allowed to close.

M. BHS Door and Building Interfaces

1. Fire alarm door connections to the building's Fire Alarm System (FAS) – Provide a terminal strip for door fault and status information, and for fire alarm connections in each IOP associated with each fire door.

   a. The PLC system shall be pre-programmed to accommodate these connections.

   b. There shall be jumpers installed at the fire alarm connections that will be removed once the fire alarm is connected to the terminal strip by the fire alarm contractor.

   c. The terminal strip shall be clearly marked and the connections identified on the IOP drawings.

   d. These connections include the following:

      1) FAS to BHS – Fire alarm signal shall initiate an orderly shutdown of the BHS.

      2) BHS to FAS – Run signal shall notify the FAS that the conveyor immediately upstream to the door is running.

      3) BHS to FAS – The BHS shall notify the FAS that the door is in its fully closed position.

   e. The failsafe style of the contact shall be continuously monitored as a Normally Open – Held Closed relay contact in a constantly energized relay controlled by the building fire alarm system.

   f. In the event that the PLC input monitoring this relay contact turns off, the conveyors, make-up devices, and sorting devices controlled by the IOP will immediately stop – provided that the fire/security door is clear – by means of removing the 480VAC 3PH power from the motors.

   g. The fire control alarm zones shall be entirely represented at the Fault Monitoring System.

2. Security door connections to the building's Access Control System (ACS) – Provide a terminal strip for each card reader and for door fault and door status information in each IOP for each associated security door.

   a. The PLC system shall be pre-programmed to accommodate these connections.

   b. The terminal strip shall be clearly marked and the connections identified on the IOP drawings.

   c. These connections include the following:

      1) ACS to BHS – Start signal shall enable the Belt Start button for one second (adjustable). On activation, the associated control station start pushbutton shall be activated.

      2) BHS to ACS – Run signal shall notify the ACS that the conveyor immediately upstream to the door is running and to shunt the Balanced Magnetic Switch (BMS) open condition.

3) BHS to ACS – Maintenance override signal shall notify the ACS that the door has been authorized to be placed in Maintenance Mode.

4) BHS to ACS – Conditioned BHS signal shall notify the ACS that the conveyor has stopped running but is still enabled and can restart at any time without re-enabling the security system.

5) BHS to ACS – Future BHS door signal wire shall be installed but not placed in use, instead is will be made available for use in the future.

d. All security control interface points shall be located in an enclosure in the control room and adjacent to the building security control interface panel.

e. The failsafe style of the contact shall be continuously monitored as a Normally Open – Held Closed relay contact in a constantly energized relay controlled by the building security control system.

N. Life Safety Operation

1. If an emergency event exceeds the ability of the terminal's emergency power system to provide the allotted emergency power to the BHS, power will only be provided to the fire and security door locations.

2. This power shall automatically be used by the BHS to remove bags on conveyors underneath the doors and then to close the doors.

3. The control room will also retain power during this event, but no other portions of the BHS will receive power. This life safety function should be monitored and displayed as part of the emergency power operations status.

4. Normal BHS operations will be commenced only when the signal sent by the terminal's emergency power system to the operator interface within the control room is removed and normal power is provided to the BHS.

O. Description of Operation for Flat Plate Inbound System

1. These multiple drive devices that are capable of operating with a single non-functioning drive, the device will be permitted to run with one of the motor disconnects in the off position once the selector switch is placed into bypass mode.

2. The flat plate claim device shall have a minimum of five control stations in the public view area.
- All stations contain an EPB.

3. In non-public view areas there shall be a minimum of one control station containing an EPB, a system start key switch, a non-illuminated SPB, and an RPB where applicable.

