ADDENDUM No. 1

BAGGAGE HANDLING SYSTEM UPGRADES

FAA AIP No. 3-19-0012-083 (BIL-ATP TERM-2025)

June 9, 2025

This addendum forms a part of the Contract Documents and modifies the original Bidding Documents dated May 22, 2025. Acknowledge receipt of this addendum in the space provided on the proposal form, failure to do so may subject the Bidder to disqualification.

BIDDER MUST ACKNOWLEDGE RECEIPT OF ADDENDUM No. 1 ON THE PROPOSAL FORM FOR THE BID TO BE CONSIDERED RESPONSIVE.

General Items

1. **Planholders List**
   The planholders list can be found at http://rapidsrepro.com/planroom/
2. **Contractor Questions**
   Bidder questions received and proposed answers are attached to this Addendum.
3. **Pre-Bid Presentation**
   The Pre-Bid meeting presentation and sign-in sheet is attached to this Addendum.

Specifications

4. **Section 00 00 01 – Notice of Hearing and Notice to Bidders** (section not reissued with this addendum)
   a. **Contract Time Information**
      i. **Revise** item c. from "Substantial completion within 30 Calendar Days" to "Substantial completion within 60 Calendar Days".
5. **Section 00 00 02 – Instructions to Bidders** (section not reissued with this addendum)
   a. **Article 19 – Award of Contract**
      i. **Revise** item 19.01 C. from "Substantial completion within 30 Calendar Days" to "Substantial completion within 60 Calendar Days".
6. **Section 00 00 08 – Contract Agreement** (section not reissued with this addendum)
   a. **Article 5 – Contract Time**
      i. **Revise** item c. from "Substantial completion within 30 Calendar Days" to "Substantial completion within 60 Calendar Days".
   b. **Article 6 – Liquidated Damages**
      i. **Revise** Allowed Construction Time for Substantial Completion from "30 Calendar Days" to "60 Calendar Days".
7. **General Contract Provisions – Section 80 Execution and Progress** (section not reissued with this addendum)
   a. **Section 80-08 – Failure to Complete on Time**
      i. **Revise** Allowed Construction Time for Substantial Completion from "30 Calendar Days" to "60 Calendar Days".
8. **Section 34 77 39 – Baggage Handling System** (section **REISSUED** with this addendum)
   a. **Section 1.04.A.2.b**
      i. **Removed –** "motor starters"
   b. **Section 1.04.A.2.d**
      i. **Removed -** "light curtains"

c. **Section 2.05.C.4.a**

i. **Removed -** "light curtains,"

d. **Section 2.05.C.3.a**

i. **Removed -** "and bag tracking"

e. **Section 2.07.B.4.H.17.C**

i. **Removed -** "For applications requiring throughput of greater than 10 bags-per-minute: Allen-Bradley Safety Light Curtains may be used"

f. **Section 2.12.H.16.p**

i. **Removed -** "Measured from point positive bag tracking is established to security status identification on the exit conveyor of the CT-80."

g. **Section 3.06.B.1.e**

i. **Removed -** "Length Measurements for Accelerated/Delayed and Added Bag Tracking in the EDS matrices"

h. **Section 3.06.B.7-9**

i. **Removed -**

"7. Length Measurement for Accelerated/Delayed and Added Bag Tracking in EDS Matrices
   a. Accelerated/Delayed Bag Tracking
      1.) The CBIS shall be capable of detecting when a bag has been delayed or accelerated out of its tracking window (lost in track) by more than the minimum conveyable item identified herein.
      2.) Upstream of EDS (single bag): The CBIS shall reacquire the bag and continue tracking.
      3.) Upstream of EDS (2 bags leading edge to trailing edge): The CBIS shall detect this and be able to prevent the bags from entering the EDS in this condition.
      4.) Downstream of EDS (single bag): If already screened and downstream of the EDS, any security status assigned to the bag will no longer be considered valid and the bag shall be routed to the CBRA.
      5.) Downstream of EDS (multiple bags): If multiple bags are involved and tracking windows have been infringed, then the CBIS shall be capable of detecting this and route the bags to the CBRA.
   b. Added Bag Tracking
      1.) The CBIS shall be capable of detecting when a bag has been added to the tracking zone so long as that bag is added anywhere other than on top of, underneath, or directly beside another bag. The system shall be capable of detecting the minimum size bag, as identified herein, that has been added touching the leading or trailing edge of another bag.
      2.) Upstream of EDS (single bag): The CBIS shall reacquire the bag and continue tracking.
      3.) Upstream of EDS (2 bags leading edge to trailing edge): The CBIS shall detect this and be able to prevent the bags from entering the EDS in this condition.
      4.) Downstream of EDS: If the addition occurs downstream of the EDS and only the added bag itself is affected (added bag does not infringe on the tracking window of another bag) then the added bag shall be routed to the CBRA.
      5.) Downstream of EDS: If the addition occurs downstream of the EDS and the added bag infringes on the tracking window of another bag, then the CBIS shall be capable of detecting this and route the bags to the CBRA.
8. Bag Tracking
   a. After bags have been scanned or manually encoded, their position shall be tracked by bag tracking photocells. After bags have been scanned by the RF reader or on exited from the Level 1 device, their position shall be tracked by bag tracking photocells.
   b. The tracking photocell shall be typically located at the discharge end of tracked conveyors.
   c. All bag tracking photocells shall also be programmed to update the position of the bags and shall have HSPD arming capability to cause bags to be diverted.
9. Missing Bag Jam

a. For sortation systems, a missing bag jam is defined as a jam that occurs when three (3) consecutive bags are sensed at a conveyor discharge end photocell and not detected at the next downstream photocell within a predetermined period.
b. For EDS security screening systems, a missing bag jam is defined as a jam that occurs when three (3) consecutive bags are sensed at a conveyor discharge end photocell and not detected at the next downstream photocell within a predetermined period.
c. All tracked conveyor subsystems shall incorporate missing bag jam detection logic.
d. Provide a means at the MDS to be able to override the missing bag jam logic. This shall be allowable within clear bag sortation subsystems only to prevent a gridlock situation in case of a failure. When overridden, provide a text alarm on the MDS to alert the BHS operators that the missing bag jam logic has been disabled for a specific photocell."

i. **Section 3.06.B.15.**

i. **Removed -** "The function of this photocell can also be combined with baggage tracking (not with jam or cascade functions)."

j. **Section 4.03.A.2.a**

i. **Removed -** "– positive bag tracking values at divert points."

k. **Section 4.03.A.6.c**

i. **Removed –** "bag sortation"

l. **Section 4.04.C.1-2**

i. **Revised –**

"1. Upon issue of a Certificate of Conditional Acceptance for the completed BHS/CBIS alterations, including all upper- and lower-level controls, a sixty (60) day operational period shall commence in which the Cedar Rapids Airport Commission shall put all systems into on-line operations processing the daily flow of baggage.

2. During the first thirty (30) days this operational period, provide full-time technical site representation during the hours of operation with a minimum of 16 hours per day, 7 days per week. Ensure the representatives are capable and duly qualified to provide service for any problems that occur during this period. At minimum, provide one qualified personnel per shift to trouble shoot and immediately resolve any problems that might arise. The contractor's onsite personnel shall be capable of troubleshooting and resolving all electrical and controls related issues. After the initial 30 days of onsite support the contractor shall provide an additional 30 days of On-call support. A VPN shall be provided to the contractor to facilitate on-call support."

m. **Section 1.04.C.2**

i. **Revised –**

"2. Control Systems, Motor Control Panels (MCPs), and Remote-Control Panels (RCPs)

a. Modify existing MCPs and RCPs for the outbound subsystems, as required, to accommodate the specified functions. The outbound conveyors, make-up, and associated security doors shall be controlled by their respective subsystem PLCs with appropriate back-up redundancy as specified herein. Existing PLC & MCP mounted touchscreen HMIs shall be replaced with updated equipment. The Touchscreen terminal located on the PLC cabinet shall be relocated to a nearby MCP (coordinate with the Cedar Rapids Airport Commission)

b. Modify, as required, the existing MCPs for the reconfigured subsystems. Remove all internal unused power and control components/functions from the modified MCPs.

c. Install ethernet capable control devices, control stations, stack lights and related functionality (e.g., E-Stop, jam detection/reset) required to maintain the existing functionality of the BHS.

d. Furnish and install new MDS and MIS hardware as required to satisfy the specified requirements for reporting and MDS as defined herein.

e. Furnish and install new PLC processing, memory, storage capacity, I/O, and MCP panels needed to accommodate the specified control functions, with sufficient capacity to complete all necessary modifications to the existing reconfigured outbound BHS, and to accommodate

the phased implementation of the BHS as illustrated in the contract drawings. Co-locate the new PLCs with the new BHS server hardware to allow for UPS backup. Replacement of PLC shall require a recontrol of the system and replacement of all existing controls equipment including Control stations, stack lights, VFDs, etc.

f. Locate new server rack large enough to accommodate new BHS server hardware and PLCs (Coordinate location with Cedar Rapids Airport Condition). Provide power drop to accommodate new hardware in server rack.

g. Replace all existing VFD and contactor hardware with field mounted VFDs, with the exception of the first five ticket counter belts and oversize input belt, which shall be equipped with new remote VFDs for ease of maintenance.

h. Replace all existing controls architecture with ethernet IP."

n. **Section 1.04.C.4.a**

i. **Added –** "Licenses to the manufactures developed software shall be provided for all provided laptops and workstations."

o. **Section 1.05.E.1.u**

i. **Added –** "60-day CBIS run-in period"

p. **Section 1.06.B.2**

i. **Added –** "Sixty (60) days shall be provided to allow viewing of installation conditions."

q. **Section 1.05.CC.1**

i. **Revised – "**Submit a listing of key personnel with resumes and qualifications that will be working on the project to the Cedar Rapids Airport Commission or their representative for approval. The following list is an example:"

r. **Section 2.07.B.c**

i. **Added** – "VFDs shall be field mounted, on the motor it is driving, in all locations to allow for ease of access. Ticket counter lines and oversize induction are the exception to this."

s. **Section 2.11.A.7**

i. **Added –** "Two MDS workstations shall be installed in the new system. This provision ensures a redundant setup."

t. **Section 2.12.A16.e**

i. **Revised –** "E-stop circuits shall use a safety relay that controls the VFD's dual-channel STO input. This configuration must meet the required SIL or PL rating (e.g. SIL 2 / PL d) as determined by the application, in accordance with IEC 61800-5-2, IEC 61508, and/or ISO 13849-1"

u. **Section 3.10.A.3**

i. **Added –** "All motor starters will be removed from the system. These are to be replaced with VFDs. All existing VFDs will be replaced with VFDs that are ethernet IP capable."

v. **Section 4.02.H.3**

i. **Revised –** "Include details on TSA staffing needs for OSR and/or CBRA support. TSA testing & commissioning will be required as part of the recontrol & hardware migration."

END OF ADDENDUM

RESPONSES TO QUESTIONS NO. 1

Project Name:	Baggage Handling System Upgrades
Project Number:	25T001.07
AIP Project Number:	3-19-0012-083 (BIL-ATP TERM-2025)
Date of Issuance:	June 9, 2025

The following information is for clarification purposes only, and does not materially affect the requirements listed in the contract documents. Modifications to requirements will be formally updated by addenda.

RESPONSES TO QUESTIONS		
	CONTRACTOR QUESTION	**RESPONSE**
1	Where are the contract drawings for BHS sequencing plans and overall program phasing plans?	No phasing drawings are issued. As-built drawings and the drawings included in the Project Specifications & Plans manual are the only documents provided. How the improvements are phased will be up to the contractor.
2	What address should be on the bid bond for Cedar Rapids?	The Owner is the Cedar Rapids Airport Commission and the address is: 2515 Arthur Collins Parkway SW, Cedar Rapids, Iowa 52404.
3	Is there a contact at Leidos available?	Not at this time.
4	Please confirm if all ControlNet devices and ControlNet networks are to be replaced with Ethernet/IP enabled devices on a new Ethernet/IP network.	See Addendum 1.
5	Please confirm if the existing EDS interface shall be replaced with Ethernet/IP.	See Addendum 1.
6	Please confirm if the existing PLCs are to be replaced.	See Addendum 1.
7	Please confirm if new PLC code is required.	See Addendum 1.
8	Are the existing VFDs to be replaced? If yes, will the new VFDs be allowed to reside within the existing MCPs?	See Addendum 1.
9	Please confirm existing control stations, photoeyes and encoders are to remain.	See Addendum 1.
10	Please confirm section CC "Project Management Team" on page 41 of the 347739 specification is for reference and not a list of mandatory personnel required to be assigned to this project.	See Addendum 1.
11	Please confirm the existing PLC & MCP mounted touch screen HMIs are to be updated to reflect new programming and that new touch screen HMIs are to be added to the other MCPs.	See Addendum 1.
12	Please confirm what TSA testing and commissioning will be required as part of the recontrol & hardware migration.	See Addendum 1.
13	Please confirm the anticipated award date is October 10th, 2025 with an on-site mobilization date of either January or February 2026.	The Cedar Rapids Airport Commission may hold bids for a period not to exceed 120 calendar days from the date of the bid opening for the purposes of conducting the bid evaluation, establishment of Federal Funding, and issuance of a contract, if one is to be issued. October 10, 2025 is 120 Calendar Days from the bid opening date and a contract is to be issued on or before this date, if one is to be issued. Following submittal and appproval of the properly executed contract documents, onsite mobilization is required between January 8, 2026 and February 2, 2026.

14	Should the bidders believe additional time on-site is warranted, please confirm the bidders shall be allowed to clarify as such within their proposal.	No. Such clarification would be considered a conditional bid and the bid would be considered Irregular. By submitting a bid, bidder agrees to complete the project within the timelines indicated in the contract procurement document.
15	With a minority goal of 0%, please clarify if the minority forms are required with the proposal.	Minority forms are required to be submitted with the proposal.
16	There is reference throughout the BHS specifications to "Contract Drawings". The only "Contract Drawings" received are as-built drawings. If available, please provide additional drawings which explain the scope of work.	As-built drawings and the drawings included in the Project Specifications & Plans manual are the only documents provided.
17	Section 4.0.3.C (Conditional Acceptance Operational Period) on page 170 of the 347739 BHS Specification requires two (2) resources, a minimum of 16 hrs. per day for two (2) months (1,920 man hours). Would on-call support (via remote access such as VPN) be acceptable during for this duration?	See Addendum 1.
18	Please confirm a remote connection (i.e. VPN) will be provided to the successful bidder.	See Addendum 1.
19	Would locating the PLCs in the server room or in a new CCR panel installed in another area be an acceptable alternative?	See Addendum 1.
20	Does the recontrolled BHS system need to comply with PGDS version 8.0 in all aspects?	System should match existing functionality. Existing system was designed and commissioned in accordance with PGDS V3.
21	Should the recontrol project upgrade the system to use VFDs for all motor controls?	See Addendum 1.
22	For the recontrol, should the new VFDs be field-mounted near the motors the control?	See Addendum 1.
23	Is the addition of light curtains required prior to each EDS machine?	See Addendum 1.
24	Can you please confirm whether providing and installing workstation consoles is required?	See Addendum 1.
25	How many workstations are required for this project?	See Addendum 1.
26	Can the field execution period be extended in lieu of the 30-day limit?	See Addendum 1.
27	The current CT-80 EDS machines interface with the BHS system using discrete inputs and outputs. Will the Leidos CT-80s be upgraded by Leidos to support Ethernet communications?	Leidos has been contacted to confirm. No response is available at this time.
28	Please confirm whether bids should exclude ISAT-related costs and whether any ISAT requirement by TSA would be addressed via a contract change order.	Provide provision for ISAT testing in bid. Detailed scope of testing will be discussed in TIM with TSA after award.
29	The current BRP stations utilize Allen-Bradley PanelView 2711P-T10C4A1 which has been discontinued. Should the current BRP stations be upgraded to the current PanelView or other current manufacturer models?	See Addendum 1.
30	Should the PanelView in MCP-MU1 be upgraded?	See Addendum 1.
31	Can the PanelView in CCR-PLC be eliminated, considering the CCRT enclosure will be removed?	See Addendum 1.
32	Should individual software licenses be provided for each workstation and laptop?	See Addendum 1.
33	If all motors are VFD-controlled and field-mounted, may the E-Stop relays be used to control the VFDs via their Safe Torque (STO) signals?	See Addendum 1.

34	Please clarify whether a warm or hot backup PLC configuration is required.	Provide warm back-up, the loss of tracking data is expected during warm backup recovery.
35	Please confirm whether geographic separation is required for the redundant servers.	See Addendum 1.
36	What are the nighttime working hours available when the system needs to be shut down to facilitate changes?	Airport operations shall be maintained at all times. Working hours will be dependent on the airline departure flight schedule. As discussed at the prebid meeting, these vary daily, currently the typical first outbound is 0500 and the last outbound is 2000-2130.
37	Can work be performed during daytime operation hours that will not impact operations?	Yes, provided no disruption to operations. The contractor will be responsible for coordinating with local TSA and operations for daytime work.
END.		

Notes from the meeting have been added to this document in red colored text.

BAGGAGE HANDLING SYSTEM (BHS) UPGRADES

Eastern Iowa Airport (CID)
Cedar Rapids, IA
Pre-Bid Meeting
June 3, 2025

EASTERN IOWA AIRPORT FLYCID

BNP ASSOCIATES, INC.

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Welcome and Introductions

- Airport Staff:
  - Marty Lenss, Airport Director
  - Kathy Bell, Director of Finance & Administration
  - Jared Vetsch, Airport Systems IT Coordinator
  - Carl Williams, Facilities Maintenance Supervisor
- Design Team:
  - Eric Scott, Foth
  - Patrick Slaught, BNP

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The prebid meeting sign-in sheet is attached.

Bidding

- Letting Date: Thursday, June 12, 2025 @ 2:00 PM *(local time)*
- Bid Requirements *(checklist – noted on Proposal Form):*
  - Proposal Form, signed
  - Acknowledgement of Addenda (if applicable)
  - Disadvantage Business Enterprise "Utilization Statement" AND:
    - *When DBE Participation: "Letter of Intent" (For each DBE)*
    - *When Goal Not Met: Iowa DOT Form 102115 (Evidence of Good Faith Efforts)*
  - Buy American Certification Form for Total Facility
    - *If Waiver requested: Within 15 Calendar Days, Apparent Low Bidder submit FAA Form 5100-136, Project Content Percentage Worksheet, & FAA Form 5100-137, Final Assembly Questionnaire.*
  - Bid Guarantee (Bid Bond): 5% of Bid
    - Submitted in a separate envelope

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Bidding, Checklist

ATTACHMENTS TO THIS BID

The following documents are attached to and made a part of this Bid and are a condition of Bid responsiveness:

- ☐ Signed Proposal Form
- ☐ Acknowledgement of Addenda (if applicable)
- ☐ Disadvantage Business Enterprise "Utilization Statement" AND:
  - ☐ When using DBE(s): Disadvantage Business Enterprise "Letter of Intent" for each DBE.
  - ☐ When not meeting DBE Goal, Evidence of good faith efforts required by 49 CFR Part 26, Appendix A: DOT Disadvantaged Business Enterprise Information Statement of DBE Commitment Form (Form 102115)
- ☐ Buy American Certification Form for Total Facility.

ATTACHMENTS TO THIS BID IN SEPARATE ENVELOPE

The following document is submitted in a separate envelope and made a part of this Bid:

- ☐ Bid Guarantee (Bid Bond) in the form set forth in the Bidding Documents.

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Checklist indicated on the Proposal Form.

Bidding, Proposal Attachment

UTILIZATION STATEMENT
Disadvantage Business Enterprise

The undersigned bidder/offeror has satisfied the requirements of the bid specification in the following manner. *(Please mark the appropriate box)*

- ❑ **The bidder/offeror is committed to a minimum of 0.00% DBE utilization on this contract.**
- ❑ **The bidder/offeror, while unable to meet the DBE goal of 0.00%, hereby commits to a minimum of _____% DBE utilization on this contract and also submits documentation, as an attachment demonstrating good faith efforts (GFE).**

Iowa DOT DBE Directory: https://secure.iowadot.gov/DBE/Home/Index/

5 Only DBE's certified by the Iowa DOT with current valid certification can be counted towards participation.

Bidding, Proposal Attachment – cont'd.

LETTER OF INTENT
Disadvantage Business Enterprise
(This page shall be submitted for each DBE firm)

Bidder/Offer Name:_____
Address:_____
City:_____ State:_____ Zip:_____

DBE Firm: DBE Firm:_____
Address:_____
City:_____ State:_____ Zip:_____

DBE Contact Person: Name:_____ Phone: (___)_____

DBE Certifying Agency: _____ Expiration Date:_____

Each DBE Firm shall submit evidence (such as a photocopy) of their certification status.

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Bidding, Proposal Attachment – cont'd.

Form 102115
08-00

Iowa Department of Transportation

DISADVANTAGED BUSINESS ENTERPRISE INFORMATION
STATEMENT OF DBE COMMITMENTS
(To be completed in ink by All Bidders as per the current DBE Specification)

The submittal of this form with the signed proposal constitutes your DBE commitment.
The following work will be subcontracted to **certified** DBE firms.

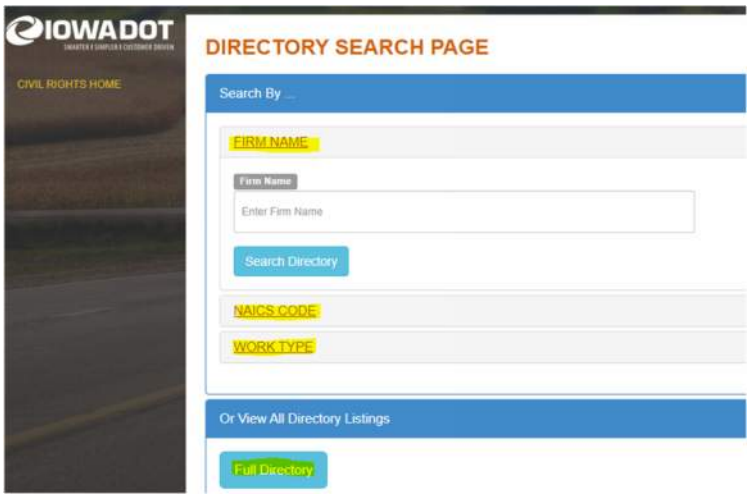
Bid
Lett
Cou
Prop
Con

1. DBE Firm* Date Contacted Person Contacted	2. Work or Items To Be Subcontracted	3. Submit Quote Yes/No	4. Use Quote Yes/No	5. Am

7 Form filled out and utilized to demonstrate Bidder's good faith effort in obtaining DBE participation.

Bidding, Proposal Attachment – cont'd.

Iowa DOT DBE Directory: https://secure.iowadot.gov/DBE/Home/Index/



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Bidding, Proposal Attachment – cont'd.

BUY AMERICAN CERTIFICATION FORM FOR TOTAL FACILITY

(Building projects such as Terminal, SRE, ARFF, etc.)

As a matter of bid responsiveness, the Bidder or Offeror must complete, sign, date, and submit this certification statement with their proposal. The Bidder or Offeror must indicate how they intend to comply with 49 USC § 50101 by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e. not both) by inserting a checkmark (✓) or the letter "X".

☐ The Bidder or Offeror hereby certifies that it will comply with 49 USC. 50101 by:

a) Only installing steel and manufactured products produced in the United States, or;

b) Installing manufactured products for which the FAA has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing, or;

c) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the Bidder or Offeror agrees:

1. To provide to the Owner evidence that documents the source and origin of the steel and manufactured product.
2. To faithfully comply with providing US domestic products.
3. To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

☐ The Bidder or Offeror hereby certifies it cannot comply with the 100% Buy American Preferences of 49 USC § 50101(a) but may qualify for either a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent Bidder or Offeror with

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If selecting Type 3 Waiver - additional documentation to be submitted by the apparent low bidder and possibly the second low bidder, within 15 Calendar Days of the bid opening.

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General Project Overview

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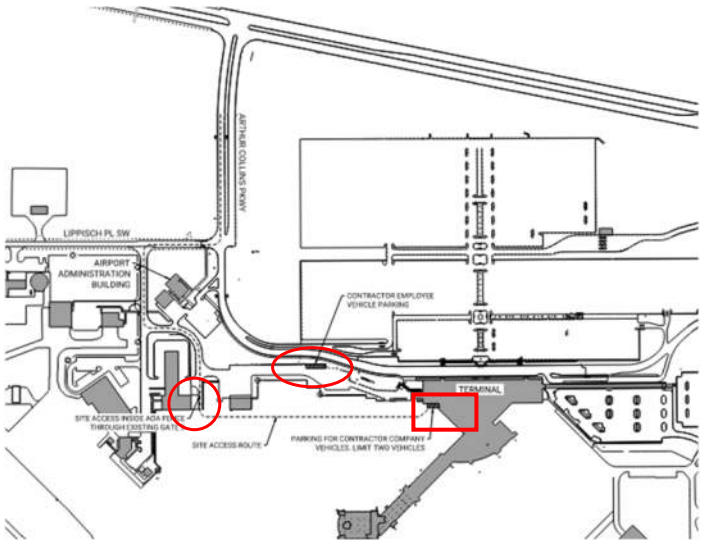
Project Site Overview



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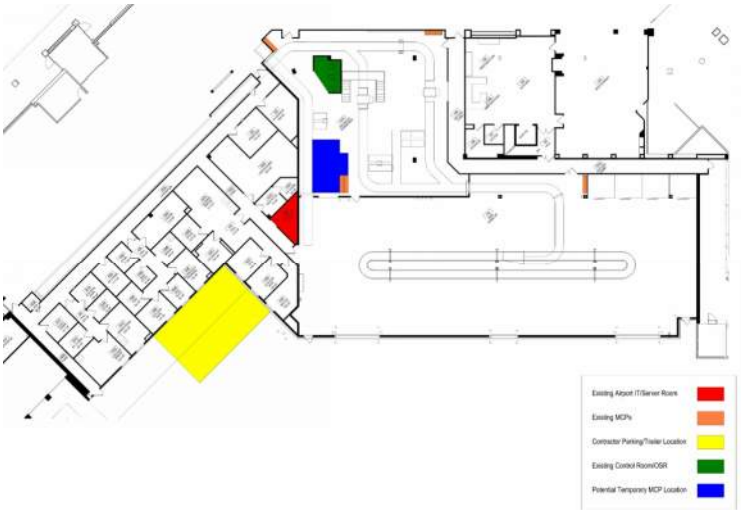
Existing is a mini-inline constructed in 2012. No mechanical equipment replaced as part of project.
Servers replaced, VFDs replaced at drives, PLC replaced.
Ethernet: IP addressable.
Existing EDS machines stay - currently Ethernet. Leidos to be onsite during BHS integration of EDS machines, tracked zones.

Scope of Project



- Upgrades Include:
  - BHS upper and lower-level controls replacement
- Construction Phasing:
  - Maintain Operations
  - Implementation/phasing by Contractor.
  - Coordinate EDS cutover with TSA
  - Testing to be conducted for each cutover prior to go live.
  - Typical last outbound: 2000-2130 (Varies Daily)
  - Typical first outbound: 0500

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12 A CCR has been submitted to TSA. TIM will be conducted once contractor under contract.
Existing touchscreens to be replaced or existing upgraded.
A temporary MCP is allowable.
Test Luggage to be provided by the contractor.
Licenses necessary to be procured by the contractor to allow security access to Airport IT.

Construction Schedule

- Report on Bids: June 23, 2025
  - Owner may hold bids up to 120 calendar days from date of the bid opening before executing the contract.
- Notice-of-Intent to Award / Contract Executed: immediately following establishment of federal funding (Anticipated no later than October 10, 2025)
- Notice-to-Proceed – Issued to Commence Onsite Construction:
  - *Following approval of properly executed contract documents & pre-construction meeting*
  - Early Start Date: January 8, 2026
  - Late Start Date: February 2, 2026

allowable timeframe, following approval of properly executed contract documents, for Contractor to elect to commence onsite construction.

- Substantial Completion: 30 Calendar Days
- Final Completion: 120 Calendar Days following Substantial Completion Date
- This project is subject to Liquidated Damages as prescribed within the Project Manual

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30 Calendar Day accrual commences at the time onsite construction commences or the Late Start Date, whichever occurs first.

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Safety and Security

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Safety and Security

- Security – Supplementary Provision C – Local Provisions:
  - Airport Issued Badge – All individuals
  - Escorting – Limited
- TSA Coordination

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Miscellaneous

- Federal Contract Provisions – including
  - Davis Bacon Wages
  - Buy American
- Prime Contractor – shall perform at least 25% of total contract amount
- Mobilization Bid Item – limited to 10% of total contract amount
- Questions: received by 5:00 p.m. (local time) Thursday, June 5, 2025
  - Questions received after this date may not be answered
  - Questions are preferably emailed to:
    - eric.scott@foth.com
  - Questions will be formally answered by addendum
- Plan Holders List: Rapids Reproductions

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Addenda Items

- Addendum #1 - anticipated June 9, 2025
  - Pre-bid presentation
  - Contractor questions to date

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Questions and Answers

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Frequently Asked Questions

- Can the Bid Date be pushed back? **No.**
- Can itemization of Proposal Form be submitted after the bid? **No.**
- What is the expectation for holding prices? **Bidders are required to hold their bid prices. Price increases and/or escalation after bids are submitted and during construction cannot be accepted by the Owner. The Owner intends to expeditiously execute a contract to assist contractors in getting Purchase Orders issued to subcontractors and suppliers as soon as possible.**

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Sign In Sheet

EASTERN IOWA AIRPORT
BAGGAGE HANDLING SYSTEM UPGRADES
FAA NO. 3-19-0012-083 (BIL-ATP TERM-2025)

Pre-Bid Meeting
June 03, 2025, 3:00 PM

NAME	FIRM	PHONE NUMBER	EMAIL	INITIALS
Kathy Bell	EIA	319.731.5714	K.Bell@flycid.com	
Eric Scott	Foth	319.297.2069	Eric.Scott@foth.com	
Patrick Slaught	BNP	310.601.0262	pslaught@bnpassociates.com	
Frank Dahl	Control Touch	502.387.5634	Fdahl@controltouch.com	
Jake Groneck	Control Touch	859.468.4969	Jgroneck@controltouch.com	
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Eastern Iowa Airport

SECTION 34 77 39

SECTION PARTS

PART 1 – GENERAL SPECIFICATIONS

PART 2 – PRODUCT SPECIFICATIONS

PART 3 – EXECUTION SPECIFICATIONS

PART 4 – QUALITY CONTROL SPECIFICATIONS

BNP ASSOCIATES, INC.

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SECTION 34 77 39
BAGGAGE HANDLING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. General

1. Section 34 77 39 of these project specifications is divided into four (4) parts as follows:
    a. Part 1 specifies general administrative, performance, and procedural requirements for the Baggage Handling and Checked Baggage Inspection System (BHS/CBIS) scope of work, including modification of conveyor segments (with associated conduits, control stations and related BHS field devices) and installation of conveyor equipment with required system integration between the furnished components, modified and existing components that are designated to remain, as specified herein and in the accompanying drawings.
    b. Part 2 specifies product information including BHS/CBIS manufacturers and integrators, BHS equipment suppliers, materials to be used on this project along with control system design and approved equipment requirements.
    c. Part 3 specifies execution requirements, including installation, demolition, and equipment removal, detailed subsystem descriptions, construction phasing, and special electrical and control requirements.
    d. Part 4 specifies the minimum quality control that shall be maintained and performed by the contractor for this project, including required system acceptance inspections and testing.
2. This BHS specification (34 77 39) and the accompanying BHS/CBIS contract drawings are performance-based documents intended to outline the overall scope of work, define functional requirements, and establish minimum standards of quality for the project. Review and verify the proposed BHS/CBIS layout with existing site conditions and provide the overall installation plan as summarized herein.
3. Provide the engineering, programming, and fabrication of all baggage handling conveyor equipment (with related maintenance access zones), transportation to/from the site, power, and control panels with associated distribution control system design requirements, maintenance diagnostics and statistical reporting functions, installation, testing and turning over in working order the modified BHS, in compliance with the project documents and applicable sections of the PGDS. Comply with all local, state, and federal laws, codes and safety standards, and provide a safe and efficient system for all personnel who operate, maintain, or have access to the completed BHS.
4. In accordance with federal law and the Eastern Iowa Airport's security program, all originating outbound checked baggage is required to be screened for explosive materials. To improve the existing conditions for checked baggage screening, which is currently performed via an mini-inline CBIS and ETD stations at locations of the facility, the existing baggage systems at the Terminal shall be modified as illustrated on the accompanying drawing.
5. The laws of the City of Cedar Rapids, the State of Iowa, and the United States of America (USA) shall apply and govern the Contract.
6. Unless otherwise specified, all references to sums of money shall be in United States Dollars (USD), the currency of the USA.

1.02 RELATED DOCUMENTS

A. General

1. The Contract Drawings, Divisions 00, 01, and 02 of the Contact Documents, and general provisions of the Contract, including General and Supplementary Conditions, apply to the work of this Section.
2. These written specifications, in conjunction with the accompanying drawings, constitute the contract documents for the project. If there are any discrepancies between these written specifications and the drawings, the more stringent requirement will apply as interpreted by the Cedar Rapids Airport Commission or their representative.
3. As indicated throughout the contract documents, this project involves the phased modification of the existing CBIS. Design, implement, and demonstrate to the Cedar Rapids Airport Commission and the TSA the installed BHS and mini-inline CBIS in compliance with all TSA security protocols, BHS/EDS integration requirements, and all associated performance and commissioning requirements as specified herein and consistent with PGDS guidelines in place at the time of the original design (PGDS V3).
4. All documentation associated with the operation/functionality of the CBIS, including related operations and maintenance (O&M) reports, documents generated by the contractor, and documents relating to SAT, Pre-TRR, TRR, and ISAT are Sensitive Security Information (SSI). Control/manage and mark these documents as SSI in accordance with 49 CFR Parts 15 and 1520. Mark all documentation pertaining to the following as SSI:
    a. System detection and decision logic and associated software.
    b. Methodology of CBIS use, bag screening/clearing procedures, and alarm resolution.
    c. Technical specifications of screening equipment and system equipment parameters.
    d. Locations at which specific screening methods or equipment are used.
    e. Threat images and descriptions that are associated with and will be interfaced between the BHS and EDS machines.
    f. Performance data from screening systems, including the testing of the screening systems.
5. These contract documents are confidential and are not to be distributed or copied, in part or in whole, without the written consent of an authorized representative of the Cedar Rapids Airport Commission or their representative.

B. Drawings
1. The BHS drawings (refer to drawing B000 for complete listing), architectural drawings, addendum, contract provisions, special provisions, and supplementary provisions apply to the work of this section.
2. The architectural define the facility conditions that currently exist at the airport. These drawings will be used for bidding purposes and preparation of BHS related design/engineering documents.
3. Assume responsibility to request and obtain architectural drawings and project phasing plans applicable to the BHS from the Cedar Rapids Airport Commission or their representative.

C. Existing Equipment Documentation and Information
1. Contact the Cedar Rapids Airport Commission and user airlines to request the documents required for coordination and reference purposes between the existing system(s) and the proposed BHS modifications for the implementation of the upper and lower-level controls upgrade:
    a. As-built drawings (mechanical/electrical).
    b. PLC/BHC codes.

D. Special Related Documents:
1. Division 00 – Contract Requirements
2. Division 01 – General Requirements
3. Division 26 – Electrical Requirements
4. EDS Supplier Reference Documents:

a. Leidos Reveal Imaging CT-80 DR+ Installation Reference
5. PGDS v8.0
6. Additional special documents such as CUTE/IMUSE documents.
7. Contact the appropriate firm or supplier to request the necessary documents that would be required for coordination, testing, interface, and reference purposes.

1.03 DEFINITIONS

A. Acronyms and Initialisms

Term	Meaning
ACS	shall mean Access Control System
AFF	shall mean Above Finished Floor
ANS	shall mean American National Standards
ANSI	shall mean American National Standards Institute
AOA	shall mean Airport Operations Area
ASCII	shall mean American Standard Code for Information Interchange
AT	shall mean Advanced Technology X-Ray Machine
ATO	shall mean Airline Ticket Office
BAIT	shall mean Bag Auto-ID Transfer
BCR	shall mean Baggage Control Room
BHC	shall mean Baggage Handling Computer system (i.e., SACs, MIS, MDS, and operator workstations)
BHS	shall mean Baggage Handling System
BIDS	shall mean Bags Information Display System
BIT	shall mean Baggage Inspection Table
BMTT	shall mean Bag Maximum Travel Time
BNP	shall mean BNP Associates, Inc., the BHS consultant
BPM	shall mean Baggage Processing Message
BRP	shall mean Baggage Removal Point
BSD	shall mean Bag Status Display
BSO	shall mean Baggage Service Office
BVS	shall mean Baggage Viewing Stations
CBIS	shall mean Checked Baggage Inspection System
CBRA	shall mean Checked Baggage Resolution Area; synonymous with terms Resolution Room, Baggage Inspection Room, and ETD Area.
CBS	shall mean Checked Baggage Screening
CEMA	shall mean Conveyor Equipment Manufacturers Association
CID	shall mean Eastern Iowa Airport
CM	shall mean Construction Manager, a firm or person or such other manager as appointed by the Cedar Rapids Airport Commission for the purpose of managing the Contract and, in so far as it concerns the functions exercisable by the construction manager, includes their nominated representatives.
COF	shall mean Coefficient of Friction
CRAC	shall mean Cedar Rapids Airport Commission
CSC	shall mean Conveyor System Controller
CT	shall mean Computed Tomography
CTX	shall mean Computer Tomography Examiner
CUTE	shall mean Common User Terminal Equipment
DCH	shall mean Data Communication Highway
DLR	shall mean Device Level Ring
EDS	shall mean Explosive Detection System (Computer Tomography)
EIA	shall mean Electronic Industry Association

Term	Meaning
EMT	shall mean Electrical Metallic Tubing
EOD	shall mean Explosives Ordinance Disposal
EPROM	shall mean Erasable Programmable Read Only Memory
E-Stop	shall mean Emergency Stop
ETD	shall mean Explosive Trace Detection
FAA	shall mean Federal Aviation Administration
FCP	shall mean Field Control Panel
FD	shall mean Fire Door
FIFO	shall mean First in, first out
FLA	shall mean Full Load Amperage
FOTH	shall mean Foth Infrastructure and Environment, LLC
FPM	shall mean Feet per Minute
FSD	shall mean Federal Security Director
GC	shall mean General Contractor, a firm or person other than the contractor who shall enter or has entered into a Contract with the Cedar Rapids Airport Commission and who shall be identified by the construction manager for work at Eastern Iowa Airport.
GOVT	shall mean Guaranteed Operator View Time
GSE	shall mean Ground Service Equipment
HDD	shall mean Hard Disk Drive
HMI	shall mean Human-Machine Interface
HSPD	shall mean High-Speed Paddle Diverter
HVAC	shall mean Heating, Ventilation, and Air Conditioning
I/O	shall mean Input/Output
ID	shall mean Identification
IEC	shall mean International Electromechanical Commission
IMC	shall mean Intermediate Metal Conduit
IQT	shall mean Image Quality Test
ISAT	shall mean Integrated System Acceptance Test
IT	shall mean Information Technology
LAN	shall mean Local Area Network
LED	shall mean Light-Emitting Diode
LEO	shall mean Law Enforcement Officer, typically part of the local bomb disposal unit
MCP	shall mean Motor Control Panel
MDS	shall mean Maintenance Diagnostics System
MEP	shall mean Mechanical, Electrical, and Plumbing
MIS	shall mean Maintenance Information System
MPP	shall mean Motor Power Panel
MTBF	shall mean Mean Time Between Failures
N/O	shall mean Normally Open
NEC	shall mean National Electrical Code
NEMA	shall mean National Electrical Manufacturers' Association
NFPA	shall mean National Fire Protection Association
NIC	shall mean Not-in-Contract
NRT	shall mean Near Real Time
NTP	shall mean Notice-to-Proceed
O&M	shall mean Operations and Maintenance
OEM	shall mean Original Equipment Manufacturer
OOG	shall mean Out-of-gauge
OS	shall mean Oversize or Oddsize

Term	Meaning
OSARP	shall mean On-Screen Resolution Protocol
OSHA	shall mean Occupational Safety and Health Administration
OSR	shall mean On-Screen Resolution
Owner	shall mean Cedar Rapids Airport Commission
PAX	shall mean Passenger
PCI	shall mean Passive Control Interface
PDP	shall mean Power Distribution Panel
PE	shall mean Professional Engineer
PGDS	shall mean Planning Guidelines and Design Standards for Checked Baggage Inspection Systems, as prepared by the TSA.
PLC	shall mean Programmable Logic Controller
PLF	shall mean Pounds per linear foot
PM	shall mean Program Manager
PMM	shall mean Permanent Magnet Motor
Pre-TRR	shall mean pre-Test Readiness Review
PSI	shall mean Pounds per Square Inch
PTRI	shall mean Passive Threat Resolution Interface
PVS	shall mean Primary Viewing Station for On-Screen Resolution
RF	shall mean Radio Frequency
RFI	shall mean Request for Information
RFID	shall mean Radio Frequency Identification
RMC	shall mean Rigid Metal Conduit
ROW	shall mean Right-of-Way
RSEDS	shall mean Reduced Size EDS
SD	shall mean Security Door
SF	shall mean Security Feed
SFS	shall mean Secure Flight Selectee
SIDA	shall mean Security Identification Area
SMFDS	shall mean Simulation Model Functional Design Specification
SSI	shall mean Sensitive Security Information
STIP	shall mean Security Technology Integrated Program
SVS	shall mean Secondary Viewing Station
SVS	shall mean Secondary Viewing Station for CBRA workstation
TCU	shall mean Threat Containment Unit
TOB	shall mean Top-of-Belt
TRI	shall mean Threat Resolution Interface (EDS Supplier's OSR Primary Viewing Workstation)
TRR	shall mean Test Readiness Review
TRT	shall mean Threat Resolution Tools
TSA	shall mean Transportation Security Administration
TSO	shall mean Transportation Security Officer (baggage screener)
UL	shall mean Underwriters Laboratories
UPS	shall mean Uninterruptable Power Supply
USS	shall mean Uniform Symbology Specification
VFD	shall mean Variable Frequency Drive
VOM	shall mean Volt Ohm Meter
WAN	shall mean Wide Area Network

B. Authorized Representative

1. the Cedar Rapids Airport Commission may designate by written notice to the contractor or by provision elsewhere herein one or more persons, firms, or corporations to act as its authorized representative in connection with the administration of this Contract. Except as otherwise specified in such written notice or elsewhere herein, such authorized representative shall have the authority to act for the Cedar Rapids Airport Commission with respect to the performance of this Contract by the contractor with the objective of achieving full compliance by the contractor of the terms and provisions of the Contract.
2. Accept and comply with instructions from such authorized representative as though such instructions had been given by the Cedar Rapids Airport Commission and deal directly with such authorized representative in all matters arising under this Contract, including matters involving contract interpretation, disputes, and arbitration procedures. However, such authorized representative is authorized to act in connection with this Contract solely as the representative of the Cedar Rapids Airport Commission and not as principal hereunder.

C. General
1. Baggage Handling System (BHS) shall mean all components, including installation materials, and all required interfaces between the existing (designated to remain) conveyor equipment/components identified herein with the new conveyor components. Such interfaces shall include all necessary 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 provide a fully functioning turnkey system as described by the contract documents.
2. Baggage Handling System Contractor shall be synonymous with equipment contractor, equipment supplier, baggage contractor, BHS contractor, supplier and contractor and shall mean the firm or company that is responsible for the design, engineering, programming, manufacture, modification, and installation of the conveyor equipment and systems required to implement the work and supply a fully functioning turnkey system as described by the contract documents.
3. In these written specifications and on the contract drawings, unless inconsistent with the content or subject matter or unless a contrary intention otherwise appears, the following clarifications/definitions shall apply:
    a. As Built shall encompass all elements of the term As Executed.
    b. Bill of Quantities shall mean a document named therein as a Bill of Quantities issued to bidders by or on behalf of the Cedar Rapids Airport Commission, stating quantities of work to be carried out.
    c. Completion shall mean:
        1.) That stage of the execution of the Work under the Contract when the Works are completed and all other things, which are required by the Contract to be performed by the contractor before completion, have been performed and accepted.
        2.) Where Contract or specifications provide a time period for completion, the last day of the period.
        3.) However, if the Cedar Rapids Airport Commission grants an extension of time for completion, it means the date resulting from the extension of time.
    d. Contract shall mean this Deed of Agreement between the Cedar Rapids Airport Commission and the contractor for the performance of the Works, together with all schedules, attachments, annexure, and other documents incorporated into this Contract.
    e. Contract Sum shall mean:
        1.) Where the Cedar Rapids Airport Commission accepted a lump sum, the lump sum.

2.) Where the Cedar Rapids Airport Commission accepted rates, the sum ascertained by adding the products of the rates and the corresponding quantities in the schedule of rates.
3.) Where the Cedar Rapids Airport Commission accepted a lump sum and rates, the aggregate of the sums referred to in paragraphs 1 and 2 above.

f. Date for Completion shall mean:
1.) Where Contract provides a date for completion that date.
2.) Where Contract or specifications provide time period for completion, the last day of the period.
3.) However, if the Cedar Rapids Airport Commission grants an extension of time for completion, it means the date resulting from the extension of time.
4.) The date certified by the Cedar Rapids Airport Commission in a certificate of completion to be the date upon which the works have reached completion.

g. Day shall mean a calendar day.

h. Diversion Point shall mean the point at which a bag will either be routed into the BHS for final sortation or routed to the next level of security screening for further processing.

i. Hot Back-up shall mean that in case of a failure of the primary component (e.g., PLC, SAC, or other redundant component) the hot back-up component shall retain the latest current status of the related system (e.g., tracking information) and shall assume full operation automatically. Hot back-up of components shall provide seamless transfer of information. All tracking sortation of baggage shall continue without interruption.

j. Including, and all variations thereof, shall mean “including but not limited to”. Likewise, “e.g.”, “such as”, and any other language indicating a listing to follow are not to be considered intrinsically all-inclusive or exhaustive.

k. Other Contractor or Other shall mean a firm or person other than the BHS contractor who shall enter or has entered into a contract with the Cedar Rapids Airport Commission.

l. Project shall mean the construction of the Terminal BHS project at Eastern Iowa Airport, as described herein and on the contract drawings.

m. Schedule of Rates shall mean any schedule included in the Contract, which, in respect of any section or item of work to be carried out, shows the rate or respective rates of payment for execution of that work, and that may also include provisional items, provisional sums, quantities, and prices. The schedules of rates are fixed sums for the duration of the Contract with the Cedar Rapids Airport Commission.

n. Site shall mean the lands and other places made available or to be made available to the contractor by the Cedar Rapids Airport Commission for the purpose of the Contract.

o. Specifications shall mean the BHS technical specification for the works included in the Contract and any modification of such specification thereafter.

p. Subsystem shall mean a set of conveyor segments and its related field elements (e.g., control stations, consoles, PLCs, MCPs, photocells), which is a system itself, and a part of the whole system.

q. Temporary Work shall mean any work required in the execution of the Contract, including the installation of temporary/interim conveyor equipment, but not forming part of the final works.

r. The Contract Drawings shall mean the drawings referred to in these written specifications or the Contract; the Cedar Rapids Airport Commission may occasionally supply modifications/revisions of such drawings and other drawings to the contractor for the purposes of the Contract.

s. The Works shall mean the whole of the work to be executed in accordance with the Contract, including variations provided for by the Contract.

t. User Airline shall mean those airlines that use the BHS(s) related to this Contract.

u. Warm Back-up shall mean that in case of a primary component failure (e.g., PLC) the warm back-up must be manually switched to become the primary component.
v. Words importing the singular include plural and words importing the plural include the singular.
w. Words importing persons include a partnership and a body corporate.
x. Words importing the masculine gender include the feminine and neutral genders.
y. Work Under the Contract shall mean any work the contractor is or might be required to execute under the Contract and includes variations, remedial work, and temporary work.

1.04 SCOPE OF WORK

A. General
1. Provide the design, engineering, fabrication, transportation to/from the site, installation, temporary BHS conditions (i.e., interim conveyor equipment and associated control functionality as required to maintain operations), removal, salvage, demolition, refurbishment, modifications, testing, and turning over in working order the BHS described herein and in compliance with these specifications and the contract drawings.
2. Provide a complete, operable, maintainable, and safe system on a turnkey basis, including the following:
a. All permanent and temporary/interim supports, header steel (unless otherwise specified), hangers, anchors, framing, and trim.
b. Motors, PLCs, MCPs, and interim and permanent power distribution panels (PDPs), and electrical power to the BHS from the sources indicated on the accompanying contract drawing package (i.e., from BHS PDPs to MCPs and associated BHS field components).
1.) Determine the source of control power. The power drawn from new equipment shall not exceed the power required for existing equipment.
c. Computers, switches/routers/firewalls, printers, cabinets, and disconnects.
d. All necessary controls and control stations for all specified field components, pushbuttons, indicator lights, light stacks, alarms, conduit, wiring, and fire/security doors.
e. All other components, whether specifically shown and described, or implied in the plans and specifications or wherever required to effectively accomplish the intended functions of the BHS and CBIS scope.
3. In all cases where a device or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices as are required to satisfactorily complete the installation.
4. Provide all hardware, software, and construction supervision required for a complete and fully functioning interface between the modified subsystems, the existing EDS machines, existing BHS modifications/reconfigurations (e.g., new BHC system, CBRA secondary passive displays, operator workstations, and associated satellite workstations/remote status monitors), and the building access control and fire alarm systems so the entire BHS (all new and modified equipment) operates on a fully integrated turnkey basis.
5. Submit implementation schedules and associated phasing plan documentation with the O&M documentation to the Cedar Rapids Airport Commission or their representative, including required manuals, equipment parts lists, and shop drawings, all in strict accordance with the specifications and applicable drawings and subject to the terms and conditions of the Contract.
6. The contract drawings are intended to generally outline the conveyor system configuration and desired functions. Pertinent building dimensions are documented along with some specified conveyor dimensions and elevations. Conveyor length and rights-of-way are presented as approximations, but these shall necessarily be determined by review and inspection of building construction drawings (as-builts) and verified by field measurements by the contractor prior to preparing shop and erection drawings. The

number, size, and locations of the BHS MCPs are presented as approximations. Verify the final number of panels with related cabinet sizes and locations based on the preparation of applicable engineering/electrical shop drawings and submit the system MCP sizes and related power requirements in accordance with the schedule of submissions.

7. Coordinate the BHS and Mini-Inline CBIS with the MEP drawings (e.g., ductwork, sprinkler system, facility electrical and plumbing rights-of-way) and architectural detail drawings to fully coordinate the BHS alterations with all the other systems that will be installed in the same area of the facility spaces.
    a. The BHS alterations and MEP/architectural coordination process shall include composite coordination drawings between the BHS, architectural, and MEP systems to resolve any interference issues, consistent with the specified requirements of Division 01, Section 01 31 00 (Project Management and Coordination).
    b. This coordination process shall also include the responsibility to coordinate the BHS conveyor conduit/wireway runs with other systems, including the sprinkler system design. Coordinate the design of all BHS equipment with other disciplines (e.g., MEP) to prevent interference with the BHS operation or related maintenance access and bag ROWs.
    c. BHS equipment, catwalks, and conveyor support structures are not allowed to support MEP equipment.
8. Identify all building interface requirements necessary to install the BHS over and above those shown on the contract drawings in the bid documents. Verify as-built conditions and notify the Cedar Rapids Airport Commission or their representative of conflicts. Any additional building modifications or alterations not so identified in the Contract bid shall be borne by the contractor.
9. Submit to the Cedar Rapids Airport Commission or their representative any request for information, clarification of specification, and variance from the specifications as a Request for Information (RFI), in compliance with Division 01.
10. Obtain and pay for all permits, inspection fees, and certificates relative to all phases of BHS construction.
11. Be responsible for all employee badges as required by the airport authority for this project. the Cedar Rapids Airport Commission shall not provide escort services for employees on the ATO and airport operations area (AOA) side of the facility.
12. Submit all electrical drawings signed and sealed by a Professional Engineer licensed in the State of Iowa.
13. Furnish and install all temporary power and lighting required for and during the installation and testing of the BHS.
14. Cooperate and coordinate with the Cedar Rapids Airport Commission and the architect for the location of all MEP rights-of-way and access/egress between the BHS catwalks and the building to confirm the final number and locations of the BHS associated stairs/ladders, conveyor maintenance crossovers, maintenance catwalks, and all other BHS catwalks and ladders over and above those shown on the contract drawings.
15. Cooperate with the architect and other contractors for coordination of the building fire zones to confirm the number and location of the BHS associated fire/security doors.
16. Develop detailed phasing plans for each subsystem designated for modification after discussions and coordination with the Construction Manager (CM) to determine the availability of the respective BHS area. Some of the existing conveyor lines that are in operational use must be reconfigured according to the phasing plan to allow airlines continued use of the Terminal BHS while modifications are ongoing. Due to the complexity of the task, extensive coordination is required to avoid schedule conflicts or interruption of airline schedules. In some cases, new equipment can be installed with no impact to the existing system. Perform these tasks at no additional cost to the project.
17. All temporary and final conveyor equipment supports shall be designed, engineered, and installed so as not to infringe on the AOAs, including drive aisles and cart staging areas.

18. Coordinate and adequately protect the conveyor equipment from MEP alterations/additions, as well as other related building service modifications and alterations. Furnish and install adequate protection around the conveyor segments wherever the facility and utility modifications are occurring. Provide protection around the construction area for uninterrupted and continued operation of the BHS.
19. Coordinate with all relative onsite disciplines/contractors, including all vendors and suppliers, for all required interfaces to the BHS. Coordinate and work closely with the EDS supplier and the Cedar Rapids Airport Commission's security representative for all BHS integration testing, including providing the necessary support/participation/test baggage and system demonstrations for the TSA's mandated certification testing (i.e., pre-TRR, TRR, and ISAT) as specified in Part 4 herein.
20. Prior to the start of the systems acceptance testing, accomplish all debugging and internal testing. Submit to the Cedar Rapids Airport Commission, daily, all records of internal testing and debugging with corrective actions. Carry out internal acceptance tests prior to conducting such tests with the Cedar Rapids Airport Commission or their representative to ensure that tests conducted with the Cedar Rapids Airport Commission or their representative are successful.
21. Upon completion of the BHS installation, all related programming, and internal testing/debugging, demonstrate the system's operating capability to the Cedar Rapids Airport Commission or their representatives for acceptance and for pre-TRR to confirm compliance with the requirements detailed in Part 4 herein. These test demonstrations shall be carried out per the approved BHS test plans, in compliance with the requirements specified in Part 4 herein and the requirements of the PGDS, as part of the base Contract.
22. It is mandatory to visit the project site prior to bidding to thoroughly become acquainted with the scope of work and installation restrictions directly associated with the existing area of the facility. Coordinate a pre-bid walkthrough with the Cedar Rapids Airport Commission or their representative. The following requirements associated with the existing BHS modifications should be reviewed and surveyed during this site visit:
    a. Existing conveyor line modifications/reconfigurations.
    b. BHS computer system modifications for report functionality changes located in the BHS control room (BCR).
    c. MDS modifications in the BCR.
    d. PLC system modification requirements (e.g., centralized in the BCR).
    e. TSA security system requirements such as staffing locations, support rooms, monitoring systems, and other TSA requirements that might impact the modifications to the existing system.
23. It is mandatory to visit the project site prior to submission of the electrical/mechanical installation drawings to thoroughly verify the provided as-built conditions. Coordinate a site-visit with the Cedar Rapids Airport Commission or their representative. The following requirements associated with the existing BHS modifications should be reviewed and surveyed during this site visit:
    a. Existing conveyor line modifications/reconfigurations.
    b. Existing controls equipment and configuration.
    c. Existing BHS power requirements
    d. Existing Airport network capabilities
    e. Existing EDS networking
    f. Exiting TSA server location and connections

B. System Description
    1. The following briefly describes the existing conditions and proposed implementation of the new BHS for Terminal at Eastern Iowa Airport:
        a. The existing BHS consists of a single ticketing line feeding two Mini-Inline Reveal CT-80 DR+ EDS machines. The two machines feed onto a single clear line which

feeds a flat plate make-up device in the bagroom. The CBIS has the space reserved for an additional EDS machine. Additionally, there is a dedicated oversize line where bags are manually screened by TSA. Once cleared bags continue down the line to an oversize runout belt in the bagroom.