4. The claim device shall also incorporate a control station at each drive for maintenance access.

a. These control stations shall contain, at a minimum, an EPB, a non-illuminated SPB, an auto/maintenance/bypass selector switch, a system start key switch and a JPB.

b. SPBs and JPBs shall only be active only when the Auto/Maintenance/Bypass selector switch is in the maintenance mode.

c. The control logic shall incorporate a time delay of four seconds (adjustable) between the time the JPB is released and it becomes enabled again to prevent repeated activation of the jog feature and possible damage to the soft start and drive unit.

5. The auto-stop timer for a claim device shall initially be set at 300 seconds (adjustable). All bag-presence photocells along the device pathway shall be used in a manner that accommodates this requirement. Once the auto-stop timer has expired, the claim device shall stop and the security doors shall then initiate shutdown procedures.

P. Description of Operation for BHS Doors

1. Overview – The door has two modes of operation, normal and maintenance. The mode of the door is selected using a selector switch on the associated control station, located on the secure side of the fire/security door. Under normal mode, the door is controlled by the PLC and the door automatically opens and closes. Under maintenance mode, the door is manually controlled using local controls on the associated control station.

    a. Normal Mode – Following a system start, the PLC activates the door open relay to open the door. When the door arrives at the door open position photocell, the door open relay is de-activated and the adjacent conveyors are allowed to start. E-stop pushbuttons that stop a conveyor adjacent to a fire/security door also stop the fire/security/environmental door. When the sub-system auto-stops, receives a fire alarm signal or the conveyor goes into standby mode, the conveyors adjacent to the door continue to run while all upstream conveyors stop. The PLC verifies the door clear photocell is clear of baggage before stopping the adjacent conveyors. Once the conveyors stop, and after a time delay (to detect any baggage coasting under the door), the PLC activates the door close relay to close the door. If baggage is present or coasts under the door then the adjacent conveyors re-start and the above sequence is repeated. When the door arrives at the door closed position photocell, the door close relay is de-activated. The Maintenance/Auto Switch is placed in the "Auto" position for normal operation.

    b. Maintenance Mode – The fire/security doors may be operated manually. Placing the Maintenance/Auto Selector Switch on the associated control station to the "MAINT" position enables the local pushbuttons and shall allow personnel to close or open the door.

    c. Closing the door manually while the associated system is running shall stop the conveyors adjacent to the door.

2. Provide a door obstruction photocell at the conveyor level positioned to determine if a bag is blocking the door passageway. During normal mode operation, do not allow the door to close if the passageway is blocked.

3. Provide photocells or, upon approval, limit or proximity switches positioned in a manner that determine door open and door close conditions.

4. Connect these recognition devices – the photocells – to the system monitoring function.

5. Configure the BHS subsystem associated with the door to not start or operated if the door is not in the fully open position. If the door falls out of the open position during conveyor operation, configure the conveyor under the door to stop immediately and all other associated conveyors to stop in a controlled manner.

6. Configure the control system to close the door at the completion of an Auto-Stop procedure.

7. Configure the system monitoring function to declare a fault condition if:

    a. The door fails to fully close when expected.

    b. The door fails to fully open when expected.

c. The door falls out of the open position during conveyor operation.

8. Configure the control system to connect door opened and closed information to the building's Fire Control System. When a fire alarm signal is received from the Fire Control System, the PLC performs an orderly shutdown of the associated sub-system and closes the door.

9. Head end and bag jam functionality is inhibited when a fire alarm signal has been received, however, emergency stop and motor overload conditions are not.

10. Configure the control system to connect door opened and closed information to the building's Security System.

11. Configure the signal for the door as Normally Open Held Closed (NOHC) for failsafe protection in case of signal loss or failure.

12. Provide a two button control station on the secure side of the door with the following features:

    a. Three position switch for open and close with spring return to the center position.

    b. Maintenance/Auto Switch

3.7. TESTING

A. General

1. This section describes the requirements for product and component testing for equipment that has not been previously accepted by the Owner for use in baggage handling applications, as well as inspections, demonstration and testing of the BHS defined in the Specification.

2. General Requirements – The BHSC shall provide all labor and materials for the inspection and demonstration of equipment and systems. Additionally, the BHSC shall provide all required test equipment and technical support personnel to support the conditional acceptance and final acceptance inspections and demonstrations.

3. Site Preparation Check List – The BHSC shall complete the Site Preparation Check List and submit to the Owner prior to commencement of any testing, inspections or demonstrations.

4. Test Equipment – The BHSC shall provide and have on site during all inspections and demonstrations all required support test equipment. At a minimum, this equipment should include:

    a. Straight edges

    b. Clamp on ammeters

    c. Digital belt tachometer

B. New Equipment Inspection, Testing and Demonstration

1. Any new concept or BHS equipment, product or component recommended by the BHSC for use on the project shall be thoroughly demonstrated to the Owner prior to approval for implementation.

2. Working Demonstration – The BHSC shall demonstrate suitability of proposed products or components through either a thorough working demonstration of the equipment at the BHSC's test facility or a field demonstration at one or more sites where the BHSC has already implemented the new concept or equipment.

3. Testing Requirements – Demonstration and testing requirements for the new concept or equipment shall be developed by the BHSC and submitted to the Owner. The demonstration and testing requirements shall identify such requirements as:
    a. Number of test cycles
    b. Number of hours of run time
    c. Processing rates
    d. Physical characteristics of items to be processed
    e. Mean time between failures
    f. Mean time to repair
    g. Serviceability, etc.

C. Static System Inspections

1. Following the BHSC's complete and documented internal check-out and testing of the relevant sections of the BHS, the BHSC shall conduct detailed mechanical and electrical static inspections to validate to the Owner that the BHS is in total compliance with all requirements in the Specification.
2. Inspection Sheets – Prior to conducting static inspections, the BHSC shall prepare detailed static inspection sheets for the Owner to review. These sheets shall also be used by the BHSC to report actual findings of electrical and mechanical equipment inspections.
3. Mechanical Inspection – The mechanical static inspection and demonstration validates that all mechanical equipment has been properly designed, manufactured, and installed in total conformance with the Specification.
4. Electrical Inspections – The electrical static inspection and demonstration validates that all electrical equipment has been properly designed, manufactured, and installed in total conformance with the Specification.
5. Concurrent MCP Testing
    a. After each MCP is wired to the conveyor subsystem it controls and its drawings are red-lined according any changes that may have occurred to the initial set of drawings for the MCP, the BHSC shall inform the Owner.
    b. The Owner will then inspect the MCP and its red-lined drawings to ensure that the MCP is properly wired and the drawings accurately depict the red-lined status of the MCP.
        1) The inspection will be failed if the drawings are not reflective of current built status or if the workmanship does not meet specification requirements.
        2) A failed inspection will result in a full re-inspection of the MCP. If the subsequent inspection is also failed, the third inspection will be at the BHSC's expense.
        3) Small inconsistencies and easily corrected non-performance issues will be allowed as long as they are quickly corrected and the inspection can progress without stopping due to the overwhelming number of failures to conform with specification requirements.

c. The BHSC shall then remove the drawings and electronically update them within 14 days to accurately depict the current built status. These updated drawings shall be placed back into the MCP with the original red-lined drawings.

d. The Owner will then compare the drawings to ensure changes were accurately made. If not, the drawings will be returned for re-submittal.

e. If further changes are made to the MCP prior to final acceptance, the drawings will be red-lined, electronically updated and reviewed in the same manner as described above.

f. The drawings will be re-issued as As-Built drawings and submitted as described in this specification.

D. Dynamic Systems Demonstrations

1. The BHSC shall conduct detailed mechanical and electrical dynamic demonstrations to validate to the Owner that the BHS is in total compliance with all requirements in the Specification.

2. Inspection Sheets – Prior to conducting dynamic demonstrations, the BHSC shall prepare detailed demonstration sheets for the Owner. These sheets shall also be used by the BHSC to report actual results of dynamic demonstrations.