C. New System Functionality Requirements
   1. Install new infrastructure - such as cables, switches, control stations, VFDs, and PLCs. (no system interruptions)
      a. Acquire EtherNet/IP hardware (no system interruptions)
      b. Convert the I/O configuration tree
      c. Align tags to the new devices (rename)
      d. Add new logic, if needed, for new device platforms
      e. Verify any Message Instruction paths (MSG) logic.
      f. Verify any produced/consumed tags (configuration)
   2. Control Systems, Motor Control Panels (MCPs), and Remote Control Panels (RCPs)
      a. Modify existing MCPs and RCPs for the outbound subsystems, as required, to accommodate the specified functions. The outbound conveyors, make-up, and associated security doors shall be controlled by their respective subsystem PLCs with appropriate back-up redundancy as specified herein. Existing PLC & MCP mounted touchscreen HMIs shall be replaced with updated equipment. The Touchscreen terminal located on the PLC cabinet shall be relocated to a nearby MCP (coordinate with the Cedar Rapids Airport Commission)
      b. Modify, as required, the existing MCPs for the reconfigured subsystems. Remove all internal unused power and control components/functions from the modified MCPs.
      c. Install ethernet capable control devices, control stations, stack lights and related functionality (e.g., E-Stop, jam detection/reset) required to maintain the existing functionality of the BHS.
      d. Furnish and install new MDS and MIS hardware as required to satisfy the specified requirements for reporting and MDS as defined herein.
      e. Furnish and install new PLC processing, memory, storage capacity, I/O, and MCP panels needed to accommodate the specified control functions, with sufficient capacity to complete all necessary modifications to the existing reconfigured outbound BHS, and to accommodate the phased implementation of the BHS as illustrated in the contract drawings. Co-locate the new PLCs with the new BHS server hardware to allow for UPS backup. Replacement of PLC shall require a recontrol of the system and replacement of all existing controls equipment including Control stations, stack lights, VFDs, etc.
      f. Locate new server rack large enough to accommodate new BHS server hardware and PLCs (Coordinate location with Cedar Rapids Airport Condition). Provide power drop to accommodate new hardware in server rack.
      g. Replace all existing VFD and contactor hardware with field mounted VFDs, with the exception of the first five ticket counter belts and oversize input belt, which shall be equipped with new remote VFDs for ease of maintenance.
      h. Replace all existing controls architecture with ethernet IP.
   3. EDS Integration and Testing
      a. Coordinate with the TSA's contractor the site planning, phased implementation, required testing (i.e., SAT and ISAT) and all interface requirements between the security screening equipment (i.e., EDS Level 1 machines, Level 2 workstations, and CBRA ETD stations) and the BHS for all of the conveyor lines as they relate to this project.
      b. Provide the interconnection of all BHS related PLC and Ethernet based connections from the BHS to the EDS machines that are required to accommodate the interfaces between the two systems (hardwired I/O, data interface cabling, and software driven). Coordinate the details of all required communication and signal interfaces

(e.g., EDS machine status and control, bag loading and unloading, and bag status), between the EDS machines and the BHS with the EDS equipment supplier and the Cedar Rapids Airport Commission. The contractor and the Cedar Rapids Airport Commission shall request from the EDS supplier the proper documentation, typically the EDS machine integration guide, for details regarding the EDS machine's available signals, data, and required cabling between the EDS and BHS systems. Provide all necessary control cabling, along with the communication and signal interfaces, between the EDS equipment and the BHS consistent with the EDS supplier's requirements.

c. It shall be the TSA's responsibility to obtain certification upon completion of this work for all the modified EDS units.
d. The contractor shall coordinate with local TSA, the EDS supplier, and the Cedar Rapids Airport Commission to ensure that a representative from the EDS supplier is on-site for any cutovers interfacing with the EDS machines.

4. Laptop Computers
   a. Provide to the Cedar Rapids Airport Commission one (1) laptop computer. Load the new laptop and any existing maintenance laptops with all applicable PLC manufacture software programs and the BHS as-built ladder logic programs required to maintain the BHS. Licenses to the manufactures developed software shall be provided for all provided laptops and workstations.
   b. Submit to the Cedar Rapids Airport Commission or their representative, the laptop manufactures literature for approval prior to the purchase of these items.
5. The Software changes can be made offline in advance and documented in the Configuration Management Plan.
6. Furnish and install additional components, equipment, and systems as required and specified to fulfill the scope of work as described herein.

1.05 SUBMITTALS

A. General
   1. This Section offers detailed submittal instructions regarding the BHS; use in conjunction with Division 01.
   2. Submit the following documentation, along with any other documentation required by Division 01, at the time specified during the work and in accordance with the following Submittal Deadlines.
   3. Prepare all documents in the English language.
   4. All resubmitted documents shall explicitly indicate the changes that have been made to the document as compared to the prior submittal. Coordinate with the Cedar Rapids Airport Commission or their representative the method of indicating changes.

B. Bid Proposal Submissions
   1. The contractor is deemed to have studied the system design and requirements presented in the drawings and specification respectively and accepted the design and requirements as suitable and appropriate to safely accomplish the functions and processes described herein. Identify in bid submission any design aspect or specification requirement that is believed to be inappropriate or inadequate and propose alternate solutions to alleviate the perceived problem. In all cases, include in the bid submittal pricing for the base system presented in the drawings. Any alternate designs developed shall meet or exceed the design criteria as listed herein.
   2. Include in the proposal submission the following items:
      a. System Price Schedule to be provided by the contractor for all major components.
      b. Unit Price Schedule to be provided by the contractor for all major components.
      c. Alternates Price Schedule (refer to Section 1.01 herein) to be provided by the contractor for all major components.

d. Any exceptions to these specifications or Contract terms in a separate section titled “Exceptions”.
e. Type and duration of the proposed training program if different to the minimum requirements as listed in Part 3 herein.
f. Allowance to purchase items from the estimated spare parts list as detailed herein.
g. Identification of proposed BHC back-up method (e.g., Stratus).
h. Notification of any perceived safety hazard with specified design of system or its components.
i. Notification if an adjustment is required to the contractor's submittal deadlines.
j. Proposed equipment of non-standard design and equipment substitutions.
k. Define the technical support to be provided during conditional acceptance testing and after final acceptance has been granted.
l. Requirements for lay-down areas include line-item cost if an offsite storage facility and on-site offices must be rented.
m. Project schedule outline for the phased-in implementation of the BHS (indicate number of weeks for completion of work after NTP).
n. Related project list references (indicate client, location of project, type of work, year performed/completed and overall cost).
o. Provide resumes and qualifications with a listing of staff working on the project. Indicate project manager's name, names and number of programmers, technicians, instructors/training personnel, and all other required information. Include onsite and offsite participating staff and the percent of anticipated participation on this project. Provide training instructors’ professional qualifications. the Cedar Rapids Airport Commission reserves the right to approve or reject key personnel from the list.
p. Provide a line item cost for the following:
    1.) One (1) laptop computer, fully loaded/configured with all applicable PLC program ladder logic required to maintain the BHS.
    2.) All BHS related acceptance testing including all required ISAT testing. This should clearly identify the types and quantities of required testing material as well as manpower.
    3.) Any additional onsite support should be required after final acceptance.
    4.) On-site work trailer for parts storage and contractor offices.

C. Drawings Submitted for Review
1. Submit each shop and installation drawing in .pdf format to the Cedar Rapids Airport Commission for review and approval. Provide each shop drawing submittal with its respective submittal number to properly track all submittals for the project record. These shop submittals shall not include any handwritten markups/drawings.
2. the Cedar Rapids Airport Commission or their representative shall review the drawings and return them for revision and re-submittal within 21 days, where re-submittals are required. Revise and re-submit drawings for final review by the Cedar Rapids Airport Commission or their representative within 14 days. Any corrections or changes indicated on shop drawings shall not be considered as an extra work order. Do not start fabrication until receipt of the Cedar Rapids Airport Commission or their representative’s approval.
3. The comments from the Cedar Rapids Airport Commission or their representative shall not be taken to imply that the arrangement has been checked in detail. Be fully responsible for the suitability, adequacy, integrity, durability and practicality of the arrangement or assembly, components and systems as set out in the drawings, specifications and other information submitted for acceptance by the Cedar Rapids Airport Commission or their representative including all subsequent amendments. In no case shall the Cedar Rapids Airport Commission’s or their representative’s review or comments relieve the contractor in any way of his responsibility of ensuring that the equipment supplied complies with all specification and functions in accord with the wording and the intent of the applicable Specifications.

4. Do not submit drawings that are not in full compliance with the specifications unless an Engineering Change Order Request (ECR) requesting a variable from the specifications accompanies the submittal. In this case, the Cedar Rapids Airport Commission or their representative will endeavor to respond within 21 days but shall be under no obligation to do so.
5. Approved shop drawings shall always be onsite for use in the construction of the work. Failure to supply such drawings will be deemed sufficient cause to delay the work until such drawings are available for field use and reference.
6. Submit a drawing log that contains a complete list of all anticipated installation and shop drawings and submit an updated copy with each drawing submission.

D. Submittal Deadlines
1. Listed below are the submittals and dates referred to in the applicable sections. Indicate in the proposal submission any required adjustments to these dates. Days indicated are working days.

Submittal Item	Deadline
Safety Program Manual	10 days after fully executed contract for review with approved copy at the pre-installation Meeting
Quality Control Manual	20 days after fully executed contract for review with approved copy at the pre-installation Meeting
Configuration Management Plan	30 days after fully executed contract for review with approved copy at the pre-installation Meeting
Detailed Master Schedule, including list of Submittals and Dates	30 days after fully executed contract
Phasing Schedule	30 days after fully executed contract
Catalog Cuts and Equipment Specifications	20 days after fully executed contract
System Power Requirements and MCP Sizes	30 days after fully executed contract
E-Stop Zone Drawings	60 days after fully executed contract
Controls System Description and BHS Redundancy Schematic Diagrams	90 days after fully executed contract
Control Room Equipment	90 days after fully executed contract
Shop Detail Drawings	60 days prior to fabrication
Motor Schedule	60 days prior to fabrication
Installation Drawings	60 days prior to fabrication
Revise & Re-issue Drawing Period	21 days
Re-review Period (by the Cedar Rapids Airport Commission)	14 days
Training Program	90 days prior to turn-over of BHS equipment for beneficial use of BHS
Estimated Parts List	90 days prior to turn-over of BHS equipment for beneficial use of BHS
Functional Specification	180 days prior to pre-TRR review/tests
System Inspection	120 days prior to pre-TRR review/tests
Site Specific Test Plan	60 days prior to pre-TRR review/tests
Cybersecurity Plan	15 days prior to turn-over of BHS equipment for beneficial use of respective BHS sequence (phase)

Submittal Item	Deadline
Final Parts List	30 days prior to turn-over of BHS equipment for beneficial use of BHS
Work Activities Bulletin	14 days prior to each activity
Test Reports	15 days after completion of testing of respective BHS sequence (phase)
Certificate of Testing Compliance	
Certificate of Installation Compliance	15 days after completion of installation
As-Built Drawings	30 days after acceptance of respective BHS
O&M Manual Revisions (For an Existing BHS)	60 days prior to turn-over of BHS equipment for beneficial use of respective BHS
O&M Manual – Final	15 days prior to turn-over of BHS equipment for beneficial use of respective BHS
Weekly Report	Last day of each month
Submittal Log	With each submittal or as required by the project
Computer/Software/Hardware Inventory	At conditional acceptance/updated as required at final acceptance
Computer Log	To be kept during conditional acceptance period and officially submitted at final acceptance
Operational Run-in and Closeout Data Documentation	31 days after date of beneficial use or as requested by TSA

E. Detailed BHS Master Schedule
   1. Submit a detailed BHS master schedule as specified below for approval by the Cedar Rapids Airport Commission or their representative before commencing with any work. Display schedule in graphic form, large and spacious enough to be updated directly on the original submittal during the project. Show the principal dates and commensurate activity times for each entry. Include in the schedule:
      a. Beginning and ending of electrical, and controls/computer engineering for each subsystem or construction phase
      b. Drawing submittal and approval
      c. Long lead item order placement and expected delivery date
      d. Beginning and ending of fabrication per subsystem or construction phase
      e. On-dock plant to onsite transportation
      f. Beginning and ending of alterations work per each subsystem or construction phase
      g. Beginning and ending of electrical, and controls/computer installation per subsystem or construction phase
      h. Milestone dates for completion of pertinent facility interfaces (e.g., permanent system power)
      i. EDS/BHS integration test plan
      j. Contractor’s internal specification conformance acceptance test dates
      k. Pre-TRR dates
      l. EDS TRR dates
      m. EDS ISAT dates
      n. Equipment item test
      o. Training and test plan submittals
      p. Submittal of O&M manuals
      q. O&M training periods
      r. Submittal of manufacturer's recommended spare parts list
      s. Acceptance inspections, testing/commissioning by subsystem or sequence

t. Operational dates by subsystem or construction phase or sequence
u. 60-day CBIS run-in period
v. Punch list rectification
w. Final acceptance testing
x. Submittal of as-built documentation

2. Maintain and update the master schedule weekly showing the progress made and any revisions in the schedules or at any time that changes in the design, construction, procurement and installation cause any major change in the overall schedule. Required reporting frequency intervals may be shorter during critical periods at the discretion of the Cedar Rapids Airport Commission or their representative. Such additional reporting frequency shall not be grounds for additional cost claims.
3. If the weekly schedule update reflects, or the Cedar Rapids Airport Commission or their representative determines, that the contractor is at least 10% or 14 or more calendar days behind the original progress schedule (whichever is less) for the BHS project as a whole, a major Contract item, an item of BHS which is on the critical path, or an item of BHS not on the original critical path but that, because of the delay or anticipated delay, becomes a critical path item, a proposed recovery plan shall be submitted for bringing the BHS project back on schedule and for completing the BHS within the date of completion with the weekly schedule update.
4. Coordinate and interface the BHS work in line with any other concurrent work in Terminal. Such coordination and interfacing shall include for permitting the direct contractors to complete their work before proceeding to complete the balance of project under this BHS Contract. In case of failure to allow for such coordination and interfacing, no claim whatsoever shall be entertained by the Cedar Rapids Airport Commission or their representative for any additions, amendment, remedial or abortive works to be carried out by the contractor(s) to satisfactorily complete of the project. Obtain the overall construction program and project schedule of Terminal and other such direct contractors and include them into the BHS master schedule.
5. Revisions to the project schedule may be requested in case the contractor's planning for the work is revised. If there are desired changes in the project schedule to reflect revisions in the method of operating and scheduling of the work, notify the Cedar Rapids Airport Commission or their representative, in writing, stating the reason for the proposed revision.
6. Provide sufficient personnel to coordinate and complete the BHS without hindrance to the work of other trades. Provide personnel with the experience necessary for decisions regarding coordination issues at meetings as required by the Cedar Rapids Airport Commission or their representative.

F. Construction Sequencing Schedule
1. Refer to Part 3 herein for the CBIS construction sequencing general requirements as part of the overall project phasing plan.
2. Construction sequencing shall be in accordance with the project's schedule as defined in the Contract Documents. Coordinate with all other disciplines onsite and the Cedar Rapids Airport Commission or their representative to develop a BHS installation sequencing plan.
3. Submit a detailed BHS sequencing plan for each subsystem designated for modification with description of the work, staffing requirements, and schedule per sequence. Break down the BHS sequencing plan by subsystem or activity (as coordinated with the project team). Clearly identify any differences between the proposed schedule and the construction sequencing plan.

G. Shop Drawings, Installation Drawings, and As-Built Documents
1. General
a. All drawings submitted shall become the property of the Cedar Rapids Airport Commission.

b. All drawing submittals shall be to scale. The scale utilized shall be clearly defined in the title block.
c. The North arrow shall also be shown on all mechanical drawings.
d. Drawings shall include the following items unless otherwise specified.
    1.) Document Title Blocks
        a.) Each drawing title block shall provide the following specific information:
            (1.) Three letter airport code in which the system is located (i.e., CID)
            (2.) Name of the BHS
            (3.) Drawing scale
            (4.) Drawing title
            (5.) Drawing number/sheet number
            (6.) Drawing date
            (7.) Drawing revision date and revision number
            (8.) Footnote all drawing revisions on the drawing face as well as in the appropriate revisions section of the title block.
e. Professional Engineer Approval Requirements
    1.) Submit all applicable drawings and calculations signed and sealed by a Professional Engineer licensed in the State of Iowa, the same jurisdiction in which this project is located.
    2.) Minimum requirements for professional engineer signed and sealed drawings and calculations to be submitted are defined below. Submit any additional signed and sealed drawings, calculations or submissions required by federal, state or local codes. At minimum, the following drawings, calculations, and submissions shall be signed and sealed:
        a.) Electrical
            (1.) All new and modified BHS PDP and MCP connected load calculations.
        b.) Provide the above electrical professional engineer-signed and sealed drawings/calculations as listed above in two separate submittals:
            (1.) For Construction drawings/calculations
            (2.) Final as-built drawings/calculations

2. Drawing Submittal Package Requirements
    a. Submit final installation drawings defining electrical component layouts and the relationship of the equipment components to each other and to the facility to the Cedar Rapids Airport Commission or their representative prior to fabrication or procurement.
    b. Submit a motor schedule listing for the conveyor segments designated to remain for reconfiguration and re-control. The motor schedule shall include motor horsepower, voltage, source of feed, circuit breaker size, disconnect size, conduit and wire size and overload heater size selected to be used, prior to the installation of overload heaters on the controllers.
    c. Submit the BHS equipment combined heat output figures with calculations for the following areas of the facility to the Cedar Rapids Airport Commission or their representative for review. The information typically includes friction losses from conveyor equipment and heat outputs from the drive motors, MCPs, and computer equipment:
        1.) BHS control room(s)
        2.) BHS MCP room(s)
        3.) Baggage inspection room(s)
        4.) Conveyor equipment enclosures
    d. Submit as-built drawings as per the specified submittal schedule (plans and associated sections/elevations) indicating the location of the BHS, including all electrical devices, operator control panels, MCPs, switches, and other control devices. Ensure the submitted as-built documents and related information are

accurate and include all BHS/CBIS related communication/network layout drawings, final descriptions of operations, final copy of the Programmable Logic Controller (PLC) programs with all relevant drawings, final copy of BHC system and PLC software disaster recovery procedures, computer crash recovery disks, and all O&M manuals. All final as-built drawings shall be signed and sealed by a professional engineer licensed in the State of Iowa at no additional cost to the project.

e. Submit final assembly drawings, shop detail drawings, and any other pertinent drawing files in AutoCAD.DXF or Revit format, version 2020 or higher, for all phases of the work, indicating BHS components, construction, and assembly details of all components prior to releasing drawings for fabrication.

f. Submit as-built drawings on an approved physical media format.

3. BHS Electrical Drawing Submittal Requirements

   a. General

      1.) Each BHS device or conveyor and related control and power devices that appear on any BHS electrical drawings shall be identified with the appropriate ID, as established herein.

   b. Submit the following types of electrical drawings:

      1.) Plan view of the BHS noting the identity and location of all existing and relocated components, including MCPs, control devices, control stations, motors, limit switches, safety disconnect switches, HSPD power/control panels, UPS', and junction boxes as related to each BHS device. Provide these drawings with the following information:

         a.) Detailed wiring connections for field components, in block form, with a detail of the field wiring numbers and configuration.

         b.) Detailed conduit routing diagrams indicating the size of conduits and the size/number of conductors for the equipment/components and associated MCPs and UPS equipment that shall also include their respective feeders and references to their main power supply sources (i.e., PDPs).

      2.) Layout of MCPs and any related control devices or indicating lamps.

      3.) Submit all power requirements for the subsystems of this project as per the specified submittal schedule. Any discrepancies between the specified maximum allowable electrical loads and contractor design loads shall be clearly identified in the review submission. the Cedar Rapids Airport Commission shall retain the right to reject any requests for additional power beyond those as indicated in the contract documents. Calculate power requirements in accordance with the recommended practice and include connected and demand power. Include in the subsystem power requirement submittal an assessment of the BHS MCPs with respect to requirements for personal protective equipment, in compliance with NFPA 70E Standards for Electrical Safety in the Workplace.

      4.) Detailed drawing indicating locations and types of safety signage.

      5.) Detailed block diagram of the BHS upper- and lower-level networks to provide a functional overview of the system architecture and a conduit routing diagram that illustrates the installation and location of the network components. These drawings shall distinguish the difference between the contractor provided components and non-contractor components that the BHS will interface with (i.e., other airport systems). The overall submittal of these documents shall include specified redundancy provisions and related communications links to new and existing systems (e.g., location of all network devices, switches, routers, repeaters, media converters, fiber connections, terminations). All components shall be identified as new, existing, or relocated and shall include their respective part numbers, as applicable.

6.) PLC computer control system in block diagram format to include the data communication system showing the connections among all PLC, SAC, and remote I/O units.
7.) Motor manifest indicating type, part number of driven equipment, horsepower, full load amperes, and speed.
8.) MCP general layout showing enclosure size, type, power requirements, equipment location and enclosed component general arrangement. Include a separate I/O list for each PLC or remote I/O in the panel. Identify I/O assignments with equipment item numbers.
9.) Detailed block diagram representing the internal layout of components within each MCP and both internal and external layout of components related to the workstations.

c. Submit the following types of control system drawings:
1.) Plan view of the BHS noting the identity and location of each control device, control station, motor, limit switch, and safety disconnect switch as related to each BHS device of the system.
2.) Plan view of the BHS noting the identity and location of each motor with power in horsepower. Identify all motors that will have a VFD, clutch/brake or brake. Annotate which motors are controlled by VFDs; indicate the location of the VFD (either at the motor or located in the relevant MCP).
3.) Plan view of the BHS noting the identity of each conveyor with expected speed in feet-per-minute (fpm).
4.) Plan view of the BHS noting the identity of every photocell location annotated whether a tracking or non-tracking device.
5.) Plan view of the BHS noting the identity of every tracking belt tachometer or shaft mounted encoder.
6.) A set of drawings showing those conveyors that will stop by the activation of each specific E-Stop in the system as per the specified submittal schedule. The drawings should indicate (using different colors or hatches) the conveyors of the specific subsystem and any adjacent subsystems that will stop for each E-Stop or group of E-Stops as appropriate. Take into consideration the following when developing the E-Stop zones:
a.) MCP breaks shall be considered when splitting up E-Stop zones. If the downstream MCP is shut down, upstream bags left in the system should be able to divert upstream from the inoperable equipment.
b.) 45° merge E-Stops should be tied into the receiving or take-away conveyor.

d. Submit detailed shop drawings which include all interfaces between systems that are affected by the scope of work and shall include connection details (connector type, communication protocol) software protocol, transmission media, connection locations, and any other required information. The types of interfaces include the Message Broker, fire system, and EDS
e. Provide an approved 11" x 17" reduced copy of the schematic wiring diagram(s) of each MCP including outline and wiring diagram of all special devices which shall be placed in the door pocket of the MCP.

4. BHC and Control System Description Submittal
a. Submit Control System Description as specified in Parts 2 and 3 herein. This functional controls system submittal shall include the description of operation for the interim and final works of the BHS conveyor lines/subsystems, as well as the respective conveyor line’s interim operational condition.
b. For the CBRA secondary passive displays, the exact metrics, settings, and ranges to be displayed shall be determined during the project submittal phase through concurrence by the ILDT and TSA. Submit example screens for review and conduct appropriate meetings and workshops to obtain approval.

c. The BHC System submittals shall also include an application matrix/interconnection diagram of the complete BHC System along with a comprehensive list of ports/protocols relative to source and destination for each system communicating on the BHS network(s).
d. Submit the following information with regards to the network design:
1.) Performance of the network
2.) Security: No single point of failure
3.) All protocols to be used
4.) Quality of service in terms of bandwidth management
5.) Installation and site management
6.) Evolution of the network devices
7.) Knowledge transfer
8.) Network architecture and design

5. BHS Control Room Requirements
a. Submit the Computer/Control Room requirements for the proposed new redundant operator workstations with related computer/control servers, large screen displays, and other hardware installed in the BHS Control Room, as illustrated in the accompanying drawing package (refer to Part 2 herein for full details on BHS Control Room requirements), including:
1.) A proposed room layout of new equipment with phasing drawings and final layout drawings showing spatial requirements with all related equipment.
2.) Environmental requirements (temperature and humidity), to include estimated combined heat output of new computer equipment.
3.) Data transmission and communication drop locations; routing of wires/cables through cable access-ways.
4.) Fire protection
5.) Electrical and power requirements (e.g., the number and location of UPS electrical sources)
6.) Requirements associated to batteries installed in UPS devices per International Fire Code 608
7.) Lighting and outlet requirements

H. Catalog Cuts and Equipment Specifications
1. Submit a catalog cuts manual in searchable .pdf format for all manufactured and purchased items (electrical and computer equipment) as per the specified submittal schedule.
2. The catalog cut manual shall contain the following:
a. Record of Revisions: A "Record of Revisions" sheet shall be provided at the beginning of the catalog cut manual.
b. Table of Contents: A Table of Contents shall be provided at the beginning of the catalog cut manual.
3. The catalog cuts shall be legible, reproducible, and directly relevant to the specific items as used in the system. Each individual item shall be clearly indicated by the inclusion of a highlighted/shaded arrow immediately adjacent to the item. Where a variation occurs from the standard component or a special custom ordered part has been used as a replacement for the standard supply, additional details shall be submitted to clarify the identity of the component.
4. The catalog cuts shall include the following items:
a. Wiring devices (including quick disconnect devices for removable conveyors)
b. Control devices
c. Electric brakes
d. Electric clutches
e. VFDs
f. PLC and peripherals

g. Power regulators
h. Computer equipment
i. Computer monitors
j. MCP Touchscreen Terminals
k. Laptop computers

5. Conduct a thorough site survey of the existing systems and submit catalog cuts of all components to be utilized for the project.

I. Operation and Maintenance (O&M) Manuals & Addendum

1. General
   a. Provide O&M manuals in searchable .pdf format, each section having its own .pdf file.
      1.) Provide a Table of Contents .pdf file with hyperlinks to each of the sections.
      2.) Provide navigation within each .pdf section to allow users to navigate back to the Table of Contents .pdf and to the preceding and next .pdf sections.
      3.) Provide hyperlinks within the .pdf sections to all empirical data (e.g., cut sheets, drawings, as-builts, field data, training materials, verification sheets).
   b. O&M accessibility shall be password protected with tiered access levels like that of the MIS system (refer to Section 2.12H). Coordinate the access of the O&M sections according to these security levels during the design review meetings (refer to Section 2.12A).
   c. The O&M manual shall be a web-based application installed on the MIS server and accessible at all workstations.
   d. The O&M manual shall be formatted to be printable in standard 8.5 x 11” and 11 x 17” page sizes.
   e. The O&M manual shall cover all new and modified subsystems as per the format and guidelines specified below.
   f. Digitize any applicable existing O&M manual information into .pdf format and make this accessible via hyperlink through the new O&M application.
2. Purpose
   a. The O&M manual provides O&M personnel with a thorough understanding of the layout of the system, its function, special features, operational requirements, maintenance requirements, parts information, warranty information, and safety considerations including O&M access requirements for operating and maintaining the system safely and effectively.
   b. This specification is intended as a guide to indicate the basic requirements of the O&M manuals. The contractor’s standard O&M manual shall be acceptable provided it is functionally equivalent to that specified below and the documents are suitable and usable for the intended purpose.
   c. Divide the manual into two main sections:
      1.) The Operational portion of the manual shall present the information required for personnel to be able to operate the system in a safe and efficient manner. The operational information shall be presented in easy-to-understand terms so personnel not familiar with the system will have a thorough understanding of the system upon reading the operational information.
      2.) The Maintenance portion of the manual shall present the information required for personnel to be able to maintain the system in a safe and efficient manner. The maintenance information shall be presented in easy-to-understand terms so personnel not familiar with the system shall have a thorough understanding of the electrical equipment O&M requirements so that they shall be able to effectively and safely perform maintenance functions such as troubleshooting, servicing, and repairing.
3. Manual Title
   a. The title information shall be generally as follows:

Line	Information
First	“CID”
Second	“Operations Manual” or “Maintenance Manual”
Third	“For”
Fourth	System Type (e.g., Terminal Baggage Handling System)
Fifth	Date of System, as based on beneficial use date
Sixth	Project Number (to be coordinated with the Cedar Rapids Airport Commission or their representative)

4. Manual Contents
   a. Record of Revisions: A Record of Revisions sheet shall be provided at the beginning of the O&M Manual.
   b. Table of Contents: A Table of Contents shall be provided at the beginning of the O&M Manual.
   c. Chapter Index Tabs: Each chapter shall be identified with an index tab with permanently printed information.
   d. Chapter Index: Each chapter of the O&M Manual shall begin with an index for the related chapter.
5. Operational Information
   a. Chapter 1 – Glossary of Operational Terms
      1.) Include a glossary of operational related terms and equipment identification/designations.
   b. Chapter 2 – System Overview
      1.) Include, at minimum, the following items:
         a.) A basic overview of the system showing overall layout and arrangement.
         b.) Identify locations, number of and types of inputs.
         c.) Identify locations, number of and type of sort areas.
         d.) Identify system and subsystem conveyor designations.
         e.) Processing rate of each subsystem as well as the total system processing rate.
   c. Chapter 3 – Baggage Weight and Size Limitations
      1.) Include, at minimum, the following items:
         a.) Normal Size Baggage
         b.) Baggage that can be processed by system but requires special considerations/handling such as skis and golf bags
         c.) Fragile Baggage
         d.) Oddsize Baggage
   d. Chapter 4 – Detailed Description of System Operation
      1.) Include, at minimum, the following items written in a clear concise manner:
         a.) The detailed operational description of system operation shall be written to provide operational personnel a thorough understanding of how to operate the system. Operational personnel include:
            (1.) Sky Caps
            (2.) Passenger Service Ticket Agents
            (3.) Service Baggage Handlers
            (4.) TSA Agents
         b.) The operational information shall cover system start-up, shut down, operational stop/start control stations, Jam Reset and E-Stop operational requirements.
         c.) The operational information shall also provide a thorough understanding of the system fault annunciation system so that faults can be recognized, and appropriate action can be directed.
         d.) The operational information shall provide an operator's troubleshooting guide for the safe and effective correction of operational problems.

e.) The BHS shall be equipped with sortation controllers, computers and workstations; Provide detailed information for the items listed below, affected by the specified requirements of this project:
(1.) All operator interface command entries
(2.) All operator-initiated reports
(3.) All system automatically generated reports
(4.) All system fault alarm messages and reports
(5.) All graphic display information systems
(6.) Placing equipment in or out of service
(7.) BSDs
(8.) Baggage loading procedures relative to placement of barcoded baggage tags

f.) The detailing of the above information shall include:
(1.) Thorough explanation and purpose of the command message or report.
(2.) Required keyboard or operator response.
(3.) Explanation of expected system response.

g.) The operator's information shall also include procedures and recommendations for alternative modes of system operation as might be required due to various equipment or subsystem failures.

e. Chapter 5 – Operational Safety
1.) Submit safety information related to the proper and safe operation of the specified system and its equipment from an operator's point of view and shall cover, at minimum, the following items:
a.) Pre-operating procedure
b.) Start-up and shutdown procedure
c.) E-Stop and restart procedure
d.) Jam detection, jam clearance and restart procedure
e.) Equipment lockout/tag-out procedures (adhere to the most current OSHA, ANSI, and local codes, policies, and standards)

6. Maintenance Information
1.) Chapter 1 – Glossary of Terms and Identification
a.) Include a glossary of all terms and equipment identification/designations associated with the specified system. Any industry vernacular, vocabulary, descriptions or definitions necessary for further communication of information shall also be provided.
2.) Chapter 2 – Description of System Equipment
a.) Include, at minimum, the following items:
(1.) Detailed description of the mechanical conveyor equipment used in the system including widths of conveyors, general specifications, and capabilities of the system.
(2.) Detailed description of the electrical equipment used in the system, including the location of MCP(s), PLC(s), fire/security door(s), workstation(s), and BSD(s)
3.) Chapter 3 – Electrical Control Sequence of Operation
a.) Include a detailed description of the electrical control sequence of operation and the proposed locations of related field equipment/components, such as the following:
(1.) Location and operation of Control Stations
(2.) Location and operation of Photocells
(3.) Location and operation of Limit Switches
(4.) Operation of MCP(s)
(5.) Operation of PLC(s)
(6.) Operation of Fire/Security Door(s)

(7.) Operation of MDS Computer System/Workstations
(8.) Operation of MIS Database Servers
(9.) Operation of BSD(s)

4.) Chapter 4 – Maintenance Safety Procedures
a.) Submit safety information related to the proper and safe operation and maintenance of the specified system and its equipment from a maintenance point of view. Include the following:
(1.) Pre-operating procedure
(2.) Start-up and shutdown procedure
(3.) E-Stop and restart
(4.) Jam detection, jam clearance, and restart procedure
(5.) Equipment lockout/tag out procedure (the procedure shall reflect/refer to the most current OSHA, ANSI, and local codes, policies and standards)

5.) Chapter 5 – Service, Inspection and Preventive Maintenance
a.) Provide detailed information for the proper servicing of all system equipment and, at minimum, shall cover:
(1.) A general explanation, regarding what the servicing requirements is for the related system equipment.
(2.) Detailed preventive maintenance program outlining required functions and frequencies for the proper preventive maintenance of the components that make up the system equipment items such as belt conveyors, power turns, flat plate devices, HSPDs, servers/computers, BSDs, security doors, and MCPs. The information shall be brand-specific for the equipment provided for this system only. Information for equipment types and brands not provided in this system will not be acceptable. At minimum, the following items shall be covered.
(3.) Inspections for:
(a.) Straight conveyors, power turns, merge conveyors, HSPDs, and flat plate make-up devices.
(4.) Lubrication of:
(a.) Motor Bearings, Pulley bearings (as required), drive chains, speed reducers, and power turn perimeter chains/guides, and all other items requiring lubrication.
(5.) Cleaning of:
(a.) Motors, drive chains, speed reducers, photocells (and related reflectors), MCPs, and workstations/servers.
(6.) Adjustment of:
(a.) Straight conveyor belt tracking, straight conveyor belt tensioning, power turn conveyor belt tracking/tensioning, merge conveyor belt tracking/tensioning, HSPDs, flat plate devices, drive V-belt and sheave alignment, drive V-belt tensioning, drive chain and sprocket alignment, drive chain tensioning, photocell alignment and sensitivity, drive motor clutches, drive motor brakes, and limit switches.

6.) Chapter 6 – Warranty Information and Procedures
a.) Submit detailed information regarding the specific Warranty Conditions that prevail on the specified system.
b.) The detailed information regarding the system warranty shall include the following:
(1.) Date of Beginning and Expiration of Warranty Period.
(2.) Specific instructions regarding the procedures for the documentation and return of items under warranty.

(3.) Provide detailed information regarding the specific warranty conditions that apply to the specified system, assemblies, components, and parts.
(4.) Names and telephone numbers of the point of contact for warranty questions and discussions. The point of contact information shall be provided for both normal 0800 to 1700 Monday through Friday hours as well as after hours. Direct communication shall be made available 24 hours/day, 7 days/week, 52 weeks/year.

7.) Chapter 7 – Troubleshooting
a.) Submit detailed information for the proper remedial and corrective action required (troubleshooting) for repair of the system equipment malfunctions.
b.) At minimum, the following items shall be included in a detailed problem and correction troubleshooting chart:
(1.) All mechanical equipment
(2.) All electrical equipment
(3.) All control equipment
(4.) All computer equipment
(5.) BHS/EDS Interfaces
(6.) BHS/Airport Systems (e.g., Fire Alarm) Interfaces
c.) The troubleshooting information provided in the chart covers an exhaustive list of possible causes of system failure or malfunction.
d.) A procedural approach should be used in the documentation to allow service personnel to resolve problems. This method shall emulate the problem as well as provide the related solution. Information should be provided to assist in discernment of cause-and-effect issue as well as find solutions through cross referencing.
e.) Arrange the information in a three (3) column format with respective headings of:
(1.) Trouble
(2.) Probable Cause
(3.) Corrective Action
f.) Empirical Readings: This chapter shall include the Empirical Readings, as described in Part 4 herein, that were recorded at the time of the Conditional Acceptance Testing and Inspection of the system. Provide this information as a maintenance reference.

8.) Chapter 8 - Removal and Installation Procedures
a.) Submit detailed information for the proper removal and installation of all system equipment components.
b.) Information shall be brand-specific for the equipment/components provided for this system only. Information for equipment/component types and brands not provided in this system will not be acceptable.
c.) At minimum, include the following items in this chapter:
(1.) Basic Considerations
(2.) Safety Precautions
(3.) Procedural Orientation
(4.) List of special tools, gauges and equipment required for the maintenance of the system, together with illustrations and usage instructions. Also provide sources for procurement of these items.
(5.) Torque Values
(6.) V-Belt Tension Procedures and Values
(7.) Drive Chain Tension Procedures and Values
d.) Component List:
(1.) All the components for straight conveyors
(2.) All the components for power turn conveyors

(3.) All the components for merge conveyors
(4.) All the components for queue conveyors
(5.) All the components for flat plate make-up/claim devices
(6.) All the components for BSDs
(7.) All the components for workstations
(8.) All the components for sortation controllers
(9.) All the components for HSPDs
(10.) All the components for MCPs

9.) Chapter 9 – Illustrated Parts Information
   a.) Illustrated parts information shall be provided for all systems, assemblies, subassemblies, components, and parts, including all mechanical, electrical, workstation, computer, bag status displays and other necessary equipment.
   b.) Clear, concise exploded view isometric drawings showing the parts, the relationship of adjacent parts with one another within a given conveyor equipment assembly as well as the diagram number that shall reference the specific part on the adjacent parts information sheet.
   c.) The parts information sheet shall be adjacent to the isometric drawing and shall contain:
      (1.) Part reference number from isometric drawing
      (2.) Part description
      (3.) Part Number
      (4.) Manufacturer of part
      (5.) Number of parts found in the conveyor equipment isometric drawings
   d.) Include model and serial numbers for all special equipment, including power turn conveyors, and HSPDs. All parts shall be referenced to a next-higher-assembly level within the drawing hierarchy. The system of referencing shall allow the reader to follow assembly/disassembly procedures in a methodical and orderly manner throughout the documentation.

10.) Chapter 10 – Manufacturer's Literature
   a.) Submit all the manufacturer's literature for all conveyor mechanical, electrical, and electronic components.
   b.) Information shall be brand-specific for the equipment/components provided for this system only. Information for equipment/component types and brands not provided in this system will not be acceptable.
   c.) Unless unavailable, the OEM literature shall be provided. At minimum, only a first copy of a manufacturer's original literature will be accepted if the OEM literature cannot be provided.
   d.) All such copies shall be clear and legible.
   e.) All manufacturers' literature shall be appropriately highlighted with a legible solid black arrow for identification of the specific device model used in the specified system.
   f.) All manufacturers' literature shall include information adequate for proper servicing of the item, proper operation of the item as well as all required information for the ordering of the item.
   g.) Complete list of parts manufacturers including address, telephone number and point of contact.

11.) Chapter 11 – Mechanical Drawings
   a.) Provide record (as-built) BHS mechanical drawings as a complete, clear and legible 11" x 17" set of As-Built BHS mechanical drawings.

12.) Chapter 12 – Electrical Drawings
   a.) Chapter 12 shall contain:

(1.) A complete list and definition of the electrical symbols used in the electrical drawings.
(2.) A complete, clear and legible 11" x 17" set of As-Built BHS electrical drawings. The As-built drawings shall contain as a minimum the following:
(a.) Detailed wiring connection drawing noting each control device, control station, motor, and all other controls devices, in block form with a detail of the field wiring numbers and configuration.
(b.) Detailed conduit routing diagram indicating size of conduit, size and number of conductors, junction boxes, control devices, motors, safety disconnect switches, motor control panels, and workstations.
(c.) Detailed block diagram representing internal layout of components within each motor control panel, both internal as well as external layout of components related to workstations.
(d.) Schematic Wiring Diagram of each MCP, including outline and wiring diagram of all special devices. An additional approved 11" x 17" reduced copy shall be placed in the door pocket of the MCP.

13.) Chapter 13 – PLC Listings
a.) Include a complete, clear, and legible set of As-Built BHS PLC listings. The listing shall include the following:
(1.) Complete set of PLC program ladder logic diagrams as well as PLC and Sortation controller listings for the related system.
(2.) A complete Sequence of Operation shall be included on the schematic diagrams or the PLC ladder logic diagrams.
(3.) PLC ladder logic diagrams shall have detailed margin descriptors clearly identifying the function of each device and its associated contact rung locations.
(4.) Include a separate I/O list for each PLC or remote I/O in the panel. Identify I/O assignments with Equipment Item Numbers.

7. Draft O&M Manuals
   a. Submit a functional draft O&M manual application on a thumb drive or other approved media for approval to the Cedar Rapids Airport Commission or their representative prior to system start-up.
8. Final O&M Manuals
   a. A searchable .pdf application of the final O&M manual shall be presented to the Cedar Rapids Airport Commission in accordance with the submittal schedule. Timely submittal of a system's O&M manual is essential to the proper operation and maintenance of the BHS.
   b. The O&M manual shall be updated by supplement to reflect any field changes, equipment changes due to warranty changes, and any other changes made during the warranty period of the system so the manual reflects as-built information.

J. Periodic Maintenance Inspection and Lubrication Chart
1. Provide a master chart or series of charts involving periodic maintenance of all equipment items in the system and defining, under equipment item subdivisions, the points and frequency of recommended periodic maintenance functions, including inspection, lubrication and replacement.
2. This chart need not detail the procedures involved with such periodic maintenance functions since such procedures will be found in the maintenance manual, but reference shall be made to specific sections or pages therein.

3. Submit a complete list of lubricants to be used on the equipment components. This list shall be standardized on one supplier to minimize the number of different lubricants used.

K. Training Program
   1. Provide an O&M training program as specified in Part 3 herein.
   2. The training program shall be submitted to the Cedar Rapids Airport Commission or their representative for approval prior to the start of System Testing and in accordance with the schedule of submissions.

L. Quality Control Manual
   1. Provide a Quality Control Manual acceptable to the Cedar Rapids Airport Commission or their representative.
   2. Indicate inspection lists, methods and procedures that will be utilized for quality control inspection and testing to confirm compliance with the specified requirements. The procedures shall include a checklist of points to be observed.
   3. The Quality Control Manual shall ensure there is a system for final inspection and testing of completed products, construction, and installation. Such testing shall provide a measure of the overall quality of the completed product and shall simulate product end use and function. Final inspection and testing shall provide for reporting to the Cedar Rapids Airport Commission or their representative any difficulties, deficiencies, or questionable conditions. When modifications, repairs, or replacements are required after final inspection or testing, there shall be re-inspection and re-testing of any characteristics affected.
   4. The Quality Control Manual shall provide instructions for handling, storage, preservation, packaging, and shipping to protect the quality of products and prevent damage, loss, deterioration, degradation, or substitution of products. It shall also require and monitor the use of procedures to prevent handling damage to articles. Products in storage shall be protected against deterioration and damage.

M. Safety Program Manual
   1. Coordinate the requirements of this section with applicable sections in Divisions 01 and 02.
   2. Submit a site-specific system installation, construction, and commissioning Safety Program Manual to be utilized for this project for the Cedar Rapids Airport Commission’s or their representative’s approval.
   3. Designate a safety manager/coordinator acceptable to the Cedar Rapids Airport Commission or their representative.
   4. The safety program shall be implemented to identify and resolve hazards. The safety program shall emphasize the prevention of accidents by resolving hazards in a systematic manner. The safety program plan, as described below, will identify the responsibilities of all parties for implementing the safety program.
   5. The safety program shall demonstrate compliance with all applicable safety rules and regulations. The levels of compliance shall meet the OSHA Standards, ANSI Standards, NFPA Standards, NEC Standards, and trade association standards and recommendations.
   6. The safety program manual shall include the following:
      a. Have as its objective to provide for the safety of the passengers, employees, general public, airport staff, and equipment.
      b. Encompass all elements within the provided BHS.
      c. Include all interfaces with facility systems and identify all hazards within the Facilities that might result from the unique characteristics of the BHS.
      d. Identify the safety roles and responsibilities of all contractors' organizational elements and require accountability of each.
      e. Contain a hazard resolution process that includes the procedures necessary to identify and resolve hazards.

f. Indicate safety inspection lists and methods that shall be utilized by all personnel employed on this project.
g. A plan for furnishing and enforcing the use of individual protective equipment including hard hats, rain gear, protective footwear, protective clothing and gloves, eye protection, ear protection, respirators, safety belts, safety harnesses, safety lifelines and lanyards, and high visibility reflective safety vests.
h. A plan for providing first aid facilities, supplies, and trained personnel.
i. A plan for employee safety training to include employee safety orientation during the first week of work, weekly work crew safety meetings, periodic safety meetings for supervisory personnel, and special training prior to working with especially hazardous materials or operations.
j. Emergency plans for items such as fire emergencies, severe weather, earthquakes and other geologic hazards, flooding emergencies, seriously injured personnel, traffic accidents along the project site, and injuries of members of the public.
k. Pre-construction planning relative to safety and control of hazards including special tools, equipment, facilities, and individual protective gear.
l. A plan for periodic safety inspections, investigations of all accidents and injuries and submission of timely reports.
m. Submission of injury/accident/incident data for statistical analysis.

N. Configuration Management Plan
1. Submit a configuration management plan for the Cedar Rapids Airport Commission or their representative's approval and carry out all aspects of the approved plan during the project.
2. Provide examples of the established system, to identify, organize and track all documents that will be developed as part of the BHS Contract work throughout the duration of the project. Serialize all correspondence and transmittals and establish a logging system for incoming/outgoing correspondence showing action requirements and action taken. Drawings, specifications, subcontract documents, reports, estimates, studies, reviews, BHC and PLC system programming changes, and computer files shall be tracked by a logging system.
3. Once configuration for an element of the BHS is established (e.g., at design reviews or during acceptance testing), the configuration of all such elements shall not be changed without proper approval as provided for in the configuration management plan. Once configuration changes are approved, formal change order documentation shall be circulated in accordance with a distribution list, which shall include the Cedar Rapids Airport Commission or their representative, developed for that purpose.

O. Work Activities Bulletin
1. Submit a sample of the proposed BHS specific Work Activities Bulletin format that will be utilized for the project to the Cedar Rapids Airport Commission or their representative for approval. The submittal shall include example work plans for internal contractor's QA/QC inspections/testing, specification conformance inspections/testing with the Cedar Rapids Airport Commission or their representative, pre-TRR, TRR, ISAT (both contractor and TSA conducted), subsystem testing, sortation testing, every planned cutover, demolition, system outages, and other phased implementation related responsibilities for review and coordination purposes with all concerned during construction.
2. The Work Activities Bulletin shall contain the following, at minimum, and shall comply with all applicable requirements of Division 01 regarding onsite coordination, phasing, and limitations on operations:
a. Contractor's internal deadlines for completion of pertinent facility interfaces by other disciplines, such as permanent system power, support structure, facility interface requirements, and other similar responsibilities.
b. Date and time planned activity to take place from start to finish
c. Impacted user airlines

d. Details of all conveyors to be modified with duration
e. Electrical removal and installation duration
f. Contractor's internal testing with duration
g. Ticket counter/make-up device requirements for loading/unloading of test bags. Coordination with the Cedar Rapids Airport Commission or their representative and user airlines will be required
h. Witnessed system testing with duration
i. Full details of contingency plans, including the following:
    1.) Duration of specific Fault condition required to implement contingency operations.
    2.) Notification process/organizations to be notified when contingency operations are implemented in response to a Fault condition.
    3.) Manual staffing/labor location and quantity of personnel required to manually transfer bags.
    4.) Movement path for bags.
    5.) Equipment such as hand carts or baggage carts & tug to move bags plus communication devices (walkie talkies/cell phones), if required.
    6.) Required actions by the Cedar Rapids Airport Commission's O&M Group.
    7.) Required actions by the TSA or their Contractor such as changing staffing levels in baggage screening areas or installation/relocation of EDS equipment due to Fault/Construction conditions.
j. Details of person(s), with qualifications, overseeing the activity
k. Details and number of personnel to be present who are qualified to troubleshoot all aspects of their respective equipment during the planned activity, for example:
    1.) Mechanics
    2.) Electricians
    3.) Controls Engineers
    4.) Computer programmers
l. Other affected equipment manufacturers, such as EDS manufacturer. Confirmation that these manufacturers have been notified and will be in attendance if required.
m. Do not commence work until acquisition of a signed Work Activities Bulletin in hand; distribute copies to the Cedar Rapids Airport Commission or their Representative for distribution to other impacted contractors, the TSA, and the User Airlines.

P. System Inspection, Functional Specification and Test Plan
1. Submit a comprehensive, easy to read inspection and test plan for this project, with related functional specification, that will delineate the planned program for the BHS demonstrations that shall take place as part of the Cedar Rapids Airport Commission's and the TSA's or their representative's system acceptance. Prepare the inspection and test plans based on the information provided herein.
2. The Test Plan shall be provided in searchable .pdf format, each section having its own .pdf file.
    a. Provide a Table of Contents .pdf file with hyperlinks to each of the sections.
    b. Provide navigation within each .pdf section to allow users to navigate back to the Table of Contents .pdf and to the preceding and next .pdf sections.
3. The test plan shall include the following sections:
    a. Inspection Checklists that are site specific and include all equipment types installed as part of the project. The checklists shall confirm that all specification requirements pertaining to the equipment have been met.
        1.) Electrical Static Inspection Checklists
        2.) Electrical Dynamic Inspection Checklists
4. Load Testing Test Plan based upon the final version of the conveyor manifest.
5. System Wide Tests – Rate Testing to include the following, at minimum:
    a. Description of each test

b. Pass/Fail criteria
c. Number and positioning of test bags required to execute the test
d. If required, confirm all bag statistics on the MIS reports have been reset
e. Number of airline 10-digit baggage tags/BSMs required for testing. Coordination with the user airlines as required
f. List all test equipment required
g. Number of personnel required for the test to include:
    1.) Test supervisor
    2.) Mechanical
    3.) Electrical
    4.) Controls/computer engineer(s)
    5.) Personnel required to load and remove bags
    6.) BCR operator
h. List other affected equipment manufacturers and/or systems (e.g., EDS manufacturer, local TSA, fire alarm and airport security access control systems) that might be required for the test. Confirm that these manufacturers have been notified and will be in attendance.
i. Details of all reports to be printed after the test
j. Pass/Fail and notes/comments sections
k. Section for witnessed sign off, to include, at minimum, the contractor and the Cedar Rapids Airport Commission or their representative.

6. The Site-Specific Test Plan (SSTP) shall include all required PGDS Appendix D Testing broken down into the following:
    a. Introductory Testing
    b. Detailed Testing
    c. System-wide Testing
7. The functional specification and test plan program shall identify and demonstrate all system control functions relating to the operational, functional, and system performance tests. The functional specification/test plan lists each control station, control device, and their related control functions. Refer to Part 4 herein for detail test plan content requirements.
8. The test plan shall include testing of all systems integrated with the BHS Checked Baggage Inspection System (CBIS), and Fire Alarm Systems.
9. The inspection, functional specification, and testing program shall be submitted for the Cedar Rapids Airport Commission or their representative's approval prior to the start of acceptance testing in accordance with schedule of submissions. During the SAT period, the test plan shall be submitted in both hard copies for field use during the testing process and a completed electronic format (based upon acceptance testing) agreed upon by the Cedar Rapids Airport Commission or their representative.

Q. Cybersecurity Plan
1. Coordinate the development of a cybersecurity plan with all required parties (e.g., the Cedar Rapids Airport Commission, IT, TSA). Refer to PGDS Chapter 16 for all cybersecurity requirements.

R. Test Reports
1. Submit a report after completion of the internal testing, debugging, and system tests performed prior to acceptance testing summarizing the detailed results of the tests, to the Cedar Rapids Airport Commission or their representative prior to requesting final acceptance testing by the Cedar Rapids Airport Commission or their representative.
2. Carry out internal acceptance tests prior to conducting such tests with the Cedar Rapids Airport Commission or their representative to ensure tests conducted with the Cedar Rapids Airport Commission or their representative are successful.

3. Provide the Cedar Rapids Airport Commission or their representative, upon request; the results of all in-plant tests conducted on assemblies or sub-assemblies of equipment to be installed.

S. Operational Run-in and Closeout Documentation
   1. After Conditional Acceptance as described in Part 4 herein, the TSA will conduct an audit of the BHS to baseline the performance of the system and develop a Test Summary Report to summarize their analysis. Submit all reports, data, and documentation requested to the TSA to facilitate the production of this report.

T. Certification of Installation Compliance
   1. Submit certificates issued by regulating authorities in compliance with work permits (electrical, mechanical, welding, Fire Marshall, and other authorities) that the equipment has been properly installed, meets all safety standards, and is operating within the required accuracy.

U. Certification of Test Compliance
   1. Submit BHS equipment supplier's certification that the system has been tested in compliance with the supplier's requirements for testing and has met all testing requirements.