3. System Speed and Processing Rates – Conveyor equipment shall operate within 5% of the approved design criteria.

4. E-Stop Hardwire Test – The BHSC's controls engineer shall force on all motor outputs per MCP. Each E-Stop will then be tested to ensure that the correct associated conveyors are affected per drawing requirements. This test will be validated both in the field, at the MCP and in the control room.

5. Load and Weight Demonstrations – The BHSC shall conduct load and weight demonstrations to validate that the BHS performs as required by the Specification.

   a. Load and Weight demonstrations validate that the mechanical equipment has been properly designed, manufactured, and installed in conformance with the Specification. At a minimum, items to be validated include:

      1) Proper drive pulley diameter

      2) Conveyor belting is properly tensioned

      3) Full load "name plate" motor currents are not exceeded

      4) Loaded conveyors can be started

   b. Load and Weight demonstrations shall validate that the electrical equipment has been properly designed, manufactured, and installed in conformance with the specification. At a minimum, items to be validated include the following (documentation to be provided in a CSV, HTML or equivalent text soft copy file delivered prior to testing):

      1) VFD ramp and deceleration time frame

      2) Motor HP rating

      3) FLA settings

      4) Frequency settings

      5) Boost settings

6) Fault reset mode/enabled

7) Fault parameters enabled

c. During the load and weight demonstrations, the BHSC shall record the following empirical data for submittal as Verification Sheets to the Owner and inclusion in the Project Operations and Maintenance Manuals:

1) Actual "full-load" current draw per phase for main fuses

2) Actual "full-load" motor current draw per phase

6. Electrical Demonstrations – Electrical dynamic demonstrations validate that the electrical equipment and control systems have been properly designed, manufactured, and installed in total conformance with the Specification. At a minimum, items to be validated include the following.

a. Emergency stop operation

b. Manual startup operation

c. Automatic startup operation

d. Automatic shut-down operation

e. Startup warning operation

f. Motor overload protection operation

g. Photocell functions

h. Cascade stop operation

i. Jam detection operation

j. Merge operation

k. Powered door operation

l. Claim device operation

m. System monitoring functions

n. PLC connectivity

o. Maintenance mode operations

p. During the electrical dynamic demonstration, the BHSC shall record the following empirical data for submittal as Verification Sheets to the Owner and inclusion in the Project Operations and Maintenance Manuals:

1) Main feeds

a) Fuse size per phase

b) Actual amperage per phase

2) Transformers:

a) Fuse size per phase

b) Actual amperage per phase

7. Mechanical Demonstrations – Mechanical dynamic demonstrations validate that the mechanical equipment has been properly designed, manufactured, and installed in total conformance with the Specification. At a minimum, items to be validated and documented include:
    a. Conveyor speeds (without any product)
    b. Conveyor belt tracking without product
    c. Conveyor belt tracking with product
    d. VFD functions
    e. Shaft run-out
    f. Pulley shell run-out
    g. Noise levels
    h. Motor current draw with no material on conveyor
    i. Equipment vibration
    j. During the Mechanical dynamic demonstrations, the BHSC shall record the following empirical data for submittal as Verification Sheets to the Owner and inclusion in the Project Operations and Maintenance Manuals:
        1) Actual "center line" speeds of conveyors and devices
        2) Motor Information/Data
        3) Name plate horsepower
        4) Name plate full load current
        5) Actual fuse size per phase
        6) Actual overload protection size/setting
        7) Actual current draw per phase with no material on conveyor
8. Volume and Rate Demonstrations – The BHSC shall conduct two 20-minute volume and rate demonstrations to validate that the system performs as required by the Specification.
9. System Recovery Demonstrations – Upon successful completion of the previous demonstrations, the BHSC shall conduct system recovery demonstrations to validate that the BHS can be successfully returned to operation after a power failure.

E. Test Plans
1. The BHSC shall submit Acceptance Test Plans that vigorously demonstrate full compliance with all demonstration requirements. These plans shall address, at a minimum, all static inspections and demonstrations required by the Specification.
2. Systems and Subsystems – The BHSC shall develop Acceptance Test Plans for each system and subsystem to demonstrate all control functions. The test plans shall list each control station, control device, etc., and its related control function that is to be demonstrated or tested.
3. Acceptance test plans shall include the strategy and philosophy for the testing and commissioning of the new systems and how the new systems can be successfully brought online without disruption of airport/airline services.

4. Test Plan Basic Requirements – The following is a list of requirements for the Acceptance Test Plans produced as a submittal for the project. The list includes, but is not limited by the following:
    a. Name with descriptive identifiers for each test.
    b. Time required for each test.
    c. Kinds, weight, sizes and amount of test bags and baggage tubs used for testing.
    d. Bag tags, alarm materials and other external accessories intrinsic to the specific tests.
    e. Identity of test areas, including:
        1) Specific input or load lines.
        2) Conveyors and their controls.
        3) Output or unload lines.
        4) Control room, fault monitoring and sort controller activities and expectations.
    f. List of all equipment, special or otherwise, used during the tests.
    g. List of all Owner provided equipment.
    h. Measurements for determining whether or not the tests pass or fail.
    i. Types and number of personnel required for the tests, including:
        1) Supervising personnel for the BHSC.
        2) Participating disciplines for the BHSC.
        3) Support personnel for the BHSC.
        4) Participating disciplines from the Owner/Airport.
        5) Participating disciplines from the Owner's Representative(s).
    j. Space for comments made regarding test results.
    k. Check boxes for "Pass" or "Fail."
    l. Space for signatures of relevant participants.
5. Submittal – All test plans shall be submitted to the Owner for review and acceptance prior to the operational start-up date for the BHS.

F. Test Failure

1. A failure during any test period is defined as any design characteristic, malfunction or unsafe condition arising from BHS equipment or materials that damages material or reduces operating rates to less than those required in the Specification.
2. The Owner will require documented proof that all acceptance tests have been successful corrected.

G. Inspection Performance Checks

1. The Owner will review all equipment for testing purposes with the following as a guide. These checks represent examples of testing standards and are not exclusive to any other expectations

that may be reviewed for professional workmanship and adherence to the Specification and all drawings of record.

2. Conveyors

   a. Mechanical Static Inspection

      1) Record the gaps between adjacent head and tail pulleys.
      2) Record vertical clearance
      3) Check conveyor for 4" ID
      4) Check for gaps between adjacent bed sections
      5) Check for gaps between adjacent side guard sections
      6) Check for baggage snag points
      7) Check for sharp edges or shear burrs
      8) Check condition of painted surfaces
      9) Check for proper installation and alignment of stainless steel
      10) Check for installation of bed section filler plate on stainless steel trimmed conveyors
      11) Check for specified spacing of vertical braces for side guards/back guards
      12) Check for specified spacing of conveyor supports
      13) Check for sway bracing of conveyor
      14) Check all trim securement screws for specified type and proper countersinking
      15) Check for safety guarding/belly pans at points of less than 7'-6" clearance
      16) Check for proper anchoring/mounting of access ladders
      17) Check for proper belting material
      18) Check splice for proper sized Lacing
      19) Check splice for 3/4" V-notch
      20) Check splice for specified lacing cable
      21) Check for proper belt wrap
      22) Check for proper belt tension
      23) Check for specified pulley diameter
      24) Check for specified pulley shaft diameter
      25) Check vertical alignment of head and tail pulleys
      26) Check lateral position of pulleys
      27) Check for specified return roller diameter
      28) Check for specified return roller spacing
      29) Check bearing mounting hardware for tightness and lock washers
      30) Check bearing jacking bolts for proper installation and tightness