V. Final Parts List
   1. Provide a detailed listing and description of all individual system/subsystem components with reference to layout and assembly drawings.
   2. The listing of system parts shall include the following information:
      a. Name of part
      b. Complete description of part
      c. Each specific location that the listed part is used in the system(s)
      d. Total number of parts in system(s)
      e. Manufacturer of part
      f. Manufacturer's part number
      g. Source of supply
      h. Recommended quantity of spares per each item
      i. Price per unit
      j. Lead time or availability of part
      k. Complete list of manufacturers, with addresses, telephone numbers and point of contact
      l. Manufacturer's catalog literature and specifications for all purchased parts

W. System Power Requirements and MCP Sizes
   1. Submit all the MCP sizes and related power requirements for all subsystems of this project. Submit all the revised power requirements for the modified systems. The power requirements shall indicate conveyor segment horsepower removed, horsepower added, and the total connected load of the modified subsystems (horsepower and full load amps).
   2. Clearly illustrate (in color) in plan view how the BHS will be powered to satisfy redundancy requirements.
   3. Coordinate the MCP sizes and locations in the submittal with the housekeeping pad locations shown in the Structural drawings.

X. Estimated Spare Parts List
   1. Submit a list of estimated spare parts required for the first year of operation for the Cedar Rapids Airport Commission or their representative's review and consideration for a budgetary allowance. Include unit price per unit for the estimated spare parts list based on reasonable market rates. Spare parts might/shall be purchased for each phase prior to the commissioning of that phase. Include recommended inventory and replacement levels for each phase prior to commissioning as well as part description and identification

quantities in system, delivery times, manufacturers, and suppliers (their part or ordering numbers).
2. Include any special test instruments required for maintenance beyond the normal inventory of a conveyor maintenance shop. Include a device for measuring conveyor speed and shaft rotational speed, a VOM and a clamp-on handheld ammeter.
3. Submit a spare parts list in accordance with the schedule of submissions.

Y. Weekly Status Reports
1. The contractor's project manager shall submit a weekly status report to the Cedar Rapids Airport Commission or their representative, which shall include schedule updates in accordance with the provisions of the Contract terms. the Cedar Rapids Airport Commission or their representative shall have the right to change the time of submitting and the details of the report. The weekly status reports shall cover, including the following information:
   a. Percentage of electrical and controls/computer engineering completion, per subsystem
   b. Percentage of fabrication completed
   c. Equipment delivery schedule (month look ahead)
   d. Percentage of equipment installed complete:
      1.) Electrical
      2.) Controls
      3.) Computer
   e. Updated detailed project schedule
   f. Task activities planned for the next week
   g. BHS engineering issues
   h. Interface issues, including the following:
      1.) Fire and security systems
      2.) EDS machines
      3.) CBRA workstations/BSDs
      4.) PDP and MCP power supply
   i. Right-of-way issues
   j. Brief description with status of accepted and proposed change orders with associated cost
   k. Status of payments
   l. Manning by trade
   m. Percentage of testing completed
   n. Any other issues

Z. Submittal Log
1. Provide a log to the Cedar Rapids Airport Commission or their representative listing all required project submittals to include, at minimum, the following information:
   a. Submittal type
   b. Submittal revision number. The submittal revision number shall also be clearly identified within the submitted document as well.
   c. The date in which the submittal is sent out for review
   d. Company or individual to whom the submittal is sent
   e. Date in which the submittal was returned after review has been completed
   f. Review status
   g. The log entries shall be maintained as current on no less than a weekly basis with submission to the Cedar Rapids Airport Commission upon request

AA. Computer/Software/Hardware Inventory
1. Provide to the Cedar Rapids Airport Commission or their representative a detailed listing for each computer/PC to be submitted upon conditional acceptance.

2. Submit the listing (by computer) along with all program disks, manuals, manufacturers' information, and any other relevant information in an organized format (i.e., binder with dividers or an acceptable format to the Cedar Rapids Airport Commission) upon conditional acceptance.
3. The inventory shall include the following:
    a. Complete software inventory by computer, including all version numbers and dates
    b. Complete hardware inventory by computer
    c. Registration numbers, serial numbers
    d. Computer emergency boot/recovery disks

BB. Computer Log
1. Upon conditional acceptance keep a computer log to keep track of any system computer problems/issues that occur during the conditional acceptance period for troubleshooting and tracking purposes during its operational life.
2. The log shall be compiled in an electronic format acceptable to the Cedar Rapids Airport Commission or their representative and shall include, at minimum, the following information:
    a. Date/Time of occurrence
    b. Type of Issue(s) (e.g., graphic monitoring system issue, sortation computer issue, ATR array issue)
    c. Description of the issue
    d. Name/shift of individual that discovered the problem.
    e. Resolution to the problem onsite
    f. Effect on the system
    g. Contractor Individual who should be contacted for support and troubleshooting
    h. Programs, files affected by the resolution to the issue
3. At minimum, the computer log should be issued to the Cedar Rapids Airport Commission or their representative on a weekly basis or as requested by the Cedar Rapids Airport Commission or their representative.

CC. Project Management Team
1. Submit a listing of key personnel with resumes and qualifications that will be working on the project to the Cedar Rapids Airport Commission or their representative for approval. The following list is an example:
    a. Senior Project Manager
    b. Onsite Field Supervisor(s)
    c. Professional Engineer(s)
    d. Safety Manager
    e. Configuration Control/Schedule Manager(s)
    f. Quality Control/Assurance Manager(s)
    g. Project Manager(s) – Electrical and Control Systems Engineering
    h. Project Manager(s) – Computer Systems Engineering
    i. Instructors/training personnel (including instructor's professional qualifications)
2. Project organization chart to include all subcontractors
3. Include onsite and offsite participating personnel and the percent of anticipated participation on this project. the Cedar Rapids Airport Commission or their representative reserves the right to approve or reject key personnel from the list.
4. The project manager and onsite superintendents shall not be changed without the Cedar Rapids Airport Commission's or their representative's written approval.
5. The contractor, individuals, or entities constituting the contractor, officers or directors of the contractor, or entities or key members of the project management team shall have records of past performance sufficient to assure the Cedar Rapids Airport Commission or their representative that they have the experience, competence, and integrity to successfully complete this project.

1.06 PROJECT CONDITIONS

A. General
   1. the Cedar Rapids Airport Commission or their representative does not guarantee the accuracy or the completeness of the information relating to the new or existing utility services, facilities, or structures that might be shown on the drawings or encountered in the work. Any inaccuracy or omission in such information shall not relieve the responsibility to protect such existing features from damage or unscheduled interruption of operations and services.
   2. Prior to commencing the work in the general vicinity of the existing system, utility service or facility, notify the Cedar Rapids Airport Commission or their representative 72 hours in advance and obtain approval before proceeding with the work.
   3. Failure to give the 72-hour notice shall be cause for the Cedar Rapids Airport Commission or their representative to suspend the contractor's operations in the general vicinity of the system, utility service, or facility.
   4. Should damage to or unscheduled interruption of airline operations, utility service or airline facility occur by accident or otherwise, notify the Cedar Rapids Airport Commission or their representative and take all reasonable measures to prevent further damage or interruption of service. In such events, cooperate with the utility service and the airport authority until such damage has been repaired and service restored to the complete satisfaction of the utility service or the airport authority.
   5. Coordinate all building modifications performed by any trade to accommodate the installation of the BHS.

B. Installation Conditions
   1. Install this BHS at Eastern Iowa Airport working simultaneously with other trades.
   2. Visit the site to become familiarized with the site conditions and understand local conditions that might affect the project before submitting the bid proposal. Where possible, become familiar with the availability of temporary access, temporary lighting and power, telephone services, storage facilities, water supply, waste disposal facilities, labor supply, weather conditions, parking of vehicles, loading and unloading of materials, and equipment. Account for in the bid proposal any effect that any adjacent construction and O&M works might have on the BHS installation. Determine and allow in the bid proposal for all necessary precaution and for any difficulties that might arise in the execution of the BHS Contract. No claims whatsoever arising out of the site constraints, difficulties of access, temporary services and facilities, labor, and any other charges will be entertained by the Cedar Rapids Airport Commission. Sixty (60) days shall be provided to allow viewing of installation conditions.

C. Sequencing Plan
   1. Comply with the BHS sequencing plan in compliance with the overall project schedule and applicable requirements of Division 01.

D. Ramp Area Proximity
   1. The portions of the construction/installation associated with this project shall take place immediately adjacent to an active aircraft ramp area and an AOA.

E. Lay Down Area Restrictions
   1. Lay-down and shake out areas might be limited to the confines of the immediate building. All lay down areas shall be designated and approved by the Cedar Rapids Airport Commission or their representative. Coordinate usage of lay down areas with the Cedar Rapids Airport Commission or their representative.

F. Restoration of Service Costs
   1. Incur all restoration of service costs due to the negligent or accidental damage of any airport utility service or facility. the Cedar Rapids Airport Commission reserves the right to

deduct such costs from any monies due, or which might become due, from the contractor, or its surety.

G. Rights-of-Way
   1. Considering the phased implementation requirements of the BHS scope within Terminal for the interim as well as the final conditions, the BHS conveyor equipment and associated main conduit/wireway runs shall have first priority to the available rights-of-way within the facility space and as provided by the demolition and clearing of other systems during the phased implementation process. Coordinate the BHS conveyor equipment and associated main conduit/wireway rights-of-way with all MEP systems rights-of-way that are installed within the facility to accommodate the specified systems installation via site-survey and as-built verification, which shall be submitted for approval as part of the contractor's submittal process, prior to the commencement of system installations.
   2. It is acknowledged by all parties that the contractor has first priorities to the rights-of-way available and/as provided by others. Cooperate with other contractors for coordination of all building rights-of-way performed by other trades to accommodate the installation of the BHS.
   3. Preserve all ROWs for deferred/future equipment with associated catwalks depicted on the contract and as-built drawings.

1.07 PROTECTION OF THE WORK

A. General
   1. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with installation, demolition and removal. Give attention to equipment supports and bracing requirements to prevent any damage to BHS equipment.
   2. Furnish, erect, and maintain catch catwalks, dust partitions, lights, barriers, warning signs and other items as required for proper protection of operating personnel, the public, occupants of building, workmen engaged in installation, removal, and demolition operations, and adjacent construction. Comply with the requirements and restrictions of the contract drawings.
   3. Do not store or place materials in passageways, stairs or other means of egress. Do not close or obstruct catwalks, walkways, passageways, stairways, streets, walks, terminals, runways, rights-of-way, or other occupied or used facilities without written permission from the Cedar Rapids Airport Commission or their representative. Conduct operations with minimum traffic interference.
   4. Furnish, erect, and maintain temporary protection of the existing BHS designated to remain where demolition, removal and new work is being done, connections made, materials handled, or equipment moved.
   5. Protect unaltered portions of the existing system affected by the operations of the work with temporary protection as necessary so the normal activities conducted in such areas can continue without interference.
   6. Furnish suitable coverings to protect existing work. Be responsible for any damage to the existing BHS and facilities or other contents by reason of the insufficiency of protection provided. Promptly repair damage caused to adjacent facilities and restore as new.
   7. Repair any damage to work in place. This includes repair of existing fireproofing materials removed to allow the installation of any BHS related equipment.

1.08 SYSTEM DESIGN AND PERFORMANCE REQUIREMENTS

A. General
   1. All equipment shall be in strict accordance with the specifications described herein. The system shall be engineered, fabricated, and installed with the objective of being of rugged, heavy-duty, impact resistant equipment capable of withstanding the abuse and exposure to damage experienced in an air transportation baggage handling facility. Other

key factors to be considered in the development of the system and its elements shall be simplicity, reliability, maintainability, and safety, and compatibility with existing equipment.

2. The contractor is deemed to have studied the system design and requirements presented in the drawings and specification respectively and accepted the design and requirements as suitable and appropriate to safely accomplish the functions and processes described herein. Identify in the bid submission any design aspect or specification requirement that is believed to be inappropriate or inadequate and shall propose alternate solutions to alleviate the perceived problem but shall, in all cases, include in the bid submittal pricing for the base system presented in the drawings. Any alternate designs developed shall meet or exceed the design criteria as listed herein.
3. Consideration shall be given to the design, fabrication and installation of all projections, welds, and transfer points between conveyor segments and conveyor items to eliminate damage to the various types of baggage processed.
4. The system and subsystem layout configuration and item/component functional requirements are specifically described on the contract drawings. However, alternate solutions may be proposed on an optional bid cost basis for consideration by the Cedar Rapids Airport Commission. Any alternate designs developed shall meet or exceed the design criteria as listed in the specifications.

B. Material and Equipment Approvals
   1. Where manufacturer's name, brand or trademark is specified, it has been selected to establish a standard of quality for the materials, components or equipment required. Materials, components or equipment of different manufacture considered to be equal to the materials, components or equipment specified will receive full consideration and shall be subject to approval by the Cedar Rapids Airport Commission or their representative before being incorporated into the work. The Contract price shall in all instances be based only upon materials, components or equipment specified. A list of material, component or equipment suppliers shall be submitted to the Cedar Rapids Airport Commission or their representative for approval. Provide a listing of sources where any material, component or equipment, for which a substitution approval is being requested, can be obtained.
   2. Furnish all engineering data, engineering/shop drawings, literature, test results, calculations, and any other requested information, for review of substituted material, components or equipment. Pay for any redesign necessary to accommodate an approved equal.

C. Request for Deviations from Drawings or Specifications
   1. Requests for deviations from drawing or specification requirements may be approved at the discretion of the Cedar Rapids Airport Commission or their representative to permit use of standards inherent in the equipment when it has been determined by the Cedar Rapids Airport Commission or their representative that such deviations will in no way be detrimental to the conveyor equipment, the safety, O&M of the specified system, system design, system reliability and its associated inventory of spare parts.
   2. Any materials, components or equipment submitted for substitution for this BHS shall be previously proven under the loads as specified in Part 1 herein in an operational or test equivalent environment for a minimum of 1 year, 18 hours per day, 7 days per week.

D. Baggage Conveyors
   1. Conveyor Speeds
      a. Unless otherwise specified, conveyors speeds shall be selected by the following criteria to minimize the system processing time between the input conveyor(s) and the output sort destination(s):

Type/Location	Speed (Feet/Min)
Public Area Load Conveyors	90
Transport to Sortation Conveyors	120 to 240*

Claim/Make-Up Devices	90
Sortation	240*
Non-Public Load/Unload Conveyors	120
CBRA Area Load/Unload Conveyors	90
Transport to EDS	90**

*As required to achieve specified throughput rate process times.
**As required by the applicable EDS machine manufacturer. Refer to Part 2 of the project specification for details.

b. Speed Changes
   1.) Make speed changes between adjacent conveyors to increase or decrease a maximum speed (nominally 30 fpm) so as not to adversely affect baggage spacing or tracking. Conveyor speed changes between adjacent conveyor segments shall be set that the system processing times are not compromised.
   2.) Feed conveyor speed onto the related make-up device will not be greater than 120 fpm, unless otherwise specified.

E. System Processing Rates
   1. The design of the system shall include the following:
      a. EDS machine throughput shall be measured at the point or points where bags are returned from the TSA screening system to the existing BHS outbound system.
      b. All non-cleared bags shall arrive at the BIS directly following the EDS machines.
         1.) Less than (<) 2%
             Error Rate = ((Total Bags at Reconciliation) – (Valid EDS Out-of-gauge) – (Non-Cleared Bags with valid tracking IDs))/(Total Bags Inducted)
      c. 1% or less of total bags Jam in the CBIS as measured in a 24-hour period. No more than three (3) bags (real or virtual) will be involved in any given bag jam event.
      d. Throughput rates shall not be less than the above referenced amounts unless pre-approved by the Cedar Rapids Airport Commission, the TSA, or their representatives.
      e. EDS conveyor subsystem error rates shall be calculated using all EDS conveyor lines simultaneously and shall occur over a bag flow of at least 100 bags per EDS.

F. Physical Constraints
   1. Design the BHS to accommodate the following physical constraints imposed on the System by either operational or facility considerations:
      a. All conveyors, supports and related components (unless shown as floor supported, within the confines of protective guard rails, or within a confined and protected space) shall have a minimum underside clearance of 8'-0" from the bottom of the support structure to the floor, unless otherwise specifically stated on the contract drawings.
      b. If any of these design criteria cannot be maintained, notify the Cedar Rapids Airport Commission or their representative in writing for resolution.

G. Service Conditions
   1. Design each element to operate satisfactorily in its respective environment as follows:
      a. Electrical/Electronic Equipment Inside Control Panels
         1.) Temperature: 32-140°F (0-60°C)
         2.) Relative Humidity: 5-99% Non-condensing
      b. Electrical/Electronic Equipment - Indoor (Bagroom Environment)
         1.) Temperature: 32-120°F (0-48°C)
         2.) Relative Humidity: 5-99% Non-condensing
         3.) Protected from direct exposure to weather
      c. Electrical/Electronic Equipment - Outdoor or in Unheated Enclosures
         1.) Temperature: -20-120°F (-30-48°C)
         2.) Relative Humidity: 5-100% condensing

3.) Covered but not protected from driving rain.

d. Electrical Equipment Inside Computer/Control Room

1.) Temperature: 55-80°F (13-27°C)

2.) Relative Humidity: 5-50% Non-condensing

2. Provide and clearly identify any special environmental requirements more stringent than what is shown in the contract documents that might be essential for correct equipment operation (e.g., MCPs/PLCs, field-controlled components/hardware, and any other components with special environmental requirements).
3. The above listed requirements do not take into consideration separate requirements that might be required for any related non-BHS equipment that may be provided and installed by others (such as EDS machines and EDS workstations) or personnel that might drive environmental requirements in various areas where BHS equipment also exists.

H. System Safety

1. The design, manufacture, supply, installation, and construction of the BHS shall be in accordance with all the requirements in the contract documents and shall meet or exceed all applicable laws rules, orders, regulations, and codes. In this regard, bring to the attention of the Cedar Rapids Airport Commission or their representative in writing any changes in such laws, rules, orders, regulations, and codes and any condition(s), whether caused by its design or any BHS Contract requirements, which the contractor believes might result in or has resulted in an unsafe condition(s). Rectify at the contractor's own cost any such condition(s) resulting from its design and not directly as a result of any Contract requirement(s). Where the Cedar Rapids Airport Commission and the contractor mutually determine that such condition(s) is directly a result of any Contract requirement(s) or any changes in laws, rules, orders, regulations, and codes, then seek with the Cedar Rapids Airport Commission a mutual resolution of the condition(s) to be effected by a change to the Contract.
2. Use control methods and techniques, circuitry, and electrical equipment and O&M procedures to maximize safety for O&M personnel and minimize potential damage to equipment and baggage. Incorporate fail-safe techniques to prevent unsafe conditions that could result from an equipment failure or improper implementation of the operating procedures.
3. As employed herein, the fail-safe principle shall be interpreted as follows:
   a. In case an equipment failure or external influence such as improper operation, high temperature, power failure, or other adverse condition affects the proper function of a system or element involved with the safety of life or health, said system or element shall revert to a state known to be safe to all personnel interfacing with the equipment.
4. Ensure that all provided and installed equipment meets all applicable local, state, and federal safety codes, including applicable OSHA standards and requirements, for baggage handling systems/conveyors and industrial machinery environments.

I. Personnel Safety

1. The operation of the system shall be convenient and safe to use, and control functions to be performed shall be simple to minimize possible errors. Provide convenient means for emergency system shutdown.
2. Furnish and install adequate means for ensuring the safety of all personnel who have access to the system in the system design.
3. Furnish and install sufficient safety signage throughout the system.
4. Furnish and install lockable devices such as disconnect switches and lockouts to prevent the accidental activation of those portions of the system shut down for maintenance. These devices shall be installed in all areas.
5. Furnish and install equipment and component guards on all drives for conveyors and make-up devices. House all moving parts in personnel areas with guards (such as bearings, return rollers, and return conveyor belts).

6. Provide sufficient maintenance space in all limited access areas.
7. Furnish and install audible and visual warning signals along all areas of the system to make apparent any potential hazards to the public, O&M personnel resulting from moving or about-to-start equipment.
8. Furnish and install protection from falling objects in work areas or aisles located beneath overhead portions of the system with gap pans or netting.
9. Locate conduits and all other electrical components where they shall not be subject to damage by O&M personnel.
10. Coordinate access provisions for operators to minimize obstructions. Locations of control stations and electrical boxes shall be coordinated to support unrestricted access by staff. The provisions of the conveyor supports, drive configurations, personnel guarding and side guards shall allow for maximum operator accessibility.

J. Radio Frequency Interference/Electro Magnetic Interference (RFI/EMI)
1. Ensure by design and shielding that system equipment shall not create electromagnetic emissions, which can, in any way, cause interference with communications within the airport or between the airport and aircraft or ground support vehicles.
2. Choose all electrical and electronic equipment (including MCP Touchscreen Terminals and related equipment) to operate without malfunction in the presence of normal electromagnetic emissions generated by other equipment normally installed or used at the airport including the aircraft communications bands, high-power radar systems, various electrical motors and controls, power tools, welding equipment, automotive vehicles, ground power units and air handling units. Furnish and install isolation transformers and line suppression units, if required.
3. Radio frequencies, if used for communications or information transmission in the systems, shall be applied for designation and assignment by the Eastern Iowa Airport and government authorities.

K. Maintainability, Life, & Reliability
1. The requirements set forth in this section are minimum requirements and do not relieve the obligation to provide a system in which all required maintenance tasks can be readily performed.
2. Design all components so they can be easily disconnected and removed from the equipment without the necessity for extensive disassembly. Design the components for removal and replacement by two (2) staff members in a time period of at most one (1) hour. Be prepared to demonstrate that any maintenance task, not so listed, can be accomplished as described above. Correct any installation, without charge, as required to accomplish this demonstration.
3. Design the system so equipment components requiring inspection and servicing are readily accessible. Furnish and install suitable doors for this purpose. Where necessary, provide access holes in frames or guards but keep them to a minimum number and size, and ensure that they do not create protrusions or discontinuities detrimental to the baggage being conveyed.
4. Design equipment to facilitate maintenance functions in preference to ease of fabrication.
5. Design equipment such that, whenever possible, assemblies shall not require dismantling to troubleshoot, repair, or replace assemblies or components of assemblies involved in such servicing procedures.
6. Affix cover plate attachment hardware to, or hold captive in, the cover plate assemblies.
7. Provide all electric assemblies, panels, or boxes with the appropriate schematic, enclosed in a clear-faced envelope affixed in a location visible to personnel while servicing such items.
8. Provide one set of special test instruments and tools for each group of equipment items requiring such special test instruments and tools. These shall be provided in a metal toolbox with identification of the equipment for which the tools shall be used.

9. Provide a device for measuring conveyor speed and shaft/pulley rotational speed prior to commencement of acceptance testing for use by the Cedar Rapids Airport Commission or their representative, during the acceptance testing period.

L. Standard/Interchangeable Components
   1. Minimize the number of different types and makes of components used in the BHS to simplify spare part inventory.
   2. Design all equipment and components to definite standard dimensions, tolerances, and clearances to provide maximum interchangeability.
   3. Provide like types of equipment from the same manufacturer wherever practicable.

M. Lifespan
   1. Provide equipment components and items for a system equipment life of a minimum of 15 years and an operating duty cycle of 18 hours a day, 365 days per year. This provision is a design objective, not a warranty.
   2. PC-based computer equipment might not have the identical hardware available for the full 15 year period (PLC equipment does not fall under this category), as such, submit a list of the estimated spare parts required to maintain the PC-based computer hardware for the 15 years of operation for review by the Cedar Rapids Airport Commission or their representative.

N. System Reliability
   1. Failure
      a. A failure is defined as any malfunction of a System component, assembly, or subassembly which stops normal operations. A failure shall be charged only against the specific subsystem affected by the failure. The following shall not be classified as failures:
         1.) Malfunctions caused by a failure on the Cedar Rapids Airport Commission's part (after system acceptance) to properly maintain and operate the system in accordance with recommended procedures.
         2.) Malfunctions due to causes outside the system (e.g., sabotage or general power outage).
         3.) Malfunctions due to baggage jams not caused by failure of a system component, assembly, or subassembly unless it is a defective part, a poor installation, or a failure of a component or subassembly to perform its intended function.
         4.) Incipient failures detected and repaired without affecting normal system operations .
         5.) Malfunction of one of a redundant computer/PLC pair where the repair time does not affect normal system operations. Reliability of redundant computer/PLC pairs is defined in Parts 2 and 3 herein .
   2. Downtime Events
      a. A Downtime Event shall be an event in which a sub-system related problem causes an interruption of the normal services provided by a sub-system of the BHS. When such an interruption occurs, downtime for the event shall include all the time from the beginning of the interruption until all equipment stopped has restarted and normal operation in the scheduled mode is restored.
      b. The BHS shall not exceed the Downtime Event Limits stated below during each calendar month:

Duration of Downtime Event	Events/Month
Greater than 15 minutes and less than or equal to 30 minutes	20
Greater than 30 minutes and less than or equal to 60 minutes	5
Greater than 60 minutes and less than or equal to 180 minutes	1
Greater than 180 minutes	0

c. No more than ten (10) Downtime Events shall occur during any calendar day of operation.
d. For computers, PLCs, workstations, and any other control equipment operating on a slave/master configuration, no more than one failure per month for each unit within each slave/master pair is acceptable. Both units within each slave/master pair shall not be allowed to fail simultaneously.
e. Stoppages resulting from causes listed as exclusions below shall not be counted as Downtime Events; however, record all stoppages including Downtime Event Exclusions and justify, to the satisfaction of the Cedar Rapids Airport Commission, why any stoppages or downtime events should be excluded. Downtime Events of duration less than one minute shall not be counted in the calculation of Service Availability but shall be counted for Service Downtime Limits purpose.
f. Downtime Event Exclusions
    1.) Interruptions caused for downstream system dieback.
    2.) Interruptions caused by intrusions of unauthorized persons or foreign objects into the system (and were not resulting from the Contractor's acts or omissions).
    3.) Interruptions caused by non-system induced loss of service, e.g., loss of utility service, electrical power provided outside the normal range, force majeure, and acts or omissions of the Cedar Rapids Airport Commission or its agents or contractors (and where not resulting from the Contractor's acts or omissions).
    4.) Event Identification may be by an alarm, or another means such as visual inspection or notification by airport personnel. Record all events identified. List any other means of notification in the Baggage Control Room log. Failure to meet these requirements shall be included in the Monthly System Performance Report, which is a dedicated section of the Monthly Management Report.
    5.) Downtime for an event shall be counted with regard to the respective subsystem, consistent with the portion of the subsystem that is disrupted and shall not result in either double or triple counting of downtime. Where it may be possible to count a downtime event in more than one area, count it in the area that best measures the quantity of service that is not available.
    6.) Jam faults on the belt-based system resulting from bags improperly inducted into the system (i.e., odd-shaped bags, excessively light bags, loose straps on bags, bags which tumble from trays due to oddly distributed weighting or incorrect loading, caught zippers). For these bags, the Contractor shall bear the responsibility of demonstrating the jammed bag was due to poor bag hygiene, using CCTV footage, photographs, or other supporting evidence. Downtime events which result from the Cedar Rapids Airport Commission-approved outages, such as planned maintenance activities or delayed rectification of faulted equipment when the capacity is not required for production purposes.
        a.) These exceptions will require the written approval of the Cedar Rapids Airport Commission.
        b.) For delayed corrective activities, the Cedar Rapids Airport Commission reserves the right to require immediate rectification if the Cedar Rapids Airport Commission sees fit, even if approval for delayed corrective action was already granted.
        c.) If additional equipment faults during a pre-approved outage, the Contractor shall endeavour to immediately correct the additional outage or restore the pre-approved outage to an operational status.
g. Other KPIs
    1.) Reference the O&M Contract for other KPIs and conditions which may apply as part of the Contractor's responsibility to operate and maintain the BHS as part of the period following Preliminary Acceptance until Take-Over.

3. Tracking Accuracy

a. Tracking accuracy shall be defined as the percentage of successfully tracked bags from an encoding position (EDS machine, decision point, or handheld barcode readers) to the final output device. Tracking accuracy shall be a minimum of 99.5%, calculated daily, for the total number of bags input into the BHS. Tracking accuracy is a measure of the system's ability to identify and control the location of the baggage from the point of encoding to the correct output. This establishes timely system transit and sortation times with minimal manual encoding intervention. Base the tracking accuracy on missing/lost bag counts as reported/verified either by the MIS or operations/ramp personnel.
b. All bags assigned an ID by an EDS machine, shall be verified for proper destination.
c. All bags assigned an ID by an EDS machine, shall not swap their tracking ID with the tracking ID of another bag during transport through the BHS.
d. If a bag that has been successfully assigned an ID from an EDS machine gets out of its respective tracking window, that bag shall be tracked as a missing' or lost bag. It is not acceptable for any bag to be mis-routed because of a failed tracking process. Route missing or lost bags as follows:
    1.) All missing or lost bags within the EDS matrix shall be routed as detailed in Part 3 herein.
    2.) The BHC system shall generate appropriate fault messages indicating the missing bag.
e. Bags proven (as reported by maintenance/operations/ramp or TSOs) to have lost tracking due to being incorrectly introduced into the system (not loaded per the Cedar Rapids Airport Commission Bag Hygiene Policy) or are moved out a tracking window as a result of the clearance of a bag jam, shall not be counted against the tracking accuracy or system reliability. The O&M staff will, to the best of their ability, document these types of occurrences. This is to be a routine process of their daily operations.
f. Bags assigned an EDS Unknown status from an EDS machine are not to be treated/reported as mis-tracked bags; track, route, and report these bags as specified in Part 3 herein.
g. In case of an EDS dieback, an E-Stop condition or a power outage on a subsystem, the PLC shall retain all baggage tracking information such that upon restart of the conveyors, the subsystem shall route bags to the appropriate location(s).
h. For the CBIS, if a bag has been successfully scanned by the Level 1 EDS machine and tracked from the Level 1 device but fails to appear at any tracking photocell, that bag shall be identified as a missing bag by the tracking control system. Three missing bags in succession at the same tracking photocell shall cause the tracking control system to automatically stop the associated conveyors and declare a Missing Bag jam. All missing bag occurrences shall be reported.
i. Provide as part of the MIS day-end report, tracking accuracy as a percentage of bags inducted per line versus number of bags that lost tracking on the respective line. Detail in the MIS reports a listing of all bags that lost tracking with associated BSM details, time and location tracking was lost.

O. Parts Availability
1. Maintain, for immediate delivery, an adequate inventory of spare parts (especially long lead time items) required for routine maintenance of the system. Ensure that critical spare and replacement parts required by the system are made available for a minimum of a 15-year operational period through the availability of shop and as-built drawings and through the availability of the parts. Ensure the availability of custom or special components.
2. If such parts are not available during the 15-year operation period or should pricing become unreasonably high on a competitive basis, the Cedar Rapids Airport Commission has the right to permit the use of the project drawings, at their discretion, for fabricating such parts, or having such parts fabricated so as to maintain the specified system.

1.09 STANDARDS AND CONSTRUCTION CODES

A. General
   1. The design and subsequent installation shall provide adequate safety factors and shall conform to all current standards and codes of the USA(Linn County), the State of Iowa, the City of Cedar Rapids, and Eastern Iowa Airport Authority, or the country of design origin, whichever is more stringent.
   2. The operation and functionality of the EDS machines shall abide by PGDS protocols.

B. Laws, Codes, Rules, and Regulations
   1. Comply with all provisions of Division 01, Section 01 40 00 and applicable local, state, and federal laws, rules and regulations pertaining to the following:
      a. Installations, alteration, testing, removal, and demolition, including the Federal Occupational Safety and Health Act and the Construction Safety Act.
      b. Protection of the public during installations, testing, inspection, alterations, including requirements for safety of operations, noise control, removal and disposal of waste materials, control of dust, dirt, pollutants, flammable materials, explosive materials, corrosive substances, and protection against fire.

C. Construction Codes
   1. All modifications to the existing systems and construction of new system equipment and components shall be in accordance with those codes, standards, and local laws and regulations applicable to the design and construction of this equipment and generally accepted and used as good practice throughout the industry.
   2. Design all parts and sub-assemblies in accordance with good commercial practice and provide a safe, efficient, and practical design in keeping with requirements peculiar to this type of system.
   3. In case no specific local codes or standards can be identified, comply with the most recent and applicable provisions and recommendations of the following:

American Welding Society (AWS)	
D1.1/D1.1M	Structural Welding Code – Steel
AWSC1.1M/ C1.1:2012	Recommended practices for resistance welding
AWS-A2.4	Standard Symbols for Welding, Brazing, Nondestructive Examination
American Gear Manufacturers Association Standards (AGMA)	
AGMA 6013	Standard for Industrial Enclosed Gear Drives
6035-A02	Practice for Worm Gear Motors
American National Standards Institute (ANSI)	
A-1264.1	Safety code for floor and wall openings, railing, and toe boards
B-20.1	Safety code for conveyors, cableways, and related equipment
B-29.10M	Transmission roller chains and sprocket teeth
UL 62	UL Standard for Safety Flexible Cords and Cables
Z535	Safety color code
National Bureau of Standards (NBS)	
Handbook H28	Screw-thread standards
National Fire Protection Association (NFPA)	
NFPA No. 70	National Electrical Code vol. 2, National Fire Code
NFPA No. 79	Electrical standards for industrial machinery
NFPA No. 80	Standard for fire doors and fire windows
National Electrical Code (NEC, most current version)	
Underwriters Laboratories (UL) Standards	
Components shall be labeled appropriately	
UL 508	Industrial Controls Equipment

American Welding Society (AWS)	
UL 508A	Industrial Control Panels
UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems – Part 5-1: Safety Requirements – Electrical, Thermal and Energy
UL 1998	Software in Programming Components
IEC 61508	Functional Safety Standard for Electrical/Electronic/Programmable Electronic (E/E/PES) Safety Related Systems
National Electrical Manufacturers Association Standards (NEMA)	
ICS	Industrial Controls and Systems
MG1	Motors and Gear Motors
American Society for Testing Materials (ASTM)	
A-36	Structural Steel
A-794	Sheets – Cold Rolled
A-659	Sheets & Strip – Hot Rolled
A-307	Fasteners (Bolts)
A-563	Fasteners (Nuts)
F-844	Fasteners (Washers)

4. All equipment and accessory items furnished and installed under this Contract shall always be governed by applicable provisions of federal laws, including the revision of the Williams-Steiger Occupational Safety and Health Act (OSHA) of 1970, Public Law 91.596 (most current version) and the following in effect as of the Contract date:

Occupational Safety and Health Administration (OSHA)	
29 CFR Part 1910 Subpart D	Walking-working surfaces
29 CFR Part 1910-211	Definitions
29 CFR Part 1910-212	General industry standards and requirements for machines
29 CFR Part 1917.48	Conveyors
29 CFR Part 1926.555	Conveyors, construction industry standards
29 CFR Part 1926.1053	Ladders
Office of State Health Planning and Development (OSHPD)	
American Society of Mechanical Engineers (ASME)	
ASME B20.1	Safety standards for conveyors and related equipment
Conveyor Equipment Manufacturers Association (CEMA)	
ANSI/CEMA 402	Belt conveyors
CEMA B105.1	Welded Steel Conveyor Pulleys

5. All equipment shall be in imperial dimensions.

1.10 WARRANTIES

A. General Warranty
   1. Warrant any new BHS equipment for one (1) year against defective parts and labor beginning on the final acceptance date for each phase as related to this project.
   2. Warrant all new BHS equipment for three (3) years against design defects beginning on the final acceptance date for each phase as related to this project.
   3. Warrant all new BHS software and high- and low-level controls for three (3) years against design defects beginning on the final acceptance date as related to this project.
   4. Warrant existing relocated/reused and refurbished equipment for one (1) year against defective parts and labor beginning on the final acceptance date for each phase as related to this project.
   5. Assign the Cedar Rapids Airport Commission all warranties for all materials and equipment received from subcontractors and suppliers.
   6. Warrant design and throughput capability of the relocated/refurbished equipment (e.g., existing conveyor segments upstream and downstream of the new conveyor segments associated with the modified lines).

7. Considering the construction program for this project is specified to be performed under a phased implementation process, wherein existing subsystems and related conveyor equipment will either be removed from service or modified and turned over for operational use on an activity-by-activity basis, the warranty for the BHS shall begin as follows:
    a. Upon the substantial completion date of a given phase for all BHS related field components, such as, field control components and MCP control components. Submit a certified warranty statement summarizing the warranty coverage with the warranty commencement date for that given phase and outlining the BHS equipment that has been substantially completed and turned over for operational use.
    b. Upon the final acceptance date as related to this project for all related BHC systems and PLC system hardware and software provisions, submit a certified warranty statement summarizing the warranty coverage with the warranty commencement date and an outline of the BHS equipment that will be covered under the warranty.

B. Warranty Exclusion
    1. This warranty shall not apply to any defects or inconsistencies attributable to repair, alteration, misuse, or abuses by any person other than authorized personnel or subcontractors. Liability shall be limited to repairing or replacing defective or non-performing part(s) at no cost to the Cedar Rapids Airport Commission.

C. Warranty Limitation
    1. Liability shall be determined in the Contract Agreement and shall include repairing or replacing defective or non-performing parts at no cost to the Cedar Rapids Airport Commission.

D. Technical Support
    1. Provide onsite technical support as defined by the contract documents and agreed upon by the Cedar Rapids Airport Commission or their representative. This support shall be by personnel qualified to advise the Cedar Rapids Airport Commission on training, provisioning, start-up and maintenance of the equipment.
    2. The technical representative(s) for warranty support shall be within 6 hours travel distance of Eastern Iowa Airport, in the City of Cedar Rapids, State of Iowa, as required by the Cedar Rapids Airport Commission.

E. Royalties and License Fees
    1. Pay all royalties and license fees and defend all suits or claims for infringements of any prior or patent rights and save the Cedar Rapids Airport Commission harmless from liability, expense of loss on account thereof, with respect to any processes, devices, methods, articles, inventions, things or procedures used in the project.

F. Labor Warranty
    1. Warranty support shall be provided as follows:
        a. Provide labor to accomplish any warranty repair work. In case such labor is not provided in a timely fashion, pay the Cedar Rapids Airport Commission to accomplish warranty labor repair with its maintenance staff.
        b. Provide labor for work related to design deficiencies.

G. Parts Warranty
    1. Terms
        a. Provide a parts warranty stating all material and equipment furnished and installed shall be new and free from faults and defects in material, workmanship, detail or incorrect component selection; conforms to the functional and technical requirements of this section and the attached contract drawings; complies with all laws, statutes, ordinances, and codes applicable at the installation site; and that is suitable for the intended purposes. Excessive wear shall be considered a defect in the provisions hereof.

b. Parts shall be shipped freight pre-paid to the location specified by the Cedar Rapids Airport Commission. Failed/malfunctioned parts shall be returned to the contractor, free-on-board, within ten (10) days of notification of detection of such failed/malfunctioned parts.

2. Spare Parts
   a. Spare parts for each phase shall be made available for purchase by the Cedar Rapids Airport Commission prior to the commissioning of the subsystem. the Cedar Rapids Airport Commission may, taking the recommendations of the contractor, purchase such spare parts as it deems necessary; said parts shall be stocked on the airport's property. Stock control shall be by the Cedar Rapids Airport Commission who shall grant reasonable access to the contractor's warranty service agency during the warranty period. All items withdrawn from stock shall be replaced, regardless of whether the item was purchased by the Cedar Rapids Airport Commission or the Cedar Rapids Airport Commission's maintenance group directly from the contractor or from a third party, pursuant to warranty services, within two weeks of such withdrawal.
   b. Ending of the warranty period shall be contingent on the replacement of all stock withdrawn pursuant to warranty services whether the warranty service agency or the Cedar Rapids Airport Commission accomplished such services. Where the contractor has cause to believe that an item or items might require stocking pursuant to the terms and conditions of warranty provisions, which item or items the Cedar Rapids Airport Commission declines to stock, stock such items separately at no cost to the Cedar Rapids Airport Commission. In no case shall the absence of appropriate spare parts in the Cedar Rapids Airport Commission's spare parts stock be construed in any way to abridge or interfere with the responsibilities of the warranty services as defined herein.

H. Design Warranty
   1. Terms
      a. Provide a Design Warranty stating the system, materials, equipment, software, and high- and low-level controls furnished and installed are free from faults and defects in design; conform to the functional and technical requirements of this section and the attached contract drawings; comply with all laws, statutes, ordinances, and codes applicable at the installation site; and are suitable for the intended purposes. Excessive wear shall be considered a defect in the provisions hereof.
   2. Design Failure
      a. In case a design failure occurs during the warranty period, replace all such components, assemblies, or devices utilizing the design in a similar application in which the failure occurs by components, assemblies, or devices redesigned to prevent such occurrences at no cost to the Cedar Rapids Airport Commission. Submit proposed redesign drawings and re-selected component designations to the Cedar Rapids Airport Commission for their approval. Issue a new warranty period upon the replacement of such redesigned items.
      b. Components, assemblies, or devices shall be considered design failures if any of the following occurs during the warranty period:
         1.) A demand for frequent, unscheduled adjustment or other maintenance action in similar devices.
         2.) Failure of a component to perform its specified function or a failure of a component to operate at its specified rate.
         3.) Frequent activation of overload protection elements in similar devices.
         4.) Loosening of anchoring or attachment provisions on similar devices.
         5.) An increasing level of noise being generated by similar devices.
         6.) Inappropriate action of control or sensor elements during operational conditions.

7.) Occurrence of an accident or an imminent safety hazard revealed during operational conditions.
8.) Uncovering of a condition of specification non-compliance or degradation of specified functional requirements during the warranty period.
9.) More than 5% failures on one or more components or assemblies of components of similar construction or design, used in similar devices.
10.) More than 5% unscheduled replacements of an expendable component in similar devices.

c. the Cedar Rapids Airport Commission shall act to resolve any disputes regarding the definition of a design failure in a fair and equitable manner.

3. Period and Responsibility
   a. If, within three (3) years from the date of final acceptance of the work, the work or the system, or any equipment, material or software is found, in any respect, not to conform to the Warranty set forth herein, within 48 hours of notification by the Cedar Rapids Airport Commission, initiate the following series of steps to correct the deficiency:
      1.) Determine the cause of failure.
      2.) Prepare drawings showing recommended design changes and submit to the Cedar Rapids Airport Commission or their representative.
      3.) the Cedar Rapids Airport Commission or their representative shall comment with a change request or approval.
      4.) Make design changes if requested.
      5.) After the Cedar Rapids Airport Commission or their representative has approved the design, all components of the system incorporating the same design deficiency shall be modified as agreed upon by the Cedar Rapids Airport Commission or their representative.
      6.) The parts warranty and design warranty periods shall start again for the changed item/system on the date the design change has been incorporated if the make, manufacture, or model is replaced.

1.11 PENALTY CLAUSE

A. General
   1. Pay a penalty of $1,000 for each hour that a failure interferes with normal operation of more than fifty percent (50%) of the system. This penalty shall apply during installation/testing phases as well as the warranty period.

END OF PART 1

PART 2 - PRODUCT SPECIFICATIONS

2.01 BUILD AMERICA, BUY AMERICA ACT, (BABA)

A. Comply with all required Build America, Buy America Act, (BABA) provisions of the Federal Government and/or any similar provisions of Cedar Rapids or Iowa, as may be amended or updated.
   1. Refer to Section 02 Form 5100-136, “Buy American Project/Product Content Percentage Calculation - Worksheet” for additional information.
   2. Refer to Section 05, “Supplementary Provisions: Buy American Preference” for additional information.

2.02 ACCEPTABLE MANUFACTURERS

A. BHS Contractor Qualifications:
   1. Authenticate a minimum of three years demonstrable experience as a turnkey contractor/installer for airport-related BHSs using PLC controls, fault monitoring computer systems, and with the completion of at least three installations with a minimum value of $250,000 per project.

B. BHS Contractors and Integrators
   1. Subject to compliance with requirements, the following firms or approved equal are qualified to perform as BHS contractors and integrators for this project:
      a. Automatic Systems, Inc., Kansas City, MO
      b. Diversified Conveyors, Inc., Memphis, TN
      c. Daifuku (Daifuku Airport America Corporation.), Novi, MI
      d. Equipment Erectors, Inc., Somerset, NJ
      e. Five Star Airport Alliance, Salt Lake City, UT
      f. G&S Airport Conveyor, Wichita, KS
      g. JBT AeroTech Corporation, Conroe, TX

C. BHS Equipment Subcontractors
   1. Subject to compliance with requirements, the following firms or approved equal are qualified to perform as BHS equipment/component subcontractors for this project
      a. Daifuku (Daifuku Airport America Corporation), Novi, MI
      b. Five Star Airport Alliance, Salt Lake City, UT
      c. Five Intralogistics Corp., Louisville, KY

D. BHS Controls Subcontractors
   1. Subject to compliance with requirements, the following firms or approved equal are qualified to perform as BHS controls subcontractors for this project:
      a. Alliant Technologies, Louisville, KY
      b. Daifuku (Daifuku Airport America Corporation), Novi, MI
      c. Diversified Automation Incorporated, Louisville, KY
      d. Five Star Airport Alliance, Salt Lake City, UT
      e. ControlTouch Systems, LLC, Louisville, KY
      f. Kasa Companies, Inc., Salina, KS
      g. CLX Engineering, Sanford, FL

E. BHS Equipment
   1. To establish a minimum standard of quality and reliability, the following manufacturers, subject to compliance with requirements of Division 01, have been listed for various equipment/components of the BHS.

2. This list has been presented to establish this standard and the manufacturers on this list shall not be perceived or construed as favored or preferred. This list shall, in no way, preclude other manufacturers, provided their equipment and components have been reviewed by the Cedar Rapids Airport Commission or their representative and determined to be of equivalent or similar quality, functionality, and reliability. the Cedar Rapids Airport Commission or their representative's decision in this regard shall be final. The use of specific product manufacturers or models on previous projects that are not identified on the following list of approved equipment does not constitute pre-approval on this project.
    a. For Large Screen Graphics Display System:
        1.) Barco
    b. For Push Buttons:
        1.) Allen-Bradley
        2.) Square D
    c. For Control/Communication Products:
        1.) Motor Starters:
            a.) Allen-Bradley
            b.) Cutler Hammer
            c.) Square D (Type S) **For NEMA-only projects**
            d.) Telemecanique (TeSYS U-Line Series) **For IEC-only projects**
        2.) Programmable Logic Controllers (PLCs):
            a.) Allen-Bradley
            b.) Siemens Airport Logistics
            c.) Telemecanique-Modicon and Quantum series
        3.) Photoelectric Controls:
            a.) Allen-Bradley
            b.) Banner Engineering Corp
            c.) Cutler Hammer
        4.) Variable Frequency Drives (VFD):
            a.) Allen-Bradley/Rockwell Automation
            b.) Lenze
            c.) NORD Gear (motor mounted only LogiDrive and NORDAK FLEX)
            d.) Regal
            e.) Siemens Airport Logistics
            f.) SEW Eurodrive
            g.) Sumitomo Drive Technologies
            h.) Telemecanique (Altivar Series)
    d. For Motor Control Panels (MCP Cabinets):
        1.) EMF Company, Inc
        2.) Hoffman Engineering Co.
        3.) Rittal Corporation
        4.) Saginaw Control and Engineering
    e. For Signaling Devices (audible alarms):
        1.) Allen Bradley
        2.) Edwards Co. Signaling Products Div.
        3.) Federal Signal Corporation
        4.) Mallory Company
        5.) Siemens Airport Logistics
        6.) Telemecanique
    f. For Signaling Devices (visual alarms):
        1.) Allen Bradley

2.) Cooper Crouse-Hinds
3.) Federal Signal Corporation
4.) Siemens Airport Logistics
5.) Telemecanique

g. For Uninterruptable Power Supply (UPS):
1.) APC
2.) Eaton Powerware
3.) Leibert – A Regal company

h. For Hour Meters:
1.) ENM Company
2.) Hobbs Corporation

i. For Power Regulators:
1.) Sola/Hevi-Duty Electric

j. For Finger Safe Power Distribution Blocks:
1.) Alltech Corporation
2.) Cooper Industrial/Eaton-Bussman
3.) Ferraz Shawmut

k. Network Switches/Firewalls/Routers:
1.) Hewelett Packard Enterprise (Aruba Networks)

l. Computer/Server Equipment:
1.) Dell Computer Corporation
2.) Hewlett-Packard
3.) IBM
4.) NEC

2.03 MATERIALS

A. General
1. All welding and qualification of welders shall comply with AWS D1.1.
2. All fasteners shall be zinc-plated, cadmium plated, or stainless steel. All fasteners shall be locked with lock nuts or lock washers.
3. Use of alternate materials
a. Whenever an article or any class of articles, devices or material are specified by the trade name or by the name of any particular patentee, manufacturer, or dealer, or by reference to the catalog of any such patentee, manufacturer or dealer, it shall be taken to mean and specify the articles, devices or materials specified and none other.
b. Submit to the Cedar Rapids Airport Commission or their representative in writing for approval to use any articles or materials which is believed to be equal in quality, finish and durability, and equally as suitable for the purpose for which intended as the particular articles, devices or materials specified.
c. The articles, devices and materials specified shall not be changed except with the written consent of the Cedar Rapids Airport Commission or their representative. Do not contract, purchase or cause to be delivered any substitute articles, devices or materials prior to obtaining such consent.

2.04 FABRICATION

A. General
1. Fabricate equipment-using steel clean and free from rust, rust pits, kinks and sharp bends. Use forming methods that will not fracture or otherwise damage the metal. Remove burrs, sharp edges, and sharp corners. Smooth all joints and round all corners. Align joints in components to ensure smooth conveyance of baggage.

2. Punch holes in metal side guards for photocell beams and taper them from the inside (wide) to the outside (narrow). Do not burn the holes.

2.05 EXPLOSIVE DETECTION SYSTEM (EDS) – REVEAL CT-80

A. TSA Equipment Responsibility
   1. The EDS equipment will be supplied and installed by the TSA. The EDS internal system wiring, networking and controls shall be provided by the TSA's contractor.

B. Contractor Responsibility
   1. Provide all data and communication lines, and to coordinate the details of all required communication and signal interfaces (e.g., EDS machine status and control, bag loading and unloading, and bag status), between the EDS machines and the BHS with the TSA's EDS equipment supplier and the Cedar Rapids Airport Commission to successfully accomplish the intended operation described herein. Details of the available signals and data, along with the required cabling between the two systems, are typically covered in the EDS supplier's Integration Guide for the respective EDS machine(s). Request a copy through the Cedar Rapids Airport Commission. Provide all necessary control cabling, along with the communication and signal interfaces, between the EDS equipment and the BHS consistent with the EDS supplier's requirements. Provide an additional 30% of cabling conductors between the EDS equipment and the BHS, as coordinated with the EDS Supplier and the Cedar Rapids Airport Commission, to accommodate future functions. In all cases, provide any conduits and wiring between the BHS (e.g., BCR and associated satellite workstations) and the EDS (e.g., EDS machines, TSA OSR server room and CBRA workstations) required for these interfaces (hard-wired I/O, data interface cabling and software driven), to include the termination of the required I/O and data interface cabling as coordinated with and supervised by the EDS Supplier.
   2. Assume responsibility for the EDS integration with the BHS.
   3. Assume responsibility for the site acceptance testing of the integrated system, which shall be performed between the TSA's EDS provider and the contractor.
   4. The conveyor segments including their associated components and related support system upstream as well as downstream of the EDS machines shall be designed and installed so as to allow the easy removal of these conveyor segments, to gain access to their respective subsystem EDS machine for the removal of the unit/sections, through the EDS egress paths, for initial installation, major repairs and replacements. Provide quick disconnect cables/fittings for these conveyor segments and their associated components, along with caster wheels and floor locking pins on the respective conveyor's floor support legs, to assist in the removal/maneuvering of the Inline CBIS conveyor segments.

C. General
   1. The following information is for reference only. Contact the EDS machine provider to request the necessary documents that would be required for coordination, interface, and installation purposes; documents, such as: Technical Specifications, Installation Guidelines/Manual, BHS Integration Guide, BHS Interface Manual, and EDS testing guidelines.
   2. Related Documents
      a. EDS Supplier Reference Documents
         1.) Reveal CT-80 Installation Reference
         2.) Reveal CT-80 BHS Integration Specification
   3. Insert/Remove Station
      a. The orientation and alignment of test bag for daily calibration is critical. The CT-80 provides a special Insert Mode to allow this function. To utilize this function, provide

an externally mounted key switch and restart button shall be mounted and wired back to the CT-80.

4. BHS Interface Specifications
   a. The CT-80 interfaces to the BHS PLC with an interface that complies with the TSA's Office of Security Technology CBIS Interface Requirements Document (TSA OST-CBIS-IRD). All signals and data, with the exception of E-Stop circuits, are passed over this interface link. These functions include baggage handling through this segment, bag loading in and out of the segment, error and jam detection and recovery, decision transfer, status reporting to the BHS, and baggage insertion and removal at in feed and exit control stations.
   b. Provide all control cabling between the BHS and the CTX-80.

2.06 ELECTRICAL TECHNICAL REQUIREMENTS

A. Electrical Service to be Provided by the Contractor
   1. Power for the various subsystems shall be provided via the BHS MCPs, which shall feed the BHS related conveyor field components as illustrated on the Contract Drawings. The power supply to the BHS MCPs shall be provided by Division 26 and shall consist of conduit and cable in an appropriately sized junction box (supplied and installed in accordance with the requirements of Division 26) connected at its source to an appropriately sized circuit breaker located at the building substation panel or facility power distribution panel as specified under Division 26. The power drop to the 480VAC BHS MCPs shall terminate with approximately 20' of coiled cable at the BHS MCP locations. The full load ampacity rating (FLA) shall be as indicated on the contract drawings (verify the FLA requirements and notify the Cedar Rapids Airport Commission or their representative of any increase/decrease). Supply power shall be 480 volts, 3 phase, 60 hertz. Verify and advise the Cedar Rapids Airport Commission or their representative that the ampacity at the PDP is sufficient for the requirements of the system.
   2. Furnish and install all necessary conduits and wiring, including transfer switches (if required), from the various PDPs and onward to the BHS field equipment/components as necessary to meet the specified requirements. Size feeders from the power drops at 1.25 times the minimum NEC (or applicable local code) permitted size for the full-load amperage required. Provide all power connections from the MCPs to all BHS equipment, not including power to screening machines.
   3. Furnish and install power for the MCP's 120 volt, NEMA 5-20R grounded receptacle, fused to 3A, and MCP's lighting by obtaining the BHS 120-volt supply via a transformer and a separate disconnect, connected to the line side of the 480-volt input power.
   4. Furnish and install all services, feeders and disconnect switches for branch circuits to each control panel, with separate circuits for each subsystem as specified and provide and install all panel boxes, wireways, conduits, conductors, transformers, breakers/fuses, and any other equipment and materials required to complete the electrical power distribution for the operation of the system. Refer to NEC Article 300 for wiring methods.
   5. Careful consideration shall be made to the distribution of power to subsystems and its load center source such that the failure of power source does not effectively stop the baggage system in an entire zone. PDP locations shown in the contract drawings show typical locations where the contractor might locate electrical field distribution panels.
   6. Provide an assessment for review and approval, identifying compliance with NFPA 70E Standards for Electrical Safety in the Workplace regarding the BHS MCPs that are part of this project and the need for personal protective equipment.
   7. During the engineering phase, provide detailed power calculations stamped by a professional engineer licensed in the State of Iowa for approval by the Cedar Rapids

Airport Commission or their representative to reduce the PDP amperage provided and thereby reduce the power provided to the system. Coordinate the detailed power requirements including any reductions with the Cedar Rapids Airport Commission or their representative.

8. Provide separate circuits for controlling programmable logic controllers (PLCs) and powered fire/security doors. These circuits shall originate within the respective MCP.
9. Calculate the electrical power supply requirements based on total connected load with a diversity factor. Size the conductors to ensure that the voltage drop does not exceed 3% at the farthest outlet of power, heating and lighting loads, or combinations of such loads. Also ensure that the voltage drop does not exceed 5% at the farthest outlet for both feeders and branch circuits.
10. Provide 120-volt, single phase, and 60 Hz power for operation of the BHS control circuits.
11. Obtain the control power at each MCP by means of a transformer connected to the load side of the 480-volt input power.
12. All baggage systems using PLCs shall be equipped with the appropriate number and size of power regulators to ensure that the power for the respective programmable controllers is properly conditioned. Install regulators manufactured by the Sola Corporation or approved equivalent.
13. All electrical components, devices, accessories, and equipment shall be listed, labeled, and identified as suitable for use intended by testing agency acceptable to authorities having jurisdiction. This shall include MCPs and any control panels/cabinets, whether factory or contractor fabricated.
14. Faults generated by the loss of power to individual panels shall be limited to the directly affected equipment. Secondary faults and impacts to functionality of connected (but separate) equipment shall not occur. Examples of connected equipment includes system networks, interlocked E-Stop zones, and MCPs powered by a different source.

B. Power Source
   1. The electrical equipment and PLC control systems provided shall be compatible with, and operate reliably and effectively with, the normal electrical supply typically available at airports. The equipment shall not be unduly sensitive to fluctuations in supply voltage which might typically vary by ±10% of nominal values.
   2. Provide necessary electrical supply filters, conditioners, and regulators for all equipment, which cannot meet the specifications stipulated.

C. Raceways
   1. General
      a. Enclose all power and control wiring, including low-voltage wiring, in Rigid Metal Conduit (RMC), Electrical Metallic Tubing (EMT), Liquid Tight Flexible Metal Conduit (FMC), or wireways. Intermediate Metal Conduit is not acceptable.
      b. Horizontal runs of conduit shall not be supported by power turns, their safeguards, or by any side guard that is designated to be removable for the purpose of maintenance access. Rack such horizontal runs and support them from the building roof or in locations not interfering with the BHS, maintenance areas, or catwalk areas.
      c. Install drops to motors or other devices adjacent to the nearest available equipment or building column.
      d. Avoid conduit runs on the floor. Provide minimum clearance of 6" below horizontal conduit to the floor. The Cedar Rapids Airport Commission or their representative must approve exceptions to the above.

e. RMC and EMT Conduit runs shall be mounted so as not to restrict maintenance access to the BHS equipment, conveyors and system/conveyor components that required servicing.
f. Do not run communication, low voltage (less than 30 volts), or DC control wires in the same conduit or wireway with power wires.
g. It is acceptable to run 120 VAC minimum control wire and 480 VAC maximum power wire in the same conduit or wireway provided it is in conformance with local codes and VFD manufacturer's guidelines.
h. It is acceptable to run shielded 90 VDC clutch brake control wire and 480 VAC maximum power wire in the same conduit or wireway provided it is in conformance with local codes and VFD manufacturer's guidelines in lieu of running these clutch brake DC control wires in a separate conduit or wireway.
i. Conduit runs shall not be run or mounted on outside guards or perimeter chain guards of power turns.
j. Conduit runs shall be mounted on strut channels using a two piece channel strap or other means of fastening as suitable for BHS applications and approved by the Cedar Rapids Airport Commission.

2. Rigid Metal Conduit (RMC)
   a. Conform to all aspects of NEC Article 344 for RMC.
   b. Use a minimum 3/4" for all wiring.
   c. Run all conduits parallel or at right angles to structural members and equipment.
   d. Do not run conduits underground or in floor slabs unless provided for that purpose by the building contractor.
   e. In public areas, make conduit runs inconspicuous by running under cover plates, behind conveyors or otherwise concealed from public view.
   f. In non-public areas, run exposed conduit in protected locations to prevent damage by moving vehicles, equipment or maintenance personnel.
   g. Use RMC in all areas of the BHS installation at elevations less than 8'-0" above the buildings local finished floor and in all areas exposed to vehicular traffic and possible damage by operating or maintenance personnel.
   h. Use malleable iron or steel threaded fittings.
   i. Include gaskets and covers for all fittings.
   j. Use standard threaded couplings at all conduit joints.
   k. Ensure that the ends of the conduit are cut square, reamed and joined butt-tight.
   l. Electro-galvanize all conduit, elbows, fittings, couplings and nipples.
   m. Make changes to conduit size only at pull boxes, distribution panels, or branches to motors. Do not use reducers for inline reduction of conduit size.
   n. Remote control, signaling and power limited circuits shall be installed in compliance with NEC Article 725.
   o. Support conduit at intervals not to exceed 10'-0". Every individual conduit section shall be supported. Install conduit supported from building walls with a clearance of not less than 1/4" from the wall to ensure against the accumulation of dirt and moisture behind the conduit, using one-hole malleable iron clamps and clamp backs. For parallel conduit runs provide trapeze hangers or wall brackets fabricated from preformed channel with conduit clamps. Make anchors in concrete of the expansion shield type. Limit conduit run on a given conveyor to that, which is required for that specific conveyor or directly adjacent (downstream/upstream) to that particular conveyor.
   p. Ensure motor disconnect boxes, clutch/brake safety disconnect boxes and control stations, outlet boxes, junction boxes, pull boxes, and cover plates are compatible with the RMC conduit used and conform to the NEC for minimum wiring space

requirements and material thickness. Provide all boxes with screw fastened covers. Use NEMA 12 enclosures for interior equipment and NEMA 4 for all exterior equipment. Provide metal boxes; non-metal boxes shall not be used.

q. Appropriately sized insulated bushings and jumpers shall be installed on all conduits and conduit fittings that enter MCP(s), workstation/computer cabinet(s), outlet boxes, disconnects, or j-box/pull box(s).

3. Electrical Metallic Tubing (EMT)
   a. Apply the above requirements for RMC to EMT except as stated below:
      1.) Use rain and concrete compression fittings with steel compression nuts.
      2.) Use insulated throat connectors with case hardened nuts.
      3.) Use minimum size tubing of 3/4" diameter.
      4.) Use EMT only in areas at elevations greater than 8' above the buildings local finished floor and not exposed to vehicular traffic or possible damage by O&M personnel.
      5.) Appropriately sized insulated bushings and jumpers shall be installed on all conduits and conduit fittings that enter MCP(s), workstation/computer cabinet(s), outlet boxes, control stations, disconnects, or j-box/pull box(s).
      6.) Ensure that motor disconnect boxes, clutch/brake safety disconnect boxes and control stations, outlet boxes, junction boxes, pull boxes and cover plates are compatible with the EMT used and conform to the NEC for minimum wiring space requirements and material thickness. Provide all boxes with screw fastened covers. Use NEMA 12 enclosures for interior equipment and NEMA 4 for all exterior equipment.
   b. Conform to all aspects of the more stringent between this specification and NEC Articles 300 and 358 for EMT.
4. Flexible Metal Conduit (FMC)
   a. Conform to all aspects of the more stringent between this specification and NEC Articles 300 and 348 for FMC and fittings.
   b. Use liquid-tight FMC for connection to motors, photocells, limit switches or any device subject to vibrations or require adjustment after installation.
   c. Do not exceed 3' in length.
   d. Every section of FMC shall be clamped/supported.
   e. Appropriately sized insulated bushings and jumpers shall be installed on all conduits and conduit fittings that enter metallic or non-metallic MCP(s), workstation/computer cabinet(s), outlet boxes, control stations, disconnects, or j-box/pull box(s).
   f. Use minimum 1/2" for power wire.
   g. Use minimum 1/2" for control wire.
5. Wireways
   a. Wireways may be used in place of rigid conduit provided the application conforms to the requirements of NEC Articles 376 and 378.
   b. Use wireways with hinged, solid covers.
   c. Position wireways to permit access with the equipment fully operational.
   d. Fasten covers using captive screws or some other means of fastening not subject to loss such as clamps.
   e. Do not use wireways in areas subjected to vehicular traffic.
   f. It is not acceptable for any means of splicing in wireways such as terminal strips, wire nuts or other mechanical means of joining wires.
   g. Metal dividers are acceptable in wireways as a means of separation between communications/DC wiring and AC wiring to ensure no induced voltages from the AC wiring to the communications/DC wiring.

h. Use lay-in wireways to avoid the necessity of threading wires through end connectors.

D. Wire and Cable
1. General
a. Use stranded copper conductors of appropriate gauge, Type THHN or approved equal, with insulation rated for 600 volts. Use Type XHHW only if required by code or the governing Airport Authority prohibits the use of PVC insulation. Conform to all aspects of the more stringent between this specification and NEC.
b. As an alternate to the use of stranded copper conductor wire Type THHN or XHHW as described above, it is acceptable to use stranded copper conductor wire Type MTW for internal MCP wiring.
c. Connect pre-wired electrical devices to terminal blocks mounted in junction boxes adjacent to the devices.
d. Do not use blade connectors (e.g., fork or ring style) for connections.
e. It is acceptable to use multi-conductor cable for connecting portable electronic equipment. Refer to NEC for requirements on multi-conductor use.
f. Tag control and power circuit conductors with machine-printed IDs at both ends of the wire. Tag method shall be of the sleeve or other permanent type submitted to and approved by the Cedar Rapids Airport Commission or their representative. The use of multiple tags to create a single tag is not acceptable.
g. Keep all wires on reels while being pulled. Do not allow wires to contact the ground or floor.
h. Where wires or cables are connected to power distribution blocks/strips, provide finger safe distribution blocks (or similar suitable finger-safe protection provisions). This includes all instances both internal and external to MCPs).
2. Minimum wire size

Function	Wire Size
Power	12-gauge
Control	14-gauge
PLC I/O	16-gauge (connections between I/O modules and terminal strips inside MCPs)
Communication Circuits	18-gauge

3. Splicing
a. Splicing of 480VAC power wiring is unacceptable. All 480VAC wire pulls shall be from the MCP to the device (e.g., from MCP to the individual motor safety disconnect).
b. Splices are acceptable when parallel connections are used for energized and neutral control wires (e.g., power wire for photocells, E-stop circuits within a subsystem).
c. Do not splice signal wires between I/O panel and component.
d. Terminate control wires on terminal strips or on screw connectors at each component only.
4. Spare Conductors
a. Provide a minimum of 5% spare conductors in all conduit home runs, with a minimum of two spare control wires and one spare power wire.
b. Coil all spare conductors allowing sufficient length to permit future connection.
c. Tag spare conductors as required above, i.e., identify each spare conductor as a spare with its own unique wire identification number and field termination location.
5. Wiring Identification
a. Color code all electric wire and cable as follows:
1.) MCP Power Wiring: Match Existing

a.) Match the existing color coding to all MCP power wiring from source to line and load side of Main Disconnect fuses for MCPs. Verify color-coding of phase conductors on the line side to ensure compatibility with normal electrical supply available at CID. Terminate the neutral, if applicable, at the terminal board.

2.) BHS Field Components Power and Control Wiring: Load Side

a.) Apply the following to power and control wiring from the load side of fuses in MCPs to all devices powered and controlled from the respective MCP as follows:

Item	Wire Color
Power (To Motors and Control Transformers)	1. Match existing conditions 2. As dictated by local codes.
AC Control:	Red
DC Control:	Blue
AC Neutral:	White
Mech. Ground	Green

b.) Submit the wire color method to be employed for this project to the Cedar Rapids Airport Commission or their representative for approval.

E. Grounding

1. Ground all electrical equipment to building ground mat by a dedicated equipment-grounding conductor installed in accordance with the applicable codes. Obtain the extent and type of grounding, wiring method, and points of connection required from the appropriate airport authorities, local codes, or the electrical contractor.
2. Appropriately sized insulated bushings shall be installed on all conduits and conduit fittings that enter and exit the MCP or j-box/pull box.
3. Include a green 600V insulated copper ground conductor in each conduit (raceway).
4. Refer to NEC Article 348 for FMC grounding requirements.
5. Refer to NEC Article 250 to determine grounding conductor requirements and sizes.

F. Support

1. Mount conduit supported from building wall using strut channel mounts to provide clearance to the wall.
2. Do not weld conduit to structural members.
3. Avoid conduit runs to the floor. Provide minimum clearance of 6" between horizontal conduit and the floor and do not allow runs to cross any walk or access aisles.
4. Support cordsets running to items such as photocells and shaft encoders with cable mounting clips only. The cordset shall not be supported/secured with plastic wire ties.

G. Boxes

1. Provide outlet boxes, junction boxes, pull boxes and cover plates compatible with the conduit used. Provide boxes with screw fastened covers. Use NEMA 4 for all exterior equipment and NEMA 12 for interior equipment.
2. Conform to NEC Article 314 for minimum requirements for outlet boxes, junction boxes, pull boxes and cover plates.
3. Appropriately sized waterproof bushings/seals shall be installed on all conduits and conduit fittings that enter/exit the box(s).
4. Unused openings in junction boxes, raceways, cabinets, and pull boxes shall be effectively closed to afford protection substantially equivalent to the wall of the equipment.

2.07 ELECTRICAL COMPONENTS

A. Wiring Devices
   1. Provide full size oil-tight operators.
   2. As much as possible, use the same sensors (such as photocells and limit switches) to minimize the number of spares. Select sensors with the same mounting system wherever practical.
   3. Use plug-in electrical components wherever available. Do not use blade connectors (e.g., fork or ring style).

B. Control Devices/Stations
   1. Control Device Locations
      a. Control stations and devices shall be located as specified herein. Locate the control stations and devices to provide maximum possible access to the devices for servicing. In certain areas, protective guarding might be required to protect the control stations and devices. The design and installation of this protective guarding shall not prevent quick access to the control devices for adjustment, servicing, or replacement.
      b. The location, mounting, and guarding of control stations and devices shall not in any manner restrict the access and servicing of any mechanical components of the BHS.
      c. VFDs shall be field mounted, on the motor it is driving, in all locations to allow for ease of access. Ticket counter lines and oversize induction are the exception to this.
   2. Control Device Mounting
      a. The mounting of control stations and devices, shall comply with the basic requirements established in the contract drawings and as described in the following:
         1.) Control Stations in Public View
            a.) All control stations located in the view of the public shall be flush mounted with stainless steel cover plates. Such stainless-steel cover plates shall be secured to the adjacent wall or conveyor trim member with either Truss or Oval Head Phillips stainless steel machine screws of appropriate size. Control stations located in the view of the public shall not be mounted on the top surface of the conveyor front cladding. Pan Head screws are not acceptable.
            b.) All control stations located in the view of the public at load conveyors (i.e., ticket counter conveyor control stations) shall be mounted flush to the adjacent wall in a location that someone operating the control device shall not have to lean over the conveyor to access it (either upstream or downstream of the load conveyor) or mounted on a stainless-steel stanchion. The design, manufacture, and installation of the stainless-steel shrouding on the collection conveyor shall reflect these requirements.
            c.) All control stations located in the view of the public on Claim devices shall be mounted at the base of the stainless-steel trim element in the toe plate of the claim device. Design the control station mounting to provide maximum access for servicing/replacement of the control station devices.
         2.) Control Stations in Non-Public View
            a.) Mount all control stations on load conveyors in non-public view on the horizontal portion of a control station mounting assembly bridging the load conveyor.
            b.) Mount all control stations on make-up devices on a control station mounting assembly. Design, manufacture, and install the control station mounting assembly for racetrack applications to provide a rigid, well braced mounting for the related control station and devices. The control

station mounting assembly shall provide a minimum vertical bag clearance of 3’ above the surface of the racetrack device. See contract drawings for specific details.

3.) Control Devices
   a.) All photocells shall be mounted in a vertical attitude with the LED photocell status indicator clearly visible to O&M personnel from the side of the associated conveyor or conveyor equipment. Mount photocells used for jam detection, and auto-start/stop procedures so the center of the photocell beam is 2-1/2” or 3” from TOB.
   b.) Limit switches used to sense the position of Fire doors shall be mounted as an external unit to the door adjacent to the track of the door so that the switch can detect when the door is in the fully open position.
   c.) Install indicating lamps, other than those associated with MCPs, as required to properly alert personnel.
   d.) Couple shaft encoders used to determine conveyor speed to either the charge or discharge end pulley of the associated conveyor. Use of tension loaded friction drive types of shaft encoders is not acceptable.
   e.) Start-up warning alarms (i.e., audible and visual) shall be located at strategic locations to alert O&M personnel of the imminent start-up of conveyor equipment. At minimum, provide start-up alarms at baggage input areas, on top of the MCPs and along the conveyor line rights-of-way (e.g., ceiling supported conveyors). Audible/Visual Fault Warning and Start-up Alarms may utilize the same control devices. However, the audible and visual indications shall differentiate between the two separate functions.
   f.) Fault warning alarms (i.e., audible and visual) shall be appropriately located to alert O&M personnel of conveyor subsystem fault conditions. At minimum, provide fault alarms on top of the MCPs. Audible/Visual Fault Warning and Start-up Alarms may utilize the same control devices. However, the audible and visual indications shall differentiate between the two separate functions.
   g.) System Start-up and Fault Flashing Stack Lights: System start-up and fault indication beacons, with amber globes, shall be located on top of the MCPs, at the baggage input areas and along the conveyor rights-of-way (e.g., ceiling supported mounted conveyor equipment).
   h.) E-Stop Flashing Stack Lights: E-Stop Switch beacon with red rotating globe shall be mounted on top of the associated subsystem MCP.

3. Control Station and Alarm Devices
   a. All control station and alarm device components mentioned below and their equivalent alternatives are subject to approval by the Cedar Rapids Airport Commission or their representative.
   b. Pushbutton Switches: All Momentary Contact Pushbutton switches shall be of the Allen Bradley Series 800T type, Square D 9001K series, or equivalent. The color coding for the Pushbuttons shall be as follows:

Function	Color
Start/Restart (non-public locations)	Green (flush head)
Normal Stop (non-public locations)	Red (flush head)
Alarm Silence (non-public locations)	Yellow (flush head)
Lamp Test (non-public locations)	Gray (flush head)
Jam Reset (non-public locations)	Orange (flush head)
Others (non-public locations)	Black (flush head)

c. Illuminated Pushbutton Switches: All Illuminated momentary contact pushbutton switches shall be of the Allen Bradley 800T - PA16 switch with guards, Square D 9001K series, or equivalent. The color coding for the Pushbuttons shall be as follows:

Function	Color
Start (for initial start-up conditions at public areas)	Green
Jam Reset	Amber
E-Stop Reset	Red
Over-Height/Over-Length Reset	White

d. E-Stop Pushbutton Switches: All E-Stop pushbutton switches shall be of the Maintained Contact, Push-to-Stop Illuminated Red Mushroom Head switch, Allen Bradley 800T - FXP16RA1 type, Square D 9001K Series, or equivalent. The E-Stop pushbutton switches shall be equipped with a manual lockout clip manufactured by the switch manufacturer for locking the switch in the conveyor off position.

e. Selector Switches: All Selector Switches shall be of the appropriate series based on the application, as specified, and of the Allen Bradley 800T type, Square D 9001K Series, or equivalent.

f. Key-Operated Switches
   1.) Off/On and Start function key operated switches for application in public areas shall be manufactured by the Best Lock Company, Square D 9001K Series with Best Lock Company core, or equivalent so long as the switch uses a six-pin lock cylinder and core. The Cedar Rapids Airport Commission shall provide the final Operational Core. The Construction Core, normally supplied with the lock, shall be removed before the project is accepted. The switch shall provide a spring-loaded center return.
   2.) Key-operated switches for all functions other than the Off/On and Start function in public areas shall be Allen Bradley 800T, Square D 9001K Series, or equivalent.

g. MCP Indicator Lamps
   1.) Indicator Lamps shall be of the Allen Bradley Push-to-Test Pilot Light 800T - PST16, Square D 9001K series, or equivalent with appropriate color-coded lens as stated below for MCPs with less than five Indicator Lamps.
   2.) For MCPs with five or more Indicator Lamps, a common Lamp Test Pushbutton shall be employed to test Indicator Lamps.
   3.) For MCPs with five to ten Indicator Lamps, the Lamps shall be Allen Bradley #800T - PDST16, Square D 9001K series, or equivalent with appropriate color-coded lens.
   4.) For MCPs with more than ten Indicator Lamps, the Lamps shall be Sylvania #SM2A/30096 lamp socket with #I20 PC lamps or equivalent with the following lens caps:

Function	Lamp Color
Run	Green
E-Stops	Red
Conveyor Jams	Amber
Pier/Make-up Device Full/Over-Size	White
Motor Overloads	Blue

h. Non-Status Map E-Stop Switch Indicator Lamps: Certain BHSs shall require the installation of E-Stop Switch indicator Lamps external to the related System Status Map adjacent to lanyard operated E-Stop Switches. Install indicator lamps manufactured by Crouse - Hinds, Cat. #BDA - 15GP or equivalent with red globes.

i. Audible Warning Alarms
   1.) Start-Up Warning Alarms for mounting at Ticket Counter Control station locations shall be of the Sonalert device as manufactured by Mallory Company Stock #64F278 Type SC250ER, Allen-Bradley DEC/DEP Series alarm 855P-B10DEC22 for continuous tone, 855P-B10DEP22 for pulsing tone, or equivalent as determined by the Cedar Rapids Airport Commission. For those Control Stations located in higher ambient noise locations, an alarm of appropriate higher frequency and dB rating shall be used. Selection shall be based on survey of the location.
   2.) Start-Up Warning Alarms for other locations shall be of appropriate frequency and volume levels for the application location (e.g., baggage make-up areas and outbound transport line areas)Such Audible Warning Alarms shall be as follows:
      a.) Baggage Make-up Areas: Edwards Bell #340-6N5. Allen-Bradley 855H series horn. Federal Bell #46-500-WB or equivalent.
   3.) Audible Fault Warning Alarms shall be horns of appropriate frequency and volume level for the application location (e.g., baggage make-up areas and outbound transport line areas). Such Audible Fault Warning Alarms shall be as manufactured by Edwards Horn #876-N5, Allen-Bradley 855H Series horn, with or without an amber beacon, Federal Vibratone Horn #350-WB, or equivalent.

j. Audible/Visual Combination Alarms: Combination alarms for start-up or fault warnings mounted to MCPs, EDS machines, or elsewhere as approved by the Cedar Rapids Airport Commission or their representative, may be Allen-Bradley 855E Series with 120 VAC control.

k. Limit or Proximity Switches: Provide precision oil tight plug-in limit switches with contacts rated for a minimum of 10 amperes continuous duty at 120 VAC. Mount limit switches used to sense the position of fire/security doors as an external unit to the door adjacent to the track of the door so the switch can detect when the door is fully open.

4. Conveyor Motor Control Devices
   a. Motor Safety Disconnect (MSD) Switches
      1.) Provide MSD switches of the 3-pole, heavy-duty type, horsepower rated and non-fusible with a quick-make and quick-break operating mechanism and a means of padlocking the switch in the OFF position.
      2.) Provide an N/O auxiliary contact for connection to a PLC input.
      3.) Each MSD switch shall be identified with a permanently attached white phenolic plate, engraved with black characters, providing the identification of the conveyor with which the motor is associated. Dymo labels are not acceptable. Attaching the ID plate to the safety disconnect door is acceptable.
      4.) Use NEMA 12 enclosures for interior equipment and NEMA 4 for exterior equipment.
   b. Fire/Security Door Safety Disconnect Switches
      1.) Provide safety disconnect switches of the 3-pole, heavy-duty type, horsepower rated and non-fusible with a quick-make and quick-break operating mechanism and a means of padlocking the switch in the OFF position.
      2.) Provide an N/O auxiliary contact for connection to a PLC input.
      3.) Each Fire/Security Door safety disconnect switch shall be identified with a permanently attached white phenolic plate, engraved with black characters, providing the identification of the door the disconnect is associated with. Dymo labels are not acceptable.

4.) Use NEMA 12 enclosures for interior equipment and NEMA 4 for exterior equipment.

c. Relays: Use general-purpose industrial, panel-mounted relays with convertible contacts rated at 10 amperes continuous current at 120 VAC. Ensure all relays can operate manually.

d. Timers: Provide solid state timers or utilize timer functions by PLC logic. All timers shall be mounted within the appropriate MCP. Use of timer devices within photocells is not acceptable.

e. Magnetic Motor Starters (NEMA)
   1.) All motor control equipment shall comply with NEMA Standard ICS-1, ICS-2, UL publication 845 and other applicable standards of NEMA, UL, IEEE, ANSI, NEC and National Electrical Safety Codes.
   2.) Provide a separate magnetic motor starter unit for each motor drive section.
   3.) Provide one auxiliary contact on each starter and wire to a PLC input module.
   4.) Use size 0 starters for motors of 5 HP and below and size 1 for those above 5 HP. Equip all starters with:
      a.) Thermal overload protection on all poles.
      b.) Overload relays of the manual reset type.
      c.) Control voltage of 120 volts.
      d.) Electrical and mechanical interlocks where required for reversing applications.
      e.) Open type for panel mounting.
      f.) NEMA 12 enclosure for general-purpose application.
      g.) NEMA 4 for weatherproof application.

f. Magnetic Motor Starters (IEC)
   1.) In lieu of NEMA starters and fuses, IEC rated contactors are acceptable.
   2.) IEC starters shall comply by IEC, UL, CSA and VDE standards. NEC article 430 shall apply for group motor installation.
   3.) Furnish and install a separate IEC motor starter for each motor drive section.
   4.) Furnish and install one auxiliary contact on each starter and wire to PLC input module. Provide monitoring of tripped condition on the MDS and Touchscreen Terminal. Provide visible trip indication on the IEC starter.
   5.) Size the IEC rated contactors one rating higher than recommended by the manufacture.
   6.) Select IEC starters by motor full load current and the motor service factor.
   7.) Furnish and install IEC with lockout provision.
   8.) Furnish and install thermal overload protection on all poles.
   9.) Furnish and install overload relays with manual reset, unless they are already within the IEC motor starter.

g. Combination Magnetic Motor Starters
   1.) Equip each combination magnetic starter with:
      a.) An adjustable instantaneous trip circuit breaker interlocked with the enclosure cover with provisions for padlocking the disconnect switch in the Off position.
      b.) An enclosure door capable of being opened only with disconnect switch in the Off position.

h. Overload Heaters
   1.) Size overload heaters for each starter in accordance with the full load current rating shown on the nameplate of each manufacturer's selection tables.
   2.) Each individual motor starter should be equipped with overload heaters.

3.) Furnish and install an N/O auxiliary contact for each overload relay for connection to a PLC input.
4.) Enunciate individual overload failure on the Touchscreen Terminal/MDS fault reporting system.

i. Electric Brakes
1.) Provide brakes on all incline conveyors and decline conveyors, if not equipped with a VFD, and for any other conveyors where coasting of the conveyor would be detrimental to BHS operation.
2.) Furnish and install an electric brake for decline conveyors equipped with a VFD. Wire the brake separately from the VFD power source to prevent conveyor coasting.
3.) Furnish and install dry friction, spring set, solenoid release brakes integral with the drive motor.
4.) Incorporate automatic adjustment of brake disk wear or provide a brake, which requires minimal adjustment.
5.) Select the brake to be capable of cycling as required by the conveyor application under full load with no excessive wear.
6.) Choose brakes to have a minimum torque rating equal to the starting torque of the motor.
7.) Equip motor brakes installed on the end bell of the motors with an external means of manual release for maintenance personnel to operate the motor in case of a brake failure.
8.) Provide conveyors furnished with a clutch/brake assembly with a Warner Electric MCS-103-1 power supply (or approved equal) with one torque control, to allow the brake and clutch to be operated separately or both units on at a time. Locate this unit in the respective MCP.

j. Variable Frequency Drives (VFDs)
1.) General
a.) A programmable VFD with dynamic braking shall be utilized to control the operation of three phase induction AC motors for all queue conveyors, all merge conveyors where the merge is used as a queue position, and all conveyors in all bag tracking zones (e.g., CBIS) where coasting of the conveyor would be detrimental to BHS operation.
b.) VFDs shall be typically installed within their respective MCPs. To conserve MCP space, VFDs can be installed remotely at the drive unit; the Cedar Rapids Airport Commission or their representative shall approve this configuration. Provide an estimate for both configurations.
c.) All VFDs shall be UL listed and IEC compliant.
d.) Submit catalog cuts of the VFD proposed to the Cedar Rapids Airport Commission or their representative for approval.
2.) Cable and Wiring
a.) Size VFD power wiring and feeders appropriately for motor FLAs and additional power consumption of VFDs.
b.) Equip all wiring to the VFDs with removable terminal blocks or plugs such that termination of individual wires is not required when replacing a VFD unit.
c.) Provide either an approved method of wiring by the VFD OEM or VFD rated shielded cable. Use Belden, Olflex or equivalent cable. Connect the shield should to both the motor and the Potential Earth (PE) ground on the AC drive.

d.) For cable length of 50’ or more between the drive and motor, a minimum of 1 additional amp needs to be added to the drive rating to handle cable-charging current. For Cable greater than 100’ in length, a minimum of 2 amps need to be added to the drive rating for cable charging current.

3.) Safety and Equipment Protection
   a.) All VFD driven motors shall incorporate a method to ground the motor shaft to prevent induced voltage from passing through any bearing. Ground/bond the motor to the conveyor frame. The use of a drive pulley shaft is not an acceptable means of grounding.
      (1.) Ground all VFD-controlled motors with a maintenance-free conductive microfiber shaft grounding ring with at least two rows of circumferential microfibers to discharge damaging shaft voltages away from the bearings to ground.
      (2.) Coordinate with the motor manufacture to ensure motors are equipped with one shaft grounding ring installed on either the drive end or the non-drive end in accordance with the manufacturer’s recommendations.
      (3.) Bond all VFD-controlled motors from the motor foot to system ground with a high frequency ground strap made of flat braided, tinned copper with terminations to accommodate motor foot and system ground connection.
      (4.) Refer to ABB Technical Guide No. 5 and Allen Bradley Publication 1770-4.1 Application Data, Industrial Automation Wiring and Grounding Guidelines for proper grounding of motor frame for all inverter-driven induction motors.
   b.) Provide a means of dissipating drive shaft voltages and bearing currents to ground for all conveyors equipped with a VFD to prevent premature bearing failures.
   c.) Furnish and install dynamic braking resistors where required for faster stopping without overheating. Where necessary, upsize the VFDs and dynamic braking resistors to meet the application’s full load and throughput duty cycle without objectionable heating or VFD faults.
   d.) Factor in heat dissipation when designing the MCP and, if excessive heat is anticipated from the braking resistors, mount them in a separate NEMA 12 (for interior equipment) or NEMA 4 (for exterior equipment) rated panel.
   e.) If the transformer powering the MCP is greater than 10 times the drive rating, then install an input line reactor on each AC drive.

4.) Programming and Control
   a.) Provide the ability to program and monitor all drive parameters. Provide programming devices with pre-programmed parameters for various types of VFD programs (e.g., standard queue, merge) to allow simple downloading of such programs when replacement or reprogramming of a VFD is required.
   b.) Furnish and install a local keypad control for start, stop, speed reference and reverse functions.
   c.) Equip VFDs with a local port that allows connection to portable programming devices. Furnish and install one (1) VFD manufacturer’s standard programming device per 25 drives with two (2) to ten (10) pre-programmed parameters for various VFD programs (e.g., standard queue, merge) to allow simple downloading of such programs when replacement

or reprogramming of a VFD is required. Programming devices shall allow for adjustment of parameters such as ramp time, speed, and break time.

d.) Where dual-speed functionality is employed, install discrete inputs for each speed/mode of operation to ensure that proper acceleration and deceleration profiles are achieved in all cases. Refer and adhere to manufacturer's application, programming, and hardware requirements to ensure proper dual-speed functionality.

5.) Fault Monitoring

a.) Enunciate all individual VFD failures on the fault reporting system. Automatic resetting of certain faults shall be permitted; however, all such faults shall be enunciated and logged regardless of whether they have been automatically reset.

b.) Provide a means of monitoring and confirming each VFD's run/stop signal. Display a fault on the MDS in the BHS Control Room and generate an appropriate report entry in the MIS if the signal sent to the VFD from the PLC does not match the corresponding output from the VFD.

k. Photocells (Photoelectric Sensors)

1.) Furnish and install self-contained, retro-reflective photocells using an infrared modulated light source with sensitivity adjustment and readily visible LED status indicator. Retro-reflective photocells shall be used for applications where the distance between the photocell and the reflector is less than 10'-0".

2.) Photocell applications requiring a scan distance of 10'-0" or greater shall use a separate transmitter and receiver rather than the single retro-reflective photocell.

3.) Use photocells with quick disconnect cable for ease of replacement; the cable shall be UL recognized, 18AWG, one-piece molded design and be highly visible.

4.) Due to wiring constraints and noise on low voltage lines generating false triggers, DC photocells are not permitted.

5.) Mount photocells to structural members or side guards using an adjustable bracket as supplied by the photocell manufacturer so that the photocell is mounted in a vertical, not horizontal, attitude. Alignment and status LEDs shall be easily visible for maintenance personnel. All sensors and cabling shall be firmly anchored and protected from equipment and personnel impact and from random forces imposed by maintenance personnel servicing the equipment or staff working in the area. Mounting and protection devices shall inhibit tampering with sensors and their setting by non-maintenance personnel.

6.) Photocell mountings shall be directly attached to the conveyor structure as required. Use of shims between the conveyor structure and the photocell mountings is not acceptable. No penetrations through the side guards or attachment by means of magnets or other non-permanent attachment methods shall be permitted for photocell mountings or mounting brackets.

7.) Hex head 1/4"-20 bolts of appropriate length and related 1/4"-20 hardware (flat washers, lock washers and nuts) shall be used for the mounting of the photocells. Use of round head bolts is not acceptable.

8.) Mount reflectors to side guards using brackets providing both vertical and rotational adjustment. No penetrations through the side guards shall be permitted for reflector bracket mounting.

9.) Where holes through side guards are required, the holes shall be a maximum of 1.5" in diameter and located so that the center of the photocell beam is located either 2.5" or 3" above the conveyor belt. The holes in the side guards

shall be dimpled away from baggage flow to minimize the possibility of snagging a bag and causing a jam. Oblong openings in the conveyor side guards are not acceptable.

10.) Only one side guard opening per photocell and one side guard opening per related photocell reflector would be accepted. Any unused photocell/reflector openings in the side guards shall be properly filled with a welded circular blank, ground smooth and properly painted.
11.) Locate photocells on the side of a conveyor having the lesser chance of contact by operating personnel. Guard photocells if susceptible to personnel contact. Install the photocells on the catwalk side of conveyors for maintenance access.
12.) Do not attach the white phenolic plate photocell device ID plate to the plug-in photocell or its wired base. Mount the ID plate on the side guard adjacent to the photocell.
13.) Furnish and install photocells as required by the functional needs of the BHS. Photocells shall indicate a reliable life of over 10 million cycles and be repetitive and unaffected by environmental conditions such as vibration, rain, humidity, cold, heat, dust, and sunlight. Provisions shall be made to effectively accomplish the sensing of any of the typical types of airline baggage and packages. Photocell installation shall minimize vibration and shall provide protection for both the sensor and its associated wiring. Specifically, care shall be exhibited in the mounting of the photocell and its control wiring to minimize the hazard of damage from the moving of baggage, contact with associated components or by personnel working on or in the vicinity of the system.
14.) Use liquid-tight FMC or a flexible cordset for connection of photocells to minimize vibration and shall provide protection for both the sensor and its associated wiring.
15.) Furnish and install cordsets of an appropriate length to connect to photocells such that there is no greater than 1’ of excess cable length remaining. The excess cable shall be coiled and secured to the associated conveyor with the use of cable mounting clips. Cordsets shall not be secured using plastic cable ties.
16.) Photocells shall not be subject to interference from standard communication systems employed at CID due to airport and airline radio ground communications, ground to aircraft communications, aircraft to aircraft communications or any form of radar equipment operation.
17.) For applications that require critical fail-safe operation (e.g., for EDS Applications), the following components shall be used:
    a.) Develop and program PLC logic so PLCs continuously crosscheck outputs from the photocells. This code ensures fail-safe operation of photocells, photocell output wiring, I/O cards, I/O racks, PLC communications, and PLCs themselves. This code shall be written in such a manner that the system will stop appropriate conveyors and alert personnel in case the photocell, I/O card, I/O rack, any communication cable or wire breaks, or PLC failure occurs. This code should also include programming to account for long baggage or multiple bags that might appear over-length due to the absence of baggage gaps (stop conveyors if a bag length exceeds the maximum system bag length). Implement software programming filters to prevent erroneous conveyor stoppage due to the distance between photocell mounting locations and bag straps (that might instantaneously break the photocell beam). All applications shall be submitted for

acceptance to the Cedar Rapids Airport Commission or their representative prior to installation.

b.) For applications requiring throughput of 10 bags-per-minute or less: Allen-Bradley Area Access Control units may be used.

c.) .

d.) As an option to (b.) or (c.) above: redundant Allen-Bradley Series 9000 transmitted beam photoelectric sensors with a diagnostic output may be provided. Implement PLC safety controls to prevent unintended use in case of a failure.

l. Shaft Encoders

1.) Shaft encoders used to determine conveyor speed shall be directly coupled to either the charge or discharge end pulley of the associated conveyor and shall be of appropriate industrial type.

2.) Install appropriate safety guarding on all exposed parts associated with the conveyor drive's rotating shaft and direct drive gearbox, in compliance with OSHA Standards 1910.219. Ensure that the proposed safety guarding does not restrict maintenance access and it is easily removable, as the location requires, for maintenance access. Submit shaft encoder attachment and guarding details to the Cedar Rapids Airport Commission or their representative for approval.

3.) Tension-loaded friction drive shaft encoders are not acceptable.

4.) Provide cordsets of an appropriate length to connect to shaft encoders such that there is no greater than 1' of excess cable length remaining. The excess cable shall be coiled and secured to the associated conveyor with the use of cable mounting clips. Cordsets shall not be secured using plastic cable ties.

5.) Ensure the shaft encoder model chosen is applicable to meet the subsystem tracking criteria based on conveyor belt speed/resolution required (i.e., shaft encoders used for tracking within an EDS matrix (slow speed tracking area) may be a different model compared to those required for sortation system tracking (high speed tracking area)). Submit the manufacturer's data for the proposed shaft encoder(s) to the Cedar Rapids Airport Commission or their representative for approval.

C. Electrical Device Identification

1. The electrical control stations, their related control devices, field wired control devices shall be identified with a permanently attached white phenolic plate, engraved with black characters, providing the identification of the control station or control device. Dymo labels are not acceptable. Do not attach the white phenolic plate to any field device that can be easily replaced due to failure (e.g., plug-in photocell or its wired base, as this would also require the removal and reattachment of the ID plate); rather, attach the plate to the side guard or non-removable structure adjacent to the device.

2. The electrical control stations, their related control devices, field wired control devices and the electrical control devices mounted within the BHS related motor control panels (MCPs) shall use the following device identification format and designations. Use the following format and identifications throughout the BHS on the designated equipment and throughout project related documentation.

a. Control Stations

1.) Identify control stations with the prefix CS followed by the conveyor or BHS equipment ID number to which the control station is related. For example, CS/TC1-6 identifies a Control Station located on Ticket Counter Subsystem #1 related Conveyor #6.

2.) In case multiple control stations are associated with a conveyor or BHS device, use alpha designators to distinguish between them. For example, CS/TC1-6A,

CS/TC1-6B, CS/TC1-6C signifies that Ticket Counter Subsystem #1 related Conveyor #6 has three control stations. The alpha designator identifies the station related to the charge end of the conveyor while the last or highest letter indicates the station closest to the discharge end of the conveyor.

3.) Identify each control station with a permanently attached white phenolic plate, engraved with black characters, providing the identification of the control station. Dymo labels are not acceptable.

b. Control Station Devices

1.) Control Station Devices shall be identified as follows:

Control Station Device	Identification
Start/Restart Pushbutton	SPB
Normal Stop Pushbutton	PBS
E-Stop Pushbutton	EPB
Reset Pushbutton	RPB
Selector Switch	SSW
Key Operated Switch	KSW
Audible Warning Device	ALM
Bag Advance Switch	BAS
Alert Light Reset	LPB
Lamp Test Pushbutton	TPB
Alarm Silence Pushbutton	APB
Door Close Pushbutton	CPB
Door Open Pushbutton	OPB
Forward Jog Pushbutton	JFB
Reverse Jog Pushbutton	JRB
Jog Pushbutton	JPB
Jog Selector Switch	JSW
Colored Indicator Light (the first letter of the lamp color will appear instead of the underscore)	LT_

For example: The designation CS/TC1-6/RPB identifies a Reset Pushbutton in the Control Station located at Ticket Counter Conveyor TC1-6.

2.) List the above control station device designations on all electrical drawings, including wiring and schematics.

3.) Clearly identify control devices with permanently attached white phenolic plates, engraved with black characters, except E-Stop devices.

4.) Provide yellow background behind all E-Stop actuators, per NFPA 79. It is permitted for the yellow background to be a yellow enclosure or via the use of a label/legend that is yellow.

5.) Clearly indicate on all E-stops the conveyors affected by that E-Stop. Dymo labels are not acceptable.

6.) Clearly indicate on all jam reset pushbuttons the conveyor segments controlled by that jam reset control station.

7.) Position control device function ID tags for ease of reading. Orient the tag legend to be legible from the operator's access side of the control station.

c. Field Wired Control Devices

1.) Field wired control devices shall be identified as follows:

Field-Wired Control Device	Identification
Photocell	PE
Warning Alarm	WA

Field-Wired Control Device	Identification
Colored Indicator Light (the first letter of the lamp color will appear instead of the underscore)	LT_
Shaft Encoder	SE
Motor Safety Disconnect Switch	MSD
End Safety Guards	ESG

2.) Each ID shall be followed by the BHS device or conveyor to which the device is related or attached. For example, a warning alarm associated with make-up device MU1 would be labeled WA/MU1.

3.) Clearly identify field-wired control devices and junction boxes with permanently attached white phenolic plates, engraved with black characters. Dymo labels are not acceptable.

a.) Junction box IDs shall be easily read from the adjacent maintenance access areas and consistent with the associated subsystem identifications included on the wiring schematics. For example, the second junction box from MCP-TC3 would be "JB/MCP-TC3-02".

d. Control Devices in MCPs and Field-Mounted Control Panels

1.) The identification of control devices and components such as relays, timers, transformers, power supplies, overloads, fuses, and PLCs in MCPs and field-mounted control panels shall be identified with ID tags.

2.) Construct the ID tags of a white phenolic plate engraved with black characters. Dymo labels are not acceptable. The ID tags shall be located so they can be easily read when the related MCP or field-mounted control panel door is opened.

3.) Do not mount the ID tags on the covers of plastic wireways in the related MCP or field-mounted control panel.

4.) The ID tags for motor starters shall contain the conveyor ID. For example: The motor starter ID tag for conveyor TC1-1 would be “TC1-1M”.

2.08 MOTOR CONTROL PANELS (MCP)

A. General

1. Ensure adequate capacity within the panel(s) for all necessary control devices. If necessary, furnish and install MCP expansion cabinets during the interim BHS conditions to accommodate the sequenced implementation between existing, interim, and final works and where modifications to existing systems cause additional space, capacity, or location requirements are incompatible with the existing design.
2. Furnish and install UL-listed MCPs employing NEMA 12 enclosures with fully gasketed doors for interior use or NEMA 4 enclosures for exterior MCP(s).
3. The MCP shall include a fusible disconnect switch (with Class J or R fuses) or molded-case circuit breaker for the incoming power supply. The fused disconnect switch for the MCP shall have the following features:
   a. Flange enclosure construction where the external handle, connecting bar/cable, and disconnect switch are always connected regardless if the MCP door is open or closed.
   b. Quick make/quick break design.
   c. Indication at the circuit breaker or the fusible disconnect switch inside the MCP that the disconnect is in the ON or OFF position.
   d. Color-coded external handle for external visual indication of whether the disconnect switch is in the ON or OFF position.

e. Ability for the external handle to be padlocked in the OFF position for to support Lock-out/Tag-out requirements.
f. Mechanical interlock to prevent the disconnect switch from being moved to the ON position unless the mechanical interlock is operated.
g. Mechanical interlock with the motor control panel door to prevent the motor control panel door from being opened with the disconnect switch in the ON position. The disconnect switch mechanical interlock to the door shall have a manual override provision to permit the opening the door by qualified personnel using appropriate tools with the disconnect switch in the ON position.

4. Furnish and install a plexiglass safety shield with standoffs (or similar suitable finger-safe protection provisions) over the fuses/circuit breaker for the incoming 480 VAC power feed.
5. The exterior of the MCP shall be painted. The interior of the panel or cabinet including the mounting panel shall be painted white.
6. Ensure all MCP equipment complies with NEMA Standard ICS-1, ICS-2, UL publication 845 and other applicable standards of NEMA, UL, IEEE, ANSI, and National Electrical Safety Codes.
7. Prior to the installation of overload heaters on the controllers, submit a motor schedule listing motor horsepower, voltage, phase, source of feed, circuit breaker size, disconnect size, conduit and wire size and overload heater size selected to be used.
8. Base interrupting rating of all circuit breakers, fused disconnect switches, motor control centers, and panel boards on short circuit calculations and ensure they are compatible and coordinate with base contract equipment. Refer to NEC Articles 110 and 430 to determine short circuit and overload requirements.
9. Mount fuses or circuit breakers for each magnetic starter directly above the magnetic starter.
10. A laminated card showing motor schedule with horsepower, fuse size and heater size shall be affixed to the inside of the MCP door.
11. The working space in front of the MCP panel shall be a minimum of 3’. In all cases, the workspace shall permit at least 90° opening of the MCP doors. Refer to NEC Article 110 to determine working space requirements.
12. For any MCPs not located on a raised curb or raised floor, provide a concrete or galvanized steel plinth, pedestal, legs, or similar means to raise the MCP a minimum of 4” above the floor to minimize the possibility of any ground water damage to the MCPs.
13. Appropriately sized waterproof bushings/seals shall be installed on all conduits and conduit fittings that enter/exit the MCPs.
14. Furnish and install PanelView Touch Screen Monitor on the front face of each MCP to display faults and status of the respective outbound subsystems.

B. Installation Requirements
1. Comply with the following design and installation requirements:
a. Wire the line side of circuit breakers to a line side terminal strip for their incoming supply.
b. Wire the load side of the magnetic starter to a load side terminal strip for the outgoing load.
c. Connect all control wires to terminal strips designated for control wiring.
d. Make vertical runs of power and control wiring within the panel on either or both the right and left sides of the backboard.
e. Run horizontal runs of power and control wiring between the horizontal rows of starter block units.
f. Enclose all vertical and horizontal wiring in plastic wireways.

g. Make minimal wire runs to and from these wireways only to the nearest adjacent terminal block.
h. Use of latching relays or alternating relays is not acceptable.
i. Any plug-in device such as a relay, IEC starters or clutch/brake power supply shall be equipped with a spring clip restraint to prevent the plug-in device from becoming loose in its socket.
j. Splicing of control or power wiring within any MCP is not acceptable. All internal and external field wiring shall be terminated on the appropriate MCP terminal strips.
k. Appropriately sized waterproof bushings shall be installed on all conduits or conduit fittings that enter the related MCP.
l. All circuit breakers shall be of the appropriate size. Fuses are not acceptable except for OEM equipment where a circuit breaker is not feasible.

C. Panel Identification
1. Each MCP shall be identified with an ID Tag mounted on the outside face of the panel door to the immediate left of the MCP Main Disconnect. The Tag shall identify:
a. MCP Designation
b. Related Baggage Subsystem
c. Related Conveyors or Devices Controlled by the MCP
d. Attach a placard to each MCP stating the specific source of power including:
1.) Room number
2.) Panel number
3.) Bus location
4.) Circuit number
5.) Full load amperage
6.) Largest HP motor
e. All MCP identifications shall comply with the Owner's panel board identification requirements.
2. Provide a permanently attached white phenolic plate, engraved with black lines and characters of the subsystem layout, on the door face of each new and modified BHS MCP, illustrating a graphic representation of the respective subsystem. Orientation of the graphic representation shall be the same as the subsystem. The MCP layout map shall be consistent with the Graphic Display of the MDS workstation equipment, which shall monitor the faults of the entire reconfigured BHS (Outbound BHS). The ID tag engraved characters shall be minimum height of 1" or greater as required for readability.
3. The ID Tag shall be secured to the MCP door surface with a minimum of four rivets combined with an appropriate adhesive.

D. Shop Drawings
1. Submit shop drawings to show:
a. General Layouts of new MCPs.
b. Revised General layouts of existing MCPs.
c. Power, wiring, and schematic diagrams.
d. Outline and wiring diagrams of all special devices.
e. Manufacturer's data for all components.

E. Enclosure Utility Outlet and Lighting
1. Equip each enclosure or cabinet with:
a. One (1) appropriately short circuit protected, grounded duplex receptacle utility outlet meeting locally applicable standards of 120 volt, 20-ampere capacity.
b. One (1) appropriately short circuit protected, fluorescent lamp extending at least three quarters of the width of the panel. Operate the lamp by a switch located inside

the enclosure on the latch side of the primary door so that the light becomes illuminated whenever the enclosure or cabinet door is opened.

2. Power both the outlet and the lamp from the line side of the MCP main disconnect so the power to the lamp and outlet will remain on regardless of the condition of the panel's main disconnect position. Provide a disconnect switch inside the MCP as a means of turning off power to the utility outlet and the lamp.
3. The energized wire providing power to the outlet and lamp shall be yellow. All terminations of this wire shall be guarded to protect personnel from accidental contact. Mount a warning placard on the outside of the panel, next to the disconnect switch stating: "CAUTION – THIS CONTROL CABINET CONTAINS YELLOW WIRES THAT WILL REMAIN ENERGIZED WHEN THE DISCONNECT SWITCH IS TURNED OFF."

F. Control Devices
1. Install a Type 4 MCP control station on each MCP panel door.

Type 4 MCP Control Station Detail	
Function	**Description**
System Ready	Illuminates to indicate the associated subsystem(s) are ready for start-up.
Reset/ Restart	Resets a local fault after it is cleared and restarts the affected conveyor(s) / device, so long as there are no other conditions that prevent start-up.
Jam	Illuminates to indicate a jam condition in the associated subsystem.
Motor Overload/ VFD Fault	Illuminates to indicate motor overload or VFD fault within the associated subsystem.
Alarm Silence	When pressed, silences associated audible alarm.
Lamp Test	While pressed, illuminates all associated indicator lights to verify their functionality.
E-Stop	Immediately stops the associated subsystem(s) and de-energizes the associated device motors.

2. Install a Type 5 MCP Audio/Visual Alarm Stack Light on top of the MCP panel.

Type 5 MCP Audio/Visual Alarm Stack Light Detail	
Function	**Description**
Alarm	Alarms to indicate an E-Stop or jam condition has occurred in the associated subsystem(s) or the conveyors associated to the MCP are starting.
Jam	Illuminates to indicate a jam condition in the associated subsystem(s).
E-Stop	Illuminates to indicate an E-Stop condition has activated in the associated subsystem(s).

3. Hour Meter
   a. Each MCP shall be equipped with an Hour Meter that records the amount of time (in hours) that at least one of the conveyors or devices controlled by the MCP is in operation.

G. System Status
1. Status Monitoring
   a. Each conveyor subsystem's status shall be monitored by the BHS Maintenance Diagnostics System (MDS) workstation.
2. MCP Touchscreen Terminal

a. Supply, install, and program a Touchscreen Terminal such as an Allen Bradley, family of PanelView terminals (or equivalent as approved by the Cedar Rapids Airport Commission or their representative).
b. The Touchscreen Terminal shall be constructed as a NEMA 4 rating (outdoor) or NEMA 12 for indoor use.
c. The Touchscreen Terminal shall accurately and clearly depict the entire BHS. The terminal shall be configured to display system status as described below, in both text and pictorial format. Submit to the Cedar Rapids Airport Commission or their representative the functional design for approval.
d. The graphics portion of the terminal shall display, in real time, dynamic pictorial format, the operational status of the conveyors and make-up/claim devices connected to the system PLCs. Framed icons and specific conveyor IDs representing conveyor sections shall change color according to the following scheme. This shall immediately highlight problem areas so the problems that arise can be corrected in the minimum amount of time:

Condition	Color
Normal Operation – Conveyor Drive On/Running	Green
Normal Operation – Conveyor Drive Off/Timed Out	Black
Conveyor stopped due to cascading	Magenta
Conveyor Full Condition	White
E-Stop Actuation	Red
Over-length/Over-height Condition	Flashing White
Motor Overload	Blue
VFD Fault	Flashing Blue
Shaft Encoder Fault	Cyan
Conveyor Jam Condition	Yellow
HSPD Fail at Home Condition	Yellow
HSPD Failed Extended Condition	Yellow
Divert All	Flashing Green
PLC Communication Loss (Individual Components)	Red
Equipment Out of Service	Brown
Fire Alarm	Flashing Red
Over Temperature	Flashing Red
EDS Machine Failure	Red
BHS/EDS Fault	Flashing Red

e. The textual portion of the terminal shall display, in color coded text format, the operational status of the conveyors and make-up device connected to the system PLCs. The terminal provides color indications of a predetermined fixed area of the system. The text portion of the terminal shall not interfere with the graphical display area. The textual portion of the terminal shall automatically scroll to show the most current fault. The textual display shall also have a scroll back function to display faults that have scrolled off the display. The condition and the specific conveyor ID representing the conveyor sections and system devices change color according to the following scheme. This shall immediately highlight problem areas so that the problems that arise can be corrected in the minimum amount of time:

Condition	Color	Text Displayed
Normal Operation – Conveyor Drive On	Green	Running
Normal Operation – Conveyor Drive Off	Black	Timed Out
Conveyor stopped due to cascading	Magenta	Cascade Stopped
Conveyor Full Condition	White	Full
E-Stop Actuation	Red	E-Stopped
Over-length/Over-height Condition	Flashing White	Oversize
Motor Overload	Blue	Overload
VFD Fault	Flashing Blue	VFD Fault
Shaft Encoder Fault	Cyan	Shaft Encoder Fault
Conveyor Jam Condition	Yellow	Jam
HSPD Fail at Home Condition	Yellow	Failed Home
HSPD Failed Extended Condition	Yellow	Failed Extended
Divert All	Green	Push All
EDS Machine Failure	Red	EDS Failure
BHS/EDS Fault	Red	Interface Fault
PLC Communication Loss (Individual Components)	Red	Communication Error
Equipment Out of Service	Brown	Out of Service
Fire Alarm	Red	Fire Alarm
Over Temperature	Red	Over Temperature
Missing Bag Jam	Yellow	Missing Bag Jam

f. The Touchscreen Terminal shall be connected to an audio/visual alarm, which will be activated when a system alarm is triggered (e.g., jam condition, E-Stop).
g. Provide the Touchscreen Terminal with EPROM memory back-up.