31) Check bearings for grease fitting hole plug
32) Check for installation of bearing caps
33) Check motor and speed reducer mounting hardware for tightness and lock washers
34) Check for speed reducer drip pan
35) Check for speed reducer related oil leakage
36) Check for speed reducer oil level
37) Check for proper mounting of speed reducer torque arm and related hardware tightness
38) Check for specified 25% take-up pulley position
39) Check for proper type and installation of strip door type draft curtain
40) Check for proper type and installation of BHS door
41) Check for removal of construction related debris
42) Check conveyor for any items that restrict maintenance access
43) Check for proper installation of protective guard railing for specified height, location, position, mounting, etc.
44) Check for 7'-6" minimum vertical clearance for traffic aisles
45) Check for removal of construction related debris

b. Dynamic Inspection/Test
   1) Record device/conveyor speed in FPM
   2) Perform load test
   3) Perform rate test
   4) Check conveyor for proper belt tracking
   5) Check for proper operation of brake motors
   6) Check speed reducer for lateral movement on shaft during start/stops
   7) Check device/conveyor for any abnormal noises
   8) Check drive assembly for any torsion flexing during start/stop operation

c. Electrical Static Inspection
   1) Check control stations for proper ID and function tags
   2) Check all illuminated pushbutton switches for proper protective guard ring
   3) Check all control devices for proper location, mounting and tightness of mounting hardware
   4) Check that photocells are mounted as specified
   5) Check that shaft encoders are properly mounted
   6) Check that shaft encoder related coupling is properly installed

7) Check that all control devices, disconnect switches, etc. are mounted so that they are accessible from catwalks
8) Check control circuit wiring for proper size, type and color
9) Check control circuit wiring for wire number tags
10) Check power circuit wiring for proper size, type and color
11) Check power circuit wiring for wire number tags
12) Check all wiring at terminal points for "whiskers"
13) Check all wiring terminal point screws for proper torque settings
14) Check for specified wire nuts at splice points within motor junction boxes
15) Check proper routing and mounting of conduits
16) Check all conduit fittings for tightness and bushings
17) Check all Sealtite fittings for tightness and bushings
18) Check all junction boxes for covers
19) Check all junction boxes and control device boxes for open unused openings
20) Check for lockable safety disconnect switch for conveyor drive motor
21) Check lanyard cable, related supports and limit switch for proper type, installation and operation
22) Check for any restriction of maintenance access

3. BHS Enclosure Testing (MCP)
   a. Static Inspection
      1) Check for proper mounting and security of mounting
      2) Check for specified ID Information
      3) Check that all control, power devices, fuses, etc. mounted within the enclosure are identified is as specified
      4) Check all control devices for proper location, mounting and tightness of mounting hardware
      5) Check control circuit wiring for proper size, type and color
      6) Check control circuit wiring for wire number tags
      7) Check power circuit wiring for proper size, type and color
      8) Check power circuit wiring for wire number tags
      9) Check all wiring at terminal points for "whiskers"
      10) Check all wire terminal point related screws for proper torque settings
      11) Check for specified Panduit wire race way
      12) Check for any splices in Panduit wire race way
      13) Check that all Panduit wire race way covers are properly installed

14) Check proper routing and mounting of conduits
15) Check all conduit fittings for tightness and bushings
16) Check for conduit bushings and chase nipples
17) Check for proper "air-space" around programmable logic controllers
18) Check for proper operation of the door(s) mechanical safety interlock
19) Check for safety shield over line and load terminals of main breaker
20) Check for proper orientation of status panel
21) Check for specified restraint clips for plug-in type power supplies
22) Check for specified status panel ID tags for Indicator lamps
23) Check 120 Volt utility outlet
24) Check for appropriate warning/hazard labels
25) Check the internal panel lighting
26) Check for power source placard 120 and 480 volt.