2.09 FIELD CONTROL PANELS (FCP)

A. General
1. All FCP boxes shall be treated as MCPs as described within this document (e.g., appropriate clearances around the enclosure are required).
a. FCP shall either have the required clearances to be worked on in the field by trained personnel or shall be provisioned with a means to lock the door so that the FCP cannot be worked on in the field and must be taken to a secondary location for troubleshooting
1.) Each FCP door and base shall be provisioned with a means to lock the door to the base with a rivet.
2. Provide FCPs that are UL listed employing NEMA 12R enclosures.
3. FCPs shall be painted RAL 7035 (or approved equivalent).
4. FCP maximum dimensions shall not exceed:
a. 1-2 HP: 12.28” high x 12.28” wide x 10.30” deep
b. 3-5 HP: 16.28” high x 16.28” wide x 12.30” deep

5. All electrical connections to the FCP shall be NEMA 12R (or approved equivalent) cable with quick disconnect plugs that are uniquely keyed with exception of the photocell connectors which shall be keyed the same. The quick disconnect plugs shall be reviewed and approved by the Cedar Rapids Airport Commission or their representative.
6. All FCP boxes shall have a means of electrical disconnect. These shall be lockable devices.
7. Ensure that all control equipment complies with NEMA Standard ICS-1, ICS-2, UL publication 845 and other applicable standards of NEMA, UL, IEEE, ANSI and National Electrical Safety Codes (or applicable local codes).
8. FCP boxes to include braking resistors, fans, filters, circuit breakers, line reactors, I/O, contactors, relays, VFDs, ethernet communication modules, transformers, power supply, cooling fans, selector switch, disconnect switch, indicator lights, overload protection, and any associated components.
9. Every FCP enclosure shall have the following provisions:
    a. Internal temperature control
        1.) Provide thermostatically controlled cooling fans within the FCP cabinet to monitor and prevent internal temperatures from exceeding 125°F or component environmental limits, whichever is less based on an ambient temperature of 100°F (configurable). Provide cleanable filters on the intake and exhaust vents that are accessible from the exterior of the FCP. Configure, through appropriate controls functionality, the cooling equipment to run when the respective FCP internal temperature reaches 100°F and provide an audible and textual alarm at the HMI and reports applicable when the temperature exceeds 130°F (configurable).
    b. Filtered fan
    c. Filtered vent
10. All exterior components shall be NEMA 12R including connectors, handles, window, and touch safeguarding.
11. Provided continuous hinged door for access to internal components.
12. Viewing window to see drive and communication status.
13. Touch safe barrier (safety guard) to shroud the braking resistor
    a. Braking resistor wiring shall pass through the enclosure with a NEMA 12R cord grip connector.
14. Mounting
    a. FCP shall have mounting brackets on bottom and rear of enclosure.
    b. Blind pem nuts shall be placed in the top for mounting provisions to equipment.
    c. For FCPs with quick disconnect connections on the bottom of the enclosure, top mounting brackets shall be hinged with locking pins and quick release pins to provide access to cables below and easy removal.
    d. All motor junction box mounted drives and I/O shall incorporate easily removable capture screws and lugs with finger safe electrical connections.
    e. Coordinate the FCP mounting locations with the Cedar Rapids Airport Commission or their representative and all locations shall be identified on the conveyor and approved in writing.

B. Panel Identification
1. Safety awareness, data nameplate and certification labels shall be placed on the front door.
2. Filter replacement shall be placed on the side wall next to the air intake fan and exhaust.
3. Phenolic labels to indicate pilot devices and connector designations.
4. Internal components shall have individual device markers.
5. All cables shall be identified at each connector and at a minimum every 50 feet.

6. All wires shall be identified at each end and each termination point.

C. Componentry
   1. VFD approved by the Cedar Rapids Airport Commission or their representative.
      a. Dual port Ethernet/IP with ring topology cabling/connectors
   2. Line reactors shall be provided sized by current rating and duty cycle.
   3. Circuit Protection:
      a. Motor circuit protector sized by short circuit rating.
         1.) Utilize door mounted operator, if applicable.
      b. 10KA rated short circuit current rating.
      c. Meltric connector (or approved equal) with liquid tight conduit fittings provided with enclosure. This connector serves as a power disconnect. With this connector removed there shall be no 480V power to the FCP.
   4. I/O approved by the Cedar Rapids Airport Commission or their representative.
      a. I/O shall be compatible with the PLC and the network architecture.
   5. Brake Circuit
      a. Mechanical brake circuit
         1.) Brake contactor shall be controlled by I/O.
         2.) Refer to Electric Brake described elsewhere herein.
      b. Dynamic brake circuit
         1.) Brake shall be controlled by VFD.
         2.) Brake resistor sized by system HP rating and duty cycle.
   6. Connectors provided for (as a minimum):
      a. Power in
      b. Power out
      c. Ethernet in
      d. Ethernet out
      e. Control power in
      f. Remote control station
      g. Safe stop in
      h. E-STOP out
      i. Brake
      j. Encoder
      k. Photocell 1
      l. Photocell 2
      m. I/O Output
      n. All necessary components
      o. All connectors shall be uniquely keyed with exception of the photocell connectors which shall be keyed the same.
   7. Door Mounted Pilot Devices – 30mm
      a. Reverse-Off-Auto-Hand selector switch
      b. Drive Fault amber pilot light
      c. Drive Run green pilot light
   8. Terminal Blocks
      a. Screw terminals
         1.) Two level feed through permitted
         2.) Two circuit feed through permitted
      b. End anchors and end barriers shall be installed
      c. Terminal blocks shall be approved by the Cedar Rapids Airport Commission or their representative.

D. Submittals

1. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products.
2. FCP: Detailed configuration to include dimensions, components, field location, and size of each field connection. This shall be approved by the Cedar Rapids Airport Commission or their representative in writing.
3. Submit fully redundant network topology drawings to the Cedar Rapids Airport Commission and their representative for approval.

2.10 LOWER-LEVEL NETWORK ARCHITECTURE

A. General
1. Ethernet IP shall be the network protocol.
2. All cables shall be factory manufactured with factory connectors and factory tested.
3. All 480 VAC wire shall be hard piped in a separate conduit than the network cables.
4. The use of open caged wire trays shall be used with two (2) compartments and a divider separating the control wiring from the network cabling.
5. The wire tray shall have a rigid removable cover allowing easy access to the cabling. Each cover shall have a protective end cap against sharp edges. All cables running in a vertical manner shall have strain relief attachments. Any bend with a radius over 45° shall have protective component/backing to ensure cable is not damaged.
6. Mount the wire tray so it does not interfere with maintenance operations. Mock-up of tray installation shall be approved by the Cedar Rapids Airport Commission or their representative.
7. The wire tray shall be approved by the Cedar Rapids Airport Commission or their representative.
8. Network topology shall be in a DLR or similar configuration arrangement capable of bidirectional feed to all devices on the ring in the event of a cable/device failure.
9. All network switches shall be redundant and be capable of operating the entire DLR.
10. Each VFD shall be mounted on the motor or within six feet of the motor.
11. The use of Safety PLC and I/O is acceptable for E-Stop circuits if all safety codes are met.
12. No DLR shall have more the 50 nodes.
13. Do not utilize grounded Ethernet cables.
14. Test the network for packet loss; once the system is operational the test needs to be conducted to determine acceptable rates (as low as possible to ensure stability of the network).
15. DLR manage switches shall not have more than three DLR rings.
16. Each DLR shall be equipped with one (1) ethernet card.
17. Automatic device/drive configuration shall be employed for all VFDs, and the switch shall assign IP address automatically or the use of VFD memory card and then the PLC can remotely set the VFD parameters.
18. The DLR shall be design with 10% spares per DLR.
19. The PLC CPU usage shall not be more than 80% of CPU utilization (microprocessor resources).
20. Upper- to lower-level connectivity shall be connected via multimode fiber.
21. Except for the DLR, pull one (1) spare of each cable (e.g., safety stop, E-stop, ethernet) MCP to field termination panel.
22. All cables shall be identified at each connector and at a minimum every 50 feet.
23. All field device I/O shall be wired to the field mounted I/O cards. All field mounted I/O cards shall be in a NEMA 12R enclosure (e.g., FCP or motor mounted).
24. All system switches and ports shall be monitored by the FMS.
25. Dual Channel Safety Stop Relays

a. All control systems utilizing distributed I/O shall incorporate Dual Channel Safety Stop Relays into the Emergency Stop control circuits that are integrated with the PLC controller(s) and are compatible the Variable Frequency Drive (VFD) Safe Stop Circuit relay within the VFD.
b. The Safety Stop Relay and associated control methodology shall not remove control power from the VFD or the associated communications to prevent communications loss and/or phantom alarms.
c. The Safety Stop relay shall be compatible with an Ethernet/IP communications interface and shall provide diagnostics and status information with the upper-level control system.
d. This circuit shall be constructed utilizing cable and plug construction.
e. The BHS contractor design and layout must be submitted to the owner or owner's representative for approval.

26. If any of the above conditions cannot be met, a full-scale mock-up and test needs to be conducted for the Cedar Rapids Airport Commission or their representative's approval.

2.11 BHS WORKSTATION AND COMPUTER CABINETS

A. General Design Requirements
1. There shall be a control room(s) that houses the BHS workstations and the MDS server consoles. These consoles shall be designed to reduce worker's fatigue.
2. Provide a system capable of supporting all the specified electronics.
3. The system shall be comprised of floor mounted base pedestals, below the work surface base modules, (minimum of 14U per module), and above the work surface, top modules assembled together to form an operator console.
4. The system shall have a minimum 1" thick MDF core, laminated work surface. The work surface shall be not less than 1'-6" deep overall and should include a 3" deep wrist support covering the work surfaces entire front width.
5. Add-on top modules shall allow for a vertical or 12° or 15° tilt towards the user for all electronics placed above 6' in height from floor level.
6. Top modules shall be provided with removable equipment finishing masks or surrounds, cut to the size of the face of the specified electronics.
7. Two MDS workstations shall be installed in the new system. This provision ensures a redundant setup.

B. Standards
1. The system shall comply with Underwriters Laboratories (UL) listing 62Y4. Copy of the certificate of approval to be submitted upon request.
2. The system shall comply with Electronic Industry Association, (EIA), specifications for rack mounting ANSI/EIA standard RS-310.

C. Modular Pre-Engineering Construction
1. All components within the console system shall be:
a. Of pre-engineered modular construction i.e., constructed from a series of independent sectional components.
b. Be available from pre-defined set of manufacturers' model numbers.
c. Has been in common production for at least two (2) years prior to the date of submission.
d. Alterations to the design, either prior to or following installation, will be accomplished without the need for either welding or carpentry work.
e. Cables or conduits shall be able to pass through the complete width of the system without obstruction.

f. Modules may be supplied larger than 1’-7" EIA specifications to accommodate specific electronics, but all modules shall be capable of supporting EIA standard 1’-7" width rack mounted equipment, whether the originally specified electronics are of 1’-7" width EIA dimensions.
g. All modules shall be constructed of a steel superstructure framework with external attachable side panels in steel or wood.

D. Self-Supporting Skeleton Framework
1. The self-supporting skeleton framework shall:
a. Be installed onto the site in advance of any external finishing panels. The framework shall be fully capable of supporting all specified electronics without the need for attachment of any external panels.
b. Be supplied with four sets of standard EIA rack rails per module, measured in standard rack unit (U) sizes, i.e., inner rack rails and outer rack rails in pairs, one pair of each type mounted at the front and rear of each modular section. Outer racks rails shall be removable.
c. Be capable of being supplied to site in knock down (flat packed) form and be capable of assembly using interlocking tie bars and secure with bolts, without welding or carpentry work.
d. Front and rear elevation individual modular frame sections shall be pre-welded, before delivery to site, and constructed of 14, 16, and 18-gauge sheet metal. Front and rear frame sections shall be secured together by use of removable 14-gauge interlocking the bars and 1/4-20 bolts. All welds exposed to the front shall be filed smooth and sharp contours eliminated.

E. Base Pedestals
1. Pedestals to be at least 2’-6” in height and capable of supporting fully loaded top module cabinets, with a maximum loading of 1000 lb per pedestal.
2. An 18-gauge stainless steel kick plate cover shall be attached to the front section of pedestal.
3. A central through cable way shall be provided within each pedestal to allow access from under a raised floor into the enclosed console or vertical rack assembly.
4. Each pedestal shall include adjustable levelers providing for an adjustment of ±1” per leveler, fitted to the pedestals or together with heavy-duty (2.5”) plate casters, four each per pedestal.
5. Once the console is placed in the desired position, it shall become possible to adjust the leveler to a fixed position, which exceeds the casters, from the pedestals base.

F. Steel Exterior Finishing Panels
1. Exterior steel finishing panels of minimum 20-gauge (1.0 mm) sheet metal shall be furnished and attached to the self-supporting superstructure framework. All fastening to be unseen from external view.
2. Side and rear finishing panels shall be either slide-on or lift-off to facilitate ease of access for servicing and shall not require any further mechanical support to provide a secure connection to the system. For permanent connection, additional external fastening shall be supplied.
3. Steel or wood finishing panels may be applied following final termination test and commissioning of the specified electronics or earlier as directed to facilitate a timely and efficient installation and to minimize potential damage to the exterior of the system by others.

G. Finish and color

1. All exterior and frame steel components, including drawers, blank panels, and shelving shall be zinc oxide wash primer with a baked enamel paint finish of the following specifications:
    a. Supply side, top, and rear panels, drawers, shelving and blank filler panels in the color approved by the Cedar Rapids Airport Commission or their representative.
    b. Supply self-supporting frames and work surface supports in the color; approved by the Cedar Rapids Airport Commission or their representative.
    c. Supply all wooden components with a high-pressure laminate covering the MDF core.

H. Mounting Hardware
1. Mounting hardware for the specified electronics shall be available upon request. Panel bolts; washers, and clips with captive nuts suitable for use with EIA standard punched rack rails shall be included.
2. Slide kits, where appropriate, (including drawers), shall be of ball bearing operation. Friction or roller slides are not acceptable.

I. Installation Requirements
1. Comply with the following design and installation requirements:
    a. Wire the line side of fuses or circuit breakers to a line side terminal strip for their incoming supply.
    b. Connect all power wires to terminal strips designated for power wiring.
    c. Connect all control wires to terminal strips designated for control wiring.
    d. Make vertical runs of power and control wiring within the panel on either or both the right and left sides of the backboard.
    e. Enclose all vertical and horizontal wiring in plastic wireways.
    f. Make minimal wire runs to and from these wireways only to the nearest adjacent terminal block.
    g. Splicing of control or power wiring within any workstation is not acceptable. All internal and external field wiring shall be terminated on the appropriate workstation terminal strips.
    h. Appropriately sized insulated waterproof bushings shall be installed on all conduits or conduit fittings that enter the related workstation.

J. Panel Identification
1. Each workstation shall be identified with an ID Tag mounted on the outside face of the upper left workstation door.
2. The ID Tag shall be secured to the workstation door surface with a minimum of four rivets combined with an appropriate adhesive. Large tags shall require a minimum of four rivets, one for each corner of the tag.

K. Shop Drawings
1. Submit shop drawings to show:
    a. General layouts of the Workstation
    b. Power, wiring and schematic diagrams
    c. Outline and wiring diagrams of all special devices
    d. Manufacturer’s data for all components

L. Receptacles
1. In each enclosure or cabinet, include a minimum of one receptacle per electrical component powered from that enclosure/cabinet. The use of relocatable power taps/power strips or the chaining of power strips is not allowed to satisfy the above requirement.

M. Enclosure Utility Outlet and Lighting
   1. Equip each enclosure or cabinet with:
      a. One (1) appropriately fused grounded duplex receptacle utility outlet meeting locally applicable standards of 120 volt, 20-ampere capacity.
      b. One (1) appropriately fused fluorescent lamp extending at least three quarters of the width of the panel. Operate the lamp by a switch located inside the enclosure on the latch side of the primary door so that the light becomes illuminated whenever the enclosure or cabinet door has been opened.
   2. Power both the outlet and the lamp from the line side of the MCP, workstation, or computer cabinet power source (supplied by others unless otherwise stated) so the outlet power and lamp(s) will remain on regardless of the condition of the MCP, workstation, or computer cabinet power.
   3. The energized wire providing power to the outlet and lamp shall be yellow. All terminations of this wire shall be guarded to protect personnel from accidental contact. Mount a warning placard on the outside of the panel, next to the disconnect switch stating: “CAUTION – THIS CONTROL CABINET CONTAINS YELLOW WIRES THAT WILL REMAIN ENERGIZED WHEN THE DISCONNECT SWITCH IS TURNED OFF.”

N. Cooling Fans
   1. Provide cooling fans whenever necessary to prevent internal temperatures from exceeding component environmental limits based on an ambient temperature of 100°F. Provide replaceable or cleanable filters on the intake vents where fans are used.

2.12 CONTROL SYSTEM DESIGN

A. General Design Requirements
   1. This control system specification is intended to define the overall functional requirements of the system. The contractor is responsible for the definitive architecture and design which shall be subject to approval by the Cedar Rapids Airport Commission or their representative.
   2. The term “Control System” shall be understood to cover the control of all conveyors and sortation devices, as part of the BHS. The Control System consists of both BHS computer and PLC control systems. The BHS computer system shall act as the interface between the PLCs, EDS, and any other external computer/control system that requires interface to the BHS. Coordinate the required computer interfaces/protocols with the Cedar Rapids Airport Commission or their representative and user airlines.
   3. The design philosophy adopted for the control system is one of hierarchical control. Centralized supervisory and maintenance control shall be accomplished by fully redundant workstation computers. All the Cedar Rapids Airport Commission’s outbound conveyor shall be controlled by programmable logic controllers (PLCs) with Warm back-up for redundancy purposes. The outbound status will be monitored by the central MDS workstations.
   4. Bag encoding shall be accomplished similar to the existing conditions.
   5. Identify the philosophy on which this proposal is based and clearly identify in detail the proposed control system architecture, the major components to be utilized and the methodologies employed for software development. Adopt the following philosophy in the BHS control system design:
      a. No single fault can bring down the entire system (i.e., no single point of failure)
      b. The system can be easily and economically enhanced to meet the future requirements in the next 15 years (e.g., add/increase hard drive(s), RAM capacity, upgrade CPU)
   6. Submittal of the proposal shall acknowledge the functional intent of the control system specification. Understanding the design shall be the result of modifications/refinements to

the minimum requirements established herein. These changes shall not be the basis for increased cost requests.

7. Submit for the Cedar Rapids Airport Commission or their representative's approval, a comprehensive and detailed system description. This description shall include full details of operational procedures and control system provisions associated with the BHS, including the following:
   a. Control system development and implementation master schedule
   b. Schedule of system hardware employed (main elements)
   c. Interfaces to EDS machines
   d. Interface to the Cedar Rapids Airport Commission's or user airlines' baggage input consoles/tug display systems
   e. Start-up/shutdown procedures
   f. Description of conveyor control logic outlined by subsystem
   g. Data input and output routines (i.e., MIS)
   h. Automatic O&M/defect/status routines (including format)
   i. Audio/Visual indications
   j. Control station layouts/functions/operations
   k. Fallback/Anti-grid lock procedures
   l. Redundancy schematics/provisions
   m. Power supply requirements (including UPS schematics/redundancy and layout)
   n. BHS Computer operator interface routines
   o. Typical programming blocks
   p. Maintenance Diagnostics System (MDS)
   q. MIS Reporting Functionality with Sample Report Formats
   r. Communications Highways – Redundancy, Schematics, and product specifications
   s. Proposed overall system architectural diagram clearly identifying both upper- and lower-level controls with respective data communication highways; at minimum, all system PLCs (for security screening requirements, tracking and system status), all computers/PLCs with functions of each clearly identified (i.e., GUI), printers, UPS', Hubs (Ethernet, serial), drivers, and all associated components (i.e., tachometer boxes, photocells, multiplexers), BSDs, and proposed networking. Submit a schematic diagram with an outlined description that clearly defines the approach taken to satisfy the specified requirements for BHS redundancy.
8. Attend all onsite meetings as required and actively project manage the BHS design, design review process, and documentation process. Attend a minimum of three (3) mandated control system meetings at the job site or the Cedar Rapids Airport Commission's office to review the control system functional specifications and electrical control system design. Submit material to be reviewed at the meetings at least two weeks prior to the meetings. The control system meetings attendance will include, at minimum, representatives from the BHSC, the general contractor, CM, and the Cedar Rapids Airport Commission or their representative. The meetings shall review, at minimum, the following items:
   a. Meeting #1: Design Considerations
      1.) Computer and PLC System Architecture
      2.) Baggage System Computers including Redundancy requirements
      3.) PLCs including Redundancy requirements
      4.) PLC/Computer Systems – Power Requirements (including UPS requirements) and MCP sizes
      5.) BHS Computer Interface Requirements
         a.) Hardware Requirements
         b.) Software Requirements

c.) EDS Security Systems Interface Requirements
d.) Input consoles/tug display systems
e.) Fire/Security Door and Security Card Swipe Interfaces
f.) Production/Testing Schedule
g.) Redundancy Requirements

b. Meeting #2: Design Review
1.) Updates to previous meeting
2.) Subsystem control functions – Baggage Flow/Logic/PLC Control:
a.) Start-up/Shutdown Procedures
(1.) Manual Start-up/Shutdown
(2.) Automatic Start-up/Shutdown
(3.) Start-up/Shutdown from MCPs
b.) Jam Detection and Restart Procedures
c.) Cascade Operation
d.) E-Stop and Restart Procedures
e.) Audio/visual indications and locations
f.) Redundancy Requirements
g.) Fire/Security Door and Security Card Swipe Procedures
h.) Anti-grid Lock Procedures for EDS
i.) Fallback Procedures
j.) General Control Logic per Subsystem
3.) EDS Subsystems:
a.) Tracking requirements throughout the EDS for all levels of screening
b.) Start-up/shut down procedures
c.) Test Mode
d.) Insert Mode
e.) Bag ID# Assignment
f.) BMTT
g.) Fail-safe measures
h.) EDS machine and EDS loop prioritization
i.) EDS Reports
j.) Anti-grid lock measures for EDS
k.) EDS loop crossover functionality
l.) BIR PTRI/Touchscreen Terminal/BHS functionality

c. Meeting #3: Design Review
1.) Updates to previous meeting
2.) Maintenance Information System (MIS):
a.) Reports to be developed as defined herein
b.) Sample Screens
3.) Maintenance Diagnostics System (MDS):
a.) Specification Requirements
b.) Problem Resolution
c.) 2D graphical views
d.) Sample Screens
4.) Electrical System Drawings Review

9. Control System Elements
a. The control system (High- and Low-Level Controls) shall comprise, at minimum, the following elements:
b. The following High-Level Network elements:
1.) MDS Computers, which allow for the following functions:
a.) Automatic switching to a hot back-up fully redundant MDS computer.

b.) Collect and store data from the sortation and field PLCs to include in reports and status displays at the BHS workstation.
c.) Software program(s) as required to accomplish the functions specified herein.
2.) BHS workstations equipped with all appropriate software and hardware to perform the required functions.
3.) Communications highways
4.) Local Area Networks (LANs)

c. The new control system shall comprise, at minimum, the following Low-Level Network elements:
1.) New and modified existing MCPs.
2.) New PLCs, which control the BHS by communicating with the device level equipment (e.g., photocells, encoders).
3.) Remote I/O located in the subsystem MCPs, grouped by mainline.

10. Hardware: All control systems hardware for the BHS computer and the BHS PLC systems and associated purchased software shall be supplied by manufacturers whose products are supported locally and can demonstrate a minimum of five years of experience in providing control systems for conveyor systems of similar size. The Cedar Rapids Airport Commission or their representative must approve any equipment that does not meet this requirement.
11. Computer/Controls Electrical Supply
    a. The supplied computer/control systems and equipment shall be compatible with, and operate reliably and effectively with, the normal electrical supply typically available. The equipment shall not be unduly sensitive to fluctuations in supply voltage, which can typically vary by ±10% of nominal values. Electrical power supply filters/conditioners and regulators shall be supplied for all equipment, which cannot meet the specifications stipulated.
12. System Design Parameters
    a. The system design shall consider the following requirements:
    1.) High throughput capacity
    2.) Energy conservation
    3.) Satisfactory environment
    4.) Operational flexibility
    5.) Component and system reliability (including back-up provisions)
    6.) Default capability (anti-grid lock) to ensure that in the case of saturation of any subsystem, a back-up and fail-safe alternate process path or discharge point is available (i.e., in no case shall total system saturation occur). Furnish and install anti-gridlock software.
13. Environment: All communication and equipment shall be capable of functioning in an industrial environment. Where special environmental conditions are essential for correct equipment operation (e.g., computer hardware), such requirements control shall be clearly identified in the submittals identified herein. Factors such as dust, air contamination, heat from local sources, abrasives, moving or falling objects, or vibration shall also be considered. Advise of the necessity for these provisions as well as the specific requirements for each system.
14. Responsibility for Supply and Installation
    a. Supply and install all Baggage Handling Control Room and Control System hardware. This includes control consoles and mounting structures for the monitors.
    b. The general contractor shall supply hardware as designated herein and from specific documentation provided by the Cedar Rapids Airport Commission.

c. Coordinate the requirements of the control system elements in the console with the console supplier and the Cedar Rapids Airport Commission or their representative.

15. Responsibility for Programming
    a. Program the BHS computers and PLCs for all conveying, sortation, and reporting functions associated with the project. Program the control system interfaces between the BHS and any other interfacing system (e.g., EDS).
    b. Program all monitoring system functions associated with the BHS project. These functions shall include:
        1.) The provision of audible and visual system alarms at the workstation(s) and associated large screen monitors.
        2.) Real-time reaction to a failure and the capability of choosing alternate paths from the monitoring system.
    c. Programming techniques, data structures, and documentation shall be made available to and approved by the Cedar Rapids Airport Commission or their representative.
    d. Submit the as-built programming documentation for the BHS computers, PLCs, and system monitoring computers to the Cedar Rapids Airport Commission on portable hard drive or other media as follows:
        1.) Two complete, duplicate sets covering all applicable computer, PLC, and system monitoring programming documentation.
        2.) Two complete, duplicate sets of hard copy documentation (both programs).
        3.) Software for the new BHS computer systems as well as the new BHS PLC control system, including all PLC ladder logic, shall be provided in both searchable .pdf format and software versions.
        4.) The system software shall be written using as much non-proprietary software as possible.
        5.) Delivered software shall include both executable files and fully commented source code for all applications (except for purchased off-the-shelf software). Include all 3rd party software required to view or edit the source code. Establish with a reputable escrow service company a software escrow account for all withheld source code as well as documentation required to reconstruct the executables to invoke prior intellectual property rights and withhold source code for any system. This software escrow account shall provide the Cedar Rapids Airport Commission access to the source code and documentation for a minimum of 10 years. Access to the escrowed information will be authorized in case of the contractor's inability to correct design errors in the software, contract default, insolvency, or termination of business activities.

16. System Redundancy
    a. Failure of primary redundant equipment shall not degrade the response time of the control system. In the worst-case scenario where every piece of primary equipment has failed there shall be no impact on system performance whatever the combination of the failure.
    b. The BHS shall reconfigure itself automatically after redundant hardware takes control (the secondary system will become the primary, the failed system will become the secondary when it comes back on-line). The switch over handled by the system shall be fully automatic with minimal need for any operator intervention for the reconfiguration. The BHS shall report any hardware failure, power failure, communication loss, or other fault condition, raise a critical alarm and inform the maintenance personnel through both display on the text monitor(s) and by an audible alarm.

c. When the system is running on the UPS(s) during a power failure, the BHS shall monitor the UPS(s) battery level, raise a critical alarm and inform the maintenance personnel through display on the text monitor(s) and audible alarm when the battery level becomes critical, this will allow the BHS Control Room operator sufficient time to do a systematic shutdown of the BHS computer system. The system shall always monitor the state of the UPS to ensure the required power back-up functionality is always available, raise an alarm on the MDS if the battery level becomes critical.
d. Backup equipment where provided shall be used as redundant equipment. All hardware, software, and networking and system architecture shall comply with the requirements for a redundant system.
e. E-stop circuits shall use a safety relay that controls the VFD's dual-channel STO input. This configuration must meet the required SIL or PL rating (e.g. SIL 2 / PL d) as determined by the application, in accordance with IEC 61800-5-2, IEC 61508, and/or ISO 13849-1.

B. Computer and PLC Control System Architecture
1. General
a. The Control System Architecture for the Terminal Outbound BHS shall be one of de-centralized PLC design (with remote I/O) and centralized BHS computer design. The control system will primarily be controlled by new PLCs; these PLCs interface with three types of equipment:
1.) BHS field devices (e.g., motors, sensors, encoders)
2.) MDS computers
b. The BHS conveyor control system shall be based on multiple PLCs, interconnected to each other by the BHS low-level DCH.
c. LANs (high-level communications) shall be employed to provide data messaging between the BHS computers.
d. The BHS computers shall be equipped with two (2) ports for each of the interfaces on each of the BHS server computers. Ensure that a single connection failure from either does not impede BHS operation.
e. The BHS computers shall serve four primary functions:
1.) Database processing
2.) Monitoring of the status of the system
3.) Statistical information storage and presentation (i.e., Reports)
f. The control system architecture presented herein is intended to convey the minimum functional system requirements. Consider the following:
1.) Centralizing the Cedar Rapids Airport Commission's entire outbound BHS computers (primary and warm back-up) at the computer/operation room and using remote I/O.
2.) BHS computer system equipment (primary and hot back-ups) located at the computer/operation room and outbound BHS PLCs and I/O located in the MCPs (Warm Back-up).
3.) Utilization of multiple PC based computers.
4.) Provide start-up warning alarms and sufficient start-up delay to comply with OSHA standards on all existing conveyors.
5.) Provide all necessary controls (such as photocells, belt tachometers, and control stations) for new conveyors.
2. BHC System Functional Description
a. The BHC system shall accomplish the following MIS tasks:
1.) Online statistical report generation
2.) Online maintenance report generation
3.) Offline sort table generation

4.) View on screen and print any report

b. Each BHC shall be identical in that emulation of any subsystem or function can be accomplished from any workstation.

c. In case of main power supply failure, the system shall protect the complete database by means of battery powered data storage, such that re-entry of data is not required after power has been re-established. The battery powered storage system shall give a minimum storage period of 2 hours. The system automatically performs a safe shutdown when the UPS registers a low power situation.

d. A simple means to test computers for online capability and subsystem control shall be provided by means of an operator initiated self-testing routine i.e., using pull down menus. Computers shall carry out automatic self-testing routines each time they are switched on for operation.

e. Provide a means to monitor Computer System Performance. Provide a warning on the MDS when the computer system might be close to a gridlock situation (i.e., less than 20% memory capacity).

f. Processor and data storage capacity shall be sized to permit up to a 33% increase of processing and storage capacity. Further capacity increase shall be possible by addition of expansion modules.

3. Workstation System and Equipment

a. The operator workstations shall provide the operator interface to the MDS. Operators shall be able to produce statistical reports as specified herein. The operator workstations shall also serve as the operator interface to the MDS allowing operators to monitor the status of the system, respond to faults, configure equipment control, and all other operational modes. Production of custom reports from the databases maintained by the MDS computers shall be possible with the use of off-the-shelf software supplied as part of the system.

b. The workstation shall require login procedures with predefined usernames and associated passwords. The workstations shall enable and disable certain functions depending on username. Each operator workstation shall operate independently of the others; however, it shall be possible to determine the status of and users logged on to any other workstation (with appropriate username and password).

c. Each workstation shall be capable of controlling the BHS. It shall be possible to configure either workstation independently in any of the modes listed below. Switching between modes shall take a maximum of five (5) seconds.

d. The graphic and text screens provided shall be scalable to monitors/displays of differing sizes (i.e., allow for future replacement of monitors/displays of similar sizes without cutting off any information displayed on the workstation screens).

e. Modes:

1.) When accessing the MDS application - both monitors acting in concert to graphically display the entire system with a floating pointer between the two monitors. When zooming in on a section of the system, only the monitor that displays that section of the system in the overview screen shall show the larger scale area of the system requested by the operator while the other screen shall remain showing its half of the overview screen. In this mode, a three-line text bar shall appear at the bottom of one of the monitors to display system faults in text. The textual display shall scroll showing the most recent, unacknowledged or uncorrected, highest priority faults.

2.) When accessing the MDS application - one monitor graphically displaying the entire system and one monitor providing a textual display of alarms. It shall be possible to configure the text display to display alarms based on different sort criteria such as highest priority, unacknowledged/uncorrected, and by alarm

time stamp. It shall be possible to configure either screen as the text or graphics monitor.

3.) When accessing other applications - one monitor graphically showing the system status and a five-line text bar at the bottom of one of the monitors to display system faults. The textual display shall scroll showing the most recent, unacknowledged or uncorrected, highest priority faults. The graphical display shall be that display which was left on that monitor when changing from the MDS application to another application. The other monitor shall provide the display for the application being accessed at the Operator Workstation and the keyboard and mouse shall provide input for the current application. It shall be possible to configure either screen to display the above information.

4.) When accessing other applications - one monitor providing a textual display of alarms. The configuration of the textual display shall be that configuration which was last defined for the textual display in the MDS application. The other monitor shall provide the display for the application being accessed at the Operator Workstation and the keyboard and mouse shall provide input for the current application. It shall be possible to configure either screen to display the above information.

f. Access to all BHS configuration control and monitoring functions shall be by the BHS workstations. The BHS workstation computer equipment shall be housed in workstation cabinet(s) located in the control room.

g. Operator workstations shall be off-the-shelf, Windows-based, and currently supported by the vendor.

h. A detailed description of the workstation specifications (e.g., processor, memory, monitor size, hard drive size, media drives) shall be submitted to the Cedar Rapids Airport Commission or their representative prior to determining bid award.

i. All operating systems, diagnostic software, antivirus software, disk management software tools, software drivers for hard disk arrays, and relevant media (e.g., CD/DVD-ROM) drivers shall be furnished and installed.

4. Workstation Basic Functions

a. All workstations shall house the same software and be interchangeable with other workstations. This process shall be as simple as unplugging one workstation and plugging in the replacement.

b. All workstations (with the correct security level) shall have the ability to program the PLCs.

c. Display of charts, graphs, and all other visual reporting methods shall use static color categorization. The dynamic assignment of colors for individual categories (i.e. unique to each graph) is not acceptable.

d. The workstations are composed of multiple computing nodes configured in a redundant, independent arrangement to provide the following basic functions:

1.) Collect data from the PLCs to include in reports and status displays.

2.) Provide O&M Reports, both printed and on-screen, reflecting system status in all existing outbound BHS areas. It shall be possible to print any viewed message on the screen. Reports shall be capable of selecting and printing daily, weekly, monthly, quarterly, and yearly updates. In general, new reports shall be provided to reflect the modified outbound BHS:

a.) Throughput (number of bags processed for each subsystem). Selectable in 0-60 minute intervals.

b.) Equipment operating/malfunction performance summary for each subsystem and individual item

c.) System communications behavior

d.) EDS Report
e.) Day end report
f.) Computer and PLC status report
g.) Individual PLC status report

3.) Display system status and fault conditions on graphic screens, text screens, and printers indicating the following:
a.) Communications Integrity.
b.) Tach/Shaft Encoder Status: Tach out of limits.
c.) HSPD Status: Overload, Failed Extended, E-Stopped, Failed at home, Divert All.
d.) Conveyor Status: Timed out, Running, Cascade, E-Stopped, Jammed, Overload.
e.) Oddsize Sort Pier/Make-up Status: Timed out, Running, Cascade, E-Stopped, Jammed, Overload, Full, Reverse.
f.) EDS Machine Status: Timed out, Failed, Restart.

4.) Monitor PLC I/O to sense bag movement; issue sort directives to PLCs to direct bag movement.

5.) Enable system re-route/re-configuration.

6.) Use a visual indication (e.g., hourglass) to indicate that the computer processors are processing and are running. Display status of a process or processor that is predicated on another process or processor.

e. Main Menu Options

1.) The following list depicts the menu structure available to an operator from the remote workstation. Menus are displayed as pop-up windows when the operator presses the associated letter or uses the cursor and enter keys to make choices. The escape key allows one to back out of a menu or dialog box. Some menu choices lead to interactive dialog boxes where the operator might be prompted to enter additional data.

2.) Accompanying text identifies and describes each available Main Menu option. This same text is also to be displayed when corresponding items are chosen from the Help Menu screen.

3.) Main Menu Options and Help Menu Screen. The following are samples of the types of Main Menu and Help Menu screens that should be available, submit to the Cedar Rapids Airport Commission or their representative examples of the screens to be utilized for approval:
a.) Using the Keyboard
b.) Utilities
c.) Operations Report
d.) Maintenance Report
e.) Problem Resolution Text
f.) Others as required to provide specified function

4.) Using the Keyboard/Mouse: The workstation system uses the keyboard or mouse to make menu selections and to accept data from the user.

5.) Utilities
a.) The Utilities Menu is a group of commands used for general-purpose needs. The options for this menu are described below:
(1.) Clear all Statistics: Clears all statistics kept by the workstation, and the PLCs. These statistics are kept daily. Once cleared, they cannot be recovered without a password entry and second level confirmation.

(2.) Change System Date: Used to set the system date on the workstation system.
(3.) Change System Time: Used to set the system time on the workstation system.
(4.) Coordinate System Times: Used to update the system time on all system sortation, computers, and PLCs.
(5.) Offline Editor: Used to access the offline flight table editor to make changes to the flight tables or add flights.
(6.) Change Alarm Printout Spacing: Changes the spacing between alarm messages on the alarms printer.
(7.) Exit to PLC Programming Software: Used to exit normal operational mode and enter a password protected, maintenance function, for PLC programming and diagnostics functions.
(8.) Run Diagnostic Tools: Used to automatically run computer and software diagnostic tools to check on functionality of workstation computers and software.
(9.) Others as required to provide specified function.

6.) Operations Reports: The operations reports are used to monitor the daily functions of the system. Reports can be printed to the printer or displayed on the screen or can be transferred to a file in CSV format. Specific report requirements are defined elsewhere herein.
7.) Maintenance Reports: The maintenance reports are used to monitor the status of the pieces of equipment in the system and to diagnose any problems that might arise. Reports can be printed to the printer or displayed on the screen. Specific report requirements are defined in the MIS section herein.
8.) Problem Resolution Text
a.) Problem Resolution Text is a tool to help correct problems that arise with the conveyor system. When a fault occurs, it will have a number next to the description that appears on the system alarm printer.
b.) A selection can be made from the problem resolution option on the Main Menu for the appropriate text.
c.) The text will state the problem, followed with the proper primary action that should be taken. As is appropriate, additional actions for correction of the problem will also be listed in the text.
d.) A brief listing of the problems includes the following:
(1.) Jammed Bag
(2.) HSPD Jam
(3.) Jam
(4.) Motor Overload
(5.) HSPD Failed at Home
(6.) Belt Tach/Shaft Encoder Failure (tach out of limits)
(7.) Missing Bag Jam
(8.) PLC Communications Line Failure
(9.) Off-Line Update Failure
e.) Operator shall have the ability to change, edit, and save all problem resolution text.
9.) Override Capability: It shall be possible, through appropriate operator input at the operator workstation, to individually override automatic control of a conveyor thereby allowing the conveyor to run despite a sensor or other such failure. An appropriate graphical and text display shall be provided for conveyors in this override mode of operation. Override control of security

critical components to security screening shall require appropriate high-level password protection. Any overridden condition of a security critical component shall be prominently annunciated on the MDS. Start-up warning and e-stop functionality shall remain intact despite an override condition. Public area conveyors shall not have override capability. Coordinate the specific override requirements and functionality with the Cedar Rapids Airport Commission or their representative

C. EDS Security Screening Devices
   1. The System shall interface directly with the EDS security screening devices. Allow for the transmission of data pertaining to individual bag security status (e.g., cleared, alarmed, or unknown). The Control System shall allow for bag routing contingent on security status.
   2. Allow for the initiation of an EDS security screening report to be included with the provided MIS reports. The security screening report shall include information regarding the number of bags assigned each security status (e.g., cleared, alarmed, or unknown), and the resulting bag routing.

D. Building Fire System
   1. The BHS shall interface directly with the building fire system via the Cedar Rapids Airport Commission's network. Coordinate with the Fire Marshal for the location of all fire zones and for the shutdown of conveyors and fire doors impacted by a fire alarm.
   2. Display alarmed fire zone(s) on the MDS display in the BCR.

E. Programmable Logic Controller (PLC) Functional Description
   1. Furnish and install PLCs for direct interface between all I/O devices in the BHS.
   2. Equip each PLC with an EPROM or similar safeguard to provide memory back-up.
   3. Equip PLCs with Ethernet capability for possible connection to any future external devices.
   4. Equip each PLC with a minimum of 35% excess memory or capacity for 25% expansion and each Input/output (I/O) with space for adding 25% more modules.
   5. I/O modules shall have a visual indication of the status of each I/O point. The status displayed shall be for both signals input into each I/O module and the output signal from each I/O module.
   6. Provide a fully annotated printout as well as a software copy of the up-to-date PLC software and program.
   7. All PLCs shall employ a battery back-up system capable of storing data for a minimum period of two hours, should a power outage occur.
   8. Furnish and install new primary and back-up PLCs. Each of the Cedar Rapids Airport Commission's Outbound System PLC/subsystem shall be provided with a warm back-up redundant fully programmed PLC containing the same software/control functions of the respective primary PLC/subsystem..
   9. The primary function of the PLCs shall be the control of all conveyors, including:
      a. Tracking of baggage on conveyors from shaft encoders and strategically located photoelectric sensors for verification
      b. Tracking shall be of shift register methodology; the use of FIFO shall not be implemented
      c. Jam detection
      d. Normal Start/stop routines
      e. Auto-Stop/Auto-Start timing circuits and start-up routines
      f. Actuation of HSPDs
      g. Cascade stop control
      h. Inch-and-Store control, start/stop routines
      i. Control of associated feed conveyors

j. EDS/BHS interfaces
k. Statistical reporting to the Cedar Rapids Airport Commission's host computers
l. Selection of alternate flow paths in case of a failure
m. Self-diagnostics

10. All PLCs interface modules and I/O cards shall be located in MCP cabinets as specified herein.
11. Commonality of PLC manufacturers shall be maintained utilizing the minimum number of individual models of the currently available PLCs that can be provided by the PLC OEM.
12. All BHS equipment associated with the outbound system shall have fully programmed redundant PLCs configured in warm back-up mode. In case of a primary component failure the warm back-up must be manually switched to become the primary component. Warm back-up refers to a control component that is concurrently tied into the I/O structure along with the associated primary component.
    a. In case of a primary component failure, the warm back-up component shall retain the latest current status of the related system and shall assume full operation after manual intervention. Up until primary component failure, no output from the back-up unit is transmitted.
    b. In case of a failure, the warm back-up processor shall take over control of the system after it has been manually switched to become the primary component. Only the online PLC shall be controlling the operating baggage system. It shall be possible to reset the failed processor without affecting baggage processing so that the system is once again in a fully redundant configuration.
    c. Failure of a processor shall be annunciated at the workstation and touchscreen terminal both visually and audibly.

F. Network
    1. General
        a. The BHS high-level communication networks specifications and requirements as mentioned in this specification are written based on the best hardware, software and network concepts/designs that are available in the market today. Install the latest and best hardware, software and network concepts/designs that are available in the market at the point of installation.
        b. The network is to be provided within a location to be coordinated with the Cedar Rapids Airport Commission or their representative. All BHS servers are to be redundant virtual machines running on physical host servers.
        c. All virtual machines and host servers are to run in a high availability configuration.
        d. All data storage and maintenance access will use separate physical hardware.
        e. The BHS high-level communication network shall be designed to protect the network's and data's usability and integrity, including both hardware and software technologies. It shall apply adequate network security to manage access to the associated network that targets the threats and stops them from entering or spreading on the network.
    2. High-Level Network
        a. The BHS high-level network is a critical component that powers the information and application infrastructure. Therefore, it shall be designed to be fully resilient with high requirement for good network and information security.
        b. The BHS high-level network shall be designed to have good security, high performance, fully fault tolerant and compliant to open standards. The security measure shall address security at the port level, network equipment protection, network access protection through a combination of Virtual Private Network and Firewall, access to mission critical application and authentication mechanism used by mission critical applications. The performance and resiliency of the network

design shall provide a completely reliable network where equipment or physical links failure should not cause or disrupt the availability of the network. It is also mandatory for the network to be based on open standards that are established, as this will ensure that the network is always able to accommodate newer equipment with superior performance when available.

c. Protection against virus and trojan programs is extremely crucial to ensure minimal disruptions. Hence, there shall be anti-virus and content checking protection for all entry and exit points on the network. These security protections shall be installed at every interface that links to the network and also protect points of entry and exit for all LANs that hosts critical applications. Coordinate with the Cedar Rapids Airport Commission or their representative to utilize/integrate the airports existing enterprise anti-virus software (Norlem). The contractor shall be responsible for acquiring any additional licenses required for this integration. Submit details of additional virus protection program (i.e. manufacturer) to the Cedar Rapids Airport Commission or their representative for approval.
d. The network shall also be a fully resilient network and every measure shall be taken to ensure that the network availability is at its highest possible. In order to accomplish this provision of multiple source of electrical power supply, unlimited power protection, multiple routing of network cables inclusive of optical fiber, high availability network equipment and intelligent use of load balancing hardware shall be necessary.
e. The main network equipment for the network backbone shall have no single point of failure. There shall at least be two (2) network switches for the network backbone. There shall be multiple links between the network switches in a manner that failure in one (1) network link shall not disrupt the entire network backbone. Each link shall use link aggregation technology, which is also known as port trunking. Through link aggregation, multiple physical links shall be grouped to work, as one (1) logical link and loss of a physical link shall not disrupt the logical link.
f. The network cabling that form the main backbone shall not have the same cable-laying route and shall be routed a minimum distance of 15 feet apart from one another or separated as far as possible depending on the routing requirements, such as when these cables are entering or exiting an enclosure. This shall ensure that in the event of cable mishap all network cabling that forms the backbone will not be lost.
g. All network cabling (UTP and fiber optic) shall be carried in conduits and none shall be laid in an unprotected manner. This shall ensure that pests do not attack unprotected network cables.
h. All network cables should be clearly marked for easy connection tracing.
i. All network cables and patch cables shall be CAT 6A.
j. The BHSCC shall contract a third party to certify the signal strength of the all cabling to ensure that it meets the manufacturers specified requirements. The results of the verification shall be submitted to NFTA with all other empirical data. This testing shall occur prior to commissioning
k. Network Cabling:
    1.) Network cabling shall be installed by the Cedar Rapids Airport Commission approved vendor (if required) and the cabling shall be landed at a patch panel in a communications closet or other room designated by the Cedar Rapids Airport Commission.
    2.) Cabling shall be Ethernet 1000 BaseT with shielded twisted pair (STP), fiber optic or a combination thereof.

3.) 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.
4.) All connectors shall carry the same rating as the above cable.
5.) The network cabling plant shall be arranged in a star configuration with a 1000 BaseT switch in the center. Linear topology and Device Level Ring (DLR) topology may be used in appropriate conditions upon prior approval of the Cedar Rapids Airport Commission.
6.) All network 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.
7.) 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.

3. Low-Level Network
   a. For the BHS low-level network, use a Data Communications Highway (DCH) (or approved equivalent) as an industrial network to link together distinct, remote stations. Each station can consist of a PLC, a computer, or an intelligent RS-232-C interface module. The DCH shall provide high-speed communication and fast data acquisition. It is of rugged construction and well suited to a bagroom environment.
   b. The central trunkline of the DCH consists of adequate cabling capable of high-speed inter-communication between up to 200 devices via interface modules. The central trunkline shall have the capability of being up to 15,000' long, with the remote stations being as far as 100' away from the trunkline. The network shall display a high degree of noise immunity and rejection from electromagnetic and radio frequency interference (EMI/RFI).
   c. The DCH shall utilize a time-sharing method of communication control, thus eliminating the possibility of any single-interface module from dominating the network. The DCH shall allow for inter-communication of many types of ASCII devices, including:
      1.) PLCs
      2.) Maintenance terminals
      3.) Displays
      4.) Computers
      5.) Printers
      6.) Modems
   d. For the communication use a synchronous data stream from one interface module to another or to the primary BHC, and provide data transfer, message acknowledgments, and error recovery. The data shall refer to ladder rungs, register data, I/O status, and other information.
   e. Provide RS-232 D-shell connectors with captive retaining screws, D concentric twist-lock twin-axial connectors, or approved equipment. In any case, ensure that they provide easy connection to control and interfacing devices, and display a high degree of noise immunity and rejection from EMI/RFI.
   f. Ensure expansion can be accomplished by interface module-to-interface module linking with no limit.
   g. Use standard protocols with error recovery on all DCH transmissions for error checking.
   h. Place source/destination message routes in the command for each device requesting to communicate.

i. Furnish and install repeaters as required along the length of the communications highway to boost signal strength.
j. Install data ports at strategic points on the DCH to allow for system monitoring by personal computers.
k. At minimum, configure the DCH as a ring or provide redundant trunkline to ensure a single break in the trunkline does not render the system inoperable.
l. Network Architecture
    1.) An industrial Ethernet network shall link together and provide high-speed communications between distinct remote components of the outbound BHS. The network shall be capable of a minimum scan time of 5 ms and be capable of receiving, processing, and transmitting information within 50 ms or as required to facilitate baggage tracking. The network shall be capable of operating in a hot back-up configuration without any degraded functionality. The cables that form the main backbone shall not have the same cable-laying route and shall be routed a minimum distance of 15' apart from one another. This shall ensure that in case of cable mishap involving a single cable, the backbone will not be lost.
    2.) A communications bridge (e.g., ControlLogix Gateway or equivalent) shall be incorporated to provide interfacing between distinct communication interface modules. This bridge shall be capable of providing a link between the High-Level network BHS computers, the DCH, and the BHS control network (PLCs).
    3.) The network communication speed shall not be less than 5 Mbits/second. The network architecture should be designed to optimize data transfer between network devices to fulfill the required time constraints.
    4.) At minimum, shielded cable shall be used as the physical media to connect components of the network. Cable shall be capable of normal use in high noise environments. NEMA approved cable taps, connectors, and adapters suitable for use in a bagroom environment shall be used. Fiber optic cable should be used wherever possible.
    5.) Particular attention shall be given to voltage across network components. Refer to manufacturer's literature for exact range of voltage potential.
    6.) Appropriate power supply ratings shall be considered and applied for network components.
    7.) Repeaters shall be used as recommended by the manufacturer to maintain network communication speed and reliability.
    8.) The network architecture shall be designed to operate in conjunction with multiple processors. A minimum of 99 addressable nodes shall be available for communication. Communication with essential components shall be prioritized and used for reporting. The overall allowable length of the network cabling and remote components shall be at least 15,000'.
    9.) Network switch shall be the Cedar Rapids Airport Commission-approved HPE Aruba Networks switch.
    10.) No more than 32 I/O points may be assigned to each I/O module.

G. Maintenance Diagnostic System (MDS)
    1. The centralized MDS accomplishes the following:
        a. Displays and locates any system malfunction or failure through text or graphic simulation of the entire system and text display.
        b. Visually monitors the sortation system operational configuration, including conveyor flow direction, operational status (On/Off/E-Stop/Overload) and operating mode (e.g., cascade, indexing).
        c. Isolates location and cause of equipment failures.

d. Initiates fallback procedures.
e. Displays status of fire/security doors (e.g., open, closed, malfunctioning).
f. The MDS designed and installed shall be such that the Cedar Rapids Airport Commission's maintenance personnel can easily modify/add subsystems, display faults, and modify/add reports in case additional/modified subsystems are installed as part of any future project (i.e., very user friendly).

2. The diagnostic monitors shall identify the following conditions:
   a. E-Stop actuated (identify location)
   b. Motor overload tripped (identify location)
   c. Excessive actuation time of a conveyor sensor (other than in a normal queue/accumulation condition) to identify a probable jam condition or similar operational problem (identify location).
   d. Photocell failure (identify location)
   e. HSPD not in home position (identify location)
   f. System configuration (Mode of Operation)
   g. Operational status
   h. Failure of tracking encoder/pulse generator
   i. Over temperature warning for any computer or PLC cabinets
   j. Fire alarm system faults (if the BHS is tied to the fire system for local code compliance)
   k. PLC Failure (identify location)
3. System Graphic Screens
   a. The workstation shall have a minimum of two (2) 21" system graphic monitors or more as required that shall accurately and clearly depict the entire BHS.
   b. The graphics screen shall display, in near real time, dynamic pictorial format, the operational status of individual conveyors. Framed icons and specific conveyor IDs representing the conveyor sections shall change color according to the following scheme. This shall immediately highlight problem areas so the problems that arise can be corrected in the minimum amount of time.

Condition	Color
Normal Running Mode	Green
E-Stopped	Red
Fire Alarm	Flashing Red
Over Temperature	Flashing Red
Communications Loss (Individual Components)	Red
Jam	Yellow
Over-length/Over-height	Flashing White
Motor Overload	Blue
VFD Fault	Flashing Blue
Cascade Stopped	Magenta
Timed Out	Black
Out of Service	Brown
Failed at Home	Yellow
Divert All	Flashing Green
EDS Machine Failure	Red
BHS/EDS Fault	Flashing Red
Shaft Encoder Fault	Cyan
Added Bag Fault	Yellow
Fail Extended	Yellow

Condition	Color
Oddsize Running Mode – Forward or Reverse	Green with Arrow indicating direction of travel
Oddsize Pier/Conveyor Full	White

c. Graphics Manipulation
   1.) The system operator shall have the capability to zoom in on any portion of the BHS on any of the two graphics monitors.
   2.) Each portion of the BHS, split between the two screens, shall have predefined sectors for the purposes of the dynamic zoom function. Once selected, the individual conveyor shall be displayed in greater detail, with all functionality as described previously, such as color depiction of conveyor status. Textual descriptions of all related status shall be displayed.
   3.) In the zoom steps, the overall system normally displayed on that associated graphics monitor shall be shown on a reduced scale in the corner of the screen with the zoomed sector shaded for reference. This reduced display shall disappear upon return to the overall system display.
   4.) A single keystroke or mouse click shall return the operator to the previous zoom display.
   5.) Should one graphics monitor fail, the second shall display the entire system with all zoom functionality as described above by means of an operator-initiated command on the textual operator interface monitor.

d. Text Monitoring
   1.) It shall be possible to configure the MDS application at the BHS workstations to provide system status in text format.
   2.) Like the graphic screens, the text format shall use dynamic text to represent all component statuses. The fields next to the conveyor IDs described above change color and value according to the following scheme:

Condition	Color	Text Displayed
Normal Running Mode	Green	Running
E-Stopped	Red	E-Stopped
Fire Alarm	Red	Fire Alarm
Over Temperature	Red	Over Temperature
Communication Loss	Red	Communication Loss
Jam	Yellow	Jam
Missing Bag Jam	Yellow	Missing Bag Jam
Over-length/Over-height	White	Oversize
Motor Overload	Blue	Overload
VFD Fault	Blue	VFD Fault
Cascade Stopped	Magenta	Cascade Stopped
Timed Out	Black	Timed Out
Out of Service	Brown	Out Of Service
Failed at Home	Yellow	Failed Home
EDS Machine Failure	Red	EDS Failure
Fail Extended	Yellow	Failed Extended
Divert All	Green	Push All
Oddsize Forward Running Mode	Green (with arrow)	Running Forward
Oddsize Reverse Running Mode	Green (with arrow)	Running Reverse

Condition	Color	Text Displayed
Oddsize Pier/Conveyor Full	White	Full
Added Bag Fault	Yellow	Added Bag Fault
Shaft Encoder Fault	Cyan	Shaft Encoder Fault

e. Large Screen Graphics Display System
   1.) Provide at least 2 wall mounted flat screen monitors. The size of each screen shall be 40” minimum (measured diagonally) and will be adequate to ensure legibility of screen contents from all viewing locations within the control room. The monitors can be either burn-in resistant LCD with burn-in protection. The monitors shall display in real time, dynamic pictorial format, the operational status of the conveyors for the entire Terminal existing Domestic Outbound Baggage Handling Systems (no zoom capability).
   2.) It will be possible to display a single graphic image in each screen (4 different images). Provide all hardware, appropriate framing, necessary mounting provisions, software, and cabling necessary for the complete installation of these units, including, where applicable, suitable equipment enclosures.
   3.) The screen layouts presented by the monitors will be selected by Control Room personnel from any of the workstations and will be capable of displaying graphic or text images that are selectable and different than those displayed in the Workstation Monitors. It shall also be acceptable to provide a separate controller specifically for the large screen display in lieu of having any of the workstation monitors providing control.
   4.) The monitors shall be able to display either full system status screens (equivalent to a mimic panel sometimes used in large BHS control rooms), for instance displaying the graphics image from one of the Operator Workstation monitors.
   5.) The display quality shall permit easy identification of screen contents from all areas of the Control Room from which viewing is possible, under all conditions of ambient lighting of the Control Room environment.
      a.) All screen graphic layouts shall be able to be displayed on the monitors.
      b.) The images displayed by the Large Screen Display unit shall be computer generated, and therefore a hard-wired mimic displays shall not acceptable for this application.

f. Printers
   1.) All printed messages shall be date and time stamped. Fault Alarm messages provide date and time of occurrence and date and topic of fault clear. Reports provide date and time of printing. All times are in military time (e.g., one o’clock in the afternoon shall be printed as 13:00:00).
   2.) A high-speed laser printer for each Workstation is required for the printing of reports.
   3.) Provide a local means of troubleshooting faults at each printer.
   4.) A means to manually clear the printer queue (buffer) shall be provided.
   5.) All dates printed out shall be in the order of Month/Day/Year.
   6.) Submit the proposed printer(s) manufacturer’s literature to the Cedar Rapids Airport Commission or their representative for approval.

4. Provide the capability to archive all records of statistical data in a format approved by the Cedar Rapids Airport Commission). Provide means of restoring archived data and view it in the original report format that it was generated in. Operations personnel shall have the ability to retrieve the reports and print them from the redundant hot back-up computer without affecting in any manner any active data or operations.

5. The MDS shall have the capability to render individual subsystems, check-in counter conveyors, and conveyors of the baggage system available or unavailable.
6. The MDS display shall have an indicator to notify the operator that the display screens are not locked up.
7. The MDS shall be active for new equipment, as it becomes operational.
8. Diagnostics Reporting
    a. Realistic graphical representations shall be employed to portray the equipment with details up to the position of all equipment installed position, metering positions, settings, indication, lamps and alarm messages. Operation shall be accomplished by touchscreen commands.
    b. Automatic alarms will come up for the following events:
        1.) Fault of any redundant component
        2.) Fault of an individual conveyor (to distinguish overload and jam conditions)
        3.) Fault of a component of the control and monitoring system
        4.) Fault of a communication line of the control and monitoring system
        5.) Number of faulty conveyors pass the alarm threshold (2 variable thresholds)
    c. All alarm filters shall be user definable and easily changed through drag and drop interface with objects programming.
    d. All alarms shall be logged into the historical database and printed out in the alarm printer. The following events will be written in the log:
        1.) All fault of the BHS (overview and details)
        2.) All faults of the control and monitoring system
        3.) All control commands for the BHS
        4.) Changes of the system configuration
        5.) Changes of an alarm threshold
    e. Alarm Condition
        1.) An alarm condition is defined as the occurrence of a new situation, which requires acknowledgment by the operator. Thus, an alarm can be:
            a.) A logged equipment status has changed its status
            b.) An alarm monitoring inhibited point has timed out and returned to normal alarm processing
            c.) Another operator initiated or specified events
    f. Alarm Handling
        1.) The system shall manage the incoming alarms and warnings such that alarm/warning conditions are reported in a clear, concise and timely manner. The chronology of detection of alarm/warning conditions shall be retained and alarms shall be time stamped.
        2.) It shall be possible for an operator to inhibit the alarming or the logging of an alarm condition for an equipment status point. Limit violation alarming shall have dead bands in determining return-to-normal conditions.
        3.) It shall be possible to delay the alarming for a process variable for a defined time period. So, it shall be verified that an abnormal condition detected is permanent. The condition shall persist for a specified time period.
        4.) It shall be possible to automatically show the graphic of a selected alarm by selecting the alarm in the alarm list.
        5.) Maximum use of the display generator capabilities shall be made to annunciate alarms by means of color and flashing. A new alarm shall be displayed with a quick flashing in a specified color (0.5 second duty cycle) as an active alarm; but an acknowledged alarm shall have steady alarm color.
    g. Alarm List should contain all active alarms, acknowledged or unacknowledged in chronological order. It is updated automatically when a new alarm appears.

h. Alarm List of Unacknowledged Alarms should contain all unacknowledged alarms, active or already reset in chronological order. It is updated automatically when a new unacknowledged alarm appears.
i. An alarm line containing the latest alarms (between 2 and 4) shall always be visible on the operator workstations. It shall provide the same features as the alarm list.
j. An alarm category shall be a set of options on the processing of alarms, return-to-normal, and information events/messages.
    1.) Each alarm, return-to-normal and information event/message issued shall concern a single database item. For each item, the system database shall identify the alarm category for that item.
    2.) An alarm category specifies processing for each type of alarm, return-to-normal, informative event/message. The processing options shall include:
        a.) Insert the message text in the chronological history file
        b.) Print the message on alarm printer
        c.) Acknowledgment required for this message
        d.) Generate an information event message on acknowledgment
        e.) Sound the audible alarm at operator workstation
    3.) Each alarm category shall also specify the conditions under which an alarm or return-to-normal message shall be removed from alarm display lists. The alarm removal options shall include:
        a.) Remove the alarm message upon acknowledgment
        b.) Remove the alarm message if acknowledged and the point returns to normal
        c.) Remove the return-to-normal message when it is acknowledged
    4.) It shall be possible to generate group alarms. A group alarm is the linkage of several individual alarms to a common alarm.
k. Alarm Reporting Requirements
    1.) The alarm reporting capabilities include:
        a.) Alarms shall be time stamped and logged into the alarm and event logs in chronological order.
        b.) Unacknowledged point alarms and return-to-normal messages shall be presented in the alarm section of the operator workstations.
        c.) The appropriate alarm fields in the graphic displays shall flash or be clearly marked as an alarm condition whenever they are displayed.
        d.) Point alarms and return-to-normal messages shall be added to the relevant latest alarm display lists. If the alarm lists are currently being displayed, they shall be dynamically updated with the alarm message. Colors shall be used to highlight unacknowledged messages.
        e.) Point alarms can be defined to sound an audible alarm at the operator workstations.
        f.) Point alarms can also be configured to send e-mail notification to the operator (user configurable)
l. Alarm Acknowledgment
    1.) The acknowledgment of either an alarm or return-to-normal message shall perform several functions, including:
        a.) Acknowledgment shall prevent the alarm message from appearing in the alarm section of the operator workstations.
        b.) Acknowledgment shall cause the symbols and messages associated with the alarm to stop flashing or change appearance on all displays on which they appear and on the map panel. They shall continue to appear in an

alarm condition by changed color and shape unless the alarm signaled a return-to-normal.
c.) Acknowledgment shall cause the silencing of the audible alarm.
d.) Return-to-normal messages shall be removed (not displayed) from the latest alarm display lists.
e.) All workstations shall show an acknowledged alarm after that alarm is acknowledged from any workstation location.

2.) The acknowledgment of either an alarm or return-to-normal message shall be performed in several ways, including:
a.) Sequentially as alarms appear in the alarm section of the operator workstations.
b.) Individually, by selecting then acknowledging the symbol or message for the individual alarm on the appropriate operator display or alarm display list. If more than one alarm is active for the same process variable, then all these alarms shall be acknowledged together.
c.) All alarms shown on a latest alarm display list with a global acknowledgment command.
d.) Individually within the graphic operator displays

m. Alarm Inhibiting
1.) The inhibiting of either an alarm or return-to-normal message shall perform several functions, including:
a.) An inhibited point shall be processed as usual, its value in the database reflecting its current value. The flag for the point shall show it is alarm inhibited.
b.) The appropriate displays shall show the current value.
c.) Alarm conditions caused by the point shall not be logged.
d.) The audible alarm shall not be sounded.
e.) The symbol for the alarm shall not flash on the graphic display.
f.) The alarm message for the point shall not appear on the latest alarm display lists.
g.) There shall be a special monitoring inhibited alarm summary that shall list all points that have been inhibited.

2.) The inhibiting of either an alarm message shall be performed individually, by selecting the symbol for the individual alarm on the appropriate operator display or alarm display list.

n. The graphics screens for every application contain context sensitive online help for every function. Both operation and displays are designed for personnel who lack computer training. HTML type help navigation of related topics shall be provided. The operator can call up detailed information from the database by clicking the mouse on the lighting elements in the graphic image or by entering search codes on the keyboard. The detailed information is displayed in list and mask form.

o. The contractor may be permitted access by the Cedar Rapids Airport Commission or their representative from a remote location to perform diagnostics on the application software, check on systems configurations and integrity of database.

p. When a request is made by the operator to retrieve a different alphanumeric or graphic operator display or window, the new display shall appear on the operator workstation displays within two (2) seconds including update of 50 dynamic data fields based on the implemented database.

q. Hardware reliability information of all major individual hardware for this project, including the mean time between failures (MTBF) and its standard deviation for all the equipment are required for all this equipment.

H. Maintenance Information System (MIS)

1. The statistical information gathering and report generation capability to display and print certain defined information is essential to the successful operation of the system.
2. Use the BHC system to run this application.
3. Provide six (6) levels of usernames with password protection against unauthorized access to the system:

Level	User	Access
Level 1	Handling Agent	Ability to view, print and achieve reports regarding passenger and flights handled by the agent logged on
Level 2	Operator	Access to normal operational modes
Level 3	System Engineer	Access to all operational modes
Level 4	System Manager	Access to all operational modes plus ability to change software
Level 5	System Administrator	Access to all operational modes plus ability to change software and assign usernames and passwords
Level TSA	TSA Manager	Access to all TSA only operational modes

4. Provide a standard Report Generator to permit compilation of additional statistical reports. Requires Level 4 and 5 protections for use of this function.
5. Use BHC terminal(s) (keyboards, monitors, and printers) as I/O devices for the MIS.
6. Employ a user-friendly Human Machine Interface (HMI) with menu-driven routines to permit access to the system.
7. The MIS shall allow the Cedar Rapids Airport Commission to easily modify/generate/develop O&M reports to meet their own needs.
8. Provide ability to view all reports on screen as well as in printed or file format (CSV and PDF).
9. Provide ability to save, in buffer storage, and print on a first-in, first-out basis up to 20-flight closeout reports or end of day reports in case the printer is busy at any given time.
10. Provide ability to produce daily, hourly, weekly, monthly, quarterly, and annual reports as well as reports based on a user defined interval.
11. Provide a means to reset all non-SSI statistics and counters. This shall be accessible at levels 3, 4, and 5.
12. Provide a means to reset all SSI statistics and counters. This shall be accessible at level TSA.
13. Provide the capability to archive all records of statistical data in an acceptable physical media format.
14. Provide the ability for the sort allocation planning to be accomplished in Gantt Chart graphical presentation format.
15. SSI such as the following EDS and ETD performance parameters/items shall only be released to TSA Manager Users (i.e., Level TSA):
    a. Screening Alarm %
    b. Time to Decision
    c. EDS Alarm Rates
    d. OSR Alarm Rates
    e. ETD Alarm Rates
16. Generate the following reports (examples provided in Appendix A):
    a. EDS ID Report: Printout of all PLC ID numbers during the operational period.
        1.) This report shall be sortable by:
            a.) Ascending/descending dummy #
            b.) Ascending/descending time (any time field)
            c.) Baggage type

2.) Provide the ability to search the report for any text in any field.
3.) Print and display the report on demand.

b. Immediate Equipment Malfunction and Correction Report: Automatic printout upon detection of each equipment malfunction and each subsequent correction.
   1.) This report is required for the following equipment failures:
      a.) I/O fault
      b.) DCH failure
      c.) Motor failure
      d.) Photocell jam
      e.) Tachometer failure
      f.) MCP or field device failure
      g.) Door Fault
      h.) E-Stop
      i.) Diverter failure
      j.) Over-length
      k.) Over-height
      l.) Conveyor full
      m.) Missing Bag
      n.) Unexpected Bag
      o.) Unknown Bag
      p.) Motor overload
      q.) Pier failure
      r.) EDS machine failure
      s.) PLC failure
      t.) Computer to computer communication lines not linked
      u.) Host computer communication lines not linked
   2.) Print and display upon detection and correction of the malfunction.

c. Equipment Operational Summary: Printout, by subsystem of photocell and sorter statistics and summary of individual device malfunctions printed in Equipment Malfunction and Correction Report.
   1.) Print and display the report on demand.

d. Computer and PLC Status Report: Print out of which computer is on-line/offline and the computer status as well as which PLC is online/offline and the PLC status.
   1.) This report will be dynamically retrieved from the PLC Data tables.
      a.) Print and display the report on demand.

e. Equipment/System Malfunction Summary: Printout, by subsystem, of a summary of the Equipment malfunction and Correction Reports.
   1.) Print and display the report on demand.

f. Load Balancing Report: Printout of individual subsystem loading for the operational period. Time interval for current throughput figures is selectable from 1 minute to 24 hours.
   1.) Print and display the report on demand.
   2.) Load balancing report will report for the following conveyors, at minimum:
      a.) Ticket counters
      b.) All input conveyors
      c.) EDS machine queues
      d.) Runouts

g. Runout Report: Printout of default pier/make-up unit statistics for each subsystem. Time interval for current throughput figures is selectable from 1 minute to 24 hours.
   1.) Print and display the report on demand.

h. EDS Report: Print out of which EDS machine (by EDS serial number and EDS conveyor ID) is online/offline and the machine status:
   1.) This report will be dynamically retrieved from the PLC data tables and EDS interface.
      a.) Print and display the report on demand.
      b.) All EDS availability shall be cumulative for the selected time period.
      c.) Jam and lost in tracking counts shall include only jams and bags lost in tracking that involve EDS conveyors.

i. Day End Report: Printout of throughputs, and outputs. Automatically printed at the end of the operation period. Also provide a means to print/e-mail report on demand or at selectable intervals.
   1.) Print email, and display the report on demand.

j. Bag Data: Consisting of the following items (Assuming this information is available to the BHS):
   1.) BHS tracking ID number for each bag (shared by BHS and EDS)
   2.) Bag type (out-of-gauge or in-gauge)
   3.) Screened by EDS machine with machine serial number
   4.) Time stamped when entering the EDS machine or time stamped when out-of-gauge bags are identified
   5.) Level 1 screening status
   6.) Time stamped at Level 1 screening decision
   7.) Level 2 screening status
   8.) Time stamped at Level 2 screening decision. Not all EDS machines have the capability to time stamp at both Level 1 and decisions – Confirm with EDS OEM.
   9.) Time stamped when delivered to CBRA unload conveyors
   10.) Time stamped when removed from CBRA unload conveyors
   11.) CBRA ETD screening station number (if available to the BHS)
   12.) Time stamped when resolved by CBRA screening station (if available to the BHS)

k. EDS Statistics: Consisting of the following items (The following statistics shall be considered SSI and treated accordingly) (*Assuming this information is available to the BHS*):
   1.) Number of bags alarmed by specific EDS machine
   2.) Number of bags cleared by specific EDS machine
   3.) EDS machine faults (if known)
   4.) EDS machine hours of operation
   5.) Start time of operation
   6.) Start time of fault
   7.) End time of fault
   8.) End time of operation

l. Critical Tracking PEC: Immediately upstream and downstream of each EDS, prior to and after each tracked divert point, and at the last tracked photocell entering the CBRA, the BHS shall report the following for each activation of these photocells:
   1.) Bag ID
   2.) Bag disposition
   3.) Time, in hours: minutes: seconds
   4.) Totals for each disposition type

m. Photocell Tracking Statistics: Consisting of the following items:
   1.) Total number of bags seen at each photocell
   2.) Total number of missing bags at each photocell

3.) Total number of unknown bags at each photocell
4.) Total number of jams at each photocell
5.) Total number of missing bag jams at each photocell

n. Tracking Statistics: Consisting of the following items:
1.) Total number of bags in tracking
2.) Total number of bags lost in tracking
3.) % Total number of bags lost in tracking
4.) Count of lost in track at each device location

o. CBRA Area Statistics: Consisting of the following items (The following statistics shall be considered SSI and treated accordingly) (*Assuming this information is available to the BHS*):
1.) Total number of bags received in CBRA
2.) Total number of bags cleared by CBRA
3.) Total number of bags per CBRA ETD screening station
4.) Bag time in/out at each CBRA ETD screening station
5.) Number and type of alarmed objects per bag

p. Time in System Statistics: Consisting of the following items (*Assuming this information is available to the BHS*):
1.) Minimum/Maximum time bag was in system
2.) Average time bag was in system
3.) Average time bag was in system by screening level

q. Daily Report Standards per PGDS, Appendix A: Consisting of the following items:
1.) Daily CBIS summary report
2.) Daily CBIS bag volume report
3.) CBIS executive summary report
4.) PEC tracking reports for all PECs within the security tracking zone, which include:
a.) Total bag count
b.) Total missing bag count
c.) Total unknown bag count
d.) Total purged bag count

I. Baggage Control Room Equipment
1. Submit all BCR tenant finishes required for supporting the BCR equipment. At minimum, the submittal shall include:
a. Proposed layout (pending the Cedar Rapids Airport Commission or their representative approval)
b. Phasing layouts
c. Final layouts
d. Required completion date
e. Estimated combined heat output of computer equipment
f. Power requirements (including UPS sources)
g. Data transmission and communication drops
h. Clear heights
i. Lighting and outlet requirements
j. Fire protection requirements
k. Architectural requirements
l. Coordinated scheduled equipment delivery and installation dates
2. Provide readily available industrial equipment suitable for the purposes intended and functionally reliable in a BCR environment.

3. Submit to the Cedar Rapids Airport Commission or their representative for approval, quantities and manufacturer of proposed equipment. At minimum, unless otherwise approved, the BCR shall contain the following:
    a. Workstation computers and related equipment (such as printers, monitors, and keyboards) as described elsewhere loaded with application software for system monitoring and access system statistics.
    b. Uninterruptable Power Supply(s) (UPS) shall be provided. Minimum protection time shall be thirty minutes.
    c. Provide all interfacing conduit and cabling between equipment.
    d. All equipment containing memory shall be backed up by an approved external source (e.g., flash drive, offsite-backup).
    e. The back-up source shall have the ability to download all computer equipment with back-up memory programs.
    f. Instructions shall be provided to aid operator in the download of memory back-ups.
    g. Coordinate with the Cedar Rapids Airport Commission or their representative to utilize/integrate the airports existing off-site backup software (Veem). The contractor shall be responsible for acquiring any additional licenses required for this integration.

J. Security
1. Provide a secure computer control environment for the BHS. To achieve this, the network operating system shall provide multiple levels of password access appropriate for the level and authorization of staff, workmen or operators working on the BHS.
2. Different passwords are used for different access combinations by:
    a. Personnel group: Handling agents, apron/baggage supervisors, maintenance staff, control room operators, the Cedar Rapids Airport Commission’s staff, maintenance contractors, manual encoding operators, or TSA Managers.
    b. Different operating modes: Operations, monitor, training/simulations or configure.
    c. Modes of access: From control room and back-up sites via Ethernet lines.
3. Global commands with a large impact on operations (e.g., invocation of fail-safe to BHS equipment) will require higher-level passwords.
4. Operator personnel shall monitor all security violations through system printer and alarms since operations is manned round the clock although group or operational staff might not have very high password levels. All security violations will be logged by the system. Security violations shall include the following as a minimum:
    a. Unsuccessful logins
    b. Expired password date
    c. Failure to logout
    d. Attempting to gain access to an unauthorized user level
    e. Operator initiated event
5. Under fail-safe conditions, BHS shall default to a pre-defined state (Normally ON). Provide details of how the forced fail-safe mode is being invoked for the Cedar Rapids Airport Commission or their representative’s approval.
6. Provide a test mode to allow tests to be carried out offline on any software modifications carried out before saving the modified program into the live systems.
7. All the system workstations shall have identical functional capabilities. Selective access to the different functional capabilities shall be controlled with login IDs and passwords.
8. The password system shall have at least six (6) levels of security clearance, including:
    a. Handling agent
    b. Operator
    c. System engineer
    d. System manager
    e. System administrator

f. TSA manager

9. These different levels of security clearance will differ in the access to the various system functions regarding system operation and configuration. Differentiation shall be at least performed for the following functions:
   a. Display modification
   b. Database modification
   c. Report modification
   d. System configuration
   e. Report display
   f. Command initiation
   g. Operator actions
   h. Access to operating system
   i. Application programs
10. Security shall be performed at the access level to a menu, configuration dialogue, or command window.
11. A user level will be assigned to every person who is given access to the system. The user shall be required to login to the system through the various interfaces. All logins shall be recorded in the system event log. Unsuccessful logins shall raise an alarm. The system shall maintain a security database of the number of allowable unsuccessful logins and password expiry dates, which is maintained by the security officer. This feature shall allow identification of the operator responsible for all operations executed from the specific workstation or interface.
12. If, after eight (8) (configurable) hours an operator has not logged off, an alarm message shall be sent to that operator workstation until that operator is logged off. This prevents login from extending across operator shift changes.
13. Any system event that is operator initiated shall be recorded with the ID of the operator and the workstation it was issued from.
14. Access to the security configuration shall only be allowed to the user with the highest level (i.e., system administrator).
15. Level of access by vendor dial-in shall be to the Cedar Rapids Airport Commission or their representative's approval.

K. Software Design Requirements
   1. Provide all software proprietary information to the Cedar Rapids Airport Commission upon final acceptance, but this shall not release the contractor of responsibility for any technical defects (bugs) that occur with the software. Submit to the Cedar Rapids Airport Commission or their representative a staffing schedule (supervisors and software engineers) to accomplish the specified work.
   2. For all software unique to the BHS and not commercially available the as-built deliverables shall include, at minimum, all of the information necessary to make revisions in the software program applications for the BHS for changes or expansions or extension of the BHS, such as functional, performance and interface requirements; descriptions of the supervisory, control, and operating software; source listings; flow charts; configuration control documentation; and programmer and user manuals incorporating appropriate modification and control procedures, including the name of any sub-contractor used for preparation of this software.
   3. For all commercially available software used in the BHS, the as-built deliverables shall include all the documentation that is available from the supplier of such software. Copies of all programmer and user manuals and other similar material shall be provided to the Cedar Rapids Airport Commission along with a complete and fully documented listing of all software programs.

4. All systems, file servers and workstations shall be equipped with continuously running virus detection software to prevent virus infection. Coordinate with the Cedar Rapids Airport Commission or their representative to utilize/integrate the airports existing enterprise anti-virus software (Norlem). The contractor shall be responsible for acquiring any additional licenses required for this integration.
5. At minimum, adhere to the following software architecture and provide all associated hardware required to accomplish intended functions of the BHS:
    a. Human Machine Interface (HMI)
        1.) Shall provide a user-friendly interface.
        2.) Shall be of the multi-tasking operating system that can control multiple programs at once.
        3.) Shall incorporate object linking and embedding (OLE) technology, or similar.
        4.) Shall have the ability of running a software program that will automatically monitor the wellness of all installed software on the BHS workstation computers. Provide the capability of automatically initiating a self-test routine from any/all the installed computers.
    b. Networking/Communication
        1.) Shall be compatible with the data communication highway(s) (DCH) protocols.
        2.) Shall provide fast interfacing between all communication/control tiers.
    c. Utility
        1.) Shall aid in the linking of various applications (programming).
        2.) Shall generate, edit and provide tangible maintenance diagnostic and management information system reports.

L. Software Confidentiality
1. Do not disclose, or use in future work, any proprietary operation information of the Cedar Rapids Airport Commission facility, or any information considered a trade secret by the Cedar Rapids Airport Commission, which was obtained during the project work.
2. Except as otherwise required by law, the Cedar Rapids Airport Commission will not publicly disclose trade secrets or proprietary software information obtained from the contractor in the performance of the contractor's obligations pursuant to this Contract. To the extent it is necessary to provide contractor's trade secrets or proprietary software information to operate or maintain the BHS, the Cedar Rapids Airport Commission, by Contract, will prohibit the Cedar Rapids Airport Commission's O&M contractor from publicly or privately disclosing the contractor's trade secrets or proprietary software information.
3. Any information that the contractor believes is a trade secret or proprietary software information shall be specifically identified and marked as such. Blanket identification is not permitted.
4. In case the Cedar Rapids Airport Commission receives a request for the contractor's specifically identified trade secrets or proprietary software information, the Cedar Rapids Airport Commission will notify the contractor and the contractor will be required to fully defend, in all forums, the Cedar Rapids Airport Commission's refusal to produce such information. Otherwise, the Cedar Rapids Airport Commission will make such information available.
5. All software upgrades and bug fixes for proprietary software shall be provided during the one-year warranty period.

M. Source Code
1. All software shall be delivered with well-commented source code in addition to the executable version. Software shall be delivered in both hard copy and machine-readable formats on a media acceptable to the Cedar Rapids Airport Commission.

2. Computer disaster recovery disks (or similar media) shall be provided to permit the re-installation of all required data/software on all computer equipment modified under this project (e.g., servers and workstations from a ‘cold restart’/complete restoration on a new server/workstation computer.
3. The contractor may propose a non-disclosure agreement.
4. The Cedar Rapids Airport Commission shall have permission to use the software as necessary to support operations at Eastern Iowa Airport, Cedar Rapids, Iowa once obtained from the contractor.
5. A back-up copy of the configured system software shall be provided in an approved media. All original distribution software shall be delivered with an installable back-up.

END OF PART 2

PART 3 - EXECUTION SPECIFICATIONS

3.01 PREPARATION

A. General

1. Verify conditions in the field prior to start of work. If unanticipated electrical or other elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit written report to the Cedar Rapids Airport Commission in accurate detail. Pending receipt of directive from the Cedar Rapids Airport Commission, rearrange work schedule as necessary to continue overall job progress without undue delay.
2. Cover and protect systems and equipment from damage and soiling during installation, removal or alteration work, including equipment to be salvaged and stored. Erect and maintain dust-proof partitions and closures to prevent spread of dust or fumes to occupied portions of the building.
3. Obtain and pay for all CID security badges, permits, inspection fees, and certificates relative to all phases of the BHS construction.
4. Provide supports or bracing to prevent movement, settling, or collapse in which an area designated for removal is adjacent to a system designated to remain. If safety of system appears to be endangered, cease operations and notify the Cedar Rapids Airport Commission immediately. Take precautions to support endangered work until determination is made for continuing operations.
5. Locate, identify, stub off, and disconnect electrical system services that are not indicated to remain. Provide bypass connections to maintain continuity of electrical service to remaining system. Obtain permission and provide advance notice to the Cedar Rapids Airport Commission if shutdown of electrical service is necessary during changeover.

3.02 WORKMANSHIP

A. General

1. Perform installations, removal, and alteration work as shown within the specified BHS rights-of-way, with due care, including support and bracing. Be responsible for damage, which might be caused by such work, to any part of the existing system.
2. Perform new work in accordance with applicable technical sections of the specifications. Where cutting and new work involve the exterior building envelope, consult the Cedar Rapids Airport Commission to ascertain if existing guarantees, warranties or bonds are in force and execute the work so as not to invalidate such agreements.
3. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building(s).
4. Materials installed, whether provided by the contractor or not, shall be installed in a neat and workmanlike manner. Particular attention shall be paid to manufacturer’s instructions as to installation procedures.
5. Protect the employment and places of employment of each of his employees engaged in the construction work by complying with the appropriate standards as prescribed by OSHA.
6. Take necessary precautions to keep noise producing operations (e.g., impact hammering, Carborundum sawing, compressed air machinery) to a minimum. Select equipment of a quieter nature than others and enclose areas of operation with acoustical screens and partitions or other means necessary to properly reduce noise.
7. Equip motorized equipment with mufflers or other types of sound control and blanket equipment with acoustical materials.

8. Locate installation, and alteration equipment safely so that no part thereof shall endanger normal airport operations, including runways, terminals, terminal buildings, approach ways, and power utility, lighting and communication lines.
9. Promptly remove debris to avoid interference with system operations.
10. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
11. Ensure that the standard of work and materials throughout the project shall be of first-class quality and workmanship in every respect; the Cedar Rapids Airport Commission will not accept workmanship, which for any reason, is otherwise.
12. Ensure that all equipment, components, and materials are free from defects and that all equipment is manufactured and installed in accordance with the best commercial practices consistent with the intended design and usage. Do not supply used equipment, whether refurbished or reconditioned, unless indicated in the specifications and drawings or without the express approval of the Cedar Rapids Airport Commission or their representative.
13. The Cedar Rapids Airport Commission or their representative shall reserve the right to inspect any conveyor component at the contractor's factory prior to shipment of said components. Coordinate with the Cedar Rapids Airport Commission or their representative, fabrication of any components the Cedar Rapids Airport Commission or their representative requests to inspect such that said components are fully assembled and available for inspection by the Cedar Rapids Airport Commission or their representative at the previously arranged time of the factory visit.

3.03 FABRICATION & INSTALLATION SPECIAL CONSIDERATIONS

A. General
1. Design equipment to meet the requirements of handling airline baggage. Fabricate all components such that projections, welds, sharp corners, and transfer points that might cause damage to various types of baggage are eliminated. Guard bottom glides on cases, strings, tags, straps, bag handles, and destination tags against damage on side guards, transfer points, and all surfaces that baggage might contact on the conveyor system.
2. Coordinate all ongoing site work and with concurrent airport/airline operations.
3. Take into effect any long lead procurement items and take the necessary actions required to complete any installation in the ceiling space.

3.04 DELIVERY, STORAGE, HANDLING, AND ONSITE RESPONSIBILITIES

A. Delivery, Storage, Handling
1. Assume responsibility for the receiving, unloading, storage, protection, security, and distribution of all material delivered to the site associated with this Contract.
2. As necessary for the work, provide flagmen, erect proper barricades and other safeguards, and post danger signs and other warnings as warranted by hazards and existing conditions.
3. Assume responsibility for receiving, storing, handling, setting, and connecting all equipment required for the BHS installation.
4. Furnish, install, and maintain adequate protection against weather to preserve his work, materials, equipment, apparatus and fixtures free from injury, pilferage or damage.
5. Furnish to the Cedar Rapids Airport Commission, on demand, Bills of Lading for all equipment being shipped to the work site. Identify on each Bill of Lading each component and assembly involved, the equipment items to which they belong, the date and time of pick-up and the expected date and time of delivery to site. The shipping of such material

shall involve proper identification of items, proper packing and proper means for unloading them at the work site.

B. Onsite responsibilities
   1. General
      a. Erect all temporary barriers and barricades to separate work areas from areas of public access, if applicable.
      b. Provide exhaust fans (e.g., HEPA filter) to limit fumes/odors from welding, metal cutting and painting if the work being carried out is in an occupied/operational area.
      c. Coordinate with any interfacing, ongoing site work.
      d. Provide adequate portable office facilities, communication, equipment, and locker rooms for field force.
      e. Pay all costs of rental, installation, use and removal of accommodation and communication equipment.
      f. Furnish shop drawings for any substitutions of equipment specified herein or shown on the contract drawings. During the progress of the job, revised drawings may be issued. Ensure all work is performed based on the latest drawings issued.
      g. Clean and maintain workspaces, travel routes, and any other affected work areas, including:
         1.) Remove all construction refuse and discarded materials daily.
         2.) The burning of waste material is prohibited. Remove and dispose of scrap and waste material in accordance with applicable laws, codes, regulation ordinances and permits.
         3.) Be responsible for all fines received for failure to maintain or perform cleaning, and all costs due to damages directly caused by this contractor's work.
         4.) Provide hoisting material for rubbish removal.
      h. Be cognizant that equipment and lay down areas for the work might/will require relocation as directed by the CM or the Cedar Rapids Airport Commission.
      i. Be responsible for any employee parking and any site transportation that might be required to/from the construction site.
      j. Be responsible for any escort service required for the transportation of materials and employees on the ATO side of the facilities.
      k. Enforce the Cedar Rapids Airport Commission's instructions, laws, and regulations regarding signs, advertisements, fires and the presence of liquor and firearms by any person at the job site.
      l. Provide the services of a competent field superintendent during erection, wiring, testing, and correction of any discrepancies occurring during the Final Acceptance period.
      m. Smoking shall only be allowed in areas as designated by the Cedar Rapids Airport Commission.
   2. Electrical Work
      a. Provide the necessary conduit, wiring and other electrical components to complete the electrical installation from PDPs, to the equipment and be responsible for all electrical interconnections within the equipment and system.
      b. Provide all labor, materials, equipment and service necessary for and reasonably incidental to proper completion of all electrical work including electronic controls as required for the proper operation of the system as detailed herein. Provide within the design standardization of components, function and maintenance procedures.
      c. Drawings and specifications are considered to supplement each other. Work specified but not shown, or shown but not specified, shall be performed or furnished as though mentioned in both specifications and drawings.

d. Provide and install as required, at no additional cost to the Project, minor items, accessories or devices reasonably inferable, as necessary, to complete the electrical installation.
e. Refer all conflicts between the requirements described herein, drawings, and applicable codes to the Cedar Rapids Airport Commission or their representative for clarification before proceeding with the affected portion of the installation.
f. Obtain and pay for all permits, inspection fees, and certificates relative to the electrical work. Deliver all certificates and letters of approval to the Cedar Rapids Airport Commission upon completion of the work.
g. Locate all electrical equipment as shown in the contract drawings. However, field conditions shall be checked to determine exact locations and avoid interference with other trades. The Cedar Rapids Airport Commission or their representative must approve all deviations from the contract drawings.
h. At no additional cost to the project perform any reasonable location adjustment of electrical equipment requested by the Cedar Rapids Airport Commission prior to installation.
i. At no expense to the project, correct work improperly installed due to lack of construction verification.
j. Install materials and components in a neat and proficient manner. Particular attention shall be paid to manufacturer's instructions as to installation procedures.

3.05 INSTALLATION

A. General
1. Modification of the BHS shall be in strict compliance with the construction drawings to be prepared in compliance with this specification (drawing requirements detailed in Part 1 herein) and the contract drawing package
2. Assume responsibility for all interfaces between the BHS and the facility. Check the as-built condition of the facility as defined in drawings and as confirmed by site inspection prior to fabrication, installation or removal of any BHS equipment. The system arrangement and layout shall ensure equipment alignment and clearance when installed in the facility.
3. Provide all equipment required to complete the total system. Furnish all tools and necessary equipment for the performance of the installation tasks and exhibit sufficient planning to ensure their availability at the job site as required by the workflow. The Cedar Rapids Airport Commission will not furnish tools, forklifts, or erection equipment.
4. Staff the project to ensure timely completion. Accelerate construction as required if schedule milestones are not met.
5. Provide all supports, anchors and any other items necessary to facilitate the complete installation and safe operation of all equipment and components.
6. Where equipment is installed in an operating facility, provide a construction schedule to the Cedar Rapids Airport Commission or their representative for approval that will minimize interference with normal operations.

B. Anchoring
1. Firmly anchor all equipment and structures to the floor or building structure where permitted, subject to approval, by the Cedar Rapids Airport Commission or their representative. Align, level, and finish grout as required.
2. Anchor impact protection with a minimum of four 3/4" diameter epoxy adhesive anchors, each having a minimum tensile load of 7000 lb, a minimum shear load of 4300 lb, and a minimum embedment of 5-1/16”, unless otherwise stated on the specification drawings. Baseplate shall be Grade 36 steel and supported by a 1/4” thick (minimum) structural non-shrink grout with a minimum compressive strength of 2000 psi.

C. Fasteners
   1. Protect all fasteners (e.g., nuts, bolts, screws, and setscrews) against accidental loosening with lock nuts, lock washers, jam nuts, or other suitable means, and against corrosion by plating or the use of corrosion resistant materials such as zinc plating, cadmium plating, or stainless steel.
   2. Provide stainless steel fasteners in public areas.

D. Shaft Mounted Components
   1. Mount all shaft mounted components using keys, splines, or equivalent, with positive retention devices.

E. Welding
   1. Nationally certified welders shall perform all welding, and all welding shall be in strict compliance with local and national codes. Provide copies of certificates verifying that the welder(s) are nationally certified to the Cedar Rapids Airport Commission or their representative.
   2. Only compressed natural gas (CNG) and electric welders shall be used.
   3. Connecting welding equipment to any MCP power supply shall not be acceptable.
   4. Before approving any cutting or welding operation, a fire safety supervisor or appointee shall inspect the work area and confirm that the following indicated precautions have been taken to prevent fires:
      a. Ten-pound ABC dry chemical fire extinguisher to be kept onsite.
      b. No flammable liquids permitted within 50’ of work.
      c. Floors swept clean of combustibles.
      d. All wall and floor openings covered.
      e. Covers suspended beneath work to collect sparks.
      f. Opaque screens placed between work and spectators.
      g. Fire watch is required to observe all work and shall remain onsite for a minimum of 30 minutes after completion of work.
      h. Notify the Cedar Rapids Airport Commission prior to beginning work.

F. Maintenance Access
   1. Where walls immediately adjacent to conveyor equipment affect maintenance access, advise the Cedar Rapids Airport Commission or their representative of the location and size of the wall opening that needs to be developed to permit access to drive components, bearings, and other equipment that would normally be inaccessible because of the wall.

3.06 CONTROL REQUIREMENTS

A. Control Stations
   1. Mount controls consisting of pushbuttons, selector switches, and indicator lights in control stations. All controls shall be grouped to minimize the number of operating points throughout the system. In the application of a single control for a specific function, pushbutton stations may be employed.
   2. Position control stations so as not to impede access to the equipment for servicing.
   3. Mount all control stations located in public areas flush to the equipment and equip with stainless steel cover plates. Control stations located in the view of the public shall not be mounted on the top surface of the conveyor front cladding.
   4. Locate control stations to be clear of normal vehicular and personnel traffic lanes. Install guards to prevent inadvertent actuation where this cannot be accomplished.
   5. Control stations shall contain the appropriate control elements such as pushbuttons, selector switches, and those indicator lights that will augment operations.

6. Control station functions shall be identified in English using elementary concise terms supplemented by graphic symbols. All identification plates shall be mechanically affixed to the control station's face.
7. Control stations shall conform to the environmental requirements specified herein.
8. E-Stop pushbuttons, which disrupt electrical control power, shall be employed where an emergency might require immediate shutdown. Where more than one E-Stop pushbutton is used in any circuit or subsystem, only the indicator lamp in the activated E-Stop pushbutton shall be energized. Actuation of any E-Stop shall be announced on the respective status monitoring system.
9. Indicator lights, especially outside the facility, shall not be affected by extraneous light, and shall be clearly visible in all lighting conditions.
10. Control elements (e.g., switches, pushbuttons, handles) shall be selected for ease of operation in an industrial bagroom environment.
11. Control elements (e.g., switches, pushbuttons, indicator lights, bulbs) shall be easily replaceable and reasonably protected from physical damage.
12. Freestanding control stations shall be mounted on extremely rugged and braced pedestals with large firmly anchored base plates. For stanchions in public areas (e.g., check-in locations such as ticket counter, curbside, recheck, and oversize load conveyors), the stanchions shall be stainless steel. The design shall account for extraneous loading and generally abusive conditions.
13. Provide independently anchored impact protection wherever control panels, control consoles, or control stations are exposed to work area traffic.

B. Photocell Functions
   1. At minimum, provide photocells to perform the following functions:
      a. Cascade Stop
      b. Jam Detection
      c. Over-Height Detection
      d. Over-Length Detection
      e. Baggage Tracking
      f. Missing Bag Jam
      g. Merge and Priority Control
      h. Auto-Start
      i. Auto-Stop
      j. Indexing Control (Accumulation)
      k. HSPD Timing
      l. Fail-safe
   2. Combine photocell functions wherever possible provided proper operation of each circuit is maintained.
   3. Cascade Stop
      a. Locate a discharge end sensor photocell within 1' of the discharge ends of all straight conveyors and 6"on power turns and queue conveyors (or an appropriate distance from the discharge end to ensure that the piece of stopped baggage does not transition/stop on the downstream conveyor) so that the center of the photocell beam is approximately 2.5" or 3" above top of the conveyor belt to provide the signal for operation of cascade stop circuits.
      b. Should a downstream conveyor stop as a result of a jam condition or mechanical/electrical failure, the conveyor immediately upstream of the stopped conveyor shall continue to run until the discharge end photocell is blocked. At that moment, the conveyor shall stop. The preceding upstream conveyor will run until its discharge end photocell is blocked. This cascade stop function will continue through

the upstream conveyors until the jam/failure is cleared or the first conveyor in the subsystem has stopped.

c. The cascade stop photocell shall also be utilized for jam detection functions, but no control station shall be installed in conjunction with this photocell. Upon the detection of a jam at this photocell, initiate the following steps:
   1.) Stop the conveyor with the cascade stop photocell and the one immediately downstream.
   2.) Provide a jam indication signal at the MDS and touchscreen terminal and a visual warning signal in the field near the jam location.
   3.) Illuminate the jam indicator light in the nearest jam reset/restart control station.

d. Cascade controls logic shall include programming to initiate the ticket counter start ready pushbutton green light to flash when the respective ticket counter conveyor subsystem has cascaded back to the load belt. This will notify the ticket counter agent that a jam/fault has occurred in the subsystem.

4. Jam Detection
   a. Locate a discharge end sensor photocell to provide the signal for operation of jam detection circuits within approximately 1’ of the discharge ends of all straight conveyors and 6" on power turns and queue conveyors (or an appropriate distance from the discharge end to ensure that the piece of stopped baggage does not transition/stop on the downstream conveyor). Position the center of the photocell beam approximately 2.5" or 3” above top of the conveyor belt.
   b. Furnish and install jam detection photocells and a jam indicator with a jam/restart/E-Stop control station in areas that have a relatively high frequency of jams. This includes the discharge ends of all conveyors feeding onto power turns, on make-up devices where the conveyor feeds onto the device, at the bottom of inclines and decline conveyors, at all merges for both the primary and secondary lines, opposite all diverters and at any other location where experience indicates a potential jam point.
   c. As soon as the photocell detects a jam (blocked for longer than an adjustable (0 to 10 seconds in the PLC), predetermined (nominally set to 6 seconds) length of time), initiate the following steps:
      1.) Stop the conveyor with the jam detection photocell and the one immediately downstream, unless the photocell is mounted on a conveyor that feeds onto a power turn. In this case, the conveyor with the jam detection photocell, the power turn and the conveyor immediately downstream of the power turn stop.
      2.) Provide jam indication signal at the MDS and touchscreen terminal.
      3.) Illuminate the jam indicator light in the control station.
   d. Whenever a conveyor stops for any reason, reset the jam detection timer and hold until the conveyor restarts.
   e. The jam detection circuitry is only to function whenever the associated conveyor is running; i.e., if the conveyor is stopped and the jam detector photocell is blocked, the jam detection circuitry will not sense a jam condition and thus report a false jam condition.
   f. Latch stop conveyors cascade stopped because of a jam through PLC logic until the jam reset pushbutton is activated.
5. Over-Height Detection
   a. Provide over-height detection photocells at every bag input to the system to detect bags that are too high to clear the lowest downstream obstruction for all possible routes. Over-height detection photocells must be installed along the input conveyor at a point that prevents bag handlers from adding bags downstream from the photocells to prevent the possibility of bypassing the sensors.

b. The photocell shall be set at the maximum height of an OOG (not oversize) bag for the re-input conveyors (refer to the EDS manufacturer's guidelines for the maximum height/length restrictions) unless otherwise stated.
c. As soon as the photocell is interrupted, stop the conveyor.
d. Provide jam indication signal at the MDS and touchscreen terminal.
e. The over-height detection circuitry is only to function whenever the associated conveyor is running; i.e., if the conveyor is stopped and the over-height detector photocell is blocked, the over-height detection functionality will not report a false over-height condition.
f. Provide an oversize indicator lamp in the control station; this lamp may be the same unit as that for over-length detection. Illuminate the oversize indicator lamp in the control station if an over-height bag is detected.
g. Program the over-height circuit to require the following sequence to reset:
    1.) Actuate associated E-Stop
    2.) Clear the photocell by removing or re-positioning the over-height bag; the oversize indicator lamp shall extinguish
    3.) Reset (pull out) E-Stop pushbutton
    4.) Press the start pushbutton
    5.) Clear the fault on the MDS and touchscreen terminal.

6. Over-Length Detection
    a. Provide over-length detection photocells at every baggage input in the system to detect bags that are too long. This photocell shall be set at the maximum bag length the BHS will accept (i.e., 4'-6").
    b. Program the over-length measurement circuit to stop the conveyor if a preset bag length (adjustable in the PLC) is exceeded.
    c. Provide jam indication signal at the MDS and touchscreen terminal.
    d. Provide an oversize indicator lamp in the control station. This lamp may be the same unit as that for over-height detection. Illuminate the oversize indicator lamp in the control station if a preset bag length (adjustable) is exceeded.
    e. Program the over-length circuit to require the following sequence to reset:
        1.) Actuate associated E-Stop
        2.) Clear the photocell by removing the over-length bag; the oversize indicator lamp shall extinguish
        3.) Reset (pull out) E-Stop pushbutton
        4.) Press the start pushbutton. This pushbutton may be the same unit as that for over-height detection.
        5.) Clear the fault on the MDS and touchscreen terminal.
7. Merge and Priority Control
    a. 45° Merges
        1.) Merge windows shall be dynamic in that the control system establishes a window only upon indication that a bag has arrived at either the merge or through line induction photocell (i.e., a fixed window control system will not be acceptable). Merge windows shall be variable and shall be established on bags-per-minute throughput requirements per subsystem with associated window spacing. Bag length shall be measured by the control photocells to adjust the merge window length as required.
        2.) Photocells, timers, and appropriate control stations shall be located on the conveyor equipment in 45° merge situations with functionality as follows. The conveyor line onto which bags merge is the primary line, while the conveyor line from which bags are merged from shall be referred to as the secondary line:

a.) Install a photocell at the discharge end of the secondary line merge conveyor. This photocell shall have the functions of jam detection, discharge end sensing and priority control. The jam detection function of this photocell shall detect a jam at the merge point resulting from bags being transferred from the secondary line onto the primary line. When this occurs, both belts involved shall be stopped until the jam is cleared (along with other appropriate conveyors upstream that will cascade stop as necessary).

b.) Program all 45° merge conveyors in a run-on-demand mode and use energy management timers to stop. As a bag travels towards the merge conveyor, an auto-start photocell installed on the upstream conveyor, once blocked, will start up the merge conveyor. If after 20 seconds (adjustable in the PLC) the auto-start photocell doesn't detect any baggage, then the merge conveyor shall stop.

c.) Merge window logic in the PLC is used to monitor and track the flow of bags on the primary conveyor line upstream of the merge. The merge window logic shall use a photocell and timer to measure bag length to determine the required merge window for proper transfer onto the primary line. The merge window logic is used to track the position of bags and the space between the bags on the primary line. The discharge end photocell on the conveyor immediately upstream of the merge conveyor on the secondary line shall be used to measure the length of bags as they move onto the 45° merge. The PLC utilizes this length to calculate the bag window size required on the primary line to merge a bag into. If the required bag window is determined to be available on the primary line, then the bag is not stopped and is merged onto the primary line. If the bag window is determined to be unavailable, then the bag is stopped and held on the merge conveyor until the appropriate size window is detected on the primary line.

d.) The merging function shall be provided in two modes. Primary priority and reverse priority. In primary priority mode (to be considered normal mode of operation) bags on the primary conveyor line shall have priority over bags on the secondary conveyor line. The secondary line must wait for openings between bags on the primary line to be able to merge into. Priority control shall monitor the time span the photocell on the primary line is blocked to indicate the appropriate merge window is being searched for.

e.) Reverse priority mode shall be actuated in two different cases. First, if the 45° merge conveyor is stopped with bags in queue upstream (to a point which will be determined in design review meetings based upon criteria such as subsystem length and bags-per-minute requirements) then the secondary line is considered to be full and the reverse priority function shall be actuated for the period of time it takes to empty the secondary line of bags from the point in which the reverse priority was actuated. Second, if a bag is on the 45° merge waiting for a window and an opening is not detected for 60 seconds (adjustable in the PLC) then reverse priority shall also be enabled. The primary line conveyor onto which bags are being merged shall be stopped, and all merge control functionality of the secondary line shall be disengaged to allow for continuous and uninterrupted baggage flow from the secondary onto the primary line for 60 seconds (adjustable in the PLC), thus purging the secondary line of

bags. Upon completion, the merging function will revert to primary priority mode.

f.) In case there are multiple merges onto the mainline, each merge should receive equal priority to prevent any one of the merges from not being able to discharge bags onto the mainline.

8. Auto-Start
   a. Provide auto-start photocells upstream of sections of transport conveyors not specifically controlled by start/stop switches. The same photocell may control both auto-start and auto-stop circuits.
   b. Program auto-start circuits to start a string of conveyors whenever an auto-start photocell is interrupted.
   c. Before any conveyors may be started, audible start-up warning alarms shall be actuated, audible throughout the area to be affected by the starting of the conveyors. Activation of the alarms shall be through the PLCs. The horn shall sound and after a period of between 5 and 25 seconds (adjustable in the PLC) the conveyor subsystem shall start.
   d. Each conveyor in the subsystem shall be sequentially started from output to input point with an appropriate delay between each motor starter actuation to minimize electrical power surges. The next sequence of conveyors controlled by auto-start functionality shall start in a similar manner, triggered by baggage at a predetermined location on the line.
9. Auto-Stop (Time-Out)
   a. Provide auto-stop photocells upstream of sections of transport conveyors not specifically controlled by start/stop switches. The same photocell may control both auto-start and auto-stop circuits.
   b. Program auto-stop circuits to stop a string of conveyors if an auto-stop photocell does not sense a bag for an adjustable time period (adjustable in the PLC).
   c. If a conveyor stops for any reason, reset the auto-stop timer and hold until the conveyor restarts.
10. Indexing Control (Accumulation)
   a. Provide a photocell at the discharge end of each conveyor feeding an indexing conveyor.
   b. Program the indexing conveyor to run when the photocell is blocked and to stop when it is clear.
   c. Include a time delay so the conveyor can be programmed to run for a preset interval after a bag clears the photocell so the bag is completely on the indexing conveyor before the photocell’s conveyor stops.
11. HSPD Timing
   a. Provide a photocell at an appropriate distance upstream of each HSPD with the center of the photocell beam at a height of 2.5" or 3” above the top of the conveyor belt for HSPD timing/arming.
   b. Program the photocell function to ensure accurate HSPD-bag contact; given bag size, belt speed, and HSPD cycling speed.
12. Fail-safe
   a. Provide a redundant photocell arrangement an appropriate distance downstream of the alarm line with the center of the photocell beam at a height of 2.5" or 3” above the top of the conveyor belt for fail-safe monitoring.
   b. Coordinate the fault requirements and resets with TSA operational requirements.
   c. Decision Point Fail-safe Locations
      1.) The location of the fail-safe functionality and the conveyors stopped as part of a manually operated in-line decision point fail-safe fault conditions are as follows:

a.) CL1-01A
b.) CL3-01

d. When a fail-safe fault triggers, the conveyors associated to that fail-safe fault shall stop immediately.

C. E-Stop Pushbuttons

1. Furnish and install Type 2 E-stop control stations as required to ensure O&M personnel can easily and quickly reach an E-Stop pushbutton from anywhere in the system. Install E-Stop pushbuttons at the following locations:
   a. Around the perimeter of all make-up and claim devices.
   b. At each end of load/unload conveyors.
   c. Along lengths of conveyors, whether running at floor level or overhead mounted on conveyor support legs or building columns, a maximum of 50' apart.
   d. In each jam indication enclosure.

Type 2 E-Stop Control Station Detail	
Function	**Description**
Reset/Restart	Restarts the conveyor equipment after an E-stop condition or fault is cleared, so long as there are no other conditions that prevent start-up. In the case of a make-up device, the device can be restarted after time-out.
E-Stop	Immediately stops the associated conveyor equipment and de-energizes the equipment motors.

2. Wire all E-Stop pushbuttons for a single E-Stop zone in series with the coils of one or more E-Stop relays. Size the normally open contacts of the relays in series with the power source of the PLC output module(s) controlling the conveyors in the E-Stop zone. The PLC shall not be required to remove power from the associated conveyors for an E-Stop condition.
3. When an E-stop is pressed, stop the associated conveyors in the E-Stop zone, illuminate the lamp in the head of the pushbutton, and illuminate the red E-Stop fault light at the MCP.
4. Restart the conveyors and extinguish the indicator lamp and MCP fault light only after the following sequence:
   a. Reset (pull out) E-Stop pushbutton
   b. Depress the green Restart pushbutton (E-Stop indicator lamp and MCP fault light turns off and conveyors restart after warning alarm sequence)
5. When a jam has been detected and an E-Stop pushbutton in the jam indication enclosure is activated, follow the same sequence of stopping the conveyors and illuminating the light in the head of the pushbutton, but do not activate the fault warning circuits at the MCP.
6. When the normal restart switch for the conveyor is actuated, extinguish all E-Stop pushbutton lamps within the subsystem associated with that specific E-Stop actuation, actuate the start-up warning alarms and, after a delay, start all conveyors in the subsystem.
7. The activation of an E-Stop pushbutton switch shall not close any powered fire/security door within the E-Stop's area of control.
8. E-Stop conditions shall be reported both visually and audibly on the MDS and touchscreen terminal.