b. Enclosure Functional Test
1) Record all motor currents per each phase
2) Record size of motor overload heaters
3) Record size of all fuses
4) Check function of start-up alarm
5) Check function of fault warning alarm(s)
6) Check function to fault warning alarm(s) with multiple faults
7) Check function of fault warning alarm silence button
8) Check for proper settings of timers
9) Check for proper function of auto-shutdown timers
10) Check for proper function of motor overload circuitry (with proper "drop out" of related motor starters)
11) Check for proper operation of the status panel indicator lamps: E-stop, run, jam, and motor fault and overload conditions

4. Conditional Acceptance Inspection and Test Plan for System Control Functions.
a. Each control station
b. Each control station control device and its related function
c. Each photocell
d. Each control function performed by the photocell
e. Each limit switch
f. Each control function performed by the limit switch

g. Each warning alarm

h. Each warning function performed by the alarm device

i. Each warning light

j. Each function performed by the warning light

3.8. TRAINING AND TRAINING SCHEDULE

A. General

1. Training Schedule and Content – A detailed outline of the training material and content shall be submitted to the Owner for review and acceptance prior to the first scheduled training class. The BHSC shall develop a syllabus for the Maintenance Training and a syllabus for the Operations Training, incorporating class structure and schedule. Each should provide an introduction to the training sessions, including an overview of the course, the material, what is expected of the trainees, and what the trainees should expect from the instructor.

2. Mechanical Maintenance Training – The Mechanical Maintenance Training program shall provide a description of the mechanical characteristics and operational features of all mechanical equipment in the system by component and subsystem, i.e. conveyor products, merges, claim units, power turns, doors, and other system peripherals. Training should cover nomenclature and function, safety procedures, recommended preventive maintenance, troubleshooting and removal and installation.

3. Electrical Maintenance Training – Electrical Maintenance Training shall cover an operational review of the system and its control devices, control of system mechanical devices, PLC systems, Motor Control Panels (MCPs), and associated field devices such as control stations, alarms and photocells.

4. OEM Training – All training courses shall incorporate OEM-provided training from major subsystem suppliers, such as power turn, motor/reducer (gearbox)/VFD combination drives, PLCs, and door manufacturers.

5. Operations – Operations Training, distinct from the Mechanical and Electrical Maintenance Training programs, should be a vigorous, integrated program incorporating mechanical, electrical and computer functions required to properly and safely operate the system.

a. This includes an overview of the training program, introduction to the documentation set, definition of terms, and an overview of the entire system with nomenclature and function of mechanical, electrical and computer subsystems.

b. Include the proper handling bag hygiene procedures and placement of baggage onto the BHS load conveyors.

B. Training Class and Materials

1. The BHSC shall provide training by qualified instructors.

2. Training Materials – Supporting materials and teaching aids for this training program include, at a minimum, Microsoft PowerPoint presentations, CAD drawings of system layouts, and workbooks organized the same as the class material.

a. It also shall include current version of the O&M manuals, parts list and as-built drawings.

b. Also provide a Bag Hygiene Reference Sheet detailing proper handling and placement of baggage onto the BHS conveyors.

3. Training Classes – Training classes shall be provided prior to the operational start-up of the BHS.

    a. The times and duration of the training classes may involve irregular hours in order to provide training for operation and maintenance personnel on different shifts.

    b. Length and type of training will be defined in the Contract or upon review consultations during the project. The BHSC shall prepare for a minimum of two one-hour operational sessions and two two-hour maintenance sessions.

    c. The BHSC shall provide maintenance training for any specialized equipment used in the BHS. Such training shall be presented by the original equipment manufacturer of the specialized equipment. Examples of such specialized equipment include:

        1) PLC systems

        2) Motor/Reducer (gearbox)/VFD combination drives

        3) Power turns

        4) Powered Doors

        5) 45^{o} merges

        6) Claim devices

    d. The BHSC shall be responsible for developing and maintaining a training attendance record for all operation and maintenance training sessions. The training record shall note the following information in duplicate form. The original copy of the training record shall be forwarded to the Owner, with the second copy being retained by the BHSC for his files. The recorded information shall include:

        1) Title of project

        2) Date of session

        3) Time of training session

        4) Name of instructor

        5) Subject matter

        6) Signature and department of each attendee

4. Training Video Presentation – The BHSC shall develop and provide the Owner with two copies of video training DVDs that provide in-depth training information for operation and maintenance personnel. The training DVDs shall be based on the specific BHS defined by the Specification. Every subject covered during these sessions shall be included in the DVD set.

3.9. CONDITIONAL AND FINAL ACCEPTANCE

A. General

The following defines the requirements for Conditional Acceptance and Final Acceptance of the BHS defined under the Specification.

B. Conditional Acceptance/Substantial Completion

1. Satisfactory Demonstration – The BHSC shall satisfactorily demonstrate the specified BHS to the Owner to confirm that all specified design, testing, and performance requirements, static and dynamic, have been met.
2. Removal of Covers – The BHSC shall be responsible for the removal of all electrical and mechanical covers to allow for inspection by the Owner.
3. Corrective Action – Any items found that do not meet the specified requirements and require corrective action will be noted in a punch list.
4. Inspections – Resulting punch list items from such inspections and tests are relatively minor in nature and do not abrogate beneficial use of the BHS.
5. Training Complete – All specified operation and maintenance training requirements have been successfully completed.
6. Spare Parts – All system parts information has been provided and received as specified.
7. Final O&M Manual Delivery – The specified number of O&M manuals have been reviewed, approved, and delivered.
8. On-Site Documentation – The BHSC has provided adequate on-site mechanical and electrical documentation reflecting the BHS as-built conditions, so that proper operation and maintenance of the BHS can be expected.
9. Conditional Acceptance – Upon conditionally accepting the BHS, the Owner will transmit to the BHSC a signed conditional acceptance form along with the punch list.
10. Beneficial Use – Beneficial use of the BHS shall begin at the time of the conditional acceptance of the BHS unless otherwise mutually agreed between the BHSC and the Owner.
11. Date of Beneficial Use – Date of beneficial use of the BHS as established by the conditional acceptance of the BHS shall also be the date for the start of the specified warranty period.
12. Open Punch List Items – The BHSC shall complete all open punch list items within a specified time period after the conditional acceptance inspection and test of the BHS unless otherwise agreed to by the Owner.
13. Verification – Upon completion of the open punch list items, the BHSC shall return a copy of the punch list with an initialed sign-off by the BHSC's project manager verifying that each item has indeed been completed and inspected for completeness. The BHSC shall formally request a re-inspection of the BHS at time of transmitting the signed-off punch list to the Owner.
14. Follow-Up Inspection – Upon the receipt of the signed-off punch list from the BHSC, the Owner will schedule a follow-up inspection and test to validate that all noted punch list items have been satisfactorily completed.
15. Non-Conformance – Should any of the corrective work create a situation that does not comply with the BHS Specification, this shall be considered a new punch list item and shall be added to the punch list.
    a. If, during the punch list follow-up inspection and test, punch list items are still found to be not properly corrected, a second inspection and test shall be required.

b. The Owner will deduct the costs associated with any punch list inspections and tests that may be required after the original punch list follow-up inspection and test from the retainage monies being withheld.

16. The BHSC shall provide 30 days of 24-hour per day on-call support after conditional acceptance by a qualified technical representative capable of facilitating troubleshooting and correcting problems that may occur to the system during this period.

C. Final Acceptance

1. Final acceptance of the BHS shall require the BHSC to have completed all punch list items to the satisfaction of the Owner.

2. As-Built Documentation – Confirmation that the Owner has received all specified as-built documentation for the BHS.

END OF SECTION 34 77 39

Appendix 2-B: PFC 8 and 9 Project Info

Separately provided on the Procurement Website under the Appendix: Q&A tab.

Appendix 2-C: PFC-5500-1-Attachment-H-2022 ISP Final Rev

Separately provided on the Procurement Website under the Appendix: Q&A tab.