D. Fault Warning Alarm

1. Provide an audible/visual alarm on the MCP controlling the system.
2. Activate the alarm and one of the following indicator lights whenever any fault has caused a section of conveyor to stop or prevent it from starting:

Condition	Color
Jam	Amber
Motor Overload	Blue
E-Stop	Red

E. Alarm Silence
   1. Provide an alarm silence momentary contact pushbutton on the door of the MCP which, when depressed, shall silence the audible alarm. The design of the control circuitry shall be such that multiple faults shall always sound the associated fault warning alarm; i.e., if a jam condition has caused the alarm to have been sounded and the alarm has been silenced but not yet been corrected, a second fault occurring after the alarm has been silenced shall again cause the fault warning alarm to sound.
   2. Do not extinguish the illuminated fault indicator until the fault has been corrected.

F. Start-Up Warning
   1. Provide amber stack lights and audible alarms as start-up warnings in areas as specified.
   2. Activate the beacon and the horn for an adjustable time period prior to the start-up of the conveyor system. Ensure the start-up warning is of a sufficient duration as to comply with OSHA standards or local safety standards, whichever is more stringent.
   3. Appropriate audible start-up warning alarms shall be provided at public areas (e.g., ticket counter).

G. Jam Indication/Restart
   1. Furnish and install a Type 1 control station adjacent to all jam detection photocells with the following control devices:

Type 1 Jam Reset Control Station Detail	
Function	**Description**
Restart	Restarts the E-Stopped conveyor(s) or restarts the conveyors after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up. In the case of a make-up device, the device can be restarted after time-out.
Jam	Illuminates when a photocell is blocked for a set time span, indicating a jam condition.
E-Stop	Stops the associated conveyor(s) to enable personnel to safely rectify a jam condition.

      a. At minimum, install jam detection photocells and a Type 1 control station in areas with a relatively high frequency of jams. This shall include the discharge ends of all conveyors feeding onto power turns, on make-up devices where the conveyor feeds onto the device, at the bottom of incline and decline conveyors, at all merges for both the primary and secondary lines, opposite each HSPD, and at any other location where experience indicates a potential jam point.
      b. In most cases, the control stations shall be located adjacent to the conveyors under control and shall be accessible only to the personnel clearing the jam to avoid a subsystem being restarted in an unsafe condition (e.g., personnel on conveyor). All such control stations shall be located on the catwalk side of conveyors equipped with catwalks.
   2. Illuminate the jam lamp when the jam detection photocell senses a jam condition.
   3. Restart the conveyor and extinguish the E-Stop indicator lamp and MCP fault light only after the following sequence:
      a. Actuate (push in) E-Stop pushbutton (E-Stop indicator lamp goes on)
      b. Clear the jam

c. The jam light shall flash (indicating the jam photocell has been cleared and the conveyor is ready for restart)
d. Reset (pull out) E-Stop pushbutton
e. Depress green restart pushbutton (E-Stop indicator lamp and MCP fault light turns off and conveyors restart after warning alarm sequence).

4. Paint the control station enclosure with safety yellow paint and label with the IDs of the controlled conveyors in 1/2" high block letters. Jam detection reset control stations shall be placarded with the IDs of controlled conveyors.

H. Fire/Security Door
1. Provide a photocell to detect bags under the fire/security door.
2. Equip the door with either a limit switch, photocell, or proximity switch mounted in such a manner so the fully open position of the door is sensed. If the switch or photocell senses the door is not in the fully open position, the associated conveyor shall be stopped if running or shall not be permitted to start if the conveyor is not already running. This switch or photocell is in addition to those limit or proximity switches provided with the door operator if the door is powered.
3. The door is also to be equipped with a limit switch, photocell, or proximity switch mounted in such a manner so the fully closed position of the door is sensed. If the switch or photocell senses the door is not in the fully closed position, annunciation shall be sent to the fault monitoring system for rectification of the problem. This switch or photocell is in addition to those limit or proximity switches provided with the door operator if the door is powered.
4. Interface and test the door interface with the building fire/security system for door open/closed status.
5. Program the fire/security door to operate as follows:
   a. Normal Start/Stop
      1.) Start: Open the fire/security door immediately. Ticket counter inputs require card swipe permissive start. PLC to provide Building Security System with Running status.
      2.) Stop:
         a.) Run the feeding conveyor for one minute, stop the conveyor, then lower the fire/security door. PLC provides building security system with Door Closed status.
         b.) If a bag is detected under the door via the door clear photocell or the door pressure switch, continue to run the conveyors until the photocell is clear and reattempt to close the door. The door should continue attempting to close; however, an alarm should be displayed on the fault monitoring system if the door fails to close after the third attempt.
   b. Upon fire detection:
      1.) Close the dry contact.
      2.) If no bag is detected under the door by either the clear photocell or the door pressure switch, stop all conveyors and close the door.
      3.) If a bag is detected under the door by either the door clear photocell or the door pressure switch, run the conveyors until the photocell is clear and immediately stop the upstream and downstream conveyors to allow the door to close. If the door is unable to close upon detection of a fire signal or system stop signal, an alarm shall be displayed on the fault monitoring system indicating the door has failed to close.
   c. Emergency Power

1.) The fire doors and respective upstream and downstream conveyors shall be supplied with both normal and emergency power supply. Reference 1.01A herein for additional requirements.

d. Furnish and install a Type 3/B control station adjacent to each fire/security door for maintenance personnel use only (i.e., not accessible from the public side), which shall contain the following control devices:

Type 3 Fire/Security Door Control Station Detail	
Function	**Description**
Reset/ Restart	Restarts the door and subsystem conveyors upstream and downstream from the door, so long as the door is fully open and no other faults are active. In the case of an oversize slide, this resets door fault conditions.
Jam	Illuminates when the bag detection photocell is blocked for a set time span to indicate a jam condition under the door.
Maint/Auto	Switches into maintenance mode for manual door operation for maintenance and testing.
Door Open	Opens the door while in maintenance mode.
Door Close	Closes the door while in maintenance mode.
Door Stop	Stops the door at its current position while in maintenance mode.
E-Stop	Stops the subsystem conveyors upstream and downstream from the door. The E-Stop does not automatically close or open the door.

Type 3B Fire/Security Door & Oversize Detection Control Station Detail	
Function	**Description**
Reset/ Restart	Starts the subsystem conveyors upstream and downstream from the door, so long as the door is fully open and no other faults are active.
Oversize	Illuminates when the oversize photocell detects an oversize condition. Upon detection, the associated conveyors shall immediately stop to allow an agent to remove the oversize bag.
Jam	Illuminates when the bag detection photocell is blocked for a set time span to indicate a jam condition under the door.
Maint/Auto	Switches into maintenance mode for manual door operation for maintenance and testing.
Door Open	Opens the door while in maintenance mode.
Door Close	Closes the door while in maintenance mode.
Door Stop	Stops the door at its current position while in maintenance mode.
E-Stop	Stops the subsystem conveyors upstream and downstream from the door. The E-Stop does not automatically close or open the door.

e. The door-open and door-closed switches are only active when the Maint/Auto switch is in maintenance mode. Related conveyor systems are not active when in maintenance mode. Activation of the ticket counter (re-accommodation or curbside) security card swipe is not required when in the maintenance mode.

f. All powered fire/security doors shall be equipped with a manual release mechanism that disengages the door drive unit and permits the door to be manually raised or lowered.

I. HSPDs

1. Furnish and install photocells at strategic upstream locations to synchronize HSPD operation with bag position.
2. Furnish and install a sensor at the home position of the HSPD to stop the sort conveyor if the HSPD does not return to the home position within a preset time after it has started its cycle. Report the fault condition to the MDS and touchscreen terminal. Install a shaft encoder with a proximity detector controlled by a Warner electronic controller (or approved equivalent) so the at home paddle position shall always be the same.
3. Furnish and install each HSPD with one disconnect switch to control both the VFD and motor. The 3-phase MSD switch shall be used to interrupt the feed and neutral circuit to any externally powered VFD. Refer to Part 2 herein for details regarding MSD switch installation.
4. Furnish and install a photocell on the receiving conveyor spur to which the HSPD discharges to report to the control system that a bag has successfully transferred and that no jam has occurred. If a jam is detected, inhibit further diverter operation and report the fault condition to the MDS and touchscreen terminal.
5. Each HSPD feeding a conveyor spur shall have a Type 11 control station installed adjacent to the photocell or on the housing of the HSPD for maintenance personnel containing the following control devices:

Type 11 HSPD Control Station Detail	
Function	**Description**
Reset/ Restart	Restarts associated subsystem conveyors and energizing of the HSPD motor following a jam condition and subsequent clearing of the photocell at the charge end of the receiving chute opposite the HSPD or restarts the HSPD/conveyors after a fault is cleared, so long as there are no other conditions that prevent start-up.

Jam	Signals a jam condition at the photocell at the charge end of the receiving chute opposite the HSPD.
Maint/Auto	Switches into maintenance mode for manual HSPD cycling for maintenance and testing.
E-Stop	Immediately stops the associated subsystem conveyors and de-energizes the HSPD motor.

J. Motor Overloads
   1. Size the motor overload heaters to not exceed 115% of the FLA indicated on the motor's nameplate.
   2. In case any subsystem motor draws excess current, appropriate protection shall be provided to isolate supply to all subsystem elements. Either the single motor overload indicator on the affected MCP touchscreen terminal shall illuminate, the touchscreen terminal shall indicate the condition, or, if individual motor overload indicators are specified for each drive, then the affected drive indicator will illuminate.
   3. Following rectification of the cause of the overload and resetting of the overload protection device in the MCP, the system may be restarted by actuation of the start button, at which stage, the motor overload indicator shall be extinguished and normal control shall resume.
   4. Motor overload fault conditions shall be reported both visually and audibly on the MDS and touchscreen terminal.
   5. In case of individual conveyor motor overloads, all upstream conveyors shall revert to cascade stop mode; all downstream conveyors shall continue to run in normal mode.

K. Motor Safety Disconnect (MSD)
   1. Provide MSD switches as described in Part 2 herein.
   2. Rotation of the MSD to the off position shall cause the conveyor or other component to stop and appropriate alarm/statuses to be displayed on the MDS workstation as described in Part 2 herein.
   3. Rotation of the MSD to the On position shall allow the conveyor or other component to restart (with appropriate start-up alarm) only if:
      a. The conveyor does not pass through a wall or floor penetration.
      b. The conveyor is not in a public area.
   4. The use of motor starter protectors as MSDs is not acceptable.

L. Interlocks
   1. Provide fail-safe interlocks and limits in the system to ensure safe operation. Assume responsibility for the integration of all interlocks and limits that might be necessitated by the characteristics of the elements selected for combination into a total system. Interlocks and limits shall be included for the protection of personnel, equipment and baggage, and in the performance of the operational functions specified for the subsystem and elements comprising the system.
   2. Provide electrical interlocks between the various conveyors in a subsystem to inhibit a conveyor from discharging baggage onto a stopped conveyor. Interlocks shall be cascaded from the last conveyor in a train to the first. This provision shall apply to all subsystems even if two unique suppliers provide the equipment under separate contract.
   3. Provide warning signals, which are activated automatically upon start-up, where appropriate. Flashing lights shall be visible from all points in the vicinity of the equipment concerned. Alarms shall be audible within the equipment vicinity and each alarm in the system shall be distinctive from any sound within the hearing range and shall not be unduly annoying to working personnel and shall comply with all applicable codes and regulations. Although not specifically mentioned in the control subsystem descriptions all

automatic start-up functions shall be preceded with appropriate audible and visual indicators unless otherwise specified.

4. Inhibit further equipment action upon sensor failure should personnel safety be in doubt. Inform the involved equipment operator or maintenance personnel of such failure through the MDS and touchscreen terminal. Sensors shall be selected and positioned such that false signals from debris, ambient light, and personnel movement do not cause activation.
5. Coordinate the facility fire zones with the architect and to add a dry contact to the subsystems controls, so that if a fire is detected the system will perform the necessary shutdown. This feature shall be provided to the BHS control system, regardless if the system includes a fire door or not.

M. Breakaway End Cap Safety Guard Interlock
1. Provide a fail-safe breakaway end cap safety guard interlock on all run out/unload conveyors which shall immediately stop the conveyor and prevent injury to personnel and damage to baggage.
2. Activation of the end cap safety guard interlock shall be displayed on the MDS fault monitoring system.
3. When resetting the tripped end cap interlock, the operator shall go through the normal start-up procedure following all safety procedures described herein.

N. Advance Pushbutton
1. Provide push-to-run conveyor advance control pushbuttons in non-public operational areas as detailed in the contract drawings.
2. Activation of the conveyor advance control shall cause the related conveyor(s) to run as long as the control is activated or until the respective conveyor full photocell is blocked.
3. The advance pushbutton shall be color coded black.

3.07 SPECIAL CONTROL SEQUENCES

A. Outbound System Input Conveyor Manual Start Sequence
1. Each ticket counter subsystem shall be initiated to start via a local Subsystem Start Type 6 or Type 7 control station equipped with a security card swipe device or key switch to restrict access to the public:

Type 6 Ticket Counter Charge End Control Station Detail	
Function	**Description**
Reset/ Start	Starts the associated input conveyors for bag transfer or restarts the conveyors after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up.
Stop	Stops the associated input conveyors after a predetermined period to clear all bags on the input conveyors without sounding an alarm.
Jam	Illuminates when an associated photocell is blocked for a set time span, indicating a jam condition.
Start Alarm	Sounds an alarm upon start-up.
E-Stop	Immediately stops the associated input conveyors and sounds an alarm.

Type 7 Ticket Counter Discharge End Control Station Detail	
Function	**Description**
Reset/ Start	Starts the associated input conveyors for bag transfer or restarts the conveyors after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up.

Type 7 Ticket Counter Discharge End Control Station Detail	
Function	**Description**
Stop	Stops the associated input conveyors after a predetermined period to clear all bags on the input conveyors without sounding an alarm.
Jam	Illuminates when an associated photocell is blocked for a set time span, indicating a jam condition.
Oversize	Illuminates upon oversize detection via associated photocell(s) and stops the associated conveyors to allow manual bag removal.
Start Alarm	Sounds an alarm upon start-up.
E-Stop	Immediately stops the associated input conveyors and sounds an alarm.

2. Activation of the security card swipe or key switch shall supply power to the respective control station installed adjacent to the associated input conveyor segment. Actuation of the subsystem's start pushbutton will initiate the following sequence:
   a. Energize the respective visual/audible warning alarms along the conveyor line, both in the public space (e.g., ticket counter) and air side (e.g., conveyor subsystem ceiling right-of-way catwalks, make-up device work aisle(s)), for 10 seconds (adjustable).
   b. The fire/security doors shall open while the Run 10-second alarm sounds and flashes.
   c. After the 10-second Run alarm period and when the fire/security doors are fully opened, the upstream input collection conveyor(s) shall start.
   d. The downstream transport conveyors and make-up devices shall start sequentially from output to input via an auto-start function. The downstream transport conveyors shall start with an appropriate delay between each motor starter actuation to minimize electrical power surges.
   e. The start-up warning signal at the make-up device shall sound only if the device is not already running
3. The subsystem security doors shall open and close consistent with the respective subsystem start-up and shutdown sequence. The subsystem fire doors shall close only upon receiving a closure signal from the fire alarm system and open upon normal start-up sequence; otherwise they shall always remain open.

B. CBRA Clear Line Manual Start Sequence
1. The CBRA clear line shall be initiated to start via a local Subsystem Start control station. CBRA clear lines shall start via Type 10 control stations:

Type 10 CBRA Clear/Reinsert/Transfer Control Station Detail	
Function	**Description**
Reset/ Start	Starts the associated input conveyors for bag transfer or restarts the conveyors after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up.
Stop	Stops the CBRA clear/reinsert line after all bags are purged from the conveyor.
Oversize	Illuminates upon oversize detection via associated photocell(s) and stops the associated subsystem belt(s) to allow manual bag removal.
Start Alarm	Sounds an alarm upon clear bag conveyor start-up.
E-Stop	Immediately stops the associated clear bag conveyors and sounds an alarm.

2. Actuation of the subsystem's start pushbutton will initiate the following sequence:
   a. Energize the respective visual/audible warning alarms along the conveyor line, both in the CBRA space and air side, for 10 seconds (adjustable) (e.g., transfer or CBRA

clear/re-input conveyor respective subsystem ceiling conveyor right-of-way catwalks).

b. After the 10-second Run alarm period the input/load conveyor(s) shall start. The downstream transport conveyors shall start sequentially from output to input via an auto-start function. The downstream transport conveyors shall start with an appropriate delay between each motor starter actuation to minimize electrical power surges.

C. Make-up

1. Control Equipment Components

a. Furnish and install Type 1 control stations (refer to Section 3.06G above for Type 1 control station detail) on each make-up device for manual start-up operation in the locations shown on the contract drawings. Install one (1) Type 1 control station opposite each in-feed conveyor's discharge point onto the make-up device.

a. Furnish and install near each of the make-up device drive units a Type 19 control station with the following control devices for maintenance personnel only:

Type 19 Make-up Device Maintenance Control Station Detail	
Function	**Description**
Reset/ Restart	Restarts the device and after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up.
Maint/Auto	Switches into maintenance mode for manual device operation for maintenance and testing.
Jog	When in maintenance mode, the device will move forward when the JPB is held in.
E-Stop	Immediately stops the device and associated conveyors and de-energizes the device motors.

b. Furnish and install Type 2 E-Stop control stations around each make-up device in the locations shown on the BHS contract drawings for effective E-Stop functionality. Refer to Section **Error! Reference source not found.** herein for Type 2 control station details.

c. Furnish and install Type 25 Make-up Audio/Visual Alarm Stack Lights on each make-up device in the locations shown in the contract drawings:

Type 25 Make-up Audio/Visual Alarm Stack Light Detail	
Function	**Description**
Start Alarm	Alarms to indicate the make-up device is starting up, a jam detection on the infeed conveyor(s), an E-Stop has been activated, or an oversize bag is ready for pick-up at the oversize make-up belt.
Reset/ Restart	Illuminates to indicate the make-up device is starting up.
Stop	Illuminates to indicate an E-Stop has been activated.
Jam	Illuminates to indicate a jam condition on the infeed conveyor(s).
Oversize Ready	Illuminates to indicate an oversize bag is ready for pick-up at the oversize make-up belt.

d. Furnish and install all the necessary control stations with their respective control devices and functions along the device to accommodate the requirements relating to jam reset, make-up drive and maintenance control, E-stop, and crossover control (refer to Section 1.01A herein).

e. Submit control station mounting and location details to the Cedar Rapids Airport Commission for approval.

2. Control Functions

a. There will be no manual start/stop controls for the make-up in-feed conveyor subsystems other than the local device controls specified above. All conveyors, including the initial start-up of the make-up device, shall operate by means of auto-start/stop circuits.
b. In case a make-up device times out before all baggage has been unloaded, activation of any restart button on the device shall cause the device to run for an additional twenty (20) minutes (adjustable) without the feed conveyors operating.
c. The feed conveyor controls shall be designed to require the make-up device to run at full speed prior to start-up of any feed conveyors.

3. All fault annunciation and status reporting for the make-up devices and associated conveyor feed subsystems shall be displayed both graphically and in text on their respective MCP touchscreen terminals and the MDS.

D. System Ready Indication
1. A green indicator light, labeled System Ready and located on the door of each MCP, shall serve to indicate that the devices under its control are ready to operate upon receipt of a Start signal from the BHS control system and local card swipe device. To accomplish this, the light shall illuminate under the following conditions, per the respective subsystem:
a. Power is applied to the MCP.
b. The local conveyor motor and fire/security door disconnect switches are On.
c. All E-Stop pushbuttons are reset.
d. No motor overloads are tripped.
e. No jam conditions are indicated.
f. No oversize conditions are indicated.
g. All HSPDs are in the home position.
h. No faults are indicated on the MDS and touchscreen terminal.

E. Keypad Swipe Security Switch
1. Provide a 1" conduit knockout on the subsystem control stations that require interfacing with the Cedar Rapids Airport Commission’s card swipe modules, to allow a keypad/card swipe security switch to be mounted on the subsystem control panel back-plate. Provide all required interlocks to provide a fully integrated building Security System. Coordinate with the Security System manager.

3.08 BHS DETAILED CONTROL DESCRIPTIONS/REQUIREMENTS

A. General Design Requirements
1. The following subsystem control descriptions apply the referenced components and circuits to the operational aspect of the system and specify the elements under their control.
2. It shall be possible to make changes to baggage flow from the BCR workstation in response to a variety of conditions such as:
a. Jams
b. Equipment failure
c. Conveyor full condition
3. In each case an operator, having access to the proper passwords, as an example, shall be able to:
a. Activate a HSPD and set it to operate either continuously or in an alternating sequence.
b. Shut down a HSPD or conveyor.
c. Set up alternative flow paths, for instance, to bypass a defective section of conveyor, or similar.

4. Reference the as-built drawings for conveyor equipment power distribution and subsystem indication. Location for each of the existing MCPs is referenced on the BHS drawing B100.
5. The control functions associated with the outbound system and the ticket counter check-in lines are described in the following paragraphs. Apply the generic subsystem/conveyor line functional description to the detail design of each electrical subsystem of similar type.
6. Provide software for the control system reflecting the sequence of operation for each subsystem as described in the following paragraphs. The paragraphs describe the required subsystem-specific controls in addition to those standard controls required for all subsystems.
7. Provide two (2) dry contacts to the subsystem controls in the respective master PLC cabinet, as specified elsewhere herein, so in case an appropriate signal is sent from the fire alarm system (as coordinated with the fire alarm system), then the conveyor system shall shut down and the associated fire doors shall close.

B. Ticket Counter Subsystem
   1. General
      a. The outbound ticket counter system consists of the following subsystems:
         1.) TC1
      b. All fault annunciation and status reporting for the ticket counter subsystems shall display both graphically and in text on the workstation MDS or touchscreen terminal.
      c. The following describes the TC1 ticket counter line sequence of operation; all other ticket counter conveyor lines will operate in a similar manner.
         1.) The check-in ticket counter and outbound transport line portion of the subsystem consists of conveyor segments TC1-01 through TC1-10 for transport of originating outbound baggage from the passenger check-in area to the Terminal make-up sortation system.
   2. Control Equipment Components
      a. Furnish and install Type 6 and 7 control stations in the locations shown in the contract drawings. Refer to Section 3.07A.1 herein for Type 6 and 7 control station details.
      b. Ticket Counter Conveyor Start Sequence:
         1.) The TC1 line shall start via the System Start function from the BCR workstation cabinet. This function allows the local Subsystem Start key switch or security card swipe to supply power to the respective TC1 line control stations.
            a.) Automatic System Cascade Start:
               (1.) The conveyor segments downstream of TC1-01 shall start via an auto-start sequence. Provide auto-start photocells upstream of sections of outbound transport conveyors, not specifically controlled by the start/stop control station. Program the auto-start circuit to start conveyor segments TC1-01 through TC1-10 and the make-up device if not already running once the auto-start photocell is interrupted. The downstream TC1 conveyors shall start sequentially from the output to the input with an appropriate delay between each motor starter actuation to minimize electrical power surges.
            b.) Automatic System Cascade Stop:
               (1.) The conveyor segments downstream of TC1-01 shall stop via an auto-stop sequence. Provide auto-stop photocells upstream of sections of outbound transport conveyors, not specifically controlled by the start/stop control station. Program the auto-stop circuit to stop conveyors TC1-01 through TC1-10 whenever the auto-stop

photocell does not sense a bag for 5 to 30 minutes (adjustable). The same photocell may control both auto-start and auto-stop functions.

c.) Manual Stop:
(1.) Pushing the Stop pushbutton on any TC1 control stations shall stop conveyors TC1-01 through TC1-10 and close the fire/security door (if the door clear photocells are not blocked); conveyors TC1-01 through TC1-10 shall run for a predetermined period to purge all bags from the subsystem prior to the stoppage of the conveyors and closure of the door.

d.) Start-up alarms and fault alarms shall be located as required, along the outbound line and make-up device area. Start-up and fault warning alarm(s) location and function shall be consistent with the requirements specified herein.

e.) Jam reset and E-stop control station(s) location and function shall be consistent with the requirements specified herein. Install all Jam reset and E-stop stations associated with the TC1 line's conveyors in the ceiling space adjacent to each conveyor drive on the maintenance side so they are accessible by maintenance personnel.

f.) The Ticket Counter conveyors shall be enabled by the start key switch (or security card swipe). This action shall supply power to the pushbutton control stations located at the Ticket Counter area. Pressing a “Start” pushbutton on any ticket counter control station shall energize the TC1 Start-up alarm(s) in the check-in area, along the outbound transport line and the bagroom for 10 seconds (adjustable). The start-up alarms in the bagroom area shall sound only if the tilt tray sorter (or make-up sort system) is not already running. The fire/security door shall open while the Run 10-second start-up alarm sounds and flashes. After the 10 second Run alarm period and when the fire/security door is fully opened, the ticket counter check-in conveyors shall start.

3. Other Control Functions:
   a. Control Functions associated with the conveyor line's Fire/Security Door operation, Cascade Stop, Jam Detection/Restart, Oversize Detection/restart, E-Stop/Reset, MCPs, Motor Overload conditions and respective Alarm Silence function(s) shall be compliant with the requirements specified herein.
   b. Flash the Ticket Counter (Curbside) Start Pushbutton green light when the respective ticket counter conveyor subsystem has cascaded back to the load belt. This will notify the ticket counter/curbside agent that a jam/fault has occurred in the subsystem.
   c. Merge Control functions associated with any of the ticket counter conveyor lines' 45° merge and mainline conveyors shall be compliant with the requirements specified herein.

C. Mainline Outbound Transport (TC1) Subsystems
1. General
   a. The outbound transports shall feed and equally distribute all originating bags from their respective input location to the EDS security shunts.
   b. All fault annunciation and status reporting for the main outbound transport lines shall be displayed both graphically and in text on the centralized MDS and associated satellite workstations.
2. Control Equipment Components

a. Provide all the necessary control stations with their respective control devices and functions along the TC1 line to accommodate the requirements relating to jam reset, E-stop control/reset, fire/security door operation, and HSPD operation.
b. Jam reset and E-stop control station(s) location and function shall be consistent with the requirements specified herein. Install all jam reset and E-stop stations associated with the TC1 conveyors adjacent to each conveyor drive on the maintenance catwalk side so they are accessible by maintenance personnel.

3. Control Functions
   a. There will be no manual start/stop controls for the conveyors in these subsystems; all conveyors shall operate by means of auto-start/stop circuits.
   b. Automatic System Cascade Start:
      1.) The normal start-up operations of the outbound transport subsystems shall be governed by an auto-start circuit and shall be controlled by separate photocells on each input line. Install the photocells far enough upstream of each input line to allow the outbound transport subsystem conveyors to come up to speed before baggage arrives. When a bag is detected at the input line's photocell(s), the outbound transport conveyors associated with that input shall start (if not already running) sequentially from the output to the input with an appropriate delay between each motor starter actuation to minimize electrical power surges.
      2.) Start-up alarms and fault alarms shall be located along the conveyor line(s) and in locations specified elsewhere herein. Start-up and fault warning alarm location and function shall be consistent with the specified requirements indicated elsewhere herein and coordinated with the Cedar Rapids Airport Commission.
   c. Automatic System Cascade Stop:
      1.) All conveyor segments shall have the capability to shutdown via an auto-stop sequence. The conveyors of these outbound transport subsystems shall shut-down through an auto-stop circuit, which shall time-out and immediately stop all conveyors if, after a 15-minute period (adjustable), no bags have been detected by the auto-start circuits and all baggage have cleared the train of conveyors.
4. Other Control Functions:
   a. Control functions associated with the conveyor line's cascade stop, jam detection/restart, E-stop/reset, MCPs, motor overload conditions and respective alarm silence function(s) shall be compliant with the requirements specified herein.
   b. Jam reset and E-Stop control station(s) location and function shall be consistent with the requirements specified herein. Install all jam reset and E-stop stations adjacent to each conveyor drive on the maintenance catwalk side so they are accessible by maintenance personnel.

D. EDS Security Screening System
1. General
   a. Submit the control sequence of operation and functionality of the inline EDS security system to the Cedar Rapids Airport Commission or their representative for approval.
   b. This description of operation defines the overall functional requirements of the BHS control system related to the operation of the EDS subsystems. Provide the definitive architecture, detailed design, and all coordination required for the control system design in its entirety, including the BHS-EDS interface requirements, to tailor the CBIS to meet the requirements of the EDS OEM.
   c. Coordinate with the EDS OEM to determine the necessary interface(s) between the BHS and EDS machines. Provide all conduit, wiring, and communication bridges between the BHS and EDS equipment systems as required for these interfaces.

2. CBIS Screening Operations
    a. Out-of-Gauge (OOG) Bag Detection
        1.) Install an out-of-Gauge photocell on TC1 upstream of the fire door/security door as indicated in the EDS Control Plan drawings to stop out-of-gauge bags that will jam at the EDS machine entrance.
        2.) Refer to the EDS OEM for EDS machine aperture and bag size limits and install the out-of-gauge photocell accordingly.
        3.) When a bag trips the out-of-gauge photocell the TC1 line stops prompting ticket counter operators to induct the bag on the OG1 line.
    b. Level 1 Screening
        1.) All in-gauge baggage transition onto the conveyor lines feeding the Level 1 EDS machines.
        2.) The EDS machine software will automatically scan each bag, assign a Clear, Alarm, EDS Error, or EDS Unknown status to the bag, then relay the status to the BHS via the EDS/BHS interface.
            a.) Clear bags continue to the makeup device.
            b.) Alarm bags are stopped downstream of the EDS machine at an AL subsystems as indicate in the drawings for level 3 screening.
    c. Level 3 Screening
        1.) Alarm, OOG, and EDS Unknown bags are stopped downstream of the EDS for Level 3 inspection and ETD handling.
            a.) EDS Unknown bags should be reinserted or manually searched.
            b.) EDS Error bags are manually searched by TSOs.
            c.) Bags cleared at Level 3 are reinserted into the system via the CBRA clear line.
            d.) Bags that fail TSO inspection at Level 3 elevate to intervention by an LEO per law enforcement and CID protocols.
3. Security Shunt (SSx) Subsystems
    a. Reference the BHS Control Plan drawings for the layout and definition of the EDS security screening equipment associated with the security screening subsystems. All originating checked bags transfer to the EDS matrix in the bagroom.
    b. Each SSx subsystem consists of a diverter to send bags to the SSx line, a series of queue conveyors ahead of the inline EDS machine, the EDS machine itself, and all conveyors between the EDS machine and the shunt's Level 1 Decision Point. Refer to the contract drawings for all conveyor equipment IDs.
    c. Provide baggage tracking on these line downstream of the EDS machines.
    d. Control Devices and Image Quality Tests (IQT)
        1.) Install a Type 14 EDS Entrance control station upstream from each EDS machine as shown in the contract drawings.

Type 14 EDS Entrance Control Station Detail	
Function	**Description**
Reset/ Restart	Restarts the EDS entrance conveyor after a test bag is inserted on the belt, restarts the E-Stopped conveyor(s), or restarts the conveyors after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up.
Entrance Jam	Illuminates to indicate a jam condition at the EDS entrance.
Insert/Auto	Switches into insert mode for operators to insert IQT Operational Test Kits (OTKs).
E-Stop	Immediately stops the EDS associated subsystem conveyors and de-energizes the conveyor motors. The E-Stop only stops the EDS conveyor, it does not shut down the entire machine.

2.) Install a Type 15 EDS Exit control station downstream from each EDS machine as shown in the contract drawings.

Type 15 EDS Exit Control Station Detail	
Function	**Description**
Reset/ Restart	Restarts the EDS exit conveyor after a test bag is removed, restarts the E-Stopped conveyor(s), or restarts the conveyors after a jam condition or fault is cleared, so long as there are no other conditions that prevent start-up.
Exit Jam	Illuminates to indicate a jam condition at the EDS exit.
E-Stop	Immediately stops the EDS associated subsystem conveyors and de-energizes the conveyor motors. The E-Stop only stops the EDS conveyor, it does not shut down the entire machine.

3.) EDS IQT Procedure
   a.) Operations staff wait for an available window and switch the Insert/Auto switch to Insert. This places the EDS machine into IQT mode.
   b.) Once in IQT mode, the last BHS conveyor prior to the EDS machine's entrance conveyor stops and the EDS machine purges all bags being processed when Insert was pressed.
   c.) Once purged, staff places the OTK on the conveyor and presses the restart pushbutton; the OTK then travels through the EDS machine.
   d.) The OTK stops upon reaching the discharge end photocell of the EDS machine exit interface conveyor for manual removal and subsequent actuation of the start pushbutton on the control station to restart the exit conveyor.
   e.) Upon completion of the IQT, switch the Insert/Auto switch back to Auto to return to normal operations.
   f.) Coordinate with the EDS OEM the provision of all equipment and programming necessary for execution of IQTs.

4. EDS/BHS Software Integration
   a. Program the database of bag IDs maintained by the BHS control system with at least two (2) security fields to record the screening process at each level. The BHS control system shall recognize decisions from various screening levels provided by the screening system and record these decisions in the appropriate database fields.
      1.) Alarm bags transfer to the next available level of screening (Level 1 or 3).
      2.) If a Decision Pending status (referred to as Level 3 herein) was given at hand-over from the EDS machine, the corresponding EDS machine shall then send an additional (i.e., Level 3) bag status message to the BHS when a decision is available. The bag will be sent to its respective ALx subsystem for manual screening.
5. EDS Machine Queuing
   a. When all active Level 1 EDS machines and their associated queuing conveyors are full, baggage shall queue upstream of the diversion points to the Level 1 EDS security shunts until either the EDS machines are available or their associated queuing conveyors are no longer full.
   b. The BHS shall maintain tracking and bag status while both in the EDS matrix and until sorted to a clear line.
6. Decision Point Fail-safe Conditions
   a. Furnish and install fail-safe photocells on each AL subsystem immediately downstream from each Decision Point so all bags designated for transport to the AL subsystems are conveyed correctly.

b. When a bag is destined to an AL line, the receiving AL conveyor verifies the bag is received. If the bag is not verified to be received on the AL conveyor, then stop both the CL and AL conveyors as shown in the contract drawings and raise an alarm at the centralized MDS identifying a fail-safe condition.
c. When an unexpected bag is received by the AL conveyor, then stop both the CL and AL conveyors as shown in the contract drawings and raise an alarm at the centralized MDS identifying a fail-safe condition.
d.
e. Include the bag ID in the alarm to assist staff in finding the bag that failed to verify.
f. Decision Point Stack Light Modules
1.) Furnish and install a Type 18 Decision Point stacked light module at each Decision Point:

Type 18 Decision Point Stack Light Detail	
Function	**Description**
Alarm	Sounds when an E-Stop is pressed, or a fail-safe condition occurs.
Fail-safe	Illuminates to indicate a fail-safe condition.
Clear	Illuminates to indicate the bag currently sorted at the Decision Point is cleared.
EDS Unknown	Illuminates to indicate the bag currently sorted at the Decision Point is EDS unknown.
Alarmed	Illuminates to indicate the bag currently sorted at the Decision Point is alarmed.

2.) Mount the stack lights on a post at least 2’-6” above the side guard to provide an additional visual (and audible in case of fail-safe fault) indication of a bag’s status as it passes the diversion point or is processed by an EDS machine.
g. After a fail-safe triggers, the associated clear line requires manual restart at the Decision Point’s local restart pushbutton.
h. Less than 0.5% of the total bag volume shall trigger a fail-safe condition.

7. EDS Efficiency Requirements
a. Minimize the bag jam rate of the entire CBIS system (i.e., from the normal daily induction points through the EDS matrix, through Level 3 resolution, and to the points where bags are added to the sortation system) to <1%. The jam rate is measured by counting the total number of jammed bags, not jam events.
b. For each Alarm bag arriving in the CBRA, exactly one digital or printed image should be available to allow TSOs to conduct a directed search.

E. CBRA Alarm Line (AL1) Subsystem
1. General
a. This subsystem stops/holds Alarmed, BHS Unknown, and EDS Unknown bags on the BRPs for manual inspection. The AL1 subsystem receives baggage directly from the SS1 subsystem.
2. Control Stations
a. Install Type 20 CBRA E-Stop control stations along the CBRA alarm line in the locations shown in the contract drawings:

Type 20 Claim Device/CBRA E-Stop Control Station Detail	
Function	**Description**
E-Stop	Immediately stops the alarm line conveyors.

b. Install one (1) Type 17 CBRA alarm line restart control station in the location shown in the contract drawings:

Type 17 CBRA Alarm Line Restart Control Station Detail	
Function	**Description**
Reset/ Restart	Restarts the associated alarm line subsystem conveyors following an E-stop activation.
Jam	Illuminates to indicate a jam condition on the associated conveyor run.
Start Alarm	Start-up warning alarm for the associated conveyor run.
E-Stop	Immediately stops the associated alarm line subsystem conveyors and de-energizes the conveyor motors.

3. CBRA Alarm Line Energy Management
   a. The CBRA alarm line operate as run-on-demand conveyors. The belts start automatically from a shutdown/timeout state as normal with associated start alarms and beacons per the standard start-up process with run-on-demand enabled.
   b. When run-on-demand is enabled, the local system status lights illuminate steadily.
   c. After the run-on-demand timer ends, if no bag flow is detected, the conveyor stops and enters an idle state. Any detected bag flow resets the timer.
   d. When an upstream conveyor's photocell detects a bag, the conveyor restarts without any start indication.
   e. The conveyor runs for a short duration to transport the bag to the next downstream conveyor. If photocells detect no other bags in the associated motor group or the upstream motor group for a set time, the motor group shuts down normally and enters a timed-out state. When the motor group enters the timed-out state, run-on-demand disables and the local system status beacons extinguish.
4. CBRA Alarm Line Queuing Methodology
   a. The CBRA alarm line conveyors energize when the alarm line activates and operates like a runout conveyor (i.e., activated by the upstream conveyor's discharge end photocell). Once activated by the appropriate controls, these conveyor segments run until the bag reaches the discharge end photocell of each unload conveyor while the downstream conveyor is stopped (bag cascade stops at the discharge end photocell), until the bag advances fully from the conveyor segment (conveyor segment stops unless another bag is on the conveyor segment or another bag blocks the upstream conveyor's discharge end photocell), or until the bag reaches the discharge end photocell at the furthest downstream enabled BIS (bag cascade stops at the discharge end photocell and awaits removal to a BIT).
   b. Employ dynamic advancement/index control logic in compliance with PGDS queuing method requirements. When a bag arrives at the first queue belt upstream of the first BIS on the line, the bag shall be assigned to the BIS that has been available for the longest period of time. If no available BISs are active, then the bag stops and holds on the BRP prior to the most upstream enabled BIS. If there are no enabled BISs, then the bags queue at the second most downstream BRP. When a bag is assigned by the BHS to an available BIS, the bag cannot be reassigned to another BIS unless the BIS is disabled (i.e., the operator logs out).
   c. The BSD indicates the bag security status in addition to the other information described in the PGDS for BSDs. The TSO then follows the BSD prompts in compliance with proper protocols and PGDS functionality requirements. This stops any further movement of the conveyor until the discharge end photocell of the BRP becomes unblocked for 10 seconds (adjustable) to allow the TSO to remove the bag safely to the BIT, i.e., the queue belt shall not index/move if the TSO must move the bag around to access the bag's handle/straps and inadvertently moves the bag so it no longer blocks the photocell. The BHS automatically updates the BHS database containing the bag's tracking ID (pseudo-ID) with the information that the bag has initiated Level 3 inspection and a time stamp of when it transferred to the BIT.

F. Outbound Oversize Subsystems
1. General
a. The Outbound Oversize subsystems consists of one (1) conveyor subsystems for transporting oversize bags as follows:
1.) One (1), OG1 that originates in the second level and feeds directly to oversize make-up pier in the first level.
2. Control Equipment (OS CBRA and OS Clear Line)
a. Furnish and install Type 10 control stations in the locations shown in the contract drawings for start/stop control of the oversize lines at the ticketing level and in the CBRA oversize clear line induction area.
b. Provide two (2) control stations for the operation of the oversize conveyors in the CBRA. They shall be located and labeled as follows:
1.) Install a control station adjacent to the OG1-04 oversize unload conveyor's charge end with the following control devices.
a.) ALM: Audible warning alarm: Start-up warning alarm for the OG1-04 conveyor.
b.) BPB: Flush-head black momentary contact pushbutton switch. The controls for the Bag Advance pushbutton shall advance baggage toward the discharge end photocell (i.e., PE/OG1-04) of conveyor OG1-04 until either the pushbutton switch is released or the bag reaches the Full photocell PE/OG1-04.
c.) SPB: green momentary contact pushbutton switch: Actuation of the conveyor's reset/restart pushbutton shall reset faults associated to the Oddsize alarm line conveyor in the CBRA and shall energize the respective Visual/Audible warning alarm on the conveyor segment for 10 seconds (adjustable). After the 10-second Run alarm period, conveyors OG1-04 through OG1-05 shall start.
d.) EPB: Illuminated red maintained contact mushroom-head E-Stop pushbutton switch: Upon activation of the pushbutton, the respective indicator light shall illuminate. The control system shall stop conveyor segments OG1-01 through OG1-07 (minimum) and sound the associated subsystem warning alarms. Resetting of the E-stop condition shall be consistent with the System Control Requirement specified herein. The location of the E-Stop control stations and related E-Stop zones shall be coordinated with the Cedar Rapids Airport Commission.
2.) Install a control station at the charge end of OG1-05 with the following control devices.
a.) ALM: Audible warning alarm: Start-up warning alarm for the OG1-05 conveyor.
b.) SPB: Illuminated green momentary contact pushbutton switch: Actuation of the conveyor's illuminated start pushbutton shall energize the respective Visual/Audible warning alarm (on the conveyor segment for 10 seconds; adjustable). The subsystem's respective System Start pushbutton shall flash, indicating imminent system start-up. During the 10 second Run alarm period, security door SD/OG1-06 shall open. After the 10 second Run alarm period, conveyor segments OG1-05 through OG1-07 shall start and the System Start pushbutton flashing indicator shall illuminate steady. Runout conveyor OG1-07 shall operate in an inch and store (indexing) function, as described elsewhere herein.
c.) BPB: Flush-head black momentary contact pushbutton switch. The controls for the Bag Advance pushbutton shall advance baggage toward

the discharge end photocell (i.e., PE/OG1-05A) of conveyor OG1-05 until the pushbutton switch is released.

d.) PBS: Flush-head red momentary contact pushbutton switch. The controls for the conveyor segment's Normal Manual Stop shall stop conveyor segment OG1-05 through OG1-06 and close security door SD/OG1-06 upon activation of the pushbutton.

e.) EPB: Shall operate similar to CS/OG1-04/EPB, as described above.

c. Furnish and install a control station at the discharge end of OG1-05 with the following control devices:

1.) SPB: Illuminated green momentary contact pushbutton: Actuation of the conveyor's illuminated start pushbutton shall energize the respective Visual/Audible warning alarm (on the conveyor segment for 10 seconds (adjustable)). The subsystem's respective System Start pushbutton shall flash, indicating imminent system start-up. During the 10 second Run alarm period, security door SD/OG1-06 shall open. After the 10 second Run alarm period, conveyors OG1-04 through OG1-07 shall start and the System Start pushbutton flashing indicator shall change to a steady illumination.

2.) PBS: Flush-head red momentary contact pushbutton. The controls for the conveyor segment's Normal Manual Stop shall stop conveyor segment OG1-05 and close security door SD/OG1-06 (assuming the door clear photocells are not blocked) upon activation of the pushbutton. The remaining conveyor segments (OG1-06 through OG1-07 shall auto-stop normally.

3.) LTW: White over-length indicator: This indicator light shall signify, by steady illumination, an over-length bag condition at the discharge end photocell (i.e., PE/OG1-05A) of conveyor OG1-05. The indicator light's steady illumination shall change to a flashing signal when the over-length condition has been cleared, signifying that the fault is clear for the system reset, and shall extinguish only upon the restart of the conveyors, which shall be performed by actuating the system local start pushbutton.

4.) LTW: White over-height indicator: This indicator shall signify, by steady illumination, an over-height bag condition at the discharge end photocell (i.e., PE/OG1-05B) of conveyor OG1-05. The indicator light's steady illumination shall change to a flashing signal when the over-height condition has been cleared, signifying that the fault is clear for the system reset, and shall extinguish only upon the restart of the conveyors, which shall be performed by actuating the system local start pushbutton.

5.) LTA: Amber jam indicator: This indicator shall signify, by steady illumination, a jam condition at the discharge end photocell (i.e., PE/OG1-05A) of conveyor OG1-05. The indicator light's steady illumination shall change to a flashing signal when the jam condition has been cleared, signifying that the fault is clear for the system reset, and shall extinguish only upon the restart of the conveyors, which shall be performed by actuating the system local start pushbutton,

6.) ALM: Audible warning alarm: Start-up warning alarm for the OG1-05 through OG1-05 conveyor segments.

7.) EPB: Illuminated red maintained contact mushroom-head E-Stop pushbutton switch: Upon activation of the pushbutton, the respective indicator light shall illuminate. The control system shall stop conveyor segments OG1-05 through OG1-07 and sound the associated subsystem warning alarms. Resetting of the E-stop condition shall be consistent with the System Control Requirement

specified herein. The location of the E-Stop control stations and related E-Stop zones shall be coordinated with the Cedar Rapids Airport Commission.

d. Control Functions
   1.) Unless different from the below referenced control requirements and functional descriptions, the control functions shall match the existing Oversize Line functionality. Prepare software for the modified conveyor line's control systems reflecting the existing Oversize Line's sequence of operation and functionality. The existing OG1 system O&M Manuals describe the existing subsystem-specific controls in addition to the standard controls required as part of the reconfiguration of this subsystem.
   2.) Subsystem Initial Start-up at Input Conveyor (Manual Start):
      a.) The Oversize Input conveyor shall be activated by a security card swipe. This action shall supply power to the pushbutton control station located at the Input (Load Conveyor) area. Actuation of the Subsystem's Illuminated Start pushbutton shall energize the conveyor line's Visual/Audible warning alarms along the conveyor line right-of-way, both in the public space and air side, for 10 seconds (adjustable). The subsystem's respective security door shall open while the start-up alarm sounds and flashes. After start-up warning alarm period and when the security door is fully opened, conveyor segments OG1-01 through OG1-03 shall start.
   3.) Automatic System Cascade Start
      a.) The conveyor segments downstream of OG1-03 shall start via an Auto-Start sequence. Provide auto-start photocells far enough upstream of the outbound transport conveyors, not specifically controlled by the Start/Stop control station to permit the conveyor belts to come up to speed prior to the processing of baggage. Program the auto-start circuit to start conveyor segments OG1-01 through OG1-03 whenever the OS1 auto-start photocell is interrupted. All conveyors under the auto-start function shall start sequentially from the output to the input with an appropriate delay between each motor starter actuation to minimize electrical power surges.
      b.) Install an audible warning alarm near the OG1 runout conveyor in the Oversize CBRA. This alarm activates at the start-up of OG1. Furnish and install additional start-up and fault alarms as required along OG1.
   4.) Oversize Clear Line Manual Start:
      a.) The OG1-05 through OG1-06 clear bag conveyors shall be initiated to start via the local System Start at the OG1-05 conveyor segment control station. Actuation of the Control Station CS/OG1-05 Illuminated Start pushbutton will energize the respective Visual/Audible warning alarm at the OG1-05, for 10 seconds (adjustable). The security door SD/OG1-06 shall open while the Run 10 second alarm sounds and flashes. After the 10 second Run alarm period and when the security door is fully opened, the OG1-05 through OG1-06 conveyors shall start sequentially from the output to the input with an appropriate delay between each motor starter actuation to minimize electrical power surges. Runout conveyor OG1-07 shall also be energized to operate under an inch-and-store (indexing) control function.
   5.) Automatic System Cascade Stop:
      a.) All Oversize unscreened bag transport conveyor capability to shutdown via an auto-stop sequence. Provide a photocell upstream of each conveyor segment and program the auto-stop circuit to stop the OG1 line and to close the security doors if the door clear photocells are not blocked (i.e.,

whenever the auto-stop photocell does not sense a bag for a 5-30 minute period (adjustable). The same photocell may control both Auto-Start and auto-stop functions.

6.) Oversize Subsystem Input and Clear Line Manual Stop:

a.) Depressing the Stop pushbutton on the Type 7 or Type 3A control stations located on OG1-01 and OG1-05 respectively shall stop conveyors their respective conveyor segments and close the security doors (i.e., SD/OG1-01 and SD/OG1-06 (if the Door Clear Photocells are not blocked). The Type 3A Stop pushbutton shall stop conveyor OG1-01 and the Type 7 shall stop conveyors OG1-05 and OG1-06.

3. General Control Functions
   a. Start-up and fault warning alarm(s) location and function shall be consistent with the requirements specified herein. Coordinate the location of the alarms with the Cedar Rapids Airport Commission or their representative.
   b. Furnish and install auto-stop photocells. After no bags have been detected for approximately 3-5 minutes (adjustable), the conveyors stop and the fire/security door closes.
   c. Control functions associated with the line's cascade stop (forward and reverse directions), jam detection/restart, E-stop/reset, MCPs, motor overload conditions, and respective alarm silence function(s) shall be compliant with the requirements specified herein.
   d. Pushing the start pushbutton at oversize load conveyor with cause the downstream transport conveyors to start sequentially from the output with an appropriate delay between each motor starter actuation to minimize electrical power surges.
   e. The unload conveyors operate under inch-and-store controlled by the photocell at the discharge end of upstream conveyor.
   f. Furnish and install run lanyards along the length of unload conveyor. The line shall run so long as the lanyard is pulled.
   g. Furnish and install a photocell at the discharge end of each oversize unload conveyor to detect when bags have accumulated to the end of the belt.
   h. Furnish and install over-height photocells and a lighted reset pushbutton for both the forward and reverse direction.
   i. All fault annunciation and status reporting shall display both graphically and in text on the centralized MDS and associated satellite workstation(s).
4. CBRA Oversize Subsystem Control Functions
   a. The OG1 unscreened bag transport subsystem ends within the Oversize CBRA at conveyor OG1-05. The Oversize CBRA unload conveyor (OG1-05) shall have a Type 3 control station.
   b. The OG1-07 baggage make-up runout conveyor shall operate in an indexing mode for bag collection. When the bag arrives at the charge end photocell of the runout conveyor(s), the bag shall fully advance onto the runout conveyor and stop. For the OS1-05 runout conveyor, provide a run lanyard to permit baggage handlers to advance the bag(s) closer to their location.
   c. Clear bags would be presented to the bagroom for carrier pickup.
   d. Alarm bags would be held in the CBRA for CID/Local TSA handling protocols.
   e. Submit a functional specification on the Oversize CBRA operation to the Cedar Rapids Airport Commission and the TSA for approval.
   f. When the Clear bag arrives outside the Oversize CBRA at the charge end of conveyor OG1-05, the bag shall index onto the conveyor. If the airline’s baggage handlers wish to advance the bag closer to their location, the bag shall be advanced using the bag advance push-button.

g. Control functions associated with the conveyor line's fire/security door(s) operation, cascade stop, jam detection/restart, E-stop/reset, MCPs, motor overload conditions and respective alarm silence function(s) shall be compliant with the requirements specified herein.
h. Flash the Clear Line input conveyor's Start pushbutton when the Oversize Clear Line has cascaded back to the load belt. This will notify the TSO that a jam/fault has occurred in the subsystem and/or the runout conveyor is full.

G. Clear Line Subsystems
1. Clear Line Subsystem CL1
a. General
1.) This subsystem consists of conveyor segments CL1-01 through CL1-08 for transport of clear baggage to MU1. CL1 receives clear bags from the SS1 Level 1 Decision Point, and AL1 subsystem.
b. Control System Components
1.) The following description for CL1 and related sequence of operation is provided as an example; coordinate the detailed control functionality with the Cedar Rapids Airport Commission and the TSA through the shop drawing submittal process.
2.) Provide the necessary control stations with their respective control devices and functions for CL1 to accommodate the requirements relating to the fire door operation, jam reset, and E-stop/reset controls.
c. Controls Functions
1.) All conveyors will operate by means of auto-start/stop circuits.
2.) For merges, CL1 is the primary line and CL2, and CL3 are the secondary lines.
2. Clear Line Subsystem CL3
a. General
1.) This subsystem consists of conveyor segments CL3-01 through CL3-03 for transport of clear bags from the SS3 Level 1 Decision Point and the AL3 subsystem to CL1.
b. Control System Components
1.) The following description for CL3 and related sequence of operation is provided as an example; coordinate the detailed control functionality with the Cedar Rapids Airport Commission and the TSA through the shop drawing submittal process.
2.) Provide the necessary control stations with their respective control devices and functions for CL3 to accommodate the requirements relating to jam reset, and E-stop/reset controls.
c. Controls Functions
1.) All conveyors will operate by means of auto-start/stop circuits.
2.) Start-up alarms and fault alarms shall be located as required, along the conveyor line, as specified elsewhere herein. Start-up and fault warning alarm(s) location and function shall be consistent with the specified requirements indicated elsewhere herein.
3.) At the merge, CL1 is the primary line and CL3 is the secondary lines.
3. CBRA Clear Line Subsystem (CL2)
a. General
1.) This subsystem consists of conveyor segments CL2-01 through CL2-02 for transport of clear baggage from the CBRA to CL1.
b. Control System Components

1.) Coordinate the detailed control functionality of the CBRA clear line with the Cedar Rapids Airport Commission and the TSA through the shop drawing submittal process.
2.) Furnish and install Type 10 control stations along the CBRA clear line in the locations shown on the contract drawings.
3.) Provide the necessary control stations with their respective control devices and functions for CL2 to accommodate the requirements relating to jam reset, and E-stop/reset controls.

4. Controls Functions
   a. Subsystem Initial Start-up at Input Conveyor (Manual Start):
      1.) Selecting the subsystem's start pushbutton shall cause the pushbutton to flash and energize the conveyor line's visual/audible warning alarms along the conveyor ROW, both in the public space and air side, for 10 seconds (adjustable). The flashing of the illuminated pushbutton signifies imminent start-up of subsystem.
      2.) After start-up warning alarm period, all the conveyor segments of this line shall start sequentially from the output to the input with an appropriate delay between each motor starter actuation to minimize electrical power surges.
      3.) The start pushbuttons will also cause the respective collection conveyors on the CL3 line to start, if not already running. Upon successful start-up of the subsystem, the flashing pushbutton shall change to a steady illumination.
   b. Automatic System Cascade Stop:
      1.) All conveyor segments shall have the capability to shutdown via an Auto-Stop sequence. Provide a photocell upstream of each conveyor segment and program the auto-stop circuit to stop the conveyor line (i.e., CL2-01 through to the 90° merge) whenever the auto-stop photocell does not sense a bag for 5-30 minutes (adjustable).
      2.) The same photocell may control both auto-start and auto-stop functions.
   c. Manual Stop:
      1.) Pushing Stop on the input conveyor control station stops CL2-01 after a predetermined period to allow the input conveyor to be clear of any baggage.
      2.) All other downstream conveyor segments shall continue to run for a predetermined period to clear all bags on the conveyor line, prior to the stoppage of the conveyor segments.
   d. Furnish and install start-up and fault alarms along the line as specified herein.
   e. Jam reset and E-stop control station(s) location and function shall be consistent with the specified requirements indicated elsewhere in this document. Install jam reset and E-stop station(s) associated with CL2 adjacent to the conveyor drives and positioned so they are accessible by maintenance personnel.
   f. Control Functions associated with the subsystem's Cascade stop, jam detection/restart, E-stop/reset, motor overload conditions and respective alarm silence function(s) shall be compliant with the specified requirements described elsewhere herein.
   g. For the merge, CL1 is the primary line and CL2 is the secondary lines.

H. Mainline Sortation Subsystem
   1. General
      a. CL1 feeds MU1 directly.
      b. The make-up device (MU1) and associated conveyors (CL1) shall start through the control system when a bag is destined for that make-up device if not already running.
   2. Control System Components

a. Provide the necessary control stations with their respective control devices and functions along the conveyor lines for the subsystem's jam reset control function, E-stop control/reset, HSPDs, and associated control stations.

3. Control Functions
   a. There will be no manual start/stop controls for the conveyors in this subsystem other than local sort pier/device controls, as specified. All conveyors will operate by means of auto-start/stop circuits.
   b. Start-up Sequence
      1.) The normal start-up operations of the Main Sort Line of conveyors is governed by an auto-start circuit and is controlled by separate photocells; located on each input line (i.e., CI1). The photocells shall be located far enough upstream of each input line, to allow the sort line conveyors to come up to speed before baggage arrives. When a bag is detected at the input line's photocell(s), the sort line conveyors - associated with that input - shall start (if not already running) sequentially beginning with the first sort line conveyor segment relative to the input line.
      2.) An amber warning beacon shall be positioned at/near the make-up device. These beacons shall be activated at the start-up of the CL1 line. Additional Start-up Alarms and Fault alarms shall be located, as required, along the CL1 line's right-of-way (e.g., maintenance catwalk areas).
   c. Shut-down Sequence:
      1.) The CL1 conveyors of this subsystem shall shut-down through an auto-stop circuit which will time-out and immediately stop all conveyors if, after a 15 minute period (adjustable), no bags have been detected by the auto-start circuits and all baggage have cleared the train of conveyors.

I. Ancillary Subsystems (Make-up Device Feed/Make-up Device)
   1. General
      a. There is a total of one (1) Make-Up spur conveyor feed for the one (1) existing make-up device; one (1) per unit as follows:
         1.) Make-Up Spur CL1
            a.) The Make-Up Spur conveyor subsystem CL1 consists of a single line of conveyors that utilize a tip chut to deposit bags on to the flat plate makeup device MU1.
   2. Control Equipment Components
      a. Furnish and install Type 1, Type 2, and Type 19 control stations around the make-up device in the locations shown in the contract drawings. Refer to Section 3.07C herein for details regarding these control stations.
   3. Control Functions
      a. There will be no manual start/stop controls for the conveyors in these subsystems other than local make-up device controls. All conveyors, including the initial start-up of the make-up device, operate by means of auto-start/stop circuits.
      b. Design the baggage system control circuitry such that the make-up device is running at full speed prior the start-up of any feed conveyors.

J. Sort Piers
   1. General
      a. There is one oversize sort pier (OG1)
   2. Control Functions
      a. Provide run lanyards alongside each pier. Activation of the advance control shall cause the related conveyor to run for as long as the control is activated or until the respective pier full photocell is blocked.

b. Provide a photocell at the discharge end of each chute feeding a pier conveyor. Program the pier conveyor to run when the photocell is blocked and to stop when it is clear. Include a time delay so the conveyor can be programmed to continue for a preset interval after the bag clears the photocell and is completely on the pier conveyor.
c. Provide an E-stop control lanyard alongside each pier. Activation of the E-stop lanyard shall cause the pier to stop and disable the respective HSPD from discharging bags to the pier. Provide both visual and audible alarms on the MDS when the E-stop lanyard is activated.
d. Provide ¾ and full pier photocells on each pier. Provide a visual indication on the MDS when the ¾ and full photocells are blocked.
e. Provide a red full and ¾ pier strobe light at the discharge end of the pier that illuminates when the ¾ or full pier photocells are blocked.

3.09 CONSTRUCTION SEQUENCING

A. General
1. The BHS installation and associated system modifications will be required to be completed in sequences. The BHS scope of work will be in accordance with an overall project phasing plan. Reference the contract drawings for BHS sequencing plans and overall program phasing plans. Coordinate all work with the program manager, other disciplines working in the immediate area of construction, airline flight schedules and hours of operation, so as not to impact the building's normal functions and concurrent airline operations.
2. The BHS implementation staging is of vital importance to the success of the BHS installation of the new conveyor equipment and modifications to the existing subsystems. Installation of the new conveyor equipment and modifications of the existing equipment will occur simultaneously with ongoing airline operations. The new conveyor system and the modifications to the existing subsystems will increase the existing outbound operational capacity, as illustrated on the accompanying drawings, and it is therefore vital that the outbound baggage make-up area continue to process baggage throughout the implementation period without operational disruption or capacity reduction.
3. Schedule and coordinate the BHS scope of work (installation, removal, and interim connections), in accordance with the phasing sequence indicated by the Project's overall phasing plan and the BHS sequences shown in the BHS drawing package. Coordinate all work with the Cedar Rapids Airport Commission/program manager, other disciplines working in the immediate area of construction, airline flight schedules and hours of operation, so as not to impact CID's normal functions and concurrent airline operations.
4. Short duration system shutdown will be permitted for the changeover from the existing subsystem configuration to the new. Shutdown of the system during changeover shall be scheduled during times of low impacted terminal operating demands. Check and field-verify site conditions to determine and coordinate the schedule for any shutdown period. Notify the respective carrier 72 hours in advance and obtain approval before proceeding with the shutdown of the system(s).
5. Coordinate with the Cedar Rapids Airport Commission and refer to the overall project phasing plan to determine what work shifts will be available for the BHS work of each BHS sequence. Transfer all necessary construction material, conveyor equipment, tools, and components required for the implementation of the BHS to and from the designated lay down areas during the work period.
6. Leave all AOAs associated with the BHS work broom clean at the end of each shift without any equipment, tools, or components left in the area. BHS construction material,

equipment, and tools/components are permitted in the immediate area of construction only during the BHS work period/shift.

7. Existing BHS equipment indicated for removal shall be removed, and turned over to the Cedar Rapids Airport Commission. Equipment shall be turned over to the Cedar Rapids Airport Commission's airport operations and transferred to the designated area within a 5-mile radius of the airport property. Dispose any equipment not desired by the Cedar Rapids Airport Commission, in compliance with the requirements specified in Part 3 herein.
8. Any temporary load conveyors required for testing shall be installed upstream of the ATR that initiates CBIS tracking. Coordinate and receive approval from the Owner and the TSA for any configuration wherein the load conveyor is installed downstream from the ATR.

3.10 EQUIPMENT REMOVAL

A. Maintain Operations
   1. Remove existing equipment indicated on the contract drawings as To Be Removed, including all associated conduits, junction/pull boxes, wiring, control stations, field control components, MCPs, and all other related items. Maintain operation of unaffected baggage handling equipment through the implementation of temporary electrical connections or the addition of supports to replace connections or supports removed in the demolition process.
   2. If the removal of equipment creates unsecured access to a secured area, provide a guard on a 24-hour per day basis until installation of equipment returns the area to secured status.
   3. All motor starters will be removed from the system. These are to be replaced with VFDs. All existing VFDs will be replaced with VFDs that are ethernet IP capable.

B. Conduit Removal
   1. Remove conduit including junction boxes and control/wiring devices rendered unused by the demolition process in its entirety to the motor control panel. 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, cut the unused conduit flush with both surfaces of such floor or wall and abandon the section within the floor or wall if it cannot be removed without breaking masonry. Clean any area where material has been cut away with no holes or protrusions showing. Where removal creates an indentation in concrete, chip away the surrounding concrete, cut the material below floor level, and fill flush with cement.

3.11 DEMOLISHED MATERIALS TO BE DISPOSED

A. General
   1. Remove and dispose of any materials or items demolished and not designated to become the property of the Cedar Rapids Airport Commission or to be reinstalled.

B. Equipment Disposal
   1. Remove from CID site, daily, all debris, rubbish, and other materials resulting from demolition and alternation operations. Transport and legally dispose of equipment offsite in legal landfills or scrap yards. Obtain written permission from the property owner on whose property the removed materials shall be placed and submit a copy of the agreement to the Cedar Rapids Airport Commission.
   2. Burning of removed materials is not permitted on the project site.
   3. Store materials, which cannot be removed daily in areas specified by the Cedar Rapids Airport Commission.

4. Do not store or sell removed items onsite.

3.12 RECONTROLLED EQUIPMENT

A. General
1. Remove, refurbish to a new condition and relocate equipment so indicated on the contract drawings. Disassemble such equipment by removing nuts, bolts, screws, or other fasteners with the use of hand tools. Cut only those sections welded as part of the initial assembly operation that are too large to move through existing doorways and openings or too large to be moved by stake-body trucks with or without oversize permits.
2. Ensure disassembly, transportation, refurbishing and storage of this equipment in a manner to enable reassembly of the equipment in its final location in like-new condition. Supply in the bid form an itemized list of all labor and the materials required to restore the refurbished equipment to like-new condition (such as paint, electrical components, and mechanical components).

3.13 OPERATION AND MAINTENANCE TRAINING

A. General
1. Instruct and train the Cedar Rapids Airport Commission O&M personnel and the TSA's operating personnel at the work site in separate training sessions specific to each group, Conduct this training prior to Conditional Acceptance of each phase of the work and verify competence in the operation and maintenance of the new equipment and the system/subsystems.
2. Provide training by a professionally qualified instructor. Use of site supervisors, equipment or system designers as an instructor for the formal training will not be accepted unless approved by the Cedar Rapids Airport Commission or their representative.
3. Furnish all tools, equipment, materials and supplies, and perform all functions and services required to complete the training as specified. Besides safety and overview training, training shall be divided into separate categories for operations training and maintenance training further broken down to specific trades.
4. No operations training of a piece of equipment will be permitted until the equipment is properly installed and is operational.
5. A detailed outline of the proposed training to be conducted shall be submitted to the Cedar Rapids Airport Commission or their representative for approval, in accordance with the schedule of submissions, prior to the testing of the system. The training program submittal shall include, at minimum, the following information for review:
   a. Types and durations of training/classes.
   b. Name and professional credentials for each instructor/trainer.
   c. Max/min number of persons allowed per class.
   d. Any special material requirements such as classroom/conference room space, laptop computers, displays, or white boards (to be coordinated with the Cedar Rapids Airport Commission; however, the Cedar Rapids Airport Commission is not responsible to supply the space or materials).
   e. Copies of all training materials, to be used during training. All training binders/materials shall be submitted for review in the format in which they will be used during the onsite training. The O&M manuals will not be allowed to be used for training purposes; however consolidated sections of the O&M manuals which have been tailored for classroom training are permitted.
6. Times and duration of the classes may involve irregular hours to provide O&M personnel training on different shifts.

7. All training sessions will be monitored and approved by the Cedar Rapids Airport Commission. Any session or portion thereof deemed unsatisfactory, based on evaluation of the training, shall be repeated by the contractor or their representative at no additional cost to the Project.
8. Develop and maintain a training attendance record for all O&M training sessions presented. Maintain two copies of the attendance record. Forward the original copy of the record to the Cedar Rapids Airport Commission and retain the second copy for record keeping. The recorded training information shall include for each session:
    a. Date of training session
    b. Name of project
    c. Name of Instructor
    d. Subject of training
    e. Time of training session
    f. Signature and department of each attendee
9. Provide the Cedar Rapids Airport Commission with two (2) copies and the TSA with one (1) copy of the video recording of one (1) complete O&M training class for this project. The video recording shall be provided to the Cedar Rapids Airport Commission/TSA in a media acceptable to the Cedar Rapids Airport Commission, prior to beneficial use of the BHS and live baggage screening operations.

B. Operational Training
1. Provide formal instruction of the Cedar Rapids Airport Commission's operational personnel at the site who will be charged with operation of the BHS. Include a description and onsite demonstration of the electrical controls and their operation, modes of operation, the operating limitations of the equipment and the safety devices and their functions.
2. Minimum requirements for operational training shall include the following:
    a. Bag placement on load conveyors.
    b. Tub usage and loading.
    c. Operating procedures for all BHS/CBIS conveyance equipment.
    d. BHS equipment within the CBRA.
    e. CBIS fail-safe procedures and layout – including responsible party for clearing fail-safes, as coordinated with local TSA.
    f. Provide description of the BHS Control Interface with CBIS.
    g. System Safety procedures, including lock-out and Tag-out requirements.
    h. Bag Jam Clearing procedures, as coordinated with CID's O&M group and local TSA.
    i. Sensitive Security Information (SSI) Training for any BHS/CBIS related reports that are classified as SSI; this training shall comply with government SSI guidelines as per the TSA's PGDS, Appendix H.
3. All operations or individuals with access to either viewing or printing reports shall also be trained in SSI procedures (as coordinated with the TSA) prior to operation. These training sessions shall be conducted prior to the operational start-up of the respective BHS/CBIS.
4. Provide a minimum of 20 hours of operational training per shift for this project, for a minimum of three (3) shifts.

C. TSA Training
1. Provide operations training to the local TSA personnel for mechanical, electrical and computer functions as required to properly and safely operate the TSA staffed portions of the system e.g., CBRA and OSR room.
2. Training shall include the following:
    a. All BHS equipment provided in the CBRA room.
    b. All BHS equipment provided in the on-screen resolution room (OSR).

c. BHS Control interface provided so the TSA agent can conduct the Image Quality Test (IQT).
d. CBIS orientation, layout and description of operation.
e. CBIS fail-safe procedures, layout and including responsible party for clearing fail-safe.
f. Bag jam clearance procedures as coordinated with Authority's O&M group and local TSA.
g. Bag jam clearance procedure within the EDS machine (Training to be provided by the EDS OEM).
h. Contractor shall provide SSI training for the BHS reports that are classified SSI. The training shall abide with government SSI guidelines (ref PGDS Appendix H).

3. Submit training material and documentation to the TSA via the Cedar Rapids Airport Commission for review prior to the first scheduled training class.
4. Provide the Cedar Rapids Airport Commission and the local TSA with two (2) copies of the video recording of one (1) complete TSA training class for this project. The video recording shall be provided to the Cedar Rapids Airport Commission/Local TSA in a media acceptable to the Cedar Rapids Airport Commission.
5. Provide a minimum of 10 hours of TSA training per shift for this project, for a minimum of three (3) shifts.

D. Maintenance Training
1. Provide formal training of the Terminal BHS maintenance personnel with the objective of preparing the employees to perform the required preventive maintenance to minimize breakdown and to perform necessary repairs when work stoppages or breakdowns of the equipment occur. The training shall include the following:
a. Preventive and corrective maintenance procedures, including replacement of parts; lubrication quantities, types, frequencies, and application points; and an estimate of the time to perform such procedures.
b. Special tools, techniques, or procedures required for either preventative or corrective maintenance of the equipment, or its auxiliary or support components.
c. Procedures to perform adjustments required for alignment, wear and calibration for all preventative and corrective maintenance, and an estimate of time required to perform such procedures.
d. Assembly and disassembly procedures, including parts lists required for appropriate and corrective maintenance. Models, exploded views, and audiovisual materials shall be used for training. These materials shall be handed to the Cedar Rapids Airport Commission or their representative upon completion of training. Hands on field training shall be provided, subject to the approval of the Cedar Rapids Airport Commission.
2. The formal training shall consist of classroom and on the equipment training, as required to properly train personnel for each shift, prior to the start of operation. The training shall cover all aspects of the electrical and mechanical equipment provided in this project. The electrical aspects shall include electrical controls, control systems, and PLC control systems.
3. Onsite training shall be scheduled to commence immediately following classroom training and shall stress hands-on performance-based application of the classroom training. Equipment shall be started and relevant systems and components shall be demonstrated.
4. Offsite training, primarily for the technical trades e.g., electricians, controls technicians; mechanics shall focus on specialized, technical training and shall be provided by the manufacturer at their factory or training facility. In case the Cedar Rapids Airport

Commission requests specialized factory training on a specific piece of equipment, arrange for the provision of such training with the applicable manufacturer.

5. Provide maintenance training for any specialized equipment used in the related system that is not of the contractor's design or manufacture. The qualified representatives will present such training, from the manufacturer of the specialized equipment.
6. Provide a minimum of 80 hours of maintenance training per shift for this project, for a minimum of three (3) shifts.
7. Examples of specialized equipment and other BHS maintenance related training include the following:
    a. Safety procedures including lock out/tag-out
    b. O&M manual use
    c. Warranty procedures
    d. System preventative maintenance
    e. Jam clearance procedures
    f. Fail-safe procedures and clearance
    g. EDS/BHS interface and troubleshooting
    h. Power turns
    i. Flat plate devices
    j. 45° merge conveyor
    k. HSPDs
    l. Fire/Security Doors
    m. PLC systems, including basic ladder programming techniques
    n. Computer systems equipment
    o. Problem resolution screens
    p. Contingency plans
    q. Configuration management plans and procedures
    r. System reports
    s. MCP touchscreen terminals with associated fault annunciation to the graphic/text display
    t. MDS and MIS, including development of new reports, adding modified existing conveyor subsystems with associated fault annunciation to the graphic/text displays.

END OF PART 3

PART 4 - QUALITY CONTROL SPECIFICATIONS

4.01 CONTRACTOR'S QUALITY ASSURANCE GENERAL REQUIREMENTS

A. Non-Standard Equipment
   1. Any proposed equipment that is appreciably different from items previously fabricated or that has not displayed satisfactory performance in a similar environment for at least one year (for a minimum of 18 hours per day, 7 days per week) shall be so documented in the proposal. As a reference, any of the following components that do not meet the requirements listed in the previous sentence shall be considered non-standard:
      a. Controls equipment installation
   2. Prior to the start of fabrication, a prototype of the new item shall be built and test data shall be submitted showing that the item has successfully performed the equivalent of one full year of operation. The Cedar Rapids Airport Commission or their representative shall be invited to witness the test and review the test data at no additional cost to the project.
   3. The testing requirements and demonstration shall identify such requirements as follows:
      a. Number of hours of run time
      b. Number of test cycles
      c. Processing rates
      d. Mean time between failures
      e. Repair time, serviceability
   4. The Cedar Rapids Airport Commission or their representative must approve the proposed non-standard equipment design before the final design and fabrication of the overall system, provided that the BHS is produced by a firm with at least 3 years of experience in manufacturing and installing such systems comparable to that required under this Contract. The Cedar Rapids Airport Commission or their representative must approve the use of firms with less than 3 years of experience.
   5. In lieu of developing a prototype, arrangements may be made for the Cedar Rapids Airport Commission or their representative to inspect an existing component in operation at an airport at no additional cost to the project.

4.02 FIELD QUALITY CONTROL

A. General
   1. Coordinate the requirements of this section with Divisions 01 and 02.
   2. During construction, installation, or modification, cooperate with other contractors who might be working in the immediate area for coordination of right-of-way clearances and verify as-built conditions.
   3. Where walls immediately adjacent to conveyor equipment affect maintenance access, advise the Cedar Rapids Airport Commission or their representative of the location and size of the wall opening or right-of-way clearance that needs to be developed to permit access to drive components, bearings, and other equipment that would normally be inaccessible because of the wall or other interferences.
   4. Design and install conveyor equipment to provide maximum access for O&M personnel.
   5. Document the quality control observations and inspections and maintain a copy of the documentation on file.
   6. Any work found not to be compliant with the contract documents shall be promptly corrected in an approved manner.

B. Quality Assurance

1. Conduct quality control of all work, including work performed by any of its subcontractors. Include in its own direct subcontracts the provisions necessary so the quality of subcontracted work will meet the requirements herein.
2. The Cedar Rapids Airport Commission or their representative shall have the right to audit and inspect the contractor's and its direct subcontractors' quality systems. Such audits may be conducted on a random or routine basis and may include an audit of the contractor's inspection and test records. The Cedar Rapids Airport Commission or their representative shall have the right to witness any tests or inspections and shall have access to all test data including test procedures, test specifications, and test results. The Cedar Rapids Airport Commission or their representative shall have the right to conduct independent tests or inspections at its own expense on any material or equipment to be used on the project. Should such the Cedar Rapids Airport Commission-directed independent test result in failure, reimburse the Cedar Rapids Airport Commission's expense for the test.
3. The Cedar Rapids Airport Commission or their representative shall have the right to reject and replace, at the contractor's cost, any construction, production or installation, or portion thereof, which has not been accomplished or documented as accomplished in accordance with the accepted quality control plan.

C. Quality Assurance Representative
1. Appoint a quality assurance representative acceptable to the Cedar Rapids Airport Commission or their representative who will be responsible for the overall quality assurance implementation and monitoring of the general requirements.
2. The quality assurance representative shall always be available onsite during the construction period and be qualified to advise the Cedar Rapids Airport Commission or their representative on the overall BHS scope of work (i.e., installation/removal procedures, modifications, provisioning, start-up, and maintenance of the equipment).

D. Configuration Management Program
1. Maintain strict configuration control of all aspects of the design, construction, fabrication and installation of the BHS consistent with the approved configuration management plan that will be established for the project.
2. Provide each existing BHC and PLC system that shall be modified under this project which does not have an existing configuration management software solution with a software solution that shall automatically audit/manage the configuration and change management of its respective operating software applications.
3. Tracking logs for correspondence and documents shall be provided when requested by the Cedar Rapids Airport Commission or their representative. Establish a single source for transmitting and receiving documents and correspondence. Material from subcontractors shall be consolidated and submitted to the Cedar Rapids Airport Commission or their representative.
4. Logs for correspondence and document control shall be provided to the Cedar Rapids Airport Commission or their representative on electronic media and in reproducible hard copy for use in the Cedar Rapids Airport Commission's document control system.
5. The audit function shall track every change made to the BHS and its operating programs, including detecting who, where and when changes were made. The archive file management function shall manage all revisions carried out to the system, as files are modified, revisions shall also be stored and be accessible for future use.

E. Project Management Office
1. Within one week of the date of commencement initiate the project management office, inform the Cedar Rapids Airport Commission or their representative of the details of the

office, and authorize the project manager and onsite field superintendent to act as representatives.
2. The project manager shall be given full authority to make decisions and enter into binding agreements with the Cedar Rapids Airport Commission for all aspects of the project.
3. Submit a listing of all key project personnel with 24-hour contact details (cell phone number, e-mail addresses).
4. Provide all office equipment (e.g., telephones, copiers, fax, computers, plotters, furniture) required to establish the onsite project management office.

F. Pre-Installation Meeting
1. Prior to the start of the installation, attend meetings onsite as required or requested by the Cedar Rapids Airport Commission or their representative. At minimum, each BHS construction phase shall include one (1) pre-installation meeting. Pre-installation meetings shall be scheduled for each BHS phase of construction (on a phase-by-phase basis). The Cedar Rapids Airport Commission or their representative will schedule the pre-installation meetings to coordinate the onsite installation for each BHS phase with ongoing airport operations.
2. Provide at the initial pre-installation meeting to the Cedar Rapids Airport Commission or the CM the following:
   a. Safety program manual
   b. Drug policy manual
   c. Project organization chart to include all subcontractors
   d. Principle suppliers to include long lead items and planned procurement dates
   e. Insurance enrollment forms
   f. Quality control manual
   g. Configuration management plan
   h. Diversity program
   i. Updated master schedule
   j. Plans for coordination and notification for utility work
   k. Details of QA/QC program that shall include plans for coordination with the work of other contractors and procedures for sharing access to the work site.
   l. Schedule of deliveries of major equipment

G. Pre-Demolition Meeting
1. Prior to the start of any demolition, attend meetings onsite as required or requested by the Cedar Rapids Airport Commission or their representative. At minimum, each BHS construction phase shall include one (1) pre-demolition meeting. Pre-demolition meetings shall be scheduled for each BHS phase of construction (on a phase-by-phase basis). The Cedar Rapids Airport Commission or their representative shall schedule the pre-demolition meetings to coordinate the onsite removal of the BHS equipment for each BHS phase with ongoing airport operations.

H. Work Activities Bulletin
1. A BHS specific Work Activities Bulletin shall be submitted to the Cedar Rapids Airport Commission or their representative for distribution to the local TSA and impacted airlines, other impacted contractors (e.g., TSA's EDS manufacturer, ATR manufacturer, BMA manufacturer), a minimum of 7 days prior to the testing, demolition or cutover activity-taking place.
2. No work should be commenced unless the contractor has a signed Work Activities Bulletin in hand, and has distributed copies to the local TSA, User Airlines, system tenants, other impacted contractors, and the Cedar Rapids Airport Commission or their representative.

3. Include details on TSA staffing needs for OSR and/or CBRA support. TSA testing & commissioning will be required as part of the recontrol & hardware migration.
4. Include a detailed description of all preparatory work required by other trades and the BHS activities that will be required when completing overnight changeovers, to minimize disruption to the BHS. Provide a back-up plan for recovery of operations if changeover work will not be completed in time.
5. Provide all necessary coordination and operational interface to prevent disruption to AOAs.

I. Approval to Proceed
1. Before starting any work affecting existing baggage handling equipment that shall temporarily discontinue or disrupt service to the existing system/operations, notify the Cedar Rapids Airport Commission or their representative 72 hours in advance and obtain the Cedar Rapids Airport Commission or their representative approval in writing before proceeding with this phase of the work.

J. Preparatory Inspection
1. To be conducted prior to commencing work:
   a. Check schedules, project conditions, protection, traffic arrangements, utilities services maintenance, and related preparatory work for conformance to submittals.
   b. Verify adequate protection against damage.
   c. Verify qualifications of all workers.
   d. Review installation, demolition, alteration, removal, and disposal procedures to ensure coordination of contract documents requirements with each person involved in performing the work.
   e. Verify as-built conditions and notify the Cedar Rapids Airport Commission or their representative of conflicts.

K. Initial Inspection
1. To be conducted after a representative sample of the work is complete:
   a. Review the representative sample of the work against the specification and code requirements previously discussed at preparatory inspection.
   b. Check installation, removal, and disposal of each item for conformance.
   c. Check for damage and correct any damaged work.
   d. Submit the completed documentation for review to the Cedar Rapids Airport Commission or their representative detailing compliance of the above.

L. Follow-Up Inspection
1. Check completed work against results of initial inspection of representative sample of work against items mentioned in the preparatory inspection.
2. Verify that damaged work is corrected properly and approved by the Cedar Rapids Airport Commission or their representative.
3. Submit the completed documentation for review to the Cedar Rapids Airport Commission or their representative detailing compliance of the above.

M. Inspection Results
1. Certify inspection results: This certification shall state the observations were performed by or under the direct supervision of the contractor's quality assurance representative and that the results are representative of the conditions being certified.
2. Work accomplished shall be considered satisfactory only when the records and inspections show that all variances have been corrected and that the work is in conformance with the contract documents.
3. Submit completed documentation for review to the Cedar Rapids Airport Commission or their representative detailing compliance of the above.

4.03 INSPECTIONS/TESTING AND ACCEPTANCE

A. Inspection and Testing Procedures

1. General

a. In coordination with the Cedar Rapids Airport Commission, perform a throughput rate test of the existing outbound sort system, which is planned to be reconfigured. This test shall be performed prior to the commencement of the alteration requirements to record and establish (benchmark) the existing throughput rates of the system as well as the existing induction station throughput rates that shall be maintained (as a minimum requirement) for comparison purposes after the system reconfiguration. This information shall be submitted to the Cedar Rapids Airport Commission for review and confirmation. Provide the manpower required throughout the BHS for loading and handling of test material.

b. After installation of the BHS, demonstrate its operating capability. Prior to the start of systems acceptance testing (SAT), perform all debugging and internal testing. Conduct internal acceptance tests prior to conducting such tests with the Cedar Rapids Airport Commission or their representative so tests conducted with the Cedar Rapids Airport Commission or their representative are successful. Make available to the Cedar Rapids Airport Commission or their representative, daily, all records of internal testing and debugging (with corrective action carried out) performed prior to acceptance testing.

c. Submit written notice to the Cedar Rapids Airport Commission or their representative at least 14 days prior to acceptance testing that all internal acceptance tests have been completed and are ready for the witnessed testing. Ensure the Cedar Rapids Airport Commission or their representative and the TSA witness all acceptance tests and will indicate acceptance by signing and dating the test data sheet. The Cedar Rapids Airport Commission reserves the rights to back charge the contractor for the time and expenses of all who attended the acceptance testing on the Cedar Rapids Airport Commission's behalf should the requested acceptance tests be unsuccessful and require re-testing at a later date.

d. The commissioning and evaluation requirements for the CBIS shall be carried out in compliance with the testing program defined in Section 4.03 herein as well as the PGDS, including all appendices. These requirements shall determine CBIS adherence to the design performance standards (DPS) established in the PGDS.

e. Ensure the completed CBIS meets all requirements described in the PGDS prior to the Pre-TRR with the Cedar Rapids Airport Commission, the TRR with the TSA's representative, and the ISAT with the TSA's representative:

1.) Pre-TRR: All Pre-TRR testing (and retesting of failed tests) shall be carried out by the contractor, and witnessed by the Cedar Rapids Airport Commission and local TSA using the requirements of the PGDS to certify the CBIS satisfactorily passed per the pass/fail requirements of the PGDS and is ready for a TRR by the TSA's representative. All testing data and related Pre-TRR documentation that results from these tests, when passed, will be distributed by the Cedar Rapids Airport Commission to the TSA's representative, for approval, along with a TRR request.

2.) TRR: Upon successful completion of the above referenced local acceptance testing and Pre-TRR, the TSA's representative will be invited by the Cedar Rapids Airport Commission to witness a TRR, which shall be demonstrated by the contractor. The tests that will be performed during this period will be selected by the TSA's representative and those tests shall be demonstrated by the contractor, under the direction of the TSA's representative.

3.) ISAT: Upon successful completion of the TRR to the TSA's representative, a TRR report will be issued by the TSA's to the TSA or their representative and the Cedar Rapids Airport Commission. The Cedar Rapids Airport Commission will submit a letter of concurrence to the TSA regarding successful TRR demonstration, to schedule the TSA or their representative's onsite visit for the ISAT. It is anticipated that the TSA or their representative will provide test personnel and testing material (bags) for the ISAT. However, provide the necessary manpower/labor and material, as necessary, similar to previous tests performed with the Cedar Rapids Airport Commission and local TSA, to support the TSA or their representative in performing the mandated ISAT for the CBIS.

f. The entire CBIS (physical, programming, networking, and reports) as well as all legacy BHS components delivering bags to the CBIS and taking bags away from the CBIS shall be in complete and final configuration for all tests. Any components not in final configuration or any situation requiring phased commissioning shall be submitted by the contractor to TSA for approval via the Request for PGDS Variance Template contained in Appendix A of the PGDS. The BHSC shall submit to TSA or their designee the PLC code for all PLCs controlling CBIS components in the security tracking zones both at the start and conclusion of the ISAT. TSA and/or TSA's representative will verify that the tests have been performed either by witnessing the testing performed by the entity responsible for system construction or by performing an independent test of the system.

g. All testing shall be carried out with both the TSA's EDS supplier and the Cedar Rapids Airport Commission's contractor. The operation of both the BHS and EDS integration software and related controls is incumbent on both parties. Both contractors will participate in and be responsible, as applicable to their respective equipment and responsibilities, for a complete (integrated BHS/CBIS) testing of both the BHS and CBIS until the entire system, including all related reporting functions, has passed all stages of acceptance testing defined herein and is accepted by the Cedar Rapids Airport Commission and the TSA or their representatives. Any delays in testing due to one system shall not create a claim for the other contractor.

h. The Cedar Rapids Airport Commission or their representative will perform inspections and testing of the completed work on an activity-by-activity basis within a given phase, as work is completed. If any punch list items are found, they shall be rectified prior to turning over the conveyor segments of the given BHS phase for operational use or proceeding with the next BHS phase.

2. Testing Materials and Labor Requirements

a. The system shall be capable of handling the maximum and minimum specified sizes and weights without jamming, damage, or toppling of the baggage.

b. Provide all actual baggage and simulated weighted baggage required for testing. Actual baggage provided shall be representative of the many different types of baggage pieces encountered during live operations, including the maximum sizes and weights as defined herein and summarized in the table below. Simulated weighted baggage used shall be either weighted tubs or boxes.

c. The bag set shall contain multiple bag dimensions to mimic stream of commerce, enhance the pre-testing deficiency detection, and decrease variability of results between pre-testing (acceptance inspections/tests, pre-TRR) and ISAT.

d. All baggage used for testing purposes shall be approved by the Cedar Rapids Airport Commission or their representative prior to testing. The ratio of actual to simulated test baggage for this project shall be 50% of each. If needed during the testing period, replace any simulated or actual test baggage that becomes damaged to the extent it is no longer useable to maintain the number of test pieces.

e. Provide an ISAT test bag kit consisting of at least 200 bags per non-redundant EDS machine of types/sizes listed below with baggage weights which range between 5 lb and 50 lb to cover the wide variety of BHS and EDS processing specifications:

Bag Type	Length (in)	Width (in)	Height (in)
Upright	27	19	10
Carry-on Upright	24	15	9
Rectangular Duffle	22	12	12
Expandable Upright	22	17	10
Expandable Upright	22	17	9
Expandable Upright	22	14	9
Upright	27	19	10
Rectangular Duffle	22	12	12
Semi-hard shell	28	23	9
Semi-hard shell	27	21	9
Garment bag (folded dimension)	22	21	7
Large Duffle	35	16	15
Duffle	30	15	10
Small Duffle	17	9	7
Cooler	30	18	18
Long Case (Gun Case)	43	16	6
Long Case (Gun Case)	52	16	6

a. All tests shall be conducted with the above ratio of actual and simulated baggage except for load tests, which shall be acceptable to be performed with simulated baggage only. No sand, dirt, or other abrasive material shall be used for weight while performing load tests.
b. Baggage tubbing and maximum/minimum weights and dimensions shall be used in compliance with the baggage hygiene policy to be developed by the Cedar Rapids Airport Commission and the user airlines.
c. Provide all labor for the specified BHS/CBIS acceptance inspections and tests, including the necessary support and participation for the TSA's EDS supplier's SAT of the EDS machines, separate TRRs for the CBIS conveyor subsystems (i.e., pre-TRR performed with the Cedar Rapids Airport Commission's representative, TRR and ISAT performed with the TSA) and all required commissioning for specification conformance to demonstrate the systems acceptance to the Cedar Rapids Airport Commission or their representative and for TSA's certification tests. The labor/staffing for the BHS/CBIS acceptance inspections and tests shall include manual handling of the test bags and appropriate service personnel onsite during the testing period to service or adjust, as required, the system equipment as well as to open all control boxes, control station covers, drive assembly chain/V-belt guards, and covers for the Cedar Rapids Airport Commission inspection of the system equipment.
d. Provide all necessary test material, including all required measuring and recording devices (e.g., clamp-on ammeter, direct read fpm digital readout tachometer), to demonstrate the operational characteristics and performance of the equipment to the satisfaction of the Cedar Rapids Airport Commission or their representative.

3. System Inspection and Testing Plan
   a. As various subsystems might require testing independent of one another, multiple tests shall be conducted at the various stages of installation.

b. The test plan shall be submitted in both hard copies for field use during the testing process and a completed electronic format (based upon acceptance testing) agreed upon by the Cedar Rapids Airport Commission or their representative.
c. The Cedar Rapids Airport Commission or their representative's inspections and tests will include the following. The below referenced summary of inspections and test is included as a reference for the contractor to perform their own quality assurance/control program.
    1.) Electrical Static Inspection: Submit a comprehensive, easy to read electrical equipment inspection plan. To determine terminal tightness, all terminals in MCPs or field mounted devices shall be tightened to the manufacturer's recommended torque specifications with a certified calibrated torque wrench or appropriate tool. Demonstrate to the Cedar Rapids Airport Commission or their representative that the screws are set at the proper torque value and include this information in the submitted electrical static inspection reports. This inspection plan shall verify adherence to this specification for the following items:
        a.) Belt Conveyors: Control station ID/function tags – control station and disconnect switch accessibility/location – illuminated pushbutton switch protective guard ring – tightness of all hardware – photocell mounting – tach mounting and coupling – control circuit wiring size, type, color, and number tag – power circuit wiring size, type, color, and number tag – wire whiskers at terminal points – wiring terminal point screw tightness – splice point wire nuts within junction boxes – conduit routing and mounting – tightness of conduit/FMC fittings – junction box covers – unused openings in junction boxes or control device boxes – safety disconnect switch lockout capability – maintenance access – record motor name plate data, size of motor overload heaters, and size of all fuses.
        b.) HSPDs: Control station ID/function tags – control station and disconnect switch accessibility/location – illuminated pushbutton switch protective guard ring – tightness of all hardware – photocell mounting – tach mounting and coupling – control circuit wiring size, type, color, and number tag – power circuit wiring size, type, color, and number tag – wire whiskers at terminal points – wiring terminal point screw tightness – splice point wire nuts within junction boxes – conduit routing and mounting – tightness of conduit/FMC fittings – junction box covers – unused openings in junction boxes or control device boxes – safety disconnect switch lockout capability – lanyard cable supports and limit switch – maintenance access – record motor name plate data, size of motor overload heaters, and size of all fuses.
        c.) Flat Plate Devices: Control station and disconnect switch accessibility/location – control station ID/function tags – illuminated pushbutton switch protective guard ring - tightness of all hardware – photocell mounting – control circuit wiring size, type, color, and number tag – power circuit wiring size, type, color, and number tag – wire whiskers at terminal points – wiring terminal point screw tightness – splice point wire nuts within junction boxes – conduit routing and mounting – tightness of conduit/FMC fittings – junction box covers – unused openings in junction boxes or control device boxes – safety disconnect switch lockout capability – maintenance access – record motor name plate data, size of motor overload heaters, and size of all fuses.

d.) MCPs: ID information for MCP and all devices contained within – control station ID/function tags – illuminated pushbutton switch protective guard ring – location of control devices – tightness of all hardware – control circuit wiring size, type, color, and number tag – power circuit wiring size, type, color, and number tag – wire whiskers at terminal points – wiring terminal point screw tightness – plastic wire raceway – splices in plastic wire raceway – plastic wire raceway covers – conduit routing and mounting – tightness of conduit fittings – conduit bushings and chase nipples – air-space around PLCs – MCP door(s) mechanical safety interlock – safety shield over line and load terminals of MCP main breaker – orientation of touchscreen panel – restraint clips for plug-in power supply.

2.) Dynamic Mechanical Testing: Submit a comprehensive, easy to read mechanical test plan. At minimum, this test plan shall verify the specified functionality of the following equipment:
   a.) Belt Conveyors: Conveyor speed – belt tracking – shaft run-out on pulleys – excessive vibration – lateral movement of speed reducer on shaft during start/stops – abnormal noises – torsion flexing of drive assembly during start/stop operation – operation of controls – merge windows
   b.) HSPDs: Operation of clutch units – abnormal noises – cycling speed – paddle height above belt during cycle – paddle extension across full width of conveyor belt – operation of controls – capability of processing all types of baggage, including golf bags.
   c.) Flat Devices: Operation of soft-start device – engagement of plate cam followers with drive assembly – vertical or horizontal displacement of plates through drive assembly section – excessive vibration – abnormal noises – binding of perimeter finger guards with top surfaces of plates – operation of controls.
3.) Dynamic Electrical Testing: Submit a comprehensive, easy to read electrical test plan that clearly identifies all installed control devices, the control device locations in the BHS, the function of the control device, all conveyors affected by the control device, and the expected field result with applicable system monitor message/display.
   a.) Control Devices: Photocells – limit switches – status lights – start-up alarms – fault warning alarms – fault warning alarms with multiple faults – fault warning alarm silence buttons – timer settings – auto shut-down – motor overloads – motor disconnects – auto start – manual stop – cascade operation – E-Stop function – over height/over length function – jam function.
   b.) Workstations: Graphical system status display – graphic fault warning and associated text display – report generation (daily, weekly, monthly, annual, and on demand) – accuracy of all reports – redundancy operation between primary and back-up workstations – problem resolution text – modification to flight and tag tables –monitor redundancy functions – access to all security levels – ability to render individual equipment unavailable/available – statistics and counter reset capability – demonstrate statistical data back-up functionality.
   c.) Cable Testing: Test all cables, including all fiber optic and Cat-6 telecommunication cables, and all cables to be connected as part of an interface to another system (e.g., fire system).

d.) Interface Testing: Test all interfaces with other systems (e.g., fire system, EDS machines). Coordinate with other trades in support of this testing.

4.) Empirical Readings
   a.) Empirical Readings taken at the time of Conditional Acceptance Testing include the following:
      (1.) Main Feeds: Fuse size per phase, amperage per phase.
      (2.) Transformers: Fuse size per phase, amperage per phase.
      (3.) Conveyor/Device Speeds: Center line speed of conveyor/device.
      (4.) Motors: Nameplate data, horsepower, listed motor current; fuse size per phase, amperage per phase, overload heater size or designation.
      (5.) VFDs: record all VFD settings

5.) Load Testing: Submit a comprehensive, easy to read test plan listing the expected load rating for each device. At minimum, provide the following:
   a.) Individual device identifications with the expected load rating for each device.
   b.) Amperage readings per phase under No Load conditions.
   c.) Fuse sizes (if applicable) and motor heater settings.
   d.) Motor nameplate FLA for each device drive and HP.
   e.) Amperage readings per phase under full load conditions.
   f.) Pass/fail and notes/comments sections.
      (1.) All FLA readings taken during load testing shall be recorded and included in the final O&M manual for record.
      (2.) Motor FLA shall be measured with full load during load tests and any motor that draws more than the name plate FLA (after start-up in rush current has flattened) shall be replaced with a motor of appropriate size that shall result in no more than the max name plate FLA during load test.

6.) Operational, Functional, and System Performance Testing
   a.) Submit a detailed system functional test script for each of the functions summarized below, on a subsystem basis, to be reviewed by the Cedar Rapids Airport Commission or their representative per the schedule of submittal requirements.
   b.) The operational, functional, and system performance tests shall verify the newly installed control devices as described in the BHS description of operations, which shall be submitted as part of the project shop drawing submittal process, and that all the control functions required by the specification are provided. The system performance tests shall verify the compliance of the installed BHS with the requirements specified in the contract documents. The acceptance inspections and tests for the overall system shall include the applicable items outlined herein and the controls functionality of the BHS with the EDS.
   c.) These tests shall demonstrate the subsystem's compliance with the specified controls requirements of the contract documents. Tests on controls functionality shall include manual start/stop controls, bag over-height/over-length detection and reset controls, E-Stop and reset controls, jam detection and reset functionality, cascade stop controls, overload simulation, auto start/stop functions, bag tracking functionality, bag sortation, security screening functions, BHS MDS and MIS computer functionality, CBIS and EDS integrated controls functionality.

7.) Rate Testing: Submit a comprehensive, easy to read test plan detailing the loads, system loading points, manpower required throughout the BHS for loading and re-circulating testing materials (if applicable), observational manpower required to monitor the system performance during the test, and clearly identify the system reports (by name) that will be used to demonstrate the system has achieved the specified processing rates.
   a.) The rate test shall require the demonstration of the ability to accurately process the specified items per minute for 30 consecutive minutes for the outbound transport conveyors (with more than one input), EDS matrix and clear bag transport conveyors to the make-up area. To perform the 30-minute rate test for one (1) 7 bag-per-minute mainline subsystems, a total of 200 real and simulated bags would be required. All subsystems shall be rate tested. It is the intent of this specification that the maximum processing rate is for bags averaging a length of 2'-5".
8.) Redundancy Testing: Submit a comprehensive, easy to read test plan, which will demonstrate the redundancy capability of the system:
   a.) At minimum, the test(s) shall verify the ability of the system to perform the following:
      (1.) Redundancy operation of the high-level network
      (2.) Redundancy operation of the low-level network
      (3.) Redundancy operation between primary and back-up PLCs
      (4.) Redundancy operation between primary and back-up server computers
      (5.) Redundancy operation if an MDS monitor fails
      (6.) UPS operation and redundancy
9.) EDS Matrix Testing: Submit a comprehensive, easy to read test plan, which will demonstrate the EDS matrix performance on the following:
   a.) Transfer of bag ID information and screening status between the BHS and EDS machines.
      (1.) Sortation through security screening Level 1 EDS matrix.
      (2.) Sortation through security screening Level 3 CBRA.
      (3.) Bag flow/sortation through screening Level 1 as individual EDS machines are made inoperable/operable.
      (4.) Redundancy operation through all levels of EDS security screening system.
      (5.) Tracking accuracy as specified herein.
      (6.) Routing of lost tracking/missing bags (either to CBRA or returned to a Level 1 device as per the TSA protocol).
      (7.) Functionality of the EDS IQT and Insert modes.
      (8.) Operation of the decision point fail-safe system. Correct functionality of control station (cleared, alarmed and EDS unknown bag status indicator lights and audible alarms) located at each decision point.
      (9.) Accuracy of EDS reports.
      (10.) EDS machine hold and auto modes of operation with respect to the BHS.
      (11.) Test bag insert after an EDS functionality (i.e., the unknown bag shall be routed to the CBRA).
      (12.) Test E-Stop state between the EDS and BHS (all conveyor belts are stopped; no signal is sent to the EDS machine gantry).
      (13.) Test for a sustained maximum throughput rate for the complete EDS matrix.

B. Conditional Acceptance
   1. Conditional acceptance for each individual phase or BHS activity for the specified work will only be considered upon completion of the following:
      a. The individual inspections and tests are performed in the order presented below on an activity-by-activity basis, as it relates to the specified project phases.
      b. Identified deficiencies (punch list items) shall be corrected prior to proceeding to the next BHS activity and before performing the subsequent inspections or tests. As a minimum, the following inspections and tests shall be performed for each phase or BHS activity for new and modified conveyors/MCPs/devices, prior to turning the given BHS activity over for beneficial use, within a given phase.
         1.) Electrical static inspection
         2.) Dynamic electrical inspections/testing
         3.) TSA's SAT testing
         4.) Empirical readings
         5.) Functional controls tests
         6.) Pre-TRR testing with the Cedar Rapids Airport Commission or their representative
         7.) TRR and ISAT testing with the TSA
      c. Upon completion of a given phase or BHS activity for the specified work, and once all inspections/tests have been completed and punch list items have been corrected, the conveyor segments of the given phase or BHS activity (or portion thereof) shall be turned over to the Cedar Rapids Airport Commission for beneficial use. Provide the conveyor equipment maintenance for a minimum of five (5) days thereafter, upon which time that individual system shall be turned over to the Cedar Rapids Airport Commission. During the five-day period the conveyor equipment shall not experience any operational disruption/failure; should that occur, it shall be the contractor's responsibility to address and correct the fault and the five-day period shall then re-start after the correction of the operational disruption/failure.
   2. Conditional acceptance for each BHS related phase for the specified work shall only be considered after the following are completed:
      a. The conditional acceptance inspection and testing procedures presented above are successfully completed as specified for all related BHS activities.
      b. Draft O&M manuals have been delivered with details on the completed portion of the system for that phase.
      c. O&M training has been performed for the completed portion of the system for that phase.
      d. Spare parts as purchased by the Cedar Rapids Airport Commission for that phase have been delivered.
      e. All special tools and equipment required for maintenance purchased by the Cedar Rapids Airport Commission have been delivered for that phase.
      f. A certified warranty statement has been submitted to the Cedar Rapids Airport Commission, summarizing the warranty coverage with the warranty commencement date for that given Phase and outlining the BHS equipment that shall be covered under the warranty.
      g. The name, address and a 24-hour phone number of a representative who has the authority and experience to make immediate replacements and repairs for the full life of all warranties has been provided.
   3. Conditional Acceptance Inspection and Testing of Completed BHS and mini-Inline CBIS
      a. The overall reconfigured system including all upper- and lower-level controls shall demonstrate compliance with the approved test plan. The individual inspections and tests shall be performed in the order presented above on an activity-by-activity

basis. System deficiencies (punch list items) shall be corrected before performing the subsequent inspections or tests. The overall system inspections and tests for the complete BHS shall include the following minimum requirements (these tests shall be performed either upon the completion of each phase or activity or upon completion of the entire BHS alterations program):

1.) Electrical static inspection
2.) Dynamic electrical testing
3.) TSA's SAT testing
4.) Empirical readings
5.) Load testing
6.) Functional controls testing
7.) Clear bag automated sort controls/functions and performance.
8.) EDS sortation testing
9.) Pre-TRR testing with the Cedar Rapids Airport Commission or their representative
10.) TRR and ISAT testing with the TSA
11.) Redundancy testing
12.) Rate testing
13.) System endurance and stability testing
14.) CBIS certification

4. Upon successful completion of the specified inspections and testing, the Cedar Rapids Airport Commission or their representative shall issue a written notice of conditional acceptance for each phase.
5. A conditional acceptance status shall indicate that the Cedar Rapids Airport Commission has approved the equipment as worthy for operational use and that the given phase is substantially complete.
6. The conditional acceptance shall not relieve the responsibility for maintenance, security, and insurance on the system. Maintenance shall only be required if the given phase for the BHS has not been conditionally accepted for operation use. If the given phase has been accepted for operational use, maintenance shall be provided for the three (3) days specified herein.
7. In no case shall conditional acceptance relieve the responsibility for performing all the work set forth in the contract documents.
8. Conditional acceptance is applicable to each construction phase or BHS activity for the specified work and must be issued in writing, by the Cedar Rapids Airport Commission or their representative, prior to commencement of subsequent construction phase/activity. Final Acceptance of individual construction phase/activities or subsystems shall not apply.
9. At the time of conditional acceptance, of the overall BHS program/alterations, the amount of retention held until issuance of a Certificate of Final Acceptance shall be a summation of 10% of the total value of the project and the assessed value of open punch list items (to be determined by the Cedar Rapids Airport Commission).

C. Conditional Acceptance Operational Period
1. Upon issue of a Certificate of Conditional Acceptance for the completed BHS/CBIS alterations, including all upper- and lower-level controls, a sixty (60) day operational period shall commence in which the Cedar Rapids Airport Commission shall put all systems into on-line operations processing the daily flow of baggage.
2. During the first thirty (30) days this operational period, provide full-time technical site representation during the hours of operation with a minimum of 16 hours per day, 7 days per week. Ensure the representatives are capable and duly qualified to provide service for any problems that occur during this period. At minimum, provide one qualified

personnel per shift to trouble shoot and immediately resolve any problems that might arise. The contractor's onsite personnel shall be capable of troubleshooting and resolving all electrical and controls related issues. After the initial 30 days of onsite support the contractor shall provide an additional 30 days of On-call support. A VPN shall be provided to the contractor to facilitate on-call support.

3. Should any downtime occur during these hours due to major faults in the BHS (i.e., PLC fault, motor overloads, motor faults, or any other faults deemed major by the Cedar Rapids Airport Commission) the contractor will be responsible for immediate rectification and assisting the Cedar Rapids Airport Commission in any way to prevent impact to operations.
4. During the operational period, keep a detailed computer log as detailed in the submittal requirements specified in Part 1 herein.
5. If, at the Cedar Rapids Airport Commission's discretion, site representation is deemed unnecessary, it shall be discontinued and the Cedar Rapids Airport Commission shall receive a prorated credit.
6. If a problem occurs in the BHS, and the Cedar Rapids Airport Commission has elected to not require full-time technical site representation during the operation period, supply the name(s), address(s), and a 24-hour phone number of representative(s) that can be contacted who have the authority and experience to make immediate recommendations and assist the Cedar Rapids Airport Commission to return the system to a fully online state in the shortest possible time frame.

D. Conditional Acceptance with Defects
1. If the System is found to be unacceptable at the time of condition acceptance inspection and testing, the Cedar Rapids Airport Commission or their representative will issue a written Defects List report containing information about the specific defects that shall be remedied before final acceptance may be granted. At this time, if the defects do not affect the functionality of the system, the Cedar Rapids Airport Commission or their representative may elect to advise in writing that Conditional Acceptance with Defects has been granted. All terms presented in the Conditional Acceptance section herein shall apply.
2. A Conditional Acceptance with Defects status, if issued, will indicate that the Cedar Rapids Airport Commission has approved the equipment as worthy for operational use. Subsequent to Conditional Acceptance with Defects issuance, the operational period will commence in which the Cedar Rapids Airport Commission will bring the system online to process live baggage. The Cedar Rapids Airport Commission will maintain the right to judge whether any hazard can exist to personnel or equipment due to unacceptable inspection results and revoke this approval. In case the approval is revoked, the operational period will be suspended until the hazard is remedied.
3. The Cedar Rapids Airport Commission will be entitled to retain from the project payments an amount commensurate with the value of work remaining to be accomplished. Further, all outstanding work shall be performed at times during periods convenient to the Cedar Rapids Airport Commission and to the requirements of a fully operating system.
4. Notify the Cedar Rapids Airport Commission within the operational period that all outstanding items on the Defects List have been corrected and that inspection and testing may continue. When all items have been approved in accordance with these specifications, this shall conclude inspection and testing of the BHS. Only the remaining time of the operational period will be required prior to application of the final acceptance conditions.

E. Delayed Conditional Acceptance with Defects List

1. If the system is found to be functionally unacceptable at the time of conditional acceptance inspection and testing, the Cedar Rapids Airport Commission or their representative will issue a written Defects List report containing information about the specific defects that shall be remedied before the operational period begins.
2. Items appearing on the Defects List will be considered incomplete, defective or not in conformance with these specifications. The failure to include certain items does not alter the responsibility to complete the System in accordance with the contract documents.
3. A maximum period of 15 days shall be allowed to correct the outstanding items on the Defects List.
4. After all the items on the Defects List have been corrected, notify the Cedar Rapids Airport Commission or their representative that the system is ready for continuing conditional acceptance inspection and testing.
5. Upon completion of Conditional Acceptance Inspection and Testing, the terms presented in the Conditional Acceptance or Conditional Acceptance with Defects List sections herein will apply, as appropriate.

F. Final Acceptance
   1. Final acceptance will only be considered after all phases/activities have conformed to the conditional acceptance terms, all phases/activities have successfully completed the operational period, and the following criteria are met:
      a. The system has not experienced repeated repairs and adjustments and is achieving the specified rate, accuracy, and availability standards as specified herein.
      b. The system has successfully completed the specified inspections and testing with no outstanding punch list items.
      c. The Cedar Rapids Airport Commission and all other governing agencies complete their inspections and given their approvals.
      d. Certificates of installation compliance are issued to the Cedar Rapids Airport Commission.
      e. Warranties for all materials and equipment received from subcontractors and suppliers are assigned to the Cedar Rapids Airport Commission.
      f. A spare parts and tools audit is conducted and all tools have been turned over to the Cedar Rapids Airport Commission. All spare parts purchased by the Cedar Rapids Airport Commission are delivered.
      g. The PLC and source codes for all programs in the BHC system have been provided to the Cedar Rapids Airport Commission.
      h. Accurate record (as-built) drawings and all manuals as specified herein are delivered.
      i. O&M training is completed.
      j. Final O&M manuals are delivered for the complete system.

END OF PART 4